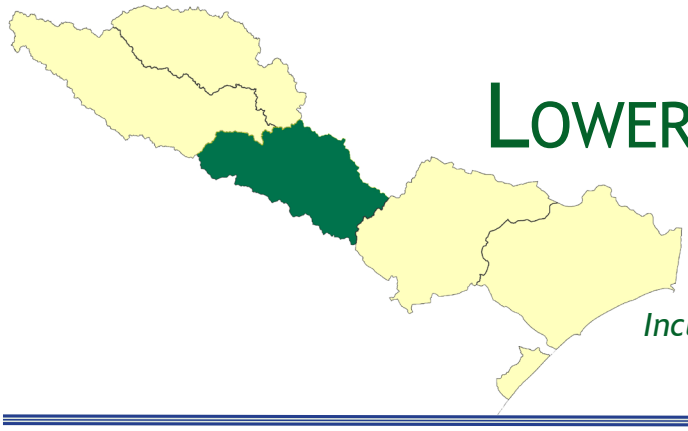


Lower Tar River Subbasin

Subbasin HUC 03020103

Includes the Tar River and Tributaries

Water Quality Overview:

This subbasin funnels water from the Tar River tributaries before entering the Pamlico Estuary and collectively delivers accumulated concentrations of stressors (e.g., nutrients) directly to the estuary. Nutrient concentrations from ambient stations within this subbasin indicate TP remaining steady and below the 1991 concentrations, while TN concentrations have increased slightly. Water quality on an individual stream basis has improved; specifically the removal of Chicod Creek from the Impaired waters list is a success due to TMDL and agricultural BMPs implementation. Non-point source and development pressures continue to be a concern in the entire subbasin.

General Description

The Lower Tar River Subbasin, hydrologic unit code (HUC) 03020103, contains the mainstem Tar River from Tarboro downstream to Washington covering ~960 square miles; this area was previously delineated as DWQ subbasins 03-03-03, 03-03-05 and 03-03-06 (Figure 3-1).

The western section of the Lower Tar River Subbasin lies within the Southeastern Plains ecoregion while the eastern portion is contained in the Middle Atlantic Coastal Plain ecoregion.

The middle section of the subbasin includes approximately 40 river miles of the Tar River from the confluence of Swift Creek in Edgecombe County to the confluence of Conetoe Creek in Pitt County. It also includes the catchments of Cokey Swamp, Ballahack Canal, and Bynums Mill, Conetoe, Crisp, Otter, and Town Creeks. Land use is primarily forest and agriculture. Many streams in this area were channelized 35 or more years ago. The two areas with the greatest potential for impacts from agricultural nonpoint source pollution are the Cokey Swamp and Conetoe Creek catchments. Cokey Swamp also receives urban runoff from Rocky Mount.

The lower section of the subbasin includes approximately 35 river miles of the Tar River from the confluence of

Watershed at a Glance

Counties: Nash, Edgecombe, Wilson, Martin, Pitt, Beaufort

Municipalities: Rocky Mount, Sharpsburg, Elm City, Pinetops, Macclesfield, Tarboro, Princeville, Conetoe, Bethel, Parmele, Robersonville, Everetts, Bear Grass, Falkland, Fountain, Greenville, Simpson, Grimesland, Washington

Permitted Facilities

NPDES WWTP:.....8
- Major.....3
- Minor.....5

Non-Discharge:.....5

Stormwater:
- General.....34
- Individual.....1

Animal Operations:.....45

2000 Population: 142,407

Area: 960 sq mi.

Impervious Surface Estimate: 15 sq mi.

Primary Classifications:

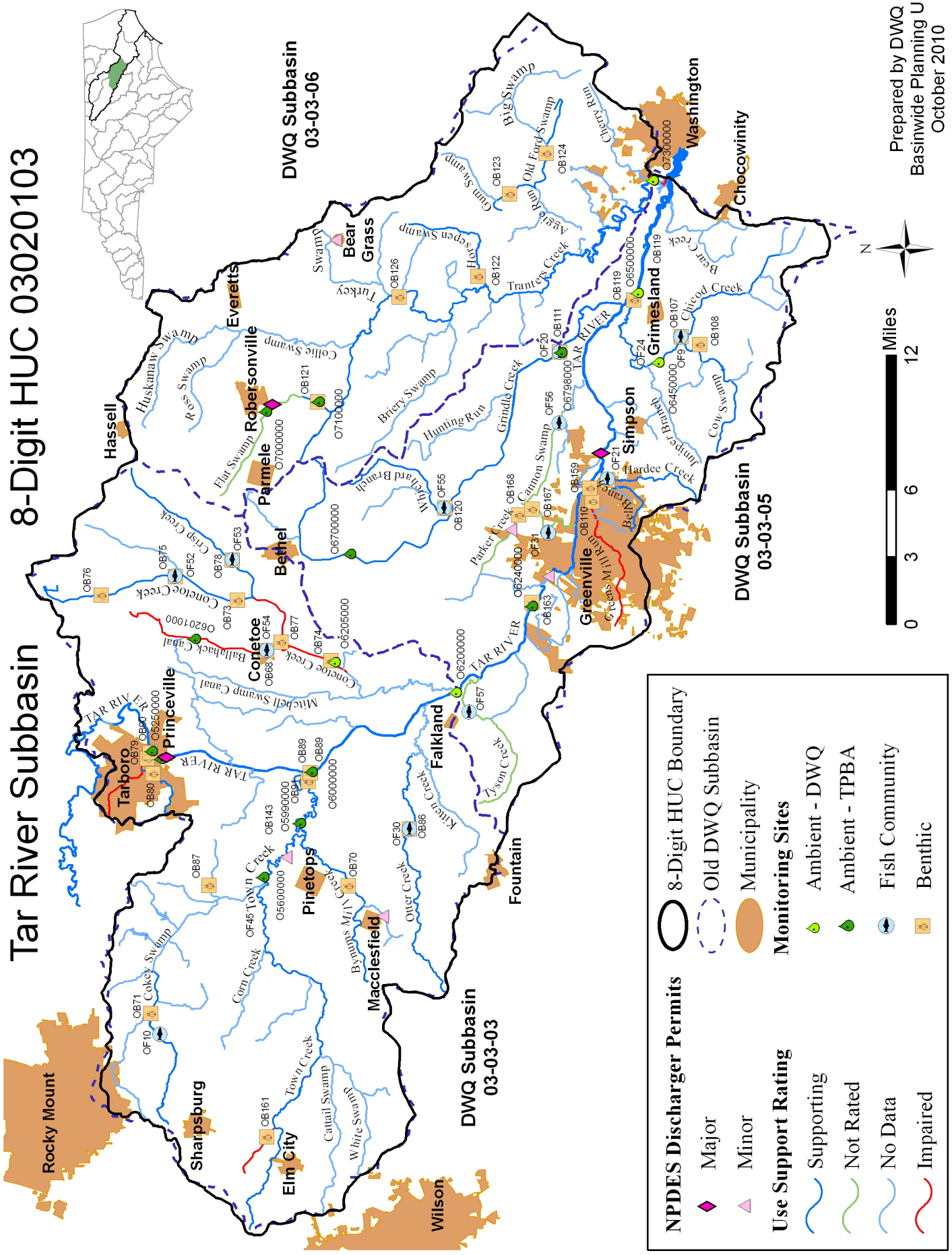
Freshwater ~Miles.....612

Supplemental Classifications miles:

B;NSW.....10
C;NSW.....397
C;Sw,NSW.....154
WS-IV;NSW.....50
WS-IV;NSW,CA.....1

Classification descriptions are found at: http://portal.ncdenr.org/web/wq/ps/csu/classifications

FIGURE 3-1. HUC 03020103 MAP



Conetoe Creek in Pitt County to just upstream of Washington, NC and the most downstream freshwater reach of the Tar River. It is located within the Mid-Atlantic Flatwoods and the Mid-Atlantic Floodplains and Low Terraces ecoregions. The main stem of the Tar River here is deep, slow flowing and tidally influenced. Chicod Creek is the major tributary with the greatest potential for nonpoint source pollution. While runoff from crop and forage lands were historic problems in this watershed, an influx of intensive poultry and hog operations during the early 1990s has become the largest nonpoint concern. Tranters Creek is another major tributary, entering the lower Tar River just above Washington (at which point HUC 03020104 begins). Subwatersheds within the lower Tar River section of this subbasin include, Green Mill Run, Cannon, Flat, Old Ford and Horsepen Swamps, Whichard Branch, Chicod, Grindle, Hardee, Parker, Tranters and Tyson Creeks.

Current Status and Significant Issues

Use Support Assessment Summary

All surface waters in the state are assigned a classification reflecting the best-intended use of that water. Chemical, physical, and biological parameters are regularly assessed by DWQ to determine how well waterbodies are meeting their best-intended use. These data are used to develop use support ratings every two years as reported to EPA. The collected list of all monitored waterbodies and their water quality rating is called the Integrated Report (IR). Water not meeting surface water standards are rated as Impaired and reported on the 303(d) list. Water quality evaluation levels and how a waterbody earns a rating of Supporting or Impaired is explained in detail in the IR methodology. The 2010 IR is based on data collected between 2004 and 2008; the IR and methodology are available on the DWQ Modeling/TMDL website: **http://portal.ncdenr.org/web/wq/ps/mtu/assessment**. The most current use support ratings for this subbasin are in Appendix 3A.

In this subbasin, use support ratings were assigned for aquatic life, recreation, fish consumption, and water supply categories. Waters are either Supporting, Impaired, Not Rated, or No Data in the aquatic life and recreation categories on a monitored or evaluated basis. All waters are Impaired in the fish consumption category on an evaluated basis, based on statewide fish consumption advice issued by the **Department of Health and Human Services**. All waters are Supporting in the water supply category. This evaluation is based on reports from Division of Environmental Health regional water treatment plant consultants.

General Biological Health

Biological samples at 20 benthic macroinvertebrate sites and eight fish community sites were sampled as part of the basinwide sampling cycle. Eastern North Carolina experienced extreme drought in 2007, which was more pronounced than the drought of 2002. Decreased runoff in 2007 contributed to less pollution entering streams; water chemistry data support this conclusion. At nearly all the sites sampled in 2007, pH and specific conductance values were lower than in 2002. Tables 3-1 and 3-2 provide summaries of benthic and fish sample site results and a description of the stream location to correspond to Figure 3-1. Site specific information is available in Appendix 3B and the entire Biological Assessment Report can be found at: **http://www.esb.enr.state.nc.us/documents/2008TARbasinwiderptfinal.pdf**.

Benthos Community Sampling Summary

The 20 benthic sites consisted of five summer sites (Coastal A and B) and 15 winter sites (Swamps). Of the five summer sites, one rated Excellent (Tar River-OB89), two rated Good (Tar River-OB90, Town Creek) and two rated Good-Fair (Tar River-OB119, Grindle Creek). Most of the winter swamp sites rated Moderate in 2007. Three streams rated Natural (Hardee, Latham and Chicod Creeks) and only one stream had Severe Stress (Ballahack Canal).

Water quality in this subbasin appears to have slightly improved since 2002. Most sites (n=12) received the same bioclassification in 2007 that they did in 2002 with five sites showed improved ratings from 2002 to 2007 (Chicod Creek, Cokey Swamp, Bynums Mill Creek, Conetoe Creek-OB75 and Crisp Creek). Only one site declined in bioclassification (Old Ford Swamp). The most downstream site on the Tar River-OB119 was Not Rated in 2002 due to saltwater intrusion. Town Creek was not sampled in 2002 but the rating it received in 2007 was the same as in 1997; however, a tributary to Town Creek was sampled as part of a special study and received a Severe rating.

Benthic macroinvertebrate communities and habitat characteristics were surveyed at an additional five stream sites in eastern Edgecombe and central Pitt counties during March 2004, to assist the Ecosystem Enhancement Program in prioritizing restoration sites. Holly Creek, Crisp Creek and Cow Swamp received Moderate bioclassifications and were considered impacted due to rural nonpoint source pollution (e.g., agriculture, residences, deforested areas). Greens Mill Run and Hendricks Creek catchments are dominated by urban runoff and associated high flow events resulting in very severe bank erosion and scour leading to a Severe bioclassification results.

Table 3-1. Benthos Biological Sample Results

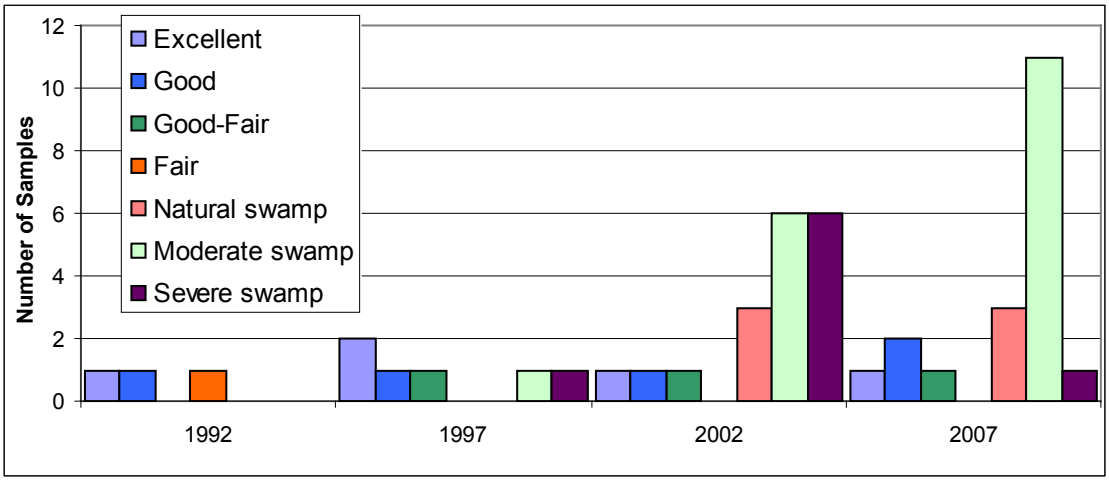
Site ID*	Waterbody	Description	Location	County	AU#.	Date	BioClass
OB87	Sasnet Mill Br	From source to Cokey Swamp	SR 1222	Edgecombe	28-83-3-3	2/7/01	Not Rated
OB161 Special Study	UT Town Cr	From source to Town Creek	SR1400	Wilson	28-83ut8	2/7/07	Severe
OB91	Town Cr	From source to Tar River	SR 1601	Edgecombe	28-83	6/27/07	Good
OB80	Holly Cr	From source to Hendricks Creek	US 64A	Edgecombe	28-81-1	3/1/04	Moderate
OB79	Hendricks Cr	From source to Tar River	St James St	Edgecombe	28-81	3/1/04	Severe
OB90	Tar R	From Tarboro Raw Water Supply Intake to Suggs Creek	US 64 BUS	Edgecombe	28-(80)	6/27/07	Good
OB89	Tar R	From Tarboro Raw Water Supply Intake to Suggs Creek	NC 42	Edgecombe	28-(80)	6/28/07	Excellent
OB163 Special Study	Tar R	From 030303/030305 boundary to Johnsons Mill Creek	US 264	Pitt	28-(84)b	6/25/07	Excellent
OB159	Tar R	From Greenville Raw Water Supply Intake to 1.2 miles downstream of the mouth of Broad Run	US 264A	Pitt	28-(94)	6/25/07	Excellent
OB119	Tar R	From a point 1.2 miles downstream of the mouth of Broad Run to the upstream side of the mouth of Tranters Creek	SR 1565	Pitt	28-(99.5)	6/26/07	Good-Fair
OB91	Town Cr	From source to Tar River	SR 1601	Edgecombe	28-83	6/27/07	Good
OB71	Cokey Swp	From source to Dickson Branch	NC 43	Edgecombe	28-83-3a	2/8/07	Moderate
OB70	Bynums Mill Cr	From source to Town Creek	SR 1120	Edgecombe	28-83-4	2/7/07	Moderate
OB86	Otter Cr	From source to a point 0.7 mile upstream of Kitten Creek	SR 1614	Edgecombe	28-86-(0.3)	2/7/07	Moderate
OB76	Conetoe Cr	From source to SR 1516	SR 1516	Edgecombe	28-87-(0.5)a	2/6/01	Not Rated
OB75	Conetoe Cr	From SR 1516 to 1350 meters North of NC 42	SR 1510	Edgecombe	28-87-(0.5)b	2/6/07	Moderate

