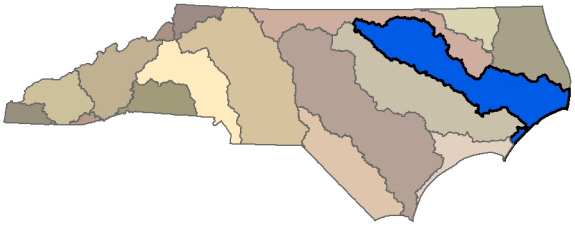
Tar-Pamlico River

Basinwide Water Resources Management Plan

2014 Summary



Introduction

This 2014 document is the fifth five-year update of the Tar-Pamlico River Basinwide Plan and the first plan that has incorporated water quantity issues and model projections. Previous basinwide plans for the Tar-Pamlico River Basin were completed in 1994, 1999, 2004 and 2010 and are available from the DWR Basinwide Planning website. This basin plan was written to provide guidance for watershed stakeholders, municipal planners, natural resources regulators, and other environmental professionals with identifying and addressing water quantity needs, water quality stressors, sources, and emerging issues.

The next and sixth update to this plan is set to be completed prior to 2024. National Pollution Discharge Elimination System (NPDES) permits were issued in 2014 and will be reviewed for renewal again in 2019. Basinwide biological and lake sampling last occurred in the Tar-Pamlico River Basin in 2012 and will be conducted again in 2017. Collaborative efforts to integrate water quality and quantity in river basin planning will continue. The Tar-Pamlico River Basin spans over 6,148 square miles making it necessary for planning purposes to divide the basin into subbasins when appropriate.

Overview

The Tar-Pamlico River Basin is the fourth largest river basin in North Carolina and is one of only four river basins whose boundaries are located entirely within the state. The Tar River originates in north central North Carolina in Person, Granville and Vance counties and flows southeasterly until it reaches tidal waters near Washington and becomes the Pamlico River and empties into the Pamlico Sound. The entire basin is classified as Nutrient Sensitive Waters (NSW).

The Tar-Pamlico River Basin's estimated developed area is ~7%, agriculture ~29%, scrub/grasslands ~12%, barren ~2%, wetlands ~23% and forested areas ~27% based on 2011 National Land Cover Data. The most prominent change between the 2001 and 2011 Land Cover data in the Tar Pamlico Basin shows a loss in forest and agriculture with an increase in scrub and grasslands. This basin is rural when compared to the Neuse River Basin, which is similar in size and hydrology. Development and population growth center around Greenville, Rocky Mount and smaller municipalities within commuting distance to Raleigh, while other municipalities have experienced negative growth.

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Hydrologic Features

There are an estimated 2,543 miles of mapped freshwater streams, and many more miles of small unmapped ephemeral, intermittent and perennial streams located within the basin. The basin includes an estimated 3,977 acres of freshwater reservoirs and lakes, ~663,504 estuarine acres, and ~36 miles of Atlantic coastline. Wetland and swamp systems are located throughout Tar-Pamlico River Basin. The basin starts in the eastern Piedmont physiographic region with about two-thirds of the basin in the Coastal Plain.

Streams in the Piedmont are typically low gradient with sluggish pools separated by riffles with occasional small rapids. Piedmont soils are highly erodible and are underlain by fractured rock formations that have limited water storage capacity. Piedmont streams tend to have low summer flows and limited ability to assimilate oxygen-consuming wastes. There are no natural lakes in the Piedmont, but there are a few reservoirs that serve as water supplies and flood control structures. Old millponds and beaver impoundments are scattered across this region.

Streams in the Coastal Plain are slow-moving blackwater streams, low-lying swamps and productive estuarine waters. The swamp streams often stop flowing in the summer and are stained by tannic acid. These streams have limited ability to assimilate oxygen-consuming wastes. Swamp streams often have naturally low dissolved oxygen and pH. Coastal Plain soils are deep sands that have high groundwater storage capacity. Natural lakes include the remnants of bay lakes in the lower Coastal Plain. Also, because of low flow conditions, wind and tides saltwater intrusion in the Tar River has been documented up to Greenville.

