UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMPILATION OF DATA FOR MICHIGAN LAKES

BY J.B. MILLER
T. THOMPSON

LANSING, MICHIGAN
JUNE 1970

Prepared in cooperation with the
Michigan Department of Natural Resources
Geological Survey Division

Open-file report

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Michigan and its counties.

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COMPILATION OF DATA FOR MICHIGAN LAKES

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INTRODUCTION

Michigan's more than 11,000 lakes are a valuable resource. Primarily, they are used for recreation but many have potential for industrial use and for water supply.

Lakes have water surfaces that expand and decrease in area, and levels that rise and fall. Records of lakes levels show that lake stages change, have seasonal trends, and may fluctuate several feet each year. Often, these changes affect the use of lakes and cause erosion of their shorelines. It is important, therefore, to monitor lake levels in order to add to their understanding and to provide a basis for increasing their usefulness.

In the early 1940's, and in cooperation with the Michigan Department of Natural Resources, a network of lake gages was established in Michigan to observe lake levels. In subsequent years, this network of lake gages was changed to provide a broad areal coverage of lakes in the State, to answer specific requests for data, and to obtain information on a large portion of Michigan's many lakes. These data have been applied primarily in studies involving the design of lake-level control facilities and establishing legal levels for lakes.

Purpose and Scope

Lake-stage records are useful in planning recreation facilities; designing control facilities in lake outlets; determining legal levels for lakes; investigating the hydrology of an area, and for many other uses. The purpose of this report is to present in useable form, lake data collected through water year 1968. Included, for each lake, are a description of the lake, a list of discharge measurements made on the inlet and outlet streams, quality of water data, location maps, and lake-stage hydrographs. Daily readings of lake levels were usually made on the lakes, but in this report only the monthly extremes are shown in the hydrographs. That is, the highest and lowest readings each month are plotted.

Need for additional lake data

To increase the utility of a lake it is often necessary to control its level. To do so requires knowledge of the hydrologic and physical characteristics of a lake. For example, the nature of the surrounding shoreline, lake area, beach profile, the size of the watershed draining into the lake, the presence of inlet and outlet streams, and the volume of water flowing into and out of a lake are features which should be defined. Much of these data are in various reports. For example, the Michigan Department of Natural Resources has completed many lake-level control studies--studies that report and synthesize these data. These data have been used in Circuit Courts in setting the legal level for lakes. Physical conditions that have been used to evaluate lake-level control problems, to analyze remedial measures, and to study proposed improvements and recommendations are also discussed in reports by the Michigan Department of Natural Resources. Some of these previously reported data are included in this report.

In addition to a lake's physical characteristics other needed information are related to the natural processes occurring in a lake. For example, how much precipitation falls on its surface?; how much water is evaporated from its surface?; how much water is lost due to transpiration by aquatic vegetation in the lake?; how much water seeps through the lake bottom?; how much water enters the lake from aquifers? The ability to answer these questions insures solution to many lake problems.

Information is also needed on the chemical and biological aspects of lakes. For example--What causes algae blooms and other nuisance growths which occur in many lakes?; what causes the problems of shoreline degradation and fish kills? Answers to these and other questions must be obtained before engineering solutions or remedial management practices can be applied to many problems associated with lakes.

The data compiled in this report form a base from which more comprehensive lake studies can be made. Such studies will require a thorough examination of current and projected lake problems, and will include parameters related to hydrologic, biologic, chemical quality, legal, recreational and other environmental aspects of inland lakes--one of Michigan's most valuable resources.

Acknowledgements

The Michigan Department of Natural Resources provided some of the lake-stage records and supplemental data presented in this report. Much of the quality-of-water data were furnished by the Michigan Department of Public Health.

Michigan Laws Pertaining to Lakes

Many laws have been passed by the Michigan Legislature relating to the waters within the State. Several of these laws have direct reference or bearing in the inland lakes of Michigan and are being listed here as a guide for those interested in legal statutes governing lakes. The following Acts summarize the most recent legislation pertaining to lakes.

Act 146 of 1961 as amended.--Inland Lake Level Act of 1961.

Act 184 of 1963.--Construction of Dams in Streams.

Act 20 of 1964.--Surplus [illegible]ers Act of 1964.

Act 291 of 1965 as amende[illegible] Inland Lakes and Streams Act.

Act 345 of 1966.--Inland Lak[illegible] Improvement Act of 1966.

Act 288 of 1967.--Subdivision Control Act of 1967.

Act 167 of 1968.--Flood Plains Control.

UNITS AND DEFINITIONS OF TERMS

Celsius.--Degrees Celsius (centigrade, °C) are the units for expressing temperature in the metric system. The freezing point of water is 0°C and the boiling point 100°C. To convert from Celsius to Fahrenheit, multiply the temperature in °C by 1.8 and add 32°.

Cubic feet per second.--A unit expressing rate of discharge. One cubic foot per second is equal to the discharge of a stream of rectangular cross section, 1 foot wide and 1 foot deep, flowing water at an average velocity of 1 foot per second.

Datum of gage.--Elevation of gage zero in feet above mean sea level.

Gage height.--The water-surface elevation referred to some arbitrary gage datum. Gage height is often referred to as stage.

High-water mark (HWM).--An identifying mark of the maximum stage reached during a period.

Hydrograph.--A graph showing stage, flow, velocity, or other property of water with respect to time.

Lake-level control study.--Investigation of the physical characteristics of a lake such as the nature of surrounding land, presence of an outlet, size of contributing watershed, and the volume of water flowing into a lake. Design of recommended control structure is usually included.

Milligrams per liter (mg/l).--A unit for expressing the concentration of chemical constituents by weight per unit of volume. It is numerically equal to parts per million (ppm) in the analyses used in this publication.

Water year.--A unit of time used by the U. S. Geological Survey. The time interval is from October 1 of any year to September 30 of the following year. The water year is designated by the calendar year in which it ends.

EXPLANATION OF TABULAR DATA

Location.--The location of a lake has been defined by the latitude and longitude of its major outlet. If a lake has no outlet, the coordinates of the southernmost point of the lake are used.

Surface area.--Surface area is the area of a lake outlined on the latest U. S. Geological Survey topographic maps as the boundary of the lake. Areas shown were obtained from Michigan Lake Inventory Bulletins 1-83, (Humphrys and Green, 1962)[1].

Maximum depth.--Depths shown were obtained from Michigan Lake Inventory Bulletins 1-83, (Humphrys and Green, 1962)[1].

Drainage area.--The drainage area of a lake is that area, measured in a horizontal plane, which is enclosed by its drainage divide. The area includes that of the lake.

Records available.--The periods for which lake-stage records have been collected.

Gage.--Standard enameled staff gages are the type of gage usually used to obtain lake levels. Water-stage recorders are used on some lakes to obtain a continuous record of stage. The datum of the gage is stated if known and refers to the zero of the gage. Mean sea level elevations are based on the datum of 1929. Many lakes have had datum changes during period of record. Lake stage elevations shown on hydrographs are based on one datum--that stated in the gage paragraph.

Established legal level.--The lake level which has been set by Circuit Courts as that beneficial to most riparian owners.

Extremes.--The maximum and minimum stages which occurred during the period of record. If the maximum or minimum is qualified as observed, the probability exists that a higher or lower stage has occurred. The years shown agree with the records available paragraph, but do not necessarily imply a complete year.

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[1]Humphrys, C. R. and Green, R. F., 1962, Michigan lake inventory: Michigan State Univ., Dept. Resource Devel. Bull. 1-83.

GPO 818-596-2

Regulation or control.--Many lakes have structures on the outlet to control the lake level. Other lakes may be affected by the regulatory effects of dams located many miles from the lake. Where a lake is known to have such structures that affect its level, it is mentioned in this paragraph.

Remarks.--The major inlets and outlets of the lake are identified. Reference is made to reports or studies containing additional information about the lake. Measurements of streamflow made in the inlets or outlets, in the vicinity of the lake, are listed. Reference is also made to gaging stations on the inlets or outlets if within close proximity of the lake.

LOCATION MAPS

A location map is included with the lake manuscript showing the physical setting of the lake with respect to location of inlet and outlet streams, locations where discharge measurements were made, shape of the lake, and the lake's proximity to nearby towns, roads, and other physical features. Figure 1, map legend, defines the features shown on the location maps.

LAKE HYDROGRAPHS

Hydrographs of lake levels are provided for each lake included in this report. The hydrographs are a plot of the monthly maximum and minimum observed gage heights. Gage heights shown are water-surface elevations referred to gage datum. To convert to mean sea level elevation, add the gage height to the datum of the gage where provided in the gage paragraph of the lake manuscript.

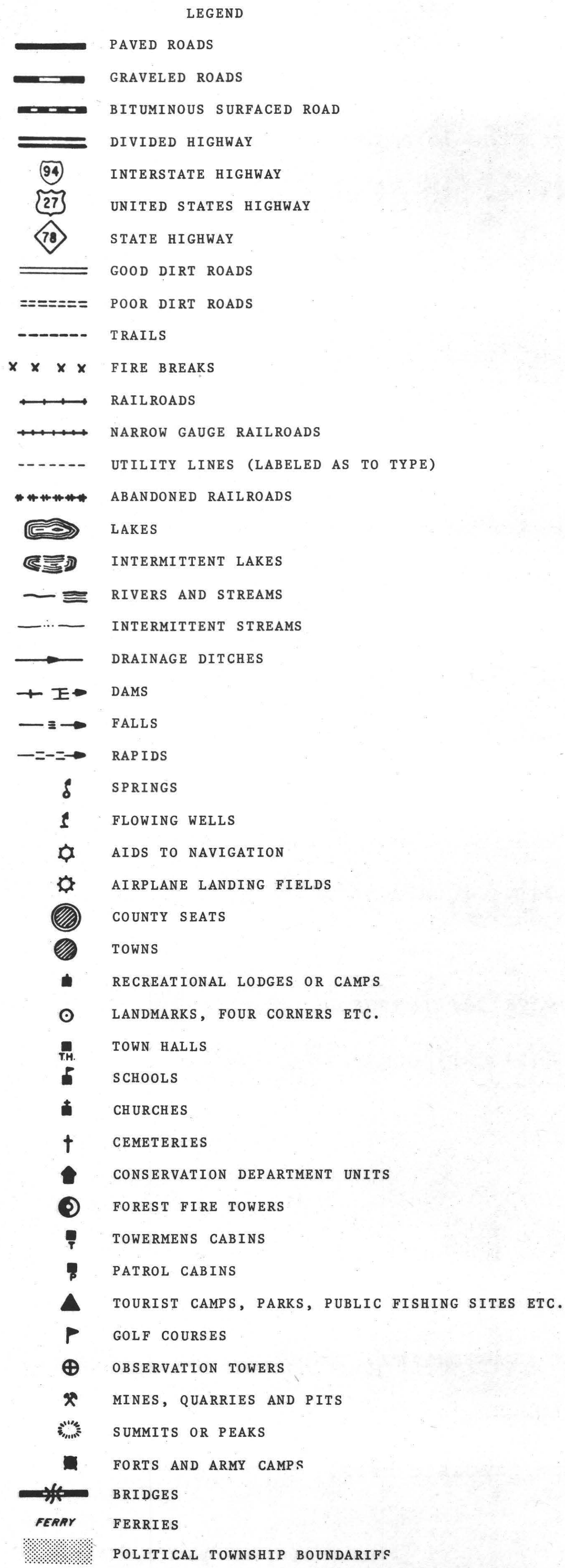

Figure 1.--Map legend defining physical features shown on location maps.

EXPLANATION OF TABLE ON CHEMICAL QUALITY

Data on the chemical quality of water in many of Michigan's inland lakes are provided in table 1. An explanation of the data included follows:

Location.--Sampling locations are given with reference to the Michigan meridian and base line and by latitude and longitude. Latitudes and longitudes are given as a 15 digit series of numbers and letters. For example, 421217N0860007W is latitude 42°12'17" North, longitude 086°00'07" West. If the exact sampling site on a lake is unknown, the major outlet of the lake is designated as the collection point. If a lake has no outlet, the southernmost point of the lake is defined.

Depth below surface.--The depth at which the sample was taken is given in feet below the water surface.

Silica (SiO_2).--Silica occurs in many minerals and is dissolved from rocks and soils. Natural waters commonly contain from 1 to 30 mg/1 (milligrams per liter) silica. Excessive amounts of silica form scale in pipes and boilers and interferes with various industrial water uses.

Iron (Fe).--Iron is dissolved from many minerals in rocks and soils. Iron is only slightly soluble in water and is readily oxidized to form a reddish-brown sediment. Excessive amounts of iron are objectionable for most domestic and industrial water uses and may promote nuisance growths of bacteria. Federal drinking water standards suggest that iron concentrations should not exceed 0.3 mg/1 for domestic uses.

Calcium (Ca) and Magnesium (Mg).--Calcium and magnesium are dissolved from most rocks and soils, especially those derived from limestones, dolomite and gypsum. Calcium and magnesium cause most of the hardness properties of water.

Sodium (Na) and Potassium (K).--Sodium and potassium are dissolved from most rocks and soils. Moderate quantities have little effect on the usefulness of water for most purposes. Sodium concentrations in excess of 5 mg/l may be objectionable for some industrial uses.

Bicarbonate (HCO_3) and Carbonate (CO_3).--Bicarbonate and carbonate are dissolved by the action of carbon dioxide in water on rocks and soils derived from limestones and dolomites. Bicarbonate and carbonate produce alkalinity in water, with concentrations in lakes being related to pH (see below), carbon dioxide content, and the photosynthetic rate. Fish and plant productivity generally increases with increasing alkalinity. High bicarbonate and carbonate concentrations may be objectionable for certain industrial water uses.

Sulfate (SO_4).--Naturally dissolved from rocks and soils containing gypsum, pyrite and other sulfur minerals. Sulfates also may be present in high concentrations in mine drainage waters and certain industrial wastes, such as tanneries and pulp mills. Under anaerobic conditions sulfate may be removed from water in the bacterial production of hydrogen sulfide gas from decomposing organic matter in bottom sediments. Conversely, lake sediments under aerated water may lose sulfur to water in the form of sulfate. High concentrations of sulfate in water may impart a bitter taste and render water unuseable for certain industrial uses. Federal drinking water standards suggest a maximum limit of 250 mg/l sulfate in drinking water.

Chloride (Cl).--Chlorides are dissolved from rocks and soils. They are also present in domestic sewage, industrial wastes, and oil well brines. Large amounts of chlorides impart a salty taste and increase the corrosiveness of water. Federal drinking water standards recommend a maximum limit of 250 mg/l for chloride. Fresh-water fish have tolerance limits for chlorides ranging from 400 for trout to over 4,000 mg/l for bluegills.

Fluoride (F).--Fluorides are dissolved in minor amounts from some minerals in rocks and soils. Fluoride concentrations of about 1 mg/l in domestic water supplies is beneficial in the prevention of tooth decay. Concentrations exceeding 1.5 mg/l in drinking water may induce mottling of teeth.

Nitrate (NO_3).--Nitrogen, an essential nutrient to aquatic life, occurs in natural waters in several forms depending upon its oxidation level. The distribution of nitrogen in its various states in the aquatic environment is referred to as the nitrogen cycle. The nitrate ion (NO_3) represents nitrogen in its completely oxidized state and usually is the result of the decay and oxidation of organic forms of nitrogen. Sources of nitrates in water include decaying organic matter, domestic and stock sewage, fertilizers, and a few industrial wastes. In the nitrate form, nitrogen is readily utilized as a nutrient by algae and other aquatic plants, thus, high nitrate concentrations in lake waters may lead to noxious algal blooms and excessive plant growth, contributing to hastened eutrophication (aging) of the lake.

Phosphate (PO_4).--The element phosphorus also forms an essential nutrient cycle in the environment. Phosphorus is most commonly reported in terms of the orthophosphate ion (PO_4^{-4}). Sources of phosphates in water include leaching from phosphate rocks, decay of organic matter, domestic sewage (largely due to phosphate based synthetic detergents), and, to a minor extent, agricultural drainage. The exact role phosphorus plays in the organic nutrient cycles is not clearly understood, however, it appears that the presence of phosphorus is essential for the full utilization of nitrogen and other nutrients. Thus, a relatively small increase in the phosphorus concentration in a lake may greatly multiply the undesirable effects of other nutrients.

Dissolved solids.--Consist mainly of the dissolved mineral constituents in water and are represented by the residue that remains after filteration, evaporation, and drying at a temperature of 180°C.

Hardness.--A property of water which causes an increase in the amount of soap that is needed to produce foam or lather. Hardness is produced almost completely by the presence of calcium and magnesium salts in solution. Hardness in water results naturally from the accumulation of dissolved soil minerals and may be increased by industrial wastes or agricultural drainage. Water high in hardness is objectionable for many industrial and domestic uses. Soft waters may increase the sensitivity of aquatic life to toxic materials. Carbonate hardness is represented by the carbonate and bicarbonate salts of calcium and magnesium. Noncarbonate hardness is represented by all other salts of calcium and magnesium. Hardness is expressed conventionally in terms of an equivalent quantity of calcium carbonate. The following scale may assist the reader in appraising hardness:

Degree of hardness	Hardness range (mg/l)
Soft	0-60
Moderately hard	61-120
Hard	121-180
Very hard	180

Specific conductance.--A measure of the ability of a water to conduct an electrical current. It is expressed in micromhos at 25°C (Celsius). Pure water has a very small electrical conductance, but the conductance increases with increasing concentration of dissolved minerals.

pH.--pH is expressed as the negative logarithm (base 10) of the hydrogen ion concentration of a solution. pH may be taken as an indication of acidity, with a solution having a pH of 7 being neutral, greater than 7 being alkaline, and less than 7, acidic. Acids, acid salts and carbon dioxide lower the pH, whereas carbonates, bicarbonates, hydroxides, phosphates and silicates raise the pH. Most domestic sewages are neutral or slightly alkaline, whereas industrial wastes usually have either relatively high or low pH values compared to the natural receiving waters. The effect of pH upon aquatic life depends upon other factors such as temperature, dissolved oxygen, and the concentrations of various ions. The Michigan Water Resources Commission has set pH limits for most water uses at from 6.5 to 8.8 with a maximum induced variation of 0.5 unit (Michigan Water Resources

Commission, 1968)[2]. For the water use designation of fish and other aquatic life, the maximum artificially induced variation is given as 1.0 unit, with the added proviso that changes in the pH of waters outside the 6.5 to 8.8 range must be toward neutrality (7.0).

Temperature.--Temperature values are tabulated in degrees Celsius (°C, centigrade) at the indicated sampling depth. Temperature standards established by the Michigan Water Resources Commission for Michigan lakes and streams are currently being revised.

Dissolved oxygen.--All living organisms are dependent upon oxygen to maintain their metabolic processes. For a diversified assemblage of warm-water biota, the dissolved oxygen concentration should be above 5 mg/l. Cold-water fish such as trout and salmon generally require a minimum dissolved oxygen concentration of 6 mg/l. The Michigan Water Resources Commission has set minimum dissolved oxygen standards for Michigan lakes ranging from 5 to 6 mg/l, depending upon fish and lake type. Maximum dissolved oxygen concentrations depend upon temperature and altitude. For Michigan altitudes, the saturation concentration of dissolved oxygen is about 11 mg/l at a temperature of 10°C (50°F) and is about 8 mg/l at 25°C (77°F).

Color.--Color in natural waters is generally due to dissolved organic matter. Color determinations are made on samples, from which all suspended matter has been removed, by comparing the samples to standards calibrated by the Hazen platinum-cobalt scale.

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[2]Michigan Water Resources Commission, 1968, Water quality standards for Michigan's intrastate waters, Water Resources Commission, Michigan Department of Natural Resources, 39 p.

Objections to high color values are usually based on esthetic grounds. High color in lake waters may be due to entrophication with high algal production.

Turbidity.--Turbidity is a measure of the amount of suspended matter that interferes with the transmission of light. Most turbidity in lakes is due to fine colloidal suspensions. Turbidity is measured in Jackson Turbidity Units. Federal drinking water standards set the maximum limit for turbidity at 5 units. Turbidity lowers the productivity of aquatic life by decreasing photosynthesis and lowering temperatures.

Analysis.--Agencies making the analyses are indicated as follows: (1) Laboratory analysis by U.S. Geological Survey, (2) field analysis by U.S. Geological Survey, (3) analysis by Michigan Department of Public Health.

ALCONA COUNTY

Cedar Lake near Greenbush, Mich.

Location.--Lat 44°33'50", long 83°19'30", in many sections, Tps. 24 and 25 N., R.8 E., 1.6 miles south of Greenbush.

Surface area.--1,020 acres.

Maximum depth.--11 ft.

Drainage area at outlet.--6.3 sq mi.

Records available.--July 1950 to December 1953 except winter periods.

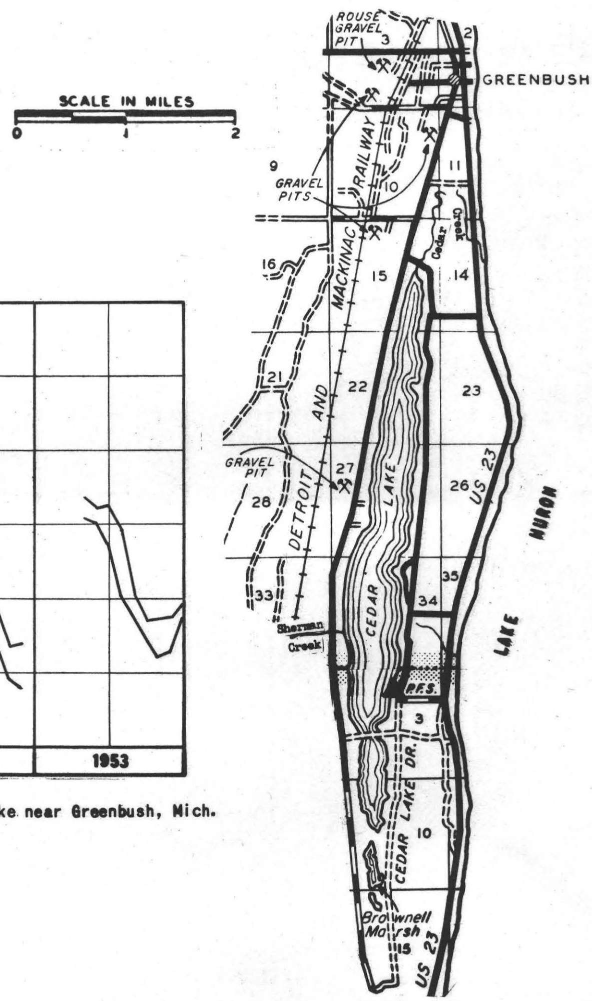
Gage.--Staff gage read daily. Datum of gage is 602.75 ft above mean sea level (levels by Michigan Department of Natural Resources).

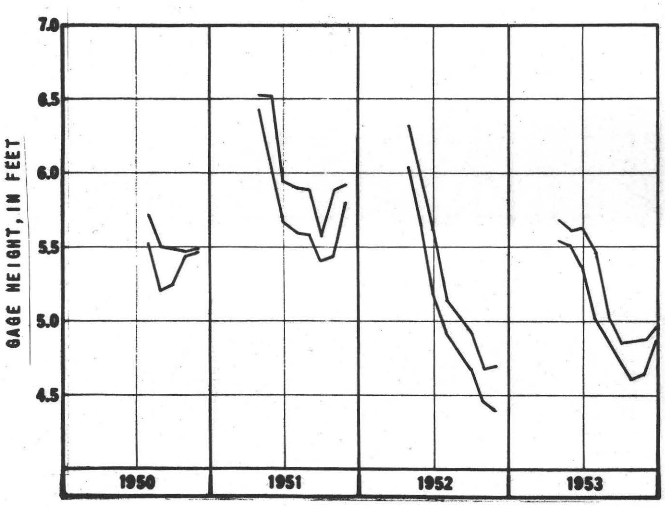
Established legal level.--608.5 ft above mean sea level, established by Circuit Court on March 16, 1954.

Extremes.--1950-53: Maximum stage observed, 6.53 ft Apr. 28, 1951; minimum observed, 4.40 ft Nov. 9, 10, 12, 16, 1952.

Regulation or control.--A fixed-crest dam equipped with stop logs was completed sometime prior to September 1954.

Remarks.--The inlet, Sherman Creek, flows into the west side of Cedar Lake. Cedar Creek, the outlet, is located at the northern tip of the lake. No discharge measurements are available on the inlet or outlet.
An engineering lake-level control study was completed in 1954 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Cedar Lake near Greenbush, Mich.

ALCONA COUNTY

Hubbard Lake near Hubbard Lake, Mich.

Location.--Lat 44°51'30", long 83°35'35", in many sections, T.28 N., R.7 E., at Hubbard Lake.

Surface area.--9,200 acres.

Maximum depth.--97 ft.

Drainage area at outlet.--146 sq mi.

Records available.--December 1942 to July 1960.

Gage.--Water-stage recorder. Datum of gage is 704.08 ft above mean sea level (levels by Michigan Department of Natural Resources). Prior to Aug. 8, 1945, staff gage at same site and datum.

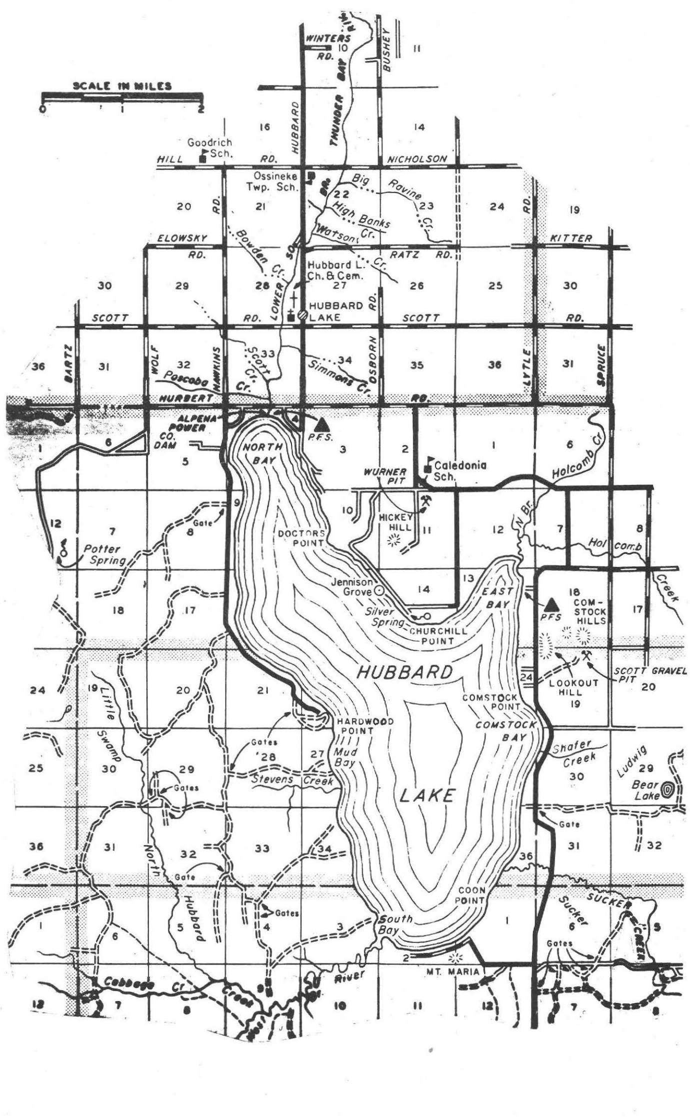
Established legal level.--The maximum elevation established by the Circuit Court on July 11, 1907 and used by Alpena Power Company, is at elevation 710.58 ft mean sea level. A minimum elevation, if established, is unknown.

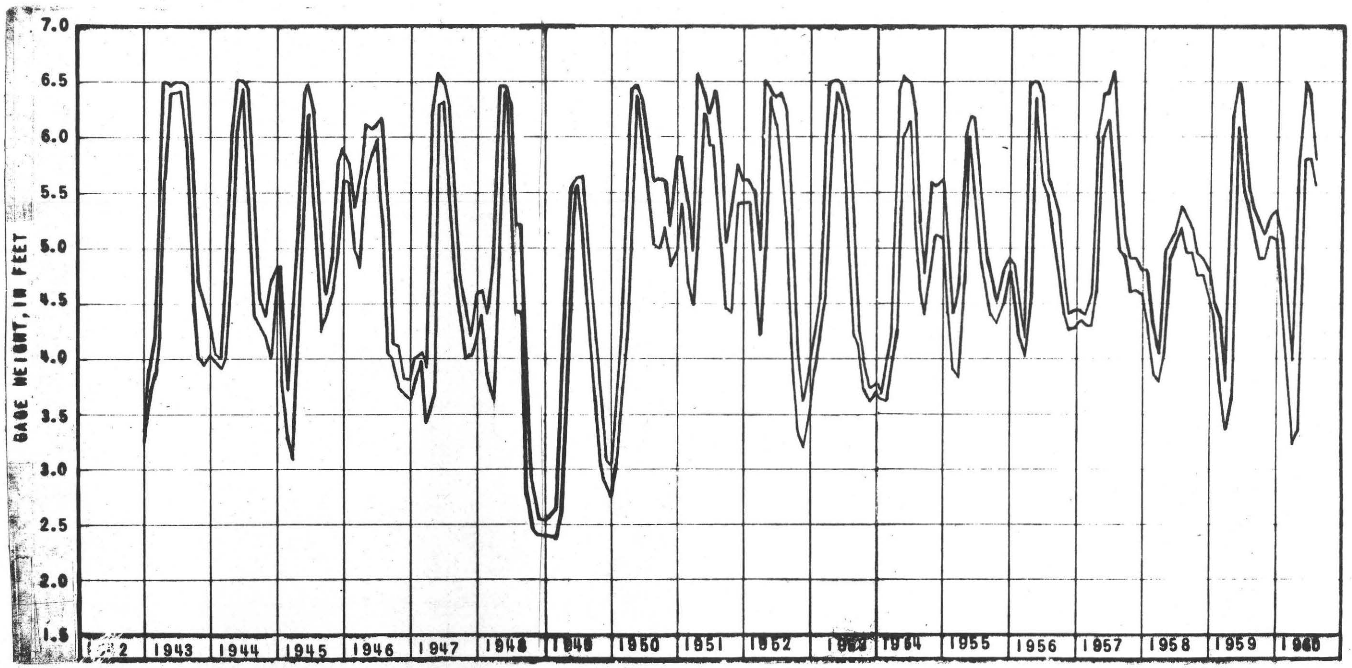
Extremes.--1942-60: Maximum stage, 6.62 ft July 4, 1957; minimum, 2.36 ft Feb. 18, 19, 1949.

Regulation or control.--Level of Hubbard Lake regulated by dam at outlet. Lake is used as storage reservoir for Alpena Power Company. Water is stored during periods of high flow and released during periods of low flow. Storage capacity of about 30,000 acre-ft is available.

Remarks.--Several creeks flow into Hubbard Lake from the south. The outlet is Lower South Branch Thunder Bay River at the north end of the lake. Discharge records for Lower South Branch Thunder Bay River near Hubbard Lake were collected during the period August 1945 to October 1953 at a site 50 ft downstream from Hubbard Lake. These records are published in U.S. Geological Survey Water-Supply Papers.

An engineering lake-level control study was completed in 1957 by the Michigan Department of Natural Resources.





Monthly maximum and minimum-stages for Hubbard Lake near Hubbard Lake, Mich.

ALGER COUNTY

Au Train Lake near Au Train, Mich.

Location.--Lat 46°24'42", long 86°49'45", in many sections, T.46 N., R.20 W., 1.3 miles south of Au Train.

Surface area.--830 acres.

Maximum depth.--30 ft.

Drainage area at outlet.--110 sq mi.

Records available.--October 1944 to September 1958 except winter periods.

Gage.--Staff gage read daily. Datum of gage is 608.17 ft above mean sea level (levels by Michigan Department of Natural Resources).

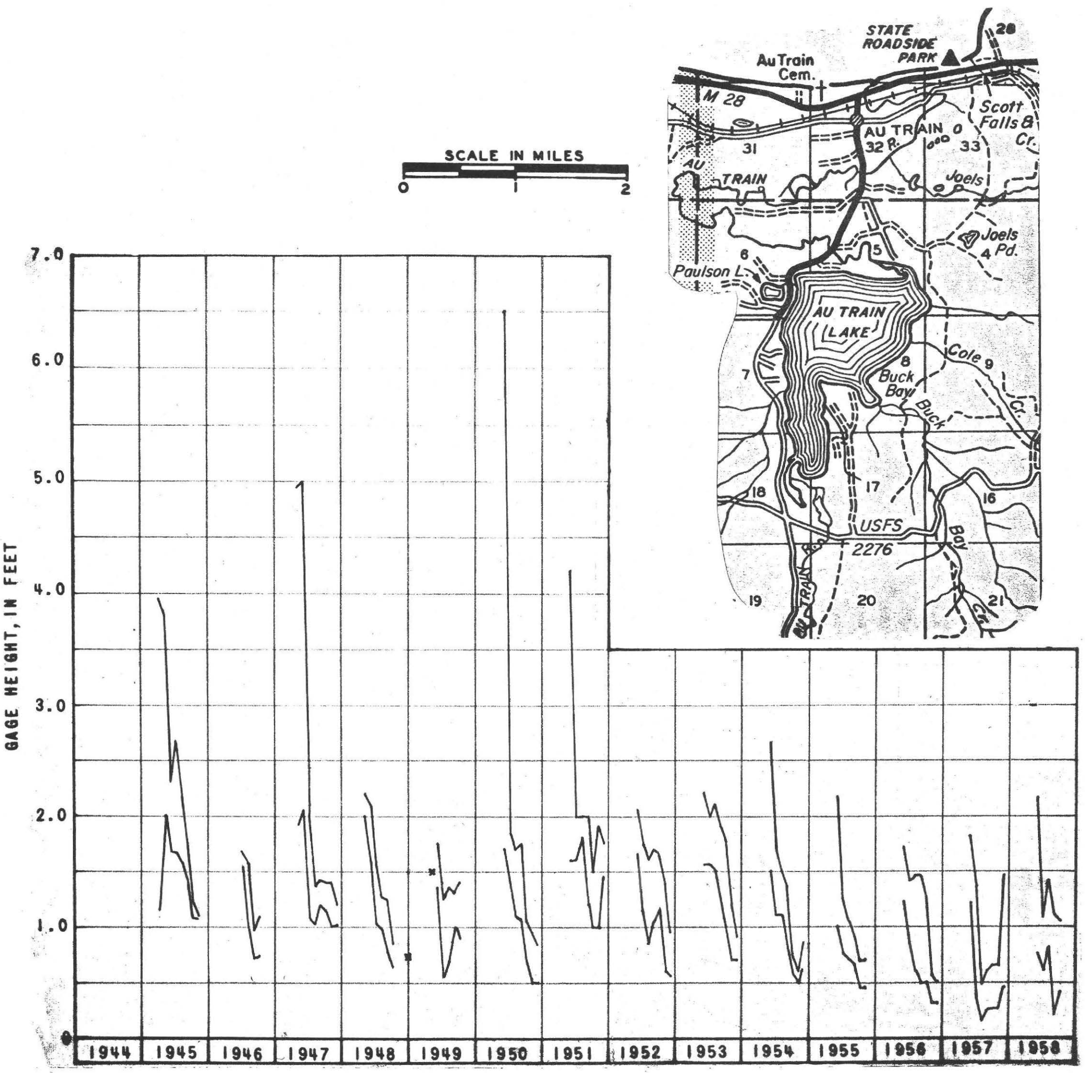
Established legal level.--None known.

Extremes.--1944-58: Maximum stage observed, 6.50 ft May 1950 (highwater mark); minimum observed, 0.15 ft July 7, 1957.

Regulation or control.--Lake levels affected by operation of Cleveland-Cliffs Iron Co. power dam on Au Train River, 3.5 miles upstream from lake.

Remarks.--The inlets are Au Train River, Buck Bay Creek, and Cole Creek. The outlet is the Au Train River. The following discharge measurements have been made on Au Train River, 0.5 mile downstream from Au Train Lake.

Date	Discharge (cfs)
Oct. 19, 1944	106
Sept. 23, 1949	108
Nov. 16, 1949	104



Monthly maximum and minimum stages for Au Train Lake near Au Train, Mich.

ALGER COUNTY

Grand Sable Lake near Grand Marais, Mich.

Location.--Lat 46°39'04", long 86°01'40", in many sections, T.49 N., R.14 W., 2.3 miles southwest of Grand Marais.

Surface area.--628 acres.

Maximum depth.--85 ft.

Drainage area at outlet.--10 sq mi, approximately.

Records available.--October 1944 to September 1950 except periods July to September 1946, November 1947, and October 1949 to April 1950 when infrequent readings were made.

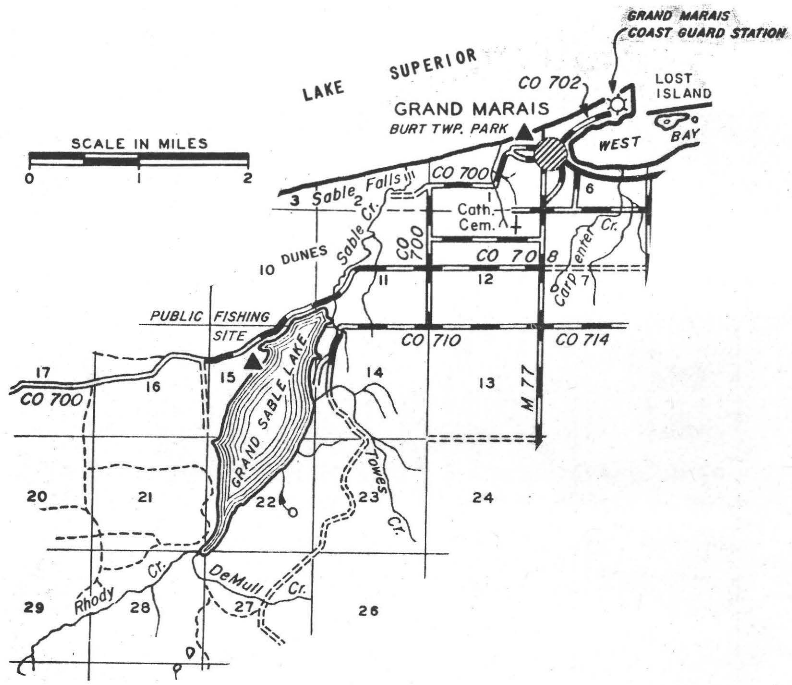
Gage.--Staff gage, read about once a week. Datum of gage not determined.

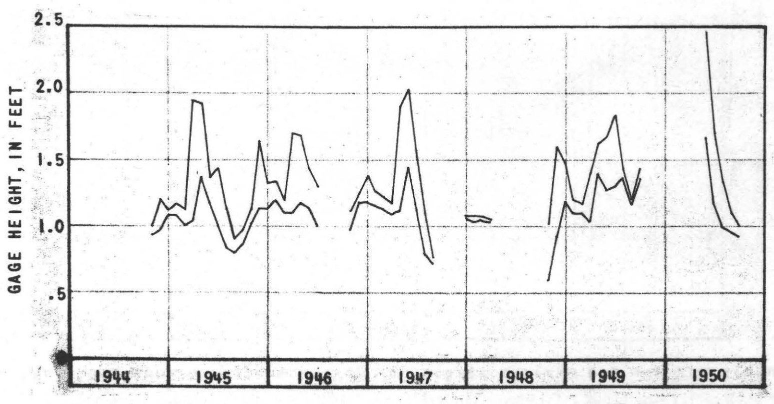
Established legal level.--None known.

Extremes.--1944-50: Maximum stage observed, 2.46 ft May 10, 1950; minimum observed, 0.60 ft Oct. 7, 1948.

Regulation or control.--None.

Remarks.--Rhody and De Mull Creeks from the south and Towes Creek from the east, enter Grand Sable Lake. The outlet, Sable Creek, leaves the lake at the north end. No discharge measurements have been made on the inlets or outlet.





Monthly maximum and minimum stages for Grand Sable Lake near Grand Marais, Mich.

ALGER COUNTY

Sixteenmile Lake near Munising, Mich.

<u>Location</u>.—Lat 46°17'33", long 86°45'59", in secs. 11-14, T.45 N., R.20 W., 10 miles southwest of Munising.

<u>Surface area</u>.—442 acres.

<u>Maximum depth</u>.—Unknown.

<u>Drainage area at outlet</u>.—7.34 sq mi.

<u>Records available</u>.—May 1959 to September 1963 except winter periods.

<u>Gage</u>.—Staff gage read daily. Datum of gage not determined.

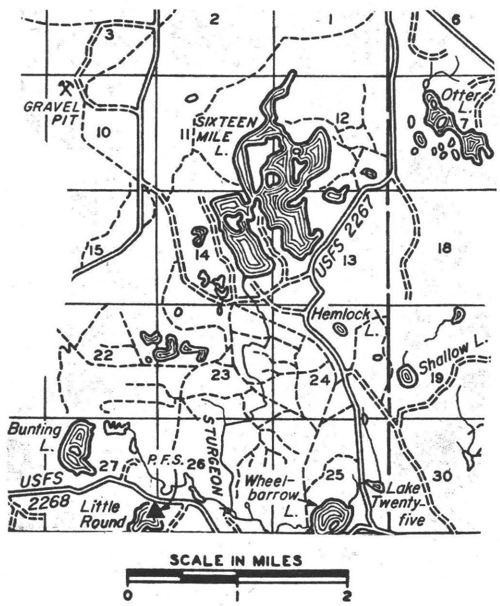
<u>Established legal level</u>.—None known.

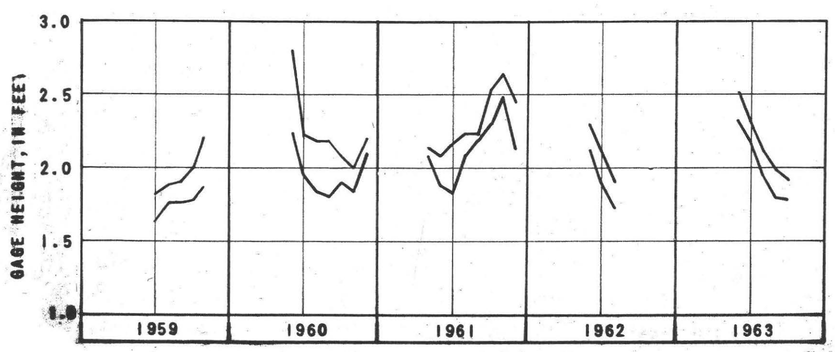
<u>Extremes</u>.—1959-63: Maximum stage observed, 2.91 ft April 1960 (highwater mark); minimum observed, 1.64 ft June 23, 24, 1959.

<u>Regulation or control</u>.--None.

<u>Remarks</u>.--There is no inlet to Sixteenmile Lake. The outlet is the Sturgeon River. The following discharge measurements were made on the Sturgeon River at the outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
Oct. 8, 1959	2.16	Oct. 27, 1961	9.30
June 3, 1960	8.69	May 16, 1962	5.93
Aug. 19, 1960	4.51	July 13, 1962	2.61
Oct. 14, 1960	3.51	Oct. 12, 1962	.31
May 12, 1961	4.16	Apr. 24, 1963	2.98
July 13, 1961	.03	July 3, 1963	.91
		Oct. 16, 1963	.25





Monthly maximum and minimum stages for Sixteenmile Lake near Munising, Mich.

ALPENA COUNTY

Long Lake near Alpena, Mich.

Location.--Lat 45°09'47", long 83°26'22", in many sections, T.33 N., R.8 E., 7 miles north of Alpena.

Surface area.--5,650 acres.

Maximum depth.--33 ft.

Drainage area.--Not determined.

Records available.--August 1942 to September 1950.

Gage.--Staff gage read once daily except winter months. Datum of gage is 648.73 ft above mean sea level (levels by Michigan Department of Natural Resources).

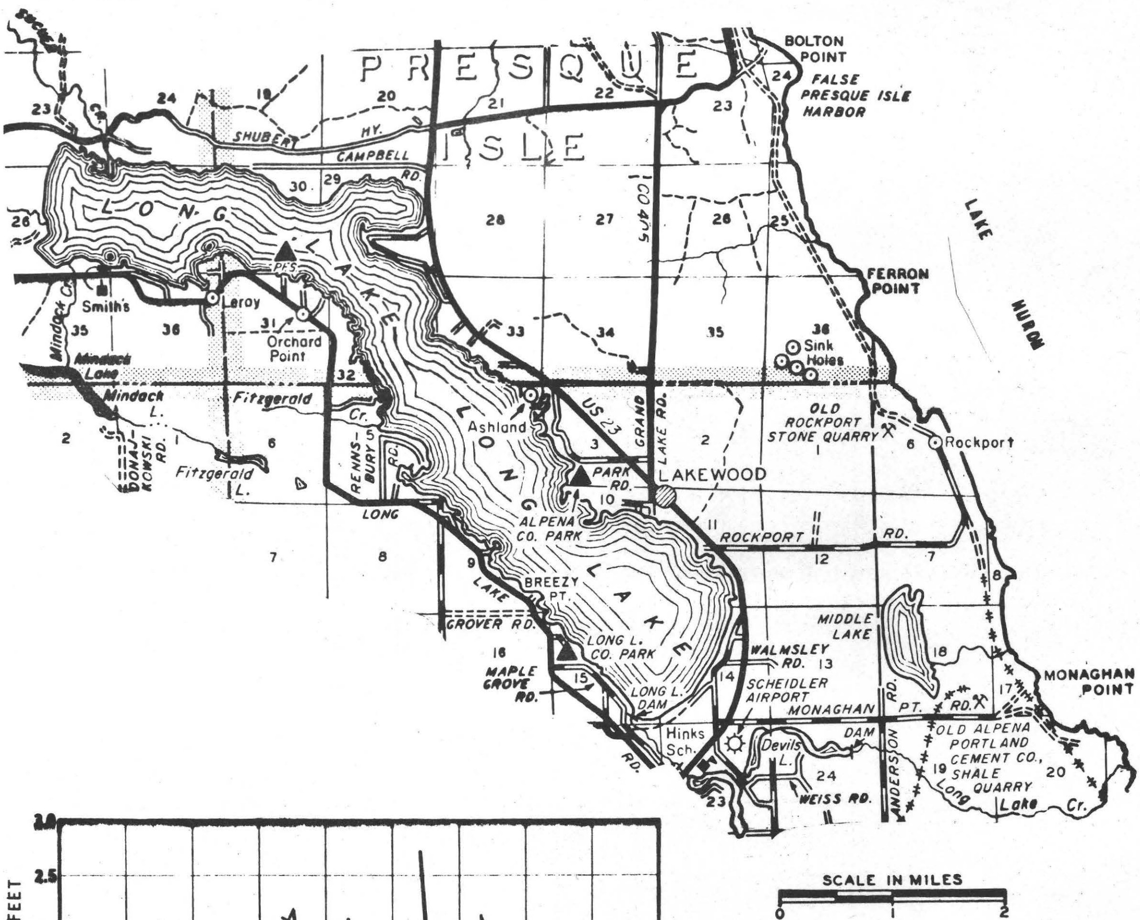
Established legal level.--None known.

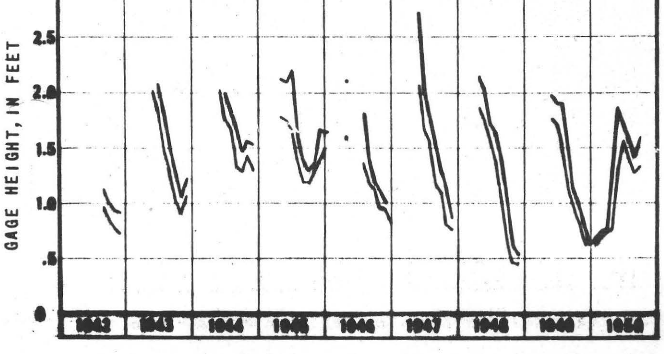
Extremes.--1942-50: Maximum stage observed, 2.72 ft May 8, 1947; minimum observed, 0.46 ft Nov. 3, 6, 1948.

Regulation or control.--Dam at outlet.

Remarks.--Sucker Creek at the northwest end of lake is the major inlet and Long Lake Creek is the outlet at the south end. No discharge measurements are available on the inlet or outlet.

An engineering lake-level control study was completed in 1942 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Long Lake near Alpena, Mich.

Elk Lake near Elk Rapids, Mich.

Location.--Lat 44°52'56", long 85°24'00", in many sections, Tps. 28 and 29 N., R.9 W., 1.2 miles southeast of Elk Rapids.

Surface area.--7,930 acres.

Maximum depth.--192 ft.

Drainage area at outlet.--410 sq mi, approximately.

Records available.--October 1951 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 586.25 ft above mean sea level (levels by Michigan Department of Natural Resources). Prior to June 20, 1952, staff gage read once daily at same datum.

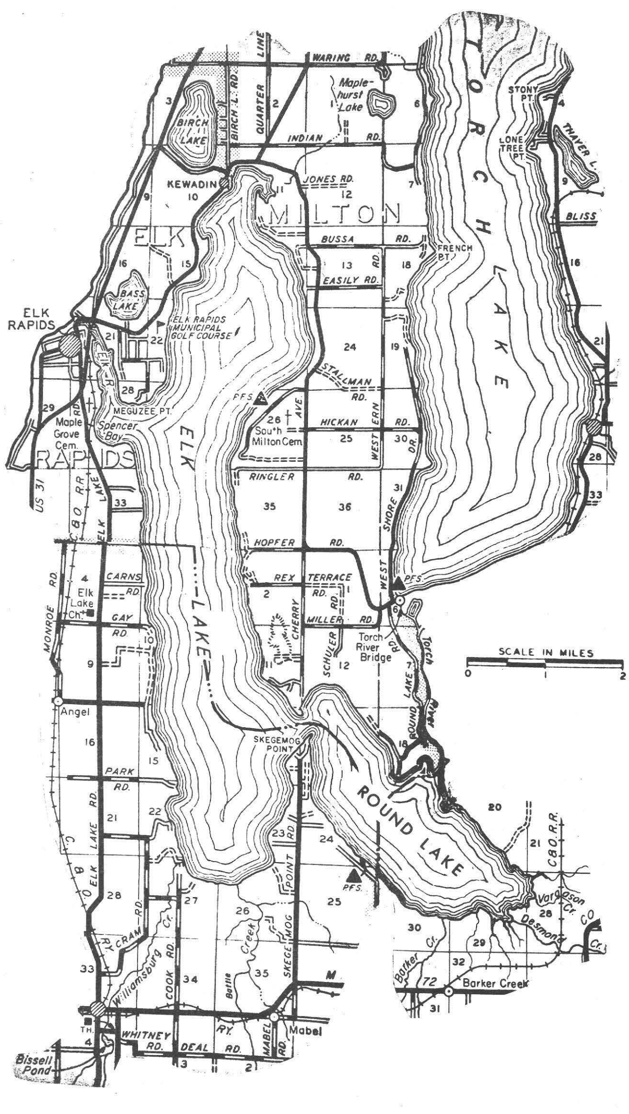
Established legal level.--None known.

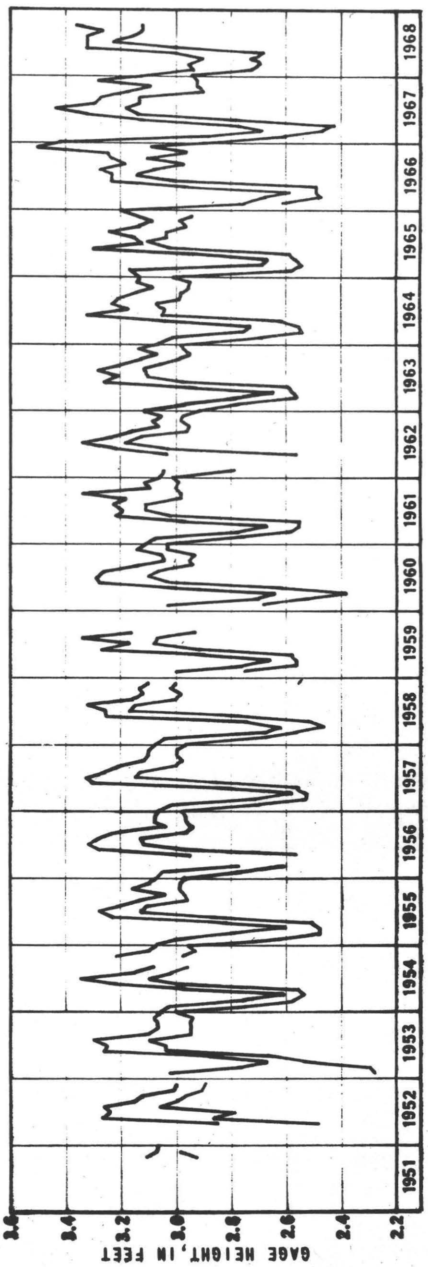
Extremes.--1951-68: Maximum stage, 3.50 ft Nov. 29, 1966; minimum, 2.28 ft Jan. 29, 1953.

Regulation or control.--Lake level regulated by dam at Elk Rapids.

Remarks.--Elk Lake is at the end of a long chain of interconnected lakes and is contiguous with Round Lake. The principal inlet to these lakes is Torch River. Smaller inlets to these lakes include Williamsburg, Battle, Barker, and Desmond Creeks. The outlet of Elk Lake is Elk River. No discharge measurements are available on the outlet. The following discharge measurements were made on Battle Creek, in NW$\frac{1}{4}$ section 2, T.27 N., R.9 W.

Date	Discharge (cfs)
May 13, 1949	9.85
June 10, 1949	9.85
Aug. 25, 1949	9.88





Monthly maximum and minimum stages for Elk Lake near Elk Rapids, Mich.

ANTRIM COUNTY

Intermediate Lake at Central Lake, Mich.

Location.--Lat 44°59'50", long 85°12'13", in many sections, Tps. 30 and 31 N., Rs. 7 and 8 W., at Central Lake.

Surface area.--1,520 acres.

Maximum depth.--82 ft.

Drainage area at outlet.--112 sq mi.

Records available.--November 1945 to September 1968.

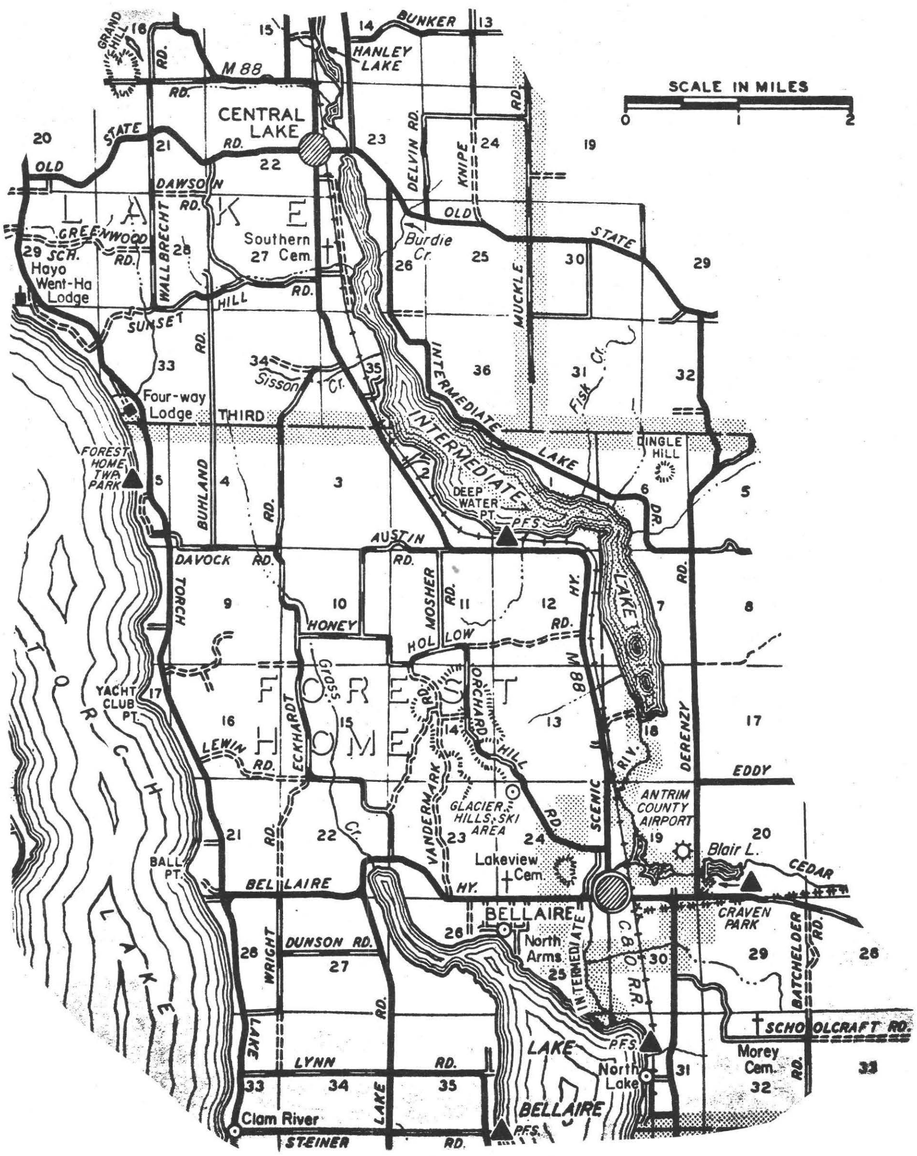
Gage.--Staff gage read daily. Datum of gage is 605.73 ft above mean sea level (levels by Michigan Department of Natural Resources).

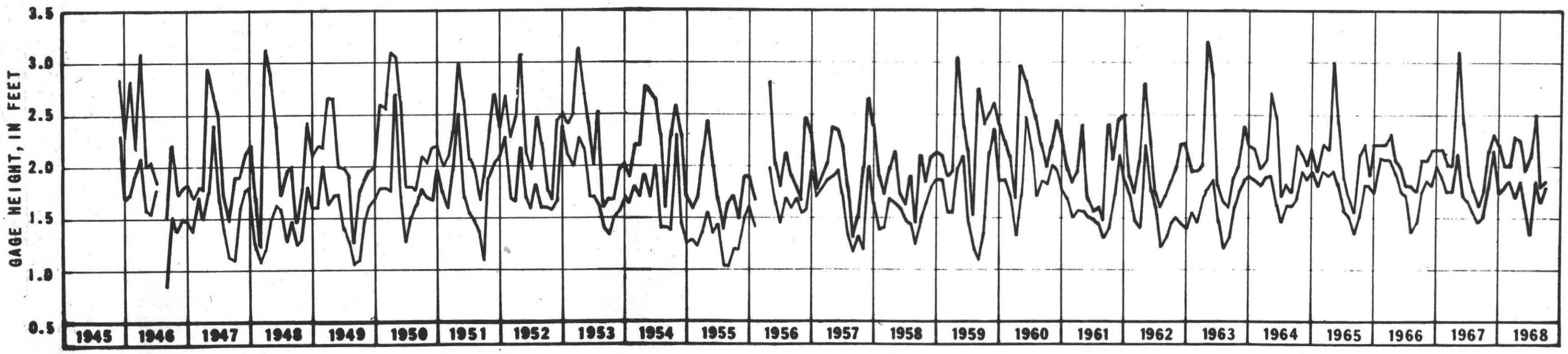
Established legal level.--None known.

Extremes.--1945-68: Maximum stage, 3.20 ft Apr. 6, 1963; minimum, 0.85 ft Aug. 13, 14, 16-18, 1946.

Regulation or control.--Lake level is regulated by dam at Bellaire.

Remarks.--There are many inlets to Intermediate Lake. The principal inlet, at the north end of the lake, is from a long, narrow chain of lakes which are part of the Intermediate River watershed. The outlet, Intermediate River, is at the south end of the lake and flows into Lake Bellaire. No discharge measurements have been made on the inlets or outlet.





Monthly maximum and minimum stages for Intermediate Lake at Central Lake, Mich.

ANTRIM COUNTY

Lake Bellaire near Bellaire, Mich.

Location.--Lat 44°56'23", long 85°12'41", in many sections, Tps. 29 and 30 N., Rs. 7 and 8 W., 2.5 miles south of Bellaire.

Surface area.--1,780 acres.

Maximum depth.--99 ft.

Drainage area at outlet.--160 sq mi, approximately.

Records available.--June 1942 to September 1943; November 1955 to November 1961 except winter periods.

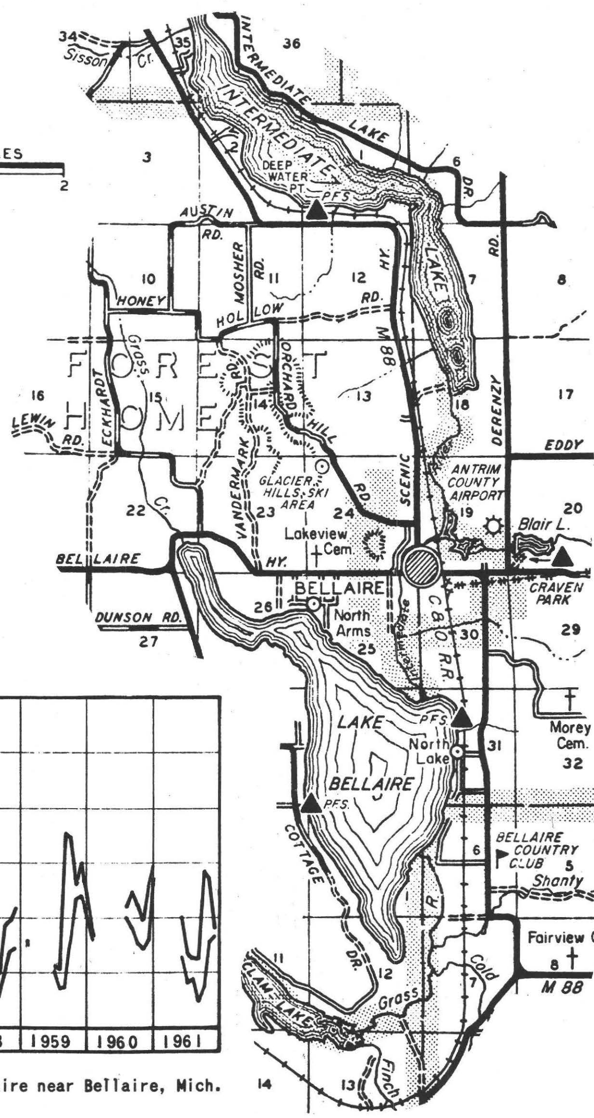
Gage.--Staff gage read intermittently. Datum of gage is 590.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

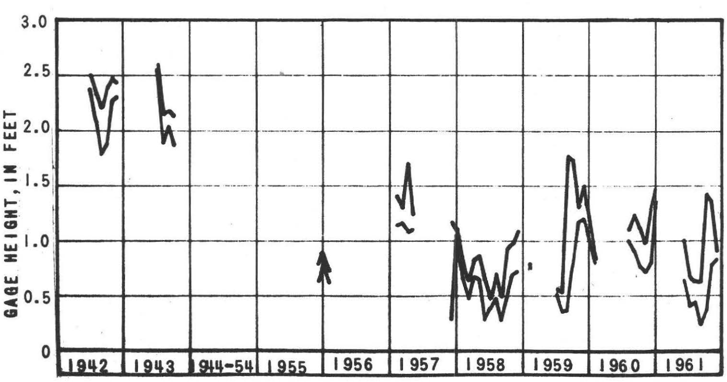
Established legal level.--None known.

Extremes.--1942-43, 1955-61: Maximum stage observed, 2.60 ft June 22, 23, 26, 1943; minimum observed, 0.24 ft Aug. 25, 1961.

Regulation or control.--No control structure on outlet. Dam at Bellaire on Intermediate River probably affects the level of Lake Bellaire.

Remarks.--The principal inlet is Intermediate River. Grass Creek enters the north end of the lake. The outlet, Grass River, is at the southeast side of the lake and flows into Clam Lake. No discharge measurements are available on the inlets or outlet.





Monthly maximum and minimum stages for Lake Bellaire near Bellaire, Mich.

ANTRIM COUNTY

Torch Lake near Alden, Mich.

Location.--Lat 44°51'00", long 85°19'40", in many sections, Tps. 29, 30, and 31 N., Rs. 8 and 9 W., 3.3 miles southwest of Alden.

Surface area.--18,800 acres.

Maximum depth.--297 ft.

Drainage area at outlet.--278 sq mi.

Records available.--June 1942 to December 1959 except some winter periods.

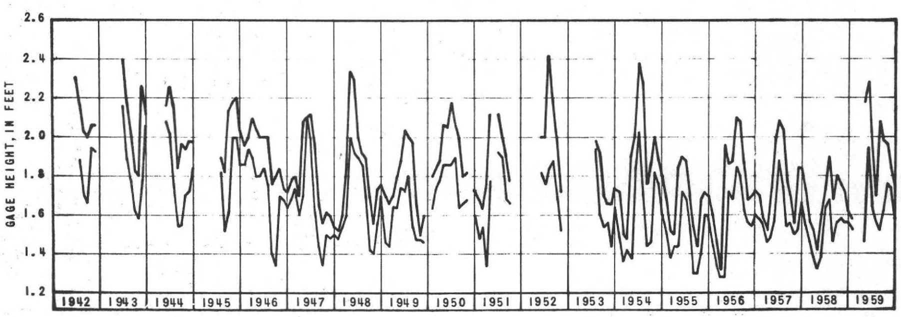
Gage.--Staff gage read daily. Datum of gage is 588.06 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

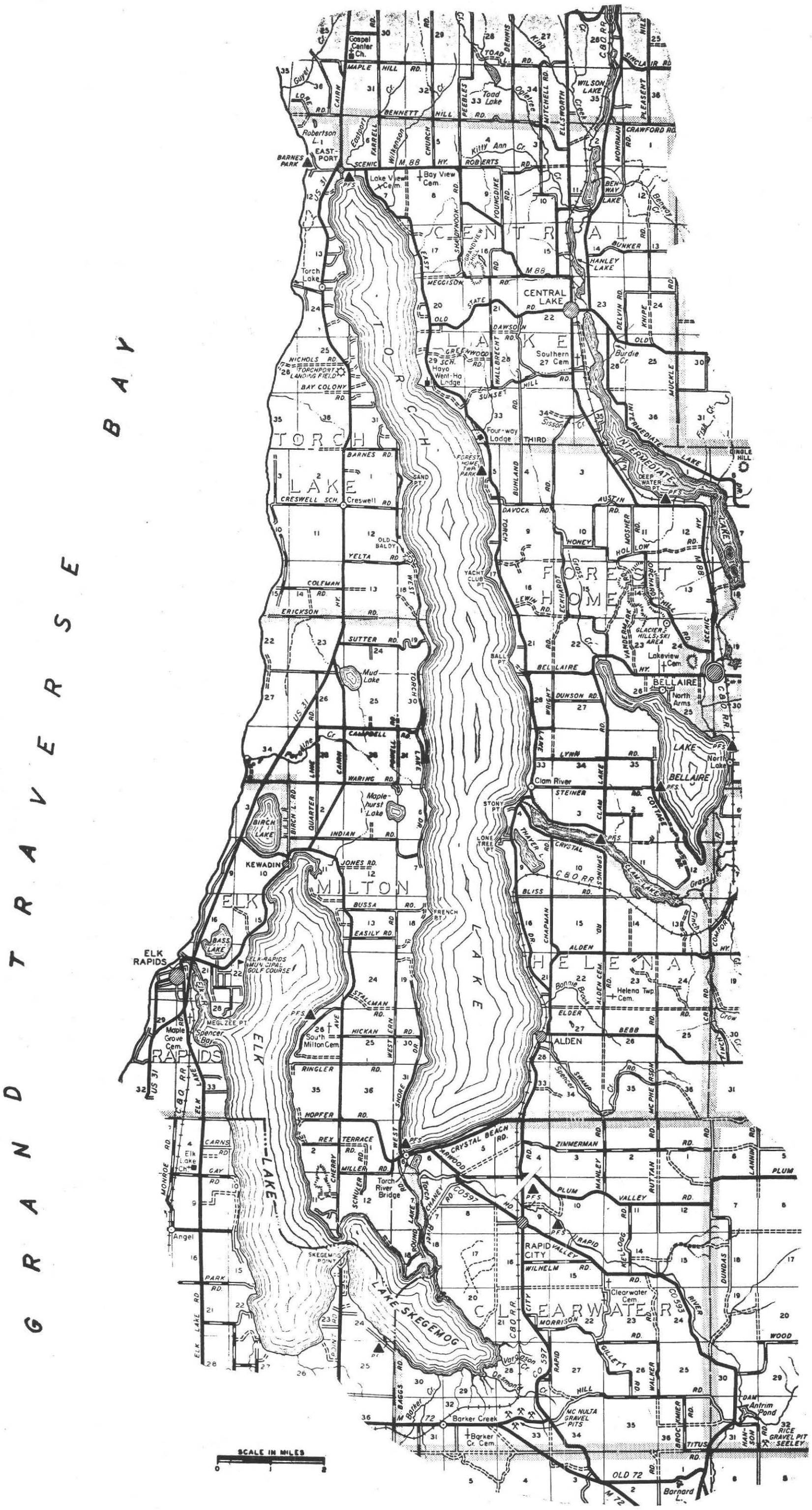
Extremes.--1942-59: Maximum stage observed, 2.42 ft July 23, 1952; minimum observed, 1.28 ft Mar. 27, 28, Apr. 1, 1956.

Regulation or control.--There is no control structure on outlet of Torch Lake, however, a dam on outlet of Elk Lake at Elk Rapids probably has some effect on the level of Torch Lake.

Remarks.--Principal inflow is from a chain of lakes east of Torch Lake and enters Torch Lake at Clam River. Smaller inlets include Eastport, Wilkinson, and Spencer Creeks. The outlet, Torch River, flows from the south end of Torch Lake into Lake Skegemog 2 miles downstream. No discharge measurements are available on the inlets or outlet.



Monthly maximum and minimum stages for Torch Lake near Alden, Mich.


GRAND TRAVERSE BAY
CENTRAL LAKE
TORCH LAKE
FOREST HOME
MILTON
ELK RAPIDS
HELENA
CLEARWATER
ELK LAKE
LAKE SKEGEMOG
LAKE BELLAIRE
INTERMEDIATE LAKE
BELLAIRE
ALDEN
RAPID CITY
KEWADIN
EASTPORT
Clam River
Torch River Bridge
Barker Creek
SCALE IN MILES
0
1
2

BARAGA COUNTY

Ruth Lake at Three Lakes, Mich.

Location.--Lat 46°33'13", long 88°12'36", in secs. 7, 8, 17 and 18, T.48 N., R.31 W., 0.5 mile west of Three Lakes.

Surface area.--192 acres.

Maximum depth.--36 ft.

Drainage area at outlet.--14.3 sq mi.

Records available.--May 1959 to September 1968 except period April to June 1960.

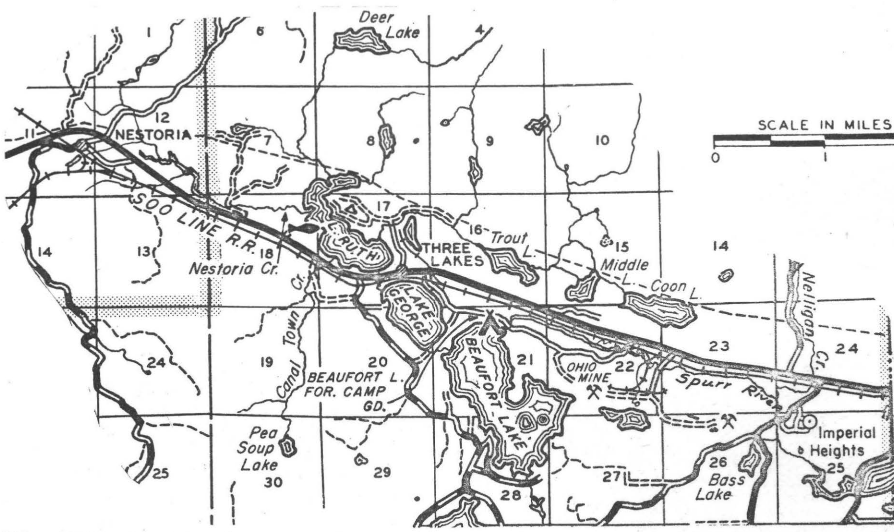
Gage.--Wire-weight gage read daily. Datum of gage not determined.

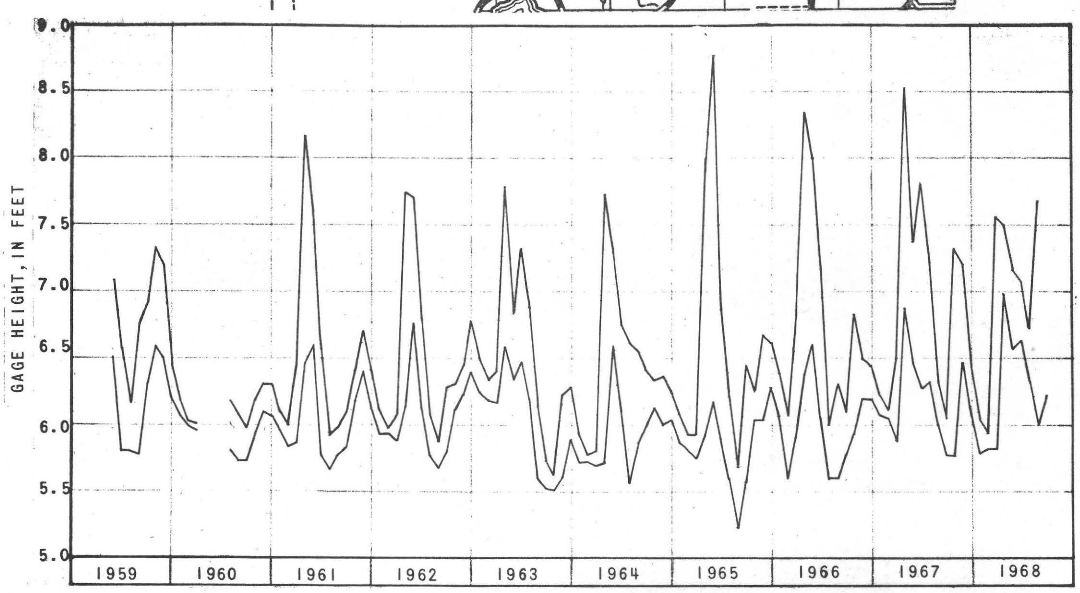
Established legal level.--None known.

Extremes.--1959-68: Maximum stage observed, 8.77 ft May 9, 10, 1965; minimum observed, 5.23 ft Aug. 16, 1965.

Regulation or control.--Outflow from Ruth, George and Beaufort Lakes passes through culverts just below Beaufort Lake. There are no features on the culverts for regulating the lake levels.

Remarks.--Inlets to Ruth Lake are Nestoria Creek, Canal Town Creek, and several unnamed tributaries. Ruth Lake is one of a chain of lakes located in the headwaters of the Spurr River basin. Ruth Lake is connected to George Lake by a narrow channel.
Sixteen discharge measurements have been made on Spurr River, one mile upstream from mouth. See "Lake Michigamme near Champion", Marquette County, for listing of measurements.





Monthly maximum and minimum stages for Ruth Lake at Three Lakes, Mich.

BARRY COUNTY

Gun Lake near Shelbyville, Mich.

Location.--Lat 42°35'24", long 85°32'26", in many sections, Tps. 2 and 3 N., R.10 W., 5 miles east of Shelbyville.

Surface area.--2,610 acres.

Maximum depth.--68 ft.

Drainage area at outlet.--33.7 sq mi.

Records available.--September 1942 to September 1968 except for some fall and winter periods.

Gage.--Staff gage read intermittently. Datum of gage is 743.665 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--744.325 ft above mean sea level, established by Circuit Court in December 1921.

Extremes.--1942-68: Maximum stage observed, 2.07 ft Apr. 6, 7, 1947; minimum observed, 0.60 ft Oct. 10, 12, 1946.

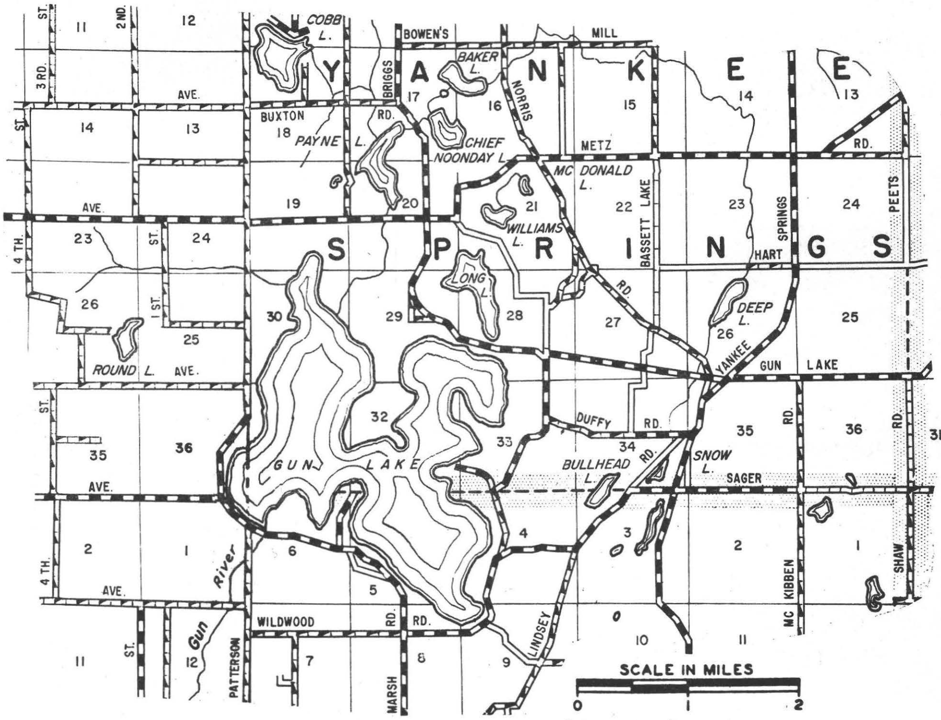
Regulation or control.--A fixed-crest concrete dam at outlet controls lake level.

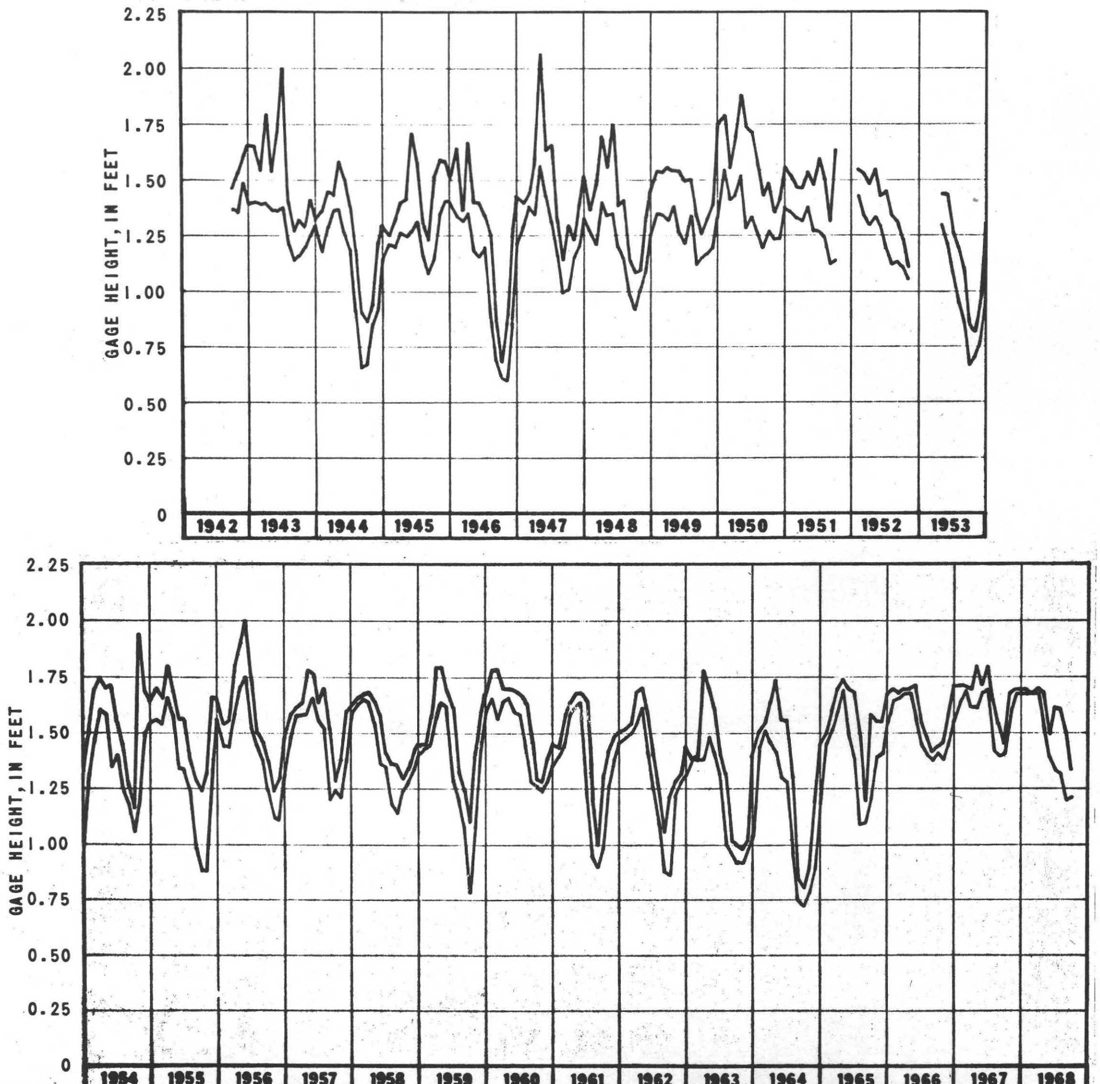
Remarks.--The principal inlets to Gun Lake are Payne Lake outlet and an unnamed stream at the northwest end of the lake. The outlet, Gun River, leaves the southwest side of the lake and flows southwest to Kalamazoo River at Otsego.

Records of monthly and yearly discharge for Gun River at the dam at outlet of Gun Lake, and at a site 3½ miles downstream from the dam were published in U.S. Geological Survey Water-Supply Paper 1307. Records are for the period 1946-47.

No discharge measurements are available on the inlets. The following measurements have been made on Gun River (published as Gun Lake Outlet) in the vicinity of dam at lake outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
Mar. 23, 1943	102	Oct. 4, 1956	0.10
Aug. 23, 1944	0	Apr. 8, 1957	59.2
Sept. 17, 1946	0	July 5, 1957	14.4
Nov. 20, 1946	11.4	Dec. 17, 1957	25.0
Dec. 10, 1946	14.8	Mar. 25, 1958	33.9
Jan. 29, 1947	26.9	June 11, 1958	8.52
Feb. 17, 1947	27.6	July 14, 1958	2.40
Mar. 13, 1947	20.6	Nov. 6, 1958	1.86
Apr. 9, 1947	170	May 21, 1959	34.0
Apr. 17, 1947	104	Aug. 7, 1959	0
Apr. 29, 1947	67.4	Nov. 6, 1959	30.8
May 6, 1947	69.3	Feb. 4, 1960	40.4
June 12, 1947	48.5	May 13, 1960	48.6
Oct. 7, 1947	13.8	Aug. 12, 1960	6.81
Jan. 8, 1948	33.5	Nov. 10, 1960	9.22
May 7, 1948	57.8	Mar. 8, 1961	70.4
May 28, 1948	38.6	June 16, 1961	2.52
Sept. 7, 1948	0	Sept. 15, 1961	0
Dec. 15, 1948	31.5	Dec. 8, 1961	22.2
Mar. 23, 1949	38.3	Mar. 22, 1962	51.5
June 20, 1949	33.3	June 14, 1962	7.78
Sept. 14, 1949	0	Sept. 13, 1962	0
Jan. 19, 1950	73.3	Dec. 19, 1962	20.2
May 3, 1950	91.6	Apr. 11, 1963	39.7
July 20, 1950	22.4	May 16, 1963	36.4
Oct. 26, 1950	12.3	Sept. 12, 1963	0
Jan. 18, 1951	41.1	Dec. 5, 1963	0
July 12, 1951	25.0	Mar. 5, 1964	0
Oct. 10, 1951	65.3	June 6, 1964	2.37
Jan. 10, 1952	58.4	Aug. 13, 1964	0
June 5, 1952	42.7	Nov. 12, 1964	0
Aug. 20, 1952	15.7	Mar. 24, 1965	52.0
Nov. 6, 1952	0	May 6, 1965	24.7
Feb. 6, 1953	20.8	July 28, 1965	0
Apr. 8, 1953	36.3	Sept. 25, 1965	22.9
July 8, 1953	2.22	Nov. 6, 1965	10.1
Oct. 9, 1953	0	July 22, 1966	0
Feb. 9, 1954	19.4	Mar. 15, 1966	57.5
May 5, 1954	45.8	Sept. 16, 1966	0
June 8, 1954	22.4	Dec. 27, 1966	34.7
Aug. 10, 1954	.16	Mar. 22, 1967	24.4
Dec. 21, 1954	31.4	May 13, 1967	54.8
Mar. 16, 1955	46.6	Aug. 30, 1967	22.8
June 8, 1955	35.3	Sept. 20, 1967	5.86
Aug. 17, 1955	0	Oct. 11, 1967	14.4
Oct. 7, 1955	0	Dec. 13, 1967	61.4
Jan. 18, 1956	16.8	Feb. 2, 1968	36.8
Apr. 13, 1956	67.8	Apr. 30, 1968	24.4
July 30, 1956	7.23	Sept. 17, 1968	2.32





Monthly maximum and minimum stages for Gun Lake near Shelbyville, Mich.

BARRY COUNTY

Jordan Lake at Lake Odessa, Mich.

Location.--Lat 42°45'38", long 85°08'46", in many sections, Tps. 4 and 5 N., R.7 W., 1.7 miles south of Lake Odessa.

Surface area.--400 acres.

Maximum depth.--53 ft.

Drainage area at outlet.--26.2 sq mi.

Records available.--March 1946 to September 1968 except for some intermittent periods.

Gage.--Staff gage read daily. Datum of gage is 806.82 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--Winter, 810.0 ft; summer, 811.0 ft above mean sea level, established by Circuit Court on Mar. 11, 1958.

Extremes.--1946-68: Maximum stage observed, 8.00 ft Mar. 15, 1953; minimum observed, 3.08 ft Jan. 4, 1964.

Regulation or control.--Lake elevation is controlled by concrete dam at outlet.

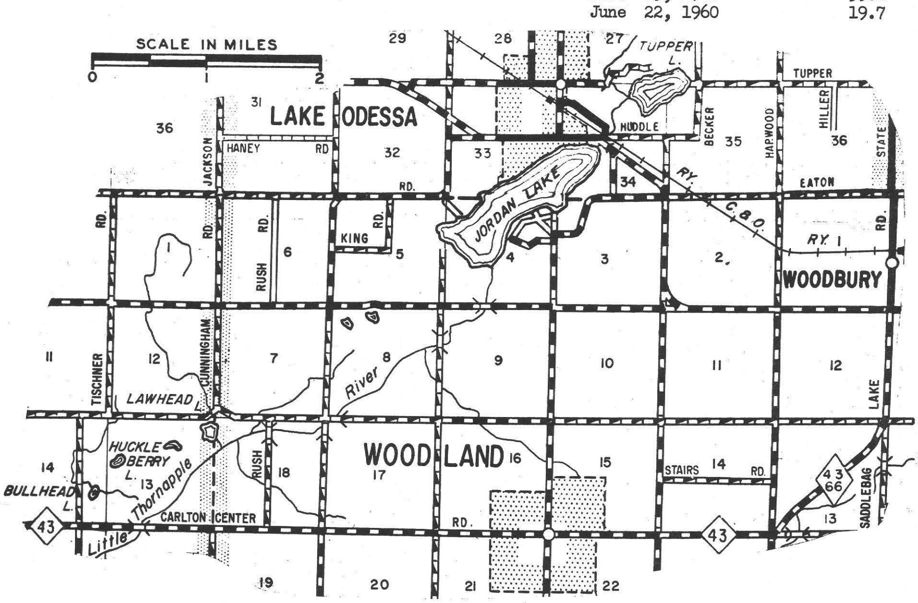
Remarks.--The inlet, Tupper Lake outlet, is at the northeast end of the lake. The outlet, Little Thornapple River, leaves the lake at the south end.

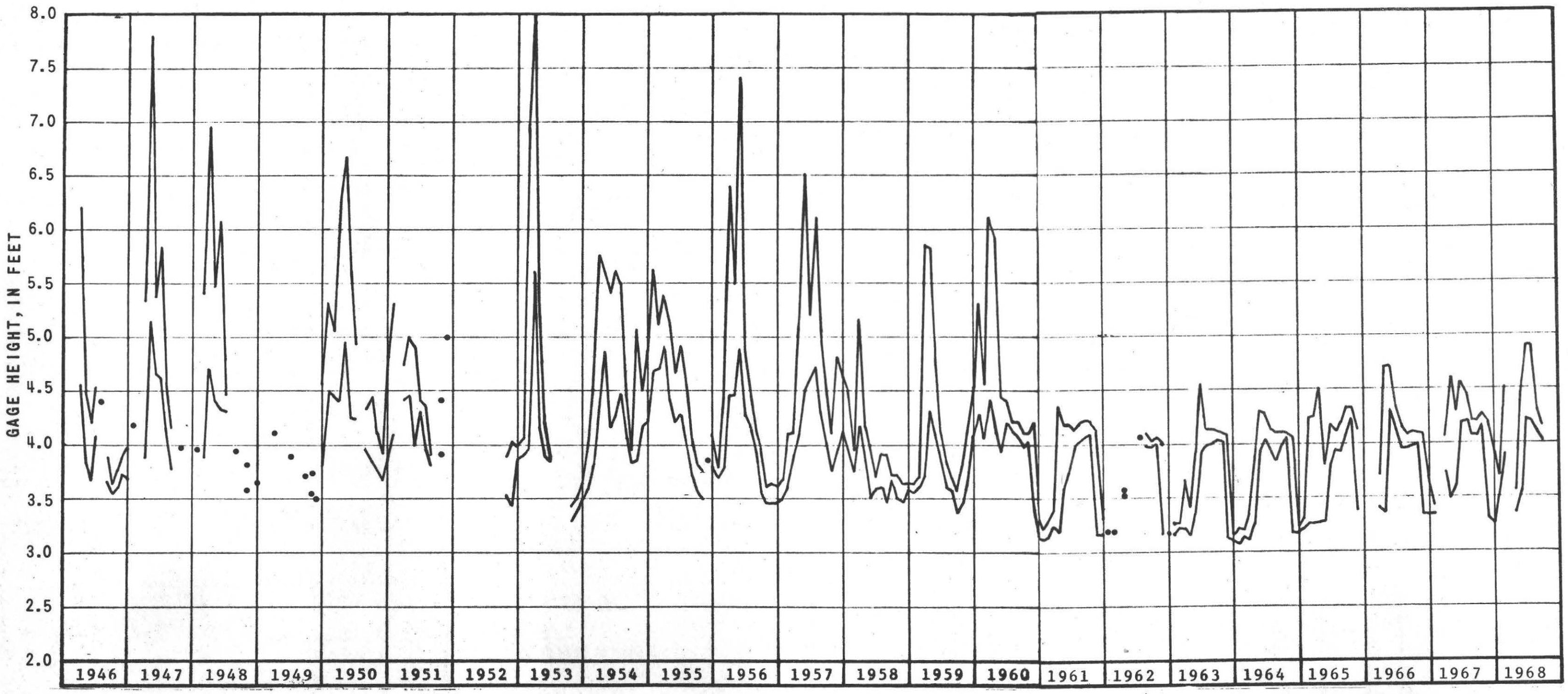
An engineering lake-level control study was completed in 1949 by the Michigan Department of Natural Resources.

The following discharge measurements have been made on Little Thornapple River (published as Jordan Lake Outlet) in NW¼ sec. 9, T.4 N., R.7 W. (drainage area, 26.2 sq mi).

Date	Discharge (cfs)
Mar. 7, 1946	148
Mar. 13, 1946	110
Apr. 18, 1946	13.8
May 20, 1946	10.1
Aug. 29, 1946	1.71
Jan. 27, 1947	16.5
Apr. 9, 1947	295
Apr. 18, 1947	88.0
May 12, 1947	37.4
Oct. 8, 1947	6.74
Jan 9, 1948	9.81
May 28, 1948	28.4
Aug. 23, 1948	2.51
Dec. 3, 1948	5.10
Mar. 22, 1949	13.0
June 21, 1949	6.51
Sept. 12, 1949	3.45
Jan. 23, 1950	29.8
Apr. 13, 1950	74.5
July 12, 1950	5.56
Oct. 27, 1950	5.99
Jan. 17, 1951	28.4
June 8, 1951	8.12
Aug. 17, 1951	.94
Nov. 29, 1951	32.3
Feb. 15, 1952	35.4
June 2, 1952	12.4
Aug. 19, 1952	6.06
Oct. 15, 1952	2.83

Date	Discharge (cfs)
Feb. 10, 1953	9.76
Apr. 15, 1953	16.8
July 7, 1953	2.04
Oct. 20, 1953	.87
Mar. 20, 1954	13.9
May 4, 1954	43.3
July 12, 1954	16.4
Nov. 23, 1954	16.2
Mar. 18, 1955	39.4
May 10, 1955	15.3
Aug. 23, 1955	3.35
Oct. 15, 1955	4.38
Feb. 20, 1956	8.15
Apr. 18, 1956	34.3
July 30, 1956	6.17
Oct. 17, 1956	1.65
Dec. 31, 1956	5.59
Mar. 21, 1957	15.5
May 13, 1957	77.0
Dec. 30, 1957	32.4
Mar. 25, 1958	23.0
June 11, 1958	5.47
July 14, 1958	4.50
Nov. 3, 1958	3.24
Apr. 22, 1959	26.6
Aug. 18, 1959	3.21
Nov. 12, 1959	8.06
Dec. 22, 1959	17.3
Feb. 13, 1960	35.8
June 22, 1960	19.7





Monthly maximum and minimum stages for Jordan Lake at Lake Odessa, Mich.

BARRY COUNTY

Pine Lake near Doster, Mich.

Location.--Lat 42°28'58", long 85°31'25", in secs. 5, 6, 7, and 8, T.1 N., R.10 W., 1.5 miles northeast of Doster.

Surface area.--660 acres.

Maximum depth.--34 ft.

Drainage area.--Not determined.

Records available.--September 1946 to September 1950, June 1963 to September 1968 except winter periods.

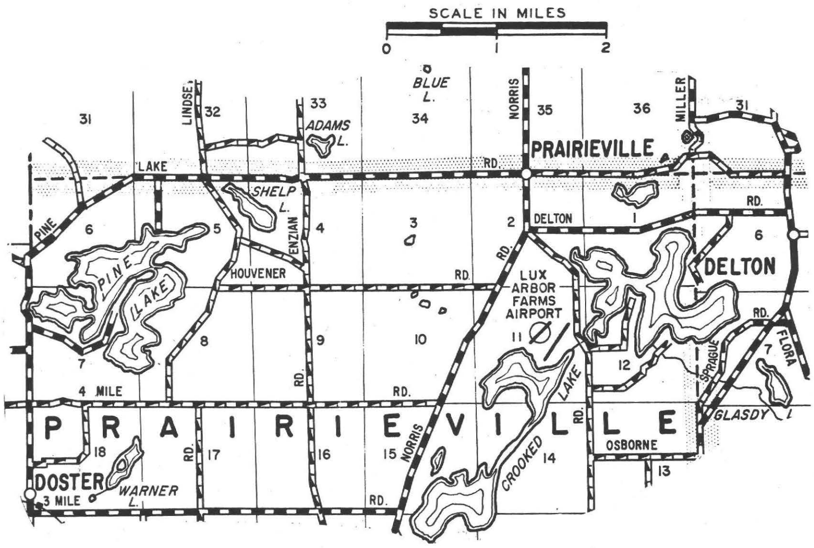
Gage.--Staff gage read daily. Datum of gage is 884.23 ft above mean sea level (levels by Michigan Department of Natural Resources).

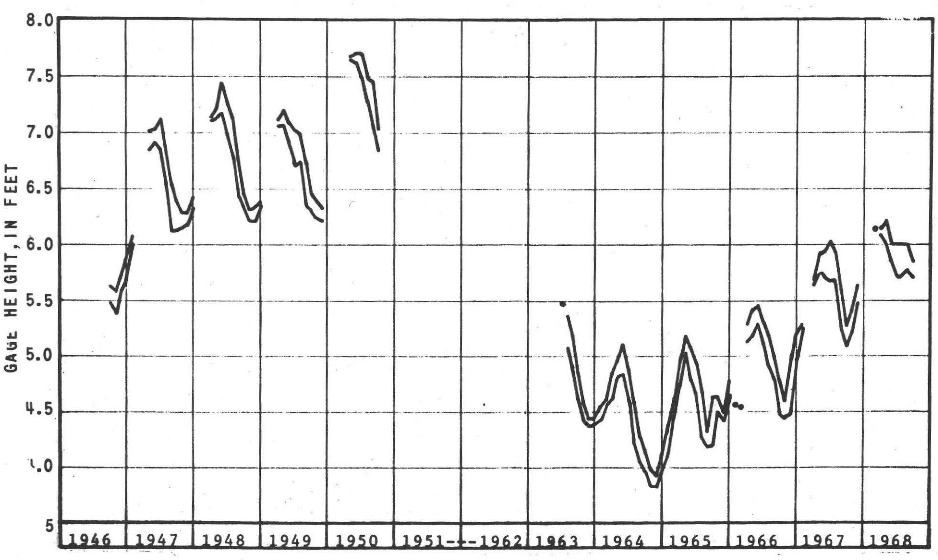
Established legal level.--None known.

Extremes.--1946-50, 1963-68: Maximum stage observed, 7.71 ft May 24, June 3, 4, 1950; minimum observed, 3.82 ft Nov. 12-15, 1964.

Regulation or control.--None.

Remarks.--Pine Lake has no inlet or outlet.





Monthly maximum and minimum stages for Pine Lake near Doster, Mich.

BARRY COUNTY

Wall Lake near Delton, Mich.

Location.--Lat 42°31'16", long 85°22'25", in secs. 28, 29, 32, and 33, T.2 N., R.9 W., 2.3 miles northeast of Delton.

Surface area.--540 acres.

Maximum depth.--36 ft.

Drainage area at outlet.--6.3 sq mi, approximately.

Records available.--July 1949 to December 1951 except winter periods.

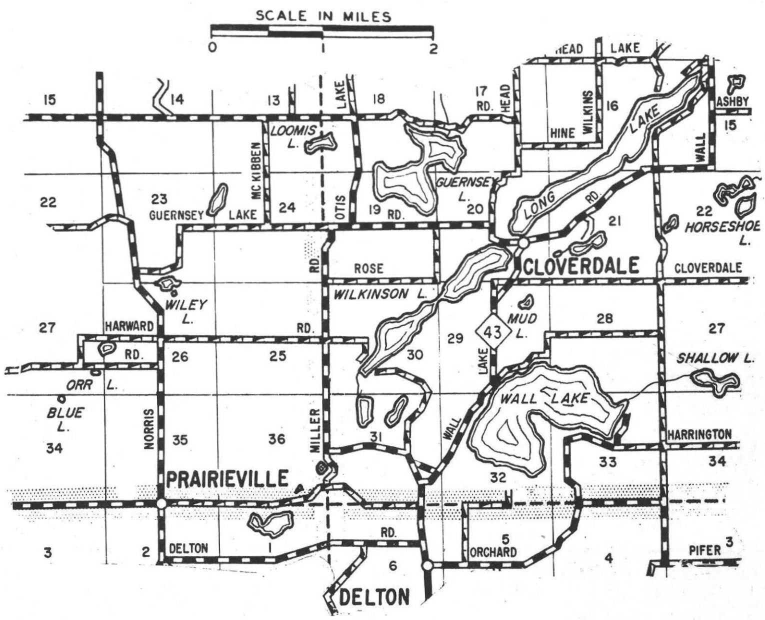
Gage.--Staff gage read intermittently. Datum of gage is 926.13 ft above mean sea level (levels by Michigan Department of Natural Resources).

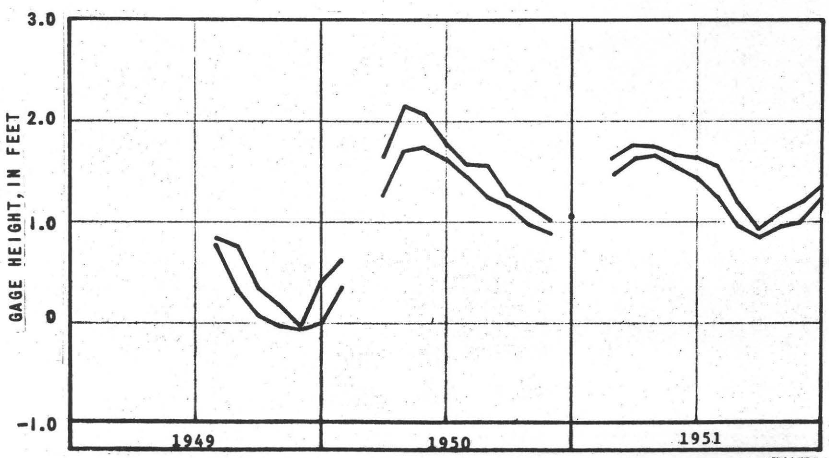
Established legal level.--927.00 ft above mean sea level, established by Circuit Court in August 1953.

Extremes.--1949-51: Maximum stage, 2.15 ft Apr. 27, 1950; minimum, -0.07 ft Nov. 7-9, 1949.

Regulation or control.--A low concrete wall across the outlet about a quarter of a mile downstream from the lake has a slight effect on lake levels.

Remarks.--Wall Lake has no inlet. The outlet leaves the east end of the lake and flows about 0.6 of a mile to Shallow Lake. On Feb. 8, 1951, a discharge of 0.03 cfs was measured in the outlet, 1,000 ft downstream from the lake.
An engineering lake-level control study was completed in 1953 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Wall Lake near Delton Mich.

BENZIE COUNTY

Crystal Lake at Beulah, Mich.

Location.--Lat 44°38'11", long 86°08'50", in many sections, Tps. 26 and 27 N., Rs. 15 and 16 W., 2.7 miles west of Beulah.

Surface area.--9,710 acres.

Maximum depth.--162 ft.

Drainage area at outlet.--32 sq mi, approximately.

Records available.--June 1942 to September 1950. Prior to 1946, records obtained only during summer and fall months.

Gage.--Staff gage read daily. Datum of gage is 595.18 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--600.48 ft above mean sea level, by resolution of Board of Supervisors in October, 1909.

Extremes.--1942-50: Maximum stage observed, 6.12 ft June 24-28, July 1-4, 1949; minimum observed, 4.12 ft Dec. 20-31, 1949.

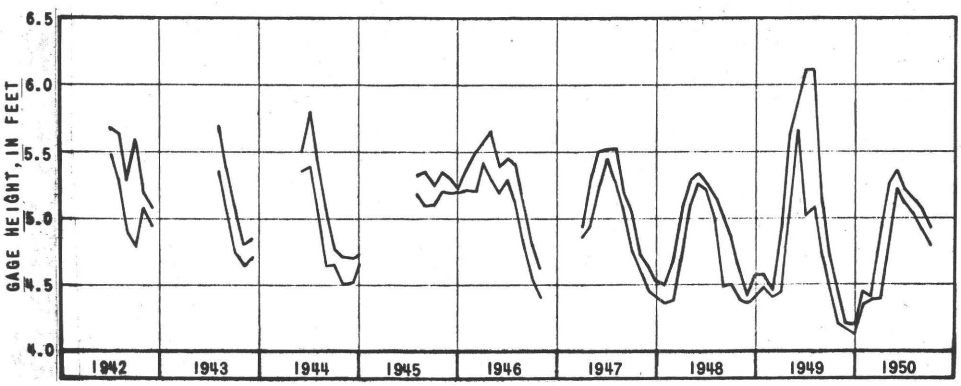
Regulation or control.--Lake level is maintained by dam at outlet.

Remarks.--Cold Creek enters Crystal Lake at Beulah at the southeastern end of the lake. Crystal Lake outlet flows southward into Betsie River about 2½ miles west of Beulah.

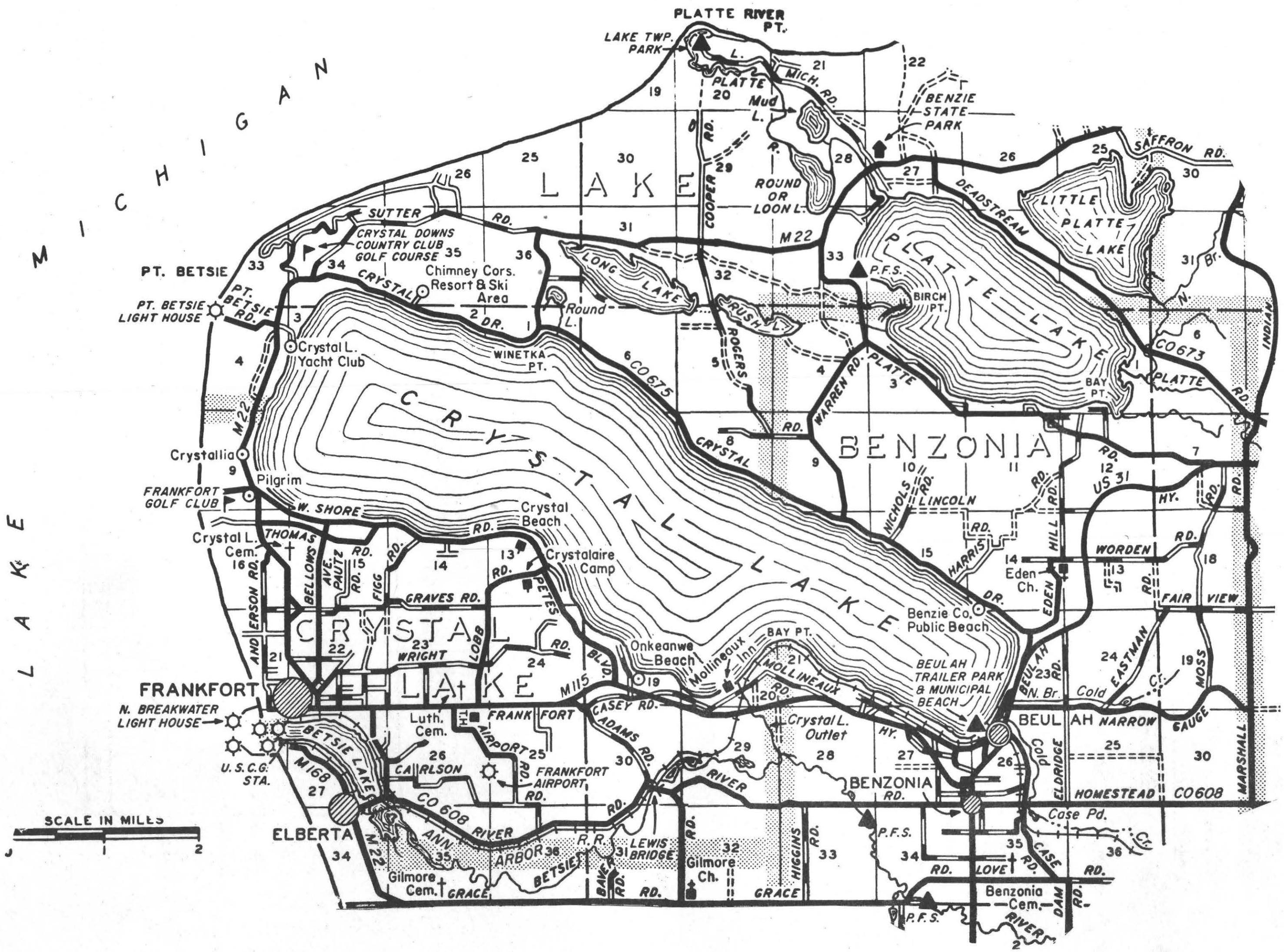
An engineering lake-level control study was completed in 1946 by the Michigan Department of Natural Resources.

No discharge measurements are available on the inlet. The following discharge measurements have been made at the outlet of the lake.

Date	Discharge (cfs)	Date	Discharge (cfs)
Oct. 7, 1942	4.36	Oct. 9, 1947	5.81
May 10, 1944	36.8	Jan. 15, 1948	.50
Sept. 19, 1944	6.05	Apr. 2, 1948	18.9
Nov. 21, 1944	7.10	Aug. 12, 1948	11.2
Aug. 9, 1945	23.3	Oct. 8, 1948	2.44
Nov. 5, 1945	23.3	Jan. 4, 1949	1.45
Jan. 31, 1946	30.3	Apr. 14, 1949	15.3
Apr. 23, 1946	31.7	Aug. 11, 1949	15.4
July 10, 1946	27.0	Oct. 17, 1949	.06
Sept. 27, 1946	4.91	Dec. 22, 1949	0
Jan. 23, 1947	0	Mar. 29, 1950	15.0
May 16, 1947	35.6	July 25, 1950	19.6
July 28, 1947	28.0	Oct. 2, 1950	7.20



Monthly maximum and minimum stages for Crystal Lake at Beulah, Mich.


LAKE MICHIGAN
PLATTE RIVER PT.
LAKE TWP. PARK
PLATTE L.
MICH. RD.
Mud L.
BENZIE STATE PARK
SAFFRON RD.
ROUND OR LOON L.
COOPER RD.
LAKE
LITTLE PLATTE LAKE
DEADSTREAM
M22
SUTTER RD.
CRYSTAL DOWNS COUNTRY CLUB GOLF COURSE
PT. BETSIE
PT. BETSIE LIGHT HOUSE
PT. BETSIE RD.
Chimney Cors. Resort & Ski Area
CRYSTAL DR.
LONG LAKE
Round L.
RUSH L.
P.F.S.
BIRCH PT.
PLATTE LAKE
CO673
PLATTE RD.
BAY PT.
INDIAN
Crystal L. Yacht Club
WINETKA PT.
CO 675
ROGERS
WARREN RD.
PLATTE
CRYSTAL LAKE
BENZONIA
Crystallia
Pilgrim
FRANKFORT GOLF CLUB
W. SHORE RD.
Crystal Beach
CRYSTAL
NICHOLS RD.
LINCOLN RD.
HARRIS
HILL RD.
US 31 HY.
WORDEN RD.
Eden Ch.
EDEN
FAIR VIEW
Crystal L. Cem.
THOMAS
BELLOWS
AVE. PAUTZ
FIGG RD.
ANDERSON RD.
Crystalaire Camp
PETES
GRAVES RD.
Benzie Co. Public Beach
CRYSTAL LAKE
WRIGHT
LOBB
Onkeanwe Beach
Mollineaux Inn
BAY PT.
MOLLINEAUX RD.
BEULAH TRAILER PARK & MUNICIPAL BEACH
BEULAH RD.
EASTMAN
MOSS
Cold Cr.
N. Br.
FRANKFORT
N. BREAKWATER LIGHT HOUSE
M115
BLVD.
CASEY RD.
FRANKFORT HY.
Crystal L. Outlet
BEULAH
NARROW GAUGE
MARSHALL
Luth. Cem.
AIRPORT RD.
ADAMS RD.
U.S.C.G. STA.
BETSIE LAKE
M168
CARLSON
FRANKFORT AIRPORT RD.
RIVER
BENZONIA RD.
ELDRIDGE
HOMESTEAD CO608
Case Pd.
ELBERTA
M 22
CO 608
RIVER
ANN ARBOR R.R.
BETSIE
LEWIS BRIDGE
Gilmore Ch.
HIGGINS RD.
BAKER RD.
P.F.S.
LOVE
CASE RD.
Gilmore Cem.
GRACE RD.
GRACE
Benzonia Cem.
DAM RD.
RIVER
SCALE IN MILES
0 1 2

GPO 818-596-4

BENZIE COUNTY

Little Platte Lake near Honor, Mich.

Location.--Lat 44°41'30", long 86°03'30", in secs.25, 26, 35, and 36, T.27 N., R.15 W., 2.7 miles northwest of Honor.

Surface area.--820 acres.

Maximum depth.--8 ft.

Drainage area at outlet.--31.1 sq mi, at County Road 673 (includes drainage area of North Branch Platte River).

Records available.--May to September 1958, April to September 1959, June to November 1960, February to November 1961.

Gage.--Staff gage read daily. Datum of gage is 578.36 ft above mean sea level (levels by Michigan Department of Natural Resources).

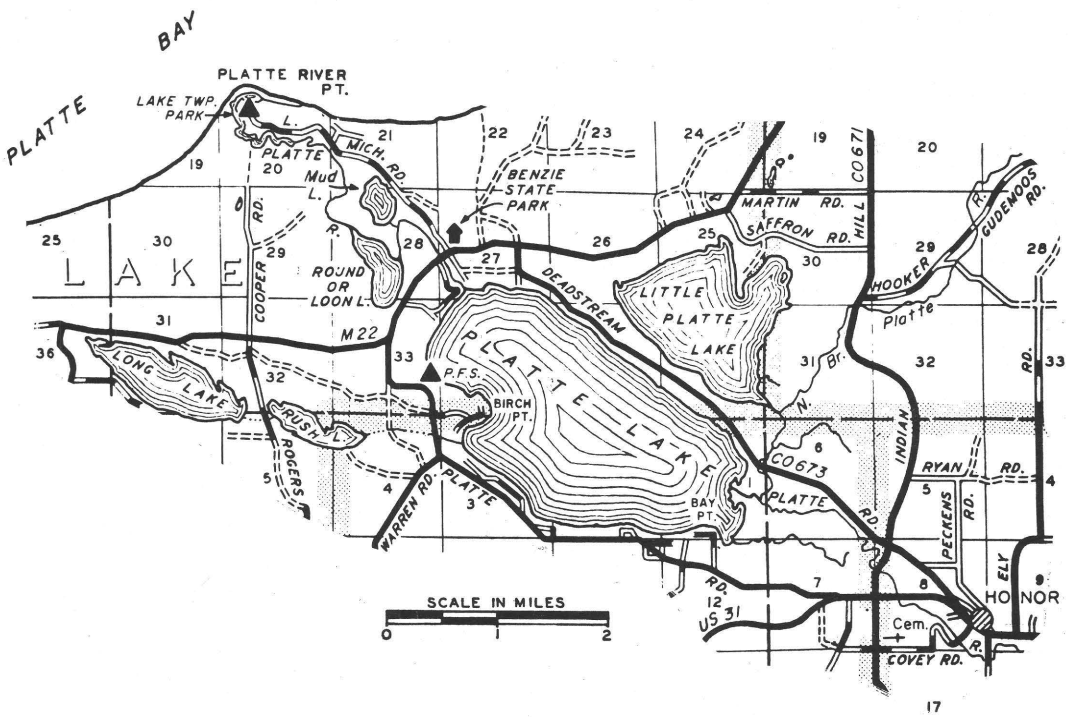
Established legal level.--586.7 ft above mean sea level, established by Circuit Court on Dec. 11, 1961.

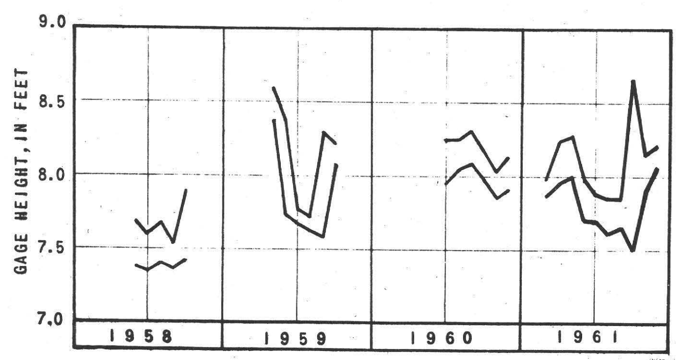
Extremes.--1958-61: Maximum stage observed, 8.65 ft Sept. 15, 1961; minimum observed, 7.35 ft June 7, 1958.

Regulation or control.--None.

Remarks.--There is no inlet to Little Platte Lake; the outlet is at the south end. North Branch Platte River joins the outlet 0.1 mile downstream from the southernmost tip of the lake. On October 7, 1957, the flow in the outlet at County Road 673 was 17.1 cfs, and at County Road 671 the flow of North Branch Platte River was 14.6 cfs.

An engineering lake-level control study was completed in 1961 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Little Platte Lake near Honor, Mich.

BENZIE COUNTY

Long Lake near Honor, Mich.

Location.--Lat 44°41'23", long 86°09'23", in secs. 31 and 32, T.27 N., R.15 W., 7.0 miles west of Honor.

Surface area.--328 acres.

Maximum depth.--20 ft.

Drainage area.--1.4 sq mi, approximately.

Records available.--September 1956 to September 1958 except winter periods.

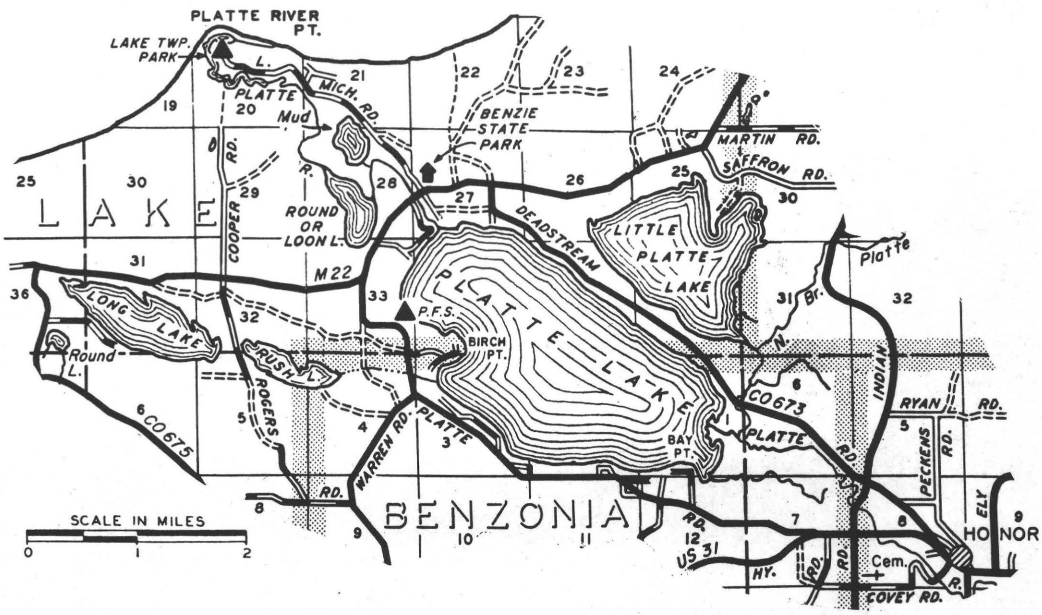
Gage.--Staff gage read daily. Datum of gage is 588.62 ft above mean sea level (levels by Michigan Department of Natural Resources).

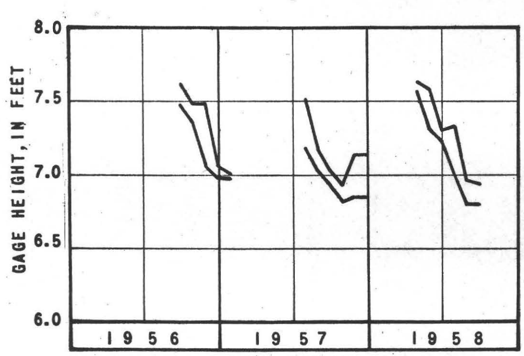
Established legal level.--None known.

Extremes.--1956-58: Maximum stage observed, 7.64 ft Apr. 7, 9, 10, 1958; minimum observed, 6.80 ft Aug. 16, Sept. 5, 1958.

Regulation or control.--None.

Remarks.--Long Lake has no inlet or outlet.
An engineering lake-level control study was completed in 1957 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Long Lake near Honor, Mich.

BENZIE COUNTY

Platte Lake near Honor, Mich.

Location.--Lat 44°42'26", long 86°06'53", in many sections, Tps. 26 and 27 N., R.15 W., 2.5 miles northwest of Honor.

Surface area.--2,520 acres.

Maximum depth.--90 ft.

Drainage area at outlet.--166 sq mi.

Records available.--June 1942 to December 1959 except winter and spring periods prior to 1948.

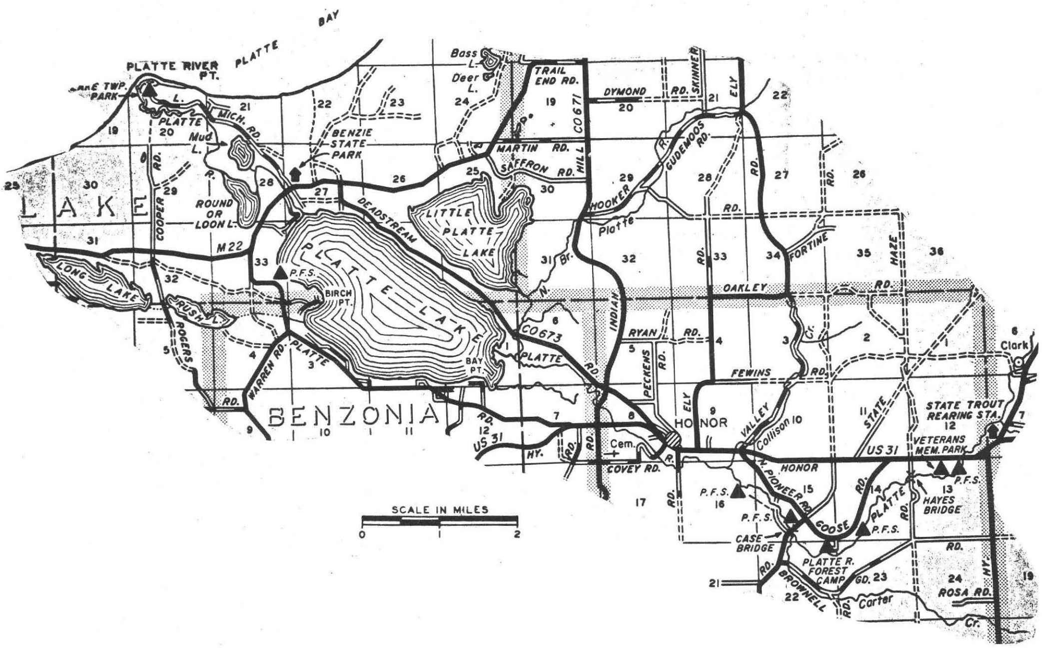
Gage.--Staff gage read daily. Datum of gage is 581.34 ft above mean sea level (levels by Michigan Department of Natural Resources).

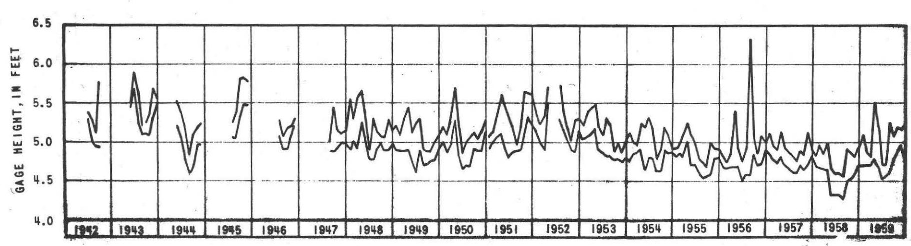
Established legal level.--None known.

Extremes.--1942-59: Maximum stage observed, 6.32 ft Aug. 4, 1956, minimum observed, 4.28 ft Aug. 5, 1958.

Regulation or control.--None.

Remarks.--The inlet and outlet to Platte Lake is the Platte River. An investigation in the Platte River basin was made on Oct. 7, 1957, for the purpose of determining the base-flow yields of various parts of the basin. The results of this investigation are published in U. S. Geological Survey Water-Supply Paper 1557. Fifty-six discharge measurements of the Platte River, at U. S. Highway 31, 4 miles east of Honor, were made during the period 1960-68. Results of these measurements are contained in U. S. Geological Survey Water-Supply Papers.





Monthly maximum and minimum stages for Platte Lake near Honor, Mich.

BERRIEN COUNTY

Dayton Lake at Dayton, Mich.

Location.--Lat 41°47'46", long 86°26'32", in secs. 5, 7, and 8, T.8 S., R.1 W., at Dayton.

Surface area.--60 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--1.54 sq mi.

Records available.--October 1959 to August 1967 except some winter and fall periods.

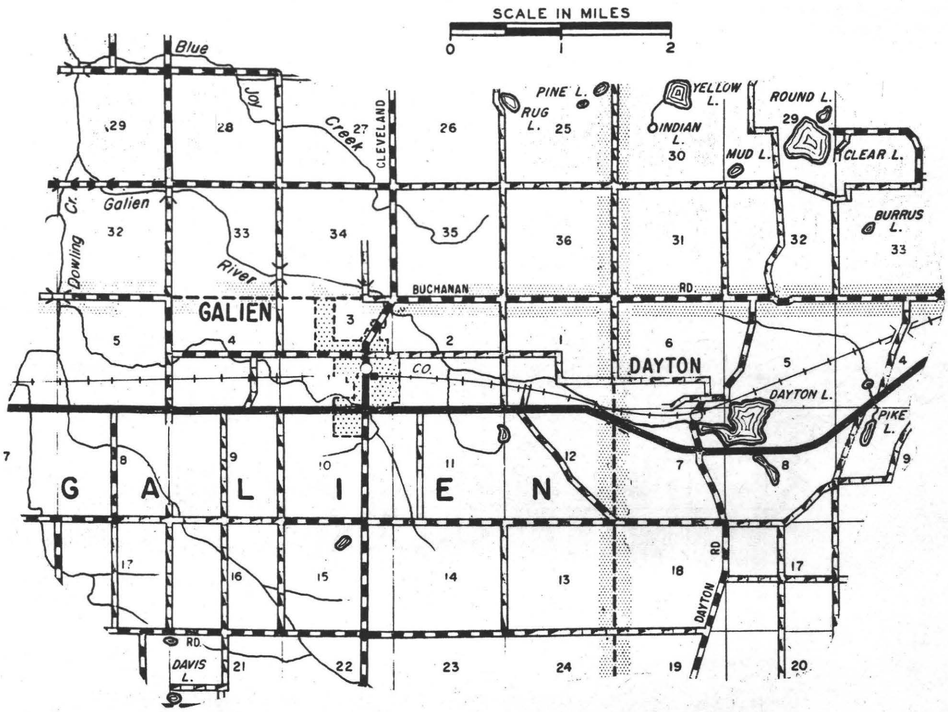
Gage.--Staff gage read daily. Datum of gage is 709.7 ft above mean sea level.

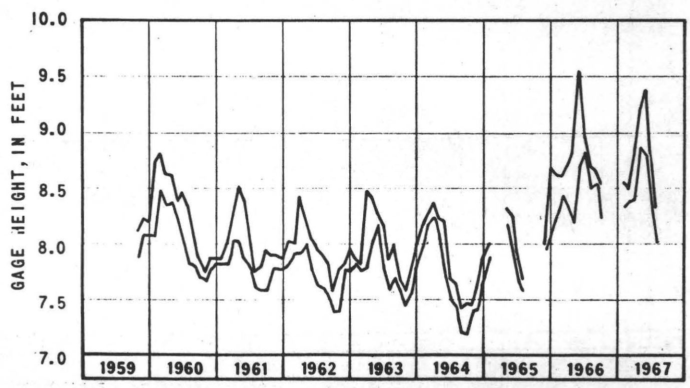
Established legal level.--None known.

Extremes.--1959-67: Maximum stage observed, 9.56 ft May 11, 1966; minimum observed, 7.19 ft Sept. 1, 2, 1964. Maximum stage during high water of 1947 was 9.23 ft Apr. 12, 1947.

Regulation or control.--Culvert at outlet acts as control.

Remarks.--There is no inlet to Dayton Lake. The outlet, Galien River, is at the west end of the lake. No discharge measurements are available on the outlet.





Monthly maximum and minimum stages for Dayton Lake at Dayton, Mich.

BERRIEN COUNTY

Grand Marais Lakes near Stevensville, Mich.

Location.--Lat 42°00'56", long 86°32'36", in secs. 20, 29, and 32, T.5 S., R.19 W., 1.2 miles west of Stevensville.

Surface area.--122 acres.

Maximum depth.--Unknown.

Drainage area.--Not determined.

Records available.--September 1944 to September 1946 except winter periods.

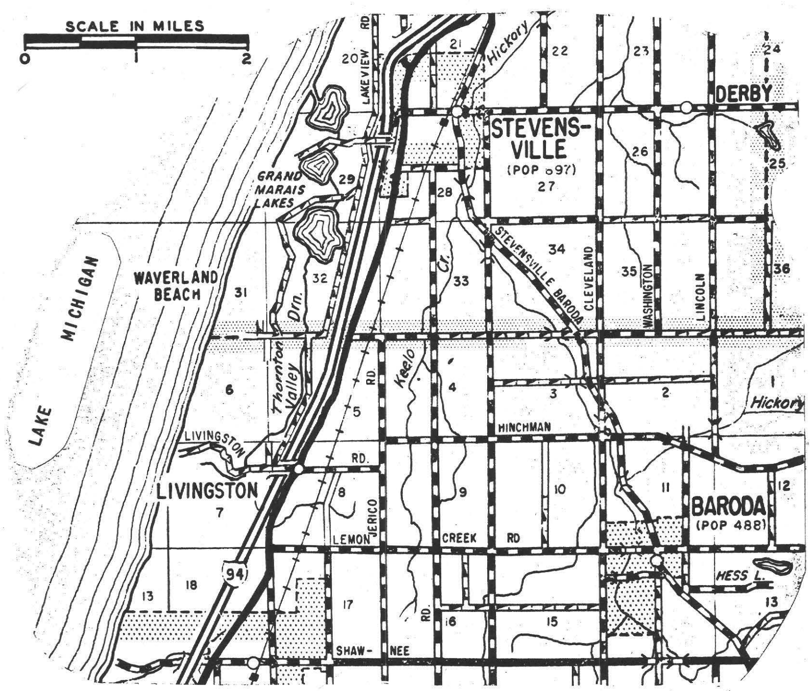
Gage.--Staff gage read intermittently. Datum of gage not determined.

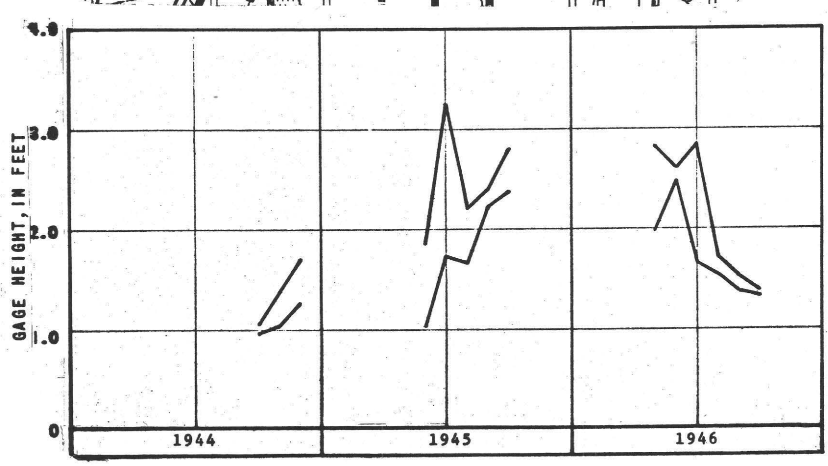
Established legal level.--582.83 ft above mean sea level, established by Circuit Court on Apr. 24, 1959.

Extremes.--1944-46: Maximum stage observed, 3.25 ft June 19, 1945; minimum observed, 0.98 ft Sept. 11, 1944.

Regulation or control.--A sand bar at the end of the outlet from North Lake often acted as a dam and caused flooding in the spring.

Remarks.--Grand Marais Lakes are a chain of three small lakes-North, Middle, and South. The inlet, Thornton Valley Drain, enters South Lake. The outlet is at the west side of North Lake and is tributary to Lake Michigan.
No discharge measurements have been made on the inlet or outlet.





Monthly maximum and minimum stages for Grand Marais Lakes near Stevensville, Mich.

BERRIEN COUNTY

Smith Lake near Dowagiac, Mich.

Location.--Lat 41°56'53", long 86°13'18", in secs. 12, 13, and 18, T.6 S., Rs. 16 and 17 W., 6.4 miles southwest of Dowagiac.

Surface area.--135 acres.

Maximum depth.--36 ft.

Drainage area.--Not determined.

Records available.--May to November 1960.

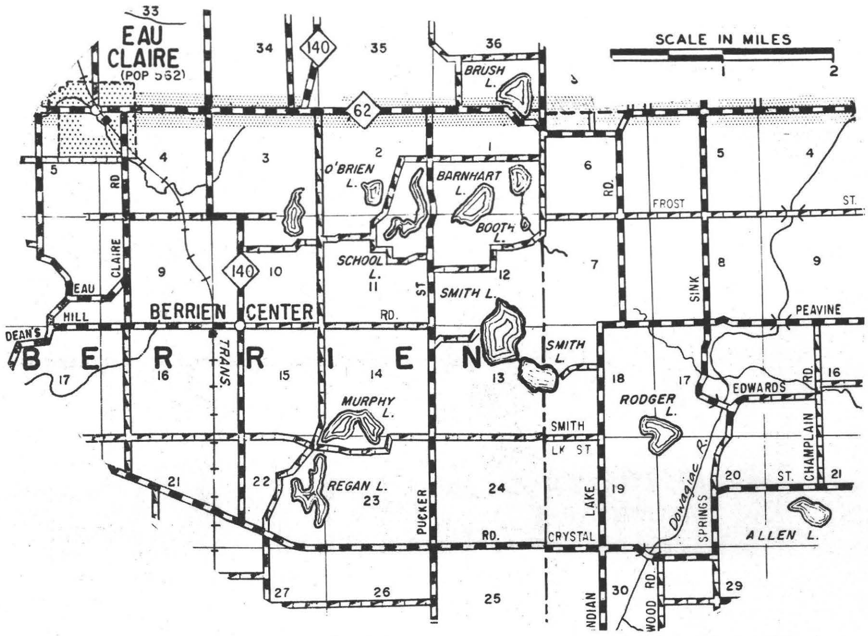
Gage.--Staff gage read daily. Datum of gage not determined.

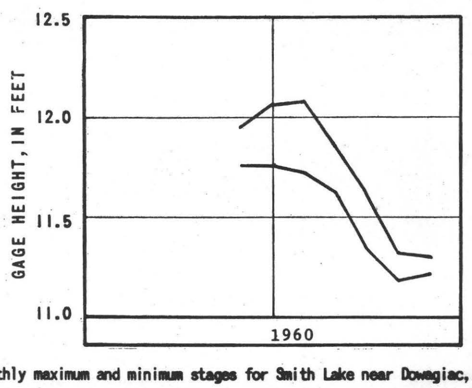
Established legal level.--None known.

Extremes.--1960: Maximum stage, 12.08 ft July 3; minimum, 11.18 ft Oct. 24-27.

Regulation or control.--None.

Remarks.--Smith Lake is comprised of two small connected lakes. It has no major inlet or outlet, however any drainage from the lake would leave from the northeast end of the smaller lake and flow east to Dowagiac River.





Monthly maximum and minimum stages for Smith Lake near Dowagiac, Mich.

BRANCH COUNTY

Byers Lake (formerly Mud Lake) near Coldwater, Mich.

Location.--Lat 41°52'04", long 85°02'15", in sec. 17, T.7 S., R.6 W., 5.3 miles southwest of Coldwater.

Surface area.--14 acres.

Maximum depth.--8 ft.

Drainage area at outlet.--15.1 sq mi.

Records available.--December 1949 to October 1950.

Gage.--Staff gage read daily. Datum of gage 952.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1949-50: Maximum stage, 12.40 ft Apr. 5, 1950; minimum, 8.00 ft Aug. 26-28, 30, 1950.

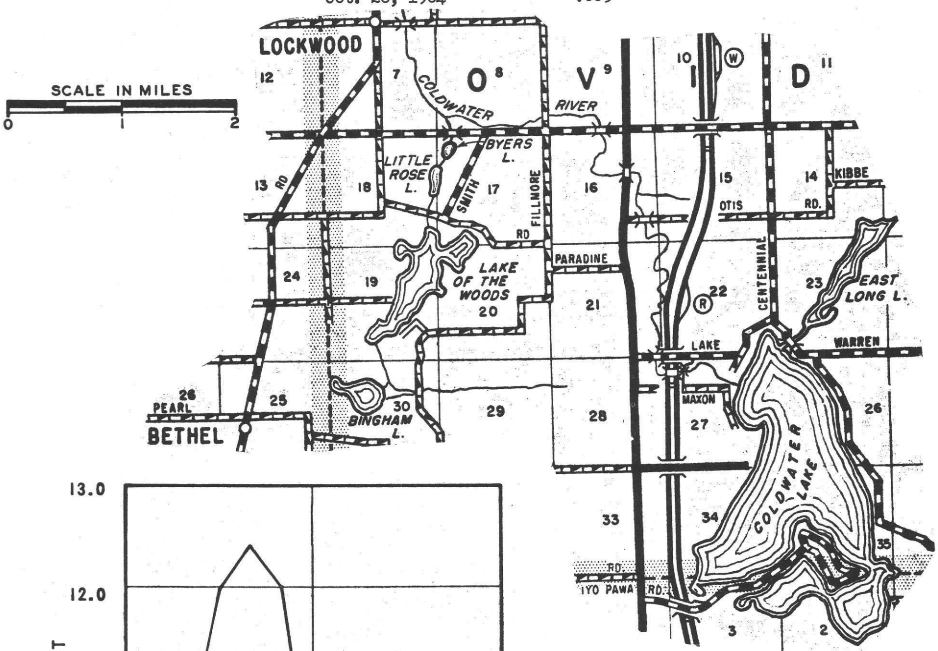
Regulation or control.--A bridge located about 300 ft downstream from the lake acts as a restriction to outflow from lake. Lake level may also be affected by backwater from Coldwater River, 500 ft downstream during flood stages.

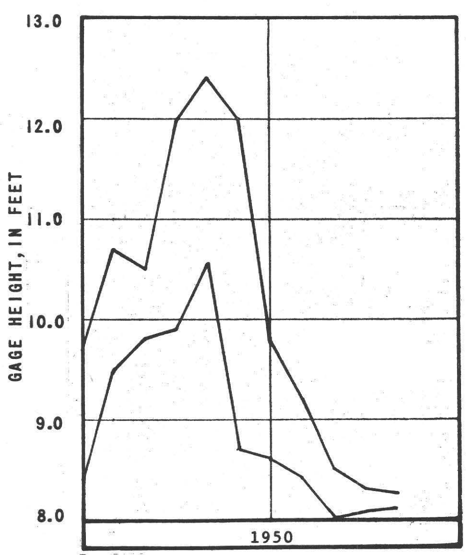
Remarks.--The inlet and outlet of Byers Lake is Betts Drain which flows out of Lake of the Woods. A dam at the outlet of Lake of the Woods controls the flow in Betts Drain.

An engineering lake-level control study was completed in 1952 by the Michigan Department of Natural Resources.

The following discharge measurements have been made at the outlet of Byers Lake.

Date	Discharge (cfs)
July 13, 1964	1.84
July 28, 1964	0
Oct. 26, 1964	.005





Monthly maximum and minimum stages for Byers Lake near Coldwater, Mich.

BRANCH COUNTY

Cary Lake near Batavia, Mich.

Location.--Lat 41°53'53", long 85°06'43", in sec. 34, T.6 S., R.7 W., 1.2 miles southwest of Batavia.

Surface area.--79 acres.

Maximum depth.--38 ft.

Drainage area at outlet.--7.3 sq mi, approximately.

Records available.--March 1964 to December 1965 except winter period.

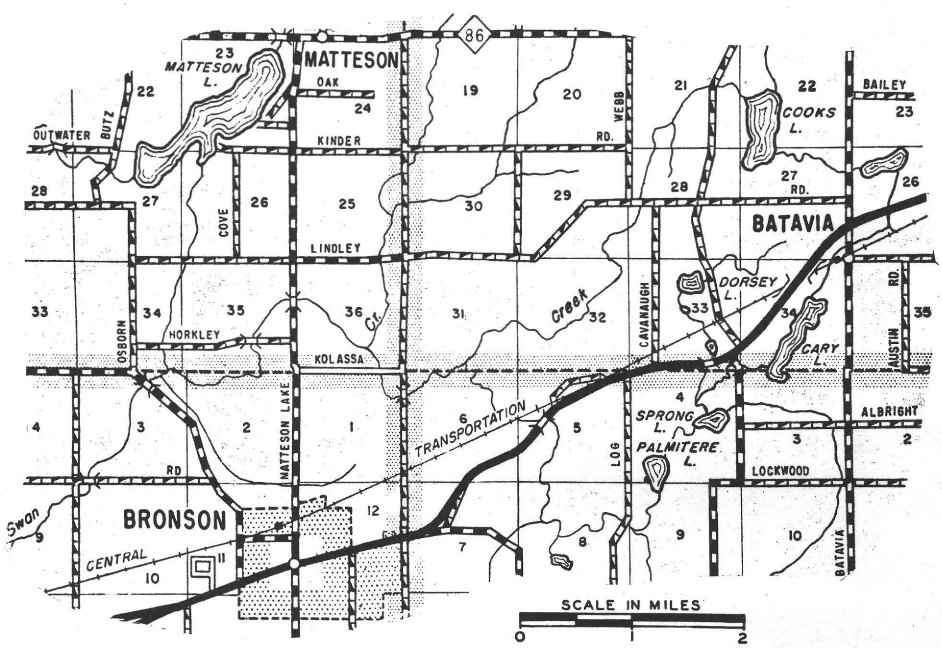
Gage.--Staff gage read daily. Datum of gage not determined.

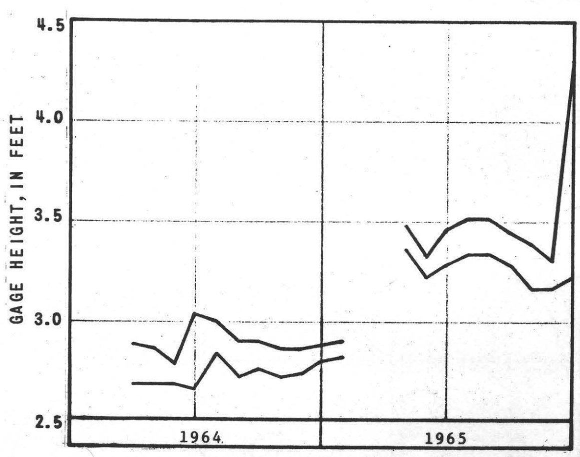
Established legal level.--None known.

Extremes.--1964-65: Maximum stage observed, 4.30 ft Dec. 24, 25, 1965; minimum observed, 2.66 ft June 6, 1964.

Regulation or control.--None.

Remarks.--The inlet to Cary Lake is an unnamed tributary at the north end of the lake. The outlet, at the southwest side of the lake, flows into Sprong Lake. No discharge measurements are available on the inlet or outlet.
See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Cary Lake near Batavia, Mich.

BRANCH COUNTY

Coldwater Lake near Coldwater, Mich.

Location.--Lat 41°50'13", long 84°59'13", in many sections, Tps. 7 and 8 S., R.6 W., 6 miles south of Coldwater.

Surface area.--1,610 acres.

Maximum depth.--92 ft.

Drainage area at outlet.--82.5 sq mi, includes all drainage into a chain of lakes (see Remarks).

Records available.--October 1943 to September 1968.

Gage.--Staff gage read daily. Datum of gage is 979.34 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--Winter, 983.5; summer, 984.5 ft above mean sea level, established by Circuit Court on Feb. 5, 1960.

Extremes.--1943-68: Maximum stage observed, 7.36 ft Apr. 3-7, 1950; minimum stage, 3.84 ft Oct. 15, 16, 27-30, 1946.

Regulation or control.--Dams located at the outlet of Coldwater and Marble Lakes control lake-level elevations in the Coldwater-Marble chain of lakes.

Remarks.--Coldwater Lake is part of a chain of lakes which include, from south to north, Coldwater, East Long, Wright, Bartholomew, Archer, Middle, Marble, First Lakes. The level of the lakes is controlled by dams on Sauk River (outlet of Marble Lake) and Coldwater River (outlet of Coldwater Lake). The lakes have a common level so that changes made on either dam will affect the level of each of the lakes. Also, see Marble Lake, Branch County.

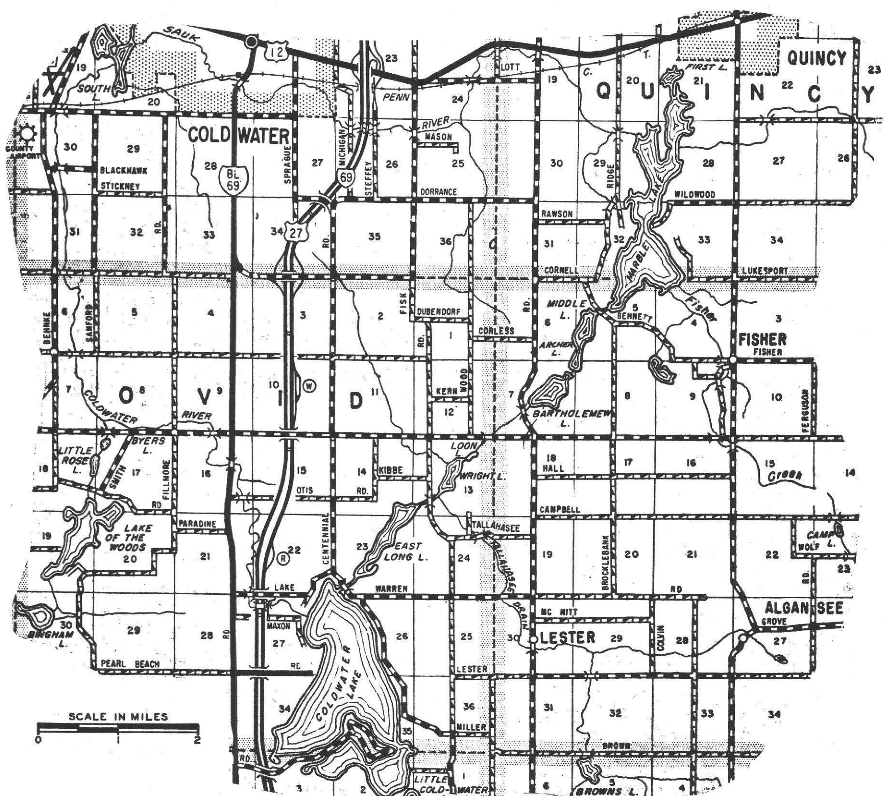
An engineering lake-level control study was completed in 1959 by the Michigan Department of Natural Resources.

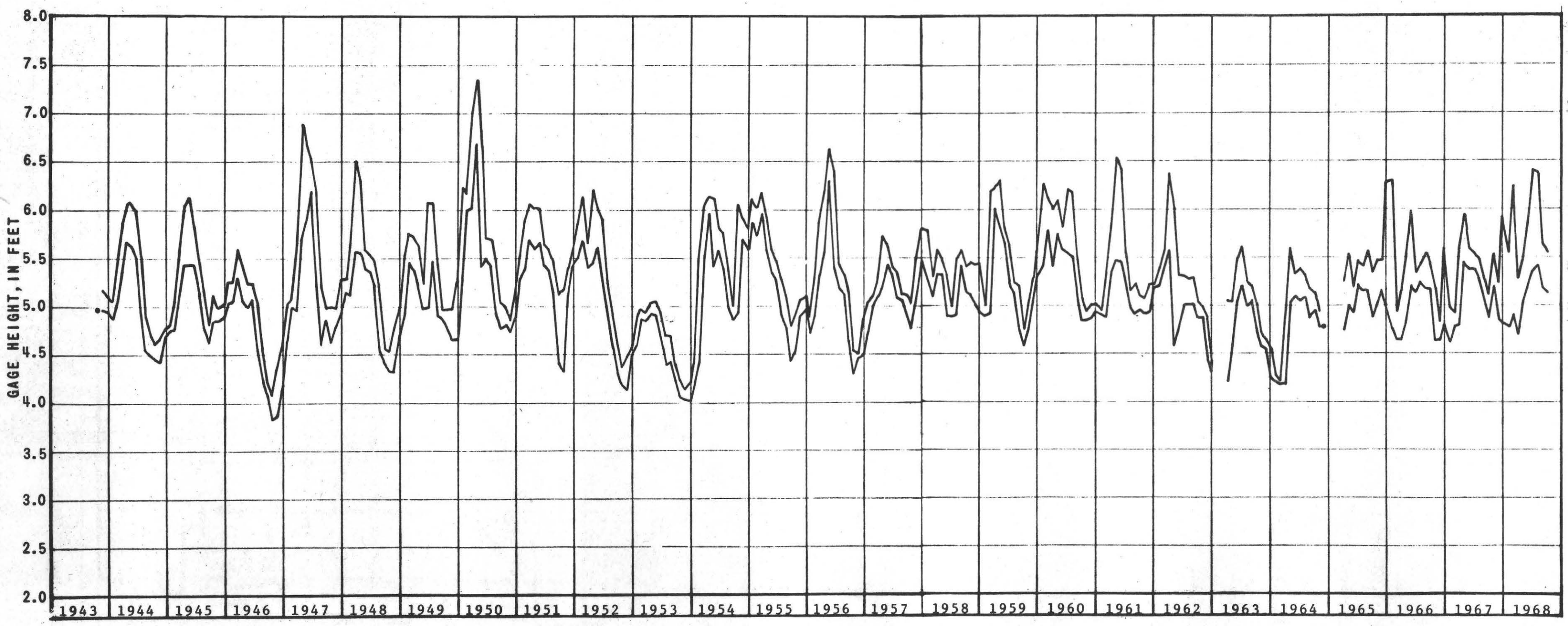
The following discharge measurements have been made on Coldwater River at a site 0.9 mile downstream from Coldwater Lake.

Date	Discharge (cfs)	Date	Discharge (cfs)
Feb. 6, 1964	8.84	Oct. 27, 1964	0.10
Apr. 15, 1964	3.60	Feb. 18, 1965	37.5
June 3, 1964	.02	Apr. 26, 1965	75.6
July 28, 1964	.32	July 28, 1965	.42
Sept. 14, 1964	.06	Oct. 28, 1965	1.31

The following discharge measurements have been made on Tallahassee Drain, an inlet stream, which discharges into the chain of lakes between East Long and Wright Lakes. The measurements were made at Tallahassee Road, about one mile upstream from Wright Lake (drainage area, 22.7 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
July 28, 1964	1.70	Oct. 27, 1964	1.68





Monthly maximum and minimum stages for Coldwater Lake near Coldwater, Mich.

BRANCH COUNTY

Craig Lake (formerly Morrison Lake) near Coldwater, Mich.

Location.--Lat 42°00'25", long 85°01'41", in secs. 29 and 32, T.5 S., R.6 W., 4.7 miles northwest of Coldwater.

Surface area.--122 acres.

Maximum depth.--25 ft.

Drainage area.--Not determined.

Records available.--August 1960 to November 1961, except period January to March 1961.

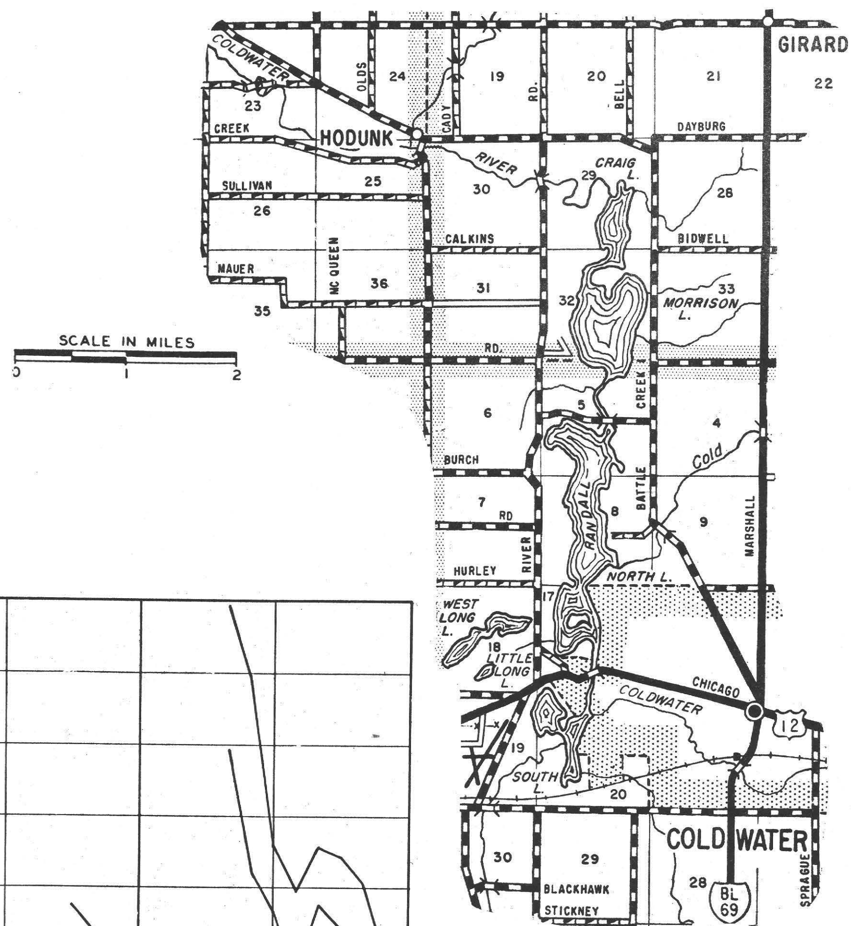
Gage.--Staff gage read daily. Datum of gage is 923.02 ft above mean sea level (levels by Michigan Department of Natural Resources).

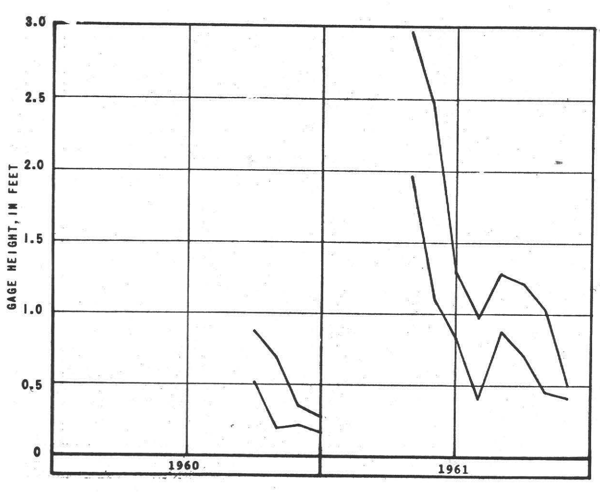
Established legal level.--Winter, 923.0 ft; summer, 924.0 ft above mean sea level, established by Circuit Court on Jan. 8, 1964.

Extremes.--1960-61: Maximum stage, 2.96 ft Apr. 27, 1961; minimum stage observed, 0.15 ft Dec. 24, 1960.

Regulation or control.--Lake level is controlled by dam on Coldwater River at Hodunk.

Remarks.--Craig Lake is a part of a chain of lakes which include South, Messenger, Cemetery, North, Randall, Morrison, and Craig Lakes. It is connected to Morrison Lake by a channel at the south end of the lake. The outlet, Coldwater River, leaves the north end of the lake. No discharge measurements have been made at the outlet of Craig Lake. Also, see South and Randall Lakes and Hodunk Mill Pond, Branch County. See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Craig Lake near Coldwater, Mich.

BRANCH COUNTY

Gilead Lake near Bronson, Mich.

Location.--Lat 41°47'23", long 85°10'08", in secs. 6 and 7, T.8 S., R.7 W., 6 miles south of Bronson.

Surface area.--128 acres.

Maximum depth.--40 ft.

Drainage area.--Not determined.

Records available.--March 1964 to September 1968 except period January to September 1966.

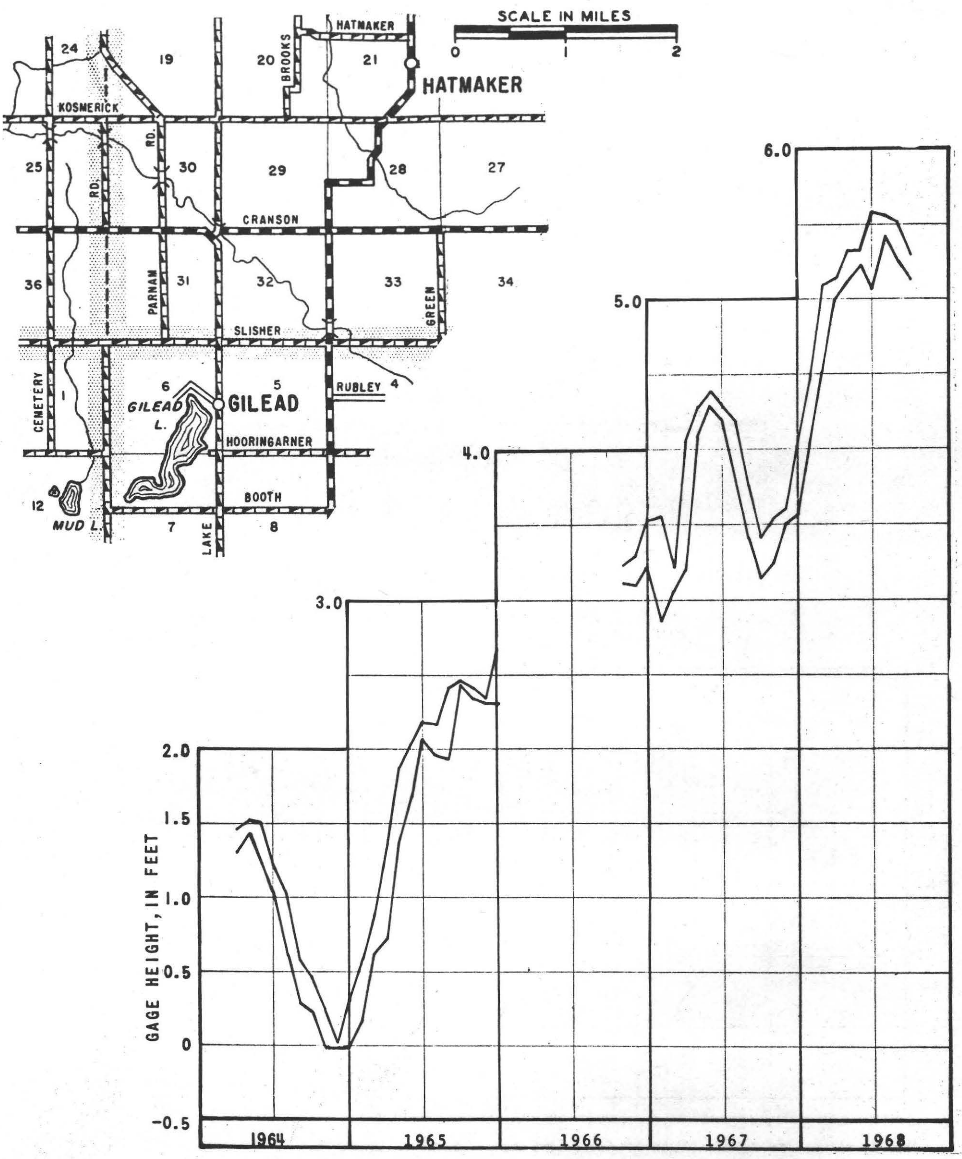
Gage.--Staff gage read intermittently. Datum of gage is 943.96 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1964-68: Maximum stage observed, 5.58 ft June 28, 1968; minimum observed, -0.02 ft Oct. 27-31 and Nov. 25 to Dec. 2, 1964.

Regulation or control.--None.

Remarks.--Gilead Lake has no inlet or outlet.
See table 1 for chemical analyses of lake water.



Monthly maximum and minimum stages for Gilead Lake near Bronson, Mich.

BRANCH COUNTY

Hodunk Mill Pond near Union City, Mich.

Location.--Lat 42°00'52", long 85°03'40", in secs. 25 and 30, T.5 S., R.6 W., 5.4 miles southeast of Union City.

Surface area.--60 acres.

Maximum depth.--10 ft.

Drainage area at outlet.--173 sq mi.

Records available.--August 1960 to March 1964 except period January to June 1962.

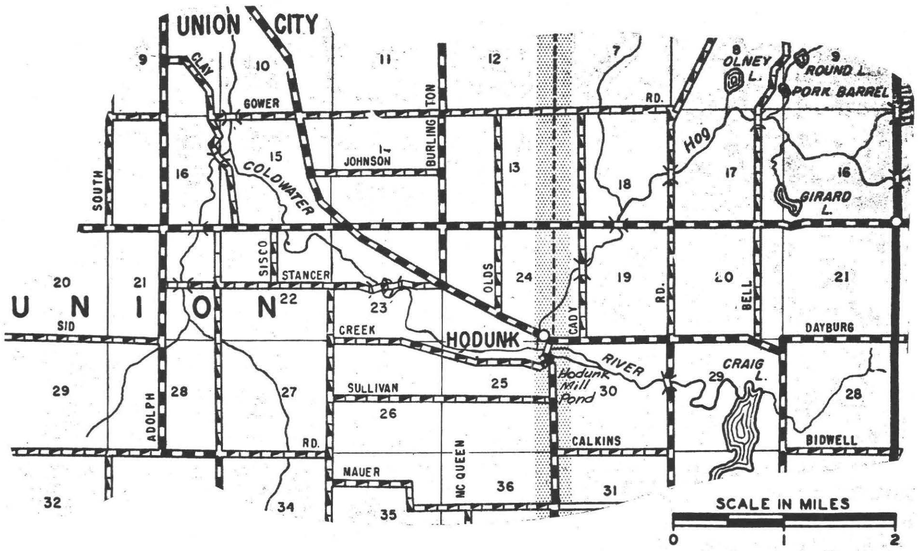
Gage.--Staff gage read daily. Datum of gage is 922.02 ft above mean sea level (levels by Michigan Department of Natural Resources).

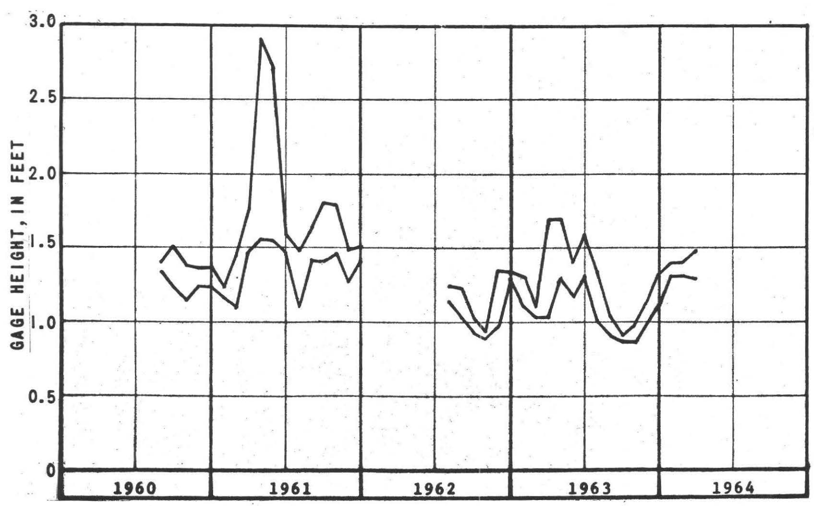
Established legal level.--None known.

Extremes.--1960-64: Maximum stage observed, 2.90 ft Apr. 30, 1961; minimum observed, 0.86 ft Sept. 27 to Oct. 4, Oct. 9-13, 1963.

Regulation or control.--The mill pond is created by a dam on Coldwater River at Hodunk. Boards in the dam are used to regulate level of pond. Dam also is the control for the chain of lakes which include South, Messenger, Cemetery, North, Randall, Morrison, and Craig.

Remarks.--The inlet and outlet of Hodunk Mill Pond is the Coldwater River. Daily records of streamflow are currently collected for Coldwater River at a site 3.3 miles downstream from the mill pond, These records are published in U.S. Geological Survey Water-Supply Papers.





Monthly maximum and minimum stages for Hodunk Mill Pond near Union City, Mich.

BRANCH COUNTY

Lake of the Woods (formerly Rose Lake) near Coldwater, Mich.

Location.--Lat 41°51'27", long 85°02'25", in secs. 17, 18, 19, and 20, T.7 S., R.6 W., 6 miles southwest of Coldwater.

Surface area.--355 acres.

Maximum depth.--76 ft.

Drainage area at outlet.--14.4 sq mi.

Records available.--January 1946 to September 1950.

Gage.--Staff gage read daily. Datum of gage is 961.51 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--963.0 ft above mean sea level, established by Circuit Court on Nov. 21, 1950.

Extremes.--1946-50: Maximum stage, 3.88 ft Apr. 21, 1947; minimum, -0.80 ft Dec. 25, 26, 1948.

Regulation or control.--A concrete dam with removable stop logs, built in the fall of 1948, controls the lake level.

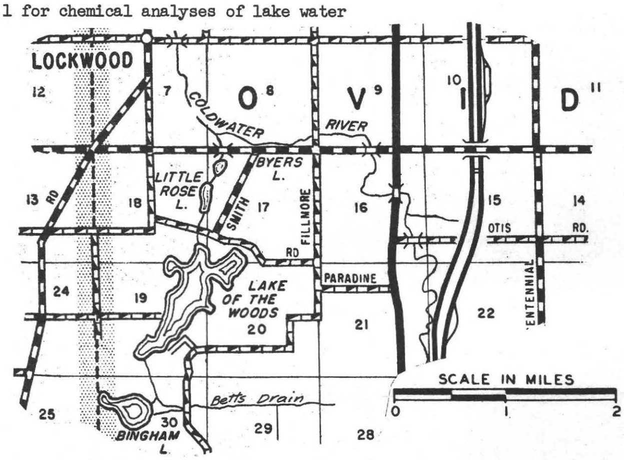
Remarks.--Betts Drain, flowing from the south, drains several square miles of low marshy area and provides an active inlet to Lake of the Woods. The outlet, at the north end of the lake, flows north one mile to Coldwater River.