Site ID*	Waterbody	Description	Location	County	AU#.	Date	BioClass
OB73	Conetoe Cr	From 1350 meters North of NC 42 to Crisp Creek	NC 42	Edgecombe	28-87-(0.5)c	2/6/07	Moderate
OB77	Conetoe Cr	From Crisp Creek to Pitt County SR 1404	US 64A	Pitt	28-87-(0.5)d	2/6/01	Fair
OB74 special study	Conetoe Cr	From Crisp Creek to Pitt County SR 1404	SR 1409	Pitt	28-87-(0.5)d	11/2/00	Poor
OB78	Crisp Cr	From source to Conetoe Creek	SR 1527	Edgecombe	28-87-1	2/6/07	Moderate
OB68	Ballahack Canal	From source to Conetoe Creek	NC 42	Edgecombe	28-87-1.2	2/6/07	Severe
OB168	Parker Cr	From source to Tar River	SR 1579	Pitt	28-95	6/25/09	Poor
OB167	Parker Cr	From source to Tar River	SR 1591	Pitt	28-95	6/25/09	Poor
OB110	Greens Mill Run	From source to Tar River	Greensprings Park	Pitt	28-96	3/2/04	Severe
OB112	Hardee Cr	From source to Tar River	NC 33	Pitt	28-97	2/14/07	Natural
OB111	Grindle Cr	From Whichard Branch to Tar River	US 264	Pitt	28-100b	6/25/07	Good-Fair
OB120	Whichard Br	From source to Grindle Creek	SR 1521	Pitt	28-100-2	2/13/07	Moderate
OB107	Chicod Cr	From source to Tar River	SR 1777	Pitt	28-101	2/14/07	Natural
OB108	Cow Swp	From source to Chicod Creek	SR 1756	Pitt	28-101-5	3/2/04	Moderate
OB126	Tranters Cr	From source to subbasin 030305/030306 boundary	SR 1552	Edgecombe	28-103a	2/13/07	Moderate
OB121	Flat Swp	From 1.5 miles downstream of Robersonville WWTP discharge to Tranters Creek	SR 1157	Martin	28-103-2b	2/13/07	Moderate
OB124	Old Ford Swp	From source to Aggie Run	US 17	Beaufort	28-103-14-1	2/12/07	Moderate
OB123	Lathams Cr	From source to Aggie Run	SR 1410	Beaufort	28-103-14-2	2/12/07	Natural
OB122	Horsepen Swp	From source to Tranters Creek	SR 1001	Beaufort	28-103-10	2/13/07	Moderate

Bioclassification of Excellent, Good, Natural, Good-Fair, Not Impaired or Moderate Stress = Supporting
Fair, Severe, Severe Stress or Poor = Impaired
* Coordinates with Station ID on Figure 3-1

The bioclassification trends for this subbasin are shown in Figure 3-2. In terms of non-swamp streams, there has been little change in bioclassification trends in this subbasin overtime. However, many of the swamp samples in this subbasin improved in bioclassification, with the largest shift being sites improving from Severe Stress to Moderate Stress. Examples of this trend included Crisp Creek-OB78, Conetoe Creek-OB75, Cokey Swamp-OB71, and Bynums Mill Creek-OB70. The most striking example of a site with a nonpoint dominated

Figure 3-2. Bioclassification Trends in HUC 03020103



watershed improving bioclassification due to drought was observed at Chicod Creek-OB107 which improved from Severe swamp in 2002 to Natural swamp in 2007.

Fish Community Sampling Summary

The fish community metrics for Coastal Plain streams are currently under development; therefore all eight of the fish community samples in this subbasin received a Not Rated classification. The eight waterbodies sampled for fish communities represent either streams with natural channels or channelized streams. Tyson Creek is the best example of a waterbody with a natural channel in this subbasin. In natural or less modified streams, fish densities are typically lower than in channelized systems. In the channelized Parker Creek and Cannon Swamps, fish densities were very high, constituting the second and third highest catch rate of fish sites in the Tar Basin in 2007.

Of the eight streams sampled in 2007, fish have been previously collected at two of them, Cokey Swamp (in 1997) and Parker Creek (in 2002). Both streams saw an increase in the number of species collected in 2007.

Table 3-2. Fish Community Sample Results

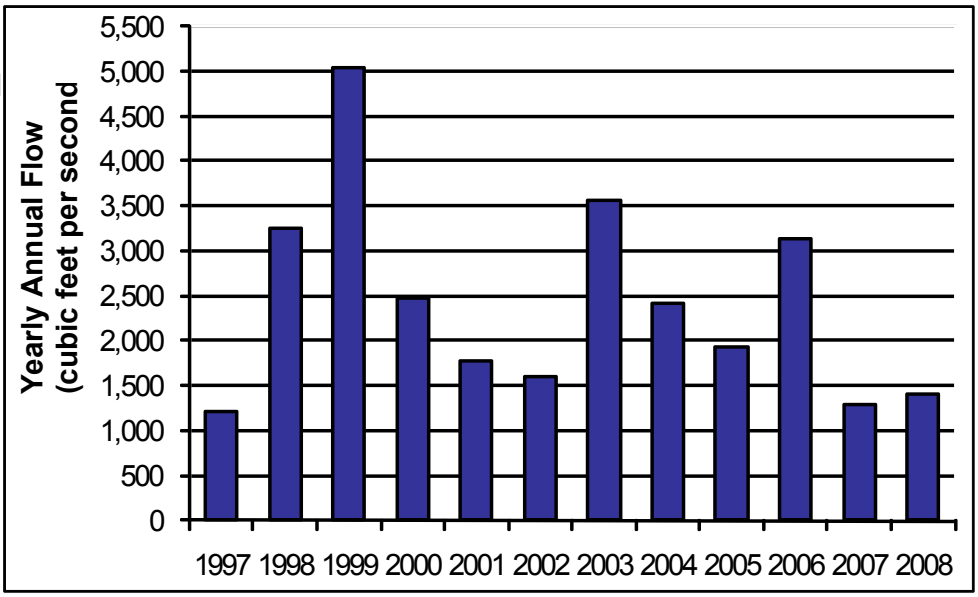
Site ID*	Waterbody	Description	Location	County	AU#	Date	NCIBI Rating
OF9	Chicod Cr	From source to Tar River	SR 1777	Pitt	28-101	4/16/02	Not Rated
OF10	Cokey Swp	From source to Dickson Branch	SR 1135	Edgecombe	28-83-3a	5/09/07	Not Rated
OF20	Grindle Cr	From Whichard Branch to Tar R	US 264	Pitt	28-100b	4/16/02	Not Rated
OF21	Hardee Cr	From source to Tar River	NC33	Pitt	28-97	4/16/02	Not Rated
OF30	Otter Cr	From source to a point 0.7 mile upstream of Kitten Creek	SR 1614	Edgecombe	28-86-(0.3)	4/17/02	Not Rated
OF52	Conetoe Cr	From SR 1516 to 1350 meters North of NC 42	SR 1510	Edgecombe	28-87-(0.5)b	5/09/07	Not Rated
OF53	Crisp Cr	From source to Conetoe Creek	SR 1527	Edgecombe	28-87-1	5/09/07	Not Rated
OF54	Ballahack Canal	From source to Conetoe Creek	NC 42	Edgecombe	28-87-1.2	5/09/07	Not Rated
OF57	Tyson Cr	From source to Tar River	SR 1255	Pitt	28-88	5/10/07	Not Rated
OF31	Parker Cr	From source to Tar River	NC 33	Pitt	28-95	5/10/07	Not Rated
OF56	Cannon Swp	From source to Moyes Run	US 264	Pitt	28-99-1-1	5/10/07	Not Rated
OF55	Whichard Br	From source to Grindle Creek	SR 1521	Pitt	28-100-2	5/10/07	Not Rated

Not Rated = Fish community metrics and criteria have yet to be developed for Coastal Plain streams
* Coordinates with Station ID on Figure 3-1

Stream Flow

Stream flow is monitored at U.S. Geological Survey gaging stations. Flow, often abbreviated as "Q", is measured in terms of volume of water per unit of time, usually cubic feet per second (cfs). There are nine gaging stations in this subbasin. Figure 3-3 provides an example of average stream flow over a 12 year period and gives an idea of which years received heavier precipitation. For more information about instream flow see DWR website: http://www.ncwater.org/About_DWR/Water_Projects_Section/Instream_Flow/welcome.html

Figure 3-3. Stream Flow at USGS 02084000 Tar River in Greenville (Yearly Average based on Daily Means)



Ambient Data

Subbasinwide, monthly chemical and physical samples are taken by DWQ (6 stations) and by the Tar Pamlico Basin Association (10 stations), starting in 2007. A majority of the ambient stations are associated with waterbody locations where potential pollution could occur from known land use activities. There are also portions of the subbasin where no water quality data are collected; therefore, we cannot evaluate the condition of the water quality in those areas. Parameters collected depend on the waterbody classification, but typically include conductivity, dissolved oxygen, pH, temperature, turbidity, nutrient measurements, metals, and fecal coliform. Each classification has an associated set of standards the parameters must meet in order to be considered supporting its designated uses. Stressors are either chemical parameters or physical conditions that at certain levels prevent waterbodies from meeting the standards for their designated use. Ten sample results are required within the five year data collection window in order to evaluate the water quality parameter and compare it to the water quality standards. Ambient stations are listed in Table 3-3, and their locations are found in Figure 3-1 and on watershed maps provided in Appendix 3D.

Table 3-3. Ambient Stations in HUC 03020103

Station ID	Agency	Active Since	Waterbody	AU#	Station Location	Stressors
O5250000	Both	8/6/73	Tar River	28-(80)	NC 33 And US 64 Bus at Tarboro	-
O5600000	TPBA	3/1/07	Town Creek	28-83	NC 111 SR 1202 near Wiggins Crossroads	Low DO, Low pH
O5990000	TPBA	3/1/07	Town Creek	28-83	US 258 near Cobbs Crossroads	Low DO, Low pH
O6000000	TPBA	3/1/07	Tar River	28-(80)	NC 42 at Old Sparta	-
O6200000	NCAMBNT	10/10/73	Tar River	28-(84)a	NC 222 near Falkland	-
O6201000	TPBA	3/1/07	Ballahack Canal	28-87-1.2	SR 1526 near Conetoe	Low DO, Low pH, Turbidity, Fecal Coliform Bacteria
O6205000	NCAMBNT	8/1/84	Conetoe Creek	28-87-(0.5)d	SR 1409 near Bethel	Low DO, Low pH
O6240000	TPBA	11/16/05	Tar River	28-(84)b	US 264 Byp near Greenville	-

Station ID	Agency	Active Since	Waterbody	AU#	Station Location	Stressors
O6450000	NCAMBNT	8/1/84	Chicod Creek	28-101	SR 1760 near Simpson	Low DO, Low pH, Fecal Coliform Bacteria
O6500000	NCAMBNT	7/5/68	Tar River	28-(99.5)	SR 1565 near Grimesland	
O6700000	TPBA	3/1/07	Grindle Creek	28-100a	SR 1427 near Bethel	
O6798000	TPBA	3/1/07	Grindle Creek	28-100b	US 264 at Pactolus	
O7000000	TPBA	3/1/07	Flat Swamp	28-103-2a	SR 1159 Third St at Robersonville	Fecal Coliform Bacteria
O7100000	TPBA	3/1/07	Flat Swamp	28-103-2b	SR 1157 near Robersonville	Turbidity, Fecal Coliform Bacteria
O7300000	NCAMBNT	10/10/73	Tranters Creek	28-103a	SR 1403 near Washington	Chlorophyll a

TPBA= Tar Pamlico Basin Association, NCAMBNT= DWQ
"-" indicates no stressors identified

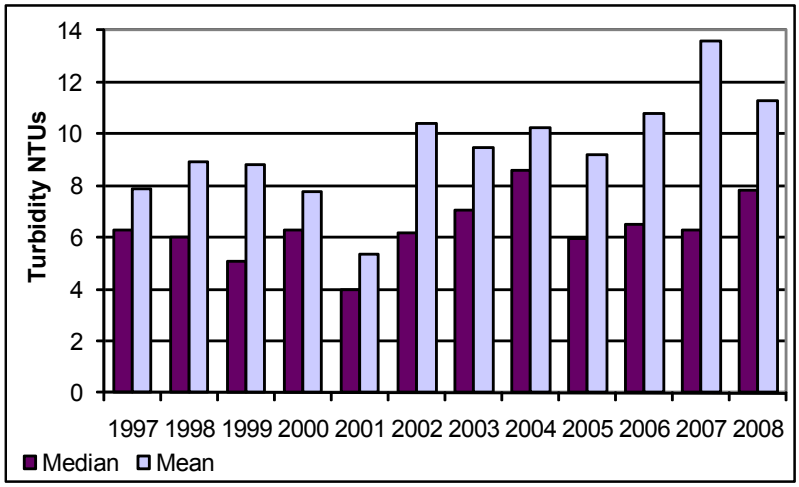
The following discussion of ambient monitoring parameters includes graphs showing the median and mean concentration values for all ambient stations (n=15) in this subbasin for a specific parameter over each year. These graphs are not intended to provide statistically significant trend information or loading numbers, but rather provide an idea of how changes in land use or climatic conditions effect parameter readings over the long term. The difference between median and mean results indicate the presence of outliers in the dataset. Box and whisker plots of individual ambient stations were completed by parameter for data between 2002-2007 and can be found in the Ambient Monitoring report: http://portal.ncdenr.org/c/document_library/get_file?uuid=994c08a8-a98d-4ff5-9425-656cadf8cfa4&groupId=38364. Summary sheets for ambient data are found in Appendix 3C.

Turbidity

The turbidity standard for freshwater (Class C) streams is 50 NTUs. Currently, Ballahack Canal at SR 1526 near Conetoe (AU# 28-87-1.2) indicated turbidity as a stressor (3 out of 10 samples exceeded 50 NTUs) and is considered Impaired. One out of 10 samples in Flat Swamp at SR 1157 near Robersonville (AU# 28-103-2a) also exceeded turbidity standards.

Turbidity is a measure of cloudiness in water and is often accompanied with excessive sediment deposits in the streambed. Excessive sediments deposited on stream and lake bottoms can choke spawning beds (reducing fish survival and growth rates), harm fish food sources, fill in pools (reducing cover from prey and high temperature refuges), and reduce habitat complexity in stream channels. Excessive suspended sediments can make it more difficult for fish to find prey and at high levels can cause direct physical harm, such as clogged gills. Sediments can cause taste and odor problems, block water supply intakes, foul treatment systems, and fill reservoirs. (USEPA, 1999 and Waters, 1995). It is important to note that the turbidity standard does not capture incident duration or the amount of sedimentation, both of which can impact aquatic species. Increasing turbidity levels is of special concern in

Figure 3-4. Summarized Turbidity values for all data collected at Ambient Stations in HUC 03020103



this basin as phosphorous binds to sediment and is transported downstream and can contribute to nutrient enrichment conditions in the estuary.

Figure 3-4 shows data from 1,078 samples over the 12 year period, of which only 10 samples (1%) had results over 50 NTUs. Turbidity exceedances are likely a result of specific incidences (land use disturbance) and are not a subbasinwide issue.

Fecal Coliform Bacteria

The fecal coliform bacteria standard for freshwater streams is not to exceed the geomean of 200 colonies/100ml or 400 colonies/100ml in 20% of the samples where five samples have been taken in a span of 30 days (5-in-30). Only results from a 5-in-30 study are to be used to indicate whether the stream is Impaired or Supporting. Waters with a classification of B (primary recreation water) will receive priority for 5-in-30 studies. Other waterbodies will be studied as resources permit. Data through 2007 indicate several streams where bacteria colony numbers exceeded 400 colonies/100ml. Streams currently impacted by fecal coliform bacteria include:

Ballahack Canal (C, NSW) at SR 1526 near Conetoe (AU# 28-87-1.2)
Conetoe Creek (C, NSW) at SR 1409 near Bethel (AU# 28-87-(0.5)d)
Flat Swamp (C, Sw,NSW) near Robersonville (AU#s 28-103-2a & 28-103-2b)
Chicod Creek (C, NSW) at SR 1760 near Simpson (AU# 28-101)

The presence of fecal coliform bacteria in aquatic environments indicates that the water has been contaminated with the fecal material of humans or other warm-blooded animals. At the time this occurred, the source water might have been contaminated by pathogens or disease producing bacteria or viruses that can also exist in fecal material. The presence of fecal contamination is an indicator that a potential health risk exists for individuals exposed to this water. Fecal coliform bacteria may occur in ambient water as a result of the overflow of domestic sewage or nonpoint sources of human and animal waste.

