Chapter 3
Pasquotank River Subbasin 03-01-52
Including: Perquimans River, Burnt Mill Creek, Little River and Tributaries

3.1 Subbasin Overview

Subbasin 03-01-52 at a Glance

Land and Water Area

Total area:	541 mi^2
Land area:	399 mi^2
Water area:	142 mi^2

Land Cover (percent)

Forest/Wetland:	32%
Cultivated Crop:	39%
Surface Water:	28%
Urban:	<1%
Pasture/ Managed Herbaceous:	1%

Counties

Perquimans, Pasquotank, Chowan and Gates

Municipalities

Hertford and Winfall

Monitored Waterbody Statistics

Aquatic Life:

Total:	40.0 mi/74,429.3 ac
Supporting:	25 mi/73,736.7 ac
Impaired:	7.9 mi/692.6 ac

Recreation:

Total:	7.9 mi/74,429.3 ac
Supporting:	7.9 mi/74,429.3 ac

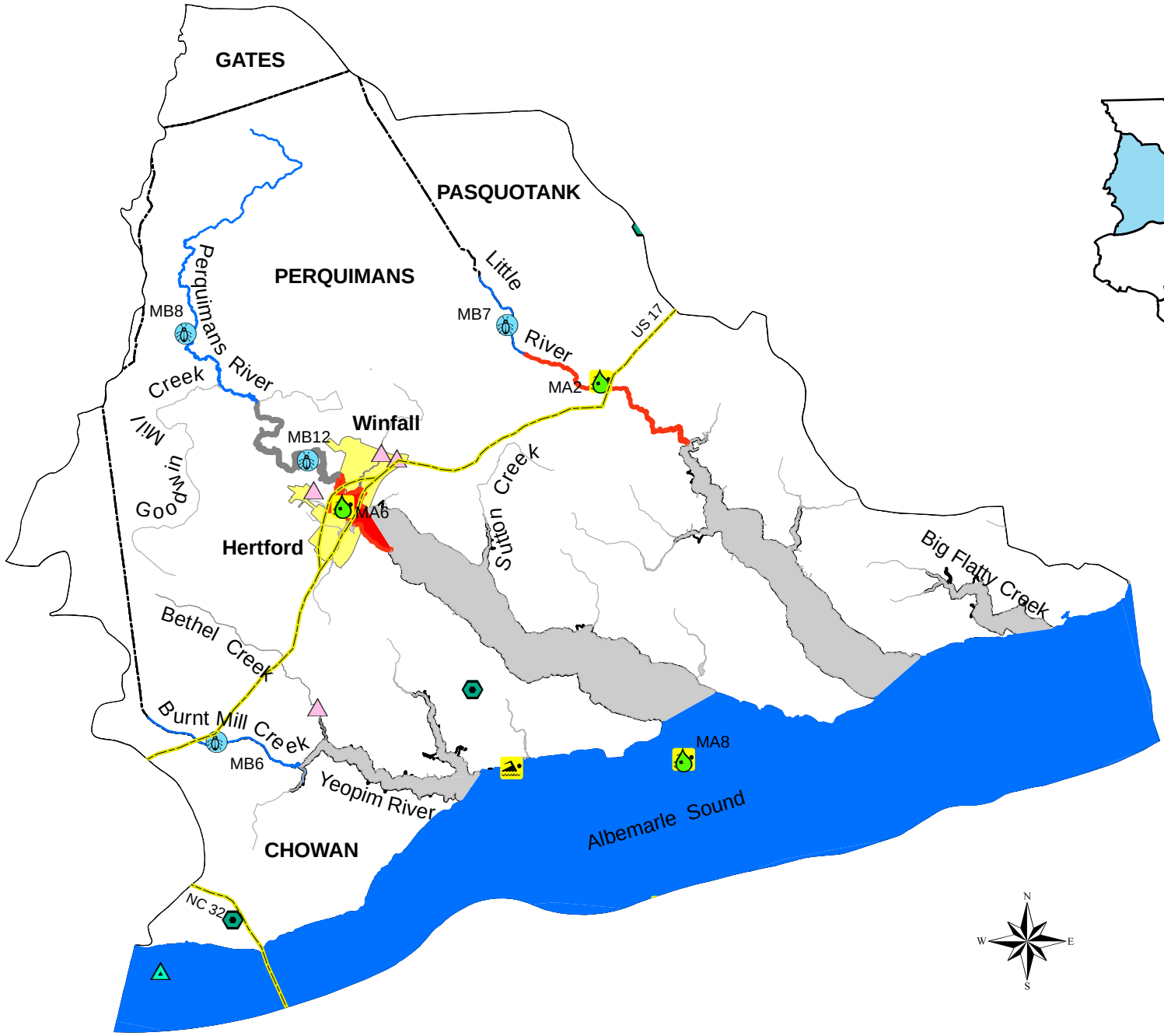
This subbasin consists of the northwestern edge of Albemarle Sound and the rivers that empty to it. The largest of these rivers are the Little River and the Perquimans River. The Perquimans River originates in the Great Dismal Swamp and flows south before emptying into Albemarle Sound. Most streams are low gradient with substrates of silt and sand. Ecologically, the subbasin contains characteristics of Chesapeake-Pamlico lowlands and tidal marshes. Land cover generally consists of cultivated crops, evergreen forests, mixed forests, forested wetlands and marshes. A small portion of the land area near the mouths of the Yeopim, Perquimans and Little Rivers are designated Significant Natural Heritage Areas.

