

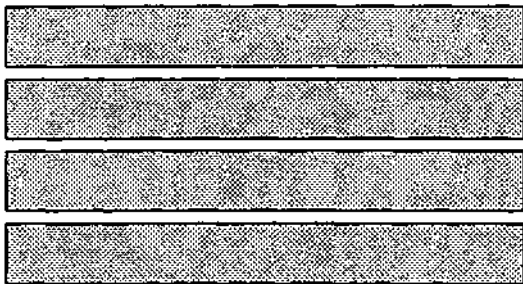
Contract Report 553

Illinois Lake Quality Assessment - 1992

by Shun Dar Lin and Raman K. Raman
Office of Water Quality Management

Prepared for
the Lake and Watershed Unit
Illinois Environmental Protection Agency

June 1993



Illinois State Water Survey
Chemistry Division
Champaign, Illinois

A Division of the Illinois Department of Energy and Natural Resources

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INTRODUCTION

Background

The state of Illinois has more than 2,900 lakes or reservoirs with surface areas of six acres or more. The origins of these water impoundments vary. Some were formed by glaciers, but most were developed by damming of streams. Over 90 of them serve as raw water-supply sources, and a few are used for industrial cooling. They are all used for recreational activities such as swimming, fishing, boating, and water-skiing, however.

Most Illinois impoundments are relatively shallow and have low capacity-inflow ratios. The impoundments in Illinois inundate fertile bottomlands and topsoils; thus they normally begin their lives with the potential for high biological productivity. Plant nutrients (nitrogen and phosphorus) and organic matter are leached from these fertile soils into the overlying waters. In addition, runoff from predominantly agricultural watersheds results in considerable input of nutrients into the lakes. Consequently, most Illinois lakes show symptoms of eutrophy characterized by hypolimnetic dissolved oxygen depletion, high levels of nitrogen and phosphorus, and varying degrees of algae and macrophyte growths. These problems become more severe over time.

The eutrophication (excessive fertilization) of lakes and reservoirs is a well-known cause of water-supply quality deterioration. The growth of planktonic algae in the water-supply impoundments may cause taste and odor problems, shortened filter runs, increased chlorine demand, increased turbidity, and, for some facilities, increased trihalomethane precursors. These ultimately lead to increased water treatment costs and, in some

instances, even to abandonment of the lake as a public water-supply source. These problems are encountered in most water-supply facilities in Illinois that use impoundments as supply sources.

Lake Management Methods

Since algal (blue-green) growth in surface water supplies is a frequent cause of significant algal-related taste and odor in drinking water, reduction of algal nutrient input to a lake or reservoir is a primary management method for eutrophication control. Lee and Jones (1988) reviewed the North American experience in eutrophication control through phosphorus management. They stressed that controlling the phosphorus input to a lake or reservoir could reduce the amount of algae. Reducing the frequency and severity of algal blooms in a water-supply lake is a necessary step to mitigate drinking water quality problems due to algae. Phosphorus can be precipitated by a coagulant such as alum. Recently, Lee and Jones (1991) claimed that significant benefits in both recreational and drinking water quality have been achieved when 25 percent of total available phosphorus load to the Sacramento-San Joaquin River Delta (California) water is controlled.

An algicide, copper sulfate is routinely applied to control algal bloom in more than 60 of the 100 water-supply impoundments in Illinois. Unfortunately, this chemical is being used without due regard to the chemistry of lake waters, the need for application, the frequency and proper method of application. For example, copper sulfate application rates in Illinois during 1982 ranged from 5 to 100 pounds per acre (lb/a) with an average 21.9 lb/a. The number of applications were from one to ten per year. The research carried out by Raman and Cook (1988) in Lake Loami (a ten-acre water-supply impoundment) suggested that there is no need to use algicides in that lake, yet for many years the lake had routinely received more than 400 pounds of copper sulfate (100 lb/a, four applications per year). It is obvious that the algicide is often misused and misapplied. This is not only economically undesirable, but also ecologically damaging.

An integrated and comprehensive approach to assessment and management of the lake watershed and water quality is beneficial. Investigations of the lake watershed should include assessment of soil types, slopes, land uses and land-use practices, soil losses, point and nonpoint pollution loads, and other relevant characteristics. Because of the limited resources for abating sediment and nutrient loads emanating from the watershed, it is imperative to identify and prioritize critical areas of the watershed for proper management so that the available resources can be allocated judiciously.

Detailed limnological assessments for each lake system will include the examination of physical, chemical, and biological characteristics of the tributary to the lake; the lake water and sediments; and the development of hydraulic budgets, nutrient budgets, and bathymetric maps.

The data collected for each lake system will aid in identifying and quantifying the lake and watershed problems, and will lead to a well-planned, comprehensive, and integrated lake and watershed management plan. The benefits that can be derived from such an endeavor fall into three categories: those that can be realized soon after the implementation of management strategies, those that can be realized in one to three years, and those benefits that accrue only over a long period of time.

Diversion of nutrient-rich inflow water is a successful method of lake management. The application of copper sulfate is a measure that has immediate benefits. The effectiveness of copper sulfate, the most widely used algicide in Illinois water-supply impoundments, is a function of the solubility of the copper ion. This solubility in a particular lake is, in turn, a function of the pH and alkalinity of the lake water. As the pH values increase in summer months as a result of algal blooms, the solubility of copper will decrease, making the algicide application less effective. A chemical analysis of the lake waters can provide the basis for determining the type and amount of algicide needed and the desirable frequency of application of the selected algicide. Proper use and application

of an algicide on the basis of sound technical data will not only result in immediate economic benefits, but will also be ecologically desirable.

In-lake management techniques such as aeration/destratification, lake bottom sealing, harvesting of nuisance organisms, and dredging can improve lake water quality in a time span of two to three years. Detailed limnological studies can indicate whether these measures would be beneficial for a particular lake. These techniques are economically feasible for municipalities, and they should be able to implement them.

Benefits accrue over a long period from measures such as erosion control, changes in land-use practices, and adoption of best management practices (BMPs) by the agricultural sector. These measures require the willingness and cooperation of all the landowners in the watershed. But even in a small watershed, it takes several years to implement a watershed management plan and to achieve perceptible lake water quality enhancement.

BMPs may include, but are not limited to: 1) erosion and sediment control, 2) agricultural soil conservation practices, 3) irrigation management measures, 4) stormwater management measures, 5) timber harvesting plans, 6) construction period management, and 7) porous pavement designs. The incentives for BMP applications include tax incentives, subsidies and compensation, awards and public recognition, and grants.

Lake Water Quality Assessment Program

In Illinois, approximately 500 lakes and reservoirs have been assessed by the Illinois Environmental Protection Agency (IEPA) as part of the Clean Water Act goal and use support attainment. To increase the number of lakes studied in Illinois, for years, the IEPA has applied for and received funds from the U.S. Environmental Protection Agency (USEPA) Region V under Section 314 Federal Clean Lakes Program (CLP), Lake Water Quality Assessment (LWQA) grants. The awarded funds under the LWQA grants were

used by IEPA to assess additional lakes, which had little or no lake data readily available, such as this 1992 project.

To fulfill IEPA's goal, the Office of Water Quality Management of the Illinois State Water Survey (ISWS) was contracted to collect data on 25 selected lakes throughout the state of Illinois. The Water Survey staff visited these lakes, and collected water and sediment samples, as well as the lake assessment information.

This report presents all the data obtained for the 25 lakes assessed.

Acknowledgments

Partial funding for this survey was provided by the Planning Section of the IEPA's Water Pollution Control Division. Gregg Good and Jeff Mitzelfelt, IEPA, assisted immeasurably in carrying out this task to its successful completion. Their help is gratefully acknowledged.

Wiley Scott, Conservation Agronomist, U.S. Soil Conservation Service (USSCS), Champaign, Illinois, was instrumental in coordinating and obtaining information pertaining to watershed land-use management practices and lake maps from several regional offices. The authors immensely appreciate USSCS's help. Wayne Herndon and Ken Russell, Illinois Department of Conservation, provided and checked lake management information for some lakes.

Special thanks go to the individuals associated with the 25 lakes surveyed. They were very courteous, shared their information and knowledge about the lakes and their watersheds, and made data collection easier. Without their fullest cooperation, this task could not have been accomplished in a timely and orderly fashion. The authors owe a debt of gratitude to each of them.

Luke Lin, Motorola Corporation, Schaumburg, Illinois, designed a format and compiled all analytical data and lake assessment information into a two-page report for

each lake. Bill Kocher, ISWS, participated in the field work. Linda Dexter typed the manuscript and the final report, and Eva Kingston edited the manuscript.

SCOPE OF WORK

The ISWS assisted the IEPA in collecting basic lake assessment data, as well as water and sediment samples for 25 Illinois lakes. The names and locations of these lakes are given in Figure 1. Their surface area varied from 20 acres (Kinmundy City Lake) to 295 acres (Washington County Lake). Lake types included excavated lowland, strip-mine, and dammed stream.

Basic lake assessment data gathered included: lake location; morphology; hydrology; ownership/access; lake, watershed, and shoreline impairments; lake and watershed management previously undertaken; source, cause, and magnitude of pollution; and use impairments.

MATERIALS AND METHODS

Lake water and sediment samples were collected at one site on each lake (typically the deepest estimated location) by ISWS and delivered to IEPA laboratories for analysis. Grab water samples were taken at one foot below the surface and two feet above the lake bottom, transported in ice, and refrigerated until analysis. Sediment samples were taken with an epoxy-coated 6-inch x 6-inch ponar dredge.

All sampling and site visits were made during a period from June 22, 1992, through August 17, 1992. Samples were collected according to the IEPA field methods guide quality assurance/quality control procedures (1987).

These samples were delivered to IEPA laboratories for analysis of total suspended solids (TSS), volatile suspended solids (VSS), turbidity, total phosphorus (TP), dissolved phosphorus (DP), nitrite/nitrate-nitrogen ($\text{NO}_2/\text{NO}_3\text{-N}$), ammonia nitrogen ($\text{NH}_3\text{-N}$),

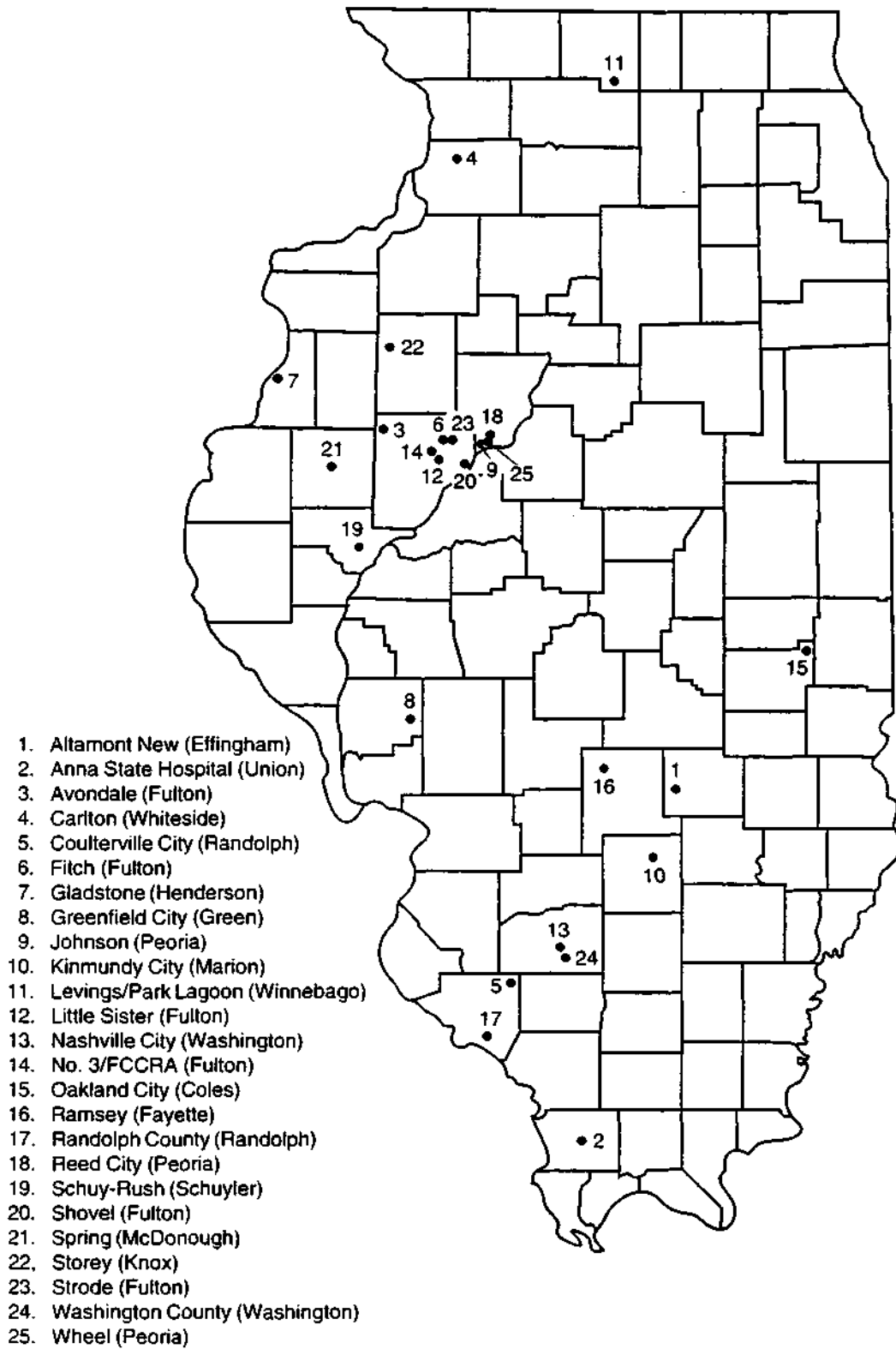


Figure 1. Locations of 25 lakes monitored

total kjeldahl nitrogen (TKN), chemical oxygen demand (COD), chlorophyll *a*, *b*, *c*, and pheophytine *a*. All analyses were performed using approved methods.

Dissolved oxygen (DO) and water temperature were measured *in situ* with a YSI DO/temperature probe (model 59) at 1- or 2-foot intervals of the water column. Transparency was determined with an 8-inch Secchi disc, which was lowered until it disappeared from view, and depth noted. The disc was raised slowly until it could be seen. This depth was also noted and the average of the two depths was recorded. Total alkalinity, phenolphthalein alkalinity, and pH were measured in the field after sample collection.

