

ANNOTATED BIBLIOGRAPHY OF SCIENTIFIC INFORMATION ON GRAND TRAVERSE  
BAY

Compiled for the Sea Grant Program

at

The University of Michigan

By FRANK T. ROSE

Ann Arbor, Michigan 1970

## FOREWORD

This bibliography has been prepared at the request of the Sea Grant Program at the University of Michigan in Ann Arbor, Michigan. The purpose of the bibliography is to provide those persons studying Grand Traverse Bay and the surrounding drainage basins with an easy-to-use list of scientific references relating to the region.

The references have been grouped within generalized subject divisions and have, within these divisions, been arranged alphabetically by author or issuing agency. Each subject division is subdivided into two parts, the first containing references to pertinent maps and charts, and the second containing general reference materials.

"REF." in the upper right-hand corner of the card refers to sources which do not contain specific information on Grand Traverse Bay, but have been included in the bibliography because they provide either basic scientific information about the Bay area as a whole, as in the case of climatological data for Michigan, or about some aspect of the surrounding drainage basins, such as the Boardman River.

Blank pages have been provided at the end of each subject division for notes or additional references.

## ACKNOWLEDGMENTS

It is impossible to mention all those who contributed to the development of this bibliography, and for this I apologize. Despite the inherent injustice of mentioning only a few persons, I must offer special thanks to: Mrs. Michele Tetley, Librarian at the Great Lakes Basin Library in Ann Arbor, Michigan; Mrs. Ruth Rehfus, Librarian at the Great Lakes Fishery Research Laboratory in Ann Arbor; Dr. David C. Chandler, Director of the Great Lakes Research Division at the University of Michigan, also in Ann Arbor.

Frank T. Rose

## Library Locations

University of Michigan libraries:

Arch. Lib.	Architecture Library 240 Architecture Building 909 Monroe Street
Astronomy Lib.	Physics-Astronomy Library 290 Physics-Astronomy Building 501 East University Avenue
Bur. of Govt. Lib.	Bureau of Government Library 100A Rackham School of Graduate Studies 915 East Washington Street
Chem. Lib.	Chemistry-Pharmacy Library 2200 Chemistry and Pharmacy Bldg. 930 North University Avenue
Eng. Lib.	Engineering-Transportation Library 3rd Floor of the Undergraduate Library Building South University Avenue
For. Lib.	Forestry Library (often referred to as the Natural Science and Natural Resources Library) 3140 Natural Resource Building 830 North University Avenue
Gen. Lib.	General Library General Library Building
Gen. Lib. - Map Room	Map room of the General Library 315 General Library Building
Great Lakes Research Division	Great Lakes Research Division Library and the Paul S. Welch Library 1077 North University Building
IST Lib.	Institute of Science and Technology Library 3rd Floor, 1ST Building 2200 North Campus Blvd.

Libraries (con't)

Lab. of Subsurface Geology	Laboratory of Subsurface Geology North University Building
Mich. Historical Collections	Michigan Historical Collections 160 Rackham School of Graduate Studies 915 East Washington Street
Mus. Lib.	Museums Library 2500 Museums Building 1108 North University Avenue
Public Health Lib.	Public Health Library 3001 School of Public Health Building 107 South Observatory Street
Sci. Lib.	Science Library (often referred to as the Natural Science and Natural Resources Library) 3140 Natural Science Building 830 North University Avenue
Trans. Lib.	Engineering-Transportation Library 3rd Floor of the Undergraduate Library Building
Undergrad. Lib.	Undergraduate Library Undergraduate Library Building South University Avenue

other libraries:

Great Lakes Basin Library 2nd  
Floor  
City Center Building 220  
East Huron Street Ann  
Arbor, Michigan

(U.S. Bur. Comm. Fish. Lib.)  
John Van Oosten Great Lakes Fishery Research Library  
Great Lakes Fishery Research Laboratory  
1451 Green Road  
Ann Arbor, Michigan

Basin Morphology, Geology  
and Topography

MAP

Michigan (State) Geological Survey Division.

Antrim County. Glacial Geology. In Publ. No. 49, 1957.

no scale indicated 17 X 11 in.

library: Great Lakes Research Division, Univ. Mich

MAP

Michigan (State) Geological Survey Division.

Bedrock map of Michigan, compiled by R.W. Kelley. Lansing, 1968.

Small Scale Map 2. inset: geological cross section of Upper and Lower Peninsula.

13 1/2 x 10 in.

scale: 1:2,500,000

library: Great Lakes Research Division, Univ. Mich. Lab. of Subsurface Geology, Univ. Mich.  
Great Lakes Basin Library, Ann Arbor. Univ. Mich., Gen. Lib. - Map Room.

MAP

Michigan (State) Geological Survey Division.

Geological map of Michigan, compiled by Helen M. Martin, 1957 revision of Publ. no.39, The Centennial Geologic Map of Michigan.

Lansing, 1957.

19 x 16in.

scale: 1:1,500,000

library: Univ. Mich., Gen. Lib. - Map Room.

MAP

Michigan (State) Geological Survey Division.

The centennial geologic map of the southern peninsula of Michigan, compiled by Helen M. Martin. In Publ. no. 39, Geological Series 33.

1936.

scale: 1:500,000

39 x 29"

library: Lab. of Subsurface Geology, Univ. Mich. Univ. Mich., Gen. Lib. - Map Room.



MAP

Michigan (State) Geological Survey Division.

Grand Traverse County. Glacial Geology. In Publ. no.49.

1957.

no scale indicated 17 x 11in.

library: Great Lakes Research Division, Univ. Mich. Lab. of Subsurface Geology, Univ. Mich.

MAP

Michigan (State) Geological Survey Division.

Leelanau County. Glacial Geology. In Publ. no.49. 1957.

no scale indicated 17 X 11in.

library: Great Lakes Research Division, Univ. Mich. Lab. of Subsurface Geology, Univ. Mich.

MAP

Michigan (State) Geological Survey Division.

Map of the surface formations of the southern Peninsula of Michigan, compiled by Helen M. Martin. In Publ. no.49.

Lansing, 1955.

scale: 1:500,000

39 ½ x 38in.

library: Lab. of Subsurface Geology, Univ. Mich. Univ. Mich., Gen. Lib. - Map Room.  
Great Lakes Basin Library, Ann Arbor.

CHART

Michigan (State) Geological Survey Division.

Stratigraphic succession in Michigan. Paleozoic through recent.

Chart 1, 1964.

library: Great Lakes Research Division, Univ. Mich. Lab. of Subsurface Geology, Univ. Mich. Great  
Lakes Basin Library, Ann Arbor.

MAP

Michigan (State) Land Economic Survey.

Geological map of Kalkaska County, surface and hard-rock formations.

Lansing, 1927.

23 ½ x 23½

scale: 1:63,360

library: Univ. Mich., Gen. Lib. - Map Room.

MAP

Michigan (State) Land Economic Survey.

Soil and lay of the land map of Antrim County. Lansing, 1923.

col. map. 28 x 30 1/2

scale: 1:63,360

library: Univ. Mich., Gen. Lib. - Map Room,

MAP

Michigan (State) Land Economic Survey.

Soil and lay of the land map of Kalkaska County.

Lansing, 1927.

col. map. 24½ x 24in.

scale: 1:63,360

library: Univ. Mich., Gen. Lib. - Map Room,

MAP

Michigan (State) Land Economic Survey.

Surface geology of Antrim County.

Lansing, 1923(?).

22 x 25in.

scale: ¾" = 1mi.

library: Univ. Mich., Gen. Lib. - Map Room.

MAP

Michigan (State) Land Economic Survey.

Surface geology of Charlevoix County.

Lansing, 1922(?).

24 x 28in.

scale:  $\frac{3}{4}'' = 1\text{mi.}$

library: Univ. Mich., Gen. Lib. - Map Room,

MAP

Michigan (State) Water Resources Commission.

General availability of groundwater in the glacial deposits in Michigan, compiled by Floyd R. Twenter, in i cooperation with Michigan (State) Dept. of Commerce, State Resource Planning Division.

Lansing, 1928.

col. map. 30 x 22in.

scale ca.: 1:1,250,000

WRC - PLI.

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Gen. Lib. - Map Room.

## MAP

Michigan (State) Water Resources Commission.

General availability and quality of groundwater in the bedrock deposits of Michigan, compiled by Floyd R. Twenter, in cooperation with Michigan (State) Dept. of Commerce, State Resource Planning Division.

Lansing, 1928.

col. map. 30 X 22in.

scale ca.: 1:1,250,000

WRC - PL 2.

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Gen. Lib. - Map Room.

## CHART

Navigation charts of the Antrim County Chain-O-Lakes, Michigan, by Mapping Unlimited. Detroit, Michigan.

1967.

11 charts

no scale

various sizes

library: Great Lakes Research Division, Univ. Mich.

MAP

U.S. Army. Corps of Engineers. Lake Survey District.

U.S. Lake Survey. Lake Michigan, Grand Traverse Bay and Little Traverse Bay, Michigan.

1969.

3 X 4ft.

scale: 1:80,000

Chart No.706

library: Great Lakes Research Division, Univ. Mich. Univ. Mich., Gen. Lib. - Map Room. Great Lakes Basin Library, Ann Arbor. U.S. Bur. of Commercial Fisheries Lab., Ann Arbor, Van Oosten Library.

MAP

U.S. Geological Survey. Topographical Maps.

Quadrangles covering Grand Traverse Bay and the areas immediately surrounding.

Boyne City quadrangle. 1961.

Central Lake quadrangle. 1954

Elk Rapids quadrangle. 1957.

Fife Lake quadrangle. 1956.

21 x 17in.

Kalkaska quadrangle. 1956.

scale: 1:62,500

Kingsley quadrangle. 1956.

Mancelona quadrangle. 1956.

Northport quadrangle. 1957.

Traverse City quadrangle. 1957.

library: Great Lakes Research Division, Univ. Mich. Univ. Mich., Gen. Lib. - Map Room.  
Great Lakes Basin Library, Ann Arbor.

Benninghoff, Win. S.

70 short cores taken from Grand Traverse Bay in 1961. 30 cores from East Arm, 30 from West Arm and 10 north of Old Mission Point. All samples preserved by adding formalin to the top of core and both ends sealed with vacuum tape. Cores stored in Benninghoff's office.

Cores have been described as to segment color, thickness, etc. by Dr. E. Bennette Henson, Dept. of Zool., Univ. Vermont at Burlington. Results of descriptions are available.

REP.

(1942)

Bergquist, S.G.

The distribution of drumlins in Michigan.

Michigan Academy of Science, Papers.

v.27, 1942: 451-464. illus.

[Discusses form, size, content and distribution of drumlins in the Grand Traverse Bay area.]

library: Univ. Mich., For. & Sci. & Museums & Gen. Lib.



REF.  
(1959)

Briggs, Louis I.

Physical stratigraphy of Lower Middle Devonian rocks in the Michigan Basin. In Geology of Mackinac Island and Lower and Middle Devonian south of the Straits of Mackinac.

Mich. Basin Geol. Soc. Annual Geol. Excursion.

June, 1959: 39-58. maps, tables.

[Physical stratigraphy of Michigan basin depicted on maps.]

library: Univ. Mich., Sci. Lib.

REF.  
(1970)

Door, John A., Jr., and Donald F. Eschman.

Geology of Michigan.

The University of Michigan Press, Ann Arbor, Michigan.

1970: 476p.

library: Great Lakes Basin Library, Ann Arbor.

REF  
(1951)

Emery, K.O.

Bathymetric chart of Lake Michigan.

Univ. Minnesota Institute of Technology, Engineering Experiment Station.

Tech. Paper no.77, April, 1951: 1-11. maps.

library: Great Lakes Research Division, Univ. Mich.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor Univ. Mich., Sci. Lib.

REP.  
(1958)

Hough, Jack L.

Geology of the Great Lakes.

University of Illinois Press, Urbana, Illinois.

1958: 313p. maps, tables, figs, charts.

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor, Univ. Mich., Sci. & Undergrad. & Museums & Michigan Historical Collection Libs.

Koelz, Walter, and John Van Oosten.

(1923)

Preliminary report on investigations conducted in certain waters of Benzie, Leelanau, Grand Traverse, Antrim, and Charlevoix Counties during the months of July and August, 1923.

Manuscript, 1923: 12p.

[Report concentrates on efforts to define the distribution of fishes in the area. Physiography of Elk and Torch Lakes explained as well as fish species present and relative abundance.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor,

Landes, K.K., G.H. Ehlers, and G.M. Stanley.

(1945)

Geology of the Mackniac Straits region and subsurface geology of northern Southern Peninsula.

Michigan (State) Geological Survey Division.

Publ. no.44, Geol. Ser. 37, 1945: 204p. tables, maps, figs, illus.

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor, Univ. Mich., For. & Sci. & Museums & General & Eng.-Trans. Libraries.

Lane, Alfred C.

(1908)

Summary of the surface geology of Michigan.

Report to the State Board of Geological Survey, Michigan. (1907)

October, 1908: 89-152. maps, tables.

[Includes Pleistocene map in two sheets. Map represents results of mapping of glacial features by U.S.G.S. and Michigan (State) Geological Survey.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., Sci. Lib.

REF.

Leverett, Frank, and F.B. Taylor.

(1915)

The Pleistocene of Indiana and Michigan and the history of the Great Lakes.

U.S. Geological Survey, U.S. Govt. Printing Office. Monograph 53, 1915: 529p. maps, tables,  
illus. figs.

[Includes discussion of the buried lacustrine clay of and the drumlins in the Grand Traverse Bay area plus maps of glacial stages and topography.]

library: U.S. Bur; Commercial Fisheries Lab., Ann Arbor. Univ. Mich., Sci. & For. & Gen. & Museums & Michigan Historical Collection Libraries.

Leverett, Frank. REF.  
(1925)  
Topography and surface geology of Antrim County.  
Michigan (State) Land Economic Survey Division in cooperation with U.S. and Michigan (State)  
Geological Surveys.  
1925: 20p. illus.

library: Univ. Mich., Sci. Lib.

Lotan, James E., and Stephen G. Shertron. REP.  
(1968)  
Characteristics of the drumlins in Leelanau County, Michigan.  
Papers Mich. Acad. Sci., Arts & Letters.  
v.53, 1967: 79-89. figs, tables.

library: Univ. Mich., For. & Sci. & Gen. & Museums Libraries.

Martin, Helen M. (1957)

Outline of the geologic history of the Grand Traverse Region.

Michigan (State) Department of Conservation.

April, 1957: 9p. illus.

[A layman's summary of the geologic history of the area.]

library: Great Lakes Research Division, Univ. Mich.

Melhorn, Wilton N.

(1956)

Valders glaciation of the Southern Peninsula of Michigan, an unpublished Doctoral thesis, Univ. Mich., Ann Arbor.

1954.