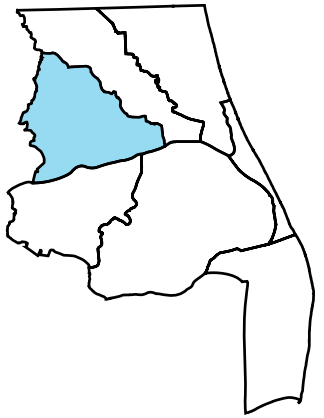
Portions of Perquimans, Pasquotank, Chowan and Gates Counties can be found in this subbasin with the highest concentration of urbanized areas around the Town of Hertford. Although the Town of Hertford experienced a net decline in population based on the 2000 census data, trends for the subbasin show expected growth in all four counties over the next 20 years. Additional information regarding population and land use changes throughout the entire basin can be found in Chapter 11.

There are four minor National Pollutant Discharge Elimination System (NPDES) discharges in this subbasin with a total permitted flow of 0.7 MGD. Three of these facilities are water treatment plants (WTP), two of which are required to monitor whole effluent toxicity (WET). Both facilities are failing to meet their 90 percent acute toxicity target for effluent concentration. Both facilities discharge filter backwash, or reverse osmosis reject water. The Winfall WTP is also experiencing significant noncompliance issues with total suspended solids (TSS) and settleable solids. There are three non-discharge permits and six stormwater discharge permits for this subbasin. For the listing of NPDES permit holders, refer to Appendix III.

A map including the locations of the NPDES facilities and water quality monitoring stations is presented in Figure 5. Table 8 contains a summary of assessment unit numbers (AU#) and lengths, streams monitored, monitoring data types, locations and results, along with use support ratings for waters in the subbasin. Appendix V provides definitions of the terms used throughout this basin plan.

