



# White Oak River Basin Restoration Priorities 2010



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This Document was developed by Rob Breeding,  
Eastern Watershed Planner, NCEEP

Cover Photo: Construction of the Jacksonville Country Club Stream Restoration,  
Jacksonville, NC

## Introduction



This document, prepared by the North Carolina Ecosystem Enhancement Program (EEP), presents a description of Targeted Local Watersheds within the White Oak River Basin. This is an update of the original document developed in 2001 by the NC Wetlands Restoration Program (NC WRP) *White Oak River Basin Watershed Restoration Plan 2001*.

The 2001 plan described 12 Hydrologic Units (14-digit HUs as denoted by the United States Geological Survey) to be targeted for stream, wetland, and riparian buffer restoration and protection, and for watershed planning efforts (i.e., Targeted Local Watersheds or TLWs). Two have been delisted. In this update, 12 new TLWs have been added as targets for restoration and preservation efforts in the White Oak River Basin.

In addition to updating the *White Oak River Basin Watershed Restoration Plan 2001*, this report complements information found in the *White Oak River Basinwide Water Quality Plan* (NC DWQ 2007). These two reports provide much of the justification for selection of HUs by detailing water quality conditions, resource management activities, and restoration and preservation needs in the White Oak River Basin.

In past documents, North Carolina Division of Water Quality (DWQ) “subbasin” units were used to organize the document and discussion of the selected TLWs. This document, however, uses the US Geological Survey’s (USGS) 8-digit Cataloging Unit in the river basin as the framework for organization and discussion of TLWs.

## What is a River Basin Restoration Priority?

EEP develops River Basin Restoration Priorities (RBRPs) to guide its mitigation activities within each of North Carolina’s 17 major river basins. The RBRPs designate specific watersheds that exhibit a need for restoration and protection of wetlands, streams and riparian buffers. These priority watersheds, called Targeted Local Watersheds (TLWs), are the USGS delineated 14-digit HUs that receive priority for EEP planning and project funds. The designation may also benefit stakeholders writing watershed improvement proposals for grant funds (e.g., Section 319 or Clean Water Management Trust Fund) by giving added weight to their proposals.

*North Carolina General Statute 143-214.10* charges EEP to pursue wetland and riparian restoration activities in the context of basin restoration plans, with the goal of protecting and enhancing water quality, fisheries, wildlife habitat, recreational opportunities and preventing floods.

## Criteria for Selecting a Targeted Local Watershed

EEP evaluates a variety of GIS data and resource and planning documents on water quality and habitat conditions to select TLWs. Public comment and the professional judgment of local resource agency staff also play a critical role in targeting local watersheds. TLWs are chosen based on an evaluation of three factors—problems, assets, and opportunities. Problems reflect the need for restoration; assets reflect the ability for a watershed to recover from degradation and the need for land conservation; and opportunities indicate the potential for local partnerships in restoration and conservation work. Methods for evaluation of these three factors are outlined below:

**Problems:** EEP evaluates DWQ use support ratings, the presence of impaired or 303(d)-listed streams, and DWQ Basinwide Plans to identify streams with known problems. EEP also assesses the potential for degradation by evaluating land cover data, riparian buffer condition, impervious cover, road density, and projected population change.

**Assets:** In order to gauge the natural resource value of each watershed, EEP considers the forest and wetland area, land in public or private conservation, riparian buffer condition, high quality resource waters, and NC Natural Heritage Program data.

**Opportunity:** EEP reviews restoration and protection projects that are already in the ground, such as Clean Water Management Trust Fund projects, US Clean Water Act Section 319 initiatives, mitigation banks<sup>1</sup>, and land conservation efforts. EEP also considers the potential for partnership opportunities by consulting with local, state, and federal resource agencies and conservation organizations to assess the potential to partner in their priority areas.

In addition to these factors, local resource professional feedback is an important element in selecting TLWs. Comments and recommendations of local resource agency professionals, including staff with Soil & Water Conservation districts, the Natural Resources Conservation Service (NRCS), county and municipal planning staff, NC Department of Environment and Natural Resources (DENR) regional staff (e.g., Wildlife Resources Commission), local and regional land trusts and other watershed organizations provide integral input to the TLW selection process. Local resource professionals often have specific and up-to-date information regarding the condition of local streams and wetlands. Furthermore, local resource professionals may be involved in water resource protection initiatives that provide good partnership opportunities for EEP restoration and preservation projects and EEP Local Watershed Planning initiatives.

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<sup>1</sup> Army Corps of Engineer data from August 2010 indicates one approved mitigation bank is present in the White Oak River Basin.

Finally, TLWs that were chosen for the last Watershed Restoration Plan or RBRP document are reevaluated. If new information reveals that a watershed is not a good TLW candidate, then it will be removed from the TLW list. An explanation for each delisting is provided in the last section of this document.

## White Oak River Basin Catalog Unit Overview

The White Oak River Basin (USGS Catalog Units 03020106 and 03030001) covers much of Onslow and Carteret Counties as well as small portions of Craven and Jones Counties. The basin encompasses a 1,264-square mile watershed area which includes the drainages of four separate river systems: the New River and its tributaries in the southwestern section; the White Oak River and its tributaries; the Newport River and its tributaries; and the North River in the eastern section. The basin also includes Bogue and Core Sounds. Large portions of the basin are publicly owned areas such as the Croatan National Forest adjacent to the White Oak River, Hoffman State Forest, and Camp Lejeune Military Reservation on the New River.

Between 1990 and 2000, the population of the White Oak Basin doubled from about 150,000 to over 310,000. Nearly three-quarters of this population is concentrated in Onslow County in the vicinity of the City of Jacksonville. Onslow County experienced a growth of nearly 31,000 (21%) between 2000 and 2010 while Carteret County grew by about 6,000 (10%). Other rapidly growing municipalities in the White Oak are Beaufort, Emerald Isle, Morehead City, and Newport. Onslow and Carteret counties are expected to grow 14% and 8% respectively over the next ten years. More information on population growth can be found at [http://www.osbm.state.nc.us/ncosbm/facts\\_and\\_figures/socioeconomic\\_data/population\\_estimates/county\\_projections.shtm](http://www.osbm.state.nc.us/ncosbm/facts_and_figures/socioeconomic_data/population_estimates/county_projections.shtm) (Office of State Budget and Management 2010).

## White Oak River Basin Restoration Goals

Based on an assessment of existing watershed characteristics and resource information, EEP maintains four restoration goals for the White Oak River Basin. Each goal reflects EEP's watershed restoration strategy to focus restoration projects within local watersheds to address water quality impacts from nonpoint source pollution. The goals also reflect EEP's focus on restoring wetland and riparian area values such as maintaining and enhancing water quality, increasing storage of floodwaters, and improving fish and wildlife habitat. The general restoration goals for the White Oak River Basin are listed below, including specific objectives for reaching those goals.

- *Protect and improve water quality throughout the Basin by reducing sediment and nutrient inputs into streams and rivers.*

- Implement stream restoration projects that reduce sources of sediment by stabilizing streambanks and restoring channel meanders, especially in headwater tributaries.
  - Restore riparian vegetation and wetlands to trap sediment and remove nutrients from surface runoff.
  - Work with local land trusts and landowners to protect in perpetuity high-quality watersheds through restoration and preservation of critical riparian and wetland tracts.
  - Support the education/outreach efforts of local Cooperative Extension Service and Soil & Water District staff, especially with respect to agricultural, residential and urban stormwater BMPs.
- *Protect shellfish harvesting waters and reduce the number & frequency of Division of Environmental Health (DEH) closures of designated shellfish growing areas.*
- Support local studies of the sources of fecal coliform bacteria and the development of strategies for reducing coliform-related inputs into local waters including urban stormwater BMPs.
  - Implement stream, wetland and riparian buffer restoration projects within watersheds that drain directly into class SA waters [e.g., tidal creeks].
  - Support local public education/outreach efforts to increase public awareness of the sources and controls of pathogens in local streams, rivers, bays and sounds.
- *Support efforts to restore local watersheds in the White Oak River Basin.*
- Work to implement the Local Watershed Plan for upper Northeast Creek and Newport River watersheds [see *Coordinating Compensatory Mitigation Requirements to Meet the Goals of the Coastal Habitat Protection Plan* (2009)] to address future compensatory mitigation needs and local stakeholder priorities.
  - Promote innovative coastal mitigation methods such as the split function crediting strategy proposed in the LWP project.
  - Develop local stakeholder collaborations.
  - Cooperate with local resource agencies to help obtain federal and state grant monies for watershed restoration efforts.
  - Promote recommendations found in the *Total Maximum Daily Loads for Fecal Coliform for the White Oak River (DWQ, 2010)* document.
  - Incorporate strategies to address the impacts of climate change
- *Support implementation of the NC Coastal Habitat Protection Plan (Street et al, 2005) and its associated implementation plans (NC Division of Marine Fisheries, 2007; NCDMF, 2009). EEP is committed to supporting the following efforts.*

- Develop additional Strategic Habitat Areas (SHAs) and coordinate data and methodology improvements with other state and federal agencies
- Develop projects that can coincidentally meet CHPP objectives while meeting mitigation requirements within designated planning areas.
- Map, monitor and restore SAV
- Improve and restore shellfish beds
- Incorporate strategies for addressing impacts of climate change
- Implement agricultural BMPs to reduce nonpoint source inputs to the estuary
- Remove barriers to anadromous fish movement and improve nursery and spawning habitats
- Protect, augment and connect Natural Heritage Areas and other conservation lands

## White Oak River Basin TLW Overview

Twelve HUs were targeted in the 2001 White Oak River Basin Watershed Restoration Plan. In this 2010 update, however, two of those HUs have their TLW status removed. An additional 12 HUs are designated as new TLWs. In total, 22 HUs are highlighted as TLWs by EEP in this 2010 RBRP.

Table 1 provides a partial summary of information used to select TLWs. Additionally, Figure 1 is a map of the White Oak River Basin showing current TLWs and those with removed TLW designation.

**Table 1. White Oak River Basin TLW Summary** (pink highlight indicates existing TLWs, turquoise indicates new TLWs, red indicates de-listed TLWs).

HUCODE	HU_Name	HU Area <sup>1</sup> (sq mi)	Stream Length <sup>2</sup> (mi)	Ag Area <sup>3</sup> (%)	Forest Area <sup>4</sup> (%)	Imperv Area <sup>5</sup> (%)	HQW or ORW Length <sup>6</sup> (%)	WSW Length <sup>7</sup> (%)	SNHA Area <sup>8</sup> (sq mi)	NHEO <sup>9</sup> (#)	Conserv Area <sup>10</sup> (%)	303(d) Length <sup>11</sup> (%)	Animal Ops <sup>12</sup> (#)	Non-forested Stream Buffer <sup>13</sup> (%)
Catalog Unit 03030001														
03030001010010	Upper New River	35	71	44	51	0.9	0.0	0	0.0	0	0.0	13	32	45
03030001010020	Mill Swamp	17	38	44	52	0.6	0.0	0	0.0	0	0.0	0.1	23	40
03030001010040	New River	58	99	28	63	1.9	0.0	0	7.1	6	16	16	21	25
03030001010050	New River (Wilson Bay)	17	41	8	35	16	23	0	0.3	1	27	5.6	3	52
03030001020010	Northeast Creek	77	80	24	58	4.1	10	0	8.1	14	42	17	2	36
03030001020040	New River	46	60	10	61	1.0	18	0	2.9	39	67	14	0	12
03030001040005	Turkey Creek	11	27	51	44	1.0	25	0	0.4	8	3	35	0	28
03030001040010	Topsail Beach	81	29	17	57	3.4	21	0	13	78	3.5	27	1	31
03030001040020	Wrightsville Beach	70	61	10	34	12	2.9	0	14	133	15	18	4	54
Catalog Unit 03020106														
03020106010010	Upper White Oak River	68	50	18	79	0.2	0.0	0	13	18	55	0.9	7	42
03020106020030	Pettiford Creek	25	38	12	67	1.9	0.0	0	12	68	65	37	0	17
03020106020060	Queen Creek	35	45	31	51	2.8	0.0	0	1.6	45	13	34	3	42
03020106030060	Gales Creek	8	9	12	43	6.8	0.0	0	0.3	6	7	53	0	42
03020106040010	North River	66	149	35	36	1.2	0.2	0	4.5	23	12	37	1	62
03020106010031	Brick Kiln Branch	7	16	39	51	2.1	0.0	0	1.7	4	23	0.0	2	48
03020106020040	Bogue Sound North	13	17	24	35	6.0	0.0	0	1.9	14	28	16	0	50
03020106030010	Newport River SW	31	30	10	88	0.2	0.0	0	13	80	67	0.0	0	40
03020106030020	Newport River	38	52	19	63	3.3	0.0	0	11	75	37	0.0	3	49
03020106030040	Newport River	36	69	25	54	0.7	0.0	0	0.0	9	6	31	0	43
03020106030070	Newport River	27	55	10	26	14	4.6	0	1.0	40	7	25	0	49
03020106050010	Pamlico Sound South	274	30	2	16	0.2	2.4	0	31	81	9	1.4	0	58
03020106050020	Core Sound	66	128	32	45	0.8	23	0	5.9	44	10	16	1	62
03020106020010	White Oak River	22	62	34	48	1.3	0.0	0	0.0	3	7	22	3	39
03020106030030	Newport River	20	37	7	89	0.2	0.0	0	3.8	11	52	13	0	10



**Table 2. White Oak River Basin TLW Summary (continued).**

<sup>1</sup>Hydrologic Unit (HU) Area estimate based on USGS 14-digit HU boundaries (USDA NRCS 1998).

<sup>2</sup>Stream Length estimate derived from blue line streams on USGS 1:24,000 scale maps (NC CGIA 2008).

