

Chapter One: The *Bohemian Girl* Project

Introduction

In late June 2008, fieldwork began on the *Bohemian Girl* Project. Prior to commencing field operations, the author consulted a series of historical and archival holdings pertaining to the *Bohemian Girl*, Samuel C. Potts, and Lake Waccamaw commercial enterprises. Preliminary research largely composed of exploring historical accounts related to the timber industry that once contributed to Lake Waccamaw's economy. Cypress shingles and lumber were major products manufactured by local timber companies. During interviews, several Lake Waccamaw inhabitants stated that the *Bohemian Girl* was employed by at least one timber (Short & Beers Co.) company to pull shingle barges (McNeill 2007, pers. comm.). According to interview sources, the *Bohemian Girl* would tow a barge filled with rived shingles from the cutting site to the mill on the northern shore. The suggestion that *Bohemian Girl* towed shingle ferries was possible, given the efficiency of boats compared to mule carts in the swampy terrain.

No written records or photographs showing *Bohemian Girl* ferrying cypress shingles across Lake Waccamaw are known to exist. Most available photographs show the steam launch with tourists or its occupants fishing on Lake Waccamaw. The lack of archival and photographic evidence led to conducting archaeological fieldwork to compensate for the lack of documentation. The probability of finding physical remains consistent with a steam launch was low given the size of the lake. Photographic evidence was used to narrow the survey area for a phase one investigation. The original objective for the *Bohemian Girl* Project was to locate and record any vessel remains, if still in existence. An interview with a local historian, John McNeill

(2007, pers. comm.), revealed an abandoned steamboat in a location that corresponded with photographic evidence (Figure 1). The location was examined using snorkel gear and a DC600



FIGURE 1: Samuel C. Potts sitting adjacent to Flemington Dr. The *Bohemian Girl* is visible in the background (Photographed provided by the Lake Waccamaw Depot Museum).

digital camera.

Today, landscape features at the site are different from *Bohemian Girl's* operational period (estimated 1880s to 1910). Road development, construction of public beaches and services, and population increase contributed to the evolution of Lake Waccamaw's maritime landscape. Photographs provided by Ginger Littrell, curator for the Lake Waccamaw Depot Museum, depict *Bohemian Girl* near the shoreline (Figure 1). The tree line blocks any view of the boathouse, however, a boathouse was located at that site (McNeill 2007, pers. comm.). At present, Dale's Seafood, Inc. is positioned less than 50 yards from the boathouse site. Remnants of pilings and a crib wharf are located where the boathouse once stood. The site was given the site designation WAL0005 by the North Carolina Underwater Archaeology Branch. There was a

concentration of ferrous and wood remains scattered throughout the site. The discovery of artifacts influenced a decision to conduct a thorough archaeological investigation of site WAL0005.

Preliminary Research

Prior to the commencing fieldwork at WAL0005, the author conducted research on North Carolina timber companies, specifically ones that operated around Lake Waccamaw. Chapter Two of this work discusses a variety of issues concerning the social and economic history of the North Carolina timber industry. Special attention was paid to the North Carolina Lumber Company, formerly known as Short and Beers Lumber Company. Frances “Frank” Alexander Gault is the son of Frances Beers Gault, the last owner of the North Carolina Lumber Company.¹ Mr. Gault provided research material on, and insight into, the cypress shingle industry at Lake Waccamaw (Gault 2007, pers. comm.). None of the information supported the hypothesis that the *Bohemian Girl* ferried shingle barges. All sources suggest that, prior to development of a small rail line around the lake, shingle barges were poled across Lake Waccamaw (Gault 2007; McNeill 2007; pers. comm.). An additional objective of this chapter was to examine equipment used for cypress shingle production to assist WAL0005 artifact identification.

Chapter Three serves as a generalized history of the state’s internal improvements and why those developments were required. This section also addresses the advantages and disadvantages of commercial steamboats. Steam launches were much smaller than river steamers. Launches were not capable of hauling mass quantities, and therefore, they were restricted to primarily to human cargo. Commercial steamers were commonly insured to protect the cargo, putting the vessels into the written record. Insurance records include vessel dimensions, cargo, and other useful information. Most steam launches were not insured and were

¹ Note the spelling of Frances Beers Gault. Frances is a male, Gault family name.

not in the written record. *Bohemian Girl* did not have an insurance record, indicating the vessel had no commercial value nor did the vessel transport cargo other than passengers.

Chapter Four provides an in depth perspective on steamboat and steam launch development. The most important factor regarding this section is using photographs and archaeological remains for several purposes, including potentially identifying artifacts and *Bohemian Girl* documentation. The *Bohemian Girl* documentation section uses photographic evidence to compare and contrast vessel changes. Continuing developments in the smoke stack and internal machinery are visible, however the photographs are neither dated nor do they state which *Bohemian Girl* is in the picture. Other information obtained through photograph analysis includes the *Bohemian Girl*'s dimensions and construction pattern. The length, beam, and draft were estimated by careful photographic examination; none of which were documented through primary sources. The same circumstances include the construction pattern and tradition, however, the photographs provided great insight about these research objectives.

Photographs were used to determine the number of *Bohemian Girls* constructed. Chapter Five consists of photographic analyses in which all known *Bohemian Girl* images were examined for similarities and discrepancies. This section also assists artifact evaluation and identification. Several photographs portray recorded artifacts at site WAL0005. Chapter Five provided additional evidence that the recovered remains belonged to *Bohemian Girl*.

The site formation process at WAL0005 is unique in comparison to most North Carolina submerged sites. The primary cause for WAL0005's distinction is the environment in which the site is located. Lake Waccamaw is a body of water with a relatively neutral pH level. Chapter Six explains that Lake Waccamaw is fed from local floodplains that produce highly acidic water that enters the lake through canals and Big Creek. Lake Waccamaw's entire bottom contains a layer

of alkaline limestone sediment. When acidic water and alkaline limestone combine, the chemical reaction results in a neutral water pH level. Neutral water is excellent for artifact preservation due to its lack of iron oxidation (Rodgers 2004: 85). Ferrous artifacts will survive much longer in Lake Waccamaw in comparison to other water sources such as the Cape Fear River or Pamlico Sound. The ferrous remains recorded at WAL0005 experienced minimal iron oxidation and are in excellent state of preservation.

After preliminary research, a system of multiple working hypotheses was constructed to address a series of questions (Chamberlin 1964; Platt 1965). The topics included a variety of issues pertaining to *Bohemian Girl's* construction, operations, and destruction. Chapter Seven composes a series of possible explanations in a generalized form. The author conducted thorough background and field research investigations, however, numerous hypotheses can not be refuted with the acquired information. This short chapter introduces and discusses the research questions about the *Bohemian Girl* Project.

Chapters Eight and Nine serve as the project's analyses and conclusion sections. The actual hull of the vessel was never identified among the wood debris scattered throughout WAL0005. The author believes additional research would further assist the project. A remote sensing project encompassing all of Lake Waccamaw is the most logical choice. Though the lake is one of the largest, natural bodies of water in the North Carolina, a complete remote sensing survey is feasible. Anomalies would be easily accessible with basic scuba equipment and the visibility is ± 5 feet (ft.). Rumors of a steamboat sunk off the WAL0005 site can not be confirmed without a remote sensing survey that can provide coordinates for visual inspection.

In addition to the remote sensing survey, the *Bohemian Girl* Project can be used as a case study for a more overall approach to steam launch research. The large steamers that plied the

Mississippi River have been thoroughly researched and several have been excavated. Steam launches were a recreational vessel, possibly the first vessel type used for this purpose by a large population. Many launch variations were constructed, but the fantail design became a common class throughout the United States. Though the *Bohemian Girl* was not significant outside the Lake Waccamaw area, it provides useful information for better understanding lifestyles of those who operated similar vessels.

Summary

The *Bohemian Girl* Project represents a basic phase two archaeological survey in which vessel remains were identified, recorded, recovered, and conserved. The project began as a phase one archaeological survey, however, the discovery of vessel remains and site location warranted a phase two project. The project, though successful, is a small part of steam launch usage throughout the United States. The *Bohemian Girl* shared similar design characteristics with other fantail launches and was used for comparable recreational purposes. Further research is recommended to locate any hull remains further offshore, if still in existence. A remote sensing project would supplement this research and possibly provide more answers than what WAL0005 yielded.

Chapter Two: The North Carolina Naval Stores and Shingle Industries

Introduction

The North Carolina timber and naval stores industries are two of the earliest commercial enterprises developed within the state. Lumber and naval stores were North Carolina's predominant exports from the eighteenth century until the Reconstruction period (Johnson 1977: 89). At Lake Waccamaw, the naval stores and shingle industries were the primary economic forces in that region (Frank Gault 2007, pers. comm.). This chapter will examine the North Carolina timber industry as a whole, then focus on Lake Waccamaw. The purpose of the chapter is to ascertain the timber industry's regional economic contribution, and determine the *Bohemian Girl's* trade involvement. A second objective is to determine if artifacts from site WAL0005 are timber industry tool remains.

Pine Tree Classification and Uses

The pine tree was the primary component of the North Carolina naval stores industry (Vance 1932). Several other types of trees were used, but the pine tree was the most exploited. Pine trees are classified as coniferous, belonging to the genus *Pinus*. Scientists estimate the pine tree family consists of over 115 species, ten of which exist in North Carolina (Little and Critchfield 1969). Only four pine species were desired for commercial use: the loblolly (*Pinus toeda*), the longleaf (*Pinus palustris* Miller), the shortleaf (*Pinus echinata* Miller), and the slash (*Pinus caribaea* Morelet)(Wahlenberg 1946). The loblolly and shortleaf species are generally found throughout the Piedmont region, while the longleaf and slash species grow along the coast. The longleaf pine was the principal species used for the naval stores industry, dramatically overshadowing the other three pine types (Wahlenberg 1946).

There are three different techniques for obtaining naval stores from pine trees: gum, sulphate, and wood (Coppen and Hone 1995). In North Carolina, the naval stores industry extracted turpentine, a coarse gum from which rosin was obtained. Rosin is a turpentine by-product produced from living trees. The inner sections of dead trees, known as lightwood,

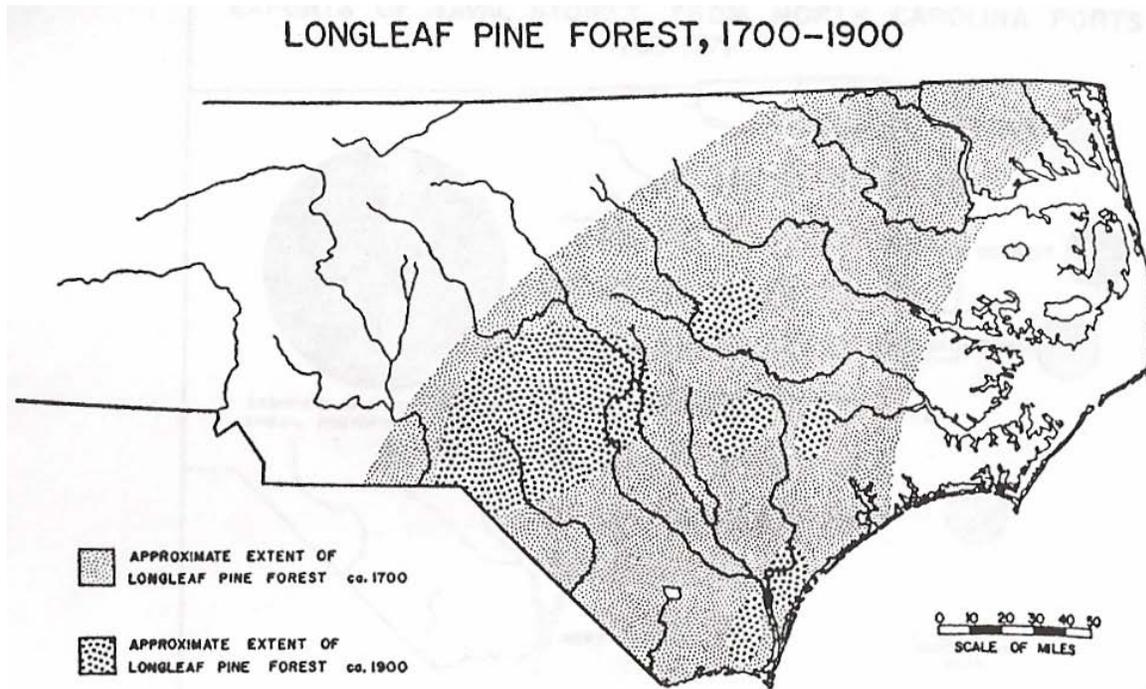


FIGURE 2: Longleaf pine distribution from 1700-1900 (Illustration from Merrens 1964: 86).

produce tar, which can be refined to produce another substance called pitch. Tar and pitch were used to waterproof wooden sailing vessels, making them necessary to the shipbuilding industry. Given the high density of pine trees throughout North Carolina, production of gum naval stores became an important economic part of the state's economy.

When the external surface of a pine tree is penetrated, it secretes a liquid known as oleoresin, or turpentine (gum). Oleoresin is produced during the metabolism process by which food nutrients convert to external tissue (Schorger and Betts 1915: 10). The oleoresin accumulates in channels underneath the pine bark. Workers can successfully increase the number of oleoresin channels by removing the bark. The bark removal also accelerates resin flow. The

resin ducts are common throughout all North Carolina pine species, but are most developed in longleaf and slash pines (Schorger and Betts 1915: 10-11). The channels run upright and across the tree surface, and the incision of either system allows resin to flow (Wahlenberg 1946: 190). To extract the maximum amount of resin, the incision must continuously reopen to prevent drying of parenchyma cells. If the severance locations are not reopened in short succession, the gum hardens and seals the incision.

Over time, when a tree is determined inefficient to produce enough oleoresin for distillation, the tree is used for producing tar and pitch. Dead trees, killed by natural events, are the best candidates for producing tar because oleoresin within the tree lies undisturbed for years with little decay (Wahlenberg 1946: 192). Tar production begins when the inner sections of a tree are cut out, processed in a kiln, covered, and burned for a considerable time. The burning process extracts the remaining oleoresin, in this case as tar. Tar, like oleoresin, is capable of a distillation process that produces pitch (Wahlenberg 1946: 193). Prior to the development of iron and steel vessels, tar and pitch were a highly valued commodity to the shipbuilding industry.

During the winter months, laborers cut fissures at the base of the tree known as “boxes.” Boxing trees required a special axe, usually of considerable length, but narrow in width (Olmsted 1904: 337). The size and number of boxes depended on tree dimensions. The larger the tree’s size, the more boxes it could yield (Olmsted 1904: 339). A skilled worker could cut some 90 boxes per day, and 10,000 per season. Pay increases were given to workers who excelled in cutting more than their original allotment. The box cutting process is considered the most significant portion of the turpentine extraction process. The successes or failures depend on where and the manner in which the boxes are cut.

Unrefined turpentine is not desirable for many purposes. The oleoresin requires distillation to be useful as spirits, oil, or rosin. Prior to 1790, most crude turpentine was shipped to England for processing. From the late eighteenth century to the early nineteenth century, North Carolina experienced a sharp increase in turpentine distilleries (Crittenden 1936). The demand for distilled turpentine did not come close to exceeding the demand for tar and pitch. In 1804, 650 barrels of distilled turpentine were exported from the state, a fraction in comparison to tar and pitch (Michaux 1819). Six years later, the number of exported distilled turpentine barrels increased to 2,160 (U.S. Treasury Department 1810). The following two decades experienced a marginal increase in distilled turpentine production, and by 1830, turpentine manufactures exceeded tar and pitch. Demand and technological developments in the distillation process rapidly aided turpentine production (*Wilmington Herald* 1851).

Naval stores were shipped in large barrels, consuming a lot of space and producing a heavy burden. The transportation of naval stores was a constant burden for distilleries, which needed to transfer production to coastal markets. During the early to middle nineteenth century, North Carolina terrain only allowed two types of transportation: overland and inland waterways. Both methods were used by various distilleries; however both methods had advantages and drawbacks.

Waterway Transportation Methods

Inland waterway, or river transportation, was the desired means for shipping over extended distances. North Carolina has a large number of rivers, inlets, and bays suited for inland commercial shipping. Prior to the introduction and use of commercial steamers, North Carolina waterways were navigated by wooden sailing vessels, rafts, or pole barges (North Carolina Board of Internal Improvements 1828: 17-18). The arrival of steamboats on North Carolina

waterways did not stop the use of pole barges or other rafts. More often than not, rivers were too shallow for steamboat use, forcing distilleries to store their products until winter. Rains increased most river depths, allowing steamboats upstream access. North Carolina newspapers frequently reported the difficulties with the lack of rain during the summer months:

Rain having fallen in large quantities during the past week, the rivers have been up, and produce has consequently come down more abundantly than at any period during the last twelve months. It is estimated by the Inspectors, that nearly 40,000 barrels of Naval Stores have been brought to town since the present freshet commenced (Wilmington Journal 1842-1856).

The development of shallow-draught steam vessels and internal improvements increased distilled turpentine production and exportation. Steamboats allowed distilleries to produce perennial marketing, as opposed to seasonal retail.

The Cape Fear River was the most used waterway during the age of steamers (1810-1900), and continues to play a major economic role today (*Wilmington Journal 1842-1856*). The Cape Fear region was the most developed of North Carolina and produced the majority of naval stores. Fayetteville, located along the Upper Cape Fear, became an important trading center. In addition to being a central trade location, Fayetteville was also responsible for the construction of numerous steamers. Fayetteville's Joshua Toomer was one of the more important shipbuilders (*Wilmington Journal 1842-1856*). Toomer experimented with a wide range of steamboats and vessel components. That experimentation led to developing shallow-draught steamers capable of navigating North Carolina's inland waterways (*Wilmington Journal 1842-1856*). The steamers were capable of carrying heavy cargo, but the majority served as towboats (*North Carolinian 1851*).

PORTS OF COLONIAL NORTH CAROLINA

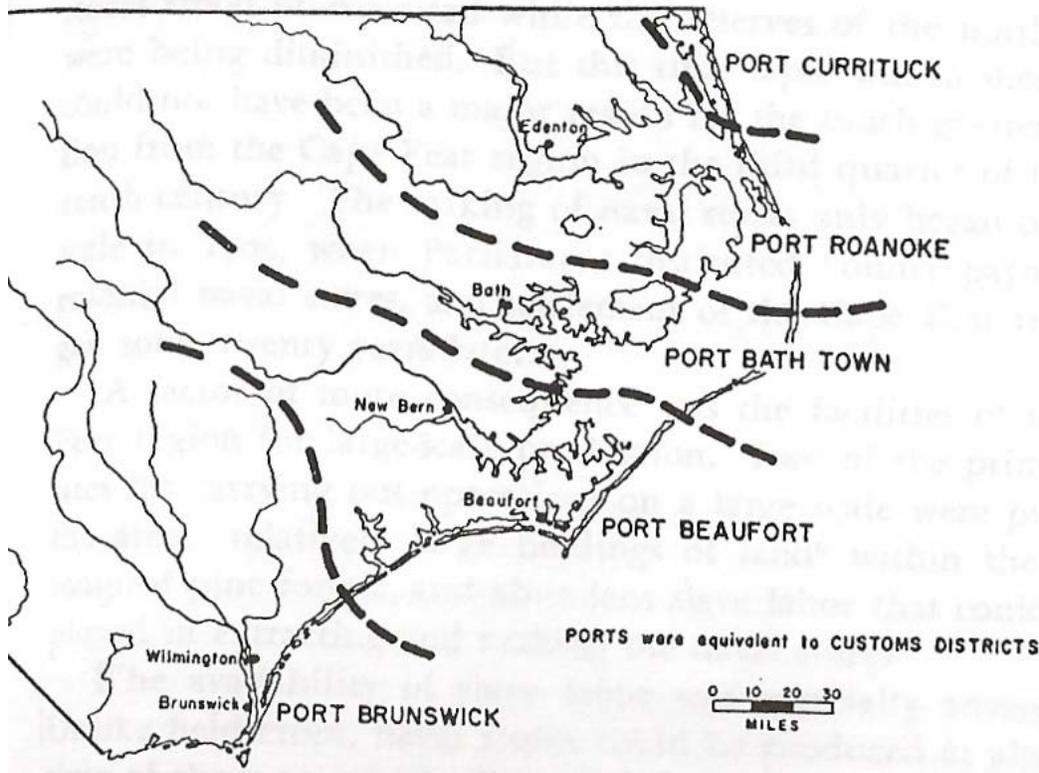


FIGURE 3: Major colonial North Carolina ports and inlets (Illustration from Merrens 1964: 87).

