TO GREAT AND USEFUL PURPOSE

A History of the Wilmington District U.S. Army Corps of Engineers

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and his attorney, J. Clements Shafer, took over the company and offered to complete the contract to the original amount of $140,000. Major Stanton accepted the offer and the contract was completed in 1895.[38]

The desired depth and width of the river increased as new projects started. The project of 1890 provided for a 20-foot channel at mean low water with a width of 270 feet. A 1912 project provided for a channel with a uniform depth of 26 feet, 300 feet wide, and 400 feet wide on the bar. As the depth increased, the size of ships docking at Wilmington also increased. The average tonnage per ship coming to Wilmington in 1886 was 421, while in 1904 the average was 1,032, rising to 1,259 in 1911.

A survey report prepared in 1900 by Captain Eugene W. Van C. Lucas, District Engineer, recommended the dredging of an anchorage and turning basin, deep and wide enough for vessels then using Wilmington Harbor to turn around, at a cost of $291,500. Both the Division Engineer and the Chief of Engineers recommended against the proposed improvements, on the grounds that it was costly and unnecessary. Brigadier General John M. Wilson, Chief of Engineers, suggested that the plan adopted at Savannah—to build mooring dolphins to which vessels were secured, instead of an anchorage—could be implemented for Wilmington at a cost of only $50,000. But subsequent surveys continued to recommend an anchorage and turning basin, and in 1907 the mooring dolphins plan was dropped in favor of the larger development.[39]

At the Cape Fear bar, the designers of New Inlet and Swash Defense dams had figured that sufficient current would be concentrated over the bar to keep the channel open with only a minimum of maintenance. The Engineers allowed the channel to follow the line of least resistance, and the natural channel bar gradually shifted to the west from 1839 to the 1920s. Opposite Bald Head Point, a kink developed in the channel until in 1924 part of the flow ran at a right angle to the ebb and flood tidal currents. That presented a hazard to shipping in the channel.[40]

In addition to the danger to ships, the condition of the channel increased the cost and difficulty of maintenance dredging. The dredges concentrated their efforts on the vicinity of the kink, but they were unable to increase the depth or width. The project adopted in 1919 provided for a 30-by-400-foot channel over the bar. But in 1922, the channel measured only 26 by 200 feet, even though hundreds of thousands of cubic yards of sand had been removed,[41] as shown in the accompanying table.

TABLE

Yardage Dredged at Cape Fear Bar Channel

Year	Yardage
1917	226,198
1918	203,235
1919	263,677
1920	658,612
1921	283,492
1922	329,976

[Source: Keuntz, *Cape Fear River Channel and Bar.*]

In 1921, the Corps of Engineers made a series of current observations, recording and plotting the paths of a number of floats during ebb and flood tides. The action of the floats demonstrated that the ebb tide flowed almost straight out to sea on a southwesterly course from the channel west of Bald Head Point, instead of straight west, the direction of the channel. In 1922, a new channel, following the current, was approved. The new channel has remained in the same general area and direction to the present day.[42]

