



Cape Fear River and Watershed Annual Report - 2014

Mission: To protect and improve the water quality of the Lower Cape Fear River Basin through education, advocacy, and action

Welcome from the Cape Fear Riverkeeper

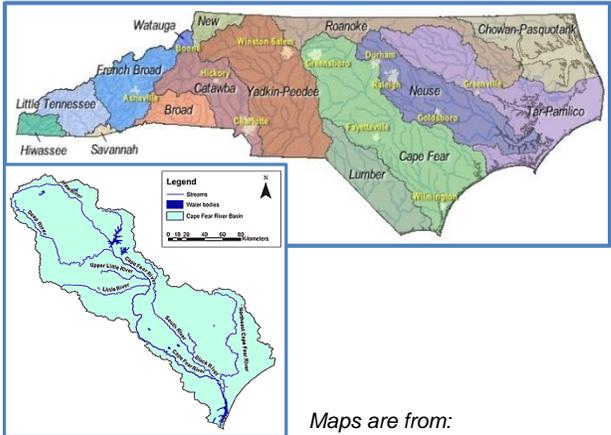
Cape Fear River Watch (CFRW) is the voice of the Cape Fear River. We are a grassroots nonprofit environmental organization with a mission to protect and improve the water quality of the Lower Cape Fear River Basin through education, advocacy and action. Founded in 1994 by clean-water activists who were concerned about the health and future of the Cape Fear, we continue to advocate for a clean, healthy, and beautiful Cape Fear River for all people of the Lower Cape Fear Region. The Cape Fear is a rich and varied watershed, unmatched in biodiversity along the eastern seaboard north of Florida. From a large coastal estuary near the mouth of the river to the slow meandering black-water streams of the coastal plain to the faster flowing streams of the piedmont, the Cape Fear is a truly remarkable river.



We invite you to be active participants in the protection and enjoyment of the Cape Fear. CFRW will continue to provide information and opportunities for your participation in such as events as our First Saturday Seminars on important issues to the region, Second Saturday cleanups of local watersheds, and Third Saturday paddles to get us out on the waters of the Lower Cape Fear watersheds. But there are many other activities including our Striper Tournament, Lakefest, and outreach and advocacy. Please visit our website for current activities and for issues in the Lower Cape Fear (<http://www.capefearriverwatch.org/>).

Cape Fear River Watershed

The Cape Fear River system is the largest watershed contained entirely within the state boundary. It is comprised of 9,164 square miles (23,734 square kilometers) or 16% of NC's total land area. The total stream length of 6,684 miles (10,694 km), which includes all tributaries, traverses 27 counties that is the home to more than 20% of the state's population.



Maps are from:

<http://nc.water.usgs.gov/realtime/index.html#hints>
http://dcm2.enr.state.nc.us/wetlands/coastal_explorers/cpfmodule/basin/basin_intro.htm

The river's headwaters begin west of Greensboro as two tributaries, the Deep and the Haw rivers. These two rivers combine to form the Cape Fear. The other major tributaries to the Cape Fear are the Northeast Cape Fear River (NECFR) and the Black River, which comprise 18% and 17% of the Cape Fear watershed, respectively. The NECFR and the Black rivers are termed blackwater rivers. The absence of clay and the presence of tannins, which are leached from organic matter in the floodplains and surrounding swamps, cause the water to be darker in color. Blackwater rivers are sourced entirely within the

Coastal Plain where they drain many swamp areas. The intersection of the Cape Fear and NECFR just above the Battleship North Carolina illustrates the sharp boundary between the more clay-rich and brown waters of the Cape Fear with the black waters of the NEFCR.

The Cape Fear is the only river in the state that empties directly into the Atlantic Ocean. The mouth of the river is located approximately 24 miles below Wilmington between Fort Caswell and Bald Head Island. The Cape Fear is reported to have received its name (Cape of Feare) for the treacherous entrance to the mouth of the river where sand shoals (Frying Pan Shoals) led to navigation hazards and loss of ships. The lower reaches of the river form an important estuarine ecosystem that includes 24,472 acres (43 square miles or 111 square kilometers).

The Cape Fear provides much of the water supply for those within the watershed. It is also an important supply for some inter-basin transfer, such as for Brunswick County. It is also critical for use in thermoelectric water cooling, commercial traffic, and recreation capacity as described below in this report.