A weighted bottle sampler and clean half-gallon bottle were used to collect a depth-integrated (surface to twice the Secchi depth) quart sample for chlorophyll at the site. This sample was placed in a foil-wrapped, quart, polyethylene bottle for chlorophyll analysis. The sample was immediately stored in a cooler with ice and subsequently transferred to a refrigerator. The chlorophyll sample was then filtered either with a hand vacuum pump or with a standard laboratory vacuum apparatus. The algae-laden filter was promptly wrapped in aluminum foil, labelled, and stored in a freezer prior to shipment for lab analysis. The volume of filtrate required to saturate each filter with suspended material was recorded to facilitate calculation of chlorophyll concentrations in micrograms per liter ($\mu\text{g/L}$).

Sediment samples were analyzed for phosphorus, kjeldahl-nitrogen, total and volatile solids, total organic carbon (TOC), 13 metals, and organic chemicals. All field monitoring and laboratory analyses were performed by using accepted methods and procedures.

Basic lake assessment information mentioned above was gathered by ISWS and transferred onto lake assessment forms developed by IEPA. The completed forms were submitted to IEPA and data were incorporated into the Waterbody System and a Comprehensive Lake Data Management System.

RESULTS AND DISCUSSION

The analytical results of water and sediment quality as well as completed lake assessment information for each of the 25 lakes investigated is individually shown in illustration A. For each lake, two pages of data are presented in tabular form, as a figure (DO and water temperature versus depth), and as a map.

Although it is preferable to collect limnological data periodically for one year or at least one season, lack of adequate resources limited the *in-situ* observations and sampling to one sampling visit for each lake and restricted to the deepest lake location. With only one dataset for each lake, it is impractical to dwell on the limnological characteristics of each lake. Some very general comments are included, however, with discussions of each water quality parameter determined. On the basis of these comments and lake management experiences, some conclusions can be drawn.

Thermal and Dissolved Oxygen Profiles

Deep lakes in the temperate zone (in Illinois, generally those with depths greater than 12 to 15 feet) experience thermal stratification from April to September. During thermal stratification, the upper layer (the epilimnion) is isolated from the lower layer (the hypolimnion) of the water by a temperature gradient (the thermocline or metalimnion). The most important phase of the thermal regime from the standpoint of eutrophication is the summer stratification period (June - September). The hypolimnion traps sediment materials such as decaying plants produced in the epilimnion or transported from the watershed. In a eutrophic lake, the hypolimnion becomes anoxic (devoid of oxygen) because of the increased amount of oxidizable material and its isolation from the atmosphere. Also, the oxygen demand from organic, rich bottom sediments hastens the oxygen depletion in thermally stratified lakes. With the absence of oxygen, the conditions for chemical reduction become favorable, and more nutrients are released to the overlying waters from the bottom sediment.

Illustration A depicts profiles of DO and temperature for all 25 lakes studied. The observed data are also presented in appendix A. Since DO and temperature were not monitored continually during this project, it is not possible to identify the onset of thermal stratification, its progression, or times of peak stratification and subsequent fall turnover.

The results obtained suggest that all the lakes (except Oakland City Lake) showed a temperature gradient. The lakes with depths > 15 feet generally had temperature profiles that display classic thermal stratification (epilimnion, metalimnion, and hypolimnion). Few deeper lakes (Altamont, New Reservoir, Coulterville, and Greenfield) showed a lesser degree of temperature deviation with depth. Spring Lake (38 feet deep) experienced almost no thermal stratification. The lakes with depths < 15 feet had surface and bottom temperature differences of almost 3°C.

The amount of oxygen gas dissolved in lake water had a dramatic effect on the lake's ability to support life. DO profiles in nearly all lakes had anoxic or reduced DO concentration in the bottom waters. The lakes with depth > 10 feet became anoxic between 12 and 20 feet. Kinmundy City Lake and Ramsey Lake, however, became devoid of oxygen at 6 and 8 feet, respectively. Oakland City Lake (9 feet deep) had about 2 milligrams per liter (mg/L) of DO difference between the surface (12.4 mg/L) and the lake bottom (10.2 mg/L). Two other shallow lakes, Avondale Lake (7 feet) and Levings Park Lagoon (6 feet), respectively, had surface DO of 9.2 and 13.6 mg/L and bottom DO of 4.8 and 8.4 mg/L. Of 25 lakes studied, 12 had surface DO > 10 mg/L, with the highest DO (14.6 mg/L) observed in Washington County Lake on August 3, 1992. The lowest observed surface DO (5.9 mg/L) occurred in Ramsey Lake on June 23, 1992.

Secchi Disc Transparency

A Secchi disc reading suggests the depth of light penetration into a body of water. From the water surface to approximately two-three times the Secchi disc depth is the

region of a lake where enough sunlight penetrates to allow photosynthetic production of oxygen by algae and other aquatic plants.

Secchi disc transparency for the 25 lakes studied ranged from 13 inches (Oakland City Lake) to 186 inches (Strode Lake). For a survey in southern Illinois lakes, Burns (1991) reported the highest Secchi transparency (240 inches) in Crystal Lake in Perry County. During this study, Avondale Lake had a low Secchi transparency (14 inches). Four of the 25 lakes (Greenfield, Washington County, Avondale, and Oakland City) had a Secchi transparency 24 inches, which represents the level generally associated with lake impairment (IEPA, 1978). Eight lakes had Secchi transparencies between 24 and 48 inches. Thirteen lakes had a Secchi transparencies 48 inches. The minimum recommended Secchi transparency set by the Illinois Department of Public Health for bathing beaches is 48 inches. Nevertheless, a lake that does not meet the transparency criteria does not necessarily constitute a public health hazard, if it is not used for swimming.

Total Suspended Solids

Total suspended solids represent material residue left on a filter 2.0 micrometers (μm) normal pore size, i.e., the concentration of all inorganic and organic matter suspended in the water column. TSS of the lakes studied ranged from 2 mg/L (Fitch Lake - surface) to 156 mg/L (Oakland City Lake - surface, 178 mg/L for the same lake - bottom). With the exceptions of Spring Lake and Wheel Lake, TSS for lake bottom water were significantly higher than that for surface waters. High TSS concentrations reduce Secchi disc transparency and can reduce plant photosynthesis. Subsequently, it reduces the amount of oxygen produced by algae and may cause anoxic conditions. On the basis of Illinois Lake Assessment Criteria (IEPA, 1978), TSS 25 mg/L are classified as high lake use impairment, where TSS for moderate use impairment are between 5 and 25 mg/L. A TSS 5 mg/L is considered minimal impairment. In this study, based on the surface TSS

values, 4 lakes (Avondale, Oakland City, Schuy-Rush, and Spring), 11 lakes, and 10 lakes are in the categories of high, moderate, and minimal use impairments, respectively.

Volatile Suspended Solids

Volatile suspended solids are the portion of TSS lost on ignition at $500 \pm 50^{\circ}\text{C}$. VSS represent the organic portion of TSS, such as phytoplankton or other suspended organic matter. VSS values for the 25 lakes were between 1 mg/L (Fitch, Reed City, and Shovel - all surface samples) and 26 mg/L (Oakland City - surface; 28 mg/L - bottom water). High VSS values are generally indicative of turbidity caused by algae and other organic debris.

Turbidity

Turbidity is an expression of the optical property of water that causes light to be scattered and absorbed by a turbidimeter, and is reported as nephelometric turbidity units (NTU). Turbidity in water is caused by suspended matter, such as clay, silt, finely divided inorganic and organic matter, soluble colored organic compounds, and plankton and other microorganisms. Turbidity of the 25 lakes ranged from 0.1 NTU (Fitch, No. 3/FCCRA, and Shovel - all surface samples) to 20 NTU (Avondale - both surface and bottom) and 34 NTU (Oakland City - bottom).

Illinois Lake Assessment Criteria (IEPA, 1978) for a moderate amount of sediment set a turbidity value between 7 and 14 NTU. Turbidity 15 NTU is indicative of substantial suspended sediment. On the basis of surface turbidity values, two lakes (Avondale and Schuy-Rush) and one lake (Oakland City) are considered to have substantial and moderate amounts of sediments, respectively. The other 22 lakes had minimal amounts of suspended sediments.

Nitrogen

Nitrogen is generally found in surface waters in the form of ammonia (NH_3), nitrite (NO_2), nitrate (NO_3), and organic nitrogen. Organic nitrogen is determined by

subtracting NH_3 nitrogen from the TKN measurements. Organic nitrogen content can provide an indication of relative abundance of organic matter (algae and other vegetative matter) in water, but has not been shown to be directly used as a growth nutrient by planktonic algae. Nitrogen is an essential nutrient for plant and animal growth. It can cause algal blooms in surface waters and create public health problems at high concentrations, however. The Illinois Pollution Control Board (1990) has set standards for nitrate not to exceed 10 mg/L as nitrogen for public water-supply and food processing waters.

Nitrate is readily used by algae as a nutrient at approximately the same extent as ammonia. If the sum of NO_2 and NO_3 nitrogen concentrations exceeds 0.30 mg/L, it may stimulate algal growth. NH_3 is a natural end product of decomposed organic material. It can exist in water in two forms as ionized (NH_4^+ and ammonium) and un-ionized (NH_3 ammonia). High levels of ammonia can be toxic to aquatic organisms, but the level of toxicity depends on water temperature and pH. The IPCB (1990) stipulates an ammonia nitrogen limitation of 15 mg/L.

Ammonia Nitrogen. The surface water ammonia nitrogen levels ranged from concentrations that were less than detectable at Gladstone Lake (0.01 mg/L) to 3.6 mg/L at Schuy-Rush Lake. The concentration at Greenfield Lake was 3.1 mg/L. With the exception of Greenfield Lake and Schuy-Rush Lake, all the other 23 lakes had ammonia levels 0.73 mg/L.

Ammonia levels in the bottom waters can be more important in that the NH_3 will rapidly be oxidized to nitrite/nitrate after lake turnover occurs. The observed bottom water NH_3 concentrations ranged from 0.02 mg/L at Fitch Lake to 5.6 mg/L at Ramsey Lake. No water sample near the bottom exceeded the IPCB's ammonia limitation (15 mg/L).

Nitrite/Nitrate Nitrogen. The sum of nitrite and nitrate ($\text{NO}_2 + \text{NO}_3$) nitrogen for 18 lake surface waters was under the detection limit (0.01 mg/L). The highest level was found in Levings Park Lagoon: 5.5 mg/L for surface water and 6.4 mg/L for bottom water. A majority of the bottom water (18 lakes) had levels under detectable limit. Therefore, none of the concentrations exceeded IPCB standards.

Total Kjeldahl Nitrogen. Total kjeldahl nitrogen (TKN) represents the sum of NH_3 , NH_4^+ , and organic nitrogen present. For the lake surface waters, TKN ranged from 0.2 mg/L (Shovel Lake/Banner Marsh) to 3.4 mg/L (Greenfield Lake), while TKN for bottom waters ranged from 0.3 mg/L (Johnson Lake/Banner Marsh) to 9.1 mg/L (Levings Park Lagoon). Bottom waters at both Ramsey Lake and Reed City Lake exceeded 6.0 mg/L TKN.

Phosphorus

Total phosphorus represents all forms of phosphorus in water. Dissolved phosphorus is the soluble portion of TP. Phosphorus occurs in natural waters and wastewaters almost solely as phosphates, and is an essential plant nutrient. In relatively uncontaminated lakes, the TP of lake surface waters is generally in the range of 0.01 and 0.03 mg/L (Hutchinson, 1967; APHA, AWWA, and WEF, 1992). Excessive concentrations of TP, like nitrate, can cause noxious growths of algae and other aquatic plants. Phosphorus is frequently the limiting nutrient in a lake ecosystem. The IPCB (1990) stipulates that "Phosphorus as P shall not exceed 0.05 mg/L in any reservoir or lake, or in any stream at the point where it enters any reservoir or lake."

Total Phosphorus. Total phosphorus concentrations of the 25 lakes' surface waters ranged from a low of 0.012 mg/L (Shovel Lake/Banner Marsh) to a high of 2.27 mg/L (Nashville City Reservoir). Surface waters at 16 lakes exceeded the IPCB limit while TP concentrations in 7 lakes were 0.3 mg/L.

In general, TP for bottom waters was higher than that for surface waters. Bottom water TP concentrations ranged from 0.016 mg/L (Fitch Lake) to 1.81 mg/L (Nashville City Reservoir).

Dissolved Phosphorus. Dissolved phosphorus is the bioavailable form of TP. In surface lake waters, DP concentrations ranged from 0.008 mg/L (Gladstone Lake and Strode Lake) to 1.67 mg/L (Nashville City Reservoir). In bottom waters, DP concentrations were between 0.008 mg/L (Shovel Lake/Banner Marsh) and 1.90 mg/L (Nashville City Reservoir).

pH

The pH value is a measure of the acidity in water: values < 7.0 indicate acidic water, and values > 7.0 indicate basic water. One species of carbonate, carbonic acid, usually controls pH to the greatest extent and is consumed by algae and other plants for growth. A rise in pH can occur due to photosynthetic uptake of carbonic acid and cause water to become more basic. Values > 8.0 in Illinois lakes are usually indicative of photosynthetic demand of carbon dioxide. The IPCB standard of pH for general-use water quality is a range between 6.5 and 9.0, except for natural causes (1990).

The pH values at the 25 surface lake waters ranged from 7.9 (Coulterville Lake) to 9.4 (Gladstone Lake). Surface water at only one lake had a pH < 8.0 . Photosynthetic activities occurred in almost all lakes. The pH values for lake bottom waters were found to be lower than those for lake surface waters. The pH values in bottom waters ranged from 7.2 (Schuy-Rush Lake) to 8.8 (Fitch Lake). Only eight lake bottom waters had a pH > 8.0 at the time that this investigation was carried out.

Alkalinity

Alkalinity is a measure of water's acid-neutralizing capacity. It is expressed in terms of an equivalent amount of calcium carbonate (CaCO_3). Alkalinity is mainly the result of carbonates, bicarbonates, and hydroxide ions in water. Total alkalinity is the amount of

acid required to bring the water to a pH of 4.5. Phenolphthalein alkalinity is determined as the amount of acid needed to bring the water to a pH of 8.3.

Low alkalinity indicates that a lake is or has the potential to be susceptible to acid rain damage. Illinois lakes usually have high alkalinity and thus are well buffered from the impacts of acid rain.

Phenolphthalein Alkalinity. Phenolphthalein alkalinity was low (0 ~ 35 mg CaCO₃/L) for lake surface waters. It was almost nonexistent in lake bottom waters.

Total Alkalinity. Total alkalinity as CaCO₃ of 25 lake surface waters ranged from 55 (Coulterville Lake) to 240 mg/L (Levings Park Lagoon). These values are typical of Illinois lakes. In general, lake bottom water has a higher total alkalinity than the lake surface water. Of the 25 lakes investigated, total alkalinity as CaCO₃ for bottom waters ranged from 63 (Altamont New Reservoir) to 318 mg/L (Reed City Lake).

