Chapter 14
Natural Resources

14.1 Ecological Significance of the White Oak River Basin

The White Oak River Basin contains some of the most biologically significant habitats along the entire U.S. Atlantic Coast. A number of federally listed species, including rough-leaf loosestrife and red-cockaded woodpecker, have important populations in this basin. There are almost 100 rare species of vascular plant in the White Oak River basin, and 68 of those species are associated with wetland habitats; examples include Venus flytrap, pondspice and Thorne's beaksedge. There are very important bird habitats in the basin, including dozens of gull/tern/skimmer colonies and colonial wading bird colonies, as well as marsh bird nesting areas. Because the White Oak River basin contains more individual significant natural areas than can be described here, the discussion of natural areas will largely be addressed through a discussion of clusters of natural areas with strong geographical connections and ecological relationships.

14.2 Rare Aquatic and Wetland-Dwelling Animal Species

Table 54 lists the Rare Animals Associated with Aquatic Habitats in the White Oak River Basin. For information on any of the species listed, visit the NC Natural Heritage Program (NHP) website at www.ncnhp.org.

Several of the listed rare aquatic species are entirely marine, such as Loggerhead and the Leatherback sea turtles. Others live in the estuarine brackish waters between the ocean and freshwater streams and rivers. For example, the Carolina Diamondback Terrapin is a small to medium (4-9 in.) reptile found in the coastal marshes, bays, lagoons, creeks, mud flats as well as tidal channels of sounds and estuaries that are bordered chiefly by *Spartina*. The American Alligator lives in slow moving coastal rivers, canals, lakes, marshes and estuaries and is a state and federally threatened species. The American Alligator has recovered from the low populations of the past century, and is no longer biologically threatened or endangered under the Endangered Species Act. However, it retains the federally threatened status due to its similarity of appearance to other rare crocodilians, and commercial hunting and trade are regulated.

Table 54 List of Rare Animals Associated with Aquatic or Wetland Habitats in the White Oak River Basin (September 2005).

Scientific Name	Common Name	Major Group	State Status	Federal Status
Sphaerium simile	Grooved Fingernail Clam	Mollusk	SR	
Procambarus plumimanus	Croatan Crayfish	Crustacean	SR	
Trichechus manatus	West Indian Manatee	Mammal	E	E
Caretta caretta	Loggerhead	Reptile	T	T
Alligator mississippiensis	American Alligator	Reptile	T	T(S/A)
Acipenser brevirostrum	Shortnose Sturgeon	Fish	E	E
Fundulus confluentus	Marsh Killfish	Fish	SR	
Malaclemys terrapin centrata	Carolina Diamondback Terrapin	Reptile	SC	
Fundulus luciae	Spotfin Killfish	Fish	SR	
Dermochleys coriacea	Leatherback	Reptile	E	E
Chelonia mydas	Green Turtle	Reptile	T	T
Rana capito	Carolina Gopher Frog	Amphibian	T	FSC
Nerodia sipedon williamengelsi	Carolina Water Snake	Reptile	SC	
Bufo quercicus	Oak Toad	Amphibian	SR	
Regina rigida	Glossy Crayfish Snake	Reptile	SR	
Seminatrix pygaea	Chicken Turtle	Reptile	SR	
Phalacrocorax auritus	Black Swamp Snake	Reptile	SR	

Rare Species Listing Criteria

E =	Endangered (those species in danger of becoming extinct)
T =	Threatened (considered likely to become endangered within the foreseeable future)
SR =	Significantly Rare (those whose numbers are small and whose populations need monitoring)
SC =	Species of Special Concern
FSC =	Federal Species of Concern (those under consideration for listing under the Federal Endangered Species Act)
T(S/A) =	Threatened due to similarity of appearance
EX =	Extirpated

14.3 Significant Natural Heritage Areas in the White Oak River basin

The NC Natural Heritage Program (NHP) compiles a list of Significant Natural Heritage Areas as required by the Nature Preserves Act. The list is based on the program's inventory of natural diversity in the state. Natural areas are evaluated based on the number and quality occurrences of rare plant and animal species, rare or high-quality natural communities, and special animal habitats. The global and statewide rarity of these elements and their quality at a site is compared with other occurrences to determine a site's significance. Sites included on this list are the best representatives of the natural diversity of the state, and therefore, have priority for protection. Inclusion on the list does not imply that any protection or public access to the site exists.