Economic Contributions of the Cape Fear River Basin

Locally, many of us experience the Cape Fear River (CFR) as a scenic wonder providing generous opportunities for recreation and for viewing diverse habitats and species. But beyond providing everyday enjoyment, the river – both in what we see locally in New Hanover and nearby counties, and throughout the overall river basin – is a vital economic resource. Some CFR-based economic activities depend heavily on the water, habitat, and scenic quality of the river while other economic considerations do not depend on those attributes. In fact, some of these activities may reduce resource quality.

Economic activities that rely on high water and overall habitat quality include public water supply, aquaculture, commercial fishing, recreation, and tourism. Most of these are discussed in order below.



The public water supply is among the economic activities that depend most heavily on water quality. The CFR serves as the water supply source for more

than 120 public water systems, which serve nearly 1.5 million people. Greensboro, Fayetteville, and Wilmington are examples of the larger communities that depend on the CFR for public water withdrawal. For instance, the Cape Fear Public Utility Authority in Wilmington provides water and wastewater services to approximately 67,000 residential, commercial and industrial accounts. Part of the water supply is from the groundwater nano-filtration facility but most of the water is derived from the CFR and treated at the Sweeney Water Treatment Facility. The costs of water reflects water treatment, delivery, wastewater treatment, and administrative services. Notably, the payment includes no value for the water resource itself; we consider the water a free good. We are able to do this because we have such an abundant source of water from the CFR basin. So the payments we make for water consumption most likely understate, perhaps substantially, the true economic value of the public water resource and the true value of the CFR basin in providing this resource. To underscore the importance of the CFR basin as a source of public water supply, we should consider what we would do if we lost this resource. Examples of loss might be with loss of supply during drought or through contamination of the water supply. What would it cost to replace our water supply from the next best available source? It would certainly cost more, and perhaps a lot more, than what we pay now for CFR basin water. For instance, the more polluted (biologic, chemical, or physical) the water the higher price for treatment as water quality standards for consumption must be met.

Fishing, hunting and other wildlife-associated recreation (e.g. boating, wildlife-viewing) are other economically important activities in the CFR basin that depend heavily on water and overall environmental quality. All of these activities generate revenue either directly or indirectly for local economies. Based on data from the U.S. Fish and Wildlife Service, recreational fishing generates approximately \$100 - \$120 million annually in direct expenditures for food, lodging, transportation, equipment, bait, etc. in the CFR basin.

Apart from the economic value of the expenditures associated with water-based recreational activities, the activity, itself, such as recreational fishing, is of considerable value to the users of the CFR water resource. This kind of value does not show up in standard commercial accounts, but can be estimated using a variety of economic analytic methods. The value is essentially the answer to the question: what is it worth to me to have access to the CFR water resource for recreational and other personally

valuable activities, for which I otherwise make no payment, except for user licenses? Using findings from recent studies of the value of North Carolina's water resources for recreational fishing use, it is estimated that the CFR basin provides an annual value of approximately \$1.0 - \$1.5 million to recreational fishers, just to have access to the CFR water resource. These same studies show that the water quality of the CFR basin is also important to recreational fishers, and that they assign value to further improvement (or avoided reduction) in CFR's water quality. The indicated value for incremental improvement (or avoided reduction) in CFR water quality is approximately \$200 - \$250 thousand per year – again, from only those persons who actively use the CFR basin for recreational fishing. The value is even more with the communities that are present in and visitors to the CFR basin.



Fishermen assembling for Striped Bass Tournament (photo Roger Shew)

Aquaculture in the CFR basin also depends substantially on water quality. Aquaculture production contributed \$52 million (based on farm gate receipts) in total value for North Carolina in 2010. While data on the value of aquaculture production are not available at the county level, CFRW expects that a substantial share of this total would occur in the CFR basin based on the quantity of aquaculture in the rural areas of Eastern North Carolina that are within the CFR basin.

Other activities, such as electric power generation, shipping, and agriculture, also depend on the CFR resource, but are less dependent on water quality. Cooling water is integral to electricity generation, and water withdrawal for electric power generation is an important economic use of the CFR resource. The Brunswick nuclear station, located near Southport, has an average water intake of nearly 1.5 billion

gallons per day. This water intake, which provides condensation cooling for the plant's steam electric generation cycle, is essential to the plant's output of electricity, which averaged approximately 15 billion kWh annually over the past several years. Total revenue for the plant was \$1.1 billion in 2011. Monitoring is important to avoid damaging losses of aquatic organisms that may be trapped in the cooling water intake system. This loss could reduce the overall productivity of the CFR fishery for both commercial and recreational use.