<sup>3</sup>Agricultural Area estimate based on 2001 National Land Cover Database (NLCD) (Homer et al., 2004).

<sup>4</sup>Forest Area estimate based on 2001 NLCD (Homer et al., 2004).

<sup>5</sup>Impervious Area Estimates based on 2001 NLCD (Homer et al., 2004).

<sup>6</sup>High Quality Waters (HQW) and Outstanding Resources Waters (ORW) (NC CGIA 2008).

<sup>7</sup>Water Supply Watershed (WSW) length (NC GIA 2008).

<sup>8</sup>Significant Natural Heritage Areas (SNHA) estimates (NC NHP 2007<sup>1</sup>).

<sup>9</sup>Natural Heritage Element Occurrences (NHEO) (NC NHP 2007<sup>2</sup>).

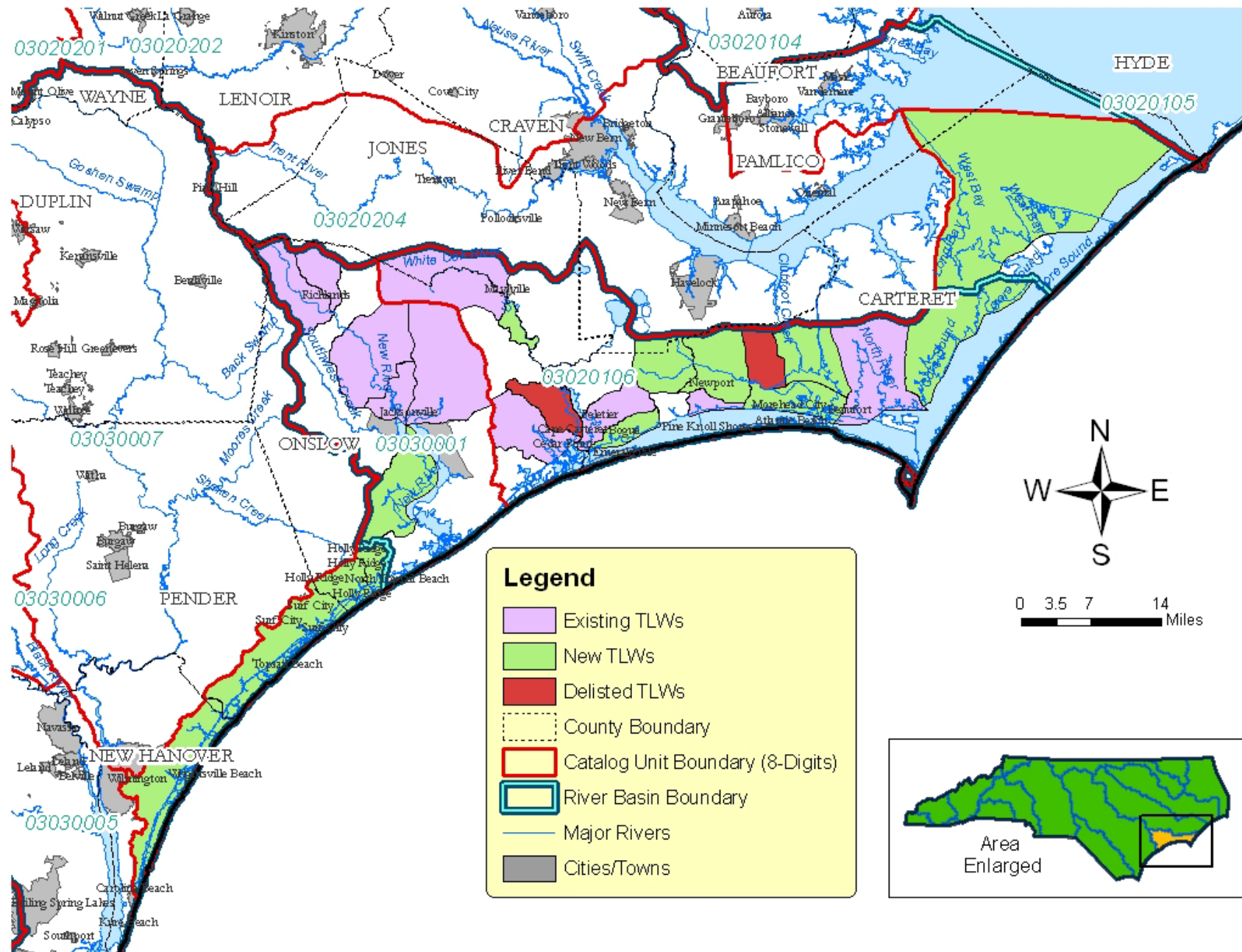
<sup>10</sup>Conserved Area estimate based on federal, state, and local land under protection (NC GIA 2008).

<sup>11</sup>303(d) List of impaired waters (NC DWQ 2006<sup>2</sup>).

<sup>12</sup>Animal Operations estimates based on NC estimates for pork, poultry, and bovine operations in 2007 (NCDA, 2007).

<sup>13</sup>Non-forested Stream Buffer estimate based on 2001 NLCD and a 100 foot buffer distance from USGS blue line streams.

Figure 1. TLWs, White Oak River Basin.



## Discussion of White Oak River Basin Targeted Local Watersheds

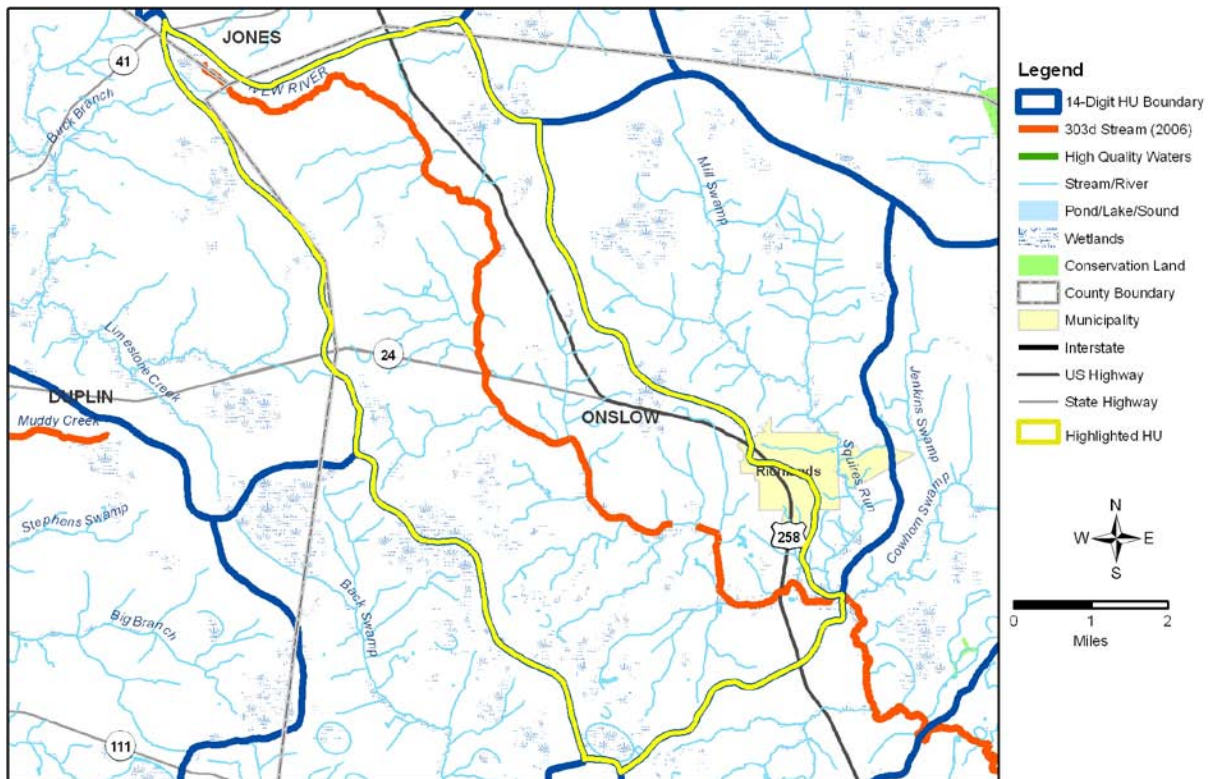
The following section provides maps and descriptions of TLWs and a discussion of the environmental conditions and activities that lead to their selection.

### White Oak 01 Targeted Local Watersheds

Upper New River: 03030001010010

This watershed is approximately 35 square miles in area with 71 miles of streams. Forty-five percent of these streams lack sufficient riparian buffer. One-third of soils here are hydric supporting 51% forested land or wetlands. Twenty-two percent of forests are designated unfragmented. A small portion of the watershed is developed around the Town of Richlands. Much of the HU is rural with about 44% used for agriculture. There is a single agricultural best management practices (BMP) project here.

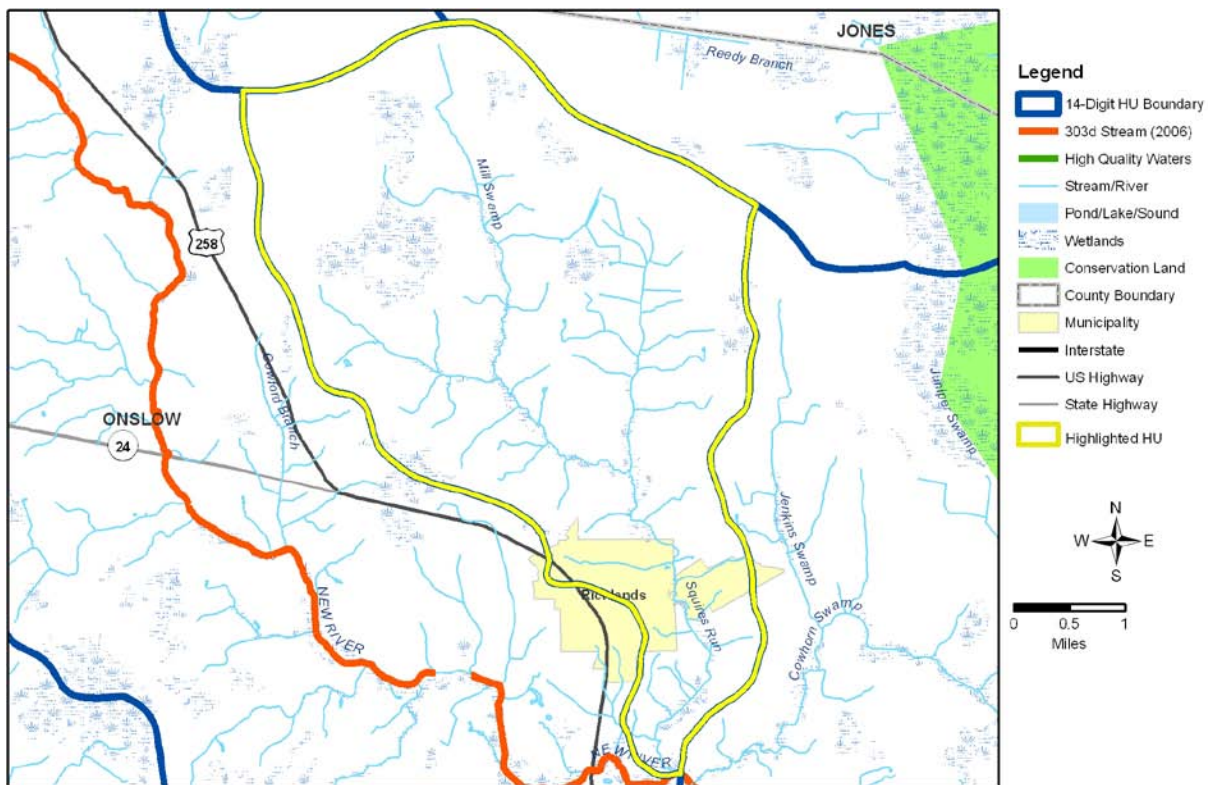
Restoration goals for this watershed include planting riparian buffer zones with appropriate woody species. Best management practices that offset the impacts of agriculture are also a high priority here. Preservation should be considered where high quality habitat exists and riparian corridors can be maintained.



Mill Swamp: 03030001010020

The Mill Swamp watershed is somewhat small at 17 square miles and has 38 miles of streams, 40% of them unbuffered. Forty-seven percent of soils are hydric supporting forested wetlands in about 52% of the HU. Twenty-one percent of the forested area is considered unfragmented (“interior”) forest. About 44% of the land area is used for agriculture including 23 permitted animal operations. Two agricultural BMP projects have been completed in the watershed.

