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thesis entitled

U. S. LAKE SURVEY NAUTICAL CHARTS:
THE INFLUENCE OF TRADITION

presented by

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has been accepted towards fulfillment
of the requirements for

M.A. degree in Geography

Richard Groop
Major professor

Date July 1, 1982

U. S. LAKE SURVEY NAUTICAL CHARTS: THE INFLUENCE OF TRADITION

By

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

Department of Geography

1982

ABSTRACT

U. S. LAKE SURVEY NAUTICAL CHARTS:
THE INFLUENCE OF TRADITION

By

Deborah Ann Johnson

Tradition has had a great influence on cartography. Conventional map symbols have developed over many centuries to improve the uniformity and utility of cartographic communication, especially for reference maps. This study examines the influence of tradition on the cartographic development of the nautical charts of the Great Lakes produced by the U. S. Lake Survey from 1841 to 1970.

ACKNOWLEDGMENTS

I thoroughly enjoyed my graduate studies in cartography at Michigan State University, thanks to many people. Dr. Richard Groop provided valuable assistance on my thesis and cartographic studies, and managed to make cartography not only interesting but entertaining, due in part to his somewhat peculiar and jaded sense of humor. Mike Lipsey made production cartography very enjoyable and worthwhile, and working at the Cartography Center with Mike and other assorted cartographers was one of the best experiences I've had at M. S. U. Also deserving a note of appreciation are Dr. "Chip" Dipp and Professor G. Hossifats ("Jump on In"), probably the most respected and reknowned scholars in the Geography Department at M. S. U., and the many great friends who made student life most entertaining. Now that I've left the five-foot raccoons of East Lansing behind for farm life on the Great Plains in Loomis, Nebraska, I'm proud to say that I graduated from M. S. U. with an M. A. degree, an M. R. S. degree, and an M. O. M. degree.

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CHAPTER ONE

INTRODUCTION

Tradition has played an important role in cartography, and conventional map symbols have developed over many centuries to provide uniformity, continuity, and simplified cartographic communication. Traditional symbols have been especially useful on general or reference maps such as topographic maps and nautical charts which provide detailed, highly accurate locational information, and many of the symbols used on these maps have become standardized. Traditional symbols have also been developed for thematic maps such as population maps which portray spatial distributions and relationships; but convention has been less important, and innovative and imaginative symbolism has often been used to create unusual thematic maps.

The role of tradition in cartography is particularly evident in the development of nautical charts. Nautical charts have been used for centuries to aid mariners in determining courses and positions at sea. As early as the sixteenth century European chartmakers introduced standard symbols to represent safe anchorage, buoys, and submerged rocks. Nautical charts kept pace with advances in navigation and cartography, but conventional symbols were preferred and the only major changes in their development were greater accuracy and improved map legibility.

This study examines the influence of tradition on the

cartographic development of the nautical charts of the Great Lakes published by the U. S. Lake Survey over a span of more than 125 years. The earliest Lake Survey charts were black and white lithographic prints produced in the mid-nineteenth century with cumbersome printing methods and unsophisticated surveying equipment (Figure 1), while most recent charts are color prints produced on modern offset presses and compiled from data obtained with echo sounding, electronic positioning, and aerial photography (Figure 2). Despite these technological advances in navigation, surveying, and cartography during the history of the U. S. Lake Survey, nautical charts changed remarkably little in appearance. The most significant visual changes were the introduction of color and improved accuracy and completeness in the representations of soundings, dangers, aids to navigation, and coastline features, but the cartographic symbols changed only slightly. Tradition and convention were very important to the Lake Survey because the use of familiar symbols and designs made the charts more uniform and easier to interpret when used in navigation.

Nautical Chart Symbolization

Little information is available on early nautical chart symbols; however, the symbols and abbreviations used on modern nautical charts in the United States are listed in a pamphlet Chart No. 1 Nautical Chart Symbols and Abbreviations by the Defense Mapping Agency and the National Oceanic and Atmospheric Administration. Most of these symbols agree with uniform international charting standards established by the International Hydrographic Organization and various U. S. charting agencies.

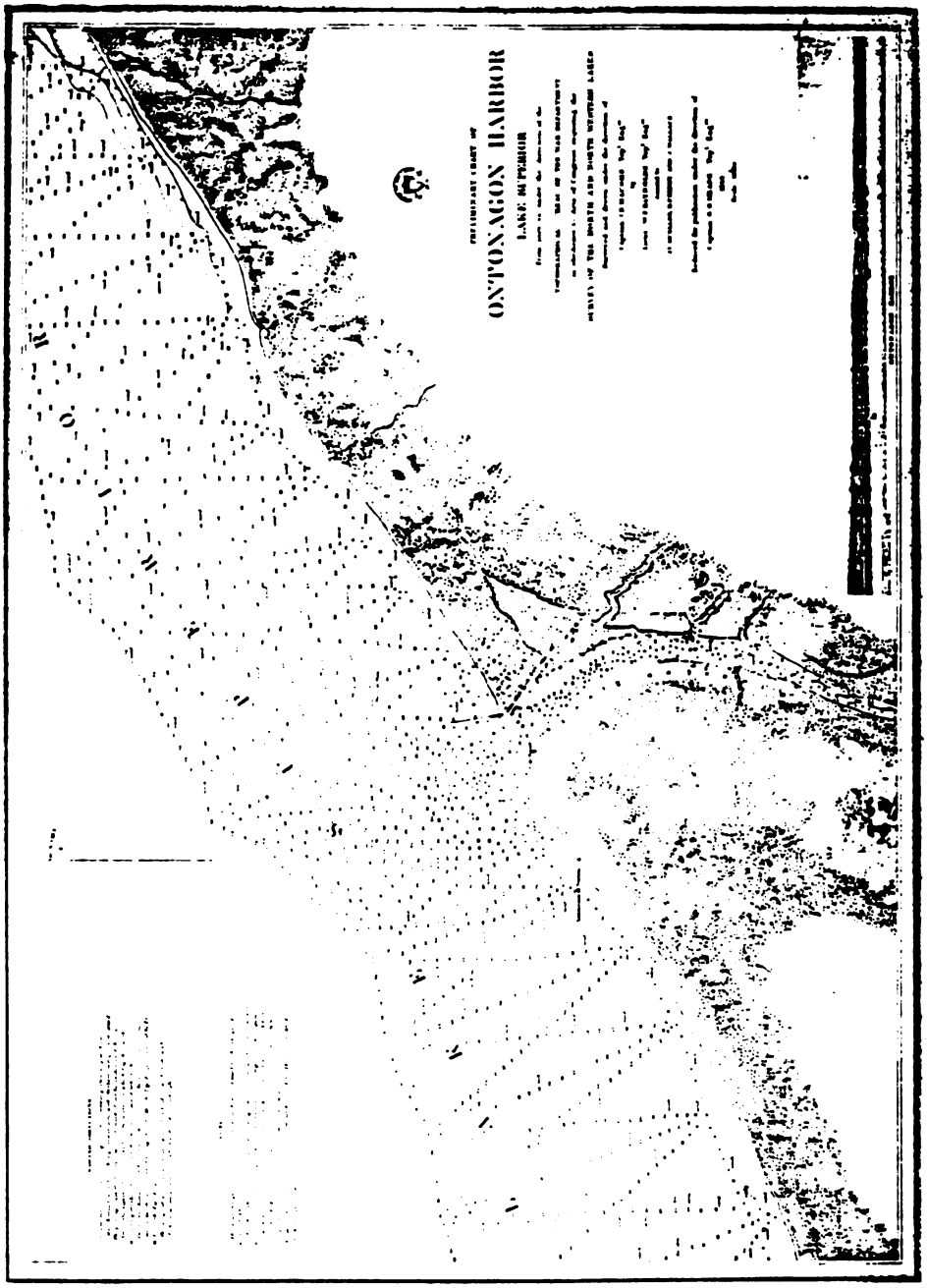

Figure 1. U. S. Lake Survey chart of Ontonagon Harbor, 1859.

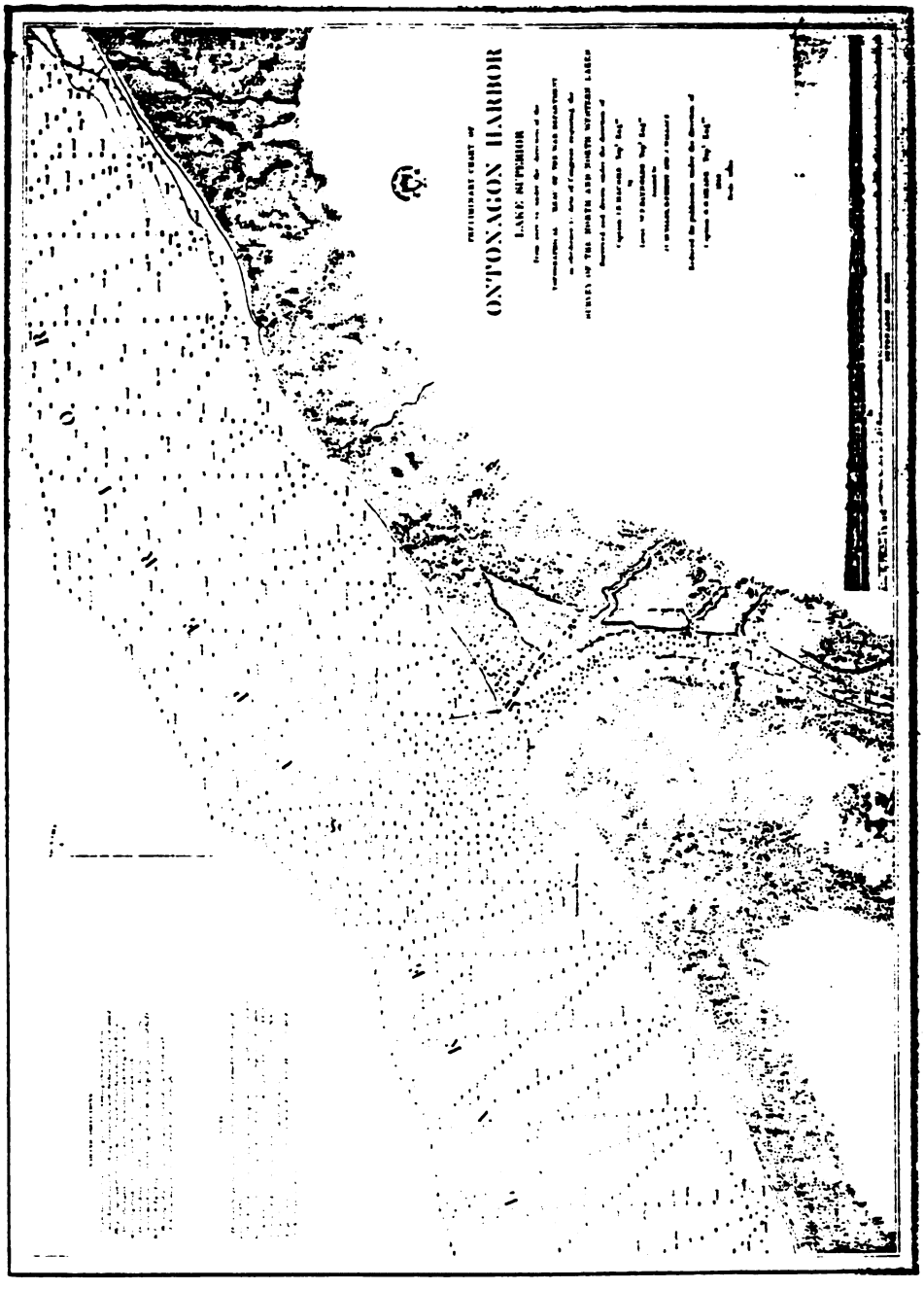

Figure 1. U. S. Lake Survey chart of Ontonagon Harbor, 1859.

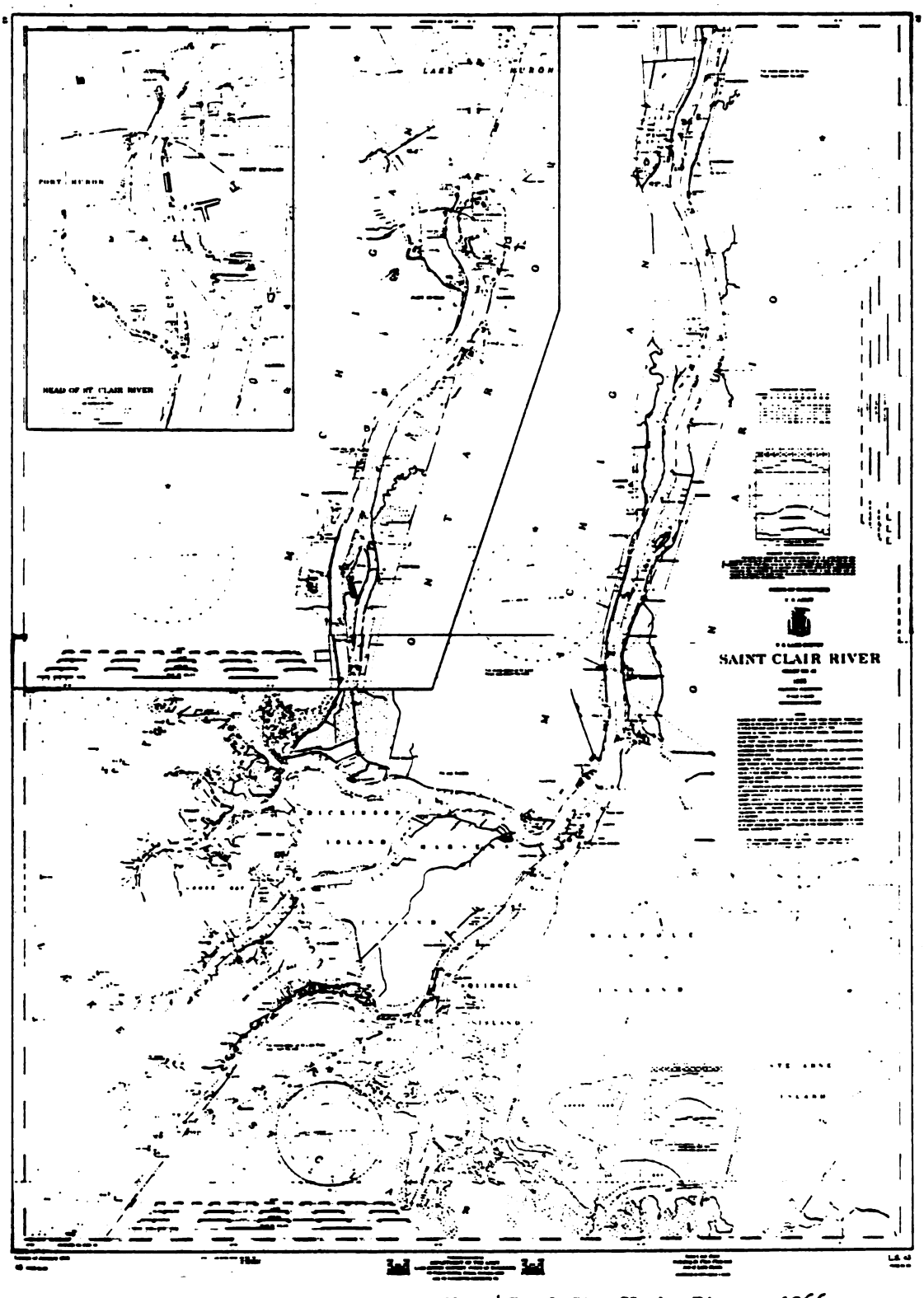

Figure 2. U. S. Lake Survey chart No. 43 of St. Clair River, 1966.

Soundings on depth to bottom are represented on nautical charts in several ways. Individual soundings are shown by numbers in either feet or fathoms. Since 1972, some have been shown in meters on American charts. Depth curves connect points of equal depth and indicate bottom contours; and on some charts, depth curves out to one, two, three, or five fathoms are tinted shades of blue to indicate the limits of navigation. Only a few of the soundings taken in a survey can be shown on a nautical chart. Least depths and dangers are the most important soundings and are always represented, and additional soundings to show characteristic bottom relief are provided where space on the chart permits.[1]

Various methods of taking soundings have been used. An early method of determining depths was by lead-line where a lead weight attached to a line marked in fathoms was dropped into the water. The lead-line method provided only a scattering of separate soundings, and the vessel had to stop to obtain accurate depth measurements. Figure 3 shows part of a chart with soundings taken by lead-line. Sounding machines were invented in the early 1800's to solve some of the problems encountered in using the lead-line.[2]

Automatic depth-registering equipment was developed by the U. S. Navy in 1922. These echo devices produce a sounding line which provides a continuous profile of the sea bed, as shown in Figure 4. However, sounding line vectors are radial and dangerous obstructions are often undetected. Multiple depth profiles, illustrated in Figure 5, are obtained by soundings recorded by different ships at different times, often with large areas between sounding lines. The most accurate method is the complete hydrographic survey

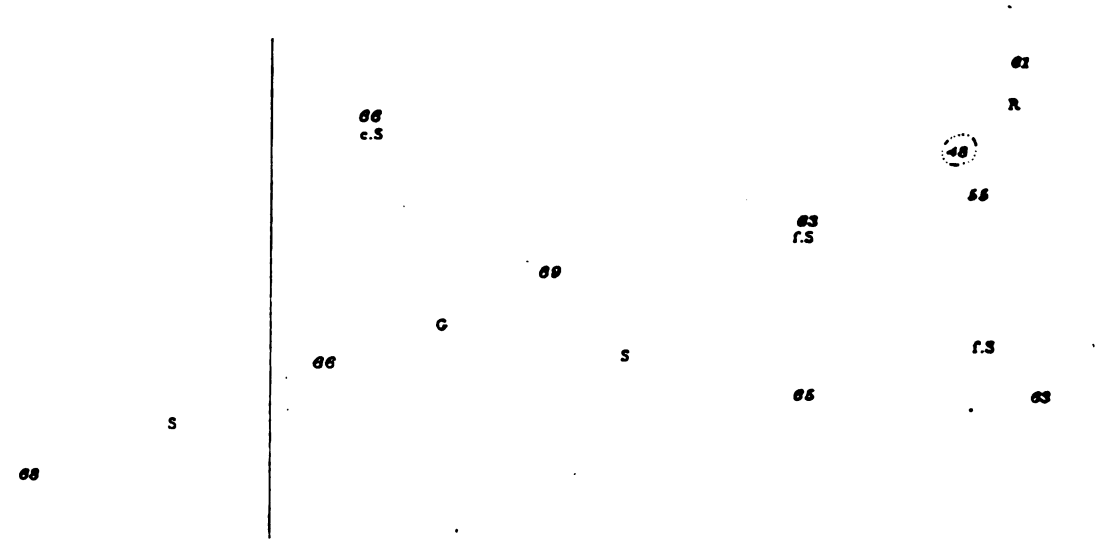

Figure 3. Lead-line soundings on part of a nautical chart. (Kember, 1971, p. 13)

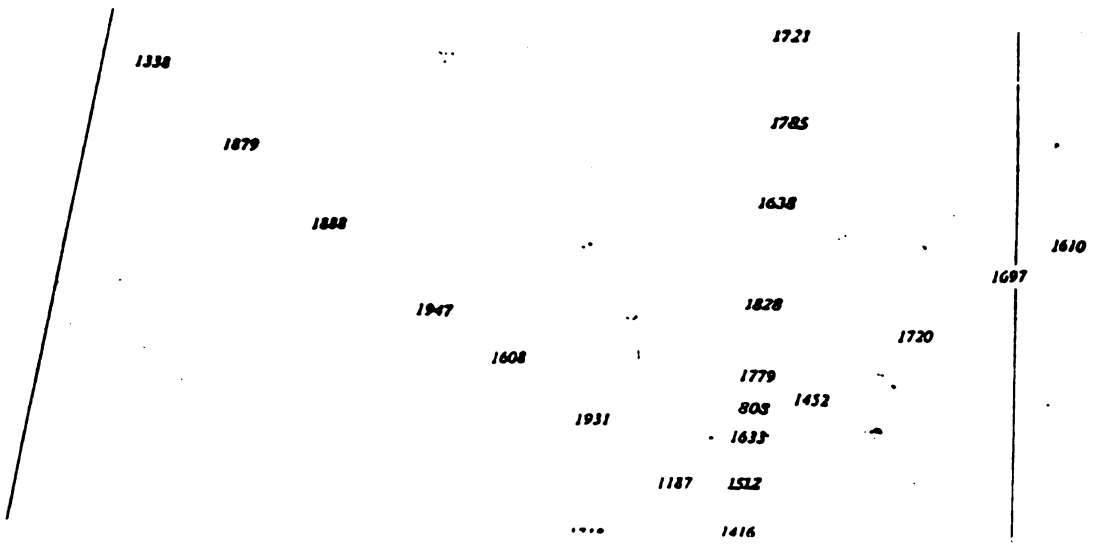

Figure 4. Depth profiles by echo sounder on a nautical chart. (Kember, 1971, p. 14)

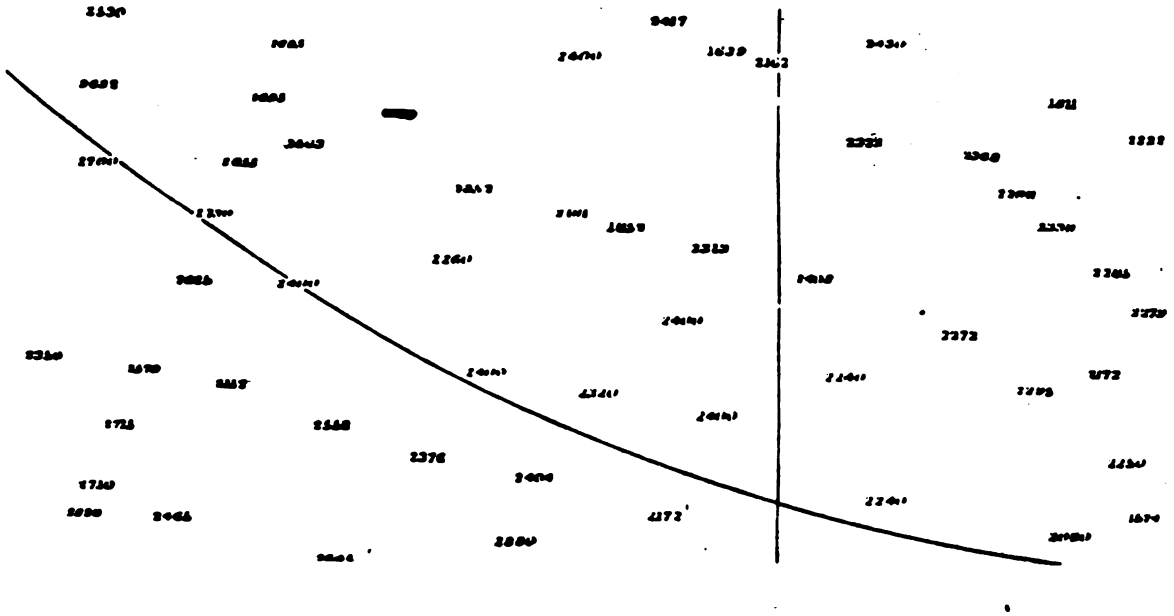

Figure 5. Multiple depth profiles represented on a nautical chart. (Kember, 1971, p. 14)

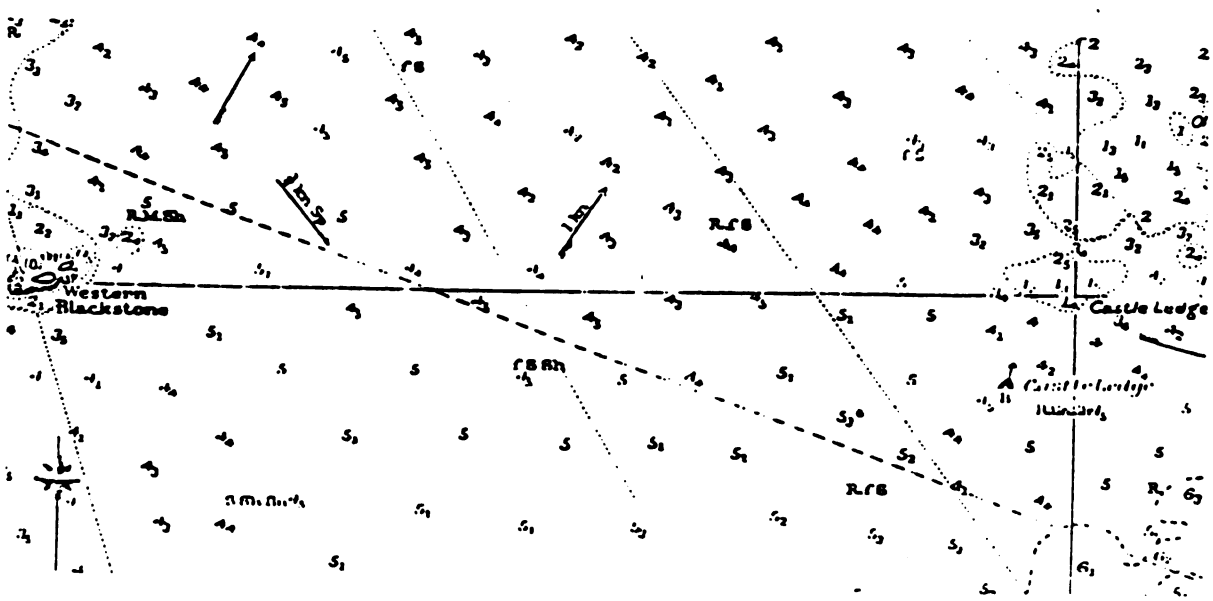

Figure 6. Soundings from a full hydrographic survey. (Kember, 1971, p. 14)

in which the sea bed has been closely and systematically measured, as shown in Figure 6. With this method the degree of accuracy possible is comparable to the accuracy of a detailed, large scale topographic map. Several methods of soundings may have been used to collect data for a single chart.[3]

All depths indicated on nautical charts are determined from a certain level of water, known as the chart datum. The mean low water is often selected as the chart datum; however, on charts of the Great Lakes and other areas where tidal effects are insignificant, the adopted datum is an arbitrary height approximating the mean water level.[4]

The principle aids to navigation represented on charts are lighthouses, beacons, lightships, radiobeacons, and buoys. Aids to navigation are shown by standard symbols designed to attract attention, and are often supplemented by abbreviations and descriptive text on the chart. The number shown and amount of information included varies with the scale of the chart.[5] Some standard symbols for buoys and beacons are illustrated in Figure 7.

Dangers to navigation are also indicated on charts. Included are rocks, coral reefs, shoals, ship wrecks, and other obstructions that may or may not be visible. Various standardized symbols for dangers are shown in Figure 8.

Land areas depicted on nautical charts are highly selective and vary with the scale, intended purpose of the chart, and available information. While navigational aids and landmarks are carefully charted, the remaining shore areas are given more generalized representation. Relief may be shown by contours, hachures, or tint

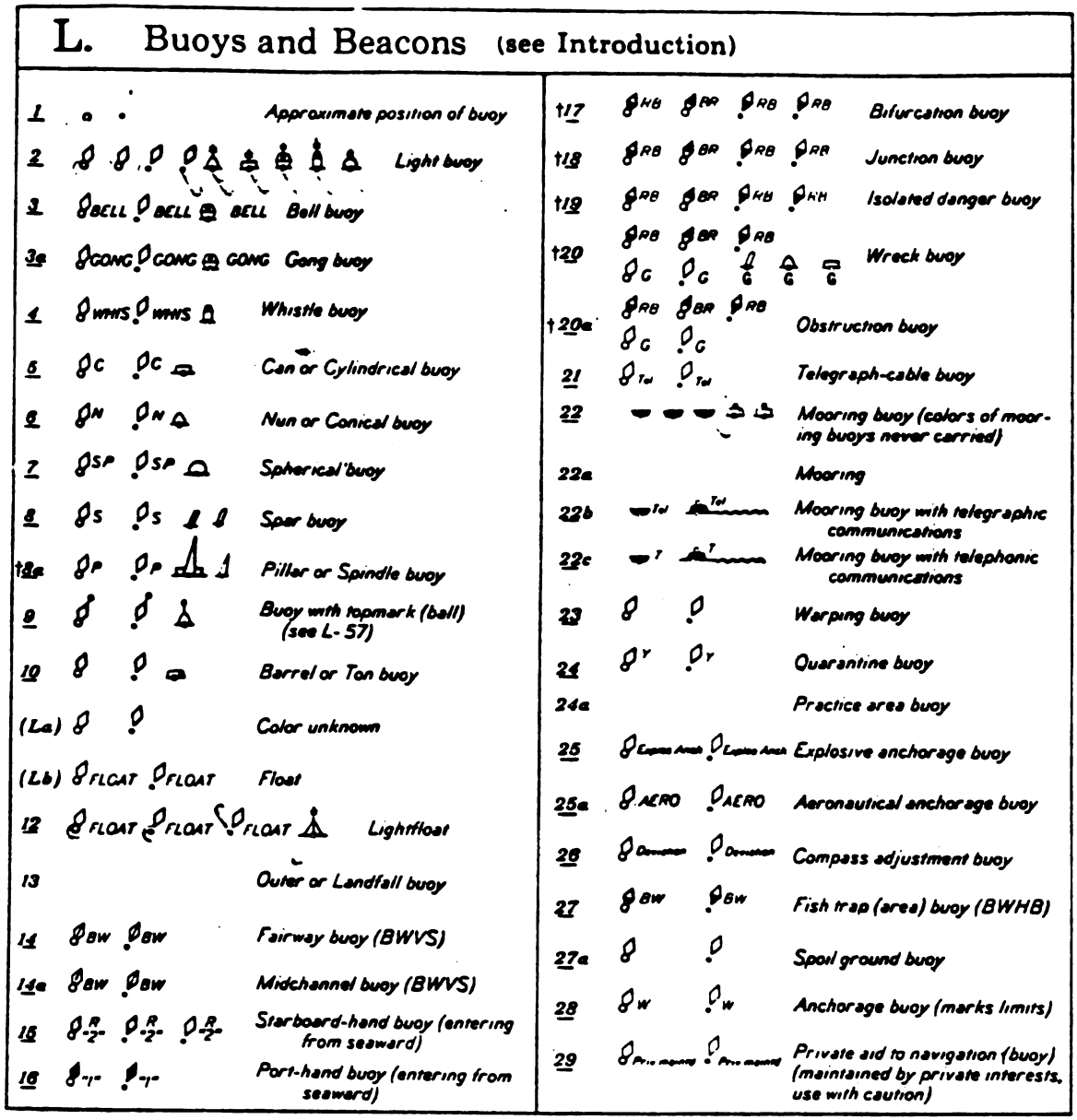

Figure 7. Standard symbols for buoys and beacons from Chart No. 1 Nautical Chart Symbols and Abbreviations. (1979)

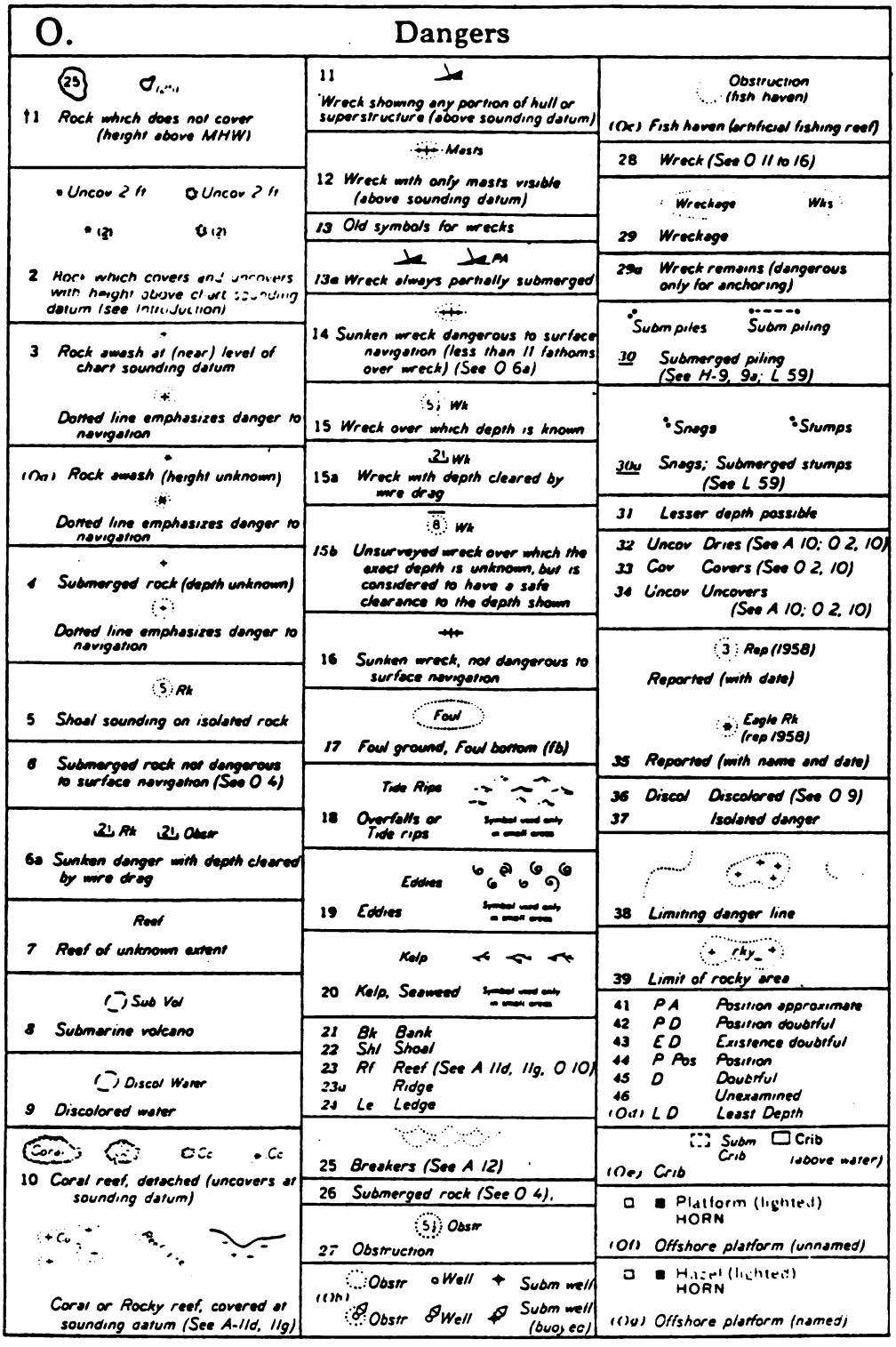

Figure 8. Standard chart symbols for dangers to navigation. (Chart No. 1, 1979)

shading, and vegetation may be shown by standard symbols. Cities are usually represented by their major streets with buildings near the water front shown on large scale maps. Figure 9 shows standard symbols for coast lines and Figure 10 lists symbols for natural features along the shore. Land areas are usually depicted from less than a mile to several miles inland, depending on the scale of the chart. Since the availability of radar for commercial use in 1945, land areas have been depicted in greater detail and extended further inland on nautical charts to aid navigation by vessels using radar.[6]

Additional information provided on nautical charts sometimes includes a compass rose showing magnetic variation to facilitate the plotting of bearings and courses, sailing courses, and the quality of the sea bottom. Figure 11 lists the standard abbreviations used to indicate bottom characteristics.