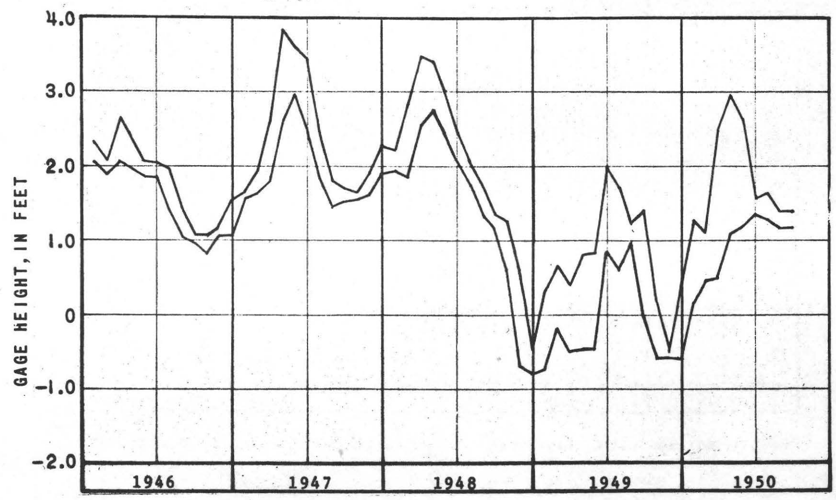
An engineering lake-level control study was completed in 1952 by the Michigan Department of Natural Resources.

The following discharge measurements have been made at the outlet of Lake of the Woods (published as Rose Lake Outlet).

Date	Discharge (cfs)	Date	Discharge (cfs)
Apr. 10. 1946	6.64	Jan. 6, 1948	8.62
May 15, 1946	2.24	May 4, 1948	16.6
Jan. 24, 1947	3.58	Oct. 14, 1948	1.43
Apr. 16, 1947	36.4	Nov. 23, 1948	9.28
May 5, 1947	38.5	Mar. 18, 1949	13.5
Sept. 19, 1947	1.76	June 16, 1949	0
Nov. 17, 1947	1.43	Apr. 28, 1950	65.1

See table 1 for chemical analyses of lake water





Monthly maximum and minimum stages for Lake of the Woods near Coldwater, Mich.

BRANCH COUNTY

Marble Lake near Quincy, Mich.

Location.--Lat 41°55'23", long 84°54'26", in many sections, Tps. 6 and 7 S., R.5 W., 1.9 miles southwest of Quincy.

Surface area.--780 acres.

Maximum depth.--60 ft.

Drainage area at outlet.--82.5 sq mi, includes all drainage into a chain of lakes (see Remarks).

Records available.--July 1958 to February 1960; March 1964 to December 1965.

Gage.--Staff gage read daily. Datum of gage is 982.6 ft above mean sea level.

Established legal level.--Winter, 983.5 ft; summer, 984.5 ft above mean sea level, established by Circuit Court on Feb. 5, 1960.

Extremes.--1958-60, 1964-65: Maximum stage observed, 3.11 ft Apr. 4, 1959, Jan. 13, 1960; minimum observed, 1.16 ft Nov. 27, 1964.

Regulation or control.--Dams located at the outlets of Coldwater and Marble Lakes control lake-level elevations in the Coldwater-Marble chain of lakes.

Remarks.--Marble Lake is part of a chain of lakes which include, from south to north, Coldwater, East Long, Wright, Bartholomew, Archer, Middle, Marble, and First Lakes. The level of the lakes is controlled by dams on Sauk River (outlet of Marble Lake) and Coldwater River (outlet of Coldwater Lake). The lakes have a common level so that changes made on either dam will affect the level of each of the lakes. Also, see Coldwater Lake, Branch County.

An engineering lake-level control study was completed in 1959 by the Michigan Department of Natural Resources.

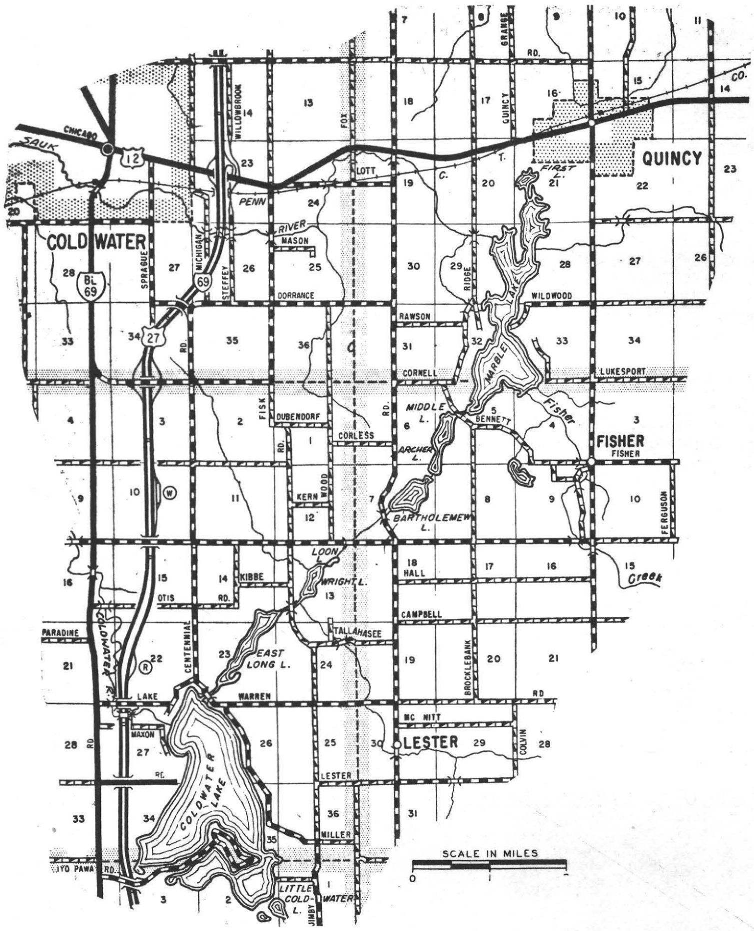
The following discharge measurements have been made on Sauk River (formerly East Branch Coldwater River) at Ridge Road, 0.3 mile downstream from Marble Lake.

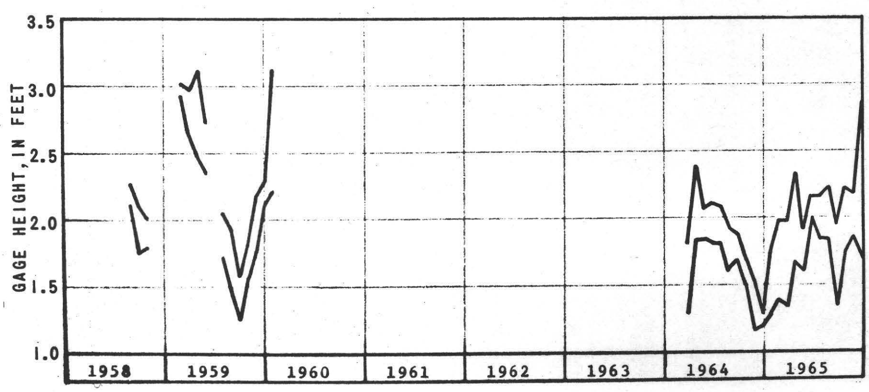
Date	Discharge (cfs)	Date	Discharge (cfs)
Apr. 15, 1964	14.2	Oct. 26, 1964	0.25
June 2, 1964	.61	Feb. 18, 1965	52.6
July 13, 1964	1.90	Apr. 26, 1965	88.7
July 29, 1964	1.09	July 27, 1965	8.10
Sept. 14, 1964	.38	Oct. 28, 1965	8.94

The following discharge measurements have been made on Fisher Creek, on inlet at Fisher Road, 1.1 miles upstream from Marble Lake, drainage area 16.8 sq mi.

Date	Discharge (cfs)	Date	Discharge (cfs)
Feb. 6, 1964	1.44	Sept. 14, 1964	0.92
Apr. 15, 1964	5.19	Oct. 26, 1964	1.53
June 2, 1964	2.56	Feb. 18, 1965	10.6
July 13, 1964	1.78	Apr. 26, 1965	29.1
July 29, 1964	1.17	July 28, 1965	1.78
		Oct. 28, 1965	4.96

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Marble Lake near Quincy, Mich.

GPO 818-596-5

BRANCH COUNTY

Matteson Lake at Matteson, Mich.

Location.--Lat 41°55'23", long 85°13'21", in secs. 22, 23, 26, and 27, T.6 S., R.8 W., 2.0 miles southwest of Matteson.

Surface area.--256 acres.

Maximum depth.--36 ft.

Drainage area at outlet.--18.2 sq mi.

Records available.--April 1964 to December 1965 except period December 1964 to February 1965.

Gage.--Staff gage read daily. Datum of gage not determined.

Established legal level.--None known.

Extremes.--1964-65: Maximum stage 4.16 ft Mar. 7, 1965; minimum stage observed, 1.42 ft Oct. 25-28, 1964.

Regulation or control.--None.

Remarks.--Two unnamed inlets enter Matteson Lake at the north end and south side respectively. The outlet, Little Swan Creek, is at the southwest end of lake.

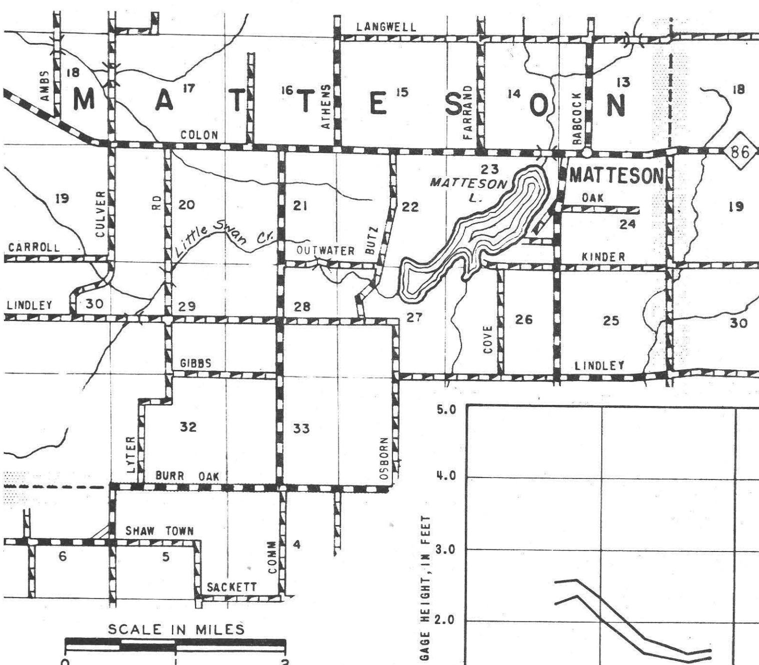
The following discharge measurements have been made on the inlet in NE¼ sec. 13, T.6 S., R.8 W., at Langwell Rd., 1.0 mile north of Matteson (drainage area, 8.94 sq mi).

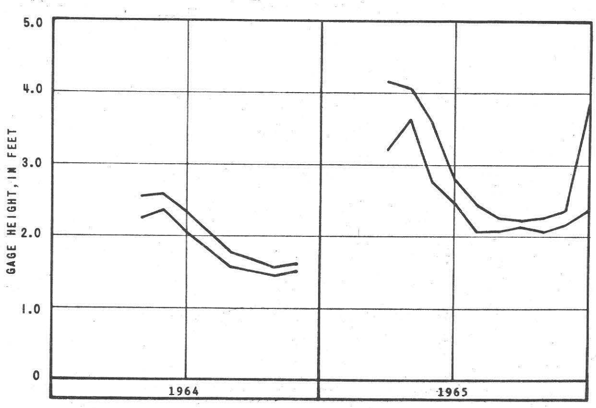
Date	Discharge (cfs)
July 13, 1964	0.40
July 28, 1964	.16
Oct. 27, 1964	0

The following discharge measurements have been made on Little Swan Creek at Comm Road, 2.9 miles southwest of Matteson. Drainage area, 19.4 sq mi.

Date	Discharge (cfs)
Apr. 16, 1964	6.29
June 2, 1964	4.42
July 29, 1964	.61
Sept. 14, 1964	.57
Oct. 26, 1964	.56
Feb. 18, 1965	22.9
Apr. 26, 1965	34.7
July 28, 1965	1.65
Oct. 19, 1965	1.83

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Matteson Lake at Matteson, Mich.

BRANCH COUNTY

Oliverda Lake near Sherwood, Mich.

Location.--Lat 42°02'12", long 85°15'05", in secs. 8, 9, 16, and 17, T.5 S., R.8 W., 2.5 miles north of Sherwood.

Surface area.--128 acres.

Maximum depth.--35 ft.

Drainage area.--10.2 sq mi, at Blossom Rd., 0.4 mile downstream from lake.

Records available.-- March 1964 to December 1965; October 1966 to September 1968.

Gage.--Staff gage read intermittently. Datum of gage not determined.

Established legal level.--None known.

Extremes.--1964-68: Maximum stage observed, 3.42 ft July 3-5, 1968; minimum observed, 1.74 ft Nov. 2-14, 20, 1964.

Regulation or control.--None.

Remarks.--Oliverda Lake is connected to Kenyon Lake. The inlet to Kenyon Lake is Spencer Creek which then discharges to Oliverda Lake. Spencer Creek subsequently flows south 1.5 miles into the St. Joseph River.

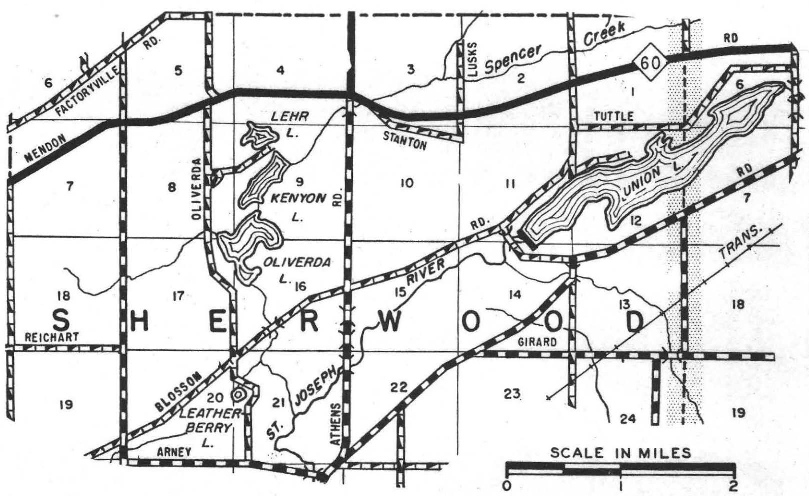
The following discharge measurements have been made on Spencer Creek, at State Highway 60 above Kenyon Lake, 5.0 miles west of Union City (drainage area, 5.83 sq mi).

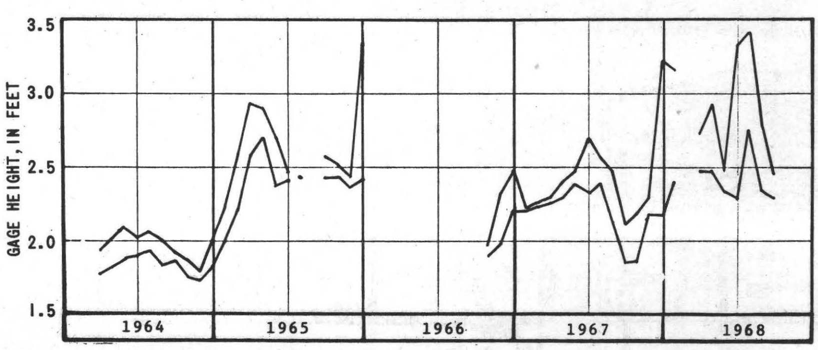
Date	Discharge (cfs)
July 13, 1964	0.58
July 28, 1964	.19
Oct. 26, 1964	.14

The following discharge measurements have been made on Spencer Creek, at Blossom Road, 0.4 mile downstream from Oliverda Lake.

Date	Discharge (cfs)
July 13, 1964	0.89
July 28, 1964	0
Oct. 26, 1964	.62

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Oliverda Lake near Sherwood, Mich.

BRANCH COUNTY

Randall Lake near Coldwater, Mich.

Location.--Lat 41°58'41", long 85°01'44", in secs. 5, 6, and 8, T.6 S., R.6 W., 3 miles northwest of Coldwater.

Surface area.--220 acres.

Maximum depth.--35 ft.

Drainage area at outlet.--158 sq mi. As part of a chain of lakes (see Remarks), the effective drainage area, which includes all drainage above Hodunk, is 173 sq mi.

Records available.--August 1960 to August 1963 except periods February to June 1962 and October 1962 to March 1963.

Gage.--Staff gage read daily. Datum of gage is 922.76 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--Winter, 923.0 ft; summer, 924.0 ft above mean sea level, established by Circuit Court on Jan. 8, 1964.

Extremes.--1960-63: Maximum stage observed, 3.20 ft Apr. 27, 1961; minimum stage, below the zero of the gage, in the fall of 1962 and 1963.

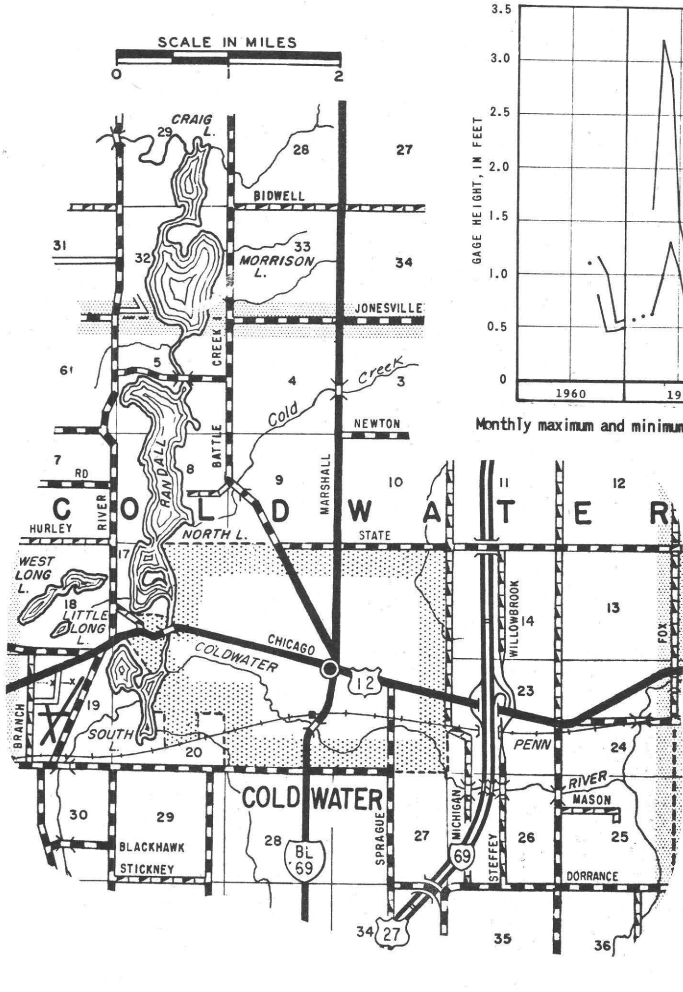
Regulation or control.--Lake level is controlled by dam on Coldwater River at Hodunk.

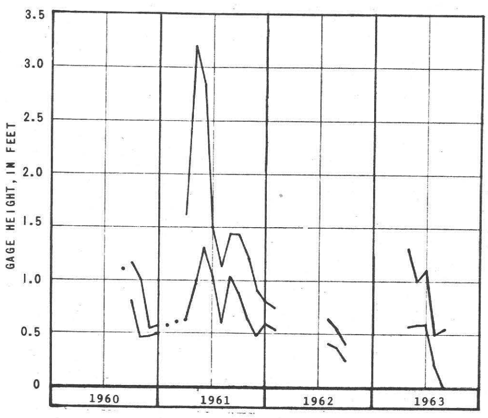
Remarks.--Randall Lake is part of a chain of lakes which include South, Messenger, Cemetery, North, Randall, Morrison, and Craig Lakes. It is connected to Morrison Lake by a narrow channel and is contiguous with North Lake. Also, see South Lake, Branch County.

The following discharge measurements have been made on Cold Creek (formerly Mud Creek), an inlet, at Michigan Road, 3.5 miles upstream from North Lake (drainage area 14.4 sq mi).

Date	Discharge (cfs)
July 13, 1964	0.24
July 29, 1964	.08
Oct. 26, 1964	.10
Mar. 16, 1965	12.6
Apr. 26, 1965	25.6

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Randall Lake near Coldwater, Mich.

BRANCH COUNTY

South Lake near Coldwater, Mich.

Location.--Lat 41°56'40", long 85°01'53", in secs. 17 and 20, T.6 S., R.6 W., 1.5 miles west of Coldwater.

Surface area.--118 acres.

Maximum depth.--18 ft.

Drainage area.--173 sq mi, includes all drainage into chain of lakes above Hodunk (see Remarks).

Records available.--August 1960 to September 1968.

Gage.--Staff gage read intermittently. Datum of gage is 922.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--Winter, 923.0 ft; summer, 924.0 ft above mean sea level, established by Circuit Court on Jan. 8, 1964.

Extremes.--1960-68: Maximum stage observed, 4.02 ft Apr. 26, 27, 1961; minimum stage, 0.64 ft Oct. 2, 18, 19, 1964.

Regulation or control.--Lake level is controlled by dam on Coldwater River at Hodunk.

Remarks.--South Lake is a part of a chain of lakes which include South, Messenger, Cemetery, North, Randall, Morrison and Craig Lakes. The principal inlets to South Lake are Coldwater River and Sauk River (formerly East Branch Coldwater River). The outlet flows from the north end of the lake into Cemetery Lake.

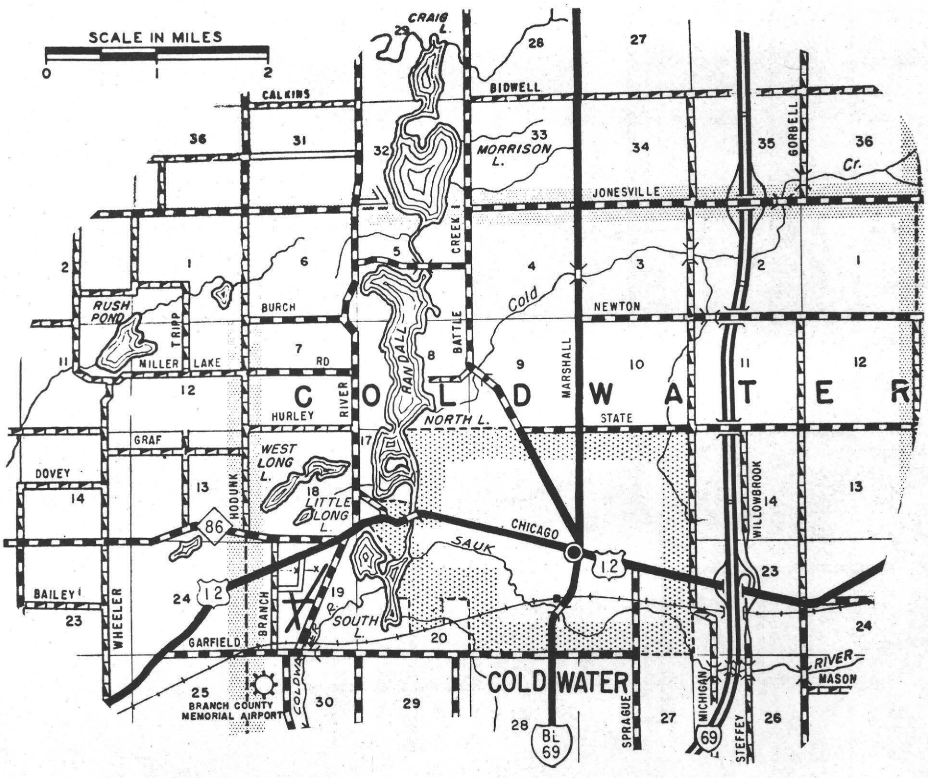
Daily records of streamflow were collected on Sauk River, at site 0.8 mile upstream from the lake (drainage area, about 60 sq mi) during period 1937-62. These records were published in U.S. Geological Survey Water-Supply Papers as East Branch Coldwater River at Coldwater. Since 1962, the following additional discharge measurements have been made at the same site.

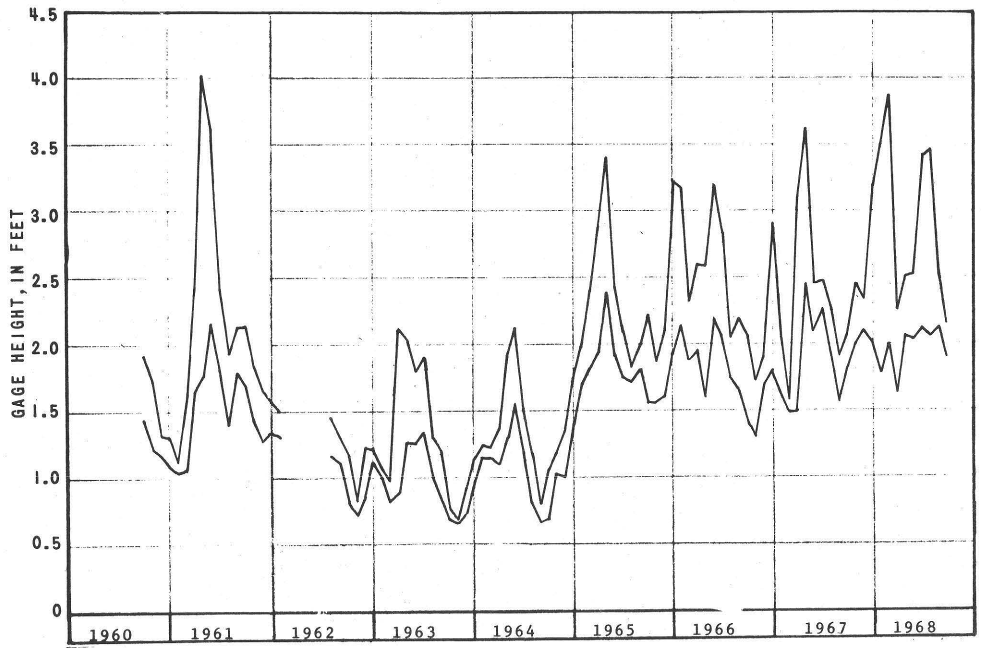
Date	Discharge (cfs)	Date	Discharge (cfs)
Apr. 16, 1964	12.3	Oct. 26, 1964	0.28
June 3, 1964	3.03	Feb. 18, 1965	65.4
July 13, 1964	1.35	Apr. 26, 1965	127
July 29, 1964	.50	July 27, 1965	7.09
Sept. 14, 1964	.33	Oct. 28, 1965	10.5

The following discharge measurements have been made on Coldwater River at Garfield Rd., 2.6 miles southwest of Coldwater, drainage area, 114 sq mi.

Date	Discharge (cfs)	Date	Discharge (cfs)
Feb. 6, 1964	13.2	Sept. 14, 1964	0.65
Apr. 16, 1964	21.1	Oct. 26, 1964	.78
June 2, 1964	4.62	Feb. 18, 1965	71.8
July 13, 1964	5.18	Apr. 26, 1965	164
July 29, 1964	1.96	July 27, 1965	2.79
		Oct. 28, 1965	26.6

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for South Lake near Coldwater, Mich.

BRANCH COUNTY

Vincent Lake near Girard, Mich.

Location.--Lat 42°03'16", long 85°00'43", in secs. 4 and 9, T.5 S., R.6 W., 1.8 miles northwest of Girard.

Surface area.--65 acres.

Maximum depth.--35 ft.

Drainage area at outlet.--1 sq mi, approximately.

Records available.--March 1964 to December 1965.

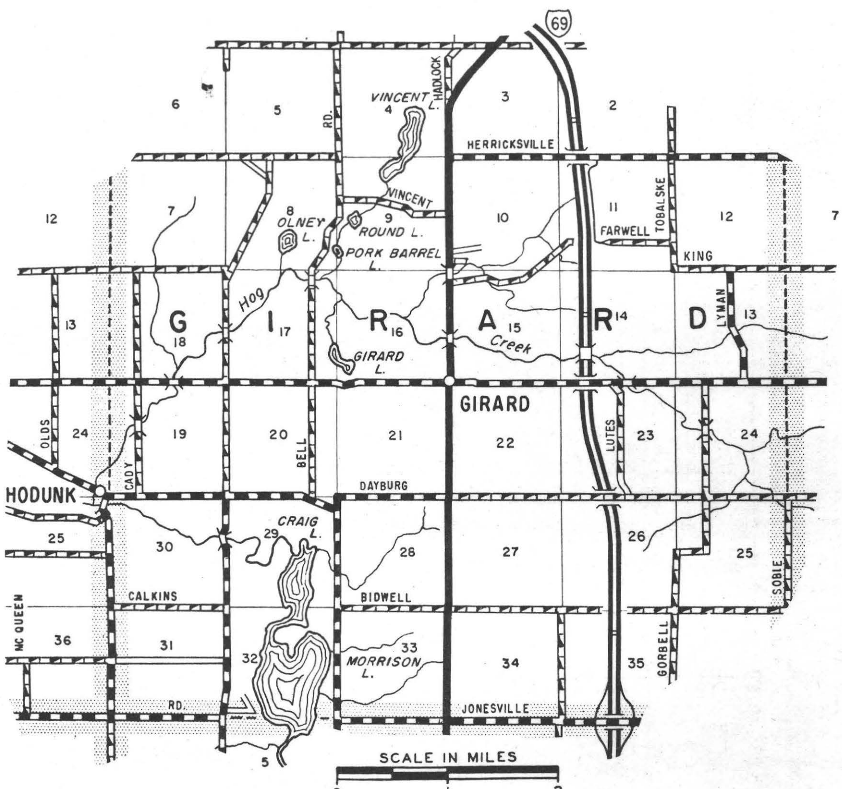
Gage.--Staff gage read daily. Datum of gage not determined.

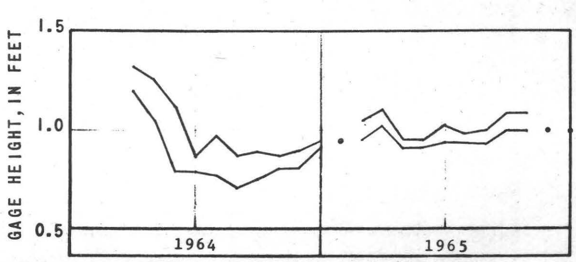
Established legal level.--None known.

Extremes.--1964-65: Maximum stage, 1.31 ft. Mar. 27, 1964; minimum, 0.70 ft. Aug. 4-10, 17, 18, 1964.

Regulation or control.--None.

Remarks.--Vincent Lake has no inlet. The outlet, at the south end of the lake, is tributary to Hog Creek. No discharge measurements have been made on the outlet.
See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Vincent Lake near Girard, Mich.

BRANCH COUNTY

Wright Lake (formerly Mud Lake) near Coldwater, Mich.

Location.--Lat 41°51'33", long 84°57'12", in sec. 13, T.7 S., R.6 W., 6.3 miles southeast of Coldwater.

Surface area.--30 acres.

Maximum depth.--25 ft.

Drainage area.--Not determined.

Records available.--July 1958 to March 1960 except periods January, August, and September 1959.

Gage.--Staff gage read daily. Datum of gage is 967.10 ft above mean sea level (levels by Michigan Department of Natural Resources).

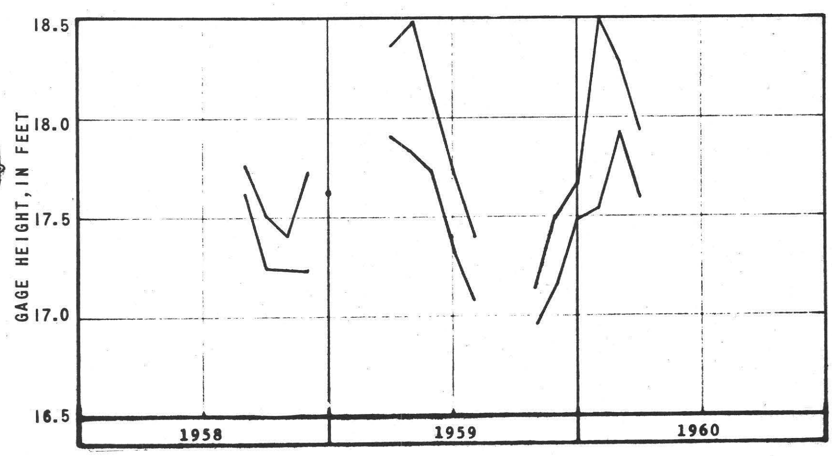
Established legal level.--Winter, 983.5 ft; summer, 984.5 ft above mean sea level, established by Circuit Court on Feb. 5, 1960.

Extremes.--1958-60: Maximum stage observed, 18.50 ft Jan. 15, 1960; minimum observed, 16.96 ft Oct. 1, 1959.

Regulation or control.--Dams located at the outlets of Coldwater and Marble Lakes control lake-level elevations in the Coldwater-Marble chain of lakes.

Remarks.--Wright Lake is part of a chain of lakes which include, from south to north, Coldwater, East Long, Wright, Bartholomew, Archer, Middle, Marble and First Lakes. The level of the lakes is controlled by dams on Sauk River (outlet of Marble Lake) and Coldwater River (outlet of Coldwater Lake). The lakes have a common level so that changes made on either dam will affect the level of each of the lakes. Also, see Coldwater and Marble Lakes, Branch County.

An engineering lake-level control study was completed for the Coldwater Lake chain in 1959, by the Michigan Department of Natural Resources.



Monthly maximum and minimum stages for Wright Lake near Coldwater, Mich.

CALHOUN COUNTY

Beadle Lake near Battle Creek, Mich.

Location.-- Lat 42°16'12", long 85°08'48", in secs. 20 and 29, T.2 S., R.7 W., 3.9 miles southeast of Battle Creek.

Surface area.--146 acres.

Maximum depth.--36 ft.

Drainage area.--Not determined.

Records available.--April to November 1950.

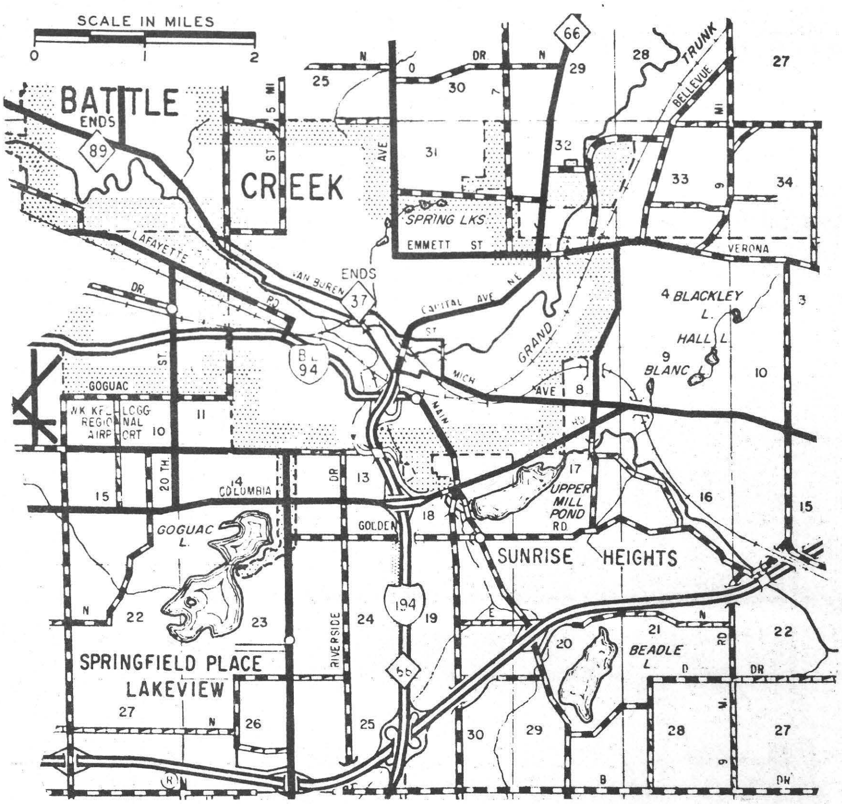
Gage.--Staff gage read daily. Datum of gage not determined.

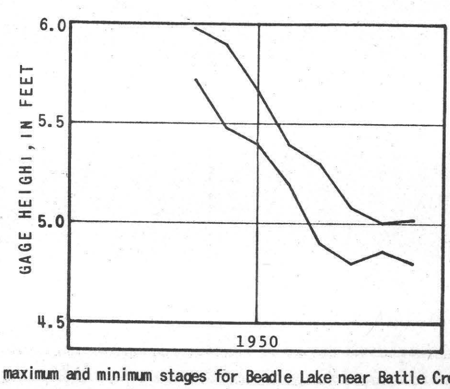
Established legal level.--None known.

Extremes.--1950: Maximum stage, 5.98 ft Apr. 27; minimum, 4.80 ft Sept. 10, Nov. 5.

Regulation or control.--None.

Remarks.--Beadle Lake has no inlet or outlet.





Monthly maximum and minimum stages for Beadle Lake near Battle Creek, Mich.

CALHOUN COUNTY

Duck Lake near Springport, Mich.

Location.--Lat 42°23'52", long 84°46'52", in many sections, T.1 S., R.4 W., 4.2 miles west of Springport.

Surface area.--630 acres.

Maximum depth.--61 ft.

Drainage area at outlet.--5.48 sq mi.

Records available.--October 1959 to July 1966 except some winter periods.

Gage.--Staff gage read intermittently. Datum of gage not determined.

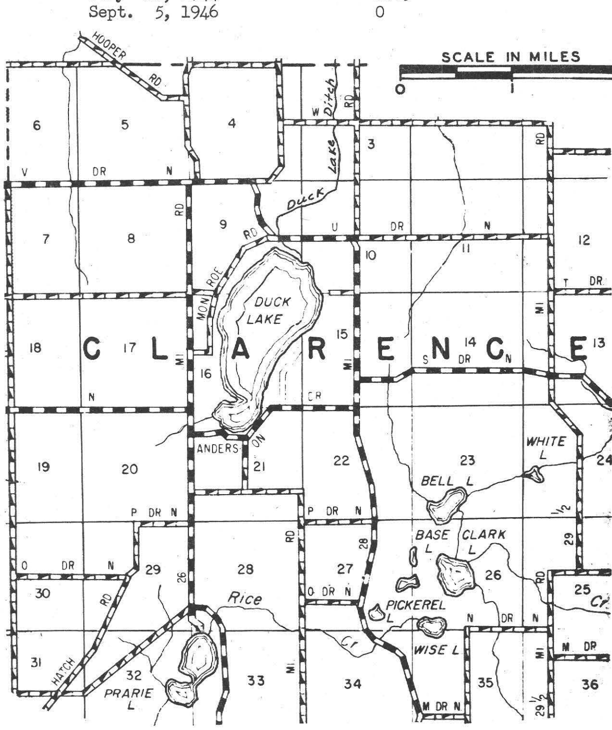
Established legal level.--929.0 ft above mean sea level, established by Circuit Court on July 19, 1944.

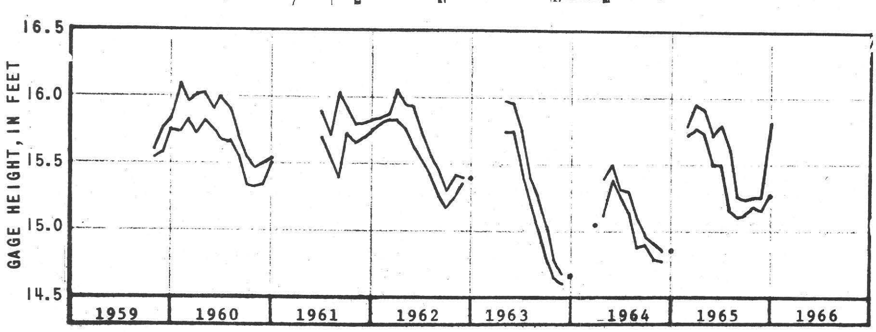
Extremes.--1959-66: Maximum stage observed, 16.10 ft Jan. 14, 1960; minimum observed, 14.62 ft Nov. 11, 16, 1963.

Regulation or control.--A fixed-crest dam consisting of interlocking steel sheet piling was completed in January 1950, at the lake outlet.

Remarks.--An unnamed inlet is located at the southwest side of the lake. The outlet, Duck Lake Ditch, flows from the north end of the lake to Narrow Lake.
An engineering lake-level control study was completed in 1946 by the Michigan Department of Natural Resources.
The following discharge measurements have been made on Duck Lake Ditch, at Duck Lake outlet (drainage area, 5.48 sq mi).

Date	Discharge (cfs)
May 11, 1944	5.70
July 20, 1944	1.03
Sept. 5, 1946	0





Monthly maximum and minimum stages for Duck Lake near Springport, Mich.

CASS COUNTY

Baldwins Lake near Union, Mich.

Location.--Lat 41°47'00", long 85°49'12", secs. 9 and 16, T.8 S., R.13 W., 2.5 miles east of Union.

Surface area.--265 acres.

Maximum depth.--55 ft.

Drainage area.--Not determined.

Records available.--March 1958 to December 1960.

Gage.--Staff gage read daily. Datum of gage is 729.43 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

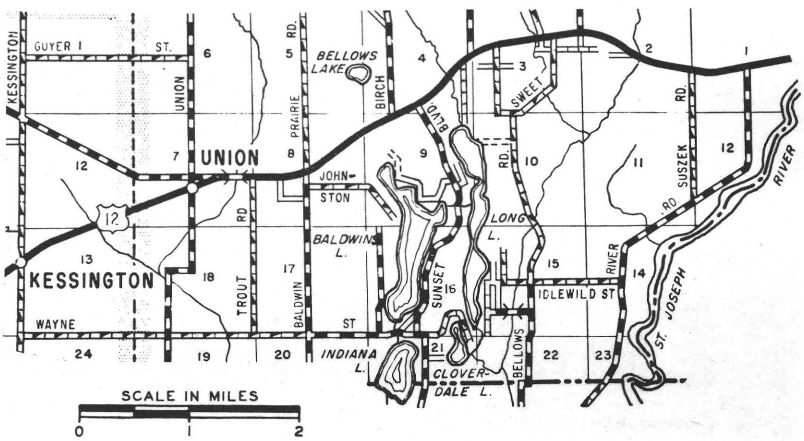
Extremes.--1958-60: Maximum stage, 26.30 ft July 3, 1960; minimum, 25.46 ft Sept. 17-20, 1959.

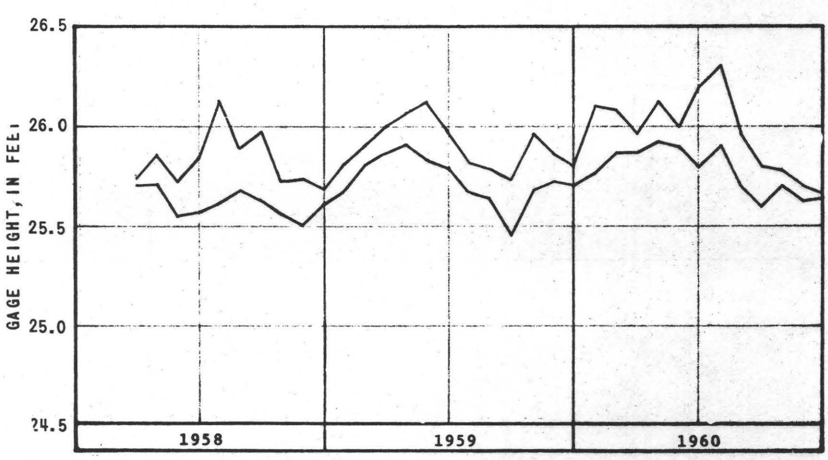
Regulation or control.--None.

Remarks.--The principal inlet to Baldwins Lake is the outlet from Indiana Lake. The outlet leaves the east bay of Baldwins Lake and flows about 400 feet into Long Lake.

On May 16, 1958, the flow in the inlet was estimated at 2.5 cfs. No discharge measurements are available on the outlet.

An engineering lake-level control study was completed in 1959 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Baldwins Lake near Union, Mich.

CASS COUNTY

Barron Lake near Niles, Mich.

Location.--Lat 41°50'10", long 86°11'11", in secs. 20, 21, 28, and 29, T.7 S., R.16 W., 3.5 miles east of Niles.

Surface area.--199 acres.

Maximum depth.--28 ft.

Drainage area.--3 sq mi, approximately.

Records available.--September to October 1950, January 1952 to August 1953.

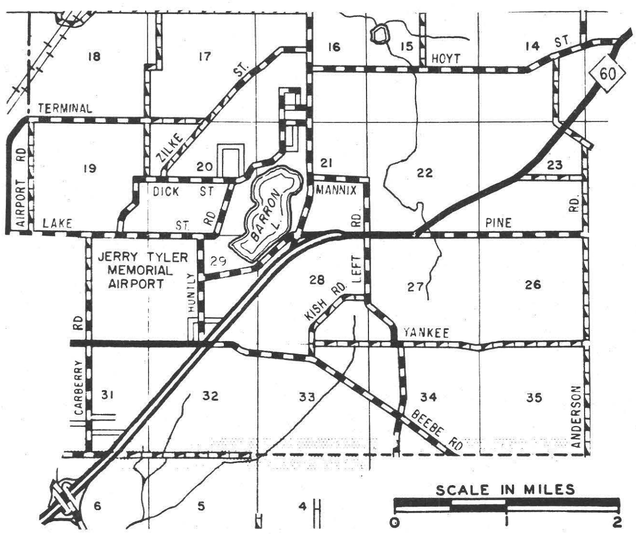
Gage.--Staff gage read daily. Datum of gage is 750.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

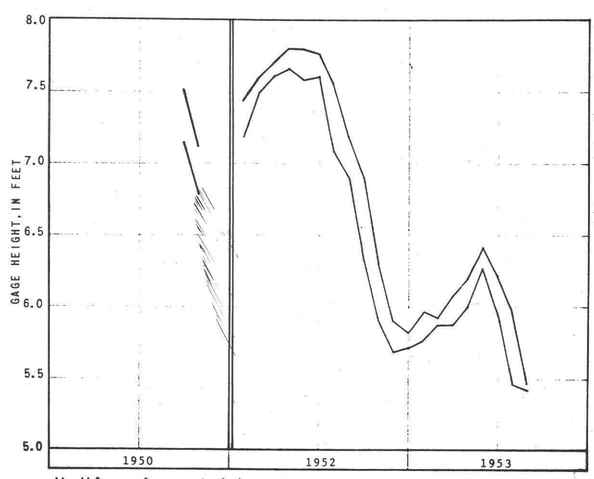
Established legal level.--None known.

Extremes.--1950, 1952-53: Maximum stage observed, 7.80 ft Apr. 17, 18, May 26-28, 1952; minimum observed, 5.42 ft Aug. 11, 1953.
The lake is reported to have reached a stage of 9.4 ft during the spring of 1950 (from highwater mark).

Regulation or control.--Some provisions have been made to pump excess floodwater from the lake to prevent flood damage.

Remarks.--Barron Lake has no inlet or outlet.
An engineering lake-level control study was completed in 1953 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Barron Lake near Niles, Mich.

CASS COUNTY

Cloverdale Lake near Union, Mich.

Location.--Lat 41°45'54", long 85°49'15", in secs. 16 and 21, T.8 S., R.13 W., 2.8 miles southeast of Union.

Surface area.--37 acres.

Maximum depth.--Unknown.

Drainage area.--Not determined.

Records available.--March to December 1958.

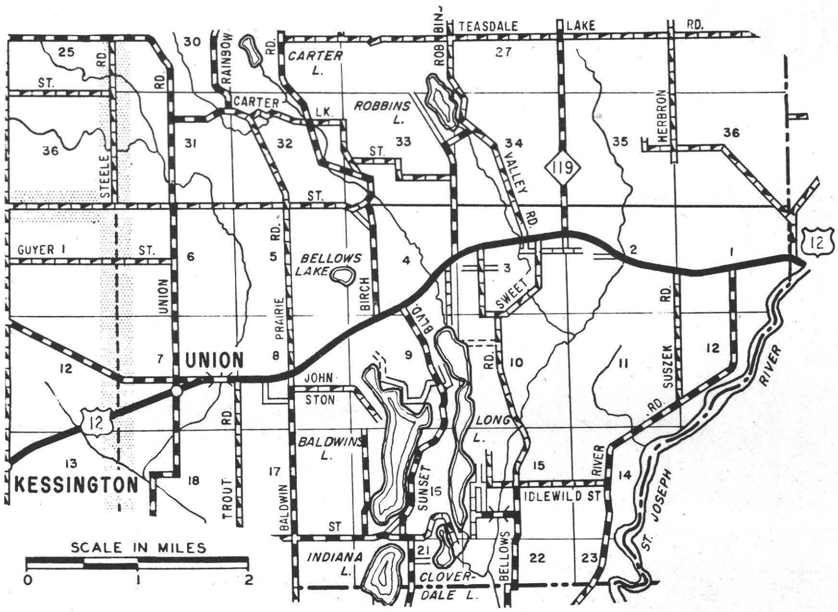
Gage.--Staff gage read daily. Datum of gage is 718.48 ft above mean sea level (levels by Michigan Department of Natural Resources).

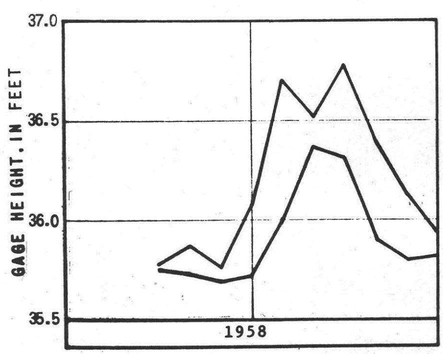
Established legal level.--None known.

Extremes.--1958: Maximum stage, 36.78 ft Sept. 18; minimum, 35.70 ft May 29, 30.

Regulation or control.-- None.

Remarks.--Cloverdale Lake has no inlet. The outlet leaves the east side and flows east about 200 feet to Long Lake outlet. No discharge measurements are available on the outlet.
An engineering lake-level control study was completed in 1959 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Cloverdale Lake near Union, Mich.

CASS COUNTY

Eagle Lake near Edwardsburg, Mich.

Location.--Lat 41°48'04", long 86°00'48", in secs. 2 and 3, T.8 S., R.15 W., 3.5 miles east of Edwardsburg.

Surface area.--379 acres.

Maximum depth.--35 ft.

Drainage area at outlet.--3.15 sq mi.

Records available.--October 1959 to September 1968 except some winter periods.

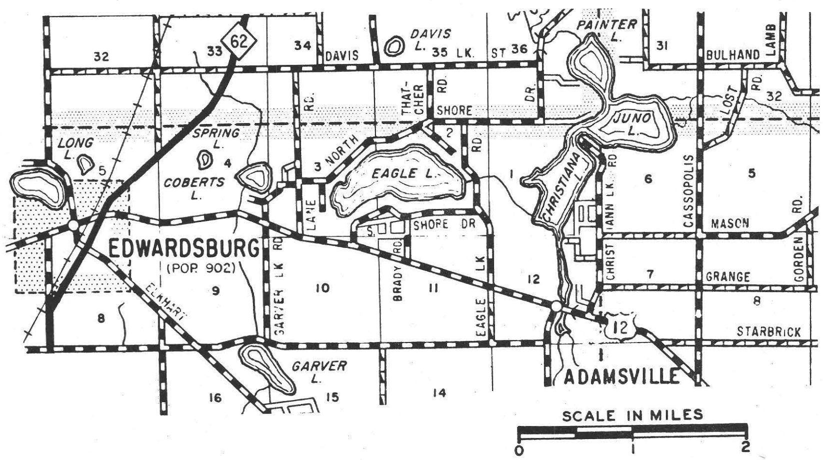
Gage.--Staff gage read daily. Datum of gage is 790.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

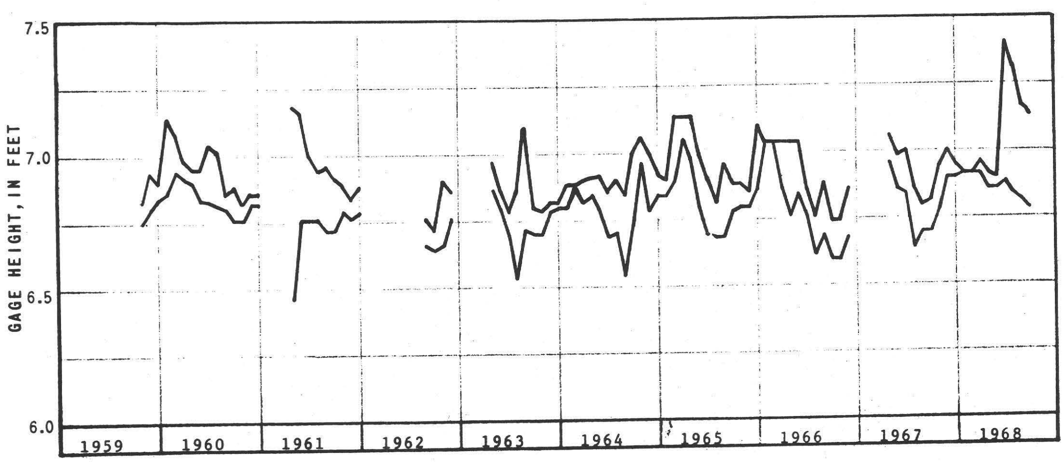
Established legal level.--796.75 ft above mean sea level, established by Circuit Court in May 1933.

Extremes.--1959-68: Maximum stage, 7.40 ft June 24, 25, 1968; minimum stage observed, 6.46 ft Apr. 1-14, 1961.

Regulation or control.--Control structure at upstream side of bridge at outlet.

Remarks.--Eagle Lake has no definite inlet. The outlet is at the east end of the lake and drains into Christiana Lake.
No discharge measurements have been made on the outlet.





Monthly maximum and minimum stages for Eagle Lake near Edwardsburg, Mich.

CASS COUNTY

Garver Lake near Edwardsburg, Mich.

Location.--Lat 41°46'37", long 86°03'02", in secs. 9, 15, and 16, T.8 S., R.15 W., 2.2 miles southeast of Edwardsburg.

Surface area.--67.0 acres.

Maximum depth.--42 ft.

Drainage area at outlet.--10 sq mi, approximately.

Records available.--March 1950 to December 1953.

Gage.--Staff gage read daily. Datum of gage is 789.42 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--791.4 ft above mean sea level, established by Circuit Court on Aug. 28, 1958.

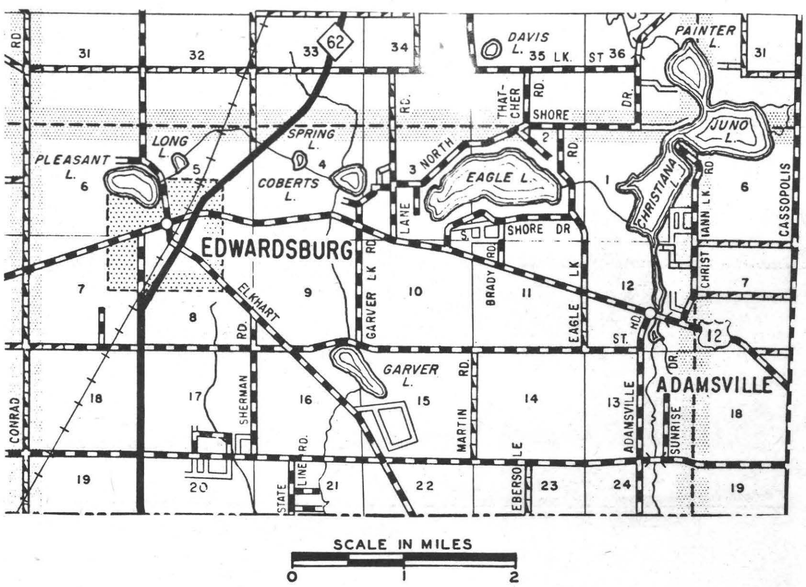
Extremes.--1950-53: Maximum stage, 3.20 ft June 3, 1950; minimum, 2.0 ft July 30, 31, Aug. 1, 1953.

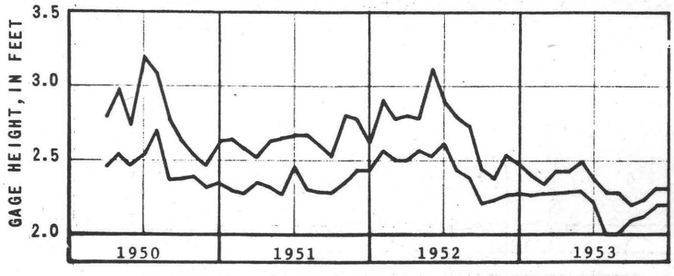
Regulation or control.--None.

Remarks.--The inlet drains Pleasant, Long, Spring, and Coberts Lakes, and enters at the north side of Garver Lake. The outlet leaves the southwest side of the lake and is tributary to the St. Joseph River.

On Mar. 27, 1952, 8.2 cfs was measured on the inlet, 1.2 miles upstream at U.S. Highway 12, and 10.0 cfs was measured on the outlet, 1,000 ft downstream from Garver Lake.

An engineering lake-level control study was completed in 1953 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Garver Lake near Edwardsburg, Mich.

CASS COUNTY

Harwood Lake near Three Rivers, Mich.

Location.--Lat 41°55'46", long 85°45'42", in sec. 24, T.6 S., R.13 W., 6.7 miles west of Three Rivers.

Surface area.--122 acres.

Maximum depth.--55 ft.

Drainage area at outlet.--4.1 sq mi.

Records available.--February to June 1953.

Gage.--Staff gage read daily. Datum of gage is 870.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--877.00 ft above mean sea level, established by Circuit Court in 1932.

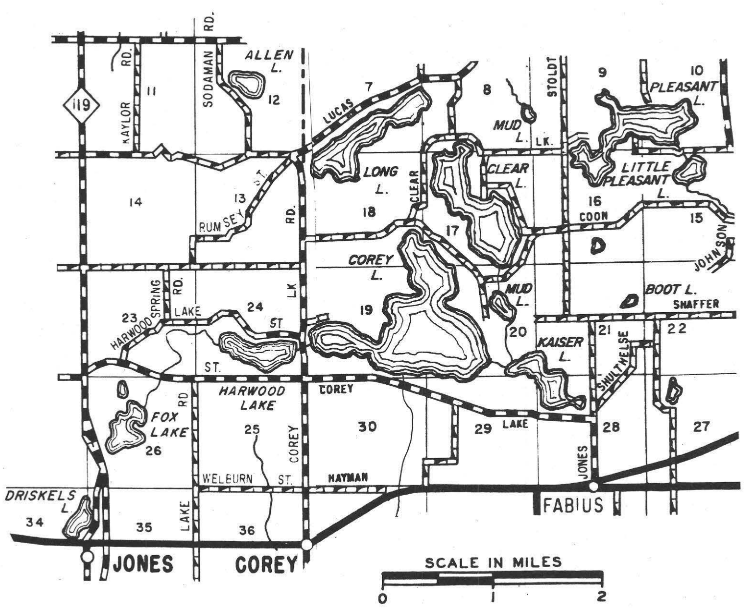
Extremes.--1953: Maximum stage observed, 8.90 ft Mar. 4, 5; minimum observed, 8.70 ft June 20, 22.

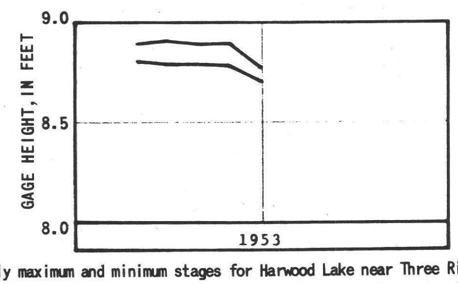
Regulation or control.--A dam at Harwood Lake outlet has 5-foot spillways with stoplogs.

Remarks.--Harwood is one of a chain of lakes consisting of Long, Clear, Harwood, Mud, Kaiser, and Corey Lakes. The inlet to Harwood Lake is a small unnamed stream from the west. The outflow drains through a culvert at the east end of the lake into Corey Lake.

No discharge measurements are available on the inlet or outlet.

An engineering lake-level control study was completed in 1953 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Harwood Lake near Three Rivers, Mich.

CASS COUNTY

Hutchens Lake near Vandalia, Mich.

Location.--Lat 41°54'49", long 85°50'40", in secs. 28 and 29, T.6 S., R.13 W., 3.6 miles east of Vandalia.

Surface area.--67 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--0.5 sq mi, approximately.

Records available.--March to November 1958.

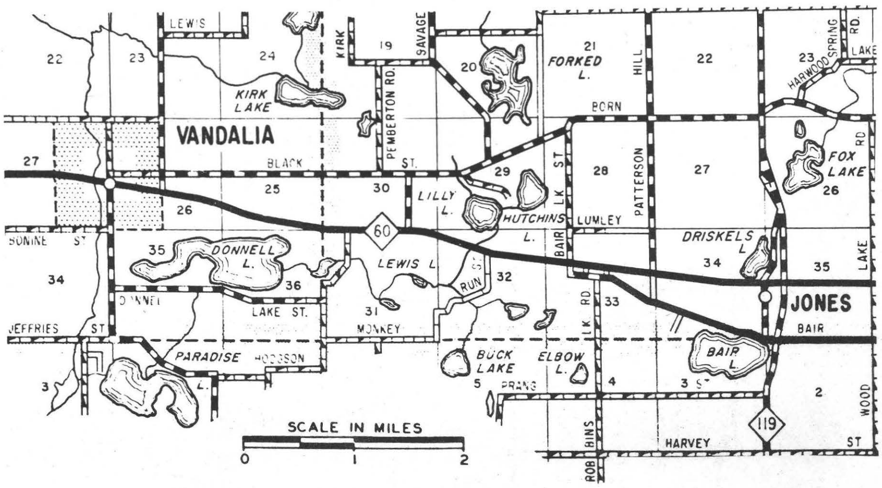
Gage.--Staff gage read daily. Datum of gage is 869.49 ft above mean sea level (levels by Michigan Department of Natural Resources).

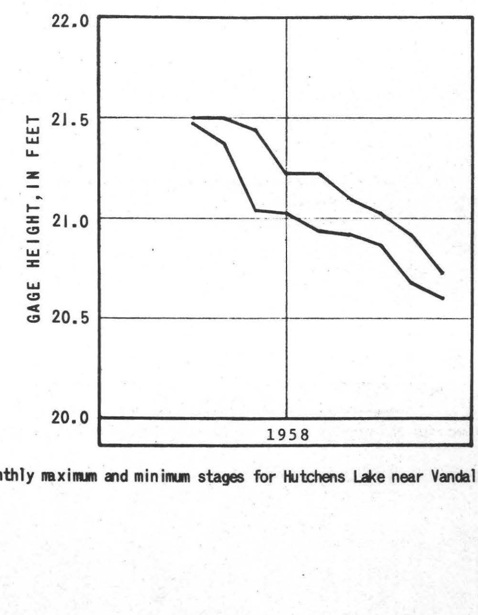
Established legal level.--891.0 ft above mean sea level, established by Circuit Court on Feb. 25, 1960.

Extremes.--1958: Maximum stage, 21.50 ft Mar. 26, Apr. 6; minimum, 20.60 ft Nov. 8, 9.

Regulation or control.--None.

Remarks.--Hutchens Lake has no inlet. The outlet is at the southwest tip of lake and flows west about 250 ft into Lilly Lake. This outlet is dry except in periods of high runoff.
An engineering lake-level control study on Lilly and Hutchens Lakes was completed in 1959 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Hutchens Lake near Vandalia, Mich.

CASS COUNTY

Lilly Lake near Vandalia, Mich.

Location.--Lat 41°54'40", long 85°50'52", in sec. 29, T.6 S., R.13 W., 3.3 miles east of Vandalia.

Surface area.--100 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--1.7 sq mi, approximately.

Records available.--March to June 1958.

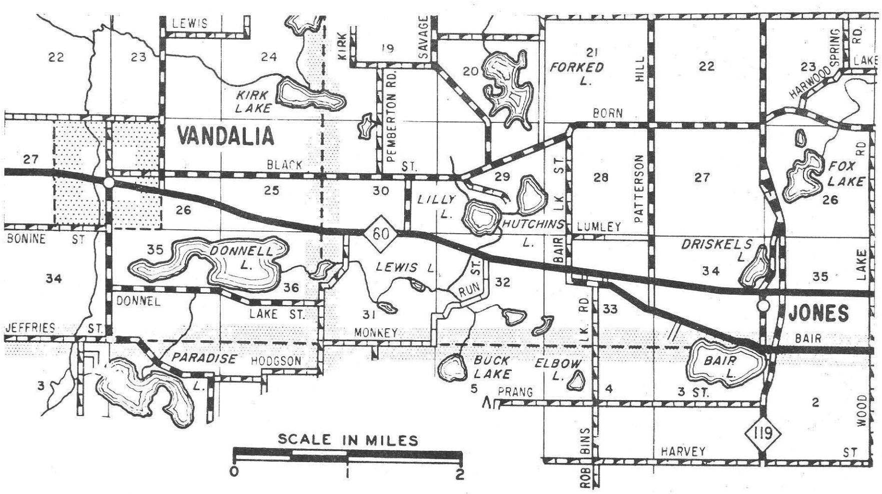
Gage.--Staff gage read daily. Datum of gage is 869.49 ft above mean sea level (levels by Michigan Department of Natural Resources).

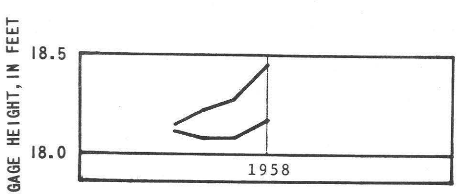
Established legal level.--Winter, 887.0; summer, 887.5 ft above mean sea level, established by Circuit Court on Feb. 25, 1960.

Extremes.--1958: Maximum stage, 18.45 ft June 13; minimum, 18.08 ft April 27, 30.

Regulation or control.--Boards were used at the entrance of a culvert at the lake outlet to partially control lake level.

Remarks.--The inlet from Hutchens Lake is dry except during periods of high runoff. Another inlet enters Lilly Lake from the northwest. The outlet is at the southeast side of the lake and flows southwest, its water eventually reaching the St. Joseph River.
An engineering lake-level control study on Lilly and Hutchens Lakes was completed in 1959 by the Michigan Department of Natural Resources.
No discharge measurements have been made on the inlets or outlet.





Monthly maximum and minimum stages for Lilly Lake near Vandalia, Mich.

CASS COUNTY

Long Lake near Union, Michigan

Location.--Lat 41°45'57", long 85°49'09", in secs. 9, 10, 15, and 16, T.8 S., R.13 W., 2.9 miles southeast of Union.

Surface area.--245 acres.

Maximum depth.--44 ft.

Drainage area.--Not determined.

Records available.--March 1958 to March 1960 except winter period of 1958-59.

Gage.--Staff gage read daily. Datum of gage is 738.43 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

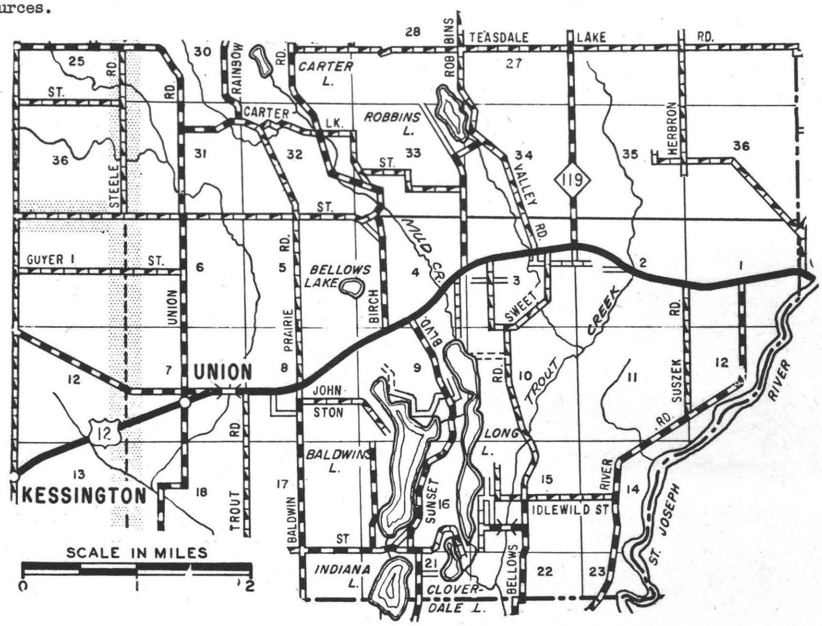
Extremes.--1958-60: Maximum stage, 16.88 ft Sept. 10, 19, 1958; minimum, 15.62 ft May 29, 1958.

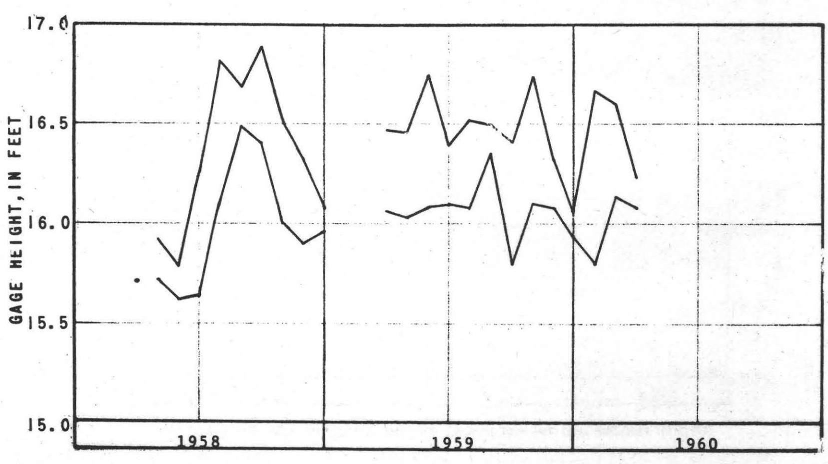
Regulation or control.--None.

Remarks.--The principal inlets to Long Lake are Mud Creek and Baldwins Lake outlet. The outlet leaves the south end of the lake and flows into Trout Creek, which flows into the St. Joseph River about 1.8 miles downstream from the lake.

On May 16, 1958, 19.1 cfs was measured on the outlet at the first bridge downstream from Long Lake. This bridge is about 1.2 miles below the lake, and at this point the flow from Trout Creek and Cloverdale Lake outlet would be included in the measured discharge.

An engineering lake-level control study was completed in 1959 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Long Lake near Union, Mich.

CASS COUNTY

Magician Lake near Dowagiac, Mich.

Location.--Lat 42°04'19", long 86°08'59", in secs. 3, 4, and 34, Tps. 4 and 5 S., R.16 W., 6.5 miles northwest of Dowagiac.

Surface area.--498 acres.

Maximum depth.--60 ft.

Drainage area at outlet.--3 sq mi, approximately.

Records available.--April 1958 to May 1961 except winter and spring period of 1960-61.

Gage.--Staff gage read daily. Datum of gage is 748.04 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--Winter, 762.0 ft; summer, 763.0 ft above mean sea level, established by Circuit Court on Nov. 13, 1962.

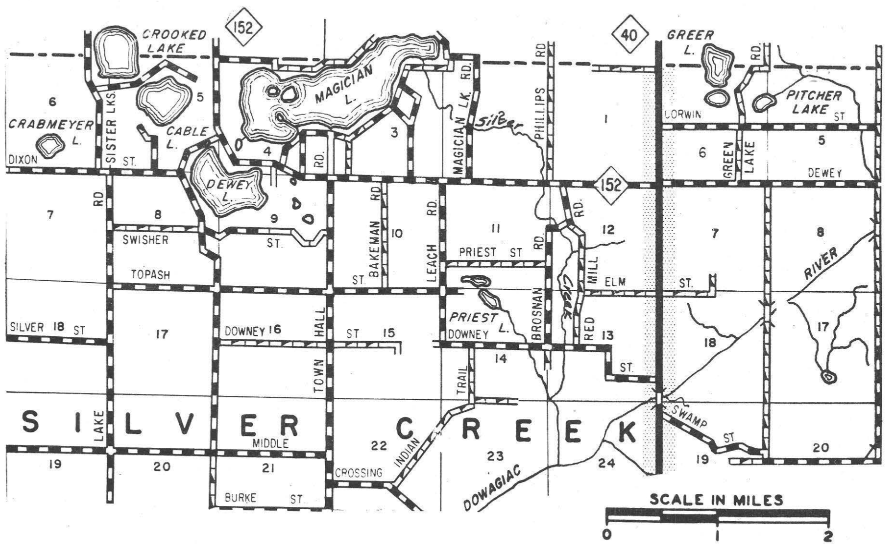
Extremes.--1958-61: Maximum stage observed, 15.13 ft Nov. 22, 1960; minimum stage, 14.06 ft Sept. 20, 1959.

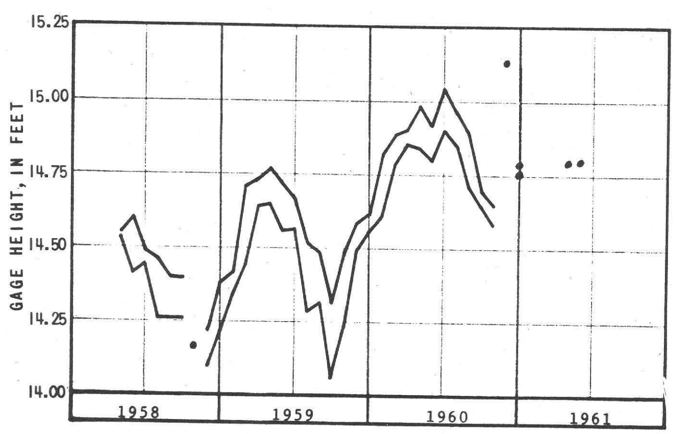
Regulation or control.--None.

Remarks.--Magician Lake has no inlet. The outlet, Silver Creek, leaves the east end of the lake and flows south to Dowagiac River.

On Oct. 28, 1958, the flow in the outlet at the first road crossing, 200 feet downstream from the lake, was estimated at 0.8 cfs.

An engineering lake-level control study was completed in 1962 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Magician Lake near Dowagiac, Mich.

CASS COUNTY

Shavehead Lake near Vandalia, Mich.

Location.--Lat 41°50'02", long 85°52'00", in secs. 18, 19, and 30, T.7 S., R.13 W., 6.2 miles southeast of Vandalia.

Surface area.--270 acres.

Maximum depth.--70 ft.

Drainage area at outlet.--7 sq mi, approximately.

Records available.--November 1956 to September 1958.

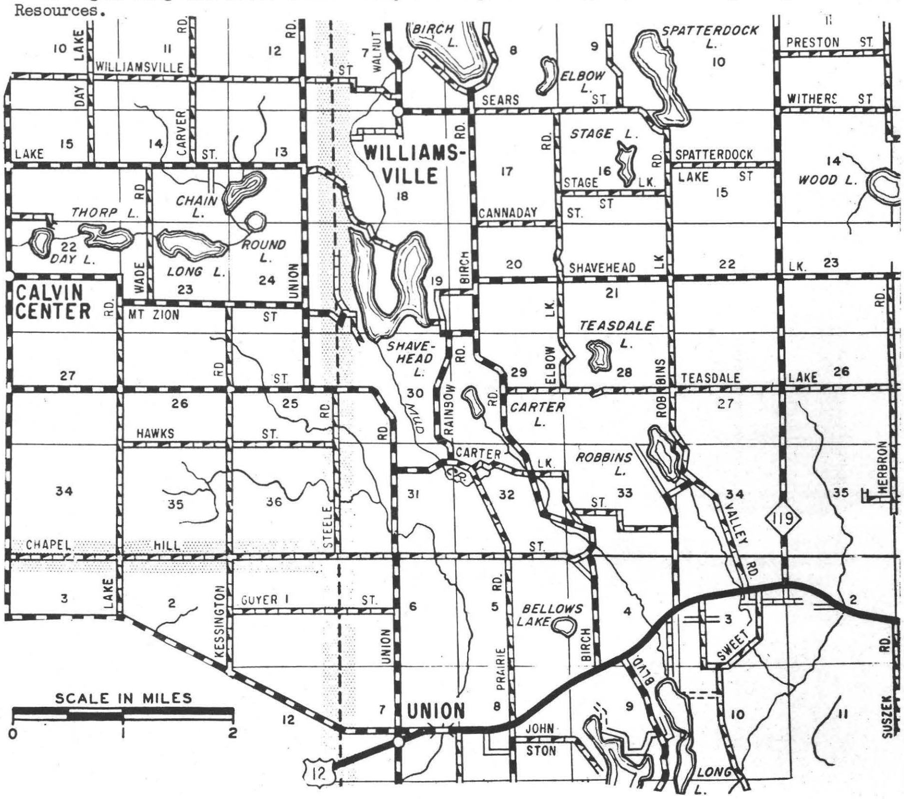
Gage.--Staff gage read daily. Datum of gage is 768.64 ft above mean sea level (levels by Michigan Department of Natural Resources).

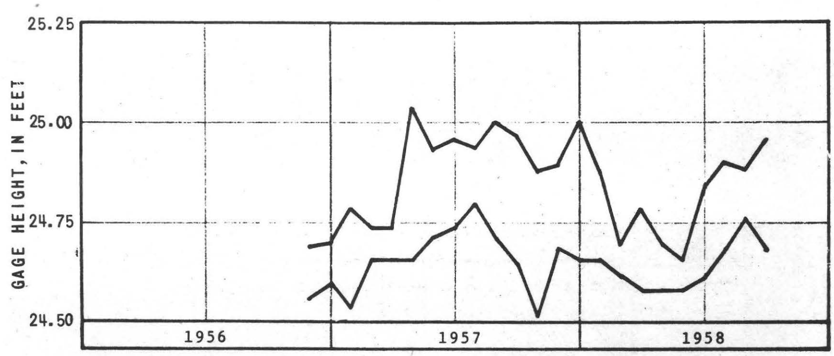
Established legal level.--Winter, 793.0 ft; summer, 793.5 ft above mean sea level, established by Circuit Court on Feb. 26, 1959.

Extremes.--1956-58: Maximum stage, 25.04 ft Apr. 28, 1957; minimum, 24.52 ft Oct. 15, 1957.

Regulation or control.--None.

Remarks.--The inlet from Birch Lake enters the north end of the west arm of Shavehead Lake. The outlet, Mud Creek, leaves the lake at the south end of the west arm and flows 3.5 miles southeast to Long Lake.
On Sept. 25, 1957, 6.51 cfs was measured at the outlet.
An engineering lake-level control study was completed in 1958 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Shavehead Lake near Vandalia, Mich.

CHARLEVOIX COUNTY

Deer Lake near Boyne City, Mich.

Location.--Lat 45°09'21", long 84°58'48", in many sections, T.32 N., Rs. 5 and 6 W., 3 miles west of Boyne Falls.

Surface area.--490 acres.

Maximum depth.--22 ft.

Drainage area at outlet.--6.0 sq mi, approximately.

Records available.--November 1957 to September 1958.

Gage.--Staff gage read about once weekly. Datum of gage not determined.

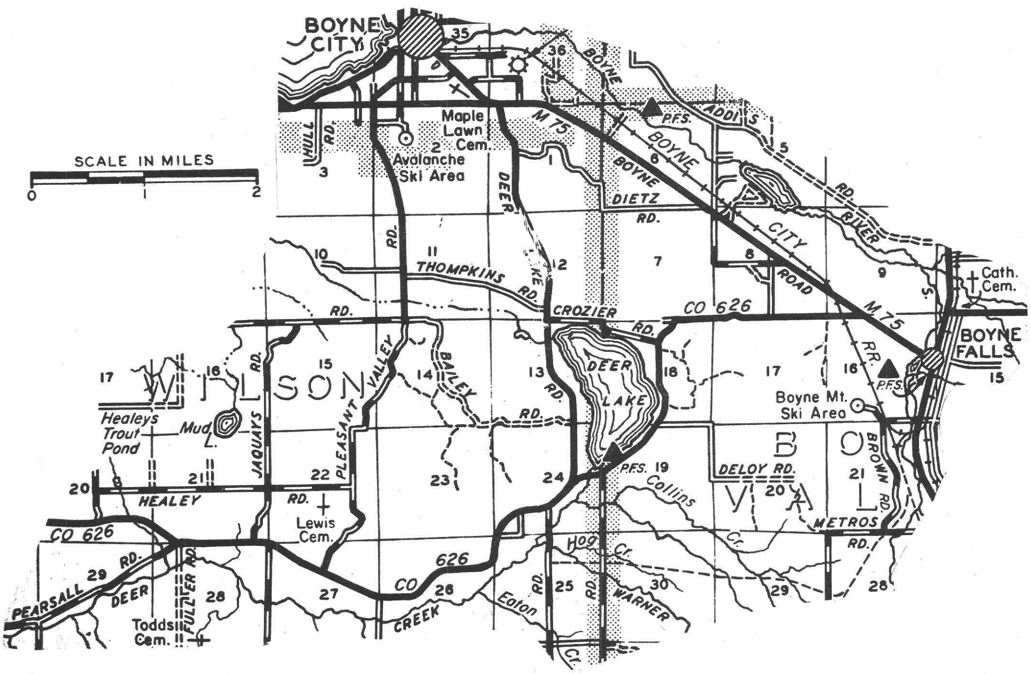
Established legal level.--709.0 ft above mean sea level, established by Circuit Court on Oct. 28, 1965.

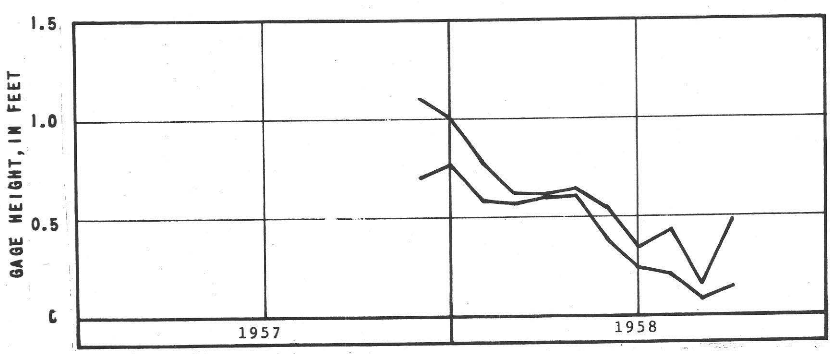
Extremes.--1957-58: Maximum stage observed, 1.10 ft Nov. 20, 25, 1957; minimum observed, 0.08 ft Aug. 16, 21, 1958.

Regulation or control.--Lake levels controlled by an old timber dam in outlet, about 100 ft downstream from lake.

Remarks.--There are several small intermittent inlets. The outlet, Deer Creek, flows from the south end of Deer Lake. On June 3, 1958, 2.15 cfs was measured in the outlet at County Road 626. On July 10, 1963, 1.50 cfs was measured.

An engineering lake-level control study was completed in 1960 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Deer Lake near Boyne City, Mich.

CHARLEVOIX COUNTY

Walloon Lake at Walloon Lake, Mich.

Location.--Lat 45°15'41", long 84°56'02", in many sections, Tps. 33 and 34 N., Rs. 5 and 6 W., at Walloon Lake.

Surface area.--4,320 acres.

Maximum depth.--100 ft.

Drainage area.--Not determined.

Records available.--August 1942 to September 1950 except period December 1942 to July 1943.

Gage.--Staff gage read daily except winter months when it was read weekly. Datum of gage not determined.

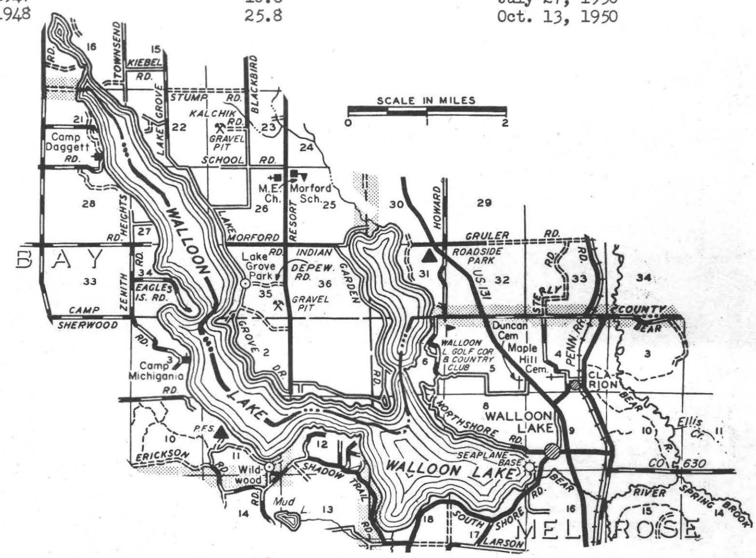
Established legal level.--None known.

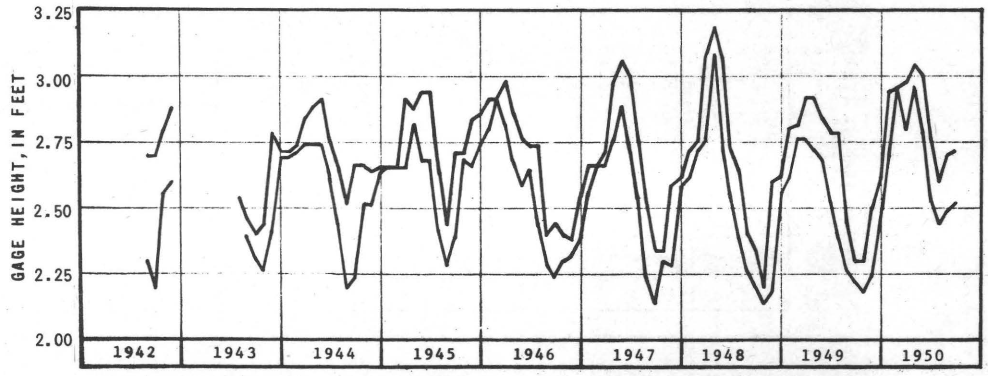
Extremes.--1942-50: Maximum stage observed, 3.18 ft Apr. 11, 1948; minimum observed, 2.14 ft Sept. 10, 1947, Oct. 7, 1948.

Regulation or control.--Lake level is maintained by a fixed crest concrete dam at outlet. Crest of dam is divided into two parts. The right section, 22 ft wide, has its crest at elevation 2.61 ft gage datum. The left section, 13 ft wide, is at 1.93 ft gage datum.

Remarks.--A small unnamed stream enters Walloon Lake at north end of east arm of lake. The outlet, Bear River, is at the southeast side of the lake.
The following discharge measurements have been made on Bear River at the outlet of Walloon Lake.

Date	Discharge (cfs)	Date	Discharge (cfs)
Nov. 30, 1944	26.4	May 27, 1948	29.6
Oct. 17, 1945	26.5	July 27, 1948	13.5
Jan. 30, 1946	47.3	Oct. 12, 1948	5.11
Apr. 24, 1946	28.2	Dec. 15, 1948	15.4
June 27, 1946	24.3	Apr. 21, 1949	23.9
Sept. 26, 1946	12.4	July 19, 1949	14.2
Dec. 16, 1946	7.20	Oct. 17, 1949	6.66
Apr. 29, 1947	46.4	Dec. 14, 1949	12.9
July 23, 1947	21.4	Apr. 11, 1950	73.6
Oct. 13, 1947	10.6	July 27, 1950	13.0
Jan. 28, 1948	25.8	Oct. 13, 1950	27.5





Monthly maximum and minimum stages for Walloon Lake at Walloon Lake, Mich.

CHEBOYGAN COUNTY

Black Lake near Cheboygan, Mich.

Location.--Lat 45°29'55", long 84°19'22", in many sections, Tps. 35 and 36 N., Rs. 1 and 2 E., 13 miles southeast of Cheboygan.

Surface area.--10,100 acres.

Maximum depth.--50 ft.

Drainage area.--597 sq mi, at gaging station on Black River, 0.3 mile downstream from Black Lake.

Records available.--November 1942 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 609.26 ft above mean sea level.

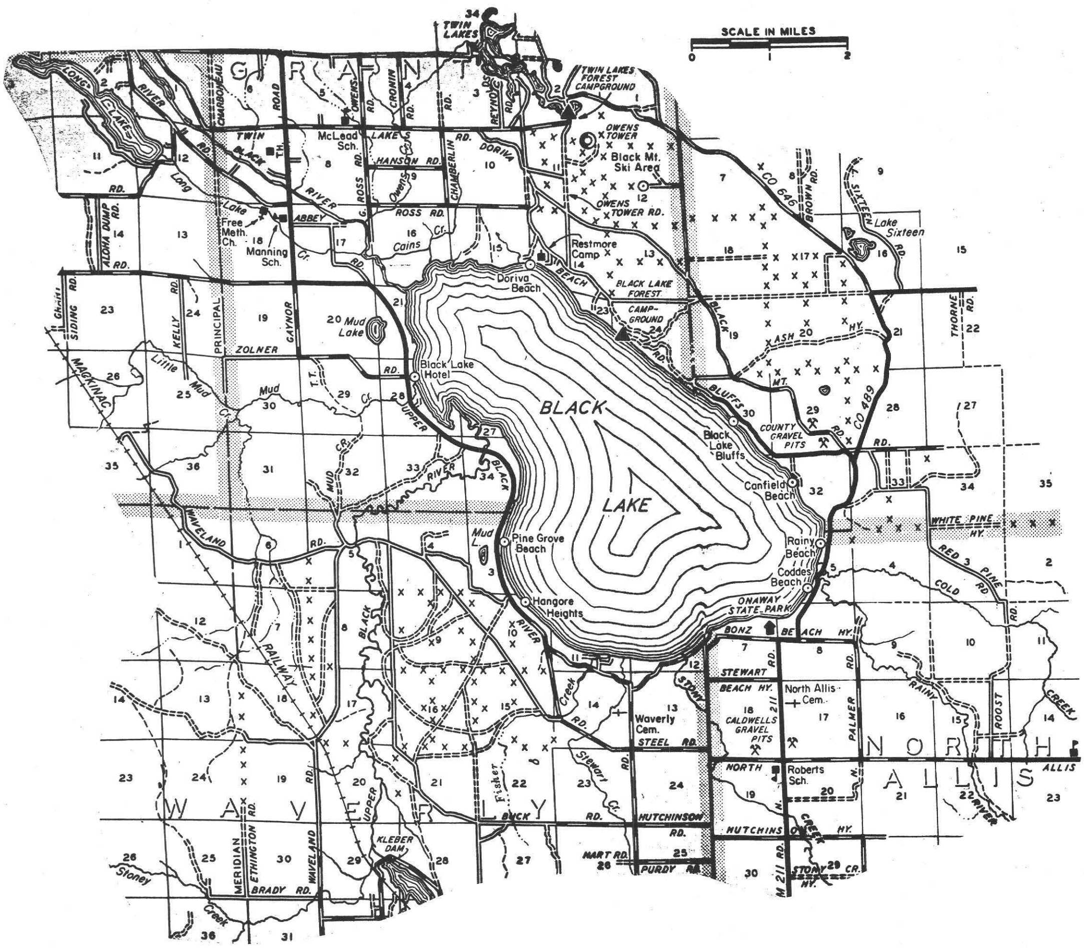
Established legal level.--None known.

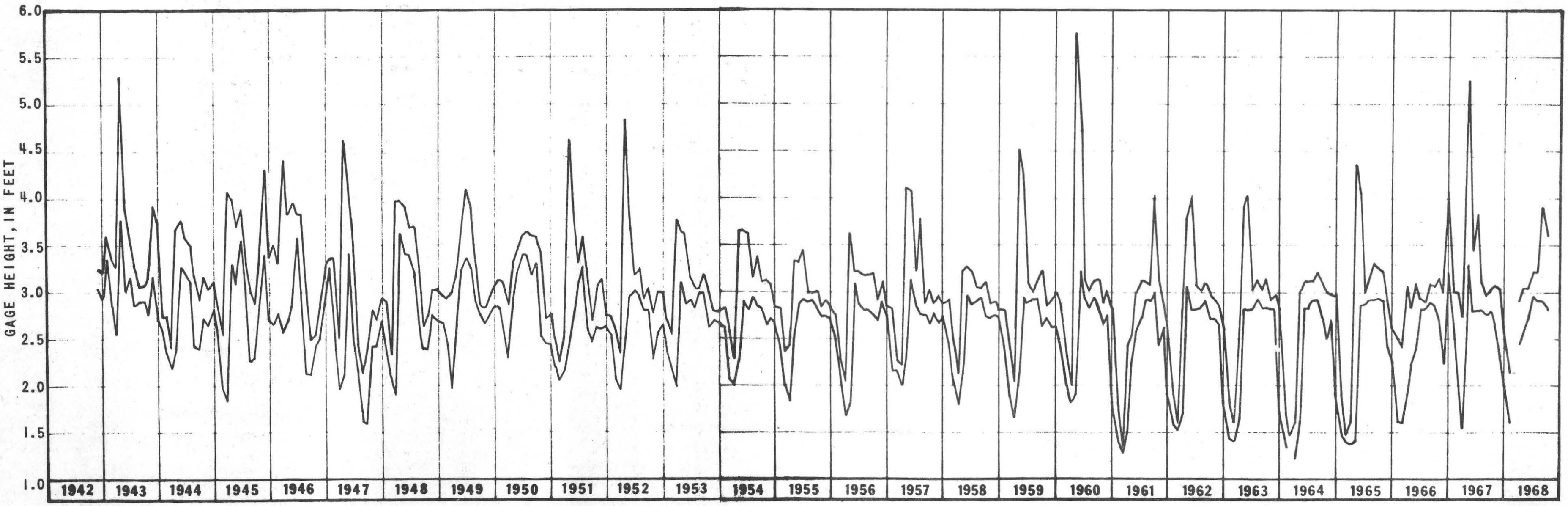
Extremes.--1942-68: Maximum stage, 5.74 ft Apr. 20, 1960; minimum stage observed, 1.21 ft Mar. 4, 1964.

Regulation or control.--Lake levels controlled by regulation at Alverno Dam, located on Black River, about 5½ miles downstream from Black Lake.

Remarks.--The major inlets to Black Lake are Black River and Rainy River. Smaller inlets are Stony, Stewart, and Fisher Creeks. Black River is the only outlet. Daily records of streamflow are currently collected for Black River, at sites 10.8 miles upstream, and 0.3 mile downstream from Black Lake. Daily records of streamflow for Rainy River are collected at a site 5.0 miles above Black Lake. These records are published in U. S. Geological Survey Water-Supply Papers.

An engineering lake-level control study was completed in 1947 by Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Black Lake near Cheboygan, Mich.

CHEBOYGAN COUNTY

burt Lake at Indian River, Mich.

Location.--Lat 45°24'38", long 84°37'18", in many sections, Tps. 35 and 36 N., R.3 W., at Indian River.

Surface area.--16,700 acres.

Maximum depth.--73 ft.

Drainage area.--583 sq mi, at gaging station on Indian River, 500 ft downstream from Burt Lake.

Records available.--April 1942 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 590.21 ft above mean sea level (levels by Michigan Department of Natural Resources). Prior to Nov. 12, 1942, staff gage read daily at same datum.

Established legal level.--None known.

Extremes.--1942-68: Maximum stage, 5.58 ft May 13, 14, 1960; minimum, 3.34 ft Oct. 21, 1957.

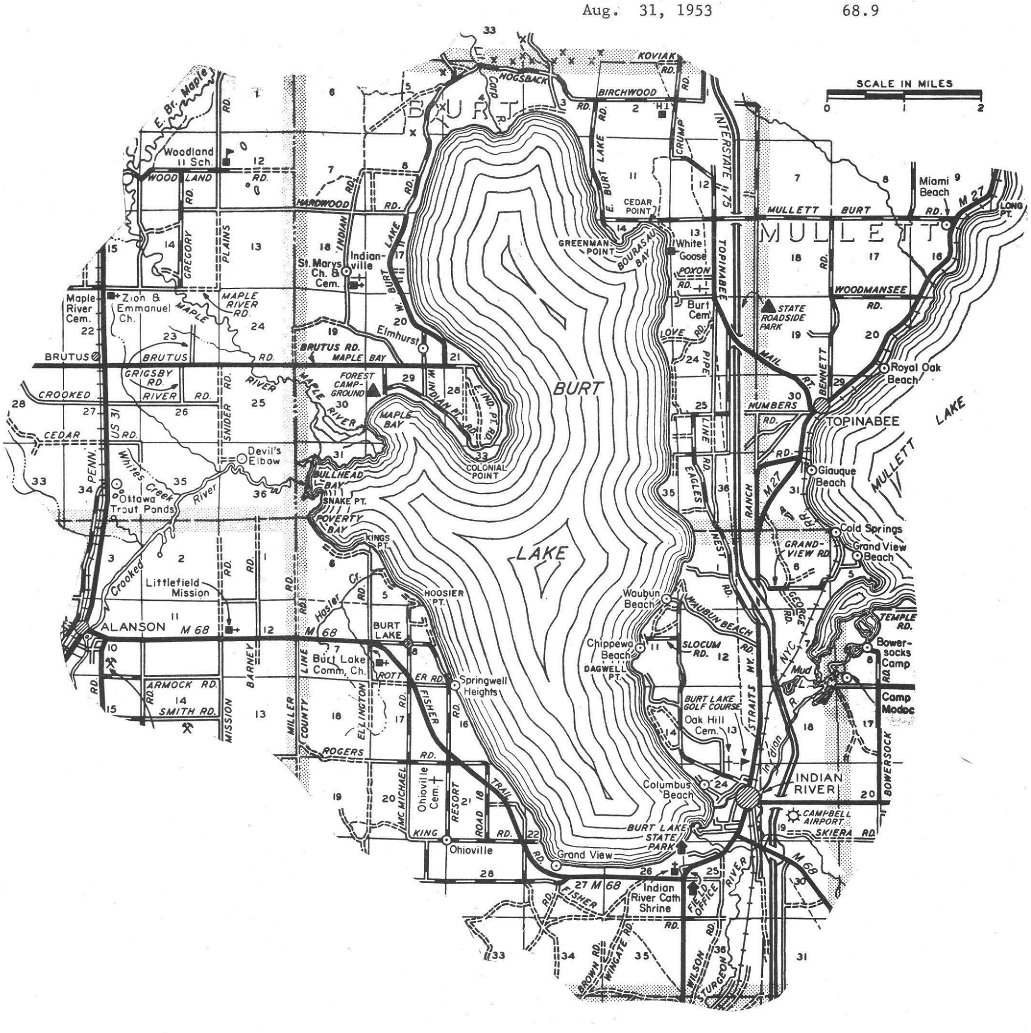
Regulation or control.--Lake levels affected by regulation from dam at Cheboygan.

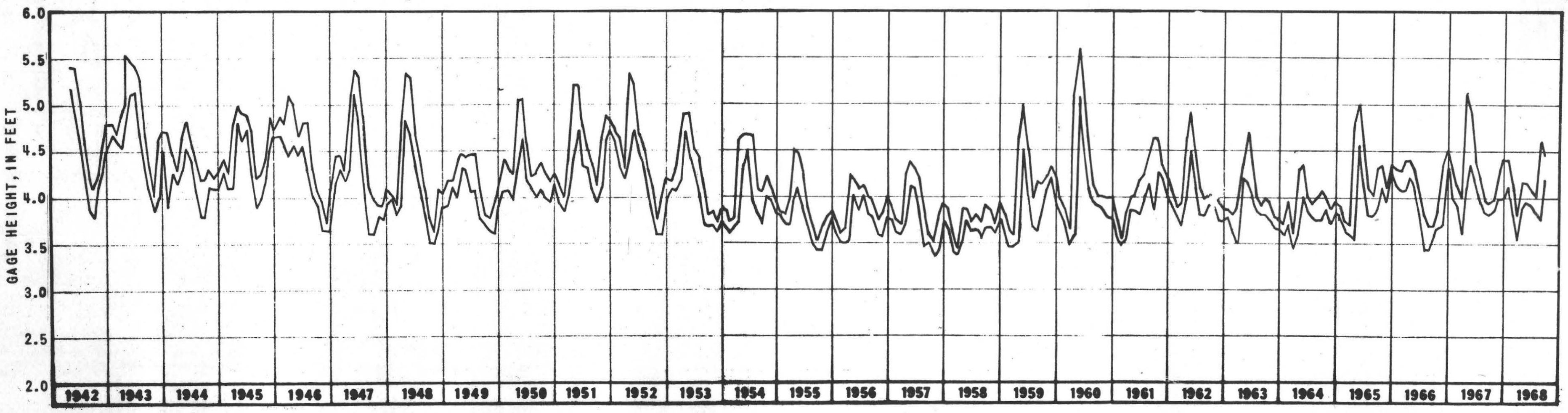
Remarks.--Burt Lake is part of the navigable inland water route. The inlet to Burt Lake along this route is Crooked River and the outlet, Indian River. Maple River, Sturgeon River, and Little Carp River also flow into Burt Lake. Daily records of streamflow are currently collected for Indian River, at a site 500 ft below Burt Lake and for Sturgeon River, at a site 9 miles upstream from Burt Lake. These records are published in U. S. Geological Survey Water-Supply Papers.

An engineering investigation of the inland water route was completed in 1961 by the Michigan Department of Natural Resources. A report "Lake Levels of the Inland Route, Michigan" was completed in 1958 by Michigan-Corps of Engineers, U. S. Army.

The following discharge measurements have been made on Maple River, 2 miles east of Brutus.

Date	Discharge (cfs)	Date	Discharge (cfs)
May 25, 1942	146	Nov. 20, 1942	140
June 16, 1942	136	Dec. 15, 1942	109
July 21, 1942	105	Apr. 3, 1943	274
Aug. 20, 1942	110	May 11, 1943	162
Sept. 30, 1942	106	Sept. 11, 1943	126
		Aug. 31, 1953	68.9





Monthly maximum and minimum stages for Burt Lake at Indian River, Mich.

CHEBOYGAN COUNTY

Cheboygan Pond at Cheboygan, Mich.

Location.--Lat 45°38'15", long 84°28'45" in many sections, T.37 N., R.1 W., at Cheboygan.

Surface area.--Unknown.

Drainage area.--1,500 sq mi, approximately.

Records available.--November 1942 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 590.00 ft above mean sea level. Prior to Aug. 30, 1967, staff gage at same datum, read hourly by Consumer Power Co. employees.

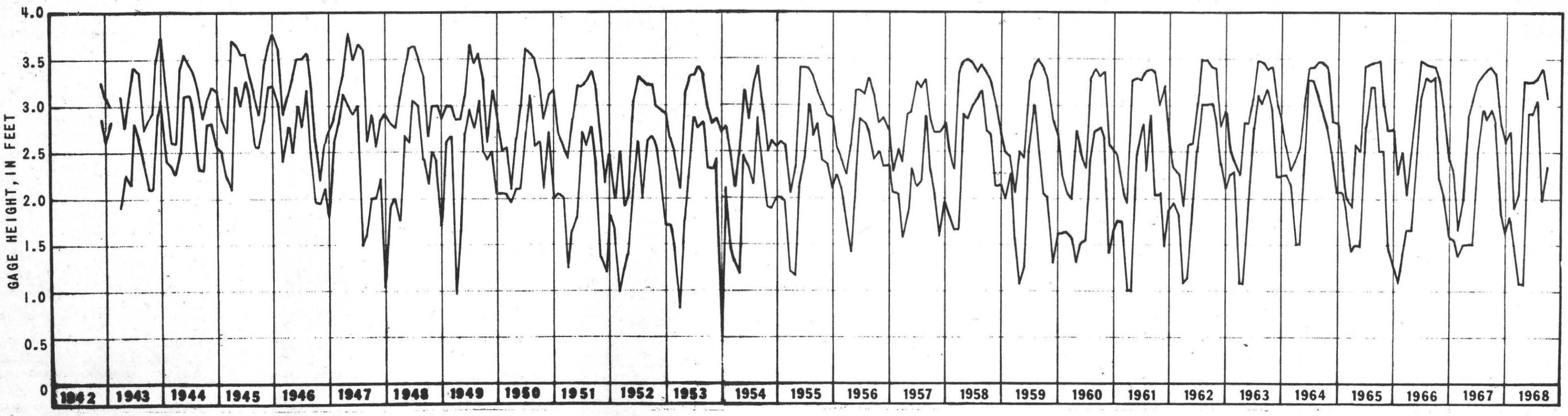
Established legal level.--None known.

Extremes.--1942-68: Maximum stage, 3.80 ft Apr. 10, 1947; minimum, 0.48 ft Dec. 28, 1953.

Regulation or control.--Pond elevations are regulated by dam at Cheboygan; prior to Dec. 31, 1965 levels affected by powerplant at Cheboygan. Vertical lift gates on right bank, about 1,500 ft above dam, are used to lower pond level during winter periods and during high stages to prevent flooding.

Remarks.--Cheboygan Pond is part of the navigable inland water route. The inlet and outlet of Cheboygan Pond is the Cheboygan River. Other inlets are Black River and Tannery Gulley. Daily records of streamflow for Cheboygan River, at site 300 ft downstream from Mullet Lake, are published in U.S. Geological Survey Water-Supply Papers.

An engineering investigation of the inland water route was completed in 1961 by the Michigan Department of Natural Resources. A report "Lake Levels of the Inland Route, Michigan" was completed in 1958 by Michigan-Corps of Engineers, U.S. Army.



Monthly maximum and minimum stages for Cheboygan Pond near Cheboygan, Mich.

CHEBOYGAN COUNTY

Douglas Lake near Pellston, Mich.

Location.--Lat 45°34'30", long 84°43'40", in many sections, T.37 N., R.3 W., 5.5 miles east of Pellston.

Surface area.--3,400 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--26.5 sq mi.

Records available.--June 1942 to December 1959. Prior to 1947, only summer records were collected.

Gage.--Staff gage read daily during summer months, during period 1942-46. Staff gage read intermittently 1947-59. Datum of gage not determined.

Established legal level.--None known.

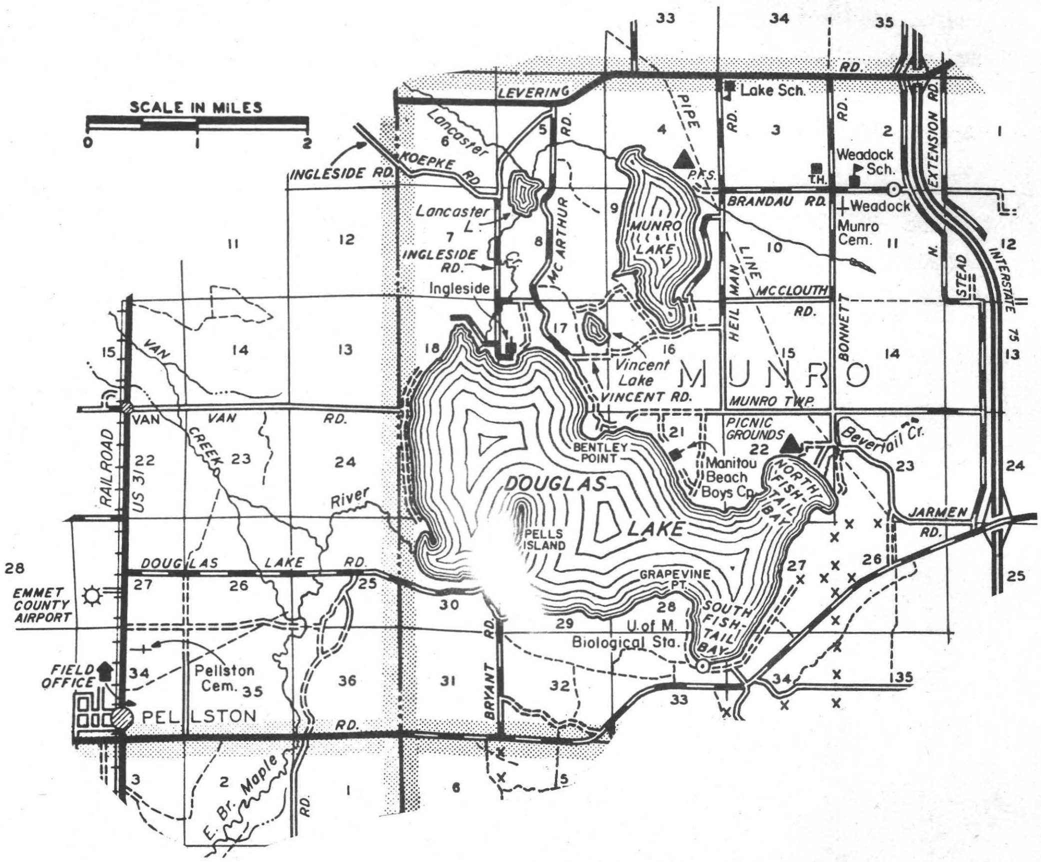
Extremes.--1942-59: Maximum stage observed, 7.02 ft May 7, 1959; minimum observed, 3.12 ft Oct. 15, 1955.

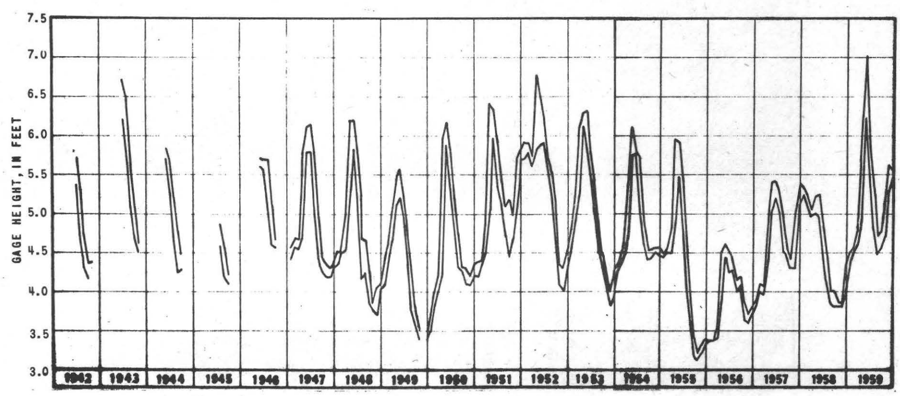
Regulation or control.--A lake-level control dam was removed in 1943 and has not been replaced.

Remarks.--Beavertail Creek flows into Douglas Lake from the northeast and Lancaster Creek from the northwest. The outlet is East Branch Maple River located at southwest side of lake.

The following discharge measurements have been made on East Branch Maple River at the first bridge below the outlet of Douglas Lake.

Date	Discharge (cfs)	Date	Discharge (cfs)
June 16, 1942	36.3	Apr. 17, 1951	65.7
July 21, 1942	17.0	July 18, 1951	16.8
Aug. 20, 1942	4.56	Oct. 23, 1951	12.3
Sept. 30, 1942	5.61	Jan. 16, 1952	43.5
Nov. 20, 1942	22.0	Apr. 18, 1952	150
Dec. 15, 1942	17.7	July 16, 1952	19.4
Jan. 19, 1943	17.5	Oct. 15, 1952	.95
May 10, 1943	75.4	Jan. 22, 1953	10.6
July 12, 1943	47.2	Apr. 20, 1953	75.5
Sept. 11, 1943	12.9	July 16, 1953	19.8
Nov. 30, 1944	7.00	Oct. 16, 1953	1.03
Oct. 17, 1945	1.66	Jan. 15, 1954	1.45
Apr. 18, 1946	42.1	Apr. 14, 1954	25.4
June 27, 1946	32.5	July 21, 1954	20.3
Sept. 25, 1946	6.78	Oct. 13, 1954	3.82
Dec. 16, 1946	2.00	Jan. 19, 1955	13.3
Apr. 29, 1947	43.9	Apr. 20, 1955	39.6
July 23, 1947	19.7	July 20, 1955	4.39
Oct. 13, 1947	1.67	Oct. 19, 1955	.37
Feb. 17, 1948	3.56	Jan. 17, 1956	.54
May 26, 1948	39.9	Apr. 16, 1956	8.38
July 27, 1948	9.19	July 17, 1956	8.39
Oct. 12, 1948	.68	Oct. 18, 1956	.79
Dec. 14, 1948	1.03	Jan. 15, 1957	1.34
Apr. 19, 1949	27.2	Apr. 10, 1957	6.09
July 15, 1949	7.40	July 16, 1957	19.2
Oct. 24, 1949	.51	Oct. 18, 1957	2.24
Dec. 13, 1949	.61	Jan. 10, 1958	27.9
Apr. 11, 1950	2.82	Apr. 3, 1958	20.6
July 27, 1950	10.4	July 8, 1958	7.06
Oct. 23, 1950	.89	Oct. 8, 1958	.89
Jan. 16, 1951	.68	Jan. 8, 1959	.61





Monthly maximum and minimum stages for Douglas Lake near Pellston, Mich.

CHEBOYGAN COUNTY

Mullett Lake near Cheboygan, Mich.

Location.--Lat 45°34'40", long 84°29'15", in many sections, Tps. 36 and 37 N., Rs. 1 and 2 W., 4.8 miles south of Cheboygan.

Surface area.--17,100 acres.

Maximum depth.--147 ft.

Drainage area at outlet.--865 sq mi.

Records available.--November 1942 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 591.21 ft above mean sea level.

Established legal level.--None known.

Extremes.--1942-68: Maximum stage, 3.27 ft May 13, 14, 1960; minimum, 1.12 ft Dec. 29, 1952.

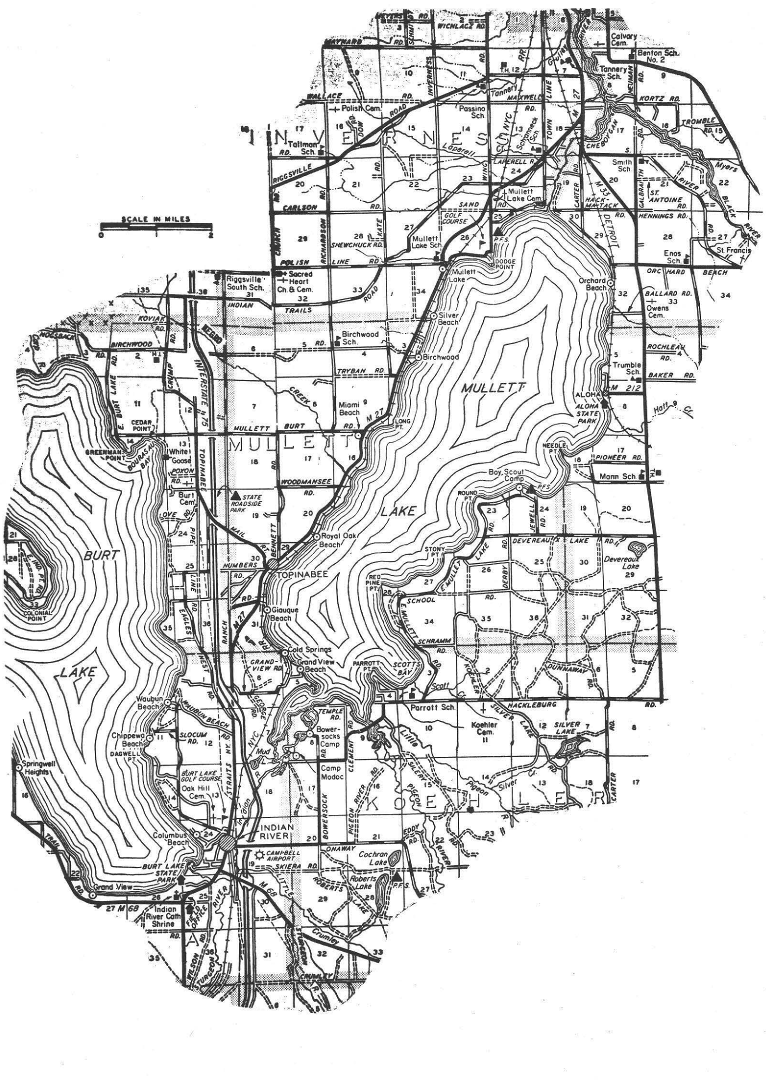
Regulation or control.--Lake elevations are regulated by dam at Cheboygan. Prior to Dec. 31, 1965, levels affected by powerplant operation at Cheboygan. Vertical lift gates on right bank, about 500 ft above dam, are used to lower lake level during winter periods and during high stages to prevent flooding.

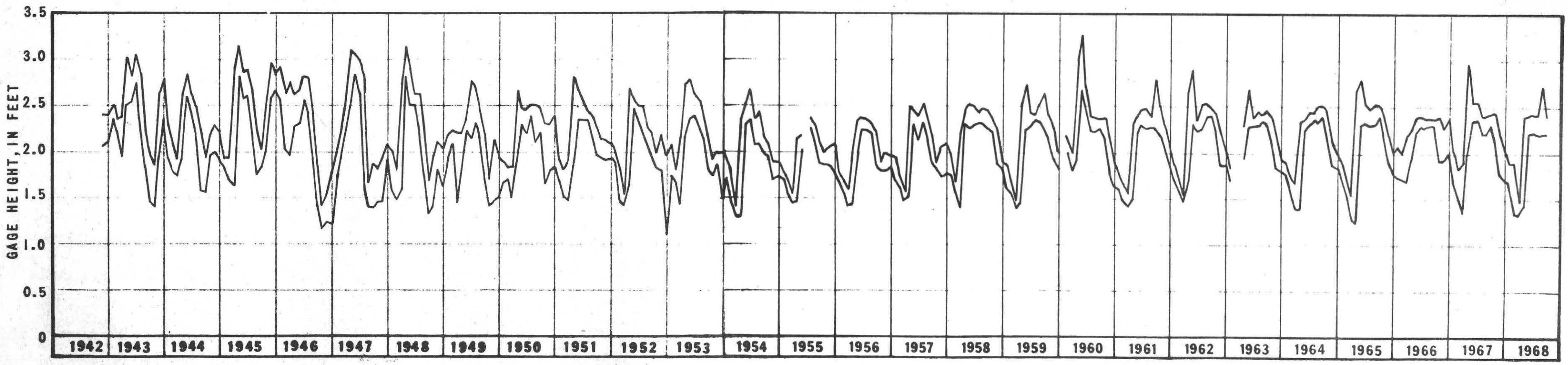
Remarks.--Mullett Lake is part of the navigable inland water route. The inlet to Mullett Lake, a part of this route, is Indian River. The outlet is Cheboygan River. Other major inlets are Pigeon, Little Pigeon, and Little Sturgeon Rivers, and Negro and Scott Creeks. Daily records of streamflow are currently collected for Indian River, at site 500 ft downstream from Burt Lake; Cheboygan River, at site 300 ft downstream from Mullett Lake; and Pigeon River, at site 7 miles upstream from Mullett Lake. These records are published in U.S. Geological Survey Water-Supply Papers.

An engineering lake-level control study was completed in 1951 by the Michigan Department of Natural Resources. A report "Lake Level of the Inland Route, Michigan" was completed in 1958 by Michigan-Corps of Engineers, U.S. Army.

An engineering investigation of the inland water route was completed in 1961 by the Michigan Department of Natural Resources.

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Mullett Lake near Cheboygan, Mich.

CHIPPEWA COUNTY

Caribou Lake near DeTour Village, Mich.

Location.--Lat 45°59'20", long 83°58'59", in many sections, T.42 N., Rs. 3 and 4 E., 4 miles west of DeTour Village.

Surface area.--825 acres.

Maximum depth.--20 ft.

Drainage area at outlet.--3.94 sq mi.

Records available.--July 1967 to September 1968.

Gage.--Staff gage read daily. Datum of gage not determined.

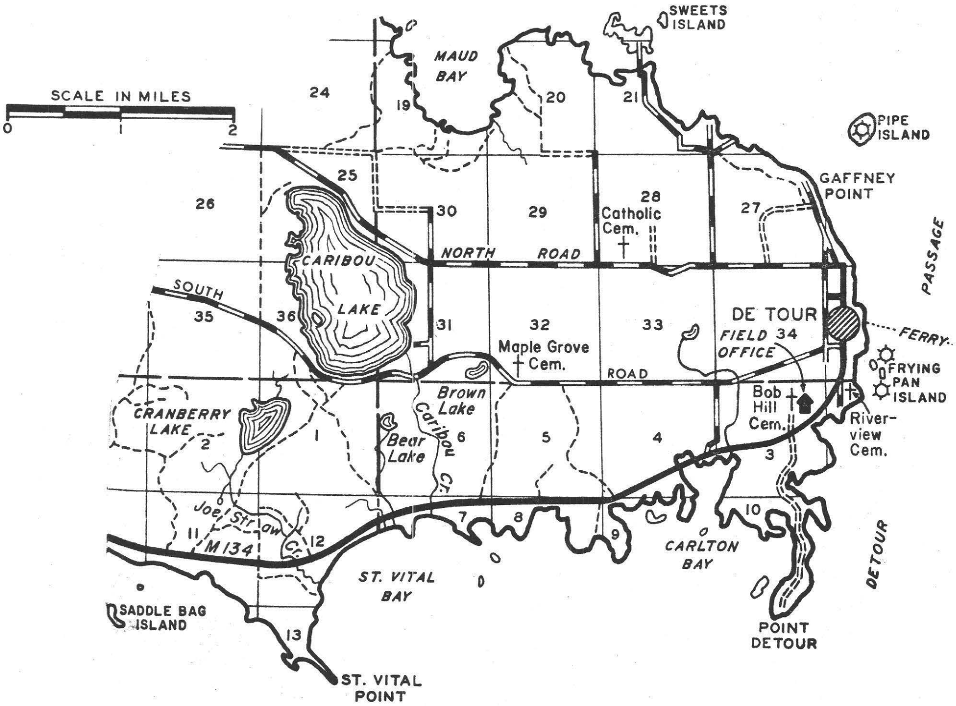
Established legal level.--None known.

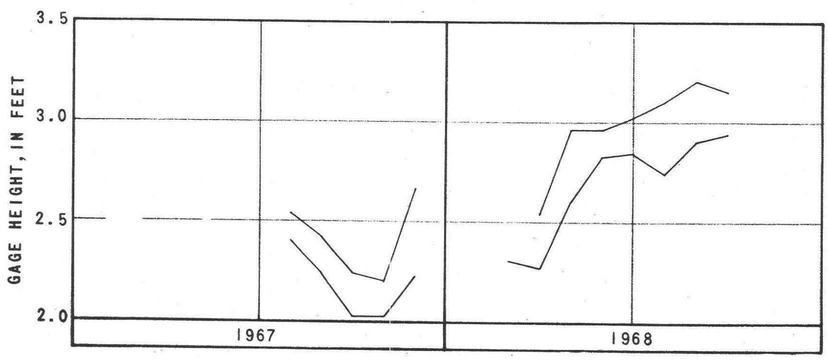
Extremes.--1967-68: Maximum stage observed, 3.20 ft Aug. 23, 24, 1968; minimum observed, 2.02 ft Sept. 20, Oct. 5 - 7, 1967.

Regulation or control.--None.

Remarks.--There is no inlet to Caribou Lake. The outlet, Caribou Creek, is at the southeast side of the lake and is tributary to Lake Huron.
The following discharge measurements have been made on Caribou Creek, at bridge on South Road at outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
July 11, 1967	0.44	Jan. 15, 1968	10.6
Oct. 31, 1967	1.10	May 15, 1968	3.41
		July 24, 1968	10.0





Monthly maximum and minimum stages for Caribou Lake near Detour Village, Mich.

CHIPPEWA COUNTY

Carp Lake near Trout Lake, Mich.

Location.--Lat 46°16'58", long 85°10'38", in secs. 22 and 27, T.44 N., R.6 W., 1.3 miles southwest of Trout Lake.

Surface area.--560 acres.

Maximum depth.--35 ft.

Drainage area.--Not determined.

Records available.--May 1959 to July 1965 except winter periods.

Gage.--Staff gage read weekly. Datum of gage not determined.

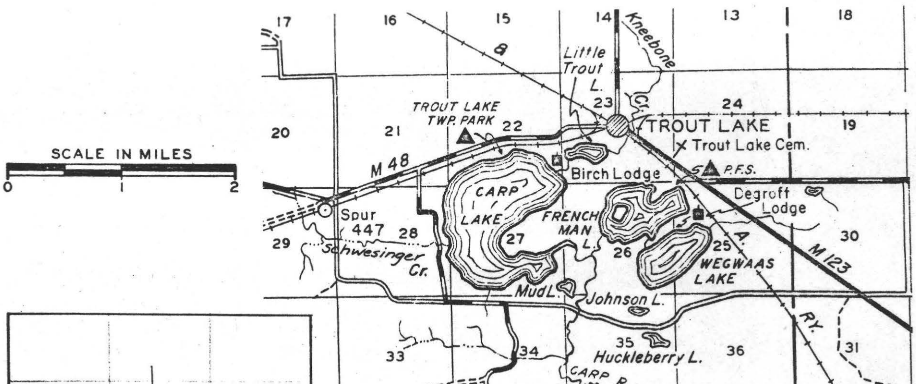
Established legal level.--None known.

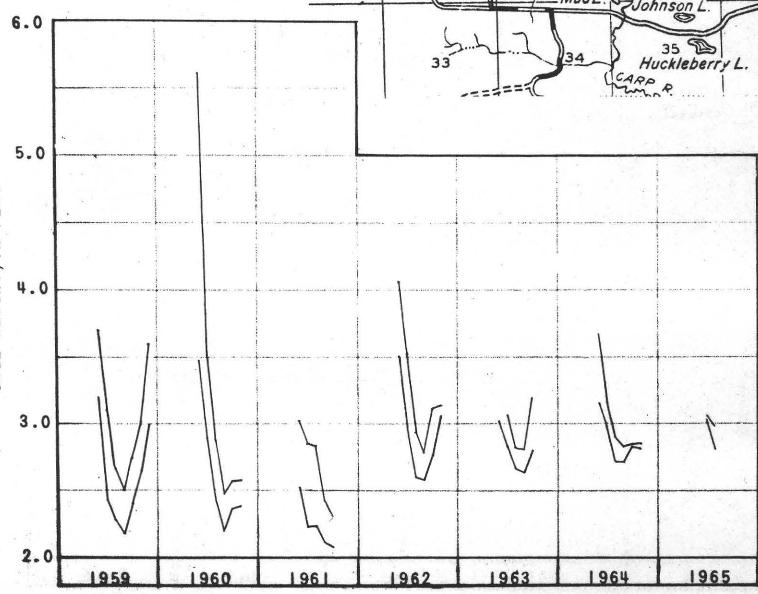
Extremes.--1959-65: Maximum stage observed, 5.62 ft May 10 or 11, 1960; minimum observed, 2.08 ft Sept. 12, 1961.

Regulation or control.--None.

Remarks.--Schwesinger Creek from the west, and Kneebone Creek from the northeast, are the inlets to Carp Lake. The outlet, Carp River, is at the southeast end of the lake.
No discharge measurements are available on the inlets. The following discharge measurements have been made on Carp River in NW¼ sec. 35, T.44 N., R.6 W. (drainage area, about 15 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Aug. 18, 1959	10.4	Oct. 10, 1962	14.4
Oct. 14, 1959	32.2	Apr. 25, 1963	48.3
Mar. 24, 1960	90.2	July 9, 1963	10.0
July 21, 1960	21.5	Oct. 8, 1963	8.95
Oct. 11, 1960	18.2	May 13, 1964	57.8
May 11, 1961	39.6	July 7, 1964	13.0
Aug. 10, 1961	19.7	Nov. 2, 1964	12.9
Oct. 18, 1961	13.8	June 17, 1965	22.1
May 15, 1962	55.6	Oct. 11, 1965	48.1
July 16, 1962	10.5	Jan. 26, 1966	26.4
		June 1, 1966	21.3





Monthly maximum and minimum stages for Carp Lake near Trout Lake, Mich.

CHIPPEWA COUNTY

Hulbert Lake near Hulbert, Mich.

Location.--Lat 46°18'53", long 85°06'48", in many sections, T.45 N., Rs.6 and 7 W., 3 miles southeast of Hulbert.

Surface area.--557 acres.

Maximum depth.--85 ft.

Drainage area.--7.62 sq mi.

Records available.--May 1964 to September 1968 except some winter periods.

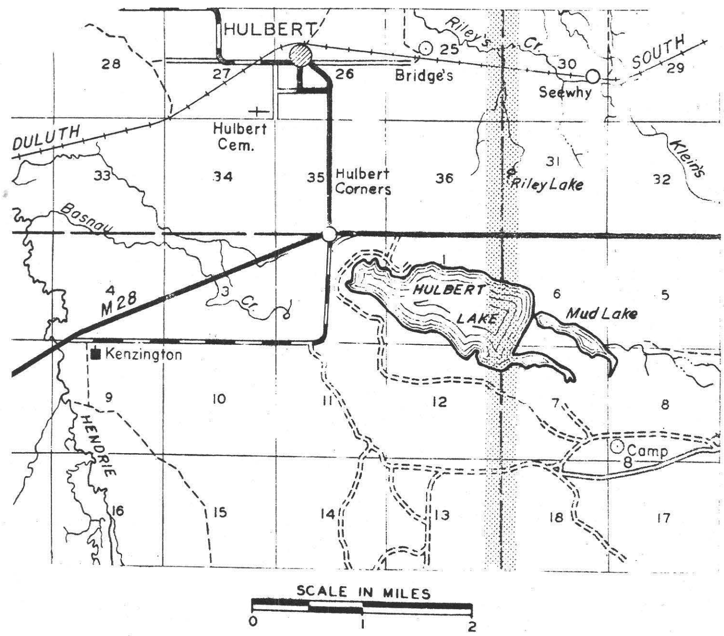
Gage.--Staff gage read daily. Datum of gage not determined.

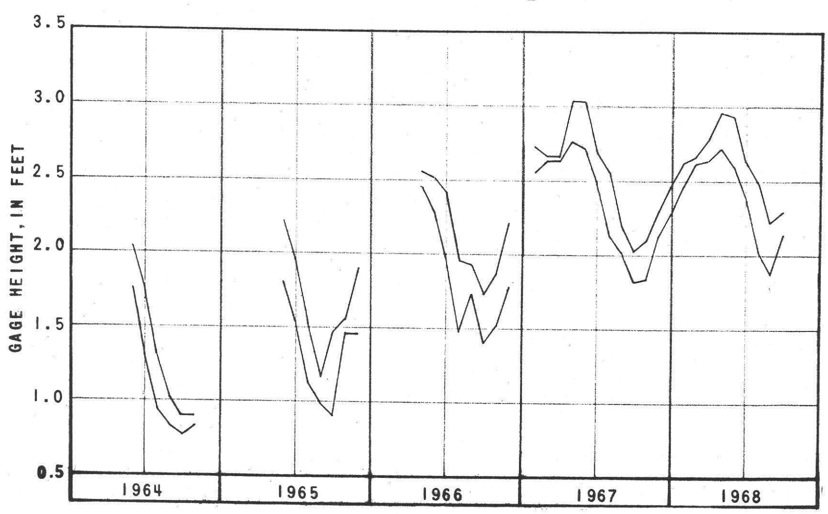
Established legal level.--None known.

Extremes.--1964-68: Maximum stage observed, 3.04 ft Apr. 19, May 1, 1967; minimum observed, 0.78 ft Sept. 20 1964.

Regulation or control.--None.

Remarks.--An unnamed tributary to Mud Lake which is connected to Hulbert Lake by a narrow channel, is the only inlet. There is no outlet from Hulbert Lake. No discharge measurements have been made on the unnamed tributary.





Monthly maximum and minimum stages for Hulbert Lake near Hulbert, Mich.

CLARE COUNTY

Arnold Lake near Harrison, Mich.

Location.--Lat 44°03'55", long 84°45'00", in sec. 2, T.19 N., R.4 W., 4 miles northeast of Harrison.

Surface area.--118 acres.

Maximum depth.--80 ft.

Drainage area.--Not determined.

Records available.--October 1962 to November 1963 except winter period.

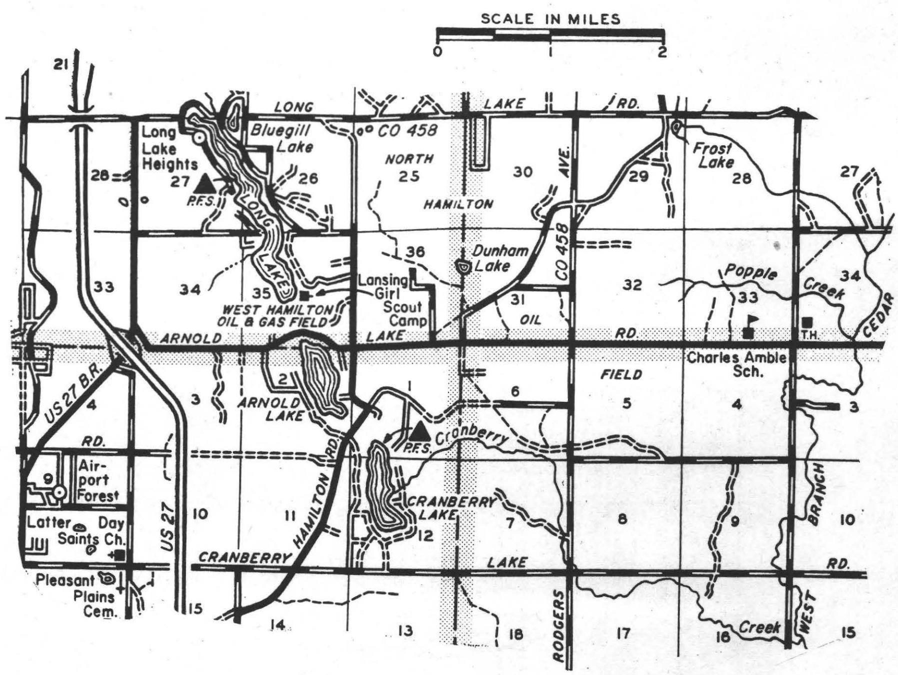
Gage.--Staff gage read daily. Datum of gage not determined.

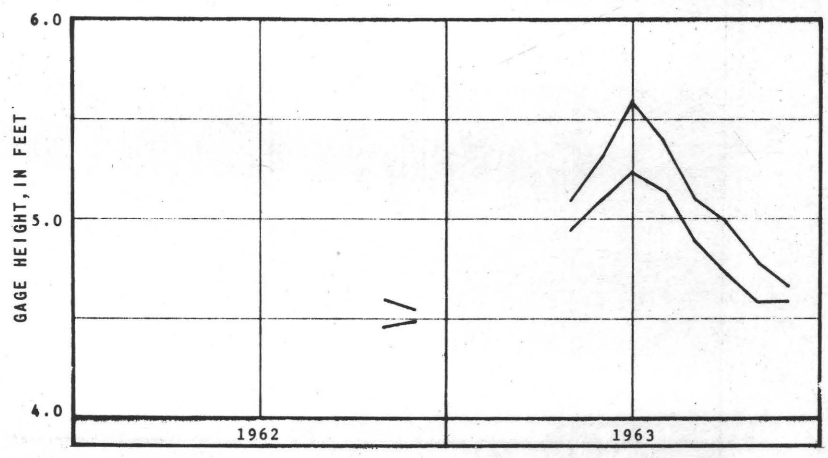
Established legal level.--None known.

Extremes.--1962-63: Maximum stage, 5.60 ft June 10, 1963; minimum, 4.46 ft Oct. 2, 3, 1962.

Regulation or control.--None.

Remarks.--Arnold Lake has no inlet or outlet





Monthly maximum and minimum stages for Arnold Lake near Harrison, Mich.

CLARE COUNTY

Budd Lake at Harrison, Mich.

Location.--Lat 44°00'48", long 84°47'28", in secs. 16, 21, and 28, T.19 N., R.4 W., at Harrison.

Surface area.--175 acres.

Maximum depth.--34 ft.

Drainage area.--0.78 sq mi.

Records available.--October 1959 to September 1968, except periods March to June 1964; January 1968.

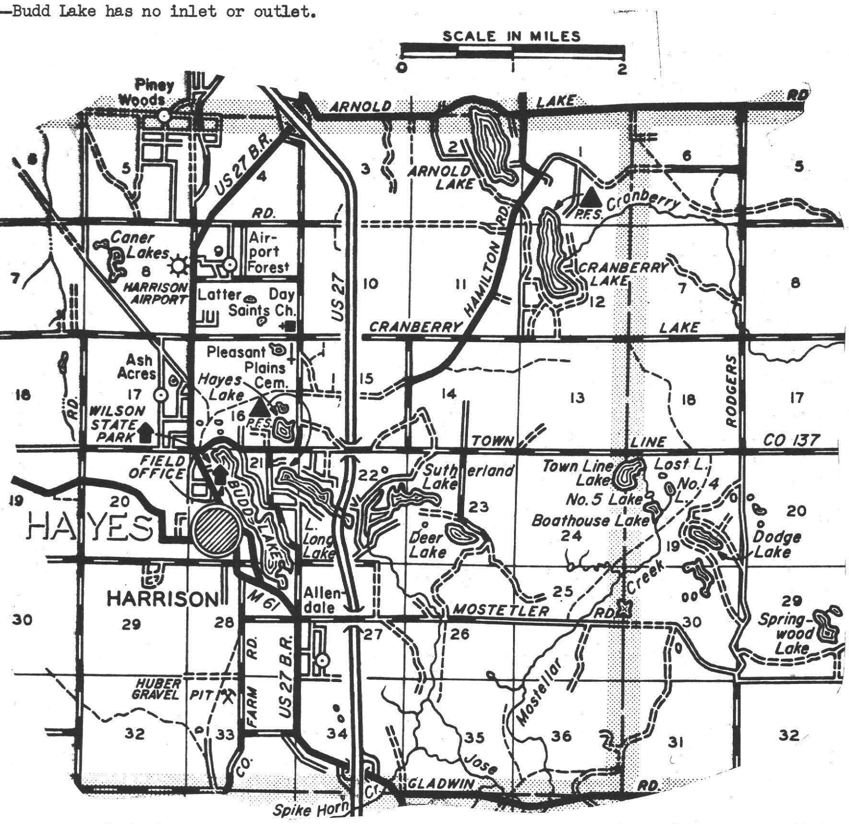
Gage.--Staff gage read daily. Datum of gage not determined.

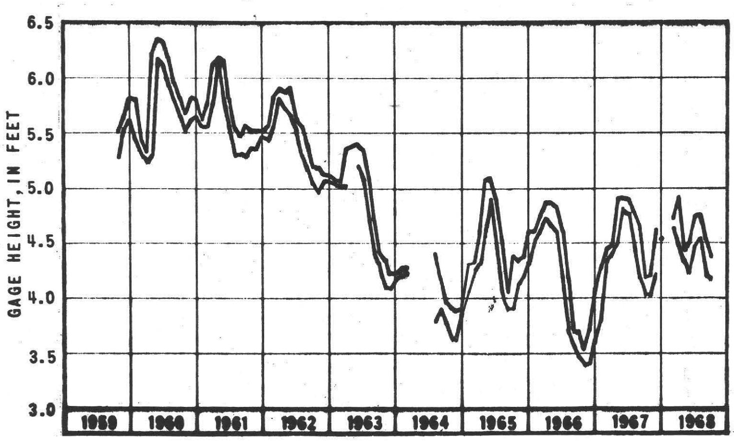
Established legal level.--None known.

Extremes.--1959-68: Maximum stage, 6.36 ft May 23, 1960; minimum, 3.40 ft Oct. 11, Nov. 1, 1966.

Regulation or control.--None.

Remarks.--Budd Lake has no inlet or outlet.





Monthly maximum and minimum stages for Budd Lake at Harrison, Mich.

CLARE COUNTY

Eight Point Lake near Lake, Mich.

Location.--Lat 43°49'53", long 85°04'05", in secs. 19, 20, 29, and 30, T.17 N., R.6 W., 3.5 miles southwest of lake.

Surface area.--388 acres.

Maximum depth.--25 ft.

Drainage area.--Not determined.

Records available.--September 1959 to September 1961 except periods March to May 1960 and February, March, 1961.

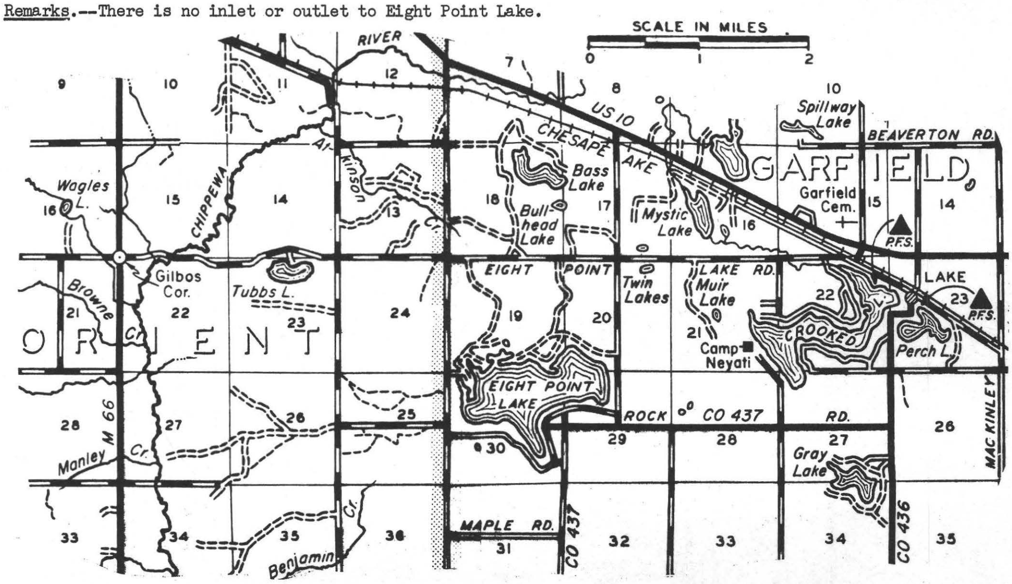
Gage.--Staff gage read daily. Datum of gage not determined.

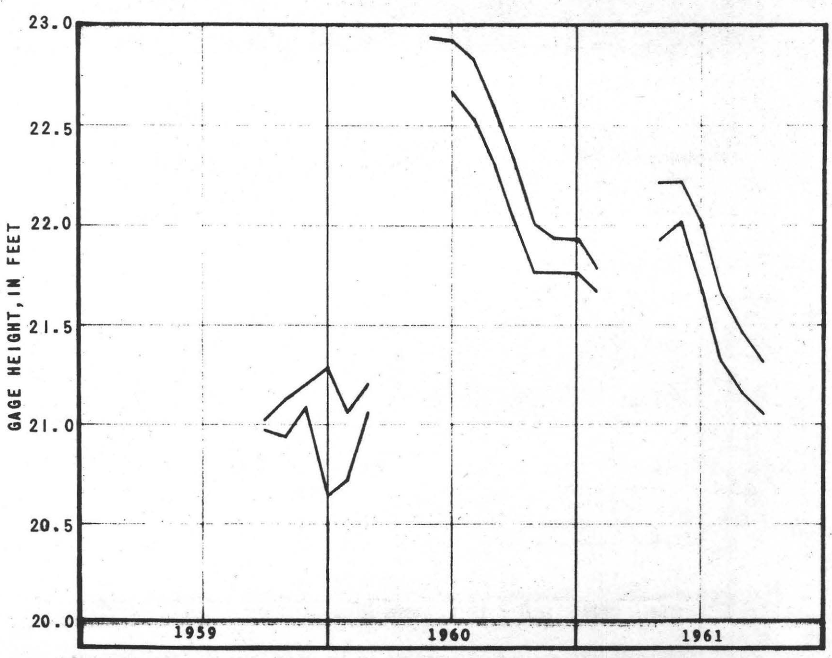
Established legal level.--None known.

Extremes.--1959-61: Maximum stage observed, 22.94 ft May 29-31, 1960; minimum observed, 20.64 ft Dec. 21, 1959.

Regulation or control.--None.

Remarks.--There is no inlet or outlet to Eight Point Lake.





Monthly maximum and minimum stages for Eight Point Lake near Lake, Mich.

CLARE COUNTY

Little Long Lake near Harrison, Mich.

Location.--Lat 44°01'20", long 84°46'35", in secs. 21 and 22, T.19 N., R.4 W., 1 mile east of Harrison.

Surface area.--43 acres.

Maximum depth.--61 ft.

Drainage area.--6.0 sq mi, approximately, at outlet of Sutherland Lake.

Records available.--October 1956 to August 1958.

Gage.--Staff gage read daily. Datum of gage 1,092.73 ft above mean sea level (levels by Michigan Department of Natural Resources).

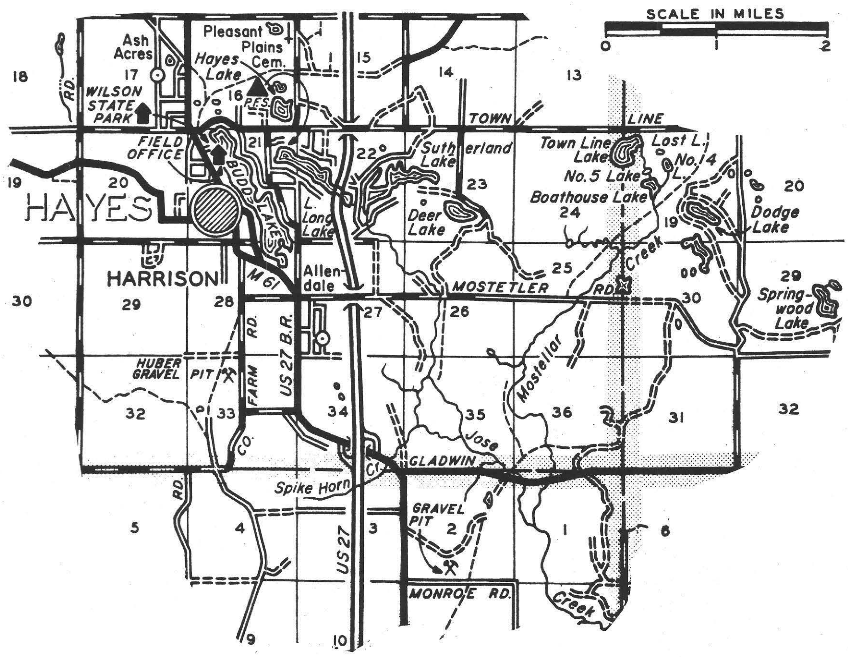
Established legal level.--None known.

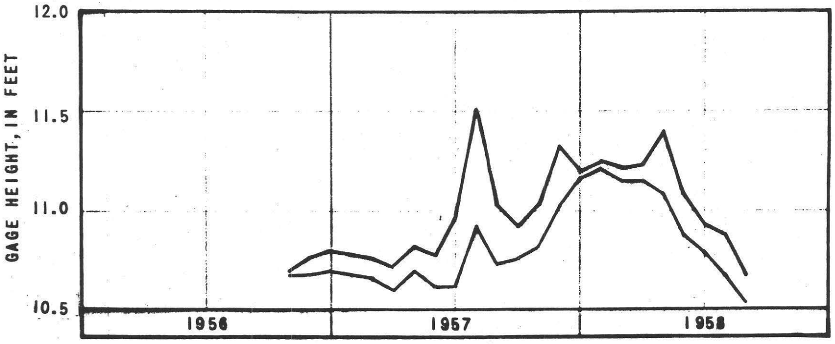
Extremes.--1956-58: Maximum stage, 11.51 ft July 11, 1957; minimum stage observed, 10.53 ft Aug. 16-30, 1958.

Regulation or control.--The control dam for Little Long Lake and Sutherland Lake is located on the Sutherland Lake outlet at the point where the outlet leaves the lake.

Remarks.--Little Long Lake has no inlet. The outlet is the connecting channel with Sutherland Lake at the east end of Little Long Lake. Jose Creek, the outlet of Sutherland Lake, may also be considered the outlet of Little Long Lake. On Sept. 23, 1958, the flow in Jose Creek was 0.06 cfs, at site one mile downstream from Sutherland Lake.

An engineering lake-level control study was completed in 1958 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Little Long Lake near Harrison, Mich.

CLARE COUNTY

Long Lake near Harrison, Mich.

Location.--Lat 44°06'12", long 84°46'29", in secs. 22, 26, 27, and 35, T.20 N., R.4 W., 6 miles northeast of Harrison.

Surface area.--210 acres.

Maximum depth.--76 ft.

Drainage area at outlet.--5.1 sq mi.

Records available.--April 1950 to September 1958 except period November 1955 to January 1958 and some winter periods.

Gage.--Staff gage read intermittently. Datum of gage is 1,133.66 ft above mean sea level (levels by Michigan Department of Natural Resources).

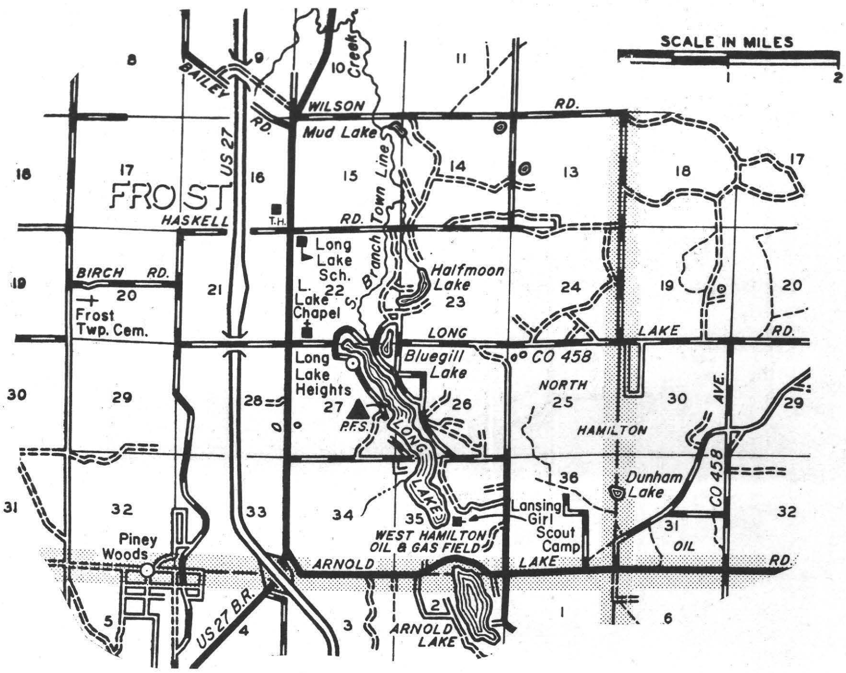
Established legal level.--1,135.4 ft above mean sea level, established by Circuit Court on Sept. 14, 1953.

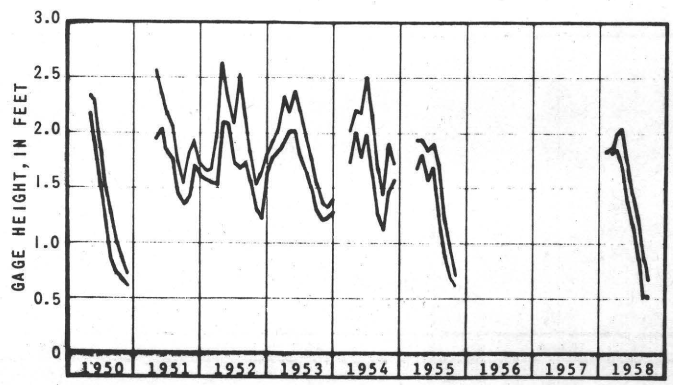
Extremes.--1950-58: Maximum stage observed, 2.64 ft Apr. 15, 16, 1952; minimum observed, 0.52 ft Aug. 29, 30, Sept. 23, 1958.

Regulation or control.--A dam was installed on the outlet in October 1949. This dam was removed in November 1955 and a new dam completed prior to April 1956.

Remarks.--There is one very small inlet on the southwest side of Long Lake. The outlet, South Branch Townline Creek, flows from the north end of the lake. On Sept. 20, 1960, 2.05 cfs was measured in the outlet, at bridge 2 miles downstream from Long Lake.

An engineering lake-level control study was completed in 1952 by Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Long Lake near Harrison, Mich.

CLARE COUNTY

Sutherland Lake near Harrison, Mich.

Location.--Lat 44°01'13", long 84°46'29", in secs. 22 and 23, T.19 N., R.4 W., 1.2 miles east of Harrison.

Surface area.--42.9 acres.

Maximum depth.--10 ft.

Drainage area at outlet.--6.0 sq mi, approximately.

Records available.--October 1956 to September 1958 except February and March of 1957, and 1958.

Gage.--Staff gage read daily. Datum of gage is 1,077.07 ft above mean sea level (levels by Michigan Department of Natural Resources).

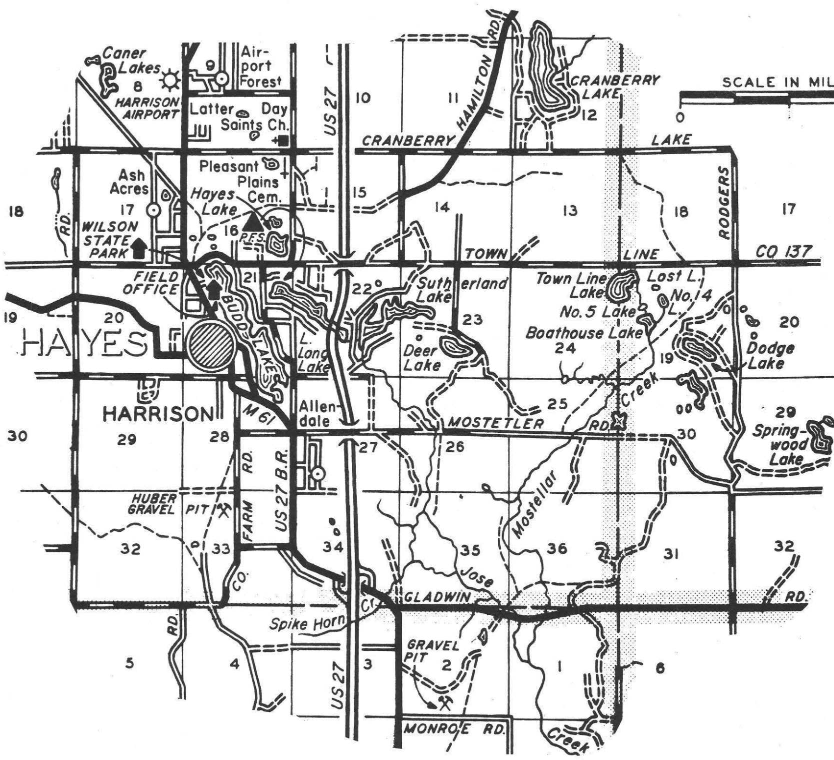
Established legal level.--None known.

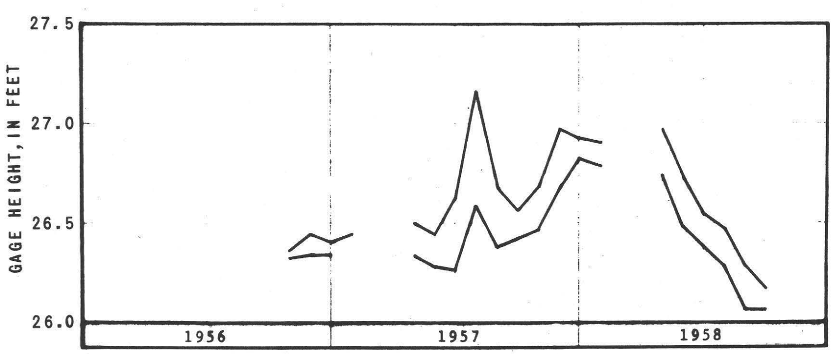
Extremes.--1956-58: Maximum stage, 27.16 ft July 11, 1957; minimum, 26.06 ft Aug. 19, Aug. 23 to Sept. 5, 1958.

Regulation or control.--Lake level controlled by dam at outlet.

Remarks.--The only inlet is the channel connecting Little Long Lake with Sutherland Lake at the west end of Sutherland Lake. The outlet is Jose Creek. On Sept. 23, 1958, the flow in Jose Creek one mile downstream from Sutherland lake was 0.06 cfs.

An engineering lake-level control study was completed in 1958 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Sutherland Lake near Harrison, Mich.

CLINTON COUNTY

Park Lake near Bath, Mich.

Location.--Lat 42°47'07", long 84°26'36", in secs. 28 and 29, T.5 N., R.1 W., 2.3 miles southeast of Bath.

Surface area.--185 acres.

Maximum depth.--27 ft.

Drainage area at outlet.--2 sq mi, approximately.

Records available.--December 1946 to September 1950 except periods February 1947, July to September 1948 and January to October 1949.

Gage.--Staff gage read daily. Datum of gage is 841.52 ft above mean sea level (levels by Michigan Departmnet of Natural Resources).

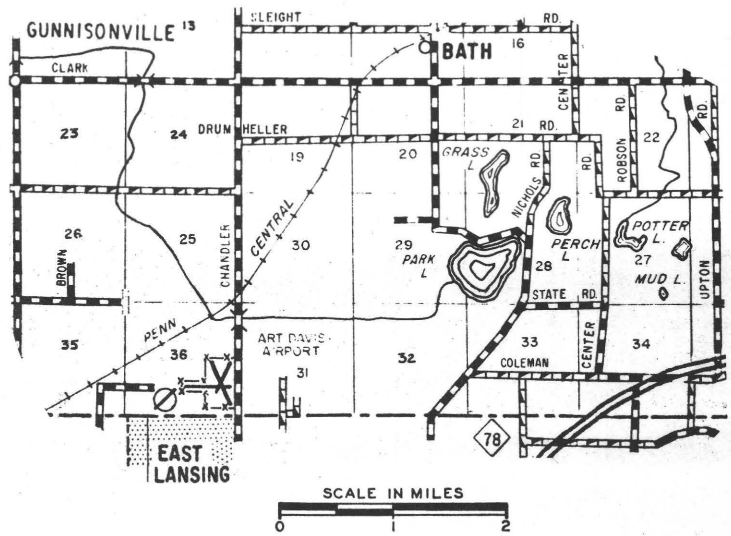
Established legal level.--846.25 ft above mean sea level, established by Circuit Court on June 16, 1941.

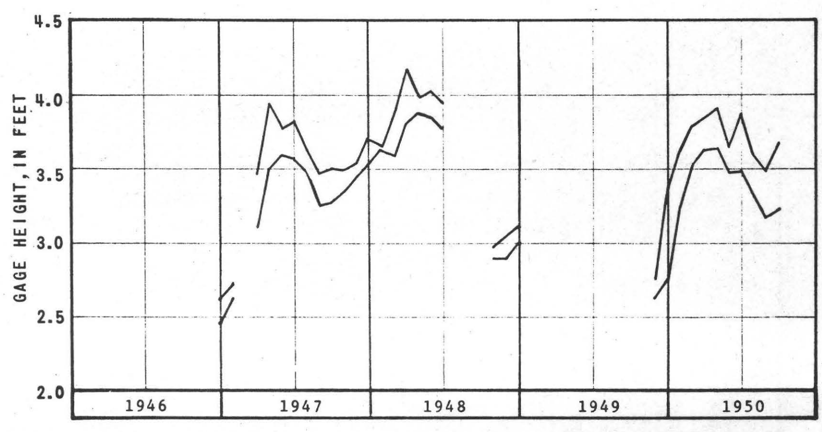
Extremes.--1946-50: Maximum stage observed, 4.16 ft Mar. 20, 1948; minimum observed, 2.45 ft Dec. 11, 1946.

Regulation or control.--None.

Remarks.--Park Lake has no inlet. The outlet, at the south side of the lake, flows into Remey-Chandler Ditch which is tributary to the Lookingglass River. No discharge measurements are available on the outlet.

An engineering lake-level control study was completed in 1947 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Park Lake near Bath, Mich.

CRAWFORD COUNTY

Lake Margrethe near Grayling, Mich.

Location.--Lat 44°39'37", long 84°49'00", in many sections, T.26 N., R.4 W., 3.5 miles southwest of Grayling.

Surface area.--1,920 acres.

Maximum depth.--65 ft.

Drainage area at outlet.--15.6 sq mi.

Records available.--November 1942 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 1,131.23 ft above mean sea level.

Established legal level.--1,135.041 ft above mean sea level, established by Circuit Court in July, 1937.

Extremes.--1942-68: Maximum stage, 4.23 ft Sept. 15, 1961; minimum, 2.34 ft Sept. 24-27, 1948.

Regulation or control.--Level of lake regulated by manipulation of stop logs in control dam at outlet.

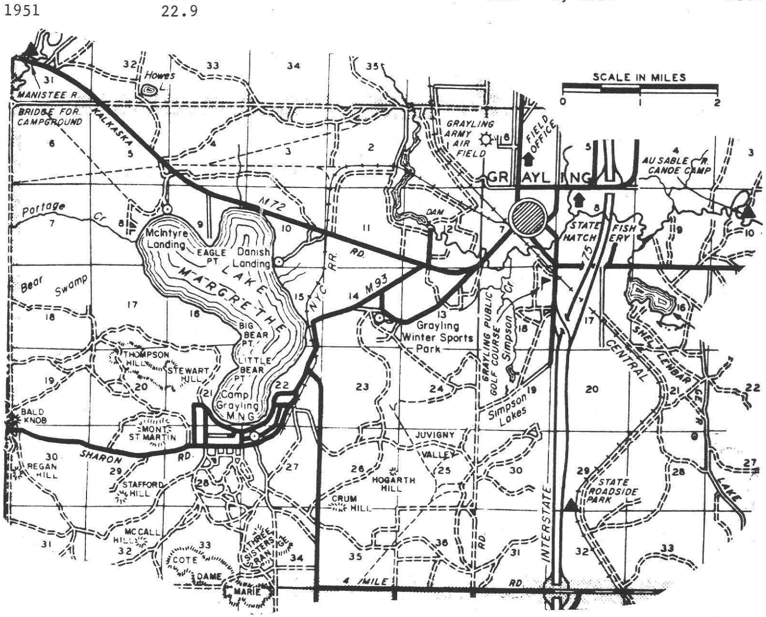
Remarks.--There are several very small streams flowing into the north end of the lake. The outlet, Portage Creek, flows into Manistee River.

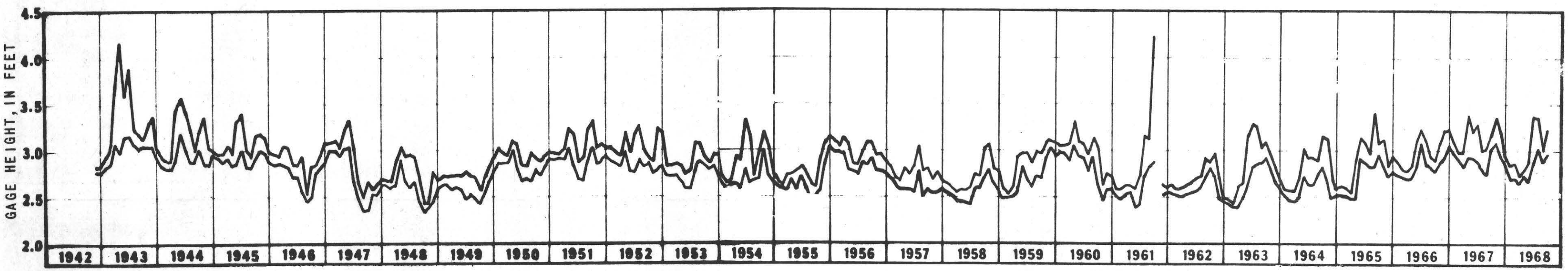
An engineering lake-level control study was completed in 1952 by the Michigan Department of Natural Resources.

The following discharge measurements have been made on Portage Creek in the vicinity of dam at outlet.

Date	Discharge (cfs)
May 6, 1942	8.24
May 14, 1942	10.8
May 15, 1942	21.7
May 24, 1942	29.9
June 1, 1942	45.6
June 6, 1952	54.7
July 15, 1942	11.8
July 30, 1942	18.9
Aug. 28, 1942	13.3
Oct. 2, 1942	32.0
Nov. 11, 1942	25.1
Dec. 24, 1942	22.0
Jan. 25, 1943	25.6
Mar. 30, 1943	30.2
June 2, 1943	77.2
July 7, 1943	34.0
Sept. 30, 1943	11.7
Oct. 29, 1943	14.6
Nov. 22, 1943	39.8
Dec. 17, 1943	28.3
Mar. 17, 1944	25.8
Nov. 1, 1944	17.2
Apr. 11, 1945	20.8
Sept. 28, 1948	8.11
Jan. 3, 1949	12.6
May 6, 1949	21.0
Aug. 19, 1949	12.4
Oct. 18, 1949	10.1
Dec. 13, 1949	21.7
Apr. 13, 1950	33.8
July 20, 1950	19.5
Oct. 19, 1950	15.4
Jan. 15, 1951	22.9

Date	Discharge (cfs)
Apr. 5, 1951	30.2
July 25, 1951	4.94
Oct. 25, 1951	32.8
Jan. 25, 1952	33.8
Apr. 16, 1952	40.8
July 23, 1952	47.1
Oct. 17, 1952	7.76
Jan. 27, 1953	28.0
Apr. 10, 1953	30.8
July 23, 1953	14.9
Oct. 13, 1953	12.0
Jan. 12, 1954	26.6
Apr. 27, 1954	36.0
July 9, 1954	35.7
Oct. 11, 1954	20.3
Jan. 11, 1955	25.9
Apr. 21, 1955	28.4
July 5, 1955	7.96
Oct. 4, 1955	3.34
Jan. 3, 1956	21.7
Apr. 2, 1956	40.7
July 3, 1956	22.0
Oct. 4, 1956	18.3
Jan. 2, 1957	24.5
Apr. 2, 1957	23.1
July 11, 1957	23.4
Oct. 3, 1957	10.2
Jan. 2, 1958	26.8
Apr. 1, 1958	21.1
July 1, 1958	2.72
Oct. 2, 1958	10.2
Jan. 2, 1959	23.1





Monthly maximum and minimum stages for Lake Margrethe near Grayling, Mich.

DELTA COUNTY

Moss Lake near Isabella, Mich.

Location.--Lat 45°54'02", long 86°40'02", in many sections, Tps. 40 and 41 N., R.19 W., 3 miles west of Isabella.

Surface area.--1,080 acres.

Maximum depth.--5 ft.

Drainage area at outlet.--10 sq mi, approximately.

Records available.--April 1956 to September 1959 except winter months.

Gage.--Staff gage read daily. Datum of gage is 607.36 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

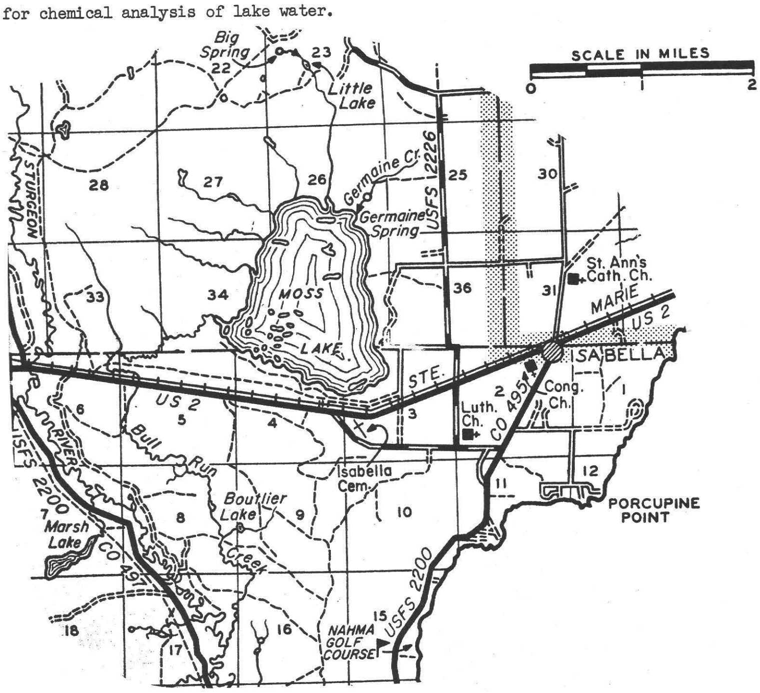
Extremes.--1956-59: Maximum stage observed, 4.19 ft Apr. 21, 22, 24-27, 1957; minimum stage, 2.36 ft Aug. 19-21, 1957.