The Pamlico Sound estuarine system is somewhat protected from oceanic influences because of the Outer Banks. The estuary dynamics, including tidal, climatic, long retention time and nutrient loading conditions, enable eutrophication processes within the Pamlico River. 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 total nitrogen (TN) by 30% and no increase in total phosphorus (TP) loads compared to 1991 conditions.

Nutrient Sensitive Water Strategy

Nutrient enrichment of the waterbodies within this basin continues to be the main water quality issue and the focus of regulatory and strategy related activities. Water quality standards have not been met in the Pamlico River Estuary even though implementation of the NSW strategy by WWTP dischargers, municipal stormwater programs, and agriculture have occurred.

A statistical analyses of concentration data and loads were performed at five ambient stations by DWR. Data from the most downstream ambient station on the Tar River at Grimesland show an increase in TN and TKN concentrations and a decrease in ammonia and nitrate/nitrite concentrations, while there is no change in TP. Flow-normalized loads indicate an overall 18% decrease in nitrate/nitrite (NOx-N), 3% decrease in total nitrogen (TN), 7% decrease in total phosphorus (TP) and a 13% increase in Total Kjeldahl nitrogen (TKN). Loads were also analyzed using the USGS-LOADEST program, which showed TN and TP loads only dropping below the 1991 baseline year during very low flows (Figures 1 & 2).

The trend analyses point toward a rise in organic nitrogen. This warrants identifying sources and reducing inputs of organic nitrogen throughout the basin. It is likely that there are other nutrient sources besides those regulated under the NSW strategy that are contributing. Some nonpoint

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sources may have not been accounted for or are exceeding the original source contributions. Potential sources that need more research in regards to their potential contributions include groundwater and atmospheric deposition.

Figure 1: Total Nitrogen Load Estimate at Tar River at Grimesland, AMS 06500000 (USGS-LOADEST)*

