A Cultural Landscape Approach (CLA)
Overview and Sourcebook
for
Wisconsin's Mid-Lake Michigan Maritime Heritage Trail Region

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Introduction

This report provides a historic a "cultural landscape" overview and source book for the Wisconsin Mid-Lake Michigan Maritime Heritage Trail Region. Consisting of coastal and submerged areas of Ozaukee, Sheboygan, and Manitowoc Counties, the trail region includes an estimated 120-140 historic shipwrecks. The report provides an array of cultural landscape approach (CLA) perspectives on the region's historic maritime heritage. In 2011 the Federal Advisory Committee of the NOAA National System of Marine Protected Areas recommend the adoption of CLA as the means for achieving the integrated management of cultural resources throughout the System. The Maritime Heritage Program of the NOAA Office of National Marine Sanctuaries have adopted a derivative of CLA the call Maritime Cultural Landscapes (MCL) as a unifying paradigm across the sanctuary system. This "sourcebook" represents one of the early pilot research projects of existing and potential National Marine Sanctuary sites commissioned through the NOAA ONMS.

NOAA ONMS Maritime Cultural Landscape investigations of the California's Redwood Coast (Delgado 2013) and the Graveyard of the Atlantic identify a multitude of important cultural landscape features and specific factors important to the human history and its relationship to the coastal and marine environment. Consisting of a series of strong interpretive statements and a comprehensive coverage of important heritage resources, such studies find ready application in the improved public engagement.

This report looks more at the foundations of landscape and less on specific interpretations of place. It is intended to aid NOAA ONMS and other stakeholders considering the establishment a maritime heritage-focused National Marine Sanctuary on the western side of Lake Michigan. Wisconsin's historic shipwreck resources are well documented when compared with those of most other U.S. States. Since 1988 the Wisconsin Historical Society (WHS) with generous continuing support from the University of Wisconsin Sea Grant Institute and numerous other partners have surveyed that the sites of more than 100 historic shipwrecks. With over 50 listed Wisconsin easily leads the nation in the percentage of historic wrecks on the National Register of Historic Places. The WHS has published several technical reports detailing the archaeology and operational history of Great Lakes shipwrecks. Although evaluated by vessel type and use under multiple property contexts for Wisconsin shipwrecks developed by Cooper and Kriesa in 1990, the archaeological investigations are site specific in their analysis and interpretation.

Following in the direction set by Cooper and Kriesa this study offers "bigger picture" contexts and processes associated with the creation of an Atlantic Maritime cultural landscape in the Great Lakes Region. These contexts and processes not only have value in identifying and interpreting historic resources; they can provide important information to contemporary MPA managers about long term environmental factors and processes of change. Biophysical factors involved in the historic cultural landscape remain important today. Identifying such factors is an important benefit of employing a Cultural Landscape Approach.

The study expands on the analysis from Meverden and Thomsen (2008) *Wisconsin's Historic Shipwrecks: An Overview and Analysis of Locations for a State/Federal Partnership with the National Marine Sanctuary Program*. It provides a basic breakdown and analysis of shipwrecks by trail regions, condensed discussions of selected individual wrecks, as well as discussions of the respective maritime heritage trails shipwrecks and potential as a National Marine Sanctuary. It provides more detailed biophysical information connected with Great Lakes shipping, shipwrecks, and maritime communities.

Although an aid for planners and policy makers, the body of the report takes no position on the question of where best to establish a National Marine Sanctuary in Wisconsin. We suggest, however, that such an assessment involve a wider array social and ecological factors and data than Meverden and Thomsen used in recommending the Mid-Lake Maritime Heritage Trail Region as the best choice for National Marine Sanctuary. In terms of historical significance, all four Maritime Heritage Trail regions contain a large numbers of historically significant shipwrecks and cultural landscapes that merit further study and active preservation. A successful MPA involves far more than the presence of important resources. Resource preservation, potential economic and non-economic values, public access, and community connection are a few of many other factors that require consideration.

In identifying this as a "sourcebook" we hope that the types of information and connections highlighted as relevant in applying a Cultural Landscape Approach will become the sources for deeper study and for new efforts to harness the social power and hard data associated with maritime cultural heritage in the service of improved MPA management and enhance value for the public.

This study was funded through the Friends of the Thunder Bay National Marine Sanctuary and the Office of National Marine Sanctuaries. The authors received substantial assistance from the staff of Office of the State Archaeologist at the Wisconsin Historical Society and the Thunder Bay National Marine Sanctuary. The contents of the report reflect the opinions and errors of the authors and not the sponsoring organizations.

Chapter I. Area Location and Shipwreck Patterns

The Mid-Lake Maritime Heritage Location and Wisconsin Shipwrecks

This Mid-Lake Michigan Maritime Heritage Trail Region is one of four along Wisconsin's coastline (Figure 1).

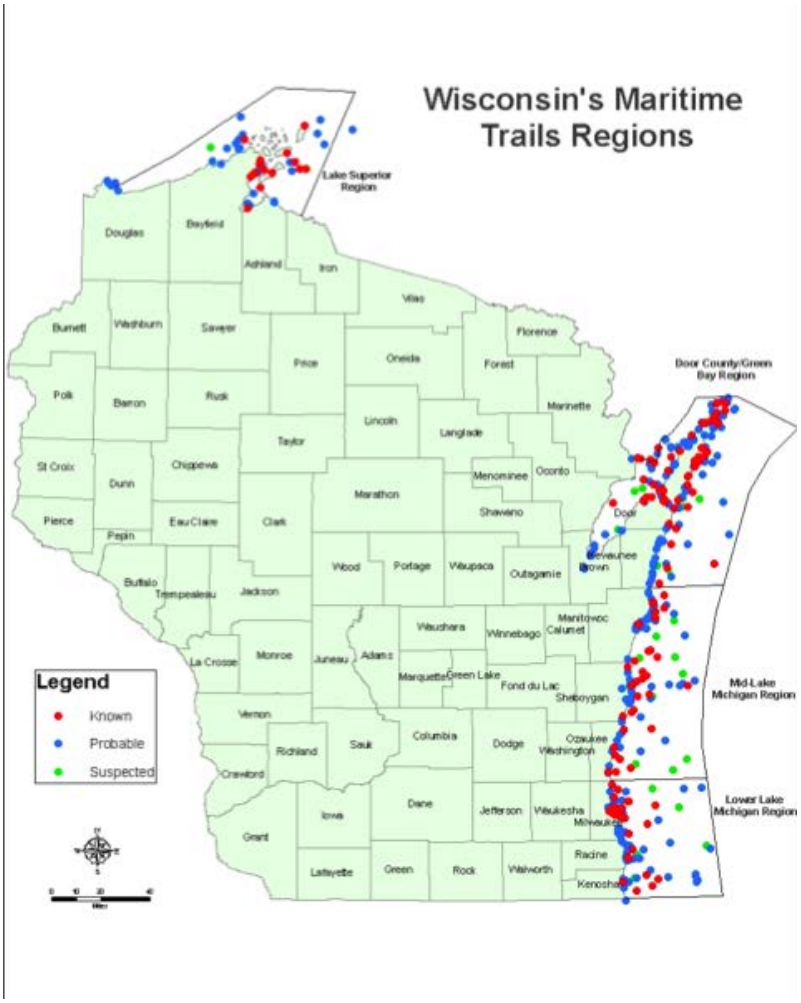

FIGURE 1. The four Maritime Trails regions. The dots indicate known and potential locations of shipwrecks.

The Mid-Lake Region includes all Lake Michigan waters adjacent to Manitowoc, Sheboygan, and Ozaukee Counties. Extending to the Michigan border about 35 miles eastward out into the lake, the area covers 2,552 square miles of water and includes 94.2 miles of coastline (Niedzwiedz 1995). From north to south, the coastal cities include Port Washington, Sheboygan,

Cleveland, Manitowoc, and Two Rivers. Numerous smaller agricultural towns and villages also lay along the coast but coastal bluffs.

The Mid-Lake Michigan Maritime Heritage Trail Region as a unit of management reflects administrative convenience rather than distinguishing cultural or environmental factors. Its largest communities, however, all have individual histories intimately tied to Lake Michigan. Connected with a Lake Michigan maritime transportation corridor central to the story of United States westward expansion and the nation's rapid urban, industrial, and agricultural expansion during the nineteenth and twentieth centuries, Sheboygan, Manitowoc and their smaller neighbors developed in concert with the Midwest as it became America's breadbasket and industrial core.

General Observations on Shipwrecks and Environment in the Mid-Lake Region

1. The Mid-Lake Michigan Region's coastal and marine cultural landscapes embody the intertwined histories of harbor engineering, shoreline change, regional maritime commerce, and local economics.

2. "Wisconsin's Lake Michigan shoreline is generally vulnerable to shore erosion from the Illinois State line to the Sturgeon Bay Canal, a distance of 185 miles. From the Sturgeon Bay Canal around the northern tip of Door County to Green Bay, shore erosion is largely limited to bays and clay banks. Erosion rates are particularly high along sand plains and high bluffs composed of till. Short-term erosion rates of 3 to 15 feet per year have been recorded along sand plains and 2 to 6 feet per year along high bluff lines" (Wisconsin Coastal Management Program 2008).

3. From a maritime perspective, the physical coast lacks natural harbors or sheltered waters, has unstable sediments including sandy patches that make poor holding ground for anchoring, and offers few distinctive visual or submerged landmarks.

4. The location, shape, and composition of the contemporary shoreline and near coastal area is the product of long-term geological and geographical factors and the intensive human modifications that began with the early U.S. settlement of western Wisconsin.

5. The Mid-Lake Michigan Maritime Heritage Trail follows a long linear 92.4-mile shoreline dominated by sand dunes and bluffs. The US Army Corps of Engineers has classified 30% of the present shoreline as artificial and 20.5% as industrial. The dominant shoreline vegetation (51%) is classified as manicured lawn.

6. The large pier and breakwater structures detailed in USACE Table 7 and the artificial shoreline in Table 5 are a product nearly 180 years of planned human engineering of the Mid-Lake Michigan Region's shoreline.

7. The Mid-Lake Michigan region's coastal geomorphology has affected the composition and likely condition of the historic shipwreck population.

8. Nineteenth century coastal engineers viewed the natural Great Lakes as a static environment and attributed changes observed after 1836 to human agency: e.g. harbor structures.

9. Harbor locations and build characteristics contributed significantly to the patterns of shipwrecks occurring the Mid-Lake Michigan Region.

10. Engineers designed Mid-Lake Michigan piers to create protected transportation lanes from harbor fronts along the rivers out to safe deepwater navigation.

11. From 1836 into the early 20th century, federal engineers and local leaders engaged in a leapfrogging war with coastal sedimentation. While an extensive pier expansion and dredge usually brought temporary improvements to harbor access—the engineering brought unintended consequences including the shoaling of the waters approaching the harbors, the creation of sand bars dangerous to navigation, and damaging wave conditions inside harbor areas.

12. The standard development of East – West parallel piers created narrow and sometimes dangerous, or even deadly entrances to harbors.

13. Highly detailed records exist of harbor surveys, construction projects, and waterfront areas that can allow for a comprehensive historical reconstruction of shorelines and the build environment of harbors in Manitowoc, Sheboygan, Two Rivers, and Port Washington.

Observations on Coastal Geomorphology and Shipwrecks

In the Mid-Lake Michigan Region, a combination of softer, geologically-unstable shorelines and unconsolidated, near-coastal sediments—principally sand—have resulted in a lack of natural harbors or good anchorages.

1. Concentration of many of the wrecks near the principal harbors

2. Most sailing vessels stranded on this shores were released with little or no damage due to the soft bottom

3. Many vessels sunk/stranded in areas historically described as “quicksand” could not be saved and rapidly disappeared, mostly after being stripped.

4. Wrecks covered by sand occasionally appear and disappear—but are difficult to find or relocate. Wreckage buried by unconsolidated lake bottom may have high material preservation

Wisconsin Shipwrecks and the Mid-Lake Region

Shipwrecks were a near daily occurrence during the Great Lakes shipping seasons throughout the 19th and early decades of the 20th century. Most shipwrecks involved a few hours or at most a few days of fear, frantic work, and relief as the vessel or vessel involved was hauled from a beach or pumped out and returned to service with minor repairs. A small fraction of these incidents involved the total loss of the vessel and, more rarely, in loss of life. Meverden and Thomsen (2008) draw from the Wisconsin Historical Society shipwreck database and report the potential statewide historic shipwreck population as 651. Of these reported wrecks, 540 have locations associated with one of the Maritime Heritage Trail Regions. The aggregate numbers of shipwrecks accurately illustrate historic patterns and processes. The specific numbers, however, are subject to change as research reveals the identities of additional wrecks, or yields information about the salvage, or the loss of vessels in other area of the lakes. The aggregate shipwreck numbers cited throughout the report are not wholly consistent; however, the patterns they reflect are accurate at the broader cultural landscape level.

Region	Reported Wrecks	Percent of Total Reported in All Regions	Known Wreck Locations	Known in Region as Percent of Total Known	Known as Percent of Total Historic Reported in Trail Region	Known Percent of Historic Wrecks Reported all Regions	Estimated Shoreline
Lake Superior	65	12.0 %	21	13.9 %	32.3	3.9 %	NA
Door County	192	35.6 %	68	45.0 %	35.4	12.6 %	404.4
Mid-Lake Michigan	137	25.4 %	33	21.9 %	24.1	6.1 %	92.4
Lower Lake Michigan	146	27.0 %	29	19.2 %	19.9	5.4 %	69.5
Total	540	100.0%	151	100 %	100%	28.0 %	NA

TABLE 1. Derived from Wisconsin Historical Society Data (Meverden and Thomsen 2008).

The Mid-Lake Michigan Region ranks third among the trail regions in number of historically reported shipwrecks (137) and second in reported wreck locations (33). The shipwreck and coastline characteristics figures for the Mid-Lake and Southern-Lake Michigan Maritime Heritage Trail Regions are very similar and quite distinct from either the Door County or Lake Superior Maritime Heritage Trail regions.

Mid-Lake Michigan Shipwreck Locations

As the map below suggests, the majority of shipwrecks in the mid-lake region involved the stranding of sailing craft along the shoreline.

Meverden and Thomsen (2008) divide Wisconsin's historic wrecks into two categories based on depth. They assigned more value for locating a national marine sanctuary with fully intact "deep" wrecks –those in greater than 25 feet of water than those they describe as being in the "surf zone" (< 25 feet water depth). The great majority of all Wisconsin shipwrecks in all regions are found in less than 25 feet. A closer look suggests that this dichotomy may have less value in determining or managing a sanctuary. As the fuller biophysical and historical landscape discussions reveal, specific coastal dynamics influence the locations and preservation potential of historic wrecks with many examples of well-preserved shallow wrecks through the state.

While the causes of coastline wrecks seem straightforward, the mid-lake wrecking patterns merit a full geo-spatial statistical analysis against the backdrops of bathymetry and historic shipping routes (Figures 3, 4). The relationship between bottom topography, wind patterns, and local sea state may have contributed to yet unrecognized patterns of vessel foundering.

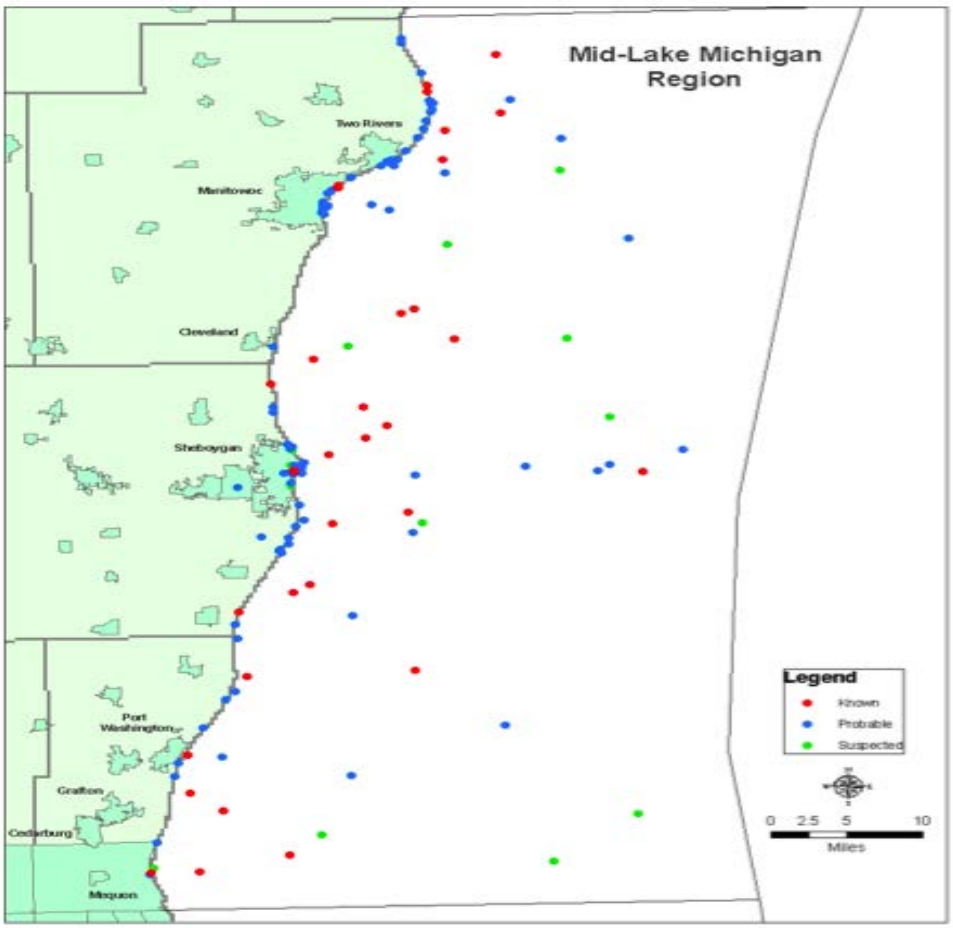

FIGURE 2. The Mid-Lake Region Historic Shipwrecks.

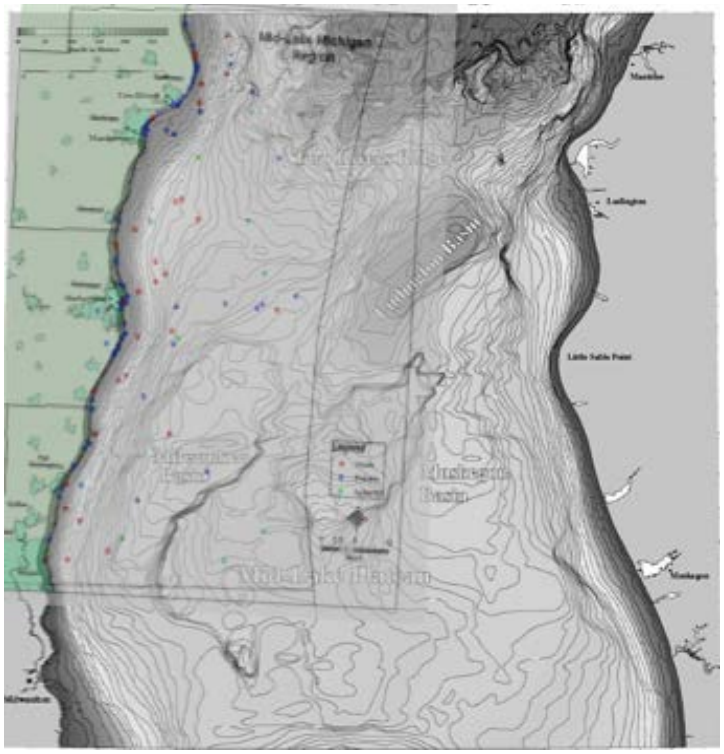

FIGURE 3. Mid-Lake Region shipwrecks superimposed with bathymetry data.

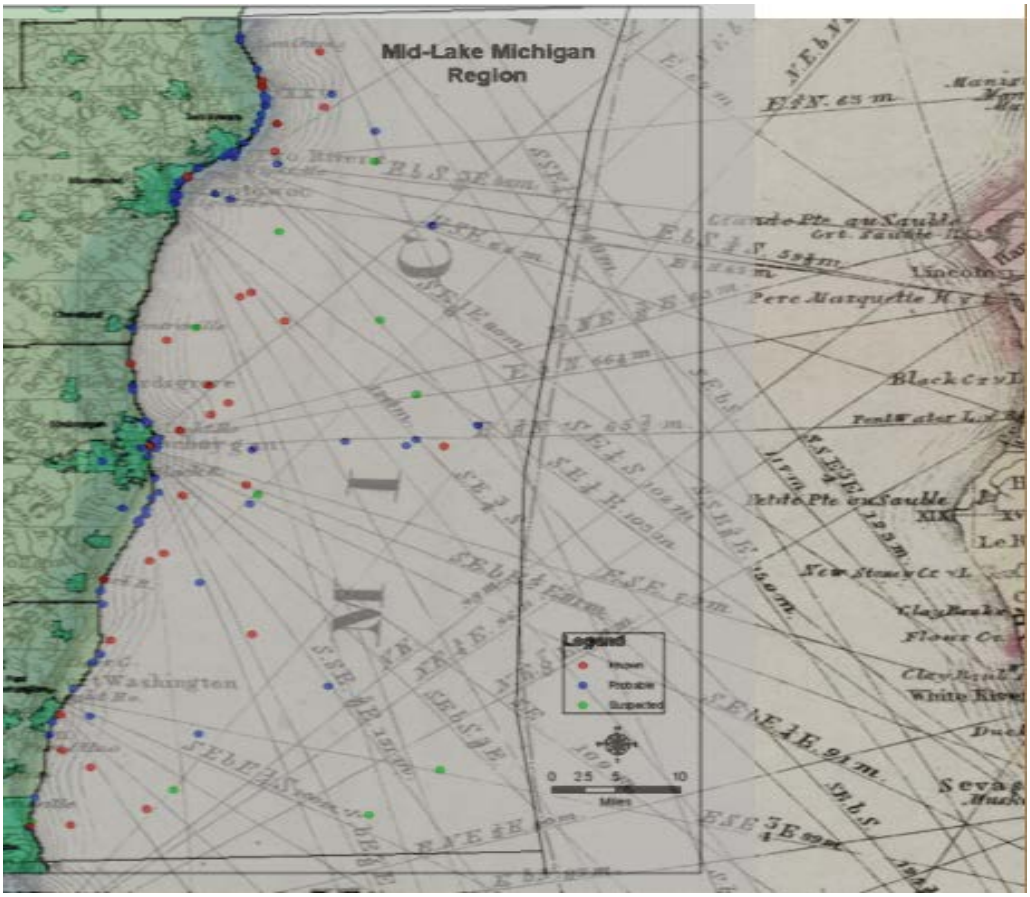

FIGURE 4. Mid-Lake Region shipwrecks superimposed with 1868 navigation lanes.

Shipping routes are a principal determinant of shipwreck patterns. Shipwrecks tend to cluster near major harbors as well as along the convergence point of busy shipping lanes. During the second half of the 19th century, vessels, particularly smaller and medium-sized schooners, carried forest products and supplies, and traded with many Great Lakes communities, thus many frequently used routes developed between ports. These areas are suggested on the 1868 map where the mid-lake wreck locations are coarsely overlaid with routes (Figure 4).

Shipwrecks by Era, Type, and Cause

The vast majority of ships that wrecked in the Mid-Lake Region were wooden sailing vessels built before the collapse of the Great Lakes maritime economy in the mid-1870s. However, the historical significance and interpretive value of individual shipwrecks can be difficult to sort out. A wreck frequently embodies many points in time and space. Vessel function, patterns of usage, and even its physical classification and physical form may change throughout its career. Nonetheless, the time and place of the vessel's construction and loss often has specific meaning that connects with the broader patterns and local dimensions of its history.

In this study, however, we have created periods based on shipwrecking dates in order to capture larger dimensions of landscape change and have divided the mid-lake wrecks into three broad eras. The pioneer era up to 1859, the commercial era from 1860 to 1879, and industrial era wrecks occurring after 1879. Change did not occur simultaneously in all places in the Great Lakes region and the wrecking patterns warrant finer grained chronological evaluation.

Many of the developments in marine technology that characterized the industrializing Great Lakes from the mid-1880s forward began to develop in the 1860s and early 1870s. However, the near succession of shipbuilding in the region from about 1875 to beginning of the 1880s provides a clear break in development. The shipbuilding industry that ensued coincided with the rapid development of heavy industry and the types and sizes of vessels coming off the yards were quantitatively and qualitatively different than in the past. Between the early 1880s and the end of the 1890s, shipbuilding on the Great Lake saw perhaps the most rapid period of technological innovation in U.S. maritime history. The sparse representation of newer craft among the mid-lake wrecks reflects these changes.

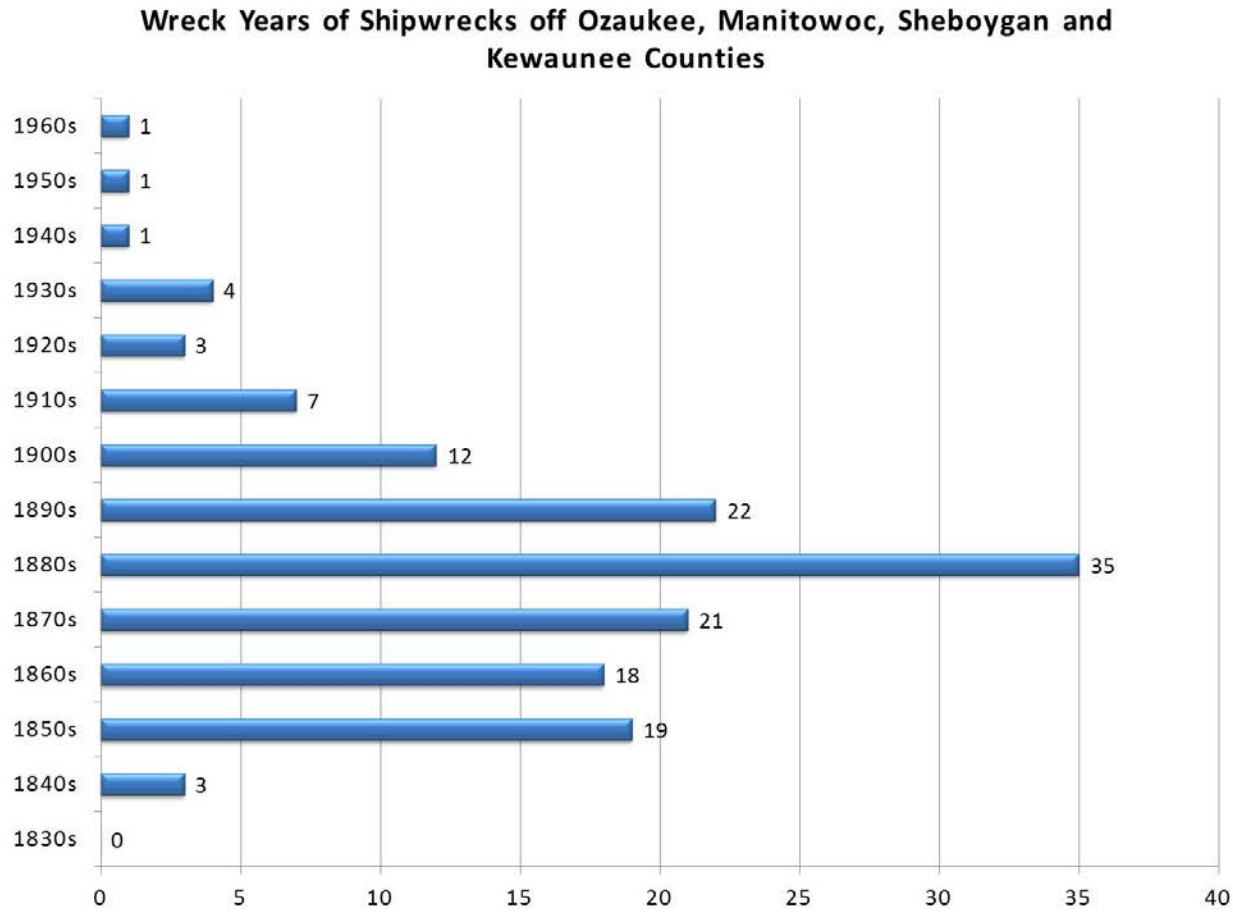

FIGURE 5. Mid-Lake Region wreck data by decade.