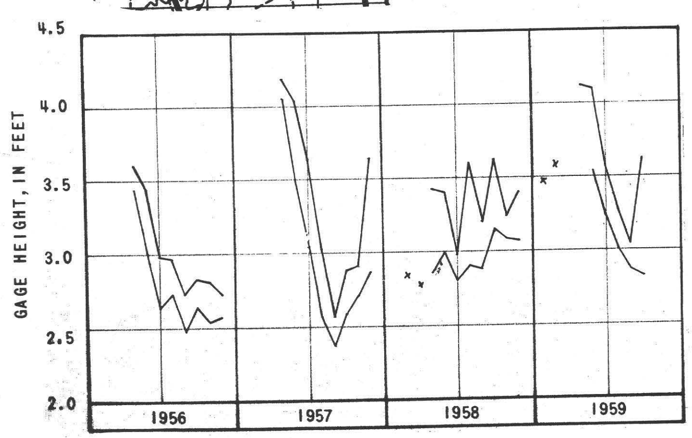
Regulation or control.--None.

Remarks.--Germaine Creek and small intermittent streams enter Moss Lake from the west and north. The outlet, Bull Run Creek, leaves the southwest side of the lake and is tributary to the Sturgeon River. No discharge measurements have been made on the inlets or outlet.

An engineering lake-level control study was completed in 1959 by the Michigan Department of Natural Resources.

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Moss Lake near Isabella, Mich.

DICKINSON COUNTY

Lake Mary near Loretto, Mich.

Location.--Lat 45°44'56", long 87°49'01", in many sections, T.39 N., R.28 and 29 W., 2.2 miles south of Loretto.

Surface area.--86 acres.

Maximum depth.--83 ft.

Drainage area at outlet.--15 sq mi, approximately.

Records available.--May 1964 to September 1968 except some winter periods.

Gage.--Staff gage read daily. Datum of gage is 841.4 ft above mean sea level (levels by Michigan Department of Natural Resources).

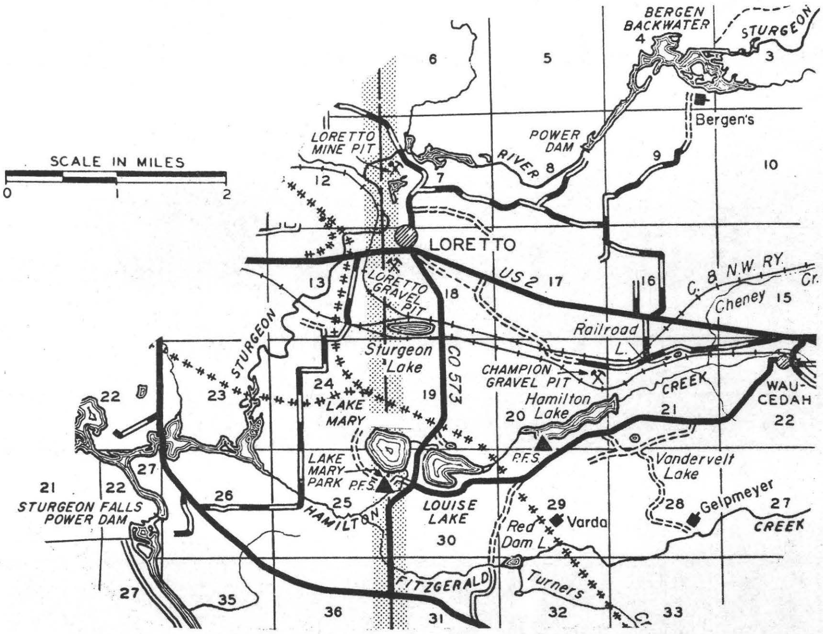
Established legal level.--None known.

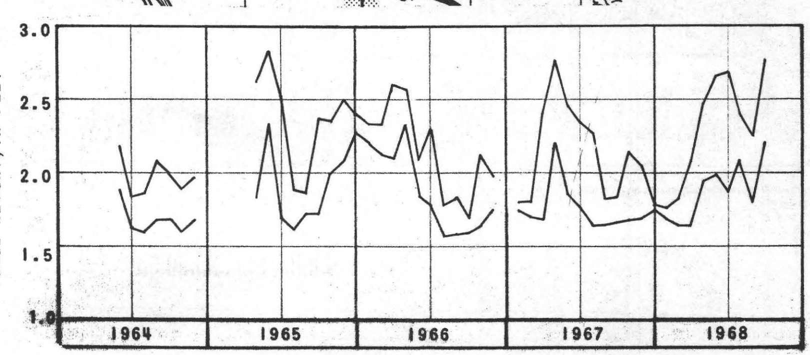
Extremes.--1964-68: Maximum stage observed, 2.82 ft May 10, 1965; minimum observed, 1.56 ft July 22, 1966.

Regulation or control.--Concrete dam at outlet. Since April 1965, a 6- inch channel iron has been installed and removed from spillway at various times to control lake level.

Remarks.--Hamilton, Louise, and Mary Lakes comprise a chain of lakes on Hamilton Creek, a tributary to the Sturgeon River. Hamilton Creek enters Lake Mary through Louise Lake outlet and leaves the lake at the south side.
The following discharge measurements have been made on Hamilton Creek at the outlet of Lake Mary.

Date	Discharge (cfs)	Date	Discharge (cfs)
May 11, 1964	23.9	Sept. 12, 1966	2.12
Aug. 5, 1964	17.5	Nov. 16, 1966	4.04
Oct. 1, 1964	14.3	Jan. 13, 1967	4.34
Mar. 22, 1965	3.93	May 18, 1967	15.2
July 22, 1965	2.40	Aug. 1, 1967	1.97
Nov. 4, 1965	4.11	Oct. 3, 1967	3.62
July 12, 1966	2.88	Jan. 5, 1968	3.17
		July 15, 1968	18.6





Monthly maximum and minimum stages for Lake Mary near Loretto, Mich.

EMMET COUNTY

Crooked Lake near Conway, Mich.

Location.--Lat 45°26'00", long 84°47'20", in many sections, T.35 N., Rs. 4 and 5 W., at Conway.

Surface area.--2,400 acres.

Maximum depth.--68 ft.

Drainage area at outlet.--101 sq mi.

Records available.--June 1942 to September 1968 except period June 1942 to July 1945 when gage was read only during summer months.

Gage.--Water-stage recorder. Datum of gage is 593.38 ft above mean sea level. June 13, 1960 to June 29, 1964, staff gage read daily, at same datum. Prior to June 13, 1960, staff gage read daily, at datum 1.0 ft higher.

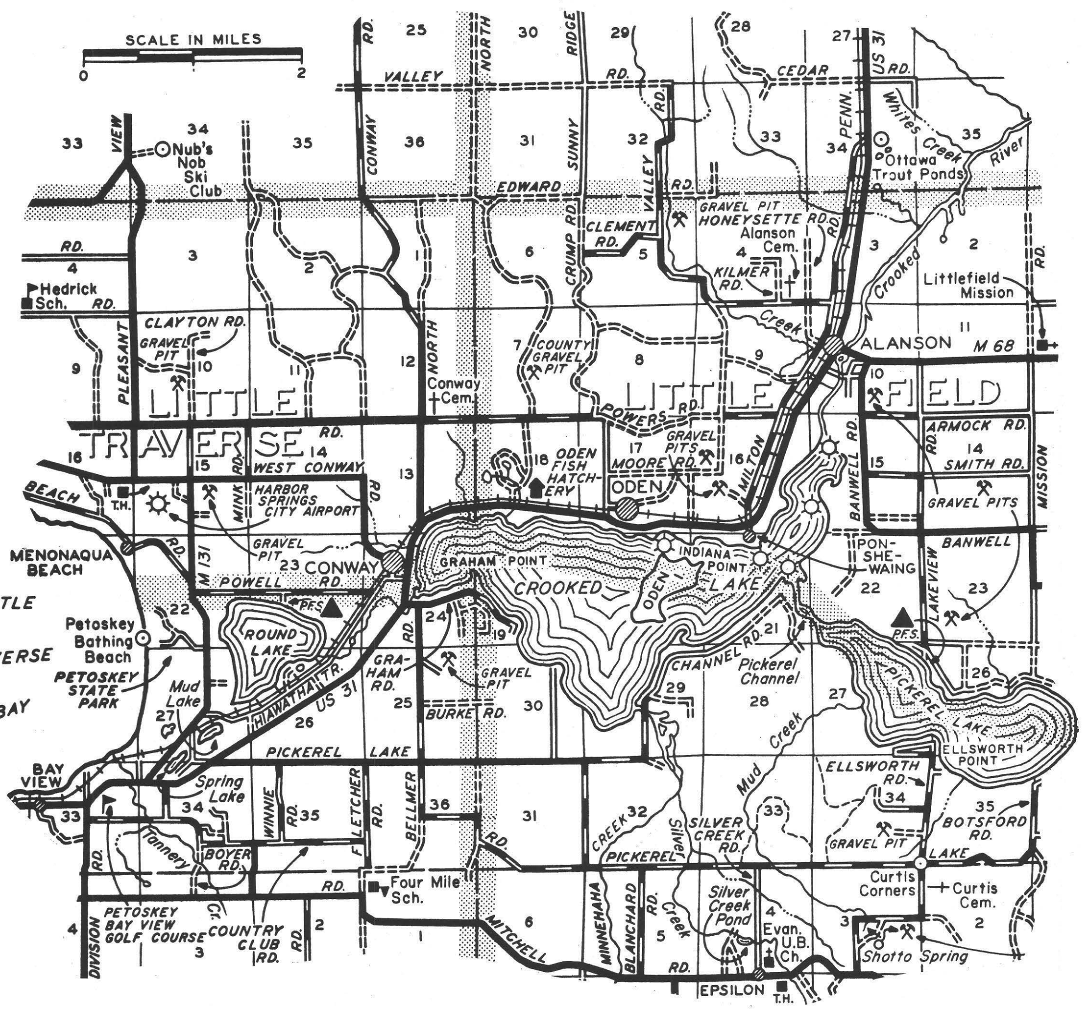
Established legal level.--None known.

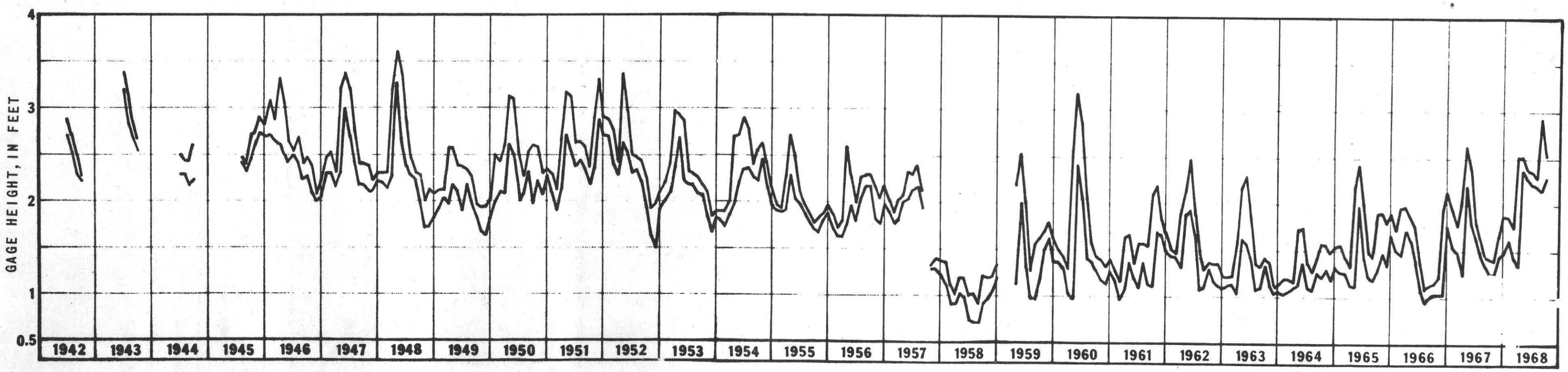
Extremes.--1942-68: Maximum stage observed, 3.60 ft Apr. 12, 1948 (present datum); minimum stage, 0.72 ft July 1, 2, Aug. 9-11, 1958 (present datum).

Regulation or control.--In March 1968, a dam with boat lock was completed on Crooked River at Alanson. Prior to March 1968, lake levels affected by regulation of dam at Cheboygan.

Remarks.--Main inlets to Crooked lake are Minnehaha Creek from the south, Round Lake outlet from the west and Pickerel Lake outlet from the southeast. There are several small inlets along the north side of the lake. The outlet, Crooked River, flows out of the northeast end of lake into Burt Lake. No discharge measurements are available on the inlets or outlet.

Crooked Lake is the upstream end of the navigable inland water route. An investigation of the inland water route was completed in 1961 by the Michigan Department of Natural Resources. A report "Lake Levels of the Inland Route, Michigan" was completed in 1958 by Michigan-Corps of Engineers, U.S. Army.





Monthly maximum and minimum stages for Crooked Lake near Conway, Mich.

GPO 818-596-8

EMMET COUNTY

Paradise Lake (formerly Carp Lake) at Carp Lake, Mich.

Location.--Lat 45°41'09", long 84°46'50", in many sections, T.38 N., Rs.3 and 4 W., at Carp Lake.

Surface area.--1,820 acres.

Maximum depth.--17 ft.

Drainage area at outlet.--26.3 sq mi.

Records available.--June 1942 to September 1968 except some winter periods.

Gage.--Staff gage read daily. Datum of gage is 707.54 ft above mean sea level (levels by Michigan Department of Natural Resources).

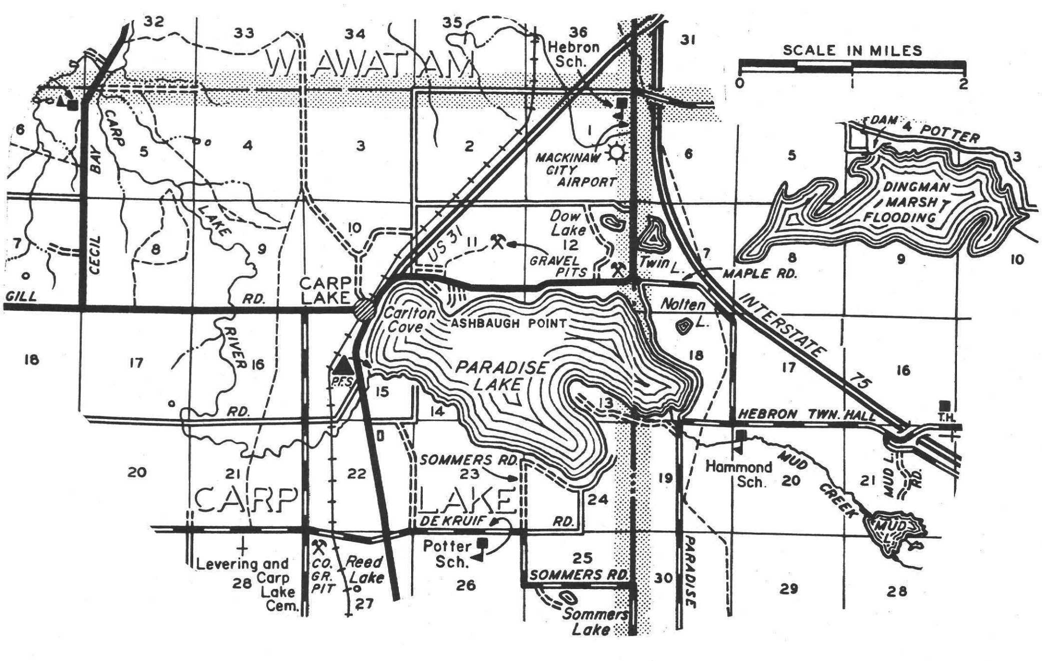
Established legal level.--None known.

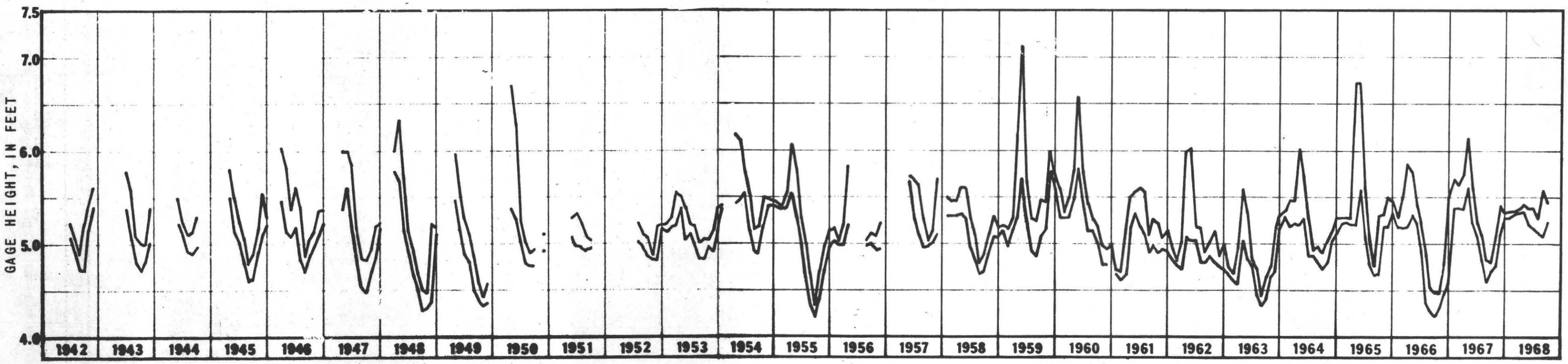
Extremes.--1942-68: Maximum stage observed, 7.12 ft (highwater mark) May 5, 1959; minimum stage, 4.20 ft Sept. 28-30, 1955.

Regulation or control.--Lake level maintained by dam on outlet. Crest of dam has been changed at different times.

Remarks.--Mud Creek flows into Paradise Lake from the southeast. The outlet, Carp Lake River, flows from the southwest corner of the lake to Cecil Bay in Lake Michigan.
The following discharge measurements have been made on Carp Lake River in vicinity of dam at lake outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
Nov. 30, 1944	13.6	Oct. 15, 1952	0.42
Oct. 17, 1945	2.74	Jan. 22, 1953	30.6
Jan. 24, 1946	22.6	Apr. 20, 1953	45.9
Apr. 18, 1946	26.4	July 16, 1953	9.46
June 27, 1946	24.3	Oct. 16, 1953	1.18
Sept. 25, 1946	1.32	Jan. 15, 1954	9.50
Dec. 16, 1946	14.3	Apr. 14, 1954	57.3
Apr. 28, 1947	76.6	July 21, 1954	8.37
July 23, 1947	4.33	Oct. 13, 1954	13.0
Oct. 14, 1947	.04	Jan. 19, 1955	14.8
Feb. 17, 1948	4.55	Apr. 20, 1955	112
May 26, 1948	16.2	July 20, 1955	0
July 27, 1948	.02	Oct. 19, 1955	0
Oct. 12, 1948	.21	Jan. 17, 1956	7.61
Dec. 14, 1948	11.8	Apr. 16, 1956	56.6
Apr. 19, 1949	34.1	July 17, 1956	12.5
July 15, 1949	1.23	Oct. 18, 1956	3.25
Oct. 24, 1949	.07	Jan. 15, 1957	12.6
Dec. 13, 1949	.16	Apr. 10, 1957	14.3
Apr. 11, 1950	30.5	July 16, 1957	39.3
July 27, 1950	.11	Oct. 18, 1957	5.37
Oct. 23, 1950	2.75	Jan. 10, 1958	14.5
Jan. 16, 1951	11.5	Apr. 3, 1958	18.4
Apr. 12, 1951	89.3	July 8, 1958	7.16
July 18, 1951	20.8	Oct. 8, 1958	1.93
Oct. 23, 1951	31.4	Jan. 8, 1959	15.9
Jan. 16, 1952	27.6	May 6, 1959	255
Apr. 18, 1952	117	May 11, 1959	199
July 16, 1952	6.43	May 13, 1959	164





Monthly maximum and minimum stages for Paradise Lake at Carp Lake, Mich.

EMMET COUNTY

Wycamp Lake near Cross Village, Mich.

Location.--Lat 45°39'21", long 84°59'23", in many sections, T.38 N., Rs.5 and 6 W., 2.4 miles northeast of Cross Village.

Surface area.--650 acres.

Maximum depth.--6 ft.

Drainage area at outlet.--23 sq mi, approximately.

Records available.--August 1959 to December 1961 except winter periods.

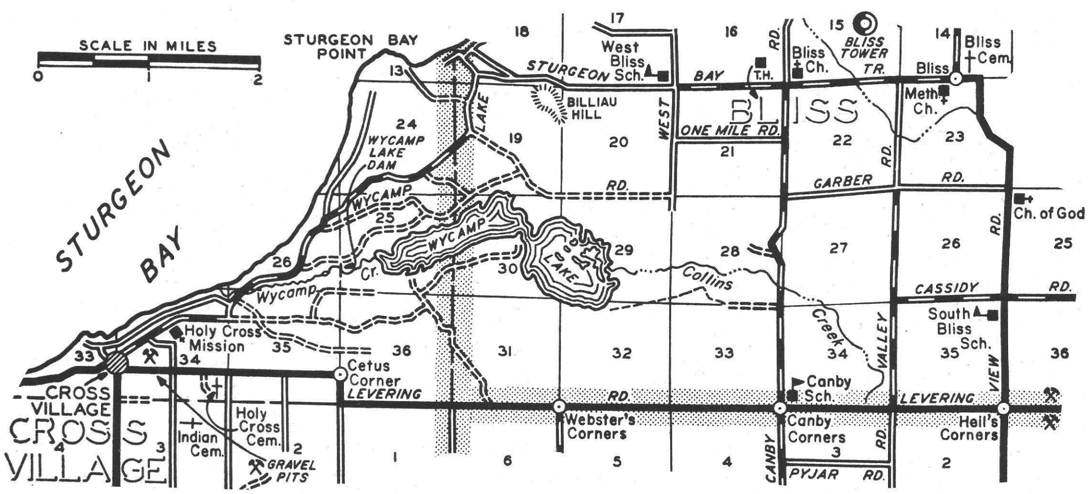
Gage.--Staff gage read intermittently. Datum of gage is 610.31 ft above mean sea level (levels by Michigan Department of Natural Resources).

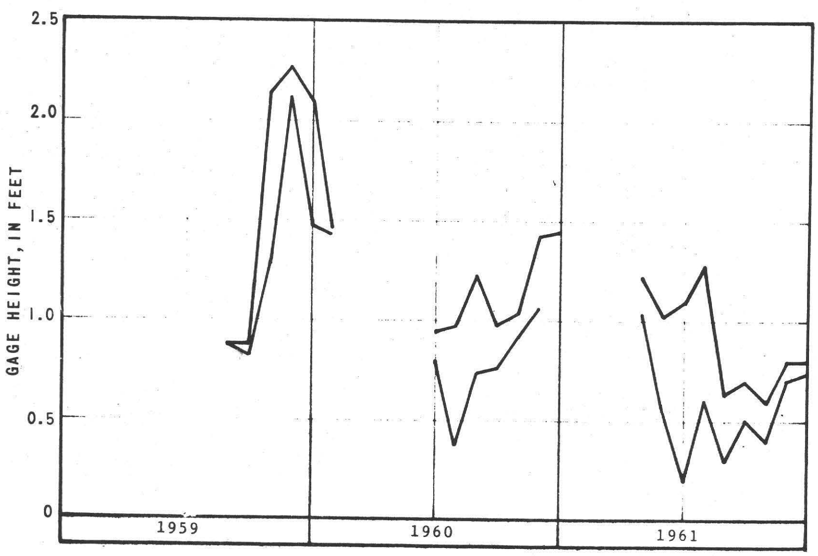
Established legal level.--Winter, 611.0 ft; summer, 611.8 ft above mean sea level, established by Circuit Court on Feb. 23, 1961.

Extremes.--1959-61: Maximum stage observed, 2.26 ft Nov. 21, 1959 (caused by beaver dam); minimum observed, 0.20 ft June 20-22, 1961.

Regulation or control.--There is no man-made dam on outlet, however, beaver dams caused high water during the winter of 1959-60.

Remarks.--Several small intermittent streams drain into the east end of the lake where the ground is very swampy. The outlet, Wycamp Creek, flows from the west end of the lake for about 1.5 miles to Lake Michigan. No discharge measurements are available on the inlets or outlet.
An engineering lake-level control study was completed in 1960 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Wycamp Lake near Cross Village, Mich.

GOGEBIC COUNTY

Cisco Lake near Watersmeet, Mich.

Location.--Lat 46°15'12", long 89°27'05", in many sections, Tps. 44 and 45 N., R.41 W., 13 miles west of Watersmeet.

Surface area.--506 acres.

Maximum depth.--20 ft.

Drainage area at outlet.--50.6 sq mi.

Records available.--July 1942 to September 1968.

Gage.--Staff gage read daily. Datum of gage 1,679.53 ft above mean sea level (levels by Michigan Department Natural Resources).

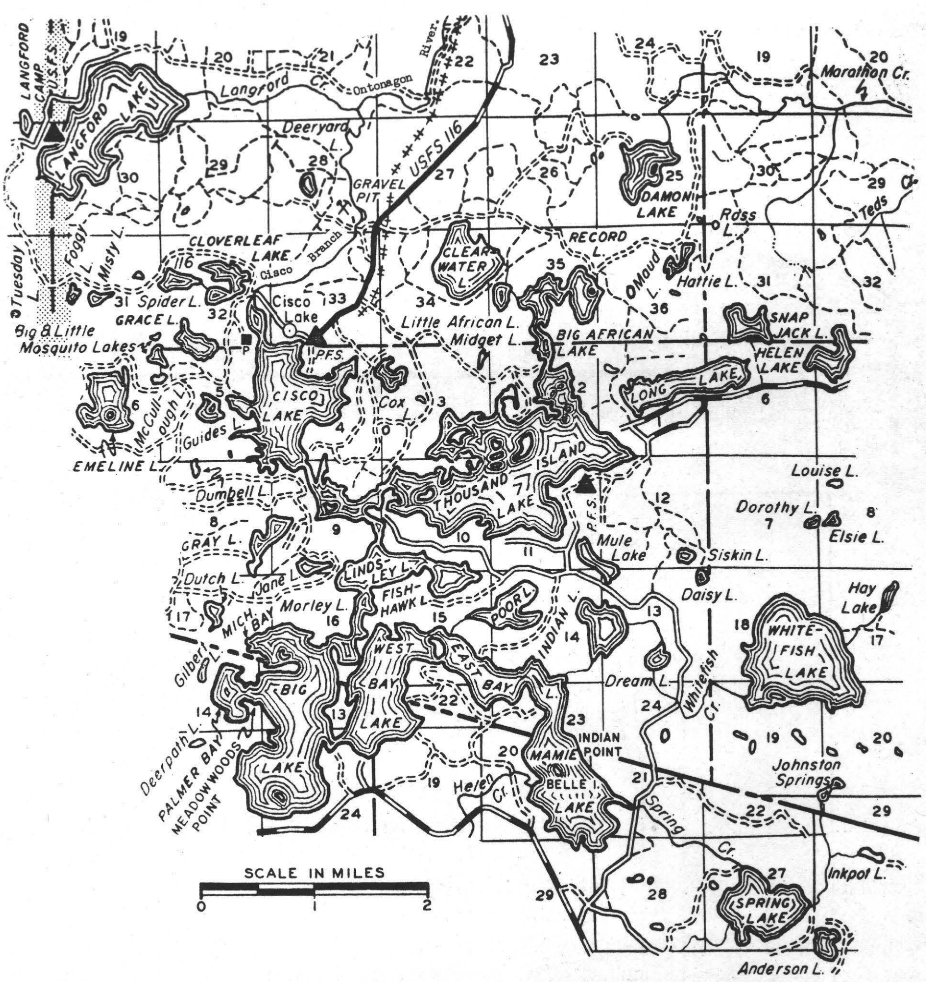
Established legal level.--None known. The Upper Peninsula Power Co. maintains the lake level at an elevation of about 1682.5 ft during winter months and 1683.5 ft during summer months.

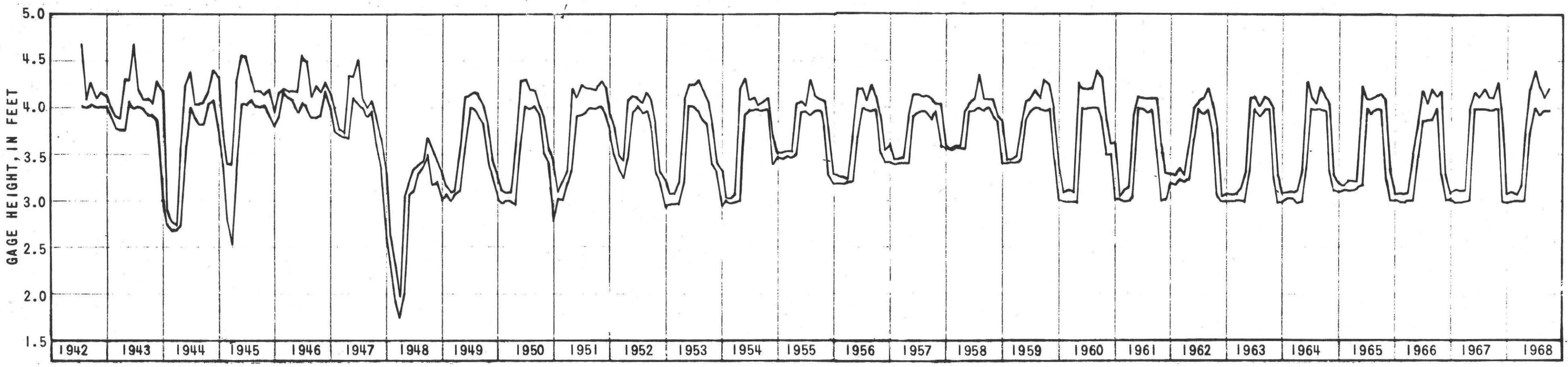
Extremes.--1942-68: Maximum stage, 4.69 ft July 19, 1942; minimum, 1.72 ft Mar. 20-22, 1948.

Regulation or control.--The lake level is controlled at the outlet by a concrete dam of two bays with removable flash boards.

Remarks.--The inlet to Cisco Lake is the combined outlet from Lindsley Lake and Thousand Island Lake. The outlet is Cisco Branch Ontonagon River. Discharge records for Cisco Branch Ontonagon River at Cisco Lake Outlet were collected during the period October 1944 to September 1968, at site 80 ft below the dam, and from July 1942 to September 1944, 5 miles downstream. These records are published in the annual U. S. Geological Survey Water-Supply Papers.

An engineering lake-level control study was completed in 1962 on the Cisco Lake Chain by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Cisco Lake near Watersmeet, Mich.

GOGEBIC COUNTY

Thousand Island Lake near Watersmeet, Mich.

Location.--Lat 46°13'45"; long 89°25'38", in many sections, T.44 N., R.41 W., 12 miles southwest of Watersmeet.

Surface area.--1,080 acres.

Maximum depth.--81 ft.

Drainage area.--50.6 sq mi, at outlet of Cisco Lake.

Records available.--October 1961 to May 1963.

Gage.--Staff gage read daily. Datum of gage is 1,667.2 ft above mean sea level (levels by Michigan Department of Natural Resources).

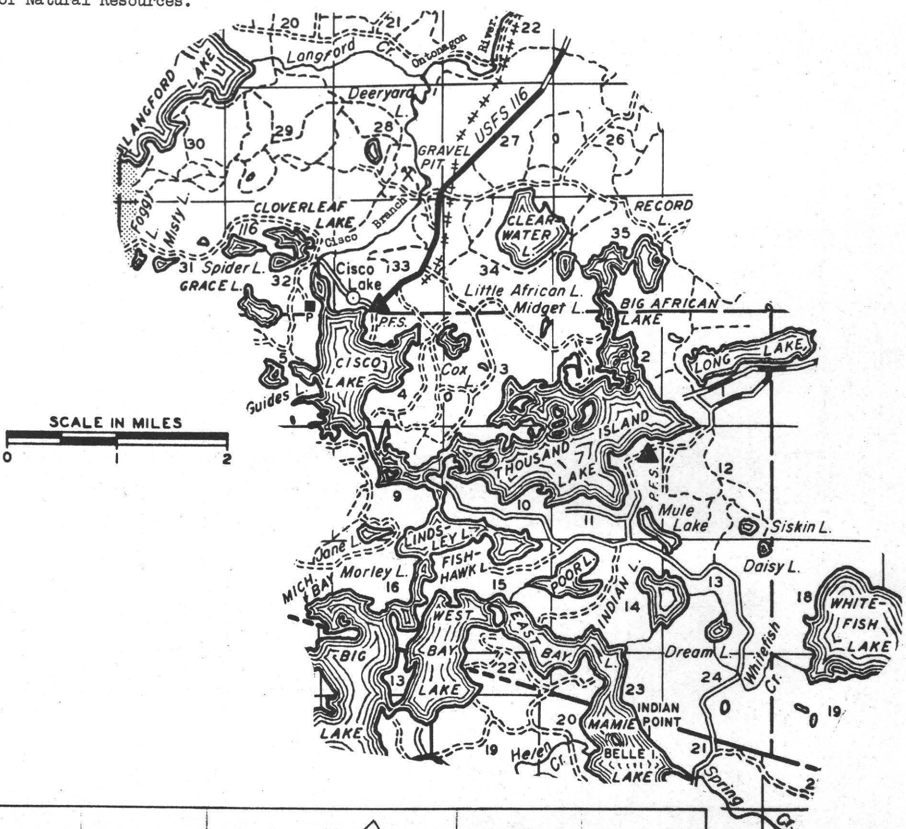
Established legal level.--None known.

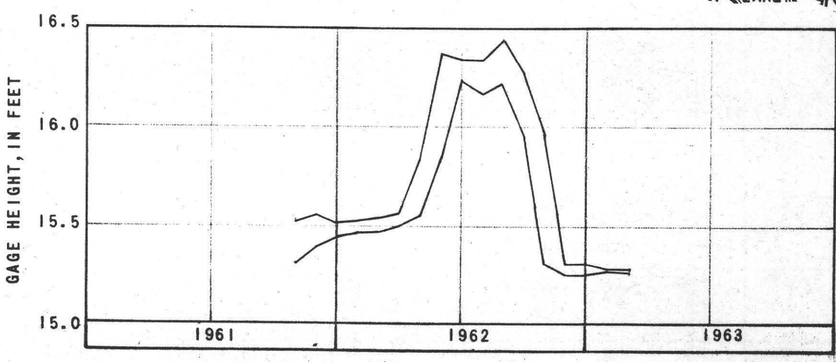
Extremes.--1961-63; Maximum stage, 16.44 ft Aug. 24, 25, 1962; minimum, 15.25 ft Nov. 29 to Dec. 9, 1962.

Regulation or control.--Lake level is regulated by dam at outlet of Cisco Lake.

Remarks.--Thousand Island Lake is a part of the Cisco Chain of Lakes. Various small creeks flow into this chain of lakes. The outflow from Thousand Island Lake is through Cisco Lake to the Cisco Branch Ontonagon River. Also, see Cisco Lake, Gogebic County.

An engineering lake-level control study was completed in 1962 on the Cisco Lake Chain by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Thousand Island Lake near Watersmeet, Mich.

GRAND TRAVERSE COUNTY

Duck Lake at Interlochen, Mich.

Location.--Lat 44°38'12", long 85°45'25", in many sections, T.26 N., R.12 W., 0.8 mile southeast of Interlochen.

Surface area.--1,930 acres.

Maximum depth.--98 ft.

Drainage area at outlet.--40 sq mi, approximately.

Records available.--June 1942 to September 1943 and April 1959 to December 1961 except some winter periods.

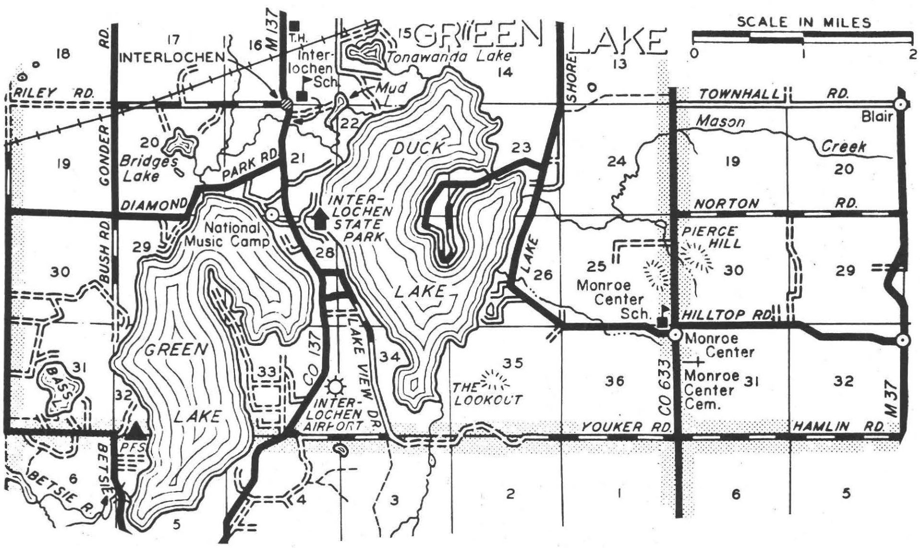
Gage.--Staff gage read daily. Datum of gage is 833.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

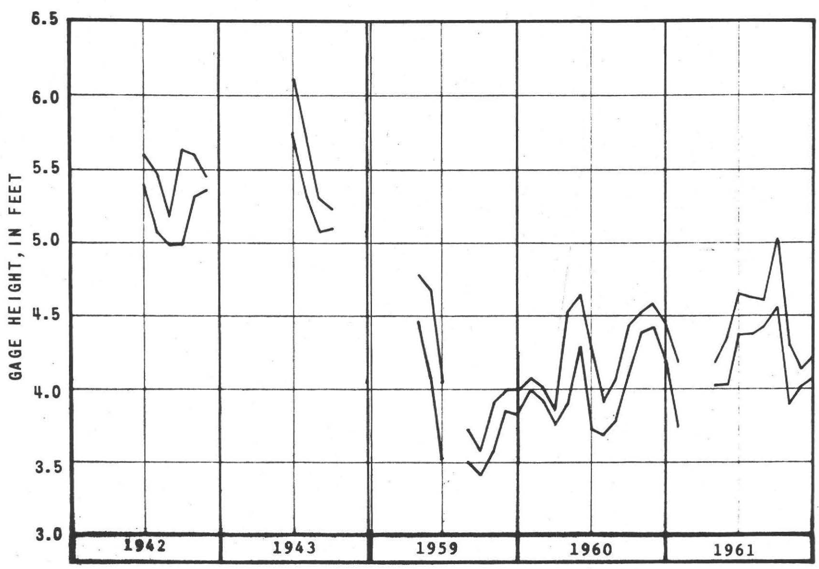
Established legal level.--837.3 ft above mean sea level, established by Circuit Court on June 18, 1959.

Extremes.--1942-43, 1959-61: Maximum stage observed, 6.12 ft June 6, 1943; minimum observed, 3.42 ft Sept. 14, 18, 19, 1959.

Regulation or control.--Log dam, 1¼ miles below Duck Lake may affect lake levels.

Remarks.--Inlets to Duck Lake are Mason Creek from the east, an unnamed stream from the south, and the outlet from Tonawanda Lake from the north. The outlet at the west side of Duck Lake flows into Green Lake. No discharge measurements are available on the inlets or outlet.
An engineering lake-level control study was completed in 1959 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Duck Lake at Interlochen, Mich.

GRAND TRAVERSE COUNTY

Fife Lake at Fife Lake, Mich.

Location.--Lat 44°33'32", long 85°20'42", in many sections, T.25 N., R.9 W., at Fife Lake.

Surface area.--617 acres.

Maximum depth.--60 ft.

Drainage area at outlet.--11.1 sq mi.

Records available.--October 1944 to December 1959 except winter months during period 1944-47.

Gage.--Staff gage read daily. Datum of gage not determined.

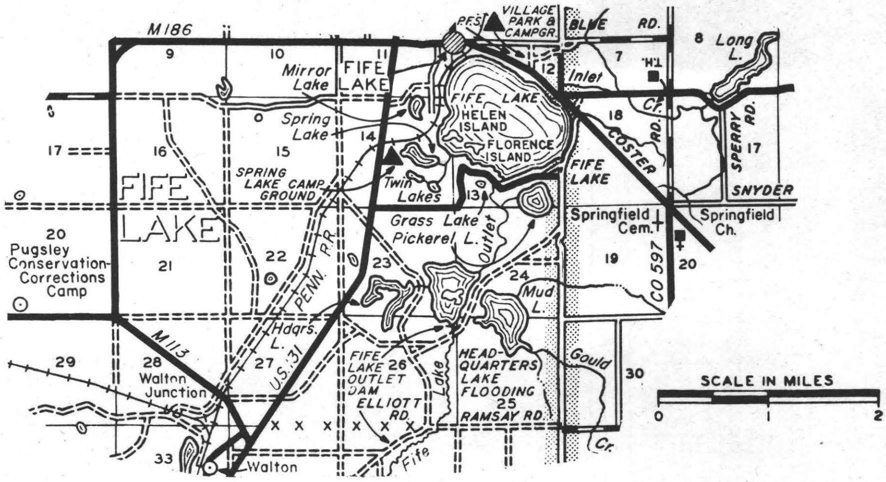
Established legal level.--None known.

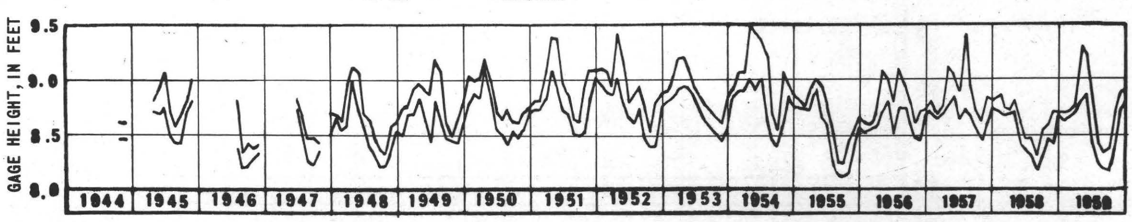
Extremes.--1944-59: Maximum stage, 9.48 ft Apr. 17, 19, 1954; minimum, 8.10 ft Sept. 24, 26, 1955.

Regulation or control.--None.

Remarks.--The inlet is an unnamed stream flowing into east side of lake. Fife Lake Outlet, at the south end of the lake, flows south to Manistee River.
The following discharge measurements have been made on Fife Lake Outlet at the lake.

Date	Discharge (cfs)	Date	Discharge (cfs)
Nov. 21, 1944	4.50	Apr. 23, 1952	16.1
Oct. 3, 1945	4.19	July 29, 1952	6.96
Jan. 4, 1946	6.45	Oct. 28, 1952	2.22
Mar. 26, 1946	10.7	Jan. 7, 1953	6.90
June 28, 1946	4.47	Apr. 9, 1953	11.1
Sept. 18, 1946	2.09	July 27, 1953	3.01
Dec. 11, 1946	3.46	Oct. 22, 1953	2.99
May 29, 1947	14.4	Jan. 19, 1954	5.09
July 8, 1947	4.17	Apr. 27, 1954	18.5
Oct. 7, 1947	2.60	July 14, 1954	10.8
Dec. 23, 1947	4.50	Oct. 5, 1954	6.45
Mar. 17, 1948	4.88	Jan. 20, 1955	8.10
July 9, 1948	4.10	Apr. 5, 1955	11.3
Oct. 6, 1948	.52	July 25, 1955	1.80
Dec. 23, 1948	3.62	Oct. 24, 1955	3.01
Apr. 7, 1949	8.52	Jan. 13, 1956	4.91
July 27, 1949	10.2	Apr. 12, 1956	9.76
Oct. 17, 1949	2.25	July 30, 1956	7.34
Dec. 21, 1949	5.06	Oct. 2, 1956	3.58
Apr. 4, 1950	11.1	Jan. 17, 1957	4.99
July 19, 1950	3.63	Apr. 30, 1957	12.1
Oct. 18, 1950	2.86	July 25, 1957	11.0
Jan. 31, 1951	6.00	Oct. 14, 1957	2.46
Apr. 12, 1951	12.8	Jan. 29, 1958	5.61
July 26, 1951	5.09	Apr. 4, 1958	4.29
Oct. 8, 1951	5.20	July 29, 1958	1.05
Jan. 30, 1952	9.02	Oct. 23, 1958	2.82





Monthly maximum and minimum stages for Fife Lake at Fife Lake, Mich.

GRAND TRAVERSE COUNTY

Green Lake near Karlin, Mich.

Location.--Lat 44°35'32", long 85°47'40", in many sections, Tps. 25 and 26 N., R.12 W., 1 mile north of Karlin.

Surface area.--1,990 acres.

Maximum depth.--102 ft.

Drainage area at outlet.--59.6 sq mi.

Records available.--June 1942 to September 1968.

Gage.--Staff gage read daily. Datum of gage is 820.25 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

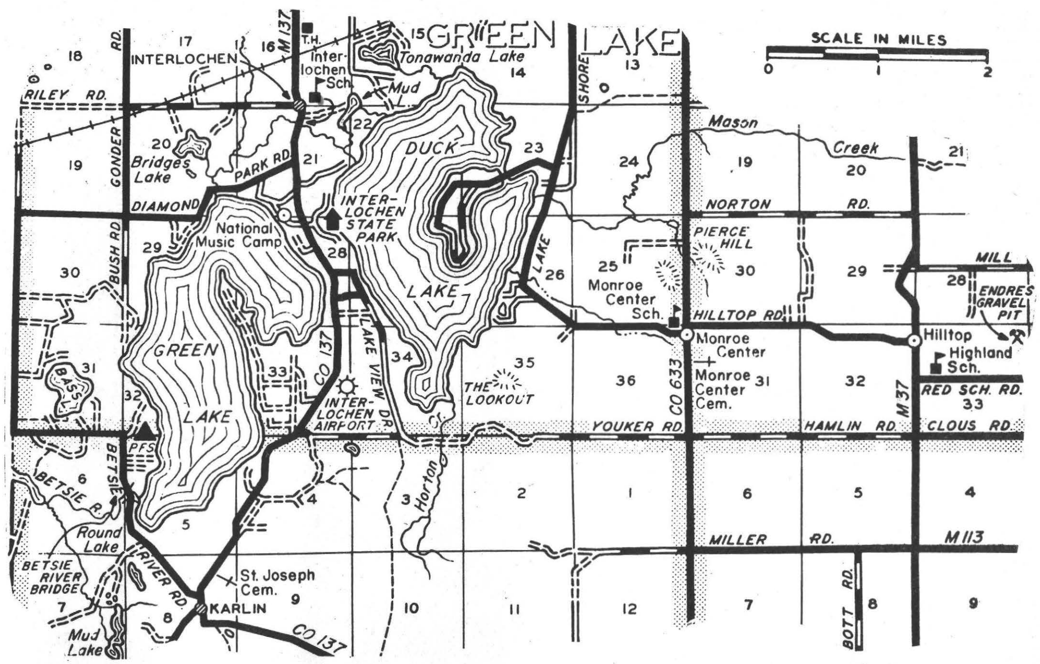
Extremes.--1942-68: Maximum stage, 6.16 ft June 26, 27, 1954; minimum, 4.18 ft Oct. 24, 1946, Sept. 1, 2, 1963.

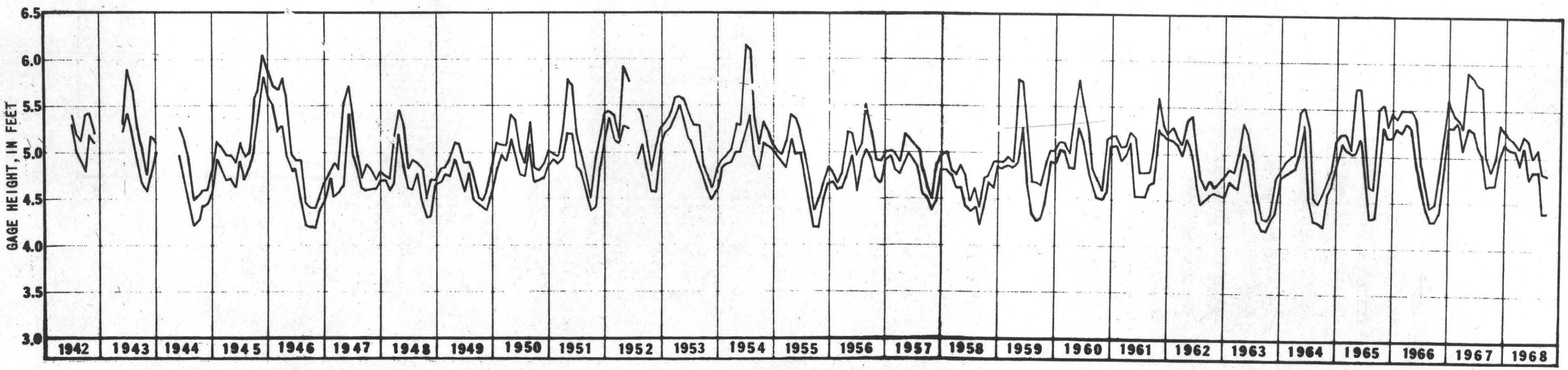
Regulation or control.--None.

Remarks.--The principal inlet is the outlet of Duck Lake. The outlet, Betsie River, is at the south end of Green Lake.

The following discharge measurements have been made on Betsie River at highway bridge, 1 mile northwest of Karlin, Mich.

Date	Discharge (cfs)
Nov. 21, 1944	43.4
Oct. 17, 1945	84.8
Jan. 30, 1946	109
Apr. 23, 1946	83.4
July 10, 1946	45.6
Oct. 28, 1946	33.7
Dec. 30, 1946	43.4
May 16, 1947	133
July 28, 1947	44.3
Oct. 7, 1947	44.8
Jan. 15, 1948	47.7
May 17, 1948	76.8
Aug. 12, 1948	30.4
Oct. 8, 1948	25.5
Jan. 4, 1949	50.8
Apr. 14, 1949	75.0
Aug. 11, 1949	25.0
Oct. 17, 1949	24.9
Dec. 22, 1949	46.5
Mar. 29, 1950	67.3
July 25, 1950	38.4
Oct. 18, 1950	39.1
Jan. 31, 1951	54.5
Apr. 23, 1951	128
July 26, 1951	47.4
Oct. 8, 1951	46.3
Jan. 21, 1952	95.0
Apr. 23, 1952	149
July 29, 1952	66.2
Oct. 14, 1952	23.4
Jan. 9, 1953	60.5
Apr. 23, 1953	84.2
July 27, 1953	50.4
Oct. 20, 1953	31.1
Jan. 28, 1954	51.0
Apr. 19, 1954	80.0
July 14, 1954	110
Oct. 5, 1954	60.0
Jan. 20, 1955	57.5
Apr. 6, 1955	78.0
July 26, 1955	29.8
Oct. 20, 1955	23.1
Jan. 13, 1956	47.1
Apr. 12, 1956	80.9
July 30, 1956	48.1
Oct. 2, 1956	39.6
Jan. 7, 1957	55.8
Apr. 30, 1957	63.6
July 25, 1957	40.3
Oct. 15, 1957	27.9
Jan. 29, 1958	62.3
Apr. 4, 1958	55.4
July 29, 1958	29.2
Oct. 23, 1958	39.4
Jan. 20, 1959	51.6
Apr. 15, 1959	102
July 8, 1959	32.9
Oct. 27, 1959	50.9
Jan. 25, 1960	75.2
Jan. 30, 1961	64.8
Apr. 18, 1961	89.2
July 14, 1961	34.4
Oct. 11, 1961	80.1
Apr. 17, 1962	97.7
July 12, 1962	31.2
Oct. 10, 1962	42.2
Jan. 10, 1963	53.4
Apr. 16, 1963	101
July 10, 1963	27.8
Oct. 9, 1963	24.3
Jan. 21, 1964	53.8
Apr. 14, 1964	83.7
July 14, 1964	29.7
Oct. 8, 1964	34.6
Jan. 14, 1965	62.9
Apr. 8, 1965	62.5
July 9, 1965	27.6
Oct. 11, 1965	79.2
Jan. 5, 1966	85.8
Apr. 6, 1966	105
July 14, 1966	25.1
Oct. 20, 1966	39.0
Jan. 12, 1967	94.3
Apr. 5, 1967	105
July 18, 1967	57.1
Oct. 3, 1967	37.5
Jan. 3, 1968	71.0
Apr. 12, 1968	85.4
July 22, 1968	43.4





Monthly maximum and minimum stages for Green Lake near Karlin, Mich.

GRAND TRAVERSE COUNTY

Long Lake near Traverse City, Mich.

Location.--Lat 44°41'19", long 85°45'15", in many sections, T.27 N., R.12 W., 8.5 miles southwest of Traverse City.

Surface area.--2,860 acres.

Maximum depth.--88 ft.

Drainage area at outlet.--23.1 sq mi.

Records available.--July 1942 to September 1943 except period December to May.

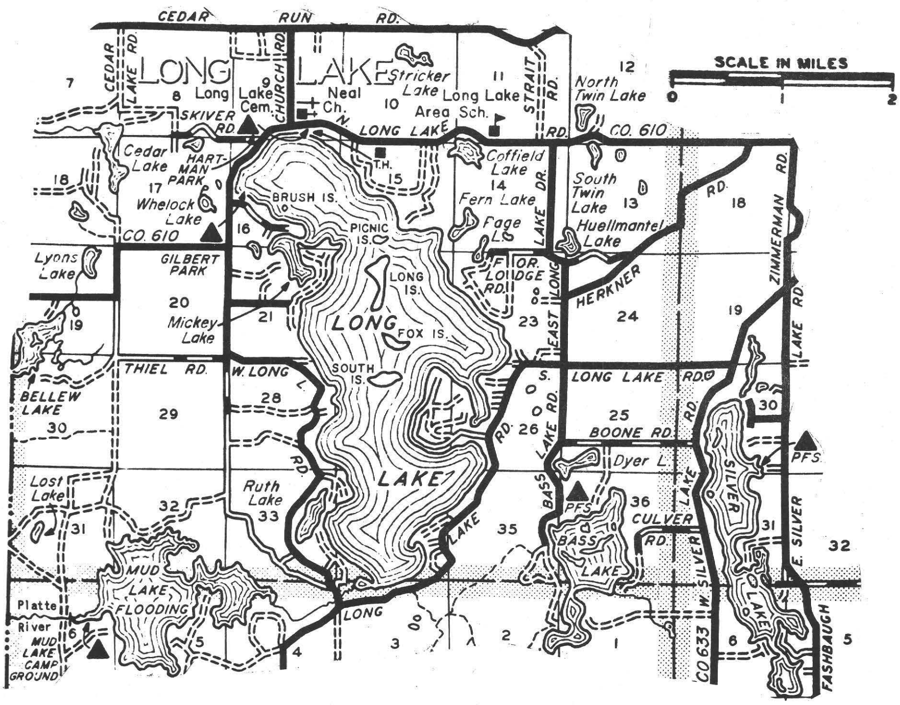
Gage.--Staff gage read daily. Datum of gage not determined.

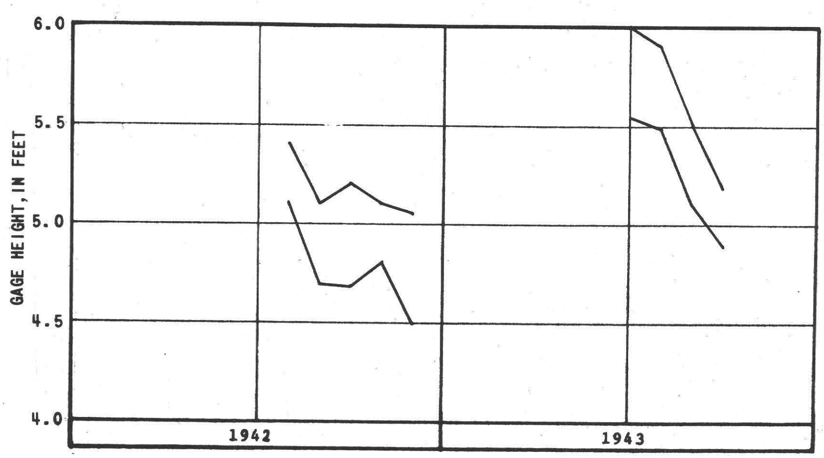
Established legal level.--None known.

Extremes.--1942-43; Maximum stage observed, 6.00 ft June 25-27, 29, 1943; minimum observed, 4.50 ft Nov. 28, 29, 1942.

Regulation or control.--None.

Remarks.--There are no inlets to Long Lake. The outlet, Platte River, is at the south end of the lake. No discharge measurements have been made at the outlet of Long Lake.





Monthly maximum and minimum stages for Long Lake near Traverse City, Mich.

GRATIOT COUNTY

Halfmoon Lake near Riverdale, Mich.

Location.--Lat 43°27'08", long 84°49'52", in secs. 5 and 6, T.12 N., R.4 W., 4.5 miles north of Riverdale.

Surface area.--80 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--Not determined.

Records available.--August 1957 to July 1961 except period January to March 1961.

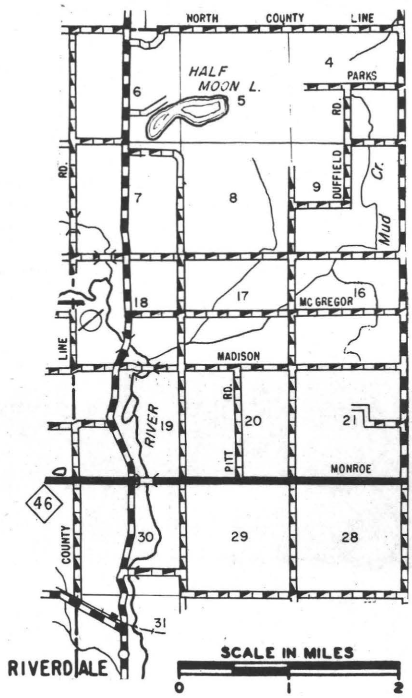
Gage.--Staff gage read daily. Datum of gage is 813.51 ft above mean sea level (levels by Michigan Department of Natural Resources).

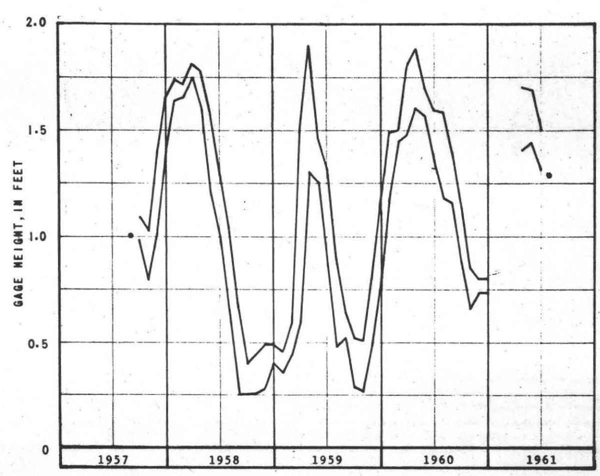
Established legal level.--None known.

Extremes.--1957-61: Maximum stage observed, 1.90 ft Apr. 3, 1959; minimum observed, 0.26 ft Aug. 19, Sept. 16, Oct. 6, 7, 1958.

Regulation or control.--None.

Remarks.--There is no inlet or outlet to Halfmoon Lake.
An engineering lake-level control study was completed in 1960 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Halfmoon Lake near Riverdale, Mich.

HILLSDALE COUNTY

Baw Beese Lake near Hillsdale, Mich.

Location.—Lat 41°54'17", long 84°36'56", in many sections, Tps. 6 and 7 S., Rs. 2 and 3 W., 0.5 mile southeast of Hillsdale.

Surface area.—474 acres.

Maximum depth.—71 ft.

Drainage area at outlet.—12.5 sq mi.

Records available.—June 1961 to September 1968.

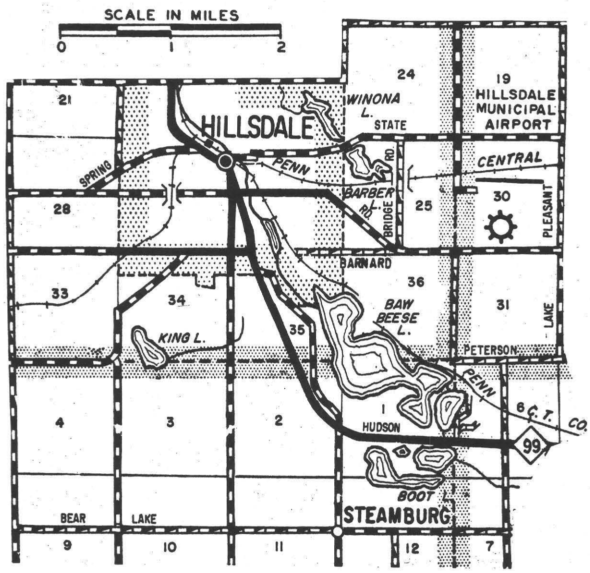
Gage.—Staff gage read daily. Datum of gage is 1,080.97 ft above mean sea level (levels by Michigan Department of Natural Resources).

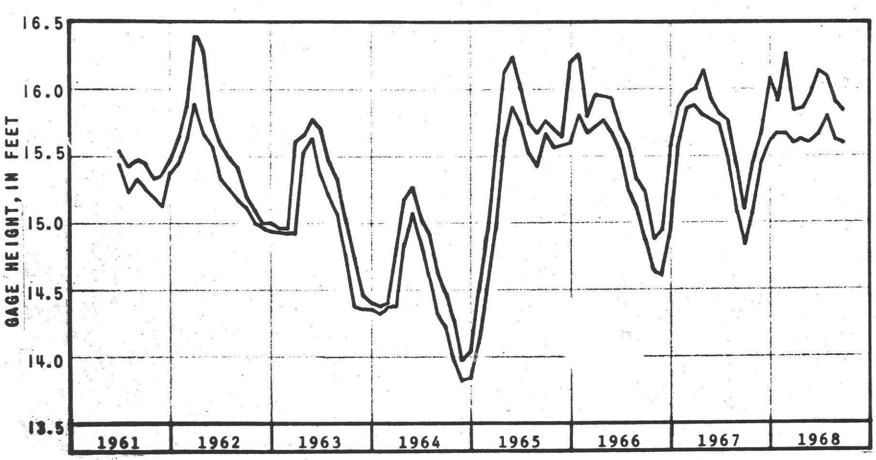
Established legal level.—None known.

Extremes.—1961-1968: Maximum stage, 16.41 ft Mar. 22-25, 1962; minimum, 13.82 ft Nov. 26, 1964.

Regulation or control.—None.

Remarks.—Baw Beese Lake includes First, Second, Third, and Fourth Lakes. Its main inlet enters at the east end of Fourth Lake. An inlet from Boot Lake enters the south side of Fourth Lake. The outlet is located at the northwest end of Baw Beese Lake and flows into a mill pond at Hillsdale, thence to the St. Joseph River. No discharge measurements are available on the inlets or outlet. See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Baw Beese Lake near Hillsdale, Mich.

HOUGHTON COUNTY

Bear Lake near Calumet, Mich.

Location.--Lat 47°14'19", long 88°35'19", in secs. 22, 23, and 27, T.56 N., R.34 W., 6 miles west of Calumet.

Surface area.--180 acres.

Maximum depth.--6 ft.

Drainage area at outlet.--1.62 sq mi, approximately.

Records available.--May 1961 to September 1968 except winter periods.

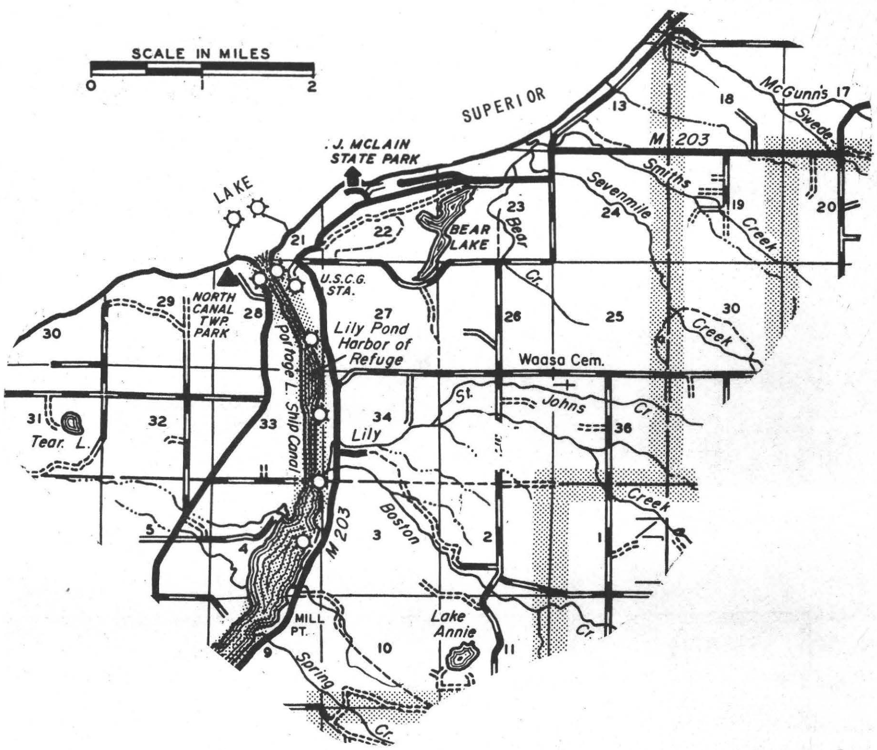
Gage.--Staff gage read intermittently. Datum of gage not determined.

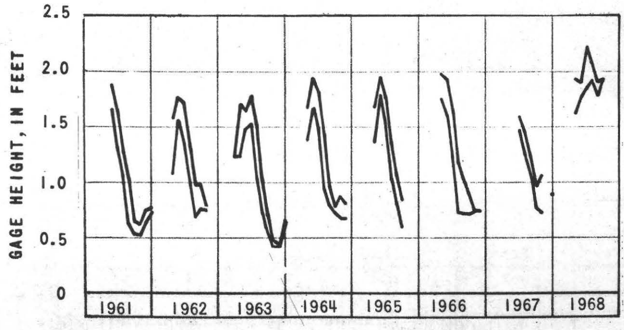
Established legal level.--None known.

Extremes.--1961-68: Maximum stage observed, 2.23 ft June 14, 1968; minimum observed, 0.42 ft Oct. 15, Nov. 1, 1963.

Regulation or control.--A small earth dam at outlet, with concrete spillway and stop logs, controls lake level.

Remarks.--There are no surface inlets to lake. The outlet, unnamed, leaves the north end of the lake and flows about 0.8 mile to Lake Superior.
No discharge measurements are available on outlet, however at times, there is no flow.





Monthly maximum and minimum stages for Bear Lake near Calumet, Mich.

HOUGHTON COUNTY

Otter Lake near Arnheim, Mich.

Location.--Lat 46°55'45", long 88°33'22", in many sections, T.52 N., R.34 W., 4 miles west of Arnheim.

Surface area.--935 acres.

Maximum depth.--29 ft.

Drainage area at outlet.--705 sq mi.

Records available.--November 1942 to September 1968.

Gage.--Chain gage to 6.74 ft with staff gage above 6.74 ft, read daily. Datum of gage is 605.98 ft above mean tide at New York City (July 22, 1943 U.S. Corps of Engineers bench mark). Prior to July 18, 1967, staff gage at same datum.

Established legal level.--None known.

Extremes.--1942-68: Maximum stage, 14.57 ft Apr. 20, 1952; minimum, 0.20 ft July 30, 31, 1963.

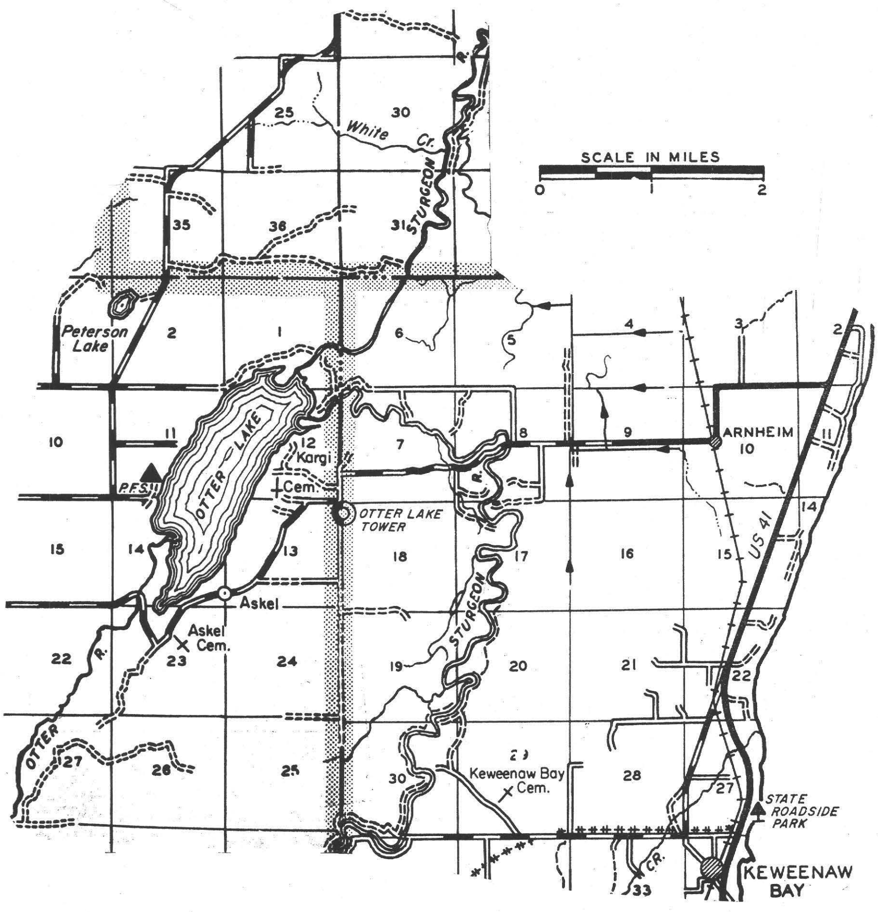
Regulation or control.--Some fluctuations in lake level occur as a result of regulation by Prickett dam on the Sturgeon River, 34 miles upstream from Otter Lake.

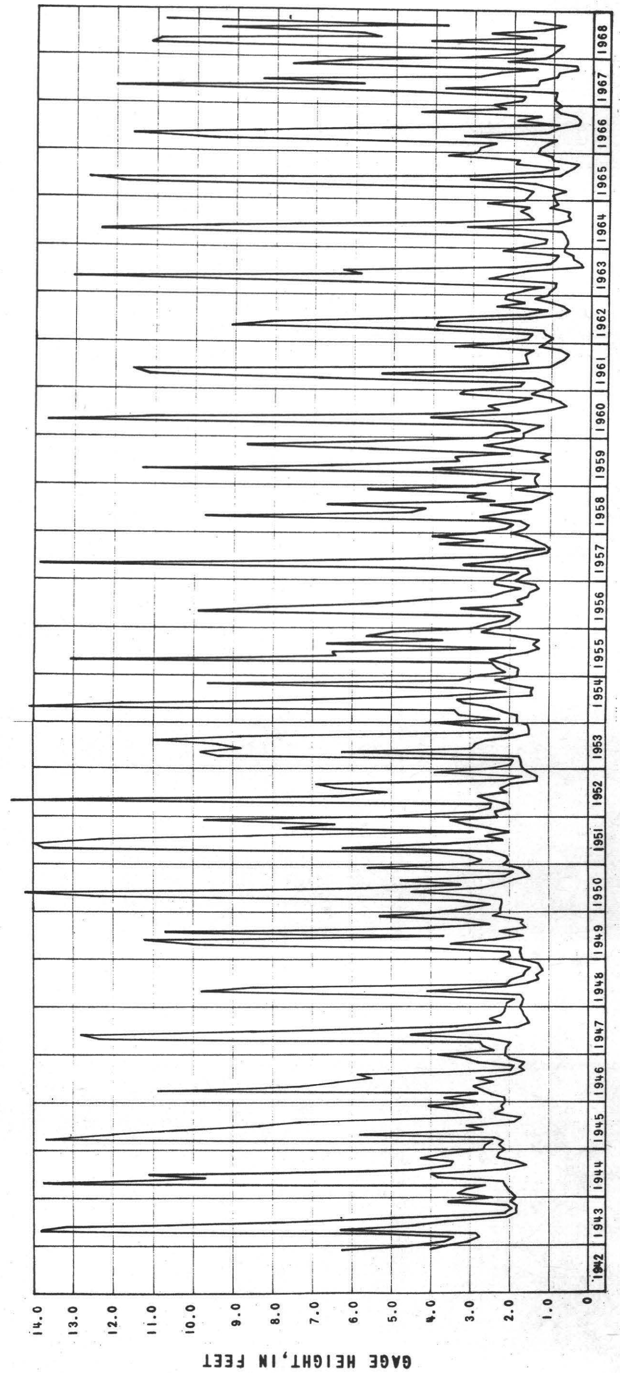
Remarks.--There are two large inlets to Otter Lake, Sturgeon River on the northeast side and Otter River on the southwest side. In addition to these, several small streams flow into the lake from the hills on the east and west sides. The outlet is Sturgeon River, which leaves the lake on the northeast side about 0.5 mile north of where it enters the lake.

Discharge records have been collected at a regular gaging station on the Otter River, 5.5 miles upstream from the lake since November 1962. From October 1942 to October 1962 this station was located 3 miles upstream from Otter Lake. Discharge records are published in U.S. Geological Survey Water-Supply Papers as "Otter River near Elo, Mich." Discharge records on the Sturgeon River, upstream from the lake, covering the periods February 1932 to June 1941, October 1942 to September 1968, are published as "Sturgeon River near Alston, Mich." This station is 34 miles upstream of Otter Lake.

A gaging station is located on Sturgeon River, 0.2 mile below Otter Lake. Records have been collected and published since October 1942 as "Sturgeon River near Arnheim, Mich." A series of discharge measurements were made on the outlet by the U.S. Corps of Engineers, Duluth District, between September 1928 and January 1932, and during April 1941. However, no stage record was collected during these periods.

A report on the Sturgeon River which includes Otter Lake, rendered under the provisions of House Document No. 308, Sixty-ninth Congress, 1st Session, was completed in December 1932 and was published as House Document No. 97, Seventy-third Congress, 1st Session. A second report, "Review and Survey Report on Sturgeon River, Mich." was completed in September 1943. Both reports are by the U.S. Corps of Engineers.





Monthly maximum and minimum stages for Otter Lake near Arnheim, Mich.

HOUGHTON COUNTY

Rice Lake near Lake Linden, Mich.

Location.--Lat 47°09'38", long 88°16'17", in secs. 7, 8, 17, 18, and 19, T.55 N., R.31 W., 6.8 miles southwest of Lake Linden.

Surface area.--680 acres.

Maximum depth.--9 ft.

Drainage area at outlet.--7.57 sq mi.

Records available.--June 1959 to September 1962 except winter and spring periods.

Gage.--Staff gage read daily. Datum of gage not determined.

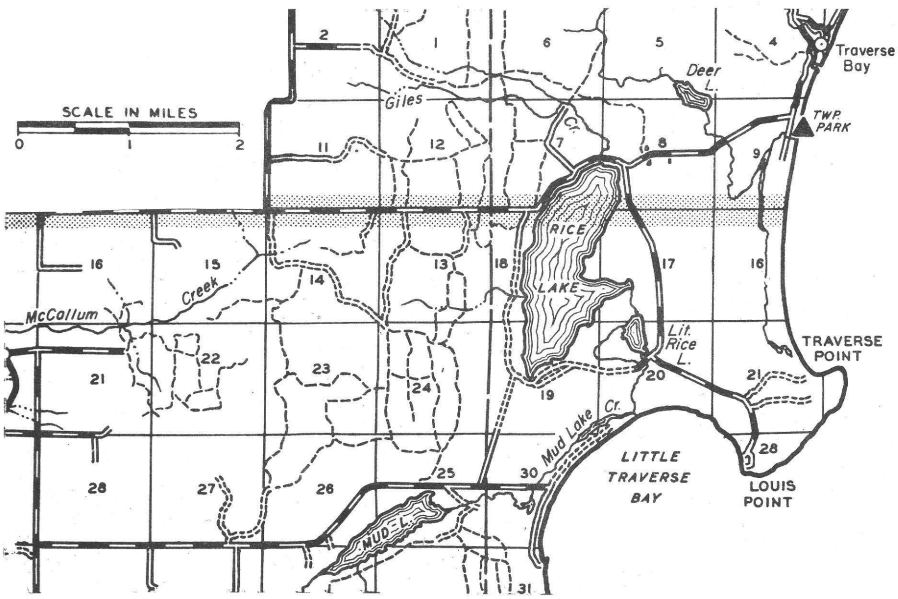
Established legal level.--None known.

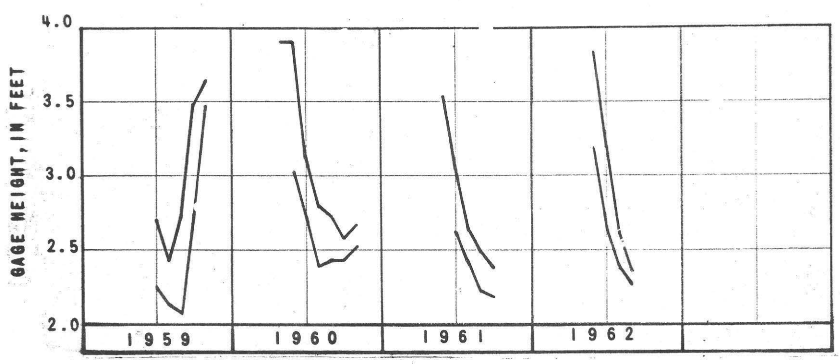
Extremes.--1959-62: Maximum stage, 3.90 ft sometime in April or May 1960 (from highwater mark); minimum stage observed, 2.06 ft Aug. 3-5, 1959.

Regulation or control.--A small dam, manipulated with 10x14 inch channel irons, is located on the outlet below Little Rice Lake and controls the lake level. In addition, there is some beaver activity which at times has a controlling effect on lake levels.

Remarks.--The main inlet is Giles Creek. There are also several small unnamed streams which flow into the lake. The outlet flows from the eastern arm of the lake thru Little Rice Lake into Little Traverse Bay of Lake Superior.

No discharge measurements are available on the inlets or outlet.





Monthly maximum and minimum stages for Rice Lake near Lake Linden, Mich.

HOUGHTON COUNTY

Twin Lakes (Gerald and Roland) near Winona, Mich.

Location.--Lat 46°53'01", long 88°51'31", in many sections, T.52 N., R.36 W., 2.4 miles northeast of Winona.

Surface area.--641 acres (Gerald, 349 acres; Roland, 292 acres).

Maximum depth.--Gerald, 41 ft; Roland, 41 ft.

Drainage area.--11.7 sq mi, at outlet of Roland Lake.

Records available.--September 1957 to September 1968 except April 1963 to May 1964 and winter periods.

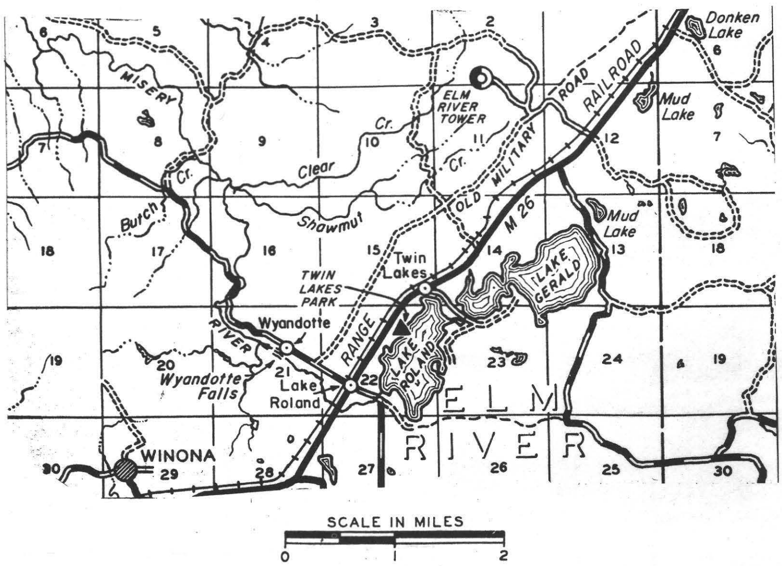
Gage.--Staff gage read intermittently. Datum of gage not determined.

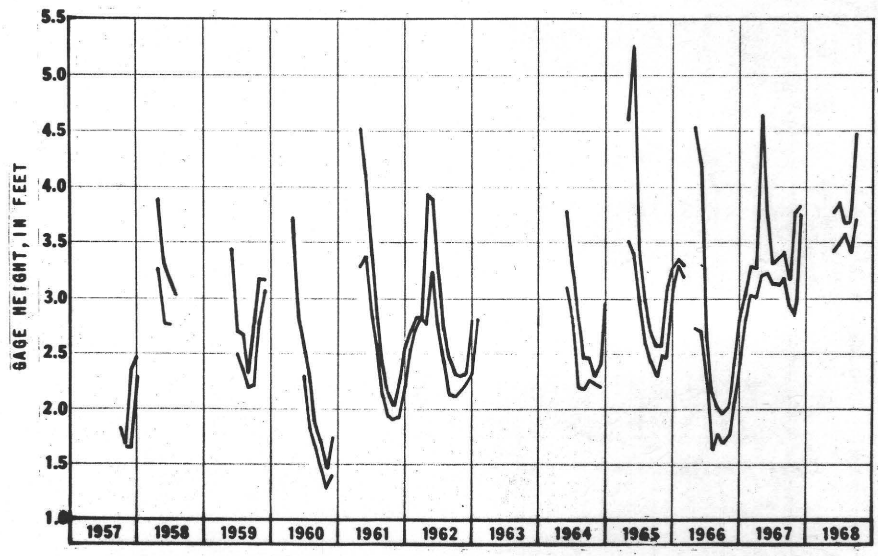
Established legal level.--None known.

Extremes.--1957-68: Maximum stage observed, 5.28 ft May 7, 1965; minimum observed, 1.28 ft Oct. 21, 23, 24, 1960.

Regulation or control.--Two rectangular concrete culverts equipped for installing stop logs are located at Roland Lake outlet and control the lake level.

Remarks.--Twin Lakes consists of Roland and Gerald Lakes which are connected by a short, unobstructed channel. There are several small unnamed streams flowing into the lakes. Misery River is the outlet, leaving the southwest end of Roland Lake and flowing northwest about 10 miles to Lake Superior.
No discharge measurements are available on inlets or outlet.





Monthly maximum and minimum stages for Twin Lakes near Winona, Mich.

INGHAM COUNTY

Lake Lansing near Haslett, Mich.

Location.--Lat 42°45'45", long 84°24'37", in secs. 2, 3, 10, and 11, T.4 N., R.1 W., 1.0 mile north of Haslett.

Surface area.--453 acres.

Maximum depth.--37 ft.

Drainage area at outlet.--4 sq mi, approximately.

Records available.--October 1946 to August 1950; July 1960 to September 1968 except some winter periods.

Gage.--Staff gage read intermittently. Datum of gage is 848.88 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1946-50; 1960-68: Maximum stage observed, 3.48 ft June 29, 1968; minimum observed, 1.22 ft Sept. 17, 1964.

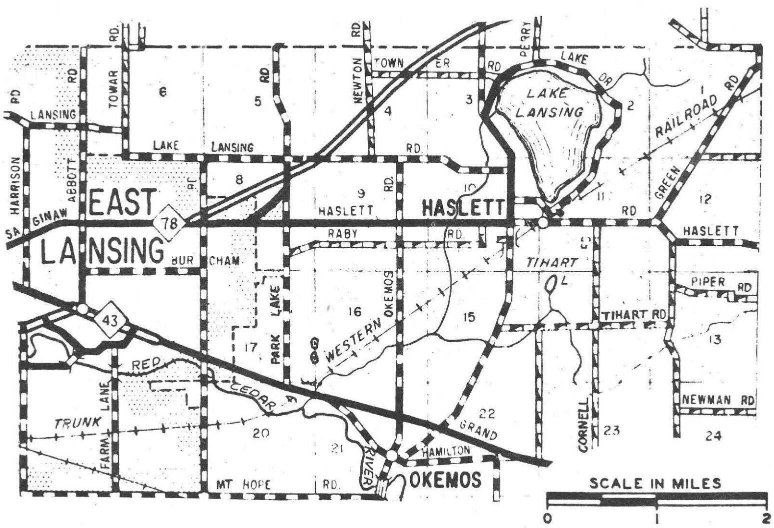
Regulation or control.--A fixed crest concrete dam exists at the lake outlet.

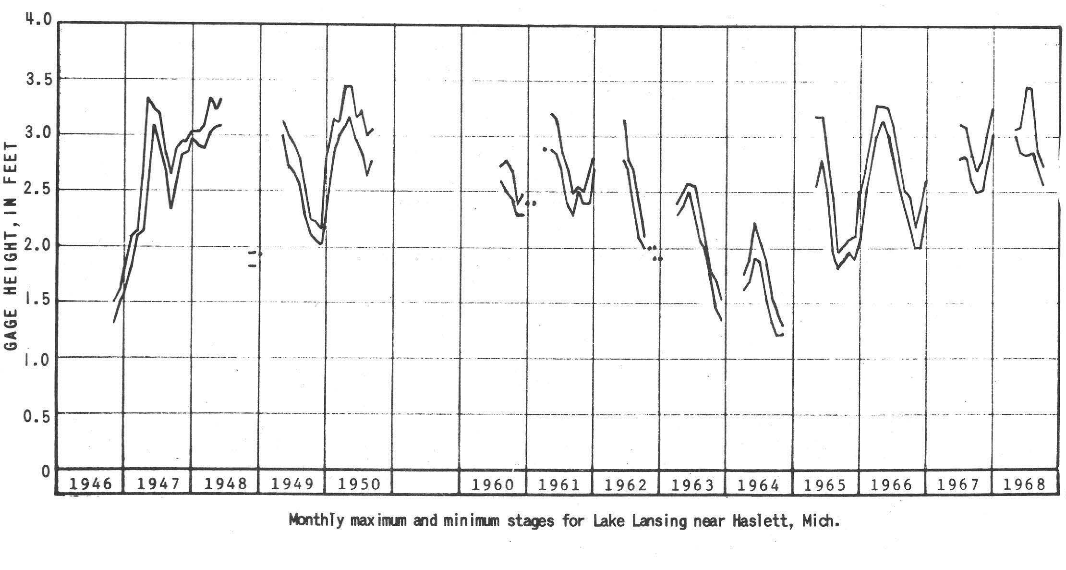
Remarks.--The inlet is located at the northeast side of the lake. The outlet, at the northwest side of lake, is tributary to Red Cedar River.

The following discharge measurements were made on the outlet in the vicinity of the dam.

Date	Discharge (cfs)	Date	Discharge (cfs)
Apr. 24, 1947	13.0	Dec. 2, 1948	0
Nov. 4, 1947	1.58	Mar. 29, 1949	4.35
Nov. 4, 1947	1.87	June 23, 1949	.90
Feb. 13, 1948	1.02	June 24, 1949	.77
June 8, 1948	.95	Sept. 28, 1949	0
Aug. 23, 1948	0	Sept. 8, 1950	.68

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Lake Lansing near Haslett, Mich.

IONIA COUNTY

Morrison Lake near Clarksville, Mich.

Location.--Lat 42°52'07", long 85°12'19" in secs. 2, 35, and 36, Tps.5 and 6 N., R.8 W., 2.6 miles northeast of Clarksville.

Surface area.--330 acres.

Maximum depth.--36 ft.

Drainage area at outlet.--10.6 sq mi.

Records available.--May to November 1944; October 1946 to December 1947; May to August 1948; December 1948 to September 1950; January to May 1958; July 1958 to January 1959; March 1959 to June 1961.

Gage.--Staff gage read daily. Datum of gage is 805.64 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--Winter, 806.0 ft; summer, 807.0 ft above mean sea level, established by Circuit Court on June 20, 1961.

Extremes.--1944, 1946-50; 1958-61: Maximum stage observed, 3.30 ft Mar. 31, Apr. 2, 1960; minimum observed, 0.03 ft Oct. 17, 1946.

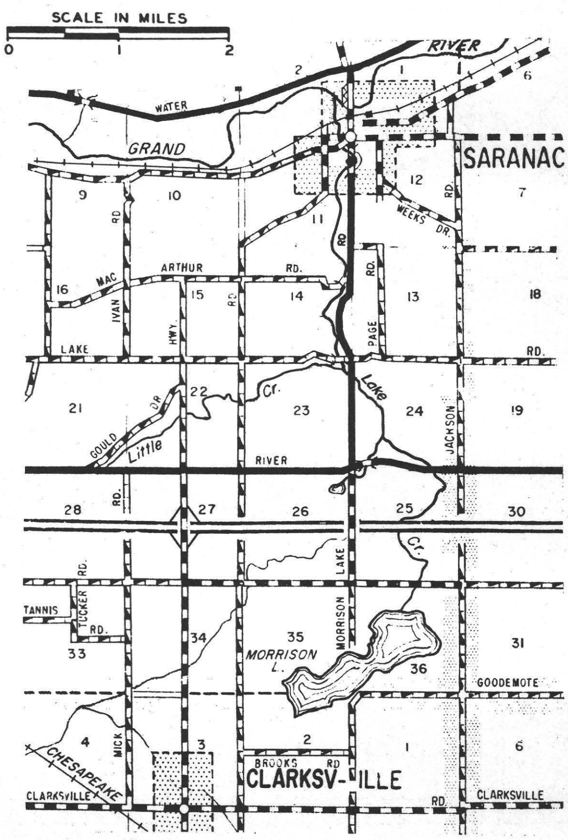
Regulation or control.--None.

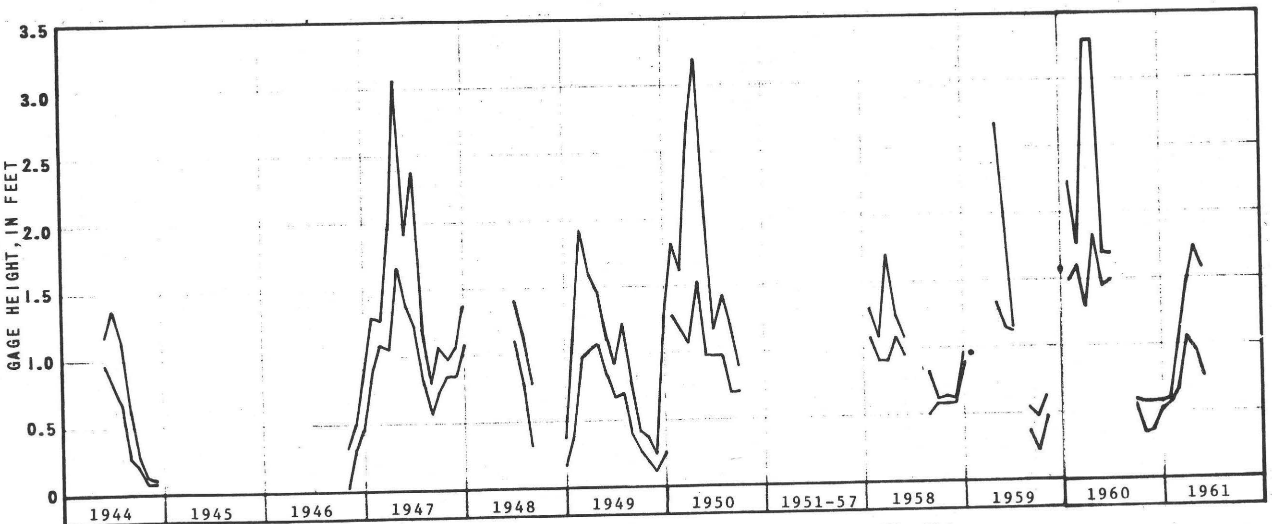
Remarks.--There are several small unnamed intermittent streams that enter Morrison Lake. The outlet, Lake Creek, flows into the Grand River at Saranac.

An engineering lake-level control study was completed in 1959 by the Michigan Department of Natural Resources.

The following discharge measurements have been made on Lake Creek (published as Morrison Lake outlet) at the outlet of Morrison Lake (drainage area, 10.6 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
May 5, 1944	8.41	May 12, 1947	14.3
May 22, 1945	25.9	Oct. 21, 1947	.77
June 23, 1945	2.37	Jan 8, 1948	3.32
Mar. 7, 1946	51.2	May 28, 1948	5.26
Mar. 13, 1946	42.1	Sept. 7, 1948	0
Apr. 18, 1946	3.97	Dec. 3, 1948	0
May 20, 1946	2.84	Mar. 22, 1949	4.37
Aug. 29, 1946	0	June 13, 1949	.18
Jan. 27, 1947	7.13	Sept. 12, 1949	0
Apr. 6, 1947	92.5	Jan 23, 1950	13.2
Apr. 9, 1947	74.2	Apr. 13, 1950	40.1
Apr. 18, 1947	46.4	Aug. 7, 1950	3.94





Monthly maximum and minimum stages for Morrison Lake near Clarksville, Mich.

IOSCO COUNTY

Bass Lake near McIvor, Mich.

Location.--Lat 44°20'08", long 83°39'05", in sec. 1, T.22 N., R.6 E., 7 miles north of McIvor.

Surface area.--49.5 acres.

Maximum depth.--22 ft.

Drainage area.--Not determined.

Records available.--May 1949 to December 1950 except period January to June 1950.

Gage.--Staff gage read twice weekly. Datum of gage is 770.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

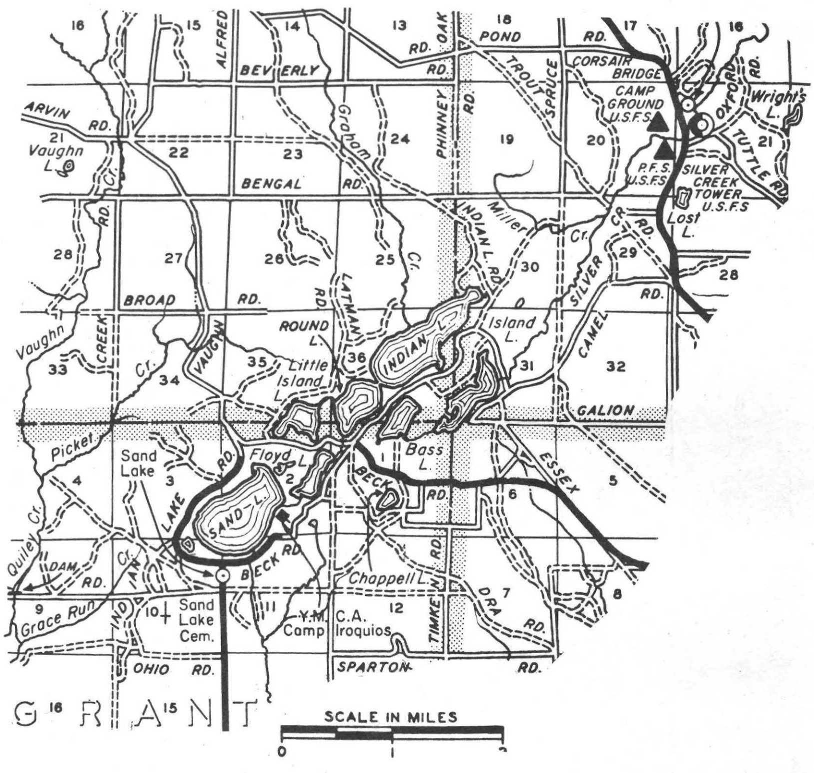
Established legal level.--None known.

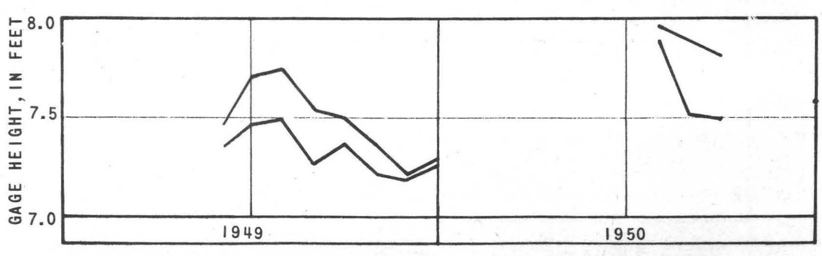
Extremes.--1949-50: Maximum stage observed, 7.96 ft July 21, 1950, minimum observed, 7.18 ft Nov. 11, 1949.

Regulation or control.--Log dam in outlet located about 500 ft below Bass Lake.

Remarks.--Bass Lake has no inlet; the outlet is to Island Lake. No discharge measurements have been made on the outlet.

An engineering lake-level control study was completed in 1950 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Bass Lake near McIvor, Mich.

IOSCO COUNTY

Chain Lake near South Branch, Mich.

Location.--Lat 44°29'08", long 83°50'52", in secs. 8 and 9, T.24 N., R.5 E., 2.3 miles northeast of South Branch.

Surface area.--91.0 acres.

Maximum depth.--18 ft.

Drainage area.--Not determined.

Records available.--April 1961 to June 1962.

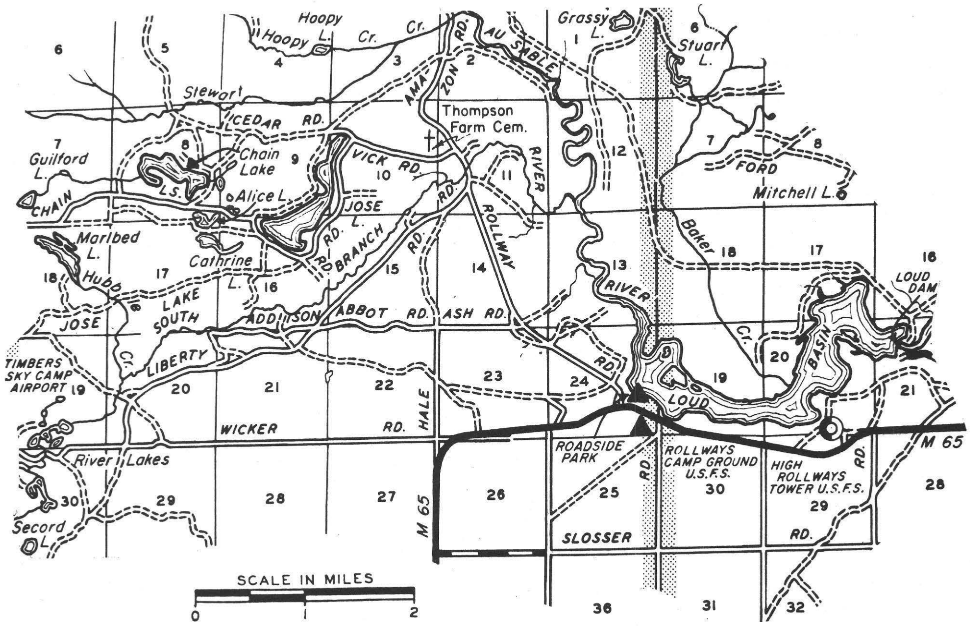
Gage.--Staff gage read weekly. Datum of gage not determined.

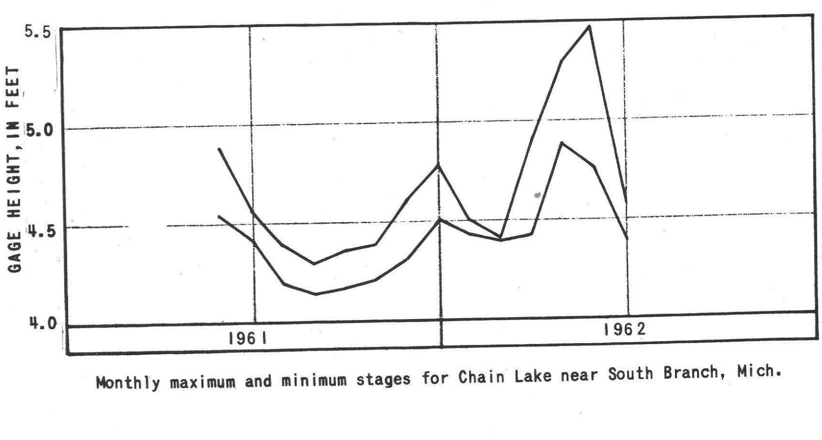
Established legal level.--None known.

Extremes.--1961-62; Maximum stage observed, 5.46 ft May 4, 1962; minimum observed, 4.14 ft Aug. 23, 1961.

Regulation or control.--None.

Remarks.--There are several small inlets to Chain Lake. The outlet is at the east end of the lake. No discharge measurements have been made on the inlets or outlet.





Monthly maximum and minimum stages for Chain Lake near South Branch, Mich.

IOSCO COUNTY

Floyd Lake near McIvor, Mich.

Location.--Lat 44°19'58", long 83°39'51", in secs. 1 and 2, T.22 N., R.6 E., 6.5 miles north of McIvor.

Surface area.--41.0 acres.

Maximum depth.--17 ft.

Drainage area.--Not determined.

Records available.--May 1949 to December 1950 except period January to June 1950.

Gage.--Staff gage read twice weekly. Datum of gage is 770.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

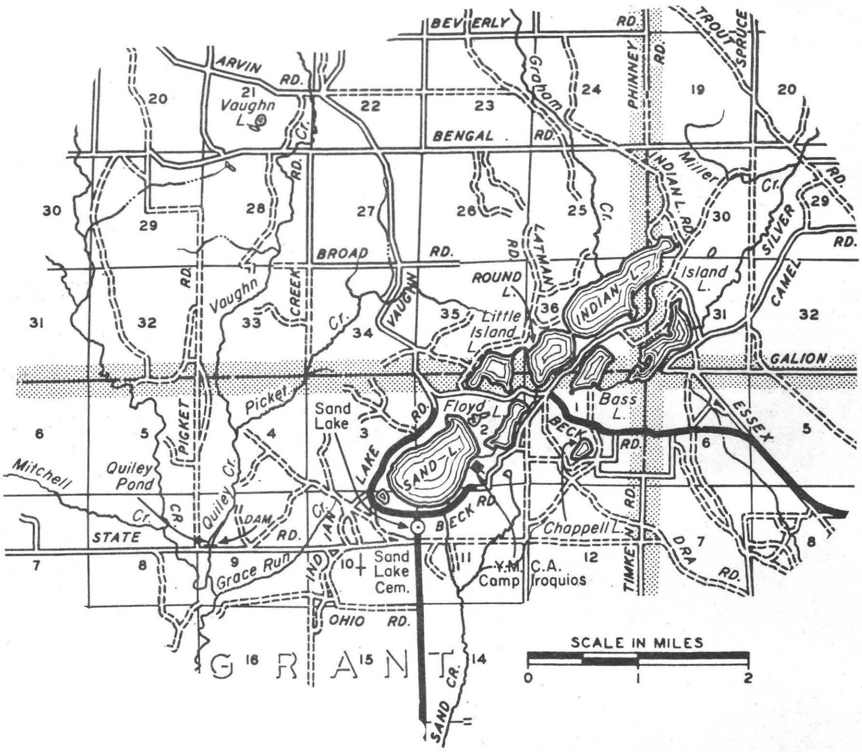
Established legal level.--778.6 ft above mean sea level, established by Circuit Court on September 22, 1959.

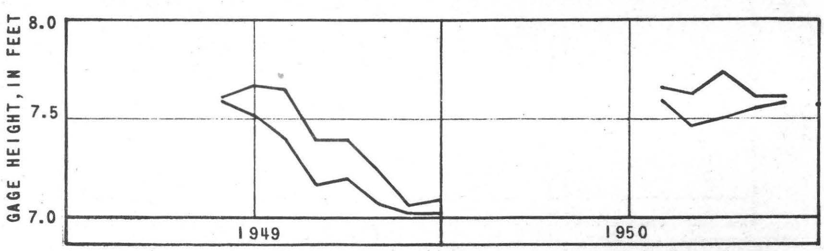
Extremes.--1949-50: Maximum stage observed, 7.74 ft Sept. 15, 1950; minimum observed, 7.02 ft Nov. 11, Dec. 16, 1949.

Regulation or control.--None.

Remarks.--Floyd Lake has an outlet to Sand Lake and an inlet from Round Lake. No discharge measurements have been made on the inlet or outlet.

An engineering lake-level control study was completed in 1950 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Floyd Lake near McIvor, Mich.

IOSCO COUNTY

Island Lake near McIvor, Mich.

Location.--Lat 44°20'33", long 83°38'12", in sec. 31, T.23 N., R.7 E., 7.3 miles north of McIvor.

Surface area.--87.0 acres.

Maximum depth.--17 ft.

Drainage area at outlet.--0.8 sq mi, approximately.

Records available.--May 1949 to December 1950 except period January to June 1950.

Gage.--Staff gage read twice weekly. Datum of gage is 770.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

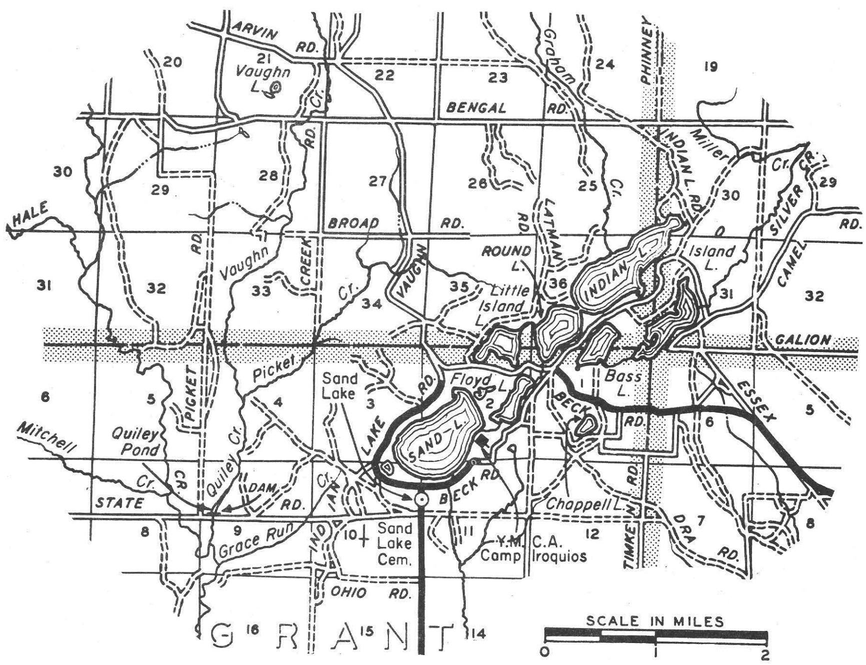
Established legal level.--None known.

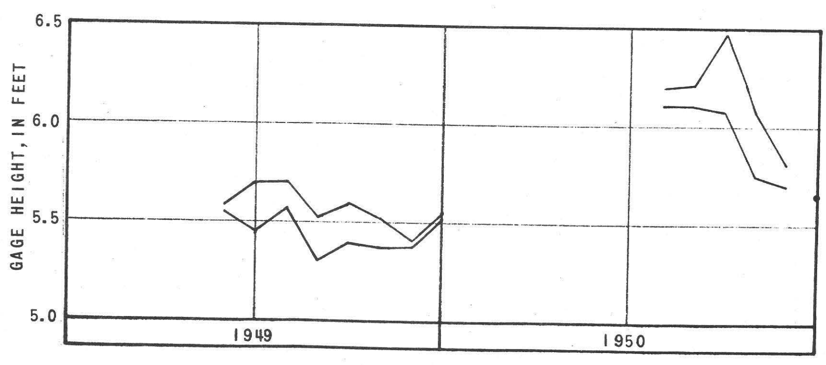
Extremes.--1949-50: Maximum stage observed, 6.46 ft Sept. 19, 1950; minimum observed, 5.30 ft Aug 27, 1949.

Regulation or control.--Log dam at outlet.

Remarks.--Island Lake has an inlet which flows from Bass Lake. The outlet is Silver Creek. No discharge measurements have been made on the inlet or outlet.

An engineering lake-level control study was completed in 1950 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Island Lake near McIvor, Mich.

IOSCO COUNTY

Little Island Lake near McIvor, Mich.

Location.--Lat 44°20'03", long 83°40'04", in sec. 2, T.22 N., R.6 E., 7 miles north of McIvor.

Surface area.--57.5 acres.

Maximum depth.--9 ft.

Drainage area.--Not determined.

Records available.--May 1949 to December 1950 except period January to June 1950.

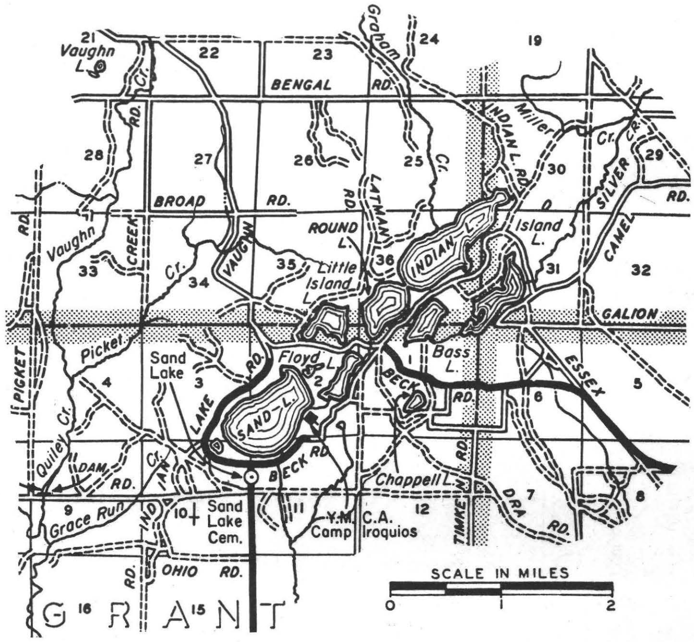
Gage.--Staff gage read twice weekly. Datum of gage is 770.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

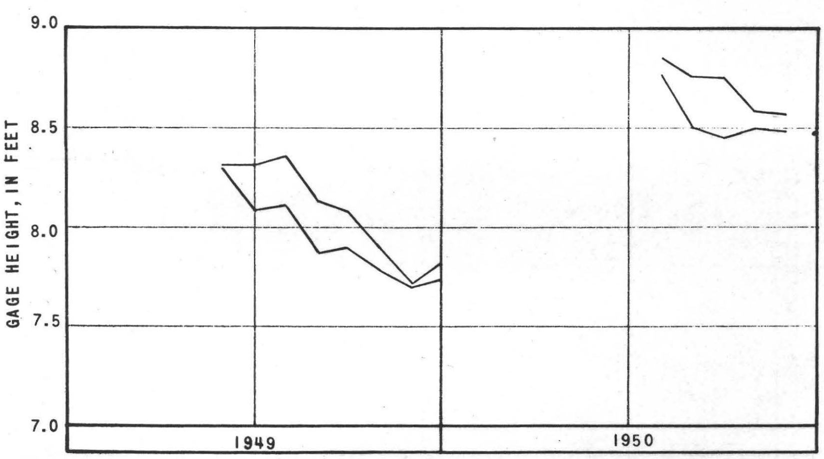
Established legal level.--None known.

Extremes.--1949-50: Maximum stage observed, 8.87 ft July 10, 1950; minimum observed, 7.70 ft Nov. 4, 8, 11, 1949.

Regulation or control.--None.

Remarks.--Little Island Lake has no inlet or outlet.
An engineering lake-level control study was completed in 1950 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Little Island Lake near McIvor, Mich.

IOSCO COUNTY

Round and Indian Lakes near McIvor, Mich.

Location.--Lat 44°20'07", long 83°39'48", in sec. 36, T.23 N., R.6 E., 7 miles north of McIvor.

Surface area.--91.5 acres (Round), 218 acres (Indian).

Maximum depth.--15 feet (Round and Indian).

Drainage area.--Not determined.

Records available.--May 1949 to December 1950 except period January to June 1950.

Gage.--Staff gage read twice weekly. Datum of gage is 770.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

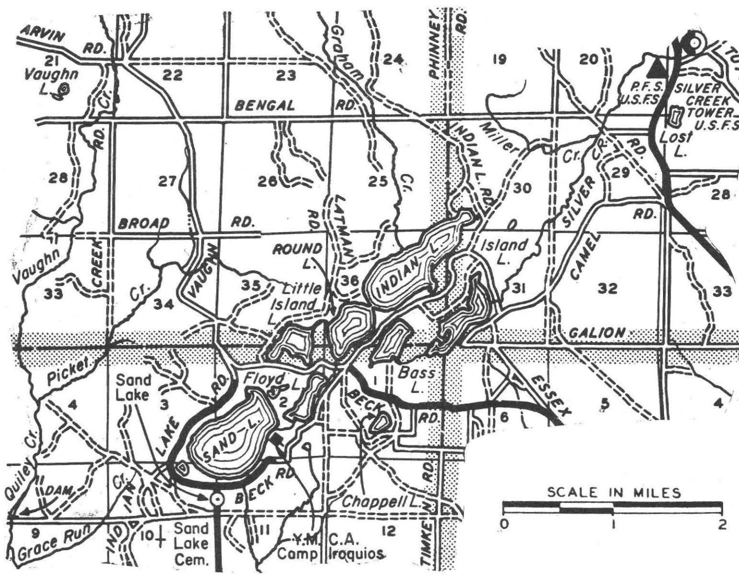
Established legal level.--None known.

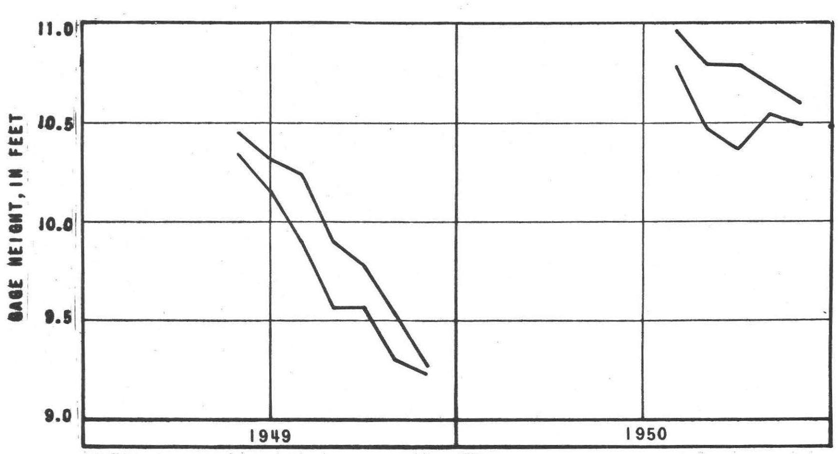
Extremes.--1949-50: Maximum stage observed, 10.96 ft July 9, 1950; minimum observed, 9.23 ft Nov. 11, 1949.

Regulation or control.--Concrete dam with fixed crest at outlet of Round Lake.

Remarks.--Round Lake and Indian Lake are connected by a short wide channel and are at a common level under ordinary conditions. The inlet, Graham Creek, is at the north side of Indian Lake. The outlet, located at the south end of Round Lake, connects with Floyd Lake. No discharge measurements have been made on the inlet or outlet.

An engineering lake-level control study was completed in 1950 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Round and Indian Lakes near McIvor, Mich.

IOSCO COUNTY

Sand Lake near McIvor, Mich.

Location.--Lat 44°19'10", long 83°40'50", in secs. 2, 3, 10, and 11, T.22 N., R.6 E., 5.9 miles north of McIvor.

Surface area.--239 acres.

Maximum depth.--25 ft.

Drainage area at outlet.--11.0 sq mi, approximately.

Records available.--May 1949 to October 1951 except periods December 1949 to June 1950 and December 1950 to June 1951.

Gage.--Staff gage read daily. Datum of gage is 770.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

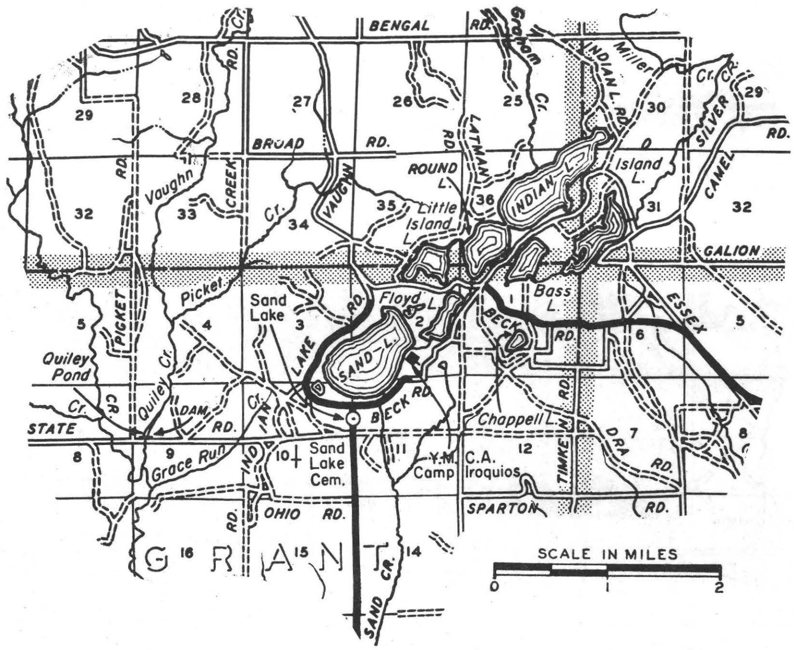
Established legal level.--None known.

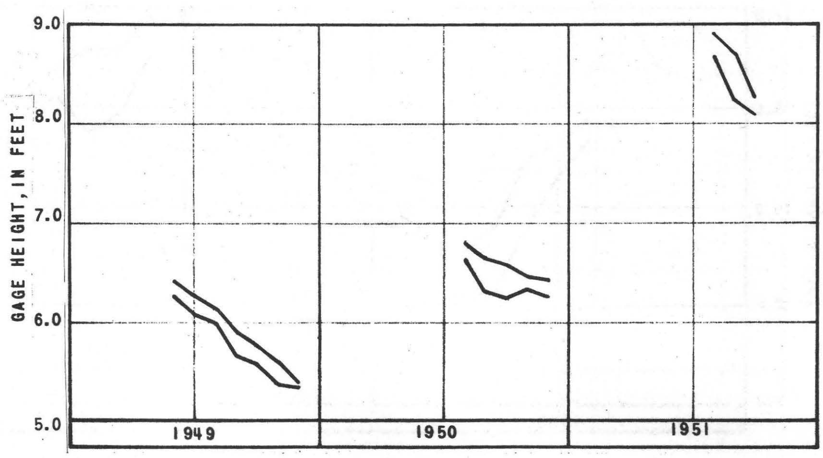
Extremes.--1949-51: Maximum stage observed, 8.90 ft July 6-11, 1951; minimum observed, 5.34 ft Nov. 5, 6, 1949.

Regulation or control.--None.

Remarks.--Sand Lake has an inlet which flows from Floyd Lake. The outlet, Sand Creek, is at the south end of the lake. No discharge measurements have been made on the inlet or outlet.

An engineering lake-level control study was completed in 1950 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Sand Lake near McIvor, Mich.

IOSCO COUNTY

Tawas Lake near East Tawas, Mich.

Location.--Lat 44°17'30", long 83°30'19", in many sections, T.22 N., R.8 E., 0.8 mile north of East Tawas.

Surface area.--1,600 acres.

Maximum depth.--5 ft.

Drainage area at outlet.--98 sq mi, approximately.

Records available.--April 1951 to December 1953.

Gage.--Staff gage read daily. Datum of gage is 580.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

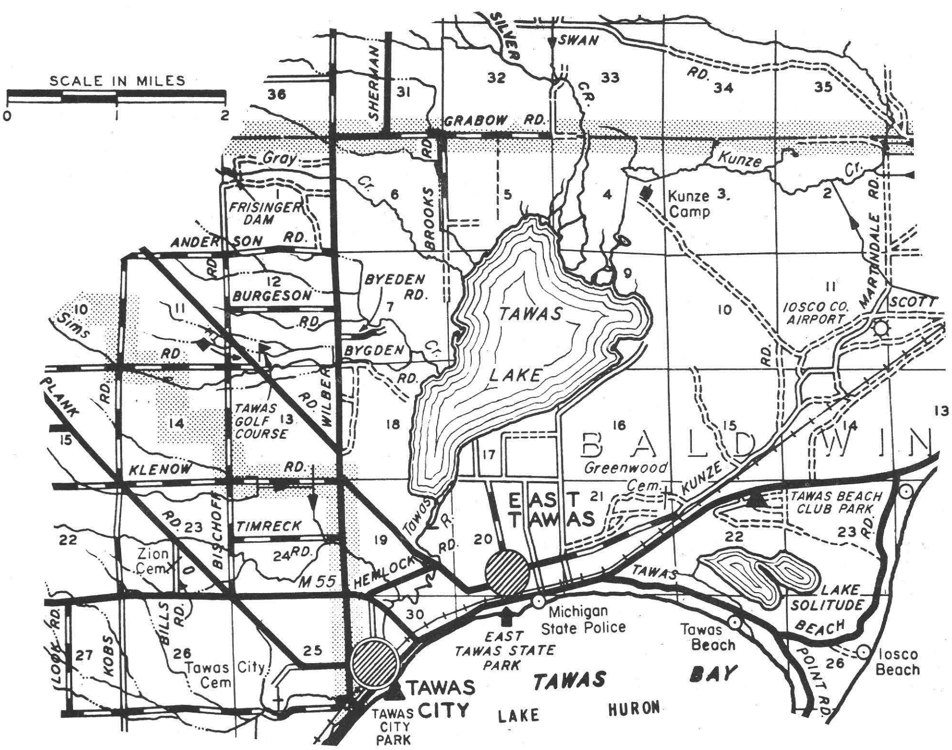
Established legal level.--582.5 ft above mean sea level, established by Circuit Court on October 6, 1959.

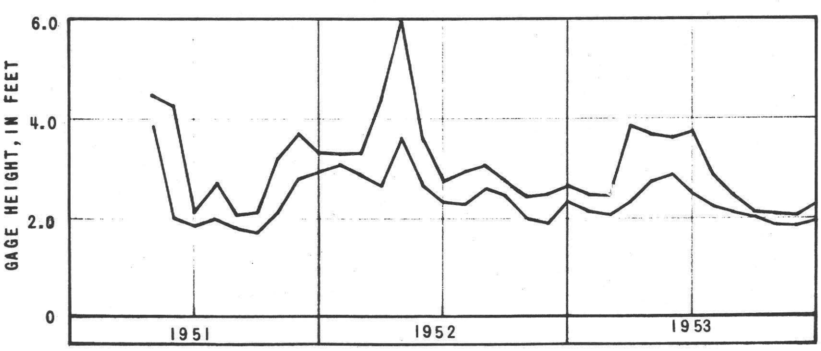
Extremes.--1951-53: Maximum stage, 6.00 ft Apr. 15, 1952; minimum, 1.76 ft Sept. 4, 5, 1951.

Regulation or control.--None.

Remarks.--There are many inlets to Tawas Lake of which Silver Creek is the largest. Silver Creek and Kunze Creek enter the lake at the northern end. Grays Creek, Sims Creek, and an unnamed inlet flow into the lake from the west. The outlet, Tawas River, leaves the lake at the south end and flows about two miles to Lake Huron. No discharge measurements are available on the inlets or outlet.

An engineering lake-level control study was completed in 1954 by the Michigan Department of Natural Resources. An addendum to this report was completed in 1959.





Monthly maximum and minimum stages for Tawas Lake near East Tawas, Mich.

IOSCO COUNTY

Van Etten Lake near Oscoda, Mich.

Location.--Lat 44°26'56", long 83°20'23", in many sections, T.24 N., R.9 E., 2 miles north of Oscoda.

Surface area.--1,320 acres.

Maximum depth.--32 ft.

Drainage area at outlet.--280 sq mi, approximately.

Records available.--March 1949 to September 1958.

Gage.--Staff gage read daily. Datum of gage is 580.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--589.20 ft above mean sea level, established by Circuit Court, in December 1944.

Extremes.--1949-58: Maximum stage, 13.90 ft Mar. 28, 1950; minimum, 4.90 ft Feb. 13-22, 1955.

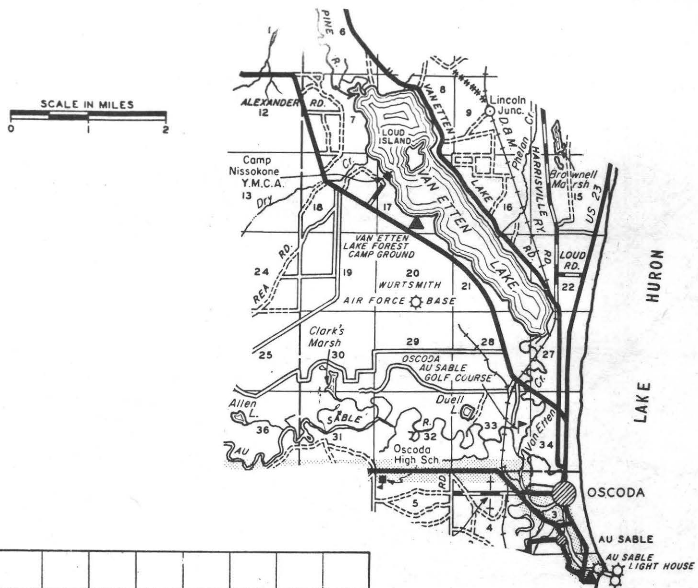
Regulation or Control.--Concrete-control dam at outlet. Two twenty-four foot bays with tainter gates are used to control the lake level and to discharge flood flows.

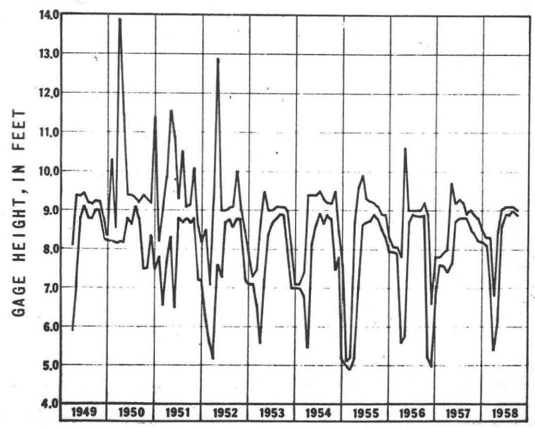
Remarks.--The main inlet is Pine River at the northwest end of lake. Other inlets are Dry Creek from the west and Phelan Creek from the east. Van Etten Creek is the outlet flowing from the south end of the lake to the AuSable River, a distance of about 3 miles.

Engineering lake-level control studies were completed in 1950 and 1955, by the Michigan Department of Natural Resources.

The following discharge measurements have been made on Pine River, 1.5 miles upstream from Van Etten Lake.

Date	Discharge (cfs)
July 13, 1944	105
Nov. 2, 1944	77.0
Mar. 27, 1945	159





Monthly maximum and minimum stages for Van Etten Lake near Oscoda, Mich.

IRON COUNTY

Chicagon Lake near Crystal Falls, Mich.

Location.--Lat 46°05'05", long 88°29'12", in many sections, Tps. 42 and 43 N., Rs. 33 and 34 W., 7.5 miles west of Crystal Falls.

Surface area.--1,100 acres.

Maximum depth.--115 ft, Department of Natural Resources.

Drainage area at outlet.--15.0 sq mi.

Records available.--October 1944 to June 1959 except some winter periods.

Gage.--Staff gage read daily except winter periods when gage was read weekly. Datum of gage is 1,429.77 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

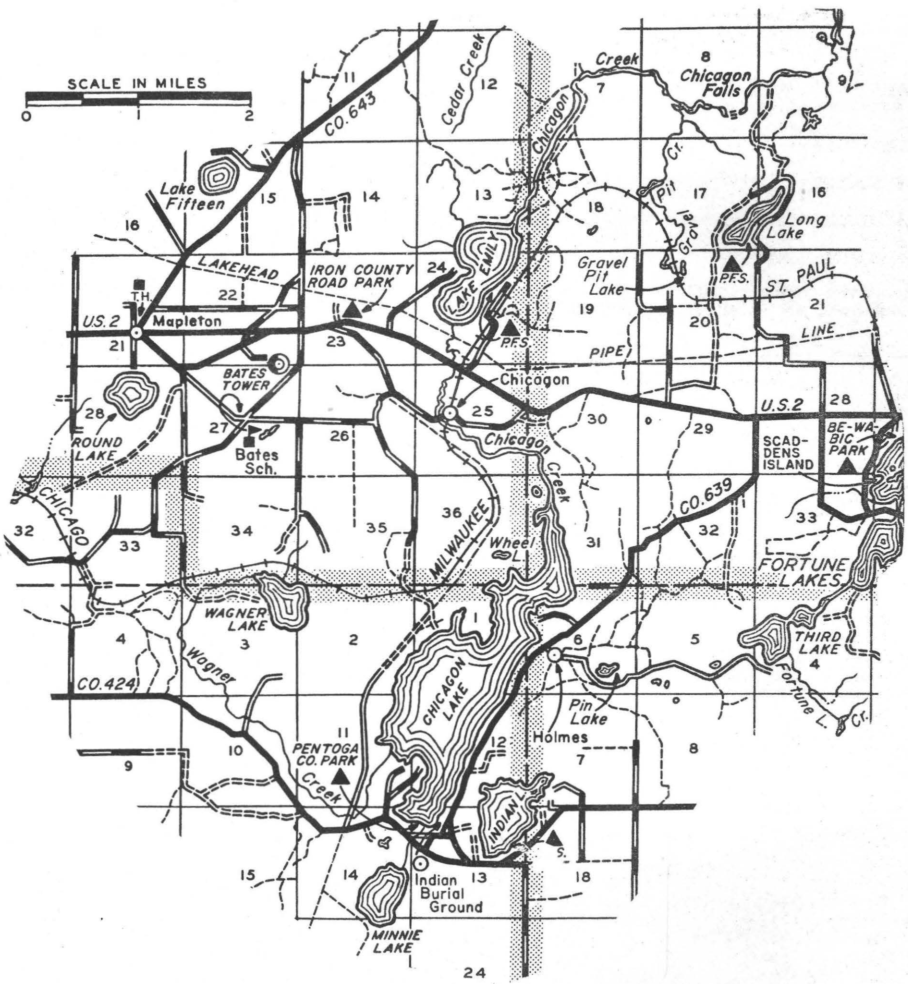
Extremes.--1944-59: Maximum stage observed, 3.20 ft July 1, 1953; minimum observed, 1.23 ft Aug. 13, 24, 30, 1945.

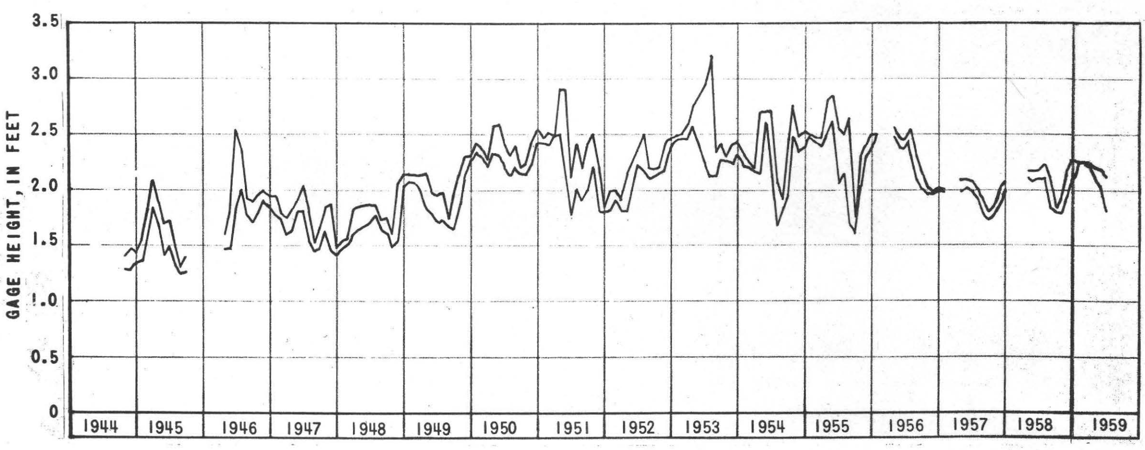
Regulation or control.--None known.

Remarks.--The inlets to Chicagon Lake are Wagner Creek at the southwest side of the lake and Minnie Lake outlet at the south end. The outlet, Chicagon Creek, is at the north end of the lake and is tributary to Paint River.

No discharge measurements are available on the inlets. The following discharge measurements have been made on Chicagon Creek at bridge on U.S. Highway 2 (drainage area, 17.4 sq mi)

Date	Discharge (cfs)	Date	Discharge (cfs)
July 19, 1945	12.1	Aug. 5, 1952	29.0
Nov. 5, 1945	9.75	Oct. 2, 1952	.79
Jan. 17, 1946	10.7	Jan. 6, 1953	9.21
Apr. 30, 1946	5.80	June 3, 1953	26.6
Sept. 11, 1946	5.65	Sept. 1, 1953	9.43
Jan. 2, 1947	9.44	Jan. 6, 1954	12.0
June 9, 1947	10.3	June 29, 1954	25.6
Aug. 5, 1947	3.28	Oct. 5, 1954	.10
Jan. 8, 1948	5.81	Jan. 4, 1955	10.9
May 4, 1948	15.8	Apr. 25, 1955	20.1
July 7, 1948	1.35	July 13, 1955	.92
Oct. 7, 1948	0	Oct. 3, 1955	0.50
Feb. 4, 1949	4.61	Jan. 5, 1956	8.57
May 3, 1949	14.1	May 3, 1956	19.0
Aug. 3, 1949	0	July 5, 1956	17.5
Nov. 3, 1949	.63	Oct. 1, 1956	5.25
Feb. 7, 1950	6.23	Jan. 2, 1957	9.36
May 16, 1950	31.8	Apr. 8, 1957	11.6
Aug. 7, 1950	8.74	July 1, 1957	8.28
Nov. 2, 1950	0	Oct. 3, 1957	1.18
Jan. 3, 1951	5.46	Jan. 6, 1958	5.95
June 8, 1951	26.7	Apr. 3, 1958	9.54
Aug. 7, 1951	12.1	July 8, 1958	25.9
Oct. 2, 1951	8.41	Oct. 6, 1958	.82
Jan. 7, 1952	9.31	Jan. 5, 1959	2.62
May 6, 1952	9.33	Apr. 1, 1959	6.81





Monthly maximum and minimum stages for Chicagon Lake near Crystal Falls, Mich.

IRON COUNTY

Fortune Lakes near Crystal Falls, Mich.

Location.--Lat 46°05'37", long 88°24'58", in many sections, Tps. 42 and 43 N., R.33 W., 4 miles west of Crystal Falls.

Surface area.--423 acres, total of First, Second and Third Lakes.

Maximum depth.--70 ft (First Lake, Michigan Department of Natural Resources).

Drainage area.--9.00 sq mi, at outlet of First Lake, the most downstream lake.

Records available.--October 1944 to September 1959 except period 1953-55 when gage was read infrequently.

Gage.--Wire-weight gage read intermittently. Datum of gage is 1,356.82 ft above mean sea level (levels by Michigan Department of Natural Resources). Oct. 2, 1952 to Aug. 20, 1956, chain gage at same datum. Prior to Oct. 2, 1952, staff gage at same datum.

Established legal level.--None known.

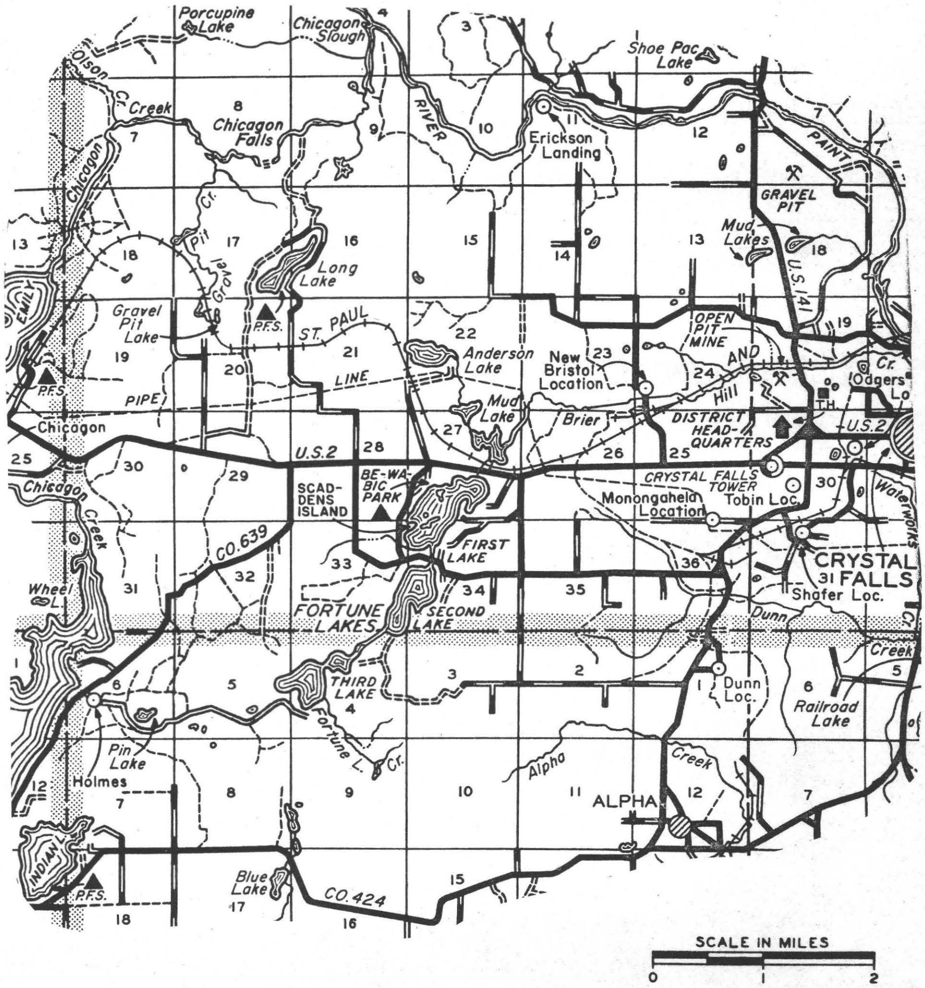
Extremes.--1944-59: Maximum stage observed, 10.17 ft July 22, 1952; minimum observed, 8.42 ft Apr. 18-21, 1946, June 3-5, 18, 1947.

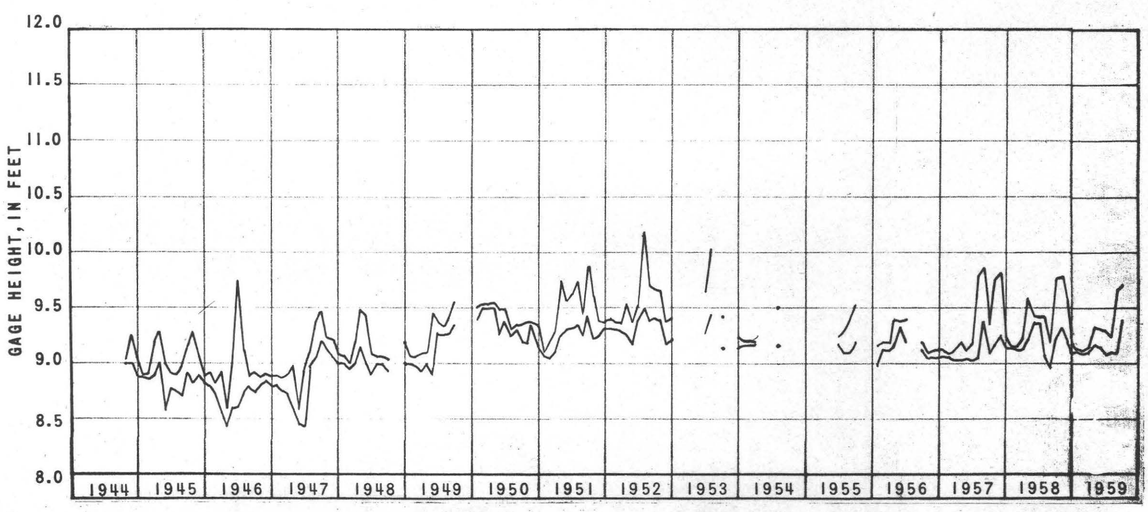
Regulation or control.--Dam at outlet of Mud Lake may have some effect upon level of Fortune Lakes.

Remarks.--The inlet to Fortune Lakes is Fortune Lake Creek which enters the southeast side of Third Lake. The outlet, at the north end of First Lake, flows into Mud Lake. The outlet of Mud Lake is Briar Hill Creek.

The following discharge measurements have been made on Briar Hill Creek, about one mile downstream from Mud Lake (drainage area, 11.8 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Mar. 30, 1945	20.6	Aug. 5, 1952	26.1
July 19, 1945	14.5	Oct. 2, 1952	3.64
Nov. 6, 1945	14.7	Jan. 6, 1953	12.4
Jan. 17, 1946	14.1	June 2, 1953	16.5
Apr. 30, 1946	5.67	Sept. 1, 1953	19.7
Sept. 11, 1946	20.6	Jan. 6, 1954	16.0
Feb. 20, 1947	9.58	June 29, 1954	26.8
June 10, 1947	11.6	Oct. 5, 1954	14.1
Aug. 5, 1947	5.30	Jan. 4, 1955	13.0
Jan. 8, 1948	11.7	Apr. 25, 1955	22.5
May 4, 1948	20.5	July 13, 1955	14.2
July 6, 1948	8.10	Oct. 3, 1955	1.07
Oct. 6, 1948	6.11	Jan. 5, 1956	11.2
Mar. 3, 1949	9.17	May 3, 1956	13.9
May 3, 1949	6.43	July 5, 1956	18.0
Aug. 3, 1949	.58	Oct. 1, 1956	12.8
Nov. 3, 1949	11.8	Jan. 2, 1957	10.2
Feb. 7, 1950	10.0	Apr. 8, 1957	14.2
May 15, 1950	27.8	July 1, 1957	8.64
Aug. 7, 1950	13.0	Oct. 3, 1957	3.82
Nov. 2, 1950	11.5	Jan. 6, 1958	9.29
Jan. 3, 1951	12.3	Apr. 3, 1958	2.06
June 8, 1951	20.2	July 8, 1958	16.2
Aug. 7, 1951	20.1	Oct. 6, 1958	14.0
Nov. 1, 1951	16.7	Dec. 2, 1958	10.9
Jan. 7, 1952	14.7	Apr. 1, 1959	9.75
May 6, 1952	16.8	June 30, 1959	8.26





Monthly maximum and minimum stages for Fortune Lakes near Crystal Falls, Mich.

IRON COUNTY

Ice Lake near Iron River, Mich.

Location.--Lat 46°06'00", long 88°36'34", in secs. 19, 24, 25, and 30, T.43 N., Rs. 34 and 35 W., 1.4 miles east of Iron River.

Surface area.--85 acres.

Maximum depth.--35 ft.

Drainage area at outlet.--0.50 sq mi.

Records available.--May 1959 to October 1961 except winter periods.

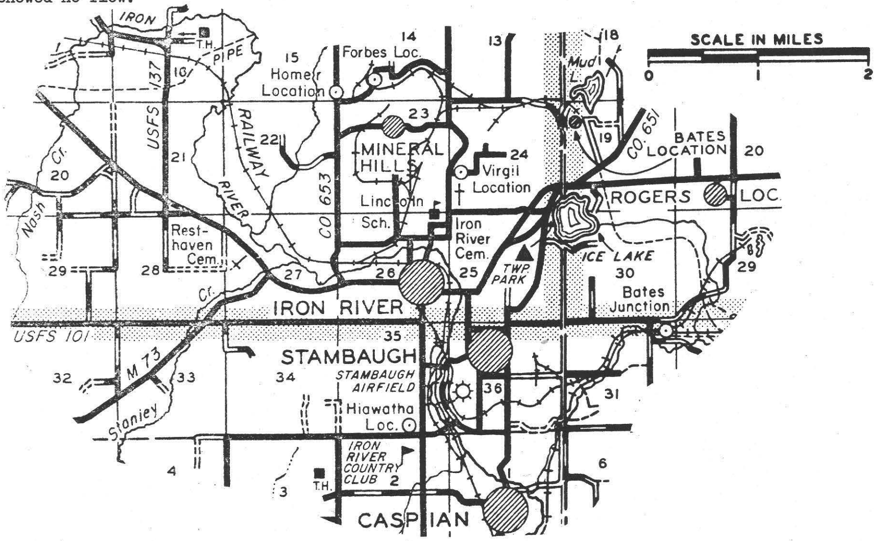
Gage.--Staff gage read daily. Datum of gage not determined.

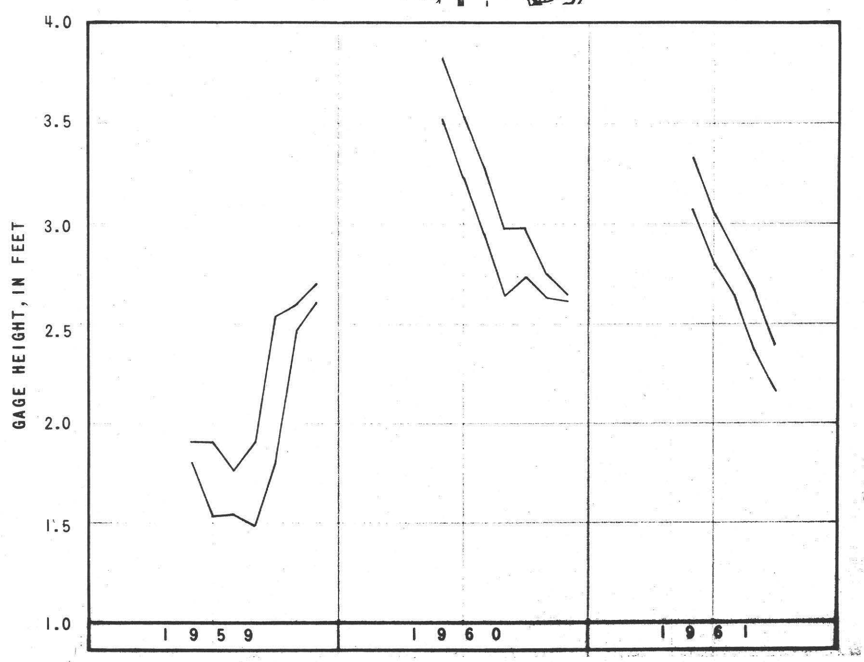
Established legal level.--None known.

Extremes.--1959-61: Maximum stage observed, 3.83 ft May 7, 1960; minimum observed, 1.48 ft Aug. 5, 1959.

Regulation or control.--None.

Remarks.--There is no inlet to the lake. The outlet, at the east side of lake, is a small unnamed tributary to Iron River. No discharge measurements have been made on the outlet, however occasional inspections in 1959 showed no flow.





Monthly maximum and minimum stages for Ice Lake near Iron River, Mich.

IRON COUNTY

Stager Lake near Crystal Falls, Mich.

Location.--Lat 45°59' 17", long 88°19'42", in secs. 5 and 32, Tps. 41 and 42 N., R.32 W., 7.5 miles south of Crystal Falls.

Surface area.--112 acres.

Maximum depth.--50 ft.

Drainage area at outlet.--4.67 sq mi.

Records available.--April 1955 to July 1957 except winter and spring months.

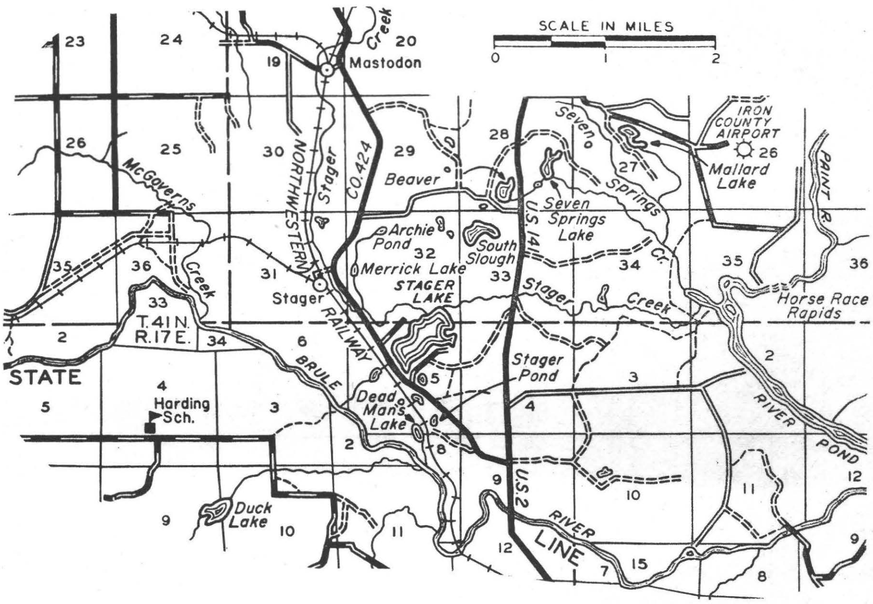
Gage.--Staff gage read daily. Datum of gage is 1,287.29 ft above mean sea level (levels by Michigan Department of Natural Resources).

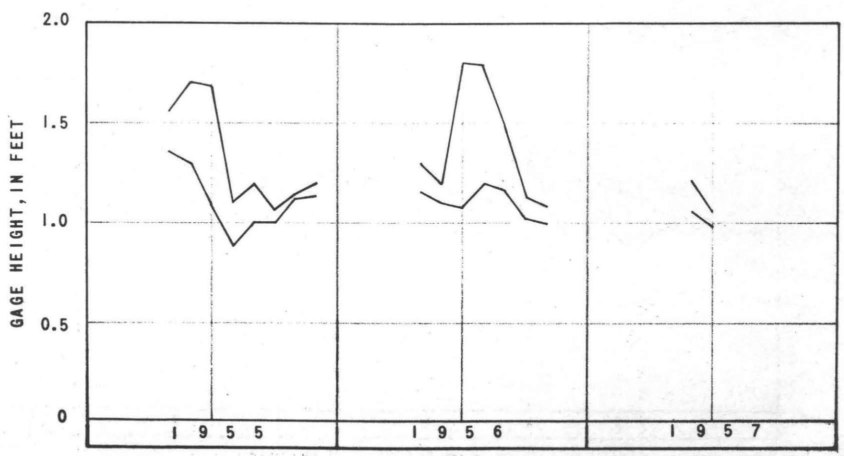
Established legal level.--Winter, 1,287.5 ft; summer 1,288.0 ft above mean sea level, established by Circuit Court on June 10, 1958.

Extremes.--1955-57: Maximum stage observed, 1.80 ft June 16, 1956; minimum observed, 0.88 ft July 25, 26, 1955.

Regulation or control.--Rock dam on outlet, 200 ft below lake.

Remarks.--Stager Creek is the inlet and outlet of Stager Lake and is tributary to Paint River about 2.5 miles downstream from Stager Lake. No discharge measurements are available on Stager Creek.
An engineering lake-level control study was completed in 1957 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Stager Lake near Crystall Falls, Mich.

IRON COUNTY

Stanley Lake near Iron River, Mich.

Location.--Lat 46°04'12", long 88°41'58", in secs. 4, 5, and 8, T.42 N., R.35 W., 3.2 miles southwest of Iron River.

Surface area.--310 acres.

Maximum depth.--39 ft.

Drainage area at outlet.--3.28 sq mi.

Records available.--May 1964 to September 1968.

Gage.--Staff gage read daily. Datum of gage not determined.

Established legal level.--None known.

Extremes.--1964-68: Maximum stage observed, 2.83 ft May 9, 10, 1965; minimum observed, 1.69 ft July 29-31, 1965.

Regulation or control.--None known.

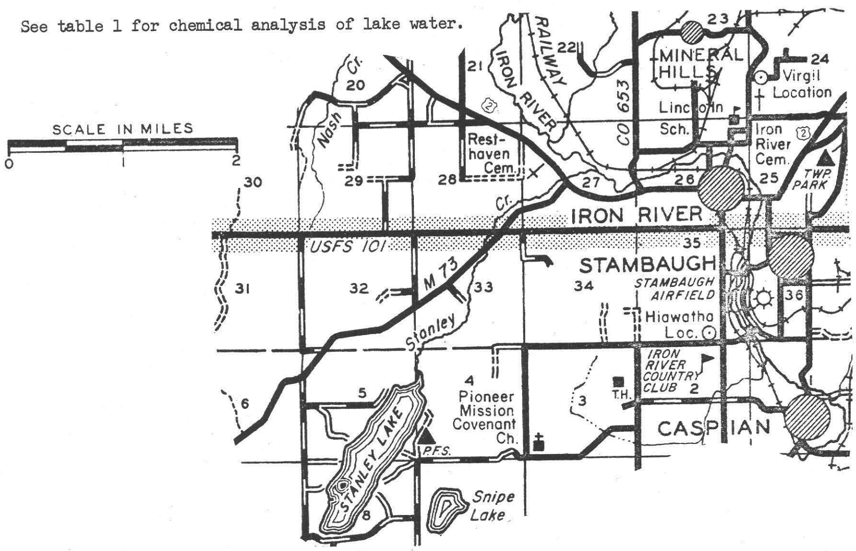
Remarks.--There is no active inlet to the lake. The outlet is Stanley Creek, a tributary to Iron River. The following measurements have been made on Stanley Creek at State Highway 73 (drainage area, 3.28 sq mi).

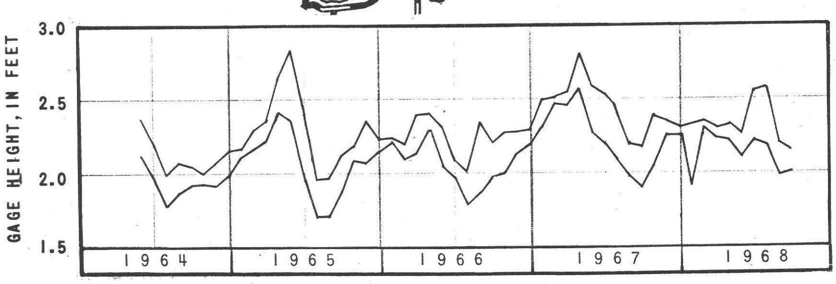
Date	Discharge (cfs)	Date	Discharge (cfs)
June 1, 1964	1.89	Nov. 1, 1966	1.08
Aug. 5, 1964	1.62	Jan. 13, 1967	1.75
Oct. 1, 1964	1.05	June 5, 1967	2.05
July 22, 1965	1.21	Aug. 1, 1967	1.95
Nov. 3, 1965	1.47	Oct. 3, 1967	1.20
July 12, 1966	1.05	Jan. 5, 1968	1.05
Sept. 2, 1966	2.47	Apr. 13, 1968	3.73
		July 15, 1968	4.19

The following measurements have been made on Stanley Creek at U.S. Highway 2 (drainage area, 5.0 sq mi, approximately).

Date	Discharge (cfs)	Date	Discharge (cfs)
Oct. 17, 1945	1.68	Sept. 19, 1946	1.16
Nov. 30, 1945	2.66	Nov. 21, 1946	2.14
Mar. 2, 1946	2.23	June 10, 1947	2.72
Apr. 29, 1946	1.70	Nov. 3, 1948	.60

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Stanley Lake near Iron River, Mich.

IRON COUNTY

Sunset Lake near Iron River, Mich.

Location.--Lat 46°08'22", long 88°36'28", in many sections, T.43 N., R.34 W., 3.5 miles northeast of Iron River.

Surface area.--545 acres.

Maximum depth.--54 ft.

Drainage area at outlet.--11.5 sq mi.

Records available.--October 1955 to June 1959 except winter periods.

Gage.--Staff gage read daily. Datum of gage is 1,545.27 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--Winter, 1,546.5 ft; summer, 1,547.0 ft above mean sea level, established by Circuit Court on June 11, 1958.

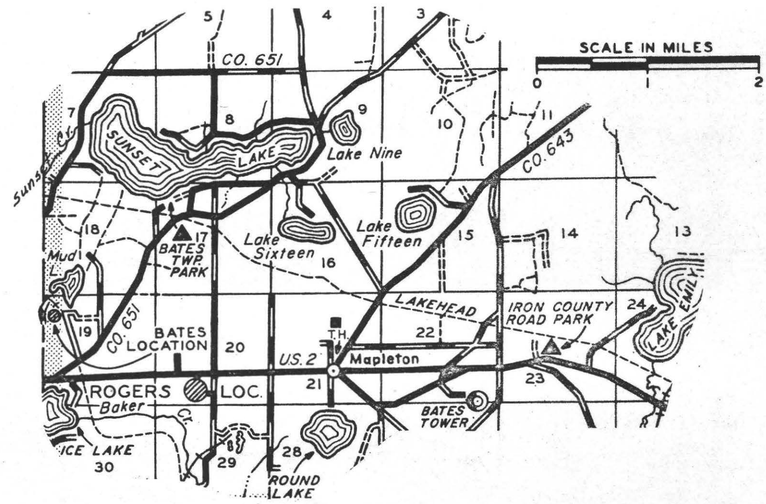
Extremes.--1955-59: Maximum stage, 2.48 ft Apr. 23-26, 1957; minimum stage observed, 0.72 ft Mar. 26, 1959.

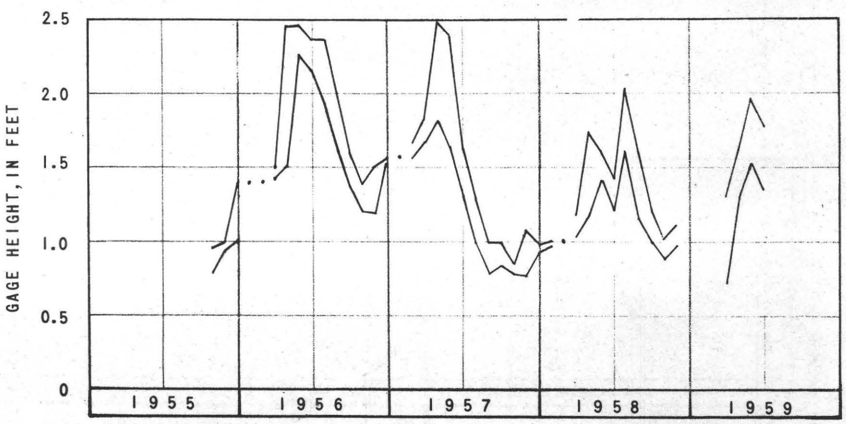
Regulation or control.--A makeshift log and concrete dam, probably constructed in 1955, partially controls Sunset Lake levels.

Remarks.--The inlets to Sunset Lake are Lake Sixteen outlet from the south, Lake Nine outlet from the east and several unnamed streams from the north. The outlet is Sunset Creek, at the west end of the lake.
An engineering lake-level control study was completed in 1958 by the Michigan Department of Natural Resources.
The following discharge measurements have been made on Sunset Creek in NE¼ sec. 27, T.43 N., R.35 W. (drainage area, 19.3 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Nov. 30, 1945	14.7	Sept. 19, 1946	11.8
Mar. 2, 1946	13.1	Nov. 21, 1946	13.2
Apr. 29, 1946	16.6	June 10, 1947	16.7
		Nov. 3, 1948	8.87

Also, the lake gage observer reported no flow in the outlet on Oct. 20, 1956.





Monthly maximum and minimum stages for Sunset Lake near Iron River, Mich.

JACKSON COUNTY

Portage Lake near Munith, Mich.

<u>Location</u>.--Lat 42°21'07", long 84°15'12", in many sections, Tps. 1 and 2 S., Rs. 1 and 2 E., 2.8 miles south of Munith.

<u>Surface area</u>.--531 acres.

<u>Maximum depth</u>.--40 ft.

<u>Drainage area at outlet</u>.--7 sq mi, approximately.

<u>Records available</u>.--April to July 1944, July 1945 to April 1953, May 1956 to February 1962.

<u>Gage</u>.--Staff gage read intermittently. Datum of gage is 900.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

<u>Established legal level</u>.--912.00 ft above mean sea level, established by Circuit Court on June 6, 1956.

<u>Extremes</u>.--1944, 1945-1953, 1956-1962: Maximum stage observed, 12.86 ft Apr. 27, 1961; minimum observed, 8.86 ft Sept. 20, 1948.

<u>Regulation or control</u>.--An earth fill dike and drop inlet box located at the outlet, control the lake level. Construction of the dam and control structure was completed in May 1957. In 1932 a dam was built on Portage Lake outlet. In June 1944 the earth dike portion of this dam failed. The dam further deteriorated to the extent that it had little effect upon the lake level.

An experimental fish dam, located about 0.7 mile upstream from Portage Lake, affects the flow in the inlet.

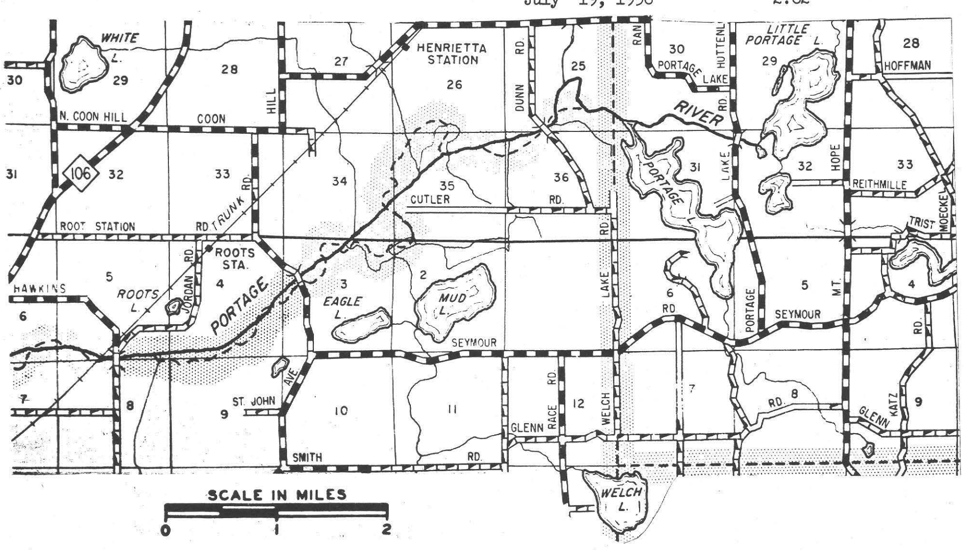
<u>Remarks</u>.--The principal inlet enters at the south end of the lake. The outlet leaves the north end of lake and flows a short distance to Portage River.

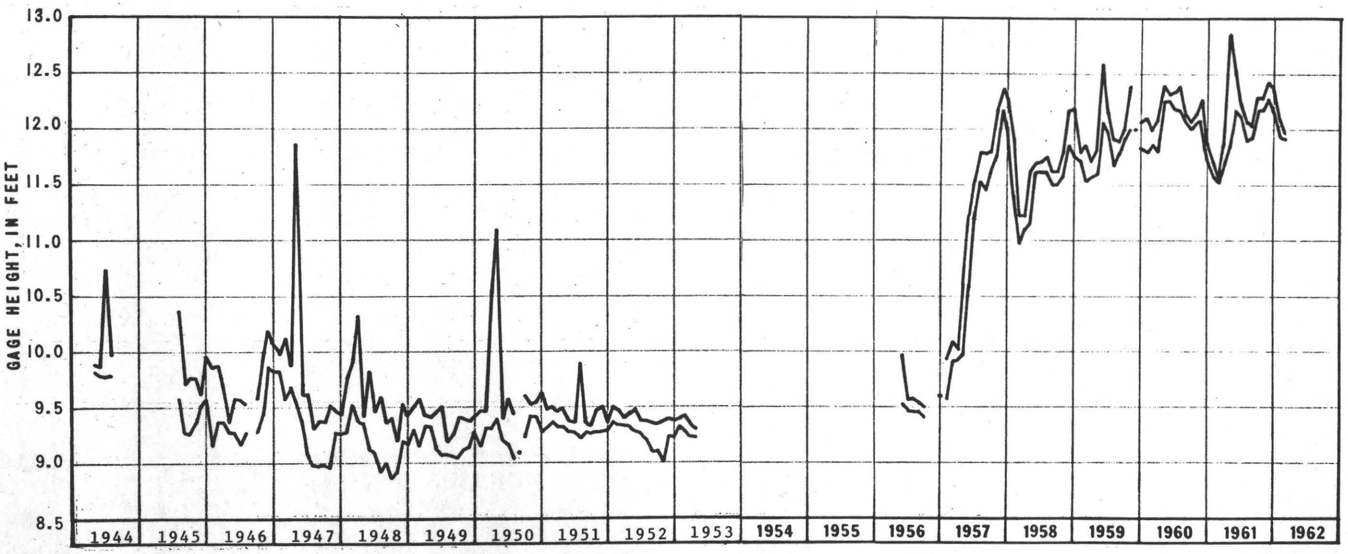
An engineering lake-level control study was completed in 1956 by the Michigan Department of Natural Resources.

No discharge measurements have been made on the outlet.

The following discharge measurements have been made on the inlet, in SE¼ sec. 6, about 0.4 mile upstream from lake (drainage area, 3.9 sq mi, approximately).

