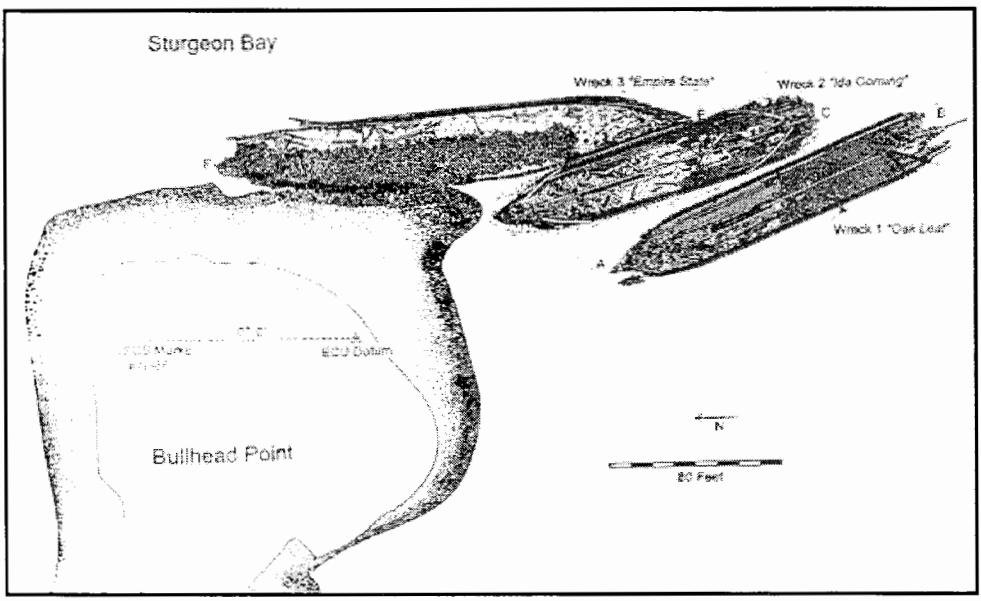
Research Report No. 11

Of Limestone and Labor
Shipwrecks of the Stone Trade

The 1999 Bullhead Point Stone Barge Investigation

Sturgeon Bay, Wisconsin • Phase II - *Predisturbance Underwater Archaeological Site Report*



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Abstract

The 1999 Bullhead Point project was designed as a Phase II archaeological survey of three shipwrecks located at Bullhead Point, Sturgeon Bay, Wisconsin. Abandoned during the first quarter of the 20th century, the vessels were converted stone barges owned last by the Sturgeon Bay Stone Company. With an aim toward interpreting both the shipwrecks and the point itself, the Bullhead Point survey generated archaeological data necessary for a better understanding of Sturgeon Bay's stone industry, stone barge construction, and the role of these vessels in the stone trade. The data was particularly useful in substantiating the historical record regarding the wrecks' identities. The successful three-week project was carried out as a joint endeavor by the Program in Maritime Studies at East Carolina University, the Wisconsin Historical Society, the University of Wisconsin Sea Grant Program, and the Wisconsin Underwater Archaeology Association.

Acknowledgements

The Bullhead Point archaeological survey was made possible through the combined efforts of the Wisconsin Historical Society (WHS), particularly their Underwater Archaeology Program, and the Maritime Studies Program at East Carolina University (ECU). Special funding and assistance was provided by the University of Wisconsin Sea Grant Program, which sponsored a real-time internet link with archaeologists in the field. John Karl of the Sea Grant Program ably downloaded reports and photos sent from Sturgeon Bay to construct daily updates, placing both WHS and ECU on line for the first time during a field project. Special thanks go to the administrators of each program, Robert Birmingham of the WHS and Timothy Runyan of ECU, for smoothing the way administratively for joint operations. Jeff Gray, the Wisconsin State Underwater Archeologist and assistant Fil Ronca, both contributors of this publication, effectively brought together divergent groups and specialized programs, in an effort to ensure that Wisconsin's maritime heritage and submerged cultural resources be studied and respected.

Field assistance to WHS and ECU crew members was provided by the Wisconsin Underwater Archaeology Association (WUAA), and special thanks go to Russel Leitz and Kathy Klecker for their camaraderie, enthusiasm, and research. Groups such as WUAA will lead the way in joint professional/volunteer projects into the future. Thanks also to Sturgeon Bay resident Jon Van Harpen for sharing his sizable research regarding Sturgeon Bay's stone industry, and Robert and Beth Yount for providing the field crew comfortable housing at Robertson's Cottages Resort.

Special gratitude also goes to Director Jay Martin and Registrar Collections Curator Molly Biddle of the Wisconsin State Maritime Museum and Curator Christine Randall of the Door County Maritime Museum, for opening their two exemplary facilities to project archaeologists. Eastern Wisconsin is particularly blessed with a fine maritime tradition, supported by museum facilities that will carry this tradition into the future. In this light it was particularly gratifying to witness the actions of superintendent George Pinney and his crew from the Door County Highway Department who volunteered to move a section of shipwreck from an area where it would be destroyed, to the Leathem and Smith Park where it could be viewed and protected for public benefit. Thanks also to graduate students Mike Hughes, Russ Green, Cathy Green, Mike Plakos and Kimberly Eslinger.

This work was funded by the University of Wisconsin Sea Grant Institute under grants from the National Sea Grant College Program, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, and from the State of Wisconsin. Federal grant number NA86RG0047, Project C/C-3.

1

Introduction

Shipwrecks often fire the imagination with Disney induced images of pirates and treasure. In this unfortunate context, shipwrecks of everyday work vessels sometimes loose their public allure, becoming unimaginative refuse lying on a watery bottom. Most archaeologists realize, however, that shipwrecks typically represent the remains of mundane vessels, and that it was the everyday worker, with their the generic barges and tugs, that brought prosperity to Wisconsin's Door County region in the 19th and early 20th centuries, earning a place in history by shear determination and hard work. The purpose of this project was to archaeologically analyze three sunken hulks, lying near Bullhead Point in Sturgeon Bay, Wisconsin, with the aim to better reveal the historic past (Figure 1). In a broad sense, these wrecks help to reconstruct part of the late 19th century community of Sturgeon Bay, a time when staccato blasts of dynamite and black powder echoed over a constant ring of stone drills, and the intermittent rumbling of hundreds of tons of cargo cascading into the gigantic hollow shells of waiting stone barges.

The subject of the limestone industry and maritime transportation are well represented in the material remains of Sturgeon Bay in the form of abandoned quays, quarries, and wrecked stone barges. In September of 1999, archaeologists from the Wisconsin Historical Society (WHS) and the Program in Maritime Studies from East Carolina University (ECU), combined with volunteers from the Wisconsin Underwater Archaeology Association (WUAA) to analyze and record one of these underwater sites. The examined site included what is locally known as Bullhead Point, an artificially constructed rock crib pier of considerable size, and three shipwrecks located near its shore (Figure 2).

Historical sources for this area include newspapers, government documents, and quarry owner reports concerning mining activity in the region. Sparse written history exists, however, from the working man's point of view. In most cases, the sources mentioned above fall short of completely satisfying our curiosity regarding the every day working life of quarrymen and their ships. It is obvious from this lack of written sources that our ancestors in Sturgeon Bay considered their work mundane, and certainly not worth recording.

Fortunately, despite the dearth of historical sources, historical archaeology can help expand our understanding of the region's stone trade during the late 19th and early 20th centuries. Many questions beg to be answered. For example: What were the working conditions on board stone barges? How were sailing ships and steamers converted to carry stone? How did these conversions affect their sailing qualities? How were the barges loaded and unloaded? How were they designed and constructed both inside and out? The remains of shipwrecks and their associated artifacts, when interpreted archaeologically, can tell a story unencumbered by

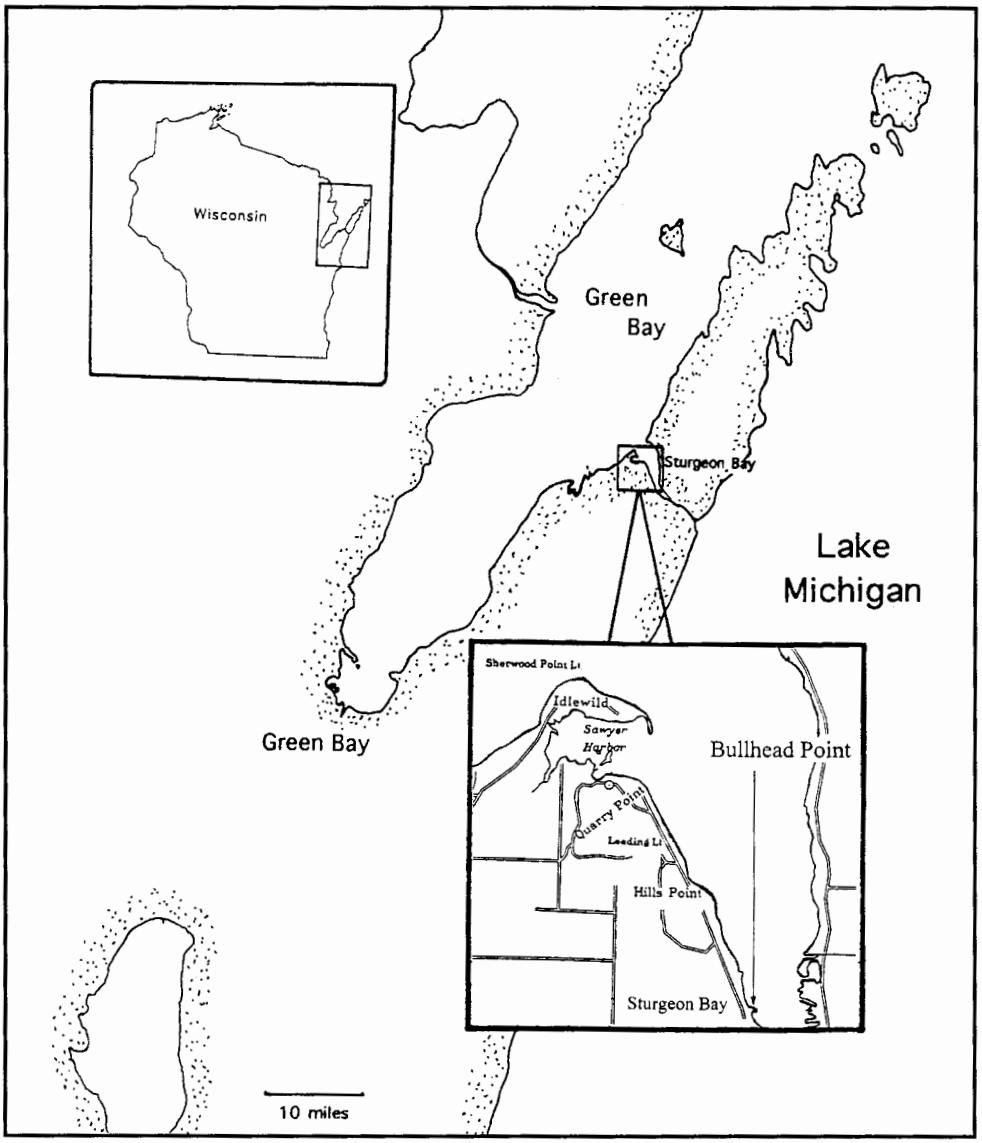

Figure 1. Project Location Map.

a witness's particular bias, viewpoint, or social and economic class. In many areas of history, archaeology has become an ideal tool to supplement the study of unchronicled activity, and this is exactly the case in developing a more comprehensive understanding of stone mining in Sturgeon Bay. In particular, the vessels at Bullhead Point afford an excellent opportunity to learn more about the primary means of transporting quarried stone via stone barges.

Extremely important to the maritime industries of the Great Lakes, stone barges received almost no historical notice, even though they likely hauled as much cargo as any other maritime transportation system in the late 19th and early 20th centuries. The advent of the consort towing system in the late 1850s began a peri-

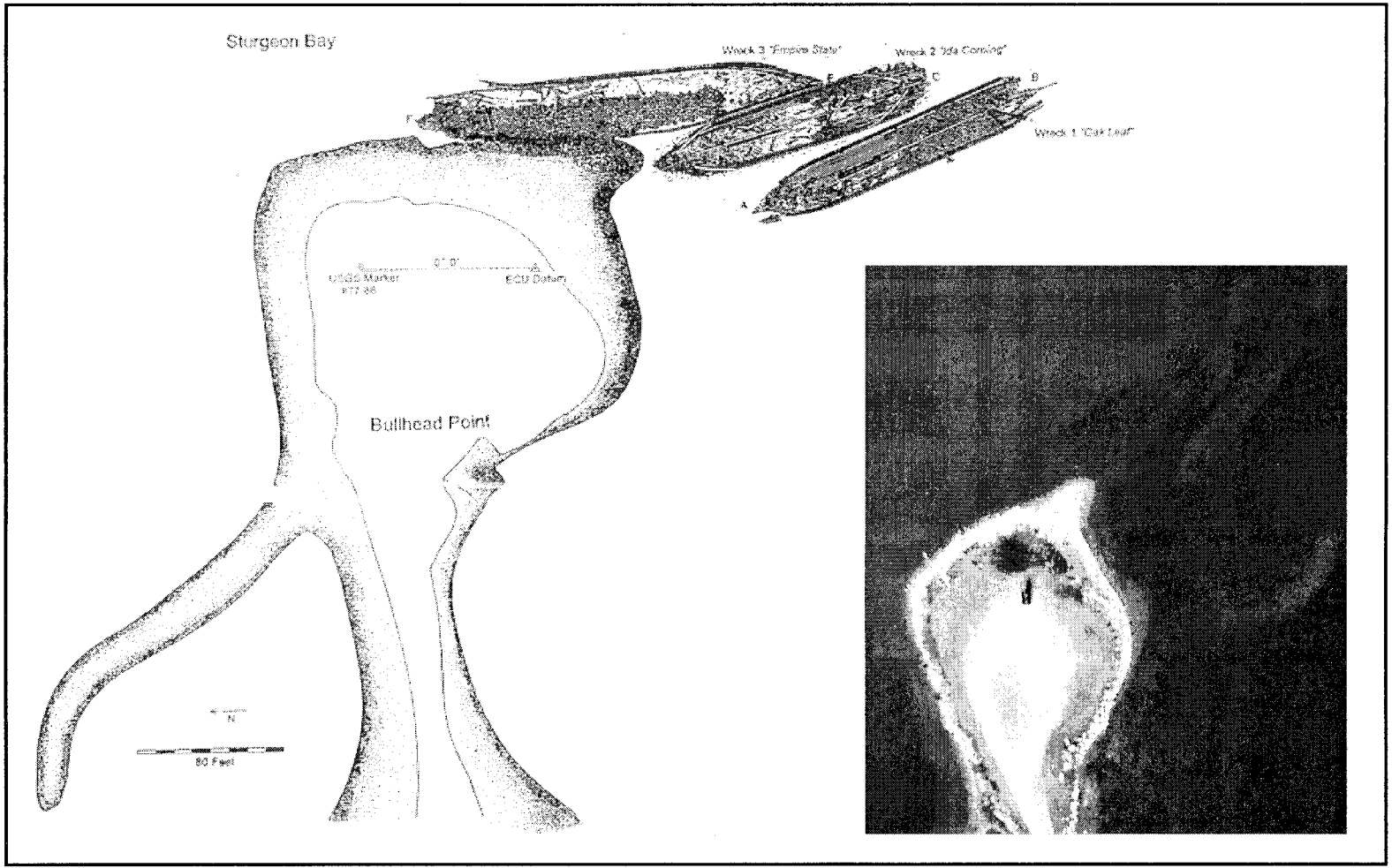

Figure 2. Bullhead Point Overall Site Map with Aerial Photo.

od in maritime transportation whereby a steamer's cargo space was supplemented by towing several manned barges in line astern. As nearly every steam vessel (except passenger ships) of this period towed barges, it stands to reason that barges likely outnumbered powered vessels. (Depending on your definition, barges would outnumber steamers to the extent that most independent sailing ships on the lakes were towed during at least part of their voyage, greatly confusing the concepts of sailing schooner and schooner barge.)