Shipping/water-based commercial transportation also relies on the CFR resource. Over the past 10 years, the total tonnage of shipments through the Port of Wilmington increased from 2.3 million tons in 2004 to 5.3 million tons in 2013. Key trading partners include Brazil, China, South Korea, Belgium, and Turkey. Leading export commodities, by tonnage, include forest and wood products, and food. Leading import commodities include grains, chemicals, and fertilizers. Access to efficient export facilities is vital for southeastern North Carolina's wood products industry. Similarly, imports – e.g., chemicals – support other local industry.

The above activities contribute to the region's economy through commercial value and non-market value. In sum, the CFR basin is a critical economic resource for the counties in the basin and beyond. We should be good stewards of this important resource.

Ongoing Activities for Advocacy and Action in the Lower Cape Fear

Described below are several current and ongoing efforts by Cape Fear River Watch involving Advocacy and Action. These efforts are greatly aided by numerous volunteers and organizations that we partner with to improve the waters of the Cape Fear River but also the health, economy, and beauty of the Cape Fear Watershed.

Fish Passage and Restoration Efforts

The construction of a nature-like rock arch weir at Lock and Dam No. 1 during 2012 to 2013 by the US Army Corps of Engineers (USACE), has led to recent national- and state-wide drive for the restoration of anadromous fish and their spawning habitat within the Cape Fear River. The USACE has been evaluating the design of the new fish passage structure for two years; results have been mixed but encouraging. This design is the first of its kind used on the Atlantic

coast; however, similar structures have been built successfully in the mid-west.

North Carolina State University Professor Joe Hightower and USACE-contracted Josh Raabe, conducted the second year of fish passage efficiency by tagging American shad, striped bass, and flathead catfish. Receivers were placed upstream and downstream from each of the three Lock and Dams to detect passage. The latest monitoring report released by the USACE indicated fish passage may need a helping hand. As noted in the report, this is the first quantitative evaluation of the rock arch rapids design for fish passage efficiency of American shad, striped bass, and flathead catfish. One of the most important concluding remarks made in the report is that “all three species passed through the fishway in both years and may benefit from the continuous potential to pass compared to waiting for locking events to occur”. It was determined that all three species passed upstream through the rock arch rapids fishway. American shad (53-65%) and striped bass (19-22%) passage efficiency did not meet success criterion (80%) in either year, whereas 80% of flathead catfish passed the structure in 2013 but only 38% passed in 2014. Limited passage efficiency may be influenced by several factors such as physical conditions (high and low flow conditions), design (lack of laminar flow or sufficient space for fish to pass through) and/or the fact these species have been blocked from upstream migration for over a 100 years.



Lock and Dam #1 with the Rock Arch Rapid fish passage structure completed in May 2013 (photo Alan Cradick)

The Cape Fear River Partnership, a coalition of federal, state, private and non-profit organizations, which includes Cape Fear River Watch, is in full support of developing a modification strategy to improve fish passage efficiency. In the words of Luther Aadland, fish passage design expert, “there is

risk in everything including doing nothing...the best we can do is to use our best logic, judgment and collective experience.” As noted by Mike Wicker of the US Fish and Wildlife Service, the project is not less successful than expected but instead is a project not fully implemented. Adaptive management is a requirement for most all restoration efforts. Monitoring and modification is important as the Partnership considers similar structures for fish passage at Lock and Dam 2 and 3. The years to come will be exciting and challenging. Cape Fear River Watch is ready and willing to support every effort to restore these critical anadromous fish populations. We encourage your participation and support of this effort to improve the river and fisheries for future generations.

Table 1. Upstream passage efficiency for American shad, striped bass, and flathead catfish at the three lock-and-dams on the Cape Fear River during 2013 and 2014 spawning periods. Passage efficiency at LD#1 is for tagged fish that passed through the rock arch rapids fishway (excludes fish passed through lock chamber).

| | 2013 | | | 2014 | | |
|------------------|--------|-----------|------------|--------|-----------|------------|
| | Passed | Available | Efficiency | Passed | Available | Efficiency |
| LD-1 | | | | | | |
| American shad | 16 | 30 | 53.3% | 15 | 23 | 65.2% |
| Striped bass | 8 | 42 | 19.0% | 17 | 79 | 21.5% |
| Flathead catfish | 16 | 20 | 80.0% | 6 | 16 | 37.5% |
| LD-2 | | | | | | |
| American shad | 5 | 14 | 35.7% | 8 | 14 | 57.1% |
| Striped bass | 7 | 9 | 77.8% | 16 | 18 | 88.9% |
| Flathead catfish | 9 | 10 | 90.0% | 2 | 2 | 100.0% |
| LD-3 | | | | | | |
| American shad | 5 | 5 | 100.0% | 5 | 6 | 83.3% |
| Striped bass | 7 | 7 | 100.0% | 8 | 15 | 53.3% |
| Flathead catfish | 6 | 6 | 100.0% | 1 | 2 | 50.0% |