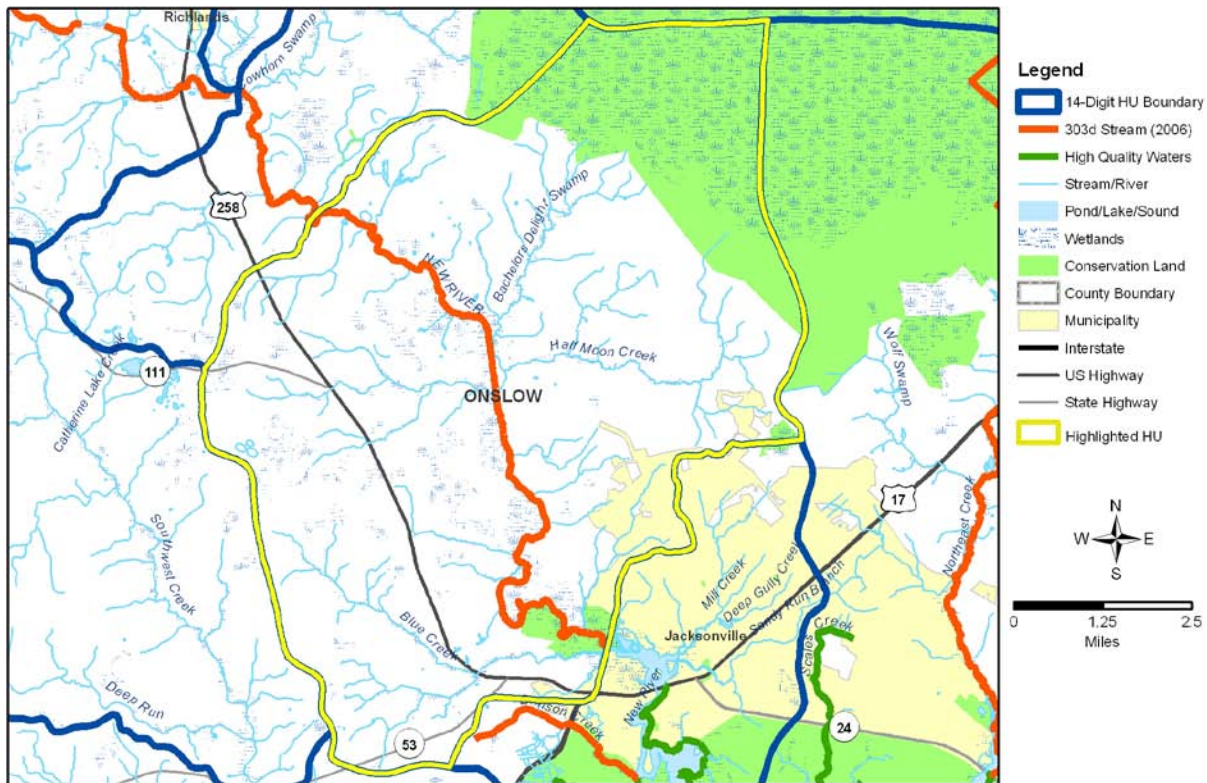
Similar to the Upper New River watershed, preservation should be considered where high quality habitat exists and riparian corridors can be maintained. Stormwater BMPs should be a priority around the Town of Richlands and agricultural BMPs should be considered to offset those inputs. Riparian buffer projects are a high priority on the streams that lack them.



New River: 03030001010040

This watershed is approximately 58 square miles of Middle Atlantic Coastal Plain ecoregion and includes 99 miles of stream. Its major tributaries include Bachelors Delight Swamp, Half Moon Creek and Blue Creek. Approximately 28% of the land is used for agriculture and there are 21 (19 hog, 1 poultry, and 1 cattle farm) permitted animal operations here. A small part of the City of Jacksonville exists in the south and includes nearly 2 square miles that are subject to Phase II stormwater regulation. Developed land includes about 9% of the total HU area and on average, the amount of impervious surface is very low. Sixty-three percent of the watershed is forested (17 square miles unfragmented) or in wetlands. Hydric type A soils cover about 38% of the watershed. Over seven square miles are designated Significant Natural Heritage Area (SNHA). Three agricultural best management practice (BMP) projects and one Clean Water Management Trust Fund project have been implemented here.

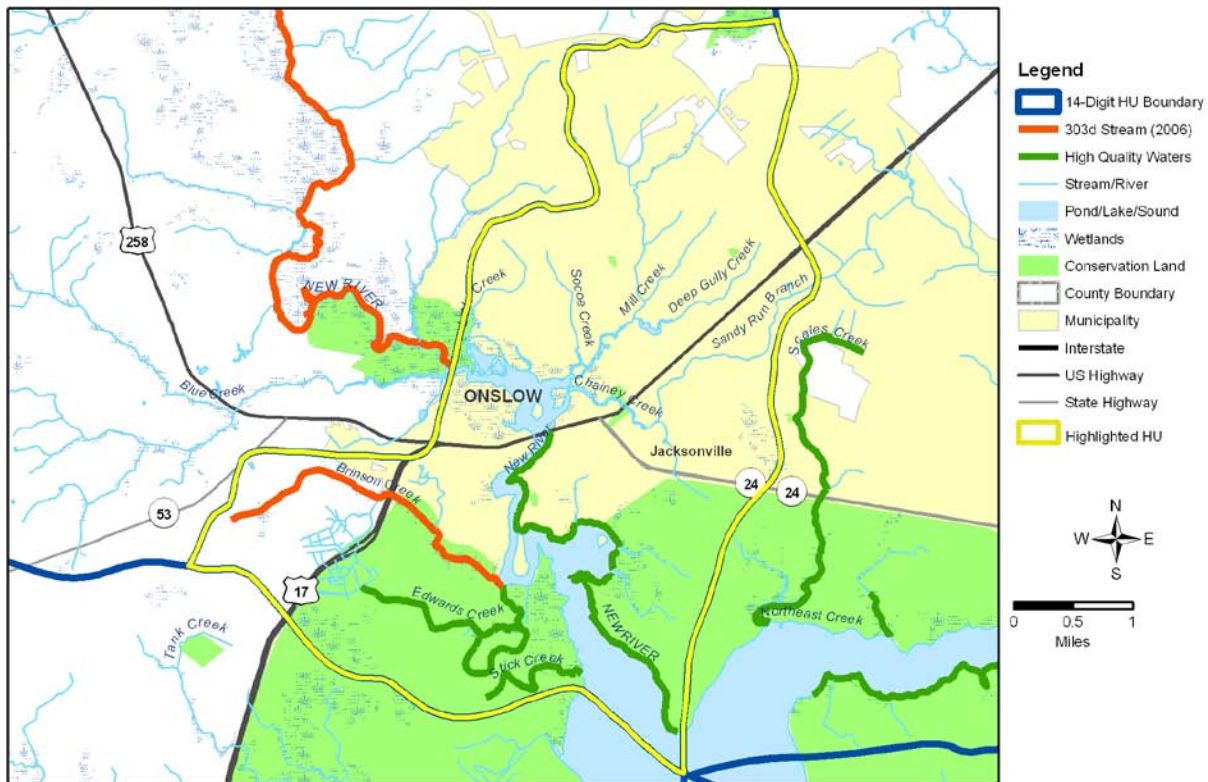
Priorities for this watershed include projects that reduce agricultural inputs and preservation of forested areas and riparian corridors. Stormwater BMPs are a priority in the vicinity of Jacksonville.



New River: 03030001010050

This segment of the New River watershed houses much of the City of Jacksonville. It covers about 17 square miles of area and has nearly 41 miles of streams, 23 of which are designated High Quality Waters (HQW). Despite the HQW designation, over 52% of streams lack wooded buffers and 6% of waters are listed as impaired on the state's 303(d) listing. This HU includes 8% open water and two square miles is closed to shellfishing. Nearly half the watershed is developed and accounts for 16% imperviousness. The NC Department of Transportation (DOT) has programmed 5.4 miles of Transportation Improvement Program (TIP) projects there. Eight percent of the watershed is used for agriculture and 35% is forest or wetland. About 18% of soils are hydric.

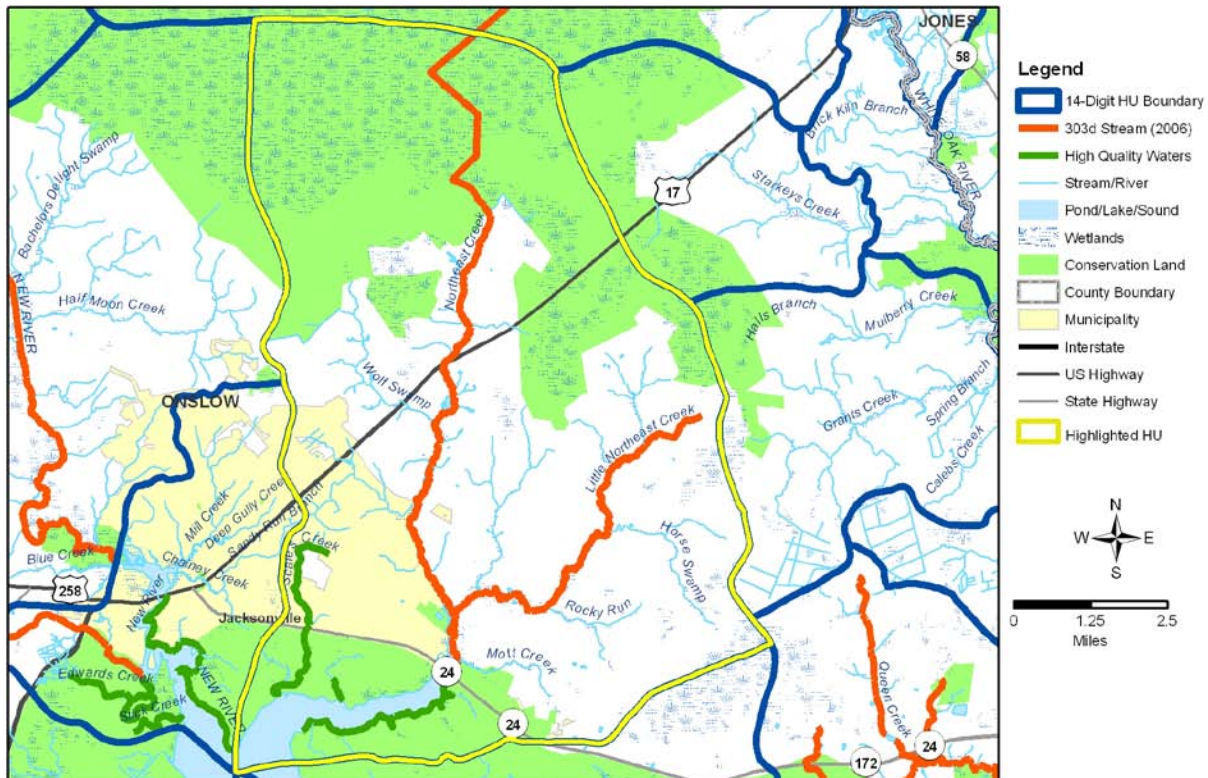
The Jacksonville portion of the watershed is subject to Phase II stormwater regulations and stormwater BMPs are a priority for this region. In the southwest part of the watershed, projects that address inputs in heavily ditched areas are high priority.



Northeast Creek: 03030001020010

The Northeast Creek watershed houses the eastern part of Jacksonville and covers 77 square miles. Fifteen square miles fall within the city limits and are subject to Phase II regulation. About 15% of the watershed is considered developed with over 4% imperviousness. About 24% of the watershed is in agriculture. There are over 80 miles of streams here with approximately 36% unbuffered. Seventeen percent of waters in Northeast Creek are listed on the states impaired waters list while 10% are still classified as High Quality Waters (HQW). Fifty-eight percent of the HU is forested or forested wetlands with about 22 square miles of unfragmented forest, much of which is in Hoffman Forest. Over 55% of soils in the watershed are classified as hydric type A, meaning they can support wetland communities. Eight square miles are designated SNHA and 14 Natural Heritage Element Occurrences (NHEO) can be found here. Of the open water occurring in the watershed, 2.3 square miles are designated primary or secondary fish nursery habitat and 2.4 square miles are closed to shellfishing. The NC Department of Transportation (NCDOT) has scheduled over nine miles of TIP projects for development in the near future.

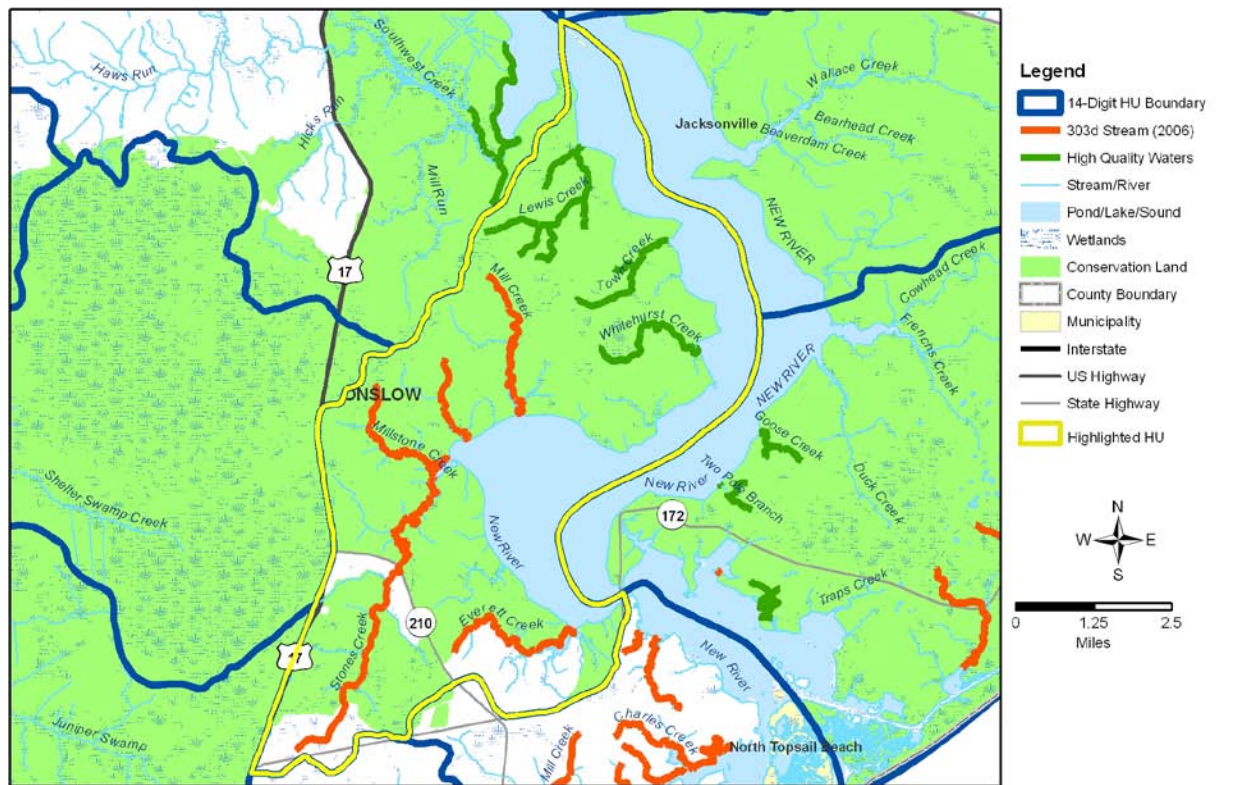
This watershed was one of three focus areas for a collaborative study called *An Approach to Coordinate Compensatory Mitigation Requirements to Meet Goals of the Coastal Habitat Protection Plan* (ECU, 2009). This study was a collaborative effort among ECU, NC Environmental Defense (NCED), and EEP. It is the basis for the ongoing Local Watershed Planning effort in this basin. Implementing the non-traditional mitigation projects recommended by the plan is a high priority for this watershed. Additional high priority projects include those that restore more natural stream flow in the headwaters and reduce storm inputs in the developed part of the watershed.