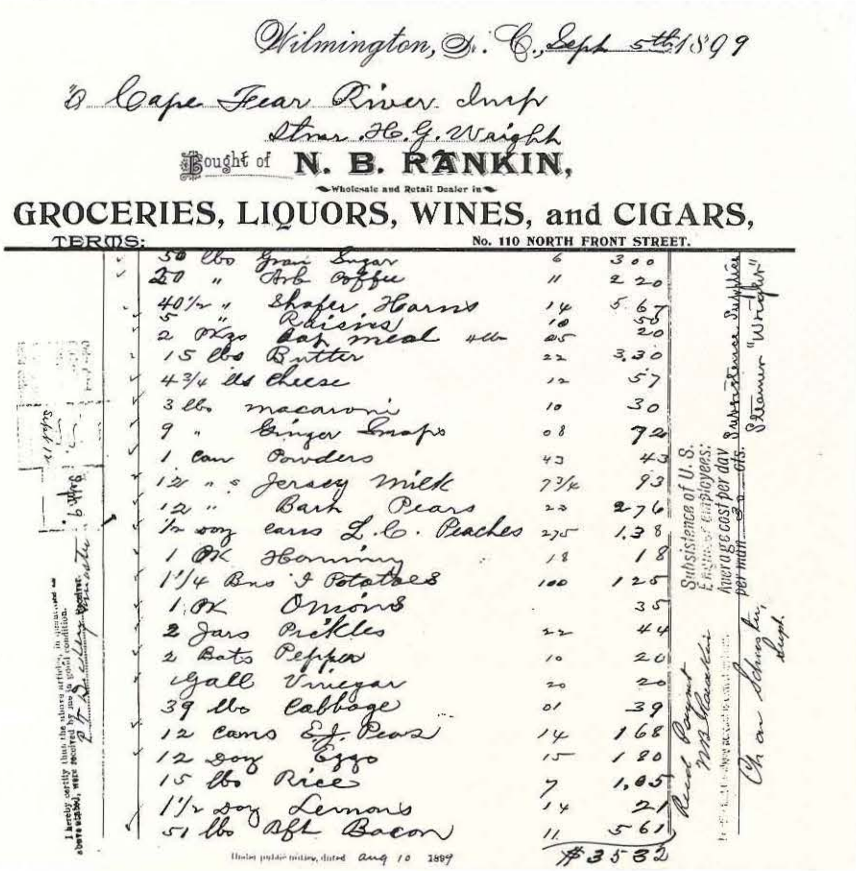
Upper Cape Fear River Locks and Dams

The improvement of the Cape Fear River between Wilmington and Fayetteville had been a dream of many Fayetteville citizens. After the Civil War, the river remained under the state charter of the Cape Fear Navigation Company. Congress appropriated $30,000 in March 1881 for the river's improvement, provided

the claim of the Cape Fear Navigation Company could be purchased. The federal government extinguished all rights and claims of the company by the payment of $10,000 that same year.[43]

Crews began clearing the river of snags in 1882, to provide a continuous channel over the 66 miles immediately below Fayetteville. In 1885, Congress specified a channel depth of four feet from Wilmington to Elizabethtown, a distance of 73 miles, and three feet, 42 miles farther to Fayetteville. Dredging, snagging, and jettying were all done on the river, with but few results. A freshet could wipe out the work of an entire season in just a few days. Fayetteville residents, under the leadership of Edward J. Hale III, Frederick Toomer Hale, and Thomas Hill Hale, continued to call for a year-round channel from Wilmington to Fayetteville.[44]

The Rivers and Harbors Act of 13 June 1902 provided for the construction of three locks and dams on the Cape Fear above Wilmington, at a cost of $1,350,000. They were intended to afford a depth of eight feet at mean low water between Wilmington and Fayetteville. The District completed surveys and selected three sites. Locks and dams were to be built at Kings Bluff, 39 miles above Wilmington; Browns Landing, 71 miles above Wilmington; and Tolars Landing, 95 miles above Wilmington.



Wilmington, N. C., Sept 5th 1899

To Cape Fear River Imp

Stmr H. G. Wright

Bought of **N. B. RANKIN,**

Wholesale and Retail Dealer in

GROCERIES, LIQUORS, WINES, and CIGARS,

TERMS: No. 110 NORTH FRONT STREET.

50 lbs	Gran Sugar	6	3 00
20 "	Arb Coffee	11	2 20
40½ "	Shafer Hams	14	5 67
5 "	Raisins	10	50
2 Pkgs	Oat meal 4 lb	05	20
15 lbs	Butter	22	3 30
4¾ lbs	Cheese	12	57
3 lbs	macaroni	10	30
9 "	Ginger Snaps	08	72
1 Can	Powders	43	43
12 "	Jersey milk	7¾	93
12 "	Bart Pears	23	2 76
½ doz	cans L. C. Peaches	275	1 38
1 Pk	Hominy	18	18
1¼ Bus	I Potatoes	100	1 25
1 Pk	Onions		35
2 Jars	Pickles	22	44
2 Bots	Pepper	10	20
1 Gall	Vinegar	20	20
39 lbs	Cabbage	01	39
12 Cans	E. J. Peas	14	1 68
12 doz	Eggs	15	1 80
15 lbs	Rice	7	1 05
1½ doz	Lemons	14	21
51 lbs	Aft Bacon	11	5 61
			$35 32

Subsistence of U.S. Engineer employees: Average cost per day per man 30 cts.

Subsistence Supplies Steamer "Wright"

Recd Payment N B Rankin

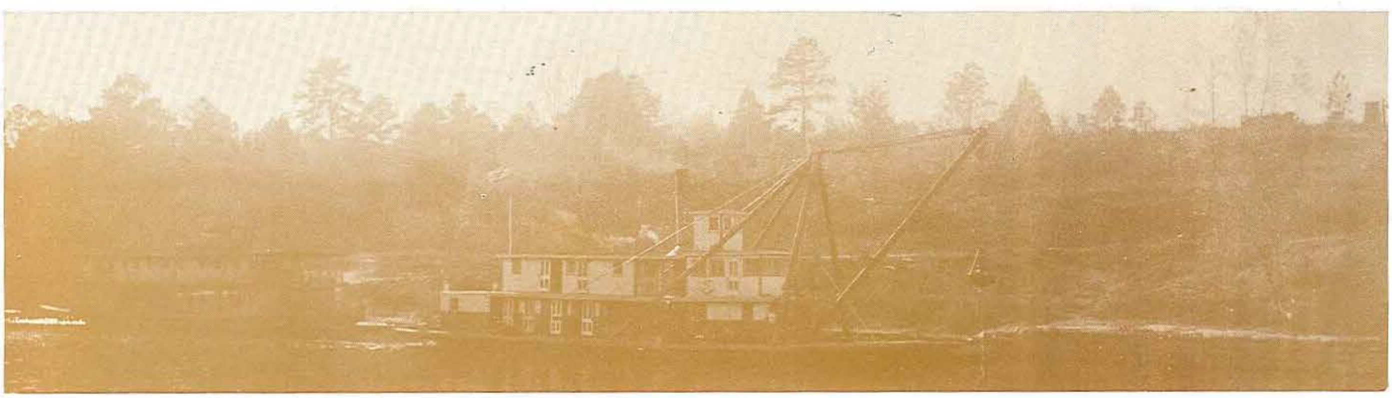
Chas Schnacker Supt.