Coal Ash and Related Issues

Coal ash was catapulted back into national headlines in February when a massive coal ash spill coated the Dan River for over 70 miles in a thick layer of toxic muck. The spill was horrible but not completely unexpected, especially by those who have warned for years that storing toxic coal ash in unlined pits near waterways was inviting disaster.

The Cape Fear Basin is home to two coal ash storage areas - the Sutton Plant in New Hanover County and the Cape Fear Plant in Chatham County. Cape Fear River Watch, represented by our partners at the Southern Environmental Law Center (SELC) have filed Clean Water Act citizen lawsuits against Duke Energy for surface water and ground water contamination at both sites, as well as selenium contamination of Sutton Lake, a public fishing area. These citizen suits demand that Duke clean up its

mess and stop polluting our water resources. The suits are supported by data gathered by the Riverkeeper including water samples showing contamination, photographs and video of violations, deformed fish, and evidence of continuing leaks. Following the Dan River spill, the North Carolina General Assembly vowed to pass legislation that cleaned up coal ash. Regrettably, their resolve dissolved under pressure from Duke lobbyists. Ultimately, they passed a weak cleanup bill that addresses only four of NC's fourteen coal ash sites. The Sutton Plant is one of those. Unfortunately, the Cape Fear Plant, where five high hazard dams sit leaking above the drinking water for one in five North Carolinians, was left off the list. We hope our lawsuits will succeed where the NC General Assembly failed. On a positive note, the Department of Natural Resources has reclassified Sutton Lake from a private cooling pond to a public resource (waters of the state), meaning that more stringent water quality protections will now be required.



Sutton Power Plant and Coal pile next to Sutton Lake (photo Alan Cradick)

Concentrated Animal Feeding Operations (CAFO)

The Cape Fear is impacted more than any other place on the planet from CAFOs. We are working to build legal cases against CAFOs that illegally discharge waste into rivers and streams in all of the major sub-basins of the Cape Fear, threatening drinking water supplies, and the people who depend on the river for their livelihoods and recreation. We sample streams adjacent to these factory farms, and sadly, those waterways frequently have bacteria and nutrient levels that are off the charts. Sadly, environmental enforcement at these sites is almost non-existent. Legal action seems to be the only option left. Recently, we have campaigned against a proposed new poultry slaughterhouse in Cumberland County

above our drinking water intake. Involvement includes helping to organize the local community, urging elected officials to reject the plan, building opposition from downstream municipal water suppliers, and keeping the issue in the media.

Titan (Carolinas Cement Company)

We continue to fight the proposed Titan Cement project in New Hanover County. We have held off the company for over 6 years and have built a strong coalition of groups opposed to the project. We have used the issue as a springboard for improvements to our zoning ordinances, making it harder for heavy industry to pollute. Our legal challenges to the air permit should be heard soon and we are hopeful for a positive outcome. We are preparing to counter Titan's next move, likely either the initiation of the federal Environmental Impact Statement (EIS) or a local application for a Special Use Permit. We are committed to continuing the fight for as long as it takes to turn Titan away.

One of the reasons we believe protecting the Northeast Cape Fear River – where Titan would build an enormous strip mine and coal burning kiln is the incredible wildlife that calls the river corridor home. We have partnered with the NC Coastal Federation and Wildlands Network to document this wildlife with wildlife cameras. We're calling these photos Northeast Cape Fear Wildlife Selfies.



Protecting North Carolina Waters

We have teamed up with SELC to protect NC waterways in response to NC Department of Environment and Natural Resources' (DENR) unwillingness and inability to do so. We recently brought a legal challenge to the City of Burlington's waste water treatment operations and forced them to make corrections and improvements that will repair problems and dramatically reduce spills.