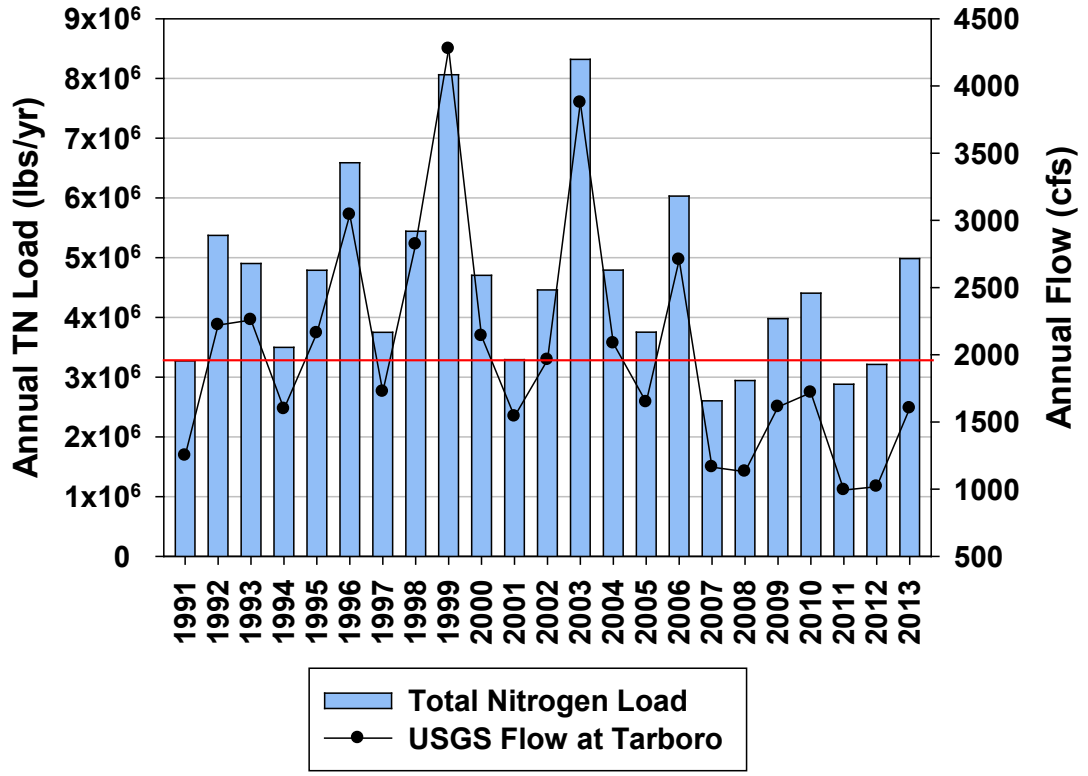
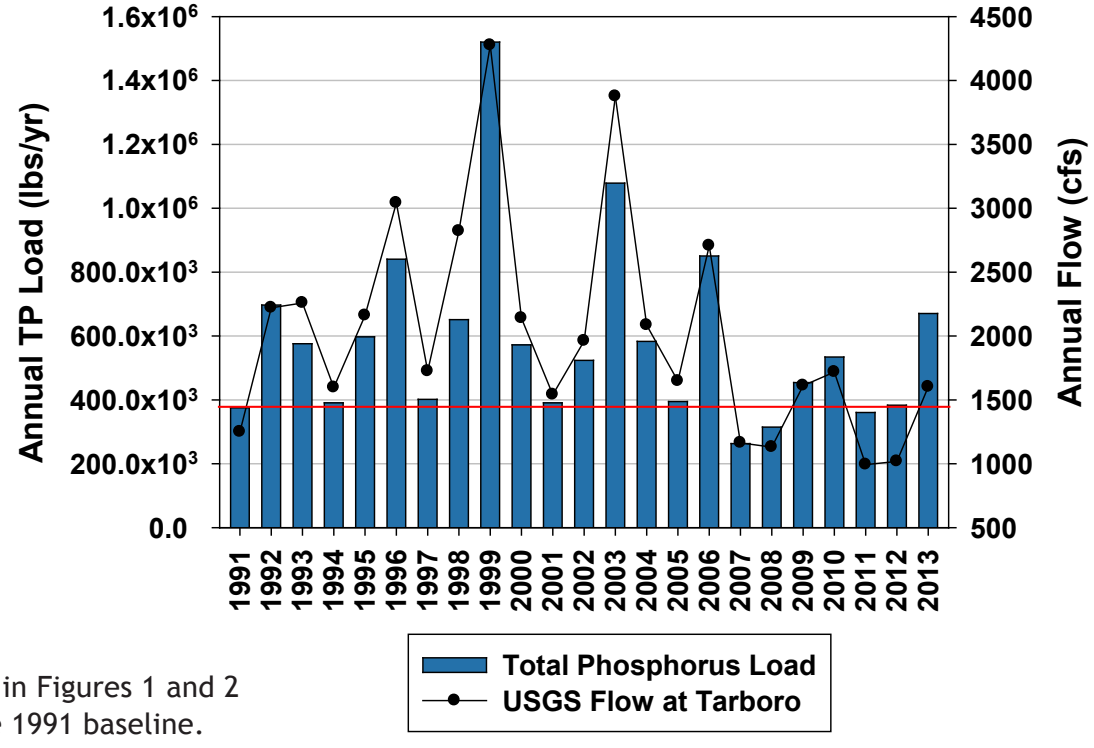


Figure 2: Total Phosphorus Load Estimate at Tar River at Grimesland, AMS 06500000 (USGS-LOADEST)*



*The red line in Figures 1 and 2 represent the 1991 baseline.

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Point Source

The Tar Pamlico Basin Association (TPBA) currently has 16 members representing 20 discharge facilities accounting for 98% of the known effluent flow to the basin. The TPBA began water quality monitoring at 36 stations on a monthly basis in March 2007. Prior to the 2014 permit renewal the TPBA members did not have individual permit nutrient limits. In 2014 each permit received individual nutrient limits, but TPBA members still function under a collective nutrient cap to meet their reduction requirements of the NSW strategy. To date, the TPBA has consistently been under their nutrient cap limits. The remaining 2% of effluent flow is from 18 small facilities that have permits limits based on their size and capability.

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 likely to increase; therefore, the reevaluation of stream flow will become more critical to water quality in the future.

