Report on Water Pollution in the

LAKE ERIE BASIN

SOUTHEASTERN MICHIGAN AREA

ST. CLAIR RIVER—LAKE ST. CLAIR

UNITED STATES DEPARTMENT OF THE INTERIOR

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION

GREAT LAKES REGION

MAY 1967

REPORT ON

WATER POLLUTION IN THE LAKE ERIE BASIN
SOUTHEASTERN MICHIGAN AREA
ST. CLAIR RIVER-LAKE ST. CLAIR

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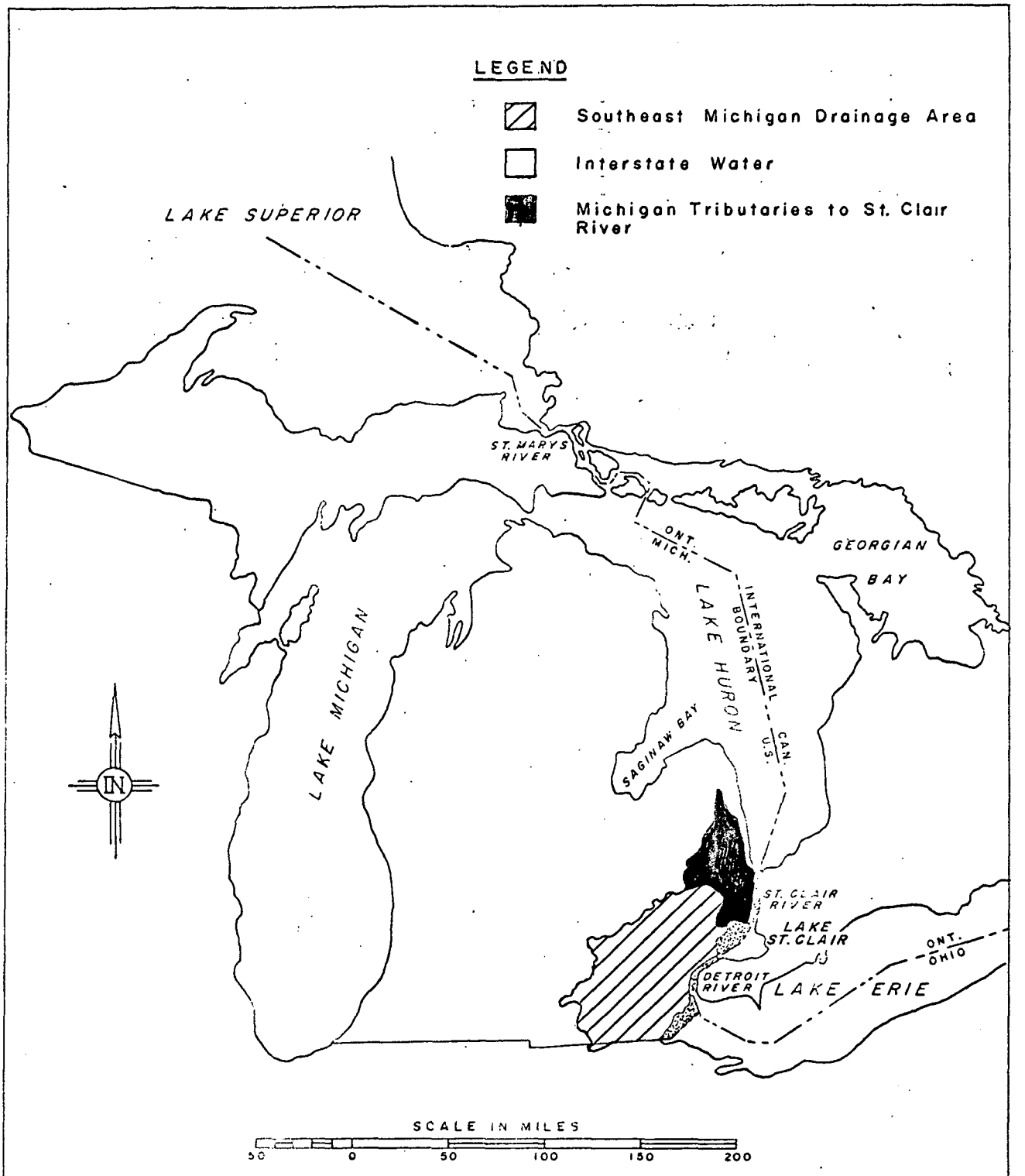
U.S. DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
Great Lakes Region
Detroit Program Office
U.S. Naval Air Station
Grosse Ile, Michigan

PREFACE

The southeastern Michigan area draining into Lake Erie has been recognized as one of the major water pollution areas of the Lake Erie system. Extending across the natural watershed boundaries of southeastern Michigan's major tributaries is the metropolitan area of Detroit and its suburbs. The water quality problems of Lake Erie, Detroit River, Lake St. Clair, St. Clair River, and the individual tributaries are interrelated and compounded by the urbanization and industrialization of the area.

The complexity of the problem requires a comprehensive plan for "CLEAN WATER" that takes into account the cause and effect relationships of water resource utilization from the headwaters of the smallest tributary to the large water reservoirs that constitute the Great Lakes.

This document was assembled by the Detroit Program Office, Federal Water Pollution Control Administration, with the intention that it be used together with information from other sources to develop a comprehensive plan for water pollution control in the southeast Michigan tributaries of the Lake Erie Basin. The intended purpose of the plan would be to restore the usefulness of these waters for recreational purposes, provide a more suitable environment for fish and aquatic life, and enhance the value of this resource. It would improve the quality of the area's waters for municipal and industrial purposes, aesthetic enjoyment, and other beneficial uses.



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GREAT LAKES-ILLINOIS RIVER BASIN PROJECT

LOCATION MAP
LAKE ERIE BASIN
ST. CLAIR RIVER-LAKE ST. CLAIR

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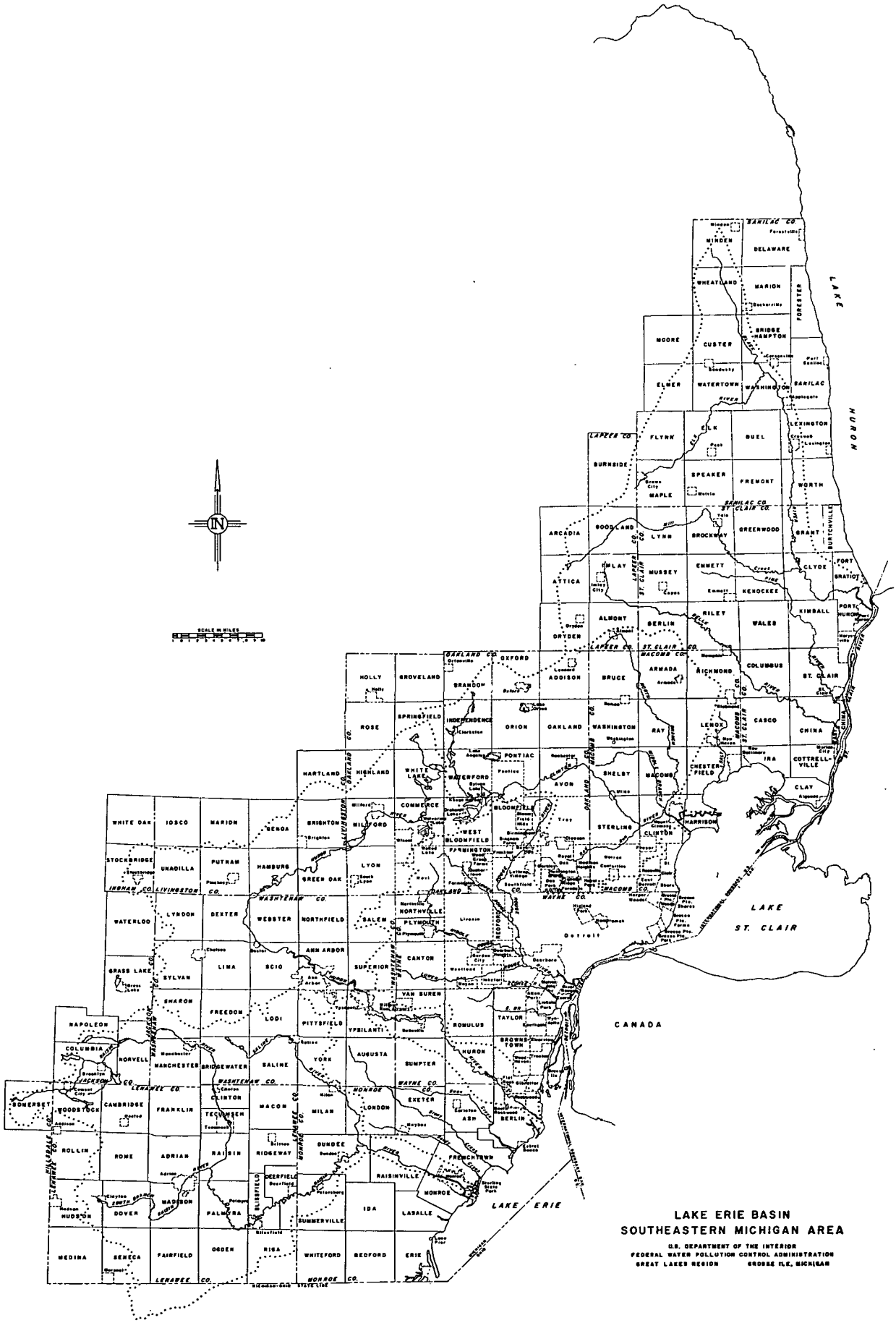
GREAT LAKES REGION GROSSE ILE, MICHIGAN



LAKE ERIE BASIN
SOUTHEASTERN MICHIGAN AREA

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION GROSSE ILE, MICHIGAN

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INTRODUCTION

AUTHORITY

Comprehensive water pollution control studies were authorized by the Federal Water Pollution Control Act of 1956, as amended (33 USC 466 et seq.).

> Sec. 3.(a) "The Secretary shall, after careful investigation, and in cooperation with other Federal agencies, with State water pollution control agencies and interstate agencies, and with the municipalities and industries involved, prepare or develop comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof and improving the sanitary condition of surface and underground waters. In the development of such comprehensive programs due regard shall be given to the improvements which are necessary to conserve such waters for public water supplies, propagation of fish and aquatic life and wildlife, recreational purposes, and agricultural, industrial, and other legitimate uses. For the purpose of this section, the Secretary is authorized to make joint investigations with any such agencies of the condition of any waters in any State or States, and of the discharges of any sewage, industrial wastes, or substance which may adversely affect such waters."

> Sec. 5.(f) "The Secretary shall conduct research and technical development work, and make studies, with respect to the quality of the waters of the Great Lakes, including an analysis of the present and projected future water quality of the Great Lakes under varying conditions of waste treatment and disposal, an evaluation of the water quality needs of those to be served by such waters, an evaluation of municipal, industrial, and vessel waste treatment and disposal practices with respect to such waters, and a study of alternate means of solving water pollution problems (including additional waste treatment measures) with respect to such waters."

Initiation of the Great Lakes-Illinois River Comprehensive Program Activity followed an appropriation of funds by the 86th Congress late in 1960. In accordance with the provisions of the Act, the Secretary of Health, Education, and Welfare delegated the responsibility for the study

to the Division of Water Supply and Pollution Control of the Public Health Service. Passage of the "Water Quality Act of 1965" gave the responsibility for these studies to the Federal Water Pollution Control Administration (FWPCA). As a result of Reorganization Plan No. 2 of 1966, the FWPCA was transferred from the Department of Health, Education, and Welfare to the Department of the Interior effective May 10, 1966.

PURPOSE

This report presents the water quality of the St. Clair River and Lake St. Clair, Michigan as it exists today, and includes predictions of population, water use, and waste load trends for future years. Its purpose is to present information that can be used as a basis for developing a basin wide water pollution control program. The objectives of the Federal Water Pollution Control Administration are to enhance the quality and value of the Nation's water resources, and to prevent, control, and abate water pollution through cooperative municipal, State, and Federal pollution control programs.

SCOPE

The areas covered by this report are the international waters of the St. Clair River and the drainage basin that lies within the State of Michigan, as well as the international waters of Lake St. Clair.

ORGANIZATION

The Detroit Program Office, located at the Naval Air Station, Grosse Ile, Michigan, began collecting water quality data on the St. Clair River and Lake St. Clair in 1964. Its staff include specialists in several

professional skills, including sanitary engineers, hydrologists, chemists, biologists, and bacteriologists. The resources of the Robert A. Taft Sanitary Engineering Center at Cincinnati, Ohio have been utilized, and assistance and guidance have been obtained from the Great Lakes-Illinois River Basins Project, Chicago.

ACKNOWLEDGMENTS

The Detroit Program Office has received the cooperation and assistance of local, State, and Federal agencies, as well as interested individuals. The principal agencies taking an active part in providing assistance in the preparation of the report are as follows:

State Agencies -

Michigan Water Resources Commission
Michigan Department of Public Health

Federal Agencies -

U.S. Department of Commerce
- Weather Bureau
- Office of Business Economics
- Bureau of Census

U.S. Department of the Interior
- Bureau of Commercial Fisheries
- Bureau of Sports Fisheries and Wildlife
- Bureau of Outdoor Recreation
- Geological Survey

U.S. Department of Defense
- Detroit District Corps of Engineers
- Lake Survey, Corps of Engineers

GENERAL DESCRIPTION

St. Clair River

The St. Clair River (Figure 1) is the outlet of Lake Huron, and carries through it the entire drainage from Lakes Huron, Michigan, and Superior. It is actually part of the strait between Lake Huron and Lake Erie. The Detroit River forms the lower part of the strait.

A natural restriction in the river at Port Huron, together with the backwater effects of the rest of the river, control the level and outflow of Lake Huron.

The St. Clair River is about 38 miles long, and depths throughout its length exceed 28 feet. Throughout its length on both sides the banks are fairly high, and are developed for residential, industrial, and recreational purposes. The river is confined to a channel, averaging 1/2 mile in width for the upper 27 miles from Port Huron to Algonac. At Algonac, the river divides into numerous distributaries, forming the delta portion known as the St. Clair Flats. River velocities range from about 5 miles per hour in the Port Huron area to about 2 miles per hour in the St. Clair Flats channels.

The discharge of the St. Clair River, during the 64-year period 1900 to 1963, has averaged 177,000 cubic feet per second (cfs). However, the mean discharge during 1964 was 151,000 cfs, or 26,000 cfs below the long-term average.

The hydraulic characteristics as unsed in this report would not be greatly effected by the lower discharge rates during the survey period.

The river has an average water level drop of 5.7 feet between Lakes Huron and St. Clair.

There are two large islands in the upper St. Clair River: Stag Island, with a length of approximately two miles, located just south of Marysville, Michigan; and Wood Tick Island, with a length of about one half mile, located just south of Marine City, Michigan. Both islands are located in Canadian waters. The distribution of the total river flow around these islands is as follows:

East of Stag Island -	35%
West of Stag Island -	65%
East of Wood Tick Island -	17%
West of Wood Tick Island -	83%

When the river reaches the Algonac Region, 32 percent of the flow enters the North Channel, 20 percent enters the Middle Channel, and 4 percent enters the Chenal Ecarte. The remaining 44 percent enters the South Channel. Of this 44 percent, 21 percent flows through the St. Clair Flats Canal, 20 percent flows through the St. Clair Cutoff Channel, and 3 percent enters Lake St. Clair through the Bassett Channel.

The locations of the St. Clair River sampling stations are shown in Figure 1. Flow distribution studies were carried out at all the ranges in the river except SR 39.0. The results of these studies are summarized in Table 1, entitled "Flow Distribution of the St. Clair River."

Tributaries

The Black River is the largest tributary of the St. Clair River. It empties into the river at Port Huron, Michigan. The Black River has a drainage area of 740* square miles, and an average discharge of 430(1) cfs. It has its headwaters in north central Sanilac County, and flows south-

* Estimated
(1) Estimated by comparison with drainage areas of Black River near Fargo and Mill Creek near Abbottsford, Michigan

TABLE 1. FLOW DISTRIBUTION OF THE ST. CLAIR RIVER

Range	Station No.	Feet from West Shore	Percent* of flow
SR 35.4	P-34	100	9.6
	P-35	500	23.3
	P-36	800	26.9
	P-37	1,000	21.6
	P-38	1,400	18.6
SR 31.2	P-39	100	14.9
	P-40	700	27.0
	P-41	1,000	16.6
	P-42	1,400	24.9
	P-43	1,900	16.6
SR 26.7	P-44	100	18.4
	P-45	800	30.2
	P-46	1,200	19.1
	P-47	1,600	19.5
	P-48	1,900	12.8
SR 17.5	P-50	100	24.8
	P-51	1,200	38.8
	P-52	1,700	9.6
	P-53	2,200	16.6
	P-54	2,600	10.2
SR 13.7	P-56	100	8.7
	P-57	700	26.1
	P-58	1,000	19.5
	P-59	1,400	32.9
	P-60	1,900	12.8
SR 10.0N	P-61	100	13.2
	P-62	500	27.6
	P-63	900	11.2
SR 10.0S	P-64	100	4.1
	P-65	500	16.5
	P-66	900	23.4

*The sampling station represents this percentage of the total flow of the river.

FIGURE 1

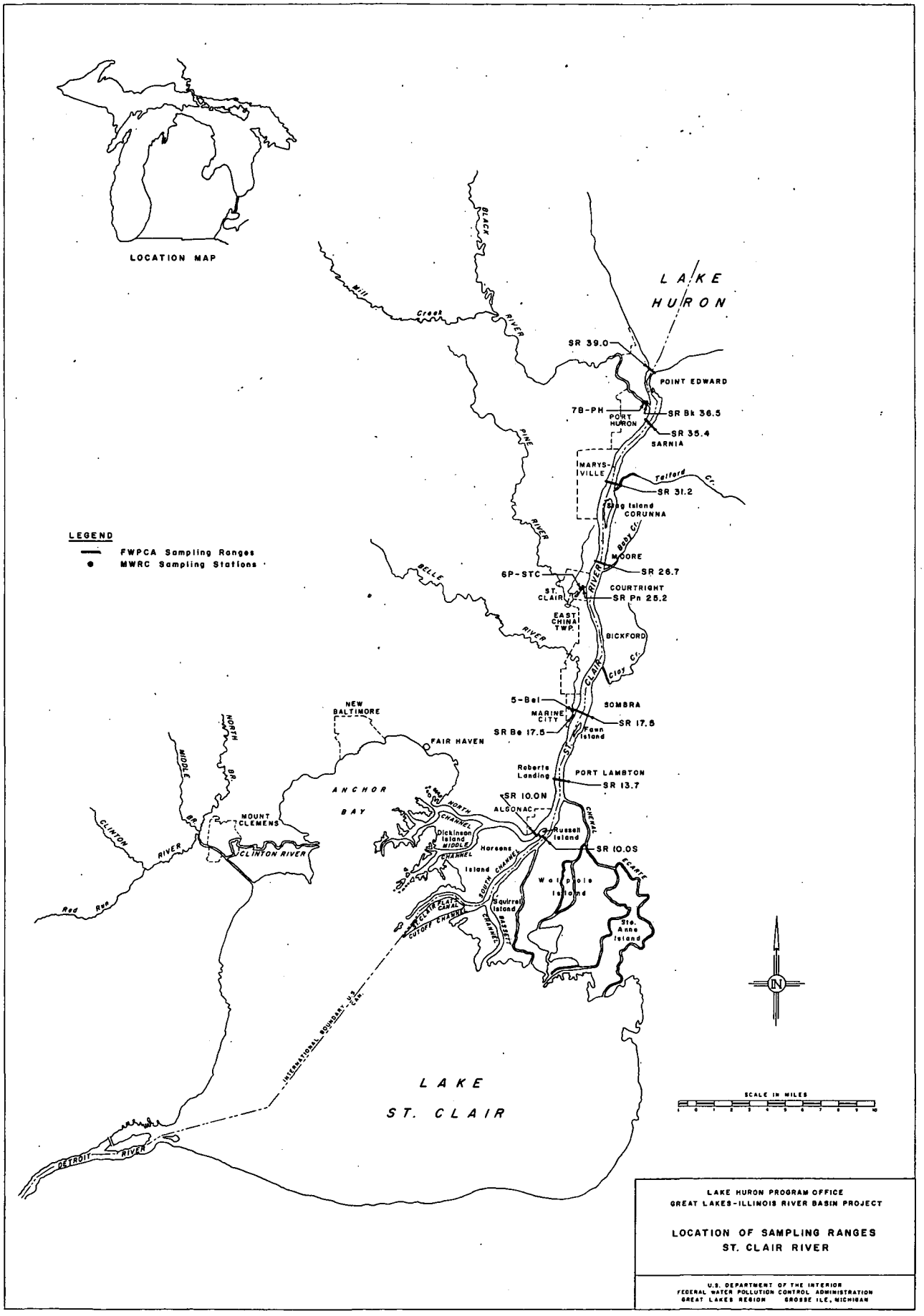
LOCATION MAP
LEGEND
FWPCA Sampling Ranges
MWRC Sampling Stations
LAKE HURON
BLACK RIVER
Mill Creek
PINE RIVER
BELLE RIVER
SR 39.0
POINT EDWARD
7B-PH
PORT HURON
SR Bk 36.5
SR 35.4
SARNIA
MARYS-VILLE
Talfors Cr.
SR 31.2
Stag Island
CORUNNA
Bear Cr.
MOORE
SR 26.7
6P-STC
ST. CLAIR
COURTRIGHT
SR Pn 25.2
EAST CHINA TWP.
BICKFORD
Clay Cr.
ST. CLAIR RIVER
5-Bel
SOMBRA
MARINE CITY
SR 17.5
SR Be 17.5
Fawn Island
NEW BALTIMORE
FAIR HAVEN
Roberts Landing
PORT LAMBTON
SR 13.7
SR 10.0N
ALGONAC
ANCHOR BAY
NORTH CHANNEL
Dickinson Island
MIDDLE CHANNEL
Russell Island
CENTRAL CHANNEL
Horsens Island
SR 10.0S
SOUTH CHANNEL
Walpole Island
ST. CLAIR RIVER
Squirrel Island
CUTOFF CHANNEL
BASSETT CHANNEL
Ste. Anne Island
MIDDLE BR.
NORTH BR.
CLINTON RIVER
MOUNT CLEMENS
Red Run
INTERNATIONAL BOUNDARY
LAKE ST. CLAIR
DETROIT RIVER
N
SCALE IN MILES
LAKE HURON PROGRAM OFFICE
GREAT LAKES-ILLINOIS RIVER BASIN PROJECT
LOCATION OF SAMPLING RANGES
ST. CLAIR RIVER
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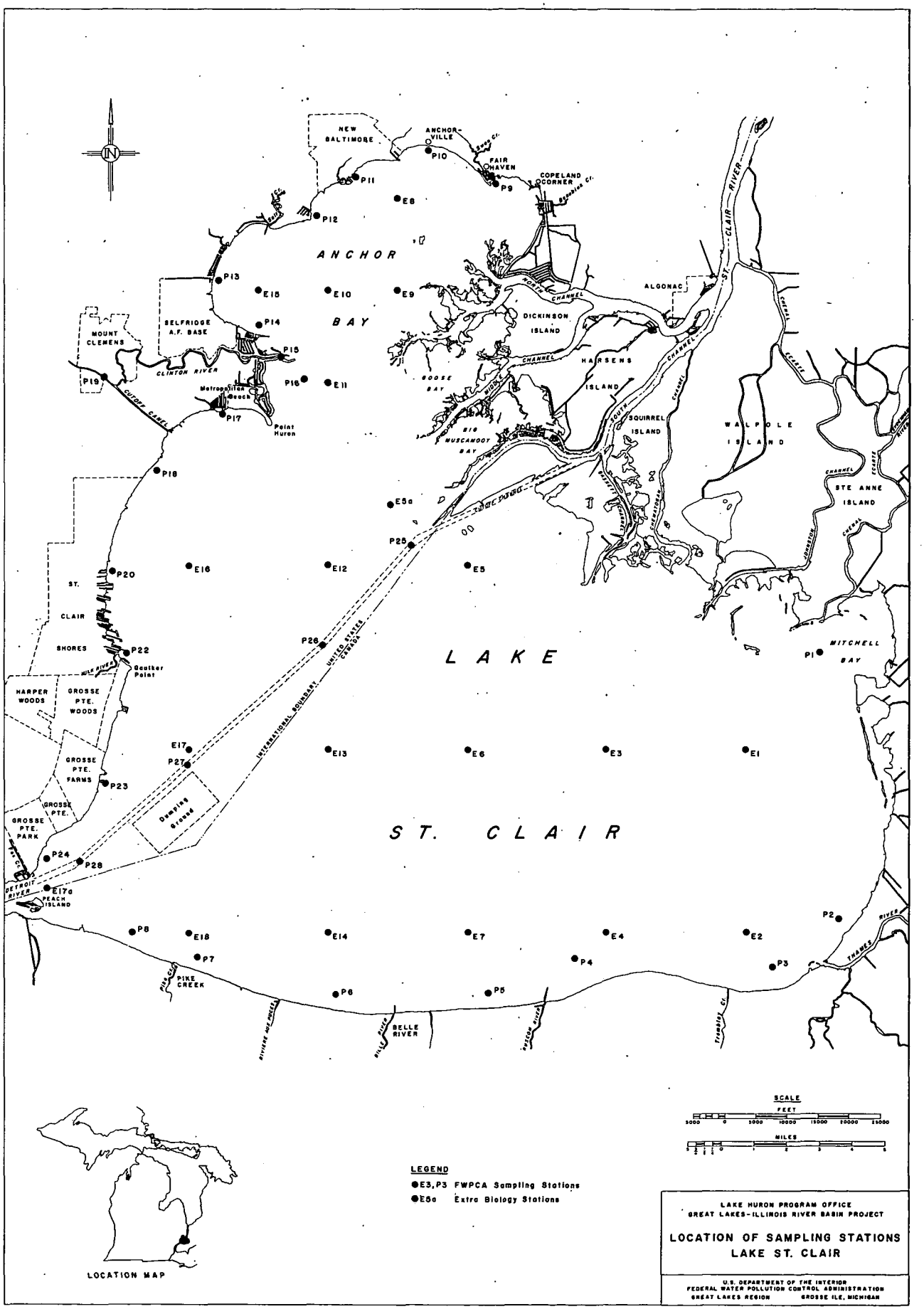
FIGURE 2



LAKE HURON PROGRAM OFFICE
GREAT LAKES-ILLINOIS RIVER BASIN PROJECT

LOCATION OF SAMPLING STATIONS LAKE ST. CLAIR

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GREAT LAKES REGION GROSSE ILE, MICHIGAN

easterly to Port Huron and the St. Clair River.