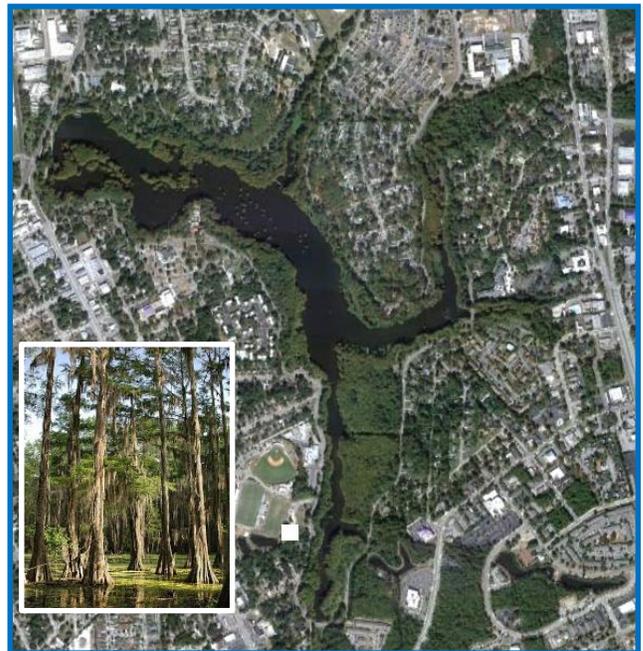
Greenfield Lake – A Valuable Resource Worth Protecting

Greenfield Lake was created in the 1730s by Dr. Samuel Green by damming a creek to aid rice production. When Tidewater Power Company extended its trolley lines to Greenfield Lake in 1912, it quickly became a popular recreation destination and a hotspot for lake activities. Diving boards, docks, bathhouses, and a pavilion were built. In 1918, the partners in downtown's Bijou Theatre opened an amusement park on the grounds, which ran for a season or two, complete with a roller coaster and a petting zoo. The lake property was purchased by the City of Wilmington for \$25,000 in 1925. During the Great Depression, WPA workers cleared underbrush, landscaped the grounds, built terraces, and constructed the road that we know today as Lake Shore Drive.

Greenfield Lake was the inspiration for the Azalea Festival. Local legend holds that physician Houston Moore was driving around the lake, admiring the beautiful flowers, when he developed the idea that would eventually become the Azalea Festival; the first festival was in the 1948. Today, the lake boasts a five-mile paved pathway surrounded by beautiful scenic views of cypress trees draped with Spanish moss, vibrant pink, purple, and white azaleas, and local wildlife. The newly renovated amphitheater on the south side of the lake regularly hosts musical and theater arts events.

Greenfield Lake today is an urbanized watershed well within the bounds of the City of Wilmington. The lake's watershed encompasses approximately 2550 acres with a resident population of more than 10,600 people. The highly developed watershed has 36% impervious cover, which includes parking lots, streets, and houses. A high impervious surface area means that stormwater runoff is a significant source of pollution to the lake. Other sources of pollution include occasional leaks from sewage collection lines near the lake (including one line that actually crosses the lake) as well as fecal pollution by abundant waterfowl using the lake. Collectively these pollution sources have caused major challenges to water quality in the Lake, and it has been considered **eutrophic** (literally "well fed") for quite some time. Eutrophic conditions sometimes arise from the natural tendency for lakes and ponds to accumulate nutrients and organic matter, but in this setting it is quite clear that Greenfield Lake is affected primarily by humans – termed "**cultural eutrophication**".

The most obvious manifestation of eutrophication in shallow lakes like Greenfield is excessive plant growth. Aquatic plants occur in many forms, including rooted plants, filamentous "algae", floating plants like duckweed, and phytoplankton, which are generally invisible unless their numbers are excessive, in which case we talk about "algal blooms". Aquatic plants can provide useful ecosystem services: food for herbivores, shelter for invertebrates and fishes, protection from shoreline erosion, and nutrient uptake. Excessive plant growth, however, can also create harmful conditions. Foremost among the concerns is night-time depression of dissolved oxygen levels. Aquatic plants help oxygenate the water by conducting photosynthesis during the day. However, their respiration at night consumes oxygen without the balancing of photosynthetic oxygen production, and the result can be nocturnal **hypoxia** (oxygen levels low enough to stress animals) or even **anoxia** (the absence of dissolved oxygen, in which case animals would suffocate or be forced out). Anoxia can also cause undesirable odors and the release of nutrients from lake sediments, which creates a vicious cycle of over-enrichment.



Greenfield Lake has a watershed area of 2550 acres, most of which is shown in this image. Note the development with 36% of the watershed having impervious surfaces (Google maps)

Water quality monitoring in Greenfield Lake has been conducted since 1997 by the UNCW Aquatic Ecology Laboratory under the direction of Dr. Michael Mallin.

