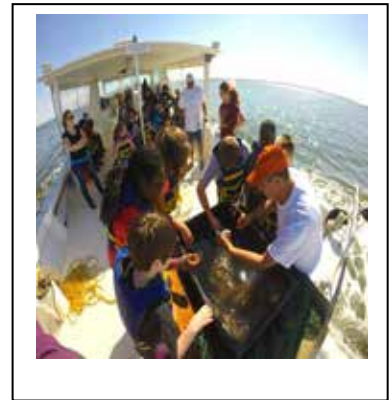




Suffolk's Seafood Industry



Buffer Restoration Project



Future Environmental Leaders

# 2014 STATE OF THE NANSEMOND RIVER AND ITS TRIBUTARIES REPORT

AN ANALYSIS OF WATERWAY SAMPLING DATA  
COLLECTED JANUARY 2013 – DECEMBER 2014

NRPA Water Quality Committee  
Suffolk, Virginia  
Released April 2015

# Nansemond River Preservation Alliance

## 2014 State of the Nansemond Report Card

	Parameter	2010	2012	2014	Where We Are in 2014	Where We Want to Be
P O L L U T I O N	<b>Bacteria</b>					
	Upper Nans.	F	D-	D-	Expanded closure of Nansemond River,	100% of waters meeting recreation standards.
	Lower Nans.	B+	B+	C	Closed all Bennett's & Knott's Creeks for shellfish harvesting.	Open all waters for shellfish harvesting.
	<b>Total Nitrogen</b>	D	C+	C+	Slight decrease in Total Nitrogen	Levels << algae bloom thresh.
	<b>Phosphorus</b>	D	D+	D+	Levels far exceeded could cause algae blooms/eutrophication	Levels << algae bloom thresh.
	<b>Dissolved Oxygen</b>	B	B	B	Average levels healthy Seasonal variations - below minimum thresholds	Sufficient for abundant aquatic life (>>5.0mg/L).
	<b>Water Clarity</b>	Poor - based upon limited data	D	D	Poor - Impediment to SAV growth, Secchi Disk reading <0.5m.	Clarity sufficient for SAV growth. Secchi Disk reading >1.0m
H A B I T A T	<b>Wetlands Shoreline Buffer</b>	B-	C+	C+	27,000 acres but wetlands sparse in high runoff areas. Encroachment in RPA buffer.	No further loss of forests. No further encroachment in RPA buffer.
	<b>Oyster Restoration</b>	startup mode	B-	B-	Plans to establish an oyster sanctuary in 2015. Need to increase # homeowners	Significant restoration of oyster reefs, Nansemond R. and Chuckatuck Creek.
	<b>Open Space &amp; Public Access</b>	D	C+	C+	Sleepy Hole access planned. John Smith Trail open. Nans. Wildlife Refuge (radio trans. site) closed to public.	Open Sleepy Hole access. Access at Constant's Wharf. Wildlife Sanctuary (radio transm. site) open to public.
P O C L O L N U T R I O L	<b>Storm Water Improvements</b>	C+	C+	C+	Public Works created TMDL Plan. Need to enforce CPBA. Storm water runoff an issue.	Meet EPA requirements. Implement TMDL plan for reduction in pollutants.
	<b>Sewer System Improvements</b>	C+	C	C+	Upper Nansemond impaired. Installing sewer lines in communities near river.	Meet EPA/DEQ requirements. Replace faulty pump stations - 100% integrity.
	<b>Clean Boating</b>	B	B+	B+	Constant's Wharf & Bennett's Creek Landing has pump out. HRSD will pump out.	100% compliance with clean boating standards.
E D U	<b>Education &amp; Awareness</b>	Start up mode	A	A	Community-wide programs Program in schools Educational collaborations	All residents are environmental stewards

## 2014 State of the Nansemond and Its Tributaries Report

Published by the Nansemond River Preservation Alliance Water Quality Committee

### EXECUTIVE SUMMARY

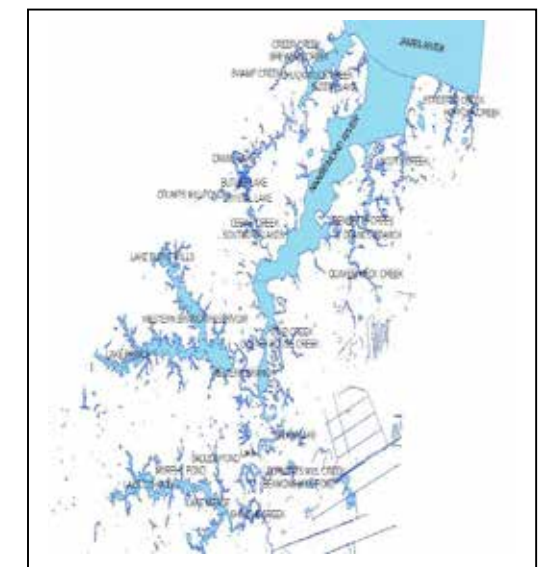
The data shows that Bennett's, Bleakhorn and Knott's Creeks and portions of the Nansemond River are seriously compromised and need significant efforts to help restore the waterways to good health. The health of the river ultimately determines the fate of the watermen who depends on the waterways for their livelihood and to the citizens of Suffolk who boat, hunt and swim on the waters. Migratory and resident birds and animals depend on a healthy river for survival. The Nansemond River is home to a 208 acre U.S. Fish and Wildlife preserve located south of Sleepy Hole Park. If further degradation of the waterways continues it could have significant impact on the City of Suffolk's property values and on the recreation industry to include duck hunting since few people would choose to live or recreate on a polluted waterway.

NRPA is able to report some progress in several areas. The trend of average dissolved oxygen has improved, however, there are times during the year when dissolved oxygen falls below critical threshold levels. Unfortunately, the majority of the health indicators remain relatively unchanged from the 2012 report and the recent condemnation of additional oyster grounds is proof the River and creeks continue to decline at an alarming rate. At the current rate the entire river could be closed to shellfishing in the near future. Much work remains to be done to restore the Nansemond River and its creeks to full health. This effort has to be a partnership between the citizens of Suffolk who need to embrace good environmental practices such as picking up pet waste and proper application of fertilizer. The city government needs to continue working in collaboration with organizations to educate citizens and to properly enforce all applicable laws, regulations and land use permits.

A summary Report Card and Supporting Data and Graphs are included in Sections 2 and 3.

### NRPA WATER QUALITY COMMITTEE

CAPT Steven Barnum, NOAA (RET), Chair  
 David Basnett  
 Pam Courtney  
 Captain Robert Crocker  
 Paul E. Fisher  
 Philip Ford  
 Robert Foley  
 Pat Hillard  
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 Steven Kirkpatrick  
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 Alex Pinell  
 Cyndi Pinell  
 Neil Wilson  
 A. Scott Wilson  
 John Wass  
 Jack Van Straten  
 Joseph Verdirame, MD  
 Nick Worth  
 Elizabeth Taraski, PhD, Executive Director



Nansemond River and Its Tributaries

## NANSEMOND RIVER PRESERVATION ALLIANCE (NRPA) MISSION STATEMENT

The mission of the Nansemond River Preservation Alliance is to raise public awareness and encourage environmental stewardship of the Nansemond River, Bennett's, Bleakhorn, Chuckatuck and Knott's Creeks and their tributaries and wetlands. NRPA creates programs and also works in collaboration with local, regional, statewide and national organizations, government agencies and businesses. NRPA is a member-supported, non-profit organization.

## NRPA ORGANIZATION AND PROGRAM SUMMARY

In less than four years NRPA, through the efforts of 200+ volunteers and a part-time executive director, created ten programs that have educated and encouraged over 3,000 residents to become environmental stewards. NRPA has a 22 member board and four committees: Water Quality Committee, Environmental Education Committee, Shoreline Committee, and Increasing Public Access Committee.

NRPA's activities include: 1) Conducting the approved VA Department of Environmental Quality Citizen Water Sampling program. 2) Developing and publishing the bi-annual waterways quality report. 2) Educating 1,000, 7th grade students/year through the NRPA Nansemond Watershed Initiative: *"Connecting the Classroom with the Environment"* program. 3) Twice a year presenting the Environmental – *River Talk* program designed to educate the community on best practices by bringing experts to the community. 4) Planning and sponsoring the community – wide educational River & Creek Fest program. 5) Working collaboratively with businesses, community organizations and governmental agencies on buffer restoration projects.

