

4.5.5 Cape Fear River Basin

4.5.5.1 River Basin Description

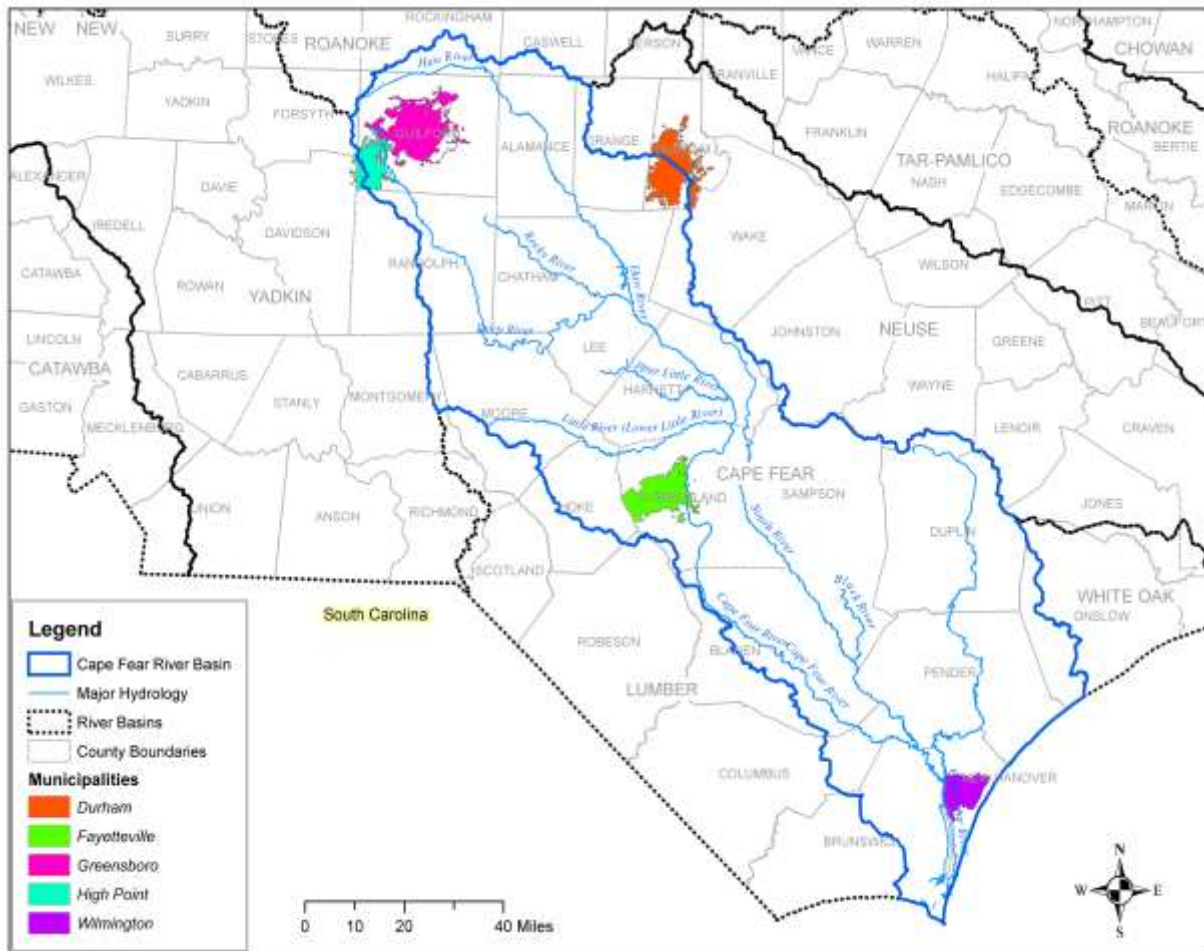
The Cape Fear River Basin is the largest river basin in North Carolina and is contained entirely within the state. The Cape Fear River flows southeast through the Piedmont ecoregion into the Coastal Plain before reaching the city of Wilmington and draining into the Atlantic Ocean. The basin covers about 9,164 square miles and has 21,300 miles of freshwater streams, 31,135 acres of freshwater lakes and reservoirs, 31,753 acres of estuarine habitat, and 47 miles of Atlantic coastline (NCDWQ 2005a; NCDWR 2015h). Major drainages in the basin include the Haw River, Deep River, Northeast Cape Fear River, Black River, and the Cape Fear River.