Date	Discharge (cfs)	Date	Discharge (cfs)
Mar. 30, 1944	4.47	Jan. 24, 1950	4.72
June 9, 1944	3.23	Apr. 18, 1950	5.50
July 27, 1944	2.36	July 21, 1950	3.84
Aug. 30, 1944	1.92	Nov. 6, 1950	2.96
Aug. 30, 1944	1.73	Feb. 22, 1951	5.17
Oct. 5, 1944	.32	May 15, 1951	3.18
Mar. 9, 1945	2.98	Aug. 27, 1951	2.47
Apr. 6, 1945	3.45	Nov. 28, 1951	3.18
May 20, 1945	3.98	Feb. 25, 1952	3.74
May 23, 1945	4.05	June 11, 1952	2.46
May 26, 1945	4.45	Aug. 4, 1952	2.44
Apr. 9, 1946	3.27	Oct. 22, 1952	2.17
May 17, 1946	7.07	Jan. 31, 1953	2.06
Sept. 13, 1946	1.45	Apr. 25, 1953	4.20
Jan. 23, 1947	2.46	Aug. 19, 1953	1.40
Mar. 21, 1947	3.78	Oct. 31, 1953	1.81
Apr. 4, 1947	6.40	Mar. 9, 1954	3.40
Apr. 11, 1947	8.73	May 20, 1954	2.62
Apr. 15, 1947	2.78	Aug. 30, 1954	1.68
Oct. 30, 1947	5.31	Nov. 20, 1954	4.91
May 19, 1948	4.49	Feb. 24, 1955	3.09
Aug. 27, 1948	1.95	Apr. 30, 1955	3.20
Nov. 29, 1948	2.42	Aug. 10, 1955	2.13
Mar. 15, 1949	2.19	Oct. 22, 1955	2.24
June 20, 1949	2.53	Jan. 26, 1956	1.83
Sept. 27, 1949	2.03	Apr. 11, 1956	3.42
		July 19, 1956	2.62





Monthly maximum and minimum stages for Portage Lake near Munith, Mich.

JACKSON COUNTY

Wamplers Lake near Onsted, Mich.

Location.--Lat 42°04'48", long 84°08'58", in many sections, Tps. 4 and 5 S., R.2 E., 5.8 miles north of Onsted.

Surface area.--780 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--Not determined.

Records available.--September 1942 to September 1968.

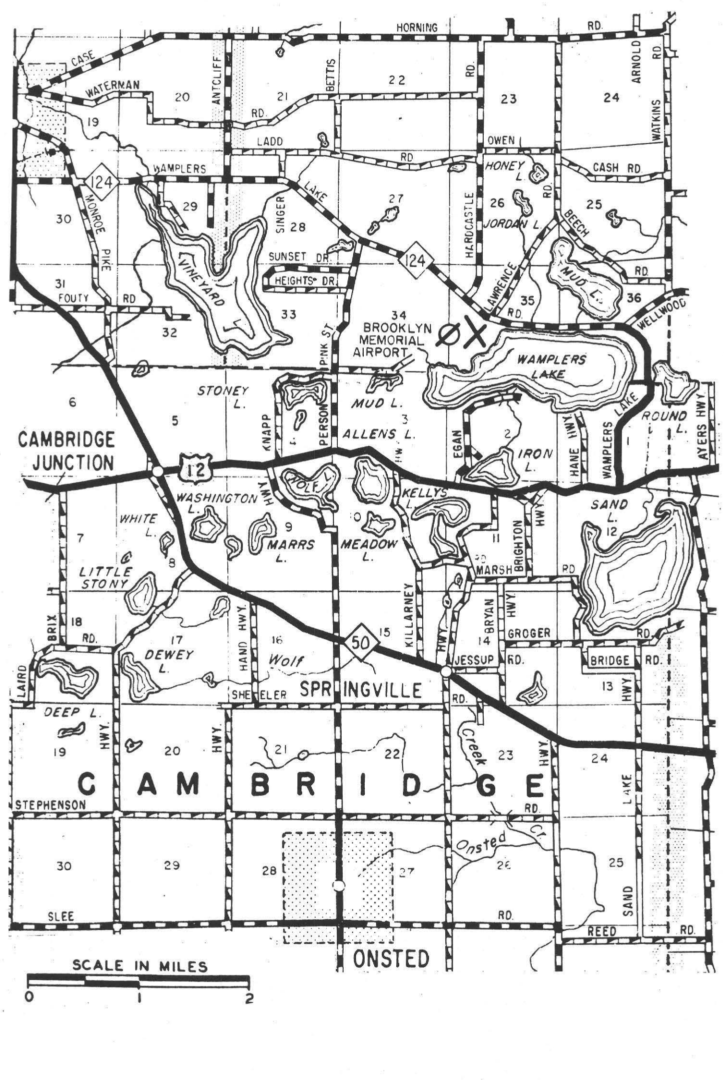
Gage.--Staff gage read intermittently. Datum of gage is 964.71 ft above mean sea level.

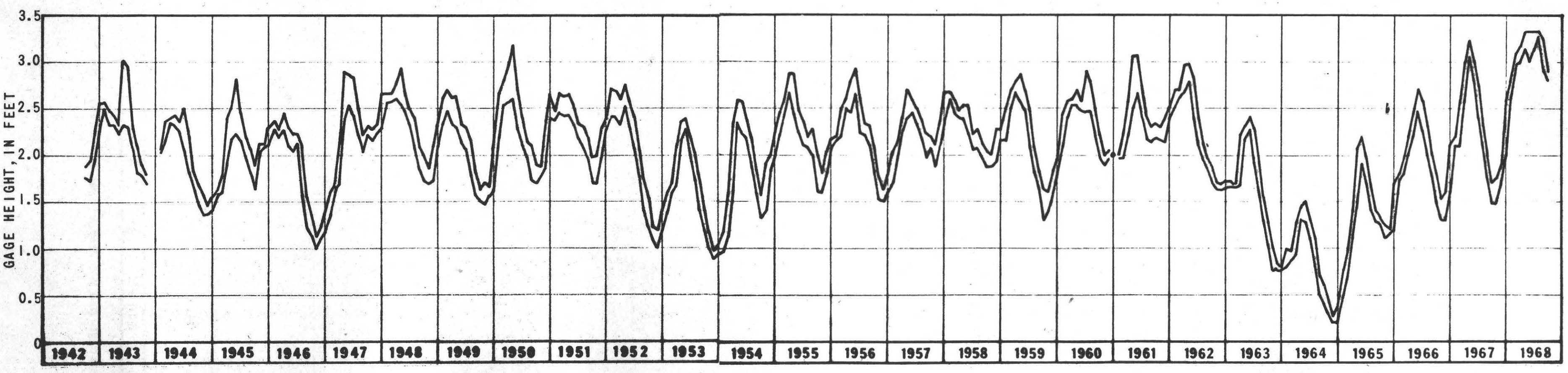
Established legal level.--None known.

Extremes.--1942-68: Maximum stage was over the top of gage (3.33 ft) Apr. 7, May 28, June 5, 26, July 27, 1968; minimum stage observed, 0.20 ft Nov. 18, Dec. 1, 5, 1964.

Regulation or control.--When Wampler Lake stage becomes high, water can be diverted through a canal to Sand Lake. The water in the canal is controlled by a gate valve located at the north end of a 2.5 ft culvert which extend under U.S. Highway 12 to Sand Lake. The gate valve is closed when Sand Lake gets higher than Wamplers Lake. This prevents flow from Sand Lake to Wamplers Lake. There is no control in the Wamplers Lake outlet to Mud Lake.

Remarks.--Principal inlets to Wamplers Lake are two small streams draining ponds and swamps on the north side of the lake. The outlet is at the north side of the lake and is tributary to Mud Lake.
No discharge measurements are available on the inlets or outlet.





Monthly maximum and minimum stages for Wamplers Lake near Onsted, Mich.

JACKSON COUNTY

White Lake near Henrietta, Mich.

Location.--Lat 42°21'29", long 84°20'30", in sec. 29, T.1 S., R.1 E., 1.5 miles south of Henrietta.

Surface area.--65.0 acres.

Maximum depth.--35 ft.

Drainage area at outlet.--Not determined.

Records available.--November 1961 to August 1962 except winter period.

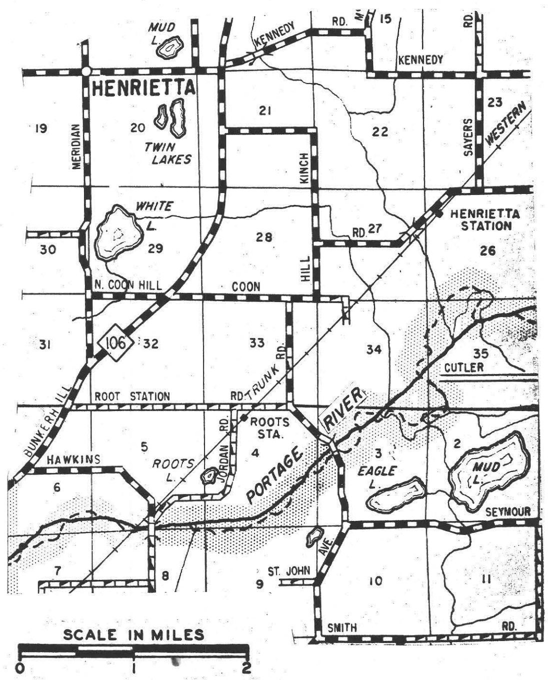
Gage.--Staff gage read daily. Datum of gage is 927.75 ft above mean sea level (levels by Michigan Department of Natural Resources).

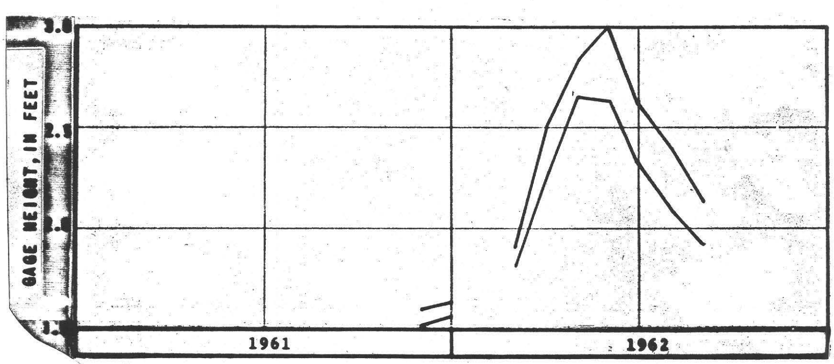
Established legal level.--931.48 ft above mean sea level, established by Circuit Court on Feb. 25, 1963.

Extremes.--1961-62: Maximum stage, 3.00 ft May 5, 1962; minimum, 1.52 ft Nov. 14, 1961.

Regulation or control.--None.

Remarks.--One small unnamed inlet enters the south side of the lake. The outlet leaves the east side and flows about 4 miles to Portage River. No discharge measurements are available on the inlet or outlet.





Monthly maximum and minimum stages for White Lake near Henrietta, Mich.

KALAMAZOO COUNTY

Atwater Pond near Oshtemo, Mich.

<u>Location</u>.--Lat 42°13'59", long 85°39'09", in sec. 1, T.3 S., R.12 W., 2.2 miles southeast of Oshtemo.

<u>Surface area</u>.--43 acres.

<u>Maximum depth</u>.--Unknown.

<u>Drainage area at outlet</u>.--13.0 sq mi.

<u>Records available</u>.--May 1964 to July 1968 except period February and March 1968.

<u>Gage</u>.--Staff gage read monthly December 1966 to July 1968. Prior to December 1966 gage read daily. Datum of gage is 868. 86 ft above mean sea level (levels by Michigan Department of Natural Resources).

<u>Established legal level</u>.--None known.

<u>Extremes</u>.--1964-68: Maximum stage observed, 2.20 ft Nov. 10, 1966; minimum observed, 0.86 ft July 2-6, 1964.

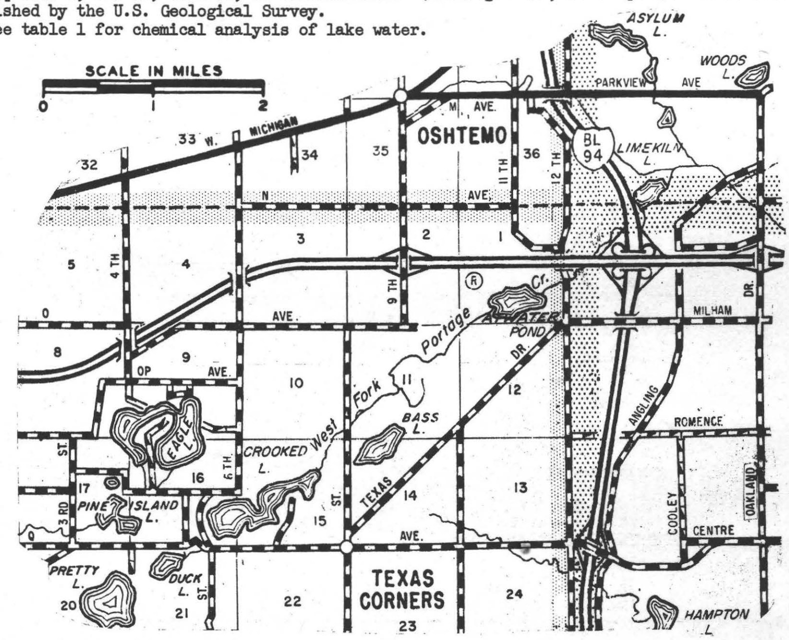
<u>Regulation or control</u>.--None.

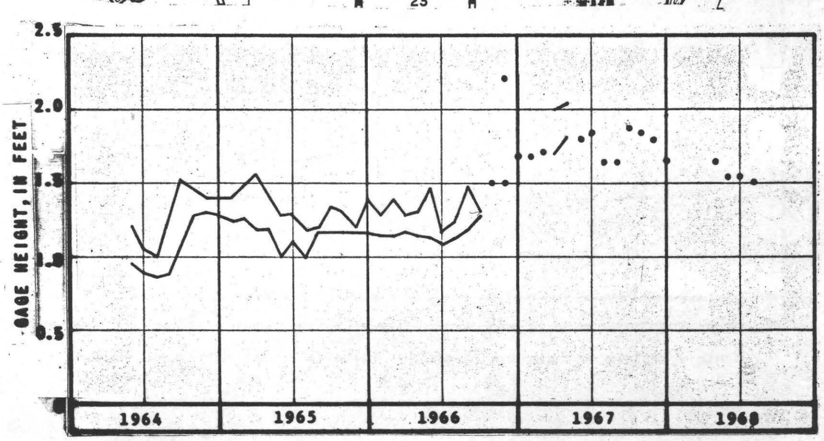
<u>Remarks</u>.--West Fork Portage Creek flows into the southwest end of Atwater Pond and out the east end. No discharge measurements are available on the inlet. The following discharge measurements have been made on the outlet in SE¼ sec. 1, T.3 S., R.12 W., at 12th St., 0.3 mile downstream from the pond (drainage area, 13.0 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Nov. 10, 1959	7.37	Aug. 18, 1964	4.06
Dec. 1, 1959	7.33	Oct 19, 1965	5.22
July 27, 1964	2.92	May 8, 1967	7.88

Records of daily discharge have been collected since September 1959 on West Fork Portage Creek, in NE¼ sec. 5, T.3 S., R.11 W., at Oakland Drive (drainage area, 18.7 sq mi). These records are published by the U.S. Geological Survey.

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Atwater Pond near Oshtemo, Mich.

KALAMAZOO COUNTY

Austin Lake near Kalamazoo, Mich.

Location.--Lat 42°09'59", long 85°32'28", in many sections, T.3 S., R.11 W., 9.0 miles south of Kalamazoo.

Surface area.--1,050 acres.

Maximum depth.--14 ft.

Drainage area at outlet.--14.2 sq mi.

Records available.--July 1944 to July 1950; April 1958 to September 1968 except periods November 1948 to June 1949, April to November 1963, and some winter periods.

Gage.--Staff gage read daily except period April 1958 to March 1963 when gage was read intermittently. Datum of gage is 852.45 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--856.0 ft above mean sea level, established by Circuit Court June 2, 1925. This level of 856.0 in 1925 is equal to 855.64 ft after the 1929 datum adjustment.

Extremes.--1944-50, 1958-68: Maximum stage observed, 4.42 ft May 2-4, 1950; minimum observed, -0.07 ft Oct. 20, Dec. 10, 1964.

Regulation or control.--A concrete dam with removeable boards, at the outlet, controls lake level.

Remarks.--The principal inlet is the diversion canal from Gourdneck Creek which flows through West Lake into the northwest side of Austin Lake. At times, depending on relative lake levels, water will flow through a connecting channel from Long Lake into the northeast side of Austin Lake. At other times the flow will be reversed, or if both lake levels are low, there will be no flow. Inflow to Austin Lake is also supplemented at times by water discharge from the nearby Upjohn Company recharge ponds. The outlet leaves the southeast end of the lake and flows south about 1.5 miles to Gourdneck Creek.

An engineering lake-level control study of West Lake, which also covers Austin Lake, was completed in 1946 by the Michigan Department of Natural Resources.

The following discharge measurements have been made on the channel connecting West and Austin Lakes, in NW¼ sec. 26, T.3 S., R.11 W., at Portage Road.

Date	Discharge (cfs)	Date	Discharge (cfs)
May 12, 1964	2.33	Sept. 10, 1965	0
June 4, 1964	0	Oct. 5, 1965	2.56
July 20, 1964	0	Dec. 9, 1965	2.55
Oct. 5, 1964	0	Jan. 5, 1966	10.9
Jan. 7, 1965	.20	Feb. 8, 1966	5.64
Feb. 9, 1965	4.78	Mar. 15, 1966	2.13
Feb 16, 1965	7.07	May 10, 1966	7.70
Apr. 8, 1965	8.78	June 14, 1966	10.3
May 14, 1965	0	July 7, 1966	15.1
June 10, 1965	4.21	Aug. 11, 1966	3.32
July 13, 1965	.60	Sept 8, 1966	2.37
Aug. 4, 1965	.25	Nov. 9, 1967	0

The following discharge measurements have been made on Austin Lake outlet, in SE¼ sec. 36, T.3 S., R.11 W., downstream from dam.

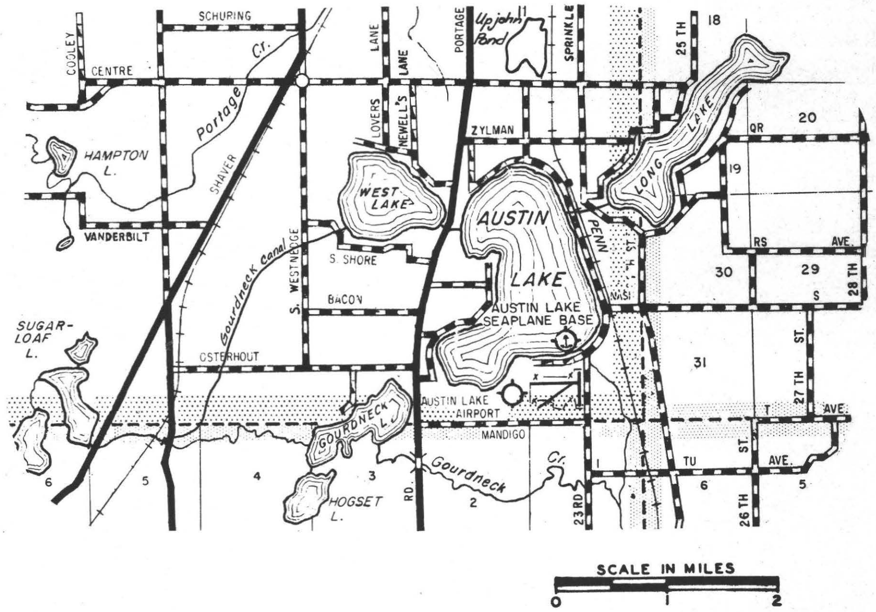
Date	Discharge (cfs)	Date	Discharge (cfs)
Apr. 6, 1947	12.3	Dec. 15, 1948	0
Apr. 27, 1947	16.6	Mar. 22, 1949	9.27
May 7, 1947	22.5	June 14, 1949	6.41
Oct. 28, 1947	0	Sept. 15, 1949	0
Jan. 7, 1948	6.45	Jan. 18, 1950	5.81
May 27, 1948	19.6	May 2, 1950	24.1
Aug. 12, 1948	9.86	Aug. 5, 1950	4.08

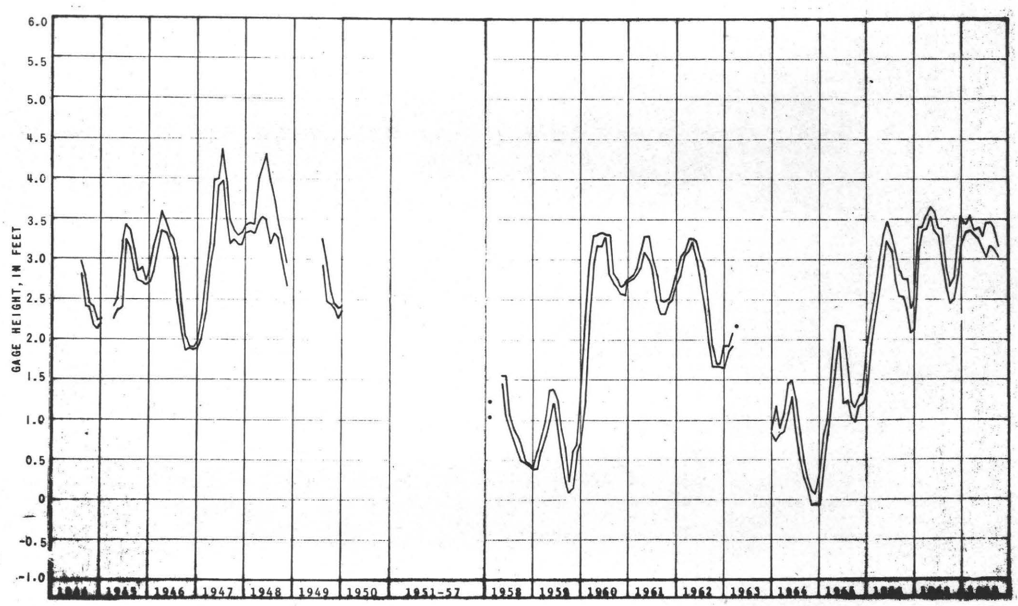
The following discharge measurements have been made on Austin Lake outlet, in SE¼ sec. 1, T.4 S., R.11 W., at TU Avenue, 1.4 miles downstream from the lake (drainage area, 15.5 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
July 28, 1964	0.44	Oct. 18, 1965	0
		May 9, 1967	22.4

Records of daily discharge have been collected since Oct. 1965 on the inlet, Gourdneck Canal, in NW¼ sec. 33, T.3 S., R.11 W., at Osterhout Road. These records are published by the U.S. Geological Survey (see West Lake).

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Austin Lake near Kalamazoo, Mich.

KALAMAZOO COUNTY

Barton Lake near Vicksburg, Mich.

Location.--Lat 42°05'10", long 85°32'57", in secs. 23, 26, and 27, T.4 S., R.11 W., 2 miles south of Vicksburg.

Surface area.--347 acres.

Maximum depth.--52 ft.

Drainage area at outlet.--51.1 sq mi.

Records available.--December 1963 to January 1968.

Gage.--Staff gage read daily. Datum of gage not determined.

Established legal level.--None known.

Extremes.--1963-68: Maximum stage, 2.55 ft June 25, 1967; minimum, 0.10 ft Mar. 2, 1964.

Regulation or control.--Simpson-Lee Paper Company regulates the flow in the inlet, Portage Creek, at their mill in Vicksburg about 2 miles above Barton Lake.

Remarks.--Portage Creek enters Barton Lake at the northeast end. Howard and Rawson Lakes connect with Barton Lake at the southwest end. Portage Creek is also the outlet, flowing from the east end of Barton Lake to Portage River.

The following discharge measurements have been made on the inlet in NE¼ sec. 24, T.4 S., R.11 W., at W Ave., about 2 miles above Barton Lake (drainage area, 35.2 sq mi).

Date	Discharge (cfs)
July 28, 1964	7.42
Oct. 18, 1965	14.7
May 9, 1967	67.9

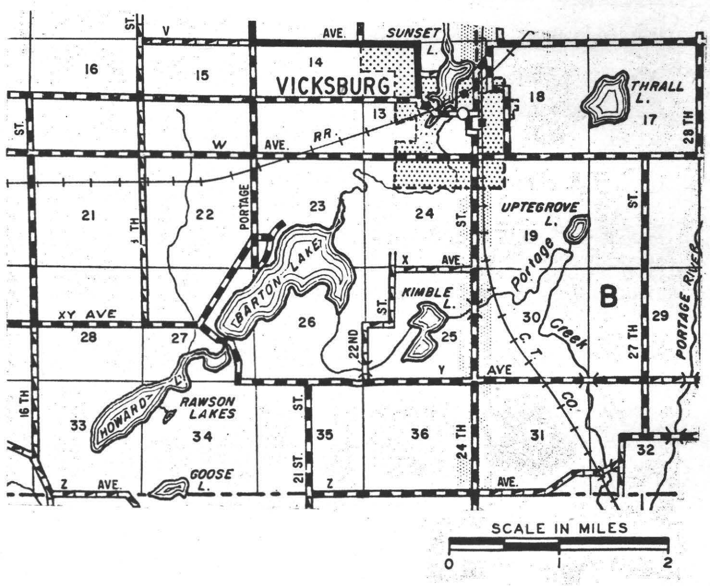
The following discharge measurements have been made on the outlet in NE¼ sec. 25, T.4 S., R.11 W., at 24th St., about 1.5 miles below Barton Lake and 0.3 mile below Kimble Lake (drainage area, 53.9 sq mi).

Date	Discharge (cfs)
July 28, 1964	12.9
Oct. 19, 1965	41.4
May 9, 1967	87.2

The following discharge measurements have been made on Howard Lake inlet in SW¼ sec. 27, T.4 S., R.11 W., at XY Ave. (drainage area, 8.01 sq mi).

Date	Discharge (cfs)
Apr. 16, 1964	0.14
June 2, 1964	.10
July 28, 1964	.09
Sept. 15, 1964	.04
Feb. 19, 1965	.23
Aug. 6, 1965	.30
Oct. 9, 1966	.35
May 3, 1966	3.52
Aug. 30, 1966	.71
May 9, 1967	9.77

See table 1 for chemical analysis of lake water.



Monthly maximum and minimum stages for Barton Lake near Vicksburg, Mich.

KALAMAZOO COUNTY

Bass Lake near Texas Corners, Mich.

Location.--Lat 42°12'57", long 85°40'39", in secs. 11 and 14, T.3 S., R.12 W., 1.1 miles northeast of Texas Corners.

Surface area.--38 acres.

Maximum depth.--Unknown.

Drainage area.--Not determined.

Records available.--April 1964 to January 1968.

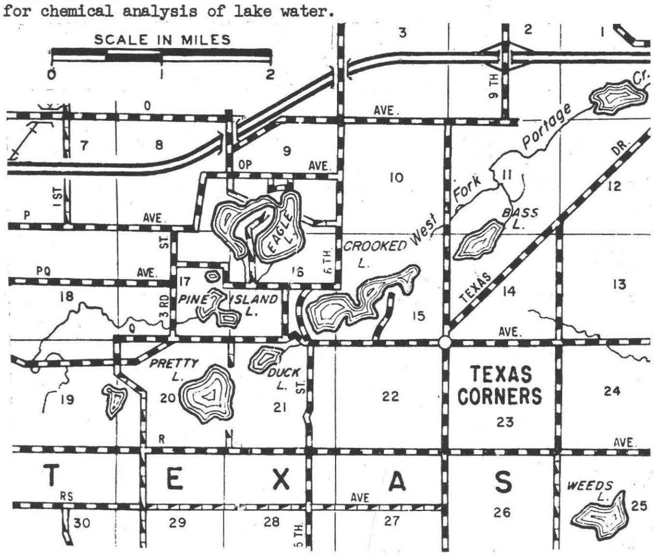
Gage.--Staff gage read daily. Datum of gage not determined.

Established legal level.--None known.

Extremes.--1964-68: Maximum stage, 10.12 ft Dec. 8-12, 18-31, 1967, Jan. 1-31, 1968; minimum, 6.89 ft Sept. 17, 18, Nov. 1, 15, 1964.

Regulation or control.--None.

Remarks.--Bass Lake has no inlet. The outlet, a small intermittent stream at the northeast end of Bass Lake, flows about 0.4 mile to West Fork Portage Creek.
No discharge measurements are available on the outlet.
See table 1 for chemical analysis of lake water.



Monthly maximum and minimum stages for Bass Lake near Texas Corners, Mich.

KALAMAZOO COUNTY

Campbell Lake near Kalamazoo, Mich.

Location.--Lat 42°19'15", long 85°28'48", in secs. 3 and 4, T.2 S., R.10 W., 5.5 miles northeast of Kalamazoo.

Surface area.--146 acres.

Maximum depth.--Unknown.

Drainage area.--Not determined.

Records available.--December 1963 to September 1968.

Gage.--Staff gage read intermittently August 1967 to September 1968. Prior to August 1967, gage read daily. Datum of gage not determined.

Established legal level.--None known.

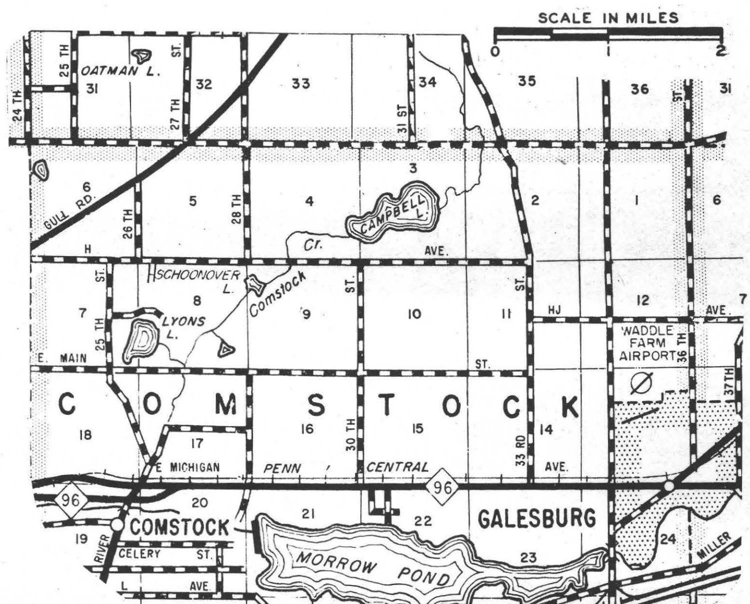
Extremes.--1963-68: Maximum stage observed, 5.80 ft Feb. 14-28, Mar. 1-10, 1967; minimum observed, 5.06 ft Aug. 9, 10, 1964.

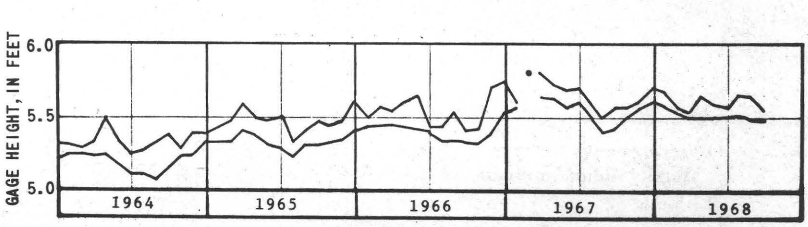
Regulation or control.--None.

Remarks.--There is an unnamed stream entering the east end of Campbell Lake. The outlet, Comstock Creek, leaves the southwest end of the lake and flows about 4 miles to the Kalamazoo River.

No discharge measurements are available on the inlet. The following discharge measurements have been made on the outlet, in NW¼ sec. 17, T.2 S., R.10 W., about 3 miles downstream from lake (drainage area, 18.3 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Feb. 6, 1964	4.43	Aug. 5, 1965	3.30
Apr. 16, 1964	4.80	Oct. 19, 1965	4.54
June 2, 1964	1.99	May 5, 1966	8.27
July 27, 1964	1.76	Aug. 30, 1966	5.05
Sept. 14, 1964	2.44	May 8, 1967	8.19
Feb. 18, 1965	6.54	Sept. 30, 1968	5.85





Monthly maximum and minimum stages for Campbell Lake near Kalamazoo, Mich.

KALAMAZOO COUNTY

Crooked Lake near Kalamazoo, Mich.

Location.--Lat 42°12'39", long 85°41'32", in secs. 15 and 16, T.3 S., R.12 W., 7.8 miles southwest of Kalamazoo.

Surface area.--162 acres.

Maximum depth.--50 ft.

Drainage area.--Not determined.

Records available.--September 1960 to October 1962; November 1963 to February 1968 except periods September and October 1961, and April 1962.

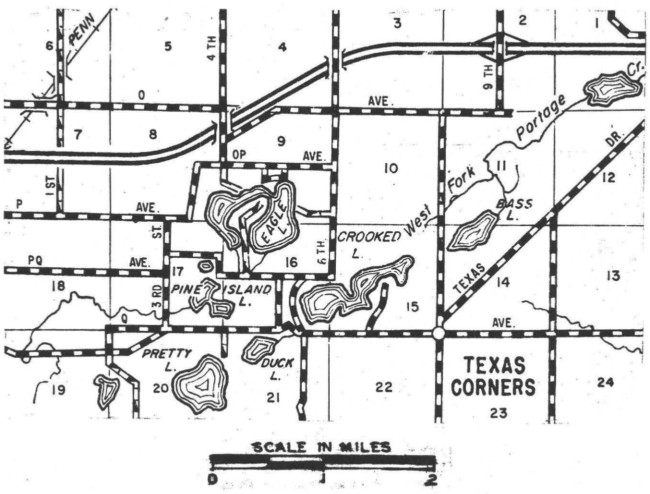
Gage.--Staff gage read daily. Datum of gage not determined.

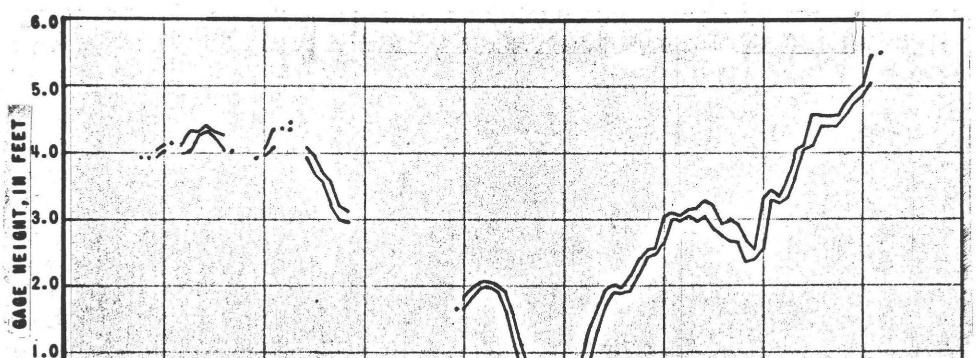
Established legal level.--None known.

Extremes.--1960-62, 1963-68: Maximum stage observed, 5.50 ft Feb. 3, 1968; minimum observed, 0.35 ft Nov. 3, 1964.

Regulation or control.--Since Apr. 10, 1965 water has been pumped into the lake from a well finished in a deep aquifer to raise the lake level. Pumping was continuous until Oct. 20, 1966 and has been intermittent since.

Remarks.--Crooked Lake has no surface inlet or outlet.
On Oct. 6, 1965, a discharge of 1.54 cfs was measured flowing into Crooked Lake from the pumped well. See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Crooked Lake near Kalamazoo, Mich.

KALAMAZOO COUNTY

Eagle Lake near Mattawan, Mich.

Location.--Lat 42°12'39", long 85°43'12", in secs. 8, 9, 16, and 17, T.3 S., R.12 W., 4.0 miles east of Mattawan.

Surface area.--224 acres.

Maximum depth.--16 ft.

Drainage area.--Not determined.

Records available.--November 1963 to January 1968 except winter periods.

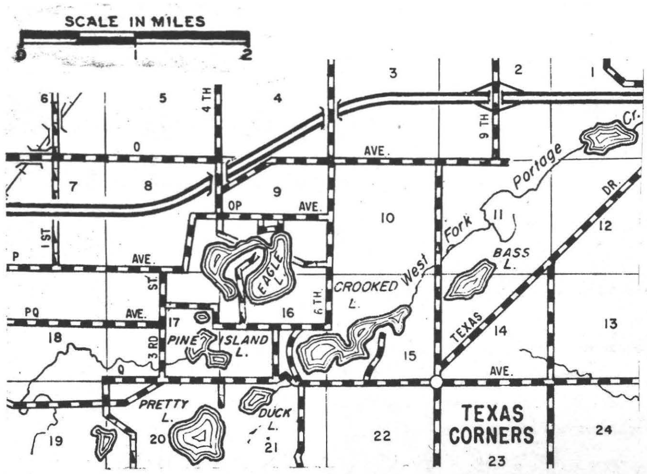
Gage.--Staff gage read intermittently. Datum of gage not determined.

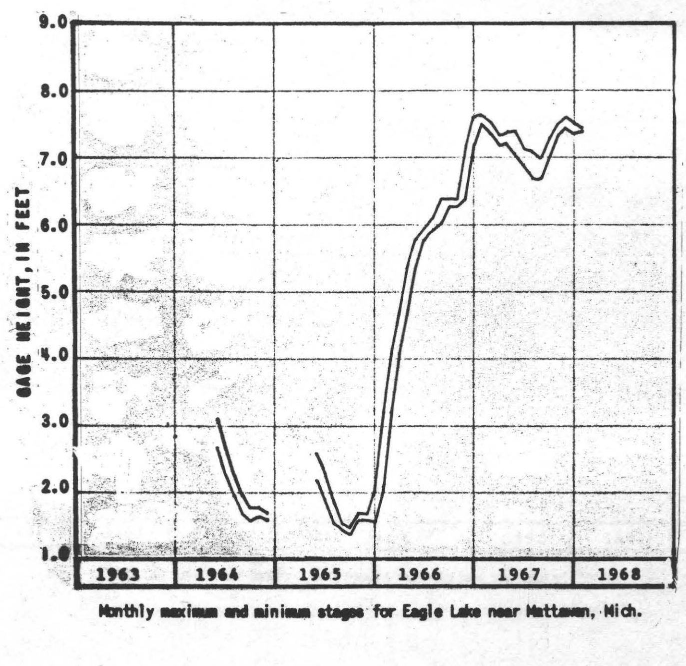
Established legal level.--None known.

Extremes.--1963-68: Maximum stage observed, 7.66 ft Jan. 2, 1967; minimum observed, 1.40 ft Sept. 14, 196

Regulation or control.--Starting in late December 1965, water has been pumped into Eagle Lake from a well finished in a deep aquifer to maintain the lake level.

Remarks.--Eagle Lake has no surface inlet or outlet.
Ground water pumped into Eagle Lake has been estimated to be from 1,000 to 1,200 gallons per minute.
See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Eagle Lake near Mattawan, Mich.

KALAMAZOO COUNTY

Gourdneck Lake near Kalamazoo, Mich.

Location.--Lat 42°09'17", long 85°34'33", in secs. 3 and 34, Tps. 3 and 4 S., R.11 W., 9.5 miles south of Kalamazoo.

Surface area.--222 acres.

Maximum depth.--52 ft.

Drainage area at outlet.--11.6 sq mi.

Records available.--April 1958 to September 1968 except periods April 1963 to March 1964, January to March 1965 and November 1967 to August 1968.

Gage.--Staff gage read intermittently. Datum of gage is 849.50 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1958-68: Maximum stage observed, 2.20 ft Aug. 22, 23, 1966; minimum observed, 0.64 ft Feb. 15, 1963.

Regulation or control.--Flow into Gourdneck Lake is regulated by a dam, 1.3 miles upstream on Gourdneck Creek.

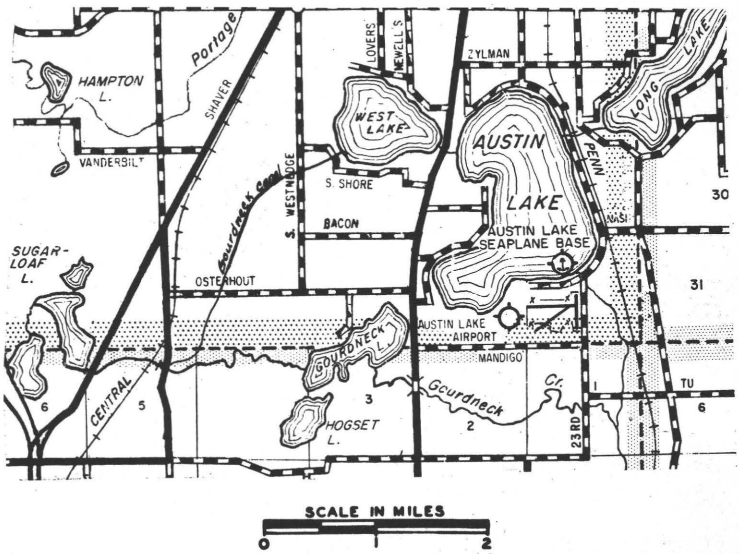
Remarks.--The inlet and outlet of Gourdneck Lake is Gourdneck Creek. Hogset Lake is connected to Gourdneck Lake at the south end.

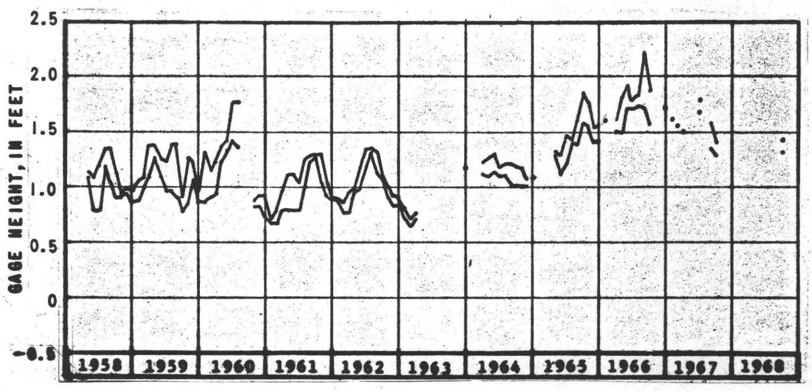
Records of daily discharge have been collected since January 1964 on Gourdneck Creek, in NE¼ sec. 5, T.4 S., R.11 W., at Oakland Drive, 1.3 miles upstream from Gourdneck Lake. Also, see Sugarloaf Lake.

The following discharge measurements have been made on Gourdneck Creek, in SW¼ sec. 1, T.4 S., R.11 W., at 23rd St., 1.8 miles downstream from Gourdneck Lake (drainage area, 13.1 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Oct. 17, 1963	6.77	Oct. 11, 1966	8.38
Feb. 6, 1964	5.90	Nov. 8, 1966	13.5
Mar. 3, 1964	6.58	Dec. 6, 1966	21.8
Apr. 9, 1964	14.9	Jan. 5, 1967	13.8
June 2, 1964	5.37	Feb. 7, 1967	23.0
July 28, 1964	3.36	Mar. 17, 1967	20.4
Sept. 15, 1964	4.27	Apr. 12, 1967	29.0
Jan. 8, 1965	10.5	May 9, 1967	23.2
Feb. 19, 1965	10.7	July 11, 1967	13.9
Mar. 5, 1965	20.3	Aug. 16, 1967	10.0
Apr. 7, 1965	23.2	Sept. 26, 1967	9.77
Aug. 5, 1965	3.88	Oct. 5, 1967	10.8
Oct. 18, 1965	7.33	Nov. 9, 1967	15.8
Feb. 8, 1966	11.4	Jan. 9, 1968	18.9
Mar. 15, 1966	14.3	Feb. 14, 1968	29.6
Apr. 6, 1966	15.4	Mar. 13, 1968	22.3
May 3, 1966	18.7	May 8, 1968	15.5
June 14, 1966	13.4	June 4, 1968	11.5
July 7, 1966	6.80	July 12, 1968	15.7
Aug. 11, 1966	9.49	Aug. 9, 1968	20.5
Sept. 8, 1966	11.2	Sept. 6, 1968	11.1

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Gourdneck Lake near Kalamazoo, Mich.

KALAMAZOO AND BARRY COUNTY

Gull Lake near Richland, Mich.

Location.--Lat 42°22'38", long 85°24'10", in many sections, Tps.1 N. and 1 S., Rs. 9 and 10 W., 2.7 miles east of Richland.

Surface area.--2,050 acres.

Maximum depth.--110 ft.

Drainage area at outlet.--28.9 sq mi.

Records available.--October 1942 to September 1950; December 1963 to September 1968.

Gage.--Staff gage read daily. Datum of gage for period 1942-50 was 877.68 ft above mean sea level (levels by Michigan Department of Natural Resources). Datum of gage for period 1963-68 not determined.

Established legal level.--None known. Lake level is generally lowered during the winter months by operation of dam on the outlet.

Extremes.--1942-50: Maximum stage, 2.24 ft May 11, June 28, 1943; minimum, 1.00 ft Feb. 3-12, 1946. 1963-68: Maximum stage, 2.20 ft June 25, 1968; minimum stage observed, 0.88 ft Mar. 9, 13, 17, 18, 1967.

Regulation or control.--Concrete dam with spillway is located on the outlet, about 0.5 mile downstream from the lake.

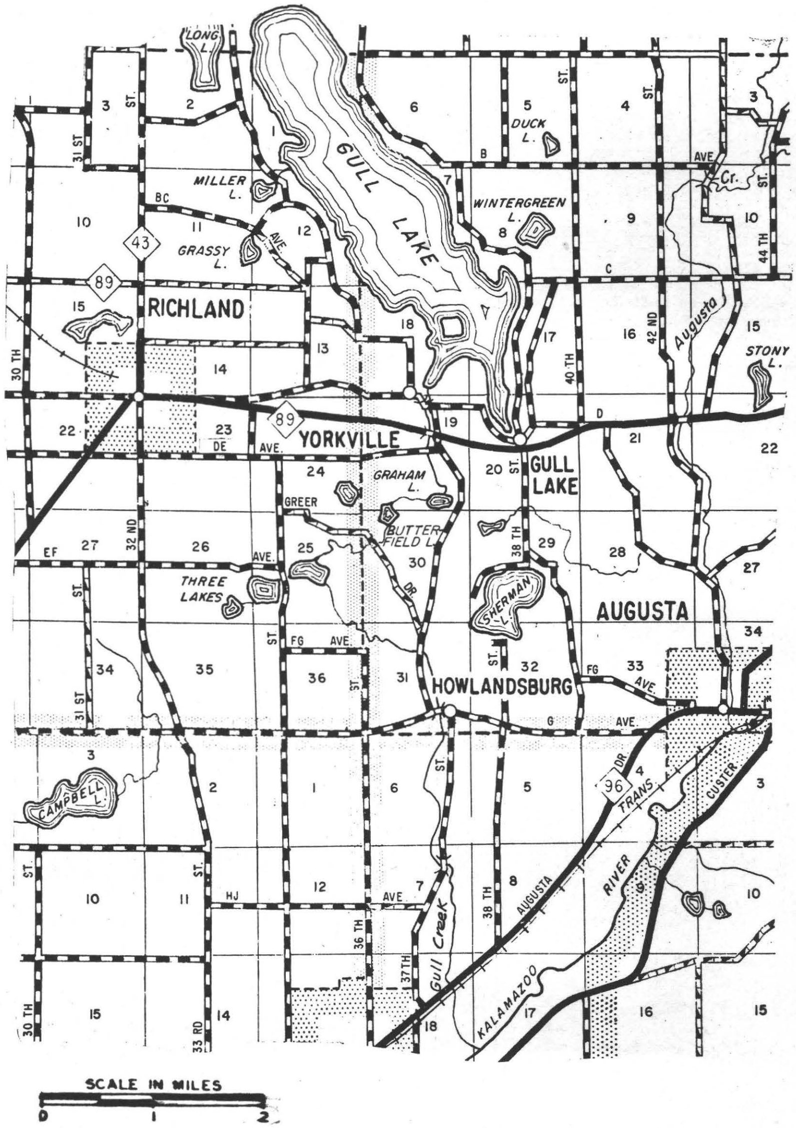
Remarks.--An unnamed stream enters the north end of Gull Lake and Miller Lake outlet enters the west side. The outlet, Gull Creek, leaves the lake at the south end.

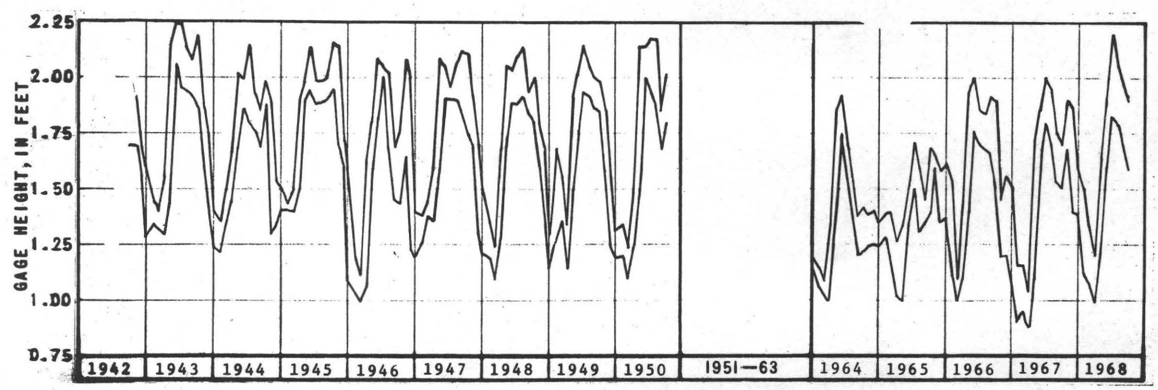
The following discharge measurements have been made on Gull Creek in NE¼ sec. 19, T.1 S., R.9 W., at DE Ave. (drainage area, 28.9 sq mi).

Date	Discharge (cfs)
July 27, 1964	0.22
Oct. 18, 1965	3.17
May 9, 1967	0.65

Daily records of discharge have been collected since October 1964 on Gull Creek in NE¼ sec. 7, T.2 S., R.9 W., at 37th Street (drainage area, 38.1 sq mi). These records are published by the U.S. Geological Survey.

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Gull Lake near Richland, Mich.

KALAMAZOO COUNTY

Indian Lake near Vicksburg, Mich.

Location.--Lat 42°09'27", long 85°27'52", in many sections, Tps. 3 and 4 S., R.10 W., 4.3 miles northeast of Vicksburg.

Surface area.--758 acres.

Maximum depth.--75 ft.

Drainage area at outlet.--55.5 sq mi.

Records available.--July 1944 to September 1950. December 1963 to January 1968 except some winter periods.

Gage.--Staff gage read daily. Datum of gage was 840.00 ft above mean sea level from July 1944 to September 1950 (levels by Michigan Department of Natural Resources). Since December 1963 gage has been at a different and undetermined datum.

Established legal level.--None known.

Extremes.--1944-50: Maximum stage observed, 9.06 ft Apr. 6, 1947; minimum observed, 5.72 ft July 29-31, Aug. 8, 1946. 1963-68: Maximum stage observed, 6.24 ft May 19, 1966; minimum observed, 4.17 ft Feb. 21, 1964.

Regulation or control.--None.

Remarks.--Portage River is the inlet and outlet of Indian Lake. There are also several smaller inlets including Dorrance Creek.

An engineering lake-level control study was completed in 1946 by the Michigan Departement of Natural Resources.

The following discharge measurements have been made on Portage River, in SE¼ sec. 28, T.3 S., R.10 W., at S. Ave., 0.9 mile west of Pavilion, and about 0.8 mile upstream from Indian Lake (drainage area, 32.8 sq mi).

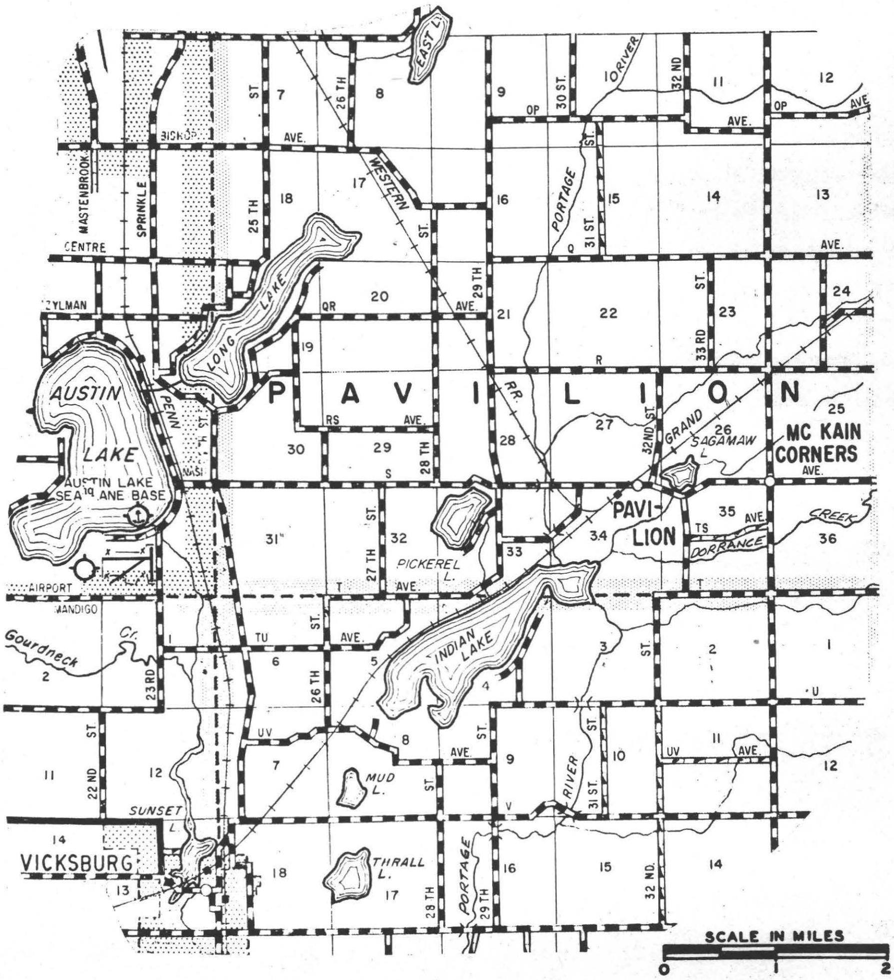
Date	Discharge (cfs)	Date	Discharge (cfs)
Oct. 17, 1963	4.38	Feb. 18, 1965	21.9
Apr. 16, 1964	13.4	Aug. 5, 1965	10.0
June 2, 1964	8.46	Oct. 18, 1965	11.1
July 27, 1964	6.39	May 3, 1966	38.3
Sept. 15, 1964	4.95	Aug. 30, 1966	11.6
		May 8, 1967	40.6

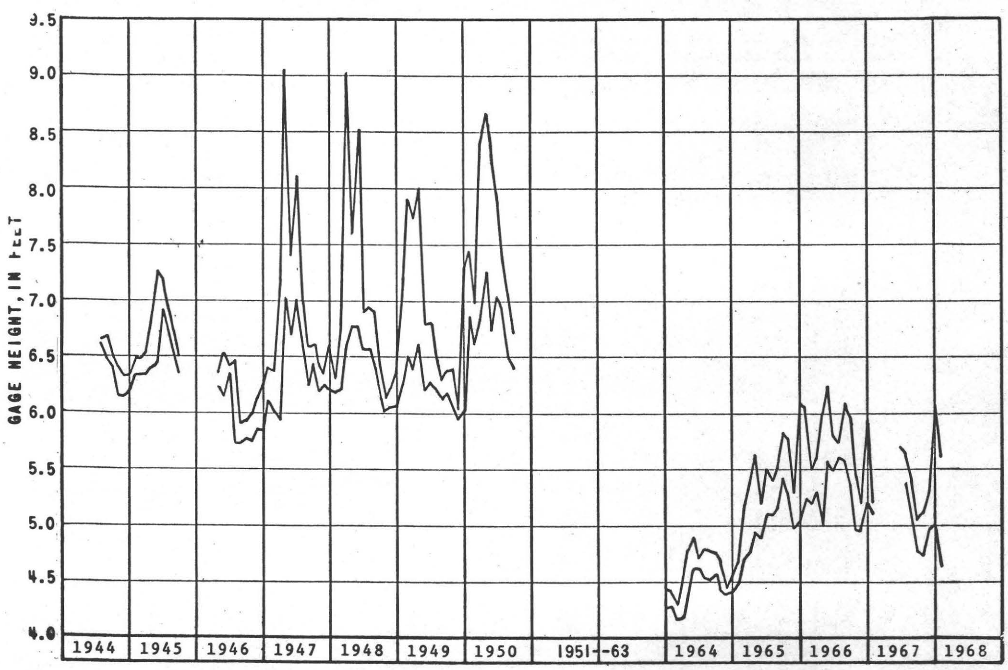
The following discharge measurements have been made on Dorrance Creek, in SW¼ sec. 36, T.3 S., R.10 W., at 34th St., 0.5 mile south of McKain Corners, and 1.7 miles upstream from Indian Lake (drainage area, 13.0 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Apr. 16, 1964	2.70	Aug. 6, 1965	.25 (estimated)
June 2, 1964	.86	Oct. 18, 1965	1.64
July 27, 1964	.41	May 4, 1966	7.10
Sept. 15, 1964	.28	Aug. 30, 1966	1.72
Feb. 18, 1965	5.88	May 8, 1967	8.02

Records of daily discharge have been collected from March 1946 to September 1951 and from October 1964 to September 1968 on Portage River, in SW¼ sec. 16, T.4 S., R.10 W., about 4 miles downstream from Indian Lake (drainage area, 68.2 sq mi). These records are published by the U.S. Geological Survey.

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Indian Lake near Vicksburg, Mich.

KALAMAZOO COUNTY

Long Lake near Kalamazoo, Mich.

Location.--Lat 42°11'09", long 85°32'17", in many sections, T.3 S., Rs. 10 and 11 W., 8.0 miles south of Kalamazoo.

Surface area.--575 acres.

Maximum depth.--57 ft.

Drainage area at outlet.--6.59 sq mi.

Records available.--April 1958 to September 1968 except periods September 1960, April to November 1963, and March 1968.

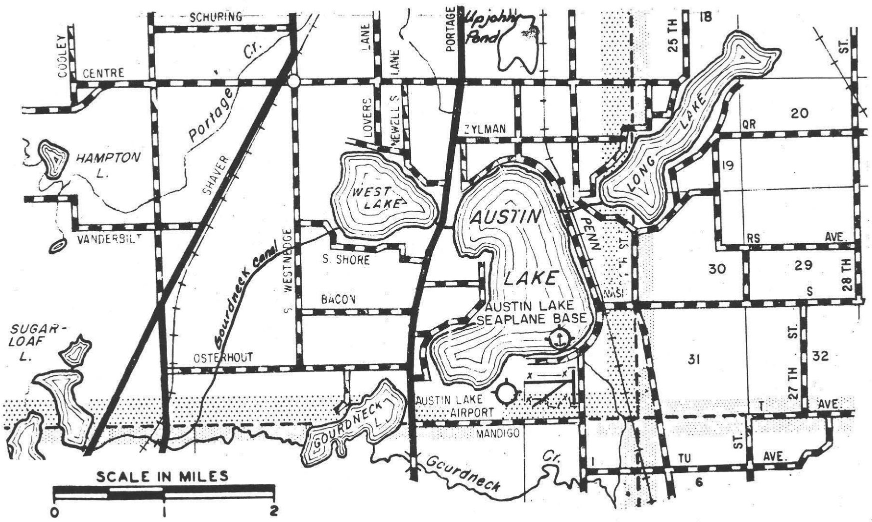
Gage.--Staff gage read daily except period April 1958 to March 1963 when gage was read intermittently. Datum of gage is 847.68 ft above mean sea level (levels by Michigan Department of Natural Resources).

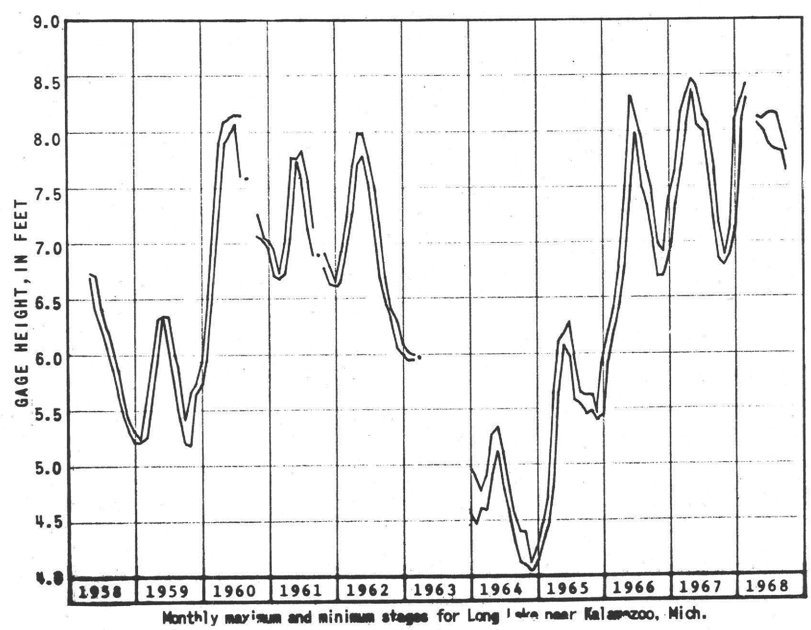
Established legal level.--856.00 ft above mean sea level, established by Circuit Court on July 27, 1939.

Extremes.--1958-68: Maximum stage observed, 8.46 ft Apr. 5-14, 1967; minimum observed, 4.04 ft Nov. 14, 15, 1964.

Regulation or control.--A concrete dam equipped for installing or removing boards to regulate lake levels, exists at the outlet of Long Lake.

Remarks.--The channel connecting Long and Austin Lakes is both an inlet and an outlet, depending on relative lake levels. Under natural conditions with fairly high water levels, flow will be from Long to Austin Lake. In recent years, the levels of Austin and West Lakes have been raised by water diverted from Gourdneck Creek plus water piped to Austin Lake from the nearby Upjohn Company recharge pond. Under these conditions flow has been from Austin to Long Lake. During the drought years of 1963-64, the channel was dry. No discharge measurements are available on the channel.
See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Long Lake near Kalamazoo, Mich.

KALAMAZOO COUNTY

Portage Lake near Climax, Mich.

Location.--Lat 42°15'21", long 85°21'22", in secs. 27, 28, 33, and 34, T.2 S., R.9 W., 1.6 miles northwest of Climax.

Surface area.--180 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--5.04 sq mi.

Records available.--December 1963 to December 1967 except February, March, May, and October, 1967.

Gage.--Staff gage read intermittently January 1966 to December 1967. Prior to January 1966, gage read daily. Datum of gage not determined.

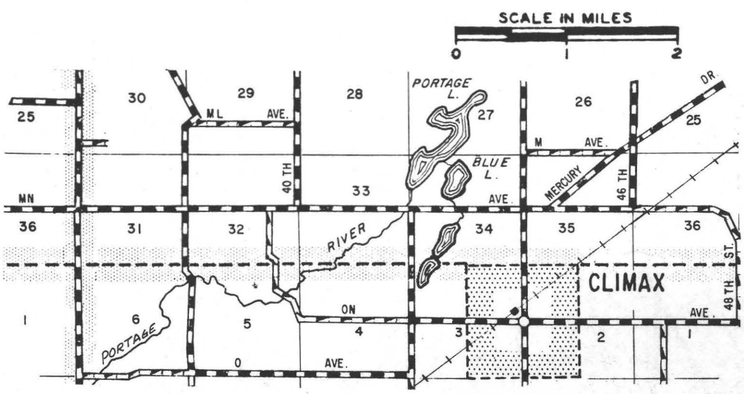
Established legal level.--None known.

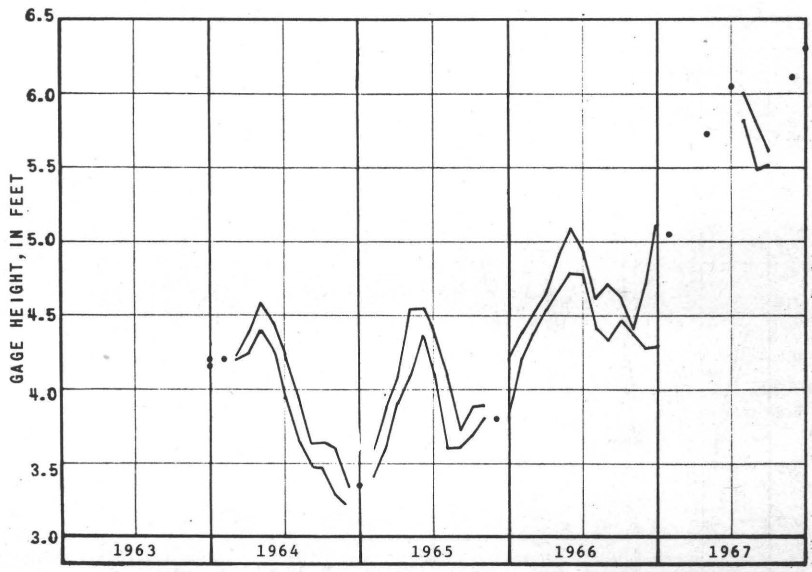
Extremes.--1963-67: Maximum stage observed, 6.30 ft Dec. 12, 1967; minimum observed, 3.21 ft Nov. 14, 1964.

Regulation or control.--None.

Remarks.--Portage Lake is the headwaters of Portage River. The lake has no inlet other than a connecting channel with Blue Lake. The outlet, Portage River, leaves the southwest end of the lake and flows in a southerly direction to the St. Joseph River.

Observations of zero flow were noted on Portage River, in NE¼ sec. 33, T.2 S., R.9 W., at MN Road, 0.2 mile downstream from Portage Lake on July 28, 1964, Oct. 18, 1965, and May 8, 1967 (drainage area, 5.04 sq mi).





Monthly maximum and minimum stages for Portage Lake near Climax, Mich.

KALAMAZOO COUNTY

Sherman Lake near Augusta, Mich.

Location.--Lat 42°20'42", long 85°23'20", in secs. 29, 31, and 32, T.1 S., R.9 W., 2.1 miles northwest of Augusta.

Surface area.--120 acres.

Maximum depth.--35 ft.

Drainage area.--0.83 sq mi.

Records available.--December 1963 to September 1968, except February 1966.

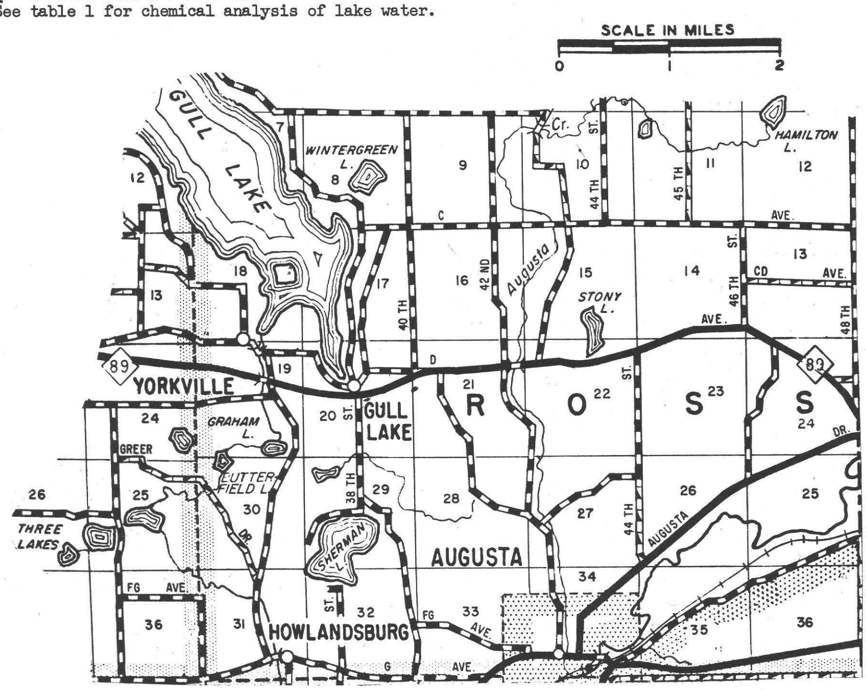
Gage.--Staff gage read intermittently June 1966 to September 1968. Prior to June 1966, gage read daily. Datum of gage not determined.

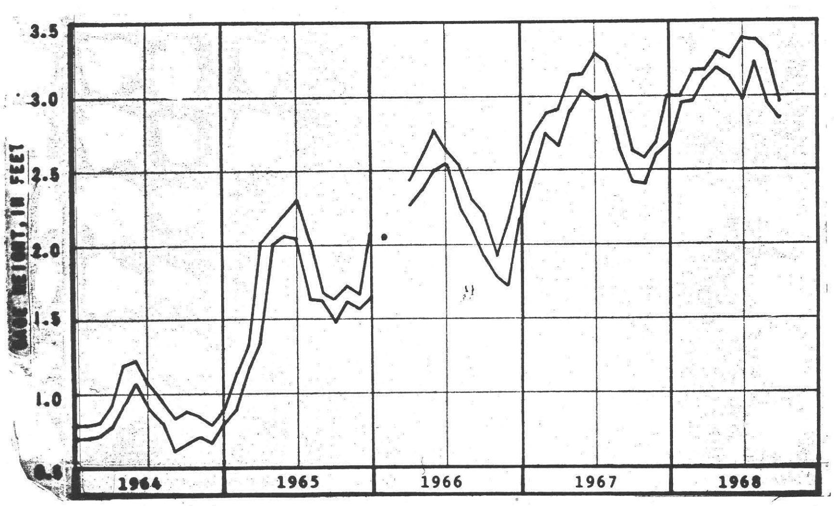
Established legal level.--None known.

Extremes.--1963-68: Maximum stage observed, 3.39 ft June 27, 28, 30, 1968; minimum stage, 0.60 ft Aug. 19, 1964.

Regulation or control.--None.

Remarks.--Sherman Lake has no inlet or outlet.
See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Sherman Lake near Augusta, Mich.

KALAMAZOO COUNTY

Stony Lake near Augusta, Mich.

Location.--Lat 42°22'27", long 85°20'47", in secs. 15 and 22, T.1 S., R.9 W., 2.7 miles north of Augusta.

Surface area.--63 acres.

Maximum depth.--16 ft.

Drainage area.--2.40 sq mi.

Records available.--December 1963 to October 1967 except June 1966.

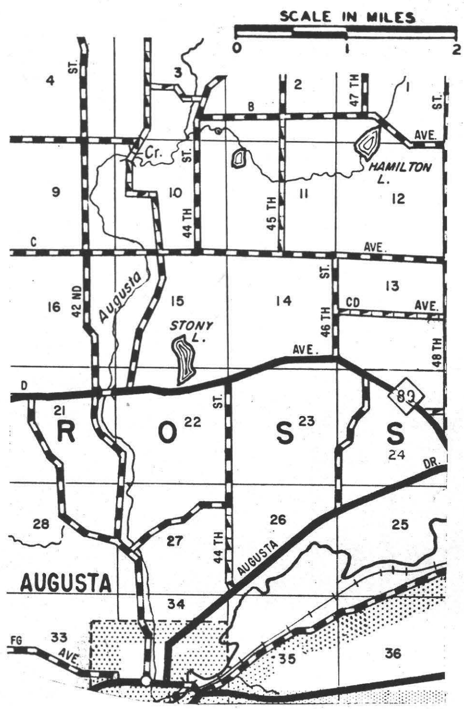
Gage.--Staff gage read intermittently. Datum of gage not determined.

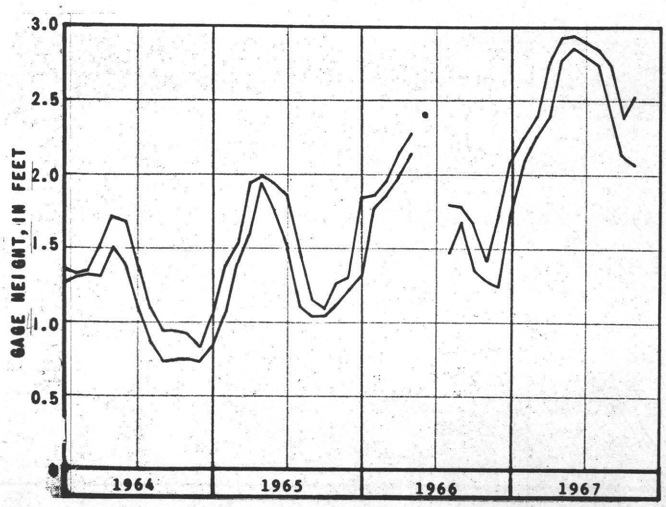
Established legal level.--None known.

Extremes.--1963-67: Maximum stage observed, 2.94 ft May 8, 13, 1967; minimum stage, 0.73 ft Aug. 10, 11, 19, Nov. 8-12, 20, 1964.

Regulation or control.--None.

Remarks.--Stony Lake has no inlet or outlet.





Monthly maximum and minimum stages for Stony Lake near Augusta, Mich.

KALAMAZOO COUNTY

Sugarloaf Lake near Schoolcraft, Mich.

Location.--Lat 42°09'23", long 85°37'32", in secs. 5, 6, 31, and 32, Tps. 3 and 4 S., R.11 W., 3.0 miles north of Schoolcraft.

Surface area.--148 acres.

Maximum depth.--30 ft.

Drainage area at outlet.--5.65 sq mi.

Records available.--December 1959 to January 1968 except periods July to September 1960 and April to November 1963.

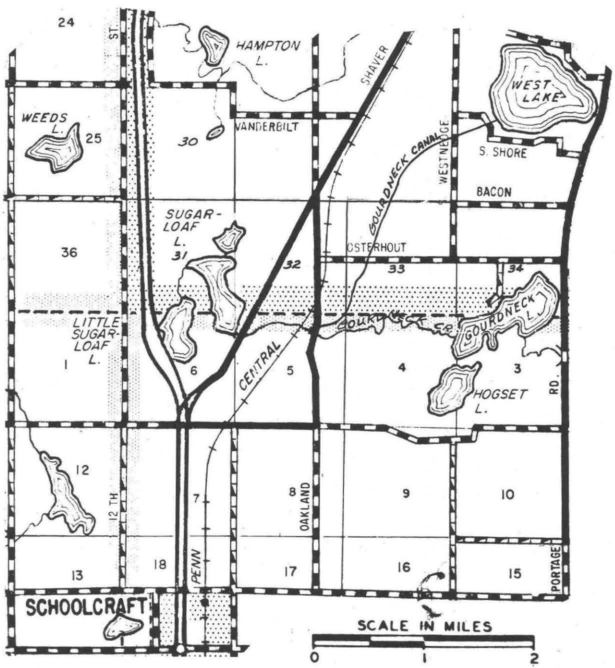
Gage.--Staff gage read daily from November 1963 to January 1968. Prior to November 1963 staff gage read intermittently. Datum of gage is 856.76 ft above mean sea level (levels by Michigan Department of Natural Resources).

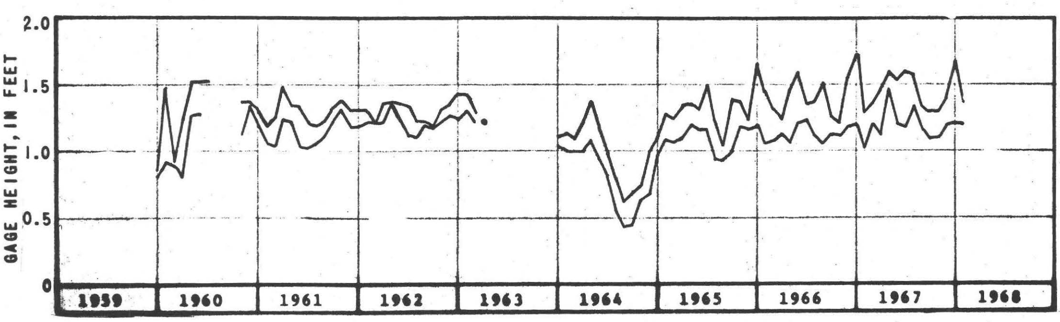
Established legal level.--None known.

Extremes.--1959-68: Maximum stage observed, 1.74 ft Dec. 8, 1966; minimum observed, 0.43 ft Aug. 9, 10, 1964.

Regulation or control.--Sugarloaf Lake is controlled by a dam on the outlet, 0.6 mile downstream from the lake.

Remarks.--Sugarloaf Lake has two inlets. Little Sugarloaf Lake outlet enters the lake at the northwest end and an outlet from an unnamed lake enters Sugarloaf Lake at the north end. The outlet, Gourdneck Creek, leaves the lake at the southwest end. A dam on Gourdneck Creek, 0.6 mile downstream is operated by Simpson-Lee Paper Company. Some of the flow is diverted at the dam through a canal to West Lake.
Records of daily discharge have been collected since January 1964 on Gourdneck Creek, below the dam, in NE¼ sec. 5, T.4 S., R.11 W. (drainage area, 7.29 sq mi). Also, records have been collected since October 1965 on Gourdneck Canal in NW¼ sec. 33, T.3 S., R.11 W. These records are published by the U.S. Geological Survey.
See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Sugarloaf Lake near Schoolcraft, Mich.

KALAMAZOO COUNTY

West Lake near Kalamazoo, Mich.

Location.--Lat 42°10'57", long 85°33'51", in secs. 22, 23, 26, and 27, T.3 S., R.11 W., 7.5 miles south of Kalamazoo.

Surface area.--335 acres.

Maximum depth.--12 ft.

Drainage area.--Not determined.

Records available.--April 1958 to January 1968 except period April to October 1963.

Gage.--Staff gage read daily from November 1963 to January 1968. Prior to November 1963 gage read intermittently. Datum of gage is 851.82 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--856.0 ft above mean sea level, established by Circuit Court on Apr. 1, 1946.

Extremes.--1958-68: Maximum stage observed, 4.31 ft Apr. 14, 1967; minimum observed, 0.58 ft Oct. 26-29, 1964.

Regulation or control.--Water is diverted through a canal to West Lake from Gourdneck Creek watershed.

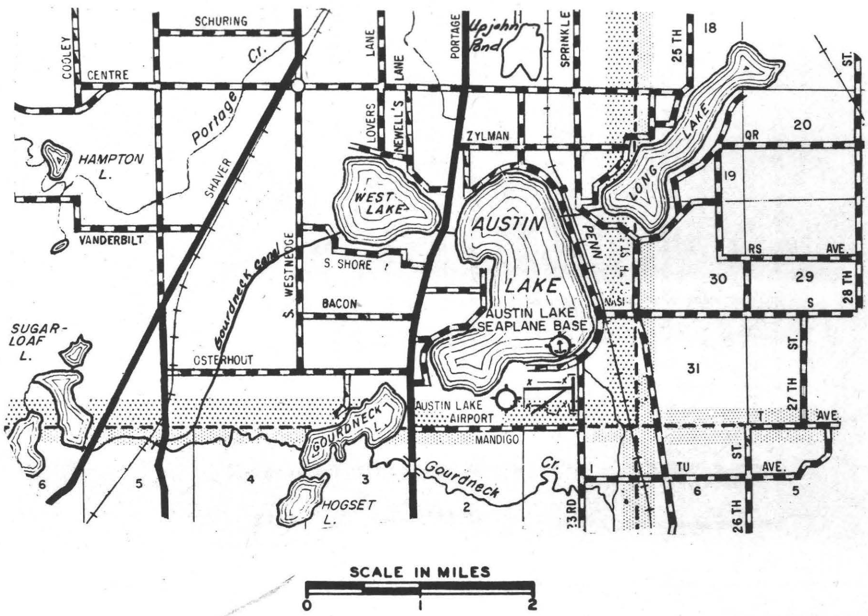
Remarks.--The diversion canal, herein called Gourdneck Canal, enters the southwest end of West Lake. The outlet, at the east end of West Lake, is a short connecting channel with Austin Lake.

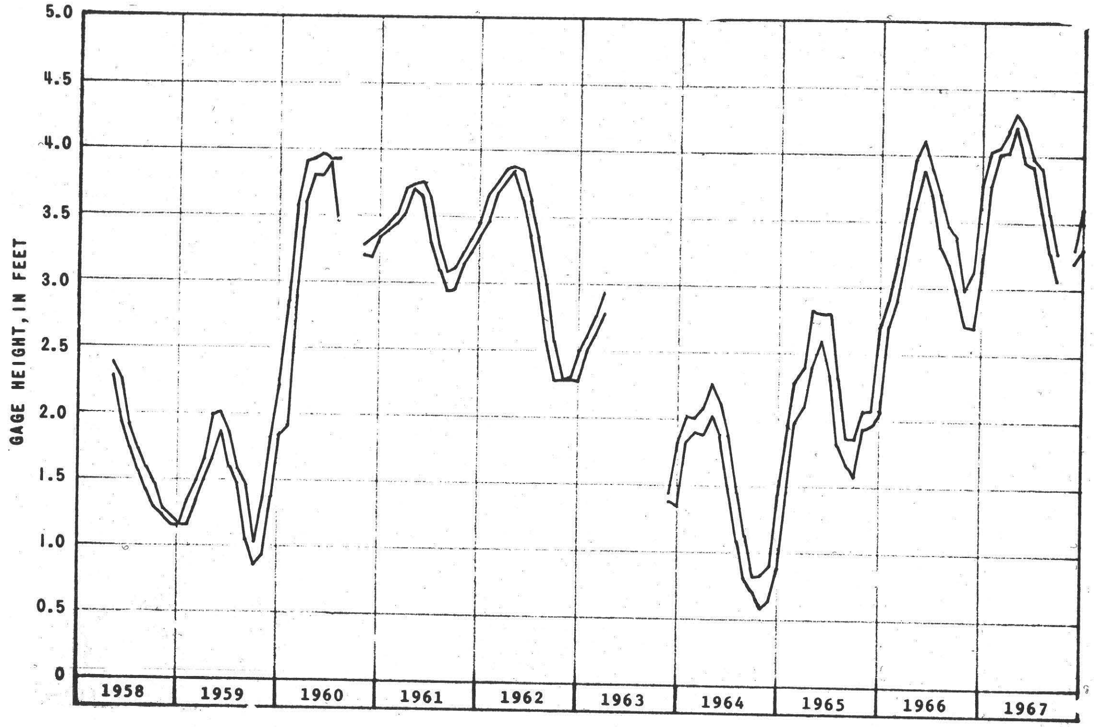
An engineering lake-level control study was completed in 1946 by the Michigan Department of Natural Resources.

Records of daily discharge have been collected since October 1965 on Gourdneck Canal in NW¼ sec. 33, T.3 S., R.11 W., at Osterhout Road. These records are published by the U.S. Geological Survey.

See Austin Lake for listing of discharge measurements made in the outlet channel between West and Austin Lakes.

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for West Lake near Kalamazoo, Mich.

KALKASKA COUNTY

Manistee Lake near Kalkaska, Mich.

Location.--Lat 44°46'10", long 85°01'15", in secs. 27, 33, 34, and 35, T.28 N., R.6 W., 8 miles northeast of Kalkaska.

Surface area.--860 acres.

Maximum depth.--18 ft.

Drainage area.--Not determined.

Records available.--April 1944 to September 1950 except some winter periods.

Gage.--Staff gage read daily. Datum of gage not determined.

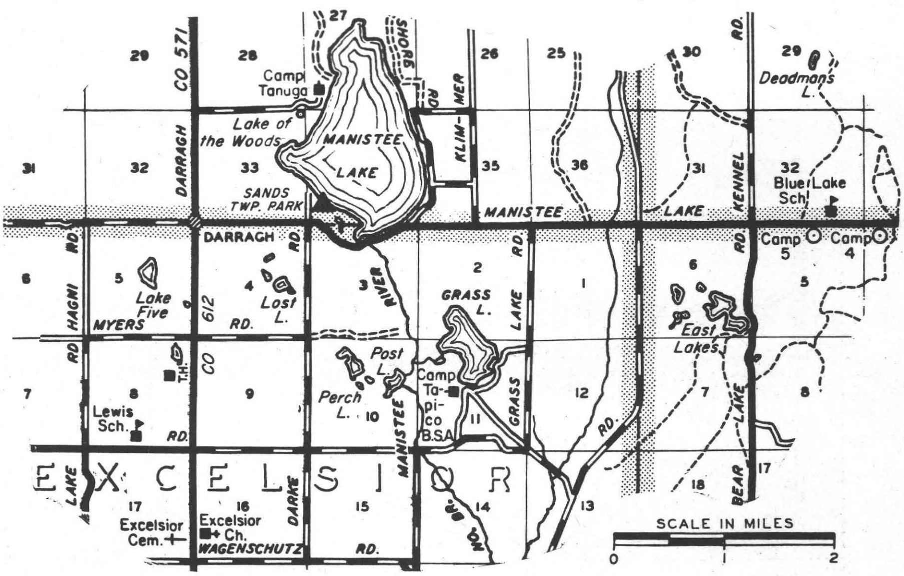
Established legal level.--None known.

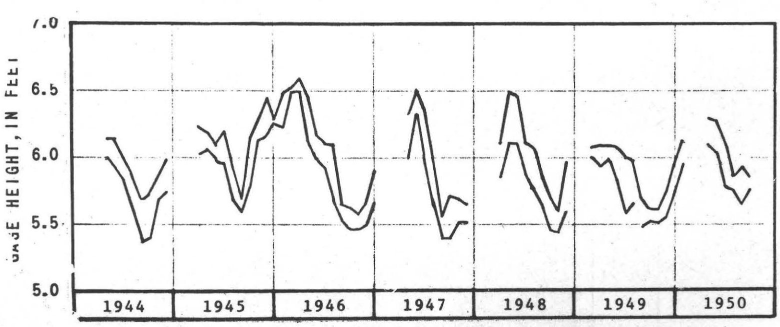
Extremes.--1944-50: Maximum stage, 6.60 ft Mar. 22, 1946; minimum, 5.36 ft. Aug. 28, 1944.

Regulation or control.--None.

Remarks.--Manistee Lake is the headwaters of North Branch Manistee River. The outlet of Manistee Lake is at the south end of the lake and flows south to Post Lake. There is no inlet. The following discharge measurements have been made at the outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
Feb. 24, 1945	3.69	Mar. 17, 1948	4.03
Oct. 3, 1945	5.21	Aug. 4, 1948	4.69
Jan. 4, 1946	5.61	Oct. 6, 1948	.34
Mar. 26, 1946	10.4	Dec. 23, 1948	2.47
July 11, 1946	3.56	Apr. 7, 1949	6.35
Sept. 18, 1946	1.40	July 27, 1949	2.42
Dec. 31, 1946	3.74	Oct. 18, 1949	.55
Apr. 14, 1947	6.40	Dec. 21, 1949	3.00
July 8, 1947	3.03	Apr. 4, 1950	6.72
Sept. 30, 1947	2.48	July 19, 1950	1.96
Dec. 23, 1947	2.81	Oct. 28, 1954	5.16





Monthly maximum and minimum stages for Manistee Lake near Kalkaska, Mich.

KEWEENAW COUNTY

Gratiot Lake near Phoenix, Mich.

Location.--Lat 47°21'44", long 88°06'13", in many sections, T.57 N., R.30 W., 8.5 miles east of Phoenix.

Surface area.--1,440 acres.

Maximum depth.--78 ft.

Drainage area at outlet.--10.7 sq mi.

Records available.--June 1943 to September 1950 except winter and spring months and period November 1945 to September 1946.

Gage.--Staff gage read daily. Datum of gage not determined.

Established legal level.--None known.

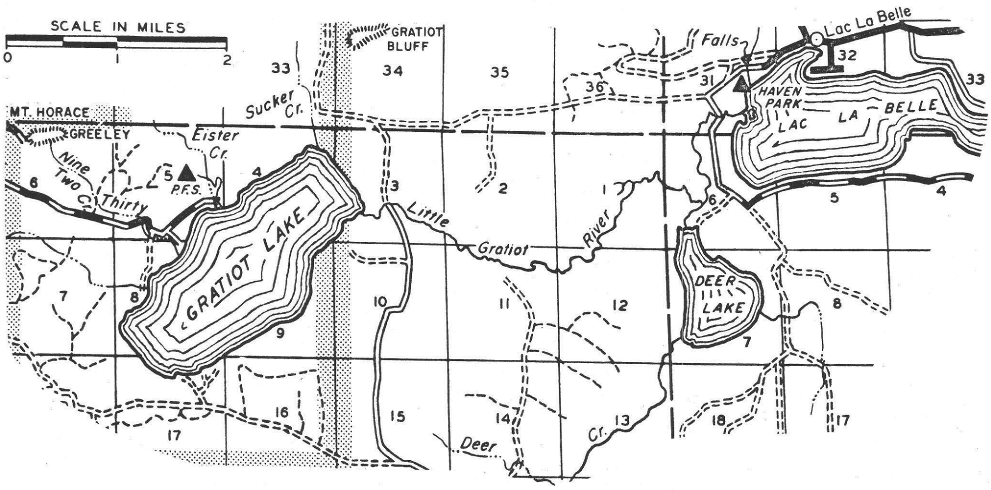
Extremes.--1943-50: Maximum stage observed, 6.56 ft May 1950 (from highwater mark); minimum observed, 3.36 ft Oct. 7, 8, 16, 1943.

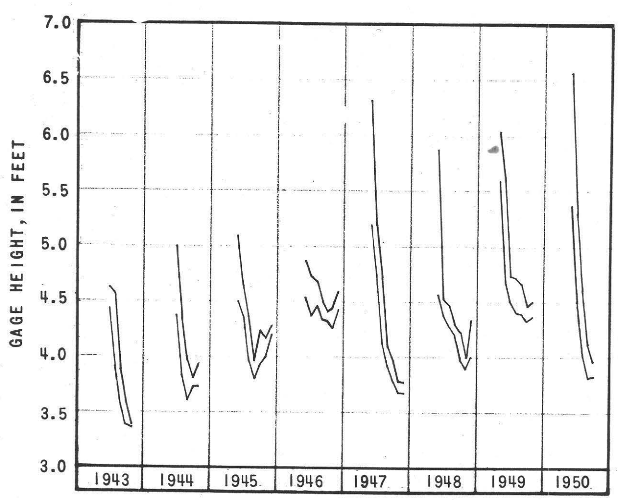
Regulation or control.--There is no control structure, however beaver dams in the outlet affect lake level at times.

Remarks.--Sucker, Eister, and Nine Thirty Two Creeks are the principal inlets to Gratiot Lake. The outlet, Little Gratiot River, is at the east end of the lake and flows east to Lac LaBelle.

The following discharge measurements have been made on Little Gratiot River at the outlet of Gratiot Lake.

Date	Discharge (cfs)	Date	Discharge (cfs)
May 15, 1945	25.1	May 19, 1948	30.3
Sept. 12, 1945	9.57	Oct. 22, 1948	.20
May 22, 1946	20.8	May 16, 1949	37.7
May 23, 1947	61.5	Oct. 13, 1949	4.23
		May 19, 1950	122





Monthly maximum and minimum stages for Gratiot Lake near Phoenix, Mich.

KEWEENAW COUNTY

Lake Fanny Hooe near Copper Harbor, Mich.

Location.--Lat 47°27'58", long 87°51'58", in secs. 32, 33, and 34, T.59 N., R.28 W., 1.2 miles east of Copper Harbor.

Surface area.--231 acres.

Maximum depth.--48 ft.

Drainage area at outlet.--15.6 sq mi.

Records available.--June to September 1959; May 1961 to September 1967 except winter periods.

Gage.--Staff gage read daily. Datum of gage not determined.

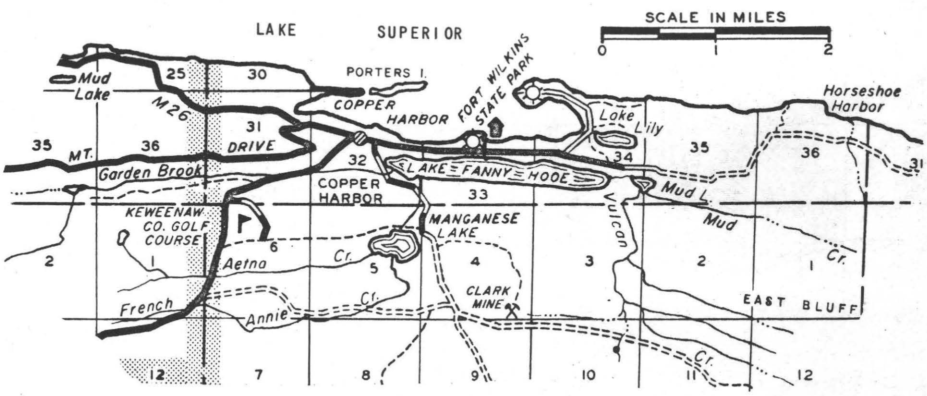
Established legal level.--None known.

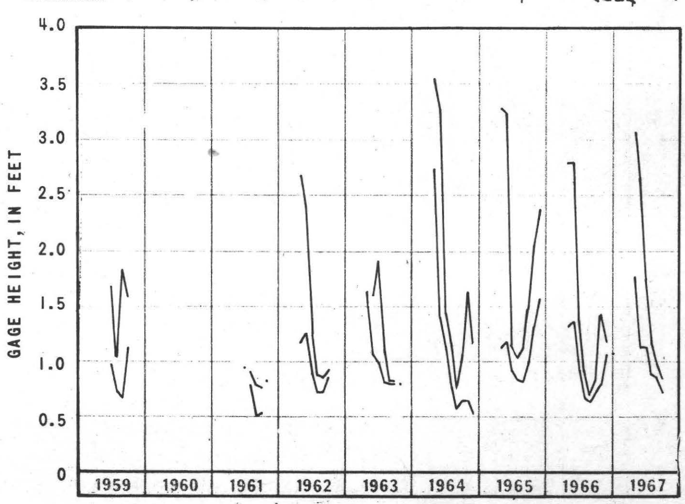
Extremes.--1959, 1961-67: Maximum stage observed, 3.55 ft Apr. 22, 1964; minimum stage, 0.50 ft Aug. 28, 29, 1961.

Regulation or control.--Concrete dam at outlet has five spillways adaptable for stop log operation to control lake level.

Remarks.--The principal inlets to Lake Fanny Hooe are Garden Brook, Lake Manganese outlet, and Mud Lake outlet. The outlet of Lake Fanny Hooe is at the north side of the lake and flows about 0.2 mile to Lake Superior.
The following discharge measurements have been made on the outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
Oct. 13, 1959	25.1	July 31, 1963	0.52
July 27, 1960	4.53	Oct. 15, 1963	.05
Oct. 26, 1960	.20	July 30, 1964	.07
May 9, 1961	121	Sept. 30, 1964	.52
June 22, 1961	5.36	Aug. 10, 1965	.57
Oct. 11, 1961	.43	Dec. 22, 1965	14.6
May 9, 1962	69.2	Aug. 4, 1966	0
June 13, 1962	6.98	Dec. 18, 1966	13.4
Sept. 11, 1962	4.07	May 20, 1967	23.4
Apr. 30, 1963	94.4	Aug. 22, 1967	.63





Monthly maximum and minimum stages for Lake Fanny Hooe near Copper Harbor, Mich.

KEWEENAW COUNTY

Lake Medora near Copper Harbor, Mich.

Location.--Lat 47°26'02", long 87°59'06, in secs. 3, 4, 9, 10, and 11, T.58 N., R.29 W., 5.1 miles southwest of Copper Harbor.

Surface area.--695 acres.

Maximum depth.--30 ft.

Drainage area at outlet.--5.36 sq mi.

Records available.--June 1959 to August 1963 except winter and spring months.

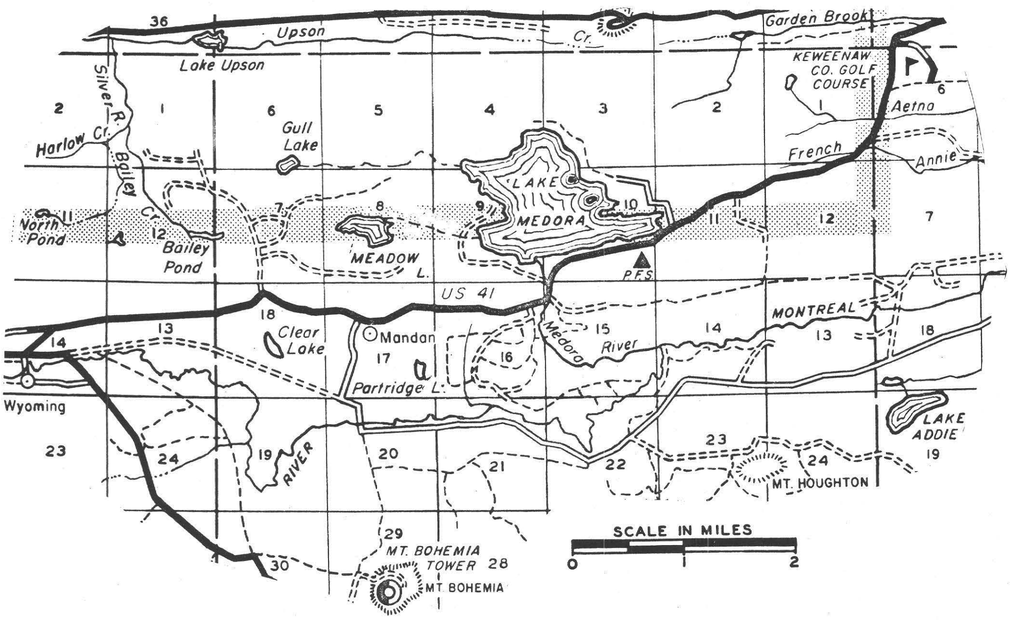
Gage.--Staff gage read daily. Datum of gage not determined.

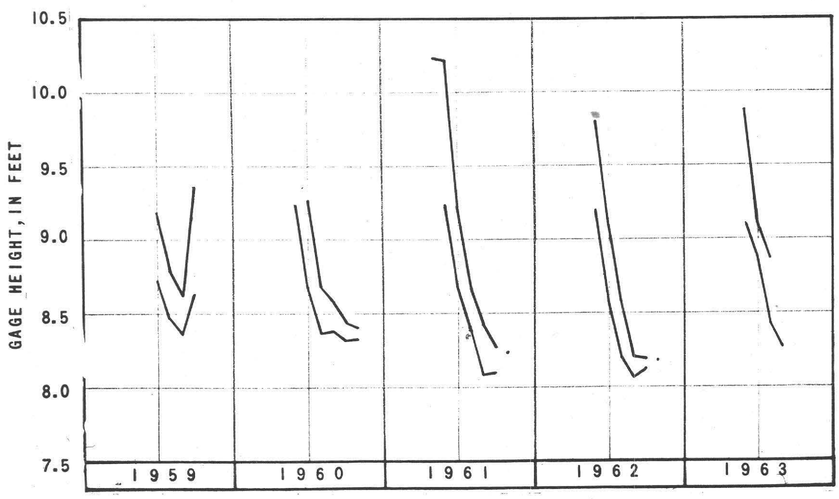
Established legal level.--None known.

Extremes.--1959-63: Maximum stage observed, 10.23 ft Apr. 30, 1961; minimum observed, 8.06 ft Aug. 28, 30, 1962.

Regulation or control.--There is a fish barrier on the outlet consisting of vertical steel bars. No regulation of lake level is maintained.

Remarks.--There is no active inlet to Lake Medora. The outlet, Medora River, is at the southernmost point of the lake and flows about 1.5 miles to Montreal River.
No discharge measurements have been made on the outlet.





Monthly maximum and minimum stages for Lake Medora near Copper Harbor, Mich.

LAKE COUNTY

Big Star Lake near Baldwin, Mich.

Location.--Lat 43°49'23", long 85°57'40", in many sections, T.17 N., R.14 W., 7.7 miles southwest of Baldwin.

Surface area.--912 acres.

Maximum depth.--25 ft.

Drainage area.--9.0 sq mi, approximately.

Records available.--August 1957 to August 1958 except period December to March.

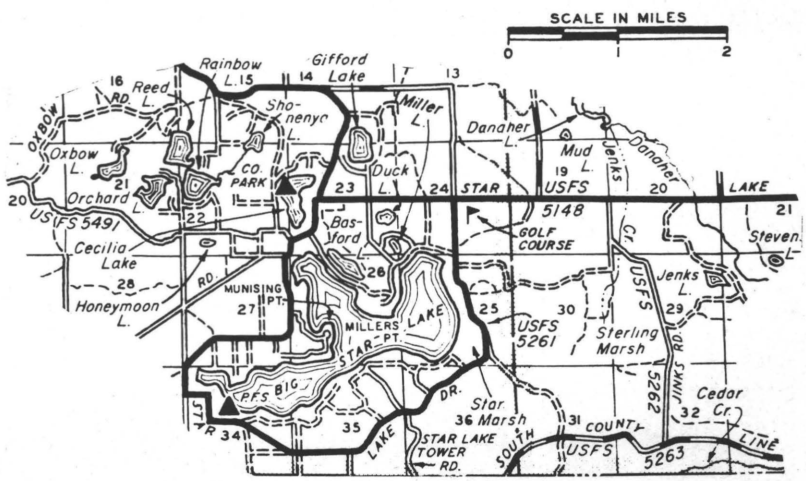
Gage.--Staff gage read daily. Datum of gage is 823.51 ft above mean sea level (levels by Michigan Department of Natural Resources).

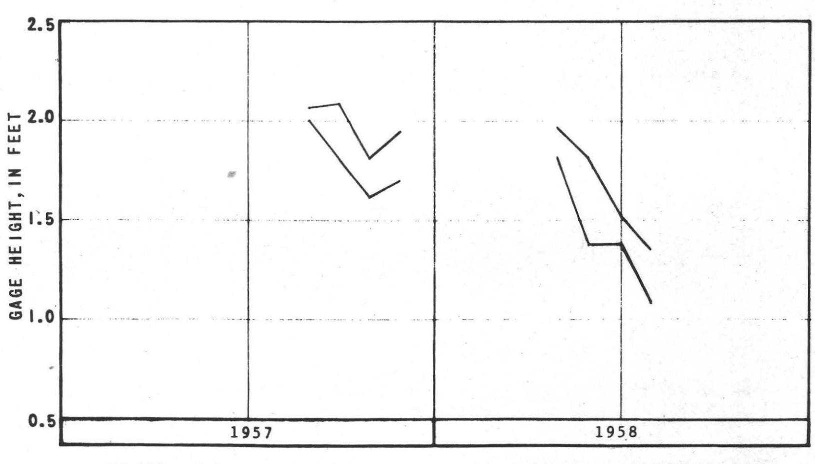
Established legal level.--None known.

Extremes.--1957-58: Maximum stage observed, 2.09 ft Aug. 31, 1957; minimum observed, 1.08 ft July 27 and Aug. 2, 1958.

Regulation or control.--None.

Remarks.--Big Star Lake has no inlet or outlet. An engineering lake-level control study was completed in 1959 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Big Star Lake near Baldwin, Mich.

LAKE COUNTY

Idlewild Lake near Idlewild, Mich.

Location.--Lat 43°52'55", long 85°47'00", in secs. 5, 6, 7, and 8, T.17 N., R.12 W., 0.9 mile southeast of Idlewild.

Surface area.--105 acres.

Maximum depth.--Unknown.

Drainage area.--Not determined.

Records available.--September 1957 to April 1959 except periods March to September 1958 and January to March 1959.

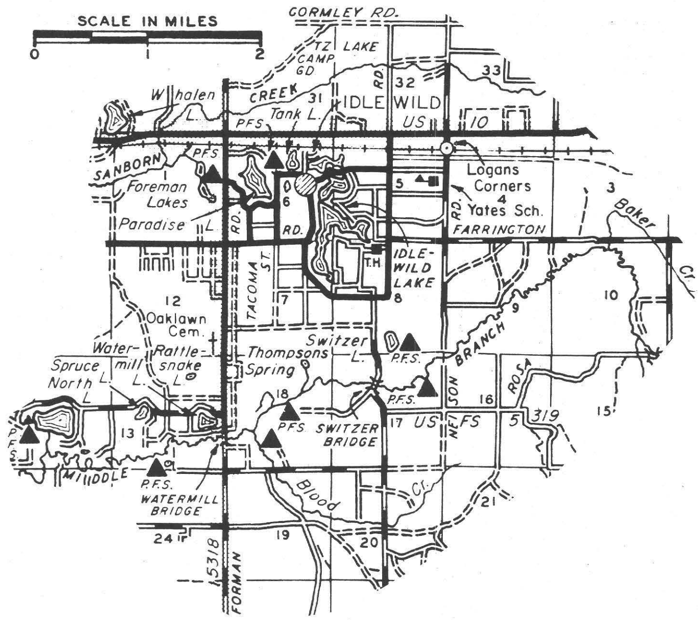
Gage.--Staff gage read daily. Datum of gage not determined.

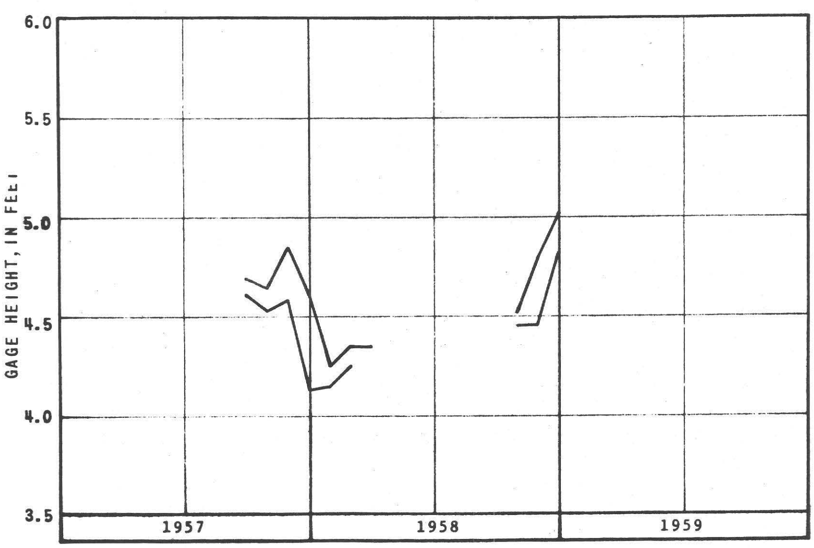
Established legal level.--None known.

Extremes.--1957-59: Maximum stage observed, 5.76 ft Apr. 3, 4, 1959; minimum observed, 4.13 ft Dec. 30, 31, 1957.

Regulation or control.--None.

Remarks.--Idewild Lake has no inlet or outlet.





Monthly maximum and minimum stages for Idlewild Lake near Idlewild, Mich.

LAKE COUNTY

Paradise Lake near Idlewild, Mich.

Location.--Lat 43°53'34", long 85°47'44", in sec. 6, T.17 N., R.12 W., 0.5 mile west of Idlewild.

Surface area.--39.3 acres.

Maximum depth.--33 ft.

Drainage area.--Not determined.

Records available.--September 1957 to November 1958 except period November 1957 to July 1958.

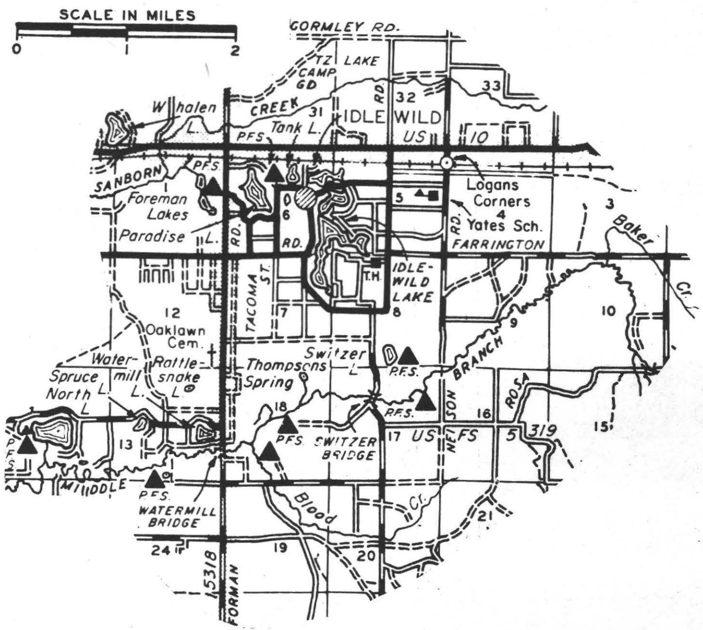
Gage.--Staff gage read daily. Datum of gage not determined.

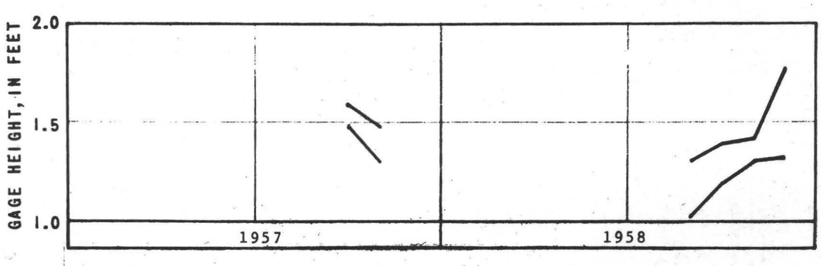
Established legal level.--None known.

Extremes.--1957-58: Maximum stage observed, 1.76 ft Nov. 29, 1958; minimum observed, 1.01 ft Aug. 19, 1958.

Regulation or control.--None.

Remarks.--Paradise Lake has no inlet or outlet.





Monthly maximum and minimum stages for Paradise Lake near Idlewild, Mich.

LAKE COUNTY

Tank Lake near Idlewild, Mich.

Location.--Lat 43°53'48", long 85°47'23", in sec. 6, T.17 N., R.12 W., 0.3 mile northwest of Idlewild.

Surface area.--7.0 acres.

Maximum depth.--Unknown.

Drainage area.--Not determined.

Records available.--September 1957 to April 1958 except period December to March.

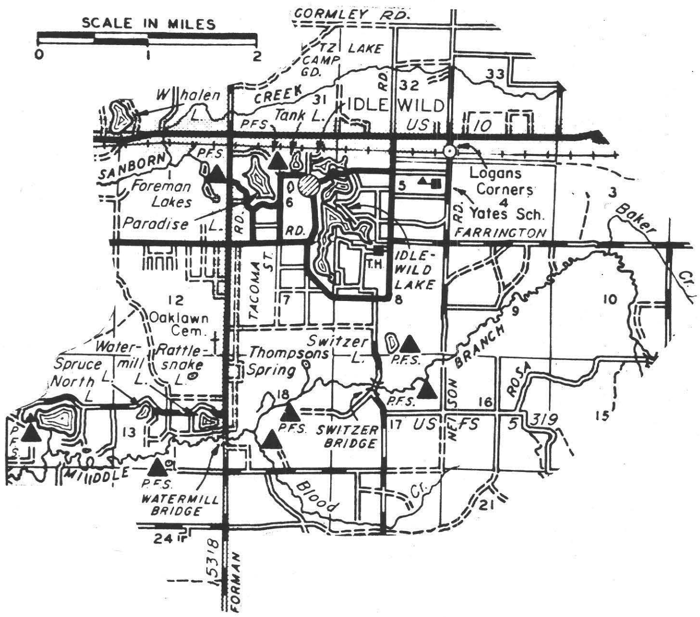
Gage.--Staff gage read daily. Datum of gage not determined.

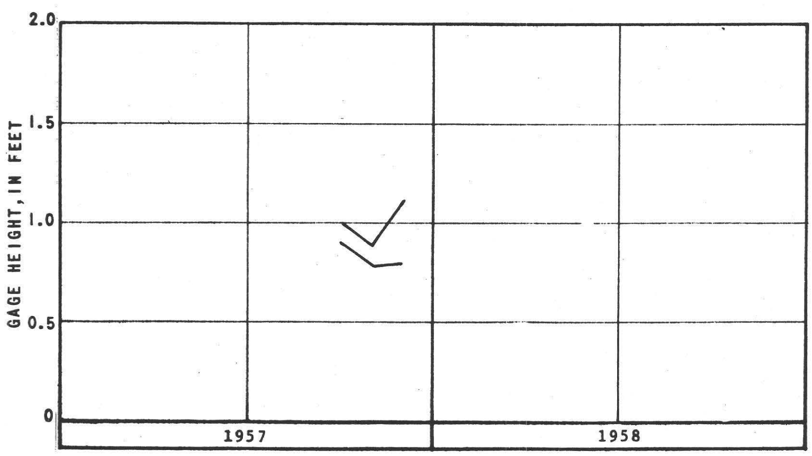
Established legal level.--None known.

Extremes.--1957-58: Maximum stage observed, 1.30 ft Apr. 1-5, 1958; minimum stage, 0.78 ft Oct. 11-15, 1957.

Regulation or control.--None.

Remarks.--Tank Lake has no inlet or outlet.





Monthly maximum and minimum stages for Tank Lake near Idlewild, Mich.

LEELANAU COUNTY

Glen Lake near Glen Arbor, Mich.

Location.--Lat 44°53'31", long 85°56'45", in many sections, Tps. 28 and 29 N., Rs. 13 and 14 W., 2 miles east of Glen Arbor.

Surface area.--6,270 acres.

Maximum depth.--130 ft.

Drainage area at outlet.--30.8 sq mi.

Records available.--June 1942 to September 1968 except some winter periods and period from October 1950 to July 1952 when readings were intermittent.

Gage.--Staff gage read daily. Datum of gage is 596.00 ft above mean sea level.

Established legal level.--596.75 ft above mean sea level, established by Circuit Court, July 23, 1945.

Extremes.--1942-50, 1952-68: Maximum stage observed, 1.90 ft June 23, 1943; minimum observed, 0.40 ft Nov. 11-19, 1949.

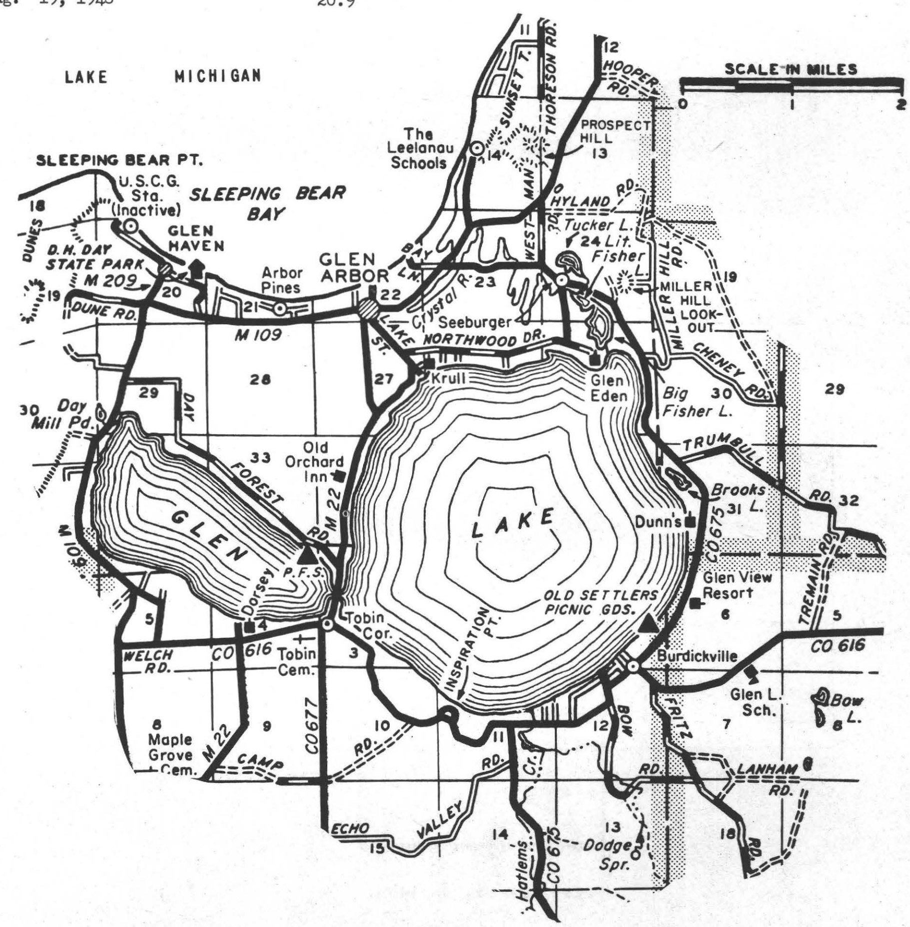
Regulation or control.--Concrete dam on outlet about 0.7 mile downstream from lake is equipped with stop logs for regulation of lake level.

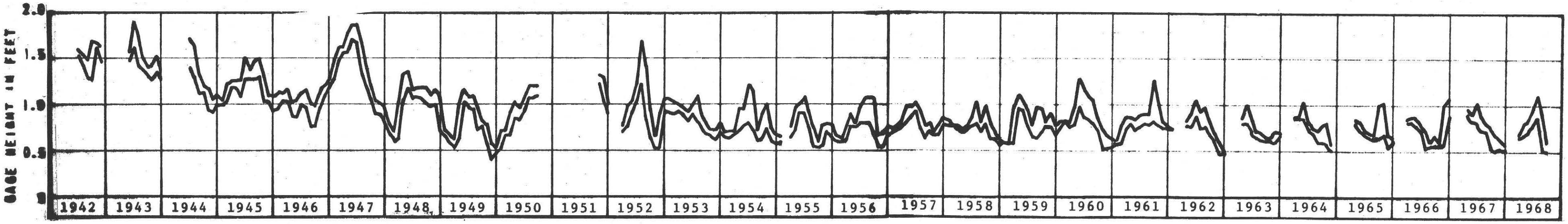
Remarks.--There is one very small inlet on the south side of Glen Lake near Burdickville. Crystal River is the outlet flowing from the northeast side of the lake to Lake Michigan.

An engineering lake-level control study was completed in 1949 by the Michigan Department of Natural Resources.

No discharge measurements are available on the inlet. The following discharge measurements have been made on Crystal River about 0.7 mile below the lake.

Date	Discharge (cfs)	Date	Discharge (cfs)
Aug. 23, 1946	12.5	Oct. 8, 1948	30.4
Sept. 26, 1946	20.0	Jan. 4, 1949	57.9
Jan. 23, 1947	47.6	Feb. 23, 1949	61.1
May 16, 1947	83.7	Apr. 14, 1949	11.9
July 9, 1947	68.9	Aug. 11, 1949	21.3
Oct. 9, 1947	25.9	Oct. 17, 1949	71.9
Jan. 23, 1948	65.6	Dec. 22, 1949	42.8
Feb. 24, 1948	59.5	Mar. 29, 1950	62.9
Apr. 2, 1948	12.1	July 25, 1950	26.9
May 17. 1948	62.0	Oct. 2, 1950	48.2
Aug. 19, 1948	20.9		





Monthly maximum and minimum stages for Glen Lake near Glen Arbor, Mich.

LEELANAU COUNTY

'Lake Leelanau at Leland, Mich.

Location.--Lat 45°00'56", long 85°45'33", in many sections, Tps. 28, 29, 30, and 31 N., R.12 W., at Leland.

Surface area.--8,220 acres.

Maximum depth.--121 ft.

Drainage area at outlet.--110 sq mi.

Records available.--June 1942 to September 1968 except some winter periods.

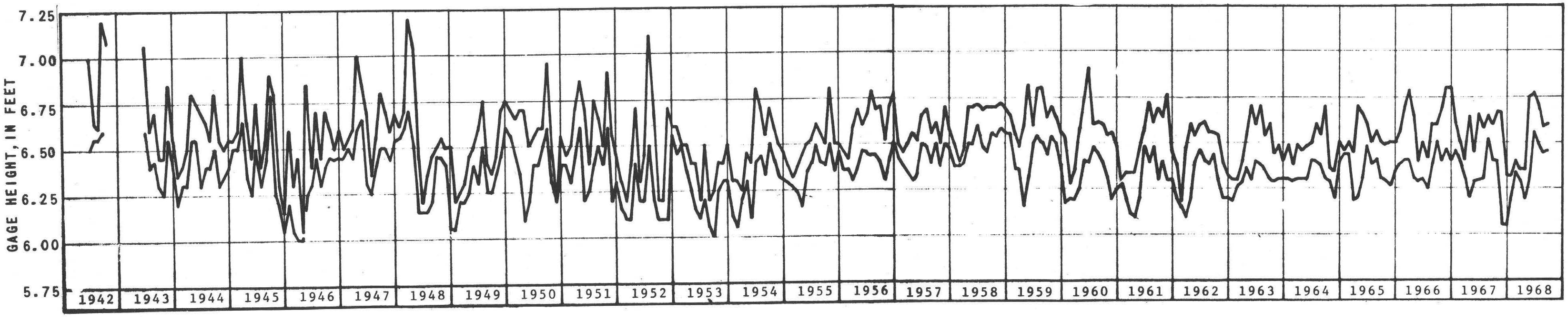
Gage.--Wire-weight gage read daily since Apr. 18, 1967. Datum of gage is 582.57 ft above mean sea level. June 1942 to June 1954, staff gage read weekly, July 1954 to Apr. 17, 1967, staff gage read daily at same datum.

Established legal level.--None known.

Extremes.--1942-68: Maximum stage, 7.20 ft Sept. 21, 23, 1942, Mar. 23, 1948; minimum, 6.00 ft Mar. 2, Apr. 20, 1946, Sept. 11, 1953.

Regulation or control.--Level of lake is controlled by dam at northwest side of lake at Leland.

Remarks.--Principal inlets to the lake are Cedar Run, Victoria, Weisler, Belnap, Merbert and Houdek Creeks. Various smaller, unnamed creeks also flow into the lake. The outlet flows from the northwest end of the lake, through Leland, to Lake Michigan. No discharge measurements are available on the inlets or outlet.



Monthly maximum and minimum stages for Lake Leelanau at Leland, Mich.

LENAWEE COUNTY

Devils Lake near Manitou Beach, Mich.

Location.--Lat 41°58'50", long 84°18'38", in many sections, Tps. 5 and 6 S., R.1 E., 0.7 mile north of Manitou Beach.

Surface area.--1,330 acres.

Maximum depth.--63 ft.

Drainage area at outlet.--15.2 sq mi.

Records available.--September 1942 to September 1950 except May and June, 1944.

Gage.--Staff gage read daily. Datum of gage is 1,040.55 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

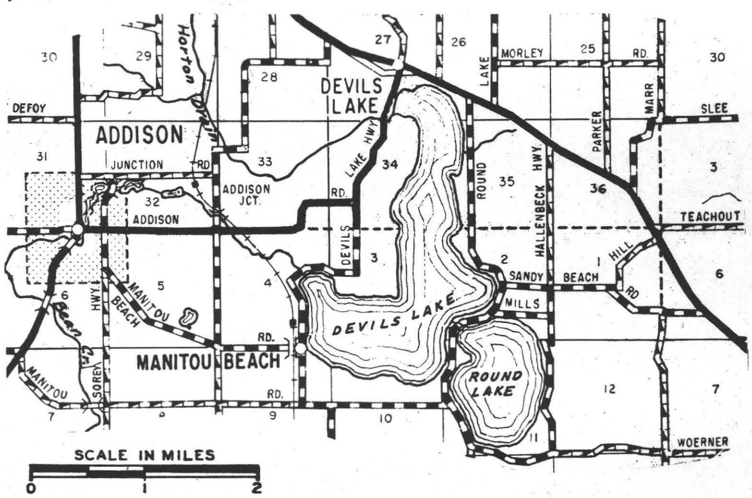
Extremes.--1942-50: Maximum stage observed, 3.42 ft Apr. 5, 1950; minimum stage, 1.11 ft Oct. 15, 16, 1946.

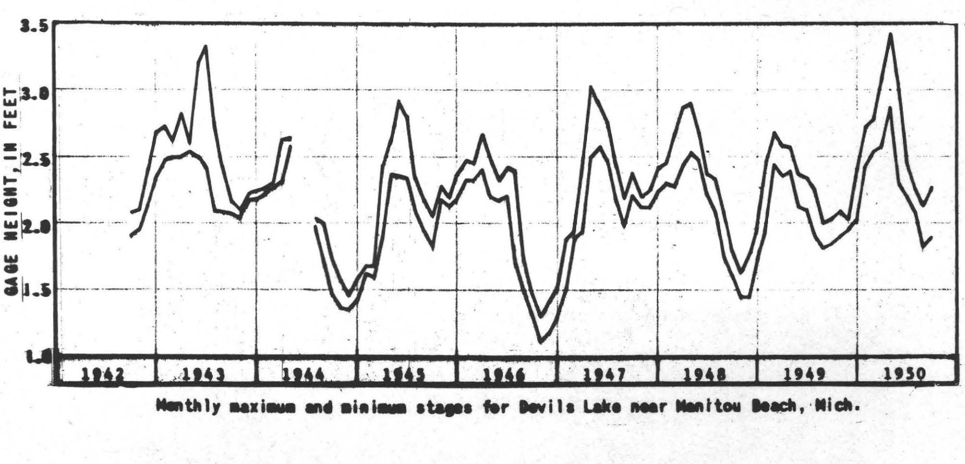
Regulation or control.--Lake level is controlled by a fixed-crest concrete dam at outlet.

Remarks.--The inlets to Devils Lake are Horton Drain, which enters the northwest side of the lake, the channels from Round Lake, and a small, unnamed stream entering the northeast side of the lake. The outlet, Bean Creek, leaves the west end of the lake and flows southward to the Maumee River, in Ohio.

No discharge measurements are available on the inlets. The following discharge measurements have been made on Bean Creek (published as Devils Lake outlet) at the lake outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
July 23, 1945	1.41	May 20, 1948	21.1
Apr. 11, 1946	6.35	Sept. 16, 1948	0
May 16, 1946	2.18	Dec. 14, 1948	0
Sept. 9, 1946	0	Mar. 16, 1949	9.69
Feb. 18, 1947	0	June 21, 1949	6.92
Apr. 16, 1947	45.9	Sept. 16, 1949	0
May 5, 1947	38.2	Jan. 23, 1950	18.7
Aug. 15, 1947	0	Apr. 19, 1950	45.4
Nov. 17, 1947	1.87	Aug. 21, 1950	0
Jan. 20, 1948	5.19		





Monthly maximum and minimum stages for Devils Lake near Manitou Beach, Mich.

LENAWEE COUNTY

Dewey Lake near Brooklyn, Mich.

Location.--Lat 42°02'12", long 84°13'42", in sec. 17, T.5 S., R.2 E., 5 miles south of Brooklyn.

Surface area.--104 acres.

Maximum depth.--28 ft.

Drainage area at outlet.--1.3 sq mi, approximately.

Records available.--May 1960 to January 1962 except for period during winter of 1960-61.

Gage.--Staff gage read daily. Datum of gage is 980.10 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--Winter, 999.5 ft; summer, 1000.0 ft above mean sea level, established by Circuit Court on May 15, 1962.

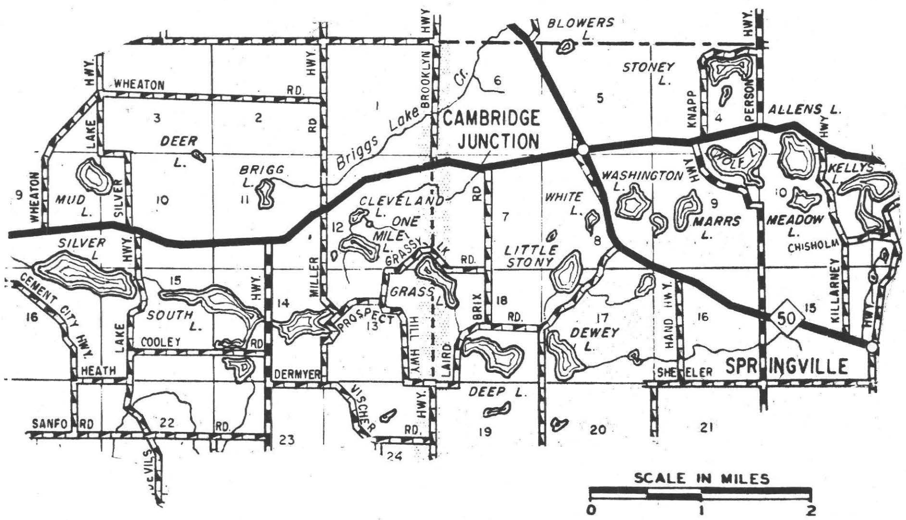
Extremes.--1960-62: Maximum stage, 20.31 ft Mar. 15, 1961; minimum stage observed, 19.34 ft Sept. 18, 1960.

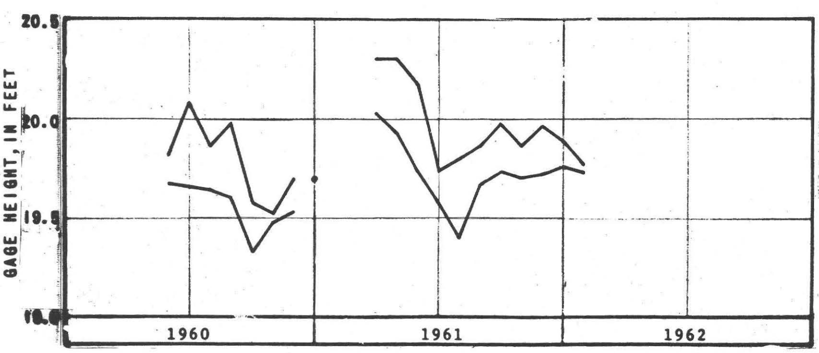
Regulation or control.--A concrete drop inlet box at the upstream end of tile drain at lake outlet controls lake levels.

Remarks.--The inlet is an intermittent stream which enters the southeast side of Dewey Lake. An unnamed outlet leaves at the northwest end of the lake through an underground tile drain about 300 feet in length. It then flows through an open ditch to Little Stoney Lake, a distance of about 1,800 feet.

No discharge measurements are available on the inlet or outlet.

An engineering lake-level control study was completed in 1962 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Dewey Lake near Brooklyn, Mich.

LENAWEE COUNTY

Posey Lake near Hudson, Mich.

Location.--Lat 41°53'44", long 84°18'30", in secs. 3, 4, and 34, Tps. 6 and 7 S., R.1 E., 3.6 miles northeast of Hudson.

Surface area.--150 acres.

Maximum depth.--45 ft.

Drainage area at outlet.--8.04 sq mi.

Records available.--September 1954 to August 1955.

Gage.--Staff gage read daily except during winter and spring when it was read intermittently. Datum of gage is 938.43 ft above mean sea level (levels by Michigan Department of Natural Resources).

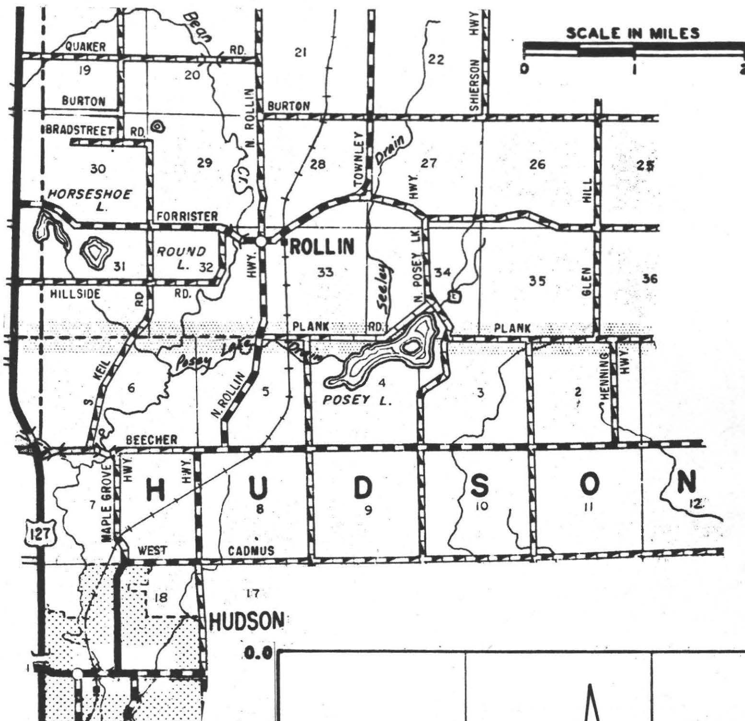
Established legal level.--Winter, 946.5 ft; summer, 947.0 ft above mean sea level, established by Circuit Court on Oct. 11, 1955.

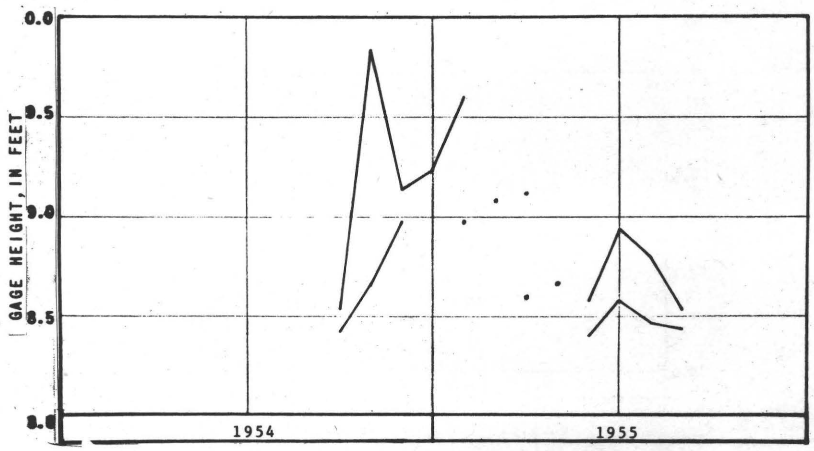
Extremes.--1954-55: Maximum stage observed, 9.84 ft Oct. 15, 1954; minimum observed, 8.40 ft May 9, 1955

Regulation or control.--A fixed-crest dam at the outlet controls the lake level.

Remarks.--Principal inlets are Seeley Drain and Little Posey Lake outlet, both entering the north side of Posey Lake. The outlet, Posey Lake Drain, leaves the west end of the lake and flows west about two miles to Bean Creek.

No discharge measurements are available on the inlets. On Mar. 1, 1955, 10.7 cfs was measured on the outlet in the vicinity of the control. An engineering lake-level control study was completed in 1955 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Posey Lake near Hudson, Mich.

LENAWEE COUNTY

Sand Lake near Onsted, Mich.

Location.--Lat 42°02'21", long 84°08'35", in many sections, T.5 S., Rs. 2 and 3 E., 3.6 miles northeast of Onsted.

Surface area.--440 acres.

Maximum depth.--53 ft.

Drainage area.--Not determined.

Records available.--September 1942 to December 1959 except periods January to June 1943, January to April 1944, September 1953 to March 1954, and August 1954 to January 1955.

Gage.--Staff gage read daily. Datum of gage is 962.65 ft above mean sea level (levels by Michigan Department of Natural Resources).

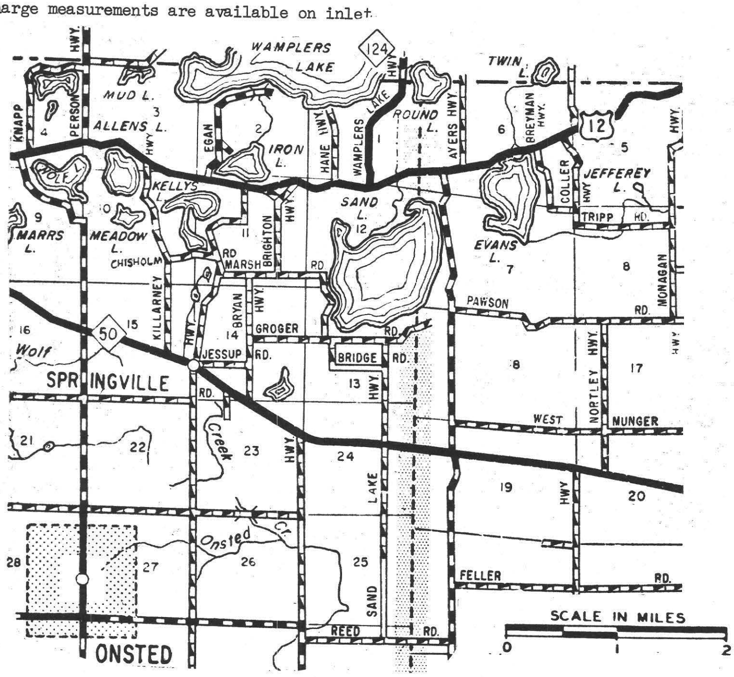
Established legal level.--969.64 ft above mean sea level, established by Circuit Court in August 1963.

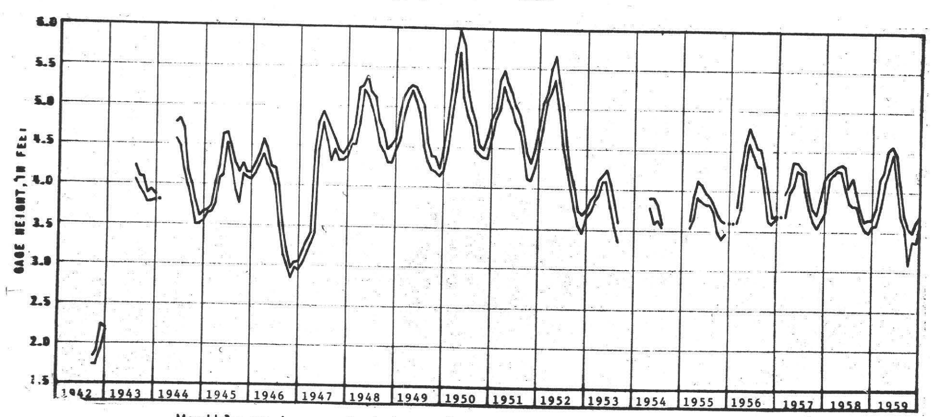
Extremes.--1942-59: Maximum stage observed, 5.99 ft Apr. 5, 1950; minimum observed, 1.74 ft Sept. 25, Oct. 1-3, 13, 1942.

Regulation or control.--A canal connects Wamplers Lake to Sand Lake. Flow in this canal is controlled by a gate valve at the north end of a 2.5 ft culvert passing under U.S. Highway 12. When Wamplers Lake stage gets high, the gate valve is opened allowing water to flow from Wamplers to Sand Lake. When Sand Lake gets higher than Wamplers Lake the gate valve is closed preventing water from flowing back to Wamplers Lake.

Remarks.--The principal inlet to Sand Lake is the controlled channel from Wamplers Lake. There is no outlet.

No discharge measurements are available on inlet.





Monthly maximum and minimum stages for Sand Lake near Onsted, Mich.

LIVINGSTON COUNTY

Bass Lake near Lakeland, Mich.

Location.--Lat 42°26'57", long 83°51'37", in secs. 21, 28, and 29, T.1 N., R.5 E., 1.3 miles southwest of Lakeland.

Surface area.--141 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--Not determined.

Records available.--March to June 1951.

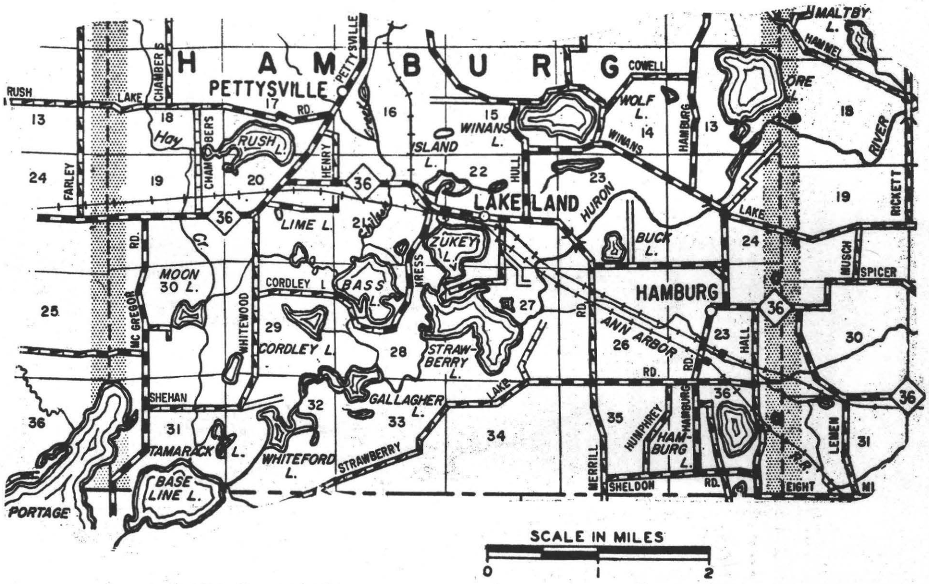
Gage.--Staff gage read daily. Datum of gage is 851.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

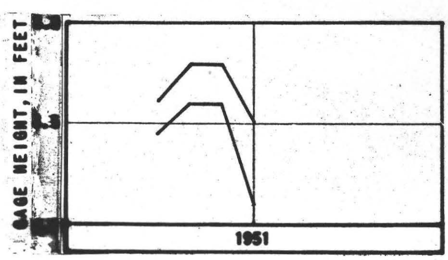
Established legal level.--853.95 ft above mean sea level, established by Circuit Court on Nov. 10, 1963.

Extremes.--1951: Maximum stage observed, 3.80 ft April 1, 3, May 7; minimum observed, 3.10 ft June 23.

Regulation or control.--None known.

Remarks.--Hay and Chilson Creeks discharge into Bass Lake. The outlet, at the south end of Bass Lake, flows to Gallager Lake. No discharge measurements of the inflow or outflow have been made.
An engineering lake-level control study was completed in 1956 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Bass Lake near Lakeland, Mich.

LIVINGSTON COUNTY

Briggs Lake near Brighton, Mich.

Location.--Lat 42°30'35", long 83°43'52", in secs. 3 and 4, T.1 N., R.6 E., 3.0 miles southeast of Brighton.

Surface area.--75 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--0.2 sq mi, approximately.

Records available.--May 1951 to December 1953.

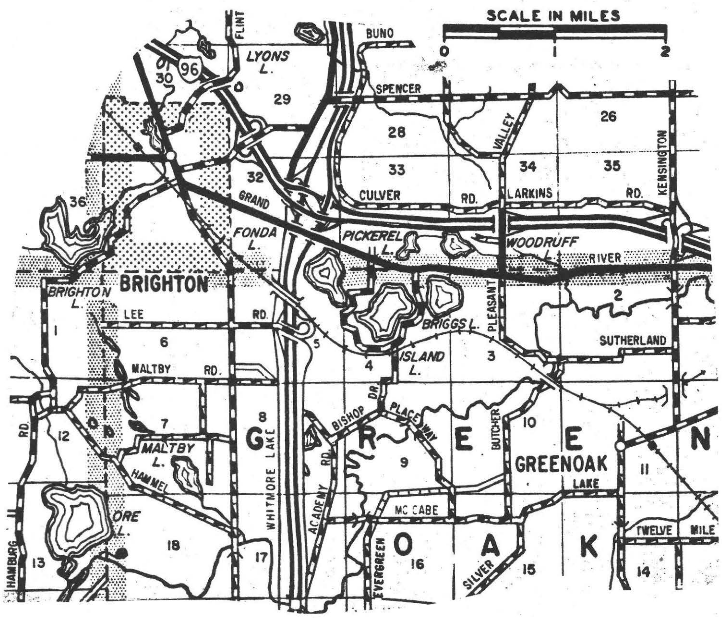
Gage.--Staff gage read daily. Datum of gage is 885.03 ft above mean sea level (levels by Michigan Department of Natural Resources).

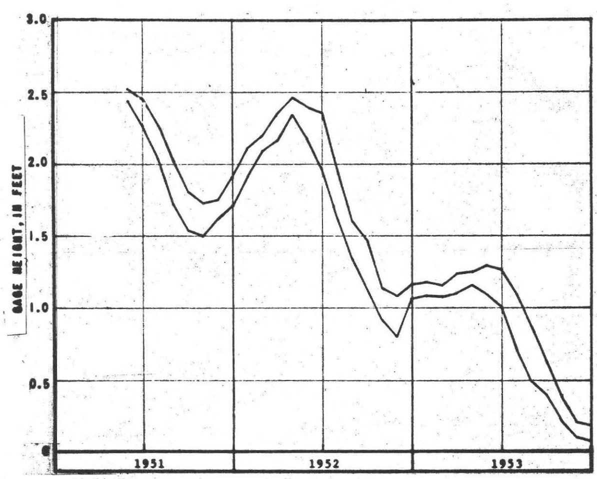
Established legal level.--None known.

Extremes.--1951-53: Maximum stage observed, 2.52 ft May 23, 1951; minimum stage, 0.08 ft Dec. 5, 1953.

Regulation or control.--None.

Remarks.--Briggs Lake has no inlet or outlet.
An engineering lake-level control study was completed in 1955 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Briggs Lake near Brighton, Mich.

LIVINGSTON COUNTY

Cedar Lake near Howell, Mich.

Location.--Lat 42°31'47", long 83°59'10", in secs. 28 and 29, T.2 N., R.4 E., 6.1 miles southwest of Howell.

Surface area.--117 acres.

Maximum depth.--Unknown.

Drainage area.--Not determined.

Records available.--August 1961 to September 1962.

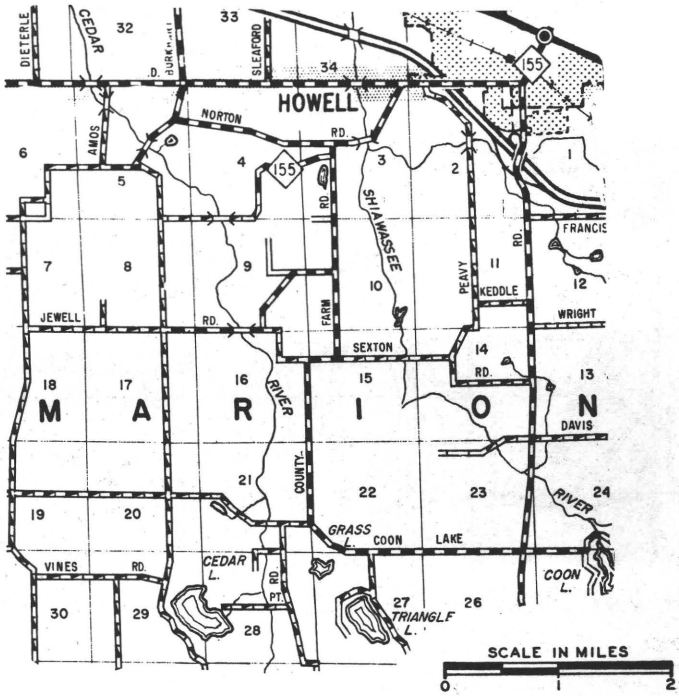
Gage.--Staff gage read intermittently. Datum of gage is 931.27 ft above mean sea level (levels by Michigan Department of Natural Resources).

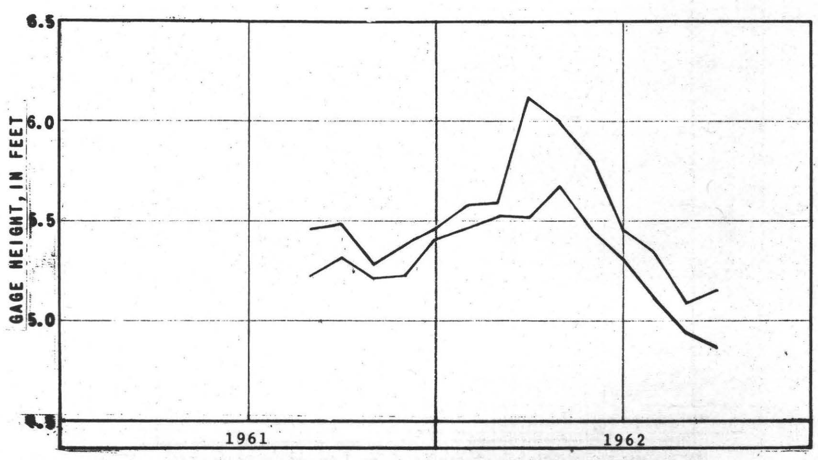
Established legal level.--936.6 ft above mean sea level, established by Circuit Court on Nov. 9, 1963.

Extremes.--1961-62: Maximum stage observed, 6.12 ft Mar. 23, 1962; minimum observed, 4.86 ft Sept. 6, 1962.

Regulation or control.--None.

Remarks.--Cedar Lake has no inlet. The outlet is at the east end of the lake and flows 0.5 mile east to Cedar River. No discharge measurements have been made on the outlet.





Monthly maximum and minimum stages for Cedar Lake near Howell, Mich.

LIVINGSTON COUNTY

Fonda Lake near Brighton, Mich.

Location.--Lat 42°30'38", long 83°44'53", in secs. 4, 5, 32, and 33, Tps. 1 and 2 N., R.6 E., 2.1 miles southeast of Brighton.

Surface area.--84 acres.

Maximum depth.--39 ft.

Drainage area at outlet.--0.5 sq mi, approximately.

Records available.--May 1951 to September 1953 except winter periods.

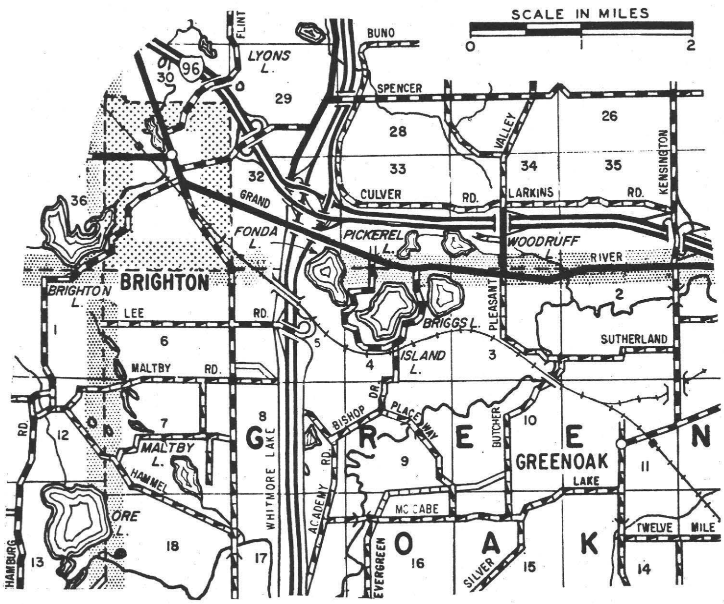
Gage.--Staff gage read intermittently. Datum of gage is 885.09 ft above mean sea level (levels by Michigan Department of Natural Resources).

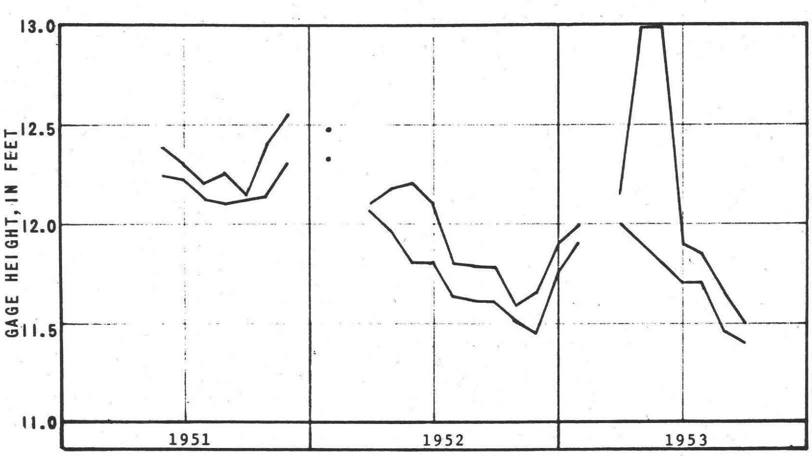
Established legal level.--None known.

Extremes.--1951-53: Maximum stage observed, 12.98 ft Apr. 30, May 2, 1953; minimum observed, 11.40 ft Sept. 4, 1953.

Regulation or control.--None.

Remarks.--Fonda Lake has no inlet. The outlet leaves the southeast end of the lake and flows to Island Lake. No discharge measurements have been made on the outlet.
An engineering lake-level control study was completed in 1955 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Fonda Lake near Brighton, Mich.

LIVINGSTON COUNTY

Hiland Lake near Pinckney, Mich.

Location.--Lat 42°26'00", long 83°59'12", in sec. 32, T.1 N., R.4 E., 3.0 miles southwest of Pinckney.

Surface area.--123 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--89 sq mi, approximately.

Records available.--November 1944 to September 1968.

Gage.--Staff gage read daily. Datum of gage is 880.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--883.0 ft above mean sea level, established by Circuit Court on Jan. 27, 1962.

Extremes.--1944-68: Maximum stage observed, 3.80 ft Feb. 8, 1968; minimum observed, 2.00 ft July 5, 6, 1966.

Regulation or control.--A fixed-crest concrete dam with flashboards is located at the north end of Hiland Lake.

Remarks.--The inlets to Hiland Lake are the outlets from Halfmoon and Gosling Lakes. The outlet, Portage River, leaves the north end of the lake and flows southeasterly about 4 miles to Little Portage Lake.

An engineering lake-level control study was completed in 1948 by the Michigan Department of Natural Resources.

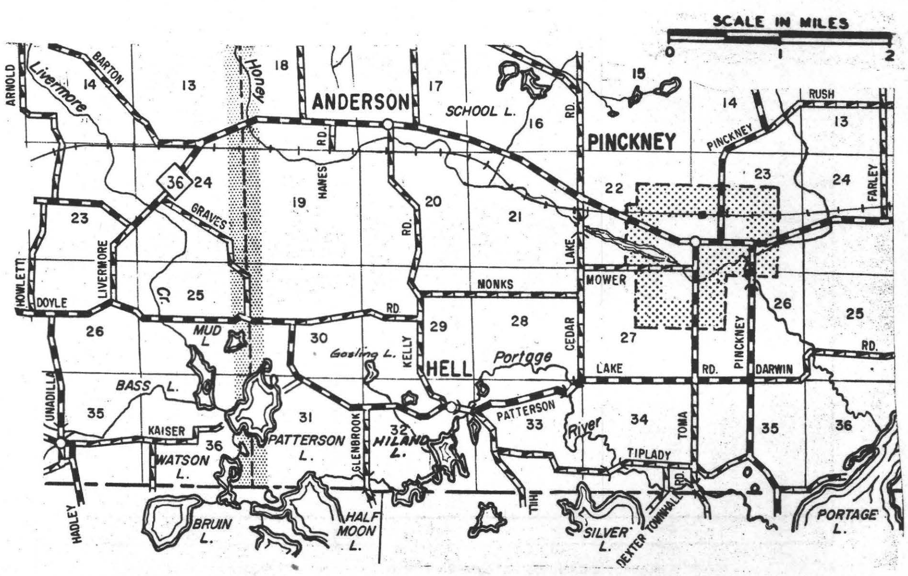
Discharge records have been collected on Portage River, 2.5 miles downstream from Hiland Lake (drainage area, 92 sq mi, approximately) since November 1944. These records are published by the U.S. Geological Survey as "Portage River near Pinckney." Prior to October 1963, records were published as "Portage Creek near Pinckney."

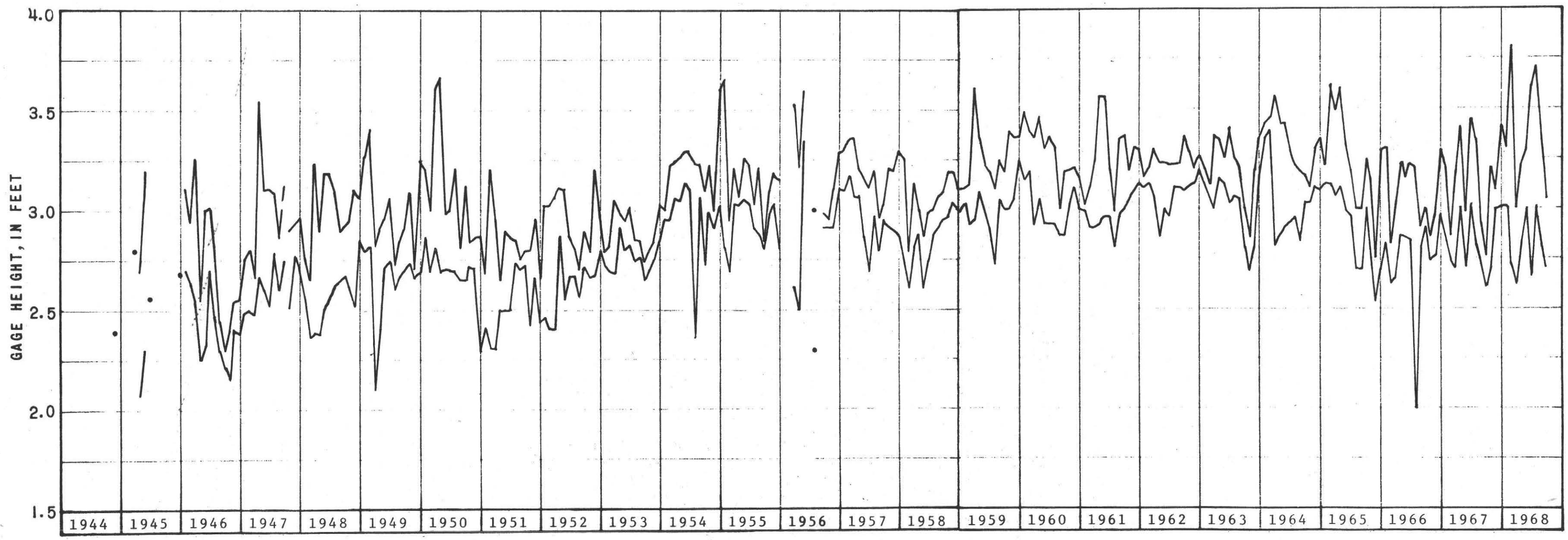
The following discharge measurements have been made at Hiland Lake outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
Aug. 28, 1946	1.72	Oct. 23, 1946	5.77
Sept. 17, 1946	.66	Dec. 10, 1946	16.2
		Jan. 22, 1947	37.0

The following discharge measurements have been made on Gosling Lake outlet in NW¼ sec. 32, T.1 N., R.4 E., 3 miles southwest of Pinckney (drainage area, 1.34 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Aug. 24, 1955	0	Oct. 20, 1958	0
Sept. 22, 1955	0	June 9, 1959	.12
Jan. 25, 1956	0	Sept. 14, 1959	0
Apr. 24, 1956	.22	Apr. 22, 1959	.53
June 7, 1956	.31	Aug. 2, 1959	0
Aug. 3, 1956	0	Oct. 12, 1960	0
Aug. 22, 1956	0	Jan. 13, 1961	0
Sept. 20, 1956	0	May 23, 1961	.07
Oct. 15, 1956	0	Sept. 12, 1961	.16
Nov. 13, 1956	0	Mar. 27, 1962	.44
Feb. 6, 1958	0	July 19, 1962	.005
Apr. 3, 1958	.19	Sept. 28, 1962	.04
May 8, 1958	.15	Apr. 17, 1963	.06





Monthly maximum and minimum stages for Hiland Lake near Pinckney, Mich.

LIVINGSTON COUNTY

Island Lake near Brighton, Mich.

Location.--Lat 42°30'18", long 83°44'30", in sec. 4, T.1 N., R.6 E., 2.8 miles southeast of Brighton.

Surface area.--140 acres.

Maximum depth.--77 ft.

Drainage area at outlet.--0.5 sq mi, approximately.

Records available.--May 1951 to August 1952.

Gage.--Staff gage read daily. Datum of gage is 885.09 ft above mean sea level (levels by Michigan Department of Natural Resources).

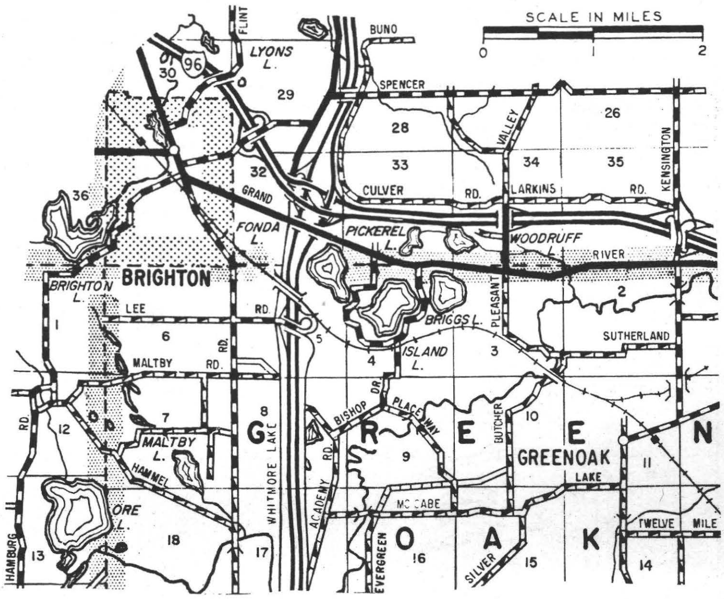
Established legal level.--None known.

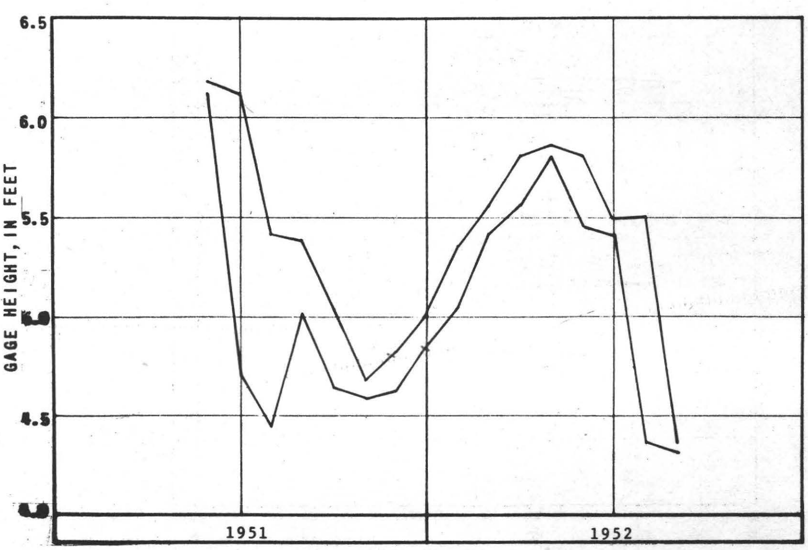
Extremes.--1951-52: Maximum stage observed, 6.18 ft May 27, 1951; minimum observed, 4.30 ft Aug. 5-9, 1952.

Regulation or control.--None.

Remarks.--The inlet to Island Lake is from Fonda Lake. There is no outlet. No discharge measurements have been made on the inlet.

An engineering lake-level control study was completed in 1955 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Island Lake near Brighton, Mich.

LIVINGSTON COUNTY

Ore Lake near Hamburg, Mich.

Location.--Lat 42°28'24", long 83°47'50", in secs. 13 and 18, T.1 N., Rs. 5 and 6 E., 1.6 miles north of Hamburg.

Surface area.--220 acres.

Maximum depth.--80 ft.

Drainage area at outlet.--35 sq mi, approximately.

Records available.--March 1948 to March 1956 except periods February to April 1949, September 1949 to February 1950, July 1953 to December 1953, and June 1954.

Gage.--Staff gage read daily. Datum of gage is 850.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

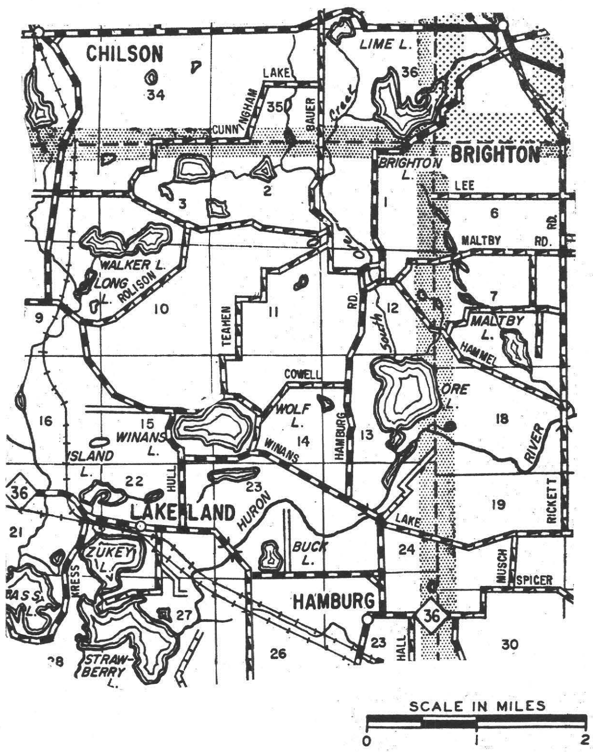
Extremes.--1948-56: Maximum stage observed, 8.60 ft Apr. 7, 1950; minimum observed, 3.90 ft Jan. 11, 1954.

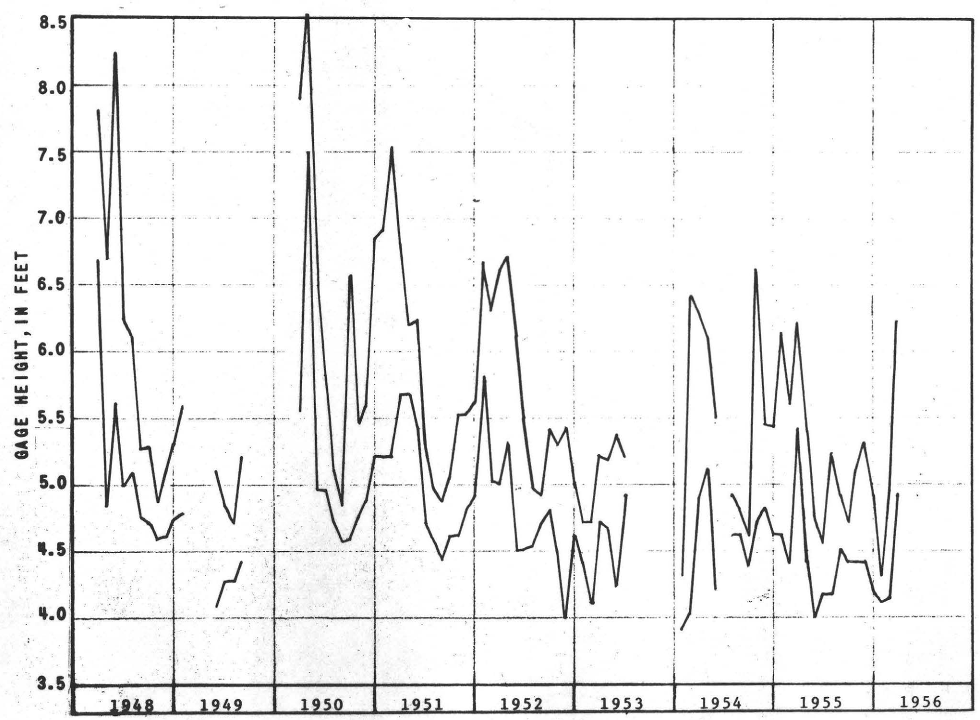
Regulation or control.--None. The stage of the Huron River affects the stage of Ore Lake.

Remarks.--The inlets, which enter the north side of the Ore Lake, are South Ore Creek and an unnamed stream which drains several small lakes northeast of Ore Lake. The outlet, at the south side of the lake, flows into the Huron River.