The Pine River has a drainage area of 170* square miles, and an average discharge of 97(2) cfs. It empties into the St. Clair River at St. Clair, Michigan.

The Belle River empties into the St. Clair River at Marine City, Michigan. It has a drainage area of 190* square miles, and an average discharge of 108(2) cfs.

Talford Creek, in Ontario, Canada, has a drainage area of 21* square miles, and an average flow of 12(2) cfs. It empties into the St. Clair River about 2 miles north of Corunna, Ontario.

Baby Creek in Ontario discharges into the St. Clair River about 1/2 mile south of Moore, Ontario. It has an average flow of 4(3) cfs, and a drainage area of 11.5* square miles.

Clay Creek, in Ontario, has an average flow of 5(3) cfs, and a drainage area of 14* square miles. It empties into the St. Clair River 1-1/2 miles south of Bickford, Ontario.

Navigation

The St. Clair River is the navigation route to the St. Lawrence Seaway from the upper Great Lakes. This channel has been improved by the United States at various locations along the river to provide a minimum depth of 27.1 feet for both upbound and downbound traffic. There is a single deep channel at the St. Clair Cutoff Channel.

Point Edward, Ontario, is located at the head of the St. Clair River.

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(2) Estimated by comparison with drainage area of North Branch Clinton River near Mt. Clemens, Michigan.
(3) Estimated by comparison with drainage area of East Branch Coon Creek at Armada, Michigan.

There is a maintained channel with a depth of 21 feet along the front of the docks in Point Edward.

Sarnia, Ontario is a city near the head of the St. Clair River opposite Port Huron. There is a channel from the river to the wharves, 2,400 feet long, with a controlling depth of 18 feet.

Port Huron is located on the Michigan side of the river at its head. In this area, the full width of the St. Clair River is available for navigation by both upbound and downbound traffic. The river has a controlling depth of 27.4 feet over a width of 800 feet. The Black River empties into the St. Clair River at Port Huron. In the Black River there is a channel from its mouth to the Grand Trunk Western Railroad bridge. This channel has a length of 8,200 feet, and a width that varies from 160 feet at the mouth to 75 feet at its upper end. Upstream from the railroad bridge, the channel is 75 feet wide for 2,300 feet. In the first channel, there is a least depth of 14 feet from the mouth, 4,900 feet upstream. From this point, the depth decreases to 11 feet at the end of the second channel. Above the dredged portion the Black River is navigable for small boats only.

Stag Island is an island in the St. Clair River approximately 2 miles long. It is located just south of Marysville, Michigan in Canadian waters. The main channel, used by all river traffic, is west of Stag Island, and has a minimum width of 1,000 feet and a controlling depth of 27.4 feet. The Canadian channel is a non-maintained channel to the east of Stag Island. In 1950 there was a minimum width of 500 feet and a depth of 21 feet in the Canadian channel.

There are two channels in the St. Clair River from opposite Moore, Ontario to below the mouth of the Pine River in St. Clair, Michigan. The

channel that is used for river traffic is the western one. This channel has a minimum width of 1,000 feet, and a minimum depth of 27.3 feet. The Canadian Channel is a non-maintained channel on the east side of the river. It had a minimum depth of 24 feet and a minimum width of 400 feet.

Courtright, Ontario is a village on the Canadian Channel opposite St. Clair, Michigan. There are depths of 15 to 20 feet along its wharves.

Moore, Ontario is a village on the north end of the Canadian Channel, 1-1/2 miles above Courtright. There is a depth of 12 feet at the end of the wharf in Moore.

The Pine River empties into the St. Clair River near the south end of St. Clair, Michigan. There is a channel in the Pine River from the mouth, upstream for 2,500 feet. It was dredged 100 feet wide and 13 feet deep. There is then an additional length of 3,300 feet. This section of channel was dredged 75 feet wide and 11 feet deep. A survey taken in 1944 showed the controlling depth to be 9 feet for a distance of 3,000 feet above the mouth. From there the depth gradually decreased to 3 feet at a point 10,000 feet above the mouth.

Wood Tick Island is an island about 1/2 mile long. It is located just south of Marine City, Michigan, and is completely in the Canadian portion of the St. Clair River. The channel passing on the west side of the island has a width of 1,000 feet and a controlling depth of 27.2 feet. The channel to the east of Wood Tick Island has a width of at least 400 feet and a depth of 18 feet. It is used less frequently than the main channel.

Sombra, Ontario is a small village on the east channel of the St. Clair River, and opposite Marine City, Michigan. In this village there is

a public wharf that is used as a refuge for small boats drawing less than 4 feet of water.

The Belle River empties into the St. Clair River near the south end of Marine City, Michigan. This river is used as a winter harbor for medium-sized vessels. A channel was dredged for a distance of 5,400 feet. In 1957, the controlling depth was 7 feet for the first 2,500 feet. This depth increased to 5 feet at the end of the remaining 2,900 feet.

Port Lambton, Ontario is a village on the east side of the St. Clair River, about one mile north of the Chenal Ecarte. There are two wharves in the village. One has a depth of 20 feet and the other has a depth of 9 feet along the river face.

Roberts Landing, Michigan is on the west side of the river. From 2,000 feet above to 4,000 feet below Roberts Landing, the river has been dredged to a depth of 27.2 feet.

Algonac, Michigan is a village opposite Russell Island in the St. Clair River. It has docks with 12 to 15 feet of water. At Algonac the river divides into two parts. North Channel turns west and South Channel continues southwest.

South Channel is the main channel for river traffic. It has a length of about 6-1/4 miles and a minimum depth of 27.1 feet. It has a minimum width of 700 feet at the Southeast Bend section, and elsewhere a minimum width of 1,000 feet.

The St. Clair Cutoff Channel runs from the South Channel at the head of the Bassett Channel to its junction with the Lake St. Clair Ship Channel. It is a straight channel, 27,700 feet long and 700 feet wide, with a controlling depth of 27.1 feet.

Lake St. Clair

Lake St. Clair is a shallow, heart-shaped body of water about 25 miles long and 25 miles wide (Figure 2). It is a ponded area in the river, part of a strait between Lake Huron and Lake Erie. The upper part of the strait is the St. Clair River, which flows out of Lake Huron and into the northern part of Lake St. Clair. The Detroit River is the lower end of the strait and flows from the southwestern tip of Lake St. Clair to Lake Erie. The entire drainage from the upper Great Lakes - Superior, Michigan, and Huron - flows through the St. Clair River, Lake St. Clair, and the Detroit River with an average annual flow of 178,000 cfs.

Lake St. Clair has a surface area of 490 square miles, and a drainage area of 5,000 square miles, exclusive of the upper Great Lakes and the St. Clair River drainage areas.

The lake is a shallow saucer-shaped basin with gently sloping bottom, having a maximum natural depth of 21 feet, and a dredged channel for navigation running diagonally across the lake from the mouth of the St. Clair River to the head of the Detroit River at a depth of 27 feet below datum (571.7 feet above sea leavel, IGLD*).

The northeast and east shorelines of Lake St. Clair are predominantly marshland. An extensive delta of marshland and shallow water with low profile islands throughout has been formed at the mouth of the St. Clair River. This delta extends six miles into Lake St. Clair, and is traversed by the five main channels, into which the St. Clair River divides as it enters the delta area.

The level of the lake varies seasonally, with summer maximum levels

*International Great Lakes Datum. Mean water level of Gulf of St. Lawrence at Fathers Point, Quebec.

averaging 1.8 feet higher than winter levels. This is a result of seasonal variance in runoff from the drainage basin of the upper lakes. Superimposed on the annual fluctuation is a change in the general range of levels from a low 569.86 feet IGLD in June 1936 to a high of 575.70 feet above sea level IGLD in July 1952. Temporary fluctuations in level of varying amounts up to several feet are caused by wind action, sudden barometric changes, or ice jams in the St. Clair River which reduced the major source of supply to the lake. Occasional level changes result from changes in Lake Erie level, which cause a reduction of Detroit River flow and raising of Lake St. Clair levels. Such reactions are rare and very temporary in their effects on Lake St. Clair.

Lake levels during 1964 (the period of the survey) were at record lows throughout the Great Lakes. Lake Erie was 1 to 1-1/2 feet below average, and Lake Michigan-Huron was about 3 feet below average. The level of Lake St. Clair was approximately 2 feet below the long-term average during this time. Flow in the St. Clair River during 1964 averaged 153,000 cfs, which is 25,000 cfs below the all-time average of 178,000 cfs for 65 years of record.

Although the levels and flow were lower than average, no major effects on the hydraulic characteristics of the lake were noted.

Retention time in Lake St. Clair, using average flow and average levels, is computed as approximately eight days. This, of course, would vary under field conditions because of current movements, eddies, and recirculation, particularly in the eastern half of the lake due to the natural configuration of the bottom and shoreline. It does indicate, however, that the flushing interval is very short.

Currents in Lake St. Clair are predominantly north to south because of the overwhelming influence of the flow-through of the St. Clair-Detroit River system. The flow distribution of 68 percent through the main channels to the main body of the lake, and 32 percent into Anchor Bay, sets the general flow pattern of Lake St. Clair. These currents are modified and influenced by wind friction on open areas of the lake, particularly the eastern half of the lake.

During the months of June through October, the most frequent winds are from the south and southwest. From November through March, winds from the southwest to northwest are the most frequent.

Winds from the west through north quadrants (Figure 3) were observed to result in a generally southerly current in the center part of the lake from the Anchor Bay area and St. Clair Cutoff Channel. These currents moved near the south shore in the vicinity of Belle River, then swung westerly along the shore toward the Detroit River.

In Anchor Bay, counter-clockwise movements were observed from the mouth of the North Channel swinging to a southerly flow past the mouth of the Clinton River into the main body of the lake.

Water was observed to move southerly along the Michigan shore from about Milk River to the Detroit River.

Irregular and slowly moving currents were observed in the area near the Clinton River cutoff and throughout the eastern part of the lake. This would seem to indicate upwelling or sinking in these areas as shown on Figure 3.

Winds from the south through west quadrant, Figure 4 , gave essentially the same results as the northwest quadrant, with the exception of an

indication of a counter-clockwise current in the bay, south and west of Point Huron. However, insufficient observations were made in the eastern part of the lake to draw conclusions for this wind condition.

Insufficient data were available to determine currents for the winds from the north through east, and east through south quadrants.

In the shallow parts of the lake, currents may reverse and large eddies may form under all wind conditions. These eddies and reversed currents may cover large areas of the lake, but since they occur in the shallow areas, relatively small volumes of water are affected.

Under normal conditions, approximately 48 percent of the water about to enter the Detroit River from Lake St. Clair is in the Canadian part of the lake.

Besides the St. Clair River, there are numerous small rivers and streams that flow into Lake St. Clair (Figure 5).

Beaubien Creek has a drainage area of about 24* square miles. It has an average flow of approximately 14(1) cfs, and discharges into Anchor Bay about 1 mile south of Copeland Corner.

Swan Creek has a drainage area of about 25* square miles. It has an average flow of approximately 14(1) cfs and empties into Anchor Bay at Fair Haven.

Salt Creek has a drainage area of 29* square miles. It has an average flow of approximately 17(1) cfs and discharges into Anchor Bay about 3 miles southwest of New Baltimore.

The Clinton River has a drainage area of approximately 740 square miles. It has had a mean flow of 484 cfs for the 29 years of record, 1935 to 1963.

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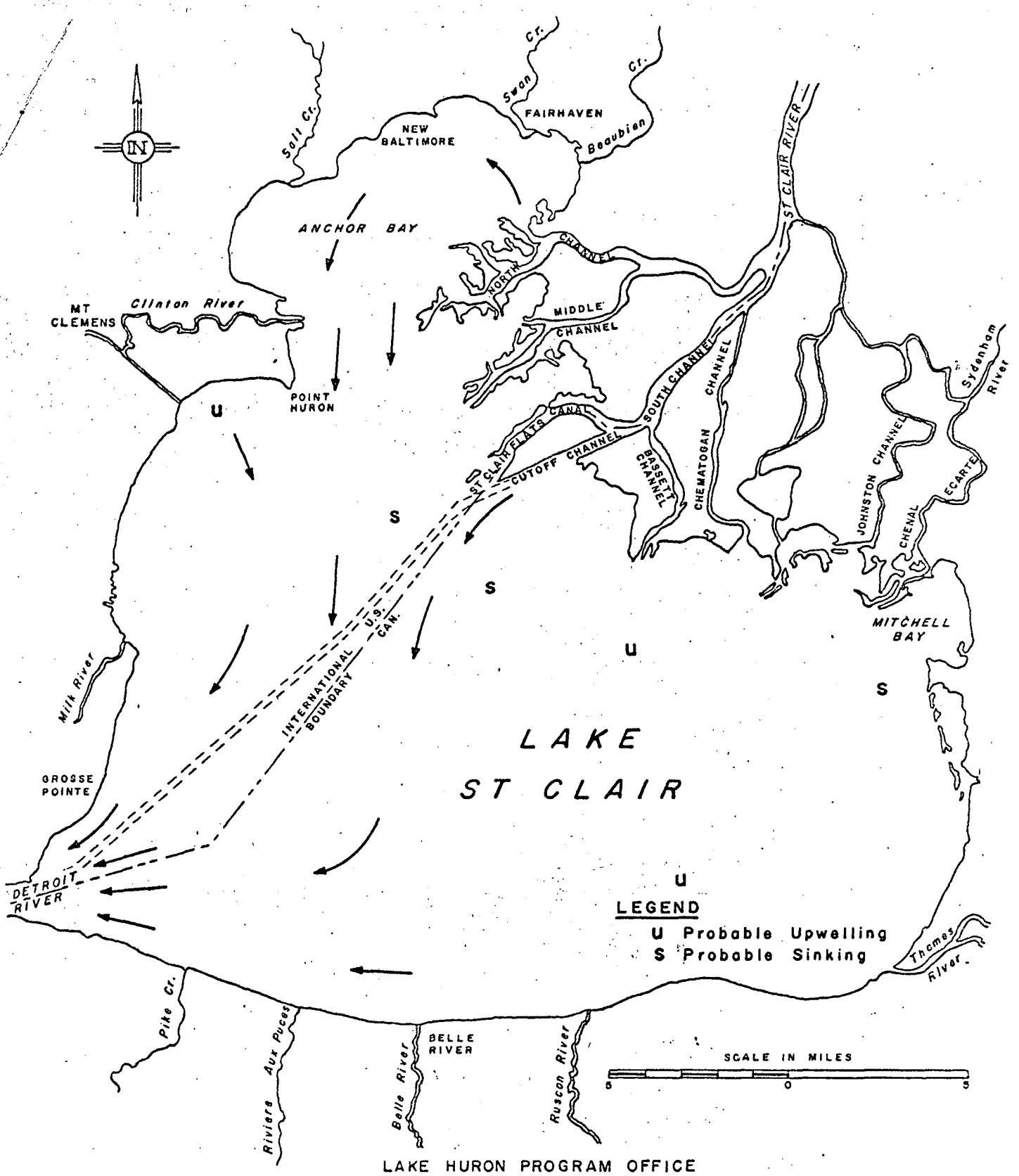
*Estimated

(1) Computed by ratio of drainage areas with North Branch Clinton River.

FIGURE 3

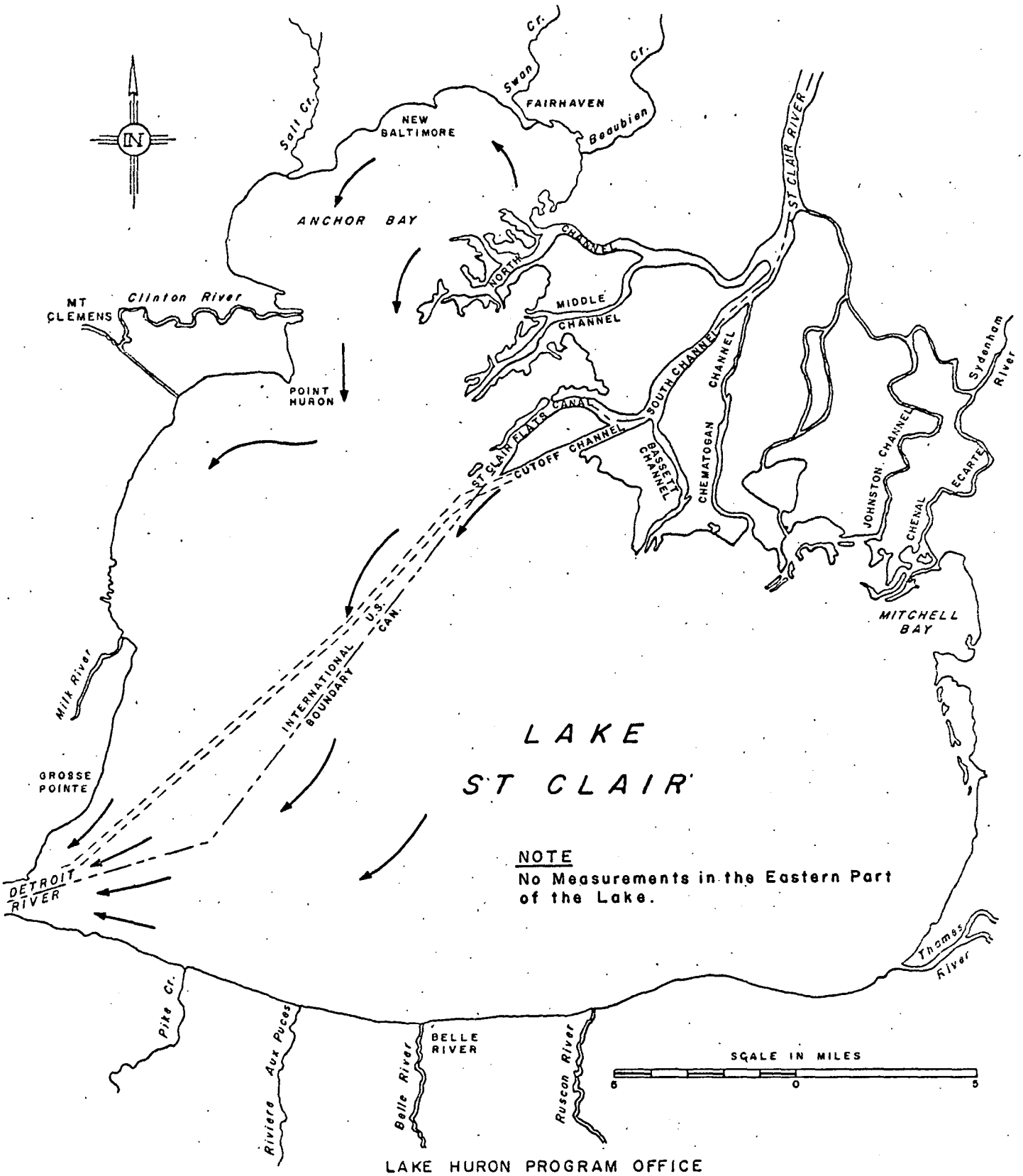


LAKE HURON PROGRAM OFFICE
GREAT LAKES-ILLINOIS RIVER BASIN PROJECT

RESULTS OF S.V. CURRENT MEASUREMENTS FOR NW QUADRANT WINDS

U.S. DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V GROSSE ILE, MICHIGAN

FIGURE 4



LAKE HURON PROGRAM OFFICE
GREAT LAKES-ILLINOIS RIVER BASIN PROJECT

RESULTS OF S.V. CURRENT MEASUREMENTS FOR SW QUADRANT WINDS

U.S. DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V GROSSE ILE, MICHIGAN

It discharges into the west side of Anchor Bay about two miles north of Point Huron.

Pike Creek in Ontario has a drainage area of about 35* square miles. It has an average flow of approximately 20(1) cfs. It empties into Lake St. Clair at Pike Creek, Ontario about 10 miles east of Windsor.

Riviere Aux Puces, Ontario has a drainage of approximately 23* square miles. It has an average flow of approximately 13(1) cfs. It empties into the lake near Puce, Ontario, about 13-1/2 miles east of Windsor.

The Belle River in Ontario has a drainage area of about 40* square miles. It has an average flow of approximately 23(1) cfs. It discharges into Lake St. Clair at Belle River, Ontario, about 17 miles east of Windsor.

The Ruscon River in Ontario has a drainage area of about 67* square miles. It has an average flow of approximately 38(1) cfs, and discharges into the lake about 5 miles east of Belle River, Ontario.

The Thames River in Ontario has a drainage area of about 2,200 square miles. It has a flow of approximately 2,100(2) cfs. It discharges into the extreme southeastern corner of Lake St. Clair.

The Sydenham River has a drainage area of approximately 1,140* square miles. It has an average flow of about 1,000(3) cfs and discharges into the Chenal Ecarte in Ontario.

Navigation

The chief importance of Lake St. Clair is that it forms a connecting link between Lake Huron and Lake Erie. There is a navigation channel across the lake from the end of the Cutoff Channel of the St. Clair River to the

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*Estimated
(1) Computed by ratio of drainage areas with North Branch Clinton River.
(2) Computed by ratio of drainage areas with Thames River near Thamesville.
(3) Computed by ratio of drainage areas with Sydenham River at Alvinston.

head of the Detroit River. This Lake St. Clair Ship Channel is 27 feet deep (based on a low water datum of 571.7 feet above Father Point, Quebec), has a minimum width of 700 feet at its upper end, and a width of 800 feet as it crosses the lake.

The St. Clair Flats Canal is a non-maintained channel between the outlet of the South Channel of the St. Clair River and the Lake St. Clair Ship Channel. It is 25 feet deep, 700 feet wide, and 7,200 feet long.

The Lake St. Clair dumping ground runs parallel to the lower end of the Lake St. Clair Ship Channel, and is 900 feet southeast of it. It is 2-1/2 miles long and 1-1/4 miles wide. Because of the existence of shoals above a depth of 8 feet, navigation in this area is considered unsafe.

The Grosse Pointe area of Michigan is located on the western shore of Lake St. Clair, from the head of the Detroit River to about 10 miles north. In this area there are a number of piers that extend into the lake for a distance of from 600 to 1,800 feet. These piers are in water that is 6 to 10 feet deep.

The Milk River is a small river that empties into the lake under the Jefferson Avenue bridge at Gaulker Point. Gates have been installed downstream from the bridge to control the upstream water level during periods of high lake level. The section of the river below the gates is developed for the use of small boats.