**The Nansemond River Preservation Alliance supports the Environmental Protection Agency in its efforts to restore our waterways to full health. Specifically, NRPA supports the City of Suffolk's Watershed Implementation Plan to significantly reduce pollution in the Nansemond River. NRPA is an advocate for protection of wetlands and maintenance of forested areas in the watershed and advocates for the proper enforcement of the Chesapeake Bay Preservation Act.**

## PURPOSE OF REPORT

An important tenet of the NRPA philosophy is to educate citizens about the current status of our waterways and encourage them to be environmental stewards. The 2014 State of the Nansemond River Report and its Tributaries Report Card is the third report released by the NRPA Water Quality Committee on the status of Suffolk's waterways. The 2014 Report is an analysis of data collected from several sources including two years of NRPA's own data. The first report, published in 2011, was a compilation and analysis of 30 years of Virginia Department of Environmental Quality (DEQ) data. The 2012 Report released in 2013 was an analysis of data provided by the DEQ, City of Suffolk Public Works and sampling data collected by the NRPA Water Quality Committee in 2012 – the first year NRPA began to collect its own data.

## METHODOLOGY

The NRPA Water Quality Committee when preparing the report reviewed and analyzed data from the following sources: NRPA monthly water sampling, Department of Environmental Quality, Virginia Department of Health and the City of Suffolk Public Works. NRPA also spoke with representatives from the Environmental Protection Agency, Chesapeake Bay Foundation, Lynnhaven Now, Virginia Institute for Marine Sciences (VIMS) and the United States Geological Survey (USGS) regarding best practices.



## ABOUT THE NANSEMOND RIVER

The Nansemond River was named for the Native American tribe that fished its waters for thousands of years before European settlers arrived. In 1608 Capt. John Smith sailed into the Nansemond River and in 1642, Anglican settlers formed a Parish near the shores of the Nansemond, known today as St. Johns Church.

The Nansemond River originates in downtown Suffolk. Lakes Cahoon, Kilby and Meade were once streams which were the headwaters of the Nansemond. They have since been separated from the River by dams and are now owned by the City of Portsmouth. Lakes Burnt Mills and Prince were once streams which were the headwaters of the Western Branch but were also impounded by dams and are now owned by the City of Norfolk. Except for lake overflow, the Nansemond River has no significant source of fresh water except for stormwater runoff from rain events.

The Nansemond River runs more than 20 miles from downtown Suffolk to its confluence with the James River and is home to 208 acre US Fish and Wildlife Preserve. Bennett's Creek, which feeds into the Nansemond downstream of the Rt. 17 Bridge, is a major tributary. The Nansemond Watershed drains 161,358 acres of land in Suffolk and Isle of Wight County. However, a significant portion of the rain water drains into the aforementioned lakes. Salinity at the mouth of the Nansemond averages 15 parts per thousand (brackish) and due to tidal flow decreases to nearly negligible in downtown Suffolk. Much of the Nansemond River, outside of the navigation channel, is of shoal depth and is bordered with numerous wetlands.

Chuckatuck Creek, which parallels the Nansemond River for a portion of its length, feeds into the James just north of the Nansemond. Upper Chuckatuck Creek is connected to Crane Lake, one of the 12 Lonestar Lakes, which originated as marl mining pits. The remaining lakes are isolated from Chuckatuck Creek and several serve as part of the Suffolk municipal water supply. Shingle Creek flows into the Nansemond River in downtown Suffolk. Bennett's and Knott's Creeks are located east of the Nansemond River.

The Nansemond Watershed has a legacy of livestock and agriculture, from tobacco in the 18th century to peanuts, soybeans and cotton today. But the real legacy of the Nansemond stems from its once thriving oyster, crab and shad fisheries which are all but gone today as the result of pollution and loss of habitat. Major activities on the River today include shellfish harvesting in the lower reaches and waterfowl hunting, recreational fishing, swimming and boating along the length of the River.

## REPORT CARD

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### POLLUTION

The Nansemond River and Bennett's, Bleakhorn and Knott's Creeks are impaired. The Virginia Department of Health on August 26, 2014, after reviewing thirty months of data, expanded the shellfish condemnation areas in Suffolk and issued Condemnation #063-046, Lower Nansemond River and Condemnation #063-008 Upper Nansemond River. These orders closed all of Bennett's, Bleakhorn and Knott's Creeks and expanded the closure area on the Nansemond River. 700-1,000 additional acres were closed. Note: Prior to 2014 portions of the Nansemond River were closed, these portions remain closed. In addition to the actual closures two points are important: The Virginia Department of Health based its decision on reviewing thirty months of data, not a single storm event. A contributing factor is non point source pollution: it is not from a single source. General runoff into the River and creeks contributes to the degradation. The ongoing degradation of the waterways is a clear signal that the City of Suffolk must fully embrace the tenets of the Chesapeake Bay Preservation Act to stem the rise in non-point source pollution.

Other sources of pollution include sediment, nitrogen, phosphorus which can originate from improper erosion control measures and over applying lawn fertilizer which ends up in stormwater runoff into the River. The pollutants in the runoff feed algae and reduces water clarity in the Nansemond and creeks denying sunlight to the submerged grasses which produce oxygen and feed aquatic animals. The EPA, under a consent decree, ordered all jurisdictions bordering the Chesapeake Bay and tributaries to submit Watershed Implementation Plans (WIPs) for significant reductions in pollutants discharged into the Bay. The consent decree is based upon the science of total maximum daily loads (TMDLs), the levels which waterways can absorb and dissipate. However, much work remains to restore the Nansemond River to full health.

### BACTERIA

High levels of fecal bacteria in the River result from storm water runoff, animal and pet droppings, faults in sanitary sewer pump stations and lines and improperly maintained septic systems. As stated above the Virginia Department of Health issued two condemnation notices on August 26, 2014 which expanded the condemnation areas in the Nansemond River and closed all of Bennett's and Knott's Creeks for shellfish harvesting. Significant spikes in bacteria levels were observed during the reporting period and reported to local authorities. Because there are no public beaches, there is no requirement to report high-bacteria counts to the citizens of Suffolk.

**2013-14 Grade, Lower Nansemond: C      2013-14 Grade, Upper Nansemond: D-**

### NITROGEN & PHOSPHORUS

Nitrogen and phosphorus pollution result primarily from use of fertilizers on agricultural and suburban lands. Runoff during rains carries pollution-bearing sediment into the River, either directly or via the storm water system. These nutrients promote the growth of algae which consume the dissolved oxygen necessary to support marine life and reduce water clarity. In 2013-14 nitrogen and phosphorus levels in much of the upper Nansemond exceeded algae bloom thresholds. Monitoring conducted from 2013 through 2014 showed slight improvement in nitrogen levels. However, phosphorus levels still exceeded algae bloom threshold levels for much of the River.

**Grade, Nansemond: (Nitrogen) C+      Grade, Nansemond: (Phosphorus) D+**

### DISSOLVED OXYGEN

Marine animals suffocate without sufficient levels of dissolved oxygen. Dissolved oxygen is produced by underwater plants through photosynthesis. Reducing nutrients will reduce algae and increase dissolved oxygen. In 2013-14, average dissolved oxygen levels in the Nansemond River were sufficient to support marine life, but during the summer months when algae thrive dissolved oxygen levels fell below critical levels.

**Grade, Nansemond: B**

### WATER CLARITY

Underwater grasses (Submerged Aquatic Vegetation) provide water filtration and produce dissolved oxygen. In addition, they provide food for aquatic animals such as Blue Crabs. SAVs depend on relatively clear water for sunlight to enable photosynthesis. In 2013-14, water clarity in the Nansemond River was poor or less than 40 inches.

**Grade, Nansemond: D**



### OYSTER RESTORATION

One adult oyster can filter 50 gallons of water/day. Therefore, oysters play a significant part in helping to rid the river of waterborne pollutants – they must be given a chance to survive and prosper. The regional goal is to restore the oyster population to 1608 levels when Captain John Smith arrived in the region. This is an ambitious goal since according to recent reports,

the oyster population is currently at 3% of the 1608 level. Several NRPA members are growing oysters with the intent to deposit the mature oysters at the NRPA Oyster Sanctuary that will be opened in 2015. Watermen make their livelihood in Suffolk by harvesting oysters and bringing them to the marketplace. The watermen industry is highly dependent on the health of the River and creeks.