Chemical Oxygen Demand

The chemical oxygen demand is a measure of the oxygen requirement of the organic content of a sample that is susceptible to oxidation by a strong chemical oxidant. The COD test is less time-consuming than the biochemical oxygen demand (BOD) test and can be related empirically to BOD, which is related to biological processes that occur when bacteria feed on dead animal and plant matter and animal wastes, and they consume oxygen during the decomposition process. The COD result is typically slightly greater than that for the BOD test, because the COD test includes some materials that are not readily biologically degradable.

Illinois' Lake Assessment Criteria state that COD values > 30 mg/L indicate a high magnitude of organic enrichment from plant and algal matter and COD values between 20 and 30 mg/L are considered as moderate organic enrichment. COD values for 25 lake surface waters ranged from 9 mg/L (Shovel Lake/Banner Marsh) to 38 mg/L (Washington

County Lake). COD values for bottom waters ranged from 10 mg/L (Shovel Lake/Banner Marsh) to 45 mg/L (Avondale Lake).

Chlorophyll

All green plants contain chlorophyll *a*, which constitutes approximately 1 to 2 percent of the dry weight of plankton's algae (APHA, AWWA, and WEF, 1992). Other pigments that occur in phytoplankton include chlorophyll *b* and *c*, xanthophylls, phycobilius, and carotenes. The important chlorophyll degradation products in water are the chlorophyllides, pheophorbides, and pheophytines. The concentration of photosynthetic pigments is used extensively to estimate phytoplanktonic biomass. The presence or absence of the various photosynthetic pigments is used, among other features, to identify the major algal groups present in the water body.

In the 25 lakes studied, chlorophyll *a* ranged from 3.74 $\mu\text{g/L}$ (Strode Lake) to 73.82 $\mu\text{g/L}$ (Avondale Lake). Chlorophyll *b* ranged from 6.00 (Johnson Lake/Banner Marsh) to 16.74 $\mu\text{g/L}$ (Altamont New Reservoir). Seven lake waters contained no chlorophyll *c*, and the highest concentration (14.97 $\mu\text{g/L}$) was observed in Lake No. 3/FCCRA. Pheophytine *a* was found in only three lakes: Gladstone Lake (3.87 $\mu\text{g/L}$), Nashville City Reservoir (2.99 $\mu\text{g/L}$), and Oakland City Lake (0.39 $\mu\text{g/L}$).

Trophic State

Eutrophication is a normal process that affects every body of water from its time of formation. As a lake ages, the degree of enrichment from nutrient materials increases. In general, the lake traps a portion of the nutrients originating in the surrounding drainage basin. In addition, precipitation, dry fallout, and ground-water inflow are the other contributing sources.

A wide variety of indices of lake trophic conditions have been proposed in the literature. Indices have been based on Secchi disc transparency, nutrient concentrations, hypolimnetic oxygen depletion, and biological parameters, including chlorophyll *a*, species

abundance, and diversity. The USEPA suggests in its *Clean Lakes Program Guidance Manual* (1980) the use of four parameters as trophic indicators: Secchi disc transparency, concentrations of chlorophyll *a*, phosphorus, and carbon in water.

In addition, the lake trophic state index (TSI) developed by Carlson (1977) on the basis of Secchi disc transparency (SD), chlorophyll *a* (CHL), and surface water total phosphorus (TP) can be used to evaluate a lake's trophic state. The TSI number can be calculated from SD in meters (m), CHL in micrograms per liter ($\mu\text{g/L}$), and TP in $\mu\text{g/L}$ as follows:

$$\text{on the basis of SD,} \quad \text{TSI} = 60 - 14.41 \ln(\text{SD}) \quad (1)$$

$$\text{on the basis of CHL,} \quad \text{TSI} = 9.81 \ln(\text{CHL}) + 30.6 \quad (2)$$

$$\text{on the basis of TP,} \quad \text{TSI} = 14.42 \ln(\text{TP}) + 4.15 \quad (3)$$

Each increment of ten in the TSI represents a theoretical doubling of biomass in the lake. The advantages and disadvantages of the use of TSI were discussed by Hudson et al. (1990).

A TSI is derived from the average of three calculated results using formulas (1)-(3) for every monitored lake. It is used to define the trophic state of a lake as indicated in table 1, which is modified from Carlson (1977). The values of TSI and trophic state for 25 lakes are listed in table 2. Six lakes (Nashville City Reservoir, Washington County Lake, Avondale Lake, Oakland City Lake, Greenfield Lake, and Schuy-Rush Lake) are classified as hypereutrophic. A majority of the lakes (15) are eutrophic. The others (Johnson Lake/Banner Marsh, Fitch Lake, Shovel Lake, and Strode Lake) are mesotrophic. No lake included in this investigation can be considered oligotrophic. If based only on the SD calculation, however, Strode Lake ($\text{SD} = 186 \text{ inches} > \text{limit of } 157 \text{ inches}$) falls within the realm of the oligotrophic state.

Table 1. Quantitative Definition of Lake Trophic State

<i>Trophic state</i>	<i>Secchi disc transparency</i> (inches) (m)		<i>Chlorophyll a</i> ($\mu\text{g/L}$)	<i>Total phosphorus - lake surface</i> ($\mu\text{g/L}$)	<i>TSI</i>
Oligotrophic	>157	>4.0	<2.6	<12	<40
Mesotrophic	79-157	2.0-4.0	2.6-7.2	12-24	40-50
Eutrophic	20-79	0.5-2.0	7.2-55.5	24-96	50-70
Hypertrophic	<20	<0.5	>55.5	>96	>70

Table 2. Trophic State Index (TSI) and Trophic State for Lakes Assessed in 1992

	<i>Lake</i>	<i>TSI</i>	<i>Trophic state</i>
1.	Altamont New Reservoir	66	Eutrophic
2.	Anna State Hospital Lake	62	Eutrophic
3.	Avondale Lake	75	Hypereutrophic
4.	Lake Carlton	62	Eutrophic
5.	Coulterville Lake	60	Eutrophic
6.	Fitch Lake	48	Mesotrophic
7.	Gladstone Lake	53	Eutrophic
8.	Greenfield Lake	72	Hypereutrophic
9.	Johnson Lake/Banner Marsh	49	Mesotrophic
10.	Kinmundy City Lake	70	Eutrophic
11.	Levings Park Lagoon	65	Eutrophic
12.	Little Sister Lake	61	Eutrophic
13.	Nashville City Reservoir	82	Hypereutrophic
14.	Lake No. 3/FCCRA	58	Eutrophic
15.	Oakland City Lake	74	Hypereutrophic
16.	Ramsey Lake	69	Eutrophic
17.	Randolph County Lake	55	Eutrophic
18.	Reed City Lake	59	Eutrophic
19.	Schuy-Rush Lake	72	Hypereutrophic
20.	Shovel Lake/Banner Marsh	45	Mesotrophic
21.	Spring Lake	63	Eutrophic
22.	Storey Lake	54	Eutrophic
23.	Strode Lake	44	Mesotrophic
24.	Washington County Lake	77	Hypereutrophic
25.	Wheel Lake/Banner Marsh	65	Eutrophic

Notes:

<u>TSI</u>	<u>Trophic State</u>
<40	Oligotrophic
40-50	Mesotrophic
50-70	Eutrophic
>70	Hypereutrophic

SUMMARY

This report is a summary of all data collected in 1992 for 25 lakes. The data are presented in the form of individual listings and maps for each lake (Illustration A). Each lake summary contains a lake map, morphological data, watershed information, information on lake impairments and water quality problems, analytical results of lake water and sediment qualities, and the lake trophic status. Only the results of physical and chemical characteristics of lake water samples are discussed in this report. On the basis of only one observation for each lake, it is concluded that four lakes (Strode, Shovel Lake/Banner Marsh, Fitch Lake, and Johnson Lake/Banner Marsh) have the highest water quality. Four other lakes, (Nashville City Reservoir, Avondale Lake, Oakland City Lake, and Greenfield Lake) have poor water quality yet serve as public water-supply sources. Further investigations of these four lakes with poor water quality is recommended.

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Illustration A. Lake Assessment Information and Water and Sediment Quality Data for 25 Illinois Lakes

Abbreviations

Under "Usages and Impoundments":

- (1), (2), (3), (4): from low to high level of use
- P: potential for increased use
- I: increasing trend of use
- D: decreasing trend of use

Under "Usages and Impoundments", "Water Quality Problems", and "Causes of Quality Problems":

- M/N: minimal/none
- S: slight
- M: moderate
- H: high or substantial

Under "lake trophic status":

- O: oligotrophic
- M: mesotrophic
- E: eutrophic
- H: hypereutrophic

Under others:

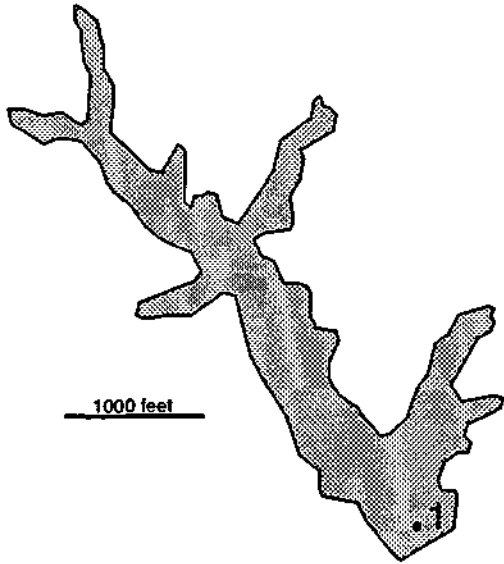
- WTP: Wastewater treatment plant
- IDOT: Illinois Department of Transportation
- IDOH: Illinois Department of Health
- CMS: Central Management Services
- CRP: conservation reserve program
- FSA: Food Security Act
- USDA: United States Department of Agriculture
- WRDGC: Water Reclamation District of Greater Chicago

Altamont New Reservoir

Effingham County Map Code: RCJ

City Hall
202 N. Second, Altamont, IL 62411
618/483-5212

General



Lake Location	4 miles SE of Altamont	
Deepest Point	Latitude	39°01'54"
	Longitude	88°42'48"
Lake Surface Area, acres	60.0	
Length of Shoreline, miles	2.1	
Maximum Depth, feet	29	
Average Depth, feet	17	
Lake Storage Capacity, acre-feet	1020	
Watershed Drainage Area, acres	620	
Hydraulic Retention Time, years	1.976	
Lake Type	Dammed stream	
Year Constructed	1972	
Ownership	Public	
Inflowing Streams	Turkey Creek	
Outflowing Streams	Turkey Cr. to Little Wabash	
Unique Features	-	

Usages and Impairments

Public Access Yes
Entire lake bottom publicly owned and entire shoreline public access, unlimited free access

No. of Visitors per Year <25,000
Designated Uses and Impairments

Aquatic life	M
Domestic water supply	S
General recreation	S

Non-recreational Lake Usage
Potable water supply - (4),P

Recreational Lake Usage

Fishing - (3)
Low power boating - (4)

Recreational Facilities

One boat ramp

Shoreline Usage, %

Woodland 100

Watershed Drainage Area Usage, %

Residential	3
Cropland	30
Woodland, hayland	67

Water Quality Problems

Problems

Suspended sediment	M
Sediment deposition	H
Algal blooms	H
Water level fluctuation	H

Differences in Turbidity and Water Quality

In different portions of lake? No
At different times of the year? No

Fishing

Major Types of Fish

Catfish, bass, crappie, and bluegill

Causes of Quality Problems

Potential Pollution Sources
Runoff (cropland, pasture, woodland), septic tanks, erosion (streambank, shoreline), sediment in lake

Causes of Impairment

Unknown toxicity	S
Nutrients	M
Siltation	M

Sources of Impairment

Agriculture	H
Nonirrigated crop production	H

Altamont New Reservoir

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	50 - 70 % hayland	Required by City to protect the lake (via written agreement)
	30% cropland at upper end of watershed	

Comments:

Through written agreement with the City of Altamont and the landowners in the watershed, no chemicals are used in the watershed to protect the lakes.

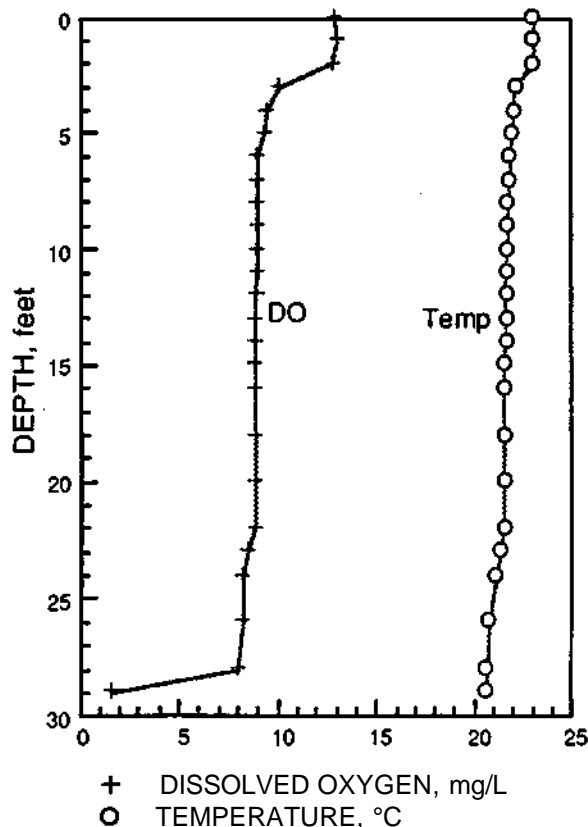
Water and Sediment Qualities

Sampling Date	06/22/92
Site Number	1
Water Depth of Site, feet	29
Secchi Disc Transparency, inches	27
Chlorophyll a, µg/L	41.83
Chlorophyll b, µg/L	16.74
Chlorophyll c, µg/L	0.57
Pheophytin a, µg/L	0.00
Trophic State Index	66
Trophic State	Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	277
Total Suspended Solids, mg/L	22	124
Volatile Suspended Solids, mg/L	14	24
Turbidity, NTU	2.8	17
NO ₂ NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	0.5	0.09
Total Kjeldahl Nitrogen, mg/L	1.1	1.4
Total Phosphorus, mg/L	0.070	0.131
Dissolved Phosphorus, mg/L	0.060	0.022
Alkalinity, mg CaCO ₃ /L		
Total	79	63
Phenolphthalein	31	8
Field pH	9.2	8.6
Chemical Oxygen Demand, mg/L	25	29

DO & Temperature Profiles (Time, 15:40)



Sediment Quality

(mg/kg; ppm, K: less than detection value)

Phosphorus-P, ppm	572
Kjeldahl-N, ppm	629
Solids, % wet	62.9
Vol. solids, %	3.0
TOC, %	-
Arsenic, ppm	5.3
Barium, ppm	81
Cadmium, ppm	1K
Chromium, ppm	10
Copper, ppm	54
Iron, ppm	14000
Lead, ppm	13
Manganese, ppm	669
Mercury, ppm	0.02
Nickel, ppm	10
Potassium, ppm	1000K
Silver, ppm	1K
Zinc, ppm	38

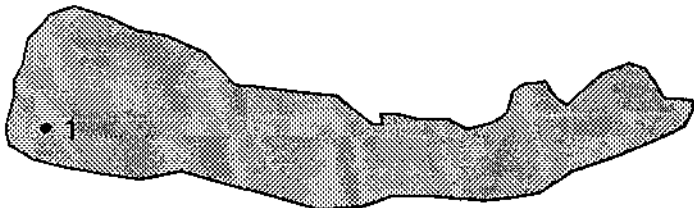
Anna State Hospital Lake

Union County

Map Code: RIC

Business Administrator, ASH
1000 N. Main St., Anna, IL 62906
618/833-5161

General



Lake Location	2 miles W of Anna
Deepest Point	Latitude 38°28'18"
	Longitude 89°17'48"
Lake Surface Area, acres	24.5
Length of Shoreline, miles	1.2
Maximum Depth, feet	19
Average Depth, feet	9
Lake Storage Capacity, acre-feet	221
Watershed Drainage Area, acres	500
Hydraulic Retention Time, years	0.379
Lake Type	Dammed stream
Year Constructed	1936
Ownership	State
Inflowing Streams	Green Creek
Outflowing Streams	Green Creek
Unique Features	

Water supply source for Anna-Johnsboro Water Commission, but abandoned 4 years ago. The state has declared the WTP and lake as surplus. IDOT wants IDOH to rectify dam safety inspection deficiencies, and CMS will not proceed unless the deficiencies are rectified.