New River: 03030001020040

This portion of the New River covers about 46 square miles and includes 60 miles of stream. Over 18% of waters here are designated HQW with 13 square miles of primary or secondary fish nursery habitat. Sixty-one percent of the watershed is either wetlands or forest and nearly one-quarter of the total area is open water. About 30% of this HU is conservation land and 39 NHEOs can be found here. A very small amount of the watershed is developed (~5%). Ten percent is agricultural land. Three CWMTF projects have been implemented in the watershed. Fourteen percent of streams are 303(d)-listed and 12% of them lack woody buffers. Over five square miles of open water is closed to shellfishing.

Projects that improve estuarine water quality, shellfish habitat and fish nursery habitat are priorities for this HU.

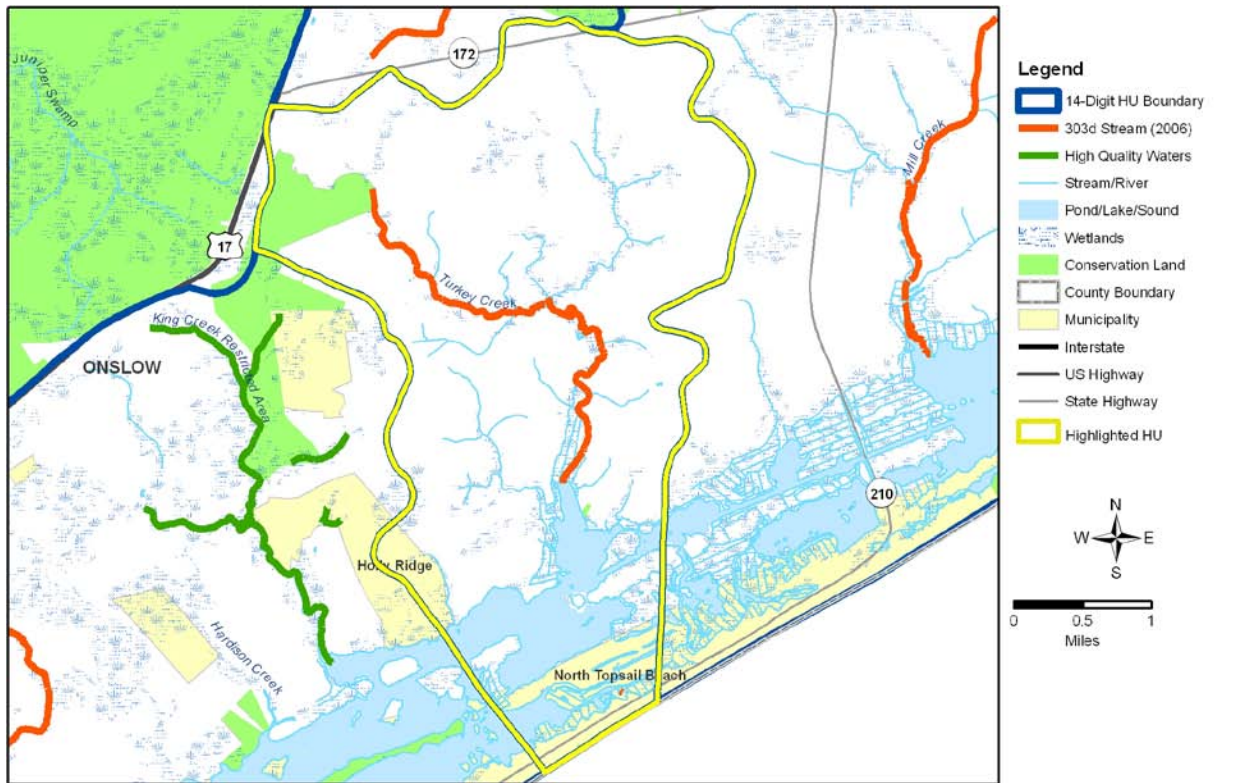




Turkey Creek: 03030001040005

The Turkey Creek watershed is approximately 11 square miles and is one of the component HUs of the White Oak Local Watershed Plan. It contains about 27 miles of streams with about 28% of them lacking significant stable buffers. Most of the main stem of Turkey Creek is listed as impaired on the state's 303(d) list. Seven percent of the watershed area is open water; two square miles are designated primary or secondary fish nursery habitat. A small amount of the watershed is impervious, mostly around the towns of Holly Ridge and North Topsail Beach. Nearly one-third of soils here are hydric. These hydric soils support approximately 62% of the HU area in forested wetlands. An additional 26% of the watershed is used for agriculture. Two CWMTF projects have been completed here.

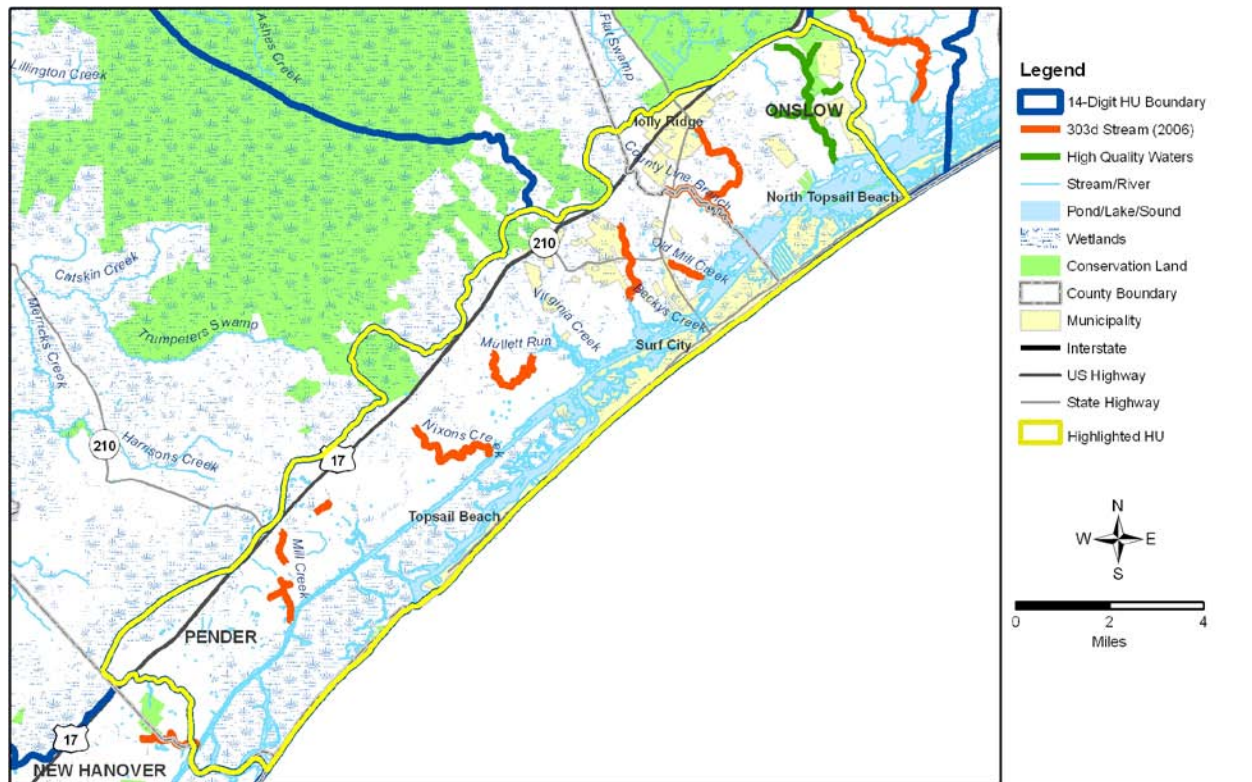
The highest priority projects for Turkey Creek are preservation projects that complement the restoration projects in related Local Watershed Planning areas in Northeast Creek and in the Newport River area. Other priorities for the HU include buffer projects, stormwater BMPs, and agricultural BMPs.



Topsail Beach: 03030001040010

The Topsail Beach watershed is approximately 81 square miles in area with 12% open water. Assets and problem issues were both abundant here making Topsail Beach a high priority TLW. There are only 29 miles of stream in this HU with nearly a third unbuffered. Twenty-seven percent of waters are on the 303(d) list. Twenty-one percent of waters are designated HQW by the Division of Water Quality, including 19 square miles of primary and secondary finfish nursery area. Almost 2.5 square miles of waters are closed to shellfishing. Approximately 12% of the land area is developed, 57% is forested wetland, and 17% is used for agriculture. This region is rich in natural heritage element occurrences (78) and 13 square miles of land are designated SNHA. CWMTF has sponsored four water quality improvement projects here. NCDOT has programmed almost 18 miles of TIP projects for development in the near future.

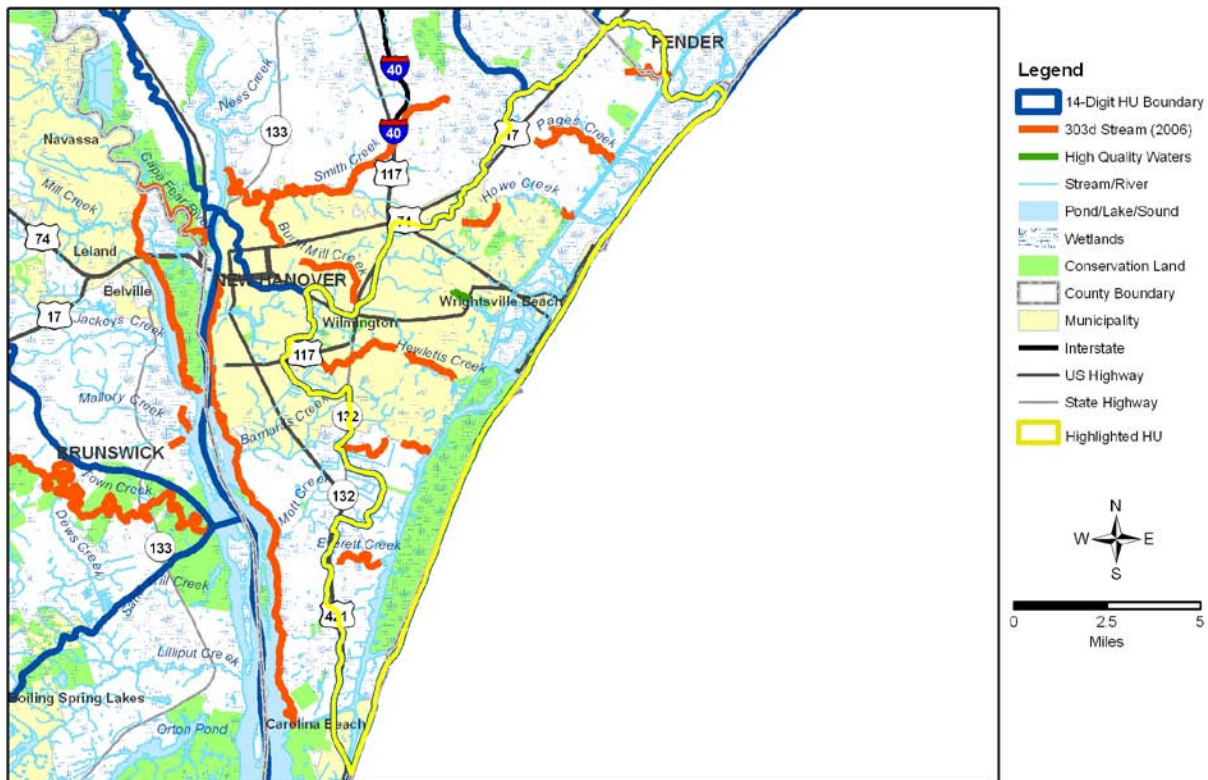
Stormwater management projects that reduce impacts from runoff are highest priority here. Restoration that improves nursery and shellfish habitat are needed in this watershed as well.



Wrightsville Beach: 03030001040020

The Wrightsville Beach HU ranked high for assets, problems and opportunities. It includes 70 square miles of land (85%) and open water (15%). There are 61 miles of streams in this watershed, 18% 303(d)-listed and 54% unbuffered. Thirty-eight percent of the watershed is developed with approximately 12% imperviousness. A significant portion of the City of Wilmington lies within the watershed boundaries and accounts for most of the impervious surface. Thirty-four percent is forested wetland with 14% of the total HU area designated SNHA. There are 133 documented NHEOs here. CWMTF has developed eight watershed improvement projects and the local land trust has developed two here. There are 15 square miles of fisheries nursery habitat designated here and 5 square miles of shellfish closures. NCDOT has planned the development of 4 miles of road projects.

Priority projects for this watershed will address stormwater impacts to the estuary. Fishery and shellfish habitat improvement projects are most important.