Anchor Bay is the northwest arm of the lake. The North Channel of the St. Clair River flows into this bay. The maximum depth in Anchor Bay is about 11 feet in the central area. The bay is separated from the rest of the lake by a bank with a maximum depth of 8 to 9 feet.

New Baltimore and Fair Haven are villages on the north shore of Anchor

Bay. New Baltimore has docks in six feet of water, whereas in the Fair Haven area there are a series of dredged canals. Swan Creek empties into the Fair Haven area of the bay.

Salt Creek empties into Anchor Bay about three miles southwest of New Baltimore. A small boat harbor exists in the mouth of this stream, with a controlled depth of three to four feet.

The Clinton River empties into the west side of Anchor Bay approximately two miles north of Point Huron. A minimum depth of five feet exists in the river from the mouth upstream for three miles.

Pike Creek is located on the south shore of the lake. It has an entrance channel that is 40 feet wide and 5 feet deep.

Riviere Aux Puces is located on the south shore of the lake about 3-1/2 miles east of Pike Creek. There are parallel steel sheet pile training walls approximately 80 feet apart at the mouth, and extending 200 feet into the lake. These walls afford some protection for small boats. This entrance channel has a depth of 5 feet.

The Belle River enters the lake at the Village of Belle River on the south shore of the lake about 17 miles east of Windsor. There is a channel 60 feet wide and 6 feet deep extending into the lake for approximately 1,400 feet.

The Thames River empties into the southeast corner of Lake St. Clair. From the river mouth there is a channel that extends 7,900 feet into the lake. It is 100 feet wide and has a depth of 6 feet. There is a channel 7 feet deep in the river that is used to reach Chatham, 19-1/2 miles upstream from the river mouth. From Chatham to Louisville, a distance of 7 miles, there is a depth of 5 feet in the river.

Mitchell Bay is located in the northeast corner of the lake. There is

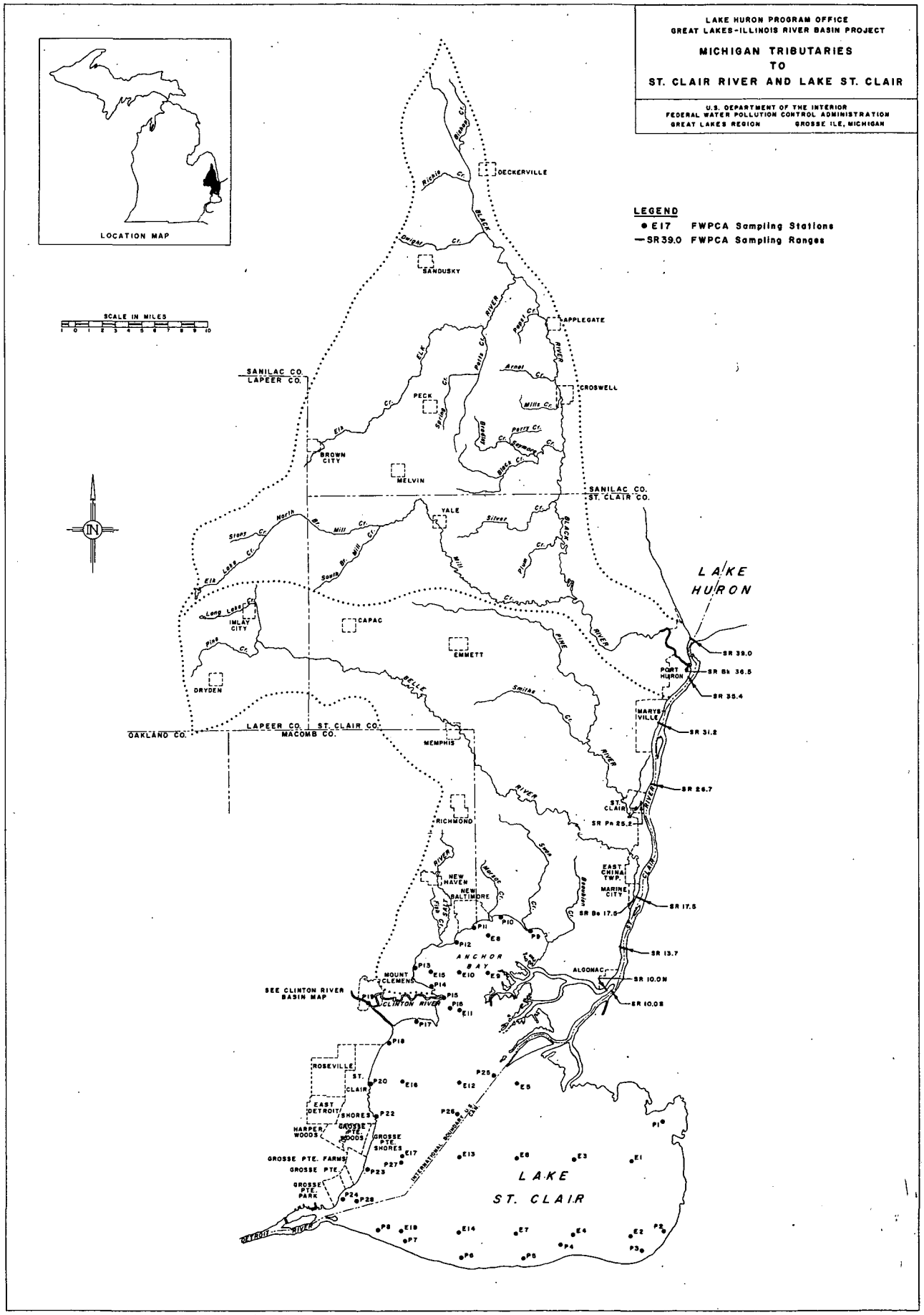
a 1,500 foot channel, 50 feet wide and 4 feet deep, extending southwest from Mitchell Bay into the lake. From this channel there is a 3 foot deep dredged channel that leads to Chenal Ecarte.

Climate

The climate of the St. Clair River-Lake St. Clair Basin is subject to considerable variation due to storms sweeping across the lake regions. The Great Lakes, however, exert a stabilizing effect by cooling the air masses in the summer and warming the winter air.

Records from the U.S. Weather Bureau indicate that extreme temperatures are very infrequent occurrences. Temperatures of 100°F or more occur about once in every four years, and sub-zero temperature occurs four days in the average winter. The mean annual temperature of Detroit is 41.9°F, with an average annual precipitation of 31.49 inches. Approximately 25 percent of this total precipitation is runoff to streams. The prevailing winds are from the southwest with an average velocity of 10 to 12 miles per hour (mph).

FIGURE 5


LAKE HURON PROGRAM OFFICE
GREAT LAKES-ILLINOIS RIVER BASIN PROJECT
MICHIGAN TRIBUTARIES
TO
ST. CLAIR RIVER AND LAKE ST. CLAIR
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION GROSSE ILE, MICHIGAN
LOCATION MAP
SCALE IN MILES
LEGEND
E17 FWPCA Sampling Stations
SR39.0 FWPCA Sampling Ranges
LAKE HURON
LAKE ST. CLAIR
DECKERVILLE
SANDUSKY
APPLEGATE
CROSWELL
PECK
BROWN CITY
MELVIN
YALE
SANILAC CO.
LAPEER CO.
ST. CLAIR CO.
CAPAC
IMLAY CITY
EMMETT
DRYDEN
PORT HURON
MARYSVILLE
MEMPHIS
OAKLAND CO.
MACOMB CO.
RICHMOND
ST. CLAIR
NEW HAVEN
NEW BALTIMORE
EAST CHINA TWP.
MARINE CITY
ANCHOR BAY
MOUNT CLEMENS
ALGONAC
SEE CLINTON RIVER BASIN MAP
CLINTON RIVER
ROSEVILLE
EAST DETROIT
HARPER WOODS
GROSSE PTE. WOODS
GROSSE PTE. SHORES
GROSSE PTE. FARMS
GROSSE PTE.
GROSSE PTE. PARK
INTERNATIONAL BOUNDARY
DETROIT RIVER
SR 39.0
SR Bk 36.5
SR 35.4
SR 31.2
SR 26.7
SR Pa 25.2
SR 17.5
SR Be 17.0
SR 13.7
SR 10.0N
SR 10.0S

WATER USE
(U.S. Drainage Basin)

Municipal Water Supply

There are approximately 81,000 people served by public water in the Lake St. Clair-St. Clair River Basin. The St. Clair River is the major source of water for these people. Port Huron supplies about one-half of the public water demands in the basin.

The populations served in 1990 and 2020 are expected to be 150,000 and 250,000, respectively. Projected water use for these years is shown in Table 2. Table 3 lists the public water supplies and their sources.

Industrial Water Use

There are numerous industries in the basin that use water directly from surface sources. The quantity of water used by them and their projected use is shown in Table 2. The Projected figures include water for new industries which are anticipated to develop in the future.

Water-related Recreation

The Lake St. Clair-St. Clair River Basin has numerous facilities for recreational activities, such as the St. Clair Flats State Game Area, Port Huron State Game Area, and Algonac State Park. Lake St. Clair is a popular boating lake which offers good fishing and duck hunting for the sportsman. This lake is protected by law from commercial fishing.

In 1965, residents of the area registered an estimated 7,000 boats of various sizes. Recreational activities in the basin include swimming, boating, fishing, skiing, camping, hunting, and picnicking.

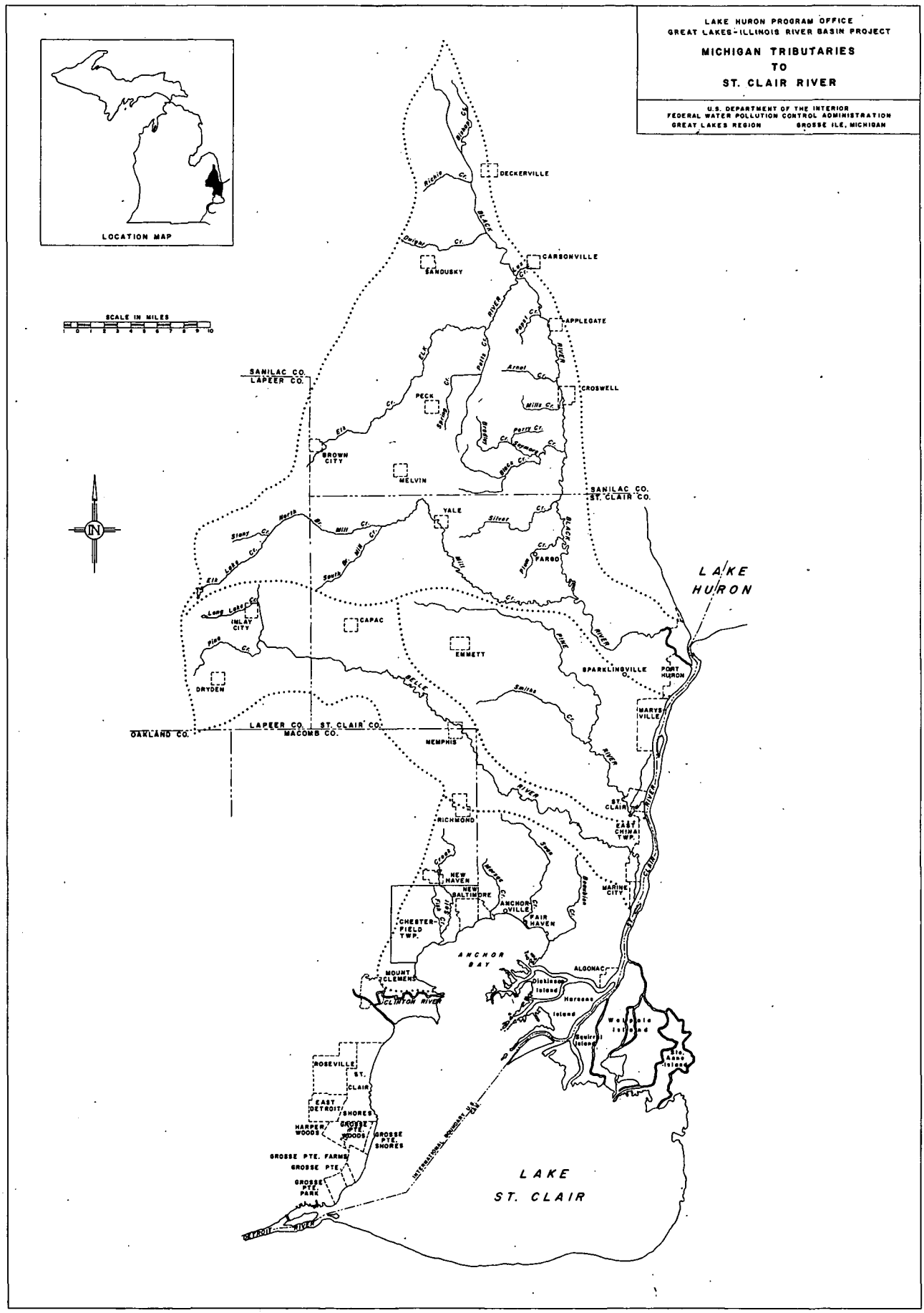
TABLE 2. PROJECTED WATER USE (MGD)**

	1965	1990	2020
Municipal*	17	31	45
Industrial	24	43	58
Total	41	74	103

*Includes water for small industries.

**Tributaries shown on Figure 6.

FIGURE 6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GREAT LAKES-ILLINOIS RIVER BASIN PROJECT
MICHIGAN TRIBUTARIES
TO
ST. CLAIR RIVER
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION
GROSSE ILE, MICHIGAN
LOCATION MAP
SCALE IN MILES
0 1 2 3 4 5 6 7 8 9 10
N
DECKERVILLE
CARSONVILLE
SANDUSKY
APPLEGATE
CROSWELL
PECK
BROWN CITY
MELVIN
YALE
FARGO
SANILAC CO.
LAPEER CO.
SANILAC CO.
ST. CLAIR CO.
LAKE HURON
CAPAC
INLAY CITY
DRYDEN
EMMETT
SPARKLINGVILLE
PORT HURON
MARYSVILLE
OAKLAND CO.
LAPEER CO.
ST. CLAIR CO.
MACOMB CO.
MEMPHIS
RICHMOND
ST. CLAIR
EAST CHINA TWP.
NEW HAVEN
NEW BALTIMORE
ANCHORVILLE
FAIR HAVEN
MARINE CITY
CHESTERFIELD TWP.
ANCHOR BAY
MOUNT CLEMENS
CLINTON RIVER
ALGONAC
Dickinson Island
Harsens Island
Walpole Island
Squirrel Island
Ste. Anne Island
ROSEVILLE
ST. CLAIR SHORES
EAST DETROIT
HARPER WOODS
GROSSE PTE. WOODS
GROSSE PTE. SHORES
GROSSE PTE. FARMS
GROSSE PTE.
GROSSE PTE. PARK
DETROIT RIVER
INTERNATIONAL BOUNDARY
LAKE ST. CLAIR

TABLE 3. MUNICIPAL WATER SUPPLIES*
Lake St. Clair-Clair River Basin

Town	1960 Pop.	Owner**	Source	Treatment**
Marine City	4,404	M	St. Clair River 200'-14" intake in 38' of water	1
Memphis	800	M	Wells in drift 78' to 87' deep	-
Dryden	476	M	Wells in drift 96' deep	-
Imlay City	1,654	M	Wells in drift 44' deep	5
Capac	1,235	M	Wells in drift 160' deep	-
Algonac	3,190	M	St. Clair River 125'-16" intake in 39' water	1 & 6
New Baltimore	2,043	M	Lake St. Clair 1700' of 12" intake 7' deep & 1750' of 20" intake 7' deep	1
New Haven	1,200	M	Wells in drift 25' & 44' deep	-
Richmond	2,025	M	Wells in drift 125' to 251' deep	-
Chesterfield Twp.	1,000	T	Water from New Baltimore	-
Fairhaven	2,000	T	Anchor Bay 1275'-12" intake in 14' water	1
Colony Assoc.	1,500	P	Anchor Bay 20'-10" intake in 12' of water	5
Old Club - Harsens Island	250	P	St. Clair River 30'-3" intake in 15' of water	5
Deckerville	798	M	Wells in drift 21' deep	5
Sandusky	2,066	M	Wells in rock 140' to 190' deep	-
Carsonville	502	M	Wells in rock 150' deep	-

*Taken from "Data on Public Water Supplies in Michigan," Engineering Bulletin No. 4 by the Michigan Department of Public Health.
**See Owner and Treatment Code, page 29.

TABLE 3 . MUNICIPAL WATER SUPPLIES* (cont.)
Lake St. Clair-Clair River Basin

Town	1960 Pop.	Owner**	Source	Treatment**
Croswell	1,817	M	Wells in drift 82' to 96' deep	4
Peck	548	M	Wells in rock 170' deep & in drift 70' deep	-
Brown City	993	M	Wells in rock 330' deep	-
Yale	1,621	M	Wells in drift 56' to 181' deep	6
Port Huron	36,084	M	St.Clair River 100'-36" intake in 40' of water	1
Marysville	4,065	M	St.Clair River 550'-24" intake in 28' water	1 & 6
St. Clair	4,538	M	St.Clair River 1000'-16" intake in 30' water	1 & 6
Sparlingville Nelson Sub	350	P	Wells in drift	
Sparlingville Witzke Sub	350	P	Wells in drift	

*Taken from "Data on Public Water Supplies in Michigan," Engineering Bulletin No. 4 by the Michigan Department of Public Health.
**See Owner and Treatment Code, page 29.

OWNER AND TREATMENT CODES

Owner Code:

M = City or Village
T = Township
P = Private
D = District
C = County
S = State
U.S. = Federal

Treatment Code:

1. Std. Filtration*
2. Lime softening**
3. Zeolite softening
4. Iron Removal
5. Chlorination
6. Fluoridation

* Implies at least chlorination, chemical coagulation, and rapid sand filtration.

**Lime softening includes filtration.

SOURCES AND CHARACTERISTICS OF WASTES

Municipal

This report will include only the American sources of wastes. The basin covers the land section that drains into the lake and river that are shown on Figure 6.

There are 16 sources of municipal wastes in the basin which have a combined 1965 flow of approximately 16 million gallons per day (MGD). The population served by these plants is about 70,000, and this figure has been projected to be 250,000 by the year 2020. Municipal waste flow at that time is estimated to be 40 MGD.

Waste constituents that are discharged by municipal waste treatment plants in the basin are listed in Table 4.

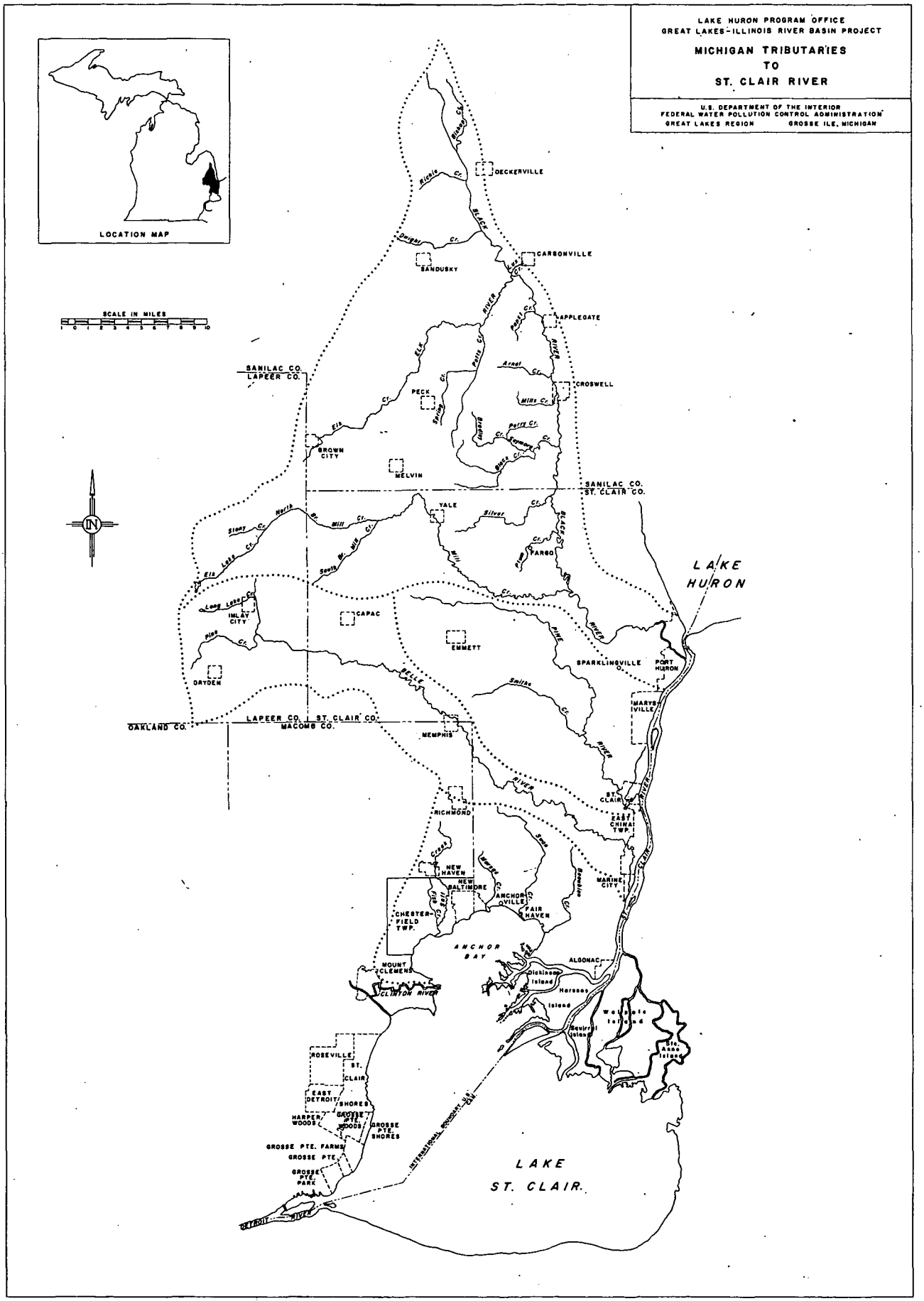
Figure 7 shows the location of cities and towns of the basin.

Municipal waste discharges were chlorinated at least from May 15 to September 15 as was required by the Michigan Department of Public Health. A Health Department order, effective January 1967, requires municipalities to chlorinate throughout the year. The information in this section is based on the 1965 operating records of the individual plants furnished the Michigan Department of Public Health.

Marine City Sewage Treatment Plant - 1965

This primary plant serves about 4,800 people. The 1965 average flow of 0.65 MGD had approximately 50 percent of the BOD_5 removed by the plant. Effluent BOD_5 averaged 47 milligrams per liter (mg/l) with variations between 34 and 68 mg/l. The effluent is chlorinated continuously throughout the year.

FIGURE 7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MICHIGAN TRIBUTARIES
TO
ST. CLAIR RIVER
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION
GROSSE ILE, MICHIGAN
LOCATION MAP
SCALE IN MILES
1 0 1 2 3 4 5 6 7 8 9 10
N
DECKERVILLE
CARSONVILLE
SANDUSKY
LAPPLEGATE
CROSWELL
PECK
BROWN CITY
MELVIN
SANILAC CO.
LAPEER CO.
SANILAC CO.
ST. CLAIR CO.
YALE
FARGO
LAKE HURON
IMLAY CITY
CAPAC
EMMETT
SPARKLINGVILLE
PORT HURON
MARYSVILLE
DRYDEN
OAKLAND CO.
LAPEER CO.
ST. CLAIR CO.
MACOMB CO.
MEMPHIS
RICHMOND
ST. CLAIR
EAST CHINA TWP.
NEW HAVEN
NEW BALTIMORE
ANCHORVILLE
FAIR HAVEN
MARINE CITY
CHESTERFIELD TWP.
ANCHOR BAY
ALGONAC
MOUNT CLEMENS
CLINTON RIVER
Dickinson Island
Harsens Island
Walpole Island
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EAST DETROIT
HARPER WOODS
GROSSE PTE. WOODS
GROSSE PTE. SHORES
GROSSE PTE. FARMS
GROSSE PTE.
GROSSE PTE. PARK
INTERNATIONAL BOUNDARY
LAKE ST. CLAIR
DETROIT RIVER

Marysville Sewage Treatment Plant - 1965

Approximately 4000 people are served by this primary plant. About 50% of the BOD_5 was removed from the 1965 average flow of 1.14 MGD. BOD_5 values in the effluent varied during the year from 19 to 67 mg/l with an average of 44 mg/l. The effluent is chlorinated continuously throughout the year.