Steamboats varied in length, beam, and draught but all were constructed to operate on specific rivers. Steamboats ranged between 100'-130', with a beam between 15'-25'. The Henrietta Steamboat Company owned and operated the largest steamer, *Fayetteville*, on the Cape Fear River (*Wilmington Chronicle* 1842). The *Enterprise*, which also worked on the Cape Fear River, was among the smallest steamers and only drew 17 inches of water (*Wilmington Journal* 1842-1856). Internal improvements not only increased the amount of cargo traffic, but passenger traffic as well. Each steamboat company reserved at least one vessel for passengers, however, passenger steamers were usually of smaller burden. The reduction in size was compensated by

increased speed, allowing passengers swift mobility through most eastern sections of the state (*Wilmington Journal* 1842-1856).

The Use of Railroads

Over the course of many decades, naval stores resources accessible by water were nearly expended. By 1833, several citizens from Wilmington's elite urged construction of a railroad. These merchants approached the state government for financial assistance to build and operate this relatively new transportation method. In 1835, the town of Wilmington received a state charter allowing construction. Actual construction did not commence until the following year and proved difficult. State assistance was required for completing the rail line, and the state obtained a \$500,000 subscription. The construction of the Wilmington & Weldon Railroad lasted four years, but the 161 miles of track, at one point, was the longest in the world (Sprunt 1916: 149-154). The new rail line accessed previously untouched naval stores resources.

Wilmington's immediate response to the railroad was one of excitement and expectation of market increase. The following editorial was published revealing the anticipation of the railroad's usefulness:

We always recur to this subject with pleasure, no less than with a sense of duty, because we believe its progress is regarded with interest elsewhere, and certainly it is closely identified with the well being of the State, and the prosperity of this town and the adjacent parts. The work goes on with vigor and rapidity. A good deal of produce has already been brought to this market by the way of the railroad, such as Turpentine, Tar, Bacon, Corn, etc. and by another business season, the receipts through that channel will no doubt be immense (Wilmington Advertiser 1838).

The successes of the first railroad convinced Wilmington's citizens and merchants that additional railroads could further increase market revenue. In 1846, a new line from Wilmington into South Carolina was laid out. The line passed through Columbus County, which up to this point had not

been exploited, although it had substantial pine and cypress forests that had remained virtually untouched (Gault 2007, pers. comm.)

Columbus County

Columbus County is 50 miles west of Wilmington. The county was only accessible by an overland route, with the exception of the Waccamaw River. The river is fed by Lake Waccamaw, but the waterway flows into South Carolina as opposed to a North Carolina port. Prior to development of the new rail line, only small roads and trails connected this county to more developed regions. The lack of access was why the county's abundant naval stores and timber had not been harvested earlier (Gault 2007; pers comm.). The new railroad was named the Wilmington and Manchester Railroad, the names of the starting and ending towns. An article in the *Wilmington Journal* describes the potential effects of the new line on Columbus County's development:

On our way there, we traversed a considerable portion of the country over which the projected railroad will pass, and we could not conceive of a country more favorable, in every respect, for the construction of the Road. As level, almost, as a perfect plain, with a profusion of the finest timber we have ever laid our eyes upon. When the Road is built, those immense bodies of fine Turpentine lands will come into play, and consequently they will rise unprecedentedly in value. We conversed with a great many gentlemen, and all of them are anxious for the success of the Road. No wonder that they should. It will be the making of Columbus County (Wilmington Journal 1842-1856).

In 1855, the Wilmington and Manchester Railroad increased Wilmington's revenue 10% compared to the prior year. The railroad promoted the growth of local businesses, despite the adverse economic situation in North Carolina (*Wilmington Journal* 1842-1856).

During the 1850s, Columbus County and neighboring regions were the sites of considerable turpentine and timber production. Large quantities of timber products were

produced and shipped to markets by rail. In 1856, the *Wilmington Journal* (1842-1856) published a report containing production figures

...were interesting in exhibiting the production of the pine forests and their great value as articles of transportation. That portion of the forest extending from Lake Waccamaw to Fair Bluff, a distance of thirty miles, may be considered a fair example. From points within this distance there has been transported during the year 82,360 barrels of Naval Stores, and, if the ordinary demand had existed, immense quantities of Timber and Lumber would also have sought this market. These statistics exhibit in the strongest language the inducements to foster and encourage the local business as the most reliable and certain traffic, and one of which cannot be diverted by rival works, but will continue to increase with increased facilities.

Wilmington was not the final destination for the naval stores and timber products. The goods were usually loaded on sailing vessels, most likely a schooner, and shipped to the large ports in New England. The port of Wilmington was the leading exporter of naval stores throughout the United States, but given North Carolina's hazardous coastline geography, the port was restricted to mainly coastal trade.

The Pine Tree's Near Demise

Columbus County relied heavily on the naval stores industry. The industry's importance is evident in the formation of the Council Tool Company. Formed in 1886 by John Pickett Council, the company manufactured tools specifically designed for turpentine (*News and Reporter* 1930). Council Tool Company became a major producer of naval stores implements used all over the world. The manufacturer produced every tool necessary to construct a box and process oleoresin. Such tools include: box and maul axes, tin pullers, gutter chisels, box pullers, and hacks (Figure 5). The Council Tool Co. produced every tool component, including the iron striking edges and wooden handles. The company was successful from its formation and continues to produce tools for various industries.

Through over-production and environmental factors, North Carolina longleaf pine resources were depleted in many regions. The rise in turpentine demand and prices encouraged increased manufacturing, thus resulting in depletion of the necessary resources (Forbes 1930). Over-harvesting was only one issue concerning the pine woodland areas; the boxing process made pines susceptible to insect infestation. The invading insect types were drawn to injured tree sections, preferably open wounds that allow easy access. Insects fed off the trees, eventually resulting in the tree's death. Naval stores researchers and entomologists are not certain what insect species was mostly responsible for the pine destruction, but several species are prevalent throughout North Carolina (Outland 2001: 325).



FIGURE 4: Turpentine tools located at Turnbull Creek State Park (Photograph provided by the North Carolina Forestry Museum).

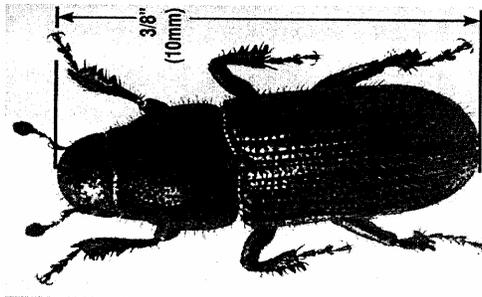


FIGURE 5: Ips bark beetle (Illustration from Outland 2001: 326).

Insect researchers argue that the Ips bark beetle is the most common species known for invading pine trees. Entomologists argue this beetle species is responsible for more tree deaths, than the other bark beetle species combined (Outland 2001: 326). The Ips' attack pattern usually singles out weakened trees, but the destruction of groups is a common occurrence. The Ips beetle also carries a blue-stain fungus that spreads throughout the tree, weakening the tree beyond recovery. Damage caused by the Ips beetle allows other invading insects the ability to further destroy tree integrity. Such insects include the black turpentine beetle and the southern pine beetle.

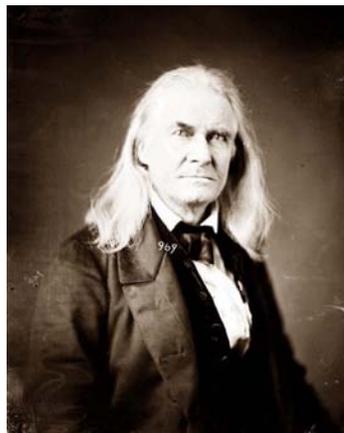


FIGURE 6: Photograph of Edmund Ruffin (Outland 2001: 329)

Edmund Ruffin (1794-1865), argued that hogs were responsible for the pines failure to reemerge (Ruffin 1843: 250). The hogs were said to eat the pine cones, which housed seeds necessary to generate new trees. Even young trees were at risk as the hogs uprooted the small

trees to devour roots. More recent observations argue the absence of brush fires contributed to the pine tree demise (Outland 2001: 330). In modern times, forestry technicians purposely start low-level fires with the intention to burn away undergrowth. In addition to eliminating hindering plant species, brush fires also assisted in eradicating invading insects (Outland 2001: 330-332). The insects generally attack the lower portions of a tree, and low-level fires potentially flush out the harmful insects.

Other Timber Products

The combination of over harvesting and insects forced turpentiners to make difficult decisions in determining if their trees were worth rejuvenating, moving their business to new locations, or changing industries altogether (Outland 2001: 330). The turpentiners commonly turned to agriculture as a means by which they could retain their land and produce capital. The decade after 1850 experienced significant declines in turpentine production and increases in crops, specifically cotton.

Timber products, other than naval stores, were also exported from North Carolina. As early as the eighteenth century, North Carolina commercially produced ship components and shingles. The following tables, from 1768 to 1772, display timber exports from major ports (Merrens 1964: 94-95).

TABLE 1
North Carolina Port Records from 1768

Port	Sawn Lumber		Shingles		Staves	
	Amount in feet	%	Pieces	%	Pieces	%
Currituck	0	0	909,340	15	73,600	4
Roanoke	233,056	7	2,644,157	44	1,337,778	77
Bath Town	516,323	16	382,500	6	61,600	4
Beaufort	91,054	3	565,140	10	129,299	7
Brunswick	2,328,075	74	1,504,000	25	139,340	8
Total	3,168,508	100	6,006,137	100	1,741,617	100

TABLE 2
North Carolina Port Records from 1769

Port	Sawn Lumber		Shingles		Staves	
	Amount in feet	%	Pieces	%	Pieces	%
Currituck	10,300	0.3	1,425,000	25	65,700	2
Roanoke	135,356	4	1,551,900	27	1,469,986	54
Bath Town	542,125	16	381,600	7	332,700	12
Beaufort	336,085	9.7	758,550	13	514,803	19
Brunswick	2,437,000	70	1,536,000	27	361,200	13
Total	3,460,866	100	5,653,050	100	2,744,470	100

TABLE 3
North Carolina Port Records from 1770

Port	Sawn Lumber		Shingles		Staves	
	Amount in feet	%	Pieces	%	Pieces	%
Currituck	10,300	0.3	1,425,000	25	65,700	2
Roanoke	135,356	4	1,551,900	27	1,469,986	54
Bath Town	542,125	16	381,600	7	332,700	12
Beaufort	336,085	9.7	758,550	13	514,803	19
Brunswick	2,437,000	70	1,536,000	27	361,200	13
Total	3,460,866	100	5,653,050	100	2,744,470	100

TABLE 4
North Carolina Port Records from 1771

Port	Sawn Lumber		Shingles		Staves	
	Amount in feet	%	Pieces	%	Pieces	%
Currituck	44,500	1	933,800	16	541,450	15
Roanoke	232,398	6	2,154,910	38	1,786,563	48
Bath Town	514,900	14	607,700	11	318,100	9
Beaufort	334,856	9	332,200	6	714,828	19
Brunswick	2,811,654	70	1,659,000	29	351,000	9
Total	3,811,654	100	5,687,610	100	3,711,941	100

TABLE 5
North Carolina Port Records from 1772

Port	Sawn Lumber		Shingles		Staves	
	Amount in feet	%	Pieces	%	Pieces	%
Currituck	0	0	669,820	11	316,266	19
Roanoke	172,236	4	2,565,850	41	1,544,762	50
Bath Town	653,500	16	683,700	11	206,600	7
Beaufort	428,641	10	530,000	9	606,269	19
Brunswick	2,864,000	70	1,766,000	28	445,800	14
Total	4,118,377	100	6,216,170	100	3,119,697	100

Sawn lumber production increased with the number of sawmills throughout the state, especially in areas of dense pine woodlands. Shingles and staves were different than sawn lumber, both in terms of production and exploited tree species. Sawn lumber primarily used pine but shingles and staves require more durable wood species. Staves were produced using various species of oak. Staves accounted for a large portion of timber products, ranking second behind naval stores.

The Emergence of Shingles

The third most exported timber product was shingles. White cedar (*Chamaecyparis thyoides*) and cypress (*Taxodium disitchum*) were the preferred species for producing shingles (Merrens 1964: 104-105). Both species share similar characteristics that include: soft, light, and resistant to saturation and drying damage. The softness attribute is necessary to cut and rive shingles to desired dimensions. The wood is light in weight, especially in comparison to other local wood species. The lack of substantial weight is ideal for use on rooftops and siding, reducing the structural burden. When saturated and quickly dried, most wood species deteriorate at increased time frames (Gault 2007, pers. comm.). White cedar and cypress do not deteriorate at the same rate as other wood species, allowing a longer usage period.

The two tree species are most common throughout the coastal plain, especially in swampland or floodplains. The species abundance was limited due to the wide distribution of

large groupings. Prior to the eighteenth century, most shingle production took place in the Great Dismal Swamp. By 1768, Port Brunswick became a major shingle export location (Merrens 1964: 105). The following four years, Port Brunswick exported nearly 1.5 million shingles, solidifying the Cape Fear region as a significant supplier. Over time, internal improvements increased and the need for more resources pushed timber and shingle manufacturers inland to new counties, including Bladen, Columbus, Cumberland, and Robeson.

Over an extended period of time, the naval stores industry depleted Columbus County's pine woodlands. After the Civil War, demand for naval stores declined, but the need for timber increased. Cypress shingles emerged as a lucrative business venture, producing capital for sawmills in the Lake Waccamaw vicinity. The first shingle mill company at Lake Waccamaw was started in 1869 by Charles O. Beers (Little 1980). Two years later, H.B. Short opened a second shingle mill on Lake Waccamaw's southern shore, and became Beers main competitor. In 1879, the two companies merged, forming the Short & Beers Lumber Company, based in Hallsboro (Frank Gault 2007, pers. comm.). The Short & Beers Company was quite successful despite several competitors in close proximity, such as the Waccamaw Lumber Company in Bolton, the Thompson Lumber Company and Pierson Company located in Hallsboro (Frank Gault 2007, pers. comm.).

Frances Beers Gault was born in 1875 at St. Peter, Minnesota. Gault was the nephew of Charles Beers, who lived in the Lake Waccamaw vicinity. Frances Gault was a certified civil engineer and started work with the Short & Beers Company as a surveyor. Gault surveyed a large portion of Green Swamp, where there was an abundance of cypress used for shingles. When Beers died in 1911, Gault assumed control of the company (Gault 2002). Shortly thereafter, Gault renamed the corporation the North Carolina Lumber Company, and maintained

control for several more years. Eventually, the company was sold to Georgia Pacific (Gault 2007, pers. comm.). In late May 1930, sections of the North Carolina Lumber Company burned (*The News Reporter* 1930). The shingle mill was spared, but other sections were completely destroyed. Shortly after, the North Carolina Lumber Company was shut down and never reopened (Gault 2007, pers. comm.).

From Cypress Stump to Manufactured Product

The shingle companies in the Lake Waccamaw region did not use advanced technology as they relied solely on skilled labor to produce cypress shingles. The first step in the production process was to find a suitable tree, large enough to produce numerous cuts. The tree was sawn down using cross-cut saws. Several Lake Waccamaw cypress trees required at least two days to fall, due to their massive size (Gault 2007, pers. comm.).



FIGURE 7: Waccamaw Lumber Company labor force (7 May 1913) (Courtesy of the Lake Waccamaw Depot Museum).

After the timber was cut, either mules or oxen were used to drag the felled tree to a location where riving took place (Figure 8). The North Carolina Lumber Company operated in the vicinity of the present-day Lake Waccamaw State Park, where large cypress was most abundant. The timber was cut into long sections, flat on both ends (Figure 9). Using a froe and wooden mallet, a worker cut into the wood at a specific thickness from one end to the other. That process was repeated until the timber was completely cut into long, thin sections. A worker used a “horse”, a wooden device that resembles a chair. He would sit on the horse and place his feet on a pedal that clamped a shingle in place. The clamp held the shingle while the worker, using a froe or other sharp edge, finished the shingles into the final dimensions. Shingles are tapered, and producing quality shingles was a skill only gained through experience.



FIGURE 8: Laborer standing next to stack of cut shingles (Courtesy of the Lake Waccamaw Depot Museum).

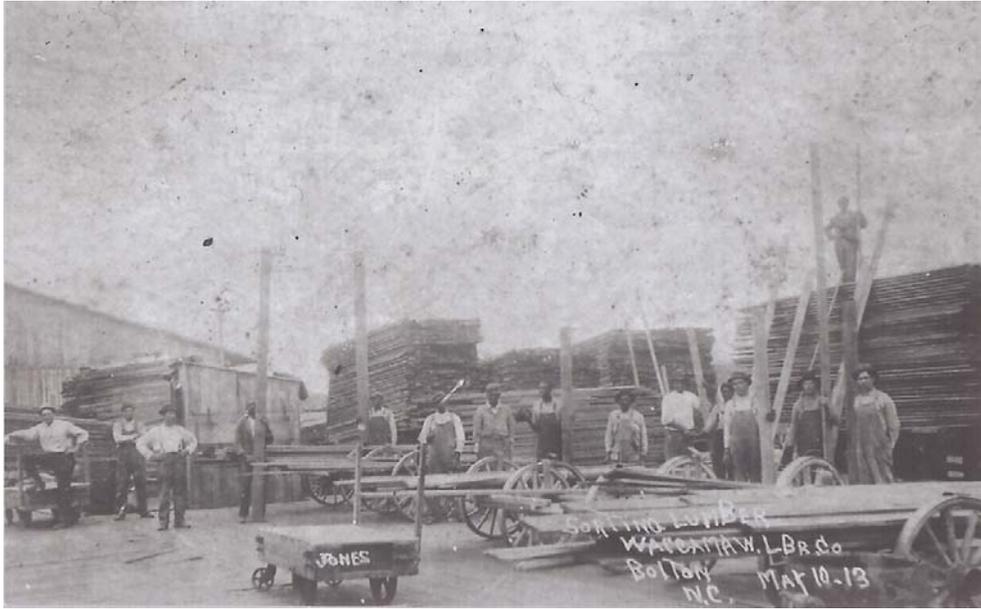


FIGURE 9: The Waccamaw Lumber Company mill facility (10 May 1913) (Courtesy of the Lake Waccamaw Depot Museum).

The last task in the production process was transporting shingles to the production facility. The North Carolina Lumber Company utilized pole barges to ferry shingles to their production facility (Gault 2007, pers. comm.) (Figure 11). Given the small vessel dimensions,



FIGURE 10: Laborer ferrying shingles across Lake Waccamaw (Courtesy of the Lake Waccamaw Depot Museum).

many shingle barges overturned and sank. Several barges are still intact with cypress shingles still in the vessels (Gault 2007, pers. comm.). Oral history suggested the *Bohemian Girl* participated by towing shingle barges (McNeill 2007, pers. comm.), but no documentary evidence suggests the steam launch did this. The shingles were then loaded onto a pier and pulled by mule to train depot (Figures 12-13). Eventually, a railroad was built around the lake that reduced the need for shingle barges.



FIGURE 11: The “Shingle Pier” at Lake Waccamaw. This pier was located near the *Bohemian Girl*’s boathouse (Courtesy of the Lake Waccamaw Depot Museum).



FIGURE 12: Laborers pushing a shingle load off the pier (Courtesy of the Lake Waccamaw Depot Museum).

The Atlantic Coastline Railroad ran from Wilmington past Lake Waccamaw. The finished shingles were loaded on the railroad and then shipped to various places throughout the country. Shingles from Lake Waccamaw are literally in all sections of the state and country (Gault 2007, pers. comm.).

Assessment and Conclusion

The shingle industry, like the naval stores industry, declined in the early twentieth century. When the demand for shingles no longer warranted large-scale production, Columbus County shingle companies closed or adapted. Pierson Company is the only company still in existence; however, they only retain a general store and lumber yard.

The North Carolina timber industry was formed because of necessity. Other states had the capabilities and resources to produce large scaled timber products, but did not rely on that industry like North Carolina. The limited North Carolina coastline is the most important factor connecting the states' dependence on timber exports. Given the inaccessibility of North Carolina's ports to large sea-going vessels, North Carolina was limited to coastal trade. The state

could not compete with other colonies such as South Carolina, Virginia, and Massachusetts. The other states did not produce large quantities of timber products simply because they had other sources of revenue.

