Hydrology of Indiana Lakes

By J. I. PERREY *and* D. M. CORBETT

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PREFACE

This report was prepared by the U.S. Geological Survey, Water Resources Division, C. G. Paulsen, chief, under the general direction of J. V. B. Wells, chief, Surface Water Branch.

The field work and the collection and tabulation of basic information is part of a continuous cooperative program with the Division of Water Resources of the Indiana Department of Conservation, and the preparation of the report was the culmination of this program.

The data presented in this report were collected and prepared for publication under the supervision of Don M. Corbett, district engineer, Indianapolis, Ind. The sections dealing with the origin and extinction of lakes, and with ice condition, temperature and evaporation were prepared by J. I. Perrey. The introduction and the sections dealing with basic data on lake levels and stabilization of lakes were prepared jointly by J. I. Perrey and Don M. Corbett. Acknowledgement is made to Charles H. Bechert, Director, Division of Water Resources, Indiana Department of Conservation, for furnishing the table for the section on Legal lake levels, and the gage-height hydrographs and for reviewing the report.

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HYDROLOGY OF INDIANA LAKES

By J. I. Perrey and D. M. Corbett

ABSTRACT

Indiana's lakes are a valuable resource for both recreational use and their industrial potential. Some lakes are used for water supply.

The natural lakes are glacial in origin and are most concentrated in northeastern Indiana. Many of the lakes were drained by the early settlers. The natural processes of sedimentation and accumulation of organic deposits tend also to reduce the number and size of lakes. The trend toward fewer lakes has been reversed in recent years by the construction of artificial lakes; the number of lakes has increased from a little over 500 in 1800 to over 1,000 at the present time.

The recreational value of the lakes and the desirability of maintaining constant lake levels led to legislation relative to the establishment of legal lake levels and to a program of lake-level observations, supplemented by the collection of hydrologic data affecting lake levels.

Observations of both surface temperature and temperature profile were made by investigators as early as 1875. The earlier data and data collected since 1946 have been analyzed to show the fluctuation of temperature with season, depth of water, size of lake, and other influencing factors. Surface temperatures, which may vary several degrees within 24-hour period, fluctuate with air temperature and reach highs of about 85°F in August. The bottom temperatures of lakes more than 100 feet deep seldom rise above 45°F. Subsurface water temperatures below ice cover reach a uniform value of about 39°F except that just below the ice which remains closely to 32°F. During summer, temperature stratification is established as the lake warms. Shallow lakes reach temperature extremes about 5°F above and below those of the deep lakes. Size of the contributing drainage area, surface area of the lake, and flow through the lake have little effect on water temperatures below a depth of about 20 feet. Little aquatic life exists below depths of 30 feet from mid April to mid September owing to lack of oxygen in the water. Large amounts of cool water, 5 to 10 degrees cooler than ground water which averages 50° to 55°F in northern Indiana, are available in the lower portions of the deep lakes.

Evapotranspiration accounts for the disposal of about 70 percent of the precipitation in Indiana. During a year's time evaporation from the lake surface about equals the precipitation falling on the lake. During dry periods evaporation from a lake may exceed the inflow from small drainage areas and cause a lowering of lake levels. For the period April through October, evaporation as measured in a class A land pan of the U. S. Weather Bureau has averaged 44 inches at Evansville, 34 inches at Indianapolis, and 31 inches at Valpariso. A coefficient of about 0.7 is usually applied to yearly evaporation data from Class A land pans to obtain equivalent evaporation from lake surfaces.

Ice cover on the lakes extends from about December 15 to March 15 and reaches thickness of 24 to 30 inches during the colder winters. Ice can be damaging to lakeside installations by thrust action or by the wind action on ice cakes.

The stabilization of lake levels often requires the construction of outlet control structures. A detailed study of past lake-level elevations and other hydrologic data is necessary to establish a level that can be maintained and to determine the means necessary for maintaining the established level. Detailed lake-level records for 28 lakes are included in the report, and records for over 100 other lakes are available in the U. S. Geological Survey office, Indianapolis, Ind. Evaporation data from the four Class A evaporation stations of the U. S. Weather Bureau have been compiled in this report. A table showing the established legal lake level and related data is included.

INTRODUCTION

To the casual observer a lake is a relatively stable body of water, nearly always of the same area and level. To the more discerning person, who may be concerned about property or facilities located on the shores, it is soon apparent that a lake is a variable thing whose surface expands and contracts, and whose level rises and falls. Closer observation will reveal that these oscillations have seasonal trends, and operate between variable extremes.

With the intensive use of lakes and their shores, it is common for variable surface levels to interfere with the use of lake property. This problem may be solved by either accommodating the use of the property to the conditions of the lake, or by controlling the lake itself. The latter method is frequently selected because it will generally increase the utility of the lake.

The degree to which a lake may be controlled will depend largely upon physical conditions such as the elevation of surrounding land, the presence of an outlet, the size of contributing watershed, and the flow of water into the lake. The water flowing into the lake will determine largely the amounts of water that must be regulated to gain control.

Not all problems stem from a need for control or stabilization, some may arise from a desire to merely increase or decrease the surface area, or raise or lower the average level. Whatever the purpose, the solution will involve a change in some physical feature connected with the lake, and some manipulation that will tend to counteract the normal processes of nature: precipitation, evaporation, transpiration, change of temperature, surface runoff, and underground inflow and outflow. Physical features frequently may be changed, and the changes made quite permanent, but usually it is practical to obtain only a limited control over the natural processes.

In designing any type of control device it is necessary to have a knowledge of conditions that are undesirable and in need of control, factors that are causing the undesirable conditions, and quantities that must be controlled. The features of a lake most frequently in need of control are the level and surface areas. The surface area is a function of the level since it varies with the level, and may be treated as a problem in level control. In turn, all problems in levels are related to the volume of water in the lake, and become problems in volume control. It is also readily apparent that variations in volume are directly connected with the gain or loss of water in the lake.

With a little imagination one can quickly visualize the complicated intertwining of natural processes that are constantly changing the volume of water. The rainfall on the surface, the water entering from inflowing streams, the contribution from springs, the evaporation from the surface, the water used by vegetation and returned to the air through the process of transpiration, the flow through the outlet, and seepage into the ground, are all continually adding to or subtracting from the water in the lake. With this multiplicity of processes the study of lakes becomes a study in hydrology.

Hydrology of Lakes

Hydrology, as related to lakes, is the science that deals with the processes governing the depletion and replenishment of the waters of lakes. It takes into consideration precipitation, evaporation, transpiration, flow into and out of the lake, from both surface and underground sources, temperature, ice formation, sedimentation, and the effects of artificial control. It is the tool by which the behavior of lakes may be analyzed. Once the causes for the behavior are recognized and evaluated, means for their control modification, or counteraction may be devised. The recognition of causes for given conditions may be relatively simple, for example, the relation between high lake levels and excessive precipitation is apparent to the most casual observer. The evaluation of the cause, that is, the determination of the amount of water involved, is not so simple.

The determination of all the hydrologic factors is dependent on some type of measurement: the amount of precipitation is determined from rainfall caught and measured in rain gages; the surface inflow or outflow are determined from measurements of streamflow; gains and losses in lake volume are determined from measurements of lake levels.

The measurements of the various hydrologic factors are the basis of any hydrologic study. Data from observations of hydrologic phenomena are therefore called basic data. Basic data peculiar to lakes are information on size of contributing drainage areas, size of surface area, lake temperatures, and lake levels. Precipitation, evaporation, and streamflow are types of basic information that are common to other fields of study as well as lakes. Of the various types of basic data, lake levels are perhaps the most easily understood by the layman, the easiest to apply to many problems, and the easiest to observe and measure.

Although many types of basic data may be determined by direct measurements, some must be obtained by indirect means. Losses due to evaporation generally cannot be measured with accuracy by direct observations of lake surfaces; they are usually estimated by comparisons with evaporation losses from standard evaporation pans. However, other methods are being developed that will eventually improve the technique of determining such losses (anonymous 1952). Water gained by inflow from the ground or lost by seepage into the ground cannot be measured directly, and must be determined by indirect methods.

Nearly all water problems involve problems of volume or quality. The solutions to the problems are dependent upon the evaluation of basic factors affecting the volume to be controlled. In other words, the solutions are dependent to a large degree upon basic data.

If a problem involves lake levels, as most lake problems do, it is desirable to have a knowledge of the levels that might be considered normal during the various seasons, the maximum and minimum levels, and the frequency and duration of extreme levels. Reliable information can be obtained only from frequent measurements or observations of the levels. Such observations must be made as events occur. We cannot go out today to observe last year's levels, nor even the one that occurred yesterday. Problems must be anticipated far in the future, and the collection of basic data started years before it is needed so that the range of conditions may be as wide as possible.

The importance of lake hydrology will grow with the increasing importance of lakes in our economy. Year by year the lakes of Indiana are increasing in value.

The importance of lakes for recreation and utility is easily understood when one considers that the number of lakes in Indiana of 5 acres or more in size has grown from a little over 500 in 1800 to more than 1,000 natural and artificial lakes today. The increase has been due to the construction of artificial lakes, mainly in those portions of the State where few or no lakes existed formerly.

Not all the construction of lakes has been done in recent years. Some of the largest artificial lakes were constructed during the canal-building days, over a hundred years ago. The old Wabash and Erie Canal was fed by two great reservoirs, no longer in existence. The Splunge Creek reservoir, along the Clay-Vigo County line, is said to have covered 4,000 acres, and the nearby Birch Creek reservoir in Clay County covered 1,400 acres. The former,

if the area was correct, was the largest body of water in the State, excluding Indiana's portion of Lake Michigan and the old Kankakee swamp areas.

Although the building of artificial lakes was started early in the history of Indiana, the greatest activity is now taking place. Many of the recently constructed lakes are used for water supply. These lakes required hydrologic studies to determine the size of spillways required to discharge floodwaters without overtopping their dams, studies of the amount of storage required to meet anticipated demands for water, and studies of the ability of the watershed to replenish the water used by evaporation and for water supply.

Some lakes now under construction for recreational purposes will be among the deepest in the State when they are completed and so large in relation to their drainage areas that they will require 6 to 10 years to fill. Determination of the length of the filling period required studies of hydrologic data.

Indiana Laws for Preservation of Lakes

In 1905 the Indiana Legislature passed the first law "to preserve the fresh water lakes of the State of Indiana at their established level and protect them from danger of being injuriously affected or destroyed by the lowering of waters thereof by any drains or ditches." This law recognized the growing importance of lakes as centers for recreation, and tended to stop some of the land reclamation practices of former years, which had lowered many of the natural lakes and greatly reduced their areas.

As the use of lakes increased through the years new laws were passed to amend, strengthen or supplement the 1905 law. By 1935 it was realized that some definite elevation should be used in establishing a level for a lake. Consequently, a law was enacted which formulated a procedure to be followed in establishing a lake level, and provided for recording the level in the county recorder's office.

In 1947 another law was enacted that made records of lake-level observations essential to the administration of laws establishing levels for lakes. The 1947 law stated in part:

> The Indiana Department of Conservation of the State of Indiana is hereby authorized and empowered to establish, by appropriate monuments, the average normal water level of all natural and artificial lakes of the State of

> Indiana and to construct or sponsor and supervise the construction of dams, spillways and control works necessary to maintain the average normal lake level. Such water level monuments shall be as permanent in character as practicable and shall fix the average normal level, and indicate the elevation of the highest point to which the water of such lake or lakes shall have risen within the past ten years prior to the passage of this act.

In 1951 the Legislature repealed the 1935 lake-level law and enacted a new statute designed to accomplish more effectively the same purpose as the 1935 law.

Present Lake Investigation

Sometime after the passage of the 1935 lake-level law, it became apparent that to accomplish the purpose of the law more knowledge of lake levels and their variations was needed. Consequently, in the fall of 1942, the Geological Survey, in cooperation with the Water Resources Division of the Indiana Department of Conservation, established 11 gaging stations on lakes in northern Indiana. In succeeding years, a definite program of lake-level observations was established; by November 1946 gages had been installed on 109 lakes, and the collection of records, on a daily basis wherever practicable, had begun.

About that time it was also realized that data on lake levels alone were not sufficient to provide a full understanding of the various factors that affect lakes and account for differences in their behavior. To provide additional data for the lake study, the number of precipitation stations in the northern lake section were increased and two evaporation stations were established in cooperation with the U. S. Weather Bureau. Several lakes were selected for intensive studies that involved the recording of temperatures of lake-water, measuring inflow and outflow, mapping of the topography of lake beds to permit determination of volume of water, and collecting of other pertinent hydrologic data.

During the period 1947 to 1951, additional lakes were included in the program and some of less importance were omitted from the study. The number of lake gages in operation reached a peak of 122 in 1949, but has averaged about 110 in recent years.

The study of the hydrology of Indiana lakes was carried on simultaneously with the collection of basic data, and has now reached the point where its results may be presented to the public together with basic data for selected lakes.

This report describes the development of Indiana lakes, the factors that tend eventually to obliterate them, the annual cycle of water temperature, the theory of temperature changes within the body of a lake, evaporation from lakes, ice conditions on northern Indiana lakes, and problems involved in attempting to stabilize lake levels. It presents also the basic data for selected lakes.

The report is intended to provide the layman as well as the engineer an understanding of the natural processes that affect the behavior of all lakes. It should provide the basic information necessary to analyze many of the problems connected with lakes, and aid in reaching sound decisions regarding the solutions to these problems.

CREATIVE AND DESTRUCTIVE FORCES AFFECTING LAKES

Origin and Distribution of Indiana Lakes

Some thousands of years ago the region that is now Indiana was covered by great glaciers or ice sheets, hundreds of feet thick, that moved down from the north over a large part of the State. As these ice sheets advanced they changed every square mile of land surface they touched. They planed off the existing hilltops and filled in the former valleys in the manner of a gigantic bulldozer. Their final retreat produced the land surface upon which the lakes of Indiana were formed.

Two stages of glaciation have been recognized in Indiana. During the older, the Illinoian, glaciers covered about 82 percent of the State, leaving only a rough triangular area within the State, from Evansville to Martinsville to Jeffersonville, unglaciated. The younger, the Wisconsin, occurred many thousands of years after the Illinoian. During this stage the ice advanced as far south as a line roughly defined by Terre Haute, Rockville, Greencastle, Mooresville, North Vernon, Connersville, and Brookville. This advance of ice overrode the surface deposits of the older Illinoian glaciation and materially reduced or removed them entirely. The younger Wisconsin glaciation is responsible for the hundreds of natural lakes in northern Indiana.

The advancing ice transported large quantities of rock material; some was pushed before the ice mass and some was contained within it. As the ice retreated to the north it left a covering of glacial debris called drift or till. Along the margins of the ice, piles of glacial debris, liberated by the retreating ice front, were dumped, thus forming irregular and lobate ridges known as moraines. Between moraines, the ice dropped its load as a sheet of till of variable thickness called ground moraine. Melt waters from the ice left stratified deposits known as outwash within and on top

of the till sheets, along the margins, and behind and beyond the moraines.

The moraines were hilly ridges in which mammoth blocks of ice were buried. The buried ice melted slowly and eventually left water-filled holes, which became the deeper lakes in Indiana. On the rolling surface of the drift shallow depressions were filled with water where there were no outlets to permit the water to drain away. These depressions formed shallow lakes, and eventually many became swamps and marshes.

After the disappearance of the glaciers, those lakes without sufficient inflow of surface water and ground water to satisfy the demands of evaporation, transpiration, and seepage losses gradually dried up. Others with large contributing watersheds overflowed at outlets formed at the lowest point in their brims, and as water flowed from one lake to another, drainage systems were formed involving a chain of lakes. Such chains are now found in the upper reaches of the Tippecanoe and Pigeon Rivers. Others, without surface outlets, existed as long as there was a balance between inflow from surface and underground sources and water losses from the lake.

The greatest concentration of glacial lakes in Indiana is along the Mississinewa and Packerton morainic systems which extend from Steuben County in the northeast corner of the State diagonally southwestward for about 75 miles. Hundreds of lakes are located on and behind these moraines and their various arms in Steuben, Noble, Kosciusko, and Whitley Counties and northern Wabash County. The grouping of the lakes becomes less dense away from the main moraines in the direction of Fort Wayne or South Bend.

Other groups of lakes, although more scattered, are found in other morainic systems. The Valparaiso moraine follows a general northeasterly course from the Illinois boundary across Lake, Porter, and LaPorte Counties, and the Maxinkuckee moraine, a course along the Pulaski-Fulton and Starke-Marshall County lines.

Gradual Extinction of Northern Indiana Lakes

Once created, lakes are doomed to gradual extinction by natural causes. Hundreds had disappeared in the thousands of years that elapsed between the Ice Age and the first settlement in the area by white men.

With the advent of our civilization and the growth and spread of populations, more tillable land was brought into production. This demand led to more land drainage which hastened the extinction of many lakes.

Filling by Organic Material and Marl Deposits

After the glaciers, vegetation took root in the soil and spread to the shallower portions of lakes. The growth of aquatic plants produced deposits of organic muck along the shores and on the bottoms of many lakes and slowly filled the depressions that were once occupied by water. The shallower lakes, in which vegetation covered the entire bottom, gradually deteriorated into swamps and then marshes with comparative rapidity. The deeper lakes with organic deposits around the edges show only retreating shorelines.

The multitude of muck beds scattered over the northern part of the State are evidence of the lakes and swamps that once existed, at elevations much above present lake levels, and indicating that many of the lakes were much larger in the past. The muck deposits have considerable range in depth averaging 3 to 4 feet in many lakes, but some extinct lakes and ponds have organic deposits more than 30 feet deep.

Marly soil, found extensively in and around northern Indiana lakes, has helped to decrease the size and depth of these lakes. It is a fresh-water deposit of high calcium carbonate content, mixed with clay, silt, and small amounts of other minerals and organic matter. It is a soft, granular, earthy material, ranging in color from milky white to bluish gray or yellowish brown, depending on the amounts of mineral and organic matter mixed with it.

The calcium carbonate of the marl is precipitated from the water in the lake or pond, in part through the action of aquatic organisms. Where the lake or pond is fed at a relatively high rate by hard spring water of high calcium bicarbonate content, the precipitation of marl is especially vigorous.

Marl beds range in thickness from a few inches to more than 45 feet. Deposits of 6 or 7 feet are common and many between 10 and 20 feet are found in Indiana. Blatchley and Ashley (1900) surveyed the marl deposits of many Indiana lakes in 1899 and 1900 and reported that "in some cases the accumulation of marl has almost or quite filled up the lake."

Fresh-water marl deposits are now used commercially to some extent as a source of agricultural lime. During the period 1899 to 1940, the deposits were used also in a number of places as a source of lime in the production of Portland cement. The largest and longest used deposit, for this purpose, is located on Big and Little Turkey Lakes in LaGrange County. The Wabash Portland Cement Co. erected a plant at Elmira on Big Turkey Lake and began the manufacture of cement in August 1900. The plant, the last of its kind in Indiana, has not been operated since 1945.

Sedimentation

From their very beginning, the lakes of Indiana have been decreasing in both area and depth owing in part to the quantities of sediment carried into them by their inflowing streams. However, the process of filling these lakes by sediments has not been as rapid as that caused by the organic deposits, as the sediment load in most northern Indiana streams does not appear to be heavy.

The largest deposits of sediment are found near the mouths of the tributary streams. In some lakes, a combination of sediment and organic deposits have built up large swamp and marsh areas around the mouths of the inlets resulting in corresponding decreases in the areas of the lakes. Although a large part of the sediment, particularly the larger and heavier particles, settles as soon as the inflowing water reaches the still water of the lake, a certain amount moves out into the main body of water, where the smaller and lighter particles settle at a much slower rate. Thus, deposition of sediment over the entire bottom of the lake gradually makes the lake shallower.

Extensive investigations of the amount and distribution of the accumulated sediment in Winona and Tippecanoe Lakes were conducted by Wilson (1935, p. 302-303; 1937, p. 248) of Heidelberg College. These studies indicate that the maximum depth of Winona Lake decreased from an original 127 feet to 79 feet, and the original area and volume were reduced 37.4 and 43.6 percent, respectively. In Tippecanoe Lake the maximum depth decreased from 164 feet to 123 feet, and the original area and volume were reduced 20.8 and 31.9 percent respectively. The original depth, area, and volume are based on geologic evidence and it is believed that they indicate conditions at the time the lakes were formed after the ice age.

Although the depth of sediment deposits may be determined by simple measurement of samples of bottom materials taken from the beds of lakes, it is more difficult to determine the rates at which the materials were deposited. Rates may be determined indirectly by sampling the bottom at periodic intervals, but the samples must be taken in the same locations each time to avoid errors resulting from irregularities in the bed and varying distances from the point at which the sediment enters the lake.

Direct measurements of sediment depositions were made with collectors installed by Scott and Miner (1935) at various locations on Winona and Tippecanoe Lakes in July 1930. The collector (fig. 1) consisted of a wire cable with a float attached at the upper end, an anchor at the lower end, and cylindrical glass collecting

jars wired to the cable at various intervals. These collectors were allowed to remain in position in the lakes for periods ranging from 10.8 to 60 months. As a result of this study the sediment in the deepest parts was found to be increasing at the rate of about one-third inch per year in Winona Lake, and at the rate of about one-fifth inch per year in Tippecanoe Lake.

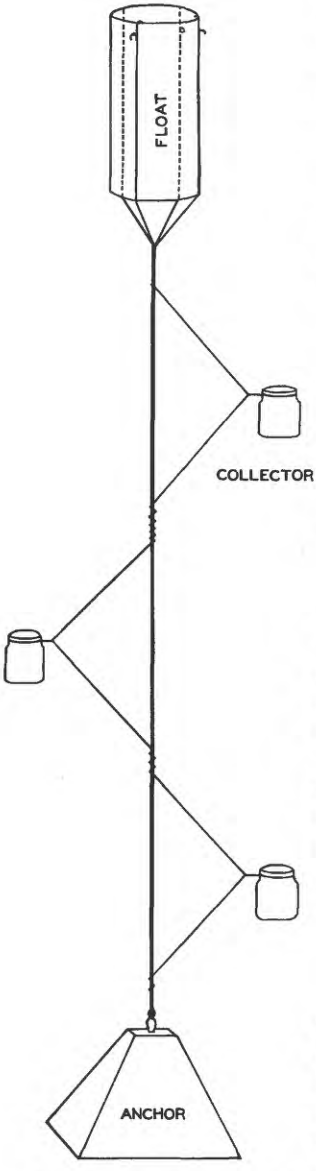

Figure 1.--Sediment collector used by Scott and Miner.

After taking the observations in 1935, Mr. Miner set out four strings of collectors in the deep water of Winona Lake for longer periods of observation. In the summer of 1949 he removed the collectors from Winona Lake after they had been submerged for 14 years. "The minimum rate of sedimentation near the bottom in deep water was about half an inch per year, or at the rate of a foot every 24 years." (Miner, 1949) This rate appears to be somewhat greater than that determined in the summer of 1935.

Because of the long existence of the lakes it is apparent that the rate of sedimentation is either variable or has not always been as rapid as these recent short period observations indicate. At the rate of one half inch per year, it would have taken only 1,150 years for the 48 feet of sediment in the deep part of Winona Lake to be deposited. Geologic evidence indicates that the period of accumulation must have been much longer.

Drainage

The most rapid changes in lake levels are believed to have been manmade and to have taken place since the settlement of the State. The demand for agricultural land brought about the draining of swamps and, consequently, the lowering of many lake levels as areas of rich muck lands were reclaimed. This process brought about the complete disappearance of some of the shallower lakes.

For example, Cedar Lake in Steuben County has disappeared as a result of drainage. An examination of aerial photographs of this area reveals evidence that the lake once had a surface area of 557 acres. However, it has not existed as an open body of water for many years. In 1899 Ashley wrote (Blatchley and Ashley, 1900) "It [Cedar Lake] has now been partly drained so that with the exception of a few lagoons its former area is a marsh." Topographic maps made as recent as 1938 show a marsh area of 392 acres remaining at that time. Today the lake is completely drained and its former bottom is being cultivated. Cedar Lake was always shallow and probably was not more than 15 feet deep when originally formed. At the time of the first drainage project, the water had a maximum depth of perhaps not more than about 5 feet.

Many other lakes that have not been completely drained have decreased in area as a result of artificial drainage. Although some of these lakes still are sizable bodies of water, their present water-surface areas are by no means an indication of their original size.

According to early reports, Cedar Lake in Lake County was lowered 8 to 12 feet prior to 1900 by dredging an outlet to Cedar Creek.

Eagle Lake in Starke County was reported, in May 1900, to have been reduced in size by half or more, to an area of about 70 acres as a result of dredging. The area of the same lake was found to be only 24 acres in 1939.

In 1897, a ditch was dredged into Bruce Lake in Fulton County and the lake lowered considerably. The lower level was found unsatisfactory, and a dam was built later to restore the lake to approximately its former level.

Chapman Lake, in Kosciusko County, was lowered twice prior to 1900, the total amounting to about 6 feet. The water area before the lake was lowered was estimated to have included about 850 acres. Since 1900 the lake level has been raised slightly by the construction of a small dam and the combined area of Big and Little Chapman Lakes is now 526 acres. Chapman Lake appears to have had an original area of about 1,370 acres as indicated by the muck deposits around the lake. The level of the lake at that time was at an elevation of about 836 feet above mean sea level, or about 8 feet higher than the present level. The decrease in size, prior to dredging of the outlet channel, came about through natural causes.

Ridinger Lake, in Koscuisko County, was lowered 4 feet in 1900, but in 1947 a control dam was built to maintain a higher and more desirable level.

Many other lakes have been lowered sizable amounts in the past. Heaton Lake in Elkhart County was lowered about 5 feet in 1885; Troy Cedar Lake in Whitley County was lowered about 10 feet in 1900; Loon Lake in Whitley County was lowered about 12 feet in the spring of 1900, and in Noble County, Bear Lake was lowered about 6 feet and High Lake about 8 feet in 1899. Many other lakes have been lowered smaller amounts by drainage.

New and Enlarged Lakes

The creation of new lakes began during the epoch of canal building when lakes were needed as feeders for the canals. Sylvan Lake in Noble County is perhaps the first notable example of such work in Indiana. Entirely artificial, it was created in 1837 as a feeder lake for the proposed Michigan and Erie Canal.

In the early days the levels of some natural lakes were raised and their areas enlarged to furnish sources of power for grist mills. A dam for a mill was built at Webster Lake in Kosciusko County in 1830 and raised the lake level 7 feet. This mill continued to operate until 1951. Dams were erected and the water level raised in many other lakes. The level of Lake Manitou was raised about 7 feet in 1830; Lake Wawasee, 5 feet in 1833; Lake George in Steuben County, 4 feet in 1836; and Hamilton Lake, 9 feet in 1837.

In recent years, the needs of an increasing population brought about a great demand for more lakes for water supply, flood control, and recreation. A dam was constructed on Fall Creek, a tributary of White River, in 1942 by the Indianapolis Water Co. to increase the water supply of Indianapolis, thus creating Geist Reservoir, a lake of 1,800 acres, the largest artificial body of water in Indiana. Bloomington Reservoir was constructed on Beanblossom Creek, also a tributary of White River, in 1953 by the city of Bloomington to increase its source of water supply, creating an artificial lake of 1,650 acres at spillway level. The acute shortage of water at the Muscatatuck State School and for the city of North Vernon resulted in the creation of an 185-acre artificial lake in 1953 on Brush Creek in the vicinity of Butlerville. The towns of Batesville, Salem, Scottsburg, Huntingburg, and Oakland City also have created lakes for water supply.

The Cagle's Mill flood-control dam, completed in December 1951, has behind it a permanent lake area of 1,400 acres for

recreational purposes. This is the first large flood control reservoir created in Indiana.

More and more lakes are being created for recreation purposes, particularly in the southern part of the State where natural lakes are very rare. Greenwood Lake in Martin County, with an area of 800 acres, is perhaps the largest of such lakes. However, this lake is now within the boundaries of the Crane Naval Ordnance Depot and not open to the public.

Brown County has several artificial lakes of which Yellowwood, with a water surface of 147 acres, is the largest. Martin, Morgan and Monroe Counties have a scattering of artificial lakes. Clay, Vigo, Sullivan, and Knox Counties have several lakes formed from surface drainage into abandoned strip coal mines. As evidenced by the activities cited herein, it is apparent that man realizes the value of lakes and the multiple purpose they serve, and it is rather obvious that more new lakes will be planned and constructed in future years.

TEMPERATURE OF LAKES

Scope of Studies

The first account of observations of temperatures of Indiana lakes was prepared by Levette (1876). His report tabulates the surface and bottom temperatures and temperature profiles (temperatures at various depths from the surface to the bottom of the lake, formerly called serial temperatures) of 12 lakes in northern Indiana taken in the fall of 1875. Unfortunately, the dates on which the observations were made are not given; consequently it is difficult to compare these data with more recent observations of similar type as temperatures vary appreciably with the time of year. In 1896, temperature studies of Lake Wawasee were made by Dolan (1896).

The first extensive study of temperatures of lake waters was made at Maxinkuckee Lake between July 1899 and June 1901 by Evermann and Clark (1920, p. 152-216), in connection with a physical and biological survey of the lake by the United States Fish Commission (now the U. S. Fish and Wildlife Service). This study includes tabulated observations of both surface and temperature profiles of Lake Maxinkuckee.

Scott (1915) in his report on the lakes of the Tippecanoe basin, records temperature profiles taken in 13 lakes during the summers of 1912 and 1914.

Beginning with the summer of 1946 and continuing through December 1948, the U. S. Geological Survey in cooperation with the Division of Water Resources, State Department of Conservation, recorded lake temperatures of a representative group of lakes of various sized and depths. The objective was to obtain comparative data. The 10 lakes selected for this study are scattered over northern Indiana and include Cedar Lake in Lake County, Flint Lake in Porter County, Bass Lake in Starke County, Maxinkuckee Lake in Marshall County, Winona and Tippecanoe Lakes and Lake Wawasee in Kosciusko County, Bixler Lake in Noble County, and Lake James and Clear Lake in Steuben County. Weekly observations of the temperature of the water near the surface of these lakes were made by local gage observers. Temperature profiles were taken in the deepest parts of the lakes about once a month. During the colder months, it was not always possible to obtain the profile readings because unsafe ice conditions prevented reaching observation points.

Surface Temperatures

A study of the available data clearly establishes these observed results: that, except when the lake is under ice cover, the temperature of the lake water at the surface fluctuates with the temperature of the air with which it is in contact; that these fluctuations follow seasonal trends of air temperature; and that the temperature of the water will vary several degrees within a 24-hour period if the air temperatures vary widely during the same period. Ice cover provides a blanket of insulation which keeps the water underneath at a nearly constant temperature. Prolonged spells of below 32°F temperatures merely increase the thickness of the ice blanket without lowering the temperature of the unfrozen water.

The work of Evermann and Clark (1920) at Maxinkuckee Lake affords an excellent source of information on daily temperature variations. Daily surface temperatures were taken at 6 a. m., 12 m., and 6 p. m., for the period July 1, 1899, to June 30, 1901, and infrequent observations were taken during some of the following years until 1913.

Observations during each winter period, December 15 to March 31, generally gave variations in water-surface temperatures of less than 1°F in any one day. These small variations in water temperature may be accounted for, even on days of wide variations in air temperatures, by the fact that the temperatures of open surface water are generally below 39°F during this period and for the greater part of the time near the freezing point of 32°, and a continued drop in air temperature results in formation of ice. The

temperature of surface water immediately below ice cover usually will be between 32°F and 34°F, with that in intimate contact with the ice remaining close to 32°F.

When lakes are open and water temperatures are between 32°F and 39.2°F any tendency for the water to become warmer will increase its density, as fresh water reaches its maximum density at 39.2°F; consequently, the heavier water will move downward and be replaced by colder and lighter water from below, thus maintaining a nearly constant temperature at the water surface. Of course, if this process continues long enough, the whole body of water will eventually become warmed to 39.2°F and the temperature at the water surface will gradually increase.

When the air temperature drops rapidly and the surface temperature of the water is between 32° and 39.2°F, the cooling water at the surface becomes lighter and remains at the surface, and results in a significant decrease in surface temperatures or the formation of ice. Such a change is more likely to take place between evening and the following morning, as air temperatures usually rise during the day and fall at night.

At Maxinkuckee Lake very few observations show more than 1°F increase in daytime surface temperatures during the winter months, but several instances of temperature drops of 3° to 4°F overnight have been recorded, particularly during mid-December when rapid cooling of the lake occurred as a result of below-freezing air temperatures.

During the spring and summer months when the water temperature of the lake surface is above 39.2°F, daily variations of 6°, 8°, and 10°F in the water at the surface are not uncommon. These variations are possible because of a greater differential existing between surface temperatures and those a short distance below the surface. The top few inches of water may be warmed very rapidly under the hot summer sun, and because the water becomes lighter as its temperature increases it will remain on top. Consequently there will be very little mixing with the water underneath, particularly on calm days. On cool days this same top layer will be cooled until it reaches the temperature and density of the water of the next lower stratum after which any further cooling and increase in its density will cause it to decend and the lower, less dense water to rise to the top. After this action has started the movement of the lower and more uniform temperatured water to the top will maintain a rather constant or very slowly cooling lake surface temperature throughout the day.

The general pattern of the annual cycle of lake surface temperatures for northern Indiana lakes is as follows. Temperatures for the months of January and February range between 32° and 34°F. March temperatures continue in this range until the ice cover leaves, usually about March 15th, then the temperatures begin to rise. The rapidity of this rise depends on the solar radiation absorbed by the water, the air temperature, the inflow of large quantities of relatively warm water from spring rains, and other factors. By April 1st the water temperature at the surface is up to 40° or 45°F. It will continue to rise in the following months, reaching about 55° by May 1st, about 65°F by June 1st, and about 75°F by July 1st. The term "about" is used as the temperatures may vary 5° in either direction, depending upon the weather conditions. During July and August the rate of increase diminishes, but temperatures continue to rise until about the third or fourth week of August when a maximum is reached. During July and the early part of August the water temperatures at the surface are about 80°F and then rise to a maximum of about 85°F during the latter part of August. Once the peak is passed, the water begins to cool rapidly, dropping to about 65°F by October 1st, about 55°F by November 1st, about 40°F by December 1st, and about 33°F by December 15th. The lakes usually freeze over during mid-December each year and there is little change from that time until the ice leaves the next spring.

Temperature Profiles

Although lake temperature profiles were made as early as 1875 it was not until the exhaustive studies of Evermann and Clark (1920) that data in sufficient detail were collected to trace the temperature changes that take place from day to day in the depths of a lake.

On July 18, 1899, a regular observation station for temperature profiles was established at the deepest place in Maxinkuckee Lake, known as the Deep Hole, where the water had a maximum depth of 89 feet at the ordinary stage of the lake. Temperature profile readings were taken daily from July 18 to September 30, 1899, and from two to three times a week from July 17, 1900 to June 28, 1901. Readings were taken at the lake surface and usually at 5-foot intervals from the surface to the bottom.

The equipment used to obtain these observations is described by Evermann and Clark (1920, p. 197) as follows: "From July 18 to August 14, 1899, a self-registering Negretti-Zamba deep-sea thermometer was used. From August 15 to September 21, a Ritchie Thermophone was used, with not wholly satisfactory results, after which the deep-sea thermometer was again used."

Although these observations were made more than 50 year ago they still furnish one of the most complete sets of data upon which a theory for lake-temperature phenomena may be based.

Starting with the basic fact that water reaches its maximum density at a temperature of 39.2°F and that at lower or higher temperatures it will be less dense and therefore weigh less per cubic foot, it may be concluded that when waters of different densities come in contact with each other the heavier and more dense water will descend and the lighter or less dense water will rise.

There is only a small range of temperature between 32° and 39.2°F where colder unfrozen water will rise above warmer water. Above 39.2°F there is a range of about 50°F in temperature through which the water becomes progressively lighter in Indiana lakes. The density-temperature graph (fig. 2) shows that through

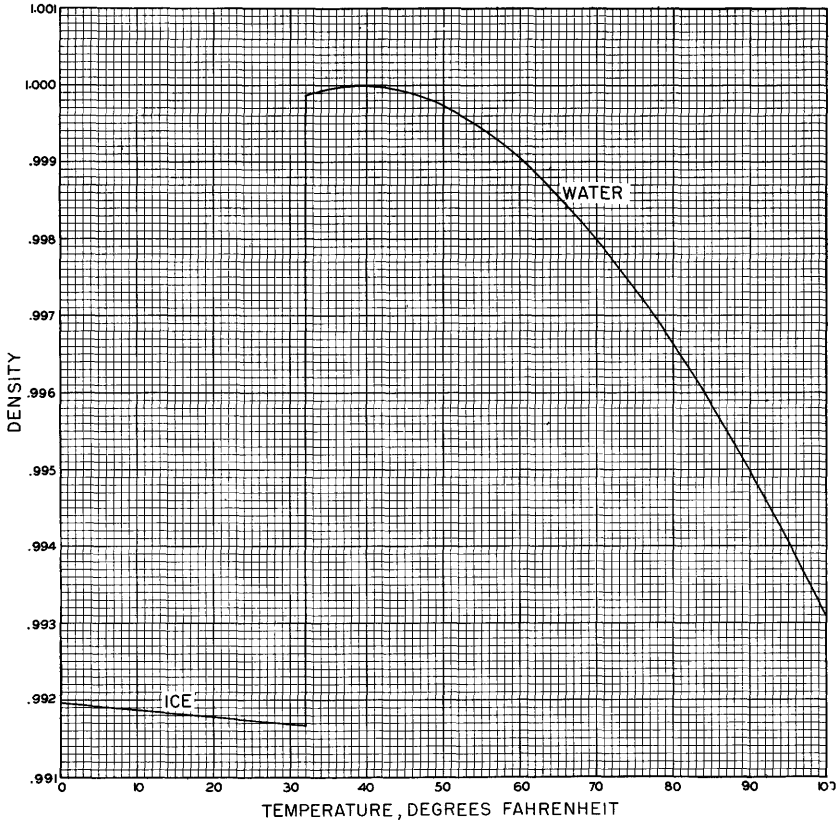

Figure 2. --Water temperature-density relationship.

the range of 37° to 42°F the variation from the maximum density is very slight. Beyond this range the density decreases with increasing rapidity. For example, the difference in the densities of water at 80° and 85°F is more than four times as great as at 45°F and at 50°F, and more than six times as great as at 42°F and at 47°F. The practical implication of this phenomenon is that there will be over six times as much resistance for water at 85°F to mix with water at 80°F as there will be for water at 47°F to mix with water at 42°F. It also means that at the higher temperatures there will be more stratification of water, or in other words, water of different temperatures existing in separate layers.

Water is a poor conductor of heat; so poor in fact, that so far as lake temperatures are concerned the amount of heat that one layer of water will absorb from another layer with which it is in contact is negligible. Most of the heat in the water is transferred by convection — that is, by water of one temperature moving through water of another temperature.

The principal gain or loss in heat of the whole body of water in a lake is largely due to absorption of solar radiation or radiation from the lake surface and to the energy used for evaporation. There is also some gain or loss of heat by contact of the water with the bed of the lake, and by the sensible heat carried into or away from the lake by the inflowing and outflowing water.

Theory of Temperature Changes Below the Surface

With the foregoing principles in mind, it is possible to analyze the processes that take place in changing water temperatures within the body of a lake. Starting at a time when the entire lake is at a temperature of 39.2°F, the point of maximum density, which occurs shortly after the ice leaves, progressive changes that occur in the spring, summer, fall and winter months may be followed and analyzed in a logical manner.

From figure 3 it is evident that the temperature of the air in contact with the surface of the lake varies considerably from day to day and that the temperature of the water at the surface of the lake follows the trend of the air temperatures. In the spring months the general tendency is for the air temperatures to gradually increase. As the surface of the lake warms in following this trend, the warm water remains at the surface provided the weather is calm, but if the weather is windy the warm surface water mixes with the water immediately below, thus deepening the layer of warmer water to the depth of wave disturbance.

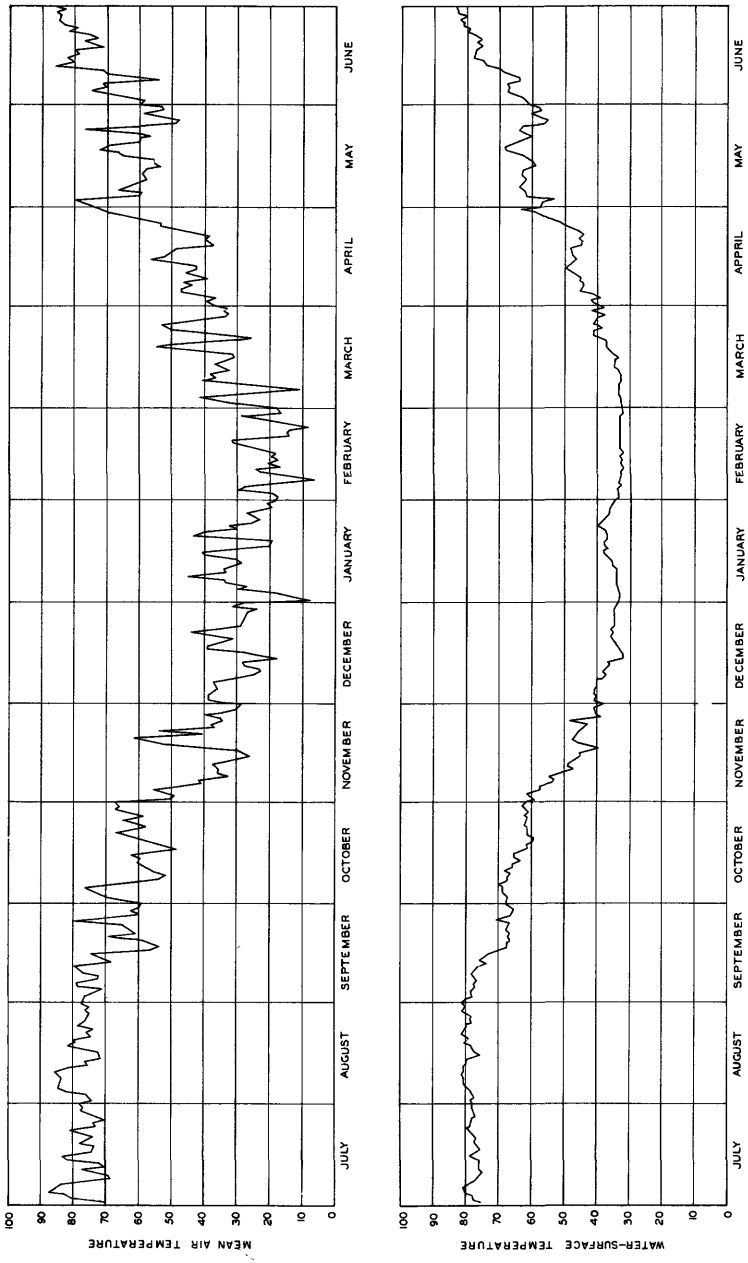

Figure 3.--Water-surface temperatures and mean air temperatures, Maxinkuckee Lake at Culver, Ind. Data from Evermann and Clark.

Wind, undoubtedly, plays an important part in creating a uniform temperature in the upper layers of lake water. This may be particularly true of the larger lakes where the wind has sufficient sweep to create sizable waves. The depth to which wind action affects water temperatures in relatively small lakes is still uncertain, but the data available on air and water temperatures tend to indicate that such effects are far less significant than those produced by the convection currents in the water.

There is very little variation in the density of water in the temperature range 37° to 42°F. Consequently, as the surface temperatures increase slightly above 39.2°F, there is very little resistance to water of different temperatures mixing and the least disturbance tends to mix the whole body of water and raise its temperature uniformly. As the water temperatures rise beyond 42°F more resistance to mixing develops and stratification begins to take place. At this point the resistance to mixing is still not too great and water at the lower depth will continue to warm slowly for another 2° or 3°F, but at the same time the surface temperature will increase at a more rapid rate and thereby increase the differential between surface temperature and temperatures at lower depths.

If a situation could exist in which the air temperature would continue to gradually increase without the usual daily fluctuations and the weather would continue calm, a layer of warm water of relatively shallow depth would form on the surface with a gradation to the 42° to 45°F water below. But as the air temperature does fluctuate there will be periods when it will be cooling the water surface. As the water cools it becomes heavier and descends until it reaches its own temperature level displacing the lighter and warmer water. In this process the warmer water is cooled somewhat by the passage of the colder water through it and a vertical uniform temperature zone is developed in the upper layer of water. During the early stages of this process, while the surface temperatures are below 50°F, solar radiation or insolation plays an important part in shaping the events that follow.

In clear water "the sun's rays penetrate to considerable depths so that their energy is distributed throughout a large mass, with a consequent slow rise in temperature. About one-tenth of the insolation incident at the water's surface reaches a depth of 30 feet, and small amounts penetrate much deeper. ***In quiet water daily temperature changes are felt at least 20 feet below the surface." (Trewartha, 1943). Consequently, during the early stages when the variation in density per degree of temperature is low and the resistance to mixing is slight a gradation in the temperatures from 45° to 50°F takes place through a depth of about 20 feet.

The surface temperatures of northern Indiana lakes reach 50° during the latter part of April or about the first of May. At that time of year the air temperatures do not drop much below 45°F. Consequently, during the cooler spells the surface water is not cooled enough to descend below a depth of about 20 feet where the water remains at a temperature of 45° to 46°F. As the process of heating and cooling goes on three distinct temperature zones are developed. The first, a rather uniform warm zone, extends down from the surface to the second zone in which the temperature changes quite rapidly, and finally the third, a colder zone, that reaches to the bottom. These zones are called the epilimnion, thermocline, and hypolimnion respectively (see fig. 4).

When the epilimnion temperature graph is vertical, that is, when a uniform temperature exists throughout this stratum, water that has been cooled at the surface descends rapidly to the thermocline. As this water reaches its own temperature level it has sufficient momentum to slightly penetrate or dig into the stratum of colder water below. This disturbance mixes warmer water with colder water and raises the temperature of the next layer slightly and thus increases the depth of the epilimnion and gradually moves the thermocline to lower levels. During the warming stages of the lake the thermocline descends rather slowly and the epilimnion will not extend deeper than to about the 20 foot depth, because the portion of the day devoted to cooling the water is less than that devoted to warming the water and the descending cold water has not been cooled enough to penetrate deeper than the upper part of the thermocline.

After the water temperature peak has been passed, in the latter part of August, the portion of each day during which the water is cooled exceeds the warming period and the thermally induced currents in the water are working longer hours. The temperature of the epilimnion decreases rapidly and extends to deeper depths as the currents eat into the thermocline and push it toward the bottom. This process continues until the epilimnion extends from top to bottom in the lake. As cooling goes on the water remains at a uniform temperature throughout its depth until it has cooled to about 37° or 38°F. Any further cooling will lower the surface temperatures and produce a reversed thermocline in the upper layers.

At the time ice forms, the water below the surface will be at very nearly 35° or 36°F throughout its depth except for the last few feet at the bottom which will approach 39.2°F. This uniform temperature is possible because of the slight difference in density of water at 36°F and 39.2°F and the lack of resistence to mixing. After the ice cover has formed, the water in contact with the ice will be only slightly above 32°F. The effect of air temperatures on the water is then very slight since the water is protected by the ice blanket.

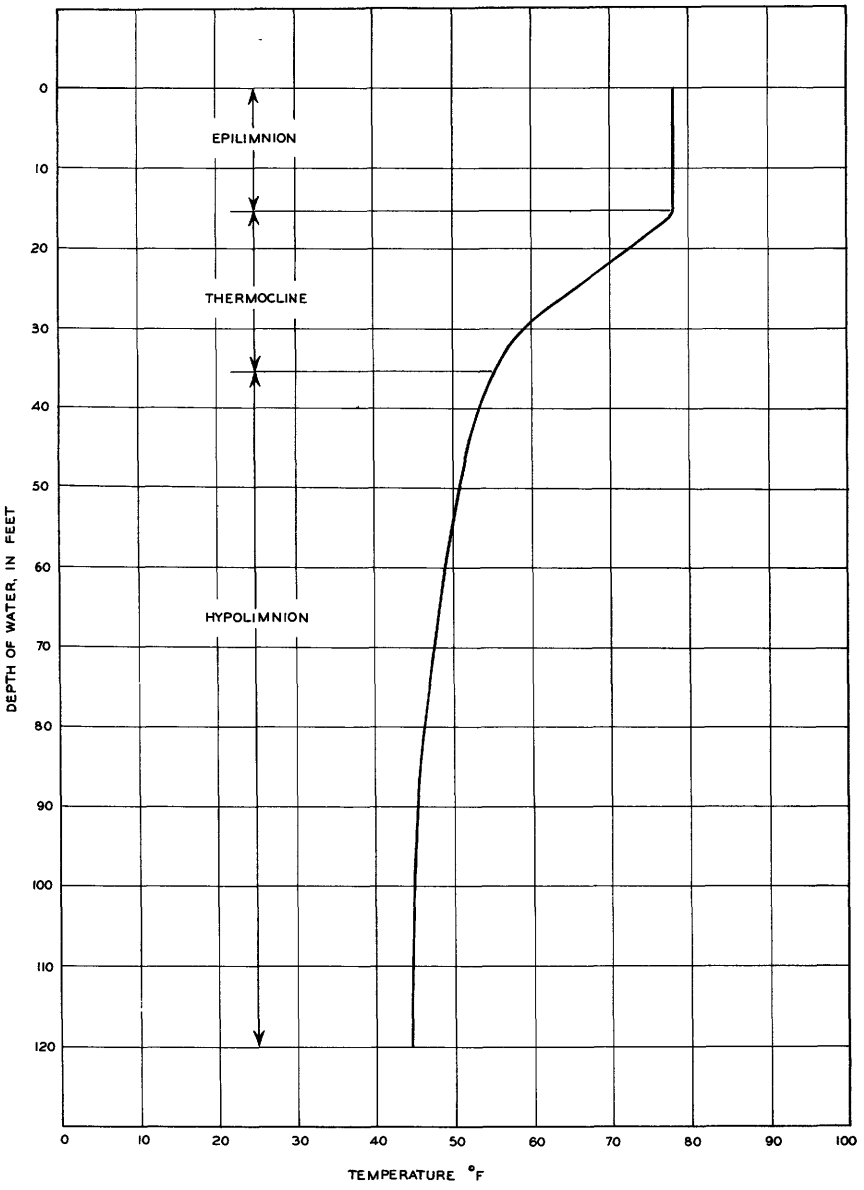

Figure 4. --Typical temperature profile graph with temperature zones indicated.

During the period of ice cover, ground temperatures have more effect on the temperature of the water than air temperatures. Ground temperatures some distance below the ground surface remain at approximately 52°F in the lake region of northern Indiana. The ground in contact with the water is somewhat colder than 52°F during the winter months because it is cooled by the water. In cooling the ground, the water picks up heat which gradually raises the temperature of the lake through the winter until a temperature of about 39°F is reached. Heating above this point is prevented because the warm water rises to the top where it is immediately cooled by the ice and any excess temperature is taken up in melting the ice. From this point on there is practically no change in lake temperatures until the ice melts.

The temperature profiles taken in Maxinkuckee Lake during 1900 and 1901 (Evermann and Clark, 1920) offer a splendid opportunity to follow day to day changes in water temperature and to observe how the theory of temperature change, as described above, really works. From these observations, 30 graphs (figs. 5-9) have been prepared for selected days to show the progress of temperature changes throughout the year. The graphs are considered to be typical of those that might occur at approximately the same time in any year.

The normal temperature cycle extends from the breakup of ice, usually about March 15, in one year until the breakup the following year. Unfortunately, the temperature profiles of 1900 and 1901 do not coincide with the cycle as described, but begin at another point on the cycle. For illustrative purposes the sequence of observations have been changed to coincide with the pattern of the normal temperature cycle. The observations for the period March 26, 1901, (the day after the ice disappeared) to June 30, 1901 (figs. 5 and 6), have been arranged ahead of the observations for the period July 17, 1900 to March 14, 1901 (figs. 7-9).

Figure 5, A shows that a uniform temperature of 40°F existed from the surface to the bottom of the lake on March 26 the day after the ice disappeared. This follows the theory that the entire body of water will be very near the temperature of maximum density, 39.2°F, at the time of the breakup of ice in the spring.

By April 19 (fig. 5, B) the entire body except for that in contact with the ground, has warmed up about 2°F. This indicates that free circulation took place in the 40° to 42°F range of water temperatures that existed during the period from March 26 to April 10. In this range the variation from maximum density is small and the resistance to mixing of water of different temperatures is slight.

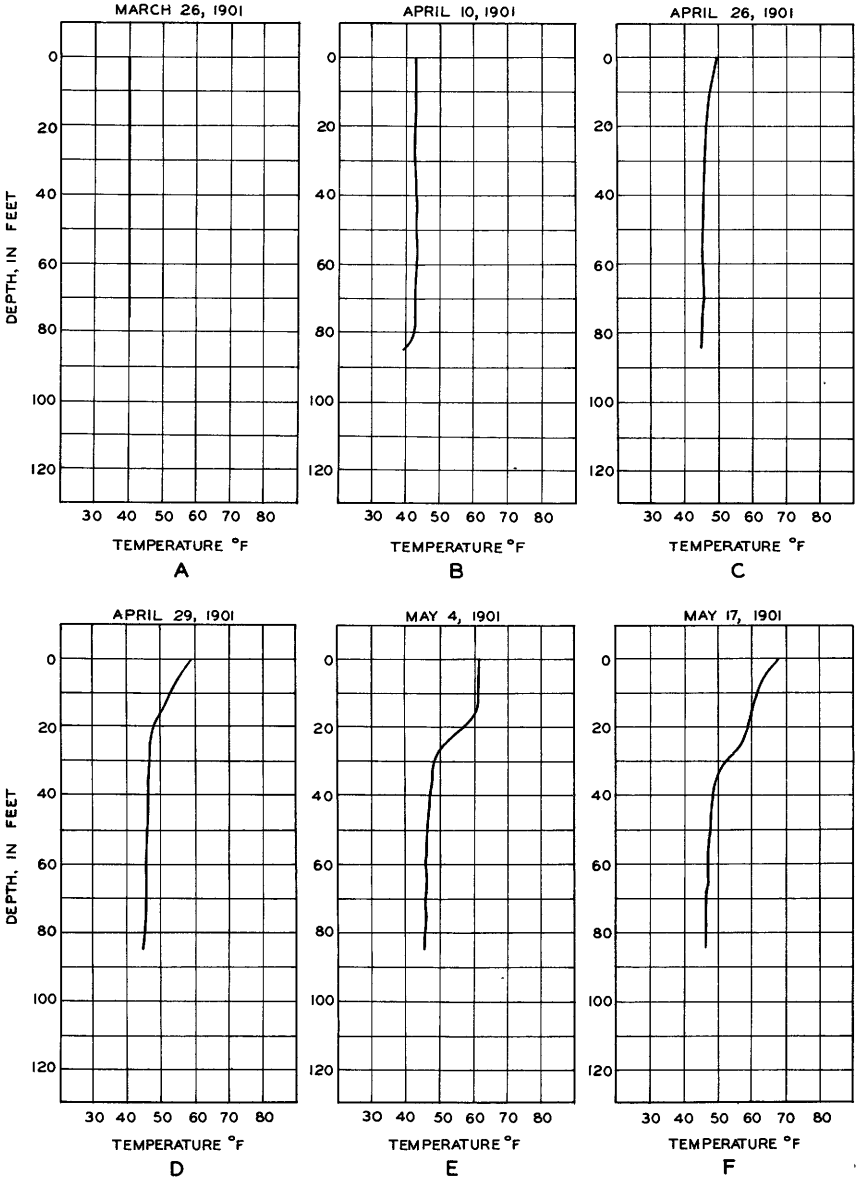

Figure 5.--Temperature profiles for Maxinkuckee Lake at Culver, Ind., at intervals for March to May 1901. Data from Evermann and Clark.

On April 26 (fig. 5, C) the water surface had warmed enough so that resistance to mixing of water of different temperatures was noticeable and a thermocline started to develop. By April 29 (fig. 5, D) this thermocline extended to a depth of 20 feet, a depth significant in that for all the deeper lakes in northern Indiana, it has been found to be the depth to which the thermocline descends in the early stages of its development and the depth at which the epilimnion ends during the warming period. The depth is believed to be controlled by the depth to which the sun's rays are able to penetrate with sufficient energy to warm the water. The thermocline for April 29 also indicates that gradual warming of the water was continuing after April 26 with no cooling periods to develop an epilimnion. This is also borne out by the minimum and maximum daily recorded air temperatures which gradually increased from a minimum of 50°F on April 25 to a maximum of 85°F on April 30, 1901, without the minimum air temperatures ever falling below the minimum observed temperature of the water. On May 3 and 4, 1901, the minimum daily air temperature fell to 52°F and 49°F respectively. These air temperatures developed an epilimnion and caused the thermocline to descend as shown in figure 5 E.

Air temperatures registered in the fifties from May 4 to 15, with a minimum of 43°F occurring on May 15. This period was followed by rapidly warming weather with the air temperature rising to 84°F on May 17, 1901. The water-temperature graph for May 17 (fig. 5 F) shows that the cold weather during the period May 4-17 forced the thermocline to descend deeper, and the warm weather at the end of the period caused a secondary thermocline to start forming in the upper layers. Temperature profiles for other dates during this period confirm the depressing of the thermocline during cooling periods.

Cooling weather between May 17 and 24 caused a vertical epilimnion (fig. 6 A) to form again, the secondary thermocline to be deepened, and the primary thermocline to be shortened greatly.

Variable air temperatures, with minimums as low as 43°F between May 24 and June 6, caused the primary thermocline (fig. 6 B) to descend to nearly the 60-foot depth, with secondary and tertiary thermoclines slightly in evidence at about the 38- and 20-foot depths. These thermoclines merged to form an essentially new elongate major thermocline.

Warm weather between June 6 and June 28 gradually increased temperatures at the surface and in the upper layers, but made only very slight changes in water temperatures below a depth of 30 feet. The graphs for this period are shown in figures 6 C-F.

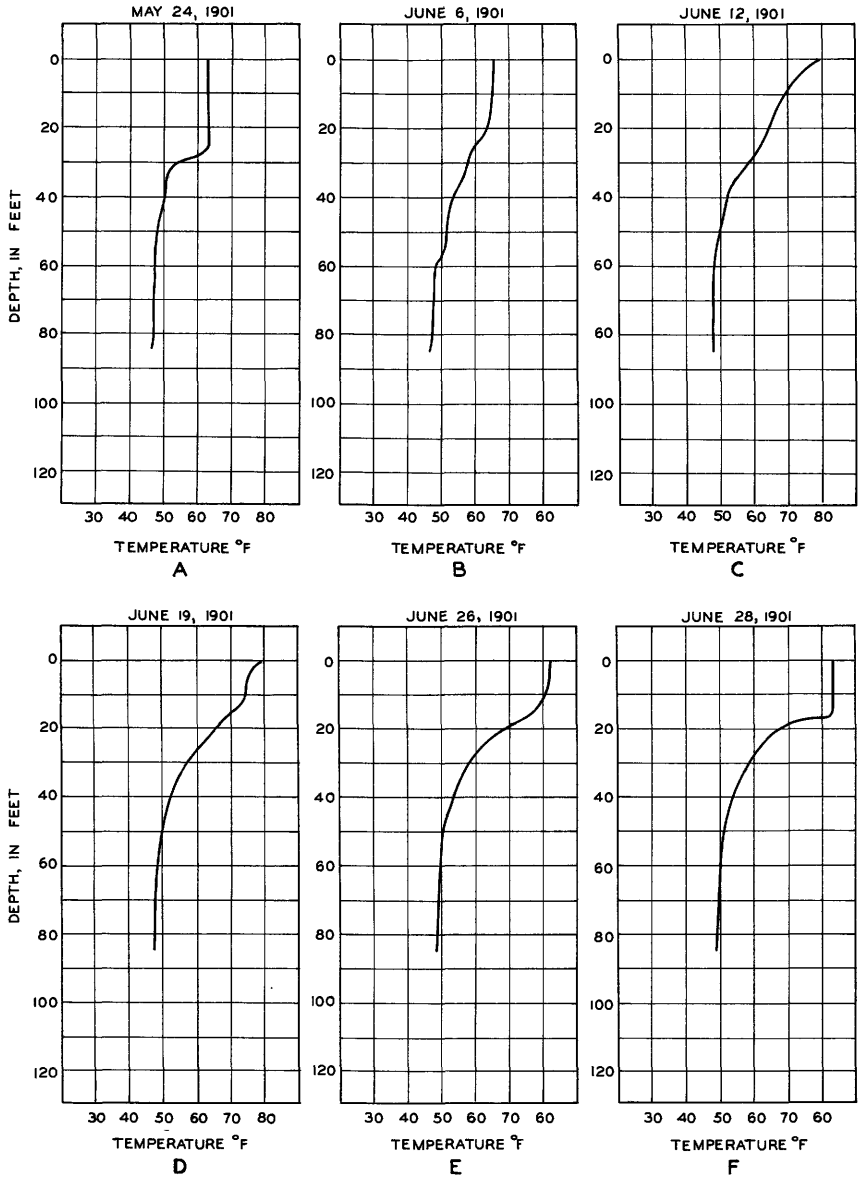

Figure 6.--Temperature profiles, for Maxinkuckee Lake at Culver, Ind., at intervals for May to June 1901. Data from Evermann and Clark.

The graphs in figures 7 A-D cover the period of gradual warming of the upper layers of the lake until the maximum amount of heat is reached about the third week of August. Until this time, the lake has been warming since the breakup of ice and all the temperature-profile graphs have been typical of the warming period.

The graph for September 5, 1900 (fig. 7 E), is representative of the first cooling period. The epilimnion has retreated and the upper part of the thermocline descended slightly.

By September 22 (fig. 7 F), the epilimnion has cooled 11° or 12°F and is vertical for a depth of 40 feet. The thermocline has descended to nearly the 50-foot depth and is much shortened. For the first time during the year, water of over 60°F temperature has penetrated below a depth of 40 feet.

By October 17 (fig. 8 A), the thermocline is down to a depth of about 55 feet, 60°F water down to the 52-foot depth, and the epilimnion cooled to 63°F.

The thermocline dropped to a depth of 65 feet by November 2, (fig. 8 B), and the epilimnion with water 60°F descended to 60 feet.

By November 9 (fig. 8 C), the thermocline had disappeared entirely and only the epilimnion remained from surface to bottom. a nearly uniform temperature existed throughout the entire body of water.

A point of particular interest is that the epilimnion did not penetrate below 25 feet from March 26, when the ice cover disappeared, until September 5, a period of 5 months. Then during the cooling period September 6 to November 9, a period of slightly more than 2 months, the epilimnion dropped from a depth at 20 feet to the bottom at 85 feet. This phenomenon clearly demonstrates the greater rapidity of heat penetration to the lower depths during the cooling period than during the warming period.

Once the epilimnion reaches the bottom of the lake the whole body of water cools uniformly and the temperature-profile graph remains a straight line (figs. 8 D and 8 E) until the water has reached a temperature of about 40°F.

By December 17, 1900 (fig. 8 F), the lake had been almost completely frozen over several times. Water temperatures lowered past the point of maximum density and a slight temperature inclination had formed with temperatures ranging between 34°F at the surface and 36°F at the bottom.

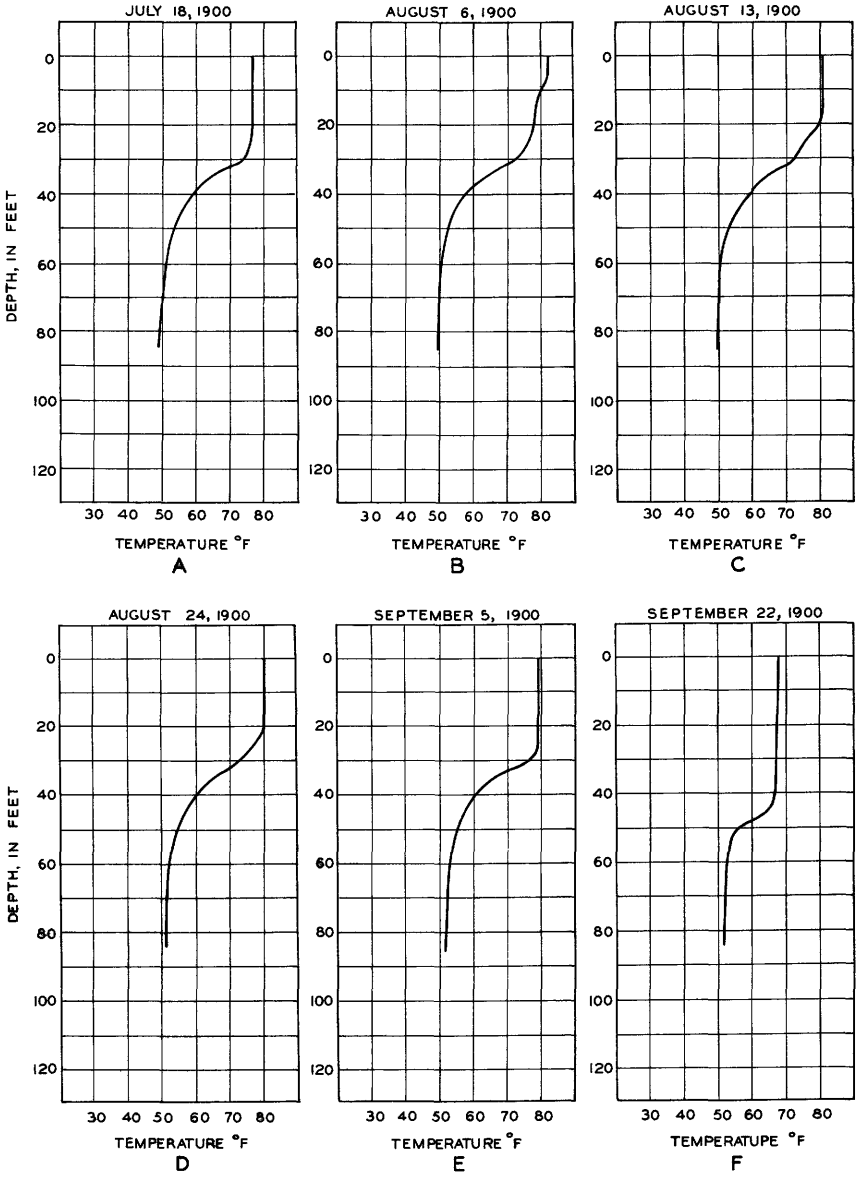

Figure 7. --Temperature profiles for Maxinkuckee Lake at Culver, Ind., at intervals for July to September 1900. Data from Evermann and Clark.

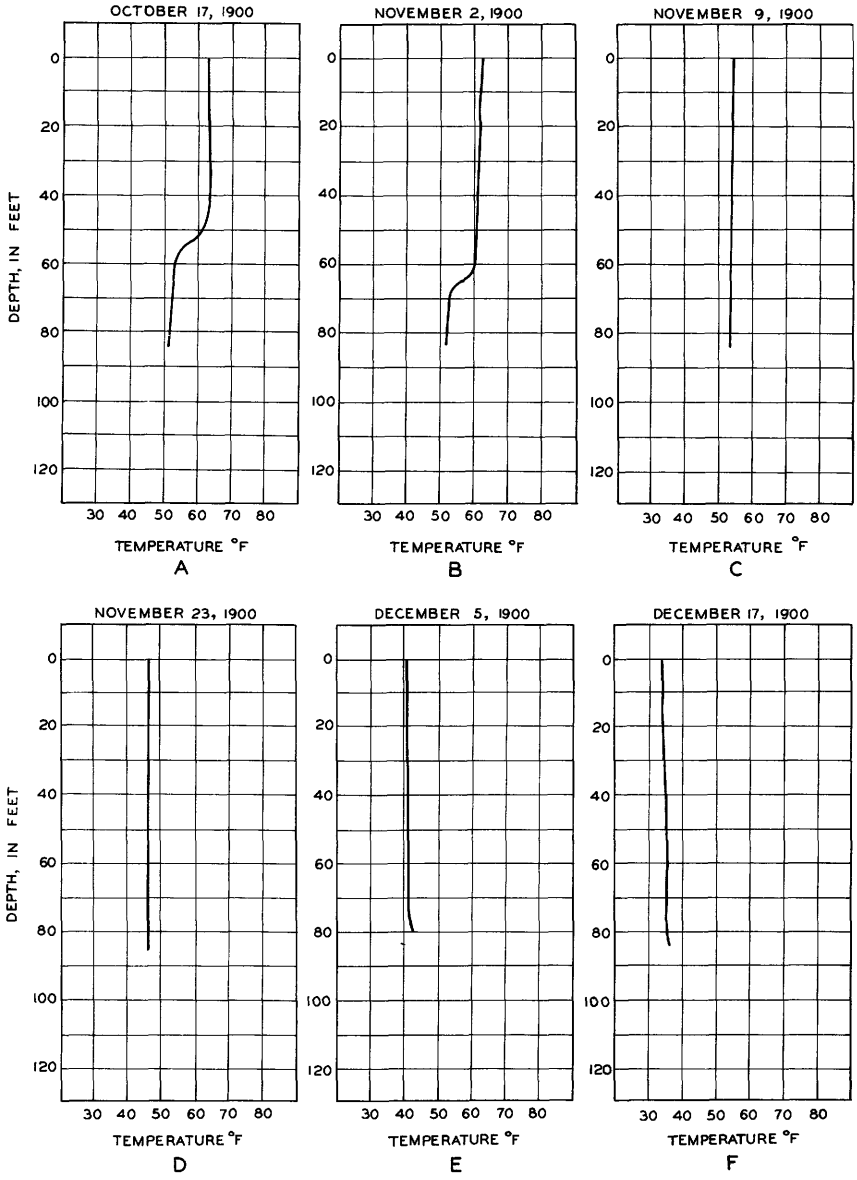

Figure 8.--Temperature profiles for Maxinkuckee Lake at Culver, Ind., at intervals for October to December 1900. Data from Evermann and Clark.

The temperature graphs shown in figure 9 are all for the period of ice cover. During this period the lake was either completely or almost frozen over.

The graphs show practically no change in water temperatures during late December and early January as open water existed at the observation point although most of the lake was under ice cover.

By January 26, (fig. 9 B), under the influence of ice cover, a slight reversed thermocline existed, water temperature throughout most of the depth had increased slightly, and water in contact with the bottom was somewhat warmer. The graphs in figures 9 C to 9 F are all typical of conditions under the ice cover. They show a gradual warming of the water through the winter with a tendency to approach a temperature of 39.2°F.

The effect of ground temperatures upon the lower lake strata may be seen by examining some of the temperature-profile graphs. When the water temperature at the bottom of the lake is above 52°F, the lower end of the temperature graph will incline in the direction of the 52°F temperature. When the water temperatures are between 39°F and 52°F there is no noticeable effect from the higher ground temperatures because any increase in water temperature will immediately cause the water so affected to rise to the surface (fig. 8 D). When the lake temperature is below 39°F the lower end of the graph will again bend in the direction of 52°F (fig. 9 B).

In the system of heat transfer herein described it should be noted that heat is carried to the depths of the lake only when the surface is cooling and vertical currents move down into the cooler strata of the thermocline below. While water is being heated on the surface the vertical currents are nonexistent and heat cannot penetrate to any considerable depth. Frequently, when warming periods are rather protracted secondary thermoclines will be formed. When this happens the primary thermocline does not deepen until the secondary thermocline has descended and merged with the primary thermocline (figs. 7 B to 7 E).

Comparison of Temperature Profiles in Ten Indiana Lakes

The temperature-profile observations since 1946 have been taken about once a month and therefore do not show the daily changes shown by the Evermann and Clark (1920) studies. However, as they have been made on a number of lakes they do show the effects of depth, size, and other characteristics.

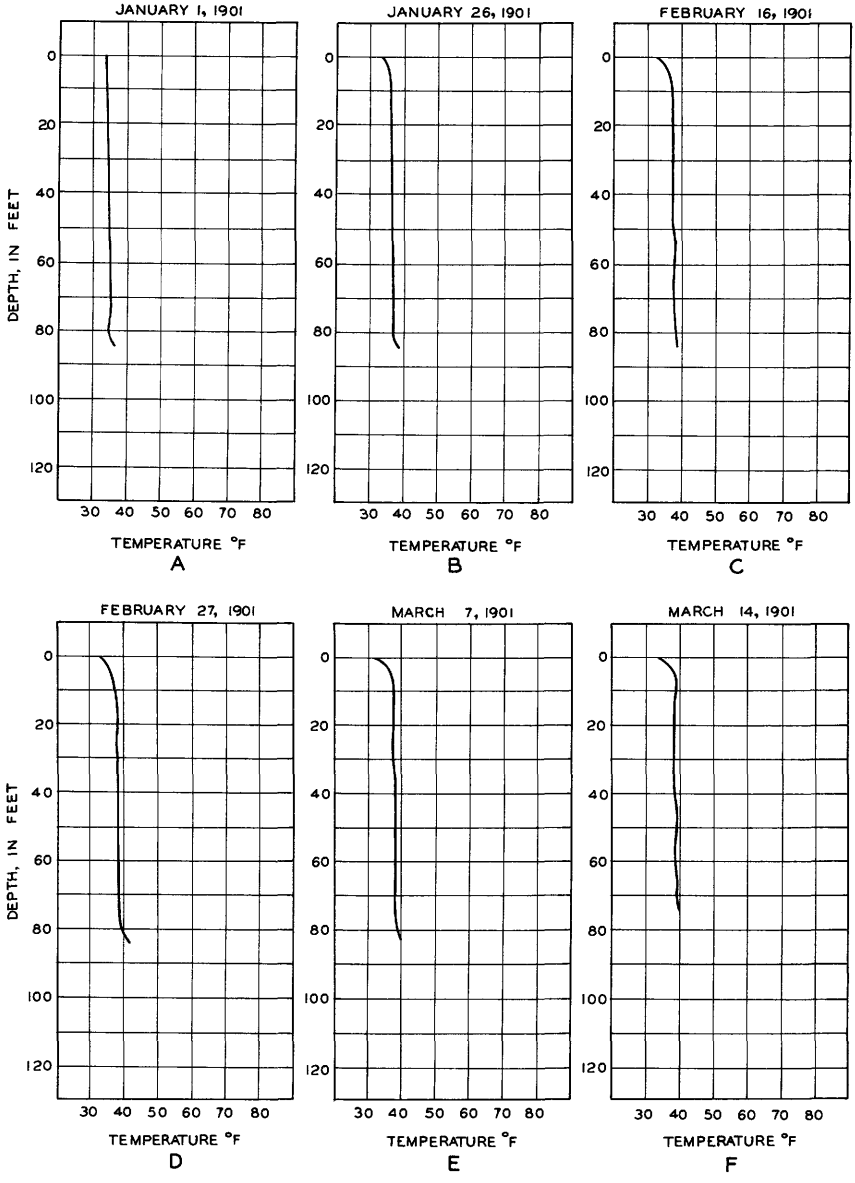

Figure 9.--Temperature profiles for Maxinkuckee Lake at Culver, Ind., at intervals for January to March 1901. Data from Evermann and Clark.

The equipment used was a Leeds and Northrup Thermohm calibrated to give direct temperature readings. The temperature scale was graduated to half degrees, and readings to tenths of a degree were obtained by estimating between scale graduations. Surface temperatures were also read on a mercury thermometer or tube thermometer filled with red liquid, graduated in degrees from 20° to 120°F for comparison with the Thermohm readings. Surface readings were made about 1 inch beneath the surface of the water.

Tippecanoe Lake, 117 feet deep, is the deepest lake in the State, and at the bottom has the coldest water recorded for any lake in the State. The temperature of the water at that depth does not rise above 45°F. The upper part of the temperature graph follows the general pattern previously described. The epilimnion does not extend below 20 feet until after the peak temperatures have been reached in August (fig. 10); then it descends rapidly to about 100 feet and is obliterated because the temperatures at the surface have decreased to the same temperatures as those at the bottom.

In Maxinkuckee Lake (fig. 11) the bottom temperatures at 80 feet average about 10°F warmer in the summer and early fall than the temperatures at the same depth in Tippecanoe Lake. Temperatures at the surface and first 10 to 15 feet of depth are about the same as those of Tippecanoe Lake, but the thermocline is generally at a considerable lower depth.

Cedar Lake (Lake County), the shallowest lake studied, with a maximum depth of 15 feet, is 4° to 5°F warmer in spring and 4° to 5°F cooler in the fall than Tippecanoe and other deeper lakes. The temperature graphs for Cedar Lake (fig. 12) is about the same as the temperature graphs for the upper 15 feet of other lakes. The lake, being less than 20 feet deep, seldom develops more than one temperature zone and thus lacks a thermocline and hypolimnion. Because of the shallower depths and the smaller volume of water in proportion to surface area, the temperature changes are more rapid and pronounced than in the deeper lakes.

In the upper 10 feet, Flint Lake (fig. 13) has about the same temperature in summer as Tippecanoe Lake. However, it is much colder between the depths of 10 and 40 feet. The colder thermocline may result from the considerable quantities of ground water pumped into the lake in the summer months by the Valparaiso Water Department. At 70 feet it is 3° to 4°F warmer than Tippecanoe at the same depth except in the winter months.

Bass Lake (fig. 14) has a large surface area and is very shallow, having an average depth of only 6 feet. Because of its shallowness it warms more rapidly in the spring and cools more

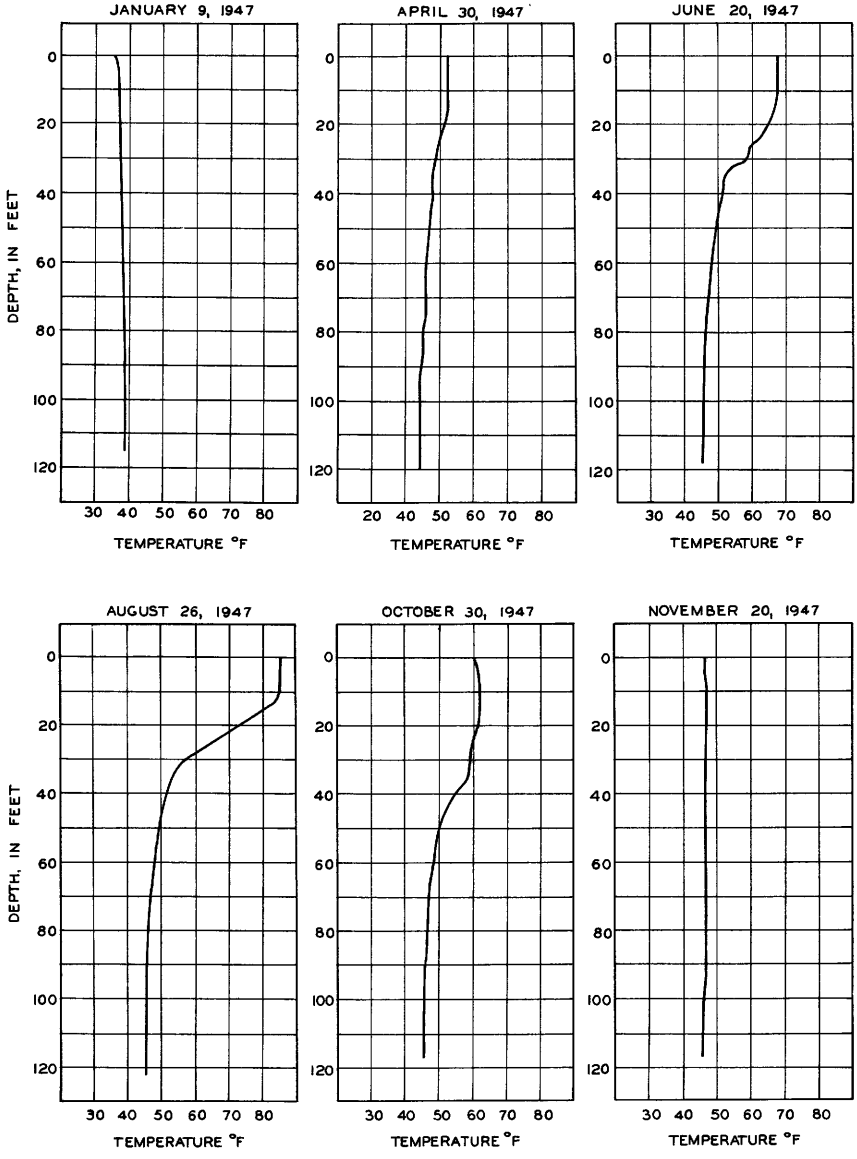

Figure 10. --Temperature profiles for Tippecanoe Lake at Oswego, Ind., at intervals for January to November 1947.

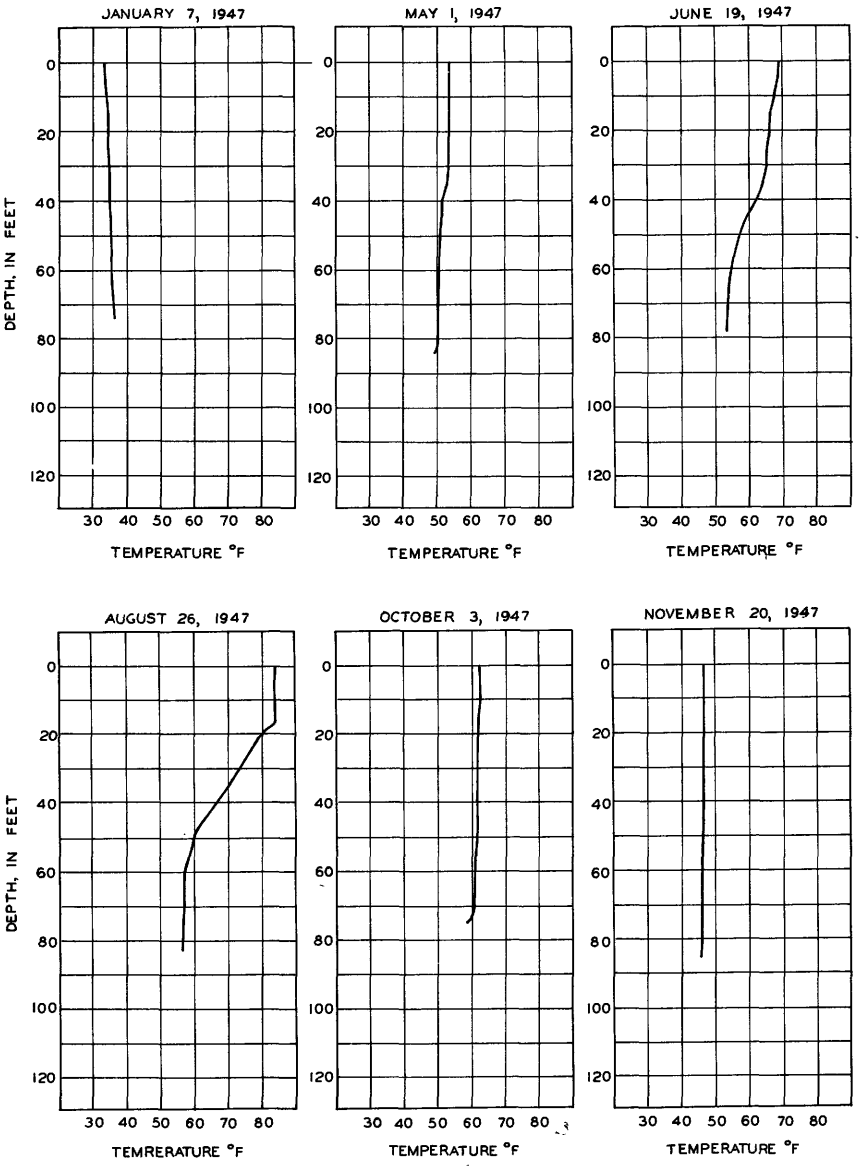

Figure 11. --Temperature profiles for Maxinkuckee Lake at Culver, Ind., at intervals for January to November 1947.

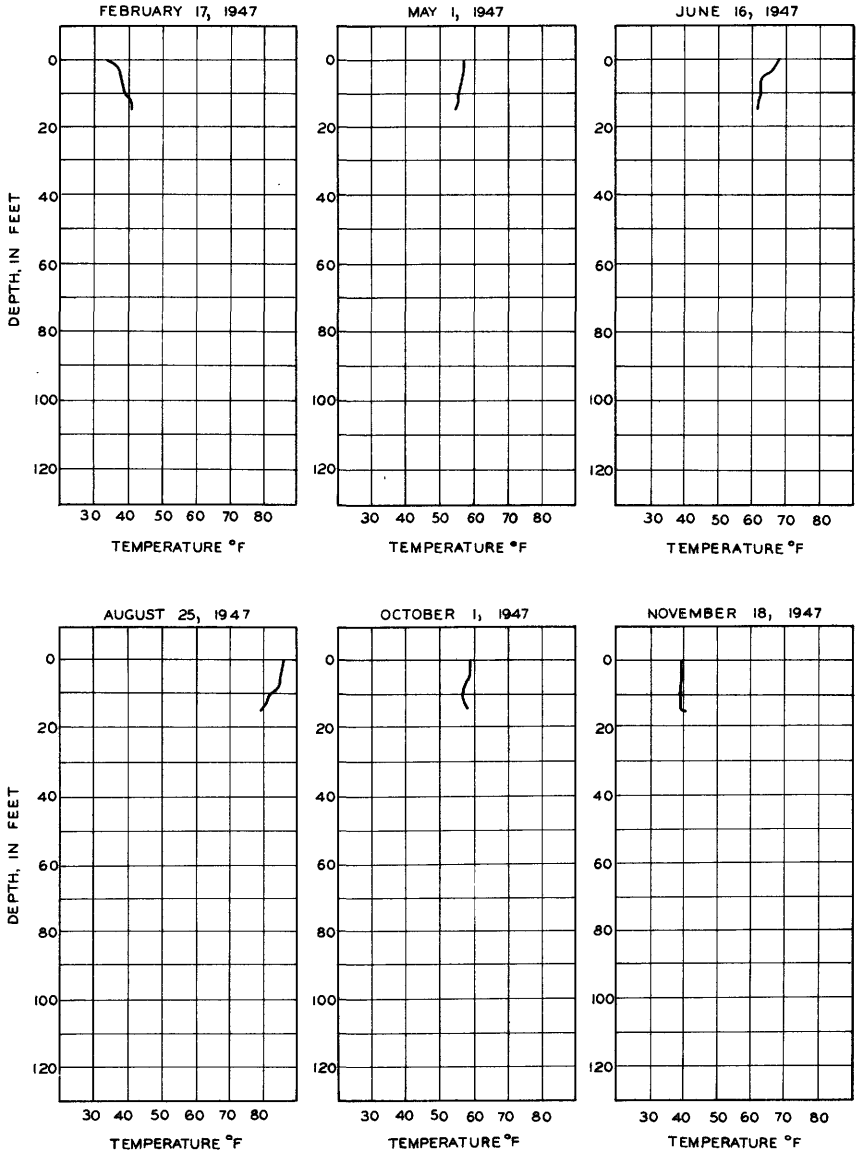

Figure 12. --Temperature profiles for Cedar Lake at Cedar Lake in Lake County, Ind., at intervals for February to November 1947.

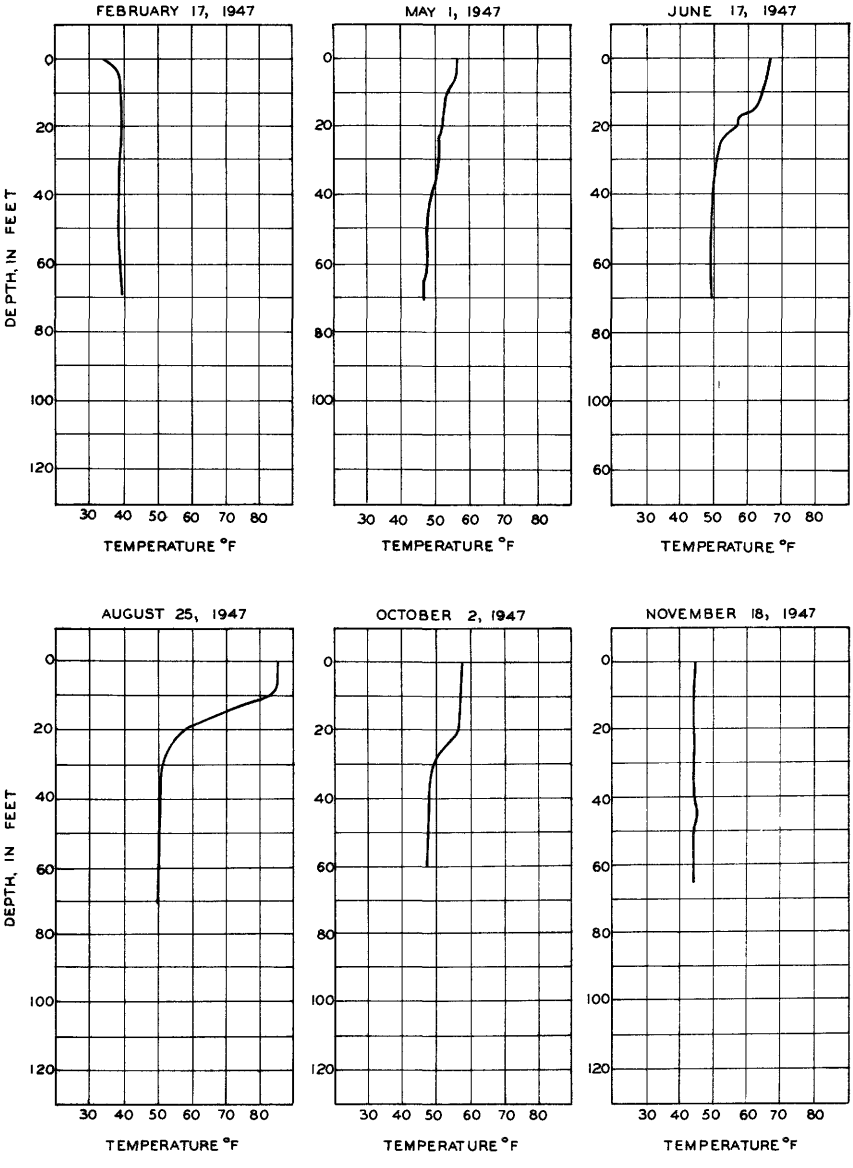

Figure 13. --Temperature profiles for Flint Lake near Valparaiso, Ind., at intervals for February to November 1947.

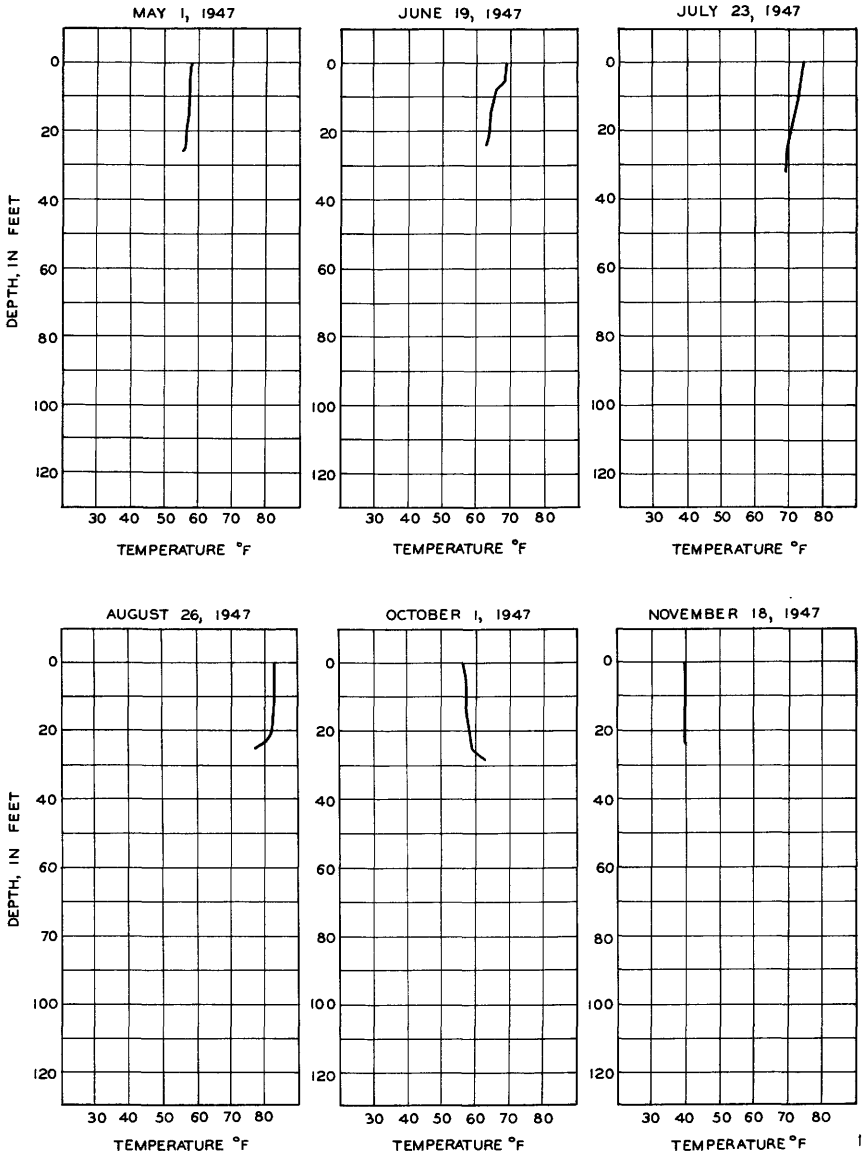

Figure 14. --Temperature profiles for Bass Lake at Bass Lake, Ind., at intervals for May to November 1947.

quickly in the fall than the deeper lakes. The surface temperatures during the summer are about the same as for other lakes but the warm water extends to much greater depths. The absence of a thermocline during most of the year is a significant difference from most of the other lakes studies. A nearly uniform temperature from the surface to the bottom at 33 feet is common even in the summer months, possibly due to the small volume of water to be changed in temperature in proportion to surface area available to absorb or radiate heat.

The temperature graph for Winona Lake (fig. 15) closely follows that for Tippecanoe Lake to a depth of 40 feet and then shows gradually warmer temperatures as the bottom is approached. The bottom temperatures at 75 feet average about 3°F warmer than the temperatures at a corresponding depth in Tippecanoe Lake.

In Wawasee Lake (fig. 16) the temperatures for the first 10 to 15 feet of depth are about the same as those in Tippecanoe Lake, but lower depths are much warmer than those for corresponding depths in Tippecanoe Lake, being about 8°F warmer at a depth of 60 feet, the bottom. Another peculiarity is that the thermocline extends to a depth of about 55 feet during the summer months, which is much deeper than in other lakes.

The temperatures for Bixler Lake (fig. 17) are about the same as those in Tippecanoe Lake for the upper 10 feet of depth and slightly cooler between 10 and 25 feet. At a depth of 37 feet, which is the bottom of Bixler Lake, the temperatures are about 3°F warmer than at the same depth in Tippecanoe Lake.

At Lake James (fig. 18) the temperatures are almost exactly the same as in Tippecanoe Lake except at the bottom, where the temperatures at 85 feet may be 1° to 2°F colder than those at the same depth of Tippecanoe Lake. This lake is the same depth as Maxinkuckee Lake but the bottom temperatures average about 14°F colder than those of Maxinkuckee Lake.

Clear Lake, with a maximum depth of 105 feet, is the second deepest lake in Indiana. The temperature graph (fig. 19) generally follows that for Tippecanoe Lake, except near the surface the temperatures for Clear Lake are about 2° to 3°F cooler and the bottom temperatures 2° to 3°F warmer than those for corresponding depths in Tippecanoe Lake. The thermoclines for Clear Lake and Tippecanoe Lake coincide.

From this survey and study of the various lakes in northern Indiana, the author concludes that in general the lakes follow the same pattern of temperature changes with no significant differences except in the shallow lakes.

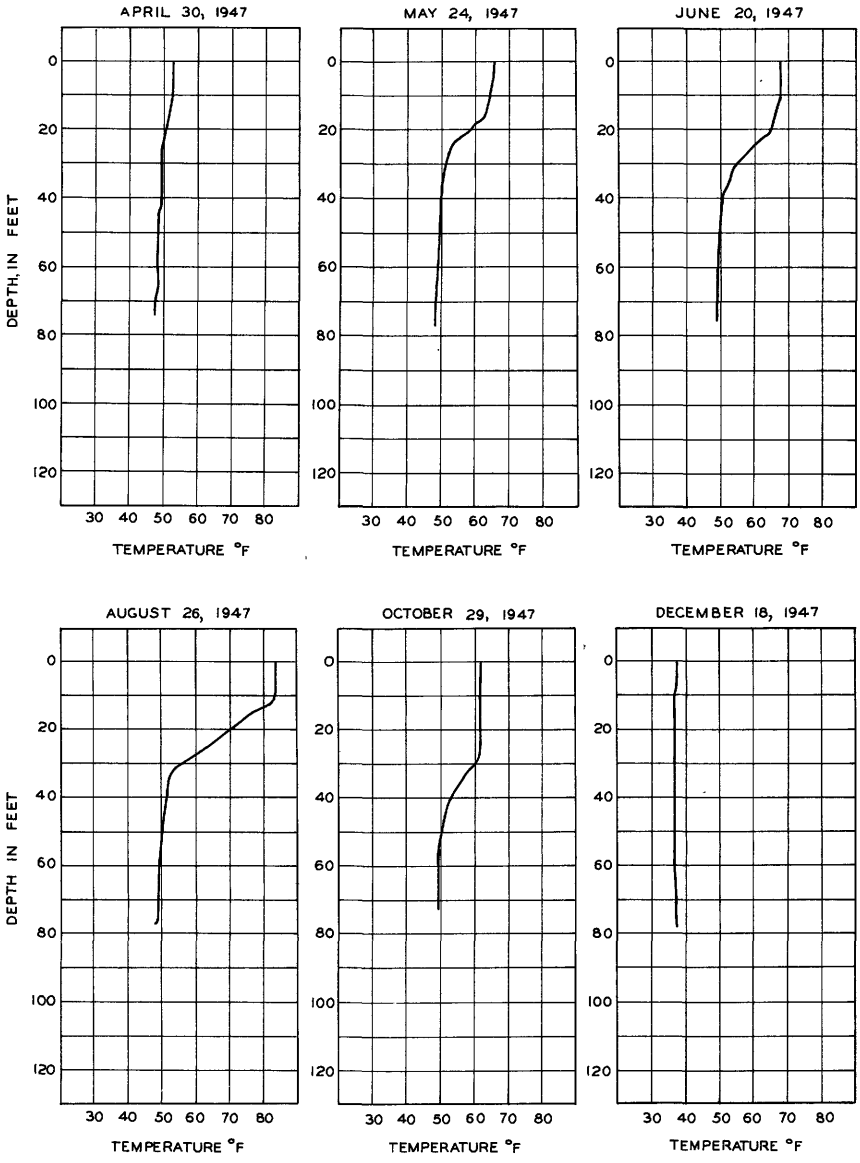

Figure 15. --Temperature profiles for Winona Lake at Warsaw, Ind., at intervals for April to December 1947.

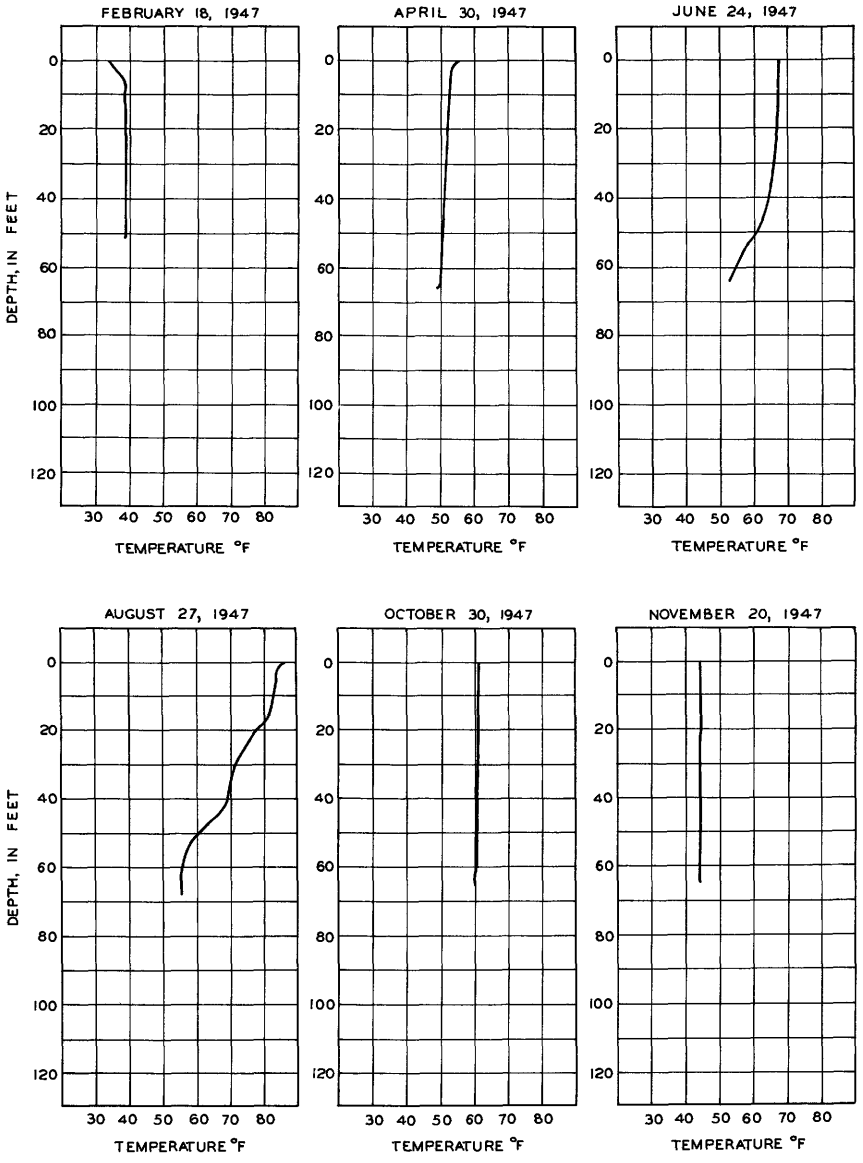

Figure 16. --Temperature profiles for Lake Wawasee near Wawasee, Ind., at intervals for February to November 1947.

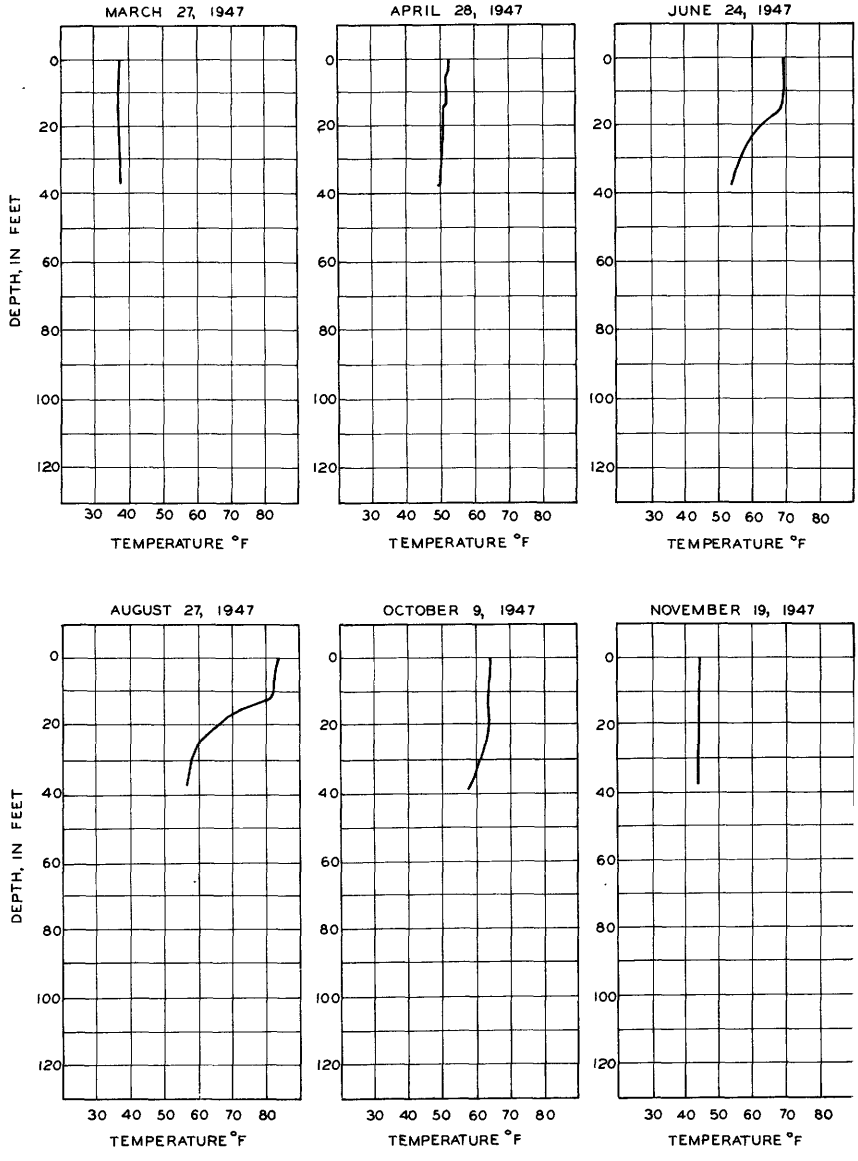

Figure 17. --Temperature profiles for Bixler Lake at Kendallville, Ind., at intervals for March to November 1947.

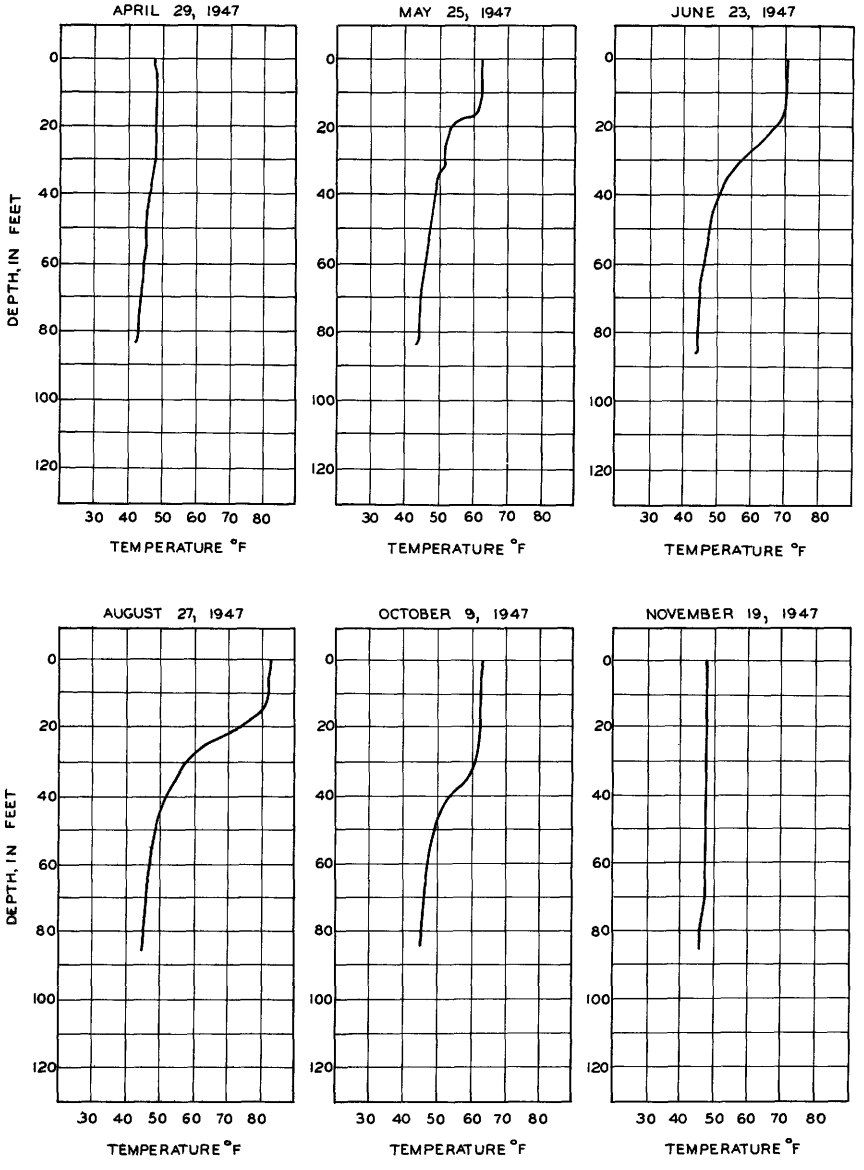

Figure 18. --Temperature profiles for Lake James at Lake James, Ind., at intervals for April to November 1947.

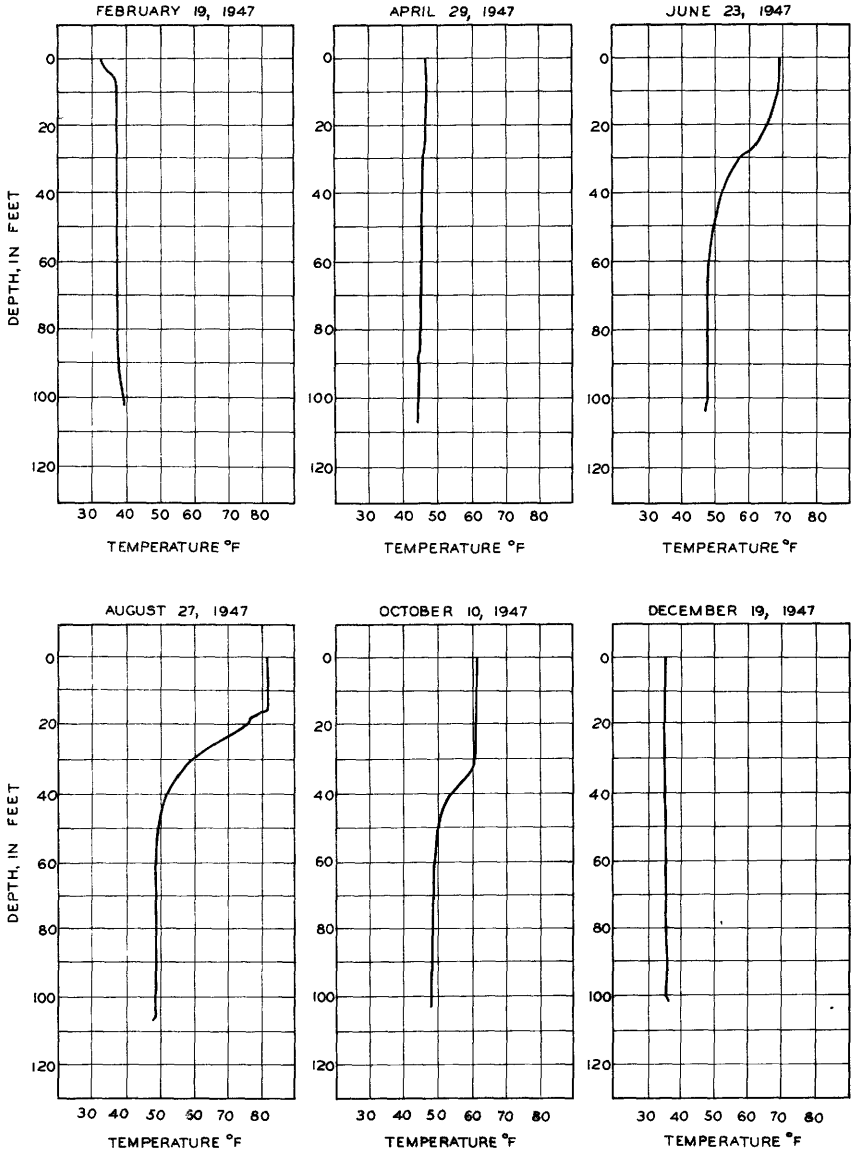

Figure 19. --Temperature profiles for Clear Lake at Clear Lake, Ind., at intervals for February to December 1947.

Effect of Size of Drainage Area

The size of surface drainage area contributing water to a lake appears to have little effect upon water temperatures, particularly temperatures below a depth of 20 feet. This indicates that the inflowing water, which is generally of a higher temperature than the lake water, flows across the surface of the lake rather than penetrating into the lower depths. This point is illustrated by the records for Clear Lake and Tippecanoe Lake. Both are deep lakes, but the former has a drainage area of only 7.25 square miles whereas the latter has a drainage area of 118 square miles. Clear Lake has no outflow during the low-water season; whereas Tippecanoe Lake has a considerable outflow throughout the year. The temperature graphs for these two lakes show no significant difference that might be interpreted as being due to the size of the drainage area.

Another and perhaps more significant reason for the inflowing water not materially affecting the temperatures is that the inflow is not in sufficient quantities to make a complete change in the water in the lake as rapidly as ordinary temperature changes occur. The average inflow into Tippecanoe Lake is about 100 cfs; the maximum daily flow is perhaps about five times as much. The total volume of the lake is 1,472,152,000 cubic feet. At a rate of 100 cfs inflow it would take 170 days to change the water in the lake completely, or if the maximum daily rate could be maintained for an extended period it would require about 35 days. These periods are too long for the inflow that actually occurs to have any appreciable effect upon the entire body of water in Tippecanoe Lake.

Effect of Size of Surface Area

The surface area of the lake does not appear to influence temperatures greatly. A comparison of the temperature graphs for Bixler Lake, area 112 acres, and Tippecanoe Lake, area 1,037 acres, shows great similarity. The slight difference in the two lakes are probably due to factors other than surface area.

Effect of Depth of Water

The depth of the water is the most important factor, other than climatological conditions, in determining the temperature characteristics of a lake. The deeper the lake the more water there is to be warmed or cooled per square foot of surface area. Lakes more than 20 feet deep have the same general characteristics for comparable depths. Those lakes less than 20 feet deep are likely to warm faster during the spring months and cool faster in the fall

months because the heat absorbed or lost per square foot of water surface will be confined to smaller volumes of water in the shallow lakes.

For those lakes studied that have depths of more than 20 feet, the thermocline, whose upper end usually was in the vicinity of the 20 foot depth through the summer months, appears to act as an artificial bottom to limit vertical circulation of the water and in effect makes all the deeper lakes react as though they were of the same depth.

Many of the small variations in temperature previously described for various lakes are probably due to variations in local weather condition. It should also be recognized that lakes located in somewhat warmer or colder climates would have characteristics peculiar to those climates, but the method of heat transfer within the bodies of the lakes would still be the same as those for the lakes of northern Indiana.

"Turnover" of Lakes

The spring and autumn "turnover" of lakes to which reference is frequently made is a phenomenon in which the water on the bottom of the lake rises to the top rather suddenly and the water at the surface descends to the bottom. A "turnover" on Maxinkuckee Lake in 1900 is described (Evermann and Clark, 1920) as follows:

> So long as the colder, heavier water is at the bottom, it will so remain, but let the upper end of the column (of water) become colder and, consequently, the heavier, it will go down, and the lighter bottom water will come up. This is precisely what does happen. If the series of temperatures from July 24 onward be examined, it will be observed that the difference between surface and bottom temperatures becomes successively less. By the 23rd of November, 1900, the difference was only 0.5 of a degree, the surface being 46.7° and the bottom 46.2°. Sometime between the 23rd and the 26th, probably on the night of the 24th, the temperature throughout the upper column fell below 46°, or lower than that of the lower end of the column. The upper half of the column then being the heavier, it of necessity went to the bottom, the bottom half came up, and the temperature of the lake became uniform throughout. This is shown by the serial temperature readings of November 26, which show that the temperature at all depths from top to bottom was 44°, a condition which practically continued until the ice went off. It can therefore be safely assumed that, in 1900, Lake Maxinkuckee "turned over"

some time between the evening of November 23 and the morning of the 26th; and what occurred then, in all probability occurs every November or December.

On the basis of studies and analyses of changing temperatures in Indiana lakes as contained in the preceding pages, the change from top to bottom does not take place suddenly but is a prolonged process extending over several months. Consequently, there is no "turnover" as described by Clark.

In the fall of the year there is no circulation throughout the entire depth of water until a uniform temperature has been established from top to bottom. Previous to such a time the circulation is only from the top to the thermocline. With the establishment of uniform temperatures throughout, the depth circulation continues until stratification again takes place at temperatures below 39°F.

During periods of ice cover, circulation occurs as a result of warming of the water from the bottom. This takes place probably at a rather slow rate, as it requires about 2 months for the water to rise from the 35°F temperature at the time the ice cover forms, to the 38°F temperature that is acquired later in the winter.

As soon as the ice cover disappears the convection currents are again set up from the top to the bottom until stratification again is established, after which the circulation is only between the surface and the thermocline.

As there is no circulation in the water below the thermocline from about mid-April to mid-October, the water becomes stagnant in depths below about 30 feet. This has been proven by profile chemical analysis of lake waters collected by various observers (Birge and Juday, 1911; and Ricker, 1937). During the late summer the epilimnion is usually well supplied with oxygen, while through the thermocline there is a gradually diminishing supply, and the hypolimnion is deficient in oxygen. The entire volume of water does not again become recharged with oxygen until the water temperatures have become uniform from top to bottom in the fall.

Implications of Temperature Information

In order to live, aquatic life requires that the water contain enough absorbed oxygen to support that life. Most lakes become stagnant and deficient in oxygen below a depth of 30 feet for approximately 5 months from mid-April to mid-September. Therefore, aquatic life accustomed to living in depths of 30 feet or more

which cannot readily adapt itself to shallower depths through a considerable portion of the year, cannot exist in most Indiana lakes. Also, as there is an increasing deficiency in oxygen in depths from 20 to 30 feet during mid-summer, it is probable that certain types of aquatic life will not be found in depths of more than 20 feet. Maxinkuckee Lake and Lake Wawasee are possible exceptions to this rule because the thermoclines in those lakes are located somewhat deeper than in other Indiana lakes. The water might be suitable for aquatic life 10 feet deeper in these lakes than in most other lakes. Conversely, Flint Lake has a summer thermocline at a higher level than other lakes and depths over 10 feet might be found unsuitable for some aquatic life.

One of the most interesting facts revealed by the studies of lake temperature in northern Indiana lakes is the large volume of cold water stored in the deeper lakes. During the late summer months the water from the deeper parts of these lakes is from 5° to 10°F colder than the nearby ground water. This cold water, because of its greater density, has been trapped near the bottom of the deep lakes since the previous winter and has warmed very slowly as the summer progressed.

For example, in Tippecanoe Lake, the deepest known lake in Indiana, it is common during late summer to find water 80°F in the upper layers and 45°F in the bottom 50 feet, and all water from 50 to 117 feet below the surface less than 50°F in temperature.

The following table gives the volume in gallons at different levels of Tippecanoe Lake:

Capacity of Tippecanoe Lake

Depth (feet)	Volume (gallons)	Depth (feet)	Volume (gallons)
Surface	11,011,697,000	60	1,932,383,000
5	9,600,812,000	65	1,665,998,000
10	8,472,559,000	70	1,420,385,000
15	7,452,922,000	75	1,192,910,000
20	6,495,774,000	80	981,675,000
25	5,612,805,000	85	786,806,000
30	4,811,360,000	90	606,815,000
35	4,113,671,000	95	442,008,000
40	3,536,073,000	100	292,543,000
45	3,057,891,000	105	165,084,000
50	2,640,836,000	110	73,267,000
55	2,268,609,000	115	19,186,000

The above table shows that the capacity of Tippecanoe Lake below the 50-foot level, where water 50°F or colder is found throughout the year, is 2, 640, 836, 000 gallons. This enormous volume would provide 7, 235, 000 gallons of water 50°F every day in the year without giving consideration to the 4-month period December 1 to March 31 each year when the temperature of the entire lake is quite likely to be below 50°F. By distributing the total volume of water below the 50-foot level over the period April 1 to November 30, it would provide an average of 10,820,000 gallons for each day of that 8-month period.

The same table shows that the capacity of Tippecanoe Lake below the 90-foot level, where water 45° or colder is found throughout the year, is 606, 815, 000 gallons. This volume would provide 1, 662, 500 gallons of 45°F water every day in the year if no other cold water was available. However, the whole body of the lake is at a temperature of 45°F or less from about December 1 to April 1, after which the level below which 45° water would be available gradually declines through the spring months so that withdrawal below the 90-foot level would be limited to the months of August, September, and October. Therefore, the 606, 815, 000 gallons of water below the 90-foot level would all be available for use in these 3 months, which would raise the rate at which water could be used to 6,650,000 gpd. By distributing the total volume of water below the 65-foot level over the period April 1 to November 30 it would provide an average of 6, 828, 000 gallons for each day of the 8-month period.

EVAPORATION FROM LAKES

Evapotranspiration is nature's most thirsty consumer of water. It alone consumes about 70 percent of the water that falls on Indiana as precipitation. The remaining 30 percent is drained away by streams.

Between precipitation and evaporation, water may pass through many processes and uses by nature. It may be temporarily stored in the ground, used by vegetation and later transpired from the leaves, collected in lakes and streams to be evaporated over a period of time, or passed on by streams to the ocean where it is evaporated into the atmosphere. In any case, water is almost continuously passing into the atmosphere wherever moisture is in contact with the air. Even during periods of precipitation some water is being evaporated into the atmosphere.

The rate of evaporation from water surfaces is dependent upon such conditions as temperature of water, area of water surface

in contact with the air, temperature and relative humidity of air, and movement of air. As these conditions change from place to place and season to season, the rate of evaporation changes also.

In Indiana evaporation usually reaches its highest rate in July and is lowest in January. Because of high evaporation rates in late spring, summer, and early fall, water losses from lakes due to evaporation are likely to exceed precipitation on the lake during those periods. The opposite is true during late fall, winter, and early spring.

Lake levels tend to rise during periods of low evaporation rates, when water accumulations are in excess of water losses, and tend to decline during the remainder of the year. The combination of a high precipitation and moderate evaporation in spring usually results in high lake levels in late April or early May. Minimum levels usually occur in October.

Evaporation is of particular importance to lakes that have no outlets. It is usually the principal means of water loss for such lakes, although in some instances transpiration by vegetation around the borders of the lake and underground outflow may account for sizable water losses.

The levels of lakes with outlets, particularly if there is constant inflow and outflow, are likely to be affected to a lesser degree by direct evaporation from the lake surface than lakes without outlets, even though the quantities of water evaporated are equivalent for equal areas. In such cases the inflow and outflow are the predominant factors.

Measurement of Evaporation from Water Surfaces

So many factors affect the amount of water in a lake that it is generally impractical or even impossible to separate and make direct measurements of the amount of water lost by evaporation. Factors such as inflow, outflow, precipitation, seepage, and changes in level must all be determined with a high degree of precision if the residual is to be considered evaporation. More precise methods for determining lake evaporation have been recently developed (Anonymous, 1952).

The usual method of determining amounts of evaporation is to measure the evaporation loss from a large pan. The loss from the pan is then corrected by a factor to reduce it to equivalent loss from a lake or pond. Many types of evaporation pans, both floating and land, have been used. The standard pan used by the U. S. Weather Bureau for collecting the data used in this report is the class A land pan (see fig. 20). This pan is 4 feet in diameter and

Figure 20. --Class A evaporation station, Kendallville, Ind.

and 10 inches deep, and a depth of water between 7 and 8 inches is maintained. The unpainted, galvanized iron pan is placed on timbers so that the bottom of the pan is about 6 inches above the ground. The pan is placed on a level, open spot exposed to the maximum possible sunshine. The depth of water is measured with a hook gage in a stilling well.

The total annual evaporation from the surfaces of lakes and streams is usually considered to be about 0.7 of the evaporation from a class A pan. The daily and monthly rates, however, may vary widely from this ratio. Pan evaporation is likely to be higher than lake evaporation in the spring months and lower in the fall months because the temperature of the shallow water in the evaporation pan changes much more rapidly than that of large bodies of water.