Usages and Impairments

Public Access Yes
Entire lake bottom publicly owned and entire shoreline public access, unlimited free access

No. of Visitors per Year <25,000

Designated Uses and Impairments

General recreation	S
Aquatic life	S

Non-recreational Lake Usage
None

Recreational Lake Usage

Fishing - (4)
Low power boating - (2)

Recreational Facilities

One boat ramp

Shoreline Usage, %

Pasture	10
Woodland	90

Watershed Drainage Area Usage, %

Cropland	30
Pasture	20
Woodland	50

Water Quality Problems

Problems

Suspended sediment	S
Sediment deposition	S
Algal blooms	S
Aquatic macrophytes	MN
Taste/odor	S
Fishkills	MN

Differences in Turbidity and Water Quality

In different portions of lake?	No
At different times of the year?	No

Fishing

Fair

Major Types of Fish

Largemouth bass, warmouth, bluegill, green sunfish, longear, crappie, bullhead

Causes of Quality Problems

Potential Pollution Sources
Urban storm drainage

Causes of Impairment

Siltation	M
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Sources of Impairment

Urban nonpoint	M
Agriculture	S

Anna State Hospital Lake

Lake Protection Management

Treatment Date Type and Extent of Treatment Reason for Treatment

Comments:

The watershed is under good protection. Most of the crop fields are being converted under the Conservation Reserve Program, i.e. pasture/hayland/residential purposes. Approximately 60% of the watershed is in forest or secondary succession moving towards a forest condition.

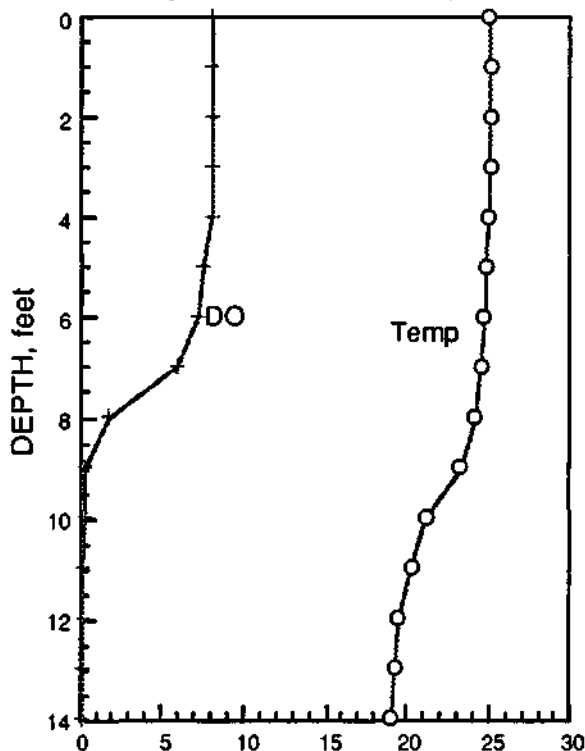
Water and Sediment Qualities

Sampling Date		08/05/92
Site Number		1
Water Depth of Site, feet		14
Secchi Disc Transparency, inches		38
Chlorophyll a, µg/L		30.26
Chlorophyll b, µg/L		5.22
Chlorophyll c, µg/L		0.00
Pheophytin a, µg/L		0.00
Trophic State Index		62
Trophic State		Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	12
Total Suspended Solids, mg/L	8	23
Volatile Suspended Solids, mg/L	4	12
Turbidity, NTU	4.2	4.3
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	0.35	0.029
Total Kjeldahl Nitrogen, mg/L	0.9	1.5
Total Phosphorus, mg/L	0.051	0.102
Dissolved Phosphorus, mg/L	0.019	0.030
Alkalinity, mg CaCO ₃ /L		
Total	90	90
Phenolphthalein	11	0
Field pH	8.7	7.3
Chemical Oxygen Demand, mg/L	22	27

DO & Temperature Profiles (Time, 11:30)



+ DISSOLVED OXYGEN, mg/L
 O TEMPERATURE, °C

Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	1308
Kjeldahl-N, ppm	2790
Solids, % wet	27.1
Vol. solids, %	10.8
TOC, %	-
Arsenic, ppm	10.6
Barium, ppm	319
Cadmium, ppm	1
Chromium, ppm	25
Copper, ppm	111
Iron, ppm	43000
Lead, ppm	41
Manganese, ppm	1900
Mercury, ppm	0.10
Nickel, ppm	30
Potassium, ppm	1600
Silver, ppm	1K
Zinc, ppm	120

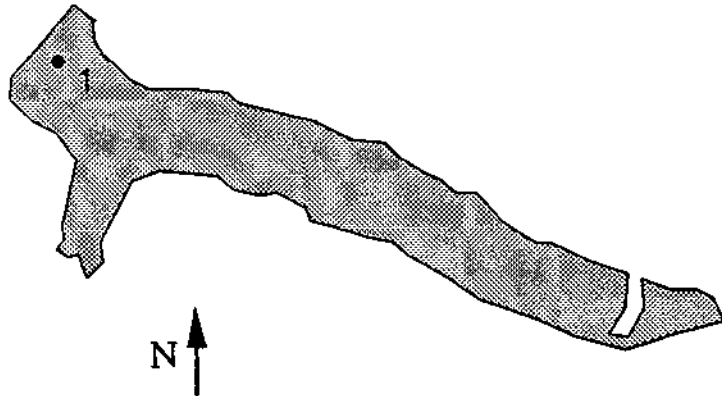
Avondale Lake

Fulton County

Map Code: RDD

Town of Avon
Box 77, Avon, IL 61415
309/465-3425

General



Lake Location	0.5 miles E of Avon
Deepest Point	Latitude 40°37'46"
	Longitude 90°25'20"
Lake Surface Area, acres	23.8
Length of Shoreline, miles	1.2
Maximum Depth, feet	11.0
Average Depth, feet	7.5
Lake Storage Capacity, acre-feet	178
Watershed Drainage Area, acres	1650
Hydraulic Retention Time, years	-
Lake Type	Dammed stream
Year Constructed	-
Ownership	Public
Inflowing Streams	Unnamed Creek
Outflowing Streams	Galley Creek
Unique Features	

The lake was used as a water supply source until about 1980. The WTP is abandoned. The sources now are three wells 3 miles east of town.

Usages and Impairments

Public Access Yes

Entire lake bottom publicly owned, entire shoreline public access, swimming from 1 to 7 pm. Daily fishing fee (rod and reel) for non-members, campers and members (\$60 annual family fee) are free, only trolling motors allowed

No. of Visitors per Year <25,000

Designated Uses and Impairments

Aquatic life	M
General recreation	M
Primary contact	M

Non-recreational Lake Usage

None

Recreational Lake Usage

Fishing - (3)	No power boating - (3)
Swimming - (3)	Low power boating - (3)
Camping - (3)	Waterfowl observation - (2)
Picnicking - (3)	

Recreational Facilities

Park, picnic area, swimming beach, camping facilities", concession stand

*Draw people from Cuba, Bushnell & Peoria

Shoreline Usage, %

Residential	49
Woodland	50
Recreation development	1

Watershed Drainage Area Usage, %

Cropland	84
Pasture or grassland	14
Woodland	1
Recreation development	1

Water Quality Problems

Problems

Suspended sediment	M
Algal blooms	H
Aquatic macrophytes	MN
Water level fluctuation	S
Fishkills	MN

Differences in Turbidity and Water Quality

In different portions of lake?	No
At different times of the year?	Yes

Fishing

Good

Major Types of Fish

Largemouth bass, catfish, crappie, bluegill, flathead catfish, some bullheads, carp, lake has not been stocked in ten years

Causes of Quality Problems

Potential Pollution Sources

Runoff (cropland, pasture/grassland, and woodland), lawn/camp site, sediment in lake, waterfowl, and rough fish

Causes of impairment

Nutrients from farmlands	M
Siltation	M
Thermal modification	M

Sources of Impairment

Agriculture	M
Pasture	S
Waterfowl	S
Herbicide/algicide application*	S

* 50 lbs of CuSO₄ applied twice a year to control algae.

Avondale Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	Terraces, linear ft	35,000
	Grass waterways, acre	70
	Grade stabilization structure	10
	Pond	1
	Diversions, linear ft	3,000

Comments:

Tillage, %			
No-till	20	Chisel or disc till	5
Mulch-till	40	Woodland	1
Moldboard plow	20	Hayland or pasture	14

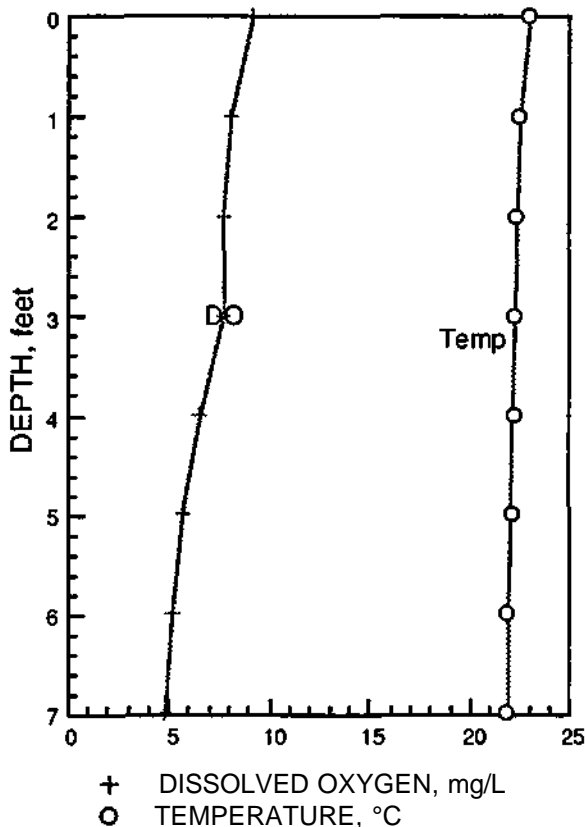
Water and Sediment Qualities

Sampling Date	07/08/92
Site Number	1
Water Depth of Site, feet	7
Secchi Disc Transparency, inches	14
Chlorophyll a, µg/L	73.82
Chlorophyll b, µg/L	6.54
Chlorophyll c, µg/L	0.04
Pheophytin a, µg/L	0.00
Trophic State Index	75
Trophic State	Hypereutrophic

Water Quality (K: less than detection value)

Depth, feet	1	5
Total Suspended Solids, mg/L	35	64
Volatile Suspended Solids, mg/L	16	20
Turbidity, NTU	20	25
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	0.07	0.21
Total Kjeldahl Nitrogen, mg/L	1.3	1.0
Total Phosphorus, mg/L	0.150	0.159
Dissolved Phosphorus, mg/L	0.024	0.029
Alkalinity, mg CaCO ₃ /L		
Total	112	116
Phenolphthalein	8	1K
Field pH	8.5	8.3
Chemical Oxygen Demand, mg/L	35	45

DO & Temperature Profiles (Time, 10:30)



Sediment Quality

(mg/kg: ppm, K: less than detection value)

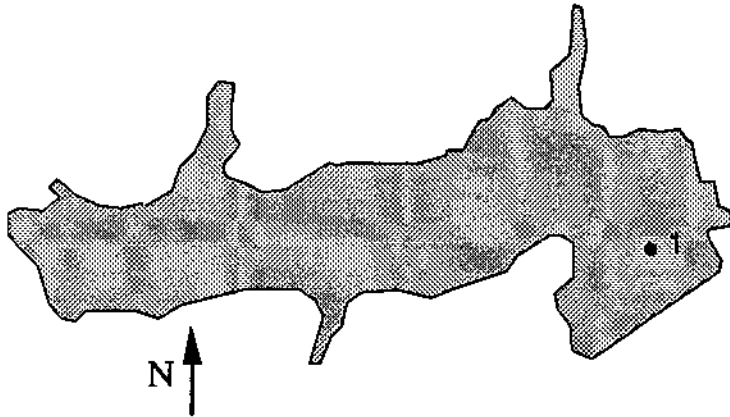
Phosphorus-P, ppm	812
Kjeldahl-N, ppm	2540
Solids, % wet	33.9
Vol. solids, %	8.3
TOC, %	-
Arsenic, ppm	9.4
Barium, ppm	239
Cadmium, ppm	1
Chromium, ppm	23
Copper, ppm	50
Iron, ppm	31000
Lead, ppm	31
Manganese, ppm	861
Mercury, ppm	0.09
Nickel, ppm	24
Potassium, ppm	1800
Silver, ppm	1K
Zinc, ppm	100

Lake Carlton

Whiteside County Map Code: RPF

IL Dept. of Conservation
1870 Lake Road, Morrison, IL 61270
815/772-4708

General



Lake Location	3 miles N. of Morrison	
Deepest Point	Latitude	41°50'36"
	Longitude	89°57'42"
Lake Surface Area, acres	75.4	
Length of Shoreline, miles	2.9	
Maximum Depth, feet	27	
Average Depth, feet	10.9	
Lake Storage Capacity, acre-feet	822	
Watershed Drainage Area, acres	1416	
Hydraulic Retention Time, years	0.871	
Lake Type	Dammed stream	
Year Constructed	1969	
Ownership	State	
Inflowing Streams	Unnamed	
Outflowing Streams	Unnamed to Rock Creek	
Unique Features	State park	

Usages and Impairments

Public Access Yes

Entire lake bottom publicly owned and entire shoreline public access, unlimited free access, camping, horse trail, equestrian camping, hiking trails, ice fishing

No. of Visitors per Year >200,000

Designated Uses and Impairments

Aquatic life H
General recreation H

Non-recreational Lake Usage

None

Recreational Lake Usage

Fishing - (4) Low power boating - (4)
Camping - (4) Picnicking - (4)
Sailboating - (1) Waterfowl observation - (4)

Recreational Facilities

One boat ramp, boat rental, park, concession stand

Shoreline Usage, %

Woodland 45
Recreation development 55

Watershed Drainage Area Usage, %

Cropland 59
Pasture 19
Woodland 22

Water Quality Problems

Problems

Suspended sediment S
Sediment deposition M
Algal blooms S
Aquatic macrophytes M
Water level fluctuation S
Fishkills, taste/odor MN

Differences in Turbidity and Water Quality

In different portions of lake? No
At different times of the year? Yes

Fishing

Excellent

Major Types of Fish

Bluegill, crappie, bass, catfish

* Cattail bed at NE end of the lake, macrophytes all along the shoreline covered with filamentous algae.