Chapter Three: North Carolina Inland Navigation

Introduction

Development of steamboat technology revolutionized commercial transportation. While vessels making transoceanic and coastal voyages were able to harness the wind, sailing ships encountered problems when traveling inland waterways. The issues faced by sailing vessels in inland North Carolina were a lack of wind to and shallow waterways. A self-propelled, shallow-draft vessel was required to pursue commercial ventures. In North Carolina, steamboat transportation opened a new era of economic prosperity and areas once considered isolated, became accessible. This chapter focuses on the early history of steamboat operations in North Carolina and the impact of commercial steamboat activity. The records of the North Carolina General Assembly and of river navigation companies provide figures that demonstrate the economic impact of commercial steamboats.

The first commercial steamboat, the *Clermont*, was designed and constructed by Robert Fulton. In August 1807, Fulton's *Clermont* completed an inland voyage on the Hudson River from Albany to New York City, an impressive 150-mile trip (Thurston 1891). The *Clermont* maintained an average speed of 5 knots. While Fulton neither invented the steam engine nor constructed the first steamboat and he is commonly recognized as the visionary of commercial steam-vessels. Fulton's original design was improved by later inventors and shipwrights. As steamboat technology advanced, newer vessels were equipped with more powerful, efficient engines and hull designs were more hydrodynamic (Gardiner 1993: 44).

The Mississippi River was one of many locations of inland steamboat usage from the earliest types of steam-powered vessels until introduction of combustion engines. The

Mississippi/Missouri River system is the farthest-reaching inland waterway in the United States and, prior to steamboat development, many areas of the river were inaccessible (Gardiner 1993: 45). Steamboats on the Mississippi River were designed specifically for river use. They had powerful double and triple expansion engines, and were shallow draft, allowing the vessels to operate in all water levels and climatic conditions. Manifests of steam-powered vessels indicate that steamships on the Mississippi River increased by six-hundred percent in twenty years (Sloan 1971: 27). The North Carolina government recognized the need for steam vessels and initiated a program to create navigation companies to open inland waterways.

North Carolina's Lack of Maritime Trade

Commercial trade and shipping in North Carolina were difficult because the coastline lacked sufficient deepwater ports and encompassed dangerous shoals. North Carolina's shallow waters prevented large ships from making port, forcing merchants to use lighter tonnage vessels for their trade. The North Carolina trade network needed vessels that could operate inside the sounds and on shallow inland waters. The introduction of steam vessels to North Carolinians was well-received and competition began to establish the first steamboat corporation (Crittenden 1931: 147).

The primary exports through North Carolina ports were tobacco and naval stores. During the American Revolution, Virginia's ports were blockaded by the Royal Navy, which prevented exporting tobacco. Merchants realized North Carolina was the best route for shipping and receiving commodities. The popular importing and exporting locations were Wilmington and smaller towns along Albemarle Sound (Crittendon 1931:157). Prior to the Revolutionary War, the majority of commodities received by the American colonies came from Great Britain. American merchants were forced to work through other nations to acquire the merchandise and

wares needed by the military and civilian population. Commercial goods from France, the Caribbean, and Spain made their way into North Carolina. Merchants who conducted business with alternative trade sources were forced to accept products of lesser quality than British goods, but the merchants were left with few options (Weaver 1903: 27). Trade after the American Revolution resumed in other states at pre-war rates, but the trade networks in North Carolina lacked organization. The period of trade instability did not last, and in the last decade of the eighteenth century ocean commerce in North Carolina was higher than any other time (Weaver 1903: 31).

Trade networks for North Carolina merchants were almost identical to those prior to the American Revolution (Weaver 1903: 122). There was a gradual increase in ship tonnage during the Revolutionary War, rising from 37,000 to 47,000 tons (Crittendon 1931:158). Trade with Great Britain averaged about 33% but fell to about 10% at the end of the eighteenth century. The majority of exports from North Carolina at this time made their way to the West Indies while the remaining exports went to other American states. In North Carolina, production and exporting tobacco made a dramatic increase in the later decades of the 1700s. The majority of tobacco exports went through Wilmington, which is situated at the mouth of the Cape Fear River (Crittendon 1931: 161).

The majority of North Carolina's business revenues were acquired through foreign trade which generated useful records showing tonnage and rates. Those records indicate that little trade was conducted between North Carolina ports because they were exporting the same materials. In 1815, North Carolina's maritime trade used less than ten major ports. Camden, Edenton, Plymouth, Washington, Ocracoke, Beaufort, New Bern, Fayetteville, and Wilmington were the principal, maritime commerce centers in North Carolina (Weaver 1903: 125).

The major port during North Carolina's earliest period of inland navigation was Wilmington located on the Cape Fear River (Weaver 1903: 120). This waterway has enough depth to allow large merchant vessels to make port, but only a handful of smaller vessels powered by lateen sails or oars could travel further upstream. Lateen-rigged vessels could operate in the upper Cape Fear but the river narrowed and was lined with trees, preventing sufficient wind. The lack of wind required oars for upstream transportation of commercial goods. Rowing was very difficult in North Carolina rivers, due to fast currents. Overland shipping was the primary method of hauling merchandise and commodities from Wilmington to inland. When North Carolina merchants saw the benefits of steamboats on the Mississippi River and in northern states, they realized the potential for steam vessel technology in their waters (Weaver 1903: 121). Different steamboat companies and firms were established in various parts of the state, all of which had the intention of launching the first steamboat in North Carolina.

Steamboat Operations in North Carolina

The first company to launch a steam-powered vessel in North Carolina was the New Bern Steamboat Company (Lytle 1952: 36). The company purchased their boat in 1817 at Norfolk, Virginia, for \$53,000. The *Norfolk*, as it was named, operated on Pamlico and Albemarle Sounds, transporting passengers from New Bern to Elizabeth City. The *Norfolk* was not the success predicted by the New Bern Steamboat Company, and by May 1818, the firm halted operations. An attempt to put the steam vessel back in service was also unsuccessful. Two months later, the *Norfolk* relocated to the James River (Lytle 1952: 37). The main issue pertaining to the failure of the *Norfolk* was an inefficient engine that could not propel the vessel in moderate to high winds (Lytle 1952: 37).

Joseph Seawell ordered the second steamboat to operate in North Carolina, *Henrietta*. *Henrietta* was built on the Cape Fear River near Fayetteville. *Henrietta* operated on the Cape Fear River near Wilmington beginning in April 1818. This vessel was more successful than the *Norfolk*, and continued operating until 1858 (Lytle 1952: 42). The size of *Henrietta* caused problems when trying to navigate upstream on the Cape Fear (Lytle 1952: 43). The same difficulties faced by *Henrietta* were experienced by later steamboats.

The third North Carolina steamboat was *Prometheus*, built by Otway Burns, a famous War of 1812 privateer captain. *Prometheus* was launched in 1818 and put into operation on the Cape Fear River. Like many vessels during the early steamboat period, *Prometheus* lacked sufficient power. The majority of engines at this time lacked the power to move a vessel against a strong current or headwind (*Cape Fear Recorder* 1818). *Prometheus* was not a successful commercial vessel but did gain notoriety when United States President James Monroe took a tour of the Cape Fear onboard (Sprunt 1916). The steamboat was abandoned eight years after its launch.

North Carolina's Issues Facing Steamboat Use and Resolutions

The state of North Carolina recognized problems faced by vessels on inland waters. The State created a committee to assist in making North Carolina's inland ports more accessible to larger vessels. The General Assembly of 1815 selected the Internal Improvement Committee (Weaver 1903: 9). The Internal Improvement Committee created the following plan to improve accessibility of inland waters:

1. Companies should be incorporated for improving navigation of the principle rivers, companies to hold their rights forever.

2. The rights and privileges of a company should extend from the source of the river to its mouth or to the state line and to all tributary streams.
3. Each company should be entitled to levy such tolls as would yield fifteen per cent on capital invested.
4. The state should subscribe one-third of the capital stock of each company.
5. A Board of Commissioners was to be appointed to superintend public works, two engineers were to be employed, surveys were to be made and reports were to be returned annually to the General Assembly (Murphy 1821: 26).

This bill was rejected by the House of Commons, although it passed in the Senate. The failure of the bill did not stop merchant desires for inland navigation improvements. The idea of internal improvements remained an issue in North Carolina.

Navigation companies were soon established to survey and assess what was needed to create successful waterways for commerce and travel (Weaver 1903: 10). Four main companies were established, including the Cape Fear Navigation Company, the Roanoke Navigation Company, the Tar River Company, and the Neuse River Company. The river companies were assisted by the State which required stock in return. Standards for roads and rivers were enforced during the formative years of these companies. Each company was to open a specific river and was allowed grants from the State to see their projects through to completion (Weaver 1903: 12-13). The primary task for all companies was to clear obstructions that could prevent vessel travel. Each particular river company also faced geological problems that hindered opening the rivers.

The Cape Fear Navigation Company

The Cape Fear River was the most important river in North Carolina, making its navigation company the earliest and the most significant. The Cape Fear Navigation Company

was originally formed in 1792 with the intention of improving the waterway from Cross Creek (Fayetteville) to the Deep River (Weaver 1903: 162).

In 1796, the General Assembly passed an act concerning improvement of the Cape Fear River that stated: “Whereas the navigation of the Cape Fear River from Averysborough up to the confluence of Deep and Haw Rivers, and of each of said rivers as far as can be effected, would be of important public utility; and many persons are willing to subscribe money to effect the work, and it is just that such subscribers, their heirs and assigns, shall receive reasonable tolls in satisfaction for the money advanced by them to execute the said work, and for the risk they run, Be it enacted,” (N.C. Law 1796).

In accordance with the same bill, registers were to be established in Randolph and Chatham Counties with the intention of authorizing subscribers to endorse the river projects. All finances were to be paid in Spanish currency or its equivalent. Each share in the river company was originally five dollars, and the dividend rate would be decided by the acting president, who was elected by the company shareholders. Ten years was the time frame in which the company was required to open the river for commercial accessibility, but if the company did not succeed, all rights to the river’s navigation would be forfeited and assigned elsewhere. The company was successful and area businesses and banks made contributions to opening the Cape Fear River. In return for their financial services provided to the navigation company, the business contributors were authorized to hold the company’s stock (N.C. Act 1796).

The Cape Fear Navigation Company conflicted numerous times with the State Government. The Board of Internal Improvements authorized various acts which required the navigation company to force stockholders to disburse any outstanding payments or withdraw their subscriptions to the company. In 1821, the Board of Internal Improvements contributed

\$25,000 to the company to assist in clearing the Cape Fear River above Wilmington (N.C. Law 1821). There were two conditions involved with the State providing the funds to the navigation company: the original company stock was reduced by half and the Board of Internal Improvements was given jurisdiction over development and maintenance of the waterway (N.C. Law 1821). During deliberations between the navigation company and State, the Board of Internal Improvements considered taking over the Cape Fear Navigation Company because Board members were unhappy with progress made. The actual work completed was much less than planned. In 1823, the Board took over the Cape Fear Navigation Company and reported the Cape Fear River was free of obstructions from Wilmington to Fayetteville.

In spite of the sanctions and resolutions passed by the State, the financial records from the time period indicate a substantial amount of work had been done on the Cape Fear River. The obvious proof of river improvement would be steamboats operating on the river in previously inaccessible areas. Reports given to the Board of Internal Improvements show the rate of shipping and crops dropped over a thirty year period (1828-1852) (Weaver 1903: 168). Tolls collected along the Cape Fear River in 1834 were more than the two preceding years combined. As a result, the Board of Internal Improvements opened deliberations to inquire if the company was operating with honest intentions, and if not, should the State buy the rights to the river (Weaver 1903: 169).

In the years following the 1834 Board of Internal Improvements inquiry, it was apparent to steamboat operators that the Cape Fear River was not being maintained to standards required by law. Obstructions blocked the waterway and eroding banks created shallow areas, both of which impeded trade between Wilmington and Fayetteville. The State held 650 shares valued at

\$40,000 and was required to match additional funds given by private companies or individuals to the company for river improvement/maintenance (Weaver 1903: 167).

It is obvious shareholders of the Cape Fear Navigation Company and interested parties were too eager to open the river, instead of using their capital to enhance the company's credibility. The Cape Fear Navigation Company made marginal profits and, according to State documents, two of every three efforts to navigate downriver failed (Weaver 1903: 167). The river company is commonly regarded as a failed attempt to commercialize the most important river in the state, but it is argued the river opened new avenues of commerce within North Carolina's western markets and contributed to a limited growth in state economics (Sloan 1971: 56). The Cape Fear Navigation Company survived the American Civil War and participated in the Reconstruction, but was known for its corruption during the Post-bellum period (Weaver 1903: 169).

The Roanoke Navigation Company

The Roanoke is the second largest river in North Carolina. It flows into Albemarle Sound. The Roanoke River allowed up to 100 miles of upstream navigation to various sections in North Carolina. The Roanoke River is much deeper in comparison to the Cape Fear, and only required improvements in a few sections (Weaver 1903: 169). The Roanoke was much better suited for commercial shipping, but its proximity to larger Virginia ports made it less appealing to merchants who wanted the best rates (Weaver 1903: 170). The Roanoke Navigation Company is arguably the most important and influential river company in North Carolina history. The municipalities accessible via the Roanoke River included Plymouth, Hamilton, and Halifax. The 1812 act chartering the Roanoke Navigation Company was entitled, "An act for improving the

navigation of Roanoke River from the town of Halifax to the place where the Virginia line intersects the same,” (N.C. Law 1812).

The subscription books were developed in towns within range of the Roanoke Navigation Company operations. The act stated the stock was set at \$100,000 and the State retained the right to 200 shares (Weaver 1903: 171). Once the company acquired 400 subscription shares, it was allowed to incorporate with an elected president and four directors. The Roanoke Navigation Company’s infrastructure was very similar to that of the Cape Fear Navigation Company; both were in existence during the same time period and operated under the same laws. The company was given ten years to complete its improvements and proved more successful than the Cape Fear Navigation Company (Weaver 1903: 170).

The Roanoke Navigation Company had a cohesive infrastructure, allowing the company to operate efficiently with available finances. The company made profits from toll stations established along the river, and within three years, expanded its stock to \$300,000, three times the original charter (N.C. Law 1815). The number of State shares increased by 50 as well, and the Roanoke Navigation Company was given more influence and jurisdiction. The toll rates were previously decided upon by the State but under authority of the Roanoke Navigation Company. A question of legality arose in 1816 when dividend returns for the subscriptions were not obtained. The result was an act that officially declared the Roanoke Navigation Company a legitimate organization (N.C. Law 1816). The authors of the various acts concerning the company were careful to include the names of subscribers to the original charter four years earlier (Weaver 1903: 171). The company headquarters was in Halifax, and every year, stockholders assembled to carry out various aspects of business, most importantly, collected the

in stock dividends. The 1816 Act also doubled the time given to the company to complete its internal improvement projects by extending the deadline to 1832.

An interesting dilemma arose with the improvements that took place on the Roanoke River. The river winds through North Carolina and into Virginia, but eventually comes back into North Carolina. The members of the Roanoke Navigation Company had to convince the Virginia government to permit passage of commercial vessels on its section of the Roanoke River, then back into North Carolina. Deliberations in 1816 were successful as Virginia decided to allow the Roanoke Navigation Company full jurisdiction over the river and any works of improvement (V.A. Law 1816). The Virginia government reasoned that people along the Roanoke River would benefit from the Roanoke Navigation Company improvements, and the only way for the system to work was to have a single company in control. North Carolina and Virginia worked together in providing necessary funds to complete improvements on the Roanoke River. The Roanoke Navigation Company was granted all rights and privileges on the Roanoke in both states. The company stock increased by another \$200,000 as improvements extended upstream (Weaver 1903: 171).

The Roanoke Navigation Company was very successful in improving the Roanoke River for steamboat use. Steam vessels continued to traverse many sections of the Roanoke River into the twentieth century (Weaver 1903: 174). The Roanoke Navigation Company had only one blemish on its record for improvements; the company could not create an outlet to the Atlantic Ocean. The only natural waterway leading to the Atlantic Ocean is Ocracoke Inlet, but this area is littered with dangerous, shifting shoals (Weaver 1903: 174). Improvements to this inlet were undertaken numerous times, but climatic conditions prevented any permanency. Had the Roanoke Navigation Company opened Ocracoke Inlet for steady use, the company would have

been very successful. The improvements and maintenance of the Roanoke River were taken over by the Federal government in 1872 (Weaver 1903: 174).

The Tar River Company

The Tar River flows into Pamlico Sound and was deemed suitable for commercial steamboat operations. The Tar River Company was chartered in 1805 and, like the majority of the small river companies, there are few state records indicating its influence on state economics (N.C. Law 1805). The Tar River Company had a much smaller stock when compared with the Cape Fear and the Roanoke Navigation Companies. The capital stock of the Tar River Company was \$75,000 and was partially funded by the Board of Internal Improvements (Weaver 1903: 175). The Tar River Company had a short, uneventful career but served a purpose in North Carolina's plan for internal improvements. The most important port along the Tar River was Washington, but the town was not the destination for most merchants (Weaver 1903: 175). The Tar River Company also lacked a sea outlet. The absence of an outlet to the Atlantic Ocean confined the Tar River Company to local transactions and coastal trading. There were too many more influential ports that could provide better rates than Washington or any other landing along the Tar River.

By 1833, the North Carolina government realized the Tar River's minimal impact on the economy. The Board of Internal Improvements put in motion ways to salvage any finances contributed by the state to the Tar River Company (N.C. Resolution 1833). The General Assembly passed a resolution that ordered cancellation of the Tar River Company's charter and directed the terms of its surrender. There is little documentation of the Tar River Company's existence after the 1833 Resolution, but the company remained in operation until after the Civil War (N.C. Public Works 1868).

The Neuse River Company

The last major river that saw improvements was the Neuse which flows into Pamlico Sound. The Neuse was better suited for commercial use when compared to the Tar. The Neuse River Company was chartered in 1812 and incorporated with a capital stock of \$50,000 (N.C. Law 1812). The Neuse River Company received the least funding of any river company. There was much expectation that the company would open the Neuse as close to Raleigh as possible (Weaver 1903: 176). By the mid-1800s, it was obvious the Neuse River Company would have little impact on the state economy (Weaver 1903: 177). The objective of providing a usable route from Pamlico Sound to Raleigh was not necessary after the introduction of railroad. The Board of Internal Improvements asserted railroads were more practical for shipping and receiving goods at the state capital.

The Neuse River Company, like others across North Carolina, had its charter expired by *non-user*. The term *non-user* was generally used to describe rivers or canals where all improvement efforts were abandoned, or the lack of commercial traffic rendered the waterway ineffective. The Neuse River Company, like the Tar River Company, did not compare to the Cape Fear or Roanoke Navigation Companies. Larger ports attracted more merchants and their accessibility to more of the state's interior made the smaller companies obsolete. In 1834, the Neuse River Company was no longer conducting or maintaining improvements, and little effort was made to revive the corporation (N.C. Public Works 1836). A second company to maintain the Neuse River was established in 1850, which operated until after the Civil War (Weaver 1903: 177).

Results of North Carolina's Internal Improvements

The North Carolina government spread its resources all over the state for internal improvements. The majority of funding went to the four eastern rivers, but other companies were established to improve navigable waters. Since the highest percentage of State funds went to the major companies, corporations on smaller rivers, canals, and swamps were largely privately owned. The North Carolina government passed numerous acts and bills to improve the smaller rivers and canals, but the majority were created with the objective of connecting them to larger bodies of water (Weaver 1903: 178). By the time of the Civil War, railroads became more practical in transporting goods throughout North Carolina.

The Board of Internal Improvements redirected funding from the river companies to railroads, but efforts to maintain the rivers continued. Improvements made by the State and river companies did create some economic growth within North Carolina. The steam vessels that did make their way upstream created networks that were not otherwise possible with overland shipping. While the North Carolina river companies were not overwhelming successes, they served a purpose in opening waterways for commercial ventures. The steam vessels operated in the inland and coastal waterways because development of transoceanic steam vessels was in early stages. Only a handful of steamboats could traverse the Atlantic Ocean, or make long voyages before their coal supply was depleted. In 1815, many steamboats were converted from sailing vessels, yet retained their sails for open water employment (Gardiner 1993: 28). The percentage or tonnage of goods transported on steamboats were dramatically lower than sailing vessels, mainly because the sailing ships were larger, had deeper draughts, and more cargo space (Gardiner 1993: 36). The steamboats had the advantage, when and if, inland travel was required.

Steamboats could traverse waterways upstream and with no wind; a task impossible for sailing ships.