Collection of Evaporation Data in Indiana

Realizing that evaporation is an important factor affecting the levels of Indiana lakes, two evaporation stations were established in cooperation with the U. S. Weather Bureau in the lake region of northern Indiana on April 1, 1947. One station was located at

the Kendallville water works (see fig. 20) on the shore of Bixler Lake and the other at the Valparaiso water plant on the shore of Flint Lake. Both are class A evaporation stations where daily observations are made of relative humidity, maximum and minimum temperatures, wind movement, precipitation, and evaporation.

In addition to the two stations in northern Indiana an evaporation station has been operated in Indianapolis since May 1, 1937, and at Evansville since May 1, 1946.

Evaporation observations in Indiana are generally made only during the months of April through October. This period was selected because it is not practicable to make observations during freezing weather when ice formation prevents reading of the hook gage used in measuring the amounts of water evaporated.

Variation in Evaporation in Indiana

Temperature is the principal factor affecting the average rate of evaporation. It is, therefore, logical to expect evaporation rates to be higher in the southern part of the State with its higher temperatures than in the northern part. This assumption is borne out by records obtained at the various evaporation stations. For the period April to October, the average evaporation from a class A evaporation pan totals about 44 inches at Evansville, about 34 inches near Indianapolis, and about 31 inches at Valparaiso. When pan evaporation is converted to evaporation from a free water surface by using the average coefficient of 0.7 and when allowances are made for evaporation during the months of November to March, it will be found that the average annual evaporation from open water surfaces is about equal to the average annual precipitation in Indiana. However, during periods of drought the evaporation rates are generally higher than average and during wet periods the reverse is likely to be true.

Analyses of Available Records

For purposes of design, studies of water losses, and other water utilization problems it is frequently desirable to know the amount of water losses that may normally be expected for particular days, periods, or seasons; the time of greatest or least evaporation; and the variations from the normal values. For such purposes, average or "normal" values are usually determined by averaging observations taken over a long period of time. To determine normal values of daily evaporation with sufficient accuracy to preclude appreciable changes in the averages by one or two future extreme observations, at least 25 years of record, and preferably more, should be used in computing the normals.

None of the evaporation records being collected in Indiana are as much as 25 years long. The Indianapolis record, which is the longest, covers a period of 17 years, except for the months of April and July, which are 16 years in length; June, which is 15 years in length; and October, which is 9 years in length. Although this record is not enough for determining good averages, it can be used as a guide to indicate the amount of evaporation that may be expected on any day.

In figure 21, the average daily evaporation for various dates has been plotted for Geist Reservoir station near Indianapolis to demonstrate how the evaporation varies in the period April to October. A curve of normal evaporation drawn through these points shows that it reaches its maximum about July 10. The minimum point is not shown because of the lack of winter evaporation observations.

The evaporation from a lake or pond may vary considerably from that observed in a land evaporation pan. The temperatures of the two bodies of water will have a decided effect upon their relative rates of evaporation. The water in the evaporation pan will follow the temperature of the air closely and will seldom vary more than 3°F from the air temperature. Lake temperatures, on the other hand, may vary considerably from air temperatures. During the spring months, the lake temperatures will average several degrees colder than the air temperatures, and during the fall months will be several degrees warmer. Consequently, the rate of evaporation from lakes will be lower in the spring and higher in the fall for corresponding air temperatures.

Evaporation from a lake surface is generally less than that from an evaporation pan. A coefficient of 0.7 is generally used to convert annual class A pan evaporation to equivalent lake evaporation. However, the evaporation from lakes for individual days or months may vary considerably from 70 percent of pan evaporation and may even exceed the pan evaporation at times. Furthermore, pan coefficients ranging from 0.6 to 0.8 or greater have been reported.

Even though there are differences in evaporation from lakes and evaporation pans, the data observed in the latter can be very useful in the study of lakes and reservoirs. For example, comparisons have been made of the observed evaporation at Kendallville and Valparaiso for the months of August and September, 1948, and the losses from several lakes during the same period.

To simplify the computations, lakes having no surface outflow (and presumably negligible or balancing underground inflow and

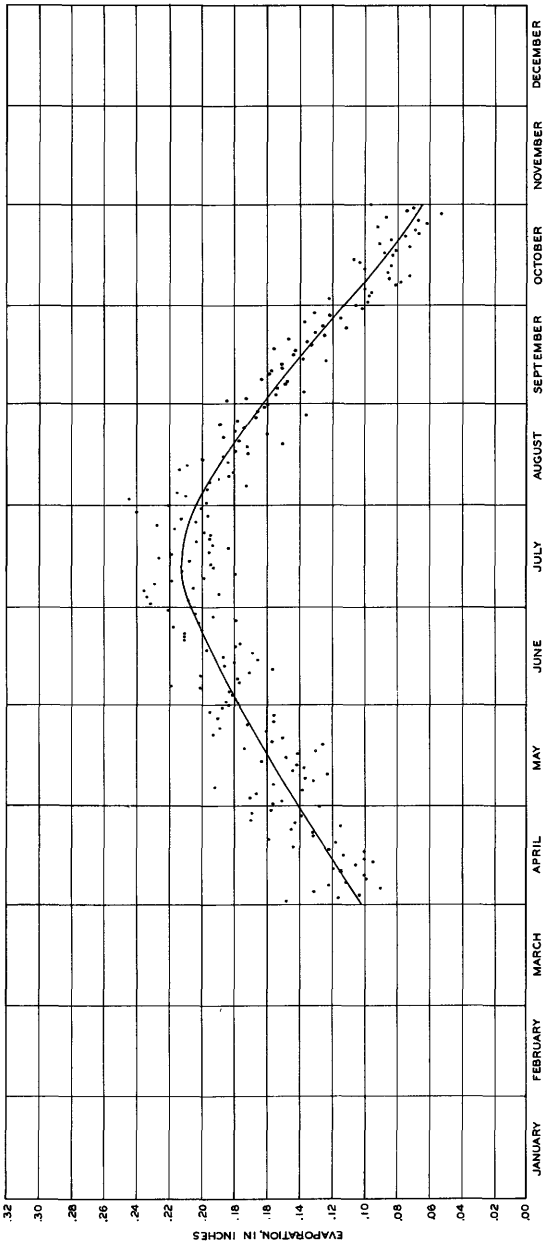

Figure 21.--Graph of average daily evaporation, Class A evaporation pan, Geist Reservoir, Indianapolis, Ind.

outflow) during this period and for which rainfall data for nearby areas is available have been used. Lakes having small drainage areas are best suited for such studies because both surface inflow and surface outflow generally stop during the drier months and the only factors left to affect the lakes are evaporation, transpiration, precipitation, and seepage. The rainfall data used should be obtained near the lake because summer storms are likely to be quite variable in intensity over relatively small areas.

Bixler Lake with a drainage area of 3.63 square miles has no surface inflow nor surface outflow during the drier periods of the year. During the months of August and September 1948 there was no outflow but there may have been a small amount of inflow for a few days after the heavy rain on August 10, 1948. During the remainder of the period there was no rainfall heavy enough to cause an appreciable amount of inflow other than the rain that fell upon the lake itself.

Figure 22 shows a progressive graph of the daily net water loss from Bixler Lake as determined from the daily water-level readings. This graph, in general, shows the decline in lake level through this period. The effect of rain which fell on August 4, 5, 11, 17, 30, and September 7, 9, 18, 20, 21, 29, and 30 can be seen in the rise in the lake level as indicated by decreases in net water loss. Consequently, if the rainfall amounted to more than the evaporation and other losses, the lake would rise and show a

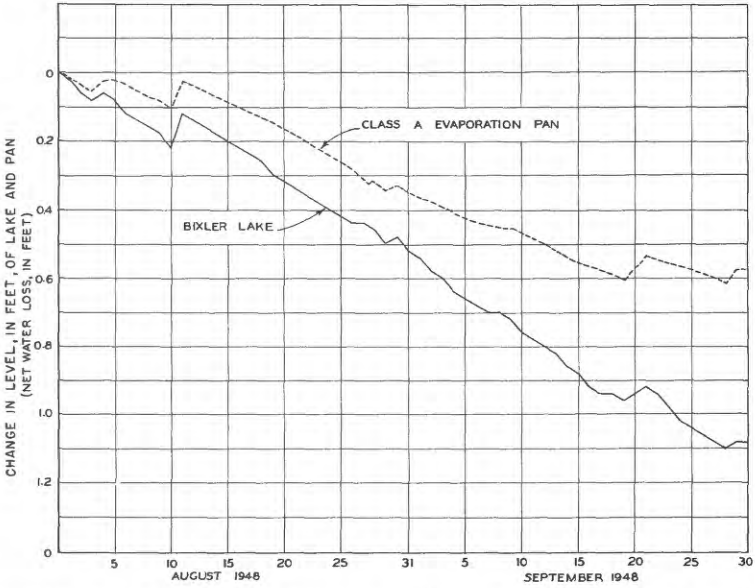

Figure 22. --Comparison of measured evaporation loss at Kendallville with water loss at Bixler Lake, evaporation adjusted for rainfall at Kendallville.

net gain rather than loss. If the rainfall was just equal to the losses, there would be no change in level.

On the same chart is shown the accumulative daily net loss from the evaporation pan at the evaporation station on the shore of Bixler Lake. The two graphs are very similar in shape, but the lake graph descends more rapidly and indicates greater losses than those observed in the evaporation pan. Probably the excess losses, are due to differences in rates of evaporation, transpiration, and seepage into the ground.

During the month of September, when surface runoff into the lake is believed to have been negligible, the water in the evaporation pan declined only 0.22 foot while the lake level fell 0.56 foot, or 0.34 foot more than the water in the pan. A study of the daily records shows that the rate of divergence of the two curves was constant throughout the month and that the loss in excess of pan evaporation was, therefore, constant.

A similar study of Pleasant Lake at Pleasant Lake (fig. 23) was made by using the evaporation data from Kendallville and precipitation data at Angola. It is recognized that the evaporation and rainfall data in other areas are not strictly applicable at Pleasant Lake, but they are believed to be generally near enough to the conditions at the lake to furnish a reasonable comparison. The comparison of losses through the period is quite good except during

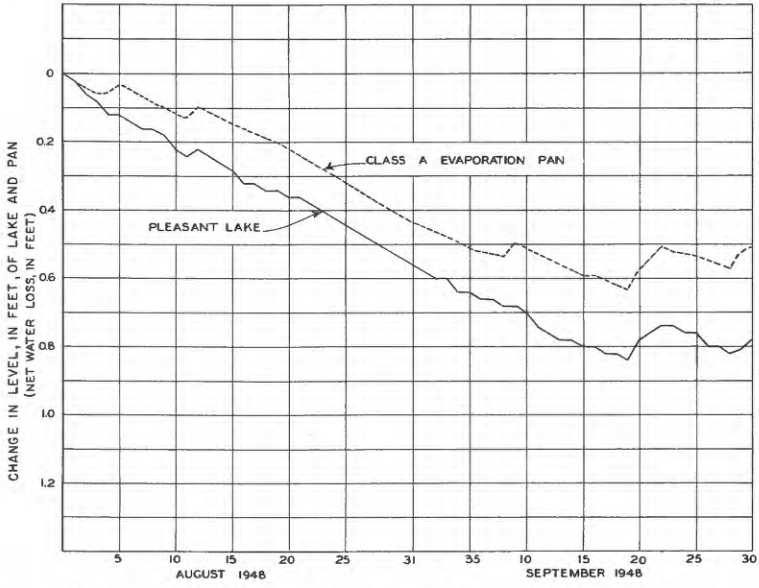

Figure 23. --Comparison of measured evaporation loss at Kendallville with water loss at Pleasant Lake, evaporation adjusted for rainfall at Angola.

September 1948, when the rainfall at Angola apparently was greater than at Pleasant Lake. The difference in rainfall is particularly noticeable on September 9, when it made a noticeable hump in the graph for the evaporation pan but caused only a flattening of the lake graph.

The period from August 13 to September 5 is best for study purposes as there was very little rainfall during that time. The two graphs are nearly parallel through the period indicating that the rates of loss from the pan and the lake were the same and that there was no appreciable loss in excess of evaporation.

Similar studies were made for Loomis Lake (fig. 24) which is quite near the evaporation station on the shore of Flint Lake near Valparaiso, and for Clear Lake (fig. 25) at LaPorte. Flint Lake could not be studied because it is affected by pumpage of water into and out of the lake by the Valparaiso Water Department. Loomis Lake, however, is close enough for the evaporation data observed at the water works to apply directly. For comparison with Clear Lake, the Valparaiso evaporation data and LaPorte rainfall data were used.

The comparison for Loomis Lake shows that the graph of water loss from the evaporation pan is generally parallel to that for the lake. The same is true for the comparison with Clear Lake. Both of these graphs indicate only small losses from the lakes in excess of losses from evaporation.

The data for Pleasant, Loomis, and Clear lakes shows that water losses from the lakes during the rain-free periods are very nearly equal to and very nearly the same rate as the losses from the evaporation pans. This indicates that the evaporation from the lake surfaces during these periods was very nearly equal to that from the pans. It seems unlikely that other gains (considered negligible for these lakes) or losses should so nearly equal any difference in the evaporation rates. Much of the divergence in the graphs at the end of the period probably can be attributed more to the rainfall data used than to actual seepage losses.

The Bixler Lake graph, because of its steady divergence from the pan evaporation graph, certainly can be considered as indicating a rather steady loss other than evaporation. The Kendallville water plant is located on the shore of Bixler Lake and operates a number of ground water wells near the lake. It is quite possible that a sizable amount of water infiltrates into the ground in the vicinity of the wells.

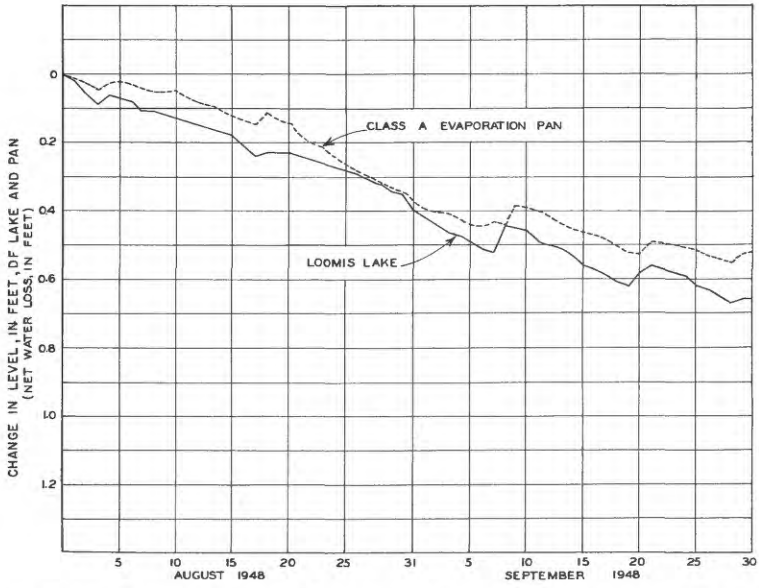

Figure 24. --Comparison of measured evaporation loss at Valparaiso with water loss at Loomis Lake, evaporation adjusted for rainfall at Valparaiso.

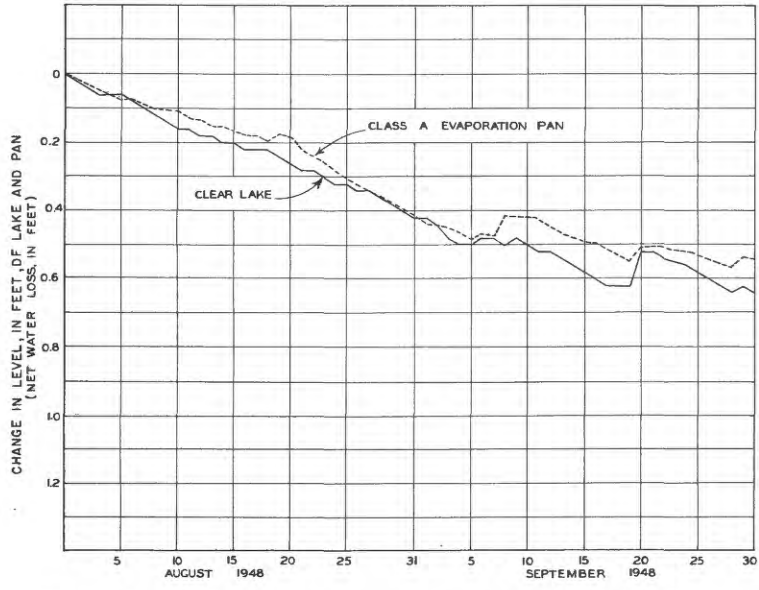

Figure 25. --Comparison of measured evaporation loss at Valparaiso, Ind., with water loss at Clear Lake, evaporation adjusted for rainfall at La Porte, Ind.

Although all the illustrations of water losses from lakes given here have indicated some loss in excess of that due to evaporation, it should not be inferred that all lakes are subject to losses in excess of the evaporation. There are a number of lakes that are known to have definite accretions during the dry season when surface runoff is at a minimum. Wabee Lake is an example. It is fed by springs and the minimum outflow observed on October 17, 1946, at the end of a long dry period, was 0.65 cfs or 420,000 gpd. This represented water left after water losses of all types had been satisfied. Lakes of this type would have been included in the illustrations but lack of rainfall data in their vicinity or other deficiencies in the records prevented their use.

ICE CONDITIONS ON NORTHERN INDIANA LAKES

The freezing of a lake is an interesting phenomenon which varies considerably from winter to winter and with the size and depth of the lake. The general pattern is nearly the same each year: small shallow lakes and ponds freeze first, then the large shallow lakes, and finally the larger deep lakes. The length of time from the first appearance of ice along the shores to the complete freezing of an ice cover on a lake, and the dates on which ice is first noticed and on which complete cover is achieved, vary widely from year to year. Likewise, the dates on which the last ice disappears may vary by 6 weeks or more.

Ice Formation

The small and shallow lakes cool rapidly during the fall months and readily freeze over during the first severe cold spell after the whole mass of water has been chilled to near the freezing point. They are usually more protected from the winds than the large lakes and freeze with a smooth, clear sheet of ice over the surface rather early in the winter.

The large and deep lakes, with their greater volumes of water, cool more slowly and are likely to have ice only around the edges when small lakes have become completely frozen over. If the weather continues calm and cold, these lakes freeze over rather quickly, although it usually takes several days even in the most favorable freezing weather for them to become completely covered with ice as the surface is always somewhat disturbed by winds. However, if during the early freezing weather there are protracted periods of wind, the freezing occurs later and proceeds at a slower pace.

Evermann and Clark, (1920, p. 223) describe the freezing process as follows:

> The ice first forms in sheltered calm places and any object that breaks the wind or tends to calm the water tends to the formation of a sheet of ice. Thus ice appears not only along the shore in sheltered bays, but also around any projecting body in the water - a stake, or a patch of bulrushes or pondweeds. Usually the formation of ice proceeds from day to day in a more or less orderly manner from these nuclei to the middle of the lake until the whole is frozen, ---.

After a lake has frozen over, continued cold increases the thickness of the ice. The maximum thickness reached during the winter depends upon the degree of coldness and the length of time the cold weather persists. Ice 7 to 8 inches thick is common for winters in northern Indiana, but during colder winters it may attain thicknesses of 24 to 30 inches.

Duration of Ice Cover

In the northern portion of the State the average duration of complete ice cover is approximately 90 days, extending from December 15 to March 15. The date on which the lakes freeze over in any particular year may range over a period of a month, while the date of disappearance of ice may range over a period of six weeks. The table below lists the average periods of ice cover for several seasons.

Season	Average period of ice cover	Average duration (Days)
1942-43	December 5 to March 15 --------	100
1943-44	December 15 to February 28-March 11 ----------	76-87
1944-45	December 15 to March 12 -------	87
1945-46	December 15 to March 5 --------	80
1946-47	December 19-January 4 to March 25-April 6 ----------	81-109
1947-48	December 17 to March 20 -------	95
1948-49	December 22 to February 17 ----	59
1950-51	December 6 to March 3 ---------	86

Where one beginning and one ending date are given in the above table, most lakes froze over or thawed out within a few days of the given dates. When more than one date is given, freezing over or thawing out was so variable and uncertain on different lakes that an average period of beginning or ending is shown.

The 1946-47 season was particularly variable. A number of the smaller lakes froze over around December 2, with the ice disappearing around December 7th or 8th. For example, Loomis Lake, a small lake near Valparaiso, froze over on December 13, and then was followed by a succession of other lakes freezing over. Of 87 lakes, for which ice reports are available, 2 froze over on the 14th, 3 on the 15th, 44 between the 16th and 19th, 6 between the 20th and 24th, 14 between the 25th and 31st, and 17 between January 1 and 9, 1947.

During the 1946-47 year the disappearance of the ice from the lakes was nearly as variable as its formation. Between March 16th and 31st, 15 lakes were reported free of ice, and between April 1 and 6, 39 lakes were reported ice free. Other reports of ice conditions on lakes did not definitely indicate the day on which the ice disappeared.

Effect of Temperature

A decrease in temperature below 39.2°F causes water to expand slightly until the freezing point is reached. As water changes into ice its volume suddenly increases. It is needless to say that the sudden increase in volume does not take place through a great thickness of ice, but starts with a very thin skim of ice. The ice then grows in thickness at a rate which is dependent principally on the air temperature.

The water at the surface of a lake is usually very close to 32°F at the time of freezing. As long as the unfrozen water remains at 32°F, the rate at which it freezes will be dependent upon air temperature. However, if the water should become supercooled, as it may on rare occasions, the formation of ice throughout the body of supercooled water will take place very rapidly. In this case, the rate at which the ice is formed will be influenced also by the amount that the water is cooled below the normal freezing point of 32°F.

The length of time required to transform water at 32°F into ice of various thicknesses is shown in figure 26. The graphs in this illustration show that an infinite amount of time is required to freeze ice to any appreciable thickness if the air temperature remains at 32°F. However, if the air temperature drops to 30°F and remains constant, ice 1 inch thick will freeze in 18.5 hours, and at 0°F an inch can be frozen in 1 hour and 10 minutes. Three days of continuous zero weather would result in the freezing of 10 inches of ice.

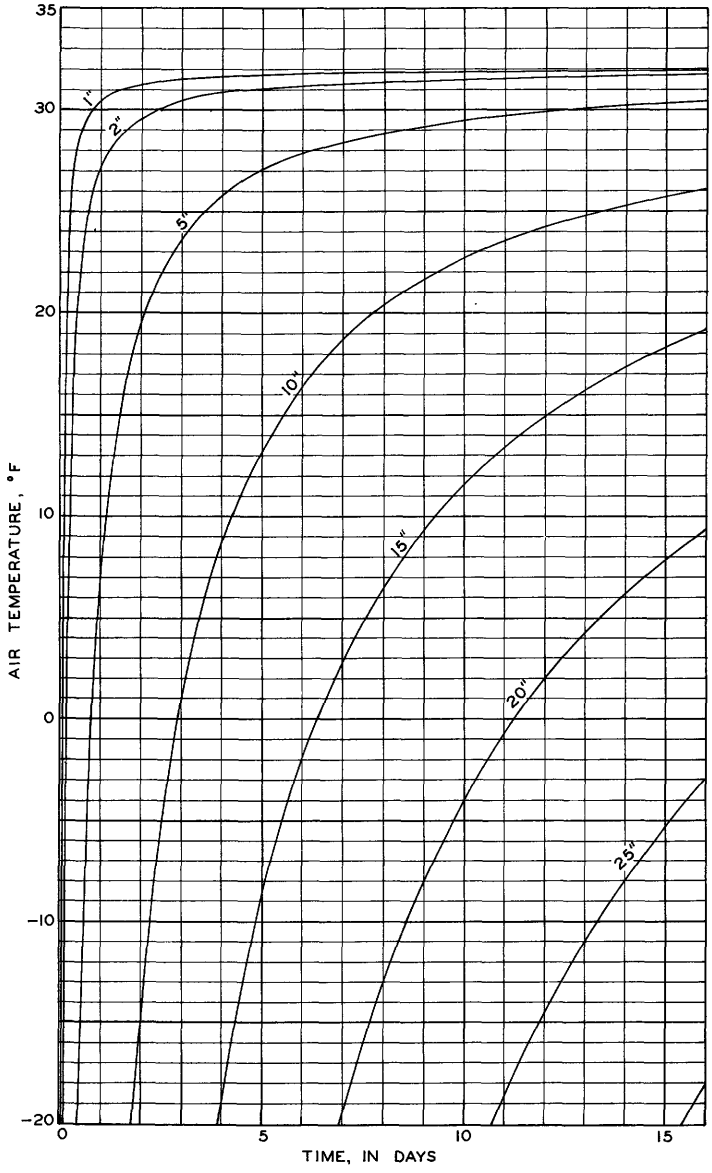

Figure 26. --Graph showing time required to freeze ice of various thicknesses.

The graphs of ice thickness are based on constant temperatures, and, because of their curvature, cannot be used directly with average temperatures. In general, during a period of variable temperatures, more ice will be formed than the chart indicates for the average temperature. The greater the spread between the maximum and minimum temperatures, the greater will be the divergence from the chart.

As long as the air temperatures remain below 32°F the only effect of air-temperature variations on ice thickness is to vary the rate at which the ice sheet is growing in thickness. Air at temperatures above 32°F, of course, melts the ice and tends to decrease its thickness. In addition to the air, solar radiation is another source from which ice may gain heat. If the ice surface is free from snow, solar radiation may heat the ice considerably and cause thawing, even though the air temperatures are well below freezing. On sunny days solar radiation rather than air temperatures may be responsible for the predominating temperature effect on ice, but on cloudy or overcast days the air temperatures will provide the overriding influence.

Although considerable expansion takes place at the moment of freezing, ice, once formed, reacts to temperature changes in the same manner as other solids. As temperatures decrease the ice contracts, and as they increase it expands.

The coefficient of linear expansion of ice varies from 0.00002928 per degree Fahrenheit at 32° to 0.00002806 at 0°F, with an average value of 0.00002867 per degree Fahrenheit in this range. Using the average coefficient of linear expansion it is found that for a drop in temperature from 32°F to 0°F ice will contract 11.0 inches per thousand feet. If the ice completely covers the lake and is firmly attached to the shores, the contraction will introduce strains in the ice and cause cracks to form. When temperature changes slowly little cracking will occur, because the ice, which behaves in a somewhat plastic manner, will flow sufficiently to relieve the contraction strains. But when temperature changes rapidly the ice is unable to relieve the strains in this manner and wide cracks will appear.

If the weather remains cold, a state of equilibrium is reached in which the strains have been relieved by movement and cracking of the ice. The cracks fill with water and freeze, and the ice again becomes a continuous mass.

As the temperature rises after a cold spell the ice will expand, and if held firmly at the shores, the expansion will cause the ice to bulge in the center or plow up the earth at the shore line. Great pressure is exerted by the expanding ice and is capable of moving boat piers and stout seawalls.

If the ice bulges in the center, owing to expansion, the bending will introduce strains and cause it to crack. At times the ice does not crack in an exactly vertical plane, and this permits one side of a cracked ice sheet to ride up the inclined face of the crack and overlap the other side, thus relieving the pressure. At other times the pressure is relieved by the ice merely buckling and cracking in many places.

On a mild sunny day following cold weather one can hear for considerable distance the booming and rumbling as new cracks are formed to relieve the stresses in the ice cover. In fact, these sounds can be followed as the cracks progress from one side of the lake to the other.

During periods of thick ice cover (10 inches or more) rapidly rising air temperatures may not greatly raise the temperature of the ice through its entire thickness. At such times the surface ice will expand as the temperature rises; consequently the lower portion of the ice cover will not expand nearly so much because it will be maintained at a nearly constant temperature by the water underneath. The expanding surface ice will then cause the ice underneath to crack, and the cracks will penetrate only part way to the surface. In clear ice, mosaic patterns made by these partial cracks can frequently be seen.

The quality of the ice cover varies with the temperature of the air. As the air temperatures fall below 32°F the ice becomes colder and also increases in thickness. With increasing coldness the ice becomes harder and more brittle. At temperatures below 0°F it is very hard and brittle. In very cold weather a decrease in hardness and brittleness is noticed in a thick ice cover as cuts are made into the lower and warmer parts of the ice. The temperatures in thick ice will be graded from near the air temperature on the surface to near 32°F at the bottom where it is in contact with water.

During thawing periods ice generally does not become gradually thinner and thinner until it finally disappears, but becomes gradually warmer throughout its thickness and begins to melt internally as well as on the top and bottom surfaces. Solar radiation is very effective in heating and melting ice internally and if the ice surface is free of snow can greatly increase the melting rate over that caused by air temperatures. The internal melting reduces the ice to a porous mushy state in which the ice becomes softer and softer until it loses most of its strength. It is then said to be rotten. Once it has reached the mushy state a little wind will cause it to mix with the water, and it will break up, melt, and disappear very rapidly.

Damage by Ice

Alternating warm and cold weather will cause ice to go through a series of expansions and contractions. The cracks produced by this process fill with water and freeze, and each successive period of expansion causes the ice boundaries, if not firmly held in place, to push out more and more. Such movements can be very destructive to shore installations.

Another type of destructive movement of ice is the movement of ice sheets by wind. As long as the ice cover is firmly attached to the shores it is not affected much by wind. But after rainstorms, when the lake has risen and the ice cover has been separated from the shores, it becomes a large freely floating body, and is easily moved by wind. Once the whole sheet of ice has begun to move, it is of such great mass, especially if very thick, that it possesses great inertia and will push up on the shore in great cakes. In severe windstorms it has been known to plow up great mounds of earth, move trees, and crush houses.

STABILIZATION OF LAKES

In the early days of the settlement of Indiana, the fluctuations of lakes were of little concern to people. Land was plentiful and that affected by flooding or marshy conditions was disregarded in favor of other lands more favorable for settlement. As the State became more densely populated, land became more valuable and farmers, aware of the potentialities of the rich muck lands in the swamps and marshes bordering the lakes, constructed drainage ditches to drain the swamps and even to lower the lakes to provide more tillable acreage. Very little objection was raised to this practice, for, before the days of easy travel, the city dwellers were not using the lakes on a large scale for recreational purposes.

Improved Transportation and its Effect on Use of Lakes

At about the beginning of the present century, the era of the electric interurban transportation came into existence, providing quick transportation from city to city and points in between. Weekend travel to many areas that were formerly beyond the practical reach of the horse and buggy was now possible. Those lakes within easy reach of the interurban lines were invaded by people who bought lake front lots for summer cottages. Streetcar lines were built from some cities and towns to nearby lakes to facilitate the new traffic. The automobile gave additional impetus to the increasing use of lakes for recreational purposes, and as automobile

transportation became common, the population around the lakes increased by leaps and bounds.

The change in use of the lakes and their shorelines from agricultural activities to recreational and habitational functions brought new problems. No longer could one make changes in lakes by draining or damming them without affecting the rights of others whose interests in the lakes were different.

Agricultural and Recreational Use of Lakes

The increasing demand for agricultural products has made it profitable for farmers to drain and reclaim low lands in the vicinity of lakes. These low lands are not always adjacent to the lakes, but, as in the case of lands adjacent to lakes, they cannot be drained without affecting lake levels. In other cases, the lands to be drained are downstream from the lakes, and in deepening the ditches to obtain adequate drainage the lake levels also are affected. The cottage owners, boat livery operators, fishermen, and resort proprietors generally are interested in maintaining lake levels at the elevations to which they have been accustomed. This is particularly important during low-water periods to preserve fish spawning and feeding beds and provide better boating and fishing. However, the conflicting interests are in general agreement that unusually high levels, as are common on many lakes during the spring months, are undesirable and limit the use of the lakes. High levels submerge piers, flood low lands and lake cottages, render septic tanks inoperative, and create many other difficulties.

From the standpoint of the cottage owner and recreationalist, it is generally desirable to keep the lakes at about the same level the year around. It is recognized that there may be disagreement on which level is most desirable by parties with different interests. For example, the cottage owner who built on low land during a dry year may desire a lower lake level than another owner who is located on higher land and who has trouble getting his boat through the shallow water to the shore. Some farmers may want low lake levels for better drainage, while others may want higher lake levels to make the water more accessible to them. In spite of the many conflicting interests, it is frequently possible to agree on a lake level that will, in general, be of some benefit to all concerned even though not all the objectionable features are eliminated entirely.

When a given lake level with limited variations in elevation has been decided upon, a problem of obtaining it and its maintenance

arises. With the problem recognized the degree of satisfaction obtained in the solution will depend largely on the type of lake involved and the extent to which those who are interested in stabilizing the lake level will cooperate.

Requirements for Maintaining Constant Lake Levels

To maintain a lake at a constant level requires an outlet structure that will permit the discharge of excess quantities of water as fast as they flow into the lake as well as hold the water in the lake during periods of dry weather. In addition to this requirement the outlet channel or ditch must have sufficient capacity to carry away the maximum discharge from the lake without causing appreciable backwater on the dam. If the level of the lake is to remain at or near the crest elevation of the dam during dry weather the inflow must be perennial and sufficient to offset losses from the lake due to seepage into the ground, transpiration, and evaporation.

To maintain an absolutely constant level on a lake at all times is seldom practical because of the necessity of providing constant regulation in keeping with the variation in inflow. Usually lake-level control is limited to maintaining levels within certain limits that will keep the regulation of the outlet gates to a minimum without producing objectionable levels. In general, the narrower the limits within which the lake will be permitted to vary, the more difficult and expensive will be the problem of control.

The range in level of an uncontrolled lake depends upon the maximum quantity of water flowing into the lake, the storage capacity of the lake, and the capacity of the outlet to discharge excess water. Thus it is apparent that a small lake with a large inflow will have a much greater range in level than a large lake with the same or a smaller inflow, provided the outflow channel capacities are the same.

By proper design and regulation of outlet control works, lakes that normally fluctuate through a wide range in levels may frequently be controlled within much narrower limits. Likewise, those lakes that normally fluctuate through small ranges may have the range reduced to narrower limits if the normal fluctuation is induced largely by factors other than seepage, transpiration, and evaporation, which are generally impractical to control.

For lakes with small drainage areas the problem of maintaining a sutiable level during the dry periods of the year is frequently more difficult than that of trying to dispose of the excess water

during wet periods. Sometimes it is possible to improve the low-water situation by increasing the size of the drainage area and the inflow through the construction of new drainage-ditch feeders. This remedy may also create a high-water problem if the lake has no outlet, such as in the case of Pine and Stone Lakes in LaPorte County. In 1924 the Kabelin Ditch was constructed to intercept the drainage of a larger area to relieve the unusual low-water conditions of Pine and Stone Lakes. Since that time the levels of these lakes have risen to such heights that damage to real estate on low lands around the lake shores has become a problem, previously given little or no consideration, and the construction of an outlet is being considered as a means of alleviating this condition. The problem of regulating this condition will probably require careful study and analysis of the factors producing it, particularly the weather factors.

Problems of Lake-Level Control on Some Indiana Lakes

Bass Lake in Starke County is an example of a lake with insufficient drainage area to maintain the level through the summer months. The lake has a surface area of 1,405 acres and occupies 60 percent of its drainage area, thus 60 percent of the rain falling in this basin falls directly on the surface of the lake. A dam at the outlet helps store water in the lake through the winter and spring months for the purpose of maintaining higher levels during the dry summer months. Very little of the water escapes from the lake by way of the outlet, yet the annual variation in level averages about 1.53 feet. To help relieve the low-water conditions during the summer months, when the lake is used most for recreation, the property owners have considered the installation of pumps to pump water into the lake from other drainage basins or from wells. Maintaining the lake level during the dry periods would require the pumping of approximately 5 million gallons of water per day.

The easiest solution for the low-water problem, although it is not a complete solution, is to store as much water in the lake as is possible during the high-water season for tiding over the low-water season. This method does not help reduce the range in lake levels on the lake nor decrease high-water levels but it helps preserve a higher low-water level.

For the lakes with year around inflow the elimination of high water is usually the most serious problem. Webster, Sylvan, and Ridinger Lakes are good examples of this type of lake. Excess water is controlled by discharging water from the lake nearly as fast as it is received, usually by operation of a dam equipped with gates that may be operated as required. If the range in stage is

not too great, a fixed dam without gates may be used to keep the lake within limits of a desired level.

Webster Lake is controlled by two outlet structures. The main structure is a concrete dam, 35 feet long by 8 feet high, with seven 5-foot wooden, adjustable sluice gates mounted on the crest. The auxiliary structure is a 20-foot concrete dam with five 4-foot wooden, adjustable sluice gates mounted on the crest (this structure is the old mill dam). During periods of low runoff the gates are left in place to maintain the lake at nearly constant level. During the periods of high runoff the gates on both structures may be opened manually to discharge excess water.

Sylvan Lake at Rome City is controlled by a concrete dam with a spillway 50 feet long surmounted with 12 gates which are manually operated as required. This dam has sufficient height to provide complete regulation without danger of submergence from the channel downstream.

Ridinger Lake has a concrete control dam with a 10-foot fixed concrete spillway and a 6-foot sluiceway equipped with stop logs. The fixed spillway maintains the lake at a desirable level during the low-water season. The high-water conditions are relieved by removing stop logs from the sluiceway.

Tippecanoe Lake is controlled by placing boards between upright H-beams set in concrete in the bed of Tippecanoe River. The boards are installed during the low-water months to raise the lake level and removed during the high-water months to provide a completely opened channel.

These control dams are all located on lakes where the low-water flow is in excess of the requirements for seepage, transpiration, and evaporation.

Effect of Inflow and Outflow on Planning Control Dams

In planning for the design and construction of control dams, consideration must be given to factors other than the lake. A preliminary step is the study of the inflow and outflow of the lake to determine the effect of storage upon the outlet discharge. As the lake level rises, part of the water entering the lake is withheld in storage and for a short period of time the outflow will be less than the inflow. When the flow is through a chain of lakes, a flood peak passing downstream becomes progressively smaller as it passes through each lake because of the water retained in storage. During falling stages, the outflow is greater than the inflow because water is coming out of storage as the lake levels recede.

Studies of inflow and outflow have been made on several lakes; the difference between the rate of inflow and outflow is surprisingly large for some lakes, and the larger the lake-surface area, the larger this difference will be. These conditions are not unusual but common to any unregulated lake.

At Cedar Lake in Lake County, during the storm of March 13 and 14, 1944, the peak inflow was 328 cfs and the outflow at the same time was only 42 cfs, or one-eighth of the inflow. The maximum outflow of 75 cfs, which was the capacity of the outlet, was reached on March 16, two days after the peak inflow. Cedar Lake, with a surface area of 805 acres (1.25 square miles), has considerable storage capacity to accommodate runoff from the 8.05 square miles of its drainage area.

Bixler Lake, during the storm of June 12, 1946, had a maximum inflow of 183 cfs and an outflow of less than 2 cfs at the same time. A high rate of inflow was sustained for several hours and by the time the inflow had dropped to 115 cfs, the outflow had increased to 10 cfs. The outflow finally reached a maximum of 13 cfs on June 15 when the inflow had also dropped to 13 cfs. In this case, the maximum outflow was delayed 3 days after the maximum inflow. Bixler Lake has a surface area of 112 acres (0.175 square miles), with a contributing drainage area of 3.63 square miles.

The high water of April 12, 1944 at Ridinger Lake showed a peak inflow of 316 cfs with an outflow of 170 cfs at the same time. The peak outflow of 216 cfs came 24 hours later. Ridinger Lake with a surface area of 115 acres (0.179 square miles) is about the same size as Bixler Lake, but its drainage area of 32.5 square miles is nearly ten times that of Bixler Lake. Its storage capacity is, therefore, less in proportion to the drainage area and a smaller ratio between inflow and outflow exists.

Effect of Storage in Lakes on Streamflow

Because of the dampening effect of lakes on floods, consideration must be given to the effect downstream if the flood storage capacity of a lake is eliminated and the discharge passed on downstream as fast as it enters the lake. First, the typical outlet channel probably is only large enough to accommodate the discharges that have customarily come from the lake in the past. If the peak discharges should be increased 5 to 10 times, as would be necessary to hold constant levels on Cedar Lake or Bixler Lake, then the outlet channels would become inadequate, resulting in water overflowing to adjacent lands. This condition could be prevented by dredging the outlet to provide a channel with sufficient capacity to carry the increased flow. If the outlets are

enlarged to carry larger flood flows, the water will arrive downstream sooner and in larger volumes. In the examples cited above, the peak discharges were delayed 1 to 3 days in passing through the lakes. A more rapid concentration of flows will increase the high water in lakes and streams downstream unless they also are prepared to carry more water. If a stream should pass through a chain of lakes and each lake in succession should be regulated to discharge flood waters rapidly, the flood hazard on the lower reaches of the stream would be increased many times.

An idea of the flood-retention properties of a group of lakes may be obtained by comparing the peak discharges during the high water caused by several days of heavy rainfall shown in the following table. The storm during the period May 14-17, 1945, was selected because of its nearly equal intensity over the northern part of the State.

Comparison of peak discharge for the storm of May 14-17, 1945
[*Adjusted to equivalent discharge for drainage area (126 sq mi) equal to that for Tippecanoe River near Warsaw, Ind.]

Stream	Drainage area (sq mi)	Lake area (acres)	Total precipitation (in)	Date	Peak discharge (cfs)	*Adjusted discharge (cfs)
Tippecanoe River, 15 miles north of Warsaw	126	4822	3.00	May 20	320	320
Hart Ditch, at Munster	57	0	2.63	May 15	918	1600
Wildcat Creek, at Greentown	166	0	2.75	May 17	1680	1400
Little River, at Huntington	259	0	3.00	May 17-18	2750	1720
Eel River, at North Manchester	423	804	3.50	May 17	3990	1750

The Tippecanoe River drainage basin above Warsaw, contains 39 lakes, with a combined surface area of approximately 4,822 acres, which constitute 6.0 percent of the drainage area. The drainage basins for the other streams, excepting Eel River, listed in the table above, contain no lakes or ponds of consequence. The Eel River drainage basin contains 14 small lakes with a combined surface area of 804 acres, or only 0.3 percent of the drainage area. The storage capacity of these lakes, which are all in the upper headwater areas, is considered as having a very minor effect on Eel River discharge.

In comparing the peak discharges one should bear in mind that this storm traveled from west to east and that Hart Ditch, which is near the Illinois State line, received its heaviest rainfall on May 14, and the other streams, which are on the eastern side of the State, received their rainfall on May 15 and 16. The time factor in the eastward movement of the storm across the State accounts for the progressively later dates of the peaks for all streams except the Tippecanoe River, where the peak was retarded approximately 3 days longer than can be accounted for by the eastward movement of the storm. This phenomenon is attributed to the storage of water in the 39 lakes contained in the Tippecanoe River drainage basin.

If the peak discharges for the other streams are adjusted (on basis of a plot of peak discharge against drainage area) to the Tippecanoe River drainage area and rainfall, they will average about 1,600 cfs. This discharge may be taken as the equivalent of what would have occurred in the Tippecanoe River if it had not been for the storage and retarding effect of the lakes. In other words, the lakes in the Tippecanoe drainage basin reduced the peak flow of the river 79 percent.

As a result of the natural flood control properties of the upper Tippecanoe drainage basin, the stream channel is much smaller than other streams of equal drainage area, the flow is more uniform throughout the year, and no serious flood problems have developed.

The foregoing examples have indicated the effect upon streamflow that might be expected with lake storage and without lake storage. In considering the effect of lake stabilization upon the downstream reaches of a stream it is not usually necessary to consider such extreme changes as might be brought about by the total elimination of lake storage. Usually it is impractical to achieve such conditions, and some intermediate plan that will permit a certain amount of fluctuation in lake levels is adopted.

Effect of Control Dam on Ridinger Lake

To illustrate what can be accomplished in a practical way by the construction of a control dam, the case of Ridinger Lake is cited. In June 1946 a petition to clean out Grassy Creek or Elder Ditch, the outlet of Ridinger Lake, was approved by the Circuit Court of Kosciusko County upon condition that a control dam be constructed to maintain the lake level at 843.12 feet, mean-sea-level datum. The ditch was cleaned in June 1947 and the control dam was built in October of the same year. The dam consists of a fixed spillway of a concrete gravity-type section 3.25 feet high with a 10-foot horizontal crest, and a 6-foot sluiceway equipped with stop logs. These stop logs eventually will be replaced with a vertical lift gate.

By using the discharge rating curves determined before and since the construction of the dam, it is possible to determine how the cleaning of the outlet and operation of the dam has affected the level of the lake and discharges in the outlet. Two high-water periods have been selected to demonstrate the effect of the dam. The first is the period April 8-21, 1944, when the highest level of the period of record occurred and before the ditch was cleaned. The second is the period February 26 to March 10, 1948, after the dam was built.

The period April 8-21, 1944, includes three separate rainstorms. The first covered a period of four consecutive days, April 9-12, during which an average of about 3.60 inches of rain fell over the drainage basin. The next rainfall averaged about 0.85 inch on April 15 and 16. The last rainfall, reported on April 20, amounted to about 0.20 inch over the area. These three storms resulted in three crests instead of one on the lake during the period considered.

In figure 27 discharge graphs show the inflow and the outflow of the lake that occurred from April 8 to 21, 1944, and the possible outflow in the same period had the control dam been installed at that time. In making the graph to show the effect of operating the dam, an assumed condition of all but two stop logs removed from the sluiceway was used to start the period in order to have a lake level nearly equal to that which actually existed during the first 2 days of the record. It was then assumed that the observer, on the morning of April 10, 1944, having witnessed the rain of the day before and the continuing rain, would remove all the stop logs at 10 o'clock, and leave the sluiceway entirely open. The stop logs would not be replaced during the remainder of the period.

With the assumed removal of the stop logs, the discharge would immediately increase by about 24 cfs and would continue to be somewhat larger than actually occurred until on April 14 when it would drop somewhat below the actual discharge for most of the remaining portion of the period. The effect of the increased discharge during April 10-13 would be to permit less water to go into storage in the lake and thereby reduce lake levels. The outlet channel, on the assumption that it would be cleaned out, would permit passing a peak discharge 28 cfs larger at a stage 2.0 feet lower than under conditions before the outlet was cleaned out.

The gage-height graph of the actual lake levels is shown in figure 27 and also the computed gage-height graph showing the levels that would have existed if the control dam had been in operation in April 1944. The computed graph shows that the maximum level would have been 2.0 feet lower and that the levels would have remained approximately 1.5 to 2.0 feet lower than actual conditions throughout the period.

During the period February 26 to March 10, 1948, after the construction of the control dam, two rainstorms took place. The first storm on February 27 and 28 averaged about 1.50 inches over the basin, and the second on March 1, averaged about 0.12 inch.

The discharge graphs for the storm of February 26 to March 10, 1948 are shown in figure 28. The observed outflow curve is computed from gage readings and a rating for the dam. The period started with two stop logs in place in the sluiceway. One stop

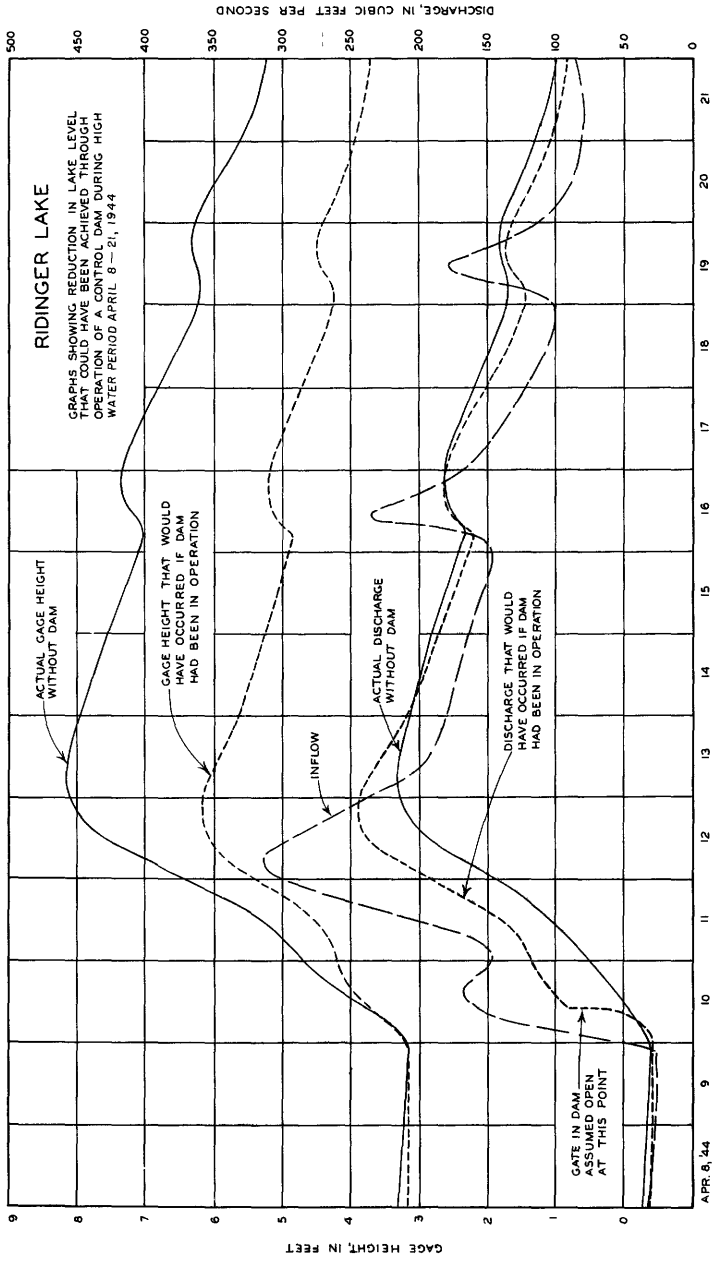

Figure 27.--Graphs showing reduction of level and discharge of Ridinger Lake that could have been achieved through operation of a control dam during high water of April 8-21, 1944.

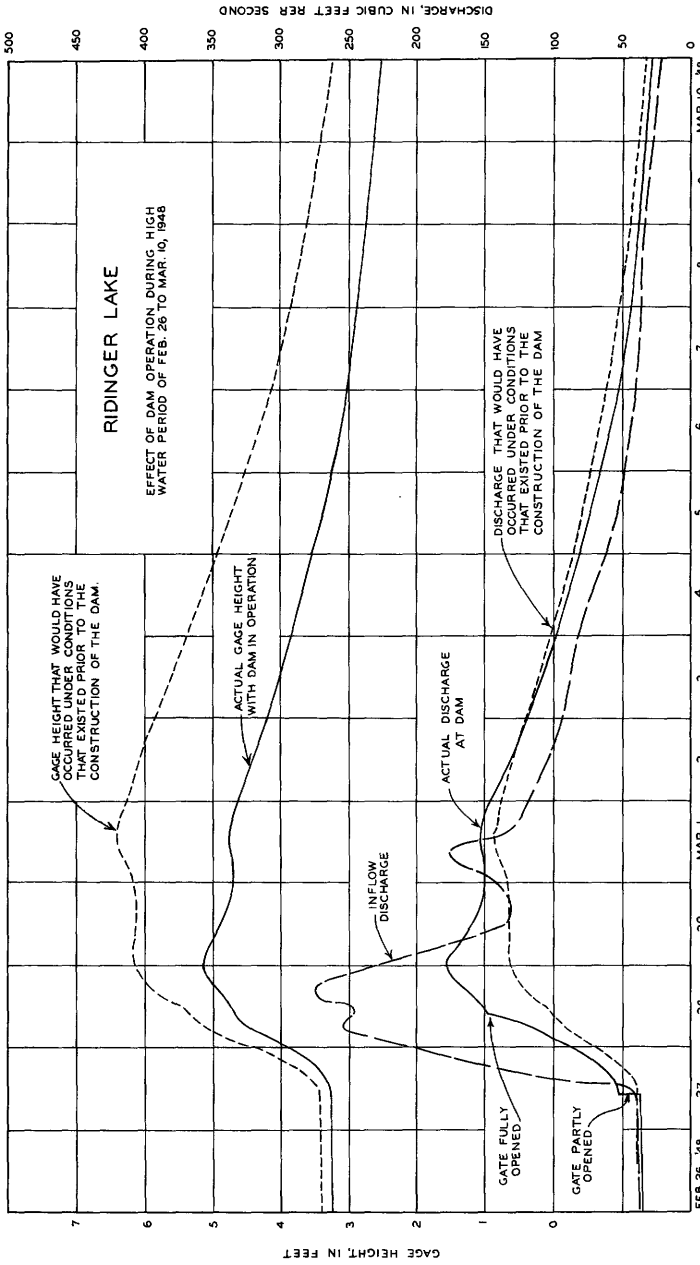

Figure 28.--Graphs showing actual reduction of level and discharge of Ridinger Lake through operation of control dam during high water of February 26 to March 10, 1948.

log was removed at 10 a.m. on February 27 and the other at 10 a.m. on February 28. No stop logs were in the sluiceway for the remainder of the period. The increase in discharge caused by the removal of the second stop log was not nearly as great as for the the removal of the first, because the second stop log was under a high degree of submergence at the stage at which it was removed. The inflow curve was computed from the outflow and rate of change in storage in the lake.

To determine the discharges that would have existed if the ditch had not been cleaned and the dam built, the rating curve that applied before the cleaning was used to compute the new outflow and lake levels. The discharge curve obtained shows a smaller outflow during the first part of the storm period and later a greater outflow than existed with the dam. The peak discharge would be about 35 cfs less than the 178 cfs that occurred with the dam, and would occur a day and a half later. More water would go into storage during the rising stages and would be gradually released later.

The gage-height graphs in figure 28 show that the peak lake level without the dam would be 1.25 feet higher and would occur about a day and a half later. The lake levels on March 1, 2, and 3 would be about 1.5 feet higher than occurred on those days with the dam.

The lake levels could be lowered still more if the outlet had greater capacity. During the high water of February 29 and March 1, 1948, the outlet was filled to bank full and there was only about 3 inches fall over the dam. This caused the fixed spillway to operate under 83 percent submergence and thereby reduced its efficiency. The amount of water that could pass through the sluiceway also was reduced by the low head under which it operated. However, even under these adverse conditions, the peak lake level was 1.25 feet lower than it would have been if the outlet had not been cleaned.

Prior to the building of the dam, Ridinger Lake usually receded to a level of about 1.5 feet on the gage during the lowest water period of the year, and during some years remained below 2.0 feet during the whole summer. These low levels were unsatisfactory from a recreational standpoint and the established level of 3.12 feet was much more desirable. During the summer of 1948, the first summer after the dam was built, the level remained between 3.00 and 3.30 feet from May 20 until November 16 and averaged about 3.15 feet for the period. Thus, a more desirable level was maintained throughout the whole low-water season.

BASIC DATA ON LAKE LEVELS FOR SELECTED LAKES

The basic data collected at lake-level stations consists of readings of lake elevation, usually taken daily to the nearest hundredth of a foot, by a local observer. The records consist of daily, monthly, and yearly mean water-surface elevations and graphs showing the fluctuation in elevation. Discharge measurements made at the outflow are also available in some instances.

The lake records, except those contained herein, have not been published but are available in the files of the district office of the U. S. Geological Survey in Indianapolis, Ind. A list of stations where lake levels have been recorded may be found in the section Legal Lake Levels on page 266.

Records for 28 lakes have been selected for publication on the basis of completeness of record and general importance. The data for each station consists of a description of the station; tables listing the maximum and minimum lake level for each water year, the maximum recorded ice thickness and period of ice cover for each water year, discharge measurements made at the lake outlet, and average lake levels; and lake level hydrographs (figs. 29-139). The lake-level hydrographs were furnished by C. H. Bechert, director, Division of Water Resources, Department of Conservation, and show the variations in lake levels in each water year of record. A water year is the 12-month period ending September 30 of the indicated year.

The description of the station gives the location, surface area, drainage area, records available, type and history of gages, average level, the established legal level, and the lake-level control. The location of the lake is obtained from the most accurate maps available. The surface area (when the lake is at the established legal level) and the drainage area, unless otherwise noted, are obtained from aerial photographs taken in 1938 by the Agricultural Adjustment Administration, Department of Agriculture (photographs are now in the custody of the Commodity Stabilization Service). Under "gage" are given the type, location, and datum of the present gage, the frequency of readings, and a history of past gages. In order to work with small numbers the gages have been set at datums differing from mean sea level by multiples of 10 feet. The elevation of the water surface above mean sea level may be determined by adding the gage reading to the gage datum. Under "Average level" is given the average lake level in gage height and in elevation above sea level for the number of years indicated. The established legal level is that elevation set by the courts to which the average level of the lake is to be held. It is normally set at about the average level that has prevailed for a number of years prior to the establishment of the legal level. The means of maintaining the established level are described in the "Lake level control" paragraph.

Bass Lake at Bass Lake, Ind.

Location. --Secs. 7 and 18, T. 32 N., R. 1 W., and secs. 12, 13, 14, 23, and 24, T. 32 N., R. 2 W., Starke County.

Surface area. --1,405 acres.

Drainage area. --3.66 sq mi.

Records available. --October 1942 to September 1953.

Gage. --Staff gage at south shore of lake at Fishburn's Store at Junction of State Highways 35 and 10. Gage read to hundredths once daily. Datum of gage is 700.00 ft above mean sea level, datum of 1929.

Average lake level. --11 years; gage height, 13.52 ft; elevation, 713.52 ft.

Established legal level. --Established Aug. 10, 1948, at gage height 13.65 ft; elevation, 713.65 ft above mean sea level.

Lake-level control. --Lake level maintained by sheet-piling dam with crest 6.4 ft long at gage height 14.08 ft. Prior to fall of 1946, control was an old concrete dam.

Extreme levels for Bass Lake, 1943-53

Maximum			Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943	May 20, 1943 ----	14.04	Oct. 27, 1942 ---	12.29
1944	Apr. 13, 1944----	*14.15	Sept. 27, 1944 --	12.51
1945	June 22, 23, 1945 -	13.65	Nov. 5, 6, 1944--	12.33
1946	Mar. 19, 1946 ---	14.01	Sept. 30, 1946 --	12.53
1947	June 19, 1947 ----	13.97	Oct. 16, 1946 ---	12.23
1948	May 15, 1948 ----	14.44	Sept. 29, 30, 1948-	13.06
1949	June 16, 17, 1949 -	14.14	Oct. 29, 30, 1948-	12.81
1950	Apr. 4, 1950 ----	14.62	Oct. 2, 1949 ----	12.89
1951	May 11, 1951 ----	14.50	Nov. 7-15, 1950-	13.30
1952	Mar. 18, 1952 ---	14.59	Sept. 30, 1952 --	13.19
1953	June 6-9, 1953 ---	13.63	Sept. 30, 1953---	12.42

* Estimated

Maximum recorded thickness and periods of ice cover 1943-52

Water year	Maximum thickness (inches)	Total days of cover	Period
1943	-------	101	Nov. 27, 1942, to Mar. 7, 1943.
1944	12	72	Dec. 12, 1943, to Feb. 22, 1944.
1945	2	-----	Dec. 5, 1944, to-?
1946	10	50	Jan. 10, 1946, to Feb. 28, 1946.
1947	-------	73	Dec. 18, 1946, to Feb. 28, 1947.
1948	24	131	Nov. 6, 1947, to Dec. 6, 1947.
			Dec. 10, 1947, to Mar. 18, 1948.
1949	3	79	Dec. 10, 1948, to Feb. 26, 1949.
1950	3	81	Jan. 4, 1949, to Mar. 25, 1950.
1951	-------	95	Nov. 23, 1950, to Feb. 25, 1951.
1952	-------	-----	Dec. 2, 1951, to-?

Discharge measurements at outlet of Bass Lake

Date	Gage height (feet	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 6, 1943	13.72	0.77	Jan. 7, 1946-	12.86	0
Oct. 12,----	13.53	.05	Feb. 8------	13.73	1.20
Jan. 18, 1944	[a]13.58	0	Apr. 5------	13.79	1.42
Mar. 17,----	14.05	12.00	June 5------	13.55	0
Apr. 25,----	14.10	15.0	July 18------	13.29	0
May 9,----	13.94	12.5	July 24------	13.19	0
June 11,----	13.49	0	Nov. 12------	12.69	0
June 23,----	13.63	.60	Dec. 12------	12.69	0
July 11,----	13.29	0	Dec. 20------	12.76	0
Aug. 14,----	12.85	0	Feb. 17, 1947-	13.03	0
Sept. 12,----	12.63	0	Feb. 10, 1948-	13.51	0
Apr. 12,----	12.93	0	May 3------	14.12	0
May 14,----	13.19	0	May 11------	14.34	5.44
Aug. 21,----	13.12	0	May 18------	14.39	3.73
Nov. 16,----	13.35	* .05			

* Estimated.

[a] Ice cover.

Average lake level for Bass Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	*12.33	12.53	12.68	13.07	13.34	13.52	13.65
1944	13.60	13.72	13.69	13.61	13.67	13.93	14.00
1945	12.53	12.39	12.43	12.48	12.50	12.72	13.02
1946	13.36	13.37	13.49	13.73	13.74	13.89	13.80
1947	12.39	12.68	12.72	12.92	13.03	13.08	13.37
1948	13.30	13.33	13.46	13.59	13.57	13.90	14.13
1949	12.92	12.94	13.02	13.42	13.84	14.02	14.04
1950	13.12	12.99	13.16	13.78	14.23	14.45	14.48
1951	13.52	13.33	13.58	13.78	13.86	14.11	14.31
1952	13.61	13.92	14.18	14.36	14.33	14.36	14.42
1953	13.00	12.80	12.92	12.93	13.01	13.16	13.40
Average	13.06	13.09	13.21	13.42	13.56	13.74	13.87

Year	May	June	July	Aug.	Sept.	Annual
1943	13.86	13.89	13.74	13.77	13.82	*13.43
1944	13.90	13.66	13.24	12.86	12.62	13.54
1945	13.35	13.57	13.37	13.12	12.90	12.87
1946	13.67	13.66	13.37	12.95	12.60	13.47
1947	13.61	13.90	13.60	13.24	13.44	13.16
1948	14.25	14.07	13.92	13.60	13.22	13.70
1949	13.98	14.04	13.92	13.59	13.14	13.57
1950	14.20	14.25	14.29	14.04	13.75	13.89
1951	14.32	14.20	14.05	13.89	13.62	13.88
1952	14.33	14.32	13.94	13.71	13.38	14.07
1953	13.50	13.49	13.36	13.09	12.61	13.11
Average	13.91	13.91	13.71	13.44	13.19	13.52

* Partial month or partial year.

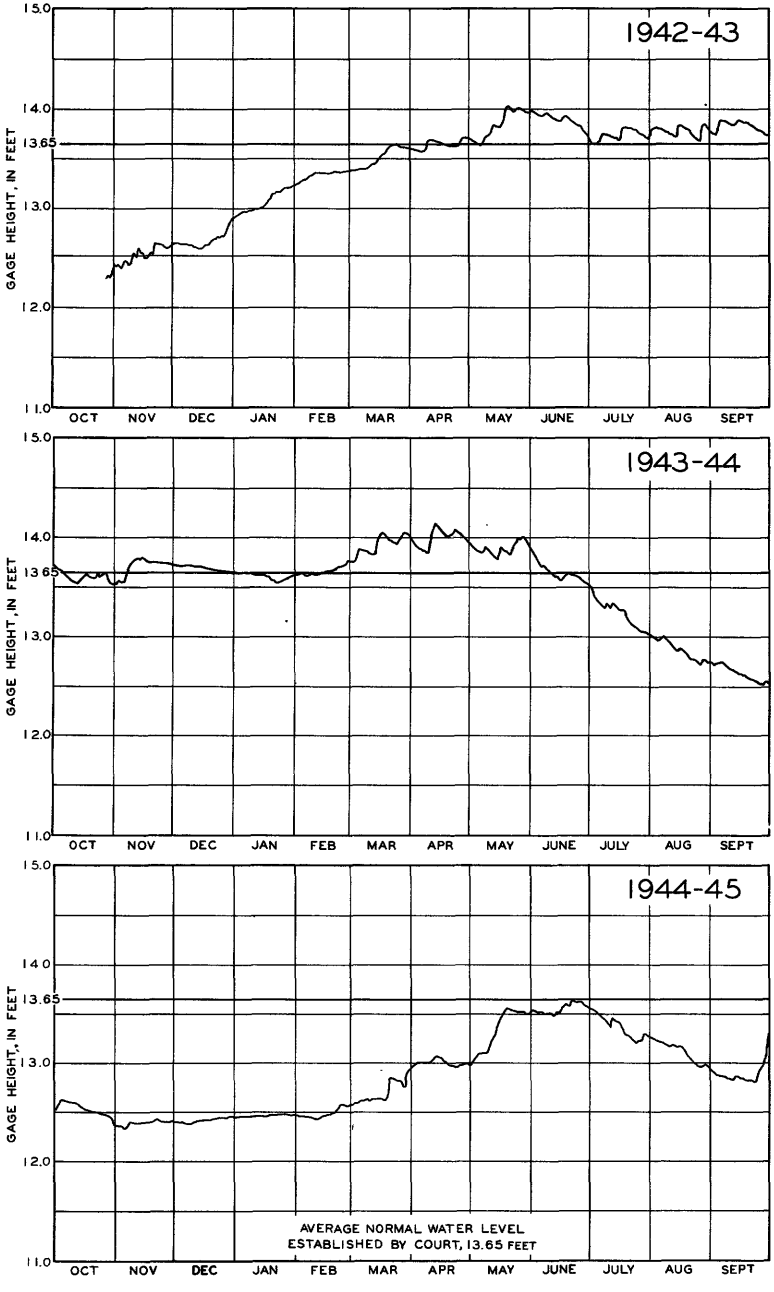

Figure 29. --Lake-level hydrographs for Bass Lake at Bass Lake, Ind., for water years 1943-45.

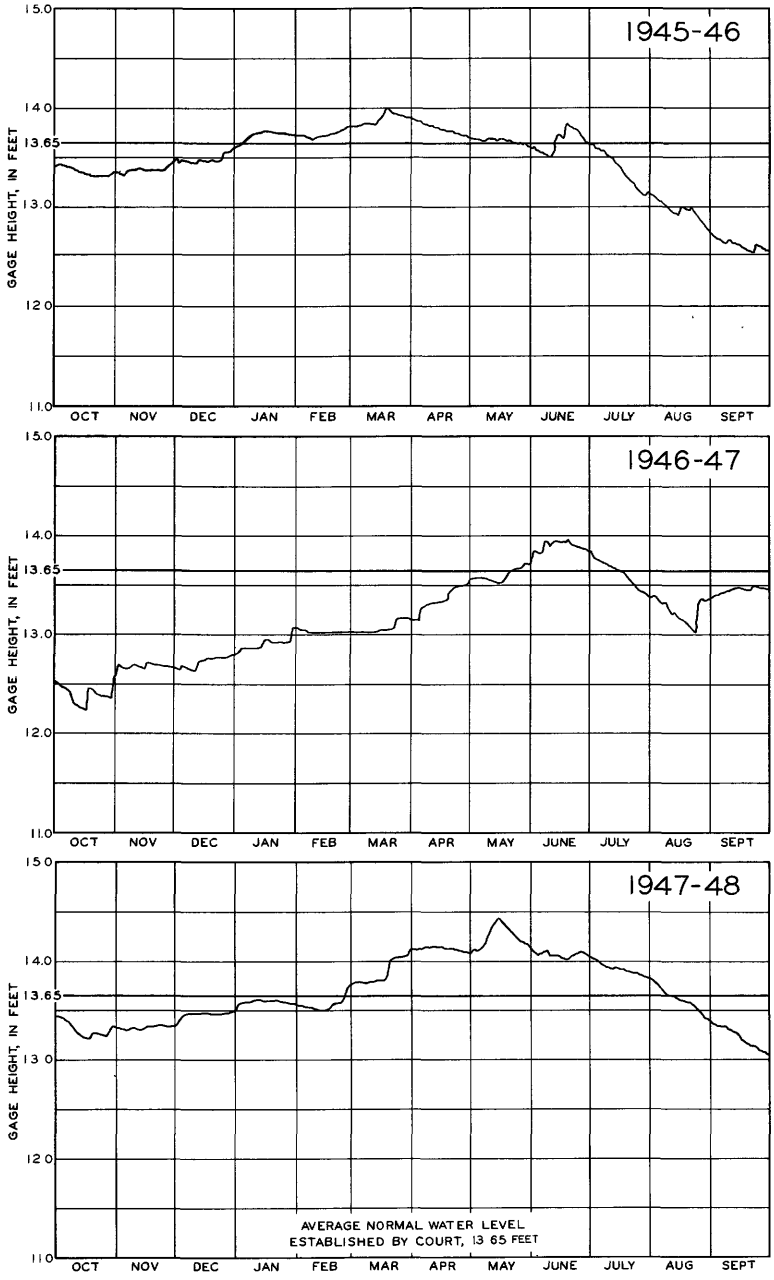

Figure 30. --Lake-level hydrographs for Bass Lake at Bass Lake, Ind., for water years 1946-48.

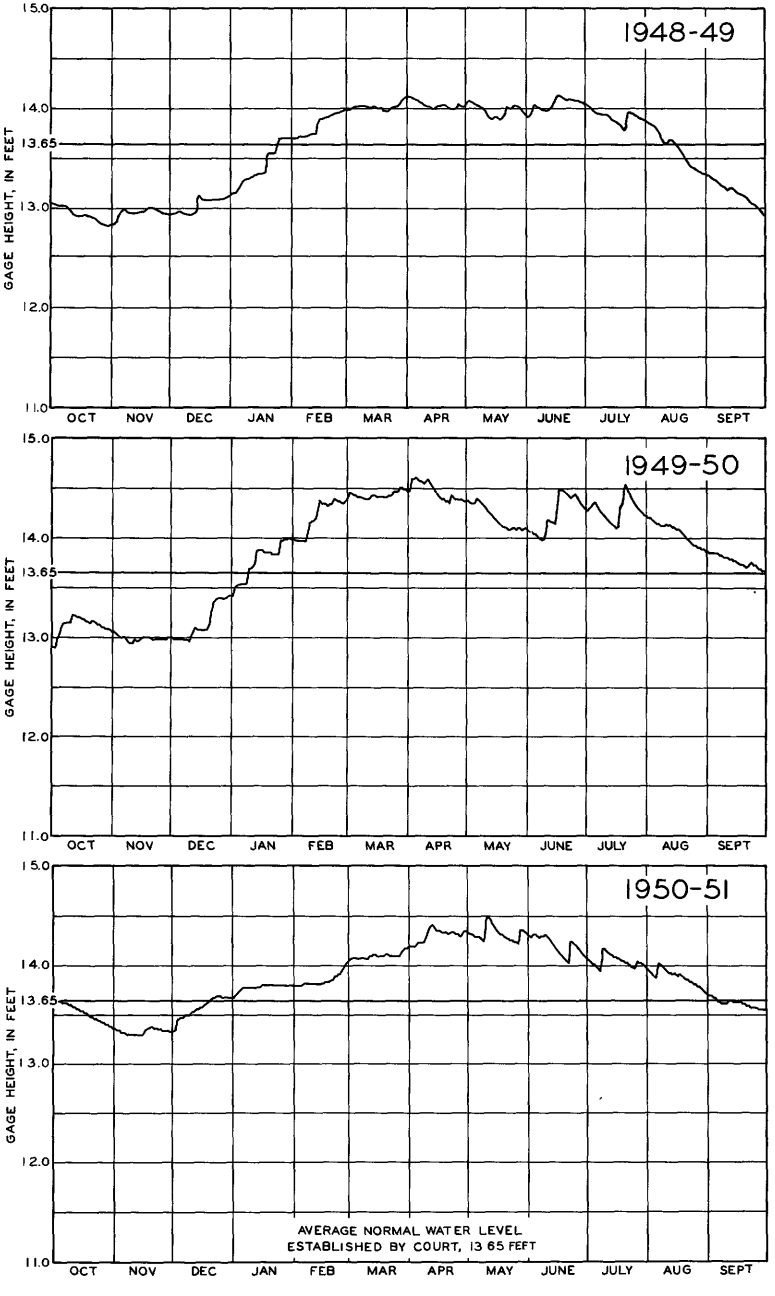

Figure 31. --Lake-level hydrographs for Bass Lake at Bass Lake, Ind., for water years 1949-51.

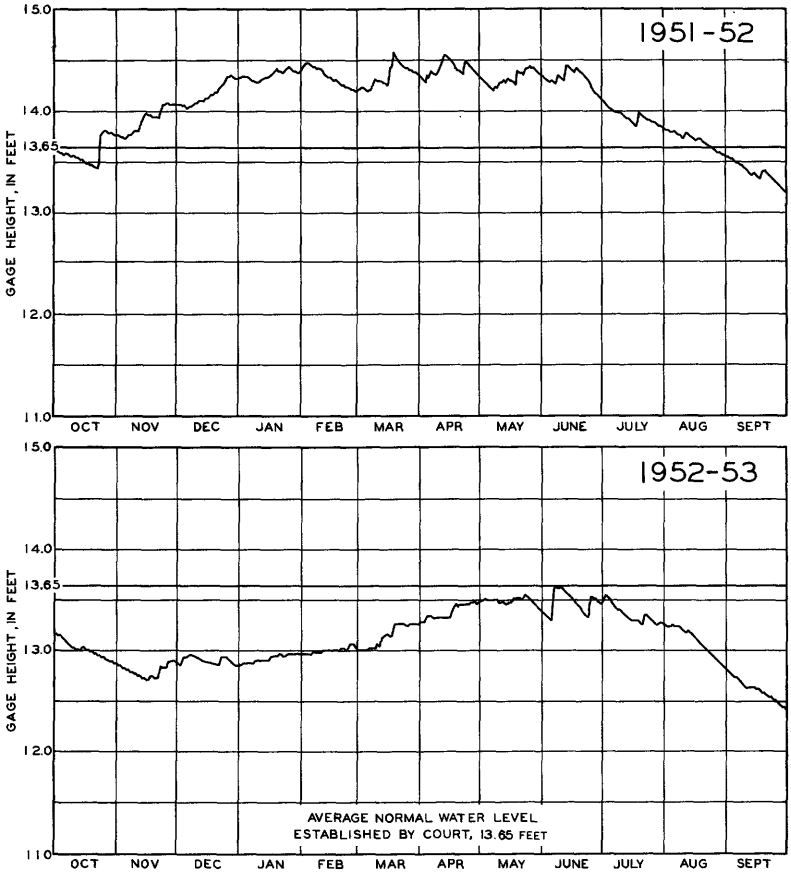

Figure 32. --Lake-level hydrographs for Bass Lake at Bass Lake, Ind., for water years 1952-53.

Bear Lake at Wolflake, Ind.

Location. --Secs. 7, 8, 17, and 18, T. 33 N., R. 9 E., Noble County; $1\frac{1}{2}$ miles southwest of the town of Wolflake.

Surface area. --125 acres.

Drainage area. --6.12 sq mi.

Records available. --November 1942 to September 1933, (no record Jan. 3, 1943, to Mar. 31, 1943).

Gage. --Staff gage on east shore of lake, 800 ft north of outlet. Gage read to hundredths once daily. Datum of gage is 890.00 ft above mean sea level, datum of 1929. Prior to July 14, 1948, staff gage at north shore of lake at same datum.

Average lake level. --11 years; gage height, 4.81 ft; elevation, 894.81 ft.

Established legal level. --None.

Lake-level control. --Lake level maintained by rock-fill dam in outlet channel 380 ft downstream from lake.

Extreme levels for Bear Lake, 1943-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943	Dec. 30, 1942--	8.25	July 3-6, 1943----	*4.90
1944	Apr. 12, 1944--	6.61	Sept. 26, 27, 1944-	4.33
1945	Mar. 31, 1945--	* 5.82	Nov. 1-3, 1944 ---	4.23
1946	Jan. 12, 1946 --	5.90	Sept. 29, 30, 1946-	3.90
1947	Apr. 22, 1947--	* 5.29	Oct. 14-17, 1946--	3.74
1948	Mar. 6, 1948---	5.50	Sept. 28, 1948----	3.93
1949	Feb. 16, 1949--	5.50	Oct. 30, Nov. 2, 1948	3.78
1950	Apr. 5, 1950---	6.06	Oct. 2, 1949------	4.23
1951	Feb. 22, 1951--	5.70	Sept. 30, 1951----	4.08
1952	May 27, 1952---	5.36	Sept. 29, 30, 1952-	3.38
1953	Mar. 19, 1953--	5.48	Oct. 31 to Nov. 3, Nov. 7-17, 1952 -	* 2.90

*Estimated.

Maximum recorded thickness and periods of ice cover for Bear Lake, 1943-53

Water year	Maximum thickness (inches)	Total days of cover	Period
1943	6	------	Dec. 3, 1942, to-?
1944	--------	98	Dec. 5, 1943, to Mar. 12, 1944.
1945	--------	81	Dec. 14, 1944, to Mar. 4, 1945.
1946	8	87	Dec. 12, 1945, to Mar. 8, 1946.
1947	11	101	Dec. 19-24; Dec. 30, 1946, to Apr. 3, 1947.
1948	15	94	Dec. 17, 1947, to Mar. 19, 1948.
1949	5	94	Dec. 17, 1948, to Mar. 21, 1949.
1950	8	100	Dec. 6, 1949, to Mar. 24, 1950.
1951	20	81	Dec. 11, 1950, to Mar. 1, 1951.
1952	--------	81	Dec. 23, 1951, to Mar. 13, 1952.
1953	5	54	Dec. 31, 1952, to Feb. 22, 1953; Mar. 8-12, 1953.

Discharge measurements at outlet of Bear Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 12, 1943	5.17	0.35	Jan. 20, 1947-	2.74	0
Oct. 8------	4.93	.20	Mar. 4, 1948-	5.35	14.8
Feb. 16, 1944	5.05	.95	Mar. 4, 1949-	4.92	6.67
Mar. 31------	4.83	*4	Sept. 7------	4.40	0
Aug. 11------	4.60	0	Dec. 1------	4.60	1.03
July 11, 1945	4.77	.10	Jan. 17, 1950	5.64	27.5
Sept. 4------	5.09	* .10	Mar. 8------	5.32	20.7
Dec. 19------	5.55	5.57	May 4------	4.95	8.39
May 17, 1946	5.18	.05	Sept. 13------	4.86	6.69
June 19------	5.24	10.4	Nov. 21------	4.79	6.51
July 3------	4.89	.80	May 15, 1951-	4.83	8.75

* Estimated.

Average lake level for Bear Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	--	*7.94	7.93	6.82	5.45	5.29	5.48
1944	4.91	4.92	5.14	5.06	5.07	5.35	5.79
1945	4.36	4.33	4.44	4.66	4.94	5.59	4.73
1946	5.49	5.44	5.41	5.48	5.39	5.39	5.17
1947	3.80	4.04	4.09	4.42	4.96	4.89	5.10
1948	4.74	4.83	5.04	5.09	5.11	5.24	4.92
1949	3.86	4.00	4.25	4.98	5.09	4.84	4.78
1950	4.54	4.53	4.74	5.51	5.24	5.23	5.44
1951	4.55	4.63	4.99	4.86	5.03	4.87	4.90
1952	4.20	4.50	4.56	4.92	4.78	4.72	4.74
1953	3.14	3.05	3.73	4.62	5.18	5.34	5.14
Average	4.36	4.75	4.94	4.96	5.08	5.15	5.11

Year	May	June	July	Aug.	Sept.	Annual
1943	5.89	5.17	5.11	5.23	5.16	*5.84
1944	5.16	4.96	4.96	4.56	4.42	5.02
1945	4.83	4.88	4.75	5.07	5.07	4.80
1946	5.27	5.22	4.68	4.35	4.04	5.11
1947	5.06	4.98	4.78	4.64	4.72	5.62
1948	4.99	4.80	4.68	4.43	4.08	4.83
1949	4.77	4.96	4.64	4.44	4.33	4.58
1950	4.80	4.94	4.84	4.65	4.86	4.94
1951	4.69	4.56	4.96	4.52	4.24	4.73
1952	4.60	4.60	4.24	3.86	3.51	4.44
1953	5.10	4.81	4.52	4.41	3.86	4.41
Average	5.01	4.90	4.74	4.56	4.39	4.81

* Partial month or partial year.

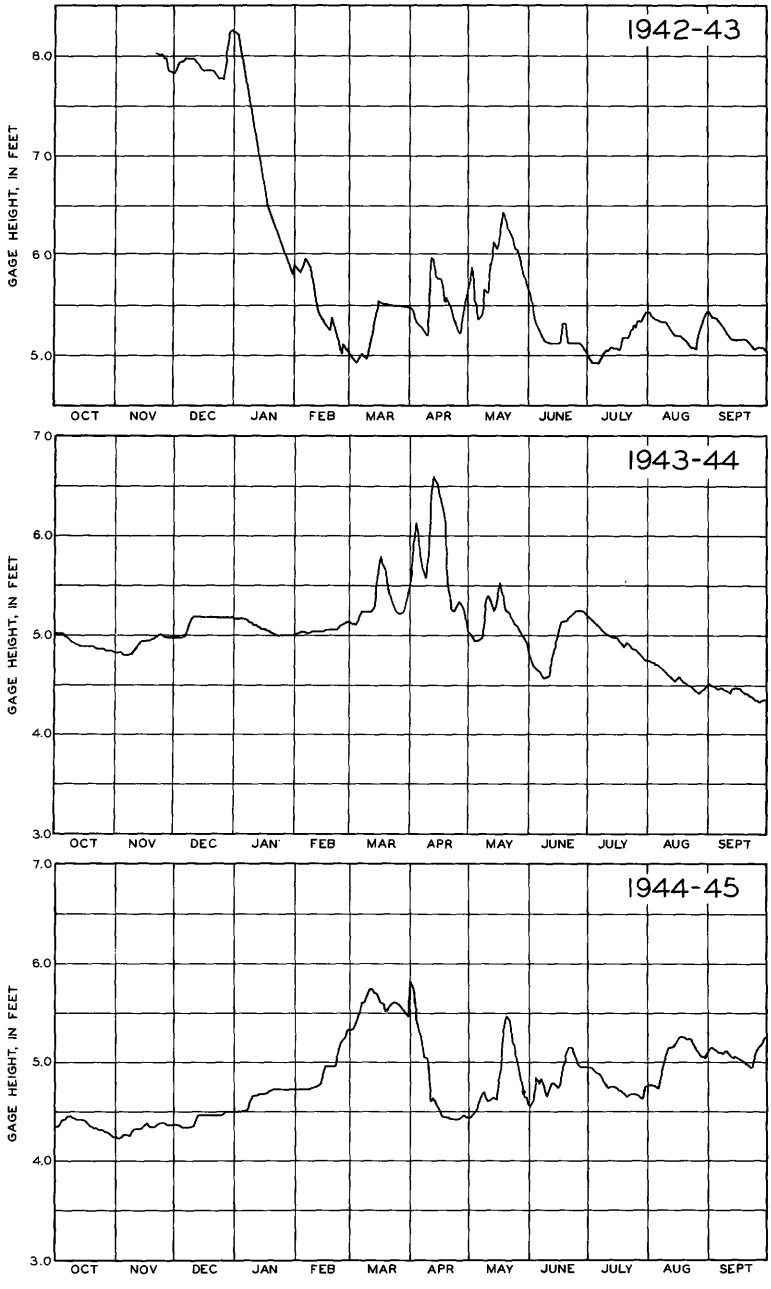

Figure 33. --Lake-level hydrographs for Bear Lake at Wolflake, Ind., for water years 1943-45.

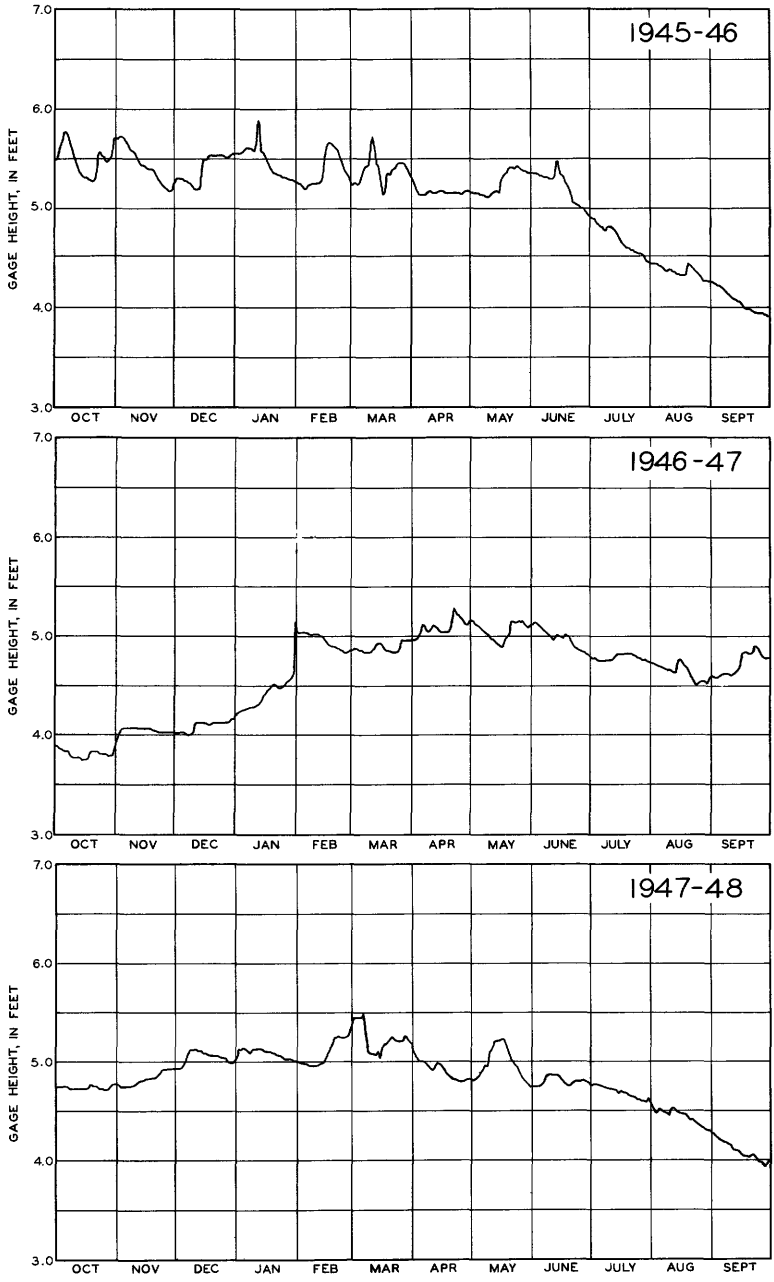

Figure 34. --Lake-level hydrographs for Bear Lake at Wolflake, Ind., for water years 1946-48.

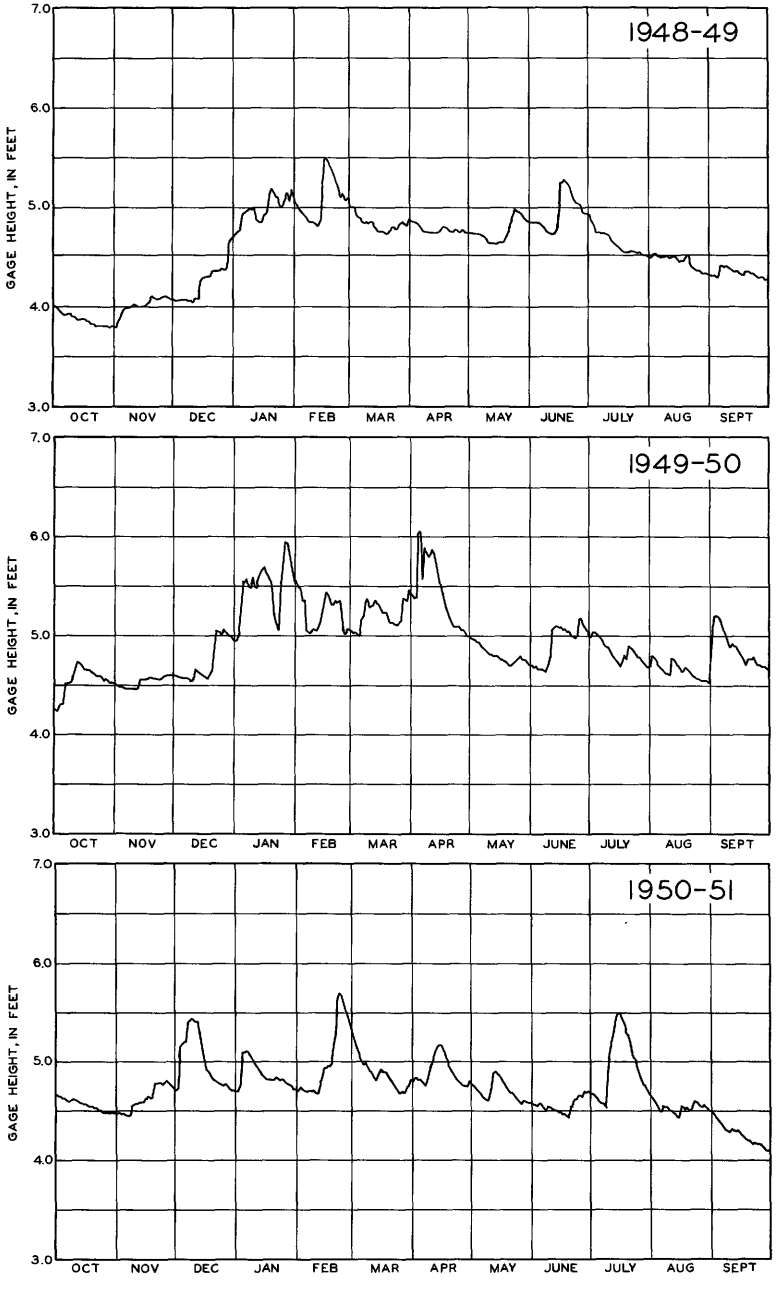

Figure 35. --Lake-level hydrographs for Bear Lake at Wolflake, Ind., for water years 1949-51.

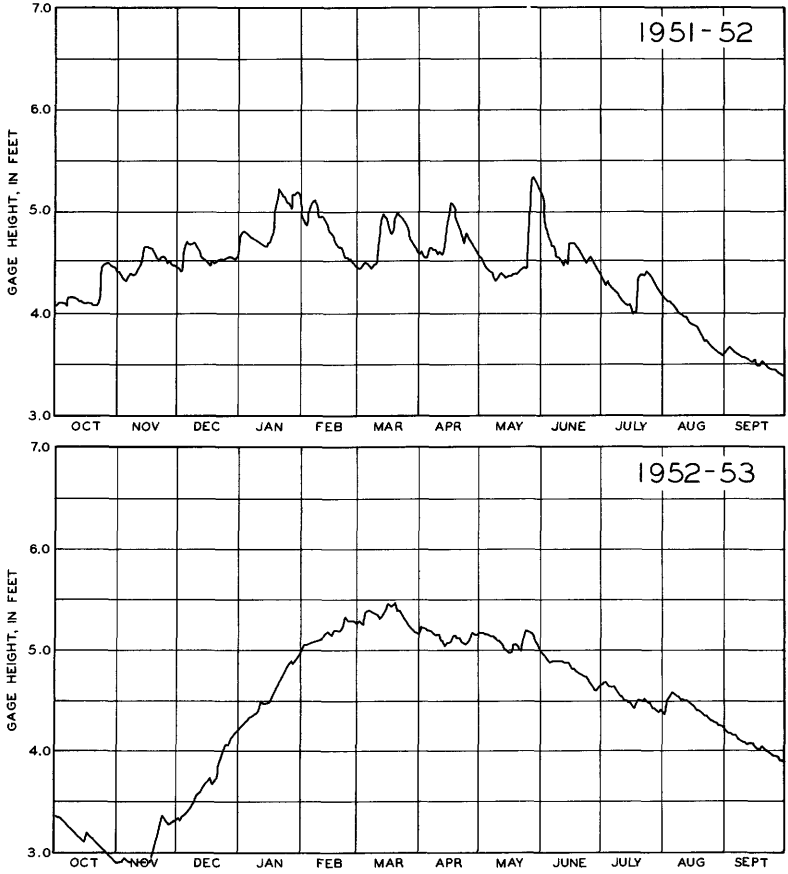

Figure 36. --Lake-level hydrographs for Bear Lake at Wolflake, Ind., for water years 1952-53.

Big Lake near Wolflake, Ind.

Location. --Secs. 32, and 33, T. 33 N., R. 9 E., Noble County, 3.5 miles south and 0.3 mile southwest of the town of Wolflake.

Surface area. --204 acres.

Drainage area. --6.77 sq mi.

Records available. --August 1943 to September 1953 (no record, Jan. 1, 1944, to Feb. 15, 1944).

Gage. --Staff gage on piling in lake at northwest shore. Gage read to hundredths once daily. Datum of gage is 890.00 ft above mean sea level, datum of 1929.

Average lake level. --10 years; gage height, 9.22 ft; elevation, 899.22 ft.

Established legal level. --None.

Lake-level control. --Lake level maintained by the bed of outlet channel.

Extreme levels for Big Lake, 1944-53

Maximum			Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943[a]	Aug. 4, 5, 1943----	*9.20	Aug. 24, 1943 ------	8.79
1944[b]	Apr. 16, 1944-----	11.65	Sept. 29, 30, 1944 --	8.51
1945	May 19, 20, 1945--	11.29	Oct. 31 to Nov. 2, 1944	8.47
1946	Oct. 7, 1945------	9.95	Sept. 30, 1946------	8.02
1947	Apr. 23, 1947-----	11.18	Oct. 17, 1946-------	7.82
1948	Mar. 29, 1948-----	11.01	Sept. 28, 1948------	8.70
1949	Feb. 18, 19, 1949 --	11.36	Oct. 29 to Nov. 2, 1948	8.59
1950	Apr. 4, 1950------	*12.76	Oct. 1-3, 1949------	9.02
1951	Oct. 1, 1950------	9.96	Sept. 29, 30, 1951----	7.80
1952	Jan. 28, 1952-----	9.88	Sept. 17, 1952------	*7.66
1953	May 24-26, 1953 --	8.60	Sept. 22-30, 1953---	7.32

* Estimated.
[a] August and September.
[b] Jan. 15, 1944, to Feb. 15, 1944, missing record.

Maximum recorded thickness and periods of ice cover for Big Lake, 1944-52

Water year	Maximum thickness (inches)	Total days of cover	Period
1944	1½	------	
1945	-------	------	
1946	1	79	Dec. 17, 1945, to Mar. 5, 1946.
1947	9½	101	Dec. 15-26; Dec. 31, 1946, to Mar. 29, 1947.
1948	15	70	Dec. 17, 1947, to Feb. 24, 1948.
1949	3	------	Dec. 25, 1948, to-?
1950	6	100	Dec. 15, 1949, to Mar. 24, 1950.
1951	-------	------	Nov. 27, 1950 to-?
1952	-------	------	Dec. 14, 1951, to-?

Record for period from Jan. 15, 1944, to Feb. 15, 1944 missing.

Discharge measurements at outlet of Big Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 3, 1943-	9.17	2.04	Jan. 15, 1950	12.08	57.2
Oct. 8------	8.70	.44	Jan. 20-----	11.88	47.6
Feb. 16, 1944-	8.71	.46	Jan. 27-----	12.26	57.9
Aug. 11------	8.77	.00	Feb. 7-----	11.02	30.1
Apr. 10, 1945-	10.43	29.3	Feb. 22-----	11.34	35.0
July 11------	9.14	2.53	Mar 24-----	11.09	28.0
Sept. 6------	8.97	1.03	Apr. 8-----	12.52	60.3
Nov. 28------	8.87	1.89	May 3-----	10.43	19.2
Dec. 17------	8.77	1.04	May 24-----	9.74	4.99
May 15, 1946-	8.76	1.84	Sept. 13-----	9.92	1.52
Oct. 1------	8.00	.00	Oct. 17-----	9.63	2.08
Mar. 9, 1949-	10.22	17.0	Nov. 1-----	9.19	14.7
Apr. 27------	9.48	6.24	Nov. 21-----	8.66	9.11
Sept. 6------	9.22	.58	Feb. 20, 1951	9.27	37.6
Dec. 1------	9.28	.90	May 15-----	8.64	15.5
Dec. 19------	9.40	2.43			

Average lake level for Big Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1944	8.65	8.73	8.65	*8.60	*8.76	9.78	10.75
1945	8.57	8.59	8.66	8.74	8.97	9.50	9.98
1946	9.41	8.90	8.84	9.46	9.41	9.60	9.04
1947	7.93	8.18	8.32	8.80	9.43	9.46	10.53
1948	9.01	9.06	9.33	9.51	9.56	10.52	10.28
1949	8.67	8.80	9.01	10.17	10.72	9.99	9.49
1950	9.47	9.34	9.79	11.71	11.30	11.25	11.76
1951	9.68	8.69	8.97	9.14	9.10	8.63	8.69
1952	7.92	8.25	8.40	9.15	8.87	8.52	8.41
1953	7.64	7.50	7.87	8.22	8.20	8.38	8.26
Average	8.70	8.60	8.78	9.35	9.43	9.56	9.72

Year	May	June	July	Aug.	Sept.	Annual
1943	----	----	----	*8.98	8.90	*8.94
1944	10.39	9.81	9.17	8.75	8.59	9.22
1945	9.99	9.72	9.15	9.33	8.95	9.18
1946	8.80	9.09	9.01	8.51	8.18	9.02
1947	10.18	9.86	9.50	9.12	9.11	9.20
1948	10.11	9.90	9.69	9.32	8.86	9.60
1949	9.53	10.09	9.82	9.26	9.12	9.55
1950	9.97	10.11	10.23	9.98	9.90	10.40
1951	8.40	8.16	8.47	8.20	7.97	8.67
1952	8.26	8.35	8.44	8.11	7.86	8.37
1953	8.39	8.15	7.73	7.68	7.37	7.95
Average	9.40	9.32	9.12	8.84	8.62	9.22

* Partial month or partial year.

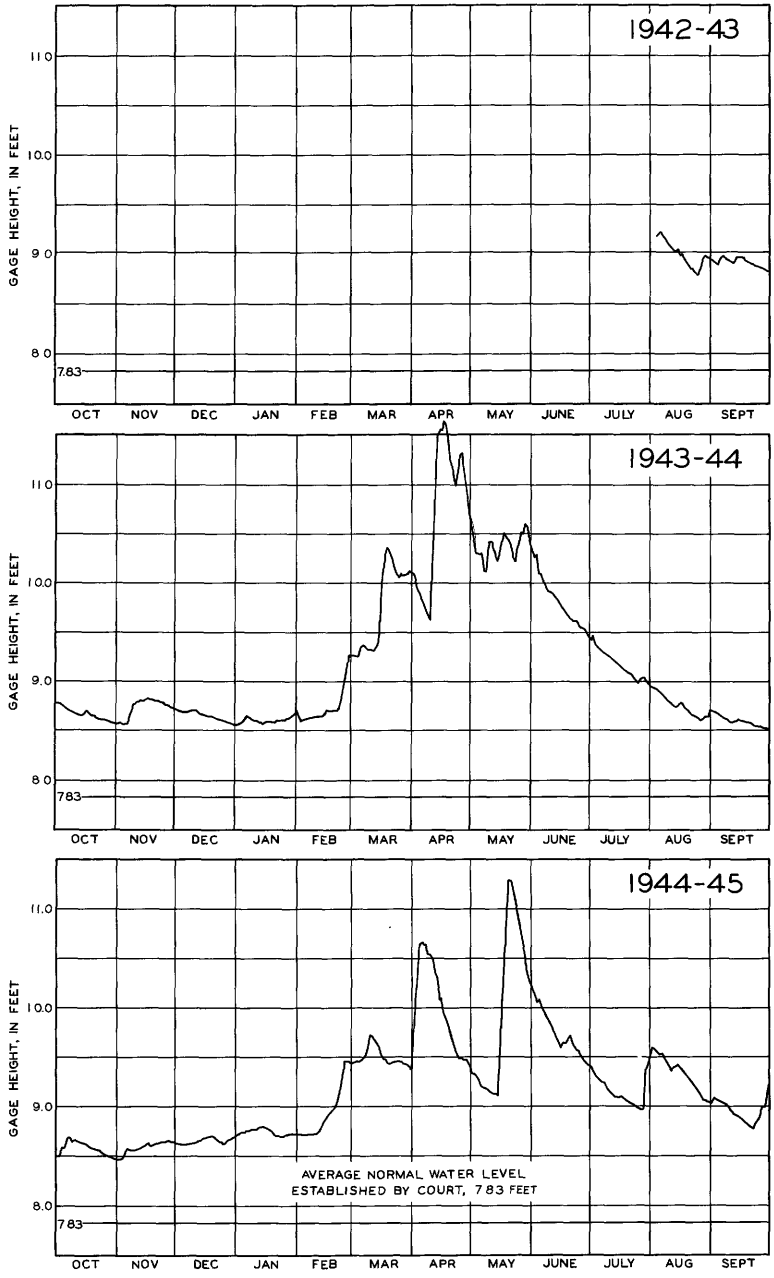

Figure 37. --Lake-level hydrographs for Big Lake at Wolflake, Ind., for water years 1943-45.

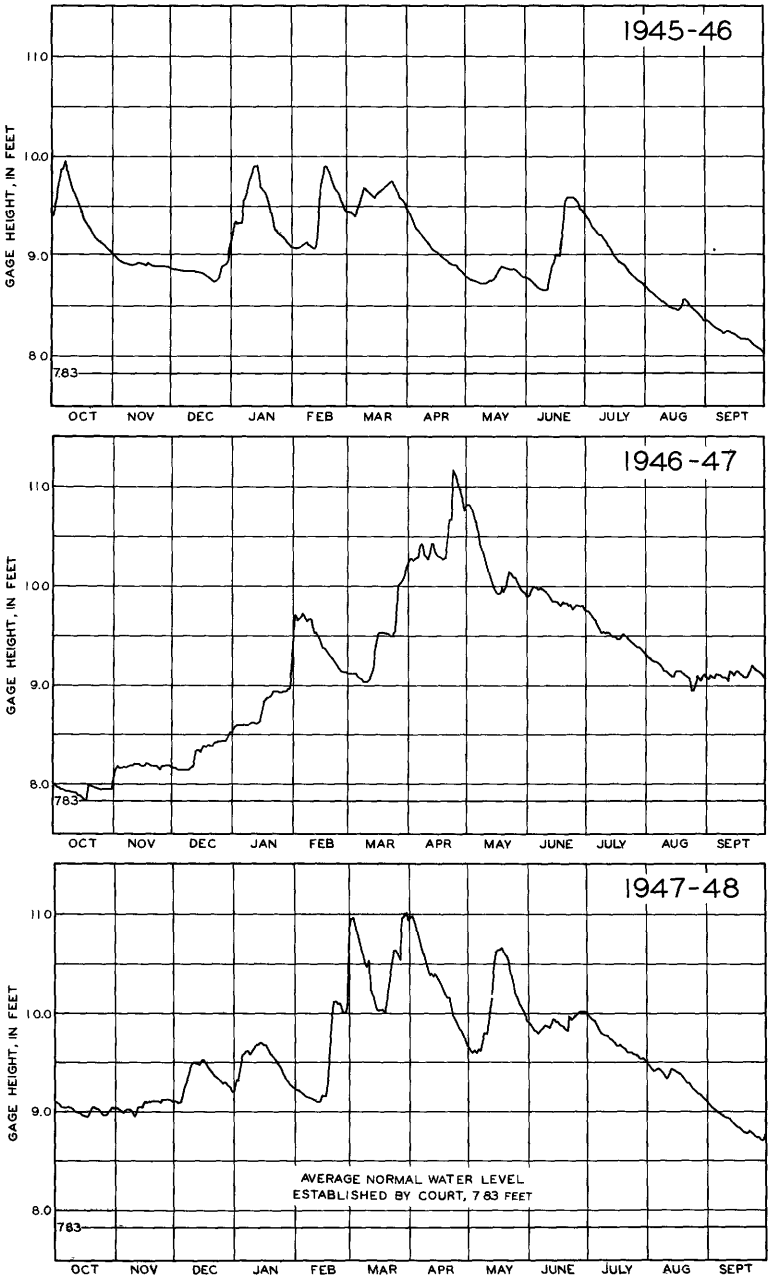

Figure 38. --Lake-level hydrographs for Big Lake at Wolflake, Ind., for water years 1946-48.

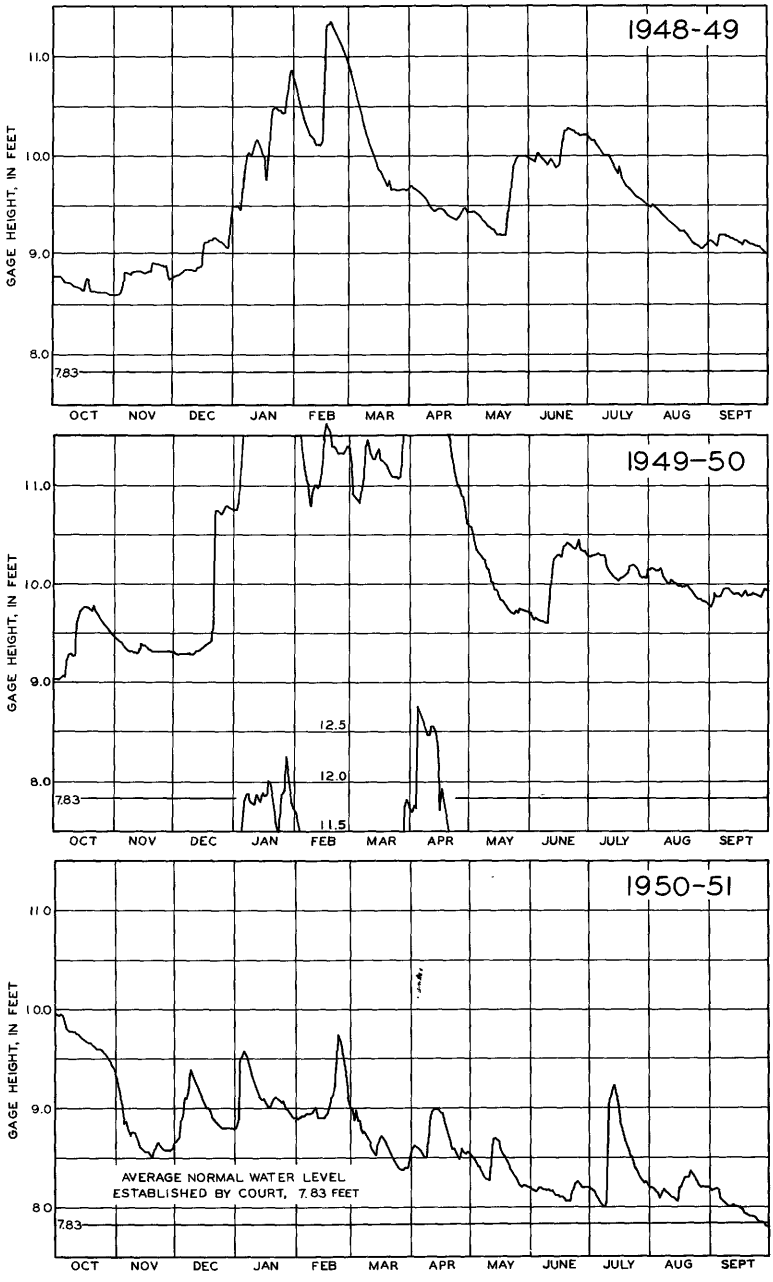

Figure 39. --Lake-level hydrographs for Big Lake at Wolflake Ind., for water years 1949-51.

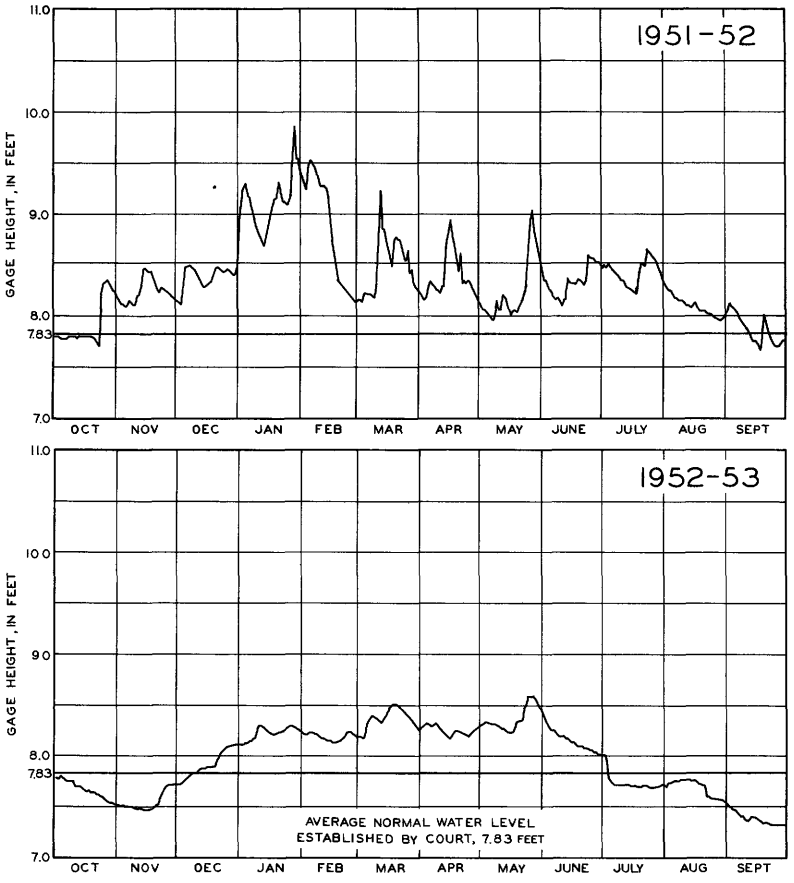

Figure 40. --Lake-level hydrographs for Big Lake at Wolflake Ind., for water years 1952-53.

Bixler Lake at Kendallville, Ind.

Location. --Secs. 3, 4, T. 34 N., R. 11 E., secs. 33, 34, T. 35 N., R. 11 E., Noble County.

Surface area. --112 acres (determined from Bixler Lake contour map).

Drainage area. --3.63 sq mi.

Records available. --May 1945 to September 1953.

Gage. --Staff gage on concrete pier 20 ft upstream from control dam. Gage read to hundredths once daily. Datum of gage is 960.00 ft above mean sea level, unadjusted.

Average lake level. --8 years; gage height, 2.87 ft; elevation, 962.87 ft above mean sea level.

Established legal level. --Established Apr. 25, 1952, at gage height 3.65 ft, elevation, 963.65 ft above mean sea level.

Lake-level control. --Lake level maintained by Columbus deep-notch-type concrete control dam built in October 1946. A flood gate 18 inches in diameter in each abutment provides relief from extremely high water.

Extreme levels for Bixler Lake, 1946-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1946	June 20, 1946 ----	5.10	Sept. 30, 1946---	2.64
1947	Apr. 2, 1947-----	4.89	Oct. 17, 1946 ---	2.36
1948	Feb. 28, 1948----	5.15	Sept. 28, 1948---	2.51
1949	Feb. 15, 1949----	5.23	Oct. 30, 1948 ---	2.09
1950	Apr. 4, 1950-----	5.75	Oct. 2, 1949 ----	3.12
1951	Dec. 3, 4, 1950 --	5.08	Feb. 11, 1951---	2.58
1952	Jan. 20, 1952 ----	4.75	Sept. 30, 1952---	*2.34
1953	May 23, 1953-----	4.36	Nov. 18, 1952---	1.71

* Estimated.

Maximum recorded thickness and periods of ice cover for Bixler Lake, 1946-53

Water year	Maximum thickness (inches)	Total days of cover	Period
1946	9	71	Dec. 16, 1945, to Feb. 24, 1946.
1947	4	62	Dec. 18, 1946, to Feb. 17, 1947.
1948	12 7/8	----	Dec. 16, 1947, to-?
1949	5½	62	Dec. 26, 1948, to Feb. 25, 1949.
1950	6½	54	Dec. 15-21, 1949; Jan. 8-10, 17-25 1950; Feb. 5, 6; Feb. 20 to Mar. 24, 1950.
1951	8	89	Dec. 1, 1950, to Feb. 27, 1951.
1952	7½	78	Dec. 14, 1951, to Jan. 19, 1952; Jan. 24, to Mar. 4, 1952.
1953	------	31	Dec. 28, 1952, to Jan. 15, 1953; Jan. 26, to Feb. 6, 1953.

Discharge measurements at outlet of Bixler Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Oct. 1, 1945-	3.53	1.16	July 1, 1946	4.46	6.67
Dec. 29------	3.41	1.04	July 16-----	3.82	.12
Jan. 11, 1946-	4.48	9.93	Aug. 20-----	3.34	.02
Jan. 29------	3.60	2.91	Aug. 28-----	3.16	0
Feb. 5------	3.50	1.32	Sept. 9-----	2.92	0
Feb. 14------	4.31	8.41	Oct. 1-----	2.61	0
Feb. 14------	4.47	8.53	Oct. 10-----	2.47	0
Feb. 15------	4.53	9.84	Oct. 16-----	2.36	0
Feb. 18------	4.58	12.2	Nov. 21-----	2.62	0
Feb. 23------	4.28	8.74	Dec. 17-----	2.86	0
Feb. 25------	4.16	7.71	Jan. 8, 1947	3.02	0
Mar. 2------	4.14	6.79	Jan. 28-----	3.93	.42
Apr. 11------	3.62	2.21	Feb. 6-----	4.55	6.14
May 15------	3.20	.06	Feb. 13-----	4.24	1.74
May 27------	3.32	.45	Feb. 20-----	4.26	1.60
June 13------	4.86	11.2	Mar. 27-----	4.69	9.64
June 14------	5.00	12.8	Apr. 12-----	4.28	17.8
June 15------	5.03	12.9	Apr. 19-----	3.71	[a]12.4
June 16------	5.02	12.6	July 29-----	3.43	0
June 17------	5.00	12.5	July 31-----	3.35	0
June 20------	5.10	12.7	Oct. 31-----	2.28	0
June 22------	4.98	12.0	Mar. 1, 1948	5.03	[a]26.4
June 26------	4.63	8.91	Mar. 1-----	5.02	19.2

Discharge measurements at outlet of Bixler Lake--Con.

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Mar. 3, 1948-	4.68	[a] 22.4	Aug. 30, 1951	3.56	0.01
Mar. 3------	4.73	9.87	Oct. 8-----	3.28	0
June 10------	4.17	1.08	Nov. 20-----	3.84	.01
June 10------	4.13	[a] 9.98	Dec. 20-----	4.01	.14
Nov. 5------	2.24	0	Feb. 7, 1952	4.42	16.6
Feb. 2, 1949-	4.28	1.72	Mar. 25-----	4.12	[a] 13.1
May 5------	4.31	1.95	July 17-----	3.34	0
Sept. 9------	3.45	0	Dec. 10-----	1.75	0
Mar. 15, 1950-	4.41	[a] 17.0	Jan. 13, 1953	1.70	0
Nov. 9------	3.95	0	Feb. 6-----	2.09	0
Nov. 15------	4.03	.81	Mar. 27-----	4.25	1.76
Jan. 31, 1951-	2.76	[a] 3.05	Apr. 16-----	3.61	[a] 13.7
Apr. 10------	4.50	4.94	June 4-----	3.84	0
May 1------	3.81	.21	July 6-----	3.30	0
June 6------	3.83	.06	July 28-----	2.81	0
July 10------	4.86	[a] 29.5	Aug. 26-----	2.59	0
Aug. 1------	3.89	.14	Sept. 23-----	2.13	0

[a] Gates on dam open.

Average lake level for Bixler Lake for water years 1946-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1946	3.70	3.33	3.38	4.02	4.01	4.28	3.54
1947	2.47	2.60	2.75	3.47	4.32	4.36	4.36
1948	2.90	3.05	3.84	4.36	4.30	4.51	4.43
1949	2.27	2.26	2.38	4.26	4.43	3.71	4.31
1950	3.63	3.65	4.01	4.87	4.13	4.34	4.49
1951	4.04	4.12	3.89	3.52	3.59	3.79	4.07
1952	3.38	3.95	3.98	4.38	4.08	4.17	3.97
1953	2.08	1.78	1.88	2.28	2.73	3.87	4.16
Average	3.06	3.09	3.26	3.90	3.95	4.13	4.17

Year	May	June	July	Aug.	Sept.	Annual
1946	3.26	4.14	3.92	3.34	2.82	3.64
1947	3.87	4.32	3.65	3.02	3.07	3.52
1948	4.56	4.20	3.86	3.35	2.75	3.84
1949	4.33	4.21	3.97	3.73	3.34	3.59
1950	3.71	3.92	4.28	4.04	4.22	4.11
1951	3.87	3.96	4.19	3.91	3.36	3.86
1952	3.97	3.86	3.41	2.91	2.54	3.73
1953	4.09	3.67	3.07	2.79	2.22	2.88
Average	3.96	4.04	3.79	3.39	3.04	2.87

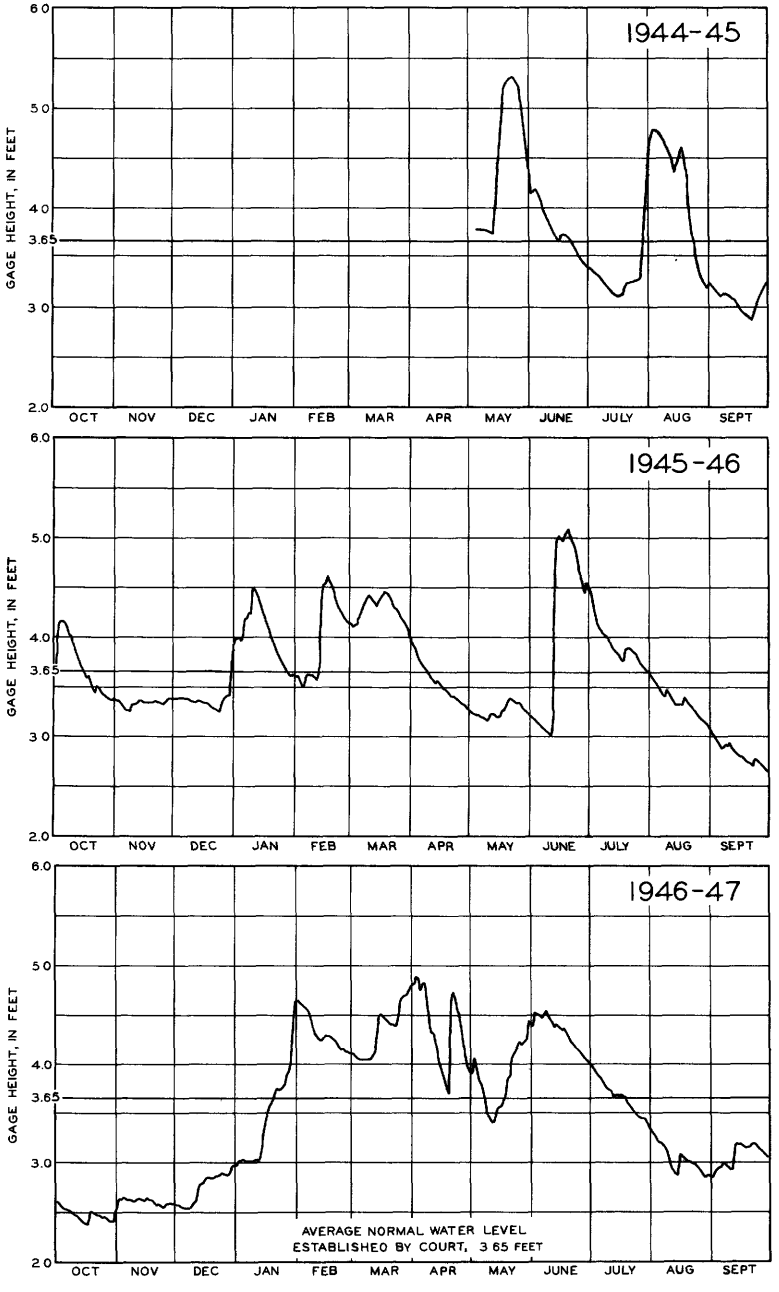

Figure 41.--Lake-level hydrographs for Bixler Lake at Kendallville, Ind., for water years 1945-47.

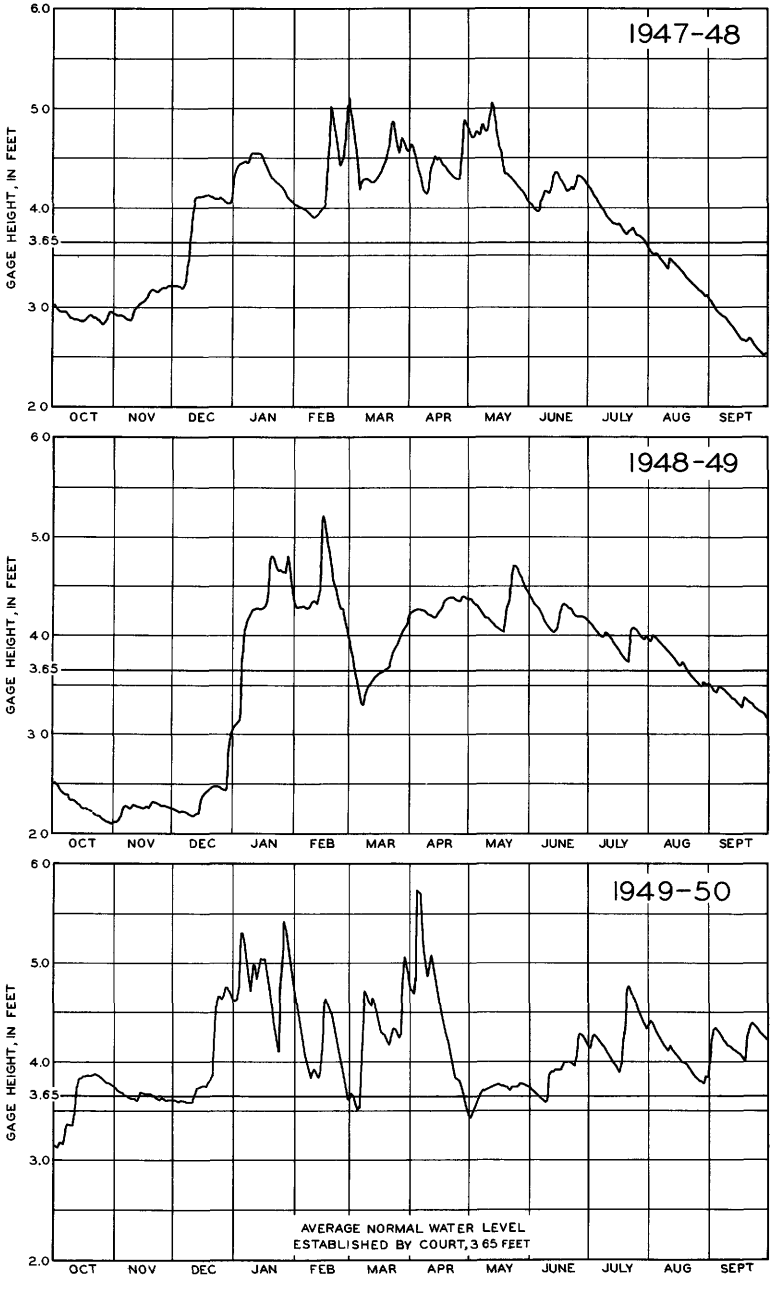

Figure 42. --Lake-level hydrographs for Bixler Lake at Kendallville, Ind., for water years 1948-50.