Nautical charts are continually updated to show changes in aids to navigation, newly reported dangers such as ship wrecks and shoals, and harbor improvements. All charts must be hand corrected according to information in the weekly publication Notice to Mariners. The user must continue to update a chart and when a new edition is printed, the old one is discarded.[7]

Nautical charts are normally classified by scale. Sailing charts are the smallest scale charts, generally 1:600,000 or smaller and are used for route planning and offshore navigation. The shoreline and land areas are generalized, and only offshore soundings and principle aids to navigation are shown. General charts range in scale from 1:100,000 to 1:600,000 and are used for coastwise navigation outside outlying reefs and shoals. Coast charts are used for

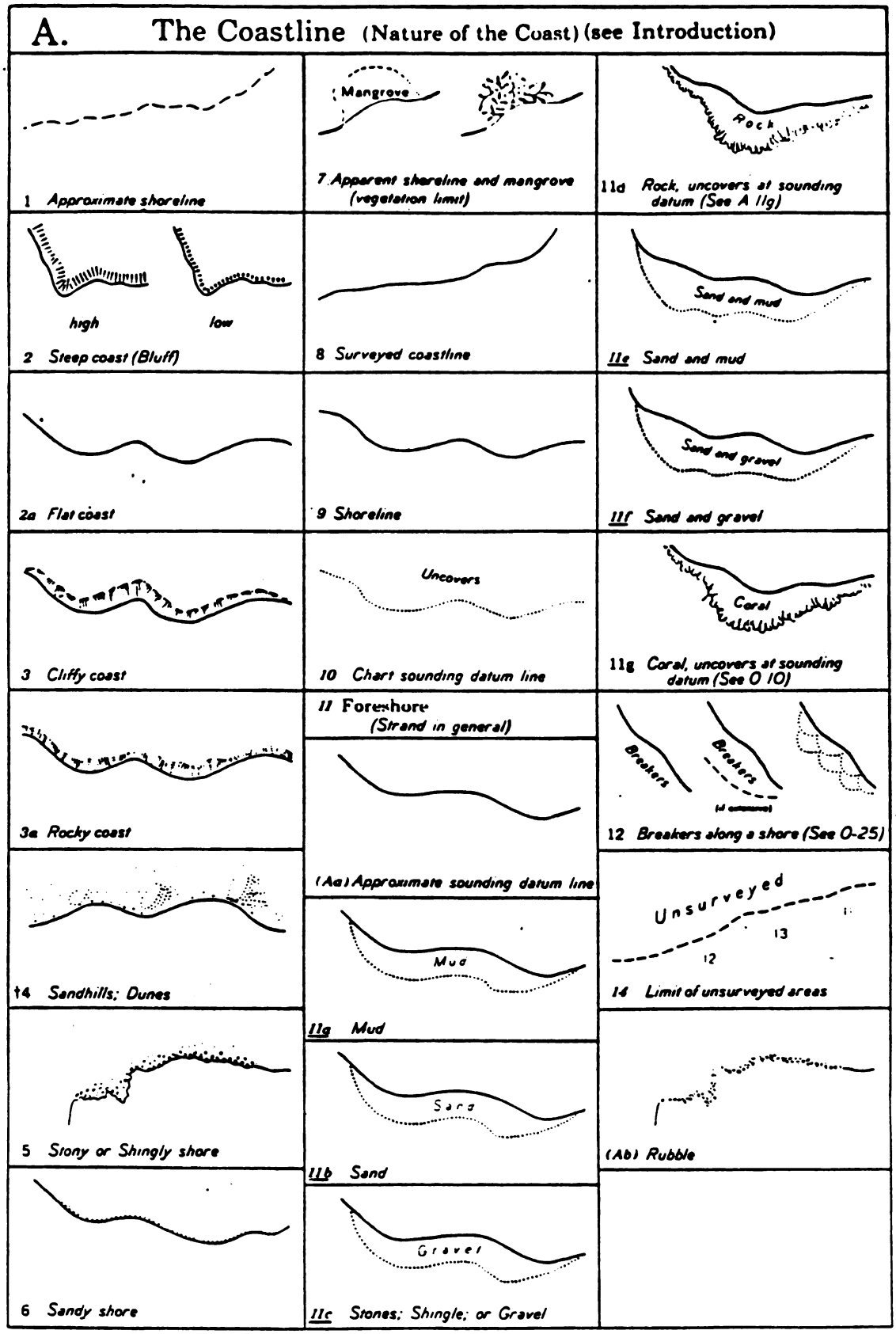

Figure 9. Standard coastline symbols. (Chart No. 1, 1979)

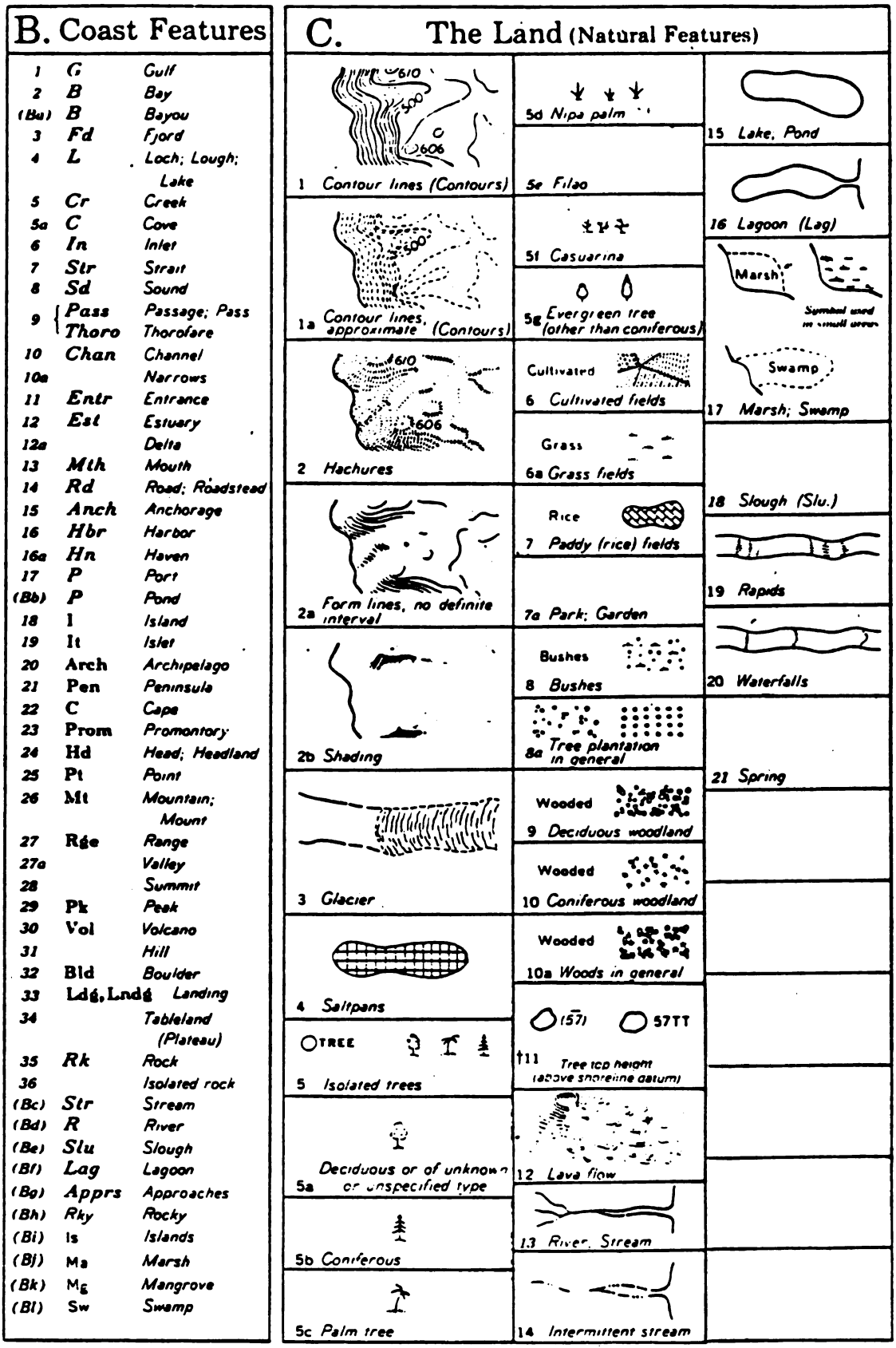

Figure 10. Standard symbols for coast features and natural features. (Chart No. 1, 1979)

S.	Quality of the Bottom							
1	Grd	Ground	12	Ck	Chalk	20	Sc	Scoriae
2	S	Sand	12a	Ca	Calcareous	21	Cn	Cinders
3	M	Mud; Muddy	13	Qz	Quartz	21a		Ash
4	Oz	Ooze	13a	Sch	Schist	22	Mn	Manganese
5	Ml	Marl	14	Co	Coral	23	Sh	Shells
6	Cl	Clay	(Sa)	Co Hd	Coral head	24	Oys	Oysters
7	G	Gravel	15	Mds	Madrepores	25	Ms	Mussels
8	Sn	Shingle	16	Vol	Volcanic	26	Spg	Sponge
9	P	Pebbles	(Sb)	Vol Ash	Volcanic ash	27	K	Kelp
10	St	Stones	17	La	Lava	28	Wd	Seaweed
11	Rk; rky	Rock; Rocky	18	Pm	Pumice		Grs	Grass
11a	Blds	Boulders	19	T	Tufa	29	Stg	Sea-tangle

Figure 11. Standard abbreviations for bottom characteristics. (Chart No. 1, 1979)

inshore coastwise navigation, large inland waterways, and navigation through wide bays and harbors; scales range from 1:50,000 to 1:100,000. Harbor charts have scales larger than 1:50,000 and are used for navigation and anchorage in small waterways and harbors. River and canal charts at large scales are used mostly by small craft.[8]

Development of the U. S. Lake Survey

Early nautical charts were produced by individuals but by the sixteenth century official chart making organizations were established in Europe, and by the nineteenth century modern government hydrographic offices were established to produce charts. In the United States, several charting agencies were developed during the 1800's, including the U. S. Lake Survey.

In 1807, the federal government established the Survey of the Coast to compile maps and charts, primarily to ensure safe navigation on the Atlantic Coast. In 1832 the Survey of the Coast was divided into three branches: geodesy, topography (of the coast), and hydrography, and in 1836 the agency was redesignated the U. S. Coast Survey. Figure 12 shows a typical chart published by the U. S. Coast Survey. The agency was renamed the National Ocean Survey in 1970 and made a branch of the National Oceanic and Atmospheric Administration (NOAA), Department of Commerce, formed to provide nautical and aeronautical charts of the U. S. and its possessions.[9]

A second agency was established to provide nautical charts for the military. In 1777, a Military Cartographic Headquarters was formed to produce military maps for George Washington during the Revolutionary War. The sea battles of the War of 1812 led to the development of the U. S. Navy Depot of Charts and Instruments in

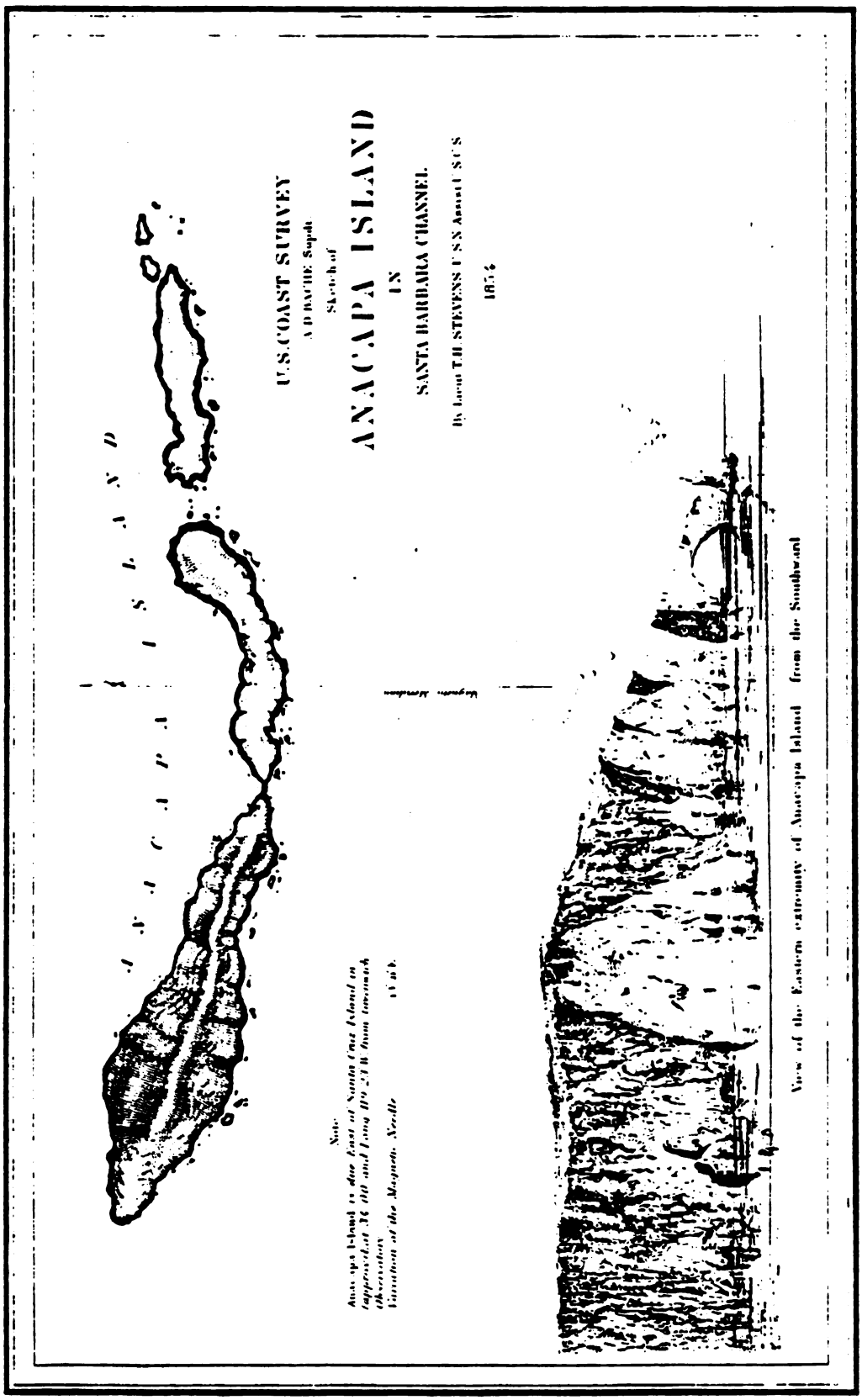

Figure 12. U. S. Coast Survey chart of Anacapa Island, 1854. (Thompson, 1979, p. 3)

1830 to serve as a storehouse for charts, sailing directions, and navigational instruments. In 1854 it was renamed the U. S. Naval Observatory and Hydrographical Office, and in 1866 it was divided into two offices. One of these two offices, the U. S. Naval Oceanographic Office, was established to carry out surveys and compile charts of the Atlantic and Pacific Oceans. In 1972 the Naval Oceanographic Office and other mapping agencies were incorporated into the Defense Mapping Agency (DMA) with Topographic, Hydrographic, and Aerospace Centers.[10]

A third agency, the Corps of Topographical Engineers, was established in 1838. The Topographic Corps and the Naval Depot surveyed routes for transcontinental railroads and gathered information for nautical charts of the Atlantic and Pacific Oceans. During the Mexican War from 1846 to 1848 these agencies prepared military maps and learned to coordinate land map and nautical chart data. The Corps of Topographical Engineers was consolidated with the Army Corps of Engineers in 1863, and in 1972 it was incorporated into the Defense Mapping Agency.[11]

An important project conducted by the Corps of Topographical Engineers and later the Army Corps of Engineers was the surveying and charting of the Great Lakes. This project began in 1841 when the U. S. Lake Survey was established in response to growing commerce on the Great Lakes and a lack of accurate information necessary for safe navigation. Its purpose was to survey the Great Lakes, prepare and publish nautical charts and bulletins based on the surveys, and study the hydraulics and hydrography of the lakes.

The U. S. Lake Survey expanded over the years to include the New York State canals, Lake Champlain, and the Minnesota-Ontario border lakes. Old charts were continually revised and updated, and new charts were prepared to keep pace with changing navigational conditions and needs. In 1970, the U. S. Lake Survey was merged with the U. S. Coast and Geodetic Survey to form the National Ocean Survey. The National Ocean Survey has continued the work of the former U. S. Lake Survey from 1970 to the present, and the nautical charts are used by all commercial vessels and most recreational craft on the lakes.

These and other charting agencies also issue several important navigation publications to supplement the charts. The American Practical Navigator, originally published by Bowditch in 1802 and purchased by the U. S. Navy Hydrographic Office in 1868, is currently issued by the Defense Mapping Agency. This book is considered the final authority on navigation and provides comprehensive, updated information on all aspects of navigation, charts, and hydrography.[12]

"Sailing Directions" or "Pilots" are books containing descriptions of coastlines, harbors, ports, dangers, aids to navigation, weather, and other information not easily shown on charts. Coast Pilots covering the coasts of the U. S. and its possessions are published annually by the National Ocean Survey, and were formerly published by the U. S. Coast and Geodetic Survey and the U. S. Lake Survey. Those covering foreign coasts, called Sailing Directions, are published by the Defense Mapping Agency.[13]

Notice to Mariners, first published in 1869, is a pamphlet issued weekly by the Defense Mapping Agency in cooperation with the

National Ocean Survey, the U. S. Coast Guard, and the Army Corps of Engineers. It is the official publication for the correction of changes in aids to navigation, dangers, sailing directions, and other information. It is used to update all nautical charts, and lists new charts, new editions of charts, and new publications.[14]

In summary, nautical chart production in the U. S. has had a varied history of organizations producing charts, information on charts, and methods of data collection. However, the cartographic design and visual appearance of nautical charts have changed little throughout this history.

Background and the Development of the Research Problem

The subject of this research is the nautical charts of the Great Lakes published by the U. S. Lake Survey. The purpose of this study is to determine the influence of tradition on the cartographic development of the Lake Survey charts by examining the history of the Lake Survey mapping activities and the cartographic changes on the charts over time. A list of U. S. Lake Survey charts published from 1841 to 1970 was also compiled to provide information on the types of changes in design and data deemed significant enough by the U. S. Lake Survey to warrant the elimination of obsolete charts and the addition of new charts and revised editions. This study focuses on four objectives:

1. A summary of the history of the U. S. Lake Survey mapping activities.
2. A summary of the cartographic development of U. S. Lake Survey charts through time.

3. An analysis of the cartographic changes and the role of tradition.

4. A reasonably complete list of all the Lake Survey charts published.

Methodology

The first objective, a summary of mapping activities of the U. S. Lake Survey, required a descriptive historical analysis from both primary and secondary sources. Primary sources provided the majority of information in this study, particularly Annual Reports of the Chief of Engineers, U. S. Army. Secondary sources were historical summaries and descriptions based on information from primary and other sources, including papers published by the U. S. Lake Survey and journal articles. Based on an analysis of mapping activities, the history of the U. S. Lake Survey was divided into four periods. Each historical period was signified by a change in the purpose or projects of the Lake Survey.

A second objective, a summary of the cartographic development of Lake Survey nautical charts, required a different methodology. Lawrence (1971) presented a useful scheme for analyzing an individual map or series of maps:

1. Objective assessments. Such observations must necessarily be confined to dealing with precise details of the map under examination, namely
   (a) the overall features of the map, and
   (b) methods utilised for presenting the mapped data.

2. Subjective assessments. Under this heading come all those factors in which personal or preference enters, even if only to a limited extent. Such factors fall into the following groups:
   (c) suitability of mapping techniques;
   (d) adequacy of detail depicted for map purpose;
   (e) aesthetic considerations.[15]

The main purpose of this analysis was to note the changes in cartographic symbolization over time. This required an objective assessment of the overall features of the map and the cartographic symbols used to present the data. A subjective assessment was not applied because the charts were not being analyzed to determine their cartographic quality.

Because of the volume of charts published by the Lake Survey, representative samples were chosen for examination using the four periods of the Lake Survey history as a framework for the cartographic analysis. Various scale charts from each period were examined to determine the cartographic changes within and between periods. Samples were chosen from four scales:

1. Small scale general charts at 1:400,000 and 1:500,000
2. Medium scale coast charts from 1:80,000 to 1:120,000
3. Large scale river charts from 1:10,000 to 1:40,000
4. Large scale harbor charts from 1:5,000 to 1:40,000.

Three libraries were used to examine the charts, including the Michigan State Library in Lansing, the Michigan State University library in East Lansing, and Western Michigan University's Waldo Library in Kalamazoo.

The third objective, an analysis of the influence of tradition on the cartographic development of the charts required an examination of the extent of the cartographic changes and the reasons why certain changes were made to determine the importance of tradition in the design of the charts.

The fourth objective, a fairly complete list of all Lake Survey

charts published from 1841 to 1970, required an examination of annual U. S. Lake Survey chart catalogs obtained from libraries in the Great Lakes region and the Library of Congress. Index maps from one of the annual catalogs were included with the list of charts compiled in this study to illustrate the areas typically covered by the charts.

FOOTNOTES CHAPTER ONE

[1]U. S. Naval Oceanographic Office, American Practical Navigator (Bowditch), Pub. No. 9 (Washington, D. C.: Government Printing Office, 1966), p. 108.

[2]Ibid., p. 27.

[3]Kember, I. D., "Some Distinctive Features of Marine Cartography," The Cartographic Journal 8 (June 1981): 15-16.

[4]U. S. Naval Oceanographic Office, p. 109.

[5]Ibid., p. 111.

[6]Ibid., p. 114.

[7]Ibid., pp. 105-106.

[8]Ibid., p. 104.

[9]Thompson, Morris M., Maps for America Cartographic Products of the U. S. Geological Survey and Others, (Washington, D. C.: Government Printing Office, 1979), p. 1.

[10]Ibid., pp. 9-11.

[11]Ibid.

[12]U. S. Naval Oceanographic Office, p. 6.

[13]Ibid., p. 14.

[14]Ibid., p. 97.

[15]Lawrence, G. R. P., Cartographic Methods, (London: Metheun & Co., Ltd., 1971), p. 71.

CHAPTER TWO

HISTORY OF THE U. S. LAKE SURVEY MAPPING ACTIVITIES 1841-1970

Introduction

The U. S. Lake Survey operated from 1841 to 1970 and during that time the mission of the Lake Survey changed and expanded in response to varying navigation needs. The history of the Lake Survey is divided into four periods based on major changes in mission:

1. 1841-1882 Initial Survey
2. 1889-1911 Resumption of the Lake Survey
3. 1911-1948 Expansion of Operations
4. 1948-1970 Modern Period

During the first period the U. S. Lake Survey was established to survey the Great Lakes and prepare and publish nautical charts based on the surveys, and by 1882 the surveys were officially completed and seventy-six nautical charts had been published. Field operations ended in 1882, but the printing and sale of charts continued.

During the second period the Lake Survey operations resumed for the purpose of updating and correcting some of the charts. Later, because of larger ships and the deepening of channels and harbors, greater water depths were ascertained and charted. At first, only strategic locations were surveyed, but it became apparent that larger areas of the lakes needed to be resurveyed to modernize the charts. In 1907 a project for the systemmatic

resurvey of the Great Lakes was formulated. This general project outlined the work necessary to make the surveys and charts adequate for all future demands. Included was the plan to determine and chart lake depths in all significant regions of the Great Lakes to a plane of thirty feet below the adopted low-water datum of the open lakes and twenty-five feet below the corresponding datum in the channels of the connecting rivers. It was estimated that the project would be completed in 1918. In 1911, however, plans changed when the survey and charting of additional waters was added to the project.

The third period was characterized by a great expansion of Lake Survey operations. The survey and charting of the New York canals was added in 1911, Lake Champlain in 1913, and the Minnesota-Ontario border lakes in 1914. These additional projects were completed by 1938, and the Lake Survey continued the general project formulated in 1907.

During the fourth period the Lake Survey expanded to accommodate the growing needs of recreational traffic on the Great Lakes. The Lake Survey was originally established to serve the needs of commercial vessels, but the nautical charts and bulletins were also used by recreational craft. An increased demand for special recreational charts was recognized in 1948 when the first looseleaf book of small craft charts was published with several additional books of recreational charts following. In 1970, the National Ocean Survey took over the projects of the U. S. Lake Survey.

1841-1882 The Initial Survey

The Great Lakes have had a long history of use as a navigation network. For hundreds of years Indians of the region traveled in

birchbark canoes on a vast waterway of connecting rivers and lakes throughout the Great Lakes and Canada, from the St. Lawrence seaway to the Arctic Ocean. Navigation on the Great Lakes was of vital importance to the French fur traders and Indian trappers in the 1600's and 1700's, and to the British when they gained control of the area in 1763. Americans first began to settle in the Great Lakes region in the late 1700's and early 1800's, and by 1864 Americans had acquired all but thirty-two square miles of land in Michigan, often through unscrupulous treaties with the Indians. And, as American settlers obtained land in the region, commerce on the Great Lakes began to develop, requiring more and more accurate navigational information.

In 1816 army engineers began local surveys of Lake Erie and Lake Ontario preliminary to harbor improvements. The Erie Canal opened in 1825, facilitating the settlement of the Great Lakes region, and in 1830 Congress passed the Indian Removal Act as the pressure for land increased. By the 1840's, the area around Lake Erie and Lake Ontario was well settled by Americans, and the improvement and formation of harbors at important points had begun. While areas around Lake Huron and Lake Michigan were rapidly being settled, the upper lakes region remained sparsely populated, and the Lake Superior area was still inhabited primarily by Indians and fur traders. In 1840 the U. S. Topographical Engineers began a survey for a ship canal around the falls at Sault Ste. Marie to aid shipping at Chicago, the only good harbor on Lake Michigan, and to develop ports on Lake Huron and Lake Superior. Commerce between

the lake ports continually increased, particularly between Buffalo, Detroit, and Chicago as mineral wealth around Lake Superior and other Great Lakes areas was discovered.[1]

Navigation on the Great Lakes was considered more hazardous than on the ocean. During violent gales and storms, ocean vessels drift at sea until the storm subsides. Vessels on the Great Lakes, however, were often thrown on shore during extended storms unless a port or harbor of refuge was reached. There were few harbors of refuge on the Great Lakes, few lighthouses and beacons, and knowledge of dangerous shoals and reefs was minimal. The only charts of the Great Lakes were made from surveys by Captain H. W. Bayfield of the British Navy in the early 1820's, and they were of little value to American navigators. Figure 13 shows one of Bayfield's charts. These charts showed the coastlines with reasonable accuracy, but only indicated water depths in a few places and charted few of the reefs and shoals along the American shores. Commerce on the Great Lakes was characterized by great loss of lives and property.[2]

The need for new surveys of the Great Lakes was first suggested at a meeting in Detroit in October, 1831 and Congress was petitioned to provide the surveys. In March, 1841 Congress appropriated $15,000 for a "Hydrographical Survey of the Northern and Northwestern Lakes" and the U. S. Lake Survey was organized to survey the Great Lakes and their connecting rivers, furnish reliable navigation charts, and study the hydrography and hydraulics of the lakes so that necessary improvements for safe navigation could be made. Annual appropriations were to be provided for the survey.[3]

The survey was first assigned to the Corps of Topographical

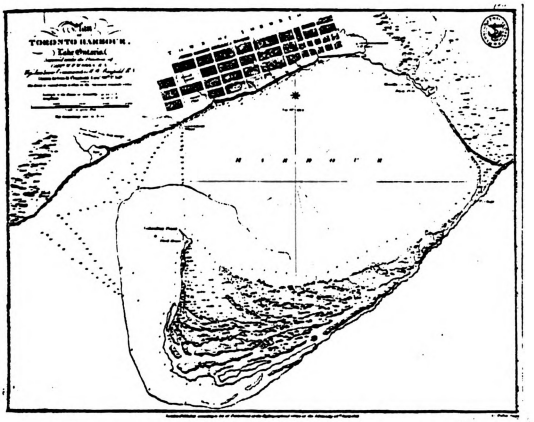

Figure 13. Chart of Toronto Harbor, 1816, by. H. W. Bayfield. (Fleming, 1936, p. 69)

Engineers under the War Department, and then to the Army Corps of Engineers when the two corps merged in 1863. An officer of engineers supervised the survey, and engineer officers and civilians were employed as assistants. Colonel J. J. Abert, Chief of Topographical Engineers, placed Captain W. G. Williams in charge of the Survey of the Northern and Northwestern Lakes in May, 1841. Captain Williams organized the U. S. Lake Survey and opened the first office in Buffalo, New York. The office was moved to Detroit, Michigan in 1845, where it remained until 1970. Captain Williams established a point of commencement for the survey on the north extremity of the southern cape of the entrance to Green Bay, a favorable point to begin a system of triangulation. He was later succeeded as supervisor of the Lake Survey by a series of engineer officers.[4]

Field Work

The Lake Survey operations were divided into field work and office work with field work conducted from May to October. Several parties of surveyors were formed each season for survey work, topographical work, and inshore and offshore hydrography. The field work was not easy, for the upper Great Lakes region was heavily forested and extensive labor was necessary to clear areas for surveying. According to General Reynolds, supervisor of the Lake Survey in 1866:

> The character of the country in which the surveys are being prosecuted forbids that attention to the details of topography which would otherwise be desirable. It is the exception to find anything but a dense forest, in which it is impossible to make an accurate survey without opening every foot of the line of sight. No sketching can be done that is reliable. Parties within easy hearing distance cannot see each other. And, lastly though by no means least, during the summer season, which is the only one

> in which work can be done at all, the forests are so full of venemous insects that it is next to impossible for an instrument to be used.[5]

William Hearding, assistant to a field survey party assigned to charting the northwest end of Lake Huron in 1851 described the details of setting up camp at Mackinac Island:

> ...With the aid of some of our own men, the steamer's crew soon discharged our supplier of flour; hard bread; corn meal; rice; potatoes; beef; hams; beans; peas; sugar; coffee; tea; matches; boxes of soap; oil cans; sails; axes; tents; cooking stove; spikes and nails; spades and shovels; crowbars; coils of buoy rope; tool chests; camp stools; tables and chairs; personal baggage; lumber; grindstone; and a hundred other things essential to our work and convenience. Before we had taken leave of the Captain of the steamer who had been quite courteous and attentive to us on the trip, some of our party were busied in clearing away the bushwood and felling such trees as were necessary to be removed.
> ...We were fairly settled and in full working trim in the course of two or three days, and had made good progress in the preliminaries of our work when visitors were announced one morning, just as we had seated ourselves at the breakfast table. This leading personage of these, was the chief of a tribe of Indians who lived in our vicinity, and who claimed ownership to the lands along the main shore, and also to the whole group of islands. Assuming this early visit to imply for its object some business of importance, and partly guessing its meaning, our chief officer Lt. Scammon with courteous tact left the table and proceeded towards the canoe in which this dusky warrior with questionable grace and gravity was seated, and using the French language gave him a cordial invitation to our breakfast table, which invitation was accepted with becoming dignity....
> ...Upon the conclusion of the meal he produced a pipe from under his blanket and tapped it slowly upon the palm of his hand he accepted the proffered tobacco with silent dignity and having filled and lighted his pipe, resumed his seat. He asked the meaning of our sudden occupation, of his territory, and what was our purpose in come there....As soon as a full explanation of our objective had been made, and the whole party had smoked in silence for a minute or two, he expressed himself as being glad to see his white friends and hoped we should find our residence on his land pleasant and satisfactory. He then proceeded to say, that the Great White Father was very rich, and undoubtedly intended to renumerate him, if he allowed us to cut down his trees....[6]

Often nearly 200 men were assigned to work during the summer season from May to October. For example, in 1875, five shore parties

of twenty-five men each were assigned to take the soundings, determine the depth of the rivers and lakes out to thirty-five feet from shore, and note all shoals, reefs, and obstructions. Six triangulation parties of three men were assigned to the triangulation or location of difficult objects. Two steamers with thirty men each took soundings of the lakes from the limit of the shore parties out ten miles.[7]

In order to make hydrographic and topographic surveys, the Lake Survey engineers had to establish networks of horizontal and vertical control. A system of primary triangulation with carefully measured bases was used to establish this network. Where this was not practical, the positions of points were determined by observations of longitude and latitude, or by the method of latitude and azimuths. A primary triangulation network covering the Great Lakes was established between 1865 and 1875. It was later supplemented by other primary surveys, forming part of the primary triangulation net covering the United States. Secondary nets were established along shorelines to make it useful for hydrographic work.[8]

Methods of surveying improved over the years with the purchase of more precise instruments and larger work forces. Astronomical observations for time and latitude were made with a sextant while longitudes were determined by the chronometric method or a method of gun powder flash signals. The accuracy of triangulation increased when more modern base apparatus was made specially for the Lake Survey in 1852 and 1876. The angles of triangulation were measured with theodolites from stations around the horizon. The stations were pyramid platforms built near the shore, ranging in height

from 40 to 115 feet. In 1865 a method of sending Morse code messages between stations was introduced.[9]

Topography and inshore hydrography work was conducted by shore parties who established temporary camps every twelve miles along the lake shore. Surveys were made of the inshore waters and a strip of land along the shore to provide landmarks for navigators. The shoreline was surveyed with either compass and chain or theodolite and chain. Points on the shore were determined by chained off-sets at right angles to the compass or theodolite courses, or by intersections from two main stations. Four men were needed to carry instruments and stadia rods and conduct the topographical surveys. Because the shores of the lakes were often either densely wooded or marshy, only the general topography of the shore one-half to three-fourths of a mile inland was sketched, but detailed surveys were made at settlements and towns. Contours for ten and twenty feet of elevation were determined, and all roads, streams, buildings, and woods were indicated. The work was plotted at a scale of 1:10,000 and details were sketched on a field sheet.[10]

Between 1860 and 1875, waters were sounded with the lead-line for inshore hydrography. Soundings were taken from the shore out one-half mile or to depths of three or four fathoms. Shoals and dangerous points within several miles of shore were also included. Sounding stations were established at 100 to 400 meter intervals along the shore, and a line of buoys 500 to 1,000 meters apart were placed along the four-fathom curve and other locations.[11]

For offshore hydrography, soundings were extended ten miles out from the line determined by shore parties. Lines of soundings

about one mile apart were run by steamer. Soundings were taken every ten minutes and observers on shore took readings to the steamer and noted the time. Soundings were taken every five minutes in water less than twenty fathoms deep. Beginning in 1860, lines of soundings were also run across the lakes at fifteen mile intervals to obtain general lake depths. However, even the most accurate soundings did not guarantee clear channels and the location of all obstructions.[12]

In 1859 the Lake Survey established gauges and began to record water level and meteorological observations over the entire Great Lakes region. The purpose was to establish a uniform plane of reference for the soundings, and to solve questions regarding lake level fluctuations and tides on the Great Lakes. Previously, water level readings were taken on temporary gauges, and soundings were reduced to the mean level during the survey period. Lake levels were computed each month for navigators because the level could change sufficiently to affect safe navigation. From 1867 to 1869 the supply of water in the lakes was investigated by methods of gauging the velocity of the rivers connecting the lakes. The determination of the mean level of the lakes and their height above the ocean was initiated in 1875.[13]

Office Work

Lake Survey office work was conducted from October to May, when the weather was unfavorable for field work. Surveyors and office clerks computed and plotted the geodetic positions of points of triangulation, coordinates of stations, topography and hydrography,

and reduced the soundings to a plane of reference while draftsmen compiled and drew the charts from this data. The office clerks also issued charts, maintained registers of charts, field sketches, instruments, and records and reports on water levels, tides on the lakes, and other scientific information. The Lake Survey was also in charge of studying and reporting recommendations for harbor and channel improvements and construction.[14]

The final charts were compiled and drawn by Lake Survey drafters as soon as the surveys were completed. The data for the projections and coordinates of all points fixed by the surveys were compiled from office computations, and the data on topography and hydrography was provided on detail sheets. The final charts were engraved at the Engineer Department in Washington, D. C. In later years the charts were photolithographed immediately after completion by the drafter, and these photolithographs were distributed while the plates were engraved. In 1852 the first Lake Survey charts were published and the systematic distribution of charts began. The charts were issued free of charge to any American or Canadian vessel navigating the lakes and were distributed at the Detroit Lake Survey office and at an agency in Buffalo, New York.[15]

After 1870, a new system of chart publication was adopted. A general chart of each lake at 1:400,000 was published, and the shoreline of each lake was divided into sections, with a coast chart of each section published at 1:80,000. The charts of the rivers, harbors, and other special locations were published at larger scales. All the charts published during this period were black and white prints made from copper plates. Included on the charts

were sailing lines, a water table showing mean level and fluctuations, a table of magnetic variations, a table of light houses, sailing directions, and a list of dangers to navigation.[16]

The Survey of the Northern and Northwestern Lakes was completed in 1882. A continuous chain of triangulation in the Great Lakes was established and seventy-six nautical charts of the lakes and connecting rivers had been published. With the completion of the survey, field operations ended, but the printing, correcting, and issuing of the charts continued. Corrections and additions were based on local surveys and reports by engineer officers in charge of river and harbor improvements on the lakes.[17]

1889-1911 Resumption of the Lake Survey

The Lake Survey work completed in 1882 was considered sufficient for future navigation, however, navigational requirements expanded, necessitating the resumption of the Lake Survey operations. From 1889 to 1911 the previous work of the survey was updated and new projects were initiated to make the surveys and charts more adequate for growing lake commerce. The first annual Bulletin was published, color charts were introduced, a general project for Lake Survey operations was adopted in 1907, and in 1909 a chart project was formulated.