North Carolina's commercial steamboat systems and companies were not the most impressive in the United States, nor were they the most profitable. The geography of North Carolina did not permit deep-draught vessels, limiting the number of commercial ports in the state. Geological features of North Carolina prevented economic growth, but during periods of war, the state provided avenues for importing and exporting goods. The Outer Banks, the various shallow inlets, and dangerous shoals made North Carolina a haven for wartime merchants.

The focus of this research was to examine the early effects of commercial steamboats on the North Carolina economy. The study discussed the advent and technological innovations involving commercial steamboats such as the initial, marine steam engine and propulsion. The *Charlotte Dundas* and *Clermont* were the technological leaps in steamboat innovation that inspired the use of steam-powered vessels in North Carolina. Examples of the advantages and disadvantages of early North Carolina steamboats were provided to illustrate the difficulties faced by the State Government and private companies. The struggle to open North Carolina's waterways demonstrated the necessity and resolve endured to facilitate economic growth within the state.

The formation and improvements of North Carolina's ports impacted the local and coastal trade networks. The development of river and navigation companies opened new areas of commerce within the state, and ultimately laid the foundation for future North Carolina commercial opportunities. The introduction of steamboats and the improvement of the waterways affected the North Carolina economy immensely.

Chapter Four: The Steam Launch

Introduction

The development of North Carolina inland navigation improved trade and transportation. Internal improvements on inland and coastal waterways made steamboat operations feasible. The use of steamboats and launches increased North Carolina's market economy. This chapter broadly discusses North Carolina steam vessel evolution and then focuses on *Bohemian Girl*.

Steam Engine Use and Improvements

Steam engine development did not occur because of demand from the maritime community. The first steam engines were constructed in the latter half of the seventeenth century for the mining industry. England is credited with the first steam engine development which was needed to operate water pumps. Constant flooding in mine shafts impeded quarrying efforts, and the deepest mines experienced the worst inundation. The steam engines powered water pumps which allowed workers more accessibility and more safety (Mitchell 1994: 4). Flash floods presented a serious danger to miners, but after the introduction of steam water pumps, that risk was reduced. Considerable time passed between the first steam engine development and their introduction to maritime vessels.

A major improvement to primitive steam engines was the introduction of the piston-cylinder principle (Mitchell 1994: 6). The theory was composed by Denis Papin, an English physician, during the last decade of the seventeenth century. Papin patented his idea which was simple in effect: a heat source (fire) was placed under a cylinder containing water and then the heat is removed. The process drives a piston up and down, producing kinetic energy. That energy, if concentrated, was capable of powering marine vessels. Papin realized the theory was

sound, but the materials to construct the needed boiler type were not accessible. The amount of pressure needed to produce the required energy was unsafe for the ferrous materials available in 1690 (Mitchell 1994: 10). Nearly a century later, several engines were developed with materials capable of producing high pressures, but were extremely expensive. James Watt was credited for significant steam engine improvements, the most important of which is the condenser. The condenser alternately heated and cooled the boiler cylinder, which allowed steam and vacuum pressure to work opposite sides of the piston (Mitchell 1994: 8). The condenser increased efficiency and is arguably the most important step in steam engine progression. Another 40 years passed before steam engines were successfully introduced to commercial marine vessels.

The Marine Steam Engine

Marine steam engines were developed with the intentions of increasing convenience and efficiency. In contrast to steam engines constructed for land use, marine steam engines were built with different requirements. Such requirements included: smaller size, accessibility, fuel efficiency, simplistic design, durable, of insubstantial weight, and constructed in sections for adjustment (Denholm-Young 2001: 18). Marine and land engines shared a common objective in turning high temperatures into usable energy, ranging from fourteen pounds below atmospheric pressure to high levels (Denholm-Young 2001: 19). Each pressure rating has an equivalent temperature, and certain engines require different operational pressure ratings. Steamboat operators employed gauges to monitor an engine's pressure rating. Steam pressure gauges displayed both atmospheric pressure and Fahrenheit temperature. Steamboat operators relied on pressure gauges to maintain efficiency and to prevent boiler explosions caused by excessive pressure. For operational and safety concerns, pressure gauges were essential to steam-powered vessels (Mitchell 1994: 12).

Paddle-wheel and propeller steam vessels utilized different machinery to transfer power from the engine to their propulsion source. Propeller-driven launches transfer power to the screw through the tail shaft (Denholm-Young 2001: 139). The propeller's thrust was seized by a shaft collar then transferred to the thrust bearing. The thrust bearing was usually secured to the vessel's framing (Denholm-Young 2001: 139).

Launch engines were secured to the wooden framework (Denholm-Young 2001: 139). Bolt fasteners were run through a soleplate and secured to wooden chocks (Denholm-Young 2001: 140). The bolts and soleplate were required to withstand excessive abuse, given the amount of propeller shaft vibration (Denholm-Young 2001: 142). Engines with multiple cranks experienced less vibration than single-crank designs. Two or more cranks increased revolution stability, which in turn reduced the overall vibration.

Simple and Compound Engines

During the 1870s and 1880s, simple engines were the basic power plant commonly used by recreational launches (Mitchell 1994: 252). Simple engines composed one cylinder, limiting the engine capability to 10 horsepower or less. Noncondensing, one-cylinder engines were rugged and could withstand most working environments (Mitchell 1994: 252). One-cylinder engines were simple in design, which allowed inexperienced operators use and repair. Most simple engines were about three feet in height, and three feet in width. The engine's small stature allowed its use for several applications. Another attribute was the simple engine's adaptability to different working environments (Mitchell 1994: 252). Simple engines were capable of serving different purposes, such as operating a launch, powering sawmills, or used to drive water pumps. Simple engines were used for several decades until replaced by gasoline engines (Mitchell 1994: 253).

Compound engines were similar to one-cylinder engines, but contained two cylinders. In theory, the additional cylinder doubled the engine's working capability. The compound engine was designed to be more efficient while steam was expanded in two stages. Like a simple steam engine, a single crank tandem-compound engine had all of its working parts clearly visible (Denholm-Young 2001: 139). Compound engines were composed of several different materials, each designed for specific purposes. The cylinders were constructed of gunmetal, commonly known in the United States as red brass (Denholm-Young 2001: 139). The piston and slide valve were both composed of cast iron. The piston rings were crafted using phosphor bronze (Denholm-Young 2001: 139). Other parts, including valve gear, reversing levers and gear were composed of either wrought iron or steel.

Triple and Quadruple Expansion Engine

Very few triple and quadruple expansion engines were manufactured for steam launches (Mitchell 1994: 286). Given the size and complexity, the triple and quadruple designs were not desired for small launches. Simple and compound engines were the common designs found in most launches (Mitchell 1994: 286). In terms of recreational use, triple and quadruple expansion engines were not as efficient as single and compound engines. Triple and quadruple engines were designed for large, commercial steamers (Mitchell 1994: 291).

Boilers

Several types of boilers were used in steam launches. Such boiler types included: single-ended marine multitubular, double-ended, naval multitubular (through tube), vertical, locomotive type, and water tube (Denholm-Young 2001: 43-47):

Single-Ended Marine Multitubular – this boiler type was manufactured for steam vessel classes ranging from launches to commercial trawlers. The design permitted this type useful to varying vessel types, which made this boiler the most popular.

Double-Ended – this boiler type was used on vessel which required additional power when extra space was not available.

Naval Multitubular (Through Tube) – this boiler type was used on vessels of considerable length, but of limited width and height. The boiler was narrow and elongated, and allowed even weight distribution at the vessel lower sections.

Vertical Boiler – this boiler type required little floor space, but had the disadvantage of substantial height.

Locomotive Type – this boiler type was long and narrow, and could fit in tight positions. Given the limited weight, the locomotive type boiler produced substantial horsepower.

Water Tube - this boiler type's distinct advantage was the quickness in which steam was raised from a small water amount.

The Emergence of the Steam Launch

Steam launches were not a popular vessel class until the 1870s and 1880s. Regardless of the vessel type's popularity, steam launches were produced during the earliest steam navigation developments (Denholm-Young 2001: 52). Steam launches were not practical for extensive commercial use due to smaller size. Though launches could access narrow waterways, cargos carried were far less than larger steam vessels and the newly-developed rail system. Steam launches demonstrated usefulness during the American Civil War and the Crimean War. Small launches proved more efficient than small sailing vessels and hand-oared boats. During the 1860s, shipbuilders improved hull designs and steam engine development increased steam

launch marketability. Like many military technologies, steam launches became useful for utilitarian and recreational purposes. By 1870, steam launches became accessible to the mass public and served as possibly the first recreational vehicle (Denholm-Young 2001: 55).

The first recreational launches were quite expensive, limiting the vessel type to the upper classes. The Herreshoff Manufacturing Company, founded by Nathanael Herreshoff, was one of few boatbuilding corporations producing large numbers of steam launches (Mitchell 1994: 24). In the United States, the majority of steam launches were built by local craftsmen (Mitchell 1994: 25). *Bohemian Girl* was locally built, supposedly by the captain's brother (Wyche 2008). As steam launches became more common, the middle class was given access to the vessel and incorporated it into various economic and recreational roles. Given steam launches' small dimensions, the vessel class was primarily designed for passenger cargo. The mass production of steam launches lowered ownership prices, allowing middle-class citizens the opportunity in acquiring a small steam vessel. In the United States, launches became so common that a variety of launch types were available through mail order.

Steam Launch Classification

Several steam launch types were developed throughout the late nineteenth and early twentieth centuries. Each type was designed for a specific purpose and performed operations particular to its construction. Such styles included open (no canopy), canopy, cabin, naphtha, "yot", naval, and torpedo launches (Mitchell 1994: vi). Most launch hull designs share similar construction patterns such as high length to beam ratios, equal frame spacing, and easily manufactured. Research observations note the majority of launches had a four to one length to beam ratio. The *Bohemian Girl*, though no formal documentation exists, had an estimated four to one ratio. The vessel was 35 feet long and with an estimated nine feet beam. Launches were

designed to operate in shallow water, and most drew five feet or less (Mitchell 1994: 17). The major differences between the launch designs were the use of a canopy, cabin, and engine placement. The *Bohemian Girl* shared characteristics to both open and canopy launch design and is compared in the following section.

Open Launch

The open launch is comparable to today's fishing or johnboats. This vessel class was not designed for pleasurable cruises, but more towards rugged activities. Simple in design, construction, and engineering, open launches were a preferred vessel for operators with little steam vessel experience (Mitchell 1994: 128). The open launch class was the first dominant

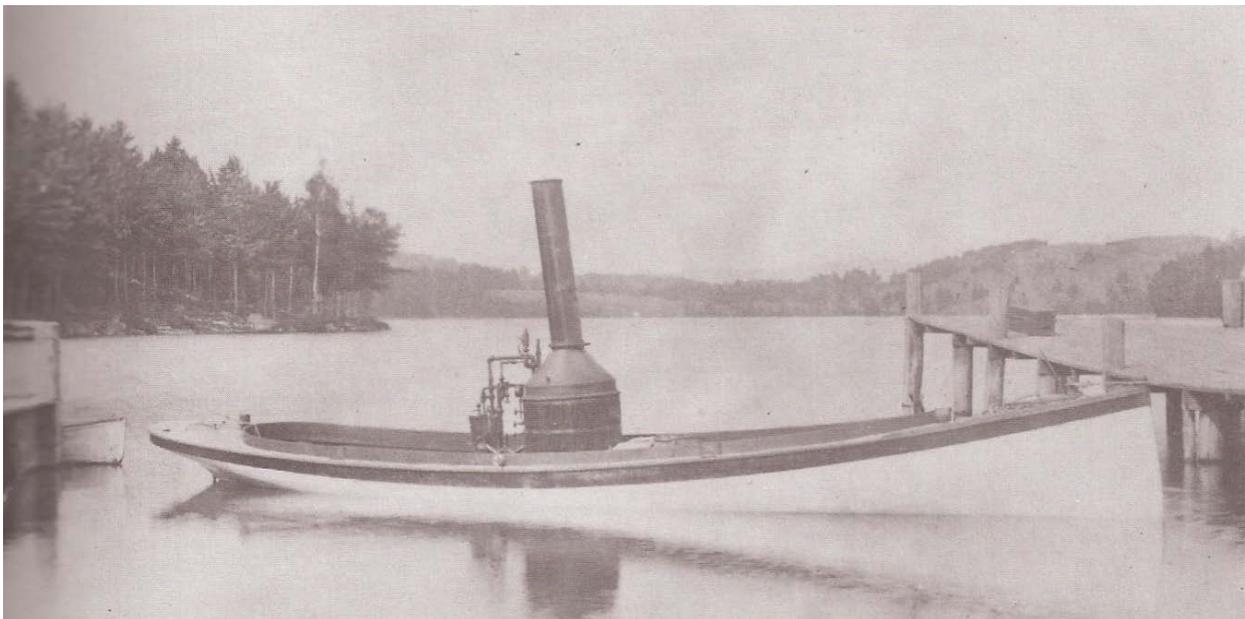


FIGURE 13: The *Mt. Maid*, owned by Captain Nathan Young. This open launch was the first steam powered vessel on Lake Sunapee, New Hampshire. A local newspaper agency published an 1877 announcement that advertised lake trips for 50 cents (Mitchell 1994: 129).

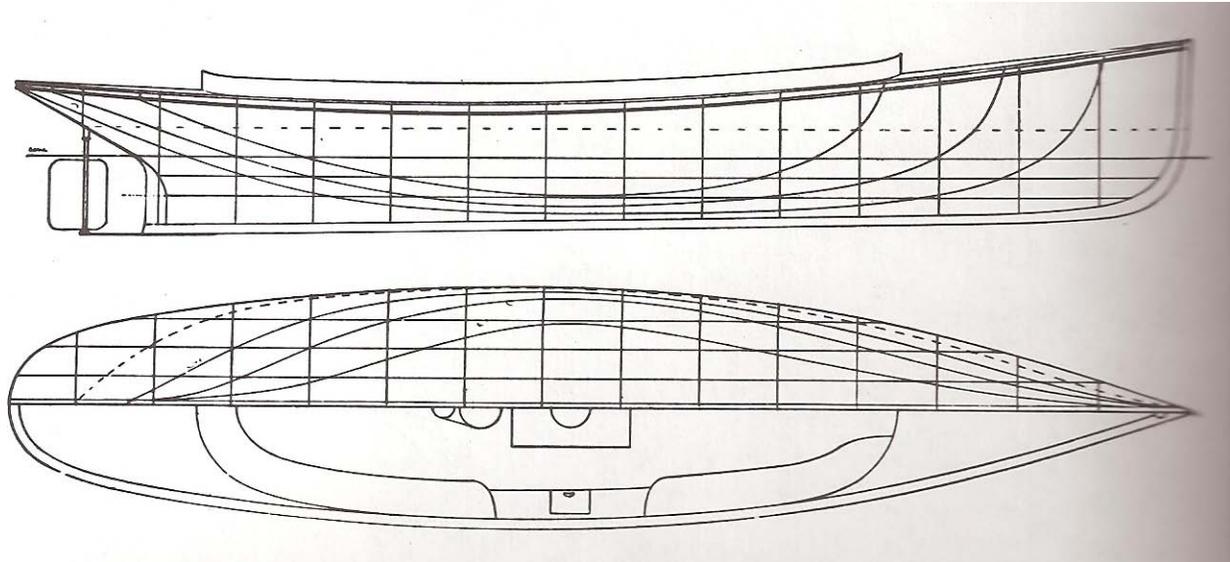


FIGURE 14: Lines drawings of a 30 ft. fantail open launch similar to the *Bohemian Girl*'s design (Mitchell 1994: 142).

launch type that emerged throughout the United States. Open launches remained a favorite vessel class among steam launch enthusiasts (Mitchell 1994: 134). The open launch's simplicity is its dominant asset, making it a desirable boat for inexperienced users.

Canopy Launch

Canopy launches represent the classic image of steam launches. The difference between this vessel class and open launches is the canopy situated to provide protection from environmental elements. The *Bohemian Girl* was classified as a fantail canopy launch, however, one early photograph indicates the vessel was once an open launch (Figure 19). Canopy launches were ideal for touring calm lakes and rivers. The canopy launch represents one of the first motorized technological advancements designed primarily for recreation (Mitchell 1994: 154). Given the simplicity of design and construction, these vessels were lower priced than steam yachts and other contemporary steam vessels (Mitchell 1994: 154). Canopy launches became very common throughout the United States and are considered the first recreational vehicle

designed exclusively for pleasure (Mitchell 1994: 178). The fantail canopy launch depicted is the *Nellie*, constructed in 1872 by Atlantic Works (Figure 15). The vessel is comparably similar

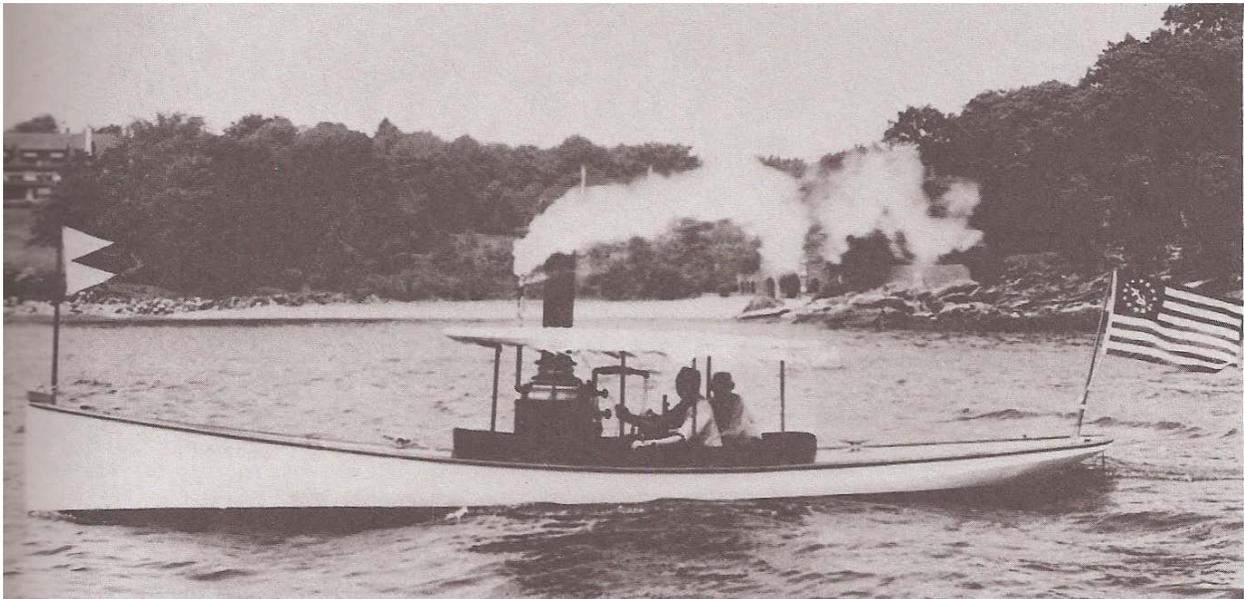


FIGURE 15: The *Nellie*, an 1872 canopy launch that measured 30' x 5'. The launch was constructed by Atlantic Works of Boston (Mitchell 1994: 155).

to the *Bohemian Girl* in both design and engine size. The *Bohemian Girl* was a larger vessel, but the engine and machinery are possibly of similar size. The *Nellie*'s engine measured 3.5" x 4.5" and was operated by a single crank which allowed five horsepower (Mitchell 1994: 265). The *Bohemian Girl*'s engine was not photographed, but boiler and stack sizes indicate a similar engine was used. The boiler and stack dimensions, for both the *Nellie* and *Bohemian Girl*, were not documented, however photographic analyses show consistencies when compared to onboard passengers. An important physical contrast between the *Bohemian Girl* and the *Nellie* was the internal space. The photograph shows that the *Nellie* had a small cockpit, whereas the *Bohemian Girl*'s cockpit extended several feet forward and aft of the boiler. The *Nellie* has limited internal space, limiting its passengers to situate amidships. The *Bohemian Girl*, with more length and

beam, also had more internal space in which the passengers could position themselves away from the engine and boiler.

The *Bohemian Girl* shared characteristics comparable to open and canopy launches. The main difference between open and canopy launches was the installation of a canopy to cover passengers. In terms of hull and power plant design, both classes shared similar characteristics. The *Bohemian Girl* was initially constructed as an open launch, but was later refitted with a canopy. The canopy covered the entire cockpit, which allowed the passengers protection from the sun, rain, and soot. When comparing photographs of similar launches to the *Bohemian Girl*, it is assumed the *Bohemian Girl* used comparable power plant and boiler systems. (For further photographic analyses, see Chapter Five). The *Bohemian Girl* was not unique in terms of design or power plant, but was the only known steam launch at Lake Waccamaw. The boat operated until the early 1900s. Captain Sam Potts died in 1910, and no documentation confirmed that the vessel was operated after his death.