Additionally, since they were often conversions of vessels whose useful lives had ended, barges necessarily contain ship construction information from many ship types. Barge conversion studies, therefore, may give us better insight into how Great Lakes schooners, freight and passenger propellers, luxury paddle-wheelers, and steam barges were built, and how different yards combated problems such as hogging and sagging (drooping of the ends) in wooden ships. In the future, given a large enough database of archaeological studies, researchers may be able to identify the "fingerprints" of individual ship constructors, or perhaps more properly define shipbuilding techniques, traditions and periods.

Project Objectives

The archaeological site at Bullhead Point consists of four main features, three shipwreck sites and the point itself. With this in mind, the Phase II archaeological survey of Bullhead Point was designed to accomplish several objectives. First, detailed plan view site maps were created of each feature to allow archaeological interpretation of the major artifacts independently. Second, the features themselves were plotted in an overall plan view for an accurate interpretation of their relationship to one another (see Figure 2). A comprehensive plan view is important in any archaeological interpretation, as spatial relationships often delineate the larger picture not just physically, but also historically. As this was a Phase II survey, great care was taken not to disturb or harm the site in any way.

The project's remaining goals were to verify the identity of the three wrecks lying near Bullhead Point, and to obtain archaeological information on how the vessels were converted for use as stone barges. The three vessels are known locally, and also appear in early 20th century newspaper accounts as the schooners *Ida Corning* and *Oak Leaf*, and as the steamer *Empire State*. As is often the case, newspaper reports are only as accurate as their sources, and have proven in the past to be notoriously suspect. Word of mouth identifications have also proven wrong more often than not. Archaeological verification of the names of these wrecks included a comparison of overall measurements with their reported enrollment measures, as well as other construction details. This is an important first step in substantiating the historical record. Finally, the data generated by the Bullhead Point survey will add significantly to the database of Wisconsin's shipwrecks and hopefully make future archaeological studies more fruitful.

2

Project Location and Environment

Sturgeon Bay, Wisconsin is a moderate size port city of 25,000 people located half way up the Door Peninsula. Referred to locally as "The Door", the peninsula is a conical outcrop that stretches some 65 miles (104.6 km) northeastward into Lake Michigan from the eastern shore of Wisconsin. Most residents, when asked to describe their whereabouts in the state, will hold their hand up, mitten fashion, stating that if their hand represents Wisconsin, the thumb represents Door County. This is indeed a simple and accurate way of describing the Door Peninsula's location. The town of Sturgeon Bay is located on a bay of the same name. At its southeastern end, the bay connects to a rift across the peninsula known as the Sturgeon Bay Ship Canal, which for the most part is a natural cut in the peninsula's limestone. The canal was lengthened in 1879 to fully connect the waters of Green Bay to the west, with Lake Michigan in the east.

The visible rock strata that makes up the Door Peninsula is part of the Niagara Escarpment, an arc of limestone (the remains of an ancient Ordovician Sea bottom) stretching from Illinois, along the east coast of Wisconsin, through northern Michigan and Canada, and eventually reversing itself as it enters the United States at Niagara Falls in western New York State. The formation consists chiefly of dolomite, a metamorphosed version of limestone that is much harder than its parent rock but retains many of limestone's qualities. It can be quarried for building material, or crushed and baked to form lime or quicklime. A true testament to this stone's hardness is the cataract of Niagara Falls itself, whose great erosive powers, in a geological sense, would have cut through most softer rock in much shorter time.

Much of the industrial history of the Door Peninsula is linked with its underlying backbone of dolomitic limestone. The hardness of the material made dolomite useful both for building, and for crushed bedding under the tracks of railroads in the 19th century. It was also useful as rubble and riprap (loosely piled broken stone) for stone crib piers on the lake shores, and, as mentioned, could be baked to produce mortar and concrete. The great rift in this stone, which makes up most of the Sturgeon Bay Ship Canal, exposes large natural shelves and is easily mined. Thus, Sturgeon Bay was twice blessed with a good commercial product and an ideal natural harbor.

Bullhead Point and it's three attendant shipwrecks are located on the west bank of the Sturgeon Bay Ship Canal (see Figure 2). The point appears to be a large rock and riprap outcropping piled on an older rock crib pier structure. It is impossible now to tell if the structure was the extension of a natural spur in the canal bank, or if it is entirely man made. It is, nonetheless, impressive in size measuring 380 ft. (116.0 m) in length by 200 ft. (61.0 m) in maximum width. The outcropping stands approximately 5-8 ft. (1.5 to 2.4 m) above the waterline, and would easily

Figure 3. Bullhead Point during early Winter or late Spring during a low water event.

have supported horse drawn mining cars and rail lines reportedly installed to load waiting barges with limestone (Rowe 1979:11). The point now employs a gravel roadway and cul-de-sac type of turn around for visitors.

The waters of Green Bay and Lake Michigan intermingle inside Sturgeon Bay. Water temperatures at Bullhead Point are more reflective of Green Bay, however, due to the Bay's proximity to the point. September water temperatures ranged from 60 to 56 degrees Fahrenheit (15.6 to 13.3 degrees Celsius). The wrecks lie in shallow water and are exposed at low water, which is seasonal on the Great Lakes rather than tidal; the deepest wreck sections lie in 8 to 10 ft. (2.4 to 3.0 m) of water. Northwest winds can disturb the site sending 1 to 2 ft. (0.3 to 0.6 m) breakers crashing into the wrecks, greatly churning up the bottom sediments and limiting visibility from 10 to 15 ft. (3.0 to 4.6 m) on calm days, to 3 ft. (0.9 m) or less on windy days.

Freshwater algae and plants thrive on the wreck sites and produce a green jungle of growth that serves as cover for many freshwater fish species. More importantly, in an archaeological sense, is the fact that the sites have been colonized by filter feeding zebra mussels (*Dreissena polymorpha*). These freshwater mussels were introduced to the lakes through bilge water discharge from ships inbound from the Baltic Sea. As they have no natural predators in the lakes region, zebra mussels have proliferated and cover nearly 50% of the shipwrecks' exposed surfaces. At times their mass, which can be several inches thick, hid details of the wrecks and necessitated their removal with paint scrappers. Their sharp shells also proved disastrous to diving suits, often puncturing or shredding non-reinforced areas. It should be stated, however, that the mussels do not appear to have damaged the wreck sites. Their thread-like attachments to smooth surfaces have not pried articulated pieces apart, and it must be admitted that their filter feeding has increased the visibility underwater to an unprecedented extent.

Winter ice movement and storms have likely had the greatest impact on the Bullhead Point wreck sites (Figure 3). The wrecks lay very near the surface any ice movement in the winter will push and pry on individual pieces of the shipwrecks. Below the surface, scantling pieces were seen to sway in the current. Fasteners were often loose or had worked larger holes than they originally occupied. It can be surmised that the shallower sites will break apart first, but the deeper areas must also be affected in time.

3

Historical Background

Ships will continue carrying commodities so long as there is money to be made in trade and commerce. It is, therefore, no stretch to predict that vessels will continue to be lost through human error, human intervention (warfare), accident, or the elements. Less dynamic, though equally as effective, abandonment also represents a means by which vessels make their way into the archaeological record. Vessels that have survived their useful life transporting commodities have been disposed of in many different ways, depending upon their scrap value for a given area and time. For instance, it was not uncommon for salvors to burn wooden ships on the Great Lakes in the early part of the 19th century in order to recover the valuable metal fasteners holding vessels together. This would not necessarily have been a common practice on the east coast during the same period, since fasteners were cheap and accessible.

By the turn of the 20th century, many wooden vessels across the United States were converted to barges, thereby extending their utility. On the eastern seaboard for example, "...old clipper schooners from Maine to Chesapeake Bay ended their days tethered to a towline" (Karamanski 2000:40). When these vessels were no longer useful as barges they were often intentionally sunk and filled to extend wharves and docks. At the turn of the 20th century, as they had from time immemorial, hulks were also towed to backwaters and simply allowed to settle to the bottom. By this time a wooden vessel's scrap value was no longer worth its demolition, especially since the increased use of modern iron and steel hulls all but ruled out new construction in wood and the potential reuse of a wooden vessel's fasteners and fittings. Economic downturns allowed other ships to simply settle at their moorings awaiting cargoes that would never arrive.

These economic patterns, therefore, are crucial to understanding history. Within this framework, historical archaeology depends almost entirely on the interpretation of artifacts within the context of their historical and economic settings. The focus of this report, three abandoned vessels lying near Bullhead Point, are no exception. The history outlined here is not intended to be a comprehensive history of Sturgeon Bay, but rather will focus on the area's stone industry, particularly the Sturgeon Bay Stone Company, in whose service these barges were last employed. It should be noted that secondary historical sources on this subject are scarce, while general regional histories tend to downplay industrial activity and focus on ethnography and important events, often leaving the reader to wonder why people lived in the area at all.

Sturgeon Bay and the Stone Industry

To accurately portray the history of Sturgeon Bay, one must closely examine the interrelationship of the region's economic development and its link to the area's geologic contribution.[1] Sturgeon Bay Harbor was created by a natural rift in the dolomite ridge that is Door County, Wisconsin. In 1878 this rift was extended by completion of the Sturgeon Bay Ship Canal to fully connect the waters of Green Bay to the west with Lake Michigan on the eastern side of the Door Peninsula (Holand 1917:152). The Sturgeon Bay ship canal allowed ships to pass through the county, cutting 100 miles (160.9 km) from their journey around the Door and enabling them to bypass the treacherous waters at the peninsula's northern tip known as Death's Door (see Figure 1).

The site of Sturgeon Bay was first settled by whites as a fur trading post in the 1820s (Holand 1917:304-305). Other centers in Door County such as Little Sturgeon Bay, approximately 10 mi. (16.1 km) southwest of Sturgeon Bay, were built up around saw mills and shingle factories in the 1830s and 1840s. These industries produced needed building materials for burgeoning lake port cities such as Chicago, Milwaukee, and Green Bay. For a time, Little Sturgeon competed successfully with Sturgeon Bay as the economic center of the Door, shipping lumber, shingles, ice, and for a time, well built sailing ships from its fine sheltered wharf facilities (Hirthe 1986:15-32).

As Sturgeon Bay was the only fully protected harbor in the county, it attracted early 19th century settlement and development. The area's bountiful stone resources were first examined by United States Indian Agent Samuel Stambaugh in 1831. From his outpost at Green Bay Stambaugh authored a report entitled *The Quality and Condition of the Wisconsin Territory*, in which he revealed that Sturgeon Bay had a "commodious harbor...with the best stone available for building purposes" (Collections of the State Historical Society of Wisconsin 1900:425). While touring the region in 1843, Army Lt. Douglas Houghton confirmed Stambaugh's discovery and added that the area possessed other natural resources as well. Houghton revealed that Sturgeon Bay enjoyed tremendous stands of hardwood timber, as well as underlying strata of Niagara Limestone. Moreover, because the stone lay close to the surface, little stripping of the overburden was necessary (Rowe 1979:8).

Equally important, the particular geography of Sturgeon Bay allowed for easy access to its natural resources. Limestone made up the bluffs on both sides of

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[1] Several published histories including Holand's *History of Door County Wisconsin* (1917), and the Hirthes' *Schooner Days in Door County* (1986), are well supplemented by archaeological reports such as Cooper's *1986-1987 Archaeological Survey of the Schooner Fleetwing Site, Survey of Submerged Cultural Resources in Northern Door County* (1989), and Cooper/Rodgers, *Report on Phase I Marine Magnetometer Survey in Death's Door Passage, Door County Wisconsin* (1989), with Gray's, *Fueling the Fire: An Underwater Archaeological Investigation of the Claflin Point Wreck in Little Sturgeon, Wisconsin* (1998), to provide an adequate overall historical background of the county.

the harbor allowing for the commodity's easy transport via ship and barge. Indeed, according to a 1911 government report on the stone industry, "The proximity of some of the quarries in eastern Wisconsin to water transportation on Lake Michigan has greatly aided their rapid development" (Burchard 1912:68).

The stone found in the Sturgeon Bay area had unique qualities well suited for its eventual industrial use. The building, or construction, stone industry has two major branches: dimension stone and crushed or broken stone (Currier 1960:1). Though the Niagara Dolomite in Sturgeon Bay was extremely dense, 155 pounds per square foot, and nicely colored from buff to bluish gray, it is found in horizontal beds too thin and fractured for uniform dressing. Unblemished stone in thick deposits are a necessity for building or finished stone. The Niagara Dolomite's hardness, lack of absorbency, crushing strength, and transverse strength, however, made it ideal for the enormous piers and breakwaters constructed throughout the Great Lakes from the mid-19th through the early 20th century (Buckley 1898:340-343; Currier 1960:71). Stone for these projects was usually in the form of rubble, or "one man stone" weighing 50-100 lb. (22.7-45.4 kg) each, or riprap stone weighing 2-5 tons apiece (Holand 1917:168). Crushed limestone can also be used for cement (quick lime), beet sugar processing, highway and railroad beds, and added to steel for its carbon component (Beck 1991:54-56).

Stone became Door County's first export when the federal government began a quarrying operation in Sturgeon Bay in 1834. This stone was used to build the breakwater at Michigan City, and it has been suggested that prior to 1917 nearly every harbor on Lake Michigan was built in part with Door County stone (Holand 1917:166). The first private stone business in Sturgeon Bay was started by Robert Laurie and his son John in 1880. In its first year of operation the firm shipped about 900 cords of stone valued at $2,700, and by 1883 was shipping about 4,300 cords annually (Stanley Green File, DCHS). The senior Laurie had some experience in the trade. In 1868 he had quarried his own stone and operated a lime kiln in order to build himself Sturgeon Bay's first stone house. Discovering that there was an emerging local market for lime, Laurie continued in the lime business, and in 1870 burned and sold about 1,000 kegs of lime. It should be noted that the value of water transport was immediately recognized, even for short hauls within Sturgeon Bay, for Laurie employed at least one scow in "...delivering stone up the bay to the village" (Stanley Green File, DCHS).

In 1885, two more quarries opened in Sturgeon Bay, reflecting the local demand for stone basements, and more increasingly, stone buildings. By 1898, there were at least five quarries in town including the Laurie Stone Company, Leathem and Smith, the Green Quarry, and Termensen and Jensen Company, also known as the Washington Stone Company (Day 1894:542; Buckley 1898:340). In total, eight quarry sites were opened in Sturgeon Bay from 1880 through 1900 (Stanley Green File, DCHS). Significantly, in 1900 the combined output of stone from the city's quarries reached a sizable aggregate of 24,900 cords, or 174,300 tons (*Door County Advocate* 8 December 1900). An approximate turn of the century ranking of the largest firms can be reconciled by the following shipping quantities in 1900: Leathem and Smith 8,500 cords; Termansen and Jensen, 6,000 cords; Graef and Nebel, 4,300 cords; and Green and Hagen, 3,600 cords (DCA 8 December 1900).