I hereby certify that the above articles, in quantity and quality as above stated, were received by me in good condition.

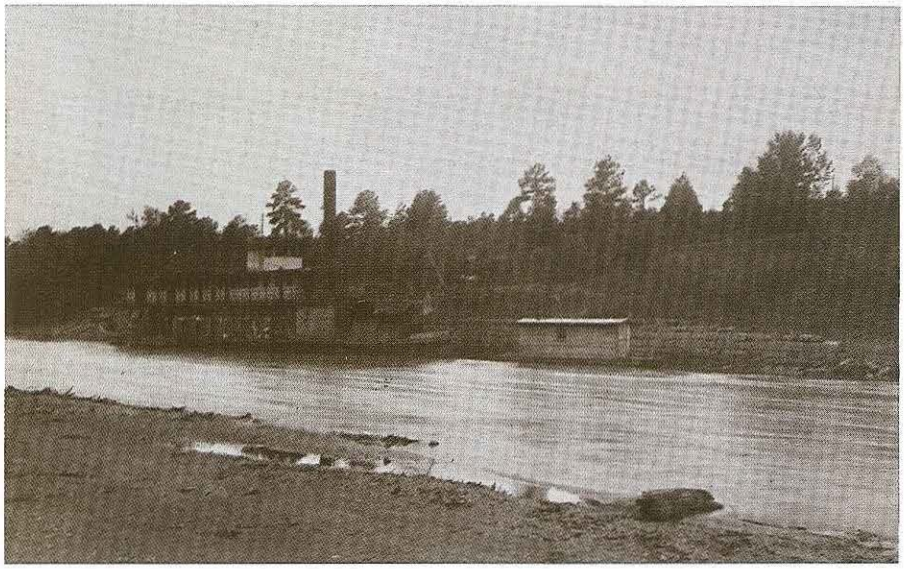
Under public notice, dated Aug 10 1899

Invoice for subsistence supplies for the H.G. Wright

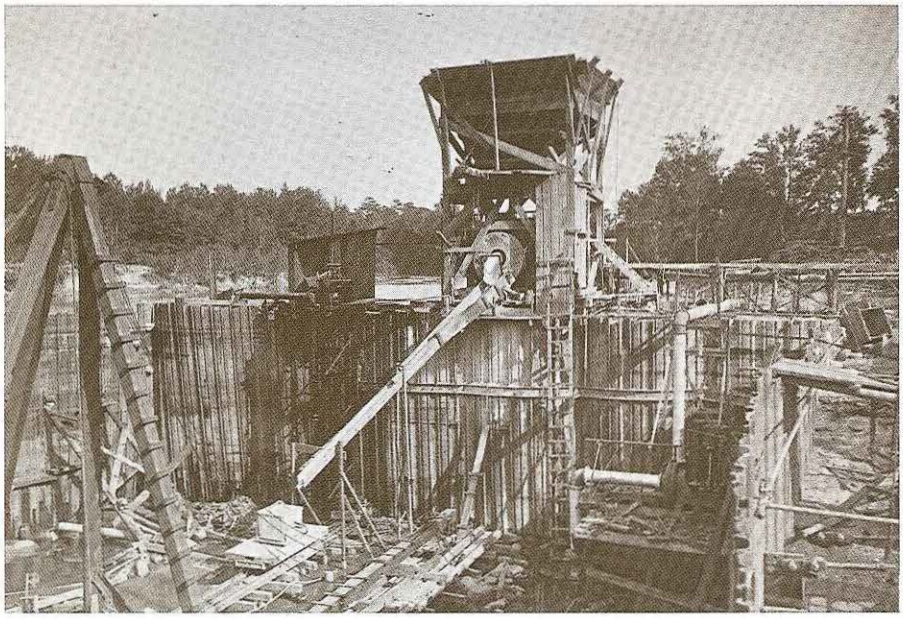
U.S. Snagboat H.G. Wright



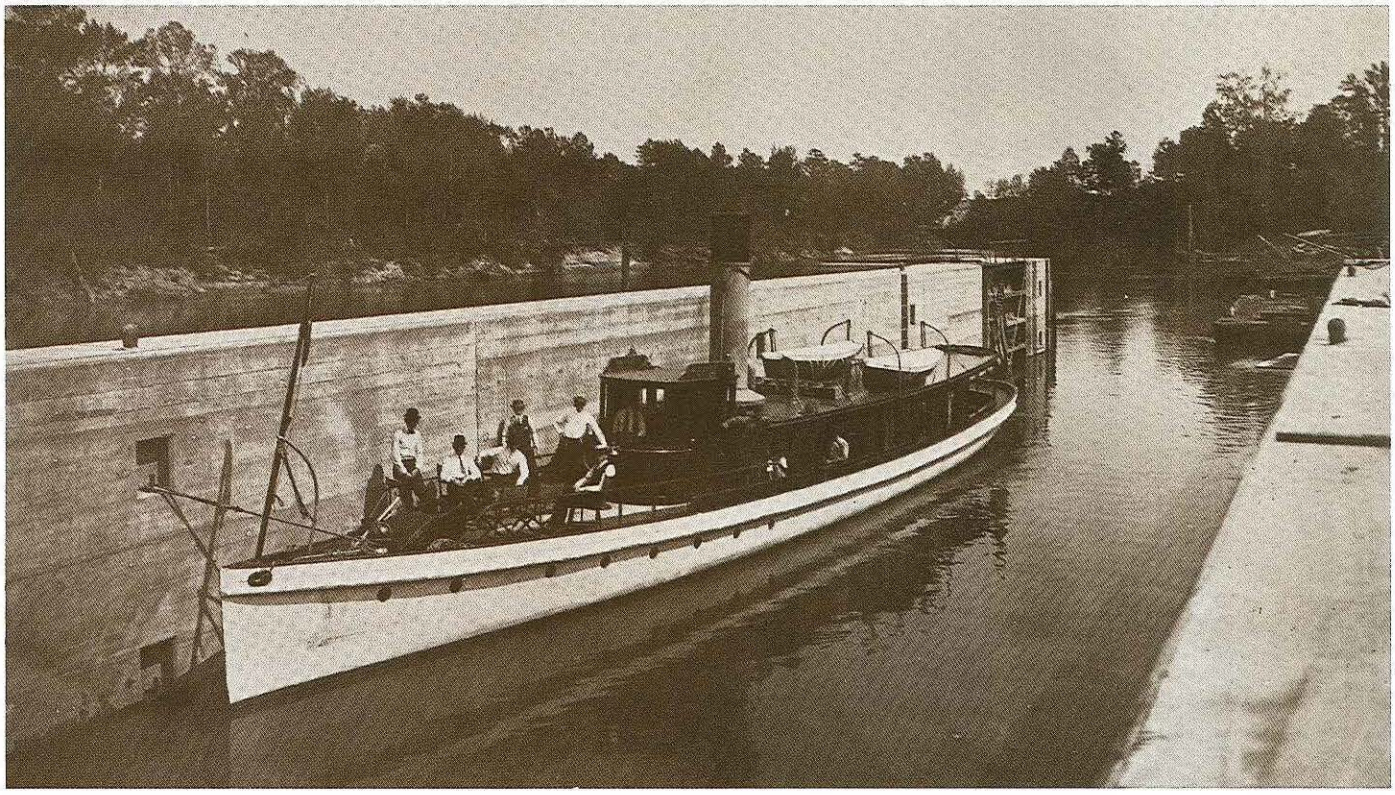
Sternwheeler passenger–freight boat traveled the Cape Fear River between Wilmington and Fayetteville, 1912.



Looking downstream from the coffer dam, Lock and Dam 1, is a construction scene showing concrete mixer and traveling derrick, 1914.



Construction scene at Lock and Dam 2 shows lock site and unloading trestle, 1914.



Steamer Mercur passing through the lock at Lock and Dam 1, 1915.

The three locks and dams faced strong opposition within the Corps of Engineers. The Division Engineer, Colonel Dan. C. Kingman, inspected the river and concluded, "I doubt very much if this river is worthy of improvement by locks and dams."[45]

On 11 January 1907, Major Joseph E. Kuhn, District Engineer, wrote a memorandum for the Board of Engineers for Rivers and Harbors on the project for canalization of the upper Cape Fear. Kuhn found fault with the project for several reasons. First, considered as a business proposition, the commerce on the river did not justify canalization at the estimated cost. Second, little new commerce could be expected because the river was paralleled on both sides by railroads out of Wilmington, although boats on the river might exercise a restraining influence on freight rates charged by the railroads. Third, Kuhn rejected the argument that canalization of the river would make Fayetteville a distributing point for a sizable territory beyond. "The benefits likely to result from this condition are, to say the least, extremely problematical, and probably chimerical."[46] The board agreed with Kuhn and recommended the construction of only two of the locks and dams, at Kings Bluff and Browns Landing. Congress appropriated $100,000 for the project in 1910.

