

# Chapter 1

## Pasquotank River Subbasin 03-01-50

Including: Pasquotank River and Tributaries

### 1.1 Subbasin Overview

#### *Subbasin 03-01-50 at a Glance*

##### **Land and Water Area**

Total area:	454 mi <sup>2</sup>
Land area:	390 mi <sup>2</sup>
Water area:	64 mi <sup>2</sup>

##### **Land Cover (percent)**

Forest/Wetland:	46%
Cultivated Crop:	34%
Surface Water:	18%
Urban:	<1%
Pasture/ Managed Herbaceous:	1%

##### **Counties**

Gates, Pasquotank and Camden

##### **Municipalities**

Elizabeth City

##### **Monitored Waterbody Statistics**

###### **Aquatic Life**

Total:	44.0 mi/38,523.8 ac
Supporting:	26.5 mi/29,338.2 ac
Not Rated:	17.5 mi/9,185.6ac

###### **Recreation**

Total:	38,523.8 ac
Supporting:	38,523.8 ac

The Pasquotank River subbasin 03-01-50 contains the headwaters of Pasquotank River and its headwaters from the Great Dismal Swamp. Ecologically, the subbasin contains characteristics of the Chesapeake-Pamlico lowlands and tidal marshes, as well as nonriverine swamps and peatlands. Most streams are of low relief and swampy, and channelized ditches are common. Southward, a significant portion of the waters in this subbasin are brackish estuarine, including Albemarle Sound and the Pasquotank River below Elizabeth City. Land cover generally consists of evergreen forests, mixed forests, forested wetlands and marshes, and cultivated crops, such as wheat, cotton and peanuts.

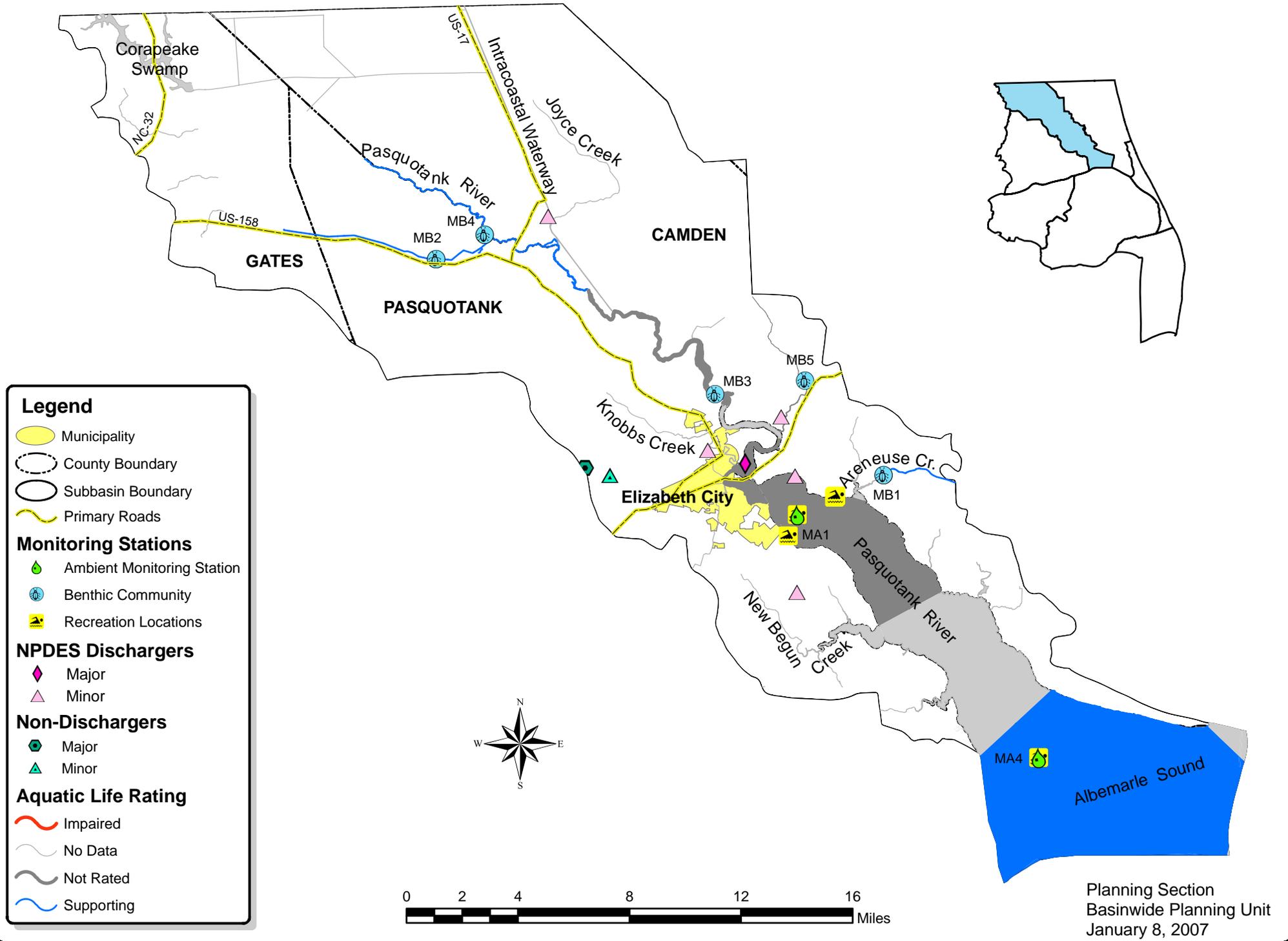
Portions of Gates, Pasquotank and Camden Counties are found in this subbasin with the largest population centered around urbanized areas. Between 1990 and 2000, Elizabeth City has experienced a growth rate of 20 percent. The population of the subbasin is expected to continue to increase over the next twenty years. Refer to Chapter 11 for more information about population growth and trends.