Figure 5 Pasquotank River Subbasin 03-01-52





Legend

- Municipality
- County Boundary
- Subbasin Boundary
- Primary Roads

Monitoring Stations

- Ambient Monitoring Station
- Benthic Community
- Recreation Locations

NPDES Dischargers

- Major
- Minor

Non-Dischargers

- Major
- Minor

Aquatic Life Rating

- Impaired
- No Data
- Not Rated
- Supporting

Planning Section
Basinwide Planning Unit
January 8, 2007

Table 8 Pasquotank Subbasin 03-01-52

AU Number	Classification	Length/Area	Description	Aquatic Life Assessment					Recreation Assessment			Shellfish Harvesting			
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result	SH Rating	GA	Stressors	Sources
ALBEMARLE SOUND															
30c	SB	73,736.7 S Acres		S	MA8	NCE			S	MA8	NCE			Dioxin	Industrial Site
										N54	NCE				
			Portion of Albemarle Sound in subbasin 03-01-52. Waters of Albemarle Sound (All waters south and east of a line running in a southerly direction from Horniblow Point (North end of Norfolk-Southern Railroad Bridge) to a point of land on the east side of R												
Burnt Mill Creek															
30-8-1	C;Sw	5.2 FW Miles		S					ND					Habitat Degradation	Unknown
			From source to Yeopim River		MB6	M	2005								
Little River															
30-5-(1)a	C;Sw	2.8 FW Miles		S					ND						
			From source to SR 1225		MB7	M	2005								
30-5-(1)b	C;Sw	7.9 FW Miles		I	MA2	CE	Chlor a	10.9	S	MA2	NCE			Chlorophyll a	Unknown
			From SR 1225 to Halls Creek												
Perquimans River															
30-6-(1)a	C;Sw	17.0 FW Miles		S					ND					Habitat Degradation	Unknown
			From source to Bagley Swamp		MB8	M	2005								
30-6-(1)b	C;Sw	7.1 FW Miles		NR+					ND					Habitat Degradation	Unknown
			From Bagley Swamp to Norfolk-Southern Railroad Bridge		MB12	F	2005								
30-6-(3)	SC	692.6 S Acres		I	MA6	CE	Low DO	12.3	S	MA6	NCE			Chlorophyll a	Unknown
					MA6	CE	Low pH	45.6						Low pH	Unknown
					MA6	NCE	Chlor a	8.7						Low Dissolved Oxygen	Unknown
			From Norfolk-Southern Railroad Bridge to a line across the												

Table 8 Pasquotank Subbasin 03-01-52

AU Number	Classification	Length/Area	Description	Aquatic Life Assessment					Recreation Assessment			Shellfish Harvesting			
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result	SH Rating	GA	Stressors	Sources

Use Categories:
AL - Aquatic Life
REC - Recreation
SH - Shellfish Harvesting

Monitoring data type:
MF - Fish Community Survey
MB - Benthic Community Survey
MA - Ambient Monitoring Site
ML- Lake Monitoring
N- DEH RECMON

GA - DEH SS Classification and Growing Area
APP- Approved
CAO- Conditionally Approved-Open
CAC- Conditionally Approved-Closed
PRO- Prohibited

Results:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
NI - Not Impaired
S- Severe Stress
M-Moderate Stress
N- Natural

Use Support Ratings 2006:
S - Supporting, I - Impaired
NR - Not Rated
NR*- Not Rated for Recreation (screening criteria exceeded)
ND-No Data Collected to make assessment
NR+-Not rated because draft criteria used for rating

Results
CE-Criteria Exceeded > 10% and more than 10 samples
NCE-No Criteria Exceeded

Miles/Acres
FW- Fresh Water
S- Salt Water

Aquatic Life Rating Summary

S	m	73,736.7	S Acres
I	m	692.6	S Acres
S	m	25.0	FW Miles
NR+	m	7.1	FW Miles
I	m	7.9	FW Miles
NR	e	14.7	S Acres
NR	e	8.0	FW Miles
ND		18,220.6	S Acres
ND		40.9	FW Miles

Recreation Rating Summary

S	m	74,429.3	S Acres
S	m	7.9	FW Miles
ND		18,235.3	S Acres
ND		80.9	FW Miles

Fish Consumption Rating Summary

I	m	73,736.7	S Acres
I	e	18,927.8	S Acres
I	e	88.8	FW Miles

Four sites were sampled for benthic macroinvertebrates in 2005. Three of the sites received a Moderate bioclassification based on swamp criteria. One site received a Fair bioclassification using draft Coastal B criteria. Long-term trends in water quality cannot be assessed with the limited macroinvertebrate data; however, there is one exception. This exception can be found in the Little River where a more diverse benthic community was identified in 2005 than in 2000.