The construction of the two locks and dams was hampered by the poor foundation at Kings Bluff and by high water. The test pit at Kings Bluff was begun in February 1912 by enclosing an area of 36 square feet. When the excavation reached 16.5 feet, a boiling spring burst through the clay, bringing up quicksand and rising nine feet in 30 minutes. A new test pit was enclosed, but before excavation could begin, the river began to rise; the crews worked feverishly to build a cofferdam and keep it just above the rising water. When the water receded, the excavation resumed. At an elevation of minus four feet (Bald Head datum), a new boiling spring, far greater than the first one, burst through and damaged the sides of the cofferdam. The exceedingly frustrated District Engineer, Major Horton W. Stickle, told Colonel Kingman, "If any site could be found more unsuitable for foundation purposes it has never come to my attention."[47]

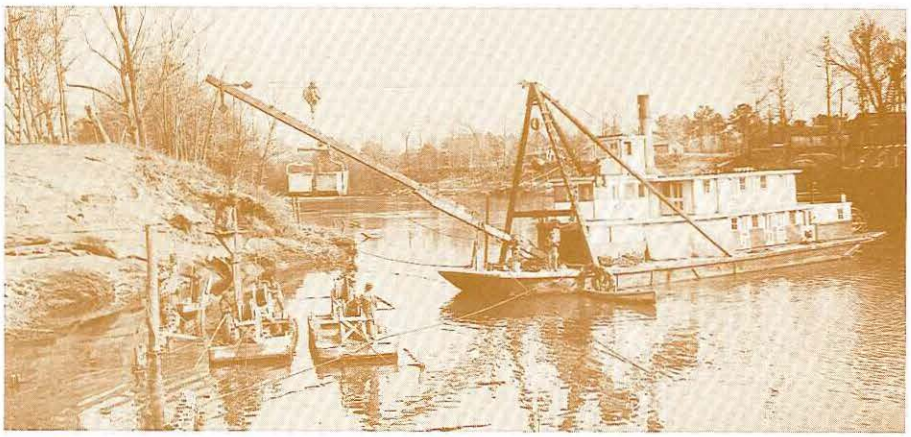
By November 1913, crews had completed the cofferdam with a bottom secured with concrete, 18 feet below low water. Once the cofferdam was finished, the work progressed smoothly. On 15 July 1915, the lock gates were closed for the first time and the lock put into operation.[48] The dam is a fixed, rock-filled, timber crib structure. The lock is concrete with steel gates and measuring 40 feet wide and 200 feet long.

The District learned several lessons while building Lock and Dam 1 and applied them to the construction of Lock and Dam 2 at Browns Landing. For example, the Board of Engineers had recommended pumping out the cofferdam of Lock and Dam 2 without sealing the bottom with concrete. However, the concrete floor at Lock 1 prevented the cofferdam's failure when pumped out, by providing a secure foundation for the steel sheet piling. District Engineer Clarence S. Ridley recommended following the same method at Lock and Dam 2. By pouring the concrete lock floor in 20 feet of water, the cofferdam walls were enabled to withstand the pressure of the river.

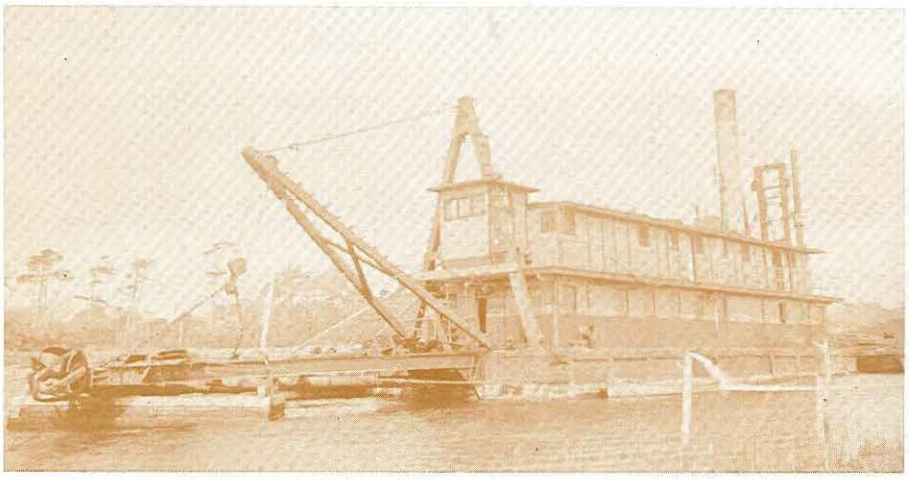
The District completed work on Lock and Dam 2 in 1917. The dam is a rock-filled structure with a portion of the rock coming from an old Corps of Engineers jetty between Browns Landing and Fayetteville. Lock 2 is identical in size to Lock 1.[49]

A Board of Engineers appointed in 1911 postponed construction of Lock and Dam 3 to determine if an eight-foot channel could be maintained by dredging to supplement the two sets of locks and dams. Dredging began in June 1919, starting at Fayetteville. Wilmington District's pipeline dredge *Croatan* worked only three days between 18 June and 25 October because of freshets or low water. Ordinarily the *Croatan* would remove between 1,500 and 2,000 cubic yards per day, but while on the Cape Fear she seldom removed more than 300 cubic yards. The material was a fine and heavy sand with a large percentage of gravel in places. Also, the large number of stumps, roots, and rocks in the stream frequently stopped the pumps, requiring repairs.