**Grade, Nansemond: B-**

### WETLANDS AND SHORELINE BUFFER

Wetlands, including the shoreline buffer, comprise the interface between the Nansemond River and its shoreline. This interface acts as a filter to help remove pollutants such as bacteria, nitrogen, phosphorus and sediment which might otherwise enter the River from storm water runoff. Wetlands also provide a critical habitat for waterfowl, are a nursery for juveniles and are an important link in the health of the River.

The Nansemond River and its tributaries are bestowed with more than 27,000 acres of tidal wetlands. (Virginia Institute of Marine Sciences, 2013 Report)

In 1988, the Virginia General Assembly enacted the Chesapeake Bay Preservation Act (the "Bay Act") designed to preserve its wetlands in order to protect the Bay from pollution due to storm water runoff. The key provisions of the Act were the establishment of a Resource Protection Area (a defined shoreline boundary) together with a 100 ft. vegetated buffer adjacent to the shoreline. NRPA has taken actions to educate individuals, businesses and elected officials about the Bay Act and also recommended best-practices used in other communities to protect the waterways for current and future generations.

**Grade, Nansemond: C+**



### OPEN SPACE AND PUBLIC ACCESS

The Nansemond River and its tributaries are surrounded by nearly 35,000 acres of forested land - that land is slowly giving way to development. The city needs to ensure that development projects along the waterways incorporate best practices that preserve and protect the important 100 ft shoreline buffer.

The City of Suffolk maintains several public parks with water access or views, including Bennett's Creek Park, Sleepy Hole Park and Lone Star Lakes Park. Only Bennett's Creek Park has a boat ramp with access to the Nansemond River. The City of Suffolk developed a plan for a kayak and canoe launch facility at Sleepy Hole Park and has recently identified funding. Healthy waterways and increasing the number of public access points are key economic drivers that will have a positive impact on tourism and the quality of life in Suffolk.

The U.S. Fish and Wildlife Service maintains the 208 acre Nansemond Wildlife Refuge, located south of Sleepy Hole Park. Although the Refuge is not open to the public at present, the City of Suffolk hopes to provide viewing access in the future through the former Naval Radio Transmitter site adjacent to the preserve.

**Grade, Suffolk Waterways: C**

### POLLUTION CONTROL EFFORTS

The Public Works Department is active in creating a Total Maximum Daily Load Program (TMDL) to reduce stormwater runoff and a plan to address the 'impaired' status of the Nansemond River and creeks. Sewer systems are replacing septic systems in communities located near the waterways. Installing sewer systems are costly and take time. Properly enforcing the Chesapeake Bay Preservation Act which means maintaining the 100 ft buffer is a scientifically proven method to reduce stormwater runoff. The City of Suffolk produced its' first comprehensive annual report for Virginia Stormwater Management Plan (VSMP) with regards to the City's General Permit for Municipal Separate Storm Sewer Systems. This report is required under The Clean Water Act and Virginia Law. The report can be found at:

[http://www.suffolkva.us/pub\\_wks/engineering-stormwater/stormwater/ms4/](http://www.suffolkva.us/pub_wks/engineering-stormwater/stormwater/ms4/)

NRPA commends the city on the initial report and the list of actions to be taken to mitigate non-point source pollution from entering the watershed. The six primary goals are: 1) Public Outreach and Education; 2) Public Involvement/Participation; 3) Illicit Discharge and Elimination; and 4) Construction Site Stormwater Runoff Control; 5) Post Construction Stormwater Management in New Development and Redevelopment; and 6) Pollution Prevention/ Good Housekeeping for Municipal Operations. And, last but not least is the creation and implementation of Total Maximum Daily Load (TMDL) plans for the impaired waters of the City. The goal of these plans is to reduce the amount of pollutants entering the watershed and waters of Suffolk. **As evidenced by the recent 2014 condemnation of shellfishing waters in the lower Nansemond River and all of Bennett's, Bleakhorn and Knott's Creeks, NRPA recommends that the programs that are developed to carry out these actions be fully funded and supported at all levels of city leadership to restore Suffolk's watershed. Restoration efforts are needed to avoid future condemnations and reopen shellfish harvesting areas that have been condemned.**

A graphic of the impaired waters that was prepared by the City is included with this report.

**Grade, Suffolk's Waterways: C**

### CLEAN BOATING

A majority of boating activity on the Nansemond River and its tributaries are recreational boating. During the spring, summer and fall the waterways become very busy. There is a highly visible public pump out station located at Constant's Wharf. There is a less visible pump out station located at Bennett's Creek Landing. The Hampton Roads Sanitation Department has a program where their staff will travel to your dock and pump out your boat.

**Grade, Suffolk's Waterways: B+**



### EDUCATION AND PUBLIC AWARENESS

NRPA firmly believes that the river and creeks belong to everyone, provides great meaning to people's lives and creative, river/creek-focused programs can enhance the quality of life for our citizens while also empowering them to be lifelong environmental stewards. We believe that all families regardless of their socioeconomic level can make a difference in restoring the health of "their" waterways. NRPA's programs and activities are successful because of the 200+ dedicated volunteers and alliances with non-profit organizations, businesses, governmental agencies and educational institutions.

NRPA's environmental education, shoreline restoration and water quality sampling programs and activities are designed to educate and encourage all citizens to preserve and restore Suffolk's beautiful natural resources for future generations.

A sampling of NRPA's programs and activities include:

- The NRPA Oyster Growers Program introduced in 2011 educated over 1,100 K-12 children. Building on the Oyster Growers Program, NRPA in 2013 developed and launched the Nansemond Watershed Initiative: "Connecting the Classroom with the Environment" program (NWI). NWI is a six-module program where NRPA volunteers go into the classroom and team teacher the lessons with the teachers. The program includes several hands-on scientific experiences, a boating or outdoor shoreline field experience; a student self-directed action plan to have the student take an active role in learning about the environment and provides several community environmental opportunities for students to participate beyond the classroom experience. During the period September 2013 – December 2014, 1,500, seventh grade students participated in the NWI program and became "junior" NRPA members – the next generation of civic-minded, environmental stewards.
- Workshops and River Talk program that educate citizens about home-based, best practices that can help protect the waterways. Topics include: Living Shorelines, rain gardens, planting native plants, environmental regulations and policies.
- Buffer restoration projects in collaboration with the City Parks and Recreation Department. NRPA is establishing an oyster sanctuary and planting a living shoreline.
- Community-wide NRPA River & Creek Fest—a fun and exciting way for all citizens to learn about waterway quality sampling, meet their river creek "critters", experience Suffolk waterways and just enjoy the outdoors.

**Grade, Suffolk's Waterways: A**

**What Can You Do To Help? Please contact the NRPA Office.**

# 2014 State Of the Nansemond and Its Tributaries Report Supporting Documentation and Data – 2013 Through 2014

Prepared by the NRPA Water Quality Committee

## INTRODUCTION

This report serves as supporting documentation for the 2014 *State of the Nansemond and Its Tributaries Report*. Specifically, the statistics in this report served as the basis for the letter grades (A – F) assigned by the NRPA Water Quality Committee to each water quality parameter in the *Report*. The statistics in this Report represent an update of the *Baseline Levels of Pollution in the Nansemond River as of 2010*<sup>1</sup> and are based on measurements performed in 2013-2014 by NRPA and the City of Suffolk. Data from the 2011-2012 report is presented along with 2013-2014 to show relative change.

The Nansemond River has been designated an “impaired stream” by the State of Virginia. This means that portions of the Nansemond do not meet Virginia State water quality requirements for harvesting of shellfish. NRPA collects water quality data on a monthly basis over the length of the River and submits the data to Virginia Department of Environmental Quality (DEQ). This data is used for the overall assessment of Virginia’s waters and for reports to the US Congress and Environmental Protection Agency (EPA) the latest of which can be found at: [“http://www.deq.virginia.gov/Portals/0/DEQ/Water/WaterQualityAssessments](http://www.deq.virginia.gov/Portals/0/DEQ/Water/WaterQualityAssessments).