The Cape Fear River Basin can be characterized by three general regions: the Upper Cape Fear, including the headwaters in the Piedmont; the Middle Cape Fear, including the fall line and the Sandhills; and the Lower Cape Fear, which includes the coastal region with blackwater streams and swamps. The headwaters include the Deep River, originating near High Point, and the Haw River, originating north of Greensboro, which join to form the Cape Fear River just downstream of the B. Everett Jordan Reservoir dam. Much of the headwater area is located in and flows through highly urbanized areas, which significantly impacts water quality in the basin. Blackwater streams and rivers in the lower Cape Fear include the South River, Black River, and the Northeast Cape Fear River. Species found in the Sandhills and Coastal Plain have a high rate of endemism due to unique habitats in those ecoregions.

Land use in the basin is 42% forested, 18% wetland, 12% urban or developed, 6% grassland, and 21% agricultural (MRLC 2011; Jin et al. 2013). Public lands make up a large portion of this basin and include approximately 234,381 acres of state and federal lands. Significant public lands include the B. Everett Jordan Reservoir, Bladen Lakes State Park, and numerous game lands managed by the NC Wildlife Resources Commission (NCWRC). The estimated 2010 human population was 2,072,304, which represents about 22% of the state's total population (USCB 2012; NCDWR 2015h).

The basin encompasses all or part of 26 counties and includes 115 municipalities of varying population sizes. Sizable cities located in this basin include Durham, Greensboro, High Point, Fayetteville, and Wilmington. Figure 4.5.5.1 depicts the geographic location of the basin.

Figure 4.5.5.1 Location of the Cape Fear River Basin.



4.5.5.2 Aquatic Resource Conditions

Lake Michael and segments of Black River, Deep River, Little River, South River, and several freshwater streams have supplemental classifications as High-Quality Waters (HQW) or Outstanding Resource Waters (ORW) because they either have excellent water quality or they are a significant resource to humans and/or wildlife (NCDWQ 2015d). Coastal estuarine waters associated with the Intracoastal Waterway, the Cape Fear River near the Lilliput Creek, Walden Creek, and Snow’s Cut confluences, Buzzard Bay, Muddy Slough, and other coastal tributaries also carry an HWQ or ORW classification (NCDWR 2015a).

Table 4.5.5.1 provides information on water quality classifications and use support ratings in the basin.

Table 4.5.5.1 Water quality classifications and use ratings in the Cape Fear River Basin.

Classifications	Percent		Percent		Percent		Percent	
	Freshwater Miles	(Basin Waters)	Freshwater Acres	(Basin Waters)	Coastal Acres	(Basin Waters)	Saltwater Miles	(Basin Waters)
Total Basin Waters	10,828		68,884		31,753			
Classified Waters	9,059	83	31,208	45			9,238	
HQW	163	< 1	262	< 1			233	
ORW	129	< 1	3,623	5			0	

Use Ratings	Percent		Percent		Percent		Atlantic Coast	Percent
	Freshwater Miles	(Monitored Waters)	Freshwater Acres	(Monitored Waters)	Coastal Acres	(Monitored Waters)	Miles	(Monitored Waters)
Total Monitored	6,591		34,831		23,870		20	
Supporting	1,300	20	6,731	19	1,946	8	20	100
Impaired	501	7	4,490	13	16,995	71	0	
Not Rated	731	11	14,747	42	0	0	0	
No Data	4,060	62	8,862	26	4,929	21	0	

There are HQW and ORW Special Management Strategy Areas (SMSAs) in the basin for the Northeast Cape Fear River, Deep River, Little River, Black and South River Area, Topsail and Middle Sound Area, Masonboro Sound Area, and six additional areas totaling 124,355 ORW acres and 152,786 HQW acres (NCDWR 2015c). These areas require site-specific provisions to protect resource values (e.g., no new discharges or expansion of existing discharges) (NCAC).