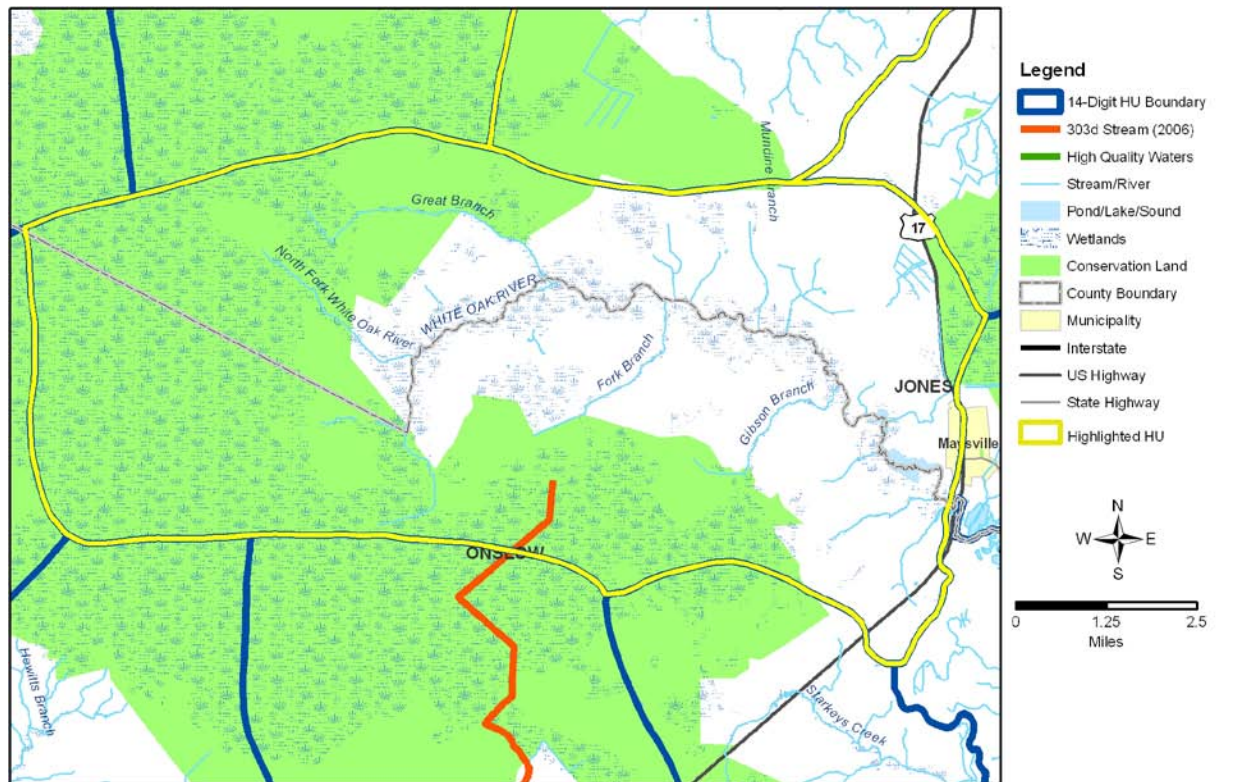


## White Oak 06 Targeted Local Watersheds

White Oak River: 03020106010010

This HU includes the North Fork and part of the upper White Oak River. It consists of 68 square miles and includes about 50 miles of streams, 44% of them unbuffered. A great deal of the headwaters is designated conservation land, including 12.5 square miles SNHA and one major WRC priority area. Eighteen NHEOs occur here. The watershed houses seven permitted livestock operations. There is very little developed land (~2%). Most of the watershed is forested (79%) including almost 35 square miles of unfragmented forest. Approximately 18% of the HU is used for agriculture. NCDOT has planned over four miles of TIP projects here.

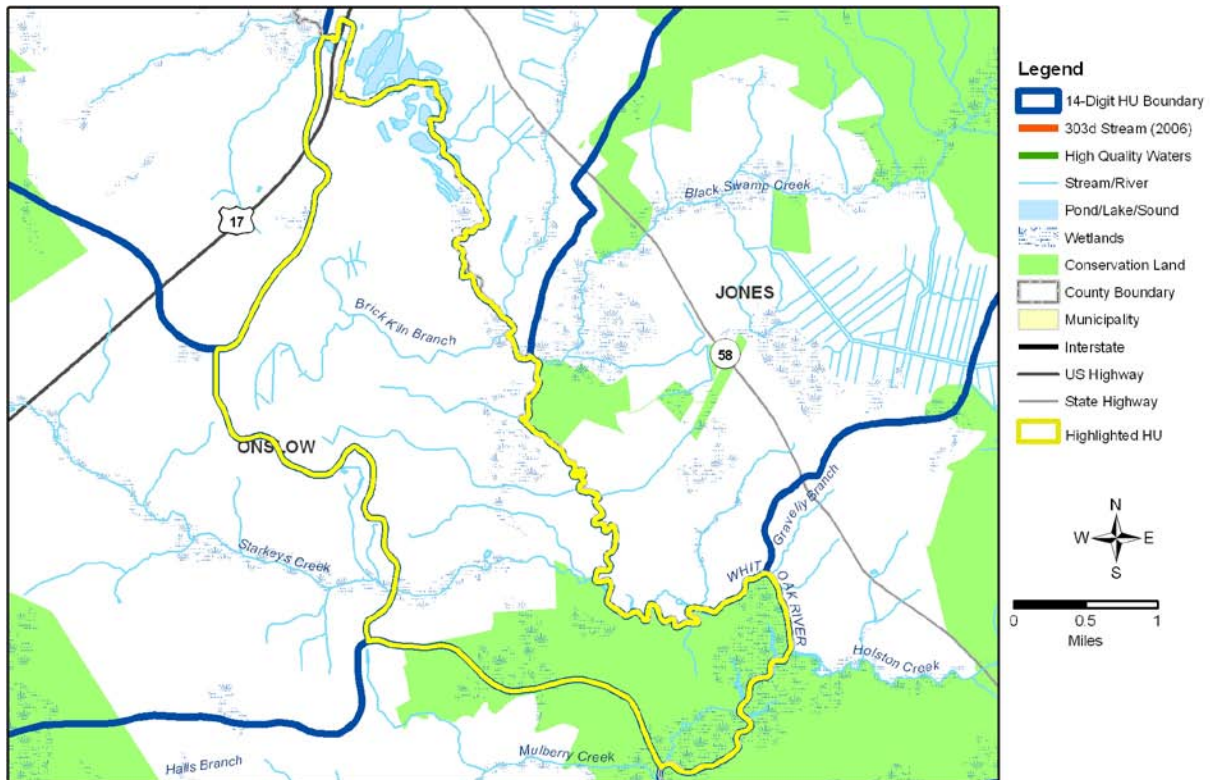
Priorities for the watershed are projects that expand and connect conservation areas and those that establish buffer in exposed riparian areas. BMPs that reduce agricultural inputs are also important here.



Brick Kiln Branch: 03020106010031

The Brick Kiln Branch watershed covers small area (7 square miles) south of where US17 crosses the White Oak River. There are about 16 miles of stream here, half of which lack wooded riparian buffers. Approximately 8% of the watershed is developed with an average imperviousness of 2%. Hydric soils cover about a third of the watershed and half the watershed is forested or forested wetland. Thirty-nine percent of the watershed is used for agriculture. CWMTF and WRC have each developed a single watershed improvement project here.

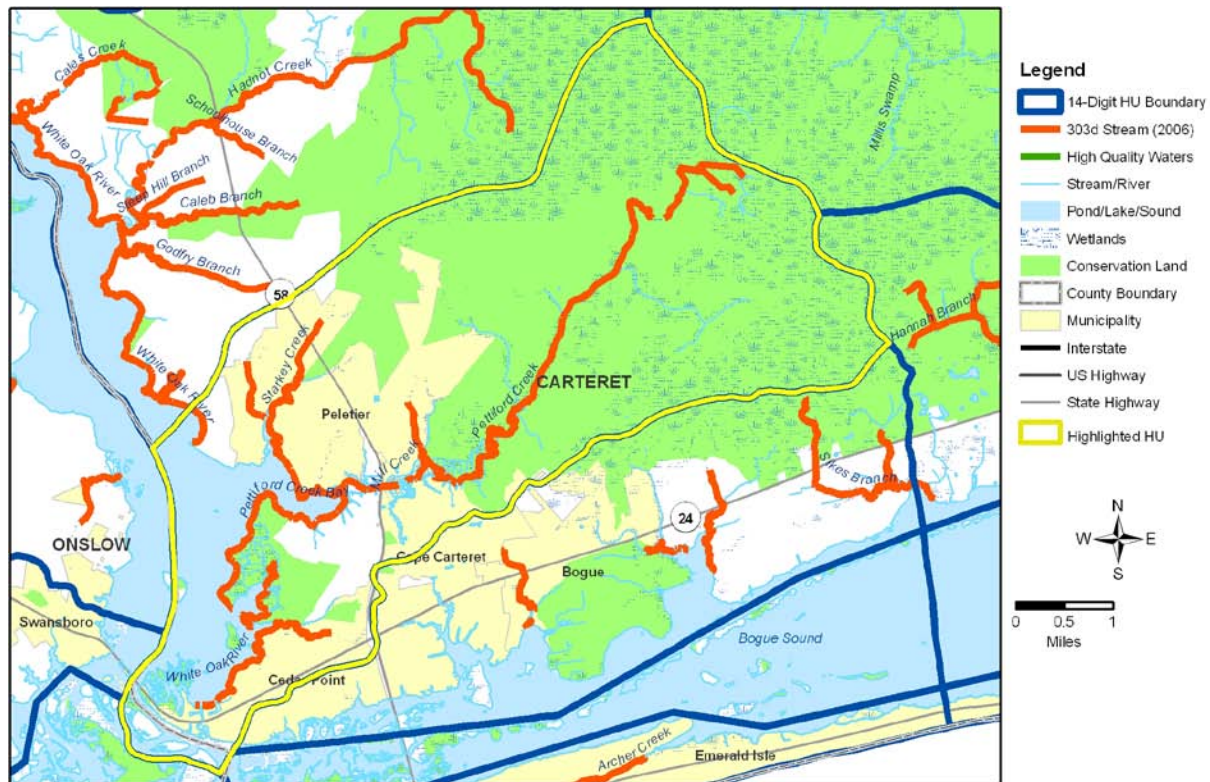
The highest priority projects for this HU include those that reduce agricultural inputs into the waterways. Buffer restoration is also a high priority for Brick Kiln Branch.



Pettiford Creek: 03020106020030

Pettiford Creek is impaired from its headwaters to the confluence with the White Oak River. The watershed includes 12% open water on the mainstem of the river with 1.1 square miles closed to shellfishing. The HU covers 25 square miles and includes 38 aggregate stream miles (17% unbuffered; 36% 303(d)-listed). The watershed is rich in assets and opportunities for augmenting conservation projects. There is a single local land conservancy project and six CWMTF projects. Eighty-seven percent of soils in the watershed are hydric and 67% is covered by forests or wetlands. Twelve square miles are designated SNHA and 68 NHEOs are documented here. About 9% of the watershed is developed and 12% is used for agricultural purposes.

High priority projects for this watershed include BMPs to manage runoff in developed areas around the confluence of Pettiford Creek and the White Oak River. Projects that improve instream habitat and water quality conditions in Pettiford Creek are important here too.



Bogue Sound North: 03020106020040

This HU includes much of the coastal marsh habitat on the inland side of Bogue Sound. It is 13 square miles of land and open water and includes 17 miles of stream (50% lack wooded buffers). Eighty percent of soils here are hydric and forested wetlands cover about 35% of the HU. Sixteen percent of waters here are listed as impaired. Twenty-three percent of the HU is developed accounting for an impervious surface cover of about 6%. Nearly one-quarter of the HU is used for agriculture. CWMTF has two projects here and the local land trust has one.

Projects that reduce agricultural inputs and offset impacts of impervious surface runoff into the sound are most important here. Establishing buffers along streams and ditches will promote these goals.



Queen Creek: 03020106020060

The Queen Creek watershed is about 35 square miles in area and has 45 miles of streams. Of the streams here, 34% are 303(d)-listed and 42% lack intact riparian buffer. Thirty-one percent of the HU is used for agriculture and 12% is developed (~3% imperviousness). Six percent of the HU is open water, including 1.2 square miles of primary and secondary fish nursery habitat. Nearly 2 square miles of water are closed to shellfishing. Forest or forested wetlands account for over half the watershed area. Four-and-a-half square miles are designated conservation lands. There are 45 documented NHEOs in the watershed and about 5 square miles of unfragmented forest cover. CWMTF has implemented three watershed projects in this HU.

Highest priority projects for Queen Creek include buffering streams and ditches to reduce agricultural inputs. Where ditching has occurred, stream restoration projects are important as well. Stormwater BMPs in the Swansboro vicinity should be considered to reduce impervious surface runoff.