The White Oak River basin contains some of the most biologically significant habitats along the Atlantic Coast. Because the White Oak River basin contains so many individual significant natural areas, the discussion of natural areas will focus on four of the largest sites in the basin.

Camp Lejeune Marine Corps Base contains some of the highest quality longleaf pine and pocosin habitat in the state, as well as high quality examples of the Pine Savanna, Wet Pine Flatwoods and Small Depression Ponds. Often termed "limesinks" because of the way they are

formed, the Small Depression Pond community occurs where depressions in the uplands intersect the watertable. The seasonally exposed margin of this wetland supports a high diversity of herbs, including many rare plants.

In addition to the numerous limesinks, Camp Lejeune also contains large wetlands called "Domed Pocosins", so named because they are higher than the surrounding lands. The low relief and a gradual accumulation of organic matter from previous generations of plants promoted the development of this deep peat layer. (The word "pocosin" is traceable to an Algonquin Indian word translatable as "swamp-on-a-hill".) Pocosins are easy to drain, and for this reason, the best examples are preserved in public areas like Croatan National Forest and Camp Lejeune. Pocosins are found nowhere else in the world except North and South Carolina and a few areas in southern Virginia. North Carolina has 70 percent of the remaining pocosins, and some of the highest quality areas lie within Camp Lejeune. The deep, peaty soils absorb rainwater and release it slowly into adjacent estuaries, preserving the proper mix of saltwater and freshwater that is critical for many fish and shellfish.

Bogue Inlet includes considerable area of the lower White Oak River and serves as an important link between the Croatan National Forest and Camp Lejeune. This nationally significant site contains some of the highest quality environments remaining along the coastal edge of North Carolina, with excellent examples of maritime forest and dune communities, and extensive areas of unditched marshes and tidal creeks.

The **White Oak River Marsh** is a significant natural heritage area that contains exemplary freshwater tidal marsh and swamp communities, including one of the best examples of the rare Tidal Red Cedar Forest natural community. This tidal forest type is known only from the area around the New River and White Oak River to Ocracoke.

Beaufort Inlet/Shackleford Banks Macrosite refers to the area of Shackleford Banks, Fort Macon, and the several sound islands around Beaufort Inlet and contains numerous nesting sites for colonial waterbirds. Shackleford Banks itself is one of the most natural barrier islands on the Mid-Atlantic coast, with an outstanding cluster of community, plant, and animal elements. The area also includes some of the best examples nationally of Dune Grass and Maritime Wet Grassland natural communities.

14.4 Public Lands

The White Oak River basin contains many public lands. In addition to Croatan National Forest, the federal government also owns Camp Lejeune Marine Base and Cape Lookout National Seashore. The state owns a number of smaller but significant properties including: Hammocks Beach and Fort Macon State Parks, Theodore Roosevelt Natural Area, Rachel Carson Estuarine Reserve, and White Oak River Impoundment Game Land. In 2001, the Clean Water Management Trust Fund helped acquire a conservation easement on 775 acres to protect waters of Hargett Creek and White Oak River.

The White Oak River basin lies within the landscape that is the focus of the Onslow Bight Conservation Forum, a landscape-scale collaborative conservation effort. The partnership of private organizations and federal and state agencies is working to develop and implement a strategy for the conservation and enhancement of biological diversity and ecosystem sustainability throughout the Onslow Bight Landscape compatible with the land use objectives of

the partners. Buffering military bases has recently taken on greater meaning for the State of North Carolina, which helped catalyze the effort. Planning for the terrestrial landscape has moved forward, and the partnership will soon tackle the estuarine and near-shore marine elements of the strategy. Looking for quality natural areas is part of this, to provide habitat for at-risk species off military lands. The partnership has helped to leverage funding for conservation of a number of ecologically significant areas, including Stones Creek Game Lands adjacent to Camp Lejeune, as well as the Quaternary tract, with 1,400 acres adjacent to the White Oak River. Other key conservation projects in the basin include North Carolina Coastal Federation's North River Farms, and the North Carolina Coastal Land Trust's efforts in moving forward the establishment of Croatan Game Land and Pettiford Creek State Forest. For more information about NCNR, visit www.ncnr.org.

14.5 Fisheries

The graphs below show findings from the NC Division of Marine Fisheries showing overall annual landings and hand landings per shellfish harvest trip. Hand landings are provided for the trip and catch-per-trip data because there is a mechanical harvest fishery for clams in the White Oak River basin on an alternating season schedule. All oysters are harvested by hand methods in the White Oak River basin. Clams are harvested year round, while oysters are only harvested during a season that lasts approximately five months.