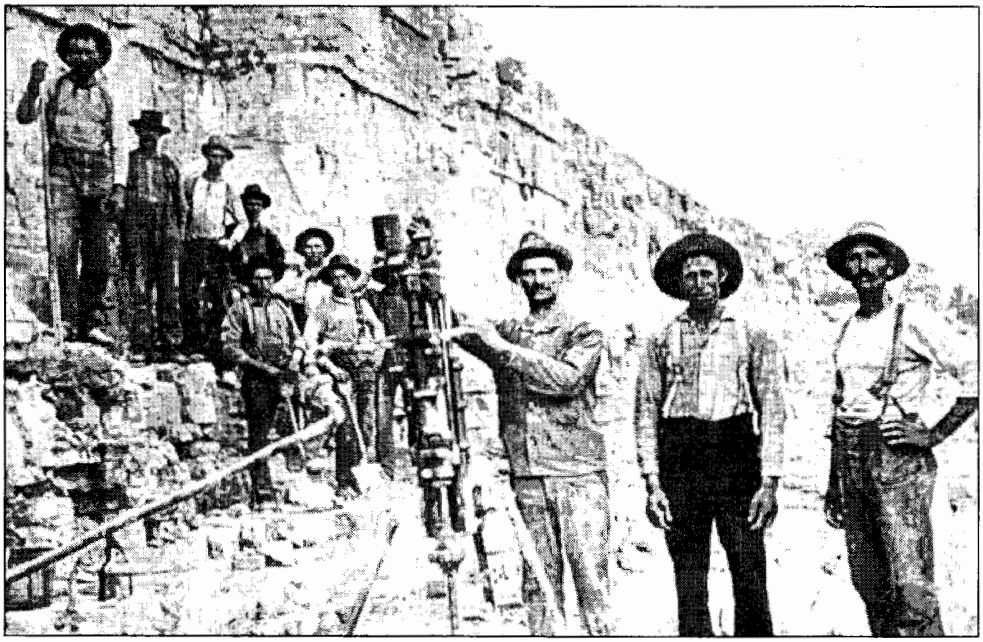

Figure 4. Dolomite Drilling Crew on a limestone shelf. Note the pneumatic drill.

The quarries throughout Sturgeon Bay reflected Wisconsin's significant national standing as a prime producer of limestone in the United States (Figure 4). In 1890, Wisconsin ranked eighth among the country's 41 limestone producing states, generating about one-twentieth of the industry's $19,095,179 in revenue (Day 1895:68). Four years later Wisconsin ranked seventh, moving the federal government to state that "The limestone industry in Wisconsin has become one of considerable importance" (Day 1895:83). In 1902 the state remained seventh among the 41 limestone producing states, generating $1,351,058 of the $30,231,003 total revenue (United States Geological Survey 1903:9). This represented a significant rise in the value of Wisconsin limestone, for in 1899 statewide revenue for the commodity totaled only $826,486 (USGS 1903:55). These were the peak years for stone production in Sturgeon Bay.

The Sturgeon Bay Stone Company

In 1903, the Termensen and Jensen quarry merged with Louis Nebel and John Graf's stone business to form the Sturgeon Bay Stone Company. All of the men had experience in the Sturgeon Bay stone industry (Figure 5), and their merger truly reflects how tightly knit the city's quarries were. Soren Termensen and Lars Jensen had both worked for the Brewster Quarry, which closed about 1893. Five years later, the pair opened the Termensen and Jensen quarry after leasing a portion of shoreline owned by the Washington Ice Company near the head of Sturgeon Bay. A foreman for the Hagen quarry for almost twenty years, Louis Nebel joined with John Graf in 1900, and began quarrying stone just north of the former Hagen and English quarry site.

The four new partners of the Sturgeon Bay Stone Company assumed the corporation's principal positions: Louis P. Nebel, President; John Graef, Vice-President and Treasurer; Soren Termansen, Secretary; and Lars H. Jensen, General Manager. Together with the Green, Laurie, and Smith quarries, the Sturgeon Bay Stone Company represented the "Big Four," or most influential of the quarries, of Sturgeon Bay's stone industry during the first years of the 20th century (Stanley Green File, DCHS). When the firm opened for business in 1903 three quarry sites were under its direction, two on the west side of Sturgeon Bay and one on the east side near the mouth of the bay (DCA 17 January 1903).

Before the opening of navigation in 1903 the company had already acquired orders for 2,000 cords of stone, all of which would be hauled by the company's tug *Sydney Smith* and three scows (Figure 6). The quarry's first year of operation was indeed well timed, as Wisconsin was then among the nation's top producers of limestone. In early July, the Sturgeon Bay Stone Company secured a contract to furnish 2,200 cords of stone for harbor work at Ludington, Michigan, an order that brought welcome security to the fledgling business.

At the end of July, the company's first major loss occurred when the tug *Sydney Smith* lost one of its two scows on a trip to Frankfort, Michigan. Harassed by heavy weather, the consort got within 2,000 ft. (609.6 m) of its destination when *Temperance*, the larger of the two scows rolled, flooded, and sank (DCA 1 August 1903). Interestingly, the smaller scow rolled as well, but was saved when its rail broke, allowing its deck load of stone to slide into the water. The fact that the larger scow's rail held fast, prevented it from righting and sealed its fate, illustrating dramatically one of the inherent dangers endured by stone barge crews.

Valued at $6,000 and only three years old, the loss of the large scow was a significant one, and clearly provided the impetus for the company purchasing the

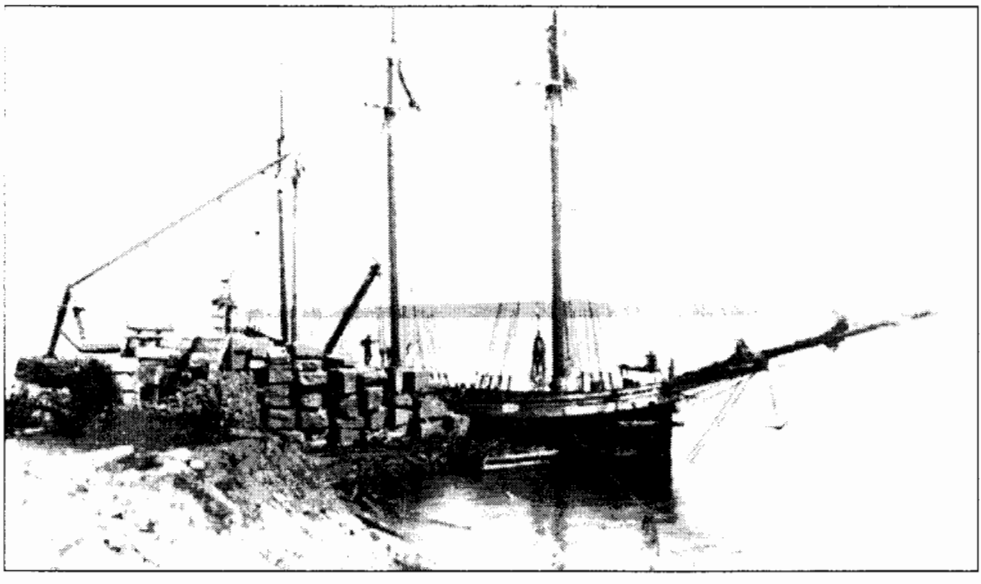

Figure 5. Schooner loading slabs of limestone at a crib pier, location unknown but similar to Bullhead Point.

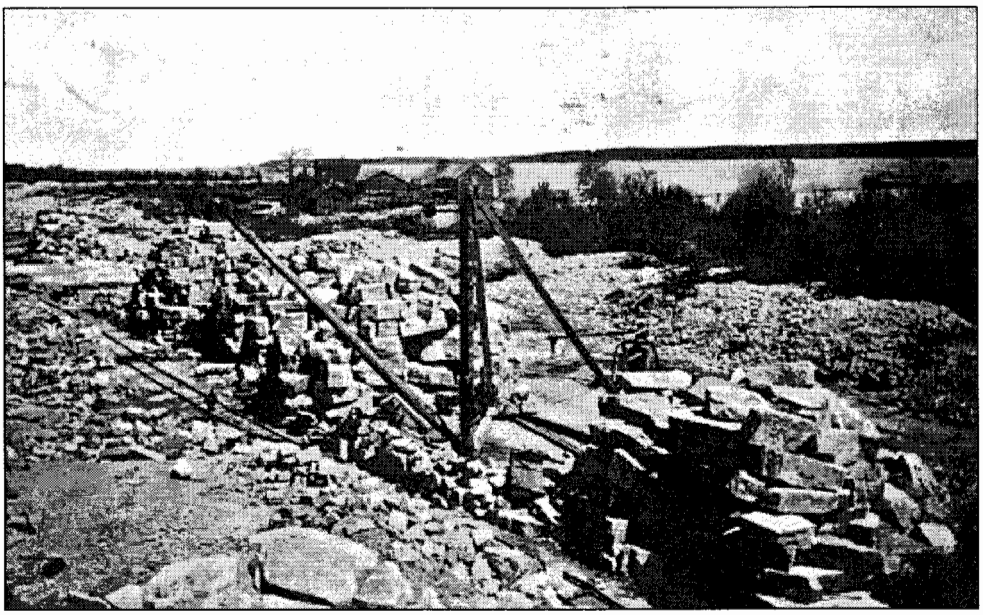

Figure 6. Stone Quarry near Sawyer, WI. Note the narrow gauge rail line serviced via loading boom and derrick.

$2,500 schooner-barge *Bliss* only a few weeks later (DCA 8 August 1903). Unfortunately, the *Bliss* foundered the following November, inducing the company to sub-contract (charter) its towing, and leave the tug *Sydney Smith* laid up for the 1904 season (DCA 7 November 1903). The Sturgeon Bay Stone Company's misfortune continued during the summer of 1904 when the threat of a strike accompanied the firm's chartering of the tug *Duncan City*.

The threatened strike provides an interesting glimpse into the safety, economics, and politics associated with the stone carrying trade. The Sturgeon Bay Stone Company wanted the *Duncan City* to run with only a single crew, a condition that the Licensed Tugmen's Protective Association (LTPA) would permit only on trips less than 35 miles (56.3 km) (DCA 16 July 1904). Since the company hired the tug to run from Sturgeon Bay to Manitowoc and Menominee, it argued that the trip was less than 60 miles (96.6 km) long and could be made in less than eight hours, therefore an exception should be made. Rather than establish a precedent, the LTPA president refused the company's request. Using a non-union crew was briefly considered as an alternative, though ultimately the firm chose to abide by union guidelines (DCA 16 July 1904).

Misfortune plagued the Sturgeon Bay Stone Company through the fall of 1904 when the 360-ton barge *Alert* and a small scow were lost en route to Petosky, Michigan. After taking nearly 6 feet (1.8 m) of water in its hold, the *Alert* succumbed to heavy weather shortly after its two-man crew was taken aboard the consort steamer *Duncan City* (DCA 24 September 1904). Notably, the *Alert* was valued at $800, yet it was uninsured, revealing that the company did not feel their barges were worth the cost of insurance.

The firm continued chartering steamers for hauling its stone and towing barges through 1905, and eventually sold the aging tug *Sydney Smith* for $7,125 in the spring of that year (DCA 8 April 1905). However, having arrived at the conclusion that a company owned steam barge would increase profits, the Sturgeon Bay Stone Company purchased the steamer *I.N. Foster* for a reported $10,000 (DCA 6 May 1905). The decision was a sound one, for over the next dozen years contracts remained steady for the company, and serious mishaps upon the lakes were few.

In 1906 two contracts for nearly 9,000 cords of stone prompted the purchase of the barge *Oak Leaf* (Figure 7). Two years later the Sturgeon Bay Stone Company was awarded a 20,000 cord contract for the breakwater at Ludington, Michigan, a two year project that prompted the purchase of the *Ida Corning* (Figure 8). The notable acquisition of the later vessel, prompted the *Door County Advocate* to declare that "The company will have one of the best fleets of the kind in this region" (DCA 12 March 1908). The former passenger steamer *Empire State* (Figure 9) was added to the company's fleet in 1910.

Crib stone continued to be a mainstay of the business through much of its operation; 7,725 cords of this type were shipped in 1907, along with 911 cords of building stone (47,498 tons aggregate) (DCA 24 December 1908). By 1910, the Sturgeon Bay Stone Company operated a fleet of seven vessels, all of which were busily engaged in fulfilling the large Ludington breakwater contract. The fleet delivered an impressive 7,400 tons of stone per week for the project, revealing much about the vast quantities of stone quarried by the company during this period (DCA 30 June 1910). An appreciation for the size of the project can be gained by the

Figure 7. The *Oak Leaf* and her escort the *I.N. Foster* unloading stone at a crib pier. Note the donkey boiler on the fore deck of *Oak Leaf*, and small cabin on the after deck.

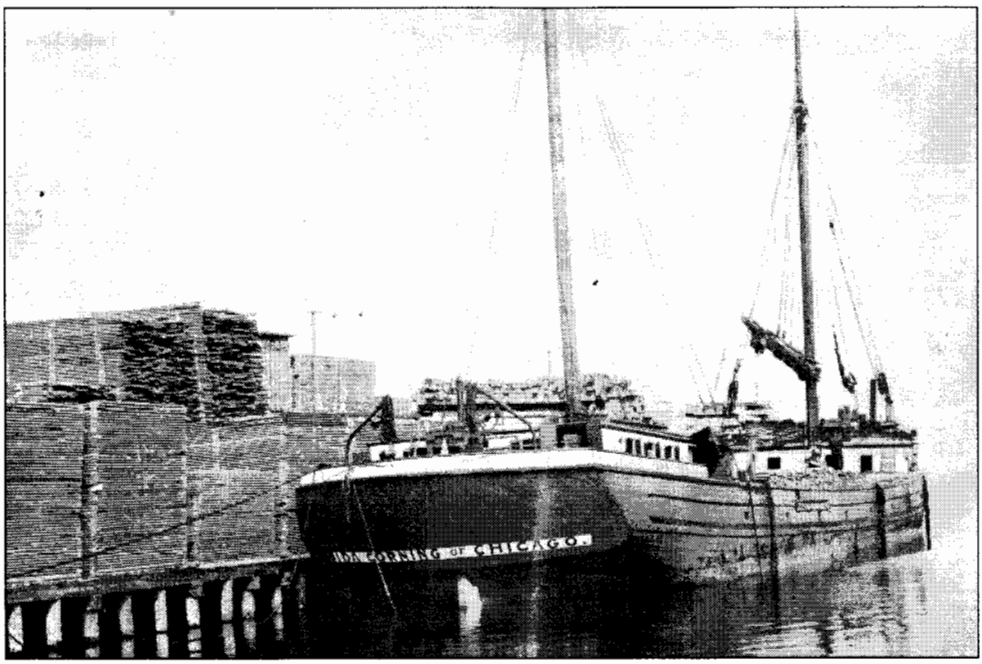

Figure 8. *Ida Corning* with Grand Haven rig taking on a deck load of lumber.

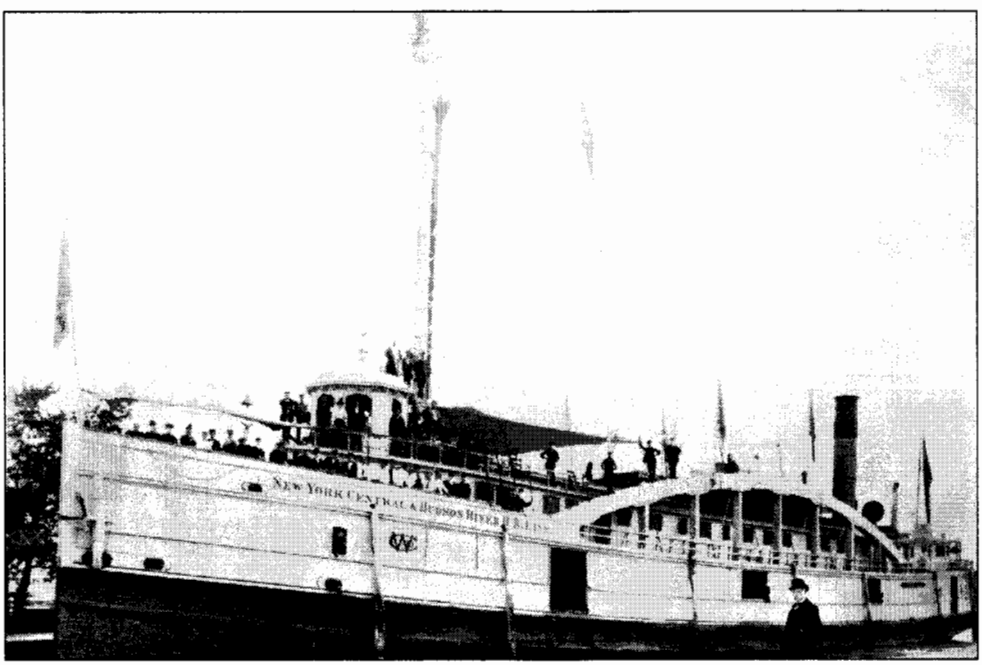

Figure 9. The *Empire State* in her glory days as a steamer.

fact that the contractors, Schnorbeck and Greiling, used the stone as fast as it was delivered and reportedly could have used more.