New Baltimore Sewage Treatment Plant - 1965

This trickling filter plant serves about 3200 people which contributed an average 1965 flow of 0.20 MGD. Effluent BOD_5 values range from 15 to 62 mg/l with an average value of 31 mg/l. BOD_5 removal was approximately 89%. The effluent is chlorinated the year-round.

New Haven Sewage Treatment Plant - 1965

About 1200 people are served by this trickling filter plant which had an average flow in 1965 of 0.14 MGD. Effluent BOD_5 values varied from 13 to 39 mg/l with an average of 28 mg/l. The effluent was chlorinated from May 15 to September 15 in 1965. A recent new Health Department order will require chlorination throughout the year.

Port Huron Sewage Treatment Plant - 1965

This primary plant is the largest plant in the basin serving about 38,000 people by treating an average flow of 11.7 MGD. The effluent BOD_5 of this plant averaged 49 mg/l in 1965 with very little variation. The effluent is chlorinated continuously throughout the year. BOD_5 removal for 1965 was around 45%.

Richmond Sewage Treatment Plant - 1965

This trickling filter plant serves about 3000 people which in 1965 contributed an average flow of 0.35 MGD. Effluent BOD_5 values varied from 16 to 35 mg/l during this period, with an average of 23 mg/l. BOD_5 removal was approximately 87%. The effluent was chlorinated from at least May 15 to September 15 in 1965. A recent Health Department order will require chlorination throughout the year.

St. Clair Sewage Treatment Plant - 1965

This primary plant serves about 5000 people which in 1965 contributed an average flow of 0.48 MGD. BOD_5 values varied from 20 to 75 mg/l during this period, with an average of 23 mg/l. BOD_5 removal was approximately 74% which is high for a primary plant. The effluent is chlorinated continuously throughout the year.

East China Township Sewage Treatment Plant - 1965

This primary plant had an average flow in 1965 of 0.07 MGD from a population served of approximately 1100. Effluent BOD_5 values varied from 37 to 93 mg/l with an average of 68 mg/l. BOD_5 removal is about 45%. The effluent is chlorinated throughout the year.

Croswell Sewage Treatment Plant - 1965

About 1000 people are served by this trickling filter plant which had an average flow in 1965 of 0.34 MGD. Effluent BOD_5 values during this period varied from 12 to 46 mg/l with an average value of 25 mg/l. BOD_5 removal is estimated to be about 85%. The effluent was chlorinated

from May 15 to September 15, in 1965. A recent Health Department order will require chlorination throughout the year.

Imlay City Sewage Treatment Plant - 1965

This trickling filter plant serves about 2000 people which contributed a wastewater flow in 1965 of 0.14 MGD. Effluent BOD_5 values during the year varied from 21 to 112 mg/l, with an average of 52 mg/l. The BOD_5 removal is estimated to be about 85%. The effluent was chlorinated from May 15 to September 15 in 1965. A recent Health Department order will require chlorination throughout the year.

Sandusky Sewage Treatment Plant - 1965

This trickling filter plant serves about 2000 people which contributed a wastewater flow in 1965 of 0.37 MGD. Effluent BOD_5 values during 1965 varied from 23 to 37 mg/l, with an average of 30 mg/l. BOD_5 removal is estimated to be 85%. The effluent was chlorinated at least from May 15 to September 15 in 1965. A Health Department order will require that the effluent be chlorinated throughout the year.

Memphis Sewage Treatment Plant - 1965

This town has a waste stabilization lagoon for treating the wastes of about 1000 people. The waste flow is estimated to be approximately 0.03 MGD. The effluent is controlled and is usually discharged late fall and early spring.

Yale Sewage Treatment Plant - 1965

The 1600 people served by this waste stabilization lagoon contributed an estimated flow in 1965 of 0.24 MGD. The effluent is controlled and is usually discharged in late fall and early spring.

Algonac - 1965

This town has about 500 people served by sewers, but the town has no treatment facilities. They have plans for a treatment plant which will probably be under construction by spring 1967.

Brown City Sewage Treatment Plant - 1965

A waste stabilization lagoon serves about 1000 people which contributes an estimated flow of 0.2 MGD. The effluent is controlled and is usually discharged in late fall and early spring.

Capac Sewage Treatment Plant - 1965

The 1200 people served by this waste stabilization lagoon contributed an estimated flow in 1965 of 0.1 MGD. The effluent is controlled and is usually discharged in late fall and early spring.

Industrial

The Lake St. Clair and St. Clair River Basin streams receive the direct discharge of approximately 24 MGD of industrial waste from 12 American industries. Canadian industrial wastes are not included in this report. Waste constituents include concentrated salt brine, toxic metals, soluble oil, fiber, BOD_5, and cooling water.

Not a constituent. material causing or producing BOD_5 is the constituent

Wastewater treatment is rated by the Michigan Water Resources Commission. The rating used in this report is by the Michigan Water Resources Commission as listed in their April 1, 1966 ratings.

Four industries in the basin discharge wastes to the Black River and one to the Elk River, a tributary to the Black River. The St. Clair River has 5 industries along its length. The 2 remaining plants are located on the Belle River.

Table 5 lists some of the chemical characteristics of the wastes. The municipalities in which the industries are located are shown in Figure 7.

Diamond Crystal Salt Company

Diamond Crystal Salt Company is located in St. Clair and discharges 7.2 MGD of cooling water to the St. Clair River. Every two weeks, approximately 25,000 gallons of concentrated brine is discharged to the St. Clair River. No treatment is provided and control is rated as adequate. Sanitary wastes are treated by the City of St. Clair.

Dunn Paper Company

Dunn Paper Company, located in Port Huron, discharges wastes from paper making operations through a submerged outfall in the St. Clair River. No flow or waste data are available. Control is provided by save-alls and is rated as adequate. Sanitary wastes are treated by the City of Port Huron.

Marysville Plating Company

Marysville Plating Company is located in Marysville and discharges 0.006 MGD from plating operations to the St. Clair River. Treatment consists of the removal of toxic metals by use of a still and is rated as adequate. Sanitary wastes are treated by the Marysville sewage treatment plant.

Midwest Machine Company of Indiana, Inc.

Midwest Machine Company of Indiana, Inc., located in Marysville, discharges wastewater from the manufacture of equipment to Bunce Creek, a tributary of the St. Clair River. Control is rated as adequate. Treatment is provided by the Marysville municipal sewage treatment plant for sanitary wastes.

Morton Salt Company

Morton Salt Company, located in Marysville, discharges 8 MGD of cooling water to the St.Clair River. Every two weeks approximately 25,000 gallons of concentrated brine is discharged to the St. Clair River. No treatment is provided and control is rated as adequate. Sanitary wastes are treated by the Marysville sewage treatment plant.

Croswell Pickle Company - Division of Borden Company

Croswell Pickle Company - Division of Borden Company is located in Croswell and discharges its wastewater to the Black River. Treatment consists of a holding pond with controlled discharge. Waste control is rated as adequate.

Michigan Milk Producers Association

Michigan Milk Producers Association is located in Peck and discharges to the Elk River, a tributary of the Black River. This is a milk-receiving station, and the waste consists of milk can equipment washings. The flow is estimated at 0.01 MGD which contain less than 100 pounds of BOD_5 per day. Control is rated as "C" which means "no control - need not established."

Michigan Sugar Company

Michigan Sugar Company is located in Croswell. A wastewater flow of 1.44 MGD containing BOD_5 is treated in a lagoon and discharged to the Black River. Treatment is rated as adequate.

Port Huron Paper Company

Port Huron Paper Company, located in Port Huron, discharges 7.1 MGD of wastes containing BOD_5, fiber, and color to the Black River. Treatment facilities consist of save-alls. Adequacy of this control has not been established.

Stokely-Van Camp, Inc.

Stokely-Van Camp, Inc. is located in Croswell. This company uses spray irrigation to dispose of its BOD_5 containing wastewater. A lagoon is available in case of a pump failure. Treatment and control is rated as adequate.

Michigan Milk Producers Association

Michigan Milk Producers Association is located in Imlay City. They use field irrigation through a ridge and furrow arrangement for treating their wastewater of 0.1 MGD. Approximately 1500 pounds of BOD_5 are applied to the field. They have a secondary treatment plant (trickling filter) not in use at the present time. Control adequacy has not been established.

Vlasic Foods Products

Vlasic Food Products is located in Imlay City. Wastes containing BOD_5 and chlorides are lagooned during periods of low-river flow. Lagoon discharge is determined by stream flow. Adequacy of the control and treatment has not been established.

TABLE 4. MUNICIPAL WASTES CHARACTERISTICS
Lake St. Clair-St. Clair River Basin

Plant Name	Flow MGD	5-Day BOD mg/l	Temp. °F	Susp. Solids mg/l	Susp. Vol. Solids mg/l	pH
Marine City	0.65	47	58	47	41	7.6
Marysville	1.14	44	53	46	22	7.4
New Baltimore	0.20	31	55	38	28	7.2
New Haven	0.14	28	62	23	17	7.8
Port Huron	11.70	49	58	50	25	7.6
Richmond	0.35	23	55	19	16	7.3
St. Clair	0.48	42	-	53	30	-
E. China Twp.	0.07	68	57	45	29	7.5
Croswell	0.34	25	63	28	16	7.3
Imlay City	0.14	52	59	40	28	7.0
Sandusky	0.37	30	56	27	20	7.6
Memphis	0.03	-	-	-	-	-
Yale	0.24	-	-	-	-	-
Algonac	No information					
Brown City	0.20	-	-	-	-	-
Capac	0.1	-	-	-	-	-

TABLE 5. LAKE ST. CLAIR-ST. CLAIR RIVER BASIN INDUSTRIAL WASTES CHARACTERISTICS

Industry	Location	Receiving Stream	Waste Constituents	Waste Flow (MGD)	Treatment Provided	MWRC Rating*
Diamond Crystal Salt Co.	St. Clair	St.Clair R.	$CaSO_4$, NaCl, $CaCl_2$	7.2	None	A
Dunn Paper Co.	Port Huron	St.Clair R.	Fiber	-	Save-alls	A
Marysville Plating Co.	Marysville	St.Clair R.	Toxic Metals	0.006	Bisulfite red of Cr^6 still	A
Midwest Machine Co. of Indiana, Inc.	Port Huron	Bunce Creek	Soluble oil, cooling	0.009	None	A
Morton Salt Co.	Marysville	St.Clair R.	$CaSO_4$, NaCl, $CaCl_2$	8	None	A
Croswell Pickle Co. Div. of Borden Co.	Croswell	Black R.	BOD, Chlorides	0.2	Holding Pond	A
Michigan Milk Prod. Assn.	Peck	Elk R.	BOD	-	None	C
Michigan Sugar Co.	Croswell	Black R.	BOD	1.44	Lagoon	A
Port Huron Paper Co.	Port Huron	Black R.	Fiber, color	7.1	Save-alls	B
Stokely-Van Camp, Inc.	Croswell	Black R.	BOD	-	Spray irrigation & lagoon	A
Mich. Milk Prod. Assn.	Imlay City	Belle R.	BOD	0.1	Field irrigation	B
Vlasic Food Products Co.	Imlay City	Belle R.	BOD, Chlorides	0.06	Holding Pond	B

* A - Adequate Control, B - Control provided - adequacy not established, C - No control - need not established.

TABLE 5. LAKE ST. CLAIR-ST. CLAIR RIVER BASIN INDUSTRIAL WASTE CHARACTERISTICS (cont.)

Industry	BOD #/day	Susp.Solids #/day	Oil (gals)	Concentrated Brine
Michigan Milk Producers Assn. Peck	100			
Michigan Sugar Co.	6000			
Port Huron Paper Co.	1200	4000		
Michigan Milk Producers Assn. Imlay City	1500			
Diamond Crystal Salt Co.				Intermittent brine discharge
Morton Salt Co.				Intermittent brine discharge
Midwest Machine Co. of Indiana			5	

POPULATION AND WASTE LOAD PROJECTIONS

Demographic studies were conducted by the Great Lakes-Illinois River Basins Project, Chicago, for the southeastern Michigan portion of the Lake Erie Basin, of which the Lake St. Clair-St. Clair River Basin is a part. Population trends, on a national, regional, and county basis were analyzed, and population projections were developed for the various parts of the basin.

The population centers in the Lake St. Clair-St. Clair River Basin are Port Huron (36,084), Marysville (4065), St. Clair (4538), Algonac (3190), and Marine City (4404), according to the 1960 census figures. For this report, each area was analyzed, assuming that by 2020, the area will be urbanized and served by water and sewer systems. Then the individual areas were added to yield the total population served. For the basin, the 1965 population served by sewerage systems was estimated to be 70,600 and projected to be 150,000 by 1990 and 250,000 by the year 2020. These numbers should not be construed to be total population of the basin.

Table 6 shows the estimated waste flow in MGD for the Lake St. Clair-St. Clair River Basin.

BOD_5 projections were based on present day inventory information obtained from the Michigan Water Resources Commission, the Michigan Department of Public Health, and the U.S. Public Health Service. Municipal and industrial water use growth rates and BOD_5 production in terms of population equivalents were determined from studies on the Lake Michigan Basin and applied to the inventory data obtained for the Lake St. Clair-St. Clair River Basin.

The results of these projections are shown on Table 7 . For example, in 1965, a total of 46,400 pounds per day of BOD_5 were produced in the area, of which 71% were removed by treatment, leaving 13,500 pounds of BOD_5 being discharged to the river. By the year 2020, with the same degree of treatment, 41,700 pounds would reach the river. In order to show an improvement over present water quality, 90% or more removal will be necessary at that time.

TABLE 6. WASTE FLOW PROJECTIONS (MGD)

	1965	1990	2020
Municipal			
Residential	13	23	33
Industrial	3	5	7
Total Municipal	16	28	40
Industrial (direct to river)	24	43	58
Total to river	40	71	98

TABLE 7. BOD_5 PROJECTIONS (#/day)

	1965	1990	2020
Municipal			
Residential	12,000	27,000	50,000
Industrial	2,400	4,300	5,800
Total Municipal	14,400	31,300	55,800
With present 57% removal	6,200	13,500	24,000
With 90% removal	1,440	3,130	5,580
With 95% removal	720	1,570	2,790
Industrial (direct to river)	32,000	57,500	77,000
With present 77% removal	7,300	13,200	17,700
With 90% removal	3,200	5,750	7,700
With 95% removal	1,600	2,880	3,850
Total in Basin	46,400	88,800	132,800
Total to the River			
With present removal	13,500	26,700	41,700
With 90% removal	4,640	8,880	13,280
With 95% removal	2,320	4,440	6,640

COMMERCIAL SHIPPING

Lake St. Clair and the St. Clair River, along with the Detroit River, form the connecting link between Lakes Huron and Erie. All ship traffic between Lake Erie and Lakes Huron, Michigan, and Superior, must travel through this link.

Table 8 lists a breakdown of the waterborne commerce passing through the area. All of the following information is taken from the U.S. Army Corps of Engineers' publication entitled, "Waterborne Commerce of the United States, Calendar Year 1964." This data, therefore, includes barge, ferry, and tugboat traffic during the navigation season, from March 26 to December 17.

During 1964, a total of 103,489,580 short tons of imports and exports were handled by commercial shipping on the Lake St. Clair-St. Clair River link.

Dredging Operations

Dredging operations in the St. Clair River-Lake St. Clair Basin are under the jurisdiction of the U.S. Army Corps of Engineers. Maintenance dredging is undertaken at the mouth of the Black River and in the St. Clair Cutoff Channel. The Lake St. Clair Channel is dredged intermittently as required. Over 200,000 cubic yards of sand and gravel are dredged from the channels in the St. Clair River and Lake St. Clair annually.

Much of the dredging is done by the Corps itself. When dredging is done by private concerns, a permit from the Department of the Army is required and an inspector appointed by the District Engineer is present at all times to insure that only authorized dumping grounds are utilized.

TABLE 8. WATERBORNE COMMERCE ON THE LAKE ST. CLAIR-ST. CLAIR RIVER LINK

Comparative Statement of Traffic

Year	Traffic of Ports		Through Traffic		Total	
	Tons	Passengers*	Tons	Passengers	Tons	Passengers
1955 ---------	4,518,493	1,109	114,802,424	26,279	119,320,917	27,388
1956 ---------	4,507,741	19,460	105,889,435	23,347	110,397,176	42,807
1957 ---------	4,449,801	217,495	111,261,978	22,413	115,711,779	239,908
1958 ---------	3,405,764	227,928	73,988,621	21,008	77,436,861	248,936
1959 ---------	4,087,365	192,368	74,745,996	20,016	78,859,216	212,384
1960 ---------	4,185,987	233,435	92,988,622	17,715	97,192,281	251,150
1961 ---------	4,632,928	233,134	79,782,557	18,568	84,568,403	251,702
1962 ---------	5,182,669	205,996	82,021,145	15,225	87,237,089	221,221
1963 ---------	5,911,903	196,293	87,008,814	13,368	92,957,697	209,661
1964 ---------	5,891,378	205,366	97,553,381	15,421	1/ 103,489,580	220,787

1/ Includes sand dredged and clays and earths dumped in American bottoms.

* Canadian Import or Export passengers confined to the river included only once in total.

TABLE 8. WATERBORNE COMMERCE ON THE LAKE ST. CLAIR-ST. CLAIR RIVER LINK (cont.)

Comparative Statement of Traffic

Total Passages 1964		Passenger Traffic	
Upbound	- 25,947	Upbound	- 111,945
Downbound	- 24,979	Downbound	- 108,842

Tonnage Breakdown (American and Canadian)	1964
Overseas Imports	948,145
Overseas Exports	4,476,981
Canadian Imports	6,937,250
Canadian Exports	11,866,007
Lakewise	79,191,335
Coastwise	18,911
Internal	5,692
Local	45,259
Total	103,489,580

Explanation of Terminology

Overseas Exports and Imports refers to tonnage shipped to and from the Lake St. Clair-St. Clair River by the United States and Canada.

Canadian Exports and Imports refers to the shipping trade of Canada.

Lakewise Shipping refers to traffic between U.S. and Canadian ports on the Great Lakes system.

Internal Shipping refers to traffic involving carriage in both inland waterways and the waters of the Great Lakes system.

WATER QUALITY
St. Clair, Black, Pine, and Belle Rivers

The Detroit Program Office sampled the St. Clair River from July 1964 to December 1964, and this data will be treated in tables as well as narrative.

The Michigan Water Resources Commission data for 1964 are presented in table form only, and the 1966 International Joint Commission (IJC) data are also herein tabled. The Detroit Program Office and the Michigan Water Resources Commission 1964 data were compared to the 1966 IJC data to show any water quality changes.

Sampling ranges and stations for the St. Clair, Black, Pine, and Belle Rivers are shown in Table 9 and Figure 8.

Chemistry

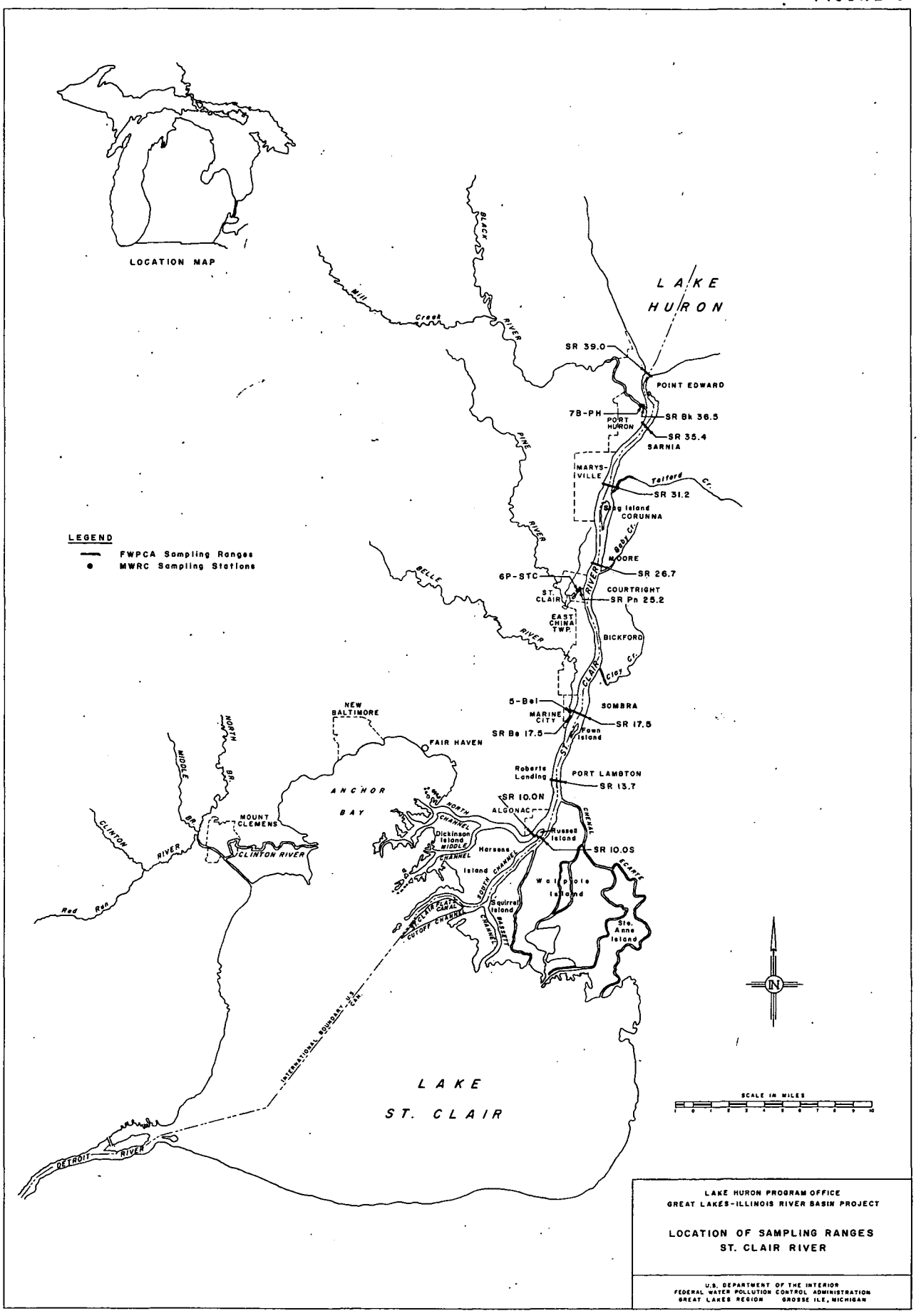
The following water quality measurements were made on the St. Clair River during 1964: water temperature, pH, phenol, chloride, and alkalinity ($CaCO_3$). Tables 10 and 11 show the average, maximum, and minimum values recorded from these measurements.

Temperature average values for the sampling season ranged from 16.9°C to 18.3°C. Minimum and maximum values for all stations ranged from 9.0°C to 23°C. Temperatures varied only slightly on any given day of sampling and did not exceed 1.5°C. Tributary temperatures generally compared with the St. Clair River, with occasional slight increases.

pH values at all river and tributary stations ranged from 7.4 to 8.5.

Chloride values ranged from 4 to 23 mg/l on the St. Clair River, with 23 mg/l measured on Range SR 17.5 close to the Canadian shore. Chloride values on the tributaries showed a much higher concentration with average values

FIGURE 8


LOCATION MAP
LAKE HURON
BLACK RIVER
Mill Creek
SR 39.0
POINT EDWARD
7B-PH
SR Bk 36.5
PORT HURON
SR 35.4
SARNIA
PINE RIVER
MARYS-VILLE
Telford Cr.
SR 31.2
Bog Island
CORUNNA
Bear Cr.
MOORE
SR 26.7
6P-STC
ST. CLAIR RIVER
COURTRIGHT
SR Pn 25.2
BELLE RIVER
EAST CHINA TWP.
BICKFORD
Clay Cr.
5-Bel
SOMBRA
MARINE CITY
SR 17.5
SR Be 17.5
Fawn Island
NEW BALTIMORE
FAIR HAVEN
Roberts Landing
PORT LAMBTON
SR 13.7
SR 10.0N
ALGONAC
NORTH CHANNEL
Russell Island
SR 10.0S
Dickinson Island
MIDDLE CHANNEL
Harsens Island
SOUTH CHANNEL
Walpole Island
Squirrel Island
Ste. Anne Island
ANCHOR BAY
MOUNT CLEMENS
CLINTON RIVER
NORTH BR.
MIDDLE BR.
Red Run
INTERNATIONAL BOUNDARY U.S. CAN.
LAKE ST. CLAIR
DETROIT RIVER
LEGEND
FWPCA Sampling Ranges
MWRC Sampling Stations
SCALE IN MILES
LAKE HURON PROGRAM OFFICE
GREAT LAKES-ILLINOIS RIVER BASIN PROJECT
LOCATION OF SAMPLING RANGES
ST. CLAIR RIVER
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION GROSSE ILE, MICHIGAN

at the Black, Pine, and Belle Rivers of 26, 43, and 75 mg/l, respectively.