Non-point Source

Agriculture

The progress achieved by the agriculture sector in implementing the Tar-Pamlico Agriculture Nutrient Control Strategy Rule is well documented in the Annual Agricultural Progress Reports submitted to the EMC every fall since 2003. As of 2002, the agriculture sector exceeded its collective 30% nutrient reduction goal and in 2013 reported a 43% reduction in estimated nitrogen loss to the basin through a combination of BMP implementation, crop shifts, fertilization rate reductions, and loss of overall cropland acres. During implementation, additional research regarding BMP effectiveness has improved nutrient accounting. Further improvement to the accounting process and identification of additional agricultural sources that may be contributing nutrients that are not accounted for under the current strategy (e.g., more detailed yearly reports capturing the addition, loss or transfer of nutrients, pasture BMPs, tile drainage, ammonia emissions from concentrated animal feeding operations, aquaculture facilities, and the expanding poultry industry) are necessary to continue progress in meeting the overall Tar-Pamlico nutrient loading reductions.

Stormwater

A better understanding of stormwater contributions could assist in refining the NSW implementation strategy. There is a need to target existing development retrofit opportunities and develop a comprehensive stormwater program that captures new development and construction activities in areas not currently subject to regulation. Approximately 55% of the basin is covered by either Phase II or the NSW stormwater rules, 1% is covered by solely ORW or Water Supply Watershed stormwater regulations, 19% by Coastal stormwater rules and 25% of the basin has no stormwater program. Nutrient stormwater controls are in place for only 54% of the basin.

The Tar-Pamlico stormwater rule establishes a nutrient export goal of 4.0 lbs/ac/yr of TN and 0.4 lbs/ac/yr of TP for new residential and commercial development projects within the planning and zoning jurisdictions of six of the largest and fastest-growing local municipalities and five

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counties within the basin. The municipalities are: Greenville, Henderson, Oxford, Rocky Mount, Tarboro, and Washington. The counties are: Beaufort, Edgecombe, Franklin, Nash, and Pitt. Each of these local governments has successfully implemented its stormwater program since 2006 and continues to achieve nutrient export targets through a combination of onsite BMPs and off site nutrient offsets.

Water Quantity

As the population continues to increase in areas of the basin, the potential exists for the basin to become more vulnerable to water management issues.

OASIS Hydrologic Model Results

The Tar River Basin Hydrologic Model* is a computer-based mathematical model that simulates surface water flows in the Tar River. The Tar River Basin Hydrologic Model was developed in consultation with the major water withdrawers in the basin and representatives of state and federal resource management agencies. The geographic scope of the model extends from the headwaters of the Upper Tar and Fishing Creek, in eastern Person and Vance Counties respectively, down to Greenville in Lower Tar, where the river becomes tidally influenced. The model balances water coming into with water going out of the river system. The 2010 conditions are used as the base case against which the scenarios of future demands and return flows are compared. For this analysis, three different projected demand scenarios were modeled: a characterization of current conditions (2010), two scenarios of future withdrawals (2030 & 2060). The following table indicates water systems that have a deficit based on:

1- Available supply to meet **all water needs without** water shortage response plans considered in the modeling process.

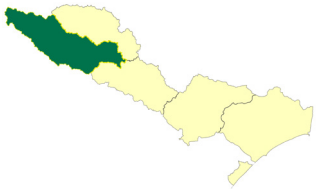
2- Available supply to meet **essential water needs with** water shortage response plans considered in the modeling process when these drought plans are at the most severe mandatory level of restrictions measures.

Water Supply Deficit	Scenario Year		
	2010	2030	2060
1- **Without** water shortage response plans	Louisburg Rocky Mount	Louisburg Franklinton Franklin County Rocky Mount Greenville Utilities C Farmville Winterville	Louisburg Franklinton Franklin County Rocky Mount Greenville Utilities C Farmville Winterville
2- **With** water shortage response plans	Louisburg Enfield	Louisburg Enfield Rocky Mount	Louisburg Franklinton Franklin County Enfield Rocky Mount Winterville Greenville Utilities C Farmville

*Model includes Ecological flows that were calculated for a required permit. Other ecological flow model scenarios are done on a site specific basis.