There is one major and five minor National Pollutant Discharge Elimination System (NPDES) dischargers in this subbasin with a total permitted discharge of 5.0 MGD. The major NPDES facility is the Elizabeth City Wastewater Treatment Plant (WWTP) with a permitted flow of 4.5 MGD. The Elizabeth City WWTP is required by permit to monitor whole effluent toxicity (WET). No WET violations were reported during the last two years of

the assessment period. There are two non-discharge permits and ten stormwater discharge permits in this subbasin. Refer to Appendix III for the listing of NPDES permit holders.

A map, including the locations of the NPDES facilities and water quality monitoring stations, is presented in Figure 3. Table 3 contains a summary of monitored waterbodies and their associated assessment unit numbers (AU#) and lengths, 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 3 Pasquotank River Subbasin 03-01-50



**Table 3 Pasquotank Subbasin 03-01-50**

AU Number	Classification	Length/Area		Aquatic Life Assessment				Recreation Assessment			Shellfish Harvesting		Stressors	Sources
				AL Rating	Station	Result	Year/ Parameter % Exc	REC Rating	Station	Result	SH Rating	GA		
<b>ALBEMARLE SOUND</b>														
30a	SB	29,338.2	S Acres	<b>S</b>	MA4	NCE			<b>S</b>	MA4	NCE			
Portion of Albemarle Sound in subbasin 03-01-50. 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														
<b>Areneuse Creek</b>														
30-3-13-(1)	C;Sw	2.9	FW Miles	<b>S</b>					ND				Nutrient Impacts	Failing Septic Syst
From source to N.C. Highway # 343														
					MB1	M	2005							
					MB1	NR	2002							
<b>Newland Drainage Canal</b>														
30-3-1.5	C;Sw	7.7	FW Miles	<b>S</b>					ND				Habitat Degradation	Agriculture
From source to Pasquotank River														
					MB2	M	2005							
<b>Pasquotank River</b>														
30-3-(1)	WS-V;Sw	15.9	FW Miles	<b>S</b>					ND					
From source to a point 1.7 mile upstream of mouth of Turners Cut														
					MB4	M	2005							
					MB4	NR	2002							
30-3-(12)	SB	9,185.6	S Acres	<b>NR</b>	MA1	CE	Low pH 39.1		<b>S</b>	MA1	NCE		Low pH	Natural Conditions
From a line across River from Hospital Point to Cobb Point to a line across River from Miller Point to Pool Point														
										N49	NCE		Nickel	WWTP NPDES
										N49A	NCE			
										N51	NCE			
30-3-(3)	WS-IV;Sw	10.8	FW Miles	<b>NR+</b>					ND				Lack of Organic Material	Unknown
From a point 1.7 mile upstream of mouth to Turners Cut to a point 0.6 mile upstream of Pasquotank County SR 1368 extension														
					MB3	F	2005							
<b>Sawyers Creek</b>														
30-3-6	C;Sw	6.7	FW Miles	<b>NR</b>					ND				Low pH	MS4 NPDES
From source to Pasquotank River														
					MB5	NR	2002						Low Dissolved Oxygen	Natural Conditions