Systematic field work was resumed in 1889 to correct some of the Lake Survey charts, but by 1900 it was evident that this method of updating the charts was inadequate. Water depths greater than eighteen feet needed to be ascertained and charted to accommodate larger ships, rapidly growing commerce, and harbor improvements on

the lakes. As a result of these needs, the U. S. Lake Survey was reorganized on January 1, 1901 to modernize the charts and expand scientific observations on the Great Lakes.[18]

The first annual Bulletin, later named the Great Lakes Pilot, was published in 1889. This was an important development which enabled the Lake Survey to simplify their charts by providing updated navigation information in booklets and monthly supplements instead of on the charts. Bulletins were supplied to all important businesses and individuals engaged in navigation on the lakes, and special notices about lake levels, obstructions, and improvements were issued to navigation interests and newspapers in the Great Lakes region.[19]

The Lake Survey initiated several changes in chart production during this period. Color charts were introduced in 1895, and by 1909 all charts were published in color. The charts were printed with depths of eighteen or twenty feet or less in blue indicating the limits of navigation. This was considered a great improvement in chart production much preferable to the old black and white prints. The method of chart production also improved. The early methods of engraving on stone and copper plates were expensive and inefficient, and a new method of transfer and etching was introduced by a Lake Survey engineer. The charts were engraved on stone, transferred to copper plates for corrections and revisions, and lithographic transfers were made from the copper plates to stone for printing new editions, which combined the speed and economy of stone engraving with the ease of correcting copper plates.[20] The policy of issuing charts also changed. Until 1890, a full set of charts

was issued free to all registered U. S. vessels. After 1890, the free issue was discontinued, and the charts were sold at a nominal price to cover the cost of printing and paper.[21]

The accuracy of locating and charting least depths and obstructions was improved with the invention of the long wire sweep method by a Lake Survey engineer in 1902. Even with minute soundings, it had become evident that shoals and dangerous objects were not always detected. The long wire sweep method utilized a copper wire suspended at a given depth by floats which was drawn through the water by steamers at each end of the wire. Obstructions were located when the floats attached to the wire tipped over, or when the wire caught and pulled. During the sweeping, soundings were made to develop lake bottom contours. In 1907, five uncharted shoals and ship wrecks were found with the wire sweep in Lake Erie and seven new shoals were located in the Mackinac Straits. In 1908, seventeen uncharted shoals of less than eighteen feet and several wrecks were found, and the location of dangerous obstructions in Lake Michigan caused the reopening of a shorter and more convenient navigation route. Many other wrecks and dangerous shoals were found in later years.[22]

Formulation of the General Project of 1907

Until 1907, the Lake Survey operated without a general policy or project. Early methods of revising and updating charts and improving navigational facilities on an ad hoc basis became inadequate with the rapid development of lake commerce and increased ship size, and for the first time, a general project to make the surveys and

charts adequate for all future demands was formulated in 1907. The general project proposed to determine and chart lake depths in all significant regions of the Great Lakes to a plane thirty feet below the adopted low-water datum of the open lakes and twenty-five feet below the corresponding datum in the channels of the connecting rivers, with the completion of triangulation and precise leveling needed to control the areas under survey. The project also provided for the extension of river-discharge measurements, investigation of lake levels, magnetic surveys in and near main navigation courses, and the prompt examination of areas where obstructions were reported. Field work was necessary for this project included triangulation, precise leveling, ordinary sounding, deep-sea sounding, sweeping, hydraulic measurement, and magnetic observations on land and water. It was estimated that this general project would be completed in 1918, if adequate appropriations were granted. After the completion of this project, Lake Survey operations would continue to provide small surveys necessary to observe natural changes and investigate wrecks and obstructions, and revise and issue the charts. It was expected that the charts would increase in importance and demand as commerce on the Great Lakes increased.[23]

Chart Project of 1909

A chart project for completing the Lake Survey charts to meet future demands was approved in April 1909. The chart project provided for the preparation of new charts and the revision of old charts so all charts would be projected on the geodetic datum adopted in 1901, with soundings referred to the planes of standard low water approved in 1909. Obsolete charts would be discontinued, and the less

important harbor charts published as insets to appropriate coast charts. It was estimated that this project would be completed in six years, and would include 104 separate charts. The series would be maintained by revisions and corrections, such as changes in aids to navigation, river and harbor improvements, additional sailing courses, and significant topographic and hydrographic changes developed by commerce and industry. Hand corrections included changes in lights and buoys, pier extension, and breakwater construction.[24]

It was estimated that the general Lake Survey project formulated in 1907 would be completed by 1918, and the chart project approved in 1909 would be finished in 1915. However, in 1911 the surveying and charting of additional waters was added to these projects, extending Lake Survey operations far beyond earlier expectations. This expansion initiated the third period.

1911-1948 Expansion of Operations

During the third era, the Lake Survey's projects considerably enlarged the area to be surveyed and charted and added several new scientific studies. Legislation in 1911 extended the survey to include the lakes and other navigable waters of the New York canals. Included was the revision and adjustment of existing survey data by field reconnaissance, supplemented by topographic and hydrographic surveys necessary to prepare navigation charts. This project was completed in 1920, and seven charts were published.[25]

Further legislation in 1913 transferred the jurisdiction of surveying and charting Lake Champlain from the Coast and Geodetic Survey to the Lake Survey. Surveys of harbors and other important areas in Lake Champlain began in 1928 and were completed in 1933,

with the publication of five charts.[26]

The Minnesota-Ontario border lakes were added in 1914. The project provided for the preparation of nautical charts of the American waters of Lake of the Woods and Rainy Lake, complete with hydrography. The remaining boundary waters were to be charted without hydrographic detail because of a lack of commerce in the area. Previous surveys by the International Boundary Commission were supplemented with additional field work. The project was completed in 1938, and four charts were published. Later, fourteen additional charts of the Minnesota-Ontario border lakes were published without hydrography.[27]

Two new scientific projects were begun during this period. In 1920 a crustal earth movement study was initiated to determine the direction and rate of earth movements in the Great Lakes basin, evident by changes in water levels. It was found that there was a downward tilting of the land to the south and west throughout the region. Further investigations were conducted to determine the directions and rates of change in different areas, which would influence the regulation and outflow of the lakes. This study is still underway.[28]

From 1928 to 1932 the Lake Survey conducted a "deep sea" sounding project using echo sounding to determine depths. Echo soundings were made on the lakes on lines three miles apart. This new technique provided valuable new information about lake bottom topography. Most important was the discovery of the dangerous Superior Shoal located in the middle of Lake Superior, with depths

from 200 to 1,000 feet and several peaks to within twenty-one feet of the surface in an area less than a mile across.[29]

The chart project formulated in 1909 was modified slightly over the years to accommodate changing navigation conditions and supplemental projects. Technical advances in production also influenced the charting project. In 1911 a flat-bed lithograph power press was installed by the Lake Survey. This was an important development enabling the Lake Survey to become self-contained and capable of a high degree of accuracy and quality in chart production. Production work required expert specialists who were in little commercial demand, so the Lake Survey was able to produce the charts cheaper and better than large commercial lithographers. The charts were revised, original copper plate or stone engravings were corrected, transfers to stone were made, color plates prepared, and charts printed on the power press.[30] In 1925 the change from flat-bed to offset lithography was begun and completed in 1937.

All the charts were printed in color, with water areas up to eighteen or twenty-one feet deep in the Great Lakes and up to twelve feet on the New York waterways shaded in blue to show safe areas for navigation. In 1915 a new plan was adopted to meet a demand for charts useful to motor boats and small pleasure craft. All areas less than six feet deep on certain harbor and river charts were to be shaded a flat or darker blue to show clearly the areas dangerous for smaller craft.[31]

Reformulation of the Chart Project

The chart project adopted in 1909 was reformulated in 1917 to include previous additions and modifications. The reformulated

project provided for revising the old charts to standard projection and to standard low water for depths, preparing new charts based on the adopted standards to depict localities not shown before in detail and to replace obsolete charts, and to incorporate enlarged insets of harbors or other locations on appropriate coast charts, either newly engraved or reproduced from existing charts. The series of charts planned in 1917 included 105 separate charts of the Great Lakes and connecting waters with fifty-two insets, five charts of Lake Champlain, and seven charts of the New York canals. The number of charts was considered flexible to accommodate future changes in navigation conditions.[32]

The charts were drawn at various scales depending on the intended purpose. A general chart of the Great Lakes, used for a regional map, was drawn at a scale of 1:1,200,000. A general chart of each lake provided for overall navigation and was drawn at scales of 1:400,000 for Lake Ontario and Lake Erie, and 1:500,000 for Lake Michigan, Lake Superior, and Lake Huron. Coast charts depicted sections of the coasts in greater detail at scales of 1:80,000 to 1:120,000. River charts were used for more exacting navigation requirements, at scales of 1:15,00 to 1:40,000. Small harbor charts were produced as insets on coast charts, and large harbors were on separate charts. Scales ranged from 1:2,500 to 1:20,000 depending on the size and importance of the harbor and the detail necessary for safe navigation.[33]

After the completion of the projects on the New York canals, Lake Champlain, and the Minnesota-Ontario border lakes in 1938, the

Lake Survey continued the general project formulated in 1907, but operations consisted primarily of chart maintenance and correction. Included were the revision and reissue of charts, revisory surveys of harbors, rivers, and shores, investigations of obstructions to navigation, observation and study of lake levels and hydraulic conditions in their outlets, and publication of annual Bulletins with monthly supplements and notices to mariners.[34]

1948-1970 The Modern Period

During the modern period recreational traffic on the Great Lakes rapidly expanded and charts specifically designed for use on small craft were in demand. The Lake Survey began to publish small loose-leaf style books of large scale charts with details and information of special interest to recreationists. Previously, the only modification in chart design for small craft was the use of dark blue shading in areas less than six feet deep on certain charts, adopted in 1915.

The Lake Survey published several loose-leaf booklets of recreation charts. The first volume published in 1948 included sixty charts of the New York canals. Recreational craft charts were published of the inland route in the northern lower peninsula of Michigan in 1960, the west end of Lake Erie in 1963, the Detroit River, Lake St. Clair, and the St. Clair River in 1963, and the south shore of Lake Erie in 1964. Charts of Lake Winnebago and the Lower Rox River were published in 1967, and of the Chicago Lake Front from Wilmette to Gary, Indiana in 1968.[35]

Several subdivisions of the Lake Survey conducted somewhat different projects during this period. The Revisory Section

provided revised data for charts every three years, but revisions were made annually on the St. Clair-Detroit River system and more frequently elsewhere when necessary. Field work included verifying and correcting hydrographic and topographic features, taking soundings, and investigating other pertinent information for revision on the charts.[36]

Inshore Sections conducted major hydrographic surveys of water depths less than thirty-five feet to revise or replace earlier surveys. They made surveys whenever it was necessary rather than operating on a regular schedule. Field work included echo sounding, electronic positioning, horizontal wire sweeping, and using aerial photography and field checking to correct topography. The vertical and horizontal control networks were also checked and maintained regularly. The horizontal network consisted of 5,000 marked points, and the vertical network had 2,000 bench marks.[37]

The Compilation Section prepared new editions and charts based on data from field work and other sources. In 1953 the Lake Survey began to use plastic instead of glass as a base for engraving the charts, allowing the engraving of a complete chart on one sheet instead of several, and during this period used modern cartographic production techniques to prepare and print the charts in color on offset lithographic presses. In addition to providing charts of the Great Lakes, the Cartographic Division provided maps for the Army Map Service and other government offices.[38]

During this period the Lake Survey began to prepare flourescent radar charts, an innovation in nautical charts. Aerial photographs of the image on the radarscope were made at regular intervals to

prepare an overlay printed in flourescent ink on the chart. The flourescence was activated by a black light, enabling the navigator to compare the image on the radarscope with the chart and plot his or her position regardless of weather conditions.[39]

Improvements in the lighting of chart rooms on ships to minimize interference with vision adaptation at night were also introduced during this period. Experiments by the U. S. Navy indicated that red light was the optimum lighting for reading nautical charts at night. However, the use of red light affected the color on charts, making red, orange, and buff disappear. As a result, on many charts these colors were replaced with magenta or purple and grey.[40]

The Lake Survey continued scientific investigations of lake levels and river flows, characteristics of lake and river bottoms, changes in shorelines and other features, the movement of the earth's crust, lake currents, and navigational facilities. The Lake Survey published data on precipitation on the lake basins, diversions of water to and from the lakes, river flows, and long-range forecasts of lake levels. Information on water temperatures, water levels at specific locations, current velocities, benchmark descriptions and elevations, and special navigation problems was furnished on request.[41]

In 1962, the Lake Survey established a Research Division to increase engineering and scientific investigations on the Great Lakes. The research projects rapidly expanded and the Research Division was redesignated the Great Lakes Research Center in 1966. A wide range of scientific research was conducted on the lakes and connecting rivers.[42]

In 1970, the Lake Survey disbanded when it was merged with the U. S. Coast and Geodetic Survey to form the National Ocean Survey, which has continued the charting and research projects of the Lake Survey to the present.

FOOTNOTES CHAPTER TWO

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CHAPTER THREE

CARTOGRAPHIC DEVELOPMENT OF THE LAKE SURVEY CHARTS

Introduction

The U. S. Lake Survey nautical charts were examined to determine cartographic changes through time. Charts at various scales were selected from the four historical periods of the Lake Survey: a small scale general chart at 1:400,000 or 1:500,000; a coast chart at 1:120,000; a river chart at 1:40,000; and a harbor chart at 1:10,000 to 1:16,000. In addition, several other charts from each era were briefly examined to confirm major trends and note any unusual features. Table 1 shows the sample Lake Survey charts examined from each historical era.

The charts were examined to ascertain cartographic changes within and between time periods including overall features of the charts, textual information, and hydrographic and topographic symbolization; because the charts at various scales were similar in design and symbolization, each chart was not described separately. Instead, the major cartographic trends and changes for each historical period were examined and any unusual features found on individual charts were noted. The Lake Survey chart projects for each period were briefly summarized to provide background information for the cartographic development of the charts.

TABLE 1

SAMPLE LAKE SURVEY CHARTS

No.	Chart	Date	Scale	Category
1841-1882				
	Lake Huron	1860	1:400,000	general chart
	Saginaw Bay and Part of Lake Huron	1860	1:120,000	coast chart
	St. Clair River	1872	1:40,000	river chart
	Ontonagon Harbor	1859	1:16,000	harbor chart
1889-1911				
#3	Lake Erie	1908	1:400,000	general chart
#52	Lake Huron	1906	1:120,000	coast chart
#43	St. Clair River	1908	1:40,000	river chart
#763	Holland Harbor	1912	1:15,000	harbor chart
1911-1948				
#5	Lake Huron	1940	1:500,000	general chart
#52	Lake Huron	1936	1:120,000	coast chart
#43	St. Clair River	1934	1:40,000	river chart
#711	Manistique Harbor	1925	1:10,000	harbor chart
1948-1970				
#5	Lake Huron	1967	1:500,000	general chart
#52	Lake Huron	1967	1:120,000	coast chart
#43	St. Clair River	1966	1:40,000	river chart
#763	Holland Harbor	1966	1:15,000	harbor chart

1841-1882 The Initial Survey

During the first historical period seventy-six black and white charts of the Great Lakes and connecting waters were published. The general land features of the shore one-half to three-fourths mile inland were charted, including streams, roads, and vegetation, and detailed surveys of towns and settlements were made. Soundings, obtained by lead-line, were taken out to a depth of about twenty-two feet, and offshore soundings were taken ten miles out from shore. Occasional soundings were obtained further out to determine general

lake depths. Water depths of eighteen feet were indicated on the charts for a maximum navigation draft of twelve feet. After 1870, a system of chart production was implemented to provide a general chart of each lake at 1:400,000, coast charts at 1:80,000, and river and harbor charts at larger scales.

The sample charts examined in detail included Figure 14, a general chart of Lake Huron published in 1860; Figure 15, a coast chart of Saginaw Bay and Part of Lake Huron published in 1860; Figure 16, a chart of St. Clair River published in 1872; and Figure 17, a Preliminary Chart of Ontonagon Harbor published in 1859.

Extensive textual information was included on these charts, but the amount of information varied with the scale as small scale charts generally had more textual information than larger scales. Included in the text was a list of authors comprised of the officers in charge of the survey, the engineers who conducted the triangulation, hydrographic and topographic surveys, the engraver, the author of information charted on Canadian waters, and survey dates. Extensive sailing directions were provided, with information on entering and leaving various ports, bays and other areas. Harbors of refuge and anchorage were described in detail on many of the charts as well as locations of dangers to navigation such as shoals, reefs, boulders, and ship wrecks. Additional notes provided legend information on soundings and depth contours, a table of magnetic variations, a list of light houses, a water level table, and occasionally a table of port distances.

Soundings were represented by numbers and depth contours in feet and fathoms. Stippled depth contours were drawn for six, nine,

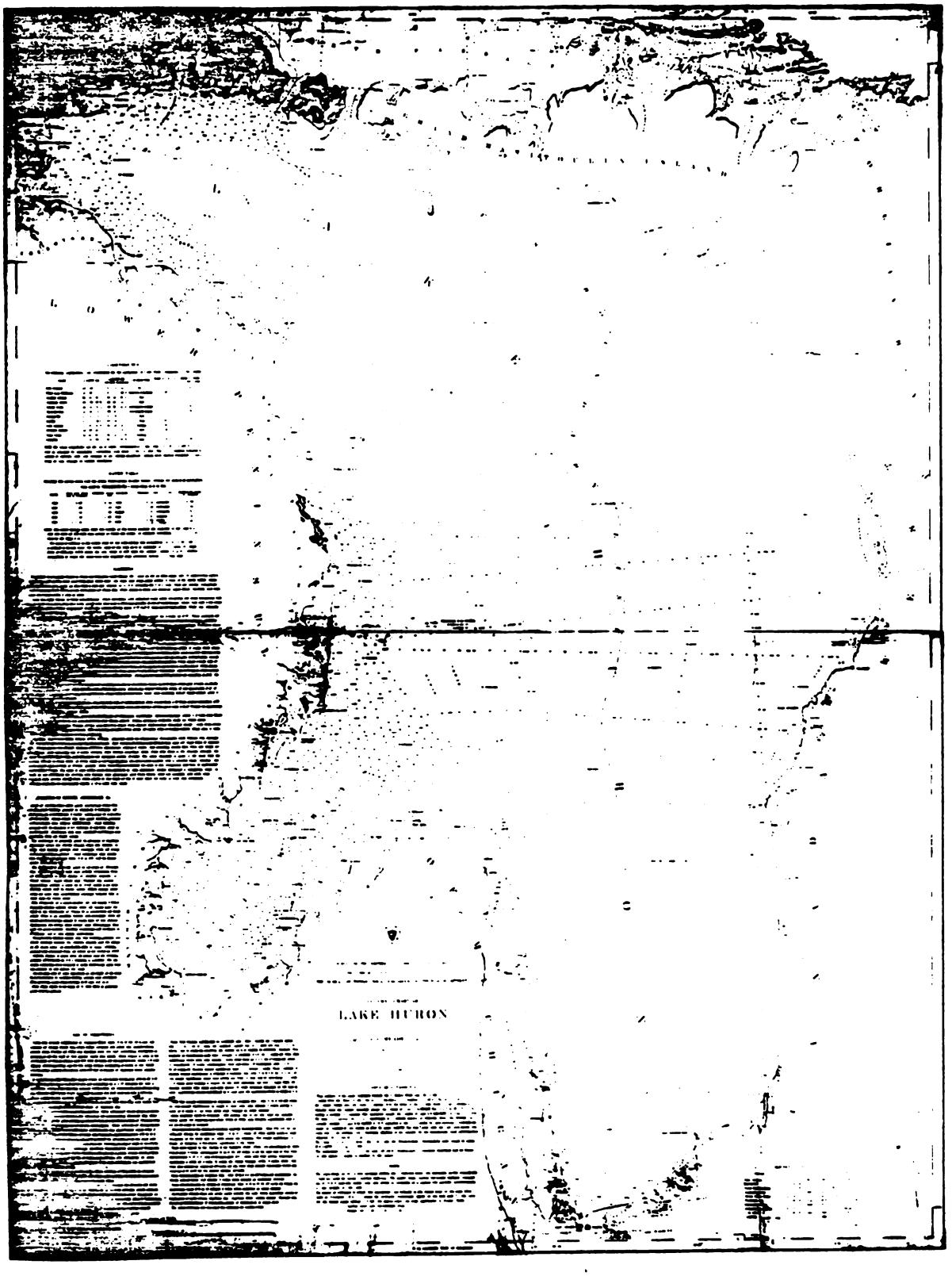

Figure 14. Chart of Lake Huron, 1:400,000, 1860.

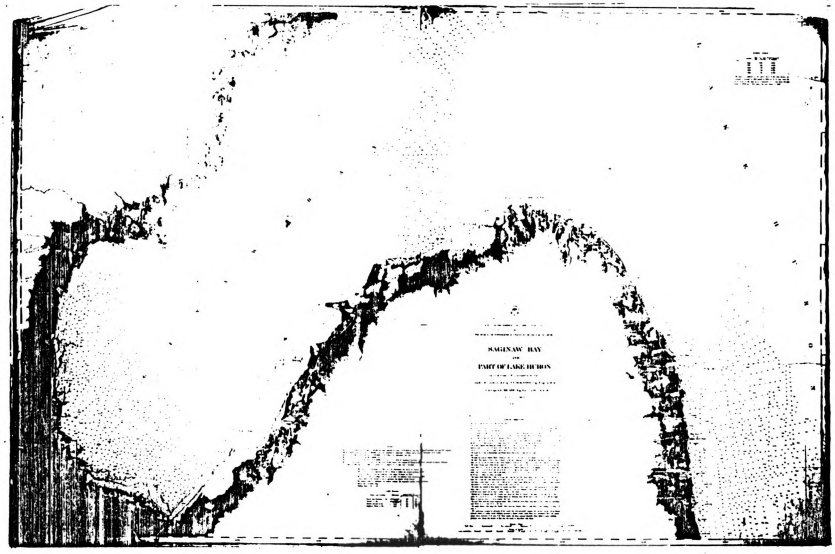

Figure 15. Chart of Saginaw Bay, 1:120,000, 1860.

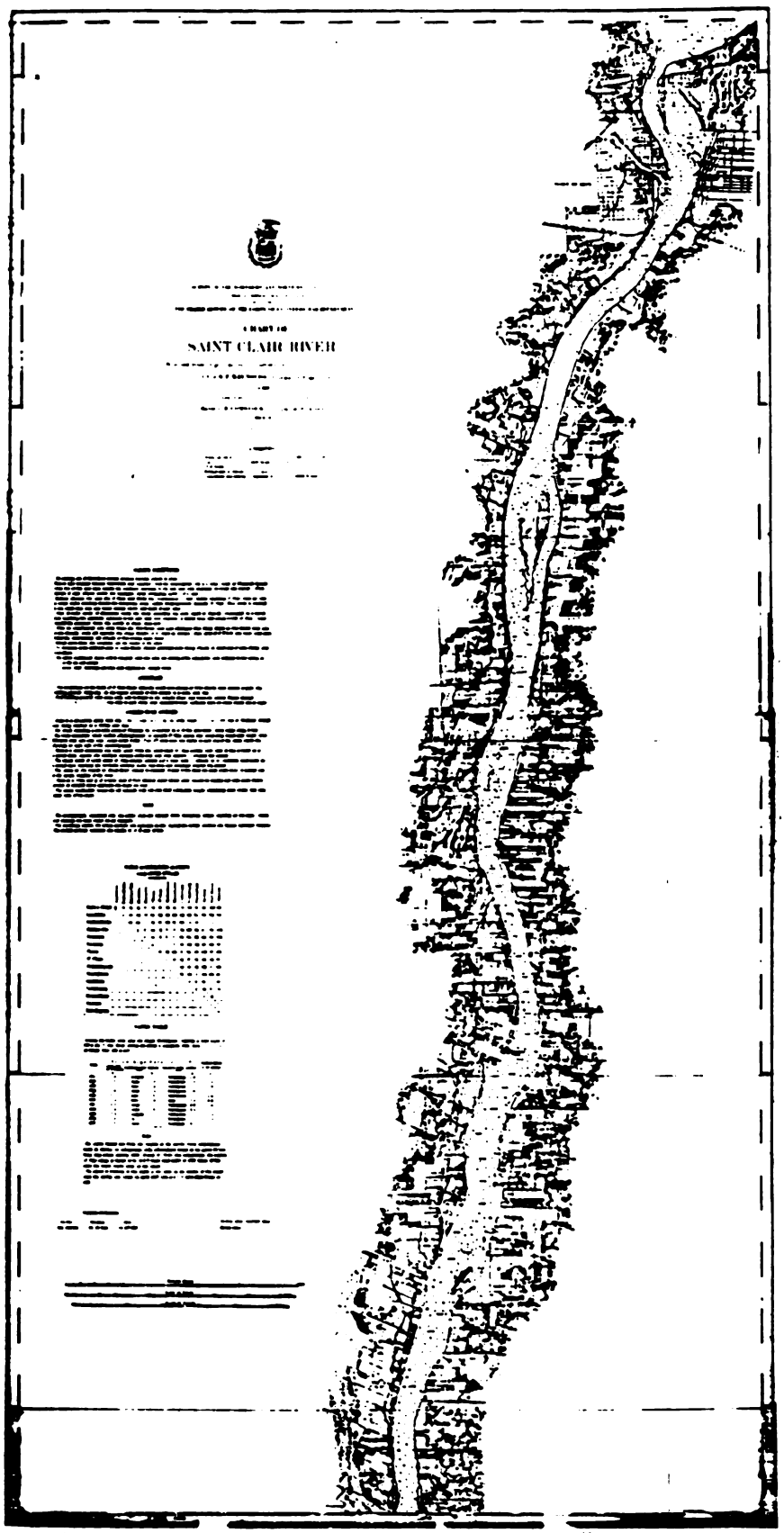

Figure 16. Chart of St. Clair River, 1:40,000, 1872.

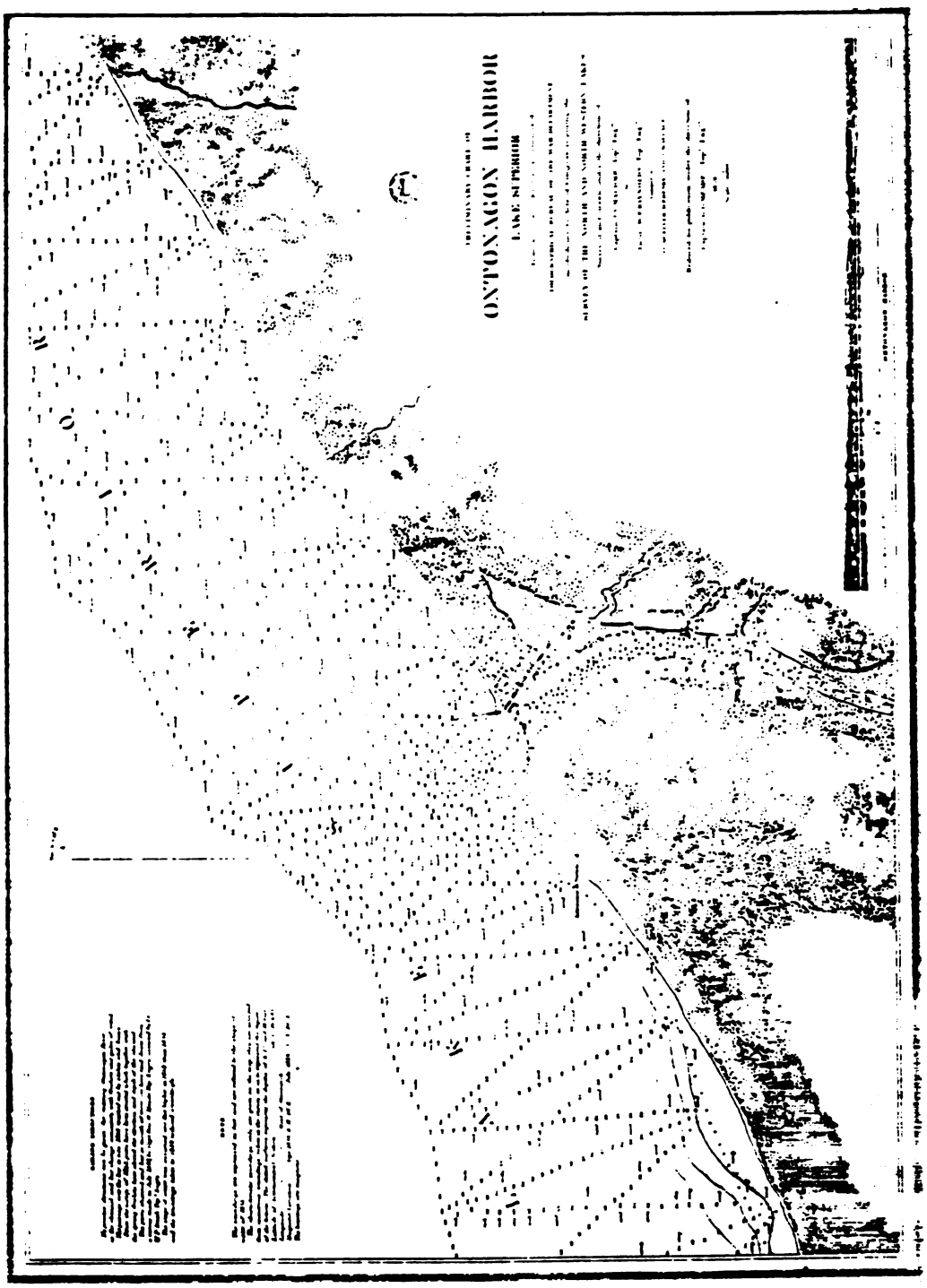

Figure 17. Chart of Ontonagon Harbor, 1:16,000, 1859.

twelve, and eighteen feet. The depth contours were shaded in dark to light grey tones to show the limits of navigation. Soundings within the dotted surfaces were in feet, and elsewhere in fathoms. Numerous soundings were shown near shore extending ten miles lakeward because more soundings had been taken in this area to determine the limits of safe navigation and dangers. Fewer soundings were shown in the open lakes because only scattered soundings had been obtained to ascertain general lake depths, as shown in Figure 18.