During the winter of 1912, the Sturgeon Bay Stone Company consolidated with the Sturgeon Bay Transportation Company and continued to operate under the former name (DCA 25 January 1912). That fall the *Door County Advocate* reported that the prospects for the stone industry were good, and the Sturgeon Bay Stone Company in particular was expected to do well with the recent award of a 3,000 ton contract for riprap stone at Muskegon. By 1915, however, the fleet was placed in ordinary much earlier than usual, a circumstance that the *Advocate* attributed to "...the failure of the government to let the [harbor] contracts, [though] the money has been appropriated for plenty of harbor work to keep things moving" (DCA 19 August 1915).

Large government contracts on the lakes demand large quantities of crushed stone and odd sized riprap for building piers and breakwaters in such places as Racine, Milwaukee, Manitowoc, Muskegon, Michigan City, South Haven, Grand Haven, Frankfort, Traverse City, Kenosha, Ecanaba, Manistee, Menominee, Oconto and others (Buckley 1898:344). Government contracts, likewise, constituted much of the Sturgeon Bay Stone Company's business, for in 1919 the lack of a government contract forced company manager Soren Termansen to report for the first time in fifteen years that the quarry remained idle (DCA 16 May 1919).

A Labor Intensive Industry

During the industry's early years, stone quarrying was a labor intensive operation, performed in shallow depressions know as open pits. Until the last quarter of 19th century, overburden above the horizontal rock shelf was removed using a simple pick and shovel, and later with a hydraulic or dragline scraper. The shelf was then undercut and a three man crew drilled the holes for blasting, one man sitting on a stool and holding a drill (Star Bit) while the other two struck it with eight pound hammers (Stanley Green File, DCHS). The crew drilled holes approximately 12-18 inches (30.4 – 45.7 cm) deep, 1.5 inches (3.8 cm) in diameter, and then filled each hole with a black powder charge, ignited by a simple match lit fuse (Stanley Green File, DCHS). The detonations sheared off the rock face that was then cut into usable sized blocks with various hand tools (Bowles 1934:16-17; Buckley 1898:12). Early 20th century developments such as pneumatic or steam drills combined with dynamite to add greater efficiency and accuracy to stone removal. The impact of mechanization on manual labor is perhaps best illustrated by the acquisition of a stone crushing machine at the Smith quarry in 1904. The 150-horsepower crusher was capable of crushing 600 yards of stone a day, a clear improvement over the single yard a day that a manual laborer could produce. Nevertheless, quarrying and transporting dimension stone and riprap, remained decidedly unmechanized.

In May of 1900, the *Door County Advocate* reported that between the five stone quarries operating in Sturgeon Bay at the time "...will employ several hundred men during the coming season" (DCA 19 May 1900). By 1908, the Sturgeon Bay Stone Company alone employed over 100 workers (DCA 18 February1908). Many

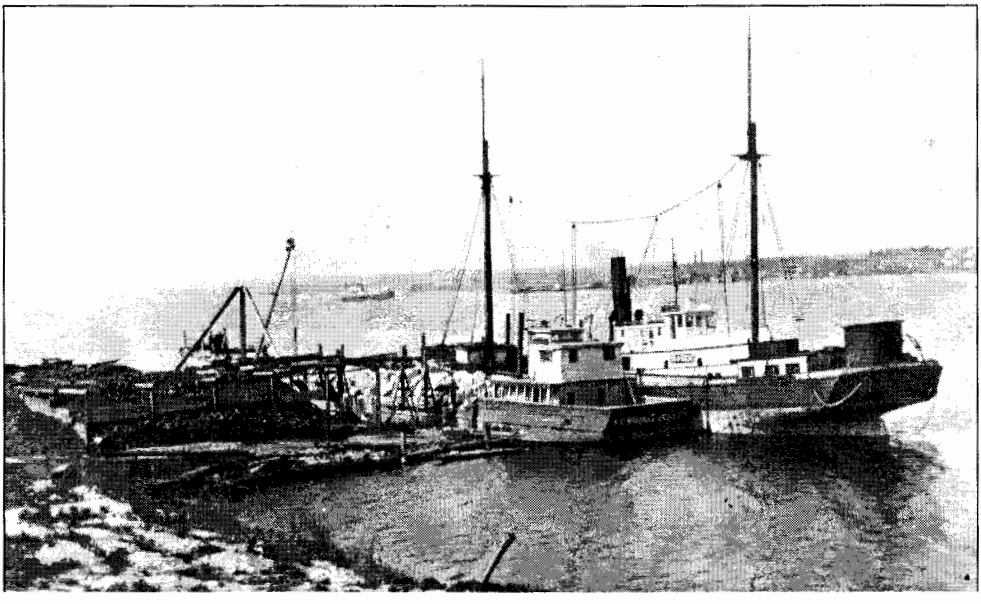

Figure 10. Two barges load stone at Bullhead while an escort tug stands by.

of these workers were housed in company owned "dormitories." In one instance, laborers brought in from Menominee were to be housed in a large tent with food supplied "...by the boarding house" (DCA 11 July 1903). Calls for workers went out as far as Chicago, as was the case in 1916 when the Green quarry needed 100 men in order to satisfy contracts for an incredible 30,000 tons of stone (Rowe 1979:20).

There was a contingent of immigrant labor as well. In 1904, thirty Macedonians were secured through a Chicago labor bureau to operate the new stone crusher at the Leathem and Smith quarry. The group was apparently industrious, for the *Door County Advocate* immediately revealed that "They are withal quiet and sober and always prepared to attend to the work for which they are employed" (DCA 16 July 1906). Unfortunately, wives and families were prohibited by the Turkish government to accompany the men to America. Consequently, it was predicted that the men would make their "pile" and eventually return home to live their lives in relative ease, "...providing that some enterprising pasha does not relieve them of their cash" (DCA 16 July 1906).

Quarrying was seasonal due to winter insurance restrictions on stone shipping from mid December to mid April, and during the off-season months workers most likely took jobs in sawmills, shipyards, or as lumber jacks or ice cutters. Quarry operators used the off season to negotiate contracts for their product, set prices, and calculate a pay scale for the next season (Rowe 1979:18). During the 1900 season the Graef and Nebel quarry paid laborers between $1.50 and $1.62 per day (DCA 5 May 1900). Interestingly, in 1903 competition for labor with local canneries forced the Green Quarry to procure 11 hands from Menominee and pay the men $2.00 per day (DCA 18 July 1903). Although the outcome is unknown, a strike at the Sturgeon Bay Stone Company erupted in 1910 when laborers demanded a .25 cent raise to $2.00 a day (DCA 10 June 1910).

Once mined, workers transported the stone to barges, or scows in the watercraft vernacular, waiting in Sturgeon Bay. The stone was first broken up and loaded by hand into mining cars, a method borrowed from underground mining operations. The loaded cars, riding 24-inch (60.7 cm) gauge track, were then gravity propelled to the end of the loading wharf (Figure 10) that extended far enough into the harbor to allow a barge to settle to its maximum draft. Along the way, stone intended for government harbors was weighed as the car passed over a portion of track designed for that purpose (DCA 4 July 1903). A winch and derrick upended the mining cars, either directly into the waiting barge, or onto a loading chute with access to the cargo hold. The barge was moved several times to present different loading hatches, and perhaps even reversed before the loading process was complete. In order to keep trim, barges were loaded carefully, since miscalculations at this point might result in a vessel swamping or turning turtle at the wharf, a dangerous if not embarrassing event.

Notably, in 1886 Louis Nebel, then a foreman at the Hagen and English quarry and later part owner of the Sturgeon Bay Stone Company, devised a dump car that greatly expedited the loading process and somewhat reduced the labor involved (Stanley Green File, DCHS). A pair of long timbers were extended from the dock, over the waiting stone barge, and finally secured to a crib outside the vessel. Steel rails, spaced 30 in. (76.2 cm) apart, were then bolted to the timbers. A manned dump car with a 6x4x1 ft. (1.8x1.2x0.3 m) box rode the tracks, propelled by gravity and controlled by a foot brake. When the car was positioned directly over the barge, a hook in back of the car was released and the stone dumped into the hold. A similar but more advanced system of pocket docks, the purpose built gravity feed system developed for bulk carriers, were likely considered too expensive for stone mining operations and were never employed in Sturgeon Bay. In 1914, however, the Leatham and Smith quarry acquired an electric conveyor belt system that greatly expedited the loading of stone barges (Rowe 1979:39-40).

Barge crews were also responsible for unloading the barge at its destination (Rowe 1979:20). Unloading, done chiefly by hand, was backbreaking labor. A common method employed a bucket, suspended from a derrick, which was lowered into the vessel's hold. A horse or mule, harnessed to the opposite end of the line, raised the bucket when full. As an alternative, a boom could be slung from the barge's remaining masts and standing rig. The barge's crew, working inside the hold and always with an eye on keeping the vessel trim, placed the stone into the bucket by hand. The hulls were unloaded evenly and when the barge was almost unloaded the cargo was arranged in two parallel mounds on either side of the keelson or the centerline of the vessel for stability (Gray 1998:116; Rodgers 1996:25). Archaeological evidence from the Claflin Point wreck in Little Sturgeon, Wisconsin suggests that the stone was generally rough hewn blocks 8-15 in. (20.3-38.1 cm) across weighing approximately 20-25 lbs (9.1-11.3 kg) (Rodgers 1996:14). Depending on the crew and barge size, unloading must have taken several days or as much as a couple of weeks (Bream 1998:155).

Hand unloading did not disappear with the advent of self-unloading technology. Like many examples of coexisting old and new technologies, such as sail and steam, these two methods of unloading existed side by side for many years.

The donkey engine, which may have been used by the Bullhead Point vessels, significantly reduced loading and unloading times. As its name implies, the donkey engine was a small steam engine that when rigged to a vessel's winch and standing rigging provided a hoist for unloading cargo, much like the donkey or horse powered bucket, but without the bother of an animal operated system.

Donkey engine systems for sail first appeared on ocean going ships in 1855 and were commonplace by the 1870s. The steam systems were fairly expensive, and Great Lakes sailing ships generally operated on a slim economic margin during the second half of the 19th century. Consequently, very few Great Lakes vessels employed the emerging technology. Moreover, the existing unloading systems in place at many lake port wharves precluded the need for the donkey system. The stone industry, however, needed an unloading system for its vessels. Barges often visited unimproved harbor sites, or worked on stone jetties and wharves at some distance from a harbor's own unloading equipment.

Leathem and Smith of Sturgeon Bay helped lead the way in self-unloading technology with the *Adriatic*, a crane and clam shell equipped stone barge converted in 1912. The *Adriatic* could unload itself in 10 to 12 hours (the *Hennepin* of 1902 and *Wyandotte* of 1907 were the first true self unloaders on the lakes) (Bream 1998:157-158). Stone delivered in this manner was primarily crushed, and not the larger blocks found both at the Claflin and Bullhead Point archaeological sites. These blocks, referred to as "one man stone", would have been a good size for hand passing but would have been difficult to pick up with a clam shell bucket. It is likely, therefore, that the type and size of stone needed for various work and the availability of shore facilities and labor dictated what type of stone and barge would be dispatched to which site.

Stone Barges

Few written descriptions detail how ships were converted to barges for the stone industry. However, it is certain that as the age of steam advanced, many sailing vessels, particularly the ubiquitous Great Lakes schooner, found a second life as a tow barge. In 1860 there were 1,122 sailing vessels and 535 steam-powered vessels on the Great Lakes (Karmanski 2000:22). Eight years later, the number of sailing vessels reached its peak at 1,855 (Merk 1916:375); yet steam vessels, eventually emerged as the more profitable vehicle for carrying many types of cargoes on the Inland Seas, "...most of the old veterans of the lake fleet underwent conversion to barges" (Karmanski 2000:40). In Sturgeon Bay specifically, it has been estimated that approximately 40 stone barges serviced the various stone quarries from 1896 to 1936 (Rowe 1979:16).

In the latter 19th century at least one Sturgeon Bay shipyard, Riebolt and Wolters, was set up to handle barge conversions (Rowe 1979:14). Leathem and Smith, then in the shipbuilding business, likely converted vessels as well. Historic photographs from this time period demonstrate that part of the conversion process necessitated the removal of any super-structure from the vessel and the main mast, bow sprit and jib boom if the converted vessel was a schooner. Steamers were converted as well. Archaeological reports reveal that most of the internal machinery

was taken out of converted steamers and through-hull fittings and pipes secured with wooden plugs. Archaeological evidence also indicates that internal bracing was added to strengthen the hull, and athwartships, tie bolts secured the sides of the vessel against the outward pressure of the bulk cargo in the hold (Gray 1998:106; Rodgers 1996:22-23).

Some barges employed a minimal sailing rig that helped speed the tow, and sails were also useful to maneuver the barge out of harms way in case a tow-line parted. Two masts, a fore and mizzen was a typical configuration. Known as a Grand Haven rig, or "Jack Ass" rig in contemporary sailing vernacular, the lack of a main mast allowed more room for deck loads and facilitated loading and unloading of bulk commodities (Martin 1995:40). The Grand Haven rig was a sail configuration employed expressly for towing. The fore and aft rigged sails may have also been used to mitigate roll, even while the vessel was under tow. Yet reportedly, the vessel could be sailed easily with this rig and it required proportionately less work. A small shack at the stern or bow of the hulk housed a skeleton crew of no more than two or three men who steered and docked the barge, secured tow lines, pumped the bilges, and, in an emergency, dropped anchor to secure the vessel against grounding or collision.

Since many of the converted barges employed a version of the schooner rig, the term "schooner-barge" ultimately became a permanent part of the Great Lakes maritime lexicon. So viable was this method of transporting bulk cargo, that purpose built schooner-barges eventually appeared on the Lakes, the largest being the 338 foot (103.0 m) *Pretoria* launched in 1900 (Cooper and Jensen 1995:49). The use of cut down ships as barges was not new to the lakes region, however, the inspiration for schooner barges on the Great Lakes appears to come from a lumber merchant in Buffalo who used dismasted sailing ships as barges beginning in 1861 (Karamanski 2000:38). The innovation appeared on Lake Michigan in 1868 when two tugs and six barges transported a cargo of lumber from Peshtigo to Chicago (Karamanski 2000:38).

Driven by profit motives, ship owners discovered that converting an aging sailing vessel to a barge, and then towing several barges in tandem (consort system), would considerably increase the cargo capacity of a single voyage. Consort towing also allowed operators to deliver barges at multiple destinations, and recover them later, giving crews an opportunity to unload a vessel without impeding other shipments. Tows on the lakes contained as many as eight barges in line astern at 1000-foot (305-meter) intervals, though it is unlikely that the heavy stone barges were subject to tows of this size. Tows even half that size must have made navigation and ship handling difficult, particularly at night and in poor weather when tow lines were difficult for other vessels to see. Communications between barges and the escorting steamer were carried out via megaphone, hand, flag, or whistle signals (Rowe 1979:20).

Although the several quarries operating in Sturgeon Bay flourished for over 50 years, the advent of the Great Depression signaled the end for the region's stone industry. Further, cheap and easily obtainable Portland cement and artificial stone products made great inroads into the natural stone market, while the curtailment of civic building projects brought on by the depression dealt the industry a

final blow. Few of the quarries in Sturgeon Bay survived the depression and many maritime assets were simply abandoned or sold. Without attention, many of the barge fleet's vessels settled to the bottom at their moorings. It was amidst these circumstances that the Sturgeon Bay Stone Company vessels *Oak Leaf, Ida Corning,* and *Empire State* made their way into the archaeological record.