[A comprehensive study of Valders glaciation in the thirteen northernmost counties of the Lower Peninsula of Michigan. Includes numerous, specific references to the Grand Traverse Bay area.]

library: Univ. Mich., Gen. Lib., Ref. Room, Thesis #3859.

Michigan (State) Department of Conservation.

Outline of the geologic history of the Grand Traverse Region, by Helen M. Martin.

April, 1957: 9p. illus.

[A layman's summary of the geologic history of the Grand Traverse region.]

library: Great Lakes Research Division, Univ. Mich.

Michigan (State) Geological Survey Division.

Geology of the Mackinac Straits region and subsurface geology of the northern Southern Peninsula, prepared by K.K. Landes, G.H. Ehlers, and G.M. Stanley.

Publ. no.44, Geol. Ser. 37, 1945: 204p. tables, maps. figs, illus.

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., For. & Sci. & Museums & General & Eng.-Trans. Libraries.

REF

Michigan (State) Land Economic Survey Division.

Topography and surface geology *of Antrim County*, by Frank Leveiett, prepared in cooperation with the U.S and Michigan (State) Geological Surveys.

1925: 20p. illus.

library: Univ. Mich., Sci. Lib.

Michigan State University. Department of Resource Development.

The Elk River Watershed. (A course compilation of information on the waters of the Elk River watershed, supervised by C.R. Humphrys.)

1968-1969: 70p. figs, tables, maps.

[Includes discussions of hydrology, water quality, stream flow and related gradients, algae problems, recreation, geology, etc.. Also includes individual discussions of some of the lakes in the area.]

library: Great Lakes Research Division, Univ. Mich.



Michigan State University. Dept. of Resource Development.

Grand Traverse Bay (A course compilation of information relating to Grand Traverse Bay, supervised by Professor C.R. Humphrys, Dept. of Res. Development.)

n.d. 117p. tables, maps. figs, graphs, pics.

[A generalized summary of available information on Grand Traverse Bay. Includes discussions of geology, shore development and land use, fishing, water quality and waste treatment, dredging, recreation uses, etc.]

library: Great Lakes Basin Library, Ann Arbor.

REF.

Rominger, Carl.

(1876)

Geology of the lower peninsula (of Michigan).

New York, Jour. Bien., 1876: 1-225. figs, tables.

library: Univ. Mich., Gen. & Sci. & Michigan Historical Collection Libraries.

REF.

Senninger, Earl J., Jr.

(1964)

Atlas of Michigan.

Flint Geographical Press. 3d ed.

1969: figs.

[Composed solely of maps of Michigan showing, among other things, topography, soil types, average annual precipitation, specific crop-producing areas, value of local industries, recreation areas, mineral deposits

library: Univ. Mich., Undergrad. Lib,

Somers, Lee H.

(1968)

Preliminary report on geological studies in northern Lake Michigan using underwater observation techniques. In Proc. 11th Conf. on Great Lakes Research, The Univ. of Wisconsin, Milwaukee, Wisc., April 18-20, 1968.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

1968: 239-244.

[Briefly describes underwater geologic observations made off Merrill Point in Grand Traverse Bay.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor

REF.

Thwaites, F.T.

(1947)

Geomorphology of the basin of Lake Michigan.

Papers Mich. Acad. Sci., Arts & Letters.

v.33, 1947: 243-251. figs.

library: Univ. Mich., Sci. & For. & Gen. & Museums Libraries.

REF.

U.S. Geological Survey.

The Pleistocene of Indiana and Michigan and the history of the Great Lakes, by Frank Leverett and F.B. Taylor.

U.S. Govt. Printing Office.

Monograph 53, 1915: 529p. maps, tables, illus. figs.

[Includes discussion of the lacustrine clay of and the drumlins in the Grand Traverse Bay area plus maps of glacial stages and topography.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., Sci. & For. & Gen. & Museums & Michigan Historical Collection Libraries.

U.S. Soil Conservation Service.

Soil survey, Grand Traverse County Michigan, by H.L. Weber, Robert Hall, Nels R. Benson, and G. Van Winter, in cooperation with Michigan (State) Agricultural Experiment Station.

U.S. Govt. Printing Office, Washington, D.C.

1965: 141p. tables, figs.

[Provides detailed descriptions of soil series plus information classification, use, management and productivity of soils. Includes discussion of history of the area and development, climate, surface geology, vegetation, transportation, crops and land ownership. Soils are mapped on 92 aerial photographs.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Gen. Lib. - Map Room.

REF.

Veatch, J.O.

(1953)

Soils and lands of Michigan.

Michigan State College Press. East Lansing.

1953: 241p. tables, figs.

[Discusses major divisions of soil parent-material, vegetation types, major land types, pedology, soil associations, land use and inventory. Includes soils map of Michigan.]

library: Univ. Mich., Sci. & For. & Trans. & Arch. & Undergrad. Libraries.

Weber, H.L., et.al.

(1965)

Soil Survey, Grand Traverse County Michigan, by H.L. Weber, Robert Hall, Nels R. Benson, and G. Van Winter in cooperation with Michigan Agricultural Experiment Station.

U.S. Soil Conservation Service. U.S. Govt. Printing Office

1965: 141p. tables, figs.

[Provides detailed descriptions of soil series plus formation, classification, use, management, and productivity of soils. Includes discussion of history of the area and development, climate, surface geology, vegetation, transportation, crops and land ownership. Soils are mapped on 92 aerial photographs.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Gen. Lib. - Map Room.



**Biology**





Benjamin, Daniel W., et.al.

(1970)

A base line study of the upper chain-o-lakes (with reference to several stations in the lower chain and Grand Traverse Bay) in Antrim, Kalkaska, and Grand Traverse Counties, prepared by Daniel W. Benjamin, Rita M. Brinker, Carol J. Dalebout, William C. Gill and David C. Hann.

January, 1970: 63p. tables, figs. maps.

[Includes list of benthic and planktonic organisms found at seven sampling stations in Grand Traverse Bay, and their abundance. Data on physical and chemical water quality for the Bay also included. Accuracy of content questionable in that study performed by students. Preliminary preview by Dr. David Chandler revealed errors in species classification.]

library: Great Lakes Research Division, Univ. Mich.

REF.

Berry, Elmer G.

(1943)

The Amnicolidae of Michigan: Distribution, ecology and taxonomy.

Misc. publications. Museum of Zoology, Univ. Mich.

No. 57, May 28, 1943: 88p. plates, figs. maps, tables.

[Includes detailed descriptions and taxonomy of species occurring in the Grand Traverse Bay area.]

library: Great Lakes Research Division, Univ. Mich.

REF.  
(1890)

A report upon the fishes of Kalamazoo, Calhoun, and Antrim Counties, Michigan.

U.S. Fish Commission (1888)

Bull. no.8, 1890: 219-225.

[Study concentrates on the fishes of the lakes and streams of the Elk River system which empties into Grand Traverse Bay.]

library: Univ. Mich., For. Lib.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor,

REF.

Chain-O-Lakes in Antrim, Kalkaska, Grand Traverse and Charlevoix Counties, Michigan.

The Institute of Fisheries Research at the University of Michigan has a great many miscellaneous records of results of limnological investigations carried out in the various lakes of the Chain beginning in the early 1920's.

library: Univ. Mich., Institute for Fisheries Research.

REF.

Curry, Karl, and LaVerne L. Curry.

(1968)

Annual report for the Elk-Skegemog Lakes Association and Three Lakes Association. Antrim County, Michigan. 1967-1968.

1968: 48p. ,aps. figs, tables.

[InclUdes results of analyses of biological and physical-chemical limnological samples collected from all the major lakes and streams of the Chain-O-Lakes system from Elk Rapids to the inlet of Intermediate River on Lake Bellaire. Information on bacteriological, bottom fauna and plankton sampling, and Lake Trout and Whitefish netting results. Includes numbers and classification.]

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys' office.

Deason, Hilary J.

(1939)

The distribution of cottid fishes in Lake Michigan.

Papers Mich. Acad, Sci ., Arts and Letters.

v.24, pt.2, 1939: 105-115.

[Distribution based on food content of predator stomachs. Four of the cottid fishes have been reported as occurring in Grand Traverse Bay.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., Sci. Lib.

Forbes, S.A.

(1882)

On some Entomostraca of Lake Michigan and adjacent waters.

Am. Naturalist.

v.16, no.7, July, 1882: 537-542. plate 8.

[Records discovery of Epischura lacustric in great quantities in Grand Traverse Bay. Includes detailed description of species.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., Museums & Sci. & Undergraduate Lib.

Hedrick, L.R., and Majorie Soyugenc.

(1965)

Yeasts recovered in mud samples from Lake Michigan. In Proc. 8th Conf. on Great Lakes Research, Ann Arbor, Michigan, March 29-30, 1965.

Great Lakes Research Division, Univ. Mich., Ann Arbor. Publ. no.13, 1965: 69-76.

[Lists yeast species taken at five stations in Grand Traverse Bay in July, 1964.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor,

REP.

Henson, E. Bennette.

(1966)

A review of Great Lakes benthos research.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

Publ. no.14, 1966: 37-54.

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor

Hile, Ralph, Paul H. Eschmeyer, and George F. Lunger.

(1951)

Decline of the lake trout fishery in Lake Michigan

U.S. Fish and Wildlife Service.

Fish. Bull. 52 (60), 1951: 75-95. tables, figs.

[Presents graphic illustrations and numerical data describing the decline of the lake trout fishery, including that which occurred in Grand Traverse Bay.]

library: Great Lakes Research Division, Univ. Mich.

U.S. Bur. Commercial Fisheries Lab., Ann Arbor Univ. Mich., For. & Sci. &  
Museums Libraries.

Hile, Ralph, and Howard J. Buettner.

(1955)

Commercial fishery for chubs (ciscoes) in Lake Michigan through 1953.

U.S. Fish and Wildlife Service.

Special Scientific Report. Fish. no.163, Oct., 1955: 1-49. tables.

[Detailed data of chub production in Grand Traverse Bay during the period 1929-1953. Data from Grand Traverse Bay compared with that from other sections of Lake Michigan. ]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., For. & Museums Libs.

REF.

Houston, William A., and LaVerne L. Curry.

(1965)

Chain-O-Lakes, Antrim, Kalkaska and Grand Traverse Counties, Michigan. Report No.1, Jan., 1965: Winter creel census at Elk Lake, Michigan; Gill netting data, qualitative diatom study, ecology of fresh water sponges and current study of Torch Lake.

June, 1965: 28p. tables, figs.

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys'  
office.

Koelz, Walter.

(1929)

Coregonid fishes of the Great Lakes.

U.S. Bureau of Fisheries.

Bull. no.43, pt.2 (1927): 297-643. tables, figs.

[Includes detailed descriptions of specimens taken from the Great Lakes including some from Grand Traverse Bay.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., Museums & For. & Gen. Libs.

Koelz, Walter, and John Van Oosten.

(1923)

Preliminary report on investigations conducted in certain waters of Benzie, Leelanau, Grand Traverse, Antrim, and Charlevoix Counties during the months of July and August, 1923.

Manuscript, 1923: 12p.

[Report concentrates on efforts to define the distribution of fishes in the area. Physiography of Elk and Torch Lakes explained as well as fish species present and relative abundance.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor

REF.

Lape, Douglas, and LaVerne L. Curry.

(1967)

1966-1967 Annual Report for the Elk-Skegemog Lakes Association.

July, 1967: 53p. tables, maps.

[Presents results of several extensive surveys of the Chain-O-Lakes performed by students of the Biology Dept. of Central Michigan University at Mt. Pleasant, Michigan. Discussion includes physical and chemical limnology, plankton, bottom fauna, fish and bacteriological studies.]

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys' office.

REF.

Lape, Douglas H.

(1968)

Cellulolytic fruiting myxobacteria and coliform bacteria, Elk and Skegemog Lakes, Antrim, Grand Traverse and Kalkaska Counties, Michigan. (Unpublished Master's Thesis, Central Michigan University, Mt. Pleasant, Michigan.)

June, 1968: 57p. tables, figs.

[Results of analyses of samples from 21 stations in Elk and Skegemog Lakes indicate relationship between fecal coliform bacteria isolated from water samples and the cellulolytic fruiting myxobacteria, Sorangium cellulosum, isolated from bottom sediments.]

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys' office.



REF.

Lape, Douglas Harley.

A limnological study of the Chain-O-Lakes, Antrim, Kalkaska and Grand Traverse Counties, Michigan. 1. A classification of the lakes based on eutrophication. (A paper submitted in partial fulfillment of the requirements for Aquatic Zoology course offered in the Graduate School at Central Michigan University, Mt. Pleasant, Michigan.)

January, 1967: 39p. tables, figs.

[Discusses the results of analyses of samples from 20 stations in the Chain-O-Lakes system plus 1 from Grand Traverse Bay. Concludes that the lakes are chemically stable, that there is never an oxygen deficiency problem, that Torch, Elk and Bellaire Lakes are oligotrophic, and that Round and Clam Lakes are eutrophic.]

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys<sup>1</sup>  
office.

Lauff, George H.

(1957)

Some aspects of the physical limnology of Grand Traverse Bay.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

Publ. no.2, June, 1957: 56p. maps, illus.

[Summarizes results of a 30 station cruise which measured transparency, surface and subsurface temperatures and magnesium and silica concentrations. Records results of sediment analysis and drift bottle recoveries. Represents all findings on charts and/or graphs and present detailed bathymetric chart.]

library: Great Lakes Research Division, Univ. Mich.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Great Lakes Basin Library, Ann Arbor.

McNamee, Porter and Seeley. Consulting Engineers. (1968)  
Report on the algal nutrients in the Boardman River.  
Ann Arbor, Michigan.  
January, 1968: 40p. tables.

[Provides detailed information as to river flow at four points along the Boardman River in Grand Traverse and Kalkaska Counties. Discusses constituent concentrations (total phosphate as PO<sub>4</sub> and organic and inorganic nitrogen as N) and phosphate load data.]

library: Great Lakes Research Division, Univ. Mich.

Marzolf, G. Richard. (1965)  
Substrate relations of the burrowing amphipod Pontoporeia affinis in Lake Michigan.  
Ecology.  
v.46, no.5, 1965: 579-592.

[Of the 10 samples collected for this study, two were taken from Grand Traverse Bay and the others just north of the mouth of the Bay. Concludes that P. affinis accounts for a large part of the energy dynamics of the benthic trophic system.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., Sci. & For. & Museums & Undergraduate Libraries.

Marzolf, G. Richard.

(1965)

Vertical migration of *Pontoporeia affinis* in Lake Michigan. In Proc. 8th Conf. on Great Lakes Research, Ann Arbor, Michigan, March 29-30, 1965.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

Publ. no.13, 1964: 133-140.