Data were also collected from three ambient monitoring stations (MA2, MA6 and MA8). Ambient monitoring on the Perquimans River (MA6) showed frequent pH measurements below the water quality standard. Perquimans River drains swamps in much of the watershed including a portion of the Great Dismal Swamp. Swamps are naturally low in pH and low pH levels are not unexpected. Refer to the *2006 Pasquotank River Basinwide Assessment Report* http://h2o.enr.state.nc.us/esb/Basinwide/PASQUOTANK2006Final.pdf and Appendix I for more information on monitoring.

Waters in the following sections and in Table 8 are identified by an assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database, list 303(d) Impaired waters, and to identify waters throughout the basin plan. The AU# is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU# indicates that the assessment is smaller than the DWQ index segment. No letter indicates that the AU# and the DWQ index segment are the same.

3.2 Use Support Assessment Summary

All surface waters in the state are assigned a classification appropriate to the best-intended use of that water. Waters are regularly assessed by DWQ to determine how well they are meeting their best-intended use. Table 9 provides a summary of use support for waters in subbasin 03-01-52.

In subbasin 03-01-52, use support was assigned for aquatic life, recreation, and fish consumption categories. Waters are Supporting, Impaired, Not Rated, and No Data in the aquatic life and recreation categories on a monitored or evaluated basis. All waters are Impaired in the fish consumption category on an evaluated basis based on fish consumption advice issued by the Department of Health and Human Services (DHHS).

For more information about use support determinations, refer to Appendix II or the *Supplemental Guide to North Carolina's Basinwide Planning: Support Document for Basinwide Water Quality Plans* found at DWQ's website http://h2o.enr.state.nc.us/basinwide/SupplementalGuide.htm. Appendix V provides definitions of the terms used throughout this basin plan.

Table 9 Summary of Use Support Ratings by Category in Subbasin 03-01-52

Use Support Rating	Aquatic Life		Recreation	
	Freshwater	**Saltwater**	**Freshwater**	**Saltwater**
Monitored				
Supporting	25.0 mi	73,736.7 ac	7.9 mi	74,429.3 ac
Impaired*	7.9 mi (19.8%)	692.6 ac (0.9%)	0	0
Not Rated	7.1 mi	0	0	0
Total	**40.0 mi**	**74,429.3 ac**	**7.9 mi**	**74,429.3 ac**
Unmonitored				
Not Rated	8.0 mi	14.7 ac	0	0
No Data	40.9 mi	18,220.6 ac	80.9 mi	18,235.3 ac
Total	**48.9 mi**	**18,235.3 ac**	**80.9 mi**	**18,235.3 ac**
Totals				
All Waters	**88.9 mi**	**92,664.6 ac**	**88.8 mi**	**92,664.6 ac**

* The noted percent Impaired is the percent of monitored miles/acres only.

3.3 Status and Recommendations of Previously and Newly Impaired Waters

The following waters were either identified as Impaired in the previous basin plan (2002) or are newly Impaired based on recent data. If previously identified as Impaired, the water will either remain on the state's 303(d) list or will be delisted based on recent data showing water quality improvements. If the water is newly Impaired, it will likely be placed on the 2008 303(d) list. The current status and recommendations for addressing these waters are presented below, and each is identified by an AU#. Information regarding 303(d) listing and reporting methodology is presented in Chapter 15.

