This report explains the development of steambarges, an important nineteenth-century vessel type. Steambarges were different from other contemporary bulk cargo carriers because they accomplished a successful breeding between the carrying capacity of sail powered cargo ships and steam technology. The primary question raised by steambarges is whether or not they are a distinctive vessel type that represents the missing link between sail and steam.

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The Missing Link Between Sail and Steam: Steambarges and the Joys of Door County, Wisconsin

PROGRAM IN MARITIME STUDIES · MARITIME HISTORY · NAUTICAL ARCHAEOLOGY · EAST CAROLINA UNIVERSITY

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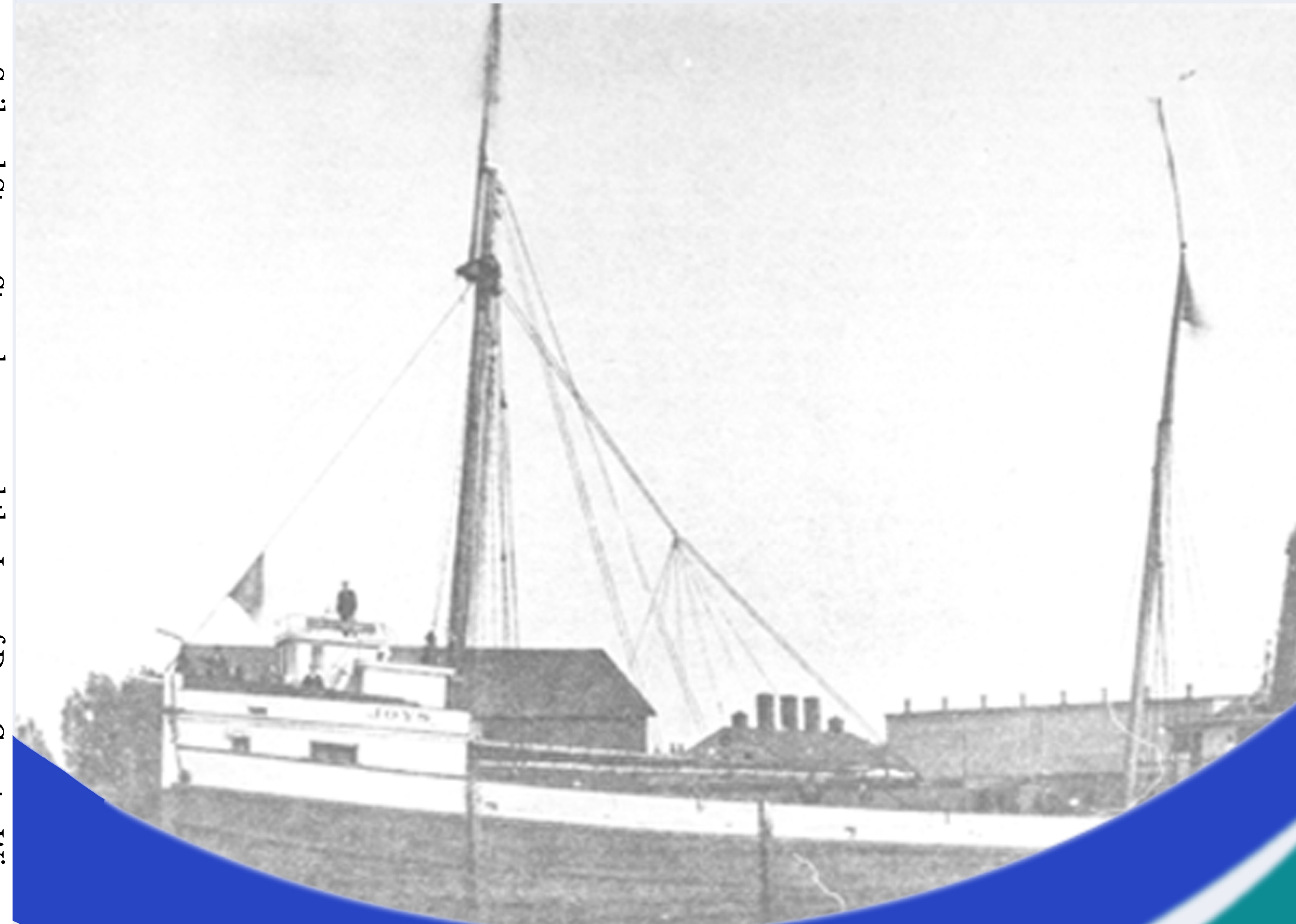
Dina M. Bazzill



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THE MISSING LINK BETWEEN SAIL AND STEAM: STEAMBARGES AND THE *JOYS* OF DOOR COUNTY, WISCONSIN

By

Dina M. Bazzill

Series Editor: Nathan Richards, Program in Maritime Studies, East Carolina University, Admiral Ernest M. Eller House, Greenville, North Carolina, 27858.

Cover: Possibly the only image of the *Joys* (Courtesy of the Center for Archival Collections, Bowling Green State University, Bowling Green, Ohio).

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DEDICATION

For Matthew-

Thank you for making my dreams your dreams.

And for Joseph-

Without whom this could not have been written.

ACKNOWLEDGEMENTS

The archaeological examination of the *Joys* would not have been possible without the Wisconsin Historical Society and East Carolina University staff: dive safety officer Mark Keusenkothen, Co-Principal Investigator Dr. Nathan Richards, and Principal Investigator Dr. Bradley Rodgers. I am especially grateful to Brad Rodgers for functioning as my thesis director, mentor, and friend. Thank you for sharing your passion for the Lakes with me. He will never know how much I appreciate the advice and support. Gratitude is also due to the field crew for all their hard work both in the field and in the lab: Stephanie Allen, Brian Diveley, Michelle Liss, Adam Morrisette, Tiffany Pecoraro, and Sami Seeb. Special thanks are to Michelle and Stephanie for their assistance with data analysis.

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CHAPTER 1
INTRODUCTION

Steambarges, single-decked steam-propelled cargo vessels, were an important 19th century vessel type specifically designed to promote the Great Lakes lumber industry. These "lumber hookers" were different from other contemporary vessel types because they accomplished a successful breeding between the carrying capacity of sail powered cargo ships and steam technology. The primary question raised by steambarges is whether or not they are, as suggested by archaeologist Dr. Bradley Rodgers of East Carolina University, a distinctive vessel type that represents the missing link between sail and steam powered cargo ships (Rodgers 2007:13). Before the development of steambarges, sail and steam vessels played distinctive roles in the Great Lakes maritime economy. Owners of sail powered vessels primarily utilized them for transporting cargo, while steam powered paddle-wheelers primarily transported passengers and limited package freight. The reason for this was simple; the machinery required to power paddle wheelers took up a significant portion of a vessel's cargo capacity and was expensive to build and operate (Still et al. 1993:69).

One of the most significant events that facilitated steambarge development was the Panic of 1857. This event wreaked havoc on both the cargo and passenger trades on the Great Lakes. Many schooner owners, whose vessels had shipped vast quantities of commodities necessary for westward expansion, were driven out of business by the depression's lower freight rates and an overdeveloped merchant marine (Labadie and Herdendorf 2004: 24). By 1860, however, the economy recovered and Americans resumed westward migration. These pioneers required building materials to feed the machine of civilization (Huston 1987: 24). As a result, businesses that survived the Panic of 1857 needed a new vessel type that could combine the carrying capacity of sail with the speed and reliability of steam. This would allow companies to ship large quantities of cargo, especially lumber, quickly and effectively. Great Lakes shipbuilders, who were no strangers to technological adaptation, rose to the challenge and developed the steambarge (Jensen et al. 1995: 32).

These insightful builders realized that palatial passenger steamers, rendered idle by the Panic of 1857, could be converted into barges and towed in consort by tugs with minimal effort and modification (Labadie and Herdendorf 2004: 8). This was the birth of the Consort System. These converted passenger steamer barges were quickly replaced by schooners because they were found in greater abundance. Tugs were also quickly replaced by steambarges in order to increase carrying capacity.

Westward expansion and post- Civil War reconstruction combined to create a lumber boom on the Great Lakes that helped establish steambarges and their consorts as a profitable and distinctive transportation system. After years of success, and as a direct result of the depletion of the Great Lakes' pine forests, steambarges followed the lumber industry west near the turn of the 20th century.

Steambarges were economically successful on the Great Lakes because they offered lumber shippers both speed and an immense carrying capacity when utilized in conjunction with the Consort System. It made steambarges cost effective for their owners because each steambarge towed up to six schooners, greatly expanding their carrying capacity and helping merchants maintain their bottom line (Labadie and Herdendorf 2004: 8). By 1899, it was typical for 1,500,000 to 2,000,000 feet of lumber to be towed by one steambarge and 4 to 6 consorts (Mansfield 1972:414). As a result, sailing schooners, sloops, and brigs lost the ability to compete in the lumber industry on their own, and few vessel owners wanted to invest in them. Prior to 1890, sailing vessels had dominated the shipping of bulk cargo; by 1900, they were nearly obsolete (Barry 1996:143). Shippers wanted, and came to depend upon, steam vessels that could move cargo quickly from port to port.

Although steambarges and the Consort System made the shipment of lumber and other bulk commodities economical and reliable, the system was not perfect. One major disadvantage of lumber carrying steambarges was that they had to be loaded and unloaded by hand. Not a single inch of cargo space was wasted. Loading and unloading were cumbersome, time-consuming, and expensive tasks that involved completely filling the limited below-decks spaces, driving wedges between the cargo and the deck beams, then piling lumber on deck until it was level with the cabins. Wedges were combined with restraining chains to support the cargo carried on deck, which could be stacked as high as 12 feet (Richards 1960:260). The standard length of board was 12 feet, and depth of hold on steambarges did not exceed 13 feet. This was to allow for the quickest loading and unloading of cargo, saving vessel owners money in wages (Barry 1996:149).

The introduction and adoption of the Consort System also eventually led to decreased vessel and crew quality. Initially, tow barges were equipped with quality masts, sails, and knowledgeable sailors. These crews could set sails to assist escort or to help themselves during times of emergency and foul weather. When the Consort System established itself as an economic success, however, many vessel owners allowed their tow barges to degrade and become unseaworthy as stand alone sailing vessels. Since tow barges were under the control of steambarges, consort crew quality suffered.

By the 1890s, maritime communities and the American and Canadian Federal Life Saving Services began to notice that tow barges were notoriously helpless. For example, undermanned vessels with unskilled crews often signaled Life Saving Service stations for assistance to tie up their vessels, cast anchor, and other tasks that, 20 years before, were common chores easily performed by sailing vessel crews. The worst effect of the decrease in crew quality was tragic loss of life. Vessel owners calculated the risk and knew that if one of their tow barges foundered, financial losses could be easily absorbed (Barry 1996:164-166). As a result, many sailors lost their lives during storms when tow cables connecting consort and escort were dropped or parted. Many ran aground or wrecked violently.

Despite the disadvantages associated with the Consort System, its efficiency and profitability made mass shipment of lumber possible, allowing valuable materials to be shipped rapidly throughout Great Lakes ports. Their efficiency, however, played a part in their demise. Rapidly declining freight rates and increased competition greatly reduced profits. The main problem for vessel owners was that the Great Lakes lumber industry could only survive as long as pine forests were abundant. This seemed no problem at mid-century. In fact, in 1852, a Wisconsin Congressman informed his colleagues that there were enough forest resources to last forever (Twining 1983:124). Only 70years passed before the Congressman was proven wrong; the great forests of pine were depleted and the lumber industry began migrating to the Pacific Coast. This, combined with economic conditions created by the Great Depression of 1929, ensured that steambarges would not survive on the Great Lakes. The lumber boom was over, the industry collapsed, and with it went the glory days of the Great Lakes steambarge (Barry 1996:149). Their descendants, wooden bulk freighters, could safely and profitably carry sufficient quantities of diverse cargos without consorts. By the 1930s, many old “lumber hookers” were simply forgotten. Their rotting old bones could be seen abandoned in backwater ports and tributaries (Richards 1960:261).

Despite the importance of steambarges to the Great Lakes economy in the 19th century, they have remained an historical and archaeological enigma. Information regarding their construction and usage remains abstruse and mostly unpublished. As a result, data concerning their place in the evolutionary chain of Great Lakes vessels is fragmented and obscure. The primary question raised by steambarges is whether or not they are, as suggested by Rodgers, a distinctive vessel type that represents the missing link between sail and steam powered cargo ships (Rodgers 2007:13). This idea is alluded to in the design of archaeologically documented steambarges because they demonstrate basic schooner hull construction combined with steam machinery. The Sunset Park Wreck, a steambarge investigated by East Carolina University in September 2005, is the vehicle through which this question will be answered. In depth analysis of steambarges is essential for uncovering facts on the life and times of not only these vessels, but the lumber industry and surrounding shipping culture. This information is also important to the preservation of Great Lakes maritime history, because it places this vessel class in both historical and archaeological contexts.

Research Methodology

During the fall of 2005 East Carolina University, in conjunction with the Wisconsin Historical Society, conducted a Phase II archaeological survey of a steambarge located in Door County, Wisconsin, near Sturgeon Bay. The vessel was later identified as the steambarge *Joys*, thus an investigation and discussion of this vessel's background and identification is warranted. Primary sources, while rare, provide detail on the vessel's typical activities. One source of basic information detailing dimensions, capacity, and ownership are the vessel's enrollments. The most important primary source is Door County's local newspaper, the *Door County Advocate*. This publication's maritime news section frequently reported on *Joys*' crew, cargoes, and destinations. When the vessel sank in 1898, the *Advocate* supplied a detailed account of the incident and an interview with the vessel's captain. *Joys* is also mentioned in a few secondary sources including Paul John Creviere's *Wild Gales and Tattered Sails* (1997), and Elizabeth Cutler and Walter M. Hirthe's *Six Fitzgerald Brothers: Lake Captains All* (1983).

The wreck, referred to as the Sunset Park Wreck for documentation purposes, is well preserved and lies in approximately 10 feet of water. The archaeological team mapped and photographed the site over eight working days. After all archaeological work was completed, a detailed site map was produced. The Sunset Park Wreck was not the first vessel investigated in Door County, and site reports from other investigations include: *The 1995 Predisturbance Wreck Site Investigation at Claflin Point, Little Sturgeon Bay, Wisconsin* (1995), *Of Limestone and Labor Shipwrecks of the Stone Trade: The 1999 Bullhead Point Stone Barge Investigation* (2003), *The Bones of a Bulk Carrier: The History and Archaeology of the Wooden Bulk Carrier/Stone Barge* City of Glasgow (2003), and *From Quarry to Quay: Shipwrecks of McCracken's Cove, the 2001-2002 Sturgeon Bay Wreck and Wharf Investigation at the Birmingham Site* (2006). These publications are important because they help place this wreck in a regional context.

Any thorough archaeological study considers previous studies. This study is no exception. Although material concerning archaeological investigation of steambarges is limited, some important resources are available. Archaeological sources specifically pertaining to steambarges include Pat Labadie and Charles Herdendorf's, *Wreck of the Steambarge* Adventure*: An Archaeological Investigation in*

Lake Erie at Kelleys Island, Ohio (2004); Labadie's *Submerged Cultural Resources Study, Pictured Rocks National Lakeshore* (1989); John Jensen et al., *Archaeological Assessment of Historic Great Lakes Shipwrecks: Surveys of the Steamers* Niagara *and* Francis Hinton (1995), Bradley A. Rodgers et al., *From Quarry to Quay: Shipwrecks of McCracken's Cove, the 2001-2002 Sturgeon Bay Wreck and Wharf Investigation at the Birmingham Site* (2006), and David J. Cooper (editor), *By Fire, Storm and Ice: Underwater Archaeological Investigations in the Apostle Islands* (1986). These works represent available sources with sections specifically discussing the origin, evolution, utilization, and archaeological documentation of steambarges. This information can be utilized to uncover what construction features are unique to steambarges (Labadie 1989: 51-54, 62-67, 146-149; Jensen et al. 1995:39-44; Cooper 1996:96-101; Rodgers et al. 2003:17; Labadie and Herdendorf 2004:30-35; Rodgers et al. 2006:37-40; Ronca 2006:17-20). Comparison of these vessels to documented schooners can establish a clear lineage between sail and steam.

Historical Research

Although archaeological analysis is important for defining the place of steambarges in the evolutionary chain of Great Lakes vessels, it is equally important to place these vessels in the historical context in which they belonged. Understanding the economic purposes for which they were built and the era in which they dominated Great Lakes trade can provide valuable clues to decode choices made during design and construction. In addition, understanding the typical working life of steambarges can help archaeologists locate, identify, and preserve these vessels in the archaeological record. Historic newspaper articles, vessel enrollments, site reports, and a variety of secondary sources all offer data that can be examined to provide a detailed history of this class.

Research into the conception, development, and subsequent demise of steambarges on the Great Lakes is, at times, a difficult undertaking because sources are limited. However, several repositories in the Great Lakes region provide valuable historical data. These include:

- C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan
- Wisconsin Historical Society, Madison, Wisconsin
- Historical Collections of The Great Lakes, Bowling Green State University, Bowling Green, Ohio
- Herman G. Runge Collection, Great Lakes Marine Historical Collection, Milwaukee Public Library, Milwaukee, Wisconsin
- Wisconsin State Maritime Museum Library and Archives at Manitowoc
- Door County Maritime Museum

- Sturgeon Bay Public Library

An investigation of steambarges would be incomplete if not paired with a basic analysis of the economic endeavor that created them: the lumber industry. Classic studies include George Hotchkiss' *History of the Lumber and Forest Industry of the Northwest* (1898), Susan Flader's *The Great Lakes Forest: An Environmental and Social History* (1983), and William Rector's *Log Transportation in the Lake States Lumber Industry 1840-1918* (1953). Hjalmar Holand's *History of Door County Wisconsin: The County Beautiful* (1917) provides an excellent overview of the port of Sturgeon Bay's history.

In addition, there are a few overall historical studies of Great Lakes ships. These include James P. Barry's *Ships of the Great Lakes: 300 Years of Navigation* (1996), Mansfield's *History of the Great Lakes, Volume One* (1899), James Cook Mills' *Our Inland Seas* (1910), Greenhill's *The Advent of Steam* (1993), and Dr. Jay Martin's Bowling Green University's dissertation, *A Social History of Life Aboard the Commercial Sailing Vessels of the United States and Canada on the Great Lakes, 1813-1930* (1995). These sources discuss steambarges as well as the practice that made them so economically successful; the Consort System.

All of these resources provide valuable data that contribute to the general goals of this study. These include investigating the financial impetus for the creation of steambarges, tracing their developmental influences through sail and steam, defining the general internal construction characteristics of the type, demonstrating how the Sunset Park Wreck fits into the archaeological record, and establishing *Joys* as the identity of the Sunset Park Wreck. In this way, steambarges can satisfactorily be identified pragmatically as the missing link between sail and steam cargo vessels. Before this can be done, however, it is important to establish the relationship between steambarges and the industry for which they were created: the Great Lakes lumber industry.

CHAPTER 2

FROM FOREST TO MILL: THE ASSAULT ON THE GREAT LAKES' PINE FOREST

Introduction

The great pine forests of Michigan, Wisconsin, and Minnesota form a specific geographical and environmental region of North America. In the 19th century, this region was the undisputed lumbering center of the United States (Rector 1953:57). Without the development and economic success of the Great Lakes lumber industry, there would have been no incentive for the creation of steambarges. These vessels represent a highly specialized technological innovation that effectively transported the products of the lumber industry faster, more effectively, and less expensively than any other valuable bulk cargo. The steambarge became a unique Great Lakes innovation specifically designed to meet the needs of the environment in which it was expected to perform. Before discussing the details of steambarge innovation, however, it is important to take a detailed look at the history of the lumbering industry, as it is key to understanding the environment that made steambarges necessary.

The Birth of the Great Lakes Lumber Industry

In the 17th century, when French and English explorers first traveled into the Great Lakes region, they found a dense forest of hardwoods and conifers bordering Lake Ontario, Lake Erie, Lake Huron, Lake Michigan, and a large portion of Lake Superior. In fact, 85 percent of the territory around these lakes was covered in forest (Mansfield 1972:514). These pioneers practiced a minimal amount of subsistence lumbering to construct trading posts, frontier army posts, and crude shelters. Although a primitive sawmill was erected near the present site of Detroit around 1750, the heyday of Great Lakes lumbering would not occur for nearly a century (Rector 1953:54-44).

After the War of 1812, a few European settlers began to trickle into the Great Lakes region (Rector 1953:55). Though adventurous and brave, these Americans treated the forest as an enemy and thought of it as a "hideous and desolate wilderness" (Twining 1983:123). The forest was home to wild animals and even wilder men, and for many pioneers it proved a formidable adversary. Because the trees represented the dangers of the wilderness, they were burned and destroyed like vermin to create space for homesteads and farms necessary for survival (Kilar 1990:19; Flader 1983:3). It was not until the 1830s that an immense flood of immigrants from New York, Pennsylvania, and Maine began migrating westward, "inundating the more desirable areas in the lower Lake states and even tentatively licking around the southern and eastern edges of the pine forest" (Rector 1953:55; Gray 1998:63).

This massive increase in immigration is partly due to the opening of the Erie Canal (1825) and the Welland Canal (1829), which allowed immigrants cheaper and easier passage west. Before the opening of the canals, merchants and settlers were forced to travel over roads that were merely dirt paths through the forest. The exorbitant cost of horses and drivers, as well as the limited cargo carrying capacity of carriages, made the cost of transporting cargo prohibitive for most shippers and immigrants (Gray 1998:18-19). Another factor that ignited the fire of immigration was the Michigan Territory's speculative land boom that occurred in the 1830s (Kilar 1990:20). The east had become overpopulated and many families, who had no land of their own, embraced the opportunity to purchase inexpensive land. Between the years 1832 and 1840 alone, the population of the Great Lakes quadrupled (Mansfield 1972:634). These immigrants created a demand for raw materials to construct their towns and farmsteads. As a result, the Great Lakes lumber industry was born. It is no surprise that the golden age of lumbering (1840-1910) coincided with this period of intense immigration (Rector 1953:43).

The growth of the earliest logging companies would not have been possible without the assistance of skilled lumbermen from New Hampshire, New York, Pennsylvania and, most especially, Maine. Many Maineites had a profound impact on the Great Lakes lumber industry and became prominent Great Lakes lumbermen (Rector 1953:63). To lure skilled workers to the region, mill owners placed advertisements in New England newspapers and passed out literature that guaranteed the profitability of lumbering and high wages for skilled lumbermen. These advertisements, combined with the exhausting of eastern pineries by 1850, enticed many skilled lumbermen to relocate to the Great Lakes (Fries 1951:12). It is ironic that by 1850 the Eastern states, which had previously supplied the lumber needs of the entire United States, began importing large quantities of timber products from the upper lakes region (Gray 1998: 41).

White Pine: Great Lakes Gold

The only species that interested the first serious commercial lumbermen was white pine. The processing of this species was so important that the northern forests came to be known as the "pineries" (Mansfield 1972:515). In fact, from the 1840s to the 1890s, the term "lumbering" referred exclusively to white pine processing. The presence of other species in pine stands actually hindered logging operations and was considered a costly nuisance (Rector 1953:53). It is difficult to ascertain how much commercially valuable timber was present in the forests of the old Northwest. George W.

Hotchkiss, one of the first historians to write about lumbering in the Great Lakes, estimated that there was once 1,000,000,000,000 feet of timber; half of which he believed was comprised of the coveted white pine trees (Flader 1983: 125). This is probably an exaggeration, but it is difficult to prove or disprove his estimate for three reasons: timber resources were not officially surveyed until the mid to late 1800s, many papers and business records kept by the lumbering companies were destroyed by floods and fire, and the estimate assigned to each particular timber stand is relative (Flader 1983: 125). According to Great Lakes historian and archaeologist Jeff Gray:

> When analyzing historic lumbering, it is important to understand yields are relative to age of the timber stand: modern white pine provides an average of 45 million board feet per 80 acre at 80 years, while virgin forests' production is estimated around 140 million board feet per acreage (Gray 2000:8).

This estimate does, however, sufficiently demonstrate the extent of northern forests before lumber production reached its peak. It was not until these vast white pine resources were exhausted that lumbermen were forced to exploit other species.

White pine, or *Pinus strobus*, was prized for two reasons: it is hearty and easy to work with. This robust species has wide geological amplitude, and is ideally suited for the Great Lakes' natural environment. Thousands of years ago, a massive glacier covered much of the Great Lakes region. This glacier pulverized the rocks and soil into the sand upon which white pine thrives best (Fries 1951:7). Although this species thrives on sandy soil, it can grow in almost any soil type. Pine trees can also produce more wood than most other species with less food and moisture (Gray 2000:8).

Perhaps most importantly, white pine has several characteristics that made it the ideal building material for several important 19th century industries. Pine planks generally have a straight grain that can be easily worked with a broad axe instead of a ripsaw. According to historian William Gerald Rector, "…it was often said that a carpenter could split a plank with his ax and the resulting finish would equal the product of saw and plane" (Rector 1953:45). This characteristic is produced in the natural environment because pine drops its lower limbs as it grows, resulting in wood that is knot free (Figure 2.1) (Gray 2000:9). Other characteristics that made white pine products desirable to 19th century artisans were lightness, strength, durability, and the ease in which it took and retained paint (Hotchkiss 1898:752).

FIGURE 2.1: White pine (Courtesy of Wayne Lusardi).

Unfortunately for the first Great Lakes lumbermen, choosing the most profitable and marketable species of wood to harvest and obtaining enough skilled labor to harvest it was only necessary if they could obtain ownership of the pine forests. Early lumbering attempts were hindered by Native American tribes' ownership of the best areas of pine forest. Fierce competition for the pinelands between white settlers and Native Americans led to bitter conflicts such as the Black Hawk War of 1832. In less than 20 years, however, the United States government deprived the Lakes' indigenous people of all their lands except a few square miles of reservation area (Fries 1951:10). When the Native Americans were mostly removed from the Great Lakes region, lumbering efforts began in earnest.

Another challenge the lumbering industry faced was a series of laws passed by the government. In 1817 and in 1822 Congress passed laws that gave the United States Navy control over live oak and red cedar on federal lands in order to protect the Navy's supply. Obviously, this law did not alleviate the Navy's concerns because, in 1831, a more extensive act was passed that made all timber cutting on federal property a felony. The first serious commercial lumbermen, however, were really only interested in harvesting one species: white pine. In response to this, the Supreme Court case of *U.S. v. Briggs* insured that all timber on federal lands was protected under the act of 1831. This left lumbermen with three options for obtaining lumber: purchasing previously cut logs, purchasing stumpage, or purchasing timberlands outright (Rodgers 1996:43-44).

Much like other banned items, lumber cut on federal lands soon became a coveted black market commodity. The penalties for illegal harvesting of federal timber were too minimal to deter poachers, especially considering the immense potential profit that could be made in just one season. The solicitor of the treasury was originally responsible for enforcing timber laws, but proved too feeble and ineffective. Poachers capitalized on this weakness as an opportunity to acquire wealth and power (Rodgers 1996:56).

In 1851, responsibility fell to the Department of the Interior, and agents began cracking down on the illicit lumber trade. What ensued was a violent battle for the forest fought between poachers and agents. The problem got so out of control that the U.S. Navy's only Great Lakes military vessel, the iron paddle-wheeler USS *Michigan*, was drawn into the action and nearly sunk as a result (Rodgers 1996:43-44). With the aid of this vessel, timber agents and U.S. Marshals were able to round up several outlaws and, "knocked the wind out of the timber revolt" (Rodgers 1996:54). Unfortunately for the US Navy, victory was short lived. In 1854, the timber pirates stopped using violence and started using their wealth and power as tools to influence Congress. This new method proved a success: Congress disbanded the Timber Agencies and the powerless land officers were once again charged with the responsibility of protecting federal timberlands. As a result, the illicit timber trade resumed unabated and did not stop until all of the Great Lakes' forests were gone (Rodgers 1996:56-57).

The Boom Years

The lumbering industry on the Great Lakes was characterized by cycles of boom and bust. Drought years, when the streams were lower and log delivery via the streams and rivers was slow or non-existent, created high demands for timber and high prices to any lumbermen that could get logs to the mill. The years following droughts were typically characterized by overproduction and saturated markets that were ideal for buyers. Despite the challenges of weather, unpredictable markets, and dishonesty and lawlessness of the men engaged in lumbering, there were some incredible success stories during the early days of the industry. These stories became legends that encouraged many small businessmen to try their luck at lumbering.

Once lumbering was established in the lakes region, mills began churning out products for regional consumption. It was not, however, until the opening of the United States' great prairie in the 1850s that the Great Lakes' white pine stands became gold mines. By the mid 1850s present day states such as Illinois and Iowa were well on their way to being settled. As the populations of these treeless areas grew, their demand for building materials became almost insatiable. Almost immediately they were forced to import materials from the lumber-rich areas of Wisconsin, Michigan, and Minnesota. This stimulated the Great Lakes' economy and provided lumbermen with a market where they could sell their products for a good price. Fortunately, mill owners were able to keep pace with increased demand because of technological developments in sawmill machinery. These developments included overshot wheels, steam power, circular saws, and upright saws (Rector 1953:57-58).

Chicago benefited most from the settlement of the American prairie. The lumber trade in Chicago began around 1830 and was greatly aided by the dredging of the Chicago River, as well as the completion of a canal connecting Chicago to the Illinois River (Charney 1988:13-14). By the 1850s Chicago based wholesalers were doing an impressive amount of business. According to Great Lakes historian William Rector, "By 1856 Chicago had supplanted Albany, New York, as the primary lumber wholesale center in the United States" (Rector 1953:58). A Chicago based newspaper noted that, "…those great lumber piles tower up to a height sufficient to excite the wonder and admiration of people not in the lumber business" (Gray 2000:11). The lumber wealth flowing into Chicago helped it become the thriving and influential metropolis it is today.

The lumbermen of the 1870s through the mid 1880s saw the Great Lakes lumbering industry transform from small locally owned operations to a booming industry run by big business. Between 1869 and 1899, lumbering became the most economically important activity in the region. This lumber boom can be attributed to three factors: continued expansion west, the great Chicago and Peshtigo fires of 1871, and post-Civil War reconstruction (Rohe 1984:19). All of these factors created a prodigious demand for building materials in America. According to historian Randall E. Rohe:

> It [lumbering] not only changed the face of the land, but also influenced settlement, urban development, population, place names, transportation routes, migrations and other geographic elements and patterns. The importance becomes obvious when one realizes that between 1869 and 1898 three Lakes states [Michigan, Wisconsin, and Minnesota] were the primary sources of lumber for the nation and that the

> lumber produced in these states well surpassed in value the gold mined in California. In fact…the value of lumber produced in just Michigan exceeded the value of gold production in California by more than a billion dollars, even at the incredibly low valuation of thirteen dollars per thousand board feet, the average wholesale price of lumber for the period 1847-1897 (Rohe 1984:16).

Although lumber exports declined to 108,459,000 board feet during the years 1873-1879, because of the recession caused by the Panic of 1873, the opening of the improved Welland Canal in 1882 caused this number to double (Palmer 1984:37). The Panic only served to drive the last few small business owners in the lumber industry to extinction, which presented the surviving big businesses with an opportunity to make better profits.

The mills that opened in the antebellum decade were crude compared to the large-scale lumbering operations that were constructed in the 1870s and 1880s (Kilar 1990:50). Big business required bigger and more long-term investments of capital because of increased production, longer hauls to market, and more expensive stumpage. Only corporations, the independently wealthy, or those with extensive credit could afford to participate in Great Lakes lumbering (Rector 1953:59). Big businesses with lots of capital were finally able to take on the biggest and most expensive problem in the lumbering industry: transportation.

From Forest to Mill

The most important factor that influenced the Great Lakes lumber industry was transportation. The problem of transportation was taken very seriously because mismanagement or bad luck in this area of business often caused mill owners to go into debt or bankruptcy (Rector 1953:15-16). "Regardless of time, place, or type of operation," wrote William Rector, "the transportation of logs was a major pivot point around which the entire manufacturing process was forced to revolve" (Rector 1953:20). A study of Great Lakes lumbering analyzed the cost of transportation between 1870 and 1901 and found that log transportation accounted for an incredible 52 to 73 percent of the total cost of logs (Rector 1953:23). No matter how well suited for industry a product is, its value is speculative if it cannot be transported to market. In the lumber industry companies had to deal with transportation of their product in two distinct phases. Getting their finished product to market was only the second half of their problem. Their first priority was getting cut logs to the mill for processing.