The tables on the following pages compare measured water quality measurements with DEQ water quality standards where they exist or with widely accepted water quality threshold levels. Measured levels are also compared with levels from minimally impaired streams where applicable. Measurements observed and collected include 1) fecal coliform bacteria, 2) total nitrogen, 3) total phosphorus, 4) dissolved oxygen, 5) water clarity and salinity. DEQ protocols for citizen science data collection were followed to ensure reliable and unbiased results. For a more full discussion of these water quality criteria and their importance to a healthy river see Virginia’s Department of Water Quality website at [“http://www.deq.virginia.gov/Programs/Water.aspx”](http://www.deq.virginia.gov/Programs/Water.aspx).

## WATER QUALITY STANDARDS AND LEVELS FOR MINIMALLY IMPAIRED STREAMS

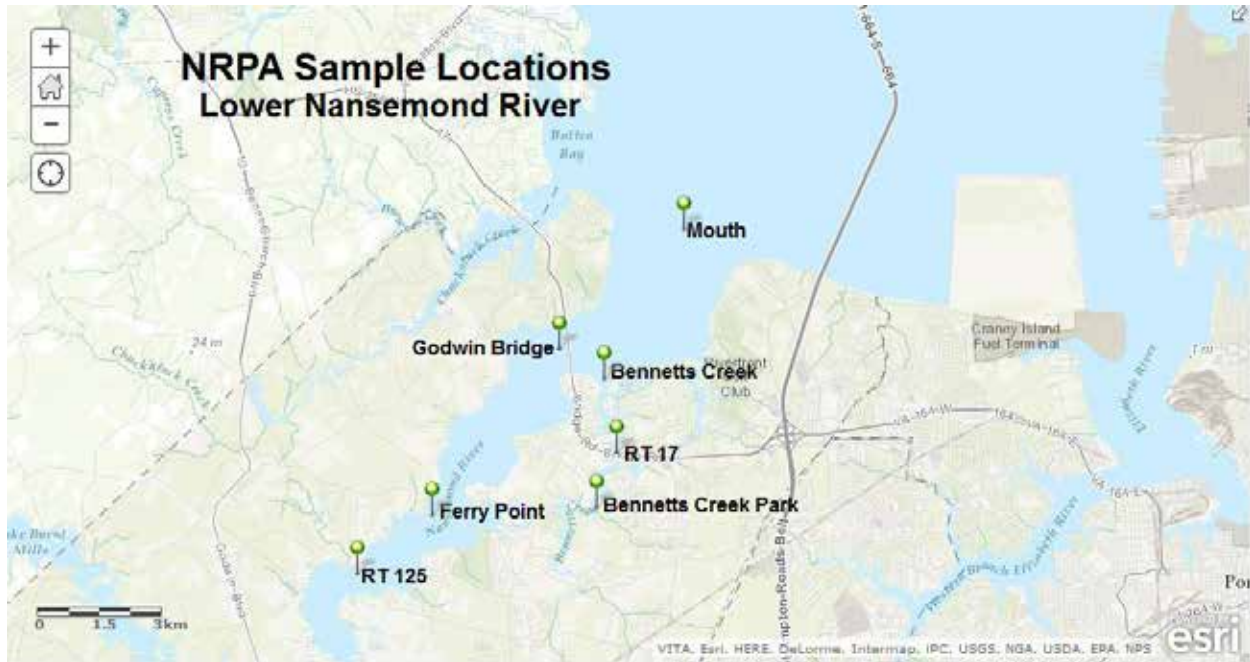
### 1. Bacteria

Historically levels of fecal coliform bacteria *Escherichia coli* (*E. coli*) in water were the standard for determining potential for pathogens that could cause illness and disease in humans. These indicator bacteria are normally prevalent in the fecal waste of warm-blooded animals and humans. In 2003, DEQ began measuring *Enterococci* bacteria in addition to *E. coli* bacteria. The standard for *Enterococci* bacteria (one sample or instantaneous measurement) is 104 colonies per 100 mL and is a better measure of bacterial contamination in salt or brackish waters.

However, the Virginia Department of Health/Division of Shellfish Sanitation continues to monitor for *E.coli* bacteria. DEQ impairment threshold levels (geometric mean) for *E.coli* bacteria are listed below for the following designated uses: Shellfish harvesting: 14 cfu/100mL<sup>2</sup> Recreation (swimming): 200 cfu/100m

<sup>1</sup> The statistics in the *2010 Baseline Levels of Pollution in the Nansemond River*, published in June, 2011 by NRPA, were derived from the DEQ’s data base of measured levels in the Nansemond River from 1985 through 2010.

<sup>2</sup> CfU stands for colony forming units.



**NRPA WATER SAMPLING SITES**  
**SAMPLING OF BENNETT’S CREEK WAS LAUNCHED JANUARY 2015**

Water containing E. coli can also be tested using the “instantaneous method” which uses one sample versus a geometric average for several samples in a month. The single-sample recreation threshold for E.coli fecal coliform is 235 cfu/100mL. Waters with fecal coliform levels above these thresholds for a significant time period are deemed impaired. Those levels and methods are stated in Virginia law “9VAC25-260-160. Fecal Coliform Bacteria; Shellfish Waters” which can be found at:

“<http://law.lis.virginia.gov/admincode/title9/agency25/chapter260/section160>”

Attached to this supporting document are maps of the recent shellfish closures for the Nansemond River and Tributaries from the Virginia Department of Health.

They can also be found here:

<http://www.vdh.virginia.gov/EnvironmentalHealth/Shellfish/closureSurvey/suffolk/index.htm>

Statistics for E.coli fecal coliform bacteria are shown on the following pages.

### 2. Total nitrogen (sum of ammonia, nitrates, nitrites) and total phosphorus

Like land based plants, estuarine plants need both nitrogen and phosphorus nutrients to grow. When too much nitrogen or phosphorus is available, the algae may grow unchecked and cause harmful blooms. Nutrient related problems such as algae blooms may start when total nitrogen levels exceed 1 mg/L (a common guideline). Minimally impaired streams have typical nitrogen levels of < 0.07 mg/L. Nutrient related problems such as algae blooms may start when total phosphorus levels exceed 0.1 mg/L (a common guideline). Minimally impaired streams have typical phosphorus levels of <0.03 mg/L.

### 3. Dissolved oxygen

Aquatic plants and animals need oxygen to live just like land based animals and humans. Measurement of oxygen in the water is stated as dissolved oxygen. Dissolved oxygen levels below 5 mg/L begin to stress fish and other marine life. Minimally impaired streams have significantly higher levels of dissolved oxygen than the minimum threshold.

### 4. Water clarity

Another important metric in assessing water quality is water clarity, typically measured visually by lowering a Secchi Disk into the water and observing when the disk can no longer be seen. Water clarity readings for minimally impaired streams typically exceed 1.0 meters (about 40 inches), allowing sunlight to penetrate the water for photosynthesis in oxygen producing underwater grasses.

### 5. Salinity

Salinity or the amounts of salt in the water are important for shellfish survival. It is important to note that salinity levels in the upper half of the Nansemond which is fed by freshwater runoff are typically too low to support an oyster population. The appropriate designated use for the upper half of the Nansemond is therefore recreation (e.g., swimming, boating).

## RESULTS

### BACTERIA IN THE NANSEMOND RIVER

Shown in Figure 1 are fecal coliform bacteria levels in taken from test sites in the Nansemond River. Figure 1 clearly shows an increase from the mouth of the Nansemond to downtown Suffolk. Although 2011-12 and 2013-14 levels are similar in the lower river, the upper river’s levels have lowered most probably due to the repair of the raw sewage transfer pipe that was leaking into Shingle Creek. However, levels far exceed levels for safe shellfish harvesting above Ferry Point and continue up the River towards downtown.