Figure 3-5. Summarized Fecal Coliform Bacteria numbers for all data collected at Ambient Stations in HUC 03020103

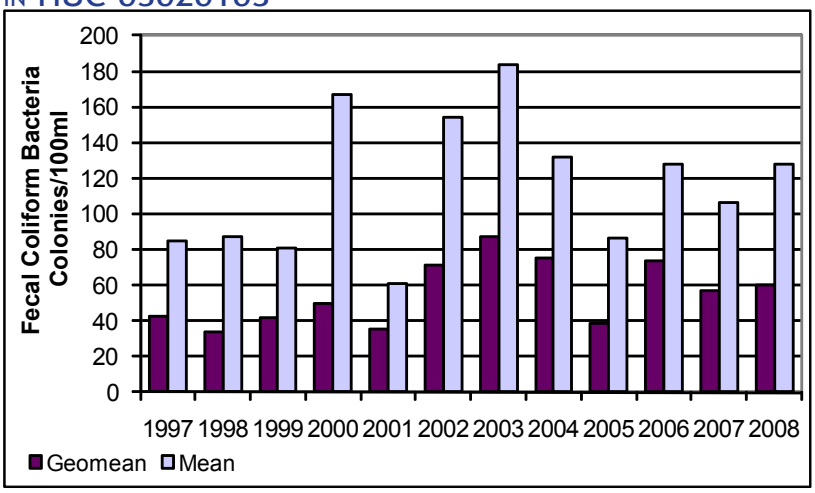


Figure 3-5 shows data from 1,081 samples over the 12 year period, of which 67 samples (6%) had fecal coliform bacteria levels above 400 colonies/100ml.

Dissolved Oxygen

The dissolved oxygen (DO) water quality standard for Class C waters is not less than a daily average of 5.0 mg/L with a minimum instantaneous value of not less than 4 mg/L, the latter standard being the most commonly used. Swamp waters may have lower values if the low DO level is caused by natural conditions. Dissolved oxygen can be produced by wind or wave action that mix air into the water or through aquatic plant photosynthesis. During the day, DO levels are higher when photosynthesis occurs and they drop at night when respiration occurs by aquatic organisms. High levels are found mostly in cool, swift moving waters and low levels are found in warm, slow moving waters. In slow moving waters, such as reservoirs or estuaries, depth is also a factor. Wind action and plants can cause these waters to have a higher dissolved oxygen

concentration near the surface, while biochemical reactions lower in the water column may result in concentration as low as zero at the bottom.

There are many sites in the basin that have low DO measurements. However, most of these sites were first sampled during the 2007 drought; the Tar Pamlico Basin Association sites began monitoring in March 2007. Nearly the entire monitoring history for these sites was during the 2007-08 drought, which, due to drops in flow, suppressed dissolved oxygen levels. Additional monitoring data during non-drought conditions will aid in identifying whether DO conditions are altered by anthropogenic pollutants.

Figure 3-6. Summarized Dissolved Oxygen Levels for all data collected at Ambient Stations in HUC 03020103

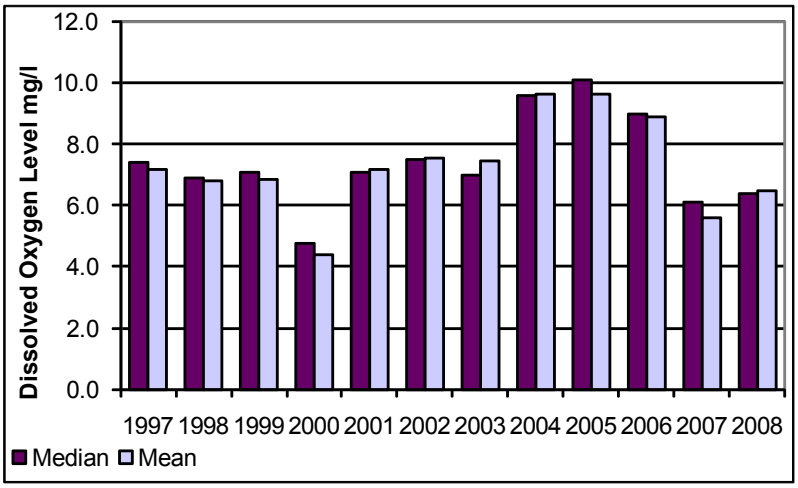


Figure 3-6 represents results from 769 samples collected over a 12 year period, of which 180 samples (23%) had instantaneous readings below 4 mg/L. A majority of the low DO levels occurred during the 2007-08 drought.

pH

The water quality standard for pH in surface freshwater is 6.0 to 9.0 standard units. Swamp water (supplemental Class Sw) may have a pH as low as 4.3 if it is the result of natural conditions. pH is a measure of hydrogen ion concentration that is used to express whether a solution is acidic or alkaline (basic). Values outside the 6.0-9.0 standard unit range can have chronic effects on the community structure of macroinvertebrates, fish and phytoplankton. The following waterbodies have experienced low pH levels at the sample sites.

Town Creek near Wiggins Crossroads (AU#28-83)
Ballahack Canal at SR 1526 near Conetoe (AU# 28-87-1.2)
Conetoe Creek at SR 1409 near Bethel (AU# 28-87-(0.5)d)

Figure 3-7. Summarized pH values for all data collected at Ambient Stations in huc 03020103

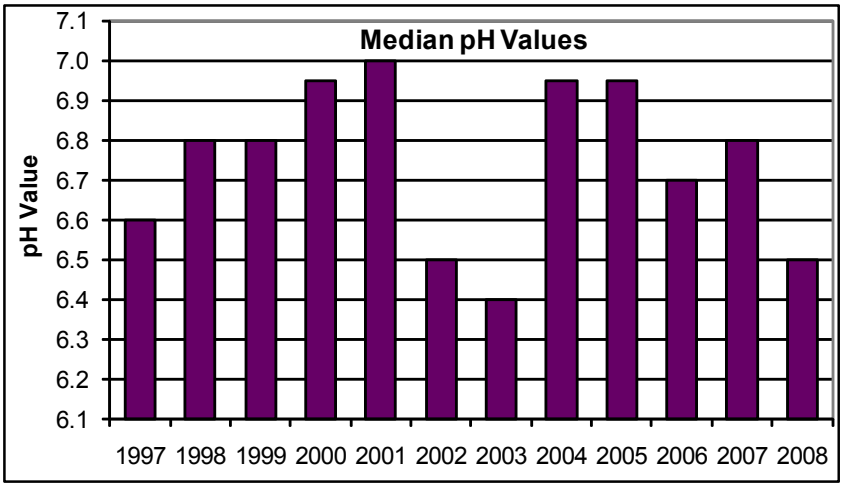


Figure 3-7 graph shows data from 1,329 samples over the 12 year period, of which only 113 samples (9%) had low pH readings.

Nutrient Enrichment

Compounds of nitrogen and phosphorus are major components of living organisms and thus are essential to maintain life. These compounds are collectively referred to as "nutrients". Nitrogen compounds include ammonia as nitrogen (NH_3), Total Kjeldahl Nitrogen (TKN), and nitrite+nitrate nitrogen (NO_2+NO_3). Total nitrogen (TN) is the sum of TKN and NO_2+NO_3. Phosphorus is measured as total phosphorus (TP) by DWQ. When nutrients are introduced to an aquatic ecosystem from municipal and industrial treatment processes or runoff from urban or agricultural land, the growth of algae and other plants may be accelerated. In addition to the possibility of causing algal blooms, ammonia-nitrogen may combine with high pH water to form ammonium hydroxide (NH_4OH), a form toxic to fish and other aquatic organisms.

Due to excessive levels of nutrients resulting in massive algal blooms and fish kills the entire Tar-Pamlico River Basin was designated as Nutrient Sensitive Water (NSW) in 1989. This designation resulted in the development and implementation of a nutrient management strategy to achieve a decrease in TN by 30% and no increase in TP loads compared to 1991 conditions. Even though implementation of the strategy has occurred by wastewater treatment dischargers, municipal stormwater programs, and agriculture, nutrient enrichment continues to be cumulatively impacting the Pamlico Estuary. A review of the NSW strategy, including implementation activities, progress towards meeting the loading goals and additional actions are discussed in Chapter 6.

Basin trend analyses were completed for nutrient concentration and daily loads to evaluate progress towards meeting TMDL reduction goals, as discussed in detail in the NSW Chapter 6. These analyses detected a statistically significant increase in TKN concentration and a decrease in NH_3 and NO_2+NO_3. There were no basinwide detected trends for TN or TP concentrations. TKN is defined as total organic nitrogen and NH_3. An increase in organic nitrogen is the likely source for the increase in TKN concentrations since NH_3 concentrations have decreased basinwide. Further analysis of these parameters were completed on a subbasin scale to determine whether concentrations changed over an 11 year time period. Currently, NC does not have nutrient standards; however, NC normal nutrient levels in class C waters are typically:

TP = < 0.05 mg/L
TN= < 0.8 mg/L
TKN= <0.5 mg/L
NH_3= < 0.05 mg/L

In early 2001, the DWQ Laboratory Section reviewed its internal Quality Assurance/Quality Control (QA/QC) programs and analytical methods. This effort resulted in a marked increase in reporting levels for certain parameters. New analytical equipment and methods were subsequently acquired to establish new lower reporting levels and more scientifically supportable quality assurance. As a result, the reporting levels quickly dropped back down to at or near the previous reporting levels. Nutrients were especially affected by these changes, as shown below:

	Reporting Level by Date (mg/L)			
Parameter	Pre-2001	3/13/2001 to 3/29/2001	3/30/2001 to 7/24/2001	7/25/2001 to present
NH_3	0.01	0.05	0.2	0.01
TKN	0.1	1.0	0.6	0.2
NO_2+NO_3	0.01	0.5	0.15	0.01
TP	0.01	0.5	0.1	0.02
Note: Do not let increased reporting levels be interpreted as a sudden upward trend. The DWQ Laboratory Section cautions that the establishment of minimum reporting levels may have been inconsistent and undocumented prior to those established in July 2001.				

Figure 3-8 represents data over a 12 year period, where 4,316 samples were taken, of which 4,079 (95%) samples had TP levels above 0.05 mg/L. These data and the estuarine algal response to nutrient loading indicates TP inputs to streams continues to be a problem.

For comparison, 1991 TP concentration data, shown in green: Median= 0.13 Mean = 0.11

Figure 3-8. Summarized Total Phosphorus values for all data collected at Ambient Stations in HUC 03020103

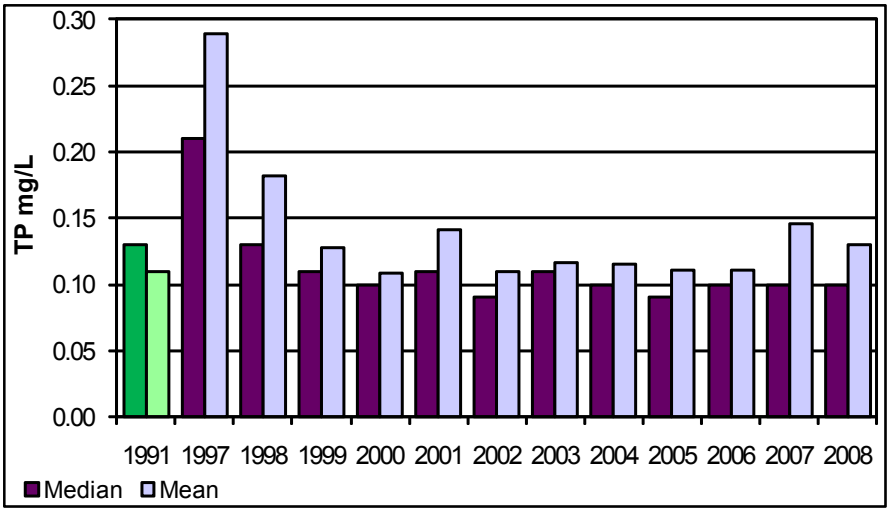


Figure 3-9. Summarized Total Nitrogen values for all data collected at Ambient Stations in HUC 03020103

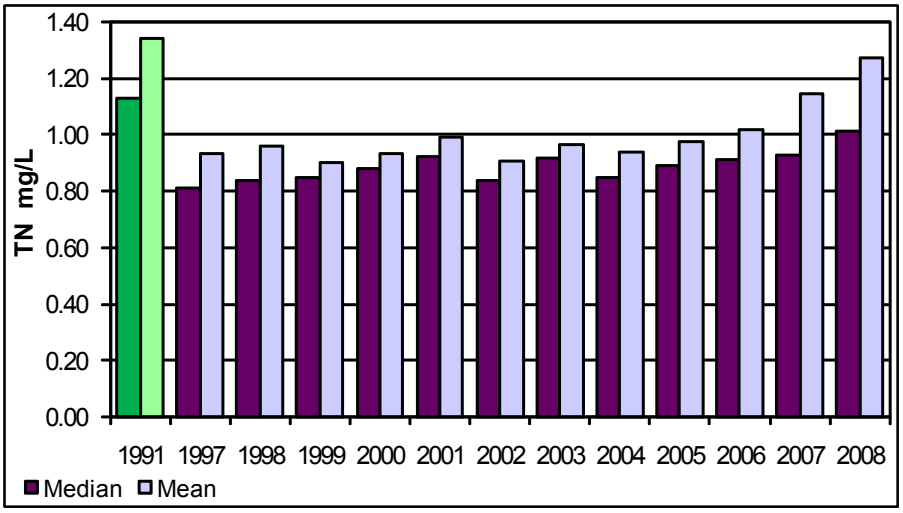


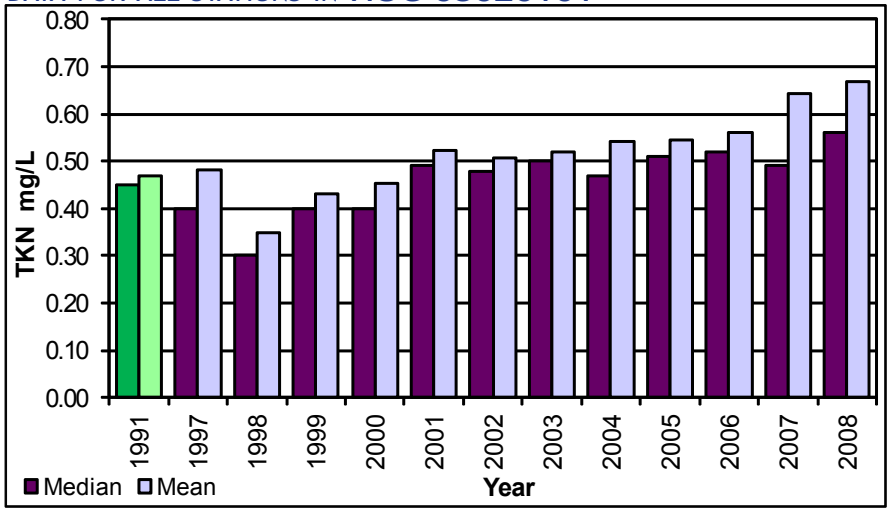
Figure 3-9 represents data from 4,307 samples collected over 12 years, of which 2,717 (63%) of them had TN levels above 0.8 mg/L. These data and the estuarine algal response to nutrient loading indicates TN inputs to streams continues to be a problem.

For comparison, 1991 TN concentration data, shown in green: Median= 1.13 Mean = 1.34

The noted basinwide TKN increase is also seen in TKN concentrations summarized for all stations within this subbasin (Figure 3-10). This subbasin is influenced by organic nitrogen inputs for HUCs 03020101 & 03020103.

For comparison, 1991 TKN concentration data, shown in green: Median= 0.45 Mean = 0.47

Figure 3-10. Summarized TKN concentration data for all stations in HUC 03020101



Restoration and Protection Opportunities

The following section provides more detail about specific streams where special studies have occurred or stressor sources information is available. Specific stream information regarding basinwide biological samples sites are available in Appendix 3B. Use support information on all monitored streams can be found in Appendix 3A. Detailed maps of each of the watersheds are found in Appendix 3D or by clicking on the following small maps. Interactive elements have been incorporated within all 10-digit watershed maps. To use the new features click on the Layers tab on the left side of the Adobe Reader window. Expand the folder tree by clicking on the (+) sign to the left of the map name. Each item in the subsequent folder tree is a layer on the map. These layers can be turned on or off by clicking the symbol to the left of the layer name. To return to your previous place within the text click the smaller map in the upper left corner of the 10-digit watershed map.

To assist in identifying potential water quality issues, we are requesting information be gathered by citizens, watershed groups and resource agencies through our Impaired and Impacted Stream/ Watershed Survey found at: http://portal.ncdenr.org/web/wq/ps/bpu/about/impactedstreamssurvey

Town Creek Watershed (0302010301)

Recommendations

Currently, there is not a sample site that can quantify nutrients draining from this watershed. Nutrient data should be collected at ambient site O5990000 to help target areas within the basin for further nutrient reductions.