Subbasin Summaries and Significant Issues

Upper Tar River Subbasin 03020101

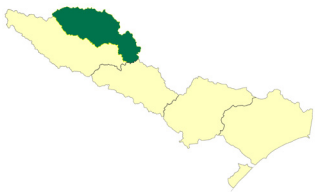


Modest water quality improvements have been made in this subbasin. Water quality is generally good with low dissolved oxygen and turbidity as noted stressors. Nutrient data indicates TKN and TP concentrations have increased since 1991. Collecting nutrient data from ambient stations representing all watersheds should be a priority to help be able to identify nutrient source watersheds. This subbasin has endangered aquatic mussel species requiring protection.

The Upper Tar subbasin has and will likely continue to observe the largest population growth of any of the subbasins, due in large part to its proximity to the City of Raleigh. Franklinton has water intakes on two separate reservoirs, which provides adequate supplies through the 2030 planning period. The other water system experiencing similar growth rates is Franklin County. Franklin County purchases all of it water supply from the Kerr Lake Regional Water System (KLRWS) and, to a lesser degree, from the Town of Louisburg. According to the 2012 Local Water Supply Plan (LWSP), under the current water contracts, Franklin County will be utilizing 78% of its total contracted water supplies by 2030 and exceeding those contracts by 2050. As a result, Franklin County has been working with the KLRWS to obtain the required Interbasin Transfer Certificate from the Environmental Management Commission (EMC) to increase the amount of water KLRWS is allowed to transfer from the Roanoke basin to the Neuse and Tar basins. Many other water systems in this subbasin are also dependent upon water from the KLRWS, either directly or indirectly. The direct recipients are the City of Henderson, the Town of Oxford, and Warren County. These water systems sell water to smaller water systems throughout the region. It is anticipated that this basin transfer will enable the water systems in the region to provide adequate water supplies to support the projected growth.

Another municipality in the Upper Tar subbasin with similar growth issues is the City of Rocky Mount. During the drought conditions of the 2000's, Rocky Mount successfully dealt with low water supply conditions primarily through strong water conservation initiatives. As a result, the Rocky Mount public utilities department keeps a close eye on the daily water supply levels in the Tar River, both in its reservoir and flows downstream of the dam. This vigilance is important considering that the OASIS hydrologic model has estimated significant demand deficits with the longest deficits lasting for 132 days and 193 days for 2030 and 2060 demand scenarios, respectively. The hydrologic model predicts at least one occurrence of demand exceeding supply during the majority of the projected years. However, these estimations ignore water conservation measures that would be enacted by the city during low water supply conditions. With the water conservation measures included, the model results show that the water supply issues will be significantly reduced. To help further mitigate this issue, the City of Rocky Mount has an emergency water supply interconnection with the City of Wilson in the Neuse river basin.

Fishing Creek Subbasin 03020102



Overall water quality in this rural subbasin is excellent, however nutrient data analysis indicates an increase in TKN and TN concentrations since 1991. This subbasin is a priority for aquatic threatened and endangered species protection. It is recommended that biological samples be taken during normal flow conditions to evaluate potential ORW reclassification.

Demands by water supply systems are minimal in the Fishing Creek subbasin, with the Town of Enfield, as the only surface water supply withdrawer. However, the water demands from the

agricultural sector can be significant during certain times of the year and especially during times of drought. Meeting these demands along with any additional demands is a concern considering that the USGS Fishing Creek gage data at Enfield, has depicted flows below 50 cfs for significant periods during the months of June through August since 2005. At the Fishing Creek gage at Enfield, the 87-year annual median flow is 479 cfs with the June-August 87-year median flow at 140 cfs. These seasonal patterns have, in part, resulted in the OASIS hydrologic model estimating small deficits for the projected 2030 water supply demand for the Town of Enfield.

Lower Tar River Subbasin 03020103

This subbasin funnels water from the Tar River tributaries before entering the Pamlico Estuary and therefore collectively delivers higher concentrations of stressors (e.g., nutrients) directly to the estuary. Nutrient data analysis at Grimesland indicates an increase in TKN and TN concentrations since 1991. 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. Threatened and sensitive aquatic species have been found in the main stem of the Tar River in this subbasin.