Other than a spike in 2001 and 2002 oyster and clam landings have generally decreased in the basin (Figures 20 and 21). Oyster landings are impacted by the oyster parasite, Perkinsus marinus (Dermo), in this basin, so their harvest decline is more noticeable. Probably the most notable data is the trip information, which shows how trips are significantly down for both species over the past three years. This decline could indicate impacts by harvest closures due to fecal coliform bacteria contamination, but market conditions could also play a role because the clam market has been down in recent years. Oyster harvests have remained at levels high enough to cause early season management closures during this time period, so market may not be a factor in the declining oyster trips.

Figure 20 White Oak River Basin Hard Clam Landings

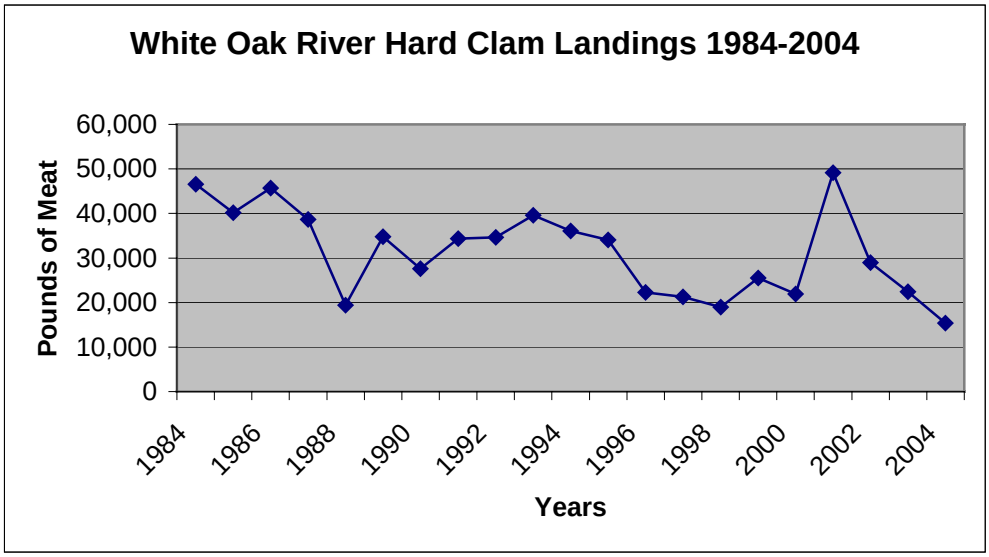
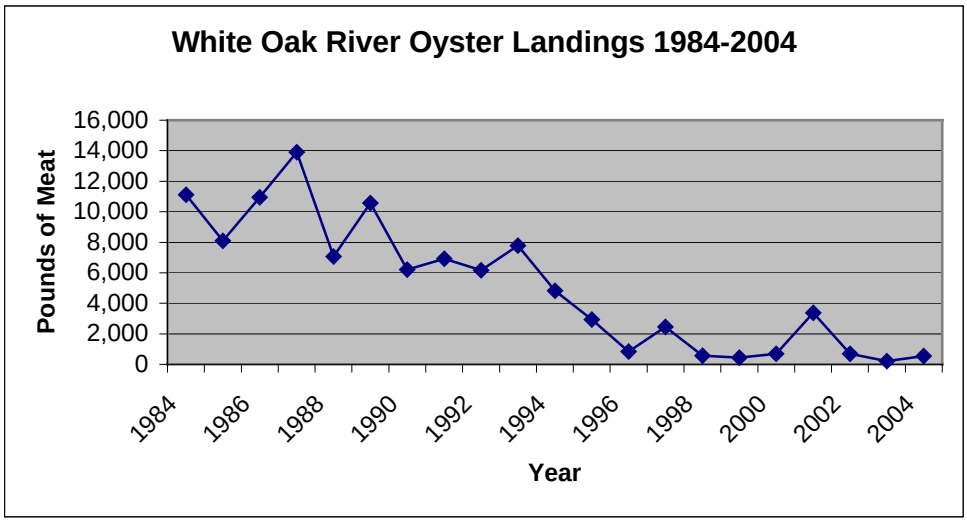


Figure 21 White Oak River Basin Oyster Landings



Oyster catch-per-unit effort is generally declining, which may be a function of disease losses (Figure 22). Clam catch-per-unit-effort (CPUE) is high and showing a pretty consistent increase, which indicates the resource is in good shape and not being overfished (Figure 23).