Restoration Opportunities & Protection Priorities

Cokey Swamp (HUCs 030201030103 & 030201030104) is a tributary to Town Creek and drains eastern Nash and western Edgecombe counties. Cokey Swamp is currently classified as C; NSW even though physically and biologically it appears to be Swamp Waters. NC Natural Heritage Program has designated part of the subwatershed as Significant Natural Heritage Area. Since 2002 the upper 8.6 miles of the stream (AU# 28-83-3a) have been Impaired based on a Severe Stress bioclassification, however the 2007 sample showed some improvement to a Moderate Stress bioclassification leading to the stream to no longer being on the 303(d) list. Urban runoff from Rocky Mount and Sharpsburg and agriculture nonpoint source pollution potentially impact the stream. There are also several waste residual application sites located within the lower subwatershed. The potential runoff impact from these areas is unknown, but should be minimal if applied appropriately.

In 2005, the Upper Coastal Plain Council of Government and the Pamlico-Tar River Foundation received a 205j grant to identify non-point source pollution through a land use assessment of property within 100-300 feet from the stream. Their land use assessment identified potential problem areas including: tilled cropland or pastures draining to the stream or ditch networks, CAFO's, spray fields, and one lagoon located within the 100-yr floodplain. Junk and abandoned cars were found within the riparian areas within Cokey Swamp headwaters.

Upper Town Creek Subwatershed (HUC 030201030102)
Excess runoff from Elm City's WWTP spray fields prompted DWQ's Raleigh Regional Office to request samples be taken in Town Creek in 2007. This spray system consistently exceeded its limits on a weekly basis (calculated ~1.1 million gallons of runoff occurred during 2006) and was under a Special Order by Consent. Sampling results in 2007 resulted in a Severe bioclassification rating indicating degraded water quality in an unnamed tributary (UT) to Town Creek at SR 1400. This UT to Town Creek (AU# 28-83ut8 2.6 mi) is Impaired on the 2010 303(d) list.

The special sample results noted that UT to Town Creek appeared to be in the process of transforming into a wetland from the documented increased volume of water from the upstream spray field. Furthermore, the riparian habitat along this reach of stream and within the channel was degraded. Water chemistry parameters such as pH and temperature indicated warmer waters and higher pH levels characteristic of upstream point sources. The special study results concluded this waterbody did not support a diversity of aquatic macroinvertebrates. The benthic community that persisted here was made up of a smaller number of highly tolerant organisms. The Deformity Analysis revealed a slightly higher rate of deformities than the natural background rate, but that those deformities did not appear to be caused by highly toxic conditions. DWQ inspections in 2008 indicate improved management of the wastewater collection system, with reduced inflow and infiltration (I&I) maintenance of adequate lagoon freeboard and the possibility of acquiring new lagoons and spray fields locations. Additional benthic surveys will be required to indicate if the WWTP's improved management has allowed stream conditions to restore to full use.

Bynums Mill Creek (HUC 030201030106), AU# 28-83-4-1, is no longer Impaired. The 2007 sample resulted in an improved conditions of Moderate Stress swamp bioclassification, although water quality issues seem to be the main concern versus habitat conditions. Macclesfield WWTP discharges into Bynums Mill Creek; the NPDES permitted flow is 0.175 million gallons/day (MGD) and the median annual daily flow is 0.064 MGD. Parameters that have exceeded the permit limits include: pH, fecal coliform bacteria, chlorine, total suspended solids, ammonia, and BOD. The facility is receiving technical assistance from DWQ's Raleigh Regional Office to better address ammonia.

Otter Creek- Tar River Watershed (0302010302)

Restoration Opportunities

Hendricks Creek (HUC 030201030202), AU# 28-81, from source to Tar River 3.9 miles is Impaired based on a Severe bioclassification in 2004. Hendricks Creek runs through the middle of Tarboro and habitat conditions represent typical conditions in highly urbanized watersheds with very severe bank erosion and scour. The creek's flashiness is apparent (e.g., high wrack lines, scour, severe bank erosion) and is indicative of highly impervious watersheds. Restoration efforts for Hendricks Creek need to focus on both habitat and water quality improvements to significantly improve benthic bioclassifications. This stream is part of an EEP local watershed plan; more information can be found at: **http://www.nceep.net/services/lwps/Tar-Pamlico/Middle_Tar_LWP_Files/Middle_Tar_Rehabilitation_Plans_Appendices/Hendricks_Creek_Rehabilitation_Plan.pdf**.

Protection Priorities

Tar River Watershed (HUC 030201030202 & HUC 030201030204)
In 2005, two sites (OB89 & OB90) were sampled along the Tar River, (AU# 28-(80)) from Tarboro Raw Water Supply Intake to Suggs Creek, in Edgecombe County between Tarboro and Greenville. Both sites received Excellent bioclassifications. However in 2007, a drought year, the OB90 site at US Bus.64 received a Good bioclassification rating. The site needs to be sampled again during a normal rainfall year to determine if it would receive an Excellent rating again. Between 2000 and 2005, Wildlife Resources Commission biologists collected mussel taxa from the Tar River between the two sites and at NC 42. These taxa consisted of Lampsilis radiata, Alasmidonta undulata, and Elliptio roanokensis, which are listed as Threatened by NC and Lampsilis cariosa, which is listed as Endangered by NC, and as a Species of Special Concern in the United States. Due to the presence of listed aquatic species and potential water quality from US Bus. 64 to NC

42, this section of the Tar River might qualify for ORW.The presence of these rare, threatened and endangered species dependent on excellent water quality makes this portion of the Tar River and contributing tributaries priorities for restoration and protection activities.

Conetoe Creek Watershed (0302010303)

Conetoe Creek Watershed, (HUCs 030201030301, 030201030303, 030201030305)
Previously half of this creek was impaired based on a Severe Stress bioclassification; however, 2007 benthic samples resulted in a Moderate bioclassification indicating improved conditions. This improvement results in 9.8 miles being removed from the 2010 303(d) Impaired waters list (AU# 28-87-(0.5)a & 28-87-(0.5)b). The lower 6.7 miles of Conetoe Creek remain Impaired (AU# 28-87-(0.5)d) based on a Poor rating from a special study conducted in 2000. It is recommended this site be sampled during the next basinwide biological sampling period.

Land use is primarily agricultural in this watershed. Water is controlled through a series of canals that are managed by a drainage district board (consisting of local landowners and a technical advisor). Over 95 miles of stream in the watershed were channelized in the 1960s with intermittent de-snagging and dredging since then. The drainage district levies a tax on landowners to maintain the canals for proper drainage including canal access, mowing, de-snagging, and pipe and crossing repairs. Woody debris were noted as sparse and the habitat is generally poor throughout the watershed. Agricultural chemicals are thought to be the cause of toxicity and channelization the cause of the habitat degradation. Reestablishment of buffers along the intermittent and perennial streams should be encouraged to reduce nutrient inputs and provide habitat for aquatic organisms.

There is one swine animal operation (AWS740120) in this watershed that has been in violation with their DWQ permit. The facility has a history of minimal emergency storage volume capacity and the sprayfields are in poor condition and not managed well. DWQ will continue to closely monitor this operation.

Ballahack Canal (HUC 030201030305), AU# 28-87-1.2, from source to Conetoe Creek, 8.4 miles had a Severe benthos bioclassification in 2007. Ballahack Canal is a highly channelized tributary of Conetoe Creek. The benthic station is located in the town of Conetoe and it has been rated Severe since 2002. This site had a very low habitat score due to the straight channel, lack of instream habitat, homogenous substrate (sand/silt), lack of pools, eroding banks, open canopy and little riparian buffer zone. In addition to the low habitat score, algal mats were abundant and the conductivity was elevated (179 umhos/cm). Ambient data indicates high turbidity levels, high fecal coliform bacteria levels, and low pH. Water flow has recently been managed by the drainage district through the use of an inflatable fabric dam. Ballahack Canal is listed on the 2010 303(d) list for Aquatic Life because of turbidity exceedances and poor biological integrity.

Crisp Creek (HUC 030201030302), AU# 28-87-1, is a tributary to Conetoe Creek. This channelized creek, has stabilized banks with a mature hardwood riparian zone. Benthic samples have shown improvements from a Severe Stress bioclassification to the recent Moderate bioclassification. This stream is part of an EEP local watershed plan; more information can be found at: **http://www.nceep.net/services/lwps/Tar-Pamlico/Middle_Tar_LWP_Files/Middle_Tar_Rehabilitation_Plans_Appendices/Crisp_Creek_Rehabilitation_Plan.pdf**.

Greenville-Tar River Watershed (0302010304)

Greens Mill Run (HUC 030201030403), AU# 28-96, from source to Tar River, 7.3 miles is Impaired due to a Severe benthos bioclassification in 2004. Stream habitat conditions represent typical conditions in highly urbanized watersheds with very severe bank erosion and scour. Stream flow flashiness is apparent (e.g., high wrack lines, scour, severe bank erosion) and is indicative of highly impervious watersheds. Restoration efforts for Green Mill Run need to focus on both habitat and water quality improvements to significantly improve benthic bioclassifications. This stream is part of an EEP local watershed plan; more information can be found at: http://www.nceep.net/services/lwps/Tar-Pamlico/Middle_Tar_LWP_Files/Middle_Tar_Rehabilitation_Plans_Appendices/Green_Mill_Run_Rehabilitation_Plan.pdf.

Parkers Creek (HUC 030201030404), AU# 28-95, from source to Tar River, 7.3 miles are Not Rated based on a 2007 fish community sample (OF31). This site is Not Rated because criteria are still being developed to rate coastal plain streams; when these criteria are finalized this stream can then be back-rated based on the 2007 sample. The sample indicated an improvement in riparian vegetation and bank stability since the 2002 sample; a diverse and abundant fish community was seen for such a small channelized stream.

In the summer of 2009, two benthic samples were taken upstream of OF31 to determine if stormwater from a specific property was contributing to water quality degradation. The samples indicated Poor ratings both upstream (SR 1579) and downstream (SR 1591) of the facility with impacted habitat in-stream and riparian limitations likely caused by historic channelization and extreme fluctuations in hydrology (flashiness). The poor aquatic macroinvertebrate habitat conditions could not be directly linked to the property of interest. Stormwater runoff and altered hydrology are likely the main reason for degraded water quality in this subwatershed. This subwatershed drains the Pitt-Greenville Airport and Greenville's industrial areas. Parkers Creek will likely be listed as impaired on the 2012 303(d) list.

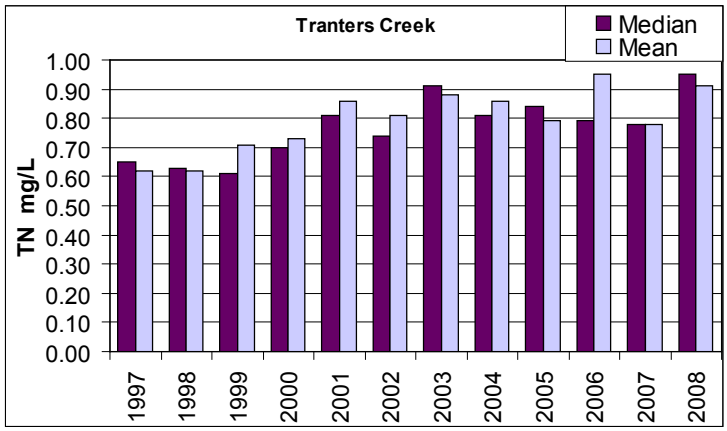
Tranters Creeek Watershed (0302010305)

Old Ford Swamp, (030201030506), AU# 28-103-14-1, had the only benthic sample site to decline in bioclassification rating, going from a natural rating in 2002 to a moderate rating in 2007. The site also had the lowest pH (4.9) recorded at a benthic site in the basin. It is hypothesized that the lack of high pH agricultural runoff during the 2007 drought was supplanted by low pH swamp waters.

Tranters Creek Watershed, AU# 28-103a, runs ~38 miles from its source in Martin County to the Tar River in Beaufort county. Tranters Creek watershed (HUC 0302010305) drains ~243 sq. miles and includes the towns of Parmele, Robersonville, Everetts, and the northwestern parts of Washington. Land use data from 2001 indicates 37% of the watershed is forested, 35% agriculture, 14% wetlands, 8% grasslands, and 6% developed. There are also several waste residual application fields in the upper watershed. Over the past 10 years one swine animal operation facility has had numerous violations, resulting in minimal emergency volume storage capacity and poor spray field conditions.

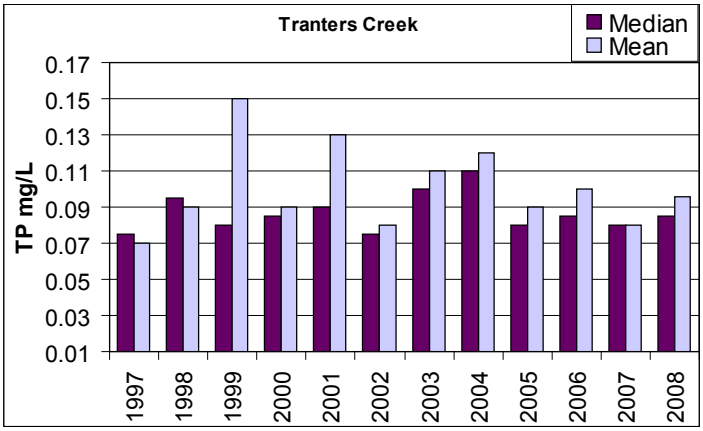
Tranters Creek and its tributaries are nutrient sensitive swamp freshwater systems that are currently supporting their designated uses. However, the TN concentration at the ambient station O7300000 is increasing and the majority of the TP concentrations remain above 0.05 mg/L as shown in Figures 3-11 & 3-12.

Figure 3-11. Total Nitrogen Concentration @ AMS 07300000



Over 12 years 142 samples were collected, of which 57 (40%) of them had TN levels above 0.8 mg/L.

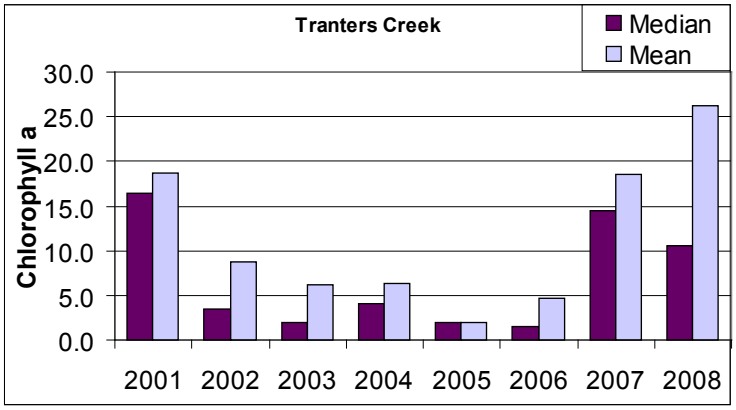
Figure 3-12. Total Phosphorus Concentration @ AMS 07300000



Over 12 years 142 samples were collected, of which 116 samples (82%) had TP levels above 0.05 mg/L.

Chlorophyll *a*, a constituent of most algae, is a widely used indicator of algal biomass. The chlorophyll *a* standard is 40 µg/L (micrograms per liter) for lakes, reservoirs, and slow moving waters in North Carolina. The chlorophyll *a* standard is used to detect an algal response to accumulated nutrients to a waterbody. Figure 3-13 shows chlorophyll *a* data collected at the mouth of Tranters Creek.