Phenol average values for all stations ranged from 1 to 6 ug/l, with slightly higher average values near the Canadian shore. The tributaries' average values ranged from 0.8 to 2 ug/l.

Average alkalinity values, as $CaCO_3$, ranged from 75 to 79 mg/l. Average values for the Black, Pine, and Belle Rivers are 104, 81, and 134 mg/l, respectively.

The 1964 data show that the waters of the St. Clair River are generally excellent quality waters. Pollution loads from the tributary streams, municipal, and industrial wastes are being absorbed at present without drastically degrading the river.

Microbiology

Tables 12 and 13 show the total coliform density values for 1964 for the St. Clair River and tributaries.

Median total coliform densities at SR Bk 36.5, SR Pn 25.2, and SR Be 17.5 were 1,400, 1,800, and 29,000 organisms/100 ml of sample, respectively. Maximum and minimum coliform densities at these three points ranged from 130,000 to 200 organisms/100 ml of sample. The heaviest densities were encountered at Station SR Be 17.5 near the mouth of the Belle River. Median coliform values at the 34 offshore points along the length of the St. Clair River ranged from 2,600 to 2 organisms/100 ml of sample. Fifteen of the offshore points had median values of less than 100 organisms/100 ml.

Bacteriologically, the St. Clair River shows excellent quality water. The waters of the Black and Pine Rivers are marginal waters, and the coliform densities of the Belle River indicate a grossly polluted water.

The 1964 values for chemical parameters analyzed by the Michigan Water

Resources Commission are shown in Table 14. These three sampling stations are water quality monitoring points on the Black, Pine, and Belle Rivers, and were sampled from 16 to 21 times for the year.

The Michigan Water Resources Commission bacteriology data for 1964 at the water quality monitoring stations are shown in Table 15.

The data from the IJC 1966 sampling season are shown in Tables 16 and 17. Ranges SR 39.0 and SR 13.7 are the only ranges sampled routinely. Chemical parameters show no significant changes since 1964. Microbiological medians at these two ranges show the St. Clair River to remain bacteriologically excellent quality water.

TABLE 9. LOCATION OF RANGES - ST. CLAIR RIVER

Range	Location	No. of Stations
SR 39.0	Head waters of St. Clair River	3
SR 35.4	St. Clair River 1.1 miles below Black River	5
SR 31.2	St. Clair River near Marysville, Michigan	5
SR 26.7	St. Clair River at Moore, Ontario, Canada	5
SR 17.5	St. Clair River 0.5 miles above Belle River	5
SR 13.7	St. Clair River 3 miles below Belle River	5
SR 10.0N	North Channel St. Clair River at Russell Island	3
SR 10.0S	South Channel St. Clair River at Russell Island	3
	Tributaries	
SR Bk 36.5	Mouth of Black River	1
MWRC 7B-PH	0.08 miles from mouth of Black River	1
SR Pn 25.2	Pine River at Highway M-29 Bridge	1
MWRC 6P-STC	0.05 miles from mouth of Pine River	1
SR Be 17.5	Belle River at Highway M-29 bridge	1
MWRC 5-Bel	0.5 miles from mouth of Belle River	1

Lake St. Clair

Lake St. Clair was sampled by the Detroit Program Office during two periods in 1964. The first sampling period was from July 20 to November 19 and was conducted at 24 stations designated "P" stations. The second sampling period was from September 1 to September 17 at 18 stations designated as "E" stations.

"P" stations were sampling points located close to the shore, and in a few cases, located on the main shipping channel crossing the lake. "E" stations were located in a rectangular grid pattern over the entire lake. Figure 9 shows the location of these stations. This report deals with surface water samples.

Chemical

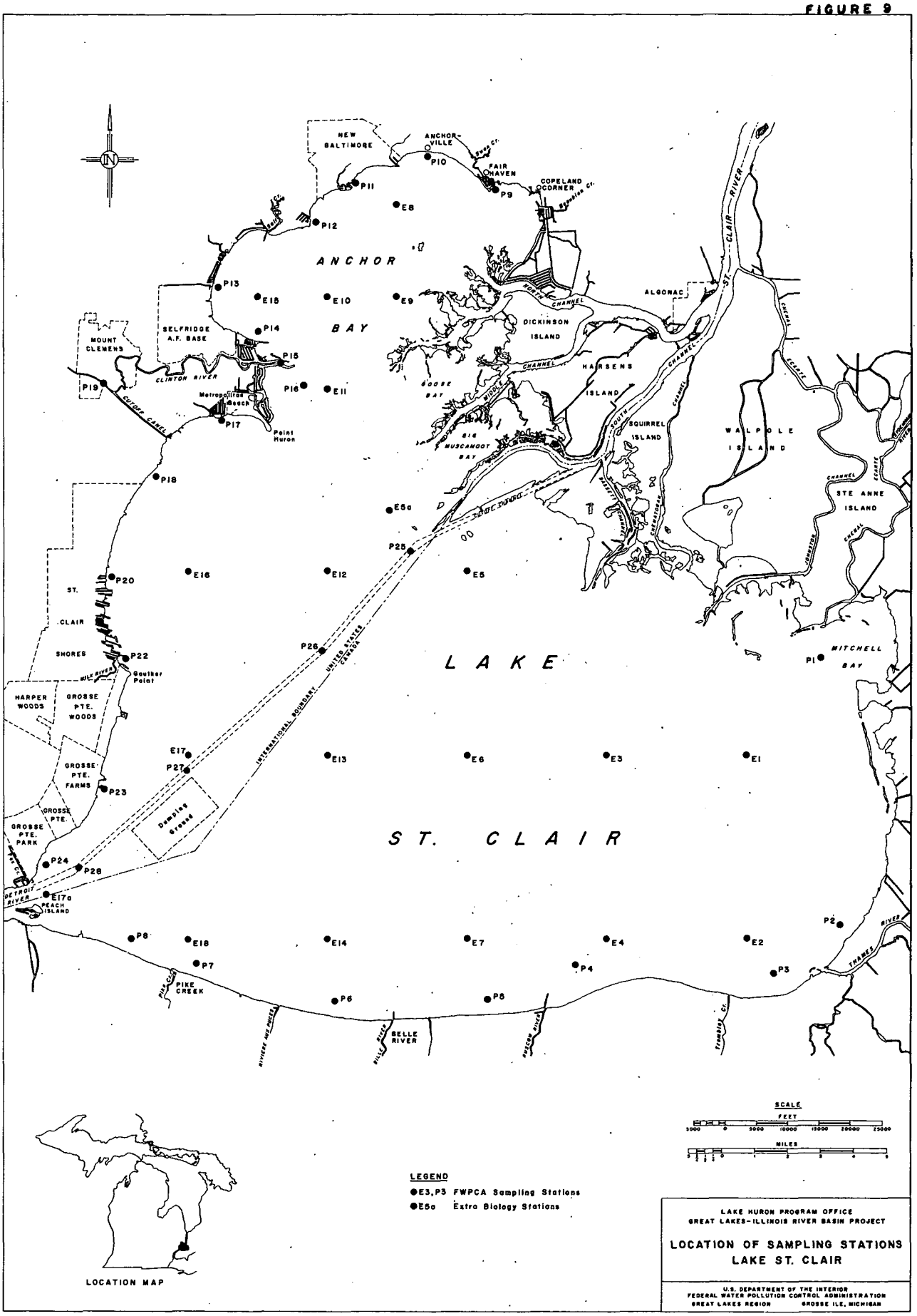
Of the water quality measurements made during 1964, the following are presented in this section: water temperature, dissolved oxygen (DO), 5-day biochemical oxygen demand (BOD_5), nitrogen (ammonia, organic, nitrate, and nitrite), total phosphates, total solids, chlorides, phenols, sodium, potassium, calcium, magnesium, sulfate, and total alkalinity ($CaCO_3$).

Table 18 lists the average, maximum, and minimum results of the above parameters at the "P" stations sampled during the period of July 20 to November 19, 1964.

Average water temperatures at "P" stations ranged from 19.8°C to 15.6°C. Maximum values ranged from 27.0°C on July 21 at P17 to 22.0°C at P25 on July 20.

DO ranged from 10.1 mg/l at site P24 near the mouth of the lake (107% saturated), to 6.7 mg/l (70% saturated) at P22 near the mouth of the Milk River.

FIGURE 9


ANCHOR BAY
LAKE ST. CLAIR
NEW BALTIMORE
ANCHORVILLE
FAIR HAVEN
COPELAND CORNER
ALGONAC
DICKINSON ISLAND
HARSENS ISLAND
SQUIRREL ISLAND
WALPOLE ISLAND
STE ANNE ISLAND
MITCHELL BAY
MOUNT CLEMENS
SELFRIDGE A.F. BASE
CLINTON RIVER
Metropolitan Beach
Point Huron
CUTOFF CANAL
GOOSE BAY
BIG MUSCAMOOT BAY
NORTH CHANNEL
MIDDLE CHANNEL
SOUTH CHANNEL
ST. CLAIR RIVER
ST. CLAIR SHORES
HARPER WOODS
GROSSE PTE. WOODS
GROSSE PTE. FARMS
GROSSE PTE.
GROSSE PTE. PARK
Gaulker Point
MILL RIVER
Dumping Grounds
INTERNATIONAL BOUNDARY
UNITED STATES CANADA
DETROIT RIVER
PEACH ISLAND
PIKE CREEK
BELLE RIVER
THAMES RIVER
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10 P11 P12 P13 P14 P15 P16 P17 P18 P19 P20 P22 P23 P24 P25 P26 P27 P28
E1 E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E12 E13 E14 E15 E16 E17 E17a E18
E5a
SCALE
FEET
MILES
LEGEND
E3,P3 FWPCA Sampling Stations
E5a Extra Biology Stations
LOCATION MAP
LAKE HURON PROGRAM OFFICE
GREAT LAKES-ILLINOIS RIVER BASIN PROJECT
LOCATION OF SAMPLING STATIONS
LAKE ST. CLAIR
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION
GROSSE ILE, MICHIGAN

BOD_5 values were highest along the American shore where they ranged from 7 mg/l at P17 to 1 mg/l at points along the International Boundary, and at several points near shore - P10, P16, and P24. Values in the Canadian waters ranged from 4 mg/l to 2 mg/l.

Ammonia, as nitrogen, ranged from 0.69 mg/l at P17 to 0.07 mg/l at P4; and nitrates, as nitrogen, ranged from 0.78 mg/l at P22 to 0.08 mg/l at P5 and P2.

Total phosphate values ranged from 1.50 mg/l to less than 0.01 mg/l. Highest values occurred on the American side of the lake where concentrations ranged from 1.50 mg/l at P18 to less than 0.01 mg/l at P28 near the main freight channel. Of seven "P" stations located on the Canadian side of Lake St. Clair, four stations had phosphate levels greater than 0.01 mg/l.

Chloride concentrations ranged from 30 mg/l to 6 mg/l.

Samples from 22 stations were examined for total solids concentrations. Values for these stations ranged from 204 mg/l at point P2 to 122 mg/l at P16 and P9.

Phenol concentrations were measured at 18 of the "P" stations. Average values ranged from 3 ug/l to 1 ug/l, whereas maximum values ranged from 12 ug/l at the lower end of the main shipping channel to 2 ug/l at 2 locations in L'Anse Creuse Bay.

Total alkalinity ranged from 118 mg/l to 68 mg/l. Average values ranged from 95 mg/l to 72 mg/l.

Table 19 lists the average, maximum, and minimum levels of water temperature, dissolved oxygen, nitrogens (ammonia, organic, nitrate, and nitrite), total phosphate, solids, chlorides, sodium, potassium, calcium, magnesium, and sulfate for the period of September 1 to September 17, 1964

at 18 "E" sampling points at the surface.

Water temperatures ranged from 24.0°C at point E17 on July 20 in the morning to 16.0°C on the morning of September 17 at E11. Average values ranged from 24.0°C to 17.5°C.

The DO values ranged from 9.6 mg/l (106% saturated) at E16 in the vicinity of the Clinton River to 8.3 mg/l (82% saturated) at point E15, also near the mouth of the river. Average values ranged from 9.5 mg/l (106% saturated) at E10 to 8.3 mg/l (94% saturated) at Station E15.

Ammonia nitrogen values based on one sample from each of five stations ranged from 0.32 mg/l at E16 to 0.08 mg/l at E6. Nitrate nitrogen values at the same five stations ranged from 1.80 mg/l at E16 to 0.10 mg/l at E2, while nitrite nitrogen values ranged from 0.014 to 0.013 mg/l.

Phosphate levels at "E" stations tested were lower than those observed at the inshore "P" stations. Values ranged from 0.10 mg/l at E1 to less than 0.01 mg/l at points E6 and E16.

Total solids concentrations at "E" stations were somewhat lower than "P" stations, and ranged from 180 mg/l at E2 to 120 mg/l at E11 and E13.

In general, chloride concentrations which ranged from 16 mg/l to 7 mg/l at "E" stations were lower than those reported at "P" sampling points.

Phenols were also lower at "E" stations, and ranged from 5 ug/l at E6 to 3 ug/l at E1, E2, E7, and E16.

Values for the remaining parameters measured were all somewhat lower than at the "P" stations.

In general, the water quality of Lake St. Clair is good, with the exception of where the tributaries enter the lake.

Microbiology

The results of the 1964 sampling of Lake St. Clair at the "P" and "E" stations are shown in Tables 20 and 21, respectively.

During the period of July 20 to November 19, 1964 a total of 24 "P" stations were sampled from 1 to 7 times. Total coliform densities ranged from 250,000 organisms/100 ml at P22 on the American side of the lake to less than 1 organism/100 ml on the Canadian side. The median total coliform values at "P" sampling points ranged from 83,000 organisms/100 ml to 5 organisms/100 ml. Densities were heaviest along the American shore, particularly at P22 and P17. At these two points, median values ranged from 83,000 to 2,500 organisms/100 ml, and maximum values ranged from 250,000 to 2,800 organisms/100 ml, respectively.

No fecal coliform determinations were carred out on samples from Canadian lake waters. Fecal coliform densities at six "P" stations in American waters ranged from 290 organisms/100 ml to 4 organisms/100 ml.

Fecal streptococci values based on 24 "P" stations ranged from 650 organisms/100 ml at P18 to less than 1 organisms/100 ml at 9 "P" stations.

Total coliform and fecal streptococci densities at "E" stations were low. No fecal coliform determinations were conducted on samples from "E" stations. The total coliform densities of samples from 18 "E" stations ranged from 230 to less than 5 organisms/100 ml. Fourteen of the 18 stations had densities of 100 or less organisms/100 ml.

Fecal streptococci densities were low at all "E" stations. Only one station had a value greater than 100 organisms/100 ml, and this was station E2, which had a maximum value of 130 organisms/100 ml.

The bacteriological quality of Lake St. Clair water is good, except along the American shoreline where the Clinton and Milk Rivers deposit coliform loads to the lake.

TABLE 10. WATER QUALITY - ST. CLAIR RIVER
Concentrations for July-December 1964

Range	Parameter		Feet from West Shore 100	800	1500
SR 39.0	Temp. °C	Avg	17.6	17.6	17.1
		Max	23.0	21.5	22.0
		Min	10.0	10.0	10.0
		NS	5	7	5
	pH	Avg	8.0	8.0	8.1
		Max	8.1	8.2	8.3
		Min	7.8	7.6	7.8
		NS	5	7	5
	Phenols ug/l	Avg	1	4	1
		Max	3	19	3
		Min	0	0	0
		NS	4	5	4
	Chlorides mg/l	Avg	6	6	6
		Max	7	9	6
		Min	5	4	5
		NS	4	6	4
	Alkalinity ($CaCO_3$) mg/l	Avg	78	78	76
		Max	82	86	77
		Min	76	72	74
		NS	4	6	4

Note: NS = number of samples.

TABLE 10. WATER QUALITY - ST. CLAIR RIVER
Concentrations for July-December 1964

Range	Parameter		Feet from West Shore 100	500	800	1000	1400
SR 35.4	Temp. °C	Avg	17.8	17.3	17.5	17.0	17.6
		Max	22.0	22.0	21.5	21.5	21.5
		Min	10.0	10.0	10.0	10.0	10.0
		NS	6	5	6	5	6
	pH	Avg	8.1	8.0	8.1	8.0	8.0
		Max	8.3	8.2	8.3	8.3	8.3
		Min	7.9	7.8	7.8	7.8	7.8
		NS	6	5	6	5	6
	Phenols ug/l	Avg	1	1	2	1	4
		Max	3	3	6	4	8
		Min	0	0	0	0	0
		NS	5	5	5	4	5
	Chlorides mg/l	Avg	6	6	6	6	6
		Max	7	7	7	7	7
		Min	5	5	5	5	5
		NS	6	5	6	5	6
	Alkalinity ($CaCO_3$) mg/l	Avg	77	76	76	76	76
		Max	79	79	79	78	78
		Min	74	74	72	72	74
		NS	6	5	6	5	6

Note: NS = number of samples.

TABLE 10. WATER QUALITY - ST. CLAIR RIVER
Concentrations for July-December 1964

Range	Parameter		Feet from West Shore				
			100	700	1000	1400	1900
SR 31.2	Temp. °C	Avg	18.3	17.4	16.7	16.8	17.8
		Max	21.5	20.5	20.5	20.5	21.5
		Min	10.0	10.0	10.0	10.0	10.0
		NS	6	6	5	5	6
	pH	Avg	8.1	8.1	8.0	8.0	8.1
		Max	8.3	8.4	8.3	8.3	8.5
		Min	7.9	7.6	7.8	7.6	7.6
		NS	6	6	5	5	6
	Phenols ug/l	Avg	1	1	2	1	3
		Max	2	3	6	3	4
		Min	0	0	0	0	0
		NS	5	5	5	5	5
	Chlorides mg/l	Avg	7	6	6	3	24
		Max	9	8	7	7	33
		Min	6	5	5	5	10
		NS	6	6	5	4	6
	Alkalinity ($CaCO_3$) mg/l	Avg	77	75	76	75	78
		Max	79	79	78	77	81
		Min	74	67	74	72	72
		NS	6	6	5	5	6

Note: NS = number of samples.

TABLE 10. WATER QUALITY - ST. CLAIR RIVER
Concentrations for July-December 1964

Range	Parameters		Feet from West Shore				
			100	800	1200	1600	1900
SR 26.7	Temp. °C	Avg	17.8	17.8	17.0	16.9	17.3
		Max	22.0	21.5	20.5	20.5	20.0
		Min	10.0	10.0	10.0	10.0	10.0
		NS	6	6	5	5	6
	pH	Avg	8.0	8.1	8.1	8.1	8.1
		Max	8.2	8.3	8.3	8.3	8.4
		Min	7.9	7.7	7.8	7.9	7.9
		NS	6	6	5	5	6
	Phenols ug/1	Avg	2	2	3	1	1
		Max	4	4	9	3	4
		Min	0	0	0	0	0
		NS	5	5	5	5	5
	Chlorides mg/1	Avg	7	6	7	6	11
		Max	8	7	10	7	21
		Min	6	5	6	5	6
		NS	6	6	5	5	6
	Alkalinity ($CaCO_3$) mg/1	Avg	77	76	76	76	77
		Max	80	79	78	78	80
		Min	74	72	74	74	74
		NS	5	6	5	5	6

Note: NS = number of samples.

TABLE 10. WATER QUALITY - ST. CLAIR RIVER
Concentrations for July-December 1964

Range	Parameters		Feet from West Shore 100	1200	1700	2200	2600
SR 17.5	Temp. °C	Avg	18.2	17.1	17.5	17.1	17.3
		Max	22.0	21.0	21.0	21.0	21.0
		Min	10.0	10.0	10.0	10.0	10.0
		NS	6	5	6	5	5
	pH	Avg	8.1	8.1	8.2	8.1	8.1
		Max	8.3	8.3	8.4	8.3	8.4
		Min	8.0	8.0	8.0	7.9	7.6
		NS	6	5	6	5	6
	Phenols ug/1	Avg	2	2	1	3	5
		Max	3	3	3	6	8
		Min	0	0	0	1	2
		NS	5	5	5	5	5
	Chlorides mg/1	Avg	8	7	8	10	15
		Max	9	8	8	11	23
		Min	7	5	7	8	12
		NS	6	5	6	5	6
	Alkalinity ($CaCO_3$) mg/1	Avg	78	78	79	78	79
		Max	81	81	81	82	82
		Min	76	76	76	74	74
		NS	5	5	5	5	5

Note: NS = number of samples

TABLE 10. WATER QUALITY - ST. CLAIR RIVER
Concentrations for July-December 1964

Range	Parameters		Feet from West Shore				
			100	700	1000	1400	1900
SR 13.7	Temp. °C	Avg	17.7	17.3	17.5	17.1	17.3
		Max	22.0	21.5	21.0	21.0	21.0
		Min	10.0	10.0	10.0	10.0	10.0
		NS	6	5	7	5	5
	pH	Avg	8.1	8.1	8.1	8.1	8.1
		Max	8.3	8.3	8.3	8.3	8.3
		Min	7.8	8.0	8.0	7.9	8.0
		NS	6	5	7	5	5
	Phenols ug/l	Avg	3	3	3	6	4
		Max	6	4	6	15	6
		Min	0	1	1	1	2
		NS	5	4	6	5	5
	Chlorides mg/l	Avg	8	6	7	10	12
		Max	9	7	10	13	14
		Min	6	5	6	8	10
		NS	6	5	7	5	5
	Alkalinity ($CaCO_3$) mg/l	Avg	79	79	79	78	79
		Max	83	84	82	80	81
		Min	76	76	74	74	76
		NS	6	5	6	5	5

Note: NS = number of samples.

TABLE 10. WATER QUALITY - ST. CLAIR RIVER
Concentrations for July-December 1964

Range	Parameters		Feet from West Shore 100	500	900
SR 10.0N	Temp. °C	Avg	17.5	17.8	17.3
		Max	21.5	21.5	21.5
		Min	9.0	9.0	9.0
		NS	5	6	5
	pH	Avg	8.1	8.1	8.1
		Max	8.3	8.3	8.3
		Min	7.8	8.0	7.9
		NS	5	6	5
	Phenols ug/l	Avg	2	1	3
		Max	7	3	16
		Min	0	0	0
		NS	5	5	5
	Chlorides mg/l	Avg	7	7	7
		Max	8	8	11
		Min	5	5	3
		NS	6	6	6
	Alkalinity ($CaCO_3$) mg/l	Avg	78	78	79
		Max	81	80	82
		Min	76	76	74
		NS	5	6	5

Note: NS = number of samples.

TABLE 10. WATER QUALITY - ST. CLAIR RIVER
Concentrations for July-December 1964

Range	Parameters		Feet from West Shore 100	500	900
SR 10.0S	Temp. °C	Avg	16.9	16.9	16.9
		Max	21.0	21.0	21.0
		Min	9.0	9.0	9.0
		NS	5	5	5
	pH	Avg	8.1	8.1	8.1
		Max	8.3	8.2	8.2
		Min	7.9	8.0	8.0
		NS	5	5	4
	Phenols ug/l	Avg	1	3	3
		Max	4	12	6
		Min	0	0	0
		NS	5	5	5
	Chlorides mg/l	Avg	7	8	11
		Max	8	10	12
		Min	6	5	6
		NS	6	6	6
	Alkalinity ($CaCO_3$) mg/l	Avg	78	77	78
		Max	81	81	81
		Min	74	74	74
		NS	5	5	5

Note: NS = number of samples.