A seaworthy and staunch steam vessel in good working condition, if competently operated, was unlikely to founder, hit a pier, or strand along the shore. By contrast, the prudently commanded sailing vessels on the lake routinely wrecked along the lakeshore to no fault of the crew or vessel (Figure 6). Sailing craft dominate the submerged maritime landscape of the Mid-Lake Region in raw numbers. The archaeological record accurately represents the local significance of steam vessels to Lake Michigan communities and economies during the Pioneer Era. During the Commercial Era between 1860 and the mid-1870s, steam navigation on Lake Michigan remained essential to the mid-lake region. It grew substantially in volume, yet resulted almost no terminal wrecks in the area. Ironically, the harbor improvements that made steam navigation safer and more efficient at Manitowoc, Sheboygan, and Port Washington brought additional hazards for the masters of sailing vessels in form of more dangerous harbor approaches and risk of mid-lake collisions with scheduled cross-lake passenger vessels and later rail car ferries.

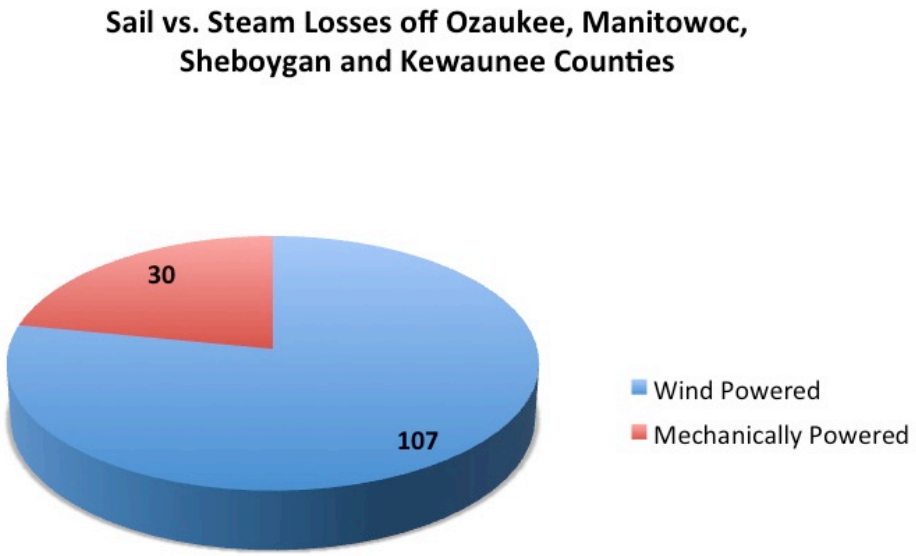

FIGURE 6. Sail vs. steam losses among Mid-Lake Region shipwrecks.

Annual Wreck Patterns

Mariners, insurance companies, and government have been aware that shipwrecks have seasonal patterns of occurrence. These patterns became clearer on the Great Lakes than on the east coast because of the conclusion of commercial navigation that occurred with the coming of winter (Table 2). In the Mid-Lake Region, 66% of the terminal wrecks occurred in the month of September, October, and November. By contrast, the summer months account for 10% of total wrecks. Given the low volume of traffic in early spring, the loss by wrecking of nine vessels is also significant. The relative hazards of the different times of the year connect directly with the underlying weather patterns for the coast described in the physical landscape chapter.

Month	All Wrecks	Burned	Collided	Foundered	Stranded
January	1	0	0	1	0
February	1	0	0	0	1
March	5	2	1	0	2
April	9	0	1	2	6
May	6	1	2	1	3
June	2	0	1	0	1
July	4	1	0	2	1
August	6	0	0	5	1
September	23	2	1	8	10
October	23	0	4	6	13
November	31	2	1	8	18
December	5	0	0	0	5

TABLE 2. Mid-Lake Region shipwrecks sorted by cause and month of occurrence.

Broad Scale Patterns in Mid-Lake Wreck Cargoes

The final cargos the wrecked ships carried embody and illustrate complex and intertwined local and regional ecological and economic histories. During the pioneer era, diverse vessel types typically carried a wide range of cargo, with specialization less common than in later decades (Table 3). This occurred especially during the period when imports by lake exceeded exports—a necessary condition as the new communities and residents working to develop new agricultural and urban economies. Of the twelve wrecks with identified cargos, only three carried the forest products that would later dominate Wisconsin's submerged historic landscape. During the commercial era, the forest product figure rises to 48% and peaks at 60% during the industrial period, before the commercial exhaustion of the northern forests at the beginning of World War I. By the 1880s and 1890s, the forest products increasingly included cordwood for fires, as well as shipments of hardwood to feed the burgeoning lakeshore furniture manufacturing industry. Although representing a modest number of wrecks, the number carrying coal increased substantially after 1880. This corresponds with the growth in regional demand for industrial fuel and the emergence of Sheboygan as an important receiving and western-rail transshipment port for coal. The coal-carrying wrecks reflect the development of regional energy landscape coinciding in time with the one identified through shipwrecks in maritime New England (Mather and Jensen 2011). The extensive employment of steam bulk carriers in the coal trade reduced the likelihood of shipwrecks when compared to the coal-carrying vessels in New England during the period.

The limited representation of grain and especially iron ore in the wrecks is significant as large bulk carriers routinely transited the north-south corridor on Lake Michigan to call at Milwaukee and Chicago. Such vessels had little need to approach the mid-lake shore and thus avoided the possibility of grounding and reduced the chances of collision—the biggest threat the region posed to large craft. Individual wrecks increased the range of cargoes and economic activities represented in the archaeological record but are less illustrative of the Mid-Lake Region's underlying maritime cultural landscape and its evolution.

Year	VESSEL NAME	VESSELTYPE	Month	Type	Primary Cargoes
1846	Rochester (1831)	schooner	10	stranded	NA
1847	Phoenix (1845)	steam screw	11	burned	passengers & freight
1847	E.G. Wolcott (?)	schooner	11	stranded	NA
1851	Gallinipper (1846)	schooner	7	foundered	light
1854	Abiah (1848)	schooner	9	foundered	NA
1854	Major Barnum (1849)	schooner	9	stranded	forest prod
1855	A.V. Knickerbocker (1840)	schooner	8	stranded	forest prod
1855	Baltimore (1847)	steam paddle	9	stranded	Groceries & Supplies
1855	Welland (<1839)	schooner	11	NA	salt
1855	John Irwin (1845)	brig	11	stranded	Groceries & Supplies
1855	Delaware (1846)	steam screw	11	stranded	Hides, Beef, Flour
1856	Niagara (1846)	steam paddle	9	burned	passengers & freight
1856	Toledo (1854)	steam screw	10	foundered	passengers & freight
1856	Bohemian (?)	schooner	10	stranded	RR Iron and Machinery
1856	F.C. Clark (1849)	brig	10	stranded	coal
1857	Brilliant (1856)	schooner	12	stranded	light
1858	Home (1843)	schooner	10	collided	forest prod
1859	Big Z (1844)	schooner	2	stranded	NA
1859	Greyhound (1853)	brig	9	stranded	grain

TABLE 3. Shipwrecks, 1846-1859, sunk off Mid-Lake Region.

The wrecks for the period include five steam and fourteen sailing vessels. Ten of the sailing vessels were lost through stranding, one sank in a collision, two foundered, and one cause is unknown, but probably stranded. Two steamers burned, two stranded, and the third—although classified as foundering—wrecked in shallow water close to shore and may have struck bottom. Fifteen of the nineteen wrecks occurred in September (5), October (5), and November (5).

Sailing Vessels

The sailing vessel wrecks during this period capture the early Great Lakes maritime landscape when commercial schooners were small and multi-purposed such as the 80-ton schooner *Rochester*. Built in 1831 and stranded in 1846, *Rochester* is the oldest vessel and the oldest wreck recorded in the Mid-Lake Region. The perfect size for an undeveloped lake, such small vessels commonly built in the 1820s and 1830s served the limited, but high cargo value markets associated with the fur trade and military activity. As the original trade in cargo and passengers

moved to steamers and larger sailing craft, small schooners such as the *Rochester* made excellent platforms for carrying forest products. At the other end of the spectrum, at 137 feet in length and more the 300-tons burden (old measurement) the largest schooner, *Bohemian,* built and lost in 1856 exhibit the dimensions of a full canaller—a class of the vessels that became increasingly common in the 1860s and early 1870s.

Pioneer Steam Vessels and Disasters

Steam navigation had immediate and long-term effects on the maritime and terrestrial cultural landscapes of the mid-coast counties. The dramatic growth in the mid-coast population runs in parallel with the resurgence and rapid expansion of long-distance steam navigation in the 1840s. During this decade, the size of Great Lakes sidewheel steamers grew exponentially. The largest palace steamers afloat in the United States, *Empire* and *Niagara,* both exceeded 1000 tons in burden and 250 feet in length. Palace steamers continued to grow in size and splendor through the middle 1850s, reaching 350 feet in length. In the 1840s, the largest palace steamers ran between Buffalo and Chicago, stopping at various ports along the way. Later, with the completion of more railways, palace steamers moved to shorter routes that connected with railroads, and to calling at places that lacked rail connections such the communities of mid and northern Lake Michigan (Figure 7).

The 1840s also saw the development and rapid embrace of "propeller" steamers. Somewhat smaller and slower than palace steamers, propellers operated with superior economy and versatility. Between 1845 and 1848, 16,000 immigrants, mostly Germans Lutherans and Dutch Reformists, came to Sheboygan from Buffalo on large Great Lakes steamers. Many others debarked at Manitowoc, Two Rivers, and Port Washington (Wisconsin Works Progress Administration 1941).

FIGURE 7. Great Lakes steamboat routes in 1848 (Doggett 1848).

The 1848 map reproduced above and published by Doggett depicts the general steamboat route at the time of Wisconsin Statehood. Some pioneer steamboats crossed the Lake further north using Rowley Point/Twin Rivers as a landmark and then followed the shoreline south, stopping at one or more of the smaller ports before calling at Milwaukee and Chicago.

The mix of frontier navigational conditions and pioneer steam technologies led to increasing numbers of disasters on the Great Lakes in the 1840s and 1850s. Five pioneer steamboats wrecked in the mid-lake area between 1847 and 1856, four involved large losses of life and are significant events in the histories and cultural memories of the three mid-lake counties.

Phoenix

On November 21, 1847, the propeller *Phoenix* burst into flames on route to Sheboygan from Manitowoc. The vessel burned to the waterline and claimed more than two hundred lives. The charred hull was towed to Sheboygan where it grounded near the pier. The machinery was salvaged and the hull broken up by ice and wave action. Any remains of the vessel are believed buried below the present Sheboygan waterfront (Wangeman 1995, Van Eyke).

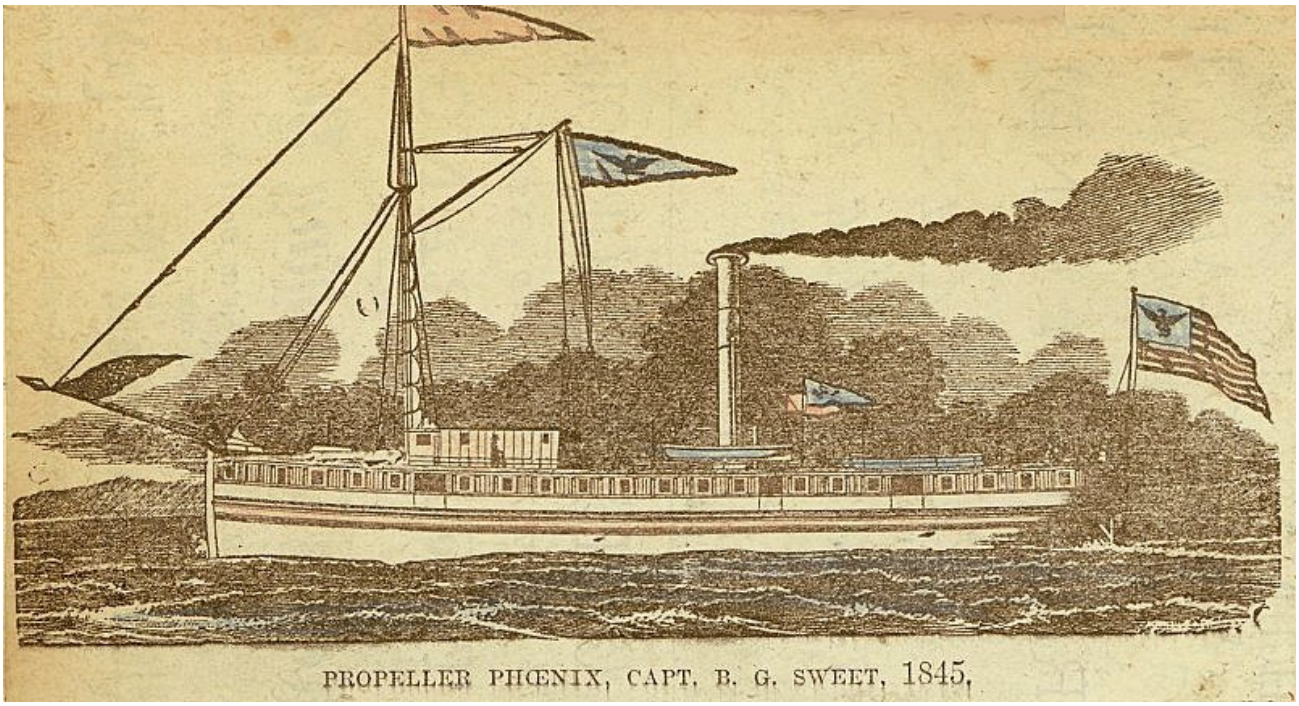

FIGURE 8. Woodcut engraving of the propeller *Phoenix*, possibly on Lake Michigan in 1845. (Courtesy of the Brendon Baillod Collection).

Delaware

On November 11, 1855, the Buffalo-bound propeller steamer *Delaware* was driven ashore about 8 miles below of Sheboygan killing 11 from a crew of 18. Built on Lake Ontario in 1846, the vessel had a cargo of green hides and 2400 barrels of beef loaded at Chicago. Originally 145 feet in length (canal size) – it was cut in half and lengthened by 30 feet in 1847. Small boats from the *Delaware* assisted in the rescue efforts when the *Phoenix* burned.

Niagara

On September 24, 1856, the palace steamer *Niagara* burned about seven miles north of Port Washington and claimed an estimated 60 lives. Archaeologists from the Wisconsin Historical Society have documented the *Niagara* and it is listed on the National Register of Historic Places. In approximately 50 feet of water, the vessel is highly accessible to divers and includes the well-preserved remains of a rare James Allaire walking-beam steam engine. The huge boiler is a physical reminder of the vast quantities of native wood consumed by the palace steamers. (Jensen 1999).

Toledo

On October 22, 1856, the *Toledo* wrecked in heavy seas while anchored within a quarter mile of the Port Washington pier, killing between 30 and 40 people including the captain. The circumstances of the wreck at Port Washington highlight the dangers posed by the unimproved Lake Michigan harbors. Parts of the wreck survive and are highly scattered just offshore from town.

Representing only five of the shipwrecks in the area, the steamers capture the significance of steam navigation along the coast during the Pioneer Era. From the mid-1840s onward, Manitowoc and Sheboygan became a common destination for Germans, and other northern European immigrants. The stories of the wrecks connect directly with lakeshore communities as important benchmarks in their history, and are parts of the pioneer heritage of many present families whose ancestors settled along the lakeshore.

The losses of life in these events illuminate the centrality of steam vessels in the movement of people across the Great Lakes during Wisconsin's territorial and early statehood decades. Steam also carried much of the package freight and manufactured goods needed to sustain growing frontier communities. Further, steam's importance helps explain the almost-desperate energy expended on harbor development by Sheboygan's business and community leaders in the 1840 and 1850s. Steamers also carried increasing volumes of western products, such as green hides and barrels of beef, as lost on the *Delaware*.

The steamers are important features in the settlement phase of the Atlantic Maritime Cultural Landscape in Wisconsin. The pioneer vessels themselves were wholly Atlantic in their conception, their builders, and their origins. The steamers provide a westward extension to the Atlantic maritime bridge that altered the cultural composition of the United States by bring millions of Germans, Irish, Scandinavians, and other northern Europeans to the United States in the middle decades of the 19th century. The large percentage of passengers carried westward on these vessels, and including nearly all who died on the *Phoenix*, were part of the larger Atlantic

Tables showing the number and kind of vessels sustaining losses on the lakes by shipwreck, stranding, and collision, during a period of eight years, from 1848 to 1855, both inclusive, with the amount of damage sustained.

STEAMBOATS.

Years.	Shipwreck.		Stranded.		Collision.	
	No.	Loss.	No.	Loss.	No.	Loss.
1848	3	$25,000	9	$47,000	------	----------
1849	1	25,000	5	21,000	3	$1,400
1850	5	98,000	8	13,400	8	28,800
1851	2	27,000	5	36,700	9	6,000
1852	3	125,000	5	14,700	16	158,350
1853	3	126,000	7	51,000	11	31,650
1854	4	110,000	2	110,000	8	31,200
1855	4	378,500	11	11,350	12	36,600
	25	914,500	52	305,150	67	286,000

PROPELLERS.

Years.	Shipwreck.		Stranded.		Collision.	
	No.	Loss.	No.	Loss.	No.	Loss.
1848	------	----------	1	$12,000	1	$400
1849	------	----------	1	5,000	------	----------
1850	------	----------	4	2,500	3	2,400
1851	2	$55,000	6	32,800	10	40,400
1852	4	85,000	5	6,900	9	73,000
1853	1	42,000	7	28,900	4	3,900
1854	5	370,000	------	----------	8	69,500
1855	7	351,000	11	9,950	19	557,750
	19	903,000	35	99,050	54	667,800

TABLE 4. Great Lakes steam losses 1848-1855 (Wade 1856).

Year	Vessel Name	Vessel Type	Month	Type	Primary Cargo
1861	Sir William Wallace (1836)	schooner	3	stranded	forest prod
1861	J.M. Jones (1855)	schooner	9	collided	forest prod
1862	Ocean Eagle (1855)	brig	10	struck Pier	grain
1864	Mahoning (1847)	brig	11	foundered	NA
1864	Oleander (1848)	brig	11	stranded	forest prod
1864	Mojave (1864)	bark	11	foundered	
1865	Fish Hawk (1858)	schooner	9	stranded	leather and flour
1866	Henry R. Seymour (1847)	brig	4	stranded	
1867	Byron	schooner	5	collided	salt, freight
1867	Tubal Cain (1866)	bark	11	stranded	grain
1868	Northerner (1851)	schooner	11	foundered	forest prod
1868	L. B. Nichols (1854)	schooner	10	stranded	forest prod
1868	Richard Roe (1857)	schooner	9	stranded	fruits & vegetables
1868	James Navagh (1857)	schooner	10	stranded	grain
1869	Belle (1860)	steam screw	11	burned	forest prod
1869	Nora (1869)	schooner	10	collided	stone
1871	Dan Tindall (1858)	schooner	9	abandoned	forest prod
1871	Major Anderson (1861)	bark	10	stranded	coal
1872	Planet (1855)	Barge (former steamer)	11	foundered	forest prod
1872	Eva M. Cone (1857)	schooner	4	stranded	forest prod
1872	Winona (1863)	schooner	11	stranded	coal
1873	Hampton (1845)	brig	9	foundered	light
1873	Minnesota (1847)	schooner	11	stranded	forest prod
1873	R.J. Sanborn (1860)	schooner	11	stranded	forest prod
1874	Dispatch (1857)	schooner	11	stranded	forest prod
1874	St. Peter (1868)	schooner	5	foundered	grain
1875	W.F. Allen, Jr. (1853)	schooner	10	stranded	forest prod
1875	Mary Ann Scott (1871)	scow-schooner	11	stranded	supplies
1875	La Salle (1874)	schooner	10	stranded	grain
1877	Magellan (1873)	schooner	11	collided	grain
1878	Express (1864)	scow brig	4	collided	light

TABLE 5. Shipwrecks in the Mid-Lake Region, 1860-1879.

The amended Wisconsin shipwreck database used in this study contains 31 reported wrecks that occurred between 1860 and 1879 (Table 5 Above). During this period, the Great Lakes maritime economy had recovered from the Panic of 1857, peaked in the early 1870s, and crashed again in the with the Panic of 1873 where it languished until the latter part of the decade. This was the "golden age" of wind-power, with the Great Lakes sailing fleet reaching its historic peak of 1,855 vessels in 1868 – a 60% increase from 1860 (Karamanski 2000).

The wrecks for the period include 29 sailing vessels, 1 steam vessel, and one towed barge (the converted hull of paddle steamer *Planet*). The sailing vessels included 3 barks, 6 brigs, 19 schooners, and 1 scow-schooner. Seventeen sailing vessels stranded, 6 foundered, five were lost in collisions, and one hit the pier head at Sheboygan.

Thirteen of the vessels wrecked while carrying forest products, 5 carried grain, 2 carried coal, and two were running light. Other cargo included salt, supplies, stone, fruit, vegetables, leather, and flour.

Twenty-five of the wrecks occurred in September (5) October (7) and November (13). Seven wrecks occurred in March (1), April (3), and two in May (2). No terminal wrecks occurred during the summer or winter months.

Year	VESSEL NAME	VESSELTYPE	Month	TYPE	Primary Cargo
1880	Hannah Etty (1864)	schooner	8	foundered	wood and coal
1880	Walter B. Allen (1866)	schooner	4	foundered	grain
1880	Betty Taylor (1874)	schooner	8	foundered	light
1881	C.S. Davis (1870)	schooner	12	stranded	forest prod
1882	Oliver Culver (1855)	schooner	12	stranded	forest prod
1882	E.M. Portch (1867)	schooner	3	collided	light
1882	Grace Patterson (1880)	steambarge	3	stranded	forest prod
1883	Petrel (1847)	schooner	10	stranded	forest prod
1883	Arrow (1852)	schooner	4	stranded	light
1883	Dart (1867)	schooner	10	stranded	fruit
1883	Guiding Star (1869)	schooner	11	stranded	coal
1884	Ahnapee (1867)	scow-schooner	6	stranded	forest prod
1884	Bessie Boat (1868)	schooner	9	foundered	forest prod
1885	Advance (1853)	schooner	9	foundered	forest prod
1885	Milton (1867)	scow-schooner	9	foundered	forest prod
1885	Nellie Church (1867)	scow-schooner	9	stranded	forest prod
1885	White Oak (1867)	scow-schooner	10	stranded	forest prod

1885	Floretta (1868)	schooner	9	foundered	ore
1885	Boss (1882)	fish tug	1	foundered	fish
1886	Hercules (1854)	scow	7	foundered	forest prod
1886	Belle Wallbridge (1857)	schooner	11	stranded	forest prod
1886	Pathfinder (1869)	schooner	11	stranded	ore
1886	Selah Chamberlain (1873)	steam screw	10	collided	forest prod
1887	Gertie Wing (1880)	schooner	5	stranded	fruit
1887	Blue Belle (1867)	scow-schooner	9	stranded	forest prod
1887	G.P. Heath (1872)	steam screw	5	burned	hay and merchandise
1887	Polynesia (1885)	schooner	10	foundered	coal
1887	Vernon (1886)	steam screw	10	foundered	passengers & freight
1890	Montgomery (1866)	schooner	11	stranded	coal
1890	Alaska (1869)	scow-schooner	NA	stranded	grain
1890	Nevada (1882)	steam screw	11	foundered	coal
1891	Mediterranean (1859)	schooner	9	foundered	rock plaster
1891	Silver Cloud (1869)	scow-schooner	7	stranded	forest prod
1892	Mary B. Hale (1857)	schooner	10	stranded	forest prod
1893	unknown scow (a)	scow	8	foundered	stone
1893	Julia (1843)	steam paddle	0	abandoned	none
1894	Emily Cooper (?)	schooner	5	stranded	NA
1894	Island City (1859)	schooner	4	foundered	forest prod
1894	Speed (1866)	scow-schooner	11	stranded	forest prod
1894	Lottie Cooper (1876)	schooner	4	stranded	forest prod
1895	Maria	schooner	11	stranded	forest prod
1897	Conquest (1853)	schooner	0	abandoned	none
1897	Wollin (1854)	schooner	4	stranded	forest prod
1897	Lookout (1855)	schooner	4	stranded	light
1897	Lavinda (1863)	schooner	0	abandoned	none
1897	Joseph G. Masten (1867)	bark	12	stranded	coal
1898	Lorenzo B. Sheppard (1855)	schooner	10	foundered	forest prod
1899	Muskegon (1871)	steam paddle	0	abandoned	none
1900	Silver Lake 1889	scow-schooner	5	collided	forest prod
1901	Sea Gem (1863)	schooner	9	stranded	forest prod
1901	Ella Ellenwood (1870)	schooner	9	stranded	forest prod

1903	Tennie and Laura (1876)	scow-schooner	8	foundered	forest prod
1904	Continental (1882)	steam screw	12	stranded	light
1905	Graham Brothers (1874)	schooner	0	abandoned	none
1906	Atlanta (1891)	steam screw	3	burned	passengers & freight
1908	R.H. Becker (1867)	scow-schooner	5	stranded	forest prod
1908	S.C. Baldwin (1871)	barge	8	foundered	stone
1908	J.M. Harvey (1896)	gas schooner	11	stranded	vegetables
1909	Commerce (1857)	schooner	11	foundered	forest prod
1909	Francis Hinton (1889)	steam screw	11	stranded	forest prod
1910	Challenge (1852)	schooner	9	stranded	forest prod
1910	Ann Arbor #1 (1892)	car ferry	3	burned	forest prod
1910	Pere Marquette 18 (1902)	car ferry	9	foundered	rail cars, coal, merchandise
1910	Lynx (1905)	scow-schooner	0	abandoned	none
1912	Rouse Simmons (1868)	schooner	11	foundered	forest prod
1914	Sheboygan (1869)	steam paddle	9	scrapped and abandoned	nothing
1919	McMullen and Pitz Dredge	dredge	11	foundered	machinery
1921	Helvetia (1873)	schooner-barge	0	abandoned	none
1922	Robert C. Pringle (1903)	steam screw	6	foundered	none
1929	Senator (1896)	steam screw	10	collided	automobiles
1930	Our Son (1875)	schooner	10	foundered	forest prod
1930	Arctic (1881)	tug	0	abandoned	none
1934	William A. Reiss (1901)	steam screw	10	stranded sc	none
1935	Henry Gust (1893)	fish tug	0	abandoned	none
1956	Humko (1946)	yacht	7	burned	unknown
1907 - 10?	Libbie Carter (1882)	scow-schooner	0	abandoned?	

TABLE 6. Shipwrecks in the Mid-Lake Region, 1880-Present.

Seventy-seven vessels are reported as wrecked or abandoned in the Mid-Lake Region from 1880 into the 1950s (Table 6). The 1880s (28 wrecks) and 1890s (20) saw the greatest concentration of terminal wrecking events in the history of the lakeshore. In other maritime regions, most notably the Northeastern/Mid-Atlantic maritime corridor, industrialization brought similar spikes in shipwrecking (Mather and Jensen 2011).

From a purely quantitative perspective – the most important environmental and economic theme revealed by shipwrecks in the Mid-Lake maritime cultural landscape involve the transportation of raw, milled, and manufactured goods associated with the Great Lakes lumber industry. Over half of all of Wisconsin's historic shipwrecks with identified cargo was carrying some form of forest-related cargo. The prevalence and persistence of hundreds of wooden schooners and modest-sized wooden steamers into the early 20th century reflected the once-abundant forests and inexpensive, but high quality raw materials they provided.