Discharge records have been collected since March 1951 on South Ore Creek, 0.5 mile upstream from Ore Lake (drainage area, 31 sq mi). Also, discharge records have been collected since October 1951 on the Huron River, 0.6 mile downstream from Ore Lake (drainage area 299 sq mi). These records are published by the U.S. Geological Survey as "Ore Creek near Brighton, Mich." and "Huron River near Hamburg, Mich."

An engineering lake-level control study was completed in 1956 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Ore Lake near Hamburg, Mich.

LIVINGSTON COUNTY

Patterson Lake near Pinckney, Mich.

Location.--Lat 42°25'47", long 84°01'35", in secs. 30, 31, and 36, T.1 N., Rs. 3 and 4 E., 4.8 miles southwest of Pinckney.

Surface area.--170 acres.

Maximum depth.--60 ft.

Drainage area at outlet.--Not determined.

Records available.--November 1944; March to May 1945; December 1945 to October 1946; January 1947 to January 1968; and April to September 1968.

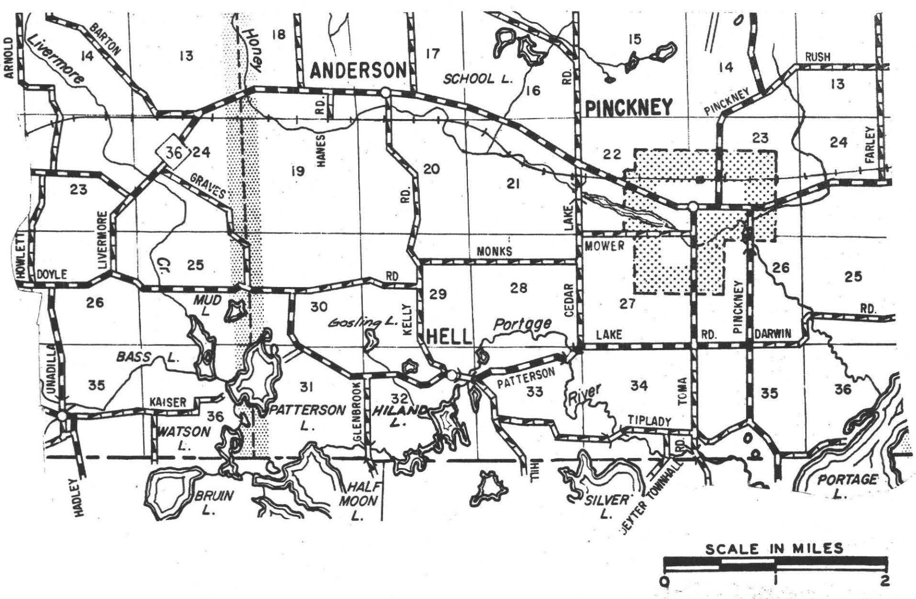
Gage.--Staff gage read daily. Datum of gage is 880.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

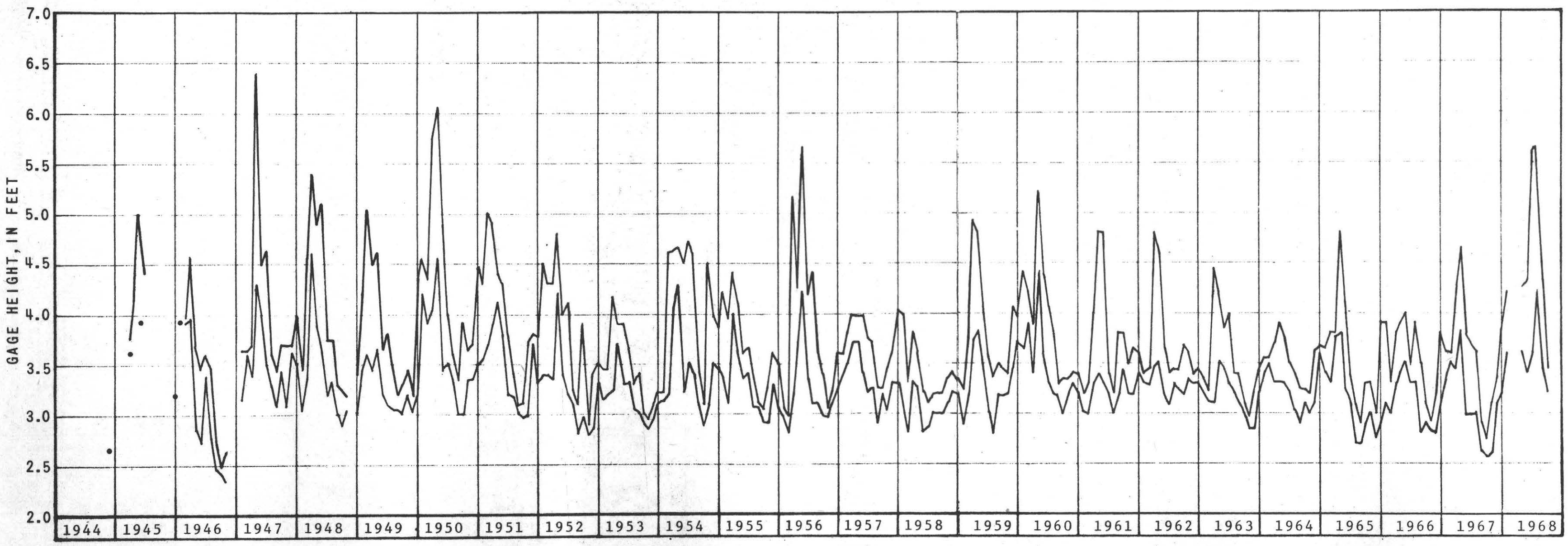
Established legal level.--None known.

Extremes.--1944-68: Maximum stage, 6.42 ft Apr. 9, 1947; minimum stage observed, 2.35 ft Oct. 13-16; 1946.

Regulation or control.--Lake level controlled to some extent by operation of dam at Hiland Lake.

Remarks.--The inlet to Patterson Lake is the outlet of Bass Lake. The outlet connects with Watson Lake then flows into Halfmoon Lake. No discharge measurements have been made on the inlet or outlet.





Monthly maximum and minimum stages for Patterson Lake near Pinckney, Mich.

LIVINGSTON COUNTY

Strawberry Lake near Lakeland, Mich.

Location.--Lat 42°26'47", long 85°51'06", in secs. 27 and 28, T.1 N., R.5 E., 1.2 miles south of Lakeland.

Surface area.--257 acres.

Maximum depth.--52 ft.

Drainage area at outlet.--Not determined.

Records available.--March 1948 to June 1949; January to April 1952; July 1952 to March 1953; and October 1953 to November 1956.

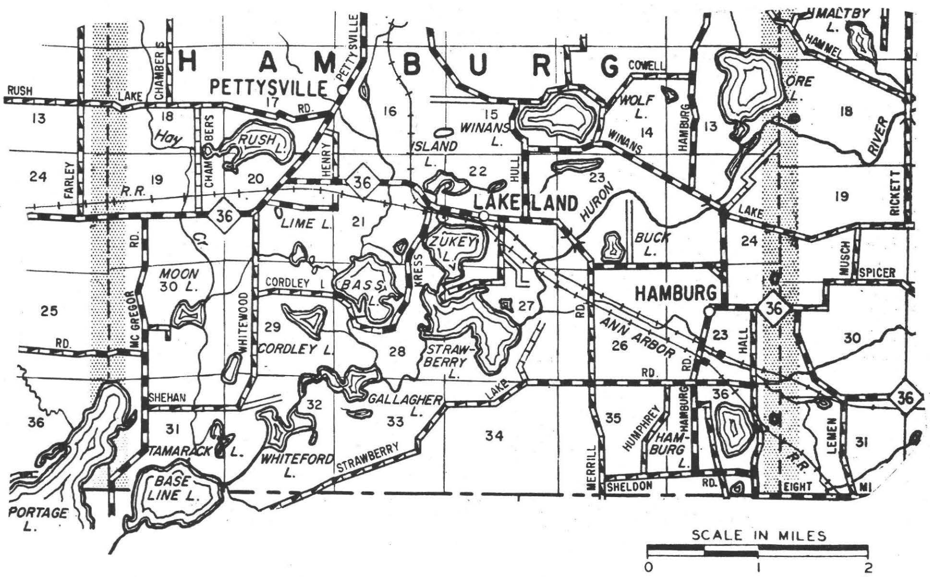
Gage.--Staff gage read daily. Datum of gage is 850.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

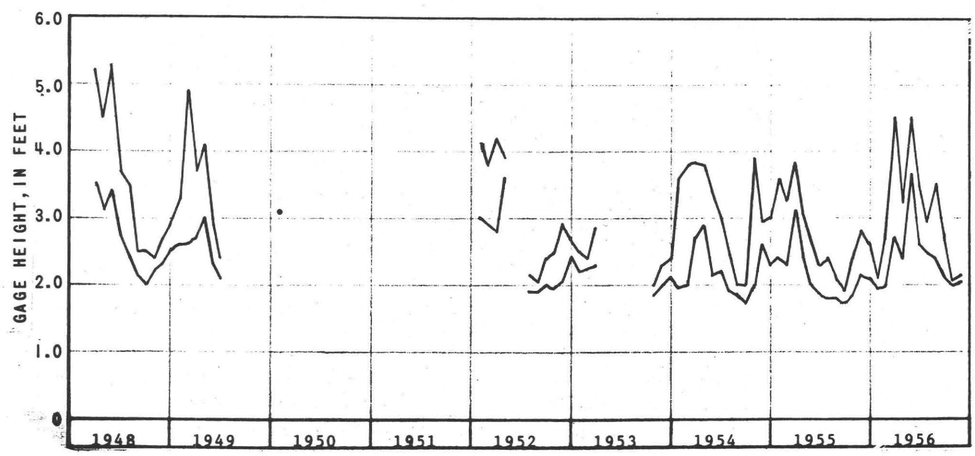
Established legal level.--None known.

Extremes.--1948-49; 1952-56: Maximum stage observed, 5.32 ft May 15, 1948; minimum observed, 1.72 ft Sept. 10, 1954 and Sept. 23, 1955.
Maximum stage known, 6.60 ft Apr. 7, 1947, from highwater mark.

Regulation or control.--None.

Remarks.--The Huron River is the inlet and outlet of Strawberry Lake. There is also an inlet from Zukey Lake.
Discharge records have been collected on the Huron River, 3 miles upstream from Strawberry Lake since October 1951. These records are published in U. S. Geological Survey Water-Supply Papers as "Huron River near Hamburg, Mich."
An engineering lake-level control study was completed in 1956 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Strawberry Lake near Lakeland, Mich.

LIVINGSTON COUNTY

Zukey Lake near Lakeland, Mich.

Location.--Lat 42°27'16", long 83°50'53", in secs. 21, 22, 27, and 28, T.1 N., R.5 E., 0.6 mile south of Lakeland.

Surface area.--155 acres.

Maximum depth.--44 ft.

Drainage area at outlet.--Not determined.

Records available.--March to May 1948; December 1948 to April 1949; July to September 1949; March 1950 to June 1951; August and September 1951; January to April 1952; and February to May 1953.

Gage.--Staff gage read intermittently. Datum of gage is 850.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

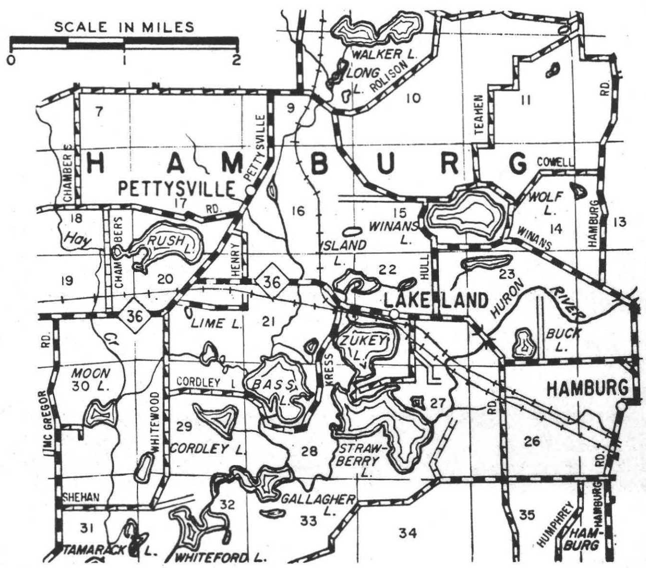
Established legal level.--None known.

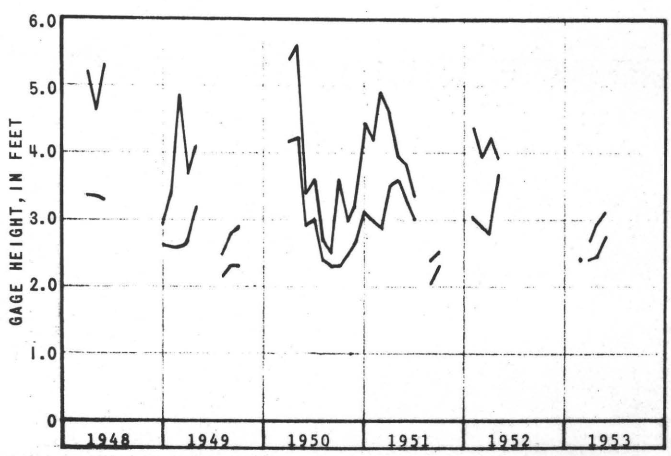
Extremes.--1948-53: Maximum stage observed, 5.60 ft Apr. 7, 1950; minimum observed, 2.05 ft Aug. 11, 1951. Maximum stage known 6.60 ft April 7, 1947, from highwater mark.

Regulation or control.--None.

Remarks.--Zukey Lake has an inlet from Island Lake. The south end of Zukey Lake is contiguous with Strawberry Lake. No discharge measurements have been made on the inlet.

An engineering lake-level control study was completed in 1956 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Zukey Lake at Lakeland, Mich.

LUCE COUNTY

N. Manistique Lake near Helmer, Mich.

Location.--Lat 46°16'55", long 85°43'10", in many sections, T.45 N., Rs.11 and 12 W., 1 mile north of Helmer.

Surface area.--1,720 acres.

Maximum depth.--50 ft.

Drainage area at outlet.--11 sq mi, approximately.

Records available.--April 1942 to September 1958 except winter and spring periods.

Gage.--Staff gage read daily. Datum of gage is 711.76 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--Winter, 712.5 ft; summer, 713.0 ft; above mean sea level, established by Circuit Court on Jan. 21, 1958.

Extremes.--1942-58: Maximum stage observed, 2.25 ft June 21-23, 1943; minimum observed, 0.83 ft Aug. 30 to Sept. 2, Sept. 7, 10, 11, 1947.

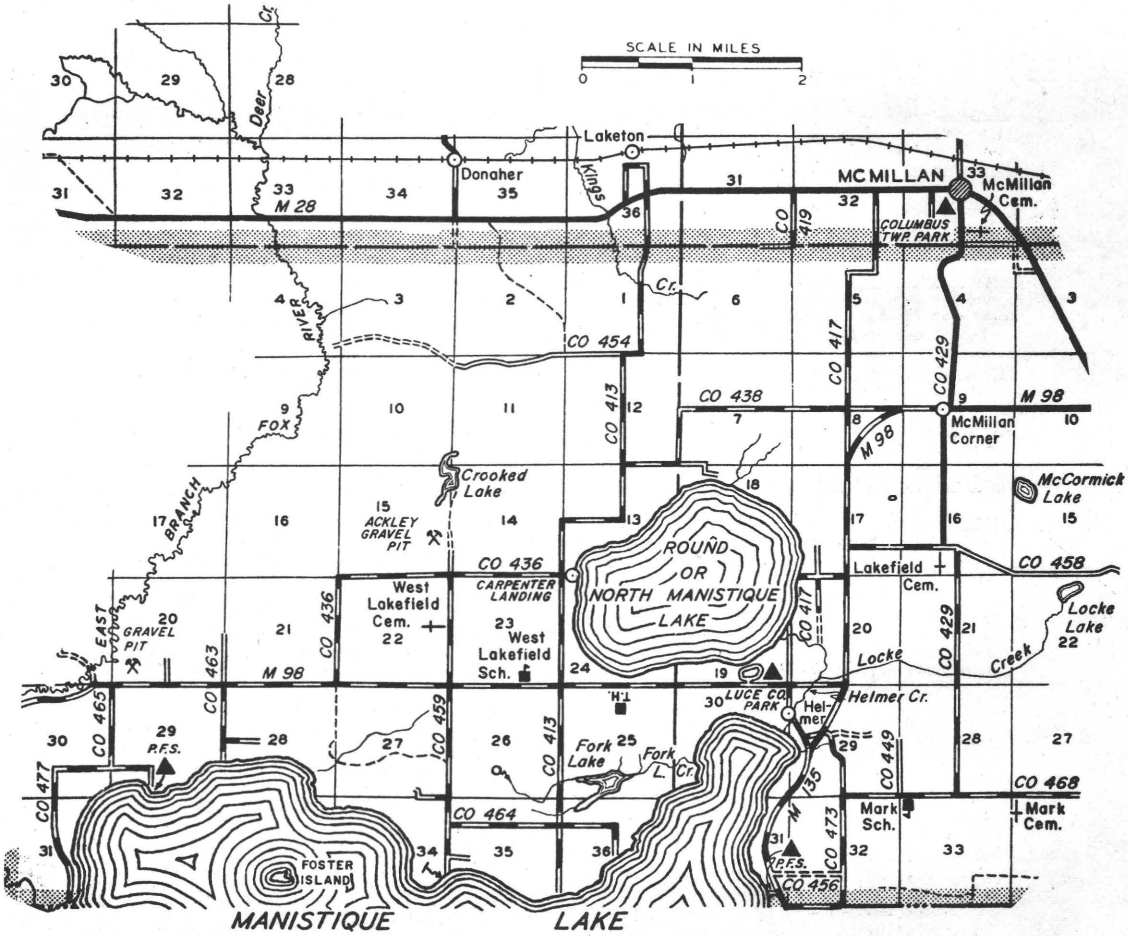
Regulation or control.--Small loose rock dam at outlet.

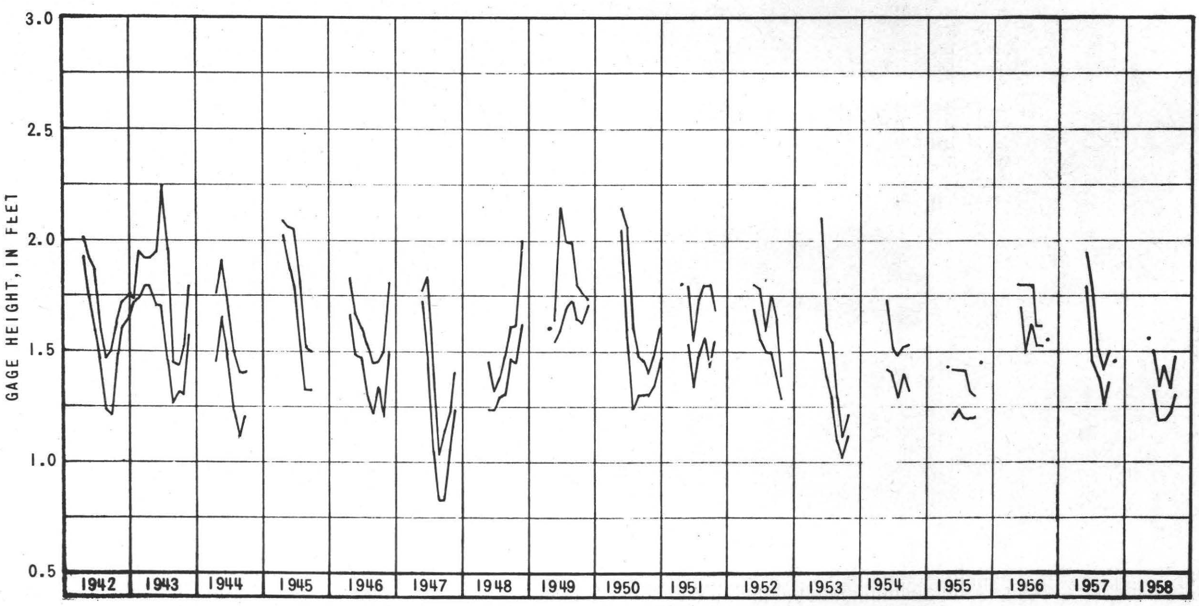
Remarks.--There are several very small inlets on the north side of the lake. The outlet leaves the southeast side of the lake and flows about 2 miles to Manistique Lake.

An engineering lake-level control study was completed in 1955 by the Michigan Department of Natural Resources.

No discharge measurements are available on the inlets. A gaging station was maintained on North Manistique Lake outlet, about three quarters of a mile downstream from the lake, during the period Aug. 22, 1942 to Sept. 30, 1944. These records are published in U.S. Geological Survey Water-Supply Papers. Since discontinuance of the gaging station the following discharge measurements have been made at the same site.

Date	Discharge (cfs)	Date	Discharge (cfs)
Oct. 26, 1944	3.82	Feb. 19, 1953	18.7
Mar. 12, 1945	18.6	May 13, 1953	26.2
May 2, 1945	18.3	July 21, 1953	22.9
Feb. 26, 1946	16.3	Oct. 15, 1953	1.88
Apr. 25, 1946	15.6	Feb. 16, 1954	17.0
Nov. 15, 1946	6.30	May 13, 1954	33.3
Mar. 5, 1947	13.3	Aug. 12, 1954	3.65
Oct. 29, 1947	1.44	Nov. 10, 1954	17.6
Mar. 2, 1948	12.1	Feb. 16, 1955	12.5
Apr. 23, 1948	26.0	Apr. 28, 1955	24.2
Oct. 7, 1948	.79	July 27, 1955	1.98
Feb. 2, 1949	15.5	Oct. 18, 1955	1.75
Apr. 25, 1949	23.8	Jan. 18, 1956	15.4
Oct. 19, 1949	11.1	Apr. 16, 1956	34.0
Feb. 6, 1950	16.0	July 17, 1956	18.1
May 2, 1950	47.0	Oct. 16, 1956	3.74
July 25, 1950	9.41	Jan. 15, 1957	10.4
Oct. 12, 1950	11.7	May 3, 1957	23.9
Jan. 15, 1951	14.7	July 16, 1957	5.68
May 14, 1951	15.4	Oct. 15, 1957	.94
Aug. 22, 1951	7.64	Jan. 21, 1958	14.7
Oct. 17, 1951	14.7	Apr. 23, 1958	31.3
Jan. 16, 1952	18.3	July 16, 1958	10.4
Apr. 21, 1952	43.7	Oct. 17, 1958	7.38
June 18, 1952	14.8	Jan. 20, 1959	11.4
Oct. 16, 1952	3.78	May 19, 1959	19.4





Monthly maximum and minimum stages for North Manistique Lake near Helmer, Mich.

LUCE COUNTY

Muskallonge Lake near Deer Park, Mich.

Location.--Lat 46°40'12", long 85°39'04", in many sections, T.49 N., Rs.10 and 11 W., 1.6 miles southwest of Deer Park.

Surface area.--786 acres.

Maximum depth.--20 ft.

Drainage area.--Not determined.

Records available.--October 1958 to September 1964 except winter periods.

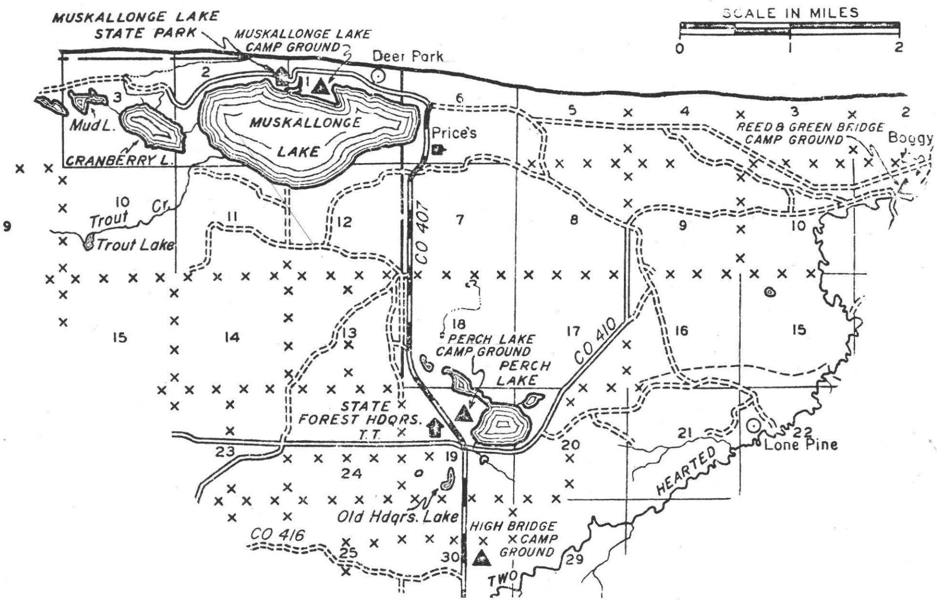
Gage.--Staff gage read daily. Datum of gage not determined.

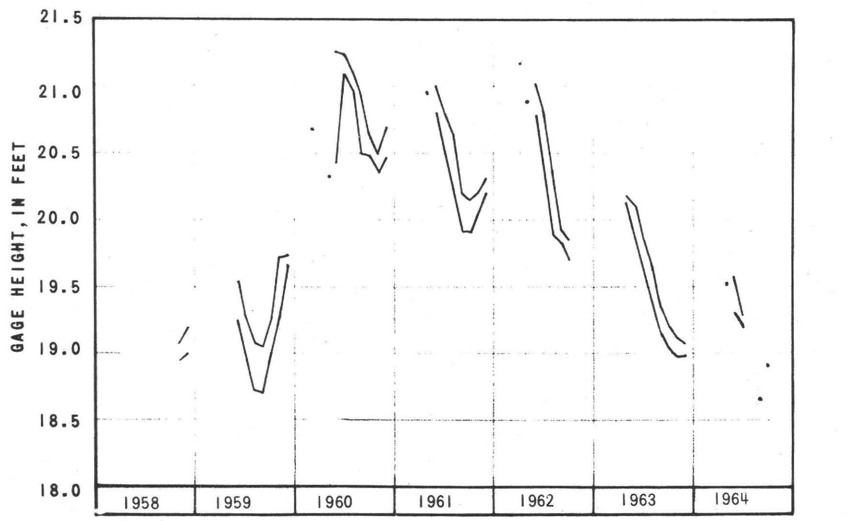
Established legal level.--None known.

Extremes.--1958-64: Maximum stage observed, 21.25 ft May 19-21, 1960; minimum observed, 18.65 ft Aug. 4, 1964.

Regulation or control.--None.

Remarks.--The inlet to Muskallonge Lake is Trout Creek. There is no continuous outlet, however, when the lake is high, water flows out through an old channel to Cranberry Lake thence to Lake Superior.
On Nov. 3, 1959, a discharge of 4.70 cfs was measured on Trout Creek about 300 feet upstream from the lake.
No discharge measurements are available on the outlet.





Monthly maximum and minimum stages for Muskallonge Lake, near Deer Park, Mich.

MACKINAC COUNTY

Brevoort Lake near Allenville, Mich.

Location.--Lat 45°59'14", long 84°56'10", in many sections, Tps. 41 and 42 N., R.5 W., 5.6 miles west of Allenville.

Surface area.--4,230 acres.

Maximum depth.--30 ft.

Drainage area at outlet.--57 sq mi, approximately.

Records available.--May 1943 to September 1950; October 1951 to September 1958 except some winter periods.

Gage.--Staff gage read daily. Datum of gage is 623.21 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--625.97 ft above mean sea level, established by Circuit Court on May 25, 1936. Levels run by the Department of Natural Resources determined the existing legal level, based on mean sea level datum, to be 625.51 ft.

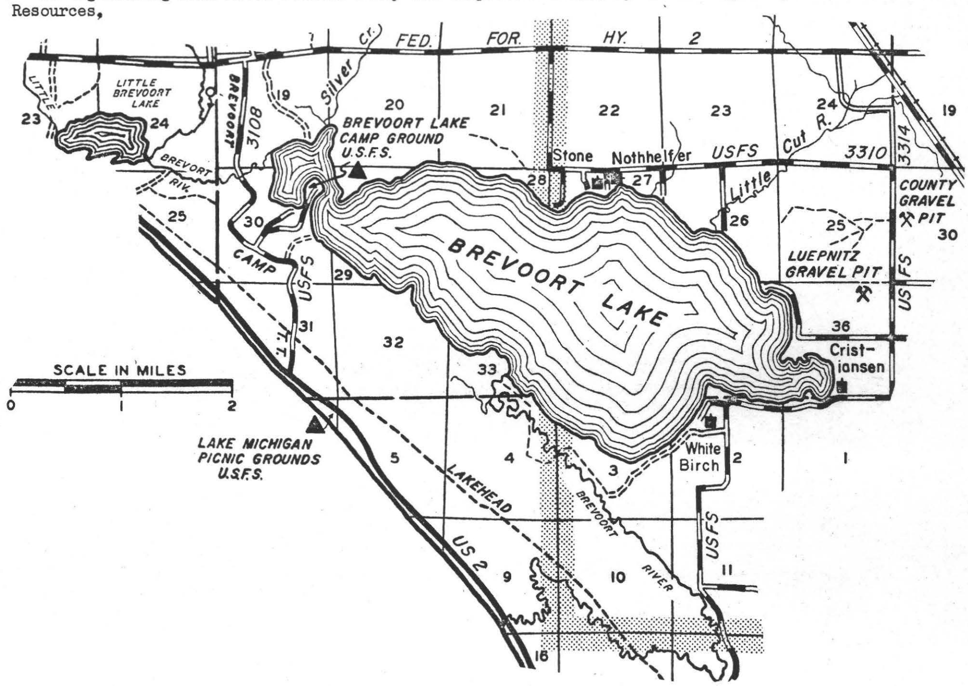
Extremes.--1943-50, 1951-58: Maximum stage observed, 3.00 ft June 23-29, 1943; minimum observed, 0.62 ft Dec. 29-31, 1943.

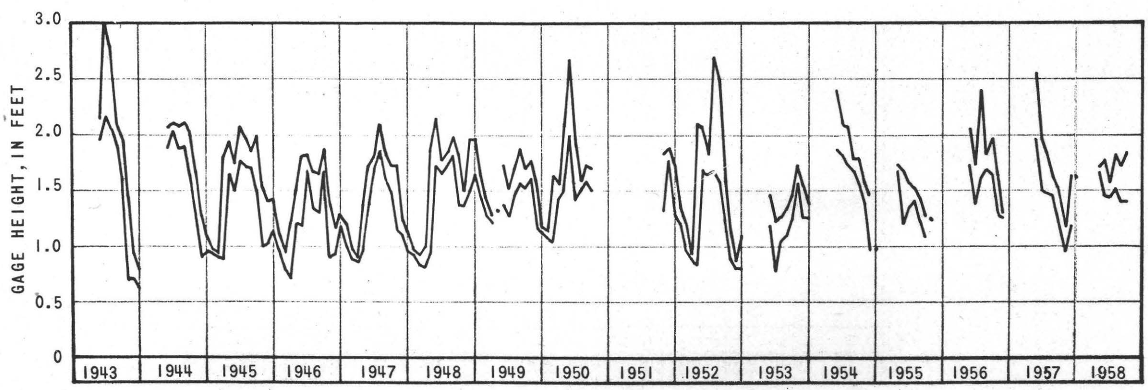
Regulation or control.--A concrete dam with stop logs controls the lake level. The dam was constructed in 1936.

Remarks.--Little Brevoort River, Little Cut River, and Silver Creek are the principal lake inlets. The outlet, Brevoort River, leaves the south side of the lake and flows about 6 miles to Lake Michigan.

No discharge measurements have been made on the inlets or outlet.

An engineering lake-level control study was completed in 1955 by the Michigan Department of Natural Resources,





Monthly maximum and minimum stages for Brevoort Lake near Allenville, Mich.

MACKINAC COUNTY

East Lake near Fibre, Mich.

Location.--Lat 46°08'17", long 84°48'55", in secs. 9, 10, 15, and 16, T.43 N., R.4 W., 6 miles southwest of Fibre.

Surface area.--995 acres.

Maximum depth.--18 ft.

Drainage area at outlet.--5.87 sq mi.

Records available.--July 1967 to September 1968 except winter period.

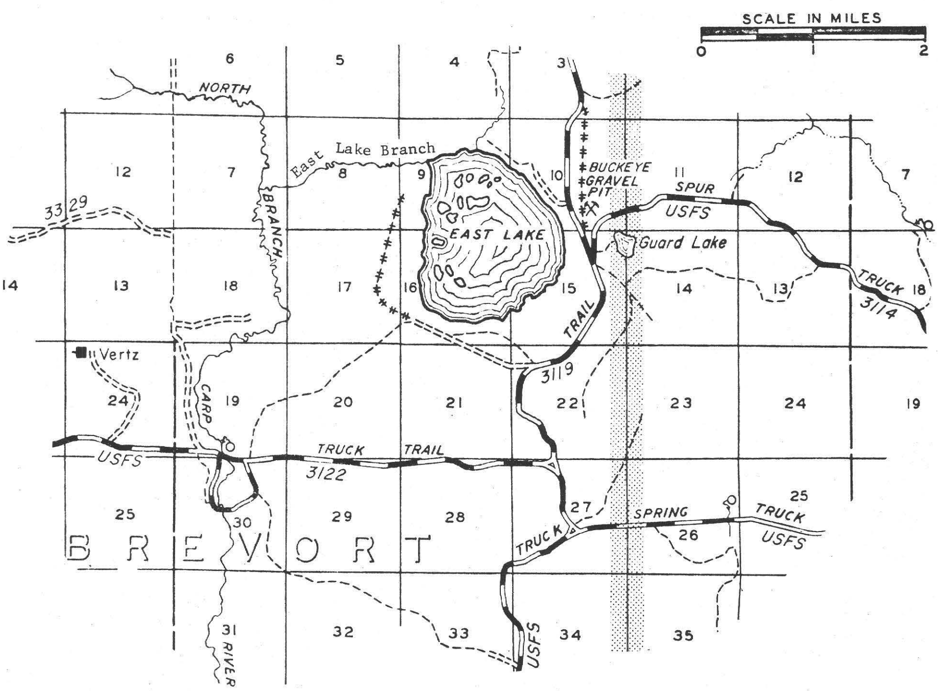
Gage.--Staff gage read daily. Datum of gage not determined.

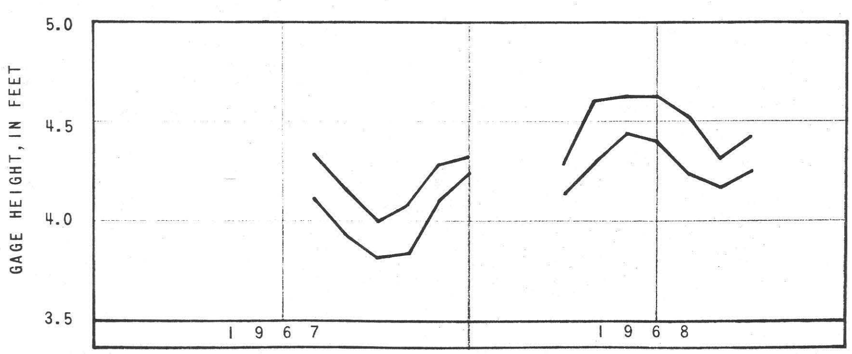
Established legal level.--None known.

Extremes.--1967-68: Maximum stage observed, 4.62 ft May 19, June 2, 1968; minimum observed, 3.81 ft Sept. 19, 20, 1967.

Regulation or control.--None.

Remarks.--A small unnamed stream draining a marsh at the north end of the lake is the only surface inlet. The outlet, East Lake Branch, leaves the northwest side of the lake and flows about 1.6 miles west to North Branch Carp River.
No discharge measurements are available on the inlet or outlet.





Monthly maximum and minimum stages for East Lake near Fibre, Mich.

MACKINAC COUNTY

Manistique Lake near Curtis, Mich.

Location.--Lat 46°14'47", long 85°51'06", in many sections, Tps. 44 and 45 N., Rs. 11 and 12 W., 5.8 miles northwest of Curtis.

Surface area.--10,100 acres.

Maximum depth.--25 ft.

Drainage area at outlet.--118 sq mi, approximately.

Records available.--April 1942 to September 1968.

Gage.--Staff gage read weekly. Datum of gage is 683.08 ft above mean sea level (levels by Michigan Department of Natural Resources). Apr. 15, 1943 to July 30, 1968, water-stage recorder at same datum. Prior to Apr. 15, 1943, staff gage at same datum.

Established legal level.--686.00 ft above mean sea level, established by Circuit Court on Jan. 19, 1948.

Extremes.--1942-68: Maximum stage, 6.28 ft May 14, 15 or 16, 1960, (from highwater mark); minimum, 1.33 ft Aug. 10, 1948.

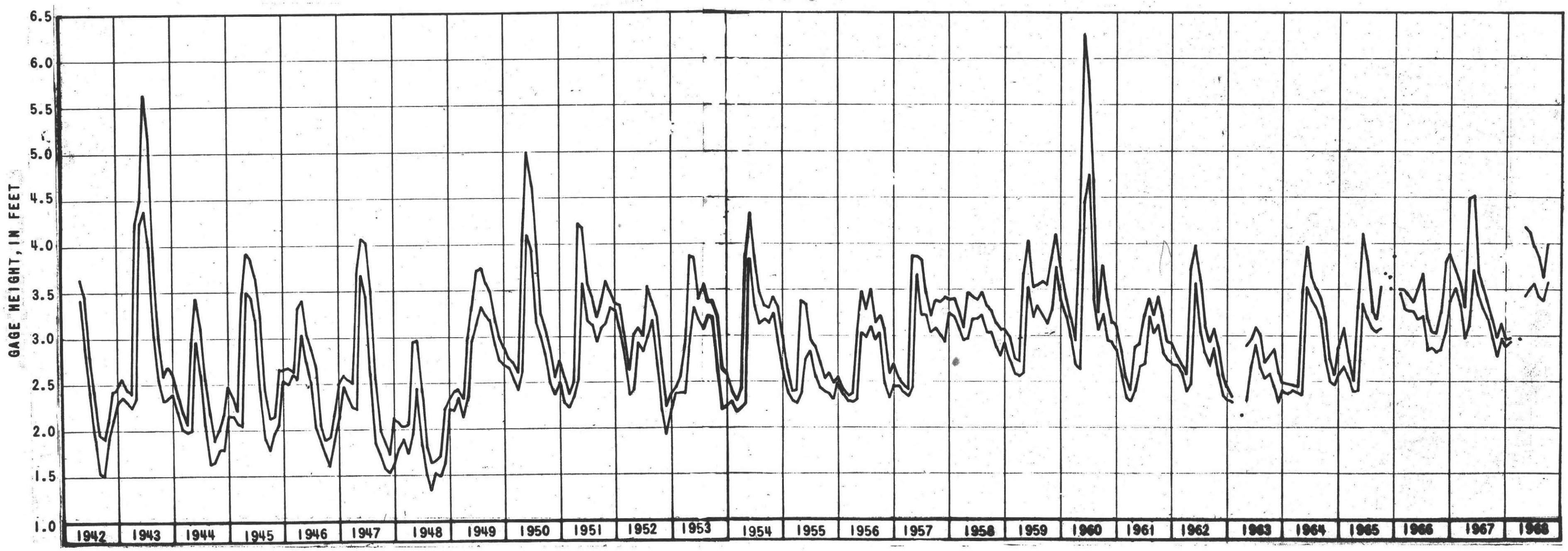
Regulation or control.--Timber dam with removable flash boards on outlet, built in summer 1948, and dam on Portage Creek, one of the inlets, affect lake levels. During periods of high runoff, water from the Fox River backs up into the lake raising the lake level.

Remarks.--Principal inlets are Helmer Creek from North Manistique Lake, Portage Creek from South Manistique Lake, and Fork Lake outlet. The outlet, Manistique River, leaves the west end of the lake and flows southwesterly to Lake Michigan.

An engineering lake-level control study was completed in 1947 by the Michigan Department of Natural Resources.

Records of daily discharge for the period Aug. 22, 1942 to Sept. 30, 1944 were collected on North Manistique Lake outlet, half a mile upstream from Manistique Lake. Also, records on South Manistique Lake, three quarters of a mile above the lake, are available for the period May 23, 1942 to Sept. 30, 1944. Records of daily discharge were also collected from Apr. 6, 1942 to June 30, 1950 on the outlet, Manistique River, 2 miles downstream from the lake. All records are published in U. S. Geological Survey Water-Supply Papers.

See North Manistique Lake, Luce County, for listing of discharge measurements made on North Manistique Lake outlet during period 1945-59.



Monthly maximum and minimum stages for Manistique Lake near Curtis, Mich.

MACKINAC COUNTY

Milakokia Lake near Gould City, Mich.

Location.--Lat 46°04'05", long 85°48'58", in many sections, Tps. 42 and 43 N., R.12 W., 6 miles southwest of Gould City.

Surface area.--1,960 acres.

Maximum depth.--26 ft.

Drainage area at outlet.--11 sq mi.

Records available.--August 1942 to November 1958 except winter and spring periods.

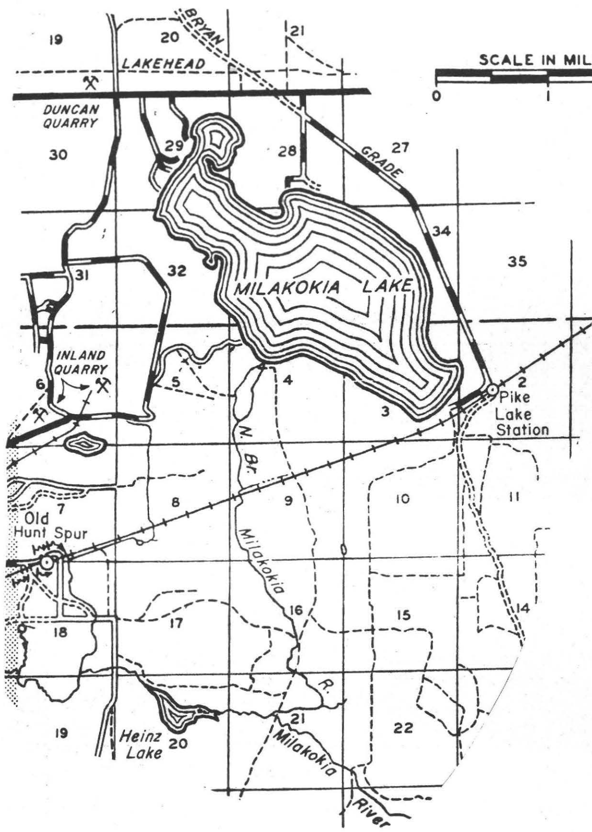
Gage.--Staff gage read daily. Datum of gage is 731.37 ft above mean sea level (levels by Michigan Department of Natural Resources).

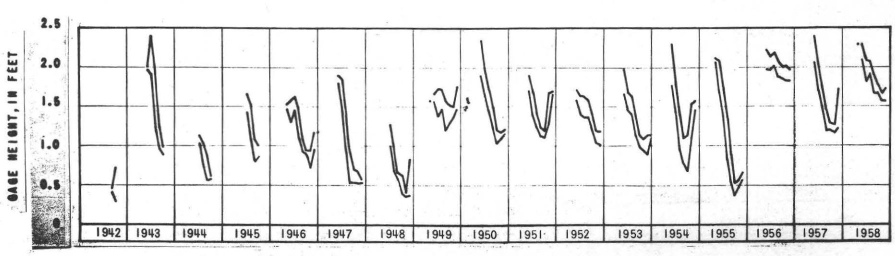
Established legal level.--None known.

Extremes.--1942-58: Maximum stage observed, 2.40 ft June 17, 18, 20, 21, 1943, May 3, 1957; minimum observed, 0.28 ft Sept. 10-14, 1942.

Regulation or control.--None.

Remarks.--There are no surface inlets to the lake. The outlet, North Branch Milakokia River, leaves the southwest side of the lake and flows about four miles to Milakokia River, tributary to Lake Michigan. No discharge measurements have been made on the outlet.





Monthly maximum and minimum stages for Milakokia Lake near Gould City, Mich.

MACKINAC COUNTY

Millecoquins Lake near Engadine, Mich.

Location.--Lat 46°08'19", long 85°30'57", in many sections, T.43, 44 N., R.10 W., 3.1 miles northeast of Engadine.

Surface area.--1,060 acres.

Maximum depth.--Not known.

Drainage area at outlet.--80 sq mi, approximately.

Records available.--August 1942 to July 1952 except periods July 1945 to July 1946, October 1951 to April 1952, and some winter periods.

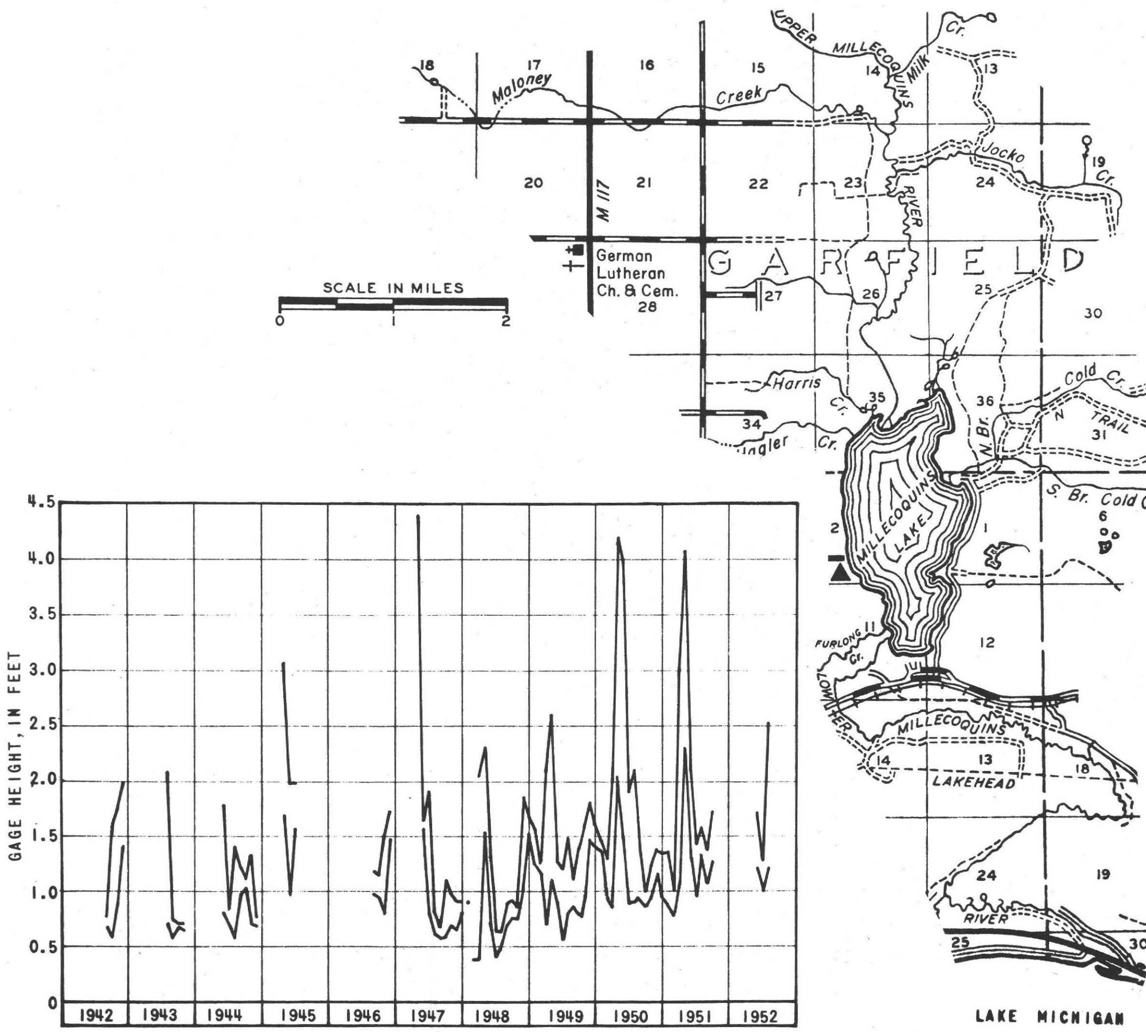
Gage.--Staff gage read intermittently. Datum of gage is 612.23 ft above mean sea level.

Established legal level.--614.06 ft above mean sea level, established by Circuit Court on June 4, 1937.

Extremes.--1942-52: Maximum stage observed, 4.40 ft Apr. 11, 1947, from high-water mark; minimum observed, 0.38 ft Feb. 14, 21, 28, Mar. 6, 1948.

Regulation or control.--No dam or other control was known to exist during the period of record.

Remarks.--Principal inlets to the lake are Millecoquins River, Furlong Creek, Hagler Creek, Harris Creek, and Cold Creek. The outlet, Millecoquins River, leaves the south end of the lake and flows about 7 miles to Lake Michigan.
No discharge measurements are available on the inlets or outlet.



Monthly maximum and minimum stages for Millecoquins Lake near Engadine, Mich.

MACKINAC COUNTY

South Manistique Lake at Curtis, Mich.

Location.--Lat 46°12'12", long 85°44'33", in many sections, Tps. 43 and 44 N., Rs.11 and 12 W., at Curtis.

Surface area.--4,000 acres.

Maximum depth.--29 ft.

Drainage area at outlet.--44 sq mi, approximately.

Records available.--April 1942 to September 1959 except period October to December 1955.

Gage.--Staff gage read daily. Datum of gage is 690.52 ft above mean sea level (levels by Michigan Department of Natural Resources).

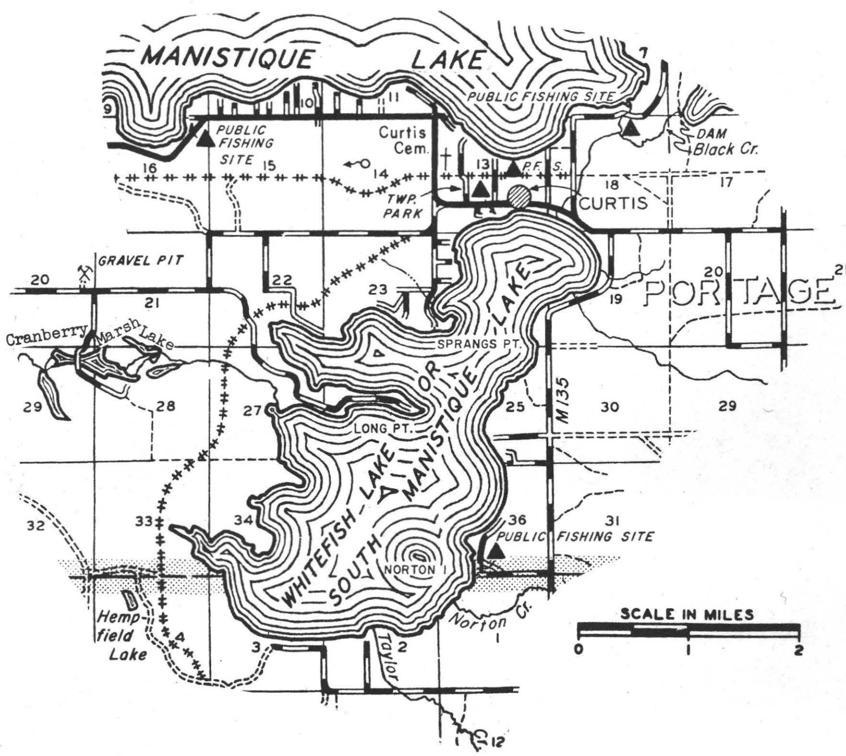
Established legal level.--None known.

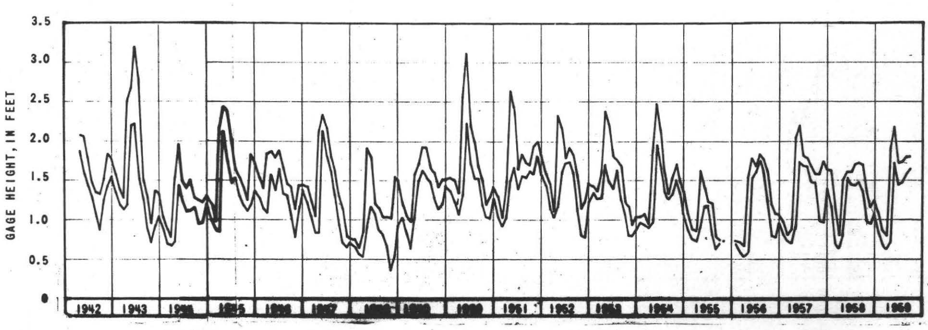
Extremes.--1942-59: Maximum stage, 3.20 ft June 22, 23, 1943; minimum, 0.36 ft Oct. 23, 1948.

Regulation or control.--Lake level is controlled by a dam equipped with flash boards, located about 250 ft downstream from lake. Prior to 1948, lake level was controlled by a dam with flash boards, at bridge about 100 ft downstream from lake.

Remarks.--Principal inlets are Norton Creek, Taylor Creek, and Cranberry Marsh Lake outlet. South Manistique Lake outlet leaves the north end of the lake and flows about 1 mile to Manistique Lake.

No discharge measurements are available on the inlets. A regular gaging station was maintained on the outlet about a quarter of a mile downstream from the lake from May 1942 to Sept. 1944. Discharge records are published in U.S. Geological Survey Water-Supply Papers.





Monthly maximum and minimum stages for South Manistique Lake at Curtis, Mich.

MACOMB COUNTY

Stony Lake near Washington, Mich.

Location.--Lat 42°42'58", long 83°05'20", in many sections, T.4 N., Rs. 11 and 12, E., 2.7 miles west of Washington.

Surface area.--700 acres.

Maximum depth.--About 25 ft.

Drainage area at outlet.--68.0 sq mi.

Records available.--March 1963 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 790.00 ft above mean sea level (levels by Huron-Clinton Metropolitan Authority).

Established legal level.--None known. The proposed operation schedule contemplates drawdown to an elevation of 796 ft above mean sea level during the winter, and filling to an elevation of 802 ft above mean sea level during the summer recreation season.

Extremes.--1963-68: Maximum stage, 12.92 ft June 26, 27, 1968; minimum, subsequent to filling of lake, 4.71 ft Nov. 21, 1967.

Regulation or control.--An earth-fill dam with concrete spillway was completed in 1962. The spillway section includes a drum gate with minimum crest elevation of 796 ft, maximum of 802 ft, and 2 sluices, one on each side, with valve controls (capable of draining lake).

Remarks.--Stony Lake is reservoir used for recreational purposes and was formed by damming Stony Creek. Inlets include West Branch Stony Creek, Mount Vernon Drain, Twin Lakes outlet and several small unnamed streams. The outlet, Stony Creek, leaves the south end of the lake and flows south about 3 miles to the Clinton River.

Daily records of streamflow are collected on Stony Creek about 3 miles upstream from Stony Lake and at a site 500 ft downstream from the lake. These records are published by the U.S. Geological Survey.

The following discharge measurements have been made on West Branch Stony Creek, in SE¼ sec. 25, T.4 N., R.11 E., about 800 ft upstream from Stony Lake (drainage area, 22.5 sq mi).

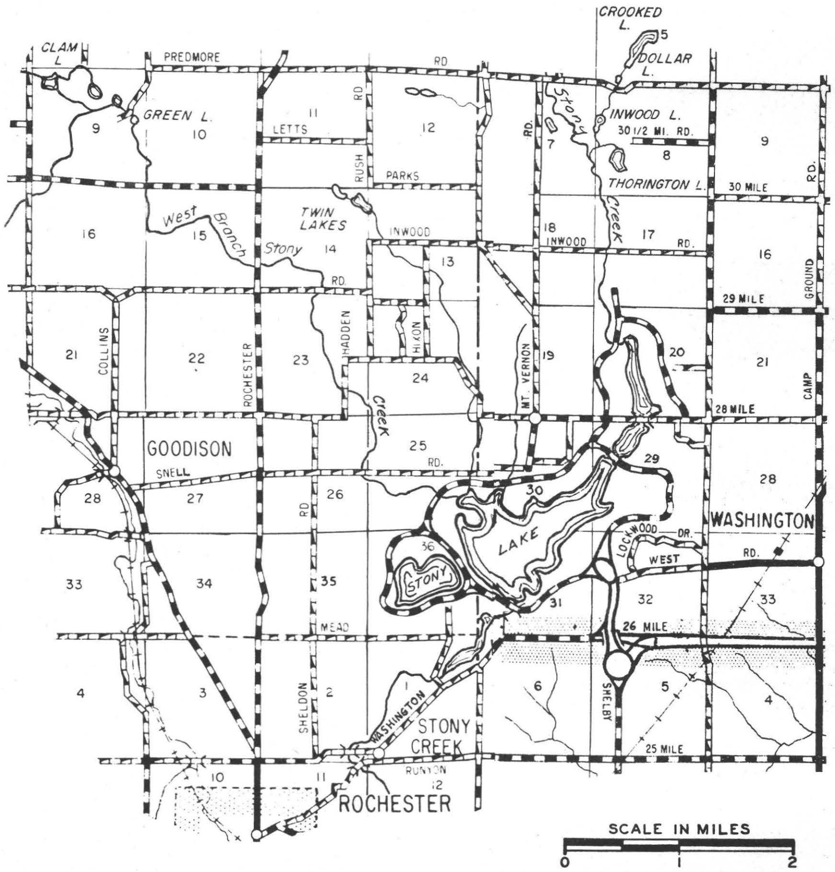
Date	Discharge (cfs)	Date	Discharge (cfs)
Oct. 22, 1964	0.57	Mar. 14, 1967	30.5
Apr. 20, 1965	25.2	Apr. 18, 1967	52.4
Aug. 18, 1965	.48	May 24, 1967	5.78
Dec. 10, 1965	1.94	Aug. 9, 1967	2.89
Mar. 16, 1966	9.56	Sept. 13, 1967	1.04
Apr. 19, 1966	9.51	Nov. 7, 1967	11.4
July 26, 1966	.38	Dec. 13, 1967	20.3
Dec. 9, 1966	19.1	Dec. 21, 1967	104
		Mar. 13, 1968	17.3

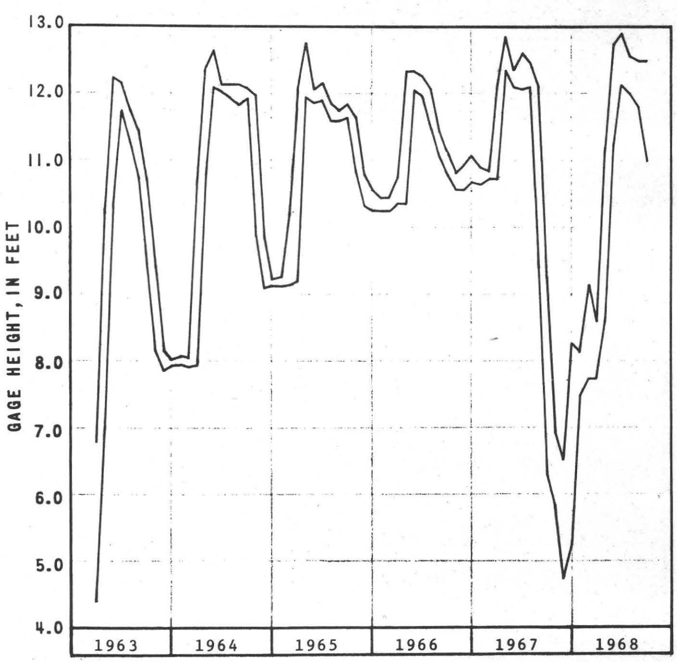
The following discharge measurements have been made on Mt. Vernon Drain, in SW¼ sec. 30, T.4 N., R.12 E., about 100 ft upstream from Stony Lake (drainage area, 1.87 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Oct. 22, 1964	0.17	Apr. 14, 1966	0.76
Apr. 20, 1965	1.52	Aug. 9, 1967	.40
Aug. 18, 1965	0	Nov. 7, 1967	.96
Dec. 10, 1965	.52	Mar. 13, 1968	1.86
Mar. 16, 1966	.96	Sept. 13, 1968	1.16

The following measurements have been made on Twin Lakes outlet, in SE¼ sec. 25, T.4 N., R.11 E., about 100 ft upstream from Stony Lake (drainage area, 3.63 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Oct. 22, 1964	0.58	July 26, 1966	.43
Apr. 20, 1965	3.71	May 24, 1967	1.38
Aug. 18, 1965	.39	Aug. 9, 1967	.74
Dec. 10, 1965	.71	Sept. 13, 1967	.51
Mar. 16, 1966	1.41	Nov. 7, 1967	2.12
Apr. 14, 1966	1.57	Mar. 13, 1968	4.38
		Sept. 13, 1968	4.28





Monthly maximum and minimum stages for Stony Lake near Washington, Mich.

MANISTEE COUNTY

Bear Lake at Bear Lake, Mich.

Location.--Lat 44°26'35", long 86°07'58", in many sections, Tps. 23 and 24 N., R.15 W., at Bear Lake.

Surface area.--1,870 acres.

Maximum depth.--24 ft.

Drainage area at outlet.--20 sq mi, approximately.

Records available.--June 1942 to September 1943 except period December to May.

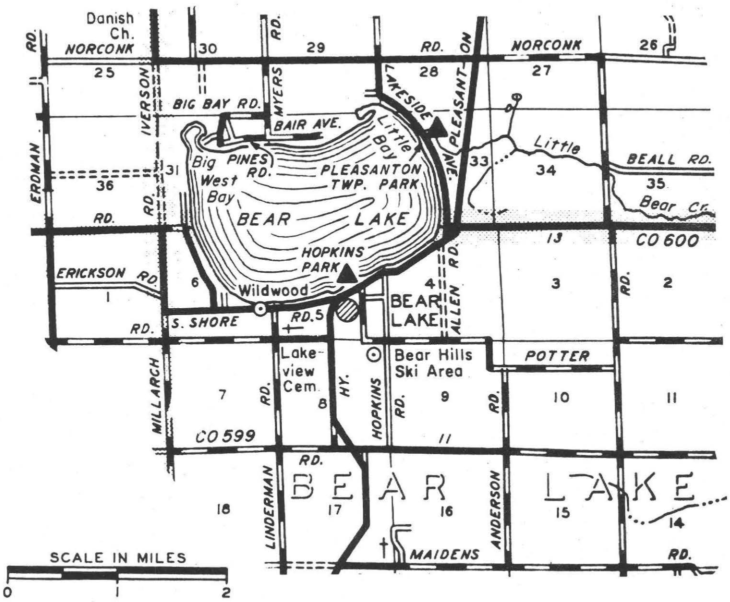
Gage.--Staff gage read daily. Datum of gage not determined.

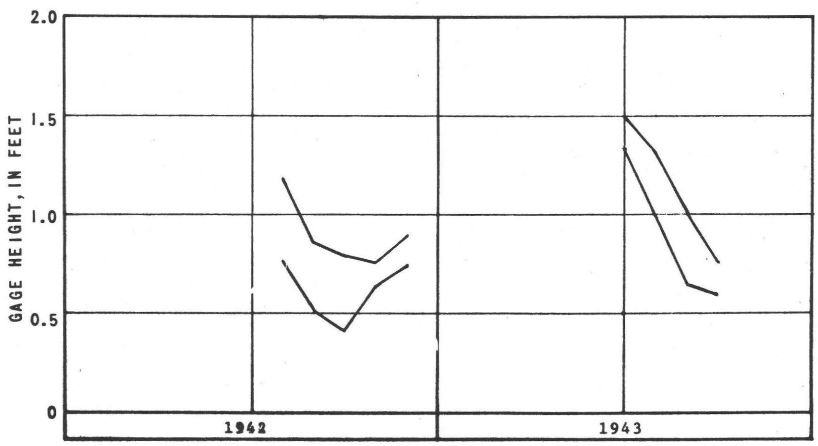
Established legal level.--None known.

Extremes.--1942-43: Maximum stage observed, 1.50 ft June 3-5, 1943; minimum observed, 0.42 ft Sept. 12, 13, 1942.

Regulation or control.--None.

Remarks.--Bear Lake has one outlet, Little Bear Creek, and no inlet. No discharge measurements have been made on the outlet.





Monthly maximum and minimum stages for Bear Lake at Bear Lake, Mich.

MARQUETTE COUNTY

Big Shag Lake near Princeton, Mich.

Location.--Lat 46°15'38", long 87°30'19", in secs. 25, 26, and 36, T.45 N., R.26 W., 2.5 miles southwest of Princeton.

Surface area.--180 acres.

Maximum depth.--Unknown.

Drainage area.--Not determined.

Records available.--December 1967 to September 1968.

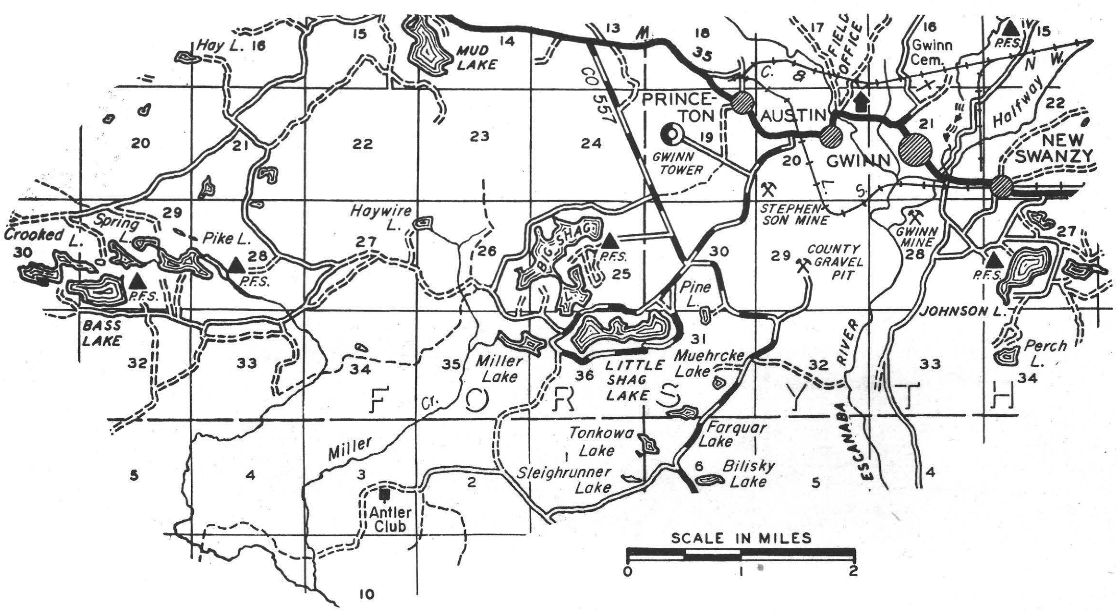
Gage.--Chain gage read intermittently. Datum of gage not determined.

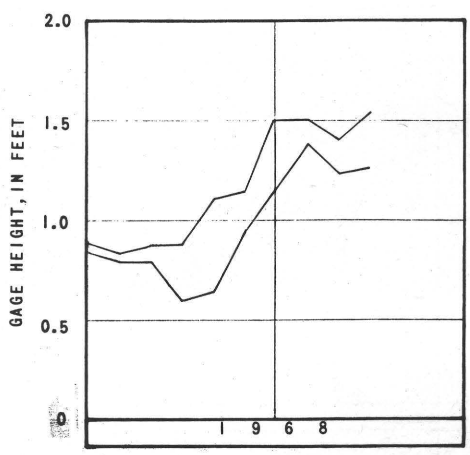
Established legal level.--None known.

Extremes.--1967-68: Maximum stage observed, 1.54 ft Sept. 9, 10, 20, 1968; minimum observed, 0.59 ft Mar. 26, 1968.

Regulation or control.--None.

Remarks.--There is no active inlet or outlet on Big Shag Lake.





Monthly maximum and minimum stages for Big Shag Lake near Princeton, Mich.

MARQUETTE COUNTY

Boston Lake at Diorite, Mich.

Location.--Lat 46°30'28", long 87°49'46", in secs. 32 and 33, T.48 N., R.28 W., at Diorite.

Surface area.--50 acres.

Maximum depth.--15 ft.

Drainage area at outlet.--1.99 sq mi.

Records available.--October 1961 to September 1967.

Gage.--Staff gage read daily. Datum of gage is 1,555.59 ft above mean sea level (levels by Michigan Department of Natural Resources).

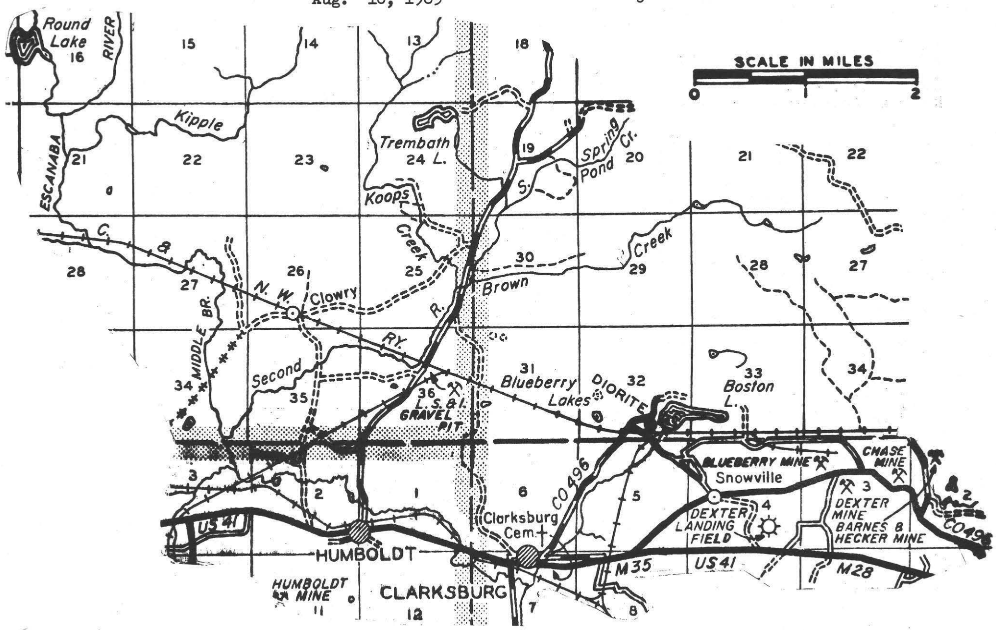
Established legal level.--None known.

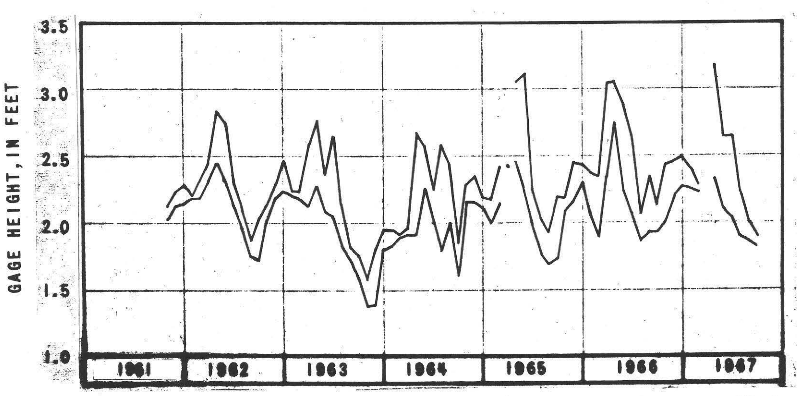
Extremes.--1961-67: Maximum stage observed, 3.17 ft Apr. 18, 1967; minimum observed, 1.38 ft Oct. 31, 1963.

Regulation or control.--None.

Remarks.--There is no inlet to the lake. The outlet is tributary to Middle Branch Escanaba River. A discharge of 0.02 cfs was measured at the outlet on Oct. 18, 1962. In addition the following estimates of flow have been made.

Date	Estimated discharge (cfs)
Oct. 4, 1961	0.1
Oct. 10, 1961	.1
May 22, 1962	2.5
Apr. 24, 1963	1.0
Sept. 25, 1963	0
May 12, 1964	3.0
Nov. 5, 1964	1.5
Aug. 10, 1965	0





Monthly maximum and minimum stages for Boston Lake at Diorite, Mich.

MARQUETTE COUNTY

Deer Lake near Ishpeming, Mich.

Location.--Lat 46°32'00", long 87°40'04", in many sections, T.48 N., R.27 W., 1.8 miles north of Ishpeming.

Surface area.--897 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--36.3 sq mi.

Records available.--October 1961 to September 1968. Prior to October 1961, once monthly lake stage readings were made by Cleveland-Cliffs Power and Light Company.

Gage.--Staff gage read twice weekly. Datum of gage is 1,300.0 ft above mean sea level (levels by Cleveland-Cliffs Power and Light Company).

Established legal level.--None known.

Extremes.--1961-68: Maximum stage observed, 91.8 ft May 12, 18, 21, 1966; minimum observed, 72.00 ft. March 26, 1963.

Regulation or control.--Lake level is regulated by Cleveland-Cliffs Power and Light Company dam at outlet.

Remarks.--There are several inlets. Base-flow discharge measurements have been made on two of these; Goldmine Creek at its mouth, and Carp Creek at the U. S. Highway 41A. The outlet is Carp River. Records of daily discharge, since July 1, 1961, are available for Carp River at a site 5 miles downstream from Deer Lake.

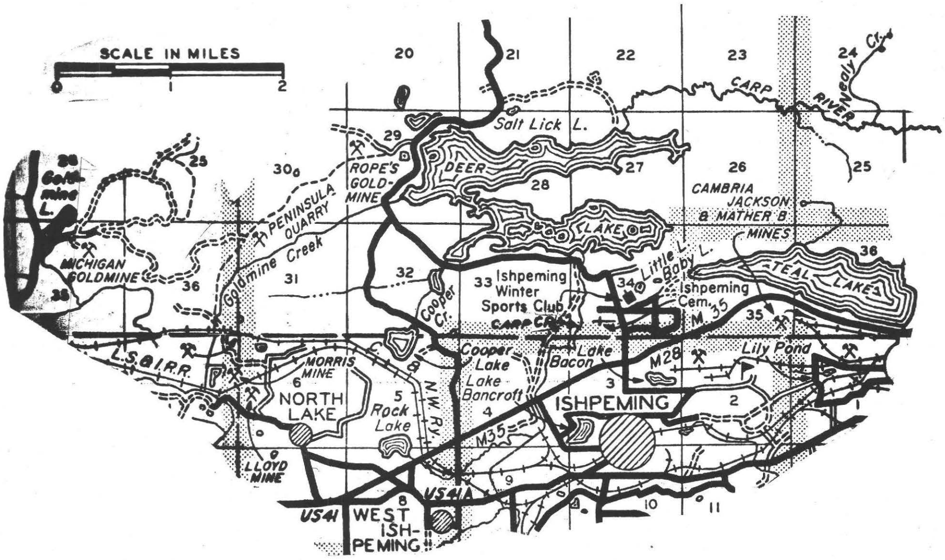
Deer Lake is used as a storage reservoir for power production. Some ground water is pumped from mines into the basin and about 2.5 cfs is diverted into the basin from Lake Sally (headwaters of East Branch Escanaba River) by the City of Ishpeming.

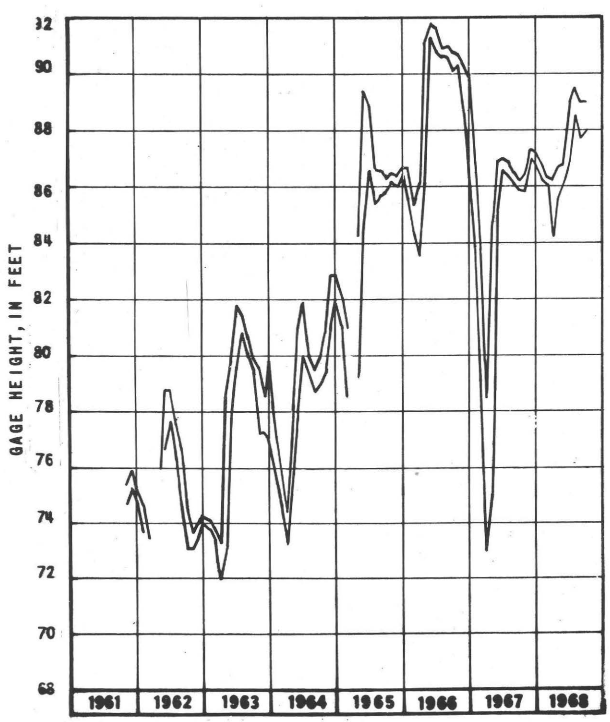
The following discharge measurements have been made at the mouth of Goldmine Creek (drainage area, 4.89 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Oct. 4, 1960	8.09	Apr. 26, 1963	5.63
Aug. 16, 1961	2.22	July 1, 1963	5.55
Sept. 10, 1961	2.45	July 16, 1963	3.92
Sept. 22, 1961	2.55	Oct. 2, 1963	3.50
Feb. 12, 1962	3.10	Feb. 19, 1964	2.82
June 28, 1962	3.63	May 20, 1964	5.84
Aug. 22, 1962	3.06	Aug. 20, 1964	2.84
Oct. 15, 1962	3.40	Jan. 6, 1965	4.75
Feb. 12, 1963	3.02	July 21, 1965	1.49

The following discharge measurements have been made at U.S. Highway 41A on Carp Creek (drainage area, 16.5 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Aug. 16, 1961	5.16	Apr. 19, 1966	71.2
Sept. 10, 1961	5.61	June 2, 1966	12.9
Sept. 22, 1961	6.52	July 6, 1966	9.01
Feb. 12, 1962	4.50	Aug. 3, 1966	20.8
June 28, 1962	5.98	Aug. 31, 1966	9.60
Aug. 22, 1962	3.94	Oct. 9, 1966	12.5
Oct. 15, 1962	7.88	Nov. 18, 1966	18.4
Feb. 12, 1963	3.99	Dec. 24, 1966	14.0
Apr. 26, 1963	12.0	Feb. 2, 1967	13.5
July 1, 1963	5.84	Mar. 6, 1967	10.3
July 16, 1963	5.02	Apr. 23, 1967	39.8
Oct. 2, 1963	4.41	May 17, 1967	19.9
Feb. 11, 1964	4.38	July 19, 1967	13.0
May 18, 1964	14.8	Aug. 17, 1967	10.2
Aug. 20, 1964	7.67	Sept. 26, 1967	10.2
Jan. 21, 1965	8.91	Nov. 29, 1967	14.4
July 21, 1965	9.47	Dec. 21, 1967	15.5
Dec. 9, 1965	13.6	Jan. 30, 1968	12.1
Jan. 14, 1966	11.3	May 24, 1968	29.9
Feb. 8, 1966	9.60	July 26, 1968	13.8
Mar. 14, 1966	16.8	Aug. 21, 1968	18.2





Monthly maximum and minimum stages for Deer Lake near Ishpeming, Mich.

MARQUETTE COUNTY

Fence Lake near Witch Lake, Mich.

Location.--Lat 46°16'16", long 88°07'11", in secs. 25 and 30, T.45 N., Rs.30 and 31 W., 4.9 miles west of Witch Lake.

Surface area.--174 acres.

Maximum depth.--28 ft.

Drainage area at outlet.--6.57 sq mi.

Records available.--April 1960 to September 1962 except winter periods.

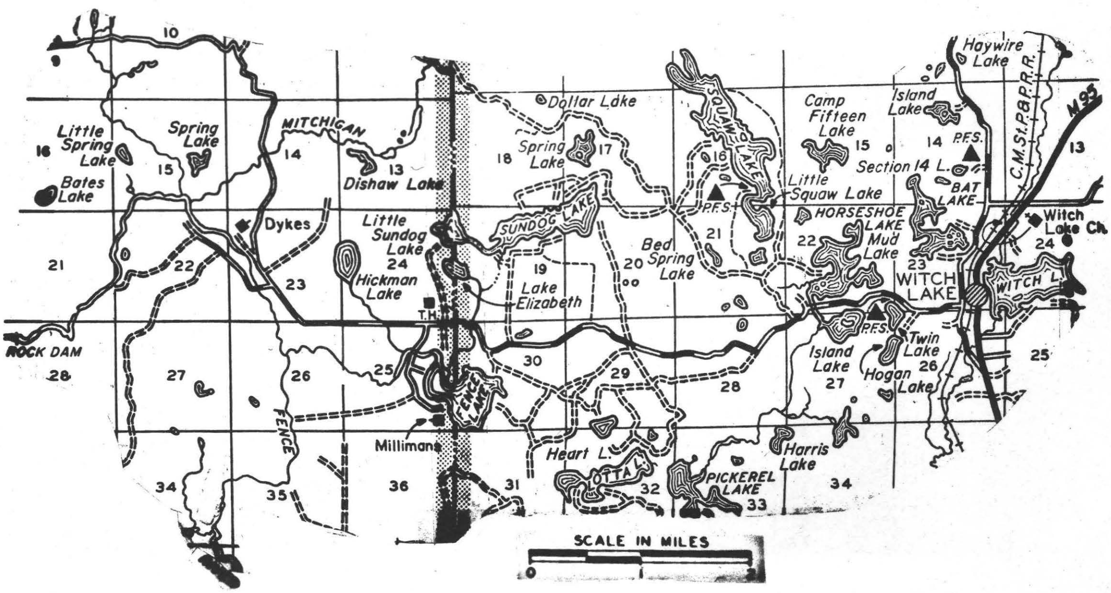
Gage.--Staff gage read daily. Datum of gage not determined.

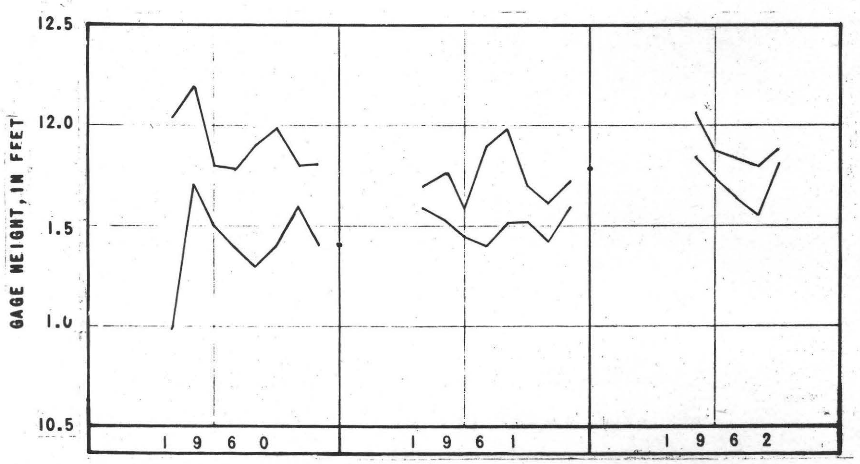
Established legal level.--None known.

Extremes.--1960-62: Maximum stage observed, 12.18 ft May 7, 8, 1960; minimum observed, 10.98 ft Apr. 20, 1960.

Regulation or control.--None.

Remarks.--The inlet is an unnamed tributary from Lake Elizabeth and Sundog Lake. The outlet is an unnamed tributary to Fence River. The outlet is located at the northernmost point of Fence Lake, about 0.2 mile northwest of the inlet. No discharge measurements have been made on the inlet or outlet.





Monthly maximum and minimum stages for Fence Lake near Witch Lake, Mich.

MARQUETTE COUNTY

Goose Lake near Negaunee, Mich.

Location.--Lat 46°27'34", long 87°30'13", in secs. 13-15, 23, and 24, T.47 N., R.26 W., 5.8 miles southeast of Negaunee.

Surface area.--395 acres.

Maximum depth.--15 ft.

Drainage area at outlet.--14.6 sq mi.

Records available.--November 1965 to September 1968.

Gage.--Water-stage recorder. Datum of gage not determined.

Established legal level.--None known.

Extremes.--1965-68: Maximum stage, 7.45 ft Apr. 21, 1966; minimum, 4.68 ft July 24, 1966.

Regulation or control.--None. The flow in the inlet is affected by ground water pumped from mines.

Remarks.--The inlet is an unnamed stream entering Goose Lake at its western extremity. The outlet, "Goose Lake Outlet", leaves the lake at the southeast end.

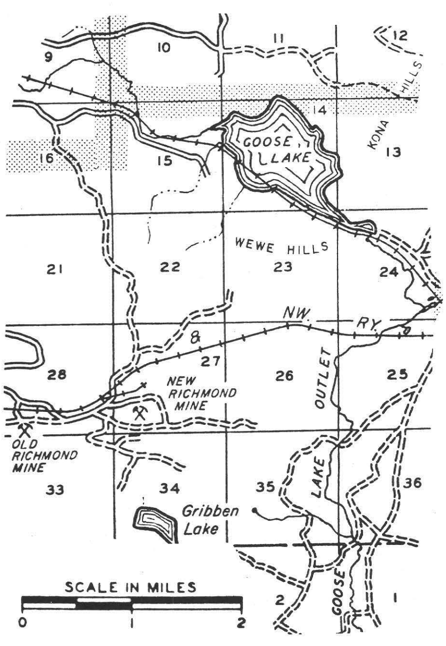
The following discharge measurements have been made on the inlet, about 0.8 miles upstream from Goose Lake (drainage area, 9.57 sq mi).

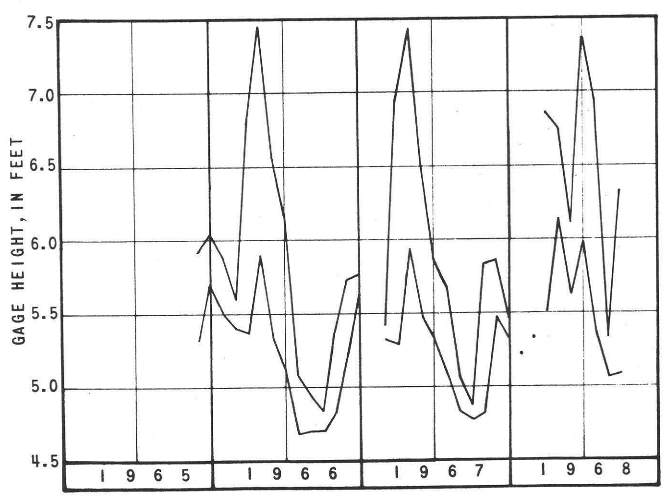
Date	Discharge (cfs)	Date	Discharge (cfs)
Aug. 23, 1961	3.46	Feb. 12, 1962	4.98
Sept. 10, 1961	3.15	June 28, 1962	3.59
Sept. 22, 1961	4.61	July 1, 1963	5.35

The following discharge measurements have been made at the outlet of Goose Lake (drainage area, 14.6 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Aug. 16, 1962	3.50	Feb. 8, 1967	11.4
July 26, 1963	5.51	Mar. 6, 1967	9.18
July 21, 1964	7.23	Apr. 29, 1967	33.7
Nov. 8, 1965	10.0	May 31, 1967	17.9
Dec. 7, 1965	18.8	June 19, 1967	23.4
Jan. 11, 1966	16.7	July 19, 1967	16.8
Feb. 8, 1966	10.8	Aug. 15, 1967	7.74
Mar. 14, 1966	18.8	Sept. 28, 1967	5.14
May 24, 1966	23.3	Oct. 24, 1967	9.17
June 7, 1966	40.8	Nov. 28, 1967	12.3
July 5, 1966	9.74	Dec. 18, 1967	9.87
Aug. 9, 1966	6.13	Jan. 9, 1968	8.12
Sept. 7, 1966	5.19	Feb. 13, 1968	8.01
Oct. 26, 1966	8.05	May 21, 1968	23.8
Nov. 18, 1966	9.00	Aug. 1, 1968	13.6
Dec. 13, 1966	18.1	Sept. 5, 1968	17.1

A gaging station is currently being operated on Goose Lake Outlet, 0.8 mile upstream from mouth (drainage area, 37.5 sq mi). Records are available since October 1965 and published by the U.S. Geological Survey.





Monthly maximum and minimum stages for Goose Lake near Negaunee, Mich.

MARQUETTE COUNTY

Lake Independence at Big Bay, Mich.

Location.--Lat 46°49'45", long 87°40'48", in many sections, T.51 N., R.27 W., 2.4 miles east of Big Bay.

Surface area.--2,070 acres.

Maximum depth.--33 ft.

Drainage area.--97.2 sq mi, at outlet.

Records available.--May 1943 to October 1959 except during winter periods.

Gage.--Staff gage read daily. Datum of gage is 621.46 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1943-59: Maximum stage observed, 6.00 ft May 1, 1951 from high-water mark; minimum observed, 3.89 ft Oct. 11-14, 1952.

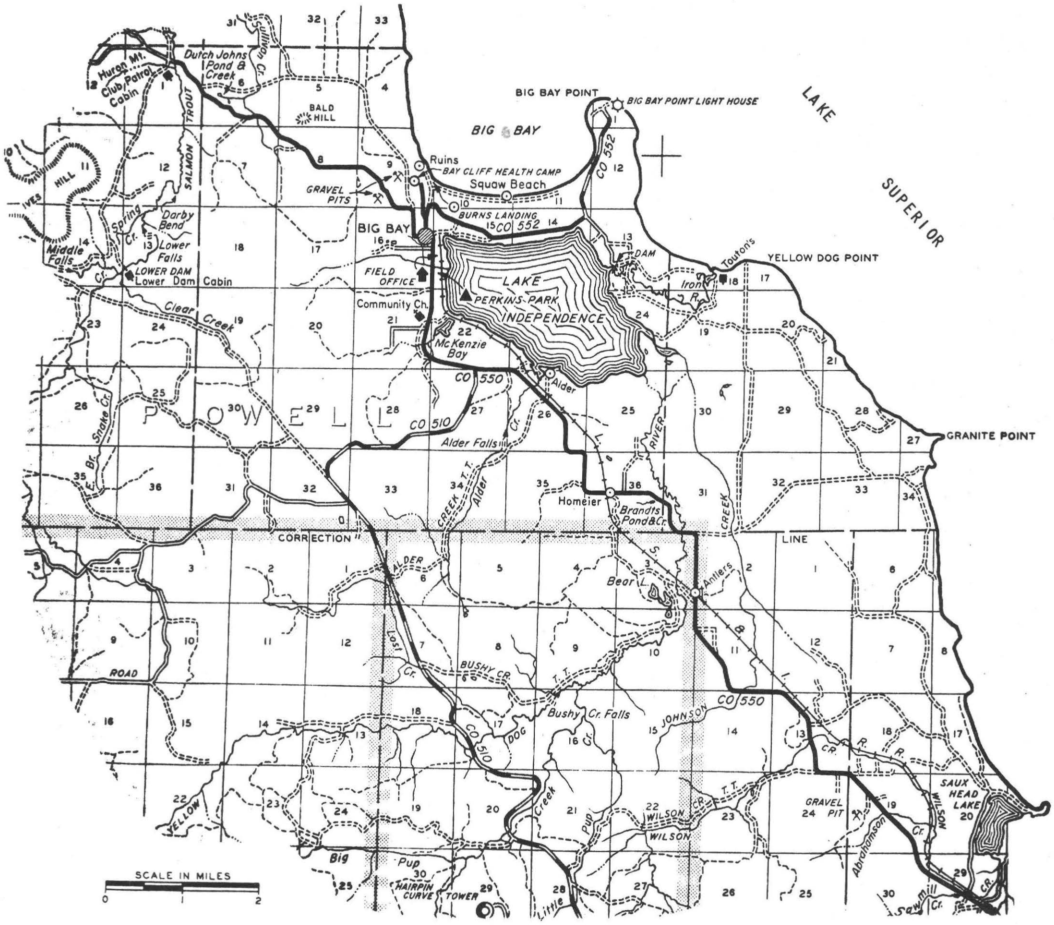
Regulation or control.--Lake level is stabilized by dam at outlet. All flow is over crest of dam since dam has no gates or flashboards.

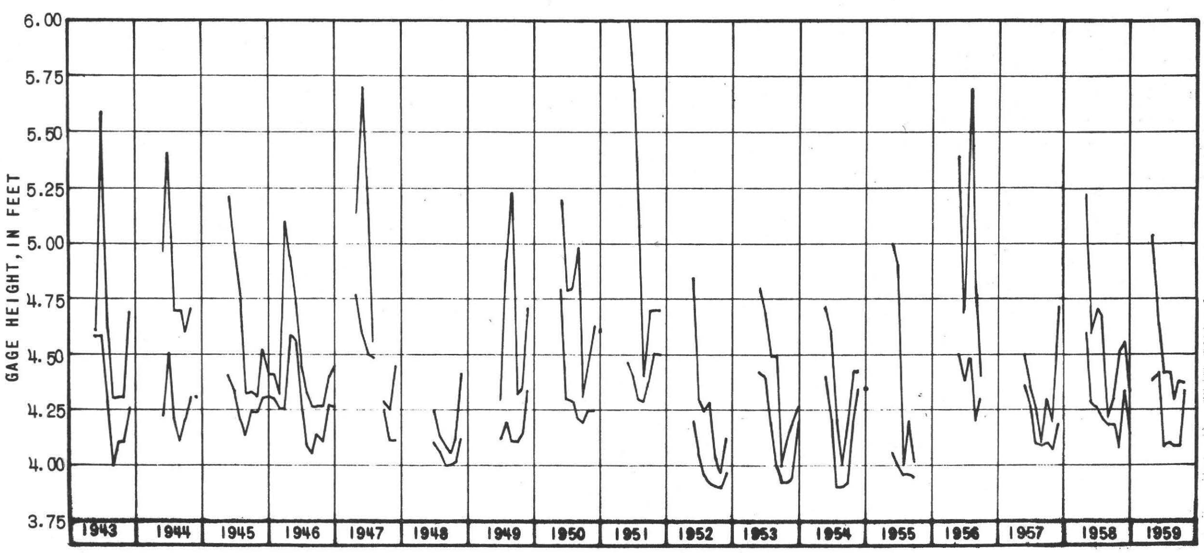
Remarks.--The inlets to Lake Independence are Alder Creek, Yellow Dog River, and several other small unnamed creeks. The outlet is Iron River which is tributary to Lake Superior.

An engineering lake-level control study was completed in 1963 by the Michigan Department of Natural Resources.

On Aug. 6, 1963, 31.1 cfs was measured on Yellow Dog Creek at County Highway 550. The following discharge measurements have been made on Iron River, about 0.2 mile downstream from Lake Independence.

Date	Discharge (cfs)	Date	Discharge (cfs)
May 18, 1945	79.5	Oct. 12, 1953	64.3
Apr. 26, 1946	89.8	May 14, 1954	380
May 30, 1947	164	Sept. 14, 1954	58.9
Sept. 24, 1947	72.5	May 3, 1955	163
June 4, 1948	55.1	July 29, 1955	52.3
Oct. 27, 1948	32.6	Oct. 17, 1955	80.2
Apr. 29, 1949	174	May 10, 1956	291
Oct. 21, 1949	56.4	July 25, 1956	169
May 18, 1950	531	Oct. 4, 1956	49.7
Sept. 6, 1950	49.3	May 9, 1957	117
Oct. 23, 1950	43.7	July 25, 1957	59.4
May 18, 1951	272	Oct. 11, 1957	38.7
Aug. 24, 1951	83.2	Apr. 22, 1958	404
Oct. 19, 1951	107	July 23, 1958	89.8
Apr. 30, 1952	240	Oct. 22, 1958	51.5
Oct. 17, 1952	38.3	May 3, 1959	144
May 15, 1953	253	June 11, 1959	61.0
July 27, 1953	88.3	Oct. 14, 1959	71.1





Monthly maximum and minimum stages for Lake Independence at Big Bay, Mich.

MARQUETTE COUNTY

Lake Michigamme near Champion, Mich.

Location.--Lat 46°29'04", long 88°04'15", in many sections, Tps. 47 and 48 N., R.30 W., 5.5 miles southwest of Champion.

Surface area.--4,260 acres.

Maximum depth.--72 ft.

Drainage area at outlet.--193 sq mi.

Records available.--July 1942 to September 1968.

Gage.--Water-stage recorder. Prior to Aug. 8, 1962, staff gage read daily (except some winter periods) at same site and datum. Datum of gage is 1,548.83 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1942-68: Maximum stage, 8.25 ft April 1960 (determined from high-water marks); minimum, 0.37 ft Oct. 7, 8, 1948.

Regulation or control.--A dam at the outlet consists of concrete over rock-filled cribbing. Much of dam is broken up and no regulation pattern is maintained. A constriction below the dam is the controlling feature at high stages.

Remarks.--The inlets to Lake Michigamme are Peshekee River, Spurr River, and numerous small unnamed tributaries. The outlet, Michigamme River, is tributary to the Menominee River.

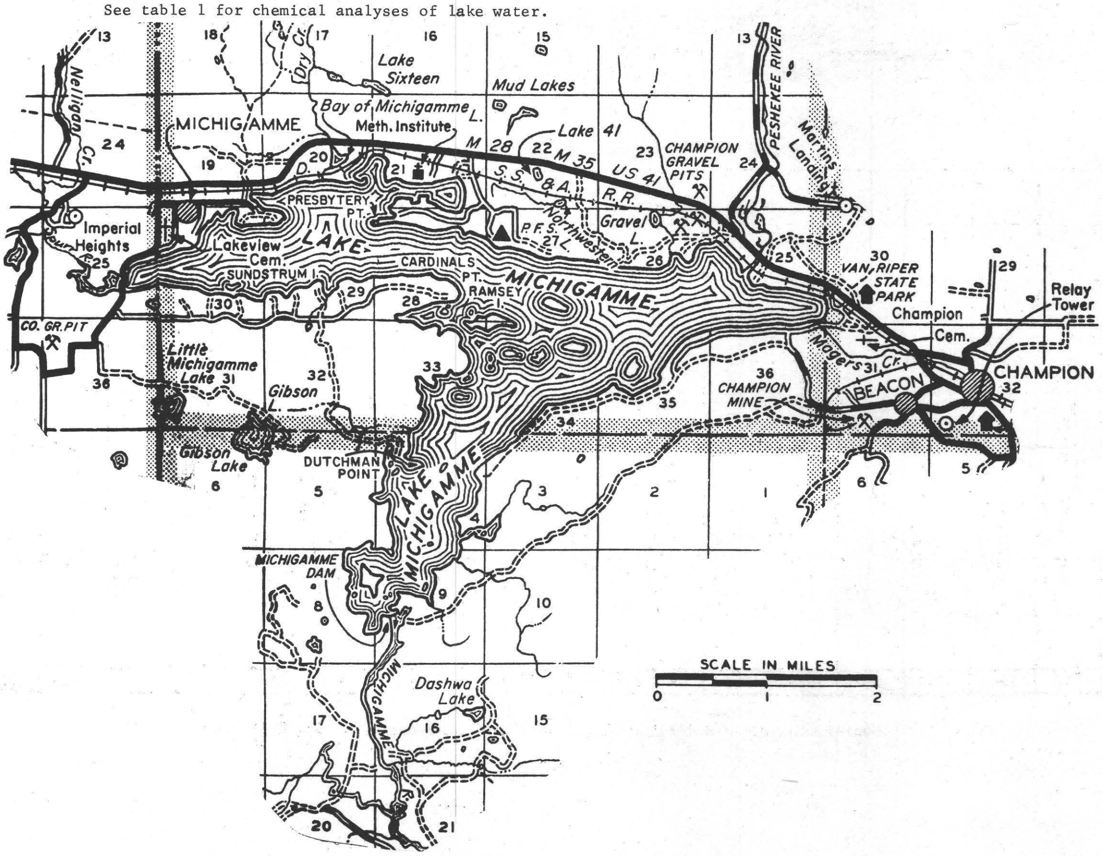
An engineering lake-level control study was completed in 1964 by the Michigan Department of Natural Resources.

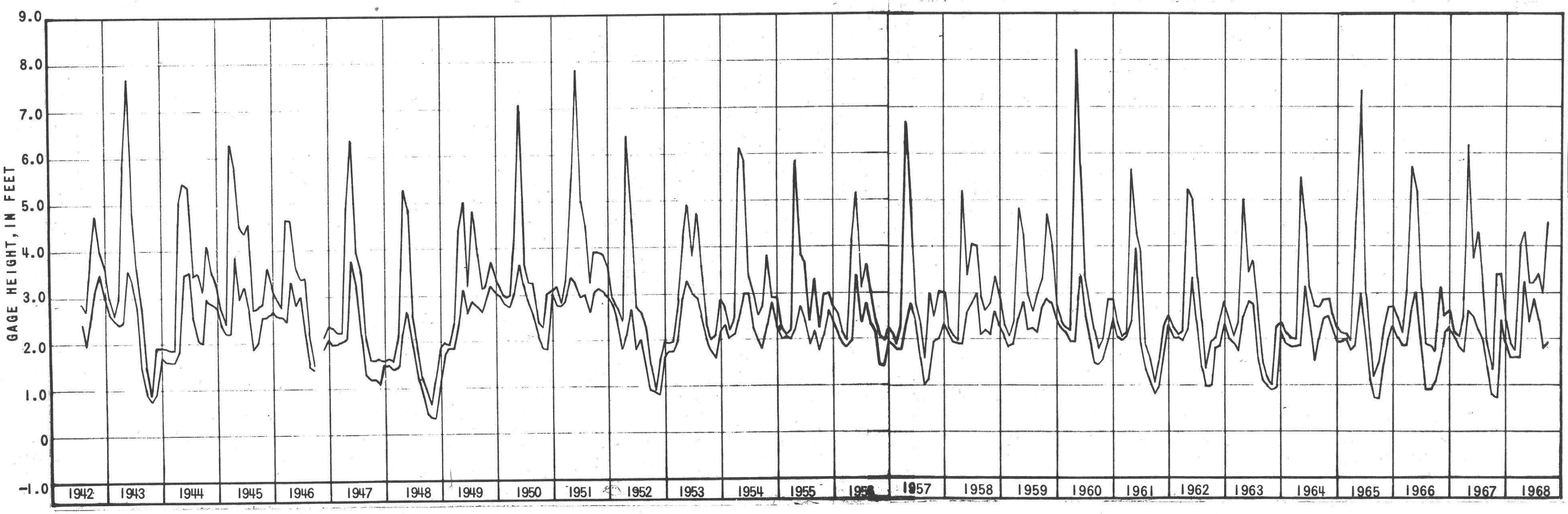
Streamflow records are collected at gaging stations: "Michigamme River at Republic," about 9 miles below the outlet, since July 1961; "Michigamme River near Champion," about 3.5 miles below the outlet, since July 1964; and "Michigamme River near Michigamme," about 1 mile below the outlet, since October 1968. Records are also collected on "Peshekee River near Champion," about 2 miles above Lake Michigamme, since July 1961. Records for these stations are published in U. S. Geological Survey Water-Supply Papers.

The following discharge measurements have been made on Spurr River, 1 mile upstream from Lake Michigamme (drainage area, 26.4 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Aug. 17, 1961	2.16	July 2, 1963	9.24
Sept. 22, 1961	2.77	July 16, 1963	6.92
Feb. 13, 1962	11.6	Oct. 2, 1963	5.09
June 28, 1962	25.4	Mar. 11, 1964	11.6
Aug. 22, 1962	3.73	May 18, 1964	56.5
Oct. 15, 1962	13.6	Aug. 13, 1964	21.2
Feb. 13, 1963	9.86	Jan. 21, 1964	18.7
May 6, 1963	44.1	July 21, 1965	15.4

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Lake Michigamme near Champion, Mich.

MARQUETTE COUNTY

Little Lake at Little Lake, Mich.

Location.--Lat 46°16'24", long 87°20'53", in secs. 19, 20, 29, and 30, T.45 N., R.24 W., 1 mile south of Little Lake.

Surface area.--454 acres.

Maximum depth.--50 ft.

Drainage area at outlet.--9.72 sq mi.

Records available.--May 1964 to September 1968.

Gage.--Staff gage read daily. Datum of gage not determined.

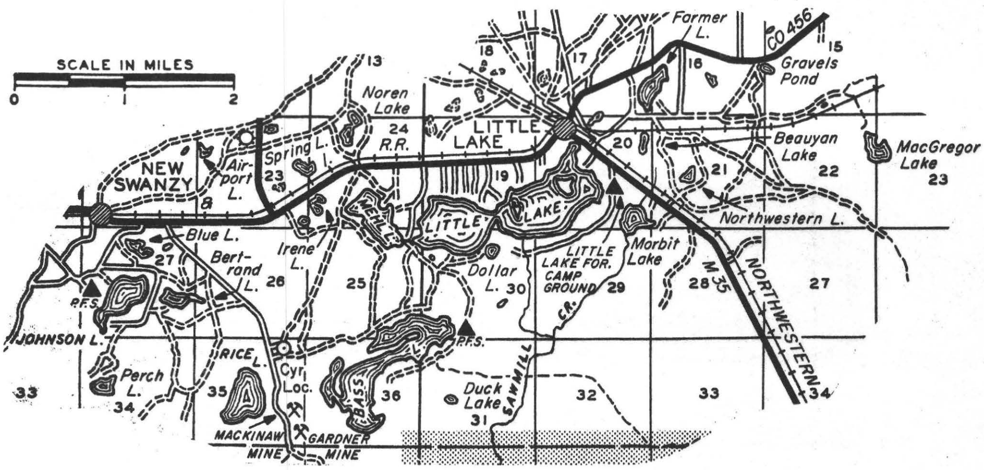
Established legal level.--None known.

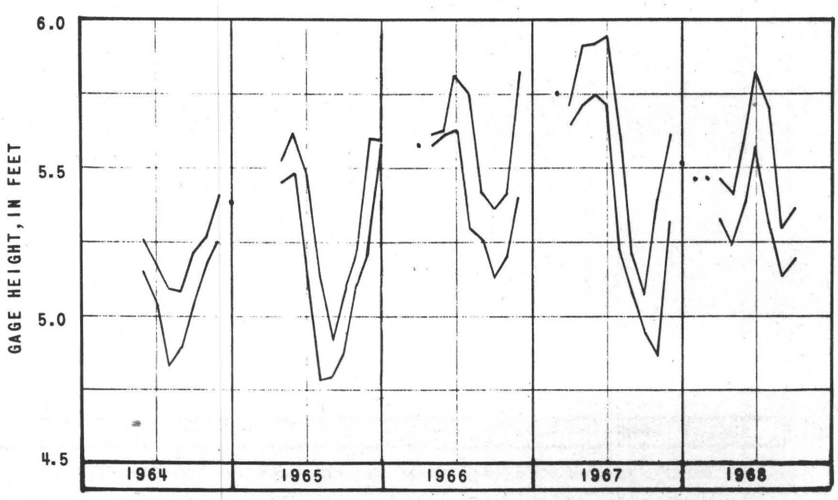
Extremes.--1964-68: Maximum stage observed, 5.95 ft June 15-17, 19, 1967; minimum observed, 4.78 ft July 31, 1965.

Regulation or control.--None.

Remarks.--The inlet to Little Lake is the outlet of Mehl Lake. The outlet of Little Lake is at the south side of the lake and is tributary to Sawmill Creek.
The following discharge measurements have been made on the outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
May 20, 1964	4.49	Sept. 8, 1966	2.25
Aug. 20, 1964	.12	Nov. 24, 1966	.56
Nov. 19, 1964	4.19	Feb. 21, 1967	2.85
June 15, 1965	3.02	Apr. 28, 1967	3.35
July 20, 1965	.71	July 18, 1967	4.53
Nov. 19, 1965	.22	Oct. 3, 1967	.42
Feb. 16, 1966	1.73	Feb. 12, 1968	3.41
June 1, 1966	1.12	Aug. 2, 1968	3.68





Monthly maximum and minimum stages for Little Lake at Little Lake, Mich.

MARQUETTE COUNTY

Teal Lake near Negaunee, Mich.

Location.--Lat 46°30'54", long 87°36'52", in secs. 31, 35, and 36, T.48 N., Rs.26 and 27 W., 0.5 mile north of Negaunee.

Surface area.--466 acres.

Maximum depth.--32 ft.

Drainage area at outlet.--3.36 sq mi.

Records available.--January 1890 to June 1951, June to December 1956, June to November 1957, April to July 1958 (monthly observations only); May 1961 to September 1968.

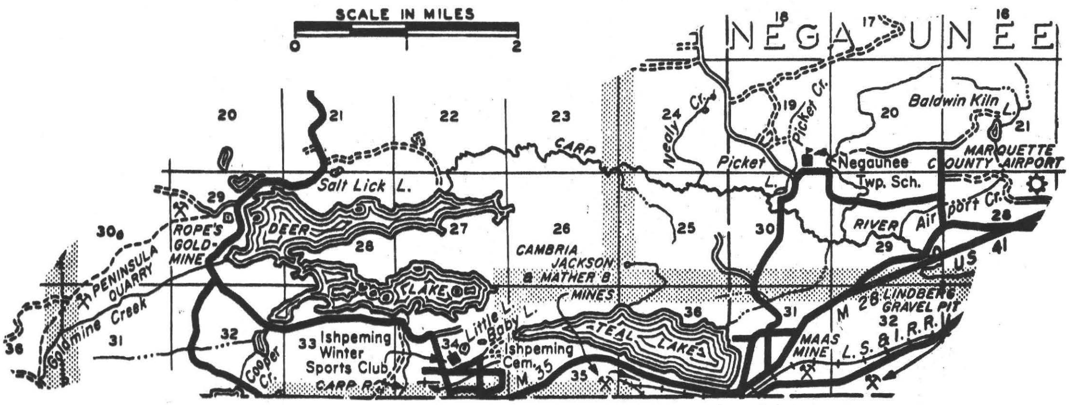
Gage.--Staff gage read intermittently. Datum of gage is 1,362.2 ft above mean sea level (levels by Michigan Department of Natural Resources).

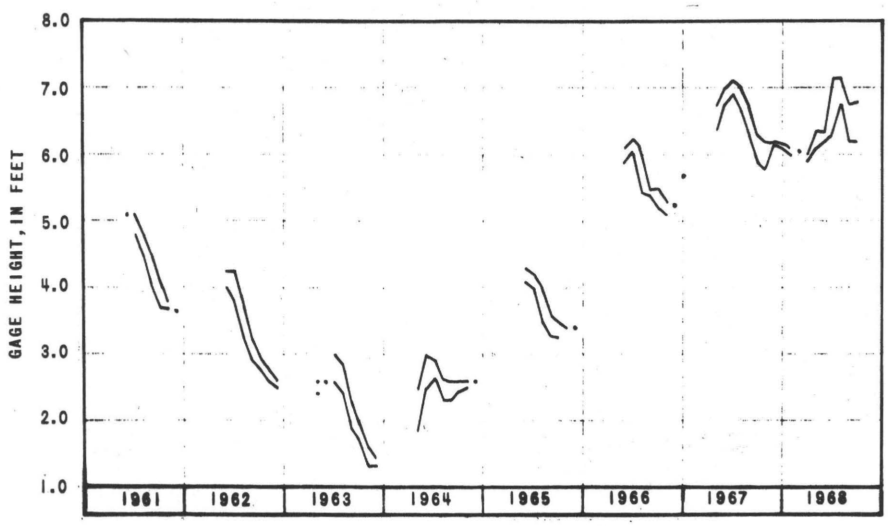
Established legal level.--None known.

Extremes.--1890-1951, 1956-58: Maximum stage observed, 8.6 ft June 1939, July 1940; minimum observed, - 2.4 ft September 1925.
1961-68: Maximum stage observed, 7.15 ft June 29, 30, July 2, 1968; minimum observed, 1.32 ft Oct. 31, Nov. 2, 3, 1963.

Regulation or control.--Lake level affected by ground water pumped into lake from nearby mine since July 1950. Teal Lake is the source of water supply for the city of Negaunee. This has a significant effect on the lake level.

Remarks.--There is a small inlet at the north side of Teal Lake. The outlet is at the northeast side of the lake and is tributary to Carp River about 1.5 miles downstream from the lake. No discharge measurements are available on the inlet or outlet.
See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Teal Lake near Negaunee, Mich.

MARQUETTE COUNTY

Witch Lake at Witch Lake, Mich.

Location.--Lat 46°16'26", long 88°00'50", in secs. 23, 24, 25, and 26, T.45 N., R.30 W., at Witch Lake.

Surface area.--209 acres.

Maximum depth.--102 ft.

Drainage area at outlet.--4.30 sq mi.

Records available.--June 1961 to September 1967 except winter periods.

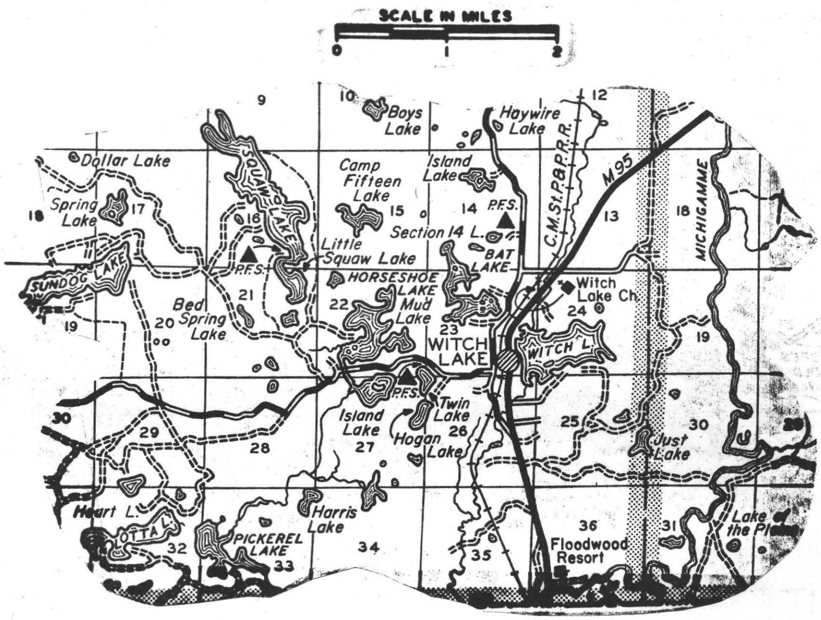
Gage.--Staff gage read daily. Datum of gage not determined.

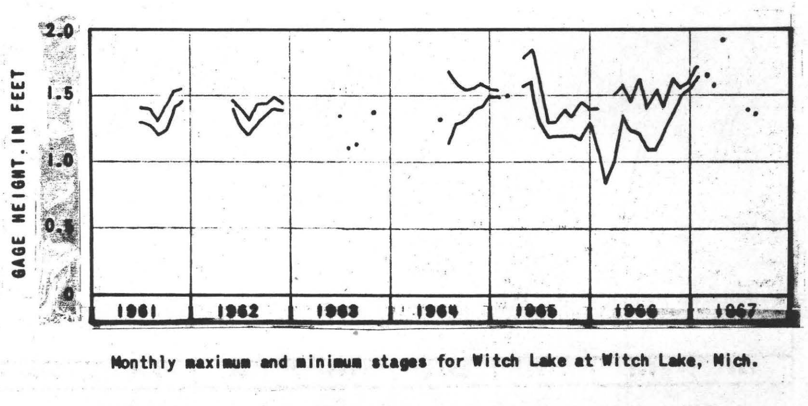
Established legal level.--None known.

Extremes.--1961-67: Maximum stage observed, 1.92 ft Apr. 11, 1967; minimum observed, 0.85 ft Feb. 14, 1966.

Regulation or control.--None.

Remarks.--The inlet is an unnamed stream entering at the northwest side of the lake. The outlet is an unnamed stream leaving the lake at the southwest side. No discharge measurements are available on the inlet or outlet.





Monthly maximum and minimum stages for Witch Lake at Witch Lake, Mich.

MASON COUNTY

Bass Lake near Pentwater, Mich.

Location.--Lat 43°49'50", long 86°25'32", in secs. 25, 26, 35, and 36, T.17 N., R.18 W., 3.5 miles north of Pentwater.

Surface area.--524 acres.

Maximum depth.--17 ft.

Drainage area at outlet.--14.3 sq mi.

Records available.--May 1947 to September 1968.

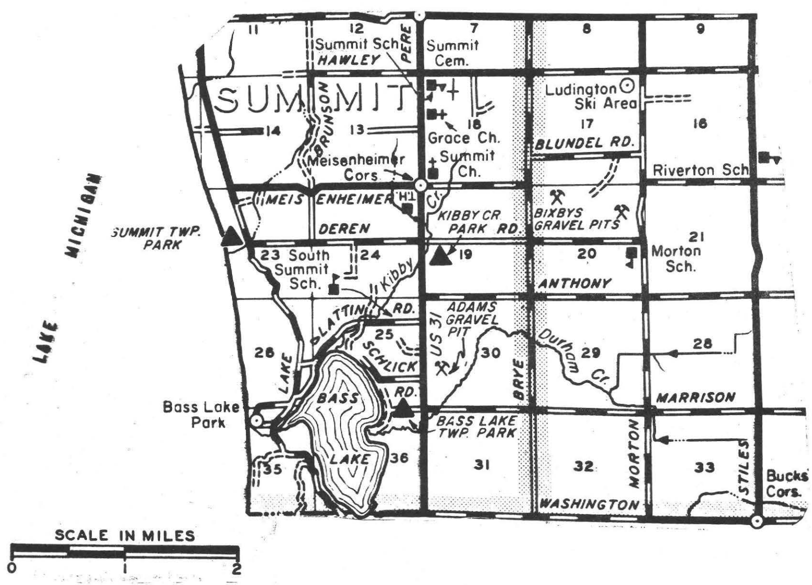
Gage.--Staff gage read daily. Datum of gage not determined.

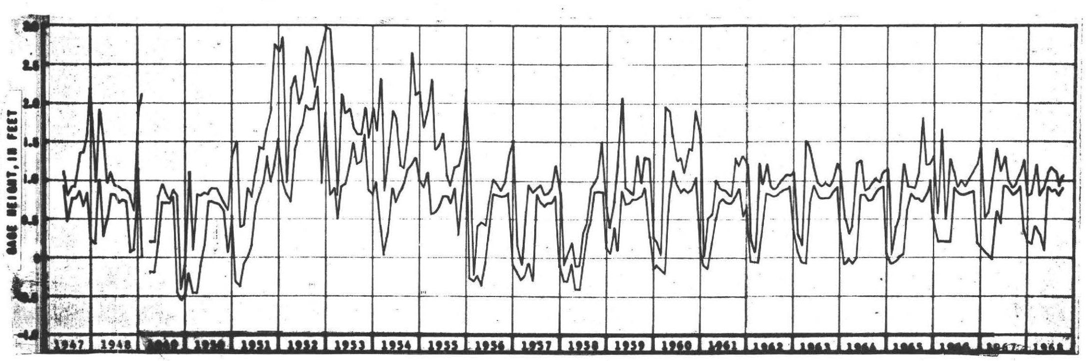
Established legal level.--None known.

Extremes.--1947-68: Maximum stage, 2.98 ft Dec. 29, 30, 1952; minimum, -0.54 ft Nov. 11, 12, 1949.

Regulation or control.--Level of lake is maintained by manipulation of stop logs in concrete dam on outlet. Dam is located about 300 ft upstream from Lake Michigan.

Remarks.--Kibby and Durham Creeks are the principal inlets to Bass Lake. The outlet is at the west side of Bass Lake. Water from Bass Lake flows westerly about 0.3 mile into Lake Michigan. No discharge measurements have been made on the inlets or outlet.





Monthly maximum and minimum stages for Bass Lake near Pentwater, Mich.

MASON COUNTY

Hamlin Lake near Ludington, Mich.

Location.--Lat 44°02'00", long 86°29'35", in many sections, T.19 N., Rs. 17 and 18 W., 6 miles north of Ludington.

Surface area.--4,750 acres.

Maximum depth.--86 ft.

Drainage area at outlet.--188 sq mi.

Records available.--June 1942 to December 1959.

Gage.--Staff gage read daily. Datum of gage is 586.72 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1942-59: Maximum stage, 8.28 ft June 3, 1945; minimum, 4.60 ft Jan. 21-27, 1943.

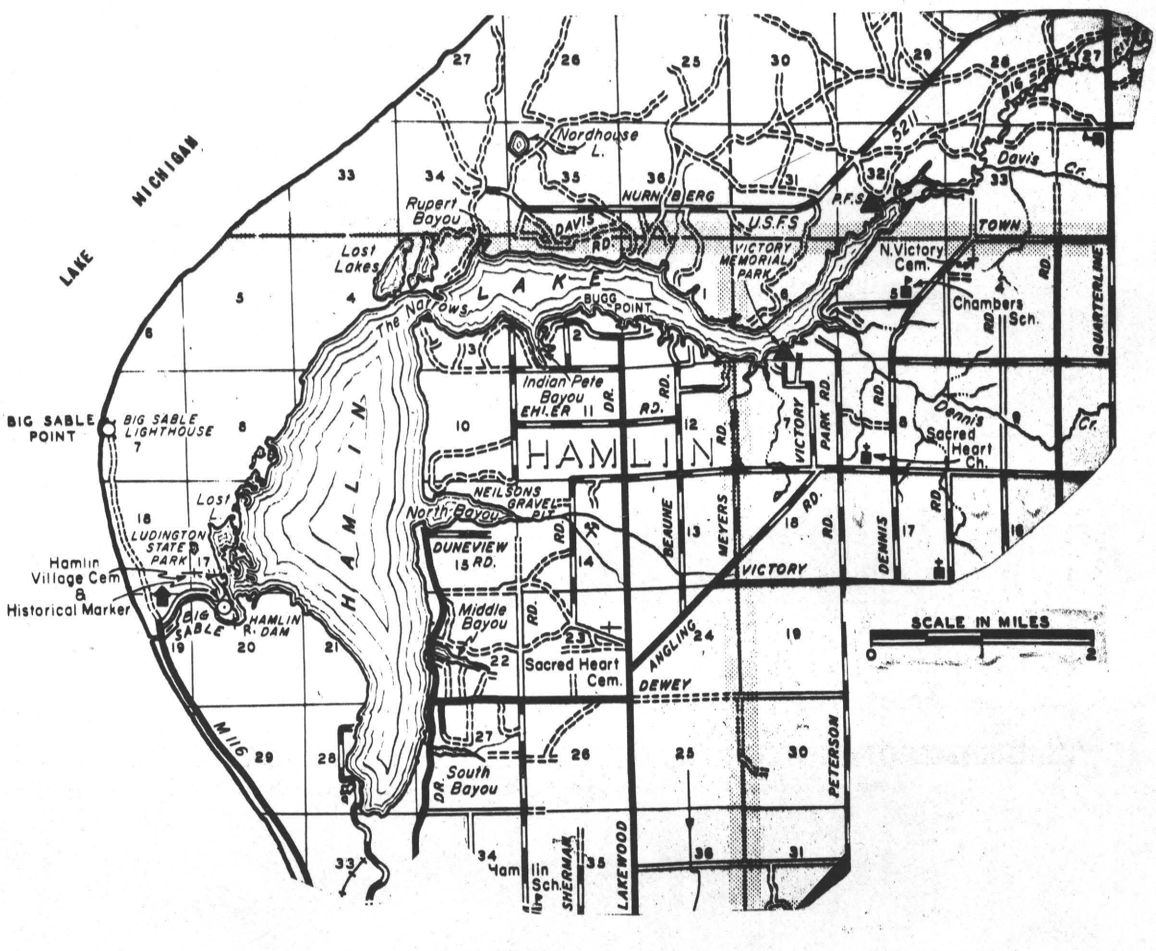
Regulation or control.--Level of lake is maintained by manipulation of stop logs in concrete dam, 1,500 ft downstream from the lake.

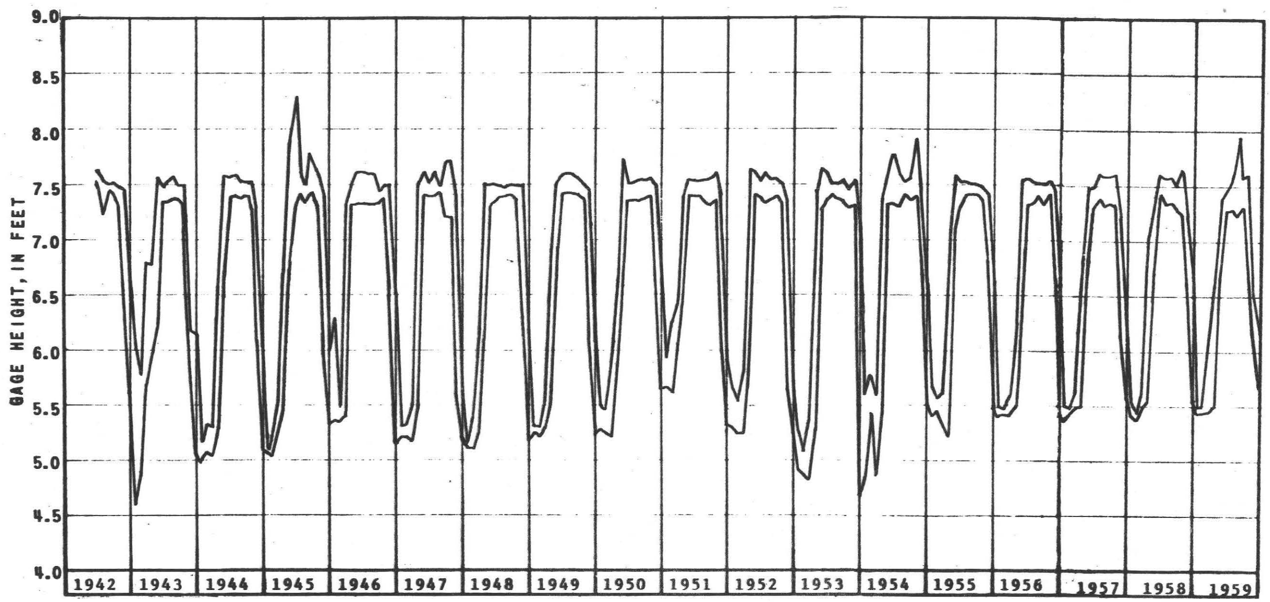
Remarks.--The Big Sable River flows into Hamlin Lake at the northeast end and out of the lake at the southwest end and thence into Lake Michigan. Other inlets include Dennis and Davis Creeks.

An engineering lake-level control study was completed in 1958 by the Michigan Department of Natural Resources.

Daily records of discharge were collected on Big Sable River, at site 7 miles upstream from Hamlin Lake from May 1942 to September 1968. These records are published in U. S. Geological Survey Water-Supply Papers. The following discharge measurements have been made on Big Sable River, at bridge, 0.5 mile downstream from dam at outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
June 10, 1942	213	May 5, 1943	226
July 14, 1942	121	May 30, 1943	337
Aug. 24, 1942	99.1	June 13, 1943	170
Jan. 6, 1943	300	Jan. 20, 1944	149
Feb. 3, 1943	206	Feb. 15, 1944	176
Mar. 4, 1943	263	Mar. 22, 1944	211
Mar. 31, 1943	570	July 8, 1948	99.2
Apr. 8, 1943	473	Aug. 3, 1948	31.4





Monthly maximum and minimum stages for Hamlin Lake near Ludington, Mich.

MASON COUNTY

Lincoln Lake near Ludington, Mich.

Location.--Lat 43°58'50", long 86°27'42", in secs. 2, 3, and 4, T.18 N., R.18 W., 1.7 miles north of Ludington.

Surface area.--156 acres.

Maximum depth.--Unknown.

Drainage area.--Not determined.

Records available.--July 1960 to December 1961.

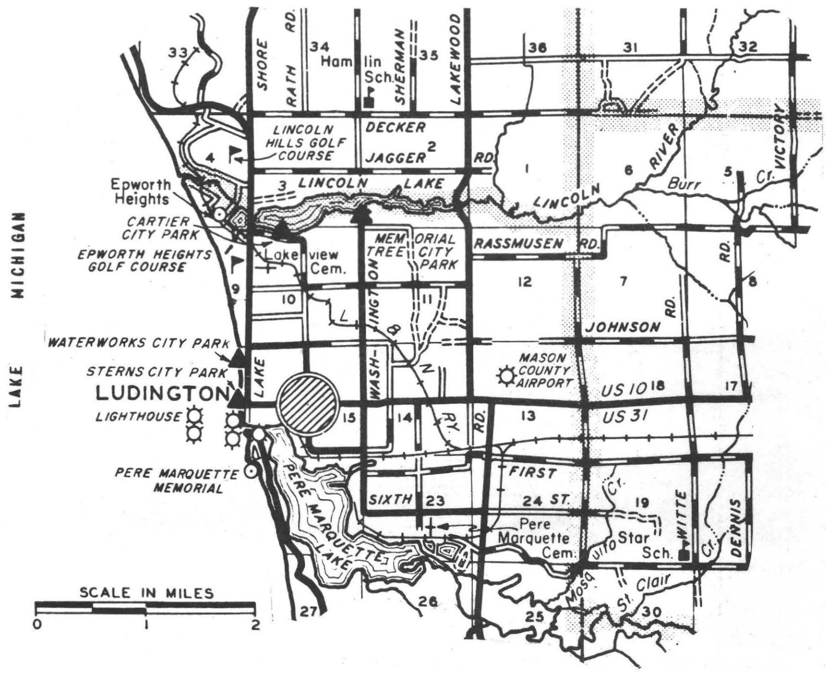
Gage.--Staff gage read daily. Datum of gage is 579.02 ft above mean sea level (levels by Michigan Department of Natural Resources).

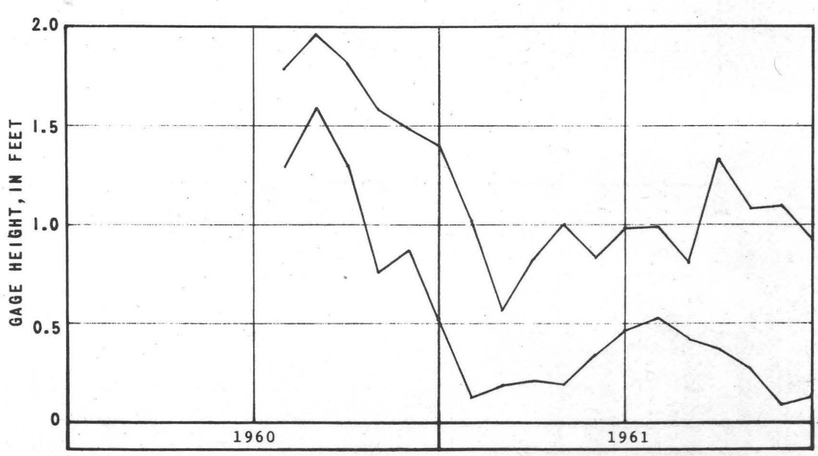
Established legal level.--None known.

Extremes.--1960-61: Maximum stage observed, 1.96 ft Aug. 26, 1960; minimum observed, 0.08 ft Nov. 8, 1961.

Regulation or control.--None.

Remarks.--Lincoln River is the inlet at the east end of Lincoln Lake. The outlet, at the west end, flows about half a mile to Lake Michigan. On April 20, 1961, 117 cfs was measured in the outlet, 750 ft northwest of a railroad bridge. No discharge measurements are available on the inlet.





Monthly maximum and minimum stages for Lincoln Lake near Ludington, Mich.

MASON COUNTY

Long Lake near Walhalla, Mich.

Location.--Lat 43°57'45", long 86°05'42", in secs. 10 and 15, T.18 N., R.15 W., 0.6 mile north of Walhalla.

Surface area.--136 acres.

Maximum depth.--62 ft.

Drainage area.--Not determined.

Records available.--March 1955 to September 1958 except periods May to July 1955, July 1956 to March 1957, December 1957 to March 1958.

Gage.--Staff gage read daily. Datum of gage is 690.30 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

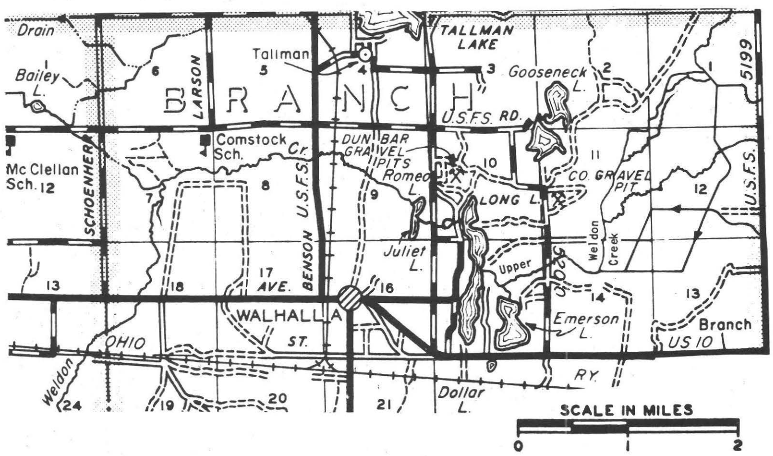
Extremes.--1955-58: Maximum stage observed, 7.02 ft Mar. 24, 1955; minimum observed, 5.40 ft Aug. 26, 27, 1955.

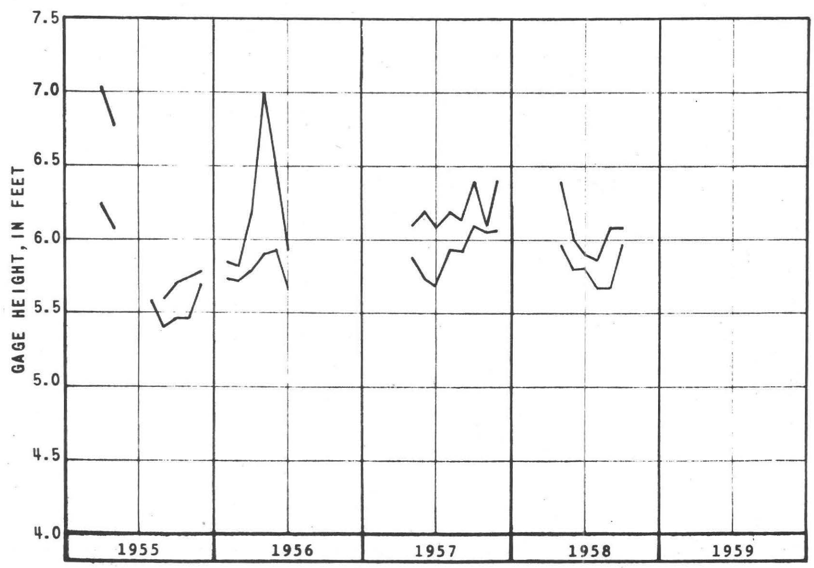
Regulation or control.--Level of lake is controlled by dam at outlet.

Remarks.--Long Lake is fed by inflow from Upper Weldon Creek. Part of the flow of this creek is diverted into Emerson Lake. Weldon Creek, the outlet, at the northwest end of the lake, flows into the Pere Marquette River.

An engineering lake-level control study was completed in 1957 by the Michigan Department of Natural Resources.

Discharge measurements were made at the lake in August 1955. At a site 3,300 feet east of Long Lake the discharge was 6 cfs. In the outlet channel immediately downstream from Long Lake dam and below Twin Lakes dam the discharge was 3 cfs and 0.1 cfs, respectively.





Monthly maximum and minimum stages for Long Lake near Walhalla, Mich.

MECOSTA COUNTY

Big Evans Lake near Barryton, Mich.

Location.--Lat 43°43'10", long 85°13'42", in secs. 2 and 35, Tps 15 and 16 N., R. 8 W., 4.6 miles southwest of Barrytown.

Surface area.--52.6 acres.

Maximum depth.--42 ft.

Drainage area.--Not determined.

Records available.--December 1950 to December 1951.

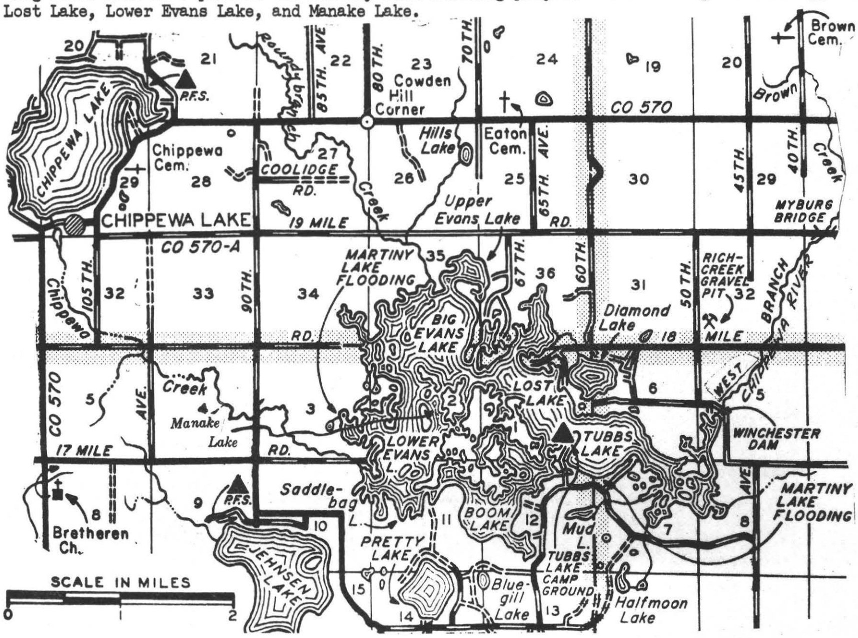
Gage.--Staff gage read twice weekly. Datum of gage is 970.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

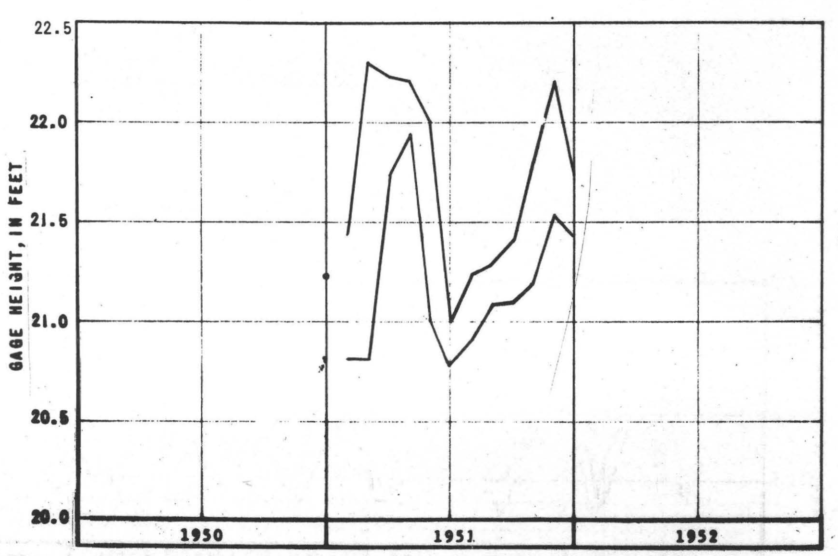
Established legal level.--None known.

Extremes.--1950-51: Maximum stage observed, 22.30 ft Feb. 27, 1951; minimum observed, 20.78 ft June 12, 17, 1951.

Regulation or control.--Winchester Dam, at outlet of Martiny Lake, has controlled the level of Big Evans Lake since June 1955.

Remarks.--Big Evans Lake is a part of the Martiny Lake flooding project and is contiguous with Upper Evans Lake, Lost Lake, Lower Evans Lake, and Manake Lake.





Monthly maximum and minimum stages for Big Evans Lake near Barryton, Mich.

MECOSTA COUNTY

Blue Lake near Mecosta, Mich.

Location.--Lat 43°36'58", long 85°17'16", in secs. 8 and 9, T.14 N., R.8 W., 3.1 miles west of Mecosta.

Surface area.--235 acres.

Maximum depth.--50 ft.

Drainage area at outlet.--40 sq mi, approximately.

Records available.--September 1953 to May 1960 except some winter periods.

Gage.--Staff gage read daily. Prior to March 1956 gage read intermittently. Datum of gage is 946.71 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--959.5 ft above mean sea level, established by Circuit Court in December, 1957.

Extremes.--1953-60: Maximum stage observed, 13.74 ft Apr. 12, 1959; minimum observed, 12.23 ft Aug. 12, 1955.

Regulation or control.--Concrete-control dam on the outlet is located about 3,000 ft downstream from Blue Lake.

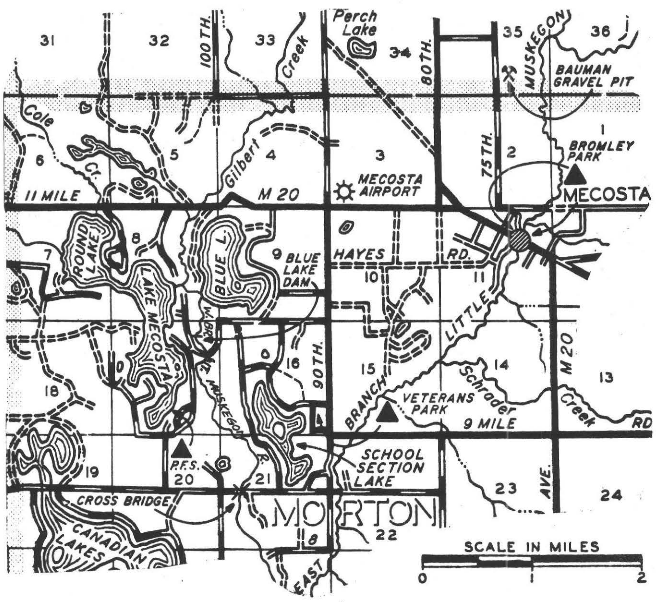
Remarks.--The inlet flows from Lake Mecosta and includes discharge from Dead Stream Creek and Gilbert Creek. The outlet is the West Branch Little Muskegon River and is located at the southwest side of Blue Lake.

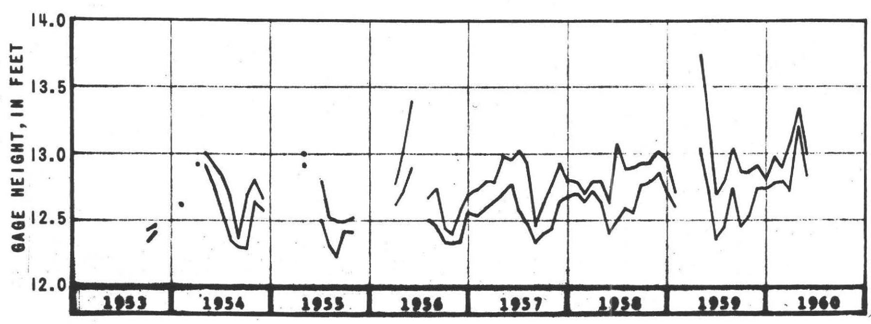
An engineering lake-level control study was completed in 1957 by the Michigan Department of Natural Resources.

The following discharge measurements have been made on West Branch Little Muskegon River in NE¼ sec. 17, T.14 N., R.8 W.

Date	Discharge (cfs)
Nov. 7, 1956	16.9
Feb. 20, 1957	25.0
Apr. 4, 1957	24.7

On July 10, 1963, the measured discharge in Gilbert Creek was 3.02 cfs and the discharge of Dead Stream Creek was 3.06 cfs. These measurements were made at a road crossing in NE¼ sec. 8, T.14 N., R.8 W. The measured discharge of West Branch Little Muskegon River was 10.0 cfs, at a road crossing in SW¼ sec. 21, T.14 N., R.8 W. on that date.





Monthly maximum and minimum stages for Blue Lake near Mecosta, Mich.

MECOSTA COUNTY

Boom Lake near Barryton, Mich.

Location.--Lat 43°41'53", long 85°13'08", in secs. 11 and 12, T.15 N., R.8 W., 5.1 miles southwest of Barryton.

Surface area.--42.7 acres.

Maximum depth.--30 ft.

Drainage area.--Not determined.

Records available.--December 1950 to January 1952.

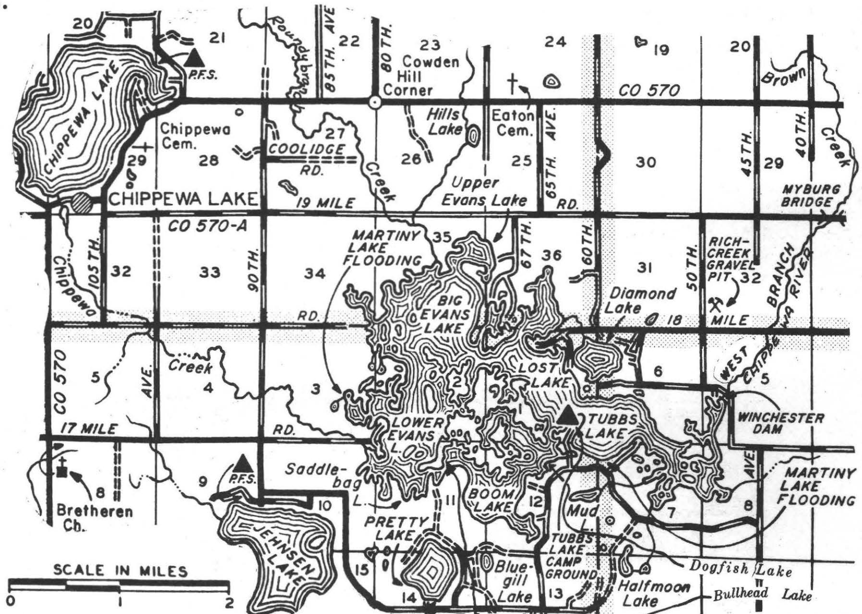
Gage.--Staff gage read twice weekly. Datum of gage is 970.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

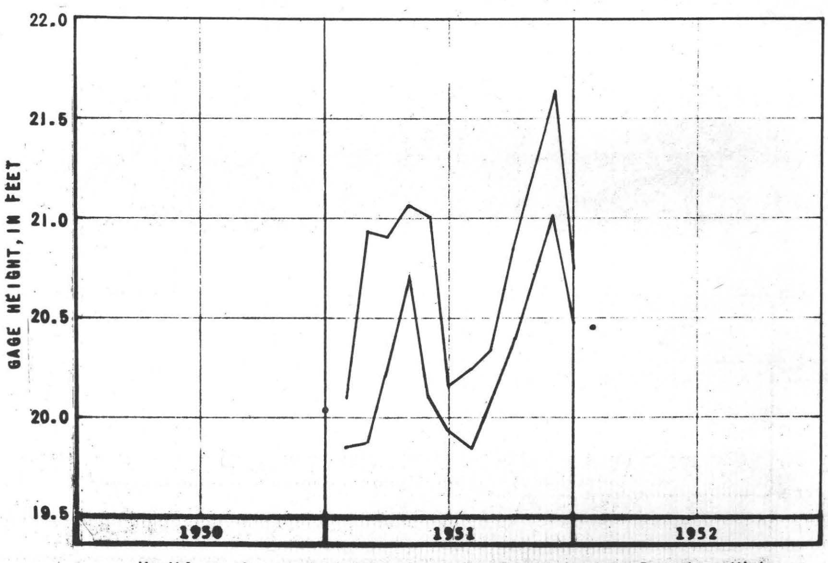
Established legal level.--None known.

Extremes.--1950-52: Maximum stage observed, 21.62 ft Nov. 18, 1951; minimum observed, 19.83 ft Jan 28, 1951.

Regulation or control.--Winchester Dam, at outlet of Martiny Lake, has controlled the level of Boom Lake since June 1955.

Remarks.--Boom Lake is part of the Martiny Lake flooding project and is contiguous with Bullhead and Dogfish Lakes.





Monthly maximum and minimum stages for Boom Lake near Barryton, Mich.

MECOSTA COUNTY

Chippewa Lake at Chippewa Lake, Mich.

Location.--Lat 43°44'35", long 85°18'10", in many sections, T.16 N., R.8 W., at Chippewa Lake.

Surface area.--770 acres.

Maximum depth.--42 ft.

Drainage area at outlet.--9.34 sq mi.

Records available.--October 1959 to September 1968.

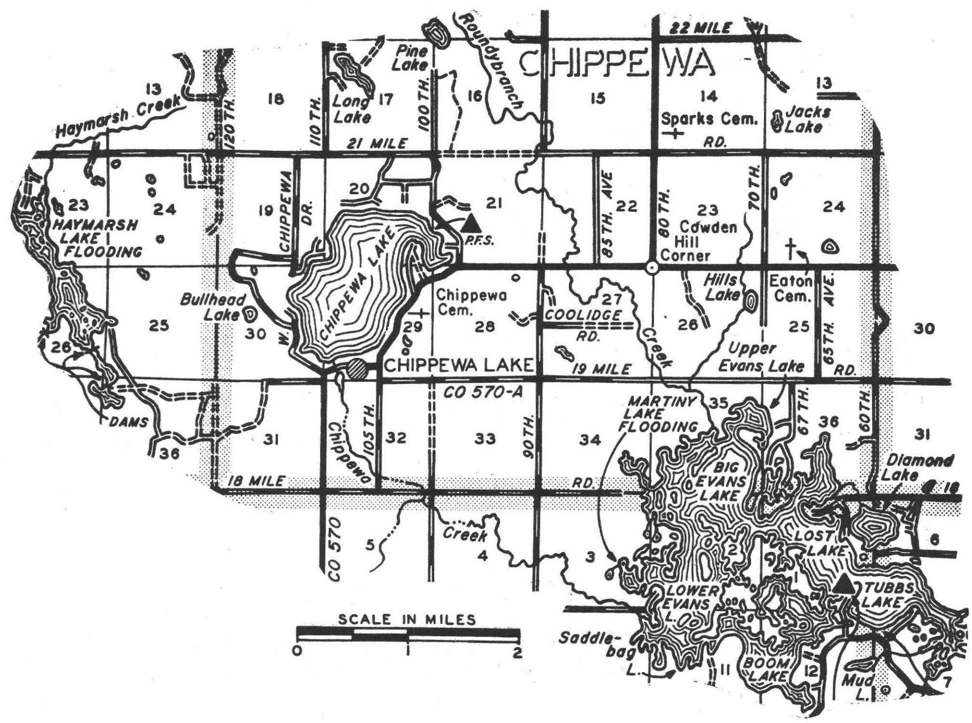
Gage.--Staff gage read daily. Datum of gage is 1,063.4 ft above mean sea level.

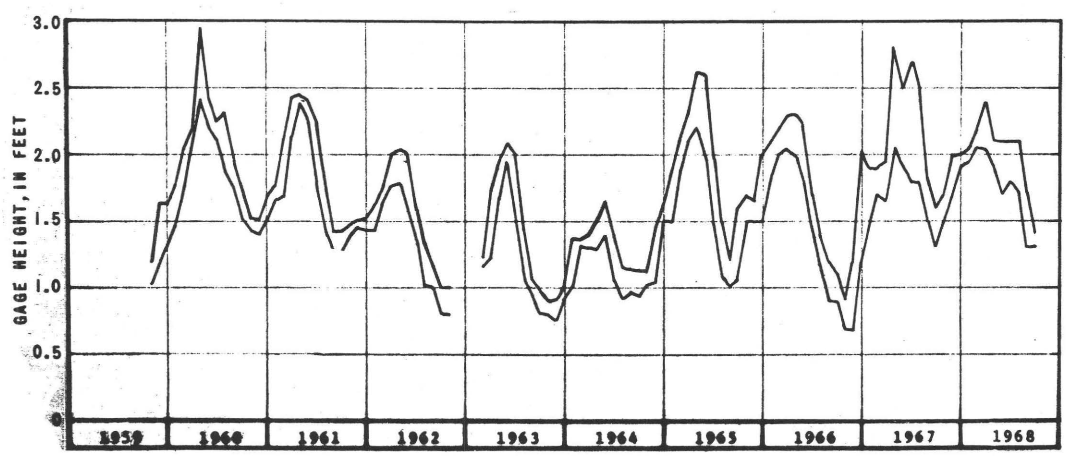
Established legal level.--1,065.2 ft above mean sea level established by Circuit Court on Jan. 5, 1967.

Extremes.--1959-68: Maximum stage, 2.96 ft Apr. 26, 1960 (highwater mark); minimum, 0.68 ft Oct. 8-14, 28, 29, Nov. 1, 2, 1966.

Regulation or control.--None known.

Remarks.--There is no major inlet to Chippewa Lake. The outlet, Chippewa Creek, is at south end of lake. No discharge measurements have been made on Chippewa Creek.





Monthly maximum and minimum stages for Chippewa Lake at Chippewa Lake, Mich.

MECOSTA COUNTY

Diamond Lake near Barryton, Mich.

Location.--Lat 43°43'30", long 85°12'28", in secs. 1 and 6, T.15 N., Rs. 7 and 8 W., 3.5 miles southwest of Barryton.

Surface area.--86.6 acres.

Maximum depth.--12 ft.

Drainage area.--Not determined.

Records available.--January 1951 to June 1958.

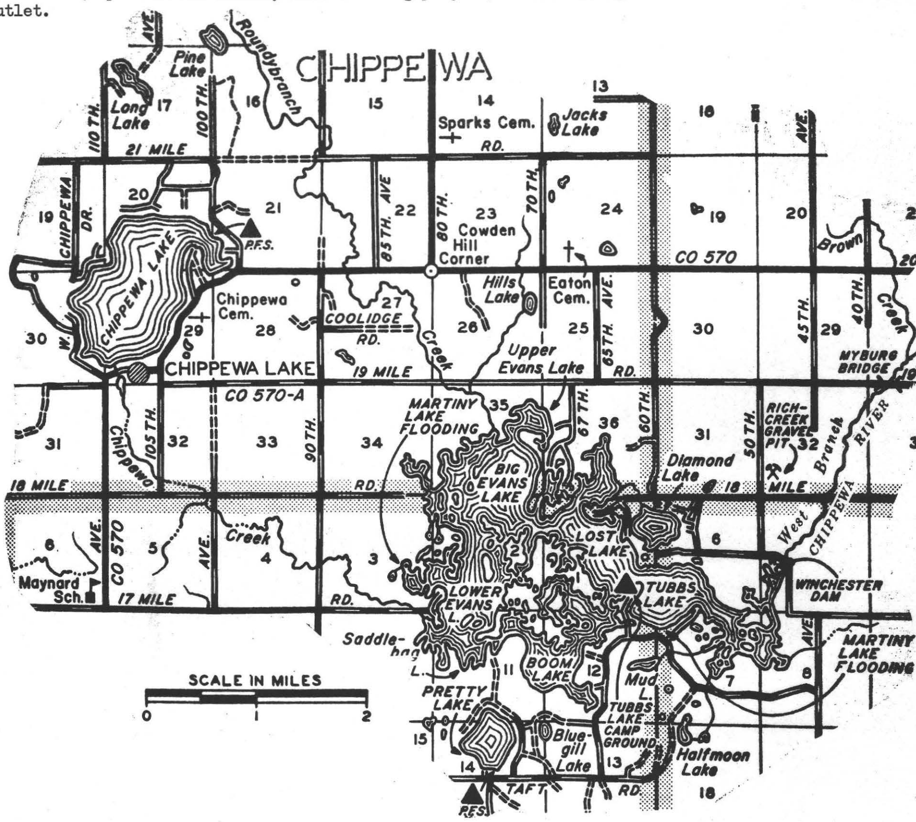
Gage.--Staff gage read weekly. Datum of gage is 980.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

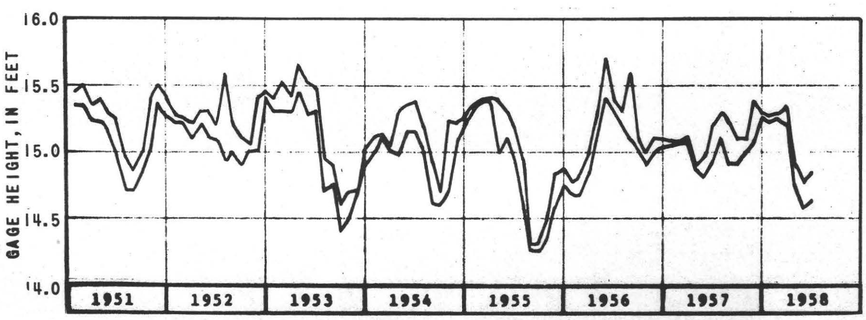
Established legal level.--None known.

Extremes.--1951-58: Maximum stage observed, 15.70 ft May 5, 1956; minimum observed, 14.24 ft Aug. 20, Sept. 24, 1955.

Regulation or control.--Winchester Dam, at outlet of Martiny Lake, may have had some effect on the level of Diamond Lake since June 1955.

Remarks.--There is no inlet to Diamond Lake. The outlet is at the northwest side of the lake and is connected with Lost Lake (a part of the Martiny Lake flooding project). No discharge measurements are available at the outlet.





Monthly maximum and minimum stages for Diamond Lake near Barryton, Mich.

MECOSTA COUNTY

Horsehead Lake near Rodney, Mich.

Location.--Lat 43°40'05", long 85°15'57", in many sections, T.15 N., R.8 W., 3.0 miles east of Rodney.

Surface area.--430 acres.

Maximum depth.--54 ft.

Drainage area at outlet.--9.4 sq mi, approximately.

Records available.--October 1955 to November 1961 except periods January, February, April to August, November, December 1957; January to May 1958; June, July, 1960; and April to September 1961.

Gage.--Staff gage read daily. Datum of gage is 992.22 ft above mean sea level (levels by Michigan Department of Natural Resources).

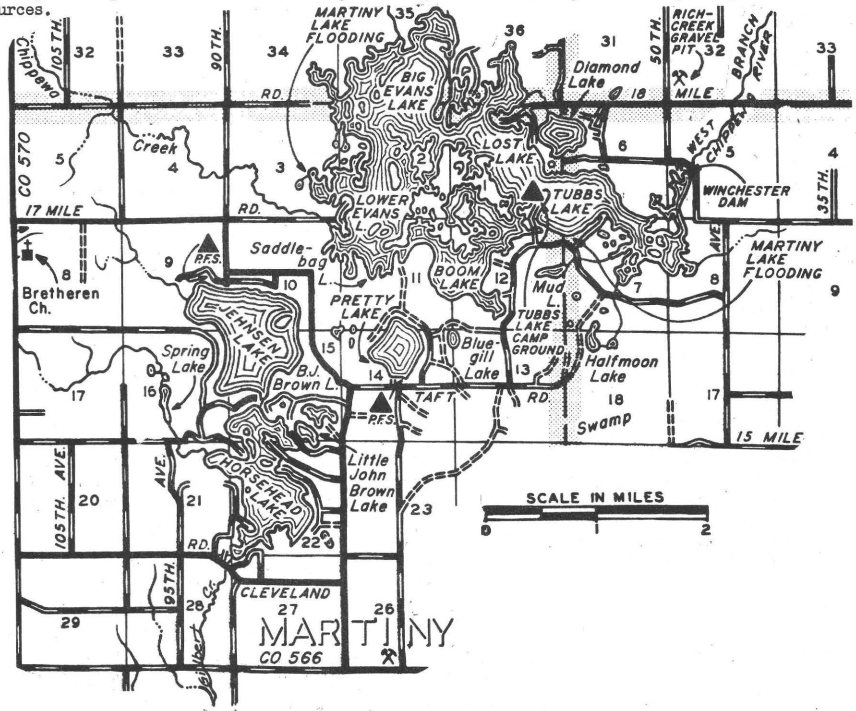
Established legal level.--1,011.6 ft above mean sea level, established by Circuit Court on Dec. 11, 1961.

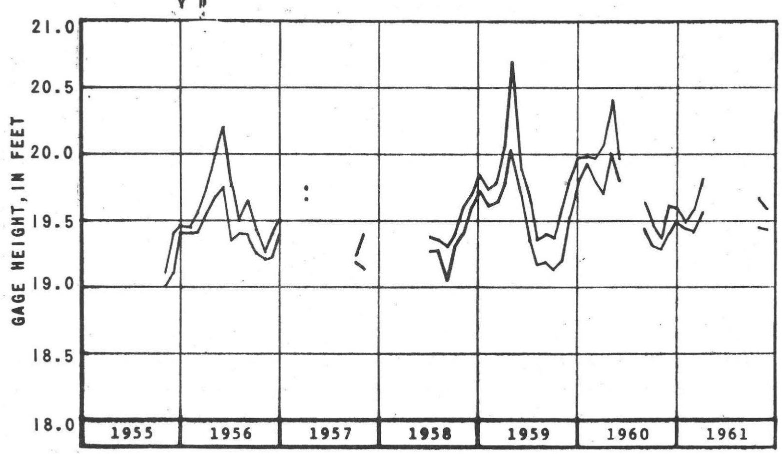
Extremes.--1955-61: Maximum stage observed, 20.70 ft Apr. 4, 1959; minimum observed, 19.0 ft Oct. 15, 1955.

Regulation or control.--None during period of record.

Remarks.--There are two inlets to Horsehead Lake, one from Spring Lake and the other from Jehnson Lake. The outlet, Gilbert Creek, is at the extreme south end of Horsehead Lake. Horsehead and Little John Brown Lakes are connected by a short neck of water and their levels are the same. No discharge measurements have been made on the inlets. The flow in Gilbert Creek at a road crossing about 3.0 miles downstream from Horsehead Lake, was 3.02 cfs on July 10, 1963.

An engineering lake-level control study was completed in 1961 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Horsehead Lake near Rodney, Mich.

MECOSTA COUNTY

Lower Evans Lake near Barryton, Mich.

Location.--Lat 43°42'45", long 85°14'22", in sec. 2, T.15 N., R.8 W., 5.3 miles southwest of Barryton.

Surface area.--41.9 acres.

Maximum depth.--37 ft.

Drainage area.--Not determined.

Records available.--December 1950 to December 1951.

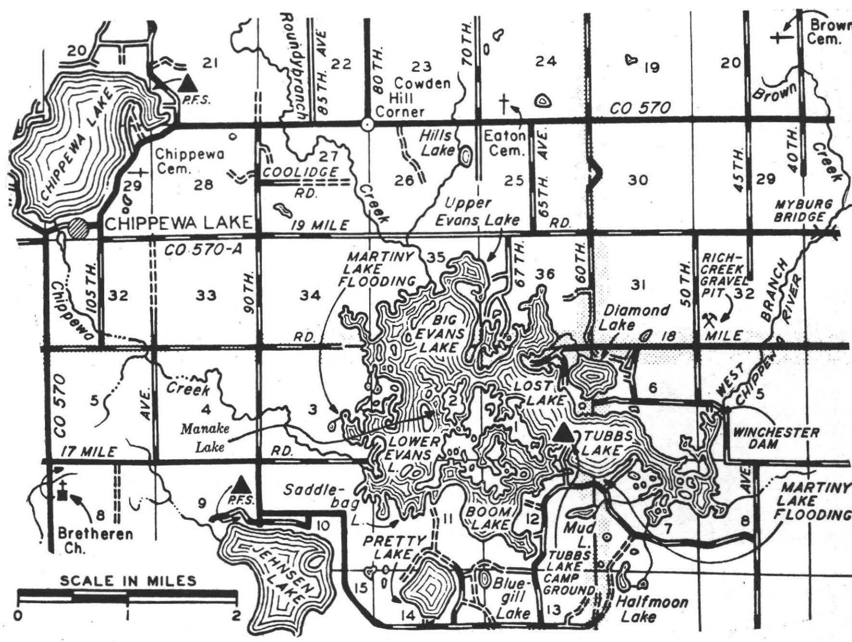
Gage.--Staff gage read twice weekly. Datum of gage is 970.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

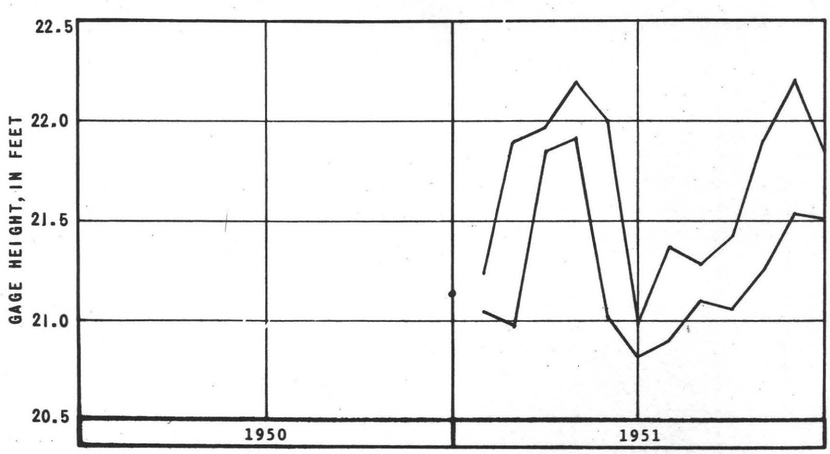
Established legal level.--None known.

Extremes.--1950-51: Maximum stage observed, 22.20 ft Apr. 26, Nov. 18, 1951; minimum observed, 20.78 ft June 17, 1951.

Regulation or control.--Winchester Dam, at outlet of Martiny Lake, has controlled the level of Lower Evans Lake since June 1955.

Remarks.--Lower Evans Lake is part of the Martiny Lake flooding project and is contiguous with Saddlebag Lake, Manake Lake, and Big Evans Lake.





onthly maximum and minimum stages for Lower Evans Lake near Barryton, Mich.

MECOSTA COUNTY

Tubbs Lake near Barryton, Mich.

Location.--Lat 43°43'06", long 85°10'58", in secs. 5 and 6, T.15 N., R.7 W., 2.9 miles southwest of Barryton.

Surface area.--128 acres.

Maximum depth.--Unknown.

Drainage area.--Not determined.

Records available.--December 1950 to January 1952.

Gage.--Staff gage read twice weekly. Datum of gage is 970.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

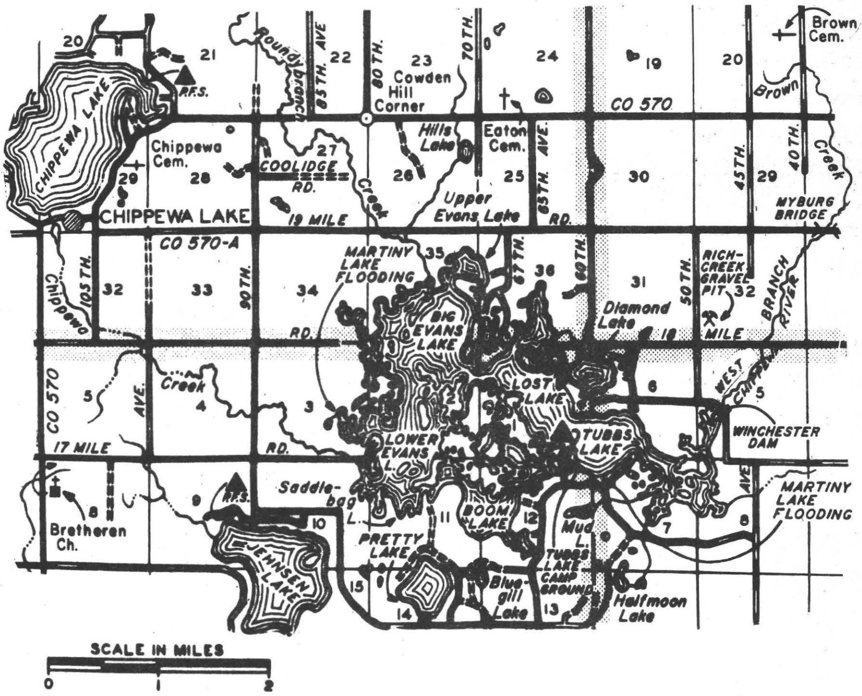
Extremes.--1950-52: Maximum stage observed, 20.68 ft Nov. 18, 1951; minimum observed, 18.98 ft July 4, 8, 12, 15, 18, 22, 25, 1951.