Aids to navigation represented on the charts included lighthouses, beacons, and buoys. Lighthouses were represented by pictographic symbols while abstract symbols were used for buoys and beacons. The location of dangers such as rocks, boulders, and reefs were indicated on the charts and lake bottom charactersitics such as mud, clay, gravel, and sand were noted. Features along the shoreline such as points, bays, and islands were often named.

On the small scale charts, land areas were indicated to about five miles inland, but at larger scales the distance was from one-half to two miles from shore. Symbols similar to modern topographic symbols were used to represent deciduous and coniferous trees, fields, orchards, grass, and swamps, and land elevations and relief were symbolized by hachures. Settlements and towns were named and indicated by streets and prominent buildings, along with rivers and railroads. Figure 19 shows the extensive detail used to depict land areas on a large scale chart.

Two unusual features were noted on these charts. On several harbor charts, an inset showing a low oblique view of the harbor was included, illustrated in Figure 20. These insets were drawn in detail

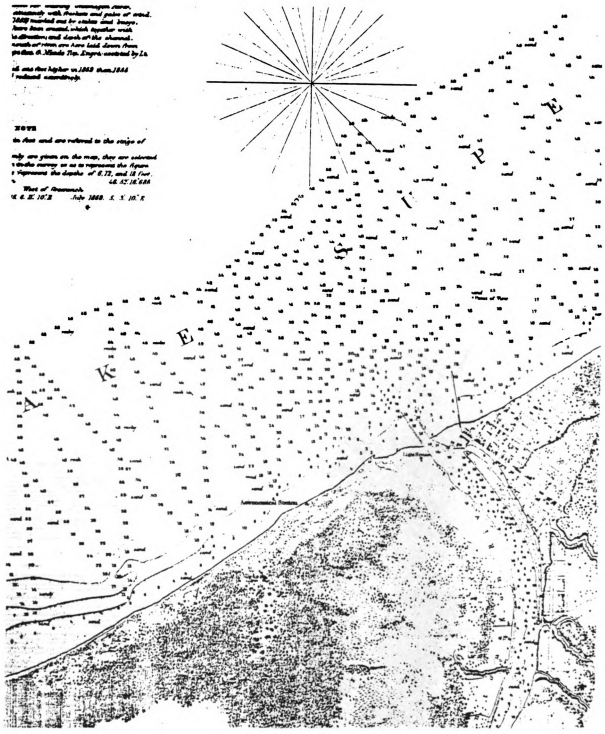

Figure 18. Portion of chart of Ontonagon Harbor, 1:16,000, 1859.

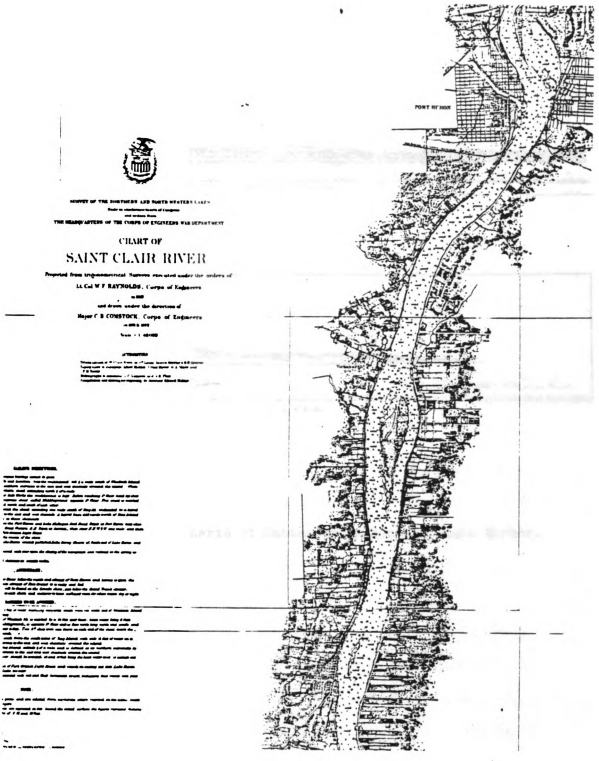

Figure 19. Portion of chart of St. Clair River, 1:40,000, 1872.

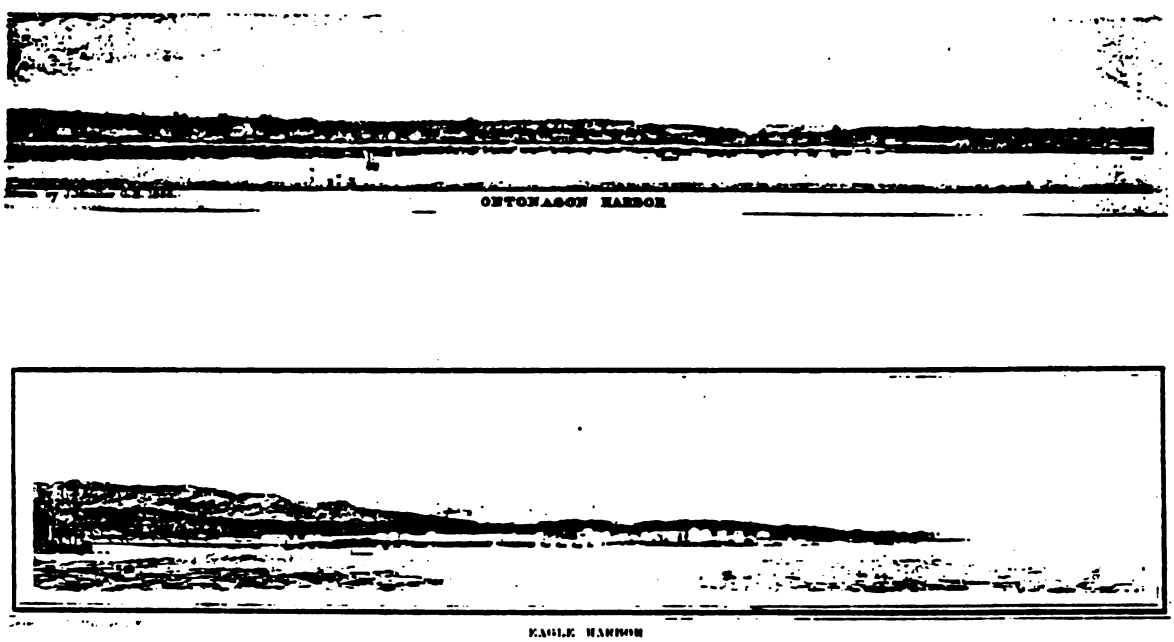

Figure 20. Insets on charts of Ontonagon Harbor and Eagle Harbor.

showing the vegetation and landscape. On the 1860 general chart of Lake Huron, several side view diagrams indicating the lake bottom contours at various locations were included.

1889-1911 Resumption of the Lake Survey

During the second era surveying and charting operations resumed. The first annual Bulletin containing navigational information supplementing the charts was published in 1889. In 1895 the first color chart was printed, and by 1909 all charts were published in color. All depths of eighteen or twenty-one feet or less were printed in blue to indicate the limits of navigation. Also, lake depths were charted to a plane thirty feet below the adopted low-water datum of the open lakes and twenty-five feet below the corresponding datum in the channels of the connecting rivers in all significant regions of the Great Lakes.

The sample charts selected for evaluation included Figure 21, a chart of Holland Harbor published in 1912. A general chart of Lake Erie published in 1908, a coast chart of Lake Huron published in 1906, and a chart of St. Clair River published in 1908 were evaluated but were not included as illustrations because available copies were too fragile for reproduction.

The most significant cartographic development during this period was that all of the charts available for examination were printed in color. It was considered a great improvement in chart production at the time, because all depths less than eighteen or twenty-one feet were shaded in blue, emphasizing the limits of navigation. The color scheme was uniform on all the charts of this period: land was a yellow-orange (buff), water was white, and depth

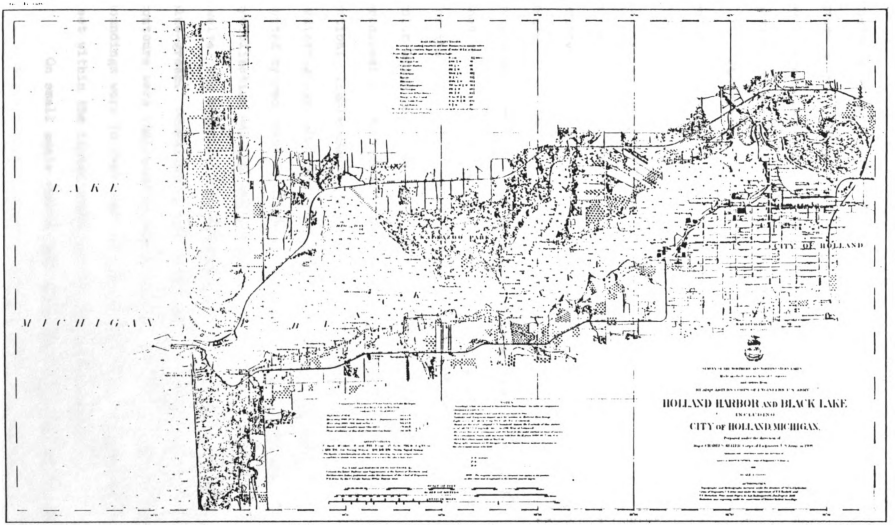

Figure 21. Chart No. 763 of Holland Harbor, 1:15,000, 1912.

contours of six, twelve, and eighteen feet were tinted shades of green-blue. On some of the charts, elevations on land were depicted by contour lines, with brown shading between the lines, and aids to navigation were represented by red and yellow abstract symbols.

The textual information on these charts was similar to that on the earlier charts of the first historical period. Because the first annual Bulletin and monthly supplements containing navigational information were published in 1889, sailing directions and descriptions of harbors of refuge and dangers to navigation were either brief or omitted on the charts. The Bulletin was an important development since it provided the navigator with more extensive up-to-date information and simplified the charts. A compass rose was a new feature used to facilitate the plotting of courses and bearings. The symbols for the aids to navigation were also improved since they were in color which made them more noticable, and they were shown more prominently. New symbols were chosen to represent the aids to navigation: lighthouses were indicated by a red circle with points radiating out, surrounded by a globe of yellow, and buoys were represented by red abstract symbols. The major change in hydrographic symbolization was the addition of color. The depth contours for six, twelve, and eighteen feet were tinted in dark to light shades of blue-green. Occasionally the twenty-one and twnety-four foot depth contours were indicated by dotted lines. On some of the charts, all soundings were in feet, and on other charts the soundings were in feet within the tinted areas and in fathoms elsewhere.

On small scale charts land areas were indicated as far as

fifteen miles inland, but on large scale charts they were depicted to less than a mile inland. Symbols representing topography were the same as on earlier charts. One significant change was the introduction of contour lines to indicate land elevation. On most of the charts examined, relief was depicted by hachures, however, on some of the large scale charts elevation was indicated by ten and twenty foot contour lines. Occasionally, the area between the contour lines was shaded in dark brown.

As on earlier charts, occasional cross sections were included as marginal information. For example, on the 1905 chart of the Northeast End of Lake Michigan at 1:120,000, side views were drawn of two points on Fox Islands, and of Pyramid Point on Manitou Island. These side views were similar to those on the earlier charts of Eagle Harbor and Ontonagon Harbor shown in Figure 20.

1911-1948 Expansion of Operations

During the third historical period, Lake Survey operations expanded to include the New York State canals, Lake Champlain, and the Minnesota-Ontario border lakes, and in 1915 a new project was introduced to shade in dark blue areas less than six feet deep on certain charts to aid small boats.

The sample charts selected for examination were a general chart of Lake Huron published in 1940, not available for illustration; a coast chart of Lake Huron published in 1936, shown in Figure 22; a chart of St. Clair River published in 1934, shown in Figure 23; and a chart of Manistique Harbor published in 1925, illustrated in Figure 24.

Only minor cartographic changes occurred during this period.

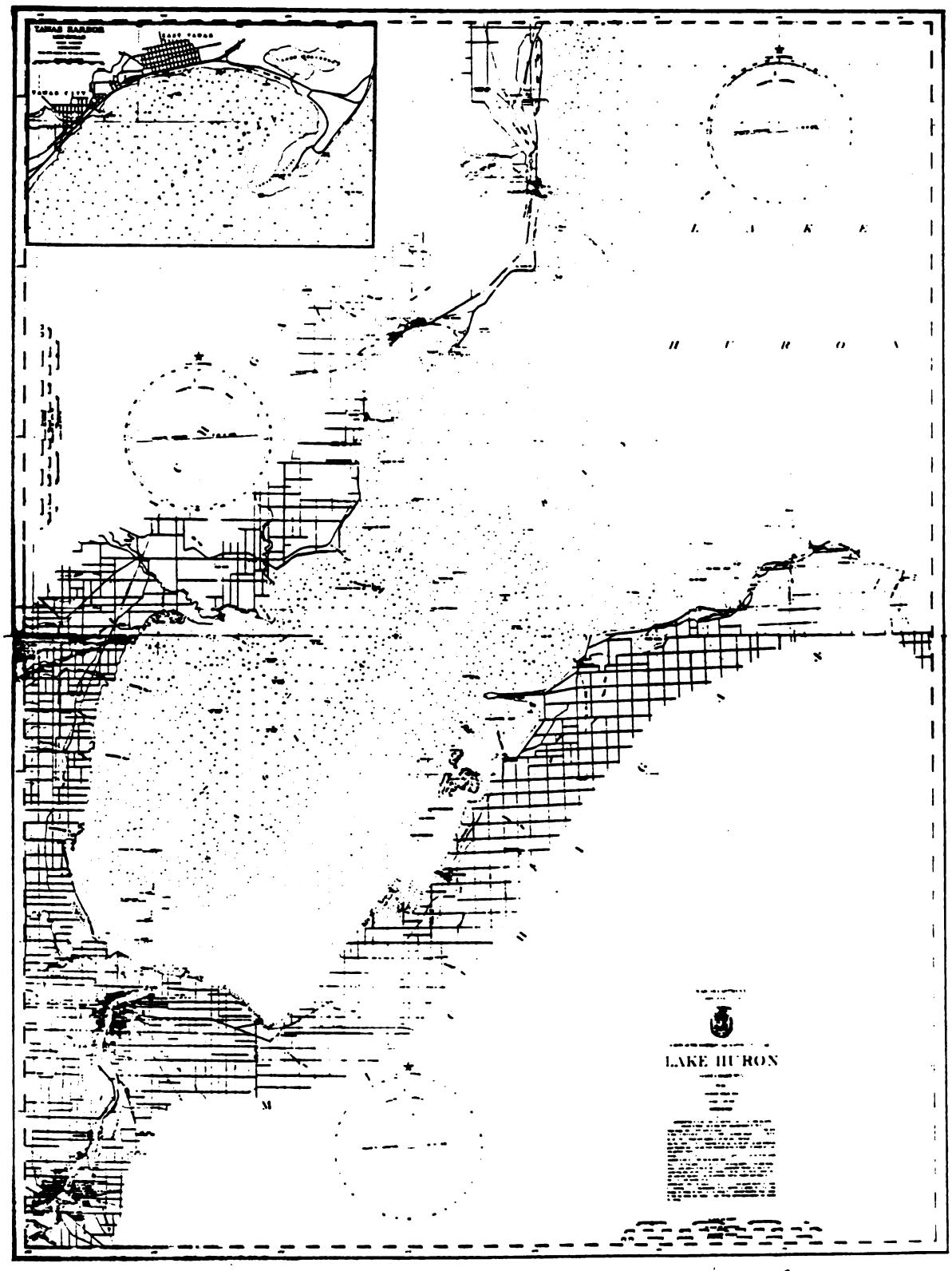

Figure 22. Chart No. 52 of Lake Huron, 1:120,000, 1936.

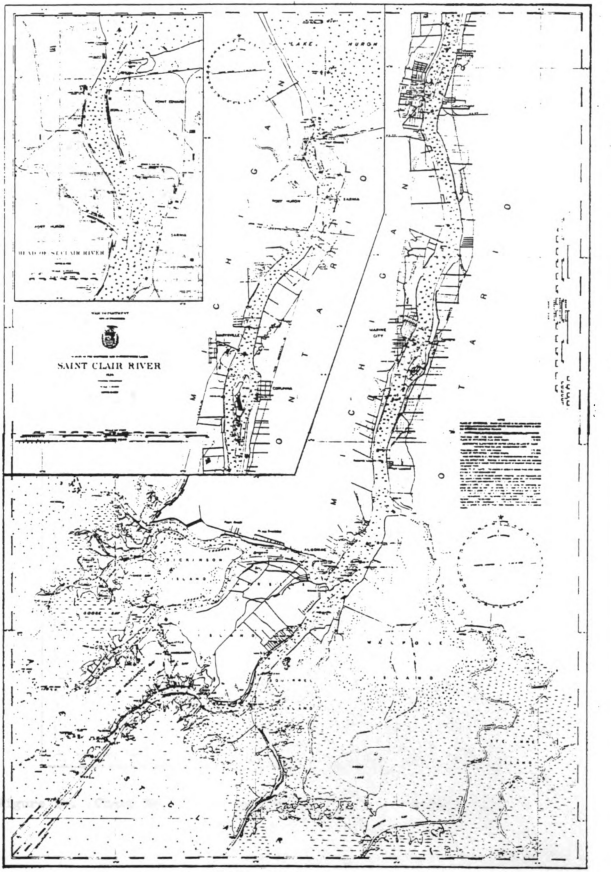

Figure 23. Chart No. 43 of St. Clair River, 1:40.000, 1934.

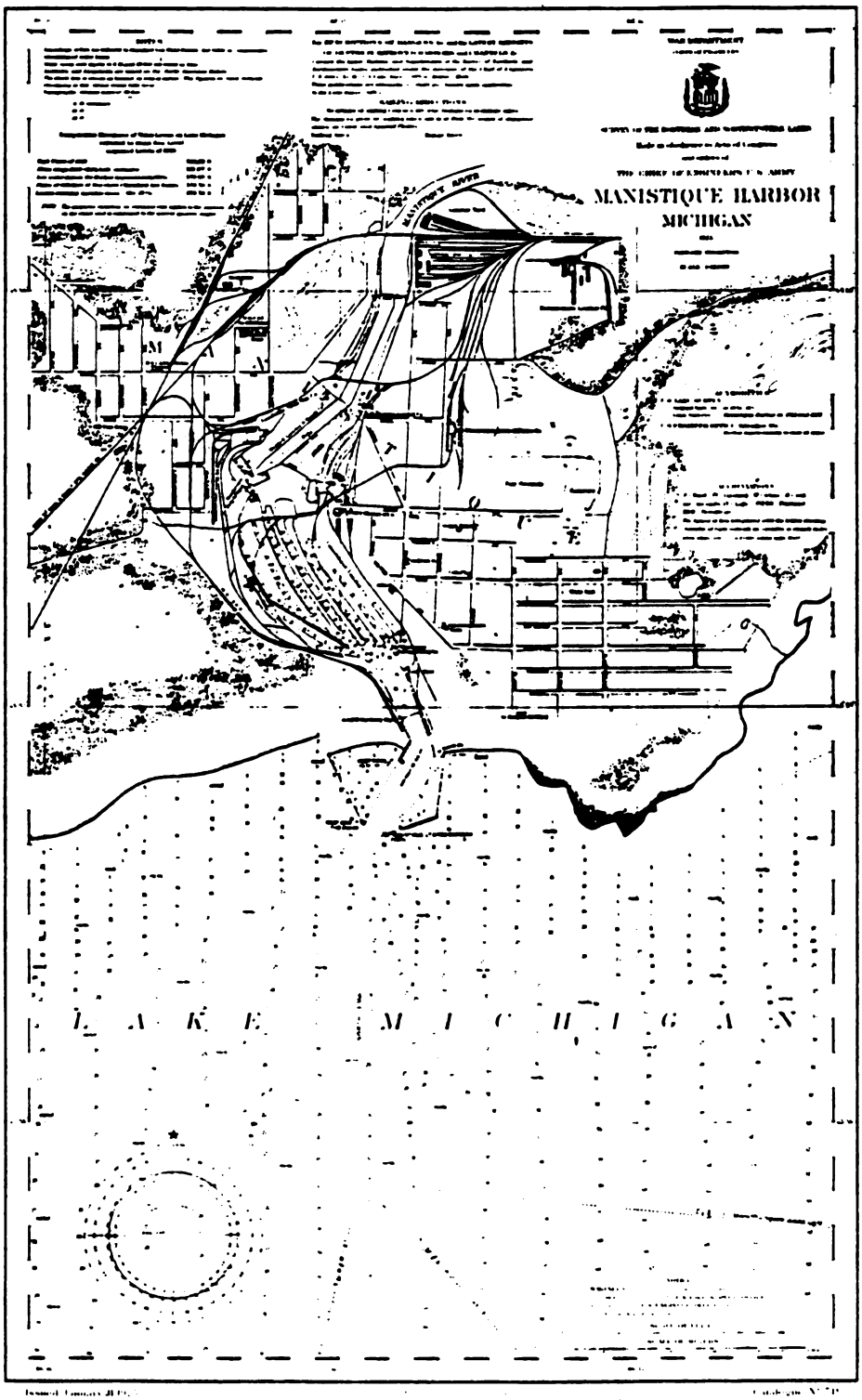

Figure 24. Chart No. 711 of Manistique Harbor, 1:10,000, 1925.

During the 1930's and 1940's the colors used on the charts changed from buff to pale beige or light yellow for land and from green-blue to light blue for depth contours. Water depths were tinted blue out to twenty-one, twenty-four, and sometimes thirty feet since greater depths were needed for larger ships during this period, and on some charts six foot depth contours were shaded dark blue for small boats. More soundings were provided, especially in open waters, possibly due to the development of echo sounding. Vegetation was symbolized less extensively and often omitted except for swamp symbols. Urban features such as streets and cities were depicted in greater detail along the coast, perhaps due to increasing urbanization on the shores of the Great Lakes, and on some of the later charts federal and state highways were drawn in red. Hachures and contour lines were occasionally omitted, textual information was less extensive, and more harbor insets were included on the charts.

1948-1970 The Modern Period

The sample charts evaluated for the modern period were a general chart of Lake Huron published in 1967, shown in Figure 25; a coast chart of Lake Huron published in 1967, shown in Figure 26; a chart of St. Clair River published in 1966, illustrated in Figure 27; and a chart of Holland Harbor published in 1966, shown in Figure 28. Several cartographic changes were introduced during this period. However, because no charts published during the late 1940's and 1950's were available for study, it is difficult to determine exactly when these changes occured.

The color scheme changed somewhat, for the color of the land was changed from beige to a pale yellow, and the water depth contours

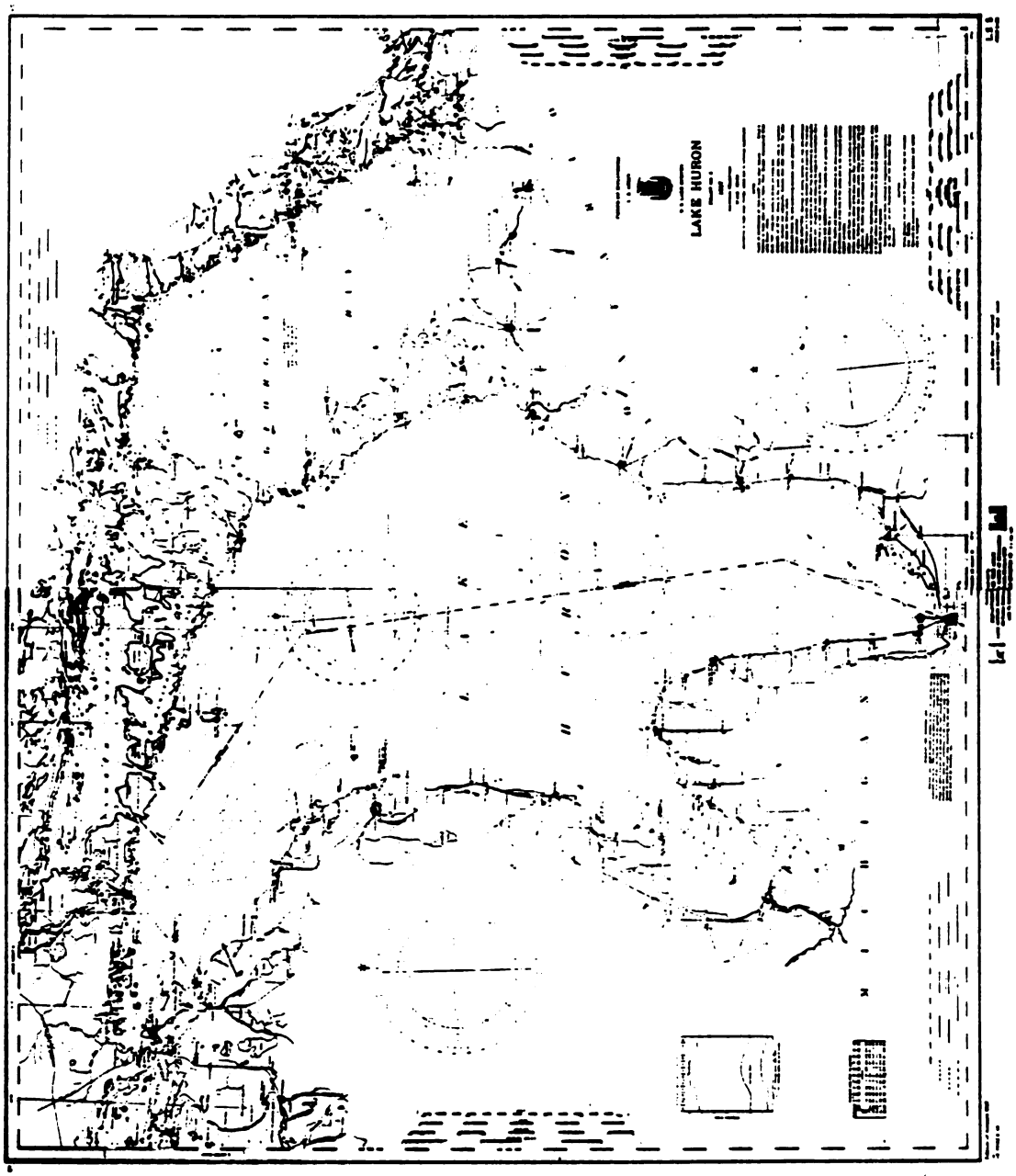

Figure 25. Chart No. 5 of Lake Huron, 1:500,000, 1967.

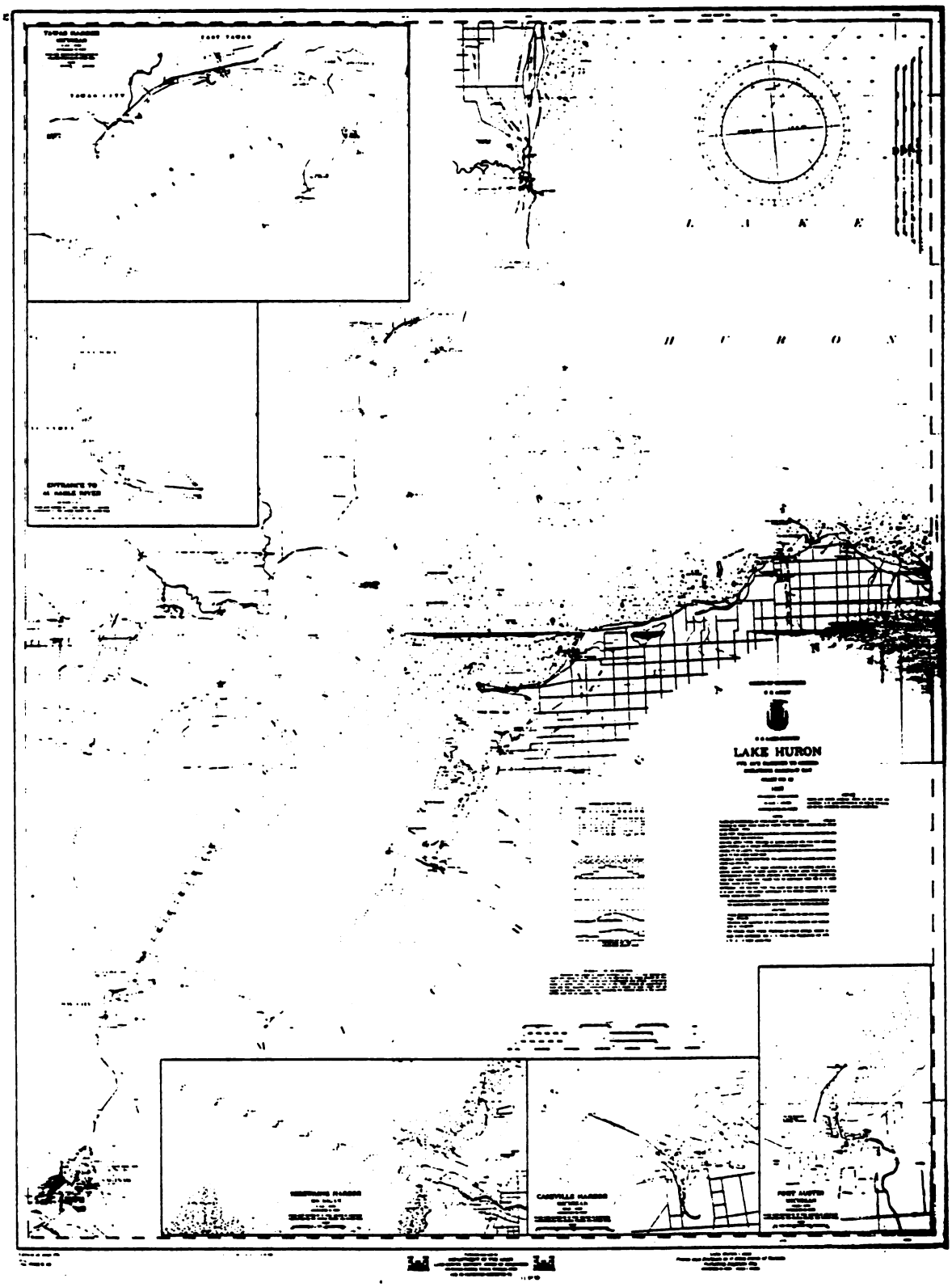

Figure 26. Chart No. 52 of Lake Huron, 1:120,000, 1967.

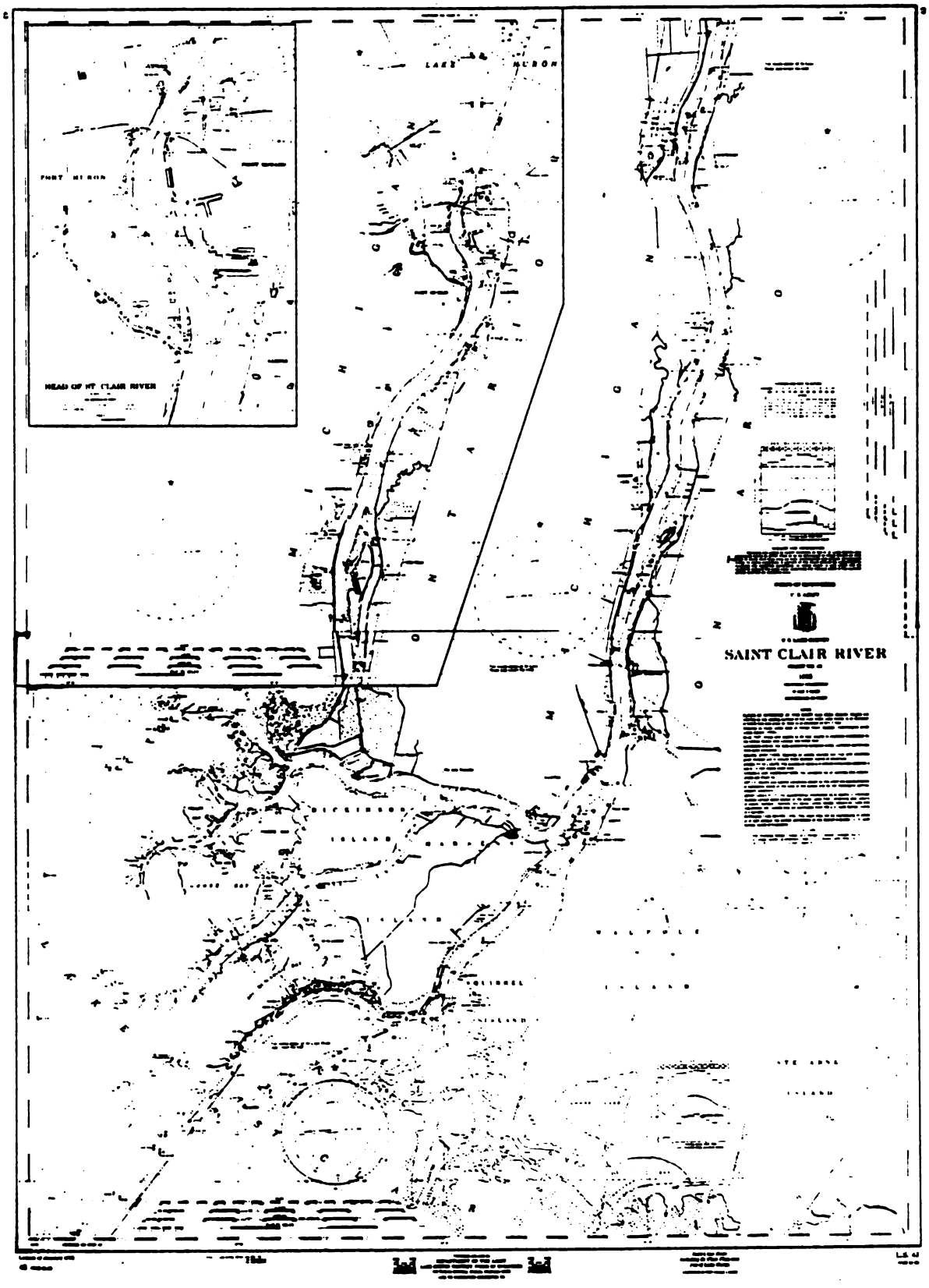

Figure 27. Chart No. 43 of St. Clair River, 1:40,000, 1966.