The lumber trade was important from early settlement and boomed in the Great Lakes region during the mid-1840s and 1850s. The American national hunger for Great Lakes wood continued to grow throughout the nineteenth century. Chicago, at the confluence of the Great Lakes, Illinois Waterway, and, most significantly, railroads to the west became the nation's largest lumber market and one its busiest commercial ports (Karamanski 2000). The mid-lake wrecks fit into these larger patterns and illustrate the local dimensions of forest products. Beginning with the early mills that produced lumber for export, the community transitioned into importers of raw materials with tanneries, lumberyards, and an extensive manufacturing sector required natural resources once available locally.

Although purpose-built steam lumber vessels (steam barges) began coming into use in the 1860s and built in Manitowoc into the late 1880s or later, a huge proportion of the trade from hinterland to market occurred on sailing vessels. These sailing vessels sometimes operated independently, but often operated as one of a string of vessels towed behind steam tugs. The low intrinsic value of most the forest products, the extensive hand labor required for loading and unloading, and the fluctuating nature of demand favored the use and reuse of old vessels—many long past their prime. In contrast with coal, ore, and grain – forest products remained a trade where the independent, smalltime maritime entrepreneur could compete and prosper.

Early economic and industrial development in the principle mid-coast ports resulted from the unusual ecological diversity of commercially useful soft and hard woods available locally, or nearby. The contemporary terrestrial landscape and the composition of the mid-lake historic shipwreck population capture the extraordinary ecological and economic transformation of Wisconsin from axe, to mill, to factory during the 19th and early 20th centuries in highly nuanced ways.

Underlying the composition and patterns of shipwrecks in the Mid-Lake Region is the influence of coastal geology and the attitudes and methods of coastal engineers charged with developing and maintaining commercial ports. These issues are discussed more deeply in the chapter that describes the development of an Atlantic Maritime Cultural Landscape during the Pioneer era. A strategically located coastline on the Western edge of the Atlantic maritime system and adjacent to fertile lands and valuable natural resources, the Mid-Lake Region's lack of natural harbors forced generations of federal coastal engineers and local contractors to recast the coastline on multiple occasions to meet changing economic and political conditions. Wrecks figure prominently in this story. Shipwrecks and the fear of shipwreck caused and shaped recurrent human manipulation of the mid-lake lake coast and near shore environments Local shipwrecks also reveal the long history of federal involvement in the shaping the affairs and economic destinies of the major mid-lake communities in Wisconsin.

Chapter II: The Biophysical Foundations of the Mid-Lake Maritime Cultural Landscape

Geology

Bedrock Geology

Coastal Manitowoc, Sheboygan Ozaukee Counties rest on bedrock from the Silurian and Devonian periods. Created with the calcium carbonate deposited by dying sea organisms during periods of ocean advancement in the Paleozoic Era, the bedrock forms an ancient maritime geological landscape (Figure 9).

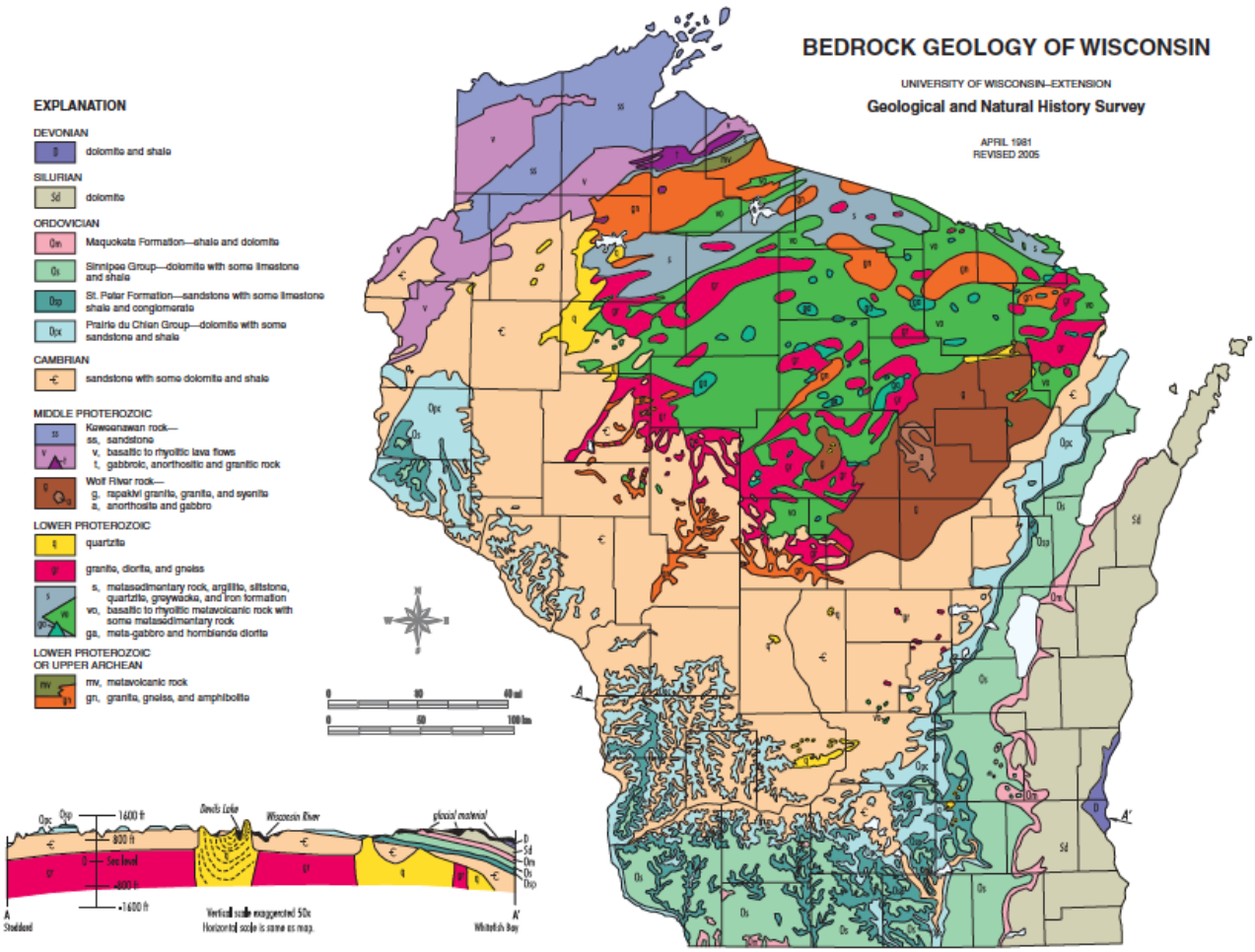

FIGURE 9. Bedrock geology of Wisconsin (Wisconsin Geological Survey 2005).

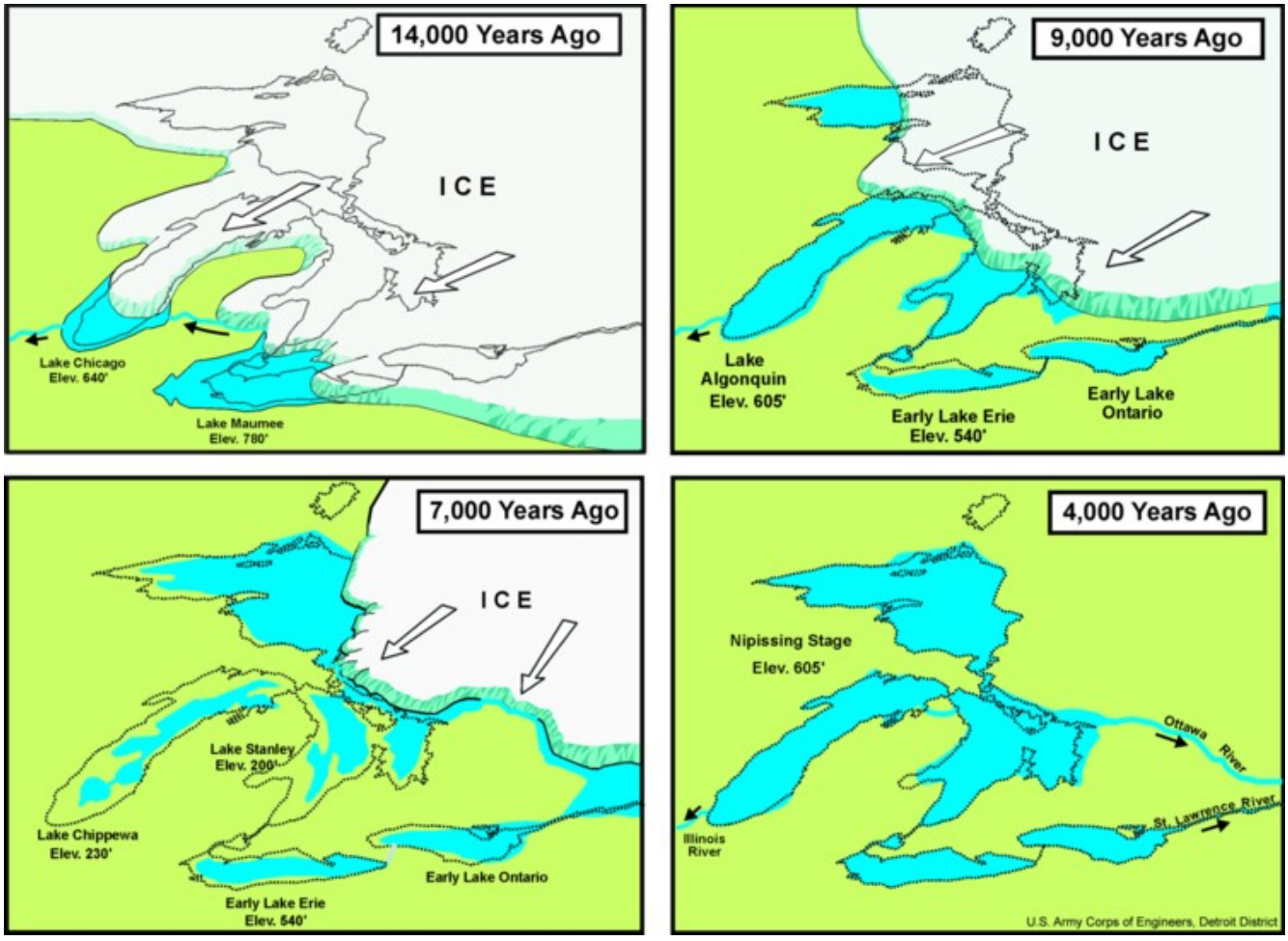

FIGURE 10. Glacial ice retreat (Courtesy of the US Army Corps of Engineers, Detroit District).

The Wisconsin Ice Sheet reached its maximum size 14,500 years ago. Its subsequent contraction over the next 10,000 years created the present Great Lakes basin, and shaped the eastern two-thirds of Wisconsin's contemporary surface geology. Glaciers flattened the landscape of the Mid-Lake Region and created the region's watershed including inland lakes, rivers, streams and creeks. The melting glaciers deposited gravel, sand, and rock in ridges called eskers, and left a coating of glacial till consisting un-stratified sand, clay, pebbles and rock (Wisconsin Cartographer's Guild 1998).

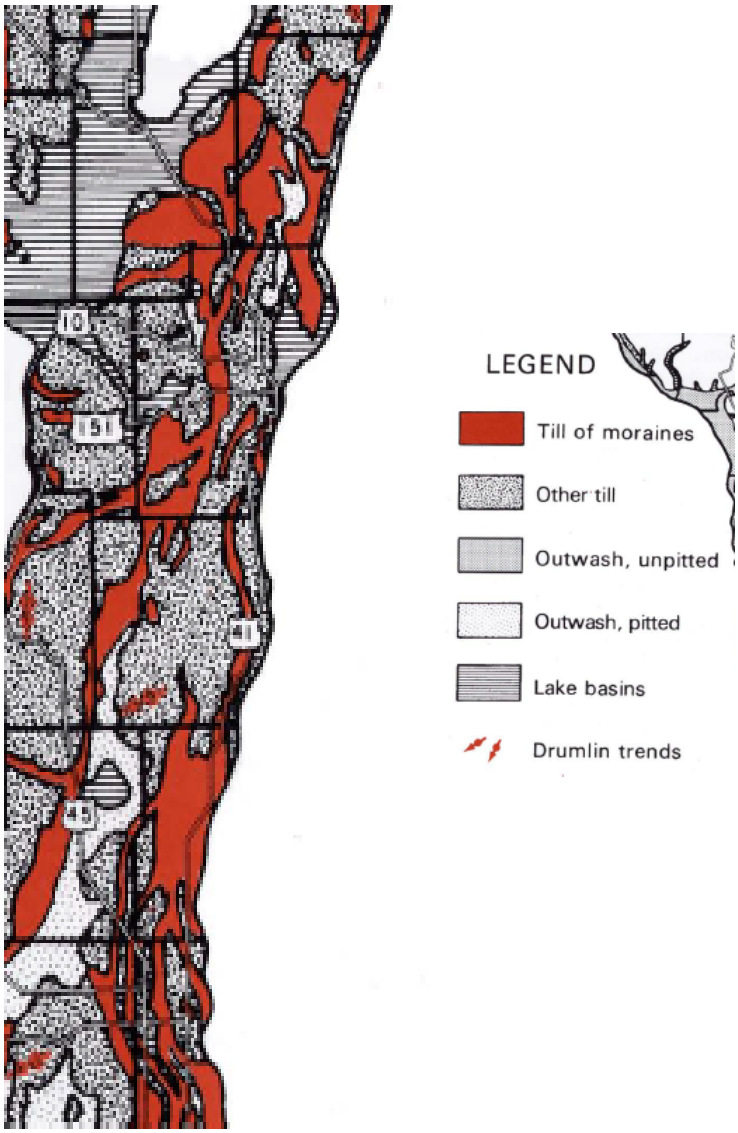

FIGURE 11. Ice Age Deposits of Wisconsin (Courtesy of the University of Wisconsin Extension Geological and Natural History Survey 1964).

The predominant coastal and inland soils are classified as forested, red, clayey or loamy with areas of stream bottom and wetland soils near Two Rivers and Manitowoc (Figure 12).

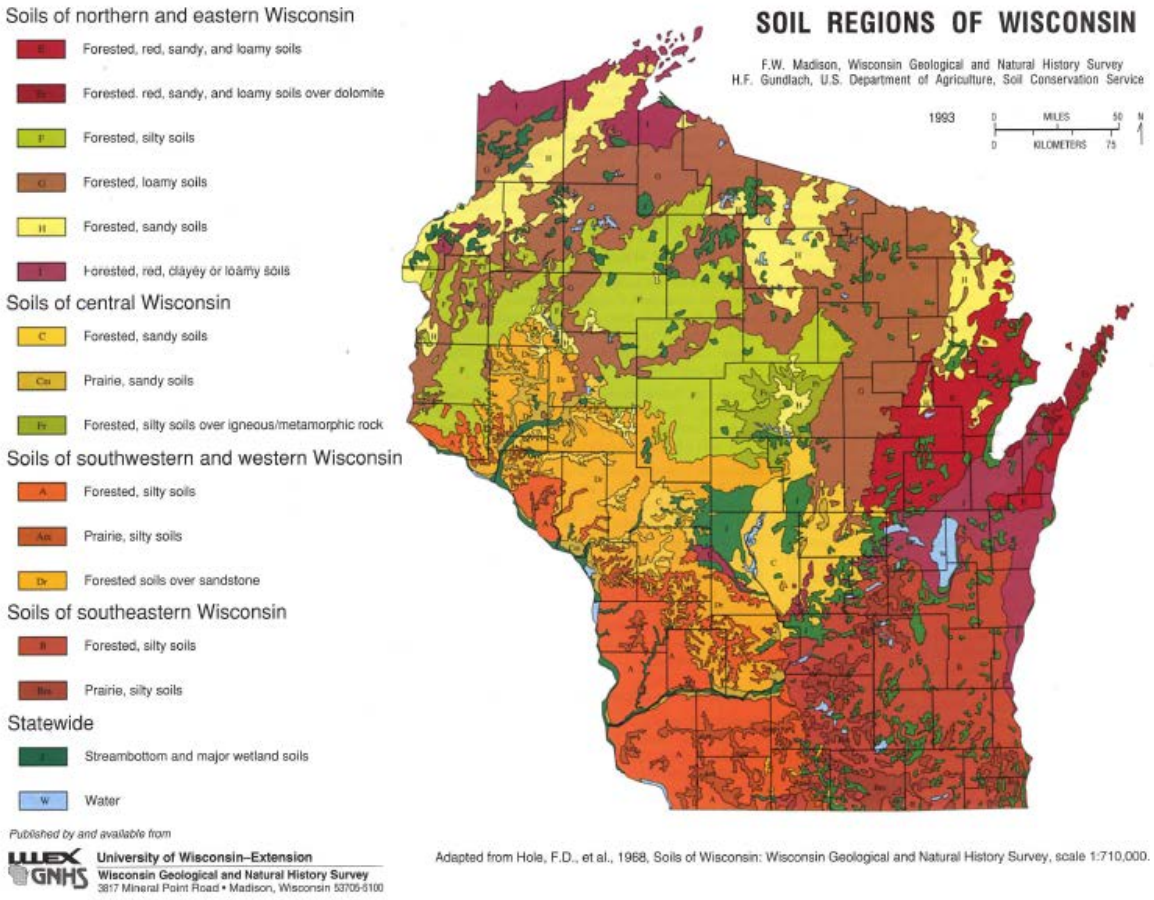

FIGURE 12. Soil regions of Wisconsin (Madison and Gundlock 1993).

The coastal geology consists principally of unconsolidated soils extending 50 and 200 feet below the surface (Figure 13).

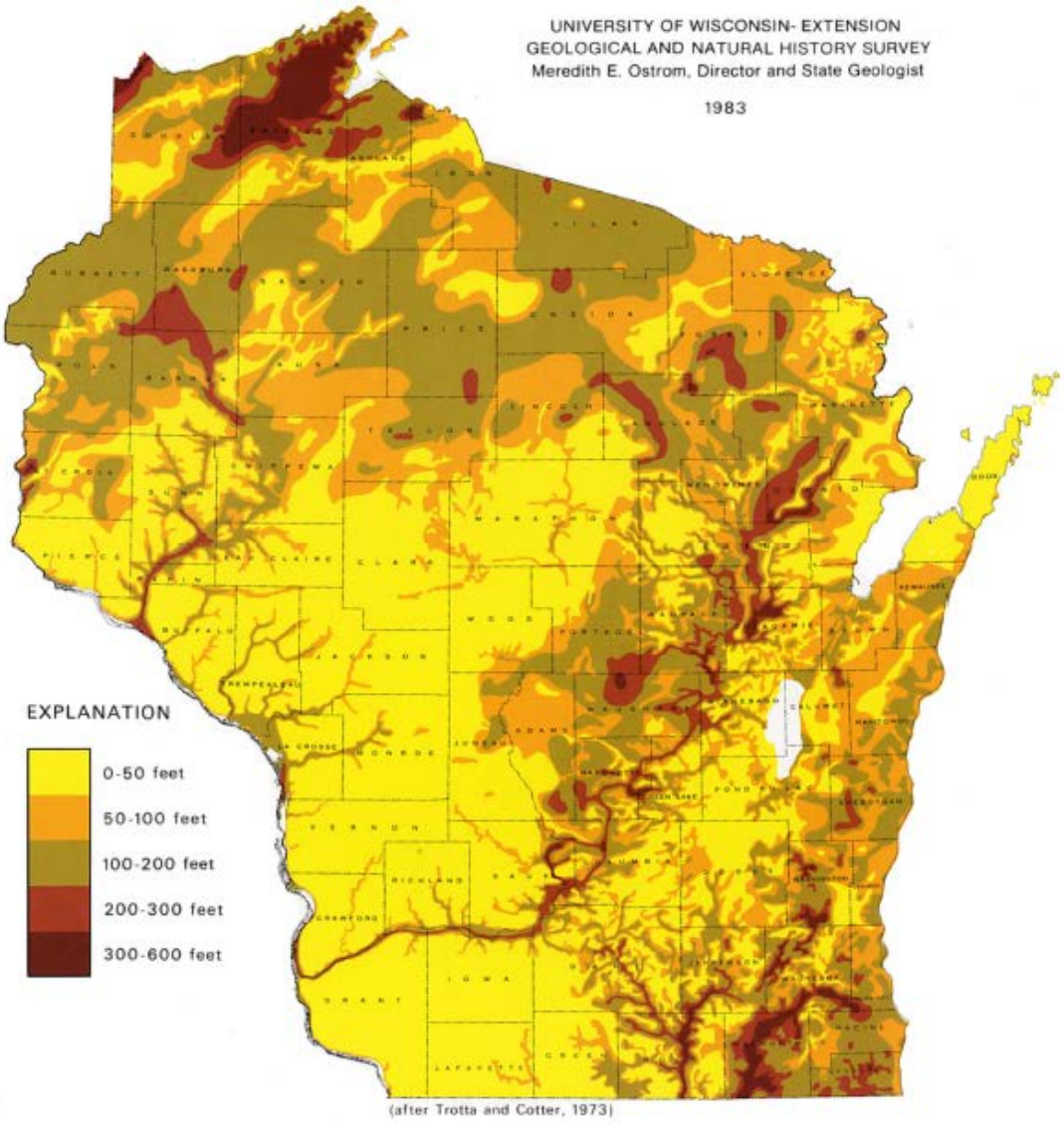

FIGURE 13. Thickness of unconsolidated soils in Wisconsin (Olstrom 1986).

County	Total Shoreline (mile)	Artificial Shoreline (mile)	Boulders, Bedrock (mile)	Cohesive Clays and Silts (mile)	Sand (mile)	Shingles, Pebbles, Cobbles (Mile)
Manitowoc County	37.4	8.7	--	--	28.7	--
Ozaukee County	27.9	6.5	--	--	15.2	6.2
Sheboygan County	28.8	12.4	0.6	--	14.0	1.8

TABLE 7. Shoreline types in the Mid-Lake Region (FEMA 2013).

Shoreline elevation and composition range from a few miles of low flat coastline to high bluffs and sand dunes.

County	Total Shoreline (mile)	Bluff 2'-10' (mile)	Coastal Wetland	Dune 2'-10' (mile)	Flat Coast (mile)	High Bluff 10'+ (mile)	High Dune 10'+ (mile)
Manitowoc County	37.4	7.5	--	11.2	3.1	15.1	0.6
Ozaukee County	27.9	3.1	--	7.8		16.4	0.6
Sheboygan County	28.8	6.8	--	15.2	1.9	4.9	--

TABLE 8. Shoreline coverage in the Mid-Lake Region (FEMA 2013).

The coastline is highly susceptible to erosion. A comprehensive 1905 geological survey captures the dynamic and shifting nature of the coast near Manitowoc:

> Nowhere along the Wisconsin coast is there a better illustration of the sawing of the lake into the land. The vertical and even overhanging cliffs of red clay or capped by tumbling sods, with occasionally a tottering and dangling fence. At the foot of the cliff is usually a thin narrow pebble beach, hardly concealing a wave-cut bench of red clay, so nearly complete is the transfer of material, which falls block by block into the water. In many places, indeed, there is no beach at all, but a narrow red clay shelf swept bare by the waves. At each storm, during the last few years, the lake has eaten back several feet. At such times the lake for over half a mile off-shore is discolored by red sediment, sweeping northward past Two Rivers (Goldthwait 1907).

Local observers consulted in the 1905 survey reported erosion in excess of 150 feet occurring at vulnerable points in the preceding few years. Extensive historical and contemporary coastal erosion data for that area is available, see FEMA 2013 for a list of readily accessible data.

Submerged Geology

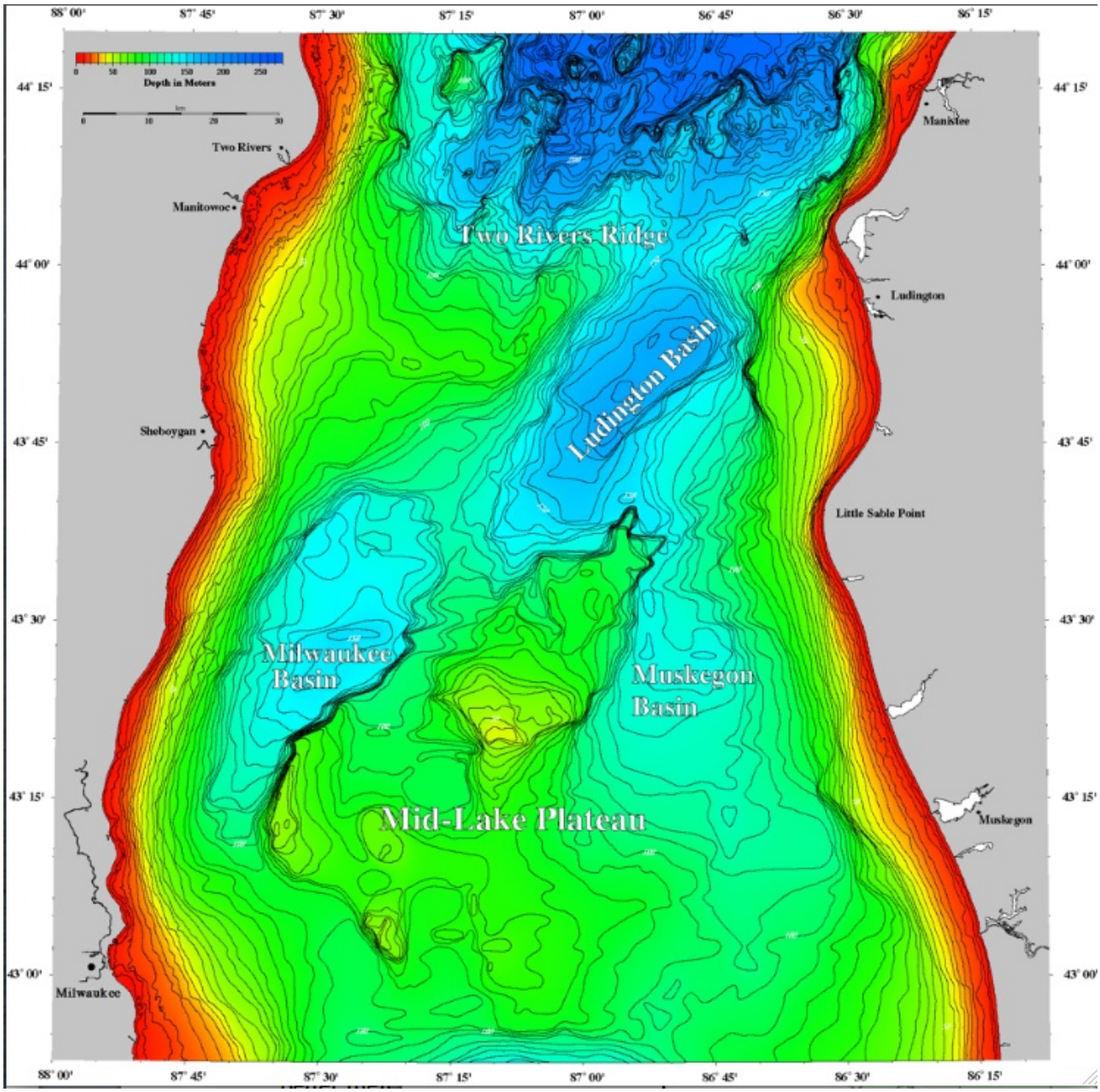

FIGURE 14. Mid-Lake Michigan bathymetry (Courtesy of the National Oceanic and Atmospheric Administration).