TABLE 11. WATER QUALITY - ST. CLAIR RIVER TRIBUTARIES
Concentrations for July-December 1964

Range		Temp. C	pH	Phenols (ug/1)	Chlorides (mg/1)	Alkalinity ($CaCO_3$) mg/1
SR Bk 36.5	Avg	18.5	7.6	2	26	104
Black River	Max	25.5	7.9	6	41	126
	Min	10.0	7.4	0	7	76
	NS	5	5	5	5	5
SR Pn 25.2	Avg	17.8	8.1	0.8	43	81
Pine River	Max	23.5	8.2	4	84	86
	Min	10.0		0	10	76
	NS	5		5	5	5
SR Be 17.5	Avg	19.3	8.0	1	75	134
Belle River	Max	26.0	8.1	3	115	145
	Min	9.5	7.8	0	49	122
	NS	5	5	5	5	5

Note: NS = number of samples.

TABLE 12. WATER QUALITY OF ST. CLAIR RIVER
1964 TOTAL COLIFORM DENSITIES (MF)*

Range		Feet from West Shore														
		0	100	500	700	800	900	1000	1200	1400	1500	1600	1700	1900	2200	2600
SR 39.0	Med		2			6					3					
	Max		2			16					4					
	Min		1			4					1					
	NS		4			5					4					
SR 35.4	Med		59	5		12		13		36						
	Max		490	10		23		20		220						
	Min		4	2		2		5		2						
	NS		6	6		6		5		6						
SR 31.2	Med		88		21			5		24				340		
	Max		390		36			10		67				>1000		
	Min		50		6			5		12				68		
	NS		6		6			5		5				6		
SR 26.7	Med		260			8			17			44		230		
	Max		300			38			26			>400		>400		
	Min		70			4			9			6		36		
	NS		6			6			5			5		6		
SR 17.5	Med		220						120				100		170	370
	Max		560						610				1400		1700	2200
	Min		110						12				52		92	240
	NS		6						5				6		5	5
SR 13.7	Med		250		60			80		340				190		
	Max		1200		140			530		1300				2600		
	Min		150		40			2		38				30		
	NS		6		5			7		5				5		

NS = number of samples.
* Determinations made by membrane filter technique.

TABLE 12 WATER QUALITY OF ST. CLAIR RIVER (cont.)
1964 TOTAL COLIFORM DENSITIES (M)*

Range		Feet from West Shore														
		0	100	500	700	800	900	1000	1200	1400	1500	1600	1700	1900	2200	2600
SR 10.0N	Med		810	180			100									
	Max		1400	>1000			>1000									
	Min		320	70			30									
	NS		5	6			5									
SR 10.0S	Med		70	160			180									
	Max		230	210			560									
	Min		20	52			70									
	NS		5	5			5									

NS = number of samples.
* Determinations made by membrane filter technique.

TABLE 13. WATER QUALITY OF TRIBUTARIES OF ST. CLAIR RIVER
1964 TOTAL COLIFORM DENSITIES (MF)*

Range	Tributary		Feet from West Shore
SR Bk 36.5	Black River	Median	1400
		Maximum	6000
		Minimum	200
		NS	4
SR Pn 25.2	Pine River	Median	1800
		Maximum	2300
		Minimum	980
		NS	5
SR Be 17.5	Belle River	Median	29,000
		Maximum	130,000
		Minimum	2,100
		NS	5

NS = number of samples.
* Determinations made by membrane filter technique.

TABLE 14. WATER QUALITY - TRIBUTARIES OF THE ST. CLAIR RIVER
MWRC - 1964 Concentrations

Station No.		Temp °C	DO	% Sat	BOD_5	NH_3-N	NO_3-N	Tot. PO_4	Susp. Solids	Vol. Susp. Solids	Cl^-	Total Hardness ($CaCO_3$)	pH
Black River (7B-PH)													
	Avg	12.4	8.9	79.0	2.4	0.044	0.14	0.16	14	5	17	140	7.9
	Max	28.0	13.3	100.0	5.7	0.410	0.34	2.80	95	9	58	140	8.2
	Min	0.0	3.4	43.0	1.5	0.000	0.00	0.00	2	3	4	140	7.5
	NS	21	21	21	21	20	21	21	20	9	21	1	
Pine River (6P-STC)													
	Avg	12.4	9.9	90.2	2.6	0.135	0.17	0.26	25	7	70	110	8.1
	Max	28.0	13.2	124.3	5.7	0.410	0.36	1.10	110	20	290	110	8.3
	Min	0.0	6.4	62.7	1.2	0.000	0.00	0.00	3	3	8	110	7.8
	NS	21	21	21	20	19	21	21	19	12	21	1	
Belle River (5-BEL)													
	Avg	13.0	7.8	69.3	2.9	0.160	0.16	0.14	43	9	81	265	8.0
	Max	28.0	12.9	100.6	4.8	0.410	0.59	0.60	162	34	138	265	8.3
	Min	0.0	2.5	32.3	1.7	0.00	0.00	0.00	3	2	38	265	7.5
	NS	21	21	21	21	20	21	21	20	16	21	1	

NS = number of samples.
All results in mg/l.
Phosphates reported as PO_4.

TABLE 15. WATER QUALITY - TOTAL COLIFORM DENSITY VALUES FOR 1964*
MPN/100ml
Tributaries

	Black River (7B-PH)	Pine River (6P-STC)	Belle River (5-BEL)
Geometric Mean	1,217	717	4,639
Median	910	730	4,300
Maximum	9,300	9,300	24,000
Minimum	300	43	430
No. of Samples	11	11	10

*MWRC values.

TABLE 16. WATER QUALITY - ST. CLAIR RIVER
IJC - Concentrations for 1966

Range	Parameters		Feet from West Shore 100	800	1500
SR 39.0	Temp. °C	Avg	15.0	14.4	14.3
		Max	22.0	21.0	21.0
		Min	9.0	7.5	7.5
		NS	7	7	7
	Total Kjeldahl Nitrogen mg/1	Avg	0.14	0.15	0.12
		Max	0.29	0.22	0.18
		Min	0.02	0.09	0.03
		NS	8	7	8
	NO_3-Nitrogen mg/1	Avg	0.2	0.2	0.2
		Max	0.4	0.6	0.4
		Min	0.1	0.1	0.1
		NS	8	8	8
	Total Phos. (PO_4) mg/1	Avg	--*	--*	--*
		Max	0.4	0.1	0.04
		Min	<0.025	<0.025	<0.025
		NS	8	8	8
	Total Soluble Phosphate mg/1	Avg	--*	--*	--*
		Max	0.3	0.04	0.025
		Min	<0.025	<0.025	<0.025
		NS	8	8	8

*One third or more of samples had values < 0.025 mg/1.
NS = number of samples.

TABLE 16. WATER QUALITY - ST. CLAIR RIVER
IJC - Concentrations for 1966

Range	Parameters		Feet from West Shore 100	800	1500
SR 39.0 (cont.)	Phenols - ug/1	Avg	3	3	3
		Max	6	8	9
		Min	0	0	0
		NS	8	8	8
	Chlorides mg/1	Avg	6	6	6
		Max	7	7	6
		Min	5	5	5
		NS	8	8	8

NS = number of samples.
*One third or more of samples had values $<$ 0.025 mg/1.

TABLE 16. WATER QUALITY - ST. CLAIR RIVER
IJC - Concentrations for 1966

Range	Parameters		Feet from West Shore 100	700	1000	1400	1900
SR 13.7	Temp. °C	Avg	14.9	14.5	14.6	14.4	14.3
		Max	22.0	21.5	21.5	21.5	21.5
		Min	9.0	8.0	7.5	7.5	7.5
		NS	7	7	7	7	7
	Total Kjeldahl Nitrogen mg/1	Avg	0.13	0.12	0.13	0.11	0.14
		Max	0.22	0.26	0.23	0.49	0.28
		Min	0.05	0.07	0.08	0.03	0.06
		NS	8	8	8	8	7
	NO_3-Nitrogen mg/1	Avg	0.5	0.2	0.2	0.2	0.2
		Max	0.7	0.7	0.8	0.7	0.4
		Min	0.1	0.1	0.1	0.0	0.1
		NS	8	8	7	8	7
	Total Phos. (PO_4) mg/1	Avg	--*	--*	--*	--*	--*
		Max	0.1	0.2	0.04	0.08	0.04
		Min	<0.025	<0.025	<0.025	<0.025	<0.025
		NS	8	8	8	8	8
	Total Soluble Phosphate mg/1	Avg	--*	--*	--*	--*	--*
		Max	0.05	0.2	0.025	0.04	0.025
		Min	<0.025	<0.025	<0.025	<0.025	<0.025
		NS	8	8	8	8	8

NS = number of samples.
*One third or more of samples had values 0.025 mg/1.

TABLE 16. WATER QUALITY - ST. CLAIR RIVER
IJC - Concentrations for 1966

Range	Parameters		Feet from West Shore				
			100	700	1000	1400	1900
SR 13.7 (cont.)	Phenols - ug/1	Avg	3	3	3	3	4
		Max	8	8	9	10	10
		Min	0	0	0	0	0
		NS	8	8	8	8	8
	Chlorides mg/1	Avg	8	7	7	11	15
		Max	9	8	9	15	22
		Min	7	6	5	8	7
		NS	8	8	8	8	8

NS = number of samples.
*One third or more of samples had values $<$ 0.025 mg/1.

TABLE 17. WATER QUALITY OF ST. CLAIR RIVER
IJC - TOTAL COLIFORM DENSITIES FOR 1966
Organisms/100ml*

Range		Feet from West Shore						
		100	700	800	1000	1400	1500	1900
SR 39.0								
	Median	-		-			-	
	Maximum	20		60			20	
	Minimum	10		10			10	
	NS	7		8			8	
SR 13.7								
	Median	285	80		410	190		270
	Maximum	900	810		990	6700		6700
	Minimum	70	30		2	2		0
	NS	8	7		7	7		7

NS = number of samples.
*Determinations carried out by the membrane filter technique.

TABLE 18. LAKE ST. CLAIR - WATER QUALITY
Concentrations for July 20-November 19, 1964
"P" Stations

Station No.		Temp °C	DO	% Sat.	BOD_5	NH_3-N	Org-N	NO_3-N	NO_2-N	Tot. PO_4	Tot. Sol. PO_4	Tot. Sol.	Susp. Sol.	Vol. Susp. Sol.	Cl^-	Phenol
P-001	Avg	16.5	-	-	-	-	-	-	-	-	-	-	-	-	15	3
	Max	25.0	-	-	-	-	-	-	-	-	-	-	-	-	24	7
	Min	9.0	-	-	-	-	-	-	-	-	-	-	-	-	11	1
	NS	3													4	3
P-002	Avg	16.9	-	-	3.0	0.26	0.08	0.08	0.005	.49	-	190	49	-	14	2
	Max	26.5	-	-	3.0	0.26	0.08	0.08	0.005	.90	-	190	49	-	17	3
	Min	7.5	-	-	3.0	0.26	0.08	0.08	0.005	.08	-	190	49	-	11	0
	NS	4			1	1	1	1	1	2		1	1		4	4
P-003	Avg	16.8	9.1	101	4.0	0.27	0.09	0.14	0.002	<.01	-	204	54	-	14	
	Max	26.5	9.1	101	4.0	0.27	0.09	0.14	0.002	<.01	-	204	54	-	19	4
	Min	7.5	9.1	101	4.0	0.27	0.09	0.14	0.002	<.01	-	204	54	-	9	0
	NS	4	1		1	1	1	1	1	1		1	1		4	4
P-004	Avg	17.5	9.1	101	3.0	0.07	0.06	0.12	0.004	<.01	-	178	61	-	10	2
	Max	25.5	9.1	101	3.0	0.07	0.06	0.12	0.004	<.01	-	178	61	-	12	6
	Min	7.0	9.1	101	3.0	0.07	0.06	0.12	0.004	<.01	-	178	61	-	9	0
	NS	5	1		1	1	1	1	1	1		1	1		4	4
P-005	Avg	16.3	9.1	99.2	3.0	0.16	0.08	0.08	0.006	.02	-	160	49	-	11	3
	Max	25.0	9.1	99.2	3.0	0.16	0.08	0.08	0.006	.02	-	160	49	-	14	6
	Min	7.5	9.1	99.2	3.0	0.16	0.08	0.08	0.006	.02	-	160	49	-	9	0
	NS	4	1		1	1	1	1	1	1		1	1		4	4
P006	Avg	16.0	9.1	99.2	2.0	0.16	0.08	0.13	0.009	<.01	-	170	42	-	10	3
	Max	24.0	9.1	99.2	2.0	0.16	0.08	0.13	0.009	<.01	-	170	42	-	13	6
	Min	7.5	9.1	99.2	2.0	0.16	0.08	0.13	0.009	<.01	-	170	42	-	7	0
	NS	4	1		1	1	1	1	1	1		1	1		5	4

Note: NS = number of samples.
Phosphates as PO_4.
All results in mg/l, except phenol - µg/l.

TABLE 18. LAKE ST. CLAIR - WATER QUALITY
Concentrations for July 20-November 19, 1964
"P" Stations

Station No.		Sodium	Potassium	Calcium	Magnesium	Sulfate	Total Alkalinity ($CaCO_3$)
P001	Avg	11.0	1.40	36.0	11.0	6	72
	Max	11.0	1.40	36.0	11.0	6	80
	Min	11.0	1.40	36.0	11.0	6	58
	NS	1	1	1	1	1	3
P002	Avg	11.0	1.20	26.0	11.0	5	79
	Max	11.0	1.20	26.0	11.0	5	85
	Min	11.0	1.20	26.0	11.0	5	74
	NS	1	1	1	1	1	4
P003	Avg	16.0	1.50	32.5	12.0	8	82
	Max	16.0	1.50	36.0	13.0	8	86
	Min	16.0	1.50	29.0	11.0	8	76
	NS	1	1	2	2	1	4
P004	Avg	7.30	0.95	26.0	9.8	7	80
	Max	7.30	0.95	26.0	9.8	7	82
	Min	7.30	0.95	26.0	9.8	7	74
	NS	1	1	1	1	1	4
P005	Avg	-	-	-	-	-	79
	Max	-	-	-	-	-	82
	Min	-	-	-	-	-	76
	NS						4
P006	Avg	6.50	1.10	28.0	17.0	19	81
	Max	6.50	1.10	28.0	11.0	19	83
	Min	6.50	1.10	28.0	11.0	19	76
	NS	1	1	1	1	1	5

NS = number of samples.
All results in mg/l.

TABLE 18. LAKE ST. CLAIR - WATER QUALITY
Concentrations for July 20-November 19, 1964
"P" Stations

Station No.		Temp °C	DO	% Sat	BOD_5	NH_3-N	Org-N	NO_3-N	NO_2-N	Tot. PO_4	Tot. Sol. PO_4	Tot. Sol.	Susp. Sol.	Vol. Susp. Sol.	Cl^-	Phenol
P007	Avg	15.6	9.3	101.4	3.0	0.20	0.07	0.12	0.006	0.02	-	153	23	-	11	1
	Max	24.0	9.3	101.4	3.0	0.20	0.07	0.12	0.006	0.02	-	153	23	-	13	3
	Min	6.5	9.3	101.4	3.0	0.20	0.07	0.12	0.006	0.02	-	153	23	-	9	0
	NS	4	1		1	1	1	1	1	1		1	1		4	3
P008	Avg	15.8	9.0	98.1	-	0.15	0.06	0.18	0.005	0.01	-	-	-	-	12	3
	Max	24.0	9.0	98.1	-	0.15	0.06	0.18	0.005	0.01	-	-	-	-	14	4
	Min	7.5	9.0	98.1	-	0.15	0.06	0.18	0.005	0.01	-	-	-	-	9	3
	NS	4	1			1	1	1	1	1					5	3
P009	Avg	18.3	9.4	99.7	2.0	-	-	-	-	-	-	122	18	-	-	-
	Max	27.0	10.1	107.1	2.0	-	-	-	-	-	-	122	18	-	-	-
	Min	10.0	8.7	92.2	2.0	-	-	-	-	-	-	122	18	-	-	-
	NS	5	2		1							1	1			
P010	Avg	18.5	9.0	95.4	1.0	-	-	-	-	-	-	144	20	-	-	-
	Max	27.0	9.0	95.4	1.0	-	-	-	-	-	-	144	20	-	-	-
	Min	10.5	9.0	95.4	1.0	-	-	-	-	-	-	144	20	-	-	-
	NS	4	1		1							1	1			
P011	Avg	18.8	7.9	83.7	2.0	-	-	-	-	-	-	184	61	-	-	-
	Max	27.0	7.9	83.7	2.0	-	-	-	-	-	-	184	61	-	-	-
	Min	10.5	7.9	83.7	2.0	-	-	-	-	-	-	184	61	-	-	-
	NS	4										1	1			
P013	Avg	19.1	8.8	96.0	2.0	-	-	-	-	-	-	145	20	-	-	-
	Max	27.0	8.8	96.0	2.0	-	-	-	-	-	-	145	20	-	-	-
	Min	10.0	8.8	96.0	2.0	-	-	-	-	-	-	145	20	-	-	-
	NS	5	1		1							1	1			

Note: NS = number of samples.
All results in mg/l.
Phosphates reported as PO_4.

TABLE 18. LAKE ST. CLAIR - WATER QUALITY
Concentrations for July 20-November 19, 1964
"P" Stations

Station No.		Sodium	Potassium	Calcium	Magnesium	Sulfate	Total Alkalinity ($CaCO_3$)
P007	Avg	8.40	1.10	28.0	11.0	20	81
	Max	8.40	1.10	28.0	11.0	20	84
	Min	8.40	1.10	28.0	11.0	20	78
	NS	1	1	1	1	1	4
P008	Avg	8.00	1.10	28.0	10.0	21	82
	Max	8.00	1.10	28.0	10.0	21	84
	Min	8.00	1.10	28.0	10.0	21	79
	NS	1	1	1	1	1	4
P009	Avg	5.55	0.95	26.0	10.3	13	77
	Max	7.00	1.10	28.0	11.0	20	84
	Min	4.10	0.81	24.0	9.6	5	70
	NS	2	2	2	2	2	5
P010	Avg	4.20	0.96	27.0	9.5	5	81
	Max	4.20	0.96	27.0	9.5	5	86
	Min	4.20	0.96	27.0	9.5	5	76
	NS	1	1	1	1	1	4
P011	Avg	4.20	0.92	28.0	9.8	6	83
	Max	4.20	0.92	28.0	9.8	6	86
	Min	4.20	0.92	28.0	9.8	6	80
	NS	1	1	1	1	1	4
P013	Avg	4.70	0.80	27.0	9.5	6	84
	Max	4.70	0.80	27.0	9.5	6	88
	Min	4.70	0.80	27.0	9.5	6	80
	NS	1	1	1	1	1	4

Note: NS = number of samples.
All results in mg/l.

TABLE 18. LAKE ST. CLAIR - WATER QUALITY
Concentrations for July 20-November 19, 1964
"P" Stations

Station No.		Temp °C	DO	% Sat	BOD_5	NH_3-N	Org-N	NO_3-N	NO_2-N	Tot. PO_4	Tot. Sol. PO_4	Tot. Sol.	Susp. Sol.	Vol. Susp. Sol	Cl^-	Phenol
P014	Avg	19.8	8.8	96.0	2.0	-	-	-	-	-	-	140	23	-	-	-
	Max	26.5	8.8	96.0	2.0	-	-	-	-	-	-	140	23	-	-	-
	Min	10.5	8.8	96.0	2.0	-	-	-	-	-	-	140	23	-	-	-
	NS	5	1		1							1	1			
P016	Avg	19.0	9.8	100	1.0	-	-	-	-	-	-	122	3	-	-	-
	Max	25.0	9.8	100	1.0	-	-	-	-	-	-	122	3	-	-	-
	Min	11.0	9.8	100	1.0	-	-	-	-	-	-	122	3	-	-	-
	NS	5	1		1							1	1			
P017	Avg	16.4	9.8	98.0	7.0	0.69	0.09	0.18	0.014	0.20	-	189	57	-	20	1
	Max	27.0	9.8	98.0	7.0	0.69	0.09	0.18	0.014	0.20	-	189	57	-	30	2
	Min	5.0	9.8	98.0	7.0	0.69	0.09	0.18	0.014	0.20	-	189	57	-	9	0
	NS	4	1		1	1	1	1	1	1		1	1		4	4
P018	Avg	18.3	9.4	97.8	3.0	0.22	0.06	0.15	0.003	1.50	-	141	13	-	10	1
	Max	24.5	9.4	97.8	3.0	0.22	0.06	0.15	0.003	1.50	-	141	13	-	14	2
	Min	5.0	9.4	97.8	3.0	0.22	0.06	0.15	0.003	1.50	-	141	13	-	8	1
	NS	5	1		1	1	1	1	1	1		1	1	-	4	4
P020	Avg	16.4	-	-	2.0	0.34	0.05	0.32	0.002	0.20	-	139	18	-	9	1
	Max	26.0	-	-	2.0	0.34	0.05	0.32	0.002	0.20	-	139	18	-	12	3
	Min	5.0	-	-	2.0	0.34	0.05	0.32	0.002	0.20	-	139	18	-	7	0
	NS	4			1	1	1	1	1	1		1	1		4	4
P022	Avg	17	6.7	69.7	6.0	0.64	0.09	0.78	0.005	0.02	-	191	50	-	9	1
	Max	26	6.7	69.7	6.0	0.64	0.09	0.78	0.005	0.02	-	191	50	-	12	3
	Min	7	6.7	69.7	6.0	0.64	0.09	0.78	0.005	0.02	-	191	50	-	7	0
	NS	4	1		1	1	1	1	1	1		1	1		4	4

Note: NS = number of samples.
All results in mg/l, except phenol - µg/l.
Phosphates reported as PO_4.

TABLE 18. LAKE ST. CLAIR - WATER QUALITY
Concentrations for July 20-November 19, 1964
"P" Stations

Station No.		Sodium	Potassium	Calcium	Magnesium	Sulfate	Total Alkalinity ($CaCO_3$)
P014	Avg	4.00	1.00	27.0	9.8	6	79
	Max	4.00	1.00	27.0	9.8	6	86
	Min	4.00	1.00	27.0	9.8	6	70
	NS	1	1	1	1	1	4
P016	Avg	4.00	1.00	27.0	9.9	19	79
	Max	4.00	1.00	27.0	9.9	19	83
	Min	4.00	1.00	27.0	9.9	19	74
	NS	1	1	1	1	1	4
P017	Avg	7.0	1.40	25.0	9.8	10	95
	Max	7.0	1.40	25.0	9.8	10	118
	Min	7.0	1.40	25.0	9.8	10	75
	NS	1	1	1	1	1	4
P018	Avg	5.00	1.10	28.0	10.0	16	83
	Max	5.00	1.10	28.0	10.0	16	88
	Min	5.00	1.10	28.0	10.0	16	76
	NS	1	1	1	1	1	4
P020	Avg	4.60	1.00	25.0	10.0	13	84
	Max	4.60	1.00	25.0	10.0	13	94
	Min	4.60	1.00	25.0	10.0	13	74
	NS	1	1	1	1	1	
P022	Avg	7.50	1.70	26.0	9.8	17	80
	Max	7.50	1.70	26.0	9.8	17	88
	Min	7.50	1.70	26.0	9.8	17	68
	NS	1	1	1	1	1	4

NS = number of samples.
All results in mg/l.