Oak Leaf

The *Oak Leaf* (U.S. Registry 19106) was originally constructed in 1866 by Peck and Kirby of Cleveland, Ohio, as a two masted center board schooner for Captain Henry Kelly (see Figure 7). The Kelly fleet routinely traded between Lake Erie and Lake Michigan. The vessel's dimensions of 129.9 ft. (39.6 m) in length by 31.9 ft. (9.72 m) in beam by 11.2 ft. (3.4 m) depth of hold calculate in New Measure tons to 319 gross tons and 303 net tons, small to average for the time period (Great Lakes Marine Collection, Milwaukee Public Library). The ship was doubtless intended to carry bulk cargo such as grain, corn, lumber, ore, coal, riprap, gravel and crushed stone; commodities in which sail could still compete with rail transportation and the ever more efficient steam bulk carrier.

The vessel's original crew of six to eight men was commanded by Capt. Hugh Morrison, a one armed man whose handicap demonstrated the dangers involved in a sailing life (Historical Data Form for *Oak Leaf,* Wisconsin Historical Society). Manual labor, without which these vessels could not operate, is innately dangerous. Maiming from loading, unloading, and sailing accidents were not uncommon, and few lifetime sailors escaped the working man's curse of the 19th century.

The schooner rig was ideal for lake navigation in the 19th century, as the few fore and aft sails could be operated by a small crew from the deck of the ship. Only to shift and raise topsails for repairs and maintenance, did the crew need to climb aloft on a schooner. In contrast, traditional square rigged ships needed much larger crews to frequently climb aloft to set and reef the sails. The fore and aft rig of schooners also increased maneuverability in the variable winds of the Great Lakes, allowing a schooner to sail much closer and tack into the wind easier than a square rigged ship. This maneuverability, coupled with the schooner's shallow draft, was extremely important when sailing into and out of ports whose harbor mouths were sometimes only 200 ft. (61.0 m) wide or less and whose bottoms' were often shallow.

The *Oak Leaf* had a routine early life carrying the commodities for which she was designed. As most vessels did in the 19th century her ownership changed hands many times. Routine repairs and maintenance occupied many off-seasons, and an entirely new deck was installed in 1874 (Board of Lake Underwriters 1874:34).

By 1886 the schooner needed a rebuild. Only five years later the vessel was converted to a barge, lengthened by 30 ft. (9.1 m), and stripped of her masts (Inland Lloyds 1895; Great Lakes Marine Collection, MPL). This conversion reflected economic times, in which smaller sailing hulls on the Great Lakes found it increasingly difficult to compete in the bulk commodities trade that went first to monopolies

of wooden ships, and then to immense steel hulled, steam powered, purpose built bulk carriers. Economy, therefore, dictated conversion of older wooden sailing vessels into barges. A barge's small crew represented a reduction in overhead from sailing vessels, while its cargo capacity enhanced that of its comparatively smaller, wooden steamer escort.

At the time of its conversion the schooner *Oak Leaf* was owned by L. Feltus, of Escanaba, Michigan and was likely used in the iron ore trade (Inland Lloyds 1895). By 1899, the converted barge *Oak Leaf* was purchased by Capt. James A. Calbick for the Pilsen Lumber Company, and continued to carry ore and grain, with the addition of lumber. The *Oak Leaf*'s dimensions had changed greatly from her schooner days with a new length of 160 ft. (48.8 m), a beam of 31.2 ft. (9.5 m), and a depth of hold of 11 ft. (3.4 m). Consequently, the barge's 319 gross tons increased to 395 gross tons, while her 303 net tons increased to 375 net tons (Great Lakes Marine Collection, MPL).

During the winter of 1906, Door County's largest newspaper, the *Door County Advocate* (DCA), reported that negotiations were underway for the *Oak Leaf*'s transfer to the Sturgeon Bay Stone Company (DCA 16 February 1906). The purchase appears to have been necessitated by the company's successful bid to furnish 8,123 cords of stone for government harbor work in Michigan (DCA 16 February 1906). The contract was expected to take two years to complete. The initial report of the *Oak Leaf*'s sale provides insight into the stone barge conversion process. It indicated that the vessel was in excellent condition and would be ready for the trade "...as soon as she has been provided with shores and the covering boards put on her decks" (DCA 16 February 1906). Moreover, the fact that she was expected to carry 120 cords of stone, approximately 840 tons, gives an idea of the vessel's cargo capacity. From the opening of navigation in 1906, the movements and activities of the barge and her escort, the steam barge *I.N. Foster*, are reported regularly by the *Door County Advocate*.

At times the *Oak Leaf* was paired with the barge *Ida Corning* on its transport route, but the tow seldom if ever consisted of more than two barges in line. Tugs and barges from other quarries often escorted the *Oak Leaf*, demonstrating that the various quarries cooperated when their loads of stone had to be delivered to the same destination (DCA 17 December 1908). It is known that during the early years of operation the Sturgeon Bay Stone Company periodically hired tugs from local quarries to do its towing.

Hauling stone was a dangerous occupation. The barge crews consisted of two or three men who could do little more than man the pumps should leaks or storms threaten their vessel. Searches for leaks in the holds of the barges were a continual activity with emergency caulking reported on several occasions (DCA 30 October 1913). In 1918, the *Oak Leaf* sank at its dock when a leak was left unattended overnight (DCA 27 September 1918). This accident easily could have occurred with the barge under tow in open water.

Barges and their escorts appear to have spent an inordinate amount of time dodging storms and inclement weather, a reflection of their poor seafaring qualities. On one occasion the *I.N. Foster* and *Oak Leaf* survived a three week odyssey, dodging storms, seeking harbors and island lees, and crisscrossing the same bodies of

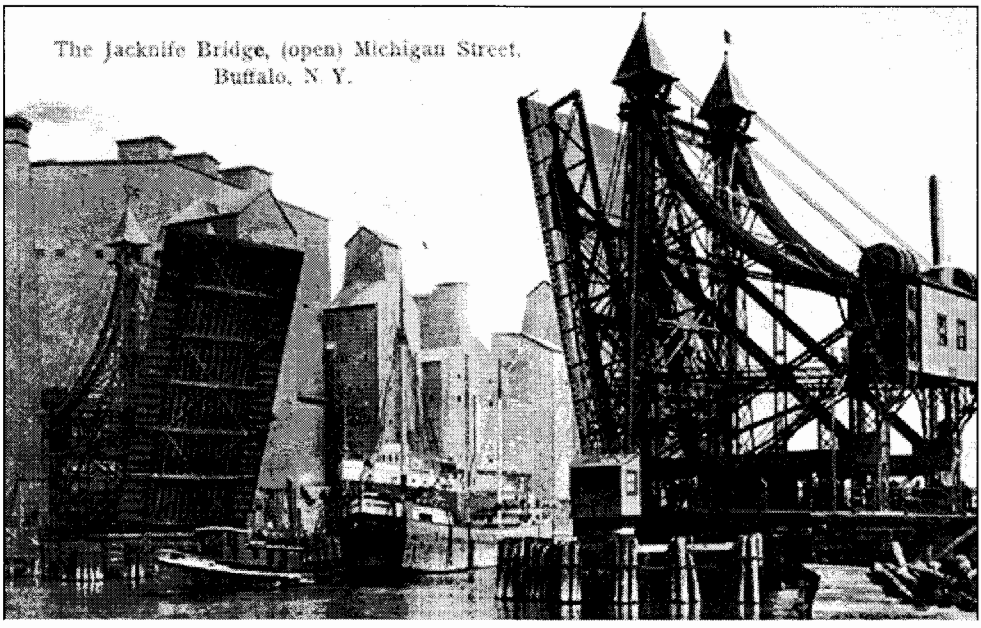

Figure 11. *Ida Corning* towed through the Michigan Street bridge in Buffalo.

water more than once, all in an attempt to get a simple cargo to Petoskey, Michigan; a day's sail away in good weather (DCA 21 November 1907). On another occasion the *Oak Leaf* rolled so badly on a return trip from Ludington, Michigan that she unshipped her mast and her deck-boiler went over the rail into the lake (DCA 2 September 1909). Indeed, most barges lost on the lakes were victims of shifting cargo that resulted in capsizing (Rowe 1979:20). Perhaps the only reason the *Oak Leaf* survived this particular gale is that her stone cargo had already been delivered. Nonetheless, the vessel and crew's safety depended primarily on the skill and judgement of the escort captains, whose otherwise good safety record was blemished in the period between 1903 and 1904 when three Sturgeon Bay barges were lost (Rowe 1979:3).

Occasionally, however, fatalities occurred even when the barge was not in distress. The body of 30-year-old Francis C. Brown, deckhand on the *Oak Leaf*, was recovered in Sturgeon Bay on 27 August 1908, after he apparently fell overboard during the barge's outbound journey to the Michigan shore. (DCA 27 August 1908). With only two or three men on board, it was unlikely that anyone would witness a fall overboard. Moreover, should an accident be seen, it would take a great deal of time to signal the tug, and more time still to turn a tow around to search for an overboard shipmate.

By 1928, the *Oak Leaf* and her sister barges, owned by the Sturgeon Bay Stone Company, laid idle at the wharf on Bullhead Point. The Stock Market crash of 1929 and subsequent depression, insured that the vessels would never again carry a load of stone. Their value was placed at $7,000 before they were abandoned. In 1931, the scuttled barges *Oak Leaf*, *Ida Corning*, and *Empire State* were burned to the waterline as a result of being judged recreational hazards (DCA 26 June 1931).

Ida Corning

Hulls for barge conversions were cheap and easy to come by, given the economic obsolescence of most sailing ships at the turn of the 20th century. These economic certainties already held sway when the *Ida Corning* (U. S. Registry 44283) was constructed as a purpose built schooner barge in 1881 (Figure 11). Two masts, a fore and a mizzen, gave this 168 ft. (51.2 m) by 31.3 ft. (9.5 m) by 10.9 ft. (3.3 m) vessel the configuration of a Grand Haven Rig.

The *Ida Corning*'s dimensions figure to 444 gross tons, and 422 net tons, slightly larger than the *Oak Leaf.* Photographs reveal that the vessel carried an after cabin on the main deck, and had a forecastle deck forward that housed the winch and perhaps a steam boiler and donkey engine. Since greater cargo capacity meant greater profit, the topside deck cabin and small forecastle deck insured that the cavernous hull could be entirely filled with cargo, thereby wasting no internal hull space on crew quarters or machinery.

Ida Corning's history plainly reflects turn of the century economics on the Great Lakes. Built only to be towed, the vessel was never intended to free sail the lakes. Like the converted *Oak Leaf,* her cargo hold supplemented the cargo capacity of her escort, and provided added flexibility in that she could be dropped at any port for unloading while the escort continued to a different destination. *Ida Corning* changed ownership several times during her early career, but continued hauling

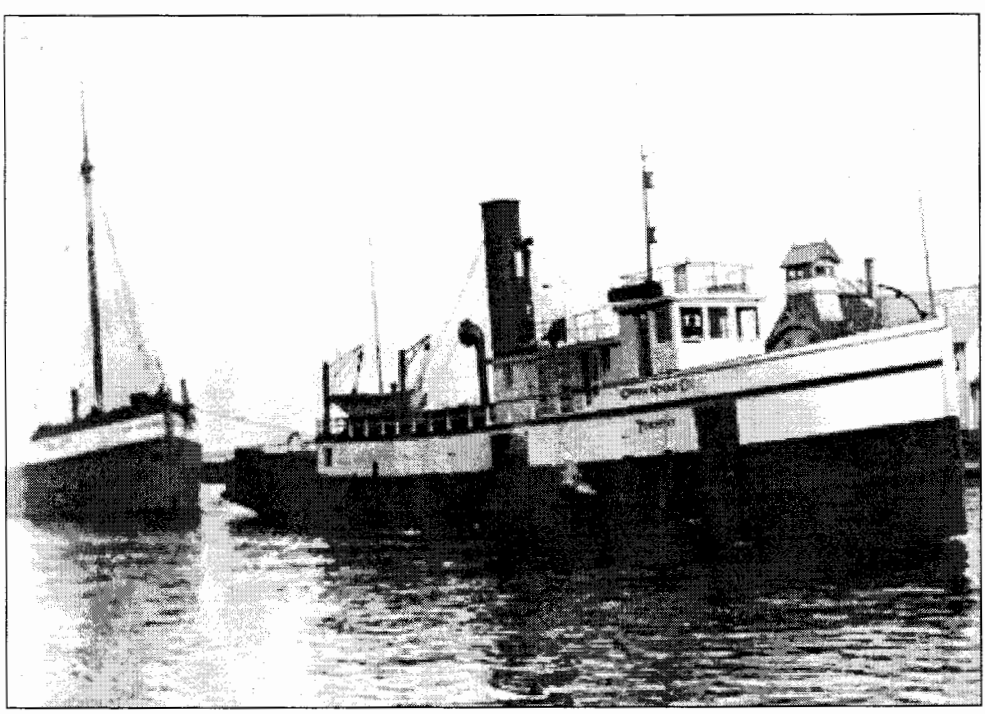

Figure 12. *Ida Corning* towed by the tug *Torrent.*

lumber until after the turn of the century (Great Lakes Marine Collection, MPL). By this time, however, the lumber industry was approaching hard times, as much of the lakes region was nearly depleted of timber. Seventy years of *laissez-faire* government and commercial management severely depleted the seemingly limitless resource, forcing many lumber companies to divest while others moved to new locations. Consequently, in 1908 the *Ida Corning* was sold to the Sturgeon Bay Stone Company and added to its flotilla of barges (Figure 12).

The vessel's career from this point is much like that of the *Oak Leaf*. The two were often found in tow of the steamer *I.N. Foster* delivering stone to various locations on the lakes. The *Ida Corning* faced the usual problems associated with hauling stone. Bad weather and small leaks were a constant worry for her small crew, as winter dry dock and caulking were routine. Although grounding or a collision with another vessel was unusual, the *Ida Corning* did run aground at least once, in November 1908. In a dense fog 7 miles (11.3 km) south of the entrance to the Sturgeon Bay Ship Canal, the barge and her escort tug *Duncan City*, struck a shoal in an area known as Clay Banks. Captain Fred Johnson of the *Duncan City* failed to take into account the increased speed of the tow since the schooner barge was both empty and under full sail. As the vessels were being pulled from the banks by the tug *Smith* under a Captain Anderson, the *Ida Corning* struck a rock and broke off its shoe and rudder, necessitating a considerable repair.

The remainder of *Ida Corning*'s career remains historically uneventful. It is unclear when the vessel was finally laid up, but her position parallel to *Oak Leaf* with the bow close to shore, suggests that she may have been used to extend the wharf sometime before the demise of the Sturgeon Bay Stone Company. In 1931 the well-used vessel was burned to the waterline.

Empire State

The *Empire State* (U.S. Registry #7229) was launched on 5 April 1862, by the Buffalo firm of Mason and Bidwell. Built as a "propeller," a term that distinguished her from contemporary paddle wheel steamers, the *Empire State* (see Figure 9) was a passenger freight steamer carrying passengers above decks and freight below deck. The vessel was reputed to be a popular passenger steamer, transporting many immigrants and prominent people westward (Fredrickson 1963:24). The ship's

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[2] Engine data obtained from Bowling Green University's *Great Lakes Marine Collection* indicates that the *Empire State*'s engine was a steeple compound, in lake's parlance (tandem compound in common language) built in 1862 by King Iron Works of Buffalo, New York. Although the cylinder dimensions and stroke in the document match the information alluded to in the second trial by Perry and Lay, it is unlikely that the *Empire State* would have employed a tandem compound engine as early as 1862 since ocean trials with Holt-type tandem compound engines had not even begun yet (Greenhill, 1993, 156-157). Because of the matching cylinder and stroke information, it appears that the Bowling Green document does refer to the compound engine installed by Perry and Lay, though the date of installation is incorrect. Notably, the Bowling Green document also indicates that the *Empire State* possessed a 9.6 ft. by 20 ft. fire box type boiler built by Shepart Iron Works in 1862. The boiler information is, of course, subject to the same caveat as the engine data.

dimensions were 212 ft. (64.6 m) in length, 32.7 ft. (9.9 m) in beam, and 12.2 ft. (3.7 m) depth of hold. These dimensions figure to 1116.53 gross tons, and 962.8 net tons (Historical Data Form for *Empire State*, Wisconsin Historical Society).