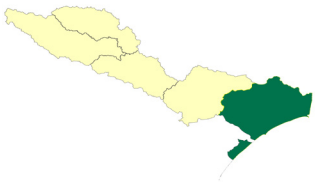
Spurred in part by the Central Coastal Plain Capacity Use Area (CCPCUA) rules, the approval of the IBT Certificate for Greenville Utilities (GUC) to serve the Town of Farmville and Greene County has enabled GUC to become a more significant regional water supply provider. This increase in service area has compelled GUC to evaluate a myriad of water supply options to deal with the anticipated regional growth. According to the 2012 Local Water Supply Plan, GUC has determined that it needs to increase its water supply in the near-term (2019) an additional 13.5 million gallons per day (MGD) above the existing 22.5 MGD and long-term (2037) to a total water supply of 56.7 MGD. Evaluations to determine the best sources of these needed water supplies are ongoing. Based upon the current water supplies, the 2030 and 2060 OASIS hydrologic model scenarios estimate small water supply shortfalls for GUC.

Groundwater levels have shown significant improvements following the expansion of the GUC surface water intake on the Tar River and allowances for basin transfers resulting in the ability for reduced groundwater usage by GUC and the regional municipalities it now serves. Continued monitoring of the freshwater aquifers and adherence to the CCPCUA rules is needed to ensure avoiding depletion of the groundwater resources.

Pamlico River Subbasin 03020104

Water quality in this subbasin is primarily impacted by nutrient loading and resulting chlorophyll *a* impairment in the estuary. Data indicates the extent of the impairment over the years corresponds to flow conditions. When the basin is in a low flow hydrologic condition, the higher chlorophyll a concentrations and percent exceedances move into the upstream portion of the estuary (2014 IR period). While under normal or elevated flows, the higher chlorophyll *a* concentrations and percent exceedance are pushed downstream and can be found as far down as the mouth of Huddy Gut (south shore) and Saint Claire Creek (north shore) (2006-2012 IR period). Copper is also a known stressor in this subbasin. Aquaculture facilities discharging to surface waters are encouraged to implement BMPs to reduce nutrients impacts.

Pamlico Sound Subbasin 03020105



Water quality concerns in this subbasin are focused on shellfish harvesting and recreational uses. A majority of the Impaired water for shellfish harvesting occur in prohibited shellfish growing areas and not based on collected fecal coliform data.

Restoration Prioritization

In 2013, the DWR's Planning Section developed a prioritization model to identify waters across the state in the most need of restoration. This model included parameters such as water quality sampling, surface water classifications, among others. Below are the top five restoration priority waters within the Tar-Pamlico River Basin:

- Ballahack Canal [AU#: 28-87-1.2]
- Tar River [AU#: 28-(36)b]
- North Fork Tar River [AU#: 28-5a]
- Sandy Creek [AU#: 28-78-1-(8)b1]
- Fishing Creek [AU#'s: 28-11c & 28-11d]

Action Plan

Full implementation of the nutrient reduction strategy has been a measured process and was reached in 2006. Point sources continually have met their targeted nutrient loading caps from the early 1990's. The agriculture community has reduced their estimated nitrogen loss from cropland and pastureland by an average 45%, since 2002. Almost 2,000 fertilizer applicators have received nutrient management training and the six local governments covered under the stepped Stormwater Rule have all adopted and implemented local stormwater programs to limit nitrogen and phosphorus inputs from stormwater runoff resulting from new development. Despite this successful implementation, water quality standards in the Pamlico River Estuary are not being met.

The Pamlico Estuary is a very complex and dynamic system. Climatic variability plays an important role in the mobilization, processing, and delivery of nutrients to the estuary. Estuarine water quality response is affected by climatic events causing variability that obscures clear trends in nutrient loading and the estuary's response to these loads, despite reductions to point and nonpoint source loads. Due to the decades of chronic overloading, the time lag required for changing land use activities to yield groundwater quality improvements, reductions to be fully expressed from nonpoint source input, and the likelihood of nutrient cycling within the estuary, it may be some time before current reductions in nutrient loading will reflect improved water quality.