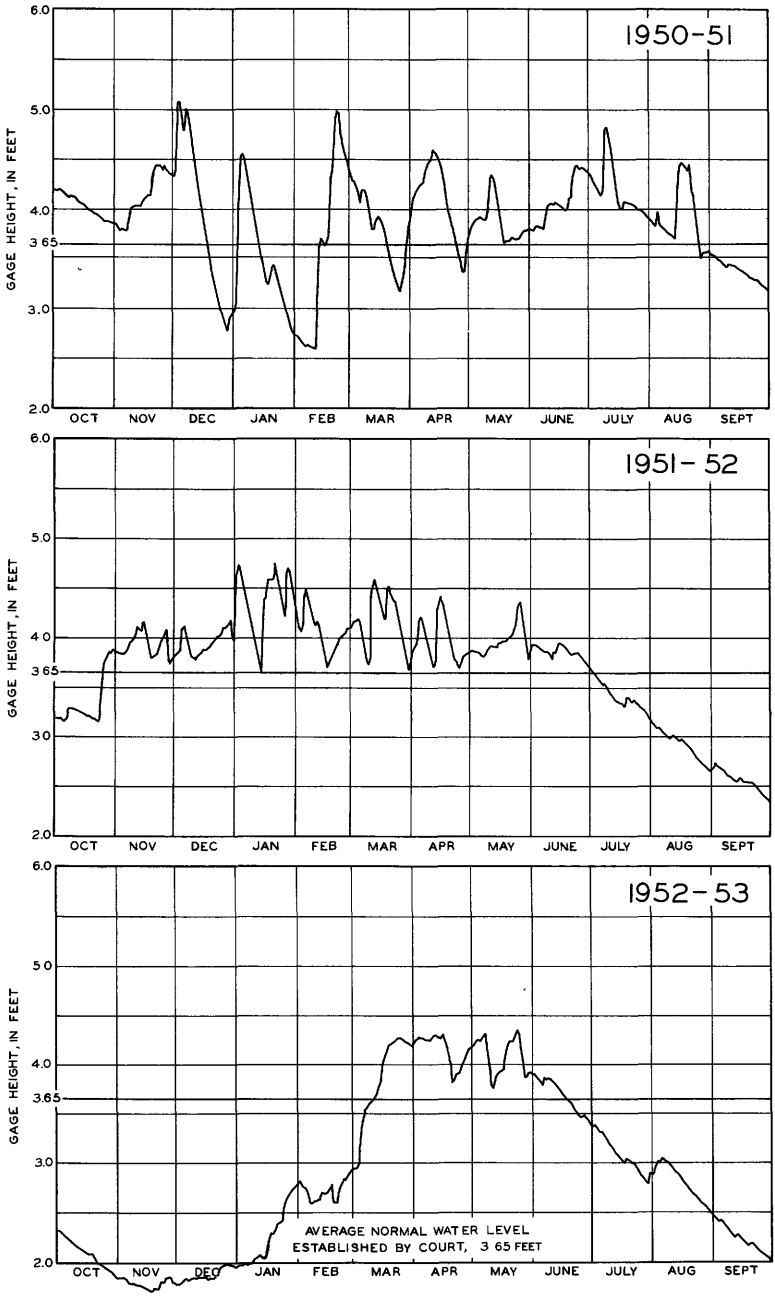

Figure 43. --Lake-level hydrographs for Bixler Lake at Kendallville, Ind., for water years 1951-53.

Bruce Lake at Lake Bruce, Ind.

Location. --Sec. 1, T. 30 N., R. 1 W., Pulaski County and secs. 6 and 7, T. 30 N., R. 1 E., Fulton County.

Surface area. --202 acres.

Drainage area. --5.19 sq mi.

Records available. --August 1943 to November 1952.

Gage. --Staff gage at south shore of the western tip of lake at Egleston Inn. Gage read to hundredths once daily. Datum of gage is 720.00 ft above mean sea level, datum of 1929.

Average lake level. --9 years; gage height, 3.72 ft; elevation, 723.72 ft.

Established legal level. --Established June 20, 1950, at gage height 3.69 ft, elevation, 723.69 ft above mean sea level.

Lake-level control. --Lake level maintained by concrete dam with rounded crest, about 18 in wide and 27 ft long. Crest at gage height 3.55 ft.

Extreme levels for Bruce Lake, 1944-52

Maximum			Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1944	Apr. 12, 1944	4.90	Sept. 26, 1944	*3.04
1945	May 17, 18, 1945	4.80	Nov. 2, 1944	*3.06
1946	June 15, 1946	4.52	Sept. 28-30, 1946	3.06
1947	Apr. 21, 1947	4.71	Oct. 14-17, 1946	2.90
1948	Feb. 28, 29, 1948	4.58	Oct. 12-17, 1947	3.18
1949	Jan. 19, 1949	4.64	Oct. 29, 1948	*3.16
1950	Apr. 4, 1950	4.64	Oct. 1, 2, 1949	3.36
1951	July 10, 1951	4.42	Nov. 6-8, 1950	3.46
1952	June 15, 1952	4.28	Aug. 7, 8, 1952	3.42

* Estimated

Maximum recorded thickness and periods of ice cover 1944-52

Water year	Maximum thickness (inches)	Total days of cover	Period
1944	10	72	Dec. 14, 1943, to Feb. 23, 1944.
1945	-------	-----	
1946	12	81	Dec. 13, 1945, to Mar. 3, 1946.
1947	8	95	Dec. 20, 1946, to Mar. 24, 1947.
1948	15	106	Nov. 30 to Dec. 5; Dec. 9, 1947, to Mar. 18, 1948.
1949	6	62	Dec. 26, 1948, to Feb. 25, 1949.
1950	5	43	Dec. 9, 15-17, 1949; Jan. 17-21, 1950; Feb. 1-11; Feb. 20, to Mar. 9, 1950; Mar. 14-18, 1950.
1951	14	101	Nov. 24, 1950, to Mar. 4, 1951.
1952	8	62	Nov. 20, 1951, to Jan. 20, 1952.

Discharge measurements at outlet of Bruce Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 5, 1943	4.39	29.0	Feb. 11, 1947	4.03	4.11
Oct. 12------	3.67	1.06	Feb. 21------	3.97	2.76
Jan. 18, 1944	3.63	.75	Nov. 19------	3.66	1.39
May 9------	4.08	11.8	Apr. 8, 1948	4.31	19.8
July 11------	3.49	.01	May 13------	4.45	60.2
June 12, 1945	3.72	2.21	May 18------	3.95	19.1
Aug. 20------	3.56	.20	June 24------	3.78	9.07
Nov. 27------	3.79	3.20	Nov. 2------	3.35	0
Apr. 3, 1946	4.01	6.59	Jan. 12, 1949	3.78	11.4
June 5------	3.67	.86	Feb. 22------	3.89	18.2
June 24------	4.16	9.65	Mar. 21------	3.63	4.15
July 9------	3.76	1.04	Apr. 25------	3.63	3.60
July 18------	3.58	.07	Mar. 16, 1950	3.82	12.8
July 19------	3.42	0	Nov. 24------	3.67	4.87

Average lake level for Bruce Lake for water years 1943-52

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr
1944	3.71	3.85	3.70	3.65	3.81	4.13	4.28
1945	3.15	3.18	3.29	3.40	3.59	3.91	4.04
1946	3.83	3.77	3.73	4.05	4.00	4.23	3.88
1947	3.02	3.67	3.79	4.02	4.08	3.95	4.36
1948	3.27	3.58	3.78	3.94	3.97	4.22	4.03
1949	3.26	3.58	3.66	3.93	3.87	3.69	3.66
1950	3.62	3.58	3.73	4.10	3.95	3.88	4.00
1951	3.54	3.59	3.65	3.78	3.79	3.76	3.85
1952	3.66	3.77	3.73	3.91	3.82	3.79	3.82
Average	3.45	3.62	3.67	3.86	3.88	3.95	3.99

Year	May	June	July	Aug.	Sept.	Annual	
1943	-----	-----	-----	*4.06	3.95	*4.01	
1944	4.08	3.84	3.46	3.18	3.12	3.73	
1945	4.13	3.77	3.59	3.58	3.46	3.59	
1946	3.80	4.01	3.64	3.30	3.12	3.78	
1947	4.10	4.09	3.57	3.25	3.20	3.76	
1948	4.00	3.63	3.63	3.52	3.36	3.74	
1949	3.70	3.67	3.59	3.51	3.42	3.63	
1950	3.62	3.70	3.79	3.52	3.55	3.75	
1951	3.70	3.64	3.86	3.65	3.56	3.70	
1952	3.74	3.78	3.56	3.68	3.57	3.74	
Average	3.87	3.79	3.63	3.52	3.43	3.72	

*Partial month or partial year.

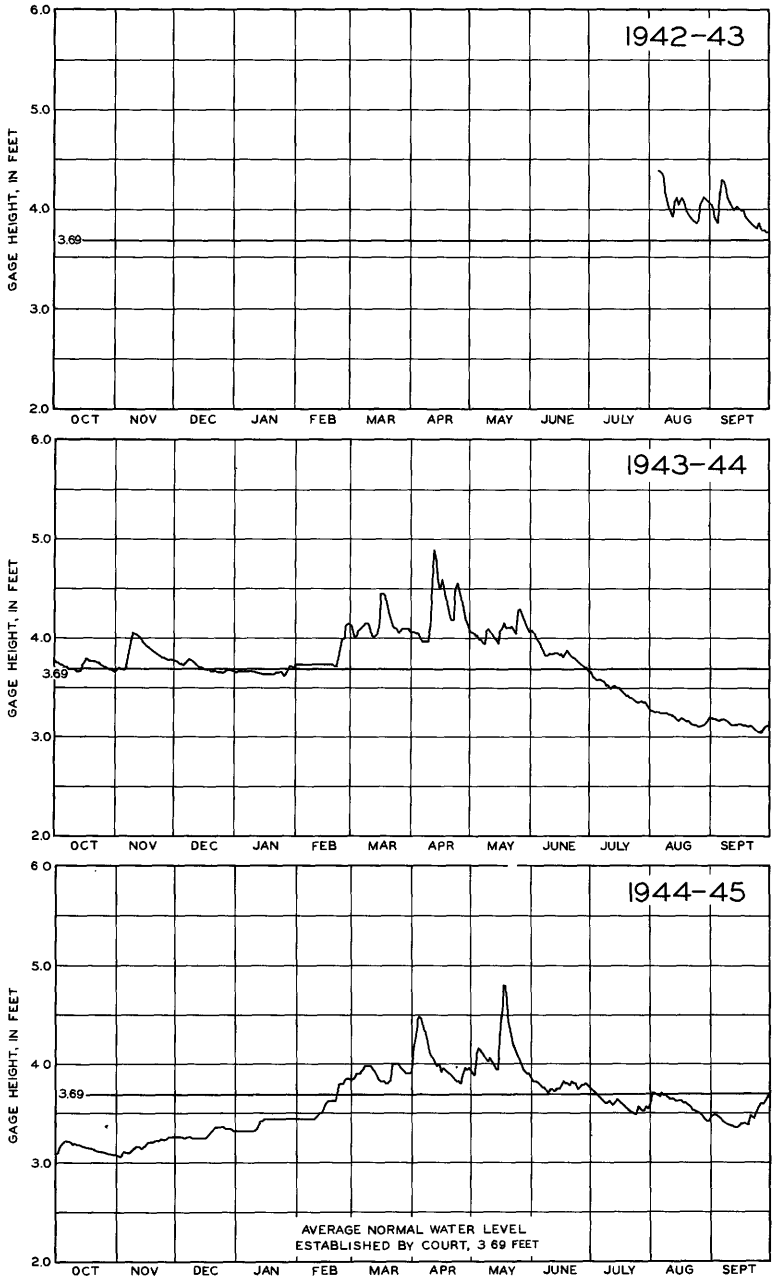

Figure 44. --Lake-level hydrographs for Bruce Lake at Lake, Bruce, Ind., for water years 1943-45.

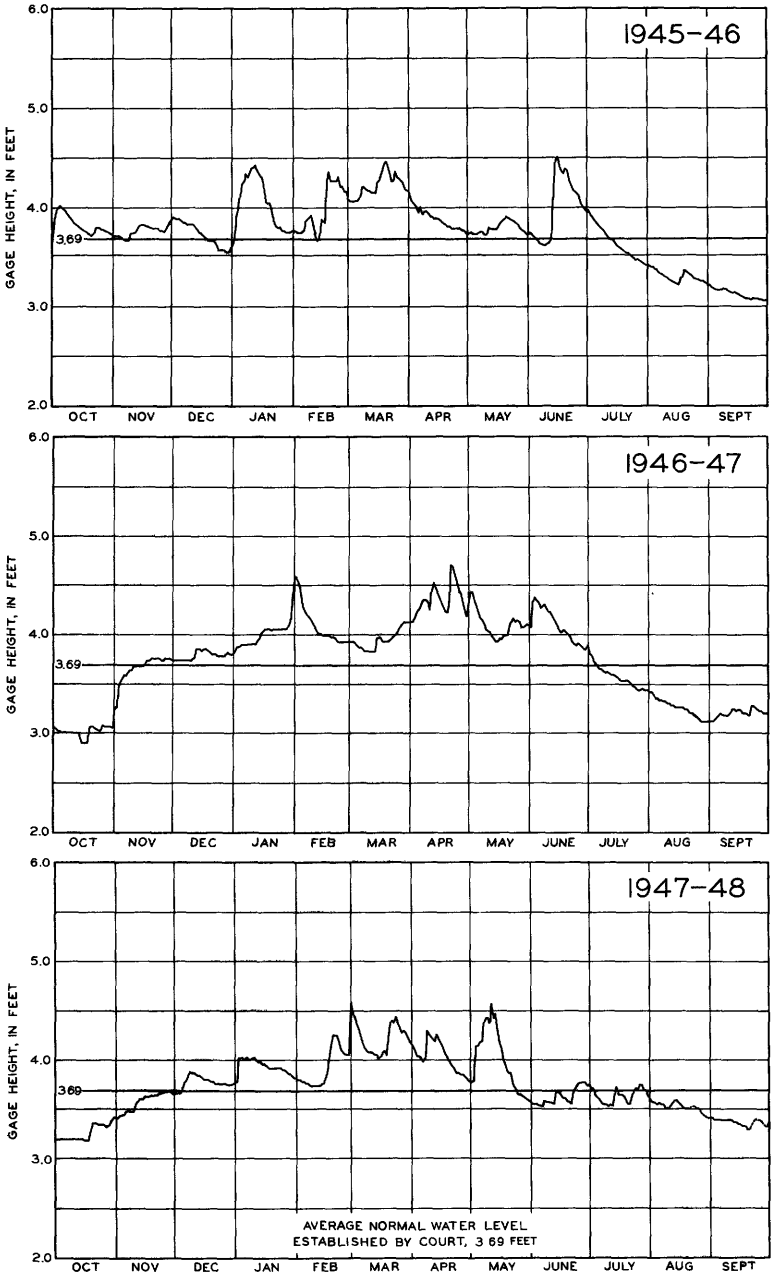

Figure 45. --Lake-level hydrographs for Bruce Lake at Lake Bruce, Ind., for water years 1946-48.

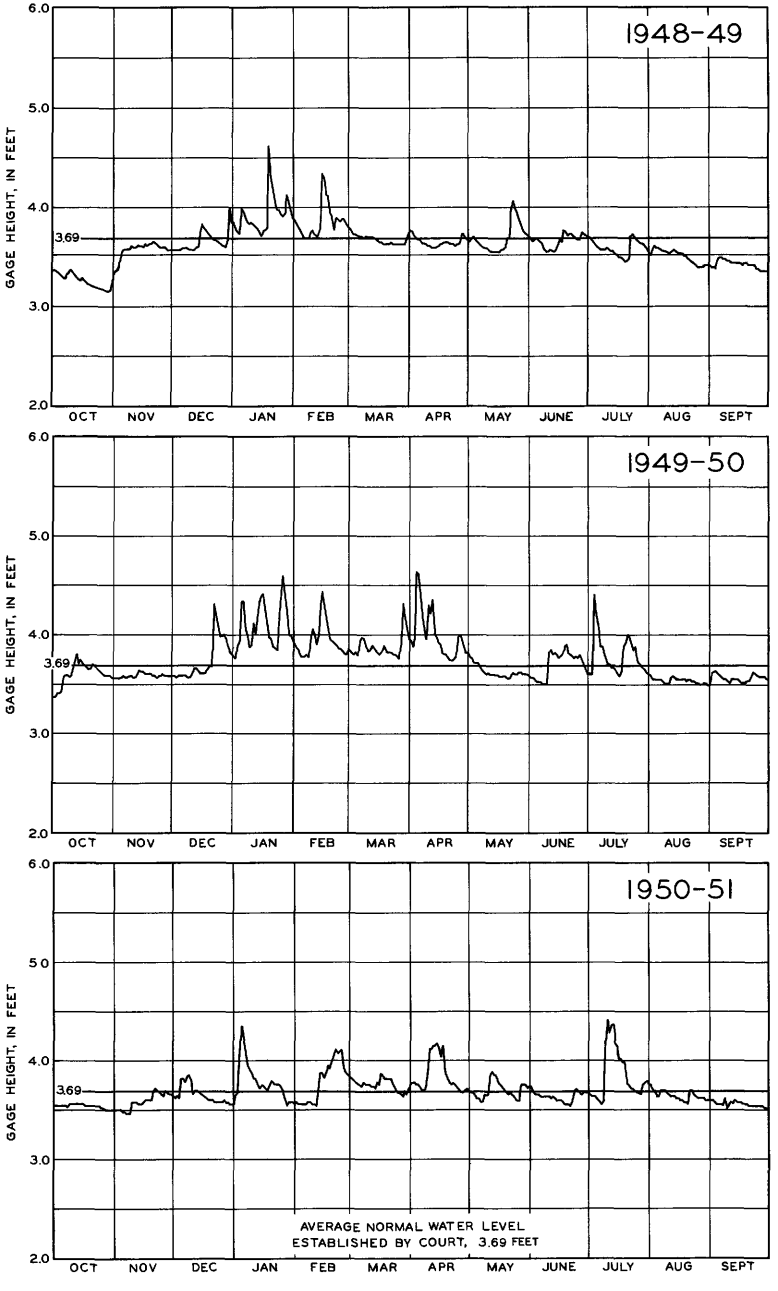

Figure 46. --Lake-level hydrographs for Bruce Lake at Lake Br
Ind., for water years 1949-51.

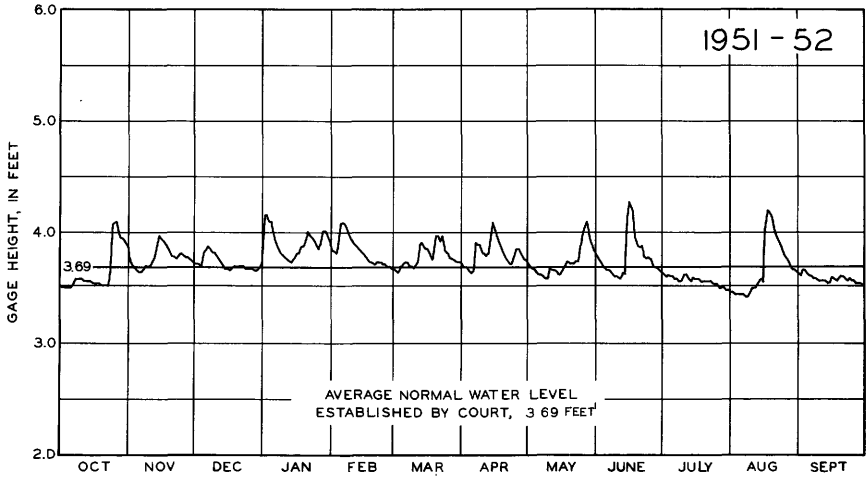

Figure 47. --Lake-level hydrographs for Bruce Lake at Lake Bruce, Ind., for water year 1952.

Cedar Lake at Cedar Lake, Ind.

Location. --Secs. 22, 23, 26, 27, 34, and 35, T. 34 N., R. 9 W., Lake County.

Surface area. --805 acres.

Drainage area. --8.05 sq mi.

Records available. --August 1943 to September 1953.

Gage. --Staff gage at middle of east shore, on boat crane post of Lawson's Marine Service Building. Gage read to hundredths once daily. Datum of gage is 690.00 ft above mean sea level, datum of 1929.

Average level. --10 years (1944-53); gage height, 2.94 ft; elevation, 692.94 ft.

Established legal level. --None.

Lake-level control. --Lake level maintained by concrete dam, 25 ft long. Crest at gage height, 2.90 ft.

Extreme levels for Cedar Lake, 1944-53

Water year	Maximum Date	Maximum Gage height (feet)	Minimum Date	Minimum Gage height (feet)
1943[a]	Aug. 16, 1943	3.45	Sept. 27-30, 1943	[a]2.97
1944	Mar. 16, 1944	4.23	Sept. 27, 1944	2.31
1945	May 19, 1945	3.87	Dec. 3-5, 1944	2.27
1946	Jan. 12, 1946	3.73	Sept. 29, 30, 1946	2.35
1947	May 1, 1947	4.11	Oct. 16, 17, 1946	2.21
1948	May 11, 1948	4.02	Sept. 28, 1948	2.07
1949	Feb. 15, 22, 1949	3.36	Oct. 29, 30, 1948	1.93
1950	Dec. 23, 1949	3.90	Aug. 27, 1950	2.40
1951	Feb. 20, 21, 1951	3.52	Nov. 6, 1950	2.45
1952	June 14, 1952	4.02	Sept. 30, 1952	2.32
1953	Mar. 18, 19, 1953	3.39	Nov. 7-9, 16-17, 1952	1.96

[a] August and September.

Maximum recorded thickness and periods of ice cover 1944-52

Water year	Maximum thickness (inches)	Total days of cover	Period
1944	------	110	Nov, 14, 1943, to Feb. 6, 1944; Feb. 11 to Feb. 27; Mar. 8-15, 1944.
1945	14	100	Dec. 3, 1944, to Mar. 12, 1945.
1946	10	88	Dec. 6, 1945, to Mar. 3, 1946.
1947	7	102	Dec. 19, 1946, to Mar. 30, 1947.
1948	16	111	Nov. 27, 1947, to Mar. 16, 1948.
1949	9	80	Dec. 11, 1948, to Feb. 28, 1949.
1950	5	100	Nov. 26-30; Dec. 9, 1949, to Jan. 1, 1950; Jan. 6-25; Jan. 27, to Mar. 18, 1950.
1951	6	-----	
1952	------	-----	Nov. 8, 1951 to - ?

Discharge measurements at outlet of Cedar Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 9, 1943	3.19	7.48	Aug. 25, 1945	2.67	0
Oct. 14	2.91	0	Oct. 26	2.85	0
Jan. 21, 1944	2.95	.25	Apr. 10, 1946	3.18	4.78
May 11	3.37	15.6	July 24	2.93	[a] .04
July 12	2.99	.73	Aug. 26	2.62	0
June 7, 1945	3.25	2.95	Sept. 23	2.44	0

Discharge measurements at outlet of Cedar Lake--Continued

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Oct. 21, 1946-	2.25	0	Apr. 19, 1948-	3.09	4.43
Nov. 18------	2.53	0	May 11------	4.06	72.7
Dec. 20------	2.79	0	May 13------	3.91	65.6
Jan. 6, 1947-	2.95	0	May 18------	3.58	35.8
Feb. 17------	3.25	2.09	Aug. 2------	4.35	0
Mar. 5------	3.23	.40	Nov. 2------	1.97	0
Apr. 7------	3.85	43.5	Feb. 21, 1949-	3.28	12.3
May 1------	4.03	61.1	Oct. 17------	3.00	.82
June 16------	3.37	10.6	Mar. 7, 1951-	3.22	13.5
Dec. 16------	3.05	2.01	May 21------	3.17	8.03
Feb. 28, 1948-	3.49	31.8	Jan. 20, 1953-	2.52	0

[a] Twigs and brush on dam crest restricting outflow.

Average lake level for Cedar Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1944	2.94	3.05	3.00	2.97	3.06	3.59	3.66
1945	2.40	2.34	2.32	2.39	2.54	3.06	3.34
1946	2.88	2.84	2.94	3.45	3.38	3.46	3.15
1947	2.26	2.50	2.66	3.04	3.29	3.31	3.70
1948	2.65	2.75	2.99	3.04	3.08	3.36	3.17
1949	2.03	2.07	2.19	2.65	3.18	3.18	3.18
1950	2.97	2.87	3.19	3.45	3.36	3.36	3.49
1951	2.58	2.51	2.74	3.03	3.21	3.22	3.27
1952	2.84	3.06	3.11	3.22	3.12	3.23	3.29
1953	2.13	2.02	2.24	2.44	2.65	3.13	3.04
Average	2.57	2.60	2.74	2.97	3.09	3.29	3.33

Year	May	June	July	Aug.	Sept.	Annual
1943	----	----	----	*3.29	3.08	*3.17
1944	3.37	3.19	2.90	2.54	2.41	3.06
1945	3.60	3.28	2.98	2.73	2.62	2.80
1946	3.12	3.32	3.09	2.66	2.46	3.06
1947	3.64	3.44	3.00	2.75	2.70	3.02
1948	3.40	2.95	2.72	2.49	2.19	2.90
1949	3.08	2.99	3.16	2.99	2.87	2.80
1950	3.26	3.06	2.93	2.67	2.56	3.09
1951	3.21	2.88	2.99	3.85	2.77	2.95
1952	3.12	3.36	2.97	2.74	2.50	3.05
1953	3.03	2.98	2.92	2.61	2.22	2.62
Average	3.28	3.14	2.97	2.85	2.58	2.94

*Partial month or partial year.

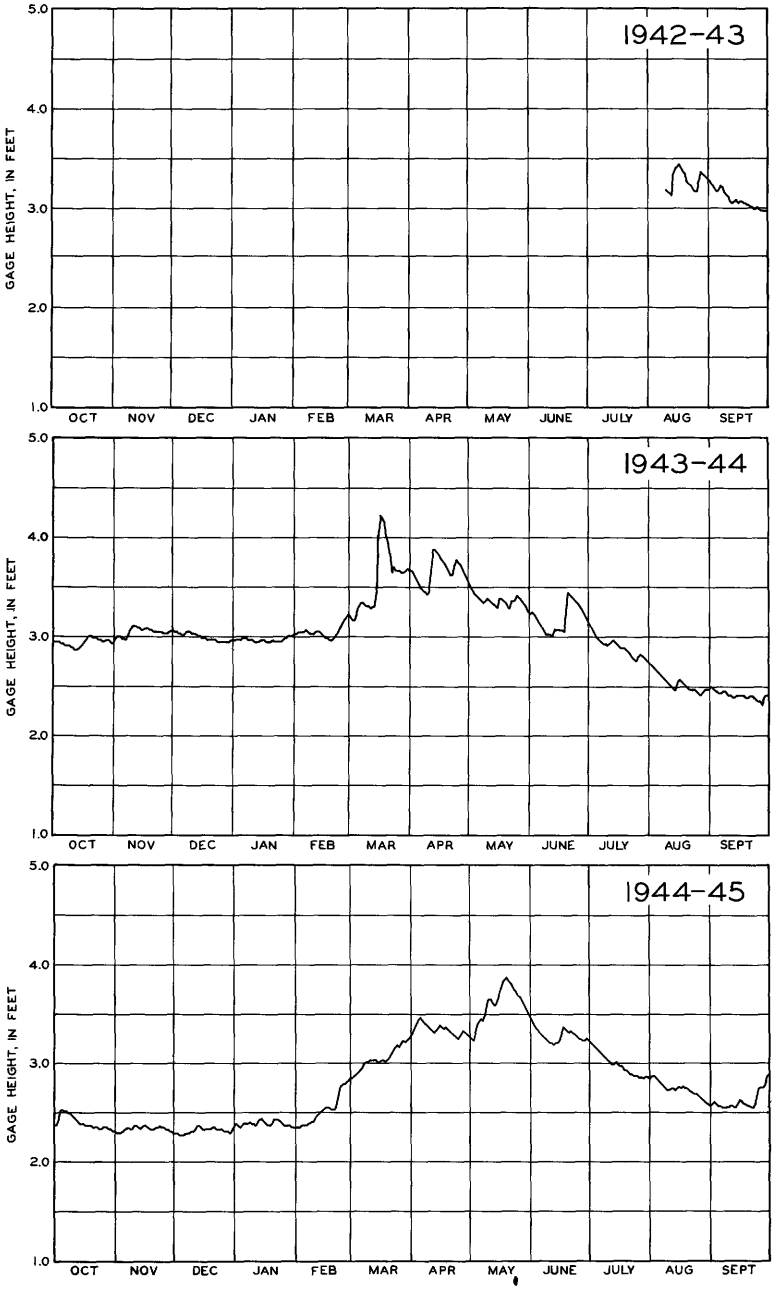

Figure 48. --Lake-level hydrographs for Cedar Lake at Cedar Lake, Ind., for water years 1943-45.

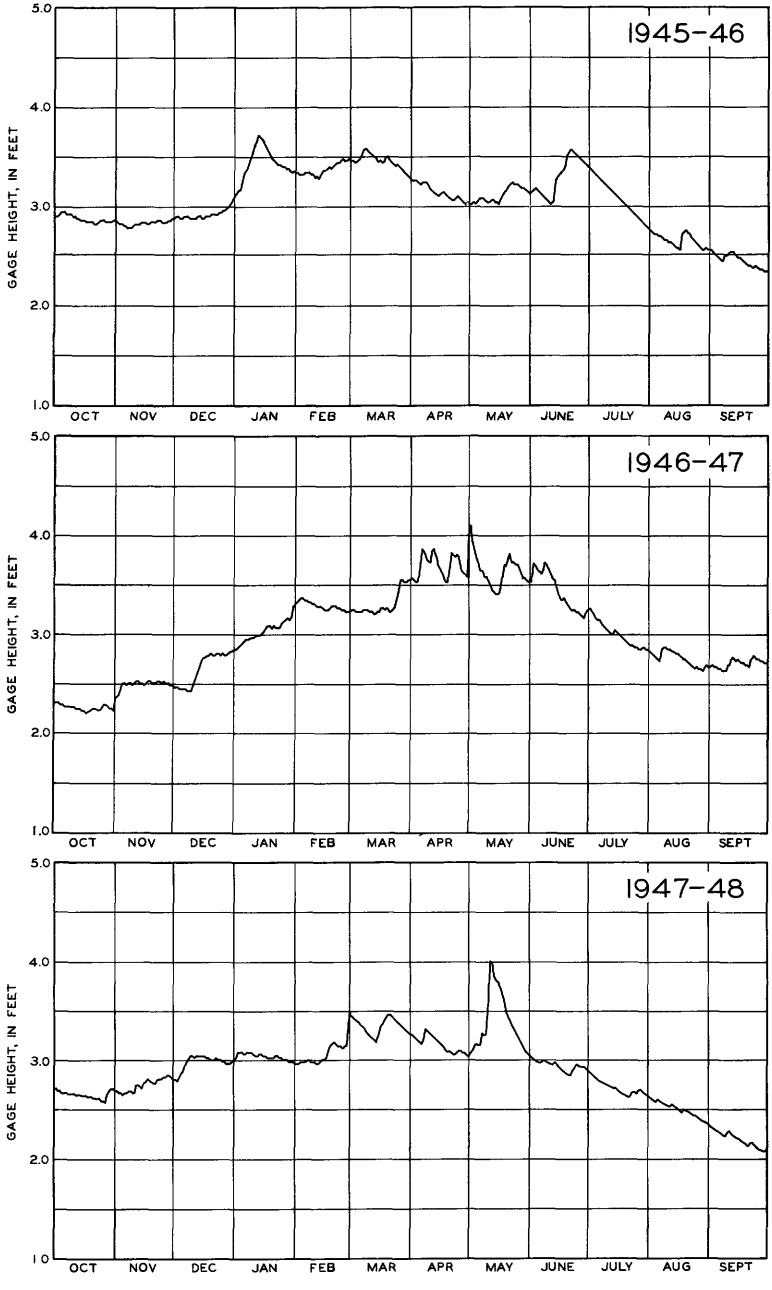

Figure 49. --Lake-level hydrographs for Cedar Lake at Cedar Lake, Ind., for water years 1946-48.

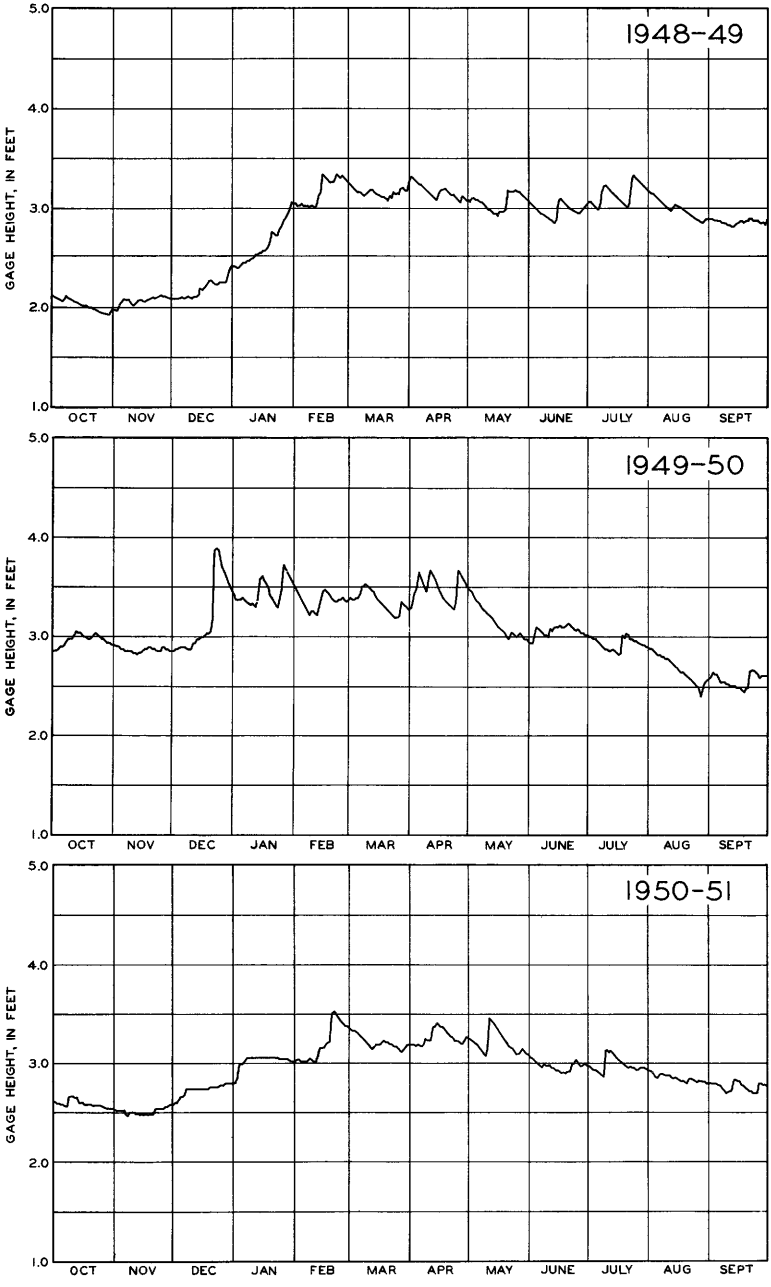

Figure 50.--Lake-level hydrographs for Cedar Lake at Cedar Lake, Ind., for water years 1949-51.

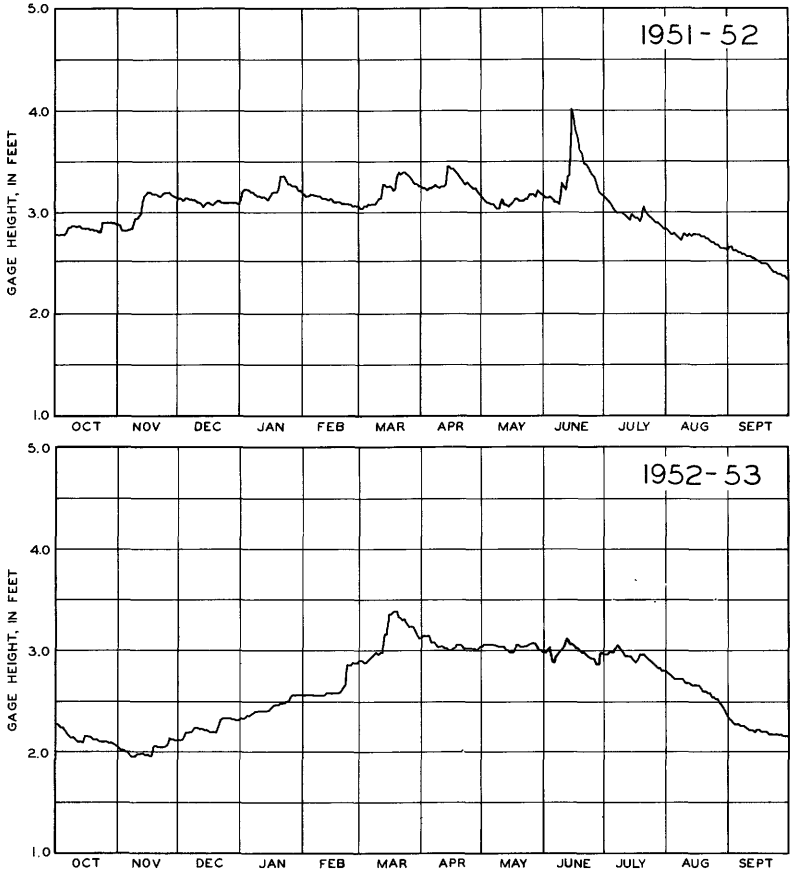

Figure 51. --Lake-level hydrographs for Cedar Lake at Cedar Lake, Ind., for water years 1952-53,

Cedar Lake near Waterloo, Ind.

Location. --Sec. 30, T. 35 N., R. 13 E., DeKalb County, 3.5 miles northwest of Waterloo.

Surface area. --27 acres.

Drainage area. --21.8 sq mi.

Records available. --August 1943 to September 1953.

Gage. --Staff gage attached to outlet control dam. Gage read to hundredths once daily. Datum of gage is 890.00 ft above mean sea level, unadjusted.

Average lake level. --10 years; gage height, 6.79 ft; elevation, 896.79 ft.

Established legal level. --Level established Apr. 10, 1953, at gage height 6.76 ft; elevation, 896.76 ft above mean sea level.

Lake-level control. --Lake level controlled by a concrete dam with sill elevation at gage height 4.65 ft. Stop logs can be placed on sill to raise lake level.

Extreme levels for Cedar Lake near Waterloo, 1944-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1944	Apr. 12, 1944	10.58	Aug. 1, 1944	6.41
1945	May 18, 1945	9.80	Oct. 2, 21-31, Nov. 1-4, 1944	6.40
1946	June 13, 1946	10.03	Aug. 2 to Sept. 21, 1946	6.38
1947	Apr. 21, 1947	10.78	Aug. 25, 1947	6.40
1948	Feb. 28, 1948	10.60	Sept. 16-20, 25-28, 1948	6.14
1949	Feb. 16, 1949	11.90	Aug. 20, 1949	6.10
1950	Apr. 5, 1950	12.84	Aug. 24, 1950	5.50
1951	Feb. 20, 1951	10.62	July 7, Sept. 18-20, 1951	5.96
1952	Mar. 13, 1952	9.72	July 10-14, 1952	5.78
1953	Mar. 4, 1953	8.46	Oct. 8, 9, 1952	5.62

Maximum recorded thickness and periods of ice cover 1945-53

Water year	Maximum thickness (inches)	Total days of cover	Period
1945	8	-----	
1946	------	-----	Unknown to Mar. 6, 1946.
1947	------	-----	Dec. 2-9, 1946; unknown to Apr. 4, 1947.
1948	10	104	Nov. 28 to Dec. 8; Dec. 19, 1947, to Mar. 20, 1948.
1949	------	71	Dec. 27, 1948, to Mar. 7, 1949.
1950	------	78	Dec. 7-12, 14-19, 1949; Jan. 7-13, 19-29; Feb. 3-14; Feb. 19 to Mar. 26, 1950
1951	4	98	Nov. 28, 1950, to Mar. 4, 1951.
1952	------	96	Nov. 20-26; Dec. 14, 1951, to Mar. 11, 1952.
1953	------	106	Nov. 30, 1952, to Mar. 15, 1953.

Discharge measurements at outlet of Cedar Lake near Waterloo

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 2, 1943	6.61	6.47	June 15, 1946	8.53	98.6
Oct. 4-----	6.45	2.37	June 17------	7.64	47.5
Feb. 11, 1944	6.49	2.61	June 18------	7.44	41.1
Apr. 24-----	8.68	170	June 20------	7.88	64.5
Aug. 1-----	6.41	*.15	July 24------	6.42	0
July 2, 1945	6.54	3.59	Feb. 13, 1947	6.70	23.8
Sept. 4-----	6.46	1.58	Oct. 23------	6.51	3.04
Dec. 12-----	6.54	4.23	Feb. 29, 1948	9.78	189
Apr. 11, 1946	6.61	6.83	Mar. 22------	8.68	122
May 24-----	6.62	8.19	Sept. 29------	6.18	0

*Estimated

Average lake level for Cedar Lake near Waterloo for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1944	6.52	6.64	6.51	6.69	6.78	7.37	7.77
1945	6.44	6.46	6.47	6.45	6.73	7.09	7.21
1946	6.87	6.60	6.62	6.89	7.06	6.90	6.61
1947	6.46	6.53	6.63	6.78	6.80	7.13	8.04
1948	6.52	6.65	6.92	6.93	7.48	7.51	7.09
1949	6.20	6.32	6.53	7.57	7.54	6.66	6.73
1950	6.35	6.12	6.90	9.04	7.73	8.59	8.63
1951	6.64	7.07	7.30	7.07	7.55	6.87	6.83
1952	6.82	7.17	7.06	8.05	7.43	7.51	7.23
1953	6.67	7.00	7.04	6.71	6.48	6.85	6.67
Average	6.55	6.66	6.80	7.22	7.16	7.25	7.28

Year	May	June	July	Aug.	Sept.	Annual	
1943	----	----	----	6.61	6.61	*6.61	
1944	7.03	6.71	6.46	6.43	6.43	6.76	
1945	7.26	6.70	6.50	6.56	6.51	6.70	
1946	6.58	7.23	6.54	6.38	6.39	6.72	
1947	7.31	6.94	6.50	6.43	6.47	6.83	
1948	7.44	6.65	6.29	6.19	6.16	6.82	
1949	6.57	6.47	6.34	6.31	6.97	6.68	
1950	6.66	6.51	6.57	5.92	6.68	7.14	
1951	6.40	6.61	6.52	6.44	6.05	6.77	
1952	6.58	6.05	6.65	7.43	7.67	7.14	
1953	6.71	6.59	6.44	6.50	6.92	6.70	
Average	6.85	6.65	6.48	6.47	6.62	6.74	

*Partial month or partial year.

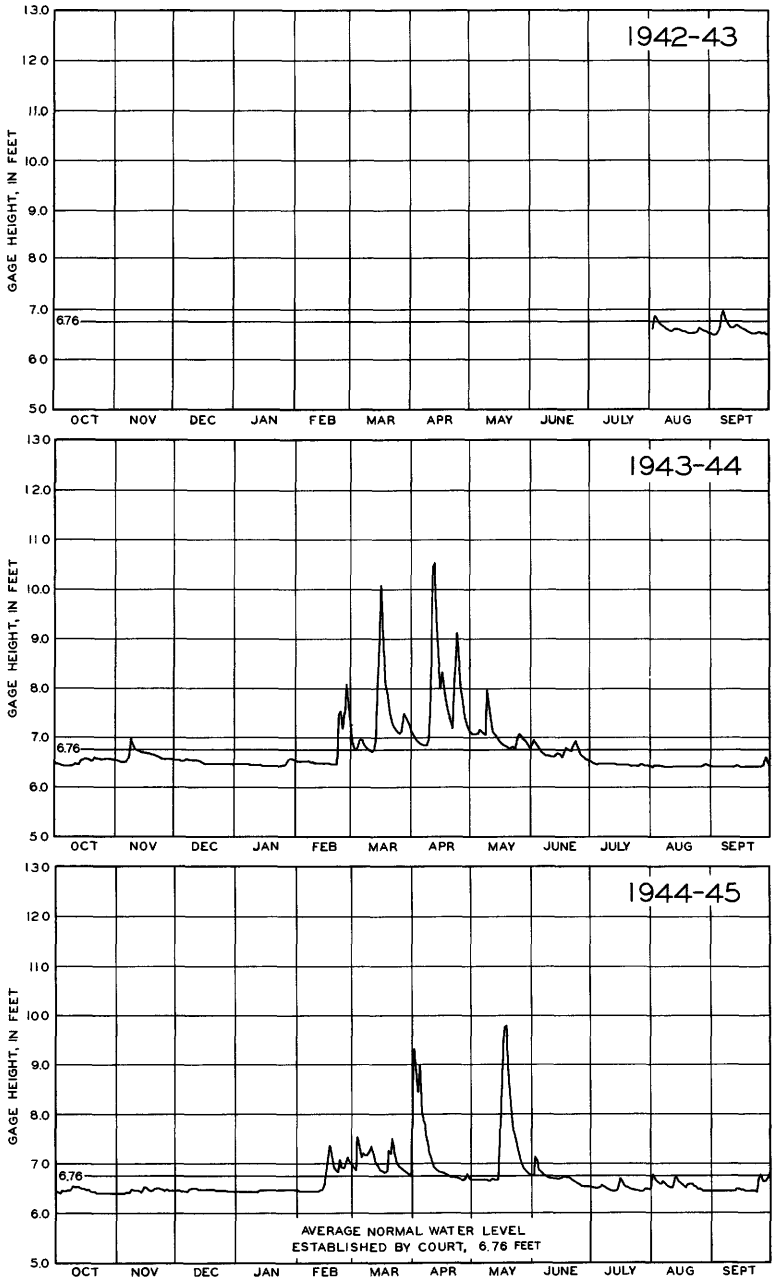

Figure 52. --Lake-level hydrographs for Cedar Lake near Waterloo, Ind., for water years 1943-45.

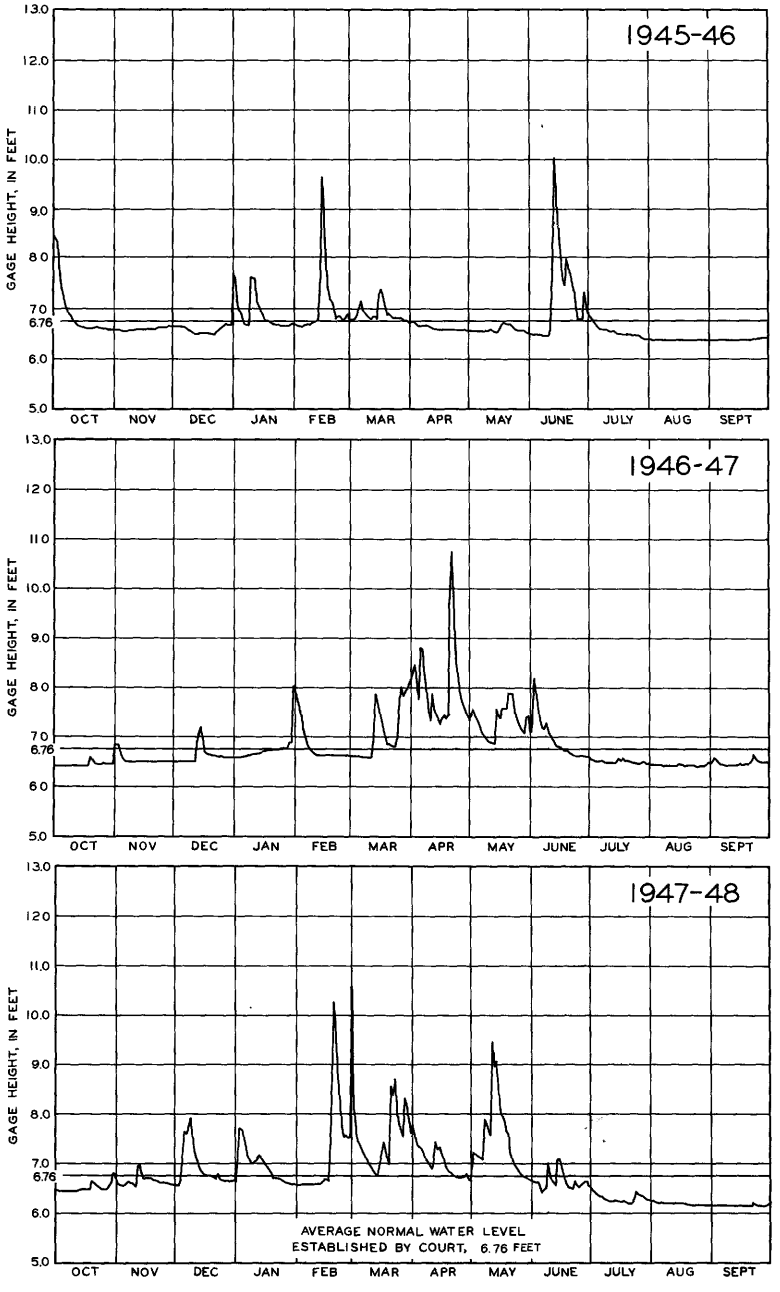

Figure 53. --Lake-level hydrographs for Cedar Lake near Waterloo, Ind., for water years 1946-48.

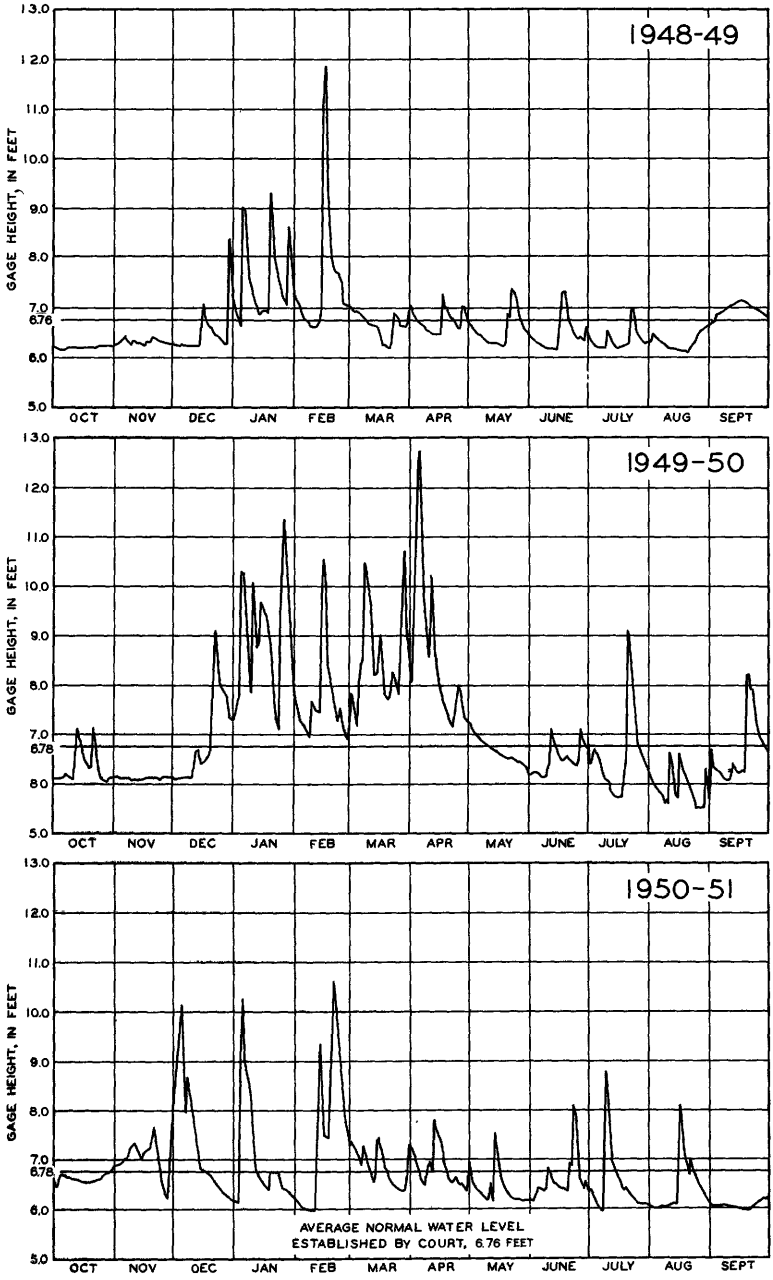

Figure 54. --Lake-level hydrographs for Cedar Lake near Waterloo, Ind., for water years 1949-51.

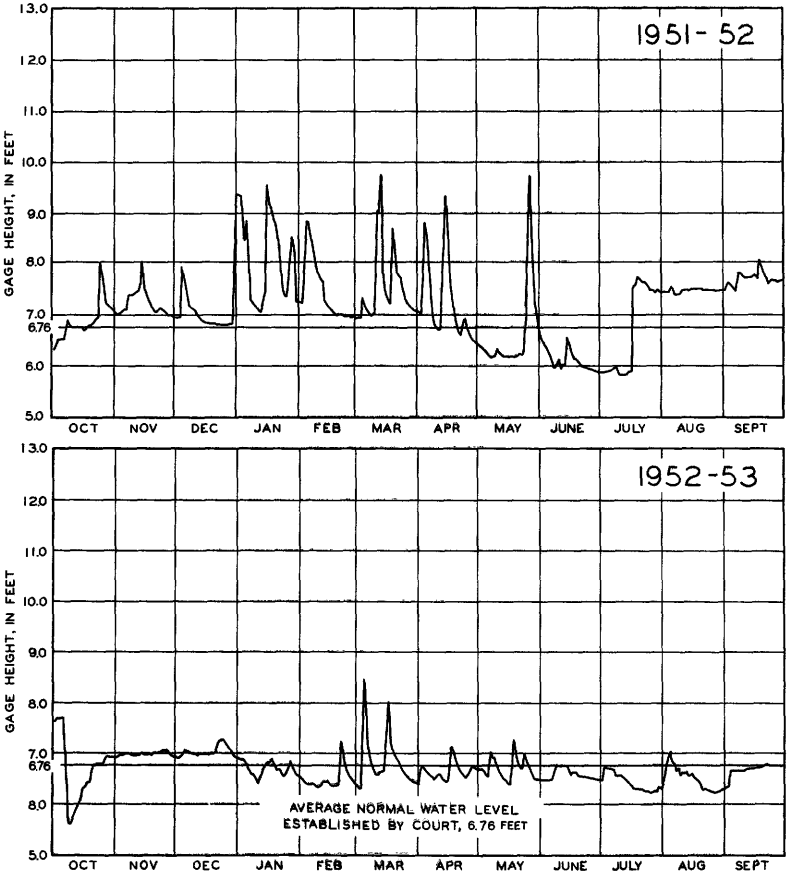

Figure 55. --Lake-level hydrographs for Cedar Lake near Waterloo, Ind., for water years 1952-53.

Crooked Lake near Wolflake, Ind.

Location. --Secs. 33 and 34, T. 33 N., R. 9., E., Noble County, and sections 3 and 4, T. 32 N., R. 9 E., Whitley County.

Surface area. --172 acres.

Drainage area. --1.32 sq mi.

Records available. --August 1943 to November 1952 (Intermittent period to Mar. 27, 1947).

Gage. --Staff gage at extreme west end of lake attached to a 12-inc maple tree, 250 ft east of road. Gage read to hundredths onc daily. Datum of gage is 900.00 ft above mean sea level, datun of 1929.

Average lake level. --8 years; gage height, 5.68 ft; elevation, 905.68 ft

Established legal level. --Established June 29, 1948 at gage height 5.69 ft, elevation, 905.69 ft above mean sea level.

Lake-level control. --Lake level maintained by bed of outlet channel.

Extreme levels for Crooked Lake, 1944-52

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1945[a]	May 17, 18, 1945 ----	6.56	Sept. 21, 22, 1945-	[a]5.38
1946[a]	Mar. 9, 19-23, 1946--	6.14	Sept. 28-30, 1946-	[a]4.85
1947[a]	Apr. 21-23, 1947 ---	6.27	Oct. 15-17, 1946--	[a]4.71
1948	Mar. 27, 1948-------	6.08	Sept. 28, 1948 ----	4.73
1949	Feb. 15, 1949-------	6.48	Oct. 20-22, 1948--	4.66
1950	Apr. 4, 1950 -------	6.91	Oct. 1, 2, 1949----	5.13
1951	Feb. 22, 1951-------	6.47	Nov. 7, 1950 -----	5.35
1952	Jan. 27, 1952 -------	6.17	Sept. 30, 1952 ----	5.20

[a] Partial record only.

Maximum recorded thickness and periods of ice cover 1944-51

Water year	Maximum thickness (inches)	Total days of cover	Period
1944	5	-----	
1945	11	-----	
1946	8	-----	
1947	5	91	Jan. 5 to Apr. 5, 1947.
1948	15	107	Nov. 30 to Dec. 4; Dec. 10, 1947, to Mar. 20, 1948.
1949	4	-----	Dec. 26, 1948, to Jan. 22, 1949, to-?
1950	5	-----	
1951	11	83	Dec. 12, 1950, to Mar. 4, 1951.

Discharge measurements at outlet of Crooked Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 12, 1943-	5.74	0.43	Aug. 21, 1946	5.28	0
Oct. 8 ------	5.60	*.18	Feb. 17, 1947	5.60	.54
Feb. 16, 1944-	5.32	*.10	Apr. 23-----	6.22	4.77
May 15 ------	6.30	*4.00	Mar. 9, 1949	6.04	2.42
Apr. 10, 1945-	6.25	3.82	Sept. 6-----	5.28	.80
June 14 ------	5.96	1.47	Dec. 1-----	5.42	.07
Sept. 7 ------	5.51	*.18	Jan. 17, 1950	6.55	9.21
Dec. 6 ------	5.60	*.05	Apr. 13-----	6.56	9.35
Mar. 11, 1946-	6.12	2.14	Nov. 21-----	5.58	.13
May 27 ------	5.74	*.55	Feb. 20, 1951	6.24	5.31
June 19------	5.91	1.52	May 15-----	6.10	2.38

*Estimated.

Average lake level for Crooked Lake for water years 1943-52

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1946	5.80	----	----	----	----	6.09	5.90
1947	4.82	----	----	*5.20	*5.56	*5.85	6.03
1948	5.32	5.36	5.53	5.66	5.87	5.93	5.84
1949	4.92	5.08	5.26	5.93	6.14	5.90	5.86
1950	5.47	5.44	5.62	6.44	6.34	6.33	6.34
1951	5.44	5.49	6.01	6.08	6.13	6.13	6.17
1952	5.45	5.68	5.75	5.96	5.89	5.84	5.85
Average	5.32	5.41	5.63	5.88	5.99	6.01	6.00

Year	May	June	July	Aug.	Sept.	Annual	
1943	----	----	----	*5.73	----	*5.73	
1945	6.13	6.00	5.76	5.77	5.50	*5.84	
1946	5.75	5.73	5.59	5.22	4.96	*5.63	
1947	5.98	5.83	5.55	5.32	5.37	*5.55	
1948	5.78	5.52	5.31	5.12	4.84	5.49	
1949	5.77	5.70	5.45	5.23	5.21	5.52	
1950	5.92	5.88	5.72	5.53	5.53	5.88	
1951	6.00	5.83	6.06	5.86	5.54	5.89	
1952	5.75	5.72	5.59	5.48	5.30	5.69	
Average	5.88	5.78	5.63	5.47	5.28	5.68	

*Partial month or partial year.

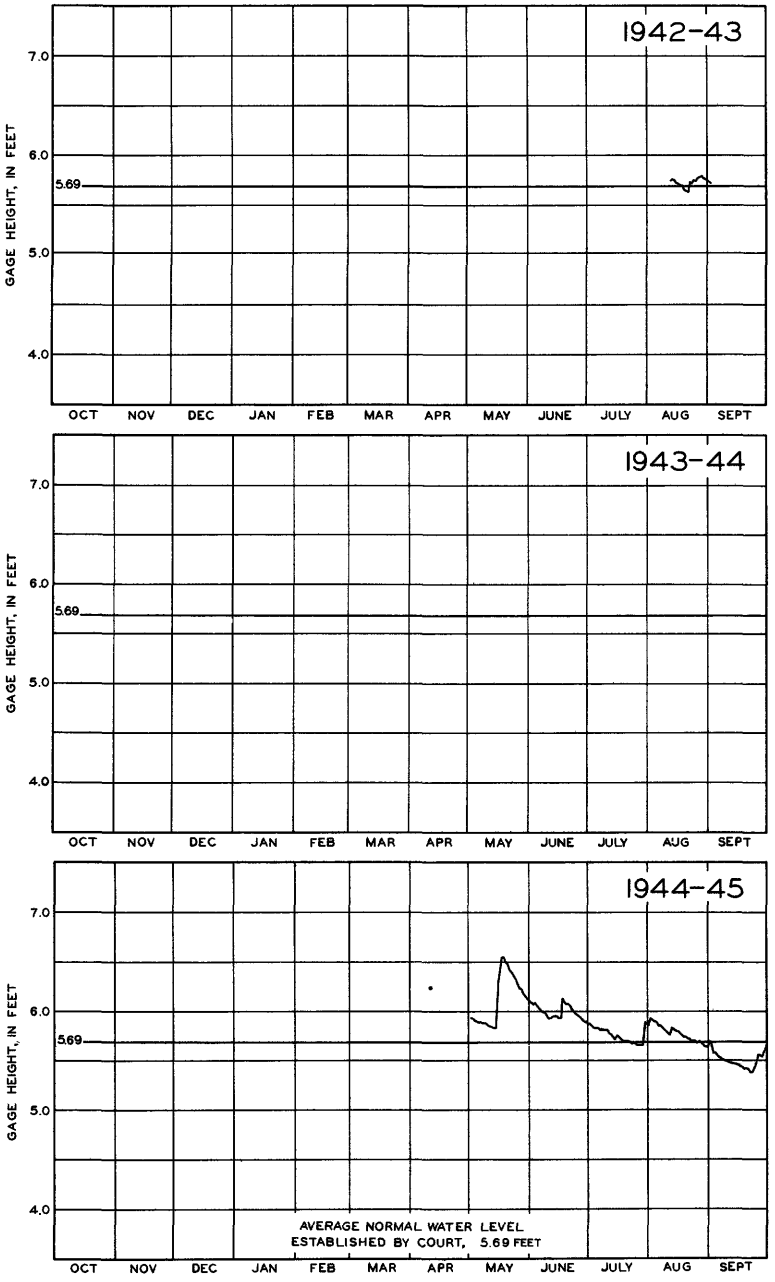

Figure 56. --Lake-level hydrographs for Crooked Lake near Wolflake, Ind., for water years 1943-45.

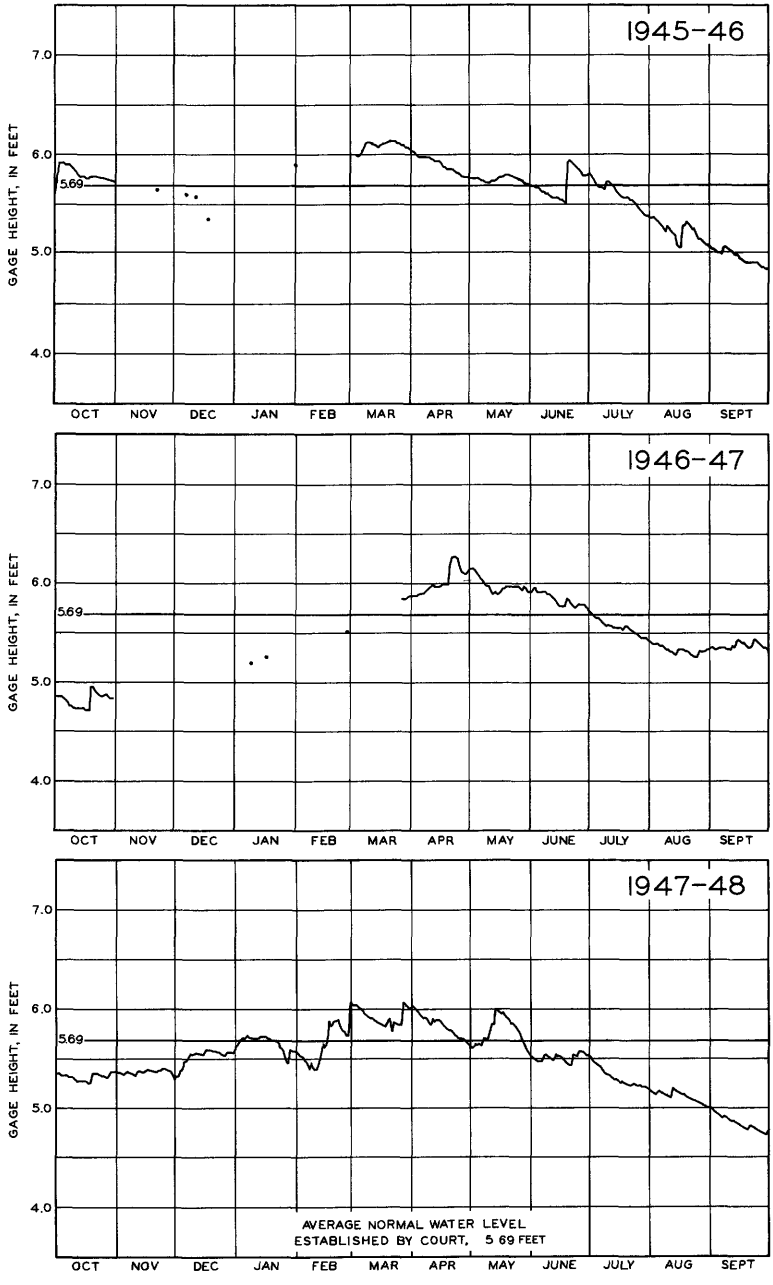

Figure 57. --Lake-level hydrographs for Crooked Lake near Wolf-lake, Ind., for water years 1946-48.

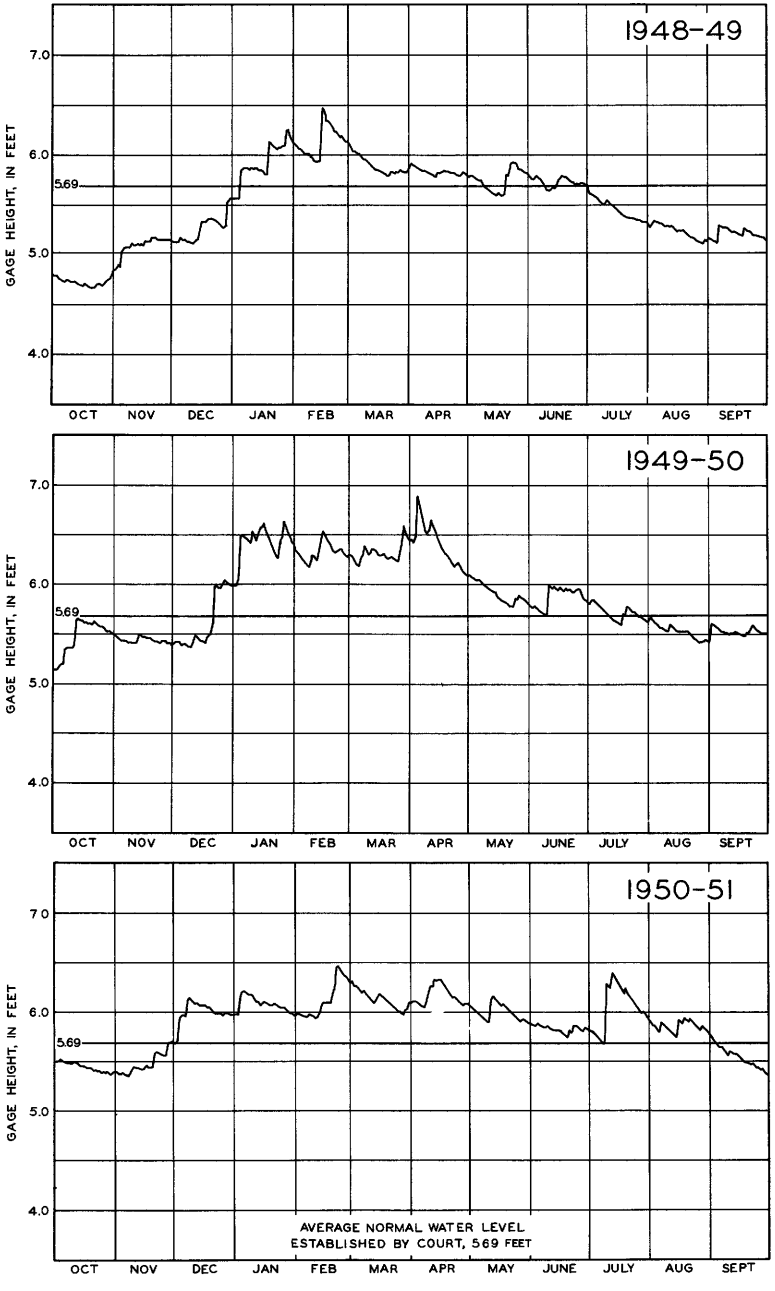

Figure 58. --Lake-level hydrographs for Crooked Lake near Wolflake, Ind., for water years 1949-51.

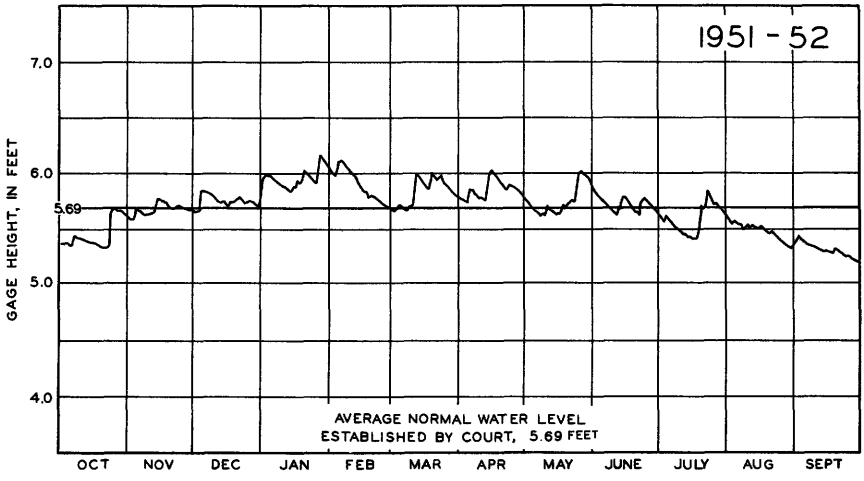

Figure 59. --Lake-level hydrographs for Crooked Lake near Wolflake, Ind., for water year 1952.

Flint Lake near Valparaiso, Ind.

Location. --Sec. 6, T. 35 N., R. 5 W., and sec. 1, T. 35 N., R. 6 W., Porter County, 3.2 miles northeast of Valparaiso.

Surface area. --86.0 acres.

Drainage area. --2.88 sq mi.

Records available. --August 1946 to September 1953.

Gage. --Float type gage inside the water plant. Gage read to hundredths once daily. Datum of gage is 780.00 ft above mean sea level, datum of 1929. Prior to Mar. 26, 1950, staff gage in front of waterworks at same datum.

Average lake level. --7 years; gage height, 17.69 ft; elevation, 797.69 ft.

Established legal level. --None.

Lake-level control. --Lake level maintained by bed of outlet channel ditch.

Extreme levels for Flint Lake, 1947-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1947	June 3, 1947 --------	20.27	Mar. 22, 23, 1947-	15.24
1948	May 19, 20, 1948 ----	19.58	Feb. 15, 1948----	*12.97
1949	May 27, 1949 -------	17.99	Dec. 29, 1948----	12.59
1950	Apr. 5, 1950 -------	20.84	Dec. 9, 10, 1949--	15.75
1951	May 13-15, 1951 ----	20.03	Dec. 1, 2, 1950---	16.69
1952	Jan. 20, 1952-------	20.40	Sept. 30, 1952 ---	17.40
1953	May 26, 1953 -------	18.32	Sept. 30, 1953 ---	15.23

*Established.

Maximum recorded thickness and periods of ice cover 1947-53

Water year	Maximum thickness (inches)	Total days of cover	Period
1947	13½	106	Dec. 19, 1946, to Apr. 3, 1947.
1948	14½	101	Dec. 11, 1947, to Mar. 20, 1948.
1949	8½	81	Dec. 20, 1948, to Mar. 10, 1949.
1950	6½	----	[a] Dec. 9, 1949, to Mar. 25, 1950.
1951	13	91	Dec. 5, 1950, to Mar. 5, 1951.
1952	7	92	Dec. 15, 1951, to Mar. 15, 1952.
1953	---	----	Mar. 7, 1953 to-?

[a] Lake open for intermittent periods.

Discharge measurements at outlet of Flint Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Sept. 23, 1946	18.27	0	Feb. 17, 1947-	16.36	0
Oct. 21-----	17.51	0	Feb. 26------	15.95	0
Nov. 18-----	17.27	0	Apr. 7------	18.14	0
Dec. 20-----	16.87	0	May 1------	16.93	1.44
Dec. 27-----	16.70	0	Sept. 23------	18.27	0
Dec. 31-----	16.65	0	Dec. 16------	15.07	0
Jan. 6, 1947	16.57	0	Nov. 3, 1948-	14.28	0

Average lake level for Flint Lake for water years 1946-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1947	17.62	17.26	16.77	16.42	16.49	15.65	18.42
1948	16.59	15.67	14.87	14.42	13.56	16.39	17.98
1949	14.82	13.73	12.73	12.94	14.09	15.43	17.33
1950	16.59	16.06	16.41	18.65	19.64	20.24	20.61
1951	17.58	16.86	16.90	17.31	17.40	18.10	19.08
1952	19.39	19.73	19.99	20.27	20.09	19.95	20.06
1953	16.89	16.42	16.33	16.95	17.35	17.94	18.08
Average	17.07	16.53	16.29	16.71	16.95	17.67	18.79

Year	May	June	July	Aug.	Sept.	Annual
1946	-----	-----	-----	*18.73	18.39	*18.56
1947	19.75	19.98	19.25	18.36	17.56	17.80
1948	18.99	19.03	18.40	17.44	16.06	16.63
1949	17.71	17.63	17.23	16.99	16.87	15.63
1950	19.99	19.95	19.50	18.91	18.26	18.73
1951	19.80	19.58	19.18	19.17	19.12	18.34
1952	19.86	19.67	19.11	18.45	17.77	19.53
1953	18.11	17.90	17.28	16.58	15.55	17.11
Average	19.17	19.11	18.56	18.08	17.45	17.69

*Partial month or partial year.

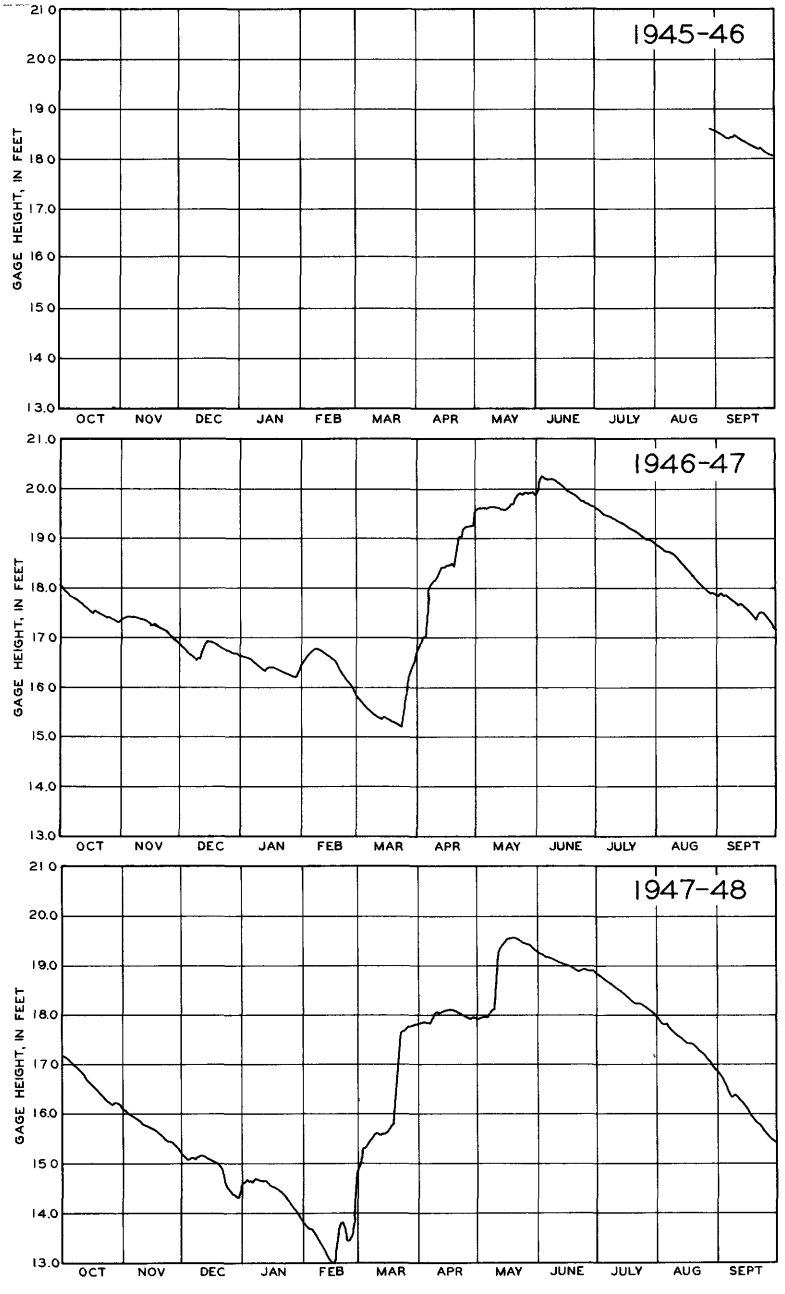

Figure 60. --Lake-level hydrographs for Flint Lake near Valparaiso, Ind., for water years 1946-48.

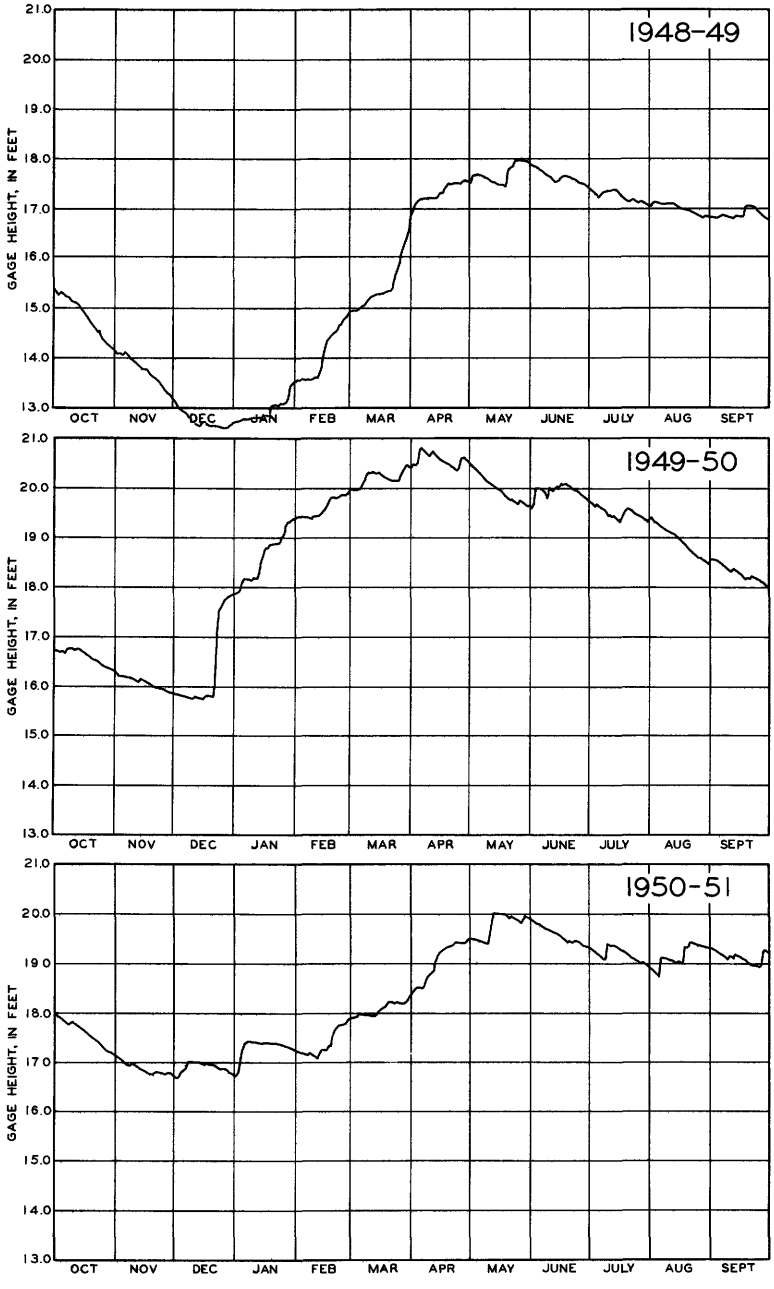

Figure 61. --Lake-level hydrographs for Flint Lake near Valparaiso, Ind., for water years 1949-51.

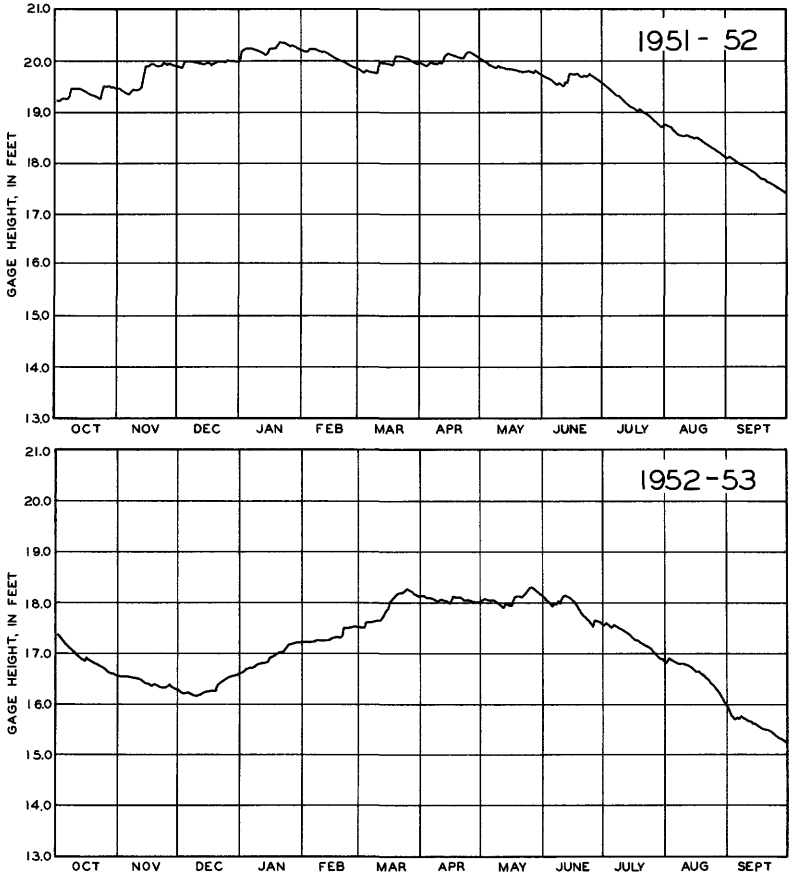

Figure 62. --Lake-level hydrographs for Flint Lake near Valparaiso, Ind., for water years 1952-53.

Hamilton Lake at Hamilton, Ind.

Location. --Secs. 21, 22, 27, 28, 33 and 34, T. 36 N., R 14 E., Steuben County.

Surface area. --765 acres.(USGS topographic maps, surveyed in 1938).

Drainage area. --12.8 sq mi (determined from the same maps).

Records available. --July 1943 to September 1953.

Gage. --Staff gage attached to concrete wing wall of south abutment of control dam on south outlet at southeastern corner of lake. Gage read to hundredths once daily. Datum of gage is 890.00 ft above mean sea level, unadjusted.

Average level. --10 years; gage height, 8.37 ft; elevation, 898.37 ft.

Established legal level. --Established July 3, 1947, at gage height 8.38 ft, elevation, 898.83 ft above mean sea level.

Lake-level control. --Lake has two outlets about 800 ft apart. One outlet has concrete dam with fixed crest, the other a concrete dam with movable flood gates.

Extreme lake levels for Hamilton Lake, 1944-53

Maximum			Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1944	Apr. 13, 1944------	9.35	Sept. 22-27, 1944-	7.61
1945	May 18, 1945-------	9.55	Oct. 22 to Nov. 3, 1943----------	7.81
1946	Feb. 21, 1946------	8.75	Sept. 8, 9, 29, 1946	7.67
1947	Apr. 21, 1947------	9.51	Oct. 14-16, 1946--	7.55
1948	Feb. 20, 1948------	9.36	Sept. 20, 1948----	7.78
1949	Feb. 15, 1949------	9.26	Oct. 21-30, 1949 -	7.88
1950	Apr. 4, 1950-------	9.68	Oct. 1, 2, 1950 ---	8.12
1951	Feb. 22, 1951------	9.32	Sept. 29, 30, 1951-	8.22
1952	May 26, 1952-------	9.08	Sept. 30, 1952----	7.97
1953	May 26, 1953-------	*8.62	Jan. 4-9, 1953----	7.27

*Estimated.

Maximum recorded thickness and periods of ice cover 1944-51

Water year	Maximum thickness (inches)	Total days of cover	Period
1944	10	75	Dec. 16, 1943, to Feb. 28, 1944.
1945	----	----	Dec. 6, 1944, to-?
1946	----	94	Dec. 1, 1945, to Mar. 4, 1946.
1947	11½	129	Nov. 29, 1946, to Apr. 6, 1947.
1948	25	97	Nov. 30, to Dec. 6; Dec. 22, 1947, to Mar. 21, 1948.
1949	6	----	
1950	----	----	
1951	15	----	Dec. 9, 1950, to-?

Discharge measurements at outlet of Hamilton Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
July 30, 1943-	8.41	5.05	July 12, 1951-	8.83	38.4
Oct. 4------	8.31	1.10	Aug. 9------	8.38	1.79
Feb. 10, 1944-	8.39	3.08	Sept. 5------	8.31	.29
Apr. 24------	2.52	*30.00	Oct. 9------	8.35	2.27
Aug. 1------	7.93	*.20	Dec. 14------	8.51	13.9
May 1, 1945-	8.45	8.12	Feb. 12, 1952-	8.68	31.9
June 29------	8.43	3.91	Mar. 26------	8.68	33.0
Sept. 4------	8.21	.07	Nov. 13------	7.93	0
May 24, 1946-	8.39	2.29	Dec. 10------	8.28	1.07
July 24------	8.13	0	Jan. 8, 1953-	8.40	5.87
Dec. 5------	7.93	0	Jan. 30------	8.44	15.7
Feb. 14, 1947-	8.46	5.87	Mar. 10------	8.51	29.0
Nov. 2, 1950-	8.37	6.98	Apr. 2------	8.51	28.6
Nov. 16------	8.53	26.6	Apr. 23------	8.47	18.9
Jan. 24, 1951-	8.58	20.1	May 19------	8.57	32.4
Apr. 12------	8.80	58.9	June 17------	8.29	*.3
May 8------	8.58	13.5	Aug. 5------	8.33	8.53
June 6------	8.46	3.56	Sept. 1------	8.05	0

*Estimated.

Average lake level for Hamilton Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1944	8.32	8.42	8.36	8.35	8.50	8.64	8.77
1945	7.86	7.97	8.16	8.34	8.45	8.64	8.68
1946	8.25	8.33	8.38	8.48	8.49	8.50	8.36
1947	7.65	7.89	8.07	8.42	8.47	8.56	8.86
1948	8.25	8.38	8.50	8.50	8.60	8.75	8.62
1949	7.90	8.18	8.36	8.65	8.70	8.49	8.48
1950	8.33	8.30	8.52	8.89	8.69	8.85	8.91
1951	8.42	8.54	8.70	8.64	8.75	8.70	8.68
1952	8.35	8.51	8.65	8.78	8.61	8.68	8.68
1953	7.73	7.44	7.45	7.32	7.49	7.93	8.49
Average	8.11	8.20	8.32	8.44	8.48	8.57	8.65

Year	May	June	July	Aug.	Sept.	Annual	
1943	----	----	*8.40	8.33	8.35	*8.34	
1944	8.65	8.38	8.09	7.82	7.67	8.33	
1945	8.80	8.53	8.37	8.27	8.17	8.35	
1946	8.34	8.35	8.21	7.90	7.73	8.28	
1947	8.69	8.68	8.30	8.14	8.27	8.33	
1948	8.62	8.41	8.32	8.18	7.89	8.42	
1949	8.43	8.47	8.39	8.26	8.15	8.37	
1950	8.51	8.47	8.48	8.33	8.49	8.56	
1951	8.66	8.55	8.55	8.41	8.30	8.58	
1952	8.56	8.52	8.33	8.24	8.15	8.50	
1953	8.54	8.37	8.27	8.20	7.93	7.93	
Average	8.58	8.47	8.34	8.19	8.10	8.37	

*Partial month or partial year.

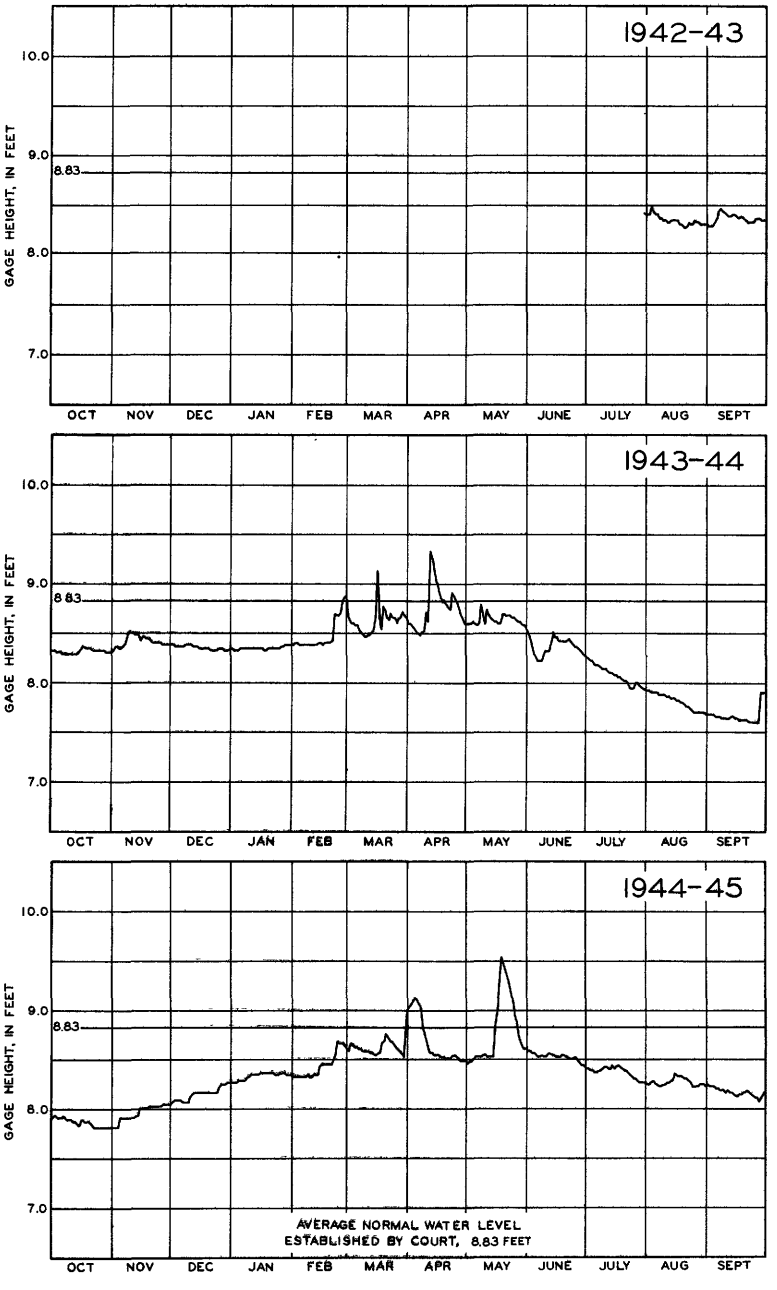

Figure 63. --Lake-level hydrographs for Hamilton Lake at Hamilton, Ind., for water years 1943-45.

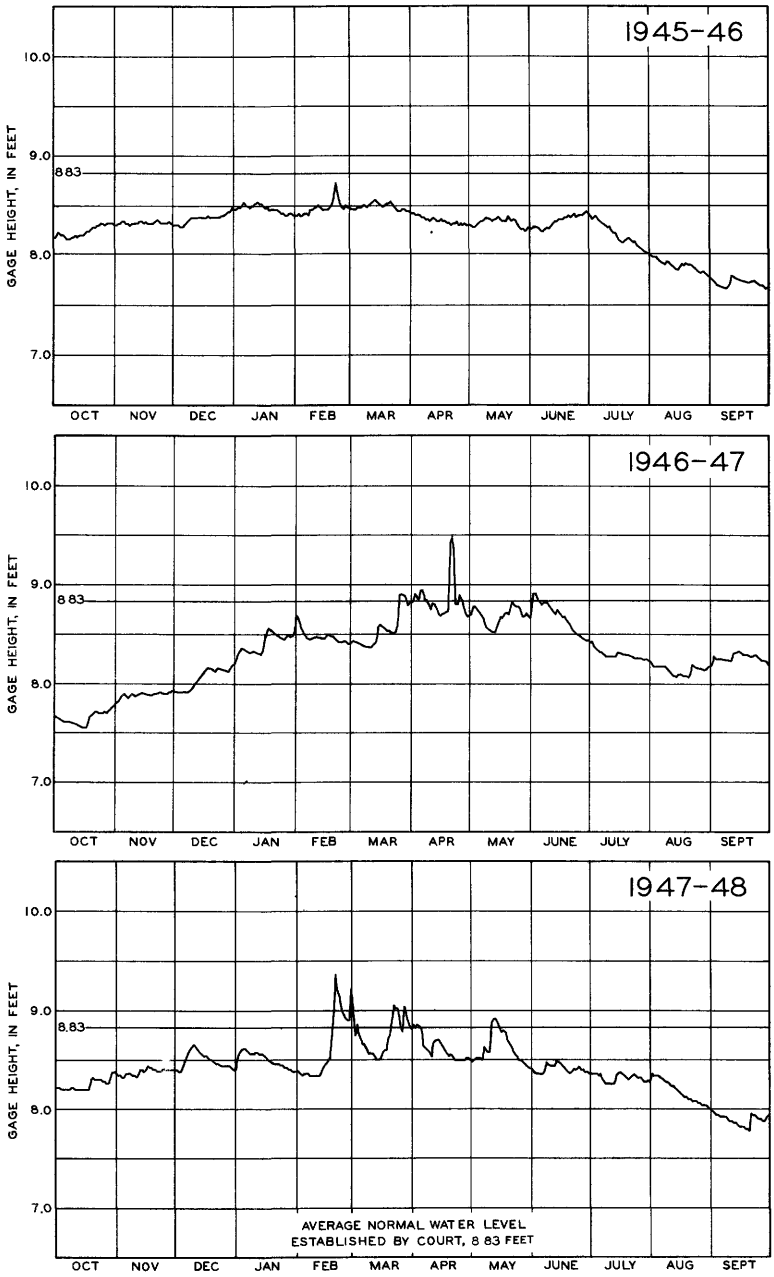

Figure 64. --Lake-level hydrographs for Hamilton Lake at Hamilton, Ind., for water years 1946-48.

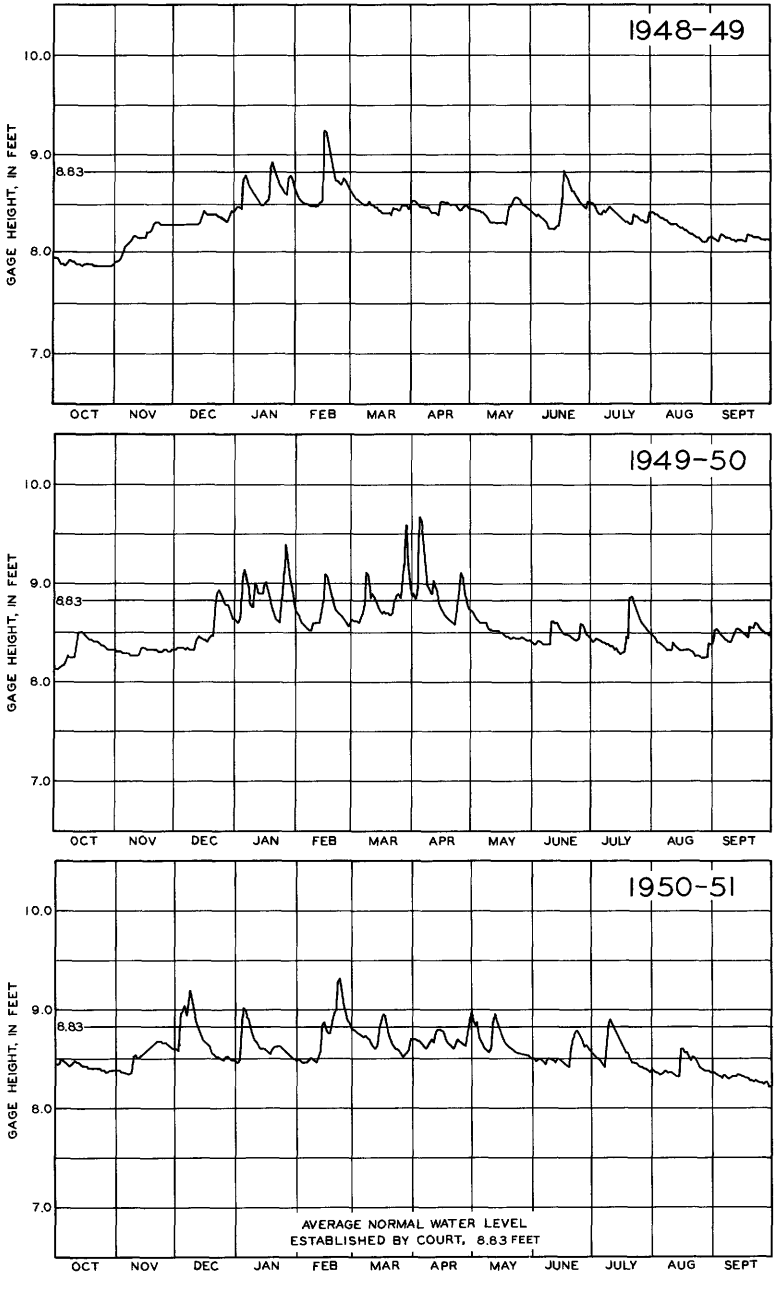

Figure 65. --Lake-level hydrographs for Hamilton Lake at Hamilton, Ind., for water years 1949-51.

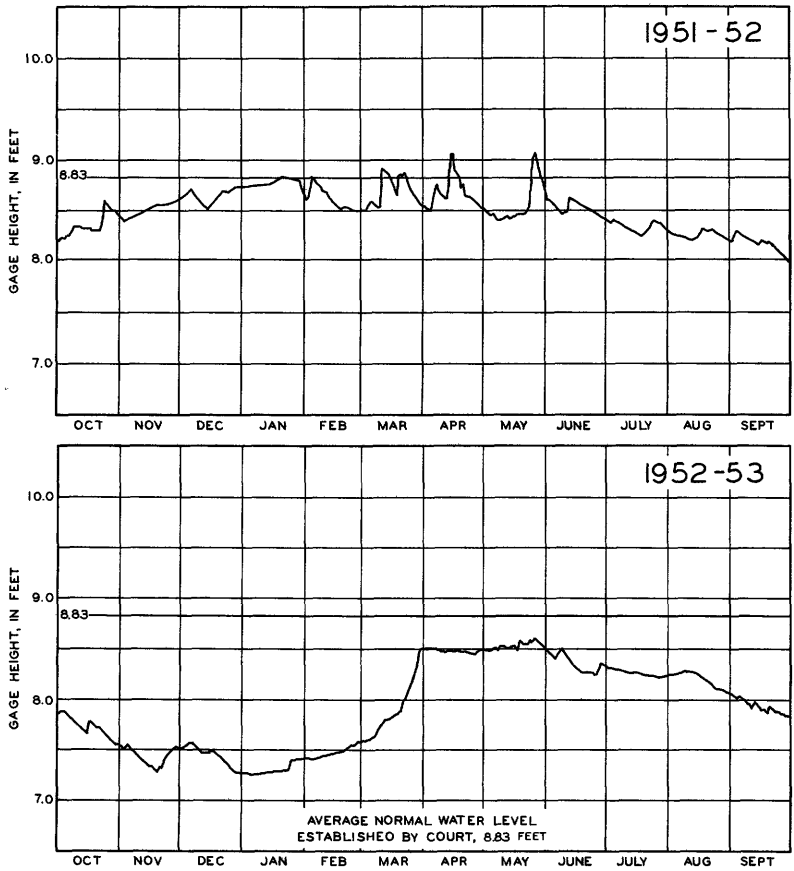

Figure 66. --Lake-level hydrographs for Hamilton Lake at Hamilton, Ind., for water years 1952-53.

Jimerson Lake at Nevada Mills, Ind.

Location. --Secs. 29, 30, 31 and 32, T. 38 N., R. 13 E., and sec. 5, T. 37 N., R. 13 E., Steuben County.

Surface area. --346 acres (determined from USGS topographic maps, surveyed in 1939).

Drainage area. --470 sq mi (determined from the same maps).

Records available. --October 1945 to September 1953. January 1937 to December 1943, weekly readings by the Northern Indiana Public Service Company.

Gage. --Staff gage bolted to northwest wingwall of outlet dam at western end of lake. Gage read to hundredths once daily. Datum of gage is 960.00 ft above mean sea level, datum of 1929. Prior to Oct. 9, 1945, reference point.

Average level. --8 years; gage height, 4.73 ft; elevation, 964.73 ft.

Established legal level. --Established July 3, 1947, at gage height at 4.66 ft, elevation 964.66 ft above mean sea level.

Lake-level control. --Lake level controlled by concrete fixed-crest dam and culvert type sluice gate. The concrete dam is 23 ft 1½ in long with a crest at gage height 4.67 ft. The adjustable metal sluice gate, width 3 ft 9 in and height 5 ft, is opened only during periods of high stages to release excess water. These structures control the levels of Jimerson Lake; Lake James, 2½ mi upstream; Snow Lake, 4 mi upstream; and has a decided effect on the level of Big and Little Otter Lake.

Extreme lake levels for Jimerson Lake, 1937-53

Maximum			Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1937[a]	Apr. 29, 1937-----	5.44	Sept. 16, 1937-----	[a]4.06
1938[b]	Feb. 24, 1938-----	5.12	Jan. 20, 1938-----	[b]3.98
1939[b]	Mar. 2, 18, 1939 --	5.31	Nov. 17, Dec. 1, 1938	[b]4.06
1940[b]	June 27, 1940-----	5.18	Jan. 11, Feb. 1-29, 1940----------	[b]3.73
1941[a]	Feb. 12, 1941-----	5.06	June 9, 1941------	[a]4.19
1942[b]	Mar. 19, 1942 ----	5.62	Jan. 22, 29, 1942---	[b]4.29
1943	May 21, 27, 1943 --	[c]6.48	Sept. 2, 1943 -----	[c]4.56
1944	Mar. 17, 18, 19, 1944	[c]5.54	Sept. 15, 1944-----	[c]4.17
1945	May 23, 1945 -----	[c]5.86	Feb. 10, 1945-----	[c]3.69
1946	Mar. 12, 1946 ----	5.17	Sept. 16-22, 1946--	3.85
1947	Apr. 25, 1947-----	5.55	Oct. 13-17, 1946---	3.81
1948	Dec. 12, 1947-----	5.15	Feb. 16, 17, 1948---	3.71
1949	Feb. 21, 1949-----	5.32	Oct. 4-7, 1948 ----	4.22
1950	Apr. 7, 1950------	6.00	Sept. 30, 1950 ----	4.35
1951	July 14-16, 1951---	5.48	Oct. 5-10, 1950 ---	4.08
1952	May 30, 31, 1952 --	5.20	Apr. 4, 1952------	4.54
1953	Apr. 30, 1953-----	4.98	Sept. 14-16, 1953--	4.37

[a] Weekly readings imcomplete year.
[b] Weekly readings.
[c] From James Lake at Lake James record.

Ice.--Ice, 6 inches thick, was reported on Jimerson Lake in 1949 and again in 1951. The ice cover in 1949 remained for a period of 50 days, from Dec. 18, 1948, to Feb. 5, 1949.

Discharge measurements at outlet of Jimerson Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Oct. 9, 1945	4.95	58.4	Aug. 9, 1951	4.44	56.4
Apr. 9, 1946	4.63	38.5	Sept. 5	4.55	37.5
May 21	4.51	2.59	Oct. 9	4.76	12.3
June 14	4.57	2.42	Nov. 17	5.00	59.1
July 24	4.25	11.7	Dec. 21	4.98	69.8
Nov. 23	4.69	3.92	Mar. 26, 1952	4.74	95.4
Feb. 14, 1947	5.01	46.6	Nov. 14	4.57	13.9
Jan. 6, 1949	4.76	39.7	Dec. 10	4.75	24.6
Feb. 17	5.27	25.9	Jan. 9, 1953	4.83	31.0
Sept. 15	4.60	5.20	Jan. 30	4.94	39.5
Dec. 7	4.84	22.8	Mar. 10	4.90	47.4
Oct. 19, 1950	4.50	17.9	Apr. 3	4.85	44.2
Nov. 15	4.60	50.5	Apr. 24	4.94	41.9
Jan. 24, 1951	4.47	76.2	May 19	4.77	41.5
Apr. 11	4.71	75.1	June 15	4.61	10.5
May 2	5.13	137	July 8	4.51	5.36
June 5	5.00	57.4	Aug. 5	4.68	17.2
July 11	5.38	141	Sept. 1	4.45	10.6

Average lake legal for Jimerson Lake for water years 1937-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1937	----	----	----	*4.72	*5.08	*4.90	*5.09
1938	*4.25	*4.08	*4.20	*4.12	*4.71	*4.89	*4.79
1939	*4.48	*4.22	*4.21	*4.18	*4.48	*5.17	*5.00
1940	*4.34	*4.14	*4.06	*3.87	*3.73	*3.98	*4.58
1941	*4.35	*4.45	*4.60	*4.73	*4.97	*4.68	*4.57
1942	*4.05	*4.30	*4.75	*4.46	*4.71	*5.22	*5.23
1943	*4.66	*4.84	*4.79	*5.04	*4.98	*5.03	*5.00
1944	*4.82	*4.94	*4.87	----	----	----	----
1945	----	----	----	----	----	----	----
1946	4.94	4.78	4.56	4.84	4.66	4.90	4.53
1947	3.92	4.58	4.80	4.82	4.97	4.50	5.22
1948	4.75	4.70	4.94	4.63	3.96	4.55	4.55
1949	4.25	4.70	4.60	4.90	5.14	5.04	5.01
1950	4.90	4.81	4.96	5.22	5.26	5.38	5.79
1951	4.31	4.55	4.75	4.52	4.41	4.68	4.74
1952	4.78	4.99	4.97	4.97	4.83	4.69	4.73
1953	4.56	4.62	4.78	4.85	4.82	4.84	4.89
Average	4.49	4.58	4.66	4.66	4.71	4.83	4.91

Year	May	June	July	Aug.	Sept.	Annual
1937	*5.15	*5.07	*4.86	*4.32	*4.21	*4.86
1938	*4.51	*4.79	*4.74	*4.70	*4.89	*4.56
1939	*5.00	*4.91	*4.94	*4.42	*4.30	*4.61
1940	*4.70	*4.96	*4.45	*4.40	*4.45	*4.29
1941	*4.31	*4.21	*4.10	*4.00	*3.95	*4.41
1942	*4.86	*4.66	*4.77	*4.96	*4.78	*4.73
1943	*5.64	*5.16	*4.71	*4.64	*4.81	*4.94
1944	----	----	----	----	----	*4.88
1945	----	----	----	----	----	----
1946	4.36	4.59	4.56	4.06	3.89	4.56
1947	5.01	4.93	4.39	4.40	4.76	4.69
1948	4.76	4.57	4.29	4.40	4.29	4.54
1949	4.90	4.95	4.91	4.74	4.66	4.82
1950	5.31	5.03	5.01	4.93	4.66	5.10
1951	5.08	4.92	5.02	4.66	4.56	4.68
1952	4.91	4.82	4.64	4.63	4.63	4.80
1953	4.78	4.59	4.48	4.61	4.36	4.68
Average	4.89	4.81	4.66	4.52	4.48	4.73

*Partial month or partial year.

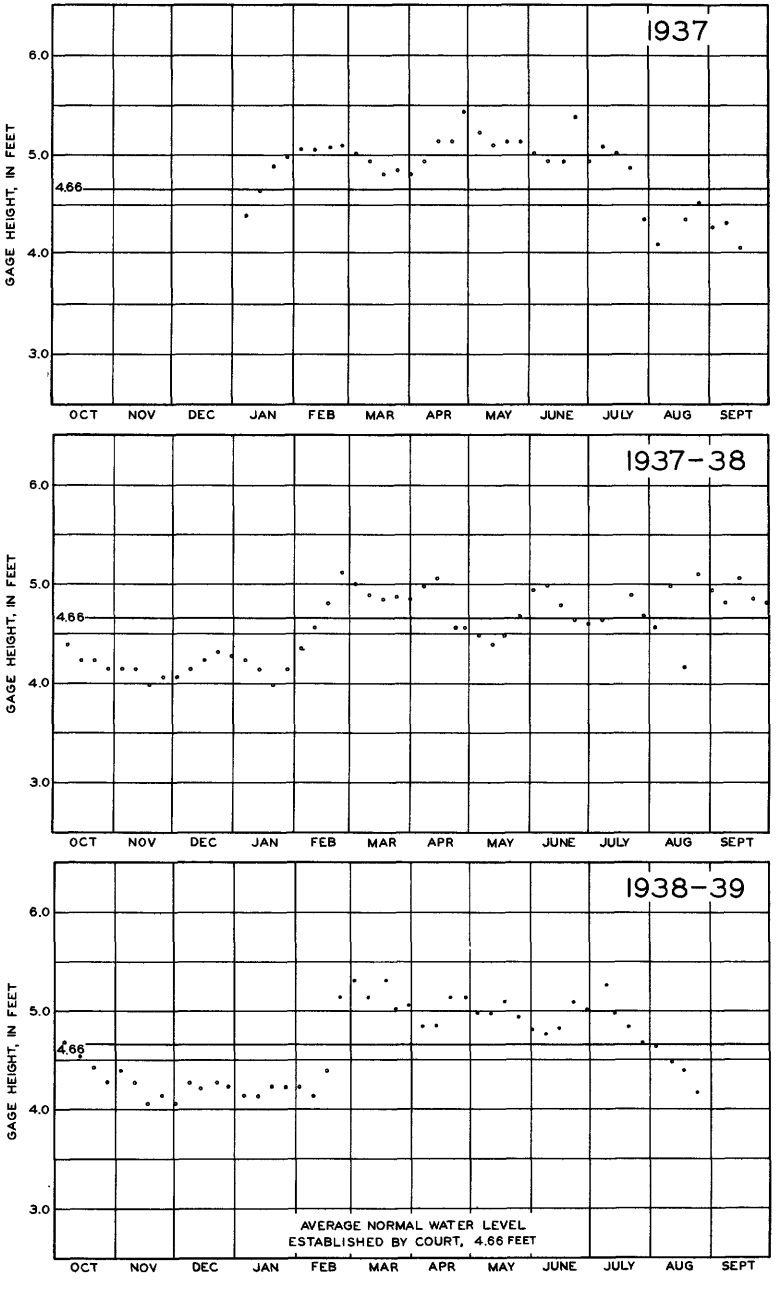

Figure 67. --Lake-level hydrographs for Jimerson Lake at Nevada Mills, Ind., for water years 1937-39.

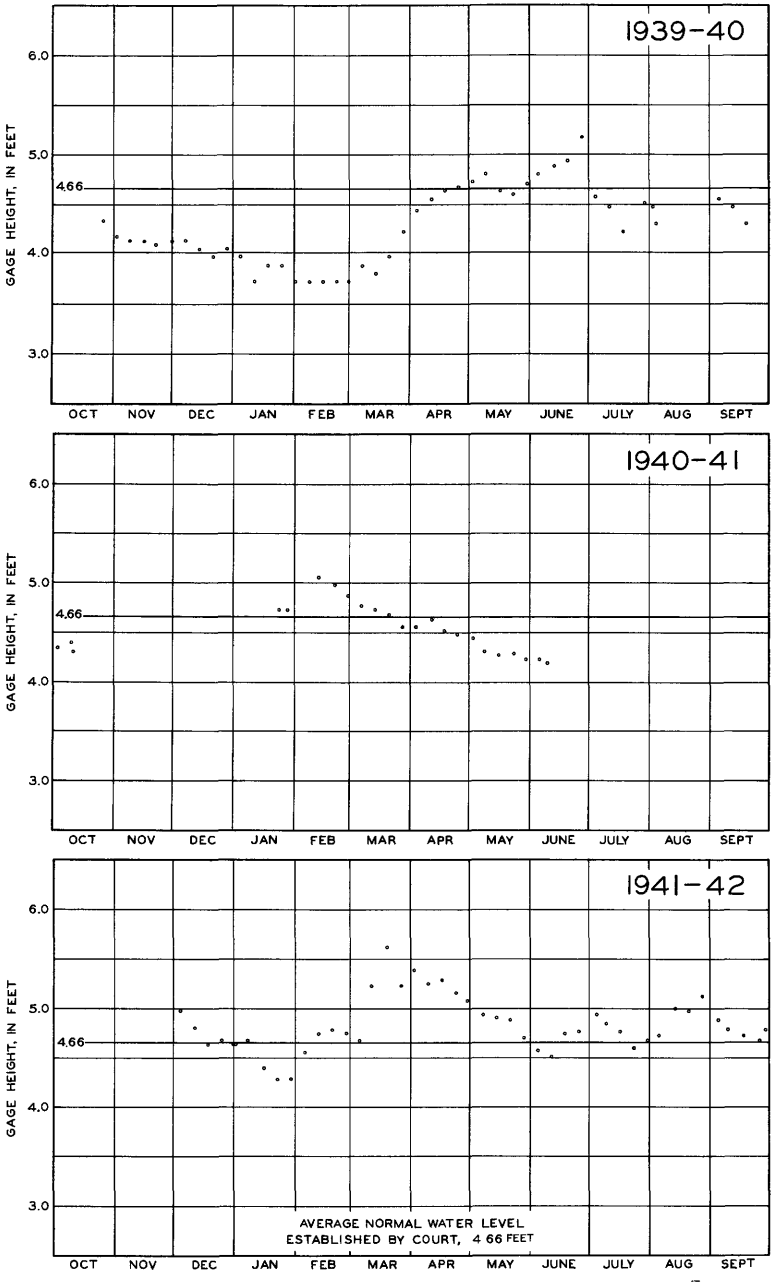

Figure 68. --Lake-level hydrographs for Jimerson Lake at Nevada Mills, Ind., for water years 1940-42.

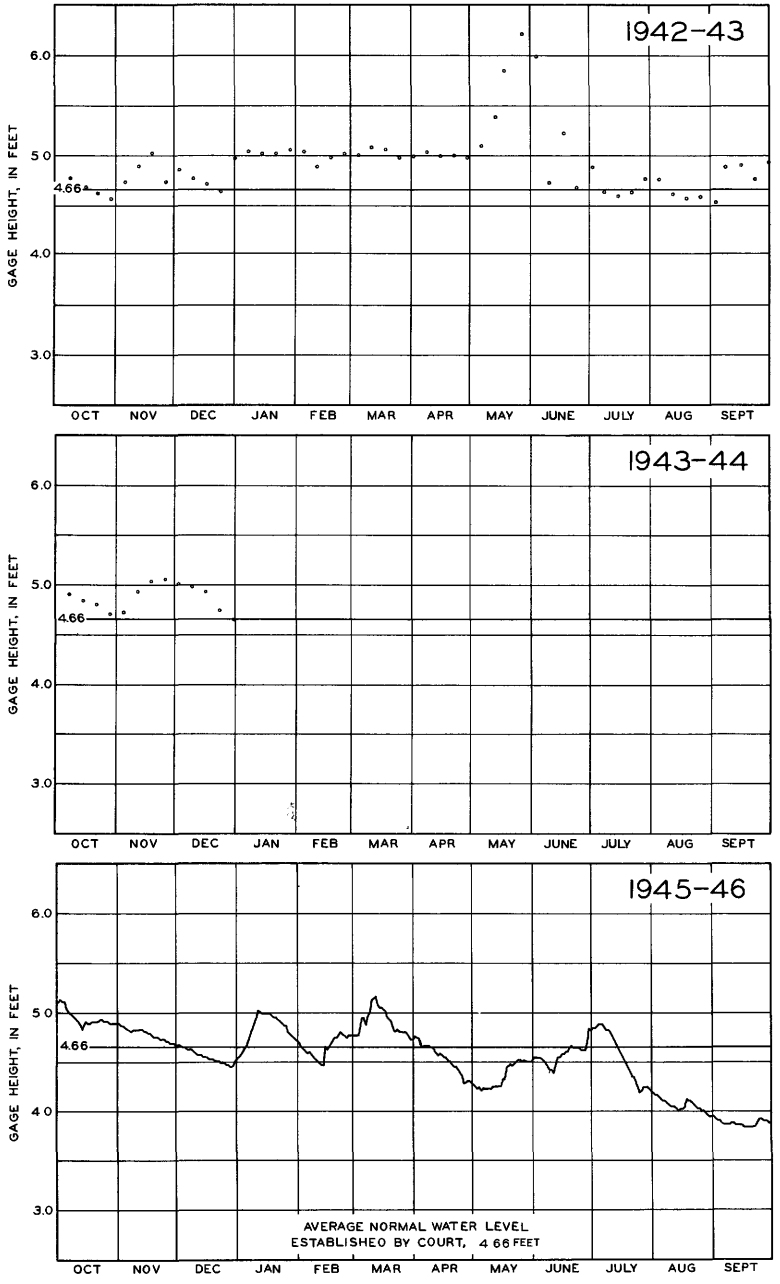

Figure 69. --Lake-level hydrographs for Jimerson Lake at Nevada Mills, Ind., for water years 1943-44 and 1946.

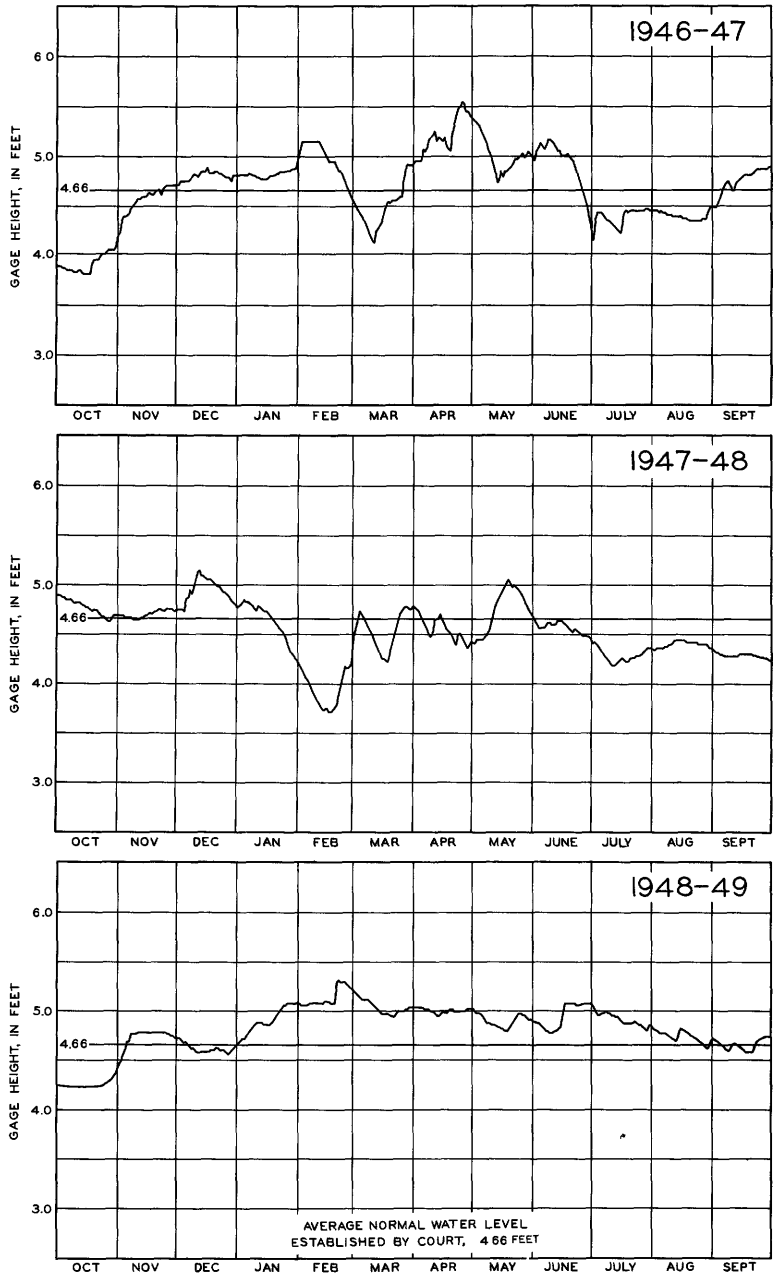

Figure 70. --Lake-level hydrographs for Jimerson Lake at Nevada Mills, Ind., for water years 1947-49.

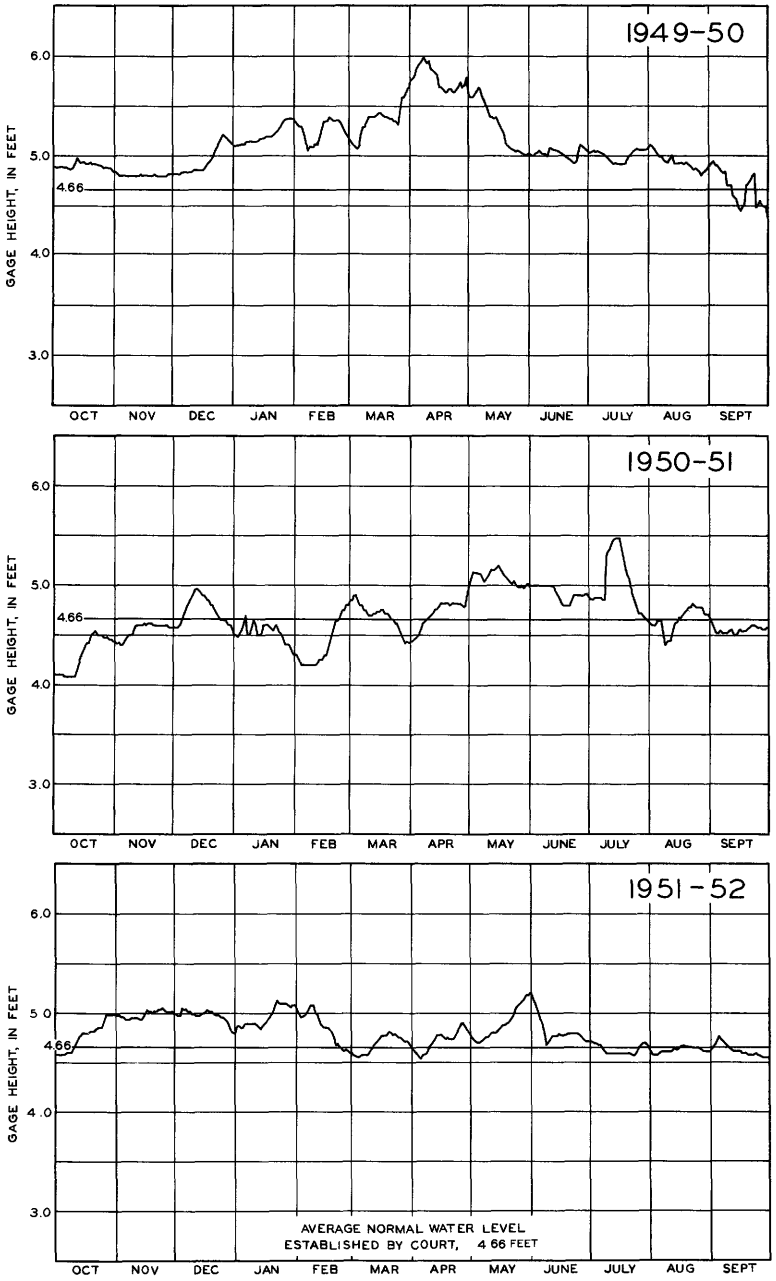

Figure 71. --Lake-level hydrographs for Jimerson Lake at Nevada Mills, Ind., for water years 1950-52.