Figure 3-13. Chlorophyll A Concentration Data @ AMS 07300000

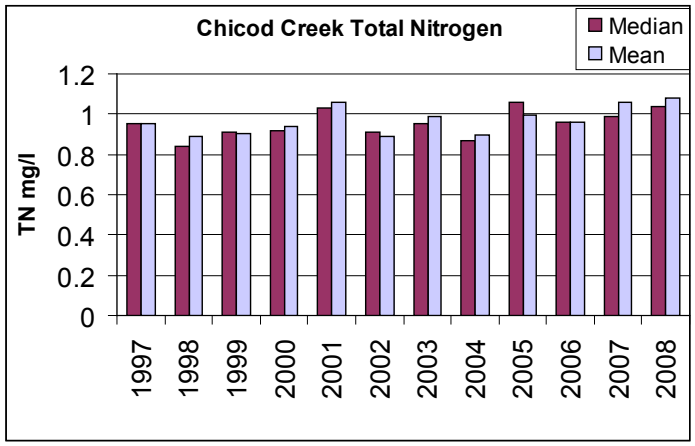


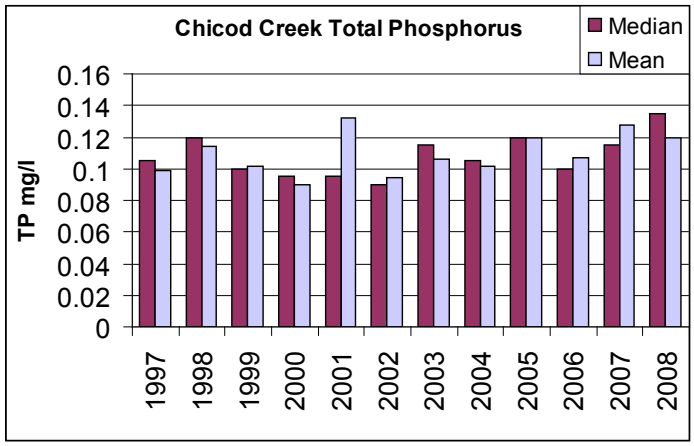
Over 8 years 87 samples were collected, of which 4 samples (4%) had chlorophyll *a* levels above 40 µg/L.

Tar River Chicod Watershed (0302010306)

Chicod Creek Watershed (HUCs 030201030603, 030201030604, 030201030605), AU# 28-101, from source to Tar River, has a history of Poor, Fair, and Severe swamp bioclassification ratings that lead to the Impairment of 14.1 miles of the watershed. However, the 2007 benthic macroinvertebrate sample resulted in a Natural bioclassification. The creek has been removed from the 2010 303(d) list for Aquatic Life use support category. During the early 1990's, the Chicod Creek watershed received federal funds to support agricultural BMP implementation. A trend analysis was conducted in 1998 to determine if statistically significant changes in nutrient loads and concentrations occurred pre and post BMP implementation. The trend results indicated a significant decrease in TN concentration and load and no statistically significant change in TP. Nutrient data from 1997-2008 indicate that for both total nitrogen and total phosphorus the mean and medians numbers for each year were above the normal levels of 0.8 mg/L for TN and 0.05 mg/L for TP, as seen in Figures 14 & 15.

Figure 14 & 15. Total Nitrogen and Total Phosphorus Concentration data for Chicod Creek Ambient Station O6500000





Chicod Creek has numerous hog farms within its drainage area that could be contributing to non-point source pollution if inadequate BMPs are used or if nutrients are traveling via groundwater to the creek. There are five swine animal operations within this subbasin that have been issued NOVs or have come close to being in violation of their permits. These facilities have had various problems including lagoon pump leaking, high freeboard levels, erosion and woody vegetation on lagoon banks, irrigation outside acceptable crop window, poor spray field conditions, and poor record keeping issues. DWQ will continue to closely monitor these facilities.

Chicod Creek was also Impaired because of high levels of fecal coliform bacteria concentrations related to agricultural activities. A **TMDL** was completed in 2004 addressing the fecal coliform bacteria. As of 2010 303(d) list of Impaired waters, the creek is no longer Impaired.

Additional Studies

Ecosystem Enhancement Program (EEP) Middle Tar-Pamlico Local Watershed Plan
Assessment of the middle Tar-Pamlico region by EEP began in 2004 with a focus on four waterbodies including: Cow Swamp, Crisp Creek, Green Mills Run, and Hendricks Creek. All of these subwatersheds have been significantly impacted by development and agricultural practices, resulting in a loss of wetlands and buffers, increased runoff, and a general degradation in water quality. The goal of the EEP plan is to provide a framework for watershed functional rehabilitation and to provide primary supporting information for implementation of the rehabilitation system while taking into consideration development and agriculture. To achieve this, efforts were focused on three investigative methods: 1) land use/land cover trending analysis; 2) watershed system modeling; and 3) riparian reach field investigation. The findings and results from these tasks were tabulated and compared with the concerns of the stakeholder groups. The end result being the location of potential restoration, enhancement, preservation and BMP sites that are best suited to meet the goals of the study. More information about these ongoing restoration opportunities can be found on the EEP website at: **http://www.nceep.net/services/lwps/pull_down/by_basin/TarPamlico_RB.html** or in Appendix 3E.

Lower Tar River (B-071206)
Special study sampling in the lower Tar River indicated dramatic changes (ranging from Excellent to Fair) in the benthic community between Tarboro and downstream of Greenville. Several factors influenced the benthic community in the lower Tar River including saline waters moving upstream towards Greenville during lower flows and wind tides from Pamlico River/Sound. Periodic saltwater events can stress the predominately freshwater aquatic benthic community in the lower Tar River. These short-term oligosaline conditions also masked the stresses associated

with urban runoff from the City of Greenville and the effects of a 17.5 MGD major discharger, the Greenville Utility Commission's WWTP (NC0023931), downstream of the City. Furthermore, the physical character of the Tar River changes in the vicinity of Greenville, from a shallow water body, with moderate current (Coastal A) to a deeper river with little or no current (Coastal B).

This study investigated possible water quality influences (e.g. urban areas of Greenville, WWTP) one potential source at a time, by sampling upstream and downstream of both the City and the WWTP. Tar River sites sampled in 2007 for this study were: NC 42, US 264, US 264A, SR 1565. The habitat scores were similar among all four of the sites suggesting that the differences in the biological communities were related to water quality at each site, or natural, physical changes in the lower Tar River. Especially in larger rivers, in-channel snags provide an important colonization habitat for aquatic macroinvertebrates. Both downstream sites (US 264A and SR 1565) had abundant snags, in addition to other habitats.

Aquatic macroinvertebrate data do not suggest any water quality problems in the Tar River below the City of Tarboro downstream to Greenville. Sampled aquatic communities were diverse and many were pollution sensitive. From US 264 to US 264A, there was a 35% decrease in the total number of macroinvertebrate taxa collected from the Tar River. Only half the numbers of EPT taxa found at the two sites upstream of Greenville were collected downstream at US 264A. The actual physical change in the Tar River (from Coastal A to Coastal B), as opposed to water quality changes, could account for these decreases.

Water quality degrades from US 264A to SR 1565, below the Greenville WWTP, as indicated by the increase in the Biotic Index and EPT Biotic Index, and the decreases in EPT taxa. Many of the taxa collected below the Greenville WWTP (SR 1565) are pollution tolerant species (but also species tolerant of naturally low levels of dissolved oxygen, oligosaline, and lentic conditions). The combination of the natural, physical changes in the lower Tar River, a moderate urban influence from the City of Greenville and the impacts of the Greenville WWTP, resulted in a decline of over 70% of the EPT fauna at the point where the Tar River flows under SR 1565, when compared with upstream sites. In addition to the Greenville urbanization and the WWTP effects, estuarine and lentic influences, as documented by both water chemistry and the biological community, affected the predominately freshwater benthos in the lower part of the Tar River between Greenville and SR 1565.

Volunteer Water Information Network

The Volunteer Water Information Network (VWIN) is a partnership of groups and individuals dedicated to preserving water quality in North Carolina. In August 2005, the Pamlico-Tar River Foundation initiated a monitoring program in tributaries to the Tar River. The UNC-Asheville Environmental Quality Institute (EQI) provided technical assistance through laboratory analyses of water samples, statistical analyses of water quality results, and written interpretation of the data. Volunteers collected water samples once a month from selected streams in Edgecombe, Nash and Pitt counties. The results of this data collection are similar to DWQ's sampling results, but VWIN also collected data on streams that DWQ does not monitor. Statistical analyses and interpretation of data from samples gathered from Briery Swamp, Chicod Creek, Cokey Swamp, Conetoe Creek, Green Mill Run, Grindle Creek, Hardee Creek, Hendricks Creek, Meeting House Branch, Moye's Run, Parker Creek, and Town Creek are found in the VWIN report located in Appendix 3E.

Permit Programs

Wastewater Dischargers

The National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States, as authorized by the Clean Water Act. Non-compliance with permit limits on wastewater flow and constituents can lead to discharge of pollutants that degrade surface waters making them unsafe for drinking, fishing, swimming, and other activities. The NPDES Permitting and Compliance Programs of DWQ are responsible for administering the program for the state. These permits are reviewed and are potentially renewed every 5 years, a list of NPDES permits is found in Table 3-4.

The Federal and State Pretreatment Program gives regulatory authority for EPA, States, and Municipal Governments to control the discharge of industrial wastewater into municipal Wastewater Treatment Plants (WWTPs) or Publicly Owned Treatment Works (POTWs). The objectives of the Pretreatment Program are to prevent pass-through, interference, or other adverse impacts to the POTW, its workers, or the environment; to promote the beneficial reuse of biosolids; and to assure all categorical pretreatment standards are met. There are currently around 700 Significant Industrial Users (SIUs) who discharge industrial wastewater to over 120 POTWs throughout the state of North Carolina. The WWTPs covered by POTW Pretreatment Programs in this subbasin are Tarboro, Greenville Utiities and Robersonville.

All NPDES permitted facilities use 7Q10s (the lowest stream flow for seven consecutive days that would be expected to occur once in ten years) as critical flow in determining permit limits for non-carcinogen toxicants. If a toxicant is a known carcinogen then the QA (the mean annual stream flow) is used in determining permit limits. In cases where an aesthetic standard is applicable to a pollutant then the permit limit is based on 30Q2 (the minimum average flow for 30 consecutive days that would be expected to occur once in 2 years). These critical flow values used to determine permit limits for all NPDES facilities may need to be reviewed as the permits come up for renewal. Currently, a 7Q10 is only evaluated in the initial application of the permit and upon expansion. Low flow conditions impact a stream's ability to assimilate both point and nonpoint source pollutants. Droughts, as well as the demand on water resources, are very likely to increase; therefore, the reevaluation of stream flow will become more critical to water quality within the next decade or so. DWQ will work with Division of Water Resources and other agencies to discuss the need and resource availability to update 7Q10 values.

Table 3-4. NPDES Discharge Permits in HUC 03020103

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	Receiving Stream	Permit Flow MGD
NC0001058	DSM Pharmaceuticals	DSM Pharm.	Non-Government	Industrial Process & Commercial Wastewater	Minor	Parker Creek	0
NC0020435*	Town of Pinetops	Pinetops WWTP	Government - Municipal	MWD < 1MGD	Minor	Town Creek	0.3
NC0020605*	Town of Tarboro	Tarboro WWTP	Government - Municipal	MWD, Large	Major	Tar River	5.0
NC0023931*	Greenville Utilities Commission	GUC WWTP	Government - Municipal	MWD, Large	Major	Tar River	17.5
NC0026042*	Town of Robersonville	Robersonville WWTP	Government - Municipal	MWD, Large	Major	Flat Swamp	1.8
NC0037231	Martin County Schools	Bear Grass Elementary School WWTP	Government - County	Discharging 100% Domestic < 1MGD	Minor	Turkey Swamp	0.005

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	Receiving Stream	Permit Flow MGD
NC0050661	Town of Macclesfield	Macclesfield WWTP	Government - Municipal	MWD < 1MGD	Minor	Bynums Mill Creek	0.175
NC0082139	Greenville Utilities Commission	Greenville WTP	Government - Municipal	Water Plants and Water Conditioning	Minor	Tar River	0
* Indicates Tar-Pamlico Basin Association Permittee Member							
MWD = Municipal Wastewater Discharge							

On-Site Wastewater Treatment Systems (Septic Systems)

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

In 2007, North Carolina Agricultural Research Service completed a report concerning nitrogen contributions from on-site wastewater systems for each river basin. The results for this subbasin based on 1990 census data indicate a population of 49,784 people using 19,583 septic systems resulting in a nitrogen loading of 497,841 lbs/yr and nitrogen loading rate of 519 lbs/mi^2/yr. These numbers reflect the TN discharged to the soil from the septic system and does not account for nitrogen used because of soil processes and plant uptake. (Pradhan et al. 2007).

Wastewater Residuals (Biosolids)

Residuals, biosolids or treated sludge, are by-products of the wastewater treatment process. After pathogen reduction, vector attraction reductions, and metal limits are met, these residuals are disposed in a manner to protect public health and the environment. Disposal sites include land fills, dedicated and non-dedicated residual disposal sites, agricultural land for crops not for human consumption, and distribution to the public for home use. When applied to the land, steps must be taken to assure that residuals are applied at or below agronomic rates based on the soil and crop types present at the disposal site. If these criteria cannot be met, permitted disposal must take place at a dedicated residual disposal site or landfill.

In this subbasin, five facilities that produce wastewater residuals (Class B) apply their treated sludge on an available 86 fields covering 1,431 acres (not all fields are used every year). A rough estimate of 100,170 lbs/yr of nitrogen and 128,790 lbs/yr of phosphorus are applied to these fields. This estimate does not include Class A residuals which are not monitored by DWQ. Of these permitted facilities, two are located in the Tar-Pamlico River Basin, the other three permit holders are facilities outside the basin but apply their residuals within the basin. Additional research would be necessary to determine if organic nitrogen from biosolids are contributing to the basinwide increase in organic nitrogen. For more information about residuals please visit DWQ's Aquifer Protection Section website: http://portal.ncdenr.org/web/wq/aps/lau.

Non-Discharge

Non-discharge systems have been the preferred alternative to discharge to surface waters for

some NSW waterbodies and DWQ requires all new and expanding NPDES permit applicants to provide documentation that considers alternatives to surface waters. Non-discharge wastewater options include spray irrigation, rapid infiltration basins, and drip irrigation systems. Although these systems are operated without a discharge to surface waters, they still require a DWQ permit. The permit insures that treated wastewater is applied to the land at a rate that is protective of groundwater and does not produce ponding or runoff into a waterbody. More information about land application and non-discharge requirements can be found on the DWQ Aquifer Protection Section Land Application Unit website: http://portal.ncdenr.org/web/wq/aps/lau. Non-discharge permits in this subbasin are listed in Table 3-5.

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

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

Table 3-5. Non-Discharge Permits in HUC 03020103

Facility Name	Permit Type	Permit #	Size
Elm City Spray Irrigation WWTP	Surface Irrigation	WQ0003405	Major
General Foam Plastics	Groundwater Remediation, Non-discharge	WQ0005620	Minor
Comer Oil Co-Williams & Lamm	Groundwater Remediation, Non-discharge	WQ0014508	Minor
GUC Residuals Land Application Program (D)	Land Application of Residual Solids (503)	WQ0003781	Minor
Macclesfield Reclaimed Water Field	Reuse	WQ0018857	Minor

Wetland Or Surface Water Disturbance (401 Certification)

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

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

Riparian Buffers

Riparian buffers in the basin are to be protected and maintained on both sides of intermittent and perennial streams, lakes, ponds, and estuarine waters. Tar-Pamlico River Basin Buffer

Rules **(15A NCAC 2B.0259)** do not establish new buffers unless the existing use in the buffer area changes. The footprints of existing uses such as agriculture, buildings, commercial and other facilities, maintained lawns, utility lines, and on-site wastewater systems are exempt. A total of 50 feet of riparian area is required on each side of waterbodies; within this 50 feet, the first 30 feet is to remain undisturbed and the outer 20 feet must be vegetated. Activities that disturb this buffer require a buffer authorization from DWQ or may require a major variance approval from the Environmental Management Commission. Pitt County is the only county that is delegated the Tar-Pamlico River Basin buffer rules. Therefore buffer authorizations and minor variances would be reviewed by Pitt County in non-incorporated areas in that County. More information about the buffer rules are available at: **http://portal.ncdenr.org/web/wq/swp/ws/401/riparianbuffers**.

Central Coastal Plain Capacity Use Area

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

To meet the requirements of the CCPCUA, Greenville Utilities Commission is proactively planning for its future water supply needs. Greenville has initiated a flow study to estimate the amount of surface water that will be available for withdrawal from the Tar River in the future, and to assist in developing a long-term plan for providing a reliable and sustainable water supply. The goal of the Tar River Flow Study is to identify the environmental issues and potential constraints associated with water withdrawals in the Tar River and provide the basis for evaluating the potential effects of increased withdrawals on instream habitat, water quality, and aquatic resources and values. The study results will also help identify saltwater encroachment upriver during periods of low inflow or drought.

Interbasin Transfers

In 1993, the North Carolina Legislature adopted the Regulation of Surface Water Transfers Act (G.S. §143-215.22L) and was subsequently modified in 2007. This law regulates large surface water transfers between river basins by requiring a certificate from the Environmental Management Commission (EMC). A transfer certificate is required for a new transfer of 2 MGD or more and for an increase in an existing transfer by 25 percent or more (if the total including the increase is more than 2 MGD). Certificates are not required for facilities that existed or were under construction prior to July 1, 1993 up to the full capacity of that facility to transfer water, regardless of the transfer amount.