Chapter Five: *Bohemian Girl* Photographic Analyses

Chapter Five examines several *Bohemian Girl* photographs that depict the vessel in various stages of development. The photographs show several characteristics that generate questions concerning whether the pictures represent a single *Bohemian Girl* or different vessels. These characteristics include: vessel name location, steam whistles, smoke stack, steam engine machinery, canopy, passengers, steering mechanisms, etc. Systematic analyses of all vessel photographs provide viable data that supports the argument that more than one *Bohemian Girl* was constructed. Every photograph was examined individually then compared to other *Bohemian Girl* pictures to display component variations. The photographs are ordered in hypothetical arrangement based on presupposed date (earliest to latest).

***Bohemian Girl* Photographic Analyses**



FIGURE 16: *Bohemian Girl* exiting Big Creek with several passengers onboard (Photograph courtesy of the Lake Waccamaw Depot Museum).

Figure 16 portrays a scene in which *Bohemian Girl* at the mouth of Big Creek carrying several passengers. This picture was hypothesized, by the author, to be the earliest known *Bohemian Girl* photograph because no canopy was present. Subsequent photographs depict the launch with a canopy, suggesting Figure 16 is possibly the oldest available *Bohemian Girl* picture. Aside from no canopy, several vessel characteristics are visible such as the smoke stack and furnace. Figure 17 is a detailed photograph enhanced to focus on the smoke stack and furnace.



FIGURE 17: Enhanced image of Figure 16. This image focuses primarily on the stack and furnace (Photograph courtesy of the Lake Waccamaw Depot Museum, modified by M.H. Thompson).

The smoke stack is the long, cylindrical object protruding up amidships. The stack was important by drawing smoke and soot up and away from the vessel's deck. The stack was also responsible for drawing air into the furnace, which provided the necessary air for fuel burning. The stack was

connected to the furnace, which appears to be square in shape. The view of the furnace is blocked by three passengers, but was partially visible in ensuing photographs.

Given the photograph's lack of clarity, the engine machinery could not be examined. Figure 17 depicts dark piping configurations directly aft of the smoke stack, assumed to be engine machinery. This assumption is based on more enhanced photographs that displayed the machinery in this location and visible above the *Bohemian Girl's* deck. Like the smoke stack, the steam engine machinery experienced two different configurations. Two hypothetical reasons for altering the steam machinery were for steam whistle integration or the photographs represent different *Bohemian Girls*. From comparative analyses to similar steam launches, the *Bohemian Girl's* power plant did not require sophisticated machinery. Steam energy transference required a minimal piping system. Given the machinery's simplicity and photographic data, it was assumed additional piping was used for steam whistles. No steam whistles were visible in Figure 17.

Mentioned earlier, the vessel in Figure 16 did not have a canopy. Figure 16 was the only photograph that depicted the launch without a canopy, which required observing other prominent characteristics. One such feature was the smoke stack. The smoke stack was one of the *Bohemian Girl's* most dominant features. During photographic analysis, at least three different stack variations were recorded. In Figures 16 and 17, the stack extended several feet to a ring that was situated about one foot below the top. The ring was a distinctive trait when comparing Figure 16 to other *Bohemian Girl* photographs. The feature provided some data that linked Figure 16 to one more photograph (Figure 18), but more evidence was required to produce a thorough assumption.

Figure 16 presented a *Bohemian Girl* that lacked a canopy and did not have steam whistles. Another important feature was two rub rails that ran along the vessel's sides. With the exceptions of Figures 16 and 18, all *Bohemian Girl* photographs had at least one steam whistle



FIGURE 18: The *Bohemian Girl* in Big Creek. Note the smoke stack, no steam whistles, and two rub rails that were similar to the vessel depicted in Figure 16 (Photograph courtesy of the Lake Waccamaw Depot Museum).

and single rub rail. The combination of similar smoke stacks, lack of steam whistles, and two rub rails reinforced the assumption the vessels in Figures 16 and 18 were the same *Bohemian Girl*.

Figure 18 presented an important feature that differentiated this *Bohemian Girl* (except Figure 16) from other vessels; the vessel's name was painted between the two rub rails (Figure 19).



FIGURE 19: Enhanced image of Figure 18 focused on the vessel's name (Photograph courtesy of the Lake Waccamaw Depot Museum, modified by M.H. Thompson).

Most *Bohemian Girl* photographs, with the exception of some when no name was visible, display the vessel's name at the fore end and below a single rub rail. The vessel's name was painted in a larger font than on the *Bohemian Girl* in Figure 19. The difference in how the name was displayed could mean multiple *Bohemian Girls*, or that the vessel was repainted. However, when taken with other vessel disparities, the name variation in Figure 19 contributed to the multiple *Bohemian Girl* hypothesis by providing another piece of data not shared by other vessel photographs.

Eventually, the *Bohemian Girl* was equipped with a steam whistle and additional machinery. Two photographs (Figures 20 and 22) displayed the *Bohemian Girl* with a single whistle, while some other photographs depict the vessel as having two whistles. It was assumed the *Bohemian Girl* would have installed one whistle prior to having two. Figure 20 presented the

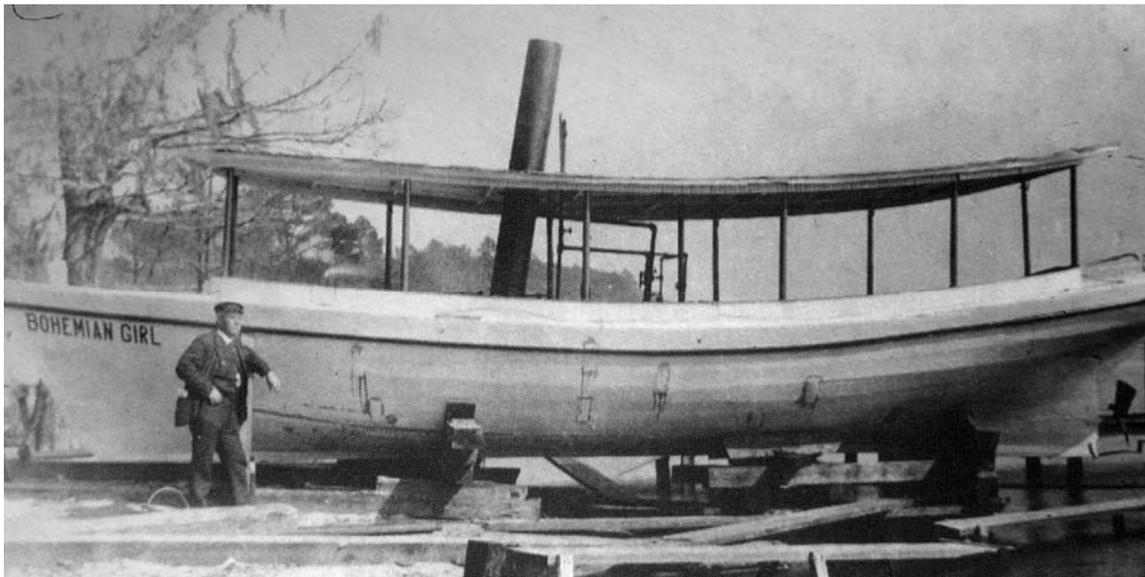


FIGURE 20: Captain Sam Potts standing next to the *Bohemian Girl*. February 10, 1886 was written in pencil on the photograph's backside (Courtesy of the Lake Waccamaw Depot Museum).

Bohemian Girl with a single whistle. The photograph was dated February 10, 1886; this date was written in pencil on the back of the photograph. Figure 21 was the only dated *Bohemian Girl*

photograph and provided evidence suggesting the vessel operated prior and subsequent to 1886. The extent of the *Bohemian Girl*'s operational timeframe was not certain, however, it fits into an era when steam launches became a common watercraft (see Chapter 4).

In Figure 20, the *Bohemian Girl* had several characteristics that differed from the vessel in Figures 16 and 18. Such characteristics include the smoke stack, presence of a steam whistle, single rub rail, and more complex steam machinery. Figure 20 was an excellent photograph in that it displayed *Bohemian Girl* on its stocks. The view of the *Bohemian Girl* out of the water allowed an examination of the vessel's steering and propulsion mechanisms. Those instruments include the propeller, whipstaff, rudder, and steering quadrant. The steering quadrant was



FIGURE 21: Enhanced image of Figure 20 focused on the *Bohemian Girl*'s stern section. Note the steering quadrant located at the top right section (Photograph courtesy of the Lake Waccamaw Depot Museum, modified by M.H. Thompson).

recovered on August 11, 2008 during field operations at the *Bohemian Girl*'s boathouse. The presence of a steering quadrant provided evidence that a wheel was used to steer the vessel. No wheel was visible in Figure 20, but visible in later vessel photographs.

Figure 22 was another *Bohemian Girl* photograph which displayed the vessel on its stocks. It was assumed that Figure 22 was possibly taken on the same day as Figure 20. The vessel's wear conditions, steam machinery and single whistle, support bracing positions, and



FIGURE 22: Mrs. Potts sitting on the *Bohemian Girl*. It is assumed this photograph was taken the same day as Figure 20. Note the steering wheel at the forward end of the cockpit, steam pressure gauge located directly aft of the smoke stack, and steering quadrant attached to the whipstaff (Photograph courtesy of the Lake Waccamaw Depot Museum).

weather conditions are identical. Those similarities provided evidence suggesting the *Bohemian Girl* in Figure 22 is the same vessel as Figure 20.

Figure 22 allowed the examination of three specific vessel characteristics that include the wheel, a steam pressure gauge, and steering quadrant. In addition to the steering quadrant, a steam pressure gauge housing was recovered during field operations on August 11, 2008. In Figure 22, a steam pressure gauge was visible directly aft the smoke stack. The gauge's overall diameter (0.75') was consistent with the estimated size of the gauge displayed in Figure 22.



FIGURE 23: WAL0005-005 (right) with a comparable steam pressure gauge. WAL0005-005 was recovered during field operations on August 11, 2008. The pressure gauge underwent conservation treatment at the North Carolina Underwater Archaeology Branch (Photograph by M.H. Thompson, 16 December 2008).

During fieldwork, several artifacts were recorded, and five removed for further research and conservation. Those objects included a steam pressure gauge, steam machinery, furnace door, and a steering quadrant. Given the use of steam engines for several applications, especially sawmills, the presence of steam engine components did not provide solid evidence these objects belonged to the *Bohemian Girl*. The steering quadrant and solid block of iron, later identified as a soleplate, provided physical evidence that indicated the remains found at site WAL0005 were vessel components. The steering quadrant measured 2.3 feet in length and 1.3 feet at its widest point. The quadrant was used in conjunction with the vessel's wheel through a cable system. Cables or chains were attached to the wheel which ran the length of the launch and connected to the quadrant. When the wheel was rotated, the cable system swiveled the quadrant. The quadrant was attached to the tiller which then forced the rudder to rotate. The steering quadrant is not



FIGURE 24: Enhanced image of Figure 22 focused on the *Bohemian Girl*'s steering quadrant (Photograph courtesy of the Lake Waccamaw Depot Museum, modified by M.H. Thompson).

visible in most photographs, which made Figure 24 a valuable research asset. The presence of a wheel, instead of a tiller, confirmed the vessel required a mechanism attached to the whipstaff.

Steering the vessel from the forward cockpit allowed an operator the ability to better navigate the *Bohemian Girl*. Neither photographic nor physical evidence confirmed when the wheel and



FIGURE 25: WAL0005-001 after chemical treatment. Several sections were broken which indicated extensive wear or inflicted during salvage (Photograph by Nathan Henry, 16 January 2009).

quadrant were installed. Figures 20 and 22 are the earliest photographs that depict the wheel and quadrant.



FIGURE 26: The *Bohemian Girl* approaching a pier. Note the installation of an additional steam whistle (Courtesy of the Lake Waccamaw Depot Museum).

The *Bohemian Girl* in Figure 26 had similar components to the vessel in Figures 20 and 22. The only discrepancy was the additional steam whistle located amidships. The second whistle was comparably larger than the original steam whistle. The second whistle was installed higher, which possibly allowed the pitch a further range. Oral history accounts indicated Captain Potts used the *Bohemian Girl*'s whistle for communication using Morse code (McNeill 2007, pers. comm.). The second whistle required additional steam machinery, which resembled a similar configuration to the original whistle. It is believed by the author the *Bohemian Girl* portrayed in Figure 26 was the same vessel depicted in Figures 20 and 22.

Figure 27 was the last photograph portraying the *Bohemian Girl*'s profile. This photograph depicted the *Bohemian Girl* with a smoke stack configuration not seen in other photographs. The stack's diameter dimensions appeared same when compared to other photographs, but the stack's height was much shorter. Two possible causes for the variation:

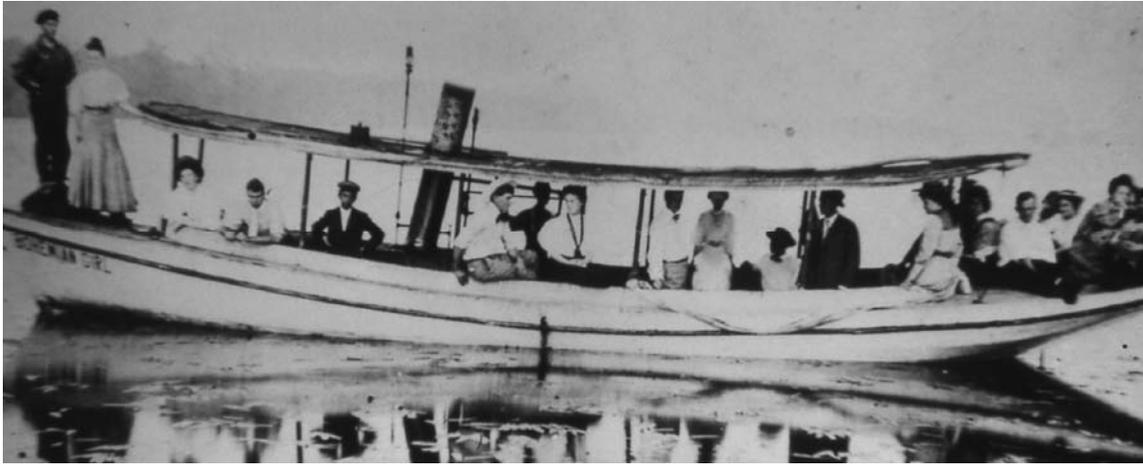


FIGURE 27: The *Bohemian Girl* with passengers. Note the stack configuration (Photograph courtesy of the Lake Waccamaw Depot Museum).

the photograph portrayed a different smoke stack, or the same stack but modified. Other vessel characteristics and components, such as the whistles, machinery, rub rails, vessel name location, were all similar to previous photographs. Given those similarities, it was assumed this vessel was the same *Bohemian Girl* portrayed in Figure 26. Figure 28 depicted an interior view



FIGURE 28: Interior view of the *Bohemian Girl* and passengers (Photograph courtesy of the Lake Waccamaw Depot Museum).

of the *Bohemian Girl* and showed several passengers. It was assumed Figure 28 was taken the same day as Figure 27. Careful analysis confirmed the presence of the same passengers in both photographs, indicating the photographs were taken on the same day. Figure 28 was the only known photograph taken onboard *Bohemian Girl*. This photograph provided an excellent view of the steam machinery and canopy construction pattern.

Several photographs portray the *Bohemian Girl*, but were not used because the vessel's characteristics were not visible for analysis. Other photographs were used for archaeological field operations. The photographs provided a starting point for field surveys and were useful in locating the *Bohemian Girl*'s boathouse and vessel remains. Figure 29, an



FIGURE 29: An enhanced image of Figure 1. The photograph portrays Sam Potts in the foreground and the *Bohemian Girl* in the background (Photograph courtesy of the Lake Waccamaw Depot Museum).

enhanced version of Figure 1, depicted the *Bohemian Girl* moored in the background. This photograph, in conjunction with local oral history, provided the starting place for field surveys.

The *Bohemian Girl* had a boathouse located adjacent to the *Bohemian Girl* in Figure 29. The view of the boathouse was blocked by the treeline, but was confirmed during field operations.

Figure 30 portrays the *Bohemian Girl*'s boathouse and its relation to the Shingle



FIGURE 30: The *Bohemian Girl* (far left), the boathouse (WAL0005), and the Shingle Pier (Photograph courtesy of the Lake Waccamaw Depot Museum).

Pier mentioned in Chapter Two. The *Bohemian Girl* is on the far left, but only half the vessel is visible. Physical evidence confirmed that site WAL0005 was the *Bohemian Girl*'s boathouse and not remnants of another structure. The boathouse was walled beneath the surface of the water, which was consistent with WAL0005 remains. The presence of a crib wharf also indicated a vessel was moored at that location. Local history accounts, physical data, and photographic evidence verified site WAL0005 as the *Bohemian Girl*'s boathouse.

The final *Bohemian Girl* photograph depicted the vessel in Big Creek. The vessel was equipped with two steam whistles, short smoke stack, and a single rub rail. This photograph was



FIGURE 31: The *Bohemian Girl* with passengers in Big Creek. Note the single rub rail, short smoke stack, and two steam whistles (Photograph courtesy of the Lake Waccamaw Depot Museum).

taken after the vessel received several modifications. It is assumed this photograph may have been taken the same day as Figures 28 and 29, given the *Bohemian Girl*'s configuration and passengers. The vessel's clarity was not enhanced, therefore a specific analysis was not available.

The *Bohemian Girl* Photographic Assessment

Photographic analyses consisted of analyzing over a dozen photographs pertaining to the *Bohemian Girl* and other vessel-related features. Through careful examination, each photograph was dissected and exposed several features. Such characteristics included the smoke stack, steam machinery, whistles, rub rails, vessel identification, etc. The features were examined to determine which photographs were of the same vessel, and determine if the photograph collection represented two or more *Bohemian Girls*. Photographic evidence substantiated the

existence of two *Bohemian Girls*, and this section grouped the photographs in accordance with their representative vessel.

Figures 16 and 18

Figures 16 and 18 portrayed the earliest *Bohemian Girl*. The only difference between the two photographs was the canopy. Figure 16 displayed the *Bohemian Girl* without a canopy, which suggests the vessel was originally an open launch. Figure 18 presented the *Bohemian Girl* with a canopy, but other features provided visible evidence the two photographs were of the same vessel. Characteristics linking the two vessels were identical smoke stacks, no steam whistles, minimal machinery, and the presence of two rub rails. Figure 18 also revealed the vessel's name painted between the two rub rails near the bow. The image in Figure 16 was not well enough focused to determine where or if the vessel had *Bohemian Girl* painted on its hull. In Figure 18, the font size and location differentiated this *Bohemian Girl* from other photographs where a vessel name was visible. Other photographs displayed the vessel's name in much larger print and below a single rub rail. Photographic evidence suggested the *Bohemian Girls* in Figures 16 and 18 were the same vessel, and possibly the original launch.

Figures 20 and 22

Figures 20 and 22 portrayed the same vessel and were possibly taken on the same day. Both photographs displayed identical vessel characteristics that include: a single steam whistle, steering quadrant, single rub rail, complex machinery, vessel's name printed in larger font and below rub rail, a wheel, and smoke stacks. The manner in which the vessel was positioned on shore and winter weather conditions contributed to the notion the two photographs were taken on the same day. As stated previously, February 10, 1886, was written in pencil on the back of Figure 20. Given identical vessel features and weather conditions, it was assumed Figure 22 was

produced on February 10, 1886. Figures 20 and 22 also contributed to field operations; both photographs displayed vessel remains that were recovered and conserved. Such remains included the steering quadrant, a steam pressure gauge, and machinery. The archaeological and photographic evidence suggest the objects found at site WAL0005 may be from *Bohemian Girl*. The vessel in Figures 20 and 22 retained several differences when compared to Figures 16 and 18, and are assumed to be a different *Bohemian Girl*.