**Table 3 Pasquotank Subbasin 03-01-50**

AU Number	Classification	Length/Area	Aquatic Life Assessment				Recreation Assessment			Shellfish Harvesting		Stressors	Sources
			AL Rating	Station	Result	Year/ Parameter % Exc	REC Rating	Station	Result	SH Rating	GA		
<b>Use Categories:</b>		<b>Monitoring data type:</b>		<b>Results:</b>			<b>Use Support Ratings 2006:</b>						
AL - Aquatic Life	MF - Fish Community Survey			E - Excellent			S - Supporting, I - Impaired						
REC - Recreation	MB - Benthic Community Survey			G - Good			NR - Not Rated						
SH - Shellfish Harvesting	MA - Ambient Monitoring Site			GF - Good-Fair			NR*- Not Rated for Recreation (screening criteria exceeded)						
	ML- Lake Monitoring			F - Fair			ND-No Data Collected to make assessment						
	N- DEH RECMON			P - Poor			NR+-Not rated because draft criteria used for rating						
				NI - Not Impaired			<b>Results</b>						
GA - DEH SS Classification and Growing Area				S- Severe Stress			CE-Criteria Exceeded > 10% and more than 10 samples						
APP- Approved				M-Moderate Stress			NCE-No Criteria Exceeded						
CAO- Conditionally Approved-Open				N- Natural			<b>Miles/Acres</b>						
CAC- Conditionally Approved-Closed							FW- Fresh Water						
PRO- Prohibited							S- Salt Water						

**Aquatic Life Rating Summary**

**Recreation Rating Summary**

**Fish Consumption Rating Summary**

S	m	29,338.2 S Acres	S	m	38,523.8 S Acres	I	e	2.2 S Miles
NR	m	9,185.6 S Acres	ND		2.2 S Miles	I	e	51,558.9 S Acres
S	m	26.5 FW Miles	ND		13,035.1 S Acres	I	e	1,094.4 FW Miles
NR+	m	10.8 FW Miles	ND		1,094.4 FW Miles			
NR	m	6.7 FW Miles						
NR	e	915.8 S Acres						
ND		2.2 S Miles						
ND		12,119.2 S Acres						
ND		1,050.4 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. Three of the four sites were also sampled in 2002 as part of a special study. A fourth site was also sampled on Sawyers Creek as part of this special study. None of these sites could be rated for benthic macroinvertebrates due to “naturally harsh conditions” during the time of sampling (DWQ ESS, May 2002). Data were also collected from two ambient monitoring stations. 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 3 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.

## 1.2 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 4 provides a summary of use support for waters in subbasin 03-01-50.

In subbasin 03-01-50, use support was assigned for aquatic life, recreation, fish consumption and water supply categories. Waters are Supporting, 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 fish consumption advice issued by the Department of Health and Human Services (DHHS). All waters are Supporting in the water supply category on an evaluated basis based on reports from Division of Environmental Health (DEH) regional water treatment plant consultants.

Table 4 Summary of Use Support Ratings by Category in Subbasin 03-01-50

Use Support Rating	Aquatic Life		Recreation	
	Freshwater	Saltwater	Freshwater	Saltwater
<b>Monitored Waters</b>				
Supporting	26.5 mi	29,338.2 ac	0	38,523.8 ac
Impaired	0	0	0	0
Not Rated	17.5 mi (39.7%)	9,185.6 ac (23.8%)	0	0
<b>Total</b>	<b>44 mi</b>	<b>38,523.8 ac</b>	<b>0</b>	<b>38,523.8 ac</b>
<b>Unmonitored Waters</b>				
Not Rated	0	915.8 ac	0	0
No Data	1,050.4 mi	2.2 mi 12,119.2 ac	1,094.4 mi	2.2 mi 13,035.1 ac
<b>Total</b>	<b>1,050.4 mi</b>	<b>2.2 mi</b> <b>13,035 ac</b>	<b>1,094.4 mi</b>	<b>2.2 mi</b> <b>13,035.1 ac</b>
<b>Totals</b>				
<b>All Waters</b>	<b>1,094.4 mi</b>	<b>2.2 mi</b> <b>51,558.8 ac</b>	<b>1,094.4 mi</b>	<b>2.2 mi</b> <b>51,558.9 ac</b>

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

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>.

### **1.3 Status of Previously and Newly Impaired Waters**

No previously or newly impaired waters were identified in subbasin 03-01-50.