3.3.1 Little River [AU# 30-5-(1)a, 30-5-(1)b and 30-5-(2)]

2002 Status

Upper Little River [AU# 30-5-(1)], from source to Halls Creek (11.8 mi.), was first listed on the 1998 303(d) list of Impaired waters for a water quality standards violation (low DO). Potential sources were identified as nonirrigated crop production, onsite wastewater systems, off-farm animal holding and/or management areas and land development. Lower Little River [AU# 30-5-(2)], from Halls Creek to the Albemarle Sound (6,263.9 acres), was then added to the 2000 303(d) list of Impaired waters for a water quality standards violation (low DO). Agriculture and onsite wastewater systems were identified as potential sources. In both segments, swamp conditions combined with agricultural runoff were thought to be contributing to the low DO levels. DWQ recommended additional sampling in order to evaluate natural and anthropogenic impacts on DO levels in the Little River. Growth management was also recommended to protect water quality from future development activities.

Current Status [AU# 30-5-(1)a]

Little River, from source to SR 1225 (2.8 miles), is Supporting in the aquatic life category due to a Moderate swamp benthic bioclassification at site MB7. Previous sampling in 2000 also resulted in a Moderate swamp bioclassification. Substrate was composed entirely of detritus and there was no evidence of channel modification. Snags, undercut banks, root mats and leaf packs

were present but rare. The riparian zone on the right streambank was wide and intact, but on the left, there was evidence of timber harvesting. There was also evidence of recent de-snagging. No active NPDES discharges are located upstream of site MB7.

Current Status [AU# 30-5-(1)b]
Little River, from SR 1225 to Halls Creek (7.9 miles), is Impaired in the aquatic life category due to a water quality standards violation at ambient monitoring station MA2. Site MA2 was sampled 46 times for chlorophyll *a* over the course of the five-year assessment period. Nearly 11 percent of the samples were above the water quality standard for chlorophyll *a* indicating nutrient enrichment at this segment of the river.

Current Status [AU# 30-5-(2)]
Little River, from Halls Creek to the Albemarle Sound (6,263.9 acres), was not sampled during this assessment period.

2007 Recommendations
DWQ recommends that the upper 2.8 miles of the Little River be removed from the 2008 303(d) list of Impaired waters as a result of the recent benthic bioclassification. Little River [AU# 30-5-(1)b], from SR 1225 (one mile downstream of SR 1221) to Halls Creek, however, will be listed on the 2008 303(d) list for a water quality standards violations. Lower Little River [AU# 30-5-(2)], should remain on the 2008 303(d) list of Impaired waters of chlorophyll *a* for further assessment of DO and swamp drainage affects.

Land use activities have significantly changed in the Little River watershed with residential and commercial development expanding. As developments occur along channels and ditches to the Little River, riparian buffers are recommended to aid in the filtering of stormwater runoff, promote infiltration and protect water quality. Road construction activity on the NC-17 bypass may have contributed to increased sediment loads in the Little River during the data collection period.

3.3.2 Perquimans River [AU# 30-6-(3)]

Perquimans River, from the Norfolk-Southern Railroad Bridge to a line across the river from Barrow Point to Ferry Point (692.6 saltwater acres), is Impaired in the aquatic life category due to water quality standards violations at ambient monitoring station MA6. Site MA6 was sampled 57 times for dissolved oxygen and pH over the course of the five-year assessment period. Over 12 percent of the samples were below the water quality standard for dissolved oxygen. Nearly 46 percent were below the water quality standard of for pH. Chlorophyll *a* was also elevated with 8.7 percent of the 46 samples collected above the water quality standard.

2007 Recommendations
Excess nutrients continue to be a water quality issue at the mouth of the Perquimans River, resulting in algal blooms and subsequent fish kills. This reach of the Perquimans River also receives drainage from swamp waters, which can contribute to low pH and low DO conditions. However, overall water quality conditions reflect that land use activities are influencing water quality. Continued growth and development in this watershed also contributes towards water quality impairments.