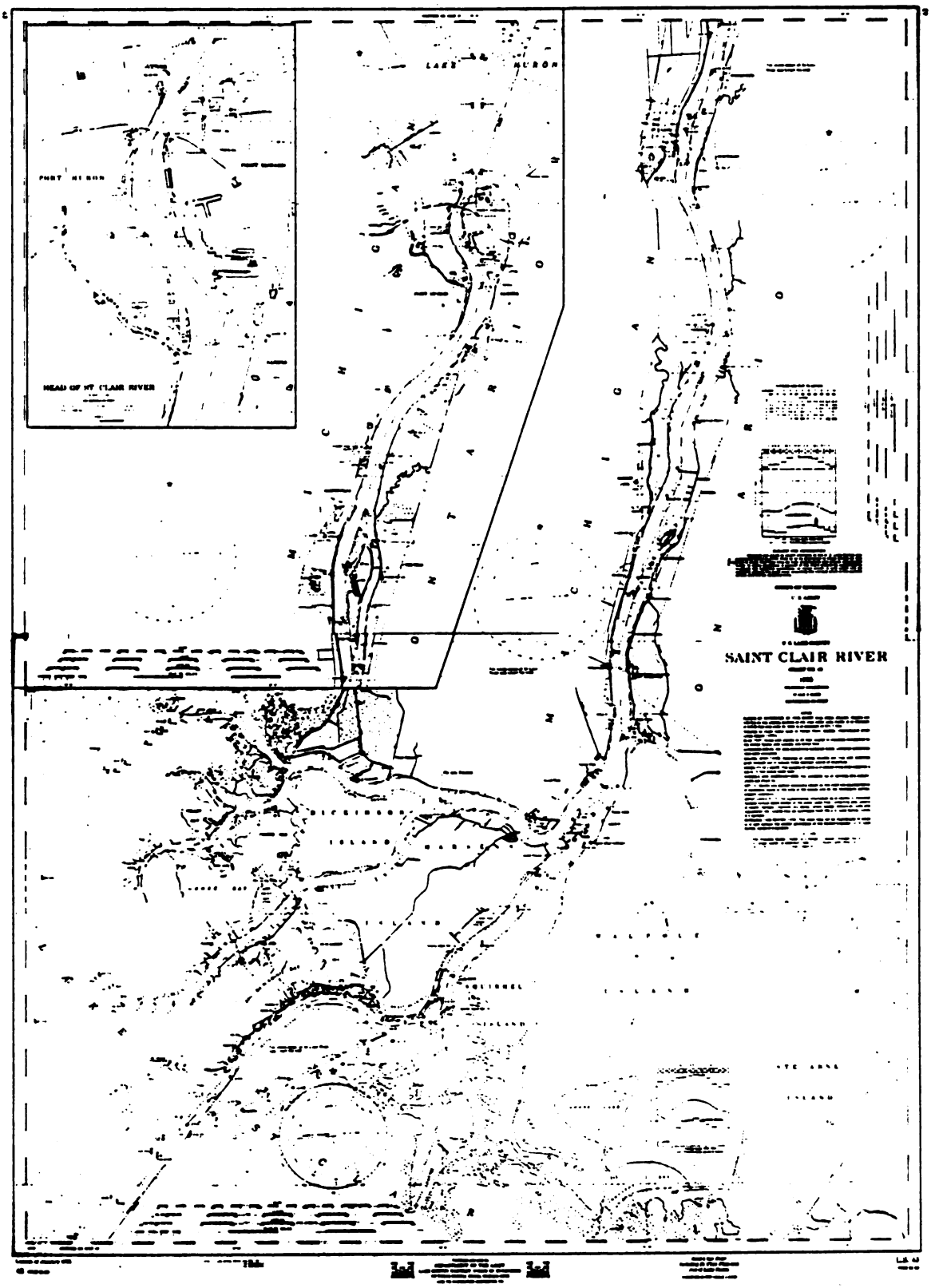

Figure 27. Chart No. 43 of St. Clair River, 1:40,000, 1966.

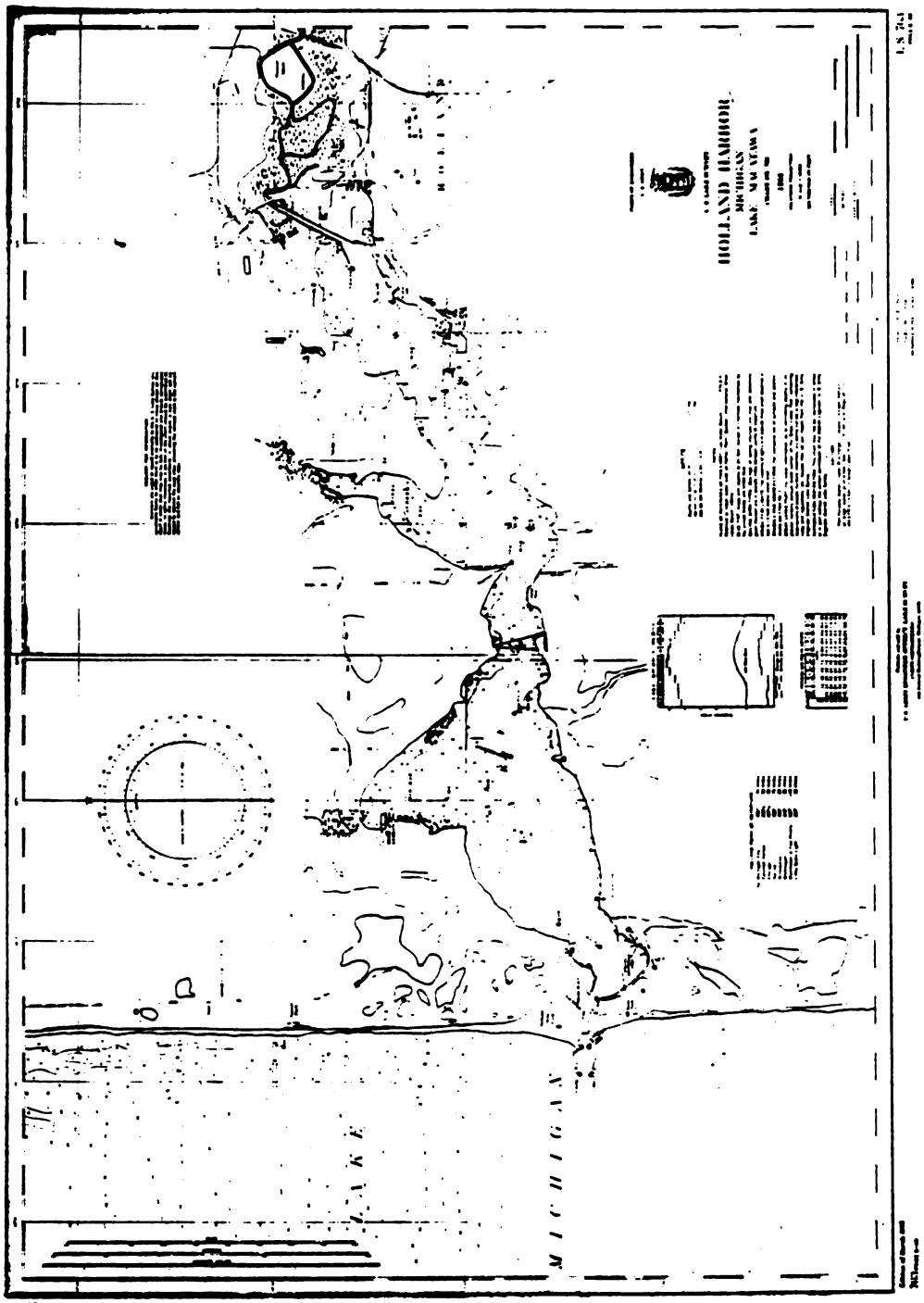

Figure 28. Chart No. 763 of Holland Harbor, 1:15,000, 1966.

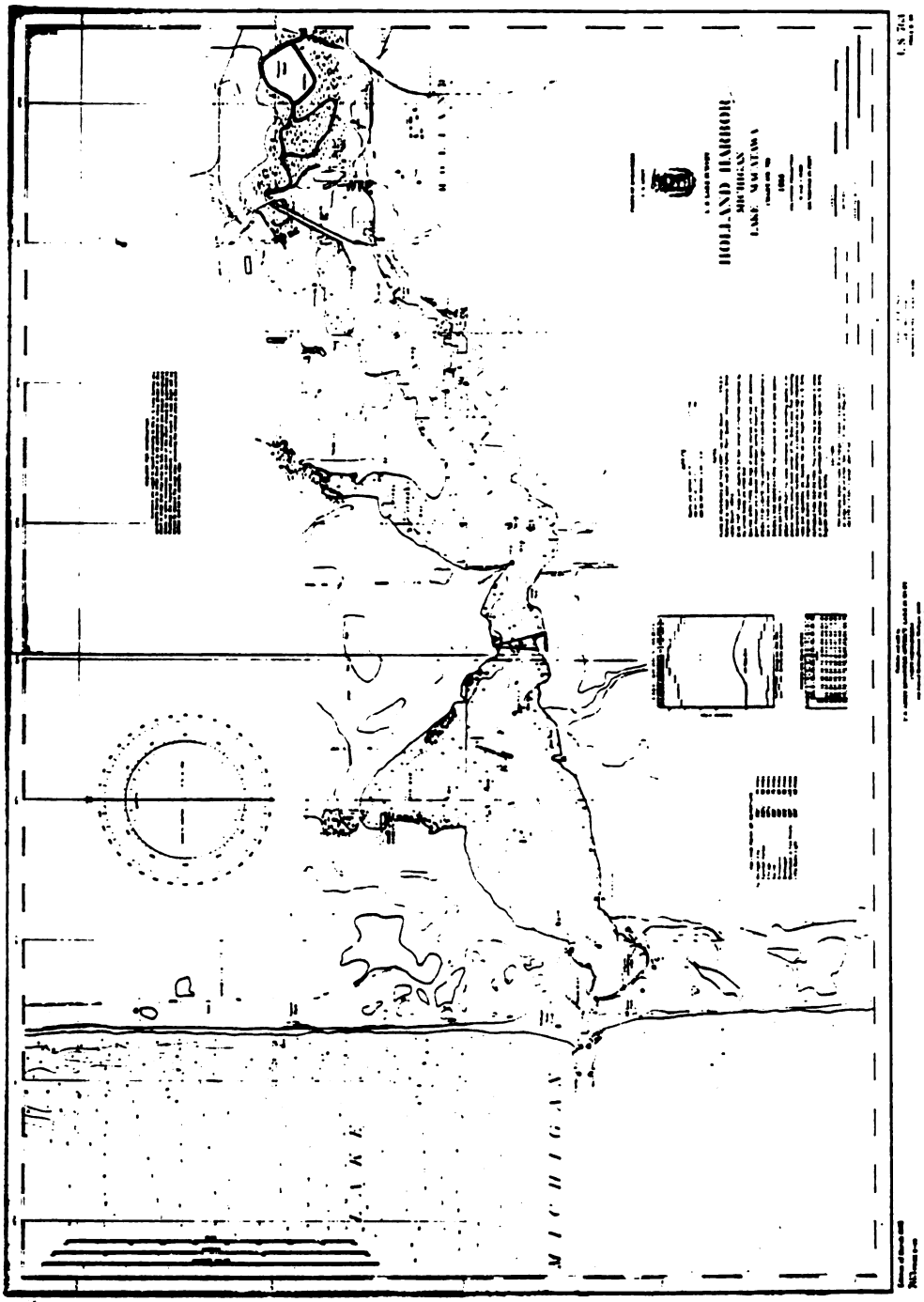

Figure 28. Chart No. 763 of Holland Harbor, 1:15,000, 1966.

to pale blue. Contour lines on land were changed to brown and brown shading between the contour lines was eliminated. In the late 1950's and early 1960's, the symbols for the aids to navigation, the compass rose, and some notes were printed in red, but by the late 1960's all these features were printed in purple, and channels were colored magenta. These changes in color probably developed with the increased use of red lights for reading charts at night, which made red and buff colors disappear and necessitated the introduction of colors better suited for this lighting.

Vegetation symbols were virtually eliminated, except swamp symbols which were now printed in blue. Land areas were depicted primarily by streets, buildings, and landmarks by the 1960's. Hachures were eliminated, and contour lines were used less frequently. By the 1960's, water depths on most charts were tinted blue to twenty-four feet, and often the thirty foot depth contour was drawn but not shaded blue. All aids to navigation and other symbols were in accordance with those illustrated in Chart No. 1 Chart Symbols and Abbreviations, but most of the symbols were similar to previous ones, except the lighthouse symbol which became more abstract and the yellow color was eliminated. Less textual information was included on these charts, and the only tables found on most charts were a water level table and a fathoms and feet to meters table.

The Lake Survey began to publish booklets of large scale recreational craft charts during this period. These 11" x 17 ½" looseleaf booklets were designed for use on small boats and showed greater details, including names and locations of yacht clubs and marinas, more water depths, and detailed shoreline features and

landmarks. The chart scales varied in different booklets and insets were often included.

The Influence of Tradition on the Lake Survey Charts

The U. S. Lake Survey produced nautical charts of the Great Lakes region for over 125 years. These charts were continually revised to improve the safety of navigation on the lakes and keep pace with changing navigational needs, and various scientific investigations were conducted to provide information on the hydraulics and hydrography of the lakes and to supplement the charts. Tradition greatly influenced the cartographic development of the Lake Survey charts through time, for the charts changed remarkably little in appearance despite the many important advances in navigation, technology, and cartography. The cartographic development of the Lake Survey charts is summarized in Table 2.

The greatest cartographic changes in the Lake Survey charts were the introduction of color and more accurate and complete representation of soundings, aids to navigation, and dangers. The use of color significantly improved the charts, for the use of shaded blue contours emphasized the limits of navigation while aids to navigation were represented by red and yellow abstract symbols which were much more prominent than the previous black and white symbols. Later, these symbols were changed from red to purple due to improved lighting conditions for night reading in the chartroom. Landform relief was represented by brown contour lines and brown shading, an improvement over the earlier black hachures, and land areas were colored either buff or later pale yellow which provided better visual contrast between water and land areas than on the black and white charts.

TABLE 2

CARTOGRAPHIC DEVELOPMENT OF THE LAKE SURVEY CHARTS

Feature	1841-1882	1889-1911	1911-1948	1948-1970
COLOR	black & white	1895- first color 1909-all in color	color changed from buff to beige and green-blue to light blue	color changed to pale yellow and pale blue
SOUNDINGS	feet & fathom numbers and shaded grey contour lines 6, 9, 12, 18 feet	shades of green-blue feet in tinted area fathoms elsewhere 6, 12, 18, 21, 24 feet	shaded blue contours to 30 feet 6 foot contours dark blue for small craft	same
AIDS TO NAVIGATION	pictographic symbols	red and yellow abstract symbols	same	red then purple abstract symbols
DANGERS	words such as rocky, wreck, reef	same	same plus some symbols	standard symbols
LAKE BOTTOM	words such as clay, mud, stone	same	same	standard abbreviations
LAND AREAS	extensive topographic symbols	same	fewer topographic symbols for vegetation more urban features	no vegetation symbols except blue swamp symbols more urban features
ELEVATION	hachures	hachures & contours brown shading	less hachures more contours	Brown contour lines & no hachures

The actual cartographic symbols changed only slightly, however. Soundings were represented by numbers and shaded contour lines on all the Lake Survey charts, and lake bottom characteristics were always symbolized by descriptive words or abbreviations. Aids to navigation on the early black and white charts were represented by pictographic symbols, but with the introduction of color they were changed to more abstract red and yellow symbols. These were later colored purple instead of red and altered only slightly to conform to international standards. Dangers to navigation were indicated by words such as reef, shoal, and wreck on the earlier charts, and by the 1930's standard symbols were used. The topographic symbols used to represent features such as trees, fields, grass, and swamps changed very little over the years; the greatest change was the gradual elimination of such representation except for swamp symbols which were colored blue by the modern period. More urban features such as roads, cities, and prominent buildings and landmarks along shore were depicted on later charts due to the increasing urbanization of the Great Lakes region and standard symbols were used to represent these features.

Other information on the charts included written information which became less extensive over time, particularly after the first publication of the Bulletin in 1889. Insets were used to show harbors and other areas at larger scales, and on early charts low-oblique drawings of harbors were sometimes used. Over time more insets were included on the charts as some of the large scale harbor charts were incorporated onto appropriate coast charts. More information was gradually provided on the charts for small boats, such as shading of

shallow waters and representation of more landmarks along shore, and during the modern period detailed large scale recreational craft charts were issued.

The Lake Survey charts changed very little in appearance for more than a century because conventional cartographic symbols and designs were preferred for several reasons. Traditional, standardized symbols increased the uniformity and utility of the charts, and this was recognized internationally with the establishment of the International Hydrographic Bureau in 1921 to adopt standard chart symbols. Many different symbols were used on nautical charts to represent a variety of important information such as dangerous shoals, ship wrecks, and shallow water, and the use of familiar symbols simplified chart reading during navigation, particularly in storms and treacherous areas. The charts were constantly updated by the Lake Survey and chart users to show new dangers, harbor improvements, and other changes, which further complicated the chart reading task and provided another reason for the use of traditional chart designs and symbols. Furthermore, it was easier and less expensive for the Lake Survey to revise old charts and print new editions if the old printing plates could be corrected rather than completely remade, and new charts were more rapidly produced using familiar symbols and designs.

The U. S. Lake Survey was very conservative and adopted only those cartographic innovations which would significantly improve the charts. The most important innovation was the introduction of color to accentuate the limits of navigation and navigational aids and dangers and provide more visual contrast and legibility, and this was considered a significant improvement in chart design. This was

the only major cartographic innovation adopted, however, illustrating the impact of tradition on the hundreds of nautical charts produced on the Great Lakes for more than a century.

APPENDIX

APPENDIX A

BIBLIOGRAPHY OF U. S. LAKE SURVEY CHARTS 1841-1970

Introduction

The following bibliography of charts was compiled from a list of charts published by the U. S. Army Corps of Engineers in 1882 and reproductions of U. S. Lake Survey annual chart catalogs obtained from libraries in the Great Lakes region and the Library of Congress in Washington, D. C. The list published in 1882 included all seventy-six original charts produced from 1841 to 1882. Additions of new charts; revisions such as changes in scale, area covered, and new inserts; and elimination of obsolete charts were ascertained from annual chart catalogs. The U. S. Lake Survey report in the 1917 U. S. Army Annual Report of the Chief of Engineers included a list of current charts and expected revisions, additions, and deletions as part of the 1917 revision of the chart project developed in 1909.

Often the description of the vicinity covered by a chart changed from year to year in the chart catalogs; this reflected actual changes in the area covered, changes in place names such as the change from Point Aux Becs Scies to Point Betsie in 1903, or changes in the landmarks chosen to indicate the boundaries of the chart. All of these description changes were included in the bibliography because it was not possible to examine all the Lake Survey charts to determine the reason for the changes.

This bibliography is a reasonably complete list of the Lake Survey charts published from 1841 to 1970. All the charts published by 1882 were included, and selected chart catalogs from 1900 to 1970

were used to compile the rest of the list. The chart catalogs examined were from 1900, 1903, 1907, 1909, 1913, 1917, 1927, 1935, 1937, 1939, 1940, 1941, 1944, 1945, 1949, 1953, 1955, 1958, 1960, 1962, 1963, 1967, 1969, and 1970. Additional chart catalogs were not included because of lack of availability and time and budget constraints. Index maps of the Lake Survey charts were provided in the annual chart catalogs, and the index maps from the 1963 catalog are shown in Figures 29a through 29h to illustrate the areas typically covered by the charts.

CHART INDEX

U. S. LAKE SURVEY CHARTS 1841-1970

Note: This bibliography follows the annual chart catalog format and uses the modern chart numbering system initiated in 1909 and modified somewhat over the years. The dates of publication for the charts in this list include the first year each chart was published, dates of changes, and the date of discontinuation; unless noted, all charts were published until 1970.

GENERAL CHARTS OF THE GREAT LAKES

Chart No.	Locality	Scale	Dates Pub.
0	General Chart of the Northern and Northwestern Lakes	1:1,200,000	1907
	The Great Lakes, Lake Champlain, New York Canals, and Lake of the Woods	1:1,200,000	1935
	The Great Lakes, Lake Champlain, and New York Canals	1:1,200,000	1939
	Inset: Drainage Basin, Northern and Northwestern Lakes	1:500,000	
	Inset Removed		1953
	Great Lakes - General Chart - including Lake Champlain and New York Canals	1:1,500,000	1968
2	Lake Ontario	1:400,000	1877
	Lake Ontario (color)	1:400,000	1903
3	Lake Erie	1:400,000	1852
	Lake Erie (color)	1:400,000	1903
5	Lake Huron	1:400,000	1860
	Lake Huron and Georgian Bay (color)	1:400,000	1907
	Lake Huron - the whole lake, Georgian Bay, and North Channel	1:400,000	1927
	Lake Huron - the entire lake, including Georgian Bay and North Channel	1:500,000	1937

Chart No.	Locality	Scale	Dates Pub.
7	Lake Michigan - the whole lake	1:500,000	1900
	Lake Michigan - the whole lake (color)	1:500,000	1903
	Lake Michigan - the whole lake, including Green Bay	1:500,000	1909
9	Lake Superior - the whole lake	1:500,000	1903
	Insets: Gargantua Harbor, Ont.	1:20,000	
	Grand Marais, Mich., Harbor of Refuge	1:10,000	
	Grand Marais, Minn., Harbor	1:8,000	
	Michipicoten Harbor, Ont.	1:5,000	
	Lake Superior - the whole lake (color)	1:500,000	1907
	Insets: same as above		
	Lake Superior - the whole lake	1:500,000	1913
	Insets: Gargantua, Ont.	1:20,000	
	Grand Marais, Mich.	1:10,000	
	Grand Marais, Minn.	1:8,000	
	Michipicoten Harbor, Ont.	1:5,000	
	Lake Superior - the whole lake (insets removed)	1:500,000	1927

ST. LAWRENCE RIVER, LAKE CHAMPLAIN, AND NEW YORK STATE BARGE CANAL SYSTEM

Chart No.	Locality	Scale	Dates Pub.
11	St. Lawrence River, No. 1 - St. Regis to Strawberry Island	1:30,000	1874
	St. Lawrence River - from St. Regis to Strawberry Island, N. Y. (color)	1:30,000	1907
	St. Lawrence River - St. Regis to Bradford Point, N. Y.	1:30,000	1927
	St. Lawrence River - St. Regis, Ont. to Weaver Point, Ont.	1:30,000	1939
	St. Lawrence River - St. Regis, Que. to Richards Landing, N. Y.	1:30,000	1945

Chart No.	Locality	Scale	Dates Pub.
11	St. Lawrence River - St. Regis, Que. to Croil Island, N. Y.	1:30,000	1960
12	St. Lawrence River, No. 2 - Strawberry Island to Isle Au Galop	1:30,000	1875
	St. Lawrence River - from Strawberry Island, N. Y. to Galop Is., Ont. (color)	1:30,000	1907
	St. Lawrence River - Bradford Point, N. Y. to ½ mile southwest of Cardinal, Ont.	1:30,000	1927
	St. Lawrence River - Weaver Point, Ont. to Lalone Island, N. Y.	1:30,000	1939
	St. Lawrence River - Richards Landing to Leishman Pt., N. Y.	1:30,000	1945
	St. Lawrence River - Croil Island to Leishman Pt., N. Y.	1:30,000	1960
13	St. Lawrence River, No. 3 - Isle au Galop to 2½ miles east of Morristown	1:30,000	1875
	St. Lawrence River - from below Galop Is., Ont. to 2½ miles east of Morristown, N. Y. (color)	1:30,000	1907
	St. Lawrence River - from below Galop Is., Ont. to 2½ miles east of Morristown, N. Y. Inset: Ogdensburg, N.Y. and Prescott, Ont.	1:30,000 1:15,000	1913
	St. Lawrence River - Lalone Island, N. Y. to Brooks Point, N. Y. (inset same)	1:30,000	1939
14	Chart No. 13 changed to No. 14 St. Lawrence River - Ogdensburg, N. Y. to Brockville, Ont. Inset: Ogdensburg, N.Y. and Prescott, Ont.	1:30,000 1:15,000	1944
13	New Chart No. 13 St. Lawrence River - Leishman Pt. to Ogdensburg, N. Y.	1:30,000	1945
14	Old Chart No. 14 St. Lawrence River, No. 4 - 2½ miles east of Morristown to Chippewa Point	1:30,000	1876

Chart No.	Locality	Scale	Dates Pub.
14	St. Lawrence River - from 3½ miles east of Morristown to Chippewa Pt., N.Y. (color)	1:30,000	1907
	St. Lawrence River - Brooks Point, N.Y. to Chippewa Point, N.Y.	1:30,000	1939
	Chart No. 14 discontinued		1941
15	St. Lawrence River, No. 5 - Chippewa Point to Wellesly Island	1:30,000	1876
	St. Lawrence River - Wellesly Island to Chippewa Point (color)	1:30,000	1903
	St. Lawrence River - Chippewa Pt., N.Y. to St. Lawrence Park, N.Y., and Jackstraw Shoal Light, Ont.	1:30,000	1927
	St. Lawrence River - Chippewa Pt., N.Y. to Point Vivian, N.Y., and Jackstraw Shoal Lt.	1:30,000	1935
	St. Lawrence River - Chippewa Pt., N.Y. to Point Vivian, N.Y. and Gananoque Narrows, Ont. Inset: Alexandria Bay, N.Y.	1:30,000 1:10,000	1939
	St. Lawrence River - Holmes Pt. to Deer Island (no inset)	1:30,000	1941
	St. Lawrence River - Brockville, Ont. to Deer Island, N. Y.	1:30,000	1944
	St. Lawrence River - Holmes Pt., N.Y. to Deer Island, N.Y.	1:30,000	1960
16	St. Lawrence River, No. 6 - Wellesly Is. to Long Island	1:30,000	1876
	St. Lawrence River - Long Island to Wellesly Island (color)	1:30,000	1903
	St. Lawrence River - from Pt. Vivian, N.Y. and Gananoque light, Ont., to Wolfe Island light, N.Y., and Burnt Island light, Ont.	1:30,000	1907
	St. Lawrence River - Pt. Vivian to Linda Island Light, NLYL, and from 3½ miles east to 2½ miles west of Gananoque, Ont.	1:30,000	1927

Chart No.	Locality	Scale	Dates Pub.
16	St. Lawrence River - Pt. Vivian, N.Y. and Lynedock Island Light, Ont., to Linda Island Light, N.Y., and Red Horse Rock Light, Ont.	1:30,000	1935
	St. Lawrence River - Pt. Vivian, N.Y. and Lynedock Island, Ont., to Linda Island, N.Y. and Howe Island, Ont.	1:30,000	1939
	St. Lawrence River - Whiskey Island Shoal to Bartlett Pt. Light	1:30,000	1941
	Insets: Clayton, N. Y.	1:10,000	
	Alexandria Bay, N. Y.	1:10,000	
	St. Lawrence River - Deer Island to Bartlett Pt. Light (insets same)	1:30,000	1944
	St. Lawrence River - Whiskey Island Shoal to Bartlett Pt., N. Y.	1:30,000	1960
	Insets: Clayton, N. Y.	1:10,000	
	Alexandria Bay, N.Y.	1:10,000	
17	St. Lawrence River	1:30,000	1937
	Inset: Cape Vincent	1:10,000	
	St. Lawrence River - Bartlett Point Light, N. Y., and St. Lawrence Island, Ont., to Cape Vincent, N. Y. and Cold Bath Shoal, Ont.	1:30,000	1939
	Inset: Cape Vincent, N. Y.	1:10,000	
	St. Lawrence River - Bartlett Point, N. Y. to Cape Vincent, N. Y.	1:30,000	1960
	Inset: Cape Vincent, N. Y.	1:10,000	
18	St. Lawrence River - Head of river	1:30,000	1937
	St. Lawrence River - Cape Vincent, N. Y. and Howe Island, Ont., to Allen Otty Shoal, N. Y., and Ninemile Point Light, Ont.	1:30,000	1939
	St. Lawrence River - Cape Vincent, N. Y., to Allen Otty Shoal, N.Y., and Kingston, Ont.	1:30,000	1960
113	St. Lawrence River - Morristown, N. Y. to Butternut Bay, Ont.	1:15,000	1969
114	St. Lawrence River - Union Park, Ont., to Ironsides, N. Y.	1:15,000	1945

Chart No.	Locality	Scale	Dates Pub.
114	St. Lawrence River - Butternut Bay, Ont., to Ironsides Island, N. Y.	1:15,000	1969
115	St. Lawrence River - Ironsides, N. Y., to Bingham Island, Ont.	1:15,000	1945
116	St. Lawrence River - Bingham Island, Ont. to Round Island, N. Y.	1:15,000	1945
	St. Lawrence River - Gananoque, Ont., to St. Lawrence Park, N. Y.	1:15,000	1953
117	St. Lawrence River - Round Island, N. Y. to Wolfe Island, Ont.	1:15,000	1945
	St. Lawrence River - Round Island, N. Y. and Gananoque, Ont., to Wolfe Island, Ont.	1:15,000	1953
131	Ogdensburg Harbor (color)	1:10,000	1903
	Ogdensburg and Prescott Harbors	1:10,000	1907
	Chart No. 131 discontinued - now inset on No. 13		1913
171	Lake Champlain, No. 1 - Rouses Point to Cumberland Head, N. Y. and Vt.	1:40,000	1913
	Lake Champlain, No. 1 - Missisquoi Bay to South Hero Island, N. Y. and Vt.	1:40,000	1927
	Lake Champlain, No. 1 - South Hero Island to Richelieu River and Missisquoi Bay	1:40,000	1935
	Lake Champlain - Richelieu River and Missisquoi Bay, Quebec, to South Hero Is., N.Y.	1:40,000	1939
172	Lake Champlain, No. 2 - Cumberland Head to Ligonier Pt., N. Y. and Vt.	1:40,000	1913
	Lake Champlain - Cumberland Head, N.Y. and Savage Island, Vt., to Four Brothers Islands	1:40,000	1939
173	Lake Champlain, No. 3 - Ligonier Pt. to Coles Bay, N. Y. and Vt.	1:40,000	1913
	Lake Champlain, No. 3 - Ligonier Pt. to Potash Bay, N. Y. and Vt.	1:40,000	1927
	Lake Champlain - Juniper Island to Cole Bay	1:40,000	1937

Chart No.	Locality	Scale	Dates Pub.
173	Lake Champlain - Four Brothers Islands to Barber Point, N. Y.	1:40,000	1939
174	Lake Champlain, No. 4 - Coles Bay to Whitehall, N. Y. and Vt.	1:40,000	1913
	Lake Champlain - Barber Point, N. Y. to Whitehall, N. Y.	1:40,000	1939
179	Burlington Harbor, Vt.	1:10,000	1913
175	Chart No. 179 changed to No. 175 Burlington Harbor, Vt.	1:10,000	1939
180	New York State Barge Canal System - Recreational Craft booklet - Barge Canal System east of Lyons, N. Y., including the Erie, Champlain, Oswego, and Cayuga-Seneca Canals - 60 charts - 11" x 17"	1:21,120	1949
	New York State Barge Canal System - Not classed solely as a Recreational Craft Chart because it is the only chart coverage of the Canal System. Depicts the Barge Canal System east of Lyons, N.Y., including the Erie, Champlain, Oswego, and Cayuga-Seneca Canals - Contains 61 charts - 11" x 17½"	1:20,000	1967
181	New York Canals No. 1 - Champlain Canal, Whitehall to Waterford	1:40,000	1927
	New York Canals - Champlain Canal from Whitehall, N. Y., to Troy, N. Y.	1:40,000	1939
	New York State Barge Canal System - Champlain Canal from Troy, N. Y., to Whitehall, N. Y.	1:40,000	1963
	Chart No. 181 discontinued		1967
182	New York Canals No. 2 - Erie Canal from Waterford to Amsterdam	1:40,000	1927
	New York Canals - Erie Canal from Troy, N. Y. to Amsterdam, N. Y. and Champlain Canal from Troy, N. Y., to Stillwater, N.Y.	1:40,000	1939
	Chart No. 182 discontinued		1955
183	New York Canals No. 3 - Erie Canal from Amsterdam to Utica, N. Y.	1:40,000	1927