Figure 22 White Oak River Basin Oyster Catch Per Unit of Effort Data

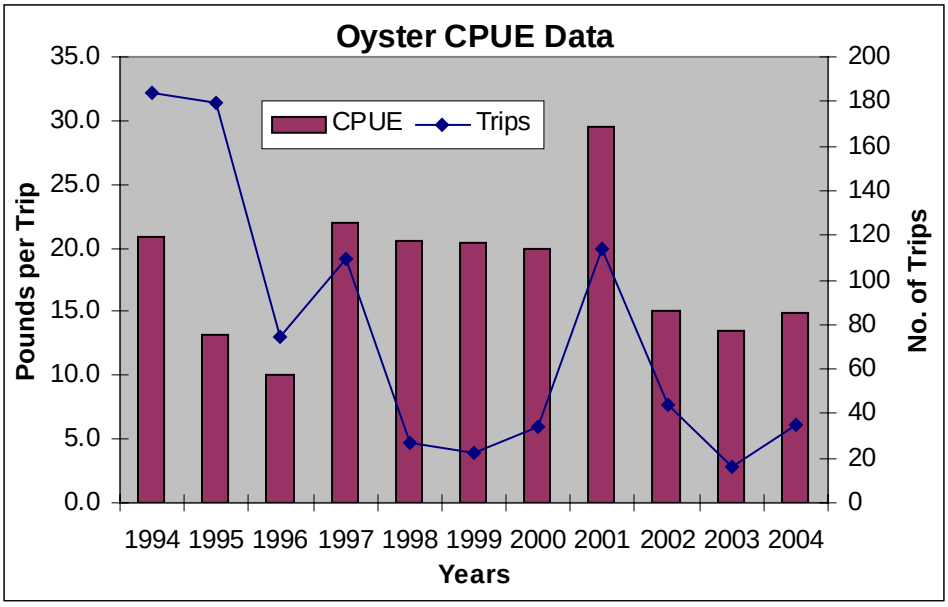
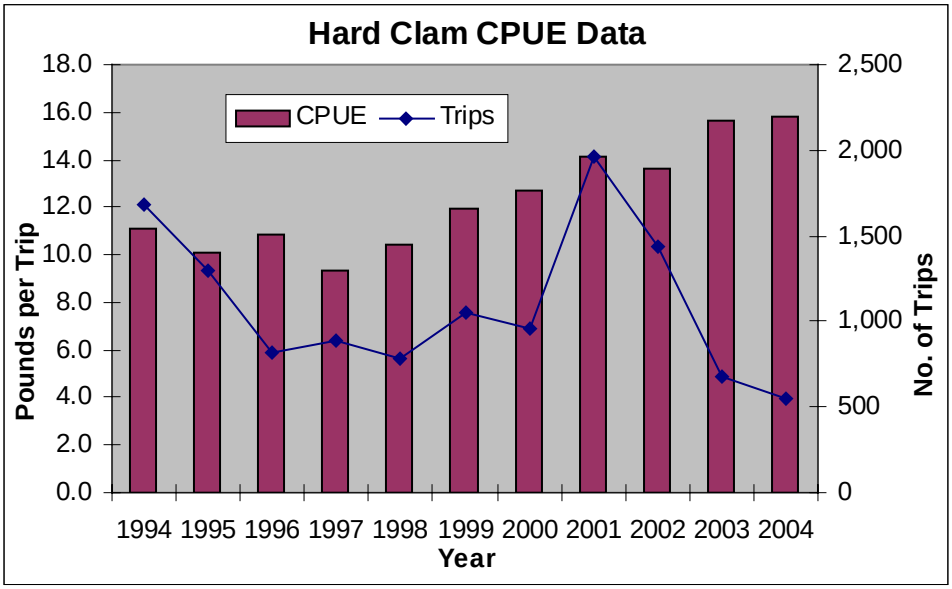
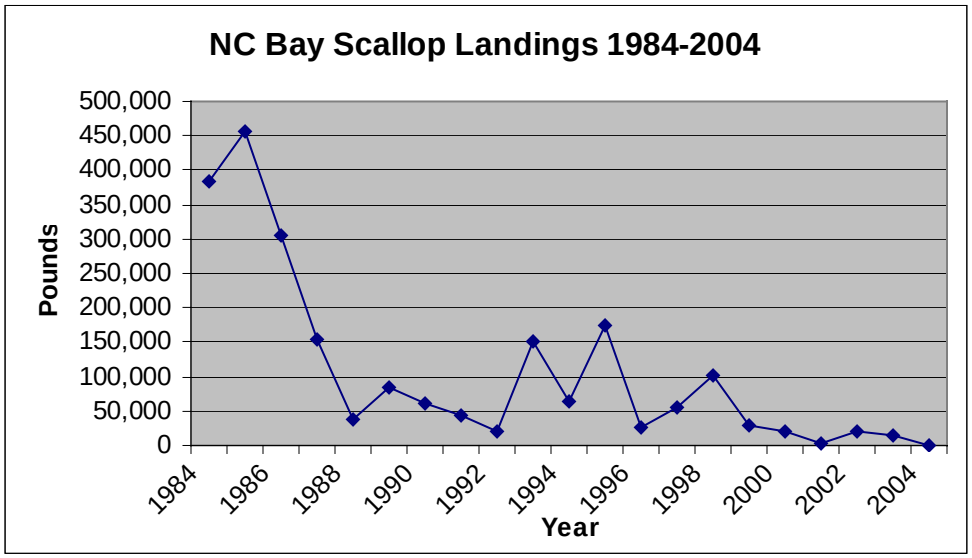