[Studies conducted in Northport Bay of Grand Traverse Bay. Concludes that migration is initiated by the disappearance of light and modified by thermal structure of the water column. Postulates that migration might represent an attempt to maintain genetic continuity.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor.

Merna, J.W.

A benthological investigation of Lake Michigan, an unpublished M.S. thesis, Michigan State Univ.

1960: 74p.

[Two of the forty stations were located in Grand Traverse Bay (stations 74a & 74b). Enumeration of bottom fauna for each station included.]

library: Great Lakes Research Division, Univ. Mich.

Michigan (State) Dept. of Natural Resources. Fish Division.

Progress report on Lake Whitefish investigations. Northern Lake Michigan - 1969.

1969: 7p. figs.

[Includes detailed discussion of results of assessment of whitefish populations in Grand Traverse Bay.]

library: Great Lakes Research Division, Univ. Mich.

Michigan (State) Fisheries Commission.

A biological examination of Lake Michigan in the Traverse Bay region, by Henry B. Ward, with appendices on the aquatic plants, protozoa, rotifera, tubellaria and mollusca of the region by H.D. Thompson, C.A. Kofoid, H.S. Jennings, W. McM. Woodworth and Bryant Walker resp.

Bull. no.6, 1896: 108p. tables, illus.

[3 of the 26 sampling stations visited during this study were located at the mouth of Grand Traverse Bay. Data is presented as to quantity of plankton present but no specific references are made to species collected at the 3 stations.]

library: Great Lakes Research Division, Univ. Mich.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor, Univ. Mich., For. & Sci. & Museums Libraries.

REF.

Michigan (State) Institute for Fisheries Research.

Clam Lake.

No. 118.

Jan. 19, 1932: 6p.

[A brief summary of the results of a very generalized limnological investigation of Clam Lake in Antrim County.]

library: Univ. Mich., Institute for Fisheries Research

REF.

Michigan (State) Institute for Fisheries Research.

Elk Lake.

Report No. 114.

Jan. 12, 1932: 12p.

[A summary of the results of a generalized limnological investigation of Elk Lake in Antrim County.]

library: Univ. Michl, Institute for Fisheries Research,

REF.

Michigan (State) Institute for Fisheries Research.

Torch Lake.

Report No. 112.

Jan. 4, 1931: 18p.

[A summary of the results of a very general limnological survey of Torch Lake in Antrim County including information as to the species of fish and insects present, oxygen concentrations, temperatures, depth, bottom conditions, etc..]

library: Univ. Mich., Institute for Fisheries Research.

Michigan (State) Water Resources Commission.

Bacteriological quality of Michigan surface waters along the Lower Peninsula coastline, 1965 and 1966.

1967: 36p. tables, illus.

[Records of coliform counts taken from 17 stations throughout Grand Traverse Bay.]

library: Great Lakes Basin Library, Ann Arbor

Michigan (State) Water Resources Commission.

Environmental effects of waste discharges on the Boardman River, with observations on Grand Traverse Bay, vicinity of Traverse City, by Carlos M. Fetterolf, Jr. and Robert F. Carr.

April, 1965: 12p. figs, table.

[Includes detailed enumeration of bottom-animal-survey results at five stations in the Boardman River as well as specific information on a number of observations made along the Boardman and in the Grand Traverse Bay area.]

library: Great Lakes Research Division, Univ. Mich.

Michigan (State) Water Resources Commission.

Report on bacteriological quality of Michigan surface waters along the Great Lakes coastline.

1968: 147p. tables, figs. maps.

[Includes total and fecal coliform data of 18 samples taken from Grand Traverse Bay (see p.63-69)]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

REF.

Michigan State University. Agricultural Experiment Station, East Lansing.

Selected data from Lake Inventory Bulletins 1-83. Analysis of size, inlet and outlet, fish species and the five largest lakes for each county, prepared by C.R. Humphrys, Jordan Tsolakidea, Jack A. Donnan, and Joyce Colby.

Water Bull. no.16, 1962.

library: Great Lakes Basin Library, Ann Arbor.

Michigan State University. Department of Resource Development.

The Elk River Watershed. (A course compilation of information on the waters of the Elk River watershed, supervised by C.R. Humphrys.)

1968-.1969: 70p. figs, tables, maps.

[Includes discussions of hydrology, water quality, stream flow and related gradients, algae problems, recreation, geology, etc.. Also includes individual discussions of some of the lakes in the area.]

library: Great Lakes Research Division, Univ. Mich.



Michigan State University. Dept. of Resource Development.

Michigan's Boardman River. (A course compilation of materials written and published by students in Resource Development 420, Water Resource Management and Resource Development 824, 1968-1969, under the direction of Prof. C.R. Humphrys.)

1969: 84p. maps. figs, tables.

[Includes considerations of water quality, soils, waste water treatment hydrology, gradients, sediment, drought flow, fauna, recreation, etc. Also discusses individual features of the river such as ponds, dams and waste contribution. Eighteen sub-watersheds identified and associated acreages given.]

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys<sup>1</sup> office.

REP.

Moffett, James W.

(1957)

Recent changes in the deep-water fish populations of Lake Michigan. Symposium on the Great Lakes.

Trans. Am. Fish. Soc. (1956)

v.86, 1957: 393-408. tables, figs.

[Results of gill net catches in 1954-55 compared with those from identical stations made in 1930-32, one station being located just north of the mouth of Grand Traverse Bay.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor Univ. Mich., Sci. & For. & Museums Libraries.

REF.

Neil, John H., and Glenn E. Owar.

(1964)

Distribution, environmental requirements and significance of *Cladophora* in the Great Lakes. In Proc. 7th Conf. on Great Lakes Research, Toronto, Canada, April 6-7, 1964.

Great Lakes Research Division, Univ. Mich., Ann Arbor. Publ. no.11, 1964: 113-121. figs, tables.

[Mentions that, based on observations only, Grand Traverse Bay is one of three areas of heavy *Cladophora* concentration on the eastern shore of Lake Michigan.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor

Paterson, R.A.

(1967)

Benthic and planktonic phycomycetes from northern Michigan. In Great Lakes Research Division Collected Reprints, v.2.

Great Lakes Research Division, Univ. Mich., Ann Arbor. v.2, 1969: 211-221. tables.

[Describes results of modified "baiting" techniques in the collection of benthic and planktonic phycomycetes from Grand Traverse Bay during the summers of 1961 & 62.]

library: Great Lakes Research Division, Univ. Mich.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Great Lakes Basin Library, Ann Arbor.

Powers, Ross E.

(1963)

A limnological study of the Chain-O-Lakes, Antrim, Grand Traverse and Kalkaska Counties, Michigan. The limnology of the lakes with special reference to the midges (Diptera: Tendipedidae).

Master's Thesis, Dept. of Biology, Central Michigan Univ., Mt. Pleasant, Michigan.

1963: 76p. tables, figs, biblio.

[Discusses results of analyses of samples taken at twelve stations throughout the chain.]

library: Michigan State Univ., Dept. of Resource Development, Office of Prof. C.R. Humphrys.

Risley, Clifford, Jr.

(1965)

Radioactivity in Lake Michigan and its tributaries. In Proc. 8th Conf. on Great Lakes Research, Ann Arbor, Michigan, March 29-30, 1965.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

Publ. no.13, 1965: 160-167. tables.

[Summarizes average alpha and beta radioactivity levels of water, bottom sediment, and plankton samples in the Boardman River in 1963 as compared with other tributaries to Lake Michigan and the lake as a whole.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor.

Salyer, J. Clark, II, and Karl F. Lagler .

(1940)

The food and habits of the American Merganser during winter in Michigan, considered in relation to fish management.

Jour. Wildlife Management.

v.4, no.2, April, 1940: 186-219. tables, figs.

[A large number of stomachs examined were taken from birds collected in the Grand Traverse Bay and Boardman River areas, both being referred to as important points of concentration for the merganser. Stomach contents presented in tables according to locality collected.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor Univ. Mich., For. Lib.

Saunders, Geo. W., F.B. Trama, and Roger W. Bachmann. ~

(1962)

Evaluation of a modified  $C^{14}$  technique for shipboard estimation of photosynthesis in large lakes.

Great Lakes Research Division, Univ. Mich., Ann Arbor. j

Publ. no.8, 1962: 61p. tables.

[Compares the use of in situ and calculated integral methods for determining levels of photosynthesis. Studies were carried out in Grand Traverse Bay and Douglas Lake.]

library: Great Lakes Research Division, Univ. Mich.

U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Great Lakes Basin Library, Ann Arbor.

REF.

Scarce, LeRoy E.

(1965)

The distribution of bacterial densities in Lake Michigan. In Proc. 8th Conf. on Great Lakes Research, Ann Arbor, Michigan, March 29-30, 1965.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

Publ. no.13, 1965: 182-196. figs, tables.

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor.

Schelske, Claire L., and Edward Callander.

(1970)

Survey of phytoplankton productivity and nutrients in Lake Michigan and Lake Superior. In Proc. 13th Conf. on Great Lakes Research, Buffalo, New York.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

(In process of publication.)

Stoermer, E.F., and J.J. Yang.

(1969)

Plankton diaton assemblages in Lake Michigan.

Great Lakes Research Division, Univ. Mich., Ann Arbor, (prepared in Res. Grant #18050DKC from FWPCA [FWQA])

Special Report no.47, 1969: 268p. tables, figs.

[12 out of approximately 800 samples were collected from Grand Traverse Bay (samples # 1108, 1245a, 1246a, 1287a, 1305a, 1306a, 1324, 1325a, 1381a, 1382, 1558) . Each genus and species described, including morphological measurements. A list of occurrences follows each species

library: Great Lakes Research Division, Univ. Mich.

REF.

U.S. Federal Water Pollution Control Administration.

Lake Michigan studies. Biological investigations. Special Report #LM4. April, 1963: 20p. maps, tables.

[No samples taken from Grand Traverse Bay. Of value in that the results of analyses of hundreds of samples taken at numerous locations throughout the Lake might be of comparative interest once results are obtained from Grand Traverse Bay.]

library: Great Lakes Basin Library, Ann Arbor.

U.S. Fed. Water Pollution Control Administration.

Biology. Water quality investigations. Lake Michigan Basin.

FWPCA, Great Lakes Region, Chicago, Ill.

Jan., 1968: 41p. tables, figs.

[Presents data (numbers of bottom organisms, i.e. scuds, sludgeworms, midges, and phytoplankton) from samples taken from Grand Traverse Bay during 1962-63, and represents phytoplankton concentrations for different seasons on charts for the Lake.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

REF.

U.S. Federal Water Pollution Control Administration.

Lake Michigan studies. Microbiological investigations.

Special Report #LM5. April, 1963: 19p. maps, tables.

[No samples taken from Grand Traverse Bay. Of value in that the results of analyses of hundreds of samples taken at numerous locations throughout the Lake might be of comparative value once results are obtained from Grand Traverse Bay.]

library: Great Lakes Basin Library, Ann Arbor.

U.S. Fish and Wildlife Service.

Commercial fishery for chubs (ciscoes) in Lake Michigan through 1953, by Ralph Hile and Howard J. Buettner.

Special Scientific Report. Fish. no.163, Oct., 1955: 1-49. tables.

[Detailed data of chub production in Grand Traverse Bay during the period 1929-1953 presented. Data from the Bay compared with that from other sections of the lake.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor Univ. Mich., For. & Museums Libs.

U.S. Fish and Wildlife Service.

Decline of the lake trout fishery in Lake Michigan, by Ralph Hile, Paul H. Eschmeyer, and George F. Lunger.

Fish. Bull. 52 (60), 1951: 75-95. tables, figs.

[Presents graphic illustrations and numerical data describing the decline of the lake trout fishery in Grand Traverse Bay.]

library: Great Lakes Research Division, Univ. Mich.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor Univ. Mich., For. & Sci. & Museums Libs.



U.S. Fish and Wildlife Service.

The whitefish fishery of Lakes Huron and Michigan with special reference to the deep-trap-net fishery, by John Van Oosten, Ralph Hile and Frank Jobs.

Fish. Bull., 50, 1946: 297-394. figs, tables. (Bull. 40)

[Contains detailed statistics on the whitefish fishery of Grand Traverse Bay, 1929 - 1942.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor

Van Oosten, John, Ralph Hile, and Frank Jobs. (1946)

The whitefish fishery of Lakes Huron and Michigan with special reference to the deep-trap-net fishery.

U.S. Fish and Wildlife Service.

Fish. Bull. no.40, 1946: 297-394. figs, tables.

[Contains detailed statistics on the whitefish fishery in Grand Traverse Bay, 1929 - 1942.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor.

Ward, Henry B.

(1896)

A biological examination of Lake Michigan in the Traverse Bay region, with appendices on the aquatic plants, protozoa, rotifera, tubellaria and mollusca of the region by H.D. Thompson, C.A. Kofoid, H.S. Jennings, W. McM. Woodworth, and Bryant Walker respectively.

Michigan (State) Fisheries Commission.

Bull. no.6, 1896: 108p. tables, illus. |

[3 of the 26 stations visited during study located at mouth of Grand Traverse Bay. Data presented as to quantity of plankton present but not species specific.]

library: Great Lakes Research Division, Univ. Mich.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., For. & Sci. &  
Museums Libraries.

## Hydrology



MAP

Michigan (State) Water Resources Commission.

General availability of groundwater in the glacial deposits in Michigan, compiled by Floyd R. Twenter, in cooperation with Michigan (State) Dept. of Commerce, State Resource Planning Division.

Lansing, 1928.

col. map. 30 X 22in.

scale ca.: 1:1,250,000

WRC - PL1.

library: Great Lakes Research Division, Univ. Mich Great Lakes Basin Library, Ann Arbor.  
Univ. Mich., Gen. Lib. - Map Room.

MAP

Michigan (State) Water Resources Commission.

General availability and quality of groundwater in the bedrock deposits of Michigan, compiled by Floyd R. Twenter, in cooperation with Michigan (State) Dept. of Commerce, State Resource Planning Division.

Lansing, 1928.

col. map. 30 x 22in.

scale ca.: 1:1,250,000

WRC - PL 2.

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ.  
Mich., Gen. Lib. - Map Room.

MAP

Michigan State University. Soil Science Department.

Water holding capacity and infiltration rates of soils in Michigan, prepared in cooperation with Michigan (State) Dept. of Commerce and Michigan (State) Dept. of Conservation, Water Resources Commission.

no scale,

no date.

5 sheets.

library: Great Lakes Basin Library, Ann Arbor.

MAP

U.S. Geological Survey. Office of WaterData Coordination.

Catalog of information on water data. Maps showing location of surface water stations.

ed. 1968. (see map #23)

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

MAP

U.S. Geological Survey. Office of Water Data Coordination.

Catalog of information on water data. Maps showing locations of water quality stations.

ed. 1968 (see map #23)

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

MAP

University of Michigan. Museums Lib. Fish Division.