Causes of Quality Problems

Potential Pollution Sources

Runoff (cropland, pasture/grassland)

Causes of Impairment

Siltation S
Thermal modification M
Noxious aquatic plant S

Sources of Impairment

Nonpoint sources S
Nonirrigated crop production S

Lake Carlton

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
1977	Terraces, linear ft	2000
	Grass Waterways, acres	1616
	Grade stab. structures	2
	Pond	1

Comments:

Tillage. %		
No-till	7	Chisel or disc till 22
Mulch-till	23	Hayland or pasture 2.6
Woodland	14.8	Park 30.6

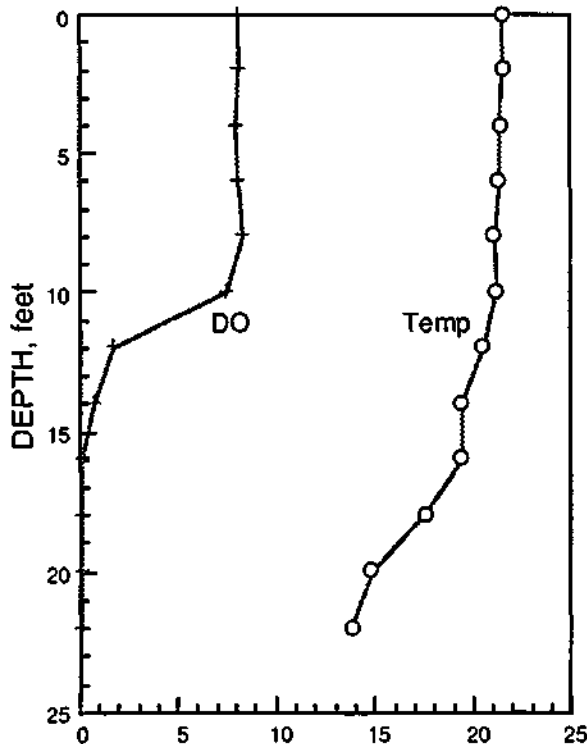
Water and Sediment Qualities

Sampling Date	07/07/92
Site Number	1
Water Depth of Site, feet	22
Secchi Disc Transparency, inches	40
Chlorophyll a, µg/L	39.52
Chlorophyll b, µg/L	3.14
Chlorophyll c, µg/L	2.10
Pheophytin a, µg/L	0.00
Trophic State Index	62
Trophic State	Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	20
Total Suspended Solids, mg/L	5	28
Volatile Suspended Solids, mg/L	4	16
Turbidity, NTU	4.7	2.8
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	0.01	1.1
Total Kjeldahl Nitrogen, mg/L	0.9	1.8
Total Phosphorus, mg/L	0.044	0.483
Dissolved Phosphorus, mg/L	0.016	0.480
Alkalinity, mg CaCO ₃ /L		
Total	161	220
Phenolphthalein	16	0
Field pH	8.9	7.6
Chemical Oxygen Demand, mg/L	21	20

DO & Temperature Profiles (Time, 15:00)



+ DISSOLVED OXYGEN, mg/L
 O TEMPERATURE, °C

Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	478
Kjeldahl-N, ppm	3720
Solids, % wet	23.8
Vol. solids, %	8.4
TOC, %	-
Arsenic, ppm	9.7
Barium, ppm	203
Cadmium, ppm	1K
Chromium, ppm	20
Copper, ppm	35
Iron, ppm	25000
Lead, ppm	26
Manganese, ppm	844
Mercury, ppm	0.04
Nickel, ppm	24
Potassium, ppm	1300
Silver, ppm	1K
Zinc, ppm	92

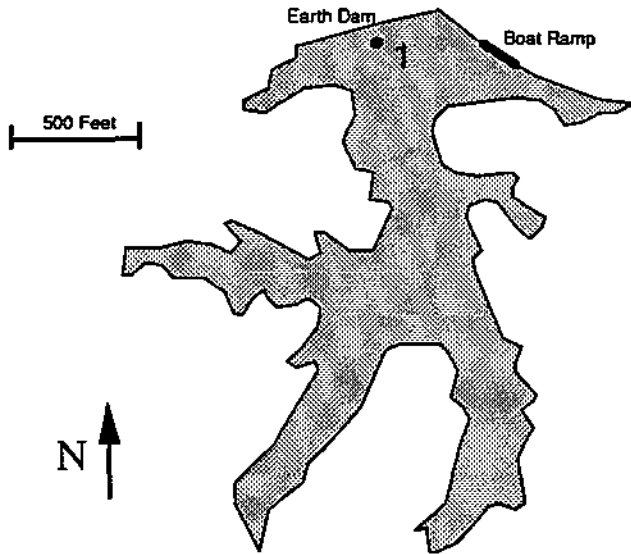
Coulterville Lake

Randolph County

Map Code: ROV

Village of Coulterville
P.O. Box 412, Coulterville, IL 62237
618/758-2813

General



Lake Location	1.5 miles N of Coulterville	
Deepest Point	Latitude	38°12'12"
	Longitude	89°37'12"
Lake Surface Area, acres	23.6	
Length of Shoreline, miles	2.3	
Maximum Depth, feet	19	
Average Depth, feet	7.6	
Lake Storage Capacity, acre-feet	179	
Watershed Drainage Area, acres	781	
Hydraulic Retention Time, years	0.25	
Lake Type	Dammed stream	
Year Constructed	1939	
Ownership	Public	
Inflowing Streams	Unnamed	
Outflowing Streams	Unnamed	
Unique Features		

Destratifier installed in April 1989 was down at time of this survey (since 7/31/92).

Usages and Impairments

Public Access Yes
Entire lake bottom publicly owned and entire shoreline public access, unlimited free access

No. of Visitors per Year <25,000

Designated Uses and Impairments

Aquatic life	S
Domestic water supply	S
Industry	S
General recreation	S

Non-recreational Lake Usage
Potable water supply - (4)
Industrial water supply - (4)

Recreational Lake Usage

Fishing - (3)
Low power boating - (3), 10hp max.

Recreational Facilities

One boat ramp, park, camping facilities, picnic area

Shoreline Usage, %

Pasture	23
Woodland	75
Water treatment plant and lake road	2

Watershed Drainage Area Usage, %

Cropland	10
Pasture	20
Woodland	70

Water Quality Problems

Problems

Suspended sediment	M
Sediment deposition	M
Algal blooms	S
Aquatic macrophytes	S
Taste/odor	MN
Water level fluctuation	M
Fishkills	MN

Differences in Turbidity and Water Quality

In different portions of lake? Yes
At different times of the year? Yes

Fishing Good

Major Types of Fish

Channel catfish, largemouth bass, crappies, bluegill (lake stocked yearly with catfish and bass, and was stocked with 76 triploid carp in 1988 and 40 in 1992)

Causes of Quality Problems

Potential Pollution Sources
Runoff (cropland, pasture, & woodland), sediment in lake

Causes of Impairment

Suspended solids	M	Siltation	M
Noxious aquatic plants	S	Nutrients	M

Sources of Impairment

Agriculture	M
Pasture	S

Coulterville Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment		Reason for Treatment
07/92	No-till	20%	Erosion control, economics
07/92	Chisel/disc (<30% residue)	65%	
07/92	Crop rotation (wheat)	15%	Erosion control and pest control
07/92	Grass waterway	3300 ft	Erosion control

Comments:

No-till was used on about 50% of the corn in the watershed but not on soybeans. Two livestock operations are located within the watershed.

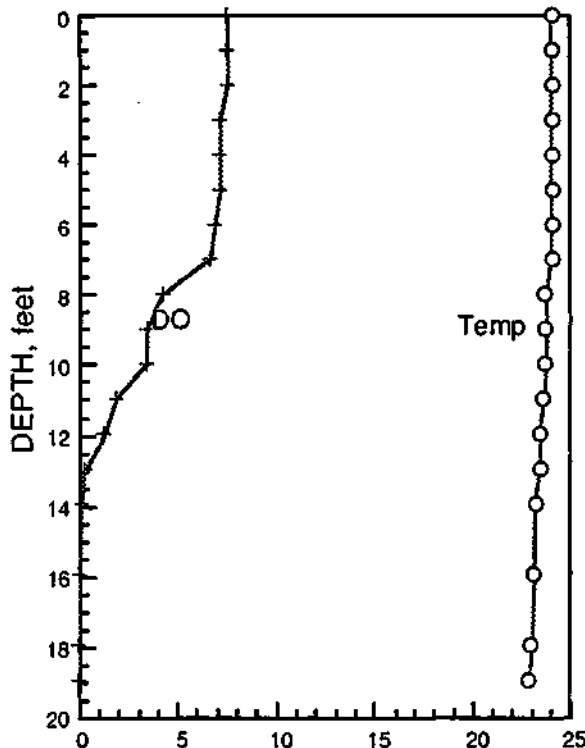
Water and Sediment Qualities

Sampling Date		08/04/92
Site Number		1
Water Depth of Site, feet		19
Secchi Disc Transparency, inches		70
Chlorophyll a, µg/L		16.43
Chlorophyll b, µg/L		1.68
Chlorophyll c, µg/L		0.00
Pheophytin a, µg/L		0.00
Trophic State Index		60
Trophic State		Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	17
Total Suspended Solids, mg/L	4	32
Volatile Suspended Solids, mg/L	2	10
Turbidity, NTU	1.7	5.8
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.1K
Ammonia Nitrogen, mg/L	0.10	0.46
Total Kjeldahl Nitrogen, mg/L	0.8	1.1
Total Phosphorus, mg/L	0.089	0.204
Dissolved Phosphorus, mg/L	0.062	0.135
Alkalinity, mg CaCO ₃ /L		
Total	55	59
Phenolphthalein	0	0
Field pH	7.9	7.1
Chemical Oxygen Demand, mg/L	24	28

DO & Temperature Profiles (Time, 09:00)



+ DISSOLVED OXYGEN, mg/L
 O TEMPERATURE, °C

Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	1643
Kjeldahl-N, ppm	3720
Solids, % wet	27.1
Vol. solids, %	12.2
TOC, %	-
Arsenic, ppm	7.6
Barium, ppm	287
Cadmium, ppm	1
Chromium, ppm	20
Copper, ppm	482
Iron, ppm	32000
Lead, ppm	43
Manganese, ppm	1800
Mercury, ppm	0.1K
Nickel, ppm	21
Potassium, ppm	1900
Silver, ppm	1K
Zinc, ppm	100

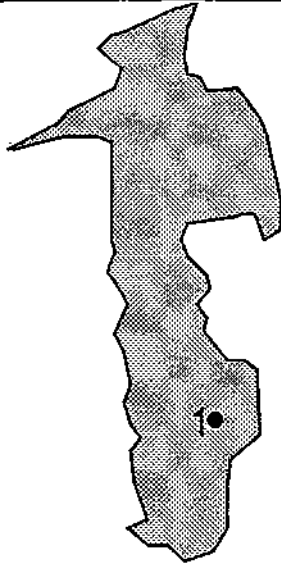
Fitch Lake

Fulton County

Map Code: UDL

Canton Park District
 250 S. Avenue D, Canton, IL 61520
 309/647-1345

General



Lake Location	1 mile NW of Canton
Deepest Point	Latitude 40°34'16"
	Longitude 90°02'59"
Lake Surface Area, acres	38.2
Length of Shoreline, miles	1.87
Maximum Depth, feet	16
Average Depth, feet	13.4
Lake Storage Capacity, acre-feet	447
Watershed Drainage Area, acres	750
Hydraulic Retention Time, years	-
Lake Type	Coal strip-mine
Year Constructed	1965 and reclaimed in 1975
Ownership	Public
Inflowing Streams	-
Outflowing Streams	Big Creek
Unique Features	-

Usages and Impairments

Public Access Yes

Entire lake bottom publicly owned and entire shoreline public access, unlimited free access, daily fees for boating (\$.50/residents, \$1/non-residents), fishing (\$2/rod/residents, \$3/rod/non-residents)

No. of Visitors per Year >25,000 to < 100,000

Designated Uses and Impairments

Aquatic life	S
Cold water fishery	S
General recreation	S

Non-recreational Lake Usage

Agricultural water supply - (2)
 Irrigation - (2)

Recreational Lake Usage

Fishing - (4), P,I Low power boating - (4), P,I
 Sailboating - (1),P,I Picnicking - (3), P,I
 Waterfowl observation - (3), P,I

Recreational Facilities

One boat ramp, concession stand, park, picnic area, playground, and bicycle trail. Two more miles of bicycle trails being constructed (total 5.5 miles). Park area is 450 acres total with five lakes.