Figure 23 White Oak River Basin Hard Clam Catch Per Unit Effort Data



Bay Scallops (*Argopecten irradians*) are found in coastal waters in the central part of the state and primarily in Carteret County. Bay Scallops have been declining since a red tide event in 1987. A Bay Scallop Fishery Management Plan was drafted in October 2006 to address this shellfish decline and to obtain a sustainable harvest. Management issues include socioeconomic concerns, protection and enhancement of habitat and water quality, fishing gear and regulations, weather events, spawning sanctuaries and Bay Scallop ecology. Figure 24 below shows the scallop landings between 1984-2004.

Figure 24 NC Bay Scallop Landings



14.5.1 Fish Kill Summary

DWQ has systematically monitored and reported fish kill events across the state since 1996. From 1999 to 2004, field investigators reported nine kill events in the White Oak River basin. Most events occurred in estuarine waters. Fish kills occurred on the New River and Northeast Creek from Jacksonville to Gray Point. Additional kill events were also reported in the White Oak River, Pasture Branch, Taylor's Creek near Beaufort, and Core Sound. Mortality estimates ranged from 30 to more than 160,000 fish per event. The most significant event to occur during the basin cycle was reported from Taylor's Creek near Beaufort, as described in Chapter 3.4.1. Annual fish kill reports can be found at DWQ's Environmental Sciences website http://h2o.enr.state.nc.us/esb/Fishkill/fishkillmain.htm.

14.6 Submerged Aquatic Vegetation (SAV)

SAV is a fish habitat dominated by one or more species of underwater vascular plant. These vegetation beds occur in both subtidal and intertidal zones and may occur in isolated patches or cover extensive areas. Freshwater vegetation may also grow in SAV beds. In North Carolina, SAV usually occurs in water less than 6 ft deep because of light limitations. SAV is valued as a Critical Habitat Area under MFC rules. Over 150 fish and invertebrate species are known to use SAV as adults or juveniles, of which about 30 are important commercial fishery species. SAV beds provide an excellent nursery area for many species, including blue crabs, red drum, pink shrimp, spotted seatrout, and gag. SAV blades provide a surface for post-larval shellfish attachment, especially bay scallops, and refuge for small fish like mummichogs, pipefish, and grass shrimp. Large predators like flounders, rays, and red drum forage around SAV. SAV produces oxygen and detritus that is exported to other habitats, and reduces moderate turbidity and turbulence.

SAV coverage has declined and currently there are about 200,000 acres of SAV in coastal North Carolina. Aerial and ground surveys of SAV condition and growth provide baseline maps for future management actions are being coordinated through APNEP, NOAA and local universities. SAV areas in Bogue and Core Sounds have been mapped. SAV is an environmental indicator and responds to water quality conditions. SAV is extremely dependent on clarity of the water column for its existence. Reduced light availability from nutrient and sediment loading is thought to be the primary cause of losses. Efforts need to continue to support SAV research to promote restoration and to identify water quality conditions that are limiting growth.