In the 19th century, timber was an inexpensive commodity without a large profit margin. Transportation costs could easily eat up profits. For this reason, most early logging activities were seasonal operations that took place during winter months (Kilar 1990:25). This allowed lumbermen to move logs out of the forest through the most inexpensive available methods, by either skidding or sleighing. Until the 1880s, this was accomplished by securing logs onto sleds, which were bound with chains. These sleds were hooked to a team of oxen or horses, and then pulled across the frozen land to the waterways (Figure 2.2) (Fries 1951:31). Eventually the teams of oxen were supplanted by steam technology in the form of draglines (Fries 1951:33).

FIGURE 2.2: Wood sleigh on its way to a river (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

Great Lakes mills had the help of local geology in the form of the regions' rivers and streams, which were used to transport cut logs downstream from the forest to the mill. Because pine has such a low density, it was more easily transported by water than other prevalent Great Lakes species (Rohe 1984:18). The Great Lakes pineries were connected to several major waterways that became "superhighways". They enabled lumbermen to ship their products to cities along the lakeshores, in Canada, all along the Atlantic coast, and via the Mississippi, Platt, Missouri, and Red Rivers to prairie farmlands. The Saginaw Basin alone boasted an estimated 864 miles of rivers suitable for log driving (Rector 1953:45, 48).

In the spring, loggers broke the cut logs from the rollaways and let them fall into the streams, where they were carried downstream to the mill. River men, or "river hogs" as they were sometimes called, were responsible for clearing the streams, pushing the logs downstream to the mills, and keeping the river free from jams and obstructions (Kilar 1990:24).

The waterways determined the placement of mills because the most logical and economical place to put a mill was near a river mouth. This location allowed them to be downstream from the forest, where the logs could be caught and held safely, and also accessible to the Great Lakes, which provided the means for shipping the finished product to distribution centers (Kilar 1990:24-25; Flader 1983:131).

As time went by, the most accessible timber was cut down. Those mill owners who could not place their mill in an ideal location had to utilize log rafts, a more expensive method of log shipment. Log rafts, often referred to as "booms", were developed in Bay City, Michigan, by Captain Benjamin Boutell in 1885. Booms were actually short logs (16 feet long and 3 to 4 feet in diameter) chained together end to end to make up the perimeter of the raft structure. These "bags" were filled with loose logs and then towed by a steamer (Figure 2.3) (Barry 1996:16). This method was more expensive because the owner of the steamer was typically an independent contractor (Rector 1953:272). These contractors often had to be paid at the time their services were rendered rather than after the timber was sold.

Log rafts were incredibly dangerous to other vessels. They were typically poorly marked and could be immense in size, which proved to be hazardous obstacles in poor visibility. In addition, loose logs that escaped from bags tended to float freely on the lakes until they met an unsuspecting vessel (Gray 1998:47). Any ship that had a surprise encounter with loose logs faced potential hull damage or worse. As a result, regular patrols known as "log pickers" were arranged to wrangle loose logs. These men arranged logs by owners marks stamped on their ends, made them into new rafts, and returned them to their owners (Barry 1996:16). Log rafts were so dangerous that the Lake Carriers' Association finally filed a formal protest with Congress in 1893. This led to regulations such as limitations on size and the construction materials that could be utilized to build rafts (Barry 1996:16).


FIGURE 2.3: A log raft that has been bundled together in a long and narrow configuration so it would fit through the channels (Courtesy of Parry Sound Public Library, Parry Sound, Ontario).

No matter what transportation method was used to transport timber from the forest to the mill, once it got there it was stored in holding ponds. There it could be moved inside the mills by conveyor belts and cut at the owner's convenience. In this way, companies were able to turn a cumbersome, bulky, and inexpensive product into a profit.

Full to the Guntline: Lumber Shovers and the Loading of Lumber Carriers

One element of transportation expenses lumbermen were powerless to fight, and one of the most overlooked aspects of lumbering, was the loading and unloading of finished products into schooners and steambarges for transportation to distribution centers. While steambarges and the Consort System, which will be discussed in more detail in Chapter 3, made the shipment of lumber and other bulk commodities economical and reliable, they were not completely efficient. One major disadvantage of steambarges was that they had to be loaded by hand. This aspect of transportation became expensive because lots of labor was required to load and unload vessels that transported lumber to markets. In 1885, an estimated 14,479 people were employed in the Wisconsin lumber industry alone. Hundreds of these individuals were engaged in the business of loading and unloading lumber carriers. To put this figure into perspective, consider that the next largest employer of Wisconsin's citizens, founders and machinists, reported only 1,431 employees in 1885 (Krejcarek

1996:16). The job of hand loading lumber was physically demanding and dangerous, thus workers were paid a premium wage (Palmer 1984:34).

Lumber shoving, as the process of loading and unloading lumber from ships was called, was a difficult task that was hard on both ships and men. A lumber shover's day began before sun-up when the mate passed out canvas aprons and harvest mitts, to help protect the men from splinters. Then the men, working in pairs, would begin removing freshly cut pine boards from rectangular crags overhanging the dock (Figure 2.4).

FIGURE 2.4: Lumber shovers passing lumber from the woodpile to the ship's deck (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

Men standing on the piles passed lumber down to the ship's deck, and then it was carried to the hatches and passed into the hold one board at a time (Figure 2.5). The limited below-decks spaces were filled first by placing lumber in neat rows on the ceiling, starting at the bilges and sides. According to Great Lakes historian James P. Barry, "…the standard length of board was twelve feet, and the thirteen-foot depth provided for the easiest and quickest handling of the cargo. If a ship were deeper, more handling was required, and that cost more money" (Barry 1996:149).

FIGURE 2.5: Lumber shovers filling the hold of a steambarge (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

Loading continued until the lumber level was "full to the guntline", meaning mounted up to the deckbeams (Palmer 1984:35). After this, boards and wedges were driven between the cargo and deck beams to keep the cargo from shifting, and to give the main deck added support. After the hold was full, the men began loading the deck (Figure 2.6). According to Palmer:

> Upended planks inside the bulwarks enabled them to pile the lumber from five to ten feet high above deck, until it smothered the cabin top and overhung the forecastle. Chains were then toggled from rail to rail, to keep this mountain from shifting. Wells would be left to get at the steering wheel and cabin companionway, the centerboard winch and the pumps (Palmer 1984:35).

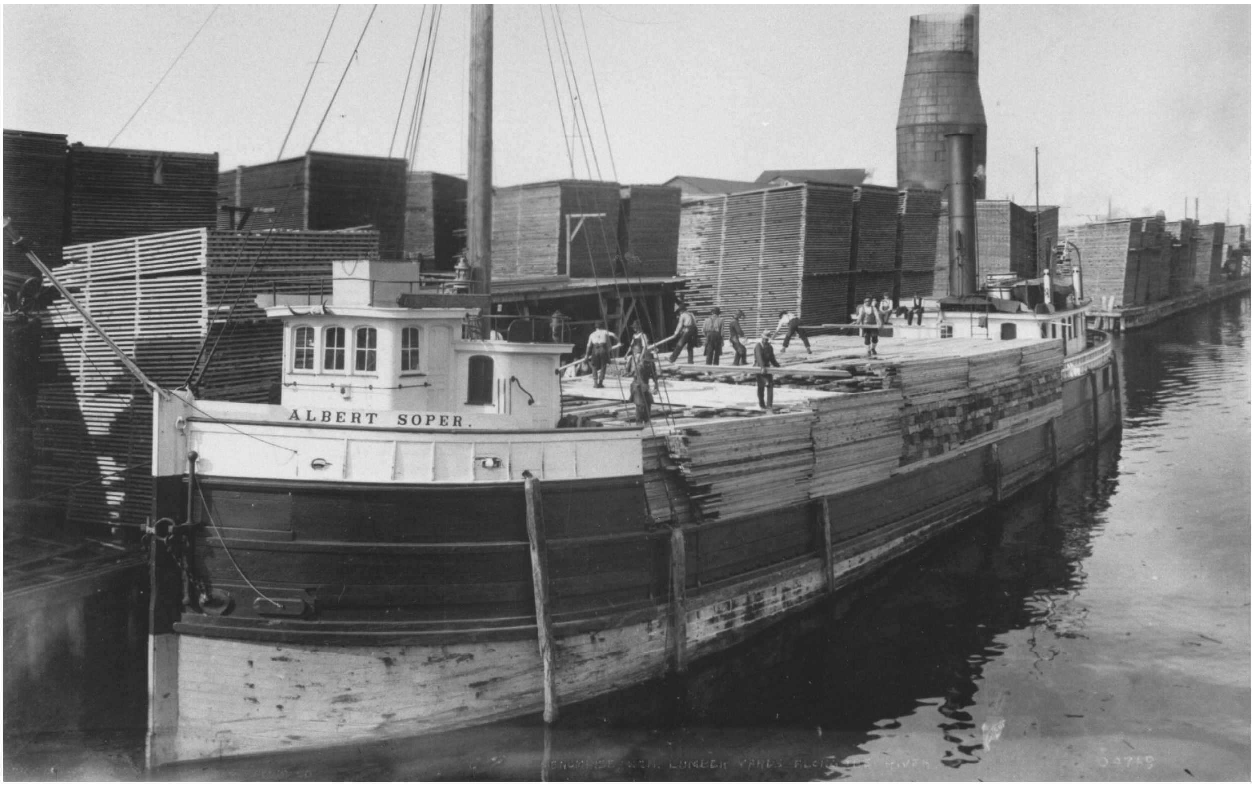

FIGURE 2.6: Lumber Shovers at work. Note how high the cargo is loaded above the deck (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

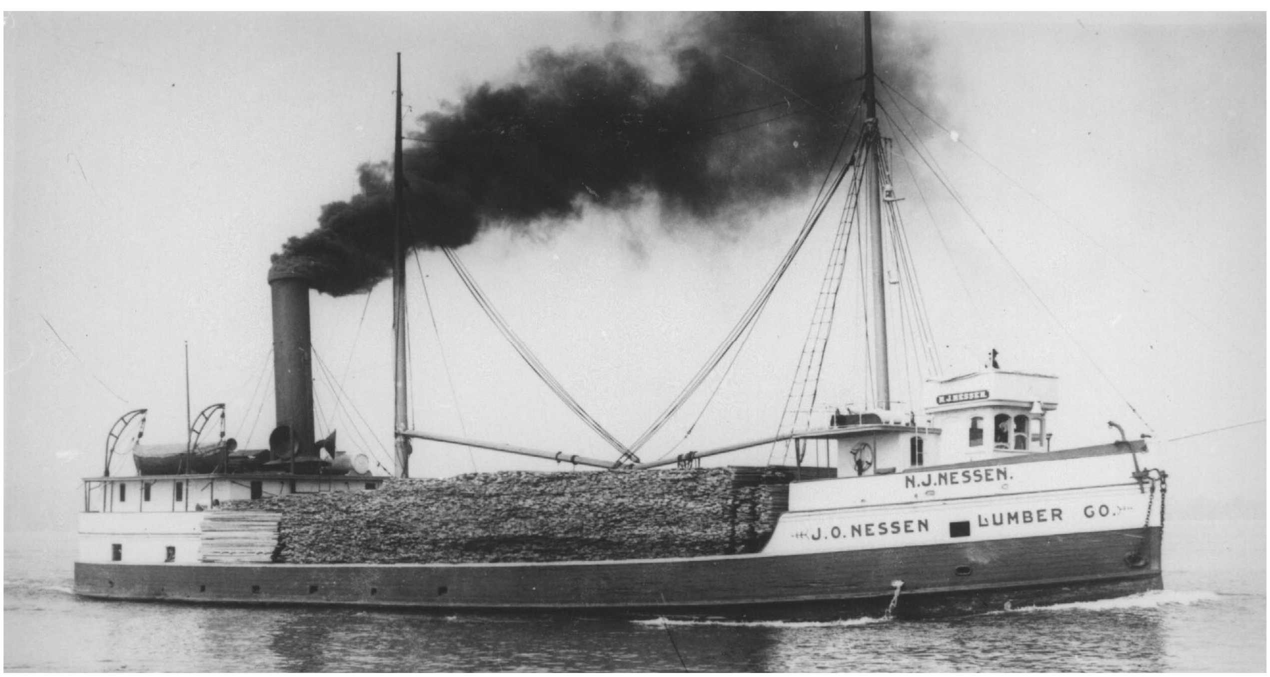

FIGURE 2.7: The *N.J. Messen* fully loaded (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

Work continued until the vessels were fully loaded (Figure 2.7). If the weather was good, the vessels could cast off at once and the shovers would begin the process of loading another vessel. The grueling grind was repeated until sundown, when the lumber shover's workday was finally over.

Timber Famine: The Death of the Great Pine Empire

The most obvious problem mill owners faced in the late 1800s was that the lumber boom could only survive as long as the Great Lakes pine forests were abundant. This seemed no problem at mid-century. In fact, in 1852, a Wisconsin Congressman informed his colleagues that:

> Upon the Rivers which are tributary to the Mississippi, and also upon those which empty themselves into Lake Michigan, there are interminable forests of pine, sufficient to supply all the wants of the citizens…for all time to come (Flader 1983:124).

After the logging boom of the 1850s, the pine forests were decimated at an accelerated pace. By 1876 the rate at which the pine forests were being consumed started alarming journalists from several prominent Great Lakes newspapers (Mansfield 1899:516). In 1898, lumbermen estimated that there were 3,000,000,000 acres of land in Wisconsin alone without forest cover, and several million more acres were hosts only to dead and dying stumps (Rohe1984:19). Between the years 1899 and 1920 the Congressman was finally proven wrong, lumber production had dropped from 6,000,000,000 board feet to only 500,000,000 board feet of pine (Rector 1953:61). The great forests of pine had been turned into a vast wasteland and Great Lakes lumbering quickly became a dying industry. The only remaining timber resources were located in remote areas that were not cost effective to transport to mill (Rector 1953:284). The passage of the McKinley Tariff Act on 1 October 1890 did not help matters. Wood and wood manufacturers were taxed between 10 to 13 percent, an additional expense they could not bear (Palmer 1984:37). One by one the mills that depended upon the great northern forests were dismantled, burned, or abandoned (Mansfield 1899:517).

Despite the damage caused by intensive logging of the Great Lakes forests, historical hindsight shows that it was not the physical act of over-harvesting alone that destroyed the timber industry. Logging did destroy virgin white pine stands, but it was not merely through the process of cutting trees. Rather, it was the *methods* the loggers used that invited the forests' worst enemy, fire.

Irresponsible logging practices resulted in acres of forest floor littered with piles of branches and treetops that were susceptible to fire (Rohe 1984:19). According to Eric A. Bourdo Jr.:

> It was the repeated fire in the aftermath of logging which was the harshest on the white pine forest. These fires killed seedlings that could have regenerated the stands…hot fires virtually sterilized the sites (Flader 1983:14).

It is ironic that the Chicago and Peshtigo fires created a destructive lumber boom because both the boom and the fire turned millions of acres of forestland into a barren, desolate, and ultimately unprofitable wasteland. Unbelievably, residents of the Great Lakes states who had migrated to the great pine forests in the 1830s saw it vanish before their very eyes in the course of their lifetimes. Historian Charles E. Twining summarized the situation best when he stated, "The Great Lakes forest could have only been saved had it been the last forest" (Flader 1983:131).

After the plains were settled, Americans kept pushing on to the new frontier, the Northwest Pacific Coast. Unsurprisingly, the lumber industry went with them. It is no coincidence that the successful Weyerhaeuser Company, which had maintained its headquarters in St. Paul, Minnesota, relocated to Tacoma, Washington, in 1890 (Flader 1983:131). Great Lakes white pine was replaced by fir and redwood shingles from Oregon and yellow pine from the South (Rector 1953:284). Much like the pine regions of the East, including Maine, Pennsylvania, and New York, the Lake states lost the lumbering industry to a new frontier with virgin forests. Those lumbermen who maintained the tools, capital, and industrial skill necessary to harvest the forest moved with the industry. The destruction of the forest was so complete that by 1920 the Great Lakes, once America's proud pine empire, was importing most of its lumber (Rohe 1984:19).

Conclusion

The lumbermens' assault on the Northern forests was both a blessing and a curse. The lumbering industry was the most important economic activity in the Great Lakes region during the 19th century, and directly influenced the settlement of America's wilderness. Without Great Lakes lumber, the settlement of the timberless regions of the plains would have been exceedingly difficult, if not impossible, at least until the invention of alternative building materials such as cement and steel. Lakes lumber built railroads, ships, barns, stores, and homes. The steamboats and railroads that carried settlers, provisions, and equipment deep into the west also depended upon Great Lakes lumber for hulls and rail ties (Corbin 2006:2-3). Lumber made the Great Lakes a wealthy region and boosted the United States' economy. Great Lakes pine was, in fact, *more* valuable than California gold by more than 1,000,000,000 dollars (Rohe 1984:16). Unfortunately, economic success came at a great cost; logging scarred the natural face of the Great Lakes region forever. No one alive today has ever seen the sea of green that awed America's first pioneers.

Transportation was the lumbermen's biggest overhead cost and, thus, his biggest enemy. Transportation was also a two-fold problem. Although lumbermen figured out a reliable and economic solution for getting their products from forest to mill, it was not until a reliable system was developed to transport processed goods from the mill to the market that the lumber industry became dominant in the Great Lakes economy. The solution to this transportation problem would require the invention of a completely new vessel class, and an entirely new system of shipping products: steambarges and the Consort System.

CHAPTER 3:

THE EVOLUTION OF GREAT LAKES STEAMBARGES: THE MISSING LINK BETWEEN SAIL AND STEAM POWERED CARGO VESSELS

Introduction

Great Lakes vessels have been undergoing a continuous process of evolution powered by experimentation, adaptation, design, and innovation since the first hull slid into the lakes in the 1600s (Labadie 1989:17). The hull types that have evolved on the Lakes have been necessarily distinct from ocean-going classes because the Lakes represent a unique geographic area. Lakes shipwrights have:

> …taken the best of contemporary French, British, and Yankee shipbuilding traditions and adapted them to the needs of the Lakes' environment, within the limitations imposed by local availability of raw materials (Labadie 1989:17).

Each new vessel type has given rise to yet another, and even the ancestors of today's giant steel bulk carriers can be traced through a family tree of vessel types starting with the schooner. No other vessel type influenced the internal design of steambarges more than schooners. Internal steambarge construction is characterized by both sail and steam design components including heavy keelson assemblies and longitudinal ceiling planking similar to sailing schooners, combined with steam components including engines, boilers, propellers, heavy stern framing, and bilge keelsons. Externally, steambarges resemble typical Great Lakes freighter profiles including a high length to beam ratio, as well as pilothouses and crew quarters located at either end with an open deck in between (Barry 1996:149).

In order to trace the evolution of sail powered cargo vessels to steam powered cargo vessels, it is necessary to understand what components of steambarge predecessors actually manifest in steambarge design and construction. Therefore, a brief synopsis of the influence of schooner, passenger steamer, and propeller development is provided. This data illuminates the origin of these components and shows how they were combined by shipwrights to form the first successful commercial steam powered bulk cargo carrier, the steambarge.

The purpose of this work is two-fold. First, it traces the technological development of the steambarge by demonstrating how innovation was the result of shipwrights' experiments with other vessel classes including schooners, steamers, and propellers. Second, it explores the reasons steambarge development was crucial to the Great Lakes economy, and why the technology became obsolete.

Schooners

The first vessels to sail the Great Lakes were dugouts and "pirogues", or birch bark canoes, utilized by indigenous tribes to travel the tributaries and shores of the Great Lakes (Mills 1910:28). This remained the primary means of boat transportation until after the arrival of the French in 1615 (Cooper 1989:17). At that time, the Lakes region was an untouched paradise filled with a plethora of natural resources, but the French were only interested in harvesting fur. Originally, French fur traders utilized the native pirogue to transport furs, but within 65 years they had improved upon the canoe's design and constructed the very first Euro-American-built boat, the "bateau". Bateaus boosted the fur trade because traders needed vessels with a larger capacity for transporting goods (Barry 1996:30). Explorers who wished to journey further west by boat than the rapids of the St. Lawrence and Niagara Rivers were forced to build new types of ships, because these waters proved too powerful and difficult to cross via pirogues and bateaus. The construction of these early vessels was based upon transplanted European ship designs, however, it should be noted that shipwrights did not choose deep-draft ocean-going vessels as their models. Rather, they selected shallow-draft designs that had proven worthy in the shallow and unprotected waters of the North Sea. The reason for this is simple: nearly all early lakes navigation took place along the shoreline (Labadie 1989:17). The first ship to sail the Great Lakes above Niagara was the *Griffon*, a small French-designed galleot built by LaSalle for the fur trade in 1679. Unfortunately, this vessel did not survive its maiden voyage, and the fur trade, which continued to grow in importance, would not stimulate the production of another large sail powered ship for 50 years (Mills 1910:63; Barry 1996:12-15). As lakes commerce grew, however, so did merchants' demands for larger and more efficient cargo vessels.

Schooners made their American debut along the East coast in the early 1700s, and were given the label "schooner" in 1717. Before long merchants, sailors, and shipwrights discovered that vessels with a schooner rig were the most efficient commercial craft. Not surprisingly, shipwrights again drew from European concepts when designing the first American vessels with schooner rigs. Their design may have been influenced by two separate European rigging design traditions. Schooners with square topsails were probably influenced by small square-rigged vessels and those without were probably influence by two-masted shallops carrying only sprit sails, gaff sails, or triangular sails (Greenhill 1980:19). These sail configurations allowed the vessels to be very dependable in various weather conditions and could be handled by smaller crews (Lenihan 1994:47).

Schooner hulls developed separately from rigging. Although 18th century American ships usually used the same narrow hull type, they sailed, as mentioned, with different rigs. Merchants valued economically advantageous narrow hulls because, "when two vessels had the same capacity or displacement, the one with the narrower hull would be faster" (Lenihan 1994:47). During the French and Indian War (1754-1763) schooners made their debut on the Great Lakes (Mills 1910:64). These flat-bottomed shallow-draft ships were discovered to be the best solution for retaining speed and efficiency despite the Lakes' shallow waters and twisting channels.

After 1800, merchant schooners, combining narrow hulls with schooner rigging, appeared on the Lakes in considerable numbers. They became an integral part of the Lakes' commerce because vessel owners began to establish packet lines to carry both passengers and freight (Labadie 1989:19-20). Once vessel owners entered the packet trade, "speed, capacity, seaworthiness, and the ability to sail on schedule year-round with any available cargo" were of the utmost importance. Fast, efficient vessels with a large cargo capacity became an even bigger economic boon with the construction of two major canals: the Erie Canal (1825), which connected the Great Lakes with the east coast, and the Welland Canal (1829), which connected Lake Erie and Lake Ontario. These two canals opened four of the five Great Lakes to continuous navigation (Still et al. 1993:69).

Despite the obvious benefits of schooners, the earliest vessels tended to be poor sailors that drifted with the wind, or "to the lee", because of the shallowness of their hulls. This technological problem was not corrected until the introduction of centerboards (Barkhausen 1990:8). Centerboards are typically wooden devices typically located in the center of a vessel, contained within a watertight case, or trunk, and originally situated to the side of a vessel's keel/keelson backbone. After 1860, vessels were built with centerboards that passed directly through the keel (Chapelle 1967: 280; Rodgers 2007:12). Centerboards protrude through the bottom of a ship's hull and can be lowered or raised from inside the vessel to prevent leeway. Vessels with centerboards are more effective sailors because they maneuver well at all loads and drafts (Chapelle 1967:279). Although there is some confusion about the introduction of centerboards on the Great Lakes, it seems that they were a common occurrence after about 1825. By 1845 centerboards were being utilized in larger commercial craft, such as barks and steamers (including steambarges by 1848), to control drift when running light (Labadie 1989:20).

Canal schooners, grain schooners, and scow schooners were three unique Great Lakes schooner varieties that moved most of the important 19th century bulk cargo (Rodgers 2007:8).

Without the important and valuable cargoes that Great Lakes schooners transported, westward migration in the United States would have been exceedingly difficult, if not impossible. Schooners, however, depended on the wind which could at times be unpredictable and unreliable. It was also time consuming to load and unload schooners by hand, although the introduction of an on-deck steam engine and boiler, called "donkey engines" and "donkey boilers", sped up the process. This system facilitated cargo loading because they could be used to power deck machinery, such as cargo winches (Kemp 1976: 259). Although the introduction of mechanized loading equipment in the 19th century made cargo handling less expensive, schooner technology began a gradual downward spiral toward the end of the century due to the introduction and success of steam-powered vessels.

Heating up the Competition: The Debut of Steam on the Great Lakes

Combining steam technology with ships was an inventive process that involved several different countries and inventors (Mills 1910:76). As in most cases, however, the first man to pull it all together and make a profit received the credit; this is the case with Robert Fulton. In 1803 Fulton, an American with a passion for mechanics, formed a partnership with Robert R. Livingston, the U.S. Minster to France, and began testing several different vessel propulsion theories (Mills 1910:84). After two failed attempts in Europe, Fulton returned to the United States to construct the *Steam Boat* in 1806. In September 1807 Fulton's vessel made its famous trip from New York to Albany (Still et al. 1993:44). With this successful venture Fulton and Livingston proved that propelling a vessel with steam was possible and, most importantly, quite profitable for transporting passengers.

In this light, passenger steamboat technology made its debut on the lower Great Lakes in 1816 with the *Ontario* and the *Frontenac*, followed by the 1818 debut of the *Walk-in-the-Water* (Taylor 1951:61). The benefits of steam-powered Great Lakes paddle wheelers over sail powered ships included faster turn-around times, predictable delivery, increased reliability, and added comfort. Despite the benefits of steamers (which, in Great Lakes parlance refers specifically to paddle-wheel steamers), they were not entirely efficient. Their deficiencies included lack of cargo capacity, expensive operation costs, and the bottleneck effect of the Welland Canal (Hatcher 1944:121).

The cost of operating a steamboat made it impossible for the vessel owners to make a profit transporting relatively low value bulk commodities such as grain, coal, and lumber. The large inefficient low-pressure engines, boilers, and fuel source took up too much valuable cargo space, and were expensive to maintain and operate (Still et al. 1993:69). Any steamer that was large enough to have a carrying capacity equal to that of sailing vessels was too big to fit through the one hundred foot locks of the Welland Canal (Hatcher 1944:121).

In addition, paddle wheelers were constructed with one or two decks of cabins that stretched from stem to stern. Any bulk cargo could not be loaded through convenient deck hatches such as those found on schooners. Loading bulk cargo or any cargo at all on a paddle wheeler was an expensive and time-consuming process that required several crewmembers and dockworkers using wheelbarrows (Thompson 1991:31). Therefore, steamboat owners and operators focused almost all of their economic efforts on transporting packaged manufactured goods and passengers in grand style. Schooners were able to maintain a separate economic niche by transporting the Lakes' bulk cargo. The promise of future potential profits, however, encouraged shipwrights to actively begin the process of combining the bulk cargo capacity of sailing ships with the predictability, efficiency, speed, and profitability of steam. This could not, however, be accomplished until builders could figure a way to downsize paddle-wheelers' bulky machinery, therefore, reducing steamers' size in general, while maintaining a large cargo capacity.

The Vandalia*: The First Great Lakes Propeller*

In 1841, in Oswego, New York, merchants praying for a faster way to deliver goods westward via steam were blessed with the launching of the *Vandalia*, an exceptional example of Great Lakes craftsmanship. *Vandalia* was the first Great Lakes vessel to have its machinery all the way aft and the first steam powered, screw propeller-driven commercial ship in the world (Thompson 1991:36; Barry 1996:52). Without the implementation of screw propellers, the transportation of bulk cargo via steam would have been impossible. The commercial adoption of the screw propeller was made possible by the efforts of two different men, Francis Pettit Smith, a farmer, and John Ericsson, a Swedish inventor (Barry 1996:52). Smith became interested in screw propulsion in 1835. He constructed a two foot long experimental model boat with a two inch diameter wooden screw that he tested on his farm pond. The success of his experiment encouraged him to approach a wealthy banker, named Mr. Wright, for financial backing. Wright agreed and, as a result, financed the production of an experimental launch and a larger vessel, *Archimedes*. Both vessels were a success, and Smith's design was adopted by the British Royal Navy (Corlett 1993:85, 87).

Ericsson was not so fortunate in England. In 1836, on the Thames River, Ericsson demonstrated that a 40-foot long vessel with a double screw propeller could successfully propel itself at a speed of 10 miles an hour. His design, however, lost out to Smith's in head-to-head competition for Royal Navy contracts. Despite this setback, Ericsson believed in his invention and, in 1839, he traveled to America with high hopes of interesting the U.S. Navy. While in the United States, Ericsson met Captain James Van Cleve who supported him in his belief that propeller technology would revolutionize ship propulsion. Van Cleve agreed to form a company to finance a screw-propelled vessel, and Ericsson agreed to pay Van Cleve one-half of the interest from the resulting patent. After securing shipwright Sylvester Doolittle and constructing an engine based on Ericsson's design, the *Vandalia* was finally launched in 1841 (Barry 1996:52). *Vandalia* was a moderate 138 tons burden, 91 feet long, 20.17 feet in beam, with an 8.25 foot depth of hold. The ship's hull is remarkably similar to that of a sailing vessel, with the exception of a small smoke stack for the boiler, located in the stern. Internally, the ship was powered by two high-pressure, vertical inverted cylinder direct acting engines (Still et al. 1993: 71; Barry 1996:52). The most unique feature of *Vandalia* was that it combined the operation of contemporary steam and sail powered vessels by carrying passengers, package freight, and occasionally bulk cargo. Amazingly, *Vandalia* could:

> …carry fifty passengers at less cost than could the large paddle-wheelers because her main stock was package freight moving to the West and rolling and bulk freight to the East (Still et al. 1993:71).

The most important advantage *Vandalia* had over steamers was that it could easily pass through the narrow locks of the Welland Canal (Lenihan 1994: 51). This is because *Vandalia* was constructed with the same full boxy lines as a Welland Canal schooner. This allowed the ship to pass through the Welland Canal with a maximum cargo capacity, something that paddle wheelers could not do. An additional advantage propellers had over steamers was that propeller engines weighed a meager 15 tons compared with the 60 to 90 tons of paddle-wheeler engines (Still et al. 1993:71). Their position in the aft end of the ship freed up room for more cargo and, thus, allowed vessel owners to maximize the profitability of their cargo space. Propellers were also cheaper to build, outfit, and run than paddle-wheelers. The most obvious advantage of propellers over sail was predictable delivery times. All of these characteristics allowed propellers to offer freight rates somewhere between those of sailing craft and paddle-wheelers (Labadie 1989:23).

Vandalia was an unprecedented success and became a prototype for all other propeller steamers designed and built on the Great Lakes, and is clearly the first structural hybrid between cargo carrying sail and steam. According to the *Submerged Cultural Resources Study: Isle Royale National Park*:

> Contemporary newspaper accounts describe *Vandalia* as a sloop, and several others of the first propellers as "steam schooners." It is clear that they were all built as

> sailing craft, with boilers, engines, and screw-propellers introduced after their completion, sometimes at ports quite distant from the shipyards where they were constructed (Lenihan 1994:51).

Arguably, however, *Vandalia* was not a *functional* link between sail and steam because it was designed to carry only passengers and package freight, but not bulk cargo as most sailing vessels did. It seems likely that the success and future potential marketability of *Vandalia's* design planted the seed for the development of steambarges, and gave the lumber industry a model for answering their most pressing problem: transporting a low value bulk commodity quickly, efficiently, and profitably. The first all bulk commodity hybrid between sail and steam was still to come in the form of the steambarge. It was not until the debut of this new ship type that vessel owners successfully maximized the potential of this technological innovation and created the first true link between sail and steam; a vessel that combined the design and carrying capacity of Great Lakes schooners with the power and reliability of steam.

Steambarges and the Consort System

The success of passenger and package freight propellers on the Great Lakes encouraged shipwrights to begin experimenting with a new vessel type that could combine the carrying capacity of sail powered ships with the speed and reliability of steam ships. The result was the steambarge. Not surprisingly, these vessels were often referred to as propellers in vessel enrollments and contemporary newspaper articles. The first vessel specifically built as a steambarge to sail on the Great Lakes was *Petrel*. This ship was built at Port Huron, Ohio, by Joshua W. Kelsey and enrolled as a propeller (David Swayze Great Lakes Shipwreck File, *Petrel*). According to an article in the *Detroit Free Press*:

> …The first steam barge [sic] came out in 1848, and was got up for lumber freighting at Vicksburg on the St. Clair River. She was named the Petrel [sic], commanded by Captain J.W. Wesley, recently deceased. The profits of carrying lumber fell short of her running expenses, and she was soon changed to a different trade (*Detroit Free Press,* 15 May 1873).