The Town of Hertford WWTP discharges to Mill Creek located downstream of ambient monitoring site MA6. The WWTP continues to have inflow and infiltration problems and the Special Order of Consent (SOC) has been extended until 2008, as planning for expansion continues. The facility has a water reuse permit (WQ0021289) and received a High Unit Cost Grant from DWQ Construction Grants & Loans to install a 325,000 gallon reuse above ground storage tank, dual 1,000 gallon per minute irrigation pumps with flow meters, and a turbidity meter. The water will irrigate 78.1 acres that has been divided into nine zones. DWQ staff will continue to work with the Hertford WWTP, providing technical assistance and ensuring that permit limits are met. Upstream segments of the river are Supporting and Not Rated (See 3.4.1 below).

3.4 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns were documented for these waters during this assessment. Attention and resources should be focused on these waters to prevent additional degradation and facilitate water quality improvements. DWQ will notify local agencies of these water quality concerns and work with them to conduct further assessments and to locate sources of water quality protection funding. Additionally, education on local water quality issues and voluntary actions are useful tools to prevent water quality problems and to promote restoration efforts. The current status and recommendations for addressing these waters are presented below, and each is identified by an AU#. Nonpoint source program agency contacts are listed in Appendix IV.

3.4.1 Perquimans River [AU# 30-6-(1)a and AU# 30-6-(1)b]

Current Status [AU# 30-6-(1)a]
Perquimans River, from source to Bagley Swamp (17.0 miles), is Supporting in the aquatic life category due to a Moderate swamp benthic bioclassification at site MB8. Substrate was a mix of silt and organic matter; sticks, snags, logs and root mats were common; and there was some evidence of channelization and recent de-snagging activities. The riparian zone was wide and intact on both sides of the stream. No active NPDES discharges are located upstream of site MB7.

Current Status [AU# 30-6-(1)b]
Perquimans River, from Bagley Swamp to the Norfolk-Southern Railroad Bridge (7.1 miles), is Not Rated^{+} in the aquatic life category. Site MB12 was sampled using draft criteria for Coastal B Rivers and labeled as NR^{+}. Coastal B rivers are defined as waters in the coastal plain that are deep (nonwadeable), freshwater systems with little or no visible current under normal or low flow conditions. Other characteristics may include an open canopy, low pH and low DO. Boat sampling is required for these waters. Site MB12 received a Fair benthic bioclassification, based on the draft criteria for Coastal B rivers. Any bioclassifications derived from sampling data should be considered draft and not used for use support decisions; therefore this section of the Perquimans River is Not Rated^{+}. (BAU, March 2006).

Site MB12 is located approximately three miles above the Town of Hertford and there are no active NPDES dischargers upstream of this site. The stream is a large deep river, approximately 100 meters wide. Substrate was a mix of silt and detritus; the water was dark and tannic; and snags and logs were abundant. Sticks, undercut banks and aquatic macrophytes were common. The riparian zone on both sides was intact and moderately wide. Several macroinvertebrate taxa

were present in both 2000 and 2005 samples that are indicators of low dissolved oxygen levels in the water. Local residents report this reach is a popular recreational fishing site.

2007 Recommendations
Along portions of the Perquimans River, water quality improvements may be obtained by planting critical areas, establishing stormwater wetlands, and encouraging the maintenance of riparian buffers.

3.4.2 Burnt Mill Creek [AU# 30-8-1]

Burnt Mill Creek, from source to the Yeopim River (5.2 miles), is Supporting in the aquatic life category due to a Moderate swamp benthic bioclassification at site MB6. Prior to 2005, the site was sampled twice. In 1995, the site was Not Rated and in 2000, the site was Moderate based on swamp criteria. Substrate was a mix of silt, sand and detritus; sticks, snags, logs and root mats were present but rare; and leaf packs and aquatic macrophytes were absent. Undercut banks were common and the riparian zones on both banks had frequent breaks, but were moderately wide. No active NPDES discharges are located upstream of site MB6.