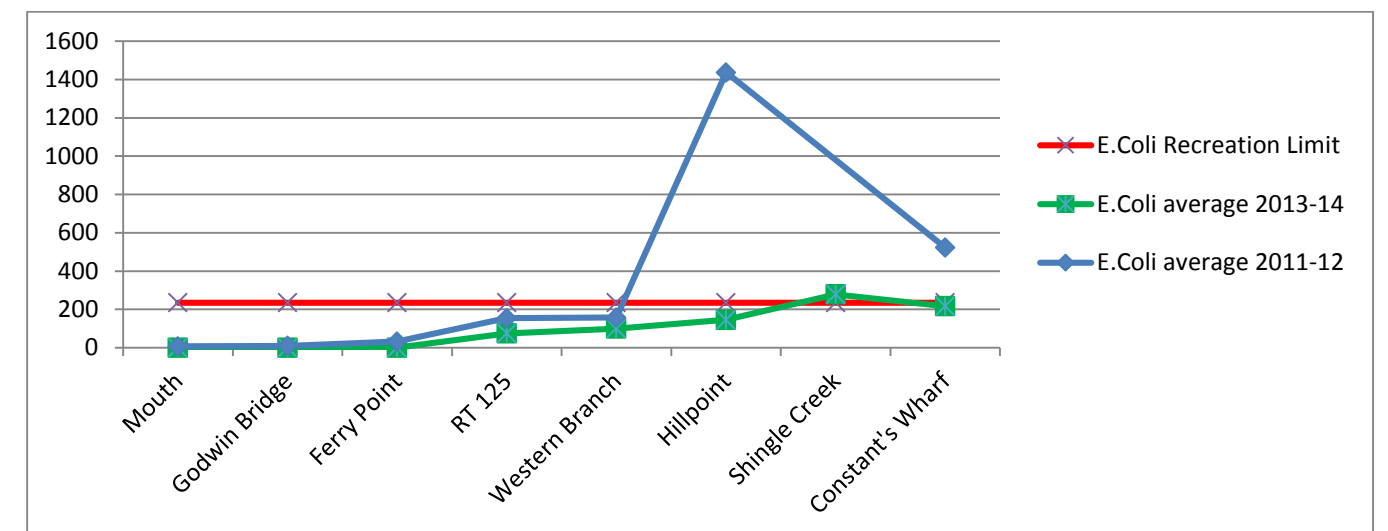


Figure 1 - Fecal Coliform Bacteria Levels (cfu/100mL) in the Nansemond River

Shown in Figure 2 are single sample fecal coliform bacteria levels taken along Shingle Creek. Testing for Shingle Creek began in 2013 and therefore no historical data is presented. The pollution is classified as non point source – contributing factors such as failing septic systems, pet owners not picking up pet waste, and removal of buffer areas along the River could be responsible.

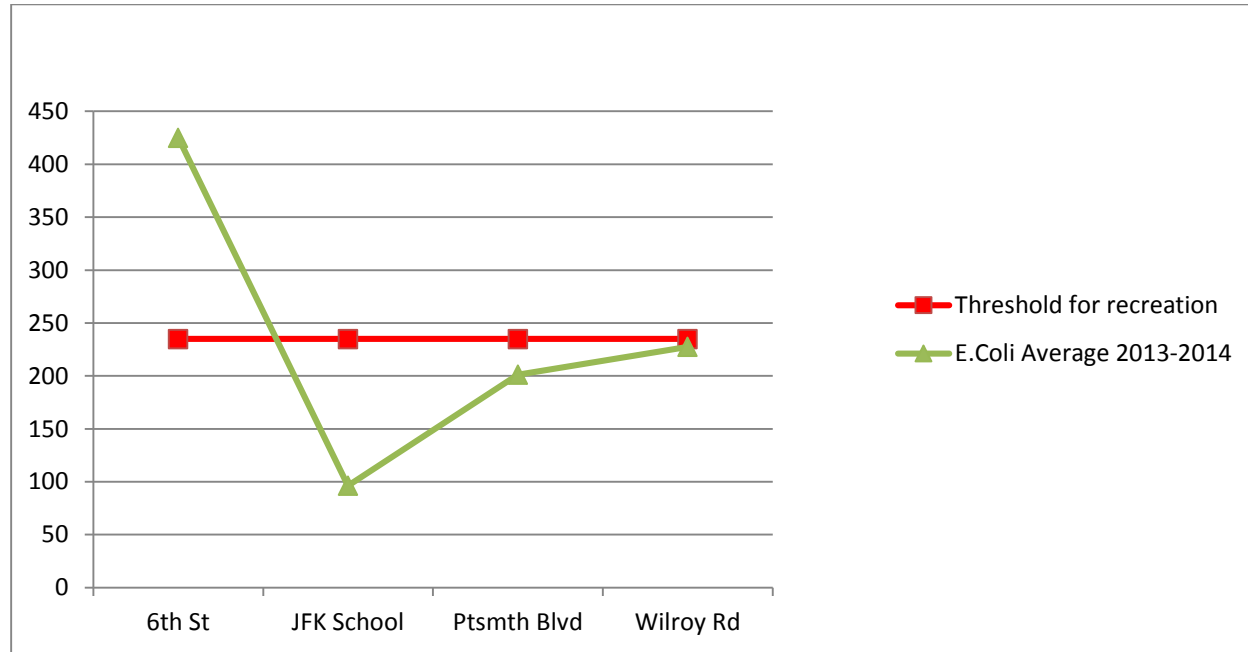


Figure 2 – Two year Average for Fecal Coliform Bacteria Levels (cfu/100mL) in Shingle Creek

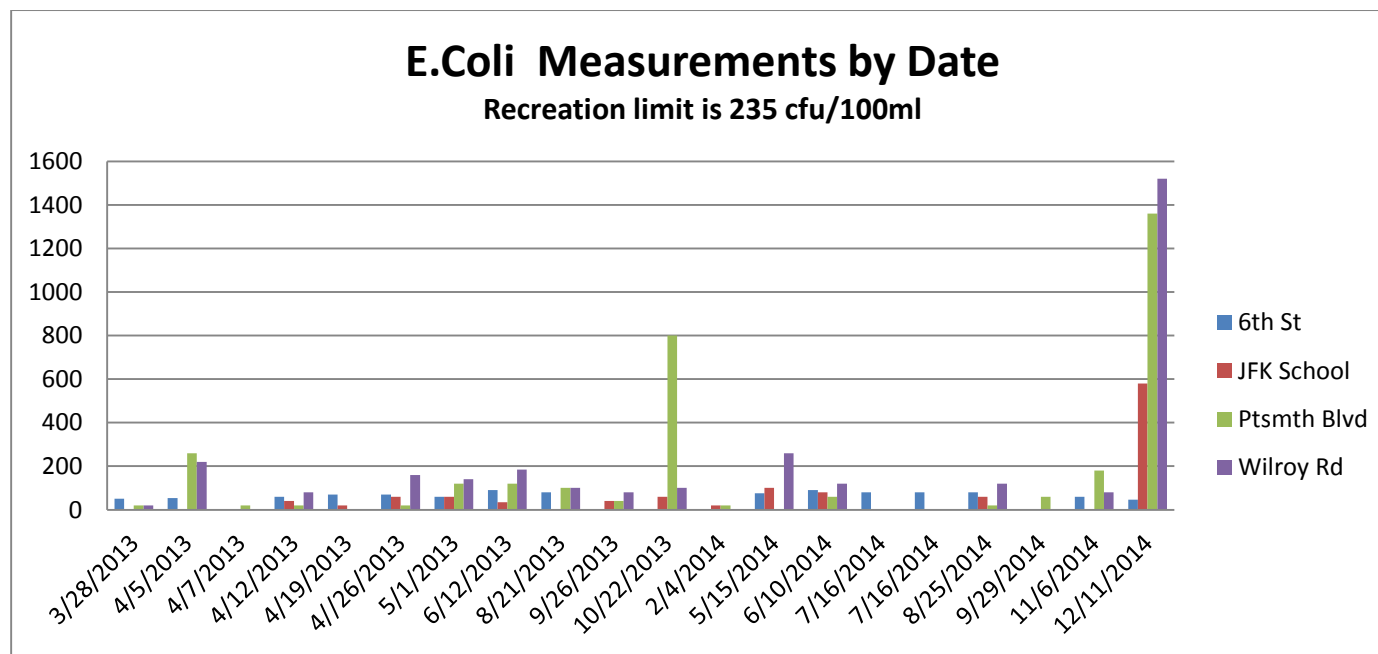


Figure 3 - Fecal Coliform Bacteria Levels (cfu/100mL) in Shingle Creek by month

**Total Nitrogen (Ammonia, Nitrates, Nitrites) and Phosphorus**

Shown in Figure 4 are average Total Nitrogen levels from test sites in the Nansemond. The general trend is a slight net decrease in Total Nitrogen from the 2012 report and is at levels below those that would contribute to an algal bloom (1mg/mL).