Shoreline Usage, %

Pasture	90
Wetland	10

Watershed Drainage Area Usage, %

Pasture	70
Recreation development	30

Water Quality Problems

Problems

Suspended sediment	MN
Sediment deposition	S
Algal blooms	S
Aquatic macrophytes	S
Taste/odor	MN
Water level fluctuation	S
Fishkills	S

Differences in Turbidity and Water Quality

In different portions of lake? No
 At different times of the year? No

Fishing

Excellent

Major Types of Fish

Northern pike, tiger muskie, largemouth bass, hybrid white bass, channelcat, bullhead, bluegill, redear sunfish, white and black crappie, walleye, green sunfish, (triploid grass carp stocked)

Causes of Quality Problems

Potential Pollution Sources

Runoff (cropland & pasture), mining, livestock operations - grazing, shoreline erosion, waterfowl

Causes of Impairment

Nutrients	S
Siltation	S

Sources of Impairment

Nonpoint source	S
Pasture	S
Waterfowl	M

Fitch Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	Tillage, %	
	Hayland or pasture	95
	Others	5

Comments:

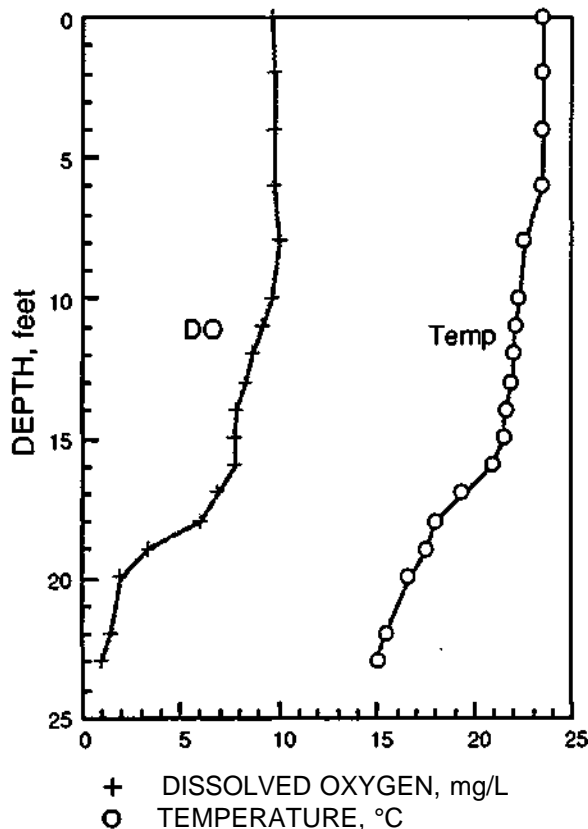
Water and Sediment Qualities

Sampling Date		07/09/92
Site Number		1
Water Depth of Site, feet		23
Secchi Disc Transparency, inches		143
Chlorophyll a, µg/L		12.71
Chlorophyll b, µg/L		2.14
Chlorophyll c, µg/L		0.73
Pheophytin a, µg/L		0.00
Trophic State Index		48
Trophic State		Mesotrophic

Water Quality (K: less than detection value)

Depth, feet	1	21
Total Suspended Solids, mg/L	2	10
Volatile Suspended Solids, mg/L	1	2
Turbidity, NTU	0.1	3
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.02
Ammonia Nitrogen, mg/L	0.06	0.02
Total Kjeldahl Nitrogen, mg/L	0.5	0.57
Total Phosphorus, mg/L	0.021	0.016
Dissolved Phosphorus, mg/L	-	0.005
Alkalinity, mg CaCO ₃ /L		
Total	132	134
Phenolphthalein	12	8
Field pH	8.9	8.8
Chemical Oxygen Demand, mg/L	16	15

DO & Temperature Profiles (Time, 14:30)



Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	402
Kjeldahl-N, ppm	884
Solids, % wet	48.2
Vol. solids, %	4.7
TOC, %	-
Arsenic, ppm	4.9
Barium, ppm	110
Cadmium, ppm	1K
Chromium, ppm	22
Copper, ppm	19
Iron, ppm	26000
Lead, ppm	14
Manganese, ppm	610
Mercury, ppm	0.04
Nickel, ppm	28
Potassium, ppm	1300
Silver, ppm	1K
Zinc, ppm	79

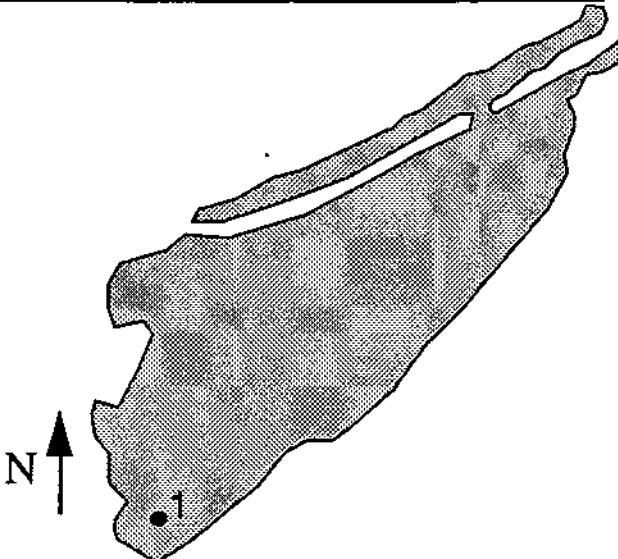
Gladstone Lake

Henderson County

Map Code: RLD

Big River State Forest (IDOT)
RR1, Box 119, Keithsburg, IL 61442
309/374-2496

General



Lake Location	1 mile SW of Gladstone
Deepest Point	Latitude 40°51'15"
	Longitude 90°58'44"
Lake Surface Area, acres	27
Length of Shoreline, miles	1.47
Maximum Depth, feet	14
Average Depth, feet	11.6
Lake Storage Capacity, acre-feet	313
Watershed Drainage Area, acres	82
Hydraulic Retention Time, years	0.531
Lake Type	Sand or gravel quarry
Year Constructed	-
Ownership	State
Inflowing Streams	-
Outflowing Streams	-
Unique Features	

A long narrow island and underwater sand ridge divide the lake into a 3.5-acre north bay and 23.5-acre south bay.

Usages and Impairments

Public Access	Yes
Entire lake bottom publicly owned, entire shoreline public access, unlimited free access.	
No. of Visitors per Year	<25,000
Designated Uses and Impairments	
General recreation	S
Aquatic life	S
Non-recreational Lake Usage	
None	

Recreational Lake Usage	
Fishing - (2)	
Low power boating - (2)	
Camping - (2)	
Picnicking - (1)	
Recreational Facilities	
Boat ramp, camping facilities (36 sites), picnic areas (3 sites)	
Shoreline Usage, %	
Recreation development	99
Woodland	1
Watershed Drainage Area Usage, %	
Recreation development	100

Water Quality Problems

Problems	
Suspended sediment	MN

Differences in Turbidity and Water Quality	
In different portions of lake?	Yes
At different times of the year?	Yes
Fishing	Good
Major Types of Fish	
Bluegill, largemouth bass, warmouth, channel catfish, white and black crappie, blue and yellow bullhead, green sunfish	

Causes of Quality Problems

Potential Pollution Sources	
Grassland runoff	

Causes of Impairment	
Suspended solids	H
Filling and draining	S
Sources of Impairment	
Nonpoint sources	S
Agriculture	S

Gladstone Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	N/A	

Comments:

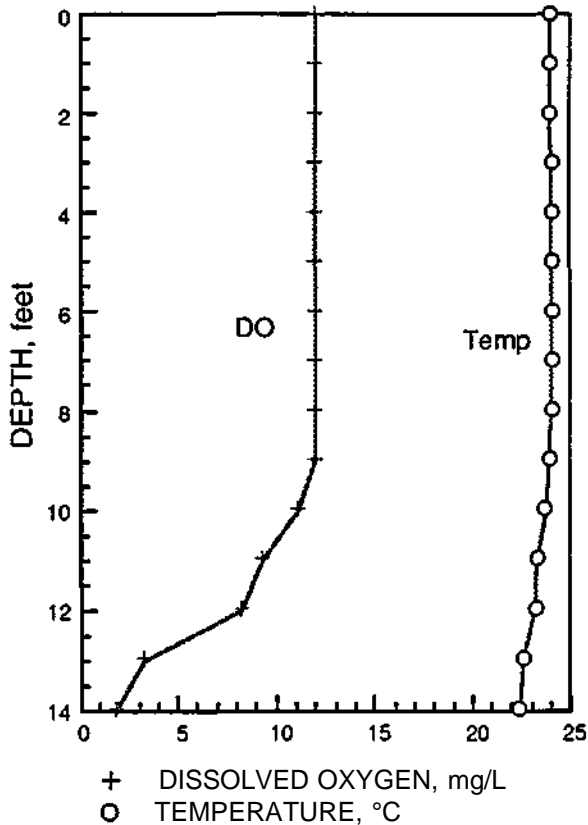
Water and Sediment Qualities

Sampling Date		08-12-92
Site Number		1
Water Depth of Site, feet		14
Secchi Disc Transparency, inches		102
Chlorophyll a, µg/L		40.05
Chlorophyll b, µg/L		11.67
Chlorophyll c, µg/L		0.65
Pheophytin a, µg/L		3.87
Trophic State Index		53
Trophic State		Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	12
Total Suspended Solids, mg/L	4	6
Volatile Suspended Solids, mg/L	3	4
Turbidity, NTU	0.3	1
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.03
Ammonia Nitrogen, mg/L	0.01K	0.03
Total Kjeldahl Nitrogen, mg/L	0.9	0.8
Total Phosphorus, mg/L	0.018	0.031
Dissolved Phosphorus, mg/L	0.008	0.012
Alkalinity, mg CaCO ₃ /L		
Total	87	83
Phenolphthalein	24	8
Field pH	9.4	8.6
Chemical Oxygen Demand, mg/L	19	20

DO & Temperature Profiles (Time, 10:00)



Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	158
Kjeldahl-N, ppm	81
Solids, % wet	74.1
Vol. solids, %	0.6
TOC, %	-
Arsenic, ppm	0.5
Barium, ppm	11
Cadmium, ppm	1K
Chromium, ppm	3
Copper, ppm	5
Iron, ppm	3700
Lead, ppm	10K
Manganese, ppm	164
Mercury, ppm	0.1K
Nickel, ppm	8
Potassium, ppm	1000K
Silver, ppm	1K
Zinc, ppm	13

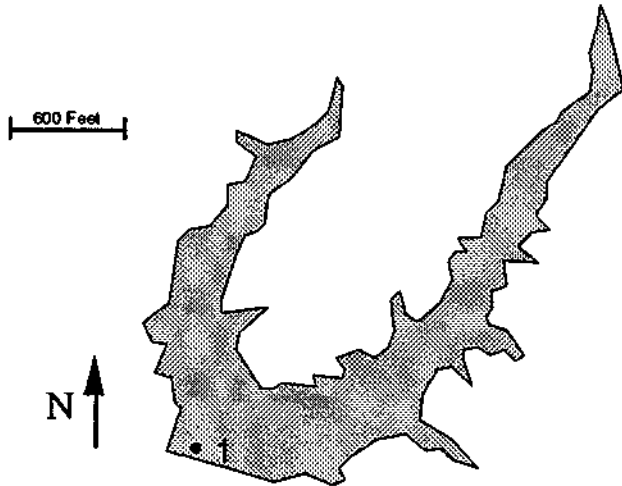
Greenfield Lake

Greene County

Map Code: RDF

City of Greenfield
P.O. Box 237, Greenfield, IL 62044
217/368-2137

General



Lake Location	1 mile E. of Greenfield	
Deepest Point	Latitude	30°20'24"
	Longitude	90°12'00"
Lake Surface Area, acres	58.8	
Length of Shoreline, miles	10.2	
Maximum Depth, feet	20.0	
Average Depth, feet	10.2	
Lake Storage Capacity, acre-feet	600	
Watershed Drainage Area, acres	833	
Hydraulic Retention Time, years	0.96	
Lake Type	Dammed stream	
Year Constructed	1959	
Ownership	Public	
Inflowing Streams	Unnamed creek	
Outflowing Streams	Tributary to Rubicon Creek	
Unique Features	Destratifier was installed in 1989.	

Usages and Impairments

Public Access Yes
Entire lake bottom publicly owned and entire shoreline public access, unlimited free access, speed limit is 6 mph (no power limit)

No. of Visitors per Year <25,000

Designated Uses and Impairments

Aquatic life	S
Potable water supply	M
General recreation	S

Non-recreational Lake Usage
Potable water supply - (4), P,I

Recreational Lake Usage

- Fishing - (3)
- Low power boating - (3)
- Camping - (3)
- Picnicking - (3)

Recreational Facilities

One boat ramp, camping facilities, concession stand, park, picnic area (lake is used heavily for fishing and camping (20 hook-ups))

Shoreline Usage, %

Cropland	20
Pasture or grassland	70
Woodland	10

Watershed Drainage Area Usage, %

Cropland	70
Pasture	29
Recreation Development	1

Water Quality Problems

Problems

Suspended sediment	M
Sediment deposition	M
Algal blooms	M
Aquatic macrophytes	M
Taste/odor	MN
Water level fluctuation	S
Fishkills	MN

Differences in Turbidity and Water Quality

- In different portions of lake? Yes
- At different times of the year? Yes

Fishing

Good

Major Types of Fish

Catfish, bluegill, bass, crappie (lake stocked annually with catfish, 2900 fingerlings stocked in June 1992)

Causes of Quality Problems

Potential Pollution Sources
Runoff (feedlot, cropland, & pasture), livestock operation, sediment in lake

Causes of Impairment

Nutrients	M
Siltation	M
Noxious aquatic plants	M

Sources of Impairment

Nonpoint sources	M
Agriculture	M
Pasture	M

Greenfield Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
8/85-4/87	Terrace, ft 15,685	Erosion control
	Grassed waterway, acre 1	
	Grade stabilization structure 5	
	Field border strip, ft 1350	
	Permanent vegetative cover, acre 85	
	Tree planting, acre 1	
	Ponds 5	

Comments:

Tillage, %	
Mulch till with 30% residue or more	65
Mulch till with less than 30% residue	35

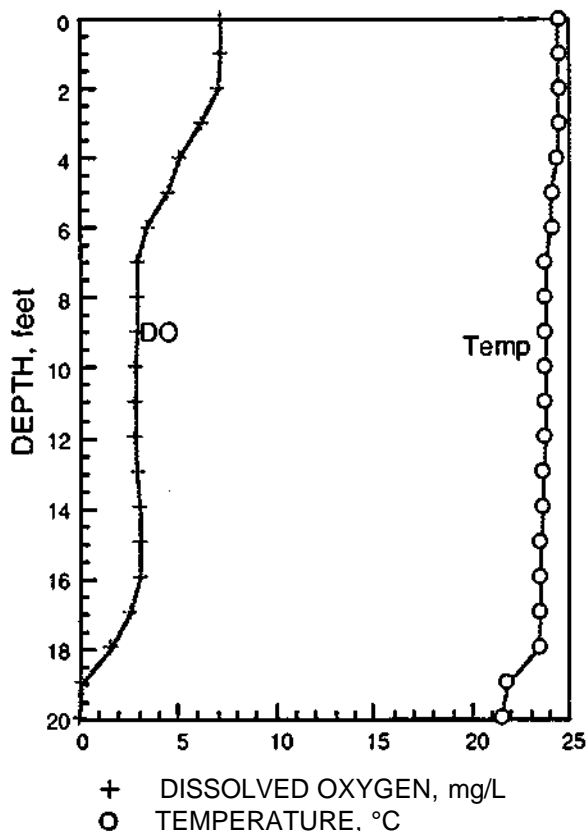
Water and Sediment Qualities

Sampling Date	08-10-92
Site Number	1
Water Depth of Site, feet	20
Secchi Disc Transparency, inches	24
Chlorophyll a, µg/L	10.41
Chlorophyll b, µg/L	2.53
Chlorophyll c, µg/L	0.64
Pheophytin a, µg/L	0.00
Trophic State Index	72
Trophic State	Hypereutrophic