Figure 26

The *Bohemian Girl* in Figure 26 was identical to the vessel in Figures 20 and 22, but with one exception. The only difference between the vessels, the *Bohemian Girl* in Figure 26 had a second steam whistle. Figures 20 and 22 displayed the *Bohemian Girl* with a single whistle, while the vessel in Figure 26 was equipped with a second. The smoke stack, rub rail, vessel name, etc. were all similar which indicated this vessel was the same *Bohemian Girl* as the one in Figures 20 and 22. Installing a second steam whistle required little modification to the power plant components and canopy. It was assumed that the *Bohemian Girl* in Figure 26 was the same vessel portrayed in Figures 20 and 22.

Figures 27 and 28

Figures 27 and 28 were another set of photographs possibly taken the same day. Unfortunately, no date was provided, but passenger analyses revealed the same people were in both photographs. In Figure 27, the vessel contained two steam whistles, a single rub rail, and the name was painted identically to vessels depicted in Figures 20, 22, and 26. The only difference between this vessel and that in Figures 20, 22, and 26 was the smoke stack. Figure 27 displayed a *Bohemian Girl* with a shorter stack with markings on the section that protruded above the canopy. Why the stack was shortened or the purpose of the markings were questioned, but no

definite answer was ascertained. Figure 28 was a useful photograph because it showed the steam machinery. Most photographs were not enhanced to provide a detailed view of the *Bohemian Girl's* machinery. The simple machinery configuration supported the assumption the *Bohemian Girl* was operated by a single-crank engine.

Conclusion

The remaining *Bohemian Girl* photographs were analyzed for purposes other than vessel analyses. Though some features are visible, Figures 29, 30, and 31 were used for field operations to create survey areas in search of vessel remains. The purpose of this section was to analyze every vessel photograph to determine how many *Bohemian Girls* operated on Lake Waccamaw. The photographic data supported the hypothesis that at least two *Bohemian Girls* were constructed. The available photographs can not confirm if a third was constructed, but it is possible given the simplicity in launch design and manufacture. The interpretation from photographic analyses was that two *Bohemian Girls* were constructed. That interpretation is consistent with oral history that a second *Bohemian Girl* was constructed following the original's accidental burning. The interpretation gathered through this research is that Figures 16 and 18 were photographs of the original *Bohemian Girl*. Figures 20, 22, 26 and 27 were of the second vessel that used a salvaged power plant, machinery, and other iron components.

The lack of a hull and extensive physical remains presented a challenge when determining how many *Bohemian Girls* were constructed. Using photographic analyses, in conjunction with documented remains and oral history, provided data indicating at least two were built. Though not the most confirming method, photographic analyses proved pivotal in this research project. The *Bohemian Girl* photographs were useful in examining the manner in which this particular launch evolved from an open launch to a recreational vehicle. Photographic

analyses proved an excellent procedure to examine a vessel, even though a hull may not remain in existence.

Chapter Six: WAL0005 Site Formation Processes

Locating the Site:

Prior to field operations, an attempt was made to locate any possible sites that might retain artifacts pertinent to the *Bohemian Girl*. Given the lack of historical documentation, the author used photographs to narrow the search for possible remains of the steam launch. The author recognized the location of one photograph (Figure 32), as the current location of Dale's Seafood, Inc.



FIGURE 32: *Bohemian Girl* location photograph (Courtesy of John McNeill and the Lake Waccamaw Depot Museum, modified by M.H. Thompson, 2008).

The *Bohemian Girl* is clearly visible in the background of this photograph (Figure 32) and is in the location of present-day Dale's Seafood, Inc., pier. Figure 33 proved essential to the archaeological field operations by providing a starting location for the project fieldwork. The author acquired additional photographs of the *Bohemian Girl* in other locations within Lake Waccamaw, however, those photographs illustrate the vessel either temporarily anchored or in active service.

Factors Affecting the Site Formation Process:

There are several factors, human and natural, that impact the site formation process on WAL0005. This section will include all dynamics that influenced the preservation state of all remains located at the site. The site is unique in terms of chemical structure and has been influenced by human salvage and shoreline modification. It is the intention of this section to discuss the various factors causing the site formation processes and the manner in which they impact the artifact remains at WAL0005.

WAL0005 is the location of where Captain Samuel C. Potts moored *Bohemian Girl*. It is also the site of the accidental burning of one *Bohemian Girl* (Nielson 2009, pers. comm.). The high density of artifacts and debris indicate the site experienced a long period of human interaction. The absence of a hull, steam engine, and large machinery remains indicate the vessel was probably salvaged after burning. The salvage of the vessel's remains dramatically affected the site formation process in that it removed the most vital component, the boat itself. Due to salvage, the study of the physical characteristics of the vessel focused more on smaller artifacts such as the steering quadrant, a possible tiller, firebox door, steam engine machinery, and photographic evidence.

Change in Shoreline Locations and Water Levels

An important factor that affected the formation process of WAL0005 is the change in shoreline location. The site was used primarily from the 1880s to the early decades of the 20th century, where the shoreline was fairly constant. In 1924, a dam was constructed at the mouth of the Waccamaw River where it flows into South Carolina (Lake Waccamaw State Park Records 2007). The construction of the dam caused a rise in the lake's water level, submerging sections that were previously exposed. Inundation of the site assisted in preserving particular artifact remains, such as the furnace door. The amount of increase in the shoreline is outside the parameters of this study, however, may it be noted that the increase in water affected the formation process of the site.

During the 1970s and 1980s, various archaeologists were encountering submerged sites that were once terrestrial, but due to eustatic and/or isostatic change, the rise in sea level submerged site locations (Ruppé 1979: 200). WAL0005 was not affected by eustatic or isostatic factors; however the rise in water level is similar to the situations experienced by archaeologists dealing with submerged land sites. Archaeological evidence supporting the author's claim in the change in shoreline location is the positioning of the first set of pilings used to form the boathouse walkway. The first set of pilings (P) is located 126 ft. from the shoreline bearing 218°. The author conducted several probing surveys and the results of those inspections confirm that P1 and P2 compose the first set of pilings used at WAL0005.

Lake Waccamaw's Unique Environment

Lake Waccamaw is unique in terms of geology and hydrology. The area encompassing the lake is part of the Cretaceous Pee Dee Formation, known to retain a fusion of calcite-

cemented sandstone, calcite-rich sandy mudstone, and fossiliferous sandy limestone (ECU 2000: 67).

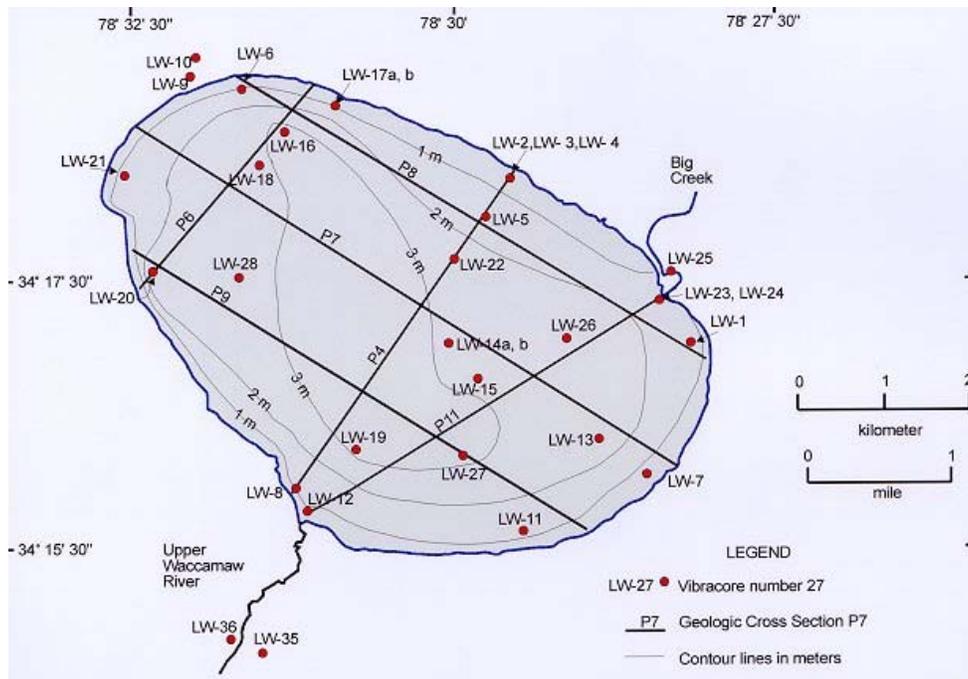


FIGURE 33: Bathymetric map of Lake Waccamaw showing vibracore locations (ECU 2000: 67).

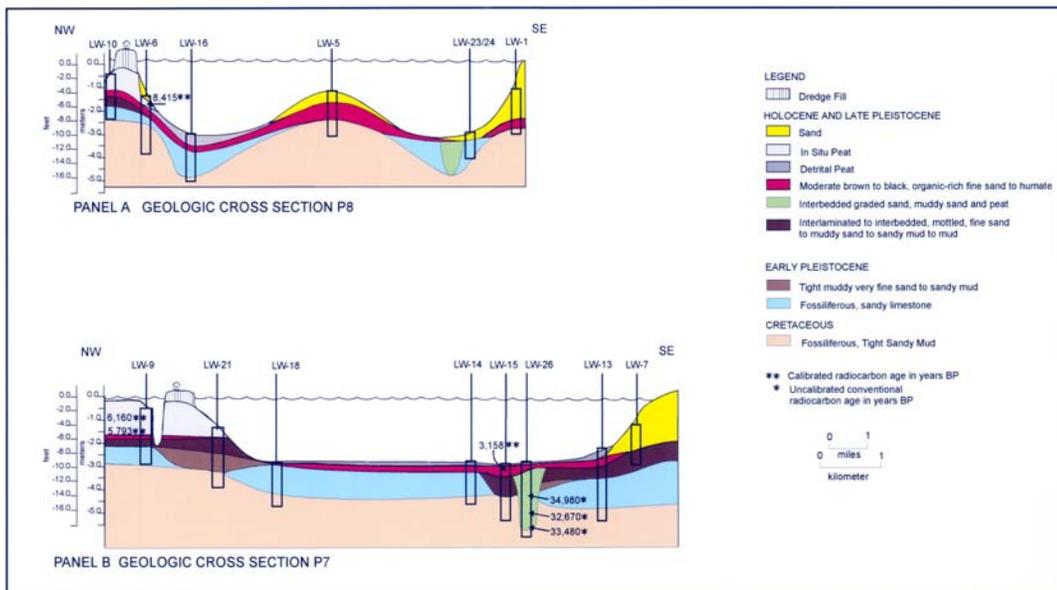


FIGURE 34: Two geological cross sections of Lake Waccamaw (ECU 2000: 68).

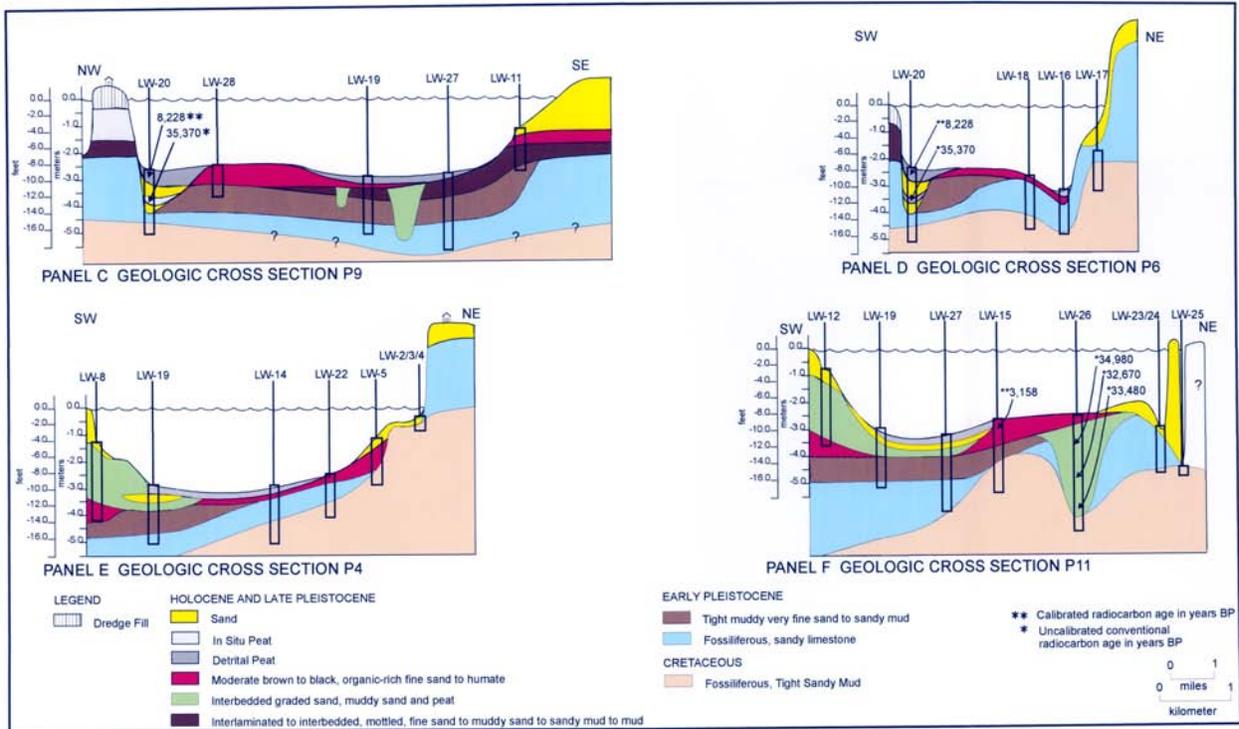


FIGURE 35: Four geological cross sections of Lake Waccamaw (ECU 2000: 69).

Water discharged from this area has a high probability of being alkaline due to elevated calcium carbonate percentages. Eastern North Carolina is notorious for blackwater rivers and streams. The blackwater waterways are usually very acidic due to amounts of organic debris absorbed in swamplands and floodplains. The blackwater pH level is commonly five or less. The geological and hydrological significance of Lake Waccamaw is that it contains a sandy limestone bottom which increases water alkalinity. Drainage from the nearby swamps and floodplains discharge highly acidic water. The combination of the two factors results in neutral pH stabilization. The pH range of Lake Waccamaw varies from 6.8 to 7.5; distinguishing the lake from other Carolina Bays composing a pH from 3.2 to 4.8 (ECU 2000: 66).

TABLE 6
Neutral pH Formula



Assessment and Conclusion

The neutral pH water creates a unique environment for marine life, and the lake is home to many endemic species of fish and mollusks. The water also produces an exceptional milieu for the preservation of organic, ferrous, and non-ferrous artifacts. The absence of salts reduces the corrosion and deterioration of ferrous and non-ferrous artifacts, thus increasing the preservation time. The unique environment reduces the amount of conservation required to treat artifacts recovered from the lake. The absence of chlorides does not deteriorate the surface of ferrous metals, yet allows the formation of oxy-hydroxide (rust) that forms a protective layer. The rust coating was not concreted and easily removed during conservation treatment. Biologics, including flora and fauna, appear to have minimal intervention in the site formation process. The biologics are present at the site, yet have no adverse effect on the artifact remains.

Chapter Seven: The *Bohemian Girl* Project Methodology

Introduction

The *Bohemian Girl* Project is a study of two, or perhaps three, steam launches that operated on Lake Waccamaw using the same name. The project's objective is to verify the number of *Bohemian Girls* using archaeological and photographic data, while incorporating limited oral history. The term "archaeological data" embodies the physical remains recorded at site WAL0005 and the "photographic data" of the available *Bohemian Girl* photographs. Additional steam launch photographs were included for comparative purposes. The *Bohemian Girl's* oral history was presented by several Lake Waccamaw inhabitants. Fortunately for this study, the majority of the narrative accounts collaborated. The physical remains used for this study represent direct results of human actions at site WAL0005. The remains were preserved at the site, and included in the archaeological record (Renfrew 1984: 10).

This chapter's objective is to analyze archaeological and photographic data to gain specific information. The obtained data will then be employed to test varying hypotheses concerning the *Bohemian Girl*. Every artifact, photograph, and historical account will be examined as a particular study. The individual examinations will then be evaluated for any comparisons or contrasts. For specific artifact reports, see Appendix I.

Archaeological, Photographic, and Oral History Data Classification

Site WAL0005 contains a number of artifacts. Every object was recorded and plotted on the site map (Appendix II). Five artifacts were recovered from the site due to endangerment and research assistance. The recovered artifacts retain characteristics specific to steam-powered vessels and were deemed "high-value" research material. A system of ranked artifact classification was developed to better ascertain any potential data (Stone 1974). Lyle Stone

recommends that the classification of historic artifacts should be initially based on corporeal properties, regardless of any cultural substance. Annalies Corbin asserts that Stone's recommendation is beneficial when artifact sets are used for statistical data, but limits the understanding of artifacts within a cultural framework (Corbin 1995: 36). Stone also suggests artifact classification is beneficial when assessing variation within a particular site (1974: 20). Using Stone's artifact classification method, the recovered artifacts from site WAL0005 can be individually evaluated. When assessed, the recovered objects can be compared to similar parts of comparable steam launches.

Roderick Sprague suggests that artifact classification should define objects based on function (1981: 252). This type of classification is flexible in that it can be used for several applications including quantitative analysis, which allows specific distinctions. Such allocated distinctions include determining if the objects belonged to an individual, were used by a family or domestic environment, or if the object was used for commerce (Corbin 1995: 36). The WAL0005 artifacts can be generalized within those three different categories. Photographs and oral history accounts were used during the artifact assessment. Nearly all recorded and recovered artifacts were fragmentary, which made the identification process more difficult. Photographs and oral history narrowed the artifact variables, and allowed positive identification.

Hypotheses

The hypotheses for this project derived from archaeological data, historic photographs, and oral history accounts. Prior to acquiring archaeological data, several postulations concerned with determining what materials to expect were reviewed. The *Bohemian Girl* was a small, fantail steam launch, therefore steam engine parts, machinery, and other ferrous parts were anticipated. Other materials such as coal, wood fragments, nails, and non-ferrous objects were

expected as well. Those assumptions were based on locating a site, because prior to this project, no site was identified. Comparison analyses of similar steam launches provided some assistance identifying steam machinery components. Historic photographs provided a starting location from which to search for *Bohemian Girl* remains. Several photographs depicting the vessel's characteristics, where it operated on Lake Waccamaw, the people who used it, and its purpose, were useful for this study. The historical accounts were useful in terms of context, but did not assist field operations or artifact analyses.

The *Bohemian Girl* Project's hypotheses were developed to be tested against a series of realistic variables. As common in archaeological research, the variables in this study are recovered artifacts. Multiple working hypotheses were developed to reduce potential research bias (Chamberlain 1964; Platt 1965). This system is useful in eliminating erroneous hypotheses when compared to the collected data. Disproving hypotheses is useful toward verifying working hypotheses that collaborate with the data. The use of archaeological data, historic photographs, oral history accounts, and comparable launch characteristics provides sufficient information to generate and test a series of hypotheses.

Hypothesis 0 (H0): The *Bohemian Girl* did not exist.

Hypothesis 0 is the null theory, suggesting the *Bohemian Girl* did not exist.

Hypothesis 1 (H1): The *Bohemian Girl* operated on Lake Waccamaw and had a boathouse on the present site WAL0005.

Hypothesis 1 is the direct opposite of H0, stating the *Bohemian Girl* did operate on Lake Waccamaw.

Hypothesis 2 (H2): The *Bohemian Girl* was used on Lake Waccamaw for towing shingle barges.

Hypothesis 2 addresses a conflict in the oral history accounts. To verify this hypothesis, this study researched the local timber industries. Interviews and photographic sources were utilized to ascertain if the *Bohemian Girl* was used for this purpose.

Hypothesis 3 (H3): The *Bohemian Girl* was used for recreation.

Hypothesis 3 is an important theory given it states the *Bohemian Girl*'s most probable objective. Interviewed and photographic sources were also used to determine if the *Bohemian Girl* was used for recreational purposes.

Hypothesis 4 (H4): There was only one *Bohemian Girl*.

Hypothesis 4 is part of this study's primary focus, to determine how many *Bohemian Girls* existed. Archaeological remains, photographic analysis, and oral history sources were used to determine if only one *Bohemian Girls* was constructed and operated at Lake Waccamaw.

H4A: Two (or more) *Bohemian Girls* existed.

H4B: The vessels existed in sequence.

4B1a: The vessels are different boats.

4B1b: Recycled parts were used to construct second boat.

The multiple working hypotheses guided all research of this project. By following and confirming the hypotheses, data collected will support or refute Hypothesis 4. Each data source was reviewed independently and produced analytical data. The primary data sets were then reviewed in conjunction to identify both similarities and discrepancies. The data sources were

complimentary in forming an informed interpretation concerning all *Bohemian Girl* research objectives.