The offshore northern reaches of the study area correspond roughly with the western edge of the Two Rivers Ridge: the end moraine of the last glacial advance. Comprised of glacial till and deposited sediments atop dolomite bedrock, the Two Rivers Ridge extends in a south, southeast, and eastern arc outward into the middle of the Lake. North and west of the ridge, the lake deepens to more than 250 meters in the Chippewa Basin. South of the Ridge, the lake bottom

rises and creates a large shallow plain that extends from close to shore north of Rowley Point, to a point about 30 miles east of Manitowoc. From this point, the edge of the plain runs to the southwest and approaches the shore south of Sheboygan. Over the past 10,000 years, this area has been alternatively flooded (9000 BCE), dry (7000 BCE), and flooded again (roughly 4000 BCE to the present.

Lake Water Levels

The Lake Michigan chart datum is 577.5 feet above sea level. Lake Michigan's water level fluctuates seasonally about 12 to 18 inches, with the highest waters in the summer and the lowest in midwinter. Over multi-year cycles, however, the Lake level has varied more than 7 feet, with the highest monthly averages 5.92 feet over the datum in 1986-87 and the lowest 1.38 feet below the datum in 1964 -66 (Figure 15). The forecasted water Level for December 6, 2013 is 577.33 feet or 14 inches lower than the long-term recorded average for the month.

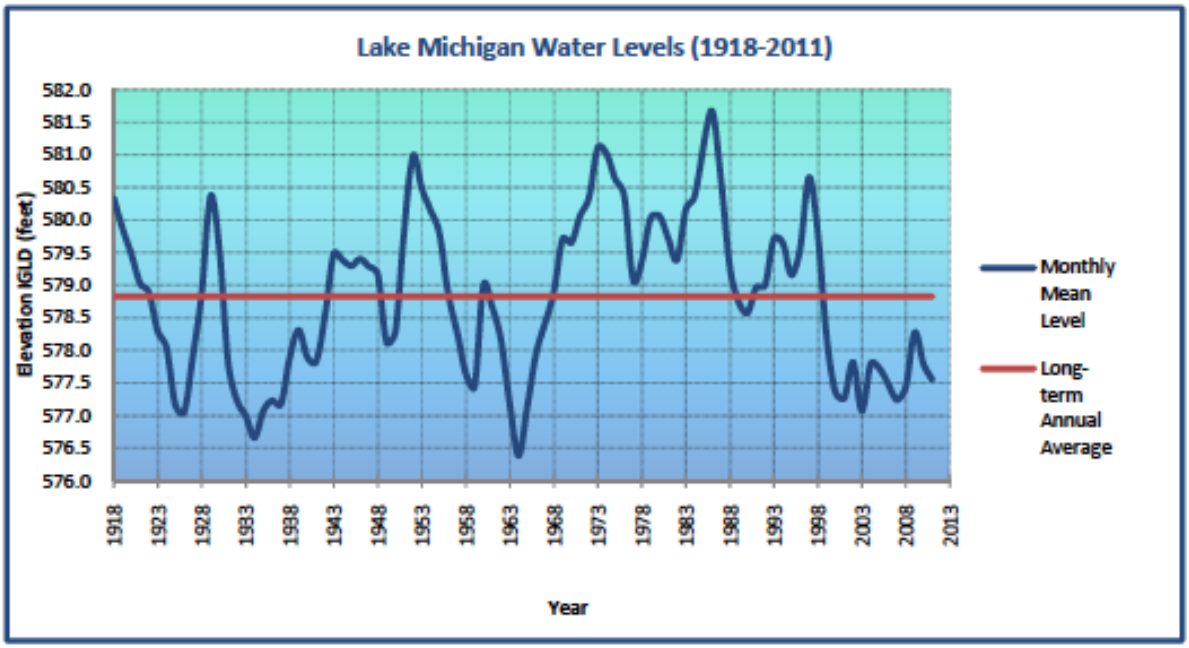

FIGURE 15. Historic Great Lakes water level data 1918-2011 (USACE, FEMA 2013).

Climate and Weather

Winds and Storms

Westerly winds prevail across the Great Lakes region. Wind at the Sheboygan pier head recorded between 1983 and 2011 blew from westerly directions between 181 and 360 degrees about 55% to 65% of the year (NOAA Data from 1983 – 2011). In general, easterly winds become common in the spring and typically peak in April. In this month, easterlies account for 50-60% of winds. Easterlies remain common into the summer, decrease in the autumn, and are rare during the winter when air masses stabilize. Though these patterns characterize regional climatic patterns, local conditions can vary considerably.

November through April have the strongest average winds while the calmest wind months are June through August. NOAA data generated at the Sheboygan Pier between 1984 and 2011 suggest that wind gusts exceeding 40 knots are most common in November, March, and April. Clashes of warm and cold air make violent squalls and thunderstorms relatively common in the summer and fall. The Storm Events Database maintained by the NOAAA National Climatic Data Center recorded 77 days between 1996 and August 2013 where significant storms occurred in Sheboygan County. Among these were many summer thunderstorms with observed winds exceeding 50 knots.

Temperature, Ice, and Precipitation

Lake Michigan moderates average local temperatures—cooling the air during the summer and warming it in the winter. Average daily high temperatures along the shore in July and August are in the high 70s and low 80 degrees Fahrenheit, and average daily low winter temperatures are between 10 and the low 20s. Extreme heat and extreme cold, however, regularly occur with sweltering summer days and brutal icy winters. Although Lake Michigan does not typically freeze, extreme cold temperatures and persistent wind can cause rapid ice build-ups along the shore or force dramatic movements of heavy ice along the lake surface.

Average precipitation for Manitowoc, Sheboygan, and Port Washington is about 32 inches per year, with August the rainiest month at about 4 inches. Annual snowfall recorded at Manitowoc between 1892 and 2011 varied from less than three inches to nearly six feet and averaged 36 inches. Average snowfall at Sheboygan is substantially greater at 46 inches.

Major Natural Resources Connected with the Historical Maritime Cultural Landscape

Forests

Before widespread Euro-American settlement, the Lake Michigan area of Wisconsin was vast and diverse of complex forest (Figure 16).

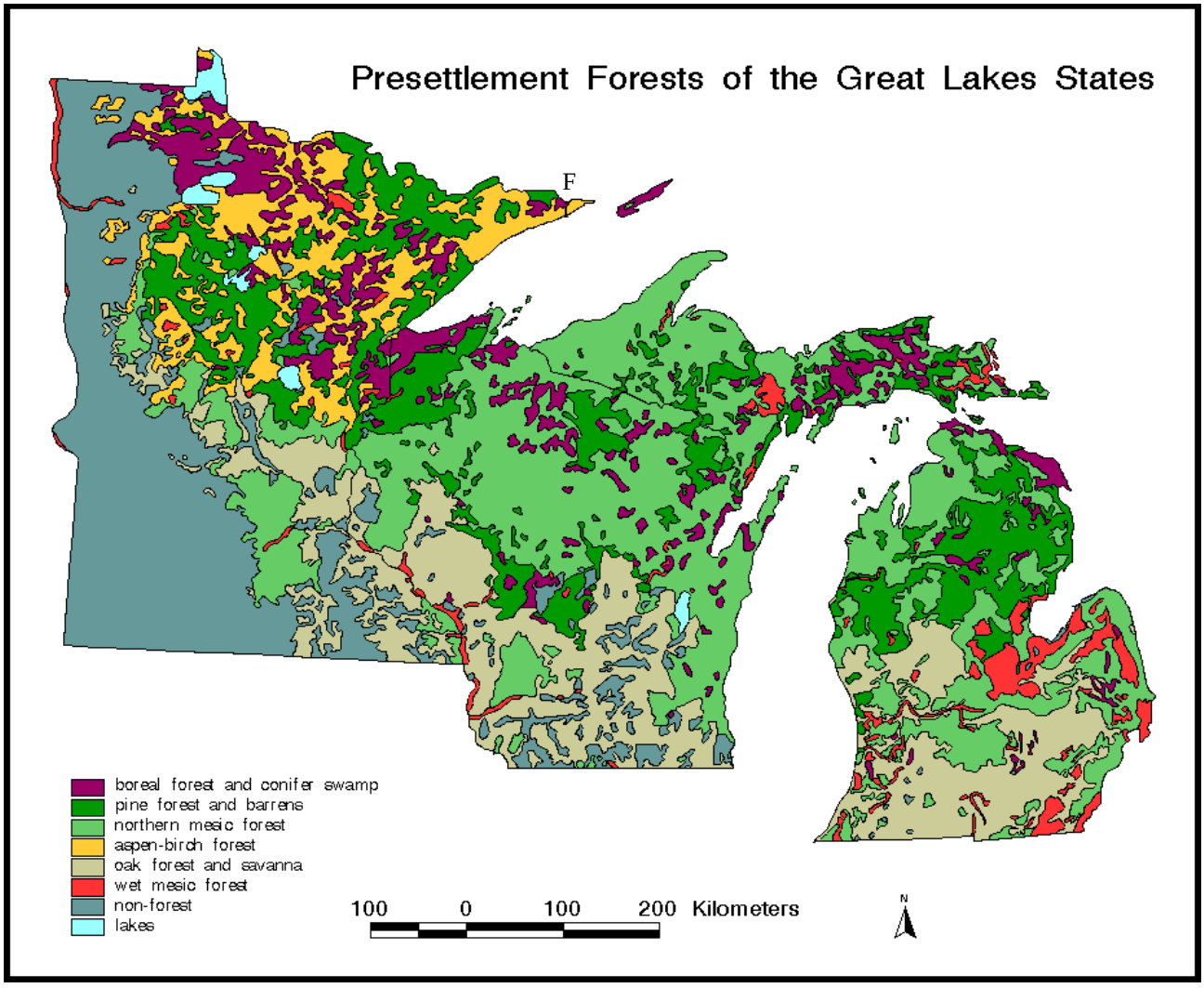

FIGURE 16. Pre-settlement forests of the Great Lakes states in the mid-1880s as reconstructed from records of the US General Land Office Survey. Based on Stearns and Guntenspergen (1988) from Cole et al, *Historical Landcover Changes on the Great Lakes*, USGS).

The mid-lake county region had considerable diversity in forest cover. The northern area above Sheboygan consisted of the larger Northern Mesic forests characterized by maple, hemlock, and yellow birch and there were significant stands of white pine as well. Below Sheboygan, a Southern Mesic forest characterized by sugar maple, basswood, and elm dominated the vegetation landscape. Conifer swamps with black spruce, tamarack, and cedar grew in significant abundance in low inshore areas. Oak forests scattered across the southern and southwestern parts

of the region. Substantial oak savannah and some southern oak forest grew to the west in what are now Fond du Lac, Winnebago, and Outagamie Counties (Figure 17).

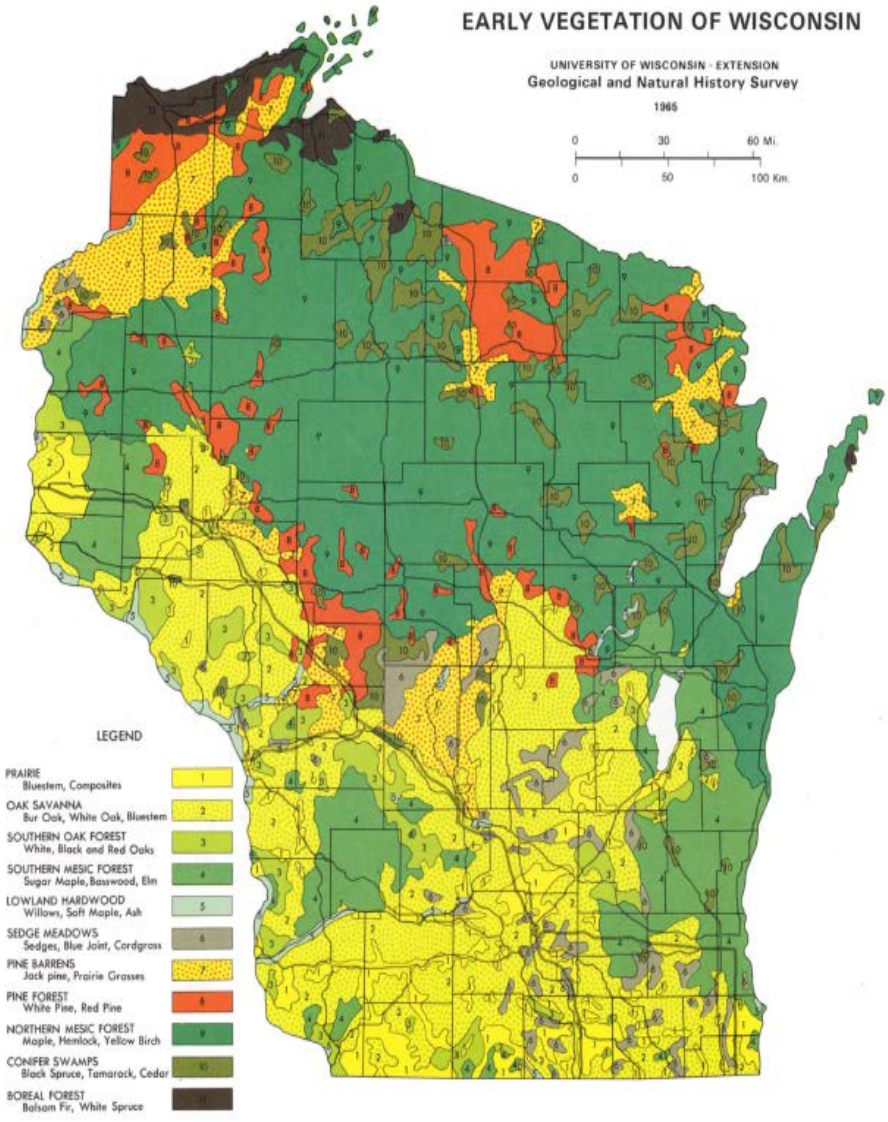

FIGURE 17. Early vegetation of Wisconsin (Wisconsin Geological and Natural History Survey 1965).

Fish

The Mid-Lake Region supported diverse natural fish stocks. Among the more culturally influential fish were whitefish, lake trout, lake sturgeon, herring, perch, chub, and pike. Vast quantities of other fish less valued by people such as suckers also supported a complex freshwater ecosystem, but in different contexts.

The19th century brought the introduction of the alewife, a small sardine-like fish found along the Atlantic Coast from North Carolina to Newfoundland (Fisheries & Oceans Canada 2007). The alewife is one of more than 180 invasive species in the Great Lakes Basin (Transportation Research Board 2008).

The cause of original invasion and its immediate ecological impacts remain in debate. Some studies linked it with the opening of the Erie and Welland Canals in 1820s. Others cite later 19th century government fish stocking as the culprit. Whatever the origin, the alewife became an import food for native lake trout—a commercially valuable species that remained abundant on Lake Michigan into the 1930s (Fuller 2014).

The sea lamprey, native to the Atlantic Ocean and Lake Ontario, reached Lake Michigan in 1934 and contributed to a dramatic crash in the trout population. The reduction in the lake trout then led to a dramatic explosion in the alewife population. Annual summer alewife die-offs choked Lake Michigan beaches in the 1950s and 1960s. Although considered a “nuisance” fish, alewife supported a large volume of trawl fishery, peaking at 41.9 million pounds in 1967 (Gunderson 2014).

In 1966 and 1967, fisheries managers began large-scale introduction of Pacific Coho Salmon and Chinook, or "King" salmon to control Alewife populations. Recreational Salmon fishing become a multi-million dollar industry along the Lake Michigan coast.

Recent invasive species introductions have damaged recreational fish stocks. Introduced through ballast water from the Caspian Sea, the Zebra mussel spread throughout Lake Michigan in 1989 (Transportation Research Board 2008).

The larger Quagga mussel came into the Great Lakes from ships loading cargo in Ukrainian rivers. Spread more slowly, they have largely displaced Zebra mussels in Lake Michigan. The Zebra and Quagga mussels can cover huge areas of the bottom (Figure 18). These “filter feeders” have increased water and substantially altered the lake’s biology and chemistry.

Scientists have linked Quagga mussel proliferation with recent population crashes of native Diporeia—a tiny benthic invertebrate that provides food for numerous high-value fish including lake trout, Chinook salmon, and possibly whitefish. Diporeia were the dominant bottom living, or “benthic” organisms in Lake Michigan before the Quagga mussels. Quagga mussels consume vast quantities of phytoplankton, the primary food for Diporeia.

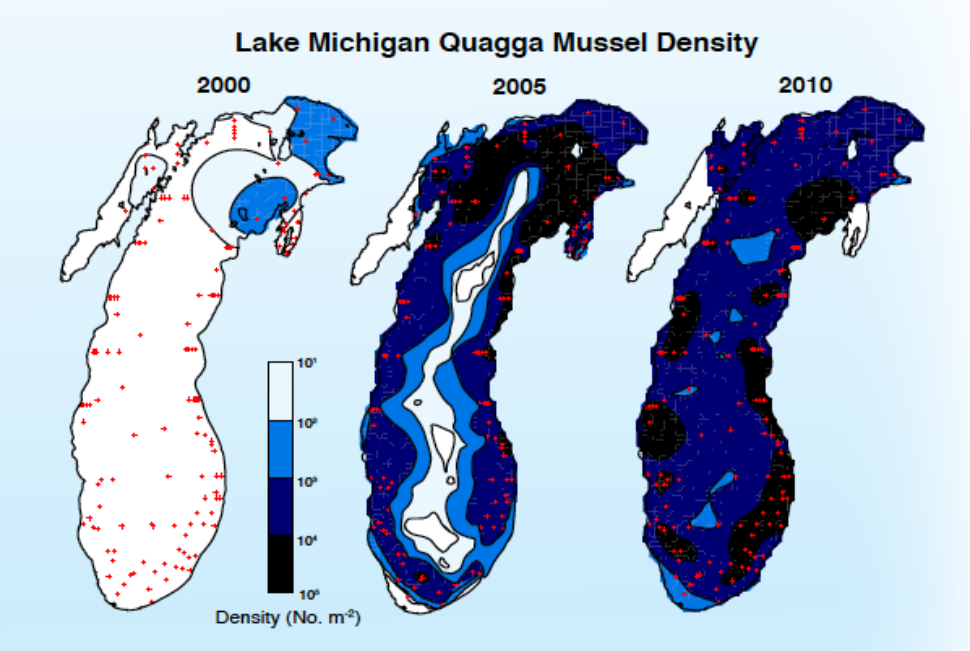

FIGURE 18. Lake Michigan quagga mussel density (Courtesy of the National Oceanic and Atmospheric Administration 2010).

The high density and persistence of Diporea on the submerged plain adjacent to the Two Rivers/ Manitowoc coast suggests an especially fertile area of the lake (Figure 19). Increased lake clarity has brought increased blooms of Cladophora, and other algae along the shore. Cladophora cling to hard substrate and may degrade whitefish spawning habitats. In addition, dead and rotting Cladophora piling up along the shore can harbor bacteria harmful to human health (Garrison 2008).

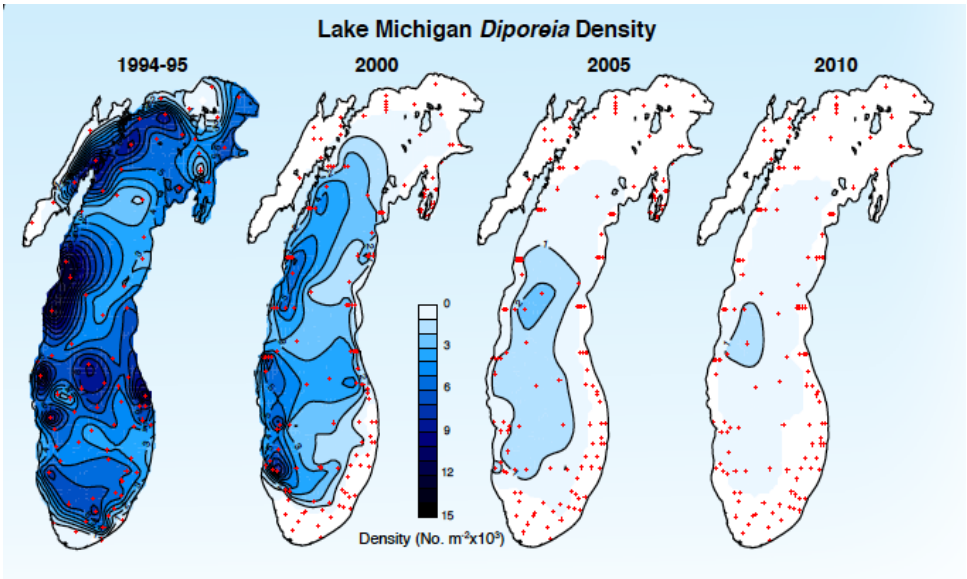

FIGURE 19. Lake Michigan diporeia density, 1994-2010 (Courtesy of the National Oceanic and Atmospheric Administration 2010).

Stone

The glacial geology characteristic of the lakeshore is not conducive for building stone. Poor quality limestone in Sheboygan and Ozaukee counties provided material for making quick lime and some construction, only high-grade dolomitic limestone occurs in bedrock deposits inland. Limestone outcrops in Manitowoc County supported some level of stone quarrying, but high quality building stone was generally imported into the region (Buckley 1898).

Energy Sources

The abundant native forests provided sufficient energy resources to meet the needs of Native Americans, as well as those of the early farms and pioneer lakeshore communities. Wood heated homes and business, and was fuel for the early steamboats. Before the Civil War, rivers provided the principle mechanical power for agricultural and lumber milling.

Post-Civil War industrialization depended on growing imports coal. The Lake Michigan communities had and retain access to ship delivered coal was less expensive than coal delvered by railroads. At present, Wisconsin still depends more heavily on coal for electrical energy than any other non-coal producing state. In 1970, the Point Beach Nuclear Power Plant opened on the lakeshore north of Two Rivers to take advantage of the abundant cold water. Scientific study and public discussions over the potential for harnessing Lake Michigan's winds to supply renewable electrical energy continue.

Chapter III. The Pioneer Era: Transforming Western Lake Michigan into an Atlantic Maritime Landscape 1800 – 1860.

Meverden and Thomsen (2008) recommend the mid-lake as the best site in Wisconsin for a National Marine Sanctuary based in part on the relative and diversity of its deeper, intact shipwrecks. Indeed, wrecks reported in the region include 40 vessels built before 1860. Beyond the wrecks themselves, the Pioneer era saw the envisioning and establishment of an Atlantic Maritime Cultural Landscape along the mid-coast. The ideas and engineering principles and policies laid down during this period continue to influence the shaping of the coastline and content of its shipwreck resources into the twentieth century.

The Western Lake Michigan Maritime Cultural Landscape before 1830

In 1830, the physical condition of Lake Michigan and dominant modes of navigation had changed little since the wrecking of La Salle's *Griffon* in the late seventeenth century. The lake remained a small-boat-sea located on the westward fringes of the Atlantic World. By Atlantic standards, Lake Michigan was not yet a "civilized" waterway in either human or environmental terms. Warfare and internal migration had altered cultural and political complexions of the lakeshore since the coming of the Europeans and the fur trade in the seventeenth century. Other than a few trading outposts and Fort Dearborn in Chicago, however, the middle and southern areas of Lake Michigan remained largely under the control of the Potawatomi Indians, the Algonquin "Keepers of the Sacred Fire."

The natural maritime landscape remained largely unchanged. The northern lake was more accommodating to Atlantic vessels and navigational practices than the south. The Door Peninsula, Green Bay, Leelanau Peninsula, Grand Traverse Bay, Beaver Island, North and South Manitou Island along with other islands and outcroppings offer diverse areas of deepwater shelter and many distinctive landmarks to aid navigation. South of the Door Peninsula, the scenic rocky shore gives way to sand dunes, eroding glacial bluffs, and lowlands. For vessels seeking reliable landmarks, the only clear headland mid-lake is Rawley Point above Two Rivers, the easternmost point on the Wisconsin coast. The waters below the point also provided the only natural protection during storms. Vessels were safe in a westerly wind, but dangerous when winds and waves come from the south or east. From the point south to Chicago, the western lakeshore offered few landmarks and no shelter for Atlantic vessels.

The lake's natural condition mattered little when trade relied on indigenous and small trading craft such as canoes and bateaux. The prudent navigators of shallow draft and lightly constructed vessels could, with warning, land at any flat beach when weather threatened. They could also take shelter by paddling up one of the rivers and creeks that crossed the shoreline.

The construction of the first Fort Dearborn at Chicago in 1803 brought the occasional small Atlantic-style schooner to southern Lake Michigan. Between 1815 and 1830, the Atlantic maritime culture developed strong foundations on the eastern Great Lakes. After the conclusion of the War of 1812, many maritime New England families settled along eastern and southern Lake Erie and made Ohio's Western Reserve an important early producer of commercial craft. Atlantic-style schooners of 50 to 70 feet or less in length became a common sight on the eastern

Great Lakes and made regular voyages to Green Bay and more occasional trips down Lake Michigan. Projects such as the Erie, Welland, and Ohio Canals dramatically reordered the physical and commercial landscape of the Great Lakes region. With the construction of the Erie Canal (1817-1825), Buffalo emerged as the dominant port on the upper Great Lakes and a center of maritime industry, one particularly important in pioneer steamboat construction and navigation. The dozen sidewheel steamers built before 1839 reduced the time, inconvenience, and cost of travel between principal Great Lakes ports and, in concert with the canals, with the Atlantic seaboard.

Communities and commerce on Lakes Erie and Ontario immediately felt the effects of Atlantic-driven technological and environmental changes to the Great Lakes region. These advancements were not manifested in the Mid-Lake Region of Wisconsin, however, until the early 1830s and came on the heels of the mining boom that began in the 1820s that for time made Wisconsin the world's largest producer of lead. By 1840, Wisconsin was producing one half of the nation's lead. Lead mining encouraged settlement, brought steam navigation from the Northern Mississippi River, and stimulated interest in creating a water route between the river and Lake Michigan (Bogue 1984; Jensen 1992).

The early 1830s saw the extinction of most tribal control over Wisconsin lands through forced treaties, federal Indian removal policy, and violence (Wyman 1998). The Black Hawk War of 1832 and the 1833 Treaty of Chicago effectively ended remaining Indian control and title to lands below the head of the Milwaukee River at the southern edge of Lake Winnebago. The establishment of "clear" federal title to the lands provided the legal foundations for Atlantic settlement along the middle and southern Lake Michigan coasts.

The Black Hawk War energized commercial navigation on Lake Michigan. In July, a fleet of four sidewheel steamers loaded with soldiers and military supplies embarked for Chicago. These steamers, the first ever to call at Chicago, also brought the first waves of a cholera epidemic, which was then sweeping the United States. By increasing the speed and number of passengers traveling long distances steamboats helped change the ecology of infectious disease in the frontier Midwest and river and lake communities were especially hit hard. Traveling south on Lake Michigan, Augustus Walker, captain of the steamer *Sheldon Thompson*, reported burying 16 men in Lake Michigan during the journey including "committing three more to the deep" at anchor in Chicago where the water was so clear "that their forms could be clearly seen from our decks" (Cromie 1984).

In 1832, the Great Lakes commercial fleet consisted of 9 steamers and 48 sailing vessels and had excess capacity (Walker 1864). The events of 1832, however, marked a turning point in Lake Michigan's Atlantic maritime history. In 1833, 12 new lake steamers joined the fleet, followed by an additional 7 in 1834 (*Niles Gazette and Commercial Register* 21 November 1835).

The natural maritime landscape could not support the expanding volume and composition of commercial vessels navigating Lake Michigan and pressure mounted for the federal government to build safe harbors and lighthouses. In 1833, Chicago secured $25,000 for harbor improvements. An articulate, if unsuccessful, 1834 memorial to Congress for a harbor at the Milwaukee River submitted by prominent ship owners, masters, and leading citizens and

captured the basic economic and nautical conditions of time. Predicting that 150 or more vessels would enter Lake Michigan from Mackinac in the coming year, they decried the lack of harbors south of Green Bay. Uniting the humanitarian with the economic, the memorial argued that a harbor at Milwaukee would add safety to navigation and encourage commercial activity because if its proximity to the western Wisconsin lead mining district (McDonell 1834). No appropriation followed, and less than a year later, a November gale wrecked more than twenty vessels across the lakes, including several on Lake Michigan. Dozens of people died from the event.