Petrel was followed by a few other steambarges including *Pacific* (1853), *Illinois* (1853), *Reciprocity* (1853), *Ross* (1854), *Coaster* (1854), and *Cleveland* (1860) (C. Patrick Labadie Collection, Comprehensive Steambarge Data Record, *Steambarges*). Although these ships were all ideally suited for the lumber trade, there was too little demand for lumber during the 1840s and 1850s to make them profitable. Steambarge owners were forced to mitigate financial losses by converting the vessels into package freighters, passenger/package freight propellers, or employ the vessels in carrying more cost effective bulk cargoes such as coal, grain, stone, or ice.

The re-introduction of steambarges and their utilization in conjunction with the Consort System on the Great Lakes was, like all technological innovation, driven by necessity. The 1860s and 1870s brought about a new era that Mark Twain described as "the Gilded Age" and Andrew Carnegie called the "Triumph of Democracy." The most significant event that facilitated the development of steambarges and the Consort System was the financial Panic of 1857. Many schooner owners, whose vessels had shipped vast quantities of commodities necessary for westward expansion, were driven out of business by the depression's lower freight rates and an overdeveloped merchant marine (Labadie and Herdendorf 2004:8). Lack of credit prohibited both shippers and receivers from financing the cost of transportation (Huston 1987:14).

By the mid-1860s, the economy, stimulated by the Civil War and reconstruction, managed to recover. Americans resumed westward migration and needed building materials to feed the machine of civilization (Huston 1987:24). As a result, businesses that survived the Panic of 1857 needed a way to ship large quantities of bulk commodities, most especially lumber, quickly and effectively. In fact, in 1864 the *Detroit Free Press* reported that the:

> …class of vessels most earnestly sought are those best adapted for the lumber trade. Nearly all of our spare vessels in this locality have been disposed of, and…a dozen more would meet with ready sale (Gray 2000:11; Lenihan 1994:55).

While the Panic of 1857 forced merchant vessel owners to struggle or go out of business, it completely devastated the package freight and passenger businesses. This left many of the palatial paddle-wheel passenger steamers idle within a decade of their construction (Mansfield 1972:403). In 1861 Mr. Noyes (no first name given), a ship owner from Buffalo engaged in the lumber trade, decided to convert two side-wheelers into barges that could be towed by tug boats (Figure 3.1). These idle and rotting vessels, named *Empire* and *Sultana*, were purchased at a small fraction of their original value and modified with minimal effort (Mansfield 1972:403). Noyes had the tug *Reindeer* tow these barges up the Saginaw River to load pine lumber. The barges were found to have an enormous carrying capacity; five times that of contemporary propellers (Lenihan 1994:56). Thus the

Consort System was born, resulting in sharply decreased shipping costs for lumber and bulk commodities (Mansfield 1972:414,520; Lenihan 1994:56). Noyes' system proved so successful that towing increased rapidly and, between 1861 and 1870, dozens of old passenger craft were transformed into lumber barges. Some vessels that were designed to look like schooners were built from the keel up as barges (Labadie 1989:25).

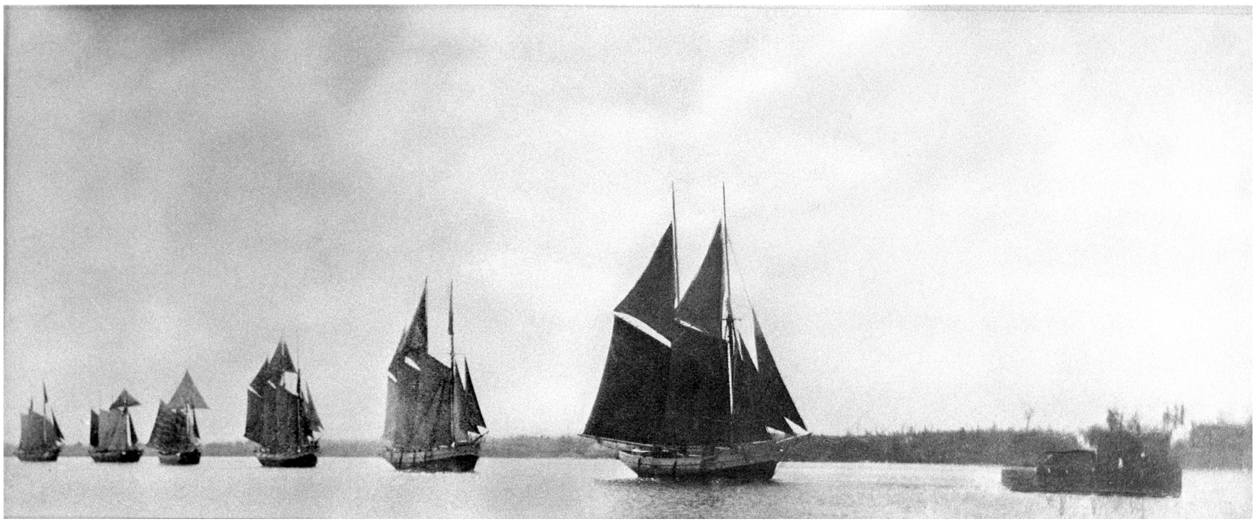

FIGURE 3.1: Tug *Joseph Goldsmith* (1881-1903) towing six schooner consorts (Courtesy of Neville Public Museum, Green Bay, Wisconsin).

The Consort System proved an ingenious solution to the lumber shortage problem, but it was not until the introduction of the steambarge that the system reached its full potential and capacity. Before the introduction of the steambarge, vessel owners attempted to employ propellers of any type as lumber carriers. Their profits from these ventures were small because these vessels were not well suited to carry lumber. Steambarges, which were sometimes referred to as "lumber hookers" or "steam-schooners" on the West coast, proved to be a profitable solution, and were designed especially with the particular needs of the lumber industry in mind (Rodgers 2007:13-14; Labadie and Herdendorf 2004:8).

In 1865, steambarges were successfully re-introduced to the lumber trade with the *Trader* (Labadie 1989:26). The 115-foot *Trader* was built by Philip Rice at Newport, Michigan and had a capacity of 250,000 feet of lumber (C. Patrick Labadie Collection, Ship Information and Data Record, *Trader*). The suitability of the vessel's design for hauling lumber and towing barges became immediately obvious. The *Trader* helped make steambarges, with their increased capacity, an immediate success and by 1866, the local media took notice (C. Patrick Labadie Collection, Ship

Information and Data Record, *Trader*). On June 26, 1866, the *Detroit Free Press* stated, "A new arrangement is being inaugurated for the transportation of lumber, consisting of the use of propellers especially adapted for the purpose…Several are now running" (Lenihan 1994:56-57). Before 1870, 45 steambarges were built and 20 passenger and freight propellers were converted for the same use (Lenihan 1994:56-57).

Steambarges are generally characterized as wooden, single decked vessels with typical Great Lakes freighter profiles; pilot house and crew quarters located at either end with an open deck in between (Barry 1996:149). The earliest steambarges had their cabins aft, and only after 1880 were most constructed with their pilothouse and some of their cabins on a raised forecastle at the bow (Figures 3.2 and 3.3). According to Great Lakes historian C. Patrick Labadie, "…this feature was advantageous in larger craft since it improved visibility for the master and wheelsman" (Labadie and Herdendorf 2004:8). Another change in steambarge construction that occurred around 1880 was the replacement of external hogging arches and trusses with internal bracing. Prior to 1880 steambarges often featured bridge-like hogging arches, hogging-chains, or iron rods (Lenihan 1994:57). It should, however, be noted that not all vessels in a particular class adhere to specific design characteristics established for their type. Variations can exist depending on specific builder choices and whether or not the vessel was converted from some other type.

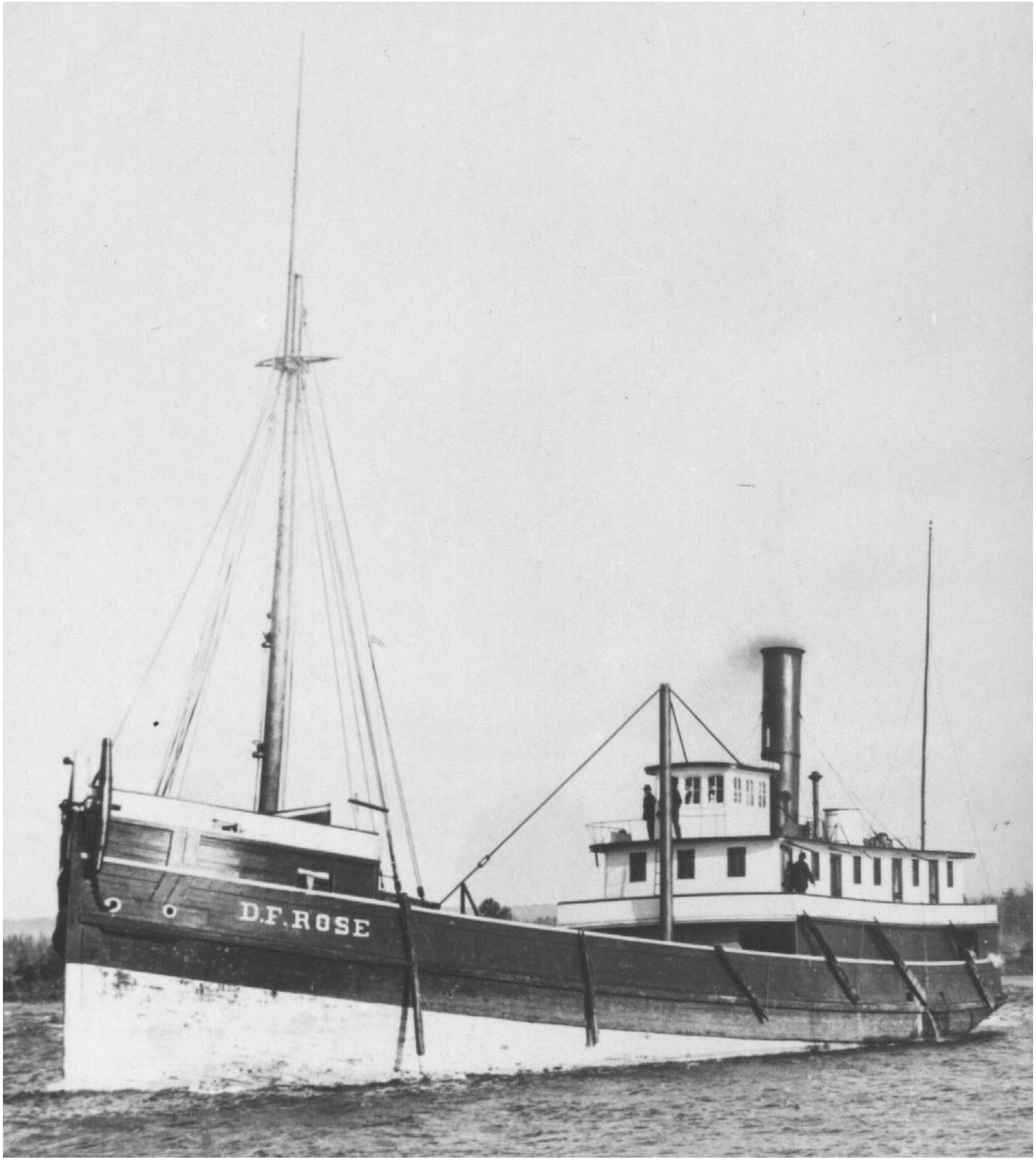

FIGURE 3.2: *D.F. Rose*, an early Great Lakes steambarge. Note the location of the pilothouse in the aft section of the vessel (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

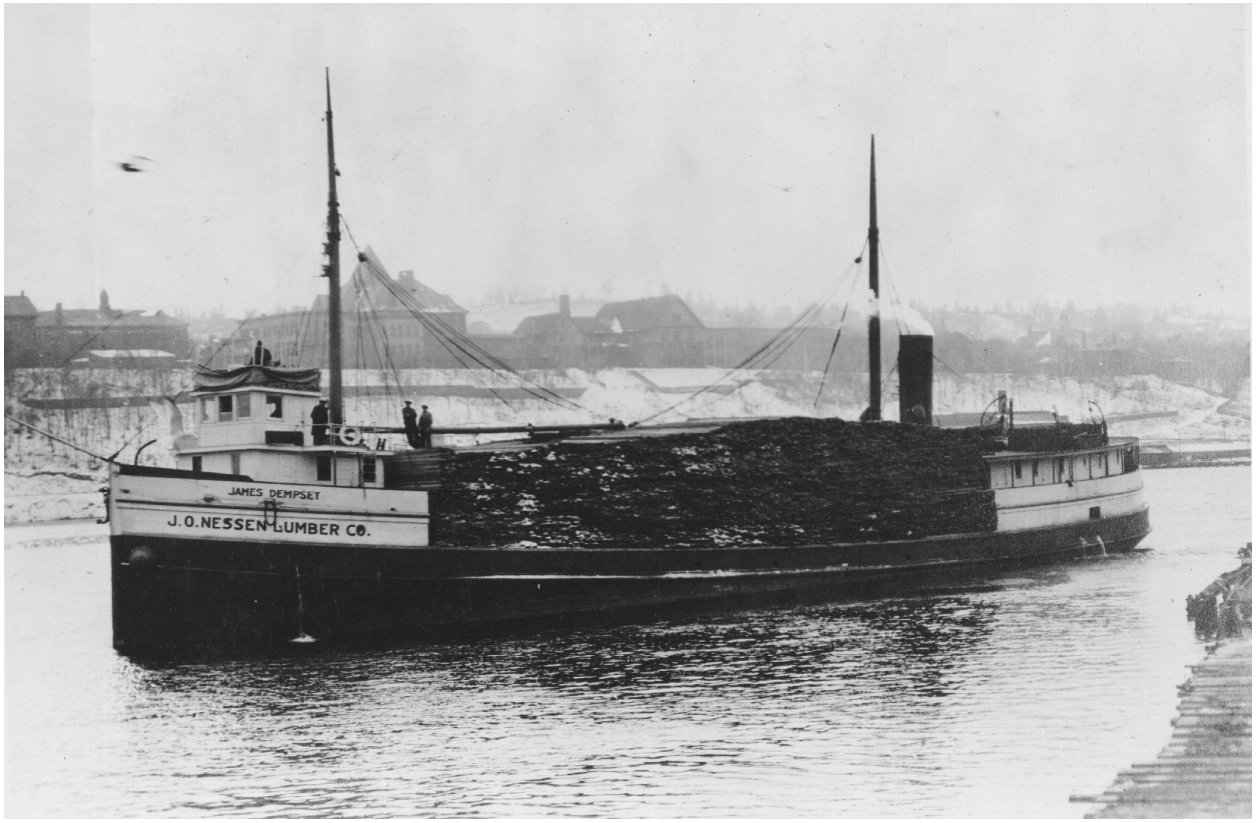

FIGURE 3.3: Post 1880 steambarge *James Dempsey* fully loaded. Note the forward location of the pilothouse on a raised "forecastle" (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

Cargo was stored below decks, but steambarges were particularly well suited for products that could be exposed to the weather and piled high in the empty deck space (Labadie and Herdendorf 2004:8). This open deck space was especially crucial for maximizing cargo capacities in the transportation of lumber products, such as cut lumber, shingles, cedar posts, logs, and railroad ties (Lenihan 1994: 57). Loads of lumber were often stacked as high as 12 to 15 feet above the deck (Rodgers 2007: 14). Most steambarges had a depth of hold of about 13 feet, which provided for the easiest and quickest handling of cargo since the standard length of board was 12 feet (Barry 1996:149). Labadie also states that most steambarges were, "between 90 and 175 feet long with capacities between 150,000 and 1,000,000 board feet (up to 800 tons) of lumber" (Labadie and Herdendorf 2004:8). These dimensions enabled the ships to pass through canals, and also allowed them to enter many of the unimproved ports and harbors around the Lakes.

Externally, steambarges look very much like wooden bulk carriers, a vessel type that began to appear on the Great Lakes after the 1869 debut of Eli Peck's *R.J. Hackett* (Barry 1996:107) (Figure 3.4). Bulk carriers revolutionized the carrying trades of bulk commodities such as iron ore, coal, and grain. They were constructed with evenly spaced deck hatches that enabled them to take advantage of new loading and unloading technologies, such as the pocket dock, which steambarges could not do. To load a bulk carrier, the vessel was positioned beneath the dock and the deck hatches lined up with spillways of a hopper loader. The spillway was then opened and gravity did most of the work loading the ship (Rodgers 2003: 8). This enabled bulk carriers to occupy a separate economic niche than steambarges, although steambarges occasionally carried bulk cargo and bulk carriers occasionally carried lumber.

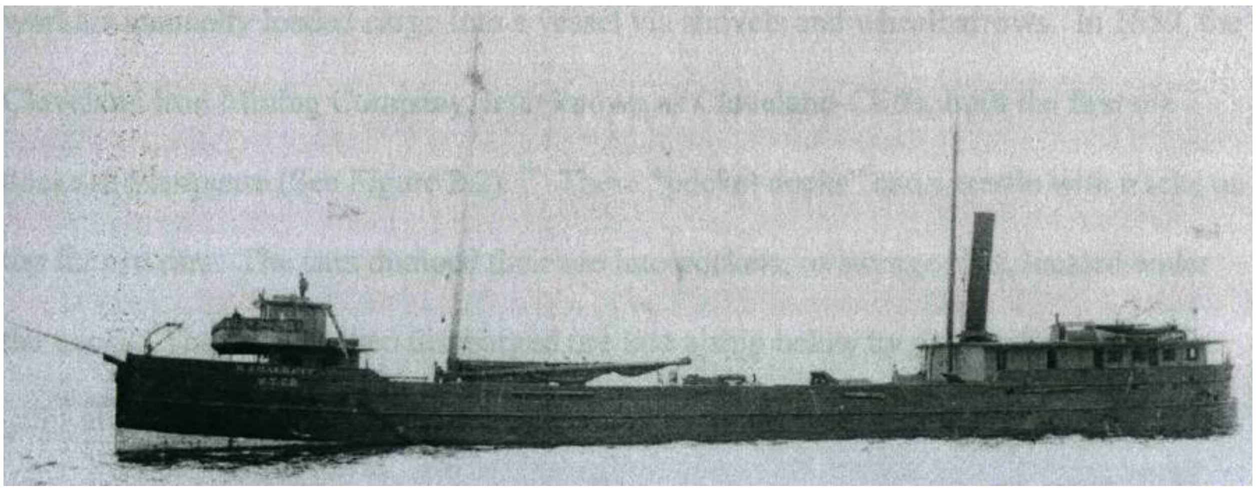

FIGURE 3.4: *R.J. Hackett* (Courtesy of C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

The external similarities of the two vessel types led to much confusion in contemporary maritime literature (Figures 3.3 and 3.5). It also seems that the term "bulk carrier" does not show up until the 1880s, leading contemporary writers to use the term "steambarge" to describe both vessel types. Each type was often mistaken for the other, especially steambarges and transitional phase single deck bulk carriers (Ronca 2006: 17-20).

Examination of the internal structure of both vessel types, however, reveals that they differed dramatically in their flooring systems. Wooden bulk carriers, since they were designed specifically to transport heavy bulk commodities, generally exhibited a double set of athwartship ceiling planks and many longitudinal stringers in their holds (Rodgers 2007: 15) (Figure 3.6). This enabled vessel owners to save time and money on timber replacement when planks were inevitably damaged during the loading and unloading of heavy bulk commodities (Rodgers 2007:15-16). Steambarges, on the other hand, retained the fore and aft ceiling of their schooner predecessors.

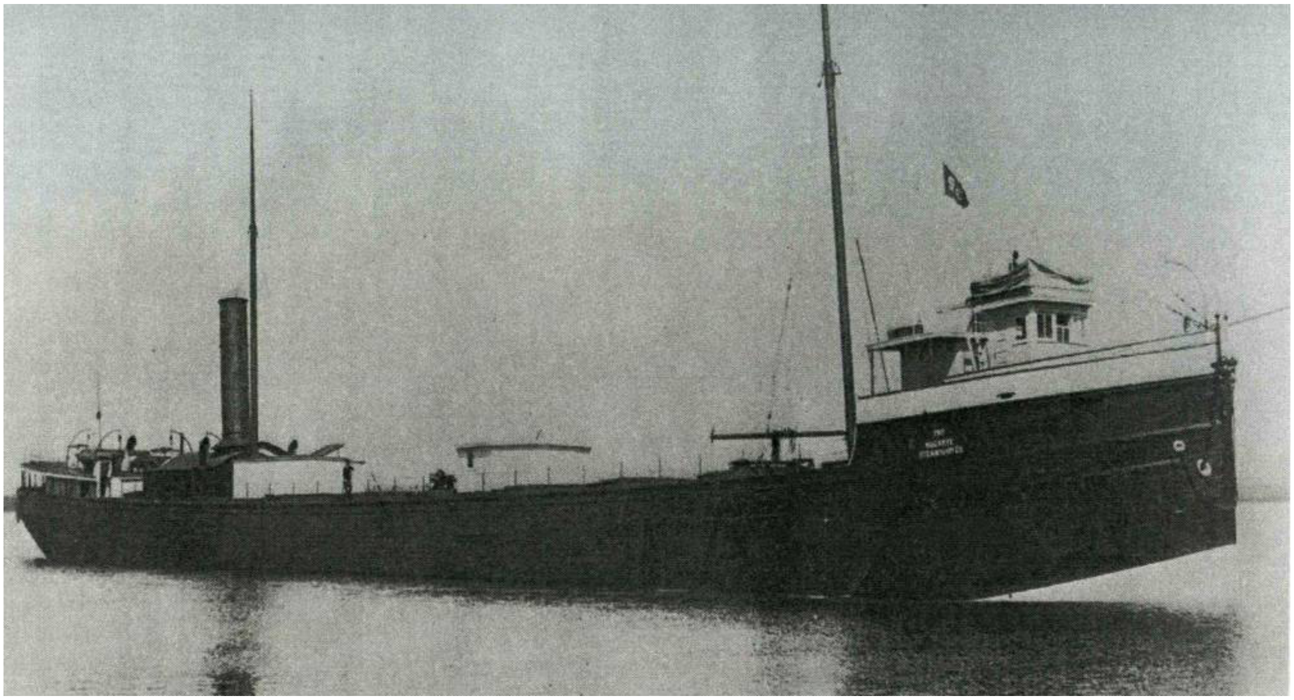

FIGURE 3.5: *City of Glasgow*, a typical Great Lakes bulk carrier (Courtesy of the Program in Maritime Studies, East Carolina University, Greenville, NC)

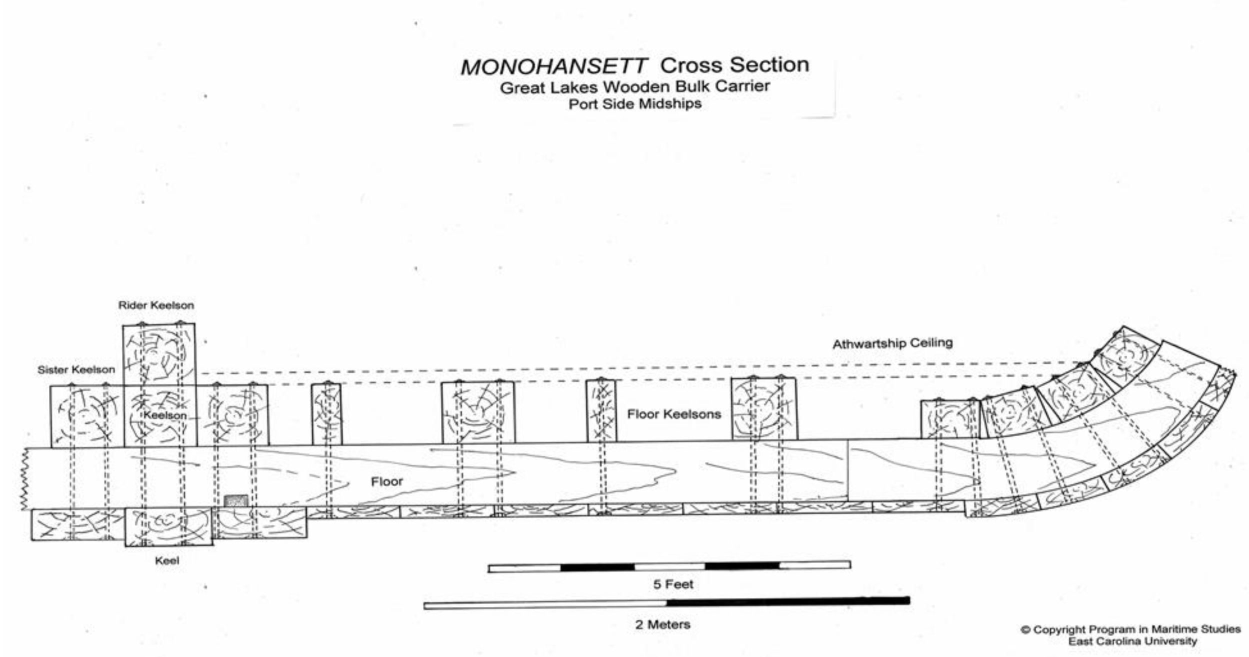

FIGURE 3.6: *Monohansett* cross section. Note the presence of several floor keelsons with overlaid athwartship ceiling (Courtesy of the Program in Maritime Studies, East Carolina University).

Internal steambarge construction, however, was actually quite similar to typical 19th century schooner construction, except steambarges contained all of the necessary equipment to make the vessel self-propelled. This equipment included boilers and engines, usually the inverted direct acting cylinder type. These engines were later replaced by compound engines (Rodgers 2007:14). Internal schooner construction is characterized by a heavy centerline keelson assembly, double-frames, and longitudinally planked ceiling timbers, all of which are demonstrated in the ship plans and archaeological remains of steambarges (Cooper 1988; Moore 2003:120-126; Rodgers and Green 2003:32-41; Rodgers et al. 2006:37-40; Labadie 1989:51-54,62-67,146-149; Cooper 1996:67-101; Jensen et al. 1995:39-44; Labadie and Herdendorf 2004:30-35) (Figures 3.7 to 3.11).

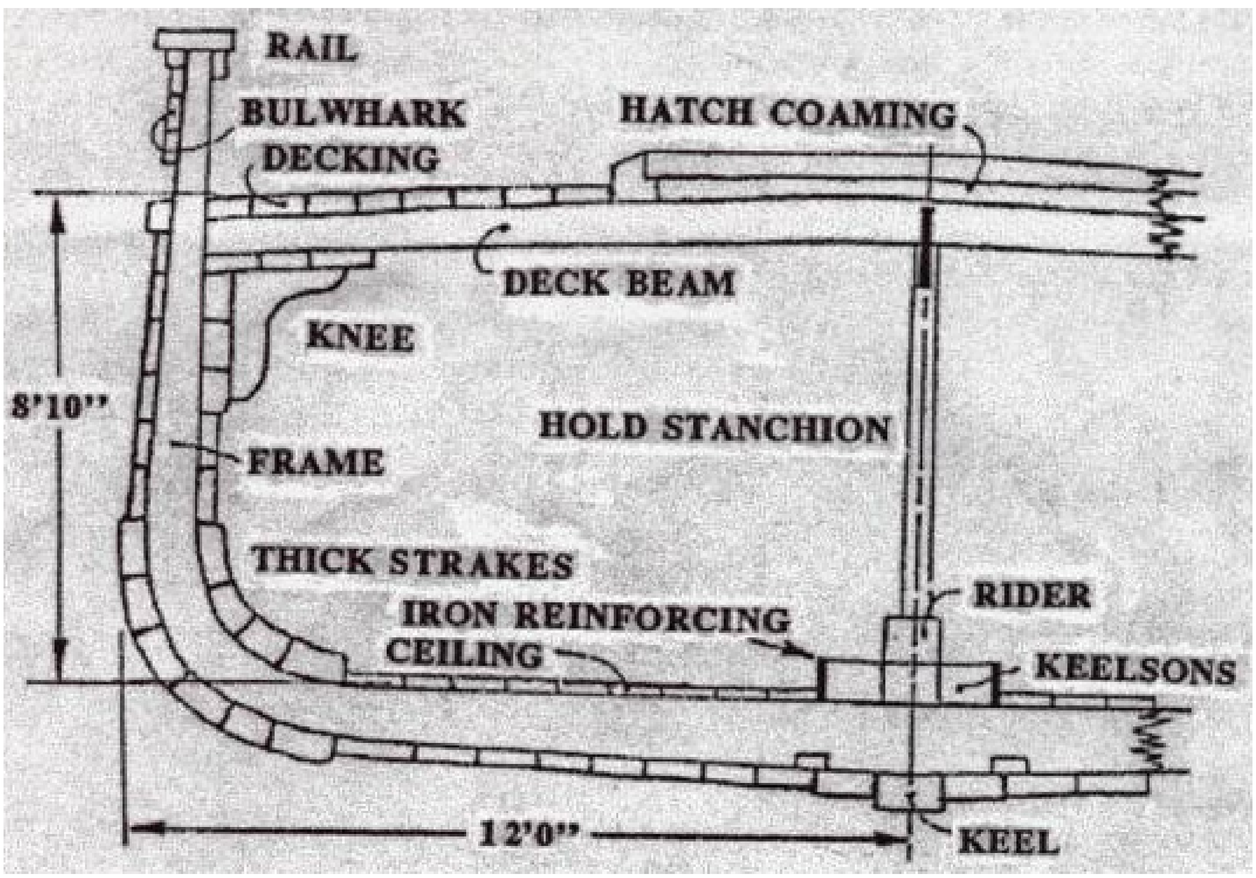

FIGURE 3.7: Steambarge *Adventure* cross section. Note the heavy keelson complex (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

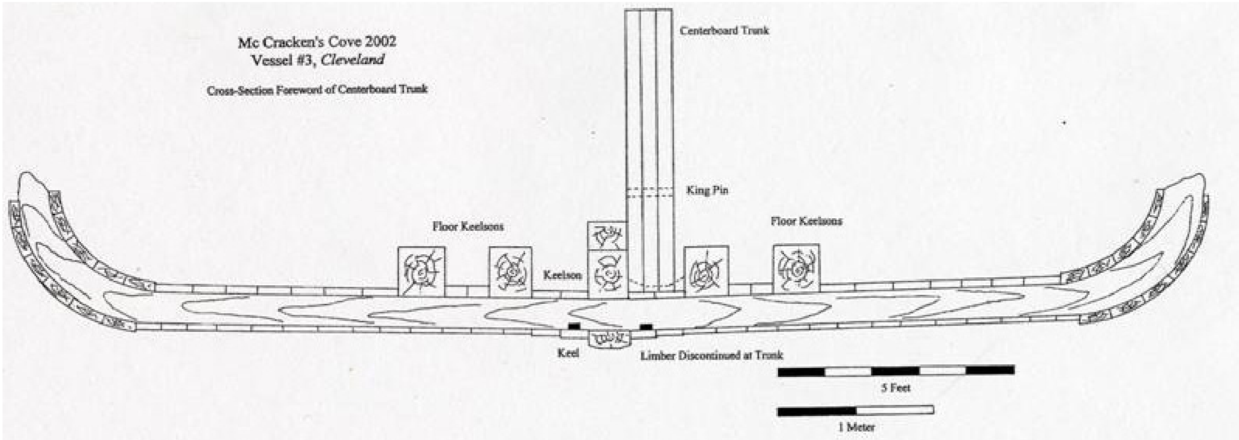

FIGURE 3.8: Steambarge *Cleveland* cross section. Note the centerboard and bilge keelsons (Courtesy of the Program in Maritime Studies, East Carolina University, Greenville, North Carolina).