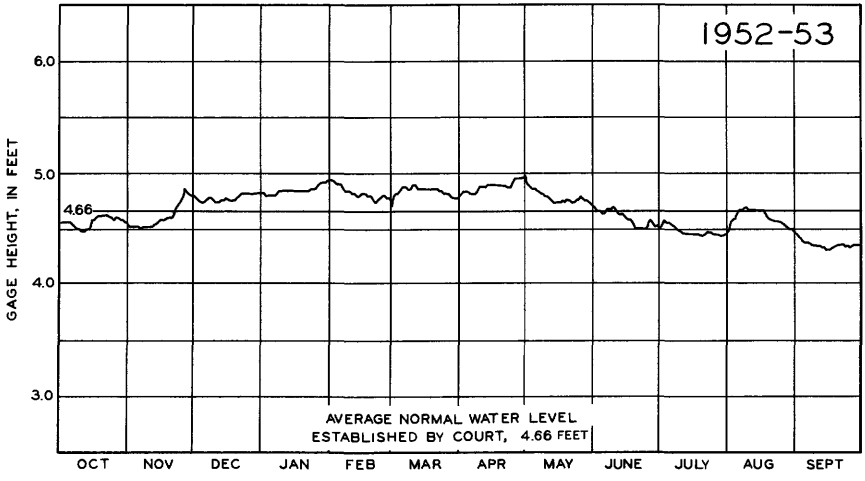

Figure 72. --Lake-level hydrograph for Jimerson Lake at Nevada Mills, Ind., for water year 1953.

Koontz Lake at Koontz Lake, Ind.

Location. --Secs. 1, 11, and 12, T. 34 N., R. 1 W., Starke County, and sec. 7, T. 34 N., R. 1 E., Marshall County.

Surface area. --298 acres.

Drainage area. --4.74 sq mi.

Records available. --October 1942 to September 1953.

Gage. --Staff gage bolted to south side of concrete headwall of control gate at north outlet. Gage read to hundredths once daily. Datum of gage is 710.00 ft above mean sea level, datum of 1929.

Average lake level. --11 years; gage height, 4.59 ft; elevation, 714.59 ft.

Established legal level. --Established September 13, 1948, at gage height 4.56 ft; elevation, 714.56 ft above mean sea level.

Lake-level control. --Lake controlled at two outlet channels which join about 500 ft downstream from the lake. North outlet supplies water to two fish-rearing ponds and is controlled by two gates, each 38 in. wide and 40 in. high, located at the head of two 30-in. pipes. The south outlet has a concrete control dam with sill 10 ft long and 1.5 ft wide at gage height 4.37 ft. Slots 4 in. wide are provided for placing stop logs on sill of dam.

Extreme lake levels for Koontz Lake, 1943-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943	May 19, 1943------	5.52	Apr. 3, 1943------	4.14
1944	Mar. 16-18, 1944--	5.07	Aug. 29, 30, Sept. 10, 1944.----------	3.87
1945	June 27-30, 1945---	5.00	Oct. 1, 1944------	3.93
1946	June 22-24, 1946---	5.08	Sept. 20-22, 29, 30, 1946----------	4.14
1947	May 21-23, 1946---	5.16	Oct. 16, 17, 1946---	4.00
1948	May 10, 1948------	5.02	Mar. 8, 1948------	4.04
1949	Dec. 19, 1948-----	5.10	Feb. 21, Apr. 13, 1949----------	4.10
1950	Dec. 22, 1949-----	5.20	Oct. 1, 2, 1949-----	4.34
1951	July 10, 1951------	5.20	Oct. 4, 1950------	4.14
1952	Mar. 13, May 28, 1952.	5.10	Nov. 17, 1951------	4.20
1953	May 24, 1953------	5.08	Sept. 30, 1953-----	4.08

Maximum recorded thickness and periods of ice cover 1943-53

Water years	Maximum thickness (inches)	Total days of cover	Period
1943	----	----	Dec. 3, 1942 to-?
1944	----	----	
1945	----	----	Dec. 13, 1944 to-?
1946	2	----	
1947	10	100	Dec. 16, 1946, to Mar. 25, 1947.
1948	20	109	Nov. 27 to Dec. 6, 1947; Dec. 12, 1947, to Mar. 19, 1948.
1949	4	78	Dec. 18, 1948, to Mar. 5, 1949.
1950	5	50	Dec. 15-19, 1949; Jan. 31, 1950, to Mar. 26, 1950.
1951	10	----	Nov. 25, 1950 to-?
1952	4	86	Dec. 14, 1951, to Mar. 8, 1952.
1953	6	45	Nov. 27 to Dec. 10, 1952; Jan. 1 to Jan. 31, 1953.

Discharge measurements at outlet of Koontz Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 9, 1943-	4.40	1.09	Apr. 16, 1946-	4.82	2.80
Oct. 13------	4.72	1.53	June 6------	4.73	4.71
Jan. 19, 1944-	3.95	4.92	July 19------	4.52	1.33
May 10------	4.49	14.2	July 25------	4.42	.82
July 13------	4.19	.40	Mar. 6, 1947-	4.70	3.56
June 11, 1945-	4.52	.45	May 21, 1948-	4.26	23.9
Aug. 22------	4.50	.01	Nov. 9, 1949-	4.59	0
Oct. 23------	4.46	.92	Nov. 28------	4.70	0

Average lake level for Koontz Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	*4.68	4.81	4.94	4.60	4.52	4.56	4.58
1944	4.69	4.66	4.51	4.18	4.18	4.68	4.70
1945	4.01	4.11	4.35	4.57	4.43	4.17	4.60
1946	4.63	4.54	4.52	4.46	4.53	4.89	4.82
1947	4.10	4.55	4.67	4.75	4.76	4.76	4.93
1948	4.58	4.75	4.56	4.71	4.73	4.56	4.54
1949	4.32	4.54	4.61	4.57	4.47	4.67	4.61
1950	4.57	4.63	4.76	4.69	4.70	4.75	4.81
1951	4.23	4.48	4.67	4.65	4.64	4.70	4.74
1952	4.67	4.66	4.73	4.85	4.65	4.81	4.73
1953	4.29	4.34	4.53	4.53	4.66	4.81	4.77
Average	4.43	4.55	4.62	4.60	4.57	4.67	4.71

Year	May	June	July	Aug.	Sept.	Annual
1943	4.17	4.87	4.80	4.51	4.78	4.74
1944	4.54	4.26	4.14	4.05	3.89	4.38
1945	4.84	4.74	4.75	4.58	4.58	4.48
1946	4.88	4.92	4.62	4.32	4.19	4.61
1947	4.90	4.58	4.49	4.43	4.64	4.63
1948	4.59	4.59	4.68	4.55	4.39	4.60
1949	4.71	4.79	4.59	4.55	4.36	4.57
1950	4.70	4.85	4.78	4.48	4.55	4.69
1951	4.68	4.80	4.87	4.74	4.63	4.65
1952	4.81	4.85	4.64	4.52	4.38	4.69
1953	4.91	4.91	4.61	4.51	4.20	4.51
Average	4.70	4.74	4.63	4.48	4.42	4.59

*Partial month or partial year.

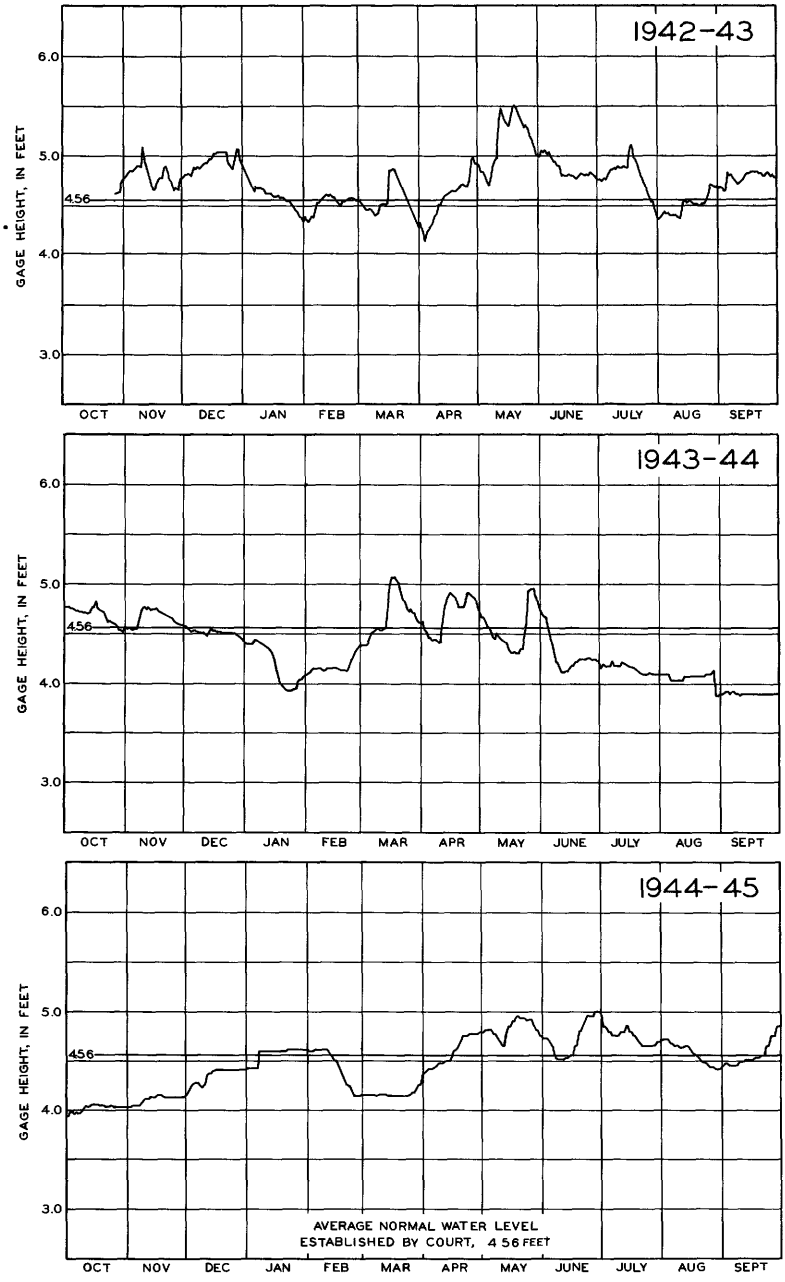

Figure 73. --Lake-level hydrographs for Koontz Lake at Koontz Lake, Ind., for water years 1943-45.

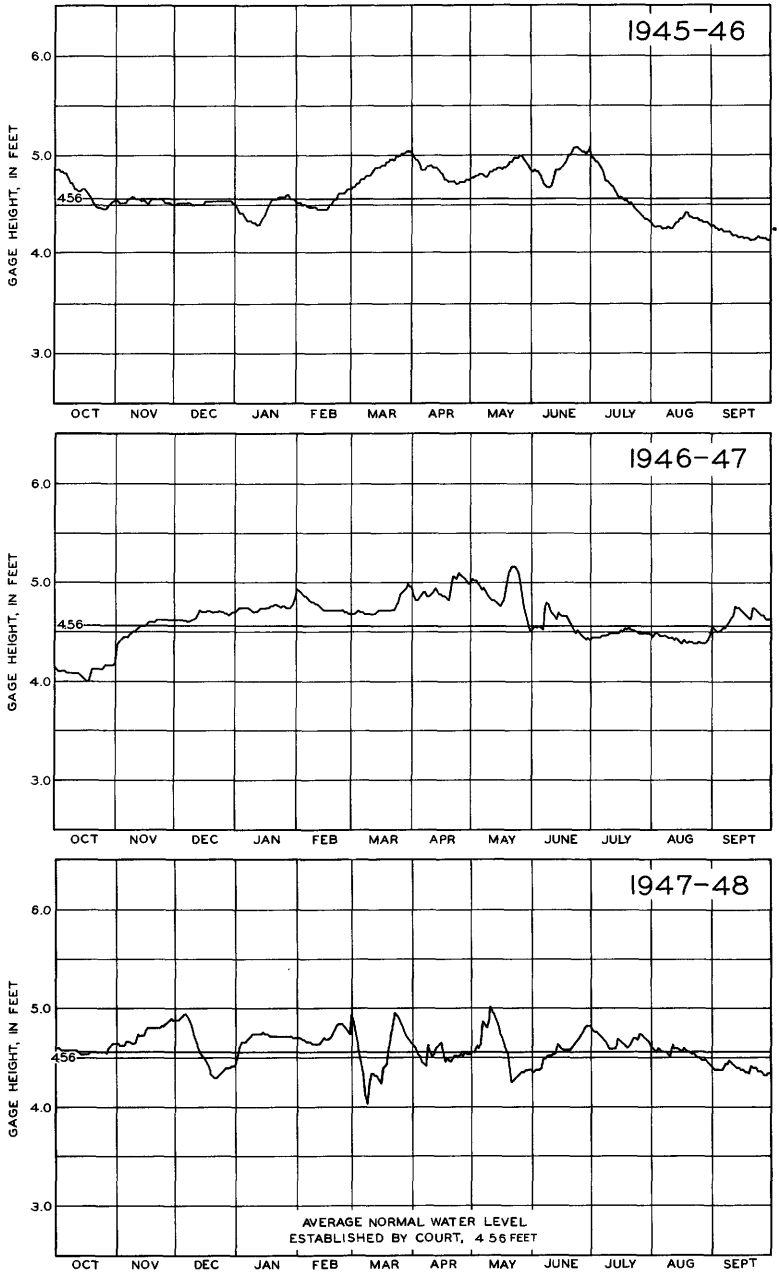

Figure 74.--Lake-level hydrographs for Koontz Lake at Koontz Lake, Ind., for water years 1946-48.

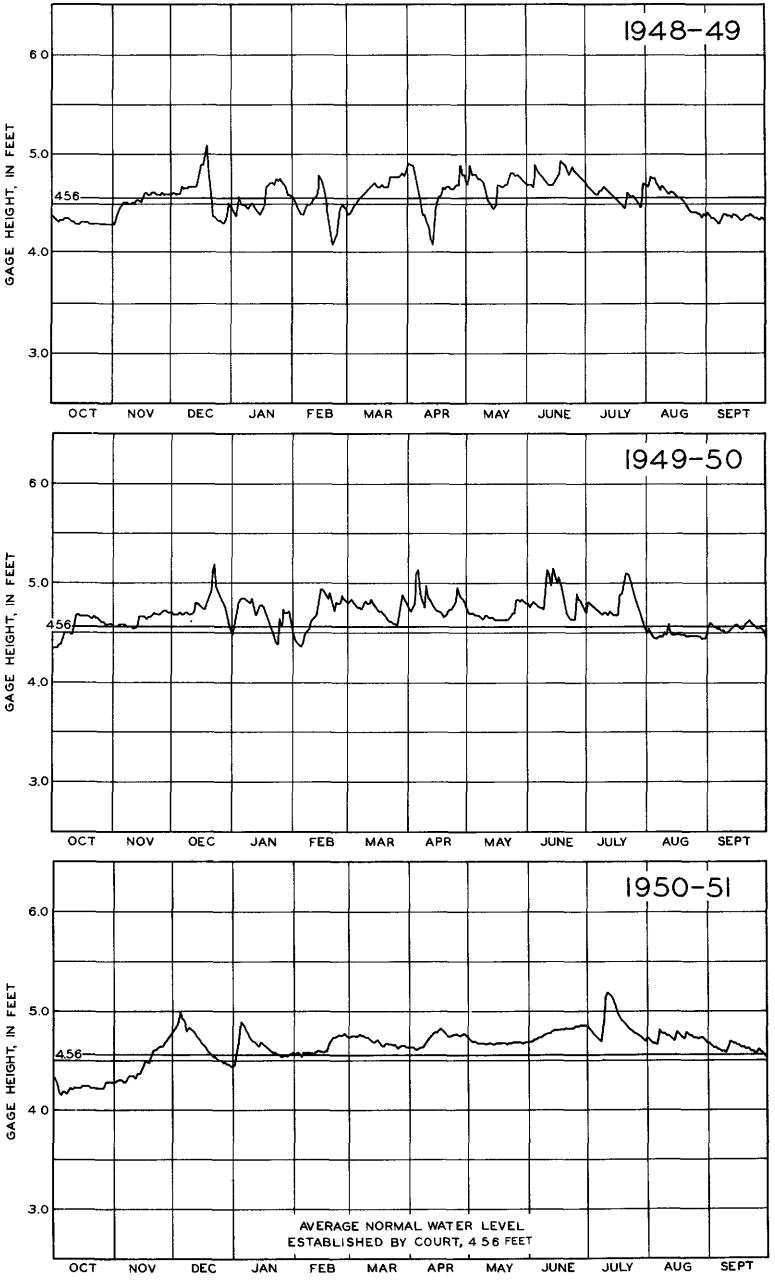

Figure 75. --Lake-level hydrographs for Koontz Lake at Koontz Lake, Ind., for water years 1949-51.

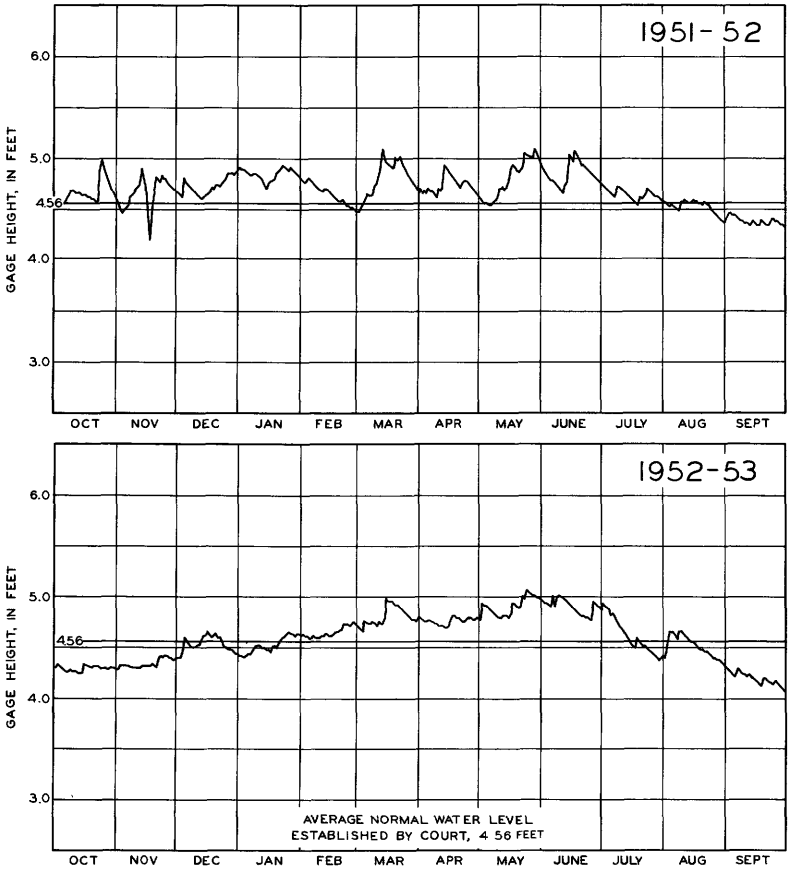

Figure 76. --Lake-level hydrographs for Koontz Lake at Koontz Lake, Ind., for water years 1952-53.

Lake James at Lake James, Ind.

Location. --Secs. 21, 22, 27, 28, 33, and 34, T. 38 N., R. 13 E., and secs. 3, 4, and 10, T. 37 N., R. 13 E., Steuben County.

Surface area. --1,034 acres for Lake James and 310 acres for Snow Lake which is at same level as Lake James (determined from USGS maps, surveyed in 1939).

Drainage area. --43.0 sq mi including that of Snow Lake (determined from same maps).

Records available. --October 1942 to September 1949.

Gage. --Staff gage on County highway bridge over outlet, 500 ft west of middle of second basin of lake. Gage read to hundredths once daily. Datum of gage is 960.00 ft above mean sea level, datum of 1929.

Average level. --7 years; gage height, 4.94 ft; elevation, 964.94 ft.

Established legal level. --Established July 3, 1947, at gage height 4.96 ft; elevation, 964.96 ft above mean sea level.

Lake-level control. --Lake level maintained by two dams at outlet of Jimerson Lake at Nevada Mills, 2½ miles downstream. The lake level of Lake James is generally 0.08 ft above that of Jimerson Lake.

Extreme lake levels for Lake James, 1943-49

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943[a]	May 21, 27, 1943	6.56	Oct. 29, 1942	[a]4.82
1944	Mar. 17-19, 1944	5.62	Sept. 15, 1943	4.25
1945[a]	May 23, 1945	5.97	Feb. 10, 1945	[a]4.04
1946	Oct. 2, 1945, Mar. 10, 1946	5.34	Sept. 21, 22, 1946	4.00
1947	Apr. 24, 1947	5.82	Oct. 11-16, 1946	3.98
1948	Dec. 10-12, 1947	5.30	Feb. 12, 1948	4.07
1949	June 21, 1949	5.65	Oct. 7-22, 1948	4.48

[a] Partial year.

Maximum recorded thickness and periods of ice cover 1946-48

Water year	Maximum thickness (inches)	Total days of cover	Period
1946	8	----	Jan. 10, 1946, to-?
1947	12	----	Jan. 1, 1947, to-?
1948	16	92	Dec. 20, 1947,to Mar. 21, 1948.

Discharge measurements at outlet of Lake James

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 12, 1943-	5.05	32.1	Sept. 4, 1945-	5.11	4.96
Oct. 4------	5.22	[a] 25.5	Jan. 10, 1946-	5.17	[a] 23.4
Feb. 10, 1944-	4.72	31.6	May 21------	4.70	[a] 14.5
Apr. 25------	5.24	113	July 24------	4.54	[a] 26.3
July 3, 1945-	5.01	[a] 13.0			

[a] Heavy growth in channel.

Average lake level for Lake James for water years 1943-49

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	*4.90	*5.08	*5.06	5.40	*5.42	*5.30	5.29
1944	5.13	5.21	5.12	4.78	4.75	5.31	5.10
1945	4.51	4.87	4.97	4.96	4.26	4.91	5.01
1946	5.15	4.99	4.77	5.05	4.71	5.14	4.75
1947	4.09	4.76	4.99	5.02	5.17	4.72	5.51
1948	4.95	4.88	5.16	4.86	4.30	4.84	4.84
1949	4.50	4.87	4.92	5.12	5.28	5.26	5.19
Average	4.75	4.95	5.00	5.03	4.84	5.07	5.10

Year	May	June	July	Aug.	Sept.	Annual	
1943	6.05	*5.40	*5.00	*4.90	5.16	5.25	
1944	5.09	5.00	4.73	4.39	4.31	4.91	
1945	5.40	5.09	4.98	*5.00	*5.20	4.93	
1946	4.56	4.77	4.83	4.27	4.06	4.76	
1947	5.28	5.29	4.62	4.56	4.96	4.91	
1948	4.98	4.83	4.53	4.57	4.44	4.77	
1949	5.19	5.37	5.26	4.94	4.85	5.06	
Average	5.22	5.11	4.85	4.66	4.71	4.94	

*Partial month or partial year.

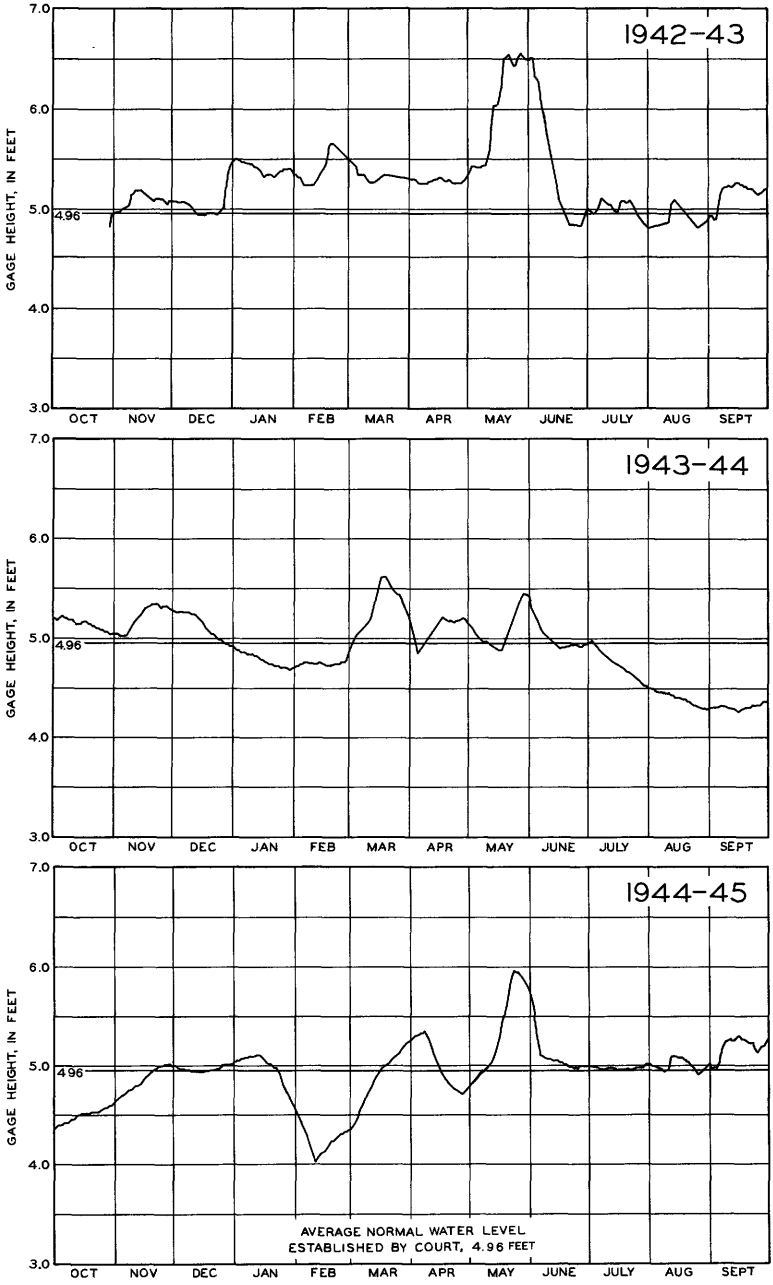

Figure 77. --Lake-level hydrographs for Lake James at Lake James, Ind., for water years 1943-45.

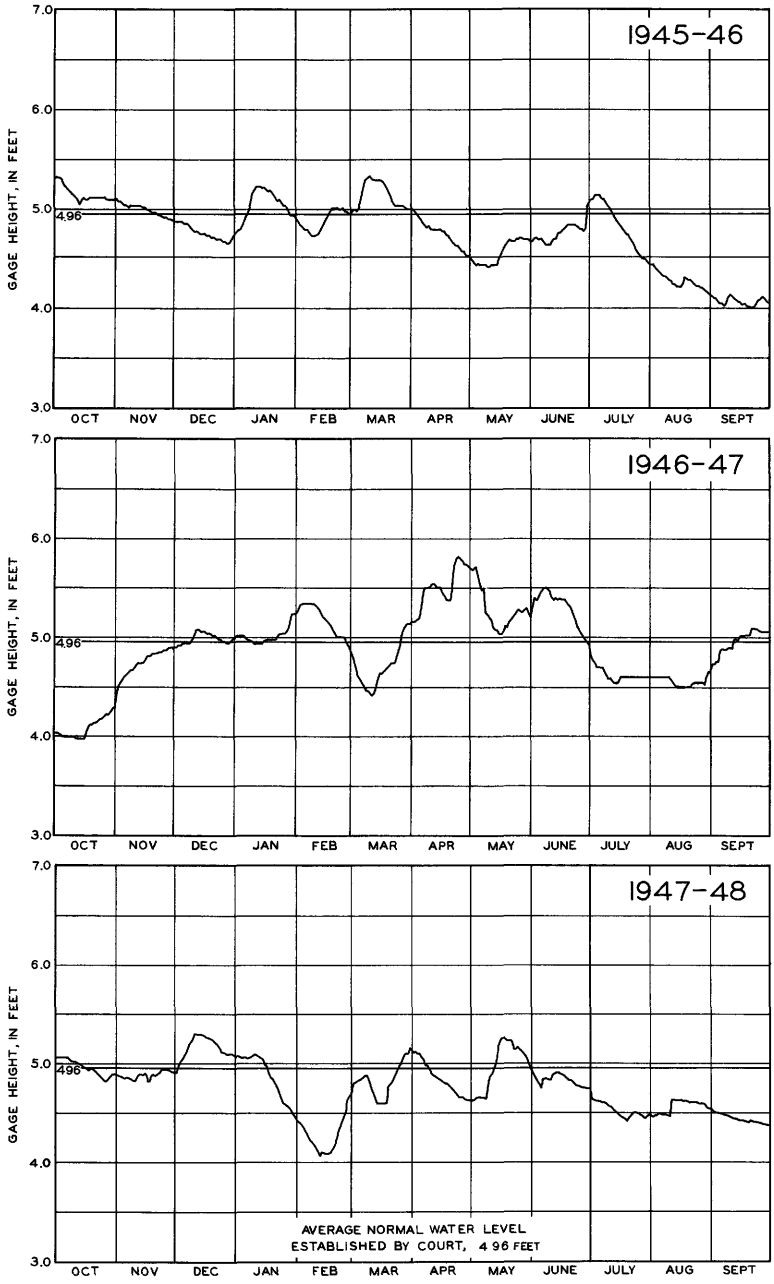

Figure 78. --Lake-level hydrographs for Lake James at Lake James, Ind., for water years 1946-48.

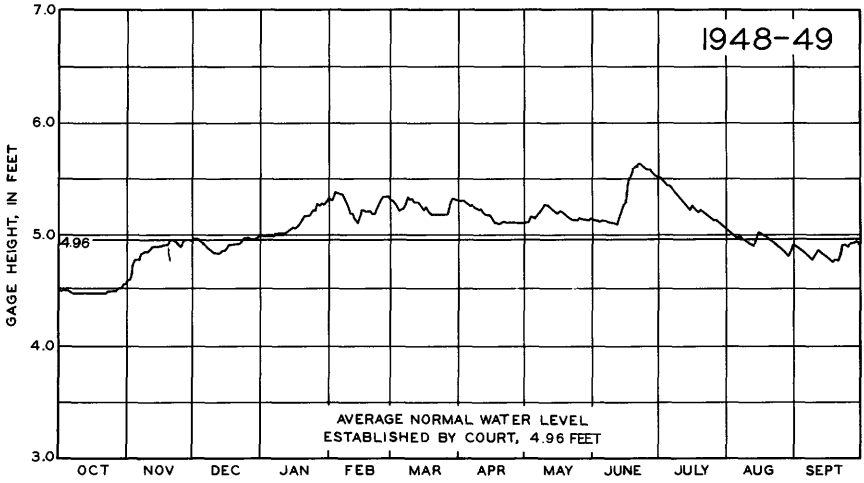

Figure 79. --Lake-level hydrograph for Lake James at Lake James, for water year 1947.

Lake Manitou at Rochester, Ind.

Location. --Secs. 9, 10, 15, 16, and 22, T. 30 N., R. 3 E., Fulton County.

Surface area. --631 acres.

Drainage area. --38.1 sq mi.

Records available. --October 1942 to September 1953.

Gage. --Staff gage attached to south wing wall of control gates on fish hatchery feeder canal. Gage read to hundredths once daily. Datum of gage is 770.00 ft above mean sea level, datum of 1929.

Average lake level. --11 years; gage height, 8.24 ft; elevation, 778.24 ft .

Established legal level. --Established September 27, 1948, at gage height 8.41 ft, elevation, 778.41 ft above mean sea level.

Lake-level control. --Lake level maintained by concrete dam, crest width 88 ft, at gage height 7.76 ft. A 24-in. culvert with movable steel gate controls amount of water going to the Federal Fish Hatchery fish ponds.

Extreme lake levels for Lake Manitou, 1943-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943	May 18, 19, 1943----	9.25	Sept. 28, 29, 1943--	8.11
1944	Apr. 12, 1944------	9.13	Sept. 26, 1944-----	6.94
1945	May 17, 1945-------	8.91	Oct. 1, 1944-------	7.07
1946	Feb. 14, 1946 ------	8.84	Sept. 30, 1946-----	6.71
1947	Apr. 22, 1947 ------	8.91	Oct. 16, 1946------	6.49
1948	Feb. 28, 1948 ------	9.19	Sept. 20, 1948-----	7.67
1949	Feb. 16, 1949 ------	9.24	Oct. 28-31, 1948---	7.00
1950	Apr. 5, 1950 -------	9.38	Oct. 2, 1949-------	7.94
1951	Feb. 21, 1951-------	8.94	Nov. 4, 5, 1950 ----	8.00
1952	Feb. 6, 7, 1952 -----	8.58	Nov. 2-10, 1951, Sept. 3, 5, 6, 12, 14-16, 1952--------	8.24
1953	Oct. 18, 1952-------	8.48	Sept. 30, 1953-----	7.48

Maximum recorded thickness and periods of ice cover 1943-51

Water year	Maximum thickness (inches)	Total days of cover	Period
1943	----	----	Dec. 26, 1942, to-?
1944	----	89	Dec. 14, 1943, to Mar. 11, 1944.
1945	----	----	
1946	2	----	Dec. 17, 1945, to-?
1947	----	79	Dec. 22, 1946, to Mar. 10, 1947.
1948	17	95	Nov. 28, 1947, to Feb. 29, 1948.
1949	3	----	Dec. 9, 1948, to-?
1950	3	58	Dec. 13, 1949, to Jan. 24, 1950, Jan. 29 to Feb. 13, 1950.
1951	----	115	Nov. 24, 1950, to Jan. 20, 1951, Jan. 28 to Mar. 25, 1951.

Discharge measurements at outlet of Lake Manitou

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 17, 1943-	8.43	75.5	Apr. 19, 1946-	8.23	0
Oct. 11------	8.14	2.98	June 7------	8.41	8.70
Jan. 17, 1944-	7.93	5.74	Aug. 23------	7.16	0
May 8------	8.23	58.1	Dec. 11------	7.36	0
July 11------	8.01	0	July 29, 1947-	8.05	0
Aug. 20, 1945-	8.45	[a]11.8	June 24, 1948-	8.61	[a]47.8
Sept. 17------	8.51	[a] 1.00	Oct. 24, 1950-	8.02	[a]8.37
Nov. 27------	8.09	7.53			

[a] Restricted flow; debris in front of screens.

Average lake level for Lake Manitou for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	*8.40	8.31	8.28	8.35	8.33	8.36	8.42
1944	8.19	8.21	8.08	7.98	8.15	8.31	8.58
1945	7.21	7.40	7.69	7.81	7.91	8.23	8.40
1946	8.27	8.14	8.21	8.51	8.54	8.47	8.29
1947	6.67	7.22	7.44	7.91	8.59	8.59	8.66
1948	8.19	8.49	8.41	8.30	8.50	8.53	8.39
1949	7.56	8.09	8.41	8.59	8.54	8.32	8.39
1950	8.30	8.23	8.35	8.70	8.53	8.53	8.71
1951	8.06	8.14	8.32	8.36	8.41	8.38	8.40
1952	8.27	8.31	8.31	8.31	8.42	8.42	8.38
1953	8.42	8.32	8.28	8.27	8.27	8.29	8.28
Average	7.96	8.08	8.16	8.28	8.38	8.40	8.44

Year	May	June	July	Aug.	Sept.	Annual
1943	8.72	8.59	8.51	8.60	8.26	*8.43
1944	8.47	8.48	7.94	7.28	7.04	8.06
1945	8.52	8.45	8.28	8.49	8.47	8.07
1946	8.54	8.45	8.08	7.30	6.87	8.14
1947	8.57	8.45	8.11	7.76	7.98	7.99
1948	8.48	8.51	8.32	8.08	7.76	8.33
1949	8.40	8.42	8.50	8.11	8.01	8.28
1950	8.33	8.35	8.46	8.35	8.27	8.42
1951	8.36	8.48	8.46	8.39	8.30	8.34
1952	8.39	8.37	8.32	8.32	8.29	8.34
1953	8.28	8.27	8.26	8.15	7.59	8.22
Average	8.46	8.44	8.29	8.08	7.89	8.24

*Partial month or partial year.

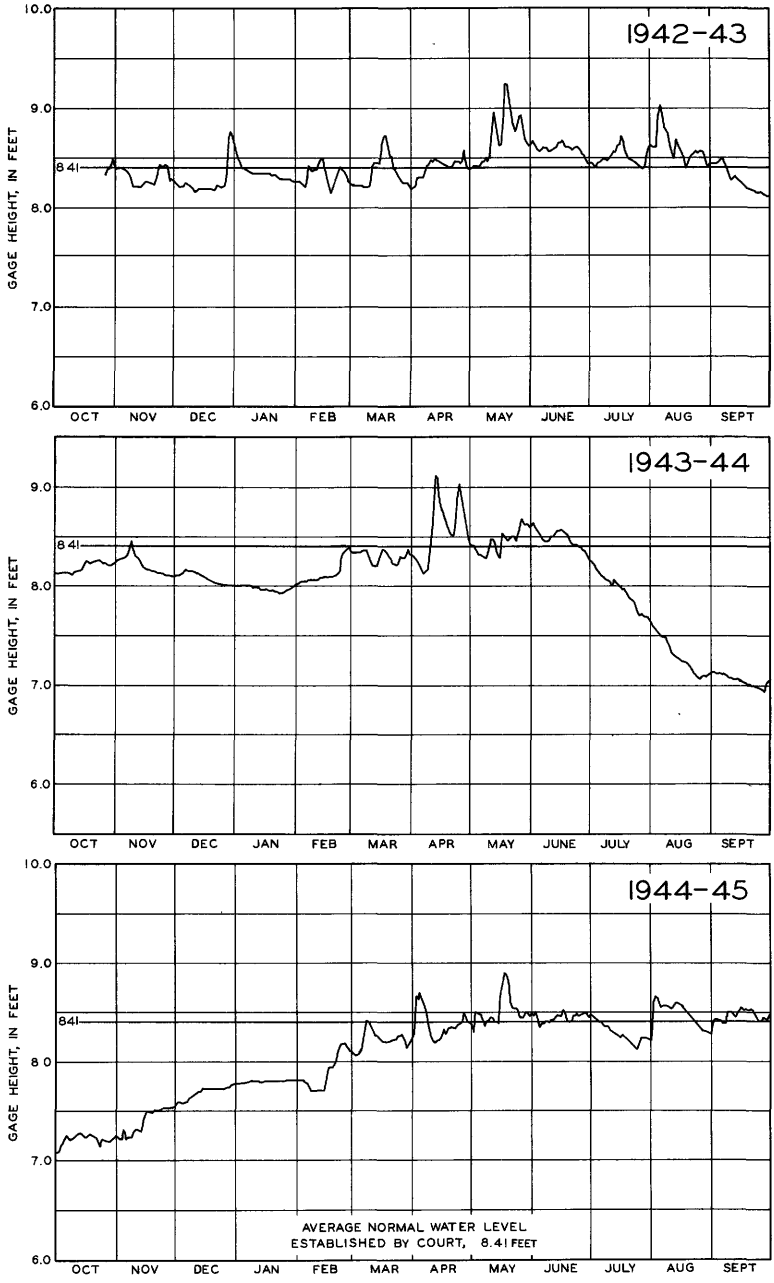

Figure 80. --Lake-level hydrographs for Lake Manitou at Rochester, Ind., for water years 1943-45.

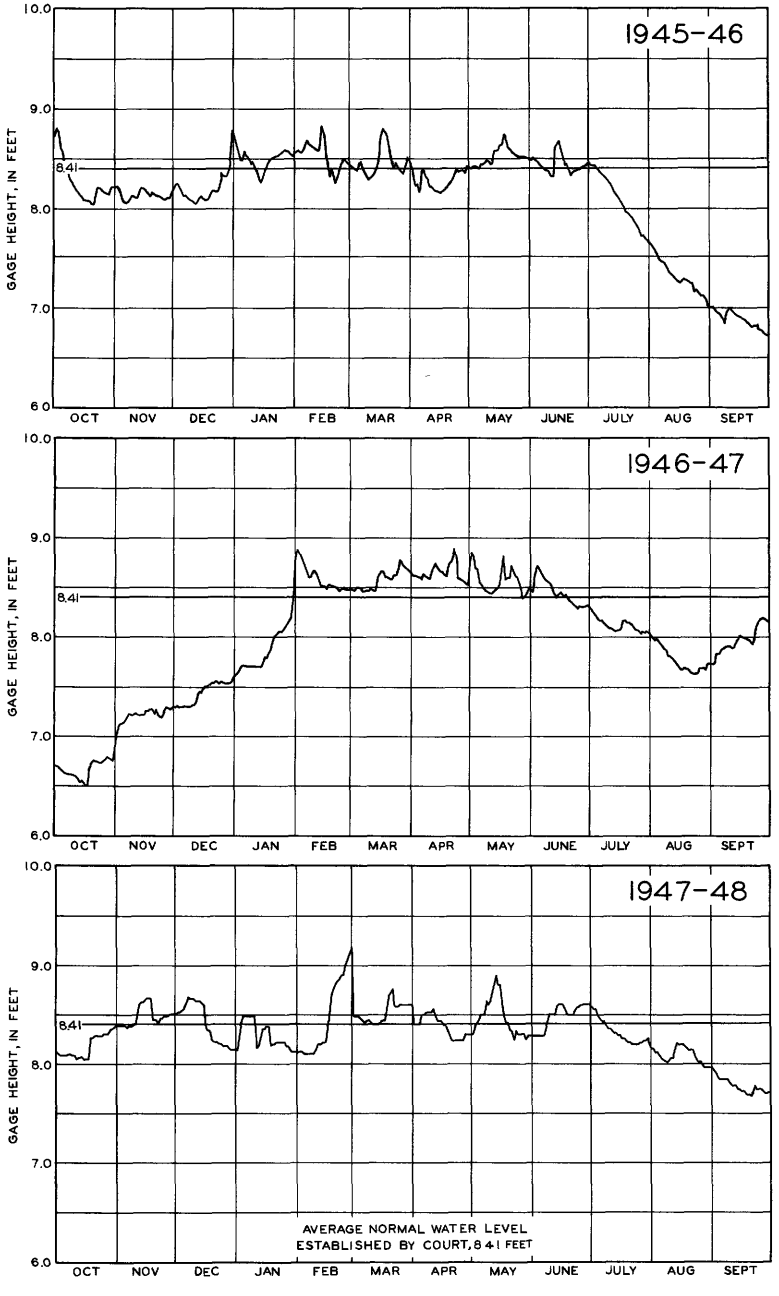

Figure 81. --Lake-level hydrographs for Lake Manitou at Rochester, Ind., for water years 1946-48.

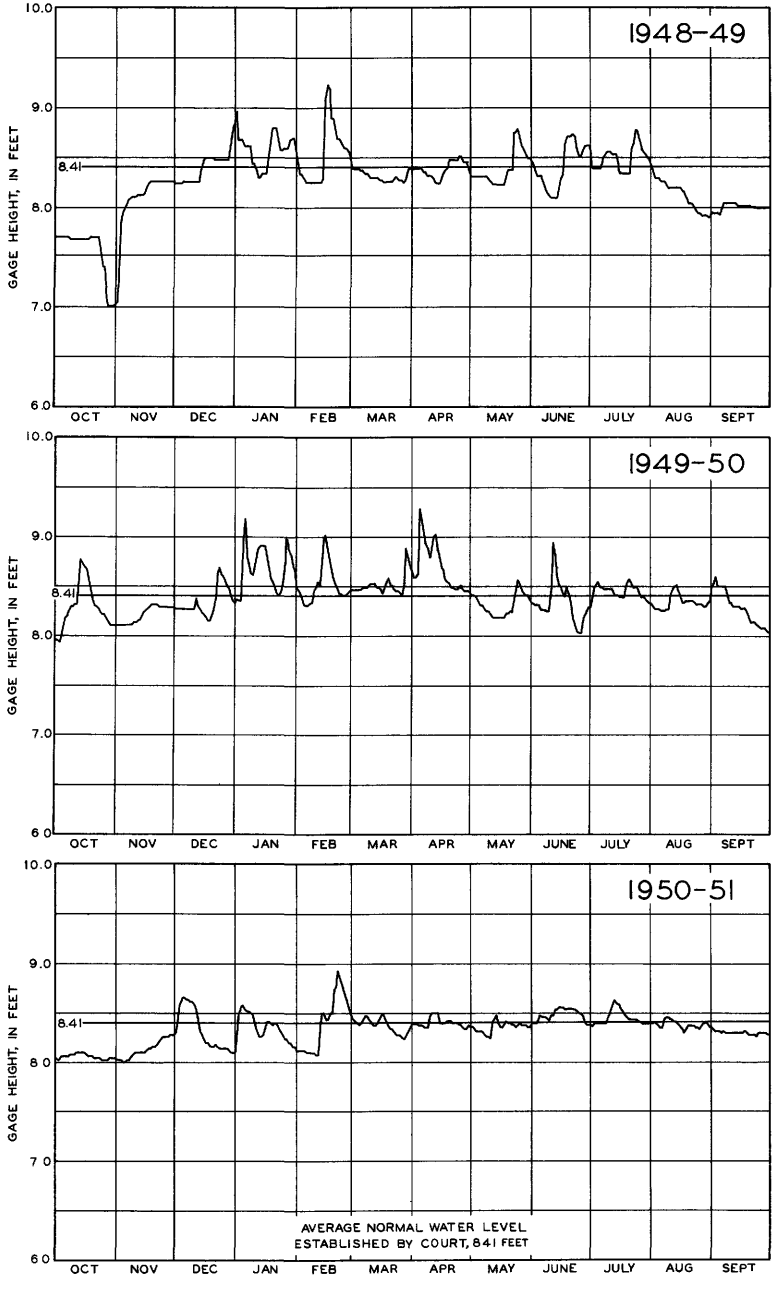

Figure 82. --Lake-level hydrographs for Lake Manitou at Rochester, Ind., for water years 1949-51.

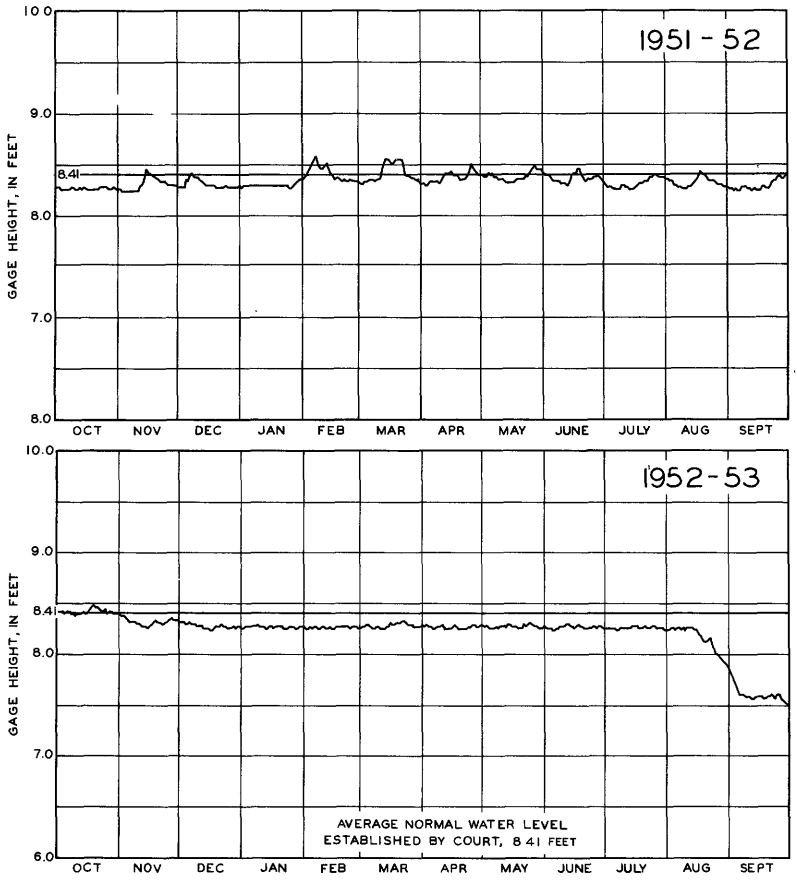

Figure 83. --Lake-level hydrographs for Lake Manitou at Rochester, Ind., for water years 1952-53.

Loon Lake at Ormas, Ind.

Location. --Sec. 31, T. 33 N., R. 9 E., Noble County and secs. 25 and 36, T. 33 N., R. 8 E., sec. 1, T. 32 N., R. 8 E., and sec. 6, T. 32 N., R. 9 E., Whitley County.

Surface area. --190 acres.

Drainage area. --18.8 sq mi.

Records available. --October 1942 to September 1953.

Gage. --Staff gage in two sections at outlet at extreme northeast corner of lake. Gage read to hundredths once daily. Datum of gage is 890.00 ft above mean sea level, datum of 1929.

Average lake level. --11 years; gage height, 5.34 ft; elevation, 895.34 ft.

Established legal level. --Established Dec. 8, 1953, at gage height 5.14 ft; elevation, 895.14 ft above mean sea level.

Lake-level control. --Lake level maintained by bed of outlet channel. Court action now pending for recleaning outlet ditch and constructing control dam.

Extreme lake levels for Loon Lake, 1943-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage heitht (feet)
1943	May 20, 21, 1943----	8.94	Sept. 30, 1943--	4.66
1944	Apr. 17, 1944------	8.06	Sept. 26-28, 1944	3.66
1945	May 20, 21, 1945----	7.51	Oct. 29 to Nov. 4, 1944---------	3.63
1946	Jan. 12, 1946-------	6.16	Sept. 30, 1946---	3.84
1947	Apr. 24, 1947------	7.18	Oct. 16, 17, 1946	3.66
1948	Mar. 2, 3, 1948-----	7.16	Sept. 27, 28, 1948	4.06
1949	Feb. 18, 1949------	7.10	Oct. 29, 1948---	3.96
1950	Apr. 5, 1950-------	8.40	Oct. 1, 2, 1949--	4.38
1951	Feb. 23, 1951------	7.18	Nov. 7, 1950----	4.76
1952	Jan. 28-31, 1952----	6.70	Sept. 28-30, 1952	4.48
1953	Mar. 17, 18, 1953---	5.84	Sept. 30, 1953 --	*3.88

*Estimated.

Maximum recorded thickness and periods of ice cover 1943-52

Water year	Maximum thickness (inches)	Total days of cover	Period
1943	----	102	Dec. 4, 1942, to Mar. 15, 1943.
1944	----	----	Dec. 15, 1943, to-?
1945	----	----	Dec. 18, 1944, to-?
1946	11	84	Dec. 12, 1945, to Mar. 5, 1946.
1947	10	91	Jan. 4, 1947, to Apr. 4, 1947.
1948	----	94	Dec. 17, 1947, to Mar. 19, 1948.
1949	4	----	Jan. 30, 1949, to-?
1950	2	----	Dec. 15, 1949, to-?
1951	----	----	Dec. 1, 1950, to-?
1952	----	----	Dec. 13, 1951, to-?

Discharge measurements at outlet of Loon Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 13, 1943	5.13	3.67	Feb. 16, 1949	6.98	39.7
Oct. 8	4.52	1.03	Mar. 8	5.90	14.7
Jan. 7, 1944	4.58	.86	Mar. 23	5.50	6.97
May 15	6.39	28.3	Apr. 26	5.48	5.74
Apr. 10, 1945	6.85	26.3	Sept. 6	4.54	.01
July 11	5.36	3.64	Nov. 30	5.03	1.01
Sept. 1	4.80	2.05	Dec. 20	5.28	3.24
Oct. 5	5.76	12.8	Jan. 15, 1950	7.91	69.1
Dec. 17	4.88	2.20	Jan. 18	7.68	54.9
Mar. 12, 1946	5.94	13.4	Jan. 27	7.85	64.4
May 14	4.78	1.70	Feb. 7	6.43	24.8
July 25	4.58	.51	Feb. 22	6.88	32.6
Aug. 21	4.30	.08	Mar. 1	6.46	23.5
Oct. 1	3.81	0.	May 3	6.06	16.4
Apr. 23, 1947	7.16	24.1	May 24	5.44	4.80
July 2	5.42	8.11	Nov. 22	5.29	4.34
Mar. 2, 1948	7.14	27.3	May 9, 1951	5.42	7.71
Sept. 28	4.06	0	Nov. 7, 1952	4.76	0
Oct. 28	3.97	0	July 2, 1953	4.76	1.44
Dec. 29	5.20	4.90			

Average lake level for Loon Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	*5.72	6.36	6.29	6.85	6.44	6.66	6.19
1944	4.51	4.72	4.67	4.52	4.80	5.85	7.13
1945	3.72	3.74	3.92	4.17	4.79	5.85	6.35
1946	5.48	5.20	4.99	5.72	5.69	5.96	5.28
1947	3.75	4.01	4.20	4.84	5.57	5.48	6.59
1948	4.64	4.84	5.19	5.40	5.51	6.69	6.30
1949	4.04	4.26	4.72	6.11	6.41	5.75	5.54
1950	5.04	5.05	5.55	7.42	6.80	6.87	7.31
1951	4.85	5.03	5.89	5.83	6.01	5.99	6.08
1952	4.98	5.50	5.60	6.28	6.08	5.89	5.94
1953	4.35	4.37	4.87	5.18	5.24	5.56	5.33
Average	4.64	4.83	5.08	5.67	5.76	6.05	6.19

Year	May	June	July	Aug.	Sept.	Annual
1943	7.49	6.43	5.59	5.12	4.83	*6.20
1944	6.88	5.43	4.40	3.90	3.77	5.05
1945	6.29	5.99	5.30	5.33	4.65	5.01
1946	4.97	5.18	4.87	4.29	4.00	5.13
1947	6.48	5.82	5.00	4.49	4.61	5.06
1948	6.09	5.55	4.95	4.55	4.21	5.33
1949	5.51	5.81	5.24	4.54	4.48	5.19
1950	5.66	5.64	5.38	4.91	5.14	5.89
1951	5.63	5.28	5.97	5.41	5.00	5.58
1952	5.62	5.97	5.58	4.99	4.61	5.59
1953	5.42	5.10	4.14	4.17	4.02	4.81
Average	6.00	5.65	5.13	4.70	4.48	5.34

*Partial year or partial month.

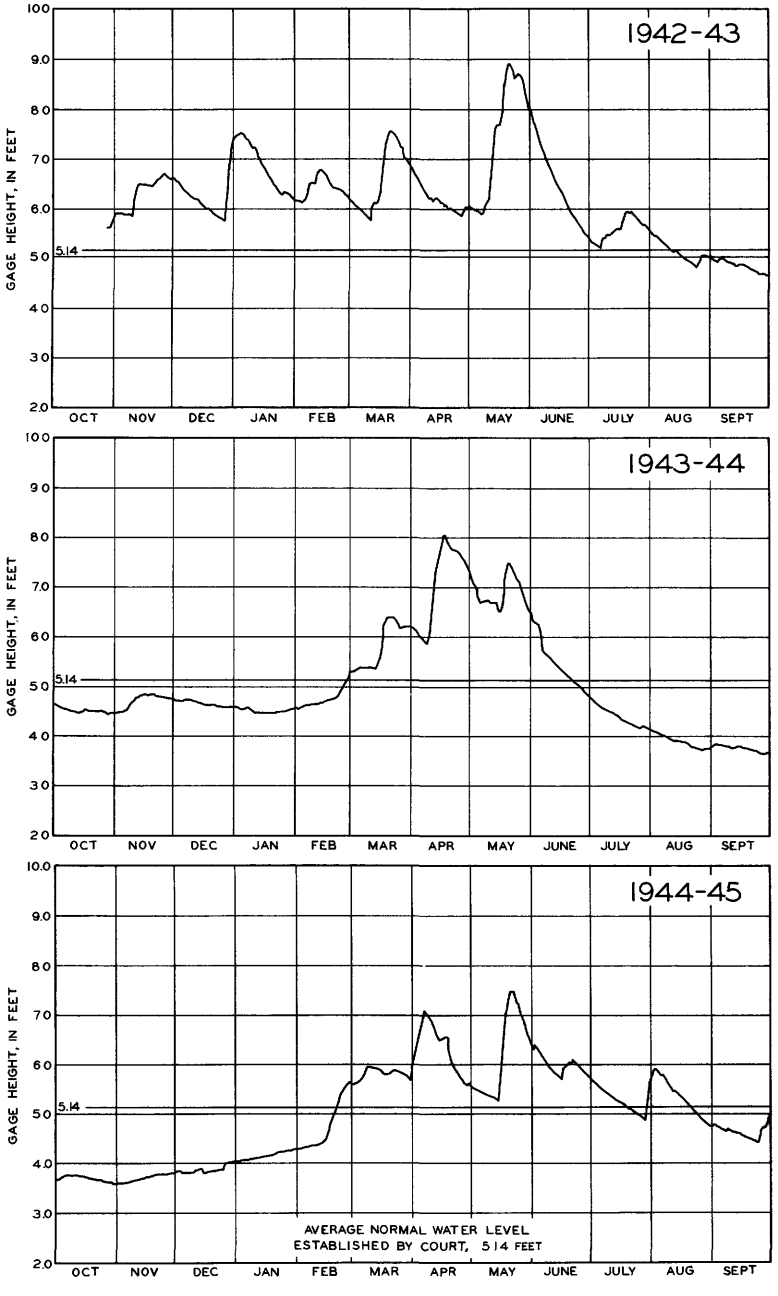

Figure 84. --Lake-level hydrographs for Loon Lake at Ormas Ind., for water years 1943-45.

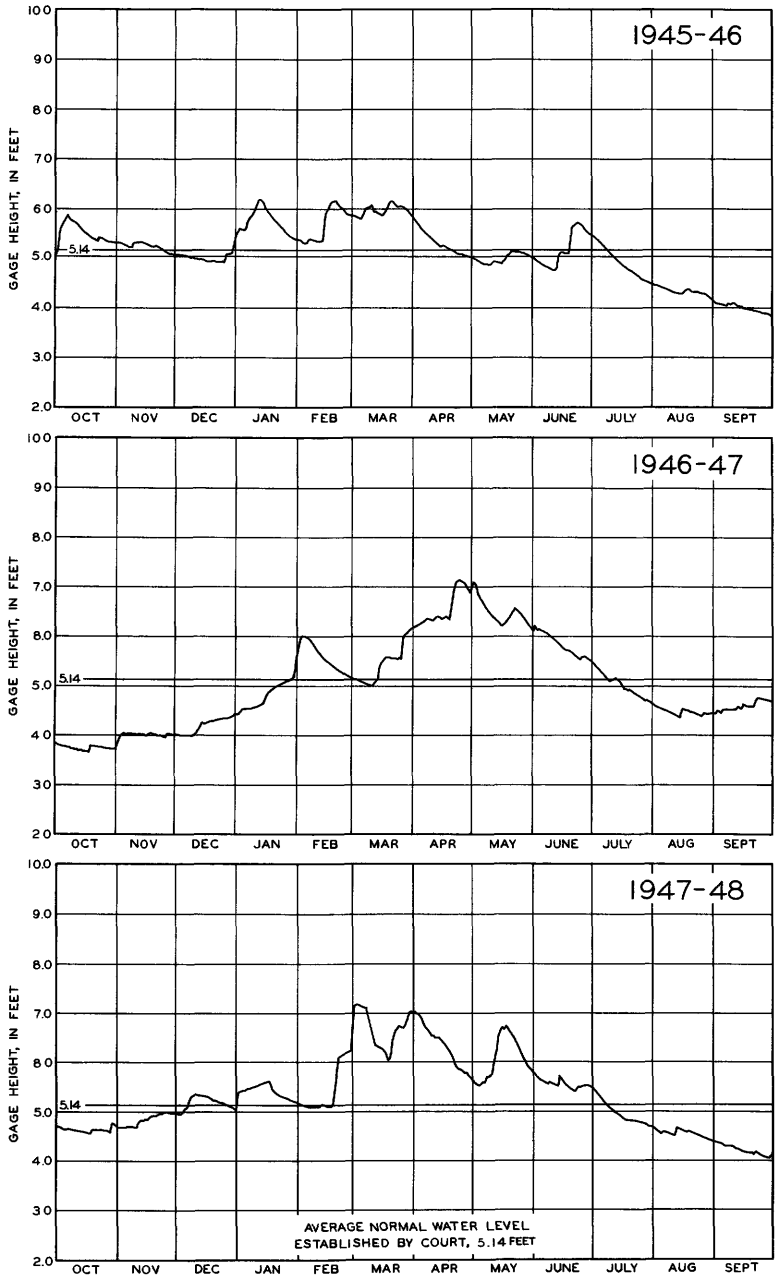

Figure 85. --Lake-level hydrographs for Loon Lake at Ormas, Ind., for water years 1946-48.

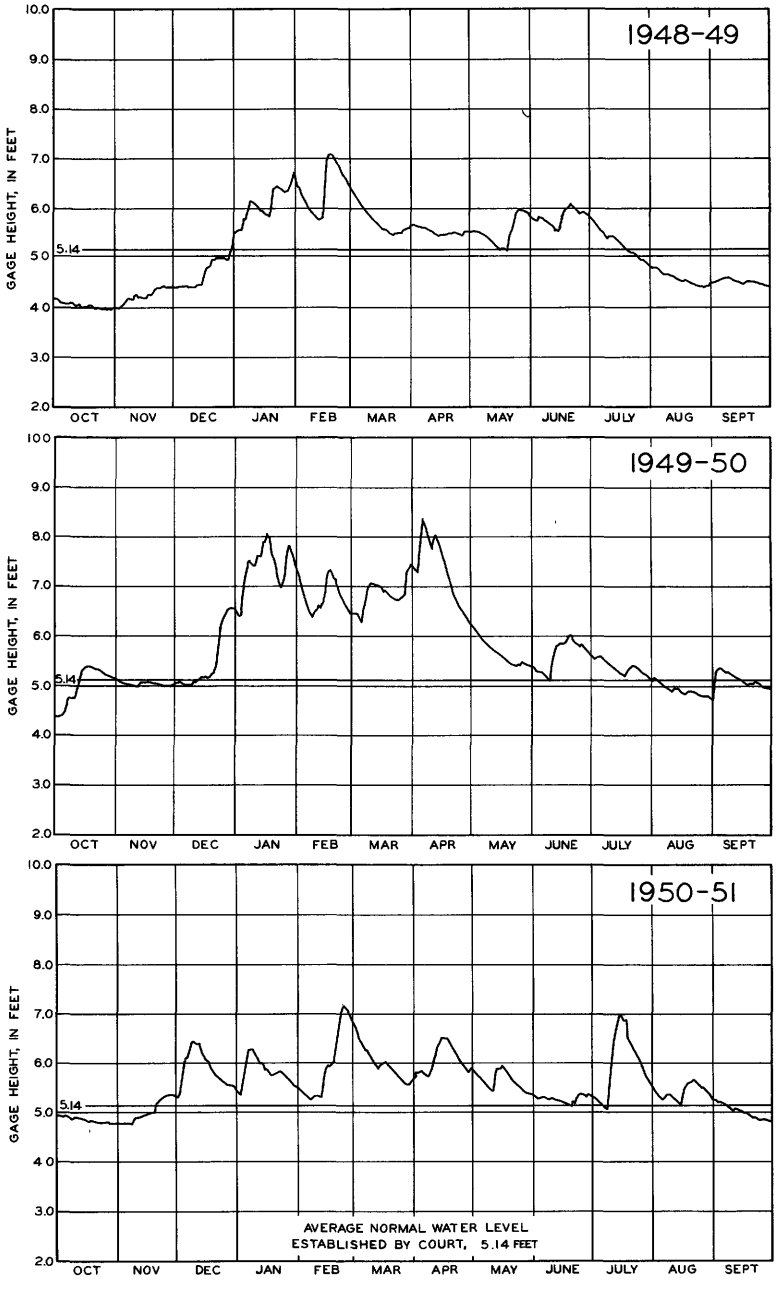

Figure 86.--Lake-level hydrographs for Loon Lake at Ormas, Ind., for water years 1949-51.

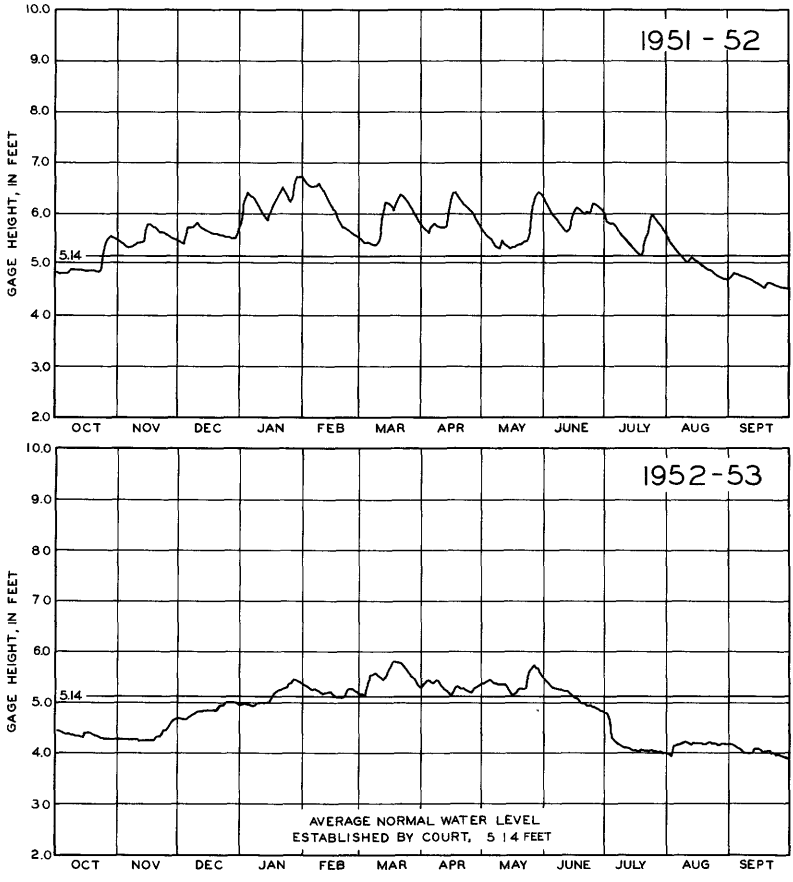

Figure 87. --Lake-level hydrographs for Loon Lake at Ormas, Ind., for water years 1952-53.

Maxinkuckee Lake at Culver, Ind.

Location. --Secs. 15, 16, 21, 22, 27, 28, 34, T. 32 N., R. 1 E., Marshall County.

Surface area. --1,650 acres.

Drainage area. --9.48 sq mi.

Records available. --October 1942 to September 1953.

Gage. --Staff gage attached to east side of north abutment of outlet dam. Gage read to hundredths once daily. Datum of gage is 730.00 ft above mean sea level, datum of 1929.

Average level. --11 years; gage height, 3.12 ft; elevation, 733.12 ft.

Established legal level. --Established August 9, 1948, at gage height 3.12 ft; elevation, 733.12 ft above mean sea level.

Lake-level control. --Lake level maintained by 17-ft fixed-crest concrete dam, crest gage height, 2.9 ft. Dam was built in 1926 by Culver Military Academy.

Extreme lake levels for Maxinkuckee Lake, 1943-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943	May 20, 1943-------	4.58	Oct. 27, 28, 1942--	2.90
1944	Apr. 24, 1944------	3.92	Sept. 25-27, 1944-	2.54
1945	May 18, 19, 1945----	3.72	Oct. 30, 21, 1944--	2.54
1946	Oct. 2, 1945 -------	3.48	Sept. 30, 1946----	2.30
1947	June 8, 1947 -------	3.52	Oct. 15, 1946----	2.15
1948	May 14, 1948-------	3.69	Sept. 28, 1948----	2.62
1949	Feb. 16, 17, 1949---	3.65	Sept. 30, 1949----	2.44
1950	Apr. 11. 1950------	4.38	Oct. 2, 1949------	2.42
1951	Apr. 15, 1951------	3.72	Nov. 6, 7, 1950---	2.75
1952	May 26-28, 1952----	3.52	Sept. 29, 30, 1952-	2.66
1953	May 23-25, 1953----	3.28	Nov. 13-17, 1952 -	2.40

Maximum recorded thickness and periods of ice cover 1943-52

Water year	Maximum thickness (inches)	Total days of cover	Period
1943	----	100	Dec. 7, 1942, to Mar. 16, 1943.
1944	----	-----	Dec. 15, 1943, to-?
1945	----	-----	Dec. 20, 1944, to-?
1946	----	80	Dec. 18, 1945, to Mar. 7, 1946.
1947	5	89	Jan. 4, 1947, to Apr. 2, 1947.
1948	16 5/8	88	Dec. 23, 1947, to Mar. 19, 1948.
1949	2	55	Jan. 1-9, 20-28; Jan. 30 to Mar. 7, 1949.
1950	----	25	Jan. 20-24; Feb. 24 to Mar. 15, 1950.
1951	----	86	Dec. 12, 1950, to Mar. 7, 1951.
1952	----	57	Dec. 17, 1951, to Feb. 11, 1952.

Discharge measurements at outlet of Maxinkuckee Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 6, 1943	3.40	15.6	Nov. 16, 1950	2.80	[a] 0.76
Oct. 12	2.99	4.96	Feb. 1, 1951	3.19	17.1
Jan. 21, 1944	2.99	4.55	Apr. 12	3.66	32.8
May 11	3.64	34.6	May 16	3.47	28.1
July 13	3.00	5.25	June 21	3.10	11.5
Apr. 12, 1945	3.30	27.8	July 18	3.28	21.5
June 5	3.64	30.6	Aug. 28	3.01	6.01
Aug. 21	3.07	8.18	Sept. 19	2.89	2.29
Sept. 17	2.86	1.59	Oct. 16	2.80	1.38
Nov. 27	3.06	8.26	Nov. 19	3.23	21.5
Apr. 3, 1946	3.28	23.4	Dec. 17	3.20	19.2
June 5	3.02	7.04	Jan. 14, 1952	3.29	23.2
Aug. 26	2.52	0	Feb. 18	3.31	21.1
Oct. 22	2.26	.04	Mar. 19	3.35	27.7
Nov. 19	2.68	[a] .18	July 25	2.99	[a] 5.78
Dec. 20	2.74	*.042	Aug. 21	2.88	15.03
Jan. 7, 1947	2.89	2.02	Sept. 19	2.78	[a] .56
Feb. 17	3.12	10.0	Oct. 14	2.56	*.10
Feb. 20	3.10	15.3	Nov. 11	2.40	0.
May 1	3.49	33.0	Dec. 12	2.70	*.20
Dec. 16	3.11	8.26	Jan. 22, 1953	3.04	7.60
Feb. 23, 1948	3.15	12.3	Feb. 13	3.07	9.13
Feb. 29	3.36	22.4	Mar. 2	3.10	10.2
May 13	3.67	28.5	Mar. 24	3.30	20.4
Aug. 31	2.84	[a] 1.40	Apr. 13	3.19	[a] 13.8
Feb. 22, 1949	3.61	35.1	May 5	3.21	17.3
Apr. 11	3.17	16.5	June 5	3.07	8.16
Sept. 2	2.64	[a] .61	June 29	3.06	[a] 10.3
Nov. 21	2.70	[a] .74	July 23	3.06	[a] 9.76
Mar. 16, 1950	3.73	35.5	Aug. 21	2.78	[a] .49
May 1	4.02	43.8	Oct. 6	2.38	0
Oct. 11	2.90	2.54	Nov. 9	2.18	[a] 0
Nov. 6	2.74	[a] .60			

*Estimated.

[a] Leakage through dam.

Average lake level for Maxinkuckee Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	*2.93	3.14	3.20	3.41	3.33	3.35	3.28
1944	3.02	3.08	3.02	2.99	3.10	3.38	3.66
1945	2.62	2.65	2.77	2.94	2.98	3.20	3.29
1946	3.25	3.07	3.07	3.23	3.19	3.34	3.17
1947	2.24	2.65	2.73	2.97	3.12	3.08	3.35
1948	2.87	2.94	3.07	3.14	3.11	3.38	3.39
1949	2.52	2.71	2.92	3.35	3.54	3.35	3.17
1950	2.69	2.68	2.93	3.68	3.85	3.76	4.15
1951	2.88	2.86	3.18	3.26	3.31	3.44	3.54
1952	2.90	3.17	3.25	3.34	3.33	3.27	3.38
1953	2.56	2.48	2.71	2.92	3.09	3.19	3.20
Average	2.77	2.86	2.99	3.20	3.27	3.34	3.42

Year	May	June	July	Aug.	Sept.	Annual	
1943	3.91	3.81	3.50	3.35	3.23	*3.40	
1944	3.65	3.31	2.90	2.68	2.61	3.12	
1945	3.47	3.54	3.16	3.09	2.94	3.05	
1946	3.09	3.12	2.95	2.60	2.38	3.04	
1947	3.36	3.39	2.98	2.75	2.94	2.96	
1948	3.47	3.27	3.24	2.98	2.73	3.13	
1949	3.20	3.21	3.01	2.85	2.56	3.03	
1950	3.64	3.52	3.47	3.24	3.00	3.38	
1951	3.44	3.18	3.20	2.98	2.88	3.18	
1952	3.35	3.35	3.03	2.84	2.72	3.16	
1953	3.21	3.11	3.08	2.86	2.55	2.91	
Average	3.44	3.35	3.14	2.93	2.78	3.12	.

*Partial month or partial year.

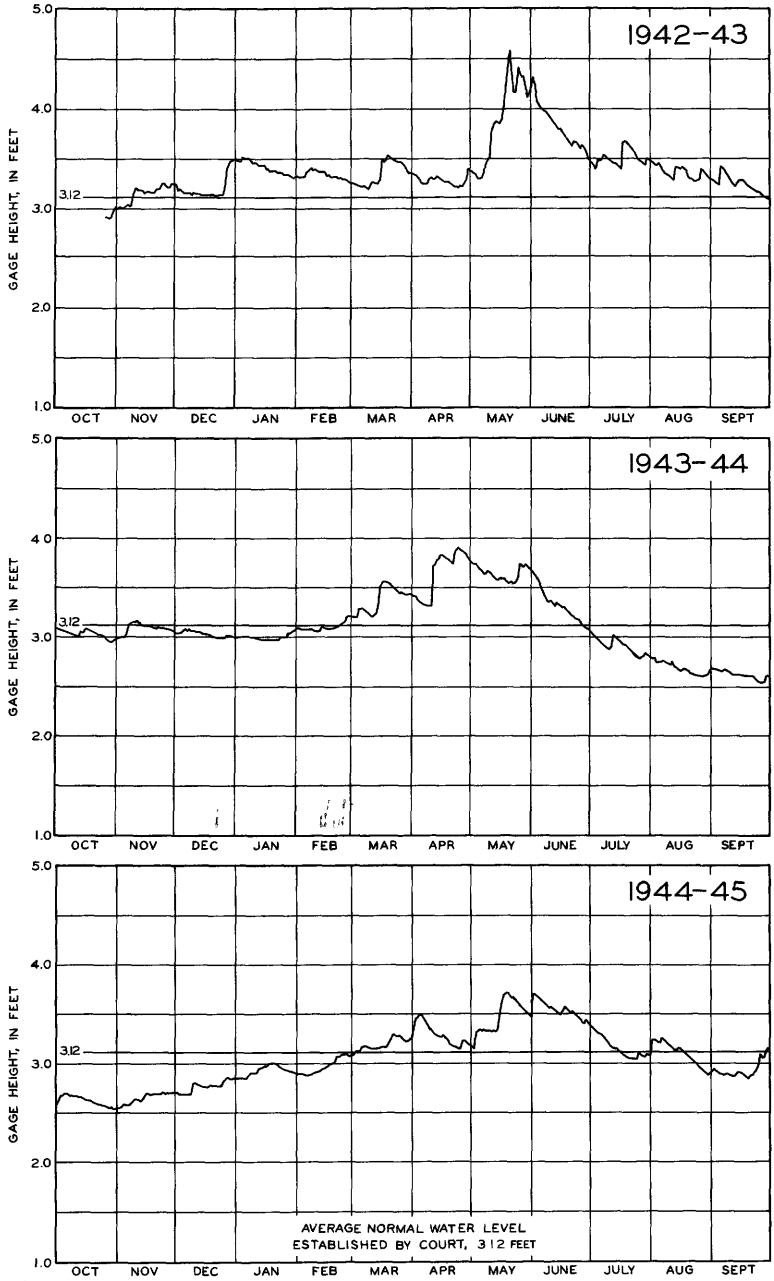

Figure 88.--Lake-level hydrographs for Maxinkuckee Lake at Culver, Ind., for water years 1943-45.

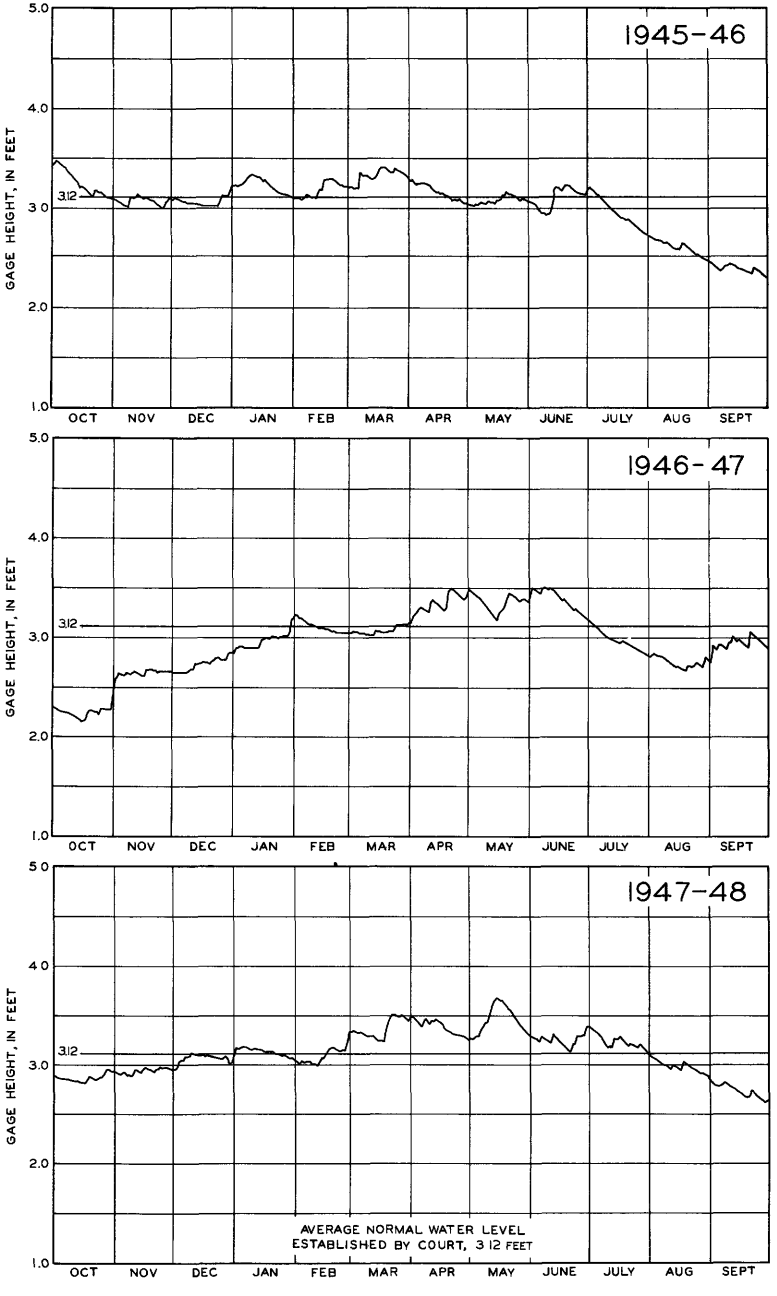

Figure 89. --Lake-level hydrographs for Maxinkuckee Lake at Culver, Ind., for water years 1946-48.

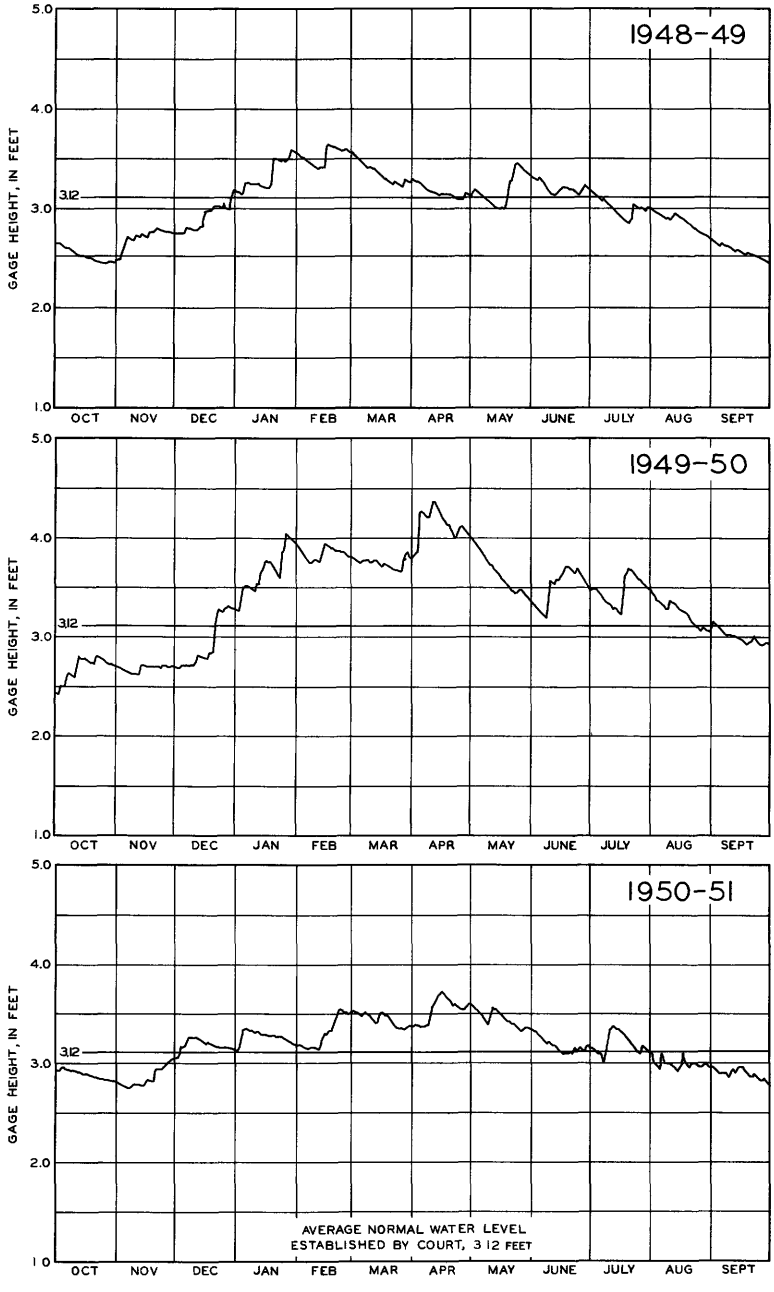

Figure 90. --Lake-level hydrographs for Maxinkuckee Lake at Culver, Ind., for water years 1949-51.

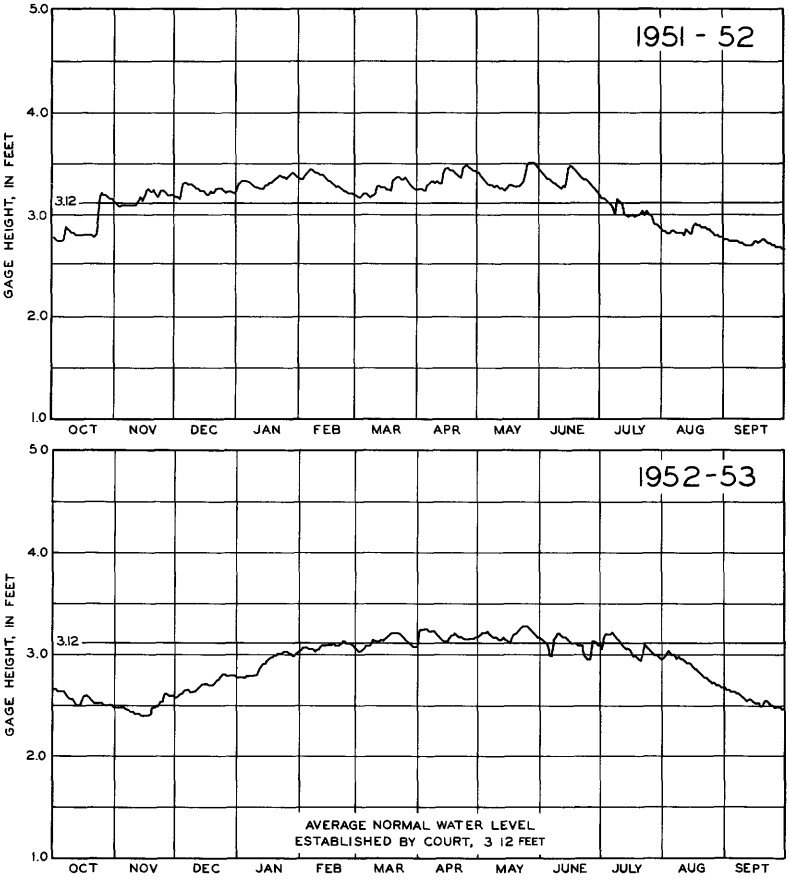

Figure 91. --Lake-level hydrographs for Maxinkuckee Lake at Culver, Ind., for water years 1952-53.

Muskelonge Lake near Warsaw, Ind.

Location. --Sec. 3, T. 31 N., R. 6 E., Kosciusko County, 4.9 miles southeast of Warsaw.

Surface area. --23.8 acres.

Drainage area. --11.1 sq mi.

Records available. --August 1943 to November 1952.

Gage. --Staff gage attached to willow tree on north bank of outlet, 50 ft downstream from lake. Gage read to hundredths once daily. Datum of gage is 840.00 ft above mean sea level, datum of 1929.

Average lake level. --9 years, gage height, 2.02 ft; elevation, 842.02 ft.

Established legal level. --Established September 20, 1948, at gage height 2.67 ft; elevation, 842.67 ft above mean sea level.

Lake-level control. --Lake level maintained by riffle about 0.5 mi downstream from lake.

Extreme lake levels for Muskelonge Lake, 1944-52

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943 [a]	Aug. 15, 1943----	[a] 2.73	Sept. 3, 1943-----	[a] 1.66
1944	Apr. 13, 1944----	5.22	Aug. 21, 22, 1944 -	*1.02
1945	May 17, 1945-----	4.76	Oct. 1, 1944------	1.21
1946	Oct. 1, 1945 -----	4.98	Sept. 27-30, 1946-	1.20
1947	Apr. 25, 1947----	3.44	Oct. 5-16, 1946---	1.19
1948	Feb. 29, 1948----	3.68	Sept. 28, 1948----	1.04
1949	Feb. 16, 1948----	3.58	Oct. 4-7, 11-15, 1948 ----------	1.10
1950	Apr. 5, 1950-----	3.90	Oct. 2, 1949------	1.36
1951	July 11, 1951-----	3.50	Sept. 28-30, 1951 -	1.32
1952	May 25, 1952-----	3.46	Oct. 1-6, 1951----	1.32

* Estimated.

[a] August and September.

Maximum recorded thickness and periods of ice cover 1944-52

Water year	Maximum thickness (inches)	Total days of cover	Period
1944	10	----	Unknown to Feb. 26, 1944.
1945	-----	----	
1946	-----	83	Dec. 16, 1945, to Mar. 8, 1946.
1947	10	101	Dec. 19, 1946, to Mar. 29, 1947.
1948	8	----	Unknown to Mar. 21, 1948.
1949	6	52	Dec. 25, 1948, to Jan. 15, 1949; Jan. 31 to Mar. 1, 1949.
1950	4	43	Jan. 15-28; Feb. 19 to Mar. 19, 1950.
1951	8	----	Dec. 3, 1950, to-?
1952	6	20	Jan. 1-20, 1952.

Discharge measurements at outlet of Muskelonge Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 5, 1943	2.58	17.8	Jan. 4, 1949	2.08	11.2
Oct. 6 -----	1.60	2.11	Feb. 15 ------	3.52	129
Jan. 6, 1944	1.53	1.56	Mar. 2 ------	2.37	25.1
Apr. 21 -----	3.22	48.6	Mar. 22 ------	2.04	9.29
June 12, 1945	2.05	7.55	May 3 ------	2.18	11.2
Sept. 7 -----	1.94	6.23	Aug. 30 ------	1.37	.92
Nov. 26 -----	1.98	7.59	Nov. 1 ------	1.72	3.87
May 27, 1946	2.22	12.4	Dec. 14 ------	1.92	8.35
June 21 -----	2.59	19.2	Jan. 12, 1950	3.09	69.8
Dec. 3 -----	1.52	1.69	Jan. 19 ------	2.85	54.9
Apr. 22, 1947	3.36	48.7	Jan. 31 ------	2.76	49.6
Jan. 27, 1948	1.73	4.00	Mar. 14 ------	2.64	38.9
Mar. 1 -----	3.51	49.3	May 2 ------	2.42	21.6
Mar. 11 -----	2.05	12.6	Sept. 12 ------	1.59	2.97
Mar. 24 -----	3.11	37.6	Oct. 31 ------	1.52	1.83
Sept. 28 -----	1.05	.21	Nov. 20 ------	2.09	14.5
Oct. 14 -----	1.11	.27	May 8, 1951	2.19	9.99
Nov. 30 -----	1.57	2.14	Aug. 18, 1952	1.71	4.96

Average lake level for Muskelonge Lake for water years 1943-52

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1944	1.65	1.87	1.64	1.36	1.73	2.46	3.42
1945	1.34	1.48	1.51	1.51	1.67	2.16	2.49
1946	2.81	2.10	2.05	2.43	2.48	2.45	1.94
1947	1.28	1.59	1.57	1.90	2.46	2.24	2.62
1948	1.63	1.89	2.07	2.13	2.13	2.67	2.42
1949	1.13	1.55	1.73	2.45	2.49	2.13	2.08
1950	2.04	1.69	2.05	3.05	2.72	2.70	2.89
1951	1.50	1.74	2.29	2.34	2.42	2.46	2.61
1952	1.54	1.82	2.01	2.50	2.36	2.35	2.48
Average	1.66	1.75	1.88	2.19	2.27	2.40	2.55

Year	May	June	July	Aug.	Sept.	Annual
1943	----	----	----	*2.12	1.96	*2.04
1944	2.99	1.98	1.48	1.18	1.19	1.91
1945	2.79	2.20	1.68	2.51	2.19	1.96
1946	2.17	2.11	1.88	1.44	1.21	2.09
1947	2.43	2.28	1.73	1.49	1.79	1.94
1948	2.42	2.11	1.72	1.36	1.12	1.97
1949	2.14	2.32	1.96	1.49	1.49	1.91
1950	2.17	2.45	1.93	1.72	1.68	2.25
1951	2.35	2.16	2.38	1.64	1.42	2.08
1952	2.43	2.26	1.80	1.51	1.71	2.06
Average	2.43	2.21	1.84	1.65	1.58	2.02

*Partial month or partial year.

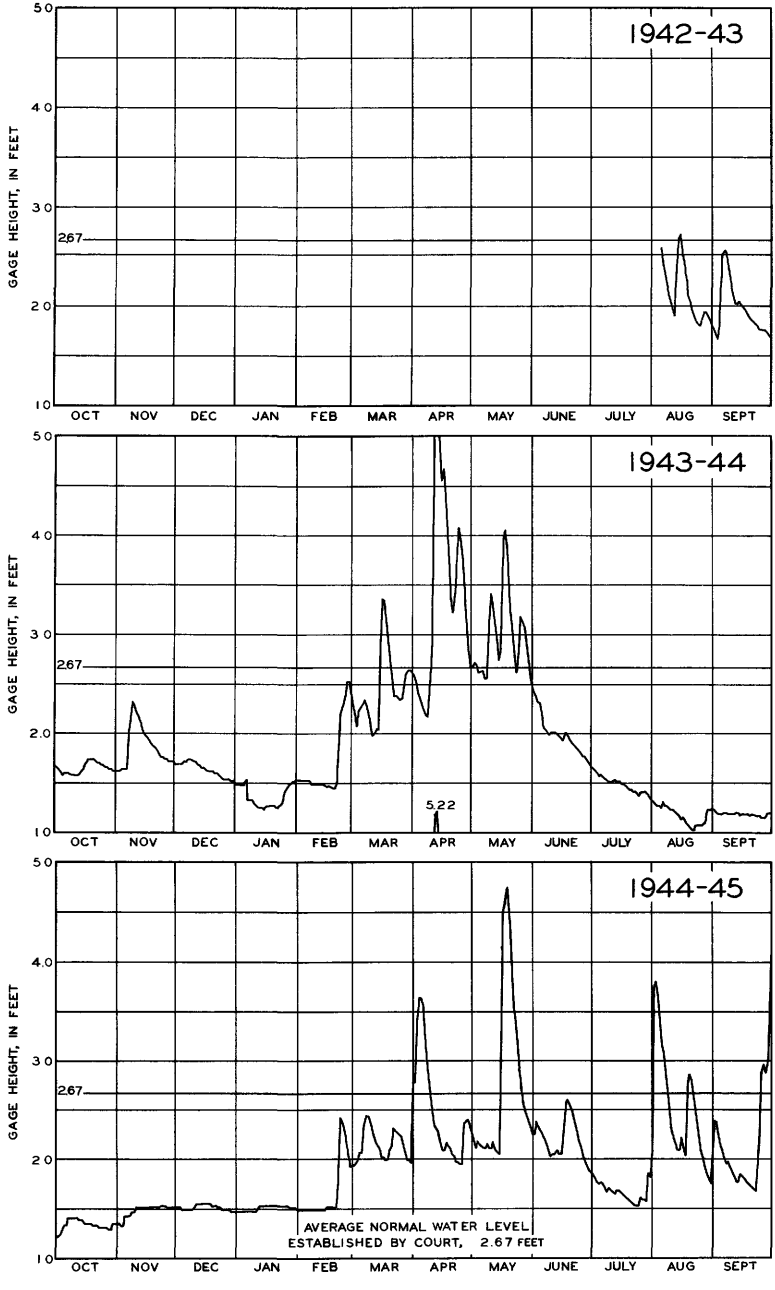

Figure 92. --Lake-level hydrographs for Muskelonge Lake near Warsaw, Ind., for water years 1943-45.

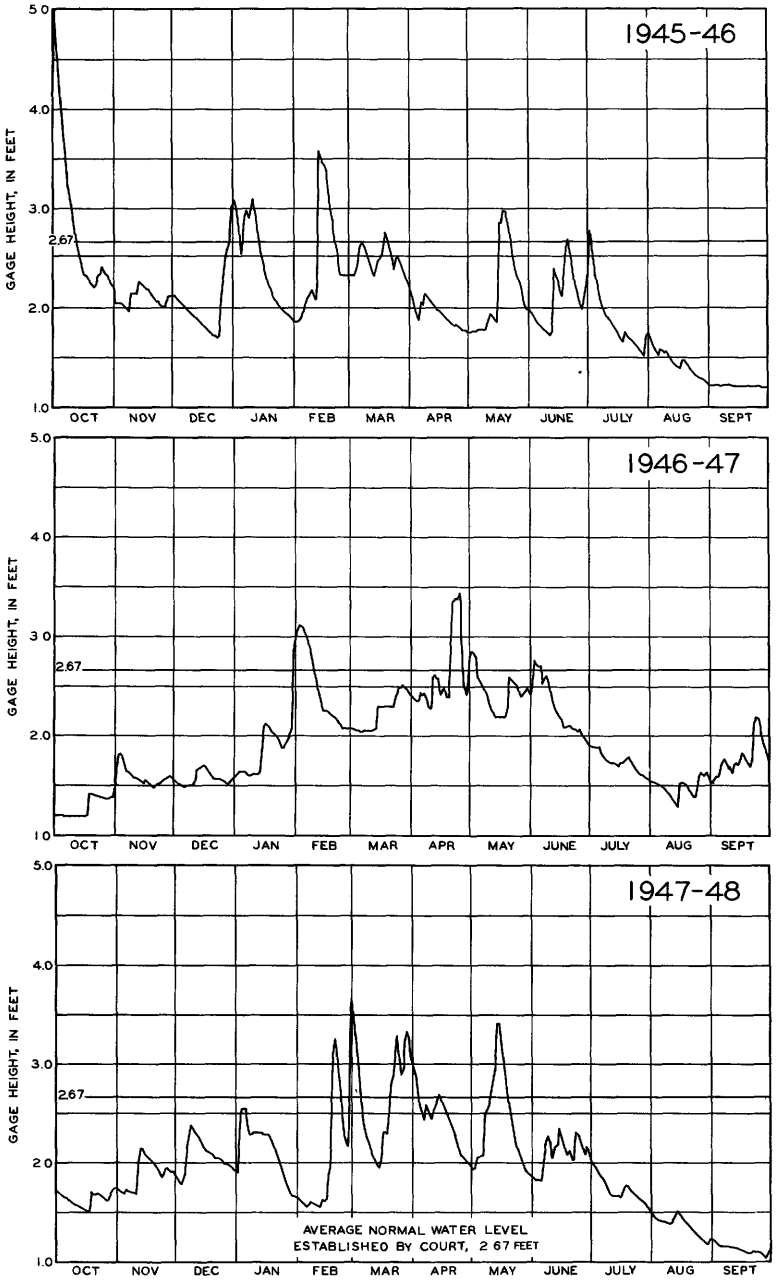

Figure 93. --Lake-level hydrographs for Muskelonge Lake near Warsaw, Ind., for water years 1946-48.

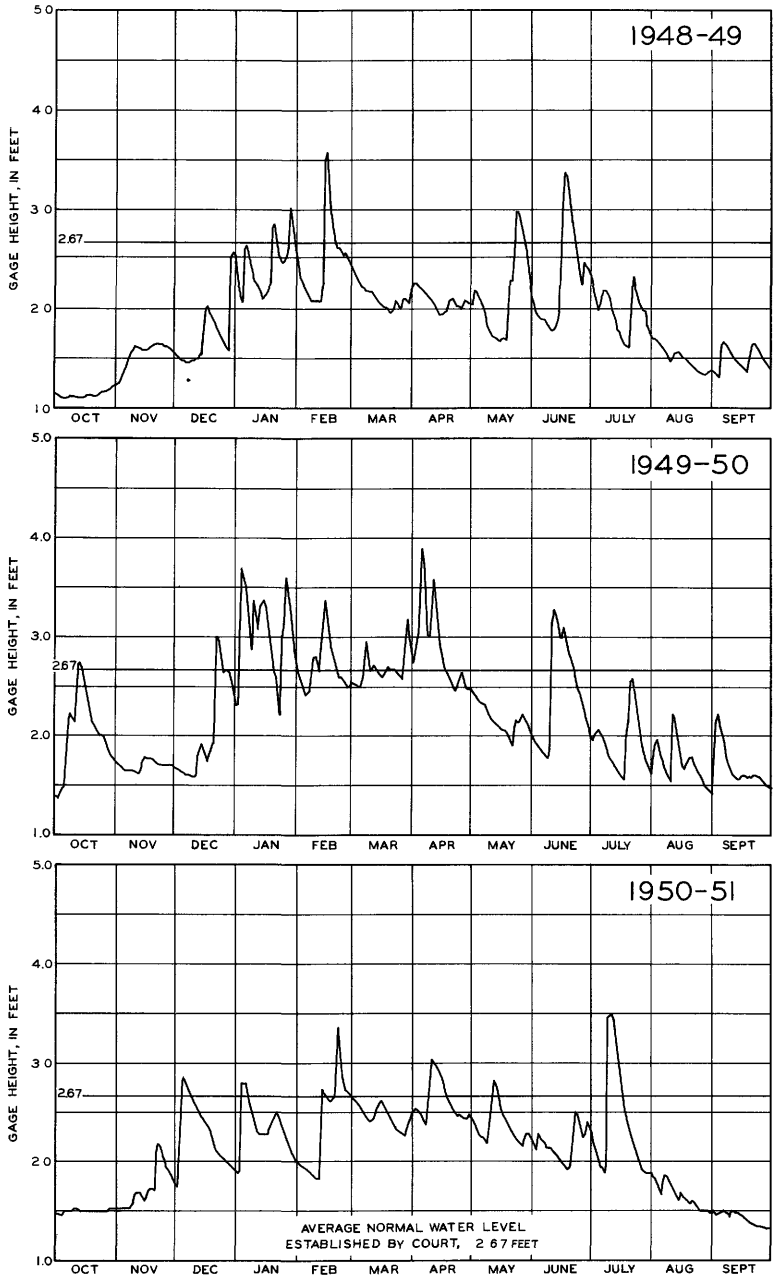

Figure 94. --Lake-level hydrographs for Muskelonge Lake near Warsaw, Ind., for water years 1949-51.

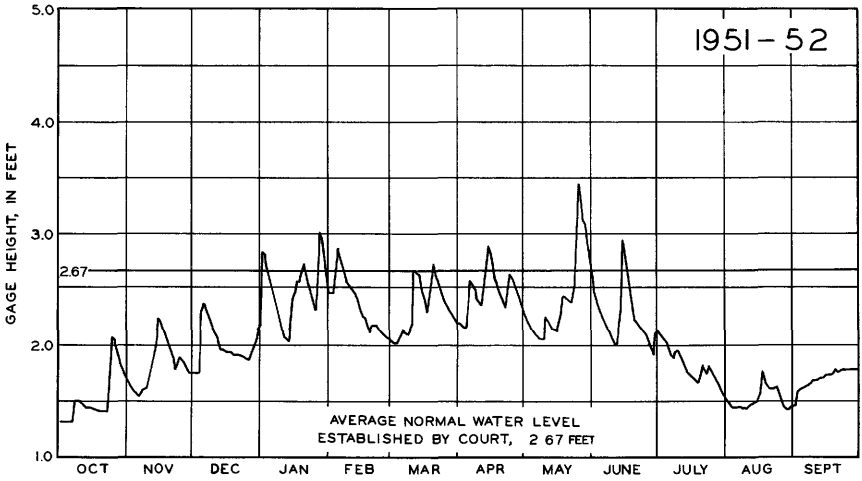

Figure 95. --Lake-level hydrographs for Muskelonge Lake near Warsaw, Ind., for water year 1952.

Ridinger Lake near Pierceton, Ind.

Location. --Sec. 1, T. 32 N., R. 7 E., and sec. 36, T. 33 N., R. 7 E., Kosciusko County, 4.6 miles northwest of Pierceton.

Surface area. --115 acres.

Drainage area. --32.5 sq mi.

Records available. --September 1943 to September 1953.

Gage. --Staff gage on north shore of east lobe of lake, at Riley resort. Gage read to hundredths once daily. Datum of gage is 840.00 ft above mean sea level, datum of 1929.

Average lake level. --10 years; gage height, 3.09 ft; elevation, 843.09 ft.

Established legal-level. --Established June 17, 1949, at gage height 3.12 ft; elevation, 843.12 ft above mean sea level.

Lake-level control. --Lake level controlled by concrete dam with Columbus type horizontal spillway, 10.0 ft long, and sluiceway, 6.0 ft wide. Crest of horizontal spillway at gage height 3.01 ft; base of sluiceway at gage height 0.10 ft.

Extreme levels for Ridinger Lake, 1944-53

Water year	Maximum Date	Maximum Gage height (feet)	Minimum Date	Minimum Gage height (feet)
1944	Apr. 13, 1944----	8.06	Jan. 17-19, 1944-----	1.35
1945	May 18, 1945----	7.49	Oct.23,31 , Nov.1,1944	1.45
1946	Oct. 3, 1945----	6.03	Sept. 6,7, 1946-------	1.44
1947	Apr. 23, 1947----	6.21	Oct.3-9,15-17,1946---	1.56
1948	Feb. 29, 1948----	4.93	Oct. 5, 1947---------	*2.00
1949	Feb. 16, 1949----	*5.55	Mar. 14-18, 1949-----	2.80
1950	Apr. 5, 1950----	7.44	May 1,2, July 15,1950-	2.90
1951	Feb. 22, 1951----	6.28	Apr.29,30, May 1-8, 1951 ----	2.80
1952	Jan. 2, 1952----	5.45	Feb. 21 to Mar.9,1952-	2.80
1953	Mar. 5, 1953----	3.86	Mar.29 to Apr. 1,1953-	2.80

* Estimated.

Maximum recorded thickness and periods of ice cover for Ridinger Lake, 1944-53

Water year	Maximum thickness (inches)	Total days of cover	Period
1944	2	-------	Dec. 19, 1943, to-?
1945	-------	-------	
1946	6	76	Dec.22, 1945, to Mar. 7, 1946.
1947	4	99	Dec. 19-28, 1946, and Jan. 3 to Apr. 1, 1947.
1948	15½	93	Dec. 17, 1947, to Mar. 19, 1948.
1949	2	29	Dec. 18, 1948, to Jan. 15, 1949.
1950	-------	-------	Dec. 15, 1949, to-?
1951	4	72	Dec. 17, 1950, to Feb. 26, 1951.
1952	8	-------	
1953	4	-------	Dec. 18, 1952, to Jan.17, 1953, Feb. 21, to-?

Discharge measurements at outlet of Ridinger Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 4, 1943	3.13	20.4	Aug. 28, 1947	2.48	*4.50
Oct. 6	2.01	5.53	Sept. 4	2.58	6.90
Jan. 7, 1944	2.00	3.84	Sept. 18	2.72	16.5
May 15	4.31	68.8	Oct. 25	3.08	.62
Mar. 2, 1945	3.45	39.5	Oct. 30	3.38	7.51
June 14	2.70	14.6	Oct. 30	3.38	45.1
Sept. 7	2.60	13.6	Jan. 4, 1948	3.87	65.9
Nov. 27	2.33	11.5	Feb. 18	4.52	127
Apr. 18, 1946	2.39	12.7	Feb. 18	4.59	143
May 22	3.01	22.8	Feb. 19	4.91	100
June 19	4.24	50.7	May 10	3.38	65.3
June 21	4.64	63.1	May 13	4.46	138
June 24	4.09	44.3	May 14	4.50	139
June 26	3.60	32.0	Aug. 19	3.18	1.95
June 28	3.25	24.0	Dec. 23	3.22	16.4
July 1	2.95	16.0	Jan. 4, 1949	3.18	36.6
July 6	2.61	8.43	Mar. 2	2.96	51.4
July 6	2.60	8.71	Mar. 22	3.01	16.4
July 11	2.38	6.89	May 4	3.12	18.3
July 26	2.08	2.95	May 11	3.06	1.28
Aug. 22	1.72	.94	June 28	3.54	57.5
Oct. 11	1.60	* 1.25	Aug. 31	3.16	3.13
Dec. 4	1.83	3.83	Nov. 29	3.04	7.59
Jan. 17, 1947	2.95	24.3	Jan. 14, 1950	5.59	222
Feb. 19	2.64	18.2	Nov. 22	3.64	38.6
Apr. 2	4.15	53.2	May 10, 1951	3.00	12.3
Apr. 21	5.59	115	Aug. 18, 1952	3.20	7.04
Apr. 27	6.17	135			

*Estimated.

Average lake level for Ridinger Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	--	--	--	--	--	--	--
1944	1.96	2.41	1.93	1.58	2.23	4.00	5.29
1945	1.52	1.61	1.63	1.59	2.47	3.41	3.77
1946	3.64	2.35	2.24	3.66	3.70	3.83	2.51
1947	1.67	1.94	1.96	2.57	3.36	3.16	4.62
1948	2.63	3.24	3.23	3.41	3.52	3.26	3.04
1949	3.14	3.25	3.31	3.75	3.80	2.96	3.01
1950	3.21	3.02	3.37	4.92	3.89	4.06	4.42
1951	3.13	3.28	3.46	3.59	4.08	3.58	3.62
1952	3.22	3.43	3.40	4.21	3.34	3.45	3.33
1953	3.12	3.13	3.24	3.32	3.27	3.32	3.19
Average	2.72	2.77	2.78	3.26	3.37	3.50	3.68

Year	May	June	July	Aug.	Sept.	Annual	
1943	--	--	--	--	2.55	*2.57	
1944	4.97	2.69	1.69	1.52	1.50	2.64	
1945	4.04	3.28	2.51	2.84	2.57	2.60	
1946	2.40	3.02	2.32	1.76	1.58	2.75	
1947	4.03	3.59	2.28	2.70	2.75	2.88	
1948	3.37	3.18	3.18	3.16	3.07	3.19	
1949	3.40	3.61	3.18	3.15	3.15	3.31	
1950	3.13	3.30	3.22	3.27	3.36	3.60	
1951	3.15	3.08	3.70	3.26	3.12	3.42	
1952	3.52	3.21	3.31	3.21	3.15	3.40	
1953	3.25	3.07	3.08	3.19	3.10	3.19	
Average	3.53	3.20	2.85	2.81	2.72	3.09	

* Partial month or partial year.

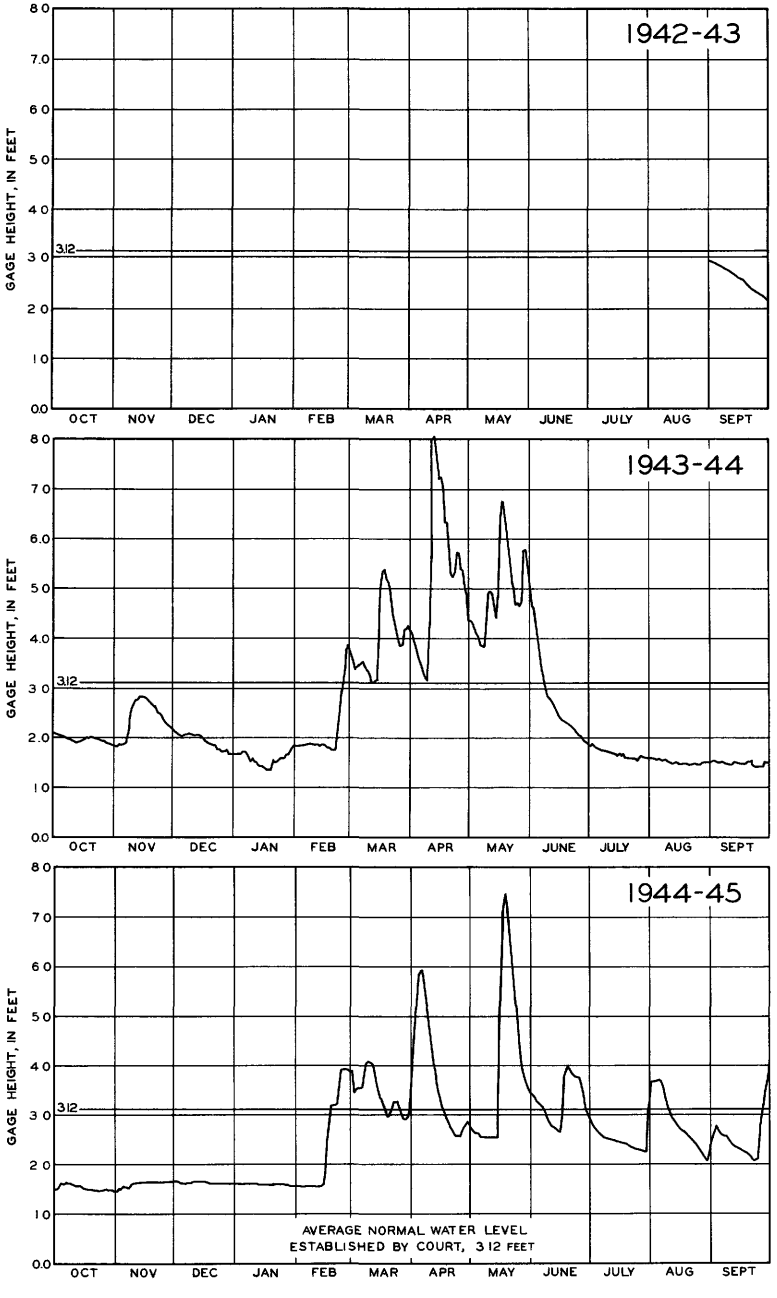

Figure 96. --Lake-level hydrographs for Ridinger Lake near Pierceton, Ind., for water years 1943-45.

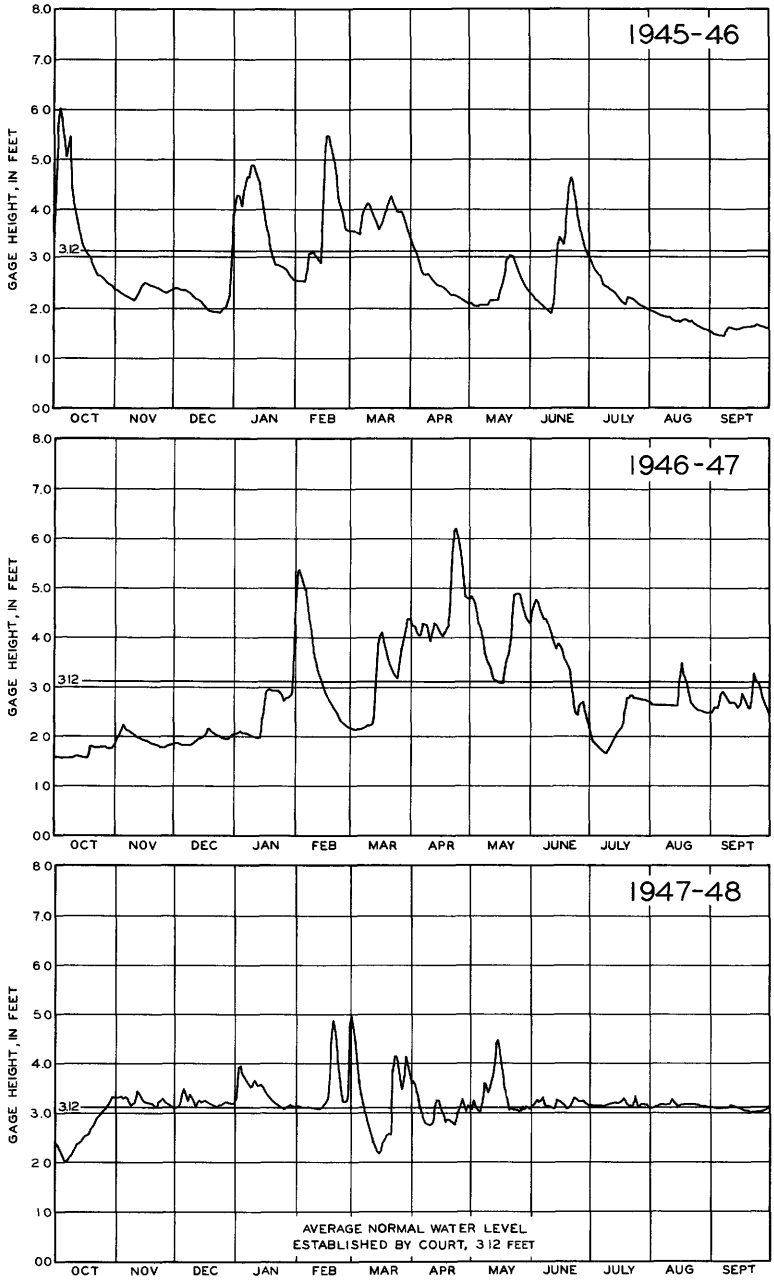

Figure 97.--Lake-level hydrographs for Ridinger Lake near Pierceton, Ind., for water years 1946-48.

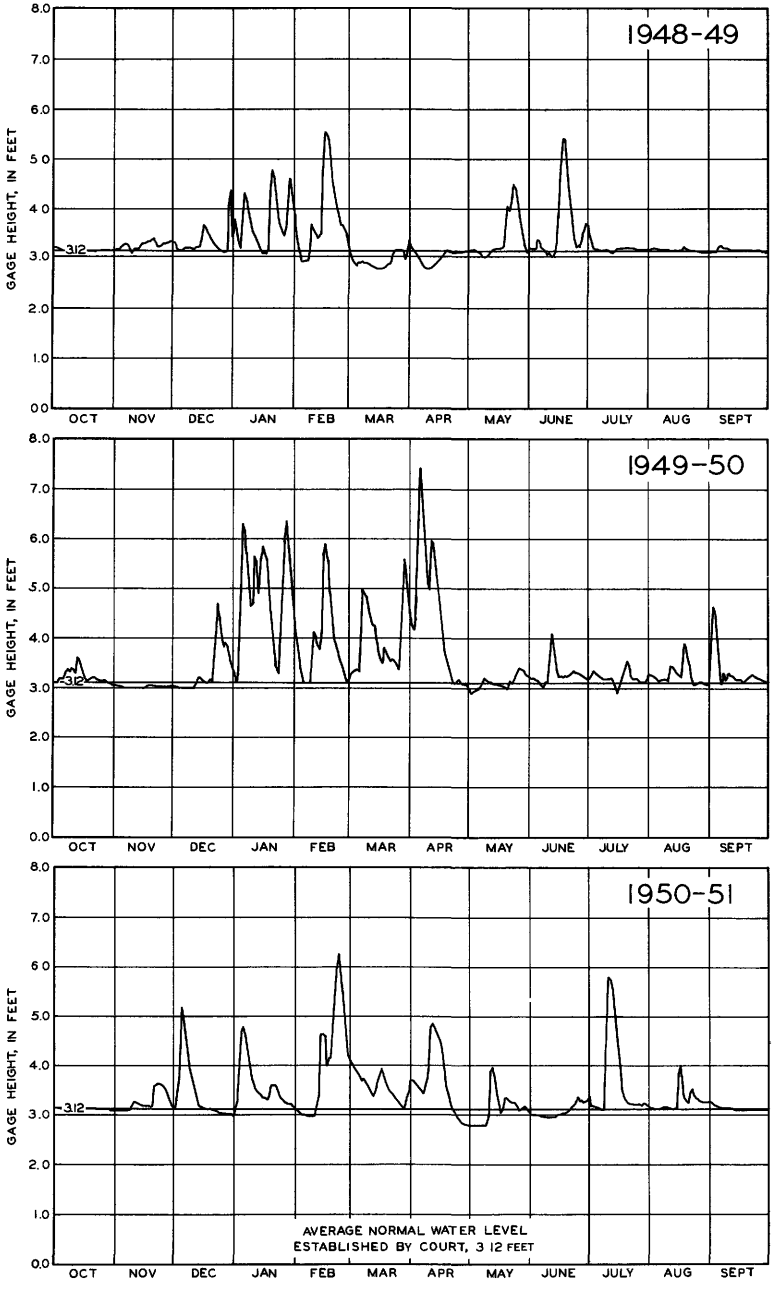

Figure 98.--Lake-level hydrographs for Ridinger Lake near Pierceton, Ind., for water years 1949-51.

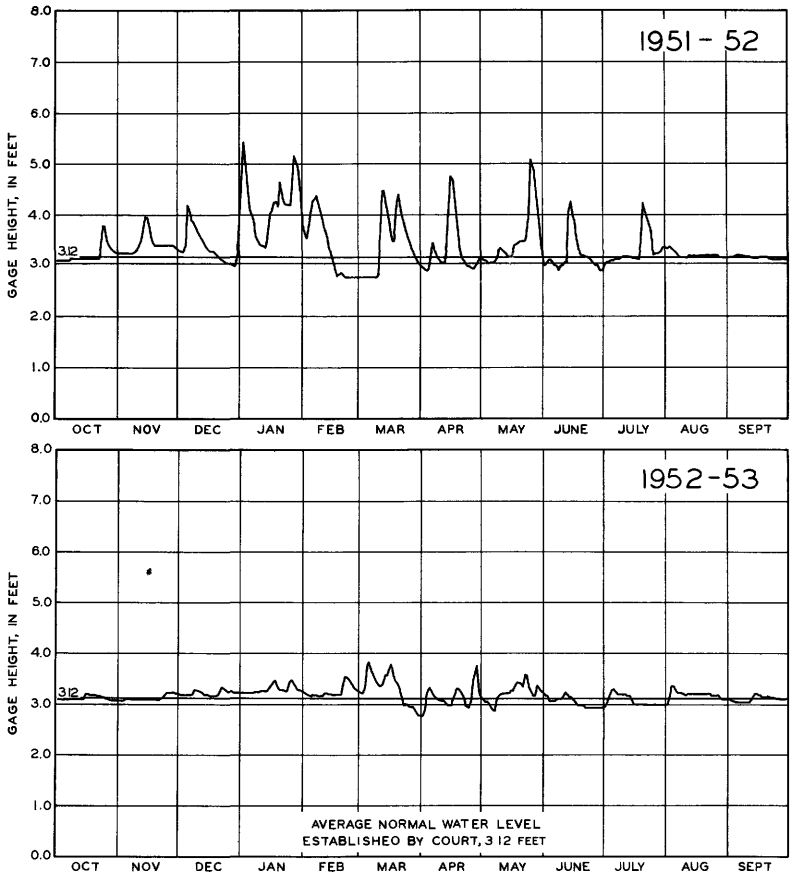

Figure 99. --Lake-level hydrographs for Ridinger Lake near Pierceton, Ind., for water years 1952-53.

Round Lake and Cedar Lake at Tri-Lakes, Ind.

Location. --Sec. 12, T. 32 N., R. 9 E., and sec. 7, T. 32 N., R. 10 E., Whitley County. Cedar Lake lies in sec. 2, 11, and 12, T. 32 N., R. 9 E., Whitley County.

Surface area. --Round Lake, 125 acres; Cedar Lake, 131 acres.

Drainage area. --Round Lake, 3.57 sq mi; Cedar Lake, 1.62 sq mi.

Records Available. --Cedar Lake, October 1942 to September 1947. Round Lake, January 1946 to September 1947. Round and Cedar Lake published as one record October 1947 to September 1952.

Gage. --Cedar Lake. Staff gage at east corner of north abutment of bridge over channel between Round and Cedar Lakes. Datum of gage is 900.00 ft above mean sea level, datum of 1929. Prior to July 11, 1946, staff gage on south shore, 900 ft east of last used site.

Round Lake, staff gage bolted to east side of north dam abutment on outlet, 1,500 ft downstream from Round Lake. Datum of gage is 900.00 ft above mean sea level, datum of 1929.

Gages read to hundredths once daily.

Average level. --Cedar Lake (1942-47), gage height, 1.43 ft; elevation, 901.43 ft. Round Lake (1946-47), gage height, 1.25 ft; elevation, 901.25 ft. Round and Cedar Lakes (1947-52), gage height, 1.78 ft; elevation, 901.78 ft.

Established legal level. --Established June 29, 1948, at gage height, 1.90 ft; elevation, 901.90 ft above mean sea level.

Lake-level control. --Lake levels maintained by concrete dam at outlet of Round Lake. Dam constructed in August 1947, has a crest width of 25 ft at gage height of 1.84 ft.