Greenville Utilities Commission, in 2008, requested the transfer of surface water from the Tar-Pamlico River Basin to the Neuse Basin. The request was in the amount of 8.3 MGD to meet Farmville and Greene County's maximum day demands through 2030, with the ability to transfer 9.3 MGD under emergency conditions to the Contentnea Creek subbasin. Transfer to the Neuse River is for 4.0 MGD to meet Winterville's maximum day demands through 2030, with the ability to transfer 4.2 MGD under emergency conditions. More information about this project is available from the Division of Water Resources website: **http://www.ncwater.org/Permits_and_Registration/Interbasin_Transfer/**.

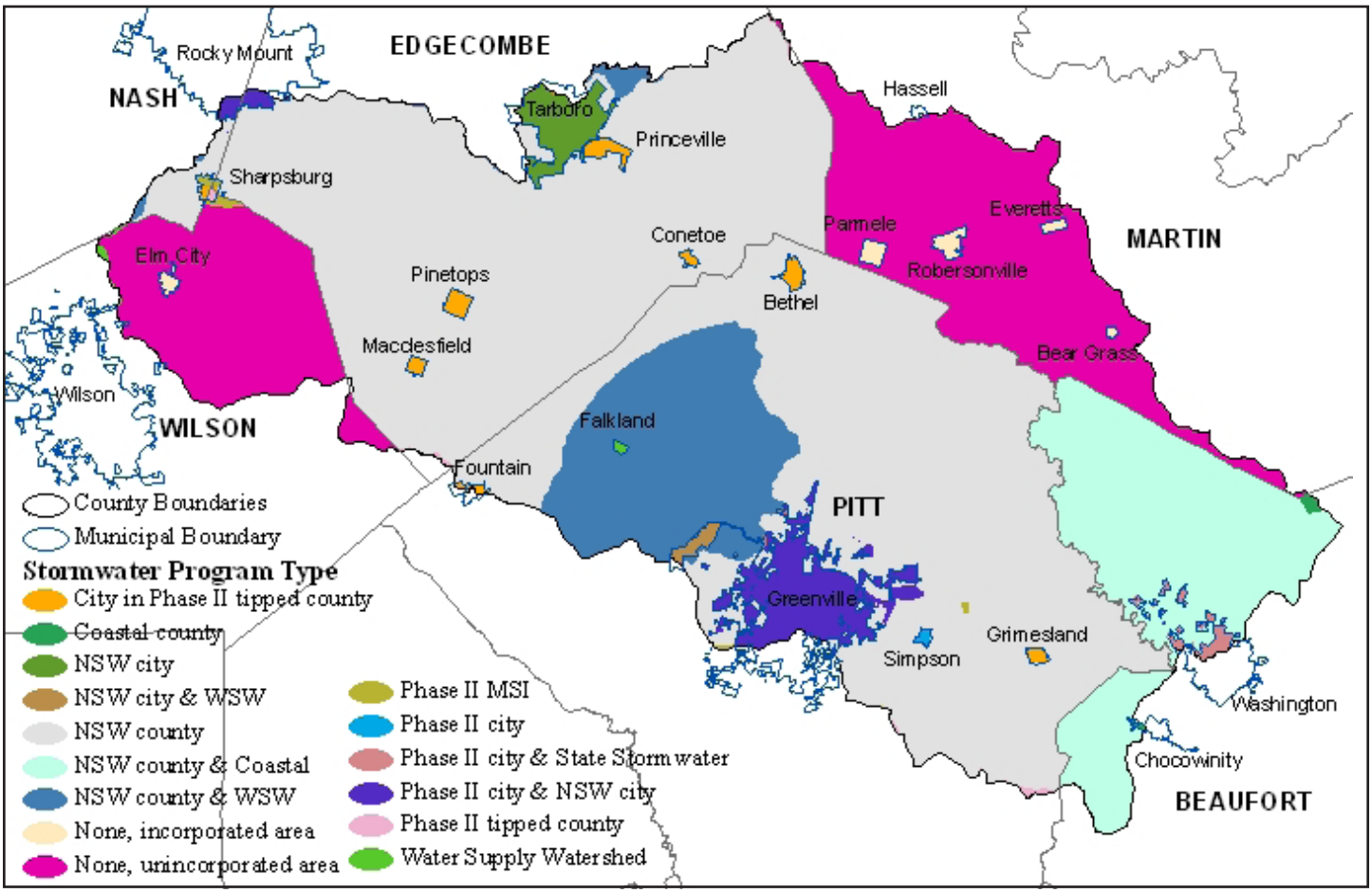
Stormwater

DWQ administers several different stormwater programs. One or more of these programs affects many communities in the Tar-Pamlico River Basin. The goal of the DWQ stormwater discharge

permitting regulations and programs is to prevent pollution from entering the waters of the state through the use of stormwater runoff controls. These stormwater control programs include Phase II NPDES and State post-construction, coastal stormwater, HQW/ORW stormwater, Tar-Pamlico River Basin NSW stormwater, and associated with the Water Supply Watershed Program requirements. Figure 3-16 indicates the different stormwater programs in this subbasin.

Greenville, Tarboro, and Washington and Nash, Edgecombe, and Pitt counties are required to implement actions to prevent and treat stormwater runoff required by the Tar-Pamlico NSW stormwater rules. These local programs are to include new development controls to reduce nitrogen runoff by 30 percent compared to pre-development levels and to keep phosphorus inputs from increasing over those pre-development levels. Local programs must also identify and remove illicit discharges; educate developers, businesses, and homeowners; and make efforts toward treating runoff from existing developed areas. As of July 2009, there are 34 general stormwater permits and one individual stormwater permit issued in this subbasin.

FIGURE 3-16. STORMWATER PROGRAM COVERAGE IN HUC 03020103



Agriculture

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

The conversion of agricultural lands to developed lands with impervious surfaces is another potential nonpoint source of pollution. A report by the American Farmland Trust organization identifies this subbasin as having high quality farmland with large areas threatened by

development. A map of these areas is available at: http://www.farmland.org/. Some farmers are protecting their land from development through the Conservation Reserve Enhancement Program (CREP). CREP is a voluntary program utilizing federal and state resources to achieve long-term protection of environmentally sensitive cropland and marginal pastureland. These voluntary protection measures are accomplished through 10-, 15-, 30-year and permanent conservation easements. In this subbasin there are approximately 5,215 acres in easements, of which 48% are in 30 year or permanent easements.

North Carolina Agriculture Cost Share Program

Financial incentives are provided through North Carolina's Agriculture Cost Share Program, administered by DENR's Division of Soil and Water Conservation to protect water quality by installing BMPs on agricultural lands. In the Lower Tar River Subbasin, $1,461,965 was spent, between 2003-2008, on BMPs to reduce nonpoint source pollution from agriculture. Approximately, 20,166 acres were affected by BMPs that prevented an estimated 107,515 tons of soil, 304,016 lbs of nitrogen and 154,858 lbs of phosphorous from runoff into surface waters. Animal waste BMPs also accounted for better management of an estimated 105,398 lbs of nitrogen and 143,376 lbs of phosphorous.

DWQ's Animal Feeding Operations Unit

The Animal Feeding Operations Unit is responsible for the permitting and compliance activities of animal feeding operations across the state. Poultry farms with dry litter waste are not regulated or monitored by DWQ. Table 3-6 summarizes the number of registered livestock operations, total number of animals, number of facilities, and total steady state live weight (SSLW) in this subbasin. These numbers reflect only operations required by law to be registered, and, therefore, do not represent the total number of animals in the subbasin.

Animal waste is often stored in lagoons before it is applied to fields. It is a concern that several animal operations in the basin will be abandoned without proper closeout of the lagoons. Numerous environmental hazards exist from these lagoons including: ammonia emissions, overflows into surface waters, and groundwater contamination.

Table 3-6. Animal Operations in HUC 03020103

Type	# of Facilities	# of Animals	SSLW
Animal Individual	2	-	-
Swine	42	161,485	30,399,055

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

A better understanding of groundwater quality in relation to animal feeding operation locations is needed. Most animal operations are located immediately adjacent to surface water bodies. Groundwater that is moving from beneath a facility into the surface water system may transport significant levels of nutrients. However, lack of groundwater quality data at animal operations hampers quantifying their impacts.

Restoration, Protection & Conservation Planning

Population

The 2000 census estimated population for this subbasin is 141,646 and this is expected to increase with the results of the 2010 census (Table 3-7). As population increases, so does our demand for clean water from aquifer and surface water sources and for the land and water to assimilate wastes.

Table 3-7. Watershed Population Estimates* for HUC 03020103

10-Digit HUC	2000 Population	2000 Population Density (per sq mi)	2010 Estimated Population	2020 Estimated Population	2030 Estimated Population
0302010301	25,355	128	25,036	24,750	24,423
0302010302	15,709	126	14,526	13,402	12,284
0302010303	4,043	41	4,201	4,364	4,529
0302010304	50,117	501	60,017	69,813	79,587
0302010305	13,729	57	13,732	13,700	13,614
0302010306	32,692	169	38,859	44,940	50,984
03020103	141,646	148	156,371	170,969	185,420

*NC Office of State Budget and Management: http://www.osbm.state.nc.us/

Land Use

Land use in this subbasin shows increasing urbanizing areas and a strong agriculture use, both of which continue to place increasing demands on water quality and quantity. Table 3-8 lists the percentage of predominant land cover types within this subbasin (based on 2001 land cover data). A map showing these land types can be found in Appendix 3D.

Table 3-8. Land Cover Percentages in HUC 03020103

Land Cover Type	Percent
Developed Open Space	5.50
Developed Low Intensity	1.82
Developed Medium Intensity	0.67
Developed High Intensity	0.21
Total Developed	8.19
Bare Earth Transition	0.04
Deciduous Forest	7.82
Evergreen Forest	16.43
Mixed Forest	2.69
Total non-Wetland Forest	26.94
Scrub Shrub	3.10
Grassland Herbaceous	9.91
Pasture Hay	2.76
Cultivated Crops	34.90
Total Agriculture	37.66
Woody Wetlands	13.59
Emergent Herbaceous Wetland	0.57
Total Wetlands	14.16

Local Initiatives & Conservation Planning

Resources & Guides

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

Conservation planning is important on a local level to protect natural resources that provide recreational, aesthetic, and economic assets important to community sustainability and

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

Land conservation, accompanied with stream restoration projects, can be very successful at protecting water quality. Prevention and protection activities are known to be more cost effective than retrofits and restoration. DWQ strongly encourages conservation in this watershed. Local land trusts can help landowners explore conservation options and identify potential funding sources. For more information about land trusts in North Carolina see the Conservation Trust for North Carolina at: http://www.ctnc.org/site/PageServer. With the assistance of land conservancies, and several state and federal agencies ~6,784 acres are protected within this subbasin, much of which are riparian buffers.

Local Initiatives

DWQ has regulatory authority over permitted activities to enforce the Clean Water Act and corresponding state regulations to protect water quality. However, local governments can also regulate and promote activities that protect water quality. Several local governments provided information on local activities, ordinances, and concerns about protecting their natural resources and water quality. The following information reflects projects and practices on a local level that protect water quality.

Pitt County

Pitt County complies with Tar-Pamlico Stormwater Rules established to help reduce nutrient runoff from new developments and limit post construction impacts. County staff are responsible for illicit discharge detection and elimination, while also educating citizens on reducing nitrogen pollution from their lawns and septic systems. Through their efforts of implementing the stormwater rules in the urbanizing areas, they acknowledge a need for a more comprehensive basinwide stormwater approach to help capture new developments rapidly occurring in areas that are exempt from current stormwater regulations. They note developments that occur in the smaller towns are much more intensively developed and have a higher percentage of impervious surface than those managed under the stormwater rules.

City of Greenville

The City of Greenville recently awarded a contract to Pamlico-Tar River Foundation and East Carolina University to complete a Watershed Master Plan. This project will include mapping of the current municipal stormwater system, hydrology and hydraulic modeling, identification and prioritization of CIP projects, potential funding sources, and to establish a water quality baseline. This Plan will be utilized to assess the 3 square mile watershed of Meetinghouse Branch and Bell Branch. After successful completion of the pilot study, all watersheds within the City of Greenville will be assessed using the same criteria.

Erosion and Sedimentation Control

The Sedimentation Control Commission was created to administer the Sedimentation Control Program pursuant to the N.C. Sedimentation Pollution Control Act of 1973. It is charged with adopting rules, setting standards, and providing guidance for implementation of the Act. The Division of Land Resources (DLR) is the primary agency responsible for managing land disturbing activities that have the potential to violate the Sedimentation Pollution Control Act. For those land disturbing activities, an Erosion and Sedimentation Control Plan must be approved by DLR prior to land disturbing activities. Due to the large number of land disturbing activities and the limited number of DLR staff available to do inspections, cities and counties have been encouraged to adopt a local erosion and sediment control ordinance in compliance with state

requirements. The Sedimentation Control Commission can then delegate the local government authority to administer the erosion and sedimentation control program within its jurisdiction. The local programs' staff then performs plan reviews and enforces compliance with plans within their jurisdictions. Within this subbasin the City of Greenville and Pitt County have local erosion and sediment control ordinances.

Construction Grants and Loans

The Construction Grants and Loans (CG&L) Section of DWQ provides grants and loans to local government agencies for the construction, upgrades, and expansion of wastewater collection and treatment systems. As a financial resource, the Section administers five major programs that assist local governments. Of these, two are federally funded programs administered by the state, the Clean Water State Revolving Fund (SRF) Program and the State and Tribal Assistance Grants (STAG). The STAG is a direct congressional appropriation for a specific "special needs" projects within NC. The High Unit Cost Grant Program, the State Emergency Loan (SEL) Program and the State Revolving Loan (SRL) Program are state funded programs, with the later two being below market revolving loan money. The Section also received an additional Capitalization Grant authorized by the American Recovery and Reinvestment Act of 2009 in the amount of $70,729,100. These funds are administered according to existing SRF procedures. All projects must be eligible under Title VI of the Clean Water Act. For more information please see the CG&L webpage at: http://portal.ncdenr.org/web/wq/cgls. Projects currently underway in this subbasin are listed in Table 3-8.

Table 3-8. CG&L Projects

Location	Project Description	Date	~Amount
Pinetops	Rehab & connection to Macclesfield	3/6/2002	$2,983,500
Macclesfield	Rehab and Spray Irrigation	Not yet made	$2,907,940
Everetts	New Collection Lines	9/12/2001	$1,870,141
Bethel	Rahab as part of larger project connecting to Greenville	8/22/2001	$3,000,000
Parmele	New Collection System	4/24/2001	$2,201,625
Bethel	$621,285 Loan for Pretreatment PS & FM along with EPA Grant	1/12/2002	$621,285
Bethel	Pump Station & Force Main	4/23/2002	$1,954,715
Elm City	Sanitary Sewer Rehabilitation-Phase 1	6/28/2006	$425,000
Greenville	Greenville Utilities WWTP & Remote Pumping Stations Electrical & SCADA System Upgrades	11/7/2008	$13,356,080

Clean Water Management Trust Fund

Created in 1996, the Clean Water Management Trust Fund (CWMTF) makes grants to local governments, state agencies, and conservation non-profits to help finance projects that specifically address water pollution problems. The fund has made several investments in the Lower Tar River Subbasin. Table 3-9. includes a list of recent projects and their cost.

Table 3-9. CWMT Projects

Application ID	Proposed Project Description	Amount Funded	County
2004A-012 NC Coastal Land Trust - Acq./ Fletcher Tract, Tranter's Creek	Acquire a permanent conservation easement on 204 riparian acres along the Tar River and Tranters Creek.	$241,000	Pitt
2005B-505 Elm City, Town of - WW/ Sewer Rehabilitation, Town Creek	Rehabilitate or replace approximately 21,600 linear feet of sewer collection line serving 668 residential and 57 commercial customers. Would reduce fecal coliform and nutrient delivery to Town Creek.	$1,000,000	Wilson

Application ID	Proposed Project Description	Amount Funded	County
2006D-003 Tar River Land Conservancy- Donated Mini/ Goodfred Tract, Tar River	Minigrant to pay for transactional costs for a donated easement on 147 acres along the Tar River.	$25,000	Edgecombe
2006S-011 Tarboro, Town of- Storm Mini/ Hendricks Creek		$50,000	Edgecombe
2007D-009 NC Coastal Land trust - Donated/Mini/ Riggs tract, Tar River	Minigrant to pay for transactional costs for a donated easement on a 49-acre tract on the Tar River.	$25,000	Pitt
2008-531 Princeville, Town of - WW/ Pump Station Rehabilitation, Tar River	Design, permit and rehabilitate 4 pump stations to improve reliability and improve water quality in Tar R, which is a Nat. Significant Aquatic Habitat and contains rare aquatic species	$80,000	Edgecombe
2008-804 Tarboro, Town of - Plan/Acq/ Tar River Greenway Plan		$56,000	Edgecombe

This list does not include regional or statewide projects that were in multiple river basins, or projects that were funded and subsequently withdrawn.