Lake Michigan's economic significance grew rapidly and seemed endless in possibility in the middle 1830s. The economic boom and recurrent maritime disasters added urgency to the calls for federal investment in Lake Michigan navigation. As an 1836 memorial to Congress warned, "a steam-boat in making a trip to Chicago, is obliged to take in enough wood at Mackinac or Green Bay, to last her the whole distance of four hundred miles, which any one acquainted with the management of these vessels, knows they cannot carry without greatly endangering the lives of her passengers." The long run down Lake Michigan exposed sailing vessels "to almost certain destruction" if caught in a storm blowing from the north (Edgerton 1921). The US enrolled Great Lakes fleet of 1836 consisted of more than 40 steamboats and well over 100 sailing vessels, totaling nearly 25,000 tons (Walker 1864).

Mid-Lake Harbor Surveys of 1836 – Baseline Studies in Maritime Cultural Landscape

More open to study than construction, Congress (with President Jackson's assent) funded a series of engineering surveys for potential harbors around the lakes including Wisconsin's Lake Michigan coast. In 1836, J.M. Berrien, an experienced Army civil engineer, completed surveys and submitted plans for Wisconsin harbors at mouths of the Root (Racine), Milwaukee, Sheboygan, Manitowoc, and Kewaunee Rivers. These studies provide important baseline environmental and cultural data for the Mid-Lake Michigan's Atlantic Maritime Cultural Landscape.

By broad agreement, the Milwaukee River offered the best natural and economic location for a harbor. Berrien explained that "it will probably be made, at no very distant day, the termination of extensive works of internal improvement between the Lake and the Mississippi, which will form a very important link in the chain of works – by which it is proposed to connect the valley of the stream with the Atlantic cities" (Berrien 1837). Manitowoc and Sheboygan also offered commercially useful rivers with access to abundant fertile land, natural resources, and industrial power and had strategic mid-lake locations.

Manitowoc

Located about 90 miles north of Milwaukee, the Manitowoc River is the second largest river along the coast of Western Lake Michigan. From an Atlantic maritime perspective, the Manitowoc River offered a natural landscape with excellent commercial potential. Berrien described the river as "peculiarly adapted to improvement, compared with the mouths of the lake streams generally."

Key characteristics of the Manitowoc River that Berrien identified:

1. Consistent 10 to 12 foot water depths extending least 1000 feet upriver from the lake

2. No obvious navigation hazards in the river

3. Potential as part of a navigable waterway between Lake Winnebago and Lake Michigan

4. Rich forests of pine and other valuable timber along the river valley

5. Geographical fitness as a harbor of refuge.

The detailed map submitted by Berrien provides river and coast hydrographic soundings and a schematic and elevation profile for two proposed piers that extending from the river mouth out into Lake Michigan (Figure 20). On the river mouth, Berrien observed: "its discharge is direct, and but little obstructed by bars. There appears to be no deposit, of any amount, by the stream; the bar indicated on the map being formed by the deposit of the wash of the lake, by the opposing currents of the river and lake" (Berrien 1837). He made no refer to the continual shoreline erosion that supplying the sand and gravel sediments recorded on this map.

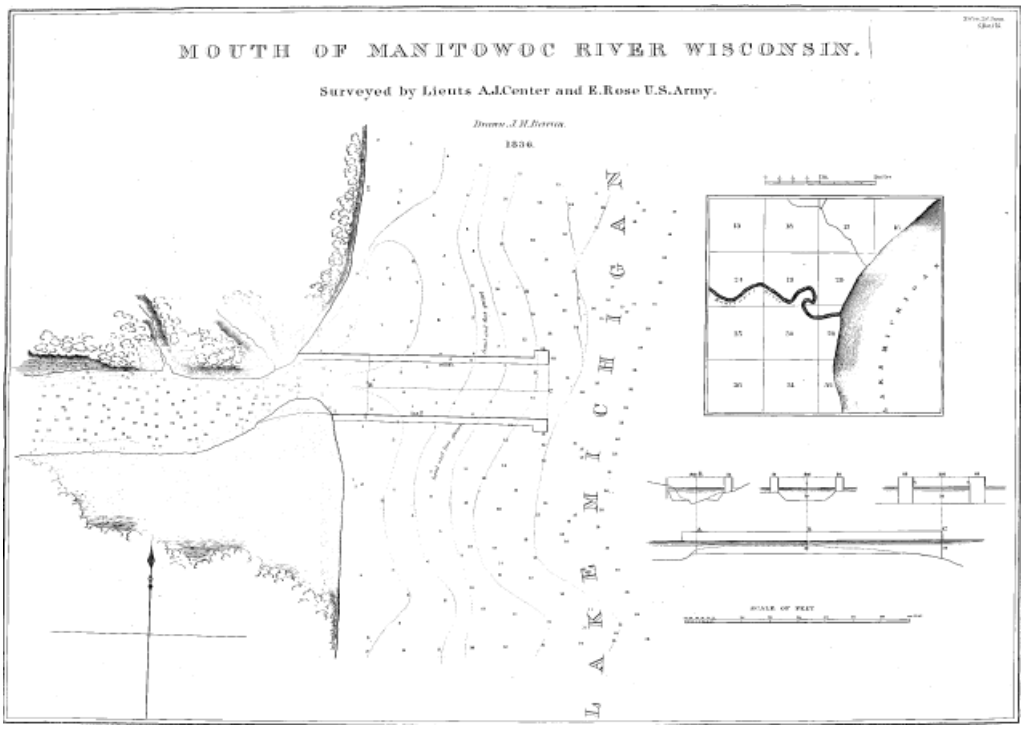

FIGURE 20. J.M. Berrien's 1836 map of the Manitowoc River (Berrien 1836).

Berrien's design, one common to all of his Lake Michigan plans, had a simple concept: use abundant wood and stone resources to create a protected channel that extends from the deepwater area of the lower river, out through coast shallows and into a commercially navigable depth on the lake. At Manitowoc, he proposed creating a 10-foot deep and 175-foot wide navigation channel out to the 14 feet depth contour on the lake protected by two parallel piers, one 852 feet and the other 720 feet long composed of a series of 24-foot by 24-foot softwood cribs filled with stone, and attached to the bottom with oak pilings. The completed piers would rise seven feet above the lake and decked with three-inch thick oak planks (Figure 21). Although not built by the government, local engineers adopted Berrien's designs as reflected by the first crib piers in Sheboygan and Manitowoc in the early 1850s. Indeed, the general design mirrors those used in many Great Lakes harbors and waterfront industrial sites. Several well-preserved submerged historic crib piers survive intact in the waters of Door County and the Apostle Islands.

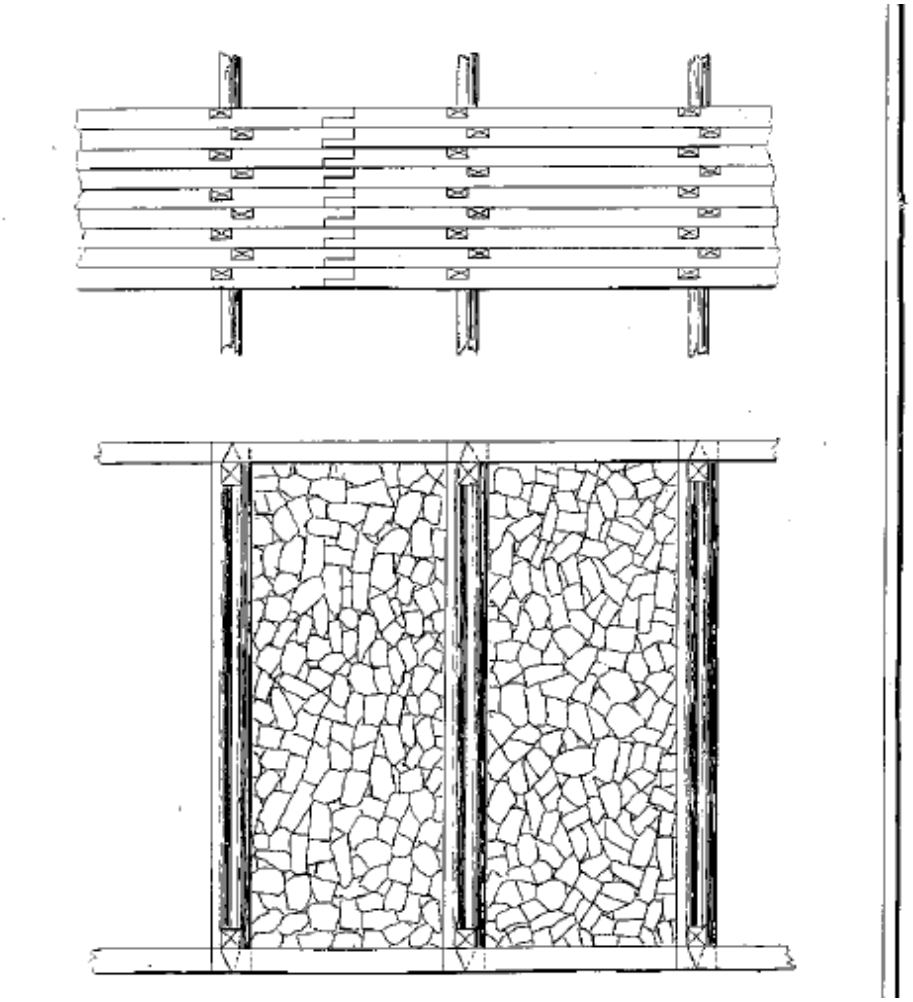

FIGURE 21. Proposed crib pier design for Lake Michigan harbors from J.M. Berrien's 1836 map for the proposed Sheboygan harbor piers (S. Doc. 175 25th Cong. 2nd Session).

The surrounding natural landscape lessens the cost of the wood required for the cribs and decking, priced at $10,000, a low price giving the massive volumes required. Berrien noted that, “timber of all kinds is found near at hand, and of the greatest abundance.” However, the overall price tag for the proposed harbors was exorbitant with the estimated cost for Manitowoc alone reaching nearly $83,000. The highest costs were for labor ($25,000) and stone ($21,000), which Berrien assumed was locally available, but not had yet located.

Sheboygan

The Sheboygan River, about 60 miles north of Milwaukee, Berrien reported “from its favorable position, its depth and capacity with within, and the character of its exterior, as well as from the natural production and fertility of the country through which it flows, strongly recommends itself for early improvement.”

Berrien described the river as having a moderate discharge of water that varied with the season and wind conditions. “It is almost entirely free from sediment, the exterior bar being formed by the wash along the lake shore meeting the current of the stream, when the sand held in suspension by the water of the lake is deposited. The variation in depth is slight and unimportant.” Berrien’s Sheboygan harbor pier plans closely follow Manitowoc’s and called for a protected navigation channel 175 feet wide and 10 feet deep that extended out to the 14-foot depth contour on Lake Michigan and protected by parallel wood and stone piers 1,007 and 827 feet in length.

Berrien’s map for Sheboygan, however, reveals a more challenging natural landscape for deep water vessels than Manitowoc, one characterized by a very tight entrance and a great deal of adjacent shallow water (Figure 22).

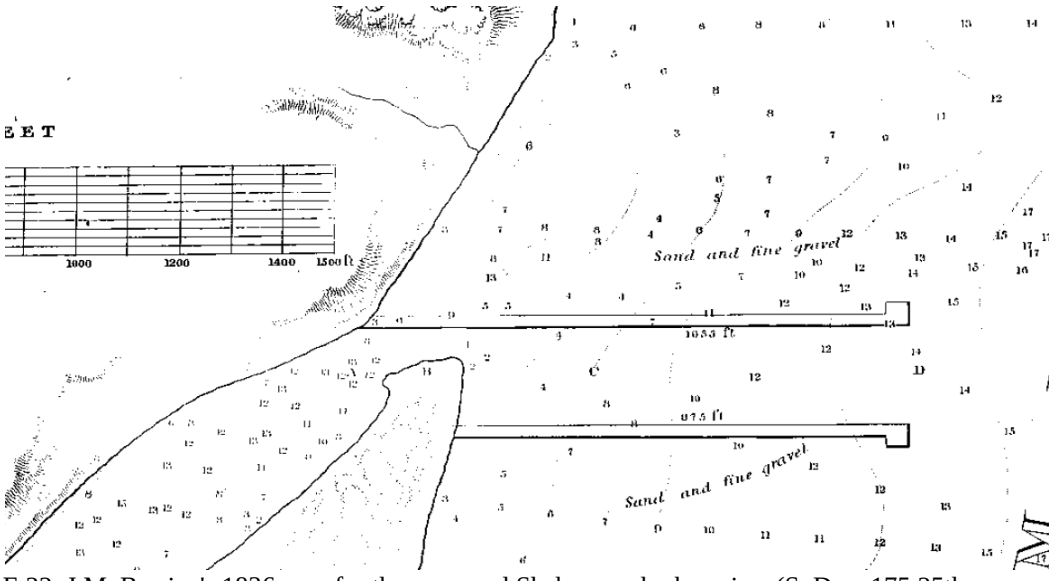

FIGURE 22. J.M. Berrien's 1836 map for the proposed Sheboygan harbor piers (S. Doc. 175 25th Cong 2nd Session).

Using the same prices for material and labor, Berrien estimated the total cost for the Sheboygan piers at nearly $85,000. In addition to abundant local wood, Berrien highlighted the local sources of limestone on the lakeshore 1 1/2 miles north of Sheboygan, and better sources two or three miles up the river.

Berrien's 1836 report offer a broad window into the environmental perceptions, coastal engineering methods, and the economic and social values of pioneer federal government engineers on the Great Lakes. Berrien and later generations of government engineers sought large-scale, overly simple answers to the complex environment challenges of the mid-lake coast. To begin with, they conceived the coastal and lake environment as static places that would not change substantially in absence of human intervention. While Berrien could not have understood the complex wind and current processes that govern the deposition and movement of coastal sediments in the Mid-Lake Region, his failure to account for the active erosion evident in the local bluffs and underwater soundings is less understandable. The westward drift of the shoreline should have been obvious, and provided an unending source of fine sediments that would, in fact, create problems. Berrien expected the long piers at Sheboygan, and by extension Manitowoc, would "confine the discharge from the stream to the proper channel, and protect the entrance from the wash along the shore of the lake."

When finally built, however, the long piers trapped sediment, increased shoaling, and facilitated the formation of dangerous sandbars. Furthermore, the narrow channels and harbor entrances required for natural flushing envisioned also contributed to many shipwrecks in the Mid-Lake Region after 1860. Between 1852, when construction began on the first generation of federal crib piers, and the early 20th century, federal engineers relied on longer piers and aggressive dredging to improve and maintain the mid-lake harbors. Longer piers and deeper channels increased the economic capacities of the mid-lake ports, but accelerated dangers associated with the basic design. In addition to contributing to shipwrecks, the extended piers brought serious waterfront damage and floods occurred when storms forced lake water up the confined channels, which spilled over into the towns. In the 1840s and 1850s, the focus was on developing basic harbor facilities and aids to navigation. Most of these projects were completed through combinations of private and municipal investments.

Fueled in part by a tremendous "bubble" in the value of frontier lands, interest and settlement along in Western Lake Michigan spiked in the mid-1830s. The rapidly growing population of white settlers and the prosperous lead mining region in the southwest encouraged the organization of the Wisconsin Territory on July 3, 1836. The first Wisconsin Territorial Commission by the Secretary of the Wisconsin Territory John Horner consisted of a roughly engraved miner's hand and forearm grasping a pick and a pile of lead ore. The first territorial legislature voted to commission a replacement seal as the first did not represent "the various and peculiar interests of the territory" (Holzhueter 1979). The various designs submitted as replacements sought to better capture Wisconsin's identity. The center of the seal adopted in 1838 depicted agriculture, mining, education, and a grand capital bracketed to the right by the Lake Michigan coast, complete with a schooner and lighthouse.

The national economy crashed in the Panic of 1837 and with it, the value of land along Lake Michigan. This applied an immediate brake to settlement and development and to a decline in commercial navigation on the Great Lakes. Both in and along the lake, however, the foundations for an Atlantic commercial maritime economy and culture were firmly established. On shore, Wisconsin farmers and pioneer entrepreneurs had initiated the agriculture, natural resource extraction, and processing sectors of the economy. More broadly, the experiences and studies of the 1830s completed by Berrien and others provided an idealized template for local and national leaders of what an "improved" Lake Michigan landscape. Lighthouse and strategically located harbors that provided for safe navigation also unlocked the economic opportunity found in the region's rich soils and natural resources.

Commercial Growth and Developing Harbors 1840 - 1859

Wisconsin's mid-lake population grew dramatically in 1840s. In Manitowoc County, the population climbed from 235 in 1840 to 629 in 1846, 1258 in 1847, and 3,702 in 1850. Faster growth occurred in Sheboygan County where the population expanded from 132 in 1840 to 1,637 in 1846 and 8,379 in 1850 (Quaife 1918). Many of the new residents were immigrants from North Europe and nearly all had traveled to Wisconsin on a Great Lakes steamer.

The increasing number of vessels navigating Lake Michigan gave the coastal towns increasing access to the regional and national economies. Steam navigation contributed directly to the coastal towns by bringing in settlers as well as foodstuffs, manufactured goods, and products. The towns became strategic fuel stops for the inefficient wood-burning steamers. Along the lakeshore, the early exports were primarily forest products and fish, however, the rapid development of farmlands made agriculture an increasing important contributor to coastal economies.

In 1840, a letter from Thomas Holdup Stevens, commandant of the Washington Navy yard, stated the situation on Lake Michigan in 1840 in bold terms. "From Death's door, the northern point of Wiskonsin, on Lake Michigan, till you reach Chicago, a distance of not less than 250 miles, there is not a solitary port of refuge offered to the storm-tossed mariner." Included as a supporting document for yet another memorial to Congress, Steven's letter described potential mid-lake harbor sites:

> The first of these, Manitowoc, must be looked to as the future pinery of all the country on the west side of Lake Michigan . . . the next, Twin River is capable of the same advantage, and both are so peculiarly situated , for supplying fuel for the rapidly increasing steam-navigation on those waters . . .Sheboygan, I believe now admits vessels drawing 4 or 5 feet of water, and the moth of it can, no doubt be deepened to admit all classes of vessels navigating the lakes (Stevens 1840).

Manitowoc and Two Rivers

In 1840, Manitowoc celebrated the opening of its first federal lighthouse. Although population growth remained slow during the early 1840s, Manitowoc's lumber trade was active with three to four million board feet of lumber lightered out to vessels in deep water "at great risk and

expense" annually. A sand bar at the river mouth that did not exist during the 1836 survey had grown so high in 1843 that locals spent three days scraping a channel with shovels to allow a modest size schooner to enter the river. The year Case and & Clark erected a large bridge pier consisting of decked over piling that supported local commerce for many years (Plumb 1904:58).

The late 1840s saw more change and growth. The lumber industries prospered and in 1847, Manitowoc's first schooner, *Citizen*, was built, an important event in the formation of the city's maritime cultural identity. During the 1848 season, Manitowoc exported $13,719 worth of goods and imported $49,129 (White 1850). In 1849, 85 steamboats and 204 sailing vessels called at Manitowoc. Steamers called at least weekly and vessels drawing under six feet could find safe harbor in the river. Two years later, 788 total vessels amounting to 227,940 tons entered the port (C. Patrick Labadie, Pers. Comm.). Significant public involvement in funding the harbor did not come until the early 1850s, when the village secured a loan from the state of $15,000 to make harbor improvements to complement the small Congressional appropriation of $8000. At nearby Two Rivers, in 1851, 822 steam and 192 sailing vessels made stops (Andrews 1853).

The major exports for both places were forest products, with fish a distant second in value. Reflecting their geographic and economic connections with the Green Bay region, the two ports were part of the Mackinaw Customs District and both, Israel Andrews observed in his 1852 compendium report on Great Lakes commerce and navigation, required appropriations for lighthouses and piers. A newspaper announcing weekly steamboat service between Chicago and Manitowoc reported that the Manitowoc River and bar have a 6-foot of water depth—far shallower than reported in 1836 (Labadie Collection; See also Evan Gagnon, *Neshotah: The Story of Two Rivers*).

Growth continued unabated into the mid-1850s and federal records provide itemized records for the port of Manitowoc in 1855 (Figures 23, 24). In contrast with earlier years, Manitowoc's exports, led by the lumber sector, far exceeded imports. In a 306-day navigation season, Manitowoc saw 1644 arrivals and departures for a total of 812,910 tons—an average of 494 tons per vessel. Of the $794,575 of goods transported in or out of Manitowoc, 95% came or went by lake vessel. In 1856, the Goodrich line of steamers instituted regular service between the western Lake Michigan ports. Goodrich became a staple of Manitowoc's maritime economy and landscape. Manitowoc remained an important stop for the large palace steamers throughout the decade.

Statement of the quantity and value of articles of merchandise received by lake shipments at the port of Manitowoc, State of Wisconsin, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples.....barrels..	650	$2 50	$1,625 00
Bricks.....M...	50	7 00	350 00
Coal.....tons...	35	10 00	350 00
Horses.....number..	39	100 00	3,900 00
Iron.....tons...	184	90 00	16,560 00
Machinery.....do....	150	200 00	30,000 00
Nails.....kegs...	2,878	5 00	14,390 00
Molasses.....barrels..	712	20 00	14,240 00
Salt.....bags...	6,100	15	915 00
Salt.....barrels..	2,115	2 00	4,230 00
Sleighs.....number..	8	35 00	280 00
Sugar.....barrels..	1,020	20 00	20,400 00
Sugar.....hhds...	181	100 00	18,100 00
Vinegar.....barrels..	159	5 00	795 00
Wagons and buggies.....number..	12	75 00	900 00
Whiskey.....barrels..	427	15 00	6,405 00
Value of merchandise, taken from warehouse and mercantile books and bills, not included above.....			171,686 00
Total value of merchandise, received by lake shipment, at Manitowoc, in 1855....			305,126 00

FIGURE 23. Manitowoc imports, 1855.

Statement of the quantity and value of articles of merchandise shipped by lake vessels from the port of Manitowoc, Wisconsin, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Cedar posts.....M....	134	$50 00	$6,700 00
Fish.....half barrels..	1,820	4 50	8,190 00
Flour barrels.....number..	500	50	250 00
Furs.....			1,000 00
Laths.....M feet..	6,600	4 00	26,400 00
Leather.....pounds..	5,136	40	2,054 40
Lumber.....M feet..	17,675	12 00	212,100 00
Pickets.....M....	60	8 00	480 00
Railroad ties.....number..	1,000	12½	125 00
Schooners built for Chicago.....do....	2	{ 6,000 00 } { 9,000 00 }	15,000 00
Shade trees.....do....	1,000	50	500 00
Shingles.....M....	60,600	2 75	166,600 00
Square timber.....M feet..	10	100 00	1,000 00
Spokes.....M....	5	10 00	50 00
Wood.....cords..	3,000	2 00	6,000 00
Total value of merchandise shipped by lake vessels from the port of Manitowoc in 1855.....			446,449 40

FIGURE 24. Manitowoc exports, 1855.

Sheboygan

In 1839 or 1840 Sheboygan's first federal lighthouse at North Point was fully operational. Between 1845 and 1848, the number of vessels stopping at Sheboygan grew from 75 to 525 vessels (S. Misc. Doc. 60 31st Cong. 1st Session). The city and private businesses built the first deepwater piers, with no help from the federal government. William Farnsworth built the first crude pier in 1841. A key addition to the local maritime landscape came in 1845 with the construction of an 800-foot pier capable of servicing the largest steamboats of the period.

A notice published in the *Sheboygan Mercury* in 1848 reveal the private sector efforts to improve the safety of local navigation:

> To those interested—a buoy has been placed at the extreme south end of the reef by Messrs. Kirkland & Newberry, for the benefit of those not well acquainted with its bearings. A boat coming from the east will find a great plenty of water near the buoy, and can also take a straight course for either pier instead of bearing into the lake until opposite the piers as in the case with those not acquainted with the depth of water. The buoy is place in 14 feet of water and there is no less water between them and the piers on a straight course (*Sheboygan Mercury* 5 November 1848).

According to a federal official, by 1848, Sheboygan had become an important commercial port "with her piers and her shipping and with all the activity and buzz of business characteristic of a "seaport." Yet that year Sheboygan exports amounted to only $12,191, even less than Manitowoc. However, the imports reached $*571,800* – eleven times more than Manitowoc (Abert 1850).

In 1850, Sheboygan was the northern most port in the newly created Milwaukee Customs District. The Israel Andrews Report described Sheboygan as having "a good location for business, though the harbor needs some improvement." In 1851, Sheboygan imported goods worth $1,304,961 and exported just $121,705. Its largest exports were 69,440 hides, 1.8 million board feet of lumber, 247,000 shingles, 1.2 million lath, and 3,384 barrels of fish. Its imports "consist principally of assorted merchandise necessary for the consumption of a new country—salt, and the household property of immigrants (Andrews 1853).

In 1852, Congress appropriated $10,000 to improve Sheboygan's harbor. Ironically, the city's initiatives created jurisdiction concerns that delayed the commencement of federal pier construction for more than four years. By that year, steamboats provided nearly daily service (6 trips per week) between Sheboygan and Milwaukee (Andrews 1853).

In 1854, Sheboygan had two 1000-foot long piers comprised of 400 feet of pile piers in the river and 600 feet of crib piers out into the lake to an intended depth of 10.5 feet that followed Berrien's design in 1836. The piers made entering the river during a strong north wind dangerous and sometimes impossible for south bound sailing vessels as the 175-foot width and the piers' proximity to shallow water provided inadequate sea room to quickly luff about and gain safe harbor. In the winter of 1853-54, a heavy northeaster seriously damaged the piers. That year Lt.

Col. James Graham of the Army Corps of Engineers found the minimum depth of water over sand bar the harbor entrance at 8.5 feet and 10 feet overall channel depth going up the river. Although only a minor issue in calm weather for most vessels calling at Sheboygan in the 1850s, the sandbar became a potential ship-killer in modest waves. In July of 1854, Sheboygan's common council voted to transfer title of the existing piers to the federal government. Less than a year later, the continued shortfall in federal appropriations led the town to raise $20,000 to aid in construction and this gave them title to segments of the new pier.

The narrow distance between the locally owned existing piers created a highly congested and frequently impassible channel when ships tied alongside the piers, a usual condition in the mid-1850s when an average five vessels arrived or departed daily. These congested river-mouth scenes urged the government engineer with immediate jurisdiction over Wisconsin harbor projects to widen future federal piers from 200 to 240 feet (*Monthly Nautical Magazine and Quarterly Review* 1856).

Detailed federal records provide a clear picture of Sheboygan's maritime commerce in 1855 (Figure 25). Between 1851 and 1855, the value of imports through the port of Sheboygan had grown five-fold ($6.7 million) and exports almost ten-fold ($1.1 million). This was a reflection of the city's rapidly growing agricultural hinterland and its growing industrial and commercial activity and a powerful argument for public investment. When compared with Manitowoc in 1855, Sheboygan's port records reveal a more diversified economy and the growing importance of agriculture and local manufacturing (Figure 26). Lumber and other forest products remained important, but did not dominate the port's economy.