Currently, it is unknown precisely what type of steam engine the *Empire State* originally employed. Likely it was a vertical inverted single cylinder direct action, non-compound type. However, in 1867 and 1868, Horatio Perry and John Lay used her to demonstrate the efficiency of a new steam engine design they had recently patented that was similar to new European tandem designs; in which "... the saving of fuel was the only point sought to be obtained" (C. Patrick Labadie Collection). The detailed results of the trials provide an extraordinary glimpse into the *Empire State*'s conversion from a single cylinder steam engine to a compound (two cylinder) unit.

The first trial, conducted in December 1867, indicated that the vessel then employed a single cylinder, low-pressure direct acting vertical steam engine. These were fairly inefficient engines, since the steam ejected from the cylinder was not used to expand another lower pressure cylinder, (as it was on a compound engine); it was simply ejected, similar to a locomotive type engine. The *Empire State*'s power plant possessed a single 44-inch (112-cm) diameter piston that traveled a 39-inch (99-cm) stroke. During the trial, the engine ran for 24 consecutive hours, at an average speed of 63 revolutions per minute with 50 pounds of steam pressure. The engine ultimately made 99,399 revolutions and consumed over 28 cords of wood (C. Patrick Labadie Collection). It is likely that this was the *Empire State*'s original engine, since at the time of the trial the vessel was only five years old.

The second trial, in February 1868, found the *Empire State* fitted with a Perry and Lay direct acting combined cylinder engine. A decided improvement over the single cylinder power plant, the compound engine employed two cylinders in order to use steam pressure more efficiently. Steam from the boiler was first introduced to a small diameter, high-pressure cylinder, and then to a larger diameter, low-pressure cylinder. Thus, the low-pressure piston utilized residual steam that would normally escape a single cylinder engine. The *Empire State*'s new engine utilized a high-pressure piston that was 25 in. (63.5 cm) in diameter and a low-pressure piston of 54 in. (137.0 cm) in diameter. Each piston traveled a 39-inch (99-cm) stroke.

The parameters of the first trial were adhered to exactly in the second, and a comparison of results between the two trials revealed that the compound engine consumed 21 percent less fuel than its single cylinder predecessor. This represented a savings so substantial that four steamers were reportedly fitted with the combined cylinder engine in time for the coming season. Here, the interplay between marine innovation and a ship owner's profit margin is well illustrated, since a more economical engine necessarily translated into larger profits. In this light, the *Empire State*'s role in proving the efficiency of Perry and Lay's compound engine cannot be overstated.[2] It appears that the *Empire State* trials played a significant role in the development of the steam engine on the Great Lakes, for it is a historical fact that compound engines eventually supplanted single cylinder engines, and that three cylinder engines (triple expansion) were eventually proven to be even more efficient.

As with the *Oak Leaf* and *Ida Corning*, the *Empire State* changed ownership several times during her early career. In 1864, the *Register of the Ships of the Lakes and*

River St. Lawrence indicated the steamer was owned by the Western Transit Company (Thomas 1864:33). At this time, two years after her construction, the vessel was valued at $50,000, and made Buffalo its home port (Thomas 1864:33). Thirty-three years later the *Empire State* was still owned by the Western Transit Company, which by then operated an impressive fleet of 16 steamers (Blue Book of American Shipping 1897:27, 58).

In late April 1900, M.J. McCormick chartered the *Empire State* and her sister ship *Badger State* for the Buffalo-Green Bay Line (DCA 28 April 1900). The passenger steamers were to run the entire season "...with a guarantee of a certain amount of freight for each trip" (DCA 28 April 1900). Over the ensuing five months the *Empire State* is variously reported running for the Lackawana-Green Bay Line and Lackawana-Green Bay-Western Line. During this period the *Empire State* ran regularly between Buffalo, several ports in Green Bay, and also made stops in Menominee, Michigan.

On 27 June 1900, the *Empires State*'s most significant navigational accident occurred when the vessel ran aground in a thick fog near Sugar Creek, south of Little Sturgeon Bay. Carrying oats from Green Bay and 13 passengers for the Lackawanna, Green Bay & Western Line, the ship fetched up on the east shore of Green Bay while attempting to make Menominee on the west side of the bay. It took the tugs *George Nelson, Sydney T. Smith, Gladys Nau,* and *Torrent* three days to free the vessel, while local farmers constructed makeshift rafts and salvaged the 5,000 to 8,000 pounds (2267.9 to 3628.7 kg) of oats jettisoned to lighten the vessel (DCA 30 June 1900, DCA 7 July 1900). The *Empire State* suffered most of its damage while being pulled free of the shoal, including a broken rudder post, windlass, and two pall-posts. An embarrassed Captain Frank Powell, who had left the ship in command of his first officer just before it ran aground, eventually nursed the steamer into Sturgeon Bay shipyard of Riebolt and Wolter for repairs (DCA 7 July 1900).

Trouble struck again a month later, when the vessel's firemen, deckhands, and waiters "...struck on account of the food supplied being insufficient in amount and of inferior quality (DCA 25 August 1900). Incidentally, the strike occurred while the vessel was undergoing repairs to its "kettles" in the port of Escanaba, revealing that by 1900 the *Empire State* perhaps possessed two boilers.

Within a year of the strike, the *Door County Advocate* reported that the Barry Brothers Transportation Company purchased the *Empire State* and *Badger State* from Cleveland's Northern Transit Company for $75,000 (DCA 29 June 1901, DCA 13 July 1901). In the opinion of "well-posted local marine men", however, the sum was more likely $30,000 (DCA 13 July 1901). After extensive overhauling in Manitowoc, the steamers were put into service between Milwaukee and Chicago, though the Barry brothers briefly considered putting the steamers into service between Detroit and Cleveland (DCA 11 January 1902). That the Barry brothers contemplated the Detroit to Cleveland route at all reveals an especially ambitious inclination, for that coveted route had been monopolized by the Detroit and Cleveland Navigation Company for a third of a century (DCA 18 January 1902). Undaunted, Captain Thomas Barry piped "...you see, we are no school boys when it comes to fighting in the vessel business...we are not going there to sell out, but to stay" (DCA 18 January 1902).

Nonetheless, by the spring of 1902 both the *Empire State* and *Badger State* made their first appearance in Sturgeon Bay, and it was reported that this was the beginning of tri-weekly visits, apparently ending the possibility of the steamers being transferred to the Detroit-Cleveland route (DCA 17 May 1902). The ships plied regular routes on Lake Michigan, though their routine was broken occasionally, such as when *Empire State* transported the Morris and Berger Carnival to Sturgeon Bay and collected passengers from various ports on the bay to visit the show (SHSW Historical Data Form). On another notable occasion, the *Empire State* found herself imprisoned in ice for an entire week with 25 passengers on board. Although two impatient travelers eventually walked ashore, the remainder stayed on board and idled their time "...by reading, playing cards, and telling stories" (DCA 20 February 1904). Both vessels were apparently well taken care of, for after 42 years of service for various lines, the steamers still carried an A2 insurance rating (Inland Lloyds Vessel Register 1904:33, DCA 16 August 1902). The Barry Brothers Transportation Company eventually came into tax difficulty, and were forced to surrender the *Empire State* to the federal government in 1903.

In a spite of shrewd ownership changes, however, the *Empire State* was reacquired after being sold "by the United States Marshall" in October 1903 to F. H. Riebenack of Alpena, Michigan, who then sold the vessel to John McCoy of Milwaukee, who subsequently transferred the steamer to Margaret Barry, wife of Peter Barry (DCA 24 October 1903, DCA 21 November 1903, DCA 5 December 1903). The Barry Brothers Transportation Company had the vessel back by January 1904, and entered it into service between the western shore of Lake Michigan and Green Bay, this time competing with the Goodrich Line (DCA 16 January 1904). By 1905, the vessel was still under Barry ownership running between Milwaukee and Chicago.

Empire State's active career as a steamer came to an end at the Barry Dock in Chicago on Christmas Day 1906, when fire so sufficiently damaged the ship that repair was not economically viable (Fredrickson 1963:25). Initial reports indicated that the steamer was a total loss and had burned to the water's edge (Evening Wisconsin 26 December 1906). Subsequent reports, however, estimated the loss between $300 and $1,000, with most of the damage confined to the engine room (EW 27 December 1906, EW 4 January 1907). Rather than the fire damage alone, the steamer's advanced age, compounded by the recent fire, probably motivated the Barry Brothers Transportation Company to sell the ship. Nevertheless, once "the finest craft on the lakes", the *Empire State* would soon undertake a less glamorous role; by the spring of 1908, the vessel was being prepared at Sturgeon Bay for hauling stone (DCA 7 May 1908; DCA 14 May 1908).

Purchased by the Schnorbeck & Bennett Company of Muskegon to transfer stone from the Sturgeon Bay Stone Quarry to Holland, Michigan, part of the steamer's conversion reportedly involved the removal of the propeller and shaft (DCA 16 April 1908; DCA 23 April 1908). In regards to the *Empire State*'s seemingly ignoble

fate, the *Door County Advocate* wrote, "This is the beginning of the end of the career of a steamer that was once the pride of the Great Lakes" (DCA 7 May 1908). The paper also prophetically announced that "The next step will be to sink her and use the hulk for a breakwater or cribbing for a dock..." (DCA 7 May 1908).

By 1910 the Sturgeon Bay Stone Company had purchased the former steamer for $2,500 along with the *Richard Mott* (DCA 9 June 1910; DCA 26 June 1931). Initially, the barge *Empire State* was escorted by the tug *Erma Wheeler*. However, for the remainder of her career she could be seen towed behind the steam barge *I.N. Foster*. Though the hull had a high length to beam ratio, an undesirable attribute for a stone barge, it was deemed worthy of carrying larger sized rock that was less likely to shift in heavy sea conditions. This service probably took a considerable toll on the former steamer, since by 1912 the barge had settled to the bottom near the wharf at Bullhead Point (DCA 18 December 1913). The ship would be pumped, repaired, and placed back into service once more, before being intentionally scuttled and filled with rock in 1916 to extend the deep face of the Sturgeon Bay Stone Company's wharf (WHS Historical Data Form for *Empire State*).

Fire struck the *Empire State* again in 1929, and although the Sturgeon Bay Fire Department responded to the scene, firefighters could do no more than prevent the spread of sparks (DCA 2 August 1929). Enough of the barge remained, however, that when the *Ida Corning* and *Oak Leaf* were intentionally burned in 1931, the remainder of the *Empire State* was burned to the waterline as well (DCA 26 October 1931).

4

Description of Findings

The archaeological site at Bullhead Point consists of four main features: the three wreck sites and the point itself. It is unclear if the point is entirely man made or simply an enhanced natural projection. Its construction is consistent with a crib pier style that has been filled in and enlarged with the addition of a great deal of crushed and quarried stone. Its circular or cul-de-sac shape lends credence to the notion that wagons or mining cars were intended to off-load and turn around without interfering with newly arriving loads.

Based on the vessel's orientation, it is clear the ships near Bullhead Point were placed intentionally in their final resting positions (see Figure 2). Wreck three (*Empire State*) appears to have been placed at the head of the wharf as cribbing, used to extend the point into deeper water. Spillage over time from barge loading operations, in addition to the gradual break down and decay of timber headers and stringers in the wharf cribbing, allowed stone to spill onto the bottom where ships were loading. If enough spillage occurred the end of the wharf would become shallow, necessitating either dredging or an extension of the wharf into deeper water. Historical evidence suggests that was the case. In at least one instance the *Empire State* was loaded until it rested on the bottom during low water. In one instance, the tug that was to be her escort broke a propeller trying to pull her free from the dock.

The other two barges, lying off the south side of Bullhead Point may also have been used to extend the dock into deeper water, but their placements seem more accidental. As can be seen in figure 2, both ships are all but resting with their bows on Bullhead Point. Pulling a ship into water this shallow would normally be almost impossible. Yet in this case it can be seen that the stern of each barge was counterweighted with rock, pulling the bows upward until they were nearly out of the water. The same effect is created in beaching a canoe, a feat more easily accomplished if the steersman remains as a counterweight in the stern while the boat is beached.

Given that the vessels at Bullhead Point were probably sunk intentionally as wharf extensions, another observation can be made concerning barge conversions. A dock is useless without a deck; therefore, the main decks must have still been in place on these three vessels when they were sunk. Archaeological evidence for these decks, however, is slim. There are no deck planks or beams to be found on any of the three sites. The only evidence of decking comes from wreck number two which contains a number of charred hanging knees used to support deck beams. It is probable burning of the vessels to the waterline in 1931, acted as a site depositional filter, removing most of the evidence of a deck.

Construction details of the three wrecks lying at the point confirm that the

vessels originally represented two sailing ships and one steamer. This would seem to substantiate the historical record of the *Door County Advocate*, which identifies the vessels lying at the point as the converted steamer *Empire State*, the schooner barge *Ida Corning*, and the converted schooner *Oak Leaf*.

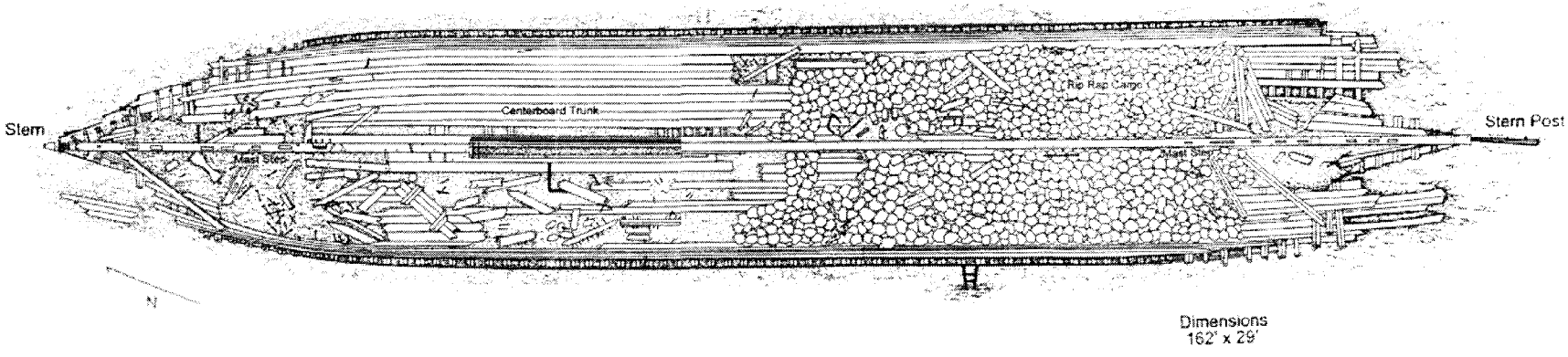
Wreck One (Oak Leaf)

Wreck one (Figure 13) represents a centerboard vessel that measures roughly 162 ft. (49.4 m) in length (stem post to the original location of the stern post) by at least 29 ft. (8.8 m) in beam. Both of these measurements are approximate, and don't necessarily represent the dimensions of the ship when it was in service. Wooden ships are notorious for changing shape over time, particularly when a good deal of their structure and internal supports have been removed. In other words, wooden wrecks eventually take the shape of the bottom where they lay, if the bottom undulates so will the wreck. Given this, however, the archaeological dimensions of wreck one more closely resemble the historical dimensions (160 ft. by 31 ft.) of the *Oak Leaf* (Great Lakes Marine Collection, MPL) than either the *Empire State* (212 ft. by 32.7 ft.) or the *Ida Corning* (168 ft. by 31.3 ft.). A depth of hold calculation is no longer possible because the deck is missing. This precludes a tonnage measurement as depth of hold is needed for this calculation.