Extreme levels for water years 1943-52

Water year	Maximum Date	Maximum Gage height (feet)	Minimum Date	Minimum Gage height (feet)
		Cedar Lake		
1943	May 17-21,25,26, 1943	2.42	July 1-6, 1943 -------	1.42
1944	Mar. 15-20, 1944 --	2.40	Sept. 26-28, 1944 ----	.51
1945	May 17, 1945 ------	2.82	Nov. 1-3, 12, 13, 1944 --	.36
1946	Oct. 2, 3, 1945-----	1.99	Sept. 30, 1946 -------	.62
1947	Apr. 21, 1947 -----	2.00	Oct. 16, 1946--------	.42
		Round Lake		
1946	Feb. 15-17, 1946 --	1.74	June 28, 1946--------	[a] 1.41
1947	Apr. 21, 1947 -----	*1.92	Dec. 4-9, 1946-------	[b] .67
		Round Lake and Cedar Lake		
1948	May 13, 1948------	2.20	Oct. 15-17, 1948-----	.68
1949	Feb. 15, 1949-----	2.52	Oct. 27, 1948, to Nov. 1-	.96
1950	Apr. 4, 1950------	2.59	Oct. 2, 1949---------	1.16
1951	Feb. 21, 1951-----	2.38	Nov. 6, 7, 1950------	1.68
1952	Jan. 27, 1952------	2.30	Oct. 5, 6, 1951 ------	1.59

* Estimated.
[a] Record for Jan. 23, 1946, to June 30, 1946.
[b] Record for Dec. 1, 1946, to Sept. 30, 1947.

Maximum recorded thickness and periods of ice cover for the water years 1943-52

Water year	Maximum thickness (inches)	Total days of cover	Period
		Cedar Lake	
1943	---------	------	Dec. 11, 1942, to - ?
1944	5	------	------
1945	---------	------	------
1946	9	85	Dec. 13, 1945, to Mar. 7, 1946.
1947	12	69	Dec. 19-23, 1946; Jan. 3 to Mar. 7, 1947.
		Round Lake	
1946	12	------	Unknown to Mar. 7, 1946.
1947	13	95	Dec. 30, 1946, to Apr. 3, 1947.
		Round Lake and Cedar Lake	
1948	16	------	Dec. 17, 1947, to - ?
1949	5	73	Dec. 25, 1948, to Jan. 28, 1949; Jan. 31, 1949, to Mar. 8, 1949.
1950	3	44	Jan. 8, 9, 17, 19, 25; Feb. 20 to Mar. 25, 1950.
1951	--------	------	Dec. 10, 1950, to - ?

Discharge measurements at lake outlets of Cedar Lake and Round Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Cedar Lake					
June 14, 1945-	1.79	1.6	May 22,1946	1.63	0
Sept. 6 ------	1.40	.02	Aug. 21-----	1.09	0
Round Lake					
Jan. 17, 1946-	1.64	3.98	July 24,1946	1.36	.38
Jan. 23 ------	1.60	3.50	Sept. 9-----	.67	0
Feb. 15 ------	1.74	7.13	Jan. 17,1947	1.12	.14
Apr. 24------	1.56	0	Feb. 16-----	1.36	5.40
May 14 ------	1.54	.04	Apr. 25-----	1.79	11.0
June 14 ------	1.59	2.43	July 29-----	1.08	0
Round Lake and Cedar Lake					
Mar. 4, 1948-	2.06	8.21	Apr. 24,1951	1.96	3.41
Mar. 16 ------	2.00	4.85	May 23-----	1.93	1.30
May 26 ------	1.87	0	June 21-----	1.90	1.27
Nov. 4 ------	1.05	0	July 24-----	2.00	6.05
Mar. 7, 1949-	1.95	2.76	Aug. 29-----	1.93	.81
Aug. 4 ------	1.55	0	Sept. 26-----	1.70	0
Nov. 23 ------	1.54	0	Oct. 24-----	1.92	1.43
Dec. 1 ------	1.54	0	Nov. 28-----	1.91	1.21
Mar. 23, 1950-	2.10	10.9	Dec. 20-----	1.98	4.30
Nov. 14 ------	1.75	0.0	Feb. 7,1952	2.14	13.6
Jan. 23, 1951-	2.00	4.96	Mar. 27-----	2.01	6.81
Feb. 20 ------	2.19	17.8	July 17-----	1.76	0
Mar. 15 ------	2.06	8.51			

Average lake levels for water years 1943-52

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Cedar Lake at Tri-Lakes, Ind.							
1943	*1.64	1.78	1.64	1.71	1.68	1.75	1.64
1944	1.72	1.71	1.70	1.55	1.73	2.16	2.11
1945	0.49	0.42	0.47	0.45	0.45	1.21	2.06
1946	1.75	1.50	1.45	1.65	1.67	1.74	1.53
1947	0.54	0.75	0.85	1.18	1.44	1.49	1.81
Average	1.23	1.23	1.22	1.31	1.39	1.67	1.83

Average lake levels for water years 1943-52--Continued

Year	May	June	July	Aug.	Sept.	Annual	
Cedar Lake at Tri-Lakes, Ind. --Con.							
1943	2.12	1.77	1.69	1.73	1.81	*1.76	
1944	2.08	1.70	1.17	0.80	0.57	1.58	
1945	2.11	1.67	1.51	1.65	1.39	1.16	
1946	1.55	1.61	1.46	1.08	0.77	1.48	
1947	1.68	1.61	1.17	0.87	0.85	1.18	
Average	1.91	1.67	1.40	1.23	1.08	1.43	

Round Lake and Cedar Lake at Tri-Lakes, Ind.

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1946	---	---	---	*1.54	1.61	1.62	[a]1.57
1947	*0.58	*0.76	0.81	1.13	1.40	1.44	[a]1.77
1948	0.74	0.78	0.93	1.34	1.65	2.06	1.97
1949	1.02	1.22	1.40	2.02	2.08	1.95	1.92
1950	1.55	1.56	1.73	2.18	2.10	2.11	2.14
1951	1.80	1.83	1.99	2.02	2.06	2.00	2.05
1952	1.72	1.91	1.97	2.11	2.03	2.03	2.01
Average	1.24	1.34	1.47	1.76	1.85	1.89	1.92

Year	May	June	July	Aug.	Sept.	Annual	
1946	1.55	1.47	*1.42	*1.07	*0.81	[a]*1.39	
1947	1.64	1.54	1.14	0.85	0.83	[a]1.15	
1948	1.97	1.85	1.71	1.53	1.23	1.48	
1949	1.90	1.86	1.68	1.40	1.28	1.64	
1950	1.91	1.95	1.90	1.82	1.93	1.91	
1951	1.95	1.90	2.04	1.94	1.80	1.95	
1952	1.96	1.94	1.90	1.83	1.77	1.93	
Average	1.84	1.79	1.68	1.49	1.38	1.78	

*Partial month or partial year.
[a]Data for Round Lake only.

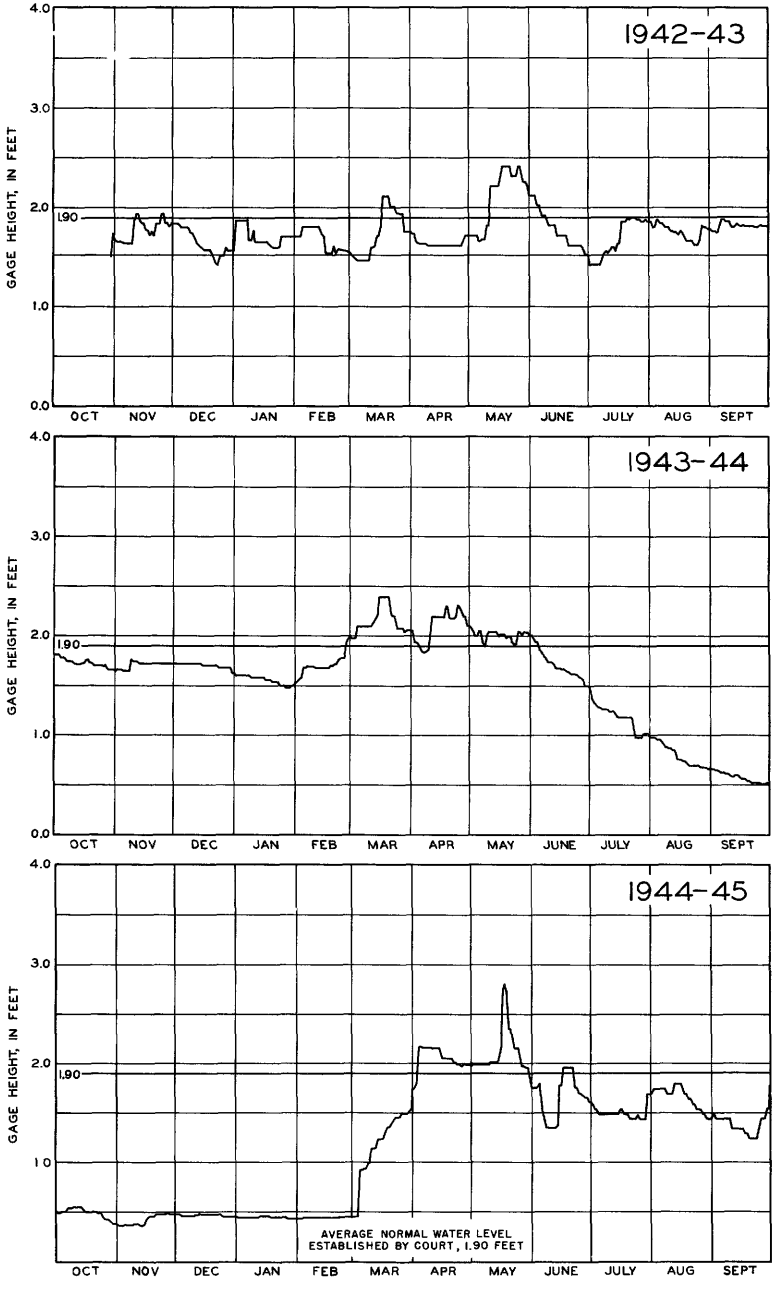

Figure 100. --Lake-level hydrographs for Cedar Lake at Tri-Lakes, Ind., for water years 1943-45.

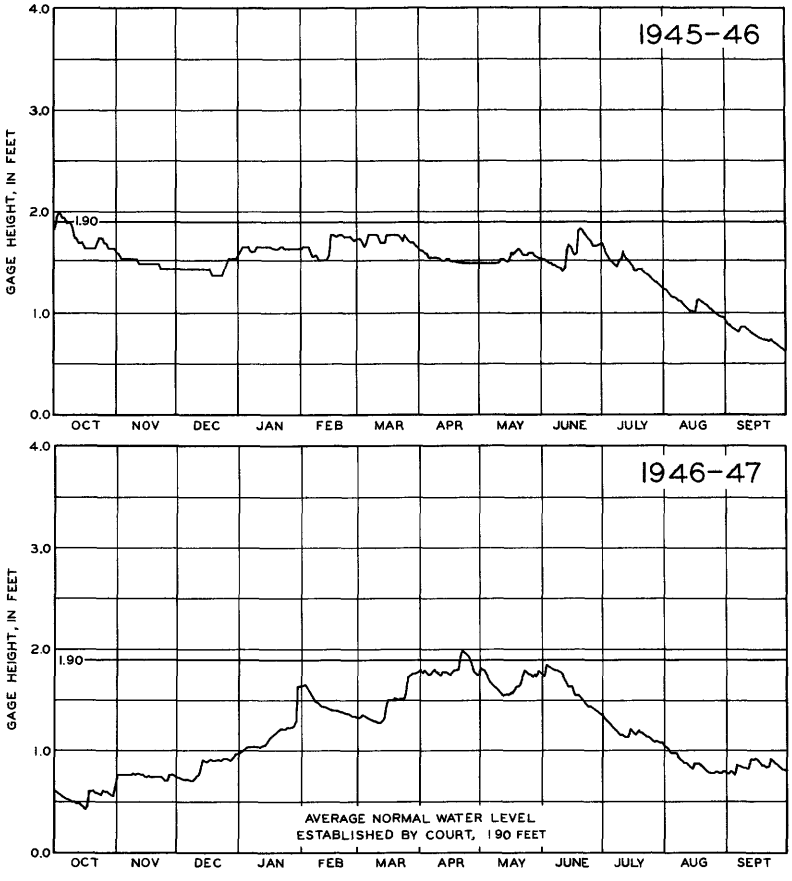

Figure 101.--Lake-level hydrographs for Cedar Lake at Tri-Lakes, Ind., for water years 1946-47.

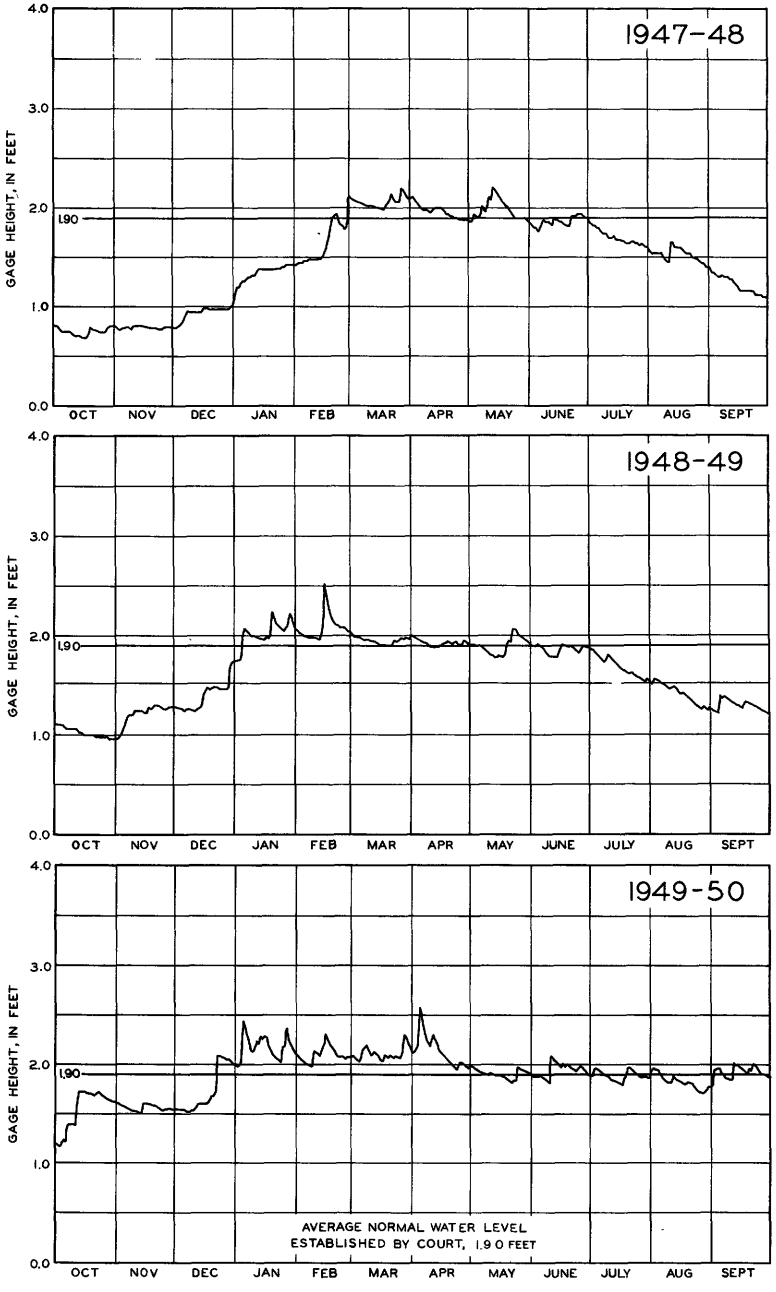

Figure 102.--Lake-level hydrographs for Round Lake and Cedar Lake at Tri-Lakes, Ind., for water years 1948-50.

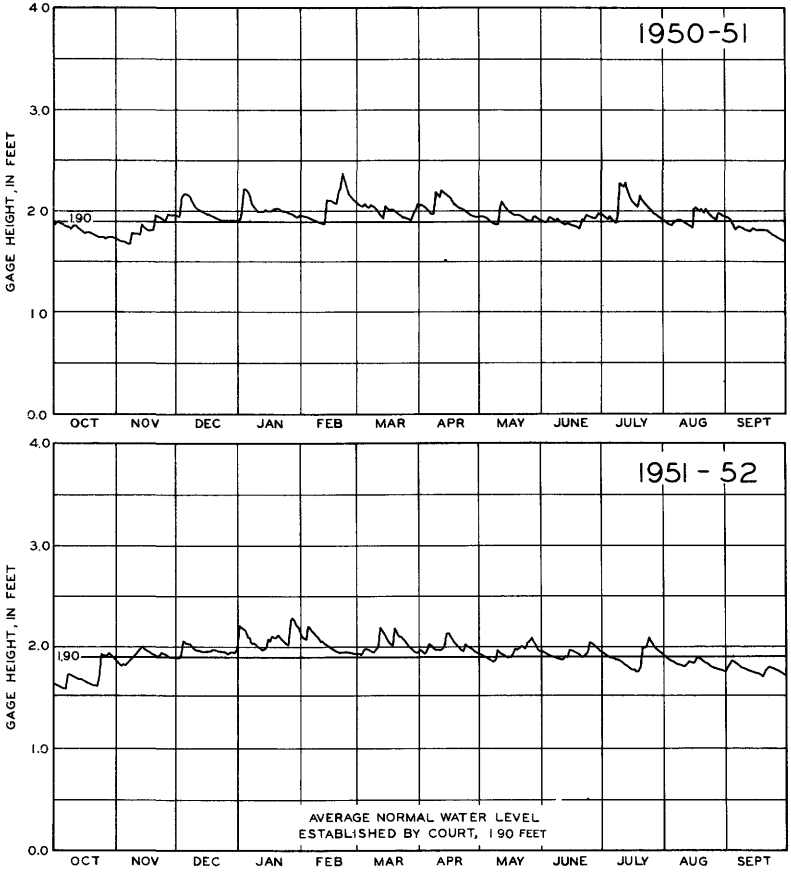

Figure 103. --Lake-level hydrographs for Round Lake and Cedar Lake at Tri-Lakes, Ind., for water years 1951-52.

Round Lake and Clear Lake at Clear Lake, Ind.

Location. --Round Lake lies in sec. 17 and 18, T. 38 N., R. 15 E., and Clear Lake lies in secs. 17, 18, 19, 20, 29, and 30, T. 38 N., R. 15 E., Steuben County.

Surface area. -Round Lake, 27.5 acres and Clear Lake, 765 acres from USGS topographic maps, surveyed 1938.

Drainage area. --7.25 sq mi. (determined from the same maps).

Records available. --August 1943 to September 1953.

Gage. --Staff gage in outlet of Round Lake at extreme north end of Round Lake. Gage read to hundredths once daily. Datum of gage is 1,030.00 ft above mean sea level, datum of 1929.

Average lake level. --10 years, gage height, 7.11 ft; elevation, 1,037.11 ft.

Established legal level. --Established June 6, 1950, at gage height 7.38 ft; elevation, 1,037.38 ft above mean sea level.

Lake-level control. --Lake levels controlled by concrete dam with a movable 14-inch high steel sluice gage on sill at gage height, 6.60 ft. Sill is 18 inches wide and 12.7 ft long.

Extremes. --The maximum and minimum levels for the water years 1944-53 are contained in the following table:

Extreme levels for Round Lake and Clear Lake, 1944-53

Maximum			Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1944[a]	May 27, 1944 ----	7.59	Sept. 26, 1944 -----	*6.36
1945[a]	Apr. 4, 1945 ----	8.31	Dec. 1, 1944 -----	6.33
1946	Mar. 10, 1946 ----	7.50	Sept. 8, 9, 1946 -----	*6.63
1947	Apr. 5, 6, 1947 ----	7.94	Oct. 13-16, 1946 ----	6.50
1948	May 11, 1948 ----	7.77	Sept. 28, 1948 -----	6.79
1949	Jan. 20, 1949 ----	7.65	Sept. 30, 1949 -----	6.57
1950	Apr. 4, 25, 26, 1950 -	7.66	Oct. 1-3, 5, 6, 1949 --	6.56
1951	July 9, 1951 ----	8.00	Sept. 29, 30, 1951 ---	6.96
1952	May 31, 1952 ----	7.62	Sept. 30, 1952 -----	6.84
1953	Apr. 17-23, 1953 --	7.39	Sept. 30, 1953 -----	6.52

* Estimated.

[a] Partial year record.

Maximum recorded thickness and periods of ice cover for Round Lake and Clear Lake, 1946-53

Water year	Maximum thickness (inches)	Total days of cover	Period
1945	6	-------	Unknown to Feb. 20, 1945.
1946	4	30	Dec. 8, 1945, to Jan. 6, 1946.
1947	15	113	Dec. 14, 1946, to Apr. 5, 1947.
1948	21	116	Nov. 30, 1947, to Mar. 24, 1948.
1949	9.5	93	Dec.18, 1948, to Mar. 20, 1949.
1950	8	118	Nov. 26 to Dec. 12; Dec. 14, 1949, to Jan. 25, 1950; Jan. 30 to Mar. 28, 1950.
1951	11	101	Nov. 25, 1950, to Mar. 6, 1951.
1952	6	------	Nov. 20, 1951, to-?
1953	6	87	Nov. 28 to Dec. 8; Dec. 15, 1952, to Feb. 28, 1953.

Discharge measurements at outlet of Round Lake and Clear Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 2, 1943	7.13	6.80	Nov. 22, 1946	6.75	0
Oct. 4 -----	6.93	0	Dec. 18 -----	6.81	0
Feb. 10, 1944	6.85	2.25	Feb. 6, 1947	7.24	7.62
Apr. 25 -----	7.30	18.9	Feb. 19 -----	7.18	*1.77
Dec. 1 -----	6.33	0	Apr. 17 -----	7.36	24.4
Apr. 8, 1945	7.38	28.1	Apr. 23 -----	7.56	35.0
May 1 -----	7.38	4.27	Apr. 29 -----	7.37	22.6
July 2 -----	7.38	2.48	Apr. 8, 1948	7.34	17.8
Sept. 4 -----	7.06	.16	Jan. 16, 1950	7.45	9.23
May 23, 1946	7.28	*.14	Mar. 9 -----	7.20	16.4
July 23 -----	7.06	.05	May 23, 1951	7.28	11.5
Sept. 26 -----	6.67	0	July 24, 1953	6.84	.16
Oct. 24 -----	6.54	0			

* Leakage under gate.

Average lake levels for Round Lake and Clear Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1944	6.85	6.86	6.81	6.85	6.88	7.06	7.21
1945	*6.55	*6.65	*6.85	*7.00	*7.10	7.28	7.53
1946	7.13	7.19	7.24	7.33	7.31	7.34	7.29
1947	6.55	6.75	6.80	6.93	7.20	7.33	7.55
1948	7.02	6.90	6.92	6.93	6.97	7.32	7.35
1949	6.71	6.88	6.84	7.10	7.27	7.11	7.11
1950	6.69	6.63	6.76	7.20	7.26	7.24	7.49
1951	7.18	7.24	7.30	7.24	7.27	7.32	7.30
1952	7.09	7.31	7.26	7.27	7.21	7.16	7.24
1953	6.74	6.70	6.76	6.73	6.75	7.17	7.26
Average	6.85	6.91	6.95	7.06	7.12	7.23	7.33

Year	May	June	July	Aug.	Sept.	Annual
1943	--	--	--	*7.00	6.92	*6.96
1944	7.30	7.16	6.79	6.55	*6.35	6.89
1945	7.55	7.53	7.30	7.14	7.01	7.12
1946	7.23	7.32	7.21	6.84	6.69	7.18
1947	7.44	7.36	7.04	6.79	7.09	7.07
1948	7.45	7.35	7.29	7.10	6.87	7.12
1949	7.26	7.24	7.06	6.81	6.64	7.00
1950	7.28	7.34	7.31	7.23	7.24	7.14
1951	7.38	7.34	7.53	7.31	7.06	7.29
1952	7.37	7.41	7.21	7.08	6.96	7.21
1953	7.23	7.19	7.13	6.98	6.65	6.94
Average	7.35	7.32	7.19	6.98	6.86	7.11

*Partial month or partial year.

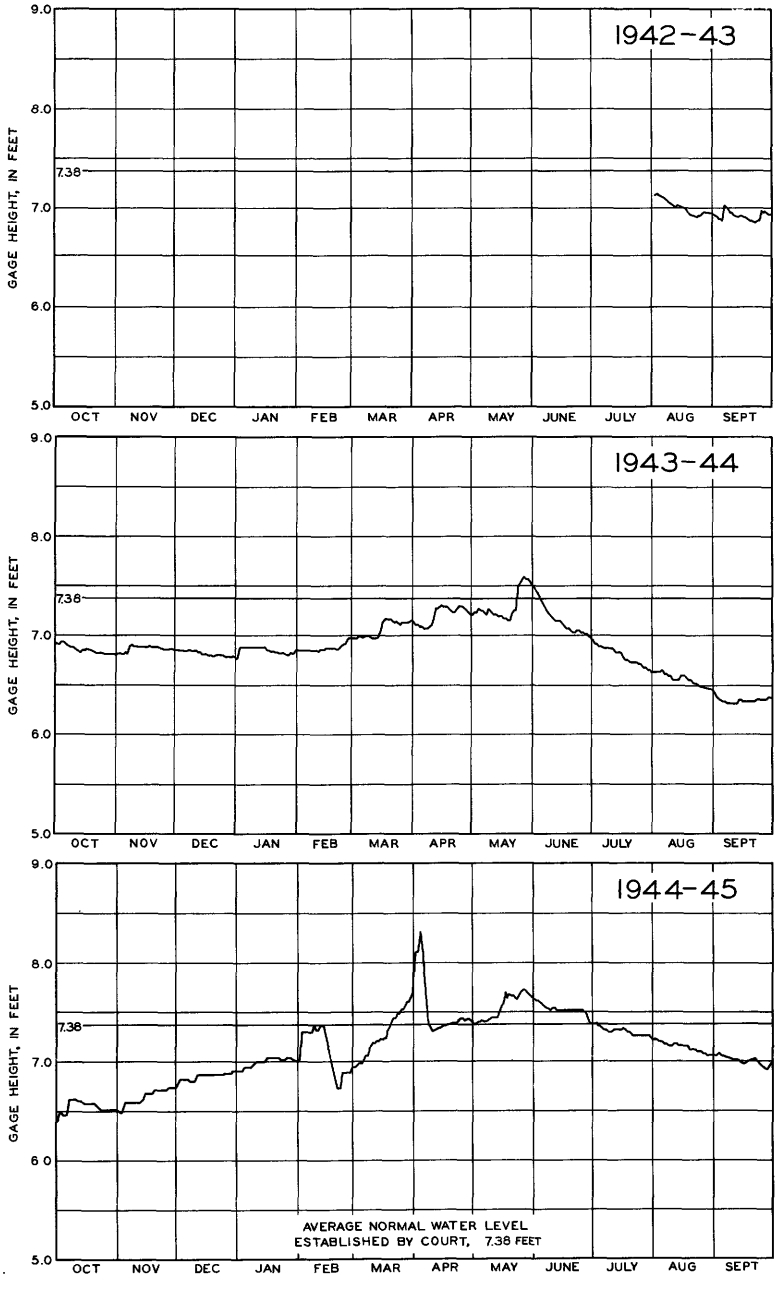

Figure 104. --Lake-level hydrographs for Round Lake and Clear Lake at Clear Lake, Ind., for water years 1943-45.

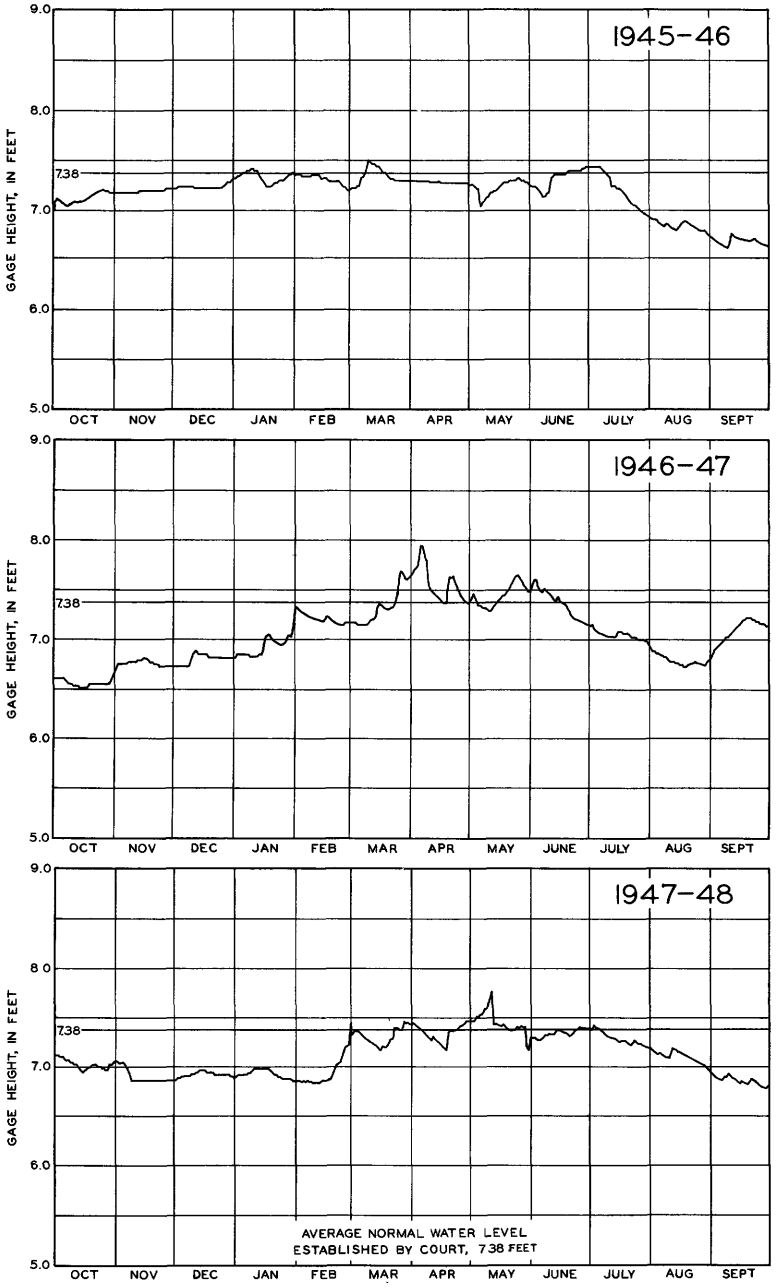

Figure 105.--Lake-level hydrographs for Round Lake and Clear Lake at Clear Lake, Ind., for water years 1946-48.

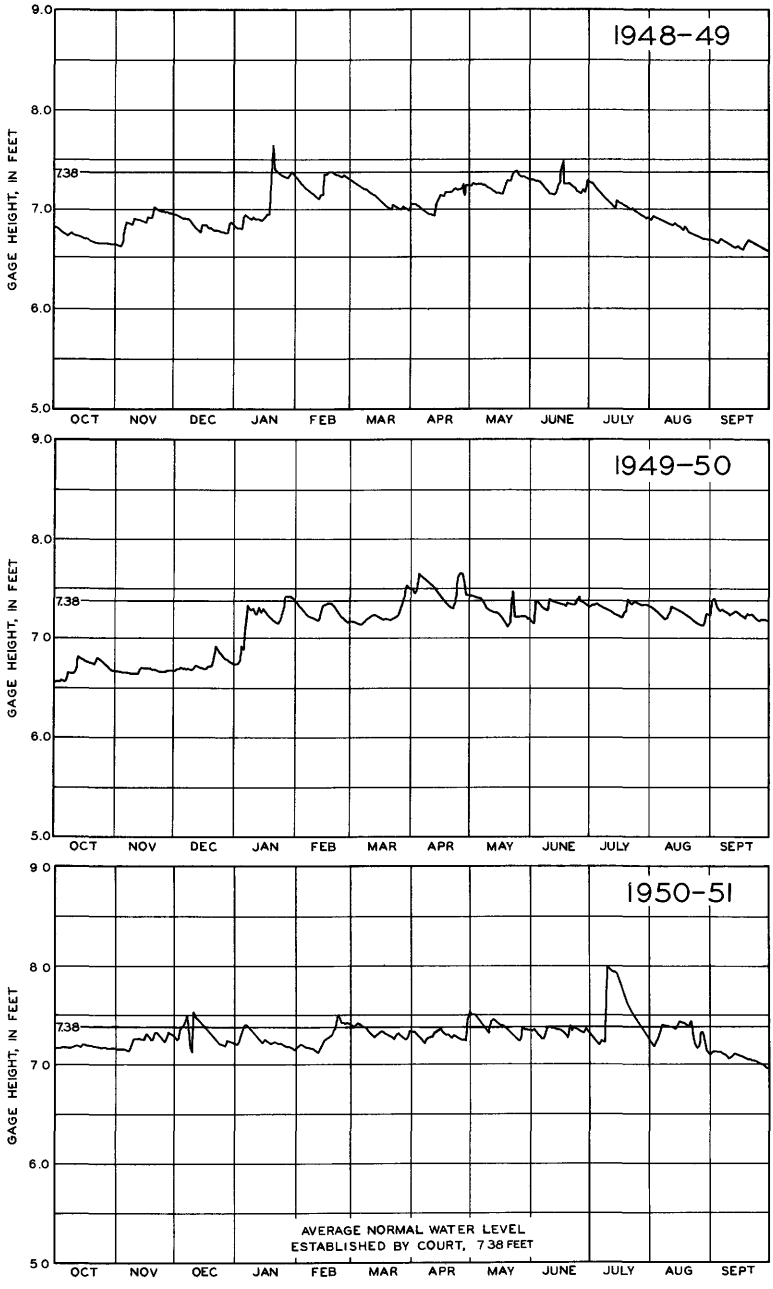

Figure 106.--Lake-level hydrographs for Round Lake and Clear Lake at Clear Lake, Ind., for water years 1949-51.

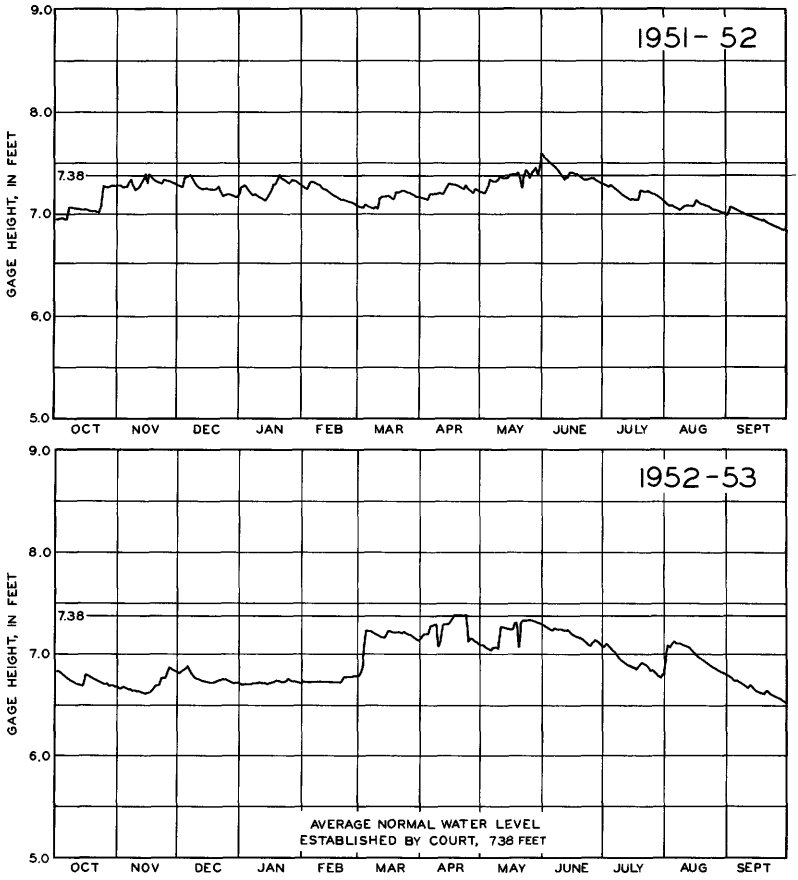

Figure 107. --Lake-level hydrographs for Round Lake and Clear Lake at Clear Lake, Ind., for water years 1952-53.

Shriner Lake at Tri-Lakes, Ind.

Location. --Secs. 2, 11, 12, T. 32 N., R. 9 E., Whitley County, 6.2 miles northeast of Columbia City.

Surface area. --111 acres.

Drainage area. --1.12 sq mi.

Records available. --October 1942 to September 1953.

Gage. --Staff gage on extreme east shore, at outlet. Gage read to hundredths once daily. Datum of gage is 900.00 ft above mean sea level, datum of 1929.

Average lake level. --11 years; gage height, 6.72 ft; elevation, 906.72 ft.

Established legal level. --Established May 22, 1949, at gage height 7.04 ft; elevation, 907.04 ft above mean sea level.

Lake-level control. --Lake level maintained by concrete dam in outlet channel, 300 ft downstream from lake crest 4.8 ft long at gage height 6.82 ft.

Extremes. --The maximum and minimum levels for water years 1943-53 are contained in the following table:

Extreme levels of Shiner Lake, 1943-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943	Dec. 28-30, 1942, Mar. 17-20, May 17-20, 25-26, 1943.	7.54	Sept. 28-30, 1943	6.46
1944	Apr. 11-17, 1944	7.56	Sept. 28-30, 1944	5.56
1945	May 17-19, 1945	7.44	Dec. 9-11, 23-30, 1944	5.44
1946	Oct. 4, 1945	7.18	Sept. 30, 1946	5.98
1947	Apr. 21, 1947	7.40	Oct. 15-17, 1946	5.76
1948	Feb. 28, 1948	7.50	Nov. 20, 21, 1947	6.06
1949	Feb. 17, 18, 1949	7.98	Nov. 2, 3, 1948	6.14
1950	Apr. 4, 5, 1950	8.16	Oct. 2, 1949	6.12
1951	Feb. 21, 22, 1951	7.54	Nov. 6, 1950	6.24
1952	Jan. 27, 1952	7.54	Sept. 28-30, 1952	6.30
1953	May 23-25, 1953	7.40	Nov. 12-18, 1952	5.96

Maximum recorded thickness and periods of ice cover for Shriner Lake, 1943-53

Water year	Maximum thickness (inches)	Total days of cover	Period
1943	--------	------	Dec. 11, 1942, to-?
1944	--------	------	Dec. 15, 1943, to-?
1945	--------	------	
1946	9	80	Dec. 18, 1945, to Mar. 7, 1946.
1947	14	93	Jan. 3, 1947, to Apr. 5, 1947.
1948	14.5	102	Dec. 10, 1947, to Mar. 20, 1948.
1949	4	25	Dec. 18, 1948, to Jan. 11, 1949.
1950	4	43	Dec. 16-18, 1949; Jan. 19-29, 1950; Feb. 23 to Mar. 23, 1950.
1951	14	69	Dec. 16, 1950, to Feb. 22, 1951.
1952	4	------	Dec. 17, 1951, to-?
1953	4	19	Jan. 5, 1953, to Jan. 23, 1953.

Discharge measurements. --None made; major part of outflow diverted to Tri-Lakes Fish Hatchery and cannot be related to gage height.

Average lake level for Shriner Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	*6.82	7.10	7.12	7.15	7.13	7.12	6.89
1944	6.29	6.24	6.20	6.11	6.23	6.82	7.30
1945	5.59	5.46	5.45	5.46	5.46	6.17	7.01
1946	6.95	6.74	6.68	6.87	6.92	6.90	6.72
1947	5.87	6.02	6.04	6.40	7.03	7.11	7.19
1948	6.15	6.09	6.25	6.68	6.94	7.23	7.16
1949	6.22	6.36	6.51	7.22	7.55	7.25	7.01
1950	6.54	6.54	6.71	7.67	7.49	7.51	7.51
1951	6.41	6.40	7.10	7.22	7.17	7.06	7.04
1952	6.59	6.86	7.05	7.28	7.13	7.07	7.01
1953	6.13	6.02	6.21	6.52	6.92	7.14	6.97
Average	6.32	6.35	6.48	6.78	6.91	7.03	7.07

Year	May	June	July	Aug.	Sept.	Annual
1943	7.30	6.92	6.83	6.67	6.59	6.98
1944	7.17	6.87	6.38	5.92	5.62	6.43
1945	7.06	6.92	6.83	6.85	6.58	6.24
1946	6.64	6.76	6.91	6.50	6.13	6.73
1947	7.25	7.00	6.66	6.33	6.28	6.59
1948	7.21	7.07	6.98	6.78	6.44	6.75
1949	6.98	6.95	6.71	6.44	6.29	6.79
1950	6.79	6.86	6.69	6.44	6.49	6.94
1951	6.96	6.84	7.10	6.94	6.74	6.92
1952	6.95	6.96	6.81	6.62	6.43	6.89
1953	7.14	7.09	6.76	6.56	6.15	6.63
Average	7.04	6.93	6.79	6.55	6.34	6.72

* Partial month or partial year.

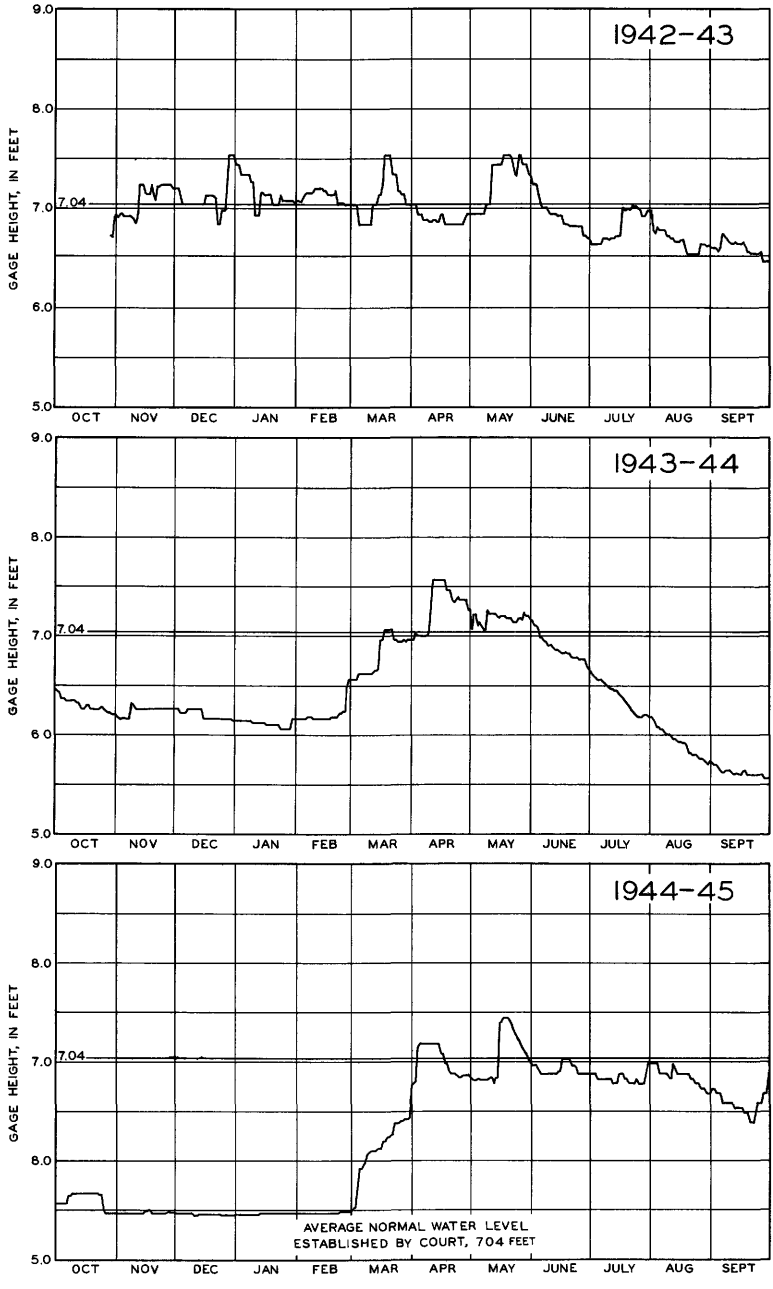

Figure 108. --Lake-level hydrographs for Shriner Lake at Tri Lakes, Ind., for water years 1943-45.

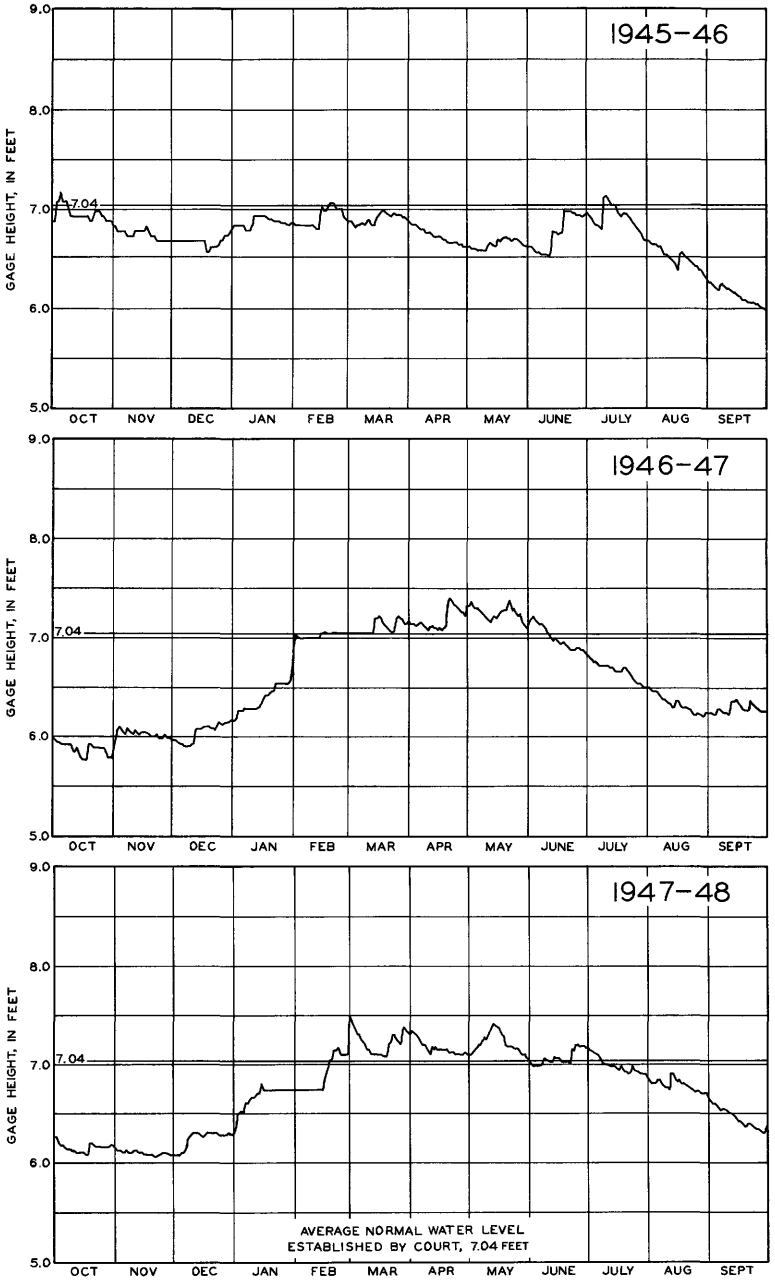

Figure 109. --Lake-level hydrographs for Shriner Lake at Tri-Lakes, Ind., for water years 1946-48.

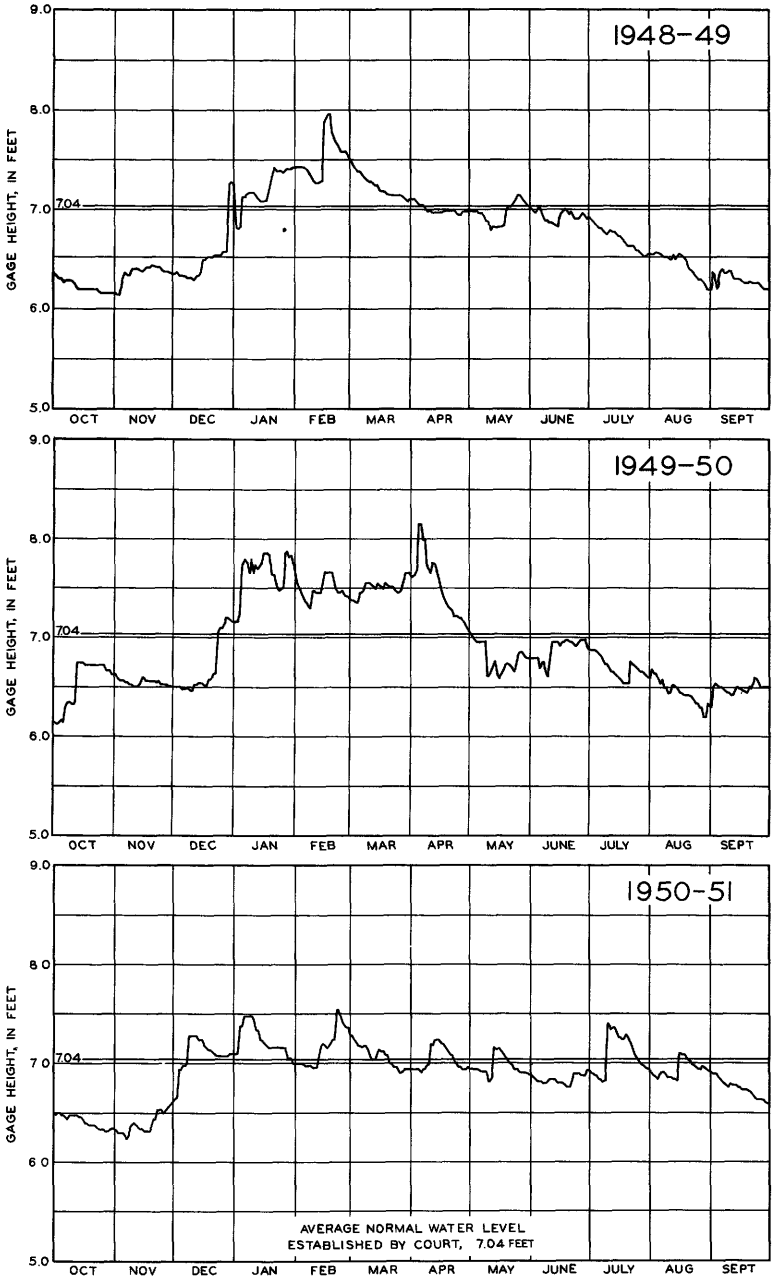

Figure 110.--Lake-level hydrographs for Shriner Lake at Tri-Lakes, Ind., for water years 1949-51.

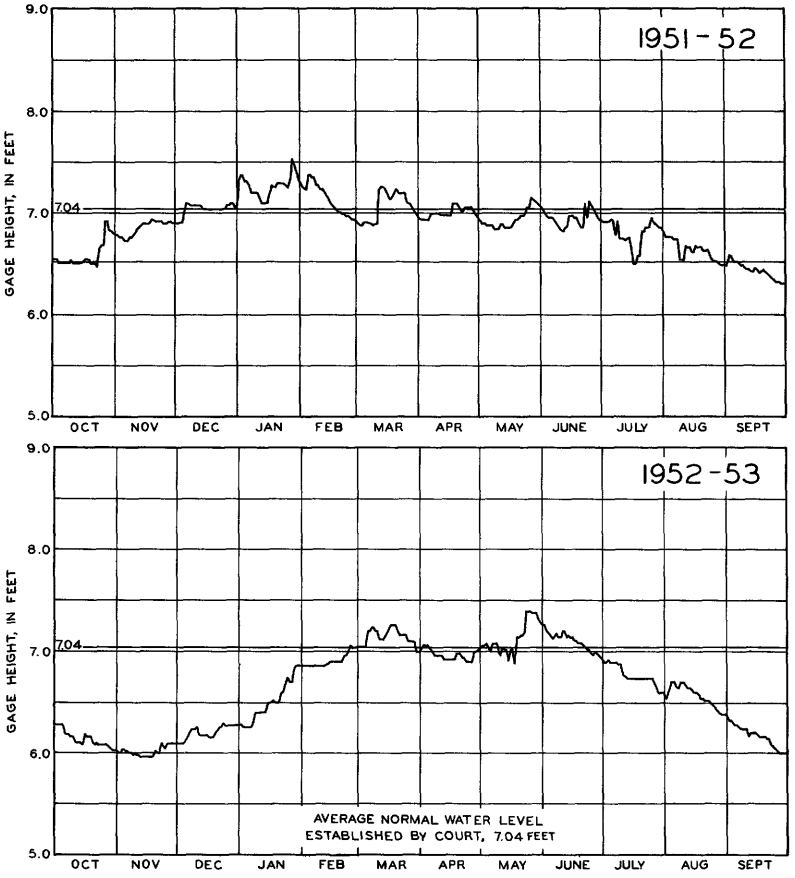

Figure 111. --Lake-level hydrographs for Shriner Lake at Tri-Lakes, Ind., for water years 1952-53.

Smalley Lake near Washington Center, Ind.

Location. --Secs. 15 and 22, T. 33 N., R. 8 E., Noble County, 0.9 mile southeast of Washington Center, and 4.7 miles soutl west of Wolflake.

Surface area. --61 acres.

Drainage area. --32.6 sq mi.

Records available. --August 1943 to September 1953.

Gage. --Chain gage on bridge over outlet 300 ft below lake. Pri to Feb. 13, 1947, staff gage on the northeast shore. Datum gage is 880.00 ft above mean sea level, datum of 1929. Gag read to hundredths once daily.

Average lake level. --10 years; gage height, 2.04 ft; elevation, 882.04 ft.

Established legal level. --None.

Lake-level control. --Lake level maintained at first bridge belov lake by gravel outlet channel.

Extreme levels for Smalley Lake, 1944-53

Maximum			Minimum	
Water year	Date	Gage height (feet)	Date	Gag heigl (feet
1943[a]	Aug. 4, 1943 ---	[a] 2.17	Sept. 30, 1943--------	[a] 1.7
1944	May 16, 1944 ---	4.13	Aug. 20, 21, 1944 -----	1.4
1945	May 17, 1945 ---	3.41	Oct. 14 to Nov. 11, 1944	1.4
1946	Oct. 2, 1945 ---	2.98	Sept. 3-9, 1946-------	1.3
1947	Apr. 21, 1947 ---	2.95	Oct. 6-17, 1946 ------	1.3
1948	Feb. 29, 1948 ---	2.95	Sept. 18, 19, 1948-----	1.3
1949	Feb. 14, 1949 ---	3.36	Sept. 30, 1949--------	1.4
1950	Apr. 4, 5, 1950---	4.48	Oct. 3, 1949----------	1.4
1951	Feb. 22, 1951 ---	*3.84	Sept. 30, 1951--------	1.5
1952	Jan. 27, 1952 ---	3.25	Oct. 6, 1951----------	1.4
1953	Apr. 4, 1953 ---	3.20	July 26, 29, 1953------	1.3

* Estimated.

[a] August and September.

Maximum recorded thickness and periods of ice cover for Smalley Lake, 1944-51

Water year	Maximum thickness (inches)	Total days of cover	Period
1944	3	-------	Unknown to Mar. 28, 1944.
1945	--------	-------	
1946	--------	-------	Dec. 13, 1945, to - ?
1947	3	43	Dec. 30, 1946, to Feb. 13, 1947.
1948	10	98	Dec. 13, 1947, to Mar. 19, 1948.
1949	--------	-------	Dec. 18, 1948, to - ?
1950	6	62	Dec. 15-20, 1949; Jan. 4-10, 19-25; Feb. 1-8; Feb. 20 to Mar. 25, 1950.
1951	--------	82	Dec. 1-3; Dec. 8, 1950, to Feb. 27, 1951.

Discharge measurements at outlet of Smalley Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 3, 1943	2.13	11.1	May 4, 1950	2.50	43.6
Oct. 8	1.65	3.50	Oct. 26	1.64	4.36
Jan. 7, 1944	2.06	2.55	Nov. 14	1.80	8.40
May 15	2.88	59.1	Jan. 25, 1951	2.31	30.4
Mar. 2, 1945	2.25	26.9	Mar. 14	2.50	45.5
Apr. 11	2.77	52.6	Apr. 24	2.44	40.7
July 11	1.89	8.82	May 23	2.18	19.0
Sept. 1	1.82	5.67	June 20	1.89	13.6
Oct. 5	2.51	37.5	July 25	2.41	31.5
Mar. 13, 1946	2.47	30.2	Aug. 29	2.05	16.8
May 27	1.85	8.90	Sept. 26	1.63	3.57
June 19	2.28	22.6	Oct. 24	2.20	29.1
Aug. 21, 1946	1.49	4.33	Nov. 28	2.06	21.8
Dec. 6	1.54	[a] .53	Dec. 19	2.12	[a] 23.1
Jan. 17, 1947	2.08	9.56	Feb. 5, 1952	3.23	96.2
Feb. 13	2.15	24.2	Mar. 27	2.52	50.8
Apr. 23	2.87	64.9	July 17	1.89	9.30
July 2	1.83	20.0	Aug. 14	1.86	9.40
Oct. 30	1.67	2.81	Nov. 18	1.61	2.37
Oct. 31	1.66	2.87	Dec. 16	1.64	3.73
Mar. 4, 1948	2.84	70.8	Jan. 15, 1953	1.84	10.4
Apr. 1	2.87	56.2	Feb. 3	1.96	15.9
Sept. 22	1.45	1.01	Feb. 27	2.09	19.8
Oct. 12 [b]	1.48	.66	Mar. 25	2.37	35.0
Mar. 2, 1949	2.67	54.8	Apr. 17	2.20	26.6
Mar. 25	2.07	20.9	May 13	2.01	17.6
Sept. 7	1.55	3.85	June 8	1.94	11.2
Dec. 15	1.69	6.25	July 2	1.67	3.52
Jan. 17, 1950	3.92	136	July 27	1.53	1.71
Feb. 8	2.78	65.1	Aug. 25 [b]	1.47	[b] .90
Mar. 1	2.83	65.7	Sept. 18 [c]	1.45	[c] .83

[a] Leaves and debris restricting flow.
[b] Point of zero flow determined 1.17.
[c] Point of zero flow determined 1.19.

Average lake levels for Smalley Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1944	1.65	1.77	*1.68	*1.51	*1.58	2.52	3.29
1945	1.45	1.50	*1.67	1.70	1.88	2.48	2.68
1946	2.18	1.84	1.80	*2.29	*2.32	2.49	2.01
1947	1.39	1.56	1.72	*2.02	*2.02	2.01	2.59
1948	1.56	1.71	1.96	2.06	2.10	2.70	2.50
1949	1.50	1.64	1.74	2.49	2.84	2.29	2.00
1950	1.78	1.64	1.93	3.48	3.05	3.00	3.42
1951	1.70	1.80	2.36	2.50	2.72	2.59	2.64
1952	1.78	2.21	2.17	2.85	2.69	2.57	2.53
1953	1.55	1.59	1.65	1.94	2.04	2.41	2.57
Average	1.65	1.73	1.87	2.28	2.32	2.51	2.62

Year	May	June	July	Aug.	Sept.	Annual
1943	--	--	--	*1.99	1.86	*1.92
1944	3.21	2.21	1.62	1.46	1.46	1.99
1945	2.58	2.31	1.87	2.15	1.70	2.00
1946	1.80	1.96	1.75	1.44	1.34	1.93
1947	2.56	2.16	1.75	1.56	1.60	1.91
1948	2.37	1.94	1.78	1.57	1.44	1.97
1949	1.99	2.04	1.80	1.56	1.50	1.94
1950	2.18	2.05	1.91	1.83	1.92	2.34
1951	2.22	1.96	2.57	2.07	1.74	2.24
1952	2.34	2.19	2.08	1.87	1.62	2.25
1953	2.21	1.85	1.49	1.59	1.46	1.86
Average	2.35	2.07	1.86	1.74	1.60	2.04

*Partial year or partial month.

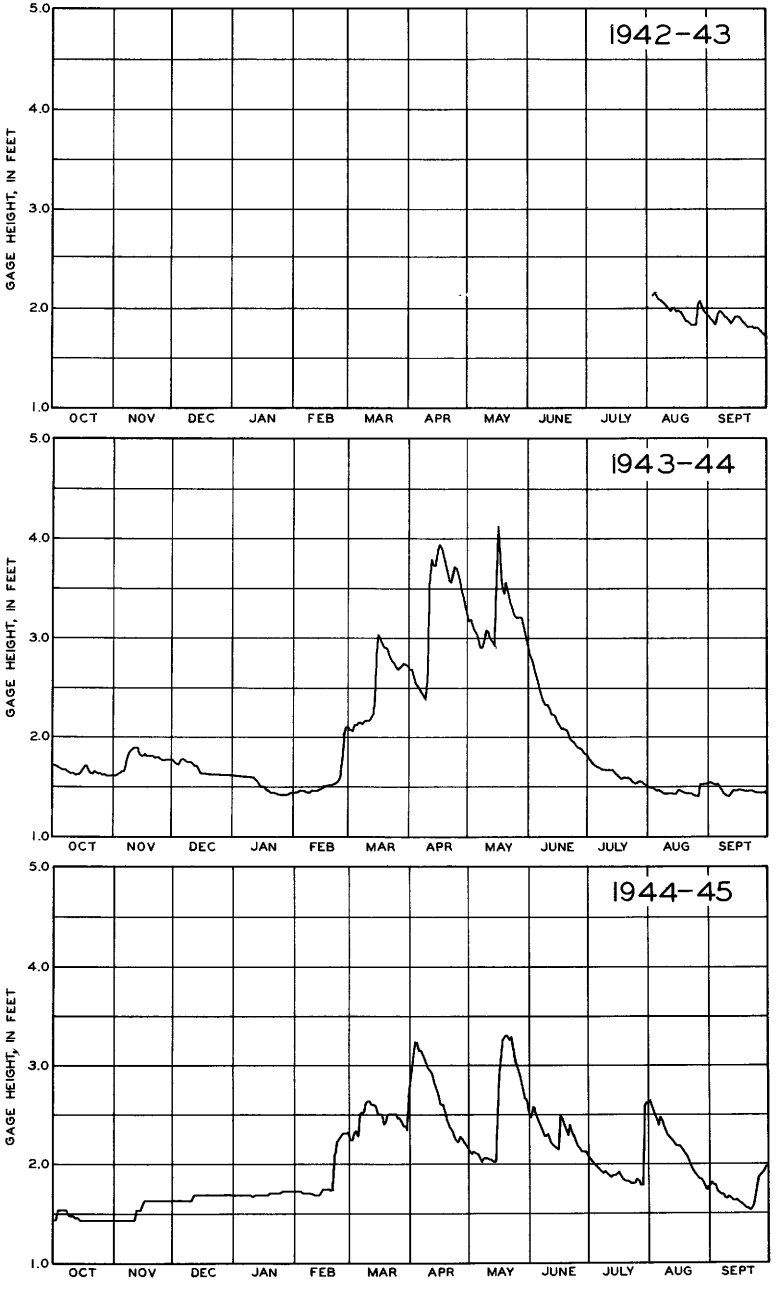

Figure 112.--Lake-level hydrographs for Smalley Lake near Washington Center, Ind., for water years 1946-48.

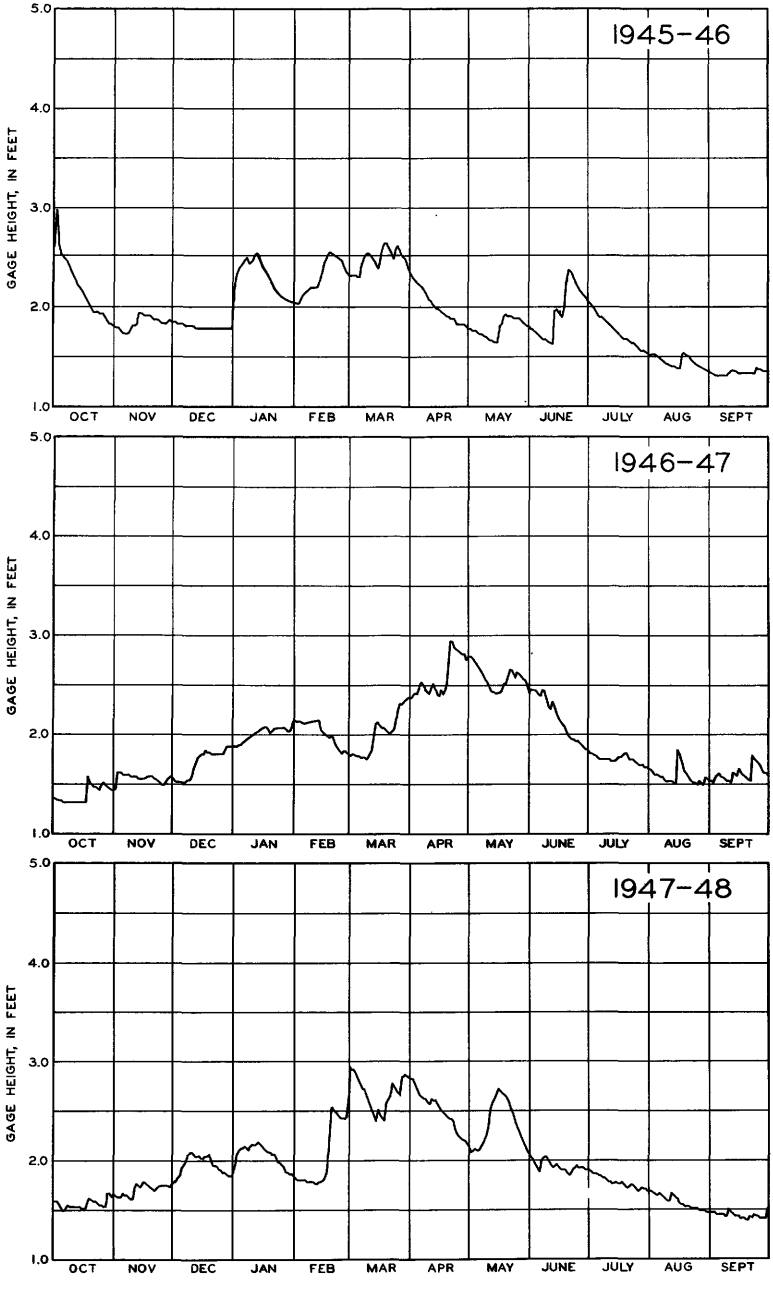

Figure 113.--Lake-level hydrographs for Smalley Lake near Washington Center, Ind., for water years 1946-48.

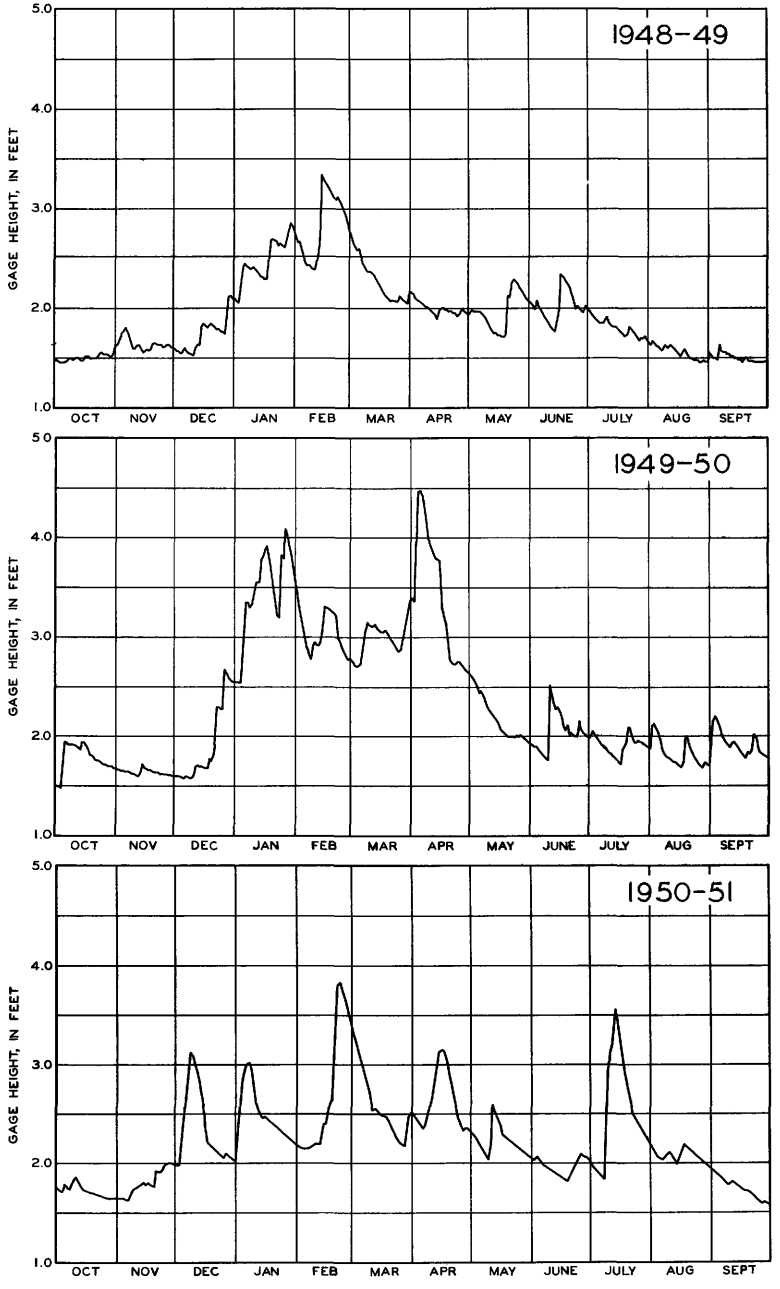

Figure 114.--Lake level hydrographs for Smalley Lake near Washington Center, Ind., for water years 1949-51.

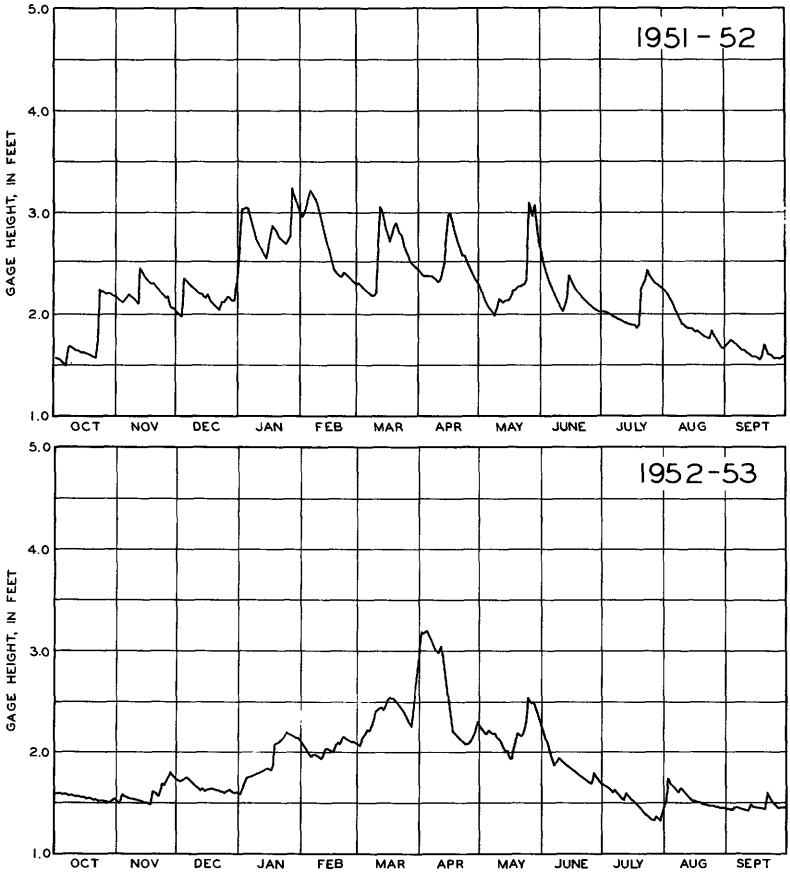

Figure 115. --Lake-level hydrographs for Smalley Lake near Washington Center, Ind. for water years 1952-53.

Sylvan Lake at Rome City, Ind.

Location. --Secs. 9, 13, 14, 15, 16 and 23, T. 35 N., R. 10 E., Noble County.

Surface area. --575 acres.

Drainage area. --31.5 sq mi.

Records available. --October 1943 to September 1953.

Gage. --Staff gage on abutment of first bridge upstream from control dam. Gage read to hundredths once daily. Datum of gage is 910.00 ft above mean sea level, datum of 1929.

Average lake level. --11 years; gage height, 6.26 ft; elevation, 916.26 ft.

Established legal level. --Established June 14, 1951, at gage height 6.20 ft; elevation, 916.20 ft above mean sea level.

Lake-level control. --Lake level controlled by concrete dam with 12 manually operated steel gates resting on the sill and spillway 50 ft long.

Extreme levels for Sylvan Lake, 1943-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943	May 18, 1943 ------	7.44	Oct. 29, 1942-----	6.21
1944	Nov. 9, 1943, Mar. 16, 17, 1944 -----	6.44	Apr. 3-5, 1944----	5.24
1945	May 18, 1945-------	6.66	Nov. 4, 5, 1944---	6.00
1946	June 19, 1946 ------	6.97	Sept. 28, 1946 ----	5.82
1947	Apr. 21, 1947 ------	6.80	Oct. 16, 17, 1946--	5.79
1948	Feb. 21, 1948 ------	6.86	Mar. 8, Sept. 18, 19, 1948 ------	5.90
1949	Feb. 15, 1949 ------	6.74	Mar. 14, 15, 1949 -	5.88
1950	Apr. 6, 1950 -------	7.56	Oct. 1, 2, 1949----	6.00
1951	Feb. 23, 1951 ------	7.14	Sept. 23-30, 1951 -	6.10
1952	Dec. 18-20, 1951 ---	7.10	Aug. 3-9, 29, 30, 1952----------	6.02
1953	Mar. 8, 9, 1953-----	6.48	Sept. 10, 11, 1953 -	5.80

Maximum recorded thickness and periods of ice cover 1946-53

Water year	Maximum thickness (inches)	Total days of cover	Period
1946	$6\frac{1}{2}$	-----	Dec. 14, 1945, to - ?
1947	12	123	Dec. 2, 1946, to Apr. 3, 1947.
1948	20	109	Nov. 27 to Dec. 6, 1947; Dec. 10, 1947, to Mar. 19, 1948.
1949	6	84	Dec. 3-13; Dec. 18, 1948, to Jan. 16; Jan. 30 to Feb. 19; Mar. 2-22, 1949.
1950	-----	69	Dec. 8-12, 14-21, 1949; Jan. 17-25; Feb. 3 to Mar. 26, 1950.
1951	4	95	Nov. 30, 1950, to Mar. 4, 1951.
1952	6	87	Dec. 16, 1951, to Mar. 11, 1952.
1953	5	89	Dec. 14, 1952, to Mar. 12, 1953.

Discharge measurements at outlet of Sylvan Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 12, 1943-	6.28	14.9	Mar. 29, 1946-	6.20	16.2
Oct. 5 ------	6.16	5.79	May 9------	6.05	7.90
Feb. 11, 1944-	6.29	9.88	July 18------	6.09	6.32
Mar. 2, 1945-	6.29	20.1	Feb. 15, 1947-	6.30	49.2
July 2 ------	6.16	12.8	Oct. 25, 1950-	6.20	15.7
Sept. 5 ------	6.08	7.72	May 17, 1951-	6.54	55.2
Nov. 29 ------	6.22	12.1			

Average lake levels for Sylvan Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	*6.29	6.40	6.45	6.40	*6.44	6.26	6.39
1944	6.24	6.35	6.31	6.25	6.27	5.87	5.81
1945	6.06	6.11	6.17	6.20	6.23	6.26	6.22
1946	6.22	6.19	6.22	6.30	6.24	6.23	6.19
1947	5.91	6.15	6.14	6.23	6.37	6.31	6.24
1948	6.14	6.22	6.45	6.49	6.35	6.28	6.24
1949	6.04	6.11	6.25	6.37	6.39	6.13	6.14
1950	6.21	6.12	6.25	6.50	6.62	6.78	6.98
1951	6.26	6.36	6.71	6.54	6.66	6.52	6.40
1952	6.21	6.32	6.54	6.56	6.42	6.45	6.41
1953	6.05	6.12	6.19	6.24	6.23	6.36	6.35
Average	6.15	6.22	6.33	6.39	6.40	6.32	6.30

Year	May	June	July	Aug.	Sept.	Annual
1943	*6.77	*6.59	6.48	6.32	6.30	*6.43
1944	5.92	6.11	6.08	5.96	6.04	6.10
1945	6.25	6.33	6.11	6.29	6.13	*6.21
1946	6.10	6.20	6.18	5.98	5.87	6.16
1947	6.20	6.27	6.13	6.04	6.27	6.19
1948	6.28	6.38	6.25	6.11	5.98	6.26
1949	6.22	6.25	6.20	6.12	6.03	6.19
1950	6.39	6.36	6.36	6.27	6.46	6.44
1951	6.40	6.34	6.38	6.30	6.14	6.42
1952	6.38	6.30	6.13	6.07	6.10	6.34
1953	6.35	6.10	6.01	6.06	5.84	6.16
Average	6.30	6.29	6.21	6.14	6.10	6.26

*Partial year or partial month.

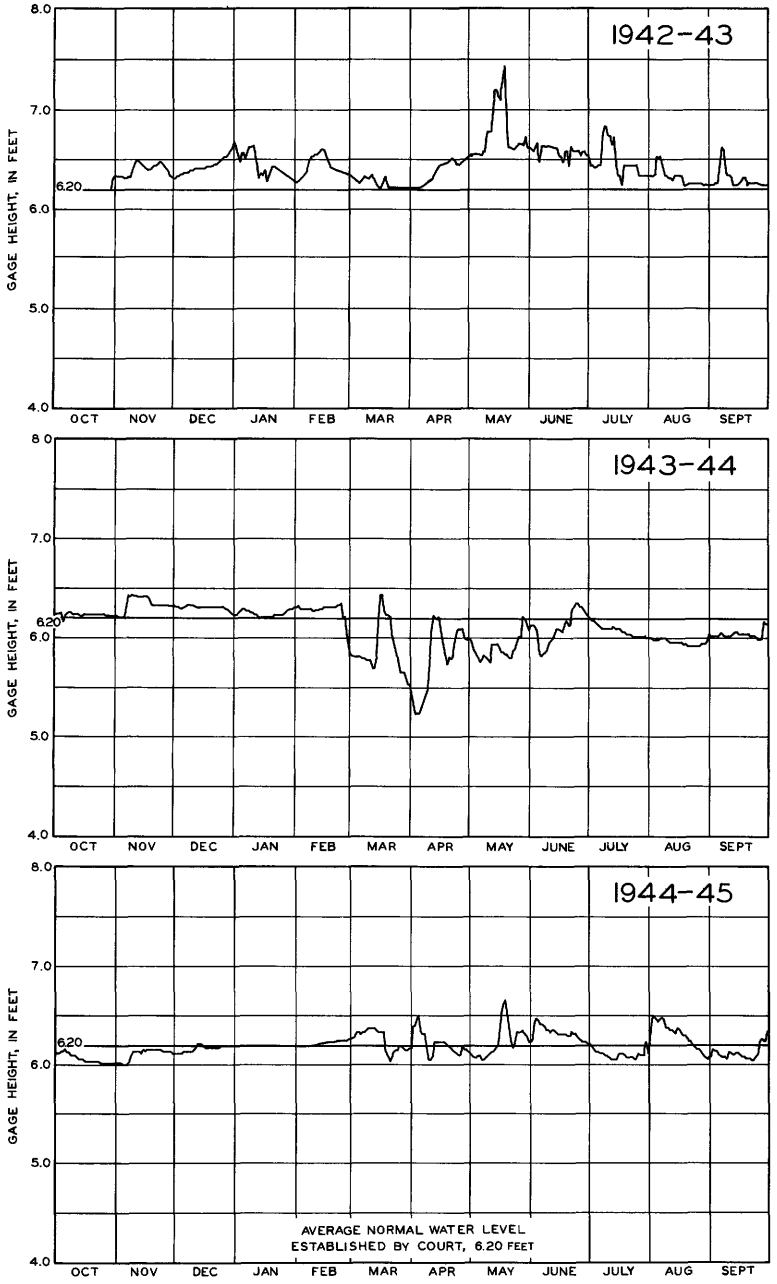

Figure 116. --Lake-level hydrographs for Sylvan Lake at Rome City, Ind., for water years 1943-45.

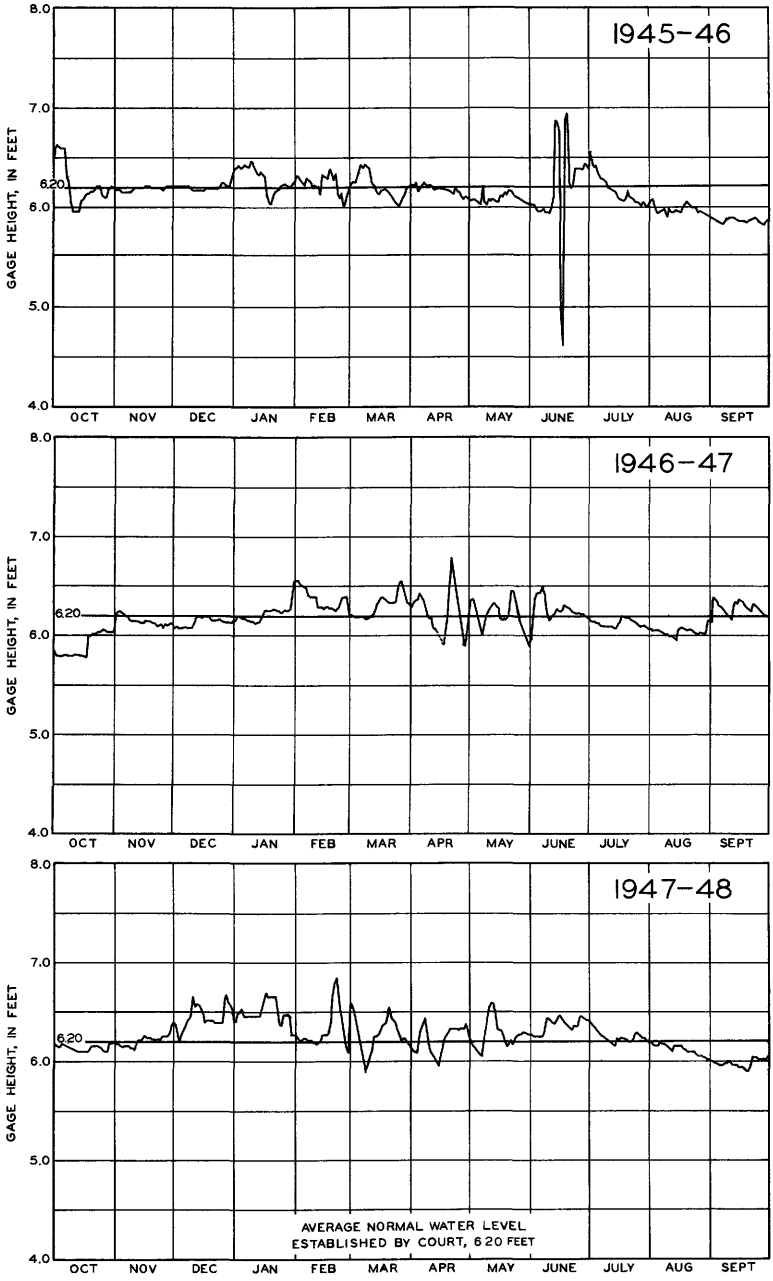

Figure 117. --Lake-level hydrographs for Sylvan Lake at Rome City, Ind., for water years 1946-48.

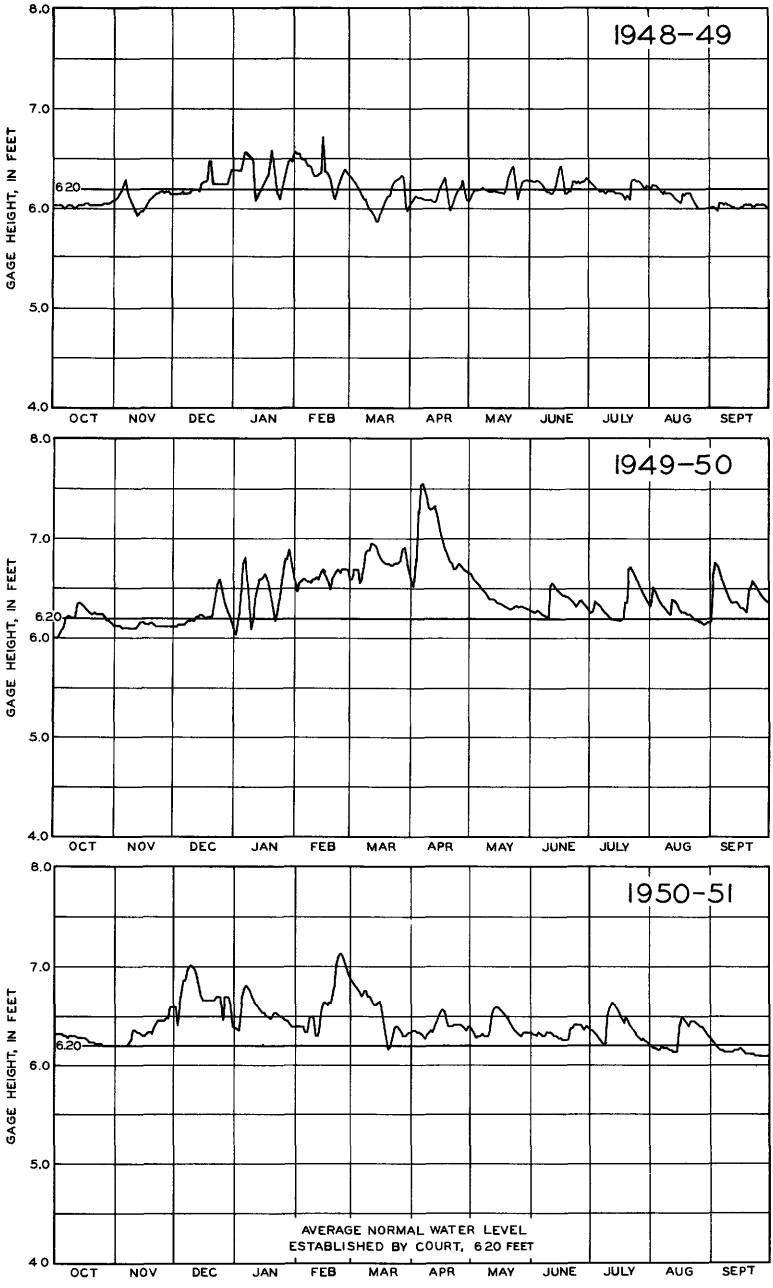

Figure 118.--Lake-level hydrographs for Sylvan Lake at Rome City, Ind., for water years 1949-51.

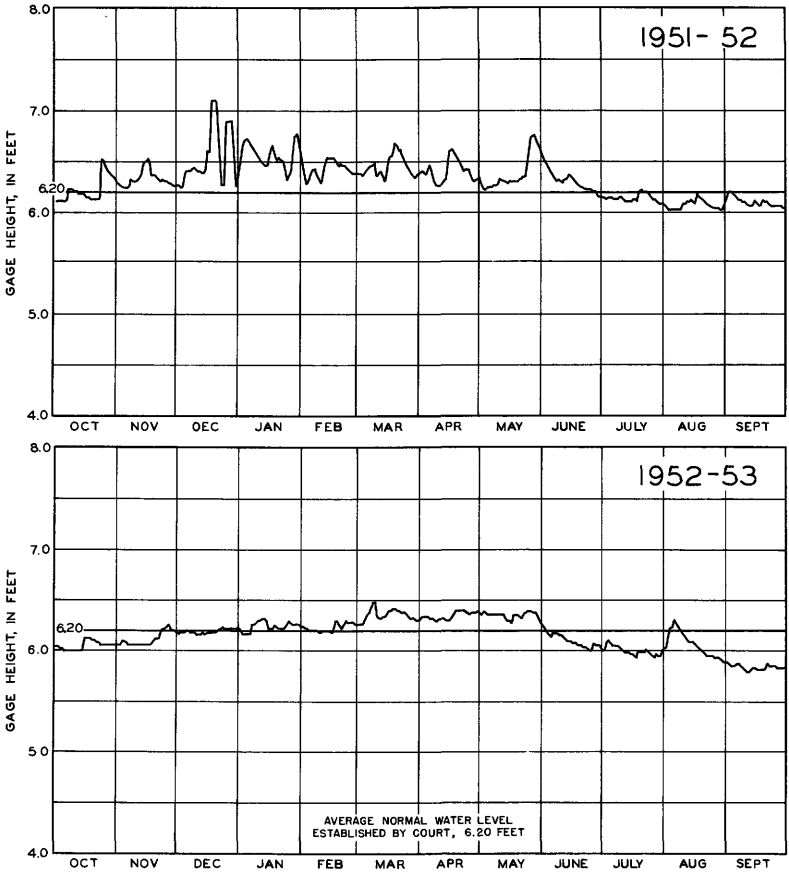

Figure 119. --Lake-level hydrographs for Sylvan Lake at Rome City, Ind., for water years 1952-53.

Syracuse Lake at Syracuse, Ind.

Location. --Secs. 4, 5, 8, and 9, T. 34 N., R. 7 E., Kosciusko County.

Surface area. --367 acres.

Drainage area. --37.3 sq mi.

Records available. --August 1943 to September 1953.

Gage. --Staff gage at second bridge upstream from control dam. Gage read to hundredths once daily. Datum of gage is 850.00 ft above mean sea level, datum of 1929.

Average level. --10 years; gage height, 8.50 ft, elevation, 858.50 ft.

Established legal level. --Established September 20, 1948, at gage height 8.87 ft, elevation 858.87 ft above mean sea level.

Lake-level control. --Lake level controlled by concrete dam with two steel sluice gates, each 6 ft wide and 5 ft high, with sill elevation at gage height 5.21 ft. A 14-ft fixed crest spillway south of the gates has a crest at gage height, 8.87 ft.

Extreme levels of Syracuse Lake, 1944-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1944	Mar. 16-18, 1944--	9.34	Sept. 27, 1944 ----	7.48
1945	Sept. 30, 1945-----	9.03	Nov. 2, 3, 1944----	7.28
1946	June 30, 1946------	9.11	Sept. 30, 1946 ----	7.39
1947	Apr. 21-23, 1947 --	9.36	Oct. 17, 1946-----	7.11
1948	Mar. 7, 1948------	9.12	Sept. 30, 1948 ----	7.56
1949	July 9, 1949-------	9.58	Oct. 28, 29, 1948--	7.14
1950	Jan. 27, 28, 1950	*10.15	Dec. 10, 1949----	*8.22
1951	Dec. 10, 11, 12, 1950, Apr. 15, 16, 1951	9.10	Sept. 30, 1951 ----	8.46
1952	Feb. 6-8, 1952	9.18	Sept. 13, 14, 21, 22, 1952----------	7.90
1953	May 25, 1953	8.82	Sept. 27-30, 1953 -	7.38

*Estimated

Maximum recorded thickness and periods of ice cover 1944-50

Water year	Maximum thickness (inches)	Total days of cover	Period
1944	3	96	Nov. 24, 1943, to Feb. 27, 1944.
1945	----	-----	Dec. 10, 1944, to - ?
1946	----	32	Dec. 5, 1945, to Jan 5, 1946.
1947	4	94	Dec. 21, 1946, to Mar. 24, 1947.
1948	16	-----	Dec. 15, 1947, to - ?
1949	$6\frac{1}{2}$	-----	Dec. 18, 1948, to - ?
1950	6	-----	

Discharge measurements at outlet of Syracuse Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 14, 1943-	9.04	16.4	July 18, 1946-	8.72	3.72
Oct. 7------	8.63	7.28	Oct. 17------	7.11	1.27
Jan. 8, 1944-	8.59	7.95	Oct. 17------	7.11	[a] 25.6
Apr. 22------	9.07	[b] 167	Oct. 6, 1948-	7.47	[b] * 1.00
Aug. 11------	7.96	*.6	Jan. 26, 1950-	10.07	[c] 127
Mar. 3, 1945-	7.81	.0	Feb. 10------	9.39	[c] 160
June 13------	8.86	4.73	Mar. 7------	8.76	[c] 16.8
Sept. 6------	8.65	13.8	Oct. 25------	8.65	[a] 14.1
May 29, 1946-	8.69	*.36	May 9, 1951-	8.83	[c] 22.2
June 22------	8.97	8.94			

* Estimated because of leakage.
[a] Flood gates closed; power plant in operation.
[b] Sluice gate partly open.
[c] Sluice gates partly open; power plant in operation.

Average lake levels for Syracuse Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1944	8.[illegible]3	8.66	8.62	8.59	8.74	9.08	8.98
1945	7.46	7.36	7.40	7.49	7.54	8.13	8.77
1946	8.78	8.70	8.67	8.73	8.71	8.61	8.58
1947	7.23	7.35	7.34	7.48	7.88	8.11	9.01
1948	8.02	7.88	8.07	8.39	8.56	9.02	8.98
1949	7.32	7.37	7.43	7.98	8.91	9.12	8.87
1950	8.50	8.36	8.46	9.67	9.36	8.88	9.50
1951	8.74	8.70	8.98	8.86	8.81	8.88	8.94
1952	8.46	8.75	8.90	8.96	9.02	8.92	8.99
1953	7.76	7.66	7.53	7.47	7.61	8.13	8.57
Average	8.09	8.08	8.14	8.36	8.51	8.69	8.92

Year	May	June	July	Aug.	Sept.	Annual
1943	----	----	----	*8.84	8.80	*8.81
1944	8.94	8.77	8.37	7.88	7.63	8.57
1945	8.84	8.90	8.73	8.69	8.68	8.17
1946	8.60	8.81	8.76	8.13	7.65	8.56
1947	9.13	9.01	8.63	8.24	8.20	8.13
1948	8.90	8.90	8.82	8.42	7.82	8.48
1949	9.00	9.22	9.38	8.96	8.51	8.50
1950	8.83	8.87	9.07	8.94	8.86	8.94
1951	8.92	8.80	8.81	8.74	8.62	8.82
1952	8.92	8.88	8.61	8.42	8.05	8.74
1953	8.79	8.61	8.12	7.85	7.51	7.97
Average	8.89	8.88	8.73	8.46	8.21	8.50

*Partial month or partial year.

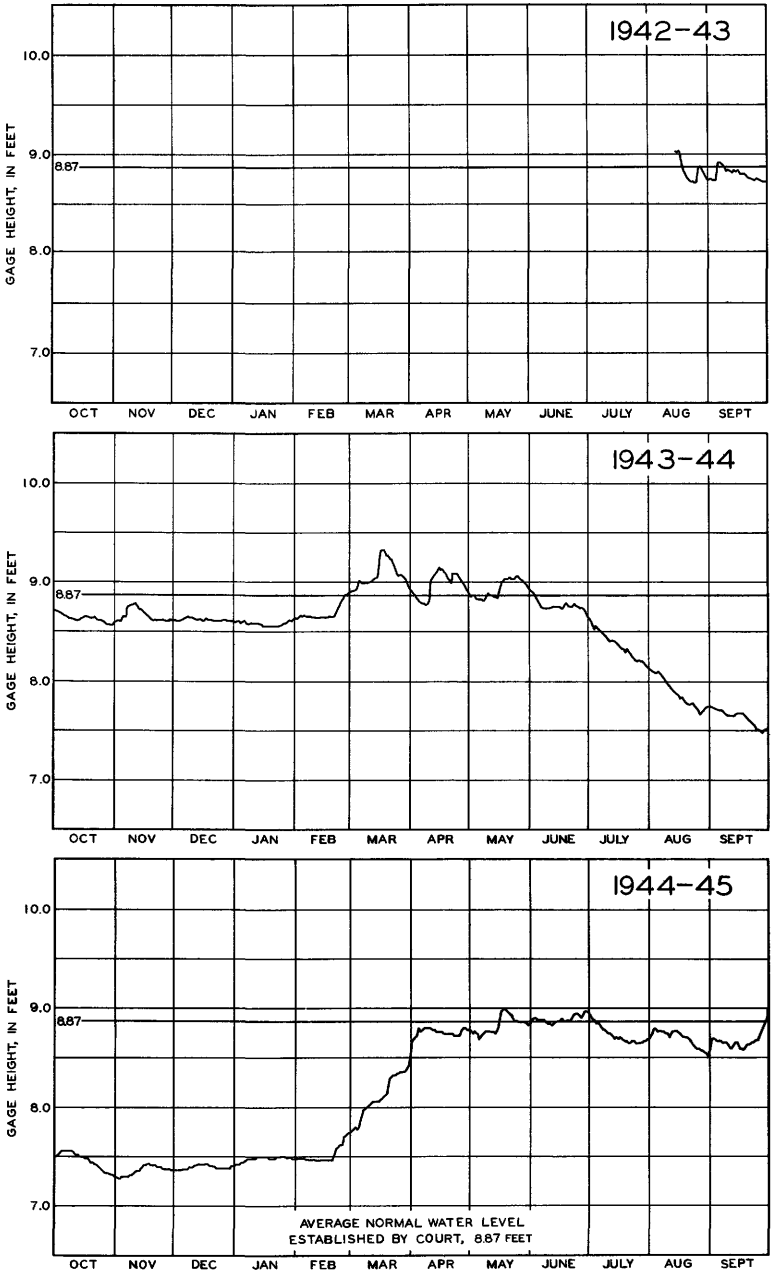

Figure 120. --Lake-level hydrographs for Syracuse Lake at Syracuse, Ind., for water years 1943-45.

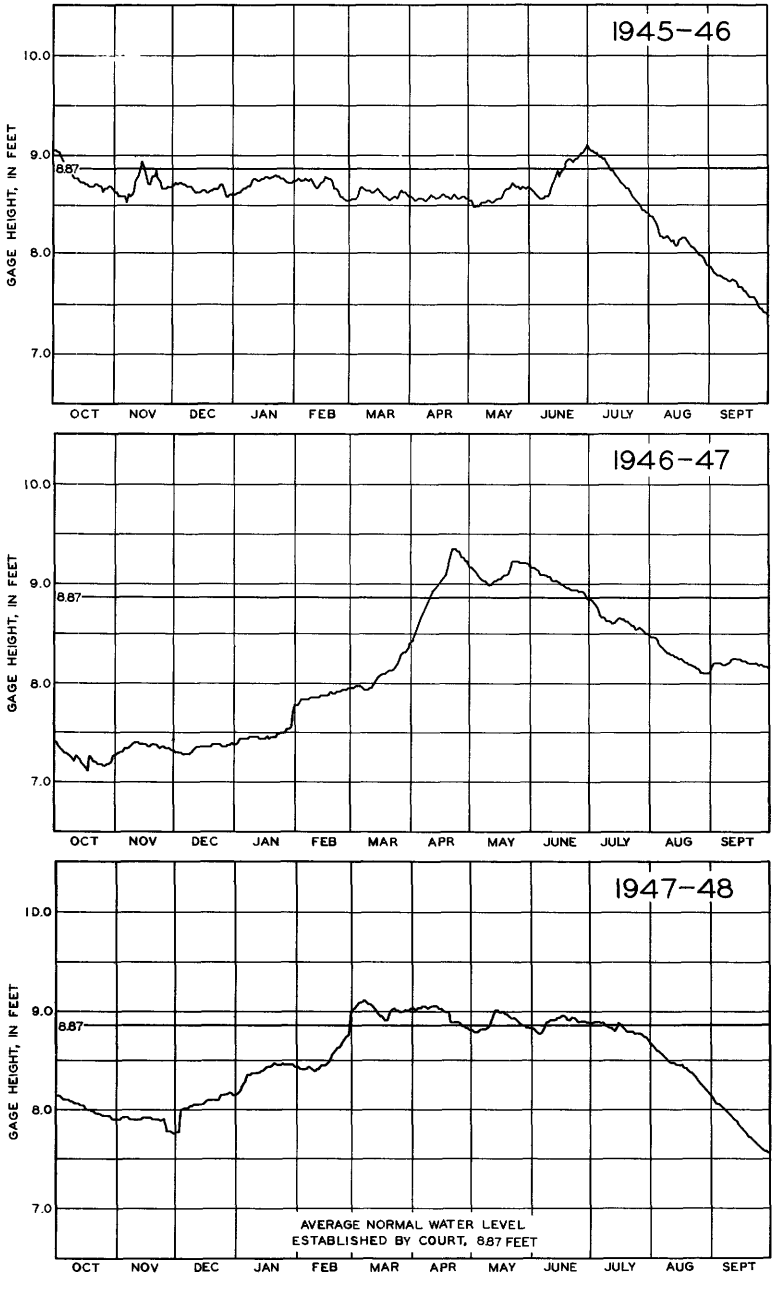

Figure 121.--Lake-level hydrographs for Syracuse Lake at Syracuse, Ind., for water years 1946-48.

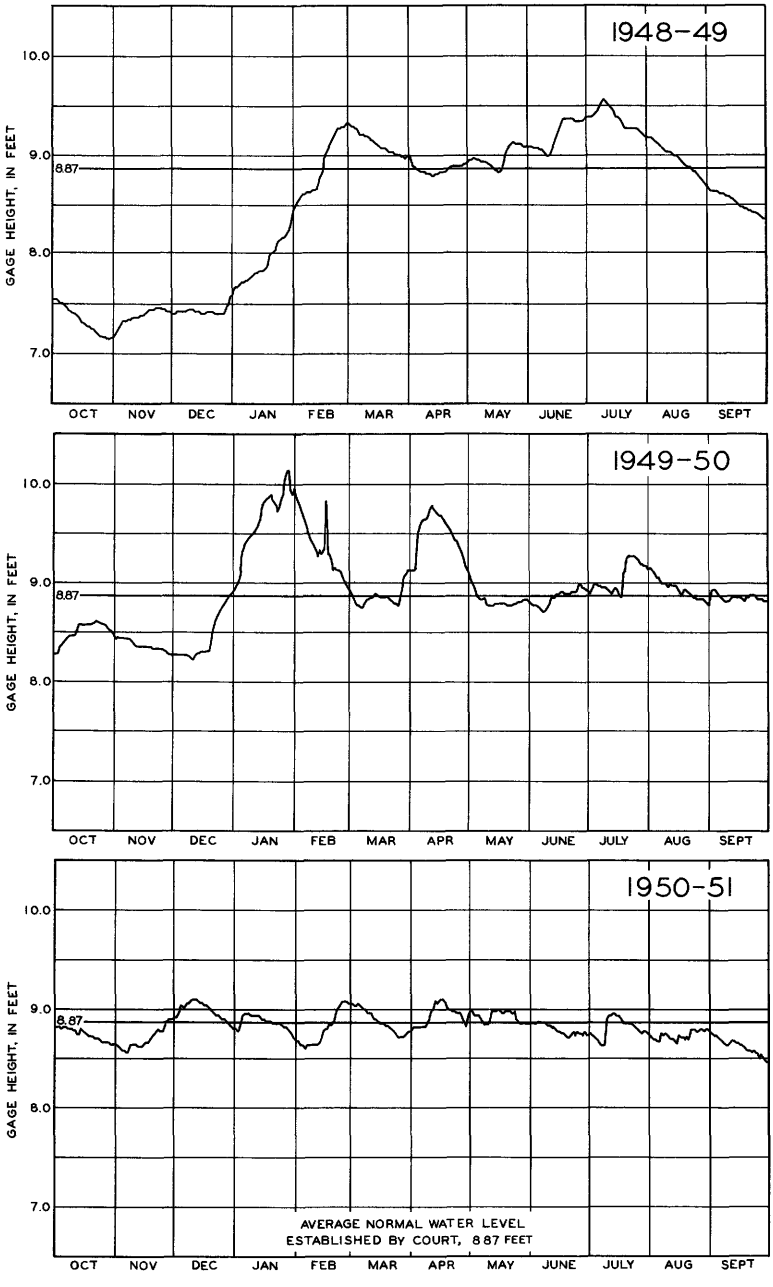

Figure 122.--Lake-level hydrographs for Syracuse Lake at Syracuse, Ind., for water years 1949-51.

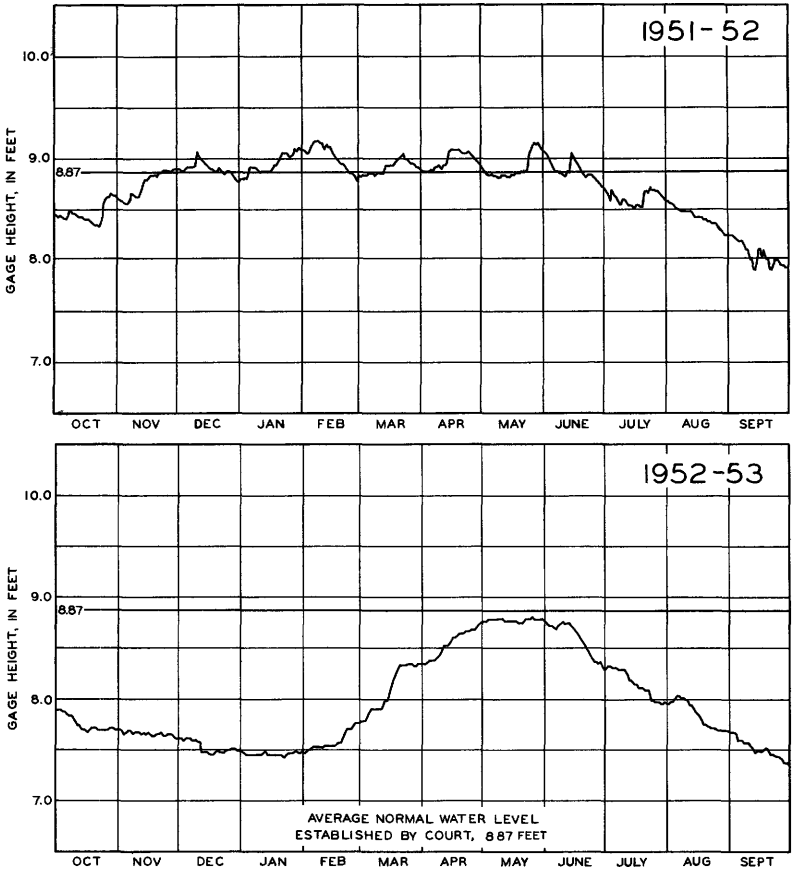

Figure 123. --Lake-level hydrographs for Syracuse Lake at Syracuse, Ind., for water years 1952-53.

Tippecanoe Lake at Oswego, Ind.

Location. --Secs. 11, 12, and 14, T. 33 N., R. 6 E., and secs. 6, 7, 8, 9, 16, 17, and 18, T. 33 N., R. 7 E., Kosciusko, County.

Surface area. --1,037 acres, including area of Upper Tippecanoe or Lake James and Oswego Lake (determined from soil survey map of Kosciusko County).

Drainage area. --118 sq mi.

Records available. --October 1942 to September 1953.

Gage. --Staff gage fastened to boat pier at Rookstool's home at west end of Oswego basin, at the head of outlet. Auxiliary headwater and tailwater gages are located at the outlet dam, about 800 ft downstream from lake gage. Gages are read to hundredths once daily. Datum of gage is 830.00 ft above mean sea level, datum of 1929.

Average lake level. --11 years; gage height, 6.50 ft; elevation, 836.50 ft.

Established legal level. --Established October 18, 1949, at gage height 6.40 ft; elevation, 836.40 ft above mean sea level.

Lake-level control. --Lake level controlled by a 56-ft concrete dam with 7-ft sluice ways. The average gage height of the dam sill is 4 ft. Lake level controlled by removable stop logs.

Extreme levels for Tippecanoe Lake, 1943-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943	May 21, 1943 -----	9.43	Oct. 29, Nov. 5, 1942	6.32
1944	May 19, 1944 -----	8.64	Aug. 27, 1944 -----	5.36
1945	May 24, 1945 -----	8.04	Oct. 28, to Nov. 2, 1944----------	5.16
1946	Feb. 20, 1946-----	7.50	Sept. 30, 1946-----	5.20
1947	Apr. 26, 1947-----	7.92	Oct. 16, 1946------	5.02
1948	Mar. 5, 1948 -----	7.96	Sept. 27, 1948-----	5.52
1949	Feb. 21, 1949-----	8.28	Oct. 28 to Nov. 2, 1948----------	5.46
1950	Apr. 10, 1950-----	9.18	Nov. 23, 1949 -----	5.66
1951	Feb. 26, 27, 1951--	8.38	Nov. 6, 7, 1950-----	5.58
1952	Feb. 4, 5, 1952----	8.02	Oct. 21, 22, 1951---	5.58
1953	Mar. 23, 24, 1953--	7.02	Nov. 14-18, 1952 --	5.25

Maximum recorded thickness and periods of ice cover 1946-53

Water year	Maximum thickness (inches)	Total days of cover	Period
1946	-----	-----	Dec. 14, 1945, to - ?
1947	12.5	108	Dec. 19, 1946, to Apr. 5, 1947.
1948	17	90	Nov. 30 to Dec. 4; Dec. 20, 1947, to Mar. 19, 1948.
1949	-----	76	Dec. 26, 1948, to Jan. 16, 1949; Jan. 30 to Mar. 8; Mar. 16-21, 1949.
1950	4	64	Dec. 15-21, 1949; Jan. 19-25, 1950; Feb. 3 to Mar. 24, 1950.
1951	-----	-----	
1952	-----	-----	Dec. 14, 1951, to - ?
1953	-----	-----	Dec. 20, 1952, to Jan. 24, 1953; Jan. 26, 1953, to - ?

Discharge measurements at outlet of Tippecanoe Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 15, 1943-	6.80	89.0	Aug. 25, 1948-	5.94	18.9
Oct. 7------	6.17	56.8	Sept. 28------	5.54	14.6
Jan. 8, 1944-	5.56	41.2	Nov. 30------	5.64	33.0
Apr. 21------	8.50	455	Dec. 23------	5.80	38.9
June 13, 1945-	6.90	136	Jan. 4, 1949-	6.26	74.7
Sept. 8------	6.19	66.2	Feb. 8------	7.47	216
May 22, 1946-	5.78	51.2	Mar. 23------	6.70	124
June 21------	6.50	85.1	May 3------	6.15	76.3
July 19------	6.10	47.3	June 22------	7.44	170
Oct. 23------	5.22	15.8	Sept. 14------	5.92	16.3
Nov. 20------	5.58	37.9	Oct. 6------	5.88	40.8
Dec. 18------	5.47	33.1	Nov. 7------	5.80	47.0
Jan. 9, 1947-	5.70	41.7	Dec. 7------	5.80	48.0
Feb. 12------	6.64	143	Jan. 14, 1950-	8.58	501
Feb. 18------	6.44	85.9	Jan. 15------	8.72	531
Apr. 21------	7.70	242	Jan. 19------	8.71	516
Apr. 22------	7.86	262	Jan. 25------	8.50	445
Apr. 29------	7.78	251	Feb. 1------	8.74	533
July 1------	6.58	82.0	Mar. 7------	7.97	305
Aug. 28------	5.60	26.4	Apr. 6------	9.08	632
Nov. 20------	5.96	43.1	Apr. 10------	9.18	677
Mar. 2, 1948-	7.68	234	May 4------	7.38	214
June 9------	6.74	84.5	June 8------	6.04	57.4
July 2------	6.57	53.0	July 7------	6.70	98.8

Discharge measurements at outlet of Tippecanoe Lake--Con.

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 22, 1950-	6.42	76.0	Apr. 17, 1952-	7.52	259
Sept. 13 ------	6.68	102	May 8 ------	6.64	130
Oct. 4 ------	6.18	67.5	June 17 ------	7.10	157
Oct. 31 ------	5.78	46.2	July 23 ------	7.12	159
Nov. 29 ------	6.28	84.2	Aug. 14 ------	6.30	67.5
Dec. 28 ------	6.76	138	Sept. 17 ------	5.82	41.1
Jan. 31, 1951-	6.66	130	Oct. 7 ------	6.01	59.5
Mar. 14 ------	7.44	242	Nov. 18 ------	5.25	19.1
Apr. 24 ------	7.58	274	Dec. 16 ------	5.47	30.5
May 23 ------	6.80	153	Jan. 15, 1953-	5.64	43.0
June 20 ------	6.10	51.8	Feb. 3 ------	6.33	97.2
July 25 ------	7.22	184	Feb. 27 ------	6.15	78.3
Aug. 29 ------	6.66	106	Mar. 26 ------	6.98	181
Sept. 20 ------	5.96	53.3	Apr. 17 ------	6.54	114
Oct. 24 ------	5.86	61.9	May 13 ------	6.50	98.5
Nov. 28 ------	6.58	126	June 8 ------	6.45	87.9
Dec. 18 ------	6.65	144	July 3 ------	5.85	15.8
Feb. 4, 1952-	8.02	337	July 27 ------	5.73	8.40
Mar. 4 ------	6.76	164	Aug. 25 ------	5.76	8.11
Mar. 17 ------	7.30	225	Sept. 15 ------	5.47	6.95

Average lake levels for Tippecanoe Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	6.38	6.72	6.76	7.43	7.17	7.36	7.14
1944	6.09	6.00	5.82	5.48	5.57	6.68	8.02
1945	5.32	5.32	5.39	5.41	5.49	6.51	7.10
1946	6.85	6.13	5.76	6.77	6.75	7.08	6.32
1947	5.17	5.54	5.43	5.75	6.45	6.32	7.46
1948	6.00	5.88	6.32	6.56	6.43	7.57	7.40
1949	5.56	5.63	5.74	7.02	7.77	7.10	6.38
1950	6.06	5.79	6.14	8.35	8.21	8.09	8.64
1951	6.08	5.86	7.04	6.98	7.04	7.42	7.34
1952	5.81	6.40	6.68	7.49	7.59	7.10	7.29
1953	5.71	5.34	5.51	5.84	6.21	6.61	6.53
Average	5.91	5.87	6.05	6.64	6.79	7.08	7.24

Year	May	June	July	Aug.	Sept.	Annual
1943	8.33	7.50	7.04	6.79	6.55	7.14
1944	8.05	6.94	5.80	5.55	5.44	6.30
1945	7.22	6.98	6.22	6.48	6.10	6.18
1946	5.75	6.03	6.22	5.65	5.34	6.20
1947	7.36	6.95	6.28	5.71	5.88	6.19
1948	7.28	6.72	6.43	6.04	5.69	6.53
1949	6.30	6.97	6.69	6.00	5.92	6.41
1950	6.83	6.64	6.59	6.48	6.52	7.02
1951	6.79	6.24	6.96	6.58	6.09	6.70
1952	6.84	7.02	6.59	6.27	5.95	6.75
1953	6.56	6.15	5.76	5.86	5.47	5.97
Average	7.03	6.74	6.41	6.13	5.90	6.50

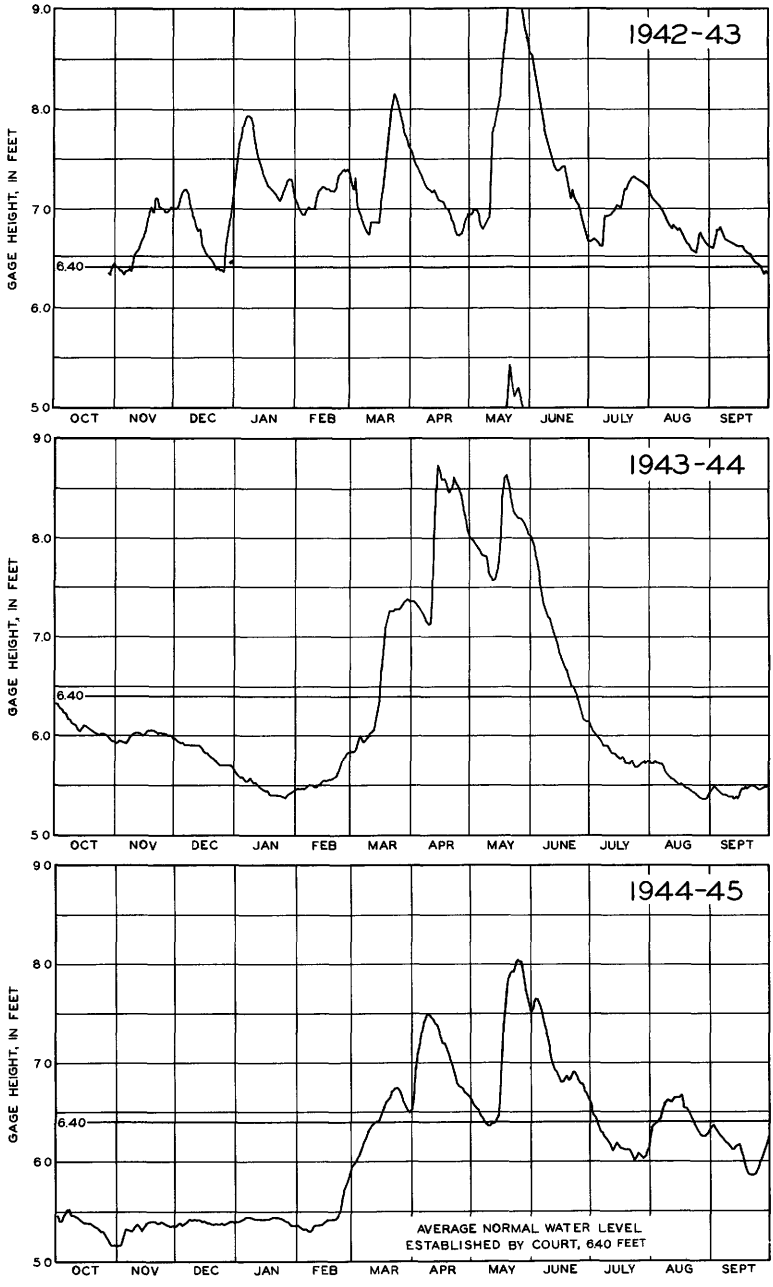

Figure 124. --Lake-level hydrographs for Tippecanoe Lake at Oswego, Ind., for water years 1943-45.

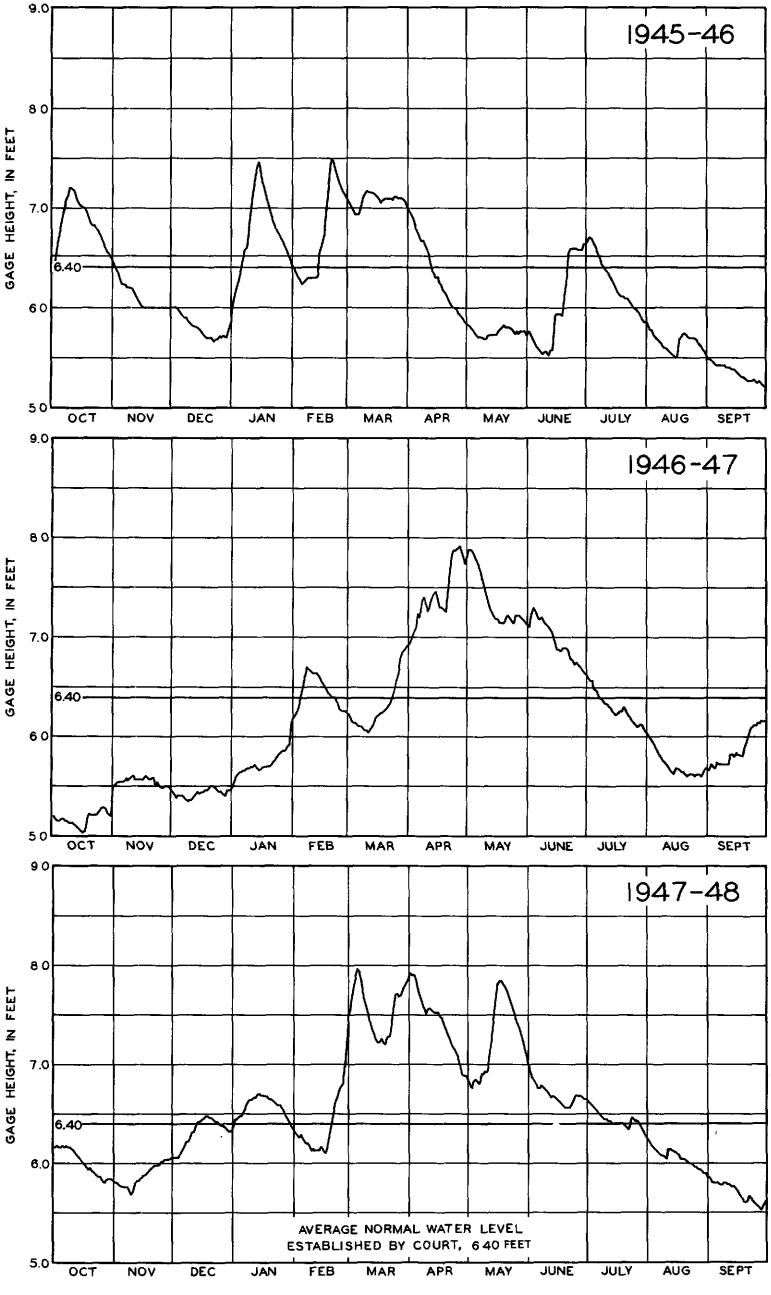

Figure 125.--Lake-level hydrographs for Tippecanoe Lake at Oswego, Ind., for water years 1946-48.

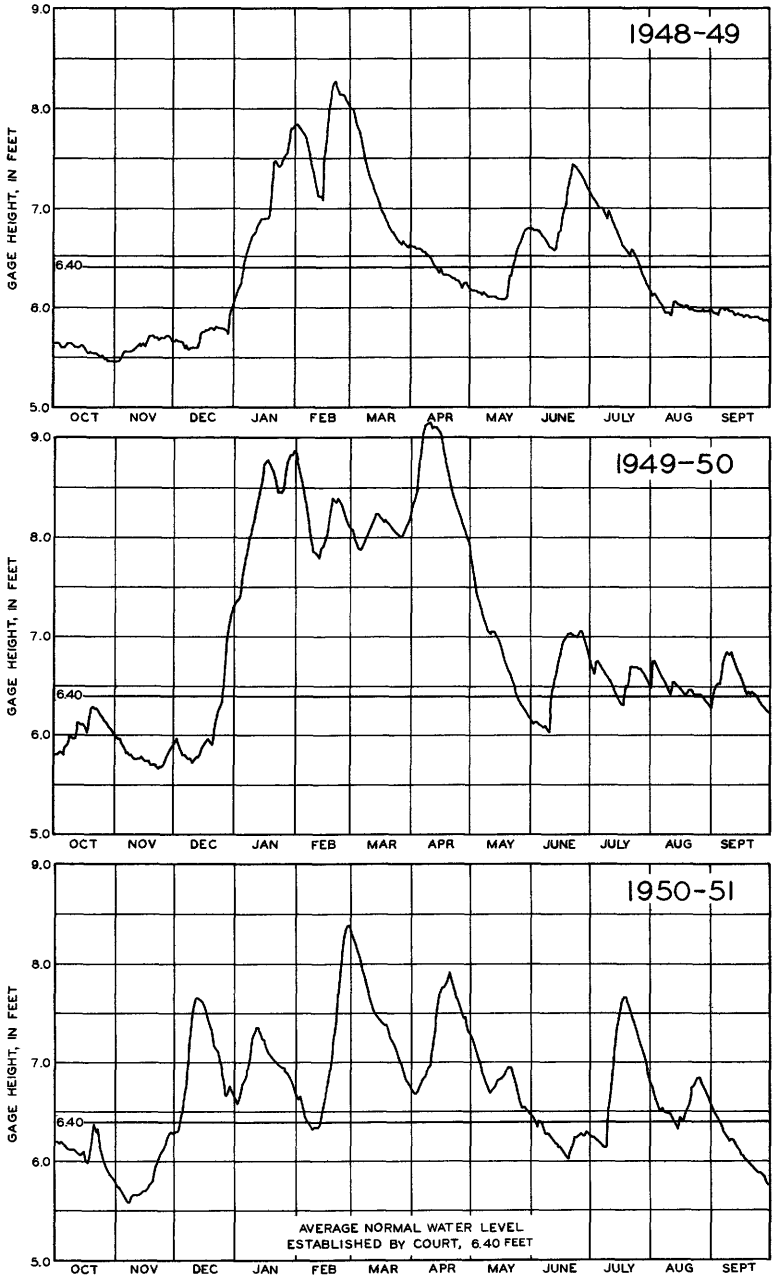

Figure 126.--Lake-level hydrographs for Tippecanoe Lake at Oswego, Ind., for water years 1949-51.