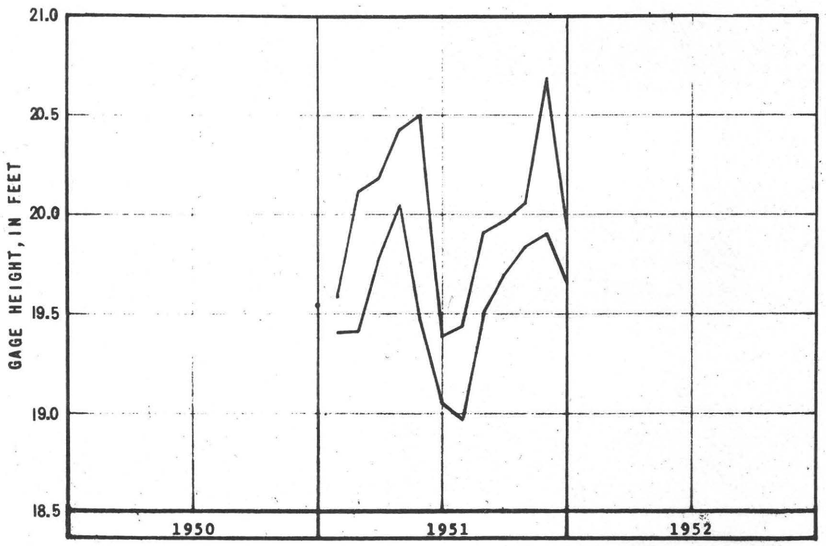
Regulation or control.--Winchester Dam, at outlet of Martiny Lake, has controlled the level of Tubbs Lake since June 1955.

Remarks.--Tubbs Lake is part of the Martiny Lake flooding project and is contiguous with Lost Lake. The outlet of Tubbs Lake is the West Branch Chippewa River.

The following discharge measurements have been made on West Branch Chippewa River at a bridge just north of the Windhester dam site. Measurements were made prior to construction of dam.

Date	Discharge (cfs)	Date	Discharge (cfs)
June 14, 1950	11.4	Oct. 1, 1952	6.18
July 11, 1950	7.22	Oct. 23, 1952	1.91
Aug. 23, 1950	.91	Nov. 6, 1952	10.1
Sept. 26, 1950	68.5	Dec. 2, 1952	23.6
Oct. 23, 1950	1.90	Jan. 6, 1953	22.2
Nov. 14, 1950	13.6	Feb. 5, 1953	21.2
Dec. 5, 1950	21.5	Mar. 16, 1953	96.5
Jan. 16, 1951	25.6	Apr. 3, 1953	55.2
Feb. 6, 1951	17.6	May 11, 1953	62.2
Mar. 16, 1951	60.6	June 3, 1953	22.4
Apr. 16, 1951	81.9	July 9, 1953	9.13
May 14, 1951	38.9	Aug. 5, 1953	13.3
June 11, 1951	14.5	Sept. 10, 1953	8.66
July 30, 1951	7.00	Oct. 15, 1953	11.5
Aug. 16, 1951	6.41	Nov. 12, 1953	12.9
Sept. 18, 1951	15.1	Dec. 10, 1953	17.5
Oct. 18, 1951	20.6	Jan 8, 1954	17.7
Nov. 29, 1951	43.9	Feb. 3, 1954	15.9
Dec. 14, 1951	39.6	Mar. 4, 1954	37.8
Jan. 9, 1952	42.8	Apr. 9, 1954	70.3
Feb. 21, 1952	45.4	May 7, 1954	68.0
Mar. 27, 1952	98.2	June 9, 1954	38.9
Apr. 17, 1952	168	July 8, 1954	23.9
May 23, 1952	28.6	Aug. 4, 1954	11.1
June 16, 1952	8.58	Oct. 7, 1954	43.2
July 17, 1952	14.6	Jan. 13, 1955	27.8
Aug. 11, 1952	23.2	Apr. 4, 1955	56.1
		July 7, 1955	2.09





Monthly maximum and minimum stages for Tubbs Lake near Barryton, Mich.

MENOMINEE COUNTY

Long Lake near Stephenson, Mich.

Location.--Lat 45°25'15" long 87°50'33", in secs.13 and 24, T.35 N., R.29 W., 11.3 miles west of Stephenson.

Surface area.--80 acres.

Maximum depth.--43 ft.

Drainage area.--Not determined.

Records available.--May to November 1959.

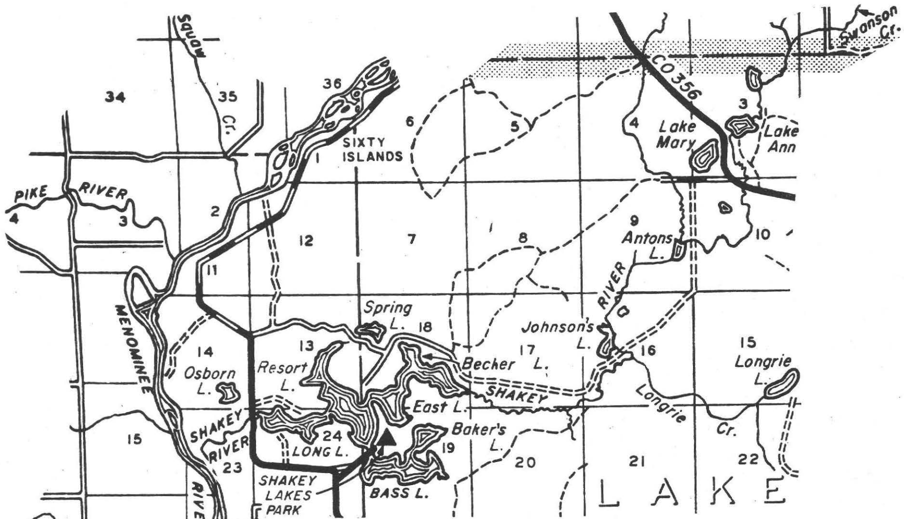
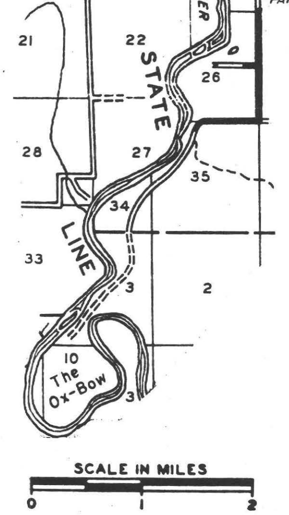
Gage.--Staff gage read daily. Datum of gage not determined.

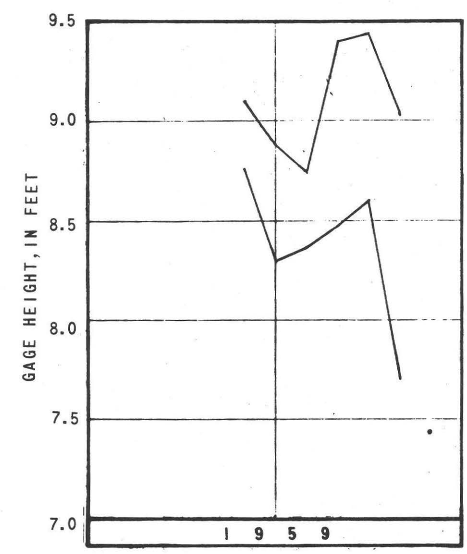
Established legal level.--682.75 ft above mean sea level. established by Circuit Court in July or August, 1963.

Extremes.--1959: Maximum stage observed, 9.44 ft Sept. 26, 1959; minimum observed, 7.44 ft Nov. 7, 1959.

Regulation or control.--Lake level is maintained by dam at outlet. Lake level is lowered prior to winter period and raised during the spring months.

Remarks.--Long Lake is part of the Shaky Lakes Chain and is contiguous with Resort Lake. Shaky River is the major inlet, entering at the east end of Becher Lake. The outlet is at the west end of Long Lake and is tributary to Menominee River. No discharge measurements are available on the inlet or outlet.



Monthly maximum and minimum stages for Long Lake near Stephenson, Mich.

MENOMINEE COUNTY

North Lake near Stephenson, Mich.

Location.--Lat 45°24'03", long 87°28'35", in secs. 26, 34, and 35, T.35 N., R.26 W., 6.6 miles east of Stephenson.

Surface area.--450 acres.

Maximum depth.--Unknown.

Drainage area.--Not determined.

Records available.--February 1958 to June 1959 except periods November and December 1958, February and March 1959.

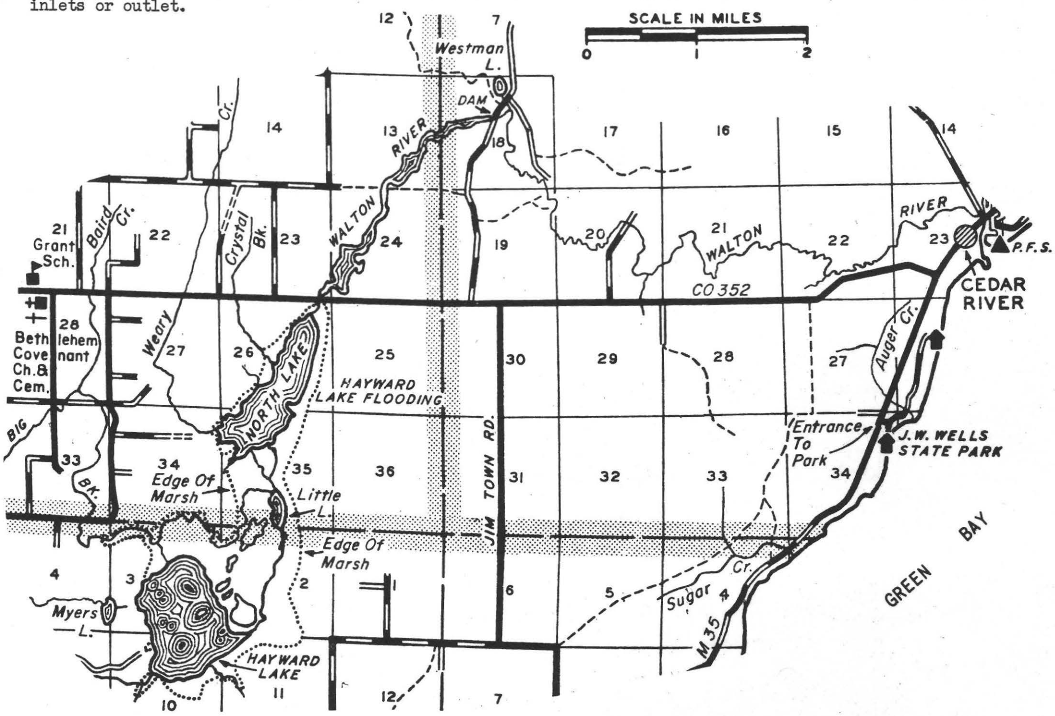
Gage.--Staff gage read intermittently. Datum of gage not determined.

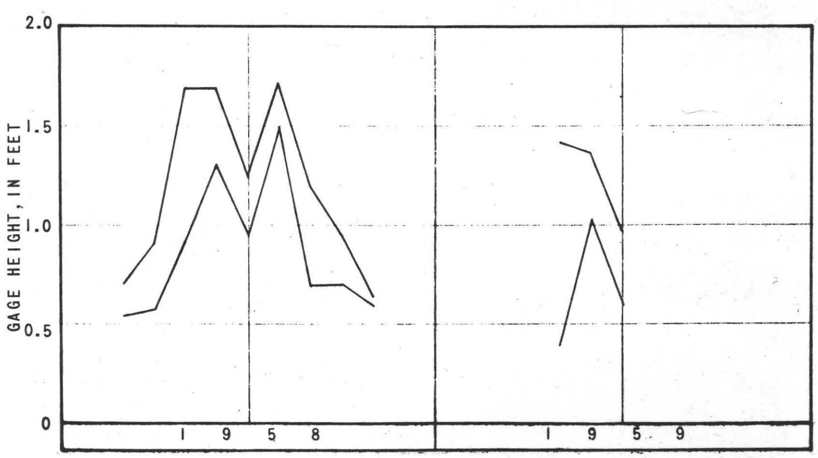
Established legal level.--None known.

Extremes.--1958-59: Maximum stage observed, 1.72 ft July 11, 1958; minimum observed, 0.34 ft Jan. 16, 21, 24, 1959.

Regulation or control.--None.

Remarks.--The inlets to North Lake are Big Brook, Hayward Lake outlet, Weary Creek, and Crystal Brook. The outlet, Walton River, is at the north end of the lake. No discharge measurements have been made on the inlets or outlet.





Monthly maximum and minimum stages for North Lake near Stephenson, Mich.

MISSAUKEE COUNTY

Lake Missaukee at Lake City, Mich.

Location.--Lat 44°18'45", long 85°14'23", in many sections, T.22 N., R.8 W., at Lake City.

Surface area.--2,000 acres.

Maximum depth.--28 ft.

Drainage area.--7.20 sq. mi.

Records available.--June 1942 to September 1968 except some winter periods.

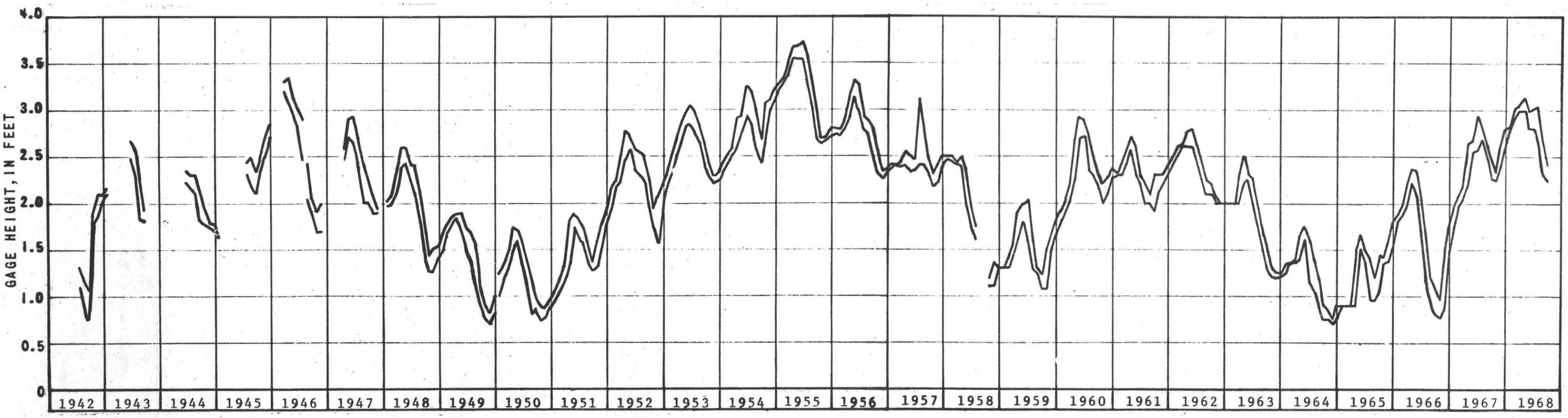
Gage.--Water-stage recorder. Prior to Aug. 24, 1965, staff gage at same site and datum. Datum of gage is 1,235.50 ft above mean sea level.

Established legal level.--1,238.0 ft above mean sea level, established by Circuit Court on Apr. 17, 1942.

Extremes.--1942-68: Maximum stage, 3.72 ft June 8, 9, 1955, minimum, 0.70 ft Nov. 11, 12, 1949, Nov. 17-28, 1964.

Regulation or control.--None.

Remarks.--Lake Missaukee has no inlet or outlet.
An engineering lake-level control study was completed in 1946 by the Michigan Department of Natural Resources.



Monthly maximum and minimum stages for Lake Missaukee at Lake City, Mich.

MONTCALM COUNTY

Crystal Lake at Crystal, Mich.

Location.--Lat 43°16'14", long 84°55'26", in secs. 7, 8, 17, and 18, T.10 N., R.5 W., 0.8 mile northwest of Crystal.

Surface area.--724 acres.

Maximum depth.--70 ft.

Drainage area at outlet.--4.9 sq mi, approximately.

Records available.--October 1942 to September 1950; and July 1960 to September 1968.

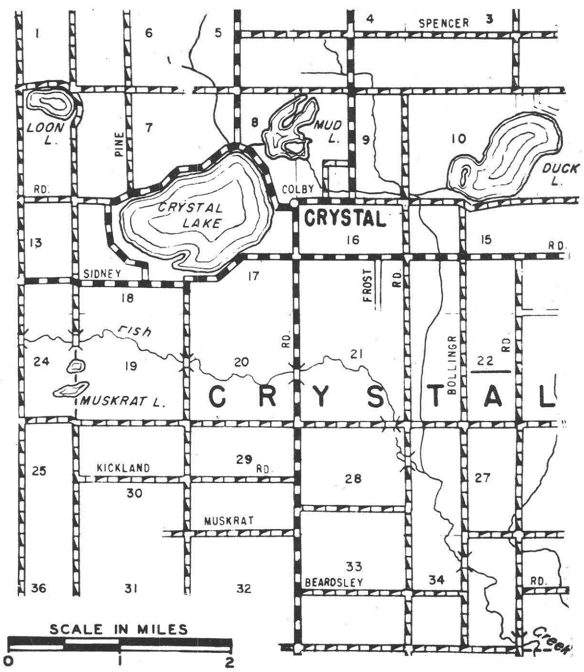
Gage.--Staff gage read daily. Datum of gage is 798.43 ft above mean sea level (levels by Michigan Department of Natural Resources).

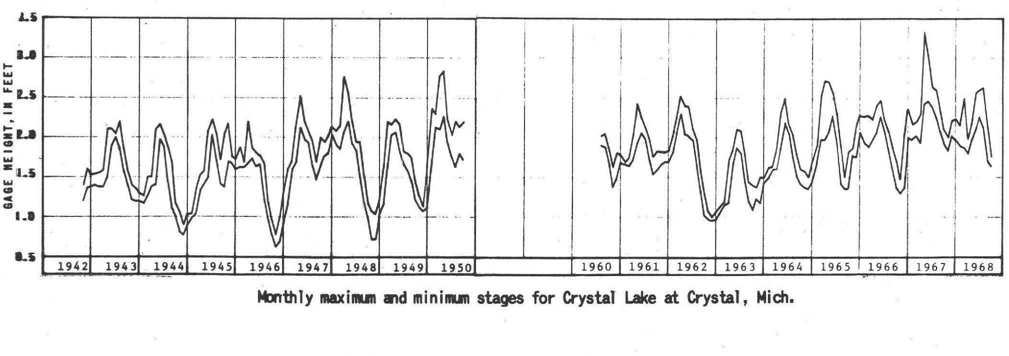
Established legal level.--800.49 ft above mean sea level, established by Circuit Court on Aug. 29, 1932.

Extremes.--1942-50, 1960-68: Maximum stage was over top of gage (3.32 ft) Apr. 22, 23, 1967; minimum stage, 0.61 ft Oct. 17, 1946.

Regulation or control.--A concrete control structure equipped with removable boards is used to control lake level.

Remarks.--There is one small inlet at the north end of Crystal Lake. The outlet, about 600 ft east of the inlet, flows a short distance to Mud Lake, thence to Fish Creek.
No discharge measurements are available on inlet or outlet.





Monthly maximum and minimum stages for Crystal Lake at Crystal, Mich.

MONTCALM COUNTY

Dickerson Lake near Stanton, Mich.

Location.--Lat 43°17'37", long 85°10'33", in secs. 5, 32, and 33, Tps. 10 and 11 N., R.7 W., 5 miles west of Stanton.

Surface area.--255 acres.

Maximum depth.--48 ft.

Drainage area at outlet.--6.3 sq mi, approximately.

Records available.--April 1961 to January 1962.

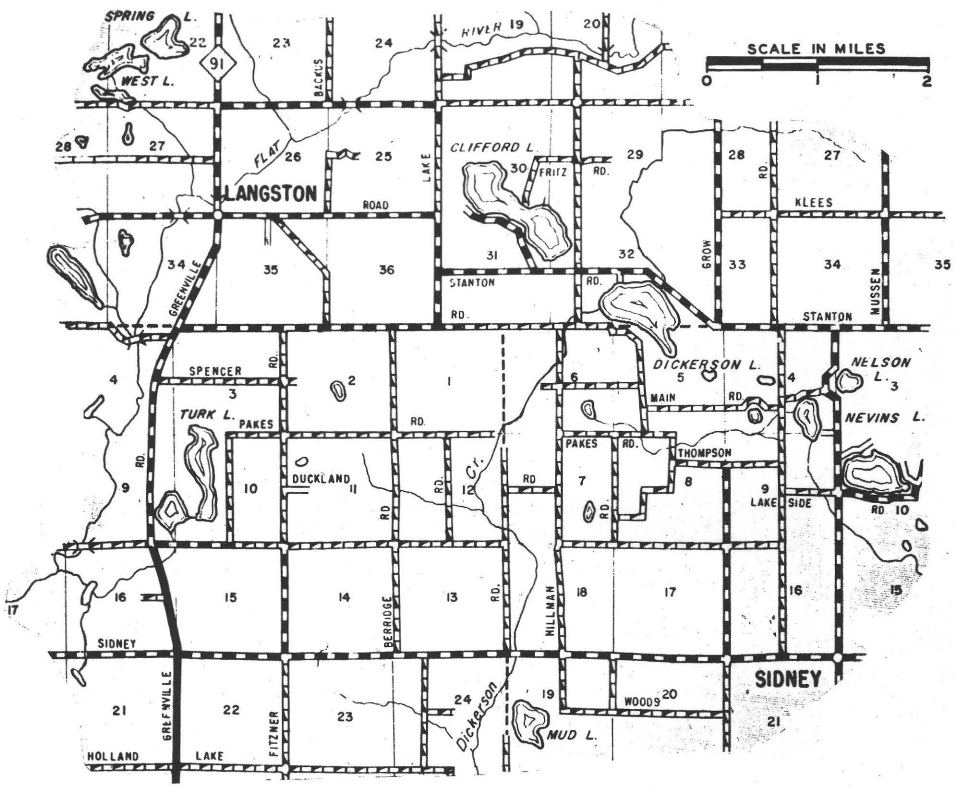
Gage.--Staff gage read weekly. Datum of gage is 850.36 ft above mean sea level (levels by Michigan Department of Natural Resources).

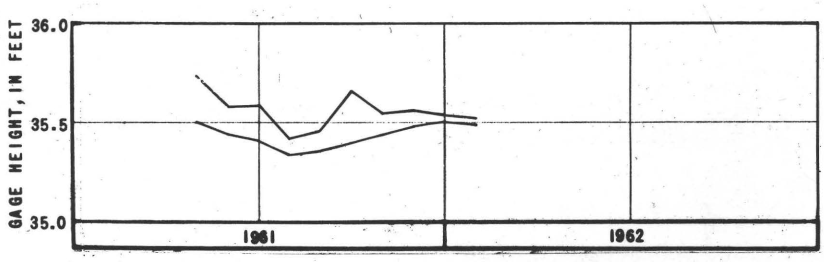
Established legal level.--None known.

Extremes.--1961-62: Maximum stage observed, 35.74 ft Apr. 24, 26, 1961; minimum observed, 35.34 ft July 10, 11, 13, 1961.

Regulation or control.--Dam at outlet, built in 1960, controls lake level.

Remarks.--There is an unnamed inlet at the northeast side of Dickerson Lake. The outlet, Dickerson Creek, is at the west end of the lake. No discharge measurements are available on the inlet or outlet.





Monthly maximum and minimum stages for Dickerson Lake near Stanton, Mich.

MONTCALM COUNTY

Duck Lake near Crystal, Mich.

Location.--Lat 43°15'25", long 84°53'18", in secs. 10 and 11, T.10 N., R.5 W., 1.4 miles east of Crystal.

Surface area.--306 acres.

Maximum depth.--9 ft.

Drainage area at outlet.--1.5 sq mi, approximately.

Records available.--December 1959 to November 1961.

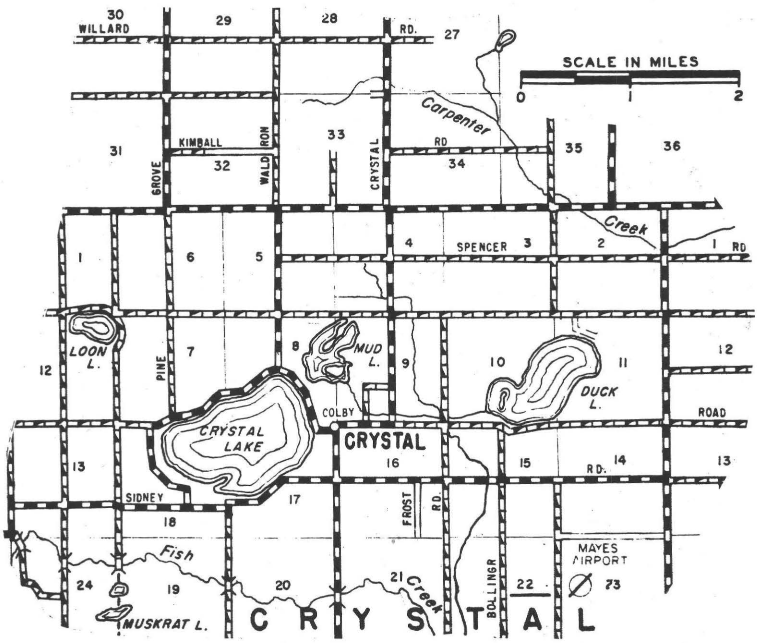
Gage.--Staff gage read daily. Datum of gage is 755.17 ft above mean sea level (levels by Michigan Department of Natural Resources).

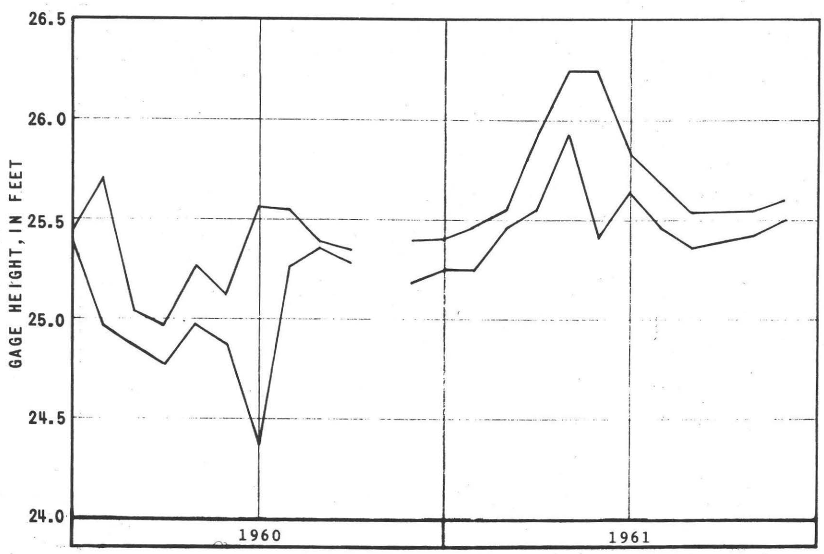
Established legal level.--781.0 ft above mean sea level, established by Circuit Court on Oct. 22, 1962.

Extremes.--1959-61: Maximum stage, 26.23 ft. Apr. 26-30, May 2, 1961; minimum, 24.37 ft June 10, 11, 1960 (caused by washout of temporary dam at outlet).

Regulation or control.--Temporary dam of earth, rock, and bagged cement.

Remarks.--There is no inlet to Duck Lake. The outlet, at the west end, joins the outlet of Mud Lake and flows south. No discharge measurements are available on the inlet or outlet.





Monthly maximum and minimum stages for Duck Lake near Crystal, Mich.

MONTCALM COUNTY

Little Whitefish Lake near Pierson, Mich.

Location.--Lat 43°21'40", long 85°32'10", in sec. 8, T.11 N., R.10 W., 3.4 miles northwest of Pierson.

Surface area.--181 acres.

Maximum depth.--40 ft.

Drainage area.--Not determined.

Records available.--May to June 1942, December 1952 to November 1953.

Gage.--Staff gage read daily. Datum of gage is 850.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--Winter, 867.72 ft; summer, 868.22 ft above mean sea level, established by Circuit Court on June 28, 1954.

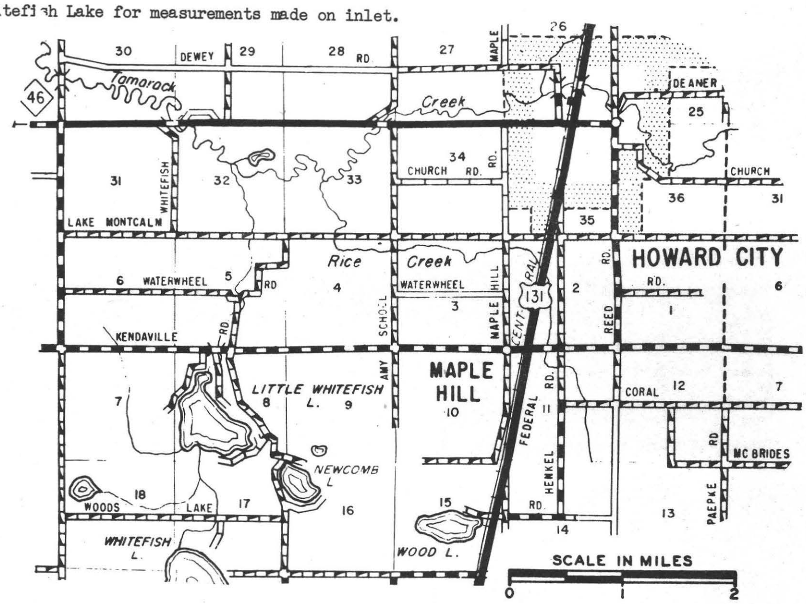
Extremes.--1942, 1952-53: Maximum stage observed, 18.94 ft Mar. 24, 1953; minimum observed, 17.56 ft May 28, 29, 1942, Sept. 12, 1953.

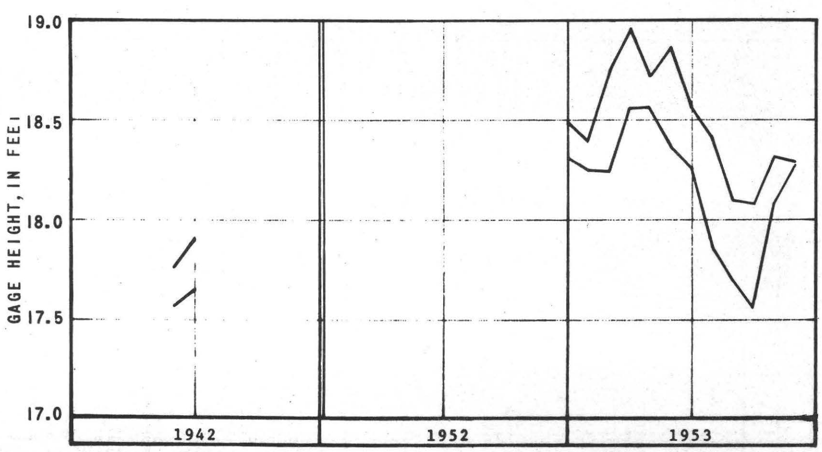
Regulation or control.--None.

Remarks.--The inlet, at the south end of the lake, includes flow from Whitefish Lake and an unnamed tributary draining the area to the south and west of Little Whitefish Lake. The outlet is at the north end of the lake. The outflow is north and joins Tamarack Creek about 3 miles downstream. The following discharge measurements were made at the outlet.

Date	Discharge (cfs)
May 19, 1942	12.8
Sept. 25, 1942	7.45

See Whitefish Lake for measurements made on inlet.





Monthly maximum and minimum stages for Little Whitefish Lake near Pierson, Mich.

MONTCALM COUNTY

Whitefish Lake near Pierson, Mich.

Location.--Lat 43°20'26", long 85°32'30", in secs. 17, 18, 19, 20, and 29, T.11 N., R.10 W., 2.5 miles northwest of Pierson.

Surface area.--500 acres.

Maximum depth.--54 feet.

Drainage area at outlet.--9.5 sq mi, approximately.

Records available.--May 1942 to September 1950, except period December 1942 to October 1944.

Gage.--Staff gage read daily. Datum of gage is 868.55 ft above mean sea level (levels by Michigan Department of Natural Resources).

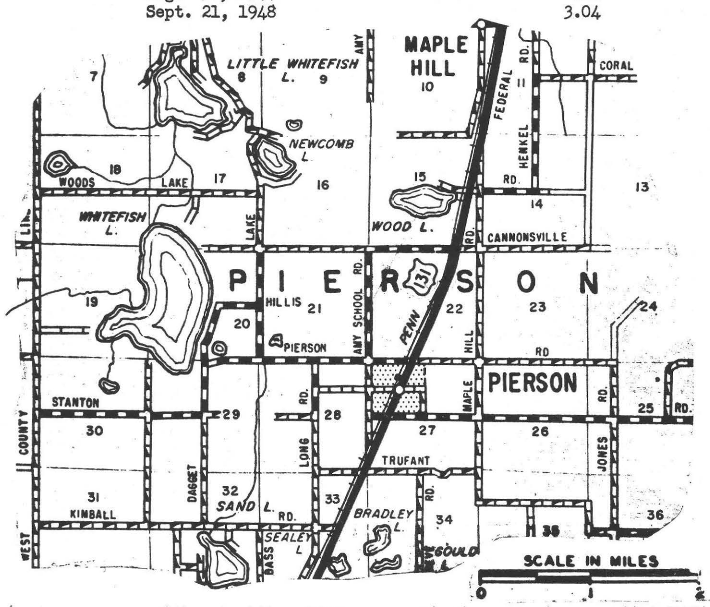
Established legal level.--870.35 ft above mean sea level, established by Circuit Court on September 28, 1948.

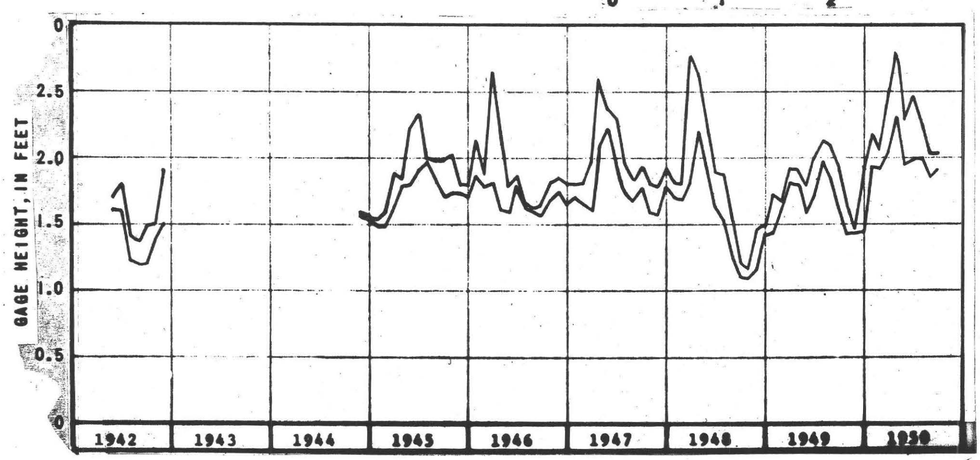
Extremes.--1942-50: Maximum stage observed, 2.79 ft Apr. 11, 1950; minimum observed, 1.08 ft Oct. 2, 5, 6, 1948.

Regulation or control.--Dam at outlet.

Remarks.--Outflow from Englewright and Butternut Lakes enter Whitefish Lake from the southwest. The outlet of Whitefish Lake is at the north end of the lake.
The following discharge measurements have been made at the outlet.

Date	Discharge (cfs)
Apr. 1, 1942	12.5
May 5, 1942	6.61
July 6, 1942	3.98
Sept. 25, 1942	5.21
Aug. 30, 1944	.60
Sept. 21, 1948	3.04





Monthly maximum and minimum stages for Whitefish Lake near Pierson, Mich.

MONTMORENCY COUNTY

Avalon Lake near Hillman, Mich.

Location.--Lat 45°05'48", long 83°57'51", in secs. 4, 5, 8, and 9, T.31 N., R.4 E., 3.7 miles northwest of Hillman.

Surface area.--372 acres.

Maximum depth.--74 ft.

Drainage area at outlet.--3 sq mi, approximately.

Records available.--May 1954 to September 1960 except winter period 1958-59.

Gage.--Staff gage read daily. Datum of gage is 789.83 ft above mean sea level (levels by Michigan Department of Natural Resources).

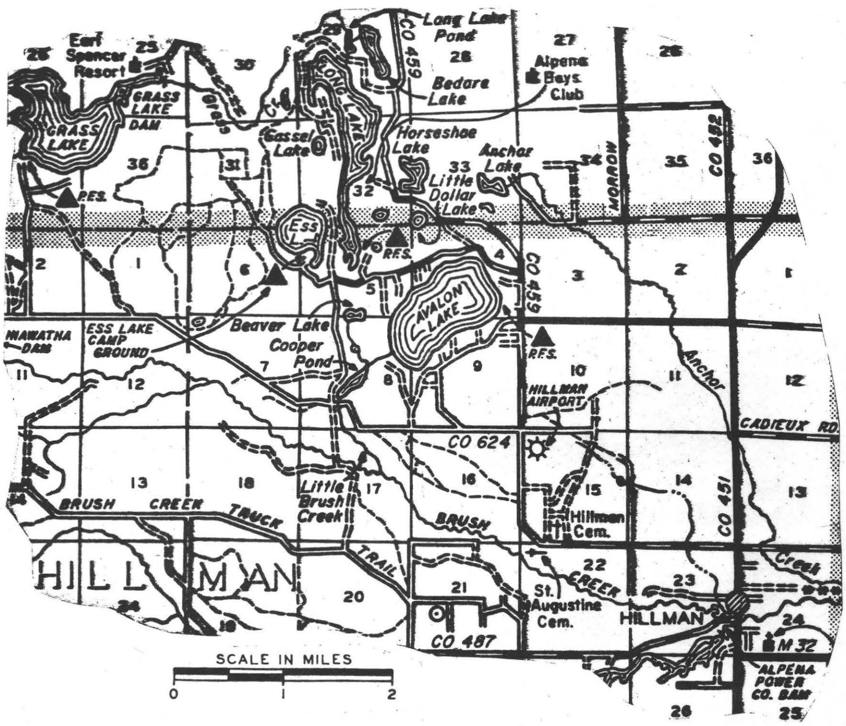
Established legal level.--None known.

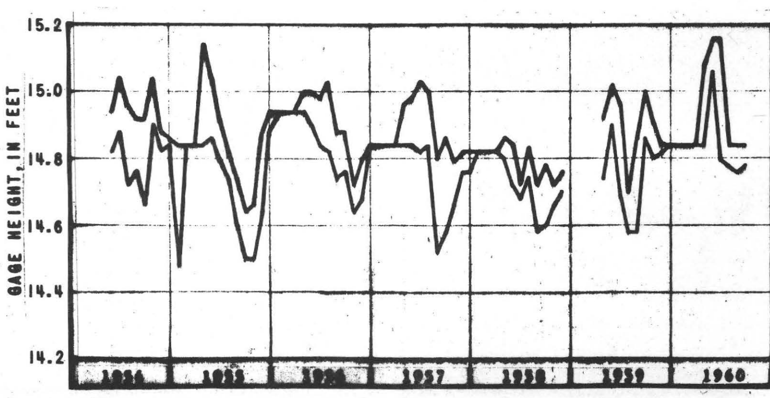
Extremes.--1954-60: Maximum stage, 15.16 ft May 22-24, June 2, 3, 1960; minimum, 14.48 ft Jan. 23, 24, 1955.

Regulation or control.--Lake level is controlled by dam at outlet.

Remarks.--There are no inlets to Avalon Lake. The outlet is at the southwest end of the lake. It extends through Cooper Pond to Little Brush Creek thence to Brush Creek, a distance of about 1.5 miles. During the week of Oct. 11-15, 1954, 3.0 cfs was measured in the outlet at the first culvert downstream from the lake.

An engineering lake-level control study was completed in 1957 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Avalon Lake near Hillman, Mich.

MONTMORENCY COUNTY

Avery Lake near Atlanta, Mich.

Location.--Lat 44°56'30", long 84°10'41", in secs. 3, 4, and 9, T.29 N., R.2 E., 5 miles southwest of Atlanta.

Surface area.--254 acres.

Maximum depth.--78 ft.

Drainage area at outlet.--12 sq mi, approximately.

Records available.--April 1951 to June 1952 except period August 1951 to February 1952.

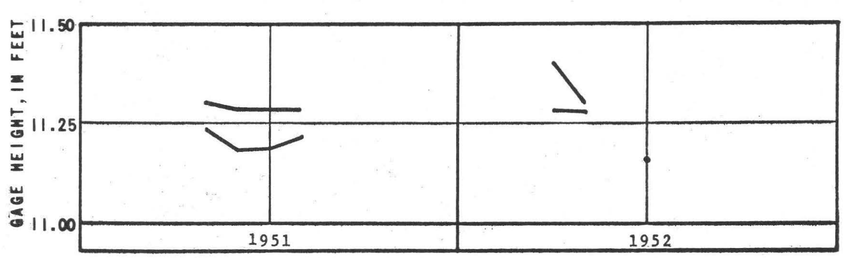
Gage.--Staff gage read daily. Datum of gage is 880.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1951-52: Maximum stage observed, 11.40 ft Mar. 25, 26, 1952; minimum observed, 11.16 ft June 23, 1952.

Regulation or control.--Lake level is controlled by dam at outlet.

Remarks.--There are two small inlets at the south end of the lake. The outlet, Crooked Creek, flows from the north end of the lake for about seven miles to the Thunder Bay River. No discharge measurements are available on the inlets or outlet.
A preliminary engineering lake-level control study was completed in 1947 by the Michigan Department of Natural Resources.



Monthly maximum and minimum stages for Avery Lake near Atlanta, Mich.

MONTMORENCY COUNTY

East Fish Lake near Lewiston, Mich.

Location.--Lat 44°51'46", long 84°10'23", in secs. 34 and 35, T.29 N., R.2 E., 7 miles east of Lewiston.

Surface area.--23.5 acres.

Maximum depth.--42 ft.

Drainage area at outlet.--0.17 sq mi.

Records available.--December 1944 to September 1966 except periods October to December 1947, April to September 1948, November 1961 to September 1962, September 1964, and January and February, 1966.

Gage.--Staff gage read daily. Datum of gage not determined.

Established legal level.--None known.

Extremes.--1944-66: Maximum stage observed, 9.34 ft May 6, 1965; minimum observed, 5.64 ft Sept 7, 10, 1956.

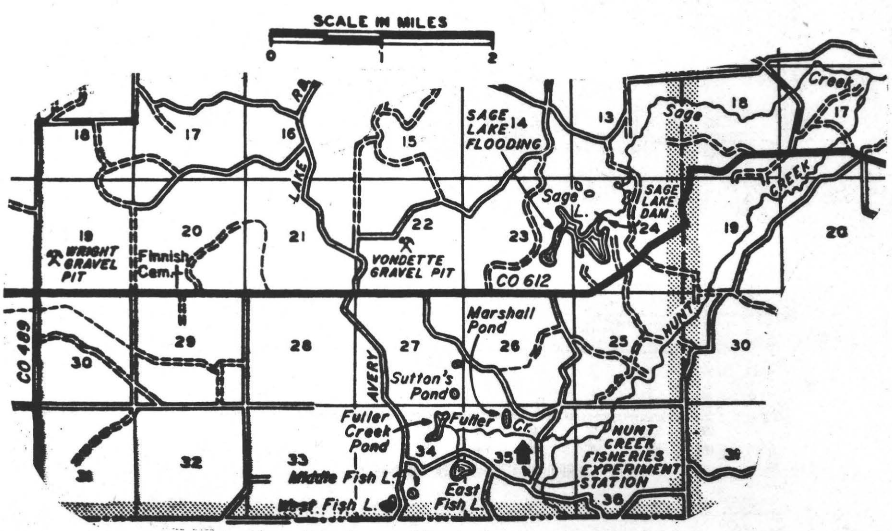
Regulation or control.--A concrete spillway and earth fill dam was built in September 1964. Prior to September 1964, there was an earthen dam with wooden spillway at the outlet.

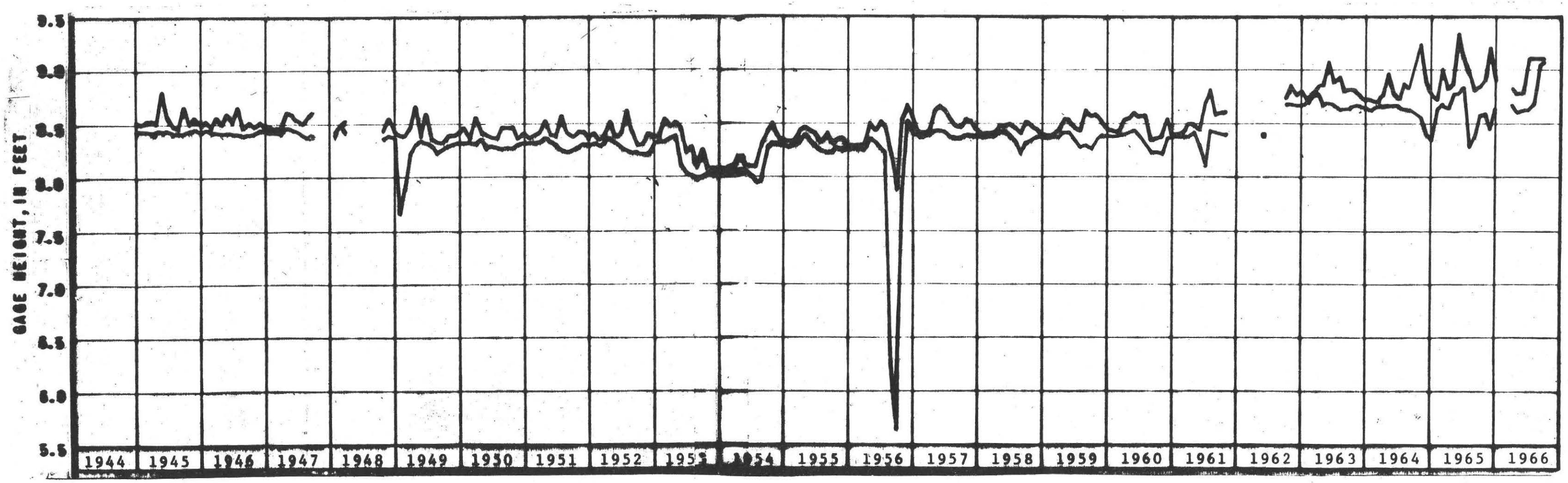
Remarks.--There are no inlets. The outlet flows about a quarter of a mile to Fuller Creek, then about one mile to Hunt Creek.

The following discharge measurements have been made on the outlet, in vicinity of the dam.

Date	Discharge (cfs)
Oct. 28, 1943	1.56
Apr. 6, 1944	1.50
Oct. 6, 1944	2.26
Mar. 29, 1945	1.55
Aug. 13, 1945	1.43
Oct. 4, 1945	1.22
Nov. 13, 1945	2.34
Dec. 4, 1945	1.45
Jan. 3, 1946	1.43
Feb. 5, 1946	1.37
Mar. 28, 1946	1.69
June 20, 1946	1.58
Sept. 9, 1946	2.60
Dec. 5, 1946	1.44
Apr. 18, 1947	2.06
July 30, 1947	1.48
Sept. 29, 1947	1.64
Dec. 1, 1947	1.69
Apr. 13, 1948	1.89
Aug. 9, 1948	1.26
Oct. 1, 1948	1.66
Dec. 30, 1948	1.58
Apr. 12, 1949	1.12
Aug. 22, 1949	.76
Oct. 20, 1949	1.26
Dec. 15, 1949	1.45
Apr. 24, 1950	1.45
July 21, 1950	1.33
Oct. 10, 1950	1.09
Jan. 29, 1951	1.56
Apr. 11, 1951	1.70

Date	Discharge (cfs)
June 18, 1951	1.49
July 27, 1951	1.28
Jan. 28, 1952	1.35
Apr. 9, 1952	1.60
July 7, 1952	1.80
Oct. 7, 1952	1.42
Jan. 23, 1953	1.25
Apr. 22, 1953	1.32
July 6, 1953	1.80
Oct. 7, 1953	1.47
Jan. 5, 1954	2.26
Apr. 20, 1954	2.07
July 7, 1954	1.08
Oct. 25, 1954	1.27
Jan. 26, 1955	1.91
Apr. 21, 1955	1.79
July 6, 1955	1.23
Oct. 6, 1955	1.65
Jan. 4, 1956	1.40
Apr. 11, 1956	1.67
July 25, 1956	1.29
Oct. 10, 1956	1.12
Jan. 3, 1957	1.24
Apr. 25, 1957	3.46
July 22, 1957	1.37
Oct. 2, 1957	1.79
Jan. 28, 1958	1.34
Apr. 2, 1958	1.36
July 16, 1958	1.39
Oct. 17, 1958	1.10
Jan. 22, 1959	1.34





Monthly maximum and minimum stages for E. Fish Lake near Lewiston, Mich.

MONTMORENCY COUNTY

McCormick Lake near Atlanta, Mich.

Location.--Lat 44°57'40", long 84°14'37", secs. 30 and 31, T.30 N., R.2 E., 6 miles southwest of Atlanta.

Surface area.--100 acres.

Maximum depth.--78 ft.

Drainage area at outlet.--17.9 sq mi.

Records available.--October 1945 to November 1953 except winter periods.

Gage.--Staff gage read intermittently. Datum of gage is 928.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

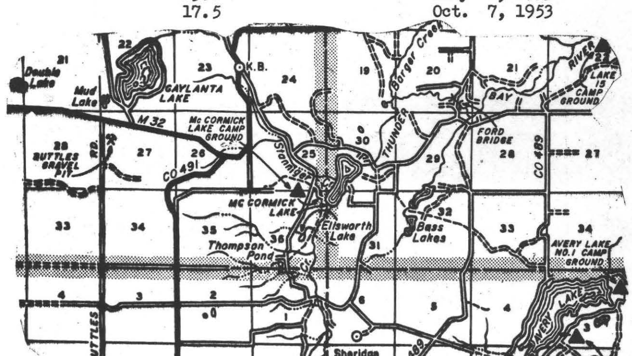
Established legal level.--None known. The dam built in 1945, was set to maintain an elevation of 933.10 ft above mean sea level.

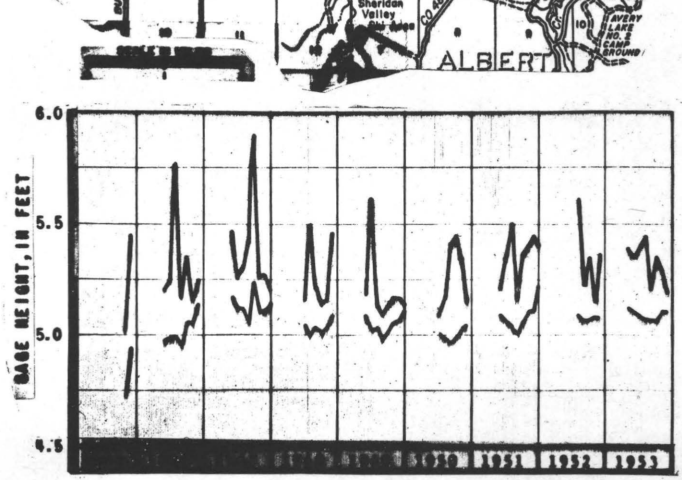
Extremes.--1945-53: Maximum stage observed, 5.90 ft Sept. 21, 1947; minimum observed, 4.72 ft Oct. 4, 1945.

Regulation or control.--Lake level is maintained by a fixed crest timber dam on outlet, built in 1937 and rebuilt in 1945.

Remarks.--Sheridan and Stanniger Creeks flow into the southwest side of the lake. The outlet, Thunder Bay River, is at the northeast side of the lake. An engineering lake-level control study was completed in 1950 by the Michigan Department of Natural Resources.
No discharge measurements are available on the inlets. The following discharge measurements have been made on Thunder Bay River (published as McCormick Lake Outlet) from 700 ft to 1,000 ft downstream from lake.

Date	Discharge (cfs)	Date	Discharge (cfs)
Sept. 5, 1945	28.3	Oct. 20, 1949	17.3
Jan. 3, 1946	23.1	Dec. 7, 1949	18.4
Mar. 28, 1946	27.3	Apr. 24, 1950	22.5
June 17, 1946	29.7	July 21, 1950	16.7
July 8, 1946	24.3	Oct. 5, 1950	16.2
Sept. 12, 1946	24.1	Jan. 29, 1951	17.9
Dec. 2, 1946	19.0	Apr. 11, 1951	29.9
May 7, 1947	31.0	July 25, 1951	16.4
Aug. 6, 1947	19.5	Oct. 4, 1951	24.4
Sept. 29, 1947	24.1	Jan. 28, 1952	23.2
Dec. 1, 1947	21.8	Apr. 24, 1952	22.6
Apr. 13, 1948	27.3	July 7, 1952	16.9
July 13, 1948	16.8	Oct. 7, 1952	18.6
Oct. 1, 1948	18.7	Dec. 22, 1952	22.1
Dec. 3, 1948	19.2	Apr. 22, 1953	24.8
Apr. 5, 1949	23.0	July 6, 1953	22.3
July 7, 1949	17.5	Oct. 7, 1953	19.2





Monthly maximum and minimum stages for McCormick Lake near Atlanta, Mich.

MONTMORENCY COUNTY

Muskellunge Lake near Atlanta, Mich.

Location.--45°06'54", long 84°11'56", in sec. 4, T.31 N., R.2 E., 8 miles northwest of Atlanta.

Surface area.--126 acres.

Maximum depth.--46 ft.

Drainage area.--Not determined.

Records available.--January 1953 to September 1956 except period August and September 1954 and winter period of 1955.

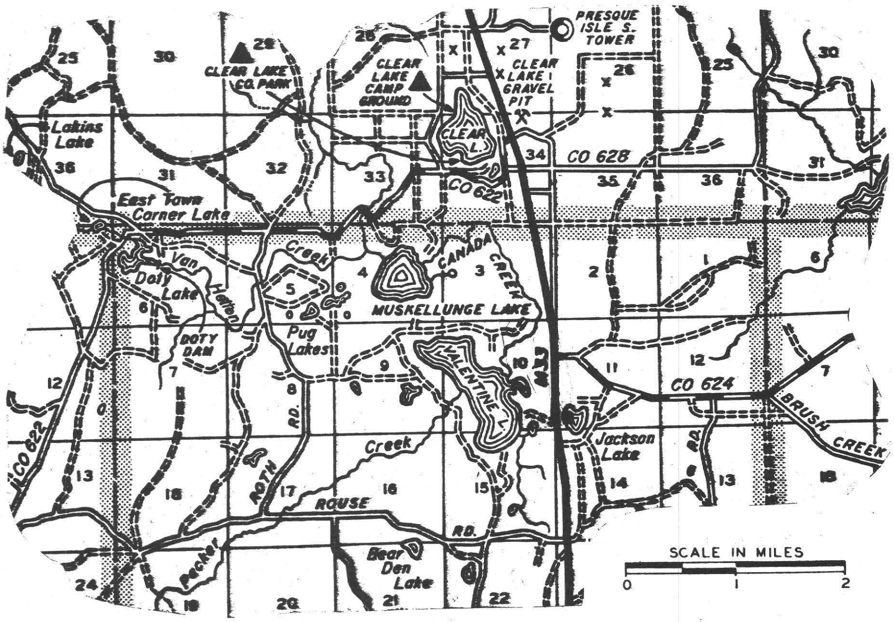
Gage.--Staff gage read intermittently. Datum of gage is 840.08 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--852.2 ft above mean sea level, established by Circuit Court on Jan. 17, 1955.

Extremes.--1953-56: Maximum stage, 12.42 ft Apr. 22, 23, 1955; minimum stage observed, 11.36 ft Oct. 21, 24, 1953.

Regulation or Control.--Concrete control structure on outlet, about 0.6 mile downstream from lake.

Remarks.--Canada Creek flows into the northeast side of the lake; Van Hetton Creek flows into the outlet above the control. The outlet is Canada Creek which flows out of the northwest side of the lake. No discharge measurements are available on the inlets or outlet.



Monthly maximum and minimum stages for Muskellunge Lake near Atlanta, Mich.

MONTMORENCY COUNTY

Rush Lake near Atlanta, Mich.

Location.--Lat 45°08'48", long 84°04'12", in secs. 21, 28, 29, 31, and 32, T.32 N., R.3 E., 10 miles north of Atlanta.

Surface area.--355 acres, includes backwater pond in outlet above dam.

Maximum depth.--30 ft.

Drainage area at outlet.--16 sq mi, approximately.

Records available.--March 1952 to December 1953 except period October to December 1952.

Gage.--Staff gage read daily. Datum of gage is 858.07 ft above mean sea level (levels by Michigan Department of Natural Resources).

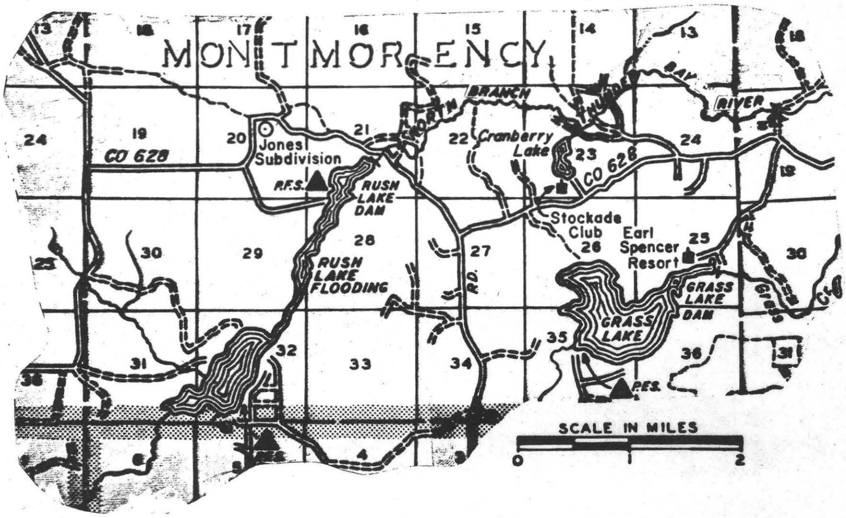
Established legal level.--863.00 ft. above mean sea level, established by Circuit Court on Oct. 17, 1955.

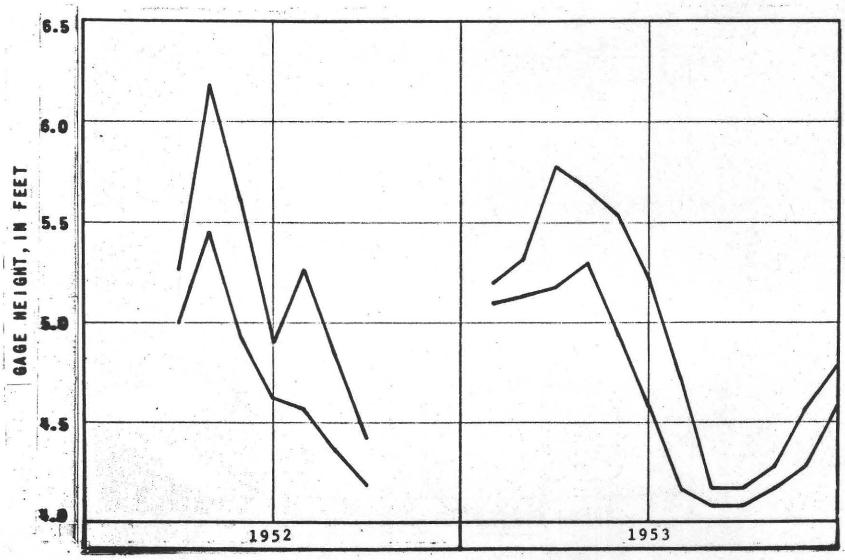
Extremes.--1952-53: Maximum stage, 6.18 ft Apr. 19, 20, 1952; minimum, 4.08 ft Aug. 27-31, Sept. 1-3, 6-12, 1953.

Regulation or control.--Dam in outlet, about 2 miles below main part of lake, controls level of lake.

Remarks.--Two main inlets enter Rush Lake on the southwest side through low swampy areas. Another inlet at the south end drains a low area about 500 feet south of the lake. The outlet, North Branch Thunder Bay River, is at the northeast end of lake. Discharge of 13.3 cfs was measured Aug. 13, 1952 and 6.72 cfs June 3, 1958 at the outlet. No discharge measurements are available on the inlets.

An engineering lake-level control study was completed in 1955 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Rush Lake near Atlanta, Mich.

MUSKEGON COUNTY

Mona Lake at Muskegon Heights, Mich.

Location.--Lat 43°10'08", long 86°17'28", in many sections, T.9 N., Rs.16 and 17 W., 3 miles southwest of Muskegon Heights.

Surface area.--695 acres.

Maximum depth.--42 ft.

Drainage area.--Not determined.

Records available.--January 1952 to January 1955.

Gage.--Staff gage read daily. Datum of gage is 576.96 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1952-55: Maximum stage, 6.46 ft Mar. 23, 1952, minimum, 3.50 ft Apr. 14, 1954.

Regulation or control.--None, however the level of Lake Michigan affects the level of Mona Lake.

Remarks.--The inlets to Mona Lake are Little Black Creek, Black Creek, and several small unnamed tributaries. The outlet of Mona Lake flows 0.4 mile into Lake Michigan.

The following discharge measurements have been made on the inlets to Mona Lake.

Little Black Creek, NW¼ sec. 8, T.9 N., R.16 W., at mouth, 0.5 mile south of Muskegon.

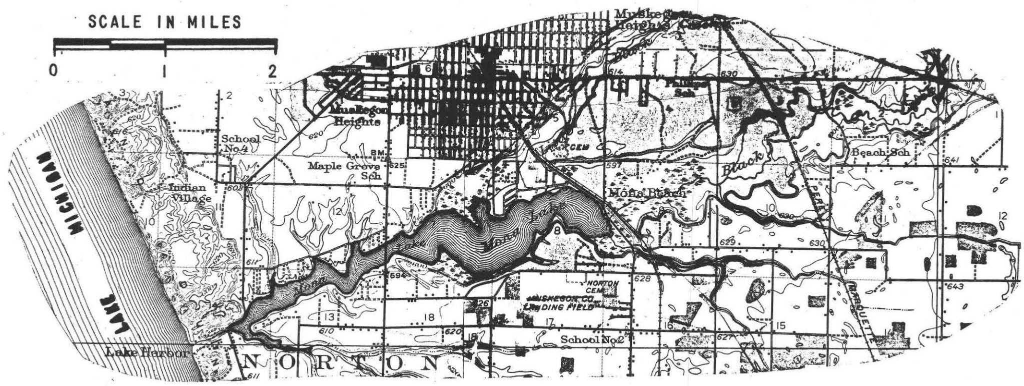
Date	Discharge (cfs)	Date	Discharge (cfs)
Jan. 16, 1952	17.3	Feb. 19, 1952	11.8

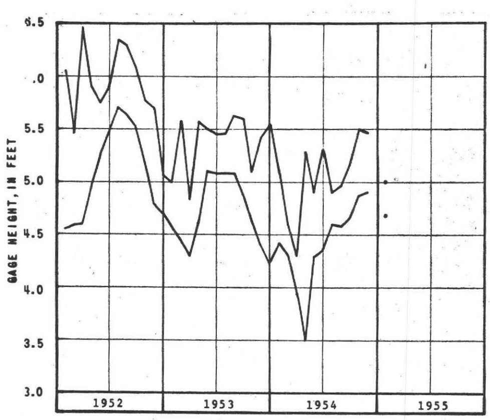
Black Creek, NE¼ sec. 3, T.9 N., R.16 W., 2 miles southeast of Muskegon.

Date	Discharge (cfs)	Date	Discharge (cfs)
Jan. 16, 1952	162	Feb. 19, 1952	57.2

Unnamed tributary to Black Creek, NW¼ sec. 10, T.9 N., R.16 W., at mouth, 1.5 miles southeast of Muskegon.

Date	Discharge (cfs)	Date	Discharge (cfs)
Jan. 16, 1952	6.20	Feb. 19, 1952	2.06





Monthly maximum and minimum stages for Mona Lake at Muskegon Heights, Mich.

NEWAYGO COUNTY

Brooks Lake near Newaygo, Mich.

Location.--Lat 43°24'02", long 85°45'38", in secs. 27, 28, 29, and 33, T.12 N., R.12 W., 2.4 miles southeast of Newaygo.

Surface area.--293 acres.

Maximum depth.--17 ft.

Drainage area at outlet.--25 sq mi, approximately.

Records available.--July 1948 to October 1949.

Gage.--Staff gage read daily. Datum of gage is 760.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--762.58 ft above mean sea level, established by Circuit Court on Sept. 18, 1950.

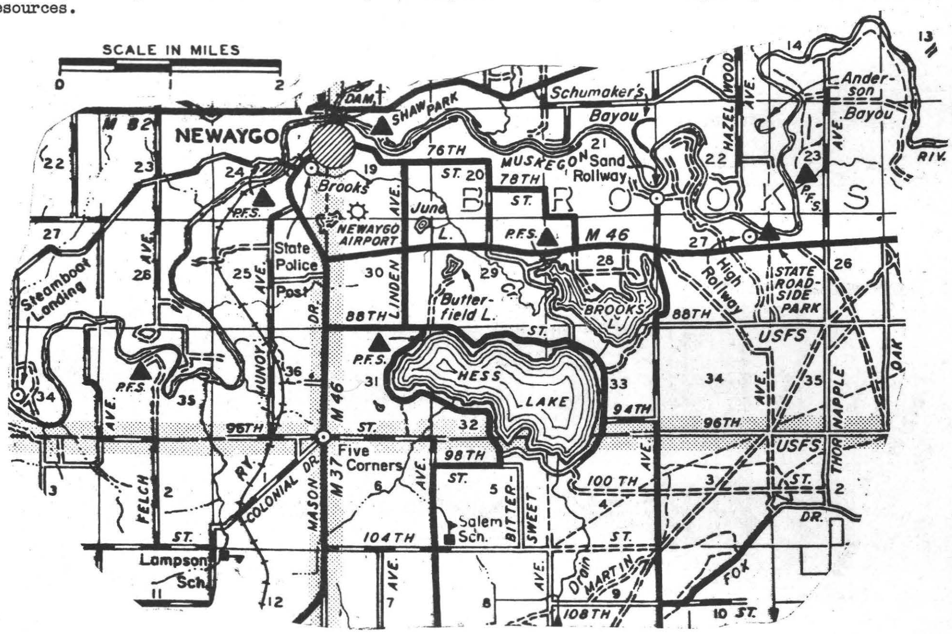
Extremes.--1948-49: Maximum stage, 2.72 ft Feb. 24, 1949; minimum, less than 1.50 ft (bottom of gage) Oct. 1-26, 1948.

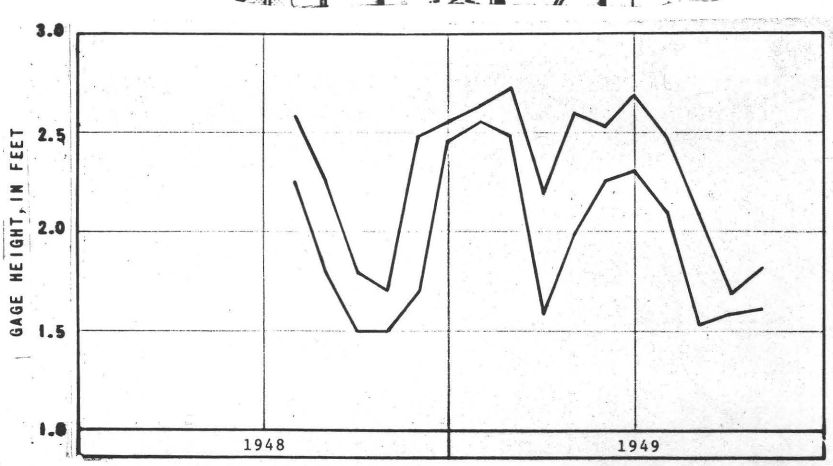
Regulation or control.--An old dam at the outlet controls the lake level. Repairs and additions have been made to the dam from time to time.

Remarks.--Brooks Lake inlet is the outlet from Hess Lake which flows about 0.2 mile and enters the south end of Brooks Lake. The outlet, Brooks Creek, flows from the west arm of the lake northwesterly to the Muskegon River.

Forty-three discharge measurements have been made on the inlet. See Hess Lake near Newaygo for the results of these measurements. No discharge measurements are available on the outlet.

An engineering lake-level control study was completed in 1950 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Brooks Lake Outlet near Newaygo, Mich.

NEWAYGO COUNTY

Fremont Lake near Fremont, Mich.

Location.--Lat 43°26'39", long 85°58'34", in many sections, T.12 N., R.14 W., 2.3 miles southwest of Fremont.

Surface area.--790 acres.

Maximum depth.--88 ft.

Drainage area at outlet.--20 sq mi, approximately.

Records available.--May 1943 to September 1950.

Gage.--Staff gage read intermittently. Datum of gage is 745.14 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--746.59 ft above mean sea level, established by Circuit Court on July 30, 1945.

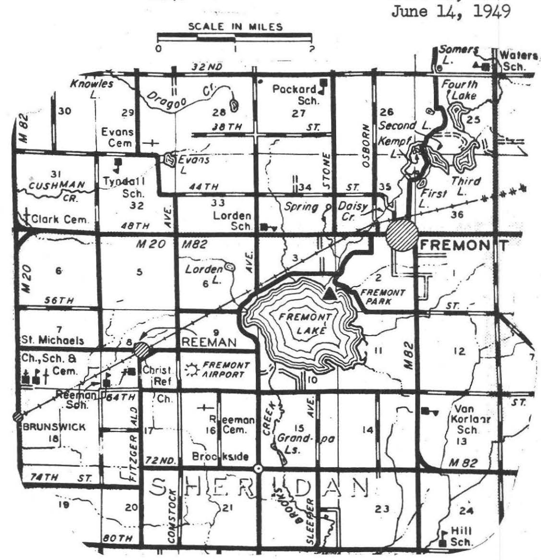
Extremes.--1943-50: Maximum stage observed, 3.54 ft Mar. 22, 1948; minimum observed, 0.67 ft Mar. 15, 1944.

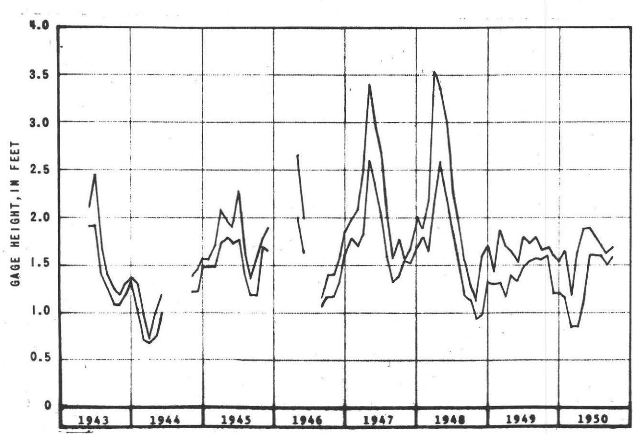
Regulation or control.--A concrete dam with removable stop logs was constructed in the fall of 1948.

Remarks.--An unnamed stream, draining a chain of lakes northeast of Fremont, is the principal inlet. Five smaller streams also flow into Fremont Lake. Brooks Creek, the outlet, flows from the southwest side of the lake.

No discharge measurements have been made on the inlets. The following measurements have been made on Brooks Creek (published as Fremont Lake Outlet), about half a mile downstream from the lake.

Date	Discharge (cfs)	Date	Discharge (cfs)
May 7, 1943	19.9	Feb. 7, 1947	15.6
Aug. 9, 1944	2.59	Apr. 24, 1947	43.5
Nov. 21, 1944	5.30	May 13, 1947	24.7
Oct. 15, 1945	10.5	Oct. 21, 1947	5.68
Apr. 19, 1946	15.7	Jan. 9, 1948	12.2
May 21, 1946	11.4	May 28, 1948	19.8
Aug. 20, 1946	2.50	Aug. 18, 1948	3.75
Sept. 24, 1946	3.08	Dec. 7, 1948	6.86
Oct. 15, 1946	2.47	Mar. 15, 1949	17.9
		June 14, 1949	3.16





Monthly maximum and minimum stages for Fremont Lake near Fremont, Mich.

NEWAYGO COUNTY

Hess Lake near Newaygo, Mich.

Location.--Lat 43°23'28", long 85°45'20", in secs. 4, 5, 31, 32, and 33, Tps. 11 and 12 N., R.12 W., 3 miles southeast of Newaygo.

Surface area.--1,120 acres.

Maximum depth.--29 ft.

Drainage area at outlet.--22 sq mi, approximately.

Records available.--August 1944 to December 1959.

Gage.--Staff gage read daily. Datum of gage is 754.56 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

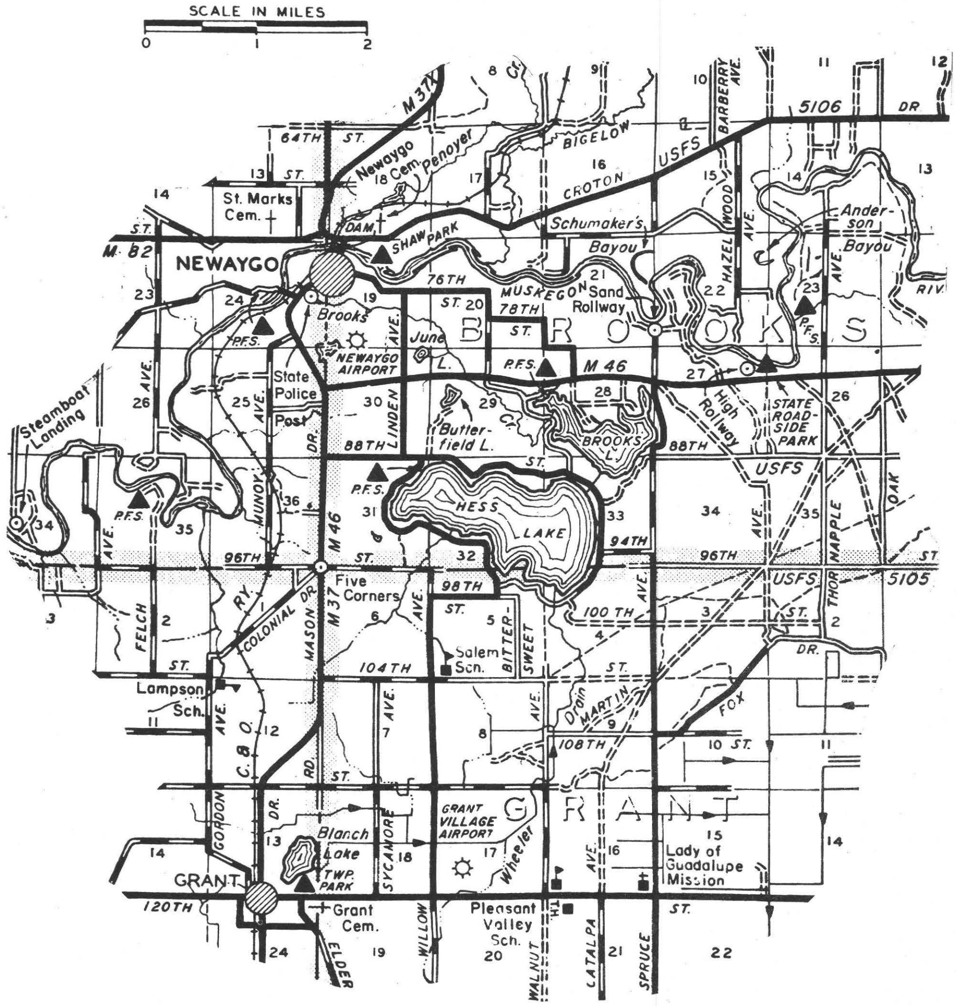
Extremes.--1944-59: Maximum stage, 9.72 ft Mar. 21, 1948; minimum, 8.12 ft May 21, 1958.

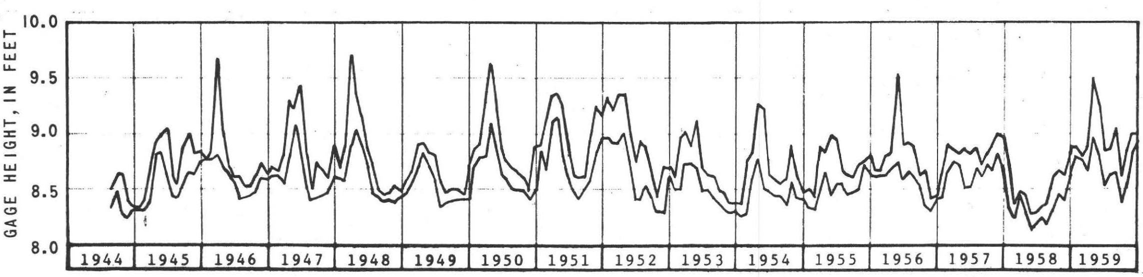
Regulation or control.--A fixed crest dam on the outlet controls the lake level.

Remarks.--Several creeks including Wheeler Drain flow into Hess Lake. The outlet is at the northeast side of the lake and flows into Brooks Lake, a distance of about 0.2 mile.

No discharge measurements have been made on inlets. The following measurements have been made in the vicinity of the dam on Hess Lake outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
Nov. 21, 1944	3.93	Oct. 8, 1953	7.87
Apr. 18, 1946	11.4	Jan. 14, 1954	5.87
Apr. 10, 1947	31.9	June 9, 1954	7.74
Aug. 17, 1948	1.40	July 15, 1954	2.91
Dec. 7, 1948	5.62	Oct. 8, 1954	16.5
June 14, 1949	6.10	Feb. 1, 1955	9.59
Sept. 13, 1949	2.54	May 12, 1955	12.2
Jan. 24, 1950	11.5	Aug. 19, 1955	.50
Apr. 12, 1950	30.0	Oct. 12, 1955	3.43
July 19, 1950	6.09	Jan. 4, 1956	6.12
Oct. 25, 1950	5.74	May 17, 1956	35.9
Jan. 24, 1951	10.8	July 18, 1956	2.59
June 5, 1951	11.0	Oct. 3, 1956	2.08
Sept. 5, 1951	3.08	Jan. 8, 1957	0
Dec. 6, 1951	21.8	Apr. 9, 1957	14.8
Feb. 6, 1952	24.3	July 9, 1957	21.6
June 3, 1952	13.3	Oct. 10, 1957	1.36
Aug. 15, 1952	10.5	Jan. 16, 1958	8.53
Nov. 4, 1952	3.65	Apr. 9, 1958	9.90
Feb. 2, 1953	8.63	July 16, 1958	0
Apr. 3, 1953	17.6	Oct. 8, 1958	10.8
July 9, 1953	4.78	Jan. 14, 1959	10.6





Monthly maximum and minimum stages for Hess Lake near Newaygo, Mich.

NEWAYGO COUNTY

Ryerson Lake near Fremont, Mich.

Location.--Lat 43°28'25", long 85°51'10", in secs. 27, 28, 33, and 34, T.13 N., R.13 W., 4.5 miles east of Fremont.

Surface area.--262 acres.

Maximum depth.--90 ft.

Drainage area at outlet.--8 sq mi, approximately.

Records available.--October 1951 to December 1952, December 1960 to March 1962.

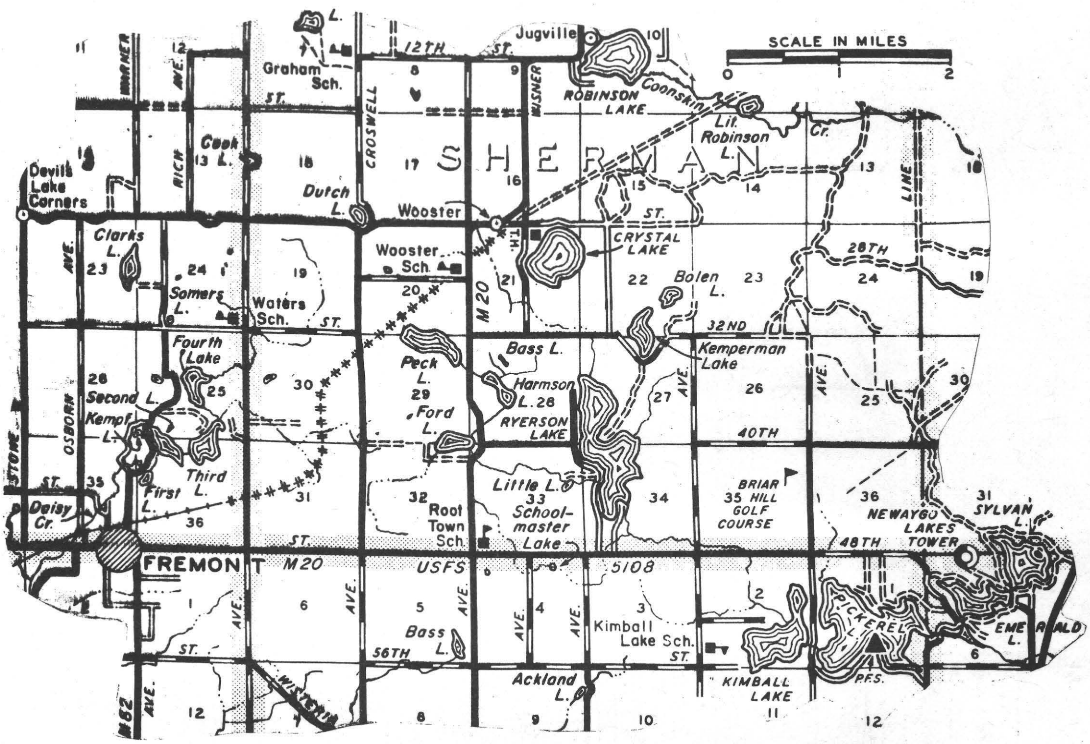
Gage.--Staff gage read intermittently. Datum of gage is 789.55 ft above mean sea level (levels by Michigan Department of Natural Resources).

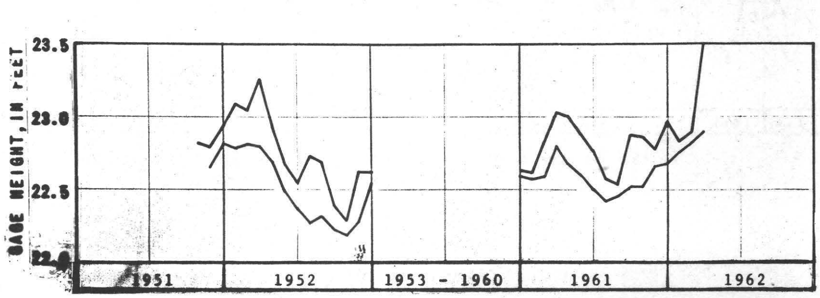
Established legal level.--812.5 ft above mean sea level, established by Circuit Court on May 22, 1963.

Extremes.--1951-52, 1960-62: Maximum stage observed, 23.50 ft Mar. 24, 1962; minimum observed, 22.19 ft Oct. 3-7, 1952.

Regulation or control.--During the period of record there were no dams on inlets or outlet.

Remarks.--Ryerson Lake has an inlet from Ford Lake and two other small inlets. The outlet, at the south end of the lake, flows southeast to Kimball Lake, a distance of about 2 miles.
No discharge measurements have been made on the inlets or outlet.
An engineering lake-level control study was completed in 1962 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Ryerson Lake near Fremont, Mich.

OAKLAND COUNTY

Cass Lake at Keego Harbor, Mich.

Location.--Lat 42°37'03", long 83°21'02", in many sections, T.2 N., R.9 E., 1 mile north of Keego Harbor.

Surface area.--1,280 acres.

Maximum depth.--123 ft.

Drainage area at outlet.--99.6 sq mi.

Records available.--September 1942 to December 1959 except period January to May 1945.

Gage.--Staff gage read daily. Datum of gage is 927.71 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--929.5 ft above mean sea level, established Jan. 6, 1964. This level has not been entirely satisfactory. Therefore a level of 929.0 ft will be maintained through the summer of 1969 and a hearing will be held in October 1969 to consider establishing a new legal level.

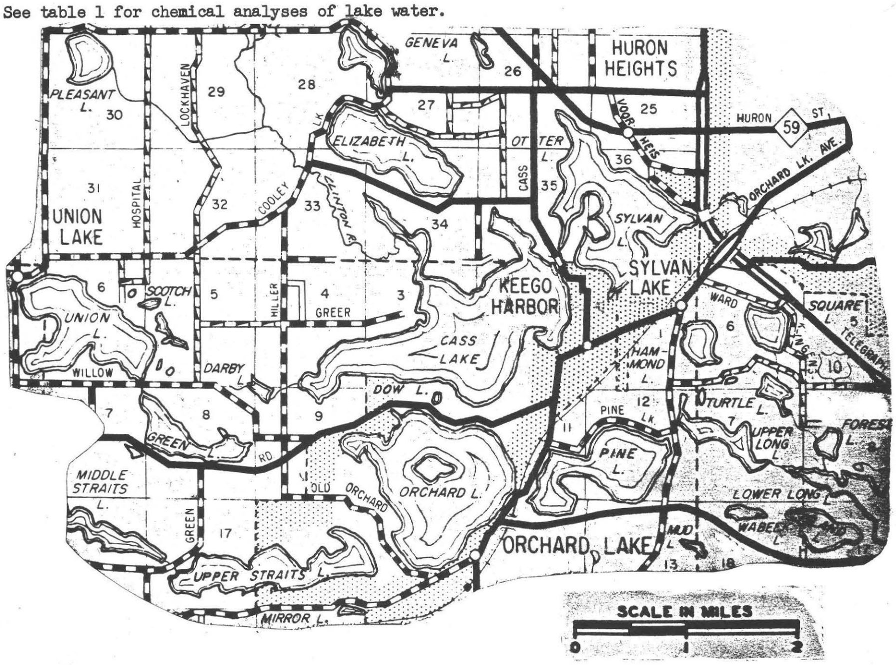
Extremes.--1942-60: Maximum stage observed, 2.82 ft Apr. 7, 8, 1950; minimum observed, 0.48 ft Aug. 26, 1944.

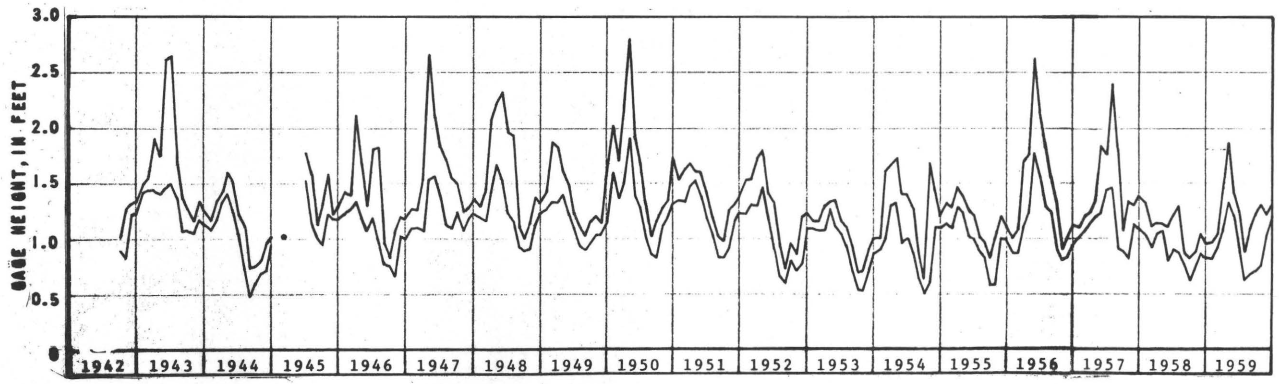
Regulation or control.--Some regulation due to operation of dam on the Clinton River below Sylvan Lake. A new dam for controlling lake level was constructed at Cass Lake outlet during the period October 1967 to February 1968. A pump has also been installed to pump water from Cass Lake to Orchard Lake during periods of low stages on Orchard Lake. Pumping began about May 31, 1968.

Remarks.--The principal inlet is the Clinton River, which enters Cass Lake on the north side. Darby Lake Outlet enters the west end. Cass Lake outlet, Clinton River, leaves the northeast end of the lake.
No discharge measurements have been made on the inlets. The following measurements were made at the outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
June 9, 1945	43.3	Aug. 14, 1953	14.1
July 13, 1948	93.4	Oct. 9, 1953	4.69
Sept. 30, 1948	8.68	Apr. 12, 1954	111
Dec. 1, 1948	63.8	June 25, 1954	43.4
Mar. 9, 1949	135	Aug. 20, 1954	3.23
June 10, 1949	29.2	Nov. 5, 1954	75.0
Sept. 15, 1949	14.2	Mar. 31, 1955	117
Apr. 12, 1950	76.4	July 20, 1955	12.2
Sept. 7, 1950	13.0	Oct. 10, 1955	12.0
Oct. 16, 1950	61.1	Jan. 5, 1956	31.4
Feb. 22, 1951	163	July 23, 1956	56.9
May 9, 1951	124	Oct. 16, 1956	15.9
Aug. 16, 1951	7.35	Jan. 17, 1957	41.1
Nov. 20, 1951	29.3	May 28, 1957	121
Feb. 14, 1952	45.8	Sept. 23, 1957	37.4
June 5, 1952	30.2	Mar. 14, 1958	71.1
Aug. 8, 1952	5.38	June 13, 1958	17.7
Oct. 28, 1952	10.2	Aug. 19, 1958	6.74
Feb. 11, 1953	18.3	Nov. 26, 1958	20.8
Apr. 14, 1953	32.2	May 13, 1959	82.5
		July 9, 1959	3.25

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Cass Lake at Keego Harbor, Mich.

OAKLAND COUNTY

Duck Lake near Highland, Mich.

Location.--Lat 42°39'45", long 83°35'28", in secs. 11, 12, and 14, T.3 N., R.7 E., 2.2 miles northeast of Highland.

Surface area.--253 acres.

Maximum depth.--31 ft.

Drainage area.--Not determined.

Records available.--October 1966 to September 1968.

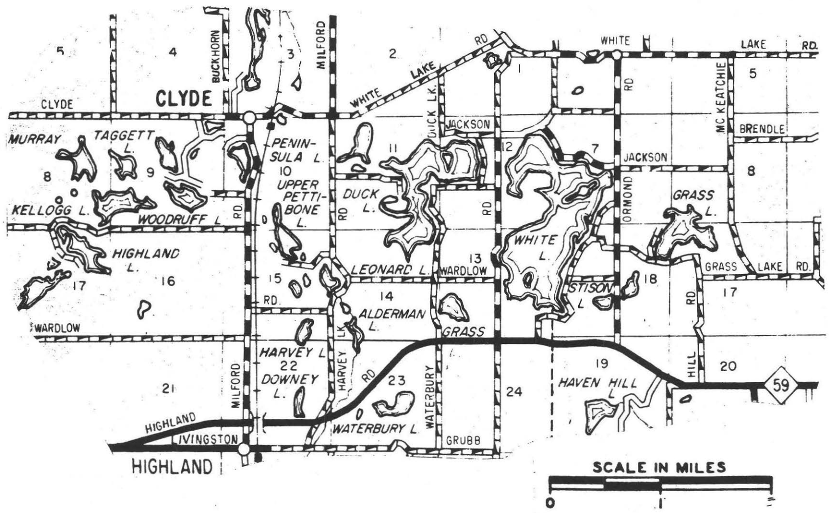
Gage.--Staff gage read daily. Datum of gage is 1,009.44 ft above mean sea level.

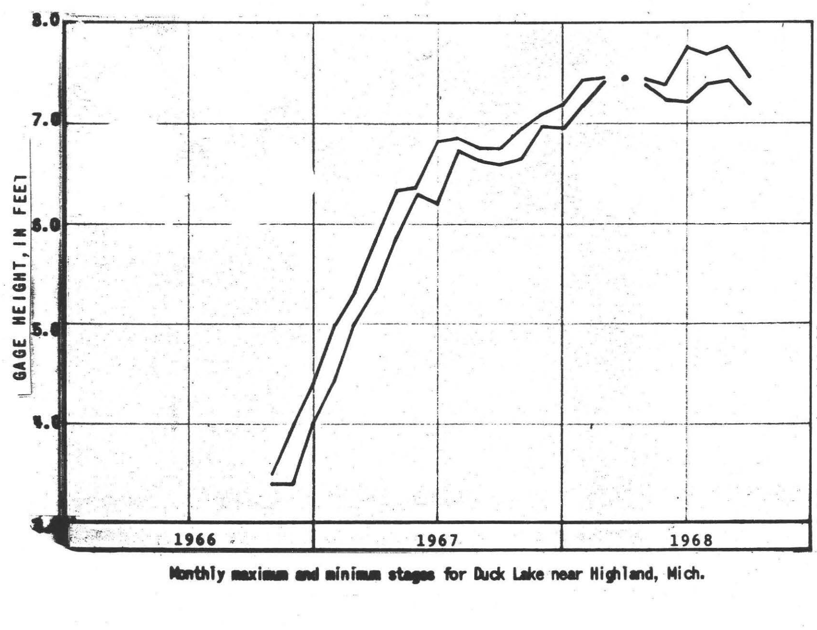
Established legal level.--1,016.63 ft above mean sea level, established by Circuit Court.

Extremes.--1966-68: Maximum stage, 7.78 ft June 29, 30, Aug. 19, 1968; minimum stage observed, 3.40 ft Oct. 11, 12, 13, 30, 31, Nov. 1, 1966.

Regulation or control.--Lake level is maintained by water pumped into the lake from a well set in a deep aquifer west of the lake. Pumping began in the fall of 1966.

Remarks.--The lake has no active inlets or outlets.
See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Duck Lake near Highland, Mich.

OAKLAND COUNTY

Elizabeth Lake near Keego Harbor, Mich.

Location.--Lat 42°37'26", long 83°22'39", in secs. 27, 28, 33, and 34, T.3 N., R.9 E., 2 miles northwest of Keego Harbor.

Surface area.--363 acres.

Maximum depth.--90 ft.

Drainage area at outlet.--2.39 sq mi.

Records available.--March 1966 to September 1968 except period September 1966 to March 1967 when only intermittent monthly readings were made.

Gage.--Staff gage read daily. Datum of gage not determined.

Established legal level.--None known.

Extremes.--1966-68: Maximum stage observed, 1.58 ft Jan. 30, 1968; minimum observed, -0.13 ft Oct. 17, 1966.

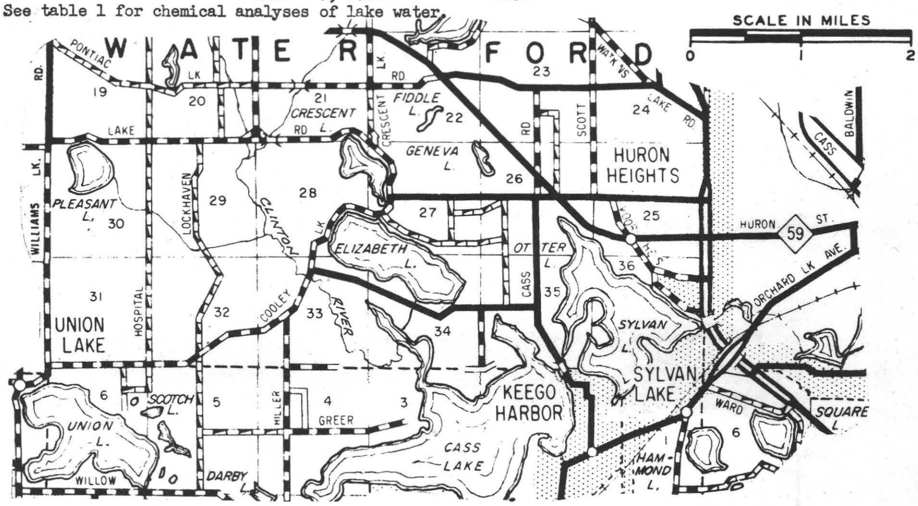
Regulation or control.--None.

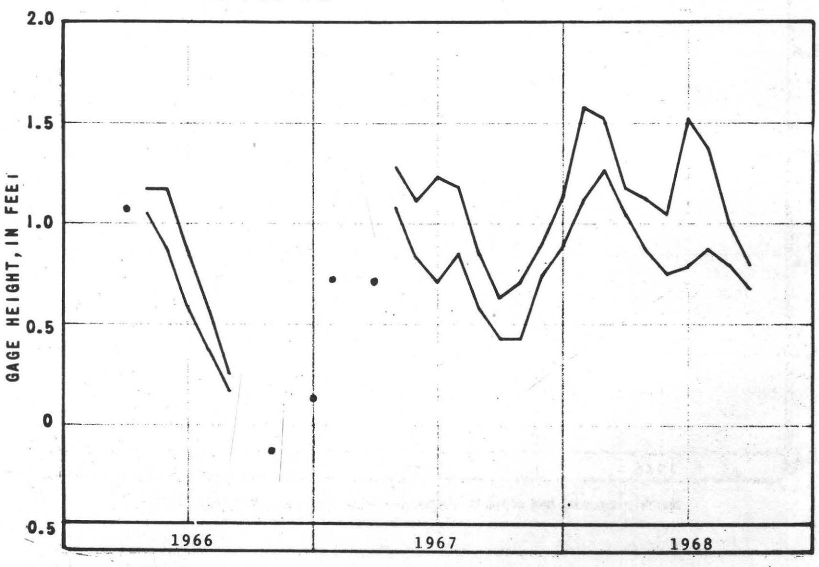
Remarks.--The principal inlet enters the northwest corner of the lake from Crescent Lake. The outlet leaves the south end of the lake and drains into Cass Lake and the Clinton River.

No discharge measurements have been made on the inlet. The following measurements have been made on the outlet at Cass-Elizabeth Lakes Road, in NW ¼ sec. 34, T.3 N., R.9 E. (drainage area, 2.39 sq mi).

Date	Discharge (cfs)
June 2, 1966	1.31
Oct. 13, 1966	0
Sept. 13, 1967	.15
Mar. 5, 1968	2.38

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Elizabeth Lake near Keego Harbor, Mich.

OAKLAND COUNTY

Galloway Lake at Pontiac, Mich.

Location.--Lat 42°39'46", long 83°14'58", in secs. 14, 15, 22, and 23, T.3 N., R.10 E., at Pontiac.

Surface area.--30 acres.

Maximum depth.--Unknown.

Drainage area.--12.1 sq mi, at Opdyke Road, 1,200 ft downstream from lake.

Records available.--September 1959 to September 1968 except for scattered periods when no readings were made.

Gage.--Staff gage read monthly from Nov. 1965 to Sept. 1968. Prior to Nov. 1965, gage read intermittently. Datum of gage not determined.

Established legal level.--None known.

Extremes.--1959-68: Maximum stage observed, 15.46 ft Mar. 13, 1962; minimum, observed, 11.44 ft Oct. 23-27, 1964.

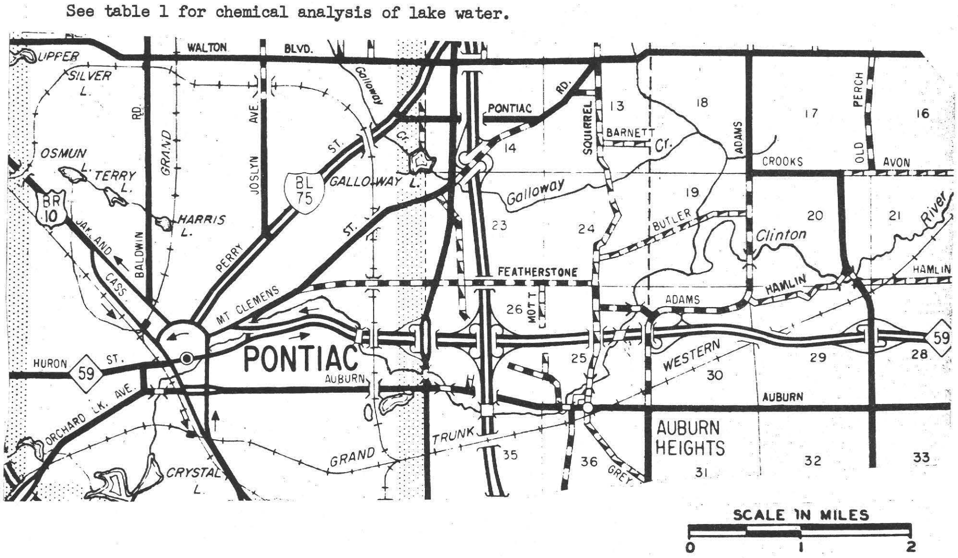
Regulation or control.--None.

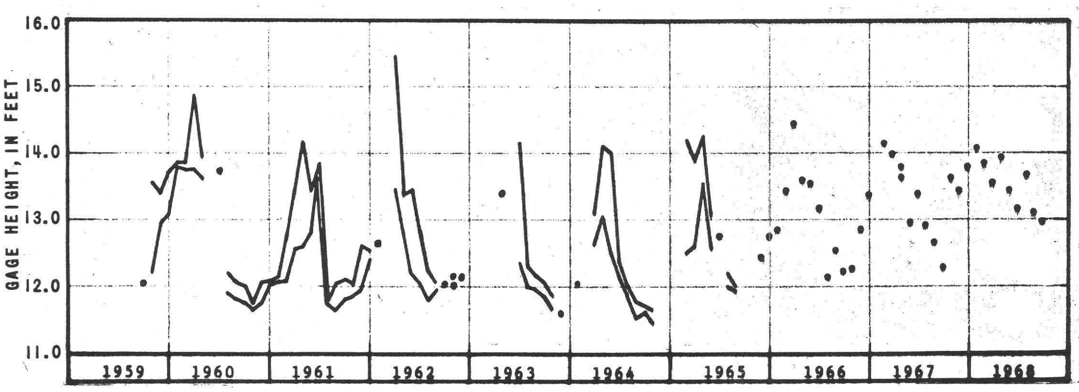
Remarks.--The principal inlet is Galloway Creek, which enters the northwest side of lake. A small intermittent stream enters the southwest side of the lake. The outlet, Galloway Creek, leaves the southeastern end of the lake and flows easterly to the Clinton River.

On Oct. 31, 1958 a discharge of 0.05 cfs was measured on Galloway Creek at Walton Road, one mile upstream from the lake, and 0.17 cfs was measured at Squirrel Road about 2 miles, downstream from the lake.

Records of daily streamflow have been collected since October 1959 on Galloway Creek, in SE¼ sec. 18, T.3 N., R.11 E. (drainage area, 17.8 sq mi). These records are published by the U.S. Geological Survey.

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Galloway Lake at Pontiac, Mich.

OAKLAND COUNTY

Judah Lake at Eames, Mich.

Location.--Lat 42°43'22", long 83°17'46", in secs. 29, 32, and 33, T.4 N., R.10 E., 0.5 mile west of Eames.

Surface area.--115 acres.

Maximum depth.--6 ft.

Drainage area at outlet.--3.44 sq mi.

Records available.--March 1966 to September 1968 except winter periods.

Gage.--Staff gage read daily. Datum of gage not determined.

Established legal level.--None known.

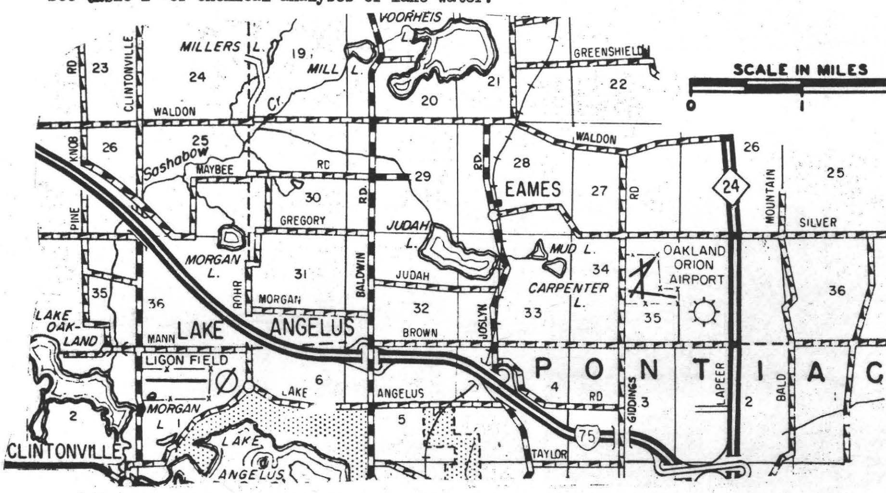
Extremes.--1966-68: Maximum stage observed, 2.26 ft June 29, 1968; minimum stage, 0.30 ft Nov. 1, 2, 1966.

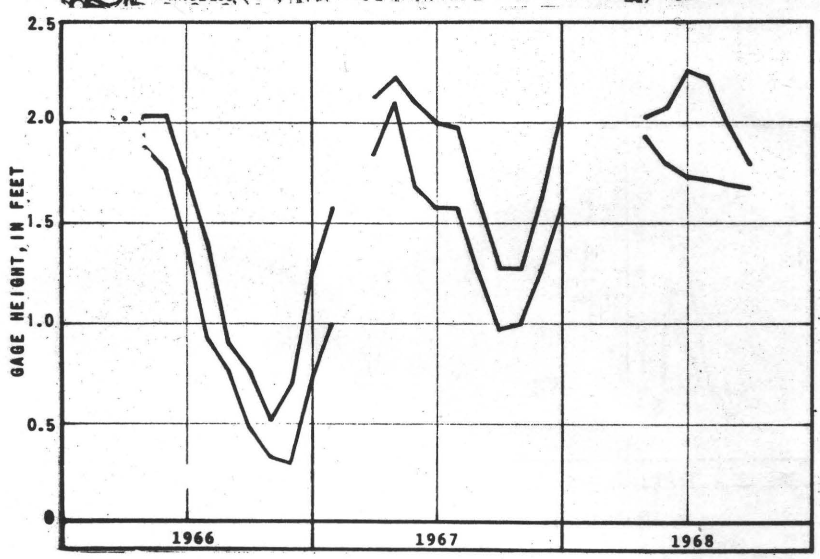
Regulation or control.--None.

Remarks.--The inlet is Mud Lake outlet which enters the east end of Judah Lake. The outlet leaves the northwest corner of the lake and flows about 2.3 miles northwest to Sashabaw Creek.
On Mar. 6, 1968, a flow of 0.24 cfs was measured on the inlet at Joslyn Road. The following discharge measurements have been made on the outlet at Baldwin Road, about 1 mile downstream from the lake (drainage area, 4.32 sq mi).

Date	Discharge (cfs)
Apr. 13, 1966	2.14
Oct. 10, 1966	0
July 21, 1967	.54
Sept. 13, 1967	0
Mar. 6, 1968	1.07

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Judah Lake at Eames, Mich.

OAKLAND COUNTY

Kent Lake near New Hudson, Mich.

Location.--Lat 42°30'45", long 83°40'35", in many sections, Tps. 1 and 2 N., Rs. 6 and 7 E., 3 miles west of New Hudson.

Surface area.--1,200 acres.

Maximum depth.--38 ft.

Drainage area at outlet.--143 sq mi.

Records available.--April 1949 to September 1968 except for occasional short periods and some winter periods.

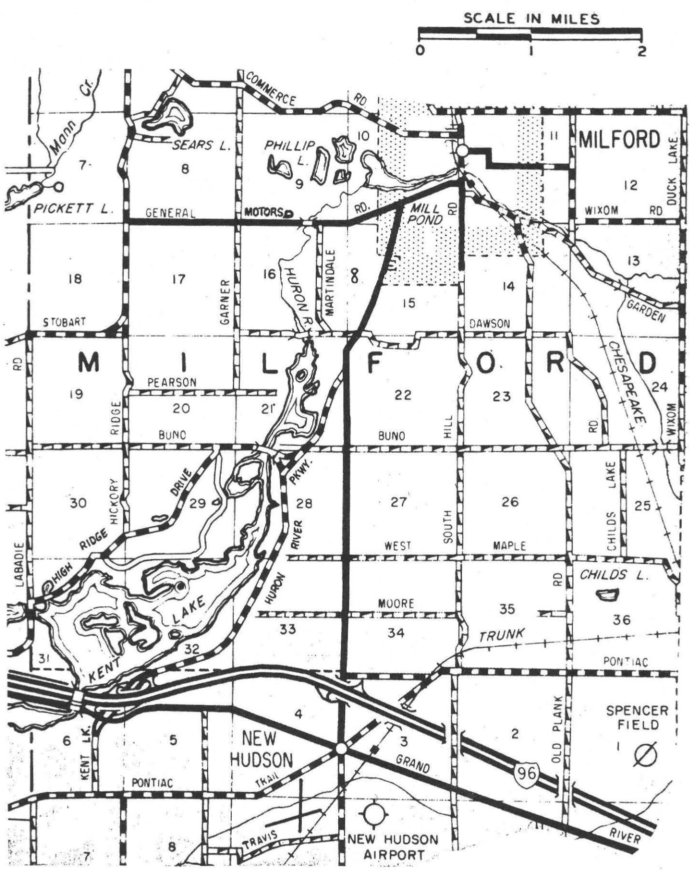
Gage.--Water-stage recorder. Datum of gage is 868.00 ft above mean sea level (from Huron-Clinton Metropolitan Authority bench mark).

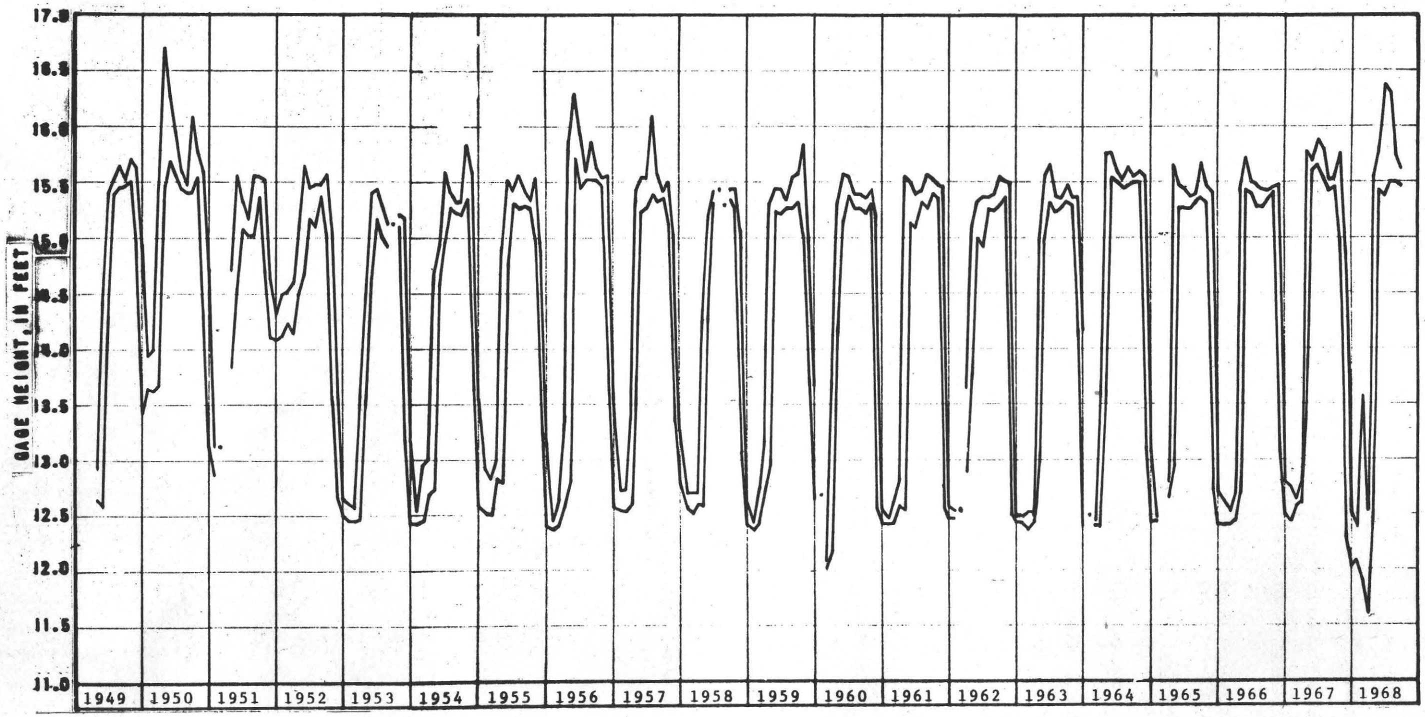
Established legal level.--None, however, the lake level is maintained at about 883.00 ft above mean sea level in the summer and lowered to about 880.00 ft during the winter.

Extremes.--1949-68: Maximum stage, 16.68 ft Apr. 6, 1950; minimum, 11.60 ft Mar. 7, 8, 1968.

Regulation or control.--A concrete dam with steel drum spillway is used to control the lake level.

Remarks.--The principal inlet and outlet is the Huron River which enters the northeast end of the lake and leaves the southwest end of the lake.
Daily records of streamflow are currently collected on the Huron River at sites 2 miles upstream and 150 ft downstream from Kent Lake. These records are published by the U.S. Geological Survey.
See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Kent Lake near New Hudson, Mich.

OAKLAND COUNTY

Loon Lake at Drayton Plains, Mich.

Location.--Lat 42°40'50", long 83°22'20", in secs. 10, 11, and 12, T.3 N., R.9 E., at Drayton Plains.

Surface area.--243 acres.

Maximum depth.--73 ft.

Drainage area at outlet.--74.4 sq mi.

Records available.--October 1943 to September 1968 except for some winter periods in early part of record.

Gage.--Staff gage read daily. Datum of gage is 945.16 ft above mean sea level.

Established legal level.--949.30 ft above mean sea level, established by Circuit Court.

Extremes.--1943-68: Maximum stage, above 5.15 ft June 27 to July 4, 1968; minimum, 3.00 ft Sept. 9-11, 1963.

Regulation or control.--A dam at the State Fish Hatchery about 0.5 mile downstream has some controlling effect on the lake.

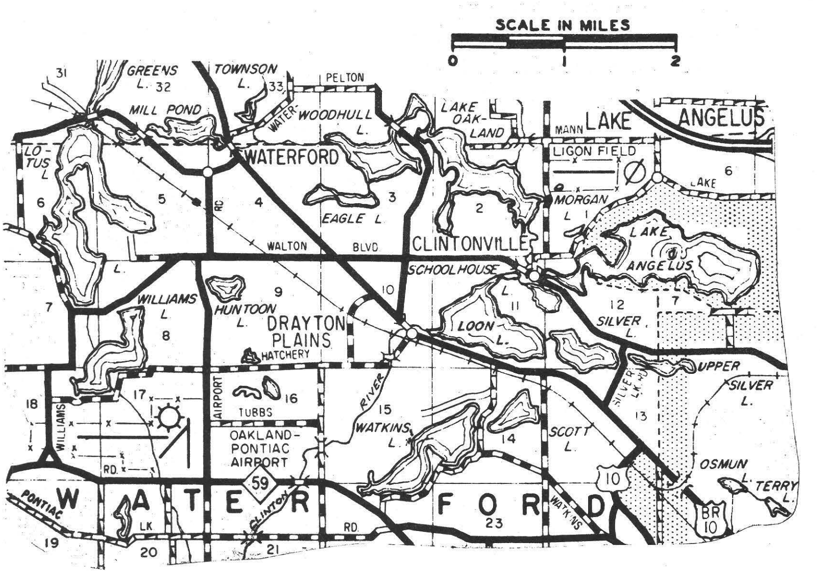
Remarks.--The principal inlet is the Clinton River which enters the north side of the lake. Silver Lake is connected to the east end of Loon Lake by a very short, unrestricted channel. The outlet, Clinton River leaves the west end of the lake.

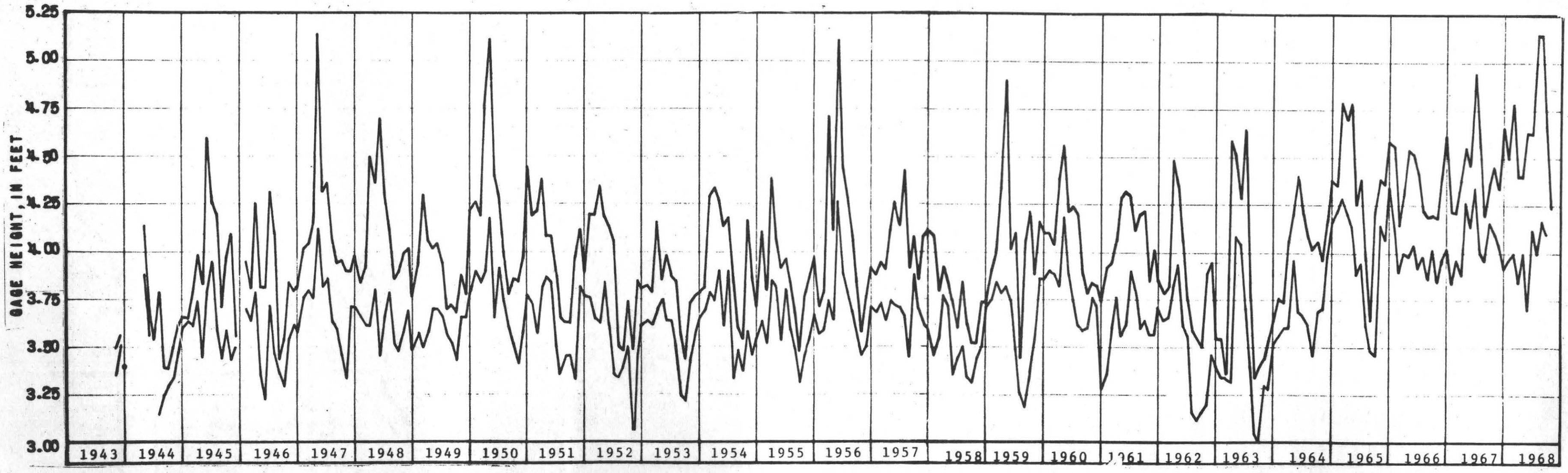
The following discharge measurements have been made on the Clinton River at Loon Lake outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
July 29, 1943	44.2	Oct. 28, 1952	14.1
Jan. 16, 1947	31.0	Feb. 12, 1953	37.8
Apr. 16, 1947	228	Apr. 14, 1953	70.2
May 13, 1947	107	July 28, 1953	21.2
July 17, 1947	43.3	Oct. 9, 1953	8.72
Nov. 19, 1947	43.6	Apr. 12, 1954	93.2
Jan. 22, 1948	38.2	June 22, 1954	38.4
May 6, 1948	58.9	Aug. 20, 1954	4.56
July 13, 1948	54.6	Oct. 8, 1954	58.1
Sept. 30, 1948	18.1	Mar. 31, 1955	96.5
Dec. 1, 1949	52.9	July 20, 1955	15.2
Mar. 9, 1949	92.4	Oct. 10, 1955	10.9
June 9, 1949	25.7	Jan. 5, 1956	23.3
Sept. 15, 1949	12.7	Apr. 16, 1956	79.2
Jan. 10, 1950	86.3	July 23, 1956	41.8
Apr. 12, 1950	193	Oct. 16, 1956	16.1
Sept. 7, 1950	16.6	Jan. 17, 1957	35.4
Oct. 16, 1950	53.7	May 28, 1957	107
Feb. 27, 1951	126	Sept. 23, 1957	18.7
May 8, 1951	96.1	Dec. 21, 1957	71.3
Aug. 16, 1951	19.0	Mar. 14, 1958	60.8
Nov. 20, 1951	76.2	June 13, 1958	24.5
Feb. 14, 1952	96.8	Aug. 19, 1958	6.02
June 5, 1952	72.5	Nov. 26, 1958	12.8
Aug. 8, 1952	8.54	May 13, 1959	68.3
		July 9, 1959	4.51

Records of daily discharge have been collected since October 1959 on the Clinton River at State Highway 59, about 2 miles downstream from Loon Lake (drainage area, 79.5 sq mi). These records are published by the U. S. Geological Survey.

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Loon Lake at Drayton Plains, Mich.

OAKLAND COUNTY

Orchard Lake near Orchard Lake, Mich.

Location.--Lat 42°35'42", long 83°21'55", in secs. 9, 10, 11, 14, and 15, T.2 N., R.9 E., 0.8 mile northwest of Orchard Lake.

Surface area.--788 acres.

Maximum depth.--110 ft.

Drainage area at outlet.--Not determined.

Records available.--September 1942 to September 1968 except various short periods when gage was removed, and during winter months.

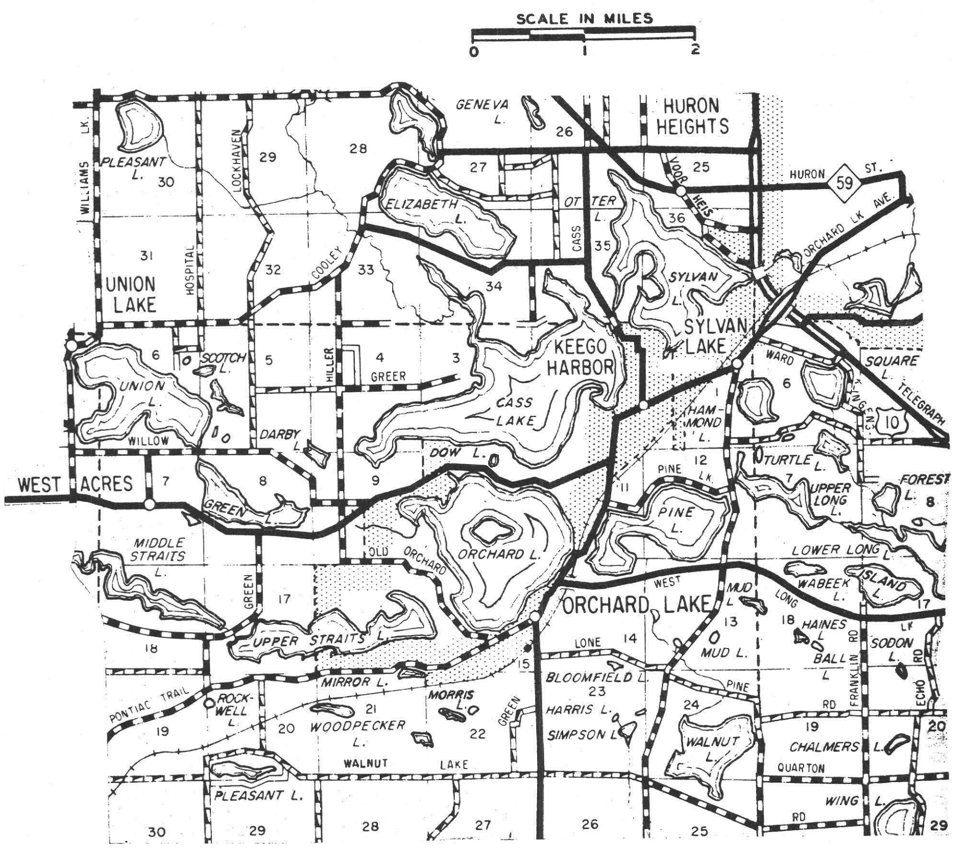
Gage.--Staff gage read daily. Datum of gage is 925.55 ft above mean sea level (levels by Michigan Department of Natural Resources).

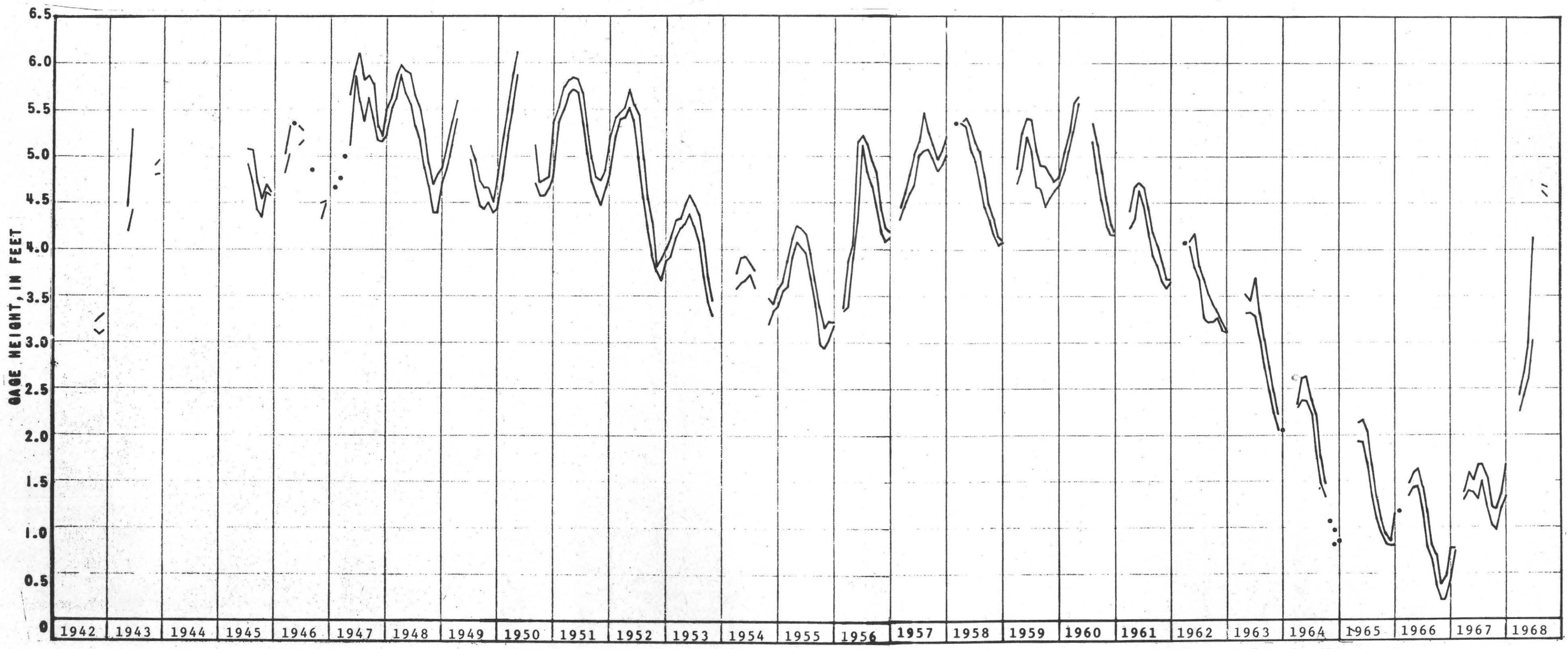
Established legal level.--930.50 ft above mean sea level, established by Circuit Court in 1966.

Extremes.--1942-68: Maximum stage observed, 6.14 ft Apr. 7, 1950; minimum observed, 0.22 ft Oct. 31 to Nov. 2, 1966.

Regulation or control.--A pipeline built in 1968, connects Orchard and Cass Lakes. A control structure at the lake end of the pipeline is set at the legal level of Orchard Lake. When Orchard Lake is above this level water flows to Cass Lake. When Orchard Lake is below this level, water is pumped from Cass Lake into Orchard Lake to maintain the legal level.

Remarks.--Orchard Lake has a small inlet at the west end of the lake. At times, water is pumped from Cass Lake to help maintain the level of Orchard Lake. The only outlet is by way of a pipeline to Cass Lake. When the level of Orchard Lake is above the control structure the overflow goes to Cass Lake and into the Clinton River. No discharge measurements are available on the inlets or outlet.
See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Orchard Lake near Orchard Lake, Mich.

OAKLAND COUNTY

Pine Lake near Orchard Lake, Mich.

Location.--Lat 42°35'02", long 83°21'08", in secs. 11, 12, 13, and 14, T.2 N., R.9 E., at Orchard Lake.

Surface area.--395 acres.

Maximum depth.--90 ft.

Drainage area.--1.82 sq mi.

Records available.--March 1966 to September 1968 except September 1966.

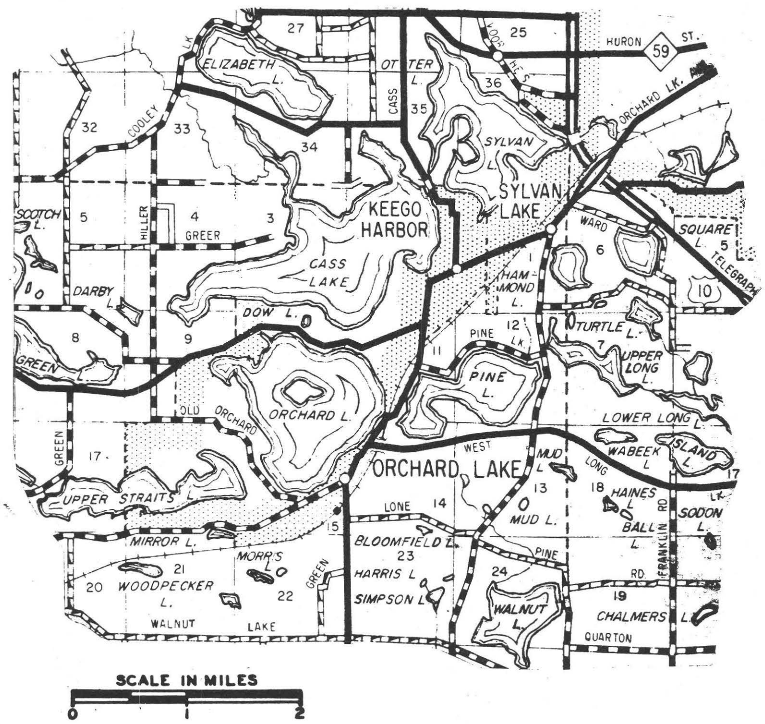
Gage.--Staff gage read daily. Datum of gage not determined.

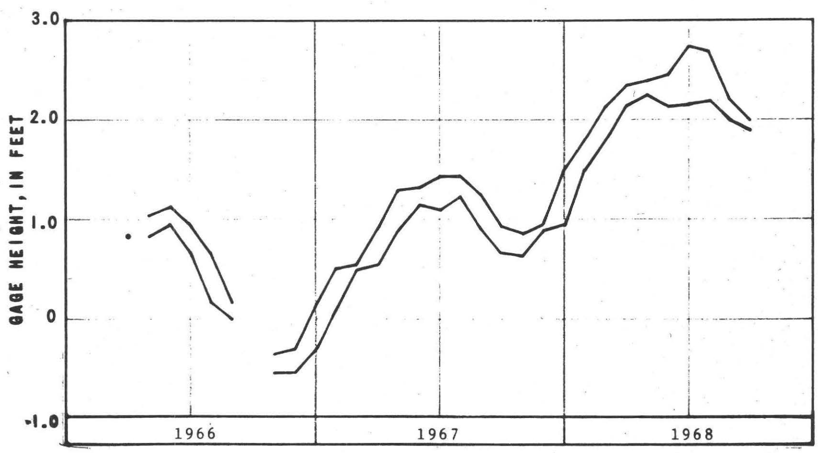
Established legal level.--None known.

Extremes.--1966-68: Maximum stage, 2.74 ft June 27-30, 1968; minimum stage observed, -0.52 ft Oct. 31, Nov. 1, 2, 1966.

Regulation or control.--None.

Remarks.--Pine Lake has an intermittent inlet which enters the northeast end of lake. There is no active outlet.
No discharge measurements have been made on the inlet.
See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Pine Lake near Orchard Lake, Mich.

OAKLAND COUNTY

Pontiac Lake near Drayton Plains, Mich.

Location.--Lat 42°39'42", long 83°27'10", in secs. 11, 12, 13, 14, and 18, T.3 N., Rs. 8 and 9 E., 4 miles southwest of Drayton Plains.

Surface area.--640 acres.

Maximum depth.--34 ft.

Drainage area at outlet.--20.8 sq mi.

Records available.--October 1945 to September 1968.

Gage.--Staff gage read once daily. Datum of gage is 960.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--962.83 ft above mean sea level, established by Circuit Court on Apr. 24, 1944.

Extremes.--1945-68: Maximum stage, 3.93 ft June 28, 1968; minimum, 0.26 ft Nov. 23 to Dec. 5, 1964.

Regulation or control.--A concrete fixed-crest dam with vertical lift gates at the outlet controls the lake level.

Remarks.--The inlet is the Huron River which enters the west end of the lake. The outlet, Huron River, leaves the south side of the lake near the east end.

An engineering lake-level control study was completed in 1949 by the Michigan Department of Natural Resources.

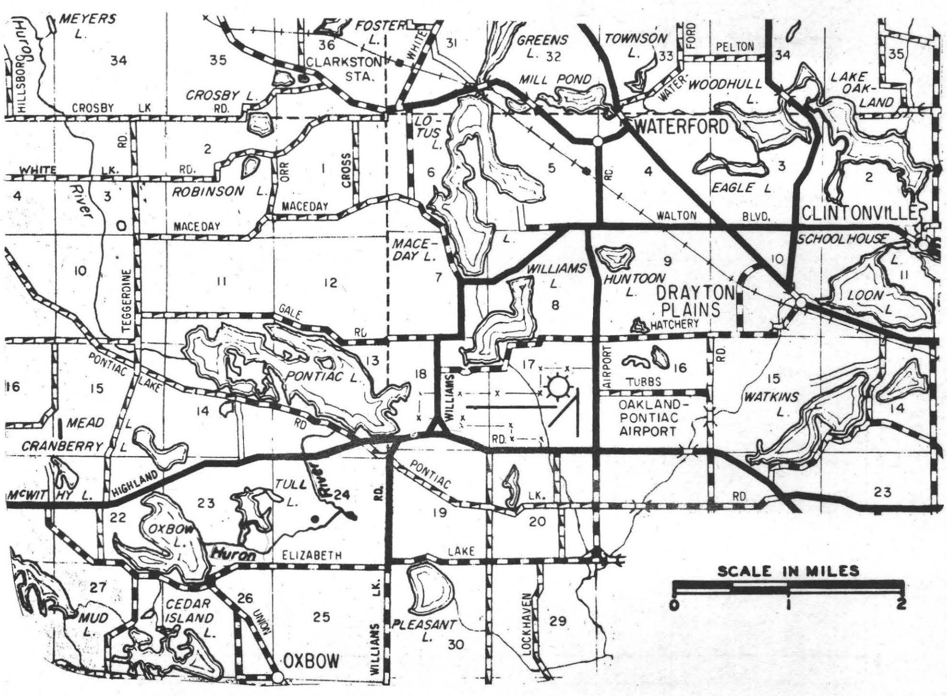
The following discharge measurements were made on the Huron River, in SE$\frac{1}{4}$ sec.3, T.3 N., R.8 E., at White Lake Road, about 2 miles upstream from Pontiac Lake (drainage area, 14.0 sq mi).

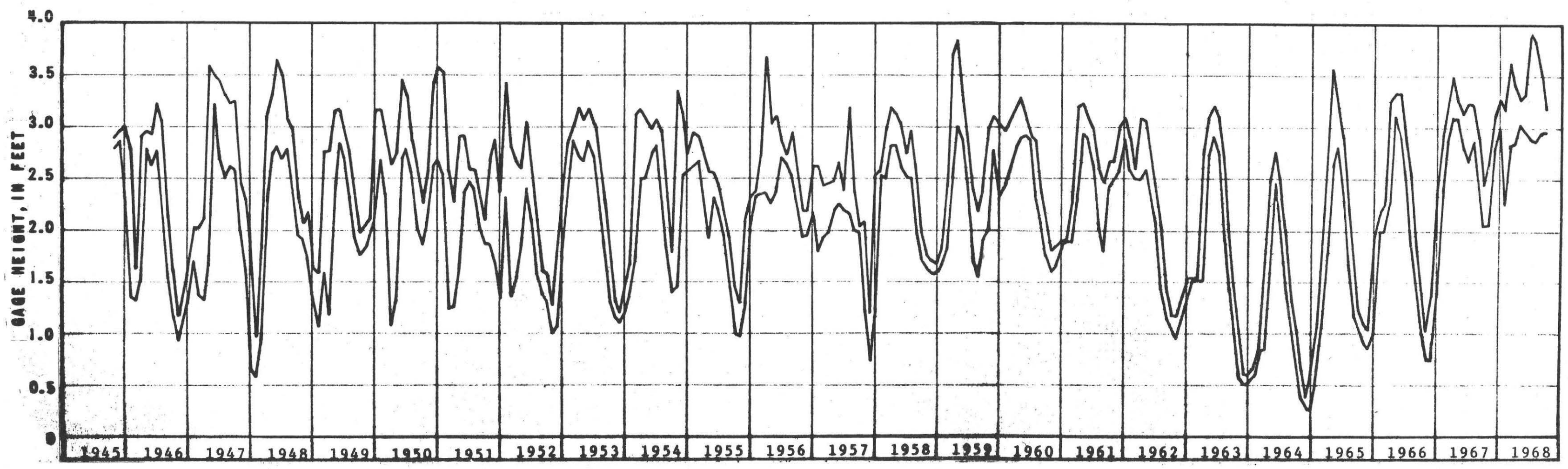
Date	Discharge (cfs)	Date	Discharge (cfs)
Feb. 23, 1966	1.95	Jan. 7, 1967	3.46
Apr. 14, 1966	3.23	May 25, 1967	2.23
July 26, 1966	.16	Sept. 13, 1967	.34
Oct. 13, 1966	.26	Mar. 5, 1968	3.28

The following discharge measurements were made at the outlet of Pontiac Lake.

Date	Discharge (cfs)	Date	Discharge (cfs)
July 13, 1948	1.46	Sept. 6, 1950	0
Sept. 30, 1948	0	Feb. 14, 1952	39.0
Dec. 1, 1948	30.4	Feb. 23, 1966	0
June 8, 1949	0	Apr. 14, 1966	4.05
Sept. 15, 1949	0	July 26, 1966	0
Oct. 7, 1949	.18	Oct. 13, 1966	.03
Dec. 8, 1949	.20	Jan. 7, 1967	.05
Jan. 10, 1950	28.9	May 24, 1967	.97
Feb. 2, 1950	22.7	Sept. 13, 1967	.16
Apr. 12, 1950	62.7	Mar. 5, 1968	1.20

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Pontiac Lake near Drayton Plains, Mich.

OAKLAND COUNTY

Proud Lake near Commerce, Mich.

Location.--Lat 42°34'24", long 83°32'31", in secs. 16, 17, 18, 20, and 21, T.2 N., R.8 E., 2.8 miles southwest of Commerce.

Surface area.--116 acres, includes Moss Lake, area 12 acres.

Maximum depth.--39 ft.

Drainage area.--76.0 sq mi, at bridge below Moss Lake in SE¼ sec. 18, T.2 N., R.8 E.

Records available.--October 1945 to January 1957, except some periods of one to two months when no records were obtained. Records also represent stages of Moss Lake.

Gage.--Staff gage read intermittently from October 1951 to January 1957. Prior to October 1951, gage read daily. Datum of gage is 901.81 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1945-57: Maximum stage observed, 2.86 ft May 13, 14, 1948; minimum observed, -0.14 ft Jan. 17, 24, 25, 31, 1956.

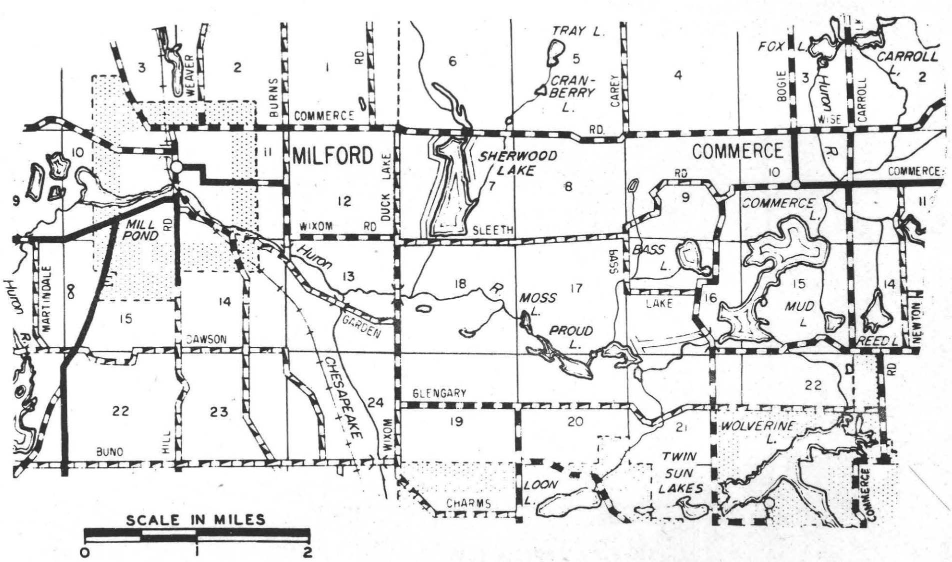
Regulation or control.--None.

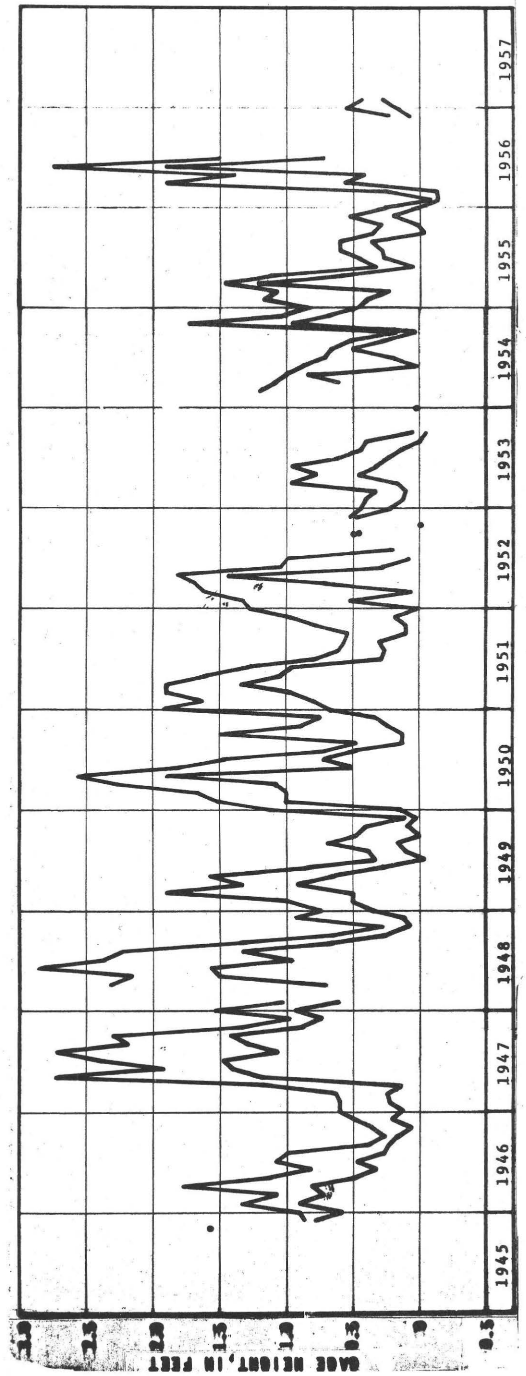
Remarks.--The principal inlet, Huron River, enters the east end of Proud Lake, about one mile downstream from Commerce Lake. Another stream, draining several small lakes, enters the north side of the lake. Huron River is also the lake outlet. It discharges from the west end of Moss Lake.

Records of daily discharge have been collected since March 1946 on the Huron River, at SE¼ sec. 10, T.2 N., R.8 E., about 3 miles upstream from Proud Lake. Daily discharges are also available since September 1948 on the Huron River, at SE ¼ sec. 9, T.2 N., R.7 E., about 5 miles downstream from Proud Lake. These records are published by the U. S. Geological Survey as "Huron River at Commerce" and "Huron River at Milford" respectively.

The following discharge measurements were made on the Huron River in SE¼ sec. 18, T.2 N., R.8 E. (drainage area, 76.0 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Jan. 17, 1947	35.5	Nov. 21, 1951	82.1
Apr. 17, 1947	209	Feb. 19, 1952	110
May 13, 1947	139	June 6, 1952	74.3
July 18, 1947	63.7	Aug. 8, 1952	17.7
Nov. 19, 1947	82.9	Oct. 28, 1952	21.5
Jan. 22, 1948	52.1	Feb. 12, 1953	42.2
May 18, 1948	264	Apr. 13, 1953	80.4
July 13, 1948	73.1	July 28, 1953	17.4
Sept. 30, 1948	32.5	Oct. 9, 1953	16.0
Nov. 30, 1948	80.0	Apr. 12, 1954	101
Mar. 11, 1949	102	June 25, 1954	36.5
June 23, 1949	34.1	Aug. 19, 1954	17.7
Sept. 15, 1949	20.7	Nov. 5, 1954	64.2
Dec. 8, 1949	43.1	Mar. 25, 1955	108
Apr. 19, 1950	193	June 14, 1955	35.3
Sept. 6, 1950	24.9	July 22, 1955	22.3
Oct. 16, 1950	61.3	Oct. 10, 1955	32.6
Feb. 22, 1951	178	Jan. 24, 1956	28.9
May 9, 1951	105	Apr. 14, 1956	85.6
Aug. 10, 1951	41.9	July 24, 1956	29.5
		Oct. 16, 1956	26.6





Monthly maximum and minimum stages for Proud Lake near Commerce, Mich.

OAKLAND COUNTY

Secord Lake near Leonard, Mich.

Location.--Lat 42°52'27", long 83°06'45", in sec. 1, T.5 N., R.11 E., 1.8 miles northeast of Leonard.

Surface area.--55 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--8.18 sq mi.

Records available.--March 1960 to September 1968 except periods November 1964 and February to April 1967.

Gage.--Gage read daily. Datum of gage not determined.

Established legal level.--None known.

Extremes.--1960-68: Maximum stage observed, 10.10 ft Apr. 8, 1965, Feb. 2, 3, 1968; minimum stage, 7.89 ft Oct. 31, Nov. 16, 17, 22-24, 1963.

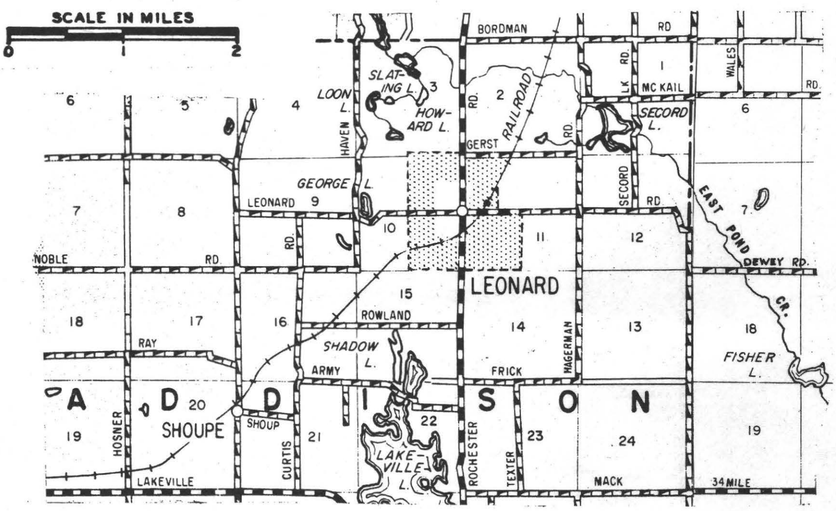
Regulation or control.--Lake level is regulated by dam at outlet.

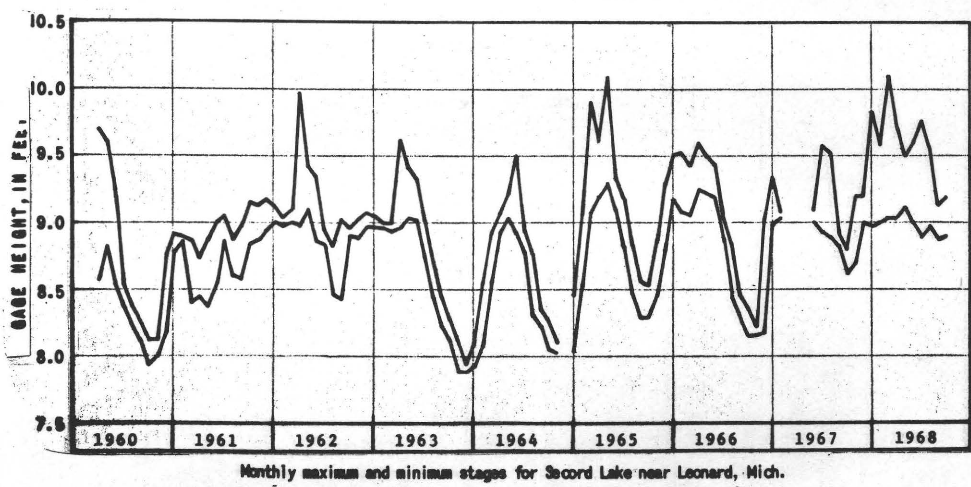
Remarks.--Two small inlets enter Secord Lake, one at the northwest side and one at the southwest side. The outlet, East Pond Creek, leaves the southeast end of the lake and flows southeasterly to the Clinton River.

No discharge measurements have been made on the inlets. The following measurements were made on the outlet at Dewey Road, about 1.5 miles downstream from the lake (drainage area, 9.49 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Sept. 15, 1959	0.96	Nov. 9, 1961	1.02
June 9, 1960	1.87	Apr. 16, 1963	2.29
Aug. 18, 1960	.06	July 30, 1964	0
Oct. 11, 1960	.02	Apr. 12, 1966	5.86
Mar. 29, 1961	4.42	May 24, 1967	3.22
May 24, 1961	.76	June 1, 1967	1.27
Sept. 11, 1961	.93	Sept. 13, 1967	.04

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Secord Lake near Leonard, Mich.

OAKLAND COUNTY

Tipsico Lake near Rose Center, Mich.

Location.--Lat 42°43'37", long 83°40'41", in secs. 19, 30, and 31, T. 4 N., R.7 E., 3.1 miles west of Rose Center.

Surface area.--301 acres.

Maximum depth.--27 ft.

Drainage area at outlet.--3.59 sq mi.

Records available.--March 1966 to September 1968.

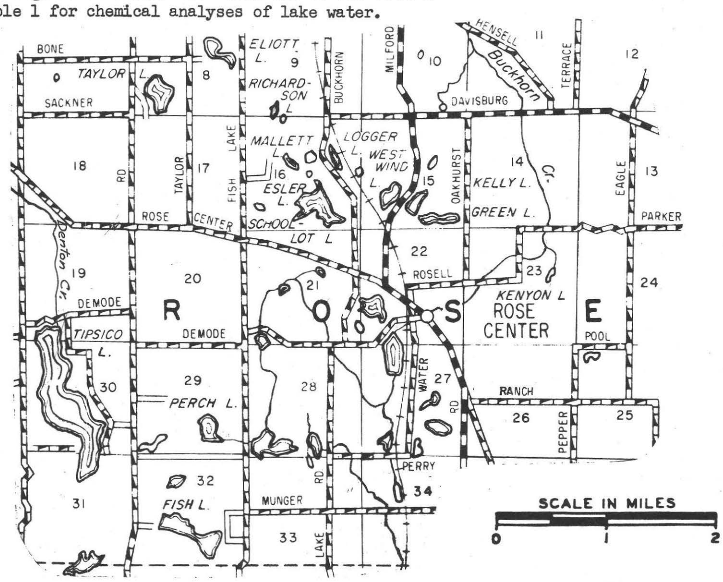
Gage.--Staff gage read daily. Datum of gage is 1,011.74 ft above mean sea level (from correlation with Oakland County gage readings).

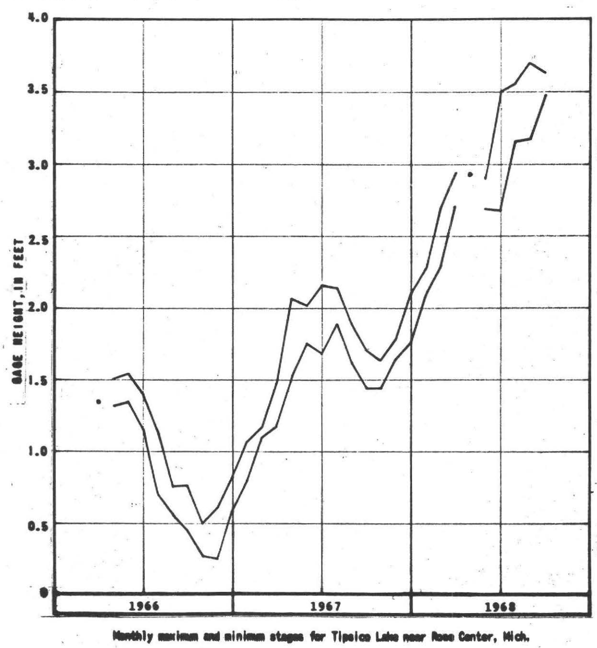
Established legal level.--1,015.39 ft above mean sea level, established by Circuit Court on June 19, 1954.

Extremes.--1966-68: Maximum stage observed 3.71 ft Aug. 22, 1968; minimum stage, 0.25 ft Nov. 1, 1966.

Regulation or control.--A control structure at outlet with flash boards is used to regulate lake levels.

Remarks.--There is no active inlet to Tipsico Lake. The outlet, Denton Creek, at the north end of the lake, is tributary to the Shiawassee River.
No discharge measurements are available on the outlet.
See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Tipsico Lake near Rose Center, Mich.

OAKLAND COUNTY

Union Lake near Commerce, Mich.

Location.--Lat 42°36'08", long 83°26'47", in secs. 1, 5, and 6, T.2 N., Rs. 8 and 9 E., 2.4 miles northeast of Commerce.

Surface area.--465 acres.

Maximum depth.--102 ft.

Drainage area at outlet.--3.11 sq mi.

Records available.--November 1944 to October 1959 except periods April 1945 to February 1946, November 1950 to October 1951, December 1952 to August 1953, and August 1959.

Gage.--Staff gage read daily. Datum of gage is 921.47 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--927.07 ft above mean sea level, established by Circuit Court on June 17, 1949.

Extremes.--1944-59: Maximum stage observed, 6.18 ft Mar. 23-28, Apr. 1, 1959; minimum observed, 4.06 ft Jan. 1, 3, 6, 7, 10, 13, 14, 17, 20, 21, 23, 27, 29, Feb. 1, 1945.

Regulation or control.--Lake levels controlled with planks in temporary dam at outlet. Dam operations started Mar. 18, 1945.

Remarks.--Union Lake has several small inlets on the east side. The outlet, Hayes Creek, leaves the southwest tip of the lake and flows into the Huron River at Commerce about 2 miles downstream from the lake.

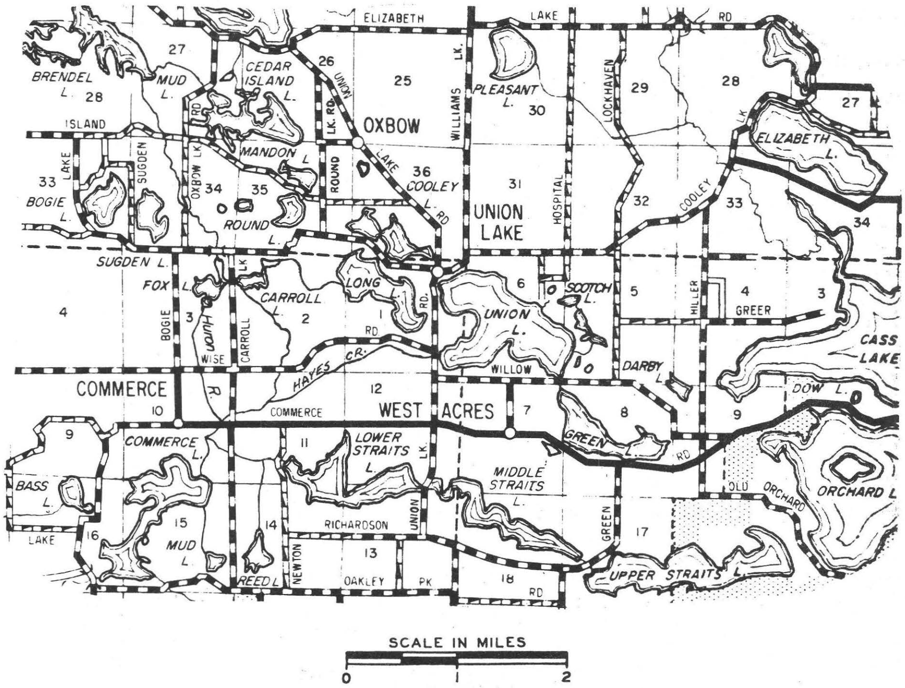
No discharge measurements are available on the inlets. The following discharge measurements have been made at the lake outlet.

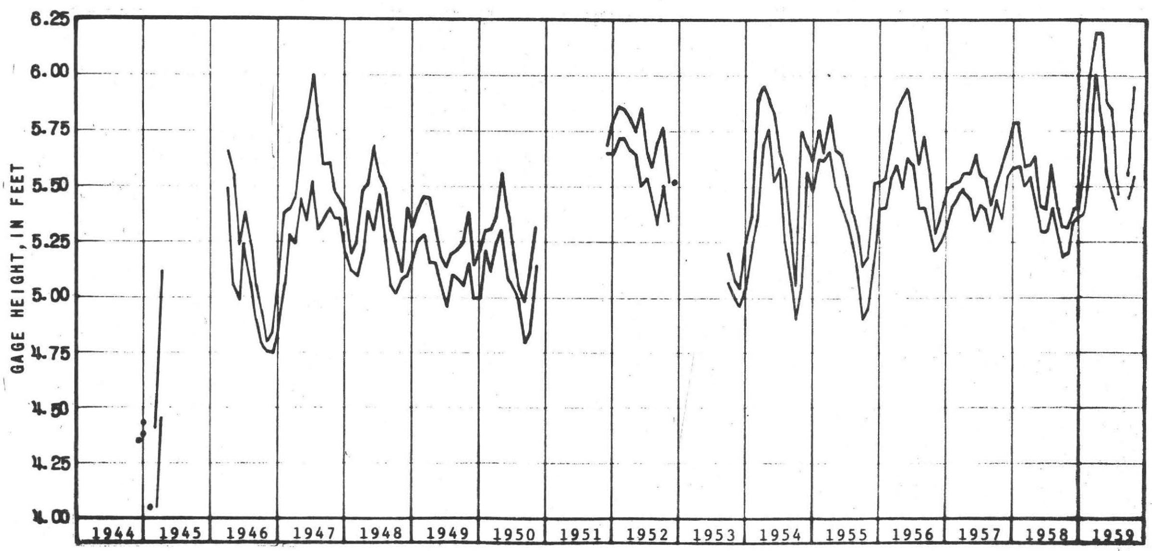
Date	Discharge (cfs)
Nov. 20, 1944	0.23
Mar. 1, 1946	5.50
Mar. 4, 1946	6.27
Mar. 12, 1946	9.36
Apr. 8, 1946	11.5
Apr. 19, 1946	5.95
May 14, 1946	.41
June 21, 1946	5.52
July 19, 1946	.59
Aug. 27, 1946	.15
Sept. 12, 1946	.19
Oct. 22, 1946	.10
Nov. 5, 1946	.10
Dec. 6, 1946	.12
Jan. 17, 1947	2.03
Feb. 18, 1947	3.57
Mar. 10, 1947	1.99
Mar. 31, 1947	7.12
Apr. 3, 1947	9.80
Apr. 9, 1947	16.8
Apr. 17, 1947	20.1
May 13, 1947	1.05
June 19, 1947	9.32
July 17, 1947	3.16
Aug. 26, 1947	5.16
Sept. 24, 1947	5.22
Oct. 16, 1947	2.13
Nov. 19, 1947	3.25
Dec. 16, 1947	7.85
Feb. 9, 1948	4.06
Mar. 17, 1948	6.49
Apr. 14, 1948	14.4
May 6, 1948	9.03
June 16, 1948	3.69
July 12, 1948	6.41
Sept. 23, 1948	.43
Oct. 15, 1948	.42
Nov. 10, 1948	6.00
Dec. 1, 1948	4.84
Jan. 6, 1949	4.44
Feb. 2, 1949	5.91
Mar. 9, 1949	7.91
Apr. 7, 1949	8.20
May 5, 1949	6.84
June 9, 1949	0
July 8, 1949	0
Aug. 1, 1949	0
Sept. 8, 1949	0
Oct. 7, 1949	.29
Nov. 4, 1949	2.81
Dec. 8, 1949	3.05
Jan. 10, 1950	9.83
Feb. 2, 1950	8.59
Mar. 9, 1950	9.04
Apr. 11, 1950	13.6
May 16, 1950	7.20
June 7, 1950	10.7
July 21, 1950	2.26
Aug. 10, 1950	.66
Sept. 6, 1950	0
Oct. 16, 1950	3.97
Dec. 5, 1950	.08
Feb. 22, 1951	9.28
Mar. 13, 1951	8.70
Apr. 12, 1951	9.33
May 9, 1951	5.64
Aug. 10, 1951	.36
Sept. 4, 1951	.97
Oct. 4, 1951	.90
Nov. 21, 1951	3.77
Dec. 7, 1951	5.76
Jan. 24, 1952	6.69
Feb. 19, 1952	6.24
Mar. 26, 1952	10.2
Apr. 8, 1952	10.3
June 5, 1952	.48
Oct. 28, 1952	.15 estimated

From March 1946 to June 1951 daily records of streamflow were collected on the outlet, Hayes Creek, at a site about 2 miles downstream from the lake (drainage area, 7.55 sq mi, approximately). These records are published in U.S. Geological Survey Water-Supply Papers.

See table 1 for chemical analysis of lake water.

GPO 818-596-19





Monthly maximum and minimum stages for Union Lake near Commerce, Mich.

OAKLAND COUNTY

Voorheis Lake near Lake Orion, Mich.

Location.--Lat 42°44'52", long 83°17'55", in secs. 20 and 21, T.4 N., R.10 E., 4 miles southwest of Lake Orion.

Surface area.--182 acres.

Maximum depth.--70 ft.

Drainage area at outlet.--5.91 sq mi.

Records available.--October 1959 to June 1967 except periods April and July 1962, March to July, September, and October 1963, January to May 1964, March to June, and August to October 1965, and January and February 1967.

Gage.--Staff gage read intermittently January 1964 to June 1967. Prior to January 1964 gage read daily. Datum of gage not determined.

Established legal level.--None known.

Extremes.--1959-67: Maximum stage observed, 2.42 ft Mar. 14-18, 1962; minimum observed, 0.20 ft Nov. 17-22, Dec. 1-8, 1963.

Regulation or control.--None.

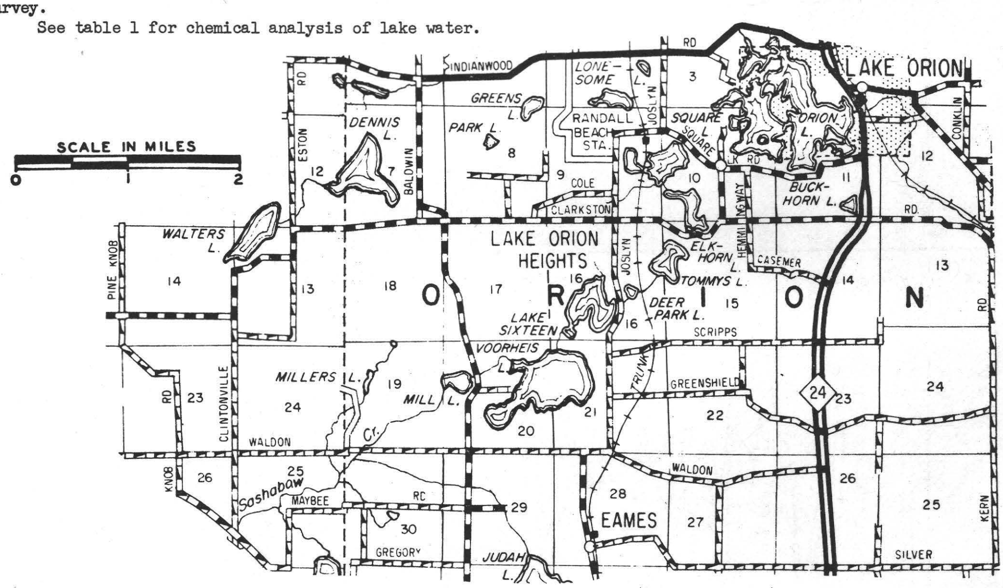
Remarks.--There are several small inlets to Voorheis Lake, one of which is from Lake Sixteen on the north. The outlet, Sashabaw Creek, leaves the northwest side of the lake and flows through Mill Lake to the Clinton River

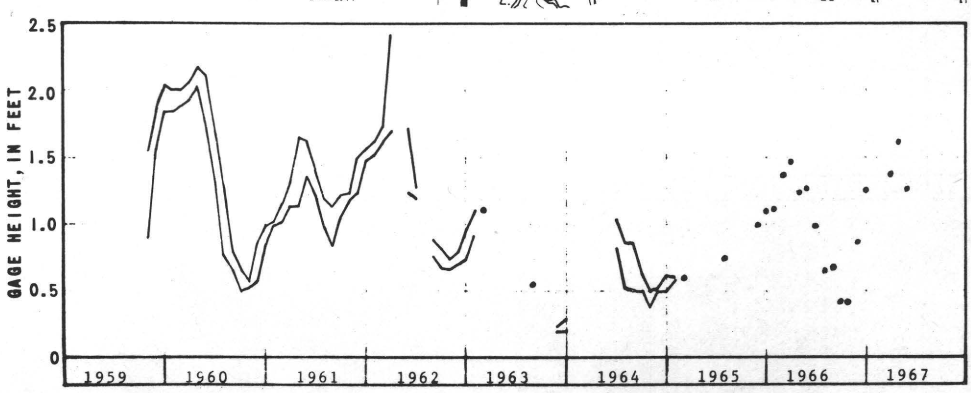
No discharge measurements are available on the inlets. The following measurements were made on the outlet about 2 miles downstream from the lake (drainage area, 9.73 sq mi).

Date	Discharge (cfs)
May 25, 1967	7.49
Sept. 13, 1967	1.30

Daily records of streamflow are also collected on the outlet, Sashabaw Creek near Drayton Plains, about 4 miles below the lake (drainage area, 21.0 sq mi). These records are published by the U.S. Geological Survey.