Chapter Eight: Analyses

***Bohemian Girl* Project Objective**

This study was designed to explain specific inquiries concerning the *Bohemian Girl*. The development of five working hypotheses was to cross check each with archaeological, photographic, and oral data. The three sources provide evidence that either support or refute the hypotheses. By creating more than one hypothesis, the study was more flexible in ascertaining explanations. This study analyzed six hypotheses concerning the *Bohemian Girl*'s existence, function, and the possibility of multiple vessels operating under the same name.

Historical research, artifact recording, and recovery processes allowed informed interpretations. This study produced interpretations concerning the *Bohemian Girl* and site WAL0005. The missing documentation required that the study be based on archaeological, photographic, and oral history data. Though the *Bohemian Girl* was not historically documented, available sources did support the notion that the vessel was locally significant. Photographic and oral history data directly supported the Hypothesis 4A that more than one *Bohemian Girl* existed, while archaeological data supported the vessel operated at site WAL0005. H0 is thus refuted.

Photographic Analysis

The photographs provided conclusive indication supporting the existence of at least two *Bohemian Girls*. This study researched various steam launch designs and concluded the *Bohemian Girl* shared “open launch” and “canopy launch” characteristics. Figure 16 (pg. 57) depicted the *Bohemian Girl* as an open launch. Due to the photograph's poor resolution and the vessel's lack of a canopy, it was assumed this was the earliest known *Bohemian Girl* photograph. Other photographs had better quality resolution and revealed the vessel included a canopy. The

steam launch research analysis confirmed minute hull or engine disparities differentiate open and canopy launches. The chief discrepancy was the canopy. The canopy's purpose was to create a pleasurable environment (Mitchell 1994: 154). If the canopy was constructed for congenial purposes, then the *Bohemian Girl* was not used for utilitarian tasks. The vessel was more likely used for excursions with passengers that supported Hypothesis 3.

This study's two focal objectives were Hypotheses 4 and 4A. Hypothesis 4 stated that only one *Bohemian Girl* existed, while Hypothesis 4A argued at least two were present. Photographic data was the primary source used to determine which hypothesis was supported. Photographs confirmed that at least one *Bohemian Girl* existed, but careful analysis was required to determine if a second existed. Chapter Four went into specific detail, analyzing all *Bohemian Girl* photographs for hull, steam engineering, and feature variations. Photographic analyses concluded that some hull variations were visible; supporting at least two *Bohemian Girls* existed.

The existing machinery suggested at least two vessels were present. Photographic analysis also showed that the internal machinery varied throughout the vessel's lifespan. In addition to the internal machinery, the vessel's stack and whistle configuration changed dimensions and styles. The change in machinery and stack suggested refurbishment or photographs of different vessels. Altering the vessel's power and whistle systems indicated the *Bohemian Girl* was either overhauled or a new vessel was constructed. No photographs indicated two *Bohemian Girls* existed at the same time.

The *Bohemian Girl* was identified by its name painted near the bow and close to the sheer. The painted name was visible in most photographs located underneath a set of rub rails. Figure 18 depicted *Bohemian Girl* painted name between two rub rails but Figure 22



FIGURE 22: Photograph of the *Bohemian Girl* with Mrs. Potts (Photograph provided by the Lake Waccamaw Depot Museum).

displayed no identification. The painted name discrepancies indicated the vessel was repainted and the name was placed at a different locations, or Figures 18 and 22 were different *Bohemian Girls*. The steam machinery/stack and painted name changes supported the hypothesis (4A) that more than one *Bohemian Girl* existed.

Oral History Data

This study incorporated oral history data to “fill in the gaps” caused by missing documents. Interviews conducted with John McNeill, Frances “Frank” Gault, and Cathy Nielson supported the hypothesis (4A) that at least two *Bohemian Girls* were built. Cathy Nielson stated a deceased family member rode the *Bohemian Girl* numerous times. That same family member informed Ms. Nielson that the vessel accidentally burned at its boathouse. Ms. Nielson also stated the vessel was eventually rebuilt, supporting hypothesis (4B1b), and continued its Lake Waccamaw excursions. Frank Gault confirmed Ms. Nielson’s account by stating he recalled being told the vessel burned and was reconstructed.

John McNeill, a local historian, provided personal accounts concerning the boathouse location and Capt. Sam Potts stories. Mr. McNeill recalled, as a young boy, playing at the site and that an abandoned *Bohemian Girl* was present at site WAL0005. Mr. McNeill also stated the vessel and its boathouse were eventually removed because they posed navigational hazards. Research concerning who removed the boathouse and vessel were inconclusive. No state or local records document the removal. Mr. McNeill substantiated Ms. Nielson's and Mr. Gault's statements that the first *Bohemian Girl* burned at its boathouse, and that an additional launch was constructed from recycled parts. Mr. McNeill's interview also supports the hypothesis 4B1b.

Archaeological Data

WAL0005 field operations verified a steam vessel operated at the boathouse location. The boathouse pilings and steam engine components confirmed WAL0005 was used by a steam vessel. Site WAL0005 yielded several dozen artifacts, including ferrous, non-ferrous, and wood remains. Though all artifacts were recorded *in situ*, five were recovered for conservation and further research. The five recovered artifacts were identified as vessel remains. After *in situ* recording, a steering quadrant (visible in Figures 20, 21, 22, and 24), soleplate, firebox door and frame, steam pressure gauge, and engine piping were recovered. The artifacts did not require excavation due to their location above the sediment. The artifacts were immediately put in wet storage using lake water. Lake water was used due to its neutral pH and would not change the artifacts' chemical structure. The artifacts were cleaned and chemically treated. For detailed conservation methods, see Appendix B. At present, the artifacts are located at the UAB conservation lab until preservation is complete. Eventually, the artifacts will be loaned to the Lake Waccamaw Depot Museum for display in a temperature-controlled facility.

Chapter Nine: Conclusions

Researching the *Bohemian Girl* to determine the number of vessels bearing that name supported the theory at least two existed. This objective was accomplished with an analysis that included archaeological, photographic, and oral history data. The observations and research allowed an interpretation that two *Bohemian Girl* vessels were built and operated. The analytical interpretation allowed the completion of the overall research hypotheses.

Findings:

Null Hypothesis 0 (H0): The *Bohemian Girl* did not exist.

The null theory suggests the *Bohemian Girl* did not exist. Historical photographs and oral history accounts confirm the vessel did exist, and operated on Lake Waccamaw (McNeill 2007, pers. comm.; Nielson 2008, pers. comm.). The null hypothesis is refuted.

Hypothesis 1 (H1): The *Bohemian Girl* operated on Lake Waccamaw.

Hypothesis 1, the direct opposite to H0, states the *Bohemian Girl* operated on Lake Waccamaw. Using the same data as H1, photographic data and oral history accounts confirm the *Bohemian Girl* did exist. Photographic analyses confirm the vessel had a boathouse but the location was not discernible. H1 is not refuted.

Hypothesis 2 (H2): The *Bohemian Girl* was used on Lake Waccamaw for towing shingle barges and provided a fiscal contribution.

Hypothesis 2 addresses a conflict in the oral history accounts. A common belief amongst Lake Waccamaw inhabitants was the *Bohemian Girl* was involved in the local shingle industry and towed shingle barges. Some oral history accounts deny this hypothesis, stating that Lake Waccamaw shingle barges were poled (Gault 2007, pers. comm.; McNeill 2007, pers. comm.).

No archaeological data was recovered that can prove or disprove H2. No photographic evidence supports Hypothesis 2. The only known Lake Waccamaw shingle photograph depicts a man poling a small vessel filled with cypress shingles (Figure 11). The lack of photographs showing the *Bohemian Girl* towing shingle barges provides some evidence that the vessel was used for other purposes. Disproving H2 also contributes to theorizing the *Bohemian Girl* produced capital for its owner or the timber industry. No data can confirm H2, therefore it is not proven or refuted.

Hypothesis 3 (H3): The *Bohemian Girl* was used for recreation.

Hypothesis 3 is an important as it states the *Bohemian Girl*'s most probable use. Historic photographs and oral history provide positive evidence confirming the *Bohemian Girl* was used for leisurely activities. No physical remains supporting H3 found. In spite of lacking physical remains supporting H3, photographs and oral accounts support this hypothesis.

Several photographs display the *Bohemian Girl* with passengers, including small children. The passengers' clothing, in most photographs, are white cotton or linen. It is assumed white cotton and linen were not typically worn during labor. Clothing worn by the *Bohemian Girl* passengers resembles garments more typical of leisurely activities, and not commonly seen in photographs of timber company laborers.

Hypothesis 4 (H4): There was only one *Bohemian Girl*.

Hypothesis 4 is part of this study's primary focus; to determine how many *Bohemian Girls* existed. It is absolutely certain at least one *Bohemian Girl* was constructed and operated on Lake Waccamaw. Archaeological evidence includes vessel remains consistent with a small steam

launch was present at site WAL0005. Several photographs showing the vessel confirm at least one existed, and oral accounts confirm traditions passed through several generations. The same resources also suggest perhaps more than one *Bohemian Girl* existed. The only rationale for H4 is the possibility the *Bohemian Girl* was refurbished, supporting Hypothesis 4B1b.

As stated in H4A, several sources indicate more than one *Bohemian Girl* was built and operated by Captain Sam Potts. The primary resource for how many *Bohemian Girls* existed are historic photographs. Though not a guaranteed method, photographic analysis is the only method by which the vessel(s) could be assessed. The photograph analyses provided substantial information concerning the hull, steam machinery, and whistle deviations. For detailed analyses, see the Photographic Analyses section of Chapter Four.

Oral history is very important to Hypothesis 4, because some sources note explained the first *Bohemian Girl* was destroyed by an accidental fire (McNeill 2007, pers. comm.; Nielson 2008, pers. comm.). Fire was a serious threat to wooden steam vessels, and given the high temperatures and sparks, a small wooden launch was very susceptible. According to oral history sources, the vessel accidentally caught fire near its boathouse and sank. Depending on how much of the vessel was damaged, sections of the original hull may have been recycled to create a new vessel. Recreating a new *Bohemian Girl* from old hull parts and operating with salvaged steam equipment could explain the lack of any hull and steam engine elements at WAL0005. The prospect of three *Bohemian Girls* exists but can not be ascertained with available data. Hypothesis 4A can only test the conjecture that two *Bohemian Girls* existed.

The *Bohemian Girl* Project provided an interpretation which suggests at least two *Bohemian Girls* existed. Careful examination of archaeological remains, historic photographs, and oral history provided useful insights that support research hypotheses. The project began as a

Phase I survey, but grew into a more complex undertaking. Though actual vessel hulls were not located, this study supports Hypothesis 4A that two *Bohemian Girls* were built and operated. This study has also suggested the use of photographic analysis for maritime study when actual vessels are not available. Available sources support Hypothesis 4A and 4B, while no refuting evidence is known to exist. Discovery of a hull or engine parts would disprove Hypothesis 4A or 4B. Only finding primary source documents stating the existence of a single *Bohemian Girl* could possibly refute Hypotheses 4A and 4B.

The study of the *Bohemian Girl* provided a useful case study for current and future steam launch research. Steam launches were used throughout the United States and abroad, signifying their popularity. An important aspect concerning these vessels was their “user friendly” approach, allowing inexperienced boaters the opportunity to operate watercraft (Mitchell 1994: 25). The simplicity in design and construction made them a favorite amongst the emerging middle class of the late 1800s. This project recommends magnetometer and side scan surveys in Lake Waccamaw’s deeper sections. The lake’s size and project’s limited technological resources prevented that type of survey. Remote sensing surveys may reveal additional submerged remains that can benefit future *Bohemian Girl* research.

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Wilmington Advertiser

1838 Published reports concerning North Carolina exports that came from major port areas. North Carolina Department of Archives and History, Raleigh, NC.

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1842 Reported on the steamboat *Fayetteville* and its efforts along the Cape Fear River. North Carolina Department of Archives and History, Raleigh, NC.

Wilmington Herald

1851 Publication expressing the economic value of North Carolina's distilled turpentine exportation. North Carolina Department of Archives and History, Raleigh, NC.

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1842-1856 The newspaper published several articles pertaining to distilled turpentine shipments and included other exported goods. North Carolina Department of Archives and History, Raleigh, NC.

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1816 Treasury report stating the state's overall population increase. North Carolina Department of Archives and History, Raleigh, NC.

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- 1836 Neuse River Company's charter is revoked. North Carolina Department of Archives and History, Raleigh, NC.
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- 1833 Resolved the Tar River Company and financial salvage. North Carolina Department of Archives and History, Raleigh, NC.

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Virginia Law

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Appendix A: The *Bohemian Girl* Project Artifact Conservation

Introduction:

The conservation process of artifacts recovered during the *Bohemian Girl* Project is strictly monitored by the North Carolina Underwater Archaeology Branch (UAB). The Phase II artifact recovery was necessary both for research purposes and potential artifact endangerment. Field operations revealed the location of the site, presenting an opportunity for looting and site tampering. The majority of the conservation process was carried out by the author, with advice and assistance from Nathan Henry, conservator for the UAB. Nathan Henry was present at the time of artifact recovery and observed the retrieval process. All ferrous artifacts are currently undergoing the final stages of conservation treatment at the UAB. The final destination for conserved artifacts is the Lake Waccamaw Depot Museum. The artifacts are state property and will be loaned to the Lake Waccamaw Depot Museum. The artifacts will be displayed with other relics representing the Lake Waccamaw maritime history.

Chemical Structure and Characteristics of Iron (Fe):

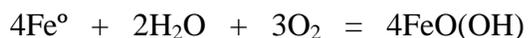
Iron is the most abundant and most utilized metal (Rodgers 2004: 71). Iron is commonly found in two forms, hematite and magnetite. The two modes are naturally found in a protected mineralized oxide state. Humans produce iron in three different grades (lowest grade to highest grade): pig iron, cast iron, and wrought iron. Iron produces a steel alloy, but the development of steel occurred in the later stages of the archaeological record. Iron is used for a variety of functions ranging tools, engines, machinery, fasteners, and weapons. The occurrence of iron on archaeological sites is very common and assists in the discovery of new locations through

magnetometer surveys. The magnetic charge produced by the iron yields a signal visible to most magnetometers used by underwater researchers.

Iron production began over 3,000 years ago (Rodgers 2004: 71). The manufacturing process and metalworker skill determine the produced iron type. Mentioned in the last paragraph, iron is fabricated in three main types: pig, cast, and wrought. Pig iron, the lowest grade, is manufactured from melted iron ore then condensed. The carbon composition of pig iron varies from 3% to 6%. The utilitarian uses for pig iron is fairly limited due to metal fragility, urging metalworkers to produce a higher grade of iron. Cast iron is an improved version of pig iron. Additional impurities were removed to strengthen the metal. Cast iron carbon content ranges from 2% to 6%. Cast iron is more useful than pig iron, however, it is still brittle. The primary uses for cast iron were for pots, piping, machinery, and munitions. The obvious physical characteristic of cast is metal layering and it deteriorates in stratum.

The highest grade iron is wrought, formed through the refinement of the highest quality pig iron. Wrought iron carbon content is less than 0.2%, making it the purest of the iron types. Wrought iron is capable of withstanding heavy burdens, therefore, it is used for utilitarian purposes what require exceptionally hard metal. The majority of the artifacts recorded and excavated from the WAL0005 are composed of ferrous metal. Cast and wrought iron were the only two types discovered. Lake Waccamaw provides an exceptional preservation environment for ferrous and non-ferrous artifacts. Regardless of the excellent water quality, the corrosion theory formula argues that iron exposed to both, water and oxygen, will turn into ferrous oxyhydroxide (rust) (Rodgers 2004: 74).

TABLE 7
Corrosion Theory Formula



The ferrous artifacts recovered during the project have experienced minimal corrosion during the period in which they were submerged. Regardless, the author followed the required procedures to indefinitely ensure the sustainability of the ferrous remains.

Pre-Excavation:

Prior to fieldwork conducted during the *Bohemian Girl* Project, several considerations concerning excavation and artifact conservation were considered. Such factors included: the discovery of potential artifacts, the type of artifacts, the budget for conservation treatment, the facilities for artifact treatment, tools and chemicals required, manpower, etc (Cronyn 1990: 4). WAL0005 is not a complex site in comparison to classical archaeological sites in Rome or Greece, however, the site did produce a unique set of challenges. The site itself was a debris field; littered with manmade artifacts, cut timber, wooden pilings, coal, and modern refuse. The process of determining which artifacts were recovered presented minimal challenges in terms of creating a vast system of conservation treatment for a variety of materials. In short, all artifacts recovered during the *Bohemian Girl* Project are made of ferrous metal, reducing the need for a variety of tools and chemicals, thus decreasing the project's budget costs. The considerations for artifact conservation were understood and carried out prior to the WAL0005 discovery.

Excavation:

The excavation process was carried out 11 August 2008. The UAB assisted in the recovery of the ferrous artifacts deemed pertinent to the study of the site and the *Bohemian Girl*. The excavation procedure for the retrieval of the ferrous artifacts was very simple; given the fact the objects were laying on top of the sediment, careful lifting of the objects was all that was required to the exhume the artifacts. The artifacts were previously recorded *in situ* and

photographed, therefore documenting the exact locations and environment from which the artifacts were removed. The artifacts were carefully stored in hard rubber containers and filled with lake water. Additional containers were filled with lake water to add to the artifact containers to prevent the unintentional dehydration of the ferrous objects. Upon return to the command post, the author recorded, measured, and weighed the artifacts. The ferrous objects were put in wet storage and kept in a climate-controlled facility.

Conservation Methodology and Treatment:

The conservation process of the *Bohemian Girl* Project began during the pre-disturbance survey (Rodgers 2004: 7). During the preparation for a reconnaissance survey, no site or artifacts were discovered. Regardless of that fact, it was determined that all artifacts relevant to this report would undergo conservation carried out by the author but supervised by the UAB. Prior to the excavation process, the author decided to not restore the artifacts to pristine condition. The author made the decision based on the opportunity to learn more about the artifacts through examination of wear marks and broken sections.

The artifacts recovered during the *Bohemian Girl* Project were retrieved from a freshwater environment with a neutral pH. The unique location in which the artifacts were found assisted in the excellent preservation qualities. Artifacts recovered from freshwater sites are usually in better physical condition than those from saltwater sites, due to the absence of corrosive salts. The conservation treatment for artifacts excavated in freshwater sites is significantly less in terms of treatment capacity, time, and necessary phases for successful preservation. Ferrous objects excavated from freshwater environments do not need electrolytic reduction and are transferred to the latter stages of conservation (Rodgers 2004: 85).

Artifact Assessment

The following section highlights important factors pertaining to WAL0005 artifacts. Such aspects include the material importance, non-material importance, and additional information the author deemed useful to this research. The field research operations produced a limited number of identifiable artifacts pertaining to steam engines and water craft. The artifacts excavated, though few in number, are useful in investigating the history of the *Bohemian Girl*. The markings, physical appearance, and locations of the artifacts reveal some aspect of the happenings that took place at that site over the course of a century.

The interpretation of non-material aspects of artifacts can rely solely on the attitude and bias of the investigator (Appelbaum 2007: 65). The primary objective for non-material information of artifacts is to interpret the history of the objects, their existing values, and their proposed future. The author sees potential problems with interpreting the non-material aspects of the artifacts recovered from WAL0005. The issues in interpreting the non-material information are that the data delivered by the author is simply an interpretation. The bias and attitude of the author will reflect in the investigation's final product. To counter the author's statement, the interpretation of the non-material aspects of the artifacts is not scientifically invalid, given there are no ruling theories in this investigation. The following paragraphs are a systematic interpretation of the non-material aspects of the artifacts recovered from during the *Bohemian Girl* Project.

The foundation for an object's non-material information is the history (Appelbaum 2007: 67). These artifacts help to understand values placed on the object by its previous owners. Simply because an artifact was not expensive at the time of production, the usefulness of the object gave it immense value to its owners. Interpreting that value is essential for the

conservation process, yet it is not always easy to decipher the history of an object. The artifacts recovered from WAL0005 are difficult to interpret in terms of history and function. The only exception is WAL0005.005, a steam pressure gauge that was recovered in close proximity to ferrous piping and coal. The purpose of this artifact is straightforward and a comparison analysis confirmed the identity of the manufacturer, but it is nearly impossible to interpret its cultural value. The remaining artifacts neither have maker's marks nor do they contain artistic decoration. The interpretation of the author is that these objects were simply for utilitarian use.