There are 1,829 miles and 18,584 acres of freshwaters considered to be nutrient-sensitive waters (NSW) in the Cape Fear River Basin (NCDWR 2015a). The NSW classification applies to all waters in the Haw River and Jordan Reservoir watersheds, and is intended for those that need additional nutrient management because of greater vulnerability to excessive aquatic vegetation growth (NCDWQ 2005a).

4.5.5.3 Aquatic Species

There are 35 SGCN in the basin: two aquatic snails, two crayfish, 18 freshwater or anadromous fishes, and 13 mussels. Appendix G provides a list of SGCN and other priority species for which there are knowledge gaps or management concerns. Appendix H identifies SGCN associated

with aquatic communities found in this river basin. Table 4.5.5.2 identifies the SGCN found in the Cape Fear River Basin.

Table 4.5.5.2 SGCN in the Cape Fear River Basin.

Taxa Group	Scientific Name	Common Name	Federal/State Listing Status*
AQ SNAIL	<i>Helisoma eucosmium</i>	Greenfield Rams-horn	
	<i>Planorbella magnifica</i>	Magnificent Rams-horn	- /E
CRAYFISH	<i>Cambarus catagius</i>	Greensboro Burrowing Crayfish	- /Sc
	<i>Procambarus ancylus</i>	Coastal Plain Crayfish	
FISH	<i>Acipenser brevirostrum</i>	Shortnose Sturgeon	E/E
	<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	E/E
	<i>Ameiurus brunneus</i>	Snail Bullhead	
	<i>Ameiurus platycephalus</i>	Flat Bullhead	
	<i>Carpoides sp. cf. velifer</i>	Atlantic Highfin Carpsucker	- / Sc
	<i>Cyprinella sp. cf. zanema</i>	Thinlip Chub	- /Sc
	<i>Elassoma evergladei</i>	Everglades Pygmy Sunfish	
	<i>Enneacanthus chaetodon</i>	Blackbanded Sunfish	
	<i>Enneacanthus obesus</i>	Banded Sunfish	
	<i>Etheostoma collis</i>	Carolina Darter	
	<i>Etheostoma mariae</i>	Pinewoods Darter	- /SC
	<i>Heterandria formosa</i>	Least Killifish	- /Sc
	<i>Moxostoma pappillosum</i>	V-lip Redhorse	
	<i>Moxostoma sp. Carolina</i>	Carolina Redhorse	- /T
	<i>Notropis chalybaeus</i>	Ironcolor Shiner	
<i>Notropis mekistocholas</i>	Cape Fear Shiner	E/E	

Taxa Group	Scientific Name	Common Name	Federal/State Listing Status*
	<i>Noturus sp. 2</i>	Broadtail Madtom	- /Sc
	[<i>cf. leptacanthus</i>]		
	<i>Semotilus lumbee</i>	Sandhills Chub	- /Sc
	<i>Alasmidonta undulata</i>	Triangle Floater	- /T
	<i>Alasmidonta varicosa</i>	Brook Floater	- /E
	<i>Anodonta couperiana</i>	Barrel Floater	- /E
	<i>Elliptio marsupiobesa</i>	Cape Fear Spike	- /Sc
	<i>Fusconaia masoni</i>	Atlantic Pigtoe	- /E
	<i>Lampsilis cariosa</i>	Yellow Lampmussel	- /E
MUSSEL	<i>Lampsilis sp. 2</i>	Chameleon Lampmussel	
	<i>Lasmigona subviridis</i>	Green Floater	- /E
	<i>Toxolasma pullus</i>	Savannah Lilliput	- /E
	<i>Villosa constricta</i>	Notched Rainbow	- /Sc
	<i>Villosa delumbis</i>	Eastern Creekshell	
	<i>Villosa modioliformis</i>	Eastern Rainbow	
	<i>Villosa vaughaniana</i>	Carolina Creekshell	- /E

See Section 4.5.3.