### **1.4 Status and Recommendations for Waters with Noted Impacts**

Based on DWQ's most recent use support methodologies, 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#. Refer to Section 1.1 for more information about AU#. Nonpoint source program agency contacts are listed in Appendix IV.

#### **1.4.1 Newland Drainage Canal [AU# 30-3-1.5]**

Newland Drainage Canal, from source to the Pasquotank River (7.7 miles), is Supporting in the aquatic life category due to a Moderate swamp benthic bioclassification at site MB2. Newland Drainage Canal is a channelized ditch and was sampled in order to assess water quality in the middle and upper portions of the subbasin.

DWQ biologists sampled three distinct reaches (above and below the road crossing), each with differing streambank and riparian characteristics. Upstream (above SR 1363), the riparian area was wide and mostly intact. Trees, shrubs and grasses were growing along the streambanks; however, areas of erosion were noted. Immediately downstream of the road crossing, there was no riparian area and the streambanks were either bare or covered with grass. Further downstream (approximately 100 meters from the road crossing), the riparian area was wide, intact and wooded. However, despite the intact riparian area and tree cover, the streambanks were unstable and eroding. Substrate consisted of silt and detritus.

Newland Drainage Canal was sampled in 2002 as part of a special study for a wetland restoration project. The Pasquotank River [AU# 30-3-(1)], Sawyers Creek [AU# 30-3-6] and Areneuse Creek [AU# 30-3-13-(1)] were also sampled. None of the streams were rated because of "naturally harsh conditions." Biologists concluded that saltwater intrusions in the lower part of the watershed and low pH in the upper part of the watershed were influencing water quality in the canal, consequently impacting the benthic communities (DWQ ESS, May 2002).

#### **1.4.2 Sawyers Creek [AU# 30-3-6]**

Sawyers Creek, from source to the Pasquotank River (6.7 miles), is Not Rated in the aquatic life category due to a Not Rated benthic swamp bioclassification at site MB5. Sawyers Creek was last sampled in 2002 as part of a special study for a wetlands restoration project. Saltwater intrusions in the lower part of the basin and low pH in the upper part of the basin created “naturally harsh conditions” and likely influenced the benthic macroinvertebrate population. In 2005, Sawyers Creek could not be sampled due to low flow conditions.

Sawyers Creek is also impacted by discharge from the Grandy Primary School (Camden County) (Permit NC0037214). During the last two years of the assessment period, the discharge had significant noncompliance issues with biochemical oxygen demand (BOD), which can lead to lower than normal dissolved oxygen levels in the receiving stream. The most recent notice of violation (NOV) was issued in July 2006 for exceeding BOD limits.

##### 2007 Recommendations

DWQ staff in the Washington Regional office are currently working with Camden County to ensure that the Grandy Primary School discharge is within permit limits; however, the area around Sawyers Creek is rapidly growing and several permits are on file for additional WWTP facilities. DWQ recommends that a county-wide collection system be considered as a viable option for future wastewater needs in the Sawyers Creek watershed. Due to the significant upgrades needed for the school WWTP to meet compliance standards on a regular basis, the school should consider connecting to the county system.

#### **1.4.3 Areneuse Creek [AU# 30-3-13-(1)]**

##### 2002 Status

Numerous algal blooms were identified as a water quality concern for Areneuse Creek by the DWQ regional office staff. Increased development activities in the watershed were identified as a potential source.

##### Current Status & Special Studies

Areneuse Creek, from source to Highway 343 (2.9 miles), is Supporting in the aquatic life category due to a Moderate swamp benthic bioclassification at site MB1. Substrate consisted of detritus and sticks. Snags and logs were abundant. Undercut streambanks, root mats and leaf packs were present, but rare. The overall habitat score was good. No new algal blooms were reported during the most recent assessment period.

This basinwide sampling site has been sampled three times – 2000, 2002 and 2005. In 2000, the site was rated Moderate. In 2002, the site was Not Rated as part of a special study for a wetlands restoration project. Saltwater intrusions in the lower part of the basin and low pH in the upper part of the basin created “naturally harsh conditions” and likely influenced the benthic macroinvertebrate population. In 2005, the benthic community was much more diverse, resulting in the Moderate bioclassification.