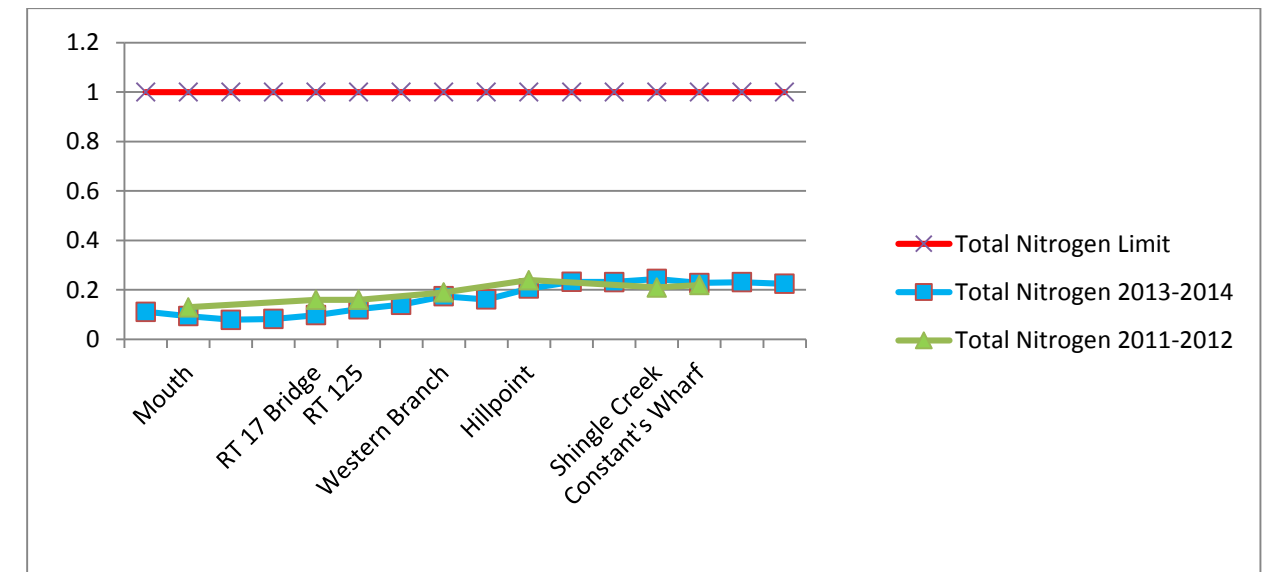


Figure 4 –Two Year Average for Nitrogen Levels (mg/mL) in the Nansemond River

Shown in Figure 5 are total phosphorus levels from test sites in the Nansemond. Levels far exceed levels that could cause algal blooms and eutrophication. Eutrophication is the process by which a body of water becomes enriched in dissolved nutrients that stimulate the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen. Possible sources of phosphorus could be misapplication of fertilizer containing phosphorus. Virginia prohibited the sale of lawn fertilizer containing phosphorus to consumers beginning in 2014. However, agriculture and golf courses are exempt and must submit a voluntary nutrient management plan.

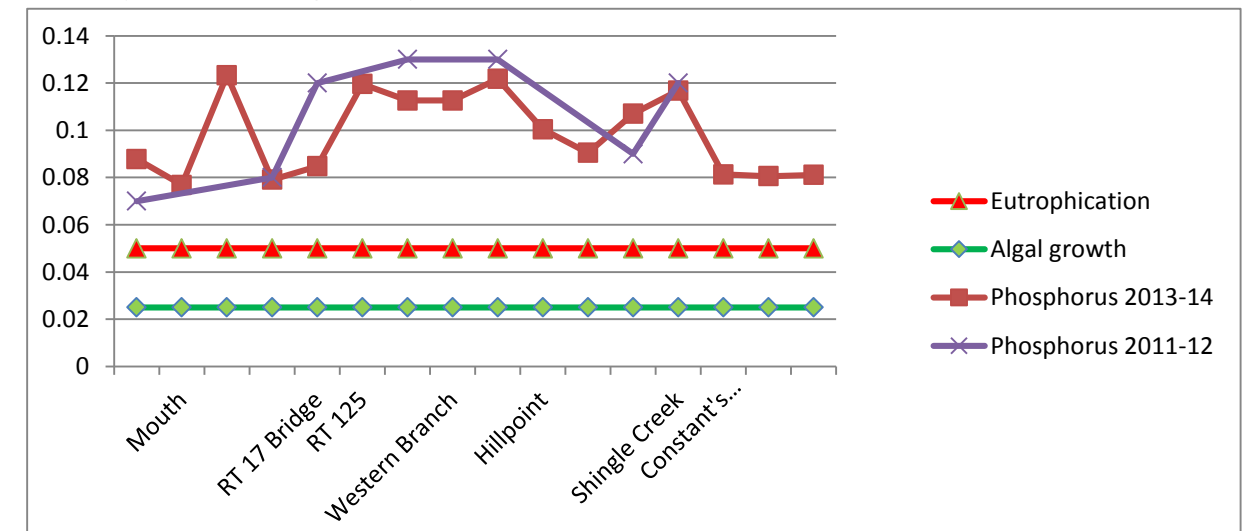


Figure 5 – Two Year Average for Total Phosphorus Levels (mg/mL) in the Nansemond River



## DISSOLVED OXYGEN

Shown in Figure 6 are dissolved oxygen levels taken from seven test sites in the Nansemond River. Average levels have generally improved and are above levels considered for a healthy ecosystem. However, there were times during the year that levels fell below minimum thresholds. Seasonal variation is normal for rivers, however levels dropping below 5g/L is an indicator that there is not enough oxygen to support animals and plants that live in the River. This was most apparent at the upper reaches of the River towards downtown.

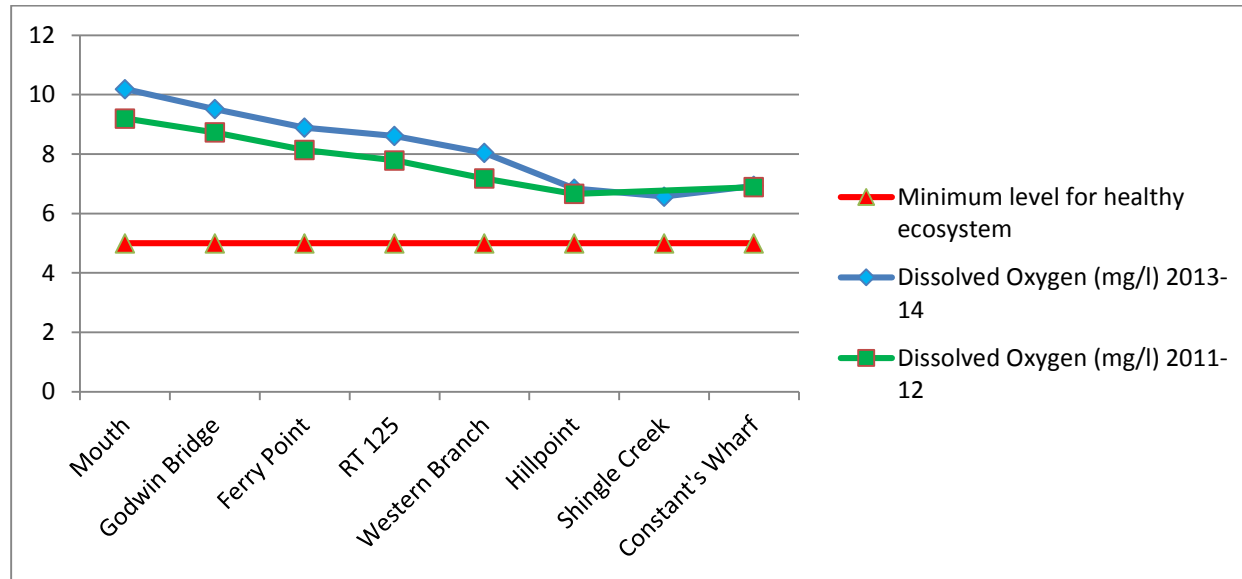


Figure 6 – Two Year Average for Average Dissolved Oxygen Levels (mg/L) in the Nansemond River