4.5.5.4 Threats Affecting Aquatic Species

The Cape Fear River Basin contains multiple areas of heavy human population density and the most populated areas are located in the Piedmont municipal regions referred to as the Triad and the Triangle (NCDWQ 2005a). The Triad is the area encompassing Winston-Salem, Greensboro, and Highpoint, and the Triangle is the area anchored by Raleigh, Durham, and Chapel Hill. All of the major urban centers in the basin are experiencing fast growth rates. As counties in the

upper basin and those along the coast experience high population growth, current capacities for drinking water and wastewater treatment will experience increased demands for service. Comparison of water supply demand projections for municipalities in the basin with percent of projected water supply available for the 2040 planning period indicates demand from growth will utilize from 50% to 99% of available water supplies in the basin (NCDWR 2014b).

The basin has numerous Concentrated Animal Feeding Operations (CAFOs), primarily swine production, with 1,349 facilities and 2,179 associated waste lagoons (NCDWR 2015i). These facilities, as well as several other impact factors in the basin, result in waters being rated as impaired, due to fecal coliform and *enterococcus* bacterial contamination, ammonia, chlorides, habitat degradation, chlorophyll *a*, low dissolved oxygen (DO), turbidity, nutrients, elevated heavy metal or cyanide levels, and other point and nonpoint pollutants (NCDWQ 2005a). While any one source may only create local impacts, the cumulative effects from multiple sources and impacts occurring throughout the basin have had a severe and long-lasting impact. Sedimentation from agriculture, forestry, and construction practices and stormwater discharge is a major issue in the basin in urbanized areas.