Statement of the quantity and value of articles of merchandise received at the port of Sheboygan, State of Wisconsin, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Apples.....barrels..	5,360	$2 25	$12,060 00
Axes.....boxes..	1,600	10 00	16,000 00
Barrels, bulk .....number..	38,000	10 00	380,000 00
Candy .....boxes..	1,633	3 00	4,899 00
Candles.....do....	2,346	8 00	18,768 00
Cider and vinegar.....barrels..	879	4 00	3,516 00
Codfish .....boxes..	1,211	12 00	14,522 00
Coffee .....bags...	16,318	13 00	212,134 00
Dried apples.....bushels..	12,000	1 50	18,000 00
Glass.....boxes..	18,300	2 50	45,750 00
Horses .....number..	1,220	80 00	97,600 00
Iron .....tons...	4,657	60 00	279,420 00
Leather .....rolls...	3,264	60 00	195,840 00
Liquor.....barrels..	4,912	25 00	122,800 00
Merchandise, as boxes, packages..number..	136,000	29 00	4,000,000 00
Molasses and syrup .....barrels..	5,630	15 00	84,450 00
Nails .....kegs...	14,000	4 00	56,000 00
Oil.....barrels..	2,898	40 00	115,920 00
Plaster.....barrels..	100	2 50	250 00
Raisins.....boxes and kegs..	14,728	2 58	38,000 00
Railroad iron .....tons...	994	60 00	59,640 00
Rice .....tierces..	1,200	28 00	33,600 00
Salæratus .....boxes..	2,543	3 00	7,629 00
Salt .....barrels..	8,524	1 75	14,917 00
Salt.....sacks..	8,868	12½	1,108 00
Soap.....boxes..	4,000	2 00	8,000 00
Starch.....do....	2,340	2 50	5,850 00
Stoves .....number..	10,460	12 00	125,520 00
Steel.....tons...	300	606 66	182,000 00
Sugar .....barrels..	6,316	15 83	100,000 00
Sugar .....hhds...	2,000	70 00	140,000 00
Tea .....chests..	6,840	20 00	136,800 00
Wagons.....number..	1,211	80 00	96,880 00
White lead .....kegs..	8,311	2 50	20,778 00
Tobacco.....pounds..	840,00	12	100,800 00
Total value of merchandise received at the port of Sheboygan, Wisconsin, by lake, in the year 1855.....	.....	.....	6,749,461 00

FIGURE 25. Sheboygan imports, 1855 (34th Cong 1st Session S. Exec. Doc 77).

Statement of the quantity and value of articles of merchandise shipped from the port of Sheboygan, Wisconsin, during the year ending December 31, 1855.

Articles.	Quantity.	Price of each.	Value.
Barley ..... bags..	3,019	$0 62½	$1,887 00
Baskets ..... number..	4,624	25	1,156 00
Beans ..... bags..	249	2 50	622 00
Bedsteads ..... sets...	1,852	2 00	3,704 00
Beer ..... half barrels..	3,425	3 00	10,275 00
Brick ..... M....	160	4 50	720 00
Butter ..... kegs..	230	20 00	4,600 00
Chair stuff ..... bundles..	493	3 00	1,479 00
Cedar posts ..... number..	10,380	6	623 00
Empty barrels ..... do....	6,367	1 00	6,367 00
Flour ..... barrels..	16,116	8 00	128,928 00
Flour ..... bags..	2,316	4 00	9,264 00
Furs ..... bales..	33	87 87	2,900 00
Grass seed ..... barrels..	20	7 25	145 00
Grass seed ..... bags..	1,217	3 00	3,651 00
Green hides ..... number..	2,338	3 00	7,014 00
Household goods ..... barrels bulk..	10,000	10 00	100,000 00
Laths ..... M....	2,934	4 50	13,203 00
Lumber ..... M feet..	6,644	16 00	106,304 00
Patent pails ..... dozens..	498	2 00	996 00
Pork ..... barrels..	223	16 00	3,568 00
Potatoes ..... sacks..	14,183	1 50	21,275 00
Pot ashes ..... casks..	359	25 00	8,975 00
Rye ..... bushels..	120	1 00	120 00
Saleratus ..... boxes..	1,224	3 00	3,672 00
Shingles ..... M....	8,062	3 75	30,233 00
Square timber ..... M feet..	9	125 00	1,125 00
Wagon hubs ..... sets...	5,000	50	2,500 00
Wagon spokes ..... M....	350	8 00	2,800 00
Wheat ..... bushels..	195,450	1 50	293,175 00
Wheat ..... bags..	47,457	3 93	186,530 00
White fish ..... half barrels..	2,951	3 50	10,329 00
Whiskey ..... barrels..	47	12 00	564 00
Wool ..... sacks..	498	70 00	34,860 00
Total value of merchandise shipped from Sheboygan, Wisconsin, in the year 1855..	.....	.....	1,103,564 00

FIGURE 26. Sheboygan exports, 1855.

During the mid-1850s, federal engineers struggled and argued about the best approach to improving the Mid-lake harbors. The need to extent the piers out into deeper water was obvious and made necessary by the near shore sandbars and the growing size of Great Lakes vessels. The difficult decisions involved the relative lengths, heights, widths, and directional orientations of the harbor piers. Observations at Sheboygan indicated that the existing piers were trapping sediment drifting down from the north and filling in the original river mouth.

Port Washington

Located on Sauk Creek, a minor waterway with neither depth nor much flow, Port Washington (first call Ozaukee) was not among the original locations proposed for a federal harbor. Despite a slower start than Manitowoc and Sheboygan, the town had "a very substantial pier" in service by 1845 (LeFevre 1847). In 1847, a pier 800 feet in length reportedly offered a 10-14 foot depth of water had made Port Washington a place "where emigrants can land and where steamboats can be supplied with wood at a cheap rate" (*Buffalo Daily News* 5.25.47*; Buffalo Express* 7/23/48). In 1848, Port Washington exports were $48,267 and its imports $378,311 (Abert 1850:54).

In 1849, the federal government erected Port Washington's first lighthouse on the North Bluff (Western Historical Company 1881:511). US Army Corp of Engineers Colonel J.J. Albert's 1850 report described the coast at Port Washington as consisting of coarse limestone gravel and clay bluff that released more less-fine sediment than either Sheboygan or Manitowoc. He noted that the heaviest winds affecting the harbor came from the northeast and southeast and recommended the widening and deepening of the river mouth and building two crib piers (one 950 the 1050 feet in length) that would be 300 feet wide at the shoreline to an opening of 250 feet on the lake (White 1850).

While Congress did not fund harbor improvements at Port Washington, in 1851 Israel Andrews found commerce flourishing with its harbor "formed by the projection of a pier into the lake. . . the town is situated on a high bluff, which shields the pier from westerly winds." Imports to the town were $904.409 and exports $139,450 (Andrews 1853). The *Wisconsin Gazetteer* of 1853 described Port Washington as a bustling place with two mills, three breweries, and two good piers (Hunt 1853:179). The commercial piers built at Port Washington during the Pioneer Era consisted of long "bridge piers" built by driving a long parallel series of pilings driving into the lake bottom and decking them over with heaving planking and offered no protection from easterly winds. The lack of protected harbor contributed directly to the disastrous wrecking of the propeller *Toledo* just offshore of the Port Washington piers during a heavy storm in October 1856.

Pioneer Era Shipbuilding in the Mid-Lake Region

Many general themes of the Pioneer Era like exploration and experimentation were also prevalent in the regions shipbuilding industry during this time. As Atlantic settlement progressed, it was the inland seas that required sailing craft with characteristics appropriate to the distinct natural conditions and economic contexts of the Great Lakes. Improved sparing plans were introduced by August Jones in the early 1820s. In the 1830s, Augustus and youngest son George Washington Jones installed a centerboard in a schooner they built for the American Fur Company. Although schooners dominated in sheer numbers, during the 1840s and 1850s, regional builders also launched numerous brigantines and some barkentine-rigged vessels equipped with large, square fore and aft sails. A Connecticut mariner and shipbuilder who settled in Ohio after the War of 1812, Augustus and his five shipbuilder sons William, Benjamin B., James Madison, Frederick Nelson and George Washington Jones were notable figures among hundreds of first and second generation salt-water transplants that exercised tremendous influence on the development of Great Lakes marine technology before 1880.

The transplantation of Atlantic shipbuilding traditions and capacities took root along Wisconsin's Mid-Lake Michigan coast in the 1840s where Sheboygan and Manitowoc both attracted and nurtured capable shipbuilders. A look at the Wisconsin vegetation map in Chapter One reveals these cities on the edges of the northern forests and surrounded by a rich mixture of hard and softwood species critical for shipbuilding during the wooden age. In the 1840s, Sheboygan and Manitowoc both enjoyed easy access to good shipbuilding timber with abundant oak and pine available for stout hulls, light decks, and towing masts.

Sheboygan has a rich shipbuilding history that includes roughly 80 schooners and perhaps 40 or more steam powered tow boats, fish tugs, and industrial bulk carriers (Labadie Collection). During the early period, Sheboygan's shipbuilding potential was good enough to attract Benjamin Buell Jones, who established a shipyard that he operated briefly before moving on to Milwaukee. During the 1860s and 1870s, local builders such as Amos Stokes and John Gregory did a brisk business building substantial schooners. In the 1870s, a thriving local fishery led to the construction of a number of steam fish tugs such as the *Maggie Lutz*. Many of the tugs and schooners transported carrying lumber, a trade that remained visible even during the Depression of the mid-1870s.

At Manitowoc shipbuilding became part of the deep maritime community identity that has persisted unbroken into the present age. Sheboygan's shipbuilding, by contrast, declined with the ending of the wooden age in the early 1890s. By that time Sheboygan was better known for its prodigious production of wooden chairs, its dairy products, and churches than its creative maritime accomplishments.

A record of Manitowoc and Sheboygan shipbuilding exists in the surviving elements of 47 wrecks of vessels built in the two cities—33 from Manitowoc and 14 from Sheboygan. 16 of these Mid-Lake built vessels wrecked in the Mid-Lake Region, including 2 Pioneer Era craft (Table 9). Only Milwaukee with 50 vessels, has more representation among Wisconsin's historic shipwrecks.

VESSEL	WHERE BUILT	BUILDER	VESSEL TYPE	CASUALTY DATE	CASUALTY TYPE	OWNERS	CARGO
Challenge (1852)	Manitowoc	William Wallace Bates	Schooner	9/05/1910	Stranded	Platt & Bros.	Wood
Fish Hawk (1855)	Sheboygan	T. Cunningham	Schooner	11/00/1865	Stranded	T. Cunningham	Leather, Flour

TABLE 9. Vessels built and wrecked in the Mid-Lake Region during the Pioneer Era.

Atlantic hulls were most prevalent along Lake Michigan's undeveloped coastlines. The lack of freshwater shipyards and appeal to tradition kept these saltwater transplants in the merchant marine limelight well into the 1870s. At minimum, the shallow harbors and shifting sand bars along the Wisconsin coastline required shallow draft hulls and labor efficient, highly maneuverable sail plans – not the deep sharp hulls and square-rigged sails at home in the open

ocean. In a sudden summer squall, an event common on the lakes, the square riggers were slow to change sails, difficult to steer, and often too deep in draft to hug the sandbar-mined coastline of the Mid-Lake Region. It was clear by the early 1830s that the inland seas demanded sailing vessels designed specifically for the shallow coasts and passages, exposed harbors, and variable gusty winds common on the Great Lakes.

Manitowoc attracted many Atlantic-trained shipbuilders. Pioneer Manitowoc's most famous shipbuilder William Wallace Bates came from shipbuilding family outside of Calais, Maine, close to the modern border with New Brunswick. Young Bates left home to follow shipbuilding opportunities in Detroit, New Orleans, and before settled in Manitowoc in 1849. Known for his intellectual partnership with the progressive marine architect John W Griffith, Bates creative genius took form in his adaptation the sharp lines of the clipper design to the meet the conditions found on the Great Lakes. Bates' clipper schooner had a shallow draft with a nearly flat bottom and sharp bow and stern. The design improved cargo capacity without increasing draft and brought extraordinary speed. Like other Great Lakes builders of the time, Bates added a retractable centerboard (Karamanksi 2000:29). These improvements took form in *Challenge* (1852) (Figure 27) and *Clipper City* (1853), two vessels famous that helped to establish Manitowoc's reputation as an innovative shipbuilding city.

Other notable shipbuilders came to the Mid-Lake Region in the Pioneer Era. In 1849 Norwegian shipbuilder Elias Sorenson arrive and he the schooners *Lomira*, *Toledo*, *North Star*, *EM Shoyer*, *Anna Thorine*, and *Guido* all between 89-120 tons between 1853 and 1856 before relocating to Milwaukee (Gjerset 1928). Sorenson's shipyard was located on the east side of the 8th Street bridge. Predating both Bates and Sorenson was Captain Joseph Edwards, who first came to Manitowoc to deliver supplies to Conroe's Mill while en route to Chicago from Green Bay in November 1836. The expanding mill on the Manitowoc River needed vessels to deliver lumber and import supplies. Despite Edwards's meager experience, he was "at the right place at the right time" and the mill hired him to build two scows. Edwards went on to have a successful shipbuilding career and built, most notably, the 54-ton *Citizen* in 1847, the first freight-carrying vessel constructed at Manitowoc (Wenstadt 2007).

The Rand family of Connecticut made a deep impression on Manitowoc shipbuilding beginning in the late 1840s with arrival the patriarch Hanson Rand. His sons E.H., E.K., and Greenleaf joined him at Manitowoc. Greenleaf Rand the yard of Stephen and William Bates in 1864 and soon teamed with Henry Burger to establish one of the region's most active shipyards. While shipbuilding and repair was a part of most coastal towns along Lake Michigan, Manitowoc emerged as a leader in commercial production by the end of the Pioneer Era.

The pioneer builders launched at least 12 vessels at Manitowoc between 1840 and 1860, with all but *Mary Stockton* (1853) rigged as schooners. Shipbuilding at Manitowoc the Pioneer Era was innovative if not revolutionary. The 1852 launch of *Challenge* in Manitowoc set the standard for speed in for Great Lakes centerboard schooners, the vernacular vessel type carried energy and raw materials on the Great Lakes well into the twentieth century. Manitowoc's association with Great Lakes centerboard schooners' persists today and resonates in the city's contemporary shipyards and on the waterfront at the Wisconsin Maritime Museum (Wenstadt 2007).

The Mid-Lake Ports at the End of the Pioneer Era

In the mid-1850s, the Army Corps of Engineers conducted extensive surveys and planning to improve mid-Lake Michigan harbors. However, financial stringency after 1857 and other political hurdles prevented any extensive federal work. Although largely following federal engineering recommendations, harbor improvements came through concerted local, state, public, and private initiatives. It would not be until after the civil war that the Mid-Lake Region would feel the full weight of federal government power and its resources in building and maintaining commercial harbors.

After more than a decade of continuous growth, the Great Lakes economy dramatically increased in 1857. By that time, the major lakeshore communities were well established. In 1858, Sheboygan recorded the arrival of 547 steam vessels. Their average of 425 tons in burden indicate that Sheboygan was attracting many of the larger Lake Michigan steamboats of the day. Sailing vessel traffic was substantially less in number (370) and far lower in tonnage. The average sailing vessel measured 250 tons, which suggests larger inter-lake vessels were a more common sight than small coasting craft. In 1858, the exporting of 528 bedsteads and a great deal of "chair stuff" suggest the early development of a furniture industry that would make Sheboygan the nation's "chair city" after the Civil War.

In Two Rivers, Manitowoc, and Sheboygan, maritime industries were integral to the early local identity. The commercial fisheries associated with the founding of Two Rivers sustained its cultural identity and continued to shape its economic history. At Sheboygan, a diversified manufacturing core was developing that would make the city a respected producer of furniture, machinery, beer, and a host of other products. Port Washington, in the maritime shadow of Milwaukee, had an identity as a modest lake port whose waterfront attracted tourists in the twenty first century.

These early lakeshore communities shared many early characteristics and challenges associated with their dependence on Lake Michigan, which continue in the present. However, after 1860, the influence of their respective geographic locations and their individual cultural and ethnic histories also encouraged economic diversity and unique identities as a lake ports.

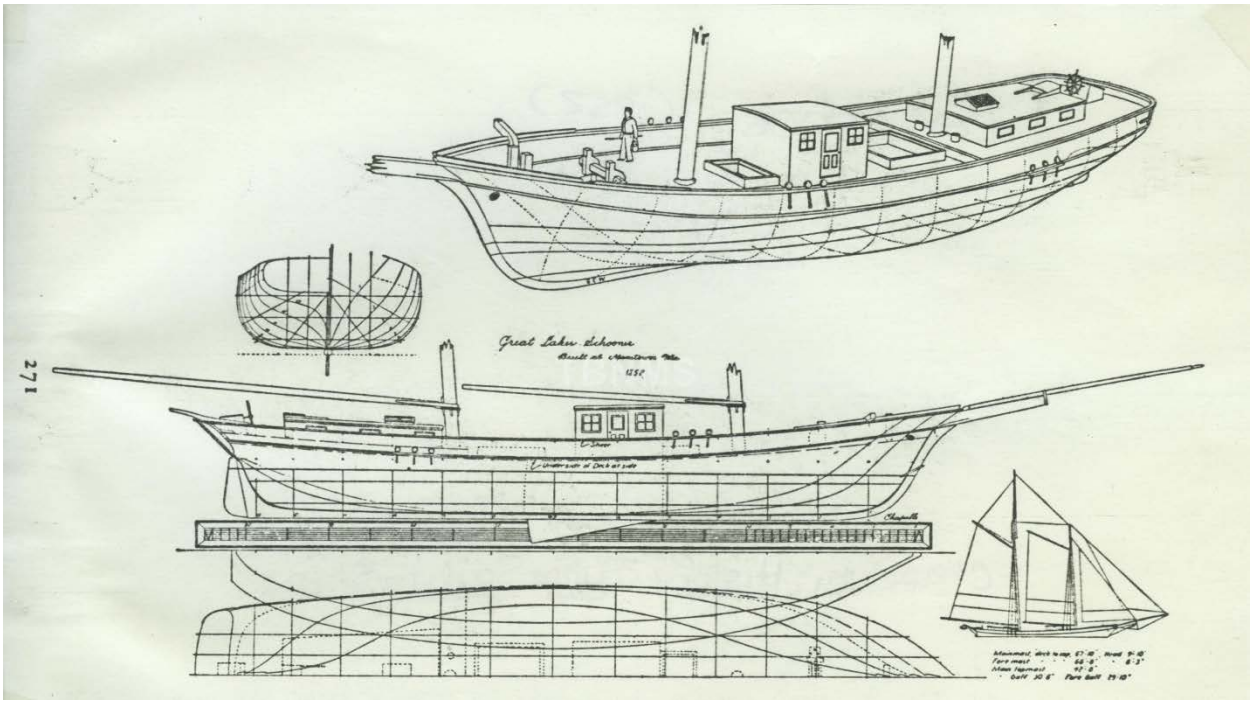

FIGURE 27. Plans for the Bates Schooner *Challeng*e (Courtesy of the Wisconsin Historical Society).

Chapter IV. The Maritime Cultural Landscape Highlights Post 1860

After 1860, industrialization became the driving force of change to Wisconsin's Mid-Lake Michigan maritime cultural landscapes. Sheboygan and Manitowoc ethnic and economic landscapes continued to differentiate to create distinctive community identities that persist today. Although both cities have strong manufacturing bases, Manitowoc retains a strong maritime economic sector and identity while Sheboygan does not. Two Rivers also retains a strong maritime sense of place, particularly with its association with commercial fishing.

Manitowoc, Sheboygan, and smaller communities such as Two Rivers and Port Washington enjoyed relatively diversified economies with strong manufacturing capacities. The lake was integral to later industrial growth. The access to raw materials and inexpensive transportation supported the growth of furniture and other woodenware industries. As industries grew larger and required more energy, industrial harbors ensured access to relatively inexpensive coal from the east. Critical for local industry, coal became an important commodity for transshipment and Sheboygan emerged as important coal port for Western Wisconsin, Minnesota, and Iowa. The skilled work associated with shipbuilding and marine engineer translated directly to manufacturing. Manitowoc's service as a steamboat maintenance base as well as shipbuilding center provided a strong position to make the expensive transition from wood to steel in vessel construction at the beginning of the 20th century. The technologies associated with steel shipping and marine engineering contributed to development of other manufacturing sectors.

Harbor Engineering at Manitowoc and Sheboygan 1860 - 1910

As America entered the industrialization age, internal improvements to the nation's transportation network received new priority in the national agenda. In the Mid-Lake Region, this plan manifested in harbor improvements. Between and 1852 and the eve of World War I, the federal government allocated nearly S1.7 million to harbor projects at Sheboygan and Manitowoc with each community chipping in more than $300,000 each (Table 10). Local investment accounted for 26% of improvement funding in Manitowoc and 36% in Sheboygan. These high percentages emphasize Mid-Lake communities' commitment to developing coastal infrastructure.

	Local Investment	Congressional Appropriations	Grand Total
Manitowoc (1852-1910)	$336,276	$946,560	$1,282,836
Sheboygan (1852-1912)	$370,000	$664,168	$1,034,168

TABLE 10. Local vs. federal investment in harbor improvements at Manitowoc and Sheboygan (Laurent 1976:193).

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In 1865, Congress allocated $52,000 for Manitowoc harbor improvement through an extensive harbor bill required the city to contribute $20,000 annually between 1867 and 1869. A measure to level temporary harbor improvement taxes garnered 304 out of 392 votes (Plumb 1904). The city used the first $20,000 to build a dredge to deepen the harbor in preparation for the arrival of federal engineers who built two new piers out to the eleven-foot contour line and added docks and cribs along the riverfront. The project, completed in 1871, included dismantling the Pioneer Era piers.

The 1871 project renewed the long battle between lake geology and coastal engineers. Responding to and anticipating larger commercial vessels federal engineers lengthened Manitowoc' piers out to the 18-foot contour line on Lake Michigan. Longer piers brought more sedimentation, thus stimulating the need for even longer piers. As the hardened piers increased in length the problem of lake-generated swells and surges in the river grew worse. A breakwater installed in 1872 to combat the swells became first of a number of engineering efforts to protect Manitowoc's inner harbor (Plumb 1904:63). The problem, which had its foundations in the original federal pier designs and faulty understanding of coastal processes occurred throughout much of Lake Michigan and proved particularly dangerous at Sheboygan, where numerous sailing vessels were lost or several damaged trying to enter the harbor.

Steamers experienced problems with piers as well. In 1891, a number of Goodrich passenger steamers crashed into the pier and uprooted four pier pilings. Four years later, a schooner damaged the elevated light conduit built in 1892. Swell and chop within the channel compounded the risk of collision and vessels breaking their moorings. By the early 20th century, Sheboygan's South Pier extended nearly one half a mile from the shoreline and the North Pier only few hundred feet less. An 1898 survey of Sheboygan Harbor described the problem:

> Heavy Seas created by winds coming from the northeast around to the southeast find an easy entrance to the harbor, and at times have been so great as to break vessels from their moorings and cause collisions with considerable damage. The disturbances extend as far as the Eight Street Bridge and even beyond that point (55th Cong 3d sess. H. Doc 5).

The problem was ubiquitous on the western shore with a 1905 report attributed the damage to the narrow piers channeling of wave energy up the river (59th Cong 1st Sess. H. Doc 62). Local newspapers described "tidal waves" hitting Sheboygan during this period. Whatever the term used, mariners and engineers recognized that man-made structures increased the natural dangers the lake posed to mariners, ships, and business districts. A fact reflected in the large number of harbor associated shipwrecks in the 1880s and 1890s. The re-engineering of harbors by including "settling basins" to diffuse lake swells did much to alleviate these problems. Entering the western Lake Michigan harbors under certain storm conditions still requires extreme caution and a high degree of skill.

Manitowoc and Sheboygan as Industrial Harbors

The environmental factors that attracted early shipbuilders to Sheboygan also brought large-scale industries. Local sources of hardwood, inexpensive transportation by lake and rail, and access to a skilled and orderly work force led to Sheboygan to become America's "Chair City" with dozens of furniture manufacturers operating between 1865 and 1920. By 1882, Sheboygan produced ¼ of all chairs manufactured in the West (Nesbit 2013). In 1900, 60% of Sheboygan's wage earning workforce labored in the chair and furniture plants. At first, local forests provided enough material for competing firms to coexist along Sheboygan's coastline and riverfront. By the 1880s and 1890s, Sheboygan relied on Great Lakes schooners to bring in cargoes of hardwood from other areas. Sheboygan's identity as the Chair City finds material expression in Mid-Lake wrecks such as the *Lottie Cooper*—lost near the harbor entrance carrying hardwood to the Matoon Manufacturing Company.

In 1880 Clemens Riess, a prosperous German immigrant living in Sheboygan, founded the C. Reiss Coal Company. By the mid-1890s, Sheboygan had become Wisconsin's principle coal port and occupied larger tracts of waterfront on Sheboygan's south side. The Reiss coal docks became principal features in Sheboygan's maritime cultural and economic landscape. By the eve of World War I, the Riess Company was perhaps Sheboygan's most important industrial company and its sister enterprise, the Wisconsin Transportation Company, owned three large cargo steamers and was the city's most significant maritime concern (Ziller 1912). Before its sale in 1902, the Riess Company operated the large Port Huron Salt Company Docks that received 150,000 to 200,000 barrels of Michigan salt annually at the beginning of the 20th century. Salt came by ship and then transferred to westbound railcars (Figure 28).

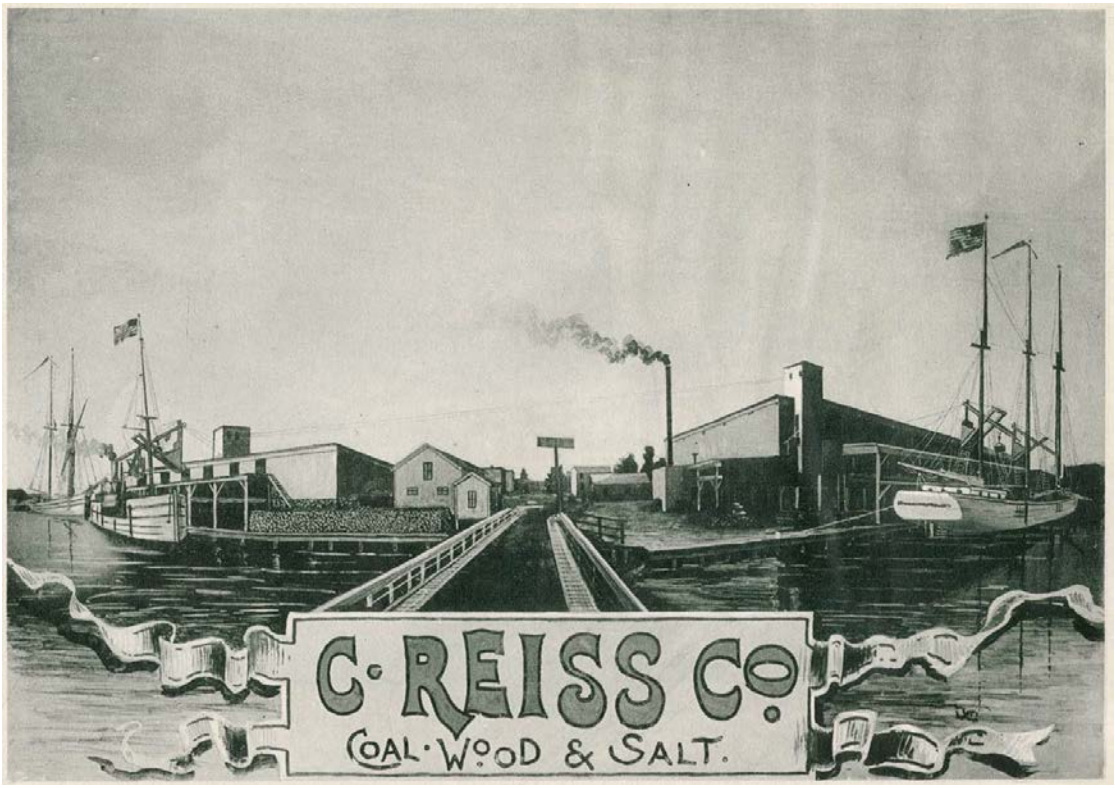

FIGURE 28. C. Reiss Coal Company (Groh and Groh 1891).