Wreck one has two mast steps and chain plates on the hull for a foremast and a mizzen. There is no indication of a main mast step or its associated chain plates. Therefore, the vessel was two masted in the Grand Haven style, typical of a barge or barge conversion of the later part of the 19th century. There are no other archaeological indications for rigging of any sort. These observations also match what would be expected of the two-masted *Oak Leaf*.

Although the top of the centerboard trunk (the centerboard is missing) is canted a few inches from exact center, it does go through the keel indicating it was built after the insurance underwriter rule changes of 1856 (Barkhausen 1990:14). It is not braced from the sides of the vessel as it would if the hold were 13 ft. or deeper (Barkhausen 1990:24). The length of the centerboard trunk, 24 ft. (7.3 m), is relatively short for the overall length of the hull, an indication that the vessel may have been lengthened. These facts also match the historical record of the *Oak Leaf* which state that her original length of 129.9 ft. (39.6 m) was increased by 30 ft. (9.1 m) in 1891.

The vessel's framing pattern contains few surprises archaeologically. Wreck one was a standard centerboard sailing vessel of the second half of the 18th century. The vessel is doubled framed with a frame room of 10 in. (25.4 cm) and a space of 14 in. (35.6 cm). The frames, on 24 in. (61 cm) centers, are sided in pairs, one 4.5 in. (11.4 cm) (forward partner) and one 5.5 in. (14.0 cm) (aft partner) above the turn of the bilge. At the keelson frames are molded at 1.1 ft. (0.3 m). Above the turn of the bilge frames are molded 9 in. (22.9 cm). Futtocks are butt scarfed, and fastened laterally with iron pins. The keelson is supported down most of its length with a single rider sided at 9 in. (22.9 cm) and molded at 8.5 in. (21.6 cm). There are no sister keelsons. An alternative method of longitudinal strengthening is, however, readily apparent.



Bullhead Point Wreck Site
Oak Leaf (vessel 1)

Figure 13. *Oak Leaf,* Plan View Site Map.

The keelson's starboard side is supported by a 1.3 ft. (0.4 m) wide by 0.75 in. (1.9 cm) thick iron hogging plate that runs from just forward the foremast to a few feet aft the mizzen mast. The hogging plate is reinforced with additional plates beginning approximately 8 ft. (2.4 m) aft of the centerboard trunk's forward edge. Each of these overlapping iron reinforcements is secured to the longer, primary reinforcing brace with 1.5 in. (3.8 cm) rivets in 10 sets of three, with the sets spaced 6 in. (15.2 cm) apart. Although the incline could not be measured, it appears that the primary plate possesses a slight, gradual arch beginning at the forward reinforced section. It is uncertain whether this longitudinal plate was part of the vessel's original construction, or if it was added when the schooner was converted to a barge.

Wreck one has virtually no deadrise and no swell to its hull and a very sharp turn of the bilge (Figure 14). As mentioned, the vessel likely had less than a 13 ft. (3.9 m) depth of hold. It would have been virtually rectangular in full cross section. The hull was constructed to sacrifice sailing qualities for cargo capacity and a shallow draft, qualities that are generic to Great Lakes ships of the later half of the 19th century.

Notably, the bilge ceiling to the turn of the bilge is fastened with countersunk nails. This feature would make it easier to unload bulk cargo by hand as there would be no nail heads to interfere with the typical square nosed shovel used to unload the bottoms of these ships. The remainder of the outer hull planking and ceiling planking is fastened with nails over compression washers (or roves). The outer hull planking is 2 in. (5.1 cm) thick while the ceiling planking is 4 in. (10.2 cm) thick. The thicker ceiling planking suggests that the interior of the ship was expected to see rather rough treatment, another indicator that the vessel was intended to carry bulk cargo.

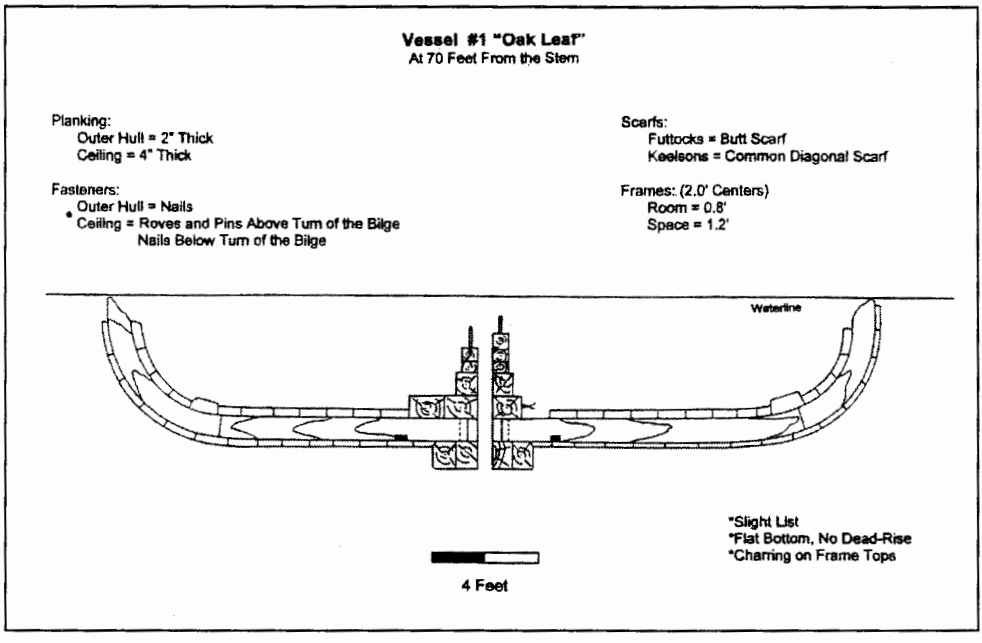


Figure 14. *Oak Leaf* Cross Section. Note missing center board.

A 5 in. (12.7 cm) wide by 1 in. (2.5 cm) thick iron shoe attached to the forward edge of the *Oak Leaf*'s stempost testifies to the abuse expected at the vessel's cutwater. The shoe is fastened to the stempost with 1.25 in. (3.2 cm) iron drift pins spaced 6.5 in. (16.5 cm) apart. On each side of the stem, a 3 in. (7.6 cm) wide by 0.5 in. (1.3 cm) thick curved plate reinforces the joint between the bottom of the stempost and forefoot. Sediment precluded detailed inspection of the stem assembly. The plates are fastened with 1.25 in. (3.2 cm) drift pins and continue below the sediment.

At the stern, the outer sternpost is separated from the inner sternpost leaning aft at roughly a 30 degree angle. The lower most gudgeon is extant and would have accepted a 3.5 in. (8.9 cm) diameter pintle. Interestingly, the gudgeon strap, 3 in. (7.6 cm) wide, by 2 ft. 7 in. (0.79 m) long, and fastened with 1 in. (2.5 cm) square bolts, is mortised to accept a 4 in. (10.2 cm) wide iron bracket possibly the top of a fish plate that runs 7 in. (17.8 cm) up the sternpost. The vessel's rudder is not extant in the arch record. Does this wreck represent the remains of the *Oak Leaf*? Nothing in the archeological record contradicts this identification. Indeed most, if not all, of the evidence points to this being the *Oak Leaf* or a similar vessel.

Wreck Two (Ida Corning)

Wreck two represents a two masted centerboard sailing vessel approximately 152 ft. (46.3 m) in length, by 30.5 ft. (9.3 m) in the beam (Figure 15). Again, the depth of hold cannot be measured so no tonnage estimate can be given. This is somewhat smaller than the 168 ft. (51.2 m) by 31.3 ft. (9.5 m) historical dimensions of the *Ida Corning*. However, several factors that relate to these measurements must be taken into account. The archaeological measurements are estimates, since the wrecks have changed shape over time and much of their structure is missing. The stern section is in a bad state of preservation with scantling pieces and deadwood missing or waiving nearly unsupported in the currents. Knowing this, it is likely the 152 ft. (46.3 m) estimate is low.

One dramatic piece of evidence on wreck two is the iron hogging strap, an internal frame used in wooden ships to support the vessels against hogging and sagging at the bow and stern (Figure 16). This support strap originally fastened to the bilge ceiling and arched from stem to stern inside the hold on both the port and starboard sides. The strap was reportedly removed from the vessel *George Presley* after that vessel sank in 1905, and was placed in the *Ida Corning* when it was converted for stone hauling (Rowe 1979:15). Archaeological experience thus far suggests that internal (and external) hogging arches are usually, though not exclusively, reserved for shallow draft steam vessels with high length to beam ratios such as those involved in Great Lakes trade.

The reason for this is two fold. First, heavy steam machinery tends to depress a hull in one area. This is not a problem if the ship is loaded with heavy cargo, as the weight becomes evenly distributed throughout the bottom of the ship. If a propeller driven ship is empty, however, it will have a tendency to springboard or bend down its entire length, as it floats high in the water at the bow and low in the stern where the engine is. Ceiling arches and hogging trusses will compensate

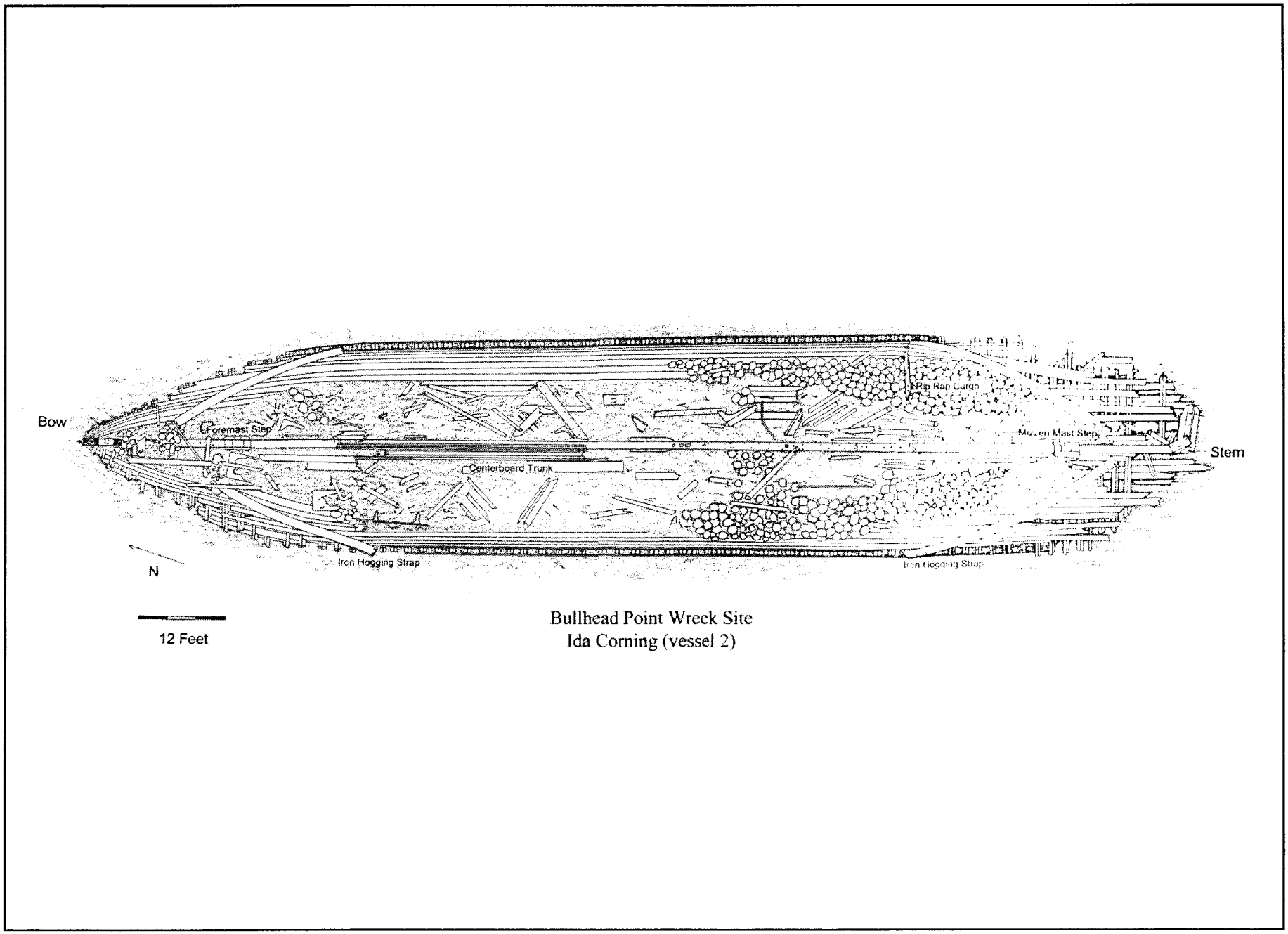


Figure 15. *Ida Corning,* Plan View Site Map. Note the iron hogging straps on the vessel's quarters.

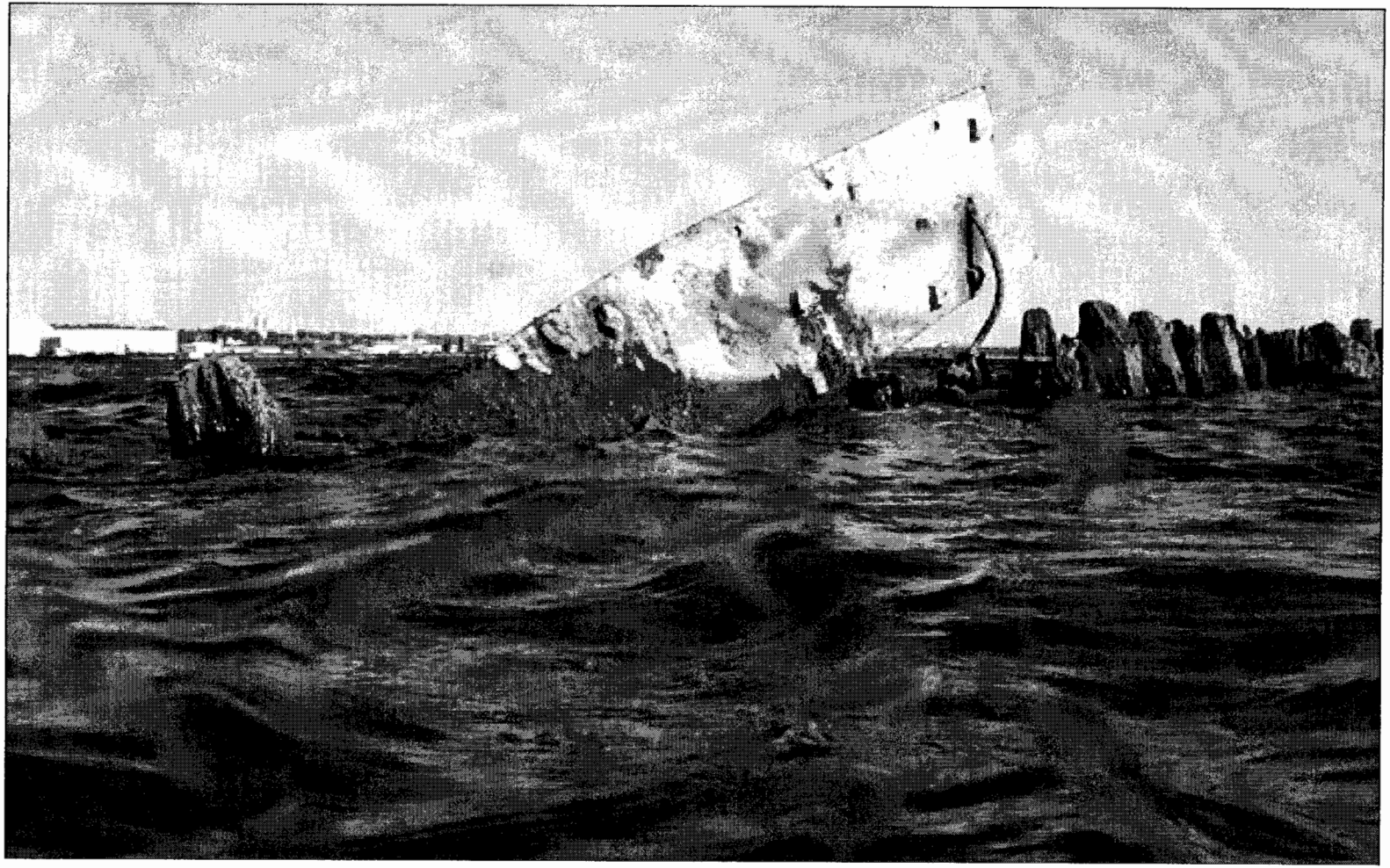


Figure 16. Close up view of iron hogging strap on *Ida Corning*'s starboard bow.

for this bending tendency, making a vessel more rigid longitudinally. Sailing ships, on the other hand, generally have no problem with spring-boarding, as they can be loaded and unloaded evenly down their entire length.