The contemporary value of the artifacts is minimal given the size of Lake Waccamaw and the short operational period of the *Bohemian Girl*. The financial and recreational importance of the *Bohemian Girl* was never documented; therefore the history of the vessel is not known to the public. Determining the modern value of an object does not solely involve WHY an artifact is conserved but HOW and to what EXTENT. The treatment goal of the author was to restore the artifacts to the time of submergence. One purpose for this was to prevent the removal of any wear marks or residues that could assist in the study of those objects. The other intention was to refurbish the artifacts to the status during its time of employment. The steering quadrant (WAL0005-001) is an artifact that presents potential research value. The artifact is unique in design and physical appearance; yet the value to its original owner is not known. The author interprets the rarity of the design as evidence the artifact was locally manufactured, possibly specifically for the *Bohemian Girl*. The contemporary value of the artifact pertains solely to the investigation of the *Bohemian Girl*. The steering quadrant was treated to the level at which it would have been at the time of submergence, and the author did not repair the steering quadrant's the broken sections.

Use of Artifact Remains to Assist Vessel Identification

During field operations the author recorded, excavated, and conserved what is believed to be a steering quadrant (WAL0005-001) (Figure 36). The quadrant, measuring 2.3 ft. in length (longest point) and 1.3 ft. in width (widest point), is composed of wrought iron.



FIGURE 36: WAL0005-001 after cleaning process (Photograph by M. H. Thompson, 15 December 2008).

The quadrant is broken in several places, but is well-preserved given Lake Waccamaw's unique hydrological environment. A steering quadrant worked by connecting the smaller end to the whipstaff and connecting cables to either side of the widest section. The cables then ran through a system of pulleys to the wheel, located in the cockpit bow aft of the forward coaming. The wheel allowed the operator to maneuver the vessel from the vessel's bow, as opposed to having a limited view using a tiller. Comparing this type of steering system to other launches contemporary with the *Bohemian Girl*, revealed that most small, recreational launches were operated by hand-tillers (Durham 1997). The *Bohemian Girl* is an anomaly in that it incorporates

some general recreational launch characteristics, but is maneuvered by a steering quadrant system.

Steam engines are fueled by either coal or wood, and require a furnace to create steam pressure. The *Bohemian Girl*, as with all steam vessels, was equipped with a firebox. The WAL0005 site is littered with anthracite coal (see site map), indicating it was the fuel used in the *Bohemian Girl*. The firebox, engine, boiler, and other large components were salvaged from the site, but a furnace door and frame were recovered (Figure 37). The firebox and its bracket were recovered in a location that, at the time of salvage, was onshore. Prior to Lake



FIGURE 37: WAL0005-003 prior to cleaning (Photograph by M.H. Thompson, 15 December 2008).

Waccamaw's dam construction in 1924, the lake was subject to periodic fluctuations in water level during seasonal rains. The firebox door measures (not including handle) 0.85 ft. long, 0.80 ft. wide, 0.10 ft. thick, and weighs 17.5 lbs. (wet). The firebox is composed of wrought iron which is very brittle due to corrosion. In comparison with other iron artifacts, the extensive

corrosion indicates the artifact was exposed to a different environment. The corrosion indicates the firebox door and frame were repeatedly saturated and dried, causing the iron to corrode at an increased rate (Henry 2008). Extreme temperature fluctuations also contribute to increased corrosion rates. Evidence for that fact is present on the firebox door, frame, and steam engine machinery which experienced extremely high temperatures. Other elements, such as exposure to extreme heat, also contribute to the furnace and frame corrosion. The firebox door and frame provide evidence to confirm a steam engine operated in this area.

During field operations, a steam pressure gauge housing was recovered (WAL0005-005) (Figure 38). The artifact was not immediately identified as a pressure gauge, but was identified during the conservation process. The artifact shared identical characteristics of a pressure gauge



FIGURE 38: WAL0005-005 (on right) next to a similar pressure gauge (Photograph by M.H. Thompson, 16 December 2008).

conserved by the UAB. WAL0005-005 experienced significant damage prior to its abandonment. The gauge's back section is nearly removed. The remaining sections are well preserved,

including threading located at the bottom portion. The internal components are no longer present, indicating the gauge was probably abandoned, not lost. It is not certain this steam gauge was used aboard the *Bohemian Girl*, however it is associated with other possible vessel components.

An additional artifact, iron piping (WAL0005-004), was located in relative proximity to the steam pressure gauge. Iron piping was used to transfer steam to power the propeller shaft. WAL0005-004 was possibly part of the *Bohemian Girl*'s internal piping, but given the extensive system, identifying which part is not possible. Similar to WAL0005-003, this artifact corroded in a pattern consistent with artifacts exposed to high temperatures. This section of piping served as a junction, from which additional piping continued to other machinery.

The future purpose of the artifacts is to be put on display at the Lake Waccamaw Depot Museum. The author chose the artifacts for their research significance and now the artifacts are available for public viewing. The presence of the conserved artifacts will increase public awareness of Lake Waccamaw's maritime history and heritage. The artifacts will be housed in a climate-controlled facility which once served as a depot for the Atlantic Coastline Railroad. The conserved objects will and should not be touched by the public due to oils produced by human skin. The oils can contribute to the corrosion of the artifacts thus increasing the inevitable deterioration process. Given the artifacts are state properties, monitoring the objects for further deterioration will be carried out by the UAB or someone affiliated with that institution. The "value" of WAL0005 artifacts is based on the author's interpretation as potential remnants of the steam vessel, *Bohemian Girl*. The artifacts are not confirmed as official remains, however, they are consistent with parts from similar watercraft. The artifacts will remain at the Lake Waccamaw Depot Museum indefinitely.

Bohemian Girl Artifact Conservation

Catalog Number: WAL0005

Artifact Number: 001

Date Received: 11 August 2008

Status: Conservation in progress

Date Completed: N/A

Object Description and Photographs:

<u>Object</u>	<u>Composition</u>	<u>Length</u>	<u>Width</u>	<u>Weight</u>	<u>Environment</u>
Quadrant	Fe (iron)	2.3 ft.	1.3 ft.	4.32 lbs.	Freshwater

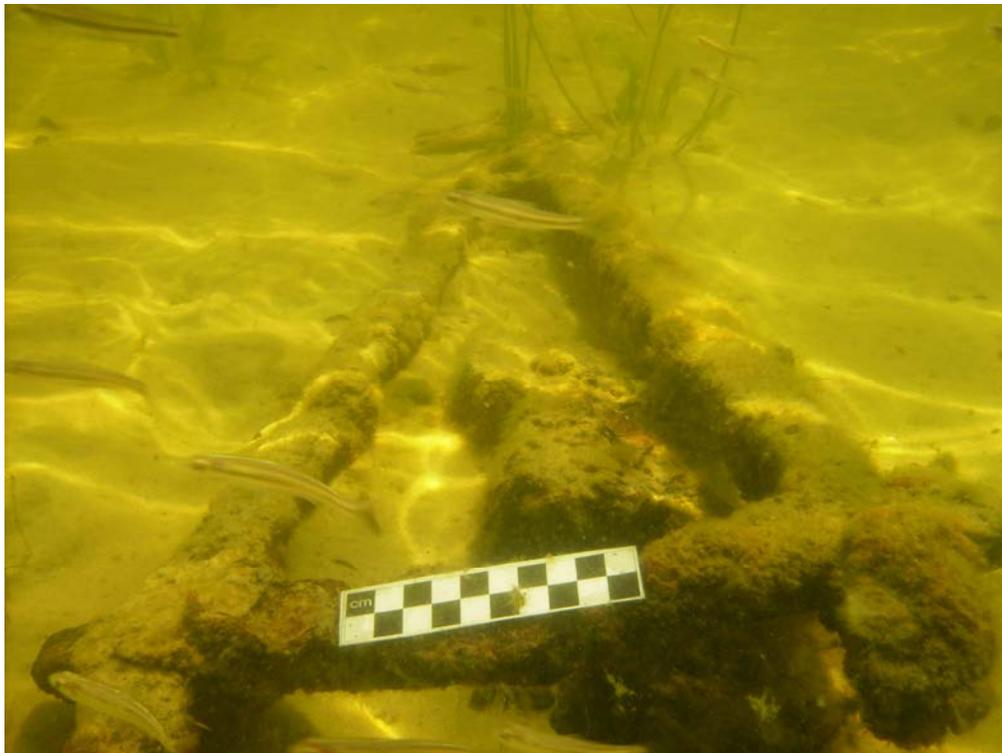


FIGURE 39: WAL0005-001 on site (Photograph: M.H. Thompson, 7 August 2008).

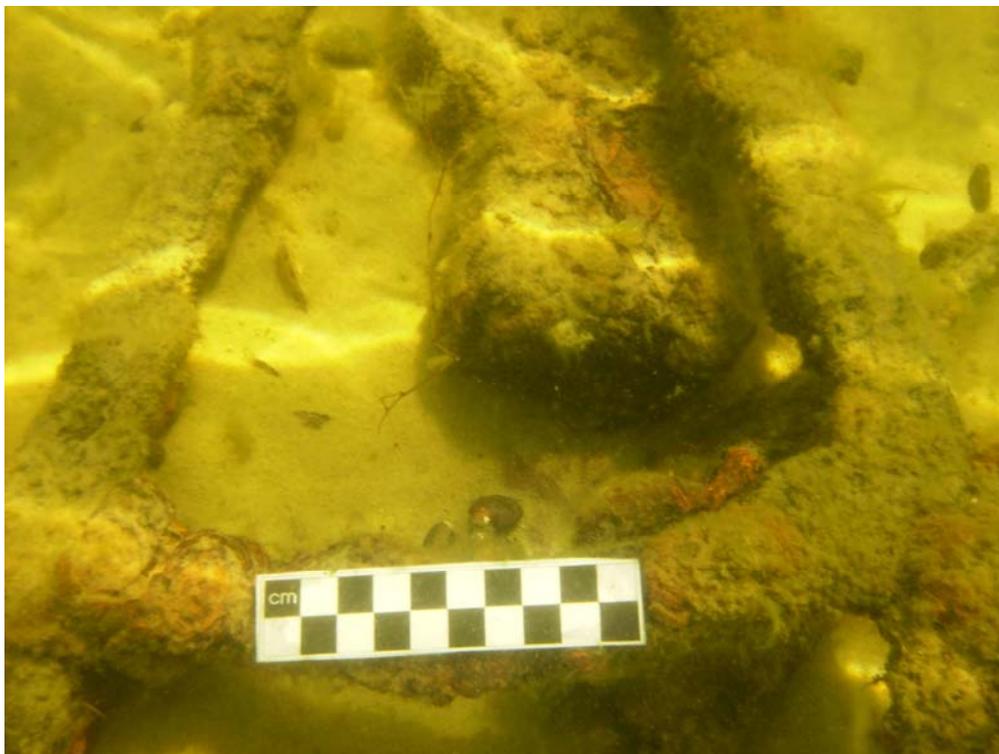


FIGURE 40: WAL0005-001 (Photograph: M.H. Thompson, 7 August 2008).



FIGURE 41: WAL0005-001 (Photograph: M.H. Thompson, 7 August 2008).



FIGURE 42: WAL0005-001 (Photograph: M.H. Thompson, 7 August 2008).



FIGURE 43: WAL0005-001 (Photograph: M.H. Thompson, 7 August 2008).

Previous Treatment: None

Remarks: Artifact is in decent state of preservation due to the absence of salts in the water of Lake Waccamaw. Minimal conservation required to acquire sustainability of the artifact.

Treatment:

11 August 2008 – Artifact recovered, measured, weighed, recorded, and put in wet storage.

14 August 2008 – The thin layer of rust concretion encompassing the artifact was carefully chipped away using a hammer/chisel and drill fitted with wire brush head. The concretion removal process was photographed to show technique and progress.

15 August 2008 – Concretion removal process completed. The removal of the concretion revealed that sections of the artifact that no longer exist. See FIGURE (). Artifact allowed to air dry and monitoring of the artifact's sustainability commenced.



FIGURE 44: Concretion removal process of WAL0005-001 (Photograph by M.L. Thompson, 14 August 2008).



FIGURE 45: Concretion removal process of WAL0005-001 (Photograph by M.L. Thompson, 14 August 2008).



FIGURE 46: Concretion removal process of WAL0005-001 (Photograph by M.H. Thompson, 14 August 2008).

4 December 2008 – Artifact monitoring process reveals artifact is sustaining well with no signs of additional corrosion.

15 December 2008 – Additional photographs taken prior to transportation and delivery to the UAB. The steering quadrant shows signs of drying out with some small sections of more corroded areas cracking. This will be resolved with electrolysis treatment and an application of a protection coat.

16 December 2008 – Artifact transferred to the custody of Nathan Henry at the UAB.

17 December 2008 – At this time, the artifact is still hypothesized to be a steering quadrant.

16 January 2009 – Tannic acid/alcohol application, followed by a coating with B72/toluene.



FIGURE 47: WAL0005-001 top (Photograph by M.H. Thompson, 15 December 2008).



FIGURE 48: WAL0005-001 bottom (Photograph by M. H. Thompson, 15 December 2008).



FIGURE 49: WAL0005-001 after chemical treatment. (Photograph by Nathan Henry, 16 January 2009).

Bohemian Girl Artifact Conservation

Catalog Number: WAL0005

Artifact Number: 002

Date Received: 11 August 2008

Status: Conservation in progress

Date Completed: N/A

Object Description and Photographs:

<u>Object</u>	<u>Composition</u>	<u>Length</u>	<u>Width</u>	<u>Weight</u>	<u>Environment</u>
Soleplate	Fe (iron)	0.65 ft.	0.50 ft.	14.7 lbs.	Freshwater



FIGURE 50: WAL0005-002 top (Photograph by M.H. Thompson 15 December 2008).



FIGURE 51: WAL0005-002 bottom (Photograph by M.H. Thompson, 15 December 2008).

Previous Treatment: None

Remarks: Artifact has no markings or any type of identification to its owner or purpose.

Treatment:

11 August 2008 – Artifact recovered, measured, recorded, and placed in dry storage and monitored as an experiment concerning iron objects recovered from a neutral freshwater pH environment.

11 September 2008 – Monitored no signs of further corrosion.

11 October 2008 – Monitored no signs of further corrosion.

11 November 2008 – Monitored no signs of further corrosion.

15 December 2008 – Rust corrosion was removed from the external surface of the artifact using a hammer/chisel and dremmel. Artifact was rewrapped in a protective cloth for transport to the UAB.

16 December 2008 – Artifact transferred to the custody of Nathan Henry at the UAB.

Bohemian Girl Artifact Conservation

Catalog Number: WAL0005

Artifact Number: 003

Date Received: 11 August 2008

Status: Conservation in progress

Date Completed: N/A

Object Description and Photographs:

<u>Object</u>	<u>Composition</u>	<u>Length</u>	<u>Width</u>	<u>Weight</u>	<u>Environment</u>
Furnace Door	Fe (iron)	0.85 ft.	0.80 ft.	17.5 lbs.	Freshwater



FIGURE 52: WAL0005-003 on site (Photograph by M.H. Thompson, 30 July 2008).



FIGURE 53: WAL0005-003 top (Photograph by M.H. Thompson, 15 December 2008).



FIGURE 54: WAL0005-003 bottom (Photograph by M.H. Thompson, 15 December 2008).



FIGURE 55: WAL0005-003 frame (Photograph by M.H. Thompson, 15 December 2008).

Previous Treatment: None

Remarks: The firebox door and frame are in a more fragile state in comparison to other artifacts recovered at the site. Conservation of this artifact will be more complicated and the boiler door will be disassembled to remove all rust concretions.

Treatment:

11 August 2008 – Artifact recovered, measured, recorded, and placed in wet storage.

11 September 2008 – Monitored while in wet storage.

11 October 2008 – Monitored while in wet storage.

11 November 2008 – Monitored while in wet storage.

15 December 2008 – Rust corrosion removed from boiler door and frame in various locations to assist in the assessment of the condition of the metal. The artifacts were wrapped in damp cloths and prepared for transportation to the UAB.

16 December 2008 – Artifacts transferred to the custody of Nathan Henry at the UAB.



FIGURE 56: WAL0005-003 after initial cleaning (Photograph by M.H. Thompson, 15 December 2008).

Further conservation is required and underway. Additional photographs will be included when conservation process is completed.

Bohemian Girl Artifact Conservation

Catalog Number: WAL0005

Artifact Number: 004

Date Received: 11 August 2008

Status: Conservation in progress

Date Completed: N/A

Object Description and Photographs:

<u>Object</u>	<u>Composition</u>	<u>Length</u>	<u>Width</u>	<u>Weight</u>	<u>Environment</u>
Machinery	Fe (iron)	1.0 ft.	0.1 ft.	0.7 lbs.	Freshwater



FIGURE 57: WAL0005-004 on site (Photograph by M.H. Thompson, 28 July 2008).



FIGURE 58: WAL0005-004 on site (Photograph by M.H. Thompson, 28 July 2008).



FIGURE 59: WAL0005-004 close up (Photograph by M.H. Thompson, 6 August 2008).



FIGURE 60: WAL0005-004 head (Photograph by M.H. Thompson, 6 August 2008).



FIGURE 61: WAL0005-004 out of wet storage (Photograph by M.H. Thompson, 15 December 2008).

Previous Treatment: None

Remarks: The object appears to be part of the internal machinery or piping from a steam engine. The inside of the pipe contained a thick, muddy substance but my interpretation is that it forms in areas that were subject to intense heat. Therefore, the black substance is the result of heat-induced corrosion. The external surface of the artifact was well-preserved with minimal signs of “pitting” or any corrosion damage.

Treatment:

11 August 2008 – Artifact recovered, measured, recorded, and placed in wet storage.

11 September 2008 – Monitored with no signs of further corrosion.

11 October 2008 – Monitored with no signs of further corrosion.

11 November 2008 – Monitored with no signs of further corrosion.

15 December 2008 – The artifact was rinsed, lightly brushed, and the inside of the pipe was cleaned of the black muddy substance caused by heat oxidation. The artifact was wrapped in wet rags for transport to the UAB.

16 December 2008 – Artifact transferred to the custody of Nathan Henry at the UAB.

Bohemian Girl Artifact Conservation

Catalog Number: WAL0005

Artifact Number: 005

Date Received: 11 August 2008

Status: Conservation in progress

Date Completed: N/A

Object Description and Photographs:

<u>Object</u>	<u>Composition</u>	<u>Length</u>	<u>Width</u>	<u>Weight</u>	<u>Environment</u>
Steam Gauge	Fe (iron)	0.55 ft.	N/A	1.98 lbs.	Freshwater



FIGURE 62: WAL0005-005 on site (Photograph by M.H. Thompson, 5 August 2008).



FIGURE 63: WAL0005-005 and a similar steam pressure gauge (Photograph by M.H. Thompson, 16 December 2008).



FIGURE 64: WAL0005-005 and similar steam gauge (Photograph by M.H. Thompson, 16 December 2008).

Previous Treatment: None

Remarks: The presence of the steam gauge on the site adds evidence to the presence of a steam engine at the site at some period. The internal components and face are missing from the steam gauge, however, the internal features of WAL0005-005 assisted in the identification of the artifact. I am currently researching the manufacturer and locations near Lake Waccamaw from which a steam gauge like WAL0005-005 was purchased.

Treatment:

11 August 2008 – Steam gauge was recovered, measured, recorded, and placed in wet storage.

11 September 2008 – Monitored no signs of further corrosion.

11 October 2008 – Monitored no signs of further corrosion.

11 November 2008 – Monitored no signs of further corrosion.

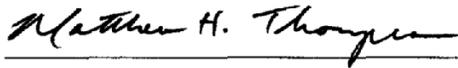
15 December 2008 – The steam gauge was examined for corrosion damage and certain sections of rust concretion was removed to examine the extent of deterioration. The artifact was recovered from a sandy location in a neutral freshwater environment. The environment from which the artifact was removed was essential to the excellent preservation. The artifact was wrapped in wet rags for transport to the UAB.

16 December 2008 – The steam gauge was transferred to the custody of Nathan Henry at the UAB.

Appendix B: Permission for Copyright Material

East Carolina University Department of Graduate Studies,

This document verifies that all photographs used in Matthew H. Thompson's the approved by the Lake Waccamaw Depot Museum. All borrowed materials were returned to the Lake Waccamaw Depot Museum.



Matthew H. Thompson



Ginger Littrell, Director of the Lake Waccamaw Depot Museum

April 30, 2010