TABLE 18. LAKE ST. CLAIR - WATER QUALITY
Concentrations for July 20-November 19, 1964
"P" Stations

Station No.		Temp °C	DO	% Sat	BOD_5	NH_3-N	Org-N	NO_3-N	NO_2-N	Tot. PO_4	Tot. Sol. PO_4	Tot. Sol.	Susp. Sol.	Vol. Susp. Sol.	Cl^-	Phenol
P023	Avg	16.9	10.0	106	2.0	0.22	0.06	0.11	0.003	0.10	-	131	15	-	8	1
	Max	26.0	10.0	106	2.0	0.22	0.06	0.11	0.003	0.10	-	131	15	-	9	3
	Min	8.0	10.0	106	2.0	0.22	0.06	0.11	0.003	0.10	-	131	15	-	6	0
	NS	4	1		1	1	1	1	1	1		1	1		4	4
P024	Avg	17.0	10.1	107.1	1.0	0.09	0.04	0.24	0.002	0.10	-	133	14	-	7	2
	Max	25.5	10.1	107.1	1.0	0.09	0.04	0.24	0.002	0.10	-	133	14	-	8	3
	Min	8.5	10.1	107.1	1.0	0.09	0.04	0.24	0.002	0.10	-	133	14	-	6	0
	NS	4	1		1	1	1	1	1	1		1	1		4	4
P025	Avg	18.1	9.5	101.9	1.0	0.11	0.07	0.51	0.008	0.10	-	131	12	-	9	3
	Max	22.0	10.0	106.0	1.0	0.11	0.08	0.68	0.013	0.10	-	131	12	-	15	5
	Min	15.5	9.0	93.6	1.0	0.10	0.05	0.34	0.002	0.10	-	130	12	-	7	0
	NS	4	2		1	2	2	2	2	2		2	1		4	4
P026	Avg	16.3	10.0	106.0	1.0	0.12	0.06	0.52	0.003	0.03	-	145	26	-	7	1
	Max	25.0	10.0	106.0	1.0	0.12	0.06	0.52	0.003	0.03	-	145	26	-	9	3
	Min	7.0	10.0	106.0	1.0	0.12	0.06	0.52	0.003	0.03	-	145	26	-	7	0
	NS	4	1		1	1	1	1	1	1		1	1		5	4
P027	Avg	16.3	10.0	106.0	1.0	0.09	0.05	0.38	0.002	0.20	-	140	12	-	7	2
	Max	24.5	10.0	106.0	1.0	0.09	0.05	0.38	0.002	0.20	-	140	12	-	8	5
	Min	8.0	10.0	106.0	1.0	0.09	0.05	0.38	0.002	0.20	-	140	12	-	6	0
	NS	4	1		1	1	1	1	1	1		1	1		5	4
P028	Avg	16.2	9.6	99.9	1.0	0.12	0.06	0.29	0.007	0.02	-	159	19	-	8	3
	Max	24.0	10.0	106.0	1.0	0.13	0.08	0.30	0.011	0.03	-	180	19	-	11	12
	Min	8.0	9.2	93.8	1.0	0.10	0.05	0.28	0.002	0.00	-	137	19	-	7	0
	NS	5	2		1	2	2	2	2	2		2	1		5	5

NS = number of samples.
Phosphates reported as PO_4.
All results in mg/l, except phenol - µg/l.

TABLE 18. LAKE ST. CLAIR - WATER QUALITY
Concentrations for July 20-November 19, 1964
"P" Stations

Station No.		Sodium	Potassium	Calcium	Magnesium	Sulfate	Total Alkalinity ($CaCO_3$)
P023	Avg	4.50	0.99	26.0	9.7	11	78
	Max	4.50	0.99	26.0	9.7	11	80
	Min	4.50	0.99	26.0	9.7	11	75
	NS	1	1	1	1	1	4
P024	Avg	4.20	1.00	27.0	9.6	12	78
	Max	4.20	1.00	27.0	9.6	12	81
	Min	4.20	4.00	27.0	9.6	12	74
	NS	1	1	1	1	1	4
P025	Avg	5.05	0.92	27.0	8.8	8	83
	Max	5.40	0.92	27.0	9.6	9	94
	Min	4.70	0.91	27.0	7.9	6	74
	NS	2	2	2	2	2	4
P026	Avg	4.00	0.90	27.0	9.3	5	77
	Max	4.00	0.90	27.0	9.3	5	78
	Min	4.00	0.90	27.0	9.3	5	75
	NS	1	1	1	1	1	4
P027	Avg	4.60	0.90	27.0	9.6	6	78
	Max	4.60	0.90	27.0	9.6	6	81
	Min	4.60	0.90	27.0	9.6	6	75
	NS	1	1	1	1	1	4
P028	Avg	4.50	1.03	27.5	9.9	12	79
	Max	4.60	4.10	28.0	10.0	13	82
	Min	4.40	0.97	27.0	9.8	11	76
	NS	2	2	2	2	2	5

Note: NS = number of samples.
All results in mg/l.

TABLE 19. LAKE ST. CLAIR - WATER QUALITY
Concentrations for 1964
"E" Stations

Station No.		Temp °C	DO	% Sat	BOD_5	NH_3-N	Org-N	NO_3-N	NO_2-N	Tot. PO_4	Tot. Sol. PO_4	Tot. Sol.	Susp. Sol.	Vol. Susp. Sol.	Cl^-	Phen
E-001	Avg	18.8	8.9	96.2	-	0.10	0.04	0.28	0.014	0.10	-	140	-	-	12	3
	Max	21.5	9.3	97.5	-	0.10	0.04	0.28	0.014	0.10	-	140	-	-	12	3
	Min	16.0	8.5	94.9	-	0.10	0.04	0.28	0.014	0.10	-	140	-	-	12	3
	NS	2	2			1	1	1	1	1		1			2	1
E-002	Avg	19.3	8.8	96.2	-	0.16	0.06	0.10	0.014	0.02	-	175	-	-	15	3
	Max	21.5	9.1	97.8	-	0.16	0.06	0.10	0.014	0.02	-	180	-	-	16	3
	Min	17.0	8.5	94.6	-	0.16	0.06	0.10	0.014	0.02	-	170	-	-	14	3
	NS	2	2			1	1	1	2	1		2			2	1
E-003	Avg	21.5	8.5	97.8	-	-	-	-	-	-	-	130	-	-	11	-
	Max	21.5	8.5	97.8	-	-	-	-	-	-	-	130	-	-	11	-
	Min	21.5	8.5	97.8	-	-	-	-	-	-	-	130	-	-	11	-
	NS	1	1									1			1	
E-004	Avg	21.0	8.7	100.0	-	-	-	-	-	-	-	160	-	-	14	-
	Max	21.0	8.7	100.1	-	-	-	-	-	-	-	160	-	-	14	-
	Min	21.0	8.7	100.1	-	-	-	-	-	-	-	160	-	-	14	-
	NS	1	1									1			1	
E-005	Avg	19.0	9.3	101.4	-	-	-	-	-	-	-	130	-	-	10	-
	Max	19.0	9.3	101.4	-	-	-	-	-	-	-	130	-	-	10	-
	Min	19.0	9.3	101.4	-	-	-	-	-	-	-	130	-	-	10	-
E-006	Avg	19.3	9.0	97.9	-	0.08	0.03	0.18	0.014	<.01	-	135	-	-	10	5
	Max	21.5	9.1	101.2	-	0.08	0.03	0.18	0.014	<.01	-	140	-	-	10	5
	Min	17.0	8.8	94.6	-	0.08	0.03	0.18	0.014	<.01	-	130	-	-	9	5
	NS	2	2			1	1	1	1	1		2			2	1

NS = number of samples.
Phosphates reported as PO_4.
All parameters reported as mg/l, except phenol - ug/l.

TABLE 19. LAKE ST. CLAIR - WATER QUALITY
Concentrations for 1964
"E" Stations

Station No.		Sodium	Potassium	Calcium	Magnesium	Sulfate
E-001	Avg	6.30	1.00	27.0	9.9	11
	Max	6.30	1.00	27.0	9.9	11
	Min	6.30	1.00	27.0	9.9	11
	NS	1	1	1	1	1
E-002	Avg	7.50	1.60	35.0	12.0	23
	Max	7.50	1.60	35.0	12.0	23
	Min	7.50	1.60	35.0	12.0	23
	NS	1	1	1	1	1
E-003	Avg	-	-	-	-	-
	Max	-	-	-	-	-
	Min	-	-	-	-	-
	NS	-	-	-	-	-
E-004	Avg	-	-	-	-	-
	Max	-	-	-	-	-
	Min	-	-	-	-	-
	NS	-	-	-	-	-
E-005	Avg	-	-	-	-	-
	Max	-	-	-	-	-
	Min	-	-	-	-	-
	NS	-	-	-	-	-
E-006	Avg	5.50	0.93	27.0	7.7	12
	Max	5.50	0.93	27.0	7.7	12
	Min	5.50	0.93	27.0	7.7	12
	NS	1	1	1	1	1

NS = number of samples.
All parameters reported as mg/l.

TABLE 19. LAKE ST. CLAIR - WATER QUALITY

Concentrations for 1964
"E" Stations

Station No.		Temp °C	DO	% Sat	BOD_5	NH_3-N	Org-N	NO_3-N	NO_2-N	Tot. PO_4	Tot. Sol. PO_4	Tot. Sol.	Susp. Sol.	Vol. Susp. Sol.	Cl^-	Phenol
E-007	Avg	18.8	9.1	98.8	-	0.13	0.04	1.08	0.014	0.10	-	145	-	-	12	3
	Max	20.5	9.2	104.0	-	0.13	0.04	1.08	0.014	0.10	-	150	-	-	13	3
	Min	17.0	9.0	93.6	-	0.13	0.04	1.08	0.014	1.10	-	140	-	-	11	3
	NS	2	2			1	1	1	1	1		2			2	1
E-008	Avg	18.0	9.0	95.9	-	-	-	-	-	-	-	135	-	-	-	-
	Max	20.0	9.1	101.9	-	-	-	-	-	-	-	140	-	-	-	-
	Min	16.0	8.8	89.8	-	-	-	-	-	-	-	130	-	-	-	-
	NS	2	2									2				
E-009	Avg	20.8	9.3	103.2	-	-	-	-	-	-	-	140	-	-	-	-
	Max	22.0	9.3	103.2	-	-	-	-	-	-	-	140	-	-	-	-
	Min	19.5	9.3	103.2	-	-	-	-	-	-	-	140	-	-	-	-
	NS	2	1									1				
E-110	Avg	20.0	9.5	105.5	-	-	-	-	-	-	-	140	-	-	-	-
	Max	20.0	9.5	105.5	-	-	-	-	-	-	-	140	-	-	-	-
	Min	20.0	9.5	105.5	-	-	-	-	-	-	-	140	-	-	-	-
	NS	1	1									1				
E-011	Avg	17.5	9.0	86.7	-	-	-	-	-	-	-	125	-	-	-	-
	Max	19.0	9.0	91.8	-	-	-	-	-	-	-	130	-	-	-	-
	Min	16.0	8.9	81.6	-	-	-	-	-	-	-	120	-	-	-	-
	NS	2	2									2				
E-012	Avg	19.0	9.3	101.4	-	-	-	-	-	-	-	130	-	-	8	-
	Max	19.0	9.3	101.4	-	-	-	-	-	-	-	130	-	-	8	-
	Min	19.0	9.3	101.4	-	-	-	-	-	-	-	130	-	-	8	-
	NS	1		1								1			1	

NS = number of samples.
Phosphates reported as PO_4.
All results in mg/l, except phenol - ug/l.

TABLE 19. LAKE ST. CLAIR - WATER QUALITY
Concentrations for 1964
"E" Stations

Station No.		Sodium	Potassium	Calcium	Magnesium	Sulfate
E-007	Avg	7.00	1.00	29.0	9.4	11
	Max	7.00	1.00	29.0	9.4	11
	Min	7.00	1.00	29.0	9.4	11
	NS	1	1	1	1	1
E-008	Avg	5.0	0.92	27.0	8.2	7
	Max	5.0	0.92	27.0	8.2	7
	Min	5.0	0.92	27.0	8.2	7
	NS	1	1	1	1	1
E-009	Avg	-	-	-	-	-
	Max	-	-	-	-	-
	Min	-	-	-	-	-
	NS					
E-010	Avg	-	-	-	-	-
	Max	-	-	-	-	-
	Min	-	-	-	-	-
	NS					
E-010	Avg	3.90	0.96	27.0	8.0	7
	Max	3.90	0.96	27.0	8.0	7
	Min	3.90	0.96	27.0	8.0	7
	NS	1	1	1	1	1
E-012	Avg	-	-	-	-	-
	Max	-	-	-	-	-
	Min	-	-	-	-	-
	NS					

NS = number of samples.
All results in mg/l.

TABLE 19. LAKE ST. CLAIR - WATER QUALITY
Concentrations for 1964
"E" Stations

Station No.		Temp °C	DO	% Sat	BOD_5	NH_3-N	Org-N	NO_3-N	NO_2-N	Tot. PO_4	Tot. Sol. PO_4	Tot. Sol.	Susp. Sol.	Vol. Susp. Sol.	Cl^-	Pheno
E-013	Avg	21.0	8.7	98.7	-	-	-	-	-	-	-	120	-	-	9	-
	Max	21.0	8.7	98.3	-	-	-	-	-	-	-	120	-	-	9	-
	Min	21.0	8.7	98.3	-	-	-	-	-	-	-	120	-	-	9	-
	NS	1	1									1			1	
E-014	Avg	20.5	8.8	99.4	-	-	-	-	-	-	-	140	-	-	10	-
	Max	20.5	8.8	99.4	-	-	-	-	-	-	-	140	-	-	10	-
	Min	20.5	8.8	99.4	-	-	-	-	-	-	-	140	-	-	10	-
	NS	1	1									1			1	
E-015	Avg	21.0	8.3	93.8	-	-	-	-	-	-	-	130	-	-	-	-
	Max	21.0	8.3	93.8	-	-	-	-	-	-	-	130	-	-	-	-
	Min	21.0	8.3	93.8	-	-	-	-	-	-	-	130	-	-	-	-
	NS	1										1				
E-016	Avg	18.8	9.2	99.1	-	0.32	0.07	1.80	0.013	<.01	-	130	-	-	8	3
	Max	21.0	9.6	99.8	-	0.32	0.07	1.80	0.013	<.01	-	130	-	-	8	3
	Min	16.5	8.7	98.3	-	0.32	0.07	1.80	0.013	<.01	-	130	-	-	7	3
	NS	2	2			1	1	1	1	1		2			2	1
E-017	Avg	24.0	8.8	105.6	-	-	-	-	-	-	-	140	-	-	7	-
	Max	24.0	8.8	105.6	-	-	-	-	-	-	-	140	-	-	7	-
	Min	24.0	8.8	100.6	-	-	-	-	-	-	-	140	-	-	7	-
	NS	1	1									1			1	
E-018	Avg	22.3	8.8	100.6	-	-	-	-	-	-	-	160	-	-	11	-
	Max	24.0	8.8	100.6	-	-	-	-	-	-	-	160	-	-	11	-
	Min	20.5	8.8	100.6	-	-	-	-	-	-	-	160	-	-	11	-
	NS	2	1									1			1	

NS = number of samples.
Phosphates reported as PO_4.
All results in mg/l, except phenol - ug/l.

TABLE 19. LAKE ST. CLAIR - WATER QUALITY
Concentrations for 1964
"E" Stations

Station No.		Sodium	Potassium	Calcium	Magnesium	Sulfate
E-013	Avg	-	-	-	-	-
	Max	-	-	-	-	-
	Min	-	-	-	-	-
	NS					
E-014	Avg	-	-	-	-	-
	Max	-	-	-	-	-
	Min	-	-	-	-	-
	NS					
E-015	Avg	-	-	-	-	-
	Max	-	-	-	-	-
	Min	-	-	-	-	-
	NS					
E-016	Avg	4.00	0.93	27.0	8.4	8
	Max	4.00	0.93	27.0	8.4	8
	Min	4.00	0.93	27.0	8.4	8
	NS	1	1	1	1	1
E-017	Avg	-	-	-	-	-
	Max	-	-	-	-	-
	Min	-	-	-	-	-
	NS					
E-018	Avg	-	-	-	-	-
	Max	-	-	-	-	-
	Min	-	-	-	-	-
	NS	-	-	-	-	-

NS = number of samples.
All results in mg/l.

TABLE 20. COLIFORM AND FECAL STREPTOCOCCI DENSITIES
1964
"P" Stations

Station No.		Organisms/100ml Total Coliforms	Fecal Coliforms	Fecal Strep
P-1	Median	300	-	3
	Maximum	460	-	3
	Minimum	150	-	3
	NS	2		1
P-2	Median	70	-	16
	Maximum	150	-	32
	Minimum	10	-	<1
	NS	4		2
P-3	Median	100	-	61
	Maximum	200	-	61
	Minimum	<1	-	61
	NS	2		1
P-4	Median	17	-	22
	Maximum	35	-	43
	Minimum	<1	-	<1
	NS	3		2
P-5	Median	11	-	1
	Maximum	31	-	2
	Minimum	<1	-	<1
	NS	7		4
P-6	Median	19	-	3
	Maximum	55	-	6
	Minimum	<1	-	<1
	NS	4		2
P-7	Median	5	-	<1
	Maximum	10	-	<1
	Minimum	2	-	<1
	NS	3		2
P-8	Median	12	-	<1
	Maximum	31	-	<1
	Minimum	3	-	<1
	NS	4		2
P-9	Median	68	21	13
	Maximum	130	26	17
	Minimum	6	16	8
	NS	4	2	2

NS = number of samples.

TABLE 20. COLIFORM AND FECAL STREPTOCOCCI DENSITIES (cont.)
1964
"P" Stations

Station No.		Organisms/100ml Total Coliforms	Fecal Coliforms	Fecal Strep
P-10	Median	590	45	13
	Maximum	2,200	65	25
	Minimum	10	10	5
	NS	5	3	3
P-11	Median	210	100	31
	Maximum	420	170	85
	Minimum	90	4	2
	NS	4	3	3
P-13	Median	500	290	93
	Maximum	1,500	290	180
	Minimum	2	290	6
	NS	3	1	2
P-14	Median	31	8	16
	Maximum	50	8	28
	Minimum	10	8	4
	NS	3	1	2
P-16	Median	41	15	4
	Maximum	100	20	6
	Minimum	9	10	2
	NS	4	2	2
P-17	Median	2,500	-	200
	Maximum	8,600	-	480
	Minimum	20	-	2
	NS	4	0	3
P-18	Median	740	-	350
	Maximum	2,800	-	650
	Minimum	22	-	44
	NS	5	0	2
P-20	Median	43	-	130
	Maximum	60	-	320
	Minimum	25	-	<1
	NS	2	0	3
P-22	Median	83,000	-	300
	Maximum	250,000	-	540
	Minimum	100	-	20
	NS	3	0	2

NS = number of samples.

TABLE 20. COLIFORM AND FECAL STREPTOCOCCI DENSITIES (cont.)
1964
"P" Stations

Station No.		Organisms/100ml Total Coliforms	Fecal Coliforms	Fecal Strep
P-23	Median	150	-	48
	Maximum	390	-	94
	Minimum	10	-	2
	NS	3	0	2
P-24	Median	82	-	36
	Maximum	200	-	60
	Minimum	4	-	12
	NS	4	0	2
P-25	Median	260	-	3
	Maximum	740	-	8
	Minimum	13	-	1
	NS	3	0	3
P-26	Median	21	-	<1
	Maximum	62	-	1
	Minimum	2	-	<1
	NS	4	0	2
P-27	Median	16	-	<1
	Maximum	42	-	1
	Minimum	2	-	<1
	NS	5	0	2
P-28	Median	35	-	5
	Maximum	64	-	9
	Minimum	6	-	1
	NS	5	0	3

NS = number of samples.

TABLE 21. COLIFORM AND FECAL STREPTOCOCCI DENSITIES
1964*
"E" Stations

Station No.		Organisms/100ml	
		Total Coliforms	Fecal Streptococci
E-1	Median	50	3
	Maximum	100	5
	Minimum	0	0
E-2	Median	5	69
	Maximum	5	130
	Minimum	5	8
E-3	Median	10	<5
	Maximum	10	<5
	Minimum	10	<5
E-4	Median	230	30
	Maximum	230	30
	Minimum	230	30
E-5	Median	80	5
	Maximum	150	5
	Minimum	10	5
E-6	Median	10	6
	Maximum	10	6
	Minimum	10	6
E-7	Median	85	5
	Maximum	120	5
	Minimum	50	5
E-8	Median	5	9
	Maximum	5	12
	Minimum	5	5
E-9	Median	120	<5
	Maximum	120	<5
	Minimum	120	<5
E-10	Median	5	<5
	Maximum	5	<5
	Minimum	5	<5

*Based on 1-2 samples.

TABLE 21. COLIFORM AND FECAL STREPTOCOCCI DENSITIES (cont.)
1964*
"E" Stations

Station No.		Organisms/100ml Total Coliforms	Fecal Streptococci
E-11	Median	30	7
	Maximum	30	8
	Minimum	30	5
E-12	Median	35	< 5
	Maximum	35	< 5
	Minimum	35	< 5
E-13	Median	35	< 5
	Maximum	35	< 5
	Minimum	35	< 5
E-14	Median	90	10
	Maximum	90	10
	Minimum	90	10
E-15	Median	5	< 5
	Maximum	5	< 5
	Minimum	5	< 5
E-16	Median	5	3
	Maximum	5	3
	Minimum	5	3
E-17	Median	20	5
	Maximum	20	5
	Minimum	20	5
E-18	Median	5	5
	Maximum	5	5
	Minimum	5	5

*Based on 1-2 samples.

BIOLOGY

Biological studies were conducted between August and October 1964 on the St. Clair River and tributaries, Lake St. Clair, and the Clinton River. The Clinton River analyses are discussed in a separate report. Phytoplankton, attached algae, benthic fauna, and physical conditions of the environment were studied. The results are listed in Tables 22 thru 34.

St. Clair River and Tributaries

Phytoplankton

Phytoplankton samples were taken at 8 stations on the St. Clair River and one each on the Black, Pine, and Belle rivers, and one on the St. Clair Cutoff Channel.

The St. Clair River has a range in algal numbers of 390 - 1510 mean number/ml (Table 22), with high values occurring in October at a time of "full bloom." Centric and pennate diatoms were the predominant forms, and blue-green algal counts were low. No appreciable change in the quality or quantity of the phytoplankton between river mile 9.7 - 39.6 was observed.

The tributary phytoplankton counts were considerably higher with ranges of all rivers 1340 - 5290 mean number/ml. Centric diatoms predominate in all rivers with flagellates being found in the Belle River, blue-greens in the Black River, and pennate diatoms in the Cutoff Channel. The rivers appear to have a "bloom" period in August and a subsequent die-off in October. (Table 23).

Attached Algae

The predominant forms in the St. Clair River tributaries are *Ulothrix* sp. and *Cladophora* sp; both of these are types of the green algae, and often characteristic of the oligotrophic environment (Table 25).

Benthic Fauna

The St. Clair River has a benthic population composed of 1 to 14 species, and predominated by *Trichoptera*, *Tubificids*, *Tendipedids*, *Ephemeroptera*, and *Tricladida*. Many pollution-sensitive forms are represented in Table 27, but the pollution-tolerant sludgeworm dominates the population between river Ranges 11.0N and 26.4N, with mean numbers ranging from 500 to 13,600/m^2 bottom. Numbers of benthic organisms increase toward the mouth of the river. This is related to the inflow of tributary water nutrients and accumulation of organic material through the length of the stream (Table 27).

The St. Clair River tributaries have a denser benthic fauna; sludgeworms predominate at all stations. Populations in the Belle, Pine, and Black Rivers increased toward the mouth of the stream, and the number of species decreased. The tributaries to the St. Clair River appear to be more polluted than the river itself. Although pollution-sensitive forms are still present, the effect of the highly enriched tributary streams can be observed at the confluence in the sharp increase of pollution-tolerant forms (Table 28).

Physical Conditions

The St. Clair River waters decrease slightly in depth as they flow toward the mouth; the bottom is rock-gravel in the northern end, and becomes softer with silt, sand, and clay toward the mouth. Transparency

remained fairly constant (Table 30), at an average reading of 1.5m for all stations.

The St. Clair River tributaries have marked indications of organic pollution. A soft bottom of clay, silt, ooze, and detritus was observed on all rivers. A sewage odor was noted on the Black, Pine, and Belle Rivers. The average depth of the rivers is about 1m except the mouth of the Black River, which is dredged annually.

Chemical composition of the bottom material is shown on Table 33.

Lake St. Clair

Phytoplankton

Twnety-nine stations were sampled for phytoplankton analyses. These were divided into nearshore and extended range stations (Table 24).

The phytoplankton population of all stations was dominated by centric and pennate diatoms, and blue-green algae, although the total plankton count was considerably higher at the nearshore station (over 3,400 organisms/ml) than at the extended range station (over 1,000 organisms/ml). The higher counts are a reflection of higher nutrient values related to tributary flow, land runoff, shallow depth, and current reduction. In only 3 samplings of 48 taken (Table 24) was the total phytoplankton count under 500 organisms/ml. This is the number designated as the "algal bloom." From the high numbers of phytoplankton present, Lake St. Clair appears to be highly productive, but the quality of plankton does not contain sufficient representatives of the nuisance algae responsible for taste, odor, and toxins to be a serious problem.

Attached Algae and Vegetation

Chara sp. was observed at all the nearshore stations sampled, and was widespread in the Anchor Bay and St. Clair Flats region. This algae is a well known contributor to taste and odor nuisances, and may be a possible cause of this problem in the Mt. Clemens water facility.

The vascular plant population is characterized by growths of Najas sp. and Potamogeton sp.. This plant growth is controlled by nutrient concentrations, depth, light penetration, turbidity, and suitable substrata. These conditions are met in the shallower borders of the lake, but the constant flow from Lake St. Clair inhibits excessive choking plant growth (Table 26).