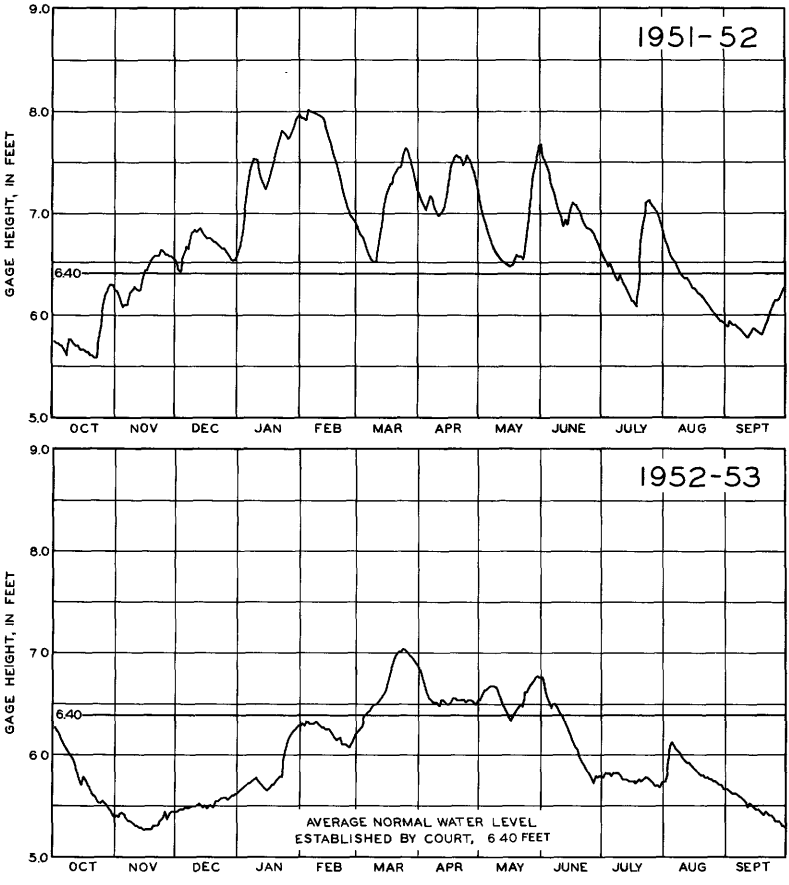

Figure 127. --Lake-level hydrographs for Tippecanoe Lake at Oswego, Ind., for water years 1952-53.

Lake Wawasee near Wawasee, Ind.

Location. --Secs. 8, 9, 10, 11, 13, 14, 15, 16, 17, 22, 23, 24, 25, 26, T. 34 N., R. 7 E., Kosciusko County, 3.0 miles southeast of Wawasee.

Surface area. --2,168 acres.

Drainage area. --37.3 sq mi.

Records available. --October 1942 to September 1953.

Gage. --Staff gage on middle pier of Wawasee Fish Hatchery boat house. Gage read to hundredths once daily. Datum of gage is 850.00 ft above mean sea level, datum of 1929.

Average lake level. --11 years; gage height, 8.54 ft; elevation, 858.54 ft.

Established legal level. --Established September 20, 1948, at gage height 8.89 ft; elevation, 858.89 ft above mean sea level.

Lake level control. --Lake level controlled by dam at outlet of Syracuse Lake. Syracuse Lake and Wawasee Lake are at same level except for slight drop through channel from Wawasee to Syracuse Lake.

Extreme levels for Lake Wawasee, 1943-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943	May 25, 26, 1943----	10.00	Dec. 26, 1942------	8.36
1944	Mar. 17-19, 1944---	9.40	Sept. 24, 27-30, 1944	7.49
1945	May 18-20, 1945----	9.08	Nov. 1-5, 1944-----	7.27
1946	July 1, 1946--------	9.13	Sept. 30, 1946 -----	7.43
1947	Apr. 22-24, 1947 ---	9.43	Oct. 17, 30, 1946---	7.11
1948	Mar. 7-10, 1948----	9.12	Sept. 28, 29, 1948 --	7.54
1949	July 11, 1949-------	9.58	Oct. 28-31, 1948---	7.14
1950	Jan. 27, 28, 1950----	10.22	Dec. 10, 11, 1949---	8.24
1951	Feb. 24-27, 1951 ---	9.18	Sept. 30, 1951 -----	8.46
1952	Feb. 10, 11, 1952 ---	9.31	Sept. 30, 1952 -----	7.93
1953	May 23, 1953-------	8.90	Nov. 15-18, 1952---	7.28

Maximum recorded thickness and periods of ice cover 1943-51

Water years	Maximum thickness (inches)	Total days of cover	Periods
1943	14	-----	
1944	10	-----	Nov. 29, 1943, to - ?; Dec. 14, 1943, to - ?
1945	2	-----	Dec. 2, 1944, to - ?
1946	11	-----	Unknown to Mar. 6, 1946.
1947	14	-----	Unknown to Mar. 29, 1947.
1948	21	-----	Unknown to Mar. 19, 1948.
1949	7	80	Dec. 9, 1948, to Feb. 26, 1949.
1950	11	-----	Dec. 10, 1949, to - ?
1951	4	-----	

Discharge measurements. --Wawasee Lake flows into Syracuse Lake. Discharge measurements are made at outlet of Syracuse Lake.

Average lake levels for Lake Wawasee for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	8.95	9.16	8.69	8.67	8.47	8.84	8.87
1944	8.63	8.67	8.59	8.54	8.69	9.10	9.09
1945	7.44	7.35	7.40	7.47	7.55	8.14	8.78
1946	8.80	8.66	8.73	8.75	8.71	8.64	8.60
1947	7.22	7.35	7.33	7.46	7.88	8.08	9.02
1948	8.01	7.90	8.06	8.39	8.52	9.05	9.00
1949	7.32	7.37	7.43	7.98	8.89	9.13	8.86
1950	8.50	8.37	8.47	9.73	9.43	8.91	9.56
1951	8.73	8.68	9.03	8.90	8.06	8.94	8.98
1952	8.46	8.77	9.00	9.03	9.13	8.96	9.06
1953	7.63	7.35	7.42	7.47	7.71	8.28	8.67
Average	8.15	8.15	8.20	8.40	8.53	8.73	8.95

Year	May	June	July	Aug.	Sept.	Annual	
1943	9.60	9.21	9.11	8.99	8.78	8.95	
1944	8.97	8.80	8.36	7.86	7.60	8.58	
1945	8.88	8.92	8.75	8.72	8.68	8.17	
1946	8.59	8.78	8.77	8.15	7.65	8.57	
1947	9.14	9.00	8.64	8.23	8.20	8.13	
1948	8.94	8.89	8.84	8.44	7.81	8.49	
1949	8.99	9.22	9.42	9.07	8.54	8.52	
1950	8.79	8.84	9.02	8.96	8.87	8.95	
1951	8.92	8.81	8.86	8.77	8.63	8.84	
1952	8.96	8.94	8.70	8.48	8.11	8.80	
1953	8.84	8.68	8.21	7.93	7.50	7.97	
Average	8.97	8.92	8.79	8.51	8.22	8.62	

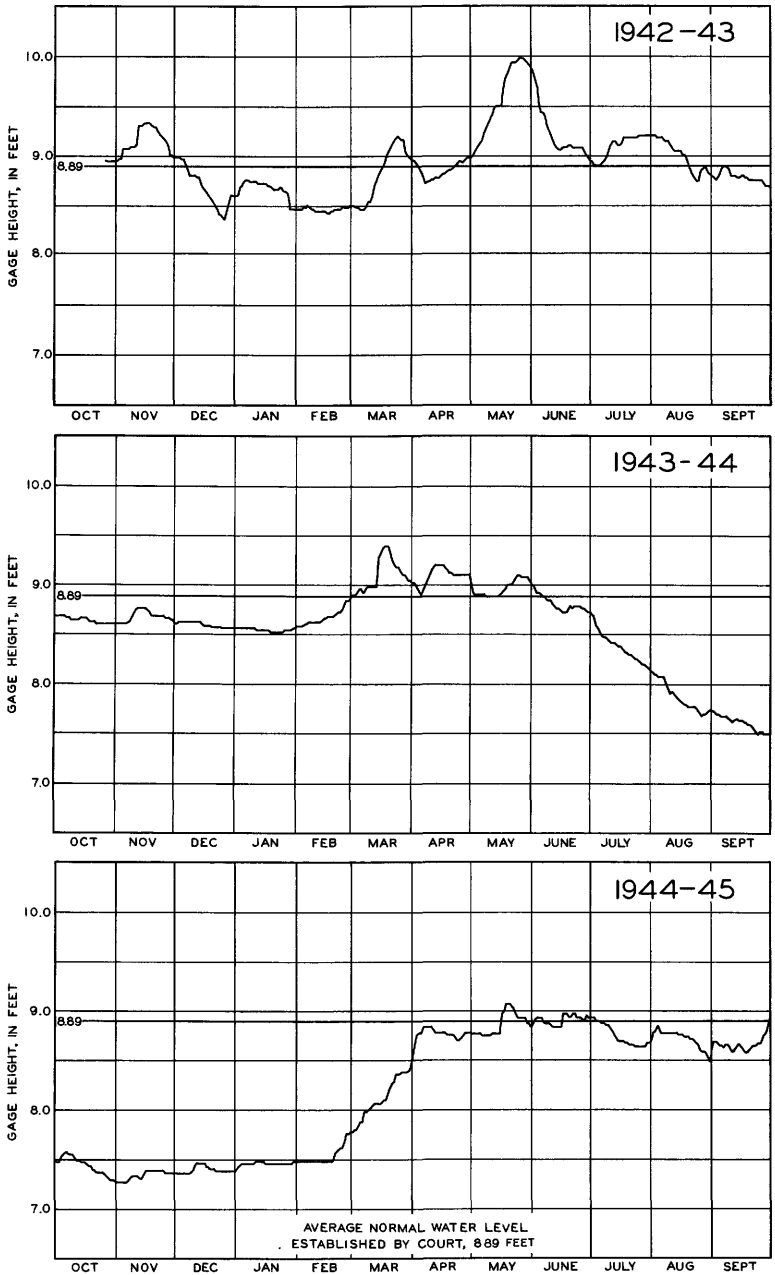

Figure 128.--Lake-level hydrographs for Lake Wawasee near Wawasee, Ind., for water years 1943-45.

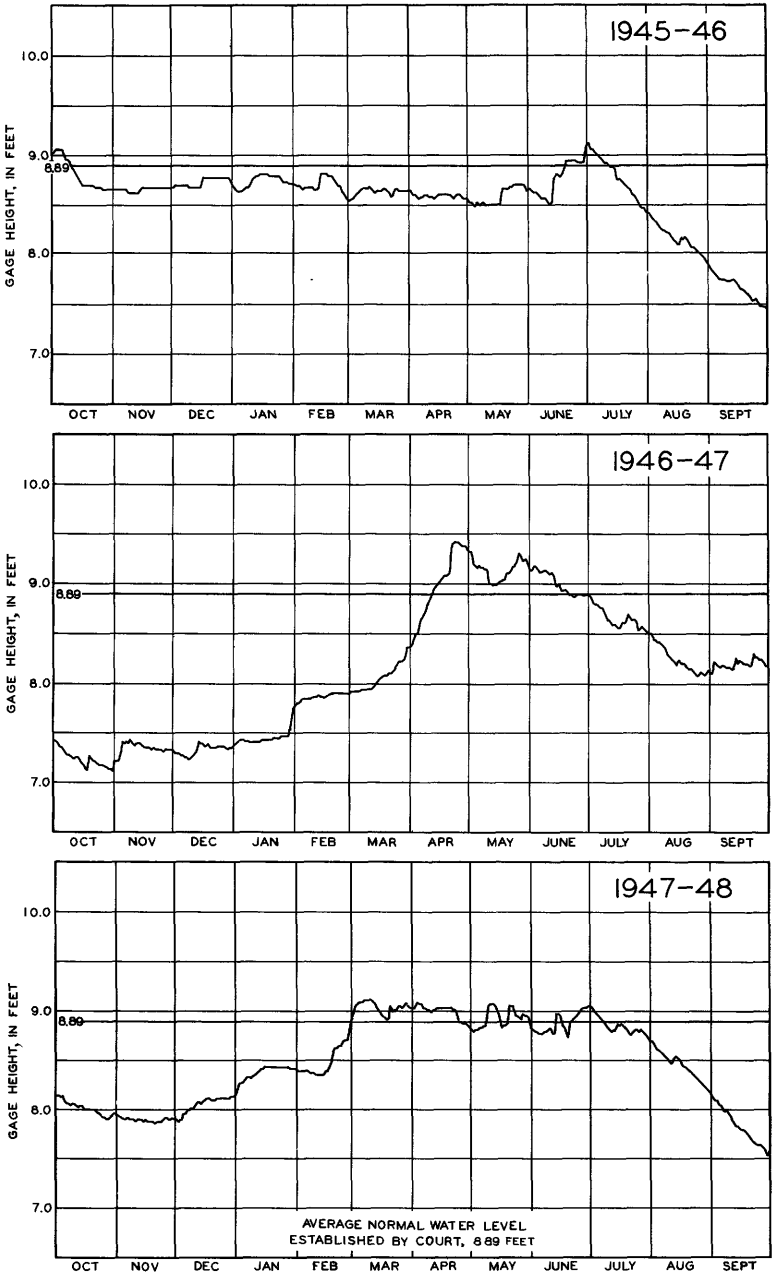

Figure 129.--Lake-level hydrographs for Lake Wawasee near Wawasee, Ind., for water years 1946-48.

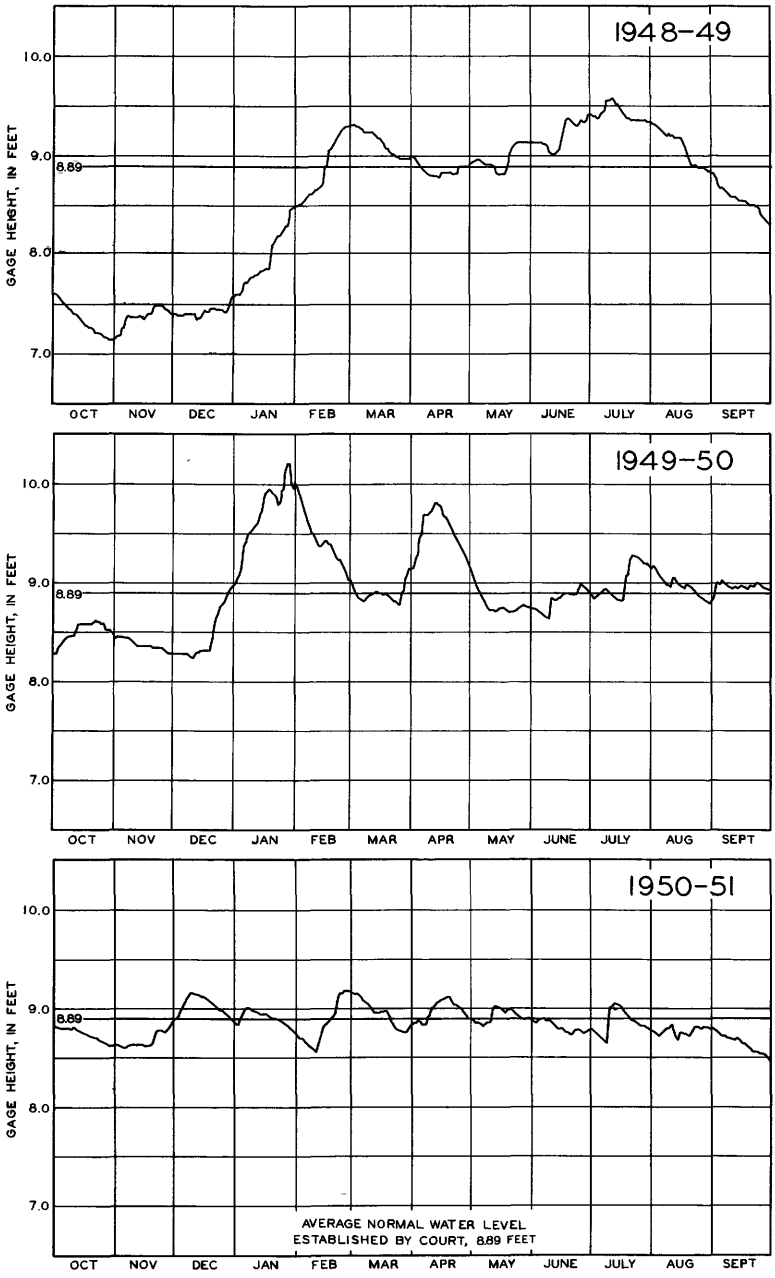

Figure 130.--Lake-level hydrographs for Lake Wawasee near Wawasee, Ind., for water years 1949-51.

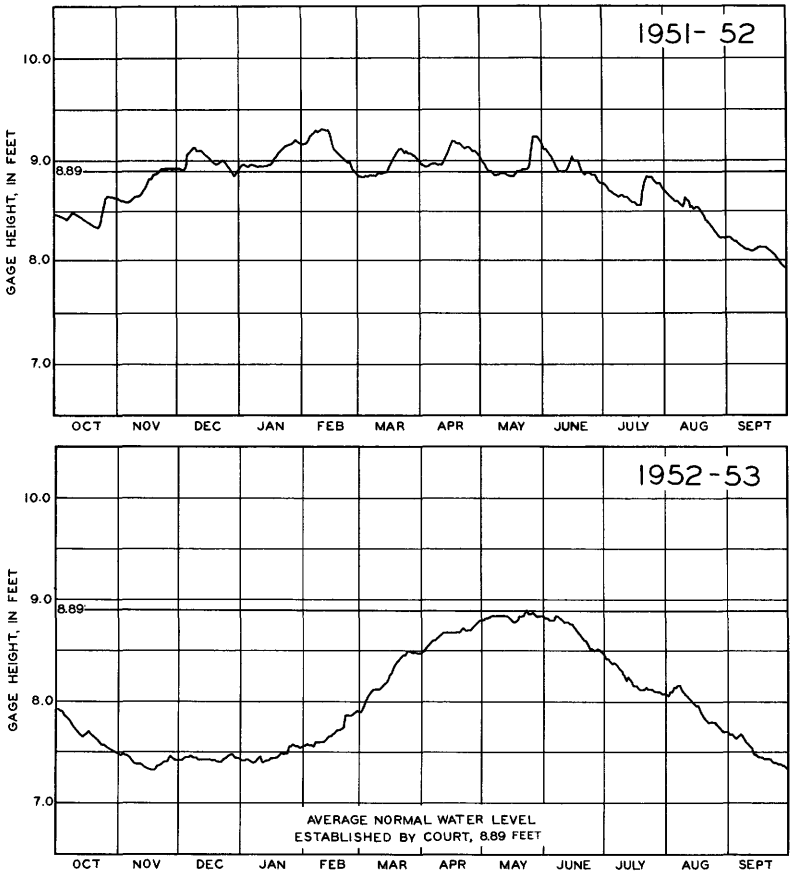

Figure 131.--Lake-level hydrographs for Lake Wawasee near Wawasee, Ind., for water years 1952-53.

Webster Lake at North Webster, Ind.

Location. --Secs. 10, 11, 12, 13, 14, and 15, T. 33 N., R. 7 E., Kosciusko County.

Surface area. --566 acres.

Drainage area. --54.0 sq mi.

Records available. --October 1942 to September 1953.

Gage. --Staff gage in lake bed on west shore front of Weghorst cottage. Auxiliary gage on abutment of concrete control structure at southwest corner of lake. Gage read to hundredths once daily. Datum of gage is 840.00 ft above mean sea level, datum of 1929.

Average lake level. --11 years; gage height, 12.41 ft; elevation, 852.41 ft.

Established legal level. --None.

Lake level control. --Lake level controlled by two outlet structures. Main structure is 35-ft concrete notch dam, with seven 5-ft wooden, adjustable sluice gates resting on the sill at gage height 9.5 ft. The auxiliary structure is 20-ft concrete notch dam with five 4-ft wooden adjustable sluice gates resting on the sill (this structure is the old mill dam) at gage height 8.2 ft.

Extreme levels for Webster Lake, 1943-53

Maximum			Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943	Mar. 20, May 19, 1943	13.51	Aug. 24, 1943	12.27
1944	May 16, 1944	13.51	Feb. 1-5, 1944	*10.75
1945	June 18, Aug. 5-6, 1945	13.27	Dec. 10, 1944	11.01
1946	Oct. 11, Dec. 31, 1945, Feb. 16, 1946	13.33	Sept. 30, 1946	*11.55
1947	June 1, 1947	13.11	Oct. 17, 1946	11.43
1948	May 11, 12, 1948	13.17	Oct. 25, 26, 1947	11.17
1949	June 18, 1949	13.39	Oct. 21-24, 1948	11.25
1950	Apr. 5, 1950	13.26	Feb. 5, 1950	11.38
1951	Dec. 7, 1950	13.32	Oct. 20, 1950	11.94
1952	Jan. 3, 1952	13.24	Sept. 30, 1952	10.58
1953	May 26, 1953	13.04	Oct. 4 to Nov. 14, 1952	*10.16

*Estimated.

Maximum recorded thickness and periods of ice cover 1943-53

Water year	Maximum thickness (inches)	Total days of cover	Period
1943	-----	-----	Dec. 6, 1942, to Jan. 1, 1943; Jan. 3, 1943, to - ?
1944	2	-----	
1945	-----	-----	Dec. 2, 1944, to - ?
1946	12	91	Dec. 6, 1945, to Mar. 6, 1946.
1947	14	107	Dec. 17, 1946, to Apr. 3, 1947.
1948	18	104	Nov. 30 to Dec. 3; Dec. 12, 1947, to Mar. 20, 1948.
1949	6¼	73	Dec. 19-21; Dec. 26, 1948, to Mar. 5, 1949.
1950	5	-----	Dec. 9-21, 1949; Jan. 19 to Mar. 26, 1950.
1951	10	-----	Dec. 11, 1950, to - ?
1952	-----	105	Dec. 14, 1951, to Mar. 27, 1952.
1953	-----	-----	Unknown to Mar. 10, 1953.

Discharge measurements at outlet of Webster Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 14, 1943 -	12.49	23.4	June 20, 1946 -	12.96	94.4
Oct. 7-------	11.99	54.3	July 19 ------	12.35	[a]42.8
Jan. 8, 1944 -	10.97	50.0	Feb. 19, 1947 -	12.74	25.8
Apr. 22 ------	13.09	224	Jan. 19, 1950 -	11.92	261
June 13, 1945 -	13.11	63.8	Jan. 26 ------	12.37	309
Sept. 6 ------	12.40	28.6	Oct. 24 ------	12.04	[b] 4.19
May 7, 1946 -	12.56	18.6	May 10, 1951 -	12.58	33.3

[a] Leakage from gates.
[b] Combined discharge of Lake Dam, Mill Dam, and leakage.

Average lake levels for Webster Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1943	12.82	13.06	13.09	13.15	12.98	12.69	12.73
1944	11.91	11.63	11.38	10.88	10.85	11.87	13.12
1945	11.49	11.32	11.15	11.20	11.23	12.29	12.80
1946	13.23	13.24	13.21	12.86	12.80	12.69	12.66
1947	11.50	11.83	11.87	11.87	12.67	12.63	12.75
1948	11.44	11.36	11.73	12.23	12.24	12.73	12.83
1949	11.38	11.61	11.84	12.99	12.80	12.89	12.84
1950	12.81	12.76	12.29	12.18	12.19	12.10	12.47
1951	12.47	12.78	12.70	12.70	12.62	12.32	12.66
1952	12.65	12.76	12.82	12.72	12.16	12.58	12.77
1953	10.17	10.36	11.73	12.37	12.20	12.43	12.70
Average	11.99	12.06	12.16	12.29	12.25	12.47	12.76

Year	May	June	July	Aug.	Sept.	Annual	
1943	12.91	12.90	12.87	12.55	12.50	12.86	
1944	13.18	13.11	12.49	12.04	11.72	12.02	
1945	13.08	13.14	12.91	13.06	12.41	12.18	
1946	12.69	12.99	12.45	11.74	11.62	12.68	
1947	13.00	12.92	12.09	11.63	12.12	12.23	
1948	12.97	12.78	12.04	11.87	11.82	12.17	
1949	12.78	13.03	12.18	12.24	12.49	12.42	
1950	12.74	12.85	12.86	12.86	12.74	12.58	
1951	12.71	12.77	12.82	12.76	12.58	12.66	
1952	12.80	12.78	12.77	12.73	12.13	12.64	
1953	12.83	12.71	12.74	12.74	12.71	12.14	
Average	12.88	12.91	12.56	12.38	12.26	12.41	

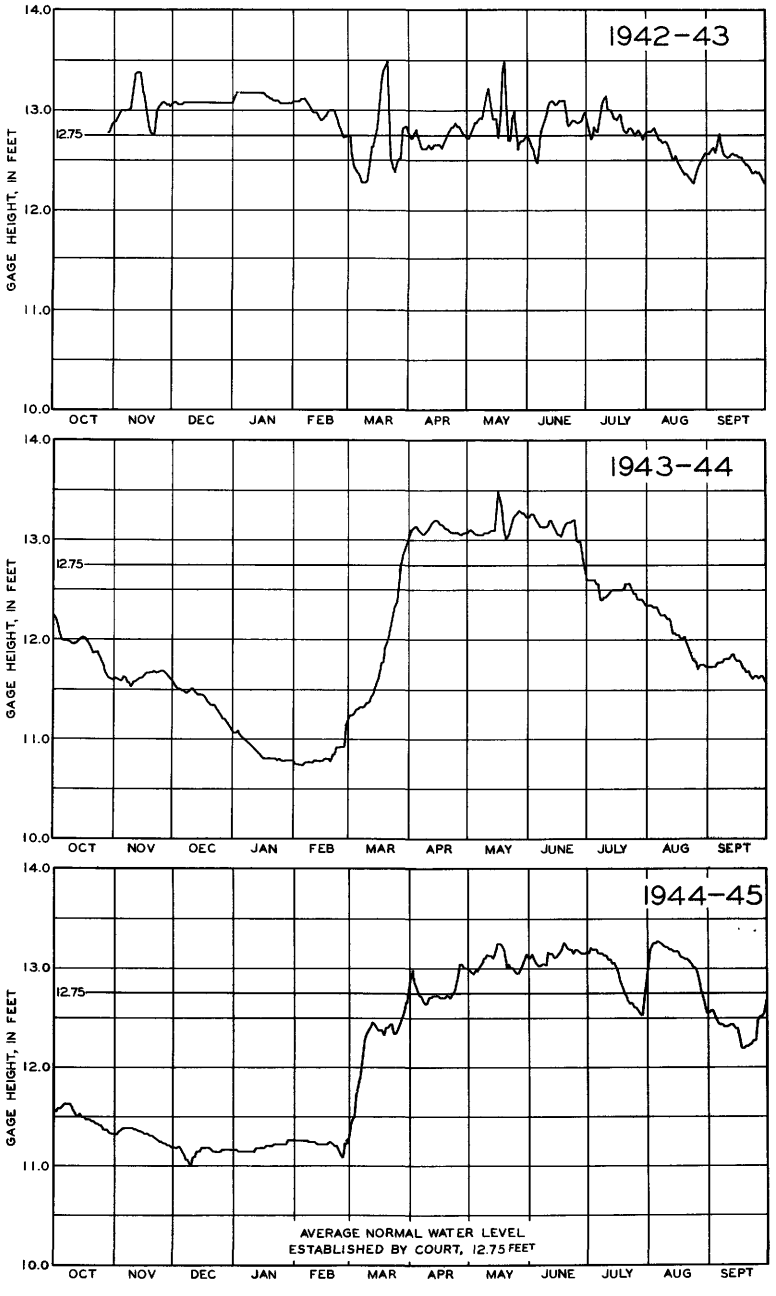

Figure 132.--Lake-level hydrographs for Webster Lake at North Webster, Ind., for water years 1943-45.

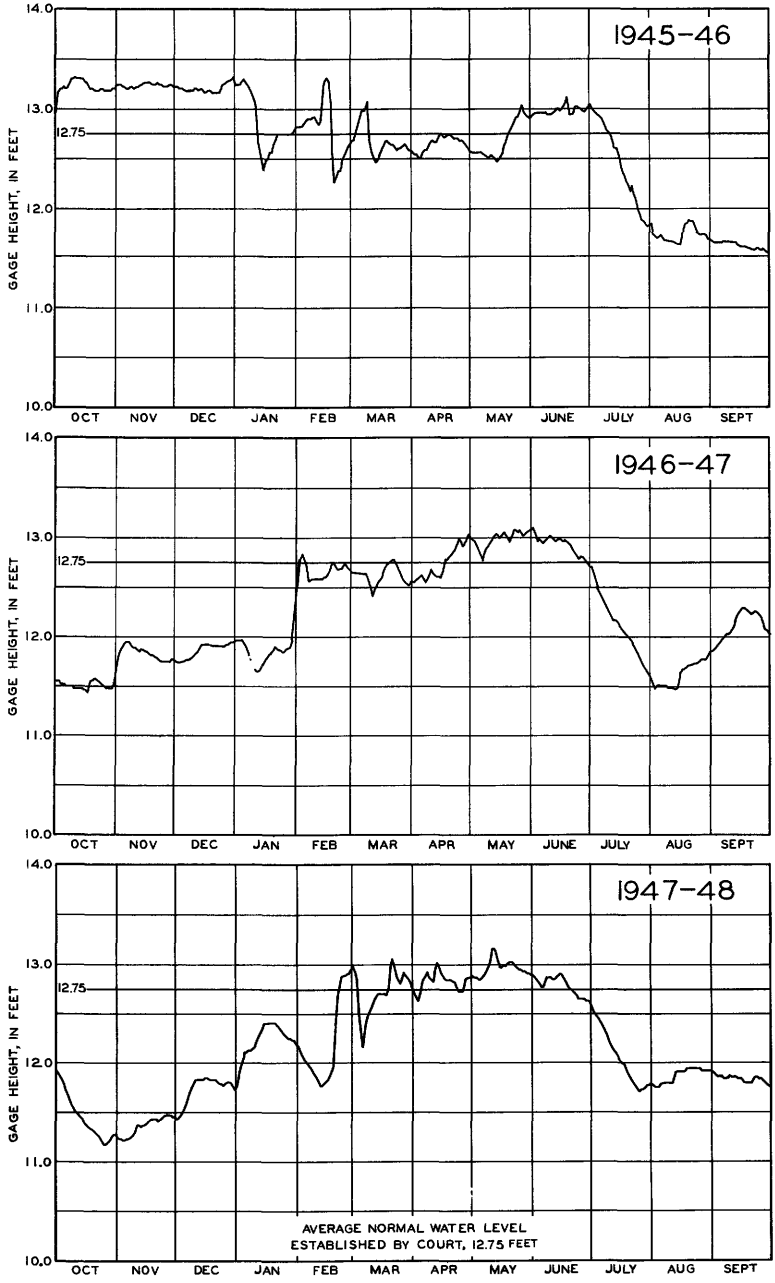

Figure 133. --Lake-level hydrographs for Webster Lake at North Webster, Ind., for water years 1946-48.

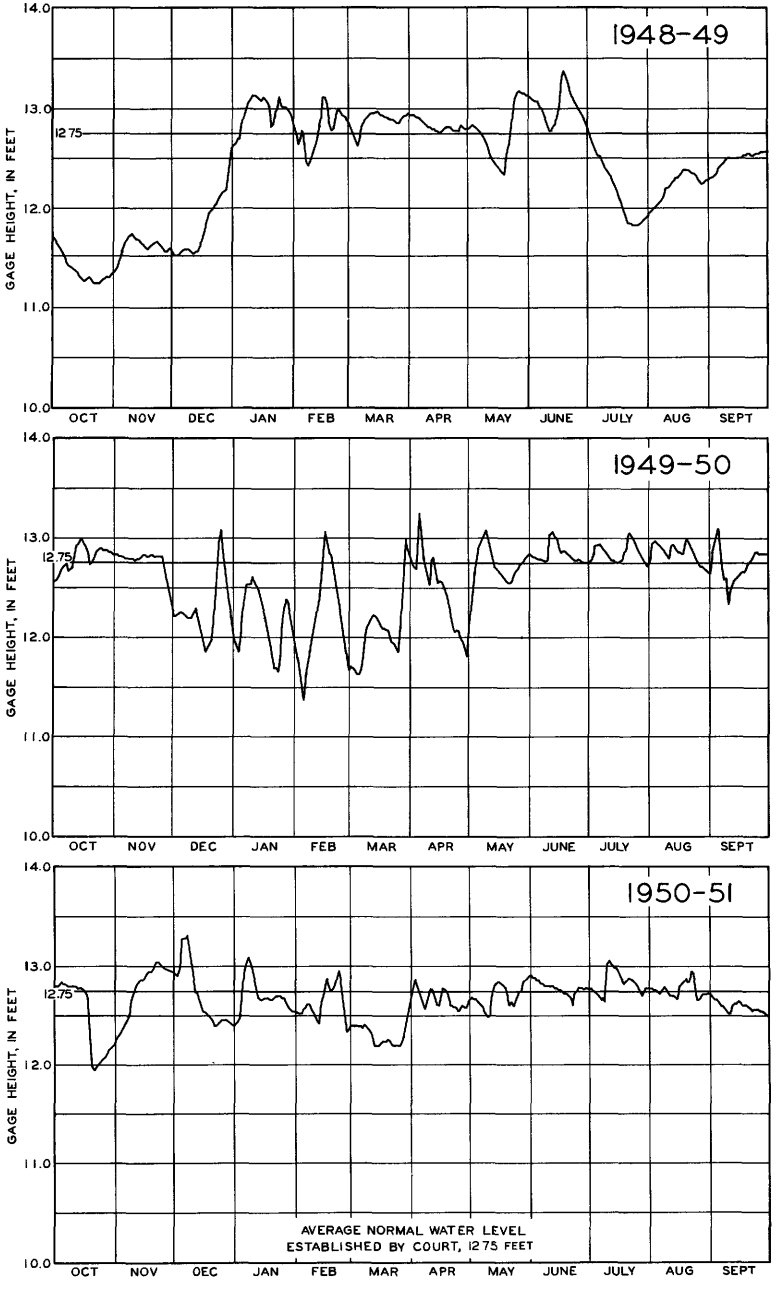

Figure 134.--Lake-level hydrographs for Webster Lake at North Webster, Ind., for water years 1949-51.

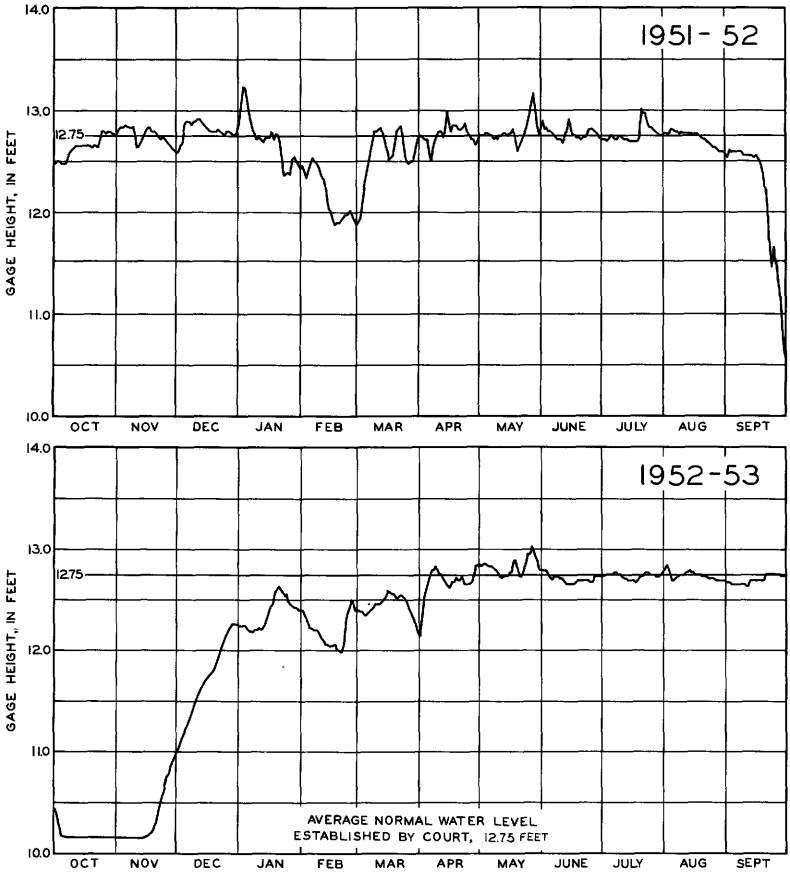

Figure 135. --Lake-level hydrographs for Webster Lake at North Webster, Ind., for water years 1952-53.

Winona Lake at Warsaw, Ind.

Location. --Secs. 15, 16, 17, 21, and 22, T. 32 N., R. 6 E., Kosciusko County.

Surface area. --529 acres.

Drainage area. --32.1 sq mi.

Records available. --August 1943 to September 1953.

Gage. --Staff gage on outlet dam abutment at west end of lake. Gage read to hundredths once daily. Datum of gage is 810.00 ft above mean sea level, datum of 1929.

Average lake level. --10 years; gage height, 1.00 ft; elevation, 811.00 ft.

Established legal level. --Established June 17, 1949, at gage height 1.06 ft; elevation, 811.06 ft above mean sea level.

Lake level control. --Lake level controlled by concrete dam built in 1937-38. When gate (12-in board) is raised sill is 20 ft long and at gage height 0.00 ft; when gate is in place sill is 24 ft long and at gage height 1.00 ft.

Extreme levels for Winona Lake, 1944-53

	Maximum		Minimum	
Water year	Date	Gage height (feet)	Date	Gage height (feet)
1943 [a]	Aug. 4, 1943	1.25	Sept. 29, 30, 1943	[a]0.83
1944	Apr. 13, 1944	2.36	Jan. 9-20, 1944	.20
1945	May 18, 1945	2.26	Feb. 2-5, 1945	.16
1946	Oct. 2, 1945	2.18	May 2, 4, 1946	.32
1947	Feb. 1, 1947	2.05	Oct. 2, 1946	.30
1948	Mar. 1, 1948	1.72	Feb. 10-12, 1948	.32
1949	Feb. 17, 1949	2.32	Mar. 20, 21, 1949	.54
1950	Apr. 5, 1950	2.90	June 6, 1950	.64
1951	July 12, 1951	2.10	Feb. 10, 1951	.47
1952	May 26, 1952	2.04	Oct. 1, 2, 1951	.79
1953	Mar. 16, 17, 1953	1.44	Sept. 27-30, 1953	.42

[a]August through September.

Maximum recorded thickness and periods of ice cover 1944-53

Water year	Maximum thickness (inches)	Total days of cover	Periods
1944	------	-----	Dec. 15, 1943, to - ?
1945	------	-----	
1946	3	73	Dec. 23, 1945, to Mar. 5, 1946.
1947	12	110	Dec. 10, 1946, to Mar. 29, 1947.
1948	12	93	Nov. 30 to Dec. 3; Dec. 12-14; Dec. 22, 1947, to Mar. 19, 1948.
1949	5	70	Dec. 19, 1947, to Feb. 26, 1949.
1950	8	64	Dec. 9-11, 16-24, 1949; Jan. 19 to Feb. 7, 1950; Feb. 22 to Mar. 25, 1950.
1951	8	74	Dec. 15, 1950, to Feb. 28, 1951.
1952	6	89	Dec. 14, 1951, to Mar. 11, 1952.
1953	4	48	Jan. 5, 1953, to Feb. 21, 1953.

Discharge measurements at outlet of Winona Lake

Date	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge (cfs)
Aug. 4, 1943-	1.25	31.6	Oct. 31, 1947-	1.30	10.3
Oct. 6 ------	.76	8.58	Dec. 17------	.62	28.8
Jan. 6, 1944-	.24	7.11	Feb. 19, 1948-	1.20	73.4
Apr. 21 ------	1.49	122	Mar. 2------	1.70	99.6
June 12, 1945-	1.29	17.7	Mar. 25------	1.32	78.9
Sept. 10 ------	1.26	23.7	May 7------	1.11	36.7
Nov. 26 ------	.43	17.1	May 13------	1.61	112
Apr. 19, 1946-	.42	14.8	Sept. 28------	.64	1.76
May 27 ------	.62	32.2	Nov. 30------	.70	[a] 3.52
June 20 ------	1.28	94.2	Jan. 4, 1949-	1.58	35.9
June 24 ------	.78	45.8	Feb. 8------	.84	47.9
June 27 ------	.99	[a] 1.72	Mar. 22------	.57	[a] 25.5
June 29 ------	1.30	12.8	May 3------	1.08	5.47
July 2 ------	1.48	27.0	June 27------	1.50	43.8
July 19 ------	1.14	5.31	Aug. 31------	.99	6.11
Aug. 6 ------	1.17	3.99	Nov. 18------	1.10	6.03
Aug. 26 ------	1.09	1.79	Dec. 14------	.96	36.3
Oct. 23 ------	.60	[a] .42	Jan. 14, 1950-	2.38	[a] 212.0
Nov. 21 ------	1.22	5.68	Jan. 20------	1.68	115
Dec. 16 ------	1.34	12.4	Jan. 24------	1.62	112
Jan. 8, 1947-	1.28	10.1	Jan. 31------	1.88	130
Feb. 4 ------	1.86	67.6	Mar. 14------	1.56	106
Feb. 18 ------	.48	20.4	Apr. 14------	2.02	161
Apr. 22 ------	1.58	123	May 2------	.94	62.2
July 30 ------	1.10	[a] 5.19	May 8, 1951-	.67	[a] 30.1
Aug. 28 ------	1.06	4.18			

[a] Leakage.

Average lake levels for Winona Lake for water years 1943-53

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1944	0.64	0.65	0.55	0.21	0.35	0.84	1.41
1945	.83	.90	.72	.21	.34	.66	.84
1946	.96	.50	.47	.79	.80	.81	.45
1947	.48	1.20	1.27	1.41	.82	.52	1.08
1948	1.18	.83	.74	.64	.69	1.10	1.04
1949	.76	.85	1.10	1.46	1.44	.81	.89
1950	1.17	1.02	1.29	2.03	1.51	1.52	1.73
1951	.90	.98	1.02	1.02	1.24	.96	1.44
1952	1.07	1.27	1.04	1.55	1.44	1.56	1.48
1953	.87	1.03	.79	.97	1.08	1.22	1.15
Average	.89	.92	.90	1.03	.97	1.00	1.15

Year	May	June	July	Aug.	Sept.	Annual
1943	----	----	----	*1.08	0.97	*1.03
1944	1.17	1.04	0.76	.60	.63	.74
1945	1.07	1.33	1.20	1.36	1.32	.90
1946	.54	.93	1.23	1.12	.98	.80
1947	.81	1.12	1.14	1.05	1.20	1.01
1948	1.16	1.16	1.07	1.01	.73	.95
1949	1.05	1.30	1.10	1.02	1.02	1.06
1950	.90	1.09	.94	1.12	1.12	1.28
1951	.94	1.11	1.34	1.06	.89	1.07
1952	1.31	1.30	1.06	.87	.87	1.23
1953	1.15	.99	.64	.62	.47	.91
Average	1.01	1.14	1.05	.99	.93	1.00

*Partial month or partial year.

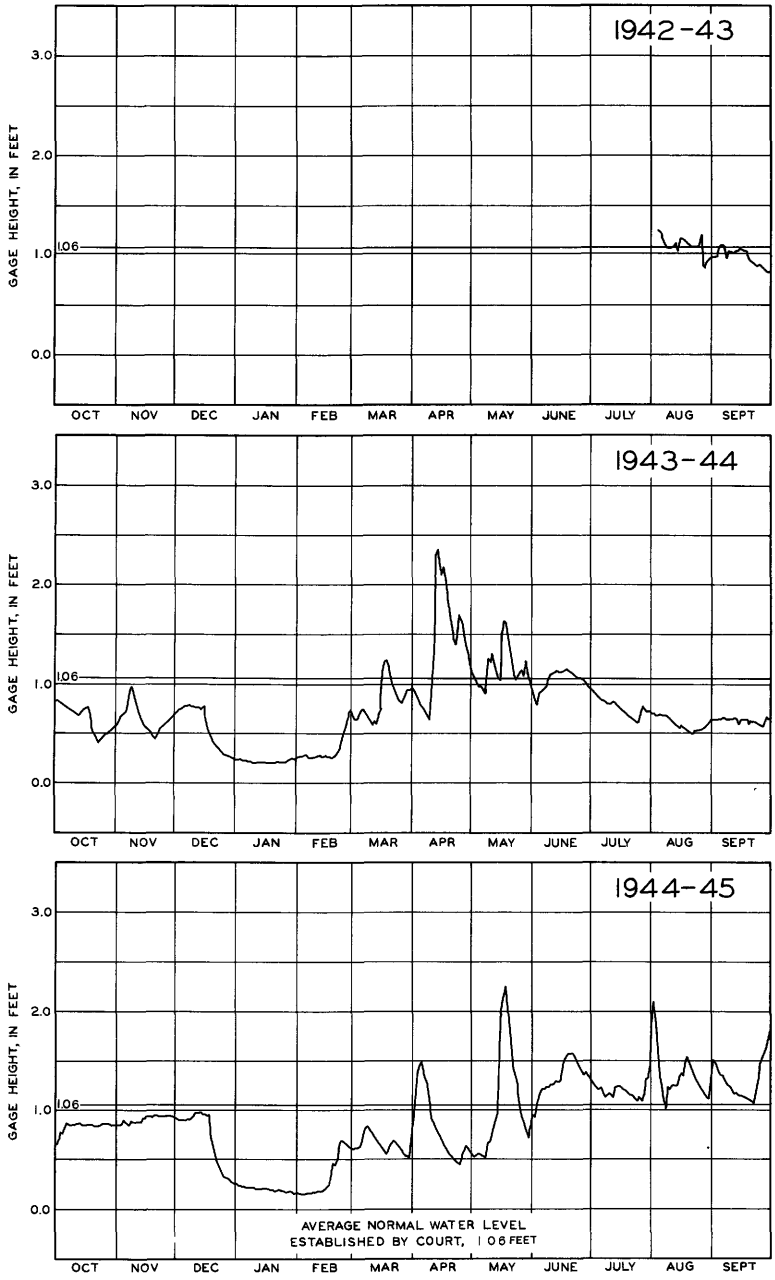

Figure 136.--Lake-level hydrographs for Winona Lake at Warsaw, Ind., for water years 1943-45.

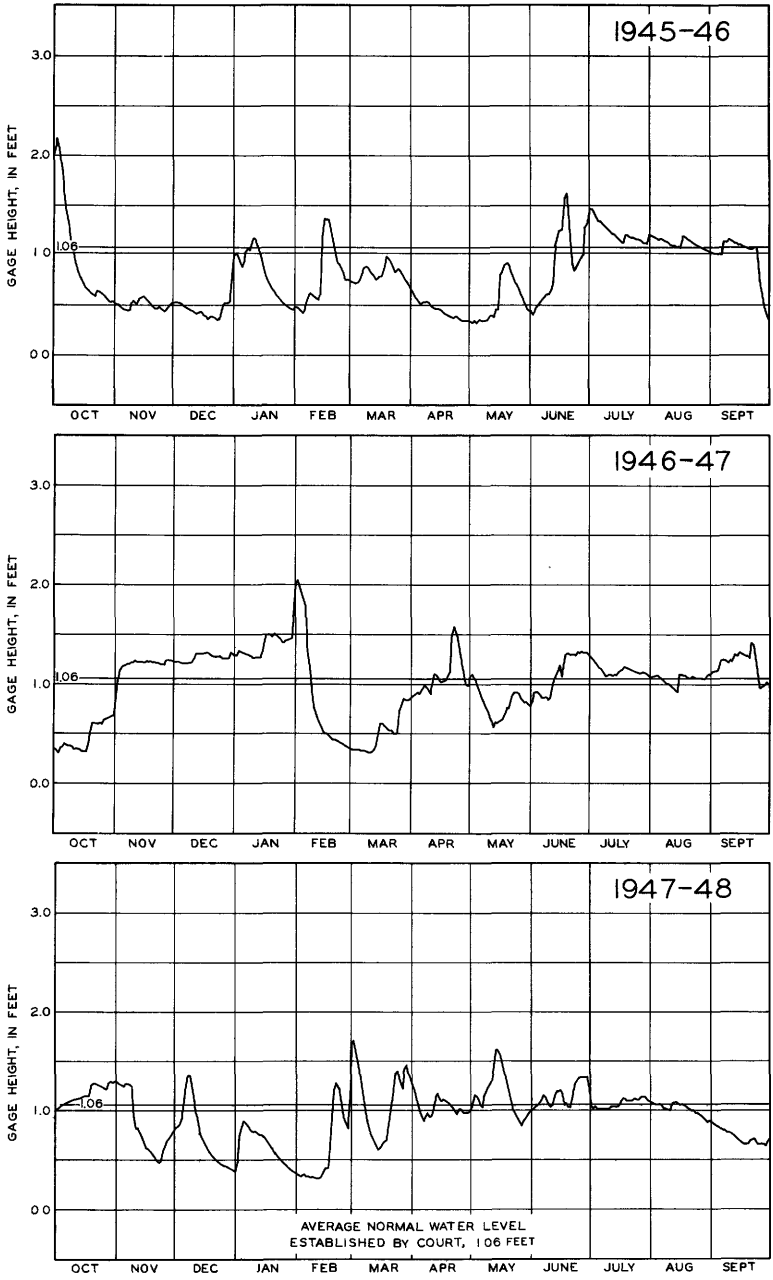

Figure 137. --Lake-level hydrographs for Winona Lake at Warsaw, Ind., for water years 1946-48.

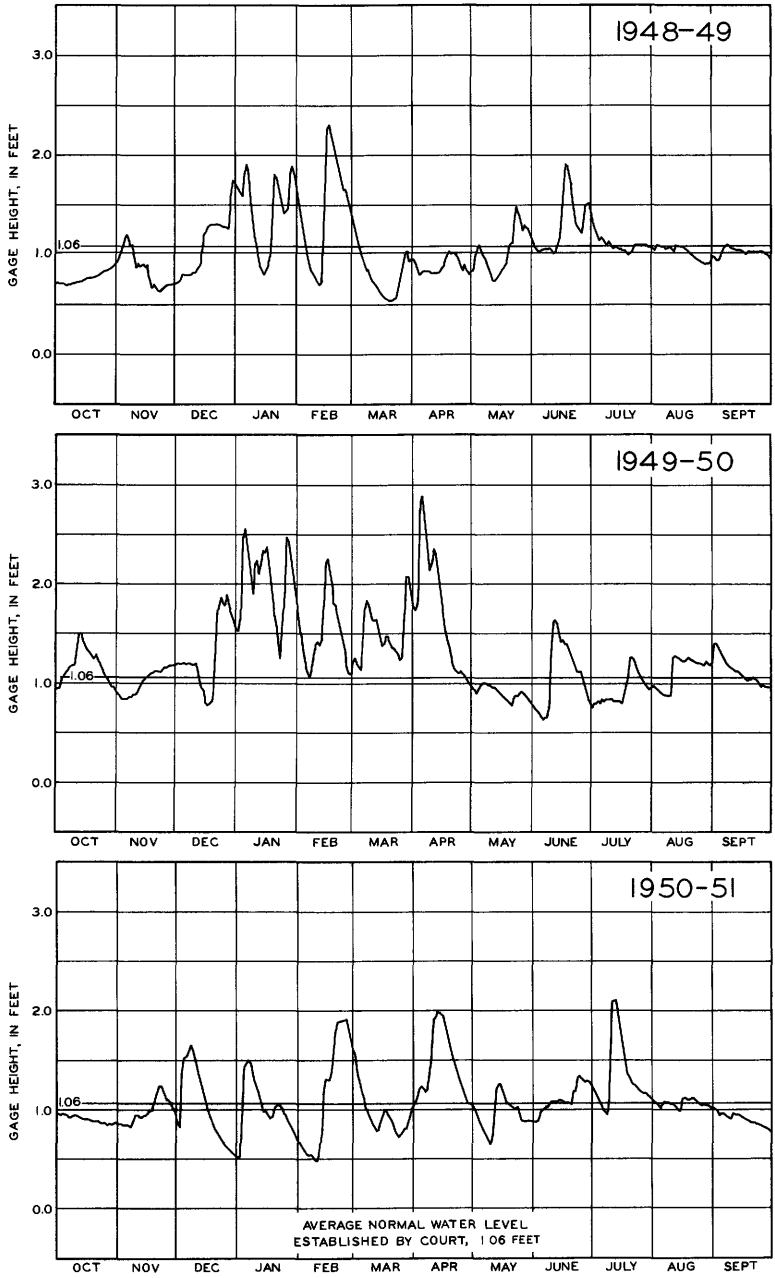

Figure 138.--Lake-level hydrographs for Winona Lake at Warsaw, Ind., for water years 1949-51.

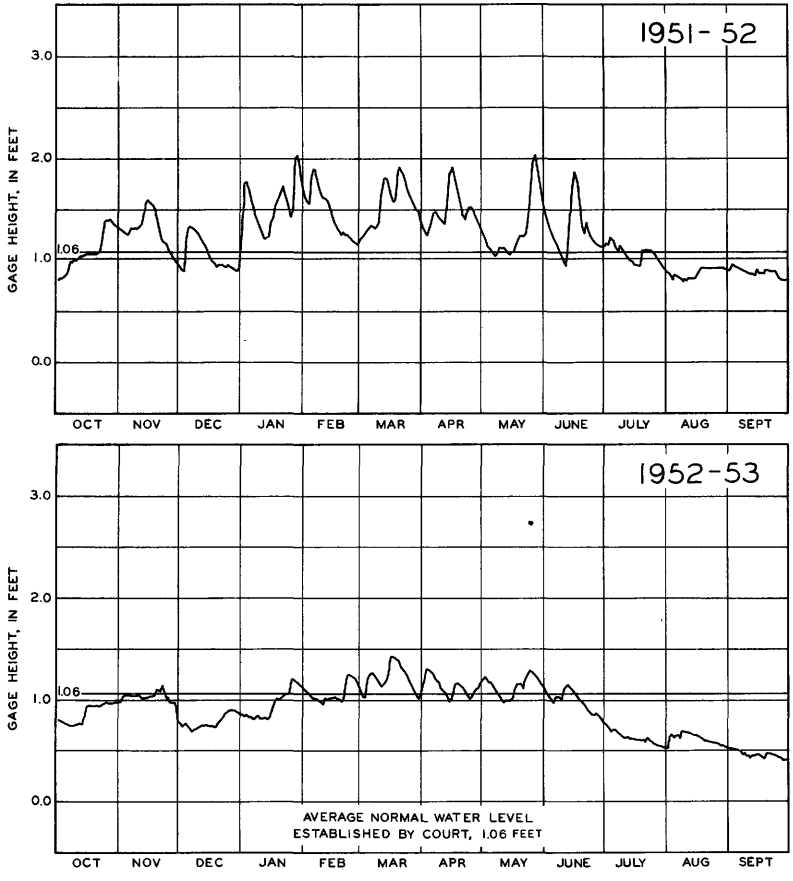

Figure 139.--Lake-level hydrographs for Winona Lake at Warsaw, Ind., for water years 1952-53.

LEGAL LAKE LEVELS

The data contained in this section was gathered and tabulated by the Division of Water Resources, Indiana State Department of Conservation and the U. S. Geological Survey. Table 1 was furnished by C. H. Bechert, Director, Division of Water Resources, Department of Conservation and represents the status of the lakes as of September 30, 1953, except for the establishment of the average normal water level which is as of December 31, 1954.

The drainage areas and surface areas of the lake were determined from aerial photographs taken in 1938 by the Agricultural Adjustment Administration except where suitable maps were available.

The lake gages were established by the U. S. Geological Survey and daily gage readings to hundredths, for the periods indicated, are available from its Indianapolis district office. The "established normal level" and "established high-water mark" shown in the table were established under the provisions of Chapter 350 of the Acts of 1947, State of Indiana.

Chapter 290 of the Acts of 1951 provides another procedure for the raising and (or) maintaining the water level of the public fresh-water lakes of Indiana. Under the provisions of this act 20 percent or more of the property owners of land abutting upon or being within 440 yards of the shore or water line of any lake containing 10 or more acres, may petition the Circuit or Superior Court of the county in which the greatest area of the lake lies, to raise or maintain the water level of the lake by constructing a control dam or other works. Although the 1951 law provides another means of establishing the water levels of the public lakes of Indiana the levels requested in the petition under this law usually conform to the average normal water level established under Chapter 350 of the acts of 1947.

Chapter 350 of the Acts of 1947, Indiana State Legislature authorizes and empowers the Indiana Department of Conservation to establish, by appropriate monuments, the average normal water level of all of the natural and artificial lakes of the State. Such water-level monuments shall fix the average normal water levels of the lakes and shall indicate the highest point to which the water of the lake shall have arisen during the 10 years prior to the passage of the act on March 14, 1947.

The lake-level monuments are permanent concrete markers, 18 inches square and 15 inches high. A bronze reference marker on which its elevation above sea level is stamped is set in the top of the monument and the elevation of the marker above mean sea level is shown in the column in the table headed "Elevation of lake level monument table".

Under the 1947 law the Conservation Department submits a petition containing factual data supporting the average normal water level that it proposes to establish as the legal water level of the lake to the Circuit Court having jurisdiction over the lake area. After proper public notice is given a hearing is held by the Court, and after presentation of evidence either in support of or against the recommendations of the Indiana Department of Conservation an order is issued establishing the water level of the lake.

When the normal (legal) level is established, the findings and the judgements of the court are recorded in a Lake-Level Record kept in the recorder's office of each county having lands draining into the lake. A like record is kept by the Indiana Department of Conservation and a copy is submitted to the Indiana Flood Control and Water Resources Commission.

Under the provisions of Chapter 350 of the Acts of 1947 the Indiana Department of Conservation is further authorized to construct or supervise the construction of dams or control works to maintain the average normal water level established by the Court.

Table 1. --Summary of legal lake levels

Name of lake	County	Drainage area (sq mi)	Surface area (acres)	Date gage established	Date gage discontinued	Petition filed in court		Established normal level		Established high water mark		Date elevations established by court	Elevation lake-level monument tablet, (ft)	Type of control structure
						No.	Date	Sea-level datum	Staff gage	Sea-level datum	Staff gage			
Adams	Lagrange	5.69	267	11- 7-45	----------	320	9-13-49	953.59	3.59	954.30	4.30	12-17-49	958.74	Fixed v-crest, one flood gate.
Attwood	Lagrange	1.31	156	10-16-47	11-30-52	488	3-14-51	899.99	9.99	900.50	10.50	8-27-51	906.06	
Bantam	Kosciusko	.33	12	Same level as Barbee L.		25,562	9-13-49	837.50	7.50	838.47	8.47	10-18-49	843.66	
Barbee, Big	Kosciusko	41.4	249	Same level as Barbee L.		25,562	9-13-49	837.50	7.50	838.47	8.47	10-18-49	843.66	
Barbee, Little	Kosciusko	44.0	56	Same level as Barbee L.		25,562	9-13-49	837.50	7.50	838.47	8.47	10-18-49	843.66	
Barbee Lakes	Kosciusko	46.5	659	Same level as Sawmill L.		25,562	9-13-49	837.50	7.50	838.47	8.47	10-18-49	843.66	
Bass	Starke	3.66	1,405	9- 5-45 10-27-42	9-30-49 ----------	15,327	11-28-47	713.65	13.65	714.04	14.04	8-10-48	----------	Fixed crest with notch.
Baugher	Noble	36.4	20	8-16-45	10-31-50	17,320	7- 1-54	878.52	8.52	880.24	10.24	10- 7-54	----------	
Bear	Noble	6.12	125	11-20-42	----------	------	------	------	------	------	------	------	----------	
Beaver Dam	Kosciusko	1.89	137	4-15-47	11-30-52	25,563	9-13-49	868.95	8.95	869.91	9.91	10-18-49	----------	
Big (a)	Noble	6.77	204	8- 3-43	----------	14,439	------	897.83	7.83	902.76	12.76	------	----------	Concrete sill.
Big Turkey	Steuben	34.6	424	8-13-45	----------	3,463	8-27-51	926.61	6.61	929.92	9.92	6-16-52	934.79	
Bixler	Noble	3.63	112	5- 4-45	----------	16,182	7-26-50	963.65	3.65	965.21	5.21	4-25-52	966.56	Fixed v-crest two flood gates.
Blackman	Lagrange	1.4	60.6	6- 3-53	----------	------	------	------	------	------	------	------	----------	
Blue	Whitley	3.47	236	12- 6-45	----------	14,231	6- 5-48	850.28	10.28	851.39	11.39	6-29-48	----------	Fixed crest.
Bower	Steuben	87.5	24	10- 3-45	----------	------	------	------	------	------	------	------	----------	
Bruce	Fulton	5.19	202	8- 5-43	11-30-52	18,353	5-25-50	723.69	3.69	724.90	4.90	6-20-50	----------	Fixed crest.
Carr	Kosciusko	2.56	64	1- 3-47	9-30-52	24,977	6-25-48	848.88	8.88	849.44	9.44	9-20-48	859.06	
Cedar	Lake	8.05	805	8- 9-43	----------	------	------	------	------	------	------	------	695.83	
Cedar	Lagrange	1.66	108	9-23-48	1- 9-51	411	7-27-50	871.90	1.90	872.24	2.24	4-22-52	----------	
Cedar	Whitley	1.62	131	Same level as Round L.		14,230	6- 5-48	901.90	1.90	902.82	2.82	6-29-48	----------	
Cedar	Dekalb	21.8	27	10-29-42 8- 2-43	9-30-49 ----------	22,115	7-26-50	896.76	6.76	900.58	10.58	4- 8-53	----------	Concrete sill, movable gage.
Center	Kosciusko	.75	112	9- 6-45	----------	------	------	------	------	------	------	------	----------	
Chapman, Big and Little	Kosciusko	17.6	526	9-19-45	----------	25,570	9-13-49	827.75	7.75	828.29	8.29	10-18-49	831.25	
Clear	LaPorte	.35	112	10-24-45	----------	22,085	4-12-49	798.20	8.20	799.06	9.06	8-31-49	801.58	
Clear	Steuben	7.25	765	Same level as Round L.		2,932	4-11-49	1,037.38	7.38	1,039.08	9.08	6- 1-50	1,042.17	
Cree	Noble	4.90	54	5-17-49	----------	16,216	9-20-50	945.23	5.23	947.73	7.73	8- 5-52	----------	
Crooked	Steuben	11.9	733	10-10-45	----------	2,724	5-21-48	988.17	8.17	988.84	8.84	6-17-48	----------	
Crooked	Whitley	1.32	172	8-12-43	11-30-52	14,229	6- 5-48	905.69	5.69	906.56	6.56	6-29-48	911.81	
Crystal	Kosciusko	.38	58	9-10-45	1-12-51	25,564	9-13-49	789.69	9.69	790.18	10.18	10-18-49	798.02	

Dalecarlia	Lake	19.4	193	10-10-46	12-31-51	-------	-------	-------	------	-------	------	-------	-------	
Dallas	Lagrange	39.4	264	Same level as Indian L.		319	9-13-49	897.36	7.36	899.60	9.60	2- 9-54	-------	
Dewart	Kosciusko	7.88	476	9- 7-45	----------	25,565	9-13-49	867.70	7.70	868.70	8.70	10-18-49	775.22	
Diamond	Noble	2.82	96	11- 9-45	----------	-------	-------	-------	------	-------	------	-------	-------	
Eagle	Noble	1.77	59	11-15-45	7-10-48	-------	-------	-------	------	-------	------	-------	-------	
Eagle	Starke	26.2	24	10-26-45	11-30-52	15,991	7-28-50	713.25	3.25	717.02	7.02	9-27-50	720.72	
Everett	Allen	2.13	41	11-28-45	----------	-------	-------	-------	------	-------	------	-------	-------	
Fish	Kosciusko	3.59	15	12- 6-50	----------	-------	-------	-------	------	-------	------	-------	-------	
Fish	Lagrange	10.8	91	8-14-45	----------	-------	-------	-------	------	-------	------	-------	-------	
Fletcher	Fulton	.62	43	10-30-45	1-31-53	18,354	5-25-50	783.20	3.20	784.53	4.53	6-20-50	789.09	
Flint	Porter	2.88	86	8-14-46	----------	-------	-------	-------	------	-------	------	-------	-------	
Fox	Steuben	1.13	142	10- 2-42	11-30-52	3,054	9-13-49	1,018.83	8.83	1,019.10	9.10	11- 2-49	1,022.16	Fixed crest.
Gage	Steuben	17.2	324	10- 3-45	----------	2,454	5-31-47	954.25	4.25	955.24	5.24	7- 3-47	960.99	
George	Lake	124	282	8-13-46	----------	-------	-------	-------	------	-------	------	-------	-------	Fixed spillway, boards optional.
George	Steuben	12.3	488	10- 2-45	----------	2,456	5-31-47	985.28	5.28	985.78	5.78	6-17-48	988.58	Fixed spillway, movable gate.
Golden	Steuben	92.1	118	----------	----------	-------	-------	-------	------	-------	------	-------	-------	
Goose	Whitley	1.42	88	8-17-45	11-30-52	14,248	6-29-48	910.96	10.96	912.72	12.72	7-22-48	915.62	Concrete weir, board optional.
Hackenburg	Lagrange	54.8	37	8-10-45	----------	319	9-13-49	897.36	7.36	899.60	9.60	2- 9-54	-------	
Hamilton	Steuben	12.8	765	7-30-43	----------	2,455	5-31-37	898.83	8.83	899.55	9.55	7- 3-47	901.20	Fixed overflow, movable gate.
Heaton	Elkhart	8.78	69	11- 6-45	11-30-52	26,015	7-28-50	767.30	7.30	768.58	8.58	9-25-30	774.47	
Hill	Kosciusko	.56	60	8-15-52	----------	-------	-------	-------	------	-------	------	-------	-------	
Hoffman	Kosciusko	7.14	145	9-18-45	11-30-52	24,979	6-25-48	785.85	5.85	789.23	9.23	9-20-48	792.33	
Hogback	Steuben	106	121	10- 9-45	----------	-------	-------	-------	------	-------	------	-------	-------	
Horseshoe	Noble	1.39	15	8-15-45	----------	17,321	7- 1-54	901.80	1.80	904.44	4.44	10- 7-54	-------	
Hovey	Posey	3.60	252	11-25-49	----------	-------	-------	-------	------	-------	------	-------	-------	
Hudson	LaPorte	3.06	293	10-23-45	----------	22,089	4-12-49	763.09	3.09	764.60	4.60	8-31-49	767.56	
Hunter	Elkhart	.72	94	11- 7-45	11-30-52	26,017	7-27-50	856.90	6.90	857.94	7.94	9-25-50	-------	
Indian Lakes	Lagrange	55.8	652	Same level as Hackenburg		319	9-13-49	897.36	7.36	899.60	9.60	2- 9-54		
Indiana	Elkhart	.53	127	11- 6-45	11-30-52	26,016	7-27-50	759.73	9.73	760.32	10.32	9-25-50	767.82	
Irish	Kosciusko	45.7	135	Same level as Barbee L.		25,562	9-13-49	837.50	7.50	838.47	8.47	10-18-49	843.66	
James	Steuben	43.0	1,034	10-29-42	9-30-49	2,453	5-31-47	964.96	4.96	966.56	6.56	7- 3-47	971.67	
Jimerson	Steuben	47.0	346	10- 9-45	----------	2,452	5-31-47	964.66	4.66	965.84	5.84	7- 3-47	967.72	Fixed spillway, emergency gate.
Jones (Sanford)	Noble	74.3	45	Same level as West L.		-------	-------	-------	------	-------	------	-------	-------	
Knapp	Noble	6.52	77	12- 5-45	----------	17,322	7- 1-54	878.25	8.25	880.50	10.50	10- 7-54	-------	
Koontz	Starke	4.74	298	10-26-42	----------	15,505	8-10-48	714.56	4.56	715.52	5.52	9-13-48	720.17	Fixed overflow, movable gates.
Kuhn, Dan	Kosciusko	3.96	103	Same level as Barbee L.		25,562	9-13-49	837.50	7.50	838.47	8.47	10-18-49	843.66	

Table 1. --Summary of legal lake levels--Continued

Name of lake	County	Drainage area (sq mi)	Surface area (acres)	Date gage established	Date gage discontinued	Petition filed in court		Established normal level		Established high water mark		Date elevations established by court	Elevation lake-level monument tablet, (ft)	Type of control structure
						No.	Date	Sea-level datum	Staff gage	Sea-level datum	Staff gage			
Lake of the Woods	Lagrange	1.0	121	5-18-51	----------	------	-------	--------	------	--------	------	--------	----------	
Lake of the Woods	Marshall	11.6	414	9-25-45	----------	24,045	7- 8-48	803.85	3.85	804.56	4.56	8- 9-48	----------	
Larwill	Whitley	.22	13.5	No Gage installed		15,054	1-10-52	896.43	------	898.93	------	4-25-52	----------	
Lilly	LaPorte	5.88	46	Same as Stone Lake		22,084	4-12-49	796.20	6.20	797.09	7.09	8-31-49	809.23	
Lime	Steuben	17.2	44	Same as Gage Lake		2,454	5-31-47	954.25	4.25	955.24	5.24	7- 3-47	960.99	
Little Otter	Steuben	19.8	88	10-11-45	12-31-52	3,224	7-27-50	965.18	5.18	966.76	6.76	10-31-50	971.45	
Little Turkey	Lagrange	56.0	124	8-13-45	----------	487	3-14-51	925.72	5.72	928.37	8.37	4-22-52	935.35	
Long	Wabash	.64	39	10-31-45	12-31-51	11,244	7-26-50	751.19	11.19	752.28	12.28	7-26-51	----------	
Long	Steuben	70.8	92	10-12-45	----------	------	--------	--------	------	--------	------	--------	----------	
Long	Porter	1.25	51	12-14-46	1-31-53	------	--------	--------	------	--------	------	--------	----------	
Loomis	Porter	.89	57	8-15-46	11-30-52	------	--------	--------	------	--------	------	--------	----------	Concrete weir, board optional.
Loon (a)	Whitley	11.2	190	10-28-42	----------	14,954	9- 51	895.14	5.14	898.95	8.95	12- 8-53	900.05	Fixed crest.
Loon	Kosciusko	2.70	37	4-15-47	11-30-52	24,981	6-25-48	865.74	5.74	866.15	6.15	9-20-48	----------	
Lower Fish	LaPorte	10.3	111	10-25-45	12-31-52	22,087	4-12-49	688.22	8.22	689.06	9.06	8-31-49	696.23	Fixed crest.
Lower Long	Noble	3.96	60	12- 5-45	12-31-52	17,323	7- 1-54	889.81	9.81	891.50	11.50	10- 7-54	----------	
Lukens	Wabash	.99	34	8- 6-48	11- 1-49	------	--------	--------	------	--------	------	--------	----------	
Manitou	Fulton	38.1	631	10-26-42	----------	18,008	6-26-48	778.41	8.41	779.25	9.25	9-27-48	780.72	Fixed-crest canal gates.
Maxinkuckee	Marshall	9.48	1,650	10-26-42	----------	24,043	7- 8-48	733.12	3.12	734.58	4.58	8- 9-48	739.47	Fixed crest.
McClures	Kosciusko	.45	26	9-20-45	12-31-52	24,978	6-25-48	865.85	5.85	866.51	6.51	9-20-48	----------	
Messick	Lagrange	55.8	55	Same as Indian Lakes		319	9-13-49	897.36	7.36	899.60	9.60	2- 9-54	----------	
Mill Pond	Marshall	4.86	28	9-26-45	11-30-52	24,046	7- 8-48	767.75	7.75	768.54	8.54	8- 9-48	772.10	Fixed sill, board optional.
Moser (a)	Wells	5.12	46	No Gage installed		19,301	--------	811.78	------	--------	------	-48	----------	
Muskelonge	Kosciusko	11.1	24	8- 5-43	11-30-52	24,982	6-25-48	842.67	2.67	845.22	5.22	9-20-48	853.40	
Myers	Marshall	1.66	86	9-26-45	11-30-52	24,044	7- 8-48	768.69	8.69	769.28	9.28	6-27-49	----------	
New	Whitley	.49	46	8-16-45	11-30-52	14,702	7-26-50	903.91	3.91	904.32	4.32	8-15-50	910.65	
North Chain	St Joseph	4.50	88	10-18-45	1-31-53	86,213	10- 2-50	721.17	1.17	722.18	2.18	12-11-50	723.99	
North Twin	Lagrange	1.99	128	5-13-53	----------	------	--------	--------	------	--------	------	--------	----------	
Nyona	Fulton	6.47	92	10-29-45	----------	18,007	6-26-48	793.91	3.91	795.68	5.68	9-27-48	----------	Fixed spillway.
Old	Whitley	3.13	32	8-18-49	----------	15,645	7- 2-54	898.07	8.07	899.74	9.74	8-18-54	----------	Fixed spillway.
Olin	Lagrange	11.3	95	Same as Oliver Lake		321	--------	899.45	9.45	900.75	10.75	9-29-52	----------	
Oliver	Lagrange	11.3	362	8-10-45	----------	321	--------	899.45	9.45	900.75	10.75	9-29-52	----------	Concrete sill, boards optional.
Pine	LaPorte	5.88	564	Same as Stone Lake		22,084	4-12-49	796.20	6.20	797.09	7.09	8-31-49	809.23	
				10-22-45	8- 6-49									
Pleasant	Steuben	.94	50	10- 8-45	----------	3,223	7-27-50	963.52	3.52	964.98	4.98	10-31-50	967.65	
Pretty	Lagrange	2.91	185	8-18-49	11-30-52	547	8-27-51	965.50	5.50	965.85	5.85	11-20-51	968.82	Concrete sill, movable beam.

								Modified elev.						
Riddles	St. Joseph	13.5	68	10-17-45	----------	87,595	4-23-51	817.50	7.50	819.46	9.46	7- 3-53	823.80	Fixed crest.
Rider	Noble	39.7	10	11-30-45	3- 3-51	-------	--------	---------	------	--------	------	---------	----------	Boards optional, mill race.
Ridinger	Kosciusko	32.5	115	8- 4-43	----------	25,361	4-11-49	843.12	3.12	848.06	8.06	6-17-49	847.14	Fixed spillway, board gate.
Ringneck	Jasper	12.0	Indefinite Swamp area	1-20-49	----------	-------	--------	---------	------	--------	------	---------	----------	
Robinson	Kosciusko	4.07	45	12-10-45	11-11-50	25,898	7-28-50	851.09	11.09	853.39	13.39	9-20-50	----------	
Rock	Kosciusko	1.78	48	8-25-49	----------	26,597	3-18-52	847.29	7.29	848.39	8.39	4-21-52	850.66	Sand bag.
Round	Steuben	7.25	28	8- 2-43	----------	2,932	4-11-49	1,037.38	7.38	1,039.08	9.08	6- 1-50	1,042.17	Concrete sill, movable beam.
Round	Whitley	3.57	125	Same level as Cedar L.		14,230	6- 5-48	901.90	1.90	902.82	2.82	6-29-48	----------	Fixed overflow.
				1-23-46	11-30-52									
Royer	Lagrange	4.91	59.7	8-14-52	----------	-------	--------	---------	------	--------	------	---------	----------	
Sand	Noble	15.0	44	11-29-45	9-10-51	17,324	7- 1-54	893.56	3.56	898.10	8.10	10- 7-54	----------	
Saugany	LaPorte	.82	71	10-24-45	10-28-50	22,088	4-12-49	791.21	11.21	792.24	12.24	8-31-49	----------	Metal culvert.
Sawmill	Kosciusko	46.5	23	9- 8-45	----------	25,562	9-13-49	837.50	7.50	838.47	8.47	10-18-49	----------	
Sechrist	Kosciusko	.66	81	Same level as Barbee L.		25,562	9-13-49	837.50	7.50	838.47	8.47	10-18-49	843.66	
Shipshewana	Lagrange	4.0	191	4- 5-51	----------	-------	--------	---------	------	--------	------	---------	----------	
Shoe	Kosciusko	.18	40	11- 1-45	11-30-52	25,566	9-13-49	841.57	1.57	842.06	2.06	10-18-49	852.47	
Shriner	Whitley	1.12	111	10-28-42	----------	14,431	4-11-49	907.04	7.04	907.56	7.56	5-22-49	910.46	Fixed overflow.
Silver	Steuben	3.72	233	10- 4-45	11-30-52	3,055	9-13-49	959.40	9.40	960.17	10.17	11- 2-49	963.54	
Silver	LaPorte	.82	54	10-23-45	----------	22,086	4-12-49	795.20	5.20	796.20	6.20	8-31-49	803.73	
Silver	Kosciusko	4.47	91	4- 1-47	----------	24,980	6-25-48	861.73	1.73	863.34	3.34	9-20-48	867.58	
Silver	Noble	.32	29	10-31-52	----------	-------	--------	---------	------	--------	------	---------	----------	
Simonton	Elkhart	4.37	245	11- 5-45	----------	26,014	7-27-50	772.19	2.19	772.72	2.72	9-25-50	----------	
Skinner	Noble	13.8	122	8-21-45	----------	-------	--------	---------	------	--------	------	---------	----------	
Skitz	Starke	Indefinite	1,400	1-15-49	3-31-53	-------	--------	---------	------	--------	------	---------	----------	
Smalley	Noble	32.6	61	8- 3-43	----------	-------	--------	---------	------	--------	------	---------	----------	
Snow	Steuben	43.0	310	Same level as James L.		2,453	5-31-47	964.96	4.96	966.56	6.56	7- 3-47	971.67	
South Chain	St. Joseph	6.00	88	10-18-45	11-30-52	86,214	10- 2-50	717.04	7.04	718.00	8.00	12-11-50	723.25	Concrete notch, boards optional.
South Mud	Fulton	4.74	87	10-30-45	----------	18,376	6-20-50	793.42	3.42	796.21	6.21	4-25-51	797.86	Fixed spillway.
South Twin	Lagrange	3.13	117	Same level as North T.		-------	--------	---------	------	--------	------	---------	----------	
Sparta	Noble	.26	24	8-22-45	1-10-51	17,325	7- 1-54	878.50	8.50	880.34	10.34	11-17-54	----------	Metal culvert.
Starve Hollow	Jackson	6.14	170	11-28-45	----------	-------	--------	---------	------	--------	------	---------	----------	Fixed spillway, emergency gate.
Steinbarger	Noble	25.2	63	Same level as West L.		-------	--------	---------	------	--------	------	---------	----------	
Stone	LaPorte	5.88	140	10-22-45	----------	22,084	4-12-49	796.20	6.20	797.09	7.09	8-31-49	809.23	
Story	DeKalb	2.48	62	11-21-45	5-11-46	-------	--------	---------	------	--------	------	---------	----------	
Sylvan	Noble	31.5	575	10-29-42	----------	15,882	4-11-49	916.20	6.20	917.44	7.44	6-14-51	921.100	Movable gates.
Syracuse	Kosciusko	37.3	367	8-14-43	----------	24,983	6-25-48	858.87	8.87	859.36	9.36	9-20-48	862.38	Fixed spillway gates, mill race.
Tippecanoe	Kosciusko	118	1,037	10-28-42	----------	25,567	9-13-49	836.40	6.40	839.43	9.43	10-18-49	845.27	Concrete weir, boards optional.

Table 1. --Summary of legal lake levels--Continued

Name of lake	County	Drainage area (sq mi)	Surface area (acres)	Date gage established	Date gage discontinued	Petition filed in court		Established normal level		Established high water mark		Date elevations established by court	Elevation lake-level monument tablet, (ft)	Type of control structure
						No.	Date	Sea-level datum	Staff gage	Sea-level datum	Staff gage			
Town	Fulton	5.62	5	5-16-49	12-31-49	------	--------	------	-----	-------	-----	----------	----------	
Troy Cedar	Whitley	5.62	94	8-23-45	8- 9-52	14,249	6-29-48	905.41	5.41	906.96	6.96	7-22-48	----------	
Upper Fish	LaPorte	10.3	101	Same level as Lower Fish		22,087	4-12-49	688.22	8.22	689.06	9.06	8-31-49	696.23	
Upper Long	Noble	2.16	77	----------	----------	------	--------	------	-----	-------	-----	----------	----------	
Village	Noble	11.5	11	11-25-52	----------	------	--------	------	-----	-------	-----	----------	----------	
Wabee	Kosciusko	13.4	180	11- 2-45	12-31-52	25,569	9-13-49	829.79	9.79	830.05	10.05	10-18-49	839.40	
Waldron	Noble	131	198	10-17-47	----------	------	--------	------	-----	-------	-----	----------	----------	
Wall	Lagrange	1.43	125	10-15-52	----------	------	--------	------	-----	-------	-----	----------	----------	
Wauhob	Porter	.29	19	8-15-46	----------	------	--------	------	-----	-------	-----	----------	----------	
Wawasee	Kosciusko	37.3	2,618	10-26-42	----------	24,976	6-25-48	858.89	8.89	859.90	9.90	9-20-48	----------	
Webster	Kosciusko	54.0	566	10-28-42	----------	27,444	7- 2-54	852.75	12.75	853.51	13.51	8-27-54	----------	Concrete notch, wooden gates.
West Lakes	Noble	131	342	Same level as Waldron L.		------	--------	------	-----	-------	-----	----------	----------	
Westler	Lagrange	37.3	81	Same level as Indian L.		319	9-13-49	897.36	7.36	899.60	9.60	2- 9-54	----------	
Wilson	Whitley	.59	28	12- 7-45	12-31-52	14,232	6- 5-48	865.39	5.39	866.85	6.85	7-22-48	875.61	Concrete weir, trapezoid notch.
Winona	Kosciusko	32.1	529	8- 4-43	----------	25,360	4-11-49	811.06	1.06	812.36	2.36	6-17-49	813.38	Concrete weir, boards optional.
Witmer	Lagrange	38.8	215	Same level as Indian L.		319	9-13-49	897.36	7.36	899.60	9.60	2- 9-54	----------	
				8- 7-45	9-30-47									
Wolf	Elkhart	.88	100	3-31-47	---------	27,674	7- 2-54	813.00	3.00	814.80	4.80	10- 7-54	----------	
Wolf	Lake	5.72	999	8-13-46	12-31-48	------	--------	------	-----	-------	-----	----------	----------	
Yellow Creek	Kosciusko	8.50	127	9-19-45	11-30-52	25,568	9-13-49	860.50	10.50	861.45	11.45	10-18-49	865.31	Concrete weir.
Zink	Fulton	.26	19	3-25-52	---------	------	--------	------	-----	-------	-----	----------	----------	

[a] Established under drainage laws.

TEMPERATURES FOR SELECTED LAKES

The data contained in this section were collected by the U. S. Geological Survey except those for Maxinkuckee Lake for the period July 1899 to June 1901 which were collected by Evermann and Clark (1920).

Surface temperature readings were generally taken near the gage location by holding a mercury or liquid-filled tube thermometer about an inch below the water surface. The readings were taken by gage observers once weekly, usually on Saturday, with occasional additional observations being made by U. S. Geological Survey engineers.

The temperature profiles in Maxinkuckee Lake collected by Evermann and Clark were taken in the deepest part of the lake in what is known as the Deep Hole. A self-registering Negretti-Zamba deep-sea thermometer was used except for the period July 18 to August 14, 1899, when a Ritchie thermophone was used.

The temperature profiles collected by the U. S. Geological Survey were taken in the deepest parts of the lakes; a Leeds and Northrup thermohm was used. The profiles in Maxinkuckee Lake were taken in the same location in the Deep Hole used by Evermann and Clark.

In July 1946 temperature profiles were taken at three different locations in each of Koontz and Ridinger Lakes to compare temperatures in different parts of the lakes. As no significant difference was found, the practice was discontinued.

An analysis of the data contained in this section will be found on p. 14.

Water surface temperatures for Bass Lake at Bass Lake, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1944		1949--Con.		1950--Con.		1951--Con.	
June 11	66	Jan. 8	36	Mar. 11	38	June 2	72
1946		15	38	17	35	9	64
July 18	84	19	34	18	38	16	68
24	85	22	35	Apr. 1	38	23	70
1947		29	34	8	40	30	68
Dec. 16	34	Feb. 5	34	15	40	July 7	72
1948		12	36	22	42	14	72
Jan. 3	33	19	35	29	46	21	72
10	33	22	35	May 6	48	28	74
17	32	26	35	13	56	Aug. 4	72
24	32	28	34	20	62	11	72
31	32	Mar. 5	43	27	62	18	70
Feb. 7	32	12	37	June 3	64	25	70
14	32	19	42	10	70	Sept. 1	74
21	32	26	45	17	64	8	72
28	32	Apr. 2	49	24	70	15	68
Mar. 6	33	9	54	July 1	72	22	68
13	34	16	52	8	74	29	60
20	54	23	52	15	72	Oct. 6	62
27	40	30	56	22	74	13	58
Apr. 3	48	May 6	73	29	72	20	58
10	48	7	62	Aug. 5	72	27	54
17	47	14	64	12	76	Nov. 3	30
24	64	21	62	19	70	10	34
May 1	62	28	64	26	72	17	36
8	62	June 4	68	Sept. 2	70	24	42
11	60	11	70	9	68	Dec. 1	48
15	64	18	74	16	66	29	34
22	64	25	74	30	68	1952	
29	64	July 2	86	Oct. 7	62	Mar. 22	37
June 5	68	9	86	14	60	29	48
12	74	16	84	21	62	31	52
19	74	23	82	28	60	Apr. 5	46
26	76	30	80	Nov. 4	50	12	44
July 10	88	Aug. 6	80	11	48	19	54
17	82	13	84	16	45	26	58
24	82	20	78	18	34	May 3	62
31	78	27	78	25	30	10	56
Aug. 7	74	Sept. 2	67	Dec. 2	34	17	60
14	78	10	66	9	34	24	58
21	75	17	68	16	34	31	68
28	85	24	72	23	32	June 7	72
Sept. 4	75	Oct. 1	60	30	34	14	75
11	75	8	62	1951		21	85
18	78	15	64	Jan. 6	32	28	82
25	69	21	64	13	32	July 12	74
Oct. 9	52	22	58	20	36	19	78
16	48	29	56	27	36	26	70
23	50	Nov. 5	49	Feb. 3	32	Aug. 2	72
30	54	12	38	10	38	9	70
Nov. 6	54	19	38	17	38	16	72
13	46	26	36	24	38	23	72
20	43	Dec. 3	32	Mar. 3	42	30	74
23	41	10	34	10	38	Sept. 6	72
27	43	17	38	17	36	13	75
Dec. 4	43	24	38	24	34	20	70
10	38	1950		31	38	27	72
11	38	Jan. 3	45	Apr. 7	42	30	64
18	38	7	38	14	44	Oct. 4	50
25	36	14	35	21	44	11	44
1949		21	35	28	54	18	48
Jan. 1	36	28	37	May 5	58	25	46
7	36	Feb. 4	38	12	62	Nov. 1	48
		11	38	19	68	8	46
		25	34	26	69	15	48
		Mar. 4	40				

Temperature profiles (°F) for Bass Lake, at Bass Lake, Ind.

Depth (feet)	1946			1947					
	July 25	Oct. 22	Nov. 19	May 1	May 27	June 19	July 23	Aug. 26	Oct. 1
Air	82	58	35	58	57.5	78	78.1	74	51
Water-surface	79	55.1	44	58	65	68.8	74.1	82.9	56
2.5	-------	-------	-------	-------	-------	68.7	-------	-------	-------
5	77.5	55	44	57.7	65	68.3	73.5	82.9	57
7.5	-------	-------	-------	-------	-------	66	-------	-------	-------
10	76.9	55.5	44.1	57.3	65	65.2	72.7	82.9	57.2
15	76.5	55.5	44	57.1	64.5	64.2	71.3	82.8	57.5
18.5	-------	-------	43.5	-------	-------	-------	-------	-------	-------
20	75.6	55.2	46.5	56.7	64.3	63.8	70.2	82.5	58.5
21	-------	-------	49.1	-------	-------	-------	-------	-------	-------
22	-------	58.8	-------	-------	-------	-------	-------	-------	-------
22.5	-------	-------	-------	-------	-------	-------	-------	80.8	-------
24	-------	59.9	-------	-------	-------	63	-------	-------	-------
25	75.3	-------	-------	56	64.2	-------	69.7	77.2	59
26	-------	-------	-------	55.8	-------	-------	-------	-------	-------
28	-------	-------	-------	-------	64.2	-------	-------	-------	63
30	74.5	-------	-------	-------	-------	-------	69.3	-------	-------
32	-------	-------	-------	-------	-------	-------	69.3	-------	-------
33	73.3	-------	-------	-------	-------	-------	-------	-------	-------

Depth (feet)	1947--Continued		1948					
	Oct. 31	Nov. 18	June 1	July 3	Aug. 3	Aug. 31	Oct. 5	Nov. 15
Air	56	41	70	71	74	70	58	52
Water-surface	59.4	39.8	70	75.1	78	79.9	57.8	44.4
2.5	-------	-------	70	-------	77.8	79	-------	-------
3	-------	-------	-------	-------	-------	-------	-------	44.5
5	59.4	39.8	69.5	75.2	77	79	57.7	-------
6	-------	-------	-------	-------	-------	-------	-------	44.6
9	-------	-------	-------	-------	-------	-------	-------	44.6
10	59.4	39.8	69	75.2	76.7	79	58	-------
12	-------	-------	-------	-------	-------	-------	-------	44
15	59	39.8	68.2	75.3	76.7	78.1	57.3	43.9
18	-------	-------	-------	-------	-------	-------	-------	43.7
20	58.2	39.8	67.7	75.3	76.3	77.4	57.2	-------
21	-------	-------	-------	-------	-------	-------	-------	43.6
22.5	58.3	39.8	-------	-------	-------	74.7	-------	-------
24	-------	40	-------	-------	-------	-------	-------	43.4
25	58.5	-------	66.8	75.2	76.2	74.2	57.2	-------
26	-------	-------	-------	-------	-------	-------	-------	43.4
27	58.5	-------	-------	-------	-------	-------	-------	-------
29	-------	-------	-------	-------	-------	73.9	57.9	-------
30	-------	-------	66.4	75.2	75.9	-------	-------	-------
32	-------	-------	-------	75.2	75.8	-------	-------	-------

Water surface temperatures for Bear Lake at Wolflake, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1948		1949--Con.		1950--Con.	
July 11	75	Aug. 5	74	Sept. 7	70	Sept. 13	70
Dec. 19	32	Dec. 16	40.5	Dec. 1	39	Oct. 18	60
						Nov. 21	40
1946		1949		1950		1951	
July 3	79	Jan. 27	34.5	Jan. 17	35	May 15	65
		Mar. 4	37	Mar. 8	35	Feb. 2	36
1947		Apr. 27	61.5	May 4	56	May 6	53
Apr. 28	55						
June 8	73						

Water surface temperatures for Big Lake near Wolflake, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1948--Con.		1949--Con.		1950--Con.	
July 11	67	Nov. 4	55	Dec. 19	35	June 20	75
Sept. 6	78					Sept. 13	72
Nov. 28	38	1949		1950		Oct. 17	58
Dec. 17	30	Jan. 21	34	Jan. 27	35	26	57
		27	34.5	Feb. 7	35	Nov. 1	59
1946		Mar. 9	37	22	35	21	40
May 15	61	31	47	Mar. 24	35	May 15	63
		Apr. 27	64.5	Apr. 8	40	Feb. 2	36.5
1948		Sept. 6	75	May 3	54		
June 3	74.5	Dec. 1	42				

Water surface temperatures for Bixler Lake at Kendalville, Ind.

Date	Temperature (°F)
1945	
Oct. 1	58
Dec. 29	32
1946	
Jan. 11	35
Feb. 14	34
Mar. 2	41
Apr. 11	49
June 15	67
22	69
26	78
July 1	81
Aug. 28	73
1947	
Dec. 18	34
1948	
Jan. 3	33
10	33
17	33
24	33
28	36
29	34
30	34
31	34
Feb. 1	34
2	34
3	34
4	34
5	34
6	34
7	34
8	34
9	34
10	34
11	34
12	35
13	35
14	35
15	34
16	34
17	34
18	34
19	34
20	34
21	35
22	35
23	36
24	36
25	37
26	37
27	37
28	37
29	37
Mar. 1	34.5
Oct. 29	48
Nov. 20	39
27	40
Dec. 4	42
11	32
16	39
18	33
25	32
1949	
Jan. 1	32
8	35
15	36
22	34
29	33
Feb. 1	34.5
5	34
12	35
19	37
26	37
Mar. 5	37
12	39
19	39
26	45
Apr. 2	50
9	52
16	51
22	52
23	53

Date	Temperature (°F)
1949--Con.	
Apr. 30	61
May 5	65
7	68
14	69
21	65
28	71
June 4	76
11	75
18	79
25	79
July 2	89
9	82
16	83
23	84
30	82
Aug. 6	81
20	78
27	79
Sept. 3	75
9	62
10	71
17	69
24	59
Oct. 1	62
8	72
14	63
15	64
22	60
29	57
Nov. 5	48
12	57
19	45
26	37
Dec. 2	37
3	35
10	33
17	33
24	36
31	36
1950	
Jan. 7	35
14	36
21	34
28	37
Feb. 4	34
11	36
18	33
25	33
Mar. 4	34
11	36
15	35
18	35
25	37
Apr. 1	39
8	43
15	40
22	46
28	48
May 6	55
13	59
20	68
26	67
27	70
June 3	67
10	73
17	76
24	74
July 1	73
8	79
15	77
22	76
29	77
Aug. 1	77
5	78
12	77
19	75
26	77
Sept. 2	76
9	72
16	71
23	66
30	65
Oct. 7	63
15	60

Date	Temperature (°F)
1950--Con.	
Oct. 21	64
28	57
Nov. 4	50
11	43
18	44
25	34
Dec. 2	34
9	33
16	33
23	33
30	33
1951	
Jan. 6	34
13	34
20	36
27	33
Feb. 3	33
10	33
17	34
24	37
Mar. 3	37
10	40
17	39
24	37
31	40
Apr. 7	45
14	44
21	48
28	51
May 5	65
12	68
19	77
26	67
June 2	72
9	68
16	77
23	75
30	75
July 7	76
10	75
14	78
21	78
28	79
Aug. 4	80
11	80
18	76
25	73
30	81
Sept. 1	73
8	71
15	67
22	63
29	63
Oct. 6	62
13	60
20	57
27	54
Nov. 3	48
10	42
17	41
20	38
24	38
Dec. 1	40
8	42
15	35
20	30
22	34
29	34
1952	
Jan. 5	35
12	35
19	35
26	34
Feb. 2	35
7	28
9	35
16	35
23	36
Mar. 1	38
8	42
22	40
29	42
Apr. 5	44

Date	Temperature (°F)
1952--Con.	
Apr. 12	45
19	54
26	63
May 3	69
10	63
17	57
24	61
31	68
June 7	78
14	77
21	80
28	85
July 5	88
12	86
19	79
26	82
Aug. 2	82
9	75
16	78
23	75
30	78
Sept. 6	72
13	78
20	68
Oct. 19	56
25	56
Nov. 1	56
8	55
15	53
22	42
29	35
Dec. 6	35
13	34
20	35
27	33
1953	
Jan. 3	32
10	31
17	34
24	37
31	42
Feb. 6	37
7	38
14	40
21	35
28	41
Mar. 2	37
7	36
14	45
21	48
26	40
27	40
28	45
Apr. 4	45
11	48
16	48
18	47
25	50
May 2	54
9	63
16	65
23	67
30	72
June 4	71
6	73
13	76
20	84
26	85
July 4	85
6	78
11	80
18	78
25	82
Aug. 1	84
8	80
15	80
22	82
26	83
29	84
Sept. 5	79
12	64
19	67
26	73

Temperature profiles (°F) for Bixler Lake, Kendallville

Depth (feet)	1946			1947			
	Aug. 28	Oct. 16	Nov. 21	Jan. 8	Mar. 27	Apr. 28	May 26
Air	----------	64	60	32	47	59	61.5
Water-surface	73.2	59.5	47.2	34.6	37.5	52.1	63.4
2.5	----------	----------	----------	36.1	37.3	52.2	----------
5	73.2	59.5	47.2	36	37.1	51.7	63.4
7.5	----------	----------	----------	----------	----------	51.7	----------
10	73.2	59.5	47.1	35.9	37.1	51.7	63.4
12.5	----------	----------	----------	----------	----------	51.7	----------
15	72.9	59.4	47.2	36	37.1	50.7	62.9
17.5	----------	----------	----------	----------	----------	50.6	----------
20	69.7	59.5	47.2	36.1	37.3	50.3	60.4
25	62.5	59.6	47	36.3	37.5	50.2	53.3
30	60.6	59.9	47	37	37.4	50.1	52.7
35	60.1	60.4	47	37.6	37.4	50	52.8
36	----------	----------	----------	38.1	37.4	50	----------
36.5	59.6	----------	48.5	----------	----------	----------	----------
37	----------	61.9	----------	----------	37.8	50	52.7
37.5	----------	----------	----------	----------	----------	49.6	----------

Depth (feet)	1947--Continued						1948
	June 24	July 7	Aug. 27	Oct. 9	Oct. 30	Nov. 19	June 5
Air	60	78.8	104	59	53	43	82
Water-surface	69.6	76.6	83.8	64	61.4	44	73.8
2.5	----------	----------	----------	----------	----------	----------	73
5	69.6	76.5	82.8	63.7	61.2	44	71.7
10	69.6	76.5	82.5	63.4	61.2	43.9	68.9
12.5	----------	----------	80.7	----------	----------	----------	----------
15	68.8	70.2	73.5	63.1	61	43.8	66.3
17.5	65.5	----------	68.5	----------	----------	----------	----------
20	62.2	66.9	65.2	63.1	61	43.8	60.8
22.5	----------	----------	----------	----------	----------	----------	64
25	58.6	59.6	60.1	62.3	61	43.8	59.5
30	56	57	58.2	61	61	43.6	57
32.5	----------	57	----------	----------	----------	----------	----------
35	----------	----------	57	59.4	61	43.6	55.3
36	54.4	----------	----------	----------	----------	----------	----------
37	----------	----------	----------	----------	61	----------	55.1
37.5	53.5	----------	56.6	----------	----------	43.6	----------
39	----------	----------	----------	57.7	----------	----------	----------

Depth (feet)	1948--Continued					
	July 1	Aug. 4	Sept. 1	Oct. 8	Nov. 18	Dec. 9
Air	64	60	65	46	45	28
Water-surface	74.8	74.5	78.5	59.2	46.2	38.9
2.5	----------	----------	78.5	----------	45.8	----------
5	74.6	74.5	77.5	59.2	46.1	38.5
7.5	----------	----------	----------	----------	46.3	----------
10	74.5	74.5	77.2	59.2	46.4	37.3
15	74.3	74.3	76.4	59.2	46.4	38.3
17.5	67.8	73.3	70	----------	46.4	----------
20	63.4	66.1	66.3	59.2	46.4	39.5
22.5	60.8	----------	----------	----------	46.3	----------
25	59.4	59.5	61	59.2	46.3	38.8
30	57.7	57.8	58.5	59	46.4	39.3
32.5	----------	----------	----------	----------	46.4	----------
35	56.7	56.9	57.5	58.8	46.4	38.5
36	----------	----------	57.2	----------	----------	38.8
37	----------	56.6	----------	----------	----------	39.5
37.5	56.4	----------	----------	----------	----------	----------

Water surface temperatures for Bruce Lake at Lake Bruce, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1948--Con.		1949--Con.		1951--Con.	
June 12	64	Feb. 7	25	Aug. 27	78	Mar. 31	45
1946		14	24	Sept. 3	76	Apr. 7	46
July 18	88	21	28	10	65	14	47
20	77	28	30	17	62	21	50
27	66	Mar. 6	30	24	56	28	59
29	87	13	28	Oct. 1	68	May 5	70
Aug. 3	84	20	46	8	63	12	60
10	75	27	45	15	62	19	74
17	72	Apr. 3	44	21	64	26	68
24	64	8	57	22	54	June 2	76
31	72	10	52	27	55	9	68
Sept. 7	80	17	50	Nov. 5	44	16	70
14	63	24	56	12	62	23	68
21	60	May 8	62	19	42	30	72
28	63	13	58	26	36	July 7	75
Oct. 5	58	15	64	Dec. 3	34	14	74
12	54	22	62	10	40	21	73
26	55	29	65	17	40	28	76
Nov. 2	57	June 5	70	24	38	Aug. 4	68
9	50	12	68	31	37	11	78
16	48	19	70	1950		18	68
23	41	July 3	78	Jan. 7	33	25	68
30	38	10	78	14	35	Sept. 1	75
Dec. 7	44	17	78	21	34	8	63
14	39	24	70	28	35	15	70
21	42	31	78	Feb. 4	31	22	65
28	40	Aug. 7	78	11	35	29	52
1947		14	70	18	36	Oct. 6	61
Jan. 4	36	21	75	25	43	13	54
11	38	28	80	Mar. 4	33	20	45
18	42	Sept. 4	74	11	34	27	52
25	40	11	70	16	35	Nov. 3	42
Feb. 1	30	18	68	18	32	10	44
8	33	25	62	25	43	17	44
15	37	Nov. 2	54	Apr. 1	42	24	48
22	40	3	55	8	42	Dec. 1	38
Mar. 1	41	4	58	15	48	8	42
8	40	5	58	22	53	15	38
15	38	6	54	29	46	22	37.5
22	40	7	55	May 6	64	29	38
29	42	8	57	13	76	1952	
Apr. 5	47	9	52	20	65	Jan. 5	37
12	50	10	51	27	62	12	44
19	52	13	45	June 3	67	19	36
26	45	20	45	10	72	26	42
May 3	42	27	42	17	71	Feb. 2	45
10	45	Dec. 4	42	24	78	9	45
17	62	11	45	July 1	76	16	40
24	65	17	38	7	78	23	44
31	62	18	35	15	84	Mar. 1	44
June 7	65	25	35	22	72	8	43
14	65	1949		29	83	15	42
21	62	Jan. 1	35	Aug. 5	76	22	42
28	78	8	39	12	74	29	49
July 5	70	12	35	19	70	Apr. 5	39
12	73	15	42	26	75	12	46
19	65	22	46	Sept. 2	75	19	58
26	72	29	35	9	70	26	64
Aug. 2	70	Feb. 5	33	16	66	May 3	70
9	75	12	32	23	63	10	58
16	75	19	38	30	65	17	54
23	80	22	38	Oct. 7	62	24	65
30	76	26	38	14	58	31	65
Sept. 6	70	Mar. 5	39	21	60	June 7	72
13	70	12	38	28	55	14	70
20	68	19	45	Nov. 4	46	21	62
27	65	21	50	11	38	28	80
Oct. 4	60	26	48	18	45	July 5	78
11	55	Apr. 2	53	24	36	12	74
18	54	9	59	25	32	19	70
25	53	16	45	Dec. 2	33	26	78
Nov. 1	52	23	62	9	33	Aug. 2	71
8	44	25	55	16	32	9	75
15	45	30	58	23	33	16	72
19	40	May 7	62	30	33	23	62
22	44	14	42	1951		30	75
29	31	21	59	Jan. 6	33	Sept. 6	65
Dec. 6	32	28	72	13	33	13	72
13	30	June 4	76	20	40	20	62
20	33	11	79	27	40	27	67
27	32	18	75	Feb. 3	33	Oct. 4	52
31	36	25	78	10	33	11	44
1948		July 2	84	17	34	18	42
Jan. 3	32	9	82	24	39	25	45
10	32	16	78	Mar. 3	41	Nov. 1	45
17	29	23	84	10	43	8	42
24	26	30	79	17	44	15	45
31	22	Aug. 6	80	24	42	22	41
		13	78			29	40
		20	75				

Water surface temperatures for Cedar Lake at Cedar Lake, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1947--Con.		1948--Con.		1949--Con.	
June 7	62	Nov. 1	55	Nov. 6	52	Oct. 22	60
		8	40	13	50	29	58
1946		15	42	20	45	Nov. 5	58
July 24	83	22	42	24	39.5	12	60
Aug. 26	76	29	32	27	43	19	50
Oct. 5	58	Dec. 6	35	Dec. 4	48	26	31
12	55	13	34	10	34	Dec. 3	36
19	48	16	33	11	34	10	40
26	55	20	33	18	35	17	38
Nov. 2	58	27	34	25	34	24	38
9	50						
16	50	1948		1949		1950	
23	35	Jan. 3	33	Jan. 1	34	Jan. 7	38
30	36	10	34	8	37	14	40
Dec. 7	38	17	33	15	40	21	33
28	33	24	33	22	36	28	36
		Feb. 7	34	29	34	Feb. 4	34
1947		14	34	Feb. 5	33	11	36
Jan. 11	36	21	36	12	38	18	38
18	33	28	37	19	36	25	36
Feb. 1	34	Mar. 6	36	21	33.5	Mar. 4	48
8	33	13	33	26	38	11	40
22	34	20	40	Mar. 5	38	18	42
Mar. 1	36	27	45	12	36	25	36
8	34	Apr. 3	42	19	36	Apr. 15	38
15	36	24	55	26	42	22	40
22	36	May 1	58	Apr. 16	40	29	45
29	34	15	55	23	48	May 6	50
Apr. 5	45	22	60	30	55	13	55
12	45	29	60	May 7	60	20	58
19	48	June 5	68	14	65	27	56
May 31	58	12	66	21	62	June 3	60
June 7	65	19	65	June 4	70	6	61
14	65	26	66	11	72	16	81
28	73	July 3	70	18	74	24	75
July 5	72	10	78	25	77	8	74
12	74	17	76	July 2	84	15	76
19	72	24	70	9	80	22	68
26	76	31	73	23	75	29	70
Aug. 2	74	Aug. 2	77	30	78	Aug. 5	66
9	78	14	71	Aug. 6	75	12	70
16	78	21	75	13	76	19	68
23	90	Sept. 4	74	20	75	26	70
30	75	11	68	27	76	Nov. 6	45
Sept. 6	72	18	70	Sept. 3	72		
13	74	25	60	10	67	1951	
20	70	Oct. 4	61	24	64	May 21	75
27	55	9	49	Oct. 8	63		
Oct. 11	60	16	55	15	62	1953	
18	65	30	55	17	63	Jan. 20	34
25	60						

Temperature profiles (°F) for Cedar Lake, at Cedar Lake

Depth (feet)				1946			
	Aug. 26	Oct. 21	Nov. 18	Jan. 6	Feb. 17	May 1	May 27
Air	84	59.5	36	25	30.5	65	56.9
Water-surface	75.5	55.4	44	33.7	33.7	57	62.5
2.5	----------	----------	----------	36.1	37	57	----------
5	73.6	55.7	44	36.5	37.5	56.8	62.5
7.5	----------	----------	----------	37.3	----------	56.2	----------
10	72	55.5	44	38.1	39	55.4	62.5
11	----------	55.5	----------	----------	----------	----------	----------
12.5	----------	----------	----------	----------	40.5	55.3	----------
13	71.2	----------	44.4	39.1	----------	----------	----------
14.5	----------	----------	----------	----------	40.9	----------	----------
15	----------	----------	----------	----------	----------	54.3	----------
15.5	----------	----------	----------	----------	----------	----------	62.1

Temperature profiles (°F) for Cedar Lake, at Cedar Lake--Continued

Depth (feet)	1947						1948
	June 16	July 23	Aug. 25	Oct. 1	Oct. 28	Nov. 18	Jan. 30
Air	87	75.5	98	57	56	35	25
Water-surface	68	75.5	85.9	58.5	62.1	39.2	35.4
2.5	65.9	---------	85.6	---------	62.3	---------	---------
5	63.7	73.6	84.8	58.1	62.3	39.2	40
7.5	62.5	---------	84.7	---------	62	---------	---------
10	62.3	71	82.5	56.5	61.8	38.9	40.4
12.5	62	---------	81	---------	61.8	39	---------
13.5	---------	---------	---------	---------	61.8	---------	---------
14.5	---------	---------	79.3	58	---------	39	---------
15	61.4	71	---------	---------	---------	40.5	41.3

Depth (feet)	1948						
	June 1	July 2	Aug. 2	Aug. 30	Oct. 4	Nov. 15	Dec. 31
Air	54	81	77	76	---------	45	32
Water-surface	67.4	75.8	79.2	82.3	60.9	42.6	34.7
2.5	66.1	---------	77.3	82.3	---------	42.8	34.1
5	65.8	75.4	77.2	82.4	61.2	42.2	33.5
7.5	65.8	---------	---------	82	---------	41.8	34.3
10	65.8	75.3	76.9	80.5	61.2	41.8	35.2
12	---------	---------	76.4	---------	---------	41.7	---------
12.5	64.1	---------	---------	78.2	---------	---------	36
13	---------	75.3	---------	---------	61.4	---------	---------
13.5	---------	---------	---------	---------	---------	---------	36
14	---------	---------	76.1	77.8	---------	41.6	---------
14.5	63.7	---------	---------	---------	---------	---------	---------

Water surface temperatures for Cedar Lake near Waterloo, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1945--Con.		1948		1949	
July 2	72	Dec. 12	36	Feb. 29	34	Jan. 6	36
Sept. 4	78			Sept. 29	61		

Water surface temperatures for Crooked Lake near Wolflake, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1949		1949--Con.		1950--Con.	
June 14	73	Jan. 11	34	Sept. 16	64	Mar. 8	35
		21	35	Nov. 3	51	13	44
1947		Mar. 9	38	23	43	Nov. 7	53
Apr. 23	49	23	42	Dec. 1	42	21	40
		31	45				
1948		Sept. 6	76	1950		1951	
Nov. 4	57.5	14	67	Jan. 17	35	May 15	64
Dec. 29	35						

Water surface temperatures for Flint Lake near Valparaiso, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1946		1948--Con.		1949--Con.		1951--Con.	
Oct. 26	59	May 29	62	Dec. 22	38	Oct. 27	54
Nov. 3	57	June 5	71	31	35	Nov. 3	45
16	47	12	71			10	40
23	35	19	68	1950		17	36
30	46	26	75	Jan. 5	30	Dec. 1	37
Dec. 7	40	July 3	74	Feb. 11	34	8	37
14	33	10	77	Mar. 11	34	15	36
28	33	17	78	18	34		
		24	73	25	33	1952	
1947		31	76	Apr. 1	35	Jan. 5	33
Jan. 4	33	Aug. 7	71	15	39	12	34
11	33	14	78	22	54	19	32
18	33	21	74	May 6	58	Feb. 2	33
25	32.5	28	79	13	66	9	33
Feb. 1	32	Sept. 4	73	20	68	Mar. 1	33
15	33	11	66	27	63	8	33
22	32	18	67	June 3	65	15	37
Mar. 9	32.5	25	59	10	75	22	40
13	32.5	Oct. 2	58	17	68	29	47
23	37	4	50	24	76	Apr. 5	46
Apr. 3	39	9	52	July 1	75	12	45
5	48	16	56	8	74	19	54
12	43	30	53	15	79	26	59
19	47	Nov. 3	55	22	73	May 3	72
27	48	6	50	29	83	10	63
May 2	54	13	42	Aug. 5	79	17	59
10	53	20	40	12	77	24	61
17	60	27	35	19	77	31	66
24	62			26	77	June 7	75
31	58	1949		Sept. 2	75	14	74
June 7	76	Feb. 4	35	9	73	21	75
21	66	Mar. 5	49	16	66	July 5	81
28	74	12	31	23	64	Aug. 9	82
July 5	75	19	36	30	71	30	75
12	74	Apr. 2	43	Oct. 7	59	Sept. 6	74
19	71	9	46	14	57	13	72
26	74	16	43	21	58	20	67
Aug. 2	73	23	50	28	57	27	65
9	77	30	57	Nov. 4	51	Oct. 4	48
16	77	May 7	69	11	36	11	48
23	82	14	71	18	40	18	52
30	77	21	69			Nov. 1	50
Sept. 6	74	28	67	1951		8	47
13	72	June 4	70	Apr. 7	42	22	47
17	67	11	72	14	41	Dec. 6	39
20	71	18	82	21	45	13	38
23	60	25	78	28	57	20	37
27	58	July 2	82	May 5	58		
Oct. 1	53	9	81	12	53	1953	
4	62	16	84	19	67	Jan. 31	37
11	56	23	78	26	67	Feb. 7	40
18	70	30	79	June 2	69	14	39
25	70	Aug. 6	75	16	75	21	39
Nov. 1	53	20	72	23	73	28	38
8	38	27	75	30	72	Mar. 7	38
12	34	Sept. 3	66	July 7	78	28	47
15	33	10	64	14	74	May 2	53
22	43	17	62	21	75	9	62
Dec. 15	34	24	57	28	78	16	66
		Oct. 1	56	Aug. 4	78	23	64
1948		8	61	11	72	June 6	72
Feb. 26	33	15	60	18	69	13	76
Mar. 27	41	17	65	25	67	27	81
Apr. 3	45	22	60	Sept. 8	71	30	85
10	47	29	51	15	69	July 18	82
17	48	Nov. 3	34	22	64	25	81
20	55.5	5	41	29	59	Sept. 12	72
24	58	7	54	Oct. 6	59	19	67
May 1	58	12	52	13	58	26	59
8	52	19	40	20	56		
15	57	26	34				
22	63	Dec. 3	34				

Temperature profiles (°F) for Flint Lake, near Valparaiso

Depth (feet)	1946		1947						
	Oct. 21	Nov. 18	Jan. 6	Feb. 17	Mar. 1	May 27	June 17	July 31	Aug. 25
Air	63	44	25	32.5	53	58	72	75	95
Water-surface	57.9	48.2	34.2	33.6	56.1	63.7	66.8	78.5	85
2.5	-------	-------	-------	37.6	56.1	-------	-------	-------	-------
5	57.9	48.2	35.7	39	56	63.7	65.7	78.5	84.9
7	-------	-------	-------	-------	55.3	-------	-------	-------	-------
7.5	-------	-------	-------	-------	-------	-------	-------	-------	84.8
10	57.8	48.3	36.1	39.1	53.3	63.7	64.1	76	81.8
12.5	-------	-------	-------	-------	52.8	-------	-------	-------	74.2
15	57.6	48.5	36.3	39.3	52.6	62.2	62	69.5	69
17.5	-------	-------	-------	-------	-------	57.7	57.4	-------	62.3
20	57.2	48.5	36.3	39.3	52	54	56.7	57.5	57.8
22.5	-------	-------	-------	-------	-------	-------	53.3	-------	-------
25	57	48.4	36.4	39.4	51	52	51.9	53.2	52.5
27.5	56.6	-------	-------	-------	-------	-------	-------	-------	-------
30	54.5	48.4	36.6	38.9	51	50.8	50.5	51.4	51.3
32.5	52.3	-------	-------	-------	-------	-------	-------	-------	-------
35	52	48.3	-------	38.8	50.3	50	49.8	50.8	50.6
40	51.7	48.3	-------	38.7	48.9	49.3	49.5	50.3	50.3
45	51.4	48.2	-------	38.6	47.8	48.9	49.2	50.2	50.2
50	51.3	48.3	-------	38.6	47.5	48.8	49.2	50.1	50.1
55	51.3	48.5	-------	38.8	47.3	48.6	49	50	50.1
60	51.3	48.5	-------	39	47.1	48.4	49	50	50.1
64	-------	-------	-------	-------	-------	-------	-------	49.8	-------
65	51.3	48.8	-------	39.1	46.9	48.3	49	-------	50.1
67.5	-------	-------	-------	-------	46.7	-------	-------	-------	-------
69	-------	-------	-------	39.6	-------	-------	-------	-------	-------
70	-------	-------	-------	-------	46.7	48	49	-------	-------
70.5	-------	-------	-------	-------	-------	-------	-------	-------	50

Depth (feet)	1947--Continued			1948					
	Oct. 2	Oct. 27	Nov.18	June 1	July 2	Aug. 2	Aug. 30	Oct. 4	Nov. 19
Air	57	57	39.5	78	87	70	74	61	53
Water-surface	57.2	63.2	44	69.3	74.8	79.2	82.1	62.3	46.2
2.5	-------	-------	-------	68.8	-------	79	82.4	-------	-------
5	57.1	63.2	43.9	67.8	74.7	77.7	82.4	62.2	46.2
10	57	63.1	43.8	65.4	73.9	77	78.9	62.2	46.4
12.5	-------	-------	-------	63.2	69	76	75.2	-------	-------
15	56.9	62.8	43.8	59	61.7	68.2	70.5	61.9	46.4
17.5	-------	-------	-------	57.3	57.3	61.1	64	-------	-------
20	56.5	60.9	43.8	56	55.3	57	57.8	60.9	46.3
22.5	-------	-------	-------	-------	-------	-------	54.8	-------	-------
25	52.3	55.8	43.8	54.6	53.3	53.7	53.9	53.8	46.5
30	49.5	53	43.8	53.5	52.3	52.7	52.5	52.6	46
35	48.5	51.4	43.8	52	51.5	51.7	51.5	50.9	46.3
40	48	50.7	44	50.6	50.4	51	50.8	50.9	46.6
45	48	50.5	45	50	50	50.7	50.8	50.5	46.6
50	47.8	50.5	43.9	49.8	49.9	50.6	50.8	50.5	46.2
55	47.8	50.5	43.9	49.6	49.7	50.6	50.5	50.5	46.4
60	47.8	50.4	43.8	49.4	49.6	50.5	50.5	50.4	45.9
64	-------	-------	-------	-------	-------	-------	51	-------	-------
65	-------	50.3	44	49.4	49.6	50.4	-------	-------	46.1
67	-------	-------	-------	-------	-------	50.3	-------	-------	46
67.5	-------	50.3	-------	-------	-------	-------	-------	-------	-------
70	-------	-------	-------	49.4	49.6	-------	-------	-------	-------
71.5	-------	-------	-------	-------	49.6	-------	-------	-------	-------

Water surface temperatures for Hamilton Lake at Hamilton, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1949--Con.		1951--Con.		1953--Con.	
June 29	84	Oct. 13	64	Aug. 9	76	Jan. 30	35
Sept. 4	79	Dec. 5	39	Oct. 9	58	Mar. 10	37
				Dec. 14	29	Apr. 2	45
1948		1950				23	49
Dec. 14	35	Oct. 20	59.5	1952		May 19	60
		Nov. 2	57	Feb. 12	28	July 8	77
1949		16	44	Dec. 10	35	Aug. 5	76
Jan. 6	35.5					Dec. 1	77
Oct. 12	65	1951		1953			
		Jan. 24	35	Jan. 8	34		

Water surface temperatures for Jimerson Lake at Nevada Mills, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1949--Con.		1951		1953	
Oct. 9	51	Feb. 17	34.5	Jan. 9	34	Jan. 9	34
		Sept. 15	65	July 11	77	30	36
1946		Oct. 12	66	Aug. 9	73	Apr. 3	44
Apr. 9	49	Dec. 6	38	Sept. 5	68	May 19	66
		7	37	Oct. 9	55	June 15	73
1948				Nov. 17	37	July 8	79
June 29	75	1950		Dec. 21	28	Aug. 5	76
Nov. 18	45	Oct. 19	58			Sept. 29	65
		Nov. 15	48	1952			
1949				Nov. 14	41		
Jan. 6	35.5			Dec. 10	39		

Water surface temperatures for Koontz Lake at Koontz Lake, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1946--Con.		1949		1950	
June 11	66	July 19	85	Nov. 9	49	June 15	79
				28	37		
1946		1948		29	35	1951	
Apr. 16	55	Feb. 10	34			Jan. 11	33

Temperature profiles (°F) for Koontz Lake, at Koontz Lake July 25, 1946

Depth (feet)	Site A	Site B	Site C	Depth (feet)	Site A	Site B	Site C
Air	76	76	76	20	65.8	64.2	55.4
Water-surface	80.3	79.3	79.8	23	*61.8	------	*53.0
5	79.4	77.8	78.7	25		58.8	
10	78.5	76.8	72.5	29		*56.5	
15	71.2	70.2	61.5				

* Bottom

Water surface temperatures for Lake James at Lake James, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1947--Con.		1948--Con.		1949--Con.	
July 3	73	July 12	74	Apr. 24	48	Jan. 29	35
Sept. 4	80	19	70	May 1	57	Feb. 5	36
		26	72	8	59	12	35
1946		Aug. 2	76	15	62	17	35
Jan. 10	34	9	78	22	64	Mar. 10	37.5
Oct. 5	62	16	77	29	65	12	34
12	58	23	72	June 5	64	19	36
19	57.5	30	79	12	63	26	42
26	57	Sept. 6	75	19	65	Apr. 2	41
Nov. 2	58	13	74	26	70	9	43
9	53	20	77	July 3	76	16	43
16	50	27	65	10	77	20	50
Dec. 7	42	Oct. 4	62	17	76	23	46
14	39	11	68	24	75	30	47
21	37	18	65	31	74	May 7	52
28	34	25	63	Aug. 7	72	14	54
		Nov. 1	56	14	73	21	57
1947		8	51	21	76	28	60
Jan. 4	34	15	45.5	28	70	June 4	67
11	34	22	41	Sept. 4	65	25	68
18	36	29	40	11	64	30	72
25	37	Dec. 6	38	18	60	July 2	73
Feb. 1	35	13	36.5	25	63	9	74
8	30	20	34	30	65	16	72
15	35	27	34	Oct. 2	62	23	70
22	36			9	60	30	71
Mar. 1	34	1948		16	60	Aug. 6	70
8	36	Jan. 3	34	23	57	13	71
15	37	10	35	30	56	20	69
22	38	17	33.5	Nov. 6	52	27	72
29	40	24	33.5	12	48	Sept. 3	70
Apr. 5	38	29	34	13	52	10	69
12	40	31	33.5	20	48	15	65
19	44	Feb. 7	34	21	47	17	63
26	47	14	33.5	Dec. 4	46	24	62
May 3	50	21	34	11	45	30	62
10	54	24	34	14	40.5	Oct. 12	64
17	57	Mar. 6	35	25	44	Nov. 4	50
24	62	13	36	31	42	Dec. 6	38
31	59	20	40				
June 7	66	27	42	1949		1950	
14	64	Apr. 3	40	Jan. 6	36	Mar. 3	34
21	68	10	44	8	40	11	44
28	70	17	42	22	35	June 6	70
July 5	72						

Temperature profiles (°F) for Lake James, at Lake James

Depth (feet)	1946				1947		
	Sept. 29	Oct. 24	Nov. 23	Dec. 18	Apr. 29	May 25	June 23
Air	56.6	69.5	32	16	64	60.8	78
Water-surface	68	59	48.3	41	48	62.6	70.5
2.5	---------	---------	---------	---------	48	62.6	---------
5	68	59.2	48.3	---------	48.4	62.6	70.5
10	68	59.3	48.3	41.3	48.4	62.6	70.3
15	68	59.1	48.2	---------	48.3	61.4	69.7
17.5	---------	---------	---------	---------	---------	56.7	69
20	68	58.8	48	41.3	48.2	53.1	67
22	66.8	---------	---------	---------	---------	---------	---------
24	66.6	---------	---------	---------	---------	---------	---------
25	---------	58.1	47.8	---------	48.1	51.8	62
26	66.5	---------	---------	---------	---------	---------	---------
28	65.4	---------	---------	---------	---------	---------	---------
30	64.8	58	47.7	41.3	48.1	51.3	56.2
32	62.8	---------	---------	---------	---------	---------	---------
34	60.5	---------	---------	---------	---------	---------	---------
35	---------	58	47.7	---------	47.4	49.5	52.5
36	57.5	---------	---------	---------	---------	---------	---------
38	56	---------	---------	---------	---------	---------	---------
40	54.7	57.1	47.7	41.3	46.5	48.8	50.3
42.5	---------	55.4	---------	---------	---------	---------	---------
45	50.9	52	47.6	---------	46	48.2	48.6
47.5	---------	50.5	---------	---------	---------	---------	---------
50	49.5	49.5	47.6	41.3	45.8	47.2	47.7
55	49.2	48.5	47.4	---------	45.5	46.6	47.1
60	48.3	47.5	47.2	41.3	44.8	45.7	46.2
65	47	46.7	47.5	---------	44.4	45.2	45.2
70	46.1	45.4	47.5	41.3	43.8	44.7	45