Streams and rivers of Michigan. Ann Arbor, 1934.

18 x 15in.

scale: 3/8" = 1mi.

library: Univ. Mich., Gen. Lib. - Map Room.

Gannon, John J. (1964)

Drought flow characteristics of Michigan streams. Supplement to 1960 report.  
Feb., 1964.

[Includes minimum discharge data for summer-fall seasons of 1952-1960 taken at the Boardman River gaging station near Mayfield, Michigan, (see p.77)]

library; Great Lakes Basin Library, Ann Arbor Univ. Mich., Public Health Lib,

Knutilla, R.L. (1967)

Flow characteristics of Michigan streams. Summaries of flow duration, low flow, high flow, and deficient discharge through September, 1964.

U.S. Geological Survey.

June, 1967: 337p. tables, illus. maps.

[Data for the Boardman River drainage basin restricted to 1953-1963 period inclusively. Presents daily discharge! data (number of days/year when flow for specified discharges were equaled or exceeded), lowest and highest mean discharge for each year, lowest and highest discharge information based on a) each climatic year and b) six month periods, and lowest mean discharge.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor,  
Univ. Mich., Sci. & Eng.-Trans. Libs.,



REF.

Messenger, A. Stephens.

(1961)

The water balance of the Lower Peninsula of Michigan.

Papers Mich. Acad. Sci., Arts & Letters.

v.47, 1962: 383-392. tables, figs.

[Summarizes computations of mean annual potential evapotranspiration (PE) and water deficits, and presents results graphically. Grand Traverse Bay area referred to specifically in relation to its isolated mean annual PE and water deficit when compared to surrounding areas.]

library: Univ. Mich., For. & Sci. & Gen. & Museums Libraries.

Michigan (State) Water Resources Commission. Boardman River:

Miscellaneous records.

[These records include stream discharge data; extremely detailed and complete physical and chemical water quality analyses results of samples taken from a number of stations in the Boardman River, the first station being located in Kalkaska County approximately 38 miles from the mouth of the River in Grand Traverse Bay; includes chart of diurnal D.O. fluctuation of the Boardman River and profiles of dissolved oxygen, dissolved minerals and bacteriological densities.]

library: Great Lakes Research Division, Univ. Mich.

Michigan (State) Water Resources Commission.

Drought flow of Michigan streams, by Clarence J. Velz, and John J. Gannon.

June, 1960: 771p. tables, figs, maps,

[Defines and evaluates the drought flow characteristics of the streams throughout the state of Michigan, including those of the Elk River and Boardman River basins, and compiles the available basic low flow records. Analyzes precipitation and temperature data collected at the Weather Bureau stations in the basins.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.  
Univ. Mich., Public Health & Eng. & Arch. & Bur. of Govt. Libraries.

Michigan (State) Water Resources Commission.

The water resources of the northern Lake Michigan and Lake Huron drainage area Lower Peninsula.

Dec., 1968: 189p. tables, figs.

[Presents comprehensive view of the existing and anticipated water uses in the area, the latter based on present trends. Includes discussions of hydrology, ground-water, water quality, navigation, irrigation, domestic and industrial water supply and waste disposal, etc.. Makes specific reference to the quality of Boardman River water at several locations (see p.66), and provides statistics as to municipal water source and consumption in both the Boardman and Elk River drainage basins.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

REF.

Michigan State University. Agricultural Experiment Station, East Lansing.

Agricultural irrigation; lawn sprinkling and recreation lawn watering.

1969: 235p. tables, maps. figs, graphs.

[Contains generalized irrigation data for Antrim, Leelanau, Grand Traverse and Kalkaska Counties, Michigan. For example: types and acreages of crops irrigated, groundwater data, etc..]

library: Great Lakes Research Division, Univ. Mich.

REF.

Michigan State University. Agricultural Experiment Station, East Lansing.

Preliminary inventory of Michigan's artificial surface water, prepared by C.R. Humphrys and R.F. Green.

Water Bull. no.12, 1962: 33p. tables, figs.

[Classification and location of inland lakes along with data as to size and height above sea level.]

library: Great Lakes Basin Library, Ann Arbor.

REF.

Michigan State University. Agricultural Experiment Station, East Lansing.

Summary of acreage analysis charts from Lake Inventory Bulletins 1-83, by C.R. Humphrys and Joyce Colby.

Water Bull. no.15, 1962: 3p.(?) tables.

[Lists number and acreages of various classes of lakes and ponds in Michigan by county.]

library: Great Lakes Basin Library, Ann Arbor

Michigan State University. Department of Resource Development.

The Elk River Watershed. (A course compilation of information on the waters of the Elk River watershed, supervised by C.R. Humphrys.)

1968-1969: 70p. figs, tables, maps.

[Includes discussions of hydrology, water quality, stream flow and related gradients, algae problems, recreation, geology, etc.. Also includes individual discussions of some of the lakes in the area.]

library: Great Lakes Research Division, Univ. Mich.

Michigan State University. Dept. of Resource Development,

Michigan's Boardman River. (A course compilation of materials written and published by students in Resource Development 420, Water Resource Management and Resource Development 824, 1968-1969, under the direction of Prof. C.R. Humphrys.)

1969: 84p. maps, figs, tables.

[Includes considerations of water quality, soils, waste water treatment hydrology, gradients, sediment drought flow, fauna, recreation, etc. Also discusses individual features of the river such as ponds, dams and waste contribution. Eighteen sub-watersheds identified and associated acreages given.]

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys' office.

U.S. Federal Water Pollution Control Administration.

Pollution of Lake Michigan and its tributary basin, 111., Ind., Mich., and Wise.. Conf. Proc. 2nd Session, Feb. 25, 1969, Chicago, 111. Volume 1.

1969: 364p. figs, tables.

[Includes inventory of Michigan's municipal waste water discharge stations including those at Bellaire, Elk Rapids, Kalkaska and Traverse City, all in the Grand Traverse Bay area. Contains information relating to treatment provided, population served, BOD counts, effects on Lake Michigan, etc. (p.97). Listing of industrial surface water discharges including five industries in Elk River Basin and three in the Boardman. List includes type of industry, treatment of discharge (if any), pollution status, etc..]

library: Great Lakes Basin Library, Ann Arbor.

U.S. Bur. Commercial Fisheries Lab., Ann Arbor.

U.S. Geological Survey.

Compilation of records of Surface Waters of the United States, October, 1950 to September, 1960.  
Part 4. St. Lawrence River Basin.

Water-Supply Paper 1727, 1964: 379p. map.

[This report contains summaries of streamflow records in the St. Lawrence River Basin, including those for the Boardman River as recorded at the gaging station near Mayfield, Michigan. Covers period from June, 1952 to Sept., 1960. Provides monthly and yearly mean discharge data as well as monthly and yearly runoff information.]

library: Univ. Mich., Sci. & Eng. Libraries.  
Great Lakes Basin Library, Ann Arbor.

U.S. Geological Survey.

Flow characteristics of Michigan streams. Summaries of flow duration, low flow, high flow, and deficient discharge through September, 1964, by R.L. Knutilla.

June, 1967: 337p. tables, illus. maps.

[Data for the Boardman River drainage basin restricted to period 1953-1963 inclusive. Presents data relating to duration of daily discharge (number of days/year when flow for specified discharges were equaled or exceeded), lowest and highest mean discharge for each year, lowest daily discharge information based on a) each climatic year and b) every six month period, and lowest mean discharge.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Sci. & Eng.-Trans. Libs.

REF

U.S. Geological Survey.

Magnitude and frequency of floods in the U.S. Part 4. St. Lawrence River Basin, by S.W. Wiitala.

Water-Supply Paper 1677, 1965: 357p. tables, figs.

[Contains records of peak stages and discharges on the Boardman River annually for the period 1953 through 1962.]

library: Great Lakes Basin Library, Ann Arbor. Univ. Mich., Sci. & Eng. Libraries.

REF.

U.S. Geological Survey. Office of Water Data Coordination.

Catalog of information on water data. Index to surface water stations.

ed. 1968: 641p. tables, illus.

[Contains information supplied by Federal, state and local agencies that acquire water data directly in the field and laboratory. Information includes exact location and number of OWDC sites, major types of data collected, frequency of data collection, form of data storage, and the storing agencies.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

U.S. Geological Survey. Water Resources Division.

Surface water records of Michigan, 1961.

1961.

[Presents stream discharge data for the Boardman River as recorded at the gaging station near Mayfield, Michigan.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich.,  
Sci. Lib.

U.S. Geological Survey. Water Resources Division.

Surface water records of Michigan, 1962.

1962.

[Presents stream discharge data for the Boardman River as recorded at the gaging station near Mayfield, Michigan.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich.,  
Sci. Lib.



U.S. Geological Survey. Water Resources Division.

Surface water records of Michigan, 1963.

1963.

[Presents stream discharge data for the Boardman River as recorded at the gaging station near Mayfield, Michigan.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Sci. Lib.

U.S. Geological Survey. Water Resources Division.

Surface water records of Michigan, 1964.

1964.

[Presents stream discharge data for the Boardman River as recorded at the gaging station near Mayfield, Mich.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Sci. Lib.

U.S. Geological Survey. Water Resources Division.

Water resources data for Michigan; Part 1, "Surface water records, 1965.

1965: 238p. tables, figs.

[Presents stream discharge data for the Boardman River as recorded at the gaging station near Mayfield, Michigan. See p.127.]

library: Great Lakes Research Division, Univ. Mich Great Lakes Basin Library, Ann Arbor.

U.S. Geological Survey. Water Resources Division.

Water resources data for Michigan, Part 1: Surface water records, 1966.

1966: 245p. tables, figs.

[Presents stream discharge data for the Boardman River as recorded at the gaging station near Mayfield, Michigan. Includes a misc. discharge record taken 500' upstream from Front Street in Traverse City.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor,

U.S. Geological Survey. Water Resources Division.

Water resources data for Michigan, Part 1: Surface water records, 1967.

1967: 259p. tables, figs.

[Presents stream discharge data for the Boardman River as recorded at the gaging station near Mayfield, Michigan. Includes a misc. discharge record made 500' upstream from Front Street in Traverse City.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

U.S. Geological Survey.

Water resources data for Michigan, Part 1: Surface water records, 1968.

1969: 271p. tables, figs.

[Presents stream discharge data for the Boardman River as recorded at the gaging station near Mayfield, Michigan. Includes miscellaneous discharge records for the North and South branches of the Boardman River.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

Velz, Clarence J., and John J. Gannon.

(1960)

Drought flow of Michigan streams.

Michigan (State) Water Resources Commission.

June, 1960: 771p. tables, maps. figs.

[Defines and analyzes the drought flow characteristics of the streams throughout the state of Michigan, including those of the Elk and Boardman River basins, and compiles the available basic low flow records. Analyzes precipitation and temperature data collected at the Weather Bureau stations in the basins.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.  
Univ. Mich., Public Health & Eng. & Arch. & Bur. of Govt. Libraries.



## Irrigation and Agriculture



REF.

Michigan (State) Water Resources Commission.

Water use for irrigation. A survey of water use in agricultural and municipal irrigation.

1959: 57p.(?) tables, figs.

[Presents irrigation data by county, including number of systems, acreage covered and percent of cropland covered.]

library: Univ. Mich., For. Lib.

REF.

Michigan State University. Agricultural Experiment Station, East Lansing.

Agricultural irrigation; lawn sprinkling and recreation lawn watering.

1969: 235p. tables, maps. figs, graphs.

[Contains generalized irrigation data for Antrim, Leelanau, Grand Traverse and Kalkaska Counties, Michigan. For example: types and acreages of crops irrigated, groundwater data, etc..]

library: Great Lakes Research Division, Univ. Mich.



REF.

Senninger, Earl J., Jr.

(1964)

Atlas of Michigan.

Flint Geographical Press. 3d ed.

1969: figs.

[Composed solely of maps of Michigan showing, among other things, topography, soil types, average annual precipitation, specific crop-producing areas, value of local industries, recreation areas, mineral deposits.]

library: Univ. Mich., Undergrad. Lib.

U.S. Soil Conservation Service.

Soil survey, Grand Traverse County Michigan, by H.L. Weber, Robert Hall, Nels R. Benson, and G. Van Winter, in cooperation with Michigan (State) Agricultural Experiment Station.

U.S. Govt. Printing Office, Washington, D.C. 1965: 141p. tables, figs.

[Provides detailed descriptions of soil series plus information classification, use, management and productivity of soils. Includes discussion of history of the area and development, climate, surface geology, vegetation, transportation, crops and land ownership. Soils are mapped on 92 aerial photographs.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Gen. Lib. - Map Room.

REF.

Vanderhill, Burke G. (1948)

The principal farming types of Antrim County, Michigan.

Papers Mich. Acad. Sci., Arts & Letters.

v.34, 1948: 195-206. figs, tables.

[Includes a brief consideration of farming types bordering Grand Traverse Bay.]

library: Univ. Mich., For. & Sci. & Museums & General Libraries.

Weber, H.L., et.al. (1965)

Soil Survey, Grand Traverse County Michigan, by H.L. Weber, Robert Hall, Nels R. Benson, and G. Van Winter in cooperation with Michigan Agricultural Experiment Station.

U.S. Soil Conservation Service. U.S. Govt. Printing Office

1965: 141p. tables, figs.

[Provides detailed descriptions of soil series plus formation, classification, use, management, and productivity of soils. Includes discussion of history of the area and development, climate, surface geology, vegetation, transportation, crops and land ownership. Soils are mapped on 92 aerial photographs.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.  
Univ. Mich., Gen. Lib. - Map Room.

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## Meteorology and Climatology



Ayers, John C.

(1965)

The climatology of Lake Michigan.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

Publ. no.12, 1965: 73p. figs. maps.

[See Appendix E: annual duration of ice cover, Grand Traverse Bay. 1851 - 1963.]

library: Great Lakes Research Division, Univ. Mich.

U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Great Lakes Basin Library, Ann Arbor.

REF.

Bloust, F., and B. DeCooke.

(1960)

Comparison of precipitation on islands in Lake Michigan with precipitation on the perimeter of the lake.

Jour. Geophys. Research. v.65, 1960: 1565-1572. illus.

[Presents limited amount of information from the Sutton Bay Weather Bureau station in Grand Traverse Bay, and compares it and that of other land-based stations with records obtained from island stations in the lake area west and north of Grand Traverse Bay.]

library: Univ. Mich., Sci. & Astronomy & Eng. & IST Lib

Bolsenga, S.J. REF.  
(1967)

Snow depth probability in the Great Lakes Basin. In Proc. 10th Conf. on Great Lakes Research, Univ. of Toronto, Toronto, Canada, April 10-12, 1967.

Great Lakes Research Division, Univ. Mich., Ann Arbor. 1967: 162-170. maps, graphs, tables.