Section 319-Grant Program

The Section 319 Grant Program was established to provide funding for efforts to reduce nonpoint source (NPS) pollution, including that which occurs though stormwater runoff. The EPA provides funds to state and tribal agencies, which are then allocated via a competitive grant process to organizations to address current or potential NPS concerns. Each fiscal year, North Carolina is awarded nearly 3 million dollars to address NPS pollution through its 319 Grant Program. Thirty percent of the funding supports ongoing state nonpoint source programs. The remaining 70% is made available through a competitive grant process. More information can be found about these contracts and the 319 Grant Program at their website: http://portal.ncdenr.org/web/wq/ps/nps/319program. In 2010, a 319 grant was awarded to East Carolina University to evaluate septic systems and nutrient transport in Pitt County.

Recommendations

- Explore development of a more comprehensive basinwide stormwater management to prevent uncontrolled development in areas currently exempt from stormwater regulations and to protect watersheds with threatened and endangered species.

- Identify sources of organic nitrogen that could be contributing to the increase in basinwide TKN concentrations. Basinwide, the ammonia component of TKN shows a decrease in concentration since 1991. Specifically in this subbasin ammonia concentrations have decreased with peaks during dryer years, while TKN concentrations have increased over 1997-2008 period.

- Total phosphorus concentrations decreased and have remained steady over the past several years over an 11 year time period from 1997-2008. However, the TP loads measured at Grimesland have not been below the 1991 baseline except for 2007 & 2008. The Tar-Pamlico NSW strategy requires no increase in phosphorus loading from the 1991 conditions, to achieve this it may be necessary to revisit older laws to identify where new technology alternatives may be able to assist in meeting nutrient goals (e.g., G.S 143-214.4. prohibits certain cleaning agents from containing phosphorus, household dishwashing machine detergent is exempt.) Several states have recently banned phosphorous in dishwasher detergent and lawn fertilizers.

- More research is needed to understand the amount nutrients entering the Tar River and its tributaries through baseflow and how this contribution can be managed. The NSW strategy

targets point and some nonpoint source nutrient contributions to surface waters. However, some nonpoint sources are not specifically addressed in the strategy. Nutrients from non-discharge spray field systems, wastewater residual applications, septic systems and tiled agriculture may all be contributing to nutrient loads in surface waters via groundwater. DWQ Aquifer Protection Planning Unit is currently compiling a few select watershed-scale estimates of total nutrient loads from permitted land application facilities which will help determine the potential nutrient loading magnitude.

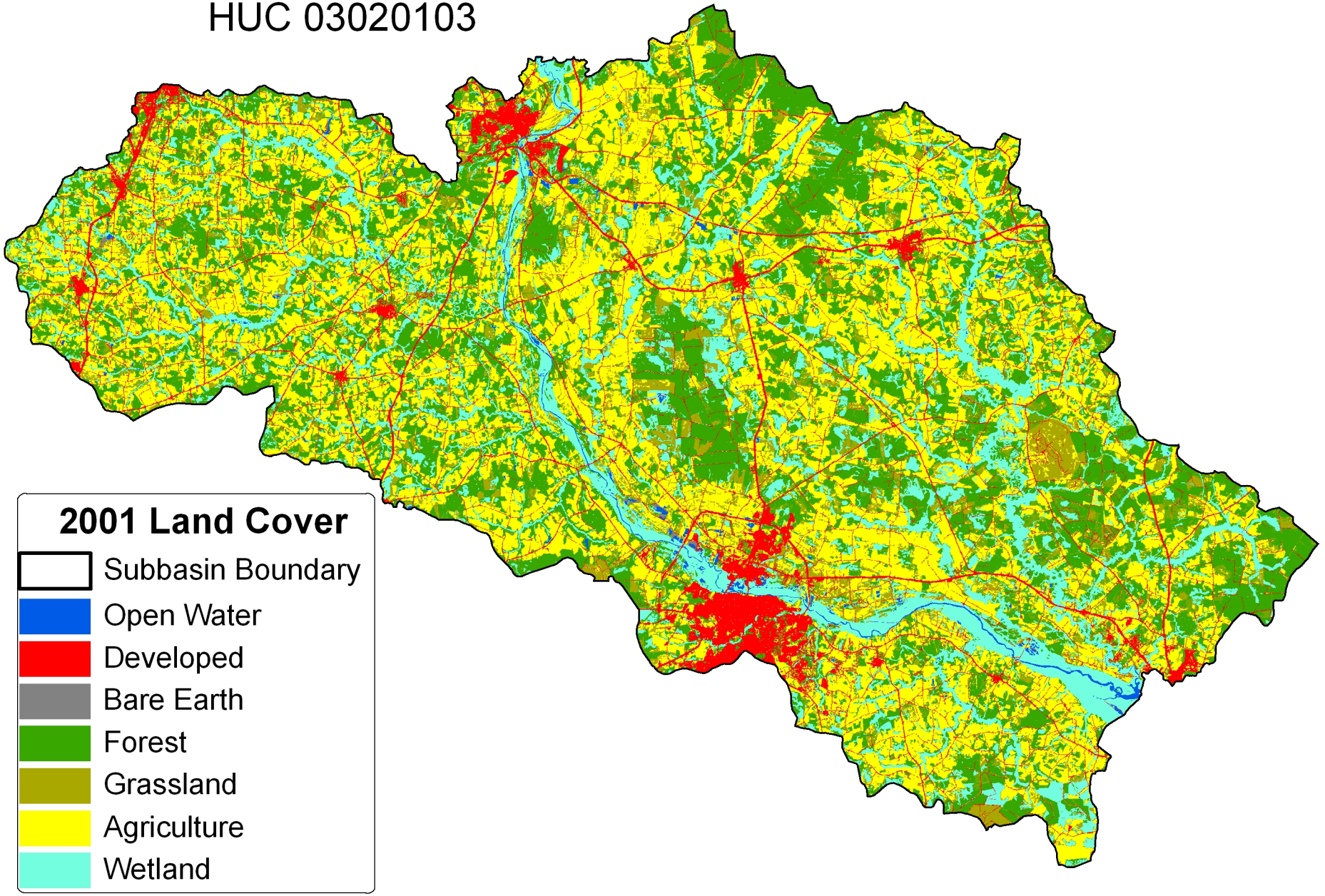
- Identify where local Drainage Districts are active and if their activities impact water quality.

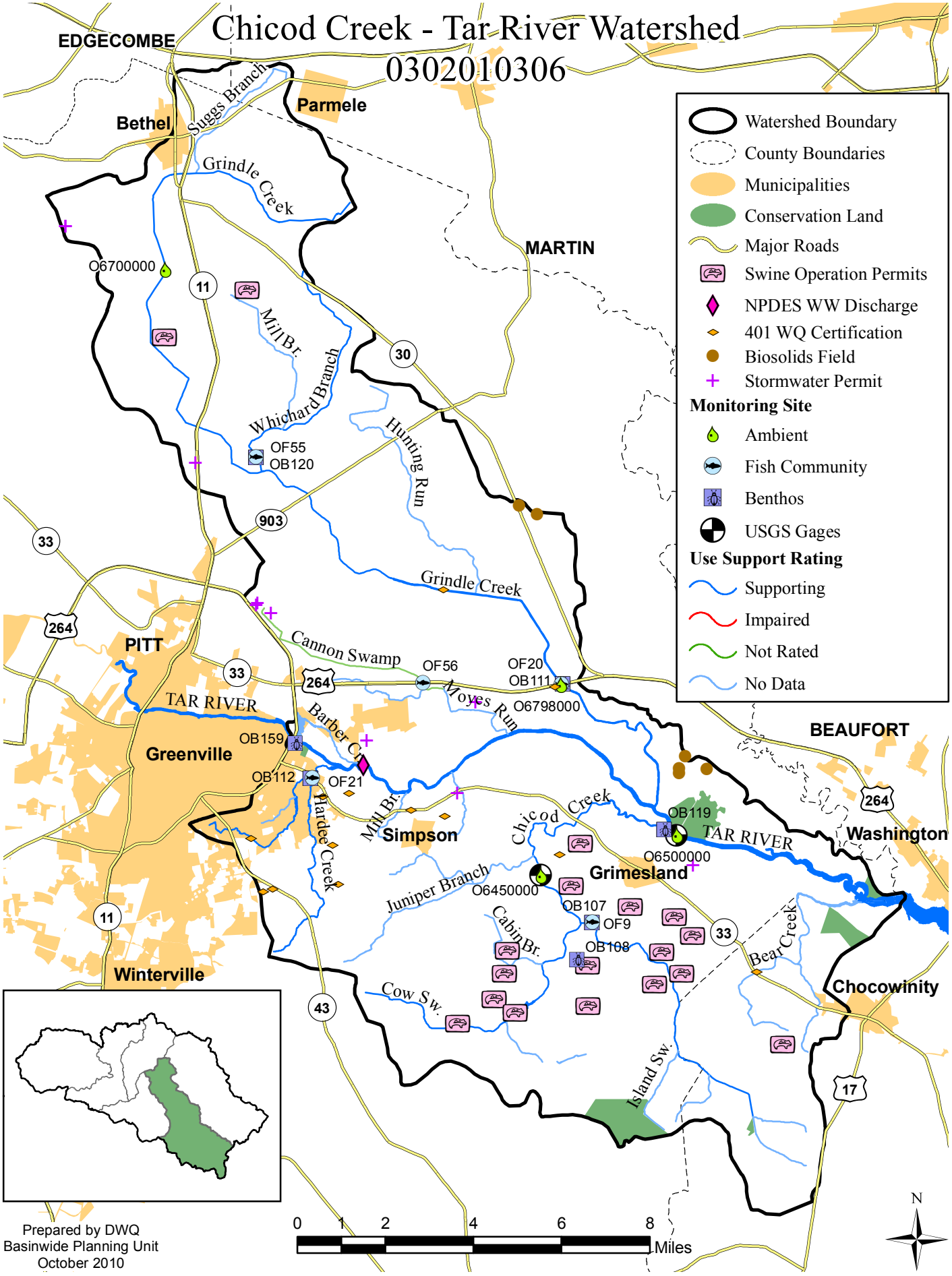
References

American Farmland Trust. Farming on the Edge: North Carolina State Map. http://www.farmland.org/resources/fote/states/map_northcarolina.asp.