Results of this monitoring work have consistently shown that Greenfield Lake has water quality challenges. The lake frequently experiences low dissolved oxygen levels vs. state standards, high levels of Biochemical Oxygen Demand (BOD, a measure of organic matter loading), high phytoplankton biomass (measured as chlorophyll a vs. state standards), and high fecal coliform contamination levels vs. state standards. The last of these problems likely derives from animal waste, including pet wastes washed in from the watershed and waterfowl in the lake itself. The lake's frequent low dissolved oxygen levels and excessive phytoplankton densities have recently caused the NC Department of Environment and Natural Resources to propose listing the lake on the Environmental Protection Agency's 303(d) list, which identifies waters that are considered impaired because they fail to meet water quality standards, and mandates efforts to mitigate those impairments. The City of Wilmington, as the lake's owner and manager, should continue to take measures to improve water quality in the lake. The lake also sometimes has excessive plant growth, which is not quantified as there are no standard methods for measurement (except in the case of phytoplankton).

The City of Wilmington has been a reasonably good steward of Greenfield Lake and is putting effort into its maintenance. The City repaired sewer system leaks and the Cape Fear Public Utility Authority, which now has responsibility for the sewer system, has identified the Greenfield Lake area as a priority for sewer system maintenance and upgrades. The City has constructed storm water detention ponds and other storm water management structures on tributaries to the lake throughout the watershed. The City introduced sterile grass carp to the lake as a plant growth control measure, installed solar bees for aeration, and has occasionally removed excess plant growth. The City also supported an effort to remove nutrient-rich sediments from the lake in the early 2000s, suctioning muck from the lake after drawing its level down one winter and pumping the dredged material across the Cape Fear River to Eagles Island. Cape Fear River Watch operates the boat concessions on the river and does continual cleanups and invasive species removal (water hyacinth) several times during the year.

The above measures have all helped, but the lake remains impacted and will need more help if it is to be restored to healthy status. Public awareness and support for restoration efforts will play a major role in making progress happen, so we at Cape Fear River Watch urge all of you to visit the lake, enjoy its amenities, and express your support for efforts to make it an even better resource for our area.

History Corner: Rice Culture – Lower Cape Fear River Basin

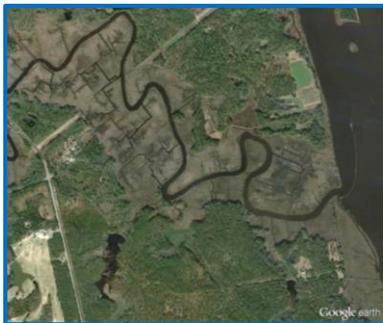
You may not know it but there have been two gold rushes in North Carolina. One of these occurred in the early 1800's with the discovery of metallic gold in the streams of the Piedmont of North Carolina. In fact North Carolina was the nexus of gold mining in the United States until the 1849 gold rush in California; there was even a Coin Mint in Charlotte. However, there was another "gold" rush that occurred before this in the Lower Cape Fear Watershed in Brunswick and New Hanover counties and also in the Low Country of South Carolina. This gold was Carolina Gold Rice that was a highly valued and major export commodity in the southern colonies until the start of the Civil War. The rice was named Carolina Gold because of the color of the outer hull. Carolina Gold rice is still grown and sold in South Carolina.



Rice was introduced into the southern colonies in the 1600's. Several stories have been told of its origins. One was that it arrived from a storm-damaged ship from Madagascar. An equally, or perhaps more likely story was that rice growers in the Caribbean or slaves from Africa brought the rice to the Low Country of South Carolina. Rice growers on the west coast of Africa, sometimes called the Rice Coast, were brought as slaves to the southern colonies because of their knowledge of growing rice crops. However, as the number of plantations grew and the acreage planted increased, larger number of slaves were brought to Charleston and Savannah to work the rice fields as commercial development was a very labor intensive endeavor. Working conditions in the lowland marshes adjacent to rivers were particularly harsh with mosquitoes, heat, and of course there was a continuing need to clear and maintain the fields and to construct "canals" for irrigation.