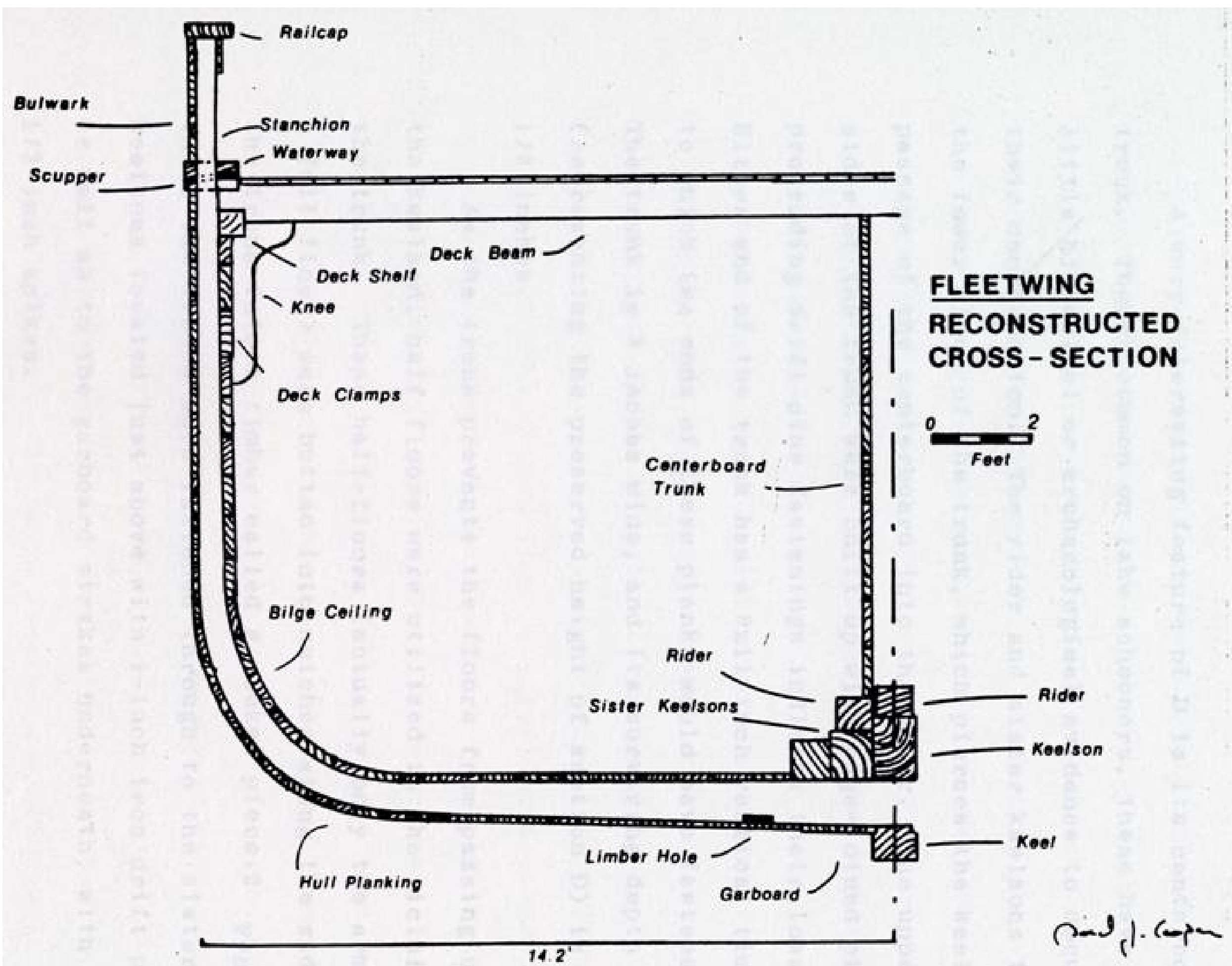

FIGURE 3.9: Cross section of the *Fleetwing*, a typical Great Lakes schooner. Note the similarities to the steambarge *Adventure's* cross section (Courtesy of East Carolina University, Greenville, North Carolina).

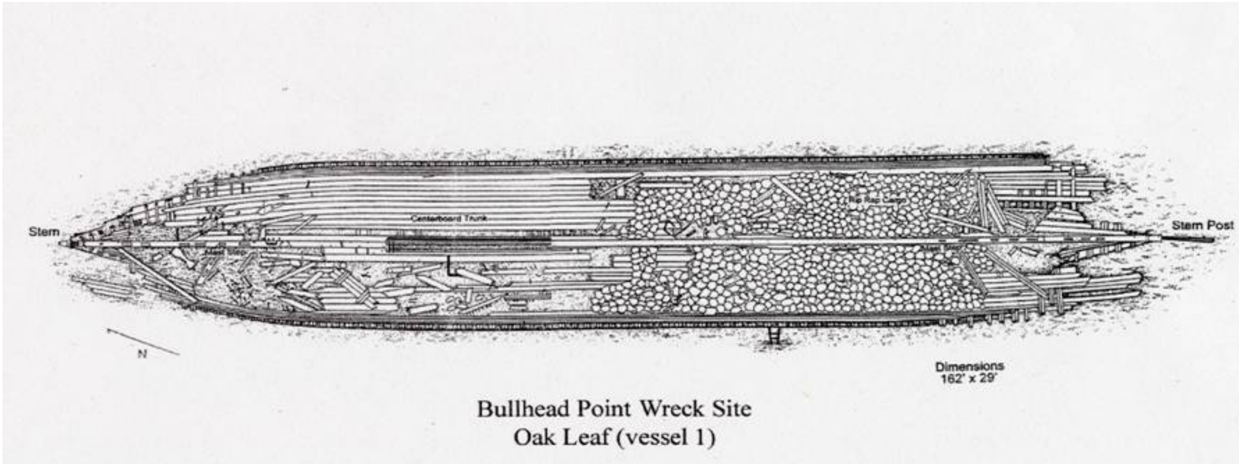

FIGURE 3.10: Site plan of the *Oak Leaf*, a typical Great Lakes schooner. Note the longitudinal planking (Courtesy of the Program in Maritime Studies, East Carolina University, Greenville, North Carolina).

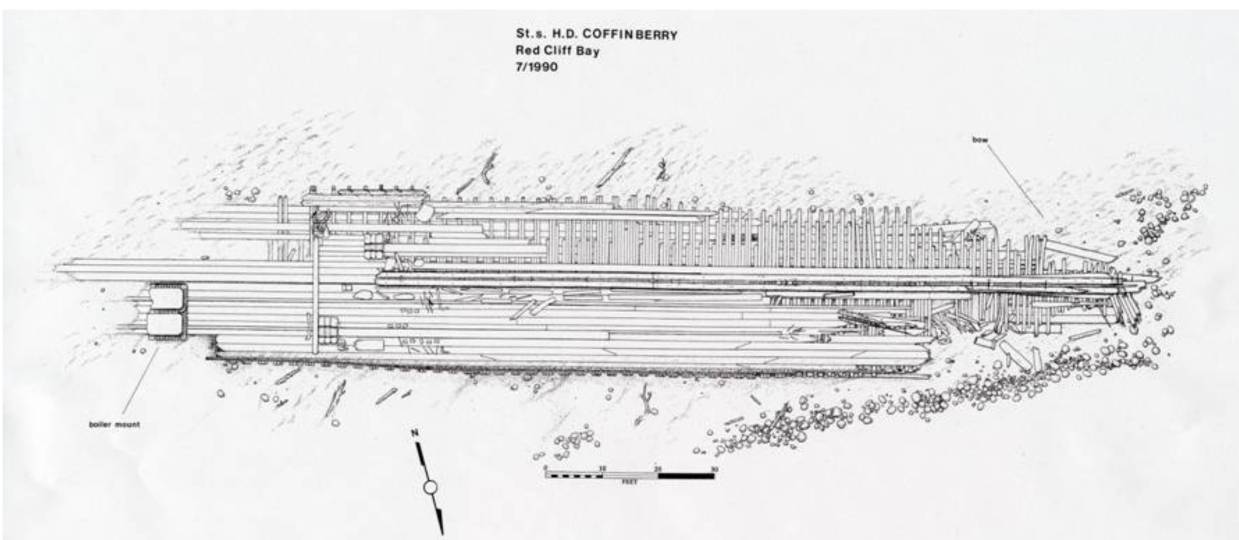

FIGURE 3.11: Site plan for the steambarge H.D. Coffinberry. Note the similarities to the Oak Leaf's construction including longitudinal planking (Courtesy of the Wisconsin Historical Society, Madison, Wisconsin).

Internal steambarge construction differs from schooner construction in that steambarges do not always contain a centerboard, although many of the earliest steambarges, schooners that were converted to steambarges, and a few late steambarges do (Labadie and Herdendorf 2004: 30-35; Rodgers et al. 2006:37-40). Steambarges also typically have bilge keelsons (no more than two per side) that help support the weight of engines and boilers (Rodgers 2007:14).

Despite the historic ambiguity between steambarges and bulk carriers, the introduction of propeller-driven steambarges placed the final nail in sail's coffin on the Great Lakes. Steambarges were so successful that, between 1865 and 1910, 800 were built on the Great Lakes. They did not, however, reach maximum efficiency until they were utilized in conjunction with the Consort System (C. Patrick Labadie Collection, Comprehensive Steambarge Data Record, *Steambarges*). This "new" Consort System made steambarges cost effective for their owners because they could carry and tow vast amounts of lumber at consistent speeds of six to eight miles an hour in almost any weather condition (Labadie 1989: 22) (Figures 3.12 and 3.13). This helped merchants maintain their bottom line by allowing them to move more cargo, thus earn more profits.

By 1870, the most popular choice for consorts was schooners. Through the Consort System, sailing craft successfully transitioned into the steam age as tow barges. After 1870, most vessels that were called schooners were actually tow barges with their tophampers cut away, main masts removed, and bowsprits cut short (Mills 1910:187). After 1890, a number of so-called schooners were actually built as tows (Lenihan 1994:59-60). These vessels were never intended to be self - propelled and spent most of their working lives at the ends of cables behind steambarges. Typically, these vessels were built with, "a straight steamer bow and a schooner hull; the stays from the foremast led directly to the bow, with no bowsprit to get in the way" (Barry 1996:148-149).

FIGURE 3.12: *Robert Holland* fully loaded towing five fully loaded barges (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

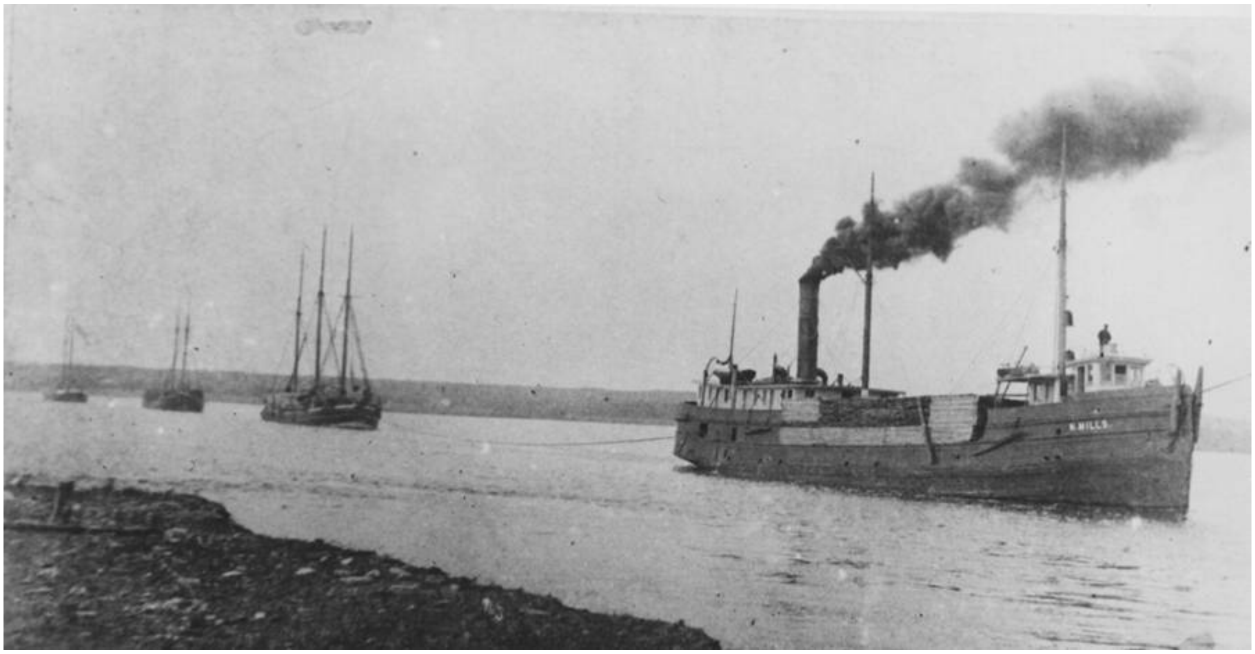

FIGURE 3.13: *N. Mills* fully loaded towing three fully loaded barges (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

The typical rig for a tow barge was the Grand Haven Rig, which consisted of two gaff-rigged masts placed at the extreme ends of the bow and stern. This left most of the amidships area clear for loading, unloading, and deck cargo. This rig also helped reduce costs for loading and unloading and increased carrying capacity. Ironically, the Grand Haven rig made schooners such effective sailors that some three-masted stand alone schooners were converted to the more economical Grand Haven Rig, allowing them to remain competitive with steambarges and the Consort System for a short time (Martin 1991:195-201). By 1899, however, it was common for 1,500,000 to 2,000,000 feet of lumber to be towed by one steambarge and 4 to 6 consorts, a powerful testament to the success of the system (Mansfield 1972:414). As a result, schooners, sloops, and brigs lost the ability to compete, and after 1890, no vessel owners wanted to invest in them. At the beginning of the 1870s, schooners dominated the shipping of bulk commodities: by 1890, they were almost obsolete. The last full rigged schooner was built in 1889, and by the 1930s only three were left in use; the only survivors out of 20,000 (Labadie 1989:22; Barry 1996:143).

One of the biggest benefits of the Consort System was that it helped vessel owners minimize the money spent on crew wages because tow barges required a small crew. While this system was economical and reliable, it was not entirely efficient. Adoption of the Consort System reduced vessel and crew quality. Initially, tow barges were equipped with quality masts, sails, and knowledgeable sailors that could set sails to assist escorts or help themselves during times of emergency and foul weather. When the Consort System established itself as an economic success, however, many vessel owners allowed their tow barges to degrade and become unseaworthy as stand alone sailing ships. Also, since tow barges were usually intended to be under the control of a steambarge, crew quality suffered. Good sailors became hard to find because tow barge crews were often paid lower wages (Martin 1995:163). In response, seamen organized a union in 1880 that forced ship owners to pay tow barge crews an extra 25 cents a day if sails were set. As a result, masts rotted, sails wore out, and typically neither was replaced (Barry 1996:148). Eventually, tow barge crews were regarded as "undesirables" or "underclass", and skilled sailors that could handle a vessel under sail became less abundant. In order to recruit full crews and save money, vessel owners eventually hired smaller crews consisting of elderly seamen, inexperienced hands, teenagers, the sickly, and other individuals that made up the, "dregs of the shoreside laboring class" (Martin 1995:163).

By the 1890s, maritime communities and the American and Canadian federal Life Saving Services began to notice that tow barges were notoriously helpless. For example, undermanned vessels with unskilled crews often signaled Life Saving Service stations for assistance to tie up their vessels, cast anchor, and other tasks that, 20 years before, were common chores easily performed by sailing vessel crews. The worst effect, however, of the decrease in crew quality was an increase in tragic loss of life. Long lines of barges created dangerous navigation hazards to other vessels during bad weather conditions. They were, however, more dangerous to their own sailors. Vessel owners calculated the risk and knew that if one of their tow barges foundered, financial losses could be absorbed (Martin 1995:163). As a result, many sailors lost their lives during storms when tow cables connecting unwieldy top-heavy consorts and escorts were dropped or ripped apart. Helpless and at the mercy of wind and waves, tow barges often could not make it to shelter. Many ran aground violently and were pounded to pieces (Mills 1910:188).

Despite the negative attributes associated with the Consort System, its efficiency and profitability made mass shipment of lumber possible, allowing valuable materials to be shipped rapidly throughout Great Lakes ports. Unfortunately, their efficiency gave rise to several problems that played a part in their demise. Rapidly declining freight rates and increased competition greatly reduced profits. According to Great Lakes historian James Cooke Mills:

> The advent of the steam barge [sic], in the early sixties, marked the beginning of a new era in the freighting of heavy, coarse commodities; and to this type, with the consequent adoption of a system of tows some years after, is due the rapid decline in rates. In 1859 the freight on grain from Chicago to Buffalo was about sixteen cents

> a bushel, ten or twelve years later it had dropped to seven or eight cents, and in the eighties, when the towing system was in full operation, it was five cents (Mills 1910:186).

The main problem for vessel owners, however, was that the lumber boom could only survive as long as the Great Lakes pine forests were abundant. This seemed no problem in the 1850s, but by the 1920s the great forests of pine were stripped clean and the lumber industry had begun its migration to the Pacific Northwest. Destruction of the pine forests was the final blow to steambarges. The Great Lakes lumber boom was over, the industry collapsed, and with it went the glory days of the steambarge (Barry 1996:149).

The steambarges' nearest descendant, the wooden single and double-decked bulk carriers, were built much larger and could carry as much cargo alone as a steambarge with several tows. The development of these vessels signaled the end of the Consort System, because the bulk freighters were too large to tow barges safely and could carry a sufficient amount of cargo to turn a profit. Steambarge design was ultimately too specialized and their capacity too limited to make them profitable in any trade other than lumber, although a few did survive by carrying coal, sand, or gravel. Another interesting anomaly is the steel steambarge *Resolute* (ex *Manda*), a steambarge that made the technological transition from wood to steel (Milwaukee Public Library Ship File). These too, however, were mostly put out of commission by the Great Depression. Ironically, although steambarges helped cause the extinction of sail powered vessels as independent wage earners, both vessel types were laid to rest at about the same time. By the 1930s, many old "lumber hookers" and tow barges were simply forgotten (Richards 1960:261). Their remains could be seen abandoned in backwater ports and tributaries-a testimony to the successful evolutionary process of Great Lakes vessel design. Some old hulls, however, fulfilled one last purpose: they were intentionally sunk and used as breakwaters around coastal communities.

CHAPTER 4
FROM MUSSELS TO BACKBONE: THE *JOYS* OF DOOR COUNTY

Introduction

During the fall of 2005, students and staff from East Carolina University (ECU) and the Wisconsin Historical Society (WHS) conducted an archaeological survey of a suspected steambarge in Sturgeon Bay, Wisconsin. The wreck site, known as the Sunset Park Wreck because of its close proximity to a park bearing that name, was mapped and analyzed over a period of eight working days. Although the Sunset Park Wreck is most likely the *Joys*, it is referred to here as the Sunset Park Wreck to stay consistent with the all archaeological data. The site is well preserved due to the cold waters of Sturgeon Bay and mostly intact from the keel to the waterline. The goal of the 2005 field season was to complete a Phase II pre-disturbance survey of the entire wreck. According to Principal Investigator Dr. Bradley Rodgers, "The object of a Phase II survey is a detailed site map, photographic imaging and interpretation of the site as well as an examination of individual artifacts for diagnostic purposes." Therefore, no artifacts were recovered because conservation plans are generally outside the scope and budget of Phase II projects. Any artifacts located during the mapping process were photographed (Rodgers 2003:1). By the end the entire wreck was mapped successfully, although weather and mechanical delays shortened some days on site.

The purpose of this chapter is to summarize the methodology and findings of ECU's underwater archaeological investigation. The Phase II pre-disturbance survey of the Sunset Park Wreck provided a valuable source of information for three different reasons. First, the project definitively identified the wreck remains as those of a steambarge. Second, it revealed the first evidence of salvage located on the Great Lakes by ECU researchers and how it is demonstrated in the archaeological record. Finally, the project served as a vital contribution to a 21-year project focused on studying major 19th century Great Lakes ship classes. The project, begun in 1985 by ECU in collaboration with the State Historical Society of Wisconsin (SHSW), has enabled researches to take a closer look at the technological evolution of internal construction and design characteristics of the major 19th century Great Lakes vessel types (Rodgers 2007:2). Analysis of the Sunset Park Wreck study is crucial to this study because it demonstrates how shipwrights transitioned bulk cargo vessels from sail to steam.

Project Location

The state of Wisconsin's most unusual geographic feature, the Door County Peninsula, is located on the eastern side of the state. This conical shaped Peninsula is approximately 84 miles long (135.185 km) and between 3 to 10 miles wide (4.83 to 16.093 km) (Rodgers 2003:3). Despite its relatively small area of 491 square miles (1,272 square km), the Door County Peninsula boasts more shoreline than any other county in the United States; about 240 miles (400 km) (Palmquist 1989:32). The Sturgeon Bay Ship Canal, constructed in 1880, bisects the Peninsula and connects the waters of Green Bay with Lake Michigan, the only Great Lake contained entirely within U.S. borders and the third largest Great Lake. The opening of the canal in 1880 vastly increased vessel traffic between Lake Michigan and Green Bay, and boosted the area's economy. With more vessels came more shipwrecks and intentional abandonments, ensuring that Sturgeon Bay would claim at least one sample of every 19th century Great Lakes vessel type.

The Sunset Park Wreck, a Great Lakes steambarge, rests on a silty and sandy bottom under approximately 10 feet of water. The vessel is located in the Sturgeon Bay Ship Canal approximately 500 feet west of the Sunset Park shore, just north of the Bay Shipbuilding Company. The wreck is oriented parallel to the shore in a north-south orientation with the bow facing north (Figures 4.1 and 4.2). To determine the exact location of the wreck, two buoys were attached to either end of the vessel and located with a Total Station from the Sunset Park shoreline where the site datum was positioned (Figure 4.3). According to archaeologist Jeremy Green, a Total Station is, "…a combination of a precise electronic theodolite and electronic distance-measuring instrument. The fundamental measurements made by the Total Station are slope distance, horizontal angle, and vertical angle (Green 2004:42).

FIGURE 4.1: Aerial photograph of the Sunset Park Wreck site taken in the 1970s (Courtesy of Jon Van Harpen).

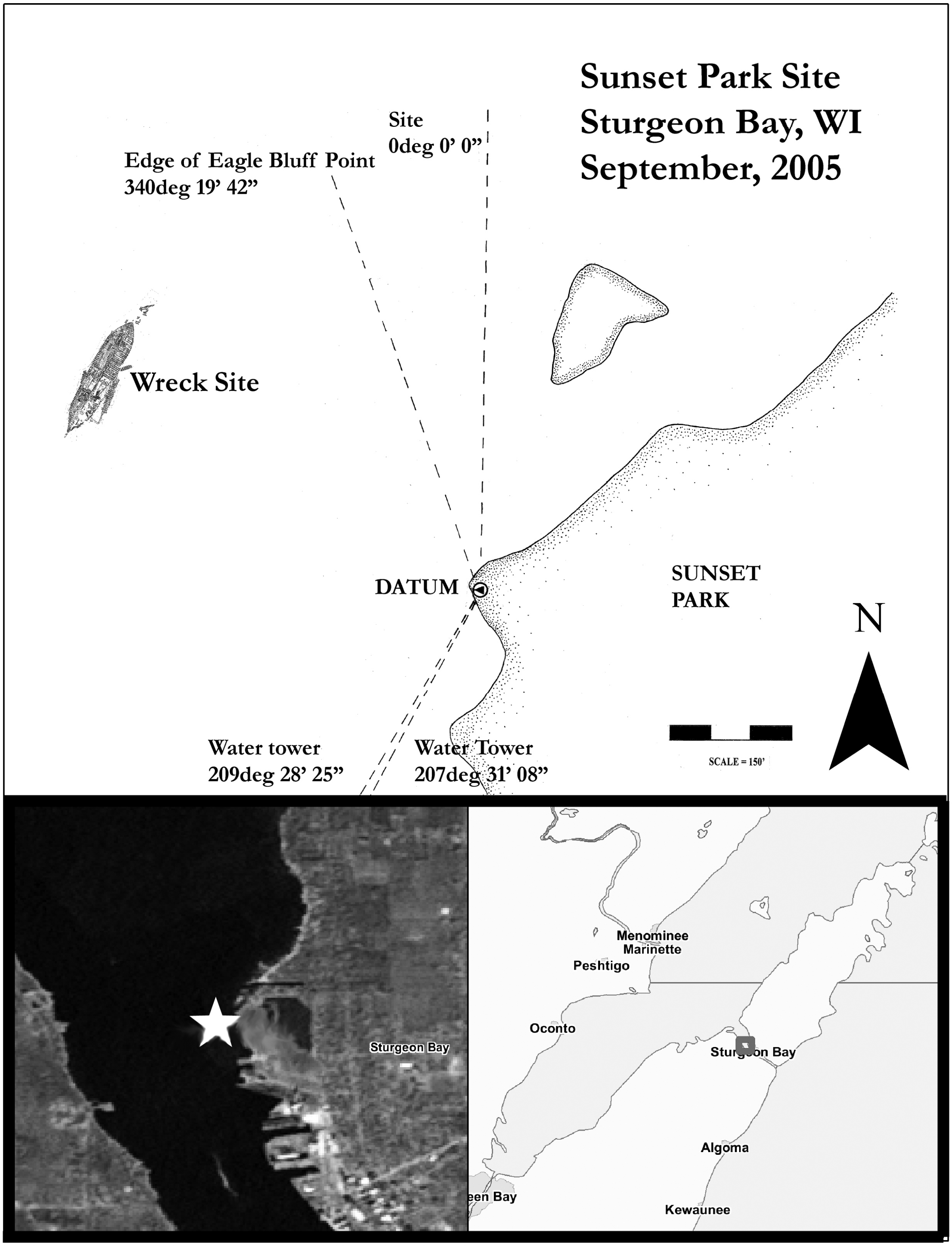

FIGURE 4.2: Orientation of the Sunset Park Wreck in relation to the Sunset Park shoreline (Courtesy of Dr. Nathan Richards, Program in Maritime Studies, East Carolina University).

FIGURE 4.3: Student crewmember at site datum locating the Sunset Park Wreck using a Total Station (Courtesy of the Program in Maritime Studies, East Carolina University).

Site History

Father James Marquette, one of the first Europeans to visit Sturgeon Bay, arrived on October 27, 1674. He found one small Potowatami Indian village and a well trodden portage path that linked the waters of Green Bay with Lake Michigan. Besides these, before 1834 all that existed in Sturgeon Bay was a temporary trading post used by French, English, and American fur traders in shipping their supplies from Green Bay to Milwaukee (Holand 1917:304). When Increase Claflin, Door County's first resident, moved to the nearby site of Little Sturgeon in 1834, Sturgeon Bay was still a heavily forested wilderness (Lotz 1994:12). It was not until 1850 that Perry Graham, a prospective lumberman, saw potential in Sturgeon Bay's forest resources and built the future city's first house. One year later he was joined by a Moravian congregation. About 20 families came to Sturgeon Bay seeking lands where they could farm and worship as they pleased (Holand 1917:305). Sturgeon Bay continued to grow, however, and during the last half of the 19th century, it developed many industries including lumbering, agriculture, ice harvesting, stone quarries, summer resorts, shipping, and shipbuilding (Holand 1917:156-175). It was not until 1880, when the Sturgeon Bay and Lake Michigan Ship Canal was finally completed, that the town of Sturgeon Bay boomed economically.

Building the canal was tedious and difficult process that began as one man's dream. Joseph Harris Senior, a resident of Sturgeon Bay, believed that the canal would help Sturgeon Bay gain economic success. Harris began the canal project in 1861 when he traveled to Washington D.C. to apply for a federal grant to finance the canal, which passed in the U.S. Senate but was rejected by the House of Representatives by two votes (Lotz 1994:65). Harris realized that it would be almost impossible to get Congress to approve the project and land grant without the political backing and power of the state of Wisconsin. So, in 1864 he ran and was elected to the Wisconsin State Senate. While in office, he drew up a charter of incorporation for the Sturgeon Bay and Lake Michigan Canal and Harbor Company and successfully lobbied to get the canal built (Holand 1917:148-149). Finally, 17 years after the process began; the 7,400 long by 100-foot wide canal was inspected by government officials and declared fully completed. For the first time ever, vessels were able to avoid the dangerous trip around the tip of the Door County Peninsula, known as "Death's Door." The canal also significantly shortened vessels' travel time on the Green Bay to Milwaukee and Chicago routes (Rodgers and Corbin 2003:215). In 1893 the canal was purchased by the government for $103,000 (Holand 1917:152-153).

The opening of the Sturgeon Bay Ship Canal vastly increased vessel traffic through Sturgeon Bay. As a result, the number of shipwrecks and intentional abandonments in the area increased greatly. Many vessel types were lost in the area including tugs, schooners, scows, tow barges, and steambarges.

Environment

Geology

Door County Peninsula is a unique geological formation with a rich and varied geological history. Over the last 400 million years, the area has been covered by both tropical seas and continental glaciers. The glaciers carved out two huge valleys, located on either side of the Door Peninsula, which became Lake Michigan and Green Bay. As a result, the Peninsula now has 250 miles of shoreline. The northern part of the peninsula boasts several natural islands, bays, and harbors, while the southern end is characterized by unbroken shoreline and a lack of natural harbors (Lotz 1994:15-16).

Door County Peninsula is also a portion of the Niagara Escarpment, a dolomitic limestone feature that extends for approximately 900 miles from New York to Wisconsin. A natural rift in the escarpment created the harbor at Sturgeon Bay (Palmquist 1989:12; Rodgers and Corbin 2003:214). Early residents in the Sturgeon Bay area were quick to realize the value of the limestone and its usefulness as a building material. In 1834, the federal government began to quarry stone to build breakwaters off Michigan City. In fact, almost every harbor constructed on Lake Michigan during the 1800s and early 1900s was built with Door County stone (Holand 1917:166). Other materials present in the bedrock of Door County include chert and shale (Palmquist 1989:85).

The sediments present in Lake Michigan include gravel, silts, and clays. The shoreline of Sturgeon Bay generally consists of sand and gravel. Not far from the shoreline, the bottom material changes into sand and silt. Typically, the granular size of the sand becomes smaller when the distance from shore and the depth of the water are increased (Rodgers 2003: 3).

Climate

Wisconsin has a "temperate continental" type of climate. Weather conditions vary greatly over the course of the year. Typical climatic conditions for the Door County can be described as a cool climate with "long, gradual cool spring and long, gradual mild autumns because of the emergent rock's shape – long and narrow, surrounded by the moderating influence of much open water" (Palmquist 1989:7).

Precipitation varies from periods of prolonged drought to occasional torrential downpours. In fact, Wisconsin experiences every type of atmospheric disturbance except hurricanes. Door County's particular climate has proved economically useful to the communities around Sturgeon Bay. During the winter, ice-harvesting companies cut large quantities of ice which were shipped out of Sturgeon Bay by boat and rail (Holand 1917:174-175). In the 1890s A.L. Hatch, a commercial fruit grower from Richland County, and E.S. Goff, a professor at the University of Wisconsin, bought land and planted plums, apples, pears, strawberries, and cherries. The gradual spring and autumn seasons allowed the men to successfully produce modest quantities of cherries, and Door County became famous for them (Holand 1917:161-162). As early as 1865 Door County was praised as a beautiful place to visit during the mild seasons. As a result, several individuals began running resorts (Holand 1917:171). Even today, Door County is highly regarded as an optimal vacation destination.

Climatic conditions directly influence the Sunset Park Wreck. The temperature during the summer and winter seasons tends to be extreme, especially on the Lakes. During the winter months, many ports on the Great Lakes are shut down for the season and vessel traffic is restricted. Sturgeon Bay is no exception. Since the Sunset Park Wreck is located in approximately 10 feet of water and in relatively close proximity to shore, the weight and movement of the ice that forms each year puts tension and stress on the wreck. Although ice may be causing some damage, the cold freshwater environment typical of the Great Lakes assists in shipwreck preservation. Storms also affect the wreck. Wind and wave actions increase and create a significant surge in the bay, which disturbs the sand and silt on the bottom. As a result, sand is carried across the wreck's surface and can act like sandpaper on the timbers. In fact, during the archaeological documentation of the site, times of high surge created low visibility conditions and slowed down documentation.

Ecology

The waters of Sturgeon Bay contain a variety of indigenous freshwater animal and plant life including fish, algae, and plants. This ecosystem, like those of the other Great Lakes, is affected by the introduction of exotic species such as the round goby, ruffe, and zebra mussels.

Zebra mussels, or *Dreissena polymorpha*, have proven to be the most aggressive invasive species in the Great Lakes. Ships inbound from the Baltic Sea first introduced zebra mussels to the lakes through their bilge water (Rodgers and Green 2003:7). This species was able to penetrate into Great Lakes ecosystems because they filled an ecological role previously unknown in North American freshwaters. Recreational boaters expedited the spread of the species because adult mussels attached themselves to boats, motors, and anchors. Larvae also contributed to the spread of the species by living in bilge water, engine cooling water, bait buckets, and live wells (Johnson and Carlton:1686-1690).

The Sunset Park Wreck is covered by thick masses of zebra mussels (Figures 4.4 and 4.5). The biggest benefit of these animals is that they filter water and improve clarity, thus improving visibility at the wreck site. In some areas of the wreck, they coat timbers and ceiling s planking so severely that any vessel detail is entirely obscured.