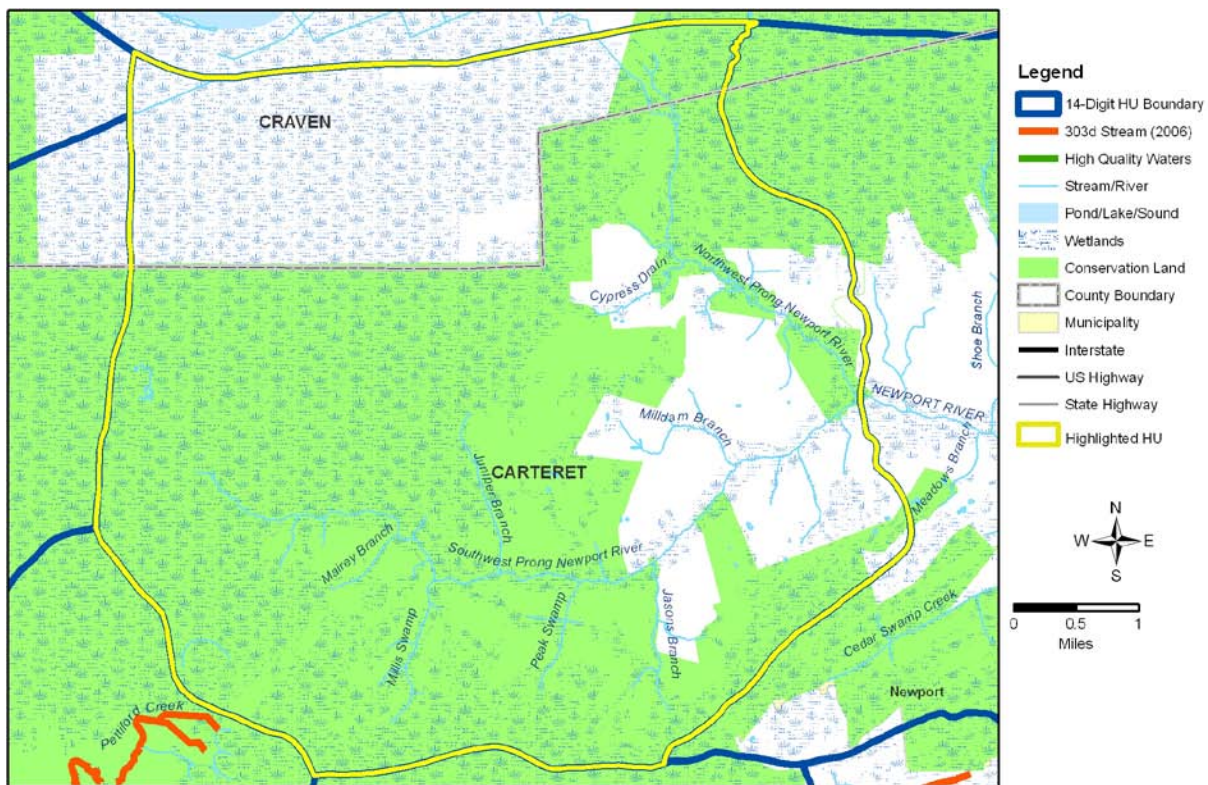




Southwest Prong Newport River: 03020106030010

This section of the Newport River is rich in assets. It covers 31 square miles and includes a relatively small amount of streams (30 miles, 40% unbuffered). Ninety-nine percent of the soil in this HU is hydric and 88 percent of the area is covered with forested wetlands. Twenty-one percent of the forested area is unfragmented and about 13 square miles are designated SNHA with a NHEO count of 80. WRC has significant holdings here in a single expansive conservation area. Very little of the watershed is developed (2%) and only 10% is used for agriculture.

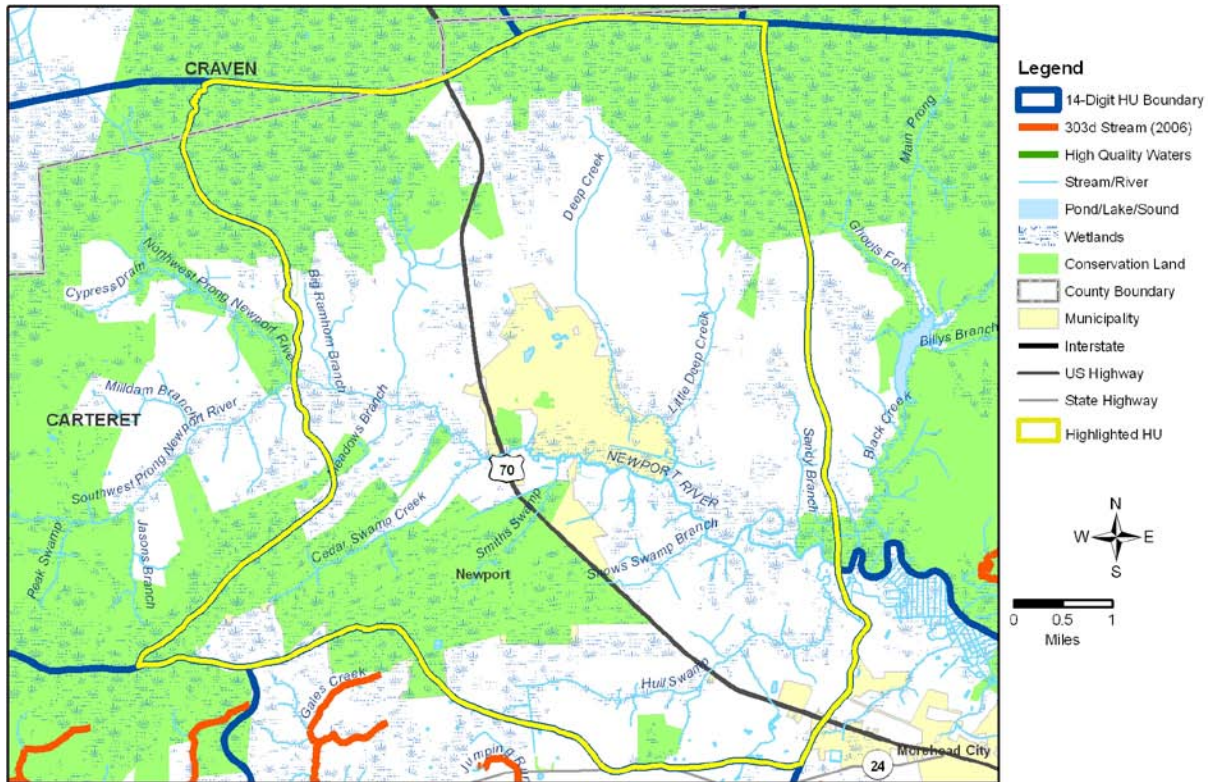
Highest priority projects here include establishing stream buffers in degraded areas. Augmenting preservation and conservation areas is also important in this HU.



Newport River: 03020106030020

This Newport River HU covers 38 square miles and has 52 miles of streams. It scored high in all categories—assets, problems and opportunities—making it a high priority watershed in this catalog unit. Nearly half the streams here lack riparian buffers. Virtually all soils in this HU are hydric and support extensive forested wetlands covering 63% of the watershed. Fourteen percent of these forests are unfragmented and 11 square miles are designated SNHA. Seventy-five NHEOs are documented in the watershed. The Town of Newport accounts for much of the HU's developed area (18%) and its 3% imperviousness. Nineteen percent of the watershed is in agricultural use. The local land trust and WRC each have one project here.

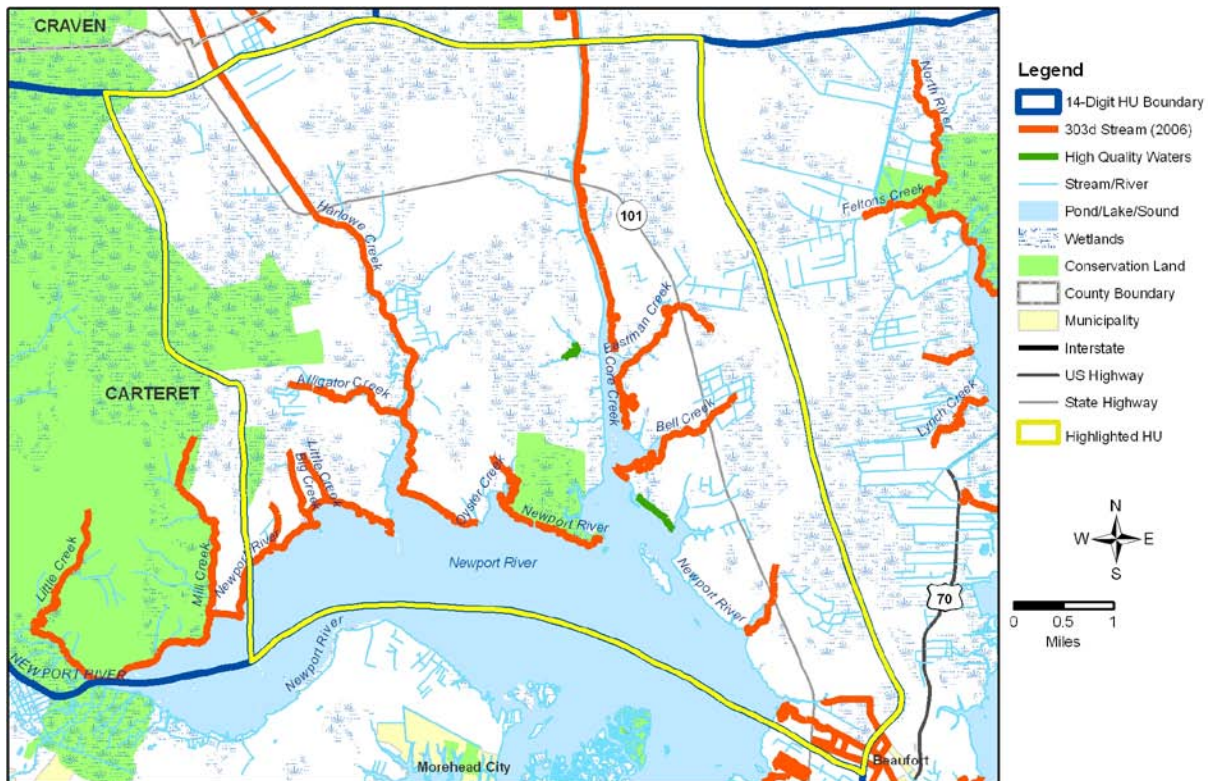
Priorities for this watershed are projects that address degraded riparian buffer zones. In localized portions of Newport, stormwater BMPs should be implemented to reduce the effects of impervious surface.



Newport River: 03020106030040

This Newport River HU contains the five subwatersheds comprising the LWP study area for White Oak 06. The ECU-NCED watershed planning project sponsored by EEP can be found at [http://www.nceep.net/services/lwps/white\\_oak/white\\_oak\\_website/coastalmitigation/](http://www.nceep.net/services/lwps/white_oak/white_oak_website/coastalmitigation/). The hydrologic unit is 36 square miles in area and has 69 miles of streams. Forty-three percent of streams lack buffers and 31% of the waters here are listed as impaired. Nearly three-quarters of the watershed has hydric soils supporting about 20 square miles of forest and wetlands. Sixteen percent of the area is open water with 1.8 square miles of fish nursery habitat and 2.6 square miles of closed shellfishing waters. Only 5% is developed and there is very little impervious surface here. Twenty-five percent of the watershed is used for agriculture. Two watershed improvement projects have been implemented in the region of the Newport River including a major agricultural BMP and a CWMTF water quality project.

High priority projects for this watershed should address restoring buffers, streams that have been ditched, and implementing non-traditional projects as those identified in the project atlas of the LWP.



Gales Creek: 03020106030060

Gales Creek is a very small HU of eight square miles with only nine miles of streams (42% unbuffered). Nearly all of the land area consists of hydric soils that support 43% of the total area in forested wetlands. Fifteen percent of the HU area is open water. An additional 12% is used for agriculture. Some other problem issues occur here such as 53% of streams being 303(d)-listed and nearly 7% of the watershed is impervious. Despite these issues, the watershed boasts about 4% Significant Natural Heritage Area (SNHA). A single CWMTF project has been implemented in Gales Creek.

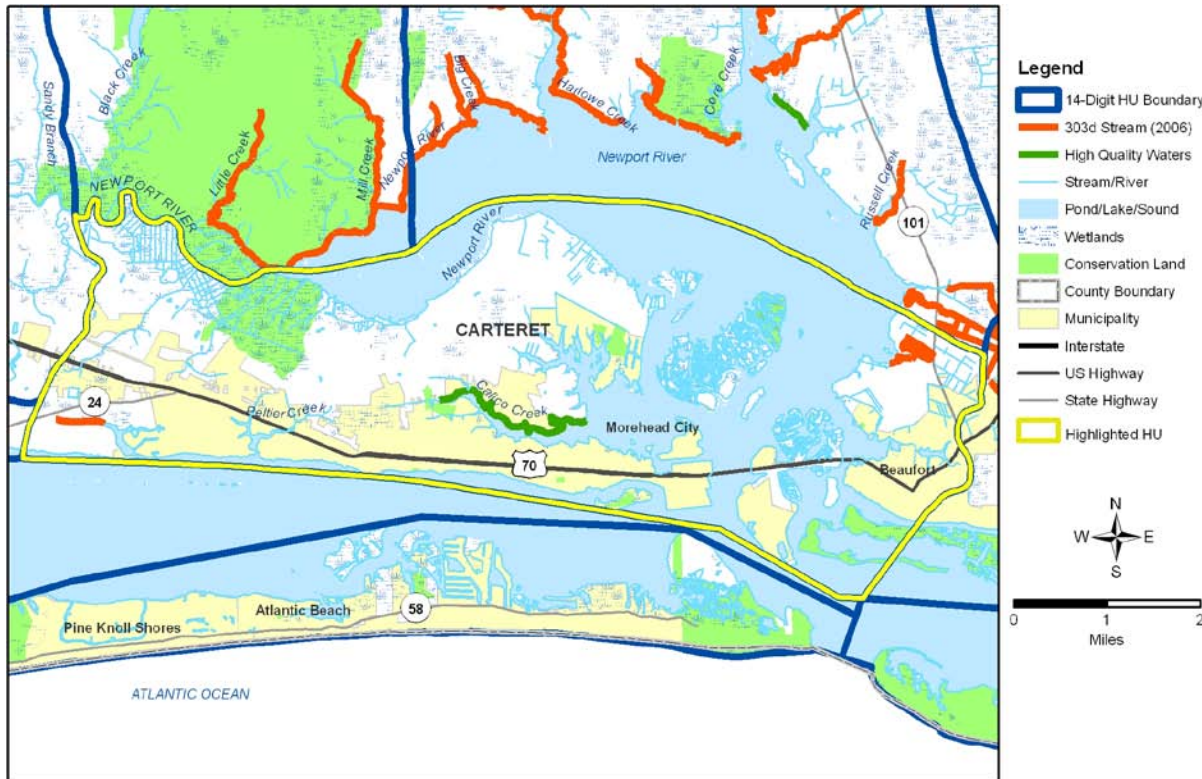
Restoration projects and BMPs that address inputs from local land usage adjacent to creeks is a high priority. Also preservation and enhancement projects that augment existing conservation areas are important to this watershed.