3.4.3 Bethel Creek [AU# 30-8-3]

Bethel Creek, from source to the Yeopim River (8.0 miles), is Not Rated on an evaluated basis in the aquatic life category due to significant noncompliance issues with permit limits at the Bethel Water Treatment Plant (WTP) (Permit NC0068861). By permit, the Bethel WTP is required to monitor whole effluent toxicity (WET) and is failing to meet its 90 percent acute toxicity target for effluent concentration. The facility discharges filter backwash or reverse osmosis (RO) reject water into Bethel Creek. The Bethel WTP is expanding, with the discharge being relocated to Albemarle Sound. The town has been advised to seek state funds to assist with renovation of the WTP.

3.4.4 Mill Creek [AU# 30-6-5-(2)]

Mill Creek, from the Perquimans County SR 1214 near Winfall to the Perquimans River (14.7 saltwater acres), is Not Rated on an evaluated basis in the aquatic life category due to significant noncompliance issues with permit limits at the Town of Winfall Water Treatment Plant (WTP) (Permit NC0081850). By permit, the Winfall WTP is required to monitor whole effluent toxicity (WET) and is failing to meet its 90 percent acute toxicity target for effluent concentration. The facility discharges filter backwash or reverse osmosis (RO) reject water into Mill Creek. During the last two years of the assessment period, the facility also experienced significant noncompliance issues with total suspended solids (TSS) and settleable solids.

The Town of Winfall's WTP recently was expanded and upgraded, and TSS are likely to meet compliance, but toxicity violations may remain an issue.

3.5 Additional Water Quality Issues within Subbasin 03-01-52

The previous sections discussed water quality concerns for specific stream segments. The following section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes, or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

According to the ***Sanitary Survey of Albemarle and Currituck Sounds, Areas* I-1, I-3 through I-16** (*DEH Shellfish Sanitation & Recreational Water Quality Section*, December 2005), there has been little change in water quality since the last survey. The only shellfish found in this area is *Rangia* clams. No commercial shellfish harvesting occurs. Freshwater runoff is the most significant factor affecting water quality in this region and can be associated with agricultural runoff or natural runoff from swampwaters following heavy rains.

Growing area I-6 consists of the Little River and Big Flatty Creek. The area is almost entirely rural and is comprised mainly of wooded areas and farmland. However, two new subdivisions are being developed along the Little River and an additional four subdivisions are being developed in the area. There was one chicken farm, two hog farm operations and approximately 150 goats observed during the survey.

Area I-7 consists of the entire watershed of the Perquimans River. The majority of the population lives in the Town of Hertford, which has an estimated population of 2,000. Hertford WTTP discharges to the Perquimans River (See 3.3.2 above). Much of the land in area I-7 is used for agriculture.

A 65.5-acre sewage disposal field treats waste from a subdivision located in land draining to area I-8, but is not adjacent to any water. Area I-8 includes the watersheds of Yeopim River and Yeopim Creek. Most of this area is rural and is either forested or farmed. There is one major subdivision whose sewage is spray field applied on land in area I-8. Three other subdivisions are occupied with seasonal residents.

3.5.1 Wastewater Non-Discharge Runoff

The Albemarle Plantation (WQ0001817) is a non-discharge facility using surface irrigation to dispose of its wastewater effluent. The disposal field for Albemarle Plantation, like several sites in northeastern NC, has limited hydraulic capacity due to poor soils. Therefore, proper operation of the site is critical to prevent ponding and run-off, while at the same time maintaining adequate freeboard. The Albemarle Plantation is in the Yeopin Creek watershed, which is currently not monitored by DWQ.

3.5.2 Dioxin Contamination Fish Consumption Advisory

In 2001, the Department of Health and Human Services (DHHS) issued dioxin advisory for the consumption of catfish and carp in the Albemarle Sound from Bull Bay to Harvey Point; West to the mouth of the Roanoke River and to the mouth of the Chowan River to the U.S. Highway 17 Bridge (Perquimans, Chowan, Bertie, Washington, and Tyrrell Counties). For more information on this advisory, please visit the DHHS website http://www.epi.state.nc.us/epi/fish/.