Benthic Fauna

Benthic macroinvertebrates were sampled at 15 nearshore stations (Table 29). Mean numbers ranged from 389 to 3,724 organisms/m^2 bottom, and number of represented species from 8 to 22. The predominant organisms were: Tendipedidae, Tubificidae, Amphipoda, and Sphaerididae; the diverse population also contained many representatives of pollution-sensitive forms. The benthic fauna did not indicate there were any areas of severe biological degradation in the deep waters of the lake. Sludgeworms were more numerous in the main body of the lake at a distance from the St. Clair River delta. This distribution is related to the sandy bottom in the delta area, and the high organic content of the central basin, which provides a favorable habitat for sludgeworms.

Physical Conditions

The bottom type of Lake St. Clair is a sand-clay-silt combination (Table 32). Transparency ranged from 0.7 to 2.5m; this value is related

to both the suspended solids and high plankton counts. The lake itself is shallow, with depths ranging from 1.0 to 7.0m - the shallowest portion being Anchor Bay with depths ranging from 1.0 to 3.0m.

Chemical coposition of the bottom material is shown on Table 34.

KEY TO PREDOMINATE PHYTOPLANKTON GENERA

DIATOMS:

a. Cyclotella-Stephanodiscus
b. Fragilaria
c. Gomphonema
d. Melosira
e. Navicula
f. Nitzschia
g. Rhoicosphenia
h. Synedra
i. Genus Unidentified

GREENS:

j. Ankistrodesmus
k. Micractinium
l. Selenastrum
m. Scenedesmus
n. Tetraedron

BLUE-GREENS:

o. Agmenellum
p. Anabaena
q. Anacystis
r. Phormidium

FLAGELLATES:

s. Dinobryon
t. Euglena
u. Genus Unidentified

Metric system is used for all measurements.

TABLE 22. PHYTOPLANKTON - ST. CLAIR RIVER - 1964
Mean Number per Milliliter

Sampling Period	Algal Group	Miles above River Mouth							
		39.6	35.9	31.7	26.4	17.2	13.5	11.0N	9.7S
August	Centric Diatoms	420	420	110	220	360	390	220	390
	Pennate Diatoms	0	80	140	80	80	80	110	80
	Greens	60	30	30	0	0	30	0	30
	Blue-Greens	0	310	0	0	110	30	80	60
	Flagellates	30	0	110	0	80	30	0	0
	Total	510	840	390	300	630	560	410	560
	Predominate Genera*	a	a,q	d,f,g,s	a	a,q	a	a,q	a
September	Centric Diatoms					420	450	600	390
	Pennate Diatoms					210	60	60	120
	Greens					40	30	0	40
	Blue-Greens					40	80	70	60
	Flagellates					60	80	140	80
	Total					770	700	870	690
	Predominate Genera*					a,b	a,b	a,q	a,h
October	Centric Diatoms	950	950	950	1,120	1,120	640	980	
	Pennate Diatoms	100	250	30	140	250	220	60	
	Greens	150	140	0	60	0	110	30	
	Blue-Greens	40	60	60	140	110	0	60	
	Flagellates	10	0	0	0	30	0	30	
	Total	1,250	1,400	1,040	1,460	1,510	970	1,160	
	Predominate Genera*	a	a	a	a,q	a,e	a,e	a	

*See key to Predominate Genera

TABLE 23. LAKE ST. CLAIR AND ST. CLAIR RIVER TRIBUTARIES - 1964
PHYTOPLANKTON
Mean Numbers per Milliliter

Tributary	Miles above River Mouth	Algal Group	Aug.	Sept.	Oct.
Black River	0.2	Centric Diatoms	2,380		920
		Pennate Diatoms	500		110
		Greens	250		200
		Blue-Greens	1,180		80
		Flagellates	140		30
		Total	4,450		1,340
		Predominate Genera*	a, d, q		a, d, j
Pine River	0.2	Centric Diatoms	1,180		1,200
		Pennate Diatoms	250		220
		Greens	60		70
		Blue-Greens	700		80
		Flagellates	0		80
		Total	2,190		1,650
		Predominate Genera*	q		a,d,e,q
Belle River	0.6	Centric Diatoms	3,080		500
		Pennate Diatoms	390		250
		Greens	200		10
		Blue-Greens	360		0
		Flagellates	1,260		3,570
		Total	5,290		4,330
		Predominate Genera*	a,d,q,u		a,h,t,u
Clinton River	0.3	Centric Diatoms	170	250	
		Pennate Diatoms	140	320	
		Greens	30	80	
		Blue-Greens	60	0	
		Flagellates	220	590	
		Total	620	1,240	
		Predominate Genera*	a,u	a,e,u	
Clinton River	10.5	Centric Diatoms			680
		Pennate Diatoms			840
		Greens			480
		Blue-Greens			1,140
		Flagellates			1,030
		Total			4,170
		Predominate Genera*			a,f,r,t

*See key to Predominate Genera

TABLE 23. PHYTOPLANKTON - LAKE ST. CLAIR AND ST. CLAIR RIVER TRIBUTARIES
1964
Mean Numbers per Milliliter

Tributary	Miles Above River Mouth	Algal Group	Aug.	Sept.	Oct.
Clinton R.	19.3	Centric Diatoms			1,410
		Pennate Diatoms			1,340
		Greens			660
		Blue-Greens			350
		Flagellates			180
		Total			3,940
		Predominate Genera*			a,e,q
Clinton R.	33.2	Centric Diatoms			330
		Pennate Diatoms			1,030
		Greens			370
		Blue-Greens			0
		Flagellates			150
		Total			1,880
		Predominate Genera*			a,c,f,h
Clinton R.	40.2	Centric Diatoms			420
		Pennate Diatoms			1,580
		Greens			640
		Blue-Greens			240
		Flagellates			1,560
		Total			4,440
		Predominate Genera*			a,e,f,t
Red Run River	0.1	Centric Diatoms			30
		Pennate Diatoms			0
		Greens			0
		Blue-Greens			760
		Flagellates			590
		Total			1,380
		Predominate Genera*			q,t,u
Cut-off Canal	0.8	Centric Diatoms	620	280	
		Pennate Diatoms	810	560	
		Greens	30	250	
		Blue-Greens	60	30	
		Flagellates	250	620	
		Total	1,770	1,740	
		Predominate Genera*	a,e,f,u	a,f,t,u	

*See key to Predominate Genera

TABLE 24. PHYTOPLANKTON - LAKE ST. CLAIR - 1964
Mean Numbers per Milliliter

Sampling Period	Algal Group	Nearshore Stations						
		P-2	P-3	P-4	P-6	P-7	P-8	P-9
August	Centric Diatoms	760	840	220	730	100	80	80
	Pennate Diatoms	1,120	730	170	200	60	30	480
	Greens	250	310	60	0	0	0	60
	Blue-Greens	390	870	200	80	0	30	60
	Flagellates	200	200	30	0	0	80	60
	Total	2,720	2,950	680	1,010	160	220	740
	Predominate Genera*	a,d,f,h	a,f,h,q	a,q	a,e,q	a	a,u	e,f
September	Centric Diatoms		1,200		480		250	
	Pennate Diatoms		450		670		250	
	Greens		1,010		80		60	
	Blue-Greens		870		340		220	
	Flagellates		80		30		80	
	Total		3,610		1,600		860	
	Predominate Genera*		a,f,l,m,q		a,f,o,q		a,o	

*See key to Predominate Genera

TABLE 24. PHYTOPLANKTON - LAKE ST. CLAIR - 1964
Mean Numbers per Milliliter

Sampling Period	Algal Group	Nearshore Stations						
		P-11	P-12	P-13	P-18	P-22	P-24	P-26
August	Centric Diatoms	140	280		3,020	950	640	390
	Pennate Diatoms	140	390		200	170	30	280
	Greens	0	60		310	1,180	110	30
	Blue-Greens	110	480		80	410	60	60
	Flagellates	110	80		170	250	140	0
	Total	500	1,290		3,780	2,960	980	760
	Predominate Genera*	a,q	a,e,f		a,c,m,u	a,k,p,u	a,u	a,h
September	Centric Diatoms	170		60	1,430	1,900		780
	Pennate Diatoms	310		480	760	390		30
	Greens	60		80	760	620		30
	Blue-Greens	80		0	590	170		30
	Flagellates	110		140	390	360		0
	Total	730		760	3,930	3,440		870
	Predominate Genera*	a,u		a,e,u	a,f,q,u	a,j,m,t,u		a

*See key to Predominate Genera

TABLE 24. PHYTOPLANKTON - LAKE ST. CLAIR - 1964
Mean Numbers per Milliliter

Sampling Period	Algal Group	Extended Range Stations							
		E-1	E-4	E-5	E-5a	E-6	E-8	E-9	E-10
August	Centric Diatoms	220	420	640		370	530	780	500
	Pennate Diatoms	360	140	110		460	80	140	170
	Greens	60	110	0		130	0	0	30
	Blue-Greens	170	520	200		0	250	140	500
	Flagellates	220	140	200		20	110	80	1,150
	Total	1,030	1,330	1,150		980	970	1,140	2,350
	Predominate Genera*	a,e,q,s	a,q	a,q,u		a,g,i	a,q	a	a,q,u
October	Centric Diatoms	980	760	560	840	730	980	1,340	620
	Pennate Diatoms	170	110	200	110	30	80	170	60
	Greens	200	80	110	30	60	170	80	60
	Blue-Greens	140	30	30	60	0	80	0	30
	Flagellates	30	0	0	0	0	0	0	0
	Total	1,520	980	900	1,040	820	1,310	1,590	770
	Predominate Genera*	a,n,q	a	a,h	a	a	a,q	a,c	a

*See key to Predominate genera

TABLE 24. PHYTOPLANKTON - LAKE ST. CLAIR - 1964
Mean Numbers per Milliliter

Sampling Period	Algal Group	Extended Range Stations						
		E-11	E-12	E-14	E-15	E-16	E-17	E-17a
August	Centric Diatoms	530	530	140	80	310	450	
	Pennate Diatoms	60	80	200	140	200	220	
	Greens	0	30	60	0	30	0	
	Blue-Greens	110	0	450	0	170	220	
	Flagellates	140	60	140	60	30	220	
	Total	840	700	990	280	740	1,110	
	Predominate Genera*	a,q,u	a	a,h,q	a	a,q	a,h,q	
October	Centric Diatoms	700	760	810		950	620	640
	Pennate Diatoms	30	30	80		170	0	60
	Greens	60	140	310		110	0	80
	Blue-Greens	60	30	80		80	0	60
	Flagellates	30	0	60		0	0	0
	Total	880	960	1,340		1,310	620	840
	Predominate Genera*	a	a	a,u		a,e	a	a

*See key to Predominate Genera

TABLE 25. LAKE ST. CLAIR AND ST. CLAIR RIVER TRIBUTARIES
ATTACHED ALGAE
October 1964

Miles Above River Mouth	Algal Form
Pine River - 4.5	*Ulothrix* sp.
Black River - 3.0	*Cladophora glomerata*
Belle River - 0.6	*Cladophora* sp.
4.0	*Spirogyra* sp.
22.5	*Cladophora* sp.
Clinton River - 10.5	*Oscillatoria* sp.
33.2	*Mougeotia* sp.

TABLE 26. BOTTOM FLORA - LAKE ST. CLAIR
August-October 1964

Station	Vascular Plants	Attached Algae
E-1	*Najas* sp.	*Chara* sp.
E-5	*Elodea* sp.	*Chara* sp.
E-6	*Vallisneria americana*	*Chara* sp.
	Najas flexilis	
E-9	*Potamogeton crispus*	*Chara* sp.
E-10	*Potamogeton crispus*	*Chara* sp.
	Myriophyllum sp.	
	Najas flexilis	
	Elodea sp.	
E-15	*Vallisneria americana*	*Chara* sp.
	Najas flexilis	
	Potamogeton crispus	
	Myriophyllum sp.	

TABLE 27. BENTHIC MACROINVERTEBRATES - ST. CLAIR RIVER
August-October 1964
Mean Numbers per square meter of bottom

Organisms	Miles Above River Mouth							
	39.6	35.9	31.7	26.4	17.2	13.5	11.0N	9.7S
Tubificidae		20	20	1,580	500	13,600	950	220
Tendipedidae		20	20	1	80	10	10	8
Pelecypoda								
Sphaeriidae								
Pisidium					2			8
Sphaerium					3			
Unionidae								
Lampsilis							1	
Hirudinea								
Glossiphonidae					1	5		
Tricladida								
Dugesia		7			50	5		
Prosobranchia								
Amnicola						3		30
Goniobasis					10	3		
Pleurocera					6			
Valvata							3	
Pulmonata							5	
Lymnea					3			
Physa		3		9	1			20
Ferrisa					5			
Isopoda								
Asellus						3		
Amphipoda								
Gammarus		1	5		5	40	8	50
Hyallela			3					60
Trichoptera								
Hydropysche	20	5	20				3	
Psychomyiidae						8	3	
Ephemeroptera			5					
Hexagenia					5	20	130	
Stenonema							40	
Others	—	—	90	—	5	10	8	—
Total	20	56	163	1,590	676	13,707	1,161	396

TABLE 28. LAKE ST. CLAIR AND ST. CLAIR RIVER TRIBUTARIES
BENTHIC MACROINVERTEBRATES
August-October 1964
Mean Numbers per Square Meter of Bottom

	Miles Above River Mouth				
	Black River			Pine River	
Organisms	0.2	3.0	12.0	0.2	4.5
Tubificidae	3,480	2,280	130	3,280	
Tendipedidae	40	360	100	170	300
Pelecypoda					
Sphaeriidae					10
Pisidium					
Sphaerium					
Tricladida					
Dugesia	10	60			
Pulmonata					
Physa					
Amphipoda					
Gammarus				3	10
Trichoptera					
Hydropysche			10		
Leptoceridae					
Rhyacophilidae					
Ephemeroptera					10
Hexagenia			10	20	60
Others		30	70	3	170
TOTAL	3,530	2,730	320	3,476	560

TABLE 28. BENTHIC MACROINVERTEBRATES - LAKE ST. CLAIR & ST. CLAIR RIVER TRIBUTARIES
August-October 1964
Mean Numbers per Square Meter of Bottom

	Miles Above River Mouth					
	Belle River			Clinton River		Red Run River
Organisms	0.6	4.0	22.5	0.3	10.5	0.1
Tubificidae	1,120	470	30	7,920	51,200	111,000
Tendipedidae	170	240		10		280
Pelecypoda						
Sphaeriidae						
Pisidium	3					
Sphaerium						
Tricladida						
Dugesia						
Pulmonata						
Physa						20
Amphipoda						
Gammarus			400	5		
Trichoptera						
Hydropysche			10			
Leptoceridae			100			
Rhyacophilidae						
Ephemeroptera						
Hexagenia		40	60			
Others		70	160	5		20
TOTAL	1,293	820	760	7,940	51,200	111,320

TABLE 29. BENTHIC MACROINVERTEBRATES - LAKE ST. CLAIR
AUGUST - OCTOBER 1964
Mean numbers per square meter of bottom

ORGANISMS	STATIONS														
	E-1	E-4	E-5	E-5a	E-6	E-8	E-9	E-10	E-11	E-12	E-14	E-15	E-16	E-17	E-17a
Tubificidae	190	1710	290	120	630	70	60	430	300	730	110	50	80	320	110
Tendipedidae	120	90	40	20	100	90	40	40	100	170	10	360	100	60	20
Pelecypoda															
Sphaeriidae															
Pisidium	40	50	30	30	20	30	50	8	30			10	8	10	
Sphaerium	40	40	10	50	100	10	50	5	140	110	60		20	90	1510
Unionidae															
Anodonta					3	3				3			5	3	
Fusconaia		3													
Lampsilis													10	3	
Lasmigona		3			3							8		5	10
Hirudinea															
Arhynchobdellida	3		5			3		3	3			3			
Glossiphonidae	40		3			3		20	20	5		8	3		
Helobdella stagnalis	5	10		5				5		5	3		30		5
Glossiphonia			3		3				10						
Tricladida															
Dugesia		8					3	30	230		3	5	20		
Prosobranchia															
Amnicola	5		200	5	190	20	80	3	200				50		
Bythinia		20	30	20	100		110	40	90		3		10	20	5
Goniobasis	10			40					5			10			
Pleurocera	3		3			3	5	3	50			10	3		
Valvata tricarinata	5			60	60	40	10	20	40	10	10	50	8		

TABLE 29. BENTHIC MACROINVERTEBRATES - LAKE ST. CLAIR (cont'd)
AUGUST - OCTOBER 1964
Mean numbers per square meter of bottom

ORGANISMS	STATIONS														
	E-1	E-4	E-5	E-5a	E-6	E-8	E-9	E-10	E-11	E-12	E-14	E-15	E-16	E-17	E-17a
Pulmonata															
Gyraulus												3			
Helisoma			5		20		5	3	3				5		
Lymnea			30		3				10						
Physa	8		30		120		10	5	30			20	10		
Isopoda															
Asellus militaris	3		3				20	90	10	3					
Lirceus lineatus	5														
Amphipoda															
Gammarus	2340	20	540	590	300	150	330	420	2370	220		400	50	70	60
Hyallela azteca			230			140						180			
Trichoptera					3										
Hydropysche				5											
Leptoceridae					3										
Leptocerus										5					
Molanna	8														
Neuroclipsis												3	3	3	
Phryganea	3														
Psychomyia										3					
Psychomyiidae												5			
Rhyacophilidae					3										
Ephemeroptera									3						
Ephemera						10	3	90	5	3		5			
Ephemeridae	20											3			
Hexagenia	3	50			100	170	50	140	70	440	190	40	60	50	5
Others	3			10		10			5			60	20		20
TOTAL	2854	2004	1452	895	1761	752	826	1358	3724	1707	389	1233	495	634	1745

TABLE 30. PHYSICAL OBSERVATIONS - ST. CLAIR RIVER
August-October 1964

Miles Above River Mouth	Depth, m.	Bottom Type	Transparency m.
39.6	10.0	Rock, gravel	-
35.9	7.0-13.0	Clay, rock, gravel	1.5 - 2.5
31.7	7.0-10.0	Clay, rock, gravel	2.0
26.4	7.0-11.0	Clay, sand, gravel, rock	1.5 - 2.0
17.2	7.0-9.0	Clay, sand, gravel	1.2 - 2.0
13.5	7.0-13.0	Clay, sand, gravel	1.1 - 1.5
11.0N	3.0-13.0	Clay, sand, gravel, silt	1.1 - 2.0
9.7S	6.0-10.0	Clay, sand, gravel	1.1 - 2.0

TABLE 31. PHYSICAL OBSERVATIONS - LAKE ST. CLAIR AND ST. CLAIR RIVER TRIBUTARIES
August-October 1964

Miles Above River Mouth	Depth, m.	Bottom Type	Transparency, m.	Remarks
Black River				
0.20	7.0 - 8.0	Ooze	1.5 - 2.5	Petroleum bottom odor
3.00	0.5	Clay, silt, sand	To bottom	
12.00	0.5	Clay, silt, sand	To bottom	
Pine River				
0.20	1.0 - 5.0	Clay, silt, sand, detritus	0.8 - 0.5	Petroleum water odor, petroleum and sewage bottom odor
4.50	1.0	Clay, silt, sand	0.5	
Belle River				
0.60	3.0	Ooze, sand, silt	0.2 - 0.3	Sewage bottom and water odor
4.00	1.0	Sand, silt, clay	To bottom	
22.50	1.5	Silt, sand, gravel, rock		
Clinton River				
0.30	3.0	Ooze, silt	0.5	Sewage water odor
10.50	1.0	Sand	0.3	Sewage bottom odor
Red Run River				
0.10	0.8	Sand	0.3	Sewage bottom and water odor

TABLE 32. PHYSICAL OBSERVATIONS - LAKE ST. CLAIR
August - October 1964

Station	Depth, m.	Bottom Type	Transparency, m.
E-1	2.5 - 3.0	Sand	2.5
E-4	4.0 - 5.0	Clay, silt	1.0 - 1.2
E-5	4.0 - 7.0	Sand, silt	1.5 - 2.0
E-5a	1.7	Sand	1.5
E-6	5.0 - 6.0	Sand, gravel, Clay silt	1.5 - 2.0
E-8	3.0	Sand, silt	0.9 - 1.5
E-9	1.0 - 1.8	Sand, gravel	1.0 - 1.5
E-10	1.0 - 3.0	Silt	1.0 - 1.3
E-11	3.0	Sand, silt	1.1 - 1.5
E-12	4.6 - 6.0	Sand, clay, silt	0.7 - 1.5
E-14	5.0	Clay, silt	1.5
E-15	2.0 - 2.3	Silt	1.0
E-16	4.0 - 5.0	Clay, silt	1.3 - 1.5
E-17	5.0	Clay, silt	1.3 - 1.5
E-17a	4.5	Sand, silt	1.5

TABLE 33. ST. CLAIR RIVER BOTTOM MUD DEPOSITS DATA

Station No.	% Solids	% Volatile Solids	NH_3-N	NO_3+NO_3-N	Org-N	Total PO_4	Total Iron	COD	Sulfides	Cu	Ni
SR 10N	57.4	5.7	0.08	0.001	1.66	0.91	4.9	25.1	0.49	0.002	0.001
SR 10S	76.4	2.7	0.00	0.001	0.13	0.15	2.8	7.7	0.14	*	0.007
SR 13.7	61.3	3.6	0.00	0.001	0.49	1.56	-	23.0	0.28	-	-
SRBE 17.4	63.4	5.4	0.07	0.001	2.35	1.64	9.1	36.0	0.17	0.003	0.004
SR 17.5	82.9	1.9	0.01	0.001	0.26	0.21	1.5	13.0	0.10	0.001	0.001
SRPR 25.2	56.4	9.0	0.11	0.001	1.84	1.62	5.5	105.0	0.36	0.008	0.006
SRBK 36.5	49.5	8.2	0.12	0.001	2.24	1.41	5.3	119.0	0.38	0.026	0.005
Clinton R. - P15	38.9	8.6	0.26	0.002	2.91	10.00	12.7	134.0	2.44	0.014	0.014

*Not detected at sensitivity of test.
-No sample collected.

NOTE: Concentrations for bottom mud deposits are shown in mg/g.
Concentrations for water samples elsewhere in the report are shown in mg/l.

TABLE 34. LAKE ST. CLAIR BOTTOM MUD DEPOSIT DATA

Station No.	% Solids	% Volatile Solids	NH_3-N	NO_3+NO_2-N	Org-N	Total PO_4	Total Iron	COD	Sulfides	Cu	Ni
E-1	79.3	1.2	0.01	0.004	0.59	0.60	2.0	8.6	0.12	*	0.001
E-4	55.1	3.9	0.03	0.006	1.24	0.93	6.3	35.0	0.09	0.001	0.007
E-5	60.8	3.3	0.04	0.003	0.66	0.62	5.6	30.0	0.36	0.004	0.006
E-6	60.2	3.2	0.04	0.003	0.86	0.16	3.4	30.0	0.08	0.001	0.002
E-8	76.3	2.1	0.02	0.003	0.58	0.78	4.6	20.0	0.14	0.001	0.004
E-9	80.4	1.2	0.02	0.002	0.36	0.40	3.5	15.0	0.32	0.003	0.002
E-10	71.1	5.0	0.02	0.002	0.77	0.76	2.6	31.0	0.20	0.002	0.002
E-11	82.0	2.8	0.03	0.002	0.41	0.40	3.9	17.0	0.10	0.003	0.003
E-12	72.3	3.4	0.02	0.003	0.69	0.74	1.8	90.0	0.19	0.002	0.002
E-14	50.8	0.8	0.04	0.004	0.39	1.34	7.2	43.0	0.15	0.003	0.008
E-15	60.4	4.0	0.03	0.001	0.89	0.93	11.3	33.0	0.34	0.002	0.005
E-16	72.7	3.2	0.03	0.002	0.62	0.74	4.3	25.0	0.22	0.002	0.004
E-17	69.8	3.7	0.04	0.004	0.56	0.74	5.4	30.0	0.16	0.001	0.004
E-18	76.3	2.9	0.01	0.001	0.64	0.60	4.0	25.0	0.13	0.002	0.003
E-19	82.0	2.2	0.03	0.001	0.73	0.32	2.4	5.4	0.13	*	0.001

*Not detected at sensitivity of test.

NOTE: Concentrations for bottom mud deposits are shown in mg/g.
Concentrations for water samples elsewhere in the report are shown in mg/l.