The second reason for a truss is that the ends of a ship (steamer or sail), displace less water than does the midships area. Since water displacement supports the midships better than the ends, the ship may begin to droop at the bow and stern over time. This tendency is known as hogging and is a particularly troublesome problem for high length to beam ratio paddle steamers intended for speed in the passenger service. Large external trusses and hogging chains are often depicted on these types of 19th century vessels. In light of hogging, an internal truss would be advantageous for any shallow draft hull routinely carrying heavy cargo. Nevertheless, it remains a fairly unexpected sight on a typical sailing vessel, and in this instance is the best archaeological indicator that wreck two is the *Ida Corning*.

Wreck two appears to have been built with two masts in the Grand Haven style. Both the mast steps and chain plates point to this configuration. No other evidence of rigging can be discerned. Again this identifies the ship as a barge or schooner barge of the type used near the turn of the 20th century.

The centerboard is 26 ft. (7.92 m) in length inside the centerboard trunk and is still in place. Again, no supports hold the centerboard trunk to port and starboard sides of the ship so the vessel likely had less than a 13 ft. (3.9 m) depth of hold. The centerboard appears to be "offset" in the plan view due to the vessel's port side list (figure 15), but it actually passes through the keel as would be expected of a ship built in 1881 (figure 17). All other support structures and pocket pieces for the frames are normal for a vessel built in the later part of the 19th century.

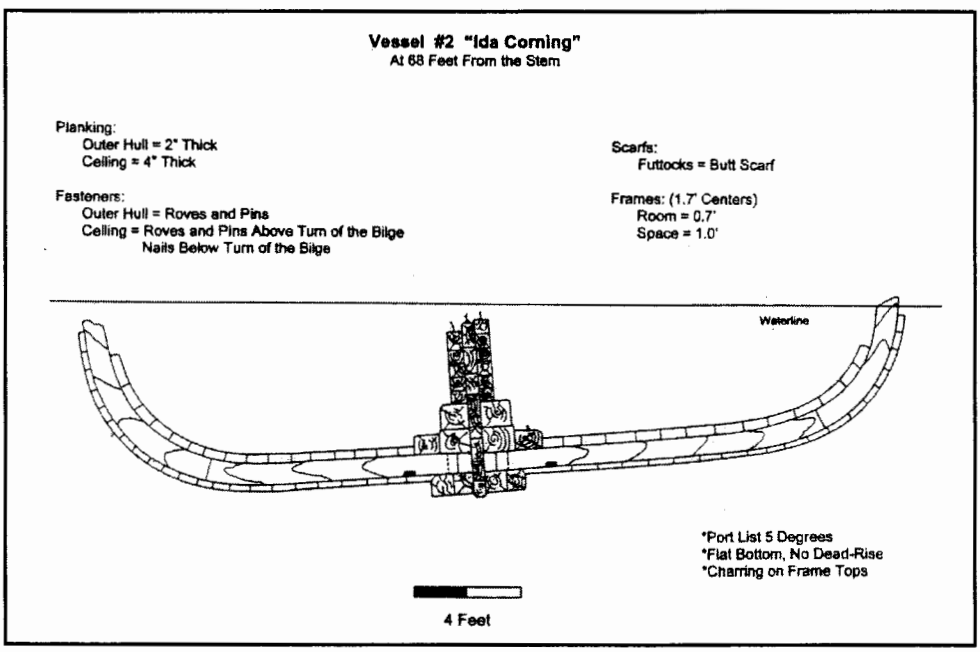


Figure 17. *Ida Corning* Cross Section. Note list to port.

Internally, wreck two is more heavily constructed than wreck one. The vessel is double framed with a frame room of 10 in. (25.4 cm) and a space of 10 in. (25.4 cm). The frames, on 20 in. (50.8 cm) centers, are sided in pairs, one 4.5 in. (11.4 cm) (forward partner) and one 5.5 in. (14 cm) (aft partner). Above the turn of the bilge, frames are molded at 8 in. (20.3 cm). Futtocks are butt scarfed and the keelson and single rider keelson are ribbed and key scarfed and fastened with 1 in. (2.54 cm) iron drift pins.

As with wreck one, the bilge ceiling is fastened with countersunk nails while the rest of the vessel is fastened with nails over roves or compression washers. Again, the smooth hold floor created by the countersunk nails would facilitate unloading of bulk cargoes with square nosed shovels. As is common with bulk carriers of this time period the 4 in. (10.2 cm) ceiling planks are twice as thick as the 2 in. (5.1 cm) outer hull planking. Again, this indicates that the hold was bearing heavy service, and the cargo itself created more wear on the ship than the environment.

Overall, with the exception of the ceiling arch and a slightly different frame spacing, wreck two and wreck one could be sister ships. Both have almost no deadrise and a rectangular cross section. Both were rigged with two masts, a fore and a mizzen and both had drafts of less than 13 ft. (3.9 m) with centerboards to help compensate for their sailing leeway. Both are fastened the same way and are nearly the same dimensions with longitudinal bracing consisting of a keelson and rider. The best indicator that wreck two might indeed be the *Ida Corning* is the internal steel arch. Detracting from this identification is the fact that the wreck does not seem to be long enough to match the historical records.

Wreck Three (Empire State)

Clearly, wreck three represents the remains of a propeller driven steamship, and considering all the historical references cited in the *Door County Advocate*, is likely the *Empire State* (Figure 18). The hull is large for a wooden ship at 212 ft. (64.6 m) in length, and 34.5 ft. (87.6 m) in beam. This compares well with the historical record that states the vessel was 212 ft. (64.6 m) by 32.7 ft. (9.9 m) by 12.2 ft. (3.7 m) depth of hold, giving 116.53 gross tons and 962.8 net tons.

Of the three wrecks at Bullhead Point, wreck three was the most difficult to study. The wreck's starboard side is nearly on shore at water level and the hold is buried under a considerable pile of stone. No attempt was made to move any of this stone for the Phase II recording, so no cross section was possible. The weight of this stone has distorted the ship from its original sleek shape and threatens to collapse the port side. The plumb bow is listing to port 10 to 15 degrees, as the entire wreck is twisting under the stress of its load. Nonetheless, the vessel is heavily constructed with double frames on 2 ft. (10.6 m) centers. The frames themselves are considerably heavier than the frames of the other two vessels with sided and molded dimensions of 8 in. (20.3 cm) and 12 in. (30.5 cm) respectively. Frame sets are tripled and quadrupled toward the after part of the ship to support the boilers and engines.

One diagnostic feature inside this wreck is the large pillow block that still supports part of the propeller shaft. Interestingly, the *Door County Advocate* report-

ed on 23 April 1908, that the shaft and propeller were being removed from the *Empire State* in order to convert it to a barge. The archaeological record, however, indicates that although the propeller has been removed, much of the shaft remains in place. The bow is still sheathed in an iron shoe for protection from ice, as was the custom for many vessels on the lakes.

The port side and bow of wreck three stands off the bottom nearly to the surface in some 10 to 12 ft. (3.1 to 3.7 m) of water. Therefore, it is easy to discern that the old steamer was sunk in order to extend the loading dock and present a new clean deep face for the wharf. Ships with a 12 ft. (3.7 m) draft could easily load off the *Empire State*'s port side.

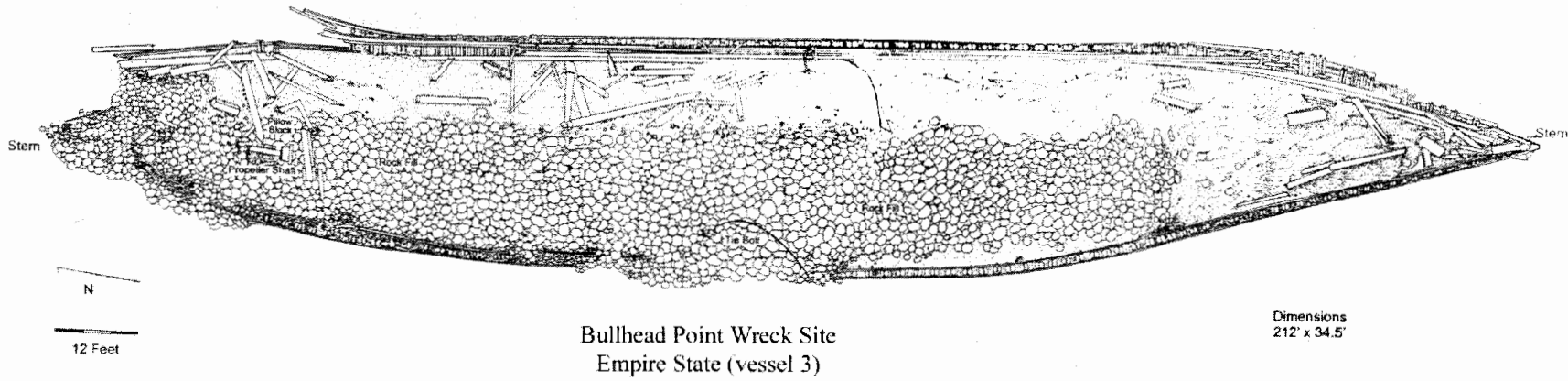


Figure 18. *Empire State,* Plan View Site Map. Note the vessel's high length to beam ratio and sharp lines.

5

Conclusions and Recommendations

The Bullhead Point survey underscores the need for archaeologists to study the everyday generic working craft of the 19th century. It was these working ships and barges that brought life to many early communities, and though they may not seem as exciting as ships of war or exploration, they are perhaps more important. These yeoman of the stone trade affected the lives of everyone in Sturgeon Bay. This inexpensive method of hauling cargo enabled the town's stone quarries to carry on a profitable business. Were the stone companies not successful, the city of Sturgeon Bay would not have prospered and developed during its formative years.

The Bullhead Point site is but one of several archaeological sites within Sturgeon Bay associated with the stone quarrying business. There are dozens of sunken barges, inundated wharves, and abandoned quarries that could be studied with an aim toward better understanding this important period in history. As it happens the three wrecks at Bullhead Point are all different types of vessels. Yet this is no accident, for it is obvious from the historical and archaeological record that the stone industry in Sturgeon Bay had a great need for barges at the turn of the 20th century. Though large beamy hulls were preferred, shipyards converted almost any vessel at hand. Since many of these barges are still residing intact on the lake bottom, the Sturgeon Bay stone industry has furnished nautical researchers a treasure trove of easily retrievable data.

The objectives for this particular project started with the documentation of the wrecks at Bullhead Point in an effort to identify just how an average ship was converted to a tow barge or schooner barge. Generally, it appears that the ship to barge conversion consisted of the removal of any superstructure and machinery other than grounding tackle and anchors from a ship. Even the deck railing was removed to facilitate loading, and there can be no doubt that dealing with hatch covers was never considered. The large cargo hatches were left wide open. Battening hatches was a big job for even a full crew and certainly not deemed necessary on these barges.

The bare main deck became home to one or two small shacks, typically one on the fore deck and one aft. The fore and mizzen masts were retained as derricks for cargo handling but any topmasts and the jib boom were removed to make towing the hulk easier. There is some evidence that a donkey engine and boiler may have supplied some of the muscle needed to off load the barge. The barge's interior was reinforced when possible to carry heavy cargo, though apparently no thought was given to reinforcing the keelson with anything other than a single rider plus a hogging plate. Sister and rider keelsons take up valuable cargo space. The hold floor (or ceiling) of these barges was planked much heavier than was the outer hull. This practice followed that of all cargo vessels on the lakes. The hold floor

was also made smooth by countersinking the fasteners to facilitate unloading the bulk cargo by shovel.

Work on board these barges must have been difficult and dangerous. The two or three crewmen had to load and off-load the barge mostly by hand and the barge captain's chief responsibility was to make sure this was done while keeping the vessel in safe trim. Crews lived away from home for weeks on end laboring in the holds with shovels and wheelbarrows to fill the derrick bucket for hoisting ashore. Quitting time simply meant retiring to a shack on deck for a meal and a nights sleep before waking up to do it all over again. Loading and unloading constituted most of a barge sailor's life on the lakes.

It is clear from historical sources that stone barges were not very seaworthy. The escorting vessels had to continually seek shelter from bad weather and it can be surmised that if a tow was surprised or overtaken by mother nature, it could be in a dangerous situation in no time at all. Moreover, since barges lacked hatch covers, they had little or no reserve buoyancy (having been loaded until the gunwales were nearly awash), and the small shacks built on deck to shelter the crew would have easily washed overboard in a storm along with any donkey machinery. Incidents like this were reported occasionally by the local newspaper. It can also be guessed that a full load of stone would conceal any leaks in the hull until the barge began to feel sluggish, no doubt a heart pounding, stomach wrenching sensation for a crew that had no life boat.

It does appear that barge crews lowered the centerboard and set sail when the wind made it possible. However, the rig amounted to two gaff sails hung from the fore and mizzen mast, and though it apparently did speed up a tow or may have even been useful in an emergency, it would not be economical for moving the barge long distances between ports. Time is money when contracts must be filled.

Do the wrecks at Bullhead Point represent the *Oak Leaf, Ida Corning,* and *Empire State*? With the possible exception of Wreck #2 (*Ida Corning*) it appears likely they do. The *Door County Advocate* reported regularly on the three barges over a span of several decades. Though a mistaken identification can be made on one or two occasions, it would not continue over a period of years, especially as the name boards of each ship would have been clearly readable when they were abandoned. The barges and their escorts were obviously favorite newspaper material, and they all became local characters via the daily print.

Archaeological evidence seems to confirm two of these identifications and is inconclusive concerning the *Ida Corning*. There is no doubt the three wrecks lying at Bullhead Point represent two sailing vessels and one steamer. Even some of the internal details, such as the *Ida Corning*'s ceiling arch and the *Empire State*'s propeller shaft remain clear in the archaeological record. Wreck measurements match historical records for both the *Oak Leaf* and *Empire State*. In this regard, the sole issue is the wreck #2's observed length. The wreck's length remains 16 ft. (4.9 m) short of the length noted in the historical record. This discrepancy may be accounted for by the poor condition of the stern section of the wreck or perhaps the vessel was modified and shortened during its career as a barge. The only other explanation would be that it was misidentified when it came into possession of the Sturgeon Bay Stone Company and continued to be misidentified over the years.

Finally, it should be noted that the Bullhead Point Site is both picturesque and archaeologically and historically important. This combination argues powerfully that the site be protected and enhanced for the benefit of city and state citizens desiring to know more about their historical roots. This one site brings to the fore the importance of passenger steam ships, schooners, schooner barges, and barges, all tremendously significant to the history of the area and the Great Lakes. For all practical purposes Bullhead Point is an underwater museum. It should be set up as such for the education and enjoyment of all.

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