##### 2007 Recommendations

Although no significant algal blooms have been reported in Areneuse Creek within the last three years, watershed and environmental conditions (i.e., wind and low flow conditions) may promote future blooms. Residential properties are located throughout the watershed, many of which are

on septic systems. Failing septic systems can introduce nutrients and bacteria into the environment. Excess nutrients in any waterbody have the potential to cause excess algal growth. DWQ recommends a targeted educational campaign in Areneuse Creek related to septic system maintenance. Failing septic systems should be identified and repaired per county and state requirements. More information about septic systems can be found in Chapter 10.

#### **1.4.4 Pasquotank River [AU# 30-3-(3) and AU# 30-3-(12)]**

These segments of the Pasquotank River are not classified by DWQ for shellfish harvesting purposes (Class SA). DEH Shellfish Sanitation & Recreational Water Quality Section completed a sanitation survey of this area in 2005 and noted that there has been little change in water quality since the last sanitation survey per the *Sanitary Survey of Albemarle and Currituck Sounds, Areas I-1, I-3 through I-16*. The only shellfish found in this area is *Rangia* clams and 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 swamp waters following heavy rains.

Area I-5 consists of the entire watershed of the Pasquotank River. Most of the area is rural with the exception of Elizabeth City. A significant increase in subdivision development has occurred since the last sanitary survey in 2001. Elizabeth City WTP discharges to the Pasquotank River and the TECOM blimp factory WWTP discharges into New Begun Creek [AU# 30-3-16-(1) and 30-3-16-(2)]. There are also two lime-treated sewage application sites in this area. Outside of Elizabeth City, agriculture is the main land use activity with the production of cabbage, corn, and soybeans.

##### Current Status [AU# 30-3-(3)]

The Pasquotank River, from a point 1.7 miles upstream of the mouth to Turner's Cut to a point 0.6 mile upstream of the Pasquotank County SR 1368 extension (10.8 miles), is Not Rated<sup>+</sup> in the aquatic life category. Site MB3 was sampled using draft criteria for Coastal B Rivers and labeled as NR<sup>+</sup>. 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 MB3 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 Pasquotank River is Not Rated<sup>+</sup>. (BAU, March 2006).

##### Current Status [AU# 30-3-(12)]

Another section of the Pasquotank River, from the line across the river from Hospital Point to Cobb Point to a line across the river from Miller Point to Pool Point (9,185.6 saltwater acres), is Not Rated in the aquatic life category due to low pH values recorded at the ambient monitoring station at site MA1. Low pH values are not unexpected in the Pasquotank River since it receives water from many classified swamp streams including the Great Dismal Swamp. Swamp waters naturally show low pH levels, which can impact freshwater and saltwater found in the Pasquotank River.

##### 2007 Recommendations

Elizabeth City, Pasquotank and Camden Counties are required to implement water supply watershed protection ordinances. Field observations and information from the local resource

agency staff indicated that urban stormwater runoff may be adversely impacting water quality in the Pasquotank River near Elizabeth City. DWQ recommends that Elizabeth City implement Phase II stormwater management strategies. In addition, improved monitoring is needed for permitted stormwater dischargers to improve compliance. Non-permitted facilities need to be evaluated for obtaining stormwater discharge permits and discharge limits. Pasquotank County and Elizabeth City are in the process of trying to develop a regional wastewater treatment facility to help eliminate package plant use and septic systems that commonly fail due to soil conditions in the area. Inflow and infiltration to Elizabeth City's WWTP is a problem and may be addressed with the construction of alternative force mains and additional pump stations. Over two million dollars of Clean Water Management Trust Funds monies have been allocated to improving the efficiency of Elizabeth City's WWTP system.

## **1.5 Additional Water Quality Issues within Subbasin 03-01-50**

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.

Agriculture is a significant land use activity in Subbasin 03-01-50. Therefore, there is a need to increase implementation of agricultural best management practices (BMPs) to protect water quality. Conservation tillage, land smoothing to improve surface drainage, critical area planting, and conservation cover crops are potential BMPs that can control erosion. Water control structures, controlled drainage, and constructed wetlands are needed to control and slow runoff, thus reducing nutrient and sediment loss. Riparian buffers and filter strips are also needed to help remove organic materials, sediment, nutrients, and pesticides from stormwater runoff. Technical assistance is needed to help land managers appropriately apply fertilizer to reduce excess runoff and nutrient loss. There are several inactive hog operations in this subbasin. It is important that lagoon closures are completed to prevent water quality contamination. BMPs implemented on existing hog facilities should be monitored to ensure compliance.

Residential development has increased in this subbasin. Local governments and agencies are encouraged to proactively plan, provide public education programs and implement conservation strategies to prevent water quality degradation.