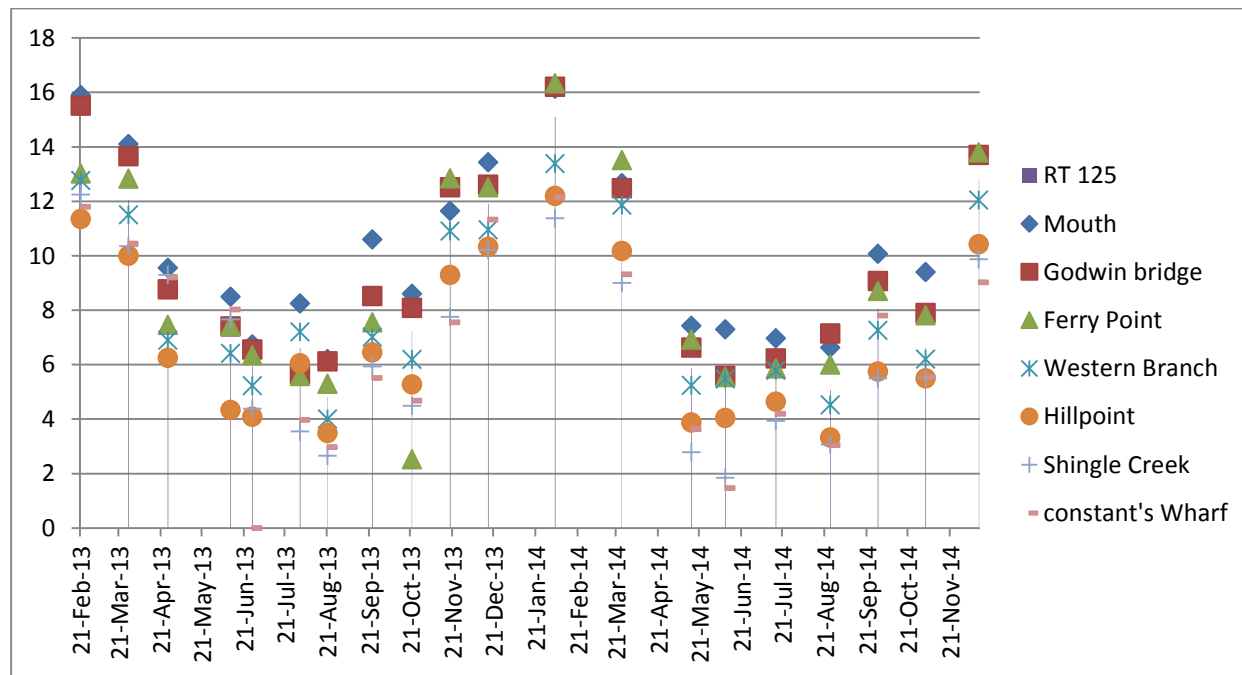


Figure 7 – Monthly Dissolved Oxygen Levels (mg/L) in the Nansemond River

## WATER CLARITY

Shown in Figure 8 are water clarity readings from test sites in the River. These levels remain relatively the same as the 2012 report and are below levels considered good for healthy sea-grass growth (> 1 meter).

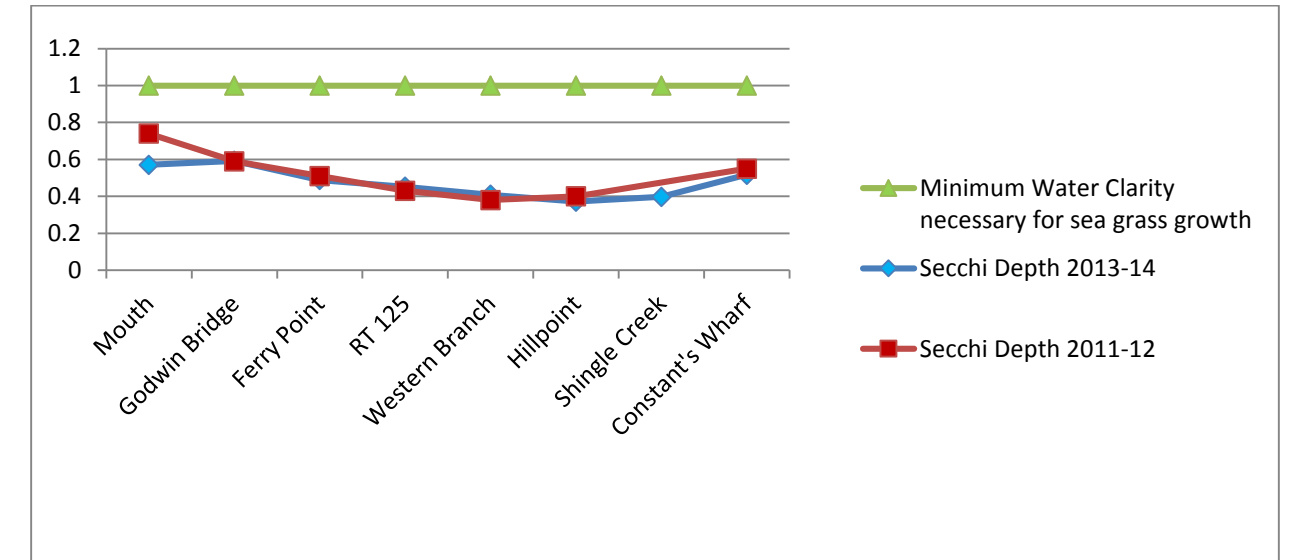


Figure 8 – Two Year Average for Water Clarity (Secchi depth in meters)

## SALINITY

Figure 9 shows the decreasing salinity along the length of Nansemond River going from the mouth to Constant's Wharf and the minimum salinity required for oyster growth. This is typical for a fresh water river flowing into a salt water body and delineates the region where oyster habitat can be found or encouraged.

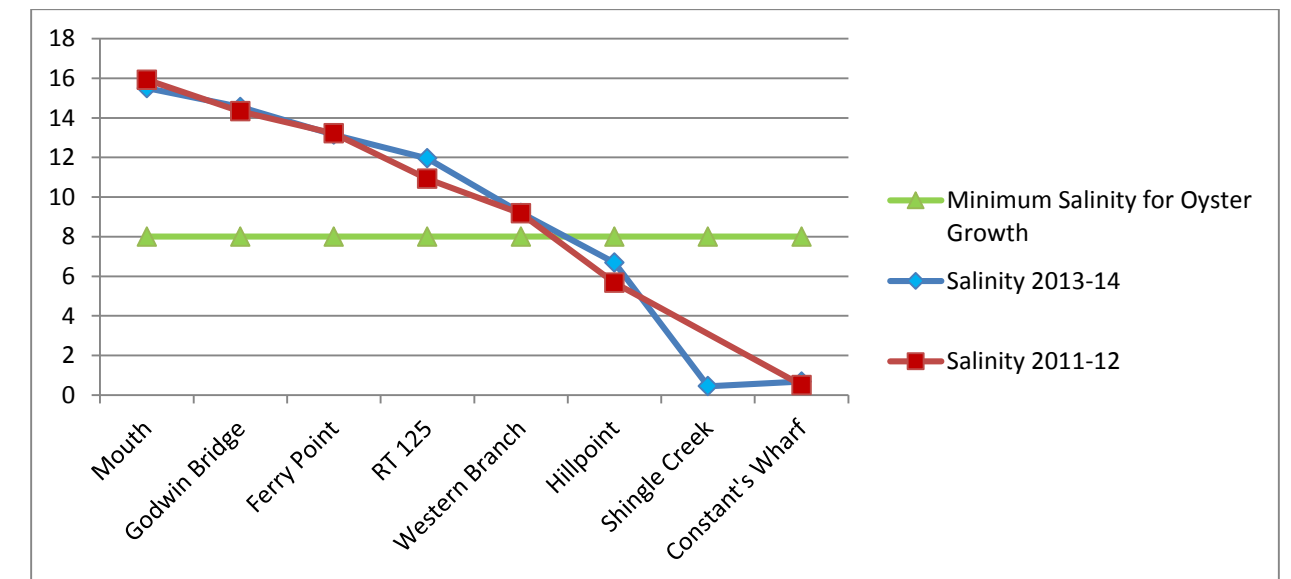


Figure 9 – Two Year Average for Salinity (ppt)