Chart No.	Locality	Scale	Dates Pub.
183	Chart No. 183 discontinued		1958
184	New York Canals No. 4 - Oneida Lake, N. Y.	1:40,000	1913
	New York Canals No. 4 - Lock 22 to Lock 23, including Oneida Lake, N. Y.	1:40,000	1927
	New York State Barge Canal System - Lock 22 to Lock 23, including Oneida Lake, N. Y.	1:40,000	1963
185	New York Canals No. 5 - Erie Canal from Brewerton to Cross Lake and to Syracuse, and Oswego Canal	1:40,000	1917
	New York Canals - Erie Canal from Lock 23 to Cross Lake, N. Y., and Oswego River to Lake Ontario, including Oswego, N. Y., and Onondaga Lake	1:40,000	1939
	Chart No. 185 discontinued		1955
186	New York Canals No. 6 - Erie Canal from 1 mile west of Cross Lake to Lyons, and Cayuga and Seneca Canal to Cayuga and Seneca Lakes	1:40,000	1917
	New York Canals - Erie Canal from west of Cross Lake to Lyons, and Cayuga and Seneca Canal to Cayuga and Seneca Lake, N. Y.	1:40,000	1935
	New York Canals - Erie Canal from Nicholson Island, N.Y., to Lyons, N.Y., and Cayuga and Seneca Canal to Cayuga and Seneca Lakes, N.Y.	1:40,000	1939
	New York Canals - Erie Canal from Nicholson Island, N.Y. to Lyons, N.Y., and Cayuga and Seneca Canal to Cayuga and Seneca Lakes	1:40,000	1949
	Insets: Entrance to Canal on Seneca Lake	1:10,000	
	Geneva, N. Y.	1:10,000	
	Chart No. 186 discontinued		1958
187	New York Canals No. 7 - Cayuga and Seneca Lakes, N. Y.	1:60,000	1927
	New York Canals - Cayuga and Seneca Lakes	1:60,000	1949
	Insets: Watkins Glen, N. Y.	1:10,000	
	Ithaca, N. Y.	1:10,000	

Chart No.	Locality	Scale	Dates Pub.
187	New York State Barge Canal System - Cayuga and Seneca Lakes, N. Y.	1:60,000	1963
	Insets: Watkins Glen, N. Y.	1:10,000	
	Ithaca, N. Y.	1:10,000	

LAKE ONTARIO AND LOWER NIAGARA RIVER

Chart No.	Locality	Scale	Dates Pub.
2	Lake Ontario	1:400,000	1877
	Lake Ontario - the whole lake (color)	1:400,000	1903
21	Lake Ontario Coast Chart No. 1 - Stony Point and South Bay to Clayton, N. Y.	1:80,000	1877
	Lake Ontario Coast Chart No. 1 - from Stony Point to Kingston and to Nut Island, Canada (color)	1:80,000	1903
	Lake Ontario Coast Chart No. 1 - from Wolf Is. light, N.Y., and Burnt Is. light, Ont., to Stony Point, N.Y., and Pt. Pleasant, Ont.	1:80,000	1907
	Lake Ontario Coast Chart No. 1 - Round Island, near Clayton, to Stony Point, N.Y., and South Bay Point light, Ont.	1:80,000	1909
	Lake Ontario Coast Chart No. 1 - Grindstone Is., St. Lawrence River, to Stony Pt., N. Y., and to Prince Edward Pt. and Pt. Pleasant, Ont.	1:80,000	1927
	Lake Ontario Coast Chart No. 1 - Howe Island and Clayton to 6 miles south of Stony Point, N.Y., and to Prince Edward Point and Point Pleasant, Ont.	1:80,000	1937
	Lake Ontario Coast Chart No. 1 - Clayton, N.Y. and Kingston, Ont. to Stony Pt., N.Y., and False Duck Islands, Ont.	1:80,000	1939
22	Lake Ontario Coast Chart No. 2 - Stony Pt. to Little Sodus Bay	1:80,000	1878
	Lake Ontario Coast Chart No. 2 - from Fair Haven to Stony Point (color)	1:80,000	1903

Chart No.	Locality	Scale	Dates Pub.
22	Lake Ontario Coast Chart No. 2 - from Stony Point to Little Sodus Bay, N.Y.	1:80,000	1907
	Lake Ontario Coast Chart No. 2 - Stony Pt. to Little Sodus Bay, N.Y. Inset: Oswego Harbor, N.Y.	1:80,000 1:8,000	1909
	Lake Ontario Coast Chart No. 2 - 6 miles south of Stony Point to Port Bay (no inset)	1:80,000	1937
	Lake Ontario Coast Chart No. 2 - 6 miles south of Stony Point, N.Y. to 8 miles west of Little Sodus Bay, N.Y.	1:80,000	1939
	Lake Ontario Coast Chart No. 2 - 6 miles south of Stony Point, N.Y., to 8 miles west of Little Sodus Bay, N.Y. Inset: Little Sodus Bay, N.Y.	1:80,000 1:15,000	1944
	Lake Ontario Coast Chart No. 2 - 6 miles south of Stony Point, N.Y., to 8 miles west of Little Sodus Bay, N.Y. Insets: Little Sodus Bay, N. Y. North Pond, N. Y.	1:80,000 1:15,000 1:20,000	1963
23	Lake Ontario Coast Chart No. 3 - Big Sodus Bay to Genesee River	1:80,000	1878
	Lake Ontario Coast Chart No. 3 - from Charlotte to Black Creek, near Fair Haven, Little Sodus Bay	1:80,000	1900
	Lake Ontario Coast Chart No. 3 - Little Sodus Bay to Charlotte, N. Y.	1:80,000	1907
	Lake Ontario Coast Chart No. 3 - Port Bay Rochester Harbor	1:80,000	1937
	Lake Ontario Coast Chart No. 3 - 8 miles east of Sodus Bay, N.Y. to Rochester Harbor, N.Y.	1:80,000	1939
	Lake Ontario Coast Chart No. 3 - Port Bay to Long Pond, N.Y.	1:80,000	1963
24	Lake Ontario Coast Chart No. 4 - Charlotte to Thirty Mile Point, N.Y.	1:80,000	1878
	Lake Ontario Coast Chart No. 4 - Charlotte to Thirty Mile Point, N. Y. (color)	1:80,000	1907

Chart No.	Locality	Scale	Dates Pub.
24	Lake Ontario Coast Chart No. 4 - Braddock Point to Thirty Mile Point, N. Y.	1:80,000	1935
	Lake Ontario Coast Chart No. 4 - Long Pond to Thirty Mile Point, N. Y.	1:80,000	1963
	Inset: Oak Orchard Harbor, N. Y.	1:10,000	
25	Lake Ontario Coast Chart No. 5 - Thirty Mile Point to Port Dalhousie	1:80,000	1878
	Lake Ontario Coast Chart No. 5 - Thirty Mile Point, N.Y., to 5 miles west of Port Dalhousie, Ont.	1:80,000	1907
	Lake Ontario Coast Chart No. 5 - Thirty Mile Point, N.Y., to 5 miles west of Port Dalhousie, Ont., including lower Niagara River	1:80,000	1927
	Lake Ontario Coast Chart No. 5 - Thirty Mile Point, N.Y., to 5 miles west of Port Dalhousie, Ont., including lower Welland Canal	1:80,000	1935
	Lake Ontario Coast Chart No. 5 - Thirty Mile Point, N.Y., to Port Dalhousie, Ont., including lower Welland Canal	1:80,000	1944
	Inset: Olcott, N. Y.	1:10,000	
	Lake Ontario Coast Chart No. 5 - Thirty Mile Point, N.Y., to Port Dalhousie, Ont., including lower Welland Canal	1:80,000	1958
	Insets: Olcott, N. Y.	1:10,000	
	Wilson, N. Y.	1:10,000	
211	East End of Lake Ontario, including Chaumont, Henderson, Black River Bays and Sackets Harbor	1:30,000	1945
	Inset: Sackets Harbor	1:5,000	
	East End of Lake Ontario, including Chaumont, Henderson, and Black River Bays, N.Y.	1:30,000	1969
	Insets: Sackets Harbor	1:5,000	
	Henderson Harbor	1:10,000	
225	Oswego Harbor, N. Y. (color)	1:8,000	1903
	Chart No. 225 discontinued - now inset to No. 22		1913
	Chart No. 225 reinstated - Oswego, N. Y.	1:10,000	1937
	Oswego Harbor, N. Y.	1:10,000	1949

Chart No.	Locality	Scale	Dates Pub.
227	Little Sodus Bay, N. Y. (color)	1:8,000	1903
	Chart No. 227 discontinued		1944
234	Great Sodus Bay, N. Y. (color)	1:10,000	1903
241	Charlotte Harbor, N. Y. (color)	1:5,000	1903
	Rochester (Charlotte) Harbor, N. Y., including Genesee River to head of navigation	1:10,000	1927
	Rochester Harbor, N.Y., including Genesee River to head of navigation	1:10,000	1939
238	Chart No. 241 changed to No. 238		1941
256	Lower Niagara River from Niagara Falls to Lake Ontario	1:30,000	1909
	Chart of Niagara Falls - see Chart No. 311		

LAKE ERIE, NIAGARA RIVER, DETROIT RIVER, LAKE ST. CLAIR, AND ST. CLAIR RIVER

Chart No.	Locality	Scale	Dates Pub.
3	Lake Erie	1:400,000	1852
	Lake Erie (color)	1:400,000	1903
	Lake Erie - the whole lake, and waterways from Lake Ontario to Lake Huron	1:400,000	1909
	Early chart: West end Lake Erie Discontinued	1:120,000	1852 1900
	Early chart: Kelley's and Bass Islands Discontinued	1:50,000	1852 1900
31	Lake Erie Coast Chart No. 1 - Dunkirk to Niagara Falls and to Morgan's Point, Canada	1:80,000	1880

Chart No.	Locality	Scale	Dates Pub.
31	Lake Erie Coast Chart No. 1 - Niagara Falls to Dunkirk N.Y., and to Morgan's Point, Ont. (color)	1:80,000	1907
	Lake Erie Coast Chart No. 1 - Niagara Falls to Dunkirk, N.Y., and to Morgan's Pt., Ont. Inset: Dunkirk, N. Y.	1:80,000 1:12,000	1927
	Lake Erie Coast Chart No. 1 - Morgan's Pt., Ont. to Sturgeon Point, N.Y., including Niagara River and Welland Canal (no inset)	1:80,000	1935
	Lake Erie Coast Chart No. 1 - East End of Lake Erie, Morgan's Point, Ont. to Sturgeons Point, N.Y., including Niagara River and Welland Canal	1:80,000	1949
32	Lake Erie Coast Chart No. 2 - 5 miles east of Erie to Dunkirk, N. Y.	1:80,000	1879
	Lake Erie Coast Chart No. 2 - Dunkirk, N.Y. to Erie, Pa. (color)	1:80,000	1907
	Lake Erie Coast Chart No. 2 - Sturgeon Pt., N.Y. to 13 miles east of Erie, Pa. Inset: Dunkirk, N.Y.	1:80,000 1:15,000	1935
	Lake Erie Coast Chart No. 2 - Sturgeon Pt., N.Y. to 20 Mile Creek, Pa. Insets: Dunkirk Harbor, N.Y. Barcelona Harbor,	1:80,000 1:15,000 1:5,000	1963
33	Lake Erie Coast Chart No. 3 - Erie to Conneaut and Long Point	1:80,000	1879
	Lake Erie Coast Chart No. 3 - from Conneaut River to 5¼ miles east of Erie (color)	1:80,000	1903
	Lake Erie Coast Chart No. 3 - 13 miles east of Erie, Pa., to 7 miles west of Conneaut, Ohio Inset: Conneaut, Ohio	1:80,000 1:10,000	1935
34	Lake Erie Coast Chart Nol 4 - Conneaut to Fairport	1:80,000	1879
	Lake Erie Coast Chart No. 4 - Chagrin River to east boundary of Ohio (color)	1:80,000	1907

Chart No.	Locality	Scale	Dates Pub.
34	Lake Erie Coast Chart No. 4 - east boundary of Ohio to Chagrin River, Ohio	1:80,000	1913
	Inset: Conneaut, Ohio	1:8,000	
	Lake Erie Coast Chart No. 4 - Conneaut to Chagrin River, Ohio	1:80,000	1927
	Inset: Conneaut, Ohio	1:8,000	
	Lake Erie Coast Chart No. 4 - 8 miles east of Ashtabula to 12 miles west of Fairport, Ohio (no inset)	1:80,000	1935
	Lake Erie Coast Chart No. 4 - 8 miles east of Ashtabula, Ohio, to 15 miles west of Fairport, Ohio	1:80,000	1939
	Inset: Mentor Harbor, Ohio	1:10,000	
	Lake Erie Coast Chart No. 4 - Ashtabula, Ohio to Chagrin River, Ohio	1:80,000	1969
	Insets: Mentor Harbor, Ohio	1:10,000	
	Chagrin River, Ohio	1:10,000	
35	Lake Erie Coast Chart No. 5 - vicinity of Fairport to Vermilion	1:80,000	1880
	Lake Erie Coast Chart No. 5 - from Vermilion to Chagrin River (color)	1:80,000	1903
	Lake Erie Coast Chart No. 5 - Chagrin River to Vermilion, Ohio	1:80,000	1927
	Inset: Vermilion, Ohio	1:12,000	
	Lake Erie Coast Chart No. 5 - 12 miles east of Cleveland to Vermilion	1:80,000	1937
	Inset: Vermilion, Ohio	1:10,000	
	Lake Erie Coast Chart No. 5 - 12 miles east of Cleveland, Ohio to Vermilion, Ohio	1:80,000	1939
	Insets: Vermilion, Ohio	1:10,000	
	Rocky River, Ohio	1:10,000	
	Avon Basin, Ohio	1:5,000	
	Lake Erie Coast Chart No. 5 - 12 miles east of Cleveland, Ohio, to Vermilion, Ohio	1:80,000	1949
	Insets: Vermilion, Ohio	1:10,000	
	Rocky River, Ohio		
	Lake Erie Coast Chart No. 5 - Moss Point to Vermilion, Ohio	1:80,000	1960
	Insets: Vermilion, Ohio	1:10,000	
	Rocky River, Ohio	1:10,000	

Chart No.	Locality	Scale	Dates Pub.
35	Lake Erie Coast Chart No. 5 - Moss Point to Vermilion, Ohio	1:80,000	1967
	Insets: Vermilion, Ohio	1:10,000	
	Rocky River, Ohio	1:10,000	
	Beaver Creek, Ohio	1:5,000	
36	Lake Erie Coast Chart No. 6 - Vermilion to Port Clinton and Point Pelee to Vicinity of Detroit River	1:80,000	1879
	Lake Erie Coast Chart No. 6 - Vermilion, Ohio to Port Clinton, Ohio, and Point Pelee to Colchester, Ont., including the islands (color)	1:80,000	1907
	Chart No. 36 discontinued - replaced by No. 39		1969
37	Lake Erie Coast Chart No. 7 - Port Clinton to Toledo and Detroit River	1:80,000	1881
	Lake Erie Coast Chart No. 7 - Colchester, Canada to Port Clinton	1:80,000	1900
	Lake Erie Coast Chart No. 7 - West end of lake from Port Clinton, Ohio, to Colchester, Ont. (color)	1:80,000	1907
	Lake Erie Coast Chart No. 7 - West end of lake, west of Port Clinton, Ohio, and Colchester, Ont.	1:80,000	1937
	Inset: Port Clinton, Ohio	1:10,000	
	Lake Erie Coast Chart No. 7 - Port Clinton, Ohio, and Colchester, Ont., to mouth of Detroit River	1:80,000	1953
	Inset: Port Clinton, Ohio	1:10,000	
	Chart No. 37 discontinued - replaced by No. 39		1969
39	Lake Erie Coast Chart - West end of Lake Erie, from Pelee Point, Ont., and Sandusky, Ohio to mouth of Detroit River	1:100,000	1953
	Lake Erie Coast Chart - West end of Lake Erie, including the Islands	1:100,000	1963
	Lake Erie Coast Chart - Point Pelee, Ont., to West end of Lake Erie, including the islands	1:100,000	1969
	Insets: Port Clinton Harbor, Ohio	1:15,000	
	Monroe Harbor, Mich.	1:20,000	

Chart No.	Locality	Scale	Dates Pub.
311	Niagara Falls	1:10,000	1876
	Niagara Falls (black and white)	1:20,000	1900
	Chart No. 311 discontinued		1913
312	Buffalo Harbor	1:30,000	1857
	Buffalo Harbor and Niagara River to the Falls (color)	1:30,000	1903
	Name changed: Upper Niagara River - Niagara Falls to Buffalo Harbor, N. Y.	1:30,000	1927
314	Buffalo Harbor, N.Y. - including Black Rock Canal	1:15,000	1927
318	Dunkirk Harbor, N. Y. (color)	1:8,000	1903
	Chart No. 318 discontinued - now inset to No. 31		1927
332	Erie Harbor and Presqu'Ile, Pa.	1:8,000	1900
	Erie Harbor and Presqu'Ile, Pa. (color)	1:15,000	1903
	Erie Harbor and Presque Isle, Pa.	1:15,000	1907
335	Conneaut Harbor, Ohio (color)	1:5,000	1903
	Chart No. 335 discontinued - now inset to No. 34		1913
342	Ashtabula Harbor, Ohio (color)	1:5,000	1903
346	Fairport Harbor, Ohio (color)	1:8,000	1903
354	Cleveland Harbor, Ohio, and Cuyahoga River, Ohio (color)	1:12,000	1903
	Cleveland Harbor, Ohio - including Cuyahoga River	1:15,000	1917
	Cleveland Harbor, Ohio - including Cuyahoga River	1:10,000	1949
357	Lorain Harbor, Ohio	1:8,000	1903
	Lorain Harbor, Ohio (color)	1:8,000	1907
	Lorain Harbor, Ohio	1:10,000	1944

Chart No.	Locality	Scale	Dates Pub.
360	Lake Erie Recreational Craft Chart - South Shore of Lake Erie - shows the shore line and adjacent waters from Cedar Point, near Sandusky, Ohio, to and including Port Clinton, Ohio; the United States islands in the vicinity; and Sandusky Bay and River to Fremont, Ohio. Scales vary, with large scale insets of harbors, such as Put-in-Bay on South Bass Island. Contains 35 charts - 11" x 17½"	various	1967
363	Huron Harbor, Ohio (color)	1:5,000	1907
364	Islands in Lake Erie - including Sandusky Bay, Ohio	1:40,000	1913
	Islands in Lake Erie- including Sandusky Bay, Ohio	1:40,000	1953
	Inset: Put-in-Bay, Ohio	1:10,000	
365	Sandusky Bay, Ohio	1:20,000	1874
	Sandusky Bay, Ohio (color)	1:20,000	1903
	Chart No. 365 discontinued - included on No. 364		1913
	Chart No. 365 reinstated Sandusky Harbor, Ohio	1:10,000	1927
370	Lake Erie Recreational Craft Chart - West End of Lake Erie - a loose leaf style volume of large scale charts showing the coast of Lake Erie from Toledo Harbor, Ohio, to the mouth of the Detroit River and including the Maumee River from Perrysburg to Maumee Bay.	various	1963
	Lake Erie Recreational Craft Chart - West End of Lake Erie - shows the shore line and adjacent waters from Port Clinton, Ohio to Toledo, Ohio, and thence to mouth of Detroit River, including Portage River to Oak Harbor, Ohio, and the Maumee River to Perrysburg, Ohio. Scale 1:15,000, with insets on larger scales. Contains 34 charts - 11" x 17½"	15:000	1967
374	Maumee Bay	1:30,000	1858
	Maumee Bay and Maumee River, including city of Toledo, Ohio (color)	1:30,000	1903
	Maumee Bay and Maumee River, including city of Toledo, Ohio	1:25,000	1907

Chart No.	Locality	Scale	Dates Pub.
374	Maumee Bay and Maumee River, including city of Toledo, Ohio	1:30,000	1927
	Name changed: Toledo Harbor, Ohio - Maumee Bay and lower Maumee River	1:30,000	1935
	Toledo Harbor, Ohio - Maumee Bay and lower Maumee River Inset: Entrance Channel to harbor	1:20,000 1:40,000	1937
	Toledo Harbor, Ohio - Lower Maumee River, Maumee Bay, and Ottawa River Inset: Entrance Channel to harbor	1:20,000 1:40,000	1969
376	Monroe Harbor, Mich.	1:20,000	1937
	Chart No. 376 discontinued - replaced by No. 39		1969
41	Detroit River - from Windmill Point Light House to Detroit River Light House	1:40,000	1876
	Detroit River - Windmill Point Light House to Detroit River Light House (color)	1:40,000	1903
	Detroit River - Detroit River lighthouse to Windmill Point lighthouse Inset: Lower Detroit River - Ballards Reef to below Detroit River	1:40,000 1:25,000	1909
	Detroit River - Detroit River light to Windmill Point light (no inset)	1:40,000	1913
	Detroit River - Detroit River Light to Windmill Point Light Inset: Lower Detroit River - Ballards Reef to below Detroit River Light	1:40,000 1:25,000	1927
	Detroit River - Detroit River Light to Windmill Point Light Insets: Lower Detroit River Trenton Channel	1:40,000 1:25,000 1:20,000	1935
	Detroit River - 3 miles south of Detroit River Light to Windmill Point, Mich. (no insets)	1:30,000	1937
41SC	Detroit River - Small Craft Chart - folded to 6' x 12½'	1:40,000	1970

Chart No.	Locality	Scale	Dates Pub.
400	Detroit River Recreational Craft Chart - Detroit River, Lake St. Clair, and St. Clair River - a loose leaf style volume of large scale charts showing the Detroit River, St. Clair, and the St. Clair River. The chart covers the waterway from Lake Erie to Lake Huron.	various	1962
	Detroit River Recreational Craft Chart - Detroit River, Lake St. Clair, and St. Clair River - shows the connecting waterway from Lake Erie to Lake Huron and includes the Trenton Channel, Rouge River, and Clinton River to Mt. Clemens, Mich. Contains 47 charts - 11" x 17½"	15:000	1967
412	Trenton Channel and approaches thereto Inset: Rouge River - Detroit River to Ford Motor Company	1:15,000 1:10,000	1960
416	Head of Detroit River - Third Street to and including Grosse Point Channel and adjacent shores, Lake St. Clair	1:30,000	1960
	Head of Detroit River - Third Street to Gaukler Point, Lake St. Clair	1:30,000	1935
	Chart No. 416 discontinued		1967
415	Rouge River, Mich. - Detroit River to Ford Motor Company Plant	1:10,000	1927
	Chart No. 415 discontinued - now inset to No. 412		1963
411	Lower Detroit River - Ballards Reef to below Detroit River light	1:25,000	1913
	Chart No. 411 discontinued - now inset on No. 41		1927
	Early chart: Mouth of Detroit River Discontinued	 1:20,000	 1874 1900
42	Lake Saint Clair - from Woodtick Island, St. Clair River, to Windmill Point Light House	1:50,000	1874
	Lake Saint Clair - from Woodtick Island, St. Clair River, to Windmill Pt. Lighthouse (color)	1:50,000	1903

Chart No.	Locality	Scale	Dates Pub.
42	Lake St. Clair - Windmill Pt., Mich., to Woodtick Island, St. Clair River	1:60,000	1937
	Lake St. Clair - the entire lake including St. Clair River to Woodtick Island	1:60,000	1949
	Lake St. Clair - the entire lake including St. Clair River to Woodtick Island	1:60,000	1960
	Inset: Mouth of Clinton River	1:30,000	
	Lake St. Clair - the entire lake including St. Clair River to Fawn Island	1:60,000	1967
42 SC	Lake St. Clair - Small Craft Chart - folded to 6" x 12¼"	1:80,000	1969
43	St. Clair River - from Fort Gratiot Light to Baby's Point	1:40,000	1872
	St. Clair River - including St. Clair Flats and foot of Lake Huron (color)	1:40,000	1907
	Insets: Vicinity of Marine City	1:16,000	
	Shoals in vicinity of St. Clair	1:16,000	
	Russell Island Shoal including Algonac and Grand Point, Mich.	1:16,000	
	St. Clair River - including St. Clair Flats and foot of Lake Huron	1:40,000	1917
	Insets: Vicinity of Marine City	1:16,000	
	Vicinity of St. Clair	1:16,000	
	Russell Island and Algonac	1:16,000	
	St. Clair River - including St. Clair Flats and foot of Lake Huron	1:40,000	1935
	Inset: Head of St. Clair River	1:16,000	
	St. Clair River - including St. Clair Flats and foot of Lake Huron	1:40,000	1939
	Inset: Head of St. Clair River	1:15,000	
	Early chart:		
	Saint Clair Flats	1:32,000	1857
	Discontinued		1900

LAKE HURON, STRAITS OF MACKINAC, AND ST. MARYS RIVER

Chart No.	Locality	Scale	Dates Pub.
5	Lake Huron	1:400,000	1860
	Lake Huron and Georgian Bay (color)	1:400,000	1907
	Lake Huron - the whole lake, Georgian Bay, and North Channel	1:500,000	1937
51	Lake Huron Coast Chart No. 1 - Head of St. Clair River to Harbor Beach, Mich., and Port Albert, Ont. Inset: Harbor Beach, Mich	1:120,000 1:8,000	1913
	Inset removed to No. 52		1927
	Lake Huron Coast Chart No. 1 - Head of St. Clair River to Pt. aux Barques and to Port Albert, Ont. Inset: Harbor Beach	1:120,000 1:10,000	1937
	Lake Huron Coast Chart No. 1 - Head of St. Clair River to Pt. aux Barques and to Port Albert, Ont. Insets: Harbor Beach Port Sanilac, Mich.	1:120,000 1:10,000 1:5,000	1953
52	Saginaw Bay, Mich. - from Sable Point to Richmondville	1:120,000	1860
	Lake Huron Coast Chart No. 2 - Saginaw Bay from Richmondville, Mich., to Au Sable Point (color)	1:120,000	1907
	Lake Huron Coast Chart No. 2 - Richmondville to Au Sable Point, Mich. including Saginaw Bay Inset: Harbor Beach. Mich.	1:120,000 1:8,000	1927
	Lake Huron Coast Chart No. 2 - Pt. Aux Barques, Mich., to 11 miles north of Oscoda, Mich., including Saginaw Bay Inset: Tawas Harbor	1:120,000 1:30,000	1937

Chart No.	Locality	Scale	Dates Pub.
52	Lake Huron Coast Chart No. 2 - Pt. Aux Barques, Mich., to 11 miles north of Oscoda, Mich., including Saginaw Bay	1:120,000	1941
	Insets: Tawas Harbor	1:30,000	
	Entrance to Au Sable River, Mich.	1:10,000	
	Lake Huron Coast Chart No. 2 - Pte. Aux Barques, Mich., to 11 miles north of Oscoda, Michl, including Saginaw Bay	1:120,000	1963
	Insets: Tawas Harbor, Mich.	1:30,000	
	Entrance to Au Sable River, Mich.	1:10,000	
	Port Austin, Mich.	1:10,000	
	Lake Huron Coast Chart No. 2 - Pte. Aux Barques, Mich., to 11 miles north of Oscoda, Mich., including Saginaw Bay	1:120,000	1967
	Insets: Tawas Harbor, Mich.	1:30,000	
	Entrance to Au Sable River, Mich.	1:10,000	
	Port Austin, Mich.	1:10,000	
	Caseville, Mich.	1:10,000	
	Sebewaing, Mich.	1:20,000	
53	South End Lake Huron - from near Cape Ipperwash, Canada to Forestville, Mich.	1:120,000	1861
	South End Lake Huron - from near Cape Ipperwash, Ont., to Forestville, Mich.	1:120,000	1907
	Inset: Head of St. Clair River	1:16,000	
	Lake Huron Coast Chart No. 3 - South End - Harbor Beach, Mich., and Port Albert, Ont., to head of St. Clair River (color)	1:120,000	1909
	Inset: Goderich Harbor, Ont.	1:10,000	
	Lake Huron Coast Chart No. 3 - Tawas Harbor to Rogers, Mich.	1:120,000	1913
	Insets: Tawas Harbor, Mich.	1:24,000	
	Alpena, Mich.	1:15,000	
	Rogers and Calcite, Mich.	1:8,000	
	Lake Huron Coast Chart No. 3 - 13 miles south of Sturgeon Point to Forty Mile Point and north to Great Duck Island	1:120,000	1937
	Insets: Alpena, Mich.	1:15,000	
	Rogers and Calcite, Mich.	1:20,000	

Chart No.	Locality	Scale	Dates Pub.
53	Lake Huron Coast Chart No. 3 - 6 miles north of Oscoda, Mich., to Forty Mile Point Light, Mich., including Great Duck Island, Ont.	1:120,000	1963
	Insets: Alpena, Mich.	1:15,000	
	Rogers City and Calcite, Mich.	1:20,000	
	Harrisville Harbor, Mich.	1:8,000	
54	Lake Huron Coast Chart No. 4 - North coast of Lake Huron from Scammon Cove to Lougheed Point, Ont., and North Channel from Sulpher Island to Little Detroit, Ont.	1:120,000	1913
	Insets: Serpent Harbor, Ont.	1:30,000	
	Little Detroit, Ont.	1:8,000	
	Chart No. 54 discontinued		1913
55	Lake Huron Coast Chart No. 5 - Southern portion of Georgian Bay from Parry Island, Ont., to Cape Hurd, and east coast of Lake Huron thence to Port Elgin, Ont. (color)	1:120,000	1907
	Insets: Penetanguishene Harbor	1:40,000	
	Southampton Harbor, Ont.	1:24,000	
	Owen Sound, Ont.	1:16,000	
	Lions Head, Ont.	1:10,000	
	Midland, Ont.	1:10,000	
	Chart No. 55 discontinued		1913
56	Lake Huron Coast Chart No. 6 - Northeast coast of Georgian Bay, from Killarney Harbor to Parry Island, Ont. (color)	1:120,000	1907
	Insets: French River, Ont.	1:24,000	
	Depot Harbor, Ont.	1:24,000	
	Alexander and Charles Inlets	1:24,000	
	Point au Basil Harbor, Ont.	1:24,000	
	Bying Inlet and approaches	1:60,000	
	Chart No. 56 discontinued		1913
57	Lake Huron Coast Chart No. 7 - Northeast coast of Lake Huron from Cape Hurd to Lougheed Point including entrance to Georgian Bay and eastern end of North Channel	1:120,000	1903

Chart No.	Locality	Scale	Dates Pub.
57	Lake Huron Coast Chart No. 7 - Northeast coast of Lake Huron, from Lougheed Point, Ont., to Cape Hurd, including eastern end of North Channel and entrance to Georgian Bay	1:120,000	1907
	Insets: Rattlesnake Harbor	1:24,000	
	Tobermory Harbor	1:24,000	
	Club Harbor	1:24,000	
	South Baymouth Harbor	1:24,000	
	Killarney Harbor	1:24,000	
	Little Current, Ont.	1:24,000	
	Chart No. 57 discontinued		1909
58	Lake Huron Coast Chart No. 8 - North coast of Lake Huron from Lougheed Point to Scammon Cove and North Channel from Darch Island to Sulpher Island	1:120,000	1903
	Lake Huron Coast Chart No. 8 - North Coast of Lake Huron from Big Shoal Cove, Ont., to Lougheed Point; and North Channel from Sulpher Island to Darch Island, Ont.	1:120,000	1907
	Insets: Serpent Harbor, Ont.	1:30,000	
	Little Detroit, Ont.	1:8,000	
	Chart No. 58 discontinued		1913
511	South End of Lake Huron - 1 mile north of Lakeport, Mich., to and including Head of St. Clair River	1:15,000	1953
513	Presqu'Ile and Middle Island	1:40,000	1860
	Presque Isle, False Presque Isle, and Middle Island, Mich. (color)	1:40,000	1907
	No. 513 changed to No. 537		
537	Presque Isle, False Presque Isle, and Middle Island, Mich. - Morris Bay to North Bay, Mich.	1:40,000	1913
	Presque Isle and Rockport Harbors - Thunder Bay Island to Presque Isle, Mich.	1:60,000	1935
	Insets: Rockport, Mich.	1:10,000	
	Presque Isle Harbor, Mich.	1:15,000	
	Thunder Bay Island to Presque Isle, Mich.	1:60,000	1960
	Insets: Rockport, Mich.	1:10,000	
	Presque Isle Harbor, Mich.	1:15,000	
	Stoneport Harbor, Mich.	1:10,000	

Chart No.	Locality	Scale	Dates Pub.
537	Thunder Bay Island to Presque Isle, Mich. Insets: Stoneport Harbor, Mich. Presque Isle Harbor, Mich.	1:60,000 1:10,000 1:15,000	1969
515	Thunder Bay	1:40,000	1860
	Thunder Bay (color)	1:40,000	1907
535	No. 515 changed to No. 535 - Thunder Bay	1:40,000	1913
	Thunder Bay - Black River to Morris Bay, Mich.	1:40,000	1927
	Chart No. 535 discontinued		1935
522	Tawas Harbor	1:16,000	1857
	Tawas Harbor (color)	1:16,000	1907
	Chart No. 522 discontinued		1917
524	Saginaw River, Mich. - from Mouth to West Bay City	1:10,000	1857
	Saginaw River, Mich. - Mouth to Bay City	1:15,000	1909
	Saginaw River, Mich. - entire river and approach in Saginaw Bay	1:30,000	1927
	Saginaw River, Mich. - entire river and entrance channel in Saginaw Bay	1:20,000	1937
528	Sand Beach Harbor of Refuge, Mich.	1:8,000	1876
	Sand Beach Harbor of Refuge, Mich. (color)	1:8,000	1907
	Chart No. 528 discontinued		1913
6	Straits of Mackinac - from Hay Point and Detour Passage to Hat Island, Lake Michigan	1:120,000	1856
	Straits of Mackinac - Detour Passage, Lake Huron, to Hat Island, Lake Michigan (color)	1:120,000	1903
	Straits of Mackinac - False Detour Channel and Presque Isle, Lake Huron, to Point Epoufette and Charlevoix, Lake Michigan Inset: Rogers and Calcite, Mich.	1:120,000 1:18,000	1913