DWR staff are evaluating the limitations of the current strategies and identified opportunities for developing a better understanding of the nutrient dynamics for both the Tar-Pamlico and Neuse River systems. While further analysis of existing data and additional data collection will provide greater certainty as to the effect of the strategies on the estuaries, existing strategy's limitations and the other basin factors that contribute to estuarine conditions must be recognized. Listed below are the over arching recommendations and research needs identified in this plan which will be pursued during this next basin plan cycle. It is important to note that at this time, DWR is not reassessing the TMDL. Water quality conditions will continue to be assessed biennially throughout the basin.

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Additional Research Needs & Recommendations

- Evaluate and quantify the extent of legacy sediment contributions to turbidity and nitrogen loads.
- Implement monitoring to better characterize the nature, magnitude and trends in groundwater derived nutrient contributions to the Pamlico River Estuary.
- Assess nutrient residence time in the Pamlico River Estuary.
- Assess organic nitrogen sources, transport and utilization.
- Assess whether the change in WWTP technology results in a transfer of nitrogen species leading to increased organic nitrogen loads.
- Evaluate aging wastewater treatment infrastructure; review inflow & infiltration possible nutrient contributions to groundwater.
- Characterize the location, geographic extent and functionality of agricultural field tile drains.
- Characterize the location, geographic extent and quantify possible nutrient loading from animal agriculture housing, waster storage and waste application.
- Characterize the potential for groundwater contamination and transport of nutrients from biosolids and wastewater land application fields to the surface waters.
- Quantify the nitrogen contributions from conventional on-site wastewater treatment systems to surface waters of the Tar-Pamlico Basin.
- Characterize and quantify contributions of anthropogenic vs. natural loads of organic nitrogen.
- Better quantification of BMP effectiveness (agricultural and stormwater BMPs); improve accounting tools; support BMP development.
- Review compliance and evaluate impacts to riparian buffers
- Quantify the magnitude in which pharmaceuticals are impacting aquatic life.
- Quantify agriculture water withdrawals to aid in water quantity model calculations.
- Identify the local Drainage Districts and understand their current role in controlling water flow and drainage issues. Work with the Districts to develop recommendations on how to protect water quality in these areas.

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Action Plan

Recommendations & Goals	Actions Needed	Participants	Implementation Status
1) **Nutrient Sensitive Water Rules Review** •Explore opportunities to strengthen the Tar-Pamlico NSW rules during the rules re-adoption process.	•Work with stakeholders and internal staff through the rules re-adoption process to identify areas where requirements can be improved and make adjustments to the Tar-Pamlico NSW rule.	•DWR- Nonpoint Source & Basin Planning staff •Public stakeholders	•Tar-Pamlico NSW rules public hearings slated for spring-summer 2015.
2) **Watershed Model** •Explore opportunities and data needs to update loading goals and reductions needed to meet water quality standards in the estuary under current conditions. •Identify information needed for development of a watershed model.	•Evaluate additional groundwater and surface water quality data needs •Identify appropriate model given data types, land use and sources.	•DWR- Planning staff	
3) **Watershed Monitoring and Trends** •Conduct additional trend and loading analyses upstream of the Pamlico Estuary focusing on smaller watersheds. •Assess short-term vs long-term nutrient trends. •Identify additional monitoring locations and parameter needs. •Better characterize basin nutrient sources and relative contributions. •Identify organic nitrogen sources and fate/utilization of DON. •Detailed TKN analyses	•Identify resources needed to extend nutrient monitoring. •Identify nutrient source contributions. •Literature review of recent NC studies regarding land use and nutrient loads. •Lab analyses of TKN samples to identify DON vs PON percentages	•DWR- Basin Planning, Modeling & Water Sciences Lab staff, •TPBA Coalition	*Completed 2014* •Load and concentrations trends were performed at 5 ambient stations with data through 2013. •Reassessment of nutrient concentration and load trends to be completed prior to 2020. •Continual biennial assessment of Pamlico Estuary. •Lab work dependent on staff and resource availability
4) **Groundwater Monitoring** •Calculate baseflow contributions at the 5 trends stations to better identify groundwater based nutrient loads vs. surface. •Establish monitoring to better characterize the nature, magnitude and trends in groundwater derived nutrient contributions to the Tar-Pamlico River.	•Provide training to staff on how to use existing baseflow calculator tools. •Identify sample sites and implement regular monitoring.	•DWR- Groundwater Planning, regional office & laboratory staff	•Staff are identifying potential existing groundwater wells to sample.