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Voorheis Lake near Lake Orion, Mich.

OAKLAND COUNTY

Walled Lake near Walled Lake, Mich.

Location.--Lat 42°30'55", long 83°29'36", in secs. 2, 3, 34, and 35, Tps. 1 and 2 N., R.8 E., 1.2 miles southwest of Walled Lake.

Surface area.--670 acres.

Maximum depth.--53 ft.

Drainage area.--Not determined.

Records available.--September 1942 to September 1968 except periods September 1949, March and June 1966, January and February 1967, and January 1968.

Gage.--Staff gage read daily. Datum of gage is 930.84 ft above mean sea level.

Established legal level.--None known.

Extremes.--1942-68: Maximum stage, 3.22 ft May 18-20, 1943; minimum stage observed, -0.06 ft Nov. 19, 1964.

Regulation or control.--None.

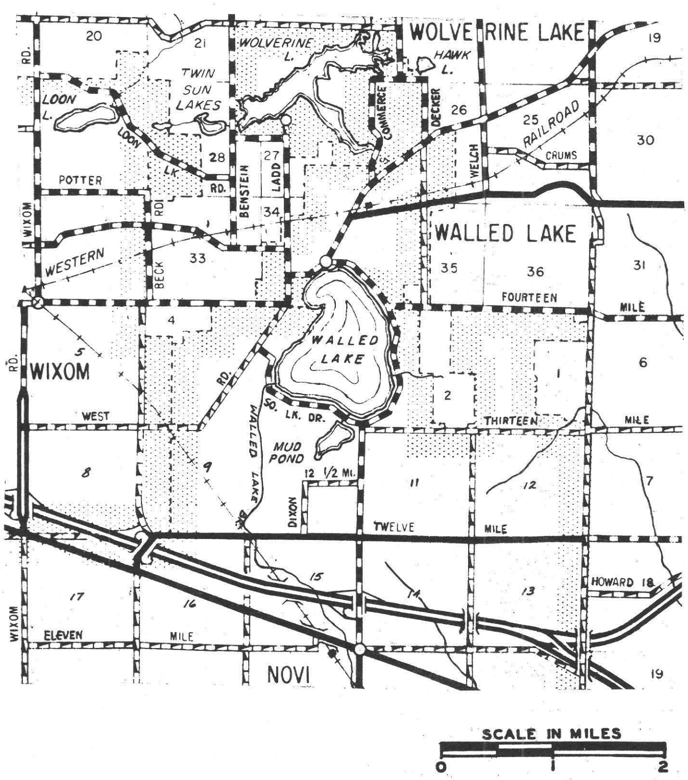
Remarks.--There is one small inlet stream which is on the east side of the lake. Mud Pond is also connected to the lake. The outlet, which leaves the southwest side of the lake, is the Walled Lake Branch, a tributary to Middle River Rouge.

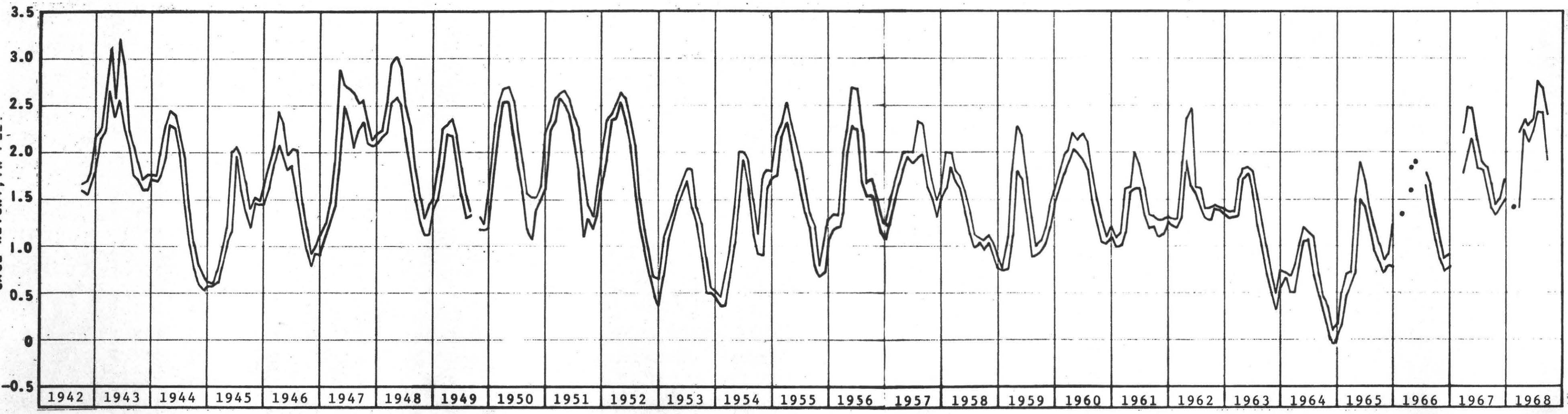
No discharge measurements are available on the inlet.

The following discharge measurements were made on the outlet, about 3 miles downstream from the lake, (drainage area, 9.75 sq mi).

Date	Discharge (cfs)
May 24, 1967	0.95
Aug. 24, 1967	.005
Sept. 12, 1967	.02

See table 1 for chemical analyses of lake water





Monthly maximum and minimum stages for Walled Lake near Walled Lake, Mich.

OAKLAND COUNTY

White Lake near Highland, Mich.

Location.--Lat 42°39'27", long 83°33'46", in secs. 7, 12, 13 and 18, T.3 N., Rs. 7 and 8 E., 3 miles northeast of Highland.

Surface area.--540 acres.

Maximum depth.--32 ft.

Drainage area.--5.8 sq mi, approximately.

Records available.--April 1966 to September 1968 except winter periods.

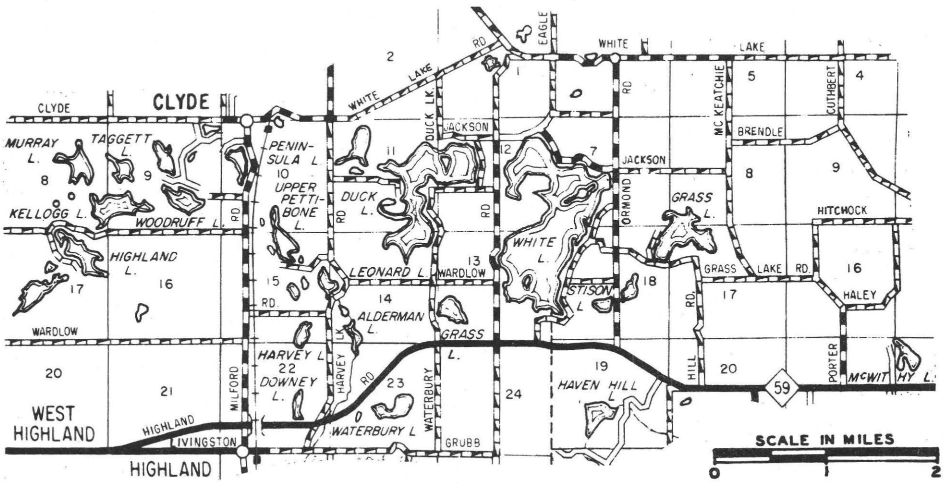
Gage.--Staff gage read daily. Datum of gage is 1,014.0 ft above mean sea level, approximately.

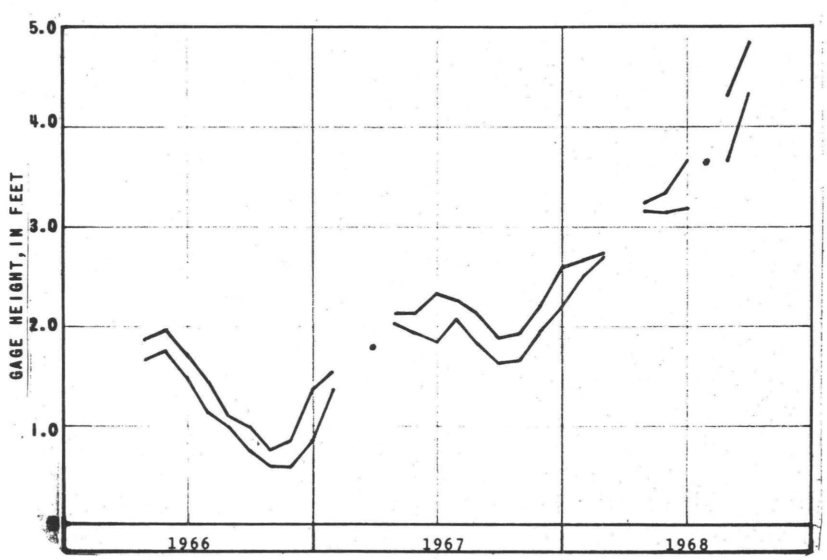
Established legal level.--1,019.10 ft above mean sea level, established by Circuit Court.

Extremes.--1966-68: Maximum stage, 4.85 ft Sept. 30, 1968; minimum, 0.60 ft Oct. 31, Nov. 1, 1967.

Regulation or control.--Lake level maintained, since about July 23, 1968, by pumping water into the lake from a well set in a deep aquifer.

Remarks.--The only inlets to the lake are very small intermittent streams draining swamps. There is no active outlet.
See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for White Lake near Highland, Mich.

OCEANA COUNTY

Silver Lake near Mears, Mich.

Location.--Lat 43°39'35", long 86°31'02", in many sections, T.15 N., R.18 W., 5.2 miles west of Mears.

Surface area.--690 acres.

Maximum depth.--25 ft.

Drainage area at outlet.--24 sq mi, approximately.

Records available.--August 1944 to September 1950, October 1959 to September 1968.

Gage.--Staff gage read daily to weekly. Datum of gage is 579.37 ft above mean sea level (levels by Michigan Department of Natural Resources).

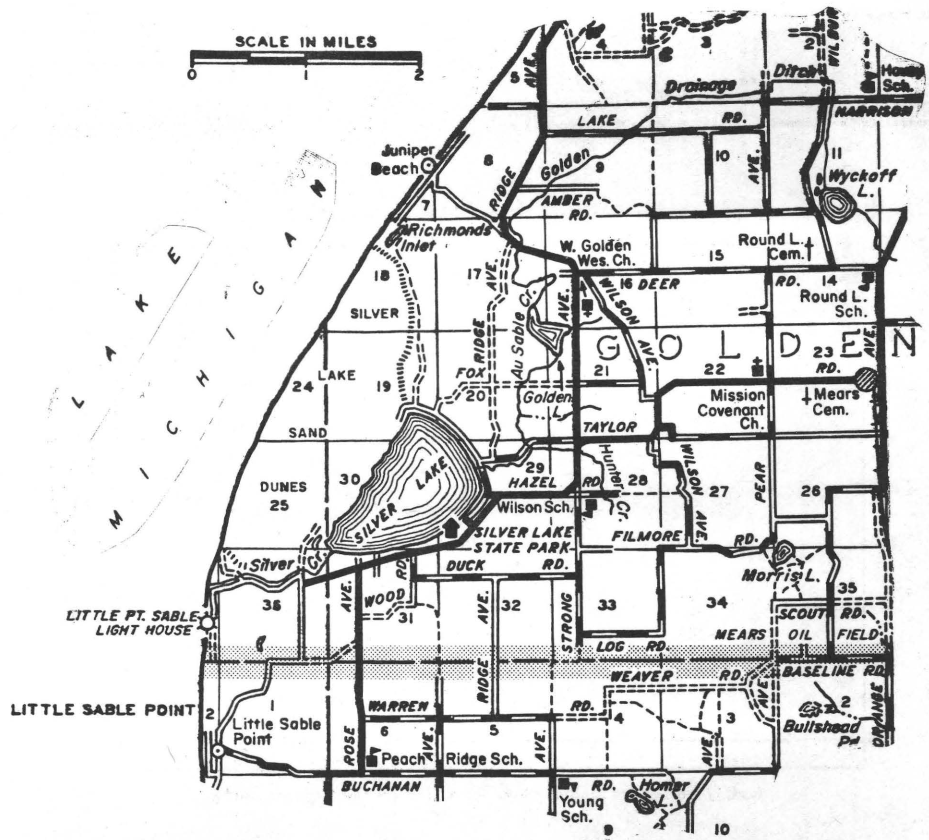
Established legal level.--Winter, 586.5 ft; summer, 587.0 ft above mean sea level, established by Circuit Court on Aug. 3, 1962.

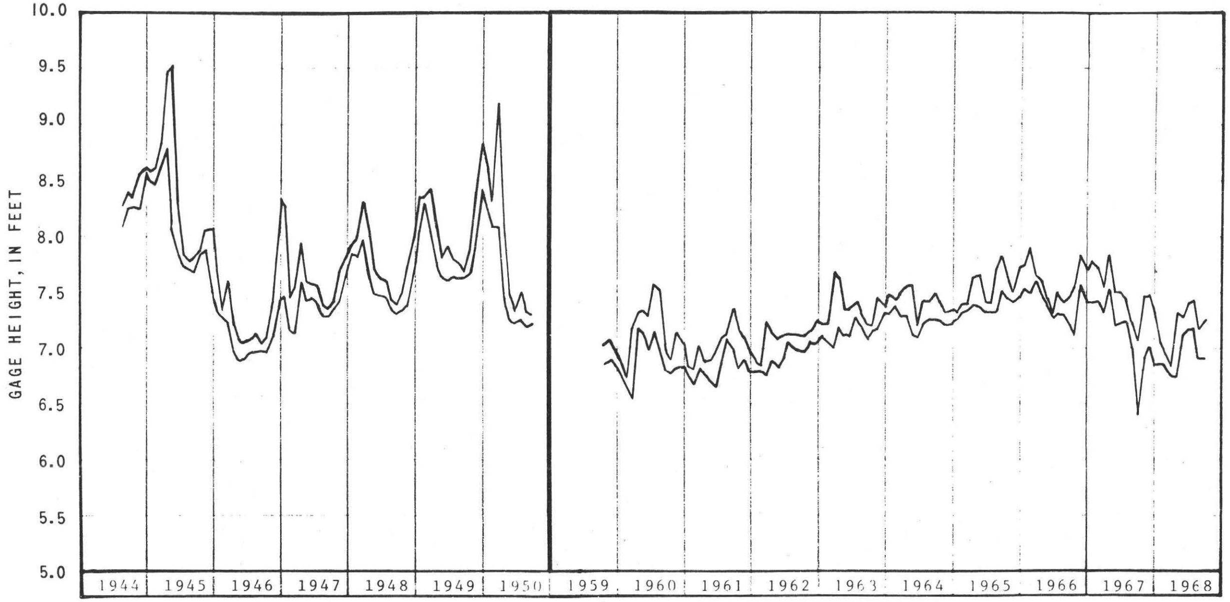
Extremes.--1944-50, 1959-68: Maximum stage observed, 9.53 ft May 5, 1945; minimum observed, 6.40 ft Sept. 15, 1967.

Regulation or control.--In June 1950, a dam with stop logs was constructed in the outlet 0.8 mile below the lake. The dam controls the lake level and can provide a volume of water which, when released, would wash drifted dune sand from the outlet and prevent undesirable high lake levels.

Remarks.--The inlet to Silver Lake is Hunter Creek which drains a large area northeast of the lake. The outlet, Silver Creek, flows for about 1.5 miles to Lake Michigan.
An engineering lake-level control study was completed in 1962 by the Michigan Department of Natural Resources.
No discharge measurements have been made on the inlet. The following discharge measurements have been made on Silver Creek about 0.5 mile downstream from the lake.

Date	Discharge (cfs)	Date	Discharge (cfs)
Aug. 10, 1944	6.10	May 28, 1948	17,0
Nov. 22, 1944	10.9	Aug. 18, 1948	8.06
Oct. 16, 1945	11.8	Nov. 16, 1948	8.04
Aug. 20, 1946	9.25	Mar. 15, 1949	23.6
May 13, 1947	19.0	June 14, 1949	7.28
Aug. 19, 1947	8.71	Sept. 13, 1949	7.54
Nov. 18, 1947	7.73	Jan. 24, 1950	14.2
Jan. 9, 1948	13.7	Apr. 11, 1950	43.4
		Aug. 9, 1950	8.71





Monthly maximum and minimum stages for Silver Lake near Mears, Mich.

OGEMAW COUNTY

Devoe Lake near Lupton, Mich.

Location.--Lat 44°23'59", long 84°02'07", in secs. 11 and 12, T.23 N., R.3 E., 2 miles south of Lupton.

Surface area.--125 acres.

Maximum depth.--52 ft.

Drainage area at outlet.--26.4 sq mi.

Records available.--October 1945 to July 1951 except periods December 1947 and March 1948.

Gage.--Staff gage read daily to intermittently. Datum of gage not determined.

Established legal level.--None known.

Extremes.--1945-51: Maximum stage observed, 10.31 ft Mar. 28, 1950; minimum observed, 7.00 ft Sept. 2, 5, 1948.

Regulation or control.--Lake level is controlled by manipulation of boards in dam at outlet. Much of the flow in Gamble Creek is diverted around Devoe Lake to Rifle River below the dam at lake outlet.

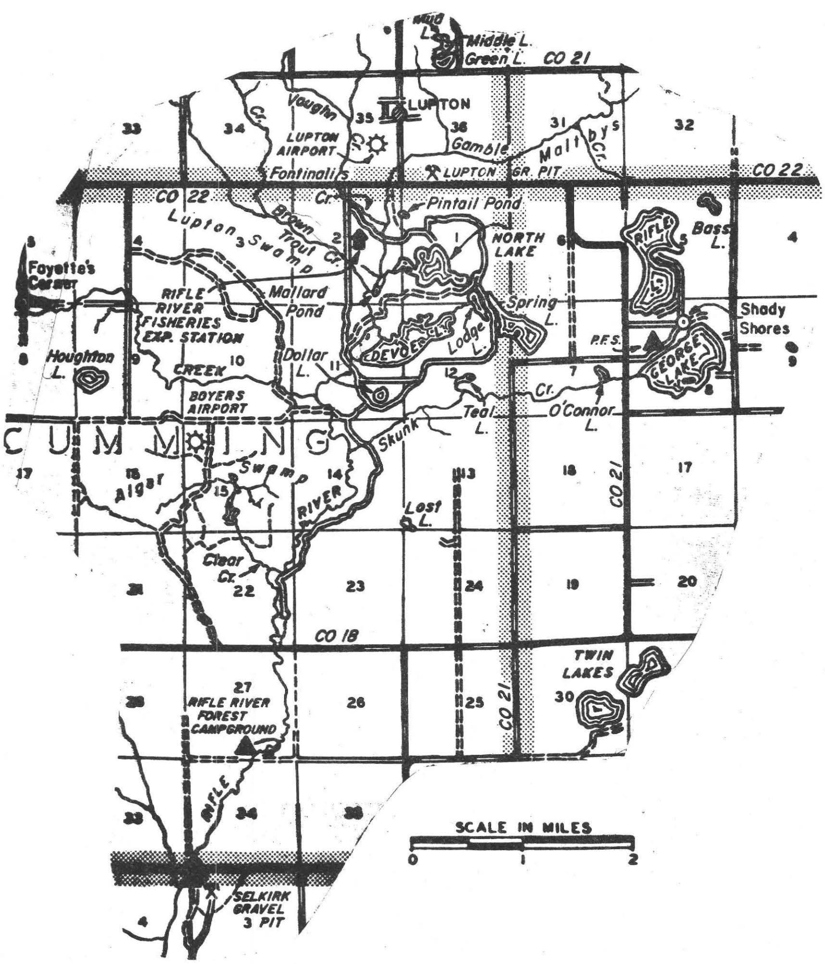
Remarks.--The principal inlet, Gamble Creek, is located at the northwest side of Devoe Lake. The inlet from Lodge Lake is at the east end of Devoe Lake. The outlet, Rifle River, is located at the southwest end of the lake.

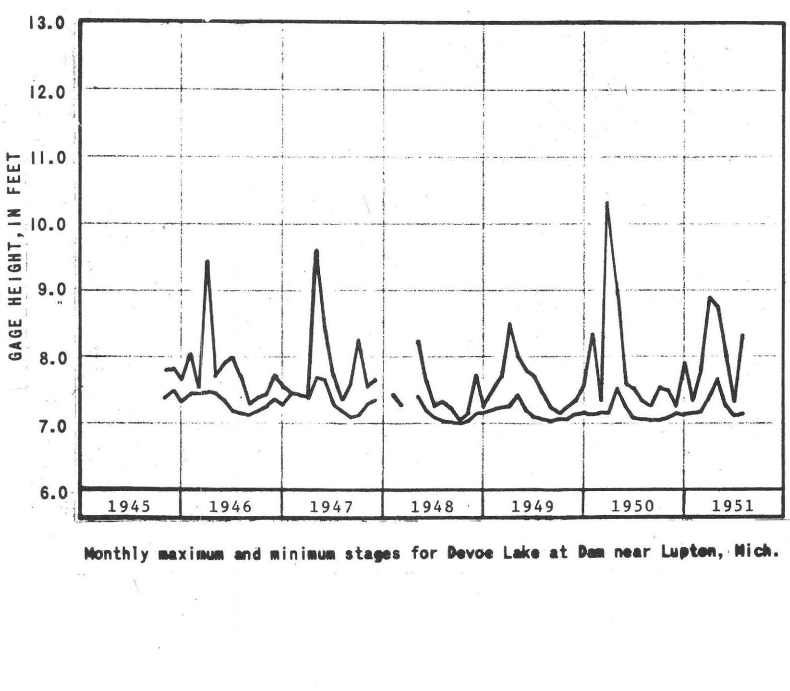
The following discharge measurements have been made on Gamble Creek, about 700 ft upstream from the lake in NE¼ sec.11 and above Gamble Creek diversion canal (drainage area, 25.5 sq mi.).

Date	Discharge (cfs)	Date	Discharge (cfs)
Sept. 20, 1945	39.9	Oct. 2, 1947	31.6
Oct. 30, 1945	27.4	Dec. 9, 1947	42.1
Nov. 14, 1945	45.1	July 19, 1948	18.3
Dec. 5, 1945	30.0	Oct. 25, 1948	23.1
Jan. 15, 1946	30.2	Dec. 8, 1948	28.2
Feb. 6, 1946	33.7	Apr. 11, 1949	37.0
Mar. 5, 1946	32.0	Aug. 12, 1949	31.3
Apr. 2, 1946	37.6	Oct. 17, 1949	20.2
May 2, 1946	25.7	Dec. 19, 1949	28.6
June 5, 1946	27.2	Apr. 25, 1950	62.4
July 1, 1946	59.8	July 17, 1950	29.8
Aug. 12, 1946	20.7	Oct. 26, 1950	21.7
Sept. 19, 1946	19.5	Jan. 25, 1951	30.4
Oct. 3, 1946	25.2	Aug. 20, 1951	20.6
Nov. 6, 1946	30.5	Aug. 25, 1952	24.3
May 13, 1947	45.6	Aug. 29, 1968	22.4
July 22, 1947	24.4		

The following discharge measurements have been made on Rifle River at dam at Devoe Lake outlet in SE¼ sec.11, and below Gamble Creek diversion canal (drainage area, 26.4 sq mi.).

Date	Discharge (cfs)	Date	Discharge (cfs)
Sept. 20, 1945	30.0	May 6, 1948	37.7
Oct. 30, 1945	30.6	June 16, 1948	20.7
Nov. 14, 1945	52.1	July 19, 1948	19.9
Dec. 5, 1945	35.4	Aug. 11, 1948	18.2
Jan. 15, 1946	37.2	Sept. 9, 1948	17.7
Feb. 6, 1946	35.9	Oct. 25, 1948	23.0
Mar. 5, 1946	35.4	Nov. 11, 1948	29.6
Apr. 2, 1946	42.0	Dec. 8, 1948	29.4
May 2, 1946	29.4	Jan. 7, 1949	32.8
June 5, 1946	31.2	Feb. 3, 1949	30.2
July 1, 1946	38.3	Mar. 8, 1949	34.0
Aug. 12, 1946	22.0	Apr. 11, 1949	47.3
Sept. 19, 1946	22.4	May 23, 1949	37.1
Oct. 3, 1946	25.6	June 27, 1949	30.3
Nov. 6, 1946	37.0	July 27, 1949	26.3
Dec. 13, 1946	39.4	Aug. 12, 1949	26.7
Jan. 16, 1947	32.1	Sept. 29, 1949	20.9
Feb. 6, 1947	27.1	Oct. 17, 1949	23.8
Mar. 11, 1947	28.5	Nov. 14, 1949	33.0
Apr. 17, 1947	92.8	Dec. 19, 1949	27.7
May 13, 1947	45.7	Jan. 27, 1950	105
June 3, 1947	44.3	Feb. 27, 1950	25.6
July 22, 1947	23.5	Apr. 25, 1950	54.4
Aug. 14, 1947	19.3	May 25, 1950	31.6
Sept. 9, 1947	18.8	June 15, 1950	18.5
Oct. 2, 1947	36.7	July 17, 1950	26.0
Nov. 10, 1947	30.0	Oct. 31, 1950	37.3
Dec. 9, 1947	45.2	Jan. 25, 1951	30.0
Jan. 12, 1948	25.7	Feb. 27, 1951	69.4
Feb. 11, 1948	23.6	Aug. 20, 1951	28.1
Mar. 31, 1948	71.6	Aug. 25, 1952	29.1
		Aug. 29, 1968	22.8





Monthly maximum and minimum stages for Devoe Lake at Dam near Lupton, Mich.

OGEMAW COUNTY

Jewett Lake near Lupton, Mich.

Location.--Lat 44°23'40", long 84°01'41", in sec. 11, T.23 N., R.3 E., 2.5 miles south of Lupton.

Surface area.--12.9 acres.

Maximum depth.17 ft.

Drainage area.--Not determined.

Records available.--August 1957 to September 1967 except winter periods of 1961 and 1963.

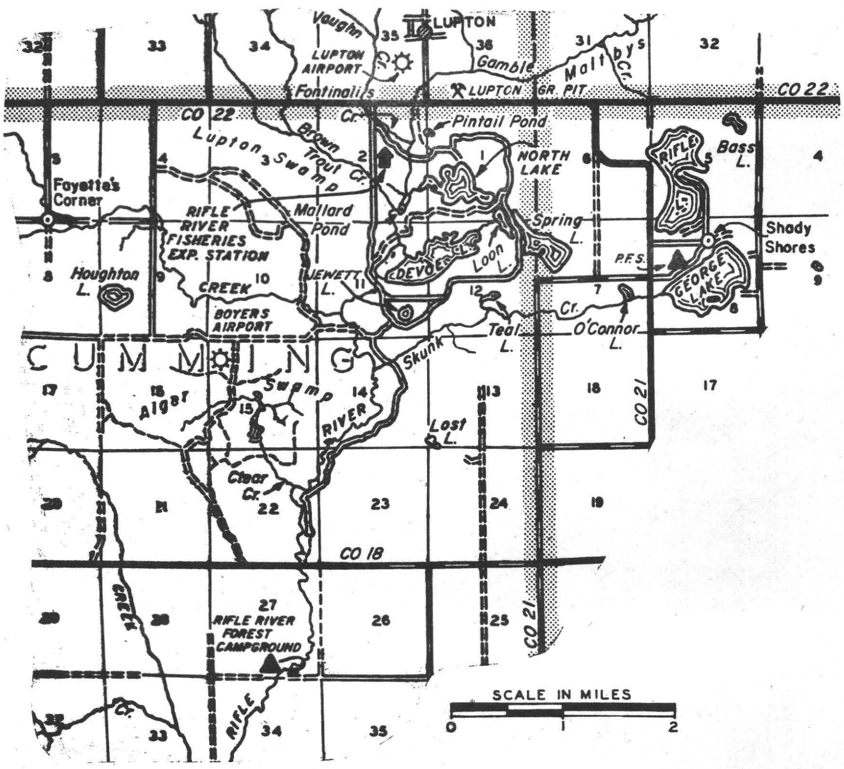
Gage.--Staff gage read weekly. Datum of gage not determined.

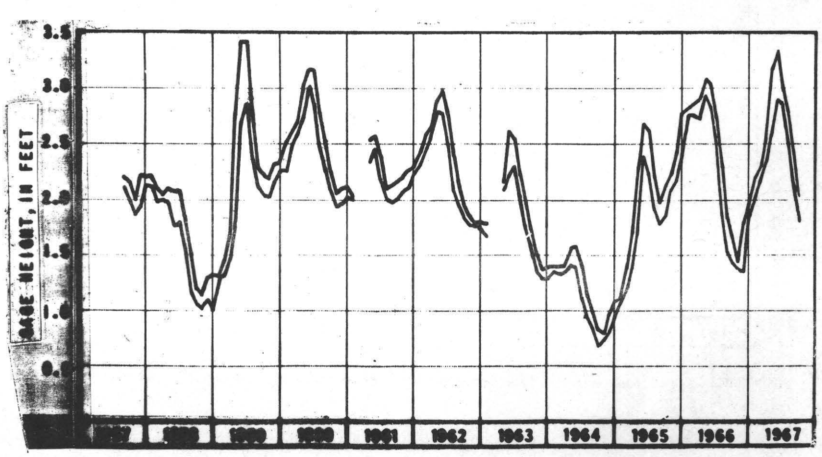
Established legal level.--None known.

Extremes.--1957-67: Maximum stage observed, 3.44 ft May 27, June 1, 1959; minimum stage, 0.68 ft Sept. 19, 1964.

Regulation or control.--None.

Remarks.--Jewett Lake has no inlet or outlet. Prior to Oct. 1, 1962, this lake was known as Dollar Lake. Records were obtained to denote ground-water trends in Rifle River basin.





Monthly maximum and minimum stages for Jewett Lake near Lupton, Mich.

OGEMAW COUNTY

Rifle Lake near Lupton, Mich.

Location.--Lat 44°24'17", long 83°58'51", in secs. 5, 6, and 8, T.23 N., R.4 E., 3 miles southeast of Lupton.

Surface area.--183 acres.

Maximum depth.--72 ft.

Drainage area.--Not determined.

Records available.--March 1954 to September 1957.

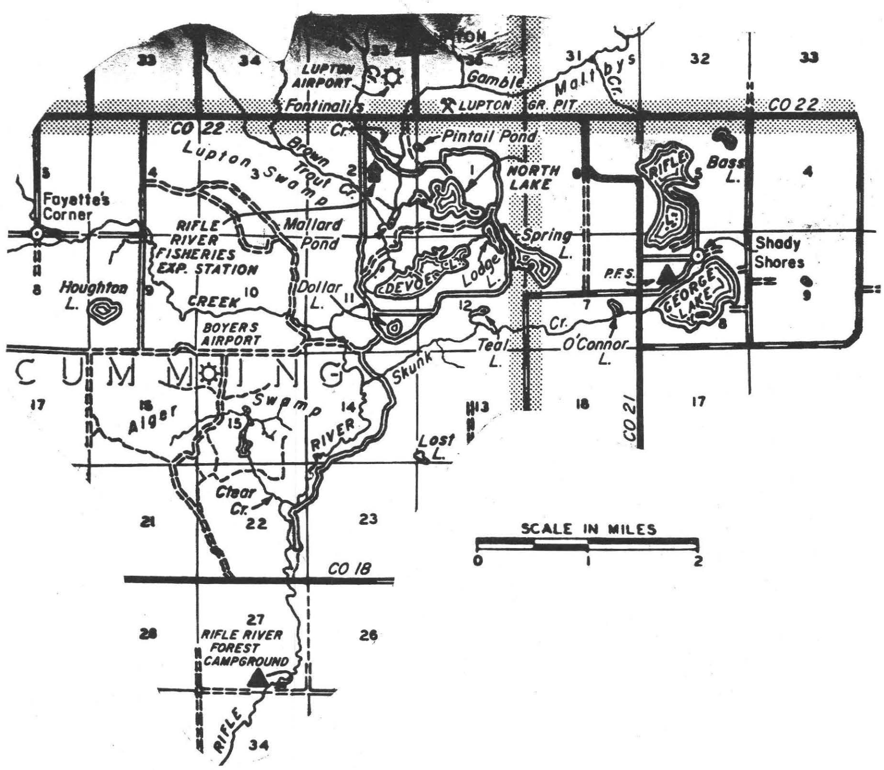
Gage.--Staff gage read weekly. Datum of gage not determined.

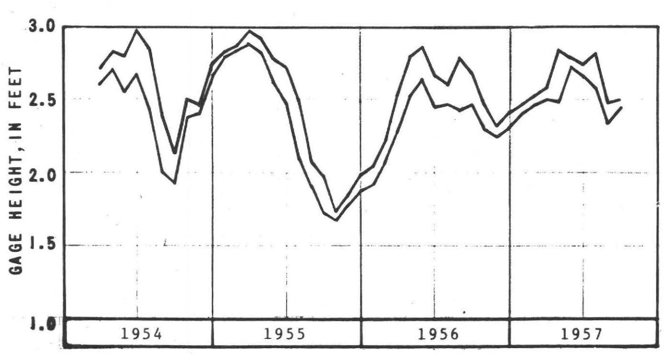
Established legal level.--None known.

Extremes.--1954-57: Maximum stage observed, 2.98 ft June 28, 1954; minimum observed, 1.67 ft Oct. 3, 1955.

Regulation or control.--None.

Remarks.--Rifle Lake has no inlet or outlet.





Monthly maximum and minimum stages for Rifle Lake near Lupton, Mich.

OGEMAW COUNTY

Sage Lake near Lupton, Mich.

Location.--Lat 44°21'13", long 83°57'46", in many sections, T.23 N., R.4 E., 6 miles southeast of Lupton.

Surface area.--785 acres.

Maximum depth.--53 ft.

Drainage area at outlet.--19 sq mi, approximately.

Records available.--July 1944 to September 1950. Low-water records during period May to August 1946 are not representative of true lake elevation due to fall between the lake and the gage during this period.

Gage.--Staff gage read weekly. Datum of gage is 851.35 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1944-50: Maximum stage observed, 4.10 ft Apr. 13, 1947; minimum observed, 0.74 ft Oct. 12, 16, 1946.

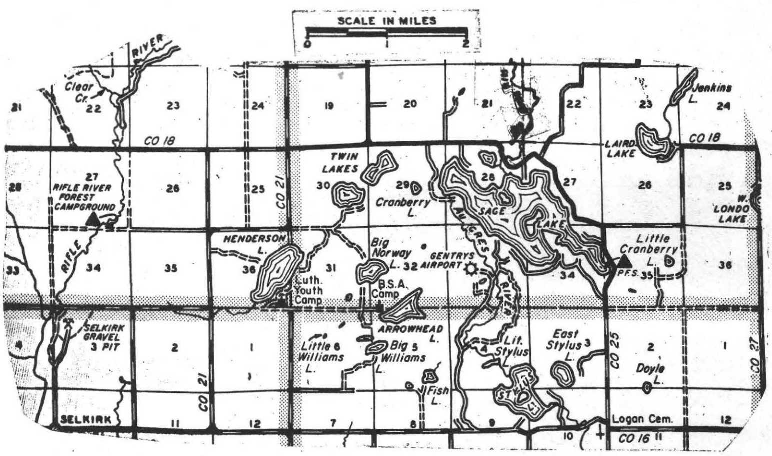
Regulation or control.--Construction of a concrete dam with removable flash boards, at the lake outlet, was completed in October 1946. Prior to this time, beaver dams in the outlet controlled the lake level.

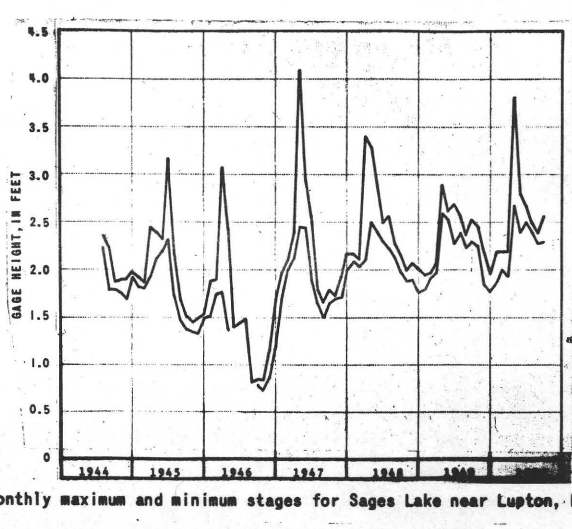
Remarks.--The principal inlet is the Au Gres River which enters the north side of lake. The outlet is also the Au Gres River from the west end of lake.

An engineering lake-level control study was completed in 1947 by the Michigan Department of Natural Resources.

No discharge measurements are available on inlet. The following discharge measurements have been made on the outlet in the vicinity of the dam:

Date	Discharge (cfs)	Date	Discharge (cfs)
Feb. 26, 1945	2.34	May 6, 1948	18.8
Oct. 30, 1945	3.17	July 19, 1948	3.00
Jan. 5, 1946	8.72	Sept. 23, 1948	.17
Apr. 2, 1946	41.6	Dec. 8, 1948	3.28
July 1, 1946	3.04	Apr. 11, 1949	8.78
Jan. 16, 1947	2.13	Aug. 10, 1949	1.50
May 13, 1947	60.7	Oct. 17, 1949	1.06
July 22, 1947	.02	Dec. 19, 1949	4.08
Oct. 2, 1947	.10	Apr. 25, 1950	31.2
Dec. 9, 1947	4.59	July 20, 1950	3.72





Monthly maximum and minimum stages for Sages Lake near Lupton, Mich.

ONTONAGON COUNTY

Gogebic Lake at Merriweather, Mich.

Location.--Lat 46°35'19", long 89°32'52", in many sections, Tps. 46, 47, and 48 N., Rs. 42 and 43 W., 4.3 miles east of Merriweather.

Surface area.--14,780 acres.

Maximum depth.--35 ft.

Drainage area.--162 sq mi, at gaging station, a quarter of a mile downstream from dam on outlet.

Records available.--July 1958 to September 1959 except winter period. Lake-level records are also available at two other points on the lake. The Gogebic County Road Commission has obtained records at the south end of the lake since 1936. The Upper Peninsula Power Company has obtained lake-level records at the control dam since 1930. These records are discussed in detail in the lake-level control study mentioned under "Remarks".

Gage.--Staff gage read daily. Datum of gage is 1,293.56 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1958-59: Maximum stage observed, 2.61 ft July 15, 1958; minimum observed, 0.50 ft Apr. 9, 10, 1959.

Regulation or control.--The lake is used as a storage reservoir by the Upper Peninsula Power Company for a downstream hydro-power plant and its levels are controlled by a dam on the lake outlet.

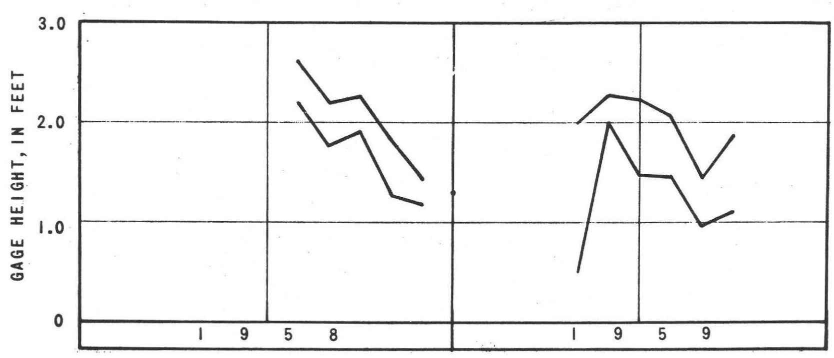
Remarks.--The inlets to Gogebic Lake are Slate River, Trout Brook, Merriweather Creek, and several other small streams. The outlet, West Branch Ontonagon River, is located at the northeast end of the lake.

An engineering lake-level control study was completed in 1961 by the Michigan Department of Natural Resources.

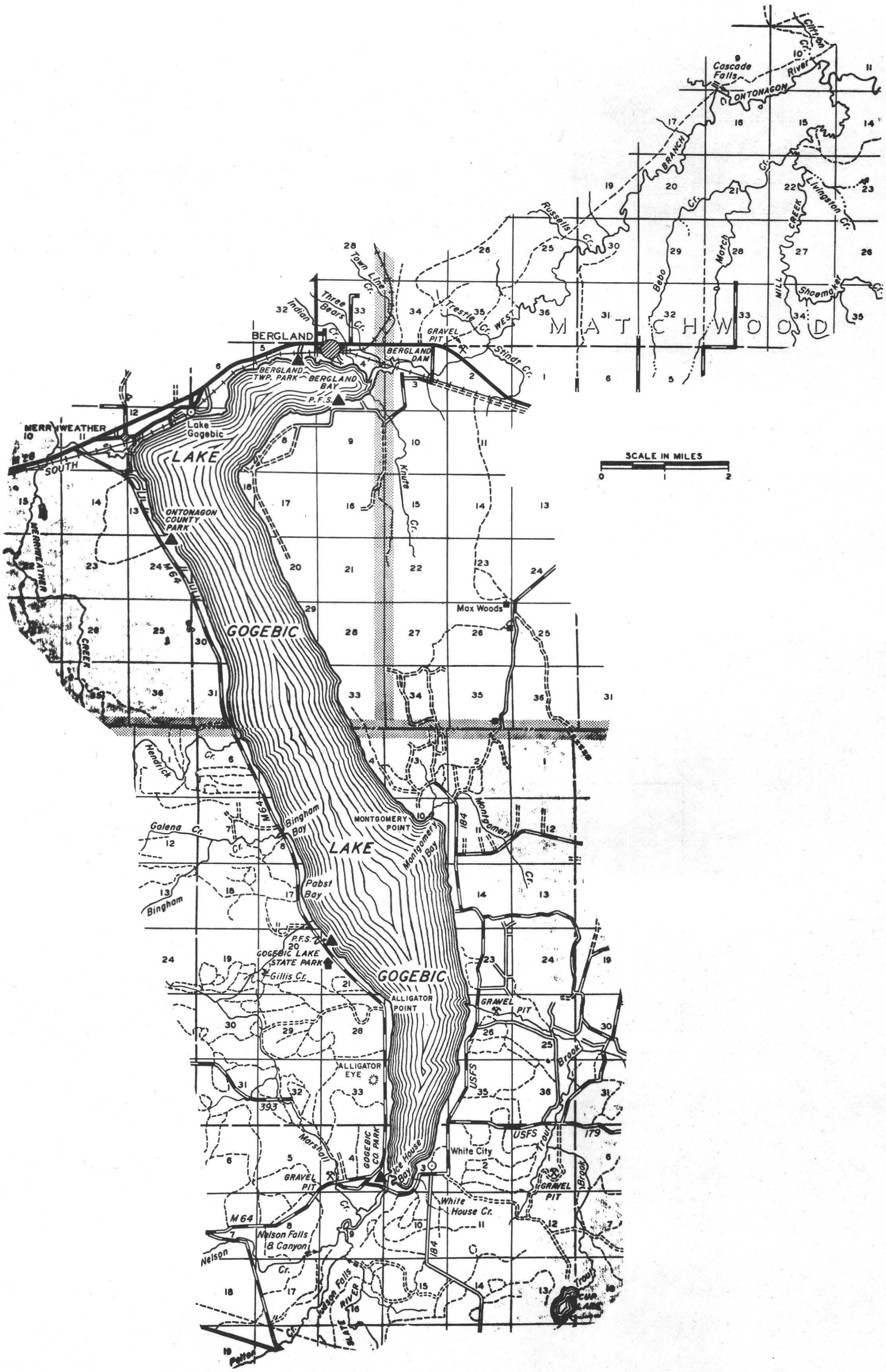
Daily discharge records for West Branch Ontonagon River have been collected since July 1942 at a gaging station, a quarter of a mile downstream from dam at outlet. These records are published by the U.S. Geological Survey.

No discharge measurements have been made on the inlets.

See table 1 for chemical analysis of lake water.



Monthly maximum and minimum stages for Gogebic Lake at Merriweather, Mich.


LAKE
GOGEBIC
LAKE
GOGEBIC
BERGLAND
MERRIWEATHER
Lake Gogebic
BERGLAND TWP. PARK
BERGLAND BAY
P.F.S.
BERGLAND DAM
GRAVEL PIT
ONTONAGON COUNTY PARK
M 64
Max Woods
MATCHWOOD
Cascade Falls
ONTONAGON River
SCALE IN MILES
MONTGOMERY POINT
Montgomery Bay
Bingham Bay
Pabst Bay
P.F.S.
GOGEBIC LAKE STATE PARK
Gillis Cr.
ALLIGATOR POINT
ALLIGATOR EYE
GOGEBIC CO PARK
Ice House Bay
White City
White House Cr.
Nelson Falls & Canyon
Galena Cr.
Hendrick Cr.
Bingham
Marshall
Nelson
Trout Brook
Knute Cr.
Town Line Cr.
Three Bears Cr.
Indian Cr.
Trestle Cr.
Stindt Cr.
Russells Cr.
Bebo Cr.
Match Cr.
MILL CREEK
Livingston Cr.
Shoemaker Cr.
BRANCH
WEST
SOUTH

OSCEOLA COUNTY

Big Lake near Evart, Mich.

Location.--Lat 43°51'50", long 85°12'08", in secs. 7 and 18, T.17 N., R.7 W., 4 miles southeast of Evart.

Surface area.--218 acres.

Maximum depth.--85 ft.

Drainage area at outlet.--1.5 sq mi, approximately.

Records available.--April to September 1950.

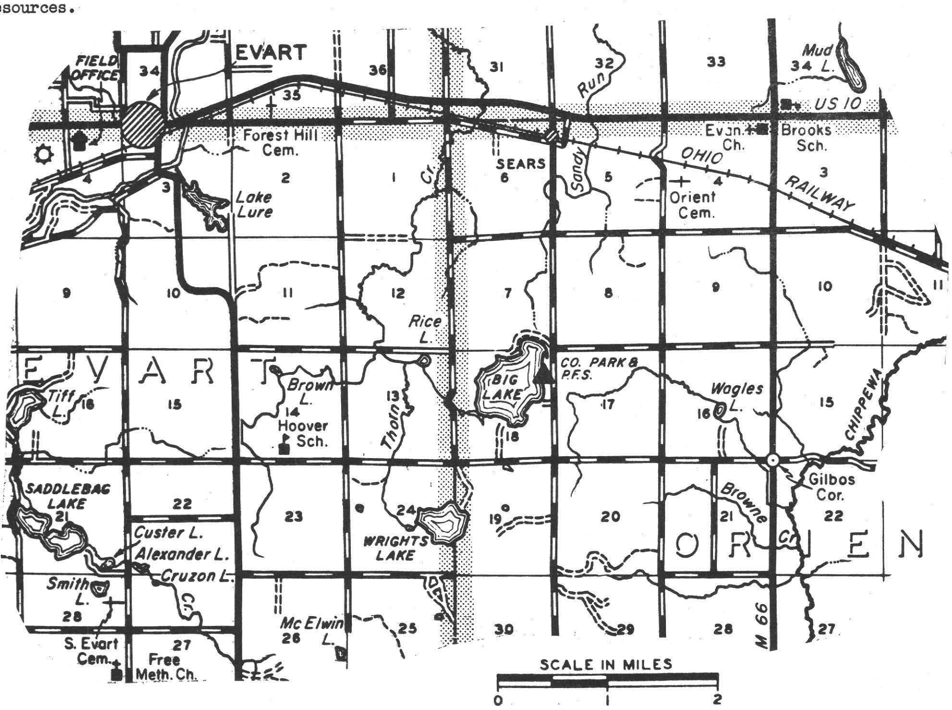
Gage.--Staff gage read daily. Datum of gage is 1,063.36 ft above mean sea level (levels by Michigan Department of Natural Resources).

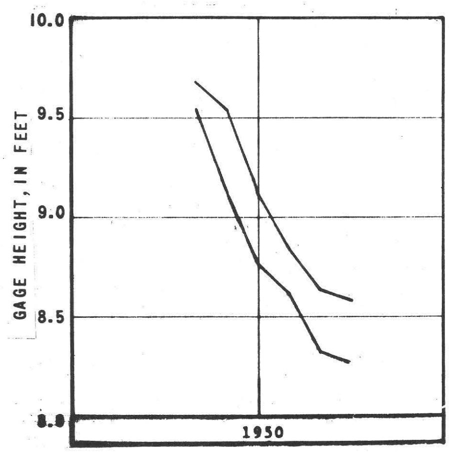
Established legal level.--1,073.1 ft above mean sea level, established by Circuit Court on May 5, 1959.

Extremes.--1950: Maximum stage, 9.68 ft Apr. 17, 1950; minimum, 8.27 ft Sept. 10, 1950.

Regulation or control.--None.

Remarks.--There is no inlet to the lake. The outlet leaves Big Lake on the southwest side and flows northwesterly to Rice Lake. On June 11, 1947, the measured flow in the outlet was 2.02 cfs.
An engineering lake-level control study was completed in 1953 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Big Lake near Evart, Mich.

OTSEGO COUNTY

Big Bradford Lake near Waters, Mich.

Location.--Lat 44°51'16", long 84°42'57", in secs. 6, 29, 31, and 32, Tps. 28 and 29 N., R.4 W., 1.8 miles southwest of Waters.

Surface area.--244 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--2.52 sq mi.

Records available.--October 1959 to September 1968.

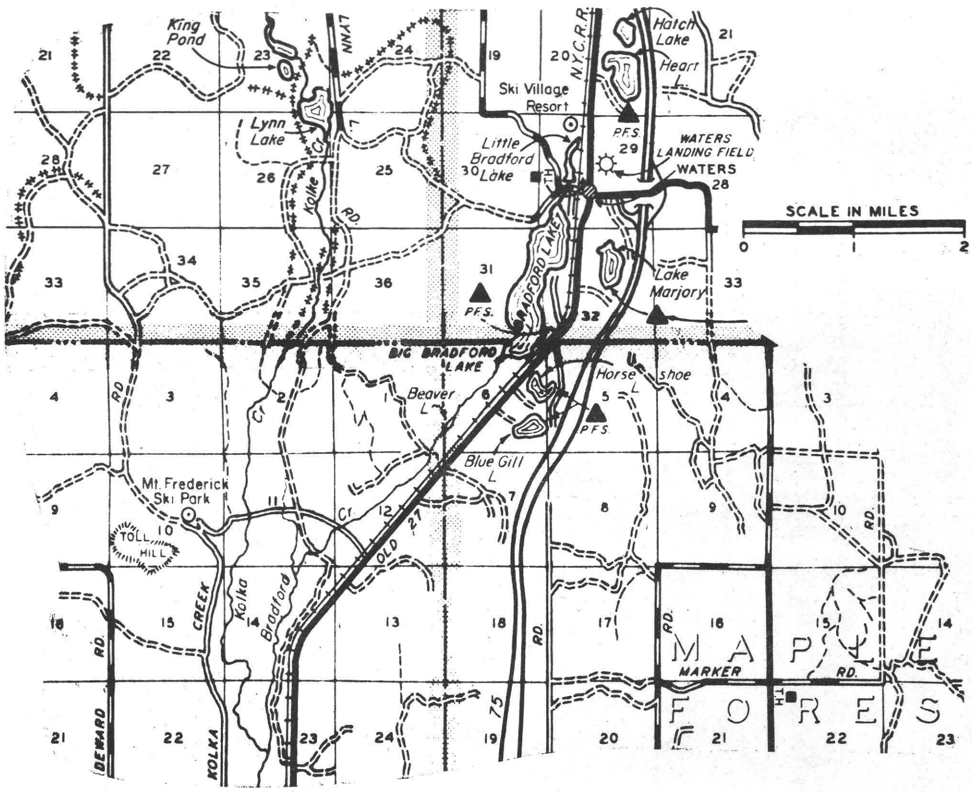
Gage.--Staff gage read daily. Datum of gage is 1,241.31 ft above mean sea level (levels by Michigan Department of Natural Resources).

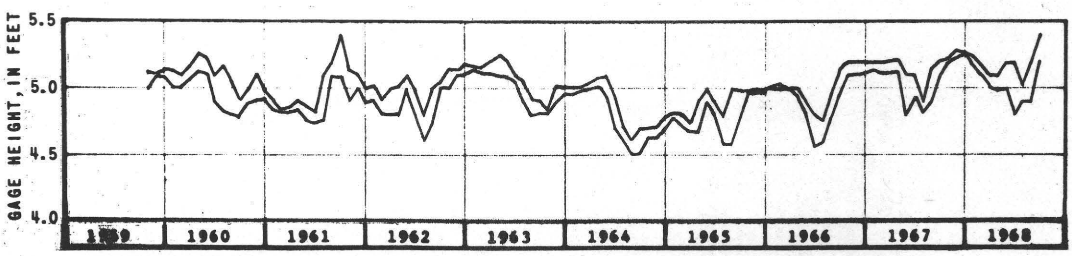
Established legal level.--None known.

Extremes.--1959-68: Maximum stage, 5.40 ft Sept. 14, 1961, Sept. 23, 1968; minimum, 4.50 ft Aug. 14-19, 1964.

Regulation or control.--Remains of old concrete dam at lake outlet controls lake level.

Remarks.--Little Bradford Lake outlet is the principal inlet to Big Bradford Lake, entering at the north end. The outlet, Bradford Creek, which is tributary to the AuSable River, leaves the south end of the lake. No discharge measurements are available on the inlet or outlet.





Monthly maximum and minimum stages for Big Bradford Lake near Waters, Mich.

OTSEGO COUNTY

Otsego Lake near Gaylord, Mich.

Location.--Lat 44°55'12", long 84°41'53", in many sections, Tps. 29 and 30 N., R.3 W., 7.5 miles south of Gaylord.

Surface area.--1,970 acres.

Maximum depth.--23 ft.

Drainage area.--Not determined.

Records available.--August 1942 to September 1968 except winter periods 1942-43 and 1943-44.

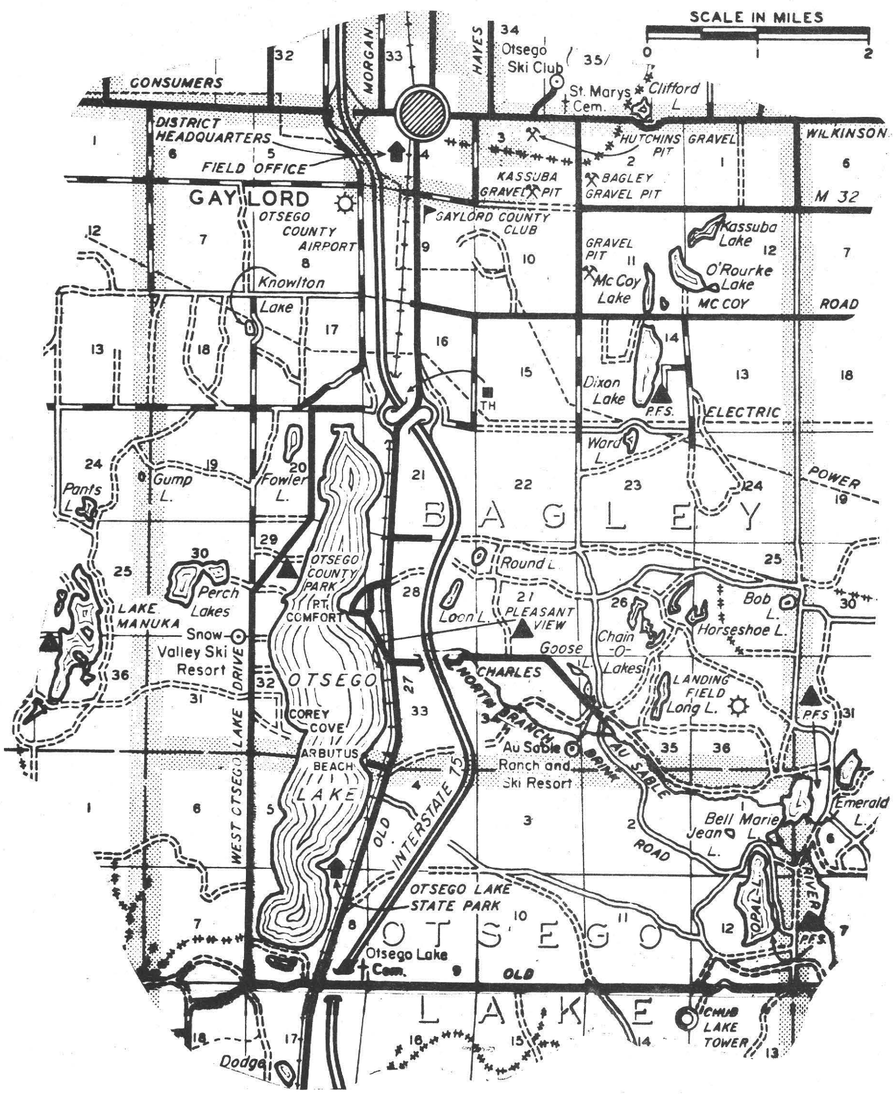
Gage.--Water-stage recorder. Datum of gage is 1,270.03 ft above mean sea level (levels by Michigan Department of Natural Resources). Prior to Aug. 18, 1958, staff gage read daily to weekly at datum 2.0 ft higher.

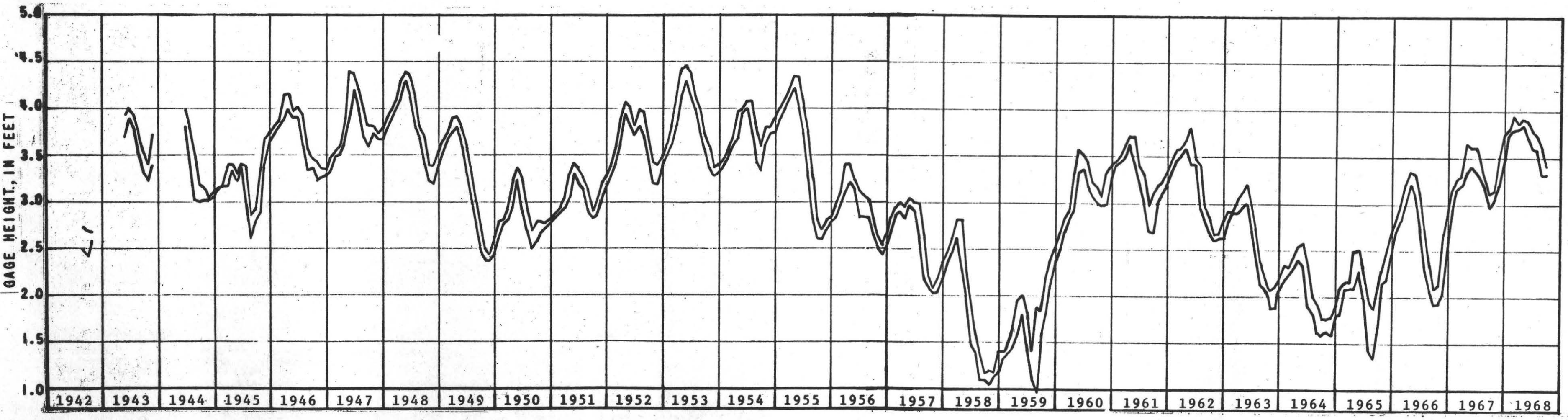
Established legal level.--None known.

Extremes.--1942-68: Maximum stage, 4.46 ft May 2, 1953 (present datum); minimum, 0.96 ft Aug. 14, 1959.

Regulation or control.--None.

Remarks.--There are no surface inlets or outlets. There are indications of ground-water flow from the south and east sides of lake to the AuSable River basin.





Monthly maximum and minimum stages for Otsego Lake near Gaylord, Mich.

PRESQUE ISLE COUNTY

Grand Lake near Rogers City, Mich.

Location.--Lat 45°19'42", long 83°33'36", in many sections, Tps. 33 and 34 N., Rs. 7 and 8 E., 14 miles southeast of Rogers City.

Surface area.--6,080 acres.

Maximum depth.--30 ft.

Drainage area at outlet.--34 sq mi, approximately.

Records available.--August 1942 to December 1959 except some winter and early spring periods.

Gage.--Staff gage read daily to weekly. Datum of gage is 588.39 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--594.00 ft above mean sea level, established by Circuit Court on Sept. 23, 1953.

Extremes.--1942-59: Maximum stage observed, 6.95 ft Apr. 26, 1952; minimum observed, 3.96 ft Sept. 30, Oct. 1, 3, 5, 8, 9, 13, 15, 16, 19, 22, 1955.

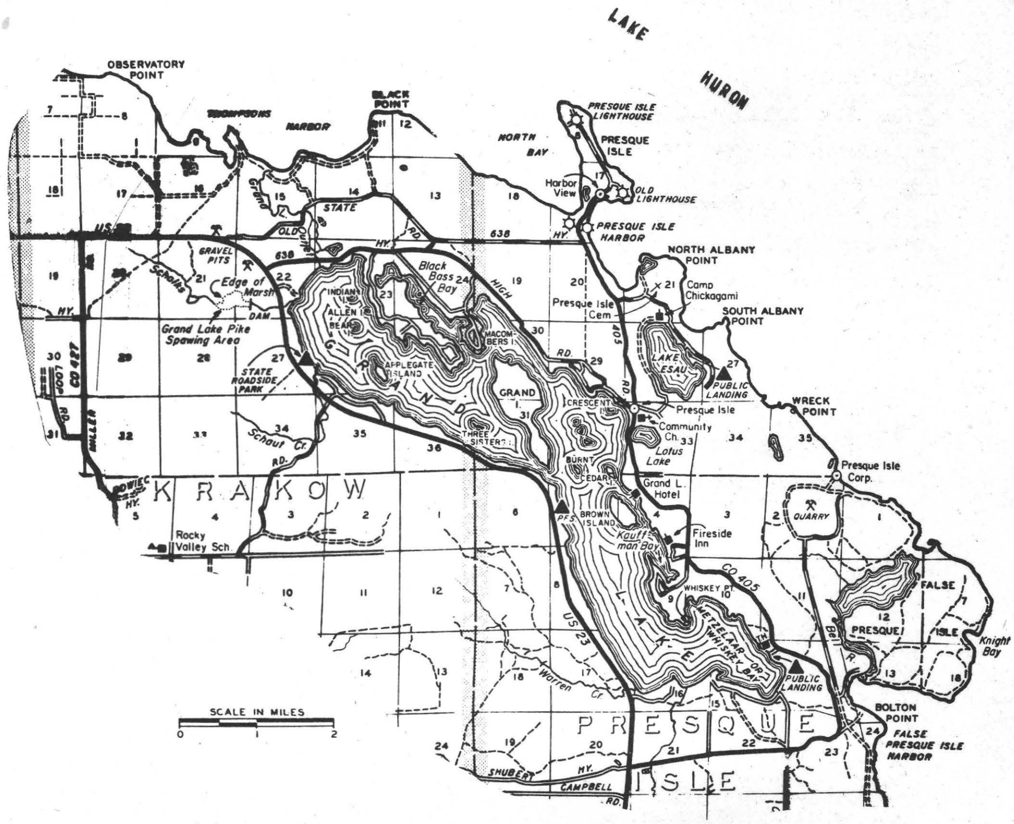
Regulation or control.--A concrete dam with removable stop logs to control lake level was completed in April 1956. Prior to this time, a makeshift dam of rocks and sand bags served to control the lake level.

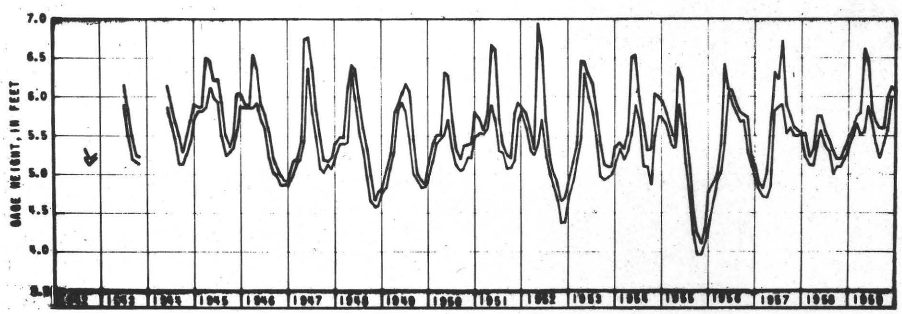
Remarks.--Grand Lake is fed by several small streams including Warren, Schalks, and Schaut Creeks from the west and Lotus Lake outlet from the east. Grand Lake Outlet flows from the northwest end of lake about 2 miles to Lake Huron.

An engineering lake-level control study was completed in 1952 by the Michigan Department of Natural Resources.

No discharge measurements are available on the inlets. The following discharge measurements have been made on Grand Lake Outlet, about 1 mile downstream from lake (drainage area, 34.3 sq mi).

Date	Discharge (cfs)
Dec. 13, 1944	20.4
Oct. 22, 1945	4.78
Jan. 9, 1946	49.9
Apr. 9, 1946	83.6
June 18, 1946	19.4
Sept. 10, 1946	.15
Dec. 3, 1946	.10
May 6, 1947	183
Aug. 5, 1947	7.92
Oct. 2, 1947	.25
Dec. 3, 1947	.48
May 11, 1948	98.1
July 7, 1948	12.8
Sept. 27, 1948	0
Dec. 2, 1948	.01
Apr. 6, 1949	47.7
July 6, 1949	49.2
Oct. 28, 1949	.17
Dec. 6, 1949	.27
Apr. 6, 1950	70.0
Oct. 25, 1950	11.8
Jan. 11, 1951	56.0
Apr. 5, 1951	103
July 25, 1951	2.58
Oct. 4, 1951	22.8
Jan. 8, 1952	57.5
Apr. 2, 1952	69.9
July 8, 1952	14.0
Oct. 8, 1952	0
Jan. 6, 1953	.45
Apr. 7, 1953	112
July 7, 1953	57.4
Oct. 7, 1953	1.58
Jan. 5, 1954	30.6
Apr. 6, 1954	67.4
July 7, 1954	45.3
Oct. 25, 1954	79.9
Jan. 3, 1955	55.5
Apr. 6, 1955	76.8
July 6, 1955	15.4
Oct. 5, 1955	0
Jan. 3, 1956	0
Apr. 3, 1956	4.77
July 2, 1956	5.26
Oct. 2, 1956	1.16
Jan. 2, 1957	44.1
Apr. 1, 1957	34.8
Apr. 2, 1957	30.8
July 2, 1957	133
Oct. 2, 1957	1.92
Jan. 8, 1958	54.5
Apr. 2, 1958	38.5
July 2, 1958	.13
Oct. 2, 1958	.02
Jan. 6, 1959	.43





Monthly maximum and minimum stages for Grand Lake near Rogers City, Mich.

ROSCOMMON COUNTY

Higgins Lake near Roscommon, Mich.

Location.--Lat 44°21'04", long 84°40'19", in many sections, T.24 N., Rs. 3 and 4 W., about 6 miles southwest of Roscommon.

Surface area.--9,900 acres.

Maximum depth.--141 ft.

Drainage area at outlet.--58 sq mi, approximately.

Records available.--September 1942 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 1,148.74 ft above mean sea level (levels by Michigan Department of Natural Resources). Prior to Nov. 27, 1942 staff gage read daily, at same datum.

Established legal level.--1,154.11 ft above mean sea level, established by Circuit Court in 1926.

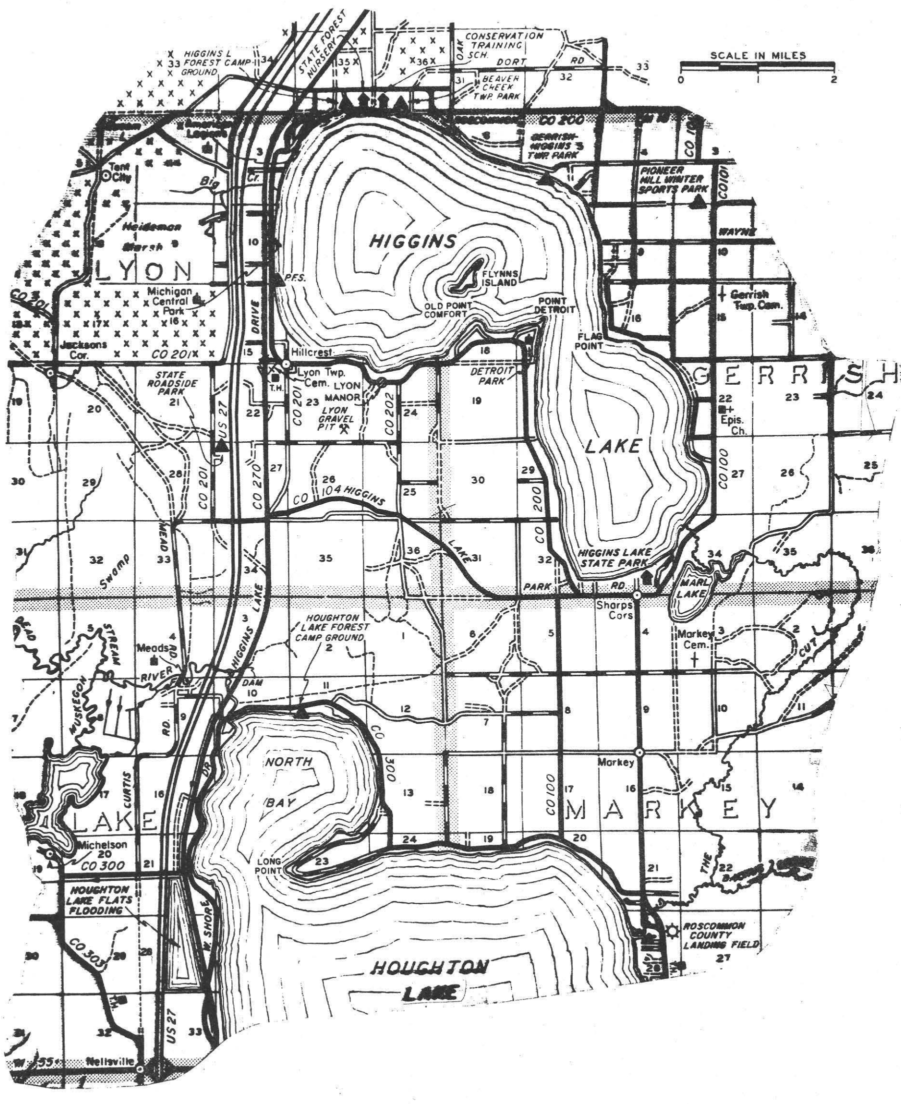
Extremes.--1942-68: Maximum stage, 6.23 ft June 26, 1954; minimum, 4.32 ft Oct. 3, 4, 1955.

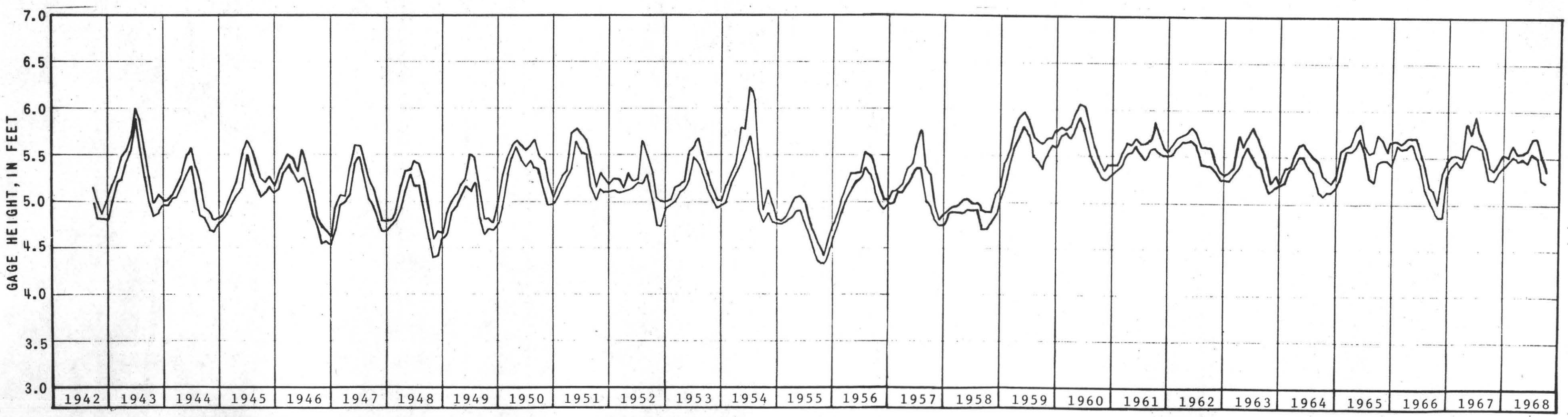
Regulation or control.--A dam with stop logs was built at the outlet in 1936 for control of the lake level. This dam was rebuilt in 1952. Prior to 1936, several dams had been built and replaced.

Remarks.--Two small streams on the northwest shore, Big Creek and Little Creek, are the only inlets to the lake. The outlet, known as "The Cut", flows from the southeast end of the lake, into Marl Lake and on into Houghton Lake.

An engineering lake-level control study was completed in 1956 by the Michigan Department of Natural Resources.

No discharge measurements have been made on the inlets. Daily records of discharge were collected at Higgins Lake Outlet, from June 1942 to July 1950. These records are published in U. S. Geological Survey Water-Supply Papers.





Monthly maximum and minimum stages for Higgins Lake near Roscommon, Mich.

ROSCOMMON COUNTY

Houghton Lake near Houghton Lake Heights, Mich.

Location.--Lat 44°24'00", long 84°47'28", in many sections, Tps. 22 and 23 N., Rs. 3 and 4 W., 5.1 miles north of Houghton Lake Heights.

Surface area.--19,600 acres.

Maximum depth.--20 ft.

Drainage area at outlet.--218 sq mi.

Records available.--June 1942 to September 1968 except winter period of 1942-43.

Gage.--Water-stage recorder. Datum of gage is 1,130.00 ft above mean sea level (levels by Michigan Department of Natural Resources). Prior to Sept. 28, 1960, staff gage read daily except winter periods when it was read twice weekly.

Established legal level.--1,138.1 ft above mean sea level, established by Circuit Court on Jan. 5, 1926.

Extremes.--1942-68: Maximum stage, 9.79 ft June 4, 1943; minimum, 6.95 ft Sept. 3, 5, Nov. 8, 1958.

Regulation or control.--A dam on Muskegon River about 0.5 mile below Houghton Lake controls the lake level by means of removable stop logs. This dam was constructed in the fall of 1938. Prior to this time, the lake level was maintained by means of an old timber dam with flash boards.

Remarks.--"The Cut" flowing from Higgins Lake, and Backus Creek, flowing from Mud Lake, join about 1 mile above Houghton Lake and flow into the east central side of Houghton Lake. Denton Creek and several other small creeks flow into the southern end of Houghton Lake. The outlet, Muskegon River, flows from the northwest end of the lake.

An engineering lake-level control study was completed in 1954 by the Michigan Department of Natural Resources.

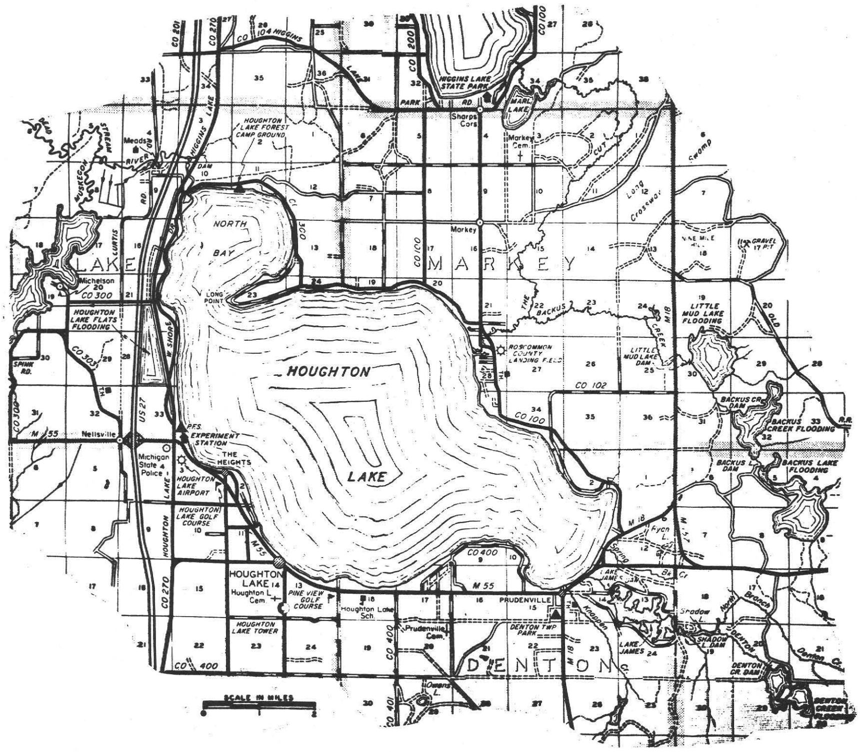
Daily records of discharge were collected at Higgins Lake Outlet ("The Cut") from June 1942 to July 1950. These records are published in U. S. Geological Survey Water-Supply Papers. Fifty-eight discharge measurements, made during the period 1944-58, have been made on Backus Creek at Mud Lake outlet in sec. 5, T.22 N., R.2 W. These measurements are published in U. S. Geological Survey Water-Supply Papers. The following discharge measurements were made on Muskegon River at U.S. 27, about 0.4 mile below the lake, and at Reedsburg dam, about 5.5 miles below the lake.

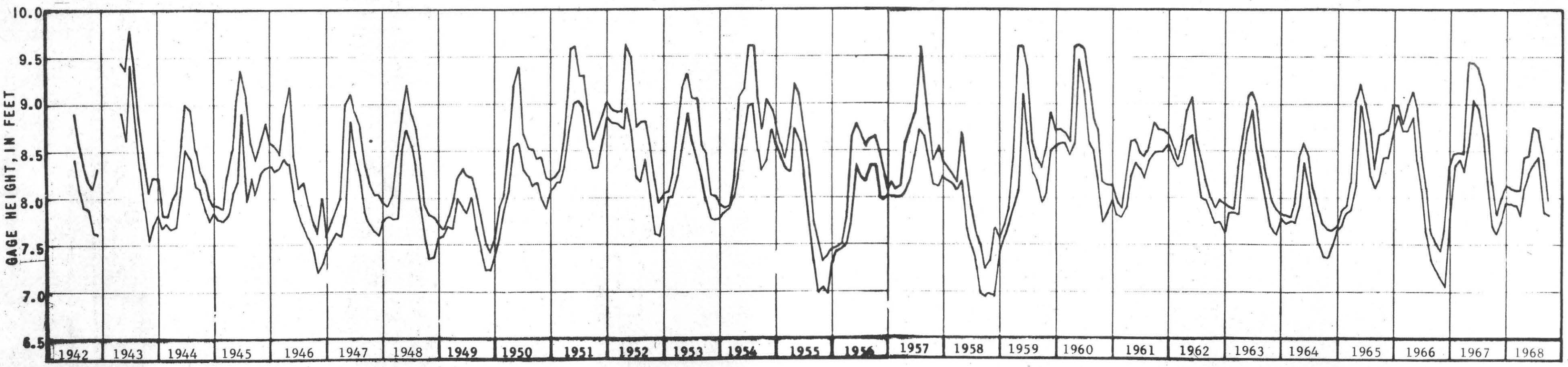
Muskegon River at U.S. 27

Date	Discharge (cfs)	Date	Discharge (cfs)
Mar. 30, 1953	237	Apr. 3, 1953	270
Mar. 31, 1953	267	Apr. 23, 1953	245
Apr. 1, 1953	232	Sept. 10, 1953	70.8

Muskegon River at Reedsburg Dam

Date	Discharge (cfs)	Date	Discharge (cfs)
Apr. 3, 1953	74.2	July 13, 1954	230
Apr. 23, 1953	414	May 19, 1954	226
Oct. 20, 1953	93.5	July 27, 1955	83.4
Jan. 21, 1954	123	Oct. 12, 1955	41.8





Monthly maximum and minimum stages for Houghton Lake near Houghton Lake Heights, Mich.

ROSCOMMON COUNTY

Lake St. Helen near St. Helen, Mich.

Location.--Lat 44°22'53", long 84°26'41", in many sections, T.23 N., Rs. 1 and 2 W., 2.3 miles northwest of St. Helen.

Surface area.--2,400 acres.

Maximum depth.--Not known.

Drainage area at outlet.--72.2 sq mi.

Records available.--May 1943 to December 1959, except some winter and spring periods.

Gage.--Staff gage read daily. Datum of gage is 1,149.01 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--1,154.15 ft above mean sea level, established by Circuit Court on Oct. 13, 1931.

Extremes.--1943-59: Maximum stage observed, 7.26 ft Apr. 1, 1949 but may have reached a stage of about 7.55 ft in June 1945 when water was over top of gage; minimum stage, 4.64 ft Jan. 21, 1954.

Regulation or control.--Level of lake controlled by manipulation of stop logs in dam on outlet, about 1.8 miles north of Lake St. Helen.

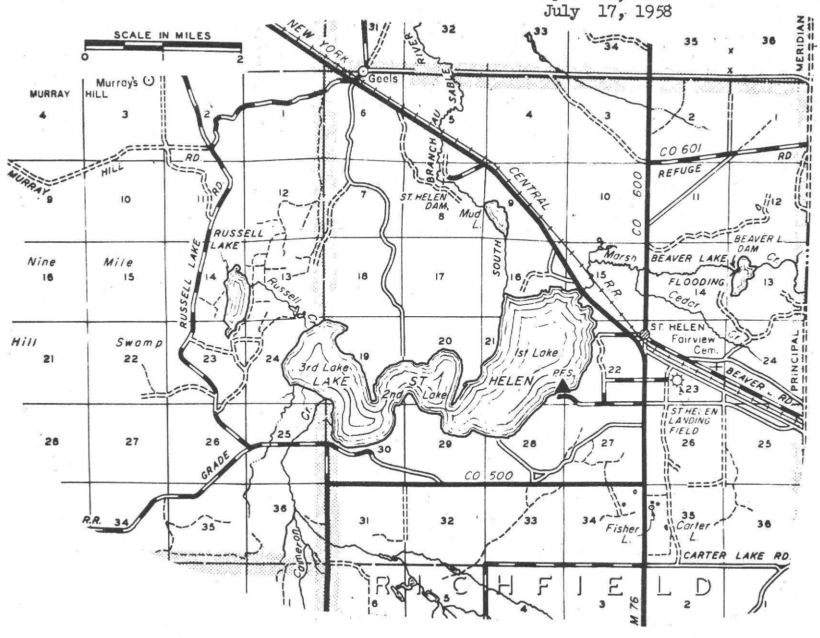
Remarks.--Marsh Creek flows into the northeast side, Russell Creek into the northwest side, and Cameron Creek into the southwest side of Lake St. Helen. The outlet, South Branch AuSable River, flows from the north side of lake.

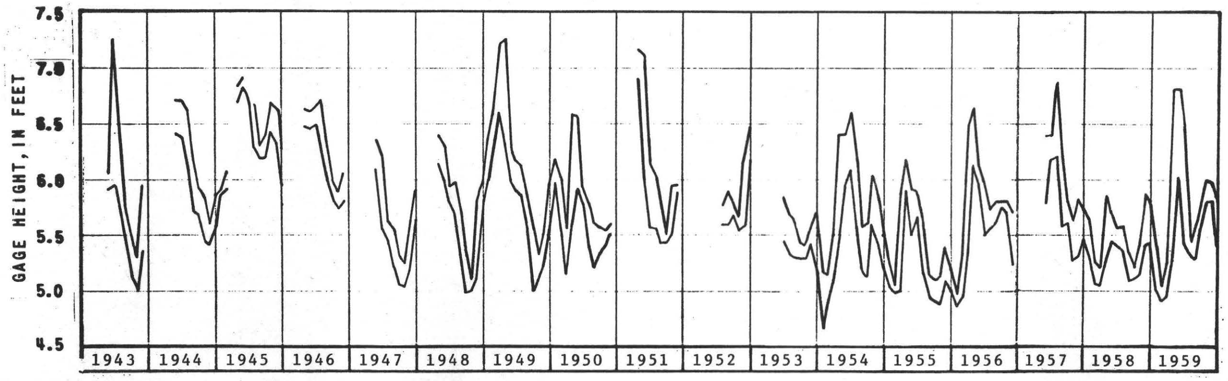
An engineering lake-level control study was completed in 1951 by the Michigan Department of Natural Resources.

The following discharge measurements have been made on South Branch AuSable River, in SE¼ sec. 8, T.23 N., R.1 W.

Date	Discharge (cfs)
Nov. 20, 1944	25.5
Oct. 29, 1945	80.8
Jan. 29, 1946	5.90
Mar. 27, 1946	14.0
July 17, 1946	11.3
Sept. 30, 1946	10.5
Dec. 6, 1946	7.35
May 22, 1947	134
July 31, 1947	7.70
Sept. 30, 1947	26.4
Dec. 22, 1947	19.5
Apr. 12, 1948	144
Aug. 9, 1948	4.72
Oct. 19, 1948	.27
Dec. 27, 1948	8.63
Apr. 26, 1949	98.2
Aug. 15, 1949	6.66
Oct. 31, 1949	1.93
Dec. 13, 1949	4.21
Apr. 6, 1950	82.2
July 20, 1950	19.3
Oct. 5, 1950	9.98
Jan. 15, 1951	31.7
Apr. 4, 1951	85.8
July 31, 1951	19.8
Oct. 25, 1951	55.7

Date	Discharge (cfs)
Jan. 29, 1952	55.6
Apr. 15, 1952	125
Oct. 30, 1952	3.04
Jan. 16, 1953	25.7
Mar. 27, 1953	155
Apr. 24, 1953	97.0
July 16, 1953	13.4
Oct. 12, 1953	5.29
Jan. 21, 1954	19.5
Apr. 21, 1954	99.3
July 13, 1954	34.2
Oct. 11, 1954	81.5
Jan. 27, 1955	36.4
Apr. 21, 1955	94.4
July 11, 1955	3.32
Oct. 11, 1955	2.28
Jan. 25, 1956	5.82
Apr. 13, 1956	137
July 24, 1956	17.5
Oct. 9, 1956	11.3
Jan. 23, 1957	23.2
Apr. 29, 1957	27.9
July 11, 1957	115
Oct. 4, 1957	16.7
Jan. 28, 1958	38.2
Apr. 3, 1958	46.6
July 17, 1958	6.14





Monthly maximum and minimum stages for Lake St. Helen near St. Helen, Mich.

SCHOOLCRAFT COUNTY

Corner Lake near Steuben, Mich.

Location.--Lat 46°09'36", long 86°36'21", in secs. 1, 6, 31, and 36, Tps. 43 and 44 N., Rs.18 and 19 W., 7.3 miles west of Steuben.

Surface area.--141 acres.

Maximum depth.--44 ft.

Drainage area.--12 sq mi, approximately, at outlet of Straits Lake.

Records available.--May 1959 to August 1960 except period Sept. 1959 to May 1960. Records are available on connecting Deep Lake for period May 1962 to November 1963 at different datum.

Gage.--Staff gage read daily. Datum of gage not determined.

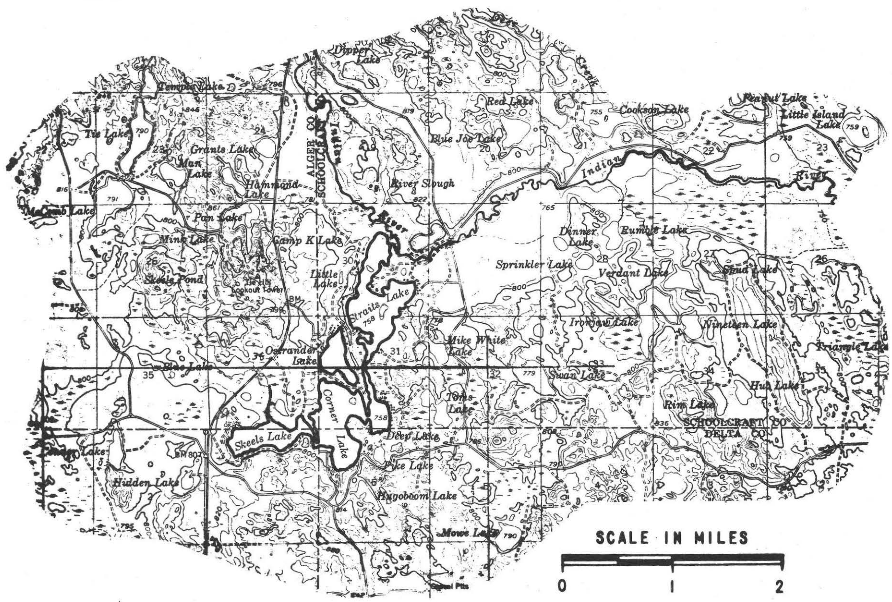
Established legal level.--None known.

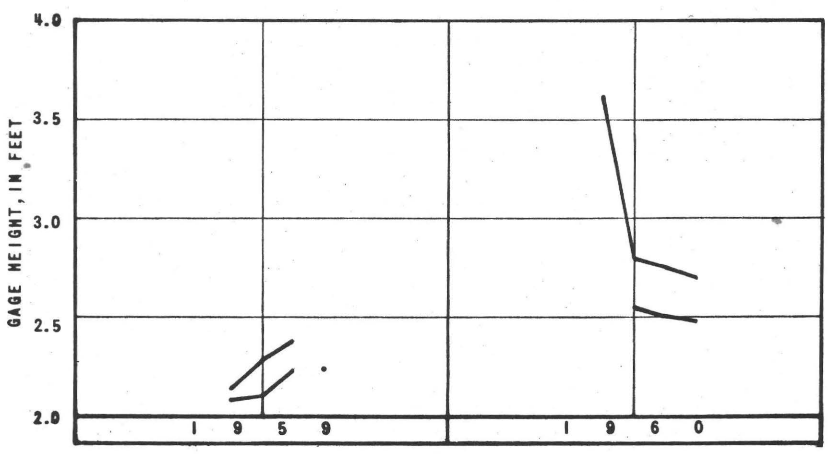
Extremes.--1959-60: Maximum stage, 3.62 ft May 1960 (highwater mark); minimum stage observed, 2.08 ft May 26, 1959.

Regulation or control.--None known.

Remarks.--Corner Lake is part of a chain of lakes including, in downstream order, Skeels, Corner, Deep and Straits Lakes. The inlet to this chain is an unnamed stream on the north side of Skeels Lake. The outlet leaves the northeast side of Straits Lake and flows about 600 feet to Indian River.

On Oct. 8, 1959, a discharge of 15.1 cfs was measured on Corner Lake outlet, the connecting channel between Corner and Deep Lakes. No other discharge measurements are available on the inlet or outlet.





Monthly maximum and minimum stages for Corner Lake near Steuben, Mich.

SCHOOLCRAFT COUNTY

Deep Lake near Steuben, Mich.

Location.--Lat 46°10'00", long 86°36'25", in secs. 6 and 31, Tps. 43 and 44 N., R.18 W., 7.2 miles west of Steuben.

Surface area.--42 acres.

Maximum depth.--40 ft.

Drainage area.--12 sq mi, approximately, at outlet of Straits Lake.

Records available.--May 1962 to November 1963 except winter period. Records are available on connecting Corner Lake from May 1959 to August 1960, at different datum.

Gage.--Staff gage read daily. Datum of gage not determined.

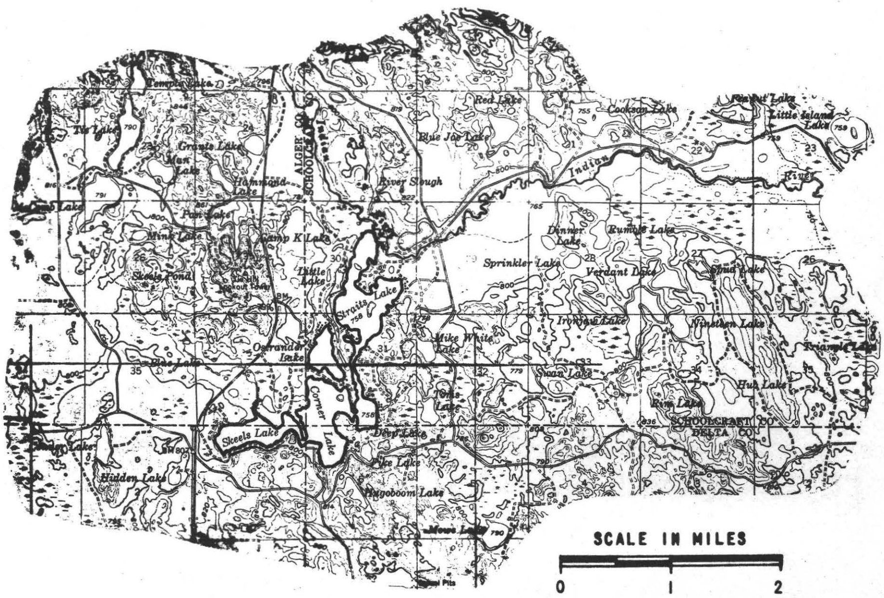
Established legal level.--None known.

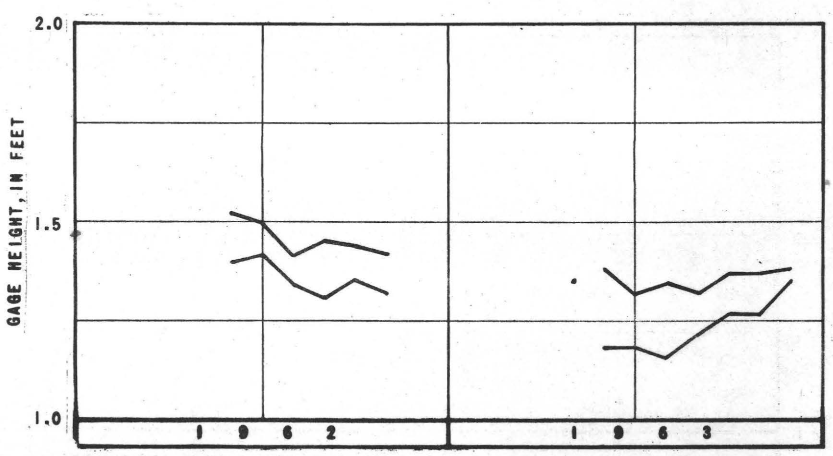
Extremes.--1962-63: Maximum stage observed, 1.52 ft May 18, 1962; minimum observed, 1.16 ft July 7-13, 1963.

Regulation or control.--None known.

Remarks.--Deep Lake is connected to Corner and Straits Lakes; Corner Lake is connected to Skeels Lake. The only inlet is an unnamed stream entering the north side of Skeels Lake. The only outlet is Straits Lake outlet, tributary to Indian River.

On Oct. 8, 1959 a discharge of 15.1 cfs was measured on Corner Lake outlet, the connecting channel between Corner Lake and Deep Lake. No other discharge measurements are available on the inlet or outlet.





Monthly maximum and minimum stages for Deep Lake near Steuben, Mich.

SCHOOLCRAFT COUNTY

Gulliver Lake at Gulliver, Mich.

Location.--Lat 45°58'27", long 86°01'42", in many sections, Tps. 41 and 42 N., R.14 W., 1.4 miles south of Gulliver.

Surface area.--836 acres.

Maximum depth.--28 ft.

Drainage area at outlet.--7 sq mi, approximately.

Records available.--November 1942 to September 1959.

Gage.--Staff gage read daily. Datum of gage is 613.09 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--Winter, 613.8 ft; summer, 614.5 ft above mean sea level, established by Circuit Court on Sept. 23, 1957.

Extremes.--1942-59: Maximum stage, 2.76 ft June 15, 18, 1943; minimum, -0.04 ft Oct. 2, 1955.

Regulation or control.--A concrete dam with one bay and equipped with stop logs, built in 1955, controls lake level. Prior to this, a timber dam built in 1947, was the control.

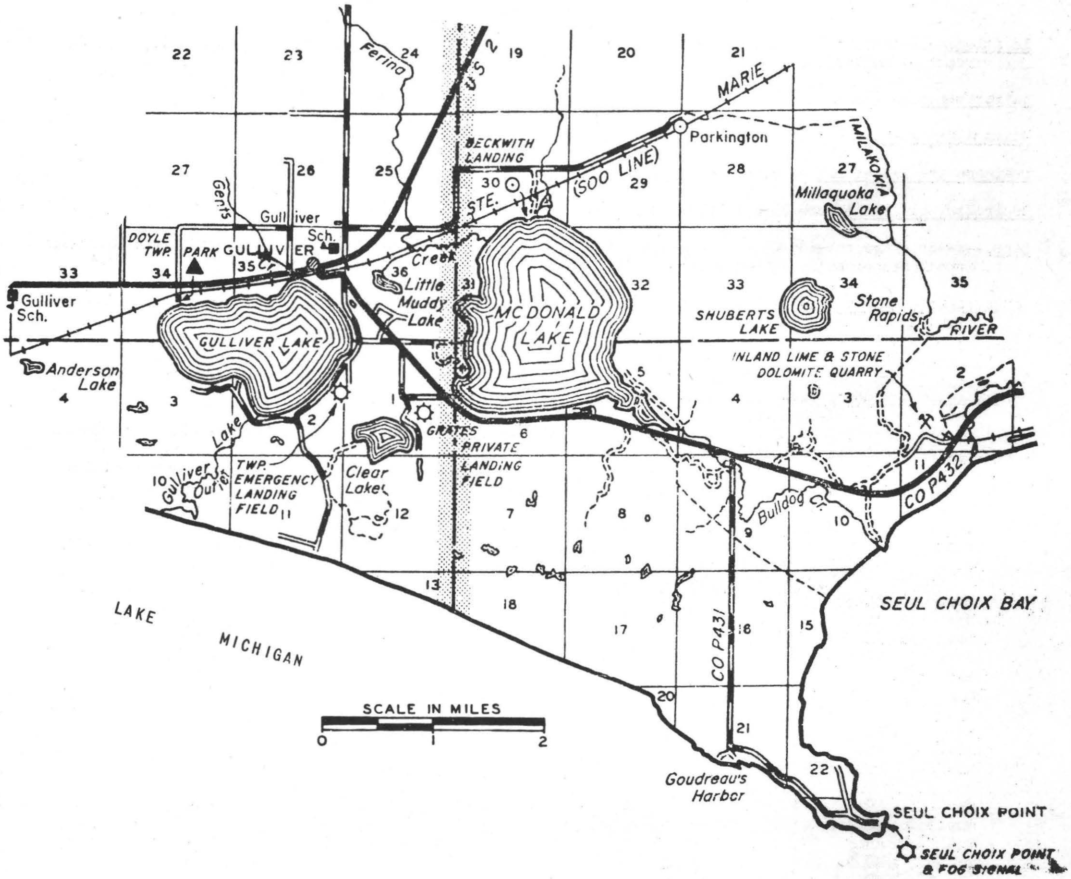
Remarks.--The inlet to Gulliver Lake is Gents Creek. The outlet, Gulliver Lake Outlet, is tributary to Lake Michigan.

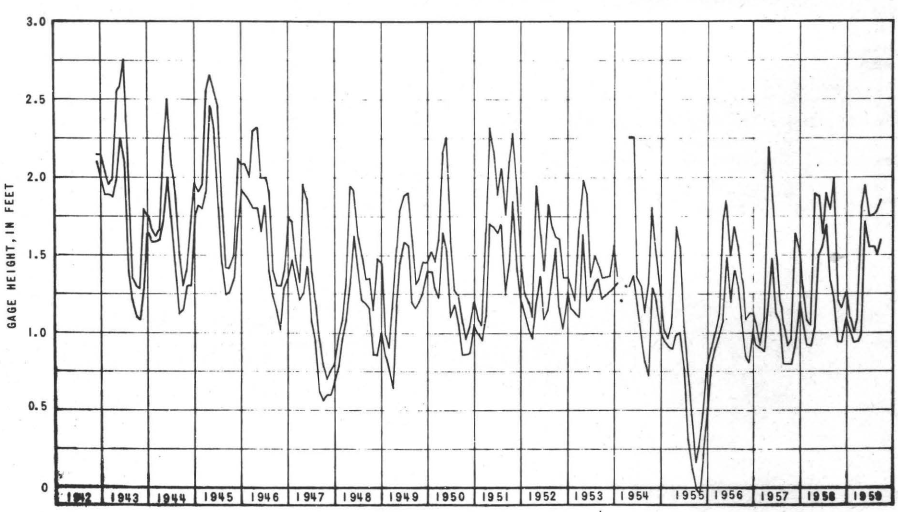
An engineering lake-level control study was completed in 1957 by the Michigan Department of Natural Resources.

The following discharge measurements were made on Gulliver Lake Outlet in the vicinity of the dam at lake outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
Mar. 16, 1945	4.20	Feb. 19, 1953	5.34
May 5, 1945	9.91	May 12, 1953	18.8
Nov. 15, 1945	8.52	July 22, 1953	.39
Jan. 23, 1946	8.79	Oct. 15, 1953	.36
Apr. 24, 1946	12.4	Feb. 15, 1954	6.00
Aug. 20, 1946	1.48	May 12, 1954	24.5
Nov. 15, 1946	10.8	Aug. 20, 1954	.92
Mar. 5, 1947	3.53	Nov. 9, 1954	10.4
Apr. 17, 1947	29.2	Feb. 16, 1955	2.55
Aug. 14, 1947	.79	Apr. 27, 1955	17.5
Oct. 29, 1947	0	July 28, 1955	0
Jan. 23, 1948	0	Oct. 19, 1955	0
Apr. 22, 1948	3.68	Jan. 17, 1956	0
Oct. 6, 1948	0	Apr. 12, 1956	19.2
Feb. 3, 1949	5.41	July 19, 1956	8.51
Apr. 26, 1949	0	Oct. 17, 1956	3.21
Feb. 10, 1950	6.40	Jan. 15, 1957	4.36
May 4, 1950	30.8	May 1, 1957	30.9
July 26, 1950	.05 estimated	July 15, 1957	.17
Oct. 12, 1950	1.88	Oct. 16, 1957	0
Jan. 15, 1951	2.00	Jan. 20, 1958	3.97
May 15, 1951	3.10	May 1, 1958	13.9
Aug. 23, 1951	0	July 17, 1958	2.41
Oct. 16, 1951	7.53	Oct. 14, 1958	4.31
Jan. 17, 1952	5.33	Jan. 19, 1959	3.20
Apr. 24, 1952	18.8	May 20, 1959	.5 estimated
June 17, 1952	6.07	Sept. 15, 1959	.64
Oct. 16, 1952	0		

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Gulliver Lake at Gulliver, Mich.

SCHOOLCRAFT COUNTY

Indian Lake near Manistique, Mich.

Location.--Lat 45°59'30", long 86°17'19", in many sections, Tps. 41 and 42 N., Rs. 16 and 17 W., 2 miles northwest of Manistique.

Surface area.--8,660 acres.

Maximum depth.--18 ft.

Drainage area at outlet.--302 sq mi.

Records available.--March 1938 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 608.66 ft above mean sea level (levels by Michigan Department of Natural Resources). Prior to July 9, 1942 chain gage and staff gage, at same datum.

Established legal level.--613.27 ft above mean sea level, established by Circuit Court on June 19, 1945.

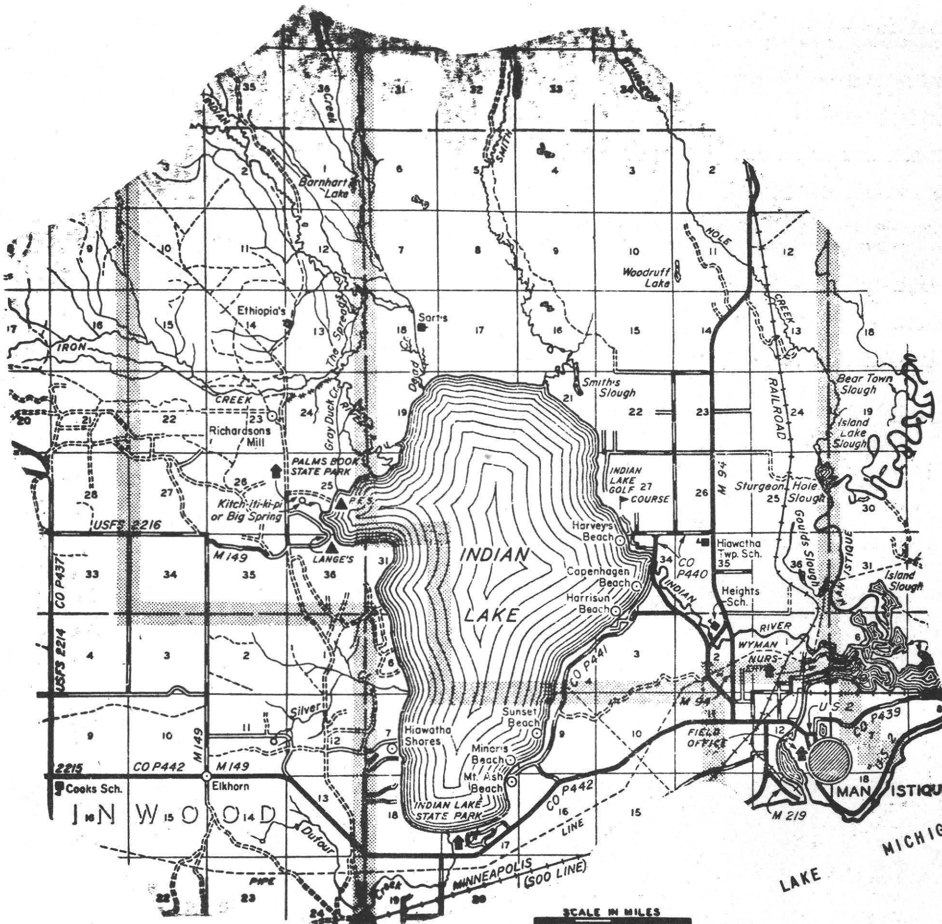
Extremes.--1938-68: Maximum stage, 7.79 ft June 24, 1943; minimum, 2.22 ft Nov. 17, 1955.

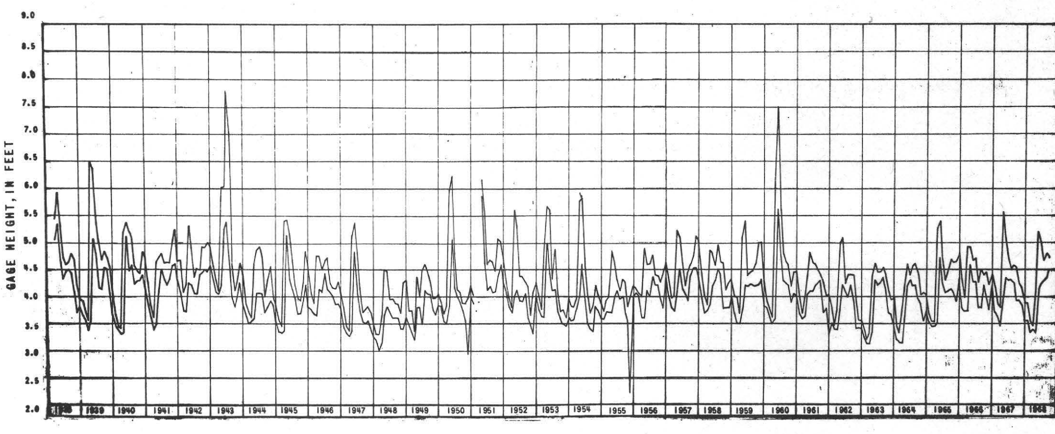
Regulation or control.--Lake level regulated by two steel vertical lift gates in a concrete and earth fill dam, 1.5 miles downstream from lake on outlet.

Remarks.--The inlets to Indian Lake are Silver Creek, DuFour Creek, Indian River, Dead Creek, Smith Creek, and Big Spring. The outlet is Indian River, a tributary of Manistique River.
A report of the water surface elevations and outflow from the lake during the high water period June 13 to July 9, 1943 was prepared in 1943 by the U.S. Geological Survey.
A regular gaging station has been maintained on Indian River, the outlet, since March 1938. These records are published in U.S. Geological Survey Water-Supply Papers.
The following discharge measurements have been made on one of the inlets, Big Spring, about 2,000 feet upstream from Indian Lake.

Date	Discharge (cfs)	Date	Discharge (cfs)
May 24, 1950	37.1	July 10, 1959	25.6
Aug. 8, 1950	31.2	Oct. 15, 1959	21.7
Nov. 9, 1950	32.2	May 23, 1960	48.1
May 15, 1951	35.5	June 24, 1960	31.8
Aug. 21, 1951	32.6	Oct. 14, 1960	26.8
Oct. 18, 1951	29.1	May 12, 1961	29.6
Apr. 24, 1952	39.4	Sept. 15, 1961	24.8
July 22, 1952	32.5	Oct. 27, 1961	22.5
Nov. 13, 1952	27.2	May 16, 1962	33.6
May 11, 1953	35.5	July 17, 1962	25.4
July 21, 1953	35.0	Oct. 12, 1962	22.8
Oct. 16, 1953	31.9	Apr. 25, 1963	24.8
May 11, 1954	33.7	Aug. 27, 1963	23.4
Aug. 20, 1954	28.5	Oct. 16, 1963	20.2
Nov. 11, 1954	31.0	May 12, 1964	26.1
Apr. 29, 1955	36.0	Aug. 27, 1964	28.9
July 28, 1955	27.1	Oct. 4, 1964	25.8
Oct. 20, 1955	21.3	July 8, 1965	27.6
May 8, 1956	25.6	Nov. 24, 1965	30.2
July 18, 1956	22.8	Feb. 24, 1966	30.6
Oct. 15, 1956	19.8	July 7, 1966	34.8
May 1, 1957	31.9	Sept. 7, 1966	28.4
July 17, 1957	30.0	Feb. 17, 1967	24.0
Oct. 17, 1957	21.2	July 25, 1967	26.6
May 1, 1958	30.9	Nov. 3, 1967	27.8
July 15, 1958	29.4	Mar. 8, 1968	22.3
Oct. 16, 1958	24.6	May 1, 1968	34.7
May 18, 1959	30.8	July 30, 1968	28.9

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Indian Lake near Manistique, Mich.

SCHOOLCRAFT COUNTY

McDonald Lake near Gulliver, Mich.

Location.--Lat 45°58'15", long 85°56'38", in many sections, Tps. 41 and 42 N., Rs. 13 and 14 W., 3.5 miles southeast of Gulliver.

Surface area.--1,440 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--12 sq mi, approximately.

Records available.--May 1943 to September 1950, December 1953, June 1954 to September 1958, and March 1961 to September 1962 except some winter periods.

Gage.--Staff gage read daily. Datum of gage is 606.58 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--Winter, 608.0 ft; summer, 608.5 ft above mean sea level, established by Circuit Court on Oct. 1, 1962.

Extremes.--1943-50, 1953-58, 1961-62: Maximum stage observed, 2.90 ft May 1, 1957; minimum observed, 0.37 ft Sept. 9, 10, 1955.

Regulation or control.--In 1942 several truck loads of rock were placed in the outlet to form a makeshift dam. A new dam was constructed in the fall of 1963 to maintain the legal level of the lake.

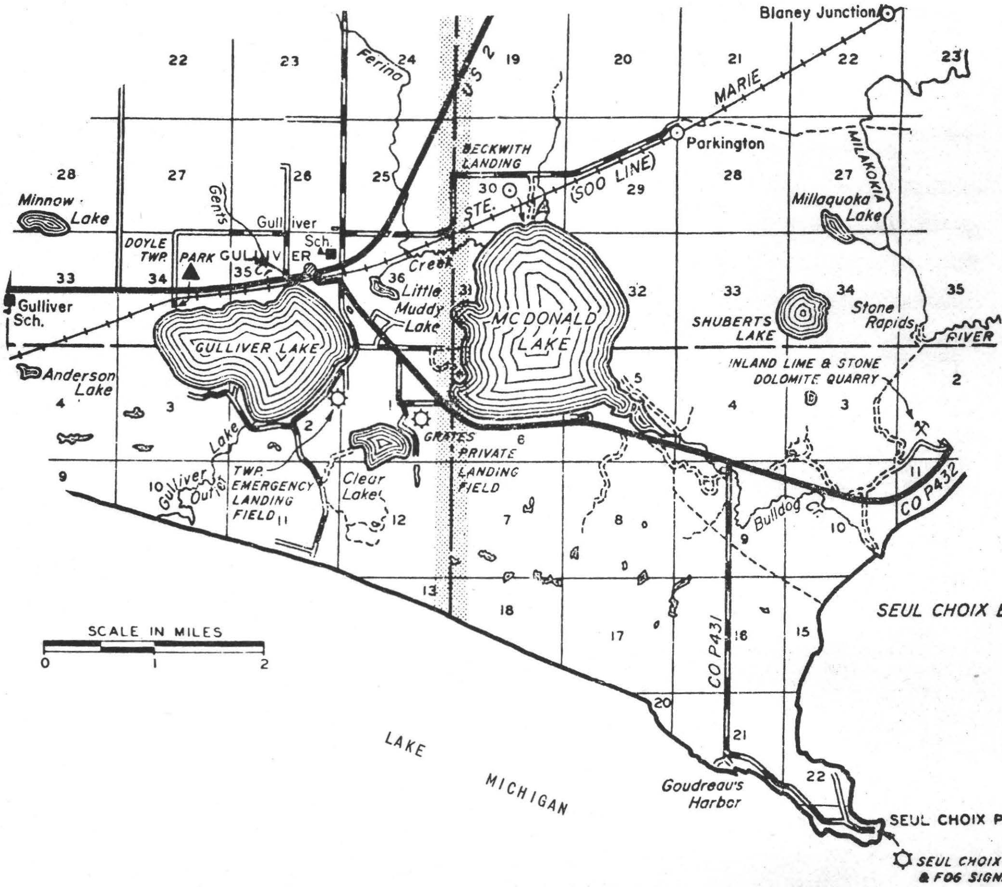
Remarks.--The inlets to McDonald Lake are Ferina Creek and a small unnamed stream entering the north end of the lake. The outlet, Bulldog Creek, is tributary to Lake Michigan.

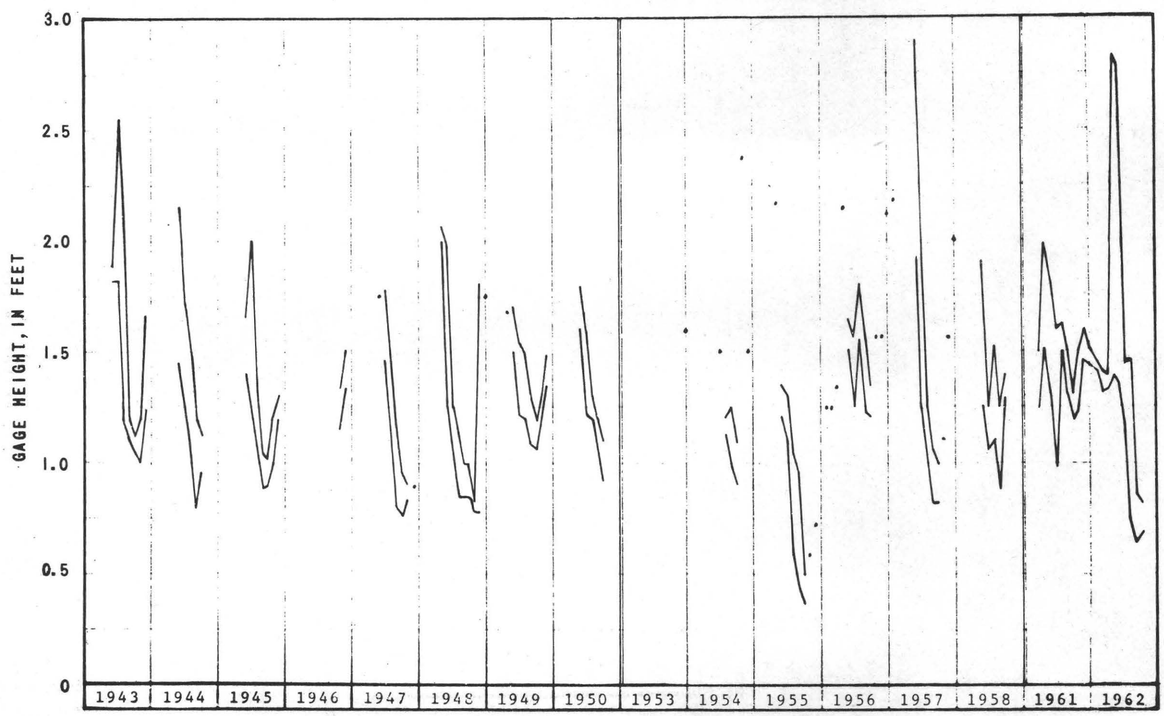
An engineering lake-level control study was completed in 1962 by the Michigan Department of Natural Resources.

The following discharge measurements have been made on Bulldog Creek, in NE¼ sec. 9, T.41 N., R.13 W., at county highway, and published in U.S. Geological Survey Water-Supply Papers as McDonald Lake outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
Mar. 12, 1945	6.92	Aug. 14, 1947	0.26
May 5, 1945	45.4	Jan. 23, 1948	3.60
Nov. 15, 1945	60.1	June 3, 1948	3.14
Jan. 23, 1946	20.1	Oct. 2, 1948	.27
Apr. 24, 1946	15.7	Feb. 3, 1949	9.17
Aug. 20, 1946	4.25	Apr. 26, 1949	39.2
Nov. 15, 1946	26.8	Oct. 20, 1949	1.31
Mar. 5, 1947	5.42	Feb. 10, 1950	11.3
Apr. 17, 1947	127	May 4, 1950	143
		July 26, 1950	2.46

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for McDonald Lake near Gulliver, Mich.

ST. JOSEPH COUNTY

Clear Lake near Three Rivers, Mich.

Location.--Lat 41°56'18", long 85°43'38", in secs. 8, 17, and 20, T.6 S., R.12 W., 4.9 miles west of Three Rivers.

Surface area.--240 acres.

Maximum depth.--60 ft.

Drainage area at outlet.--1.3 sq mi, approximately.

Records available.--February 1953 to September 1953.

Gage.--Staff gage read daily. Datum of gage is 850.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--874.75 ft above mean sea level, established by Circuit Court on Oct. 29, 1953.

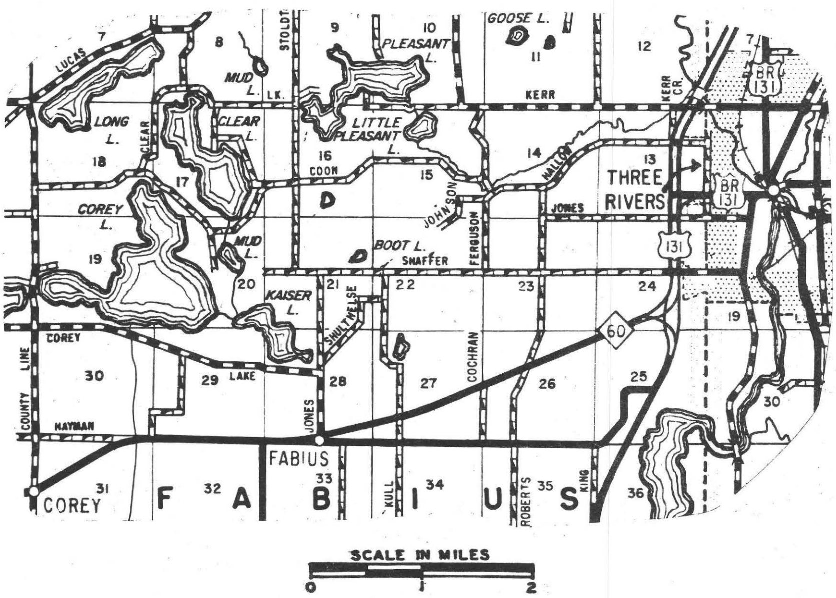
Extremes.--1953: Maximum stage observed, 25.48 ft Apr. 11, 12; minimum observed, 24.16 ft Sept. 13-16. The lake level was below the gage, or below 23.74 feet, for the period Sept. 23-30.

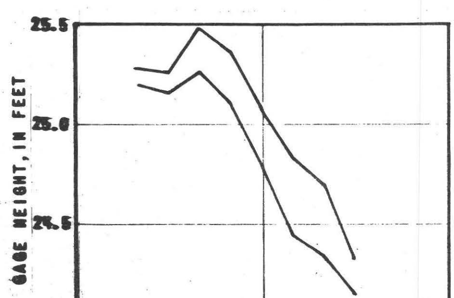
Regulation or control.--Lake level is controlled by culverts at outlet which restricts flow from the lake, and by pumpage from Long Lake.

Remarks.--Clear Lake is one of a chain of lakes which include Long, Clear, Harwood, Mud, Kaiser, and Corey Lakes. All are connected by channels except Long Lake, which is connected by a pipe line equipped with a pump to remove excess water from the lake and to discharge it into Clear Lake. This is the only surface inlet to Clear Lake. The outlet at the south end is a short culvert and channel to Mud Lake.

No discharge measurements are available on the inlet or outlet.

An engineering lake-level control study was completed in 1953 on Corey, Kaiser, Mud, and Clear Lakes by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Clear Lake near Three Rivers, Mich.

ST. JOSEPH COUNTY

Corey Lake near Three Rivers, Mich.

Location.--Lat 41°55'31", long 85°44'38", in many sections, T.6 S., Rs.12 and 13 W., 5.9 miles southwest of Three Rivers.

Surface area.--567 acres.

Maximum depth.--80 ft.

Drainage area at outlet.--6.5 sq mi, approximately.

Records available.--August 1951 to October 1953 except periods December 1951, January 1952, July 1952 to May 1953.

Gage.--Staff gage read intermittently. Datum of gage is 870.0 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--873.45 ft above mean sea level, established by Circuit Court on Jan. 25, 1932, revised to 874.5 ft on Aug. 21, 1953.

Extremes.--1951-53: Maximum stage observed, 7.56 ft Aug. 1, 1951; minimum observed, 3.96 ft Oct. 24, 1953.

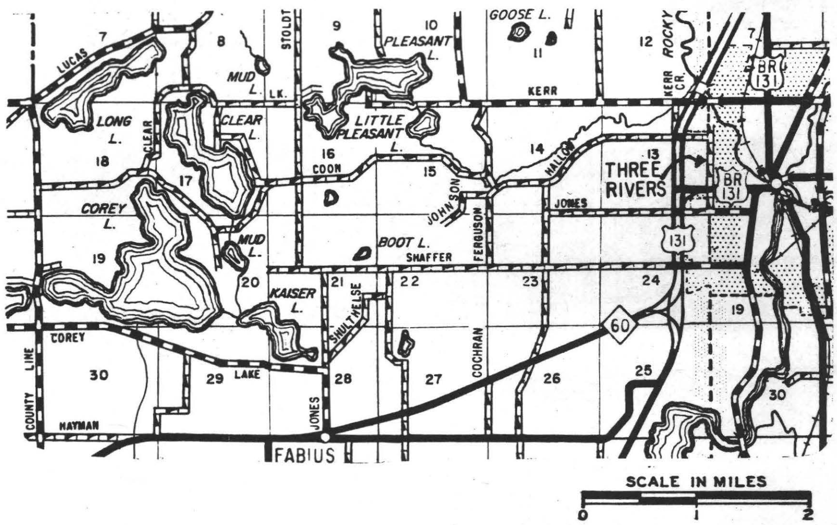
Regulation or control.--Lake level controlled by a dam at the outlet.

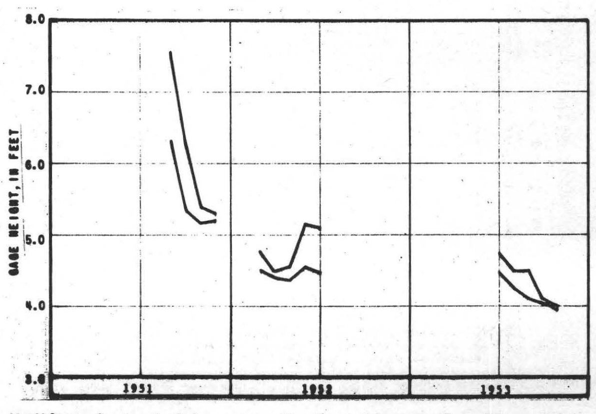
Remarks.--Corey is one of a chain of lakes which include Long, Clear, Harwood, Mud, Kaiser and Corey Lakes. All are interconnected by channels except Long Lake, which is connected by a pipe line and equipped with a pump. Water from Long Lake is pumped into Clear Lake at times of high lake level.

The principal inlet is Harwood Lake outlet which enters the west side of Corey Lake. During periods of high runoff discharge into Corey Lake may be from a total drainage area of 11.2 sq mi. It may include outflow from Long, Clear, Mud, Kaiser, Harwood and Corey Lakes. During periods of lower water levels, Corey Lake may discharge into Kaiser Lake. However, the principal outlet is an artificial drain from the south end of Corey Lake to Mill Creek, about 3 miles south of the lake. The drain was opened Aug. 1, 1951.

No discharge measurements are available on inlets or outlets.

An engineering lake-level control study was completed in 1953 on Corey, Kaiser, Mud and Clear Lakes by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Corey Lake near Three Rivers, Mich.

ST. JOSEPH COUNTY

Kaiser Lake near Three Rivers, Mich.

Location.--Lat 41°55'40", long 85°43'46", in secs. 20, 21, 28, and 29, T.6 S., R.12 W., 5.1 miles southwest of Three Rivers.

Surface area.--89 acres.

Maximum depth.--14 ft.

Drainage area at outlet.--4.7 sq mi.

Records available.--February 1953 to October 1953 except periods March and September.

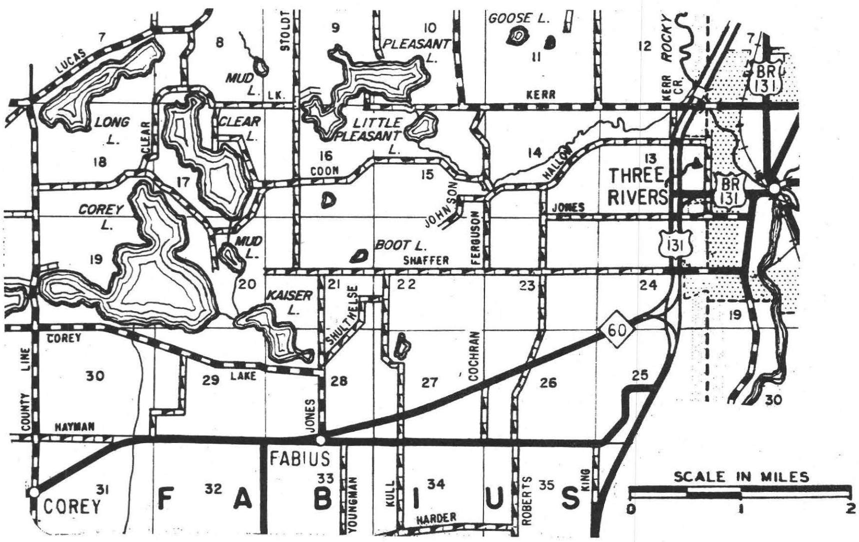
Gage.--Staff gage read daily. Datum of gage is 850.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

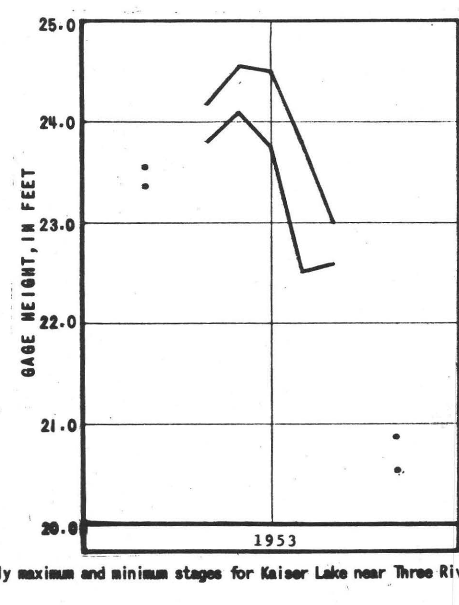
Established legal level.--874.50 ft above mean sea level, established by Circuit Court on Aug. 18, 1953.

Extremes.--1953: Maximum stage observed, 24.55 ft May 18, 20-25; minimum observed, 20.53 ft Oct. 10.

Regulation or control.--None.

Remarks.--Kaiser is one of a chain of lakes which include Long, Clear, Harwood, Mud, Corey, and Kaiser Lakes. The inlet is a stream from Mud Lake. The outlet is the connecting channel to Corey Lake. The connecting channel may serve as an inlet or outlet depending on the relative water levels in Corey and Kaiser Lakes.
No discharge measurements are available on inlet or outlet.
An engineering lake-level control study was completed in 1953 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Kaiser Lake near Three Rivers, Mich.

ST. JOSEPH COUNTY

Klinger Lake near White Pigeon, Mich.

Location.--Lat 41°48'51", long 85°32'54", in secs. 1, 2, 35, and 36, Tps. 7 and 8 S., R.11 W., 5.0 miles east of White Pigeon.

Surface area.--830 acres.

Maximum depth.--85 ft.

Drainage area at outlet.--16.7 sq mi.

Records available.--July 1944 to December 1959.

Gage.--Staff gage read daily to weekly. Datum of gage is 805.77 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

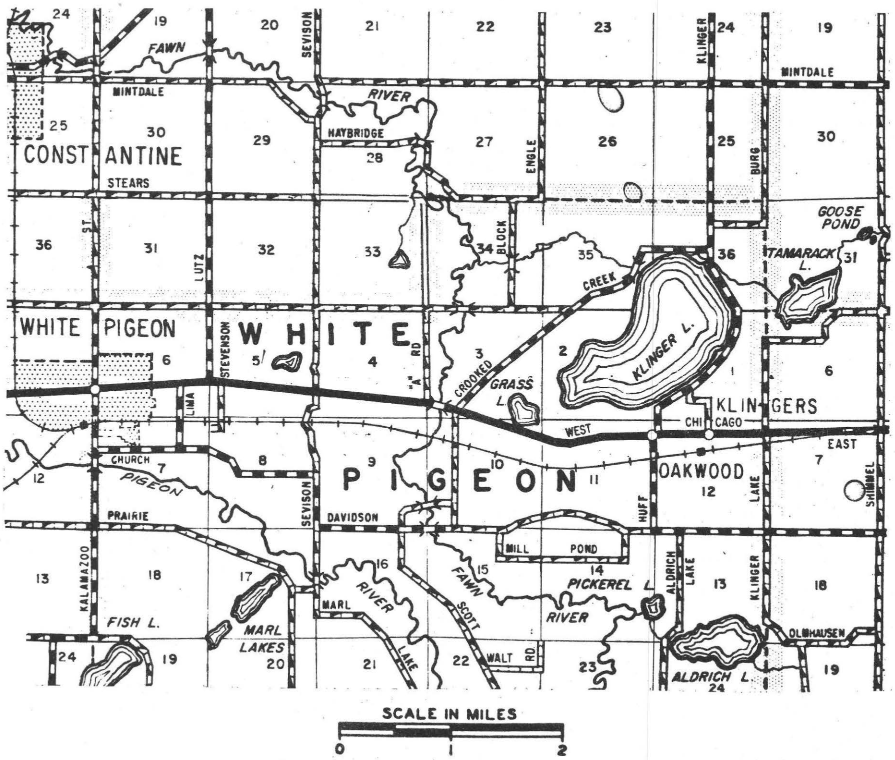
Extremes.--1944-59: Maximum stage observed, 1.20 ft Apr. 26, 27, 1954; minimum not determined; lake level was below gage datum in September, October, November, and December 1957.

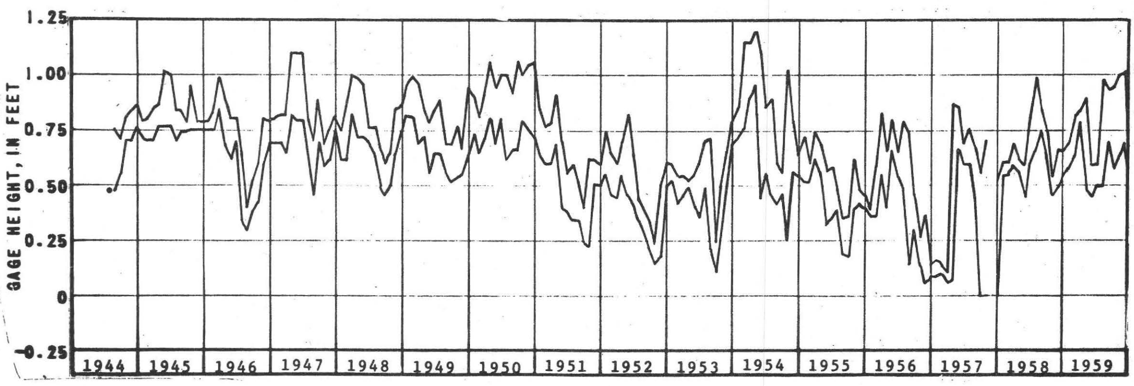
Regulation or control.--A dam, equipped with stop logs, completed in July 1950, is used to control the lake level. This dam was partially washed out in August 1956 but has been repaired.

Remarks.--The principal inlet is from Tamarack Lake and enters the northeast end of Klinger Lake. A number of small inlets flow into other parts of the lake. Klinger Lake outlet leaves the northwest side of the lake and flows about 1.5 miles to Fawn River, about 6 miles upstream from the St. Joseph River.

No discharge measurements are available on inlets. The following discharge measurements were made at the lake outlet.

Date	Discharge (cfs)	Date	Discharge (cfs)
July 23, 1941	10.61	July 8, 1953	17.5
July 21, 1944	9.95	Oct. 5, 1953	12.4
Apr. 10, 1946	18.6	Jan. 11, 1954	15.8
May 15, 1946	14.9	May 3, 1954	42.7
Aug. 13, 1946	7.75	July 14, 1954	32.0
Jan. 9, 1947	24.6	Oct. 5, 1954	24.2
Apr. 17, 1947	44.1	Mar. 14, 1955	29.7
May 7, 1947	29.8	May 9, 1955	20.7
Oct. 28, 1947	17.0	Aug. 10, 1955	15.8
Jan. 6, 1948	28.9	Oct. 3, 1955	19.5
May 27, 1948	24.4	Jan. 11, 1956	21.0
Aug. 12, 1948	15.0	Apr. 11, 1956	27.2
Dec. 17, 1948	24.2	July 31, 1956	21.6
Feb. 17, 1949	23.4	Oct. 2, 1956	9.10
June 16, 1949	23.3	Mar. 18, 1957	20.4
Oct. 6, 1949	26.3	May 16, 1957	16.0
Jan. 16, 1950	38.4	July 6, 1957	7.42
May 17, 1950	30.4	Sept. 6, 1957	12.5
July 25, 1950	31.7	June 3, 1958	11.8
Oct. 19, 1950	27.2	July 9, 1958	17.4
Jan. 10, 1951	35.5	Nov. 4, 1958	12.8
May 4, 1951	36.6	May 19, 1959	13.7
Aug. 14, 1951	29.4	Aug. 4, 1959	20.4
Nov. 14, 1951	35.2	Nov. 4, 1959	17.4
Feb. 12, 1952	35.2	May 9, 1960	24.4
Mar. 27, 1952	33.5	Aug. 22, 1963	13.9
June 12, 1952	27.3	Oct. 31, 1963	10.8
Aug. 7, 1952	19.3	Dec. 23, 1963	15.5
Nov. 10, 1952	17.7	Sept. 2, 1964	.64
Feb. 5, 1953	26.1	Dec. 30, 1964	17.1
Apr. 6, 1953	23.9	May 26, 1965	14.4
		July 29, 1965	6.96





Monthly maximum and minimum stages for Klinger Lake near White Pigeon, Mich.

ST. JOSEPH COUNTY

Mud Lake near Three Rivers, Mich.

Location.--Lat 41°55'43", long 85°43'40", in sec. 20, T.6 S., R.12 W., 5.0 miles west of Three Rivers.

Surface area.--105 acres.

Maximum depth.--10 ft.

Drainage area at outlet.--1.9 sq mi.

Records available.--February to August 1953.

Gage.--Staff gage read daily. Datum of gage is 849.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.-874.50 ft above mean sea level, established by Circuit Court on Aug. 21, 1953.

Extremes.--1953: Maximum stage observed, 25.62 ft May 19, 22, 23; minimum observed, 24.00 ft Aug. 19,

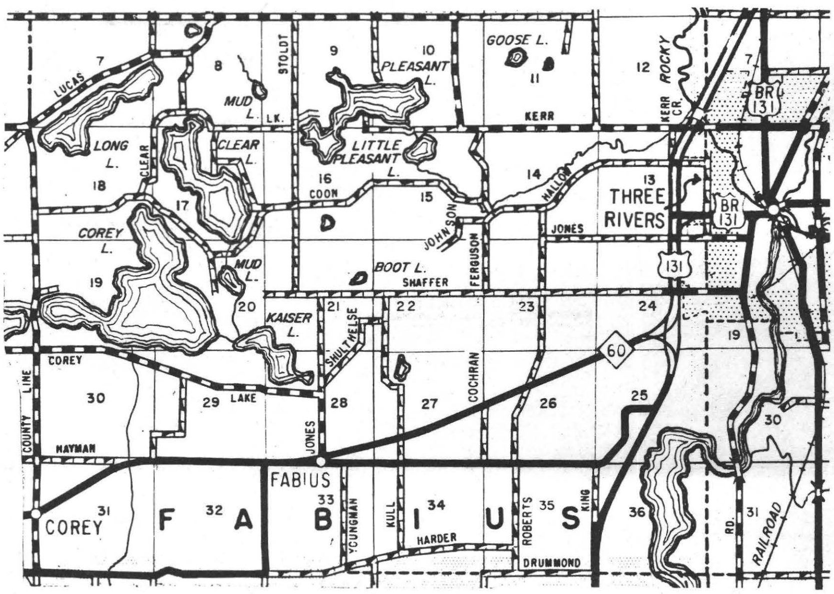
Regulation or control.--None.

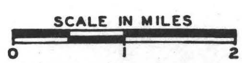
Remarks.--Mud Lake is one of a chain of lakes consisting of Long, Clear, Harwood, Kaiser, Corey and Mud Lakes. Mud Lake usually receives discharge only from Clear Lake, however, when the level of Long Lake is high, water is pumped from Long to Clear Lake and thus into Mud Lake. During these periods Mud Lake has an effective drainage area of 4.0 sq mi.

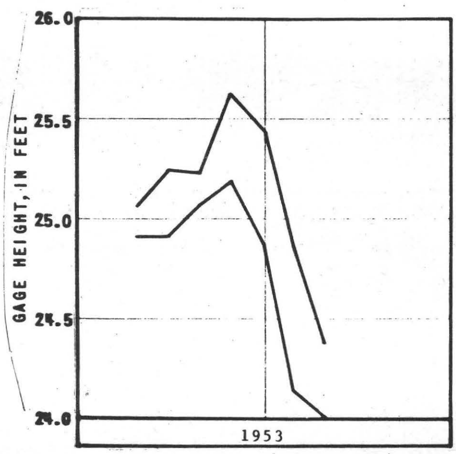
The inlet is from Clear Lake. The outlet is the channel to Kaiser Lake.

No discharge measurements are available on the inlet or outlet.

An engineering lake-level control study was completed in 1953 by the Michigan Department of Natural Resources







Monthly maximum and minimum stages for Mud Lake near Three Rivers, Mich.

TUSCOLA COUNTY

Murphy Lake near Millington, Mich.

Location.--Lat 43°18'13", long 83°28'09", in many sections, T.10 N., Rs. 8 and 9 E., 3.5 miles northeast of Millington.

Surface area.--203 acres.

Maximum depth.--41 ft.

Drainage area at outlet.--7.7 sq mi, approximately.

Records available.--April 1955 to September 1958.

Gage.--Staff gage read two or three times a week. Datum of gage is 730.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

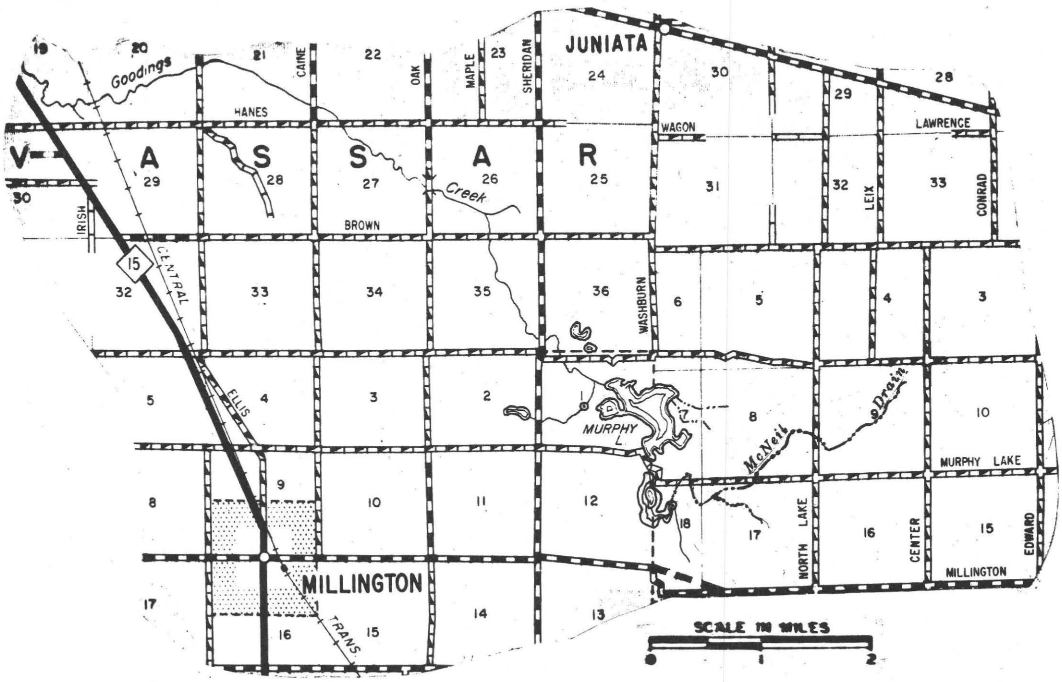
Established legal level.--Winter, 746.5 ft; summer, 747.0 ft above mean sea level, established by Circuit Court on Nov. 26, 1958.

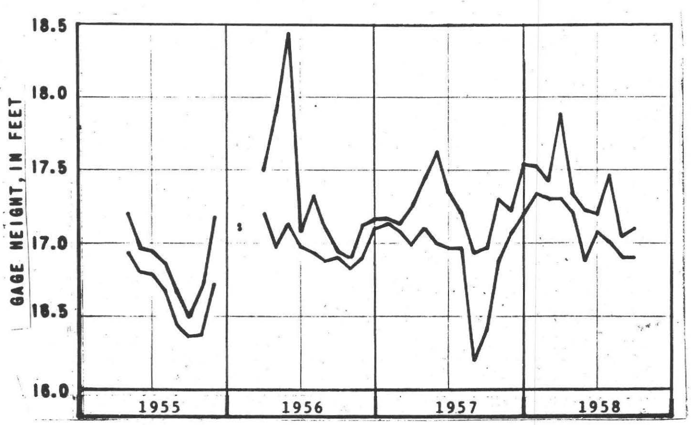
Extremes.--1955-58: Maximum stage observed, 18.44 ft May 13, 1956; minimum observed, 16.20 ft Aug. 23, 1957.

Regulation or control.--A dam with stop logs was built at the outlet in 1937 and altered in 1939 to control lake level. Prior to this, a dam was built in the lumbering days and existed to 1937.

Remarks.--Several small intermittent streams, one of which is McNeil Drain, enter the south and east sides of the lake. The outlet, Goodings Creek, leaves the northwest end of the lake and flows northwest to Cass River. No discharge measurements are available on the inlets or outlet.

An engineering lake-level control study was completed in 1956 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Murphy Lake near Millington, Mich.

VAN BUREN COUNTY

Bankson Lake near Lawton, Mich.

Location.--Lat 42°06'50", long 85°47'56", in secs. 11, 14, and 15, T.4 S., R.13 W., 4.5 miles southeast of Lawton.

Surface area.--202 acres.

Maximum depth.--60 ft.

Drainage area.--Not determined.

Records available.--July 1950 to December 1954 except periods November 1950 to April 1951, September and October 1951, December 1951 to March 1952, and July 1952.

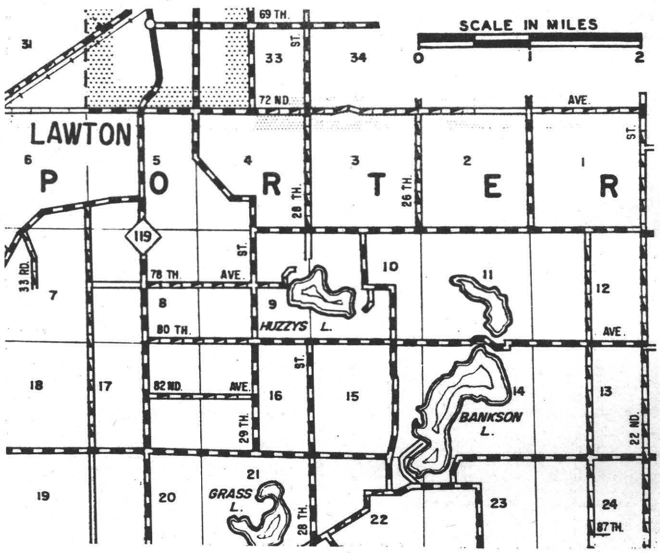
Gage.--Staff gage read daily. Datum of gage is 890.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

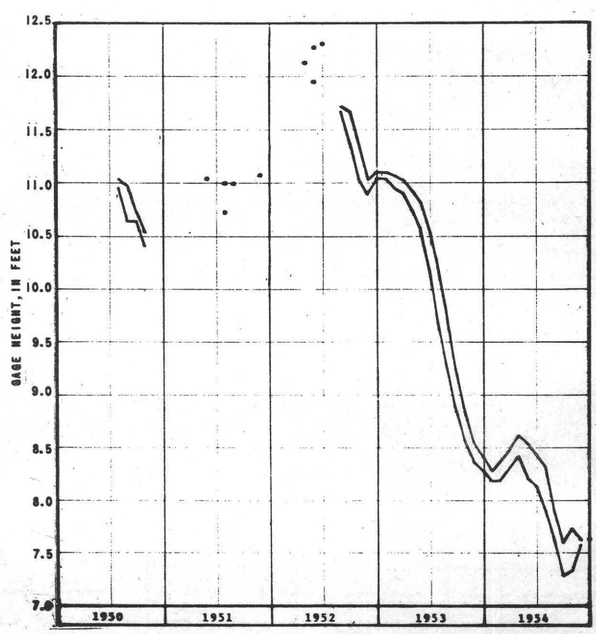
Established legal level.--None known.

Extremes.--1950-54: Maximum stage observed, 12.31 ft June 2, 1952; minimum observed, 7.28 ft Sept. 28, 1954.

Regulation or control.--None.

Remarks.--There are no inlets or outlets to Bankson Lake.
See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Bankson Lake near Lawton, Mich.

VAN BUREN COUNTY

Brownwood Lake near Paw Paw, Mich.

Location.--Lat 42°14'31", long 85°55'20", in secs. 2, 3, 34, and 35, Tps.2 and 3 S., R.14 W., 2.5 miles northwest of Paw Paw.

Surface area.--120 acres.

Maximum depth.--44 ft.

Drainage area at outlet.--1.6 sq mi, approximately.

Records available.--December 1948 to September 1952 except for periods July to September 1949, February 1950 to June 1951, September 1951, February and March 1952.

Gage.--Staff gage read daily. Datum of gage is 694.50 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--696.5 ft above mean sea level, established by Circuit Court on Apr. 29, 1960.

Extremes.--1948-52: Maximum stage observed, 2.20 ft May 25-29, 1952; minimum observed, 1.40 ft Nov. 12-15, 1949.

Regulation or control.--A concrete dam at the outlet controls lake level.

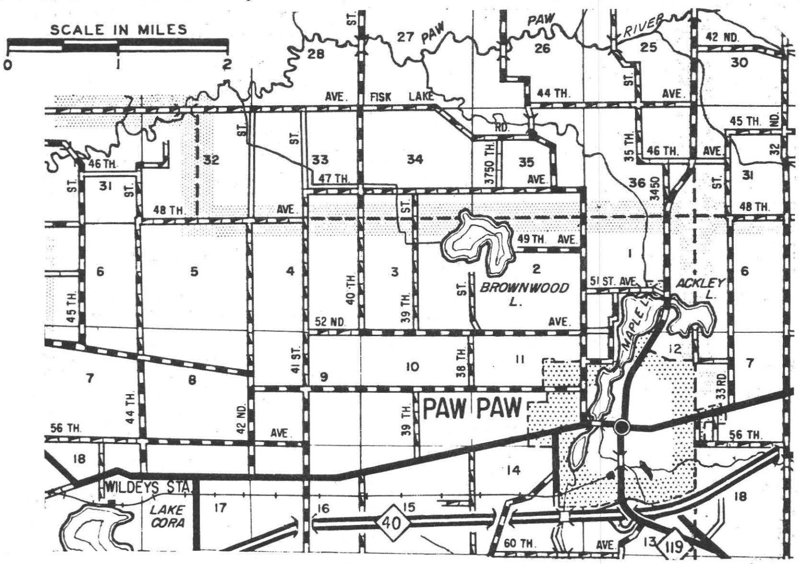
Remarks.--There is no active inlet to Brownwood Lake. The outlet, Buckley Drain, at the west end of the lake, flows to Carter Creek Drain and thence to Paw Paw River.

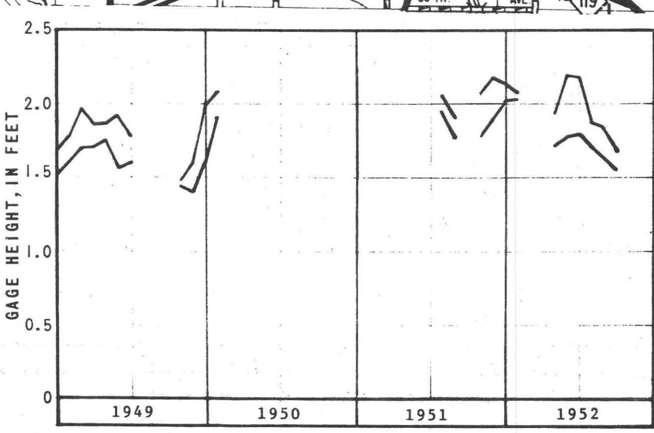
An engineering lake-level control study was completed in 1953 by the Michigan Department of Natural Resources.

The following discharge measurements have been made on the outlet about 0.3 mile downstream from the lake.

Date	Discharge (cfs)
Jan. 11, 1949	1.18
Mar. 2, 1949	1.99
Apr. 12, 1949	1.98
Oct. 19, 1951	1.05

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Brownwood Lake near Paw Paw, Mich.

VAN BUREN COUNTY

Cedar Lake near Marcellus, Mich.

Location.--Lat 42°05'00", long 85°50'19", in secs. 27, 28, and 33, T.4 S., R.13 W., 4.1 miles north of Marcellus.

Surface area.--269 acres.

Maximum depth.--80 ft.

Drainage area.--Not determined.

Records available.--February 1960 to June 1961 except September 1960 and January 1961. Once monthly readings are also available for period 1963-68, gage datum unknown.

Gage.--Staff gage read daily. Datum of gage is 890.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

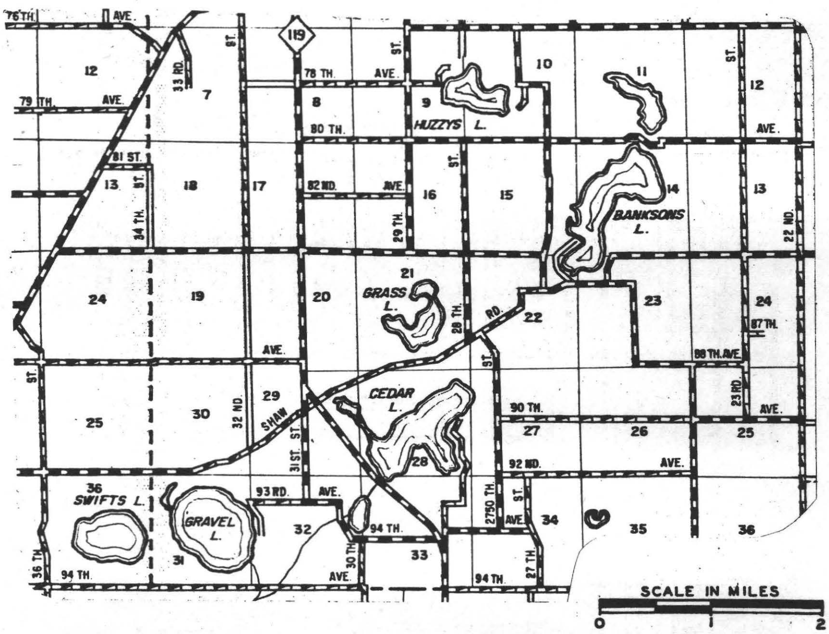
Extremes.--1960-61: Maximum stage observed, 1.88 ft July 3, 1960; minimum observed, 0.84 ft Feb. 6, 1960.

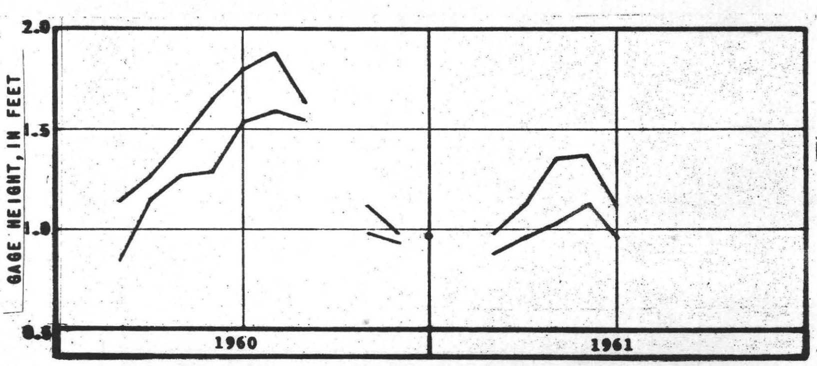
Regulation or control.--A small earthen dam in culvert holds Cedar Lake about 0.8 ft higher than adjacent Little Cedar Lake.

Remarks.--There is no inlet to Cedar Lake. The outlet, at the southwest end of the lake, is through a culvert into Little Cedar Lake.

On July 9, 1952 a discharge of 0.9 cfs was measured on the outlet of Little Cedar Lake about 0.6 mile downstream from Cedar Lake.

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Cedar Lake near Marcellus, Mich.

VAN BUREN COUNTY

Coffee Lake near Grand Junction, Mich.

Location.--Lat 42°23'48", long 86°04'58", in sec. 8, T.1 S., R.15 W., 0.7 mile southwest of Grand Junction.

Surface area.--35 acres.

Maximum depth.--25 ft.

Drainage area.--Not determined.

Records available.--October 1946 to August 1947 except February, March, and June 1947.

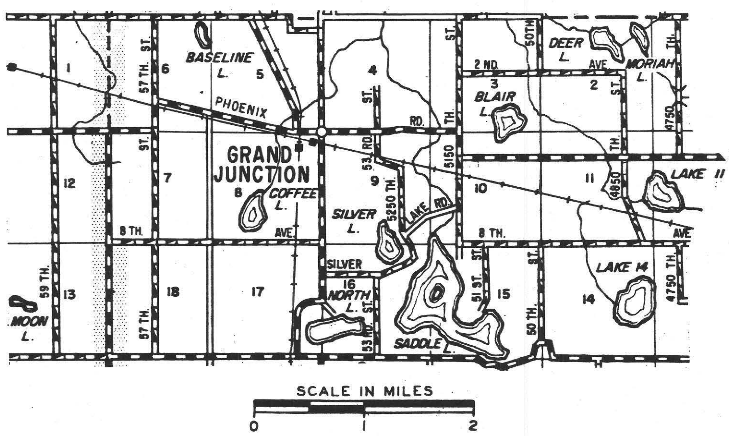
Gage.--Staff gage read intermittently. Datum of gage not determined.

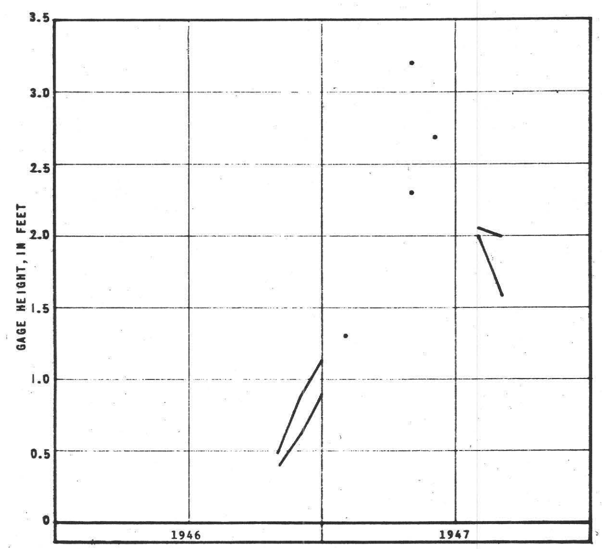
Established legal level.--None known.

Extremes.--1946-47: Maximum stage observed, 3.20 ft Apr. 7, 1947; minimum observed, 0.39 ft Oct. 11, 1946.

Regulation or control.--A concrete dam with flash boards located in the outlet about 0.3 mile downstream from the lake, controls lake level at higher stages. A local blueberry plantation pumps water from lake for irrigation during dry weather. This tends to lower the lake during summer and fall.

Remarks.--There is no inlet to Coffee Lake. The outlet is a dredged channel at the north end of the lake. It flows about 2 miles to Barber Creek, a tributary to Black River.
No discharge measurements have been made on the outlet.
See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Coffee Lake near Grand Junction, Mich.

VAN BUREN COUNTY

Gravel Lake near Marcellus, Mich.

Location.--Lat 42°04'18", long 85°51'37", in secs. 31 and 32, T.4 S., R.13 W., 4.0 miles northwest of Marcellus.

Surface area.--296 acres.

Maximum depth.--52 ft.

Drainage area at outlet.--3.5 sq mi, approximately.

Records available.--September 1948 to July 1949 and July to December 1952.

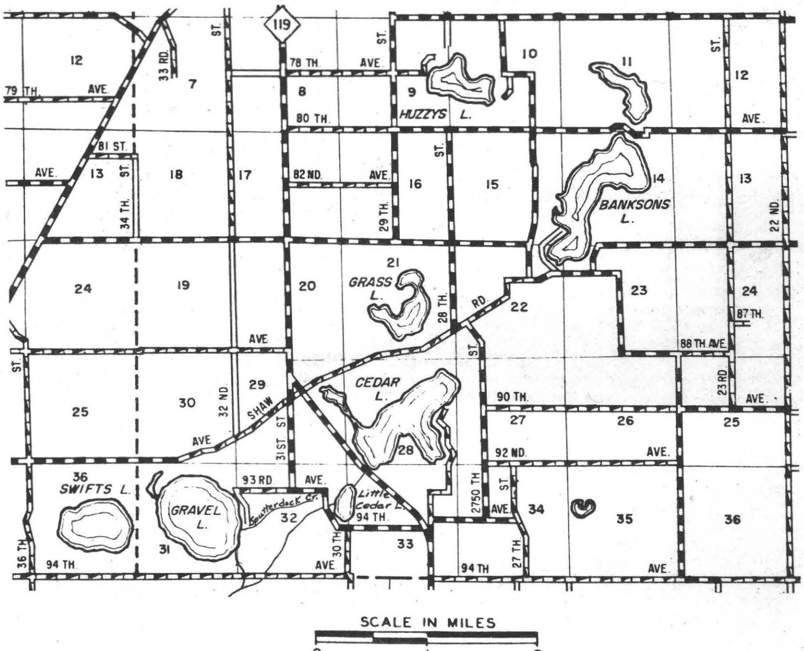
Gage.--Staff gage read intermittently. Datum of gage is 880.08 ft above mean sea level (levels by Michigan Department of Natural Resources).

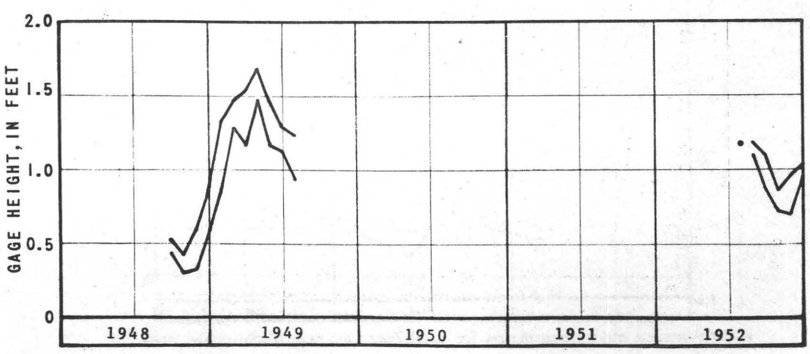
Established legal level.--881.25 ft above mean sea level, established by Circuit Court on July 25, 1949.

Extremes.--1948-49; 1952: Maximum stage observed, 1.68 ft Apr. 15-17, 1949; minimum observed, 0.30 ft Oct. 22, 1948.

Regulation or control.--A fixed-crest dam at the lake outlet controls the lake level.

Remarks.--The inlet, Sputterdock Creek, is an intermittent stream with its source near Little Cedar Lake. The outlet, at the southeast side, joins a small stream from the Cedar Lake area, then flows into Saddlebag Lake.
A discharge of 0.9 cfs was measured on the inlet about 0.8 mile upstream from Gravel Lake on July 9, 1952. A discharge of 3.7 cfs was measured at the outlet, 30 feet below the control structure on July 9, 1952.
An engineering lake-level control study was completed in 1949 by the Michigan Department of Natural Resources.
See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Gravel Lake near Marcellus, Mich.

VAN BUREN COUNTY

Great Bear Lake near Bloomingdale, Mich.

Location.--Lat 42°22'11", long 85°59'51", in secs. 13, 18, 19, and 24, T.1 S., Rs. 14 and 15 W., 2.3 miles southwest of Bloomingdale.

Surface area.--150 acres.

Maximum depth.--54 ft.

Drainage area at outlet.--11 sq mi, approximately.

Records available.--February 1960 to March 1962 except period July to September 1960.

Gage.--Staff gage read daily. Datum of gage is 673.21 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--676.8 ft above mean sea level, established by Circuit Court on May 7, 1963.

Extremes.--1960-62: Maximum stage, 4.68 ft Apr. 26, 1961; minimum stage observed, 2.80 ft July 11-15, 1961.

Regulation or control.--None.

Remarks.--The principal inlet is Haven and Max Lake Drain which enters the east side of the lake. Two smaller streams also drain into the lake, one at the north end and one at the south end.

The outlet, Haven and Max Lake Drain, leaves the west side and flows about 4 miles to South Branch Black River.

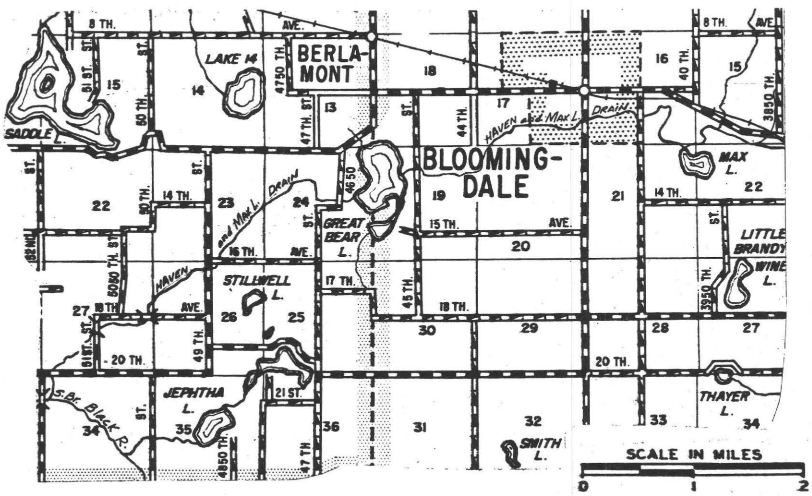
An engineering lake-level control study was completed in 1962 by the Michigan Department of Natural Resources.

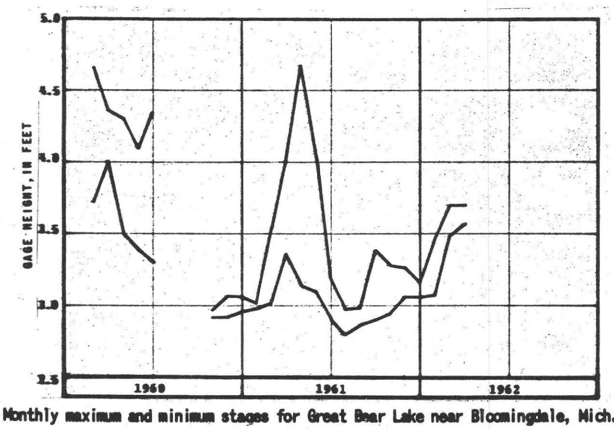
No discharge measurements are available on the inlets.

The following discharge measurements have been made on Haven and Max Lake Drain, in SW¼ sec. 27, T.1 S., R.15 W., at 20th Road, about 4 miles downstream from the lake (drainage area, 16.8 sq mi).

Date	Discharge (cfs)
Sept. 27, 1962	0.85
Apr. 15, 1963	20.4
July 8, 1963	1.83
Oct. 18, 1963	2.00

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Great Bear Lake near Bloomingdale, Mich.

VAN BUREN COUNTY

Lake of the Woods near Decatur, Mich.

Location.--Lat 42°06'28", long 85°59'56", in secs. 13, 18, 19, and 24, T.4 S., Rs. 14 and 15 W., 1.5 miles west of Decatur.

Surface area.--265 acres.

Maximum depth.--34 ft.

Drainage area at outlet.--8.39 sq mi.

Records available.--July 1948 to March 1949, September 1960 to September 1968.

Gage.--Staff gage read daily. Datum of gage not determined. Prior to March 1949, datum of gage was 750.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--751.3 ft above mean sea level, established by Circuit Court on July 20, 1949.

Extremes.--1948-49: Maximum stage observed, 1.50 ft Oct. 24-29, 1948; minimum observed, 0.36 ft Dec. 3, 1948. 1960-68: Maximum stage, 1.40 ft Sept. 26, 1961; minimum, 0.60 ft Aug. 14-18, 1964.

Regulation or control.--A steel sheet piling dam with "U" shaped weir was completed at the lake outlet in May 1953 for control of lake level. An earlier dam had failed in October 1948.