The 1880 and 1890s saw a rapid growth in the size of vessels and a shift from the building of wooden ships to those constructed of first iron and then steel. Table 11 illustrates the rapid growth in the number of Great Lakes vessels exceeding 300 feet in length between 1883 and 1895 (Table 11). Bigger ships required longer piers as well as deeper and wider channels. The plan of Manitowoc harbor from 1899 (Figure 29) illustrates the city's' increasingly industrial scale.

Built in 1883 :	**number 1,**	**mean length 300 feet,**	**mean beam 36 feet.**
1886	2	307	39
1887	1	301	39
1888	5	314	41
1889	3	309	40
1890	13	310	40
1891	5	312	41
1892	12	318	41
1893	8	343	43
1894	8	360	44
1895	13	394	45

TABLE 11. Increase in vessels built over 300' in length demanded responses from Mid-Lake coastal engineers (Abbot 1896:10).

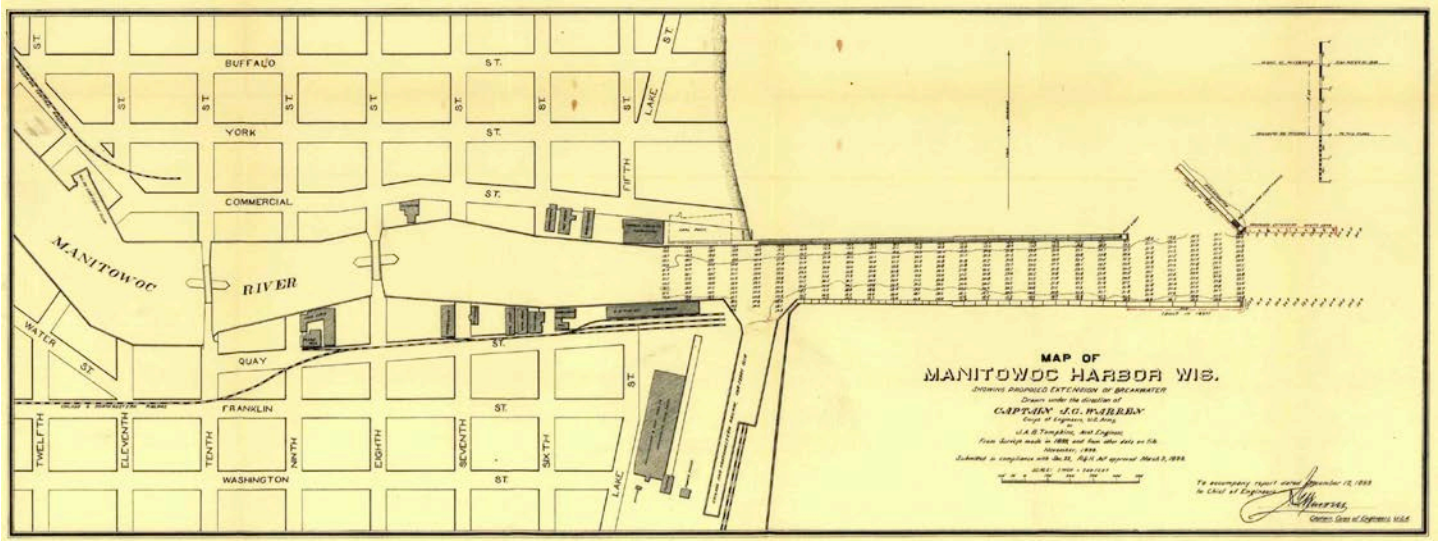

FIGURE 29. Manitowoc harbor in 1899 (Courtesy of the Patrick C. Labadie Collection, Alpena, MI.)

Great Lakes shipping required expansive inner harbors with space for multiple large vessels and adjacent intermodal transportation connections. In 1895 Henry L. Abbot, retired US Army Corps of Engineers Colonel and president of the Milwaukee & Lake Winnebago Railroad Company published a study of Manitowoc Harbor in anticipation the projected rail car ferry terminal. Abbot highlighted the advantageous rail connections to west to Minneapolis/St. Paul and potential of Manitowoc as a world-class port.

> Of the five miles of river bank included within this distance, about four are now occupied or are suitable for occupation as bulk-head landings for freight; and fully one of these four miles is well adapted to the construction of extensive slips easy of railroad access and as capacious as the new docks at Manchester, England, provided to accommodate the new ship canal from the Mersey River (Abbot 1896).

Abbot's reference to Manchester is significant in its Atlantic maritime cultural orientation. Even with industrial period activity, the Atlantic remained a source of inspiration and a point of common reference. In 1896, the completion of railroad and expansive new industrial dock marked a new era in Manitowoc's harbor history. Accompanying the 450 by 110 foot long slip was a new 250,000-ton capacity coal dock (Plumb 1902). The later car ferries were all built in similar fashion: 350' in length, 55' in beam, twin screw, and a thick steel designed to battle ice and extend the shipping season. They were built with two decks and a series of turnbuckles that helped arranged the rail cars in a space-efficient order (Figure 30).

FIGURE 30. Ann Arbor No. 3 at Manitowoc (Courtesy of the Grace E. Swensen and Robert J. Peppard Collection, Manitowoc, WI.)

The car ferry was an innovative solution to connecting railroads that separated by short stretches of water but long distances by land. Loading rail cars on giant vessel eliminated costly and time-consuming cargo handling. The rail car ferry was an innovative vessel and Manitowoc played an early role in its development. *Ann Arbor No. 1* and *Ann Arbor No. 2* began calling at Manitowoc in 1896 along their cross-lake route between Kewaunee and Frankfurt. One year later, the Pere Marquette Railroad began making regular trips between Ludington and Manitowoc twice a day. The Pere Marquette became one of the largest rail lines offered trans-lake portage for rail cars and operated five rail car ferries on Lake Michigan (Pere Marquette Railroad 1915).

Although among the biggest vessels on the lakes in the early 20th century, the corporate created ferries lacked the romance but none of the danger of the earlier vessels:

> No part of railroad service is more arduous than this "railroad across the lake" at certain times of the year. The course of the ferries is always straight as the crow flies and they are rushed across the lake, their deck-loads of cars coupled without delay to waiting engines, their decks refilled and out on the lake they go again regardless of storm and weather (Pere Marquette Railroad 1915).

The car ferries are represented submerged cultural landscape. In 1900, the *Pier Marquette* ran down the scow schooner *Silver Lake* near Manitowoc. That wreck is now on the National Register of Historic Places. The *Pier Marquette 18* a car ferry built in 1902 foundered 20 miles east of Sheboygan in September 1910 with the loss of 29 lives.

Manitowoc's dedication to harbor improvement and shipbuilding helped bring the car ferries to the city and is another example of Manitowoc's economic dependence on Lake Michigan. Manitowoc's well-maintained harbor, long piers, and geographical location made it an excellent choice for rail operators. By 1910, roughly 60% of all freight entering or leaving Manitowoc did so on the car ferry steamers. The ferries helped retain Manitowoc's status as a modest but significant commercial port into the 1960s. Rail car service to Manitowoc lasted until January of 1982 with the closing of the Ann Arbor car ferry fleet. The car ferry *Badger* maintains the nearly 120-history intermodal cross-lakes travel at Manitowoc calling twice daily during summer months. Built in 1952, the *Badger* is on the National Register of Historic Places. The industrial infrastructure associated Manitowoc's waterfront, especially its ship repair and engineering capacities and workforce have remain important to the city's economy and its identity.

Aids to Navigation and Life Saving

The increased commercial traffic in and out of Mid-Lake ports required substantial aids to navigation for mariners weaving through sand bars to access river channels. Timing of lighthouse construction varied greatly in the Mid-Lake Region. Pioneer Era lighthouses in the region include Manitowoc (1839) and Two Rivers (1853). Later lighthouses in the Mid-Lake Region include Port Washington (1869), Two Rivers (1874), and Sheboygan (1880).

Mid-Lake lighthouses often served as a pier-head beacons-a position vulnerable to wind and wave. A lighthouse built at the end of Sheboygan's north pier in 1873 burned in March 1880 but rebuilt within three months (Zillier 1912). The constant pier extensions necessitated frequent lighthouse relocation. For example, the Sheboygan lighthouse moved 460 feet down the new pier in 1884, and another 200 feet in 1889 years later. In September 1895, the pier light moved another 230 feet seaward (Anderson 2014). On a similar note, pier lights exposure to increased with their distance from shore. Surf break caused by sand bars, sudden squalls, and winter ice flows were all frequent occurrences that threatened the wooden lifeline that connected the light with the shoreline.

Sheboygan's lighthouse struggles continued into the twentieth century. In 1904, the redesigned pier light operated from a fifty-foot circular tower armored with riveted steel plates on top of a concrete foundation. By this time, the light protruded 1700 feet into the lake. Though structurally sound compared to its predecessors, the steel tower, and the north pier were removed in 1915 as part of a break wall strategy to reengineer pier placement to reduce inner harbor water turbulence. A scow transplanted the steel tower on August 19, 1915 to its new location atop the new concrete north break wall (Anderson 2014).

The harbor development at Manitowoc and lighthouse construction timeline at Sheboygan illustrate the degree to which maritime communities along the Mid- Lake Region had to constantly reengineer coastal infrastructure to maintain pace with technical advancements in shipbuilding and the increasing commercial demands by Great Lakes industries. These communities were far more than cargo loading and unloading locations. Their residents were deeply entrenched at the boundary between lake and land.

The United States Life Saving Service became a critical actor in dramatic shipwreck events during the second half of the nineteenth century. Most of the early life saving stations were maintained by part-time volunteers in similar fashion to volunteer fire departments. Startup finances for surf boats, building construction, and equipment did not include funding to sustain and maintain assets. Before 1871, the program lacked systematization and existed on meager appropriations granted to areas "as the Secretary of War may determine" (Plumb 1911). In establishment of the U.S. Life-Saving Service in 1878 led to the establishment of regional districts with Sheboygan and Two Rivers two of the nine stations in Lake Michigan District 11.

Volunteers established the lifesaving station at Two Rivers in 1874 under the command of Captain Scove, a well-known local shipbuilder, and incorporated into the U.S. Life Saving Service in 1878. The Two Rivers Life Saving Station assisted in high and low profile rescues. Two Rivers surf men rescued the entire crew of the steamer *W.L. Wetmore* on November 12, 1894. In 1912, Two Rivers lookouts were the last to see the famous Christmas Tree ship *Rouse Simmons* before it sunk (USCG History Program 2014).

Volunteers under Captain Ole Groh established the Sheboygan Life Saving Station in 1876 on the south side of the Sheboygan River. The building was stocked with two surf boats, a self-raising boat, a mortar, life preservers, and ropes. In 1880, the station was incorporated into the U.S. Life Saving Service and manned all hours of the day (Zillier 1912).

The Life Saving Service continued to open stations on the Great Lakes through the beginning of the twentieth century. By 1900, Lake Michigan possessed the most life saving stations of the five Great Lakes. With the exception of three years, funding for the program increased annually between 1876 and 1909 (Table 12). The expansion of the service, and focus on Lake Michigan is emblematic of the rising national concern over shipwrecks with the growth of coastal trade. Life saving along the Mid-Lake Region is an important thematic element of the dialogue between man and lake.

1876	$201,580	1893	$1,251,893
1877	170,228	1894	1,258,221
1878	186,611	1895	1,345,329
1879	322,526	1896	1,413,066
1880	389,523	1897	1,406,419
1881	380,072	1898	1,497,676
1882	506,239	1899	1,509,831
1883	670,757	1900	1,535,936
1884	738,893	1901	1,640,013
1885	788,209	1902	1,654,392
1886	811,120	1903	1,721,727
1887	794,512	1904	1,766,446
1888	928,213	1905	1,799,644
1889	893,637	1906	1,832,465
1890	913,786	1907	1,964,321
1891	940,201	1908	2,060,010
1892	1,009,234	1909	2,268,857

TABLE 12. Federal appropriations for the U.S. Life Saving Service on the Great Lakes, 1876-1909.

Not only did the program offer a critical service in saving property and life, but the life savers themselves kept copious records of ship sightings and operations. Most of these records have survived and located at National Archives branches and at the Wisconsin Historical Society. These records are instrumental in historical inquiries on specific vessels or shipwreck events and illuminate the many mundane services performed by the lifesaving stations. Figure 31 offers some selected casualty reports by Mid-Lake lifesavers in June 1895.

Date.	Service rendered.	Station and locality.	Nature of casualty.
May 31	Small boat; no name.	Racine, Lake Michigan...	Adrift in the lake. Towed it ashore and delivered it to owner.
June 29	Skiff; no name.....	Two Rivers, Lake Michigan.	Capsized near station. Rescued the boatman, who was clinging to the bottom of the skiff, sent him to his home, and cared for his boat.
Aug. 29	Resuscitation	Sheboygan, Lake Michigan.	Word was received at the station that a boy had been drowned half a mile away. Ran to the place, where it was found that the lad had been recovered after being submerged about one minute, and persons were trying to resuscitate him. Life-saving crew took charge of the case and restored the boy after working over him about ten minutes; then sent him home.
Sept. 1	Property saved.....	Two Rivers, Lake Michigan.	Launched a small boat and rescued a sheep that had jumped into the river from the bank opposite the station. Returned the animal to its owner.

FIGURE 31. Selected casualty reports of Mid-Lake Region life saving stations (US Life Saving Service 1908).

Shipbuilding 1860-1910

Manitowoc

The years following the Civil War solidified Manitowoc's the shipbuilding industry. Improvements to harbor kept the city in the forefront of vessel innovation, experimentation, production, and repair. Schooners dominated local production into the1870s with the partnership of Rand and Burger constructed eleven schooners at Manitowoc during that decade, including the *Lottie Cooper* in 1876. Manitowoc's shipbuilding heritage continues unbroken to the present day Manitowoc Shipbuilding Company, one of the leading repair and construction facilities for modern Great Lakes bulk craft.

Changes in American social ideals after the Civil War had direct impacts on shipbuilding in the Mid-Lake Region. America's emergent middle-class had new perspectives on work and work ethic. Many of the middleclass had climbed the social and economic ladder from blue collar to independent contractor or industry supervisor positions. The development of large, corporate passenger ship lines is directly related to the newly-formed values of the American middle class. One of the most famous of these lines, the Goodrich Line, chose Manitowoc as its principle Lake Michigan port north of Milwaukee (Hilton 2002). Manitowoc's impressive shipbuilding industry led Edgar Goodrich to move his company's maintenance yard to Manitowoc in 1859. That year Goodrich offered service up the entire Wisconsin coast and diagonally to Grand Haven and Muskegon.

The Goodrich Line's close association with the city of Manitowoc deepened the city's shipbuilding identity as local builders accepted Goodrich contracts. Bates built the propeller *Union* in 1861 (Hilton 2002). Rand and Burger produced many of Goodrich's passenger steamers including *Manitowoc* (1868), *Sheboygan* (1869), *Corona* (1870), *Navarino* (1871), *Menominee* (1872), *Oconto* (1872), *DePere* (1873), *Chicago* (1874), *City of Ludington* (1880), *Arctic* (1881), *City of Racine* (1889), *Indiana* (1890), and *Iowa* (1896). The Rand yard was also involved in the substantial refittings of *Ottawa* (1854) and *G.J. Truesdell* (1864).

Chicago was a typical three deck sidewheel steamer. It had a passenger capacity of 180 and carried passengers for forty-six years before conversion into a floating boarding house for Manitowoc Shipbuilding Company employees on the Manitowoc River (University of Michigan Library Digital Collections: Chicago). By the early 1870s, screw propellers were competing for shipyard attention and gaining popularity for their increased fuel efficiency, cargo capacity, and draft. Goodrich propeller *City of Racine* embodies the passenger/package freight propellers built at Manitowoc in the second half of the nineteenth century (Figure 32).

FIGURE 32. *City of Racine* (Courtesy of the Patrick C. Labadie Collection, Alpena, MI.)

Tugboats become central to the Great Lakes maritime economy after the Civil War. Whether operated independently or towed as part of a train of barges, Great Lakes sailing vessels depended on steam-powered tugs. Tugs built at Manitowoc include the Rand and Burger built *Frank Canfield* (1875), *Irma L. Wheeler* (1877) (Figure 33), and the Goodrich-owned wooden tug *Arctic* (1881). Built by Rand & Burger for the sole purpose of berthing Goodrich ships in the Manitowoc River, the *Arctic*'s 65' wooden hull had substantial hull reinforcements for ice

FIGURE 33. *Irma L. Wheeler* (Courtesy of the Patrick C. Labadie Collection, Alpena, MI.)

breaking capabilities and tasked with clearing the harbor at the beginning of the shipping seasons. The tug also assisted in many rescues and served until in 1930, a career of 49 years: the longest of any vessel in Goodrich's fleet and rests on the bottom of Lake Michigan neat the harbor it served (Hilton 2002:262). As a tug based in Manitowoc, *Arctic* appears in dozens of newspaper accounts in association other historic vessels.

Great Lakes tugs rarely exceeded 80' in length and generally propelled by a single screw. A larger cabin and wheelhouse lay centered on the open deck. In addition to towing schooners, and schooner-barges, tugs played an important role as harbor utility vessels. Tugs assisted bigger sidewheelers and propellers into slips, towed them out to open water, and often performed civil duties like assisting in fires. Tugs today play the same roles as they did in the Great Lakes in the second half of the nineteenth century.

Manitowoc's willingness to invest in maritime infrastructure and businesses kept the lake at the center of the community's economy and cultural identity. In the early 1870s, a local joint-stock company constructed a large drydock, which they operated until 1887 when it was sold to Henry Burger. In 1902, the incorporation of the Manitowoc Drydock Company brought the city's maritime industries into the steel age of shipbuilding. The Manitowoc Shipbuilding Company built and repaired car ferries including *Ann Arbor No. 7* and five sister ships in the middle 1920s. During World War II, Manitowoc Shipbuilding produced 28 submarines for use in the Pacific. Manitowoc's connection with the submarines is an important theme in this city's modern maritime heritage and is intimately connected with the Wisconsin Maritime Museum, which maintains one of the surviving craft.

Sheboygan

As with Manitowoc, by the 1870s Sheboygan builders began to concentrate on industrial vessels after such as the 60-ton tug *Sheboygan* and the 275-foot long wooden bulk freighters *Helena* built by Rieboldt and Wolter, a firm organized in 1885. With a shipyard and floating dry docks inside the harbor, Riebolt and Wolter employed up to 175 men during the busy seasons (*Dictionary of Wisconsin History*, Beason's *Sailors Handbook and Marine Guide 1891*). Wolter was also part owner of the Sheboygan Dredge and Dock Company, a harbor construction firm. In 1895, the increasing lake traffic in coal led Riebolt and Wolter to sell the shipyard land to the Chicago and Northwestern Railway for use by the Reiss Coal Company (*Marine Record* 24 Jan 1895). In 1896, the firm relocated to a prime spot next to the canal at Sturgeon Bay, a major loss to the Sheboygan maritime economy. The firm remained involved in local marine construction, receiving large contracts from the federal government to improve the Sheboygan Harbor. The loss of Riebolt and Wolter and its relationship to the expanding coal trademarks an important shift in Sheboygan's maritime cultural landscape. Still very much a port—its focus on industrial fuels and materials largely supplanted what had been a diversified Atlantic based maritime economy and culture. Between the late 1840s and 1920s, four large shipyards and several smaller ones turned out approximately 80 schooners and 40 tugs and barges along the Sheboygan River (Labadie Collection). Sheboygan shipbuilding, unlike Manitowoc, never transitioned from the wooden to the steel age.

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VESSEL	WHERE BUILT	BUILDER	VESSEL TYPE	CASUALTY DATE	CASUALTY TYPE	OWNERS	CARGO
Arctic (1881)	Manitowoc	Rand & Burger	Tug	00/00/1930	Abandoned	Goodrich Transit Company	Empty
Francis Hinton (1889)	Manitowoc	Jasper Hanson & Scove	Propeller	11/16/1909	Stranded	Truman & Cooper	Lumber
Lottie Cooper (1876)	Manitowoc	Rand & Burger	Schooner	4/09/1894	Stranded	Ole Groh, Fred Lorenz, W.D. Crocker, George B. Matton, E.E. Pantzra	Lumber
Muskegon (1871)	Manitowoc	Greenleaf S. Rand	Sidewheeler	00/00/1899	Abandoned	Goodrich Transit Co.	Empty
Robert C. Pringle (1903)	Manitowoc	Manitowoc Shipbuilding	Propeller	06/19/1922	Collided	Pringle Towing & Barge Co.	Wood
Sea Gem (1863)	Manitowoc	W.S. Bates	Schooner	09/09/1901	Stranded	Capt. Alonza A. Hanshaw	Slabs
Sheboygan (1869)	Manitowoc	Greenleaf S. Rand	Sidewheeler	09/24/1914	Burned	Goodrich Transit Company	Empty
McMullen and Pitz Dredge	Manitowoc	N/A	Dredge	11/18/1919	Foundered	McMullen and Pitz Company	Empty
Alaska (1869)	Sheboygan	S. Neville	Scow-schooner	00/00/1890	Stranded	C.M. Christianson & C.S. Jacobson of Milwaukee	Wheat
C.S. Davis (1870)	Sheboygan	C. Olson	Schooner	12/11/1881	Stranded	C. Olson	Slabs
Express (1864)	Sheboygan	Charles Huntley	Scow-brig	4/19/1878	Collided	Chicago Lumbering Co.	Light
Nora (1869)	Sheboygan	B.B. Cocklin & Jacob Nyles	Schooner	10/28/1869	Collided	B.B. Cocklin & Jacob Nyles	Stones
Silver Cloud (1869)	Sheboygan	Johnson	Scow-schooner	07/07/1891	Stranded	Schlyter	Wood
Hannah Etty (1864)	Two Creeks	O. Johnson	Schooner	8/26/1880	Foundered	Charles Bock (of Manitowoc)	Coal, Wood

TABLE 13. Vessels built and wrecked in the Mid-Lake Region.

Lottie Cooper and the Integrated Maritime Cultural Landscape

Sailing southward down Lake Michigan on a windy April evening in 1894, the crew of the three-masted schooner *Lottie Cooper* discovered water rising above the forecastle and cabin floors. This was an alarming, but relatively common situation on older wooden schooners. As the vessel would soon reach their homeport of Sheboygan, the captain and crew had every expectation of a safe arrival. Fewer than twelve hours later, however, one crewman was dead and the schooner wrecked, breaking apart just north of Sheboygan spilling its cargo of elm lumber along the lake front. With their ship deteriorating, the Captain could not risk sailing into the narrow and dangerous piers that marked the outer boundaries of the harbor.

As the lake front sands covered the flattened wreck, memories of the vessel and its demise receded from local memory. Nearly a century later, however, the wreck of the *Lottie Cooper* unexpectedly reappeared during a harbor redevelopment and revived the memories of Sheboygan's local maritime heritage. As of 2013, the reassembled wreck adorns a prime spot in a park in Sheboygan's manicured recreational waterfront. This quiet attraction, free to the public, continues to claim the attention of thousands of local and distant visitors every year. *Lottie Cooper*'s picturesque qualities have made it a common image on internet photo sharing and travel sites (Figure 34).

The wreck of the *Lottie Cooper* is an interesting individual contemporary landscape feature, and provides an entry point for considering historic shipwrecks as significant elements in Wisconsin's historic maritime cultural landscape. In a real, tangible sense the *Lottie Cooper* is a linking vessel that connects the Sheboygan community with its maritime past and is one of fourteen vessels both built and wrecked in the Mid Lake Region (Table 12).

FIGURE 34. *Lottie Cooper* on the waterfront at Sheboygan (Courtesy of the Wisconsin Historical Society, Madison).

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A closer look at the *Lottie Cooper* reveals the intersecting nature of the Mid-Lake Michigan cultural landscape. Built by Greenleaf S. Rand and Henry Burger in Manitowoc the schooner is a significant and accessible example of local shipbuilding heritage. The relatively late construction for a large schooner (1876) is explained its intended use as a lumber carrier. Equipped with specialized loading ports, the vessel was well suited to serve the expanding trade in high quality hardwood lumber.

By 1890, Captain Ole Groh of Sheboygan had principal ownership of the vessel. In 1894, the year of her loss, Groh and four others owned the schooner. Among its owners was George B. Matoon, owner of the the Matoon Furniture Company, then one of Sheboygan's largest manufacturing concerns. With a showroom in Chicago, Mattoon employed nearly 1000 people by the end of the 1890s. *Lottie Cooper*'s final cargo, $3000 worth of elm lumber was destined for Matoon furniture. An 1891 book of photographs attributed to the Groh Brothers includes a photograph of the Mattoon Factory with partially unloaded schooner similar in size to the *Lottie Cooper* in the foreground (Figure 35).

FIGURE 35. Matoon Manufacturing 1891 (Groh and Groh 1891).

The excerpt from highly detailed birdseye map published in 1885 reveals a complex Sheboygan maritime industrial landscape where the strategic integration of lake and rail allowed for the efficient and inexpensive delivery of raw materials and fuel and the distribution of finished products (Figure 36). Schooners such as the *Lottie Cooper* were invaluable links in the industrial supply chain that kept thousands of Sheboygan laborers employed at the beginning of the twentieth century.

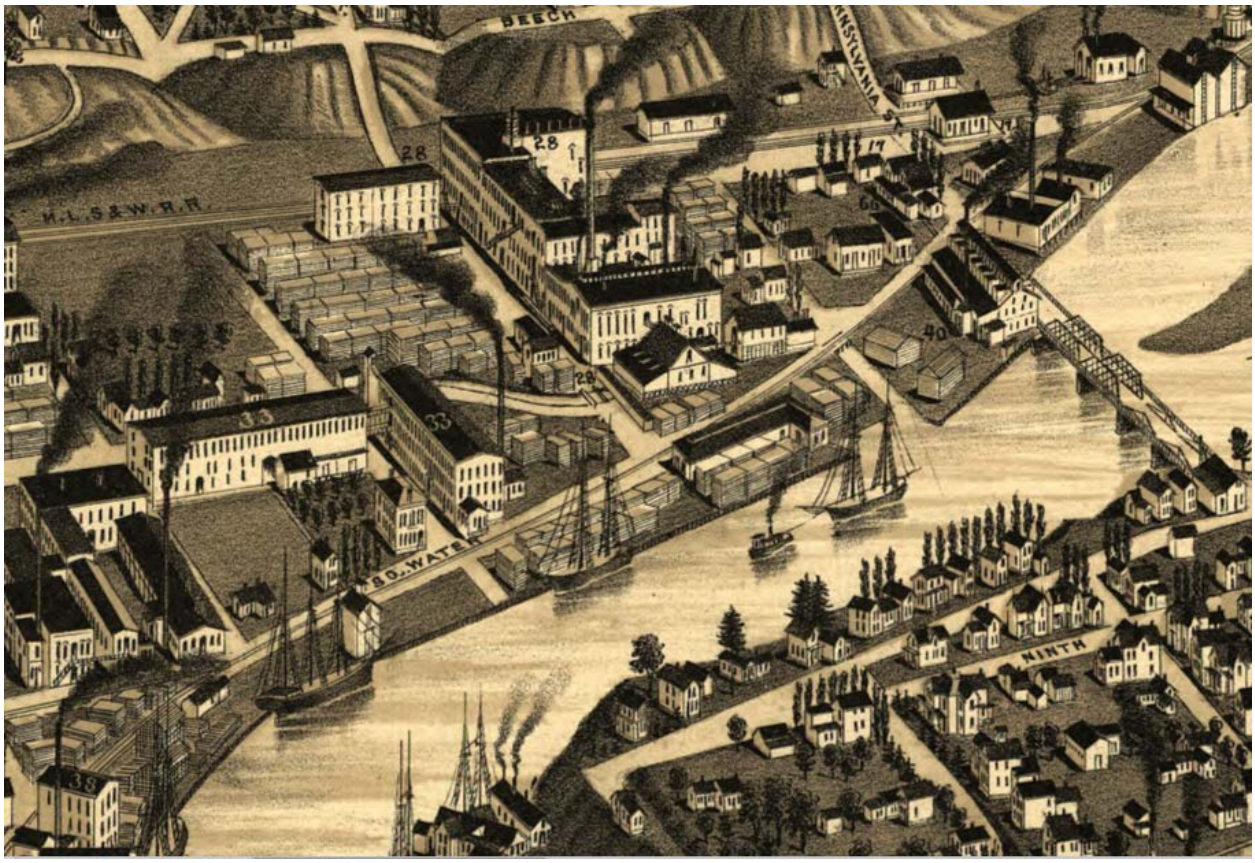

FIGURE 36. Excerpt from Sheboygan 1885 (Library of Congress. American Memory).