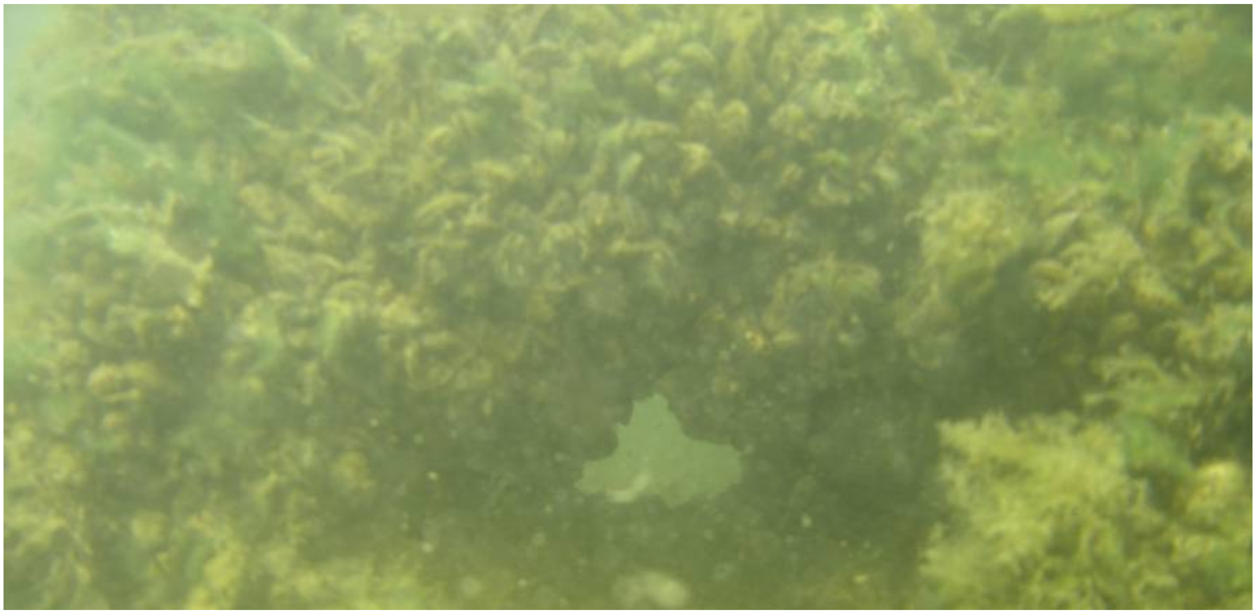

FIGURE 4.4: Thick layers of zebra mussels covering a timber on the Sunset Park Wreck (Courtesy of the Program in Maritime Studies, East Carolina University).

FIGURE 4.5: Diver utilizing a trowel to remove zebra mussels from the Sunset Park Wreck (Courtesy of the Program in Maritime Studies, East Carolina University).

Recently, the University of Vermont and the Lake Champlain Maritime Museum conducted a four year study that showed that zebra mussel colonies promote anaerobic sulfate-reducing bacteria. This is alarming, since sulfate reducers dissolve iron in shipwrecks, including fasteners, keel shoes, and any other iron component. It is theorized that, eventually, wrecks contaminated with zebra mussels will fall apart from either the loss of their iron components or the sheer volume of mussels attached to their surfaces (Rodgers 2003:5). This species represents a serious threat to Great Lakes shipwreck sites. If no method of controlling them is discovered soon, all underwater examples of Great Lakes shipbuilding innovation could disappear at an astounding rate.

Methodology

As stated above, the Sunset Park Wreck archaeological investigation was designed as a Phase II archaeological survey with the goal of recording the vessel's remains without removing artifacts or disturbing the site. This type of survey is advantageous for numerous reasons: it is quick, cost-effective, and leaves the wreck site intact. Two 25 foot skiffs, provided by the Sea Grant Institute, were anchored near the site and utilized as dive staging areas for two surface supplied air, or "hookah", systems (Figure 4.6). The hookah systems allowed two-hour dive times before the system's engines had to be refueled.

FIGURE 4.6: View of boats and hookah systems over the wreck site (Courtesy of the Program in Maritime Studies, East Carolina University).

The crew was escorted to the Sunset Park Wreck site on 6 September 2005 by Keith Meverden and Tamara Thomsen from the Wisconsin Historical Society. A visual survey of the wreck was conducted to determine the best location for the baseline, and to get a better understanding of the vessel's size and features. Because of the wreck's shallow depth and water clarity, crewmembers were able to conduct the initial examination without the use of scuba.

Archaeological work began on 7 June 2005 with the installation of a baseline, shoreline mapping, and the investigation of another nearby wreck fragment. The baseline team, utilizing SCUBA, dove on the wreck site and staged two temporary reference points, one at the bow and one at the stern, centered along the keelson of the vessel (Figure 4.7). Next, they installed a 170 foot steel cable baseline between the 2 points. Once the baseline was in place, the divers secured a parallel tape measure with nails. The tape measure allowed the Principal Investigator to divide the site into 10 foot sections, which were then assigned to individual recorders for mapping.

FIGURE 4.7: Diver installing a fence post used as a temporary reference point (Courtesy of the Program in Maritime Studies, East Carolina University).

While the baseline team was working in the water, the shore survey team established a permanent Datum with a total station. An artificial north was fixed on a rock face on the Leathem and Smith quarry property, located at 347 degrees from magnetic north. For additional accuracy, two water towers were used to ground the Datum in real geographical features. The taller of the two towers was located at 207°31'05", and the second shorter tower was located at 209°28'15". The permanent Datum was fixed on a point along the shoreline of Sunset Park with a panoramic view of the site location and surrounding area. Once these points were established, the temporary bow and stern reference points were located and recorded. The bow datum was located at 309°06'35" at a distance of 511.30 feet from the shoreline; the stern datum was fixed at 389°02'35" at a distance of 514.24 feet.

Staring on 8 June 2005, all recorders began mapping in individual 10-foot sections, or units, starting at the bow. Each student utilized the tape measure on the baseline as a reference point for triangulation and baseline offset measurements. The measurements were recorded underwater on mylar as scaled sketches of the units in feet and tenths of feet (Figure 4.8). Each evening divers transferred their day's mapping work onto a master graph paper map. This allowed recorders to resolve gaps in their data on site the next day. The entire site was recorded after 177.2 person-hours of bottom time. After the data was transferred onto the master map, a scaled representation of the entire wreck site emerged (Figure 4.9). The final draft of the master map was then traced onto mylar.

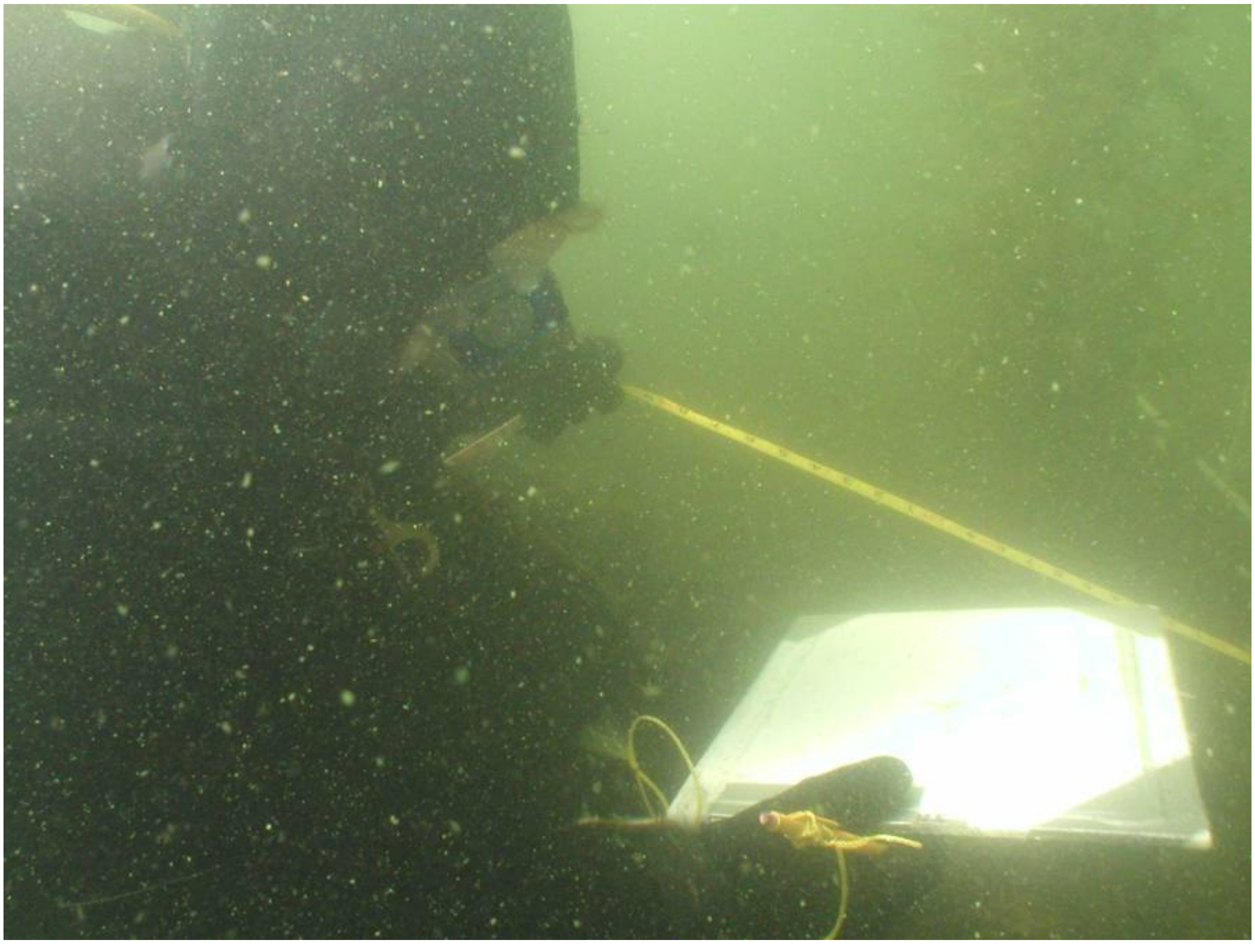

FIGURE 4.8: Archaeologist taking measurements and recording them on a sketch map (Courtesy of the Program in Maritime Studies, East Carolina University).

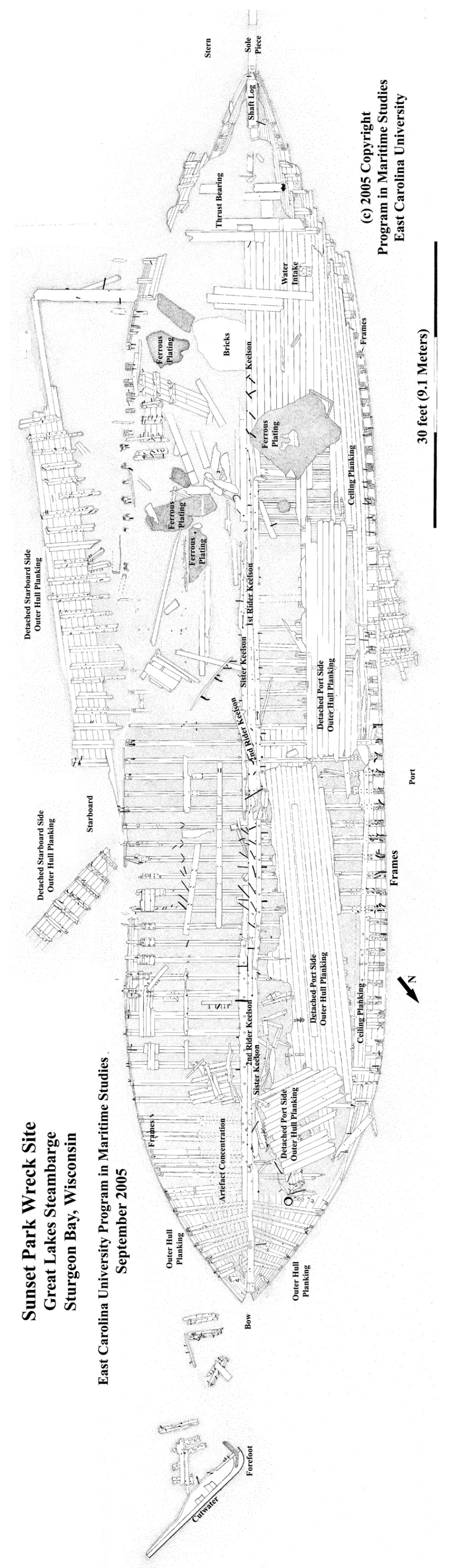

FIGURE 4.9. Site plan of the Sunset Park Wreck (Courtesy of the Program in Maritime Studies, East Carolina University).

In addition to mapping, each crewmember kept a daily field log. This log provided divers with a place to reproduce a sketch of their mylar map and record any interesting artifacts or vessel attributes observed during the day's work. The site was also recorded with digital photographs taken by Sony Cybershot cameras. Images were loaded nightly onto a laptop computer where they were assigned a description and filed by date. Mapping of the site concluded on 16 September 2005.

Site Analysis

The Sunset Park Wreck site included an articulated hull below the waterline, artifacts such as iron fastenings and molding, and evidence of an engine bed and propeller. The most obvious attribute of the wreck was heavy black charring on most timbers inside and outside the wreck. In most places, the scantlings are narrowed and the ceiling is almost completely burnt away. Despite the extensive charring, most of the vessel is present below the waterline from bow to stern.

The overall dimensions of the Sunset Park Wreck are 145 feet total length, 130.6 feet in length between perpendiculars, and 27.7 feet in beam. A depth of hold measurement is not possible because all features and structures above the waterline are missing. It should be noted that measurement taken of vessels in the archaeological record are approximate because wooden vessels change shape over time and tend to take the shape of the surface on which they settle (Rodgers and Green 2003: 32). The main structural features of the Sunset Park Wreck included the following:

Stempost Assembly

The stem represents the forward most part of the vessel and is attached to the keel by scarphing (Desmond 1984:11). On the Sunset Park Wreck, this component is detached and lies approximately 15 feet north of the bow area (Figure 4.10). The stem and forefoot structure measured 14.4 feet in length by 1.9 feet sided. The measured dimension of the broken-off stem post was 0.6 feet molded.

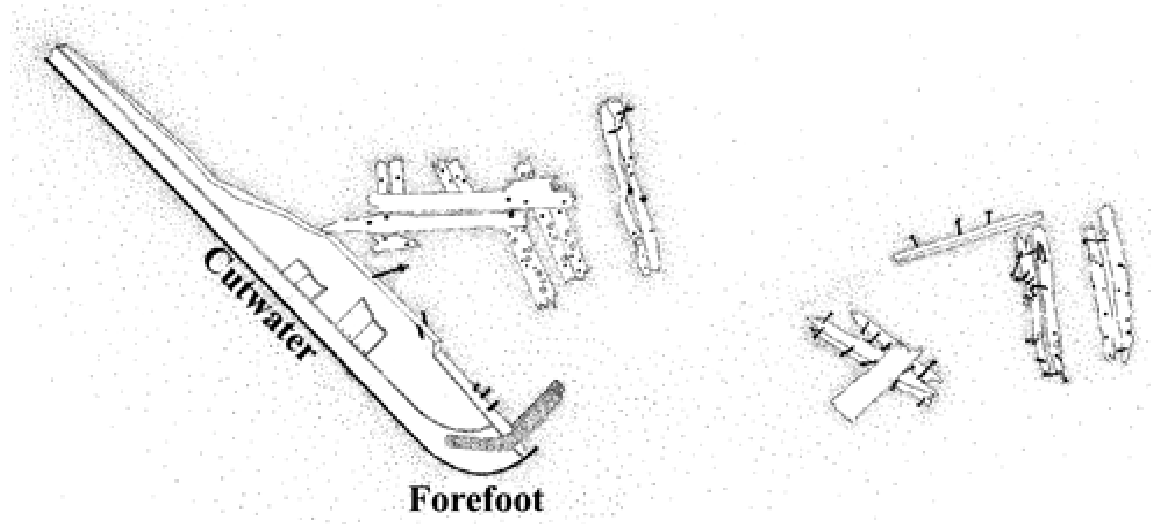

FIGURE 4.10: Stempost assembly as depicted in the Sunset Park Wreck site plan (Courtesy of the Program in Maritime Studies, East Carolina University).

Keel/Keelson Assembly

The purpose of the keel/keelson assembly is to unite the keel, floors, and deadwood into one strong structural support unit (Desmond 1984:55). This helps prevent the effects of hogging and sagging, that wooden vessels with a high length to beam ration are susceptible to. For this reason the keel/keelson assembly is often referred to as a ships' "backbone". The purpose of a heavy backbone in steamers, such as the Sunset Park Wreck, is to provide longitudinal hull strength, support for the boiler and engine bed, and, as mentioned, protect the vessel from hogging and sagging. The heavy composite backbone of the Sunset Park Wreck consisted of five large timbers all through fastened to the keel: one center keelson, two sister keelsons, fastened to the floors to add additional support to the vessel, and two rider keelsons, fastened to the top of the keelson (Figure 4.11).

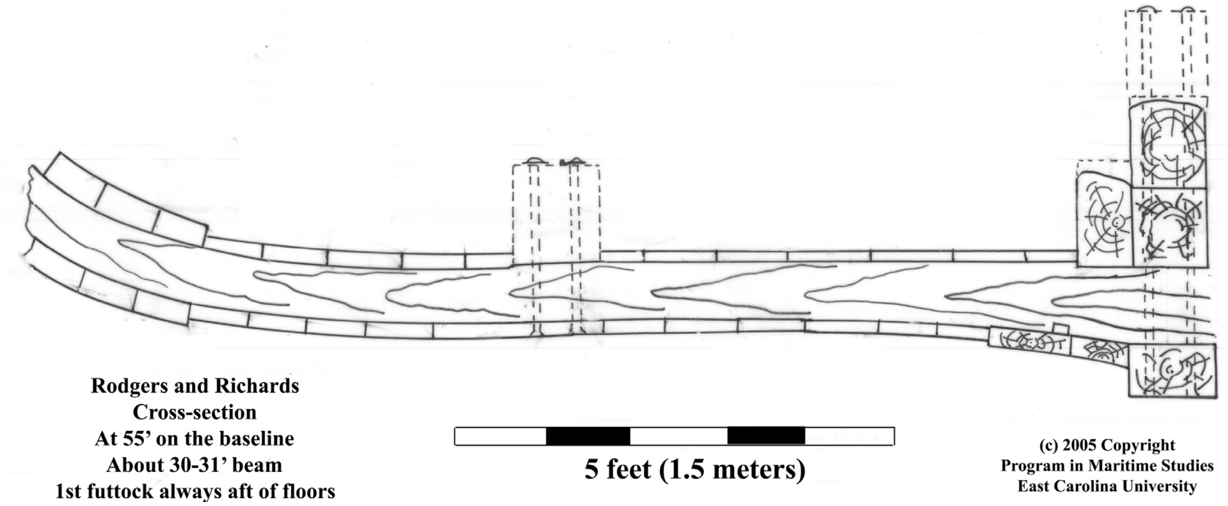

FIGURE 4.11: Sunset Park Wreck starboard side cross section (Courtesy of the Program in Maritime Studies, East Carolina University).

The dimensions of each component are as follows:

- Keel – 0.96 sided by 0.6 molded
- Keelson – 0.84 feet sided by 0.88 feet molded
- Rider Keelsons – 0.84 feet sided by 0.98 feet molded
- Sister keelsons – 0.6 feet sided by 1.16 feet molded

While the majority of the Sunset Park Wreck's backbone is well preserved and intact, there is some visible damage and deterioration, likely more a result of fire than the vessel's time underwater. The second rider keelson is missing from 36.5 feet aft of the stem area, while the first rider keelson is missing 87.9 feet aft of the stern area. The keelson disappears 110 feet aft of the fore end of the keel/keelson assembly, beneath the thrust bearing. It is unclear if it is broken, but most likely is simply buried under the sediment and impossible to discern because layers of zebra mussels, vegetation, sand, and silt were particularly thick in the vessel's stern. Bilge keelsons, one on both the port and starboard sides, would have provided additional longitudinal support for the vessel. The presence of these timbers was indicated by the presence of fasteners, indicated by dotted lines.

Frames

The Sunset Park Wreck contained cant frames in the bow, double frames throughout, and quadruple frames in the stern for engine support. Five pairs of cant frames, measuring 0.3 feet to 0.4 feet in sided dimension, were present in the bow to accommodate the curvature of the vessel (Figure 4.12).

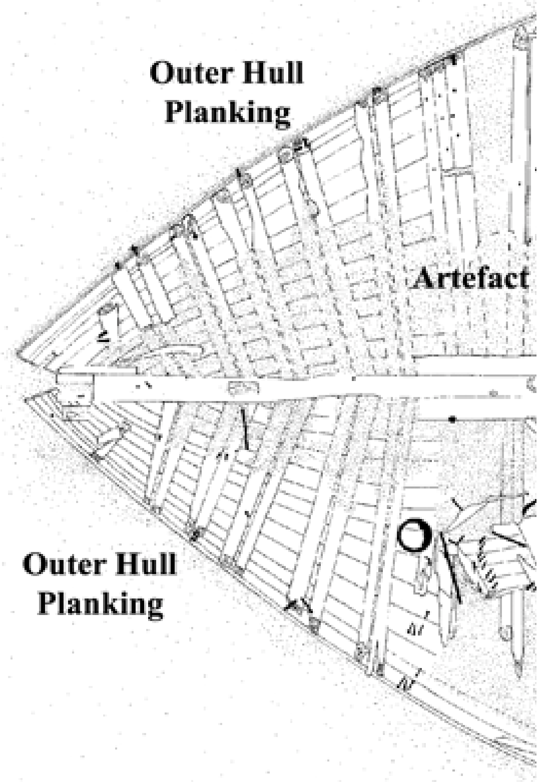

FIGURE 4.12: Cant frames as depicted in the Sunset Park Wreck site plan (Courtesy of the Program in Maritime Studies, East Carolina University).

FIGURE 4.13: The Sunset Park Wreck's double frames. Notice the clean cut on top of the left frame, which indicates that they were cut intentionally (Courtesy of the Program in Maritime Studies, East Carolina University).

As in most 19th century wooden steambarges, the frames extended from port to starboard perpendicular to and sandwiched between the keel and the keelson. Each frame was made up of a pair of futtocks measuring 0.3 to 0.4 feet sided, and were fastened to the keelson assembly every 1.8 feet with an average space of 1.0 feet between frames (Figure 4.13). In the stern, quadruple floors were present to support the engine bed. The exact dimensions of the floor and frames were often difficult to obtain due to charring and deterioration.

Ceiling Planking

Ceiling planking is the planking that covers inside of the frames, forming the surface of the hold. Throughout most of the Sunset Park Wreck, the ceiling was covered in a thick layer of silt, vegetation, and zebra mussels. However, small test strips reveal that the ceiling planks were 0.6 feet sided and longitudinally oriented. Longitudinal ceiling planking is a common characteristic of 19th century schooners and steambarges, and as such can be considered a diagnostic attribute. Much of the ceiling had been burned away, and all remaining planks were charred.

Inner and Outer Hull Planking

This vessel is double planked, a typical characteristic of steambarges that protected the hull from damage inflicted by heavy cargoes as well as natural elements. The dimensions of the inner and outer hull planks are similar; 0.6 feet sided by 0.16 feet molded. The ceiling and outer hull planking is fastened to the frames with iron pins. Two pins were used to fasten each individual plank to each frame. With the double frame construction, this resulted in four fasteners at each pair. Most of the fasteners on the ceiling of the vessel were iron nails used in combination with large washers. Though it cannot generally be seen, outer hull planks are nailed in the same pattern as ceiling planks with countersunk nails.

Several sections of outer hull planking are detached and situated either directly inside or outside the hull (Figures 4.9 and 4.14). These outside sections are between five to seven planks wide and are attached to double frames that are cleanly cut. The two largest pieces of side reside inside the hull thirteen feet aft of the bow on the port side. These sections are both 13 feet wide at their widest point. While one smaller piece is lying on top of the fore end of the second piece, it is probable that these two sections fit together and were attached at one time. The evenness of the frame tops on both the intact hull and the detached sections, as well as their locations in relation to the hull, indicate that the detached pieces were intentionally removed. Since the site is only approximately 10 feet deep and located in a well-used recreational boating area, it is reasonable to assume that the detached portions of the hull were cut down to prevent boats from grounding or snagging on the wreck.

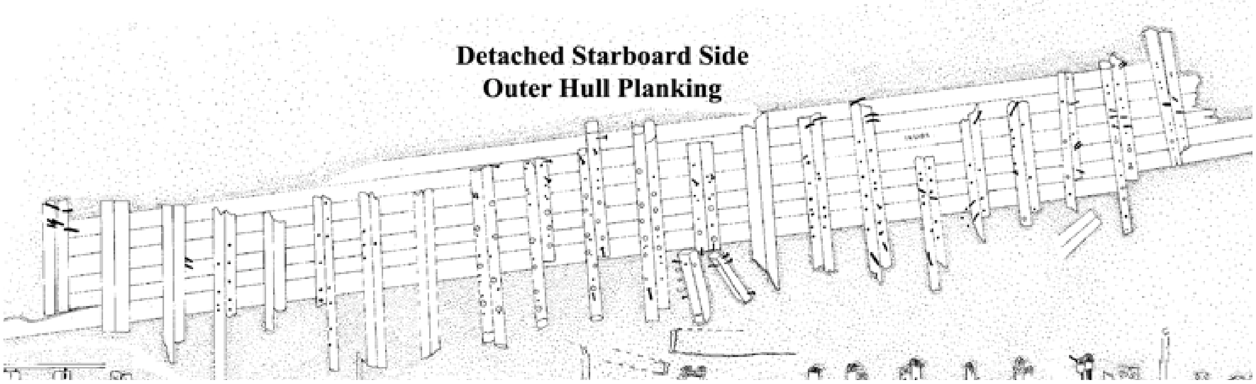

FIGURE 4.14: Portion of detached hull as it appears on the Sunset Park Wreck site plan (Courtesy of the Program in Maritime Studies, East Carolina University.)

Engine Bed

While no engine parts or intact bed structure was recorded, in the stern seventy-five feet aft of the bow, archaeologists recorded large sections of iron plating and a large deposit of bricks (Figures 4.15 to 4.17). Five large pieces of ferrous material were recorded on the starboard side and two pieces were recorded on the port side. The location of this iron plating as well as the corresponding presence of quadruple frames, indicates that these pieces were the engine or boiler beds. The brick deposit measured approximately five by five and a half feet in area, and individual bricks were measured as 0.3 by 0.6 by 0.2 feet in dimension. None of the examined bricks had any distinguishing marks.

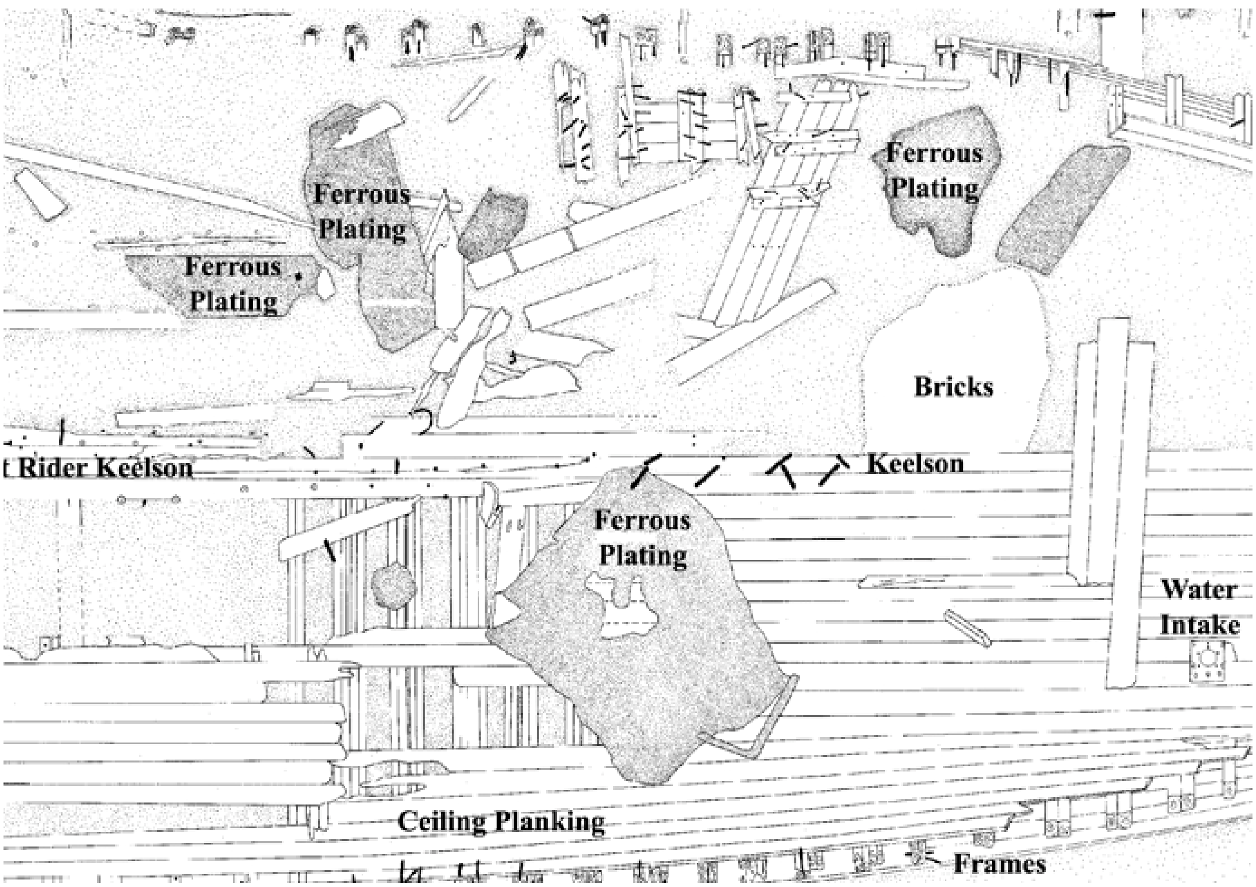

FIGURE 4.15: Plating and brick deposits as they appear on the Sunset Park Wreck site plan (Courtesy of the Program in Maritime Studies, East Carolina University).

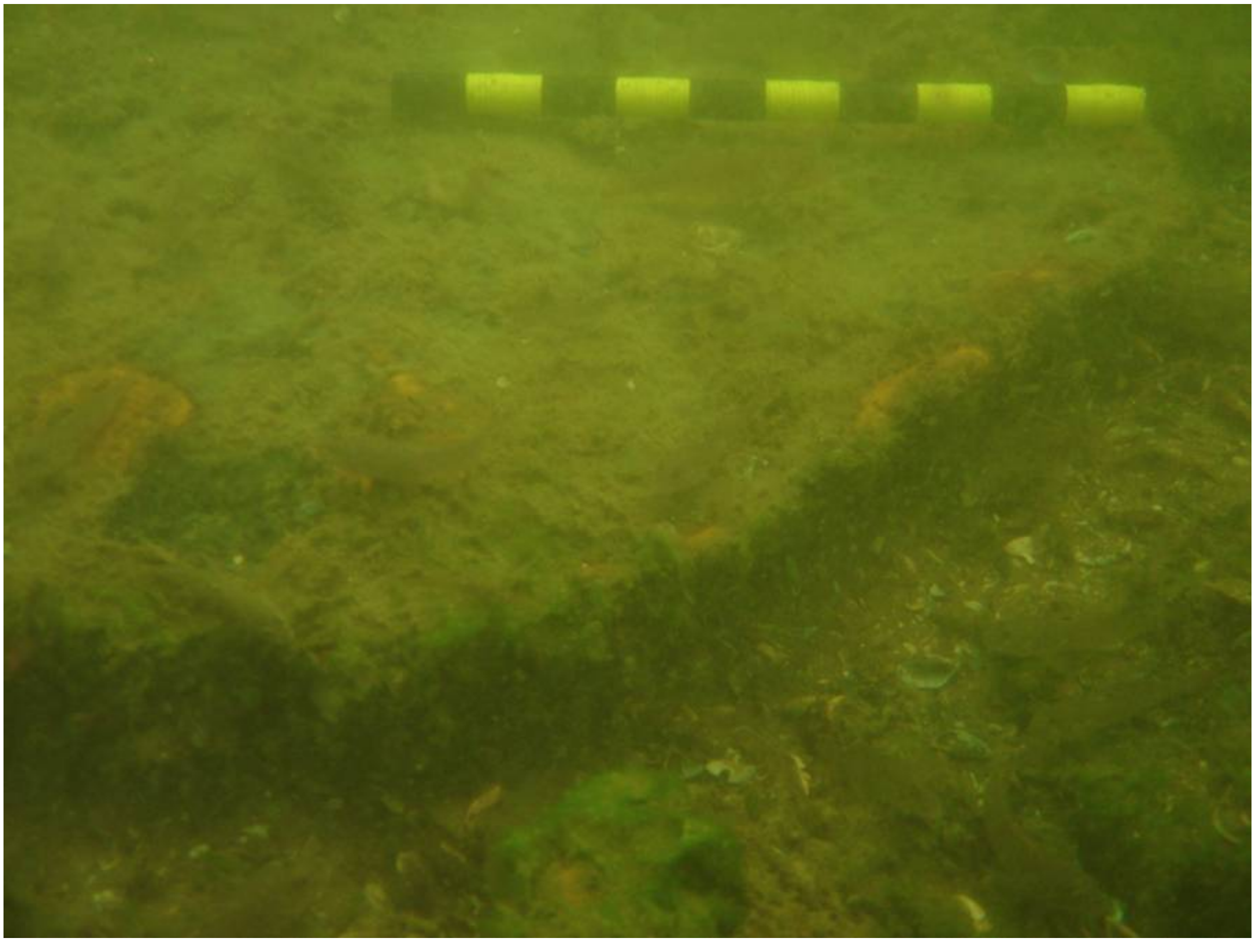

Figure 4.16: Iron plates (Courtesy of the Program in Maritime Studies, East Carolina University).