[Snow depth probability computed from snow depth at the end of the month data as reported from climatological summaries. Includes generalized projected probabilities for Traverse City, Michigan, although specific figures are absent.]

library: Great Lakes Research Division, Univ. Mich.  
Great Lakes Basin Library, Ann Arbor.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor

Brunschweiler, Dieter. REP.  
(1961)

Precipitation regime in the Lower Peninsula of Michigan.

Papers Mich. Acad. Sci., Arts & Letters.

v.47, 1962: 367-381. figs.

[Monthly, seasonal and annual precipitation data presented graphically with isopleths.]

library: Univ. Mich., For. & Sci. & Museums & Gen. Lib

Brunschweiler, Dieter.(1963)

A climatic summary of the Grand Traverse Bay area.

Papers Mich. Acad. Sci., Arts & Letters.

v.49, 1963: 395-411. figs, tables.

[Climatic data presented as isograms representing equal snowfall, mean and lowest temperatures for various months, and rainfall.]

library: Univ. Mich., For. & Sci. & Museums & Gen. Lib.

REP.

Changnon, Stanley A., Jr.

(1967)

Average precipitation on Lake Michigan. In Proc. 10th Conf. on Great Lakes Research, Univ. of Toronto, Toronto, Canada, April 10-12, 1967.

Great Lakes Research Division, Univ. Mich., Ann Arbor. 1967: 171-185. tables, figs.

[Average precipitant ion data based on records from 6 locations in the lake, these being used to determine rates of precipitation changes from shore, and numerous land based stations. The resultant data is plotted on isograms of equal precipitation.]

library: Great Lakes Research Division, Univ Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor.



REF.  
(1968)

Changnon, Stanley A., Jr.

Precipitation climatology of the Lake Michigan Basin.

Ill. State Water Survey, Urbana.

Bull. no.52, 1968: 46p. figs, tables.

[Presents climatological data with the use of isobars of equal thunderstorm frequency, number of cloudy days, precipitation, etc. based on past climatological data for 10 years. Derives seasonal and annual patterns of precipitation as related to lake effect.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Engineering Lib.

REP.  
(1926)

Day, P.C.

Precipitation in the drainage area of the Great Lakes, -1875-1924.

Monthly Weather Review.

v.54, 1926: 85-106.

library: Univ. Mich., Sci. Lib,

REF

Eichenlaub, Val.

(1964)

A synoptic climatology of winter snowfall over the upper and lower peninsulas (of Michigan).

(Doctoral dissertation available from University Microfilms, Inc., Ann Arbor, Michigan.)

1964: 196p. tables, illus. figs.

[Includes figures representing mean annual snowfall for Michigan for each month, November through March. Without exception, these figures demonstrate Grand Traverse Bay's climatological uniqueness when considered in relation to those areas immediately surrounding. Probability of snowfall also plotted.]

Heap, John A.

(1963)

Some characteristics of the winter ice cover of Lake Michigan, 1962-63. In Proc. 6th Conf. on Great Lakes Research, Ann Arbor, Michigan, June 13-15, 1963.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

Publ. no.10, 1963: 216-218. tables.

[Records dates of first ice formation and breakup in Grand Traverse Bay.]

library: Great Lakes Research Division, Univ. Mich., Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor

Heap, John A.

(1966)

Ice cover studies, Lake Michigan. In Growth of ice on Lake Michigan, by John A'. Heap and Vincent E.

Noble.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

Spec. Report no.26, 1966: 1-52.

[Describes conditions of ice cover in Grand Traverse Bay from Dec., 1963 - mid-March, 1964. See pp.20-43.]

library: Great Lakes Research Division, Univ. Mich.

U.S. Bur. Commercial Fisheries Lab., Ann Arbor, Great Lakes Basin Library, Ann Arbor

REF.

Henry, A.J.

(1900)

Normal precipitation in the region of the Great Lakes.

Monthly Weather Review.

v.27, 1900: 151-153. tables.

[Records of precipitation in Traverse City, Michigan, for the period of November, 1898 to April, 1899.]

library: Univ. Mich., Gen. Lib.

REF.

Leverett, Frank.

(1912)

Surface geology and agricultural conditions of the Southern Peninsula of Michigan, with a chapter on climate by C.F. Schneider.

Michigan (State) Geological Survey.

Publ. no.9, Geol. Series 7, 1912: 144p. maps, illus.

[Includes climatological data (precipitation, temperature, killing frost, etc.) based on records from 1886-1911. Includes maps of the surface formations of Mich.;

library: Univ. Mich., Museums & Sci. & Gen. & Michigan Historical Collection Libraries.

REF.

Michigan (State) Geological Survey.

Surface geology and agricultural conditions of the Southern Peninsula of Michigan, with a chapter on climate by C.F. Schneider, by Frank Leverett.

Publ. no.9, Geol. Series 7, 1912: 144p. maps, illus.

[Includes climatological data (Precipitation, temperature, killing frost, etc.) based on records from 1886-1911. Includes maps of the surface formations of Mich.]

library: Univ. Mich., Museums & Gen. & Sci. & Michigan Historical Collection & Chemistry Libraries,

REF.

Michigan (State) Water Resources Commission.

Climate of Michigan by stations. Average annual snowfall in inches for the period 1931-1960.

Michigan. Department of Agriculture. Weather Service.

Feb., 1966: 100p. tables.

[Includes snowfall data for Traverse City, Michigan.]

library: Great Lakes Basin Library, Ann Arbor.

Michigan (State) Water Resources Commission.

Drought flow of Michigan streams, by Clarence J. Velz, and John J. Gannon.

June, 1960: 771p. tables, figs. maps.

[Defines and evaluates the drought flow characteristics of the streams throughout the state of Michigan, including those of the Elk River and Boardman River basins, and compiles the available basic low flow records. Analyzes precipitation and temperature data collected at the Weather Bureau stations in the basins.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Public Health & Eng. & Arch. & Bur. of Govt. Libraries.

REF.

Michigan (State) Water Resources Commission.

Monthly precipitation probabilities for the climatic divisions in Michigan, prepared by Norton D. Strommen, ESSA-Weather Bureau.

Michigan (State) Department of Agriculture. Weather Service.

April, 1967: 22p. tables, maps.

library: Great Lakes Basin Library, Ann Arbor.

Michigan State University. Agricultural Experiment Station, East Lansing.

Shoretype classification of Antrim County, Michigan, by C.R. Humphrys, R.N. Horner and J.H. Rogers.

Shoretype Bull. no.12, 1958: 12p. tables, figs.

[Provides detailed descriptions plus location, extent, use, access, erosion, services and other information for each shoretype, each of which is represented graphically and/or pictorially. Includes generalized discussions of lake levels, navigation, pollution, turbidity, climate and topography, shoreline processes, etc. ]

library: Great Lakes Basin Library, Ann Arbor.  
Great Lakes Research Division, Univ. Mich.

Michigan State University. Agricultural Experiment Station, East Lansing.

Shoretype classification of Grand Traverse County, Michigan, by J.H. Rogers, C.R. Humphrys, and R.N. Horner.

Shoretype Bull. no.11, 1958: 20p. tables, figs. pics.

[Provides detailed descriptions plus location, extent, use, access, erosion, services and other information for each shoretype, each of which is represented graphically and pictorally. Includes generalized discussions of lake levels, navigation, pollution, turbidity, climate and topography, shoreline processes, etc..]

library: Great Lakes Basin Library, Ann Arbor  
Great Lakes Research Division, Univ. Mich.

Michigan State University. Agricultural Experiment \_S tat ion,.. East Lansing.

Shoretype classification for Leelanau County, Michigan, by C.R. Humphrys, R.N.Horner and J.H. Rogers.

Shoretype Bull. no.10, 1958s 22p. tables, figs. pics.

[Provides detailed descriptions plus location, extent, use, access, erosion, services and other information for each shoretype, each of which is represented graphically and pictorally. Includes generalized discussions of lake levels, navigation, pollution, turbidity, climate and topography, shoreline processes, etc.]

library: Great Lakes Basin Library, Ann Arbor.  
Great Lakes Research Division, Univ. Mich.

Niedringhaus, T.E.

(1966)

A Climatology of Michigan. (Ph.D. Thesis, Michigan State University, East Lansing, Michigan.)

1966: 230p. illus. tables.

[Contains substantial specific and general climatological information on Grand Traverse Bay and the surrounding areas. Presentation of information is based on monthly, seasonal and annual data breakdowns. Includes numerous maps of Michigan with isobars representing, among other things, precipitation, temperature, prevailing winds, coefficients of variation for certain parameters, etc..]

library: Michigan State University, Microcopy Collection, film #3984.

REF.

Senninger, Earl J., Jr.

(1964)

Atlas of Michigan.

Flint Geographical Press. 3d ed.

1969: figs.

[Composed solely of maps of Michigan showing, among other things, topography, soil types, average annual precipitation, specific crop-producing areas, value of local industries, recreation areas, mineral deposits.]

library: Univ. Mich., Undergrad. Lib.



REF.

Strommen, Norton D.

(1959)

Climates of the states. Michigan. Climatology of the United States No. 60 - 20.

May, 1959 (revised and reprinted Aug., 1967): 25p. maps, tables.

[Includes average freeze data for Traverse City for a 30 year period (p.9), normal precipitation and temperature data, and plots on maps of Michigan isobars of mean maximum and minimum temperature for Jan. and July.]

library: Great Lakes Basin Library, Ann Arbor

REP.

Strommen, Norton D.

(1967)

Monthly precipitation probabilities for the climatic divisions in Michigan.

Michigan (State) Department of Agriculture. Weather Service.

April, 1967: 22p. tables, maps.

library: Great Lakes Basin Library, Ann Arbor.

U.S. Army. Corps of Engineers. Lake Survey District. Great Lakes ice atlas, prepared by Donald R. Rondy. 1969: 47p. figs.

[Employs concept of freezing degree-days to establish ice-cover conditions for three types of winters: mild, normal and severe, each being illustrated on ice charts for each Great Lake.]

library: Great Lakes Research Division, Univ. Mich.  
Great Lakes Basin Library, Ann Arbor.  
Univ. Mich., Gen. Lib. - Map Room.

U.S. Army. Corps of Engineers. Lake Survey District.

Great Lakes ice cover Winter 1962-1963 and 1963-1964, prepared by Donald R. Rondy.

U.S. Lake Survey Basic Data Report 5-5. 49p. figs.

[Aerial observations are presented on individual lake ice charts for each Great Lake. Date of observations included.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

U.S. Army. Corps of Engineers. Lake Survey District.

Great Lakes ice cover Winter 1965-1966, prepared by Donald R. Rondy.

U.S. Lake Survey Basic Data Report 5-2.

Dec., 1966: 32p. maps, charts.

[Aerial observations are represented on individual lake ice charts for each Great Lake. Dates of observations included.]

library: Great Lakes Basin Library, Ann Arbor. Univ. Mich., Eng.-Trans. Lib.

U.S. Army. Corps of Engineers. Lake Survey District.

Great Lakes ice cover Winter 1966-1967, prepared by Donald R. Rondy.

U.S. Lake Survey Basic Data Report 5-3.

Nov., 1967: 58p. maps, tables.

[Aerial observations are represented on individual lake ice charts for each Great Lake. Dates of observations included.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

U.S. Army. Corps of Engineers. Lake Survey District.

Great Lakes ice cover Winter 1967-1968, prepared by Donald R. Rondy.

U.S. Lake Survey Basic Data Report 5-4.

Sept., 1968: 47p. maps, tables.

[Aerial observations are represented on individual lake ice charts for each Great Lake. Dates of observations included.]

library: Great Lakes Basin Library, Ann Arbor.

U.S. Dept. of Commerce. Environmental Science Services Administration.  
Key to Meteorological Records Documentation No. 4.11. Selective Guide to Climatic Data Services.

1969: 94p. tables, charts, figs.

[An extremely comprehensive guide to the sources of climatic data throughout the U.S.]

library: Great Lakes Research Division, Univ. Mich.

U.S. Soil Conservation Service.

Soil survey, Grand Traverse County Michigan, by H.L. Weber, Robert Hall, Nels R. Benson, and G. Van Winter, in cooperation with Michigan (State) Agricultural Experiment Station.

U.S. Govt. Printing Office, Washington, D.C. 1965: 141p. tables, figs.

[Provides detailed descriptions of soil series plus information classification, use, management and productivity of soils. Includes discussion of history of the area and development, climate, surface geology, vegetation, transportation, crops and land ownership. Soils are mapped on 92 aerial photographs.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Gen. Lib. - Map Room.

REF.

U.S. Weather Bureau.

Climates of the states. Michigan, by Norton D. Strommen. ESSA.

Climatology of the United States No. 60 - 20.

May, 1959 (revised and reprinted Aug., 1967): 25p. maps, tables.

[Includes average freeze data for Traverse City for a 30 year period (p.9), normal precipitation and temperature data, and plots on maps of Michigan isobars a mean maximum and minimum temperature for Jan. and July.]

library: Great Lakes Basin Library, Ann Arbor.

REF.

U.S. Weather Bureau.

Climatological data - Michigan. 1921-

[Includes daily and monthly temperature and precipitation data for Traverse City station, Michigan.]

library: Univ. Mich., For. & Gen. Libraries

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U.S. Weather Bureau.

Climatological summary Traverse City, Michigan, 1926-1955.

[A one sheet summary which presents means and extremes in temperature and precipitation as well as dates of freezing temperatures in Spring and Fall (1921-1955) as measured at the official Traverse City Weather Bureau station.]

library: Great Lakes Research Division, Univ. Mich.

REP.

U.S. Weather Bureau.

Hourly precipitation data. Michigan. 1951 -

[Contains records collected at the Bellaire hydro power plant in Antrim County, Michigan.]

library: Univ. Mich., Sci. Lib.

Weber, H.L., et.al.

(1965)

Soil Survey, Grand Traverse County Michigan, by H.L. Weber, Robert Nels R. Benson, and G. Van Winter in cooperation with Michigan Agricultural Experiment Station.

U.S. Soil Conservation Service. U.S. Govt. Printing Office

1965: 141p. tables, figs.

[Provides detailed descriptions of soil series plus formation, classification, use, management, and productivity of soils. Includes discussion of history of the area and development, climate, surface geology, vegetation, transportation, crops and land ownership. Soils are mapped on 92 aerial photographs.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.  
Univ. Mich., Gen. Lib. - Map Room.

## Pollution and Pesticides





REF.

Acres, H.G., Limited.

Thermal inputs to the Great Lakes 1968 - 2000, prepared for the Inland Waters Branch, Dept. of Energy, Mines and Resources, Canada Centre for Inland Waters.

Feb., 1970: 93p.

[Summary of existing and estimated thermal inputs to the Great Lakes. Includes name, location and relevant data for each plant considered having a direct effect on thermal input levels.]

library: Great Lakes Research Division, Univ. Mich Great Lakes Basin Library, Ann Arbor.