Water Quality (K: less than detection value)

Depth, feet	1	18
Total Suspended Solids, mg/L	17	10
Volatile Suspended Solids, mg/L	8	4
Turbidity, NTU	1.4	0.2
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	3.1	0.16
Total Kjeldahl Nitrogen, mg/L	3.4	1.4
Total Phosphorus, mg/L	0.629	0.247
Dissolved Phosphorus, mg/L	0.570	0.167
Alkalinity, mg CaCO ₃ /L		
Total	134	185
Phenolphthalein	11	0
Field pH	8.7	8.0
Chemical Oxygen Demand, mg/L	24	26

DO & Temperature Profiles (Time, 11:00)



Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	1066
Kjeldahl-N, ppm	3330
Solids, % wet	23.8
Vol. solids, %	9.3
TOC, %	-
Arsenic, ppm	8.9
Barium, ppm	283
Cadmium, ppm	1
Chromium, ppm	20
Copper, ppm	244
Iron, ppm	31000
Lead, ppm	31
Manganese, ppm	1400
Mercury, ppm	0.1K
Nickel, ppm	24
Potassium, ppm	1900
Silver, ppm	1K
Zinc, ppm	94

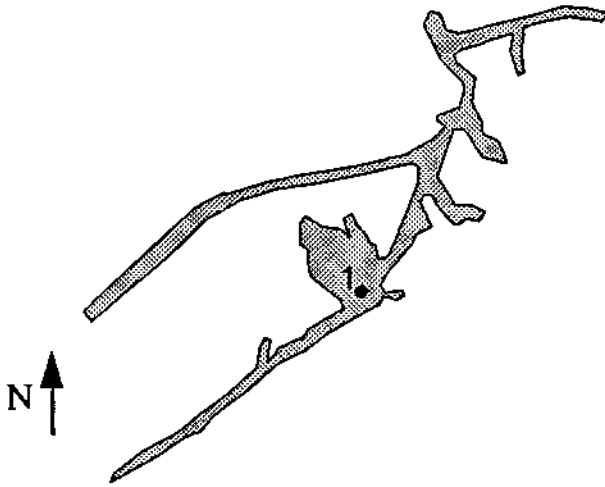
Johnson Lake/Banner Marsh

Peoria County

Map Code: UDM

IL Dept. of Conservation
2960 Court St., Pekin, IL 61554
309/347-5149

General



Lake Location	5 miles NE of Banner	
Deepest Point	Latitude	40°32'20"
	Longitude	89°50'46"
Lake Surface Area, acres	170	
Length of Shoreline, miles	11.5	
Maximum Depth, feet	38	
Average Depth, feet	25	
Lake Storage Capacity, acre-feet	8000	
Watershed Drainage Area, acres	4250	
Hydraulic Retention Time, years	-	
Lake Type	Coal strip-mine	
Year Constructed	1969	
Ownership	State	
Inflowing Streams	-	
Outflowing Streams	-	
Unique Features	State park	

Usages and Impairments

Public Access Yes
Entire lake bottom publicly owned and entire shoreline public access, unlimited free access, 10hp limit

No. of Visitors per Year <25,000
Designated Uses and Impairments
Aquatic life S
Cool water fishing S

Non-recreational Lake Usage
None

Recreational Lake Usage

Fishing - (4)
Low power boating - (3)

Recreational Facilities

Boat ramp, camping facilities, park, and picnic area. Boy Scout youth camp (primitive), hiking camps for youth only, no adults

Shoreline Usage, %
Pasture or grassland 100

Watershed Drainage Area Usage, %
Pasture or grassland 85
Wetland 5
Cropland 10

Water Quality Problems

Problems
Suspended sediment MN
Sediment deposition MN
Algal blooms M
Aquatic macrophytes S
Water level fluctuation M

Differences in Turbidity and Water Quality
In different portions of lake? No
At different times of the year? No

Fishing Excellent
Major Types of Fish
Bass (largemouth, smallmouth), catfish, northern pike, walleye, bluegill, carp, crappie (stocked each year with channel cat, walleye, and pike)

Causes of Quality Problems

Potential Pollution Sources
Runoff (pasture/grassland)

Causes of Impairment
Salinity M

Sources of Impairment
Pasture S

Johnson Lake/Banner Marsh

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	Tillage. %	
	No till	10
	Grassland & wetland	90

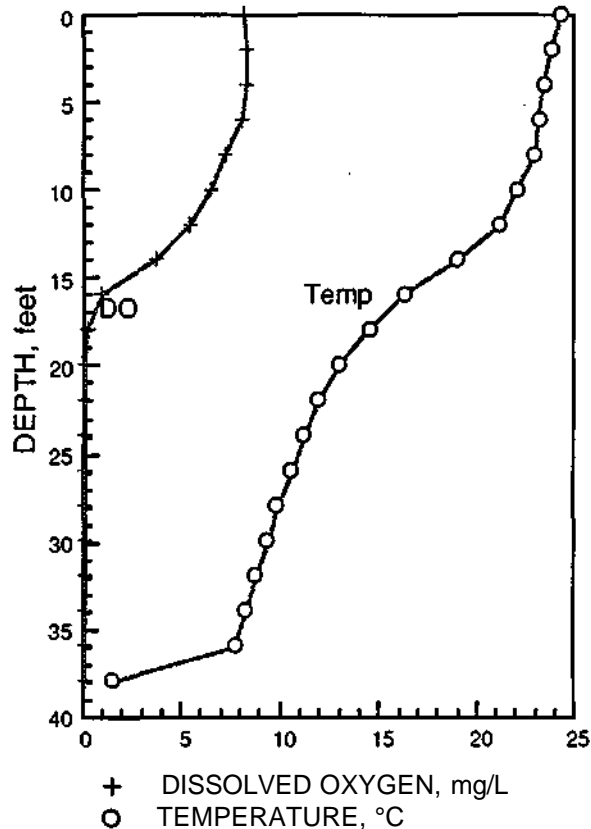
Comments:

Water and Sediment Qualities

Sampling Date	07/06/92
Site Number	1
Water Depth of Site, feet	50
Secchi Disc Transparency, inches	47
Chlorophyll a, µg/L	5.34
Chlorophyll b, µg/L	0.00
Chlorophyll c, µg/L	0.11
Pheophytin a, µg/L	0.00
Trophic State Index	49
Trophic State	Mesotrophic

Water Quality (K: less than detection value)		
Depth, feet	1	48
Total Suspended Solids, mg/L	7	12
Volatile Suspended Solids, mg/L	2	2
Turbidity, NTU	0.4	3.6
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	0.02	0.13
Total Kjeldahl Nitrogen, mg/L	0.3	0.3
Total Phosphorus, mg/L	0.015	0.025
Dissolved Phosphorus, mg/L	0.028	0.014
Alkalinity, mg CaCO ₃ /L		
Total	181	185
Phenolphthalein	0	0
Field pH	8.2	8.1
Chemical Oxygen Demand, mg/L	14	11

DO & Temperature Profiles (Time, 11:30)



Sediment Quality

(mg/kg: ppm, K: less than detection value)	
Phosphorus-P, ppm	427
Kjeldahl-N, ppm	1200
Solids, % wet	50.2
Vol. solids, %	6.8
TOC, %	-
Arsenic, ppm	31.7
Barium, ppm	191
Cadmium, ppm	3
Chromium, ppm	21
Copper, ppm	39
Iron, ppm	52000
Lead, ppm	21
Manganese, ppm	1700
Mercury, ppm	0.02
Nickel, ppm	53
Potassium, ppm	1600
Silver, ppm	1K
Zinc, ppm	130

Kinmundy City Lake

Marion County

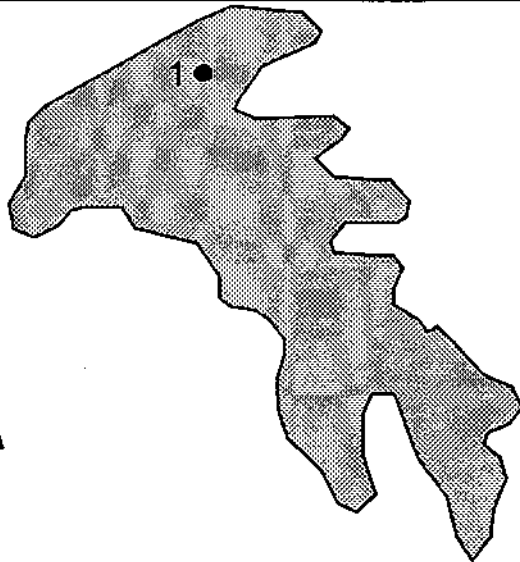
Map Code: ROZY

Village of Kinmundy

P.O. Box 58, Kinmundy, IL 62854

618/547-3221

General



Lake Location	2 miles SW of Kinmundy	
Deepest Point	Latitude	38°45'54"
	Longitude	88°51'54"
Lake Surface Area, acres	20	
Length of Shoreline, miles	3.5	
Maximum Depth, feet	16	
Average Depth, feet	8	
Lake Storage Capacity, acre-feet	150	
Watershed Drainage Area, acres	370	
Hydraulic Retention Time, years	0.512	
Lake Type	Dammed stream	
Year Constructed	1900	
Ownership	Public	
Inflowing Streams	Unnamed	
Outflowing Streams	East Fork Creek	
Unique Features	-	

Usages and Impairments

Public Access Yes
 Entire lake bottom publicly owned and entire shoreline public access, unlimited access (\$5/year)

No. of Visitors per Year <25,000
Designated Uses and Impairments
 Aquatic life S
 Domestic water supply M

Non-recreational Lake Usage
 Potable water supply - (4),P,I

Recreational Lake Usage

Fishing - (2)
 No power boating - (2)

Recreational Facilities

One boat ramp, one picnic area

Shoreline Usage, %

Woodland	95
Recreation development	5

Watershed Drainage Area Usage, %

Cropland	60
Pasture or grassland	20
Wetland	20

Water Quality Problems

Problems

Suspended sediment	H
Sediment deposition	H
Algal blooms	M
Aquatic macrophytes	M
Taste/odor	M
Water level fluctuation	M

Differences in Turbidity and Water Quality

In different portions of lake? Yes
 At different times of the year? Yes

Fishing

Major Types of Fish

Bass, channel catfish, bluegill, crappie

Causes of Quality Problems

Potential Pollution Sources
 Runoff (feedlot, pasture, woodland), sediment in lake

Causes of Impairment

Pesticides	S	Ammonia	S
Nutrients	M	Siltation	M
Taste/odor	M		

Sources of Impairment

Agriculture	H
Pasture	S
Feedlots - all types	S

Kinmundy City Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
1992	Tillage, acres	FSA conservation compliance
	No till	75 FSA conservation compliance
	Mulch till, > 30% residue	75 FSA conservation compliance
	Chisel or disc, <30% res.	75 USDA Program
	Conservation Reserve Program	20

Land treatment in the watershed occurred as a result of the 1985 and 1990 Farm Bills

Comments:

Kinmundy Lake was included in the Forbes Lake Resources Conservation Plan. The Marion County Soil and Water Conservation District is assisting the Village of Kinmundy with their efforts to construct a new lake downstream from the existing lake.

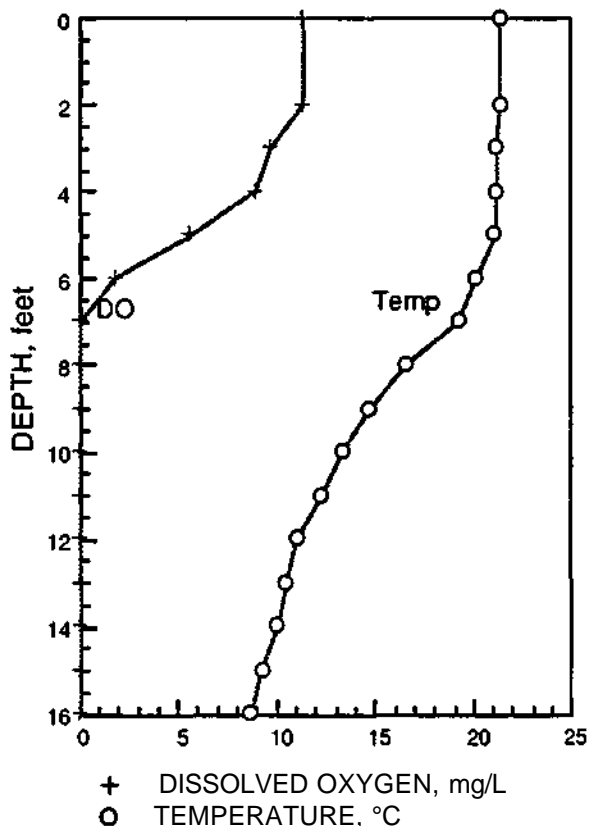
Water and Sediment Qualities

Sampling Date	06/23/92
Site Number	1
Water Depth of Site, feet	16
Secchi Disc Transparency, inches	27
Chlorophyll a, µg/L	69.83
Chlorophyll b, µg/L	16.55
Chlorophyll c, µg/L	7.49
Pheophytin a, µg/L	0.00
Trophic State Index	70
Trophic State	Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	14
Total Suspended Solids, mg/L	11	20
Volatile Suspended Solids, mg/L	9	10
Turbidity, NTU	4	6.4
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	0.10	1.9
Total Kjeldahl Nitrogen, mg/L	1.7	2.1
Total Phosphorus, mg/L	0.116	0.698
Dissolved Phosphorus, mg/L	0.020	-
Alkalinity, mg CaCO ₃ /L		
Total	81	110
Phenolphthalein	26	0
Field pH	9.2	8.2
Chemical Oxygen Demand, mg/L	37	26

DO & Temperature Profiles (Time, 10:00)



Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	1312
Kjeldahl-N, ppm	4020
Solids, % wet	30.7
Vol. solids, %	10.8
TOC, %	-
Arsenic, ppm	14.3
Barium, ppm	229
Cadmium, ppm	1
Chromium, ppm	22
Copper, ppm	511
Iron, ppm	35000
Lead, ppm	35
Manganese, ppm	1800
Mercury, ppm	0.05
Nickel, ppm	20
Potassium, ppm	1500
Silver, ppm	1K
Zinc, ppm	99

Lake No. 3/FCCRA

Fulton County Camping and Recreation Area

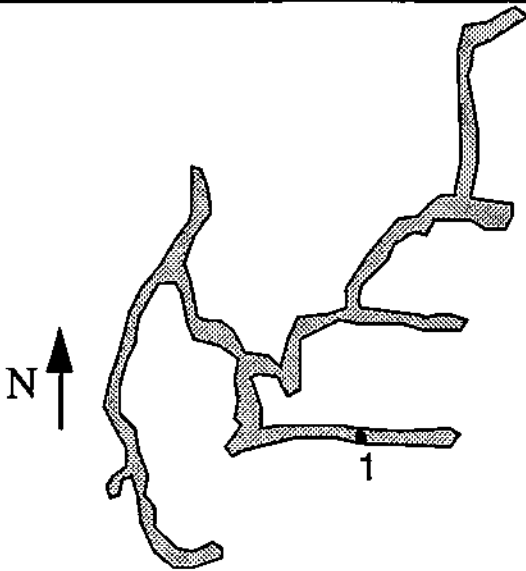
Box 258, St. David, IL 61563

309/668-2931

Fulton County

Map Code: UDN

General



Lake Location	1 mile E of Bryant		
Deepest Point	Latitude	40°31'00"	
	Longitude	90°05'24"	
Lake Surface Area, acres	45.6		
Length of Shoreline, miles	6.4		
Maximum Depth, feet	28		
Average Depth, feet	10		
Lake Storage Capacity, acre-feet	456		
Watershed Drainage Area, acres	50		
Hydraulic Retention Time, years	-		
Lake Type	Coal strip-mine		
Year Constructed	1974		
Ownership	WRDGC - Public		
Inflowing Streams	-		
Outflowing Streams	-		
Unique Features			

Crooked configuration - narrow, long. Land around the lake was used for WRDGC treated sludge disposal in the past.