Although during the time the dredge was in operation it removed 41,984 cubic yards, a survey made just after the work stopped showed that the cuts had shoaled 23,339 cubic yards while the work was under way. During freshets, the river erased all signs of the dredged channel. District Engineer J.R.D. Matheson reported, "The whole river bottom is alive during a freshet and the sand is constantly moving." He concluded "that the project was utterly hopeless by this means of improvement." The construction of the third set of locks and dams would be necessary if the project depth of eight feet was to be achieved.[50]



Workmen deposited concrete in abutment foundation as cableway delivered buckets to pontons at Lock and Dam 2, 1916.



The pipeline dredge Croatan, 1923

CHAPTER VII

It Is Like a Cat Eating a Grindstone

First, in peace: The government by its policy can favor the natural growth of a people's industries and its tendencies to seek adventure and gain by way of the sea; or it can try to develop such industries and such sea-going bent, when they do not naturally exist. . . . In any one of these ways the influence of the government will be felt, making or marring the sea power of the country in the matter of peaceful commerce. . . .

—Alfred Thayer Mahan

The decade of the 1930s, a period of economic depression, was a time of great activity for the Wilmington District. Using money from New Deal relief agencies, the Wilmington District completed old projects such as the canalization of the Cape Fear River; continued others such as the Inland Waterway; and planted the seeds for future projects with the "308" studies of the Cape Fear, Neuse, and Tar rivers. The 1930s were also a period of transition for the District's personnel.

Lock and Dam 3

Fayetteville residents were dissatisfied with the results following the completion of Locks and Dams 1 and 2 on the Cape Fear River. After 1920, the Corps of Engineers made no effort to achieve the project depth of eight feet. Emergency maintenance work only was done on the river. But the people of Fayetteville continued to campaign for a year-round eight-foot channel. In response, the Rivers and Harbors Act of 22 September 1922 called for an examination and survey of the Cape Fear River above Wilmington, with a view to the construction of a lock and dam about 15 miles below Fayetteville.

In the preliminary examination report, forwarded to the Chief of Engineers on 1 February 1923, the District Engineer, Major Oscar O. Kuentz, concluded that an eight-foot channel to Fayetteville was justified, in the belief that a boom in commerce on the river would follow the completion of the Inland Waterway from Beaufort to Wilmington. Kuentz recommended a survey and preparation of estimates to determine the advisability of a third lock and dam, as compared with dredging to a year-round navigable depth. The Board of Engineers for Rivers and Harbors remained unpersuaded, but approved the District Engineer's recommended survey anyway.[1]

The survey report, completed the next year, offered the finding of Major Kuentz that the present and prospective commerce on the river did not justify the expense of a third lock and dam. Kuentz anticipated that when the Inland Waterway was extended to Wilmington, the project would probably provide for a depth of 12 feet. Barges using the waterway would naturally draw more than eight feet, which would necessitate breaking cargoes for upriver points at Wilmington, even if there were eight feet of water to Fayetteville. Kuentz predicted that a depth of eight feet to Fayetteville would not result in a large enough increase in commerce to justify a third lock and dam. The Division Engineer, Colonel J.C. Oakes, concurred in the District Engineer's conclusions. But the people of Fayetteville were not ready to give up their fight.

Community leaders met with Kuentz in Wilmington on 16 April 1925 to present additional data concerning the development of future commerce on the river. A member of the delegation, Senator Furnifold M. Simmons, one of the

project's strongest supporters, was responsible for keeping it alive in Congress. Major Kuentz simply rejected the proposal once more. Division Engineer Oakes agreed with Kuentz and apparently shut the door on the project, saying, "The District Engineer, Assistant Engineer Merritt and I are all convinced that, under present conditions, there is no possibility of developing a traffic on the stream commensurate with the additional cost of a third lock and dam. . . . I am positively convinced that the Government should not complete the project."[2]

Finally, in 1929, the Office of the Chief of Engineers directed Major William A. Snow, District Engineer, to prepare a supplemental report on the survey of the Cape Fear River. The report was completed by Major Raymond A. Wheeler, Snow's successor as District Engineer, who served in Wilmington from 1930 to 1933, and later was Chief of Engineers, 1945 to 1949. The survey report included Wheeler's recommendation that the existing project be completed by raising Lock and Dam 1 three feet and Lock and Dam 2 nine feet, supplemented by dredging, at a total estimated cost of $652,500, rather than building a more expensive third lock and dam.