Boardman River Watershed and Traverse City Phosphorus contributions.

Letter from Robert J. Courchaine, Regional Engineer, Michigan (State) Water Resources Commission, to Mr. Lawrence C. Savage, Jr., City Manager, Traverse City, Michigan.

June 18, 1970.

[Includes brief discussion of phosphorus contributions to the Boardman River as made by the Traverse City municipal wastewater discharges and the Boardman River watershed.]

library: Great Lakes Research Division, Univ. Mich.

Michigan (State) Water Resources Commission.

Report on water pollution control in the Michigan portion of the Lake Michigan basin and its tributaries Prepared in cooperation with Michigan (State) Department of Public Health.

January 31, 1968: 263p. graphs, tables.

[Contains information on the municipal and industrial waste disposal situation in the Michigan portion of the interstate waters of Lake Michigan. Includes detailed information about the industries and towns in the Grand Traverse Bay area.]

library: Great Lakes Basin Library, Ann Arbor.

Michigan (State) Water Resources Commission.

The water resources of the northern Lake Michigan and Lake Huron drainage area Lower Peninsula

Dec., 1968: 189p. tables, figs.

[Presents comprehensive view of the existing and anticipated water uses in the area, the latter based on present trends. Includes discussions of hydrology, ground-water, water quality, navigation, irrigation, domestic and industrial water supply and waste disposal, etc.. Makes specific reference to the quality of Boardman River water at several locations (see p.66), and provides statistics as to municipal water source and consumption in both the Boardman and Elk River drainage basins.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

Michigan State University. Agricultural Experiment Station, East Lansing.

Shoretype classification of Antrim County, Michigan, by C.R. Humphrys, R.N. Horner and J.H. Rogers.

Shoretype Bull. no. 12, 1958: 12p. tables, figs. \

[Provides detailed descriptions plus location, extent, use, access, erosion, services and other information for each shoretype, each of which is represented graphically and/or pictorially. Includes generalized discussions of lake levels, navigation, pollution, turbidity, climate and topography, shoreline processes, etc. ]

library: Great Lakes Basin Library, Ann Arbor.  
Great Lakes Research Division, Univ. Mich.

Michigan State University. Agricultural Experiment Station, East Lansing.

Shoretype classification of Grand Traverse County, Michigan, by J.H. Rogers, C.R. Humphrys, and R.N. Horner. i

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Shoretype Bull. no.11, 1958: 20p. tables, figs. pics.

[Provides detailed descriptions plus location, extent, use, access, erosion, services and other information for each shoretype, each of which is represented graphically and pictorially. Includes generalized discussions of lake levels, navigation, pollution, turbidity, climate and topography, shoreline processes, etc..]

library: Great Lakes Basin Library, Ann Arbor  
Great Lakes Research Division, Univ. Mich.

Michigan State University. Agricultural Experiment Station, East Lansing.

Shoretype classification for Leelanau County, Michigan, by C.R. Humphrys, R.N.Horner and J.H. Rogers.

Shoretype Bull. no.10, 1958: 22p. tables, figs. pics.

[Provides detailed descriptions plus location, extent, use, access, erosion, services and other information for each shoretype, each of which is represented graphically and pictorially. Includes generalized discussions of lake levels, navigation, pollution, turbidity, climate and topography, shoreline processes, etc.]

library: Great Lakes Basin Library, Ann Arbor.  
Great Lakes Research Division, Univ. Mich.

Nedved, Thomas K.

(1970)

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Pesticides in the Grand Traverse Bay region of northern Lake Michigan. (A paper presented at the 13th Conf. of Great Lakes Research, Buffalo, New York, April 2, 1970.)

April, 1970: 26p. figs, tables.

[Presents analyses of 30 bottom and 63 water samples taken at various locations throughout the Bay. Analyses include pesticides detected, number of positive identifications, average concentrations and range of concentration values. Pesticides isolated include thimet, Lindane, Aldrin, Chlordane, DDT, Methyl trithion & BHC.]

library: Great Lakes Research Division, Univ. Mich.

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Ownbey, C.R., and G.E. Willeke.

(1965)

Long-term solids buildup in Lake Michigan waters. In Proc. 8th Conf. on Great Lakes Research, Ann Arbor, Michigan, March 29-30, 1965.

Great Lakes Research Division, Univ. Mich., Ann Arbor. Publ. no.13, 1965: 141-152.

tables.

[Presents data related to Grand Traverse Bay watershed populations along with land runoff of chlorides and sulfates into the Bay, and includes the results of sampling the Boardman River mouth for the same anions.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor.

REF.

U.S. Federal Water Pollution Control Administration.

Water pollution problems of Lake Michigan and tributaries.

FWPCA. Great Lakes Region, Chicago, Ill.

January, 1968: 74p. illus.

[Discussion includes references to pollution in Grand Traverse Bay, including that caused by the Grand Traverse Light Station, Northport (Leelanau County).]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor

U.S. Federal Water Pollution Control Administration.

Pollution of Lake Michigan and its tributary basin, 111., Ind., Mich., and Wise.. Conf. Proc. 2nd Session, Feb. 25, 1969, Chicago, 111. Volume 1.

1969: 364p. figs, tables.

[Includes inventory of Michigan's municipal waste water discharge stations including those at Bellaire, Elk Rapids, Kalkaska and Traverse City, all in the Grand Traverse Bay area. Contains information relating to treatment provided, population served, BOD counts, effects on Lake Michigan, etc. (p.97). Listing of industrial surface water discharges including five industries in Elk River Basin and three in the Boardman. List includes type of industry, treatment of discharge (if any), pollution status, etc..]

library: Great Lakes Basin Library, Ann Arbor.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor.

## Sediments and Soils





MAP

Michigan (State) Land Economic Survey.

Antrim County soil map. Lansing, 1923.

17 sheets, various sizes scale: 4" = 1mi.

library: Univ. Mich., Gen. Lib. - Map Room.

MAP

Michigan (State) Land Economic Survey.

Soil and lay of the land map of Antrim County. Lansing, 1923.

col. map. 28 x 30 1/2

scale: 1:63,360

library: Univ. Mich., Gen. Lib. - Map Room.

MAP

Michigan (State) Land Economic Survey.

Soil and lay of the land map of Kalkaska County. Lansing, 1927.

col. map. 24 1/2 x 24in.

scale: 1:63,360

library: Univ. Mich., Gen. Lib. - Map Room,

MAP

Michigan (State) Land Economic Survey.

Soil map, Kalkaska County. Lansing, 1927.

16 sheets

16 1/2 x 18in.

scale: 2" = 1mi.

library: Univ. Mich., Gen. Lib. - Map Room.

MAP

Michigan State University. Soil Science Department.

Water holding capacity and infiltration rates of soils in Michigan, prepared in cooperation with Michigan (State) Dept. of Commerce and Michigan (State) Dept. of Conservation, Water Resources Commission.

no scale.

no date.

5 sheets.

library: Great Lakes Basin Library, Ann Arbor.

MAP

U.S. Dept. of Agriculture. Bur. of Chem. and Soils.

Soil survey of Antrim County, Michigan, compiled by J.O. Veatch, L.R. Schoenmann and G.I. Fuller.

U.S. Govt. Printing Office, Wash., B.C.

Series 1923, no.29, 1928.

library: Great Lakes Basin Library, Ann Arbor. Univ. Mich., Gen. Lib. - Map Room.

Lauff, George H.

(1957)

Some aspects of the physical limnology of Grand Traverse Bay.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

Publ. no.2, June, 1957: 56p. maps, illus.

[Summarizes results of a 30 station cruise which measured transparency, surface and subsurface temperatures and magnesium and silica concentrations. Records results of sediment analysis and drift bottle recoveries. Represents all findings on charts and/or graphs and present detailed bathymetric chart.]

library: Great Lakes Research Division, Univ. Mich.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Great Lakes Basin Library, Ann Arbor.

Michigan State University. Dept. of Resource Development.

Michigan's Boardman River. (A course compilation of materials written and published by students in Resource Development 420, Water Resource Management and Resource Development 824, 1968-1969, under the direction of Prof. C.R. Humphrys.)

1969: 84p. maps, figs, tables.

[Includes considerations of water quality, soils, waste water treatment hydrology, gradients, sediment, drought flow, fauna, recreation, etc. Also discusses individual features of the river such as ponds, dams and waste contribution. Eighteen sub-watersheds identified and associated acreages given.]

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys' office.

REF

Moore, J.E.

(1961)

Petrography of northeastern Lake Michigan bottom sediments.

Jour. Sed. Petrography.

v.31, no.3, 1961: 402-436. figs, tables.

[Study discusses results of sediment analysis carried out in the Lake area immediately north of the mouth of Grand Traverse Bay.]

library: Great Lakes Research Division, Univ. Mich. (In Collected Reprints, GLRD, v.I, 1967) Univ. Mich., Sci. Lib. Great Lakes Basin Library, Ann Arbor.

Risley, Clifford, Jr.

(1965)

Radioactivity in Lake Michigan and its tributaries. In Proc. 8th Conf. on Great Lakes Research, Ann Arbor, Michigan, March 29-30, 1965.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

Publ. no.13, 1965: 160-167. tables.

[Summarizes average alpha and beta radioactivity levels of water, bottom sediment, and plankton samples in the Boardman River in 1963 as compared with other tributaries to Lake Michigan and the lake as a whole.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor.

REF

Senninger, Earl J., Jr. (1964)

Atlas of Michigan.

Flint Geographical Press. 3d ed.

1969: figs.

[Composed solely of maps of Michigan showing, among other things, topography, soil types, average annual precipitation, specific crop-producing areas, value of local industries, recreation areas, mineral deposits.]

library: Univ. Mich., Undergrad. Lib.

U.S. Dept. of Agric. Bur. of Chetn. and Soils.

Soil Survey Antrim County, Michigan, prepared by J.O. Veatch, L.R. Schoenmann, and G.I. Fuller.

U.S. Govt. Printing Office, Washington, D.C.

no.29, series 1923, 1928: 929-957. tables, figs.

[Includes one large-scale map (1"=1mi.) of the county.]

library: Great Lakes Basin Library, Ann Arbor. Univ. Mich., Gen. Lib. - Map Room.

U.S. Soil Conservation Service.

Soil survey, Grand Traverse County Michigan, by H.L. Weber, Robert Hall, Nels R. Benson, and G. Van Winter, in cooperation with Michigan (State) Agricultural Experiment Station.

U.S. Govt. Printing Office, Washington, D.C. 1965: 141p. tables, figs.

[Provides detailed descriptions of soil series plus information classification, use, management and productivity of soils. Includes discussion of history of the area and development, climate, surface geology, vegetation, transportation, crops and land ownership. Soils are mapped on 92 aerial photographs.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.  
Univ. Mich., Gen. Lib. - Map Room.

REP.

(1927)

Veatch, J.O.

Soil Survey of Kalkaska County, Michigan.

Geological Survey Series 1927 (No. 28)

U.S. Department of Agriculture. Geological Survey.

library: Univ. Mich., Gen. Lib. - Map Room.



REP.  
(1953)

Veatch, J.O.

Soils and lands of Michigan.

Michigan State College Press. East Lansing.

1953: 241p. tables, figs.

[Discusses major divisions of soil parent-material, vegetation types, major land types, pedology, soil associations, land use and inventory. Includes soils map of Michigan.]

library: Univ. Mich., Sci. & For. & Trans. & Arch. & Undergrad. Libraries.

(1965)

Weber, H.L., et.al.

Soil Survey, Grand Traverse County Michigan, by H.L. Weber, Robert Hall, Nels R. Benson, and G. Van Winter in cooperation with Michigan Agricultural Experiment Station.

U.S. Soil Conservation Service. U.S. Govt. Printing Office

1965: 141p. tables, figs.

[Provides detailed descriptions of soil series plus formation, classification, use, management, and productivity of soils. Includes discussion of history of the area and development, climate, surface geology, vegetation, transportation, crops and land ownership. Soils are mapped on 92 aerial photographs.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Gen. Lib. - Map Room.

## Shoreline Processes



Michigan (State) Water Resources Commission.  
Great Lakes shoreline slides.

<u>County</u>	<u>Slide Numbers</u>	<u>Box Numbers</u>
Leelanau	M2064-M2566	M71-M82
Grand Traverse	M2567-M2766	M83-M87
Antrim	M2767-M2876	M88-M90
Charlevoix	M2877-M2970	M91-M93

library: Michigan (State) Dept, Nat. Res., Water Resources Commission.

Michigan State University. Agricultural Experiment Station, East Lansing.

Shoretype classification of Antrim County, Michigan, by C.R. Humphrys, R.N. Horner and J.H. Rogers.

Shoretype Bull. no.12, 1958: 12p. tables, figs.

[Provides detailed descriptions plus location, extent, use, access, erosion, services and other information for each shoretype, each of which is represented graphically and/or pictorially. Includes generalized discussions of lake levels, navigation, pollution, turbidity, climate and topography, shoreline processes, etc. ]

library: Great Lakes Basin Library, Ann Arbor.  
Great Lakes Research Division, Univ. Mich.

Michigan State University. Agricultural Experiment Station, East Lansing.

Shoretype classification of Grand Traverse County, Michigan, by J.H. Rogers, C.R. Humphrys, and R.N. Horner.

Shoretype Bull. no.11, 1958: 20p. tables, figs. pics.

[Provides detailed descriptions plus location, extent, use, access, erosion, services and other information for each shoretype, each of which is represented graphically and pictorially. Includes generalized discussions of lake levels, navigation, pollution, turbidity, climate and topography, shoreline processes, etc..]

library: Great Lakes Basin Library, Ann Arbor  
Great Lakes Research Division, Univ. Mich

Michigan State University. Agricultural Experiment Station, East Lansing.

Shoretype classification for Leelanau County, Michigan, by C.R. Humphrys, R.N.Horner and J.H. Rogers.

Shoretype Bull. no.10, 1958: 22p. tables, figs. pics.

[Provides detailed descriptions plus location, extent, use, access, erosion, services and other information for each shoretype, each of which is represented graphically and pictorially. Includes generalized discussions of lake levels, navigation, pollution, turbidity, climate and topography, shoreline processes, etc.]

library: Great Lakes Basin Library, Ann Arbor.  
Great Lakes Research Division, Univ. Mich.

Michigan State University. Dept. of Resource Development.

Grand Traverse Bay (A course compilation of information relating to Grand Traverse Bay, supervised by Professor C.R. Humphrys, Dept. of Res. Development.)

n.d. 117p. tables, maps. figs, graphs, pics.

[A generalized summary of available information on Grand Traverse Bay. Includes discussions of geology, shore development and land use, fishing, water quality and waste treatment, dredging, recreation uses, etc.]

library: Great Lakes Basin Library, Ann Arbor.

Powers, W.E.