Chart No.	Locality	Scale	Dates Pub.
6	Straits of Mackinac - False Detour and Presque Isle, Lake Huron, to Point Epoufette and Charlevoix, Lake Michigan (no inset)	1:120,000	1927
	Straits of Mackinac - False Detour and Presque Isle, Lake Huron, to Point Epoufette and Charlevoix, Lake Michigan	1:120,000	1935
	Inset: Round Island Passage	1:10,000	
	Straits of Mackinac - False Detour Channel and Presque Isle, Mich., to Point Epoufette, Michigan, and Little Traverse Bay, Michigan (no inset)	1:120,000	1949
60	Les Cheneaux Islands - including Mackinac and Round Islands (color)	1:40,000	1907
	Les Cheneaux Islands - Beaver Tail Point, to Big St. Martin, Mackinac, and Round Islands	1:40,000	1927
	Les Cheneaux Islands - Beaver Tail and St. Martin Reefs to St. Martin, Mackinac, and Round Islands	1:40,000	1935
	Les Cheneaux Islands - Martin Reef to St. Ignace, including Les Cheneaux Islands and Round Island Passage	1:40,000	1939
	Coast Chart - De Tour Passage to Waugoshance Point, Mich.	1:80,000	1944
	Insets: Cheboygan, Mich.	1:15,000	
	Mackinac Island, Mich.	1:10,000	
	Mackinaw City, Mich.	1:15,000	
	St. Ignace, Mich.	1:15,000	
	Coast Chart - De Tour Passage to Waugoshance Point, Mich.	1:80,000	1967
	Insets: Cheboygan, Mich.	1:15,000	
	Mackinac Island, Mich.	1:10,000	
	Mackinaw City, Mich.	1:15,000	
	Hammond Bay Harbor, Mich.	1:10,000	
	Early chart: River Ste. Marie No. 1- Point Iroquois to Middle Neebish	1:40,000	1858
	Discontinued		1903

Chart No.	Locality	Scale	Dates Pub.
	Early chart: River Ste. Marie No. 2 - Middle Neebish to Hay Point	1:40,000	1858
	Discontinued		1903
	Early chart: St. Marys River (one sheet) (color)	1:80,000	1903
	Discontinued		1907
	Early chart: East Neebish Rapids	1:15,000	1854
	Discontinued		1903
61	St. Marys River No. 1 - Lake Huron to Twin Islands (color)	1:40,000	1903
	St. Marys River - Lake Huron to Lake Munuscong, including Potagannissing Bay	1:40,000	1939
	St. Marys River - overprinted with a radar-scope image visible under black light		1955
	St. Marys River - Lake Huron to Lake Munuscong, including Potagannissing Bay (radarscope image not mentioned)	1:40,000	1963
62	St. Marys River No. 2 - Twin Island to Sault Ste. Marie (color)	1:40,000	1898
	St. Marys River - Lake Munuscong to Sault Ste. Marie, including Lake George	1:40,000	1939
	St. Marys River - overprinted with a radar-scope image visible under black light		1955
	St. Marys River - Lake Munuscong to Sault Ste. Marie, including Lake George (radarscope image not mentioned)	1:40,000	1963
63	St. Marys River No. 3 - from Head of Hay Lake to White Fish Bay (color)	1:40,000	1896
	St. Marys River - Head of Hay Lake to Whitefish Bay	1:40,000	1927
	Inset: Sault Ste. Marie	1:20,000	
	St. Marys River - overprinted with a radar-scope image visible under black light		1955

Chart No.	Locality	Scale	Dates Pub.
63	St. Marys River - Head of Lake Nicolet to Whitefish Bay	1:40,000	1963
	Inset: Sault Ste. Marie (radarscope image not mentioned)	1:20,000	
64	St. Joseph Channel and Western End of North Channel - from Shoal Island light to Sulpher Island light, Ont.	1:40,000	1907
	Inset: Wilson Channel, Ont.	1:12,000	
	Chart No. 64 discontinued		1913
65	East Entrance of South Channel - including Cheboygan Harbor, Mich.	1:15,000	1935
	East Entrance of South Channel, Straits of Mackinac, including Cheboygan Harbor, Mich.	1:15,000	1939
	Chart No. 65 discontinued		1945
66	Inland Route, Mich.	1:40,000	1917
	Inset: Cheboygan, Mich.	1:15,000	
	Inland Route, Mich. - Cheboygan, Mich. to Little Traverse Bay, including Petoskey and Harbor Springs	1:40,000	1927
	Inset: Cheboygan Harbor, Mich.	1:15,000	
	Inland Route, Mich. - Cheboygan, Mich. to Little Traverse Bay	1:40,000	1945
	Inset: Cheboygan Harbor, Mich.	1:15,000	
	Chart No. 66 replaced by No. 660		1960
67	Cheboygan Harbor and Approaches	1:12,000	1909
	Chart No. 67 discontinued - now inset to No. 66		
601	Les Cheneaux Islands, Mich.	1:20,000	1939
660	Inland Route, Mich. - Recreational Craft Chart - a loose leaf style volume of 12 sheets which extends from Cheboygan on Lake Huron to Conway at the west end of Crooked Lake	1:15,000	1960

Chart No.	Locality	Scale	Dates Pub.
660	Inland Route, Mich. - Recreational Craft Chart - not classed solely as a recreational craft chart because it is the only chart coverage of the area. However, it is of the same size and format. It contains charts of the waterways from Cheboygan to Conway, Mich., including Mullett, Burt, Pickerel, and Crooked Lakes, and Crooked, Indian, Black, and Cheboygan Rivers. Contains 12 charts - 11" x 17½"	1:15,000	1967

LAKE MICHIGAN

Chart No.	Locality	Scale	Dates Pub.
7	Lake Michigan - whole lake	1:500,000	1900
	Lake Michigan - whole lake (color)	1:500,000	1903
	Lake Michigan - the whole lake, including Green Bay	1:500,000	1909
7A	Lake Michigan - Submarine Training area	1:500,000	1944
	Chart No. 7A discontinued		1949
7M	Lake Michigan - general chart on mercator projection (in addition to Chart No. 7)	1:500,000	1944
70	North End Lake Michigan - including Green Bay - from near Kewaunee, Wis. to Cheboygan, Mich.	1:400,000	1867
	North End Lake Michigan, including Green Bay - from near Kewaunee, Wis., to Portage Lake Harbor, Mich., to Cheboygan, Mich.	1:400,000	1907
	North End Lake Michigan, including Green Bay - Cheboygan, Michl, to near Kewaunee, Wis., and to Portage Lake Harbor, Mich. (color)	1:240,000	1909
	North End of Lake Michigan, including Green Bay - north of Arcadia, Mich., and Kewaunee, Wis.	1:240,000	1945
	North End of Lake Mich., including Green Bay	1:240,000	1960

Chart No.	Locality	Scale	Dates Pub.
	Early chart:		
	South End Lake Michigan - Portage Lake, Mich., and Two Creeks near Kewaunee, Wis.	1:400,000	1876
	Color		1907
	Discontinued		1909
	Early chart:		
	Grand and Little Traverse Bays - from Point aux Becs Scies to Middle Village (Point Betsie to Middle Village, Mich.)	1:120,000	1863
			1903
	Color		1903
	Discontinued		1913
	Early chart:		
	North End Green Bay - Manistique, Mich., to Porte des Morts	1:120,000	1864
	Color		1907
	Discontinued		1913
	Early chart:		
	South End Green Bay - St. Martin Island to Green Bay, Wis.	1:120,000	1864
	Color		1907
	Discontinued		1913
	Early chart:		
	Lake Michigan Coast Chart No. 1 - from Portage to below Manitowoc	1:80,000	1877
	Color		1907
	Discontinued		1917
	Early chart:		
	Lake Michigan Coast Chart No. 2 - from Calvin Creek near Manitowoc to Ulao, Wis.	1:80,000	1877
	Color		1907
	Discontinued		1917
	Early chart:		
	Lake Michigan Coast Chart No. 3 - Ulao to Kenosha, Wis.	1:80,000	1876
	Color		1909
	Discontinued		1917
	Early chart:		
	Lake Michigan Coast Chart No. 4 - Kenosha to Chicago	1:80,000	1877
	Color		1907
	Discontinued		1917

Chart No.	Locality	Scale	Dates Pub.
	Early chart:		
	Lake Michigan Coast Chart No. 5 - Chicago to New Buffalo, Mich.	1:80,000	1876
	Color		1907
	Discontinued		1913
	Early chart:		
	Lake Michigan Coast Chart No. 6 - New Buffalo to South Haven, Mich.	1:80,000	1876
	Color		1907
	Discontinued		1913
	Early chart:		
	Lake Michigan Coast Chart No. 7 - Lake Harbor to near South Haven, Mich.	1:80,000	1877
	Color		1907
	Discontinued		1913
	Early chart:		
	Lake Michigan Coast Chart No. 8 - Lake Harbor to Ludington, Mich.	1:80,000	1878
	Color		1907
	Discontinued		1913
	Early chart:		
	Lake Michigan Coast Chart No. 9 - Ludington to Point aux Becs Scies, Mich. (Point Betsie, Mich.)	1:80,000	1878
	Color		1907
	Discontinued		1913
71	Lake Michigan Coast Chart No. 1 - Seul Choix Point, Mich., to Porte des Morts, Wis., and North End of Green Bay	1:120,000	1913
	Insets: Nahma, Mich.	1:15,000	
	Cedar River, Mich.	1:16,000	
	Inset of Cedar River discontinued		1935
	Lake Michigan Coast Chart No. 1 - Seul Choix Point, Mich., to Porte des Morts, Wis., and North End of Green Bay	1:120,000	1937
	Inset: Manistique, Mich.	1:15,000	
72	Lake Michigan Coast Chart No. 2 - Porte des Morts to Kewaunee, Wis., and South end of Green Bay	1:120,000	1913

Chart No.	Locality	Scale	Dates Pub.
72	Lake Michigan Coast Chart No. 2 - Porte des Morts to Kewaunee, Wis., and South end of Green Bay	1:120,000	1927
	Insets: Oconto, Mich.	1:20,000	
	Strawberry Channel, Wis.	1:60,000	
	Algoma, Wis.	1:12,000	
	Inset of Algoma, Wis. changed to:	1:15,000	1937
	Chart No. 72 discontinued		1939
73	Lake Michigan Coast Chart No. 3 - Kewaunee and Port Washington, Wis., including Fox River and Lake Winnebago	1:120,000	1917
	Insets: Kewaunee, Wis.	1:12,000	
	Two Rivers, Wis.	1:12,000	
	Lake Michigan Coast Chart No. 3 - Algoma to 10 miles north of Port Washington, Wis.	1:120,000	1937
	Insets: Kewaunee, Wis.	1:10,000	
	Two Rivers, Wis.	1:10,000	
	Lake Michigan Coast Chart No. 3 - Algoma to 18 miles south of Sheboygan, Wis.	1:120,000	1939
	Insets: Kewaunee, Wis.	1:10,000	
	Two Rivers, Wis.	1:10,000	
74	Lake Michigan Coast Chart No. 4 - Port Washington, Wis., to Waukegan, Ill.	1:120,000	1913
	Insets: Port Washington, Wis.	1:10,000	
	Waukegan, Ill.	1:10,000	
	Add inset: Kenosha, Wis.	1:10,000	1937
	Add inset: Oak Creek Harbor, Wis.	1:5,000	1967
75	Lake Michigan Coast Chart No. 5 - Waukegan, Ill. to South Haven, Mich.	1:120,000	1913
	Inset: Michigan City, Ind.	1:10,000	
	Lake Michigan Coast Chart No. 5 - South end of Lake Michigan from Waukegan, Ill., to South Haven, Mich.	1:120,000	1969
	Insets: Michigan City, Ind.	1:10,000	
	New Buffalo Harbor, Mich.	1:10,000	
76	Lake Michigan Coast Chart No. 6 - South Haven to Benona, Mich.	1:120,000	1913
	Insets: South Haven, Mich.	1:12,000	
	Saugatuck, Mich.	1:15,000	

Chart No.	Locality	Scale	Dates Pub.
76	Inset of South Haven, Mich. changed to:	1:10,000	1935
	Lake Michigan Coast Chart No. 6 - South Haven to Benona, Mich.	1:120,000	1967
	Insets: South Haven, Mich.	1:10,000	
	Saugatuck, Mich.	1:15,000	
	Port Sheldon, Mich.	1:10,000	
77	Lake Michigan Coast Chart No. 7 - Benona, Mich. to Point Betsie, Mich.	1:120,000	1913
	Insets: Ludington, Mich.	1:12,000	
	Arcadia, Mich.	1:10,000	
	Frankfort, Mich.	1:10,000	
	Lake Michigan Coast Chart No. 7 - Benona, Mich. to Point Betsie Mich.	1:120,000	1927
	Insets: Arcadia, Mich.	1:10,000	
	Frankfort, Mich.	1:10,000	
	Pentwater, Mich.	1:12,000	
	Inset of Arcadia, Mich. discontinued		1935
	Inset of Pentwater, Mich. changed to:	1:10,000	1937
	Add inset: Arcadia, Mich.	1:10,000	1967
78	Lake Michigan Coast Chart No. 8 - Frankfort to Charlevoix, Mich., including Grand Traverse Bay and Manitou and Fox Islands	1:120,000	1913
	Lake Michigan Coast Chart No. 8 - Point Betsie, Mich., to Charlevoix, Mich., including Grand Traverse Bay and Manitou and Fox Islands	1:120,000	1939
	Insets: Traverse Ctiy, Harbor Springs, and Petoskey, Mich.	1:10,000	
	Leland, Mich.	1:2,500	
	Chart No. 78 discontinued		1944
79	Beaver Island Group - from Manistique to St. Helena Shoal and Middle Village	1:120,000	1882
	Beaver Island Group - from St. Helena to Manistique and Middle Village, Mich.	1:120,000	1907
	Inset: Beaver Harbor, Mich.	1:15,000	

Chart No.	Locality	Scale	Dates Pub.
79	Beaver Island Group - Waugoshance Point to Seul Choix Point and Boulder Reef, Mich.	1:80,000	1913
	Beaver Island Group - Waugoshance Point to Boulder Reef, and North Shore from Brevoort to Seul Choix Point, Mich.	1:80,000	1927
	Chart No. 79 discontinued		
701	Lake Michigan Coast Chart - Farnsworth Point, Michl to 15 miles southwest of Escanaba, Mich., including Big Bay de Noc and Little Bay de Noc	1:80,000	1939
	Inset: Manistique, Mich.	1:15,000	
702	Lake Michigan Coast Chart - Green Bay from Point Detour to Baileys Harbor and Menominee, Mich., including Entrance to Green Bay	1:80,000	1939
	Add insets: Detroit Harbor, Wis.	1:20,000	1949
	Jackson Harbor, Wis.	1:20,000	
703	Lake Michigan Coast Chart - Green Bay south of Peshtigo Point and Horseshoe Point, Wis., including Sturgeon Bay Canal and coast from Jacksonport to Kewaunee, Wis.	1:80,000	1939
	Insets: Oconto, Wis.	1:20,000	
	Algoma, Wis.	1:10,000	
704	Lake Michigan Coast Chart - Beaver Island Group, Waugoshance Point, Mich., to Bowlder Reef and north shore from Brevort, Mich., to Seul Choix Point, Mich.	1:80,000	1939
	Inset: Port Inland, Mich.	1:10,000	
	Add inset: St. James, Beaver Island, Mich.	1:10,000	1944
	Change to: St. James. Beaver Island, Mich.	1:15,000	1945
705	Lake Michigan Coast Chart - Platte Bay, Mich., to Lake Leelanau, Mich., including the Manitou and Fox Islands	1:80,000	1944
	Inset: Leland, Mich.	1:2,500	
	Add inset: South Manitou Harbor, Mich.	1:30,000	1958

Chart No.	Locality	Scale	Dates Pub.
706	Lake Michigan Coast Chart - Grand Traverse Bay and Little Traverse Bay, Mich.	1:80,000	1944
	Insets: Petoskey, Mich.	1:10,000	
	Harbor Springs, Mich.	1:10,000	
	Traverse City, Mich.	1:15,000	
711	Manistique Harbor, Mich. (color)	1:5,000	1907
	Manistique Harbor, Mich.	1:10,000	1927
	Chart No. 711 discontinued		1937
715	Entrance to Green Bay - Poverty Island to Porte des Morts, Wis.	1:40,000	1909
	Entrance to Green Bay - Summer Island, Mich. to Porte des Morts, Wis.	1:40,000	1927
	Chart No. 715 discontinued		1939
718	Little Bay de Noc, Mich. - Peninsula Point to Bark River, Mich. (color)	1:40,000	1907
	Insets: Escanaba Harbor	1:20,000	
	Gladstone Harbor	1:20,000	
	Add inset: Ford River, Mich.	1:20,000	1927
	Inset of Ford River, Mich. discontinued		1935
	Little Bay de Noc, Mich. - including Escanaba and Gladstone (no insets)	1:30,000	1937
720	Lake Winnebago and Lower Fox River, Wis. - Recreational Craft Chart - not classed solely as a Recreational Craft Chart because it is the only chart coverage of the area. However, it is the same size and format. It contains charts of the Lower Fox River from Green Bay to Neenah and Menasha, Wis., and Lake Winnebago, with detailed charts of Fond du Lac, Oshkosh, Neenah, Menasha, and Calumet Harbors. Contains 33 charts - 11" x 17½" (replaces Chart No. 726)	various	1967
723	Menominee Harbor, Mi. and Marinette, Wis.	1:15,000	1907
725	Head of Green Bay, Wis.	1:30,000	1853
	Head of Green Bay and Fox River below Depere, Wis. (color)	1:25,000	1907

Chart No.	Locality	Scale	Dates Pub.
725	Head of Green Bay, Wis. and Fox River below De Pere, Wis.	1:25,000	1939
	Inset: Part of Green Bay, Wis.	1:10,000	
726	Lake Winnebago, Wis.	1:60,000	1937
	Fox River - De Pere, Wis. to Lake Winnebago	1:30,000	
	Chart No. 726 replaced by No. 720		1967
728	Sturgeon Bay, Canal, and Harbor of Refuge, Wis. (color)	1:25,000	1903
	Sturgeon Bay, Canal, and Harbor of Refuge, Wis.	1:30,000	1909
	Insets: Entrance to Canal	1:10,000	
	Sturgeon Bay and Sawyer	1:10,000	
	Inset of Entrance to Canal discontinued		1935
	Sturgeon Bay and Canal, Wis.	1:30,000	1953
	Inset: Sturgeon Bay, Wis.	1:10,000	
734	Manitowoc Harbor, Wis. (color)	1:8,000	1907
	Manitowoc Harbor, Wis.	1:10,000	1937
735	Chart No. 734 changed to No. 735		
	Manitowoc Harbor, Wis., and Sheboygan Harbor, Wis.	1:10,000	1939
737	Sheboygan Harbor, Wis. (color)	1:10,000	1907
	Chart No. 737 replaced by No. 735		
743	Milwaukee Harbor (color)	1:12,000	1903
	Milwaukee Harbor	1:15,000	1927
	Milwaukee Harbor	1:10,000	1941
745	Racine Harbor - including Wind Point Shoals and Racine Reef (color)	1:15,000	1907
	Racine Harbor, Wis.	1:10,000	1941
747	Kenosha Harbor, Wis.	1:10,000	1909
	Chart No. 747 discontinued - now inset to No. 74		1937

Chart No.	Locality	Scale	Dates Pub.
749	Waukegan Harbor, Ill.	1:8,000	1909
	Chart No. 749 discontinued - now inset to No. 74		1937
750	Chicago and Vicinity - Recreational Craft Chart - shows the shoreline and adjacent waters from Wilmette, Ill., to Indiana Harbor, Ind., including Chicago Harbor. Also depicted are the North Shore Channel, the North and South Branches of Chicago River, Calumet River, and Lake Calumet. Contains 24 charts - 11" x 17½"	1:10,000	1969
751	Chicago Lake Front - Wilmette to Gary	1:60,000	1927
	Chicago Lake Front - Wilmette, Ill. to Gary, Ind. Insets: Gary and Buffington	1:60,000 1:15,000	1935
	Chicago Lake Front - Wilmette, Ill. to Gary, Ind. Inset: Gary Harbor, Ind.	1:60,000 1:15,000	1939
752	Chicago Harbor, Ill.	1:15,000	1927
753	Lake Front, Chicago, Ill.	1:24,000	1900
	Lake Front, Chicago, including Calumet Harbor (color)	1:30,000	1903
	Chicago Lake Front No. 1 - from Glencoe to Hyde Park, Ill.	1:40,000	1913
	Chart No. 753 discontinued		1927
754	Chicago Lake Front No. 2 - from Hyde Park, Ill. to Gary, Ind.	1:40,000	1913
	Chart No. 754 discontinued		1927
755	Calumet and Indiana Harbors Insets: Buffington Gary, Ind.	1:15,000 1:15,000 1:15,000	1927
	Insets removed to Chart No. 751		1935
	Calumet Harbor, Ill., Indiana Harbor, Ind., Buffington Harbor, Ind., and Calumet Lake	1:15,000	1939

Chart No.	Locality	Scale	Dates Pub.
758	St. Joseph and Benton Harbor, Mich.	1:8,000	1909
	St. Joseph and Benton Harbor, Mich.	1:10,000	1935
763	Black Lake (Holland) Harbor	1:15,000	1909
	Holland Harbor, Mich. - Black Lake and Holland	1:15,000	1913
	Holland Harbor, Mich., and Lake Macatawa	1:15,000	1939
765	Grand Haven Harbor, Mich. including Spring Lake (color)	1:15,000	1907
	Grand Haven, Mich. including Spring Lake and lower Grand River	1:15,000	1939
767	Muskegon Harbor, Mich. including Muskegon Lake (color)	1:15,000	1903
	Muskegon, Mich. and Muskegon Lake	1:15,000	1939
768	White Lake Harbor, Mich. including Whitehall and Montague, Mich.	1:15,000	1927
	White Lake, Mich., Whitehall, and Montague, Mich.	1:10,000	1939
774	Ludington Harbor, Mich. (color)	1:5,000	1907
	Ludington Harbor, Mich.	1:8,000	1909
	Ludington Harbor, Mich.	1:10,000	1935
	Ludington Harbor, Mich., and Pere Marquette Lake	1:5,000	1939
776	Manistee Harbor, Mich. (color)	1:10,000	1907
	Manistee Harbor, Mich., and Manistee Lake	1:10,000	1939
777	Portage Lake Harbor (color)	1:10,000	1907
	Portage Lake, Mich.	1:10,000	1939
784	Manitou Passage, Mich. between Manitou Islands and Pyramid Point	1:30,000	1907
	Chart No. 784 discontinued		1944

Chart No.	Locality	Scale	Dates Pub.
789	Pine Lake, Mich. Inset: Charlevoix Harbor	1:30,000 1:10,000	1909
	Lake Charlevoix (Pine Lake), Mich. including Round Lake and Charlevoix, Mich. Inset: Charlevoix, Mich.	1:30,000 1:10,000	1927
	Lake Charlevoix, Mich. Inset: Charlevoix, Mich.	1:30,000 1:10,000	1939
	Early chart: City of Chicago Discontinued	1:20,000	1874 1900
	Early chart: South Fox Island Shoals (color) Discontinued	1:20,000	1903 1913
	Early chart: Lake Winnebago, Wis. (color) Discontinued	1:40,000	1907 1909
	Early chart: Frankfort Harbor, Mich. (color) Discontinued - now inset to No. 77	1:5,000	1907 1913
	Early chart: Harbor at Michigan City, Ind. (color) Discontinued - now inset to No. 75	1:5,000	1907 1913
	Early chart: Charlevoix Harbor, Mich. (color) Discontinued - now inset to No. 717	1:8,000	1907 1909
	Early chart: South Haven Harbor Discontinued - now inset to No. 76	1:8,000	1909 1913

LAKE SUPERIOR

Chart No.	Locality	Scale	Dates Pub.
	Early chart: Lake Superior No. 1 - Grand Island to St. Marys River Color Discontinued	1:400,000	1872 1907 1909

Chart No.	Locality	Scale	Dates Pub.
	Early chart:		
	Lake Superior No. 2 - Ontonagon to Grand Island, Mich.	1:400,000	1870
	Color		1907
	Discontinued		1909
	Early chart:		
	Lake Superior No. 3 - Pigeon Bay to Duluth, Minn. and 14 Mile Point	1:400,000	1873
	Color		1907
	Discontinued		1909
	Early chart:		
	Isle Royale - including northwest coast of Lake Superior	1:120,000	1872
	Scale changed:	1:30,000	1900
	Discontinued		1909
	Early chart:		
	West end of Lake Superior	1:32,000	1863
	Discontinued		1900
9	Lake Superior - the whole lake	1:500,000	1903
	Insets: Gargantua Harbor, Ont.	1:20,000	
	Grand Marais Harbor, Mich.	1:10,000	
	Grand Marais Harbor, Minn.	1:8,000	
	Michipicoten Harbor, Ont.	1:5,000	
	Color		1907
	Lake Superior - the whole lake (no insets)	1:500,000	1927
91	Lake Superior Coast Chart No. 1 - including Whitefish Bay and head of St. Marys River - east end of Lake, from Cape Gargantua, Ont., to Two Hearted River, Mich. (color)	1:120,000	1907
	Lake Superior Coast Chart No. 1 - east end of lake, from Cape Gargantua, Ont., to Big Two Hearted River, Mich., including Whitefish Bay and head of St. Marys River	1:120,000	1913
	Inset: Gargantua, Ont.	1:20,000	
	Inset discontinued		1935
	Chart No. 91 discontinued		1937

Chart No.	Locality	Scale	Dates Pub.
92	Lake Superior Coast Chart No. 2 - South Shore from Big Two Hearted River to Grand Portal, Mich., including Caribou Island	1:120,000	1927
	Inset: Grand Marais, Mich.	1:16,000	
	Lake Superior Coast Chart No. 2 - Head of St. Marys River to Au Sable Point, Mich.	1:120,000	1937
	Inset: Grand Marais, Mich.	1:15,000	
	Add inset: Whitefish Point Harbor, Mich.	1:5,000	1963
	Add inset: Little Lake Harbor, Mich.	1:5,000	1967
93	Lake Superior Coast Chart No. 3 - South Shore from Castle Point to Big Bay Point, Mich., including Manitou Island and Stannard Rock	1:120,000	1909
	Lake Superior Coast Chart No. 3 - Grand Portal to Big Bay Pt., Mich., including Manitou Island and Stannard Rock	1:120,000	1935
	Lake Superior Coast Chart No. 3 - Grand Marais, Mich., to Big Bay Point, Mich.	1:120,000	1937
	Add inset: Big Bay Harbor, Mich.	1:5,000	1963
94	Lake Superior Coast Chart No. 4 - including Keweenaw Peninsula - from Big Bay to Ontonagon	1:120,000	1907
	Add inset: Copper Harbor, Mich.	1:15,000	1917
	Lake Superior Coast Chart No. 4 - Big Bay to Redridge, Mich., including Keweenaw Peninsula and Keweenaw Waterway	1:120,000	1937
	Insets: Eagle Harbor	1:15,000	
	Copper Harbor	1:15,000	
	Add insets: Grand Traverse Bay Harbor, Mi.	1:5,000	1963
	Lac La Belle Harbor, Mich.		
95	Lake Superior Coast Chart No. 5 - Ontonagon, Mich., to Oronto Bay and Outer Island Wis.	1:120,000	1917
	Inset: Ontonagon, Mich.	1:12,000	
	Lake Superior Coast Chart No. 5 - Redridge, Mich. to Oronto Bay	1:120,000	1937
	Inset: Ontonagon, Mich.	1:10,000	

Chart No.	Locality	Scale	Dates Pub.
95	Lake Superior Coast Chart No. 5 - Redridge, Mich. to Little Girl Point, Mich.	1:120,000	1939
	Inset: Ontonagon, Mich.	1:10,000	
	Add inset: Black River Harbor, Mich.	1:5,000	1963
	Add inset: Saxon Harbor, Wis.	1:2,500	1967
96	Lake Superior Coast Chart No. 6 - including Apostle Islands - west end of lake, from Little Girl Point, Mich., to Duluth, and thence to Beaver Bay, Minn.	1:120,000	1907
	Inset: Port Wing Harbor, Wis.	1:8,000	
	Change insets: Port Wing Harbor, Wis.	1:10,000	1927
	Two Harbors, Minn.	1:12,000	
	Change insets: Port Wing Harbor, Wis.	1:10,000	1935
	Two Harbors, Minn.	1:10,000	
	Change insets: Port Wing Harbor, Wis.	1:10,000	1937
	Two Harbors, Minn.	1:15,000	
	Add inset: Cornucopia, Wis.	1:5,000	1944
	Lake Superior Coast Chart No. 6 - Little Girls Point, Mich. to Silver Bay, Minn., including Duluth, Minn. and Apostle Islands	1:120,000	1963
	Insets: Port Wing Harbor, Wis.	1:10,000	
	Two Harbors, Minn.	1:10,000	
	Cornucopia Harbor, Wis.	1:5,000	
	Knife River, Harbor, Minn.	1:5,000	
97	Lake Superior Coast Chart No. 7 - Beaver Bay, Minn. to Pigeon Point, Minn.	1:120,000	1958
	Inset: Grand Marais, Minn.	1:8,000	
	Change inset: Grand Marais, Minn.	1:10,000	1937
	Lake Superior Coast Chart No. 7 - Beaver Bay, Minn. to Pigeon Point, Minn.	1:120,000	1958
	Insets: Silver Bay, Minn.	1:10,000	
	Taconite Harbor, Minn.	1:10,000	
	Grand Marais, Minn.	1:10,000	
98	Lake Superior Coast Chart No. 8 - including Isle Royal - northwest coast of Lake Superior from Grand Portage Bay, Minn. to Black Bay, Ont., including Thunder Bay	1:120,000	1907
	Insets: Todd Harbor, Rock Harbor, and Washington and Grace Harbors	1:30,000	

Chart No.	Locality	Scale	Dates Pub.
98	Lake Superior Coast Chart No. 8 - Grand Portage Bay, Minn., to Hawk Island, including Isle Royale and Thunder Bay	1:120,000	1937
	Insets: Todd Harbor, Rock Harbor, and Washington and Grace Harbors (Isle Royale)	1:30,000	
	Lake Superior Coast Chart No. 8 - Isle Royale, Mich. including Thunder Bay, Ont., and coast from Grand Portage Bay, Minn., to Shesheeb Point, Ont. (no insets)	1:120,000	1949
931	Grand Island, Mich.	1:25,000	1862
	Color		1907
	Grand Island, Mich. - including south shore from Grand Portal to Train Point	1:30,000	1927
	Inset: Munising Harbor, Mich.	1:12,000	
	Grand Island, Mich. - including coast from Grand Portal to Au Train Point	1:25,000	1935
	Inset: Munising Harbor, Mich.		
	Grand Island, Mich. - including coast from Grand Portal to Au Train Point	1:30,000	1937
	Inset: Munising Harbor, Mich.	1:15,000	
	Grand Island, Mich. - including coast from Sail Rock to Au Train Point, Mich.	1:30,000	1939
	Inset: Munising Harbor, Mich.	1:15,000	
	Name change: Munising Harbor and approaches including Grand Island	1:30,000	1967
	Inset: Munising Harbor, Mich.	1:15,000	
932	Munising Harbor, Mich. (color)	1:8,000	1907
	Chart No. 932 discontinued - now inset on No. 931		1927
935	Marquette Harbor	1:50,000	1860
	Marquette and Presque Isle Harbors, Mich. (color)	1:15,000	1903

Chart No.	Locality	Scale	Dates Pub.
942	Huron Islands - Huron Bay and Huron Islands	1:30,000	1869
	Huron Bay and Huron Islands, Mich. (color)	1:30,000	1907
	Chart No. 942 discontinued		1935
943	L'Anse and Keweenaw Bay	1:30,000	1866
	Keweenaw Bay, Mich. (color)	1:30,000	1907
	Keweenaw Bay, Mich.	1:30,000	1937
	Insets: L'Anse	1:10,000	
	Pequaming	1:10,000	
	Keweenaw Bay, Mich.	1:30,000	1967
	Insets: L'Anse, Mich.	1:10,000	
	Baraga, Mich.	1:10,000	
944	Portage Lake and River, Mich.	1:30,000	1865
	Portage Lake and River, Mich. (color)	1:30,000	1907
	Insets: Portage Entry and River	1:15,000	
	Portage Lake Upper Entrance and Canal	1:15,000	
	Portage Lake and Lake Superior Canals, across Keweenaw Peninsula	1:30,000	1913
	Insets: Portage Entry	1:15,000	
	Upper Entrance and Canal	1:15,000	
	Keweenaw Waterway - Portage Lake and River	1:30,000	1917
	Insets: Portage Entry	1:15,000	
	Upper Entrance and Canal	1:15,000	
	Keweenaw Waterway, Mich. - including Torch Lake	1:30,000	1937
	Insets: Hancock and Houghton	1:10,000	
946	Copper Harbor	1:10,000	1866
	Color		1907
	Discontinued - now inset to No. 94		1917
947	Agate Harbor	1:10,000	1858
	Color		1907
	Discontinued		1927
948	Eagle Harbor	1:5,000	1858
	Color		1907
	Discontinued		1937

Chart No.	Locality	Scale	Dates Pub.
949	Eagle River	1:10,000	1859
	Color		1907
	Discontinued		1913
951	Ontonagon Harbor	1:16,000	1859
	Color		1907
	Discontinued - now inset on No. 95		1917
	Early chart:		
	Apostle Islands No. 1 - including south coast of Lake Superior from Squaw Bay, Wis. to Roys Point (color)	1:50,000	1903
	Discontinued		1909
	Early chart:		
	Apostle Islands No. 2 - including Chequamegon Bay and south coast of Lake Superior from Oronto Bay to Red Cliff, Wis. (color)	1:50,000	1903
	Discontinued		1909
961	Apostle Islands (color)	1:80,000	1903
	Apostle Islands and Chequamegon Bay - including coast from Little Girl Point, Mich. to Sand Point, Wis.	1:60,000	1909
	Apostle Islands, Wis., including Chequamegon Bay	1:60,000	1944
	Inset: Bayfield, Wis.	1:10,000	
964	Ashland and Washburn Harbors, Wis.	1:15,000	1909
966	Duluth and Superior Harbors	1:15,000	1900
	Duluth and Superior Harbors (color)	1:18,000	1903
	Duluth-Superior Harbor, Minn. and Wis.	1:24,000	1927
	Duluth-Superior Harbor	1:25,000	1937
	Duluth-Superior Harbor	1:15,000	1944
	Duluth-Superior Harbor	1:15,000	1963
	Inset: Upper St. Louis River, Minn.	1:30,000	
968	Agate and Burlington Bays (Two Harbors), Minn. (color)	1:6,000	1903