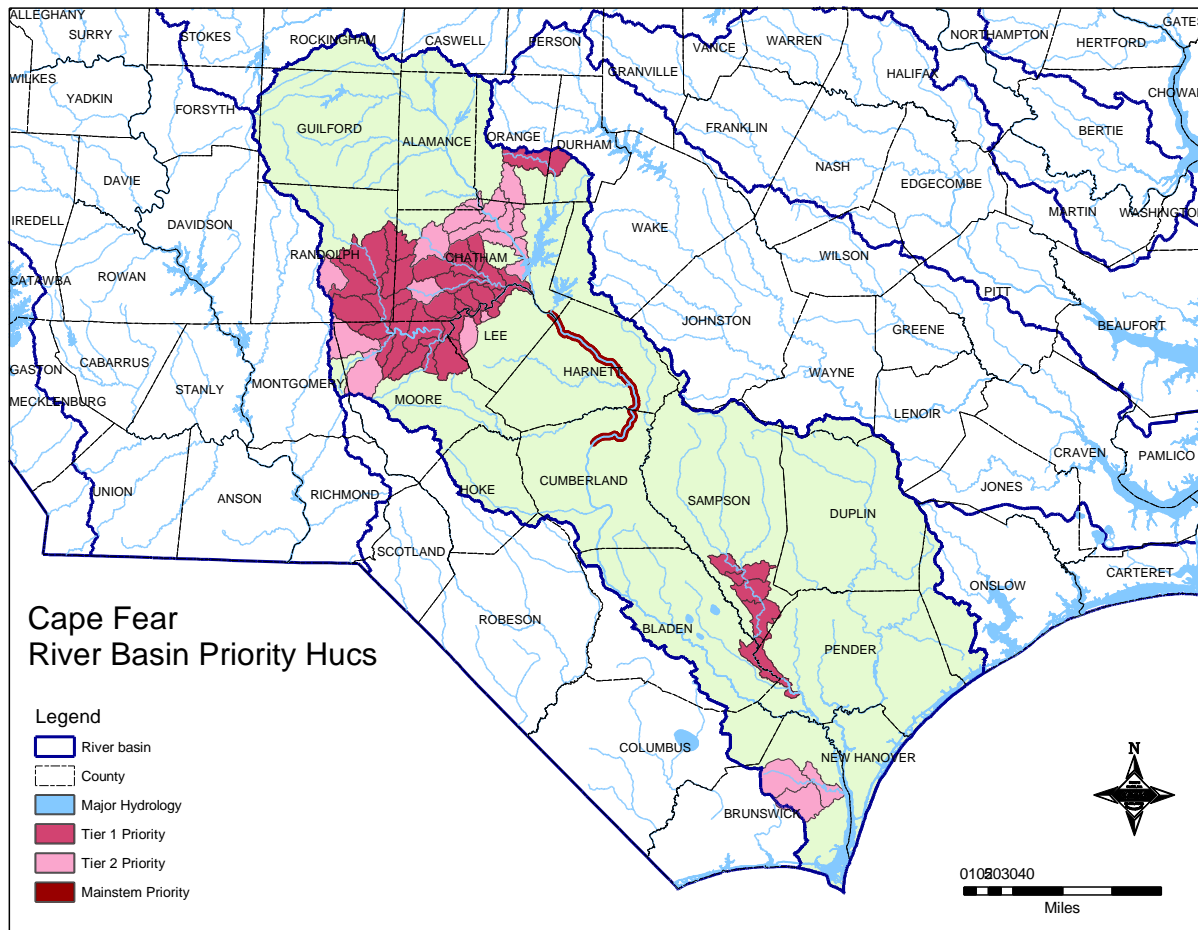
According to an NC Department of Environment and Natural Resources dam inventory (2014) there are at least 1,290 impoundments in the basin. The mainstem of the Cape Fear is interrupted by three locks and dams in the middle and lower portions of the river. The upper Cape Fear River has large barriers at Buckhorn Dam and Jordan Dam. There are also numerous smaller dams on the tributaries to the Cape Fear. The consequences of these impoundments include blocked migration routes for diadromous and resident native species, reduced recolonization and dispersal potential for multiple aquatic taxa, and unnatural flow regimes below managed dams (Williams et al. 1993; Etnier 1997; Neves et al. 1997; Warren et al. 2000; NCWRC 2005).

Invasive species (e.g., Flathead Catfish, Blue Catfish, Red Swamp Crayfish) are established in the Cape Fear River Basin and continue to negatively impact native species populations (Fuller et al. 1999; Cooper 2005) via predation and competition.

4.5.5.5 Recommendations

Conservation priorities that apply statewide to all river basins are presented in Section 4.5.3.3. Priorities identified in the Cape Fear River Basin are shown in Figure 4.5.5.2 and are included in Appendix J.

Figure 4.5.5.2 Location of priority HUC12 watersheds in the Cape Fear River Basin.



Basin Specific Recommendations

Surveys. Distribution and status surveys need to focus on aquatic snails, crayfish, mussels, and fish believed to be declining or dependent on at-risk or sensitive communities (NCWRC 2005).

- Conduct distribution and status surveys for priority species (see Table 4.5.4.2) such as the Ironcolor Shiner, Carolina Redhorse, and Atlantic Pigtoe.

Monitoring. Long-term monitoring is critical to assessing species and ecosystem health over time and gauging the resilience of organisms to continued impacts to state waters. Studies should include identification of population trends, as well as assessment of conservation or development activities. These efforts will inform species and habitat management decisions. Long-term monitoring sites need to be identified and monitoring protocols developed for all priority species. Monitoring plans should be coordinated with other existing monitoring programs where feasible.

Research. Research topics that facilitate appropriate conservation actions include habitat use and preferences, reproductive behavior, fecundity, population dynamics and genetics, feeding, competition, and food web dynamics. Increased understanding of life histories and status helps determine the vulnerability of priority species to further imperilment, in addition to identifying possibilities for improved management and conservation. All studies should provide recommendations for mitigation and restoration. Formal descriptions for known or putative undescribed species and investigations aimed at resolving taxonomic status are needed.