(1958)

Geomorphology of the Lake Michigan shorelines: Final report of Contract Nom.-1228(07).

U.S. Office of Naval Research in cooperation with Northwestern University.

1958: 103p. mimeo. 28 maps.

[Detailed descriptions of the entire Lake Michigan shoreline including Grand Traverse Bay. Descriptions inclusive as to basic shore types, heights, slopes, backshore and foreshore measurements with texture analyses, etc.. Some descriptions accompanied by photos.]

library: U.S. Army, Coastal Eng. Res. Center, 5201  
Little Falls Road, N.W., Washington, D.C.



## Water: Circulation and Levels





REF.

Ayerg, John C.

(1958)

Currents and water masses of Lake Michigan.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

Publ. no.3, 1958: 169p. figs, tables.

[Presents analyses of data collected on four synoptic cruises of Lake Michigan. Data collected includes: transparency; temperature, calcium, sodium and silica surface and vertical distribution; drift bottle studies; currents (surface and bottom - upwelling and sinking) using dynamic height method; water masses considerations including wind influences.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., Sci. Lib.

Blakkan, Bruce D.

(1963)

A freshwater geomagnetic electro-kinetograph, In Proc. 6th Conf. on Great Lakes Research, Ann Arbor, Mich., June 13-15, 1963.

Great Lakes Research Division, Univ. Mich., Ann Arbor. Publ. no. 10, 1963: 43-50.

[Records four surface current measurements made at the mouth of Grand Traverse Bay by both a freshwater geomagnetic electro-kinetograph and drogoue.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur.  
Commercial Fisheries Lab., Ann Arbor

REF.

Brunk, Ivan W.

Changes in the levels of Lakes Michigan and Huron. Great Lakes Research Division, Univ. Mich.,

Ann Arbor.

Publ. no.7, 1961: 71-78. figs, tables.

[Records graphically changes in the lakes' levels since 1860 and discusses those factors considered contributory to such changes, i.e. inflow from Lake Superior, precipitation, evaporation, diversion, crustal movements, ice blockades and changes in outlet conditions.]

library: Great Lakes Research Division, Univ. Mich.

REF.

Harrington, Mark W.

(1894)

Currents of the Great Lakes as deduced from the movements of bottle papers during the seasons of 1892 and 1893.

U.S. Weather Bureau.

Bull. B., 1894: maps.

library: Great Lakes Research Division, Univ. Mich.

(Dr. John C. Ayers' private collection.) Univ. Mich., Engineering Lib., and Michigan Historical Collections.

REF

Houston, William A., and Laverne L. Curry. (1965)

Chain-O-Lakes, Antrim, Kalkaska and Grand Traverse Counties, Michigan. Report No.1, Jan., 1965: Winter creel census at Elk Lake, Michigan; Gill netting data, qualitative diatom study, ecology of fresh water sponges and current study of Torch Lake.

June, 1965: 28p. tables, figs.

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys' office.

Lauff, George H.

(1957)

Some aspects of the physical limnology of Grand Traverse Bay.

Great Lakes Research Division, Univ. Mich., Ann Arbor. Publ. no.2, June, 1957: 56p. maps, illus.

[Summarizes results of a 30 station cruise which measured transparency, surface and subsurface temperatures and magnesium and silica concentrations. Records results of sediment analysis and drift bottle recoveries. Represents all findings on charts and/or graphs and present detailed bathymetric chart.]

library: Great Lakes Research Division, Univ. Mich.

U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Great Lakes Basin Library, Ann Arbor.

Michigan State University. Agricultural Experiment Station, East Lansing.

Shoretype classification of Antrim County, Michigan, by C.R. Humphrys, R.N. Horner and J.H. Rogers.

Shoretype Bull. no.12, 1958: 12p. tables, figs.

[Provides detailed descriptions plus location, extent, use, access, erosion, services and other information for each shoretype, each of which is represented graphically and/or pictorally. Includes generalized discussions of lake levels, navigation, pollution, turbidity, climate and topography, shoreline processes, etc. ]

library» Great Lakes Basin Library, Ann Arbor.  
Great Lakes Research Division, Univ. Mich.

Michigan State University. Agricultural Experiment Station, East Lansing.

Shoretype classification of Grand Traverse County, Michigan, by J.H. Rogers, C.R. Humphrys, and R.N. Horner

Shoretype Bull. no.11, 1958: 20p. tables, figs. pics.

[Provides detailed descriptions plus location, extent, use, access, erosion, services and other information for each shoretype, each of which is represented graphically and pictorally. Includes generalized discussions of lake levels, navigation, pollution, turbidity, climate and topography, shoreline processes, etc..]

library: Great Lakes Basin Library, Ann Arbor  
Great Lakes Research Division, Univ. Mich.

Michigan State University. Agricultural Experiment Station, East Lansing.

Shoretype classification for Leelanau County, Michigan, by C.R. Humphrys, R.N.Horner and J.H. Rogers.

Shoretype Bull. no.10, 1958: 22p. tables, figs. pics.

[Provides detailed descriptions plus location, extent, use, access, erosion, services and other information for each shoretype, each of which is represented graphically and pictorially. Includes generalized discussions of lake levels, navigation, pollution, turbidity, climate and topography, shoreline processes, etc.]

library: Great Lakes Basin Library, Ann Arbor.  
Great Lakes Research Division, Univ. Mich.

REF.

U.S. Army. Corps of Engineers. Lake Survey District.

Hydrograph of monthly mean levels of the Great Lakes.

1969.

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.  
Univ. Mich., Gen. Lib. - Map Room.

REF.

U.S. Army. Corps of Engineers. Lake Survey District.

Lake water levels. 1959 -

U.S. Lake Survey, issued as monthly reports.

library: Great Lakes Basin Library, Ann Arbor. Univ. Mich., Gen. Lib. - Map Room.

U.S. Fish and Wildlife Service.

Surface currents of Lake Michigan, 1931 and 1932, by John Van Oosten.

Special Scientific Report.

Fish. no.413, iii, 1963: 51p. figs.

[As determined from the release and recovery of drift bottles. See, in particular, diagrams pp.15, 34, 37, 39 and 46.]

library: Great Lakes Research Division, Univ. Mich.

U.S. Bur. Commercial Fisheries Lab., Ann Arbor, Univ. Mich., For. & Museums  
Libraries. Great Lakes Basin Library, Ann Arbor.

REF. U.S. Fish and Wildlife Service.

Surface currents in Lake Michigan, 1954 and 1955.

Special Scientific Report.

Fish. no.338, March, 1960: 120p. figs, tables.

[As deduced from the release and recovery of drift bottles, tubes and envelopes.]

library: Great Lakes Research Division, Univ. Mich. Univ. Mich., For. & Museums Libraries.  
Great Lakes Basin Library, Ann Arbor.

Van Oosten, John.

(1963)

Surface currents of Lake Michigan, 1931 and 1932.

U.S. Fish and Wildlife Service. Special Scientific Report.

Fish. no.413, iii, 1963: 51p. figs.

[As determined from the release and recovery of drift bottles. See in particular, diagrams pp.15, 34, 37, 39 & 46.]

library: Great Lakes Research Division, Univ. Mich.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., For. & Museums  
Libraries, Great Lakes Basin Library, Ann Arbor.





## Water: Physical and Chemical Quality



MAP

U.S. Geological Survey. Office of Water Data Coordination.

Catalog of information on water data. Maps showing locations of water quality stations.

ed. 1968 (see map #23)

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

Beeton, Alfred M., and James W. Moffett.

(1965)

Lake Michigan chemical data, 1954-55, 1960-61.

U.S. Fish and Wildlife Service.

Data Report no.6, 1965: 102p. tables, figs.

[Contains physical and chemical water quality data of samples taken from Grand Traverse Bay. Also includes information on: wind, transparency, temp, (air & water), pH, conductance, dissolved O<sub>2</sub>, total alkalinity, calcium, magnesium and total phosphorus.]

library: U.S. Bur. Commercial Fisheries Lab., Ann Arbor.

Benjamin, Daniel W., et.al.

(1970)

A base line study of the upper chain-o-lakes (with reference to several stations in the lower chain and Grand Traverse Bay) in Antrim, Kalkaska, and Grand Traverse Counties, prepared by Daniel W. Benjamin, Rita M. Brinker, Carol J. Dalebout, William C. Gill and David C. Hann.

January, 1970: 63p. tables, figs. maps.

[Includes list of benthic and planktonic organisms found at seven sampling stations in Grand Traverse Bay, and their abundance. Data on physical and chemical water quality for the Bay also included. Accuracy of content questionable in that study performed by students. Preliminary preview by Dr. David Chandler revealed errors in species classification.]

library: Great Lakes Research Division, Univ. Mich.

REF.

Curry, Karl, and LaVerne L. Curry.

(1968)

Annual report for the Elk-Skegemog Lakes Association and Three Lakes Association. Antrim County, Michigan. 1967-1968.

1968: 48p. ,aps. figs, tables.

[Includes results of analyses of biological and physical-chemical limnological samples collected from all the major lakes and streams of the Chain-0-Lakes system from Elk Rapids to the inlet of Intermediate River on Lake Bellaire. Information on bacteriological, bottom fauna and plankton sampling, and Lake Trout and Whitefish netting results. Includes numbers and classification.]

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys' office.

I  
Lape, Douglas, and LaVerne L. Curry.

REF. 1  
(1967)

1966-1967 Annual Report for the Elk-Skegemog Lakes Association.

July, 1967: 53p. tables, maps.

[Presents results of several extensive surveys of the Chain-O-Lakes performed by students of the Biology Dept. of Central Michigan University at Mt. Pleasant, Michigan. Discussion includes physical and chemical limnology, plankton, bottom fauna, fish and bacteriological studies.]

library: Michigan State University, Dept. of Resource Development, Prof. C.R.  
Humphrys'office.

REF.

Lape, Douglas Harley.

A limnological study of the Chain-O-Lakes, Antrim, Kal-kaska and Grand Traverse Counties, Michigan. 1. A classification of the lakes based on eutrophication. (A paper submitted in partial fulfillment of the requirements for Aquatic Zoology course offered in the Graduate School at Central Michigan University, Mt. Pleasant, Michigan.)

January, 1967: 39p. tables, figs.

[Discusses the results of analyses of samples from 20 stations in the Chain-O-Lakes system plus 1 from Grand Traverse Bay. Concludes that the lakes are chemically stable, that there is never an oxygen deficiency problem, that Torch, Elk and Bellaire Lakes are oligotrophic, and that Round and Clam Lakes are eutrophic.]

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys'  
office.

Lauff, George H.

(1957)

Some aspects of the physical limnology of Grand Traverse Bay.

Great Lakes Research Division, Univ. Mich., Ann Arbor.

Publ. no.2, June, 1957: 56p. maps, illus.

[Summarizes results of a 30 station cruise which measured transparency, surface and subsurface temperatures and magnesium and silica concentrations. Records results of sediment analysis and drift bottle recoveries. Represents all findings on charts and/or graphs and present detailed bathymetric chart.]

library: Great Lakes Research Division, Univ. Mich.

U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Great Lakes Basin Library,  
Ann Arbor.

McNamee, Robert L.

(1930)

The surface waters of Michigan: Hydrology and qualitative characteristics and purification for public use.

Dept. of Engineering Research, Univ. Mich., Ann Arbor.

Eng. Res. Bull. no.16, June, 1930: 323p. maps, illus. tables, figs.

[Water discussed as to quality and quantity required (physical, chemical and bacteriological), and factors which influence them (geography, precipitation, population, agriculture, etc.). Includes discussions of the Boardman River Basin (see. p.148-151) and the functions and processes involved in purification.]

library: Great Lakes Research Division, Univ. Mich.

Univ. Mich., Chem. & For. & Gen. & Eng.-Trans. & Michigan Historical Collection &  
Landscape Design Office Libraries.

Michigan (State) Department of Health.

Chemical analyses and their interpretations. Public Water Supplies in Michigan.

Eng. Bull. No.4.

March, 1948: 23p. table.

[Includes chemical analyses data of public water supply for Traverse City (July, 1933 & Nov., 1942), Elk Rapids (May, 1937), Northport (March, 1934), and Suttons Bay (April, 1937)]

library: Great Lakes Research Division, Univ. Mich.

REF.

Michigan (State) Department of Health.

Data on Public Water Supplies in Michigan. Eng. Bull. No.4. 1961: 57p. table.

[Includes chemical analyses data of public water supply for: Central Lake (7/60), Elk Rapids (9/57), and Ellsworth (8/58) in Antrim County; E. Bay Township (12/58) and Traverse City State Hospital (5/60) in Grand Traverse County; Northport (6/59) and Suttons Bay (6/59) in Leelanau County.]

library: Great Lakes Research Division, Univ. Mich.



~ ..... ~REF.

Michigan (State) Institute for Fisheries Research.

Torch Lake. Report No. 112. Jan. 4, 1931: 18p.

[A summary of the results of a very general limnological survey of Torch Lake in Antrim County including information as to the species of fish and insects present, oxygen concentrations, temperatures, depth, bottom conditions, etc..]

library: Univ. Mich., Institute for Fisheries Research.

Michigan (State) Water Resources Commission.

Boardman River: Miscellaneous records.

[These records include stream discharge data; extremely detailed and complete physical and chemical water quality analyses results of samples taken from a number of stations in the Boardman River, the first station being located in Kalkaska County approximately 38 miles from the mouth of the River in Grand Traverse Bay? includes chart of diurnal D.O. fluctuation of the Boardman River and profiles of dissolved oxygen, dissolved minerals and bacteriological densities.]

library: Great Lakes Research Division, Univ. Mich.

Michigan (State) Water Resources Commission.

Drought flow of Michigan streams, by Clarence J. Velz, and John J. Gannon.

June, 1960: 771p. tables, figs. maps.

[Defines and evaluates the drought flow characteristics of the streams throughout the state of Michigan, including those of the Elk River and Boardman River basins, and compiles the available basic low flow records. Analyzes precipitation and temperature data collected at the Weather Bureau stations in the basins.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. Univ. Mich., Public Health & Eng. & Arch. & Bur. of Govt. Libraries.

Michigan (State) Water Resources Commission.

Great Lakes water temperatures at municipal sources along Michigan's shoreline.

December, 1954: 52p. tables, figs.

[Includes temperatures and chemical analyses data for raw water samples taken from the Traverse City intake, This data restricted to 1953 only, (see p.17-18)]

library: Great Lakes Research Division, Univ. Mich. Univ. Mich., Bur. of Govt. Library.

Michigan (State) Water Resources Commission.

Water quality monitoring program. Water quality records, 1963.

[Includes data collected from the Boardman River at the gaging station near Mayfield, Michigan. Data includes measurements of temperature, dissolved oxygen, BOD, COD, pH, suspended solids, nitrate (NO<sub>3</sub>), chloride (Cl), phosphates (P<sub>04</sub>), detergents, ammonia (NH<sub>3</sub>), conductance and coliform.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., Sci. Lib.