Initially rice was grown in wet upland areas in addition to the lowland areas, but with time, most of the rice

fields were developed along the rivers and smaller tributaries to take advantage of using the tides to flood the fields. Evidence of these rice fields and plantations are still evident in the Lower Cape Fear River floodplain. The map below is a Google Map of a portion of Town Creek (Brunswick County) where it enters the Cape Fear River. Note the straight lines with right angles adjacent to the water where the freshwater marsh is located. Straight lines are rarely found in nature; when you see them they are likely related to anthropogenic activity. These are canals that were dug to funnel the water to the rice fields. Gates were used to allow the water to flood the fields when needed. These canals occur throughout the Lower Cape Fear including Clarendon Plantation just south of Town Creek, Orton Plantation further south, and Eagles Island.



Lower Town Creek tributary to the Cape Fear River. Note the straight lines and right angles in the freshwater marsh. These were the canals that were hand dug for flooding the rice fields (Google maps).

The image below is of similar canals on Eagles Island (photo from Alan Cradick)



Carolina Gold Rice was developed through experimentation with different varieties and was likely being planted before the American Revolution. This highly-valued rice was exported around the globe and was the most important variety along the Cape Fear and in South Carolina until the start of the Civil War. It was the most valuable export in South Carolina, and in North Carolina it was the second most valuable export after naval stores. The loss of cheap labor following the Civil War, along with increased

competition from other rice producing areas that included the Gulf Coast, led to the demise of rice as a major export for North and South Carolina. There was still small production following the Civil War and niche production is even occurring in South Carolina today. It is said that to the Gullah/Geechee culture, rice is still associated with prosperity and a good life.

Focus on an Ecosystem in the Cape Fear Watershed: Bottomland Hardwoods

Bottomland hardwood forests are an important and varied ecosystem primarily occurring adjacent to (riparian zone) and/or within the floodplains of the larger rivers and tributary streams within the Cape Fear watershed. Though they often appear dense and dark with wet soils and even standing water, there are slight but important differences in these ecosystems with varying river types and elevations. The Cape Fear Watershed contains both brown water (Cape Fear River) and black water (Northeast Cape Fear and Black) rivers. Brownwater rivers carry abundant sediment during floods that build the floodplain. Blackwater rivers originate in the Coastal Plain; they have little suspended sediment and highly influenced by rich organic soils of the wetlands. Areas immediately adjacent to the black water rivers are often dominated by cypress and gum species.

Elevation is the primary control on bottomland hardwood forests variability. They are subdivided into zones based on flooding frequency. The flooding frequency ranges from up to 100% in the lowest wetlands adjacent to the river to approximately 10% in the high wetlands. Plant communities segregate along these elevation gradients and must be adapted to growth in saturated, anaerobic (low to no oxygen) soils. Cypress (*Taxodium distichum*, *Taxodium ascendum*) and gum (Black gum *Nyssa sylvatica*) trees are common in the lower wetlands and are termed obligate wetland species as they are typical of wetland locations. A combination of wetland obligate and facultative (mostly occur in wetter areas) plants such as red maple (*Acer rubrum*) and other species will occur at higher elevations. The groundcover and shrub layer are often poorly developed because of stressful conditions including low light and saturated soils.

The variable plant communities provide multiple, quality habitats for year-round wildlife while also providing forage for seasonal migrant populations of waterfowl and breeding habitats for neotropical birds. Loss or fragmentation of these hardwood communities has impacted multiple species, whether

they use the forests as year-round home or as a stopover during migration and/or breeding. Bottomland hardwood forests were the home to the extinct Ivory-billed Woodpecker (*Campephilus principalis*) and they are the year-round home of the Pileated Woodpecker (*Dryocopus pileatus*), which is the largest remaining species of woodpecker. Breeding populations in these forests include the Prothonotary Warbler (*Protonotaria citrea*), Swallow-tailed Kite (*Elanoides forficatus*), and the Wood Stork (*Mycteria americana*). It has been estimated that 30% of the threatened and endangered species in the southeast rely on habitats within bottomland forests for at least part of the year.

In addition to the important habitats they provide, bottomland forests are also important in 1) aquifer recharge through infiltration, 2) flood reduction through temporary water storage and the slowing of downstream movement of flood waters, and 3) water quality as the forests filter agricultural and sediment runoff before it enters the river. Bottomland hardwood forests are critically important ecosystems to maintain and restore but they are under stress from historic losses, fragmentation, and hydrology changes. The latter is obvious along the Northeast Cape Fear where slightly changing salinity has led to the loss of living cypress. Maintenance and restoration of this imperiled ecosystem are high priorities in the Cape Fear Watershed as well as in the southeastern United States.