- Support species descriptions for undescribed taxa (e.g., Carolina Redhorse).
- Determine the vulnerability of species across all taxa groups to emerging threats such as endocrine-disrupting chemicals (EDCs) and other compounds that are present in many of our waterways.
- Identify limiting factors of declining species (e.g. Ironcolor Shiner).

In addition to the SGCN species found in the basin (see Table 4.5.5.2), a list of knowledge-gap priority species is provided in Table 4.5.5.3.

Table 4.5.5.3 Knowledge-gap priority species in the Cape Fear River Basin.

Taxa Group	Scientific Name	Common Name	Federal/State Listing Status*
AQ SNAIL	<i>Cipangopaludina japonica</i>	Japanese Mysterysnail	
	<i>Cambarus davidi</i>	Carolina Ladle Crayfish	
	<i>Cambarus hystricosus</i>	Sandhills Spiny Crayfish	
CRAYFISH	<i>Procambarus pearsei</i>	Carolina Sandhills Crayfish	
	<i>Procambarus plumimanus</i>	Croatan Crayfish	
	<i>Chrosomus oreas</i>	Mountain Redbelly Dace	
	<i>Fundulus diaphanus</i>	Banded Killifish	
FISH	<i>Lepisosteus osseus</i>	Longnose Gar	
	<i>Luxilus chrysocephalus</i>	Striped Shiner	- /SC
	<i>Petromyzon marinus</i>	Sea Lamprey	
	<i>Corbicula fluminea</i>	Asian Clam	
MUSSEL	<i>Elliptio icterina</i>	Variable Spike	
	<i>Elliptio roanokensis</i>	Roanoke Slabshell	- /T

Taxa Group	Scientific Name	Common Name	Federal/State Listing Status*
	<i>Lampsilis radiata</i>	Eastern Lampmussel	- /T
	<i>Ligumia nasuta</i>	Eastern Pondmussel	- /T
	<i>Pyganodon cataracta</i>	Eastern Floater	
	<i>Pyganodon grandis</i>	Giant Floater	
	<i>Strophitus undulatus</i>	Creeper	- /T
	<i>Unio merus carolinianus</i>	Florida Pondhorn	
	<i>Utterbackia imbecillis</i>	Paper Pondshell	

* See Section 4.5.3.

Management Practices. Management practices that reduce impacts and work synergistically with other conservation actions are needed to enhance the resilience of natural resources. Particular needs include preserving biodiversity, protecting native populations and their habitats, and improving degraded habitats. In addition, education about, and regulation and prevention of the introduction and spread of exotic or invasive species are vital.

- Promote programs to upgrade/increase compliance at wastewater treatment facilities and CAFOs.
- Provide support for land protection, particularly in riparian areas (acquisition, easements, etc.).
- Support well-planned stream restoration work in collaboration with other organizations.
- Support dam removal where appropriate.
- Reintroduce or augment rare mollusk and fish species populations in areas where water quality and stream habitats have recovered sufficiently to support them.
- Continue to identify areas critical to aquatic ecosystem health that can be conserved or restored.

Conservation Programs and Partnerships. Conservation programs, incentives, and partnerships should be utilized to the fullest extent in order to preserve high-quality resources and protect important natural communities. Protective measures that utilize existing regulatory frameworks to protect habitats and species should be incorporated where applicable. Land conservation or preservation can serve numerous purposes in the face of anticipated climate change, but above all, it promotes ecosystem resilience.

- Guide academic research projects to help achieve specific conservation goals and objectives.
- Support the development and application of an aquatic nuisance species management plan with other agencies/groups.
- Address secondary and cumulative impacts upon water quality, buffer ordinances, water supply watershed protection, headwaters protection, etc. (NCDWQ 2000a, NCWRC 2002).
- Work with and promote existing programs that help farmers reduce sedimentation/erosion (e.g., install fences to keep livestock out of streams and improve tilling practices) as well as reduce pesticide and herbicide use.