Michigan (State) Water Resources Commission.

Water quality monitoring program. Water quality records, 1964.

[Includes data collected from the Boardman River at the gaging station near Mayfield, Michigan. Data includes measurements of temperature, dissolved oxygen, BOD, COD, pH, suspended solids, nitrate (N<sub>03</sub>), chloride (Cl), phosphates (P<sub>04</sub>), detergents, ammonia (NH<sub>3</sub>), conductance and coliform.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., Sci. Lib.

Michigan (State) Water Resources Commission.

Water quality monitoring program. Water quality records, 1965.

[Includes data collected from the Boardman River at the gaging station near Mayfield, Michigan. Data includes measurements of temperature, dissolved oxygen, BOD, COD, pH, suspended solids, nitrate (NO<sub>3</sub>), chloride (Cl), phosphates (PO<sub>4</sub>), detergents, ammonia (NH<sub>3</sub>), conductance and coliform.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.  
U.S. Bur. Commercial Fisheries Lab., Ann Arbor. Univ. Mich., Sci. Lib.

Michigan (State) Water Resources Commission.

Water quality monitoring program. Water quality records, 1966.

[Includes data collected from the Boardman River gaging station near Mayfield, Michigan. Data includes measurements of temperature, dissolved oxygen, BOD, COD, pH, suspended solids, nitrate (NO<sub>3</sub>), chloride (Cl), phosphates (PO<sub>4</sub>), detergents, ammonia (NH<sub>3</sub>), conductance and coliform.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S.  
Bur. Commercial Fisheries Lab., Ann Arbor Univ. Mich., Sci. Lib.

Michigan (State) Water Resources Commission .

The water resources of the northern Lake Michigan and Lake Huron drainage area Lower Peninsula.

Dec., 1968: 189p. tables, figs.

[Presents comprehensive view of the existing and anticipated water uses in the area, the latter based on present trends. Includes discussions of hydrology, ground-water, water quality, navigation, irrigation, domestic and industrial water supply and waste disposal, etc.. Makes specific reference to the quality of Boardman River water at several locations (see p.66), and provides statistics as to municipal water source and consumption in both the Boardman and Elk River drainage basins.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

Michigan State University. Department of Resource Development.

The Elk River Watershed. (A course compilation of information on the waters of the Elk River watershed, supervised by C.R. Humphrys.)

1968-1969: 70p. figs, tables, maps.

[Includes discussions of hydrology, water quality, stream flow and related gradients, algae problems, recreation, geology, etc.. Also includes individual discussions of some of the lakes in the area.]

library: Great Lakes Research Division, Univ. Mich.

Michigan State University. Dept. of Resource Development.

Grand Traverse Bay (A course compilation of information relating to Grand Traverse Bay, supervised by Professor C.R. Humphrys, Dept. of Res. Development.)

n.d. 117p. tables, maps. figs, graphs, pics.

[A generalized summary of available information on Grand Traverse Bay. Includes discussions of geology, shore development and land use, fishing, water quality and waste treatment, dredging, recreation uses, etc.]

library: Great Lakes Basin Library, Ann Arbor.

Michigan State University. Dept. of Resource Development.

Michigan's Boardman River. (A course compilation of materials written and published by students in Resource Development 420, Water Resource Management and Resource Development 824, 1968-1969, under the direction of Prof. C.R. Humphrys.)

1969: 84p. maps. figs, tables.

[Includes considerations of water quality, soils, waste water treatment hydrology, gradients, sediment, drought flow, fauna, recreation, etc. Also discusses individual features of the river such as ponds, dams and waste contribution. Eighteen sub-watersheds identified and associated acreages given.]

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys<sup>1</sup> office.

Michigan State University. Department of Resource Development.

Michigan's Water Problems, produced by Watershed Management Class, Resource Development 824, Spring, 1967, edited by C.R. Humphrys.

1967: 354p. tables, figs.

[Includes limited amount of information on water quality in Grand Traverse Bay.]

library: Great Lakes Research Division, Univ. Mich.

Ownbey, C.R., and G.E. Willeke.

(1965)

Long-term solids buildup in Lake Michigan waters. In Proc. 8th Conf.<sup>1</sup> on Great Lakes Research, Ann Arbor, Michigan, March 29-30, 1965.

Great Lakes Research Division, Univ. Mich., Ann Arbor. Publ. no.13, 1965: 141-152. tables.

[Presents data related to Grand Traverse Bay watershed populations along with land runoff of chlorides and sulfates into the Bay, and includes the results of sampling the Boardman River mouth for the same anions.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor.

Risley, Clifford, Jr.

(1965)

Radioactivity in Lake Michigan and its tributaries. In Proc. 8th Conf. on Great Lakes Research, Ann Arbor, Michigan, March 29-30, 1965.

Great Lakes Research Division, Univ. Mich., Ann Arbor. Publ. no.13, 1965: 160-167. tables.

[Summarizes average alpha and beta radioactivity levels of water, bottom sediment, and plankton samples in the Boardman River in 1963 as compared with other tributaries to Lake Michigan and the lake as a whole.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor

U.S. Federal Water Pollution Control Administration.

Lake Michigan Basin: Physical and chemical quality conditions.

U.S. Dept. Int., FWPCA, Great Lakes Region. Chicago, 111. Jan., 1968: 81p. tables, maps.

[Detailed physical and chemical water quality conditions determined from analysis of approximately 50 samples taken from the Boardman River, Grand Traverse Bay and the adjacent region of Lake Michigan. Concludes that except for slightly higher levels of ammonia nitrogen and soluble phosphate in the western arm of the Bay, general water quality between Bay and Lake Mich. differs little.]

library: Great Lakes Basin Library, Ann Arbor.



REF.

U.S. Federal Water Pollution Control Administration .

Lake Michigan studies. Physical and chemical investigations.

Spec. Report #LM3, April, 1963: 31p. maps, tables.

[No samples taken from Grand Traverse Bay. Of value in that the results from hundreds of samples taken at hundreds of locations throughout the Lake might be of comparative interest when results are obtained from Grand Traverse Bay.]

library: Great Lakes Basin Library, Ann Arbor.

U.S. Fish and Wildlife Service.

Lake Michigan chemical data, 1954-55, 1960-61, prepared by Alfred M. Beeton and James W. Moffett.

Data Report no.6, 1965: 102p. tables, figs.

[Contains physical and chemical water quality data of samples from 9 stations in Grand Traverse Bay. Also includes information on wind, transparency, temp, (air and water), pH, conductance, dissolved O<sub>2</sub>, total alkalinity, calcium, magnesium and total phosphorus.]

library: U.S. Bur. Commercial Fisheries Lab, Ann Arbor.

REF.

U.S. Geological Survey. Office of Water Data Coordination.

Catalog of information on water data. Index to water quality stations.

ed. 1968: 391p. tables, illus.

[Contains information supplied by Federal, State and local agencies that acquire water data directly in the field and laboratory. Information includes exact location and number of OWDC sites, major type of data collected, frequency of data collection, form of data storage, and the storing agency.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

U.S. Geological Survey. Water Resources Division.

Water quality records of Michigan and Wisconsin,

1964 1964: 61p. tables, figs.

[Presents water temperature data for the Boardman River as recorded at the gaging station near Mayfield, Michigan, during the period June, 1961 through Sept., 1964.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

U.S. Geological Survey. Water Resources Division.

Water resources data for Michigan, Part 2: Water quality records, 1965.

1965: 57p. tables, figs.

[Presents average water temperature data for the Boardman River as recorded at the gaging station near Mayfield, Michigan, during the period June, 1961 through Sept., 1965. See p.3?.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

U.S. Geological Survey. Water Resources Division.

Water resources data for Michigan, Part 2: Water quality records, 1966.

1966: 72p. tables, figs.

[Presents temperature and chemical quality data for the Boardman River as recorded at the gaging station near Mayfield, Michigan. See p.29.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor. U.S. Bur. Commercial Fisheries Lab., Ann Arbor.

U.S. Geological Survey. Water Resources Division.

Water resources data for Michigan, Part 2: Water quality records, 1967.

1967: 94p. tables, figs.

[Presents temperature and chemical quality data for the Boardman River as recorded at the gaging station near Mayfield, Michigan. See p.41.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.

U.S. Geological Survey.

Water Resources data for Michigan, Part 2: Water Quality Records, 1968.

1970: 87p. tables, figs.

[Presents temperature and chemical quality data for the Boardman River as recorded at the gaging station near Mayfield, Michigan. Includes temperature of ground water data.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.



Watershed Recreation, Land Use and Vegetation



MAP

Michigan (State) Land Economic Survey.

Antrim County farm-forest map. Lansing, 1924.

17 sheets, various sizes

scale: 4" = 1mi.

library: Univ. Mich., Gen. Lib. - Map Room.

MAP

Michigan (State) Land Economic Survey.

Cover map of Antrim County. Lansing, 1923.

col. map. 28" X 30 1/2

scale: 1:63,360

library: Univ. Mich., Gen. Lib. - Map Room,



MAP

Michigan (State) Land Economic Survey.

Farm and forest map of Kalkaska County.

Lansing, 1927.

col. map. 24 1/2 x 24in.

scale: 1:63,360

library: Univ. Mich., Gen. Lib. - Map Room,

MAP

Michigan (State) Land Economic Survey.

Farm-forest map, Kalkaska County.

Lansing, 1927.

16 sheets each

16½-x X 18in.

library: Univ. Mich., Gen. Lib. - Map Room.

REP.

Andrews, Horace Justin, and Willard S. Bromley. (1941)

Trends in land use in northern Michigan, a study of Alpena, Antrim, Ogemaw and Roscommon Counties.

The Charles Lathrop Pack Forestry Foundation, Wash., D.C.

1941: 45p.

[Land use studies of Antrim County restricted to the eastern two-thirds of the county.]

library: Univ. Mich., For. & Sci. & Gen. Lib.

REP.

Emmet, Charlevoix, Antrim, Kalkaska, Grand Traverse, Benzie, and Leelanau Soil Conservation Districts assisted by the U.S. Soil Conservation Service, Coop. Extension Service.

Northern Great Lakes region multi-soil conservation districts' framework program for the Grand Traverse Bay, Broad Program area Michigan n.10.

Broad Program Area 10 - Michigan.

October, 1966: 62p. tables, figs.

[Although non-specific as to drainage basins, plan provides detailed information as to resource use and development enterprises in belt surrounding Grand Traverse Bay.]

library: Great Lakes Research Division, Univ. Mich.

Harland Bartholomew & Associates,

(1962)

Final report on the first phase of the comprehensive plan. Traverse City, Michigan, prepared for the City Planning Commission by Harland Bartholomew & Associates, City Planners, Landscape Architects, Civil Engineers. St Louis, Missouri.

July, 1962.

[Contains limited land use data for the south ends of the East and West Arms of Grand Traverse Bay.]

library: Traverse City, City Hall Building, Office of  
Robert Bach, Director of Community Development.

Michigan State University. Department of Resource Development.

The Elk River Watershed. (A course compilation of information on the waters of the Elk River watershed, supervised by C.R. Humphrys.)

1968-1969: 70p. figs, tables, maps.

[Includes discussions of hydrology, water quality, stream flow and related gradients, algae problems, recreation, geology, etc.. Also includes individual discussions of some of the lakes in the area.]

library: 'Great Lakes Research Division, Univ. Mich.

Michigan State University. Dept. of Resource Development.

Grand Traverse Bay (A course compilation of information relating to Grand Traverse Bay, supervised by Professor C.R. Humphrys, Dept. of Res. Development.)

n.d. 117p. tables, maps. figs, graphs, pics.

[A generalized summary of available information on Grand Traverse Bay. Includes discussions of geology, shore development and land use, fishing, water quality and waste treatment, dredging, recreation uses, etc.]

library: Great Lakes Basin Library, Ann Arbor

Michigan State University. Dept. of Resource Development.

Michigan's Boardman River. (A course compilation of materials written and published by students in Resource Development 420, Water Resource Management and Resource Development 824, 1968-1969, under the direction of Prof. C.R. Humphrys.)

1969: 84p. maps. figs, tables.

[Includes considerations of water quality, soils, waste water treatment hydrology, gradients, sediment, drought flow, fauna, recreation, etc. Also discusses individual features of the river such as ponds, dams and waste contribution. Eighteen sub-watersheds identified and associated acreages given.]

library: Michigan State University, Dept. of Resource Development, Prof. C.R. Humphrys<sup>1</sup> office.

REF.  
(1964)

Senninger, Earl J., Jr.

Atlas of Michigan.

Flint Geographical Press. 3d ed.

1969: figs.

[Composed solely of maps of Michigan showing, among other things, topography, soil types, average annual precipitation, specific crop-producing areas, value of local industries, recreation areas, mineral deposits.]

library: Univ. Mich., Undergrad. Lib.

REF.

U.S. Bureau of Outdoor Recreation. Lake Central Region.

Water-oriented outdoor recreation, Lake Michigan basin, Ill., Wis., Mich., Ind., prepared for the FWPCA.

1965: 150p. illus.

[Outlines present and projected water-oriented recreational demands and facilities. Proposes substantial increases in facilities in the Grand Traverse Bay area.]

library: Great Lakes Basin Library, Ann Arbor, Univ. Mich., Sci. Lib.

REP.

U.S. Dept. of Agric. and Michigan (State) Conservation Needs Committee.

Michigan Conservation Needs Inventory. 1968.

1968: 123p. tables, pictures.

(Contains generalized land use data by county (including Grand Traverse, Leelanau, Antrim and Kalkaska). The information is non-specific as to drainage basins.)

library: Great Lakes Research Division, Univ. Mich

U.S. Soil Conservation Service.

Soil survey, Grand Traverse County Michigan, by H.L. Weber, Robert Hall, Nels R. Benson, and G. Van Winter, in cooperation with Michigan (State) Agricultural Experiment Station.

U.S. Govt. Printing Office, Washington, D.C. 1965s 141p. tables, figs.

[Provides detailed descriptions of soil series plus information classification, use, management and productivity of soils. Includes discussion of history of the area and development, climate, surface geology, vegetation, transportation, crops and land ownership. Soils are mapped on 92 aerial photographs.]

library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library, Ann Arbor.  
Univ. Mich., Gen. Lib. - Map Room.

Weber, H.L., et.al.

(1965)

Soil Survey, Grand Traverse County Michigan, by H.L. Weber, Robert Hall, Nels R. Benson, and G. Van Winter in cooperation with Michigan Agricultural Experiment Station.

U.S. Soil Conservation Service. U.S. Govt. Printing Office

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library: Great Lakes Research Division, Univ. Mich. Great Lakes Basin Library,  
Ann Arbor. Univ. Mich., Gen. Lib. - Map Room.