Chart No.	Locality	Scale	Dates Pub.
968	Agate and Burlington Bays, Minn. - Two Harbors, Minn.	1:6,000	1913
	Two Harbors Minn.	1:6,000	1917
	Chart No. 968 discontinued - now inset on No. 96		
981	Isle Royale, Mich.	1:40,000	1941

MINNESOTA-ONTARIO BORDER LAKES

Chart No.	Locality	Scale	Dates Pub.
84	Lake of the Woods - southern part of the lake, south of Northwest Angle Inlet and west of Sabaskong Bay, Ont.	1:120,000	1935
	Add insets: Warroad, Harbor, Minn. Rainy River, Minn.	1:20,000 1:20,000	1963
806	North Lake (no hydrography)	1:42,240	1951
807	Northern Light Lake (no hydrography)	1:42,240	1951
808	Sea Gull Lake (no hydrography)	1:24,240	1951
809	Saganaga Lake (no hydrography)	1:42,240	1951
810	Knife Lake (no hydrography)	1:42,240	1951
811	Basswood Lake, Eastern Part (no hydro.)	1:42,240	1951
812	Basswood Lake, Western Part (no hydro.)	1:42,240	1951
813	Crooked Lake (no hydrography)	1:42,240	1951
815	Lac la Croix (no hydrography)	1:42,240	1951
817	Sand Point Lake to Lac la Croix including Crane Lake and Little Vermilion Lake (no hydrography)	1:42,240	1951
818	Namakan Lake, Eastern Part (no hydro.)	1:42,240	1951
820	Namakan Lake, Western Part, and Kabetogama Lake, Eastern Part (no hydrography)	1:42,240	1951

Chart No.	Locality	Scale	Dates Pub.
822	Kabetogama Lake, Western Part (no hydrography)	1:42,240	1951
821	Rainy Lake - International Falls to Bushyhead Island	1:25,000	1937
	Rainy Lake - International Falls, Minn. to Dryweed Island, Minn.	1:25,000	1949
	Chart No. 821 changed to No. 823		1953
822	Rainy Lake - Bushyhead Island to Big Island	1:25,000	1937
	Rainy Lake - Dryweed Island, Minn. to Big Island, Minn.	1:25,000	1949
	Chart No. 822 changed to No. 821		1953
823	Rainy Lake - Big Island, Minn. to Oak Point Island, Ont.	1:25,000	1937
	Inset: Kettle Falls, Minn.	1:10,000	
841	Lake of the Woods No. 1 - Long Point to Windy Point and Rainy River entrance	1:40,000	1927
	Discontinued		1939
842	Lake of the Woods No. 2 - West of Rocky Point and Stony Point, Minn.	1:40,000	1927
	Discontinued		1939
843	Lake of the Woods No. 3 - Northwest Angle Inlet to Big Island	1:40,000	1927
	Discontinued		1939
844	Lake of the Woods No. 4 - Between Garden Island and Long Point	1:40,000	1927
	Discontinued		1939

HYDROGRAPHIC OFFICE CHARTS

No.	Locality	Scale	Dates Pub.
1474	Lake Superior - the whole lake	?	1910
	Discontinued		1927
1475	Lake Michigan - the whole lake including Green Bay	?	1910
	Discontinued		1927
1476	Lake Huron - the whole lake and Georgian Bay	?	1910
	Discontinued		1927
1477	Lake Erie and Lake Ontario - both lakes and south parts of Lake Huron and Georgian Bay	?	1910
	Discontinued		1927
1665	Lake Erie - the whole lake, and waterways to Lake Huron	?	1910
	Discontinued		1927

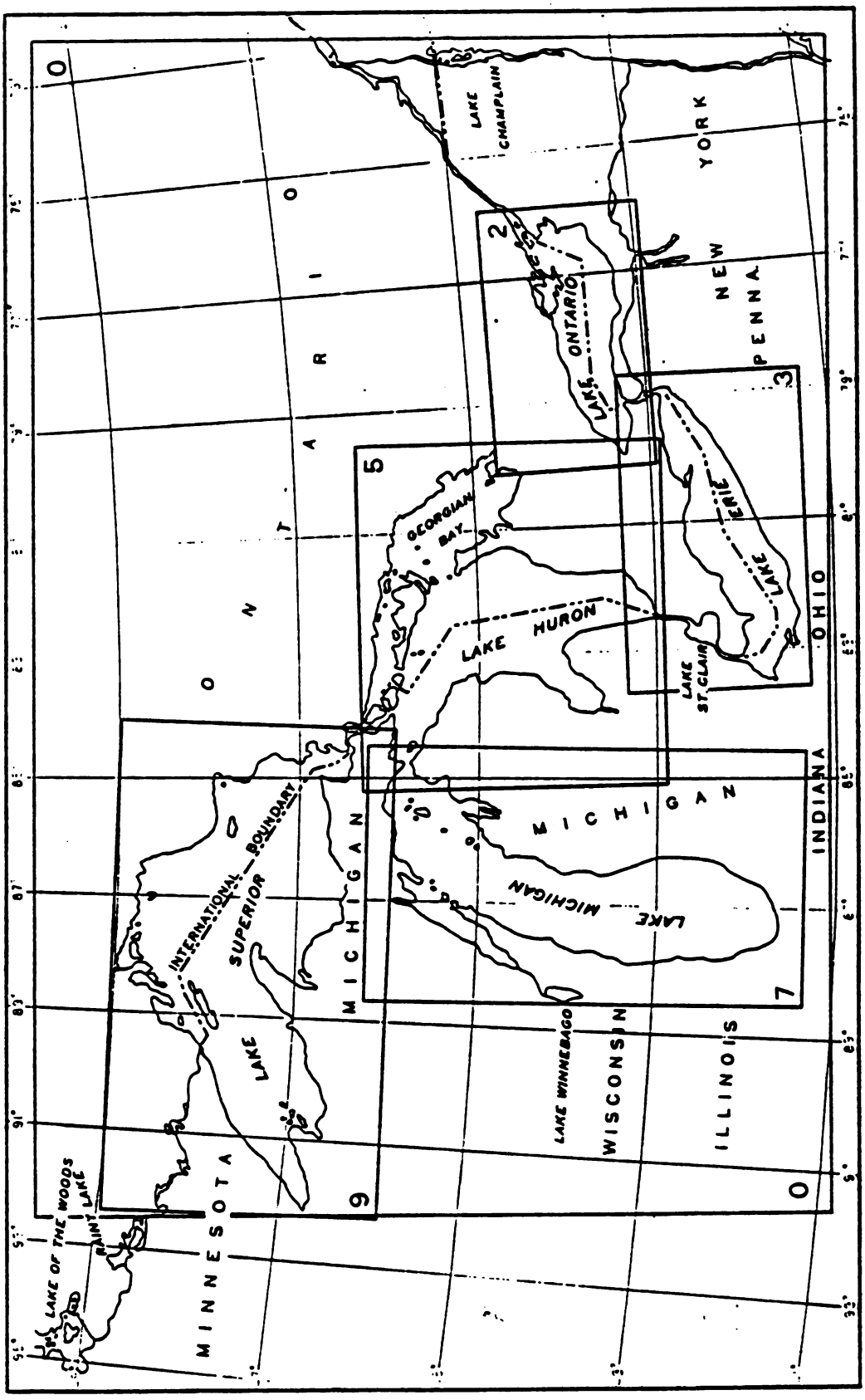

Figure 29a. Index map of general charts of the Great Lakes. (1963)

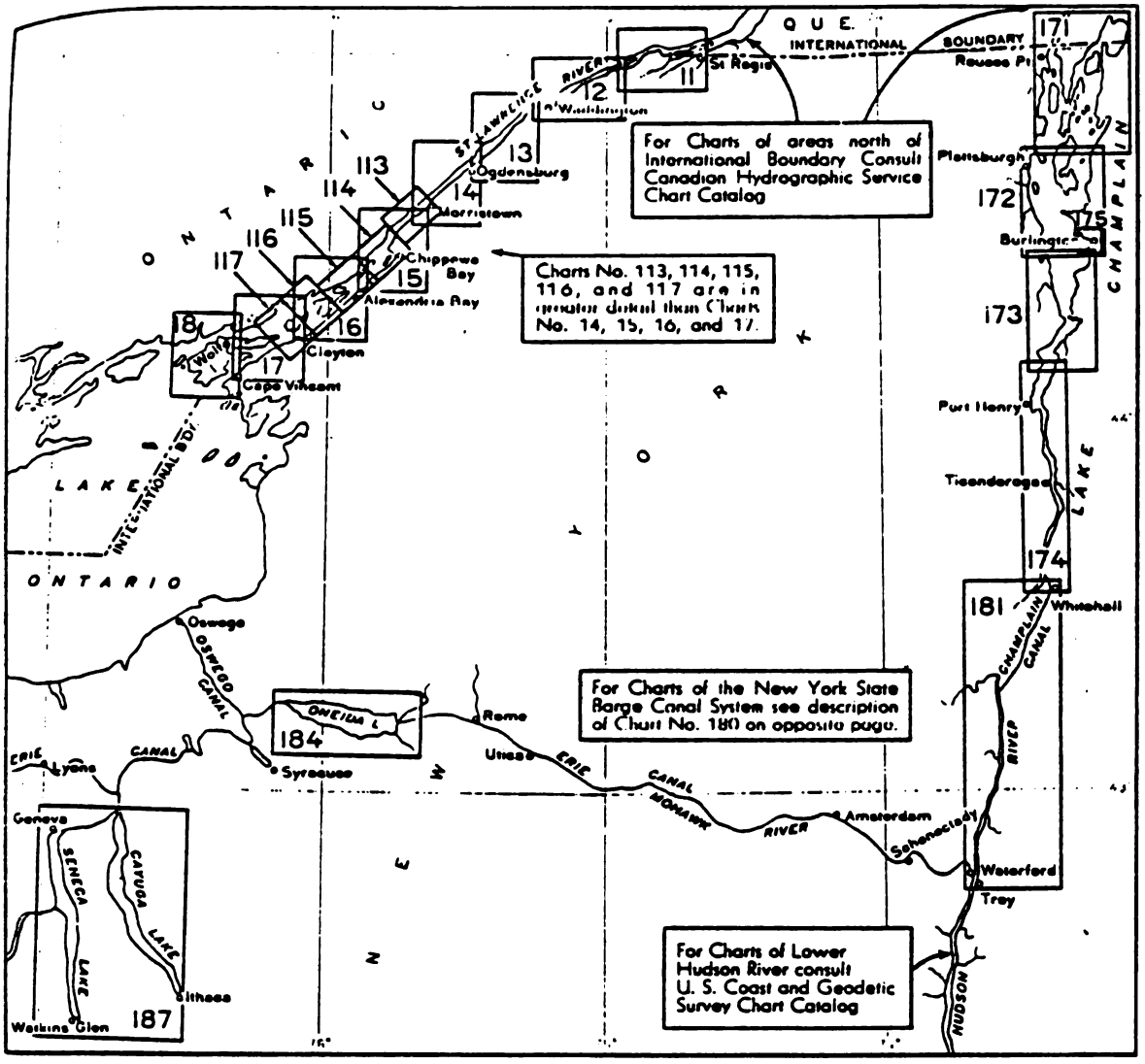

Figure 29b. Index map of charts of St. Lawrence River, Lake Champlain, and New York State Barge Canal System. (1963)

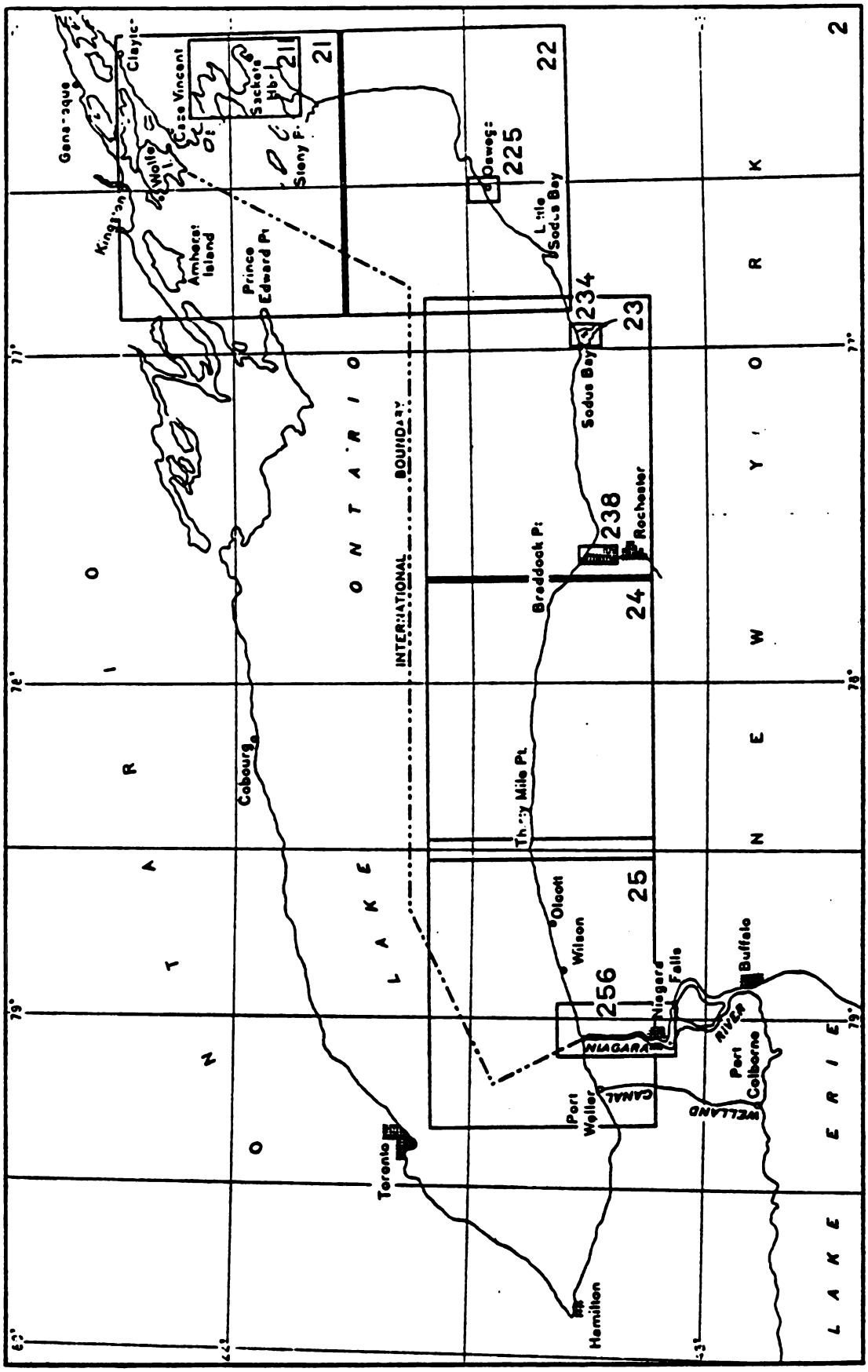

Figure 29c. Index map of charts of Lake Ontario and lower Niagara River. (1963)

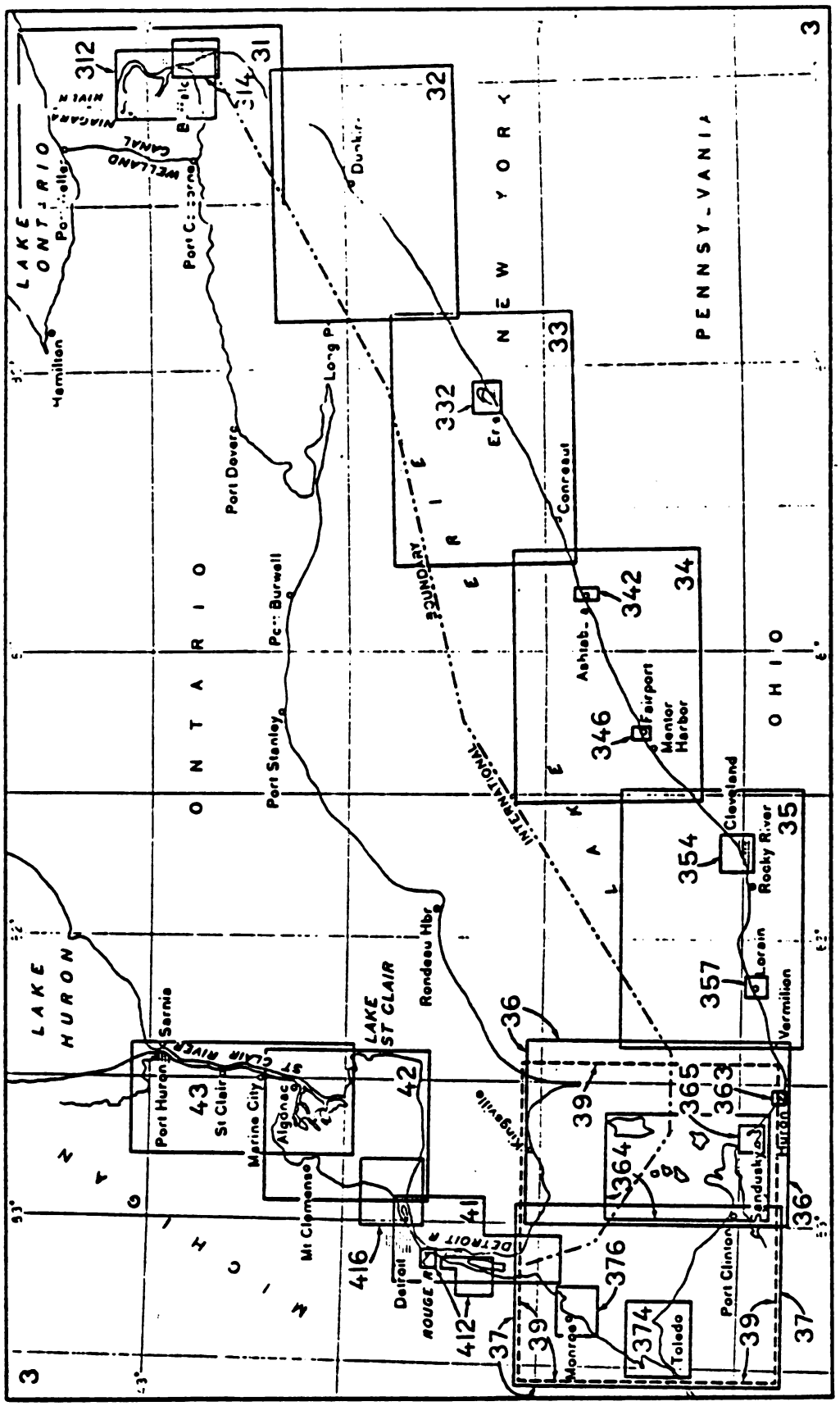

Figure 29d. Index map of charts of Lake Erie, Niagara River, Detroit River, Lake St. Clair, and St. Clair River. (1963)

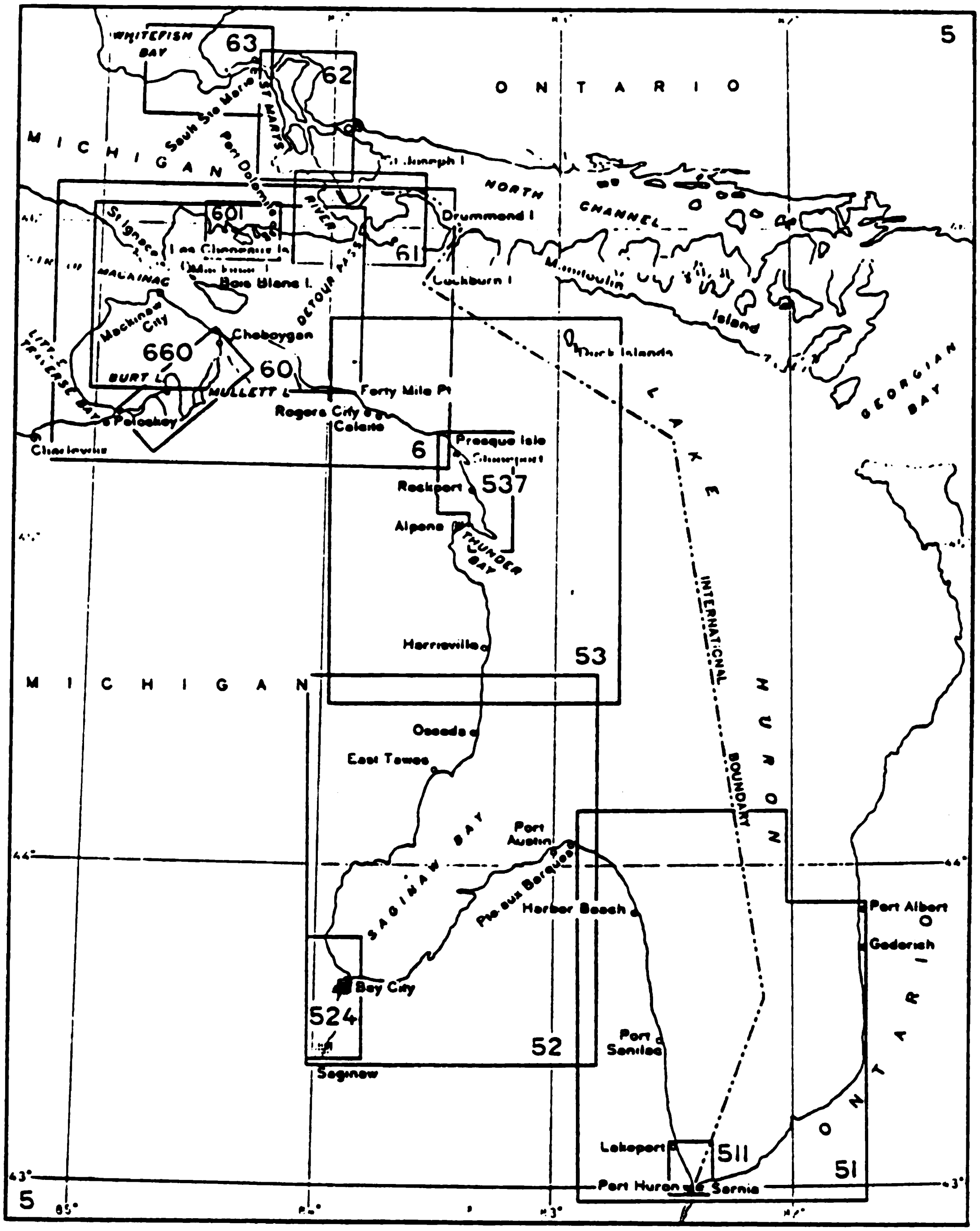

Figure 29e. Index map of charts of Lake Huron, Straits of Mackinac, and St. Marys River. (1963)

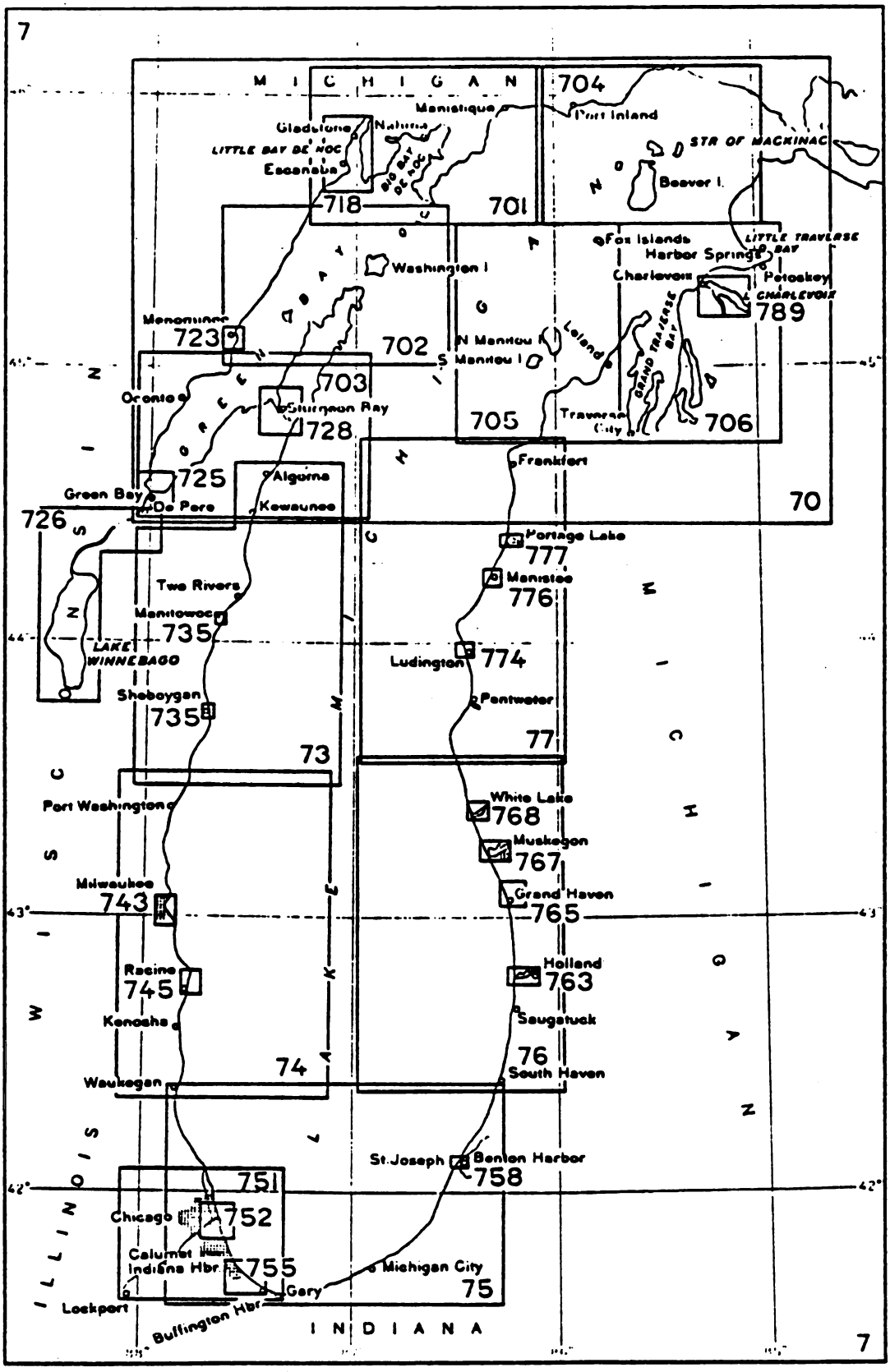

Figure 29f. Index map of charts of Lake Michigan. (1963)

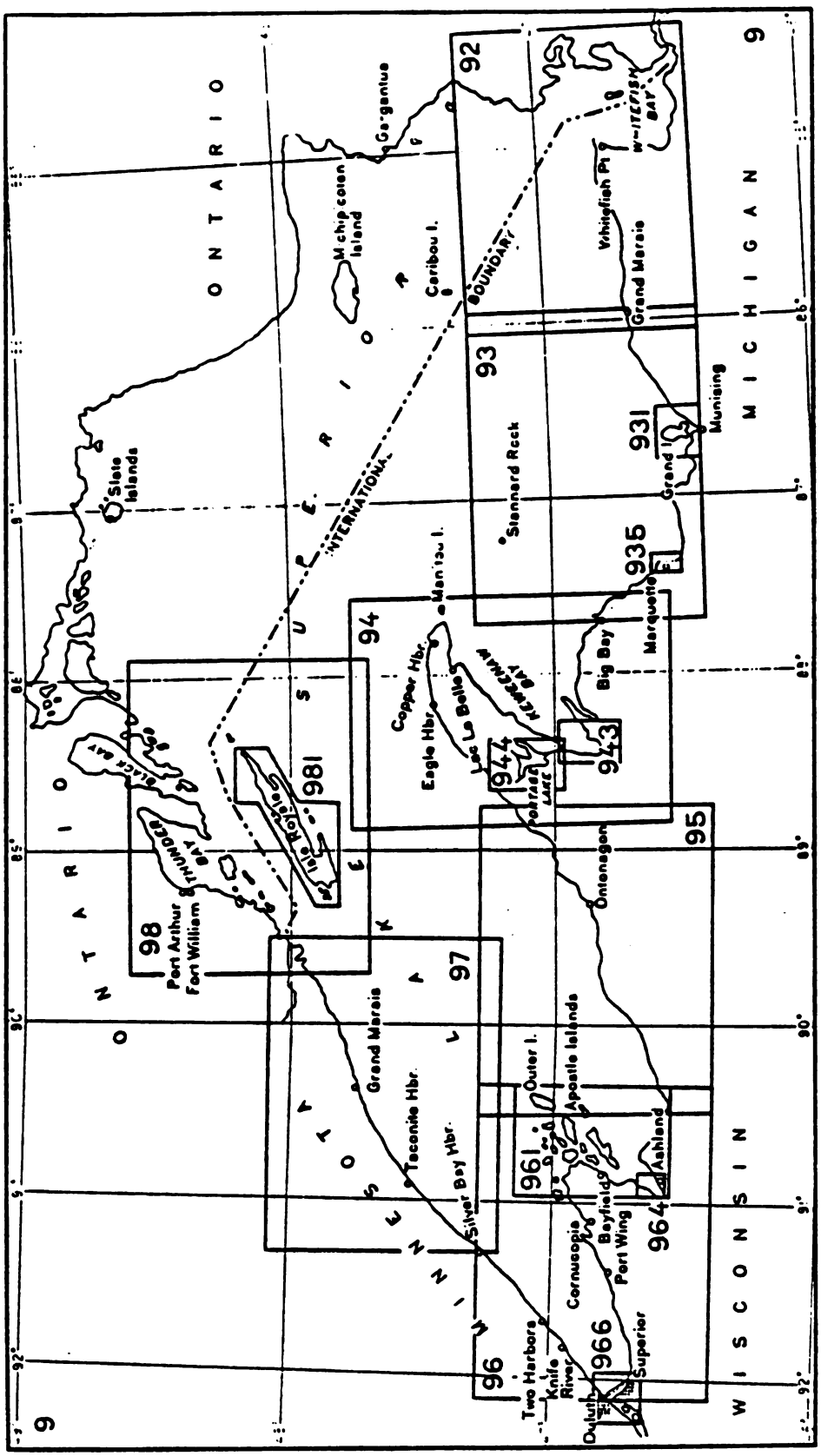

Figure 29g. Index map of charts of Lake Superior. (1963)

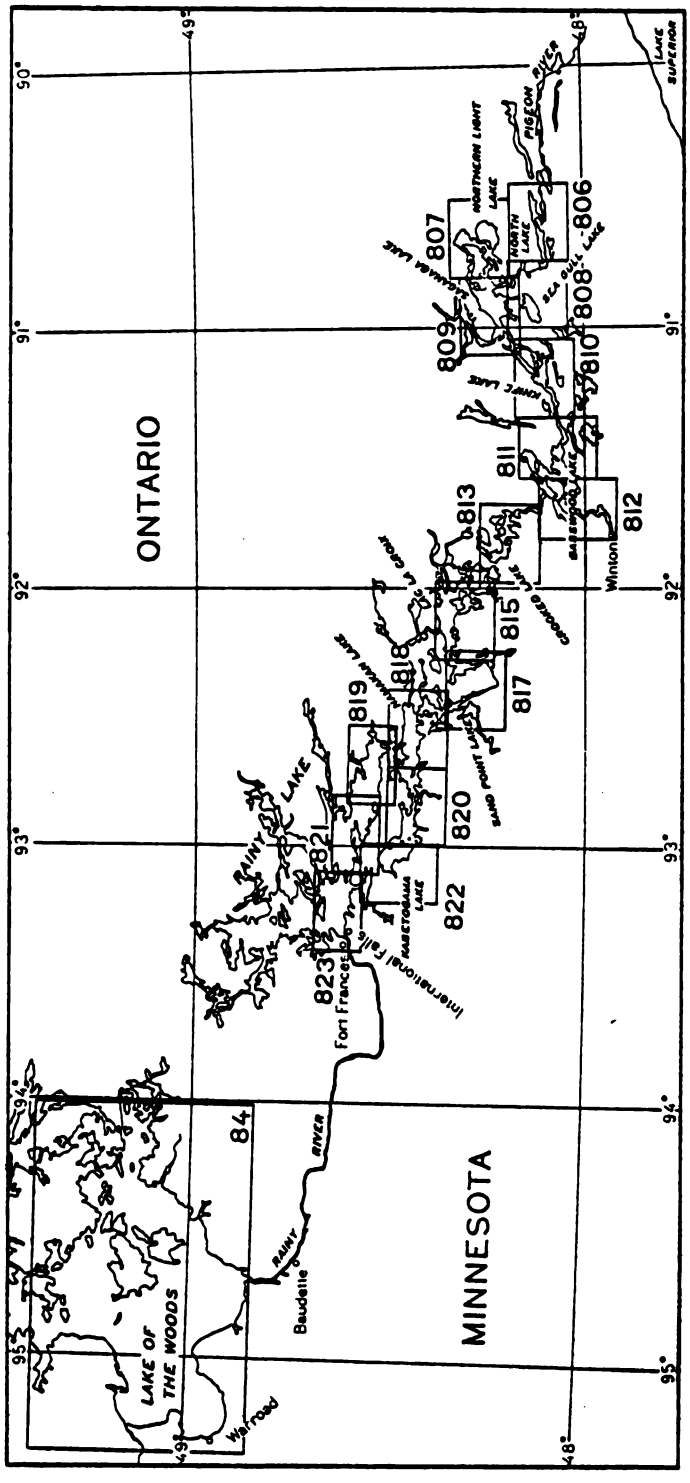

Figure 29h. Index map of charts of Minnesota-Ontario Border Lakes. (1963)

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