Newport River: 03020106030070

In this Newport River HU, there are 55 miles of streams in the 27 square mile watershed. Nearly half of the streams here lack significantly wooded buffers. Thirty percent of the total area is open water, with over 4.5% designated HQW. Approximately 1.7 square miles is designated primary or secondary fish nursery habitat and over six square miles are closed to shellfishing. Morehead City accounts for the developed area (33%) in the HU and the imperviousness is around 14%. Over 25% of the watershed is wetland or forested wetland. Forty NHEO can be found here. Watershed improvement projects are abundant here including five CWMTF, four land trust, and one WRC projects. Ten percent of the watershed is agricultural.

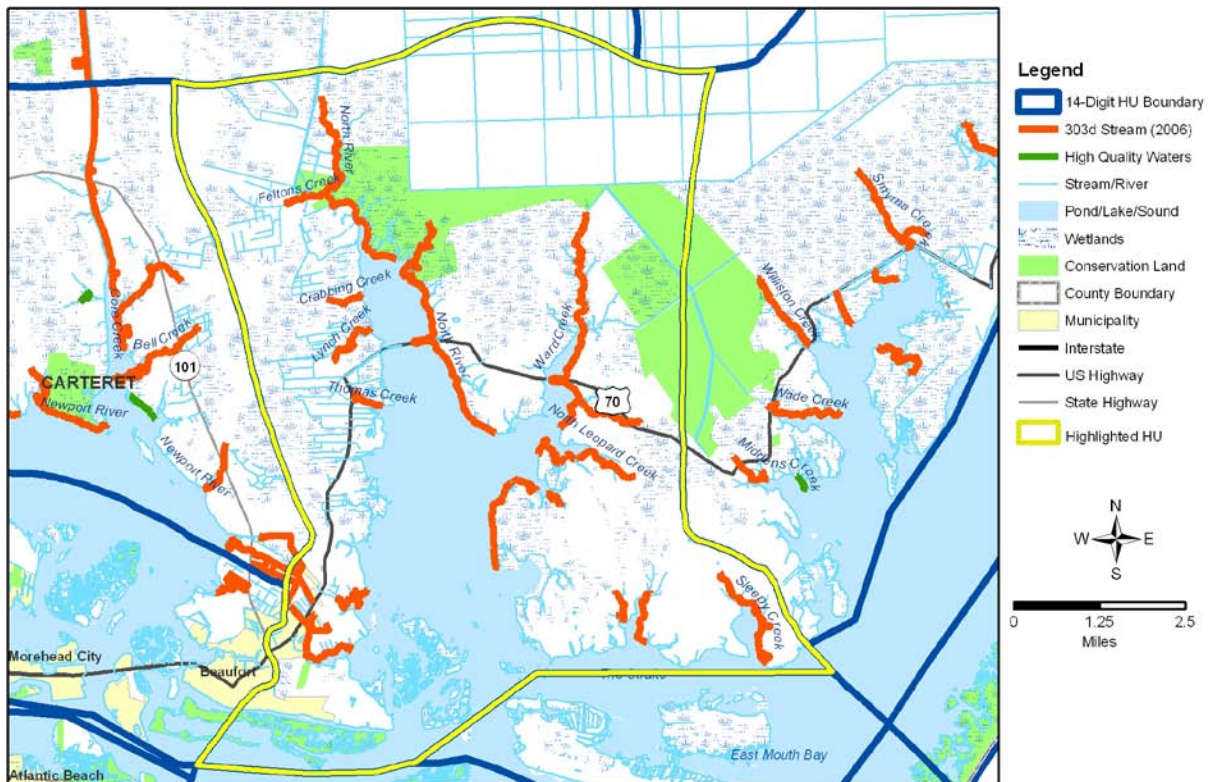
Buffer restoration projects and stormwater BMPs are the highest priorities for this part of the Newport River. Preservation (and localized restoration) of marsh areas should also be targeted projects.



North River: 03020106040010

This North River HU includes 66 square miles of Chesapeake-Pamlico Lowland and Tidal Marshes. There are 149 miles of streams, 62% lacking significantly wooded riparian areas. Thirty-seven percent of waters in this section of the North River are considered impaired and extensive ditching has occurred in the headwaters. Twenty-three percent of the total area is open water, including 4.6 square miles of fish nursery habitat and 4.8 square miles of closed shellfishing waters. Thirty-six percent of the watershed is forested or wetlands including nearly eight square miles of unfragmented forest. About 4.5 square miles is designated SNHA and 23 NHEOs occur here. Three CWMTF projects have been implemented here. Approximately 6% of the HU is developed and 35% is used for agriculture.

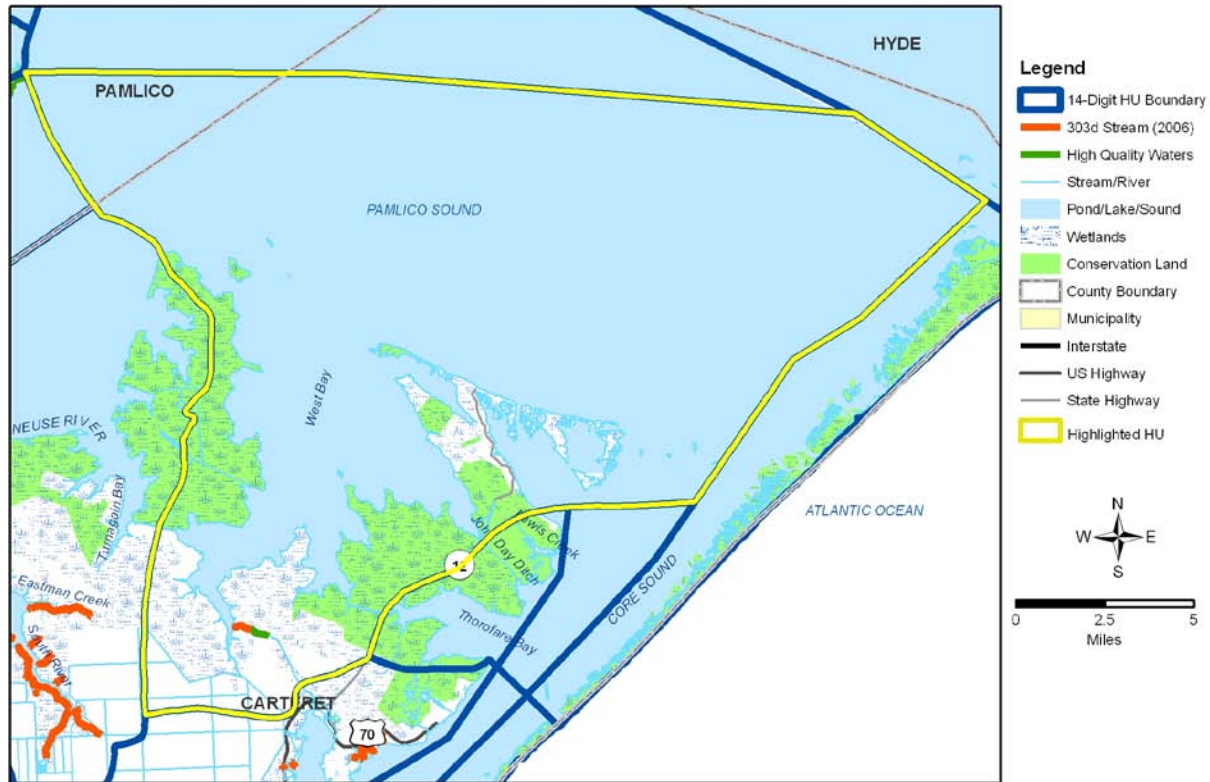
Priority projects for this part of the North River should be restoration projects that return ditched areas to more natural hydrology and habitat. Projects that reduce agricultural inputs to the estuary are equally important.



Pamlico Sound South: 03020106050010

The Pamlico Sound South HU is a newly designated TLW due to high assets, moderate problems and moderate opportunities scores. The HU is enormous at 274 square miles, primarily due to the inclusion of 82% open water in the sound. Only 30 miles of streams exist here, with 58% of them unbuffered. Very little of the watershed land area is developed and only 2% is used for agriculture. Sixteen percent of the total HU area is either wetlands or forest. Thirty-one percent of the HU is designated SNHA and 81 NHEOs are found here. Over seven square miles is designated fisheries nursery area. CWMTF has implemented two water quality improvement projects in the watershed.

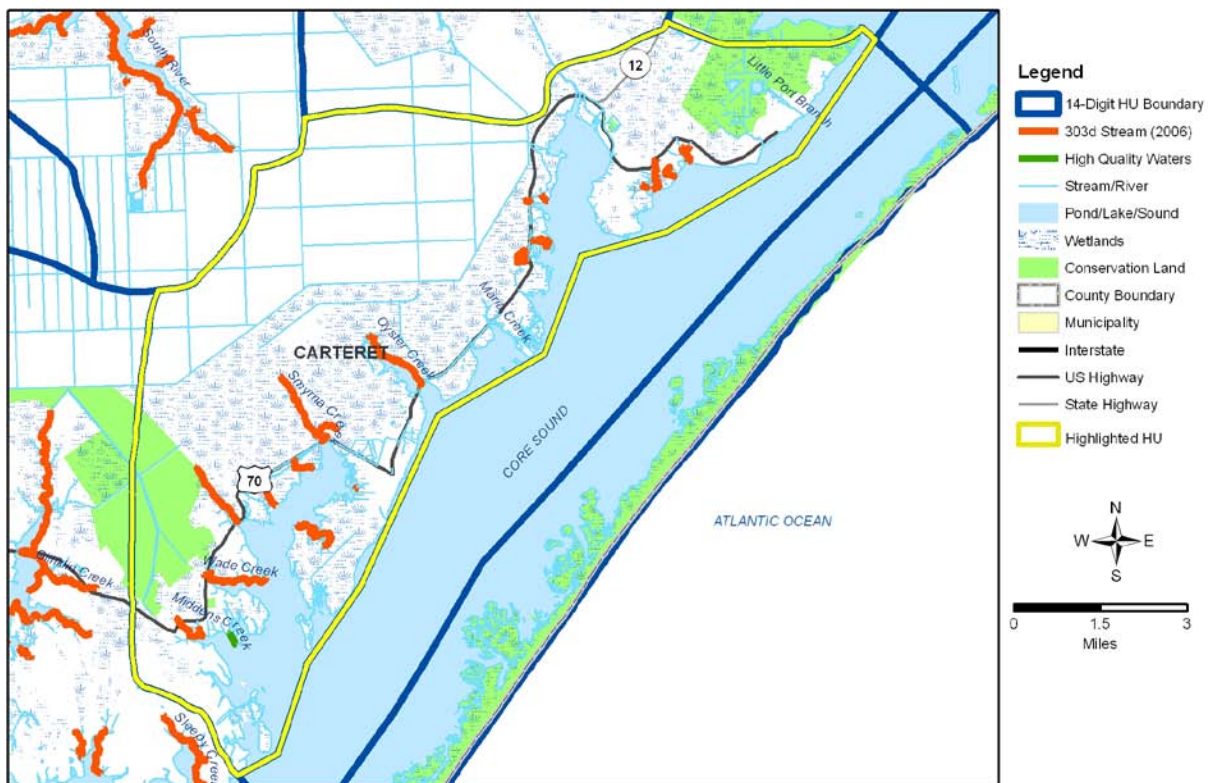
High priority projects for this watershed include projects that improve or restore estuarine habitats including SAV and oyster beds. Ditched and unbuffered streams should be restored to a more natural condition as well.



Core Sound: 03020106050020

This Core Sound HU has abundant assets and problem issues, landing it high on the list of priority TLWs. It covers 66 square miles with 128 miles of streams. Sixteen percent of streams are considered impaired and nearly 60% are unbuffered. Despite these figures, around 23 miles are designated Outstanding Resource Waters. The watershed is part of the Swamps and Peatlands ecoregion. Seventy-nine percent of the soils here are hydric and 45% is covered with forests (13.6 square miles unfragmented) or wetlands. Eighteen percent of the area is open water. Over five miles are designated primary or secondary fish nursery habitat and two square miles have been closed to shellfishing. Almost six square miles are designated SNHA and 44 NHEOs can be found here. CWMTF has developed two watershed improvement projects in the watershed. Only a small amount has been developed (5%) and 32% is in agriculture.

Priority projects in the watershed should address the extensive hydromodification on the headwaters and reduce the inputs from agriculture and silviculture. Restoration of estuarine habitats (eg—Submerged Aquatic Vegetation and oyster-bed complexes) is also important in this watershed.