The *Lottie Cooper* provides an important linking feature the Mid-Lake Michigan region's historic maritime cultural landscape. From builders to owners, cargo, crews, and circumstances of loss—the schooner is preserves the powerful connections between Atlantic maritime culture, the region's natural environment, and process of industrialization the transformed coastal Wisconsin from western frontier in the 1830s to economic heartland in the 20th century.

Chapter V. National Register Cultural Landscape Criteria to the Mid-Lake Michigan Region

The focus of this CLA investigation is to assist the NOAA Office of National Marine Sanctuary better understand the maritime heritage of the Mid-Lake Michigan Maritime Heritage Trail Region. Although not limited to using National Register of Historic Places criteria in evaluating cultural resources, NOAA ONMS has conducted investigations that have led to the listing of several shipwrecks on the Register. As ONMS works to integrate a cultural landscape approach across the Sanctuary system, it is important to consider how larger maritime cultural landscapes may related to existing National Register criteria. What follows in this chapter is an effort to link Mid-lake Michigan submerged heritage to National Register Standards. Current efforts to expand the use of cultural landscape within the National Park Service may expand definitions of significance and integrity well beyond what this report describes. The balance this chapter comes from an unpublished report by Jensen (2005) submitted to the Wisconsin Historical Society.

The Mid-Lake Michigan Maritime Heritage Trail is comprised a long linear rural historic cultural landscape that should qualify for listing on the National Register of Historic Places under Criterion A and D. A watery highway of national importance, the Transportation Corridor is intimately associated with transportation, settlement, and industry in Wisconsin. The natural environment and related collection and spatial organization of objects, sites, and structures associated with historic maritime transportation on Lake Michigan offer a rich tapestry for exploring human responses to the problems and opportunities associated with frontier shipbuilding, settlement, commerce, and the advent of large scale agricultural and industrial development.

The Maritime Heritage Trail consists of a section the deepwater navigation corridor that constituted the principle navigation route down the western side of Lake Michigan during the 19th and early 20th century and coastline dramatically shaped by maritime engineering and populated with more than 100 historic shipwrecks—nearly all built before 1880. A regional highway, the corridor also provided critical points of access, connection and exchange between maritime communities, both large and small. During the mid-nineteenth century, hundreds of thousands of Americans and immigrants followed this maritime pathway to new lives and lands in Wisconsin and other Midwestern states. As these settlers farmed the land, the corridor provided a critical avenue for carrying surplus products to market and for bringing in manufactured goods from other regions and other nations. In the later 19th and 20th centuries, the corridor became an essential component in the circulation networks for the rapidly industrializing Midwest. Included in district are the lake's surface waters, weather patterns, and subsurface natural and cultural features. When analyzed using current archaeological theories and methods these elements come together to form an important and coherent segment of Wisconsin's Lake Michigan maritime cultural landscape. This landscape has documented associations with three of the historic contexts identified and well developed in the multiple property documentation *Great Lakes Shipwrecks of Wisconsin*: The Early Industries: Fishing, Lumber, Mining, and Agriculture 1800-1930; Settlement, 1800-1930; and Package Freight,

1830-1940 (Cooper and Kriesa 1991). Further research could well identify additional historic contexts.

Wisconsin and the Maritime Cultural Landscape

FIGURE 37. Wisconsin state flag.

Any good Wisconsin map provides ample testimony to the role of navigable water in shaping the Badger State's boundaries and settlement patterns. The Wisconsin State flag and current official state seals offer high profile examples of the maritime imprint on Wisconsin's public culture. The anchor, caulking-mallet in grasp of a powerful hand and arm, and blue-jacketed mariner that they clearly depict can be read as cultural and historical symbols that represent the introduction of Atlantic World technologies and laborers to the freshwater frontier during the nineteenth century. These visual elements share iconic space with images of a miner, bars of lead, a cornucopia, pick, shovel, and plow and depict in graphic terms the implicit and explicate interplay between the natural environment and Wisconsin's pioneers. To move "Forward" as instructed by the large text message at the top of the seal, one had to break up the soil to unleash its fertility, delve into earthen depths to release trapped mineral resources, and tame the tempestuous Great Lakes by converting vast stands of virgin forest into good ships manned by strong and able mariners.

The complex interplay between culture and nature whose signature is written boldly across the Wisconsin flag is the hallmark of the cultural landscape; an important way of organizing our understanding of the historically evolving and continuing relationships between society and the environment. The cultural landscape is increasingly recognized by historic preservation and cultural heritage professionals and agencies worldwide as important concept for preserving and interpreting the material remains of the past in ways that recognize cultural pluralism, incorporate complex cultural, environmental and historical processes, and value the participation and competing interests of a heterogeneous public. Put differently, cultural landscapes can reveal much about the interplay between place and process and leaves ample room for multiple cultural groups to derive or impose meaning upon a geographic space (Coleman 2003; Anschultz et. al, JAR; Stoffle, et. al., 1997).

Over the past three decades, the concept of the cultural landscape has risen to prominence in several academic disciplines. With roots extending to Europe in the 19th century, American ideas of the cultural landscape first blossomed in the 1920s with the work of landscape architect Carl Sauer. One Sauer's seminal ideas that "the cultural landscape is fashioned from the natural landscape by a cultural group. Cultural is the agent, the natural area is the medium, the cultural landscape is the result," remains central to more recent conceptions espoused by a variety of disciplines (Groth and Wilson 2003; 5). In the eighty years that have followed Sauer's formulation, scholars have developed a variety of schema for defining and evaluating cultural landscapes. The interplay between nature and culture, however, remains essential. For anthropologically-focused archaeologists, the cultural landscape contains both material and symbolic elements, but key for anthropologists, historians, and preservationists is that cultural landscapes reflect patterned human behavior.

In the Great Lakes Region (among other places), the shipwrecks and other cultural materials deposited on the lake bottom and along the shore, can be evaluated as a series of nested cultural landscapes that reflect distinct though often related historical contexts and cultural orientations. (Anshultz et. al. citing Binford, 1983). The study of maritime cultural landscapes has a terrific potential for yielding archaeological, historical, and cultural information about Wisconsin's past. This potential is especially great for the nineteenth century and early decades of the twentieth century.

Depending upon the question being visited, applying the landscape framework to the submerged resources of Western Lake Michigan has the capacity to shed light on historical and anthropological questions that both encompass and transcend state and local boundaries by allowing Wisconsin's Great Lakes resources to be read in the light of national and international processes (Cameron and Rossler, *World Heritage Newsletter* 8, 1995). Although rooted in material and quantifiable data such as shipwrecks, related material culture, and patterns of geographical dispersion, the cultural landscape framework encourages the important theoretical questions. For example, how did the early mariners of the pioneer period "see" these lakes and how did their perceptions influence the design of the vessels they built and they way that operated them? How did the 19th century American spirit of frontier enterprise effect the equation between commercial mariner and the natural environment? To what extent did the confluence of agricultural, lumbering, and urban frontiers on the Great Lakes encourage innovations in maritime technologies? Did specific ethnic-oriented maritime strategies such those practiced by Scandinavian mariners on the Atlantic Ocean transfer to the Great Lakes? Through carefully designed archaeological projects, these and countless other questions can be

addressed by examining Wisconsin's shipwrecks and associated cultural materials. None of these questions, however, are adequately understood as isolated events and individual sites. They can be addressed, however, through an examination of the maritime cultural landscape.

A great value of Wisconsin's maritime cultural resources is the completeness of the collection, and, for the period between about 1830 and 1930, in the geographical and temporal density of the resource. During that brief century, maritime culture on the western Great Lakes moved from small sailing vessels collecting fur from outposts a contested and hostile frontier to modern giant steel freighters carrying the iron ore and other natural resources that helped to make the United States the world's greatest industrial and military power. Adopting the cultural landscape approach means recognizing that the whole of Wisconsin's maritime heritage resources is greater than the sum it its individual structures, sites, and objects. Determining significance of each of these parts for the purposes of the National Register still requires the direct association of material culture to salient historic contexts through archaeological and historic research but, significantly, it does not enforce a hegemonic theoretical or cultural valuation of these resources. As Anschultz et. al., note on the application of cultural landscapes to archaeology, "a landscape paradigm offers the potential to accommodate, if not integrate, different theoretical perspectives even while these constructs seemingly exist in tension with one another in their presentation of alternative constructions of the past" (Anshultz et. al). For a simple example, the material record of emigration and agriculture embodied in shipwrecks can be read by some as record of aggressive expansion by land hungry Euro-Americans and a step in the subjugation of indigenous people or as a collective text of documenting a heroic transatlantic and transcontinental migration by people seeking to better their lives. In this case, as in other, the patterned material record can be empirically documented and preserved while leaving the meaning of contingent upon different cultural and theoretical perspectives.

Cultural Landscapes and Historic Preservation.

The intellectual power of cultural landscapes is rooted in flexibility and a capacity to organize and integrate within a shared space disparate, even conflicting, ideas, academic disciplines, and cultures. As editors of the recent volume *Preserving Cultural Landscapes in American* noted "the vast majority of cultural landscapes . . . generally evolve unintentionally and represent multiple layers of time and cultural activity" (Alanen 2000). Cultural landscapes are both discrete physical places, and a way of organizing and analyzing the relationship between culture and nature wherever the two intersect and leave a material or cultural imprint on the land.

The National Park Service defines a cultural landscape as "a geographical area, including both natural and cultural resources, associated with a historic event, activity, or person"(Egan 2003). NPS currently divides cultural landscapes into four categories. Historic designed landscapes are deliberate artistic creations such as gardens and parks that embrace "recognized styles." Historic vernacular landscapes "evolved through use by people whose activities or occupancy shaped the landscape. Through social or cultural attitudes on an individual, family or a community, the landscape reflects the physical, biological, and cultural character of those every day lives" (Birnbaum NPS Brief 36).

Vernacular landscapes exist in rural, suburban, and urban areas; those mostly commonly recognized by the NPS are the rural historic landscapes (Egan 2003). *National Register Bulletin*

30, Guidelines for Evaluating Rural Historic Landscapes defines a rural historic landscape as: "a geographical area that historically has been used by people, or shaped or modified by human activity, occupancy, or intervention, and that possess a significant concentration, linkage or continuity of areas of land use, vegetation, buildings and structures, roads and waterways, and natural features." Included among the normative types of rural landscape are those associated with "maritime activities such as fishing," "transportation systems," and "migration trails". Most of the areas that constitute Wisconsin's maritime cultural landscapes are on submerged state lands and consisted of widely dispersed individual and clusters of related sites, structures, and objects tied together through cultural association, environment, and a circulation system defined by principle maritime transportation routes. For the purposes of an evaluation for inclusion to the National Register of Historic Places, these maritime landscapes fall under the rural historic landscape classification.

Mid-Lake Michigan Maritime Heritage Trail as a Rural Cultural Landscape.

Many historic transportation routes are listed on the National Register of Historic Places. Among these properties are relatively modern roadways, canals, historic wagon routes, railroads, military roads and early portage trails. Federal recognition of the Western Lake Michigan Maritime Transportation Corridor reflects that enormous influence of maritime transportation on the settlement and development of Wisconsin and the greater Midwest. Looked at over time the corridor can be readily compared to a historic trail that evolved into a major commercial and industrial transportation system. Conceptually it differs little from the intact sections of Oregon or Santa Fe wagon trails or surviving segments of the original transcontinental railroad. Its importance in history as previously documented in the Multi *Property Documentation Great Lakes Shipwrecks of Wisconsin* and in many individual National Register nominations is unquestioned.

Bulletin 30 articulates a classification system for rural historic landscapes that consists of eleven characteristics. These characteristics are divided into four processes that shaped the land and seven physical components visible on the land. All of the characteristics are not necessarily found within each landscape and the criteria are somewhat skewed to evaluating agricultural landscapes. The eleven characteristics, however, provide a necessary foundation for defining the maritime transportation corridor as a rural historic landscape according the requirements of National Register of Historic Places. These are listed below and then discussed individually. Those interested in a closer examination of the characteristics discussed below are directed to the appropriate section of *Bulletin 30*.

Rural Historic Landscape Characteristics

Processes:

Land Uses and Activities
Patterns of Spatial Organization
Response to the Natural Environment
Cultural Traditions

Components:

Circulation Networks
Boundary Demarcations
Vegetation Related to Land Use
Buildings, Structures, and Objects
Clusters
Archaeological Sites
Small Scale Elements

Land Uses and Activities.

> An examination of changing and continuing land uses may lead to a general understanding of how people have interacted with there environment and provide clues about the kinds of physical features and historic properties that should be present. (Bulletin 30)

Cultural practices and changing patterns of often leave a visible and patterned imprint on the land. Different patterns may reflect changing land uses, the adoption of new technologies, ethnic traditions, or a number of other natural and cultural factors. In general terms landscapes are not static; they form a physical tableau upon which cultures imprint ideas, practices, and values through alterations in the land and through the disposition of material culture. Many of the principle uses of the land within the corridor are well documented historically and archaeologically. Many are discussed in the historic contexts in *Great Lakes Shipwrecks of Wisconsin*.

The opening and closing of discrete economic niches on the Great Lakes led to important alterations in the use of the navigation corridor and appears to be evident in the observable patterns in the archaeological record. Many of these changes are the result of innovations in maritime and terrestrial transportation technologies. For example the widespread application of steam to Great Lakes passenger beginning in the 1830s result in the construction of ever larger, faster, and more elaborate sidewheel steam vessels capable of hauling the wealthy in luxury and the enterprising emigrant en masse. In 1845 alone, 250,000 people voyaged to Wisconsin on these grand vessels. By the mid-1850s, the adoption of the slower but more efficient screw propeller and increasingly dense railroad network that spanned from the East Coast to the Midwest combined to render these vessels obsolete. The early steamers had significant advantages in coping with the environment; not dependent upon fair winds they rarely needed to fear the dangerous western lee shore of Lake Michigan and they could run on a predictable schedule. The combination of steam, brightly painted wooden hulls and deckhouses, and a need for speed, in combination with primitive harbor facilities and navigation hazards significant disasters along the transportation corridor. Fire, in particular, claimed many of these vessels. Archaeological and historical work on wrecked passenger vessels in Wisconsin suggest that the rapidly evolving designs of these vessels between 1830 and 1857 reflected, in part, changing notions of shipbuilders about the dynamic nature of the Great Lakes marine environment from

oceanic to coastal/inland and new international metric about what constituted a technologically progressive ship (Jensen 1999). Because builders plans are largely non-existent and the pace of change so rapid and its material remains spread across a wide geographical area, the complex questions that reflect an interplay between changing perceptions of nature, views of technology, and the evolving regional economy best be evaluated within the integrating concept of the cultural landscape.

A similar, although perhaps more complex series of questions about the response of individual maritime entrepreneur to the rise of industrialization and vertical integration may be found in the information embedded in the wreckage of older lake schooners and in the giant wooden and steel bulk freight carriers that liter the bottom and edges of the Western Lake Michigan Corridor. Work on individual sites in Wisconsin over the past eighteen years has helped to define these questions; their effective investigation, however, calls for the spatial, temporal, cultural, and geographic analysis implied in the cultural landscape. While continuity in use of the Transportation Corridor continues to the present, patterned changes in technologies, economic niches, and entrepreneurial strategies are written into the submerged portions of the Western Lake Michigan Transportation Corridor cultural landscape.

Patterns of Spatial Organization

"The organization of land on a large scale depends upon the relationship among major physical components, predominant landforms, and natural features. Politics, economics, and technology, as well as the natural environment, have influenced the organization of communities by determining settlement patterns, proximity to markets, and the availability of transportation" (NPS Bulletin 30).

Spatial organization of the land reflects a combination of social and natural factors. For example politics, major landforms, and proximity to markets may condition the location of communities and the development of roads and systems of property. The Transportation Corridor initially reflected a series of functional responses to regional factors and processes. These include the need to connect commercial frontier outposts to large western Lake Michigan ports as well as to serve as a transportation thoroughfare between the Western, Central, and Eastern Sectors of the Great Lakes basin. The lack of natural harbors in Western Lake Michigan led to the location of major communities at places where rivers met the lake. Vessels transiting the western side of the lake had to strike a balance between being too far out in the middle of the lake which, for small vessels, made it difficult to seek shelter in bad weather, and being too close to shore where rocks, shoals, and sandbars could rapidly lead to destruction. Time and economics was an important factor. Vessels calling at multiple ports saved time by remaining closer to the shore. Cultural and political factors that helped organize these patterns more regularly include the installation of lighthouses and other aids to navigation, the establishment of lifesaving stations at particularly hazardous stretches, the institution of navigation lanes, regulation of shipping seasons by insurance companies, the development of the Sturgeon Bay canal, and the various improvement of harbors through the construction of breakwaters and dredging.

Response to the Natural Environment

"Major natural features . . . influenced both the location and organization of rural communities. Climate, similarly, influenced the siting of buildings, construction materials, and the location of clusters of buildings and structures. Traditions in land use, construction methods, and social customs commonly evolved as people responded to the physiography and ecological systems of the area where they settled" (NPS Bulletin 30).

In the maritime landscape the response to the natural environment is strongly linked to land uses and activities and patterns of special organization. While the NPS rural landscape guide focuses on settlement in describing the response to the natural environment, the process is equally applicable in a maritime transportation corridor where the fundamental issue is movement. The transportation corridor and its archaeological resources can be read as a series of complex responses to the natural environment. Maritime factors such as water depth, prevailing wind patterns, and the availability of native building material influence the designs of and construction methods used in generations Great Lakes watercraft. The shipwrecks and their geographic distribution reflect the adaptation of North Atlantic Shipbuilding traditions to the unique conditions of the Great Lakes. The documented density of wrecks on the approaches of important communities and passages may reveal much about the influence of natural and market forces on the operation of Great Lakes ships. Evolving geographical set physical parameters for vessels that governed their size, hull designs, and, where applicable, their sailing rigs. It also appears that the relative abundance and scarcity of shipbuilding materials such as oak and iron affected the quality of ships. These broader issues, once again, require study at the landscape rather than at the site-specific scale.

Cultural Traditions

"Cultural traditions affect the ways the land is used, occupied, and shaped" (NPS Bulletin 30).

An untested hypothesis concerning cultural influences the use of the Lake Michigan Transportation Corridor involves the transference of ethnically based maritime strategies. The studies of North Atlantic shipping practices in use during in 19th and 20th century have identified clear patterns of ownership and entrepreneurship among Norwegian mariner. But substituting life, labor, and skill for capital, Norwegian sailors on the Atlantic successfully competed against more modern fleets from other nations and, in the process successfully accumulated the capital for the development of more modern merchant fleets. Buying partnerships in older technologically obsolete vessels, Scandinavian mariners responded to the growth of industrial capitalism and retained high levels of independence. The costs came in high loss of life and property. An examination of the historical record suggests that this cultural tradition may have made its way to the large population of Scandinavian mariners who operate the decaying fleets of schooners during the closing days of the nineteenth century. Indeed, it may be possible to map a discrete Scandinavian maritime landscape within the confines of the larger corridor. Analysis of historical analysis of Scandinavian mariners and the mapping of temporal and spatial patterns of Scandinavian owned vessels and the archaeological examination of multiple wreck sites may provide insight into this important strategy. The landscape framework will allow for the inclusion of the many possible cultural traditions related to the transportation corridor.

Circulation Networks

> Circulation networks are systems for transporting people, goods, and raw materials from one point to another. They range in scale from livestock trails and footpaths, to roads, canals, major highways, and even airstrips. Some, such as farm or lumbering roads, internally served a rural community, while others, such as railroads and waterways, connected it to the surrounding region (NPS Bulletin 30).

Perhaps the maritime transportation corridor's chief characteristic is its function as an important center for a complex series of transportation systems that helped define the cultural and economic character of the Midwest during the 19th and 20th centuries. Corridors are critical elements of circulation systems. These linear features facilitate the movement of people, materials, energy, biota, and ideas between places. The Western Lake Michigan corridor was one of several maritime corridors the made it possible to transfer natural resources and agricultural products fast and at very low cost. This uniting of nature, processing and manufacturing centers, and markets led to the rapid development of major industrial cities and to the spread of commercial agriculture, forest product industries, and heavy manufacturing in Wisconsin and other Midwestern states. As one recent scholar of archaeology and cultural landscapes noted "an important research theme is the way transport infrastructure and modes of transport affect our concepts of place and space" (Fry 2003). Maritime landscapes, including the Western Lake Michigan Transportation Corridor, offer rich frameworks for studying place and space as it relates to culture and environment.

Boundary Demarcations

"Boundary demarcations delineate areas of ownership and land use . . . they also separate smaller areas having special functions. Fences, walls, tree lines, hedge rows, drainage or irrigation ditches, roadways, creeks, and rivers commonly marked historic boundaries" (NPS Bulletin 30).

Boundary demarcations offer one of the most challenging aspects of defining the maritime landscape. Currently, the lands encompassed by the Western Lake Michigan Transportation Corridor are held publicly. Submerged bottomlands are held by the state of Wisconsin, although in some harbors there may be some local control. Navigation, however, reflects state, federal, and international agreements. The physical boundary demarcations listed above do not in the main apply to the corridor. However, the depth contours, marked navigation channels, lighthouses and buoys, and harbors of refuge provide some structures that govern or reflect use of the waterway.

Vegetation Related to Land Use

While little in the way of vegetation appear applicable to this landscape, a broadening of the term to include other biota opens up the possibility of recognizing important markers that connect use with environmental changes. The connection of the Great Lakes by navigable water has led to the introduction of several invasive species. Sea Lamprey, for example, contributed to the devastation of important commercial fish stocks. The rapid spread of the zebra mussel has altered the visual character of the lakes by increasing water clarity through the filter feeding.

Unfortunately these invaders have colonized hundreds of submerged historic structures. Invasive species represent an imminent threat to the many of the cultural resources within the corridor.

Buildings, Structures, and Objects

"Various types of buildings, structures, and objects serve human needs related to the occupation and use of the land. Their function, materials, date, condition, construction methods, and location reflect the historic activities, customs, tastes, and skills of the people who built and used them" (NPS Bulletin 30).

No buildings fall within the corridor, however, ships, canals, and bridges according to NPS definitions, are considered structures. Harbor works such as docks and breakwaters are also structures. Large and small vessels continue to ply the waters of the corridor many carrying on the historic function of carrying bulk cargoes such as cement, iron ore, and coal. Tug boats and barges haul cargoes and provide working platforms for harbor work. A small number of commercial fishing vessels continue to work their historic grounds. Not permanently moored these working mobile structures add to the landscape's integrity by demonstrating continuity of use and by adding to the corridor's ability to evoke its historic character. Many of the working vessels corridor using the corridor are approaching or exceed fifty years in age, an illustration of the Great Lake's maritime world's stability and slowly declining dynamism. Small boats and aids to navigation are considered objects. The lake bottomlands are scattered with historic objects: anchors, jettisoned cargo, refuse, industrial and military equipment in the form of munitions, aircraft, and miscellaneous discarded goods. There are also a vast number of parts of ships: rudders, major timbers, sections of side, bottom, and deck. It is in the preserving and reading the broader archaeological scattering of objects and structures that is perhaps the most important characteristic of the historic landscape designation. This will be discussed more in the categories below.

Clusters

"Groupings of building, fences, and other features, as seen in a farmstead, ranch, or mining complex, result from function, social tradition, climate, or other influences, cultural or natural. The arrangement of clusters may reveal information about historical and continuing activities, as well as the impact of varying technologies and the preferences of particular generations. . . . Also, the location of clusters, such as the market towns that emerged at the crossroads of early highways, may reflect broad patterns of a region's cultural geography" (NPS Bulletin 30).

Although the bulletin is geared toward rural terrestrial properties, the landscape characteristic of "cluster" applies directly to the maritime landscape. Although exact dimensions of the spatial patterns require a carefully designed study, it is clear that the distribution of shipwreck sites is not random. The density of sites is greater on the approaches to harbors where a combination of factors lead to larger numbers of accidents. The wrecks of sailing vessels destroyed by going aground in easterly wind striking structures or other manmade and natural features abound near Wisconsin's port communities. Attempting to reach ports, the points of human and economic exchange, was the primary purpose of commercial and industrial vessels. High levels of traffic, limited room and water depth, and contrary winds caused many accidents. Other clusters of structures associated with the hinterland production of natural resources such as wood and stone

have been documented in the upper reaches of Western Lake Michigan. More research may reveal the presence of similar clusters on the westward edges of the corridor. Collectively the locations of these clusters in the association with hinterland resources outposts and market harbors do "reflect broad patterns of [the] region's cultural geography" (NPS Bulletin 30).

Archaeological Sites and Small Scale Elements

[Archaeological sites] "may provide valuable information about the ways the land has been used, patterns of social history, or the methods and extent of activities such as shipping, milling, lumbering, or quarrying. The ruins of mills, charcoal kilns, canals, outbuildings, piers, quarries, and mines commonly indicate previous uses of the land . . . The spatial distribution of features, surface disturbances, subsurface remains, patterns of soil erosion and deposition, and soil composition may also yield information about the evolution and past uses of the land."

"Small-scale elements . . . add to the historic setting of a rural landscape. These features may be characteristic of a region and may occur repeatedly throughout a region . . . . Collectively, they often form larger components, such as circulation networks or boundary demarcations. Small-scale elements also include minor remnants-such as canal stones, road traces, mill stones, individual fruit trees, abandoned machinery, or fence posts—that mark the location of historic activities, but lack significance or integrity as archaeological sites" (NPS Bulletin 30).

Archaeological sites and small-scale elements are the principle material cultural features that mark the historic uses of the navigation corridor's complex historic landscape. Collectively, these remnants provide a material record of the evolving human use of the Lake. These uses are not confined to the navigation contexts directly associated with shipwrecks and docks. The Lake has served as a testing ground for military equipment, a sink for sewage, a trash dump, a source of drinking water, scientific laboratory, a recreational zone, and as an aesthetic vista and spiritual place. By adopting the landscape paradigm, scholars and resource managers will have the perspective necessary to identify patterned historical aggregates out individual site and small-scale elements. For example, small durable sections of historic ship wreckage such as rudders, centerboards and trunks, pieces of bilges and sides, machinery, while possibly lacking sufficient individual integrity to qualify as National Register Eligible sites take new values when analyzed against the broader regional landscape. Modern methods of spatial analysis powered by GIS systems, the rapidly developing capacity to rapidly and accurate image the lake bottom make the construction of detailed high resolution maps of submerged lands increasingly feasible. An isolated centerboard from a historic schooner found on Sheboygan beach may seem to have little importance, but as a quantifiable item in cultural landscape it help develop the broader story of technological adaptations to the Great Lakes natural environment. Similarly, the analysis what appear to be isolated section of wreckage cast upon the beaches after storms will, when tracked as part of the landscape lead to a greater understanding of the physical dynamics governing the preservation of submerged sites and, as parts of a giant puzzle provide import elements of archaeological data. In preservation terms, and in the furthering of scholarship, this jump from site to landscape or region is critical and will help to effectively structure cultural resources management practices and scholarship in the twenty first century (Fry 2003).

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