Action Plan

Recommendations & Goals	Actions Needed	Participants	Implementation Status
5) **Stormwater** •Assess stormwater runoff impact in areas within the basin that are currently not under any stormwater program. •Evaluate the magnitude of nitrogen loading in runoff from existing developed areas and assess the need to further address this source under the strategy. •Review stormwater and sediment and erosion control compliance activities; assess need for additional staff for inspection and enforcement needs.	•Establish a working group to evaluate programs and nutrient control issues.	•DWR- Nonpoint Source & Basin Planning staff •DEMRL- Stormwater staff •Public stakeholders	•Working with stakeholders and internal staff through the rules re-adoption process to identify areas where stormwater requirements can be amended. •Compliance activities have been moved to DEMLR, but inspections have generally declined.
6) **Agriculture Nutrient Tracking** •More detailed reporting on tracking changes of BMPs and additional BMPs to offset new or increased sources of nutrients from agricultural operations. •Re-evaluate edge of field calculations to adjust for actual stream load impacts. •Encourage soil erosion prevention BMPs.	•Reconvene with Division of Soil & Water Conservation (DSWC) and Basin Oversight Committee (BOC) to explore plausibility of providing more detailed reports. •Funding for BMP research and implementation is needed.	•DWR- Nonpoint Source & Basin Planning staff •Dept of Ag & CS-DSWC Nonpoint Source Program staff	•Tar-Pamlico NSW Rules re-adoption process may identify areas for improvement •SWCD basin technician positions have been reduced from 5 to 1. •Basin Oversight Committee has limited resources for tracking.
7) **Atmospheric Deposition** •Assess atmospheric nitrogen contributions to the watershed and develop recommendations on better characterization of atmospheric nitrogen deposition and emission source regulatory considerations. •Specifically address better characterization of the contribution of ammonia emissions from Concentrated Animal Feeding Operations (CAFO).	•Workgroup with DWR & DAQ to review applicable recommendations from EPA's National Air Emissions Monitoring Study. •Review National Atmospheric Deposition Program & National Trends Network data available through NCSU.	•DWR- Nonpoint Source & Basin Planning staff •Division Air Quality •Dept of Ag & CS-DSWC Nonpoint Source Program staff	•Met with NCSU staff in May 2015 to understand what data is available. •DENR investigations into pollution concerns are in response to citizen complaints

Action Plan

Recommendations & Goals	Actions Needed	Participants	Implementation Status
8) **Threatened and Endangered Species** •Evaluate the need for development of threatened and endangered management plans that are within DWR's purview due to the presence of threatened and endangered aquatic species in the basin.	•Review and update as needed the 2005 T&E technical support document •Review DWR regulatory programs and plausibility of development of specific mussel species management plan and/or rules. •DWR continues to review national water quality criteria with acknowledgment of aquatic species needs.	•DWR- Classifications & Standards staff •NC Natural Heritage Program & Wildlife Resources Commission •US Fish & Wildlife	*Completed 2014* •Revised metal standards were approved in December 2014. •DWR is reviewing ammonia criteria and other chemicals during the triennial review of water quality standards as required by EPA.
9) **Aquaculture Facilities** •Continue follow-up actions on hybrid striped bass farms and other fish farms in the lower Basin to improve their effluent quality and better quantify their impact to the Estuary. •If warranted, include their contributions in the Basin's accounting of progress towards meeting nutrient reduction goals.	•Identify additional aquaculture production facilities with potential impacts to surface waters.	•DWR- NDPES permit & regional office staff •Public	*Completed 2014* •New general NPDES permit for bass farms being implemented by DWR. •Basin Oversight Committee has limited resources •DWR investigations into water quality concerns are in response to citizen complaints
10) **Restoration Prioritization** •Identify 9-Element watershed plans, protection plans or alternative TMDLs needs in the basin.	•Further identify waterbodies that need alternative TMDLs	•DWR- Planning staff	•GIS based prioritization tool has been developed.