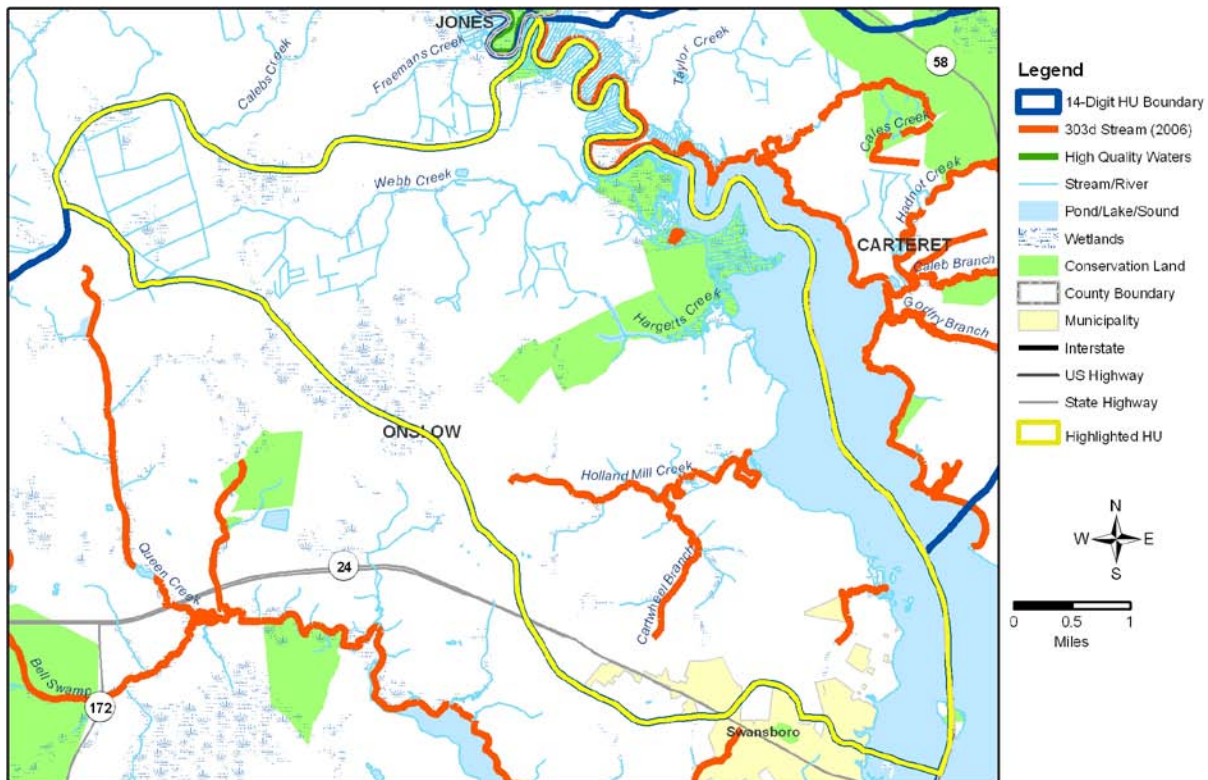


## Information on Watersheds with removed TLW designation

This section contains information on HUs that had their TLW designation removed. This change in designation affected two TLWs in the White Oak.

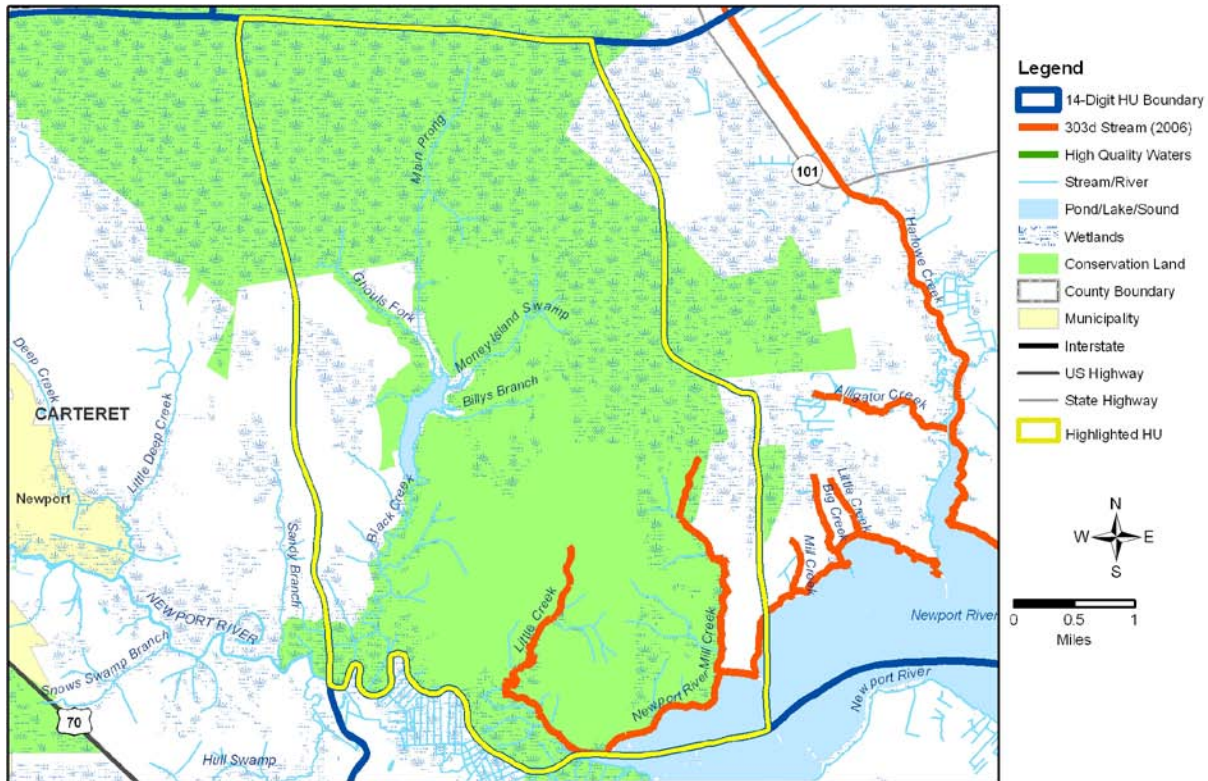
### White Oak River: 03020106020010

This HU lies in the lower part of the White Oak River drainage. It contains some 303(d)-listed streams and has some ditching in the northern headwaters. Nearly 40% of the streams here are unbuffered. The watershed scored low in assets and moderate in both problems and opportunities. These rankings were lower than other HUs in the basin and, as a result, this watershed has been delisted.



Newport River: 03020106030030

This part of the Newport River boasts a large quantity of forested and wetland area (89%), including 13 square miles of unfragmented, interior forest. The local land conservancy had implemented three projects here and WRC has significant holdings here as well. Despite these opportunities, the HU ranked too low in the assets and problems categories to be maintained on the TLW list.



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## For More Information

### Contact:

Rob Breeding  
Eastern Watershed Planner, EEP  
919-733-5311  
[rob.breeding@ncdenr.gov](mailto:rob.breeding@ncdenr.gov)

Or online at:

<http://www.nceep.net/pages/lwplanning.htm>

## Definitions

**303(d) List** – This refers to Section 303(d) of the federal Clean Water Act, under which the U.S. EPA requires states to submit biennially a list of all impaired water bodies. Impaired water bodies are streams and lakes not meeting state water quality standards linked to their designated uses (e.g., water supply, recreation/fishing, propagation of aquatic life). Best professional judgment (in interpreting water quality monitoring data and observations) along with numeric and narrative standards/criteria are considered when evaluating the ability of a water body to serve its uses.

**8-digit Catalog Unit (CU)** – The USGS developed a hydrologic coding system to delineate the country into uniquely identified watersheds that can be commonly referenced and mapped. North Carolina has 54 of these watersheds uniquely defined by an 8-digit number. EEP typically addresses watershed – based planning and restoration in the context of the 17 river basins (each has a unique 6-digit number), 54 catalog units and 1,601 14-digit hydrologic units.

**14-digit Hydrologic Unit (HU)** – In order to address watershed management issues at a smaller scale, the U.S. Natural Resources Conservation Service (NRCS) developed methodology to delineate and uniquely identify watersheds at a scale smaller than the 8-digit catalog unit. A hydrologic unit is a drainage area delineated to nest in a multilevel, hierarchical drainage system. Its boundaries are defined by hydrographic and topographic criteria that delineate an area of land upstream from a specific point on a river, stream or similar surface waters. North Carolina has 1,601 14-digit hydrologic units.

**Animal Operations** – Inventory of animal farms (bovine; swine; poultry) provided by NC Department of Agriculture (NCDA) in December 2007.

**Aquatic Habitat** – the wetlands, streams, lakes, ponds, estuaries, and streamside (riparian) environments where aquatic organisms (e.g., fish, benthic macroinvertebrates) live and reproduce; includes the water, soils, vegetation, and other physical substrate (rocks, sediment) upon and within which the organisms occur.

**Benthic Macroinvertebrates** – organisms living in or on the bottom substrate of aquatic habitats; include insect larvae, worms, snails, crayfish and mussels; can be used as indicators of stream water quality and stream habitat condition.

**BMPs (best management practices)** – any land or stormwater management practice or structure used to mitigate flooding, reduce erosion & sedimentation, or otherwise control water pollution from runoff; includes urban stormwater management BMPs and agriculture/forestry BMPs.

**EEP** – The North Carolina Ecosystem Enhancement combines existing wetlands restoration initiatives (formerly the Wetlands Restoration Program or NCWRP) of the N.C. Department of Environment and Natural Resources with ongoing efforts by the N.C. Department of Transportation (NCDOT) to offset unavoidable environmental impacts from transportation-infrastructure improvements.

**GIS** - A geographic information system integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.

**High Quality Waters (HQW)** - Supplemental NC DWQ classification intended to protect waters with quality higher than state water quality standards. In general, there are two means by which a water body may be classified as HQW. They may be HQW by definition, or they may qualify for HQW by supplemental designation and then be classified as HQW through the rule-making process.

1) The following are HQW by definition:

- (Water Supply) WS-I, WS-II,
- SA (shellfishing area),
- ORW (outstanding resource water),
- Waters designated as Primary Nursery Areas (PNA) or other functional nursery areas by the Marine Fisheries Commission, or
- Native and special native (wild) trout waters as designated by the Wildlife Resources Commission.

2) The following waters can qualify for supplemental HQW designation:

- Waters for which DWQ has received a petition for reclassification to either WS-I or WS-II, or
- Waters rated as Excellent by DWQ.

II. Classifications by Other State and Federal Agencies.

**NC DWQ** – North Carolina Division of Water Quality.

**NC WRP** – The North Carolina Wetlands Restoration Program was a wetland restoration program under NC DENR and a predecessor of the NCEEP.

**Natural Heritage Element Occurrences (NHEOs)** – NC Natural Heritage Program (NHP) documented locations of rare and endangered species (plant and animal) populations and occurrences of unique or exemplary natural ecosystems and special wildlife habitats (terrestrial and palustrine community types).

**Outstanding Resource Waters (ORW)** - Supplemental NC DWQ classification intended to protect unique and special waters having excellent water quality and being of exceptional state or national ecological or recreational significance. To qualify, waters must be rated Excellent by DWQ and have one of the following outstanding resource values:

- Outstanding fish habitat or fisheries,
- Unusually high level of water-based recreation,
- Some special designation such as NC or National Wild/Scenic/Natural/Recreational River, National Wildlife Refuge, etc.,
- Important component of state or national park or forest, or
- Special ecological or scientific significance (rare or endangered species habitat, research or educational areas).
- No new discharges or expansions of existing discharges shall be permitted.

There are associated development controls enforced by DWQ. ORW areas are HQW by definition.

**Phase II Stormwater Regulation** – federal policy requiring municipalities and counties with concentrated populations to implement defined minimum control measures to offset the impact of their storm sewer systems.

**Preservation** – the long-term protection of an area with high habitat and/or water quality protection value (e.g., wetland, riparian buffer), generally effected through the purchase or donation of a conservation easement by/to a government agency or non-profit group (e.g., land trust); such areas are generally left in their natural state, with minimal human disturbance or land-management activities.

**RBRP** - The River Basin Restoration Priorities are documents that delineate specific watersheds (Targeted Local Watersheds) within a River Basin that exhibit both the need and opportunity for wetland, stream and riparian buffer restoration.

**Resource Professionals** – staff of state, federal, regional or local (city, county) natural resource agencies –including planners, water resources and storm water engineers, parks & recreation departments, water quality programs, regional councils of government, local/regional land trusts or other non-profit groups with knowledge/expertise and/or interest in local watershed issues and initiatives

**Restoration** – the re-establishment of wetlands or stream hydrology and wetlands vegetation into an area where wetland conditions (or stable streambank and stream channel conditions) have been lost; examples include: stream restoration using natural channel design methods coupled with re-vegetation of the riparian buffer; riparian wetlands restoration through the plugging of ditches, re-connection of adjacent stream channel to the floodplain, and planting of native wetland species; this type of compensatory mitigation project receives the greatest mitigation credit under the 401/404 regulatory framework.

**Riparian** –relating to the strip of land adjacent to streams and rivers, including streambanks and adjoining floodplain area; important streamside zones of natural vegetation that, when disturbed or removed, can have serious negative consequences for water quality and habitat in streams and rivers.

**Significant Natural Heritage Areas (SNHA)** – NC Natural Heritage Program identified areas containing ecologically significant natural communities or rare species. May be on private or public lands, and may or may not be in conserved status.

**TLW** - Targeted Local Watershed, are 14-digit hydrologic units which receive priority for EEP planning and restoration project funds.

**TMDL** – Total Maximum Daily Load, is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. It is used to establish limits on sources of the pollutant.

**Use Support** –refers to the DWQ system for classifying surface waters based on their designated best use(s); at present, the DWQ primary stream classifications include the following: class C [fishing/boating & aquatic life propagation]; class B [primary recreation/direct contact]; SA [shellfish harvesting]; and WSW [water supply]. Supplemental classifications include High Quality Waters (HQW), Outstanding Resource Waters (ORW), Nutrient Sensitive Waters (NSW), Trout Waters (Tr), and Swamp Waters (Sw). All waters must at least meet the standards for class C waters.

**USGS** – United States Geological Survey.

**Watershed** –all the land area which contributes runoff to a particular point along a stream or river; also known as a “drainage basin”, although the term *Basin* usually implies a very large drainage system, as of an entire river and its tributary streams.

**Watershed Restoration Plan** – Older versions of RBRP documents were called Watershed Restoration Plans. In essence, they are the same thing.

**WSW**—Water Supply Watershed