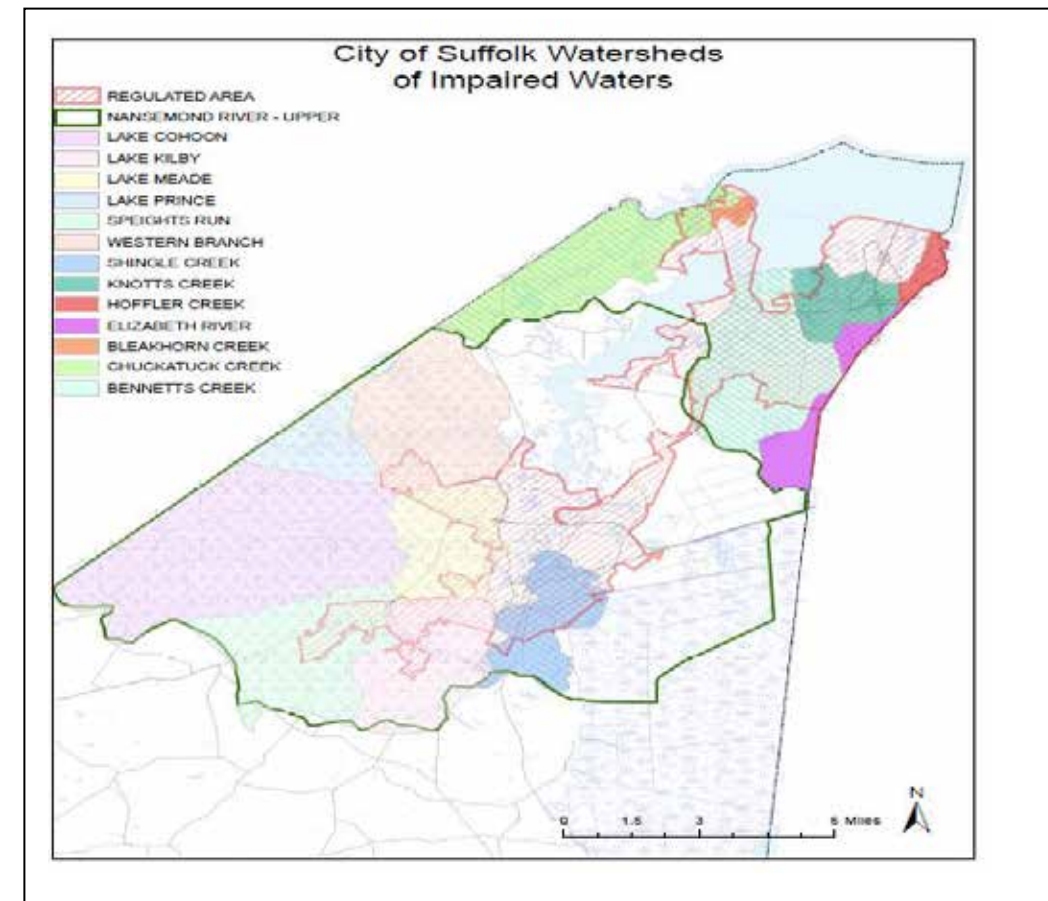
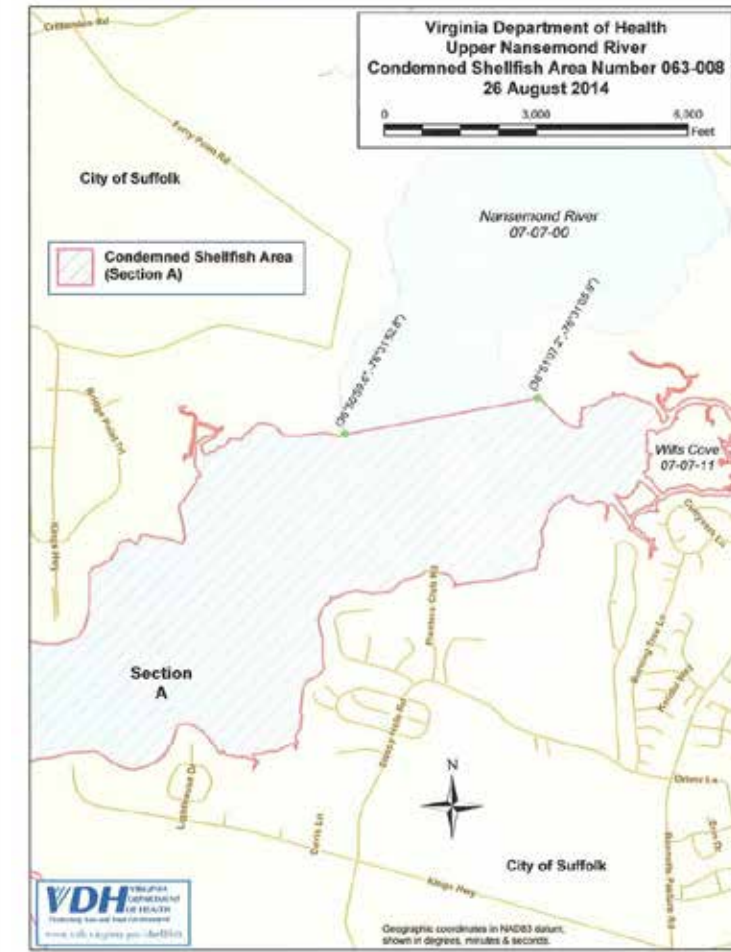
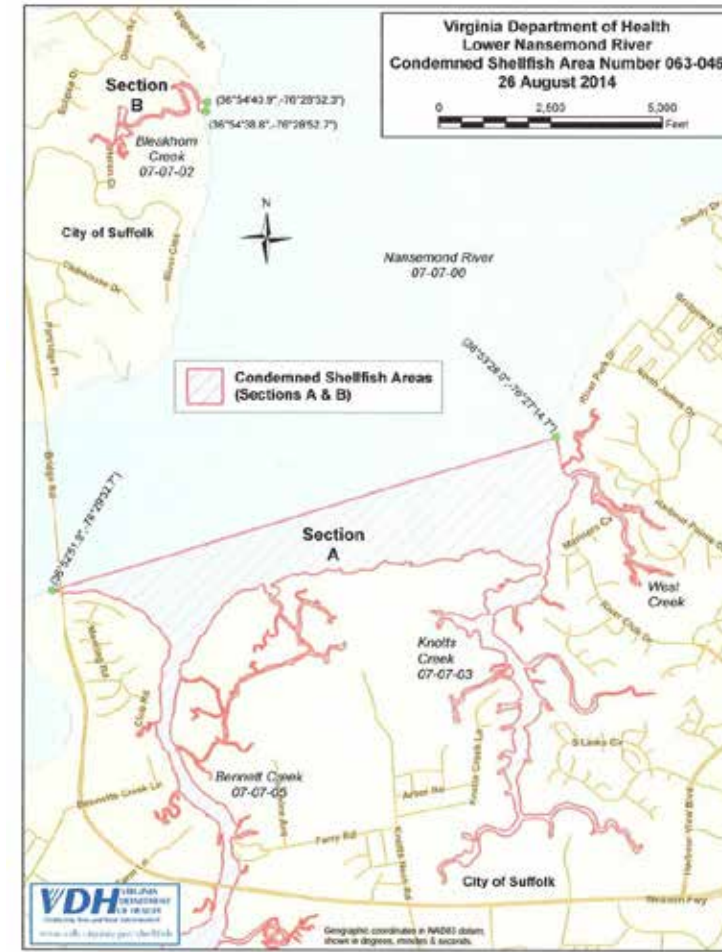
**Data Sources and Additional Resources**

The data presented is a compilation of NRPA collected data and City of Suffolk monitoring data collected during the reporting period. Numerous resources exist for additional information on efforts to manage pollution in Suffolk's watershed including the City of Suffolk's Planning Division at [www.suffolkva.us/pcd/planning/](http://www.suffolkva.us/pcd/planning/) and Public works stormwater management effort at [www.suffolkva.us/pub\\_wks/engineering-stormwater/stormwater/ms4](http://www.suffolkva.us/pub_wks/engineering-stormwater/stormwater/ms4). For information on how you can help or learn more about caring for the river and its' watershed, please contact NRPA at 757-745-7447 or visit our website at [www.nansemondriverpreservationalliance.org](http://www.nansemondriverpreservationalliance.org).

**MAPS ON INSIDE BACK COVER**

Maps of Shellfish Condemnation Areas

Map of City of Suffolk Impaired Waters



## **NANSEMOND RIVER PRESERVATION ALLIANCE**

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