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

Tar River Subbasin
HUC 03020103




Chicod Creek - Tar River Watershed
0302010306
EDGECOMBE
Bethel
Suggs Branch
Parmele
Grindle Creek
MARTIN
O6700000
11
Mill Br.
Whichard Branch
30
OF55
OB120
Hunting Run
903
33
Grindle Creek
264
PITT
Cannon Swamp
OF56
OF20
OB111
TAR RIVER
Moyes Run
O6798000
Barber Cr.
OB159
Greenville
OB112
OF21
Hardee Creek
Mill Br.
Simpson
Chicod Creek
OB119
TAR RIVER
Washington
O6500000
Grimesland
Juniper Branch
O6450000
OB107
OF9
Cabin Br.
OB108
Bear Creek
Chocowinity
Cow Sw.
Island Sw.
17
43
Winterville
BEAUFORT
Watershed Boundary
County Boundaries
Municipalities
Conservation Land
Major Roads
Swine Operation Permits
NPDES WW Discharge
401 WQ Certification
Biosolids Field
Stormwater Permit
Monitoring Site
Ambient
Fish Community
Benthos
USGS Gages
Use Support Rating
Supporting
Impaired
Not Rated
No Data
Prepared by DWQ
Basinwide Planning Unit
October 2010
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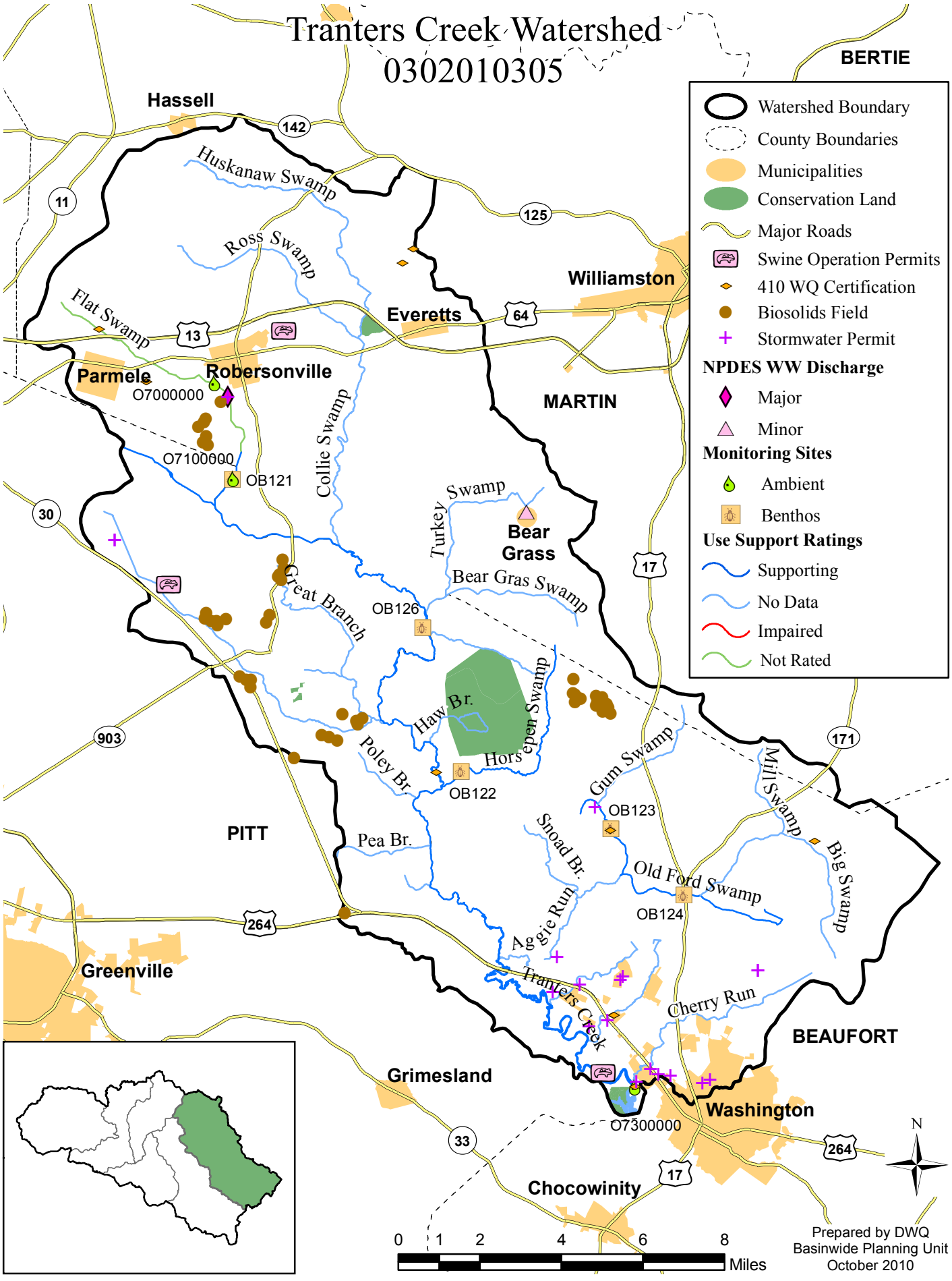
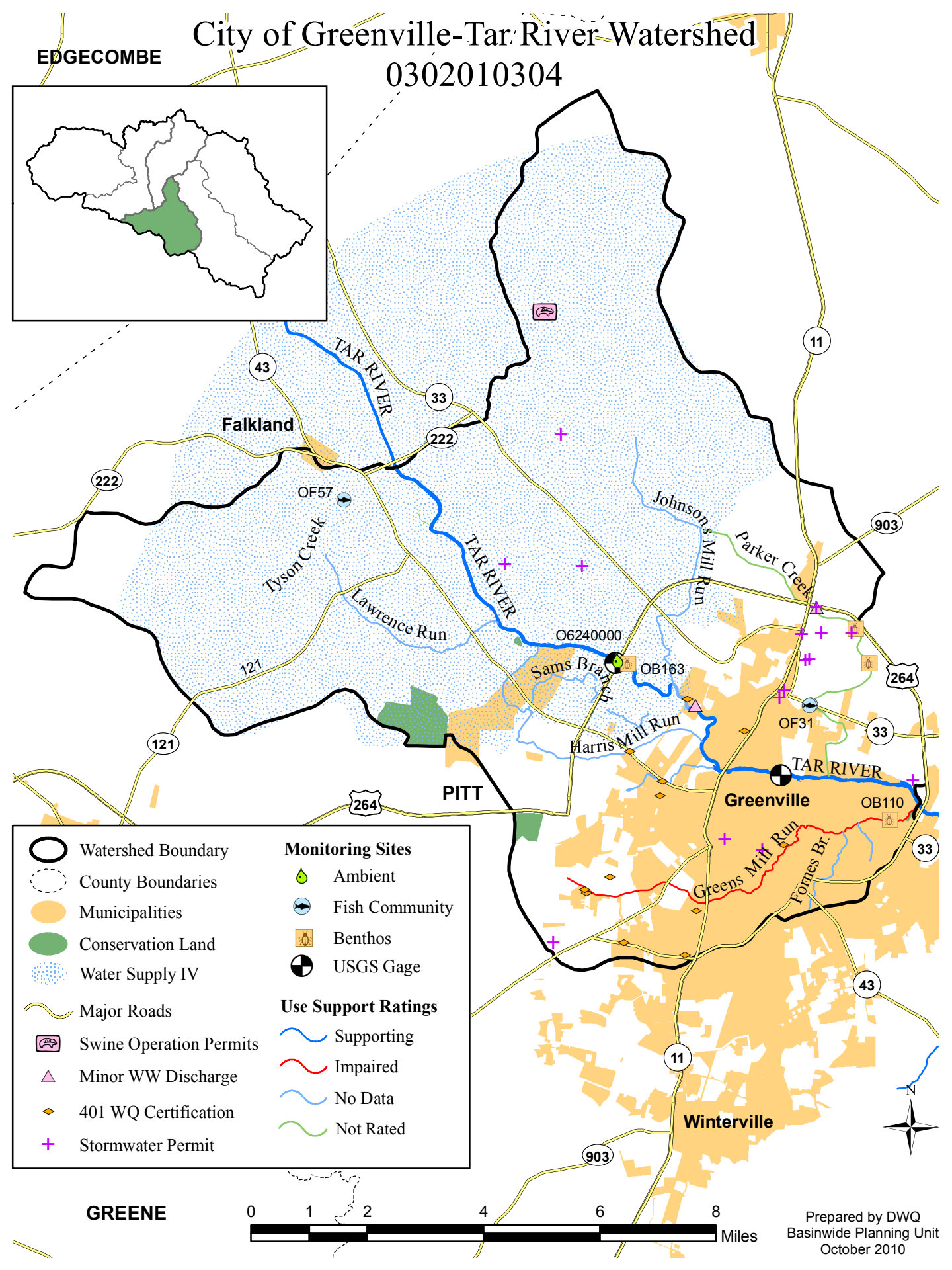
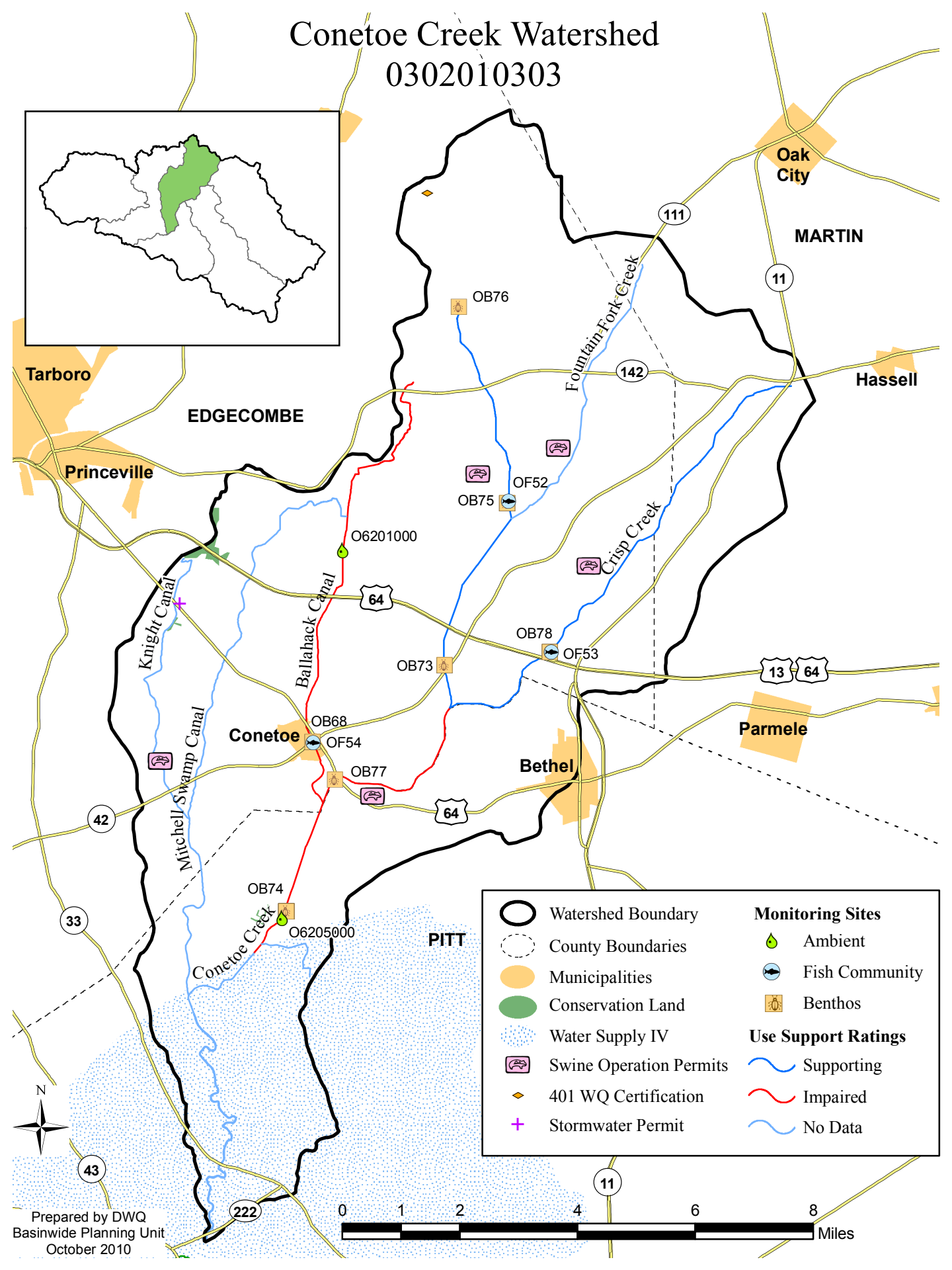
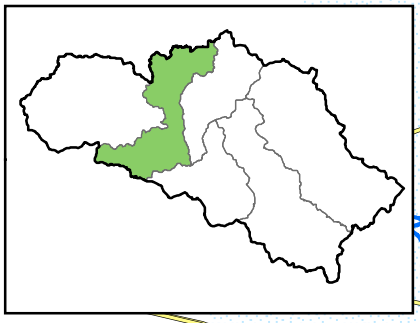
Miles
N


Tranters Creek Watershed
0302010305
BERTIE
Hassell
142
Huskanaw Swamp
11
125
Ross Swamp
Williamston
Everetts
64
Flat Swamp
13
Parmele
Robersonville
O7000000
MARTIN
Collie Swamp
O7100000
OB121
30
Turkey Swamp
Bear Grass
17
Great Branch
Bear Gras Swamp
OB126
Haw Br.
Horsepen Swamp
903
Poley Br
OB122
Gum Swamp
OB123
Mill Swamp
171
PITT
Pea Br.
Snoad Br.
Old Ford Swamp
OB124
Big Swamp
264
Aggie Run
Greenville
Tranters Creek
Cherry Run
BEAUFORT
Grimesland
Washington
O7300000
33
264
17
Chocowinity
N
0 1 2 4 6 8
Miles
Prepared by DWQ
Basinwide Planning Unit
October 2010
Watershed Boundary
County Boundaries
Municipalities
Conservation Land
Major Roads
Swine Operation Permits
410 WQ Certification
Biosolids Field
Stormwater Permit
NPDES WW Discharge
Major
Minor
Monitoring Sites
Ambient
Benthos
Use Support Ratings
Supporting
No Data
Impaired
Not Rated


City of Greenville-Tar River Watershed
0302010304
EDGECOMBE
GREENE
PITT
Falkland
Greenville
Winterville
TAR RIVER
Tyson Creek
Lawrence Run
Sams Branch
Harris Mill Run
Johnsons Mill Run
Parker Creek
Greens Mill Run
Fornes Br.
OF57
OF31
OB163
OB110
O6240000
43
33
222
11
903
264
121
Watershed Boundary
County Boundaries
Municipalities
Conservation Land
Water Supply IV
Major Roads
Swine Operation Permits
Minor WW Discharge
401 WQ Certification
Stormwater Permit
Monitoring Sites
Ambient
Fish Community
Benthos
USGS Gage
Use Support Ratings
Supporting
Impaired
No Data
Not Rated
0 1 2 4 6 8
Miles
N
Prepared by DWQ
Basinwide Planning Unit
October 2010


Conetoe Creek Watershed
0302010303
Oak City
MARTIN
Tarboro
EDGECOMBE
Princeville
Hassell
Parmele
Bethel
Conetoe
PITT
111
11
142
64
13
42
33
43
222
OB76
OB75
OF52
OB73
OB78
OF53
OB68
OF54
OB77
OB74
O6201000
O6205000
Fountain Fork Creek
Crisp Creek
Knight Canal
Ballahack Canal
Mitchell Swamp Canal
Conetoe Creek
Watershed Boundary
County Boundaries
Municipalities
Conservation Land
Water Supply IV
Swine Operation Permits
401 WQ Certification
Stormwater Permit
Monitoring Sites
Ambient
Fish Community
Benthos
Use Support Ratings
Supporting
Impaired
No Data
N
0 1 2 4 6 8
Miles
Prepared by DWQ
Basinwide Planning Unit
October 2010

Otter Creek-Tar River Watershed
0302010302



- Watershed Boundary
- County Boundaries
- Municipalities
- Conservation Land
- Water Supply IV
- Primary Roads
- Animal Operation Permits
- 401 WQ Certification
- Biosolid Field
- NPDES WW Discharge
- Minor Non-Discharge
- Stormwater Permit

Monitoring Sites

- Ambient
- Fish Community
- Benthos
- USGS Gage

Use Support Ratings

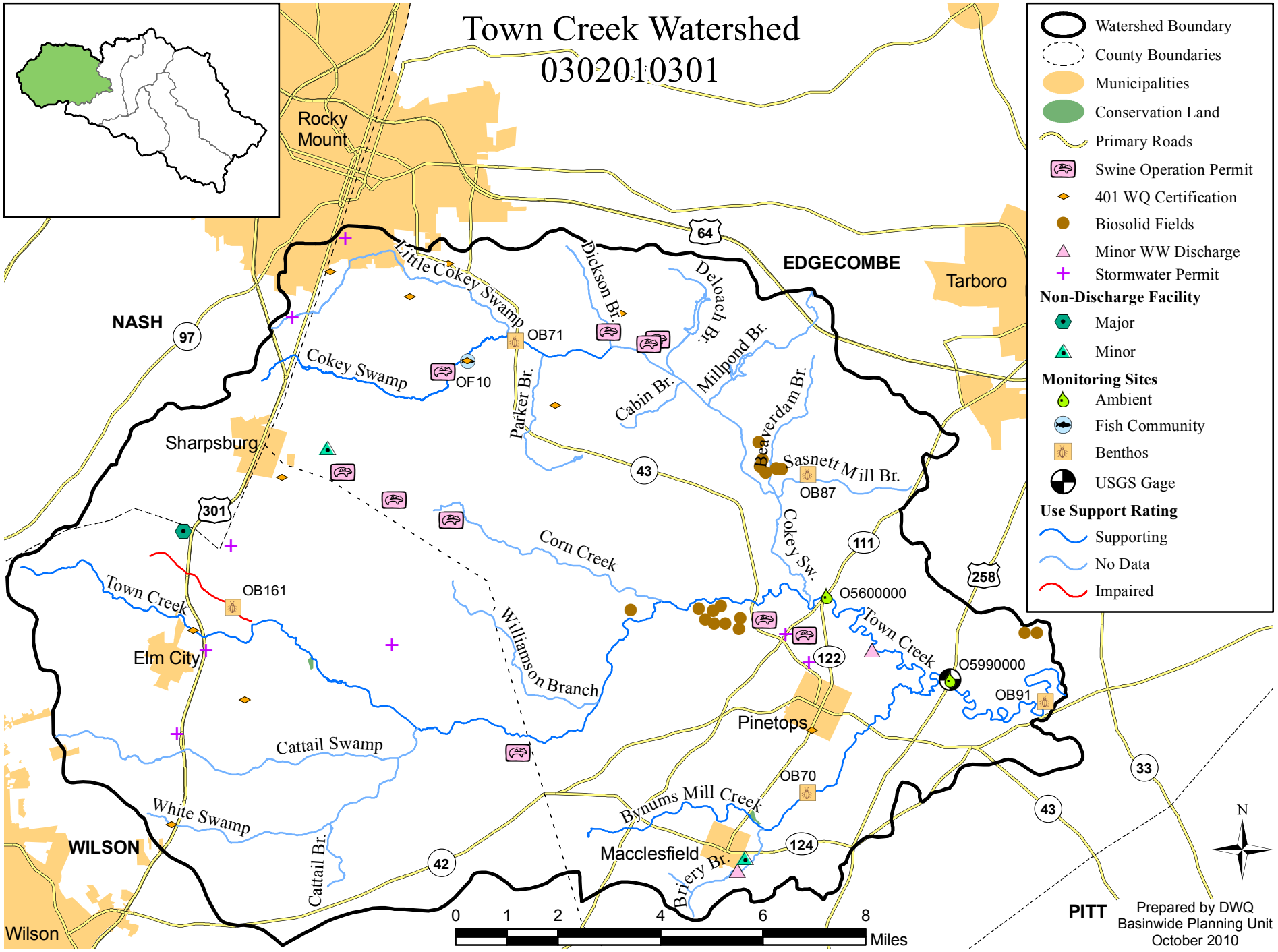
- Supporting
- No Data
- Impaired
- Not Rated

Speed
Tarboro
Princeville
EDGECOMBE
Pinetops
Conetoe
PITT
Falkland
WILSON
Fountain
Hendricks Creek
HollyCreek
TAR RIVER
Cromwell Canal and Connecting Canals
Jerrys Creek
Suggs Creek
Otter Creek
Kitten Creek
OB79
OB80
OB90
O5250000
O5270000
O6000000
OB89
OB86
OF30
O6200000
33
64
258
122
111
42
222
121
43

Prepared by DWQ
Basinwide Planning Unit
October 2010

0 1 2 4 6 8 Miles

N


Town Creek Watershed
0302010301
Watershed Boundary
County Boundaries
Municipalities
Conservation Land
Primary Roads
Swine Operation Permit
401 WQ Certification
Biosolid Fields
Minor WW Discharge
Stormwater Permit
Non-Discharge Facility
Major
Minor
Monitoring Sites
Ambient
Fish Community
Benthos
USGS Gage
Use Support Rating
Supporting
No Data
Impaired
Rocky Mount
EDGECOMBE
Tarboro
NASH
Sharpsburg
Elm City
Pinetops
Macclesfield
WILSON
Wilson
PITT
Little Cokey Swamp
Cokey Swamp
Dickson Br.
Deloach Br.
Millpond Br.
Cabin Br.
Parker Br.
Beaverdam Br.
Sasnett Mill Br.
Corn Creek
Williamson Branch
Town Creek
Cokey Sw.
Cattail Swamp
White Swamp
Cattail Br.
Bynums Mill Creek
Briery Br.
OB71
OF10
OB87
OB161
O5600000
O5990000
OB91
OB70
64
97
301
43
111
258
122
124
42
33
0 1 2 4 6 8
Miles
N
Prepared by DWQ
Basinwide Planning Unit
October 2010