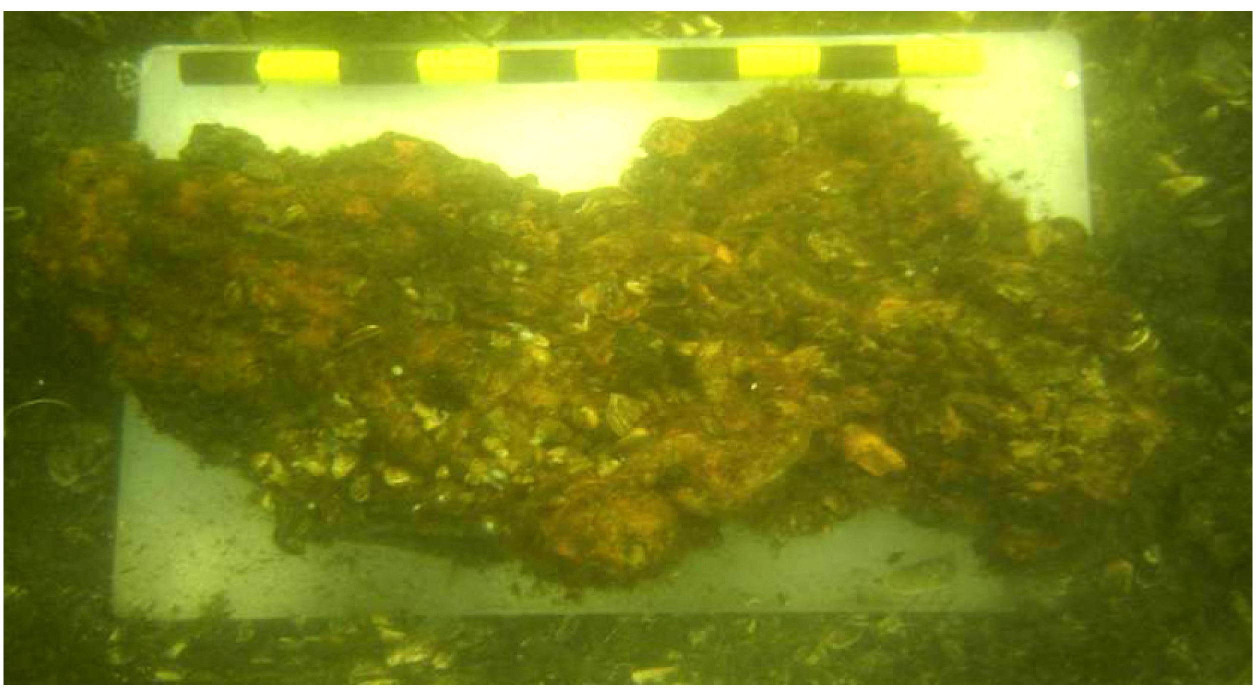

Figure 4.17: Ferrous mass (Courtesy of the Program in Maritime Studies, East Carolina University).

Propeller Assembly

Upon initial examination of the wreck, archaeologists uncovered a shaft log and sole piece aft of the stern post (Figure 4.18). The presence of these components confirmed that the wreck was once a steamer. The shaft log measured 4.8 feet in length by 0.8 feet sided. The sole piece extended out from the keel and measured 9.0 feet in length and 0.8 feet sided. No other evidence of the propeller or rudder was found on the site, probably due to salvage activities.

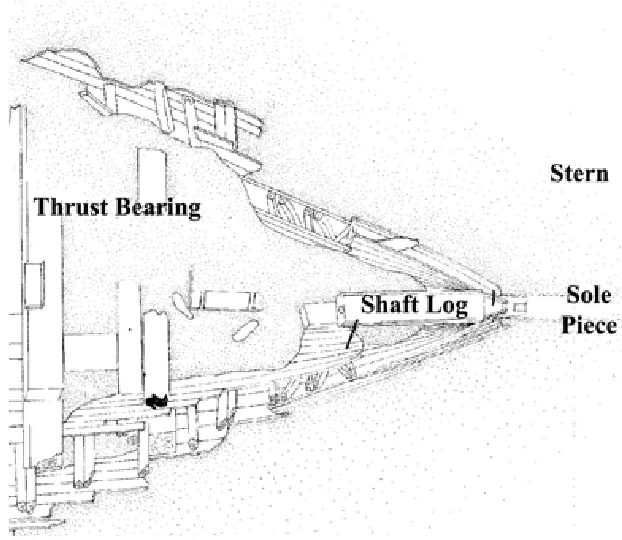

Figure 4.18: Propeller assembly as it appears on the Sunset Park Wreck site plan (Courtesy of the Program in Maritime Studies, East Carolina University).

Artifact Scatter

Besides a random scattering of loose fasteners in various shapes and sizes, the Sunset Park Wreck contained a small sampling of other artifacts including white paste porcelain fragments and decorative metal fragments (Figures 4.19 and 4.20). These artifacts were recorded in place and not recovered, due to the Phase II non-intrusive nature of the project.

Site Interpretation and Steambarge Chronology

The archaeological investigation of the Sunset Park Wreck confirmed initial suspicions that the vessel is a steambarge. This suspicion is based upon analysis of the vessels internal construction, which reveals a schooner-like hull, indicated by longitudinal ceiling planking, bilge keelsons, and a heavy composite keel/keelson assembly, with self-propulsion machinery, indicated by quadruple frames in the stern and the propeller assembly. In the archaeological record, these features are diagnostic (Rodgers 2007:14).

FIGURE 4.19: Fasteners (Courtesy of the Program in Maritime Studies, East Carolina University).

FIGURE 4.20: White porcelain, iron fasteners, and decorative metal fragments in situ. Note the lay of zebra mussels and extensive charring (Courtesy of the Program in Maritime Studies, East Carolina University).

Comparison of the Sunset Park Wreck with other archaeologically investigated steambarges further corroborates the vessel type identification and provides insight into the internal construction of wooden steambarges. Before the archaeological investigation of the Sunset Park wreck, only four other Great Lakes steambarges had been documented in detail: *Adventure*, *Francis Hinton*, *Cleveland*, and *H.D.* Coffinberry. Other steambarges have been surveyed, but not mapped in detail. These include *Herman H. Hettler*, *Michael Groh*, and *H.E. Runnels* (Rodgers et al. 2006:37-40; Labadie 1989:51-54, 62-67, 146-149; Cooper 1996:96-101; Jenson et al. 1995:39-44; Labadie and Herdendorf 2004:30-35).

The archaeological reports of these vessels are important primary sources that provide tools for comparison to the Sunset Park Wreck. In order to demonstrate the connection between the internal construction of the Sunset Park Wreck and other wooden Great Lakes steambarges, further analysis of the archaeological data gathered during the investigations of these ships is warranted. The vessels are presented in chronological order and accompanied by a brief synopsis of their archaeological examination, as well as any archaeological documentation including site plans and cross sections. Steambarges that have been surveyed, but not mapped in any detail, have not been included. These sites are too disarticulated or the documentation too minimal to provide much useful information.

Cleveland

The oldest archaeologically documented steambarge, *Cleveland*, was constructed for the lumber trade in 1860. *Cleveland* originally measured 150 feet long, 25. 5 feet in beam, and had an 11.6 foot depth of hold, although these dimensions changed during the vessel's career due to hull improvements and the vessel's conversion into a passenger/package freight propeller (Rodgers et al. 2006:25). Although the steamer's career was plagued by a series of misfortunes, it continued to function efficiently until it was declared unfit for service in 1900. After this, it was converted to a barge. By 1902, the vessel had been completely stripped and turned into a crib for a stone quarry's loading dock (Rodgers et al. 2006:25).

An archaeological investigation of the *Cleveland* was conducted by East Carolina University, Wisconsin Historical Society, and the Wisconsin Sea Grant Program in September of 2001 and 2002. Since the ship had been utilized as a crib, the hull was filled with stone. This made documentation of the vessel's construction difficult, but not entirely impossible. Internal construction components consisted of an offset centerboard, bilge keelsons, longitudinal ceiling planking, and added floor reinforcing toward the stern, evidence of boilers and engines (Figure 4.21). The vessel internally is very schooner-like, complete with a pre-1860 style portside offset centerboard, which despite its long career is probably still original equipment (Figure 4.22).

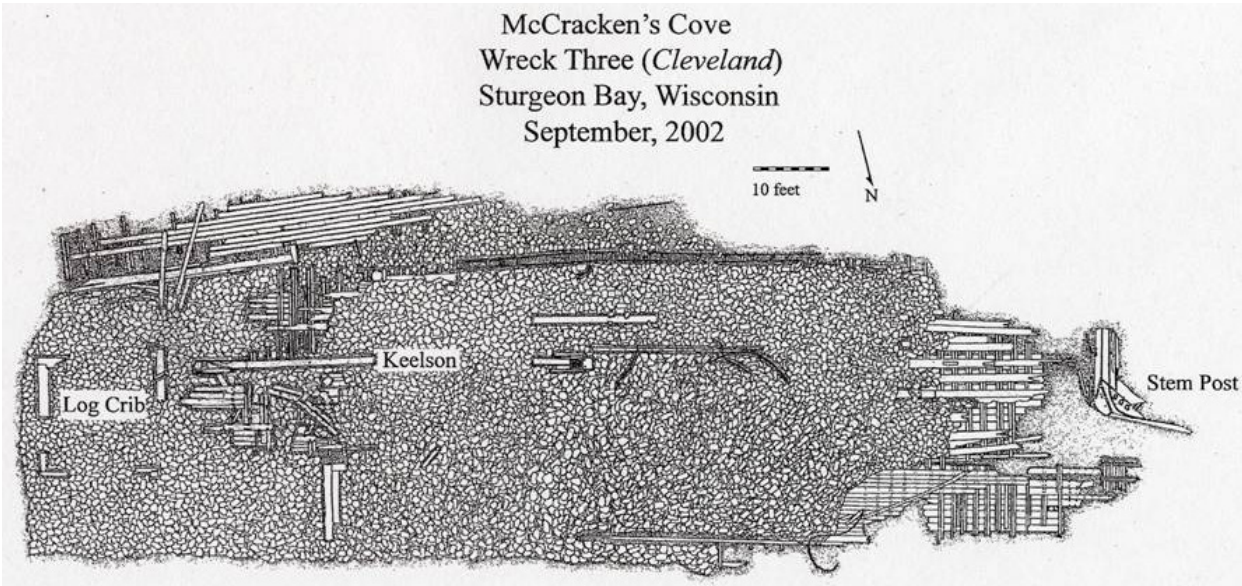

FIGURE 4.21: *Cleveland* site plan. Note the triple frames in the stern and longitudinal planking (Courtesy of the Program in Maritime Studies, East Carolina University).

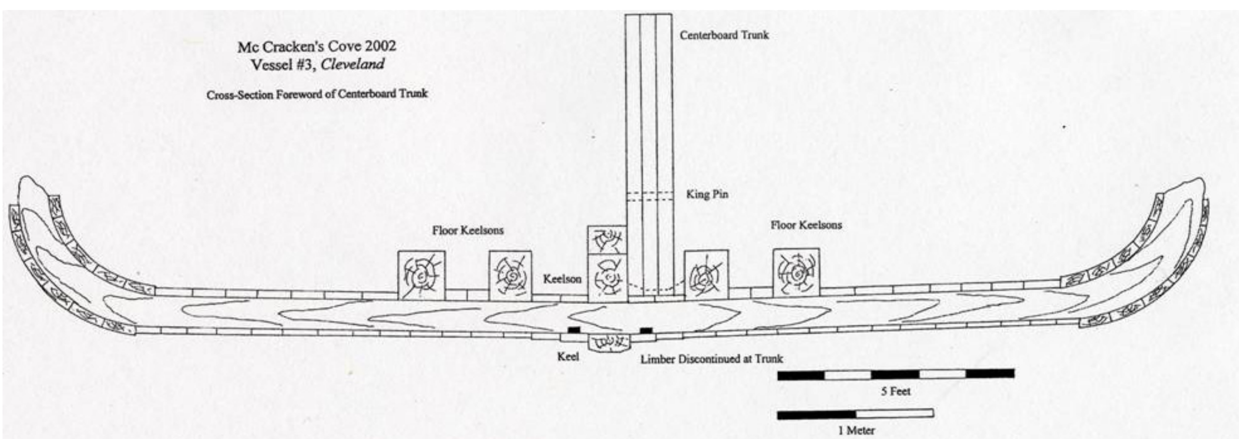

FIGURE 4.22: Steambarge *Cleveland* cross section. Note the offset centerboard and bilge (or floor) keelsons (Courtesy of the Program in Maritime Studies, East Carolina University).

Michael Groh

Michael Groh, another early steambarge, was constructed for the lumber trade in 1867 by Quayle and Martin for Thomas Manning and Michael Groh (C. Patrick Labadie Collection, Ship Information and Data Record, *Michael Groh*). The ship measured 120.4 feet in length, 23.8 feet in beam, and had a

23.8 foot depth of hold (Labadie 1989:62). *Michael Groh's* twenty-eight year career ended in 1895 when its rudder broke from the shoe on a trip to Cleveland. The vessel, rendered helpless, was driven onto the nearby shore where it pounded onto the rocks and sank (Labadie 1989:63-64).

The *Michael Groh* wreck site was examined in 1988 by the Submerged Cultural Resources United of the National Park service as part of a comprehensive evaluation of the Pictured Rocks National Lakeshore's underwater resources. The wreck is disarticulated and consists of two sections of ship's hull. The smallest section is 15 feet long and consists of a centerline keelson, double and triple frames, as well as engine supports and a bearing support block (Figure 4.23). The larger section of wreckage measured 104 feet in length and was not discovered until the conclusion of the Pictured Rocks survey project. Investigators noted in the site report that this section of hull contained double and triple frames, longitudinal ceiling planking, bilge stringers, and a single centerline keelson reinforced with an assistant keelson.

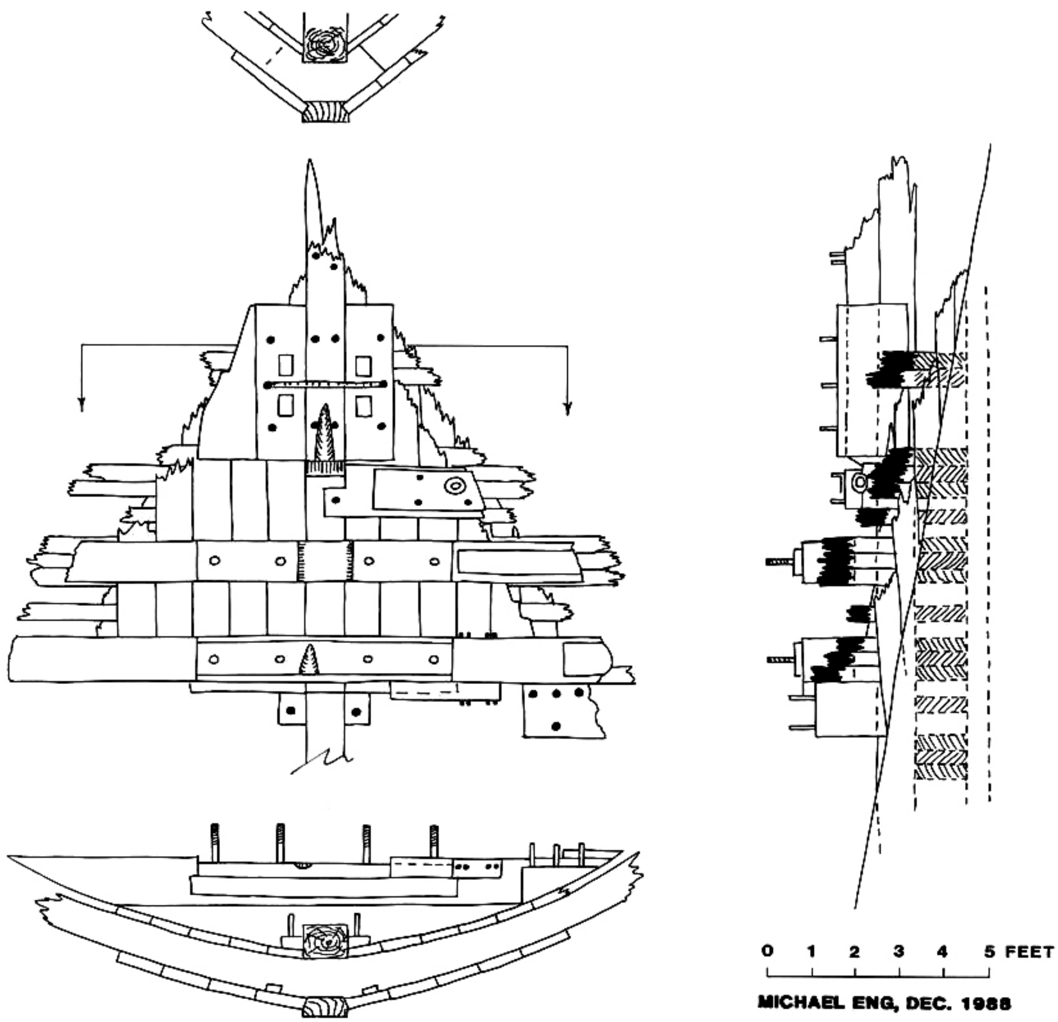

FIGURE 4.23: View of *Michael Groh's* engine bed (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

H.D. Coffinberry

H.D. Coffinberry was built in 1874 by Thomas Arnold for the firm of Rust, King & Company, and carried cargoes of coal, corn, iron ore, and lumber during its career. The ship measured 191.4 feet in length, 33.5 feet in beam, and a 13.4 foot depth of hold (C. Patrick Labadie Collection, Ship Information and Data Record, *H.D. Coffinberry*). Reports of groundings and accidents are abundant in the *Coffinberry's* history, and the ship had to be pumped out and towed to the nearest port for repair on two occasions. The ship's final demise was due to the owner's financial distress. In 1912 the crew abandoned the vessel because the owners had not paid them. Five years later the vessel was raised, salvaged, and then re-abandoned at Red Cliff Bay in northern Wisconsin (Cooper 1996:93-96).

Archaeological investigations of *H.D. Coffinberry* were conducted by the State Historical Society of Wisconsin, East Carolina University, UW-Sea Grant Institute, UW-Marine Studies Center, and the National Park Service as part of a survey of the submerged cultural resources of the Apostle Islands (Cooper 1996:1). The wreck rests on a lakebed of sand, silt, cobble, and boulders. Surviving structural elements include only a badly damaged lower hull. Internal construction components consisted of double frames throughout and triple frames in the stern, heavy centerline keelson complex including two sisters and two riders, bilge stringers, longitudinal ceiling planking, and evidence of machinery including the remains of the ship's boiler bed and badly damaged boilers (Figure 4.24) (Cooper 1996:96-101).

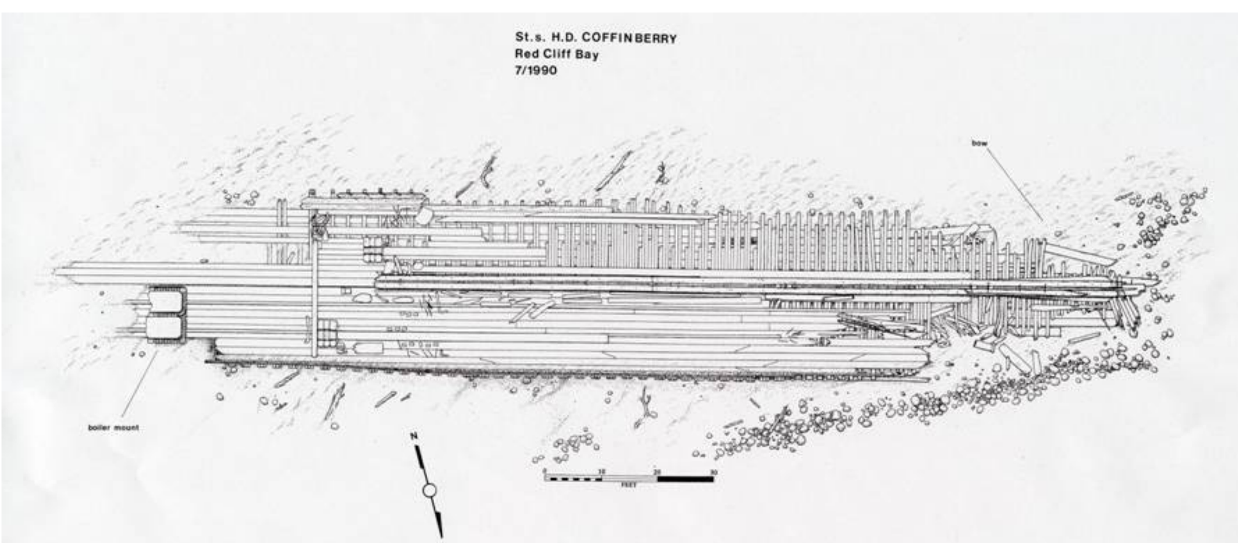

FIGURE 4.24: *H.D. Coffinberry* site plan. Note the triple frames in the stern and longitudinal planking (Courtesy of the Wisconsin Historical Society, Madison, Wisconsin).

Francis Hinton

Hanson and Scove built *Francis Hinton* in 1889 for the lumber trade (C. Patrick Labadie Collection, Ship Information and Data Record, *Francis Hinton*). *Hinton's* dimensions measured 152.2 feet in length, 30.9 feet in beam, and 10.89 feet in depth of hold (Wisconsin Historical Society, Ship Information and Data Record, *Francis Hinton*). The vessel was well maintained and its Inland Lloyds Rating never dropped below A 1 ½. *Francis Hinton* enjoyed a successful career as a lumber carrier until 1909 when the vessel foundered off of Two Rivers, Wisconsin, en route to Chicago with a full load of Norway pine. The wreck was quickly forgotten until it was rediscovered by sport divers in 1987 (Jensen et al. 1995:32, 34).

Archaeological work began on the wreck during the winter of 1994-1995. The project was conducted by Rodgers Street Fishing Village Museum in Two Rivers, Wisconsin, and the State Historical Society of Wisconsin with the assistance of Wisconsin Underwater Archaeological Association (WUAA) volunteers. The site is embedded in a clay bottom and sits almost flush with the lakebed. During investigations, divers noted the presence of the ship's bottom and broken sections of the vessel's sides. Internal construction components consisted of a heavy keelson assembly including a rider keelson and two longitudinal stringers, bilge stringers, double frames throughout and triple frames in the stern, longitudinal ceiling planking, machinery including the propeller assembly, as well as evidence of a centerboard in the bow (Figure 4.25) (Jensen et al. 1995:37, 39-45).

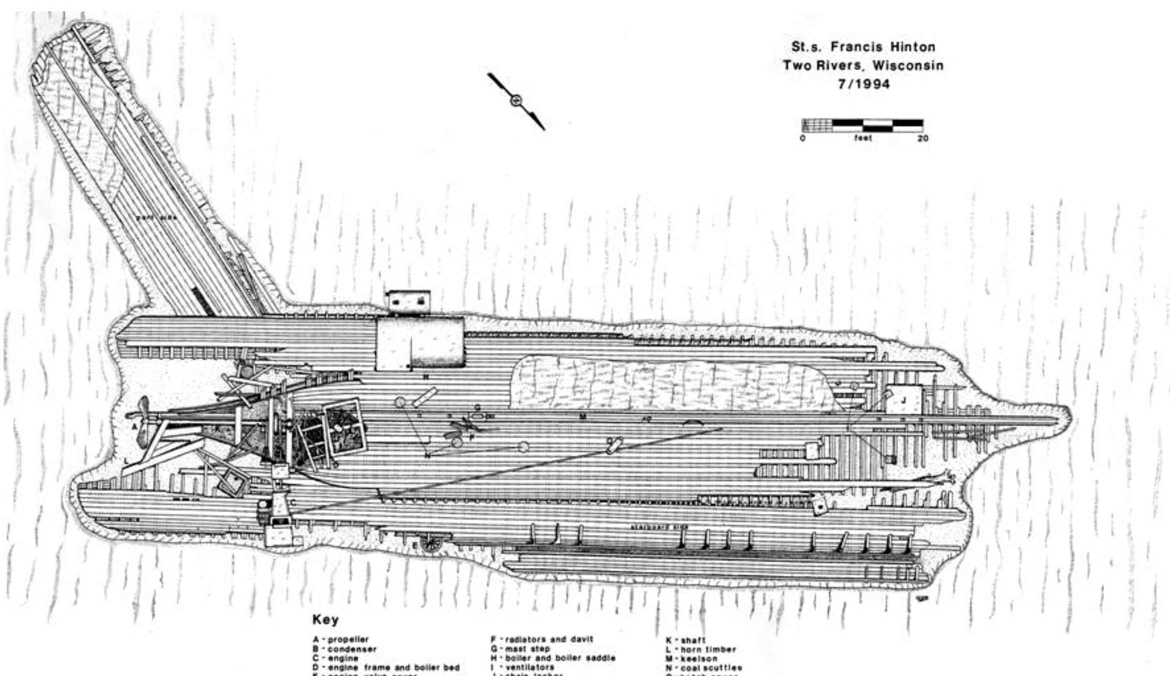

FIGURE 4.25: *Francis Hinton* site plan (Courtesy of the Wisconsin Historical Society, Madison, Wisconsin).

Adventure

Adventure was originally built as a schooner in 1875, and was rebuilt as a steambarge in 1897 by Henry D. Root of Lorain, Ohio (C. Patrick Labadie Collection, Ship Information and Data Record, *Adventure*). Conversion to a steambarge was accomplished by:

> …reconstructing and rounding the ship's square stern and installing a boiler, engine, tailshaft, propeller, and rudder. Simpler tasks included removal of the ship's bowsprit and her after (main) mast, relocating the foremast, and erecting a small forecastle at the bow. A cabin was also constructed on a raised poop deck at her stern (Labadie and Herdendorf 2004:7).

After conversion, the ship measured 108 feet in length, 24 feet in beam, and had an 8.3 foot depth of hold (Labadie and Herdendorf 2004:7). On October 7, 1903, *Adventure* caught fire while loading a cargo of burned lime at the Kelleys Island Lime & Transportation Company. As soon as it became apparent that the vessel could not be saved, it was towed away from the shoreline where it burned to the waterline and sank (Labadie and Herdendorf 2004:10-11).

In 1997, Firelands College of Bowling Green State University offered an experimental workshop course designed to train avocational divers in the techniques of shipwreck documentation. The final goal of the class was to document the *Adventure* wreck site. The archaeological survey revealed that the wreck lay upright and mostly intact below the waterline, and rests on a bottom consisting of a mixture of silt, sand, gravel, limestone cobbles, and large glacial boulders. Internal construction components consisted of characteristic 19th century schooner hull attributes including a thick composite keel/keelson assembly including two sisters and one rider keelson, bilge stringers, longitudinal ceiling planking, and a centerboard (Figure 4.26). Machinery components, including a very visible engine bed, shaft log, and stern post, were also found on site (Figure 4.28) (Labadie and Herdendorf 2004:31-34).

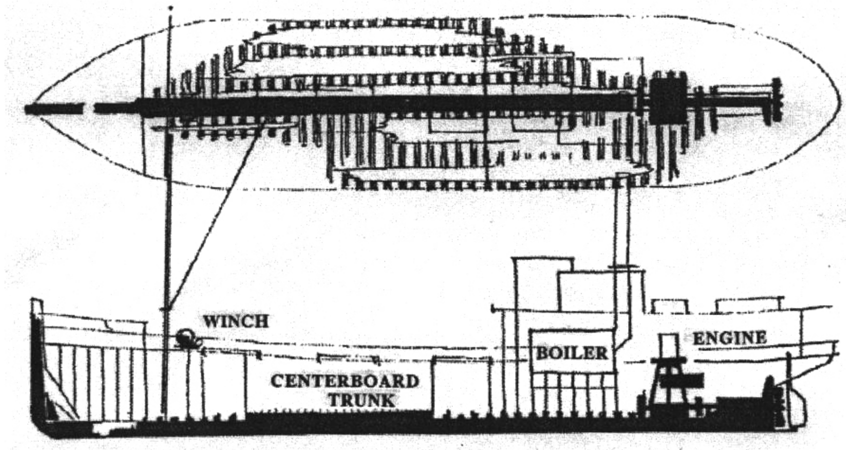

FIGURE 4.26: *Adventure* site plan. Note the heavy keel/keelson assembly (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

Conclusions

The archaeological examination of the Sunset Park Wreck, as well as *Cleveland*, *Michael Groh*, *H.D. Coffinberry*, *Francis Hinton*, and *Adventure*, provided archaeologists with an opportunity to get a closer look at what has until now been one of the most elusive 19th century Great Lakes vessel types. Of the five other archaeologically documented steambarges discussed above, only two others, *Francis Hinton* and *Adventure,* have allowed investigators to take a close look at the internal construction characteristics. *Cleveland* was mostly covered with stone, and only a small portion of *Michael Groh* was documented, while very little of *H.D. Coffinberry* remains intact. Despite this, analysis of the vessels' archaeological remains reveals some commonalities between the sites, and thus establishes some diagnostic characteristics for internal steambarge construction in the archaeological record. Most importantly, in some way all of these vessels shed light on the internal construction characteristics of steambarges and help establish the link between sail and steam powered cargo vessels.

Diagnostic internal construction characteristics of steambarges resemble that of typical 19th century schooners, including heavy keel/keelson complexes, longitudinal ceiling planking, double framing, and sometimes centerboards. Of the six vessels presented, the Sunset Park Wreck, *H.D. Coffinberry*, *Francis Hinton*, and *Adventure* all demonstrate heavy keel/keelson complexes (Labadie and Herdendorf 2004:32; Cooper 1996:96; Jensen et al. 1995:39-45). *Cleveland* (1860) and *Michael Groh* (1867), the earliest archaeologically documented steambarges, do not. Their keelsons, however, are both reinforced with assistant keelsons (Rodgers et al. 2006:40; Labadie 1989:67). These vessels primarily carried lumber and other bulk cargoes, and required strong keelson assemblies to support the wear and tear of transporting heavy bulk commodities (Labadie 1989:26). Another shared attribute that contributed to the vessels' overall strength is longitudinal ceiling planking. This characteristic, as well as double framing throughout the vessels' hulls was present on all six archaeologically documented steambarges (Rodgers et al. 2006:37-40; Labadie 1989:51-54, 62-67, 146-149; Cooper 1996:96-101; Jenson et al. 1995:39-44; Labadie and Herdendorf 2004:30-35).

The final schooner-like internal construction attribute some steambarges share with schooners is a centerboard. According to Rodgers, "…earlier craft or those that were converted to steam barges from sailing schooners, [sic] sometimes still contain centerboards" (Rodgers 2007:14). Of the six steambarges examined three contained centerboards, *Cleveland*, *Adventure*, and *Francis Hinton*. Two vessels, *Cleveland* and *Adventure*, fit the above criteria mentioned by Rodgers. *Cleveland*, constructed in 1860, was one of the earliest steambarges ever built, and was constructed during a time when shipwrights were still transitioning schooner hulls from sail to steam (Rodgers et al. 2006:37). These builders would not have wanted to deviate far from tried and true schooner construction techniques, and knew that centerboards helped make sailing vessels effective sailors. *Adventure* was originally constructed as a schooner, and the vessel's centerboard was not removed during conversion to a steambarge in 1875 (Labadie and Herdendorf 2004:32). *Francis Hinton* is an exception. This vessel was constructed as a purpose built steambarge in 1889, during the peak of steambarge construction. Archaeological investigations of the ship, however, revealed evidence of a centerboard trunk in the vessels' extreme bow. According to the site report, "The [centerboard] trunk appears to have been closed up and the centerboard removed as part of a later modification" (Jensen et al. 1995:39). The fact that this late steambarge contained a centerboard may be explained by shipwrights' choices. The site report also states that:

She [Francis Hinton] was the final vessel built by the Danish immigrants Hanson and Scove, a shipbuilding partnership primarily known for its fine schooners rather than steam vessels (Jensen et al. 1995:32).