Temperature profiles (°F) for Lake James, at Lake James--Continued

Depth (feet)	1946				1947		
	Sept. 29	Oct. 24	Nov. 23	Dec. 18	Apr. 29	May 25	June 23
75	45.3	44.8	47.1	---------	43.4	44.4	44.7
77.5	---------	---------	47	---------	---------	---------	---------
80	45	44.5	46.7	41.3	43.4	44.2	44.5
81	---------	---------	---------	43	---------	---------	---------
82	44.8	44	---------	---------	---------	---------	---------
82.5	---------	---------	45.6	---------	---------	---------	---------
83	---------	---------	---------	---------	42.8	43.7	---------
85	---------	---------	---------	---------	---------	---------	44.5
86	---------	---------	---------	---------	---------	---------	44

Depth (feet)	1947--Continued					1948	
	July 30	Aug. 27	Oct. 9	Oct. 29	Nov. 19	June 3	June 30
Air	95	82.5	59	55	40	84	76
Water-surface	77.4	82.5	63	61.4	47.4	73.3	74.4
2.5	---------	---------	---------	---------	---------	73.1	---------
5	77	81.9	62.9	61.7	47.4	70.7	74.4
10	77	81.9	62.8	61.7	47.4	67.7	74.4
12.5	---------	---------	---------	---------	---------	---------	73.8
15	76.3	79.5	62.8	61.8	47.4	64.7	72.9
17.5	---------	---------	---------	---------	---------	---------	69.2
20	71.6	72.2	62.8	61.3	47.4	61.3	63
25	63.7	62.7	62	61.5	47.2	57	57.3
30	57.6	57.5	60.9	61.5	47.2	53.7	54.3
35	53.6	54.4	58.3	57.9	47.2	51.9	52.5
40	51.2	51.7	53.1	53.7	47.2	50.3	50
45	49.3	49.8	50.2	50.2	47.2	48.6	48.3
50	48	48.3	49	48.8	47.2	47.2	47.3
55	47.7	47.6	47.8	48	47.2	46.3	46.6
60	46.7	47	47	47.2	47.2	45.7	46.2
65	46.2	46.2	46.5	46.3	47.2	45.2	45.3
70	45.3	45.7	45.8	45.9	47.2	45	44.7
75	44.8	45.2	45.3	45.4	46.6	44.7	44.5
80	44.4	44.9	45	45	45.5	44.4	44.3
82.5	---------	---------	---------	---------	45.2	---------	---------
84	---------	---------	44.7	---------	---------	---------	---------
85	44.4	44.6	---------	44.9	45.2	44.2	44
86	---------	---------	---------	44.9	---------	44.2	---------
87	44.2	---------	---------	---------	---------	---------	---------

Depth (feet)	1948--Continued					
	Aug. 4	Sept. 2	Oct. 7	Nov. 18	Dec. 9	Dec. 18
Air	64	75	52	53	---------	16
Water-surface	75.1	76.5	60	47	43.9	41
5	75.5	76.3	60	46.9	44.1	---------
10	75.6	75.7	60	47.3	42.6	41.3
15	75.5	75.7	60	47.3	42.8	---------
17.5	73.6	---------	---------	---------	---------	---------
20	69.2	73.8	60	47.3	42.1	41.3
22.5	---------	67.1	---------	---------	---------	---------
25	60.8	62.9	60	47	42.1	---------
30	56.2	56.4	60	46.6	42	41.3
35	53.9	53.2	54.9	47	42.1	---------
40	51.9	50.9	51.3	44.5	42.4	41.3
45	49.7	48.8	49.1	47.4	41.3	---------
50	48	48	47.9	47.3	42.6	41.3
55	47.3	46.9	47.2	47.5	42.6	---------
60	47.1	46.4	46.4	47.5	43.2	41.3
65	46.4	45.6	45.7	47.1	43.2	---------
70	45.9	45.6	45.2	47.4	43.1	41.3
75	45.6	45.3	44.9	46	43	---------
80	45.3	45.1	44.7	44	42	41.3
81	---------	---------	---------	---------	---------	43
85	45	---------	44.5	44.3	42	---------
86.5	---------	---------	---------	---------	42	---------
87	---------	---------	---------	44.3	---------	---------

Water surface temperatures for Lake Manitou at Rochester, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1948		1949		1951	
June 12	67	Sept. 14	72	Nov. 15	47	June 12	72

Water surface temperatures for Loon Lake at Ormas, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1948		1949--Con.		1950--Con.	
July 11	70	Jan. 6	34.5	Apr. 26	59	Feb. 7	35
Sept. 1	74	Oct. 28	59	Sept. 6	80	22	35
Oct. 5	60	Dec. 29	35	Oct. 17	58	Mar. 1	35
Dec. 17	32			Nov. 30	40	May 3	53
		1949		Dec. 20	35	Oct. 17	58
1946		Jan. 21	35			Nov. 7	53
May 14	63	Feb. 16	34	1950		22	41
		Mar. 8	38	Jan. 18	35		
1947		Mar. 23	42	27	35	1951	
Apr. 23	49					May 4	63

Water surface temperatures for Maxinkuckee Lake at Culver, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1947--Con.		1948--Con.		1949--Con.	
June 5	58	Nov. 8	43	July 31	80	Apr. 30	59
		15	43	Aug. 14	81	May 7	69
1946		22	44	21	80	Sept. 2	69
Oct. 26	60	29	35	28	87	27	68.5
Nov. 2	60	Dec. 13	33	Sept. 11	78	30	54
9	51	16	34	18	76	Oct. 20	64
16	48	20	32	25	62	21	42.5
23	38	27	33	Oct. 2	66		
30	44	29	33	9	57	1950	
Dec. 14	35			16	55	Mar. 16	35
21	33	1948		23	50	Apr. 25	48
28	33	Jan. 3	33	29	64	May 1	54
		10	33	30	52	June 15	78
1947		17	32	Nov. 6	53	Nov. 16	45
Jan. 4	33	24	32	13	43		
11	34	31	32	20	42	1951	
18	36	Feb. 7	32	27	43	Feb. 1	33
25	35	10	33.5	Dec. 4	42	June 21	73
Feb. 1	33	14	32	11	34	July 18	83
8	34	21	32	18	35	Sept. 19	67
22	33	23	40.5	25	33	Oct. 16	63
Mar. 1	33	28	34			Dec. 17	31
8	34	Mar. 6	34	1949			
22	38	13	38	Jan. 1	33	1952	
29	37	20	36	8	34	Jan. 14	33
Apr. 19	44	27	45	15	36	Feb. 18	36
26	50	Apr. 3	47	22	34	Dec. 12	37
May 10	56	10	52	29	33		
31	66	17	53	Feb. 5	33	1953	
June 14	65	24	57	22	33.5	Jan. 22	34
28	78	May 1	58	28	36	Mar. 2	37
July 5	77	13	58	Mar. 5	38	24	41
12	80	15	60	12	33	Apr. 13	49
19	73	21	68	19	38	May 5	56
26	78	29	73	26	45	June 5	71
Sept. 19	73	June 5	72	Apr. 2	48	29	76
27	63	12	70	9	49	July 23	78
Oct. 11	65	19	69	11	56	Aug. 21	77
17	68	26	74	16	44	Sept. 14	57
26	64	July 10	85	23	52		
Nov. 1	57	17	81				

Water temperatures (°F) for Maxinkuckee Lake

[Data from Evermann and Clark, 1920]

Year of 1899

Date	February	July				August	
	6 a.m.	6 a.m.	Noon	6 p.m.	Average	6 a.m.	Noon
1-------	32	---------	---------	---------	---------	74	78
2-------	32	---------	---------	---------	---------	76.5	82
3-------	-------	---------	---------	---------	---------	76	80
4-------	-------	---------	---------	---------	---------	75.5	84.5
5-------	-------	73.5	75	77	75.1	77.5	78.5
6-------	-------	73.5	80	77	76.8	71.5	82.5
7-------	32	72.5	77	75.5	75	72.5	80
8-------	-------	72	77	73.5	74.1	73	77
9-------	-------	70	77	77	74.6	71	77.5
10-------	33	72	76.5	74	74.1	73	79
11-------	-------	72.5	77.5	77	75.6	73.5	81.5
12-------	-------	74.5	80.5	79	78	74.5	80
13-------	32	77	79.5	75.5	77.3	70	80
14-------	-------	75	77	77	76.3	67	80
15-------	32	74	---------	76	75	67	80
16-------	-------	75	77.5	76	76.1	70	80
17-------	-------	75	79	78	77.3	73	81
18-------	-------	74	79	77	76.6	73.5	79
19-------	-------	74	79	78	77	76	84
20-------	-------	76	81	78	78.3	76	78.5
21-------	-------	75	82	83	80	75	82.5
22-------	-------	79	86	85	83.3	75	82
23-------	-------	79	88.5	85	84.2	75	82
24-------	-------	78	86	85.5	83.2	75	80
25-------	32	79	85.5	82	82.6	74	83.5
26-------	-------	78	84	80	81.6	75	81.5
27-------	32	78	---------	83	80.5	77	86
28-------	-------	78.5	82	83	81.2	70.5	84
29-------		78	81.5	79.5	79.6	75.5	84
30-------		77	82.5	80	79.8	75	84
31-------		75	82.5	80	79.2	77	81.5
Average-	32.1	75.3	80.5	78.9	78.25	73.7	81.1

Date	August--Continued		September			
	6 p.m.	Average	6 a.m.	Noon	6 p.m.	Average
1-------	78	76.6	77	82.5	81.2	80.2
2-------	80	79.5	76.2	82.8	80	79.6
3-------	79	78.3	80	84.2	79.8	81.3
4-------	81	80.3	73.8	---------	---------	---------
5-------	78	78	---------	---------	---------	---------
6-------	80	78	72.5	82	79.5	78
7-------	80	77.5	73.5	79.2	78.5	77
8-------	77	75.6	75	79	75	76.3
9-------	75	74.5	67	68	--------	67.5
10-------	76.5	76.2	67	69	69.5	68.5
11-------	80	78.3	69.5	77	74	73.5
12-------	78.5	77.6	69	77	71	72.3
13-------	75	75	66	75	70	71
14-------	77	74.6	57	72.5	68.5	66
15-------	76.5	74.5	64	73	69.5	68.8
16-------	80	76.6	64	74.5	72	70.1
17-------	80	78	66	76	70.8	70.9
18-------	78	76.8	62	70.5	---------	66.2
19-------	78	79.3	63.1	64	63.5	63.5
20-------	-------	77.2	61.5	68.5	65	65
21-------	77	78.2	61.5	71	67	66.5
22-------	80.5	79.2	62	69	66	65.6
23-------	82	79.6	63	65.5	67	65.1
24-------	78.5	77.8	64	66	65	65
25-------	80.5	79.3	61	66	63.5	63.5
26-------	82.5	79.3	57.5	65.5	61	61.3
27-------	83	82	57	63	62	60.6
28-------	82	81	55	61.5	60	58.8
29-------	84.5	81.3	56	62	57	58.3
30-------	82	80.5	54.8	60	56	56.9
31-------	81.5	80				
Average-	79.4	78.4	65.6	71.6	68.9	68.1

Water temperature (F) for Maxinkuckee Lake--Continued

Year of 1899

Date	October				November	
	6 a.m.	Noon	6 p.m.	Average	6 a.m.	Noon
1-------	48.5	59.5	56	54.6	54	56
2-------	52.5	61	59	57.5	45	48
3-------	52	63.5	60.5	58.6	45	44
4-------	55	61.5	61	59.1	42	42
5-------	55	61.2	60	58.7	44	52.5
6-------	54	62	62	59	47	51
7-------	54	63.5	61	59.5	48	50
8-------	52.5	64	61	59.1	50	---------
9-------	58	64.5	60	60.8	48	52
10-------	54.5	62	60	58.8	48	50.5
11-------	58.5	60	60	59.5	50	53
12-------	58.5	65	62	61.5	46	48
13-------	60	64	64	62.6	42	50
14-------	60	68	65	64.3	46	49
15-------	60.5	70.5	65	65.3	48	50
16-------	59.8	67	61	62.5	48	51
17-------	58.5	58.5	57	58	47	50
18-------	58	---------	---------	---------	50	51
19-------	--------	---------	---------	---------	48	51
20-------	--------	---------	---------	---------	47	51
21-------	--------	---------	---------	---------	46	49
22-------	50	58	---------	54	50	51
23-------	60	66	60	62	47.5	45
24-------	60	66	60	62	45	46
25-------	60	62	---------	61	43	47
26-------	55	64	60	59.6	42	47
27-------	56	---------	57	56.5	43	46
28-------	57	---------	57	57	43	47
29-------	56	59	59	58	42	44
30-------	53	59	56	56	42	46
31-------	52	60	55	55.6		
Average-	56	62.8	59.9	59.3	46.2	48.9

Date	November--Continued		December			
	6 p.m.	Average	6 a.m.	Noon	6 p.m.	Average
1-------	--------	55	44	46	43	44.3
2-------	46	46.3	42	46	43	43.6
3-------	43	44	42	43	42	42.3
4-------	47	43.6	41	42	37	40
5-------	50	48.3	35	39	38	37.3
6-------	48	48.6	38	41	39	39.3
7-------	49	49	37	40	38.5	38.5
8-------	50	50	38	42	40	40
9-------	50	50	40	40	40	40
10-------	50.5	49.6	44	42	42.6	42.6
11-------	50	51	46	48	47	47
12-------	46	46.6	40	40	40	40
13-------	49	47	40	38	35	37.6
14-------	48	47.6	35	36	36	35.6
15-------	49	49	36	36	36	36
16-------	50	49.6	32	32	32	32
17-------	52	49.6	32	35	37	34.6
18-------	50	50.3	34	39	38	37
19-------	50	49.6	38	38	38	38
20-------	47	48.3	36	36	36	36
21-------	50	48.3	34.5	37	38	36.5
22-------	50	50.3	37	38	38	37.6
23-------	45	45.8	34	36	34	34.6
24-------	45	45.3	34	34	33	33.6
25-------	45	45	32	34	33	33
26-------	44	44.3	33	34	34	33.6
27-------	44	44.3	32	34	32	32.6
28-------	44	44.6	32	34	32	34.6
29-------	43	43	32	32	32	32
30-------	47.5	45.1	32	32	32	32
31-------			32	32	32	32
Average-	47.6	47.6	36.6	37.9	37	37.2

Water temperatures (°F) for Maxinkuckee Lake--Continued

Year of 1900

Date	January				February	
	6 a.m.	Noon	6 p.m.	Average	6 a.m.	Noon
1-------	32	32	32	32	32	32
2-------	32	32	32	32	32	32
3-------	32	32	32	32	32	32
4-------	32	32	32	32	32.5	32.5
5-------	32	32	33	32.3	32	32
6-------	33	33	33	33	32	32.5
7-------	34	34	34	34	33	33
8-------	34	35	35	34.6	33.5	34
9-------	33	33	33	33	33	33
10-------	33	33	33	33	33	33
11-------	33	33	33	33	32.5	33
12-------	33	34	33	33.3	33	33
13-------	33	33	33	33	33	32.5
14-------	33	33	33	33	32	32
15-------	33	34	34.5	33.8	32	32
16-------	35	35	35	35	32	32
17-------	34	34	35	34	32	32
18-------	35	35	35.5	35.1	32	32
19-------	35	35	35	35	32	32
20-------	35	35	35	35	32	33
21-------	35	35	35.5	35.1	33.5	34
22-------	35	35.5	36.5	35.6	35	34
23-------	36	37	37.5	36.8	34	34
24-------	38	40	39	39	34	33
25-------	37	36	35	36	32	32
26-------	34.5	34	34	34.1	32	32
27-------	33.5	33	33	33.1	32	32
28-------	33	32	32	32.3	32	33
29-------	32	32	32	32		
30-------	32	32	32	32		
31-------	32	32	32	32		
Average-	33.7	33.8	33.9	33.8	32.6	32.6

Date	February--Continued		March			
	6 p.m.	Average	6 a.m.	Noon	6 p.m.	Average
1-------	32	32	33	34.5	34	33.8
2-------	32	32	34	34.5	34	34.1
3-------	32.5	32.1	34	34	34.5	34.1
4-------	32.5	32.5	34	34	34	34
5-------	32	32	34	34	34	34
6-------	33	32.5	34.5	35	35	34.8
7-------	33.5	33.1	35	35	35	35
8-------	34	33.8	35	35.5	35.5	35.3
9-------	33	33	35.5	36	36	35.8
10-------	33	33	36	36	36	36
11-------	33	32.8	36	36	36	36
12-------						
13-------	32	32.5	36	36	36.5	36.1
14-------	32	32	36	36	36.5	36.1
15-------	32	32	35	35	35	35
16-------	32	32	35	35	34	34.6
17-------	32	32	33.5	33	33	33.1
18-------	32	32	33.5	34	34	33.3
19-------	32	32	35	35	36	35.3
20-------	33	32.6	36	36	36	36
21-------	34.5	34	36	36	36.5	36.1
22-------	34.5	34.5	36	36.5	37	36.5
23-------	35	34.3	36	37	37	36.6
24-------	32	33	37	37	37.5	37.1
25-------	32	32	36.5	36	36	36.1
26-------	32	32	36	36	36	36
27-------	32	32	36	36.5	36	36.1
28-------	33	32.6	36	36	36.5	36.1
29-------			36	36	36.5	36.1
30-------			37	37.5	36.5	37
31-------			37	37	38.5	37.5
Average-	32.7	32.7	35.3	35.5	35.6	35.5

Water temperatures (°F) for Maxinkuckee Lake--Continued

Year of 1900

Date	April				May	
	6 a.m.	Noon	6 p.m.	Average	6 a.m.	Noon
1-------	39	44	45	42.6	60	62
2-------	44	44.5	46	44.8	56	58
3-------	45	45.5	45	45.1	58.5	58
4-------	46	47	47.5	46.8	60	60.5
5-------	47	48	48	47.6	60	61
6-------	48	49	49.5	48.8	59	60.5
7-------	48	49	49.5	48.8	59	60
8-------	49	49	50	49.3	59.5	60
9-------	50	50.5	50	50.1	58	58
10-------	48	48.5	48	48.1	57	57
11-------	48	48	47.5	47.8	58	60
12-------	47	47.5	46	46.8	62	64
13-------	47	47	46	46.6		
14-------	44	45	46	45	66	69
15-------	45.5	46	46.5	46	69	71
16-------	46	46.5	48	46.8	71	73
17-------	48	48.5	48	48.1	63	64
18-------	48	48	48	48	62	62
19-------	48	48.5	49	48.5	62	62.5
20-------	48	48	49	48.3	61	60
21-------	50	50	51	50.3	59	60
22-------	50	51	51	50.6	60	61
23-------	50	51.5	51	50.8	61	65
24-------	51	51.5	52	51.5	68	70
25-------	50	51	51	50.6	70	71
26-------	50	50	54	51.3	72	73
27-------	56	54	54	55.3	72	73
28-------	54	58	64	58.6	72	72.5
29-------	60	66	66	64	72	72.5
30-------	67	67	67.5	67.1	72	74
31-------					72.5	73
Average-	49.1	49.9	50.5	49.8	63.71	65.41

Date	May--Continued		June			
	6 p.m.	Average	6 a.m.	Noon	6 p.m.	Average
1-------	61	61	73	74	73.5	73.5
2-------	60	58	72.5	72	72	72.1
3-------	59	58.5	71.5	72	21	71.5
4-------	60	60.1	70	71	72	71
5-------	60	60.3	71.5	72	74	72.5
6-------	60	59.8	73.5	74	73.5	73.6
7-------	61	60	73.5	74	76	74.1
8-------	59	59.5	76	76.5	77	76.5
9-------	57.5	57.8	76	76	77	76.3
10-------	57	57	76	76.5	75	75.8
11-------	60	59.3	74	74.5	73.5	74
12-------	65	63.6	74	75	77	75
13-------			76	76.5	77	76.5
14-------	69	68	76	77	77.5	76.8
15-------	70	70	77	77	76	76.6
16-------	70	71.3	75.5	77	77	76.5
17-------	63.5	63.5	75.5	76.5	76	76
18-------	62	62	75	76.5	77	76.1
19-------	62	62.1	73	76	76	75
20-------	60	60.3	70	72	72	71.3
21-------	60	59.6	71	73.2	72	73
22-------	62	61	70	72	70	70.6
23-------	70	65.3	71	74	73	72.6
24-------	71	69.6	72	78	75	75
25-------	73	71.3	72	78	75	75
26-------	74	73	78	78	75	77
27-------	73.5	72.8	73	77.5	78	76.1
28-------	73	72.5	75	78	78	77
29-------	73	72.5	75	78	76	76.3
30-------	74	73.3	68	78	77	74.3
31-------	73	72.8				
Average-	65.08	64.74	73.21	75.32	74.9	74.6

Water temperatures (°F) for Maxinkuckee Lake--Continued

Year of 1900

Date	July				August	
	6 a.m.	Noon	6 p.m.	Average	6 a.m.	Noon
1-------	71	76	77	74.6	74	81
2-------	73	80	80	77.6	76.5	----------
3-------	75	79	78.3	77.4	75	79
4-------	78	82	80	80	76	80.8
5-------	78	83	80	80.3	77.4	81
6-------	78	81	80	79.6	79	83.5
7-------	71	82	80	77.6	79.2	81.8
8-------	77.5	77	75.5	76.6	78.8	83
9-------	73	78	77	76	79.4	83
10-------	71	77	76	74.6	78.9	83.5
11-------	73	77.5	77	75.8	79	83.6
12-------	77	72	78	75.6	78.3	81
13-------	71	78	77	75.3	78	82
14-------	71	79	78	76	79	79
15-------	75	81	79	78.3	76.2	72.1
16-------	75	77	77	76.3	75.7	77
17-------	74.5	77	76	75.5	75.5	80
18-------	72	79	78	76.3	76	80.5
19-------	75	79	78	77.3	78.5	83.5
20-------	75	80	75	76.6	77	81
21-------	73	80	80	77.6	76.2	83.5
22-------	75	80	82	79	78.2	84
23-------	78	81	80.5	79.8	78.9	80
24-------	80	78	76	78.6	77.5	82.5
25-------	75	80	79.5	78.1	77.2	----------
26-------	75	80	79	78	76	79.5
27-------	73	80	78	77	76.5	80
28-------	75	80	78	77.6	76.5	82
29-------	75.5	79	78	77.5	78	83.5
30-------	75	80.5	79	78.3	76	83
31-------	76	80	78	78	78	83.5
Average-	74.6	79	78.3	78.4	77.2	81.3

Date	August--Continued		September			
	6 p.m.	Average	6 a.m.	Noon	6 p.m.	Average
1-------	81.5	78.8	77.5	83	81	80.5
2-------	78	77.2	76	81.2	77.2	78.1
3-------	80.3	78.1	76	80.5	79	78.5
4-------	78.5	78.4	75	81	81	79
5-------	81	79.8	75	80.5	77.5	77.3
6-------	79.8	80.8	76	79.5	77.5	77.6
7-------	81.8	81	75	78	78	77
8-------	81	80.9	75.5	----------	80.3	77.6
9-------	82	81.4	76.5	81.2	78.6	78.7
10-------	80	80.8	75.1	80	77	77.3
11-------	80.5	81	75.8	79	76.3	77
12-------	81.5	80.2	72.9	72.5	76.1	73.8
13-------	80.5	80.1	72	79	78	76.3
14-------	79	79	72.1	79	72.7	74.6
15-------	78	75.4	68.8	77	74.9	73.5
16-------	80	77.5	70.1	71.1	71.8	71
17-------	79.2	78.2	68	----------	67	67.5
18-------	79	78.5	59.3	73	71.9	67.7
19-------	78.5	80.4	65	65.5	69.9	66.8
20-------	79	79	65	71	67	67.6
21-------	83.6	81.1	63.5	70	67.5	67
22-------	83	81.7	63.5	71	69.5	68
23-------	82	80.3	64	70.2	67.8	67.3
24-------	81.5	80.5	62.8	68.5	69	66.7
25-------	79	78.1	67	75.2	71.8	71.3
26-------	81.5	79	62	69.9	69	66.9
27-------	79.5	78.6	66	67.3	66.5	66.6
28-------	81.8	80.1	61.9	68	67	65.6
29-------	81.5	81	66	67.5	67.5	67
30-------	83	80.6	63.5	71	69.5	68
31-------	83	81.5				
Average-	80.6	79.7	69.6	74.6	73.2	72.4

Water temperatures (°F) for Maxinkuckee Lake--Continued

Year of 1900

Date	October				November	
	6 a.m.	Noon	6 p.m.	Average	6 a.m.	Noon
1-------	63.5	70	68	67.2	59.8	59
2-------	62.5	71	68	67.2	57	63.8
3-------	64.5	72.5	68.9	68.6	56.3	63.5
4-------	65	73.2	69	69.1	51.1	62
5-------	64.9	72	70.1	69	55.3	61
6-------	67	73.5	71	70.5	52	55
7-------	67.5	68.5	66.8	67.6	49.5	56
8-------	65	69.5	67	67.7	50	55
9-------	62.5	69.5	66.5	66.2	50	51.3
10-------	69.8	68.5	67	68.4	45.5	45.8
11-------	62	68.5	66.9	65.8	48.9	51.5
12-------	65.5	66.5	65	66	46.5	49.7
13-------	60	65.5	64	63.2	44.5	49.8
14-------	62	68	66.9	65.6	42	45.8
15-------	62.3	69.3	65.5	65.7	42.8	47
16-------	61.5	65	60	62.2	38.9	42.9
17-------	57.6	64.8	61	61.1	38.5	40
18-------	57.2	65.5	63	61.9	44.9	47
19-------	54.5	63.6	61.2	59.8	48.2	49.5
20-------	54	63	61	59.3	48.9	50
21-------	61.8	62	61.9	61.9	45.8	47.2
22-------	60.1	62.5	63	61.9	43.1	47.5
23-------	58.9	63.9	61.2	61.3	43.5	45.1
24-------	58.1	63.5	65	62.2	43	43
25-------	58	64.7	63	61.9	39	39.6
26-------	58.8	64	61.5	61.4	35.9	40.5
27-------	58.5	66.1	64	62.9	38	41.8
28-------	57.5	64	62.8	61.4	40.3	41.5
29-------	60.1	65	61.7	62.3	41.1	41.8
30-------	61.5	65.2	62.5	63.1	32.9	41.2
31-------	59.9	64.9	63.9	62.9		
Average-	61.4	66.9	64.8	64.4	45.8	49.2

Date	November--Continued		December			
	6 p.m.	Average	6 a.m.	Noon	6 p.m.	Average
1-------	58.3	59	39.9	42	42.6	41.5
2-------	60.5	63.8	38.9	40.9	41.5	40.4
3-------	58.1	62.6	40	41.2	42	41.1
4-------	59.5	57.5	40.9	41.3	41	41.1
5-------	57.5	57.9	40.9	41	40.5	40.8
6-------	---------	53.5	38.5	41.1	41	40.2
7-------	54	53.2	40.1	40.9	39.9	40.3
8-------	51.2	55.1	37.8	38.9	38.9	38.5
9-------	52.5	51.3	37.5	38.5	37.7	37.9
10-------	47.8	46.4	38.4	39.2	39	38.9
11-------	49.9	50.1	37.1	39.5	39	37.5
12-------	50.5	48.9	35.1	37	36.5	36.2
13-------	45.9	46.7	36.6	37.3	37.8	37.2
14-------	45.5	44.4	32	32	32	32
15-------	45	44.9	32	32.9	32	32.3
16-------	41	40.9	32.1	32.5	33.2	32.6
17-------	42.1	40.2	33.5	33.8	33.5	33.6
18-------	47.5	46.5	33.5	34.7	34.8	34.3
19-------	46.2	48	33.9	36.5	35	35.1
20-------	42	47	33.8	36	36.7	35.5
21-------	45.6	46.2	35	37.8	36.4	36.4
22-------	46.5	45.7	34.7	36	35.9	35.5
23-------	44.5	44.4	37.2	36.7	34.7	36.2
24-------	43	43	33.9	36.3	---------	35.1
25-------	39.3	39.3	---------	----------	---------	----------
26-------	40	38.8	---------	----------	---------	----------
27-------	42.8	40.9	---------	----------	---------	----------
28-------	41.5	41.1	33.5	35	36.7	35.1
29-------	41.7	41.5	34	35.9	35.4	35.1
30-------	42	38.7	33.9	35	34	34.3
31-------	---------	----------	33.8	34.8	33.6	34.1
Average-	47.7	47.6	36	37.3	37.1	36.8

Water temperature (°F) for Maxinkuckee Lake--Continued

Year of 1901

Date	January				February	
	6 a.m.	Noon	6 p.m.	Average	6 a.m.	Noon
1-------	33.6	34.1	33.5	33.7	34	34.1
2-------	33.2	34	34	33.7	33.3	----------
3-------	33.5	34.5	33.9	33.9	35.5	33.5
4-------	33	34.7	34.3	34	32.8	33.8
5-------	33.5	35.1	34.8	34.4	33.8	34
6-------	34	35	34.8	34.6	33.3	34.5
7-------	34.1	35	34.8	34.6	33.2	33.8
8-------	34.5	34.9	34.2	34.5	33	33.5
9-------	34	35	34	34.3	32.5	32
10-------	34	34.5	35	34.5	32.5	33
11-------	35.2	35.8	35.5	35.5	33.2	33.1
12-------	35.1	36	35.9	35.5	32.5	32.9
13-------	36	36.9	37	36.6	33	33
14-------	37	38.9	38.5	38.1	32.9	32.9
15-------	37.9	40.1	38.2	38.7	32.9	33.5
16-------	36.8	38.5	38.5	37.1	33	33.5
17-------	38.1	---------	38.1	38.1	33.1	33.2
18-------	37.9	38.7	38.2	38.2	33	33.2
19-------	37	38.5	37.3	37.6	33	33.7
20-------	37.3	39	39.5	38.6	33	33.4
21-------	37	37.1	37.9	37.3	32.8	33.5
22-------	38.1	41	39	39.7	33.2	33
23-------	39.5	40	40.6	40	33	33.2
24-------	39.1	38.8	38.1	38.6	32.9	33.1
25-------	37.6	38.2	38	37.9	33	33
26-------	37.2	37.3	36.1	36.8	32.5	33
27-------	36.8	37	36.5	36.7	32.5	33.1
28-------	36	36.9	37.5	36.8	33	33
29-------	35.5	35.9	36.1	35.8		
30-------	34.9	35.2	35.7	35.2		
31-------	34.5	35	34.5	34.6		
Average-	35.4	36.7	36.8	36.4	32.7	33.3

Date	February--Continued		March			
	6 p.m.	Average	6 a.m.	Noon	6 p.m.	Average
1-------	33.5	33.8	33	33	33	33
2-------	---------	---------	32.8	33.3	33	33.1
3-------	34	34.3	32.6	33	33.1	33
4-------	33.5	33	33.5	33.8	33.5	33.6
5-------	34	33.9	33.1	33.6	33.6	33.4
6-------	33.4	33.7	33	33.9	33.9	33.6
7-------	33.1	33.3	33	33.9	33.1	33.3
8-------	33	33.1	32.9	33.4	32.9	33
9-------	33	32.5	33.2	33.2	33.8	33.4
10-------	33.1	32.8	32.3	33.8	33.8	33.3
11-------	33.1	33.1	33.9	33	34.8	33.9
12-------	33	32.8	35.1	34.3	34.5	34.6
13-------	33.5	33.1	34.3	35.3	34.5	34.7
14-------	33.1	32.9	35	34.9	34.9	34.9
15-------	33.3	33.2	33.8	34.9	34.6	34.1
16-------	33.2	33.2	35.4	36	34.5	35.3
17-------	33	33.1	35.2	37	38	36.7
18-------	33.2	33.1	36.9	37.1	37.8	37.2
19-------	33.3	33.3	34.8	38.5	39.5	37.6
20-------	32.9	33.1	37.9	38	37.5	37.8
21-------	33.2	33.1	37	40.9	38.9	38.9
22-------	32.9	33	37.9	44.9	43.4	42
23-------	33	33	38.1	45.6	41.5	41.7
24-------	32.9	32.9	36.3	39.5	39.6	38.4
25-------	33	33	35	49	42	42
26-------	32.9	32.7	39.6	41.4	40.1	40.7
27-------	32.9	32.7	38.9	41.2	40.3	40.1
28-------	32.9	32.9	37.4	41	40.5	37.6
29-------	---------	---------	39.8	44.7	42.7	42.4
30-------	---------	---------	37.5	38.3	37.7	37.8
31-------	---------	---------	37.1	40.1	41	39.4
Average-	33.2	33.1	35.4	37.4	36.9	36.5

Water temperature (°F) for Maxinkuckee Lake--Continued

Year of 1901

Date	April				May	
	6 a.m.	Noon	6 p.m.	Average	6 a.m.	Noon
1-------	36	46.2	45.5	42.5	57.5	58.3
2-------	38.5	38.5	39	38.6	---------	50.5
3-------	38	44	43.9	41.6	51.9	68.2
4-------	40	50	47.9	45.9	56.9	67
5-------	42.5	45.5	45.5	44.5	58.9	65.1
6-------	44	43.9	43.5	44.1	60.1	68
7-------	42.1	47.6	45.6	45.1	61	63.6
8-------	40.5	48	45.5	44.6	60.4	62.1
9-------	40.8	48.9	47.9	45.9	60.1	64.5
10-------	41.9	50.5	49.9	47.4	61.9	63.9
11-------	42.5	53.5	50.9	49.9	60.9	64.1
12-------	43.9	46.7	48.7	48.4	56	59
13-------	45.3	46.3	47.5	46.7	55.5	61.8
14-------	43.4	49.3	47.2	46.6	55	61.3
15-------	44.5	48.6	48.5	47.2	57.1	61.8
16-------	44.5	51.1	49.6	48.4	61.5	68.5
17-------	52.3	47.5	46.5	48.8	63.1	70
18-------	42.5	46.5	46	45	66	70.1
19-------	41	48.1	45	44.7	63	65.2
20-------	41.5	48.3	46.9	45.6	58.5	65
21-------	42.4	45.5	43.7	43.9	58	60.5
22-------	43.5	44.5	47.3	45.1	59	62.5
23-------	45.5	47.1	49	47.2	59.5	67.1
24-------	46	52.1	51.7	49.9	61.5	65.4
25-------	46.8	55.5	51.5	51.3	55	---------
26-------	47.5	59	57	54.5	55	57
27-------	51.5	57.1	61.8	56.8	55	57.9
28-------	52	59	64.9	58.6	55	59
29-------	56.8	65.5	69.8	64	55	57.8
30-------	60.1	55.5	56.7	57.4	53.1	59.5
31-------					55.5	62.9
Average-	44.6	49.7	49.5	47.9	58.23	62.92

Date	May--Continued		June			
	6 p.m.	Average	6 a.m.	Noon	6 p.m.	Average
1-------	54.5	56.8	58	64.5	63	61.8
2-------	55	52.8	58.1	65.5	65.5	63
3-------	65.3	61.8	60.5	69	68.9	66.1
4-------	62.3	62.1	63.3	71	68.8	67.7
5-------	65.3	63.1	65	66	68.9	66.6
6-------	63.6	63.9	64.5	68.5	68.8	67.2
7-------	62	62.2	62.6	64.8	62.9	63.4
8-------	62.6	61.7	58.9	66.8	63.9	63.2
9-------	64.1	62.9	57	68.5	70	65.2
10-------	64.9	63.6	65	69.6	70.2	68.3
11-------	61.8	62.3	66	74.5	70.5	70.3
12-------	59.5	58.2	67	80	75	74
13-------	60	59.1	70.9	78	74.2	74.4
14-------	63.5	59.9	72.1	80.9	80	77.7
15-------	68	62	75	78.2	78	77.1
16-------	66.3	65.4	70.5	80.5	80	77
17-------	71	68	74	78.1	75.5	75.9
18-------	69	68.4	70.1	79	75.5	74.9
19-------	---------	64.1	72	80	78	76.7
20-------	63.5	62.3	73	77.5	73.5	74.7
21-------	61	59.8	74.3	76.4	78	76.2
22-------	63.8	61.8	74.8	82	80.9	79.2
23-------	65.5	64	73.9	81	81	78.6
24-------	63.2	63.4	76.2	83.5	82	80.6
25-------	56.9	56	77.9	83.2	81.3	80.8
26-------	51.1	54.4	77	84.5	83.9	81.8
27-------	56.5	57.8	78.5	75	84.6	79.4
28-------	59.5	61.2	79.2	85.7	84.6	83.2
29-------	57	56.6	78.8	86.2	82.3	82.8
30-------	58.9	57.2	78	85.9	84.3	82.7
31-------	63.9	60.8				
Average-	61.98	60.93	73.07	74.13	75.13	74.11

Water temperatures (°F) for Maxinkuckee Lake--Continued

Year of 1903

Date	June				July	
	6 a.m.	Noon	6 p.m.	Average	6 a.m.	Noon
1-------	--------	---------	--------	---------	71.5	77
2-------	--------	---------	--------	---------	71	73
3-------	--------	---------	--------	---------	74	77
4-------	--------	---------	--------	---------	76	79
5-------	--------	---------	--------	---------	78	80
6-------	--------	---------	--------	---------	77	83.5
7-------	--------	---------	--------	---------	78.5	86.5
8-------	--------	---------	--------	---------	79	87
9-------	--------	---------	--------	---------	79	83.5
10-------	--------	---------	--------	---------	80.5	85
11-------	--------	---------	--------	---------	81.5	84.5
12-------	--------	---------	--------	---------	81	84
13-------	--------	---------	--------	---------	78.5	81.5
14-------	--------	---------	--------	---------	78	80
15-------	--------	---------	--------	---------	74	77.5
16-------	--------	---------	--------	---------	75.5	79
17-------	--------	---------	--------	---------	75	78
18-------	--------	---------	--------	---------	73	73.5
19-------	--------	---------	--------	---------	73.5	74
20-------	--------	---------	--------	---------	72	75
21-------	--------	---------	--------	---------	72	75
22-------	--------	---------	--------	---------	72	75.5
23-------	--------	---------	--------	---------	72	79
24-------	--------	---------	--------	---------	75	81
25-------	--------	---------	--------	---------	78	78
26-------	--------	---------	--------	---------	76	79
27-------	65	76	75	72	76	81.5
28-------	70	77	75	74	77	80
29-------	71	73.2	72	72	72	80
30-------	72	75.2	75	74	76	78
31-------					71	77
Average-	69.5	75.4	74.3	73	75.6	79.4

Date	July--Continued		August			
	6 p.m.	Average	6 a.m.	Noon	6 p.m.	Average
1-------	71	73.1	70	71	71	70.6
2-------	75.5	73.1	72	77	75	74.6
3-------	78	71.3	77.1	74	78	75.3
4-------	78	77.6	73.5	75	77	75.1
5-------	80	79.3	74.5	78.5	75	76
6-------	84.5	81.6	73.5	76	74	74.5
7-------	81.5	82.1	70	72	71	71
8-------	81.5	82.5	72.5	76.5	74	74.3
9-------	87.5	83.3	74	75	75	74.6
10-------	85	83	71	75	75	73.6
11-------	84.5	83.3	72	74	74	73.3
12-------	81	82	68	72	74	71.3
13-------	78.5	79.5	71	74	74	73
14-------	78.5	78.8	69	76	76	73.6
15-------	78	76.5	68.5	71	70.5	70
16-------	79	77.8	68	75	74.5	72.5
17-------	75	76	70	76	75	73.6
18-------	74.5	73.6	73	78	76	75.6
19-------	74	77.8	73	74	72.5	73.1
20-------	75	74	70	76	75	73.6
21-------	73.5	73.5	71	74	77	74
22-------	75.5	74.3	71	74	74	73
23-------	77	76	72	75.5	73.5	77
24-------	80	78.6	73	78	74.5	75.1
25-------	77.5	77.8	73.5	78	76	75.8
26-------	78.5	76.8	72	77	77.5	75.5
27-------	81.5	79.6	73	76	75	74.6
28-------	78	78.3	73	76	75	74.6
29-------	78.5	76.8	--------	---------	---------	--------
30-------	77.5	77.1	--------	---------	---------	--------
31-------	75	74.3	--------	---------	---------	--------
Average-	78.5	77.8	71.7	75.2	74.6	73.8

Water temperature (°F) for Maxinkuckee Lake--Continued

Year of 1904

Date	October				November	
	6 a.m.	Noon	6 p.m.	Average	6 a.m.	Noon
1-------	--------	--------	---------	---------	50	52.5
2-------	--------	--------	---------	---------	50	53
3-------	--------	--------	---------	---------	50.5	53.9
4-------	--------	--------	---------	---------	51.5	53.5
5-------	--------	--------	---------	---------	49.9	50.2
6-------	--------	--------	---------	---------	42.2	48.5
7-------	--------	--------	---------	---------	47.8	48.2
8-------	--------	--------	---------	---------	47.9	48.3
9-------	--------	--------	---------	---------	43.9	43.9
10-------	--------	--------	---------	---------	47.5	44.7
11-------	--------	--------	---------	---------	42	41.8
12-------	--------	--------	---------	---------	40.3	43
13-------	--------	--------	---------	---------	42	44
14-------	--------	--------	---------	---------	41.8	43
15-------	--------	--------	---------	---------	41.3	42
16-------	--------	--------	---------	---------	42.5	44.5
17-------	--------	--------	---------	---------	43.9	45.3
18-------	--------	--------	---------	---------	44	45.5
19-------	--------	--------	---------	---------	44.9	46
20-------	--------	--------	---------	---------	46	47
21-------	--------	--------	---------	---------	43.6	45.5
22-------	--------	--------	---------	---------	43	46
23-------	--------	--------	---------	---------	43.5	44
24-------	--------	--------	---------	---------	43.5	44.2
25-------	--------	--------	---------	---------	42	43
26-------	--------	--------	---------	---------	39.8	39.9
27-------	--------	--------	---------	---------	37.5	38.5
28-------	--------	--------	52.8	---------	43	39
29-------	47.9	53	---------	50.5	39	--------
30-------	50.2	54	53.5	52.6	---------	--------
31-------	50	58	52.9	53.6		
Average-	49.4	55	53.1	52.5	44.3	45.6

Date	November--Continued		December			
	6 p.m.	Average	6 a.m.	Noon	6 p.m.	Average
1-------	53	51.8	35	---------	35	35
2-------	53	52	37	37.8	33.5	36.1
3-------	52.9	52.4	32	33	32.5	32.5
4-------	54	53	32	32.9	34	31.9
5-------	49.2	49.8	33	34.5	34.5	33.5
6-------	47.9	46.2	34.9	33	35.2	35
7-------	50.5	48.8	34.5	36	35.2	35.2
8-------	45.1	47.1	34.5	34.9	---------	--------
9-------	47.5	45.1	34.8	35	34	34.6
10-------	44	46.3	32	32	32	32
11-------	43	42.3	34	33.8	33.8	33.8
12-------	43.3	42.2	32	32	32	32
13-------	42.9	43.3	32	32	32	32
14-------	43.5	42.8	32	32.8	32	32.2
15-------	44.8	42.7	32	32	32	32
16-------	47.5	41.5	32	32	32	32
17-------	45	44.7	33	32	32	32.3
18-------	46.7	42.9	33	33	33	33
19-------	47	49.9	32	33	33.1	32.7
20-------	45.5	46.2	33	34.5	35	33.1
21-------	45.5	44.9	34.9	34.9	35.2	35
22-------	45.2	44.7	35	37	36.5	36.1
23-------	44.8	44.1	36.4	35.5	35	35.6
24-------	44.5	44.1	35	34.9	35	34.9
25-------	42.5	42.5	35	36.2	35	35.4
26-------	40	39.9	35	35	36	35.3
27-------	39.5	38.5	35	34.5	34	34.5
28-------	38	40	---------	---------	---------	--------
29-------	--------	--------	34.5	---------	32	--------
30-------	--------	--------	34	35	35.1	--------
31-------			34	34.8	34	34.2
Average-	45.9	45.4	33.8	34.1	33.8	33.8

Water temperatures (°F) for Maxinkuckee Lake--Continued

Year of 1905

Date	January			
	6 a.m.	Noon	6 p.m.	Average
1------	33.5	34.9	34.5	34.3
2------	34	34.5	32	33.5
3------	34	34.8	34.8	34.4
4------	32	32	32	32
Average	33.4	34.1	33.3	33.6

Year of 1906

Date	July			
	6 a.m.	Noon	6 p.m.	Average
25-----	62.5	72.5	-------	67.5
26-----	75	75.5	73	74.5
27-----	68.5	76.8	77.9	74.4
28-----	70	77.9	74	74
29-----	68.1	74	80	74
30-----	63.5	82	82.5	76
31-----	-------	-------	83.5	------
Average	67.9	76.4	78.5	74.3

Year of 1906

Date	August				September			
	6 a.m.	Noon	6 p.m.	Average	6 a.m.	Noon	6 p.m.	Average
1----------	71.5	77.5	84.5	77.8	64	73	70.9	69.3
2----------	76.4	81	78.9	78.8	66	68	69	67.7
3----------	71.9	77	78.9	75.9	67	72.5	70.1	69.9
4----------	73.9	78	79	77	69	-------	69.5	69.3
5----------	73.5	78.1	77.5	76.4	63	69	71	67.7
6----------	73	81.9	77.8	77.6	66.1	71	73	70
7----------	73.1	75.4	77	75.2	71	73	75	73
8----------	73	82.2	84	79.7	-------	73	75	74
9----------	73.9	-------	83.5	78.7	71.3	75	76	74.1
10----------	73.9	75.5	81.5	77	76	-------	74	75
11----------	72	83	79	78	71	80	75.2	75.4
12----------	68.8	75.1	76.5	73.5	72	76.8	76	74.9
13----------	69	73.8	75.9	72.9	-------	78.2	70	74.1
14----------	75	-------	-------	-------	60	67.2	68	65.1
15----------	71	76	72,5	73.2	-------	67	67	67
16----------	72.5	77	81	76.8	65	70.9	72	69.3
17----------	74	79	77.5	76.8	-------	-------	73	-------
18----------	72.5	77	78	75.8	68 3	74.9	80	74.5
19----------	-------	-------	-------	-------	-------	-------	-------	-------
20----------	-------	79.5	78	78.8	-------	-------	-------	-------
21----------	74.5	-------	-------	-------	-------	-------	-------	-------
22----------	-------	-------	80	-------	-------	-------	-------	-------
23----------	-------	80	80.8	80.4	-------	-------	-------	-------
24----------	75.5	80	-------	77.8	-------	-------	-------	-------
25----------	74.8	-------	81	77.9	-------	-------	-------	-------
26----------	-------	85	77.5	81.3	-------	-------	-------	-------
27----------	70	73.5	73.5	72.3	-------	-------	-------	-------
28----------	68.5	74.1	76	72.9	-------	-------	-------	-------
29----------	70	73.5	79	74.2	-------	-------	-------	-------
30----------	74.5	71	72	72.5	-------	-------	-------	-------
31----------	67	-------	-------	67				
Average-	72.5	77.7	78.5	76.2	67.8	72.6	72.4	71.2

Water temperatures (°F) for Maxinkuckee Lake--Continued

Year of 1906--Continued

Date	October				November			
	6 a.m.	Noon	6 p.m.	Average	6 a.m.	Noon	6 p.m.	Average
1	-------	-------	-------	-------	45.5	50.5	50	48.8
2	-------	-------	-------	-------	45	45	50	46.6
3	-------	-------	-------	-------	48	51	45	48
4	-------	-------	-------	-------	45.2	-------	46	45.6
5	-------	-------	57	-------	47	52.5	46.5	48.6
6	-------	-------	-------	-------	43	-------	-------	-------
7	-------	-------	-------	-------	53.5	-------	-------	-------
8	-------	-------	-------	-------	45	49	48.6	47.5
9	-------	-------	-------	-------	47.5	48	46	47.1
10	-------	-------	47	-------	41.5	53.2	44.5	46.4
11	44.5	53.5	49.5	49.2	45.2	48.9	-------	-------
12	47.2	52	52	50.4	42.5	45.1	45	44.2
13	55	55	-------	55	41.8	43	42	42.2
14	51	55.8	55.5	54.1	41	46.6	44.5	44
15	51.6	55.5	56.7	54.6	43	-------	-------	-------
16	51.8	-------	57	54.8	43.5	44.5	43.5	43.8
17	51.5	58	58	55.8	43.5	-------	40	41.1
18	56	58	61	58.3	45	45.5	-------	45.2
19	58.5	65	62.5	62	42.5	37.5	37.2	39
20	51.9	63.3	53	56.1	35.5	37	-------	36.2
21	56	59	60	58.3	39.5	-------	39	39.2
22	56.3	57.6	56	56.6	-------	-------	-------	-------
23	59	60.5	58	59.2	43.5	-------	-------	-------
24	57.5	-------	50	53.8	-------	-------	-------	-------
25	-------	-------	-------	-------	-------	-------	-------	-------
26	-------	-------	-------	-------	-------	-------	-------	-------
27	49.5	47	45.5	47.3	-------	-------	-------	-------
28	44	43	42.8	43.3	-------	-------	-------	-------
29	41.1	50	44.5	45.2	-------	-------	-------	-------
30	46	47.5	45	46.1	-------	-------	-------	-------
31	42	52	48.5	47.5	-------	-------	-------	-------
Average-	51.1	54.9	53.1	53	42.9	46.5	44.5	44.6

Year of 1907

Date	September				Date	October			
	6 a.m.	Noon	6 p.m.	Average		6 a.m.	Noon	6 p.m.	Average
13	-------	70	69	-------	1	57	61	63	60.3
14	67	-------	-------	-------	2	60	65	64	63
19	70	74	72.5	72.2	3	62	64	63	63
20	70	73	73	72	4	63	65	65	64.3
					5	59	63	63	61.7
21	67	72.5	70	69.8					
22	62	70	70	67.3	6	59	62	63	61.3
23	65	-------	66	65.5	7	59	62	60	60.3
24	61	66	63	63.3	8	54	59	61	58
25	58	62	62	60.7	9	57	58	58	57.7
					10	54	57	58	56.3
26	60	62	63	61.7					
27	61	61	61	61	11	54	57	55	55.3
28	61	62	62	61.7	12	52	53	53	52.7
29	60	60	59	59.7	13	50	52	53	51.7
30	57	-------	62	59.5	14	51	54	54	53
Average-	63	66.6	65.6	64.5	15	55	55	55	55
					16	55	55	56	55.3
					17	54	57	58	56.3
					18	54	56	56	55.3
					19	50	54	55	53
					20	53	54	53	53.3
					21	51	55	54	53.3
					22	51	55	56	54
					23	52	55	53	53.3
					24	51	53	54	52.7
					25	50	53	50	51
					26	50	49	50	49.7
					27	49	50	48	49
					28	46	46	47	46.3
					29	43	45	46	44.7
					30	49	49	49	49
					31	48	50	51	49.3
					Average-	53.3	55.6	55.6	54.8

Year of 1908

Date	August			
	6 a.m.	Noon	6 p.m.	Average
27	65	73	-------	69
28	65	74	74	74.1
29	69	70.5	73.5	71
30	70	81	80	77
31	72.9	78.5	79	76.8
Average-	68.4	75.4	76.6	73.2

Water temperatures (°F) for Maxinkuckee Lake--Continued

Year of 1908

Date	September				Date	October			
	6 a.m.	Noon	6 p.m.	Average		6 a.m.	Noon	6 p.m.	Average
1-----	75	75	-------	75	1-----	61	66	66	64.3
2-----	71.3	73.5	70.5	71.8	2-----	60	-------	62	61
3-----	61.5	72	70	67.8	3-----	56	65	64	61.7
4-----	65	72	70	69	4-----	60	65	65	63.3
5-----	67	-------	75	71	5-----	60	64	64	62.7
6-----	71	78	70	73	6-----	62	65	65	64
7-----	64	-------	71.5	67.8	7-----	62	67	67	65.3
8-----	66	-------	-------	-------	8-----	62	67	67	65.3
9-----	66.5	73.5	75	71.7	9-----	64	70	68	67.3
10-----	69	76.5	75.4	73.6	10-----	65	69	67	67
11-----	-------	77	-------	-------	11-----	61	63	61	61.7
12-----	71	81	-------	76	12-----	57	58	50	55
13-----	73	76	78	75.7	13-----	56	61	62	59.7
14-----	71	74	73	72.7	14-----	57	62	61	60
15-----	68.5	72	73	71.2	15-----	56	63	62	60.3
16-----	66.5	73.8	76	72.1	16-----	59	62	62	61
17-----	-------	74	75	74.5	17-----	60	62	52	58
					18-----	56	56	56	56
Average-	68	74.1	73.3	72.2	19-----	51	59	55	55
					20-----	51	52	48	50.3
					21-----	45	46	46	45.7
					22-----	50	46	50	48.7
					23-----	48	52	50	50
					24-----	51	54	54	53
					25-----	48	55	54	52.3
					26-----	50	54	55	53
					27-----	50	51	50	50.3
					28-----	47	49	50	48.7
					29-----	49	50	46	48.3
					30-----	45	45	45	45
					31-----	43	47	44	44.7
					Average-	54.9	58.2	57	56.7

Temperature profiles (°F) for Maxinkuckee Lake, at Culver

Depth (feet)	1946			1947					
	Oct. 22	Nov. 19	Dec. 20	Jan. 7	May 1	May 27	June 19	July 24	Aug. 26
Air	68	55	38	32	54	61	72	75.1	76
Water-surface	59.5	49.7	37	33.1	53.5	63.6	68.3	73.1	84.1
5	59.2	49.8	37	33.6	53.5	63	68.3	73	83.9
10	59.3	49.8	37	34	53.5	63	67.8	72.7	83.9
15	59.3	49.8	37.2	34.5	53.5	63	66.4	72.5	83.9
17.5	--------	--------	--------	--------	--------	--------	--------	--------	83.7
20	59.3	49.7	37.3	34.5	53.5	63	66.2	72.1	79.8
25	59.3	49.7	37.3	34.5	53.2	63	65.6	72.1	75.8
27.5	60	--------	--------	--------	--------	--------	--------	--------	--------
30	60	49.5	38.3	34.7	53.2	63	65.3	71.9	73.2
32.5	--------	--------	--------	--------	--------	59.1	--------	--------	--------
35	59.7	49.5	37.3	35	53	57.9	64.5	70.9	70.4
40	59.7	49.5	37.3	35	51.7	56.2	62.8	68.4	66.7
45	60	49.3	37.3	35.3	51.3	55.4	59.4	64	62.8
50	59.7	49.3	37.3	35.4	51	54.6	57.3	60.9	60
55	59.5	49.2	37.3	35.5	50.9	54.2	56.1	58.3	58.8
60	58.9	49.2	37.3	35.5	50.8	54	54.8	57.3	57.6
65	58.9	49.1	37.4	35.7	50.5	53.8	54.3	56.8	57.1
70	58.9	49.1	37.4	36	50.3	53.7	53.8	56.5	57
72.5	--------	--------	--------	36.2	--------	--------	--------	--------	--------
74	--------	--------	--------	36.5	--------	--------	--------	--------	--------
75	58.9	49.5	37.4	--------	50.3	53.5	53.8	55.9	56.8
78	--------	--------	--------	--------	--------	--------	53.3	--------	--------
80	58.9	49.3	38	--------	50.3	53.2	--------	55.8	56.5
82	--------	--------	41.5	--------	--------	--------	--------	--------	--------
83	--------	51.5	--------	--------	--------	--------	--------	--------	56.2
84	58.1	--------	--------	--------	49.5	53	--------	--------	--------

Temperature profiles (°F) for Maxinkuckee Lake, at Culver--Continued

Depth (feet)	1947--Continued			1948	
	Oct. 3	Oct. 31	Nov. 20	June 2	July 3
Air	69	52	46	62	83
Water-surface	62	61.5	46.3	67.4	75
5	62.1	61.5	46.4	67.5	75
10	62.2	61.5	46.4	67.3	75
15	61.9	61.5	46.3	67.1	74.8
17.5	----------	----------	----------	66.8	----------
20	61.6	61.5	46.3	65.3	74.6
22.5	----------	----------	----------	63.2	----------
25	61.7	61.5	46.3	62	74.2
27.5	----------	----------	----------	----------	72
30	61.5	61.5	46.2	61.7	68
35	61.4	61.5	46.1	60.7	63.9
40	61.2	61.5	46	60.3	62.5
45	61.2	61.4	46	60.1	61.5
50	61.2	61.3	46	59.5	60.3
55	60.8	61.3	45.9	58.7	60
60	60.5	61.5	45.9	58.3	59.7
65	60.5	61.3	45.9	58	59.7
70	60.2	61	45.9	57.9	59.6
72.5	----------	59.8	----------	----------	----------
75	58	59.3	45.9	57.8	59.6
80	----------	58.7	45.7	57.8	59.4
85	----------	57.4	45.6	57.6	59.3
86	----------	----------	----------	----------	59.3
86.5	----------	57.1	----------	----------	----------

Depth (feet)	1948--Continued				
	Aug. 3	Aug. 31	Oct. 5	Nov. 16	Dec. 7
Air	79	73	62	54	----------
Water-surface	79.1	80.4	63.2	48.4	40
5	77.6	80.4	52.8	48.3	40.5
10	77.3	80.2	62.8	48.3	40.2
15	77.3	80.2	62.6	48.6	39.8
17.5	----------	78.8	----------	----------	----------
20	77	76.4	62.7	48	39.9
22.5	----------	75.3	----------	----------	----------
25	76	74.4	62.7	48.3	40.4
27.5	75.3	----------	----------	----------	----------
30	72.7	73.4	62.6	48.3	39.4
32.5	68	70.3	----------	----------	----------
35	66.1	68.6	62.5	48.2	40.2
40	63.5	63.9	62.3	48.6	40.2
45	62.2	62.9	62.1	48.3	40.2
50	60.7	61.2	62	49	40.3
55	59.9	59.8	61.7	49	40.3
60	59.5	59.4	59.6	48.8	40.1
65	59.2	59.4	59.3	48.7	40.5
70	58.9	59.2	58.9	48.7	39.2
75	58.7	59.2	60.1	48.6	39.5
78	----------	----------	----------	----------	39.6
80	58.7	59.2	59.8	48.7	----------
82	----------	----------	----------	48.7	----------
84	----------	58.9	----------	----------	----------
85	58.7	----------	59.7	----------	----------

Temperature profiles (°F) taken in Deep Hole, Maxinkuckee Lake
[Data from Evermann and Clark, 1920]
Temperature readings, in 1899

Depth (feet)	July						
	18	19	20	21	22	23	24
Air	---------	---------	---------	--------	---------	--------	
Water-surface	77	77	78	78.2	79.1	80.5	80
5	77	77	78	78.2	79.1	80.5	80.1
10	77	77	78	78.3	79	79.7	80.1
15	76.5	76.5	76.7	78.5	78.1	78	78.5
20	74.7	74.7	75	75	75	--------	75.2
25	72.3	72.3	72.5	73.5	72	74	72.8
30	69.2	69.2	69	69	69.2	69.5	70
35	---------	63	63	64.2	64	64	65
40	63	57.5	57.3	58	59.1	58	58.5
50	57.5	52.5	53	52.6	53.1	54	53.7
60	52.5	51.5	51.7	51.2	51.3	50.5	51.5
70	51.5	50.5	50.7	51.2	51	50.5	51.2
80	50.3	50.3	50.7	50.8	51	50.5	50.8
85	---------	50.5	--------	--------	---------	50.5	50.5
89	50.5	---------	50.7	50.6	50.5	--------	---------

Temperature profiles (°F) taken in Deep Hole, Maxinkuckee Lake--Continued

Temperature readings, in 1899

Depth (feet)	July						
	25	26	27	28	29	30	31
Air	--------	---------	--------	---------	--------	---------	61
Water-surface	79.5	80	80.5	80.4	80.5	79.1	78.5
5	80	80	80.5	80.4	80.8	79.5	78.7
10	79.5	80	80.5	80.7	81	79.9	78.7
15	79.5	79.5	79	77.4	80.2	79.2	78.5
20	75.5	76	76.2	75.5	76.5	77.3	78
25	72.7	73	73.5	72.8	73.6	73	72
30	69.5	69.7	70.1	70	71	70	69.7
35	64	65	63.2	64.1	65.7	65.5	64.7
40	58.3	59.1	57.8	58.3	58.8	58.7	59
50	53.7	54	54	54	54.2	54.5	54.5
60	51.5	52.1	51.7	52	52	52	52.5
70	51.3	51.2	51.5	51.8	51.2	51.5	51.5
80	5 .7	51.5	51.2	51	51	51.7	51.2
85	50.7	51.2	51.2	51	50.8	51.3	51

Depth (feet)	August							
	1	2	3	4	5	6	7	8
Air	--------	--------	74.5	77.3	74	74.5	-------	66.6
Water-surface	78	78.3	78.5	79.5	79	78.5	77.5	77
5	78.2	78.3	78.8	79.5	79.2	78.2	77.5	77
10	78	78.3	79.3	79.5	79.2	78.2	77.5	77
15	77.5	78.3	78.3	78	79.2	78.2	75.5	77
20	74	78	78.5	77.2	78	77.7	77.5	77
25	73	75	74	74	74	75.5	75.3	74.8
30	70	69.7	69.5	70	70.2	69.8	70.2	70.5
35	64.5	64.7	63.7	64	64.5	65.5	63.7	64.2
40	59.2	59.1	59.2	60.5	59.5	59.5	59.7	58.7
50	54.6	55	54.8	55	54	54.5	54.7	54.5
60	52	52	52.5	52	52.5	52.5	52.7	52.4
70	52	51.8	51.7	51	52	52	51.8	51.7
80	51.5	51.3	51.7	51	51.5	51.7	51.8	51.7
85	51.5	51	51.3	51	51.5	51.7	51.5	--------

Depth (feet)	August							
	9	10	11	12	13	14	15	16
Air	71	72	78.5	71.5	-------	64.5	66.7	64
Water-surface	76.2	75.7	76.5	77	76.7	75	77.4	74
5	76.2	75.7	76.5	77	76.7	75.2	74.5	74.2
10	76.2	76.2	76.5	77	76.7	75.2	74.5 1/ 75.1	74.3
15	76.2	75.6	76.5	-------	77	75.2	74.5	74.3
20	76.2	75.6	76	76.5	76.5	74.9	74.3	74.3
25	76.2	76	75.2	75.5	74.4	72.3	73.6 1/ 72.1	73.8
30	70.5	70.7	70.2	72	71	68.5	70.5	69.3
32.5	--------	--------	--------	-------	-------	-------	--------	66
35	64.2	65.6	64.7	64.7	66	61	62.5	62
40	59.8	60.1	59.7	59.2	60	57.5	57.2 1/ 55	57.2
50	54.5	54.7	54.8	54.6	55	52.5	52.5	52.7
60	51.6	52.5	52.3	51.5	53	51.5	51.3	51.3
70	50.7	51.7	52	52	52.2	51	50.8	51
80	50.7	51.7	51.7	51.9	52.1	50.7	50.7	50.7
85	--------	51.7	52	51.9	52.2	50.5	50.2	50.7

Depth (feet)	August							
	17	18	19	20	21	22	23	24
Air	71.5	71.5	76.5	76	72	83	71	83
Water-surface	75.4	76.7	77.3	77.7	77	76.5	76.5	76.5
5	74.5	76.7	77.3	77.7	77	76.5	76.7	76.5
10	74.5	75.1	74.7	77.6	77	76.3	76.7	76.3
15	74.5	74.4	74	74	76.5	76.5	76.5	76.5
20	74.7	74	73.4	73	75	74.7	75	74.7
25	73.5	73.5	72.2	71.7	73	73	73.3	73
30	71.5	70.5	69.5	69.4	70.5	70.2	70	70.2
32.5	65.5	-------	64.5	64.5	66	64.8	65.7	64.8
35	61.5	61.5	61	61.5	59.5	60.8	62	60.8
40	57.2	57.2	56.8	57.2	56	56.5	57	56.5
50	53.1	53	51.3	52	52.4	52	52.7	52
60	51.5	51.5	50.3	50.5	50.5	50.4	50.7	50.4
70	51.3	51	50	49.5	50	50	50.4	50
80	51	50.5	50	49.5	50	49.9	50.2	49.9
85	50.7	50.5	49.7	49.3	50	49.5	50.2	49.5

1/ Thermometer.

Temperature profiles (°F) taken in the Deep Hole, Maxinkuckee Lake--Continued

Temperature readings, in 1899

Depth (feet)	August						
	25	26	27	28	29	30	31
Air	72.5	72.3	71.7	74	72	74.2	73
Water-surface	76.5	76.3	75.5	77	76.5	77.2	75.7
5	76.5	76.3	76.5	77	76.5	77.2	75
10	76.5	76.3	76.3	77	76.7	77	75
15	76.5	76.3	76.3	76.5	76.5	77	74.7
20	75	75.5	75.1	75	76	76.5	73.5
25	73.2	73	73.7	73.3	73.5	73.5	71
30	70	69.2	69.5	69.5	70	70.7	67.3
32.5	66.5	65	66.7	66.3	66.5	65.5	63.2
35	62.7	62	61.2	63.2	63.2	62.2	60.3
40	58	57.6	57.6	57	56.7	57	55.8
50	52.4	52.2	52.5	52.5	51.7	52.5	50.7
60	51	50.8	51	50.7	51	51.5	49.5
70	50.5	50.4	50.5	50.5	50.7	51	49
80	50	50.2	50.2	50.5	50.5	51	49
85	50	50	50	50	50.2	2/ 50.5	3/ 48.7

Depth (feet)	September						
	1	2	3	4	5	6	7
Air	73.5	77.6	75	65	79	73	70.5
Water-surface	75.8	76.3	77	75.5	76.5	75.5	74
5	75.8	76	77	75.5	76	75.5	74
10	75.8	76	76.5	75.5	75.6	74.5	74
15	75	--------	75.5	74.5	75	74	74
20	73	--------	73.2	74	74.5	73	74
25	72	--------	70.6	72.2	73.5	72.5	73
30	68.8	--------	66.2	64.8	69.5	67	68
32.5	63.8	--------	63.3	64	64	63	63
35	62	--------	59	58.7	61	60.3	59
40	56.5	--------	54.8	55.9	56	57	55
50	51	--------	50	51	51	51	50.5
60	50	--------	48.8	49.9	49.5	51	49
70	49.8	--------	48.6	49.9	49	50.5	48.5
80	49.5	--------	48.6	49	49	50.5	48.5
85	49	--------	48.4	47	49	50.5	48.5

Depth (feet)	September--Continued						
	8	9	10	11	12	13	14
Air	68.5	62	61	61	63.5	57	50.5
Water-surface	74.5	73.5	72.5	72	68.5	69.5	70
5	74.5	73	72.5	72	68.5	69.5	70
10	74.5	73	72.5	72	68.5	69.5	70
15	74.5	73	72.5	72	68.5	69.5	70
20	73.5	73	72.2	72	68.5	69.5	70
25	72	73	72.2	72	68.5	69.5	70
30	68	69	69.5	71	68	68.5	70
32.5	64.5	65.5	65.5	66.5	66	67	69
35	61	62	62.5	62.5	63	64	66.5
40	56.5	56	56.5	55.5	55.5	57	61
50	51	51.5	52.5	51.2	51	52	54.5
60	50	50	50.5	50	50	50	53
70	49.5	49.7	50.2	49.5	49	50	52
80	49.5	49.7	50	49.2	49	49.5	52
85	49.5	49.7	49.7	49.2	49	49.5	52

2/ Deep sea thermometer gave surface 76°F and bottom 52°F.
3/ Deep sea thermometer gave surface 78.5°F and bottom 52°F.

Temperature profiles (°F), taken in the Deep Hole, Maxinkuckee Lake--Continued

Temperature readings in 1899

Depth (feet)	September--Continued						
	15	16	17	19	20	21	22
Air	56	68	71	61	60.2	51.5	62
Water-surface	70	68.6	69	69	67.3	66	66
5	70	68.6	69	69	67	66	66
10	70	68.6	69	69	67	66	65.8
15	70	68.6	69	69	67	66	65.8
20	70	68.5	68.9	69	67	66	65.8
25	70	68.5	68.5	68.6	67	66	65.8
30	70	68	68	68.6	67	66	65
32.5	68.5	67	67	67.7	67	66	64.8
35	67	66	66	66.7	66.5	66	64.8
40	60.5	59.5	58.5	62.5	63	63.5	63.5
50	53.7	53	53	53.5	54.2	53.5	54
60	52.7	52	51.5	52.3	52.1	52.3	52
70	52	51.4	51.4	52	51.5	51.8	51.9
80	52	51.3	51.3	52	51.5	51.7	51.8
85	51.7	51	51.3	52	51.5	51.5	51.5

Depth (feet)	September--Continued						
	23	24	25	26	27	28	30
Air	58.5	61.4	56	51.5	48	55	53
Water-surface	65.5	--------	67	65.5	62.5	57	59
5	65.5	--------	67	66.5	64.5	57	58
10	--------	--------	66.5	66	64.5	57	54
15	--------	--------	66.5	65	64.5	57	54
20	--------	--------	66.5	64.5	64	57	54
25	--------	--------	66.5	64.5	58	57	54
30	--------	--------	67	63.5	58	--------	51
32.5	--------	--------	66	63.5	58	--------	51
35	--------	--------	66	63.5	55	--------	52
40	--------	--------	65.5	63.5	55	--------	52
50	--------	--------	56	55	52	--------	52
60	--------	--------	54	53	45.5	--------	51
70	--------	--------	52.5	51.5	45.5	--------	--------
80	--------	--------	52	50.5	45	--------	--------
85	--------	--------	53	50.5	42.5	--------	--------

Monthly summary in 1899

Depth (feet)	July			August			September		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
ater-surface	80.5	77.0	79.2	79.5	74.0	76.6	77.0	66.0	72.1
5	80.8	77.0	79.3	79.5	74.2	76.8	77.0	66.0	72.0
10	81.0	77.0	79.2	79.5	74.3	76.7	76.5	66.0	71.9
15	80.2	76.5	78.3	79.2	74.0	76.3	75.5	66.0	71.3
20	78.0	74.7	75.7	78.2	73.0	75.6	74.5	66.0	71.0
25	74.0	72.0	72.8	76.2	71.0	73.8	73.5	66.0	70.5
30	71.0	69.0	69.7	72.0	67.3	70.0	71.0	64.8	68.2
32.5	-------	-------	-------	66.7	63.2	65.4	69.0	63.0	65.7
35	69.5	63.0	64.7	66.0	60.3	62.9	67.0	58.7	63.1
40	63.0	57.3	58.7	60.5	55.8	58.1	63.5	54.8	57.9
50	57.5	52.5	53.2	55.5	50.7	53.3	54.5	50.0	52.1
60	52.5	50.5	51.7	53.0	49.5	51.5	53.0	48.8	50.8
70	51.8	50.5	51.2	52.2	49.0	51.0	52.0	48.5	50.3
80	51.7	50.3	50.9	52.1	49.0	50.8	52.0	49.5	50.2
85	51.3	50.5	50.8	52.2	48.7	50.6	52.0	48.4	50.1

Temperature profiles (°F) taken in Deep Hole, Maxinkuckee Lake--Continued

Temperature readings in 1900

Depth (feet)	July							
	17	18	19	20	21	22	23	24
Air	--------	69.5	72	76.3	65	77	79.5	81.2
Water-surface	77.1	76.3	77	78	76.6	77.5	79	80.3
5	--------	76.3	77	78	77	77.5	79.5	80.5
10	77.1	76.3	77	78.5	77	78	78.1	80.1
15	--------	76.3	77.1	77.9	77	77.2	77	77.1
20	77.1	76.3	77	77.1	77	76.9	76.8	76.6
25	--------	75.8	76	76	75	75.5	76	75.9
30	72	74	74	73.2	72	73.1	72	73.6
32.5	--------	67	69	70	70	69	68.6	71.3
35	62	63	64.5	63.5	66.5	65.5	66	68.9
40	57.3	58.5	57.7	57.4	58	58.8	58.3	58
45	--------	55.5	55	55.5	55.8	55	55	55
50	52.3	52.8	53.8	54	53	53.3	53	53
55	--------	51.8	51.5	52	51.6	52.3	52	52
60	50.5	51	50.9	51	50.7	51.1	50.9	51.1
65	--------	50.9	50.8	50	50.9	51	50.1	50.5
70	50	50	50.3	50	50	50	50.2	50
75	--------	49.9	49.9	49.9	50	50	50.2	50
80	50	49.9	49.7	49.9	49.9	50	49.8	50.2
85	49.5	49	49.2	49.7	49.5	49.2	49.1	49.3

Depth (feet)	July--Continued						
	25	26	27	28	29	30	31
Air	78	68	69.5	69	76	74	79
Water-surface	78.1	77.2	77	77	78	78	78.7
5	78.1	77.5	77	77	78	78	78.8
10	78.1	78	77	77	78	78	78.5
15	78	77.8	77	77	77.6	78	78.3
20	76.3	77.5	77	76.8	76.1	76.4	77
25	76	76	76.2	75.2	75.5	76	75.6
30	72.8	71.5	71	72.1	73	71	72.2
32.5	67	68	68.5	68	67.5	67.3	68.8
35	62.2	61.5	63	64	62.8	65	63.2
40	56.6	57	57	56.8	57	57	57.1
45	54	54.6	54.5	53.9	53.8	54.3	54.6
50	52.1	52.3	52.5	52	52	52.6	52.8
55	51	51	51	51	51	51	51
60	50.5	50.5	50.6	50.5	50.5	50.5	50.5
65	50.7	50.5	50.6	50.5	50.3	50	50.3
70	50	50.5	50.4	50.4	50	50	50
75	50	50	50.2	50.1	50	50	50
80	50	50	50	50	49.8	50	49.8
85	49.8	50	49.4	49.3	49.5	49.2	49.5

Depth (feet)	August							
	1	3	4	6	8	9	11	13
Air	73	73	73	83.5	84	82	85	77
Water-surface	78	78	78.1	81.8	82.4	82.8	83	81
5	78.1	78	78.1	81.8	82.4	82.8	83	81
10	78	78	78.1	79.8	82.2	82.8	82.5	81
15	78	78	78	78.2	79.2	79.5	82	80.8
20	76.5	77	77.6	77.5	77.5	77.5	77.6	80.3
25	75.6	76.4	76	76	76	76.2	75.7	75.7
30	73.2	73	72.5	72	70.5	70.1	70.5	72.3
32.5	67.6	68.6	68.5	68	68.5	69.2	69.5	68
35	64.1	63.2	64	63.9	62.5	64.2	63.5	64
40	58	57.2	57.9	57	58	58	58	59
45	54.6	55.5	55	54.5	54.5	54.5	55	55
50	52.6	52	53	52.5	52.1	52.2	52.8	52.6
55	51	51.2	51	51.3	51.1	51.2	51.2	51.5
60	51	51	51	50.8	50.6	50.7	50.6	51
65	50.1	50.8	50.1	50.3	50.5	50.4	50.5	50.8
70	50.2	50.5	50.1	50.1	50	50	50.5	50.3
75	50	50.2	50	50	50	50	50	50.3
80	49.9	50	50	50	50	50	50	50
85	49.5	49.5	49.8	49.8	49.8	49.9	49.9	49.8

Temperature profiles (°F) taken in Deep Hole, Maxinkuckee Lake--Continued

Temperature readings in 1900

Depth (feet)	August--Continued							
	15	17	18	20	22	24	25	30
Air	73.2	78.5	76.2	80	80	76.5	85	79.8
Water-surface	79.8	78.9	78.2	80	80.8	80.2	80.1	80
5	79.8	78.5	78.2	79.7	80.8	80	80.1	80
10	79.9	78.5	78.2	79.5	80.5	80	80.1	80
15	79.8	78.5	78.2	79.8	80.3	80	80	79.5
20	79.8	78.8	78.2	79.1	79.2	80	80	78.8
25	76.8	77	76.6	77.2	76.9	77.5	79.5	78
30	---------	72.1	72.1	71	71.5	73	71.5	73
32.5	---------	67.1	68	68.3	---------	68	68.5	70
35	---------	64.6	63.3	65.7	64	64	66.9	66
40	---------	58.3	60	59.8	59.9	60.3	61	59.8
45	---------	55.5	56	56	56	57	57	56
50	---------	53	54.2	53.5	54	54.2	54.1	54.3
55	---------	52	51.5	52.5	52.8	52.8	52.5	53
60	---------	51.5	51	52	52.3	52	52.5	52.2
65	---------	51	50.7	51.5	51.8	51.5	52	51
70	---------	51	50.6	51.2	51.7	51.2	51.8	51.8
75	---------	50.5	50.3	51	51.3	51.3	52	51.6
80	---------	50.3	50	51	50.8	51	51.6	51
85	---------	49.8	49.9	50.1	50.2	51	51	51

Depth (feet)	September								
	1	3	5	12	14	22	24	26	28
Air	82.5	77.5	86.5	68	79	68	63	76	70.5
Water-surface	80.1	79.8	79	76	75	67.4	67.2	70.2	68.5
5	80	79.8	79.1	76	75	67.4	67.2	70	68.5
10	79.9	79.2	79	76	75	67.4	67.2	69	68.2
15	79.7	78.5	79	75.8	75	67.2	67.2	69	68.1
20	79.4	78.2	79	75.8	75	67.2	67.2	68.7	68
25	78	78.2	79	75.6	74.9	67	67	69	67.8
30	73	75.4	75.6	74.5	74.5	67	66.8	68	67.8
32.5	69	71	70.5	73.9	74	67	66.8	--------	--------
35	65.2	65.2	65	73.5	73	66.9	66.8	67.9	67
40	60.3	60	60.1	64.5	64.2	66.5	66.6	67.6	67
45	57	57	57	--------	--------	--------	--------	64.5	66
50	54.8	54.3	54.5	54.6	54.5	55.1	56.5	58.5	57.9
52.5	--------	--------	--------	--------	--------	--------	--------	55	54.1
55	53	53.2	53.5	--------	--------	53.6	53.2	53.3	53.5
60	52	52.5	52.5	52.9	52.4	52.9	52.7	53.3	52.5
65	51.5	52	52	--------	52	52	--------	--------	52.4
70	51.5	52	51.5	51.9	51.6	52	51.9	--------	52
75	51.8	51.7	51.3	--------	--------	52	51.7	--------	51.6
80	51.6	51.7	51.1	51.4	51.5	51.5	51.7	--------	51.4
85	51.5	51.5	51	51.1	51.9	51.5	51.3	--------	51.4
89	50.8	50.9	50.8	Bottom temperatures					

Depth (feet)	October						
	1	3	5	8	10	12	15
Air	72.5	72	75.9	54.1	54.1	59.5	63
Water-surface	73	67.5	68.8	67.6	66	65.2	64.9
5	67.9	67.5	69.5	68	66	65.3	64.9
10	67.8	67.5	69.1	67.9	66	65.3	64.8
15	67.5	67.5	67.8	67.9	66	65.3	64.8
20	67.5	67.3	67.2	67.9	66	65.3	64.8
25	67.4	67.1	66.9	67.8	66	65.3	64.6
30	67	66.9	66.9	67.6	66	65.2	64.5
35	67	66.7	66.8	67	66	65.2	64.5
40	66.5	66.5	66.4	66.7	66	65	64.3
45	66	66.1	65.5	66.6	66	65	64
50	59	57.6	58	60.6	61.7	62	62.7
52.5	55	55	55.3	57.1	57.5	56.9	58
55	54.5	53.5	54	54.9	54.3	54.4	54.1
60	52.5	53	52.3	52.9	52.9	52.9	53
65	52.5	52	52	52.2	52.1	52.1	52.2
70	52	52	51.9	52	52	52	51.9
75	51.5	51.6	52.2	52	51.9	51.9	51.9
80	51.5	51.6	51.3	51.6	51.9	51.9	51.8
85	51.5	51.5	51.9	51.6	51.8	51.5	51.1

Temperature profiles (°F) taken in Deep Hole, Maxinkuckee Lake--Continued

Temperature readings in 1900

Depth (feet)	October--Continued						
	17	19	22	24	26	29	31
Air	47.6	52	62.9	56.6	64.5	64	62
Water-surface	63	61	61.5	61.2	61.5	61.8	62.5
5	63.5	62.5	61.4	61.2	61.5	61.8	62.5
10	63.4	62.3	61.3	61.2	61.5	61.8	62.5
15	63.3	62.3	61.3	61.2	61.4	61.8	62.5
20	63.3	62.3	61.2	61.2	61.4	61.7	62.5
25	63.3	62.3	61.2	61.2	61.3	61.7	62.3
30	63.3	62.3	61.2	61.2	61	61.3	62
35	63.3	62.3	61.2	61.2	61	61.3	61.9
40	63.3	62.3	61.2	61.1	61	61.1	61.2
45	63.1	62	61.2	61.1	61	61	61
50	62	61.5	61.2	61	61	60.7	60.7
52.5	61	61.2	--------	--------	--------	--------	--------
55	56.9	59	61.2	60.7	60.8	60.4	60.3
59.5	--------	--------	58.3	54.2	59.4	60.1	59.9
60	52.8	53	53.2	52.3	57.4	58	56.8
65	52.3	52.1	53.1	52	52.3	52.3	52.5
70	52	52	52	52	52	52	52
75	52	52	52	51.8	52	52	51.9
80	51.9	51.8	51.9	51.7	51.8	51.7	51.7
85	51.6	51.5	51.5	51.2	51.6	51.5	51.5

Depth (feet)	November						
	2	5	9	19	23	26	29
Air	75	52.9	45	51	36.8	36.2	31.5
Water-surface	62	49.9	54	45.9	46.7	44	42.9
5	61.3	59.3	54	45.9	46.7	44	42.9
10	61.3	59.3	54	45.9	46.7	44	43
15	61	59.3	54	45.9	46.6	44	42.9
20	61.3	59.3	54	45.9	46.5	44	42.9
25	61	59.3	54	45.9	46.5	44	42.9
30	61	59.2	54	45.8	46.5	44	42.9
35	60.9	59.1	54	45.5	46.7	44	42.9
40	60.5	59.1	54	45.8	46.4	44	42.9
45	60.5	59.1	53.9	46	46.3	44	42.9
50	60	59.1	53.8	46	46.2	44	42.9
55	60	59	53.7	45.8	46.2	44	42.9
60	59.8	58.8	53.7	45.7	46.2	44	42.9
62.5	58	58.5	--------	--------	--------	--------	--------
65	56.5	58.4	53.7	45.8	46.2	44	42.9
70	52.4	54	53.3	45.8	46.2	44	42.5
75	52	52	53.3	45.8	46.2	44	42.5
80	52	51.9	53.1	45.8	46.2	44	42.5
85	51.5	51.9	53	46.3	46.2	44	42.5

Depth (feet)	December							
	1	3	5	8	11	13	15	17
Air	39.9	47	36.5	36.2	29.5	30.	25	38.9
Water-surface	41.7	41.7	41	40.3	38	36.2	34.9	34
5	41.8	41.8	41	40.3	38	36.1	35	34
10	41.7	41.6	41	40.5	38	36.1	35	34
15	41.7	41.6	41	40.1	38	36.5	35	34
20	41.7	41.6	41	40.3	38	36.1	35	34.1
25	41.9	41.7	41	40.3	37	36.1	35	34.4
30	41.7	41.3	41	40.3	37.2	36.1	35.5	34.4
35	41.7	41.3	41	40.3	37	36.5	35.7	34.4
40	41.7	41.2	41	40.8	37.5	36.1	35.3	35
45	41.7	41.3	41.1	40.3	37.4	36.3	36	34.8
50	41.8	41.3	41	41	37.6	37	35.5	34.8
55	41.8	1/ 41.4	41	40.2	37.7	37	36	35
60	41.8	41.3	41	41	38	36.4	35.6	35.1
65	41.8	41.3	41	2/ 41.3	38.1	36.5	35.7	34.9
70	41.8	41.3	41	--------	37.8	37.5	35.7	35
75	41.8	41.2	41	--------	38	--------	38.8	35
80	41.8	41.3	42	--------	37.9	--------	36	35
85	41.8	42	--------	--------	39	--------	37	36

1/ Certain slight anomalies in the temperature readings occur in our records, but we beli
the records as here given cannot be far from correct.
2/ Bottom at 62 feet.

Temperature profile (°F) at Deep Hole, Lake Maxinkuckee--Continued

Monthly summary for 1900

Depth (feet)	July			August			September		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
Air	81.2	65.0	73.9	85.0	73.0	78.3	86.5	70.5	74.6
Water-surface	80.3	76.3	77.7	83.0	78.0	80.2	80.1	67.2	73.7
5	80.5	76.3	77.9	83.0	78.0	80.1	80.0	67.2	73.7
10	80.1	76.3	77.8	82.8	78.0	79.9	79.9	67.2	73.4
15	78.3	76.3	77.3	82.0	78.0	79.3	79.7	67.2	73.3
20	77.5	76.1	76.8	80.3	76.5	78.5	79.4	67.2	73.2
25	76.2	75.0	75.8	79.5	75.4	76.7	79.0	67.0	72.9
30	74.0	71.0	72.5	73.2	70.1	71.9	75.6	66.8	71.4
32.5	71.3	67.0	68.6	70.0	67.1	68.4	74.0	66.8	70.3
35	68.9	61.5	64.1	66.9	62.5	64.3	73.5	65.2	67.8
40	58.8	56.6	57.5	61.0	57.0	58.8	67.7	60.0	64.1
45	55.8	53.5	54.7	57.0	54.5	55.5	66.0	57.0	61.9
50	54.1	52.0	52.9	54.3	52.0	53.1	58.5	54.3	55.6
55	52.3	51.0	51.4	53.0	51.0	51.8	53.6	53.0	53.3
60	51.1	50.5	50.7	52.5	50.6	51.3	52.9	52.0	52.6
65	51.0	50.0	50.5	52.0	50.1	50.9	52.4	51.5	52.0
70	50.5	50.0	50.1	51.8	50.0	50.7	52.0	51.5	51.8
75	50.2	49.9	50.0	52.0	50.0	50.6	52.0	51.3	51.7
80	50.2	49.7	49.9	51.6	49.9	50.4	51.7	51.1	51.5
85	50.0	49.0	49.5	51.0	49.5	50.1	51.9	51.0	51.4

Depth (feet)	October			November			December		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
Air	75.9	47.6	61.5	75.0	31.5	45.9	39.9	25.0	36.1
Water-surface	73.0	61.2	64.7	62.0	42.9	49.3	41.7	34.0	38.5
5	69.5	61.2	64.5	61.3	42.9	50.6	41.8	34.0	38.5
10	69.1	61.2	64.4	61.3	43.0	50.6	41.7	34.0	38.5
15	67.9	61.2	64.3	61.0	43.9	50.5	41.7	34.0	38.5
20	67.9	61.2	64.2	61.3	42.9	50.6	41.7	34.1	38.4
25	67.8	61.2	64.2	61.0	42.9	50.5	42.0	34.4	38.5
30	67.6	61.0	64.0	61.0	42.9	50.5	41.7	34.4	38.4
35	67.0	61.0	64.0	60.9	42.9	50.4	41.7	34.4	38.5
40	66.7	61.0	63.8	60.5	42.9	50.4	41.7	35.0	38.6
45	66.0	61.0	63.5	60.5	42.9	50.4	41.7	34.8	38.6
50	62.7	58.0	60.7	60.0	42.9	50.3	41.8	34.8	38.7
55	61.2	53.5	57.1	60.0	42.9	50.2	41.8	35.0	38.8
60	58.0	52.3	53.8	59.8	42.9	50.2	41.8	35.1	38.8
65	52.5	52.0	52.2	58.4	42.9	49.6	41.8	34.9	38.5
70	52.0	51.9	52.0	54.0	42.5	48.3	41.8	35.0	38.6
75	52.2	51.5	51.9	53.3	42.5	48.0	41.8	35.0	39.3
80	51.9	51.3	51.7	53.1	42.5	47.9	41.8	35.0	39.0
85	51.9	51.1	51.5	53.0	42.5	47.9	41.8	36.0	39.2

Temperature readings in 1901

Depth (feet)	January						
	1	4	7	9	18	26	30
Air	23.1	41	32.1	32	16.5	23.9	24.9
Water-surface	34	34.5	33.7	34	33.1	34.2	33.4
5	34.1	34.5	34.6	34.8	35.1	36.2	36.7
10	34	34.5	34.6	35.1	35.7	36.3	36.2
15	34.2	34.5	35	35.3	36	36.2	36.5
20	34.2	35	35	35.4	35.5	36.3	36.5
25	34.6	34.5	35.2	37	35.4	36.3	37
30	34.5	34.5	35.1	35.5	35.5	36.5	37
35	34.6	34.7	35.2	35	35.8	36.7	37.4
40	34.8	34.9	35.7	37.5	35.9	36.9	37.7
45	34.9	34.6	37	37.2	36	37	37.8
50	34.9	35.2	36	37.3	36	37	38
55	34.9	35.5	36	35.5	36	37.1	38
60	35	35.4	36	36.1	36.2	37.2	37.8
65	35	35.5	36	36.2	36.4	37.2	37.9
70	35.3	35.8	35.3	36.2	36.5	37.3	37.3
75	35.4	35.3	36.3	37.2	36.9	37	37.5
80	35	35.4	37.6	36	36.8	37	37.5
85	37	37	37.2	37.5	38.1	38.8	38.3

Temperature profiles (°F) taken in Deep Hole, Maxinkuckee Lake--Continued

Temperature readings in 1901

Depth (feet)	February				
	5	8	16	25	27
Air	24.9	26.8	22.5	36.8	27.5
Water-surface	33.7	34	32.3	33	32.3
5	36.9	37	36	36.3	36
10	37.9	36.5	36.9	36.4	37
15	37	36.5	36.9	36.5	37.5
20	36.7	38.2	37.1	37.3	37.9
25	37	37	37.1	38	37.4
30	37	37.1	37.2	38	38
35	37.2	37.3	37.2	37.7	37.7
40	38	37.5	37.3	38.3	38
45	38	38	37.8	37.9	38
50	37.5	38.1	37.8	38.5	38
55	37.7	37.8	38.2	38.3	38
60	37.5	38	37.9	*38.6	38
65	37.4	38.1	37.9	37.9	37.9
70	38	37.5	37.9	38.1	38
75	37.7	37.7	38.4	38.1	38.1
80	38.2	38.5	38.8	38.8	38.9
85	38.2	39	39	38.9	41.3

Depth (feet)	March						
	1	4	7	9	14	26	28
Air	31.9	36	36.5	34.5	30	42.3	31.5
Water-surface	32.9	32.9	32.3	33.1	32.8	40.1	39.8
5	36.9	37	37.3	37.9	38.5	40.1	40
10	36.8	37.5	37.5	37.8	38.9	40.5	40.2
15	37.3	37.6	37.5	37.9	38	40.5	39.9
20	37.9	37.3	37.7	37.9	38	40.5	40
25	38	37.3	37.6	38.1	38.1	40.5	39.9
30	37.6	38	37.7	38.3	38	40	40
35	37.7	37.7	38	38.3	38	40.3	40
40	37.9	38.1	38	38.7	38	40.4	41.8
45	38	38	38	38.7	38.9	40	40
50	38	38.5	38	39	39	40.3	40.1
55	38	38.2	38	38	38.1	40.1	42.3
60	38	38.1	38	38	38	39.9	40
65	38	38.5	38.1	38.3	39	40.4	39
70	38	39	38.4	38	38.8	39.9	40
75	38.2	38.1	38.1	39.3	40	40	40
80	38.4	39	39	39	----------	40.4	40
85	40.1	40.4	40.1	40.2	----------	----------	40

Depth (feet)	April								
	1	3	8	10	15	22	24	26	29
Air	37	39.2	42	49.5	49	50	57.7	63.8	77.5
Water-surface	39.3	39.5	42	42.9	45	45	46	49.8	59
5	39.3	39.5	42	42.8	45	45	46	49	55.1
10	39.3	39.6	42.2	42.8	45.9	45	45.1	47.6	52.8
15	39.9	40	42.2	43	46.5	44.9	45.8	46.9	50.1
20	39.9	39.5	42	42.5	45	44.8	46	46.8	47.5
25	39.5	40	42.2	42.6	44.3	44.8	45.6	46.8	47
30	39.5	39.5	42.6	42.6	46.2	45	45	46.1	46.5
35	41.2	39.5	42	42.9	45.9	45.1	45.6	46	46
40	41.7	39.4	42.2	43	44.2	44.8	45.7	46	46
45	41.7	39.6	42	42.9	44.3	45.1	45.6	45.8	45.9
50	39.4	39.5	42	42.5	44	44.8	45.9	45.5	46
55	39.3	39.5	--------	43	44	44.7	45.1	45.5	45.3
60	39.4	40	--------	42.9	44	44.7	45.1	45.4	45.2
65	39.4	40	--------	42.4	43.3	44.6	45.5	45.3	45.2
70	39.4	39.5	--------	42.4	43.5	45	45	45.8	45.6
75	39.2	40	--------	42.3	43.1	44.7	45.1	45.1	45.7
80	41.5	40	--------	42.7	43.4	--------	45.5	45.1	45.2
85	39.6	40	--------	39	43	--------	45	45	44.8

Depth (feet)	May								
	4	7	13	15	17	22	24	28	30
Air	76.9	67	61	78	77.6	58	58	56.5	57
Water-surface	61	63	60	66	68.5	61	62.5	58.2	58
5	61	63.1	60.1	61	63.9	61	62.5	58.9	58.3
10	60.9	63.4	60	60	62	61.4	63	58.2	58
15	60.4	62	59.5	59.4	60	61.4	63	58.8	57.8
20	56.1	56.5	60.6	59.4	59	61.3	63	58.8	57.9
25	50.5	56.4	56.8	58.1	57.2	61.2	63	58	57.4
30	47.5	48.6	49.9	50.1	51.3	52.3	54	58	57
35	47.1	47.3	49	50.2	49	49.2	50.6	54.5	56.5
40	47	47.4	48	49.7	48.2	48.9	49.9	50.3	50.9
45	46.6	46.5	49	47.9	47.3	47.9	49	49	48.9
50	46	46.1	46.8	47.5	47.5	47.9	47.5	48.5	48
55	46	46.2	46.4	46.8	47	47.1	47.5	47.5	47.9
60	45.5	45.5	47	46.3	46.5	47	47	47.1	47
65	46	45.5	46.5	47	47	46.9	46.8	46.9	47
70	45.3	45.9	46.5	46.1	46	47	46.9	46.5	47
75	45.9	45.4	46	46.5	46	46.6	46.8	46.5	47
80	45.3	46	46	46.3	46.5	47.6	46.7	46.5	46.9
85	45.1	45.6	-------	45.9	46	46.3	46.2	46.5	46.6

Temperature profiles (°F) taken in the Deep Hole, Maxinkuckee Lake--Continued

Temperature readings for 1901

Depth (feet)	June					
	1	3	6	8	10	12
Air	66	65.3	67	54.5	66.2	89.5
Water-surface	59.5	60.9	65.5	63.5	65	79.6
5	59.5	61	65.5	63.5	64.8	72.5
10	60	61.1	65.7	64	65.1	69
15	59.7	61	64.2	63.4	64.9	66.5
20	59	60.2	64	63.2	64	64.5
25	58.3	58.8	60	61.9	62.8	62
30	57.9	57.3	58	57.6	59.4	58.7
35	57	55.9	56.2	54.8	54.1	54.8
40	49.9	52.3	53	52	52	52.3
45	49	50	52.1	50.9	50.2	51
50	48.4	48.1	51.6	49.3	49.8	50
55	48	47.9	51	52.8	48.6	49
60	49	57.8	48.2	48.2	48.3	48.3
65	47	47.1	47.8	48	48.2	48.5
70	47	47.5	47.5	48.2	48	48
75	47.5	47	47.5	48	47.9	48.3
80	47	47	47.5	47.8	47.9	48
85	-------	46.9	47	47.3	47.3	48.1

Depth (feet)	June--Continued					
	17	19	21	24	26	28
Air	74	83	77.9	83.5	83	88.2
Water-surface	76	80	76.9	78.8	82	83
5	76.1	75.5	77	78.3	82.5	83
10	76	74.9	77	78.2	80.8	83
15	68.6	71.5	75.9	78	77.4	82.9
20	66.1	66	66.5	67.1	68	67.2
25	62.8	62	62.3	61.6	63	62
30	59	58.1	58.1	58	58	58.9
35	54.9	54.5	55.6	55.6	55.5	55.6
40	53.5	52	53.2	53	54	53.5
45	50.9	51	50.9	52	51.9	52
50	50	51	50	50.2	50.1	51
55	50	49.5	49.3	49.9	50.5	50.4
60	49	49	49.9	49.2	49.5	49.7
65	48.8	48.6	49	49	49.1	49.2
70	49	48.4	48.8	48.9	49	49
75	48.2	48.2	49	48.8	49.1	49
80	48.1	48.1	49	48.5	49	49
85	48.5	48	48	48.4	48.8	49

Monthly summary for 1901

Depth (feet)	January			February			March		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
Air	41.0	16.5	27.6	36.8	22.5	27.7	42.3	26.5	33.2
Water-surface	34.5	33.1	33.8	34.0	32.3	33.1	40.1	32.3	34.8
5	36.7	34.1	35.1	37.0	36.0	36.4	40.1	36.9	38.2
10	36.3	34.0	35.0	37.9	36.4	36.9	40.5	36.8	38.5
15	36.5	34.2	35.7	37.5	36.5	36.9	40.5	37.3	38.4
20	36.5	34.2	35.6	38.2	36.7	37.4	40.5	37.3	38.5
25	37.0	34.5	35.7	38.0	37.0	37.5	40.5	37.3	38.5
30	37.0	34.5	35.5	38.0	37.0	37.5	40.0	37.6	38.5
35	37.4	34.6	35.6	37.7	37.2	37.4	40.3	37.7	38.6
40	37.7	34.8	36.2	38.0	37.3	37.8	41.8	37.9	39.0
45	37.8	34.6	36.4	38.0	37.8	37.9	40.0	38.0	38.8
50	38.0	34.9	36.3	38.5	37.5	38.0	40.3	38.0	39.0
55	38.0	34.9	36.2	38.3	37.7	38.0	42.3	38.0	38.9
60	37.8	35.0	36.2	38.6	37.5	38.0	40.0	38.0	38.6
65	37.9	35.0	36.3	38.1	37.4	37.8	40.4	38.0	38.8
70	37.3	35.3	36.2	38.1	37.5	37.9	40.0	38.0	38.9
75	37.5	35.3	36.5	38.4	37.7	38.0	40.0	38.1	39.1
80	37.6	35.0	36.5	38.9	38.2	38.6	40.4	38.4	39.3
85	38.8	37.0	37.7	41.3	38.2	39.3	40.4	40.0	40.2

Depth (feet)	April			May			June		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
Air	77.5	37.0	53.0	78.0	56.5	59.0	89.0	54.5	74.0
Water-surface	59.0	39.0	45.8	68.5	58.0	62.0	83.0	59.5	72.6
5	55.1	39.3	45.2	63.9	58.3	61.1	83.0	59.5	71.6
10	52.8	39.3	44.8	63.0	58.0	60.7	83.0	60.0	71.2
15	50.1	39.9	44.6	63.0	57.8	60.3	82.9	59.7	69.5
20	47.5	39.5	44.0	63.0	56.1	59.2	68.0	59.0	64.6
25	47.0	39.5	43.8	63.0	50.5	57.6	63.0	58.3	61.5
30	46.5	39.5	43.8	58.0	47.5	52.2	59.0	57.3	58.3
35	46.0	39.5	44.0	56.5	47.1	50.4	54.0	54.1	55.4
40	46.0	39.4	43.9	50.9	47.0	48.9	54.0	49.9	52.6
45	45.9	39.6	43.9	49.0	46.5	48.0	52.1	49.0	51.0
50	46.0	39.4	43.4	48.5	46.0	47.3	51.6	48.1	50.0
55	46.3	39.3	43.4	47.9	46.0	46.9	52.8	47.9	49.7
60	45.4	39.4	43.3	47.1	45.5	46.5	49.9	47.8	48.8
65	45.5	39.4	43.2	47.0	45.5	46.5	49.2	47.0	48.4
70	45.8	39.4	43.3	47.0	45.3	46.3	49.0	47.0	48.3
75	45.7	39.2	43.2	47.0	45.4	46.3	49.0	47.0	48.2
80	45.5	40.0	43.3	47.6	45.3	46.4	49.0	47.0	48.1
85	45.0	39.6	42.3	46.6	45.1	46.0	49.0	46.9	47.9

Water surface temperatures for Muskelonge Lake near Warsaw

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1948--Con.		1949--Con.		1950--Con.	
June 12	73	Oct. 14	49	July 13	79	Jan. 31	35
Sept. 7	79	Nov. 30	36	Aug. 30	79.5	Mar. 14	35
Nov. 26	34			Nov. 1	48	May 2	55
		1949		17	46	Sept. 19	69
1948		Jan. 4	37	Dec. 14	35	Oct. 31	57
Jan. 21	35	Feb. 15	33.5			Nov. 20	40
27	36	Mar. 2	35	1950			
Mar. 24	51.5	22	48	Jan. 12	36	1951	
Sept. 28	54	May 3	59	19	35	May 8	69
						July 6	77

Water surface temperatures for Ridinger Lake near Pierceton

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1947--Con.		1948--Con.		1949--Con.	
Mar. 2	39	Aug. 28	81	Dec. 23	36	Aug. 31	74.5
June 14	73	Sept. 4	75.5			Nov. 29	45
Sept. 7	79			1949			
Nov. 27	38	1948		Jan. 4	36	1950	
		Feb. 18	34.5	Mar. 2	36	Nov. 22	40
1947		Aug. 24	83	22	40		
Apr. 22	46	27	84	May 4	68	1951	
				11	57	June 14	65

Temperature profiles (°F) for Ridinger Lake, Kosciusko County, July 26, 1946

Depth (feet)	Site A	Site B	Site C	Depth (feet)	Site A	Site B	Site C
Air	78	78	78	20	62.5	62.0	61.5
Water-surface	80.0	79.5	79.3	25	56.7	56.7	57.0
5	79.5	79.2	78.5	30	*53.7	54.1	54.7
10	77.6	77.5	76.7	32		*53.5	
15	69.2	69.4	69.5	35			53.4
				38			*52.8

Water surface temperatures for Round Lake at Tri-Lakes, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1946--Con.		1946--Con.		1947--Con.	
June 14	73	Feb. 21	36	Apr. 28	55	Sept. 17	72
17	35	23	36	May 1	55		
		24	34	4	55	1948	
1946		27	36	5	56	Nov. 4	59
Jan. 23	34	Mar. 2	40	11	55	30	43
24	32	3	40	12	56	Dec. 29	36
25	32	6	38	15	58		
26	32	9	38	18	56	1949	
27	32	10	38	19	58	Feb. 16	36.5
28	33	13	40	22	60	Mar. 7	40
29	34	16	46	25	60	Aug. 31	73
30	33	17	46	26	60	Sept. 15	62
31	33	20	47	29	68	Nov. 23	38
Feb. 1	33	23	45	June 1	70		
2	33	24	45	2	70	1950	
3	34	27	45	5	70	Mar. 23	35
4	34	30	45	8	70	Oct. 17	60
5	34	31	42	9	72		
7	34	Apr. 3	40	12	74	1951	
8	34	6	40	15	76	Feb. 20	35
9	34	7	42	16	76	Mar. 15	35
10	35	10	40	19	78	June 21	74
11	35	13	52	22	78	July 24	80
12	36	14	52	23	78	Aug. 29	80
13	36	17	52	26	78	Oct. 24	54
14	34	20	52	29	78	Nov. 28	37
15	34	21	54	July 6	80	Dec. 20	29
16	33	24	54				
17	39	27	50	1947		1952	
				Apr. 25	49	Feb. 7	29

Water surface temperatures for Round Lake at Clear Lake, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1948--Con.		1948--Con.		1948--Con.	
July 2	75	Mar. 23	39	June 19	64	Sept. 16	65
Sept. 4	78	24	40	20	70	17	67
		25	41	21	70	18	69
1946		26	42	22	69	19	71
Nov. 2	60	27	46	23	72	20	73
9	49	28	39	24	73	21	66
16	55	29	40	25	74	22	64
30	40	30	39	26	75	23	62
Dec. 7	45	31	42	27	74	24	60
14	40	Apr. 1	41	28	75	25	59
21	35	2	41	29	74	26	59
28	32	3	40	30	74	27	58
		4	42	July 2	70	28	61
1947		5	45	3	72	29	63
Jan. 4	30	6	46	4	74	30	63
11	35	7	48	5	81	Oct. 1	62
18	30	8	49	6	77	2	62
25	38	9	45	7	76	3	60
Feb. 1	36	10	45	8	72	4	58
8	34	11	47	9	73	5	56
15	38	12	47	10	76	6	55
22	30	13	47	11	78	7	54
Mar. 1	32	14	45	12	80	8	53
8	32	15	43	13	78	9	53
15	32	16	48	14	76	10	51
22	32	17	46	15	73	11	49
29	32	18	47	16	75	12	50
Apr. 5	36	19	50	17	76	13	52
12	32	20	57	18	77	14	50
23	49	21	52	19	76	15	48
May 10	60	22	50	20	77	16	49
17	55	23	53	21	76	17	46
24	60	24	55	22	77	18	44
		25	58	23	75	19	40
1948		26	62	24	72	20	40
Jan. 29	34	27	64	25	72	21	42
30	34	28	59	26	72	22	46
31	34	29	56	27	72	23	48
Feb. 1	34	30	54	28	73	24	46
2	34	May 1	56	29	75	25	45
3	34	2	56	30	77	26	45
4	34	3	54	31	78	27	45
6	33.5	4	54	Aug. 1	73	28	47
7	33.5	5	56	2	70	29	47
8	33.5	6	59	3	72	30	50
9	33	7	55	4	72	31	53
10	33	8	48	5	68	Nov. 1	54
11	33	9	54	6	68	2	54
12	33	10	56	7	68	3	54
13	33	11	56	8	70	4	54
14	33	12	57	9	70	5	54
15	33	13	56.5	10	70	6	52
16	33	14	56.5	11	71	7	45
17	33	15	57	12	71	8	45
18	34	16	58	13	72	9	46
19	34	17	59	14	70	10	45
20	34	18	60	15	70	11	44
21	34	19	61	16	70	12	44
22	35	20	62	17	70	13	43
23	35	21	63	18	70	14	43
24	35	22	63	19	70	15	43
25	35	23	62	20	71	16	43
26	35	24	62	21	72	17	42
27	35	25	62	22	73	18	43
28	35	26	62	23	75	19	46
29	35	27	65	24	77	20	42
Mar. 1	36	28	65	25	78	21	42
2	36	29	67	26	78	22	43
3	36	30	66	27	79	23	41
4	36	31	68	28	78	24	39
5	36	June 1	67	29	78	25	39
6	36	2	67	30	76	26	40
7	36	3	69	31	73	27	36
8	36	4	71	Sept. 1	72	28	39
9	36	5	72	2	70	29	39
10	36	6	67	3	72	30	38
11	36	7	66	4	73	Dec. 1	34
12	36	8	64	5	73	2	34
13	36	9	68	6	72	3	34
14	36	10	68	7	72	4	34
15	36.5	11	72	8	70	5	40
16	37	12	68	9	68	6	36
17	37	13	68	10	67	7	35
18	38	14	72	11	66	8	34
19	38	15	68	12	68	9	34
20	38	16	66	13	68	10	34
21	39	17	68	14	67	11	34
22	40	18	72	15	67	12	34

Water surface temperatures for Round Lake at Clear Lake, Ind.--Continued

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1948--Con.		1949--Con.		1949--Con.		1949--Con.	
Dec. 13	34	Mar. 10	36	June 9	65	Sept. 7	64
14	34	11	35	10	67	8	63
15	37	12	35	11	72	9	62
16	37	13	35	12	73	10	62
17	33	14	35	13	74	11	62
18	33	15	35	14	73	12	63
19	33	16	35	15	72	13	60
20	33	17	35	16	69	14	57
21	34	18	35	17	69	15	56
22	34	19	35	18	72	16	57
23	34	20	35	19	75	17	58
24	33.5	21	41	20	78	18	58
25	33.5	22	42	21	78	19	60
26	33.5	23	38	22	77	20	60
27	33.5	24	39	23	77	21	58
28	34	25	41	24	76	22	56
29	34	26	43	25	78	23	54
30	34	27	45	26	78	24	53
31	34	28	43	27	77	25	52
		29	45	29	79	26	55
1949		30	46	30	79	27	58
Jan. 1	35	31	45	July 1	80	28	56
2	35	Apr. 1	44	2	82	29	50
3	35	2	43	3	83	30	50
4	35	3	45	4	85	Oct. 1	50
5	34.5	5	45	5	85	2	56
6	34	6	47	6	85	3	62
7	34	7	46	7	83	4	62
8	36	8	46	8	80	5	60
9	37	9	45	9	81	6	60
10	39	10	45	10	79	7	58
11	37	11	47	11	77	8	62
12	37	12	55	12	77	9	64
13	38	13	54	13	76	10	65
14	38	14	54	14	76	11	65
15	38	15	51	15	74	12	60
16	38	16	47	16	74	13	58
17	36	17	47	17	74	14	55
18	37	18	45	18	75	15	56
19	35	19	44	19	76	16	56
20	35	20	45	20	77	17	56
21	35	21	47	21	79	18	56
22	35	22	48	22	78	19	58
23	36	23	48	23	74	20	60
24	36	24	48	24	77	21	63
25	35	25	48	25	79	22	57
26	35	26	52	26	81	23	54
27	35	27	54	27	79	24	50
28	35	28	53	28	80	25	48
29	34	29	53	29	80	26	47
30	34	30	56	30	79	27	44
31	34	May 1	59	31	74	28	46
Feb. 1	33.5	2	57	Aug. 1	72	29	50
2	33.5	3	58	2	73	30	48
3	34	4	62	3	72	31	44
4	34	5	66	4	73	Nov. 1	38
5	33	6	68	5	73	2	42
6	33	7	67	6	74	3	40
7	33	8	65	7	74	4	40
8	33	9	67	8	76	5	40
9	33	10	62	9	77	6	41
10	33.5	11	57	10	79	7	43
11	33.5	12	60	11	80	8	45
12	39	13	70	12	78	9	45
13	35	14	70	13	75	10	46
14	35	15	64	14	75	11	48
15	34	16	66	15	75	12	52
16	33	17	70	16	76	13	50
17	34	18	71	17	76	14	46
18	34	19	70	18	74	15	42
19	34.5	20	66	19	72	16	38
20	35	21	65	20	67	17	38
21	35	22	64	21	66	18	38
22	35	23	62	22	67	19	38
23	35	24	65	23	68	20	38
24	35	25	60	24	72	21	36
25	35	26	59	25	73	22	34
26	34	27	58	26	75	23	34
27	35	28	58	27	75	24	34
28	34	29	59	28	73	25	34
Mar. 1	34	30	64	29	67	26	33.5
2	34	31	67	30	67	27	33.5
3	34	June 1	69	31	66	28	33.5
4	35	3	72	Sept. 1	65	29	33.5
5	35	4	74	2	64	30	33.5
6	36	5	74	3	63	Dec. 1	34
7	36	6	72	4	65	2	35
8	37	7	70	5	68	3	35
9	38	8	66	6	65	4	35

Water surface temperature for Round Lake at Clear Lake, Ind.--Continued

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1949--Con.		1950--Con.		1950--Con.		1951--Con.	
Dec. 5	35	Feb. 27	33	July 29	76	July 10	73
6	35	Mar. 4	33	31	76	14	75
7	37	5	33	Aug. 3	72	15	75
8	35	6	34	5	71	21	74
9	35	7	34	7	71	23	74
10	35	8	35	11	73	28	76
11	35	9	35	14	71	Aug. 4	74
12	35	10	34	19	72	11	74
13	34	11	34	20	71	13	74
14	33	12	34	23	68	18	73
15	33	13	34	26	72	25	68
16	33	15	35	27	74	Sept. 1	72
17	33	17	35	Sept. 1	72	2	72
18	34	19	34	5	68	8	65
19	34	20	34	8	69	9	65
20	34	21	34	12	72	15	64
21	35	22	35	14	68	16	63
22	38	23	35	16	65	21	65
23	36	24	35	17	65	23	64
24	34	25	35	22	65	29	57
25	34	26	37	25	63	30	57
26	35	27	38	30	64	Oct. 6	59
27	35	28	37	Oct. 2	62	8	52
28	34	29	35	7	58	13	55
29	33	30	34	10	59	20	53
30	33	31	35	14	55	25	51
31	33	Apr. 1	35	16	55	Nov. 1	45
		2	35	21	55	10	36
1950		3	38	24	54	11	36
Jan. 1	35	4	38	30	53	26	35
2	36	5	40	Nov. 1	55	Dec. 1	36
3	41	6	40	4	45	8	37
4	39	8	40	5	45	15	33.5
5	35	9	38	8	47	22	33
7	33	10	38	11	36		
8	33	11	41	16	44	1952	
9	33	12	40	18	40	Mar. 8	39
10	35	13	38	19	40	19	39
11	33	14	37	25	33	Apr. 26	59
12	34	15	40	Dec. 2	34	May 10	58
13	34	17	42	4	35	June 1	67
14	33	19	45	16	33	7	73
15	33	22	43	23	33	14	74
16	35	23	47	30	33	18	75
17	33	25	45			21	71
18	33	26	44	1951		28	80
19	33	27	44	Jan. 9	33	July 12	74
20	33	28	44	18	36	26	75
21	33	May 1	45	27	34.5	Aug. 9	75
22	33	2	45	Feb. 9	33	22	70
23	34	3	50	17	34	Sept. 26	58
24	34	4	57	24	37	Oct. 11	47
25	36	6	53	Mar. 2	36	25	46
26	37	7	54	6	38		
27	33	8	56	10	37	1953	
28	34	13	56	15	37	Mar. 30	44
29	33	15	60	20	34	Apr. 18	41
30	33	17	60	22	33	19	41
31	33	20	61	29	39	25	48
Feb. 1	33	23	62	31	38	May 2	52
2	33	27	68	Apr. 4	38	9	59
3	33	30	69	7	39	23	59
4	33	June 2	67	10	42	June 5	70
5	33	5	65	14	42	8	73
6	34	6	65	17	41	20	77
7	34	8	72	21	44	26	73
8	35	10	72	26	47	July 4	75
9	35	13	71	28	54	5	75
10	35	16	73	29	56	11	69
11	35	19	67	May 5	60	28	75
12	35	23	73	8	56.5	Aug. 1	76
13	35	25	77	11	54	8	73
14	35	30	68	15	60	9	73
15	35	July 1	68	19	67	15	71
16	34	3	68	23	65	18	70
17	34	6	73	26	67	22	72
18	33.5	8	73	June 2	68	23	73
19	33	12	77	7	67	29	77
20	33	14	70	9	66	Sept. 4	76
21	33	18	73	13	69	12	67
22	33	20	71	17	72	19	61
23	33	22	71	23	70	26	59
25	33	24	74	25	70	29	55
26	33	27	73	July 5	72		

Temperature profiles (°F) for Clear Lake, at Clear Lake

Depth (feet)	1946				1947				
	Sept. 26	Oct. 24	Nov. 23	Dec. 19	Jan. 8	Feb. 19	Apr. 29	May 25	June 23
Air	71	60	24	10	31	23	51	54.8	69
Water-surface	66.6	57.6	47.3	38	33	32.5	46.5	61.2	69
2.5	-------	-------	-------	-------	-------	33.5	-------	-------	-------
5	66.4	57.5	47.4	38.2	35	35.6	46.6	61.2	68.8
10	66.4	57.5	47.4	38.3	35.4	37.5	46.9	61.2	68.3
15	66.4	57.5	47.4	38.3	35.4	37.6	46.8	61.2	67
20	66.2	57	47.4	38.4	35.4	37.6	46.6	61.2	65.4
22.5	-------	-------	-------	-------	-------	-------	-------	57.2	-------
25	66.3	56.7	47.5	-------	35.3	37.6	46.2	54.1	62.5
30	66	56.7	47.5	38.5	35.4	37.6	45.8	50.1	56.7
32	66.5	-------	-------	-------	-------	-------	-------	-------	-------
34	63.1	-------	-------	-------	-------	-------	-------	-------	-------
35	61.2	56.5	47.5	-------	35.4	37.7	45.6	49.3	53.3
36	60	-------	-------	-------	-------	-------	-------	-------	-------
38	57	-------	-------	-------	-------	-------	-------	-------	-------
40	55.3	56.3	47.5	38.5	35.5	37.8	45.4	48.8	51.3
45	52.3	55.6	47.5	-------	-------	37.8	45.4	48.4	50.1
47.5	-------	54.4	-------	-------	-------	-------	-------	-------	-------
50	51	52.8	47.5	38.6	35.7	37.8	45.4	48.1	49.5
52.5	-------	50.8	-------	-------	-------	-------	-------	-------	-------
55	50.8	50.5	47.5	-------	-------	37.8	45.4	47.8	48.2
60	50.6	50.1	47.5	38.9	36	37.8	45.3	47.7	48
65	50.3	50	47.5	-------	-------	37.8	45.3	47.5	47.8
70	50.1	49.9	47.5	38.9	36.1	37.8	45.2	47.4	47.8
75	50.1	50.1	47.5	-------	-------	37.8	45.1	47.2	47.8
80	50.1	50.1	47.5	38.9	36.1	37.9	45.1	47.1	47.5
85	50	50	47.4	-------	-------	37.9	44.9	47	47.5
87.5	-------	-------	-------	-------	-------	-------	44.5	-------	-------
90	50	49.9	47.4	38.9	36.1	37.9	44.8	47	47.4
92.5	-------	49.6	-------	-------	-------	-------	44.7	-------	-------
95	49.8	49.6	47.5	-------	-------	38.1	44.8	47	47.4
100	49.4	-------	47.5	38.9	36.6	39	44.1	47	47.4
101	-------	-------	-------	41.8	-------	-------	-------	-------	-------
102	-------	-------	-------	-------	-------	39.4	-------	-------	-------
102.5	-------	-------	47.7	-------	37	-------	-------	-------	-------
103.5	-------	-------	-------	-------	-------	-------	-------	-------	47
105	49.5	49.6	48.3	-------	38	-------	44.2	47	-------
107	-------	-------	-------	-------	-------	-------	44.2	-------	-------

Depth (feet)	1947--Continued						1948		
	July 30	Aug. 27	Oct. 10	Oct. 30	Nov. 19	Dec. 19	Jan. 29	June 3	July 1
Air	91.4	70	57	51	34	30.5	21	81	58
Water-surface	77.1	81.2	61.7	59.6	46.3	35.1	33.3	73.7	73
2.5	-------	-------	-------	-------	-------	-------	-------	73.7	-------
5	77.1	81.2	61.4	59.6	46.3	35	36	73.5	72.8
10	76.4	81.2	61.4	59.6	46.3	35	36.4	73.1	72.8
15	76.4	81.2	61.1	59.5	46.3	34.9	36.5	65.4	71.8
16	-------	79.9	-------	-------	-------	-------	-------	-------	-------
17.5	-------	76.8	-------	-------	-------	-------	-------	-------	-------
20	76.2	75.3	61	59.5	46.3	34.9	36.6	62	70.3
22.5	-------	-------	-------	-------	-------	-------	-------	-------	66.5
25	67.4	66.8	60.9	59.5	46.3	34.9	36.5	59.8	63
30	59.5	58.8	60.3	59.5	46.3	34.9	36.5	57.3	58.7
35	53.4	55	58.2	58.3	46.3	34.9	36.5	53.4	54
40	50.6	51.8	53.5	54.3	46.3	34.9	36.5	51.3	51.7
45	49.3	50.3	50.8	50.8	46.3	35.1	36.6	49.8	50.1
50	48.4	49.2	50	49.7	46.3	35.1	36.6	48.8	49.2
55	48.4	48.9	49.2	49.2	46.3	35.1	36.6	48.2	48.3
60	48.4	48.7	48.8	48.5	46.3	35.1	36.6	47.7	47.8
65	48.4	48.5	48.5	48.5	46.3	35.1	36.6	47.3	47.8
70	48.4	48.5	48.3	48.5	46.3	35	36.6	47	47.7
75	48	48.5	48.3	48.5	46.3	35.1	36.6	46.9	47.7
80	48	48.5	48.2	48.5	46.3	35.2	36.6	46.8	47.7
85	48	48.5	48.2	48.5	46.3	35.6	36.8	46.7	47.5
90	48	48.4	48.1	48.3	46.3	35.5	36.8	46.6	47.5
95	47.5	48.4	48	48.3	46.3	35.5	37.2	46.7	47.5
97	47.5	-------	-------	-------	-------	-------	-------	-------	-------
100	-------	48.3	48	-------	46.1	35.5	37.6	46.7	47.4
101	-------	-------	-------	-------	-------	-------	38.1	-------	-------
102	-------	-------	-------	-------	-------	36	-------	-------	-------
103	-------	-------	47.8	-------	-------	-------	-------	-------	-------
104	-------	-------	-------	-------	46.3	-------	-------	-------	-------
105	-------	48.2	-------	48.3	-------	-------	-------	46.7	-------
106	-------	48	-------	-------	-------	-------	-------	-------	47.3

Temperature profiles (°F) for Clear Lake, at Clear Lake--Continued

Depth (feet)	1948--Continued				
	Aug. 4	Sept. 2	Oct. 7	Nov. 18	Dec. 9
Air	62	74	53	51.5	----------
Water-surface	74.3	76.2	58.8	47.5	40.4
5	74.3	76.2	58.8	47.3	40.5
10	74.4	76	58.8	47.5	40.5
15	74.4	76	58.8	47.4	40.6
20	74.2	74.2	58.8	47.5	40.1
25	73.2	69.7	58.8.	47.5	40.2
27.5	69.5	66.3	----------	----------	----------
30	60	60.8	58.6	47.5	39.1
32.5	----------	57.5	----------	----------	----------
35	53.7	54.8	57.4	47.5	38.6
40	51.5	51.7	54.5	47.5	38.6
45	50.2	49.8	49.6	47.6	38
50	49.1	48.8	47.5	47.5	39.8
55	48.3	48.2	----------	47.6	37.5
60	48	48.1	47.6	47.2	40
65	47.7	47.9	----------	47.4	40
70	47.6	47.9	47.5	47.4	40.4
75	47.5	47.7	----------	47.2	39.7
80	47.4	47.6	----------	47.4	39.8
85	47.3	47.6	----------	47.2	39.6
90	47.2	47.6	----------	47	39.8
95	47.3	47.4	----------	46.9	39.8
100	47.3	47.4	----------	46.9	40
102	----------	----------	----------	46.9	----------
103	----------	----------	----------	----------	40.2
105	47.2	47.4	----------	----------	----------
106	47.2	47.4	----------	----------	----------