Dead cypress on the east bank of the NECFR in New Hanover County (photo, Roger Shew)



Bottomland Hardwoods along Town Creek (photo, Roger Shew)

RiverKeeper's Closing Thoughts

Water is not an infinite resource. We cannot make more water, and in fact, as our global population grows, access to clean water is becoming more and more limited. This growing water crisis will likely define the next era in human history as much as any other global issue we will face. If you have seen the news coverage of the issue, which frequently focuses on far-away deserts, you may be tempted to think that here in the United States, especially here in the southeast, we are immune to the water crisis - you would be wrong to do so.

Cape Fear River Watch cares deeply about the future of our water resources. Our education programs teach children and adults alike the value of clean water and outline simple and effective ways of improving water quality. Our advocacy team grapples with important issues, using science and common sense to formulate positions that help educate policy makers, and facilitate smart and sustainable decisions regarding our water resources. Our action oriented programs give citizens an opportunity to create a connection to our river, through clean-ups, paddles, and other hands on activities.

We are making a difference in the Lower Cape Fear. We are protecting and improving the water quality of our river. We hope you will join us in the work we do for our lives today and for the lives of our children and grandchildren. Remember – **WATER IS LIFE.**



Education



Advocacy



Action



Fun

(photos from Alan Cradick)

The Best Possible Advocacy for the Future of our prized resource – The Cape Fear River



(photo Alan Cradick)

Yearly Review

CFRW, with its goals of Education, Advocacy, and Action, has been active this year with numerous outreach and educational activities as well as with position statements on various issues of importance to the Lower Cape Fear. Some of these are listed on our website www.capefearriverwatch.org/ and we encourage you to frequently visit our site for current events and discussions of the issues. However, we thought it would be useful to list some of the activities that we have participated in this year. Many of these will be repeated as annual events in 2015. We hope that one, many, or all of these may be of interest to you; you are always welcome to be a part of the Cape Fear River Watch activities.

Events:

| | |
|------------------------|----------|
| Striper Tournament | January |
| Lakefest at Greenfield | May |
| Annual Meeting | November |

Education:

| | |
|----------------------------------|-----------------------|
| Summer Camps | June, July, August |
| Greenfield Lake Tours | Ongoing |
| City Stormwater Efforts: | Enviroscape, Cleanups |
| Lock and Dam #1 Education Center | |

Advocacy Topics:

- CAFOs
- Coal Ash
- Fish Passage and Restoration
- Groundwater Contamination
- Solid Waste
- Special Use Permit
- Titan
- Water Quality
- Water Sources

First Saturday Seminars:

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| January | ----- |
| February | Bev Tetterton: Wilmington History |
| March | Nancy Buckingham: Back Yard Habitat |
| April | Carson Wood: Birds of Lower Cape Fear |
| May | ----- |
| June | Sara Babin: Biodiversity, Carnivorous Plants |
| July | Erin Carey: Bradley Creek Stormwater |
| August | Beverly Tetterton: History of the Harbor |
| September | Movie: Hydraulic Fracturing |
| October | Julian Monroe: The River Nile |
| November | James Kapetsky: Eagles Island |
| December | Chris Fonveille: Historical Perspectives |

Second Saturday Cleanups

| | |
|-----------|--------------------------------------|
| January | Burnette Blvd., Wilmington |
| February | 11 th Street, Wilmington |
| March | Holly Hills Dr., Leland |
| April | Tucker Supply, Kerr Ave., Wilmington |
| May | ----- |
| June | Kerr Ave. Wetland, Wilmington |
| July | Kay Todd Rd., Leland |
| August | Upper Burnt Mill Creek, Wilmington |
| September | Broad Str., Wilmington |
| October | Greenfield Lake BIG SWEEP |
| November | McCrary Lake Area, Wilmington |
| December | ----- |

Third Saturday Paddles

(No paddles in Jan., Feb., Dec.)

| | |
|-----------|---------------------------------|
| March | Black River |
| April | Cape Fear River (Canc. Weather) |
| May | Northeast Cape Fear River |
| June | Town Creek |
| July | Shelter Creek |
| August | Rice Creek/Town Creek |
| September | Riverkeeper at Climate March |
| October | Smith Creek |
| November | Sturgeon Creek to Brunswick |

To Become a Member

Visit Website:

www.capefearriverwatch.org/action/become-a-member

Phone: (910) 762-5606

Office: 617 Surry Street, Wilmington, NC 28401

We invite your participation and hope to see you on the water!

Contributing writers:

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