Since these men were primarily focused on building schooners it makes sense that they would include a centerboard, a typical schooner characteristic, in *Francis Hinton*, a steambarge that exhibited internal construction characteristics almost identical to those of typical 19th century schooners. In this light, it is important to note that not all ships assigned to the steambarge class satisfy all criteria established for the type.

The only attributes that differentiate steambarges from schooners in the archaeological record are engines and boilers, and those features associated with their support. These include one or two bilge stringers per side and heavy triple or quadruple framing and flooring in the stern (Rodgers 2007:14). All six wrecks demonstrate these characteristics (Rodgers et al. 2006:37-40;

Labadie 1989:51-54, 62-67, 146-149; Cooper 1996:96-101; Jenson et al. 1995:39-44; Labadie and Herdendorf 2004:30-35).

The Sunset Park Wreck as a steambarge is a unique Great Lakes vessel type and as such is an important contribution to maritime cultural history, and provides us with a tangible link to the past. It also represents a distinctive Great Lakes vessel type that was specially tailored to overcome the environmental particularities of the Lakes. It is, thus, important to protect that information for the future. Wisconsin state law protects the site and establishes ownership of the vessel and all affiliated artifacts. Although the detail in which the wreck was mapped makes any future archaeological examination unnecessary, the wreck can still serve as an educational tool. The site is well known to the surrounding communities, and any attempts to block recreational boaters and divers from examining the site would be futile. The best course of action is to educate the local community on the wreck's importance to Great Lakes maritime culture. With this in mind, the Wisconsin Historical Society plans to install a sign on the Sunset Park shore detailing the vessel's history, importance, and archaeological investigations (Figure 4.27). Hopefully, the site will educate and be enjoyed by generations of people who take nothing but pictures and leave only bubbles.

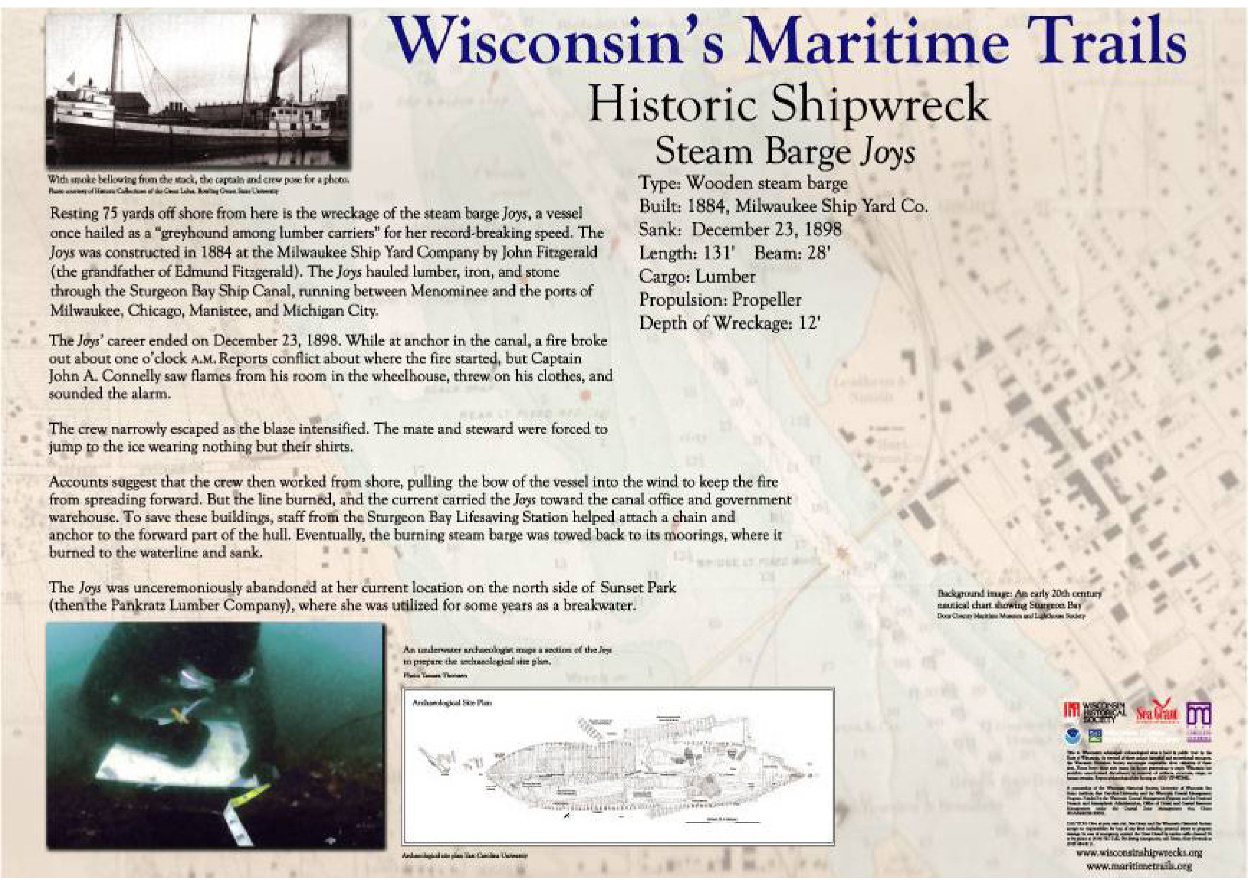

FIGURE 4.27: Mock up of the *Joys* Maritime Trails Marker that will be installed in spring, 2007 (Courtesy of the Wisconsin Historical Society, Madison, Wisconsin).

CHAPTER 5

THE HISTORY AND ARCHAEOLOGY OF THE *JOYS*: "GREYHOUND OF THE LAKES"

Introduction

During the archaeological examinations of the Sunset Park Wreck the identity of the vessel was uncertain. No definitive evidence of the wreck's identity, such as a nameplate, was discovered on site, therefore the only way to identify the Sunset Park Wreck is through a multidisciplinary approach. One of the most powerful tools archaeologists have at their disposal for identifying and interpreting shipwrecks is historical evidence. Historical data can be utilized in conjunction with archaeological data to reveal identity, typology, and other important aspects of a shipwreck site. Comparison of the Sunset Park Wreck's archaeological record with historical data pertaining to shipwrecks in Door County, Wisconsin, led East Carolina University archaeologists to conclude that the Sunset Park Wreck is likely the steambarge *Joys*.

The purpose of this chapter is to blend historical data with archaeological evidence to reveal both the history and identity of the Sunset Park Wreck. The first half of this chapter presents the history of *Joys*, focusing on hull modifications the ship experienced before, during and after wrecking that may still be present in the archaeological record. Historical information relevant to this vessel, once heralded as the "greyhound of the Lakes," is found in vessel enrollments and newspaper articles and provides enough key evidence to trace the ship's career. The second half presents and examines archaeological data uncovered during the Sunset Park Wreck project that substantiates and corroborates the identity of this wreck as the steambarge *Joys*.

The Milwaukee Ship Yard Company

In 1884, *Joys* began its 14 year career at the Milwaukee Ship Yard Company in Milwaukee, Wisconsin. The company was organized by Captain John Fitzgerald, the youngest of six brothers who were all Great Lakes' captains. In 1874, Fitzgerald bought the Allan, McClelland & Company holdings and constructed the Milwaukee Ship Yard Company on the former owner's grounds. John Fitzgerald, of course, named himself president of his new company. The only other officer was Andrew M. Joys, who served as both secretary and treasurer (Cutler and Hirthe 1983:119).

One of the Milwaukee Ship Yard Company's first orders of business was to put a plan for growth and expansion into action. They wanted to operate not only a shipyard, but also a dry dock as well (Figure 5.1). In order to accomplish this, Fitzgerald purchased a piece of land adjoining the shipyard that extended his river front property by 340 feet. Next, he changed the course of their slip so that larger vessels could be accommodated and then raised and refitted parts of the Allan, McClelland & Company floating dry dock. After this, construction began on the new dry dock (Cutler and Hirthe 1983:119). According to Richard J. Wright:

> When the program was completed, the company's 200 feet of new steam-powered floating dry docks could handle the largest freighters on the Lakes. A ninety-foot reconditioned floating dry dock could take smaller vessels, and a permanent dry dock [could take] vessels for major repairs [sic.]. The new dry dock was 311 feet long 70 feet wide at the bottom and had 15 feet of water over the sill (Cutler and Hirthe 1983:119-123).

After six years, the successful Milwaukee Ship Yard Company began getting contracts to construct several wooden steambarges. Between 1881 and 1883, the company built *C.H. Stark*, *Marshall F. Butters*, *Louis Pahlow*, and *George C. Markham* (Cutler and Hirthe 1983:123-124). In 1884, Fitzgerald and company built *Joys*, a steambarge specifically designed for the lumber trade (Figure 5.2). This vessel was named after the company's secretary and treasurer, Andrew M. Joys (Cutler and Hirthe 1983:127).

FIGURE 5.1: 1884 advertisement for the Milwaukee Ship Yard Company that ran in R.L. Polk & Company's Marine Directory (Courtesy of the C. Patrick Labadie Collection, Alpena Public Library, Alpena, Michigan).

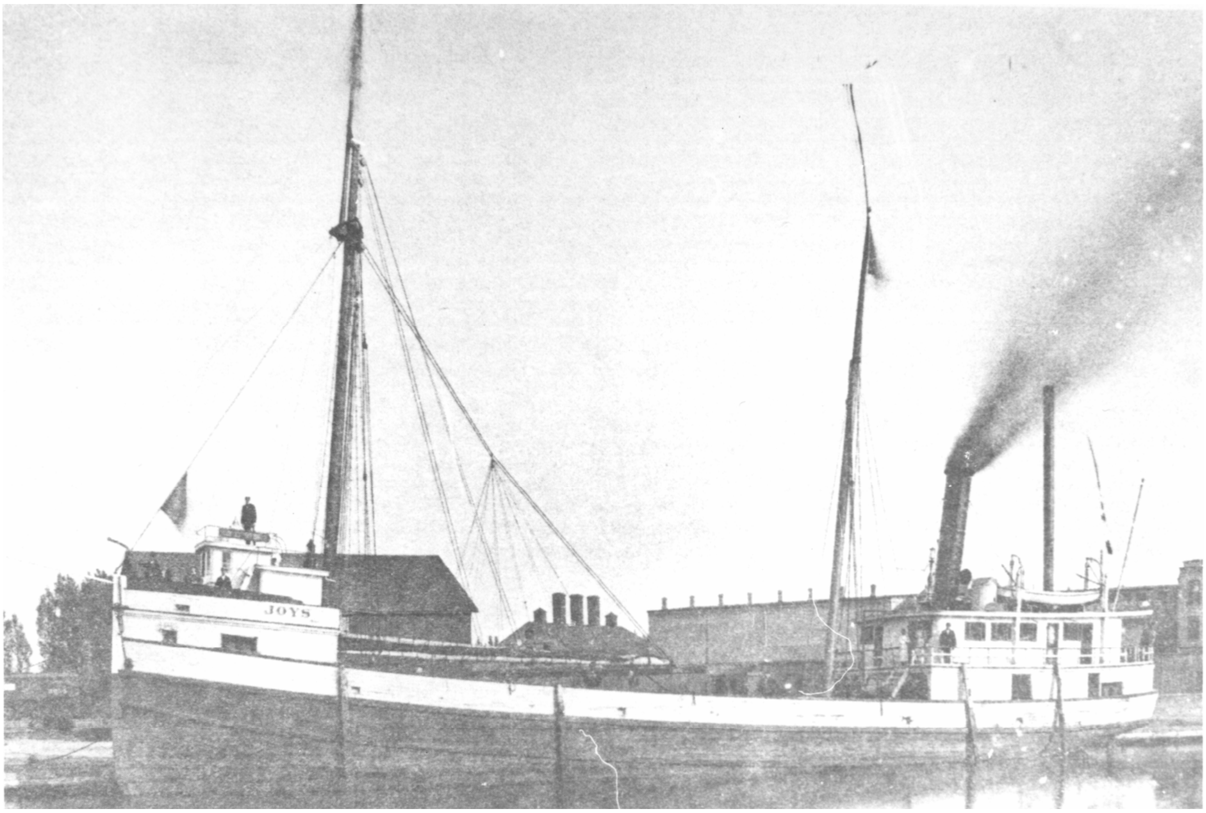

FIGURE 5.2: Possibly the only image of the *Joys* (Courtesy of the Center for Archival Collections, Bowling Green State University, Bowling Green, Ohio).

The Joys

Joys was first enrolled on October 1, 1884 as, "A propeller with one deck and two masts, plain head, and round stern" (Figure 5.1) (C. Patrick Labadie Collection, Ship Information and Data Record, *Joys*). John Fitzgerald, president of the Milwaukee Ship Yard Company, was the principal carpenter. The Milwaukee Ship Yard Company, Conrad Starke, and James Sheriffs were *Joys'* original owners, all with an equal 1/3 share (C. Patrick Labadie Collection, Ship Information and Data Record, *Joys*). James Sheriffs owned Sheriffs Vulcan Iron Works Company, which repaired marine machinery and manufactured propellers, marine engines, steam steering engines, dredging machinery, and deck hoisting engines. The Milwaukee Ship Yard Company had a convenient partnership with Sheriffs' company. Marine machinery from Sheriffs' company was often placed in vessels constructed by the Milwaukee Ship Yard Company, and Sheriffs received partial ownership of these vessels as payment. *Joys'* fire box boiler was built by R. David Marine Boiler Works, and the High Pressure Engine was built by Sheriffs' Company (C. Patrick Labadie Collection, Port Information and Data Record, *Port of Milwaukee*). The vessel's measurements were listed as 131 feet long, 28.2 feet in beam, 9.9-foot draft, 268.07 gross tons, and 221.55 net tons (C. Patrick Labadie Collection, Ship Information and Data Record, *Joys*).

Information regarding the ship is scant from 1884-1892. In 1885, the list of owners expanded to include several Milwaukee residents beyond the original part-owners. Conrad Starke and James Sheriffs each owned 4/12, and the Milwaukee Ship Yard Company owned 1/12. The list also included John Joys, A.M. Joys, and C.W. Norris, who all owned a 1/12th share. L. Olsen was master (C. Patrick Labadie Collection, Ship Information and Data Record, *Joys*). Although vessel information for these years is scant, *Joys* was definitely hauling cargo. A list in the *Cleveland Leader* states that the vessel was finally laid up at Milwaukee for the winter (*Cleveland Leader*, 4 December 1885). It is, however, unlikely that *Joys* was anything more than mildly successful during the 1885 and 1886 seasons, as these were recession years (Rector 1953:215).

Ownership, according to the enrollments, did not change again until 1887. Conrad Starke and James Sheriffs still owned 4/12 each. Two new owners, William Starke of Milwaukee and Robert Winkler of Manistee, owned 2/12 each. A.E. Johnson took L. Olsen's place as master (C. Patrick Labadie Collection, Ship Information and Data Record, *Joys*). The *Duluth Daily News* mentioned *Joys* twice in 1887. On 7 April it stated that:

> On Saturday evening the steamer *Joys* left Milwaukee for Kewaunee, where she is to take on a cargo of cedar ties for Chicago at the rate of 7 cents apiece. The same figure is being paid to other vessels engaged in the trade (*Duluth Daily News*, 7 April 1887).

One month later the paper noted that, "The steamer *Joys* sprung a leak at Manistee last Saturday night and Sunday morning had six feet of water in her. The tug *Williams* pumped her out" (*Duluth Daily News*, 9 May 1887). By 1889, William Starke had sold his share of the vessel and Conrad Starke, James Sheriffs, and Robert Winkler each owned 1/3 of the vessel. A.E. Johnson was still master (C. Patrick Labadie Collection, Ship Information and Data Record, *Joys*). Most importantly, the *Joys* was mentioned in Sturgeon Bay, Wisconsin's newspaper, the *Door County Advocate*, for the first time. This publication is a crucial primary source for historical information on the Joys. Without it, next to nothing would be known about the vessel. On December 21, 1889, the paper noted that:

> The steambarge *Joys* passed through here [Sturgeon Bay Ship Canal] again Tuesday afternoon with lumber from Menominee to Chicago. This is certainly forcing the

> season, to say the least…Lumber freights between Menominee and Chicago have advanced to $2.50 and $2.75, and the owners of the steambarges Joys [sic] and Mary Mills [sic] are making a good thing out of it by continuing their boats in commission (*Door County Advocate*, 21 December 1889).

Joys appears to have navigated the Lakes without incident until 1890. That year, both the vessel's enrollments and its physical structure experienced changes. For unknown reasons, Conrad Starke sold his share of the vessel to James Sheriffs. James transferred the ownership of his 2/3 share to Christine Sheriffs, most likely his wife. Robert Winkler maintained his 1/3 share. The *Joys'* master of three seasons, A.E. Johnson, was replaced by Louis Guthrie (C. Patrick Labadie Collection, Ship Information and Data Record, *Joys*). Two months after the enrollments changed, *Joys* collided with the schooner *Boyce* near Chicago. As a result, both the pilothouse and spar were lost and had to be replaced (*Cleveland Plain Dealer*, 24 May 1890).

In 1892, Christine Sheriff became the vessels' sole owner. The master was listed as Thos. P. Dunn (C. Patrick Labadie Collection, Ship Information and Data Record, *Joys*). *Joys* was regularly spotted hauling loads of lumber, but also transported a few cargoes of iron ore and stone. Between the years 1892 and 1898, the *Door County Advocate* began documenting *Joys*' progress regularly. The vessel began traveling a regular route through the Sturgeon Bay Ship Canal between Milwaukee, Chicago, Manistee, Michigan City, and Menominee (Figure 5.3). This route proved to be economically successful for *Joys* and it was the first vessel to pass through the canal each season from 1892-1898. The *Door County Advocate* praised the economic success of *Joys* in both 1892 and 1893. The December 17th, 1892 paper noted that:

> The propeller Joys [sic] made fifty round trips between Menominee and Milwaukee from June 1st to November 28th. This is an average of one trip in a trifle over three days and a half and includes the loading and discharging of about 350,000 feet of lumber. This is a remarkable exhibit and it is a question whether better work has ever been done on the lakes, no matter where (*Door County Advocate*, 17 December 1892).

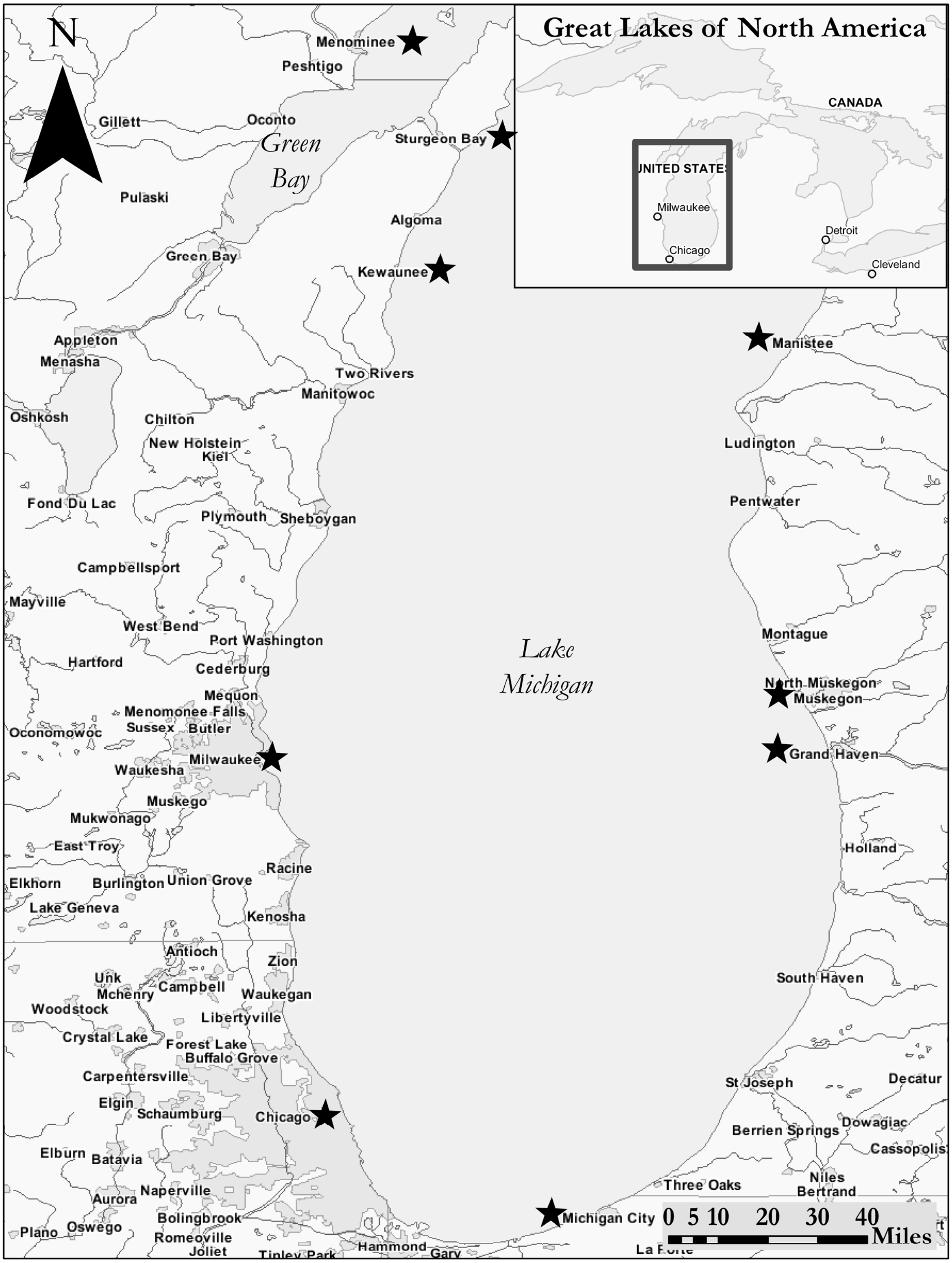

FIGURE 5.3: Cities regularly visited by *Joys* (Courtesy of Dr. Nathan Richards, Program in Maritime Studies, East Carolina University).

In 1893, the *Joys* was described as a "greyhound among the lumber carriers" because it made three round trips between Menominee and Milwaukee in one week. During these trips the vessel delivered 1,000,000 feet of lumber, which was the best showing on record (*Door County Advocate*, 9 September 1893). The years 1894 and 1895 seemed to have passed without incident except for a small collision with the scow *Lady Ellen* (*Door County Advocate*, 1 December 1894).

During the last three years of *Joys'* career, the vessel began to show signs of wear and tear and underwent several improvements and repairs. In 1896 the foremast was replaced and the crank pin on the engine "ran hot", necessitating repairs in Chicago (*Door County Advocate*, 18 April 1896; *Door County Advocate*, 25 April 1896). The next year the hull was significantly damaged during a storm and was taken to a dock in Sturgeon Bay for, "bottom searching and other repairs below the water line, as a result of having the oakum pounded out of the seams for'ard. Also the sail was completely carried away and the gaff broken" (*Door County Advocate*, 1 May 1897). At the end of the month, *Joys* found itself in trouble again when the engine broke down en route from Manistee to Michigan City. This time the ship was taken back to Sheriffs Manufacturing to receive a new cylinderhead, cylinder, piston, and pistonrod (*Door County Advocate*, 22 May 1897).

During the 1897 and 1898 seasons, *Joys* primarily carried cargoes of stone. This is consistent with the decline in the lumber industry, as discussed in Chapter 2, as well as the simultaneous ascendancy of the stone production industry in Sturgeon Bay. In 1897, the vessel contracted to carry 1,500 cords of stone from the Washington Ice Company's quarry to the Muskegon Government piers. The south harbor pier at Muskegon was in the process of being extended 200 feet, which required two 100-foot cribs. *Joys* was capable of carrying between 65 and 70 cords on each trip, but the quarry could not always keep up with the demand (*Door County Advocate*, 24 July 1897). In 1898, the vessel carried some cargoes of lumber, but was again contracted to deliver cargoes of stone, this time from the Termansen & Jensen Quarry, located on Bull Head Point in Sturgeon Bay, Wisconsin, to Grand Haven, Michigan (Van Harpen 2004:3). By September, however, it appears that the vessel was back in the Menominee lumber trade (*Door County Advocate*, 24 September 1898). Another change for the vessel during this year was that Christine Sheriff transferred a ¼ share to John A. Connelly of Chicago, who was also listed as master (*Door County Advocate*, 5 February 1898).

Christmas Fire

Unfortunately, for the Sheriffs and Captain Connelly, *Joys'* career ended on December 23, 1898. At approximately one a.m., while awaiting favorable weather in the Sturgeon Bay Ship Canal, a fire broke out (Creviere 1997:176). According to the *Door County Advocate,* the fire, "originated from the smoke stack in the vicinity of the breeching, consuming the after cabin first" (*Door County Advocate*, 24 December 1898). The *Door County Democrat*, however, states that the fire started in the hold (*Door County Advocate*, 24 December 1898).

Captain Connelly was the first to spot the fire. He stated in the *Door County Advocate* that he saw the illumination of flames from his room in the Texas, threw on his clothes, and sounded the alarm to awaken the rest of the crew. The fire apparently spread so quickly that most of the crew almost lost their lives. Some crewmembers, including the mate and steward, had rooms close to the fire and were forced to jump from the ship to the ice below wearing nothing but shirts. None of the crew, except for Captain Connelly, were able to save any of their possessions. Connelly supposedly saved the ships' papers, but later lost the books and most of the accounts in the excitement. The crew attempted to stop the fire from spreading by using the mooring line to head the vessel into the wind. Before they could accomplish this task, however, the line burned and the current carried *Joys* towards the canal office and government warehouse. When it looked like these buildings might ignite, the staff from the local lifesaving station joined the crew and attached a kedge anchor with a chain to the forward part of the hull. Eventually, the burning steambarge was towed back to its moorings where it burned to the waterline and sank (*Door County Advocate*, 24 December 1898). A week later, the vessel was surrendered to the insurance company as a total loss (C. Patrick Labadie Collection, Ship Information and Data Record, *Joys*). *Joys* was worth $15,000 and carried $14,000 worth of fire insurance (*Door County Advocate*, 31 December 1898).

Fraud?

Though history can seldom be used to accuse someone of a crime, historical hindsight reveals that the burning of the *Joys* may represent insurance fraud. Several details regarding the fire seem at odds. First, vessel owners participating in the lumber industry seem to have had a hard time turning a profit at this time. The peak of lumber production was reached in 1892. After this, production declined rapidly rendering a large portion of the steambarge fleet idle (Rector 1953:215). The excess transportation capacity certainly gave the *Joys*' owners a reason to look for an excuse to decommission the vessel. In February 1898, a vessel owner from Michigan published a letter in the *Door County Advocate* in which he expressed his concerns:

> The lumber carriers for several years past have been running at ruinously low rates on account of the strong competition of the vessel owners themselves. I think this could be very easily overcome, providing enough of the owners would get together

> to form a lumber carrying association to fix a minimum rate of freight, whereby it would show a reasonable return on the investment…(*Door County Advocate*, 5 February 1898).

Three months later the *Door County Advocate* mentioned again that the lumber trade was stagnating (*Door County Advocate*, 28 May 1898). Yet again, in June, the *Advocate* mentions signs of trouble in the lumber industry:

> The small freighters are better off this season than the big fellows. The former can secure cargoes of lumber and wood where the others would find it both impracticable and unprofitable to do so under existing conditions (*Door County Advocate*, 25 June 1898).

The difficulty the *Joys* was having obtaining cargoes was also discussed in this issue:

> The *Joys* being unable to obtain a stone cargo, or rather there being no present demand for this material at Grand Haven, Captain John A. Connolly on Monday took a ride across to Marinette on one of the passenger steamers and he was successful in corralling a load of lumber at that port. The crew of the Joys [sic] had mean time [sic] dressed the hull and upper works in a handsome coat of green and white paint, which very greatly adds to the appearance of the craft (*Door County Advocate*, 25 June 1898).

In all, it seems to have been a time of financial hardship for the *Joys'* owners. The lumber industry was suffering and *Joys* was finding it difficult to obtain cargoes.

Other suspicious aspects of the fire are evident in the statements given by Captain Connelly to the *Door County Advocate*. First, Connelly allegedly was the first to notice the fire even though his quarters were forward and farthest away. He also claims that, as soon as he saw the fire, he immediately threw on his clothes and ran to give the alarm. Secondly, the fire spread so fast that most of the crew lost everything including money, jewelry, and clothing. Connelly, however, claimed that he had time to grab the ship's papers, books, and accounts, which were also located forward and farthest from the fire, but mysteriously were later lost in the excitement. Finally, the captain claimed that he had no idea whether or not the *Joys* carried any fire insurance; claiming that James

Sheriffs, "looked after the chartering, insurance, and other details incidental to her management" (*Door County Advocate*, 24 November 1898). It seems odd that Connelly, who owned a fourth of the ship, did not know if *Joys* carried fire insurance.

One other point warrants consideration: *Joys* was destroyed by fire on the last trip of the season right before undergoing an extensive and expensive scheduled rebuild at the dry dock in Sturgeon Bay (*Door County Democrat*, 24 November 1898). It could be theorized that Connelly and Sheriffs wanted to burn *Joys* before they had to finance an expensive rebuild. Alternatively, the fire may have also been the result of the owners' lack of income. Financial hardship could have forced the owners to skimp on routine maintenance expenses, leaving the ship vulnerable to accidental fire.

Salvage

No matter what the cause of the fire, something still had to be done with the burned hull (Figures 5.4 and 5.5). Brief inspections of the wreck showed that additional damage to the vessel was sustained because the weight of the machinery and boiler aft countered that of the cables and anchors forward and broke the vessel in two amidships. This caused the foremast to break and fall (*Door County Advocate*, 31 December 1898). Later, when the hull was more thoroughly inspected, it was found to be only partially broken in two, likely at the upper bulkwarks. Despite the condition of the ship, Leathem and Smith, a local quarrying company, purchased the vessel for its engine and boiler (Creviere 1997:263).

The Leathem and Smith Towing and Wrecking Company began the job of salvaging the remains in April 1899. The wrecking tug *Wright* successfully recovered *Joys'* boiler with the help of a scow and steam derrick. It was eventually placed in the tug *Smith*; later it was purchased by the Charlevoix Lumber Company and placed in their tug (*Door County Advocate*, 22 April 1899; 4 April 1907).

Raising the hull proved to be a more difficult task and involved passing two iron cables through holes cut in the hull planking, one cable forward and one aft, along the bottom. Then a lighter was sunk over the hull, the cables fastened to it, and the water pumped out. Once the vessel was raised off the bottom, it was secured to the tug and towed to the shipyard. According to the *Door County Advocate*, "The hull will be raised on the dock and if worth it will be rebuilt, if not, the propeller wheel, shaft, rudder, shoe, etc. will be removed and the hull disposed of in some manner" (*Door County Advocate*, 29 April 1899). By May, salvagers had decided that the keelson, frames, and planking were too badly burned to warrant rebuilding. Several tons of iron were removed from the bottom of the hull, and then it was towed out to Dunlap Reef and beached (*Door County Advocate*, 6

May 1899). Finally, after 14 years of service, *Joys* was unceremoniously towed from Dunlap Reef and dropped off on the north side of the Pankratz Lumber Company's boomage, where it was scuttled and utilized as a breakwater (*Door County Advocate*, 13 May 1899). There the ship once hailed as the "greyhound of the Lakes" found its final resting place.

Vessel Identification

As mentioned, the identity of the Sunset Park Wreck was unknown during the archaeological investigations. Seven key factors seem to indicate that *Joys* is, however, the correct identity of the vessel. These include vessel type, the charred condition of the wreck, site location, length and beam, searches in shipwreck lists and databases, vessel parts and machinery noted as missing during the archaeological investigation in September 2005, and most significant, salvage holes located on the ship's hull below the waterline (Bradley A. Rodgers, 2006, pers. comm.). None of this circumstantial evidence alone confirms the identity of the vessel, but analysis reveals the following.

The Sunset Park Wreck is, quite clearly, a steambarge. Comparison of the Sunset Park Wreck's archaeological remains with the only other well documented steambarges, including *Cleveland, Francis Hinton, Adventure,* and *H.D. Coffinberry*, confirms this interpretation. Internal steambarge construction is quite similar to typical 19th century schooner construction except, of course, steambarges contained all of the necessary equipment and structural modifications, including boilers, engines, bilge keelsons, and triple or quadruple frames aft, to allow the vessels to be steam-propelled. Internal schooner construction is also characterized by heavy keelson assembly, double-frames, and longitudinally planked ceiling timbers. All of these features are present on the Sunset Park Wreck.