However, a decision to complete the project was made possible by the anticipated completion of the Beaufort-to-Wilmington section of the Inland Waterway. Wheeler, the Board of Engineers for Rivers and Harbors, and Major General Lytle Brown, Chief of Engineers, reversed the earlier decision. They determined that sufficient commerce to warrant the expense of a third lock and dam was anticipated upon completion of the Inland Waterway from Beaufort to Wilmington.

The Board of Engineers for Rivers and Harbors modified Wheeler's recommendations and reinstated the construction of the third lock and dam at Tolars Landing. The board determined that the subsoil structure and foundation materials at Browns Landing would not permit loading an additional nine feet of dam onto the existing substructure without endangering the dam's stability. The board believed also that Lock and Dam 1 at Kings Bluff should be raised three feet to achieve the eight-foot channel at Fayetteville. General Lytle Brown, Chief of Engineers, concurred with the board's conclusions.[3]

Wheeler's replacement as District Engineer was Lieutenant Colonel Eugene Reybold. Reybold served as Chief of Engineers during World War II, becoming the first non-West Point graduate appointed Chief since the early 19th century. On 21 November 1933 he awarded a contract for the lock and dam to William Eisenberg & Sons of Camden, North Carolina, in the amount of $522,616.20. Construction of a cofferdam began on 3 February 1934, with the last sheet of steel driven on 19 March. As the cofferdam was unwatered on 22 and 23 March, the river began to rise. At 5AM on 28 March the gauge read 29.2 feet. By 8:50 the next morning, the water had reached a stage of 36.9 feet, at which point the cofferdam gave way. The collapse caused a loss of approximately $15,000 and four to five weeks of time, but no lives. Reybold accused the contractor of using some "poorly considered assumptions in design coupled with a somewhat flagrant disregard for local physical conditions."[4]

Using money appropriated under the National Industrial Recovery Act of 1933, Eisenberg & Sons built a 300-by-40-foot concrete lock with a nine-foot lift and a concrete dam. Lock and Dam 3 was 100 feet longer than the other two locks and dams, its dam concrete instead of the timber cribs filled with rock at the others. The first commercial cargo from Wilmington after the completion of the project reached Fayetteville 14 March 1936. It was a barge drawing 8.2 feet, loaded with gasoline and kerosene. The arrival of the tow at Lock 3 was greeted by a welcoming ceremony conducted by William O. Huske, president of the Upper Cape Fear River Improvement Association.[5]

The opening of Lock and Dam 3 meant a boost to the Fayetteville economy—to the point where the city could not obtain any Works Progress Administration projects that required skilled laborers, because there were none unemployed there. But maintaining a channel to project depth was a constant struggle for the Wilmington District.

On 1 May 1936, Huske complained to Congressman J. Bayard Clark about conditions on the river. Recent freshets had shoaled the stream so that the boats were going to have to suspend operations. The District Engineer, Major Ralph Millis, had cooperated in the effort to dredge the river. He dispatched a snagboat with a clamshell bucket on it to follow the barges and sound at every point where they met any difficulty. The snagboat began dredging a large shoal below Lock and Dam 2, but, snorted Huske, "The snagboat only has a ½ yard clam shell