Water surface temperature for Shriner Lake at Tri-Lakes, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1946--Con.		1946--Con.		1949--Con.	
June 14	75	Aug. 3	79	Dec. 28	37	Aug. 31	74
		10	70			Sept. 15	67
1946		17	76	1948		Nov. 23	44
June 1	66	24	72	Nov. 4	57	Dec. 1	42
8	68	31	66	30	43		
15	67	Sept. 28	37	Dec. 29	33	1950	
22	74	Nov. 2	62			Mar. 23	36
July 6	74	16	54	1949		Oct. 17	49
20	81	Dec. 7	47	Feb. 16	33.5	Nov. 14	54
27	77						

Water surface temperature for Smalley Lake near Washington Center

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1949--Con.		1951--Con.		1953	
July 11	71	Nov. 2	51	July 25	80	Jan. 15	36
Sept. 1	73	Dec. 15	34	Aug. 29	80	Feb. 3	36
Oct. 5	59			Sept. 26	62	Mar. 25	40
		1950		Oct. 24	55	Apr. 17	47
1947		Jan. 17	35	Nov. 28	37	May 13	62
Apr. 23	47	Feb. 8	34	Dec. 19	29	June 8	75
		Mar. 1	35			July 2	75
1949		May 4	55	1952		27	78
Jan. 21	35	Oct. 26	57	Feb. 5	26	Aug. 25	77
Mar. 2	34			Nov. 18	48	Sept. 18	73
25	44	1951		Dec. 16	37		
Apr. 27	58	Jan. 25	36				
Sept. 7	69	June 20	74				

Water surface temperature for Sylvan Lake at Rome City

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1947--Con.		1948--Con.		1949--Con.	
Mar. 2	39	June 8	71.5	Dec. 1	42	Oct. 14	64
July 2	75					Dec. 2	40
Sept. 5	78	1948		1949			
Nov. 29	35	Jan. 21	33	Jan. 5	36	1950	
		Sept. 15	75	Feb. 9	35	Oct. 25	57
1947		Nov. 5	55	Mar. 9	38.5	Nov. 8	47
May 12	59	26	43	Oct. 13	66		

Water surface temperatures for Syracuse Lake at Syracuse, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1948--Con.		1949--Con.		1950	
June 13	70	Oct. 6	62	Feb. 2	33	Feb. 1	35
Sept. 6	70	28	51	Mar. 25	46	10	35
				Apr. 22	57.5	Mar. 7	35
1948		1949		July 29	81.5	14	35
Aug. 6	73	Jan. 5	35	Nov. 22	40	May 9	63
						Oct. 25	57

Water surface temperatures for Tippecanoe Lake at Oswego, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1948--Con.		1949--Con.		1950--Con.	
June 13	67	Jan. 10	34	Feb. 26	34	Feb. 25	33
Sept. 8	78	17	34	Mar. 1	35	Mar. 4	33
		24	34	5	35	7	35
1946		28	34	12	34	11	34
Dec. 21	35	31	34	15	37.5	18	34
28	36	Feb 7	34	19	35	25	35
		14	34	23	40	29	36
1947		21	35	26	41	Apr. 1	37
Jan. 4	33	28	36	Apr. 2	42	6	39
11	35	Mar. 3	36.2	9	44	8	39
18	35	6	35	16	42	15	39
25	36	13	35	23	49	22	42
Feb. 1	35	20	37	30	56	29	45
8	33	27	42	May 3	63	May 4	52
15	35	Apr. 10	45	7	63	6	54
22	35	17	45	14	65	13	54
Mar. 1	35	24	56	21	62	20	62
8	35	May 1	55	28	59	June 3	67
15	35	8	55	June 4	71	8	75
22	35	14	56	11	72	10	71
29	35	22	62	18	71	17	71
Apr. 5	40	29	67	25	77	24	73
19	45	June 5	72	July 2	83	July 1	70
21	45	12	70	9	82	8	74
22	45	19	72	16	77	15	74
29	49.5	26	76	23	76	22	72
May 3	50	July 3	74	30	80	29	76
10	51	10	79	Aug. 6	75	Aug. 5	74
17	62	24	75	13	77	12	73
31	58	31	76	20	71	19	73
June 7	66	Aug. 7	72	27	76	22	73
8	71.5	14	72	30	75.5	26	75
14	68	21	75	Sept. 2	52	Sept. 2	72
21	68	28	82	3	67	16	66
28	74	Sept. 4	75	10	64	23	65
July 5	73	11	70	14	66	30	65
12	74	18	70	17	66	Oct. 7	60
19	73	27	62	24	58	14	58
26	75	Oct. 9	56	Oct. 1	57	21	58
Aug. 2	75	16	55	6	62	25	57
9	81	23	50	8	63	Nov. 4	49
16	78	30	52	15	60	11	42
23	85	Nov. 2	56	22	59	18	40
28	84	6	54	Nov. 5	46	25	36
30	79	13	45	12	53	29	33
Sept. 6	73	20	45	19	43	Dec. 2	37
13	77	27	42	22	42	9	34
27	64	30	42.5	26	38	28	32
Oct. 4	61	Dec. 4	41	29	41		
11	61	11	36	Dec. 3	37	1951	
18	66	16	38.5	10	35	Jan. 31	32
25	60	18	36	17	35	June 14	70
Nov. 1	57	22	37	24	35	20	77
8	49	25	32	31	35	July 25	78
15	44					Aug. 29	81
22	43	1949		1950		Sept. 20	69
29	38	Jan. 1	35	Jan. 7	34	Oct. 24	54
Dec. 6	37	4	36.5	14	35	Nov. 28	37
13	35	8	34	21	34	Dec. 18	30
17	35	15	35	25	36		
20	35	22	34	28	33	1952	
27	35	29	33	Feb. 1	35	Feb. 4	28
		Feb. 5	32	4	33	June 17	80
1948		8	34.5	11	34		
Jan. 3	34	12	33	18	33		
7	33.5	19	34				

Temperature profiles (°F) for Tippecanoe Lake, at Oswego

Depth (feet)	1946				1947		
	Aug. 27	Oct. 23	Nov. 20	Dec. 19	Jan. 9	Apr. 30	May 24
Air	74	74	56	32	26	63	74
Water-surface	73.5	60.3	50.4	41.2	34	52.1	66.7
2.5	--------	--------	--------	--------	36.5	--------	65.3
5	73.5	59.8	50.1	41.1	36.6	52.1	64.4
10	73.5	58.9	50.1	41.1	36.6	51.9	63.6
15	72.8	59	50.1	41	36.6	51.6	62.6
20	72	58.5	50.1	41	36.7	51	59
25	68.4	58.3	50.1	41	36.7	49.6	55.2
30	58.5	58.7	50	40.9	37	48.8	51
35	55.5	58.2	49.8	40.8	37.3	48.3	50
40	53.6	58.3	49.8	40.8	37.6	48.1	49.6
42	--------	55.6	--------	--------	--------	--------	--------
44	--------	53.5	--------	--------	--------	--------	--------
45	52.2	52.9	49.7	40.8	37.9	47.7	49.2
46	--------	52.2	--------	--------	--------	--------	--------
48	--------	51.7	--------	--------	--------	--------	--------
50	51.2	51.3	49.4	40.8	38	46.8	48.4
55	50.2	50	49.2	40.8	38	46.5	47.4
60	49	48.8	48.3	40.8	38.1	46.5	47
65	47.9	47.9	47.8	40.6	38.2	46.5	46.8
70	47.1	47.5	47.5	40.7	38.2	46.1	46.4
75	46.6	46.5	46.7	40.6	38.3	45.6	45.8
77.5	--------	--------	46	--------	--------	--------	--------
80	45.4	45.5	--------	40.5	38.3	45.2	45.4
85	44.8	45	45.2	40.5	38.4	44.9	45.1
90	44.5	44.6	45	40.5	38.5	44.8	44.9
95	44.4	44.4	44.8	40.3	38.5	44.6	44.9
100	44.4	44.4	44.4	40.2	38.4	43.5	44.9
105	44.1	44.3	44.3	40.2	38.3	43.5	44.8
110	43.9	44.2	44.3	40.1	38.4	43.5	44.7
115	43.8	44	44.1	40.1	38.6	43.8	44.6
116	--------	44	43.9	--------	39.2	--------	--------
117	43.6	--------	--------	--------	--------	--------	--------
117.5	--------	--------	--------	41.5	--------	43.7	44.4
118.5	--------	--------	--------	--------	--------	--------	44.3
119	--------	--------	--------	--------	--------	43.4	--------

Depth (feet)	1947--Continued					1948	
	June 20	Jul. 25	Aug. 26	Oct. 30	Nov. 20	Jan. 28	June 3
Air	74	78.6	84.5	60	43	12	72
Water-surface	67.5	75	85	61	46.8	34.4	71.5
2.5	--------	--------	--------	--------	--------	--------	69.9
5	67.5	74.7	85	61.5	46.8	37.7	70.7
10	67.5	74	84.4	61.6	47	38	67.8
12.5	--------	--------	83.4	--------	--------	--------	--------
15	66.8	72.5	80	61.6	47	38.3	64.8
20	64.5	70.2	72.3	61.2	47	38.4	60.8
25	60.8	65.5	64.4	60.7	47	38.5	58.3
30	58	57.3	56.8	59.2	46.8	38.5	56.2
32.5	53.5	--------	--------	--------	--------	--------	--------
35	51.7	53	53.4	58.8	46.8	38.5	54.4
40	51.2	50.5	51.2	54.5	46.8	38.5	53.1
45	49.6	49.2	50.1	51.5	46.7	38.5	52
50	48.8	49.2	49.2	49.8	46.5	38.3	50.7
55	48.2	49.1	48.5	48.8	46.5	38.2	49.1
60	47.7	48.5	47.8	48.3	46.5	38.2	48.4
65	47.1	48.1	47.3	47.4	46.5	38.1	47
70	46.8	47.4	46.7	46.7	46.5	38.1	46.3
75	46.3	47	46.5	46.2	46.4	38.1	45.8
80	45.9	46.6	46.3	46.2	46.3	38	45.4
85	45.8	46.4	45.9	46.1	46.2	38	45.3
90	45.6	46.1	45.9	45.8	46.1	38	45.2
95	45.5	46.1	45.8	45.6	46	37.9	44.9
100	45.2	46	45.5	45.5	45.9	37.7	44.8
105	45.2	45.5	45.4	45.3	45.8	37.7	44.7
110	45.2	45.5	45.3	45.1	45.8	38.8	44.6
115	45.1	45.6	45.2	45.1	45.7	38.6	44.5
116	--------	--------	45.1	--------	--------	39	--------
117	--------	--------	--------	45	45.5	--------	--------
118	45.1	45.3	--------	--------	--------	--------	44.5

Temperature profiles (°F) for Tippecanoe Lake, at Oswego--Continued

Depth (feet)	1948--Continued					
	July 1	Aug. 6	Sept. 1	Oct. 6	Nov. 17	Dec. 7
Air	76	68	65	51.5	56	-------
Water-surface	76.2	75.3	78.1	61.2	48.7	43.3
2.5	-------	75.3	78.1	--------	-------	-------
5	75	74.3	78.1	61.2	48.6	43.4
10	74.2	73.9	78.1	61.2	48.6	43.3
15	73.3	73.8	78.1	61.2	48.5	43.2
17.5	70.2	-------	75.3	--------	-------	-------
20	65.9	72.3	72.3	61	48.2	43.3
22.5	-------	67.3	69.7	--------	-------	-------
25	60.5	61.8	65.4	61	48.2	43.5
27.5	-------	-------	60.7	--------	-------	-------
30	55.9	56.5	58.2	61	48.1	43.5
32.5	-------	-------	56.2	59.3	-------	-------
35	54.1	54.2	54.9	56	48.4	43.6
40	53	52.8	53.4	52.5	48.4	43.6
45	51.1	51.7	52.1	51.3	48.5	43.6
50	49.8	50.5	50.8	49.6	48.5	43.6
55	48.9	49.4	49.4	48.6	48.5	43.8
60	48	48.7	48.7	48.2	48.5	43.6
65	47.3	48.1	48	47.3	48.5	43.3
70	46.7	46.8	47.3	46.6	48.4	43
75	46.2	46.5	46.6	46.1	48.2	42.7
80	45.8	46	46	45.7	48	42.4
85	45.3	45.5	45.5	45.4	47.7	43.7
90	44.9	46	45.5	45.1	46.5	42.5
95	44.9	45.5	45.3	44.8	45.6	43.8
100	44.7	45	45.1	44.6	45.6	43.7
105	44.5	45	45	44.6	45.6	43.3
110	44.5	45	44.9	44.5	45.2	43.3
115	44.5	44.8	44.9	44.5	45.2	42.5
116	-------	-------	-------	--------	45.2	-------
117	44.5	44.8	44.5	--------	-------	-------
118	-------	-------	-------	--------	-------	43

Water surface temperatures for Lake Wawasee near Wawasee, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1946		1947--Con.		1948--Con.		1948--Con.	
Oct. 26	52	June 7	64	Jan. 17	33	Sept. 18	70
Nov. 2	58	14	66	24	33	25	61
9	47	21	65	31	33	Oct. 2	58
16	49	July 12	67	Feb. 7	33	9	54
23	36	19	67	14	33	16	55
30	38	26	67	21	36	23	49
Dec. 7	38	Aug. 2	74	28	38	30	48
14	34	9	78	Mar. 6	35	Nov. 6	52
21	33	16	77	13	38	13	48
28	33	23	83	20	38	27	40
		30	76	27	48	Dec. 4	39
1947		Sept. 6	72	Apr. 3	45	11	37
Jan. 4	33	13	74	10	46	18	32
11	33	20	74	17	48	25	30
18	33	27	60	24	61		
25	33	Oct. 4	60	May 1	57	1949	
Feb. 1	33	11	58	8	55	Jan. 1	33
8	33	18	64	15	64	5	38
15	36	25	55	22	60	8	38
22	36	Nov. 1	55	June 5	74	15	31
Mar. 1	35	8	44	12	68	22	34
8	36	15	40	19	69	29	34
15	36	22	41	26	75	Feb. 5	34
22	36	29	34	July 10	77	12	34
29	35	Dec. 6	34	17	78	19	36
Apr. 5	42	13	34	24	73	26	37
12	40	18	33	31	74	Nov. 2	51
19	48	20	35	Aug. 7	75	22	35
26	48	27	33	14	74		
May 3	52			21	75	1950	
10	50	1948		28	85	Feb. 1	35
17	59	Jan. 3	34	Sept. 4	75	May 3	51
31	58	10	33	11	64		

Temperature profiles (°F) for Lake Wawasee near Wawasee

Depth (feet)	1946		1947						
	Oct. 25	Nov. 21	Jan. 9	Feb. 18	Apr. 30	May 24	June 24	July 25	Aug. 27
Air	51.5	50	25	18	62	69	64	94.3	98
Water-surface	57.9	47.3	33.5	34	54.6	63.8	67.4	74.5	85.6
2.5	--------	--------	34.5	35.8	53	63.3	--------	--------	83.8
5	58	47.2	34.5	37.6	52.9	62.6	67.4	74.2	83.6
10	57.6	47	34.6	38.2	52.6	63.6	67.4	72.8	82.8
15	57.7	46.9	34.6	38.4	52.3	62.7	67.1	70.8	81.7
20	58	47	34.7	38.4	52.1	61.7	66.9	70.7	77.5
25	58	47	34.9	38.5	51.9	60.6	66.6	69.7	74.2
27.5	--------	--------	--------	--------	--------	58.7	--------	--------	--------
30	58	47	35.1	38.5	51.4	58	66	69.7	71.7
35	57.8	47	35.1	38.4	51	57.4	65	67.6	70
40	57.7	47	35.3	38.5	50.9	55.9	64.2	63.9	69.3
42.5	57.9	--------	--------	--------	--------	--------	--------	--------	--------
45	57.8	46.9	35.3	38.4	50.8	54.5	63	62.2	65.6
47.5	--------	--------	35.4	--------	--------	--------	--------	--------	--------
50	57.8	46.9	35.5	38.5	50.6	52.8	60.2	61.5	60.7
52.5	--------	--------	--------	38.5	--------	--------	--------	--------	--------
55	57.8	46.9	--------	--------	50.1	51.4	57	61	57
60	57.8	46.8	--------	--------	50	51.2	54.2	60	55.6
62	--------	47.2	--------	--------	--------	--------	--------	--------	--------
62.5	--------	--------	--------	--------	--------	51.1	--------	--------	--------
63	57.8	--------	--------	--------	--------	--------	--------	--------	--------
64	--------	48.1	--------	--------	--------	--------	52.8	--------	--------
65	--------	--------	--------	--------	49.6	51	--------	--------	55.4
66	--------	--------	--------	--------	49	--------	--------	--------	--------
68	--------	--------	--------	--------	--------	--------	--------	--------	55.1
70	--------	--------	--------	--------	--------	50.7	--------	--------	--------

Depth (feet)	1947--Continued		1948						
	Oct. 30	Nov. 20	June 2	July 1	Aug. 6	Sept. 1	Oct. 6	Nov. 17	Dec. 7
Air	61	42	83	70	64	70	57	49	--------
Water-surface	61	44.2	74	74.6	74.8	77.9	61.2	46.8	40
2.5	--------	--------	72.6	--------	74.8	--------	--------	--------	--------
5	61	44.2	70	74.2	74.8	77.9	61.2	46.2	39.6
10	61	44.2	70	73.7	74.6	77.4	61.2	46.6	39.8
12.5	--------	--------	68.5	--------	--------	--------	--------	--------	--------
15	61	44.2	66.8	73.6	74.6	75.7	61.2	46.6	39.8
20	61	44.2	64.2	73.5	74.4	74.5	61.2	46.7	39.9
25	60.7	44	62.8	73.1	74	73.8	61.2	46.6	39.9
27.5	--------	--------	--------	72.7	--------	--------	--------	--------	--------
30	60.6	44	62.1	69.1	72.7	72.3	61.2	46.6	39.9
35	60.8	44	61.6	64.8	69.3	70.8	61.1	46.6	39.9
37.5	--------	--------	--------	--------	--------	69.2	--------	--------	--------
40	60.8	44	61.2	64.1	66.3	67.3	61	46.5	39.9
45	60.6	44	60.3	62.8	64.3	64.3	60.6	46.3	39.9
50	60.6	44	57.3	58.6	60.7	60.2	60.4	46	39.9
55	60.3	44	55.2	55.3	56.5	56.7	59.8	45.9	39.7
57.5	--------	--------	--------	--------	--------	--------	56.2	--------	--------
60	60.3	44	54	54.2	55.5	55.7	54.6	45.9	39.8
62	--------	--------	--------	--------	--------	--------	54.6	--------	--------
62.5	59.8	--------	--------	--------	--------	--------	--------	--------	--------
63	--------	--------	--------	53.7	--------	--------	--------	46.2	--------
64	--------	--------	--------	--------	--------	55.2	--------	--------	--------
65	59.5	44	53.7	--------	54.6	--------	--------	--------	39.8
67	--------	--------	--------	--------	--------	--------	--------	--------	39.8
68	--------	--------	--------	--------	54.5	--------	--------	--------	--------

Water surface temperatures for Webster Lake at North Webster, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1949--Con.		1950		1950--Con.	
June 13	68	Mar. 25	45	Jan. 26	65	Oct. 24	57
6	79	Oct. 19	63	July 17	77		
Jan. 5	36.5			Aug. 3	75	1951	
						May 10	59

Water surface temperatures for Winona Lake at Warsaw, Ind.

Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)	Date	Temperature (°F)
1945		1948--Con.		1949--Con.		1950--Con.	
June 12	68	Feb. 14	38	June 4	77	Sept. 9	74
Sept. 10	79	19	37	11	77	16	72
Nov. 26	36	21	38	18	78	23	65
		28	38	25	80	30	65
1946		Mar. 2	36	July 2	90	Oct. 7	63
Apr. 19	60	6	36	9	83	14	61
June 24	75	13	38	16	88	21	64
July 2	77	20	44	23	82	28	58
Oct. 26	59	25	46.5	30	84	Nov. 4	51
Nov. 2	60	27	46	Aug. 6	81	11	42
9	53	Apr. 3	48	13	84	18	45
16	49	10	50	20	78	25	36
23	42	17	52	27	79	Dec. 2	36
Dec. 7	41	24	59	Sept. 3	73	9	34
14	38	May 8	59	10	71	16	35
21	35	15	60	17	66	23	35
28	38	22	65	23	64	30	35
		29	74	Oct. 1	63		
1947		June 5	75	8	67	1951	
Jan. 4	36	12	71	15	63	Jan. 6	35
11	37	19	73	22	58	13	36
18	38	26	80	29	55	20	34
25	38	July 3	81	Nov. 5	47	27	36
Feb. 1	38	10	83	17	47	Feb. 10	36
8	36	17	82	18	47	17	36
15	38	24	78	19	46	24	38
22	36	Aug. 7	77	26	38	Mar. 3	39
Mar. 1	38	14	80	Dec. 3	37	10	40
8	37	21	80	10	35	17	39
15	39	28	85	14	34	25	43
22	39	Sept. 4	82	17	37	Apr. 7	45
29	39	11	74	24	39	14	44
Apr. 5	47	18	73	21	36	21	46
12	48	25	67			28	56
26	51	Oct. 2	64	1950		May 5	66
May 3	54	9	57	Jan. 7	34	8	61
10	55	16	56	14	34	12	59
17	65	23	54	21	35	19	74
31	62	Nov. 6	54	24	37	26	67
June 7	73	13	48	28	40	June 3	74
14	68	20	46	31	35	9	67
21	71	27	44	Feb. 4	36	17	74
28	81	30	42	11	38	23	74
July 5	77	Dec. 4	42	18	35	30	75
12	79	11	39	25	33	July 7	77
19	75	25	35	Mar. 4	36	14	80
26	77			11	37	21	77
Aug. 2	78	1949		14	35	28	78
9	83	Jan. 1	36	18	37	Aug. 4	78
23	89	4	36	25	40	11	79
28	79	8	38			19	74
30	83	15	36	Apr. 1	41	25	70
Sept. 6	82	22	35	8	45	Sept. 1	75
13	78	29	33	14	41	Dec. 29	35
20	78	Feb. 5	34	15	40		
28	63	8	34.5	22	47	1952	
Oct. 4	63	12	36	29	48	Jan. 5	36
11	66	14	34	May 2	54	12	36
18	66	19	38	6	57	19	40
25	63	26	36	13	61	26	35
Nov. 8	50	Mar. 5	39	20	68	Feb. 2	36
15	42	12	38	27	70	9	36
22	43	19	39	June 3	69	16	35
29	32	22	43	10	76	24	37
Dec. 13	37	26	49	17	73	Mar. 1	39
17	35	Apr. 2	52	25	82	8	39
27	36	9	51	July 2	75	15	40
		16	51	10	81	22	42
1948		23	50	16	79	30	44
Jan. 3	36	30	61	24	78	Apr. 5	41
10	36	May 3	61	30	80	12	44
17	36	16	69	Aug. 6	79	19	51
24	36	14	71	17	83	26	58
31	36	21	65	26	78		
Feb. 7	36	28	64	Sept. 2	74		

Temperature profiles (°F) for Winona Lake, at Warsaw

Depth (feet)	1946				1947		
	July 26	Oct. 23	Nov. 20	Dec. 16	Apr. 30	May 24	June 20
Air	[illegible]	65	52	36	64	66	61
Water-surface	78.7	58.7	50.3	42.1	52.6	65.4	67.5
2.5	--------	--------	--------	--------	52.6	65.1	--------
5	78.1	58.5	50.4	42.1	52.5	65	67.5
10	77.2	58.5	50.4	42.1	52.2	64.1	67.5
15	76.5	58.5	50.4	42.1	51.8	63	66.3
17.5	--------	--------	--------	--------	--------	60.5	--------
20	69	58.5	50.4	42.1	50.8	58.6	65.2
22.5	--------	--------	--------	--------	--------	--------	62.1
25	63	58.5	50.4	42.1	49.4	53.1	59.4
30	58.3	58.2	50.4	42.1	49.2	51.3	54.7
35	55.4	58	50.3	42	49.2	50.7	52.5
36	--------	57.6	--------	--------	--------	--------	--------
38	--------	56.1	--------	--------	--------	--------	--------
40	53.3	53.6	50.3	42	49.1	50.3	50.4
42	--------	52.4	--------	--------	--------	--------	--------
44	--------	51.8	--------	--------	--------	--------	--------
45	52.2	52.1	50.2	42	48.7	50	50.1
50	50.6	51.7	50.1	42	48.4	49.6	49.9
55	50.5	51.3	50.1	41.9	48.3	49.4	49.7
60	50	51.2	50.1	42	48.2	49.1	49.4
65	49.9	51	49.9	42	48.1	48.9	49.3
70	50	51.1	49.8	41.9	47.8	48.6	49.3
74	--------	--------	--------	--------	47.2	--------	--------
75	49.5	50.7	49.8	41.9	--------	48.5	49.3
76	--------	--------	--------	--------	--------	--------	49.3
76.5	--------	--------	--------	--------	--------	48.5	--------
77	--------	--------	--------	43	--------	--------	--------
79	49.8	--------	--------	--------	--------	--------	--------

Depth (feet)	1947--Continued					
	July 24	Aug. 26	Oct. 8	Oct. 29	Nov. 20	Dec. 18
Air	92.8	81	63	58	36	33
Water-surface	76	83.3	64.5	61.5	47.2	37.1
5	74.1	83.3	64.5	61.5	47.2	37.5
10	72	83.3	64.4	61.5	47.4	36.8
15	71.2	76.2	62.6	61.3	47.4	36.8
20	69.8	69.9	62	61.3	47.4	36.7
25	65.7	63.2	61.4	61.2	47.4	36.7
30	59.8	55.5	60.1	60.2	47.4	36.6
32.5	--------	--------	--------	57.8	--------	--------
35	54.1	52	54.5	56	47.4	36.8
40	52.2	51.5	51.5	52.8	47.4	36.7
45	51.1	50.6	50.5	51.2	47.4	36.7
50	50.1	50.1	49.7	50.3	47.4	36.7
55	49.9	49.8	49.7	49.7	47.4	36.7
60	49.8	49.5	49.4	49.5	47.3	36.7
65	49.5	49.3	49.2	49.3	47.3	37
70	49.5	49.2	49.3	49.2	47.2	37.1
73	--------	--------	48	49.1	--------	--------
75	48.9	49.1	--------	--------	47.1	37.1
76.5	--------	--------	--------	--------	47.2	--------
77	--------	48.9	--------	--------	--------	--------
78	48.4	--------	--------	--------	--------	37.2

Depth (feet)	1948							
	Jan. 27	June 2	July 1	Aug. 5	Aug. 31	Oct. 5	Nov. 16	Dec. 6
Air	12	75	84	68	77	58	54	38
Water-surface	33.3	71.9	77.8	76.3	80.7	62.3	49.7	42.9
2.5	--------	70.2	76.4	74.9	--------	--------	--------	--------
5	34.2	69.5	75.4	74.9	80	62.3	49.8	42.5
10	36	68.2	74.4	74.9	80	62.3	50.1	43.7
12.5	--------	66.2	--------	--------	78.2	--------	--------	--------
15	37.2	63.8	73.7	74.9	74.7	62.3	50.1	43.7
17.5	--------	--------	67.8	74.5	--------	--------	--------	--------
20	37.5	60.6	64.7	70.5	69.2	62.1	50.1	43.7
22.5	--------	--------	--------	64	65.9	--------	--------	--------
25	37.4	58.3	58.5	60.8	62.3	61.9	50	43.9
27.5	--------	--------	--------	--------	--------	61.1	--------	--------
30	37.5	56.2	55.9	55.7	56	58.2	50	43.9
35	37.5	54.3	53.9	53.5	53.5	54.3	49.3	43.5
40	37.5	52.6	52.4	52	51.9	52.3	50	42.4
45	37.9	51.4	51.3	50.8	50.9	51.6	50	43.8
50	37.6	50.5	50.5	50.3	50.4	50.8	50	43.8
55	37.6	49.6	49.9	50.1	50.2	50.1	50.1	43.8
60	37.8	49.1	49.5	50.1	50.2	49.7	50.1	42.2
65	37.6	48.9	49.3	49	49.4	49.7	50.1	43.7
70	37.7	48.6	49.1	49	49.3	49.7	50.2	43.7
73	--------	48.6	--------	--------	--------	--------	--------	--------
75	39	--------	49	48.9	49.3	49.7	50.1	43.8
76	39.6	--------	--------	--------	--------	--------	--------	43.8
77	--------	--------	49	--------	--------	--------	--------	--------
78	--------	--------	--------	--------	49.2	49.2	50.1	--------

EVAPORATION DATA

The data in this section were collected at class A evaporation stations in Evansville, Indianapolis, Kendallville, and Valparaiso and compiled from data in the files of the U. S. Weather Bureau Office at Indianapolis. Some previously unpublished data, corrections of errors in previously published data, and estimates to supply missing data for completing monthly totals are included in this tabulation. These estimated were made by the author in collaboration with the members of the U. S. Weather Bureau at the Indianapolis office. Estimates were based on air temperatures, wind movement, and relative humidity. Water temperatures were not available for use in making estimates in most instances.

In studying the records it was found that in nearly all instances rain occurred on the days on which negative evaporation was observed. The exceptions to this occurred on November 23 and 24, 1948, at Evansville and on December 3 and 4, 1948, and November 4, 1950, at Kendallville. On the latter 3 days the observer reported slush ice in the pan which may have caused errors in the observations. It is believed that errors in determining the amount of rain that fell into the evaporation pan at times of low evaporation rates may account for negative evaporation being observed when it was not actually negative.

It was also noticed that heavy rain fell on days on which unusually high evaporation was observed. In some instances the record indicated that possibly the pan was filled to overflowing and some of the water lost and not reported by the observer. Where the observed amounts were obviously in error, estimations of the evaporation have been made by the author.

Records have been kept at most of the stations until freezing weather in the fall months prevented further readings. Where observations were made through the major part of a month, the remainder of the month was estimated in order to obtain a monthly total and also to fill out daily amounts for use in computing daily averages for the period of record. In using these figures, it should be kept in mind that observations could be made in winter months only when temperatures were above freezing. Consequently the evaporation amounts tabulated here are likely to be higher than a long time average would be that would include evaporation rates at both above and below freezing temperatures.

The daily observations in the tables are given in inches and represent evaporation from the class A type pan described on p. 50.

Evansville. --The Evansville evaporation station was established on May 1, 1946 at the Evansville Airport, lat 38°01'55", long 87°32'19". Evaporation readings were made at 7 a. m. central standard time, from May 1946 to December 1946 and at 6 a. m. since that time. Maximum and minimum pan water temperatures have been observed since October 1, 1952, and are available through the U. S. Weather Bureau.

Indianapolis. --The Indianapolis evaporation station was established May 1, 1937, at the Riverside pumping station of the Indianapolis Water Company, lat 39°46'57", long.86°11'07". The station was moved to Geist Reservoir, lat 39°54'40", long.85°59'14", on July 7, 1944. Evaporation observations were made at 7 a. m. central standard time from May 1937 to July 6, 1944; at 5:30 a. m. from July 7, 1944, to October 31, 1944; and at noon either central standard time or central daylight saving time since April 1, 1945. Pan water temperatures have been observed since April 1, 1948, and are available through the U. S. Weather Bureau.

Kendallville. --The Kendallville evaporation station was established on April 1, 1947, at the Kendallville water works, lat 41°-26'26", long.85°15'07". The station is located on top of a buried reservoir and is about 6 or 7 feet higher then the surrounding ground. Evaporation readings were generally made at about 9 a. m. central standard time during the months of October to April and at 8 a. m. from May to September until June 1948. From July 1948 to December 1953 observations were made at about 4 p. m. The observations at Kendallville from April through October average about 6 percent higher than those at Indianapolis and 14 percent higher than those at Valparaiso. These higher values seem abnormal and may be due to the exposure at Kendallville. The reservoir on which the evaporation pan is located, although covered with earth, may produce different ground temperature characteristics than normal ground because of the water being continually changed in the reservoir. The elevated position of the pan may also cause higher evaporation rates.

Valparaiso. --The Valparaiso evaporation station was established on April 1, 1947, at the Valparaiso water plant on the shore of Flint Lake, lat 41°30'44", long.87°02'24". Observations were generally made between 7 and 8 a. m. central standard time, with the readings being nearer 7 a. m. in the months of May to September and near 8 a. m. in the months October to April, during the period April 1947 to September 1951. Observations were changed to 5 p. m. on October 1, 1951, and have been made at about that time since then.

MEASUREMENTS OF EVAPORATION AT 4 STATIONS IN INDIANA

Evaporation in inches, at Evansville, Ind.

[Observations were not made before May 1946 and during November 1951, 1952, and 1953]

April	1947	1948	1949	1950	1951	1952	1953	Average
1	0.160	0.158	0.301	0.23	0.06	0.13	0.16	0.171
2	.062	.163	.053	.15	.12	.24	.10	.127
3	.126	.087	.105	.15	.08	.19	.03	.110
4	.131	.188	.091	.00	.07	.09	.08	.093
5	.039	.223	.161	.17	.16	.06	.22	.148
6	.241	.126	.035	[a] .07	.12	.09	[a] .10	.112
7	.334	.198	.173	[a] .05	.07	.10	[a] .05	.139
8	.149	.080	.184	.17	.08	.15	[a] .03	.120
9	.037	.323	.196	.23	.10	.23	.09	.172
10	.163	.183	.214	.00	.10	.30	.33	.184
11	.241	.137	.150	.25	.14	.08	.21	.173
12	.113	.277	.085	.15	.02	.08	.06	.112
13	.188	.282	.107	.04	.06	.18	.03	.127
14	.129	.026	.081	.16	.00	.09	.18	.095
15	.172	.045	.347	.14	.14	.03	.22	.156
16	.045	.085	.094	.13	.17	.10	.28	.129
17	.086	.269	.129	.17	.11	.18	.22	.166
18	.230	.181	.186	.09	.17	.15	.11	.160
19	.298	.226	.098	.20	.22	.17	[a] .04	.179
20	.220	.312	.132	.15	.33	.24	[a] .03	.202
21	.143	.211	.129	.20	.11	.24	.27	.186
22	.042	.161	.036	.25	.02	.07	.14	.103
23	.075	.141	.156	.24	.10	.13	.33	.167
24	.296	.255	.377	.26	.16	.01	.40	.251
25	.010	.293	.214	.25	.27	.06	.12	.174
26	.052	.270	.274	.21	.33	.15	.33	.231
27	.194	.205	.073	.19	.12	.33	.06	.167
28	.247	.374	.157	.12	.18	.28	.12	.211
29	.133	.156	.305	.18	.34	.42	.31	.263
30	.126	.209	.187	.09	.28	.30	.12	.187
Total	4.482	5.844	4.830	4.69	4.23	4.87	4.77	4.815

May	1946	1947	1948	1949	1950	1951	1952	1953	Average
1	0.043	0.178	0.158	0.03	0.08	0.32	0.26	0.01	0.135
2	.109	.422	.139	.09	.02	.32	.23	.36	.211
3	.102	.109	.293	.27	.01	.14	.25	.09	.158
4	.085	.080	.134	.29	.12	.26	.14	.21	.165
5	.117	.238	.076	.31	.27	.36	.32	.03	.215
6	.162	.197	.161	.29	.21	.18	.42	.16	.222
7	.204	.168	.031	.28	.13	.07	.31	.17	.170
8	.185	.174	.216	.29	.10	.19	.32	.08	.194
9	.139	.180	.251	.16	.27	.27	.21	.12	.200
10	.226	.210	.296	.42	[b] .15	.19	.21	.22	.240
11	.059	.222	.250	.14	[c] -.01	.16	.02	.35	.149
12	.037	.235	.171	.18	[c] .02	.06	.12	.08	.113
13	.235	.264	.154	.21	.13	.24	.05	.01	.162
14	.119	.242	.109	.26	.20	.26	.24	.01	.180
15	.168	.232	.163	.27	.17	.33	.38	[a] .06	.222
16	.120	.268	.034	.27	.27	.33	.15	[a] .08	.190
17	.061	.261	.214	.19	.24	.31	.42	[a] .10	.224
18	.090	.169	.247	.31	.27	.33	.17	[a] .10	.211
19	.152	.224	.251	.26	.25	.33	.03	.10	.200
20	.111	.102	.226	.26	.13	.32	.10	.18	.179
21	.057	.114	.274	.23	.31	.16	.09	.22	.186
22	.194	.168	.172	.20	.23	.28	.06	.33	.204
23	.230	.226	.248	.16	.25	.26	.24	.24	.232
24	.137	.238	.215	.26	.34	.27	.20	.12	.222
25	.335	.029	.290	.08	.11	.23	.15	.31	.192
26	.105	.108	.227	.23	.48	.32	.08	.36	.239
27	.037	.219	.300	.25	.29	.33	.20	.37	.250
28	.055	.257	.201	.21	.14	.54	.25	.31	.245
29	.245	.338	.174	.19	.25	.13	.24	.31	.235
30	.196	.161	.308	.34	.24	.26	.28	.29	.259
31	.228	.141	.348	.09	.05	.35	.23	.44	.235
Total	4.343	6.204	6.331	7.02	5.72	8.10	6.37	5.82	6.239

See footnotes at end of table.

Evaporation in inches at Evansville, Ind.--Continued

June	1946	1947	1948	1949	1950	1951	1952	1953	Average
1------	0.155	0.278	0.382	0.28	0.27	0.20	0.35	0.36	0.284
2------	.216	.384	.337	.25	.19	.39	.32	.40	.311
3------	.071	.184	.274	.31	.17	.30	.24	.28	.229
4------	.201	.189	.295	.25	.05	.13	.24	.31	.208
5------	.228	.203	.378	.23	.22	.00	.32	.43	.251
6------	.255	.243	.321	.34	.25	.20	.24	.65	.312
7------	.341	.232	.122	.30	.27	.15	.33	.28	.253
8------	.359	.363	.264	.41	.31	.11	.42	.28	.314
9------	.181	.278	.378	.39	.21	.23	.42	.46	.318
10------	.468	.328	.122	.20	.21	.06	.13	.32	.230
11------	.305	.368	.324	.12	.26	.29	.12	.50	.286
12------	.367	.277	.209	.13	.31	.32	.28	.17	.258
13------	.359	.241	.336	.11	.26	.00	.20	.34	.231
14------	.335	.316	.287	.08	.16	.15	.32	.10	.218
15------	.277	.270	.193	.07	.18	.29	.26	.31	.231
16------	.083	.328	.299	.08	.29	.26	.36	.29	.249
17------	.371	.239	.259	.06	.38	.16	.49	.42	.297
18------	.385	.177	.163	.05	.29	.08	.27	.38	.224
19------	.421	.167	.241	.14	.22	.24	.36	.30	.261
20------	.296	.210	.228	.24	.25	.18	.38	.41	.274
21------	.263	.313	.253	.27	.14	.30	.38	.50	.302
22------	.332	.103	.326	.17	.20	.21	.37	.48	.274
23------	.270	.116	.349	.31	.21	.20	.25	.37	.259
24------	.342	.207	.394	.28	.26	.04	.35	.37	.280
25------	.320	.036	.321	.30	.29	.40	.46	.43	.320
26------	.171	.040	.379	.24	.30	.37	.45	.42	.296
27------	.258	.167	.237	.24	.36	.11	.34	.15	.233
28------	.253	.090	.175	.18	.34	.32	.33	.34	.254
29------	.313	.231	.221	.27	.19	.18	.34	.24	.248
30------	.362	.202	.172	.18	.33	.11	.35	.29	.250
Total-	8.558	6.780	8.239	6.48	7.47	5.98	9.67	10.58	7.955

July	1946	1947	1948	1949	1950	1951	1952	1953	Average
1------	0.360	0.376	0.283	0.29	0.28	0.00	0.47	0.28	0.292
2------	.209	.211	.294	.31	.30	.21	.33	.33	.274
3------	.328	.306	.288	.30	.20	.19	.35	.45	.302
4------	.330	.258	.316	.32	.33	.23	.14	.27	.274
5------	.198	.272	.251	.18	.11	.28	.35	.21	.231
6------	.123	.165	.278	.34	.24	.17	.31	.40	.253
7------	.188	.121	.352	.24	.29	.29	.31	.41	.275
8------	.342	.210	.422	.24	.28	.33	.32	.31	.307
9------	.282	.304	.368	.20	.31	.41	.11	.46	.306
10------	.274	.158	.288	.24	.34	.15	.19	.34	.248
11------	.089	.218	.326	.31	.32	.21	.26	.34	.259
12------	.273	.273	.379	.27	.30	.17	.26	.37	.287
13------	.306	.153	.094	.27	.28	.16	.32	.30	.235
14------	.308	.440	.204	.16	.26	.07	.29	.30	.254
15------	.274	.231	.138	.27	.35	.22	.22	.29	.249
16------	.267	.282	.182	.13	.28	.41	.09	.25	.236
17------	.285	.208	.237	.14	.25	.19	.22	.25	.222
18------	.137	.242	.209	.11	.25	.20	.19	[a].09	.178
19------	.274	.324	.216	.17	.10	.26	.30	[a].10	.218
20------	.331	.206	.197	.16	.32	.37	.33	.25	.270
21------	.124	.242	.135	.08	.25	.29	.38	.30	.225
22------	.165	.271	.306	.20	.12	.27	.41	.06	.225
23------	.258	.257	.130	.25	.07	.20	.50	.22	.236
24------	.304	.224	.228	.26	.14	.35	.46	.30	.283
25------	.353	.253	.210	.32	.19	.17	.37	.29	.270
26------	.280	.171	.278	.24	.26	.20	.37	.34	.267
27------	.347	.120	.116	.24	.14	.34	.35	.29	.243
28------	.293	.475	.200	.29	.18	.18	.36	.30	.285
29------	.238	.174	.256	.16	.21	.36	.50	.10	.250
30------	.200	.262	.196	.27	.21	.23	.43	.33	.266
31------	.336	.285	.274	.22	.19	.29	.12	.42	.267
Total-	8.076	7.692	7.651	7.18	7.35	7.40	9.61	8.95	7.987

See footnotes at end of table.

Evaporation in inches at Evansville, Ind.--Continued

August	1946	1947	1948	1949	1950	1951	1952	1953	Average
1------	0.256	0.335	0.330	0.30	0.15	0.21	0.31	0.35	0.280
2------	.243	.235	.261	.24	.23	.36	.27	.20	.255
3------	.026	.269	.242	.22	.19	.30	.26	.34	.231
4------	.175	.320	.282	.21	.32	.30	.30	.39	.287
5------	.181	.310	.100	.24	.21	.31	.24	.14	.216
6------	.282	.291	.212	.18	.25	.36	.26	.23	.258
7------	.245	.387	.192	.22	.26	.22	.21	.22	.244
8------	.233	.408	.150	.28	.24	.31	.28	.27	.271
9------	.101	.216	.264	.24	.08	.17	.24	.27	.198
10------	.253	.264	.235	b.20	.06	.23	.24	.20	.210
11------	.332	.281	.202	.19	.13	.23	.30	.24	.238
12------	.226	.268	.173	.29	.30	.16	.20	.24	.232
13------	.159	.192	.210	.14	.17	.28	.12	.18	.181
14------	.057	.242	.273	.16	.09	.31	.21	.27	.202
15------	.050	.295	.232	.13	.08	.25	.16	.29	.186
16------	.318	.164	.228	.16	.05	.29	.24	.33	.222
17------	.054	.138	.240	.13	.25	.30	.34	.34	.224
18------	.508	.225	.257	.20	.22	.23	.19	.28	.264
19------	.123	.184	.188	.24	.13	.24	.25	.36	.214
20------	.274	.210	.274	.16	.19	.28	.32	.33	.255
21------	.231	.181	.267	.25	.24	.23	.21	.22	.229
22------	.139	.231	.224	.29	.10	.29	.17	.24	.210
23------	.137	.259	.272	.08	.30	.32	.32	.21	.237
24------	.242	.225	.259	.14	.21	.34	.29	.21	.240
25------	.160	.272	.258	.23	.21	.28	.28	.24	.241
26------	.196	.253	.238	.23	.22	.32	.19	.27	.240
27------	.242	.145	.200	.12	.16	.21	.24	.31	.203
28------	.195	.288	.237	.22	.15	.01	.27	.29	.208
29------	.159	.138	.272	.10	.16	.06	.26	.30	.181
30------	.152	.250	.189	.20	.05	.05	.17	.17	.154
31------	.160	.252	.229	.22	.07	.27	.06	.32	.198
Total-	6.109	7.728	7.190	6.21	5.47	7.72	7.40	8.25	7.009

September	1946	1947	1948	1949	1950	1951	1952	1953	Average
1------	0.147	0.064	0.341	0.27	0.26	0.29	0.22	0.31	0.238
2------	.035	.224	.282	.21	.03	.28	.34	.28	.210
3------	.163	.243	.240	.21	.01	.28	.21	.25	.201
4------	.182	.264	.199	.18	.12	.25	.19	.34	.216
5------	.177	.257	.220	.20	.28	.40	.18	.10	.227
6------	.158	.294	.091	.21	.25	.15	.17	.26	.198
7------	.193	.206	.076	.23	.23	.20	.20	.27	.201
8------	.164	.242	.089	.18	.10	.28	b.20	.28	.192
9------	.189	.280	.197	.25	.05	.20	.18	.25	.200
10------	.096	.114	.134	.19	.05	.27	.19	.23	.159
11------	.236	.162	.203	.20	.03	.07	.26	.22	.173
12------	.194	.286	.252	.28	.08	.32	.26	.43	.263
13------	.088	.061	.214	.06	.12	.29	.23	.26	.165
14------	.238	.267	.170	.14	.18	.00	.19	.23	.177
15------	.083	.344	.247	.14	.11	.20	.11	.29	.190
16------	.172	.156	.216	.05	.09	.24	.25	.21	.173
17------	.196	.196	.176	.04	.15	.20	.27	.30	.191
18------	.139	.164	.198	.08	.19	.20	.12	.24	.166
19------	.111	.207	.225	.10	.17	.19	.19	.26	.182
20------	.034	.233	.363	.27	.20	.19	.17	.07	.191
21------	.201	.296	.280	.09	.18	.29	.17	.26	.221
22------	.145	.384	.169	.20	.19	.12	.20	.25	.207
23------	.046	.238	.099	.26	.08	.13	.18	.11	.143
24------	.170	.158	.259	.19	.21	.22	.18	.22	.201
25------	.161	.186	.178	.14	.15	.01	.18	.30	.163
26------	.148	.152	.276	.16	.14	.10	.15	.26	.173
27------	.144	.228	.225	.16	.04	.17	.22	.21	.175
28------	.163	.200	.326	.17	.03	.29	.17	.29	.205
29------	.094	.170	.011	.25	.09	.18	.20	.25	.156
30------	.160	.165	.035	.16	.10	.14	.22	.37	.169
Total-	4.427	6.441	5.991	5.27	3.91	6.15	6.00	7.60	5.726

See footnotes at end of table.

Evaporation, in inches, at Evansville, Ind.--Continued

October	1946	1947	1948	1949	1950	1951	1952	1953	Average
1------	0.180	0.187	0.107	0.15	0.10	0.19	0.23	0.35	0.187
2------	.133	.124	.120	.16	.08	.11	.31	.27	.163
3------	.141	.321	.198	.03	.03	.27	.28	.22	.186
4------	.147	.157	.139	.08	.07	.24	.12	.24	.149
5------	.166	.150	.090	.01	.20	.24	.23	.15	.154
6------	.149	.124	.108	.01	.10	.22	.03	.03	.096
7------	.160	.174	.159	.57	.14	.17	.06	.08	.189
8------	.171	.219	.227	.14	.12	.08	.13	.14	.153
9------	.138	.181	.091	.05	.10	.09	.16	.08	.111
10------	.130	.156	.152	.11	.04	.11	.17	.12	.124
11------	.125	.111	.101	.24	.13	.12	.13	.14	.137
12------	.101	.110	.159	.19	.22	.11	.09	.26	.155
13------	.150	.120	.096	.19	.23	.12	.18	.19	.160
14------	.117	.159	.146	.14	.12	.16	.23	.19	.158
15------	.005	.110	.134	.13	.21	.17	.16	.12	.130
16------	.132	.392	.211	.18	.12	.15	.11	.16	.182
17------	.108	.134	.039	.13	.14	.17	.10	.21	.129
18------	.062	.031	.046	.08	.12	.14	.18	.18	.105
19------	.056	.133	.092	.12	.14	.19	.11	.17	.126
20------	.039	.110	.131	.11	.17	.20	.17	.12	.131
21------	.100	.130	.110	.05	.26	.09	[a].14	.14	.128
22------	.048	.088	.010	.05	.11	.12	[a].12	.16	.088
23------	.099	.166	.086	.15	.05	.10	[a].10	.15	.113
24------	.095	.151	.087	.15	.09	.12	.11	.15	.119
25------	.127	.078	.048	.08	.05	.12	.11	.11	.090
26------	.094	.129	.066	.11	.11	.10	.10	.10	.101
27------	.120	.194	.047	.11	.10	.11	.21	[a].02	.114
28------	.060	.181	.060	.07	.09	.01	.31	[a].03	.101
29------	.082	.091	.063	.08	.12	.07	.16	[a].03	.087
30------	.164	.027	.091	.06	.10	.02	.07	.10	.079
31------	.138	.022	.062	.04	.09	.16	.22	.12	.106
Total-	3.537	4.460	3.276	3.77	3.75	4.27	4.83	4.53	4.051

November	1946	1947	1948	1949	1950	Average	December	1946
1------	0.059	-0.007	-0.013	0.07	0.17	0.056	1------	0.058
2------	.068	-.013	.051	.11	.24	.091	2------	[a].040
3------	.001	.002	-.024	.12	.13	.046	3------	[a].040
4------	.049	.010	.011	.07	.01	.030	4------	[a].040
5------	.053	.016	.265	.12	[a].05	.101	5------	[a].040
6------	.100	.056	.037	.07	[a].09	.071	6------	.033
7------	.050	.084	.057	.09	.13	.082	7------	.046
8------	.182	.066	.069	.12	.04	.095	8------	.080
9------	.046	.103	.082	.11	.05	.078	9------	-.016
10------	.037	.102	.047	.13	.11	.085	10------	.073
11------	.012	.077	.071	.16	[a].01	.066	11------	.095
12------	.059	.010	.063	.11	[a].02	.052	12------	-.045
13------	.038	.009	.050	.11	[a].03	.047	13------	.059
14------	.056	.084	.081	.04	.09	.070	14------	.032
15------	.056	-.012	.111	.10	.11	.073	15------	.076
16------	.087	.032	.070	.11	[c].00	.060	16------	.037
17------	.005	.128	-.018	.14	.19	.089	17------	.076
18------	[a].061	.048	.072	.03	.07	.056	18------	------
19------	[a].062	-.024	.039	.07	.10	.049	19------	------
20------	.021	.065	.155	.11	[b].08	.086	20------	------
21------	.023	.048	.054	.14	[b].06	.065	21------	------
22------	.063	-.001	.045	[a].03	[b].05	.037	22------	------
23------	[a].080	.047	-.015	[a].02	[b].04	.034	23------	------
24------	[a].108	-.006	-.022	.08	[b].01	.034	24------	------
25------	.156	[b].040	.121	.02	[b].01	.069	25------	------
26------	.176	[b].040	.090	.02	[b].02	.069	26------	------
27------	.008	[b].030	.002	.09	[b].02	.030	27------	------
28------	.007	[b].040	.120	.04	[b].02	.045	28------	------
29------	.072	[b].030	.056	.00	[b].03	.038	29------	------
30------	.044	[b].020	.038	.05	[b].03	.036	30------	------
							31------	------
Total-	1.839	1.124	1.765	2.48	2.01	1.840		

[a] Estimated from total observed on underlined day.
[b] Estimated because of missing or erroneous data.
[c] Corrected since originally published by U. S. Weather Bureau.
[d] Not previously published.

MEASUREMENTS OF EVAPORATION AT 4 STATIONS IN INDIANA

Evaporation in inches, in Indianapolis, Ind.

[No observations were made during November 1951]

April	1938	1939	1940	1941	1942	1943	1944	1945
1	0.182	[b] 0.104	0.388	0.144	[b] 0.159	0.266	0.116	0.052
2	.162	[b] .164	.177	.182	[b] .247	.218	.083	.060
3	.072	[b] .130	.196	.164	[b] .159	.084	.079	.070
4	.113	[b] .138	.236	.073	[b] .191	.132	.190	.040
5	.152	[b] .118	.070	.013	[b] .243	.131	.047	.044
6	.153	[b] .150	.241	.036	[b] .207	.102	.061	.178
7	.162	.138	.166	.064	[b] .130	.201	.109	.172
8	.015	.084	.008	.189	[b] .071	.192	[b] .084	.104
9	.089	.098	.057	.077	[b] .111	.190	.018	.232
10	.103	.066	.040	.019	[b] .159	.030	.091	.195
11	.108	.212	.072	.095	[b] .075	.201	[b] .140	.117
12	.149	.072	.060	.222	.071	.049	.195	.333
13	.136	.162	.010	.172	.110	.214	.021	.094
14	.218	.111	.010	.292	.111	.045	.246	.070
15	.260	.120	.125	.296	.123	.062	.101	.048
16	.179	[b] .100	.033	.076	.209	.141	.019	.011
17	.148	[b] .100	.122	.170	.214	.086	.015	.154
18	.223	.116	.191	.164	.258	.150	.094	.128
19	.130	.030	.071	.062	.166	.126	.120	.120
20	.269	.097	.031	.332	.156	-.034	.184	.142
21	.100	.130	.027	.223	.174	.020	.032	.156
22	.202	.003	.142	.183	.157	.100	.162	.150
23	.223	.092	.203	.154	.149	.247	.043	.117
24	.139	.048	.011	.118	.189	-.050	.085	.010
25	.265	.449	.104	.196	.141	.103	.118	.031
26	.229	.058	.148	.150	.178	.052	.284	.093
27	.297	.141	.130	.138	.074	.390	.054	.043
28	.399	.177	.222	.130	.188	.184	.162	.128
29	.230	.140	.288	.200	.142	.148	.188	.128
30	.140	.218	.104	.214	.216	.120	.224	.105
Total	5.247	3.766	3.683	4.548	4.778	3.900	3.365	3.325

April	1946	1947	1948	1949	1950	1951	1952	1953	Average
1	0.102	0.038	0.193	0.046	0.09	0.17	0.05	0.26	0.148
2	.189	.054	.008	.028	.10	.02	.14	.02	.116
3	.175	.072	.091	.111	.00	.06	.12	.06	.103
4	.260	.144	.225	.089	.05	.05	.08	.09	.131
5	.014	.004	.189	.111	.07	.06	.04	.14	.090
6	.100	.286	[b] .136	.047	.06	.11	.02	.07	.122
7	.176	.164	.016	.112	.05	.02	.05	.06	.112
8	.102	.112	.155	.136	.12	.02	.09	.10	.099
9	.010	.004	.201	.102	.09	.08	.17	.07	.100
10	.128	.158	.155	.134	.05	.04	.18	.27	.114
11	.130	.178	.052	.070	.30	.03	.06	.07	.119
12	.010	.116	.075	.119	.05	.03	.06	.07	.105
13	.231	.112	.008	.104	.02	.02	.07	.03	.095
14	.133	.089	.000	.124	.00	.04	.06	.06	.100
15	.180	.053	.028	.105	.01	.16	.00	.13	.113
16	.092	.192	.144	.020	.10	.06	.05	.17	.100
17	.060	.046	.208	.071	.19	.07	.15	.14	.122
18	.166	.148	.148	.007	.16	.14	.19	.02	.144
19	.116	.190	.202	.000	.14	.19	.18	.05	.118
20	.284	.124	.290	.108	.14	.16	.21	.05	.159
21	.182	.038	.182	.131	.13	.24	.23	.12	.132
22	.179	.054	.102	.117	.15	.02	.17	.22	.132
23	.133	.050	.118	.207	.19	.12	.09	.19	.145
24	.178	.236	.198	.194	.09	.13	.03	.24	.115
25	.110	.126	.158	.119	.08	.19	.06	.04	.143
26	.248	.044	.202	.212	.21	.19	.20	.23	.170
27	.146	.182	.139	.065	.14	.08	.19	.01	.139
28	.130	.126	.202	.207	.07	.11	.22	.05	.169
29	.046	.180	.072	.212	.09	.20	.23	.04	.158
30	.070	.006	.069	.135	.01	.12	.19	.11	.128
Total	4.080	3.326	3.964	3.243	2.95	2.93	3.58	3.18	3.741

See footnotes at end of table.

Evaporation, in inches, in Indianapolis, Ind.--Continued

May	1937	1938	1939	1940	1941	1942	1943	1944	1945
1-----	0.112	0.351	0.260	0.092	0.163	0.238	0.146	0.139	0.187
2-----	.051	.401	.166	.036	.091	.306	.165	.081	.154
3-----	.208	.256	.192	.032	.260	.307	.103	.186	.004
4-----	.095	.280	.152	.020	.280	.206	.116	.260	.109
5-----	.087	.292	.072	.124	.161	.057	.180	.110	.073
6-----	.055	.290	.282	.261	.220	.164	.320	.110	.138
7-----	.077	.270	.302	.261	.029	.115	.175	.130	.151
8-----	.242	.120	.236	.164	.132	.055	.086	.078	.100
9-----	.204	.150	.138	.199	.205	.108	.079	.014	.152
10-----	.095	.169	.251	.227	.066	.156	.006	.022	.043
11-----	.217	.140	.205	.124	.045	.082	[b].141	.108	.062
12-----	.262	.048	.297	.215	.184	.154	.074	.146	.143
13-----	.032	.128	.201	.275	.144	.215	.178	.178	.070
14-----	.136	.240	.202	.260	.104	.283	.079	.216	.157
15-----	.033	.038	.177	.310	.142	.120	.238	.120	.270
16-----	.093	.102	.123	.072	.200	.196	.037	.320	.010
17-----	.284	.173	.179	.041	.098	.088	.228	.185	.036
18-----	.204	.029	.287	.122	.348	.128	.248	.137	.076
19-----	.042	.016	.217	.148	.190	.050	.048	.252	.064
20-----	.194	.217	.194	.159	.224	.184	.049	.214	.178
21-----	.135	.220	.160	.111	.216	.052	.014	.183	.154
22-----	.187	.150	.126	.210	.286	.122	.234	.226	.340
23-----	.102	.120	.137	.293	.326	.141	.184	.135	.116
24-----	.186	.139	.295	.214	.280	.073	.076	.120	.160
25-----	.186	.288	.292	.048	.290	.225	.068	.158	.148
26-----	.188	.086	.235	.008	.205	.221	.192	.191	.062
27-----	.265	.174	.290	.212	.238	.036	.186	.186	.146
28-----	.178	.152	.158	.328	.342	.092	.174	.210	.214
29-----	.275	.175	.333	.156	.328	.200	.180	.189	.208
30-----	.225	.059	.246	.110	.262	.270	.256	.184	.196
31-----	.237	.154	.264	.038	.361	.183	.108	.184	.124
Total-	4.887	5.427	6.669	4.970	6.465	4.827	4.368	4.972	4.045

May	1946	1947	1948	1949	1950	1951	1952	1953	Average
1-----	0.037	0.123	0.142	0.03	0.04	0.19	0.20	0.20	0.156
2-----	.009	.043	.112	.10	.14	.23	.21	.27	.151
3-----	.155	.097	.100	.21	.10	.19	.25	.24	.170
4-----	.064	.070	.124	.20	.15	.20	.18	.21	.166
5-----	.078	.187	.032	.25	.16	.13	.32	.04	.138
6-----	.118	.065	.083	.23	.37	.11	.36	.09	.192
7-----	.088	.121	.085	.27	.11	.09	.27	.11	.156
8-----	.110	.122	.129	[c].07	.25	.15	.10	.08	.131
9-----	.100	.156	.105	.13	.21	.20	.08	.10	.137
10-----	.122	.094	.150	.14	.14	.18	.03	.20	.123
11-----	.121	.160	.368	.17	.13	.06	.05	.26	.144
12-----	.091	.189	.147	.15	.05	.03	.08	.07	.137
13-----	.136	.254	.035	.17	.13	.18	.00	.08	.142
14-----	.099	.158	.038	.14	.19	.20	.25	.02	.163
15-----	.062	.071	.057	.31	.19	.22	.16	.00	.148
16-----	.145	.230	.067	.18	.15	.23	.21	.04	.141
17-----	.075	.072	.214	.09	.19	.22	.03	.01	.130
18-----	.025	.422	.182	.23	.13	.19	.09	.11	.174
19-----	.024	.083	.189	.22	.23	.18	.04	.15	.126
20-----	.102	.138	.144	.16	.17	.20	.00	.15	.157
21-----	.120	.264	.213	.04	.23	.22	.01	.23	.151
22-----	.132	.099	.287	.17	.21	.23	.14	.13	.193
23-----	.175	.188	.148	[c].20	.08	.18	.06	.13	.160
24-----	.089	.215	.240	.09	.36	.20	.25	.22	.189
25-----	.060	.100	.210	.14	.19	.20	.11	.04	.162
26-----	.160	.067	.154	.14	.27	.16	.05	.22	.156
27-----	.038	.154	.208	.17	.21	.20	.18	.34	.190
28-----	.158	.020	.176	.11	.02	.01	.17	.14	.156
29-----	.180	.214	.175	.18	.03	.08	.21	.21	.195
30-----	.230	.100	.255	.19	.08	.13	.15	.24	.187
31-----	.150	.116	.219	.16	.16	.20	.20	.27	.184
Total-	3.253	4.392	4.788	[c]5.04	5.07	5.19	4.44	4.60	4.905

See footnotes at end of table.

Evaporation, in inches, in Indianpolis, Ind.--Continued

June	1937	1938	1939	1940	1941	1942	1943	1944	1945
1------	0.312	0.152	0.230	0.002	0.269	0.087	0.130	0.204	0.104
2------	.267	.040	.091	.112	.127	.368	.220	.236	.274
3------	.220	.239	.089	.168	[b].150	.238	.232	.200	.118
4------	.190	.252	.171	.218	.054	.200	.252	.254	.072
5------	.163	.223	.260	.206	.222	.225	.144	.258	.156
6------	.119	.256	.246	.256	.190	.267	.266	.274	.164
7------	.260	.295	.198	.250	.260	.089	.136	.312	.144
8------	.231	.175	.322	.214	.182	.022	.141	.174	.130
9------	.272	.096	.228	.250	.283	.016	.136	.280	.190
10------	.046	.250	.240	.182	.087	.112	.180	.086	.072
11------	.030	.062	.256	.247	.100	.110	.110	.185	.114
12------	.167	.306	.146	.112	.120	.201	.137	.228	.049
13------	.200	.253	.066	.241	[b].237	.129	.256	.250	[b].150
14------	.125	.197	.018	.170	.184	.286	.166	.372	.128
15------	.119	.224	.159	.246	.128	.190	.343	.192	.212
16------	.230	.232	.230	.228	.090	.108	.225	.161	.157
17------	.190	.274	.283	.186	.104	.091	.184	.204	.221
18------	.189	.104	.268	.132	.206	.120	.366	.288	.057
19------	.090	.185	.234	.222	.266	.107	.242	.294	.136
20------	.160	.239	.363	.328	.244	.138	.250	.262	.096
21------	.229	.233	[b].210	.278	.220	.164	.225	.220	.173
22------	.218	.230	.211	.248	.166	.182	.289	.232	.157
23------	.279	.210	.301	.186	.238	.203	.196	.077	.190
24------	.176	.139	.200	.250	.216	.259	.278	.279	.197
25------	.177	.087	.200	.218	.304	.175	.206	.272	.162
26------	.109	.020	.158	.250	.256	.135	.231	.248	.087
27------	.210	.185	.332	.130	.246	.073	.123	.201	.221
28------	.274	.161	.145	.159	.244	.223	.388	.291	.192
29------	.289	.258	.233	.340	.190	.210	.191	.259	.223
30------	.258	.218	.202	.236	.228	.214	.308	.376	.167
Total-	5.799	5.795	6.290	6.265	5.811	4.942	6.551	7.169	4.513

June	1946	1947	1948	[d]1949	[d]1950	1951	1952	1953	Average
1------	0.042	0.211	0.217	0.18	0.20	0.11	0.24	0.37	0.185
2------	.062	.003	.227	.20	.22	.26	.24	.12	.180
3------	.118	.068	.167	.22	.21	.23	.20	.21	.181
4------	.190	.180	.228	.20	.09	.12	.19	.25	.183
5------	.194	.070	.261	.25	.19	.09	.20	.30	.201
6------	.170	.248	.174	.29	.23	.15	.17	.25	.219
7------	.075	.035	.073	.22	.21	.16	.15	.14	.177
8------	.219	.168	.134	.14	.25	.07	.20	.25	.178
9------	.230	.167	.174	.20	.26	.15	.30	.18	.201
10------	.220	.232	.180	.42	.14	.09	.16	.21	.171
11------	.240	.253	.170	.02	.27	[b].16	.23	.11	.157
12------	.175	.217	.260	.08	.19	.18	.41	.19	.186
13------	.207	.188	.127	.13	.25	.08	.11	.19	.180
14------	.152	.218	.211	.10	.03	.15	.17	.15	.166
15------	.197	.102	.182	.15	.10	.16	.28	.19	.187
16------	.061	.114	.118	.01	.28	.20	.22	.19	.168
17------	.194	.174	.192	.02	.37	.14	.29	.24	.197
18------	.182	.045	.218	.11	.10	.20	.31	.15	.179
19------	.184	.025	.185	.15	.02	.21	.19	.27	.177
20------	.120	.080	.275	.26	.07	.22	[b].22	.27	.211
21------	.150	.240	.110	.25	.07	.28	.15	.39	.211
22------	.177	.277	.176	.12	.16	.21	[b].23	.30	.211
23------	.171	.260	.182	.22	.18	.19	.07	.25	.200
24------	.180	.161	.272	.21	.24	.11	.26	.28	.218
25------	.254	.038	.142	.27	.18	.23	.16	.36	.202
26------	.150	.057	.184	.20	.17	.19	.39	.20	.179
27------	.090	.164	.162	.18	.30	.16	.37	.14	.193
28------	.100	.190	.156	.16	.21	.17	.14	.26	.204
29------	.194	.206	.278	.17	.10	.14	.25	[b].23	.221
30------	.234	.118	.106	.11	.21	.11	.23	.19	.207
Total-	4.932	4.509	5.541	5.24	5.50	4.92	6.73	6.83	5.725

See footnotes at end of table.

Evaporation, in inches, in Indianapolis, Ind.--Continued

July	1937	1938	1939	1940	1941	1942	1943	1944	1945
1------	0.241	0.240	0.302	0.195	0.268	0.272	0.232	0.310	0.176
2------	.132	.108	.212	.313	.276	.268	.171	.335	.178
3------	.254	.200	.238	.282	.326	.204	.216	.326	.146
4------	.226	.182	.160	.148	.148	.251	.192	.363	.144
5------	[b].221	.344	.110	.376	.198	.180	.211	.274	.171
6------	.225	.220	.220	.140	.284	.151	.189	.206	.213
7------	.245	.232	.325	.404	.200	.300	.175	[b].246	.228
8------	.126	.336	.005	.382	.244	.373	.211	.192	.213
9------	.154	.098	.268	.214	.304	.140	.152	.220	.158
10------	.282	.187	.257	.182	.228	.137	.254	.127	.189
11------	.302	.224	.316	.284	.110	.222	.132	.350	.231
12------	.214	.262	.190	.260	.213	.138	.152	.186	.201
13------	.206	.226	.330	.088	.165	.221	.195	.171	.172
14------	.048	.200	[c].416	.266	.330	.318	.237	.261	.198
15------	.274	.199	[c].272	.276	.198	.296	.286	.264	.135
16------	.304	.257	.378	.246	.262	.124	.261	.244	.211
17------	.306	.235	.261	.114	.279	.226	.288	.268	.199
18------	.290	.056	[b].300	.250	.266	.290	.141	.160	.167
19------	.215	.182	.261	.196	.150	.222	.249	.207	.147
20------	.132	.125	.130	.317	.284	.294	.120	.295	.188
21------	.115	.348	.114	.319	.286	.100	.266	.287	.216
22------	.313	.200	.258	.309	.270	.226	.200	.212	.108
23------	.145	.278	.166	.239	.270	.274	.242	.145	.217
24------	.217	.178	.148	.290	.252	.152	.218	.393	.195
25------	.237	.345	.200	.435	.248	.210	.171	.241	.244
26------	.141	.151	.260	.350	.252	.166	.169	.250	.149
27------	.218	.348	.190	.454	.240	.252	.248	.164	.218
28------	.211	.250	.216	.180	.300	.116	.238	.299	.080
29------	.212	.212	[b].210	.424	.354	.177	.273	.295	.041
30------	.114	.234	.014	.374	.362	.366	.153	.115	.139
31------	.244	.160	.124	.312	.338	.240	.211	.231	.150
Total-	6.564	6.817	[c]6.851	8.619	7.905	6.906	6.453	7.637	5.422

July	1946	1947	1948	1949	1950	1951	1952	1953	Average
1------	0.194	0.244	0.212	0.21	0.16	0.08	0.34	0.27	0.232
2------	.204	.296	.194	.19	.20	.18	.18	.11	.209
3------	.230	.229	.222	.24	.07	.21	.38	.20	.234
4------	.206	.186	.218	.24	.11	.24	.04	.18	.190
5------	.194	.211	.168	.20	.28	.28	.24	.35	.236
6------	.202	.125	.180	.16	.18	.19	.21	.41	.206
7------	.202	.058	.274	.20	.20	.23	.25	.13	.229
8------	.207	.252	.200	.15	.18	.15	.25	.25	.219
9------	.084	.265	.206	.23	.23	.34	.09	.23	.199
10------	.199	.006	.194	.12	.23	.10	.19	.18	.180
11------	.191	.153	.207	.22	.19	.10	.20	.19	.213
12------	.140	.152	.175	.22	.18	.16	.23	.20	.193
13------	.207	.246	.084	.23	.19	.16	.23	.19	.195
14------	.196	.112	.070	.22	.15	.07	.21	.24	.208
15------	.212	.240	.227	.23	.17	.21	.17	.20	.227
16------	.125	.173	.135	.19	.23	.21	.18	.20	.219
17------	.189	.037	.153	.10	.21	.18	.08	.20	.196
18------	.209	.145	.186	.08	.23	.22	.12	.01	.184
19------	.191	.067	.249	.23	.12	.18	.21	.22	.194
20------	.246	.180	.109	.21	.16	.29	.19	.19	.204
21------	.062	.092	.122	.16	.12	.22	.30	.21	.196
22------	.208	.090	.074	.10	.21	.12	.25	.17	.195
23------	.222	.274	.102	.17	.08	.17	.30	.09	.199
24------	.232	.176	.158	.13	.27	.13	.31	.24	.217
25------	.255	.200	.168	.21	.22	.16	.13	.21	.228
26------	.181	.192	.194	.19	.16	.22	.24	.20	.204
27------	.110	.170	.086	.13	.12	.21	.26	.21	.213
28------	.218	.158	.109	.20	.19	.11	.26	.21	.197
29------	.214	.168	.311	.23	.20	.20	.36	.22	.241
30------	.214	.226	.192	.14	.23	.19	.13	.22	.201
31------	.208	.428	.219	.10	.20	.21	.24	.14	.221
Total-	5.952	5.551	5.398	5.63	5.67	5.72	6.77	6.27	6.479

See footnotes at end of table.

Evaporation, in inches, in Indianapolis, Ind.--Continued

August	1937	1938	1939	1940	1941	1942	1943	1944	1945
1-------	0.150	0.076	0.222	0.334	0.210	0.212	0.204	0.242	0.167
2-------	.355	.169	.210	.378	.330	.146	.256	.269	.229
3-------	.225	.215	.100	.348	.355	.264	.165	.276	.206
4-------	.225	.242	.203	.292	.324	.217	.071	.212	.238
5-------	.092	.340	.239	.308	.296	.145	.150	.128	.211
6-------	.042	.158	.154	.328	.205	.161	.188	.188	.091
7-------	.236	.165	.285	.312	.354	.111	.172	.279	.168
8-------	.230	.222	.059	.256	.239	.088	.143	.283	.177
9-------	.297	.137	.244	.168	.296	.108	.181	.249	.206
10-------	.197	.190	.226	.365	.168	.178	.108	.270	.177
11-------	.176	.160	.222	.450	.301	.152	.290	.246	.186
12-------	.158	.356	.202	.346	.378	.254	.262	.352	.093
13-------	.196	.220	.218	.391	.228	.208	.248	.140	.103
14-------	.190	.254	.170	.291	.248	.211	.182	.200	.195
15-------	.222	.296	.142	.296	.178	.218	.188	.205	.051
16-------	.234	.026	.100	.244	.186	.076	.276	.249	.310
17-------	.199	.308	.188	.230	.288	.148	.230	.322	.152
18-------	.234	.166	.220	.362	.110	.181	.140	.030	.162
19-------	.184	.202	.122	[b].192	.020	.150	.224	.240	.125
20-------	.287	.169	.056	.194	.192	.143	.172	.235	.166
21-------	.254	.413	.263	.168	.154	.196	.066	.234	.192
22-------	.172	.137	.156	.172	.167	.174	.254	.047	.203
23-------	.016	.197	.201	.158	.170	.328	.124	.256	.106
24-------	.266	.156	.143	.202	.199	.218	.156	.196	.042
25-------	.162	.132	.205	.146	.268	.187	.190	.208	.175
26-------	.184	.180	.226	.148	.176	.199	.070	.265	.192
27-------	.147	.202	.272	.250	.213	.116	.146	.059	.137
28-------	.207	.241	.154	.032	.194	.070	.190	.014	.170
29-------	.288	.183	.180	.132	.264	.123	.140	.051	.182
30-------	.216	.247	.157	.123	.196	.139	.138	.161	.189
31-------	.186	.152	.183	.111	.200	.146	.194	.259	.202
Total-	6.227	6.311	5.722	7.727	7.107	5.267	5.518	6.365	5.203

August	1946	1947	1948	1949	1950	1951	1952	1953	Average
1-------	0.205	0.296	0.213	0.16	0.09	0.16	0.25	0.17	0.198
2-------	.245	.204	.252	.17	.20	.27	.21	[b].18	.245
3-------	.248	.056	.216	.12	.26	.14	.23	.17	.211
4-------	.192	.170	.218	.20	.18	.27	.18	.24	.216
5-------	.228	.232	.048	.19	.13	.26	.22	.13	.197
6-------	.138	.252	.184	.18	.20	.19	.21	.08	.173
7-------	.119	.254	.153	.17	.20	.03	.17	.14	.195
8-------	.231	.118	.203	.19	.25	.14	.22	.18	.190
9-------	.108	.220	.179	.16	.13	.15	.20	.10	.184
10-------	.211	.226	.203	.21	.04	.09	.09	.13	.181
11-------	.201	.112	.178	.22	.21	.21	.17	.16	.214
12-------	.114	.334	.128	.18	.11	.16	.02	.11	.209
13-------	.154	.105	.194	.06	.12	.21	.11	.22	.184
14-------	.130	.185	.204	.15	.21	.20	.22	.18	.200
15-------	.134	.246	.184	.08	.17	.21	.09	.27	.187
16-------	.130	[b].183	.171	.05	.16	.22	.11	.20	.172
17-------	.104	.011	.171	.03	.20	.17	.18	.13	.180
18-------	.068	.159	.180	.14	.20	[b].17	.20	.21	.172
19-------	.150	.154	.164	.20	.01	.20	.09	.14	.151
20-------	.180	.122	.178	.18	.22	.18	.16	.20	.178
21-------	.146	.132	.155	.20	.18	.15	.09	.19	.187
22-------	.125	.166	.137	.18	.20	.19	.07	.17	.160
23-------	.155	.174	.266	.16	.19	.19	.19	.18	.180
24-------	.134	.118	.192	.18	.19	.21	.20	.18	.175
25-------	.142	.234	.230	.17	.19	.21	.19	.18	.189
26-------	.162	.084	.212	.20	.17	.20	.18	.20	.179
27-------	.188	.070	.194	.18	.22	.05	.20	.21	.168
28-------	.136	.114	.212	.05	.18	.01	.16	.19	.137
29-------	.174	.142	.226	.07	.07	.12	.25	.22	.166
30-------	.100	.090	.276	.15	.11	.05	.20	.21	.162
31-------	.100	.146	.202	.07	.04	.17	.12	.24	.160
Total-	4.852	5.109	5.923	4.63	5.03	5.18	5.18	5.51	5.695

See footnotes at end of table.

Evaporation, in inches, in Indianapolis, Ind.--Continued

September	1937	1938	1939	1940	1941	1942	1943	1944	1945
1-------	0.085	0.161	0.048	0.200	0.322	0.190	0.282	0.108	0.218
2-------	.129	.222	.262	.155	.092	.166	.242	.210	.230
3-------	.194	.096	.148	.113	.102	.138	.170	.187	.192
4-------	.167	.200	.224	.086	.126	.120	.150	.216	.155
5-------	.199	.243	.266	.190	.100	.164	.096	.174	.182
6-------	.125	.193	.212	.055	.174	.152	.156	.155	.186
7-------	.070	.208	.218	.189	.190	.126	.084	.114	.170
8-------	.281	.238	.296	.136	.110	.082	.174	.127	.143
9-------	.197	.222	.310	.256	.236	.090	.232	.141	.140
10-------	.200	.180	.298	.204	.256	.105	.118	.152	.165
11-------	.113	.086	.256	.174	.194	.149	.158	.177	.156
12-------	.156	.116	.174	.090	.178	.158	.104	.104	.119
13-------	.126	.172	.236	.108	.222	.151	.034	.047	.030
14-------	.148	.054	.235	.226	.153	.153	.056	.095	.096
15-------	.178	.166	.125	.198	.246	.182	.104	.116	.072
16-------	.187	.198	.224	.095	.217	.177	.112	.096	.089
17-------	.168	.102	.372	.123	.222	.130	.155	.130	.127
18-------	.102	.122	.368	.126	.167	.053	.095	.159	.121
19-------	.173	.137	.100	.132	.187	.128	.126	.141	.033
20-------	.174	.159	.146	.188	.210	.112	.080	.144	.117
21-------	.128	.060	.162	.114	.196	.178	.054	.048	.100
22-------	.124	.094	.186	.198	.186	.096	.046	.190	.093
23-------	.118	.015	.154	.199	.144	.112	.118	.170	.046
24-------	.121	.131	.204	.110	.159	.188	.102	.081	.161
25-------	.164	.164	.250	.088	.322	.141	.064	.103	.141
26-------	.059	.240	.258	.182	.110	.104	.046	.100	.052
27-------	.122	.182	.132	.112	.114	.070	.110	.123	.051
28-------	.067	.180	.100	.098	.187	.094	.096	.120	.144
29-------	.060	.138	.160	.076	.088	.086	.089	.042	.158
30-------	.120	.100	.136	.137	.070	.037	.106	.091	.046
Total-	4.255	4.579	6.260	4.358	5.280	3.832	3.559	3.861	3.733

September	1946	1947	1948	1949	1950	1951	1952	1953	Average
1-------	0.170	0.090	0.214	0.28	0.04	0.30	0.20	0.24	0.185
2-------	.076	.134	.157	.15	.16	.04	.27	.25	.173
3-------	.138	.188	.157	.13	.13	.19	.11	.26	.155
4-------	.153	.232	.012	.18	.07	.10	.11	.04	.138
5-------	.169	.068	.186	.07	.19	.11	.14	.08	.154
6-------	.156	.090	.130	.17	.19	.09	.15	.15	.149
7-------	.144	.102	.022	.18	.15	.19	.20	.16	.148
8-------	.096	.119	.144	.13	.17	.17	.15	.22	.164
9-------	.125	.141	.049	.09	.00	.14	.16	.17	.159
10-------	.113	.102	.191	.14	.04	.13	.15	.14	.158
11-------	.205	.128	.124	.15	.05	.06	.18	.20	.151
12-------	.154	.186	.182	.14	.07	.22	.21	.20	.151
13-------	.089	.024	.186	.02	.05	.20	.18	.21	.123
14-------	.108	.171	.209	.09	.15	.07	.20	.13	.138
15-------	.097	.221	.167	.07	.09	.21	b.15	.05	.144
16-------	.150	.098	.162	.05	.12	.14	.17	.14	.143
17-------	.174	.124	.156	.05	.13	.13	.17	.19	.156
18-------	.063	.104	.100	.08	.13	.15	.14	.18	.133
19-------	.178	.144	.100	.10	.13	.17	.17	.16	.136
20-------	.150	.135	.272	.19	.12	.15	.12	.03	.147
21-------	.088	.168	.092	.10	b.10	.22	.11	.21	.125
22-------	.096	.175	.152	.06	.13	.10	.15	.15	.131
23-------	.037	.129	.096	.12	.09	.09	.10	.15	.111
24-------	.109	.083	.094	.10	.17	.13	.09	.11	.126
25-------	.188	.108	.110	.10	.06	.02	.14	.16	.137
26-------	.117	.102	.102	.11	.07	.07	.08	.15	.115
27-------	.113	.141	.136	.12	.08	.11	.18	.17	.122
28-------	.180	.117	.136	.11	.05	.20	.12	.21	.130
29-------	.080	.052	.084	.13	.04	.11	.13	.19	.101
30-------	.092	.081	.056	.11	.11	.11	.09	.29	.105
Total-	3.808	3.757	3.978	3.52	3.08	4.12	4.52	4.99	4.208

See footnotes at end of table.

Evaporation, in inches, in Indianapolis, Ind.--Continued

October	1944	1945	1946	1947	1948	1949	1950	1951
1	0.071	0.025	0.148	0.091	0.045	0.08	0.07	0.05
2	.070	.107	.112	.076	.123	.13	.08	.11
3	.021	.069	.094	.092	.122	.11	.08	.15
4	.023	.086	.126	.114	.096	.00	.08	.20
5	.060	.072	.116	.090	.077	.01	.10	.27
6	[b].071	.021	.126	.100	.088	.06	.09	.18
7	[b].049	.054	.112	.114	.099	.01	.12	.05
8	[b].089	.007	.126	.118	.056	.12	.10	.07
9	[b].068	.002	.091	.096	.029	.11	.05	.09
10	.088	.012	.087	.085	.108	.15	.05	.08
11	.040	.163	.124	.055	.043	.21	.11	.07
12	.026	.114	.102	.052	.030	.11	.10	.07
13	.049	.125	.056	.072	.060	.14	.15	.09
14	.100	.060	.116	.101	.100	.10	.08	.11
15	.112	.038	.114	.129	.070	.07	.10	.14
16	.075	.062	.116	.076	.089	.07	.12	.11
17	.065	.068	.054	.095	.047	.05	.08	.14
18	.070	.094	.032	.019	.052	.03	.09	.12
19	.060	.138	.058	.034	.070	.05	.11	.15
20	.094	.052	.091	.055	.081	.08	.04	.08
21	.041	.060	.041	.065	.061	.06	.17	.08
22	.092	.016	.060	.064	.004	.07	.07	.12
23	.072	.026	.072	.097	.043	.04	.04	.10
24	.080	.066	.098	.117	.054	.19	.02	.07
25	.094	.044	.132	.049	.027	.06	.05	.02
26	.107	.078	.066	.057	[c].000	.06	.06	.08
27	.099	.096	.092	.084	.036	.10	.04	.07
28	.048	.080	.082	.092	.054	.02	.06	.03
29	.100	.022	.108	.011	.043	.08	.04	.10
30	.052	.100	.114	.032	.073	.05	.04	.05
31	.058	.148	.102	.035	.033	.10	.07	.11
Total	2.144	2.105	2.968	2.367	1.913	2.52	2.46	3.16

October	1952	1953	Average
1	0.20	0.20	0.098
2	.23	.18	.122
3	.09	.14	.097
4	.10	.14	.096
5	.14	.07	.100
6	.03	.04	.081
7	.09	.08	.078
8	.07	.09	.085
9	.09	.09	.072
10	.11	.09	.086
11	.07	.12	.100
12	.08	.16	.084
13	.16	.13	.103
14	.10	.20	.107
15	.06	.00	.083
16	.05	.11	.088
17	.09	.12	.081
18	.09	.12	.072
19	.11	.13	.091
20	.13	.14	.084
21	.07	.10	.075
22	.05	.12	.067
23	.10	.10	.069
24	.10	.13	.092
25	.09	.05	.062
26	.11	.05	.067
27	.23	.02	.087
28	.05	.01	.053
29	.18	.06	.074
30	.10	.09	.070
31	.21	.09	.096
Total	3.38	3.17	2.620

November	1950	1952	1953
1	0.19	0.07	0.08
2	.08	.08	.07
3	.05	.15	.12
4	.08	.09	.11
5	.02	.12	.09
6	.10	.17	.06
7	.07	.06	[a].03
8	.05	.05	[a].05
9	.03	.02	.09
10	.03	.06	.08
11	.04	.04	.06
12	[b].05	.04	.07
13	.06	.04	.03
14	.01	.10	.04
15	.03	.02	.13
16	.07	.05	.09
17	.10	.09	.10
18	.04	.10	.11
19	.05	.03	.05
20	[b].04	.05	.09
21	[b].03	.03	.06
22	[b].03	.04	.08
23	[b].01	.05	.02
24	[b].00	.02	.04
25	[b].01	.00	.03
26	[b].02	.02	[b].03
27	[b].01	[b].02	[b].02
28	[b].02	[b].01	[b].01
29	[b].02	[b].02	[b].02
30	[b].02	[b].02	[b].02
Total	1.36	1.66	1.88

[a]Estimated from total observed on underlined day.
[b]Estimated because of missing or erroneous data.
[c]Corrected since originally published by U. S. Weather Bureau.
[d]Not previously published.

Evaporation, in inches, at Kendallville, Ind.

[No record for April 1950; pan was leaking]

March	1948	April	1947	1948	1949	1951	1952	1953	Average
1------	[b] 0.050	1------	[c] 0.109	0.018	0.059	0.00	0.09	0.06	0.056
2------	.075	2------	.036	.048	.118	.06	.13	.12	.085
3------	.050	3------	[c] .088	.109	.155	.05	.12	.12	.107
4------	.102	4------	[c] .140	.175	.120	.08	.05	.07	.106
5------	.134	5------	[c] -.010	.150	.102	.15	.02	.11	.087
6------	[b] .080	6------	.217	.209	.100	.11	.02	.11	.128
7------	[b] .050	7------	.228	.078	.146	.09	.07	.16	.129
8------	[b] .110	8------	.059	.105	.137	.07	.13	.12	.104
9------	[b] .090	9------	[c] .054	.380	.156	.03	.18	.20	.167
10------	[b] .070	10------	.132	.171	.167	.05	.17	.21	.150
11------	[b] .050	11------	.144	.147	.172	.06	.07	.08	.112
12------	[b] .100	12------	.104	.043	.194	[c] .15	.10	.08	.112
13------	[b] .080	13------	.094	.039	.162	[c] -.01	[b] .04	.09	.069
14------	[b] .090	14------	.101	.035	.209	.02	.04	.14	.091
15------	[b] .070	15------	.120	.077	.094	.10	.08	.15	.104
16------	[b] .140	16------	.078	.309	.112	.07	.13	.01	.118
17------	[b] .070	17------	.046	.187	.004	.08	.34	.10	.126
18------	.021	18------	.191	.152	.001	.15	.19	.05	.122
19------	.050	19------	.078	.198	.118	.20	.30	.10	.166
20------	.133	20------	.076	.255	.170	.14	.24	.05	.155
21------	.076	21------	[c] .007	.258	.199	.18	.21	.16	.169
22------	.100	22------	.096	.211	.255	.09	.12	.17	.157
23------	.081	23------	[c] .039	.124	[b] .233	.13	.09	.27	.148
24------	.070	24------	[c] .198	.080	[b] .233	.13	.09	.18	.152
25------	.135	25------	[c] .167	.060	.106	.10	.11	.18	.120
26------	.199	26------	.057	.302	.136	.11	.23	.08	.152
27------	.126	27------	.202	.089	.144	.19	.26	.04	.154
28------	.095	28------	.175	.289	.275	.16	.25	.03	.196
29------	.117	29------	.222	.090	.279	.28	.14	.15	.194
30------	.071	30------	.018	.207	.159	.16	.23	.18	.159
31------	.127								
Total-	2.812	Total-	[c] 3.266	4.595	4.515	3.18	4.24	3.57	3.895

May	1947	1948	1949	1950	1951	1952	1953	Average
1----------	-0.021	0.091	0.05	[b] 0.05	0.27	0.27	0.16	0.124
2----------	.177	.050	.18	[b] .10	.22	.23	.22	.168
3----------	.042	.236	.25	[b] .25	.24	.24	.16	.203
4----------	.070	.100	.26	[b] .15	.20	.31	.15	.177
5----------	.155	.032	.28	[b] .18	.10	.27	.16	.168
6----------	.152	.190	.29	[b] .33	.22	.30	.09	.225
7----------	.118	.168	.26	[b] .28	.19	.18	.09	.184
8----------	.135	.168	.20	[b] .18	.27	.07	.08	.158
9----------	.169	.122	.13	[b] .23	.22	.08	.18	.162
10----------	.142	.059	.20	[b] .15	[b] .19	.07	.27	.154
11----------	.152	.343	[c] .21	[b] .10	.00	.17	.23	.172
12----------	.202	.076	.20	[b] .15	.11	.10	.10	.134
13----------	.155	.036	.26	.18	.21	.18	.14	.166
14----------	.133	.083	.24	.26	.20	.19	.07	.168
15----------	.112	.083	.18	.22	.33	.12	.04	.155
16----------	.080	.351	.11	.20	.27	.06	.06	.162
17----------	.148	[a] .148	.21	.28	.20	.04	.05	.154
18----------	.075	[a] .147	.25	.17	.21	.10	.12	.153
19----------	.084	[a] .148	.15	.27	.19	.10	.25	.170
20----------	.170	[a] .147	.13	.28	.24	.02	.19	.168
21----------	.252	.268	.05	.34	.25	.12	.24	.217
22----------	.087	.184	[b] .10	.17	.07	.13	.27	.144
23----------	[c] .302	.184	.17	.15	.11	.09	.05	.151
24----------	.340	.261	.14	.23	.25	.16	.14	.217
25----------	[b] -.010	.207	.16	.26	.29	.04	.10	.150
26----------	.106	[a] .179	.14	.19	.18	.11	.25	.165
27----------	.192	[a] .179	.10	.15	.08	.19	.26	.164
28----------	.008	.227	.23	.18	.02	.26	.19	.159
29----------	.124	.216	.20	.12	.04	.23	.23	.166
30----------	.127	.319	.19	.24	.21	.22	.28	.227
31----------	.163	.142	.18	.18	.17	.18	.36	.196
Total---------	[c] 4.141	5.144	5.70	6.22	5.75	4.83	5.18	5.281

See footnotes at end of table.

Evaporation in inches at Kendallville, Ind.--Continued

June	1947	1948	1949	1950	1951	1952	1953	Average
1	0.145	0.272	0.22	0.34	0.18	0.23	0.17	0.222
2	.002	.133	.24	.15	.31	.27	.22	.189
3	.163	.221	.25	.11	.25	.19	.21	.199
4	.161	.071	.25	.23	.11	.22	.28	.189
5	.127	.070	.28	.32	.10	.15	.28	.190
6	.220	.000	.28	.38	.11	.22	.19	.200
7	.100	.216	.26	.30	.22	.28	.12	.214
8	.138	.138	.29	.38	.18	.29	.17	.227
9	.232	.142	.30	.17	.03	.26	.20	.191
10	.271	.138	.18	.39	.13	.33	.16	.228
11	.359	.109	.17	.27	.22	.23	.16	.217
12	.270	.095	.22	.22	.19	.13	.26	.198
13	.100	.172	.18	.12	.12	.12	.24	.150
14	[c] .199	.234	.20	.16	.19	.21	.24	.205
15	[c] .049	.114	.10	.15	.30	.18	.18	.153
16	[c] .052	.259	.02	.18	.16	.32	.18	.167
17	.210	.184	.03	.34	.25	.27	.15	.205
18	[c] .022	.227	.13	.13	.17	.32	.08	.154
19	[c] .118	.158	.22	.04	.23	.30	.21	.182
20	.290	.120	.28	.18	.23	.18	.39	.239
21	.268	.094	.22	.16	.21	.07	.38	.200
22	.282	.129	.19	.21	.23	.13	.22	.199
23	.320	.091	.22	.23	.05	.10	.30	.187
24	.208	.114	.20	.36	.27	.20	.30	.236
25	.052	.410	.24	.18	.17	.27	.32	.235
26	.218	.154	.20	.34	.17	.30	.16	.220
27	.032	.130	.08	.36	.22	.25	.26	.190
28	.370	.162	.30	.25	.15	.21	.35	.256
29	.180	.102	.08	.26	.14	.38	.28	.203
30	.230	.178	.14	.26	.16	.12	.35	.205
Total	[c] 5.388	4.637	5.97	7.17	5.45	6.73	7.01	6.050

July	1947	1948	1949	1950	1951	1952	1953	Average
1	0.188	0.223	0.25	0.20	0.12	0.30	0.28	0.223
2	.282	.182	.31	.25	.23	.29	.19	.248
3	.184	.241	.24	.09	.20	.23	.26	.206
4	.190	.287	.32	.19	.29	.29	.27	.262
5	.182	.244	.24	.20	.19	.16	.31	.218
6	.118	.268	.16	.22	.22	.31	.24	.219
7	.234	.202	.11	.25	.29	.28	.29	.237
8	.293	.207	.23	.22	.27	.19	.28	.241
9	.083	.225	.19	.35	[b] .19	.13	.27	.205
10	.057	.244	.24	.17	.15	.24	.22	.189
11	.177	.211	.20	.24	.17	.28	.24	.217
12	.232	.140	.24	.29	.12	.26	.26	.220
13	.194	.184	.18	.23	.10	.33	.21	.204
14	.100	.150	.26	.22	.19	.22	.25	.199
15	.138	.151	.24	.26	.17	.15	.27	.197
16	.124	.216	.26	.24	.25	.08	.25	.203
17	.054	.235	.20	.18	.15	.12	.20	.163
18	.154	.270	.20	.33	.14	.22	.14	.208
19	.182	.239	.23	[b] .20	.29	.22	.23	.227
20	.108	.291	.19	.09	.23	.19	.21	.187
21	.066	.083	.08	.14	.18	.32	.22	.156
22	.332	.107	.36	.21	.05	.25	.17	.211
23	.190	.158	.25	.21	.15	.35	.31	.231
24	.173	.158	.25	.23	.18	.23	.25	.210
25	.191	.281	.27	.23	.19	.26	.27	.242
26	.219	.066	.25	.16	.23	.27	.32	.216
27	.251	.206	.25	.18	.20	.16	.20	.207
28	.183	.190	.34	.19	.04	.19	.28	.202
29	.207	.214	.24	.22	.15	.24	.22	.213
30	.307	[c] .252	.19	.22	.23	.19	.20	.227
31	.359	.295	.22	.24	.20	.25	.25	.259
Total	5.752	[c] 6.420	7.19	6.65	5.76	7.20	7.56	6.647

See footnotes at end of table.

Evaporation in inches at Kendallville, Ind.--Continued

August	1947	1948	1949	1950	1951	1952	1953	Average
1	0.290	0.230	0.20	0.19	0.14	0.22	0.29	0.223
2	.200	.223	.16	.21	.24	.23	.21	.210
3	.196	.212	.11	.21	.24	.22	[b].22	.201
4	.297	.123	.20	.19	.28	.23	.25	.224
5	.180	.107	.23	.21	.18	.14	.18	.175
6	.346	.178	[b].20	.24	.14	.10	.14	.192
7	.354	.216	.26	.20	.03	.20	.23	.213
8	.290	.213	.20	.20	.14	.24	.21	.213
9	.293	.127	.32	.12	.15	[b].17	.16	.191
10	.210	.270	.26	.18	.16	.28	.17	.219
11	.289	.156	.23	.19	.21	.28	.22	.225
12	.243	.184	.08	.14	.22	.04	.17	.154
13	.260	.177	.18	.21	.23	.18	.13	.195
14	.080	.191	.39	.19	.21	.16	.25	.210
15	.335	.188	.12	.21	[b].17	.12	.29	.205
16	.086	.176	.23	.23	.14	.18	.17	.173
17	.257	.212	.15	.25	.14	.16	.20	.196
18	.195	.140	.16	.13	.13	.24	.24	.176
19	.297	.205	.26	.15	.16	.18	.18	.205
20	.264	.211	.21	.21	.14	.20	.25	.212
21	.299	.236	.27	.21	[b].16	[c].13	.20	.215
22	.102	.179	.20	.19	.16	.23	.22	.183
23	.284	.269	.22	.26	.19	.22	.20	.235
24	.236	.231	.20	.19	.23	.17	.26	.217
25	.151	.289	.20	.20	.17	.25	.23	.213
26	.091	.195	.25	.18	.11	.20	.22	.178
27	.145	.249	.21	.21	.02	.27	.26	.195
28	.164	.263	.10	.15	.12	.22	.24	.180
29	.224	.217	.18	.28	.17	.25	.27	.227
30	.136	.265	.17	.13	.15	.21	.35	.202
31	.161	.235	.18	.09	.19	.18	.32	.194
Total	6.955	6.367	6.33	5.95	5.12	6.10	6.93	6.251

September	1947	1948	1949	1950	1951	1952	1953	Average
1	0.298	0.186	0.20	[b] 0.11	0.23	0.21	0.33	0.223
2	.231	.153	.17	.14	.04	.16	.38	.182
3	.225	.193	.20	.02	.09	.12	.15	.168
4	.101	.179	.11	.23	.14	.12	.10	.140
5	.191	.201	.19	.10	.14	.20	.13	.165
6	.055	.136	.17	.18	.15	.17	.22	.154
7	.113	[c].149	.11	.19	.17	.13	.20	.152
8	.141	[c].114	.13	.14	.12	.12	.19	.136
9	.166	.181	.15	.16	.13	.16	.16	.158
10	.180	.180	.17	.09	.11	.19	.18	.157
11	.024	.187	.11	.05	.17	.22	.24	.143
12	[b].178	.207	.12	.10	.20	.22	.22	.178
13	.081	.192	.08	.08	.13	.23	.13	.132
14	.214	.246	.11	.07	.12	.20	.08	.149
15	.355	.128	.10	.09	.12	.12	.09	.143
16	.153	.168	.13	.12	.10	.25	.15	.153
17	.133	.170	.11	.13	.15	.15	.19	.148
18	.135	.149	.11	.14	.10	.10	.20	.133
19	.116	.174	.21	.18	.19	.13	.11	.159
20	.171	.110	.15	.06	.18	.09	.10	.123
21	.033	.090	.12	.11	.20	.13	.20	.126
22	.213	.131	.07	.09	.12	.10	.11	.119
23	.118	.126	.04	.18	.10	.12	.13	.116
24	.025	.093	.09	.11	.10	.13	.19	.105
25	.215	.101	.10	.08	.04	.16	.17	.124
26	.193	.151	.16	.10	.06	.17	.15	.141
27	.035	.122	.10	.08	.19	.14	.22	.127
28	.143	.160	.09	.07	.12	.17	.19	.135
29	.028	.090	.10	.11	.09	.17	.24	.118
30	.077	.030	.17	.07	.08	.15	.31	.127
Total	4.341	4.497	3.87	3.56	3.88	4.73	5.46	4.334

See footnotes at end of table.

Evaporation, in inches, at Kendallville, Ind.--Continued

October	1947	[d]1948	1949	1950	1951	1952	1953	Average
1	0.073	0.104	0.12	0.06	0.05	0.19	0.22	0.117
2	.102	.110	.12	.08	.14	.12	.23	.129
3	.052	.106	.07	.15	.17	.09	.21	.121
4	.109	.152	.01	.09	.20	.18	.14	.126
5	.098	.132	.13	.06	.15	.15	.09	.116
6	.010	.118	.22	.09	.09	.10	.10	.104
7	.235	.056	.06	.12	.11	.05	.10	.104
8	.135	.042	.11	.07	.06	.08	.09	.084
9	.053	.166	.17	.01	.06	.10	.09	.093
10	.096	.102	.20	.05	.09	.14	.13	.115
11	.117	.010	.12	.05	.09	.10	.12	.087
12	.050	.030	.16	.12	.07	.10	.18	.101
13	.089	.064	.15	.08	.08	.18	.12	.100
14	.089	.061	.08	.08	.12	.08	.12	.090
15	.088	.087	.11	.09	.10	.10	.18	.108
16	.145	.025	.10	.10	.12	.11	.12	.103
17	.214	.059	.12	.09	.10	.09	.13	.115
18	.068	.064	.03	.11	.11	.09	.15	.089
19	.025	.054	.08	.13	.14	.14	.19	.108
20	.130	.050	.08	.16	.06	.07	.16	.101
21	.114	.040	.04	.07	.08	.06	.11	.073
22	.275	.067	.21	.07	.07	.12	.15	.137
23	.026	.021	.10	.04	.09	.15	.22	.092
24	.067	.028	.09	.04	.07	.14	.05	.069
25	.081	.040	.07	.06	.01	.10	.04	.057
26	.038	.052	.14	.07	.05	.14	.05	.077
27	.080	.064	.08	.06	.08	.17	.03	.081
28	.039	.048	.07	.02	.02	.08	.08	.051
29	.102	.056	.10	.06	.05	.03	.08	.068
30	.094	.078	.07	.08	.05	.10	.09	.080
31	.037	.026	.07	.12	.13	.17	.10	.093
Total	2.931	2.112	3.28	2.48	2.81	3.52	3.87	2.989

November	[d] 1947	1948	1949	[d]1950	[d]1951	1952	[d] 1953	Average	December	[d] 1948
1	0.015	0.022	0.07	0.16	0.05	0.08	0.07	0.067	1	0.044
2	.048	.028	.05	.17	----	.08	[a].10	.079	2	.018
3	.039	.006	.01	.04	----	.10	[a].13	.059	3	-.009
4	.001	.031	.03	.03	----	.09	.10	.037	4	-.029
5	.034	.105	.04	.03	----	.11	.06	.063	5	.018
6	.019	.077	.07	.08	----	.11	.07	.071	6	.101
7	.067	.104	.07	.05	----	.11	--------	.080	7	.045
8	.076	.050	.12	.05	----	.02	--------	.063	8	--------
9	.083	.046	.08	.12	----	.09	--------	.084	9	--------
10	.020	.058	.08	----	----	.06	--------	.054	10	--------
11	[b] .030	.074	.06	----	----	.06	--------	.056	11	--------
12	.031	.027	.06	----	----	.03	--------	.037	12	--------
13	.037	.021	.08	----	----	.06	--------	.050	13	--------
14	.043	.040	.06	----	----	.07	--------	.053	14	--------
15	.019	.080	.06	----	----	.01	--------	.042	15	--------
16	.076	.061	.03	----	----	.03	--------	.049	16	--------
17	.020	.129	.00	----	----	.04	--------	.047	17	--------
18	.027	.066	.04	----	----	.07	--------	.051	18	--------
19	.013	.122	.06	----	----	.07	--------	.066	19	--------
20	.030	.066	.07	----	----	.05	--------	.054	20	--------
21	.036	.082	.01	----	----	.02	--------	.037	21	--------
22	.007	.016	[b].01	----	----	.12	--------	.038	22	--------
23	.026	.029	[b].01	----	----	.00	--------	.016	23	--------
24	.071	.016	[b].02	----	----	.01	--------	.029	24	--------
25	[b] .045	.023	[b].03	----	----	.07	--------	.042	25	--------
									26	--------
26	[b] .030	.010	[b].03	----	----	.09	--------	.040	27	--------
27	[b] .020	.032	[b].02	----	----	[b].05	--------	.030	28	--------
28	[b] .030	.034	[b].02	----	----	[b].02	--------	.026	29	--------
29	[b] .010	.008	[b].03	----	----	[b].02	--------	.017	30	--------
30	[b] .010	.020	[b].02	----	----	[b].03	--------	.020	31	--------
Total	1.013	1.483	1.37	----	----	1.77	--------	1.457	------	--------

[a] Estimated from total observed on underlined day.
[b] Estimated because of missing or erroneous data.
[c] Corrected since originally published by U. S. Weather Bureau.
[d] Not previously published.

Evaporation, in inches, at Valparaiso, Ind.

[No observations were made during part of October 1952, and during November 1951 and 1952]

January	1948	February	1948	March	1948	1949	1950
1	0.026	1	--------	1	0.025	0.040	--------
2	.303	2	--------	2	-.006	.079	--------
3	.000	3	--------	3	.141	.041	--------
4	-.022	4	--------	4	.103	.062	--------
5	.006	5	--------	5	.065	.074	--------
6	.048	6	--------	6	.068	.033	--------
7	.239	7	--------	7	-.002	.074	--------
8	.034	8	--------	8	.147	.050	--------
9	.012	9	--------	9	.075	.002	--------
10	.042	10	--------	10	.083	.073	--------
11	.086	11	--------	11	-.005	.126	--------
12	.000	12	--------	12	.067	.063	--------
13	.070	13	--------	13	.054	.054	--------
14	--------	14	--------	14	.058	.086	--------
15	--------	15	--------	15	.028	.021	--------
16	--------	16	--------	16	.275	.041	--------
17	--------	17	--------	17	.205	.039	--------
18	--------	18	--------	18	.156	.016	--------
19	--------	19	--------	19	.384	.023	--------
20	--------	20	0.130	20	.094	.041	--------
21	--------	21	.000	21	.036	[b].095	--------
22	--------	22	.002	22	.085	[b].130	--------
23	--------	23	.001	23	.054	[b].030	--------
24	--------	24	.001	24	.133	.038	--------
25	--------	25	.031	25	.062	.047	-.02
26	--------	26	.013	26	.100	.130	.13
27	--------	27	.011	27	.161	.127	.00
28	--------	28	.021	28	.104	.349	.05
29	--------	29	.046	29	.158	.136	.02
30	--------			30	.104	.180	.05
31	--------			31	.029	.077	.05
Total	--------	Total	--------	Total	3.041	[g]2.277	--------

April	1947	1948	1949	1950	1951	1952	1953	Average
1	0.071	0.005	0.050	0.03	[b]0.03	0.01	0.00	0.028
2	.083	.047	.079	.03	-.04	.10	.06	.051
3	.061	.058	.088	.00	.07	.16	.09	.075
4	.110	.174	.099	.09	.07	.00	.13	.096
5	.051	.197	.128	.02	.10	[d].07	.04	.087
6	.171	.042	.075	.06	.11	.05	.08	.084
7	.067	.158	.070	.05	-.04	.05	.12	.068
8	.100	.155	.139	.13	-.04	.19	.10	.111
9	.054	.201	.002	[a].03	-.02	.19	.13	.084
10	.078	.128	.161	[a].05	-.01	.05	.26	.102
11	.190	.221	.095	.09	.05	.11	.05	.115
12	[e].086	.095	.178	.04	.00	.00	.12	.074
13	.103	[e].062	.132	.04	-.08	.06	.11	.061
14	.070	.065	.188	.06	-.05	.00	.10	.062
15	.126	.050	.143	.05	.07	.07	.12	.090
16	.043	.180	.025	.06	.04	.16	.10	.087
17	.054	.192	.102	.11	.01	.18	.14	.113
18	.152	.190	.014	.19	.12	.21	.14	.145
19	.244	.132	.012	.17	.11	.21	.03	.115
20	.040	.239	.089	.13	.15	.17	.11	.133
21	.053	.315	.191	.09	.19	.18	.16	.168
22	.116	.259	.234	.15	.03	.17	.18	.162
23	.101	.140	.142	.12	.10	.13	.27	.143
24	.276	.190	.205	.34	.19	.09	.19	.212
25	.142	.123	.112	.00	.05	.15	.11	.098
26	.126	.205	.123	.11	.08	.20	.12	.138
27	.244	.203	.059	.15	.09	.16	.03	.134
28	.211	.188	.175	.04	.12	.25	.09	.153
29	.186	.047	.112	.03	.32	.23	.11	.148
30	[f].262	.046	.168	.04	.18	.20	.13	.147
Total	[e]3.671	[e]4.307	3.390	2.40	2.00	3.80	3.42	3.284

See footnotes at end of table.

Evaporation, in inches, at Valparaiso, Ind.--Continued

May	1947	1948	1949	1950	1951	1952	1953	Average
1	0.125	0.137	0.08	0.05	0.22	0.21	0.14	0.137
2	.113	.177	[c].08	.12	.24	.26	.31	.186
3	.053	.163	.23	.22	.17	.16	.10	.157
4	.043	.155	.29	.05	.18	.28	.00	.143
5	.148	.020	.26	.09	.08	.25	.16	.144
6	.101	.348	.28	.36	.09	.18	.14	.214
7	.115	.045	.27	.34	.04	.21	.15	.167
8	.235	.119	.12	.09	.05	.11	.11	.119
9	.169	.141	.14	.34	.29	.04	.24	.194
10	.183	.125	.11	.05	.18	.09	.31	.150
11	.160	.208	.21	.12	.20	.14	.13	.167
12	.254	.049	.17	.12	.00	.00	.06	.093
13	.239	.012	.19	.22	.19	.16	.16	.167
14	.135	.034	.14	.18	.20	.17	.09	.136
15	.147	.166	.26	.22	.25	.06	.11	.173
16	.170	[c].089	.10	.23	.32	.04	.05	.143
17	.163	[c].253	.03	.19	.26	.02	.06	.139
18	[c].070	.200	.20	.18	.07	.10	.11	.133
19	.137	.116	.19	.22	.13	.05	.23	.153
20	.168	.162	.12	.14	.30	.02	.21	.160
21	[c].067	.216	.07	.15	.25	.07	.11	.133
22	.125	.250	.03	.40	.21	.09	.19	.185
23	.278	.225	.03	.08	.06	.13	.30	.158
24	.129	.204	.09	.21	.18	.09	[c].05	.122
25	.128	.153	.21	.20	.26	.16	.06	.167
26	.134	[c].184	.06	.35	.29	.16	.23	.201
27	.205	.217	.16	.08	.08	.28	.18	.172
28	.001	.207	.14	.10	.00	.27	.20	.131
29	.035	.223	.16	.13	.14	.16	.30	.164
30	.073	.243	.16	.17	.02	.23	.28	.168
31	.162	.197	.21	.20	.22	.13	.35	.210
Total	[c]4.265	[c]5.038	[c]4.79	5.60	5.17	4.32	[c]5.02	4.886

June	1947	1948	1949	1950	1951	1952	1953	Average
1	0.305	0.200	0.07	0.30	0.09	0.16	0.12	0.178
2	.101	.204	.15	.30	.31	.15	.24	.208
3	.070	.137	.18	.40	.14	.23	.22	.197
4	.131	.145	.14	.15	.10	.26	.28	.172
5	.193	.254	.20	.16	.10	.18	.31	.200
6	.174	.151	.21	.34	.14	.41	.12	.221
7	.059	[c].156	.33	.26	.12	.26	.16	.192
8	.142	.132	.25	.24	.17	.37	.26	.223
9	.175	.136	.19	.25	.04	.51	.20	.214
10	.243	.140	.20	.21	.15	.31	.26	.216
11	.410	.148	.15	.24	.15	.12	.20	.203
12	.218	.131	.20	.24	.17	.23	.15	.191
13	.170	[c].057	.20	.20	.08	.15	.18	.148
14	.149	[c].189	.15	.15	.14	.12	.23	.161
15	.052	[c].103	.19	.20	.22	.19	.19	.164
16	.040	.123	.06	.11	.21	.29	.18	.145
17	.160	.214	.05	.29	.10	.33	.16	.186
18	.008	.191	.04	[a].09	.10	.32	.26	.144
19	.148	.141	.17	[a].16	.20	.36	[c].15	.190
20	.135	[c].091	.20	[a].08	.15	.00	.32	.139
21	.283	[c].153	.24	[a].08	.23	.10	.20	.184
22	.215	.163	.08	.18	.07	.06	.12	.127
23	.257	[c].201	.09	.20	.11	.23	.14	.175
24	.203	.172	.15	.28	.10	.16	.15	.174
25	.200	.147	.32	.20	.21	.26	.23	.224
26	.163	.215	.19	.18	.15	.14	.24	.183
27	.192	.093	.10	.30	.17	.29	.22	.195
28	.171	[c].066	.21	.19	.10	.26	.17	.167
29	.263	.184	.22	.17	.08	.27	.24	.204
30	.102	.081	.14	.22	.06	.13	.29	.146
Total	5.132	[c]4.518	5.07	6.37	4.16	6.85	6.19	5.471

See footnotes at end of table.

Evaporation, in inches, at Valparaiso, Ind.--Continued

July	1947	1948	1949	1950	1951	1952	1953	Average
1	0.178	0.215	0.22	0.16	0.12	0.29	0.26	0.206
2	.216	.122	.11	.19	.24	.12	.23	.175
3	.203	.256	.27	.19	.11	.23	.21	.210
4	.212	.242	.22	[c].00	.06	.14	.26	.162
5	.217	.262	.23	[c].15	.02	.25	.15	.183
6	.136	.197	.22	.06	.09	.21	.30	.173
7	.140	.227	.14	.32	.21	.21	.28	.218
8	.185	.200	.15	.25	[c].28	.27	.23	.224
9	.249	.218	.19	.17	[c].16	.15	.23	.195
10	.139	.218	.15	.20	.13	.25	.12	.172
11	.116	.157	.28	.20	.11	.17	.20	.176
12	.186	.151	.22	.10	.05	.21	.26	.168
13	.243	.137	.08	.09	.13	.24	.20	.160
14	.137	.189	.16	.28	.12	.18	.21	.182
15	.168	.155	.29	.18	.13	.05	.23	.172
16	.099	.110	.11	.21	.31	.13	.20	.167
17	.093	.195	.35	[c].04	.20	.07	.01	.137
18	.195	[c].279	.26	.07	.18	.23	.20	.202
19	.209	.157	.21	.17	.23	.07	.25	.185
20	.243	.221	.25	.00	.16	.19	.18	.178
21	.113	[c].233	.09	.01	.27	.22	.21	.164
22	.198	.162	.09	.20	.15	.26	.17	.176
23	.186	[c].137	.20	.18	.07	.32	.27	.195
24	.159	.085	.21	.14	.06	.19	.22	.152
25	.195	.158	.26	.19	.10	.17	.22	.185
26	.252	.193	.12	.14	.25	.18	.23	.195
27	.242	.211	.24	.04	.10	.22	.25	.186
28	.112	.199	.26	.22	.25	.12	.24	.200
29	.169	.211	.27	.20	.07	.20	.21	.190
30	.209	.245	.16	.16	.24	.16	.23	.201
31	.360	.182	.20	.28	.11	.21	.14	.212
Total	5.759	[c] 5.924	6.21	4.79	[c]4.71	5.91	6.60	5.701

August	1947	1948	1949	1950	1951	1952	1953	Average
1	0.246	0.151	0.18	0.14	0.10	0.22	0.23	0.181
2	.186	.199	.21	.23	.19	.18	.31	.215
3	.125	.213	.18	.08	.28	.19	.12	.170
4	.198	.146	.23	.18	.15	.16	.27	.191
5	.237	.139	.24	.19	.10	.12	.16	.169
6	.300	.069	.20	.20	.10	.15	.12	.163
7	.280	.161	.20	.20	.20	.17	.15	.194
8	.150	.130	.20	.17	[c].25	.18	.13	.173
9	.250	.052	.16	.12	.05	.39	.17	.170
10	.200	.044	.23	.14	.05	.14	.18	.141
11	.230	.204	.21	.17	.10	[c]-.02	.11	.143
12	.200	.102	.09	.18	.10	.12	[c].11	.129
13	.230	.187	.08	.17	.10	.29	[c].25	.187
14	.280	.200	.14	.18	.42	.06	.20	.211
15	.180	.161	.22	.13	[c].00	.25	.20	.163
16	.200	[c].161	.18	.11	.14	.03	.17	.142
17	.238	.164	.11	.20	.27	.11	.14	.176
18	.191	.170	.14	.19	.20	.20	.18	.182
19	.245	.200	.20	.14	.09	.18	.16	.174
20	.212	.150	.22	.05	.09	.12	.24	.155
21	.223	.418	.21	.23	.14	.03	.17	.203
22	.190	.221	.20	.20	.20	.15	.17	.190
23	.127	.210	.19	.20	.30	.10	.20	.190
24	.149	.310	.19	.24	.12	.28	.19	.211
25	.183	.240	.17	.11	.18	.10	.21	.170
26	.096	.256	.09	.13	.12	.19	.23	.159
27	.095	.206	.32	.12	.04	.22	.22	.174
28	.199	.190	.13	.09	.12	.18	.24	.164
29	.180	.187	.10	.08	.12	.20	.22	.155
30	.122	.275	.17	.12	.07	.30	.24	.185
31	.252	.179	.17	.11	.10	.01	.29	.159
Total	6.194	[c] 5.695	5.56	4.80	4.49	5.00	5.98	5.389

See footnotes at end of table.

Evaporation, in inches, at Valparaiso, Ind.--Continued

September	1947	1948	1949	1950	1951	1952	1953	Average
1	0.152	0.279	0.20	0.03	0.24	0.14	0.31	0.193
2	.156	.081	.19	.10	.02	.09	.28	.131
3	.193	.114	.18	.11	.04	.11	.16	.130
4	.234	.177	.20	.15	.08	.14	.20	.169
5	.111	.199	.20	.16	.13	.11	.18	.156
6	.067	.128	.09	.14	.08	.20	.16	.124
7	.109	.065	.08	.13	.12	.11	.21	.118
8	.121	.113	[b].09	.13	.08	.10	.16	.113
9	.136	.071	[b].08	.08	.07	.16	.12	.102
10	.139	.125	[b].06	.10	.14	.20	.14	.129
11	.136	.121	[b].11	.07	.14	.17	.07	.117
12	.203	.202	[b].04	.05	.17	.20	.31	.168
13	.125	.253	[b].14	.03	.26	.10	.12	.147
14	.199	.155	[b].12	.02	.14	[c].10	.08	.116
15	.226	.156	[b].05	.12	.17	[c].15	.12	.142
16	.149	.066	[b].13	.03	.07	.31	.14	.128
17	.146	.187	[b].20	.06	.16	.17	.18	.158
18	.109	.224	[b].19	.09	.12	.07	.20	.143
19	.129	.199	[b].13	.14	.09	.09	.06	.120
20	.118	.167	[b].16	.04	.16	.07	.15	.124
21	.144	.060	[b].17	.03	.17	.14	.15	.123
22	.166	.044	.10	.04	.14	.09	.07	.093
23	.104	.098	.06	.11	.07	.10	.16	.100
24	.121	.085	.06	.14	.11	.10	.18	.114
25	.120	.115	.11	.04	.06	.20	.16	.115
26	.101	.158	.12	.09	.05	.20	.16	.126
27	.101	.113	.18	.07	.26	.14	.20	.152
28	.083	.121	.12	.08	.17	.21	.12	.129
29	.078	.168	.03	.10	.07	.19	.26	.128
30	.081	.040	.06	.06	.07	.12	.27	.100
Total	4.057	4.084	3.65	2.54	3.65	4.28	5.08	3.908

October	1947	1948	1949	1950	1951	1952	1953	Average
1	0.085	0.008	0.13	0.05	0.06	0.17	0.19	0.099
2	.073	.120	.11	.05	.17	.14	.16	.118
3	.093	.126	.08	.13	.10	.05	.18	.108
4	.133	.110	.02	.07	.17	.11	.12	.105
5	.083	.121	.02	.06	.17	.13	.08	.095
6	.090	.123	.03	.07	.06	--------	.11	.080
7	.182	.100	.04	.12	.04	--------	.09	.095
8	.105	.046	.14	.02	.07	--------	.09	.078
9	.104	.069	.12	.07	.06	--------	.09	.086
10	.096	.133	.14	.02	.05	--------	.12	.093
11	.065	.082	.21	.02	.05	--------	.10	.088
12	.051	.026	.03	.05	.07	--------	.08	.051
13	.128	.042	.11	.10	.07	--------	.11	.093
14	.104	.045	.08	.03	.12	--------	.09	.078
15	.098	.059	.09	.09	.10	--------	.13	.094
16	.110	.081	.09	.08	.11	--------	.09	.094
17	.112	.068	.09	.07	.09	--------	.13	.093
18	.010	.086	.06	.11	.05	--------	.17	.081
19	.100	.079	.07	.10	.10	--------	.17	.103
20	.076	.050	.05	.02	.04	--------	.10	.056
21	.120	.076	.15	.12	.08	--------	.22	.128
22	.145	.010	.08	.11	.05	--------	.11	.084
23	.139	.063	.09	.05	.10	--------	.09	.089
24	.126	.039	.09	.03	.01	--------	.07	.061
25	.118	.017	.06	.03	[c].02	--------	.08	.054
26	.058	.048	.08	.08	.10	--------	.02	.064
27	.018	.064	.07	.05	.07	--------	.07	.057
28	.052	.057	.06	.04	.01	--------	.05	.045
29	.017	.059	.08	.05	.09	--------	.05	.058
30	.003	.060	.13	.09	.05	--------	.09	.070
31	.071	.083	.07	.11	.07	--------	.09	.082
Total	2.765	[c]2.150	2.67	2.09	[c]2.40	--------	3.34	2.580

See footnotes at end of table.

Evaporation, in inches, at Valparaiso, Ind.--Continued

November	1947 [d]	1948	1949	1950	1953	Average	December	1948 [d]	1949
1------	0.029	0.011	0.08	0.17	0.06	0.070	1------	0.040	0.01
2------	.069	.056	.05	.20	.06	.087	2------	.050	[a].00
3------	.069	.041	.03	.05	.15	.068	3------	.006	[a].00
4------	.035	.000	.04	.08	.14	.059	4------	.009	[a].00
5------	.000	.058	.02	.01	.08	.034	5------	.002	[a].02
6------	.033	.080	.04	.08	.02	.051	6------	.086	[a].02
7------	.090	.054	.05	.13	.01	.067	7------	.043	[a].03
8------	.009	.055	.13	.00	.06	.051	8------	.055	[a].03
9------	.005	.043	.07	.06	.08	.052	9------	.055	[a].01
10------	.098	.064	.10	.01	.11	.076	10------	.006	[a].01
11------	.160	.038	.05	[a].03	.03	.062	11------	.002	[a].03
12------	.060	.057	.05	[a].02	.05	.047	12------	.029	[a].07
13------	.055	.016	.01	[a].02	.03	.026	13------	.010	------
14------	.024	.018	.15	[a].03	.04	.052	14------	.019	------
15------	.007	.044	.10	-.02	.13	.052	15------	.010	------
16------	.084	.066	.11	.07	.11	.088	16------	.017	------
17------	.035	.080	.03	.01	.10	.051	17------	.037	------
18------	.030	.053	-.01	.05	.09	.043	18------	.022	------
19------	.027	.073	.05	.06	.08	.058	19------	[c].112	------
20------	.017	[c].014	.06	.00	.06	.030	20------	[c].002	------
21------	.037	.009	.05	[a].03	.02	.029	21------	[c].307	------
22------	.011	.007	[a]-.02	[a].05	.00	.010	22------	[a].100	------
23------	.051	.026	[a]-.06	[a].02	.01	.009	23------	[a].035	------
24------	.008	.030	[a]-.02	[a].01	.00	.006	24------	[a].021	------
25------	[b].030	.026	[a]-.03	[a].00	.05	.015	25------	[a].035	------
26------	[b].030	.010	[a].04	[a].01	.06	.030	26------	[a].020	------
27------	[b].020	.049	[a].12	[a].02	[b].02	.046	27------	[a].060	------
28------	[b].030	.019	[a].06	[a].04	[b].01	.032	28------	[a].065	------
29------	[b].010	.024	.05	[a].02	[b].00	.021	29------	[a].095	------
30------	[b].010	.024	.01	[a].03	[b].02	.019	30------	[a].230	------
							31------	[a].034	------
Total-	1.173	[c]1.145	1.41	1.29	1.68	1.341	Total-	1.614	------

[a] Estimated from total observed on underlined day.
[b] Estimated because of missing or erroneous data.
[c] Corrected since originally published by U. S. Weather Bureau.
[d] Not previously published.

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