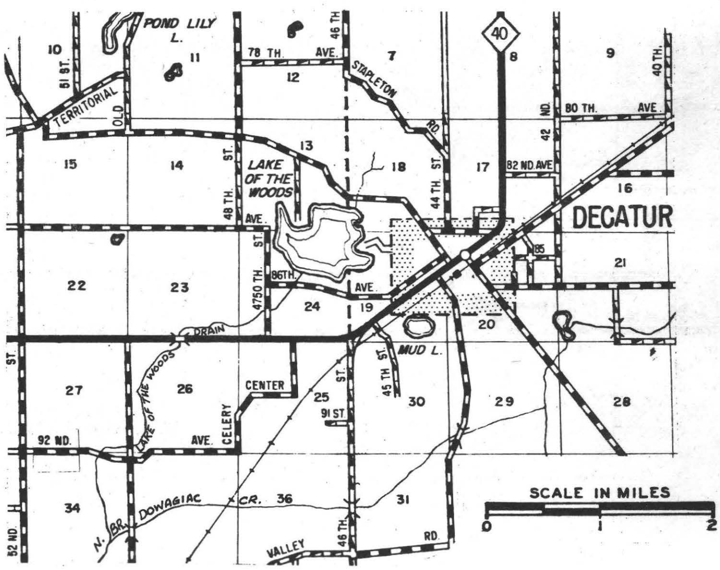
Remarks.--The inlet to Lake of the Woods is an intermittent drain entering the northeast end of the lake. The outlet is Lake of the Woods Drain which flows from the south side of the lake to North Branch Dowagiac River.

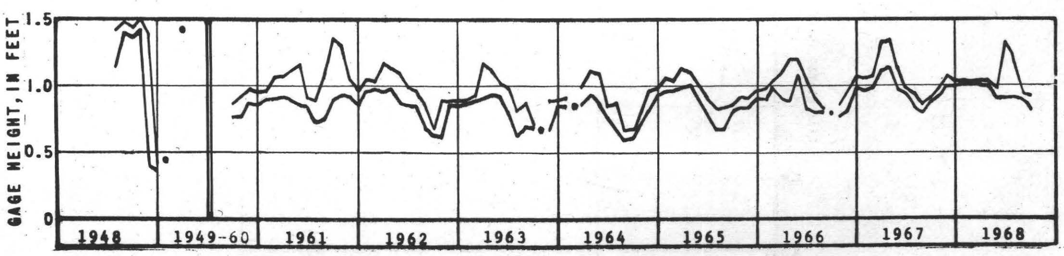
An engineering lake-level control study was completed in 1949 by the Michigan Department of Natural Resources.

No discharge measurements are available on the inlet. A discharge of 5.81 cfs was measured on Jan. 11, 1949 and a discharge of 3.84 cfs was measured on Dec. 3, 1948 on Lake of the Woods Drain, 0.6 mile downstream from the lake. In addition, the following measurements were made at a site 2.5 miles downstream from the lake at 92nd Ave. (drainage area, 13.1 sq mi).

Date	Discharge (cfs)
Sept. 27, 1962	2.91
Apr. 15, 1963	9.85
July 8, 1963	3.30
Oct. 18, 1963	2.93

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Lake of the Woods near Decatur, Mich.

VAN BUREN COUNTY

Mill Lake near Gobles, Mich.

Location.--Lat 42°22'40", long 85°54'15", in secs. 13, 14, 23, and 24, T.1 S., R. 14 W., 1.8 miles northwest of Gobles.

Surface area.--100 acres.

Maximum depth.--80 ft.

Drainage area at outlet.--1.9 sq mi, approximately.

Records available.--February 1960 to April 1961.

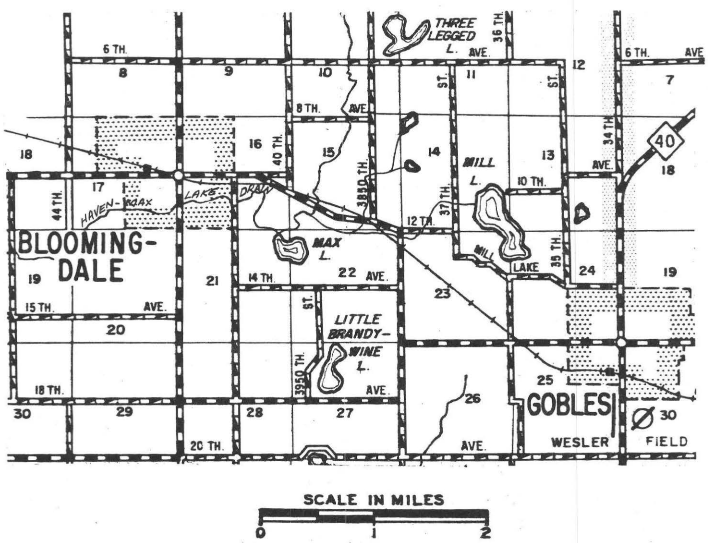
Gage.--Staff gage read intermittently. Datum of gage is 760.84 ft above mean sea level (levels by Michigan Department of Natural Resources).

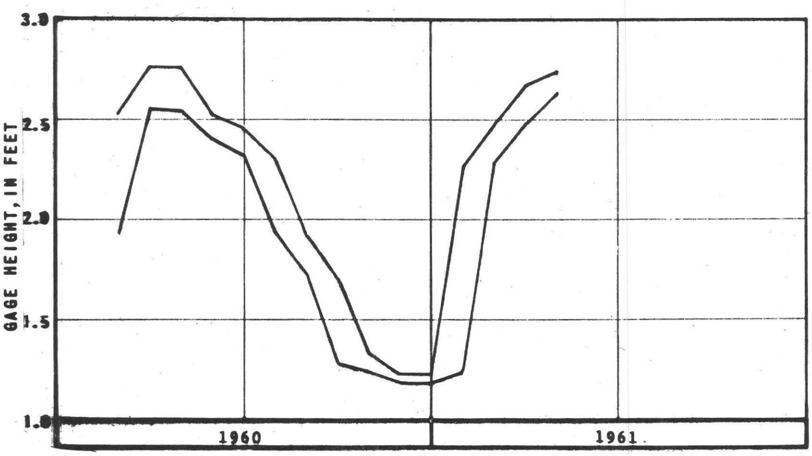
Established legal level.--None known.

Extremes.--1960-61: Maximum stage observed, 2.76 ft Mar. 31, Apr. 2, 1960; minimum observed, 1.18 ft Nov. 29, Dec. 7, 1960.

Regulation or control.--A small earthern dam at outlet controls lake level.

Remarks.--There is no inlet to Mill Lake. The outlet flows from the northwest side of Mill Lake into Haven and Max Lake Drain. No discharge measurements have been made on the outlet.
An engineering lake-level control study was completed in 1962 by the Michigan Department of Natural Resources.
See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Mill Lake near Gobles, Mich.

VAN BUREN COUNTY

Scott Lake near Bangor, Mich

Location.--Lat 42°19'47", long 86°00'15", in secs. 1 and 36, Tps.1 and 2 S., R.15 W., 5.7 miles east of Bangor.

Surface area.--190 acres.

Maximum depth.--50 ft.

Drainage area at outlet.--2.9 sq mi, approximately.

Records available.--February 1960 to December 1961.

Gage.--Staff gage read daily. Datum of gage is 677.04 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--678.5 ft above mean sea level, established by Circuit Court on July 14, 1967.

Extremes.--1960-61: Maximum stage, 2.92 ft Apr. 2, 1960; minimum, 1.14 ft July 15, 28, 1961.

Regulation or control.--None.

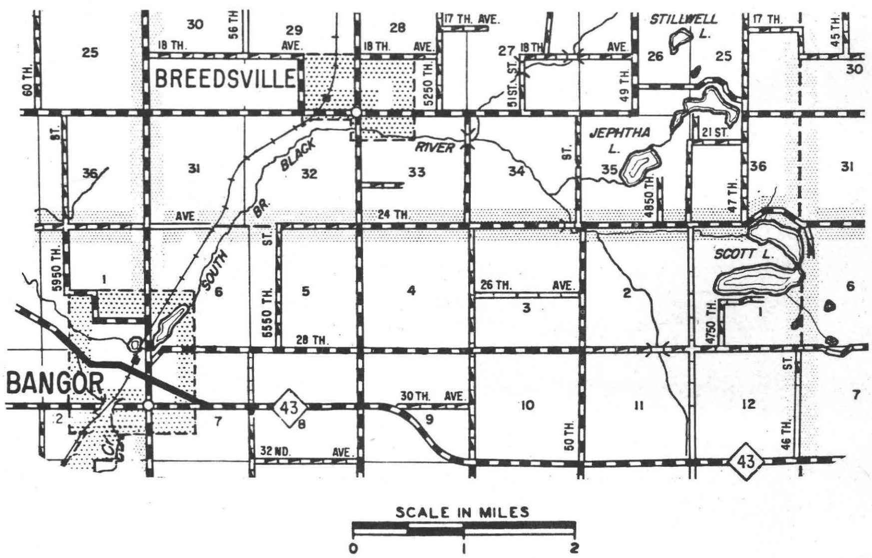
Remarks.--Scott Lake is in effect two lakes connected by a wide channel. The lakes are sometimes called "Scott Lakes" or "Scott Lake and North Scott Lake."

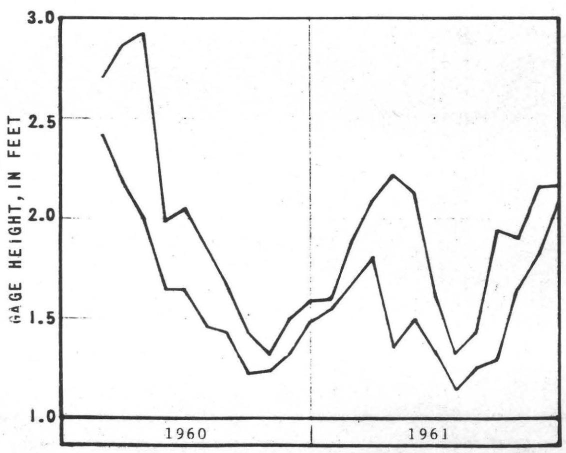
Two small inlets feed the lake, one from the north and one from the southeast. The outlet leaves the northwest tip of the lake and flows west about 1.5 miles to the South Branch Black River.

No discharge measurements have been made on the inlets or outlet.

An engineering lake-level control study was completed in 1962 by the Michigan Department of Natural Resources.

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Scott Lake near Bangor, Mich.

VAN BUREN COUNTY

Silver Lake near Grand Junction, Mich.

Location.--Lat 42°23'13", long 86°03'28", in secs. 9 and 16, T.1 S., R.15 W., 1.4 miles southeast of Grand Junction.

Surface area.--45 acres.

Maximum depth.--32 ft.

Drainage area at outlet.--0.54 sq mi.

Records available.--January to August 1949.

Gage.--Staff gage read daily. Datum of gage is 670.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1949: Maximum stage, 6.72 ft June 22; minimum, 4.62 ft Jan. 13.

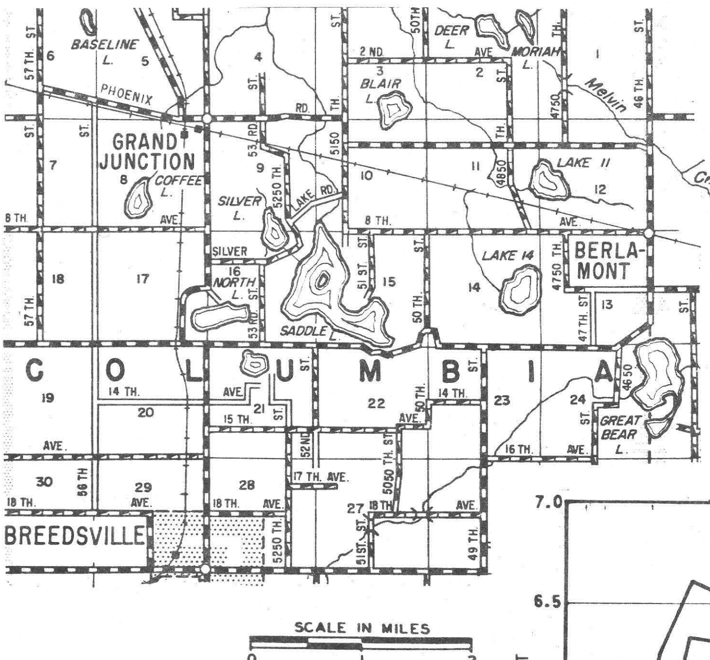
Regulation or control.--A timber plug is used in an outlet pipe to shut off flow and control the lake level.

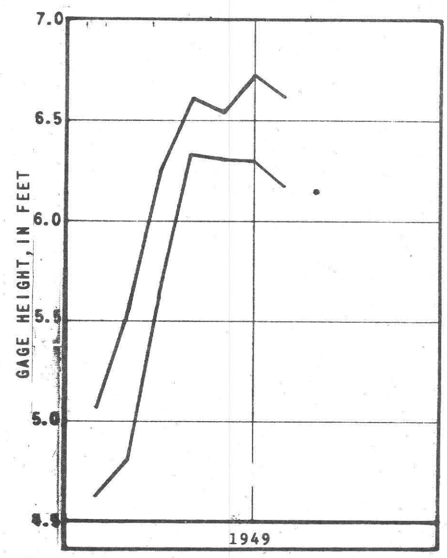
Remarks.--There are two small inlets, one at the northwest and one at the southwest side of the lake. The outlet is a 15-inch vitrified pipe which discharges into Saddle Lake about 570 ft east of Silver Lake.

No discharge measurements have been made on the inlets or outlet.

An engineering lake-level control study was completed in 1949 by the Michigan Department of Natural Resources.

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Silver Lake near Grand Junction, Mich.

VAN BUREN COUNTY

Van Auken Lake near McDonald, Mich.

Location.--Lat 42°15'00", long 86°11'26", in secs. 28, 32, and 33, T.2 S., R.16 W., 2.0 miles southwest of McDonald.

Surface area.--244 acres.

Maximum depth.--60 ft.

Drainage area at outlet.--3.3 sq mi, approximately.

Records available.--December 1948 to December 1949.

Gage.--Staff gage read daily. Datum of gage is 647.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--648.5 ft above mean sea level, established by Circuit Court on Sept. 15, 1953.

Extremes.--1948-49: Maximum stage, 2.90 ft Dec. 25, 1949; minimum, 1.18 ft Nov. 10, 1949.

Regulation or control.--There was no control structure during the period of record, however, construction of a control was completed in October 1956.

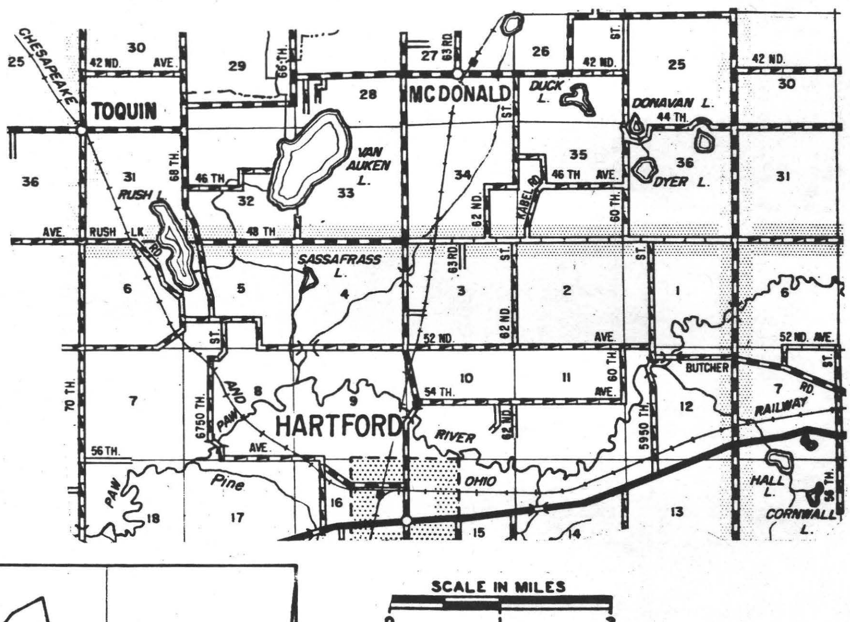
Remarks.--The inlet to Van Auken lake is a dredged ditch entering from the northwest. The outlet, Van Auken Lake Drain, leaves the southwest side of the lake and flows southerly through Sassafras Lake to the Paw Paw River, a distance of about 3 miles.

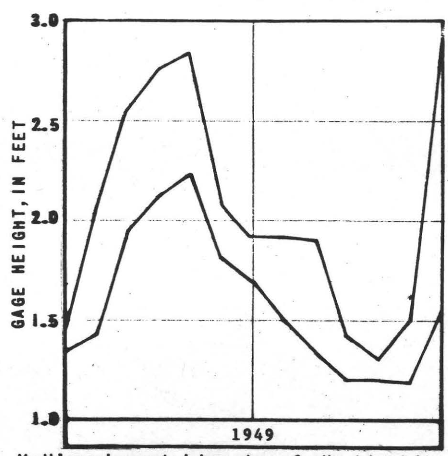
An engineering lake-level control study was completed in 1949 by the Michigan Department of Natural Resources.

No discharge measurements have been made on the inlet. The following discharge measurements have been made on the outlet about 0.25 mile downstream from the lake.

Date	Discharge (cfs)
Jan. 11, 1949	0.98
Mar. 1, 1949	6.88
Apr. 12, 1949	6.14

See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Van Auken Lake near McDonald, Mich.

WASHTENAW COUNTY

Base Line Lake near Pinckney, Mich.

Location.--Lat 42°25'10", long 83°54'13", in secs. 6 and 31, Tps.1 N. and 1 S., R.5 E., 3.4 miles southeast of Pinckney.

Surface area.--285 acres.

Maximum depth.--65 ft.

Drainage area at outlet.--400 sq mi, approximately.

Records available.--March 1951 to December 1953 except period August 12 to October 9, 1952 when lake level was below the bottom of gage.

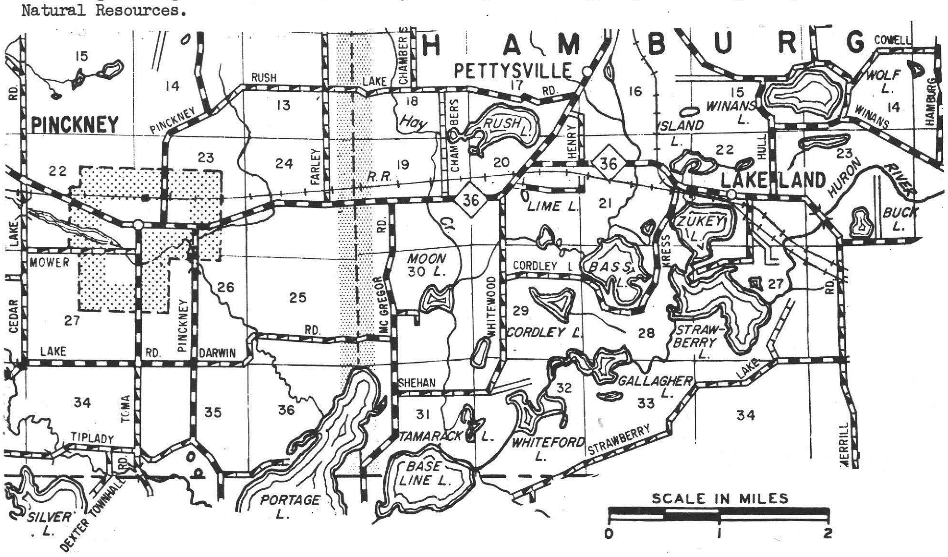
Gage.--Staff gage read daily. Datum of gage is 840.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

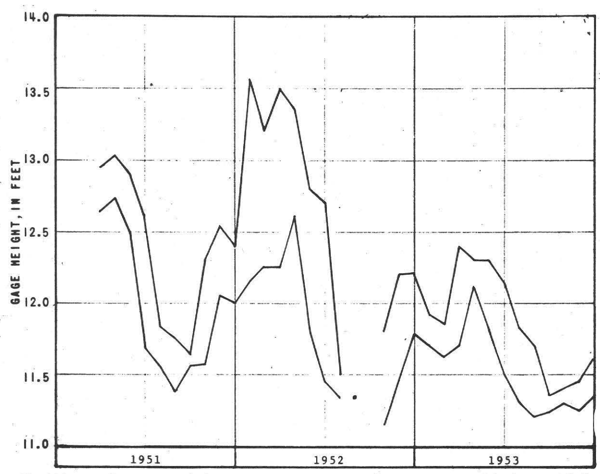
Established legal level.--851.54 ft above mean sea level, established by Circuit Court on June 4, 1956.

Extremes.--1951-53: Maximum stage, 13.56 ft Jan. 24, 25, 1952; minimum stage observed, 11.14 ft Oct. 10, 1952, but was lower during period Aug. 12 to Oct. 9, 1952.

Regulation or control.--Base Line Lake is affected by the rocky channel condition of the Huron River (outlet) below the lake. A low rock dam about 200 yards downstream from the lake is used to divert water into Portage Lake.

Remarks.--The Huron River is the inlet and outlet of Base Line Lake. Discharge records have been collected on the Huron River, 2.5 miles below Base Line Lake since March 1946. These records are published in U.S. Geological Survey Water-Supply Papers as "Huron River near Dexter, Mich."
An engineering lake-level control study was completed in 1956 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Base Line Lake near Pinckney, Mich.

WASHTENAW COUNTY

Blind Lake near Gregory, Mich.

Location.--Lat 42°25'06", long 84°01'25", in secs. 1, 6, and 12, T.1 S., Rs. 3 and 4 E., 4.2 miles southeast of Gregory.

Surface area.--68 acres.

Maximum depth.--80 ft.

Drainage area at outlet.--0.4 sq mi, approximately.

Records available.--November 1944 to December 1953 except periods December 1944 to March 1945, and July to November 1945.

Gage.--Staff gage read daily. Datum of gage is 880.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

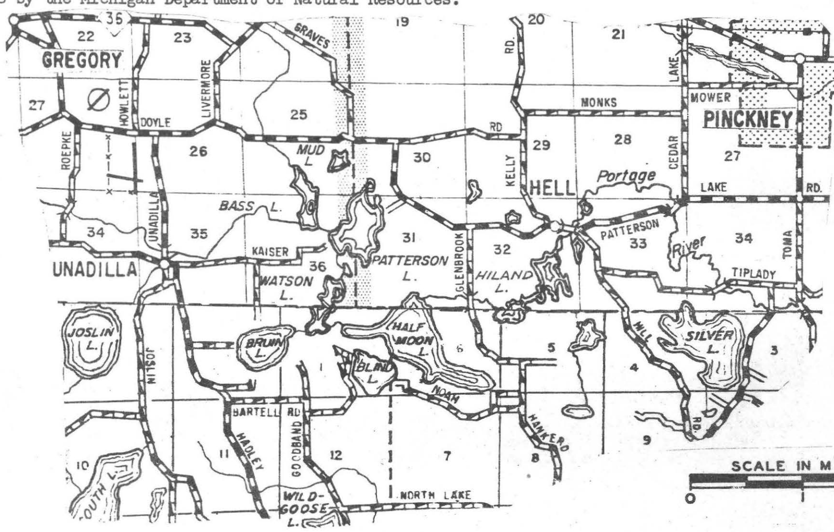
Established legal level.--None known.

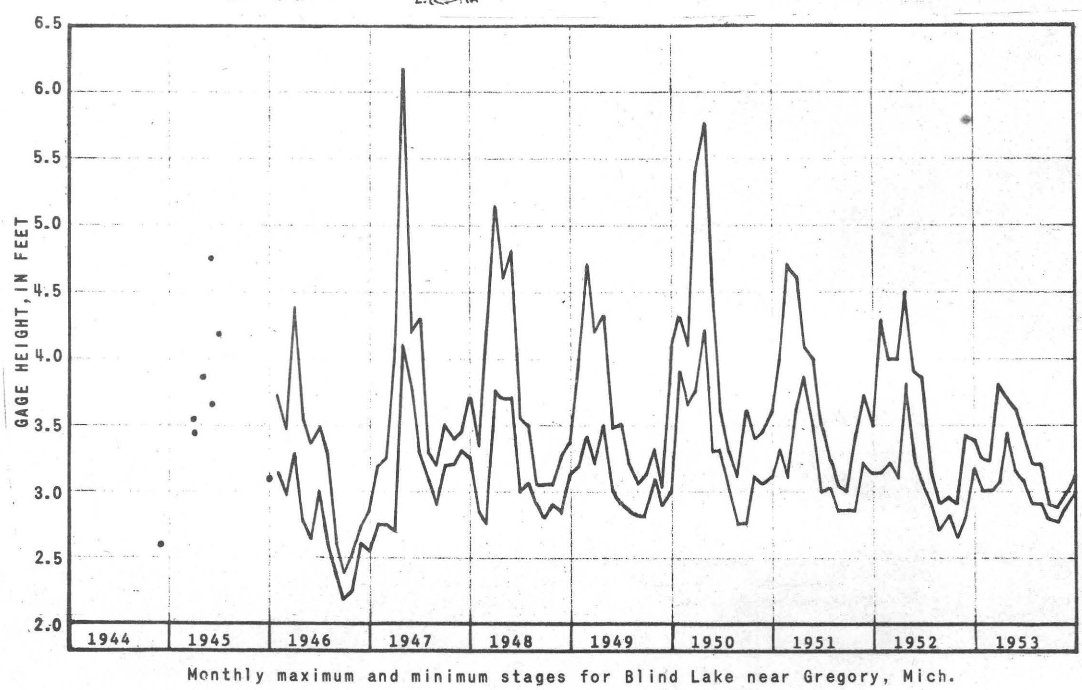
Extremes.--1944-53: Maximum stage observed, 6.18 ft Apr. 9, 1947; minimum observed, 2.18 ft Sept. 14, 1946.

Regulation or control.--Lake level controlled to some extent by operation of dam at outlet of Hiland Lake.

Remarks.--There is no inlet to Blind Lake. The outlet is a 660 ft channel to Halfmoon Lake. No discharge measurements were made on the outlet.

An engineering lake-level control study of Hiland Lake, including Blind Lake, was completed in 1948 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Blind Lake near Gregory, Mich.

WASHTENAW COUNTY

Bruin Lake near Gregory, Mich.

Location.--Lat 42°25'17", long 84°01'55", in secs. 1 and 2, T.1 S., R.3 E., 3.8 miles southeast of Gregory.

Surface area.--145 acres.

Maximum depth.--48 ft.

Drainage area at outlet.--1.4 sq mi, approximately.

Records available.--March 1945 to September 1950, except for several intermittent periods.

Gage.--Staff gage read daily. Datum of gage is 880.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

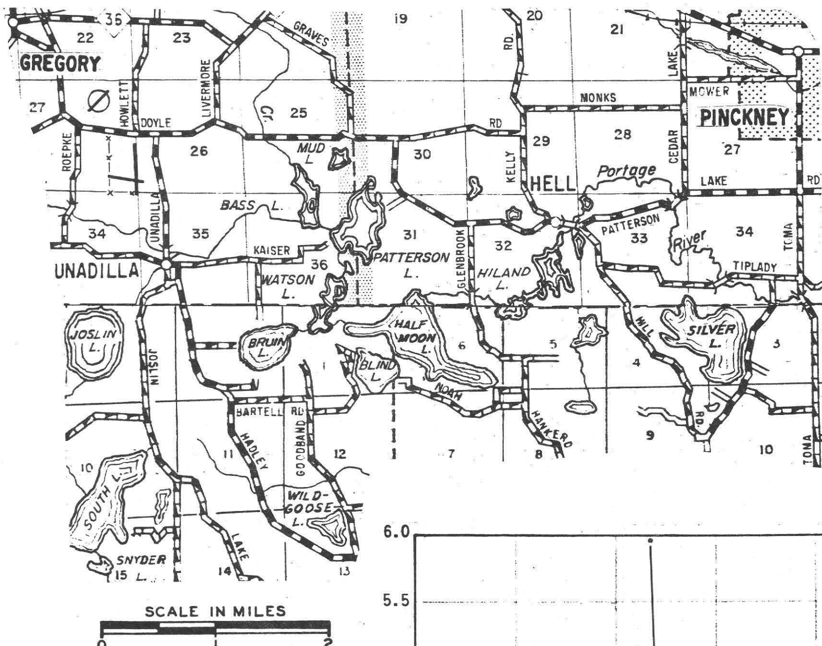
Established legal level.--None known.

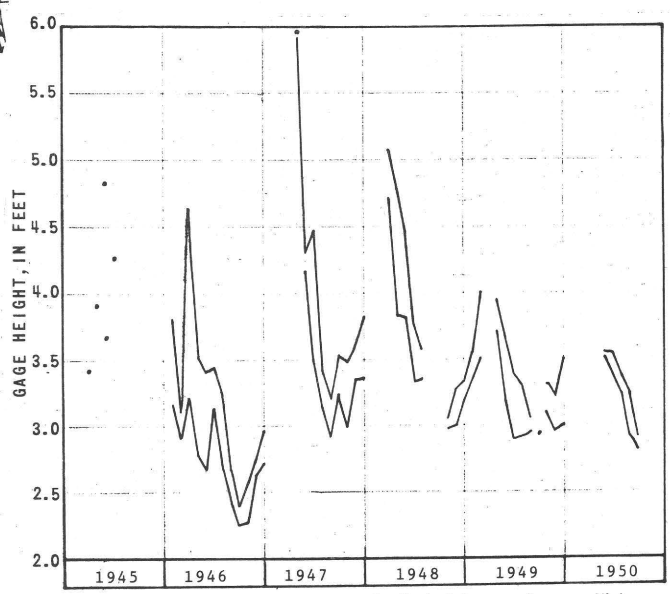
Extremes.--1945-50: Maximum stage 5.95 ft Apr. 9, 1947 (highwater mark); minimum stage observed, 2.24 ft Sept. 28-30, 1946.

Regulation or control.--Lake level controlled to some extent by operation of dam at outlet of Hiland Lake.

Remarks.--There is no inlet to Bruin Lake. The outlet leaves the lake at the east end and flows to Watson Lake. No discharge measurements have been made on the outlet.

An engineering lake-level control study of Hiland Lake , including Bruin Lake, was completed in 1948 by the Michigan Department of Natural Resources.





Monthly maximum and minimum stages for Bruin Lake near Gregory, Mich.

WASHTENAW COUNTY

Horseshoe Lake near Whitmore Lake, Mich.

Location.--Lat 42°24'13", long 83°45'34", in secs. 8 and 17, T.1 S., R.6 E., 1.3 miles south of Whitmore Lake.

Surface area.--90 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--21 sq mi, approximately.

Records available.--June 1945 to September 1950.

Gage.--Staff gage read daily. Datum of gage is 890.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--897.23 ft above mean sea level, established by Circuit Court on June 4, 1956.

Extremes.--1945-50: Maximum stage observed, 13.90 ft Apr. 6, 1947, estimated from graph based on gage readings; minimum stage observed, 5.98 ft Oct. 16-19, 1948.

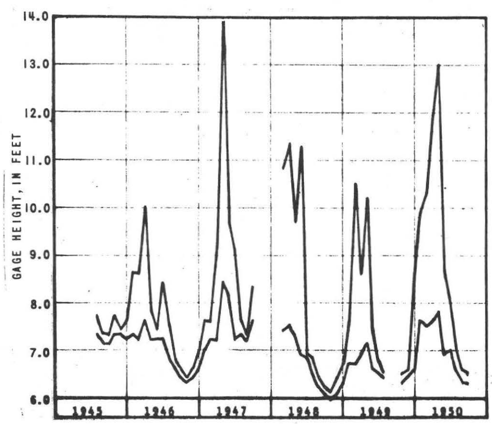
Regulation or control.--Concrete dam on outlet, in vicinity of Whitmore Lake, may affect Horseshoe Lake level during high runoff periods (see Whitmore Lake).

Remarks.--An unnamed stream at the south end and O'Connor Drain at the northeast end are the major inlets to Horseshoe Lake. The outlet leaves the lake at the north end and flows north and northwesterly to the Huron River.

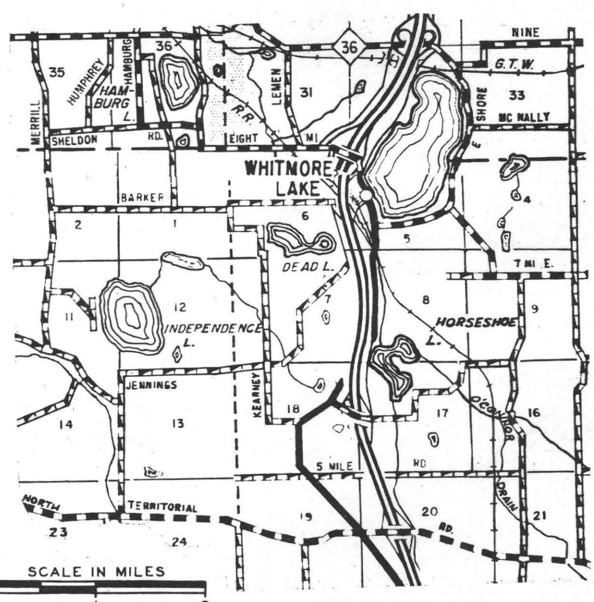
An engineering lake-level control study was completed in 1946 by the Michigan Department of Natural Resources. An addendum to this study was completed in 1956.

The following discharge measurements have been made on the Horseshoe Lake outlet, in SW $\frac{1}{4}$ sec. 8, T.1 S., R.6 E., (drainage area, 21 sq mi approximately).

Date	Discharge (cfs)	Date	Discharge (cfs)
June 12, 1945	14.4	May 14, 1947	13.4
July 17, 1945	4.16	Aug. 14, 1947	0
Mar. 5, 1946	52.9	Nov. 20, 1947	10.1
Mar. 12, 1946	46.2	May 18, 1948	49.5
Apr. 8, 1946	5.57	Aug. 26, 1948	0
Apr. 19, 1946	2.86	Nov. 30, 1948	.03
May 13, 1946	.52	Mar. 16, 1949	6.19
Sept. 11, 1946	0	June 6, 1949	1.38
Oct. 23, 1946	0	Oct. 3, 1949	0
Jan. 21, 1947	3.10	Jan. 27, 1950	86.5
Apr. 4, 1947	93.2	Apr. 20, 1950	23.9
Apr. 10, 1947	161	Aug. 4, 1950	0
Apr. 17, 1947	41.8	Apr. 14, 1952	62.3



Monthly maximum and minimum stages for Horseshoe Lake near Whitmore Lake, Mich.



WASHTENAW COUNTY

Portage Lake near Pinckney, Mich.

Location.--Lat 42°24'56", long 83°54'28", in many sections, Tps. 1 N. and 1 S., Rs. 4 and 5 E., 3.4 miles southeast of Pinckney.

Surface area.--644 acres.

Maximum depth.--85 ft.

Drainage area at outlet.--140 sq mi, approximately.

Records available.--July 1945 to December 1959 except January and February 1953.

Gage.--Staff gage read daily. Datum of gage is 850.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--851.54 ft above mean sea level, established by Circuit Court on Feb. 2, 1949,

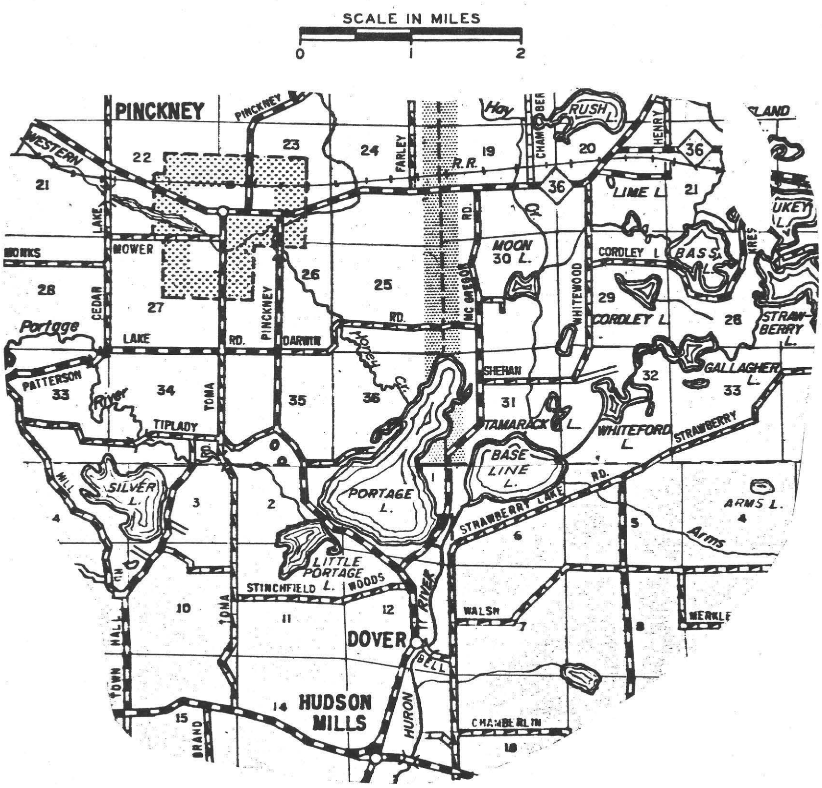
Extremes.--1945-59: Maximum stage observed, 5.38 ft Apr. 9, 1947; minimum observed, 0.16 ft Dec. 22, 1958 to Jan. 1, 1959, and Jan. 13, 14, 1959.

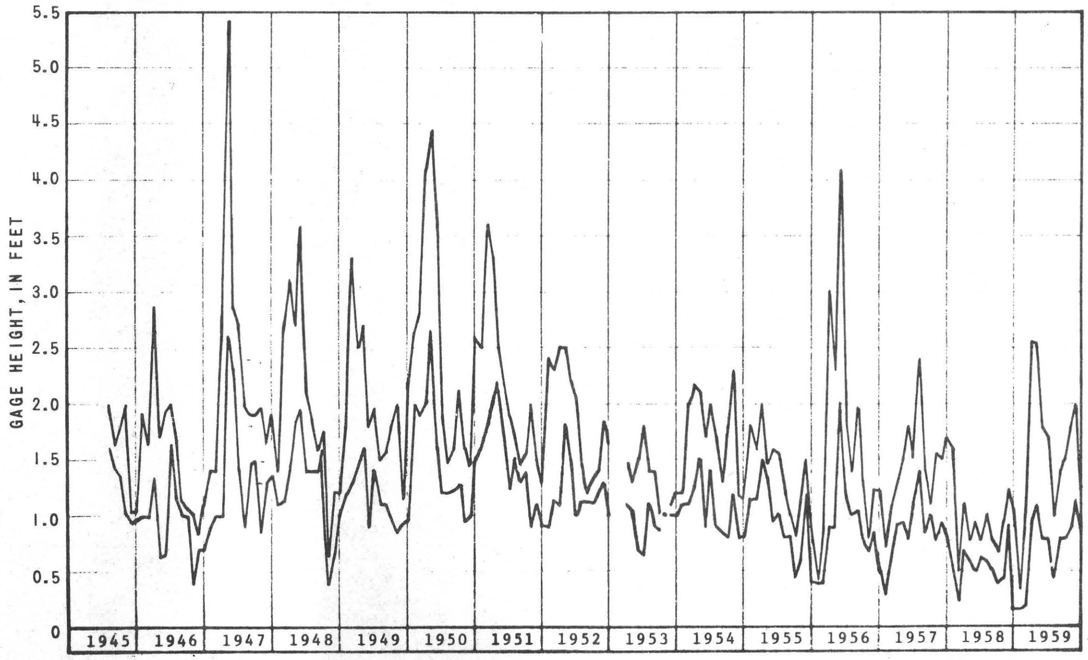
Regulation or control.--An old rock dam in the outlet channel between Portage Lake and the Huron River has been used in past years to maintain lake level. High stages on the Huron River also affect the lake level.

Remarks.--Portage River and Honey Creek are the inlets to Portage Lake. The outlet, at the southeast side of the lake, is tributary to the Huron River about 0.3 miles downstream from the lake.

An engineering lake-level control study was completed in 1948 by the Michigan Department of Natural Resources.

Discharge records have been collected since November 1944 on Portage River, about two miles upstream from Portage Lake. Discharge records have also been collected since March 1946 on the Huron River, two miles downstream from the lake. These records are published in U.S. Geological Survey Water-Supply Papers as "Portage River near Pinckney, Mich." and "Huron River near Dexter, Mich." Prior to October 1963, records for Portage River were published as "Portage Creek near Pinckney."





Monthly maximum and minimum stages for Portage Lake near Pinckney, Mich.

WASHTENAW COUNTY

Silver Lake near Pinckney, Mich.

Location.--Lat 42°25'00", long 83°57'15", in secs. 3 and 4, T.1 S., R.4 E., 2.8 miles south of Pinckney.

Surface area.--179 acres.

Maximum depth.--47 ft.

Drainage area at outlet.--Not determined.

Records available.--October 1959 to December 1961; March 1962 to December 1962; and March 1963 to September 1968.

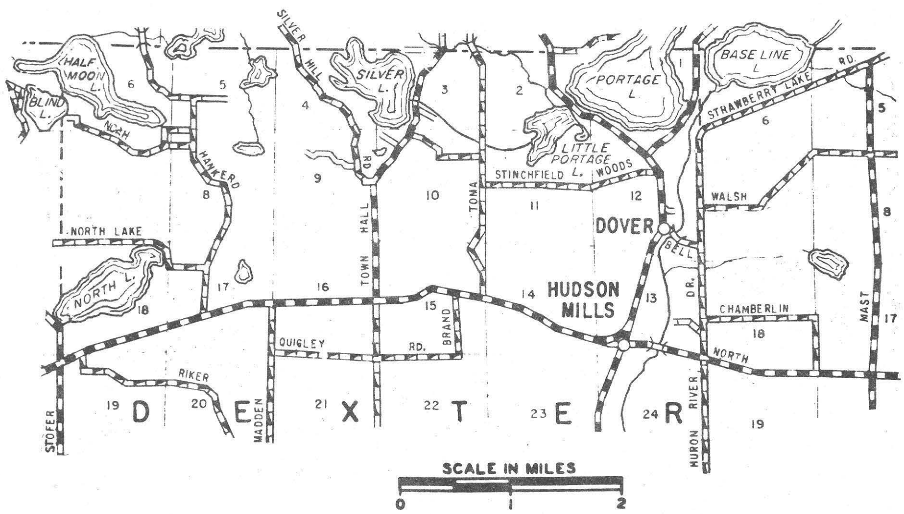
Gage.--Staff gage read daily. Datum of gage not determined.

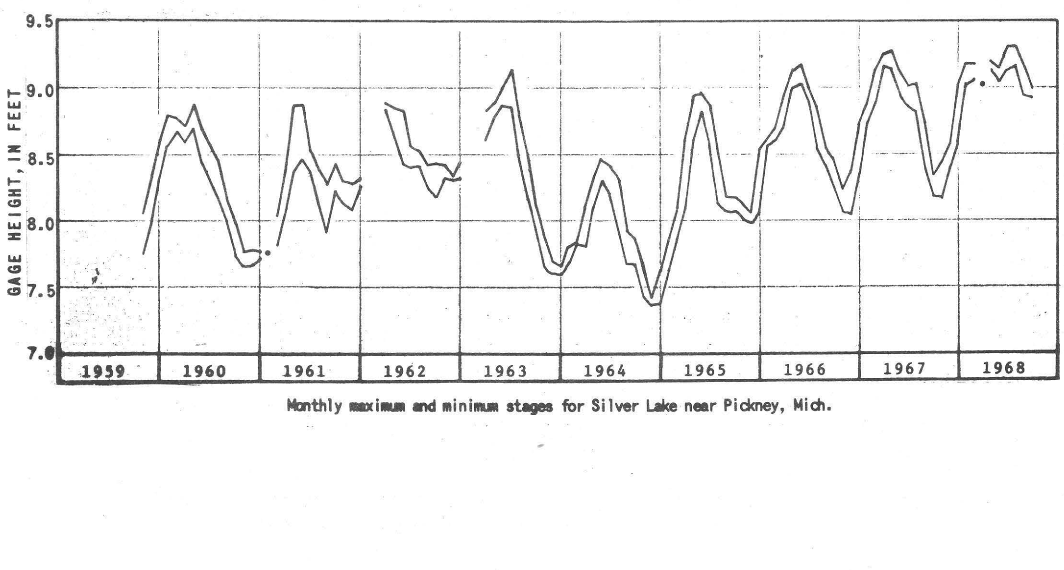
Established legal level.--None known.

Extremes.--1959-68: Maximum stage observed, 9.30 ft June 26 to July 15, 1968; minimum observed, 7.36 ft Nov. 27, 1964.

Regulation or control.--None.

Remarks.--There is no inlet to Silver Lake. The outlet, at the southeast side of the lake, flows to Little Portage Lake. No discharge measurements have been made on the outlet.





Monthly maximum and minimum stages for Silver Lake near Pickney, Mich.

WASHTENAW COUNTY

South Lake near Chelsea, Mich.

Location.--Lat 42°23'52", long 84°04'19", in secs. 10, 15, and 16, T.1 S., R.3 E., 6.0 miles northwest of Chelsea.

Surface area.--193 acres.

Maximum depth.--70 ft.

Drainage area at outlet.--14 sq mi, approximately.

Records available.--October 1967 to September 1968.

Gage.--Staff gage read intermittently. Datum of gage is 876.44 ft above mean sea level (levels by Michigan Department of Natural Resources).

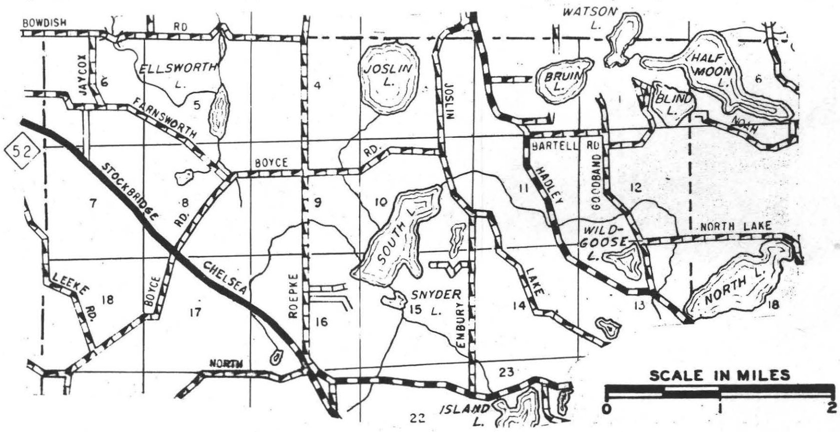
Established legal level.--None known.

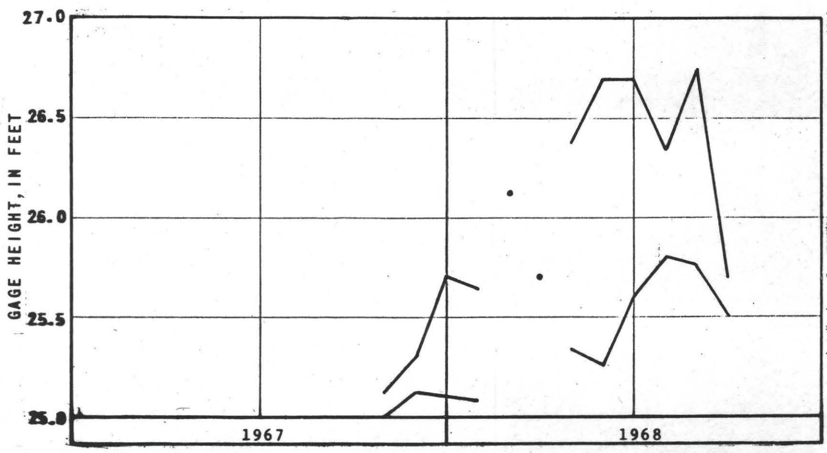
Extremes.--1967-68: Maximum stage observed, 26.75 ft Aug. 1, 1968; minimum observed, 25.0 ft Oct. 26, 1967.

Regulation or control.--None.

Remarks.--South Lake has numerous inlets. The outlet leaves the west side of the lake and flows north to Joslin Lake.
The following discharge measurements were made on South Lake outlet, in NE ¼ sec. 9, T.1 S., R.3 E., at Boyce Rd. (drainage area, 14.3 sq mi).

Date	Discharge (cfs)	Date	Discharge (cfs)
Aug. 24, 1955	1.08	Oct. 20, 1958	1.56
Sept. 22, 1955	0	June 9, 1959	2.09
Jan. 25, 1956	2.68	Sept. 14, 1959	1.14
Apr. 24, 1956	11.1	Apr. 22, 1960	19.0
June 7, 1956	8.17	Aug. 2, 1960	2.17
Aug. 3, 1956	1.39	Oct. 12, 1960	1.14
Aug. 22, 1956	3.62	Jan. 13, 1961	.21
Sept. 20, 1956	2.41	May 23, 1961	4.62
Oct. 15, 1956	1.36	Sept. 12, 1961	5.73
Nov. 13, 1956	2.26	Mar. 27, 1962	22.7
Feb. 6, 1958	4.80	July 19, 1962	.58
Apr. 3, 1958	6.90	Sept. 28, 1963	4.34
May 8, 1958	3.55	Apr. 17, 1963	5.82





Monthly maximum and minimum stages for South Lake near Chelsea, Mich.

WASHTENAW COUNTY

Whitmore Lake at Whitmore Lake, Mich.

Location.--Lat 42°25'10", long 83°45'26", in secs. 5, 32, and 33, Tps. 1 N., and 1 S., R.6 E., at Whitmore Lake.

Surface area.--677 acres.

Maximum depth.--69 ft.

Drainage area.--Not determined.

Records available.--July 1945 to December 1959 except period April 1948 to June 1949.

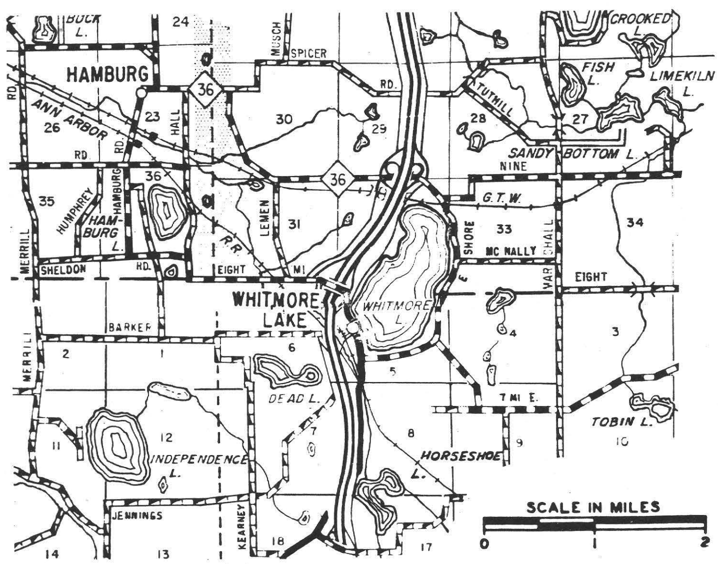
Gage.--Staff gage read daily. Datum of gage is 890.00 ft above mean sea level (levels by Michigan Department of Natural Resources).

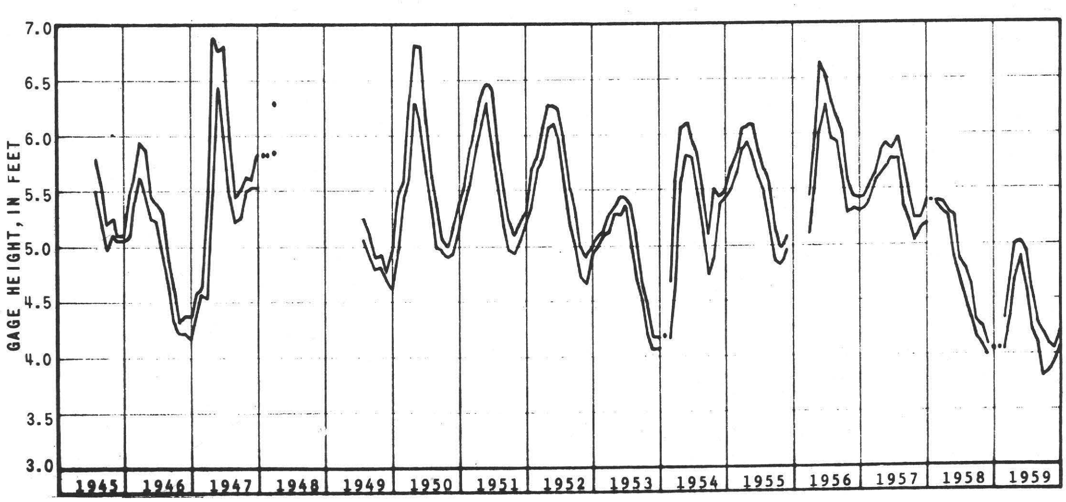
Established legal level.--None known.

Extremes.--1945-59: Maximum stage observed, 6.88 ft Apr. 23-26, 1947; minimum observed, 3.80 ft Sept. 24, 25, 1959.

Regulation or control.--A concrete dam, equipped with flashboards, was constructed on Horseshoe Lake outlet opposite Whitmore Lake, and a 42 inch concrete pipe layed to divert water into Whitmore Lake during dry periods. This pipe line, which is about 700 ft long, has a total fall of 3.28 ft towards Whitmore Lake. When high stages occur on Whitmore Lake, water flows back into Horseshoe Lake outlet.

Remarks.--Whitmore Lake has no natural inlets or outlet.
An engineering lake-level control study of Horseshoe Lake, including Whitmore Lake, was completed in 1946 by the Michigan Department of Natural Resources. An addendum to this study was completed in 1956.
See table 1 for chemical analysis of lake water.





Monthly maximum and minimum stages for Whitmore Lake at Whitmore Lake, Mich.

WASHTENAW COUNTY

Winnewanna Lake near Waterloo, Mich.

Location.--Lat 42°20'55", long 84°06'40", in secs. 28, 29, and 32, T.1 S., R.3 E., 1.2 miles east of Waterloo.

Surface area.--500 acres.

Maximum depth.--Unknown.

Drainage area at outlet.--2 sq mi, approximately.

Records available.--March 1959 to September 1968 except period February to June 1962.

Gage.--Staff gage read intermittently. Datum of gage is 949.98 ft above mean sea level (levels by Michigan Department of Natural Resources).

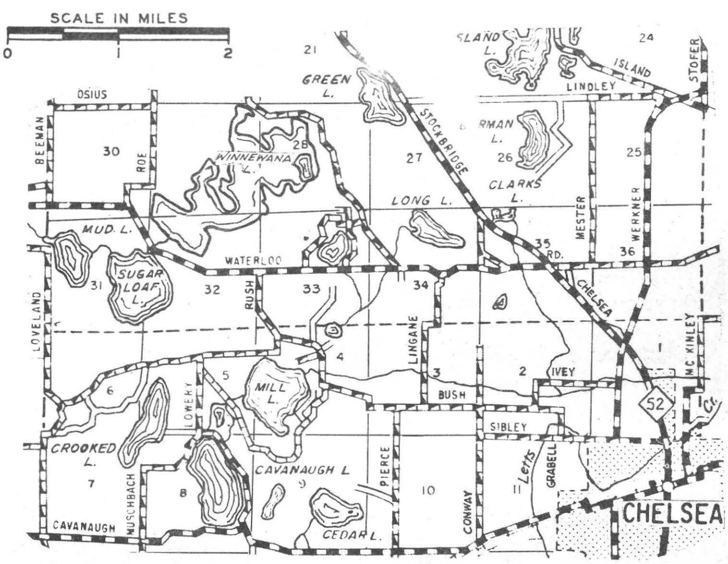
Established legal level.--None known.

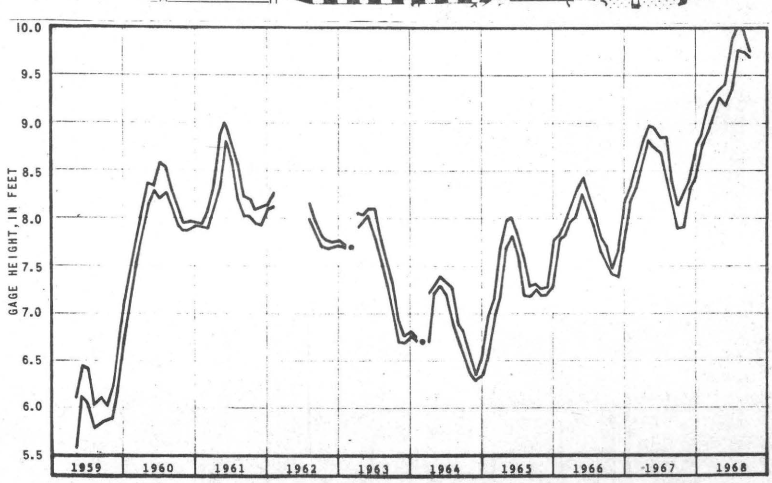
Extremes.--1959-68: Maximum stage observed, 10.00 ft July 27, 1968; minimum observed subsequent to filling of lake, 6.28 ft Nov. 12, 18, 1964.

Regulation or control.--Dam equipped with removable stoplogs at lake outlet.

Remarks.--There is no inlet to Winnewanna Lake. The outlet flows into Sugarloaf Lake.
The following discharge measurements have been made on the outlet at NW $\frac{1}{4}$ sec. 32, T.1 S., R.3 E., (drainage area, 2 sq mi, approximately).

Date	Discharge (cfs)
Mar. 13, 1957	6.21
May 9, 1957	.64
May 29, 1957	1.74
Aug. 14, 1957	.14





Monthly maximum and minimum stages for Winnewanna Lake near Waterloo, Mich.

WEXFORD COUNTY

Lake Mitchell-Cadillac near Cadillac, Mich.

Location.--Lat 44°15'08", long 85°24'40", in many sections, Tps. 21 and 22 N., Rs. 9 and 10 W., at Cadillac.

Surface area.--4,040 acres.

Maximum depth.--28 ft.

Drainage area at outlet.--46.6 sq mi.

Records available.--August 1942 to September 1968 except periods January to March, May and June, 1960.

Gage.--Staff gage read daily. Datum of gage is 1,283.41 ft above mean sea level (levels by Michigan Department of Natural Resources).

Established legal level.--None known.

Extremes.--1942-68: Maximum stage, 7.52 ft Apr. 18, 1960 (highwater mark); minimum, 4.62 ft Oct. 4, 1955.

Regulation or control.--The lake level is controlled by a concrete dam equipped with stop logs located about 1,500 ft downstream from lake.

Remarks.--The principal inlet is Mitchell Creek which enters the west end of Lake Mitchell. The outlet is Clam River which leaves the northeast end of Lake Cadillac and flows southeast to the Muskegon River.

No discharge measurements are available on the inlet. On May 16, 1946 Clam River was measured at several sites below the lakes. Results are as follows:

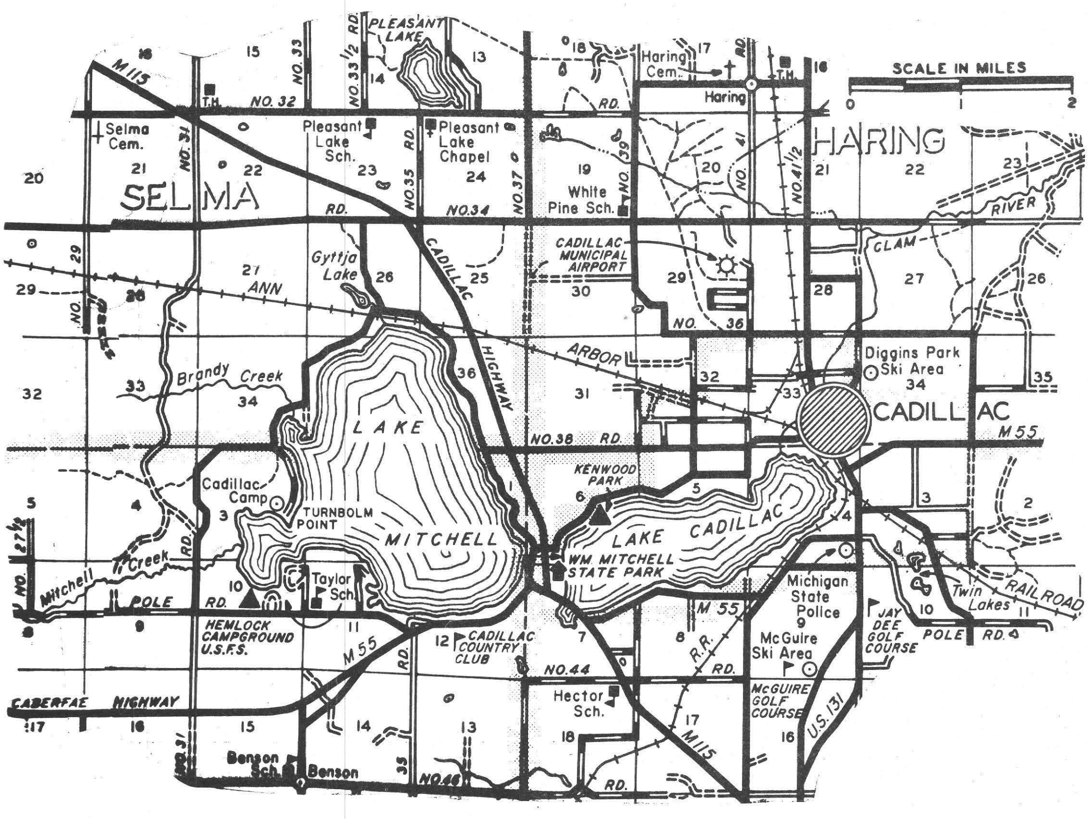
Location	Discharge (cfs)
SE¼ sec. 22, T.22 N., R.9 W.	1.42
SW¼ sec. 23, T.22 N., R.9 W.	1.06
NW¼ sec. 24, T.22 N., R.9 W.	1.24
SE¼ sec. 24, T.22 N., R.9 W.	3.10
SW¼ sec. 21, T.22 N., R.8 W.	15.0
NW¼ sec. 35, T.22 N., R.8 W.	23.5

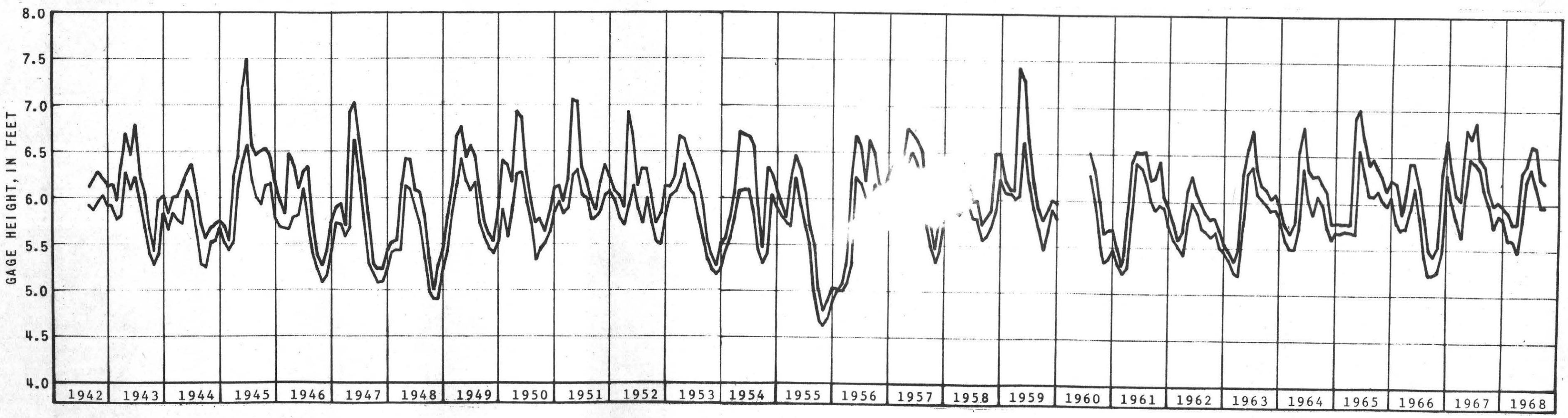
In addition to the above measurements, 61 measurements were made during the period 1945-51 at Lachance Road about 8 miles below the lake. These measurements are published in the annual U. S. Geological Survey Water-Supply Papers.

In the past, the city of Cadillac has withdrawn it's water supply from the lakes. The normal daily consumption was about one million gallons per day. During July and August withdrawals at the rate of three to four million gallons per day for three or four hours per day were not uncommon. This resulted in lowering lake levels by as much as 0.16 ft. In the fall of 1961, the city started using ground water and discontinued pumping from the lakes.

An engineering lake-level control study was completed in 1955. This was followed in 1967 by a supplemental engineering investigation. Both studies were made by the Michigan Department of Natural Resources.

See table 1 for chemical analyses of lake water.





Monthly maximum and minimum stages for Lake Mitchell-Cadillac at Cadillac, Mich.

TABLE 1.—Chemical quality of

(Results in milligrams per

Name	Location	Date sampled	Depth below surface (feet)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)
	ALPENA COUNTY						
Pit Hole	Sec.15 T.31 N., R.9 E. 450540N0831930W	June 1, 1967	0	--	.20	484	103
	BRANCH COUNTY						
Anderson	SW1/4,NE1/4 sec.24, T.8 S., R.8 W. 414537N0851054W	Aug. 4, 1965	0	--	--	--	--
Bartholomew	SW1/4,NE1/4 sec.7, T.7 S., R.5 W. 415247N0845527W	June 23, 1965	0	--	--	--	--
Beckwith	SW1/4,SW1/4 sec.10, T.7 S., R.5 W. 415215N0845253W	June 22, 1965	0	--	--	--	--
Bingham	NE1/4,NW1/4 sec.30, T.7 S., R.6 W. 415020N0850036W	Sept. 22, 1965	0	--	--	--	--
Blossom	NE1/4,SW1/4 sec.30, T.5 S., R.8 W. 420018N0851708W	June 16, 1965	0	--	--	--	--
Browns	NW1/4,NW1/4 sec.5, T.8 S., R.5 W. 414838N0845506W	June 22, 1965	0	--	--	--	--
Camp	NW1/4,NW1/4 sec.23, T.7 S., R.5 W. 415114N0845138W	June 22, 1965	0	--	--	--	--
Cary	SW1/4,SW1/4 sec.34, T.6 S., R.7 W. 415353N0850644W	Mar. 16, 1965	0	--	--	--	--
do	do	Apr. 17, 1969	0	--	--	--	--
Coldwater	SE1/4,NE1/4 sec. 2, T.8 S., R.6 W. 414817N0845746W	June 23, 1965	0	--	--	--	--
Coldwater	SW1/4,SW1/4 sec.23, T.7 S., R.6 W. 415013N0845913W	Sept. 21, 1965	5	--	--	--	--
do	do	Sept. 21, 1965	50	--	--	--	--
do	do	Nov. 7, 1968	0	--	--	--	--
Coldwater Outlet	NE1/4,sec.27, T.7 S., R.6 W. 415014N0845914W	Apr. 15, 1964	--	--	--	52	21
do	do	July 28, 1964	--	--	.21	--	--
do	do	Oct. 27, 1964	--	--	.29	--	--
do	do	Apr. 26, 1965	--	--	.43	--	--
Cooks	NE1/4,SE1/4 sec.21, T.6 S., R.7 W. 415554N0850701W	June 23, 1965	0	--	--	--	--
do	do	Sept. 20, 1965	0	--	--	--	--
Craig	SW1/4,NE1/4 sec.29, T.5 S., R.6 W. 420025N0850137W	Nov. 7, 1968	0	--	--	--	--
do	do	Oct. 7, 1964	0	--	--	--	--
do		Apr. 17, 1969	0	--	--	--	--
Dane	SW1/4,SE1/4 sec.30, T.5 S., R.8 W. 420010N0851700W	June 16, 1965	0	--	--	--	--
Dragon	NE1/4,NW1/4 sec.8, T.8 S., R.6 W. 414737N0850154W	June 22, 1965	0	--	--	--	--
Fish	SE1/4,SW1/4 sec.5, T.8 S., R.8 W. 414717N0851602W	Aug. 3, 1965	0	--	--	--	--
Fox	SE1/4,SE1/4 sec.8, T.5 S., R.6 W. 420242N0850116W	Nov. 13, 1964	0	--	--	--	--
George	SW1/4,NW1/4 sec.22, T.8 S., R.6 W. 414540N0845954W	June 22, 1965	0	--	--	--	--
do	do	Sept. 22, 1965	10	--	--	--	--
do	do	do	50	--	--	--	--
do	do	Nov. 7, 1968	0	--	--	--	--
Gilead	SW1/4,NW1/4 sec.7, T.8 S., R.7 W. 414733N0850945W	Oct. 22, 1964	0	--	--	--	--
do	do	Sept. 21, 1965	10	--	--	--	--
do	do	do	35	--	--	--	--
do	do	July 26, 1966	0	--	--	--	--
do	do	Oct. 26, 1966	0	--	--	--	--
do	do	Nov. 7, 1968	0	--	--	--	--
Girard	SW1/4,SW1/4 sec.16, T.5 S., R.6 W. 420144N0850110W	Nov. 5, 1964	0	--	--	--	--
Goodrich	NE1/4,NE1/4 sec.36, T.5 S., R.9 W. 415957N0851736W	June 23, 1965	0	--	--	--	--
Hanchet	SW1/4,NW1/4 sec.9, T.7 S., R.5 W. 415244N0845352W	June 22, 1965	0	--	--	--	--
do	do	Sept. 21, 1965	0	--	--	--	--
Hog	NE1/4,NW1/4 sec.24, T.8 S., R.7 W. 414547N0850418W	June 22, 1965	0	--	--	--	--
Honey	SW1/4,NE1/4 sec.17, T.8 S., R.8 W. 414633N0851535W	Oct. 22, 1964	0	--	--	--	--
Huyck	NW1/4,NE1/4 sec.15, T.8 S., R.6 W. 414648N0845916W	June 22, 1965	0	--	--	--	--
Kenyon	NW1/4,SW1/4 sec.9, T.5 S., R.8 W. 420328N0851500W	June 25 1965	0	--	--	--	--
Lake of the Woods	SE1/4,SE1/4 sec.18, T.7 S., R.6 W. 415126N0850225W	June 22, 1965	0	--	--	--	--
do	do	Nov. 7, 1968	0	--	--	--	--
Lavine	NE1/4,NW1/4 sec.20, T.8 S., R.6 W. 414548N0850208W	June 22, 1965	0	--	--	--	--
Leatherberry	SW1/4,NW1/4 sec.21, T.5 S., R.8 W. 420116N0851511W	June 25, 1965	0	--	--	--	--
Lehr	NE1/4,NW1/4 sec.9, T.5 S., R.8 W. 420319N0851452W	June 25, 1965	0	--	--	--	--
Lime	NE1/4,NW1/4 sec.26, T.6 S., R.7 W. 415525N0850532W	June 23, 1965	0	--	--	--	--
do	do	Sept. 20, 1965	0	--	--	--	--
Little Long	NE1/4,SW1/4 sec.18, T.6 S., R.6 W. 415646N0850301W	Apr. 7, 1964	0	--	--	--	--
Little Rose	SW1/4,NW1/4 sec.17, T.7 S., R.6 W. 415158N0850218W	June 23, 1965	0	--	--	--	--

Michigan's inland lakes — Continued

liter, except as indicated)

Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness Ca, Mg	Hardness Noncarbonate	Specific conductance (micromhos)	pH	Temperature (°C)	Dissolved oxygen	Color (Platinum cobalt units)	Turbidity (JTU)	Analysis
--	--	224	0	1500	3.0	--	0.4	--	--	1630	1446	2800	7.7	15	--	--	--	2
--	--	--	0	--	10	--	--	--	--	220	--	450	8.0	--	--	--	--	2
--	--	--	0	--	10	--	--	--	--	360	--	480	7.5	--	--	--	--	2
--	--	--	0	--	10	--	--	--	--	220	--	330	8.0	--	--	--	--	2
--	--	182	0	206	10	--	1.0	0.21	--	384	235	696	7.9	24	--	--	--	2
--	--	--	0	--	5.0	--	--	--	--	190	--	335	7.8	--	--	--	--	2
--	--	--	0	--	15	--	--	--	--	430	--	590	7.3	--	--	--	--	2
--	--	--	0	--	25	--	--	--	--	410	--	570	7.5	--	--	--	--	2
--	--	--	0	--	5.0	--	--	--	--	130	--	290	7.4	--	--	--	--	2
--	--	234	0	60	12	--	11	--	--	254	62	520	8.0	16	--	35	5	2
--	--	--	--	--	10	--	--	--	--	290	--	390	8.6	--	--	--	--	2
--	--	158	0	74	8.0	--	.9	.06	--	220	91	419	8.0	22	8.6	--	--	2
--	--	158	0	75	8.0	--	.8	.29	--	218	88	420	7.7	12	8.5	--	--	2
--	--	217	0	80	9.0	--	2.6	--	--	250	72	500	8.1	10	--	--	--	2
4.7	1.7	184	0	65	9.0	--	--	--	266	216	65	427	7.0	--	--	--	--	1
--	--	156	0	52	6.0	.3	1.2	.79	--	186	58	375	7.5	30	--	--	--	1
--	--	192	0	57	8.0	--	.4	--	--	218	60	427	7.6	13	--	--	--	1
--	--	164	0	76	6.0	--	2.3	--	278	226	92	438	7.3	8	--	5	--	1
--	--	--	--	--	10	--	--	--	--	360	--	--	9.5	--	--	--	--	1
--	--	100	0	103	9.0	--	.5	.03	--	200	118	399	7.3	24	--	--	--	2
--	--	232	0	67	18	--	6.6	--	--	257	87	550	7.7	8	--	--	--	2
--	--	--	0	--	5.0	--	--	--	--	130	--	290	7.4	--	--	--	--	2
--	--	141	8	68	14	--	1.6	--	--	190	66	430	8.6	16	--	90	30	2
--	--	--	0	--	10	--	--	--	--	150	--	280	8.0	--	--	--	--	2
--	--	--	--	--	15	--	--	--	--	240	--	350	8.3	--	--	--	--	2
--	--	--	0	--	10	--	--	--	--	220	--	400	7.9	--	--	--	--	2
--	--	--	0	--	5.0	--	--	--	--	260	--	470	7.5	--	--	--	--	2
--	--	--	--	--	15	--	--	--	--	220	--	290	9.0	--	--	--	--	1
--	--	178	0	34	10	--	.8	.05	--	190	44	356	7.8	21	8.2	--	--	1
--	--	155	0	34	8.0	--	.3	.06	--	166	39	325	7.7	9	0.8	--	--	1
--	--	222	0	38	11	--	4.8	--	--	218	36	460	7.8	8	--	--	--	2
--	--	--	0	--	5.0	--	--	--	--	140	--	280	7.5	--	--	--	--	2
--	--	128	0	22	4.0	--	0.1	.12	--	130	25	250	7.8	22	9.6	--	--	1
--	--	252	0	25	6.0	--	3.0	.19	--	252	45	450	7.3	16	0	--	--	1
--	--	140	0	25	4.0	--	.9	--	--	141	26	274	7.3	27	--	--	--	1
--	--	160	0	24	4.0	--	.5	--	--	163	32	306	7.1	12	--	--	--	1
--	--	171	0	19	6.0	--	2.1	--	--	160	20	300	8.0	8	--	--	--	2
--	--	--	0	--	10	--	--	--	--	200	--	410	8.0	--	--	--	--	2
--	--	--	0	--	10	--	--	--	--	220	--	320	7.1	--	--	--	--	2
--	--	--	--	--	10	--	--	--	--	250	--	340	8.8	--	--	--	--	2
--	--	177	0	90	4.0	--	1.8	.14	--	265	120	470	7.3	--	--	--	--	2
--	--	--	--	--	15	--	--	--	--	270	--	350	8.5	--	--	--	--	2
--	--	--	0	--	5.0	--	--	--	--	150	--	320	7.5	--	--	--	--	2
--	--	--	0	--	10	--	--	--	--	250	--	360	7.8	--	--	--	--	2
--	--	--	0	--	15	--	--	--	--	310	--	440	8.0	--	--	--	--	2
--	--	--	0	--	15	--	--	--	--	360	--	490	8.1	--	--	--	--	2
--	--	194	0	145	11	--	1.5	--	--	286	127	590	8.0	--	--	--	--	2
--	--	--	0	--	5.0	--	--	--	--	180	--	310	8.0	--	--	--	--	2
--	--	--	--	--	5.0	--	--	--	--	190	--	300	7.7	--	--	--	--	2
--	--	--	0	--	15	--	--	--	--	320	--	500	7.9	--	--	--	--	2
--	--	--	--	--	25	--	--	--	--	250	--	390	9.8	--	--	--	--	2
--	--	183	0	81	12	--	1.1	.57	--	237	87	492	7.4	24	--	--	--	2
--	--	--	0	--	20	--	--	--	--	170	--	405	7.8	--	--	--	--	2
--	--	--	0	--	10	--	--	--	--	320	--	480	8.1	--	--	--	--	2

TABLE 1.—Chemical quality of

(Results in milligrams per

Name	Location	Date sampled	Depth below surface (feet)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)
	BRANCH COUNTY (Continued)						
Long Noble	NE1/4,SW1/4 sec.7, T.8 S., R.8 W. 414718N0851658W	Oct. 22, 1964	0	--	--	--	--
do	do	Aug. 3, 1965	0	--	--	--	--
Mallow	SW1/4,SW1/4 sec.5, T.8 S., R.8 W. 414752N0851617W	Aug. 4, 1965	0	--	--	--	--
Marble	SW1/4,NE1/4 sec.32, T.6 S., R.5 W. 425516N0845427W	Nov. 5, 1964	0	--	--	--	--
do	do	Nov. 24, 1964	0	--	--	--	--
do	do	June 30, 1967	0	3.7	--	69	20
do	do	Nov. 7, 1968	0	--	--	--	--
Marble Outlet	N1/2, sec.29, T.6 S., R.5 W. 415523N0845426W	Apr. 15, 1964	--	--	--	56	21
do	do	July 29, 1964	--	--	--	--	--
do	do	Oct. 26, 1964	--	--	.48	--	--
do	do	Apr. 26, 1965	--	--	.15	--	--
Marl	SE1/4,NW1/4 sec.6, T.5 S., R.8 W. 420358N0851707W	June 29, 1965	--	--	--	--	--
Matteson	NE1/4 sec.23, T.6 S., R.8 W. 415615N0851145W	June 23, 1965	0	--	--	--	--
do	do	Apr. 17, 1969	0	--	--	--	--
Matteson Outlet	S1/2 sec.21, T.6 S., R.8 W. 415537N0851416W	Apr. 16, 1964	--			53	19
do	do	July 29, 1964	--	--	.37	--	--
do	do	Oct. 26, 1964	--	--	.28	--	--
do	do	Apr. 26, 1965	--	--	.14	--	--
Middle	SE1/4, sec.5, T.7 S., R.5 W. 415330N0845458W	June 22, 1965	0	--	--	--	--
North	NW1/4,SE1/4 sec.8, T.6 S., R.6 W. 415748N0850144W	June 23, 1965	0	--	--	--	--
North Pleasant	SW1/4,SE1/4 sec.8, T.8 S., R.6 W. 414703N0850138W	Nov. 4, 1964	0	--	--	--	--
do	do	Sept. 22, 1965	10	--	--	--	--
do	do	do	50	--	--	--	--
do	do	Nov. 7, 1968	0	--	--	--	--
Oliverda	SW1/4,NW1/4 sec.16, T.5 S., R.8 W. 420212N0851507W	June 25, 1965	0	--	--	--	--
do	do	Apr. 17, 1969	0	--	--	--	--
Palmitere	NE1/4,NW1/4 sec.9, T.7 S., R.7 W. 415255N0850750W	July 19, 1965	0	--	--	--	--
do	do	Sept. 22, 1965	15	--	--	--	--
Quaker	SE1/4,SW1/4 sec.12, T.5 S., R.5 W. 420238N0845011W	June 22, 1965	0	--	--	--	--
do	do	Nov. 7, 1968	0	--	--	--	--
Randall	NW1/4,SE1/4 sec.5, T.6 S., R.6 W. 415842N0850144W	Oct. 2, 1964	0	--		--	--
do	do	Oct. 7, 1964	0	--	--	--	--
do	do	Nov. 7, 1968	0	--	--	--	--
do	do	Apr. 17, 1969	0	--	--	--	--
Red Water	SW1/4,NE1/4 sec.22, T.8 S., R.7 W. 414535N0850622W	June 22, 1965	0	--	--	--	--
River	SW1/4,NW1/4 sec.31, T.5 S., R.8 W. 415932N0851704W	June 23, 1965	0	--	--	--	--
Round	NE1/4,NW1/4 sec.18, T.8 S., R.8 W. 414653N0851656W	Aug. 4, 1965	0	--	--	--	--
do	do	Sept. 21, 1965	0	--	--	--	--
do	do	July 26, 1966	0	--	--	--	--
do	do	Oct. 26, 1966	0	--	--	--	--
Silver	SE1/4,SE1/4 sec.9, T.8 S., R.6 W. 414706N0850019W	June 22, 1965	0	--	--	--	--
do	do	July 5, 1965	0	--	--	--	--
do	do	Nov. 7, 1968	0	--	--	--	--
South	SE1/4,SW1/4 sec.17, T.6 S., R.6 W. 415638N0850152W	July 21, 1965	0	--	--	--	--
do	do	Nov. 7, 1968	0	--	--	--	--
do	do	Apr. 17, 1969	0	--	--	--	--
Union	SW1/4,SE1/4 sec.11, T.5 S., R.8 W. 420237N0851210W	Oct. 30, 1964	0	--	--	--	--
do	do	Apr. 17, 1969	0	--	--	--	--
Vincent	NE1/4,SE1/4, sec.4, T.5 S., R.6 W. 420348N0850018W	Oct. 10, 1964	0	--	--	--	--
do	do	Nov. 7, 1968	0	--	--	--	--
West Long	NW1/4,SW1/4 sec.18, T.6 S., R.6 W. 415646N0850252W	Apr. 7, 1964	0	--	--	--	--
do	do	June 23, 1965	0	--	--	--	--
do	do	Sept. 20, 1965	0	--	--	--	--
Withington	SE1/4,SW1/4 sec.18, T.8 S., R.5 W. 414609N0845608W	June 22, 1965	0	--	--	--	--

Michigan's inland lakes — Continued

liter, except as indicated)

Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness Ca, Mg	Hardness Noncarbonate	Specific conductance (micromhos)	pH	Temperature (°C)	Dissolved oxygen	Color (Platinum cobalt units)	Turbidity (JTU)	Analysis
--	--	--	--	--	5.0	--	--	--	--	150	--	320	8.0	--	--	--	--	2
--	--	--	--	--	15	--	--	--	--	240	--	540	8.0	--	--	--	--	2
--	--	--	--	--	10	--	--	--	--	310	--	600	8.0	--	--	--	--	2
--	--	--	--	--	10	--	--	--	--	200	--	440	8.0	--	--	--	--	2
--	--	--	--	--	10	--	--	--	--	200	--	440	8.0	--	--	--	--	2
6.4	1.7	186	0	94	10	0.5	2.4	.04	318	254	102	484	7.7	23	--	12	--	1
--	--	217	0	88	13	--	2.1	--	--	256	78	520	8.2	10	--	--	--	2
8.0	2.0	202	0	66	11	--	--	--	285	226	60	463	7.0	--	--	--	--	1
--	--	149	0	73	10	.2	1.0	.12	--	204	82	420	7.7	26	--	--	--	1
--	--	187	0	76	12	--	1.7	--	--	232	79	462	8.1	13	--	--	--	1
--	--	184	0	84	10	--	2.9	--	301	248	97	487	7.2	8	--	8	--	1
--	--	-	0	--	10	--	--	--	--	250	--	400	7.8	--	--	--	--	2
--	--	--	0	--	15	--	--	--	--	270	--	390	7.5	--	--	--	--	2
--	--	224	0	63	8.0	--	1.3	--	--	244	60	490	7.9	17	10.1	70	15	2
5.3	1.4	180	0	64	9.0	--	--	--	272	210	62	424	6.8	--	--	--	--	1
--	--	224	0	59	6.0	.2	.2	.06	--	246	62	471	7.9	15	--	--	--	1
--	--	204	0	64	7.0	--	.4	--	--	230	63	446	8.0	13	--	--	--	1
--	--	172	0	94	7.0	--	.8	--	302	250	109	477	7.2	8	--	10	--	1
--	--	--	0	--	10	--	--	--	--	340	--	480	7.2	--	--	--	--	2
--	--	--	0	--	15	--	--	--	--	370	--	500	8.2	--	--	--	--	2
--	--	--	0	--	5.0	--	--	--	--	120	--	240	8.0	--	--	--	--	2
--	--	114	0	22	5.0	--	.2	.02	--	119	26	234	7.6	24	7.8	--	--	1
--	--	124	0	20	4.0	--	.6	.07	--	125	24	248	7.2	10	2.2	--	--	1
--	--	127	0	20	5.0	--	.6	--	--	120	16	270	7.9	9	--	--	--	2
--	--	--	0	--	15	--	--	--	--	270	--	420	8.0	--	--	--	--	2
--	--	234	0	73	10	--	4.8	--	--	264	72	510	8.1	14	11.1	40	5	2
--	--	--	--	--	20	--	--	--	--	130	--	300	9.2	--	--	--	--	2
--	--	192	0	47	12	--	.7	.14	--	217	60	424	7.3	18	--	--	--	1
--	--	--	0	--	15	--	--	--	--	370	--	480	8.0	--	--	--	--	2
--	--	282	0	63	8.0	--	3.0	--	--	291	60	570	8.1	9	--	--	--	2
--	--	--	--	--	20	--	--	--	--	220	--	540	8.5	--	--	--	--	2
--	--	--	--	--	20	--	--	--	--	190	--	450	8.5	--	--	--	--	2
--	--	233	0	78	22	--	4.3	--	--	264	73	570	7.8	10	--	--	--	2
--	--	170	8	73	14	--	2.3	--	--	218	70	460	8.6	15	--	100	30	2
--	--	--	0	--	15	--	--	--	--	210	--	310	7.8	--	--	--	--	2
--	--	--	0	--	15	--	--	--	--	290	--	400	7.2	--	--	--	--	2
--	--	--	0	--	5.0	--	--	--	--	20	--	50	7.0	--	--	--	--	2
--	--	15	0	8.0	3.0	--	1.2	.08	--	24	12	60	6.1	24	--	--	--	1
--	--	20	0	12	2.5	--	.5	--	60	26	10	65	6.0	30	--	--	--	1
--	--	13	0	10	3.5	--	2.6	--	50	26	16	65	6.2	12	--	--	--	1
--	--	--	0	--	15	--	--	--	--	240	--	330	8.2	--	--	--	--	2
--	--	--	0	--	15	--	--	--	--	190	--	360	8.2	--	--	--	--	2
--	--	185	0	41	8.0	--	.8	--	--	194	42	395	8.2	--	--	--	--	2
--	--	--	--	--	25	--	--	--	--	220	--	480	8.3	--	--	--	--	2
--	--	232	0	78	25	--	5.8	--	--	270	80	595	7.8	--	--	--	--	2
--	--	246	0	84	18	--	3.4	--	--	282	80	570	8.0	16	11.7	68	15	2
--	--	--	0	--	10	--	--	--	--	240	--	--	7.0	--	--	--	--	2
--	--	212	4	63	12	--	2.9	--	--	232	54	450	8.4	17	--	95	30	2
--	--	--	--	--	10	--	--	--	--	180	--	370	8.0	--	--	--	--	2
--	--	222	0	41	12	--	3.7	--	--	220	38	440	8.1	9	--	--	--	2
--	--	--	0	--	5.0	--	--	--	--	150	--	330	7.5	--	--	--	--	2
--	--	--	--	--	10	--	--	--	--	270	--	410	9.3	--	--	--	--	2
--	--	148	0	50	18	--	.4	--	--	185	--	384	7.5	--	--	--	--	2
--	--	--	--	--	15	--	--	--	--	320	--	560	7.8	--	--	--	--	2

TABLE 1.—Chemical quality of

(Results in milligrams per

Name	Location	Date sampled	Depth below surface (feet)	Silica (SiO_2)	Iron (Fe)	Cal-cium (Ca)	Mag-ne-sium (Mg)
	CALHOUN COUNTY						
Goguac	SE1/4,SE1/4 sec.22, T.2 S., R.8 W. 421637N0851307W	June 20, 1952	0	1.6	0.0	32	13
do	do	Apr. 14, 1953	0	--	--	--	--
do	do	Sept. 27, 1954	0	--	--	--	--
Spring	NE1/4,NE1/4 sec.1, T.2 S., R.8 W. 421952N0851125W	Jan. 23, 1953	0	10	0.5	60	16
St. Mary	NW1/4,NW1/4 sec.19, T.1 S., R.7 W. 422234N0851049W	Apr. 14, 1953	0	2.0	0.0	30	13
do	do	Sept. 28, 1954	0	--	--	--	--
	CHEBOYGAN COUNTY						
Mullett Outlet	SW1/4 sec.19, T.37 N., R.1 W. 453438N0842715W	Apr. 18, 1967	--	--	--	--	--
	DELTA COUNTY						
Moss	SE1/4,NE1/4 sec.4, T.40 N., R.19 W. 455325N0863843W					246	17
	DICKINSON COUNTY						
Antoine	NW1/4,SE1/4 sec.29, T.40 N., R.30 W. 464949N0880203W	Aug. 14, 1958	0	5.0	0.1	24	15
Brush	NE1/4,NW1/4 sec.19, T.42 N., R.30 W. 460136N0880640W	Oct. 15, 1964	0	--	--	--	--
Coy	NE1/4,SW1/4 sec.5, T.44 N., R.30 W. 461420N0880523W	Oct. 21, 1964	0	--	--	--	--
Edey	NW1/4,NW1/4 sec.22, T.44 N., R.30 W. 461136N0880314W	Oct. 19, 1964	0	--	--	--	--
Lyons	SE1/4,SE1/4 sec.24, T.41 N., R.29 W. 455545N0885209W	Nov. 6, 1964	0	--	--	--	--
Pickerel	SE1/4,NE1/4 sec.33, T.43 N., R.28 W. 460452N0884825W	Oct. 23, 1964	0	--	--	--	--
Sawyer	SW1/4,SE1/4 sec.28, T.44 N., R.30 W. 461037N0880336W	Oct. 19, 1964	0	--	--	--	--
Silver	NW1/4,NE1/4 sec.23, T.44 N., R.30 W. 461201N0880109W	Oct. 19, 1964	0	--	--	--	--
Solberg	SE1/4,SW1/4 sec.17, T.42 N., R.29 W. 460145N0875757W	Oct. 16, 1964	0	--	--	--	--
	GENESEE COUNTY						
Lobdell	SW1/4,NW1/4 sec.35, T.5 N., R.6 E. 424728N0835038W	Oct. 21, 1958	0	4.0	.0	--	--
do	do	Apr. 1, 1959	0	6.8	.15	46	14
Long (Fenton)	NW1/4,SE1/4 sec.23, T.5 N., R.6 E. 424900N0834250W	Oct. 21, 1958	0	3.0	.0	--	--
do	do	Apr. 1, 1959	0	1.2	.21	14	6.1
Ponemah	SE1/4,NE1/4 sec.21, T.5 N., R.6 E. 424910N0834516W	Oct. 21, 1958	0	8.0	0.0	--	--
do	do	Apr. 1, 1959	0	5.7	.05	35	14
	HILLSDALE COUNTY						
Baw Beese	NE1/4,SE1/4 sec.1, T.7 S., R.3 W. 425317N0843537W	Feb. 9, 1956	--	4.0	.0	42	16
	HOUGHTON COUNTY						
Portage	NW1/4,NE1/4 sec.3, T.53 N., R.33 W. 470130N0882834W	Apr. 3, 1968	--	3.8	.35	15	1
	INGHAM COUNTY						
Lansing	SE1/4,NW1/4 sec.11, T.4 N., R.1 W. 424455N0842404W	July 25, 1967		--	--	--	--
	IRON COUNTY						
Cable	SW1/4,NE1/4 sec.29, T.46 N., R.34 W. 462048N0883510W	May 5, 1965	0	--	--	--	--
Dawson	NE1/4,SE1/4 sec.33, T.43 N., R.31 W. 460438N0881057W	July 16, 1965	0	--	--	--	--
Deer	NE1/4,SE1/4 sec.5, T.45 N., R.32 W. 461926N0881935W	Aug. 13, 1965	0	--	--	--	--
Ellen	NE1/4,SE1/4 sec.26, T.44 N., R.31 W. 461046N0880837W	Aug. 12, 1965	0	--	--	--	--
Emily	SW1/4,NE1/4 sec.24, T.43 N., R.34 W. 460637N0882955W	Aug. 11, 1965	0	--	--	--	--
Gidden	NW1/4,NW1/4 sec. 6, T.42 N., R.31 W. 460420N0881418W	Aug. 12, 1965	0	--	--	--	--
Golden	SW1/4,NW1/4 sec.36, T.44 N., R.37 W. 461013N0885308W	July 20, 1965	0	--	--	--	--
do	do	Aug. 24, 1965	0	--	--	--	--
do	do	Aug. 24, 1965	50	--	--	--	--
Hagerman	NW1/4,SW1/4 sec.11, T.42 N., R.36 W. 460300N0884639W	July 21, 1965	0	--	--	--	--
Webb (Hannah Webb)	NW1/4,SW1/4 sec.29, T.46 N., R.35 W. 462111N0884308W	Aug. 20, 1965	0	--	--	--	--
Holmes	NW1/4,SE1/4 sec.24, T.43 N., R.31 W. 460623N0880730W	Aug. 10, 1965	0	--	--	--	--
James	SW1/4,NW1/4 sec.25, T.44 N., R.37 W. 461158N0885418W	Aug. 24, 1965	0	--	--	--	--
Mary	NE1/4,SW1/4 sec. 5, T.42 N., R.31 W. 460347N0881247W	May 12, 1965	0	--	--	--	--

Michigan's inland lakes — Continued

liter, except as indicated)

Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness Ca, Mg	Hardness Noncarbonate	Specific conductance (micromhos)	pH	Temperature (°C)	Dissolved oxygen	Color (Platinum cobalt units)	Turbidity (JTU)	Analysis
4.0	--	146	0	23	2.0	.2	0.0	--	--	132	--	290	8.4	--	--	--	--	3
--	--	157	--	14	3.0	--	--	--	--	140	--	350	--	--	--	--	--	3
--	--	--	--	--	--	--	--	--	--	--	--	310	--	--	--	--	--	3
3.5	--	232	0	31	1.0	0.1	0.0	--	--	215	--	450	7.8	--	--	25	2.5	3
4.8	--	155	1	14	3.0	0.0	0.0	--	--	130	--	350	8.3	--	--	--	--	3
--	--	127	--	7.5	4.0	--	--	--	--	106	--	280	--	--	--	--	--	3
--	--	166	2	13	2.0	--	--	--	--	143	5	280	8.3	--	--	--	--	2
2.6	--	103	0	554	5.0	--	--	--	--	685	600	1130	7.1	--	--	--	--	1
4.1	1.6	165	0	16	2.0	0.0	0.0	--	--	155	--	300	8.1	--	--	0	0	3
--	--	--	--	--	--	--	--	--	--	20	--	50	6.0	--	--	--	--	2
--	--	--	--	--	--	--	--	--	--	50	--	70	7.0	--	--	--	--	2
--	--	--	--	--	--	--	--	--	--	20	--	50	6.0	--	--	--	--	2
--	--	--	--	--	--	--	--	--	--	150	--	250	7.5	--	--	--	--	2
--	--	--	--	--	--	--	--	--	--	190	--	320	8.0	--	--	--	--	2
--	--	--	--	--	--	--	--	--	--	20	--	50	6.5	--	--	--	--	2
--	--	--	--	--	--	--	--	--	--	20	--	50	6.5	--	--	--	--	2
--	--	--	--	--	--	--	--	--	--	220	--	320	8.0	--	--	--	--	2
--	--	222	0	--	5.0	--	0.0	--	--	200	--	400	8.0	13	--	--	--	3
3.2	1.9	184	0	21	3.0	--	.6	--	183	173	22	332	7.5	4	10.2	12	--	1
--	--	145	0	--	17	--	0.0	--	--	140	--	325	8.1	14	--	--	--	3
8.1	1.2	58	0	6.0	18	--	0.4	--	87	60	12	169	7.2	3	11.6	4	--	1
--	--	220	0	--	15	--	0.0	--	--	206	--	450	7.7	14	--	--	--	3
5.2	1.5	144	0	24	9.5	--	.1	--	167	145	27	302	7.6	3	19.6	13	--	1
5.0	1.5	170	--	19	7.0	.9	.0	--	--	168	--	250	8.3	--	--	0	0	3
3.0	.6	55	0	5.0	7.0	.1	1.5	--	--	44	--	125	7.7	2	--	15	5	3
--	--	176	0	23	22	--	--	--	--	174	30	360	7.9	--	--	--	--	2
--	--	--	--	--	--	--	--	--	--	--	--	70	--	9	--	--	--	-
--	--	--	--	--	--	---	--	--	--	137	--	240	8.0	24	10.0	--	--	2
--	--	--	--	--	--	--	--	--	--	69	--	130	7.7	23	9.0	--	--	2
--	--	--	--	--	--	--	--	--	--	51	--	70	7.7	22	9.0	--	--	2
--	--	--	--	--	--	--	--	--	--	120	--	250	8.0	23	9.0	--	--	2
--	--	--	--	--	--	--	--	--	--	17	--	<50	6.2	21	9.0	--	--	2
--	--	--	--	--	--	--	--	--	--	--	--	<50	6.8	21	10.0	--	--	2
--	--	--	--	--	--	--	--	--	--	12	--	<50	7.5	21	7.0	--	--	2
--	--	--	--	--	--	--	--	--	--	12	--	<50	6.0	14	0.0	--	--	2
--	--	--	--	--	--	--	--	--	--	68	--	110	8.0	22	12.0	--	--	2
--	--	--	--	--	--	--	--	--	--	<17	--	<50	6.4	22	9.0	--	--	2
--	--	--	--	--	--	--	--	--	--	17	--	<50	6.7	22	8.0	--	--	2
--	--	--	--	--	--	--	--	--	--	<17	--	<50	6.0	21	8.0	--	--	2
--	--	--	--	--	--	--	--	--	--	51	--	100	7.5	18	--	--	--	2

TABLE 1.—Chemical quality of

(Results in milligrams per

Name	Location	Date sampled	Depth below surface (feet)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)
IRON COUNTY (Continued)							
Perch	SW1/4,SW1/4 sec.22, T.46 N., R.35 W. 462148N0884025W	Aug. 23, 1965	0	--	--	--	--
do	do	Aug. 23, 1965	12	--	--	--	--
Shank	NE1/4,SE1/4 sec.7, T.46 N., R.32 W. 462348N0882048W	Aug. 18, 1965	0	--	--	--	--
Stanley	SE1/4,SE1/4 sec.5, T.42 N., R.35 W. 460342N0884203W	July 21, 1965	0	--	--	--	--
Swan	SE1/4,NE1/4 sec.35, T.44 N., R.33 W. 461002N0882325W	Aug. 18, 1965	0	--	--	--	--
do	do	Aug. 24, 1965	0	--	--	--	--
do	do	Aug. 29 1965	13	--	--	--	--
Tepee	NE1/4,NW1/4 sec.13, T.46 N., R.37 W. 462318N0885225W	May 5, 1965	0	--	--	--	--
JACKSON COUNTY							
Vandercook (Inlet)	NE1/4,NE1/4 sec.27, T.3 S., R.1 W. 421112N0842418W	Sept. 2, 1959	0	12	.20	56	21
do	do	Dec. 17, 1959	0	7.0	.20	74	19
do	do	Apr. 21, 1960	0	5.0	.30	68	17
do	do	July 7, 1960	0	10	.00	70	18
Vandercook (Outlet)	SE1/4,SE1/4 sec.22, T.3 S., R.1 W. 421136N0842420W	Sept. 2, 1959	0	13	.10	48	22
do	do	Dec. 17, 1959	0	8.0	.00	70	19
do	do	Apr. 12, 1960	0	6.0	.20	64	17
do	do	July 7, 1960	0	7.0	.00	66	17
KALAMAZOO COUNTY							
Atwater	SE1/4 sec.1, T.3 S., R.12 W. 421407N0853854W	Oct. 19, 1965	0	--	--	--	--
Asylum	NW1/4,SW1/4 sec.30, T.2 S., R.11 W. 421555N0853810W	Sept. 27, 1922	--	17	.00	53	23
Austin	NW1/4,SE1/4 sec.36, T.3 S., R.11 W. 421000N0853230W	Aug. 14, 1952	--	--	.30	22	10
do	do	Oct. 6, 1965	0	--	--	--	--
do	do	Mar. 14, 1967	0	--	--	--	--
Barton	NW1/4,NW1/4 sec.26, T.4 S., R.11 W. 420553N0853352W	Oct. 5, 1965	0	--	--	--	--
do	do	Mar. 14, 1967	0	--	--	--	--
Bass	NW1/4,NE1/4 sec.14, T.3 S., R.12 W. 421249N0854055W	Oct. 6, 1965	2	--	--	--	--
Crooked	SW1/4,NE1/4 sec.15, T.3 S., R.12 W. 421222N0854202W	Oct. 6, 1965	2	--	--	--	--
do	do	Mar. 28, 1967	0	--	--	--	--
Eagle	N1/2 sec.16, T.3 S., R.12 W. 421250N0854258W	Aug. 30, 1965	2	4.1	--	12	4.4
do	do	Oct. 6, 1965	0	--	--	--	--
do	do	Mar. 28, 1967	0	--	--	--	--
Gourdneck	SE1/4,SW1/4 sec.34, T.3 S., R.11 W. 420927N0853443W	Oct. 5, 1965	0	--	--	--	--
Gull	NW1/4,SW1/4 sec. 7, T.1 S., R.9 W. 422405N0852448W	Oct. 4, 1965	0	--	--	--	--
Gull (Outlet)	SW1/4,NE1/4 sec.19, T.1 S., R.9 W. 422209N0852414W	Oct. 18, 1965	0	--	--	--	--
Indian	NW1/4 sec.4, T.4 S., R.10 W. 420908N0852910W	Oct. 5, 1965	0	--	--	--	--
Long	NW1/4,NE1/4 sec.25, T.3 S., R.11 W. 421109N0853217W	Sept. 24, 1965	5	--	--	--	--
do	do	Sept. 24, 1965	29	--	--	--	--
Morrow (Outlet)	NE1/4 sec.19, T.2 S., R.10 W. 421705N0853050W	Aug. 5, 1964	0	--	--	--	--
do	do	Feb. 18, 1965	0	6.3	2.4	63	16
do	do	Sept. 23, 1965	0	9.2	--	71	22
do	do	Oct. 4, 1965	0	--	--	--	--
do	do	Oct. 18, 1965	0	--	--	--	--
do	do	Nov. 3, 1965	0	--	--	--	--
do	do	Nov. 17, 1965	0	--	--	--	--
do	do	Dec. 1, 1965	0	--	--	--	--
do	do	Dec. 15, 1965	0	--	--	--	--
do	do	May 16, 1966	0	--	.31	--	--
do	do	Dec. 8, 1966	0	--	--	--	--
do	do	Mar. 19, 1967	0	--	--	--	--
do	do	Mar. 28, 1967	0	--	--	--	--
do	do	Apr. 8, 1967	0	--	--	--	--
do	do	Apr. 24, 1968	0	--	--	--	--
do	do	Sept. 20, 1968	0	11	.50	80	21
do	do	Dec. 16, 1968	0	11	.45	82	23
Sherman	SW1/4,SE1/4 sec.29, T.1 S., R.9 W. 422102N0852324W	Oct. 4, 1965	0	--	--	--	--
Sugarloaf	SE1/4,SE1/4 sec.31, T.3 S., R.11 W. 420936N0853749W	Oct. 5, 1965	0	--	--	--	--
West	NW1/4,NE1/4 sec.27, T.3 S., R.11 W. 421114N0853455W	Oct. 6, 1965	0	--	--	--	--
LIVINGSTON COUNTY							
Kent (Outlet)	NE1/4 sec.1 T.1 N., R.6 E. 423045N0834035W	Apr. 14, 1966	--	6.0	.21	59	21
do	do	Apr. 6, 1967	--	--	--	--	--
do	do	Aug. 17, 1967	--	--	--	--	--
do	do	Sept. 12, 1967	--	--	--	--	--
Whitmore	NE1/4,SW1/4 sec.32, T.1 N., R.6 E. 422557N0844520W	Oct. 24, 1965	0	--	--	--	--

Michigan's inland lakes — Continued

liter, except as indicated)

Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness Ca, Mg	Hardness Noncarbonate	Specific conductance (micromhos)	pH	Temperature (°C)	Dissolved oxygen	Color (Platinum cobalt units)	Turbidity (JTU)	Analysis
--	--	--	--	--	--	--	--	--	--	34	--	70	6.9	21	--	--	--	2
--	--	--	--	--	--	--	--	--	--	51	--	110	6.8	--	--	--	--	2
--	--	--	-	--	--	--	--	--	--	51	--	95	7.7	21	9.6	--	--	2
--	--	--	--	--	--	--	--	--	--	120	--	200	8.0	22	10.0	--	--	2
--	--	--	--	--	--	--	--	--	--	165	--	165	8.7	23	10.0	--	--	2
--	--	--	--	--	--	--	--	--	--	85	--	170	8.0	22	10.6	--	--	2
--	--	--	--	--	--	--	--	--	--	85	--	165	8.0	22	3.2	--	--	2
--	--	--	--	--	--	--	--	--	--	--	--	50	--	8	--	--	--	2
4.6	1.2	254	0	25	2.0	.0	.0	--	--	226	--	440	8.0	--	--	15	4	3
4.6	.8	256	0	58	4.0	.0	2.0	--	--	265	--	500	7.9	--	--	40	2	3
4.6	1.2	255	0	35	6.0	.0	1.0	--	--	290	--	460	8.0	--	--	30	4	3
3.1	.4	292	0	12	.0	.0	.0	--	--	250	--	460	7.8	--	--	70	0	3
3.2	.6	229	0	17	4.0	.0	.0	--	--	210	--	375	8.2	--	--	20	0	3
4.6	1.2	254	0	50	4.0	.0	2.0	--	--	255	--	500	8.0	--	--	40	0	3
4.1	.8	238	0	38	5.0	.2	2.0	--	--	230	--	460	8.1	--	--	20	4	3
3.2	.4	235	0	20	.0	.0	.0	--	--	235	--	450	8.1	--	--	60	2	3
--	--	222	0	11	3.0	--	.6	.07	198	193	11	354	8.0	15	--	--	--	1
--	--	263	--	.0	--	--	--	--	251	227	-	--	--	--	--	--	--	3
--	--	100	0	15	1.0	.2	.0	--	--	94	--	250	8.0	--	--	--	--	3
--	--	132	0	28	6.0	--	.5	--	--	138	30	266	7.4	11	9.2	--	--	1
--	--	213	--	18	8.8	--	--	--	--	196	21	--	--	--	--	--	--	1
--	--	186	0	40	26	--	4.4	--	--	201	48	441	7.9	15	4.6	--	--	1
--	--	208	--	42	5.0	--	--	--	--	207	36	--	--	--	--	--	--	1
--	--	123	0	8.0	2.0	--	.1	--	--	117	16	216	7.6	15	8.5	--	--	1
--	--	122	0	11	4.0	--	.5	--	--	120	20	231	7.3	11	9.8	--	--	1
--	--	122	--	3.0	1.3	--	--	--	--	106	6	--	--	--	--	--	--	1
2.2	.1	38	0	21	1.4	.2	.0	--	73	48	17	112	6.8	--	--	5	--	1
--	--	26	0	16	4.0	--	1.5	--	--	44	22	97	6.3	11	9.2	--	--	1
--	--	49	--	4.0	1.3	--	--	--	--	44	4	--	--	--	--	--	--	2
--	--	184	0	18	8.0	--	.8	--	--	182	31	338	7.4	16	9.6	--	--	1
--	--	172	0	20	7.0	--	.5	--	--	168	27	315	7.7	16	9.0	--	--	1
--	--	178	0	22	6.0	--	.5	.06	170	168	22	333	7.7	14	--	--	--	1
--	--	160	0	44	8.0	--	.5	--	--	189	58	358	7.3	15	9.2	--	--	1
--	--	124	0	27	8.0	--	.6	--	--	140	38	276	7.4	19	--	--	--	1
--	--	134	0	27	6.0	--	1.2	--	--	146	36	285	8.0	19	--	--	--	1
--	--	208	0	48	30	--	3.4	--	--	238	68	514	7.3	29	--	--	--	1
5.3	2.4	150	0	83	11	.1	14	--	288	223	100	455	7.6	4	--	--	--	1
9.7	1.8	232	4	49	28	.2	4.0	--	312	268	71	532	8.3	26	--	10	--	1
--	--	254	0	50	26	--	1.7	--	--	275	66	554	7.6	17	--	--	--	1
--	--	265	0	54	26	--	1.5	.50	334	293	76	576	7.7	22	--	--	--	1
--	--	219	0	52	24	--	.9	.42	292	248	68	510	7.3	--	--	--	--	1
--	--	210	0	52	26	--	.2	.66	282	248	76	494	7.3	12	--	--	--	1
--	--	202	0	51	23	--	1.2	.29	260	244	78	478	7.4	5	--	--	--	1
--	--	251	0	65	23	--	3.4	.50	340	288	82	571	7.7	8	--	--	--	1
--	--	216	0	66	13	--	2.6	--	324	252	74	497	7.5	17	--	--	--	1
--	--	226	0	73	33	--	3.0	1.2	376	267	82	589	7.2	8	--	--	--	1
--	--	244	5	63	16	--	--	--	--	274	70	530	8.5	--	--	--	--	2
--	--	204	5	67	13	--	--	--	--	251	80	470	8.6	--	--	--	--	2
--	--	212	0	74	12	--	--	--	--	249	75	460	8.0	--	--	--	--	2
--	--	260	0	56	19	--	3.3	--	356	292	78	546	7.9	--	--	--	--	1
12	1.7	280	0	46	24	.2	3.5	--	348	286	56	566	7.7	21	--	10	4	1
11	2.0	282	0	59	21	.2	4.4	--	353	299	68	602	7.8	6	--	30	--	1
--	--	106	0	8.4	5.0	--	.6	--	--	102	15	197	7.4	16	10.0	--	--	1
--	--	192	0	17	4.0	--	1.3	--	--	186	28	344	7.2	14	9.0	--	--	1
--	--	175	0	20	4.0	--	.1	--	--	130	28	243	7.8	12	10.9	--	--	1
17	1.4	206	12	37	24	.3	1.3	.13	304	234	44	486	8.4	7	--	5	--	1
--	--	223	4	33	26	--	--	--	--	222	36	465	8.4	--	--	--	--	2
--	--	198	0	25	26	--	--	--	--	190	28	410	7.7	26	--	--	--	2
--	--	179	0	30	27	--	--	--	--	177	30	405	8.1	18	--	--	--	2
--	--	140	0	31	34	.2	.5	--	--	161	46	400	8.1	--	--	--	--	1

TABLE 1.—Chemical quality of

(Results in milligrams per

Name	Location	Date sampled	Depth below surface (feet)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)
	MARQUETTE COUNTY						
Michigamme (Outlet)	SW1/4, sec.16, T.47 N., R.30 W. 461448N0880045W	July 31, 1968	--	4.5	.08	--	--
do	do	Aug. 28, 1968	--	4.8	.15	--	--
do	do	Oct. 8, 1968	--	4.6	.15	--	--
do	do	Nov. 12, 1968	--	3.8	.15	--	--
do	do	Dec. 10, 1968	--	5.0	.25	--	--
do	do	Feb. 4, 1969	--	4.2	.28	--	--
do	do	Mar. 19, 1969	--	7.5	.20	--	--
do	do	Apr. 3, 1969	--	--	--	--	--
do	do	Apr. 22, 1969	--	--	.16	--	--
do	do	May 12, 1969	--	--	.08	--	--
do	do	June 3, 1969	--	--	.10	--	--
do	do	June 17, 1969	--	--	.16	--	--
Milwaukee	NE1/4,NW1/4 sec.17, T.46 N., R.29 W. 462328N0875743W	Apr. 9, 1963	0	13	4.9	--	--
Perch	NW1/4,NW1/4 sec.15, T.45 N., R.26 W. 461803N0873300W	Aug. 14, 1958	--	5.0	.40	8.0	2.0
Sally	NE1/4,SW1/4 sec.14, T.47 N., R.27 W. 462805N0873840W	Mar. 20, 1952	--	4.1	.16	5.6	2.4
do	do	Apr. 27, 1955	--	9.0	.25	5.6	3.0
do	do	July 16, 1959	--	4.0	.10	6.0	2.0
do	do	Mar. 10, 1966	--	3.0	.20	7.0	1.0
Teal	SW1/4,SW1/4 sec.31, T.48 N., R.26 W. 463027N0873650W	Mar. 20, 1952		.6	.10	12	3.2
do	do	Mar. 20, 1955	--	4.0	1.1	12	4.8
do	do	Oct. 2, 1958	--	4.0	.10	13	3.0
do	do	Aug. 14, 1961	--	2.1	.35	17	4.3
do	do	Mar. 10, 1966	--	2.0	.00	23	6.0
	OAKLAND COUNTY						
Angelus	NE1/4,NE1/4 sec.12, T.3 N., R.9 E. 424119N0831957W	Apr. 18, 1967	0	--	--	--	--
Big	SE1/4,NE1/4 sec.28, T.4 N., R.8 E. 424329N0833038W	Nov. 16, 1967	0	--	--	--	--
Bogie	NW1/4,SE1/4 sec.33, T.3 N., R.8 E. 423705N0833036W	Nov. 15, 1967	0	--	--	--	--
Buckhorn	NE1/4,SW1/4 sec.22, T.4 N., R.7 E. 424356N0833718W	Nov. 16, 1967	0	--	--	--	--
Bush	SW1/4,SE1/4 sec.27, T.5 N., R.7 E. 424758N0833657W	Nov. 16, 1967	0	--	--	--	--
Cass	NW1/4,NE1/4 sec.2, T.2 N., R.9 E. 423657N0832058W	Apr. 18, 1967	0	--	--	--	--
do	do	Nov. 16, 1967	0	--	--	--	--
Clear	NW1/4,SW1/4 sec.28, T.5 N., R.10 E. 424853N0831739W	Nov. 16, 1967	0	--	--	--	--
Commerce	NE1/4,NE1/4 sec.15 T.2 N., R.8 E. 423454N0832907W	Nov. 15, 1967	0	--	--	--	--
Cranberry	SW1/4,NW1/4 sec.2, T.4 N., R.11 E. 424737N0830818W	Nov. 16, 1967	0	--	--	--	--
do	SW1/4,NE1/4 sec.17, T.4 N., R.11 E. 424518N0832957W	Nov. 16, 1967	0	--	--	--	--
Crooked	SE1/4,SE1/4 sec.4, T.4 N., R.9 E. 424644N0832329W	Apr. 17, 1967	0	8.1	--	46	17
do	do	Nov. 16, 1967	0	--	--	--	--
Crotched	SE1/4,NW1/4 sec.23, T.5 N., R.7 E. 424917N0833603W	Apr. 17, 1967	0	8.4	--	47	15
Deer	NW1/4,NW1/4 sec.29, T.4 N., R.9 E. 424348N0832538W	Apr. 18, 1967	0	--	--	--	--
do	do	Sept. 13, 1967	--	--	--	--	--
Duck	NE1/4,NE1/4 sec.14, T.3 N., R.7 E. 424000N0833520W	July 23, 1966	2	14	--	29	16
do	NE1/4,NE1/4 sec.11, T.3 N., R.7 E. 424035N0833610W	July 23, 1966	2	2.1	--	25	13
do	NW1/4,SW1/4 sec.12, T.3 N., R.7 E. 424025N0833453W	Apr. 17, 1967	0	4.6	--	46	14
Dunham	SW1/4,SW1/4 sec.18, T.3 N., R.7 E. 423913N0834047W	Nov. 15, 1967	0	--	--	--	--
Elizabeth	SE1/4 sec.28, T.3 N., R.9 E. 423813N0832317W	Mar. 29, 1966	0	.6	.08	40	20
do	do	Apr. 18, 1967	0	--	--	--	--
Fagon	NW1/4,NE1/4 sec.10, T.5 N., R.7 E. 425123N0833655W	Apr. 17, 1967	0	--	--	--	--
Galloway	SW1/4,SW1/4 sec.14, T.3 N., R.10 E. 423951N0831457W	Apr. 18, 1967	--	--	--	--	--
Graham	SE1/4,SE1/4 sec.5, T.4 N., R.11 E. 424722N0851058W	Apr. 11, 1967	0	--	--	--	--
do	do	Sept. 13, 1967	0	--	--	--	--
Gravel Pit	NE1/4,SE1/4 sec.2, T.2 N., R.11 E. 423652N0830643W	Nov. 15, 1967	0	--	--	--	--
Indian	SE1/4,SW1/4 sec.31, T.5 N., R.11 E. 424758N0831233W	Nov. 16, 1967	0	--	--	--	--
Judah	NW1/4,NW1/4 sec.33, T.4 N., R.10 E 424317N0831732W	Mar. 29, 1966	0	1.4	--	42	11
do	do	Apr. 17, 1967	0	--	--	--	--
Kent	SE1/4,NW1/4 sec.31, T.2 N., R.7 E. 423140N0834000W	Apr. 18, 1967	--	--	--	--	--
Lakeville	SW1/4,NE1/4 sec.27, T.5 N., R.11 E. 424924N0830845W	Apr. 17, 1967	0	--	--	--	--
do	NE1/4,SE1/4 sec.27, T.5 N., R.11 E. 424917N0830857W	Sept. 13, 1967	--	--	--	--	--

Michigan's inland lakes — Continued

liter, except as indicated)

Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness Ca, Mg	Hardness Noncarbonate	Specific conductance (micromhos)	pH	Temperature (°C)	Dissolved oxygen	Color (Platinum cobalt units)	Turbidity (JTU)	Analysis
--	--	--	--	--	--	--	--	--	--	--	--	<50	6.3	19	--	90	20	2
--	--	--	--	--	--	--	--	--	--	--	--	<50	7.7	17	--	100	30	2
--	--	--	--	--	--	--	--	--	--	--	--	45	6.6	13	--	110	20	2
--	--	--	--	--	--	--	--	--	--	--	--	<50	7.0	4	--	115	20	2
--	--	--	--	--	--	--	--	--	--	--	--	<50	7.0	0	--	120	25	2
--	--	--	--	--	--	--	--	--	--	--	--	45	6.7	1	--	120	20	2
--	--	--	--	--	--	--	--	--	--	--	--	<50	7.6	1	--	110	30	2
--	--	--	--	--	--	--	--	--	--	--	--	<50	6.2	2	--	--	25	2
--	--	--	--	--	--	--	--	--	--	--	--	<50	6.2	2	--	95	20	2
--	--	--	--	--	--	--	.4	--	--	--	--	<50	6.4	8	--	85	15	2
--	--	--	--	--	--	--	.5	--	--	--	--	<50	6.8	12	--	90	10	2
--	--	--	--	--	--	--	.5	--	--	--	--	<50	6.5	15	--	90	22	2
--	--	108	0	9.6	7.0	--	1.2	--	126	84	0	197	6.9	--	--	17	220	1
1.2	.47	30	0	5.0	4.0	.0	.0	--	--	30	--	65	7.2	--	--	0	0	3
.8	.7	20	0	5.9	2.1	.1	.4	.00	37	24	--	52	5.0	2	--	7	--	1
--	--	24	0	5.0	2.0	.0	.0	--	--	26	--	60	7.7	--	--	10	0	3
.5	.4	25	0	6.0	.0	.0	.0	--	--	23	--	60	7.1	--	--	5	--	3
.7	.4	23	0	8.0	.0	.0	.0	--	--	26	--	60	7.2	--	--	5	0	3
.8	.7	42	0	7.0	.9	.2	.5	.00	54	42	--	86	6.9	1	--	5	--	1
--	--	54	0	5.0	1.0	.6	.0	--	--	50	--	110	7.1	--	--	--	--	3
1.6	.3	37	0	7.0	2.0	1.5	.0	--	--	45	--	105	7.3	--	--	0	0	3
1.4	.6	56	0	15	2.0	.1	.1	--	89	60	14	128	7.2	--	--	3	--	1
1.8	.5	80	0	15	3.0	1.1	.0	--	--	82	--	140	7.3	--	--	0	0	3
--	--	183	0	21	20	--	.0	.01	198	178	28	338	7.9	--	--	--	--	1
--	--	168	0	18	10	--	--	.05	--	157	19	285	7.7	--	--	--	--	2
--	--	174	0	35	23	--	--	.10	--	192	49	360	8.1	--	--	--	--	2
--	--	234	0	18	11	--	--	.10	--	212	20	370	7.9	--	--	--	--	2
--	--	227	0	35	19	--	--	.08	--	212	26	395	8.1	--	--	--	--	2
--	--	198	0	40	30	--	.6	.06	280	218	56	455	8.0	9	10.9	--	--	1
--	--	206	0	15	5.0	--	--	.04	--	185	16	305	8.0	--	--	--	--	2
--	--	215	0	50	8.2	--	--	.19	--	232	56	400	7.6	--	--	--	--	2
--	--	--	0	33	26	--	--	.11	--	250	49	450	8.1	--	--	--	--	2
--	--	152	0	38	14	--	--	.06	--	177	52	315	8.2	--	--	--	--	2
--	--	150	0	15	54	--	--	.05	--	166	43	405	8.2	--	--	--	--	2
2.8	1.1	187	0	50	2.0	.4	2.0	--	196	185	32	343	7.8	13	10.3	17	--	1
--	--	207	0	30	3.8	--	--	.17	--	191	21	320	8.0	--	--	--	--	2
7.2	1.6	189	0	22	11	.2	.2	--	188	179	24	353	7.9	14	9.4	16	--	1
--	--	246	0	39	22	--	.5	.04	278	250	48	483	8.1	--	--	--	--	1
--	--	216	0	39	22	--	--	--	--	216	39	450	8.2	19	--	--	--	2
9.9	1.2	124	0	28	24	.2	.1	--	222	139	37	328	7.6	--	--	--	--	1
7.6	.8	94	0	27	22	.2	2.2	--	192	116	39	276	7.0	--	--	10	--	1
7.5	1.9	178	0	20	17	.2	1.4	--	198	173	26	357	7.8	14	10.6	14	--	1
--	--	185	0	22	3.2	--	--	.15	--	176	24	290	8.0	--	--	--	--	2
22	2.6	156	0	32	52	.3	1.6	.11	267	182	54	470	7.3	--	--	5	--	1
--	--	160	0	29	56	--	.6	.04	258	187	56	473	7.8	8	--	--	--	1
--	--	238	0	171	14	--	21	.08	496	398	203	716	7.9	--	--	--	--	1
--	--	226	4	97	94	--	1.6	.03	498	340	148	785	8.3	11	--	--	--	1
--	--	196	2	27	8.0	--	--	--	--	188	25	350	8.3	--	--	--	--	2
--	--	207	0	18	12	--	--	--	--	187	17	360	7.9	20	--	--	--	2
--	--	156	0	65	21	--	--	.06	--	215	87	460	8.0	--	--	--	--	2
--	--	194	0	23	6.8	--	--	.15	--	190	31	220	7.6	--	--	--	--	2
9.3	2.0	116	0	49	21	.3	1.1	.12	209	150	55	340	7.0	--	--	17	--	1
--	--	156	0	51	26	--	.3	.00	256	194	66	400	7.8	16	9.5	--	--	1
--	--	208	0	39	26	--	.2	.13	278	214	44	457	7.9	11	11.4	--	--	1
--	--	200	0	36	12	--	.6	.06	252	203	39	402	7.9	13	9.6	--	--	1
--	--	164	3	35	12	--	--	--	--	162	28	590	8.3	12	--	--	--	2

TABLE 1.—Chemical quality of

(Results in milligrams per

Name	Location	Date sampled	Depth below surface (feet)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)
	OAKLAND COUNTY (Continued)						
Long	SE1/4,NW1/4 sec.1, T.4 N., R.10 E. 424733N0831340W	Nov. 16, 1967	0	--	--	--	--
Loon	NE1/4,SE1/4 sec.10, T.3 N., R.9 E. 424046N0832204W	Apr. 18, 1967	0	--	--	--	--
Louise	NE1/4,NE1/4 sec.30, T.5 N., R.9 E. 424914N0832609W	Apr. 17, 1967	0	--	--	--	--
Lower Long	NE1/4,NE1/4 sec.17, T.2 N., R.10 E. 423510N0831715W	Nov. 15, 1967	0	--	--	--	--
Lower Pettibone	NW1/4,NE1/4 sec.34, T.3 N., R.7 E. 423714N0833634W	Nov. 15, 1967	0	--	--	--	--
Lower Straits	SE1/4,SW1/4 sec.11, T.2 N., R.8 E. 423509N0832816W	Nov. 15, 1967	0	--	--	--	--
Maceday	NW1/4,NE1/4 sec.7, T.3 N., R.9 E. 424117N0832603W	Apr. 18, 1967	0	--	--	--	--
Mud	NW1/4,SE1/4 sec.27, T.3 N., R.8 E. 423803N0832917W	Sept. 13, 1967	--	--	--	--	--
Oakland	SW1/4,SE1/4 sec.34, T.4 N., R.9 E. 424225N0832233W	Nov. 16, 1967	0	--	--	--	--
Orchard	SE1/4,NE1/4 sec.15, T.2 N., R.9 E. 423452N0832155W	Mar. 28, 1966	0	1.5	.07	33	13
do	do	Apr. 18, 1967	0	--	--	--	--
do	do	Nov. 15, 1967	0	--	--	--	--
Orion	SW1/4,NE1/4 sec.11, T.4 N., R.10 E. 424634N0831436W	Apr. 17, 1967	0	--	--	--	--
Oxbow	NW1/4,NW1/4 sec.26, T.3 N., R.8 E. 423829N0832856W	Nov. 15, 1967	0	--	--	--	--
Parker	SW1/4,SE1/4 sec.23, T.5 N., R.10 E. 424935N0831439W	Nov. 16, 1967	0	--	--	--	--
Pine	SE1/4,NW1/4 sec.12, T.2 N., R.9 E. 423545N0832013W	Mar. 28, 1966	0	1.7	.04	36	16
do	do	Apr. 18, 1967	0	--	--	--	--
do	do	Nov. 15, 1967	0	--	--	--	--
Pleasant	NE1/4,NW1/4 sec.30, T.3 N., R.9 E. 423838N0832619W	Nov. 15, 1967	0	--	--	--	--
Pontiac	NW1/4,NE1/4 sec.13, T.3 N., R.8 E. 424020N0832712W	Apr. 18, 1967	0	--	--	--	--
do	do	Nov. 15, 1967	0	--	--	--	--
do	SW1/4,SE1/4 sec.13, T.3 N., R.8 E. 423942N0832718W	Sept. 13, 1967	--	--	--	--	--
Secord	SE1/4,SW1/4 sec.1, T.5 N., R.11 E. 425238N0830647W	Apr. 17, 1967	0	4.2	--	55	16
Sherwood	SW1/4,SE1/4 sec.6, T.2 N., R.8 E. 423548N0833255W	Nov. 15, 1967	0	--	--	--	--
Sixteen	NW1/4,SE1/4 sec.16, T.4 N., R.10 E. 424517N0831658W	Nov. 16, 1967	0	--	--	--	--
Square	NE1/4,SE1/4 sec.6, T.2 N., R.10 E. 423629N0831831W	Nov. 15, 1967	0	--	--	--	--
Square	SW1/4,NW1/4 sec.10, T.4 N., R.10 E. 424632N0831613W	Nov. 16, 1967	0	--	--	--	--
Stiffs Mill Pond	SW1/4,SW1/4 sec.34, T.5 N., R.7 E. 424709N0833734W	Nov. 16, 1967	0	--	--	--	--
Sylvan	NE1/4,SW1/4 sec.36, T.3 N., R.9 E. 423727N0831942W	Nov. 15, 1967	0	--	--	--	--
do	S1/2 sec.31, T.3 N., R.10 E. 423720N0831929W	Apr. 14, 1966	--	--	--	--	--
do	do	July 26, 1966	--	--	--	--	--
do	do	Sept. 13, 1967	--	--	--	--	--
Tan	NW1/4,NW1/4 sec.28, T.5 N., R.10 E. 424919N0831737W	Apr. 17, 1967	--	--	--	--	--
Tipsico	SW1/4,SW1/4 sec.19, T.4 N., R.7 E. 424335N0834052W	Mar. 28, 1966	0	.6	.09	25	8.8
do	do	Sept. 10, 1966	0	10	--	20	7.8
do	do	Apr. 17, 1967	0	--	--	--	--
Union	NW1/4,NE1/4 sec.1, T.2 N., R.8 E. 423638N0832648W	Apr. 18, 1967	0	--	--	--	--
Upper Straits	NE1/4,SW1/4 sec.16, T.2 N., R.9 E. 423439N0832343W	Nov. 15, 1967	0	--	--	--	--
Valley	NE1/4,NW1/4 sec.33, T.5 N., R.8 E. 424804N0833113W	Nov. 16, 1967	0	--	--	--	--
Voorhies	NE1/4,SE1/4 sec.20, T.4 N., R.10 E. 424434N0831753W	Apr. 17, 1967	0	6.5	--	54	17
Walled	NW1/4,SE1/4 sec.34, T.2 N., R.8 E. 423148N0832912W	Apr. 18, 1967	0	1.2	--	50	16
do	do	Nov. 15, 1967	0	--	--	--	--
Walnut	NW1/4,NE1/4 sec.25, T.2 N., R.9 E. 423328N0831945W	Apr. 18, 1967	0	--	--	--	--
Walters	SE1/4,SW1/4 sec.12, T.4 N., R.9 E. 424602N0832038W	Nov. 16, 1967	0	--	--	--	--
Watkins	NW1/4,NE1/4 sec., T.3 N., R.9 E. 423930N0832228W	Apr. 18, 1967	0	--	--	--	--
White	SW1/4,NE1/4 sec.13, T.3 N., R.7 E. 423944N0833422W	Mar. 28, 1966	0	0.9	.04	29	13
do	do	July 323, 1966	0	4.9	--	25	13
do	do	Apr. 28, 1967	0	--	--	--	--
Williams	SE1/4,SW1/4 sec.8, T.3 N., R.9 E. 424028N0832507W	Nov. 15, 1967	0	--	--	--	--
Wing	SW1/4,NW1/4 sec.29, T.2 N., R.10 E 423307N0831807W	Apr. 18, 1967	0	--	--	--	--
Wolverine	NE1/4,SE1/4 sec.22, T.2 N., R.8 E. 423332N0832903W	Nov. 15, 1967	0	--	--	--	--

Michigan's inland lakes — Continued

liter, except as indicated)

Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness Ca, Mg	Hardness Noncarbonate	Specific conductance (micromhos)	pH	Temperature (°C)	Dissolved oxygen	Color (Platinum cobalt units)	Turbidity (JTU)	Analysis
--	--	202	0	23	11	--	--	.12	--	180	14	355	8.2	--	--	--	--	2
--	--	206	0	41	29	--	.4	.06	274	224	55	460	8.0	--	--	--	--	1
--	--	204	0	38	20	--	.3	.01	258	218	51	415	8.0	17	--	--	--	1
--	--	155	0	32	57	--	--	.11	--	183	56	450	7.5	--	--	--	--	2
--	--	223	3	22	15	--	--	.22	--	206	23	370	8.3	--	--	--	--	2
--	--	154	0	28	23	--	--	.07	--	184	58	335	8.1	--	--	--	--	2
--	--	174	0	28	18	--	.1	.06	212	177	34	364	8.0	--	--	--	--	1
--	--	205	0	30	22	--	--	--	--	196	28	435	8.0	---	--	--	--	2
--	--	246	0	39	28	--	--	--	--	252	50	480	7.8	--	--	--	--	2
9.3	2.4	136	0	22	19	.4	.7	.07	174	136	24	314	7.5	--	--	--	--	1
--	--	144	0	26	24	--	.1	.08	194	154	36	342	8.0	8	11.2	--	--	1
--	--	155	0	26	22	--	--	.05	--	159	32	330	8.0	--	--	--	--	2
--	--	194	0	62	16	--	1.6	.00	284	233	74	456	7.9	12	11.1	--	--	1
--	--	212	0	28	19	--	--	.15	--	211	37	385	8.2	--	--	--	--	2
--	--	193	0	52	16	--	--	.04	--	224	66	395	7.7	--	--	--	--	2
20	2.6	132	0	30	44	.3	1.4	.10	232	156	48	411	7.4	--	--	5	--	1
--	--	138	0	34	46	--	.1	.08	270	160	47	419	7.8	9	11.1	--	--	1
--	--	154	0	26	50	--	--	.06	--	179	53	420	8.2	--	--	--	--	2
--	--	163	0	38	29	--	--	.07	--	195	61	385	7.9	--	--	--	--	2
--	--	190	0	40	14	--	.4	.04	222	199	44	401	7.9	--	--	--	--	1
--	--	201	2	28	14	--	--	.10	--	202	37	365	8.3	--	--	--	--	2
--	--	193	0	21	12	--	--	--	--	177	19	375	7.8	--	--	--	--	2
3.4	1.7	188	0	46	4.5	.2	.1	--	224	203	49	382	7.9	17	9.2	26	--	1
--	--	201	0	110	12	--	--	.16	--	256	91	510	8.1	--	--	--	--	2
--	--	223	0	53	23	--	--	.16	--	258	75	450	8.2	--	--	--	--	2
--	--	139	0	17	38	--	--	.06	--	154	40	335	8.1	--	--	--	--	2
--	--	159	4	26	22	--	--	.06	--	174	44	325	8.4	--	--	--	--	2
--	--	326	0	37	15	--	--	.16	--	307	40	515	7.7	--	--	--	--	2
--	--	224	0	39	38	--	--	.16	--	242	58	495	8.2	--	--	--	--	2
--	--	196	0	40	36	--	--	--	--	218	58	512	7.5	7	--	--	--	2
--	--	182	0	42	40	--	1.2	--	284	209	60	485	7.2	26	--	--	--	1
--	--	188	0	42	40	--	--	--	--	202	48	500	7.8	--	--	--	--	2
--	--	202	0	50	14	--	1.8	.05	288	224	58	439	8.0	12	8.4	--	--	1
2.0	1.5	102	0	12	4.0	.3	1.6	.16	120	98	15	200	7.1	--	--	7	--	1
2.2	.8	88	0	11	3.0	.2	1.5	.27	129	82	10	175	7.0	25	--	17	--	1
--	--	84	0	12	2.5	--	.1	.01	90	81	12	166	7.6	14	9.9	--	--	1
--	--	178	0	24	28	--	.0	.00	208	181	35	397	7.9	8	11.5	--	--	1
--	--	94	3	22	33	--	--	.08	--	173	3	350	8.3	--	--	--	--	2
--	--	183	0	19	7.2	--	--	.06	--	172	22	295	7.5	--	--	--	--	2
7.1	1.2	174	0	53	16	.2	1.8	--	226	205	62	411	7.8	13	9.5	9	--	1
30	3.8	152	0	42	60	.2	.4	--	268	191	66	501	7.8	11	12.4	5	--	1
--	--	146	0	42	60	--	--	.07	--	196	76	480	8.2	--	--	--	--	2
--	--	156	0	47	40	--	.1	.07	262	197	69	448	7.9	7	11.7	--	--	1
--	--	156	0	33	12	--	--	.08	--	176	48	310	8.0	--	--	--	--	2
--	--	166	0	23	33	--	1.0	.07	214	169	33	389	7.9	--	--	--	--	1
9.3	1.3	126	0	12	24	.3	.7	.19	155	126	23	296	7.5	--	--	7	--	1
10	.8	118	0	11	24	.2	.9	--	186	116	20	282	7.4	--	--	10	--	1
--	--	122	0	12	22	--	.6	.05	164	123	23	281	8.1	12	9.5	--	--	1
--	--	183	0	26	23	--	--	.06	--	183	33	335	8.2	--	--	--	--	2
--	--	172	0	40	74	--	1.6	.00	332	210	69	570	7.8	11	10.7	--	--	1
--	--	177	0	22	62	--	--	.21	--	196	51	485	7.3	--	--	--	--	2

TABLE 1.—Chemical quality of

(Results in milligrams per

Name	Location	Date sampled	Depth below surface (feet)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)
	ONTONAGON COUNTY						
Courtney	SE1/4,SW1/4 sec.4, T.50 N., R.37 W. 464517N0885610W	Aug. 2, 1967	0	--	.10	--	--
Gogebic	SW1/4,NW1/4 sec.4, T.48 N., R.42 W. 463515N0893400W	July 15, 1967	0	--	.10	--	--
Pike (Tanlund)	SW1/4,SW1/4 sec.28, T.47 N., R.39 W. 462608N0891137W	July 31, 1967			.10	--	--
Six Mile	NW1/4,NE1/4 sec.4, T.50 N., R.37 W. 464553N0885611W	Aug. 2, 1967	0	--	.10	--	--
Steusser	SW1/4,SE1/4 sec.24, T.47 N., R.40 W. 462707N0891500W	July 16, 1967	0	--	.10	--	--
	OTTAWA COUNTY						
Macatawa	NE1/4,SW1/4 sec.33, T.5 N., R.16 W. 424621N0861223W	Feb. 12, 1952	0	3.3	.60	27	7.8
do	do	Oct. 30, 1952	0	--	--	--	--
do	do	Aug. 13, 1953	0	--	--	--	--
do	do	Sept. 27, 1954	0	--	--	--	--
do	do	May 3, 1955	0	--	--	--	--
Waverly Quarry	NE1/4,NE1/4 sec.20, T.5 N., R.15 W. 424812N0860610W	Feb. 12, 1952	0	1.3	.05	34	12
do	do	Oct. 30, 1952	0	--	--	--	--
do	do	Sept. 27, 1954	0	--	--	--	--
	SCHOOLCRAFT COUNTY						
Driggs	Sec.22, T.47 N., R.15 W. 461200N0861020W	1930	--	2.4	.10	24	5.6
Gulliver	Sec.35, T.42 N., R.14 W. 454430N0860150W	1930	--	8.8	--	30	14
Indian	Sec.17, T.41 N., R.16 W. 454640N0862020W	1930	--	15	--	47	10
Indian	NE1/4, sec.34, T.42 N., R.16 W 455930N0861715W	Apr. 22, 1967	--	--	--	--	--
do	do	Aug. 16, 1967	--	--	--	--	--
McDonald	Sec.6, T.41 N., R.13 W. 455950N0855850W	1930	--	4.8	.10	29	12
Ross	Sec.11, T.47 N., R.16 W. 462910N0861520W	1930	--	4.0	.10	19	5.2
Smith	Sec.18, T.43 N., R.15 W. 460705N0861350W	1930	--	4.0	.10	5.0	1.5
Thunder	Sec.20, T.43 N., R.17 W. 460600N0862750W	1930	--	4.0	--	22	
	VAN BUREN COUNTY						
Ackley	NE1/4,SE1/4 sec.1, T.3 S., R.14 W. 421400N0855300W	Oct. 3, 1963	0	--	--	48	20
Bankson	SW1/4,SW1/4 sec.14, T.4 S., R.13 W. 420650N0854800W	Oct. 3, 1963	0	--	--	16	8.6
do	do	Oct. 10, 1968	0	--	--	--	--
Mud (Base Line)	NE1/4,NE1/4 sec.6, T.1 S., R.15 W. 422508N0860535W	Oct. 18, 1963	0	--	--	30	9.9
Brandywine	SW1/4,SW1/4 sec.29, T.1 S., R.13 W. 422055N0855129W	Oct. 10, 1963	0	--	--	8.2	1.8
do	do	June 17, 1969	1.5	--	.65	--	--
Brownwood	SE1/4,NW1/4 sec.2, T.3 S., R.14 W. 421415N0855439W	Oct. 3, 1963	0	--	--	25	11
do	do	Oct. 10, 1968	1.0	--	--	--	--
Cedar	SE1/4,SE1/4 sec.28, T.4 S., R.13 W. 420500N0854925W	May 14, 1963	0	--	--	31	14
do	do	July 23, 1963	0	--	--	19	12
do	do	Feb. 19, 1964	0	--	--	31	11
do	do	July 20, 1966	0	--	--	--	--
do	do	Oct. 14, 1966	0	--	--	--	--
do	do	Jan. 13, 1967	0	--	--	--	--
do	do	Oct. 10, 1968	0	--	--	--	--
Christie	NE1/4,NE1/4 sec.35, T.3 S., R.15 W. 421015N0860110W	Aug. 21, 1963	0	--	--	19	14
do	do	Oct. 10, 1968	0	--	--	--	--
Clear	Sec.3, T.1 S., R.13 W. 422455N0854904W	Oct. 9, 1963	0	--	--	35	16
Coffee	NW1/4,SE1/4 sec.8, T.1 S., R.15 W. 422348N0860458W	Oct. 20, 1963	0	--	--	22	5.6
Cora	NW1/4,SE1/4 sec.18, T.3 S., R.14 W. 421227N0855859W	Oct. 3, 1963	0	--	--	24	11
do	do	Oct. 10, 1968	0	--	--	--	--
Crooked	NW1/4,SW1/4 sec.32, T.4 S., R.16 W. 420429N0861208W	Oct. 2, 1963	0	--	--	25	7.8
do	do	Oct. 10, 1968	0	--	--	--	--
Crooked (Indian)	SW1/4,SW1/4 sec.32, T.4 S., R.16 W. 420418N0861200W	Oct. 3, 1963	0	--	--	15	3.9
Deer	NW1/4,NE1/4 sec.2, T.1 S., R.15 W. 422502N0860128W	Oct. 20, 1963	0	--	--	102	40
do	do	July 10, 1968	0	--	--	--	--
Donavan	SW1/4,SW1/4 sec.25, T.2 S., R.16 W. 421534N0860740W	Oct. 2, 1963	0	--	--	26	14
Duck	Sec.26, T.2 S., R.16 W. 421534N0860800W	Oct. 2, 1963	0	--	--	37	23
Dyer	Sec.36, T.2 S., R.16 W. 421502N0860730W	Oct. 2, 1963	0	--	--	24	6.3
Eagle	SW1/4,NW1/4 sec.32, T.3 S., R.14 W. 420958N0855821W	Oct. 3, 1963	0	--	--	22	9.0
do	do	Oct. 10, 1968	0	--	--	--	--
Eagle	NW1/4,NE1/4 sec.3, T.1 S., R.14 W. 422505N0855523W	Oct. 17, 1963	0	--	--	27	16

Michigan's inland lakes — Continued

liter, except as indicated)

Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness Ca, Mg	Hardness Noncarbonate	Specific conductance (micromhos)	pH	Temperature (°C)	Dissolved oxygen	Color (Platinum cobalt units)	Turbidity (JTU)	Analysis
--	--	--	0	--	--	--	--	--	--	15	--	50	7.0	24	10.2	--	--	2
--	--	--	0	--	--	--	--	--	--	15	--	70	7.5	20	10.0	--	--	2
--	--	--	0	--	--	--	--	--	--	15	--	50	6.1	24	9.2	--	--	2
--	--	--	0	--	--	--	--	--	--	15	--	50	6.5	24	7.0	--	--	2
--	--	--	0	--	--	--	--	--	--	15	--	50	6.5	21	9.6	--	--	2
9.0	--	84	0	30	11	.0	6.6	--	--	100	--	235	7.6	--	--	--	--	3
--	--	165	--	29	30	--	--	--	--	154	--	440	--	--	--	25	2.5	3
--	--	--	--	25	--	--	--	--	--	--	--	--	--	--	--	30	5	3
--	--	--	--	--	--	--	--	--	--	--	--	430	--	--	--	--	--	3
--	--	--	--	--	--	--	--	--	--	--	--	450	--	--	--	--	--	3
4.0	--	140	0	24	4.0	.0	.0	--	--	135	--	260	7.8	--	--	--	--	3
--	--	152	--	29	4.0	--	--	--	--	146	--	350	--	--	--	10	0	3
--	--	--	--	--	--	--	--	--	--	--	--	350	--	--	--	--	--	3
--	--	90	--	4.9	4.0	--	--	--	88	72	--	--	--	--	--	--	--	--
--	--	150	--	11	4.0	--	--	--	154	130	--	--	--	--	--	--	--	--
--	--	122	--	57	3.0	--	--	--	214	168	--	--	--	--	--	--	--	--
--	--	79	0	19	2.0	--	--	--	--	82	17	170	7.8	2	--	--	--	2
--	--	107	0	48	2.0	--	--	--	--	132	44	255	7.8	24	--	--	--	2
--	--	12[illegible]	--	16	4.0	--	--	--	132	120	--	--	--	--	--	--	--	--
--	--	73	--	4.0	4.0	--	--	--	76	68	--	--	--	--	--	--	--	--
--	--	20	--	6.5	4.0	--	--	--	36	18	--	--	--	--	--	--	--	--
--	--	99	--	8.8	4.0	--		--	106	82	--	--	--	--	--	--	--	--
7.0	1.1	198	0	43	10	--	--	--	236	202	40	418	7.2	--	--	--	--	1
1.8	.1	82	0	11	1.0	--	--	--	88	76	8	158	6.6	--	--	--	--	1
--	--	93	0	18	3.0	--	1.1	.06	--	94	76	190	8.0	16	9.7	--	--	2
1.8	.6	128	0	11	1.0	--	--	--	143	116	10	229	6.7	--	--	--	--	1
1.7	1.1	21	0	9.6	2.5	--	--	--	68	28	11	69	6.1	18	--	--	--	1
--	--	21	0	5.0	3.4	--	.1	.11	--	29	12	60	6.5	21	5.6	400	75	2
3.4	.5	120	0	14	5.0	--	--	--	123	108	9	227	6.8	--	--	--	--	1
--	--	124	0	17	5.0	--	.3	.02	--	114	12	240	7.9	14	9.5	--	--	2
1.9	.6	150	0	12	1.0	--	--	--	137	135	12	254	7.6	--	--	--	--	1
2.1	.6	110	0	10	2.0	--	--	--	106	97	7	201	7.2	31	--	--	--	1
2.3	1.1	143	0	8.0	3.0	--	--	--	134	123	6	244	6.9	--	--	--	--	1
--	--	120	0	13	2.0	--	1.3	--	131	111	12	217	7.3	26	--	--	--	1
--	--	164	0	--	-	--	.1	.22	--	132	0	269	6.9	16	--	--	--	1
--	--	152	0	15	3.0	--	1.3	.16	154	142	18	278	7.2	--	--	--	--	1
--	--	141	1	17	3.0	--	.7	.01	--	126	10	240	8.3	17	9.0	--	--	2
2.2	.5	116	0	12	1.5	--	.8	--	109	105	10	214	7.1	--	--	--	--	1
--	--	150	0	22	3.0	--	.5	.08	--	140	13	270	8.0	15	9.0	--	--	2
7.4	1.1	162	0	23	18	--	--	--	211	154	20	335	7.3	--	--	--	--	1
2.7	.4	78	0	12	2.0	--	--	--	106	78	14	160	6.6	--	--	--	--	1
2.3	.3	124	0	6.8	2.0	--	--	--	107	105	4	211	6.9	--	--	--	--	1
--	--	130	0	13	4.0	--	.4	.00	--	116	9	230	8.1	14	9.2	--	--	2
2.3	.5	105	0	6.8	6.5	--	--	--	116	94	8	192	6.9	--	--	--	--	1
--	--	61	0	12	4.0	--	.6	.00	--	57	7	125	7.7	17	8.9	--	--	2
1.7	.2	56	0	6.4	3.5	--	--	--	62	54	8	110	6.7	--	--	--	--	1
195	3.4	232	0	42	430	--	--	--	994	419	229	1790	7.1	--	--	--	--	1
--	--	--	--	--	170	--	--	--	--	238	--	850	8.2	--	--	--	--	2
2.3	1.5	138	0	10	4.0	--	--	--	136	123	10	245	6.7	--	--	--	--	1
2.9	1.0	142	0	77	1.0	--	--	--	196	187	70	378	7.0	--	--	--	--	1
2.3	2.7	91	0	13	2.0	--	--	--	108	86	12	180	6.7	--	--	--	--	1
2.1	.7	108	0	6.4	2.0	--	--	--	100	92	4	185	6.7	--	--	--	--	1
--	--	115	0	15	3.0	--	.4	.00	--	100	6	200	8.2	--	--	--	--	2
6.4	1.3	160	0	10	8.0	--	--	--	154	134	2	294	7.0	--	--	--	--	1

TABLE 1.—Chemical quality of

(Results in milligrams per

Name	Location	Date sampled	Depth below surface (feet)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)
	VAN BUREN COUNTY (Continued)						
Eleven	NE1/4,SE1/4 sec.11, T.1 S., R.15 W. 422346N0860055W	Oct. 18, 1963	0	--	--	45	18
Fish	SE1/4,SE1/4 sec.3, T.2 S., R.13 W. 421915N0854830W	May 14, 1963	0	--	--	45	17
do	do	July 23, 1963	0	--	--	38	18
do	do	Oct. 11, 1963	0	--	--	49	14
Fourteen	NW1/4,SE1/4 sec.14, T.1 S., R.15 W. 422258N0860115W	Oct. 20, 1963	0	--	--	26	18
Gravel	SW1/4,NW1/4 sec.32, T.4 S., R.13 W. 420437N0855138W	Oct. 3, 1963	0	--	--	25	13
do	do	Oct. 10, 1968	0	--	--	--	--
Hall	SE1/4,SW1/4 sec.7, T.3 S., R.15 W. 421255N086007W	Oct. 2, 1963	0	--	--	32	15
Huzzy	NE1/4,SW1/4 sec.10, T.4 S., R.13 W. 420805N0854850W	Oct. 3, 1963	0	--	--	17	7.8
do	do	Oct. 10, 1968	0	--	--	--	--
Keeler	SE1/4,SE1/4 sec.23, T.4 S., R.16 W. 420612N0860750W	Feb. 19, 1964	0	--	--	4.3	1.1
do	do	July 20, 1966	0	--	--	--	--
do	do	Oct. 14, 1966	0	--	--	--	--
do	do	Jan. 13, 1967	0	--	--	--	--
Knickerbocker	SE1/4,SE1/4 sec.21, T.4 S., R.15 W. 420607N0860308W	Oct. 3, 1963	0	--	--	4.6	1.4
do	do	Oct. 10, 1968	0	--	--	--	--
Great Bear	NE1/4,SW1/4 sec.19, T.1 S., R.14 W. 422158N0855927W	Oct. 25, 1963	0	--	--	40	20
do	do	July 18, 1966	0	--	--	--	--
do	do	Oct. 14, 1966	0	--	--	--	--
do	do	June 17, 1969	0	--	.05	--	--
Lake of the Woods	SW1/4,SW1/4 sec.13, T.4 S., R.15 W. 420650N0860022W	Oct. 3, 1963	0	--	--	48	21
do	do	Oct. 10, 1968	0	--	--	--	--
Little Bear	SE1/4,SE1/4 sec.3, T.1 S., R.5 W. 422425N0860215W	Oct. 18, 1963	0	--	--	32	11
Little Cedar	SW1/4,NW1/4 sec.33, T.4 S., R.13 W. 420435N0855028W	Oct. 3, 1963	0	--	--	15	9.7
Lower Ieptha	SE1/4 sec.35, T.1 S., R.15 W. 422013N0860135W	Oct. 3, 1963	0	--	--	41	13
do	do	Oct. 20, 1963	0	--	--	40	15
Lower Reynolds	NW1/4,NE1/4 sec.24, T.3 S., R.15 W. 421158N0860012W	Oct. 3, 1963	0	--	--	20	8.0
Martin	SE1/4,NW1/4 sec.27, T.1 S., R.14 W. 422120N0855540W	Oct. 16, 1963	0	--	--	18	8.0
Max	NE1/4,NE1/4 sec.21, T.1 S., R.14 W. 422233N0855625W	Oct. 30, 1963	0	--	--	53	18
Merrimans	SE1/4 sec.9, T.2 S., R.16 W. 421818N0861015W	Oct. 2, 1963	0	--	--	53	20
Mill	SW1/4,SE1/4 sec.14, T.1 S., R.14 W. 422240N0855418W	Oct. 16, 1963	0	--	--	8.2	4.7
Moon	NW1/4,SW1/4 sec.13, T.1 S., R.16 W. 422300N0860744W	Oct. 20, 1963	0	--	--	22	5.2
Moriah	NE1/4,NE1/4 sec.2, T.1 S., R.15 W. 422458N0860105W	Oct. 20, 1963	0	--	--	65	36
Munson	SE1/4,NW1/4 sec.21, T.1 S., R.15 W. 422216N0860350W	Oct. 19, 1963	0	--	--	3.2	2.3
Muskrat	NW1/4,SW1/4 sec.2, T.1 S., R.14 W. 422438N0855500W	Oct. 17, 1963	0	--	--	25	16
do	do	June 17, 1969	0	--	.01	--	--
North	NE1/4,NE1/4 sec.4, T.2 S., R.13 W. 421945N0854940W	Oct. 10, 1963	0	--	--	17	5.4
do	do	June 17, 1969	0	--	.05	--	--
North	SE1/4,SE1/4 sec.17, T.1 S., R.15 W. 422235N0860423W	Oct. 20, 1963	0	--	--	23	8.4
North Scott	NE1/4,NE1/4 sec.1, T.2 S., R.15 W. 421940N0855946W	Oct. 3, 1963	0	--	--	43	14
Pitcher	SW1/4,SW1/4 sec.11, T.1 S., R.16 W. 422325N0860850W	Oct. 20, 1963	0	--	--	38	10
No Name (Ragen)	SW1/4,SE1/4 sec.7, T.3 S., R.15 W. 421300N0860547W	Oct. 2, 1963	0	--	--	17	6.7
Reynolds	NW1/4,SE1/4 sec.13, T.3 S., R.15 W. 421217N0860007W	Oct. 3, 1963	0	--	--	17	7.0
do	do	Oct. 10, 1968	0	--	--	--	--
Round	SE1/4,NE1/4 sec.31, T.4 S., R.16 W. 420456N0861220W	Oct. 2, 1963	0	--	--	7.6	2.4
do	do	Oct. 10, 1968	0	--	--	--	--
Rush	SW1/4,NW1/4 sec.5, T.3 S., R.16 W. 421412N0861215W	Oct. 2, 1963	0	--	--	34	21
Saddle	SW1/4,SW1/4 sec.10, T.1 S., R.15 W. 422330N0860310W	Oct. 20, 1963	0	--	--	34	14
do	do	June 17, 1969	0	--	.03	--	--
School Section	SW1/4,SE1/4 sec.16, T.2 S., R.16 W. 421716N0861030W	Oct. 2, 1963	0	--	--	50	17
do	SE1/4,NW1/4 sec.16, T.2 S., R.14 W. 421740N0855650W	Oct. 3, 1963	0	--	--	35	12
Scott	NW1/4,SW1/4 sec.1, T.2 S., R.15 W. 421920N0860030W	June 17, 1969	0	--	.00	--	--
Shafer	SW1/4,SW1/4 sec.19, T.3 S., R.15 W. 421112N0860612W	Oct. 2, 1963	0	--	--	29	14
do	do	Feb. 19, 1964	0	--	--	32	12

liter, except as indicated)

Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness Ca, Mg	Hardness Noncarbonate	Specific conductance (micromhos)	pH	Temperature (°C)	Dissolved oxygen	Color (Platinum cobalt units)	Turbidity (JTU)	Analysis
38	1.9	164	0	33	79	--	--	--	310	186	52	574	6.9	--	--	--	--	1
5.7	.8	218	0	10	7.0	--	--	--	212	182	4	362	8.1	--	--	--	--	1
5.8	.3	200	0	8.0	7.5	--	--	--	182	169	5	339	7.6	27	--	--	--	1
6.3	.7	222	0	7.2	10	--	--	--	227	180	0	364	6.8	--	--	--	--	1
27	1.0	126	0	13	60	--	--	--	248	139	36	441	6.9	--	--	--	--	1
3.8	.7	139	0	7.8	3.0	--	--	--	122	116	2	236	6.6	--	--	--	--	1
--	--	143	0	13	4.0	--	.7	.02	--	124	7	240	8.1	18	9.7	--	--	2
3.5	1.2	163	0	17	2.0	--	--	--	164	142	8	283	7.3	--	--	--	--	1
1.5	.4	89	0	5.4	1.0	--	--	--	88	74	2	155	6.5	--	--	--	--	1
--	--	93	0	11	2.0	--	.2	.01	--	80	4	160	7.9	17	9.7	--	--	2
1.8	1.2	5	0	10	3.8	--	--	--	30	15	11	54	5.8	--	--	--	--	1
--	--	8	0	8.4	2.0	--	1.0	--	36	14	8	44	6.1	27	--	--	--	1
--	--	30	0	--	--	--	.3	.17	--	20	0	70	6.2	15	--	--	--	1
--	--	11	0	10	3.5	--	1.7	.14	32	17	8	59	6.1	--	--	--	--	1
1.2	.2	2	0	16	2.0	--	--	--	24	18	16	56	6.6	--	--	--	--	1
--	--	5.4	0	11	1.0	--	.0	.00	--	10	6	50	6.3	18	9.7	--	--	2
18	1.7	180	0	8.4	36	--	--	--	247	182	34	438	7.1	--	--	--	--	1
--	--	164	0	24	34	--	1.5	--	240	170	36	421	7.5	27	--	--	--	1
--	--	224	0	--	--	--	.2	.47	--	190	6	465	7.0	16	--	--	--	1
--	--	172	3	21	26	--	.6	.16	--	170	26	360	8.5	21	9.5	90	15	2
3.9	1.0	183	0	59	6.0	--	--	--	238	207	56	409	6.7	--	--	--	--	1
--	--	192	0	62	7.0	--	.8	.21	--	211	53	400	8.1	16	8.4	--	--	2
26	.7	119	0	12	49	--	--	--	204	125	28	372	6.7	--	--	--	--	1
1.8	.3	84	0	9.8	2.0	--	--	--	96	78	8	159	6.5	--	--	--	--	1
3.3	.7	163	0	29	3.0	--	--	--	188	156	22	321	6.8	--	--	--	--	1
4.2	.9	162	0	28	5.0	--	--	--	200	162	28	319	6.9	--	--	--	--	1
2.0	.8	87	0	12	4.0	--	--	--	100	83	12	175	7.0	--	--	--	--	1
2.7	1.4	79	0	18	2.0	--	--	--	114	78	14	177	6.9	--	--	--	--	1
30	1.5	166	0	39	71	--	--	--	338	206	70	561	6.7	--	--	--	--	1
19	1.5	203	0	44	34	--	--	--	294	214	48	492	6.9	--	--	--	--	1
8.2	1.1	28	0	9.6	19	--	--	--	87	40	17	137	6.2	--	--	--	--	1
2.3	1.6	78	0	13	2.5	--	--	--	108	76	12	168	6.5	--	--	--	--	1
114	2.5	230	0	37	238	--	--	--	626	310	122	1160	7.4	--	--	--	--	1
.9	.4	12	0	8.4	1.0	--	--	--	32	18	8	49	6.0	--	--	--	--	1
9.4	1.2	138	0	11	18	--	--	--	163	129	16	303	6.8	--	--	--	--	1
--	--	122	7	13	12	--	.2	.02	--	120	12	250	8.7	24	11.4	40	5	2
1.7	.9	75	0	6.0	1.5	--	--	--	88	64	3	139	6.5	--	--	--	--	1
--	--	76	2	12	2.0	--	.3	.04	--	70	6	140	8.5	22	9.5	40	5	2
2.7	.5	98	0	12	1.5	--	--	--	113	92	12	194	6.8	--	--	--	--	1
3.7	1.5	160	0	36	5.0	--	--	--	194	165	34	335	6.8	--	--	--	--	1
4.2	1.4	152	0	15	4.5	--	--	--	177	136	12	281	6.8	--	--	--	--	1
6.5	1.5	80	0	3.8	13	--	--	--	108	70	4	171	7.1	--	--	--	--	1
1.7	.6	74	0	11	2.5	--	--	--	84	72	11	151	6.6	--	--	--	--	1
--	--	82	0	17	5.0	--	.7	.01	--	81	14	165	7.8	14	8.9	--	--	2
2.3	1.0	24	0	10	3.0	--	--	--	41	28	8	78	6.2	--	--	--	--	1
--	--	32	0	12	4.0	--	.2	.08	--	34	8	88	7.2	14	10.8	--	--	2
3.5	1.5	148	0	56	4.0	--	--	--	206	172	50	343	7.2	--	--	--	--	1
6.8	1.1	165	0	12	11	--	--	--	181	143	8	298	7.3	--	--	--	--	1
--	--	142	5	14	7.5	--	.3	.02	--	129	12	260	8.7	23	9.8	70	10	2
44	1.7	169	0	35	86	--	--	--	372	195	56	593	6.6	--	--	--	--	1
4.0	1.8	148	0	17	6.0	--	--	--	161	137	16	281	6.7	--	--	--	--	1
--	--	158	5	34	9.7	--	.1	.05	--	161	26	305	8.5	22	9.7	55	10	2
2.9	1.7	149	0	16	3.0	--	--	--	143	130	8	267	7.1	--	--	--	--	1
3.6	1.8	139	0	16	5.5	--	--	--	144	130	16	262	7.0	--	--	--	--	1

TABLE 1.—Chemical quality of

(Results in milligrams per

Name	Location	Date sampled	Depth below surface (feet)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)
VAN BUREN COUNTY (Continued)							
Shaw	NE1/4,SE1/4 sec.21, T.2 S., R.14 W. 421644N0855630W	Oct. 3, 1963	0	--	--	43	15
Silver	SW1/4,SE1/4 sec.9, T.1 S., R.15 W. 422320N0860333W	Oct. 18, 1963	0	--	--	16	8.8
do	do	June 17, 1969	0	--	.02	--	--
South Scott	NW1/4,SW1/4 sec.1, T.2 S., R.15 W. 421920N0860031W	Oct. 3, 1963	0	--	--	39	15
Southard	NE1/4,NE1/4 sec.36, T.2 S., R.16 W. 421518N0860648W	Oct. 2, 1963	0	--	--	6.4	1.9
Stillwell	SE1/4,NE1/4 sec.26, T.1 S., R.15 W. 422120N0860105W	Oct. 20, 1963	0	--	--	23	10
Story	SW1/4,SE1/4 sec.21, T.1 S., R.13 W. 422142N0854945W	Oct. 10, 1963	0	--	--	6.7	3.3
Sweet	SE1/4,NW1/4 sec.1, T.1 S., R.14 W. 422445N0855328W	Oct. 17, 1963	0	--	--	34	16
Swift	SE1/4,NW1/4 sec.36, T.4 S., R.14 W. 420438N0855316W	Oct. 3, 1963	0	--	--	5.4	1.7
Thayer	NE1/4,NW1/4 sec.34, T.1 S., R.14 W. 422045N0855554W	Oct. 30, 1963	0	--	--	40	11
Three Legged	NE1/4,NE1/4 sec.10, T.1 S., R.14 W. 422408N0855511W	Oct. 16, 1963	0	--	--	67	34
Three Mile	SE1/4,NW1/4 sec.21, T.3 S., R.14 W. 421110N0855714W	Aug. 16, 1963	0	--	--	7.3	3.6
do	do	Oct. 3, 1963	0	--	--	9.2	2.7
do	do	Oct. 10, 1968	0	--	--	--	--
Twin	NW1/4,SW1/4 sec.2, T.1 S., R.14 W. 422435N0855438W	Oct. 17, 1963	0	--	--	8.6	5.4
Upper Ieptha	NE1/4,NE1/4 sec.35 T.1 S., R.15 W. 422038N0860102W	Oct. 3, 1963	0	--	--	43	16
do	do	Oct. 20, 1963	0	--	--	43	16
Van Auken	NE1/4,SE1/4 sec.32, T.2 S., R.16 W. 421500N0861128W	Oct. 2, 1963	0	--	--	41	19
Wolf	SE1/4,NE1/4 sec.14, T.2 S., R.13 W. 421915N0854832W	Feb. 6, 1963	0	--	--	47	16
WEXFORD COUNTY							
Mitchell-Cadillac	NE1/4,NW1/4 sec.4, T.21 N., R.9 W. 441508N0852440	June 25, 1959	--	4.0	.1	20	4.0

Michigan's inland lakes — Continued

liter, except as indicated)

Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness Ca, Mg	Hardness Noncarbonate	Specific conductance (micromhos)	pH	Temperature (°C)	Dissolved oxygen	Color (Platinum cobalt units)	Turbidity (JTU)	Analysis
5.0	2.9	178	0	25	6.0	--	--	--	213	167	22	349	6.6	--	--	--	--	1
3.6	1.5	57	0	24	6.2	--	--	--	103	76	30	178	6.7	--	--	--	--	1
--	--	51	0	30	14	--	.4	.06	--	71	29	180	8.2	23	9.1	80	10	2
3.7	1.7	138	0	48	5.0	--	--	--	200	159	46	323	6.9	--	--	--	--	1
1.1	1.2	20	0	7.6	1.0	--	--	--	43	24	8	58	6.1	--	--	--	--	1
7.4	2.5	106	0	9.6	14	--	--	--	139	98	12	232	6.6	--	--	--	--	1
5.7	.9	9	0	17	14	--	--	--	84	30	22	109	5.6	--	--	--	--	1
39	1.8	91	0	9.2	112	--	--	--	284	151	76	533	6.8	--	--	--	--	1
1.2	.3	22	0	1.8	2.0	--	--	--	18	20	2	50	6.1	--	--	--	--	1
4.7	1.3	130	0	42	2.0	--	--	--	223	145	38	298	6.5	--	--	--	--	1
79	2.1	200	0	42	196	--	--	--	542	307	143	1010	7.1	--	--	--	--	1
1.6	.7	32	0	6.8	2.0	--	1.0	--	46	33	7	79	6.6	--	--	--	--	1
1.4	.5	32	0	7.6	2.0	--	--	--	48	34	8	81	6.4	--	--	--	--	1
--	--	34	0	12	4.0	--	.0	.01	--	39	11	80	7.4	--	--	--	--	2
.9	1.7	36	0	13	1.0	--	--	--	74	44	14	103	6.4	--	--	--	--	1
3.8	.8	185	0	27	5.5	--	--	--	208	173	22	341	7.7	--	--	--	--	1
4.2	1.1	188	0	25	5.0	--	--	--	206	173	19	347	7.0	--	--	--	--	1
31	2.0	150	0	42	64	--	--	--	314	180	57	518	7.0	--	--	--	--	1
2.6	.8	190	0	21	3.5	--	--	--	198	183	28	348	7.8	--	--	--	--	1
2.3	.6	55	0	9.0	8.0	.0	.0	--	--	66	--	150	7.2	--	--	20	2	3

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