The most readily apparent attribute of the site was that the vessel is extensively burnt inside the hull. Most of the timbers inside and outside the wreck exhibited a charred black surface. In most places, the scantlings are narrowed due to burning and the ceiling is almost completely burned away. This is consistent with the *Joys*' historical record.

FIGURE 5.4: *Joys* could possibly be the vessel located directly behind *City of Glasgow*, pictured in the forefront. *City of Glasgow* had burned in 1907 after *Joys* had been abandoned as a breakwater. Note the fore and aft configuration of the vessel, which suggests that it is a steambarge, and the burned condition of the hull (Courtesy the Door County Maritime Museum, Sturgeon Bay, Wisconsin).

FIGURE 5.5: This photograph, with a view of the shipyard in the background, is suspected to be of *Joys* (Courtesy of the Door County Maritime Museum, Sturgeon Bay, Wisconsin).

Presently, the wreck site is located in Sturgeon Bay approximately 500 feet offshore from Sunset Park and north of the Bay Shipbuilding Company. An 1899 article in the *Door County Advocate*, published four months after the *Joys* burned and sank, stated that, "The wreck of the steamer Joys [sic] has been utilized as a breakwater by the Pankratz Lumber Company for the protection of their boomage located on the north side of their dock" (*Door County Advocate*, 13 May 1899). In the 1890s, the area around the present day park was occupied by both the Pankratz Lumber Company and the Sturgeon Bay Dry Dock Company (Nancy Emory, 2005, pers. comm.). These two companies are clearly marked on a map issued by the U.S. War Department on 27 May 1925 (Figure 5.6). Today, the location of the Sunset Park Wreck seems to coincide with the historical location given for the *Joys* in the *Door County Advocate*.

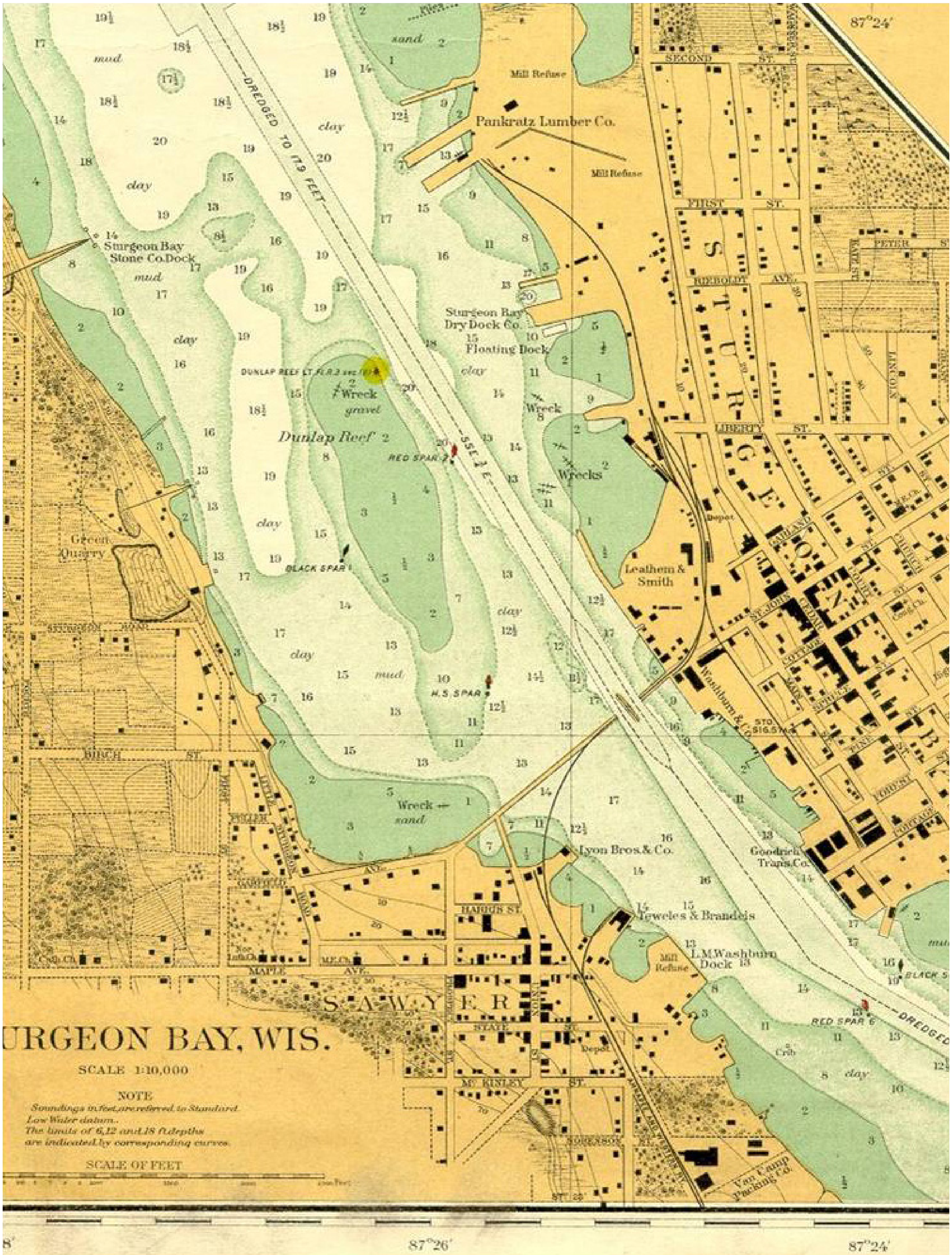

FIGURE 5.6: Map depicting the location of the Pankratz Lumber Company in 1925. Note the Sturgeon Bay Drydock Company located at the present day site of the Bay Shipbuilding Company (US War Department, 1925).

The overall length of the Sunset Park Wreck appears to be approximately 145 feet. At first glance, this appears to indicate that the *Joys* is the wrong identification for the vessel because the length listed in the *Joys'* enrollments is 131 feet. However, the length measurement system required by law at the time the *Joys* was constructed (1884) had been established in 1865. It stated:

> Length: The length at the tonnage deck is to be taken by tightly stretching a line on the upper surface of the deck, at such a parallel distance from the middle line of the ship as to clear the several hatchways and other obstacles that may present themselves; the line is then to be measured, marking the ends of the line on deck; these points are then to be squared in to the middle line of the ship, and the distances taken from them so squared in, to the inside of the plank at the bow and stern, deducting from this length what is due to the rake of the bow in the thickness of the deck, and what is due to the rake of the stern-timber in the thickness of the deck, and also what is due to the rake of the stern-timber in one-third of the round of the beam (Butts 1865:37).

These rules were almost immediately simplified in *Rules Relative to the Construction of Lake Sail and Steam Vessels*, adopted in 1866 by the Board of Lake Underwriters. The 1866 version simplifies the law and states that length measurements are to be taken from the forward side of the stem to the after-side of the stern post on deck (Board of Lake Underwriters 1866:14). In essence, therefore, the legal length of the ship does not include the fantail overhang that would add approximately 15 feet. The Sunset Park Wreck is approximately 130 feet by legal definition, but would actually be 145 feet overall. The only change made pertaining to length and tonnage measurements made after 1865 occurred on 5 August 1882, at which time an act was passed that allowed vessel owners deductions for crew space, storerooms, machinery, etc (Hirthe and Hirthe 1986:xi).

Additional historical and archaeological research provides further support for the identification of the Sunset Park Wreck as *Joys*. Sources pertaining to wrecks located in Sturgeon Bay include Wild Gales and Tattered Sails, by Paul Creviere, Jr., and the online Wisconsin Historical Shipwreck Database. No vessel matching the dimensions and charred condition of the Sunset Park Wreck was discovered except for Joys. In addition, the Door County Advocate stated that the salvors intended to remove the boiler, propeller wheel, shaft, rudder, shoe, and other valuable vessel parts if *Joys* could not be rebuilt. None of these items were present on the Sunset Park site. Since the salvors determined that the vessel's structure, including the keelson, frames, and planking, were too badly burnt to warrant rebuilding, it is logical to assume that they stripped the machinery and equipment to help pay for the cost of raising the vessel and towing it to the shipyard.

The single most important piece of evidence that identifies the Sunset Park Wreck as *Joys* is evidence of salvage located on the vessel's hull. As mentioned above, the *Door County Advocate* reported that *Joys* was salvaged by the Leathem and Smith Towing and Wrecking Company in April 1899 (*Door County Advocate*, 22 April 1899; 4 April 1907). This involved cutting holes in the vessel's planking below the waterline, into which metal rings, called "thimbles", were inserted to support iron cables (Bradley A. Rodgers, 2006, pers. comm.). The cables were connected to a barge sunk over the hull and enough water was pumped out to raise *Joys* from the bottom (*Door County Advocate*, 29 April 1899).

After all archaeological work was completed on the Sunset Park Wreck, a detailed site plan was produced that revealed evidence of salvage. This evidence, as interpreted by the Principal Investigator, includes the presence of a circular iron cleave or "thimble", and a half circle hole, cut into the detached port side outer hull planking, into which the thimble would have been inserted (Figure 5.7) (Bradley A. Rodgers, 2006, pers. comm.).

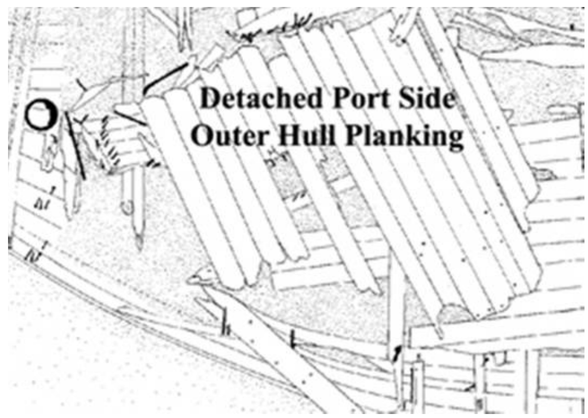

FIGURE 5.7: Evidence of salvage from the Sunset Park Wreck (Courtesy of the Program in Maritime Studies, East Carolina University).

Conclusion

Sturgeon Bay, Wisconsin has a rich history deeply steeped in maritime tradition. The opening of the Sturgeon Bay Ship Canal in 1880 assured that residents of Sturgeon Bay would have extensive contact with all types of Great Lakes vessels. More vessel traffic meant more shipwrecks and intentional abandonments, ensuring that Sturgeon Bay would play host to wide variety of 19th century Great Lakes vessel types; one of these ill-fated vessels was the *Joys*.

Although *Joys* proved to be one of the most successful steambarges on record, it succumbed to the nemesis of many wooden Great Lakes steam vessels, fire (Rodgers 2003:12; Dappert 2005:60-62). After 14 years of faithful service in both the lumber and stone industries, *Joys* was reduced to a breakwater for the Pankranz Lumber Company. The destruction of *Joys* was unfortunate for its owners but became an archaeological boon for ECU's researchers, allowing them a look into one of the Lakes' most undocumented vessel type. The wreck's vessel type, location, condition and dimensions, as well as the absence of other historical candidates, the absence of the propeller wheel, shaft, rudder, and keel shoe, and evidence of salvage combine to implicate the *Joys* as the logical choice for the identity of the Sunset Park Wreck.

CHAPTER 6
CONCLUSION

The Missing Link Between Sail and Steam: Steambarges and the Joys *of Door County, Wisconsin* uses both history and underwater archaeology to demonstrate how Great Lakes shipwrights transitioned the design of cargo sailing vessels to steam. During the 18th and early 19th centuries, before the introduction of the steambarge, merchants in the business of transporting bulk commodities had no other transportation choice than sail powered vessels. Schooners, however, depended on the wind, which could at times be unpredictable and unreliable. Loading and unloading bulk cargo on sailing vessels by hand was also an expensive and time-consuming task. This was the situation when steam technology made its debut on the Great Lakes.

The incorporation of self-propelled steam-powered vessels on the Lakes in 1816 did not immediately threaten schooners' economic dominion over the bulk cargo transportation industry in the Great Lakes economy. Competition between schooners and steamers was minimal for two reasons: cargo capacity and expense. The cost of operating a paddle-wheel steamboat made it impossible for owners to make a profit transporting relatively low value bulk commodities such as grain, coal, and lumber. The large inefficient low-pressure engines, boilers, and fuel source took up too much valuable cargo space (Still et al. 1993:69). In addition, any cargo transported by steamers could not be loaded through convenient deck hatches, such as those found on schooners. Loading bulk cargo, or any cargo at all on a paddle wheeler, was an expensive and time consuming process that required several crew members and dock workers using wheel-barrows (Thompson 1991:31). This was the situation on the Lakes until the introduction of new transportation technology in 1841. This was the first propeller, *Vandalia*. The incorporation of propeller technology in *Vandalia's* design freed up valuable cargo space and, for the first time, enabled a steam-powered vessel to pass from the Upper Lakes to the Lower Lakes via the Welland Canal (Barry 1996:52).

It seems likely that the success and future potential marketability of *Vandalia's* design planted the seed for the development of steambarges. The success of propellers on the Great Lakes encouraged shipwrights to begin experimenting with a new vessel type that could combine the carrying capacity of sail powered ships with the speed and reliability of steam ships. The result was the steambarge, the first cargo vessel type that bridged the gap between sail and steam.

The first steambarge to sail the Great Lakes was the *Petrel* (1848) (*Detroit Free Press*, 15 May 1873; C. Patrick Labadie Collection, Ship Information and Data Record, *Petrel*). *Petrel* was followed by a few other steambarges including, *Pacific* (1853), *Illinois* (1853), *Reciprocity* (1853), *Ross* (1854), *Coaster* (1854), and *Cleveland* (1860) (C. Patrick Labadie Collection, Comprehensive Steambarge Data Record, *Steambarges*). Although these ships were all ideally suited for the lumber trade, there was too little demand for lumber during the 1840s and 1850s to make them profitable. Steambarge owners were forced to mitigate financial losses by converting the vessels into package freighters, passenger/package freight propellers, or employ the vessels in carrying more cost effective bulk cargoes such as coal, grain, stone, or ice (Rodgers et al. 1996:25-27).

During the 1870s and 1880s, post-Civil War reconstruction and the resumption of westward migration created an almost insatiable demand for building materials in America. As a result, white pine fever swept the Lakes. White pine, or *Pinus strobus*, was highly demanded as a building material because it is light, strong, durable, and takes and retains paint well (Gray 2000:9). Lumbermen struggled to keep pace with the demand while transporting timber products cheaply and effectively. The problem of transportation was taken very seriously because mismanagement or bad luck in this area of business often caused mill owners to go into debt or bankruptcy (Rector 1953:15-16). "Regardless of time, place, or type of operation," wrote William Rector, "the transportation of logs was a major pivot point around which the entire manufacturing process was forced to revolve" (Rector 1953:20). In fact, a study of Great Lakes lumbering analyzed the cost of transportation between 1870 and 1901 and found that log transportation accounted for an incredible 52 to 73 percent of the total cost of logs (Rector 1953:23). As a result, steambarges were re-introduced to the Great Lakes lumbering industry with the *Trader* (1865) (Labadie 1989:26).

It was the utilization of steambarges in conjunction with the Consort System, however, that made lumber transportation cost effective. In 1861 Mr. Noyes (no first name given), a ship owner from Buffalo, engaged in the lumber trade and decided to convert two side-wheelers into barges that could be towed by tug boats. These idle and rotting vessels, named *Empire* and *Sultana*, were purchased at a small fraction of their original value and modified with minimal effort (Mansfield 1972:403). Noyes had the tug *Reindeer* tow these barges up the Saginaw River to load pine lumber. The barges were found to have an enormous carrying capacity; five times that of contemporary propellers (Lenihan 1994:56)! Thus the Consort System was born, resulting in sharply decreased shipping costs for lumber and bulk commodities (Mansfield 1899:414; Lenihan 1994:56).

The Consort System proved an ingenious solution to the lumber shortage problem, but it was not until the introduction of the steambarge that the system reached its full potential and capacity. Steambarges, sometimes referred to as "lumber hookers" or "steam-schooners" on the West coast, proved to be a profitable solution, and were designed especially with the particular needs of the lumber industry in mind (Rodgers 2007:13-14). Steambarges could tow up to five or six schooners at consistent speeds of six to eight miles an hour (Labadie 1989:22). This helped merchants maintain their bottom line, because the more cargo a ship owner could move in a season the more profit he could make.

The analysis and comparison of the *Joys'* history with data gathered during the Sunset Park Wreck site investigations is important for three different reasons: it provides archaeologists with an opportunity to observe internal construction of a typical Great Lakes steambarge and conclusively identifies the wreck as the *Joys*. This analysis also provides archaeologists with the tools to draw both historical and archaeological connections between sail and steam powered bulk cargo transportation.

The examination of steambarges in the archaeological record, such as the Sunset Park Wreck, *Cleveland*, *H.D. Coffinberry*, *Adventure*, *Michael Groh*, and *Francis Hinton* help establish a clear lineage between schooners and steambarges. Analysis of these wreck sites supports the idea that the internal construction design of steambarges establishes structural links between sail and steam. These include a heavy keelson assembly, double frames, longitudinally planked ceiling timbers and occasionally, centerboards. In fact, the only difference between the two vessel types seems to be the addition of self-propulsion machinery, including boilers and engines, as well as the associated heavy aft framing and bilge keelsons in steambarges (Rodgers 2007:15-16). All of these elements are present on the Sunset Park Wreck, which is likely the *Joys*.

Joys was a successful Great Lakes steambarge that was praised as the "greyhound of the Lakes" by *Door County Advocate* reporters who saw the vessel pass through the Sturgeon Bay Ship Canal first every season (*Door County Advocate*, 9 September 1893). After a few years of financial struggle, the vessel's 14-year career ended when it burned to the waterline in the Sturgeon Bay Canal. Comparison of *Joys'* history with archaeological data collected during the investigation of the Sunset Park Wreck site established an identity for the vessel by uncovering commonalities between the historical record and archaeological data, which were then identified on the Sunset Park site plan. Because no evidence of the vessel's name was discovered at the Sunset Park Wreck site, this is the *only* way possible to confirm the identity of the wreck. These include vessel type, the charred condition of the vessel, site location, length and beam, searches in shipwreck lists and databases, vessel parts and machinery noted as missing during the archaeological investigation in September 2005, and rectangular salvage holes located on the ships hull below the waterline. These salvage holes are by far the most significant piece of archaeological data tying the Sunset Park Wreck with *Joys*.

The inclusion of this examination into wider scope studies of Great Lakes vessel design evolution answers questions about the impetus for technological change, exchange, and innovation on the Lakes. Although Great Lakes shipwrights were constantly experimenting and tweaking the designs of vessels to make them perform best in the Lakes' environment, steambarges were arguably their finest innovation. Through these vessels, shipwrights successfully transitioned bulk cargo vessels into the steam age.

REFERENCES

Barkhausen, Henry N.

1990 *Focusing on the Centerboard*. Manitowoc Maritime Museum, Manitowoc, WI.

Barry, James P.

1996 *Ships of the Great Lakes: 300 Years of Navigation*, expanded and revised from the 1974 edition. Thunder Bay Press, Holt, MI.

Bauer, Jack K.

1988 A Maritime History of the United States: The Role of America's Seas and Waterways. University of South Carolina Press, Columbia, SC.

Board of Lake Underwriters

1866 Rules Relative to the Construction of Lake Sail and Steam Vessels. Matthews & Warren, Buffalo, NY.

Bowling Green State University

[2004] Ship Information and Data Records. *Petrel*, David Swayze Great Lakes Shipwreck File, Center for Archival Collections, Bowling Green State University, Bowling Green, OH.

Butts, I.R.

1865 *Manual of Admeasurement: The United States Law of 1864, With An Analysis of the Mode of Measuring Ships and Vessels*. I.R. Butts and Company, Boston, MA.

Calomiris, Charles W.

1991 The Panic of 1857: Origins, Transmission, and Containment. *The Journal of Economic History*, 51(1991):807-834.

Chapelle, Howard I.

1967 *The Search for Speed Under Sail 1700-1855*. W.W. Norton & Company, New York, NY.

Charney, Theodore S.

1988 Chicago Harbor a Century Ago. *Sea History*, 47(1988):13-14.

Cleveland Leader

1885 4 December.

Cleveland Plain Dealer

1890 24 May.

Cooper, David J.

1988 Archaeological Survey of the Schooner Fleetwing Site, 47 DR168, Garrett Bay, Wisconsin. Research Report No. 6. East Carolina University, Greenville, NC.

1989 *Survey of Submerged Cultural Resources in Northern Door County*. State Historical Society of Wisconsin, Madison, WI.

Cooper, David J. (editor)

1996 *By Fire, Storm and Ice: Underwater Archaeological Investigations in the Apostle Islands*. State Historical Society of Wisconsin, Madison, WI.

Corbin, Annalies

2006 Steamboat *Montana* (1879-1884)-Leviathan of the American Plains. *The International Journal of Underwater Archaeology*, 35(3):1-16.

Corlett, E.C.B.

1993 The Screw Propeller and Merchant Shipping 1840-1865. In *The Advent of Steam: The Merchant Ship Before 1900*, Gardiner and Greenhill (editors), 83-105.

Creviere, Paul John Jr.

1997 *Wild Gales and Tattered Sails*. John Paul Creviere, De Pere, WI.

Crothers, William L.

2000 *The American Built Clipper Ship*. International Marine, Camden, ME.

Cutler, Elizabeth F. and Walter M. Hirthe

1983 *Six Fitzgerald Brothers: Lake Captains All.* Wisconsin Marine Historical Society, Milwaukee, WI.

Dappert, Claire P.

2005 Oaken Whale With a Cast Iron Tail: The Single-Decked Wooden Bulk Carrier *Monohansett.* Master's thesis, Department of History, East Carolina University, Greenville, NC.

Dean, Martin, Ben Farrari, Ian Oxley, Mark Redknap, and Kit Watson (editors)

2000 *Archaeology Underwater: The NAS Guide to Principles and Practice*. Nautical Archaeology Society and Archetype Publications, London.

Detroit Free Press

1873 15 May, 1873.

Desmond, Charles

1984 *Wooden Ship-building.* Vestal Press, New York, NY.

Door County Advocate

1889 21 December.

1892 17 December.

1893 9 September.

1894 1 December.

1896 18 April.

1896 25 April.

1897 1 May.

1897 22 May.

1897 24 July.

1898 5 February.

1898 28 May.

1898 25 June.

1898 24 September.

1898 24 November.

1898 24 December.

1898 31 December.

1899 22 April.

1899 29 April.

1899 6 May.

1899 13 May.

1907 4 April.

1907 20 June.

1909 10 June.

1910 14 July.

Door County Democrat

1898 24 December.

Duluth Daily News.

1887 7 April.

1885 9 May.

Fishbaugh, Charles Preston

1970 *From Paddle Wheels to Propellers*. Indiana Historical Society, Indianapolis, IN.

Fishlow, Albert

1965 *American Railroads and the Transformation of the Ante-bellum Economy*. Harvard University Press, Cambridge, MA.

Flader, Susan L (editor)

1983 *The Great Lakes Forest: An Environmental and Social History*. University of Minnesota Press, Minneapolis, MN.

Frederickson, Arthur C. and Lucky Frederickson

1986 *Ships and Shipwrecks in Door County, Wisconsin: Volume One*. Clark Willick, Appleton, WI.

Fries, Robert F.

1951 *Empire In Pine: The Story of Lumbering in Wisconsin.* State Historical Society of Wisconsin, Madison, WI.

Gardiner, Robert and Basil Greenhill (editors)

1993 *The Advent of Steam: The Merchant Steamship Before 1900.* Conway Maritime Press, Edison, NJ.

Gray, Jefferson J.

1998 Fueling the Fire: An Underwater Archaeological Investigation of the Claflin Point Wreck in Little Sturgeon, Wisconsin. Master's thesis, Department of History, East Carolina University, Greenville, NC.

2000 It Grows in Trees: Wisconsin Lumber Industry, Part I. *Wisconsin's Underwater Heritage* 10(2000):3-11.

Green, Jeremy

2004 *Maritime Archaeology: A Technical Handbook.* Oxford Academic Press, San Diego, CA.

Greenhill, Basil

1980 *Schooners.* Naval Institute Press, Annapolis, MD.

Hatcher, Harlan

1944 *The Great Lakes.* Oxford University Press, New York, NY.

Hirthe, Mary K. and Walker M. Hirthe

1986 *Schooner Days in Door County.* Voyageur Press, Minneapolis, MN.

Holand, Hjalmar R.

1917 *History of Door County, Wisconsin: The County Beautiful.* S.J. Clarke Publishing Company, Chicago, IL.

Hotchkiss, George W.

1898 *History of the Lumber and Forest Industry of the Northwest.* G.W. Hotchkiss, Chicago, IL.

Huston, James L.

1987 *The Panic of 1857 and the Coming of the Civil War*. Louisiana State University Press, Baton Rouge, LA.

Jensen, John O., David J. Cooper, Frank J. Cantelas, and David V. Beard

1995 *Archaeological Assessment of Historic Great Lakes Shipwrecks: Survey of the Steamers* Niagara *and* Francis Hinton. Wisconsin State Historical Society, UW Sea Grant Project, R/PS 41, Madison, WI.

Johnson, Ladd E. and James T. Carlton

2004 Post-Establishment Spread in Large-Invasions: Dispersal Mechanisms of the Zebra Mussel Dreissena Polymorpha, *Ecology* 77(6):1686-1690.

Kelly, Morgan

1998 Market Contagion: Evidence from the Panics of 1854 and 1857. *The American Economic Review*, 90(1999):1110-1124.

Kemp, Peter (editor)

1976 *The Oxford Companion to Ships and the Sea*. Oxford University Press, Oxford.

Kilar, Jeremy W.

1996 *Michigan's Lumber Towns: Lumbermen and Laborers in Saginaw, Bay City, and Muskegon, 1870-1905*. Wayne State University Press, Detroit, MI.

Krejcarek, Jody

1996 The Knights of Labor and the Lumber Industry in Northeast Wisconsin, 1885-1887. *Voyageur*, 13 (1996):16-29.

Labadie, C. Patrick

1989 *Submerged Cultural Resources Study: Pictured Rocks National Lakeshore*. Southwest Cultural Resources Center, Santa Fe, NM.

Labadie, C. Patrick, and Charles E. Herdendorf

2004 *Wreck of the Steam Barge* Adventure*: An Archaeological Investigation in Lake Erie at Kelley's Island, Ohio*. Great Lakes Historical Society, Vermillion, OH.

Lenihan, Daniel J. (editor)

1994 *Submerged Cultural Resources Study: Shipwrecks of Isle Royale National Park.* Southwest Cultural Resources Center, Santa Fe, NM.

Lotz, M. Marvin

1994 *Discovering Door County's Past: A Comprehensive History of the Door Peninsula, Volume One: From the beginning to 1930*. Holly House Press, Fish Creek, WI.

Mansfield, J.H.

1972 *History of the Great Lakes In Two Volumes*, Vol. 1, reprint of the 1899 version. J.H. Beers & Co., Chicago, IL.

Martin, Jay C.

1991 The Grand Haven Rig: A Great Lakes Phenomena. *American Neptune* 51:195-201.

1995 *A* Social History of Life Aboard the Commercial Sailing Vessels of the United States and Canada on the Great Lakes, 1813-1930. Doctoral dissertation, Bowling Green State University at Bowling Green.

Mills, James Cook

1910 *Our Inland Seas: Their Shipping and Commerce for Three Centuries.* A.C. McClurg & Co., Chicago, IL.

Moore, James D. III.

2003 Return to the Stone Age: The Maritime History and Nautical Archaeology of Sturgeon Bay, Wisconsin's Dolomite Industry. Master's thesis, Department of History, East Carolina University, Greenville, NC.

Palmer, Richard F.

1983 Oswego: Lumber Trade Capital of the U.S. *Inland Seas*, 40(1984):30-38.

Palmquist, John C. (editor)

1989 *Wisconsin's Door Peninsula: A Natural History*. Perin Press, Appleton, WI.

Rector, William

1953 *Log Transportation in the Lake States Lumber Industry 1840-1918*. Arthur H. Clarke Co., Glendale, CA.

Redlich, Fritz

1947 *History of American Business Leaders, Volume 2: The Molding of American Banking: Men and Ideas*. Hafner Publishing Company, New York, NY. Reprinted 1962 by Johnson Reprint Company, New York, NY.

Richards, Donald F.

1960 The Glory Days. *Telescope Magazine* (November-December):259-261.

Rodgers, Bradley A.

1996 *Guardian of the Great Lakes: The U.S. Paddle Frigate* Michigan. University of Michigan Press, Ann Arbor, MI.

2003 *The Bones of a Bulk Carrier: The History and Archaeology of the Wooden Bulk Carrier/Stone Barge* City of Glasgow. Program in Maritime Studies, East Carolina University, Greenville, NC.

2003 *The 1999 Predisturbance Wreck Site Investigation at Claflin Point, Little Sturgeon Bay, Wisconsin*. Program in Maritime Studies, East Carolina University, Greenville, NC.

2007 Vernacular Craft of the North American Great Lakes: Twenty Years Research in Retrospective, Unpublished paper, Department of History, East Carolina University, Greenville, NC.

Rodgers, Bradley A. and Annalies Corbin

2003 Mud Box Filled With Stone: the Wreck of the Scow Schooner *Dan Hayes*. *The International Journal of Nautical Archaeology*, 32 (2): 210-224.

Rodgers, Bradley A. and Russell T. Green

2003 *Of Limestone and Labor, Shipwrecks of the Stone Trade: The 1999 Bullhead Point Stone Barge Investigation*. Program in Maritime Studies, East Carolina University, Greenville, NC.

Rodgers, Bradley A., James D. Moore III, Annalies Corbin, Jacqueline D. Piero, and Andrew T. Pietruszka

2006 *From Quarry to Quay: Shipwrecks of McCracken's Cove, the 2001-2002 Sturgeon Bay Wreck and Wharf Investigation at the Birmingham Site*. Program in Maritime Studies, East Carolina University, Greenville, NC.

Rohe, Randall E.

1984 The Upper Great Lakes Lumber Era. *Inland Seas*, 40 (Spring 1984): 16-29.

Ronca, Fil

2006 A Historical and Archaeological Assessment of the *Sela Chamberlain*, a Transitional Phase Early Bulk Carrier. Master's thesis, Department of History, East Carolina University, Greenville, NC.

Still, William N., Gordon P. Watts, and Bradley Rodgers

1993 Steam Navigation and the United States. In *The Advent of Steam: The Merchant Ship Before 1900*, Gardiner and Greenhill (editors), 44-82.

Taylor, George Rogers

1951 *The Transportation Revolution*. Rinehart & Company, New York, NY.

Thompson, Mark L.

1991 *Steamboats and Sailors of the Great Lakes*. Wayne State University Press, Detroit, MI.

Thunder Bay National Marine Sanctuary's Thunder Bay Sanctuary Research Collection

[2005] Comprehensive Steambarge Data Record. *Steambarges*, C. Patrick Labadie Collection, Alpena Public Library, Alpena, MI.

[2005] Port Information and Data Record. *Port of Milwaukee*, C. Patrick Labadie Collection, Alpena Public Library, Alpena, MI.

[2005] Ship Information and Data Record. *Adventure*, C. Patrick Labadie Collection, Alpena Public Library, Alpena, MI.

[2005] Ship Information and Data Record. *Francis Hinton*, C. Patrick Labadie Collection, Alpena Public Library, Alpena, MI.

[2005] Ship Information and Data Record. *H.D. Coffinberry*, C. Patrick Labadie Collection, Alpena Public Library, Alpena, MI.

[2005] Ship Information and Data Record. *Joys*, C. Patrick Labadie Collection, Alpena Public Library, Alpena, MI.

[2005] Ship Information and Data Record. *Michael Groh*, C. Patrick Labadie Collection, Alpena Public Library, Alpena, MI.

[2005] Ship Information and Data Record. *Petrel*, C. Patrick Labadie Collection, Alpena Public Library, Alpena, MI.

[2005] Ship Information and Data Record. *Trader*, C. Patrick Labadie Collection, Alpena Public Library, Alpena, MI.

Twining, Charles E.

1983 The Lumbering Frontier. In *The Great Lakes Forest: An Environmental and Social History*, Susan Flader (editor), 123.

Van Harpen, Jon

2003 Story of the Week Among Jack Tars of the Unsalted Seas. *Lake Nautical Affairs*, 3(2004):1-7.

Wilde, S.A.

1977 *Woodlands of Wisconsin*. University of Wisconsin Extension, Madison, WI.

Wisconsin Historical Society

[2005] Ship Information and Data Record. *Francis Hinton*, C. Patrick Labadie Collection, Alpena Public Library, Alpena, MI.