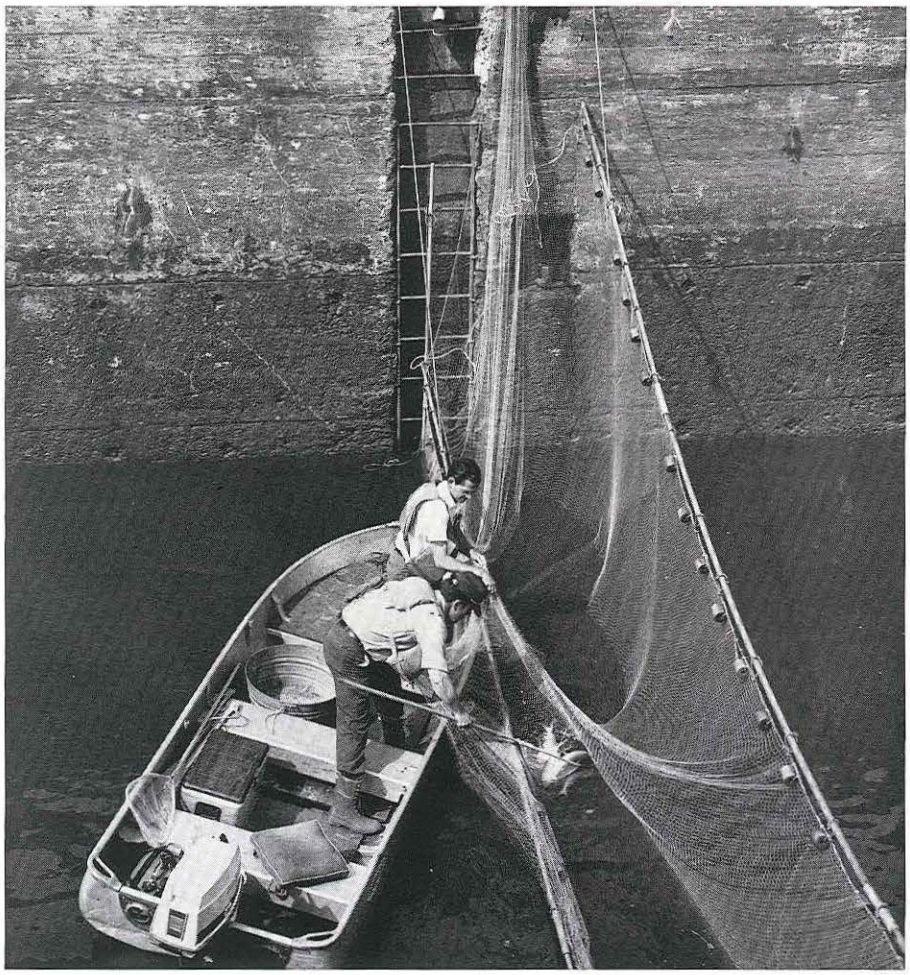
bucket on it, and with the shoal, which has developed it is like a cat eating a grindstone."[6] Huske kept the Wilmington office informed on the river's condition, and the District Engineer usually made every effort to keep boats moving on the waterway. In 1965, Lock and Dam 3 was renamed the W.O. Huske Lock and Dam in honor of Fayetteville's tireless promoter of improvements on the Cape Fear River.

The locks and dams produced a problem for fishermen on the river. The construction of Lock and Dam 1 destroyed the shad fishery. Before 1916, Fayetteville residents had caught several thousand shad every spring, and a number of people worked in commercial operations. But in the spring of 1916, fishermen caught only seven shad, because the lock and dam prevented the fish from swimming upstream to their traditional spawning area on the upper Cape Fear.

The District Engineer, Captain Clarence S. Ridley, studied the problem and recommended delaying the building of fish ladders at Locks and Dams 1 and 2 until an experiment suggested by D.J. Fergus of Wilmington could be tried. Fergus proposed stretching a net from the lower end of the locks diagonally across the stream to the opposite bank to guide the fish into the locks during the month of March. Then every hour during the day, Fergus wanted to close the lower gates, open the upper gates, and tap the lock floors with an iron rod or pipe to drive the shad through the upper gates. The experiment, carried out in the spring of 1917, proved unsuccessful.[7]

During the construction of Lock and Dam 3 and the renovations of Locks and Dams 1 and 2, fish ladders were added to the structures. The concrete ladders comprised a series of several pools, each seven inches wide by seven feet, nine inches long. But shad are sluggish by nature. They seldom jump out of water, so few used the ladders.

1934 construction scene at Lock and Dam 3, now called William O. Huske



Shad count in lock area at Lock and Dam 1. Early each shad season, workers count shad to determine when enough fish are going upstream to spawn. When the count is high, the lockmaster begins to lock them through the gates of the lock.

In 1961 a design memorandum covering major rehabilitation of Lock and Dam 1, prepared by the Wilmington District, went to the U.S. Fish and Wildlife Service for comment in accordance with the Fish and Wildlife Coordination Act of 1958. The Fish and Wildlife Service recommended a new fish ladder that would permit the shad to bypass the dam in large numbers. The District Engineer, Colonel Richard P. Davidson, estimated the cost of the fish ladder to be approximately $100,000—as much as the estimated cost for all the rehabilitation work planned. As an alternative, Davidson adopted a suggestion by Edwin (Peck) G. Long of the Engineering Division and proposed passing the shad through the navigation locks by a series of lockings.[8]

In the spring of 1962, the Wilmington District, the U.S. Bureau of Commercial Fisheries, and the North Carolina Wildlife Resources Commission carried out a joint study to determine the practicality of locking fish through Lock and Dam 1. They created an attraction flow through the lock, enticing the shad into the lock chamber and then lifting them to the upper pool. After the shad were counted, the upper gates and the lower eight valves opened to create a current so the shad would move upstream. During the first year's locking, an estimated 1,030 shad passed through Lock 1. After four years, the experiment was deemed fruitful, and the locking program expanded to include Locks 2 and 3 in 1967. The locking continues at the present and is still considered to be a success.[9]

Intracoastal Waterway

Just as a year-round channel from Wilmington to Fayetteville had been a dream for many Fayetteville citizens, the construction of a waterway paralleling the Atlantic Coast was an objective many people wanted to achieve. The existence of natural channels from the North Carolina sounds to within a short distance of Norfolk suggested the possibility of an inland water route from Norfolk to