Usages and Impairments

Public Access Yes

Entire lake bottom publicly owned and entire shoreline public access, daily entrance fee (\$4.00/car for fishing), seasonal pass (\$60/calendar year), fishing 24 hours/day, only electric trawling motors allowed

No. of Visitors per Year <25,000

Designated Uses and Impairments

Aquatic life	S
General recreation	S

Non-recreational Lake Usage

None

Recreational Lake Usage

Fishing - (3)	No power boating - (3)
Camping - (4)	Low power boating - (3)
Picnicking - (3)	Waterfowl observation - (2)

Recreational Facilities

Camping facilities, boat ramp, park, picnic area
Heavily used for fishing and camping

Shoreline Usage, %

Pasture/grassland	40	Woodland	40
Recreation development	10	Wetland	10

Watershed Drainage Area Usage, %

Cropland	75
Pasture/grassland	20
Woodland	5

Water Quality Problems

Problems

Suspended sediment	MN
Sediment deposition	MN
Algal blooms	M
Aquatic macrophytes	M
Water level fluctuation	S
Fishkills	MN

Differences in Turbidity and Water Quality

In different portions of lake?	No
At different times of the year?	No

Fishing

Good

Major Types of Fish

Largemouth bass, channel catfish, bluegill, red ear, & crappie

Causes of Quality Problems

Potential Pollution Sources

Runoff (cropland, pasture, woodland), waterfowl, rough fish

Causes of impairment

Noxious aquatic plants	M	Nutrients	M
Thermal modification	M	Metals	M

Sources of Impairment

Agriculture	S
Nonirrigated crop production	S
Pasture	S

Lake No. 3/FCCRA

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	Diversion, ft	20,000 Erosion control
	Tillage, %	
	Mulch-till	25
	Moldboard plow	45
	Chisel/disc - < 30% residue	5
	Woodland	5
	Hayland/pasture	20

Comments:

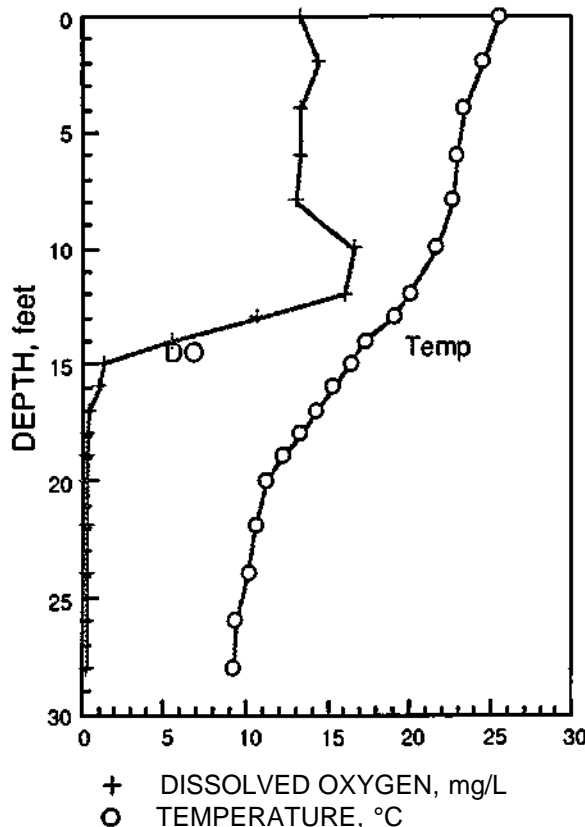
Water and Sediment Qualities

Sampling Date	07/08/92
Site Number	1
Water Depth of Site, feet	28
Secchi Disc Transparency, inches	118
Chlorophyll a, µg/L	67.42
Chlorophyll b, µg/L	3.32
Chlorophyll c, µg/L	14.97
Pheophytin a, µg/L	0.00
Trophic State Index	58
Trophic State	Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	26
Total Suspended Solids, mg/L	5	18
Volatile Suspended Solids, mg/L	5	12
Turbidity, NTU	0.1	2.2
NO ₂ /NO ₃ -Nitrogen, mg/L	0.82	0.01K
Ammonia Nitrogen, mg/L	0.21	1.5
Total Kjeldahl Nitrogen, mg/L	1.3	2.2
Total Phosphorus, mg/L	0.044	0.250
Dissolved Phosphorus, mg/L		0.244
Alkalinity, mg CaCO ₃ /L		
Total	153	290
Phenolphthalein	20	0
Field pH	8.8	7.4
Chemical Oxygen Demand, mg/L	34	25

DO & Temperature Profiles (Time, 14:30)



Sediment Quality

(mg/kg; ppm, K: less than detection value)

Phosphorus-P, ppm	488
Kjeldahl-N, ppm	1590
Solids, % wet	32.4
Vol. solids, %	5.7
TOC, %	-
Arsenic, ppm	5.0
Barium, ppm	110
Cadmium, ppm	2
Chromium, ppm	21
Copper, ppm	24
Iron, ppm	28000
Lead, ppm	19
Manganese, ppm	943
Mercury, ppm	0.03
Nickel, ppm	36
Potassium, ppm	1400
Silver, ppm	1K
Zinc, ppm	122

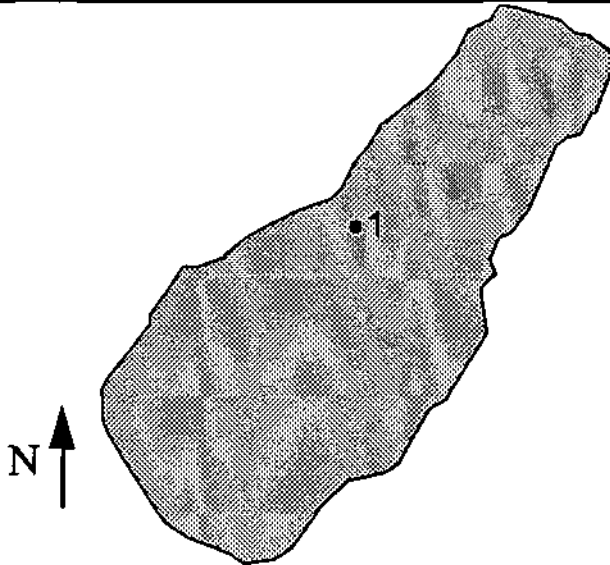
Levings Park Lagoon

Winnebago County

Map Code: RPH

Rockford Park District
1401 North Second, Rockford, IL
815/987-8800

General



Lake Location	S edge of Rockford	
Deepest Point	Latitude	42°15'35"
	Longitude	88°07'48"
Lake Surface Area, acres	23.5	
Length of Shoreline, miles	0.8	
Maximum Depth, feet	6	
Average Depth, feet	3.4	
Lake Storage Capacity, acre-feet	80	
Watershed Drainage Area, acres	5500	
Hydraulic Retention Time, years	0.022	
Lake Type	Dammed stream	
Year Constructed	1935	
Ownership	Public	
Inflowing Streams	Kent Creek	
Outflowing Streams	Kent Creek	
Unique Features		

Dredged in 1987; deep around edges and shallow in middle; no weeds even in middle shallow portions

Usages and Impairments

Public Access Yes

Entire lake bottom publicly owned, entire shoreline public access, unlimited free access for shoreline, no private boats allowed (only Park District rental paddle-boats permitted)

No. of Visitors per Year 25,000 -100,000

Designated Uses and Impairments

Aquatic life	S
General recreation	S
Primary contact	S
Stormwater detention	S

Non-recreational Lake Usage

- Flood control - (1)
- Stormwater detention - (1)

Recreational Lake Usage

- Fishing - (3)
- Swimming - (3)
- No power boating - (3)
- Picnicking - (4)

Recreational Facilities

Swimming beach, concession stand, park, picnic area, boat rental, tennis and basketball courts. Beach and concession stand open Wednesday- Sunday, 11am to 6pm. Large church picnic, ice fishing, skating allowed.

Shoreline Usage, %

Recreation development	100
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Watershed Drainage Area Usage, %

Developed areas	15
Cropland	75
Wetland	10

Water Quality Problems

Problems

Suspended sediment	S
Sediment deposition	S
Algal blooms	S
Water level fluctuation	MN
Fishkills	MN

Differences in Turbidity and Water Quality

In different portions of lake?	No
At different times of the year?	Yes

Fishing

Major Types of Fish

Stocked annually with catfish (1500 pounds)

Causes of Quality Problems

Potential Pollution Sources

Runoff (feedlot, cropland, pasture, woodland, lawn), livestock operation, urban storm drainage

Causes of Impairment

Nutrients	S
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Sources of Impairment

Pasture	S
Animal holding/management areas	M
Urban runoff	M

Levings Park Lagoon

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	Grass waterways, acre	35
	Ponds (dugout)	2
	<u>Tillage, %</u>	
	No-till	10
	Chisel or disc - <30% residue	65
	Woodland	10
	Other - developed	15

Comments:

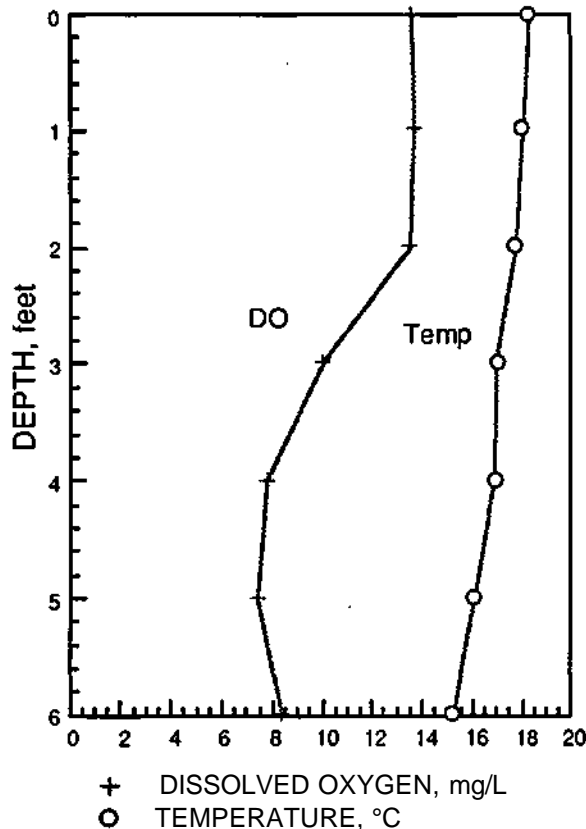
Water and Sediment Qualities

Sampling Date	08-19-92
Site Number	1
Water Depth of Site, feet	8.5
Secchi Disc Transparency, inches	22
Chlorophyll a, µg/L	35.24
Chlorophyll b, µg/L	4.94
Chlorophyll c, µg/L	2.54
Pheophytin a, µg/L	0.00
Trophic State Index	65
Trophic State	Eutrophic

Water Quality

Depth, feet	1	4
Total Suspended Solids, mg/L	22	26
Volatile Suspended Solids, mg/L	7	8
Turbidity, NTU	1.2	26
NO ₂ /NO ₃ -Nitrogen, mg/L	5.5	6.4
Ammonia Nitrogen, mg/L	0.03	0.10
Total Kjeldahl Nitrogen, mg/L	0.7	0.9
Total Phosphorus, mg/L	0.057	0.117
Dissolved Phosphorus, mg/L	0.018	0.040
Alkalinity, mg CaCO/L		
Total	240	279
Phenolphthalein	16	0
Field pH	8.6	8.2
Chemical Oxygen Demand, mg/L	10	15

DO & Temperature Profiles (Time, 11:00)



Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	702
Kjeldahl-N, ppm	2760
Solids, % wet	40.4
Vol. solids, %	6.4
TOC, %	3.6
Arsenic, ppm	5.0
Barium, ppm	194
Cadmium, ppm	1K
Chromium, ppm	22
Copper, ppm	19
Iron, ppm	24000
Lead, ppm	22
Manganese, ppm	770
Mercury, ppm	0.10
Nickel, ppm	21
Potassium, ppm	1500
Silver, ppm	1K
Zinc, ppm	102

Little Sister Lake

Fulton County

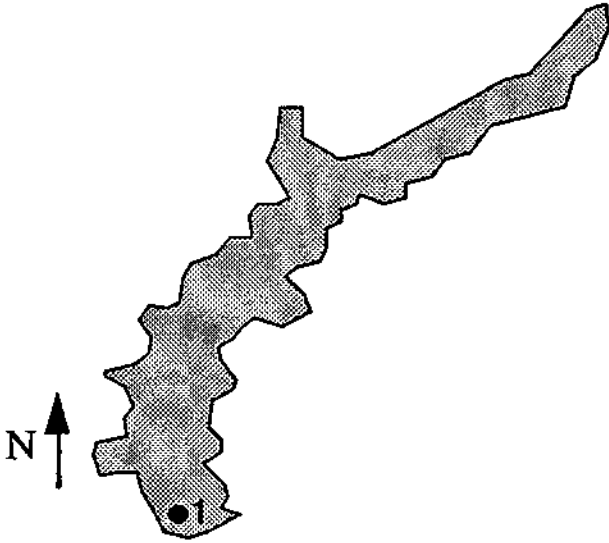
Map Code: UDF

Fulton County Board

RR #2, Cuba, IL 61427

309/647-5135

General



Lake Location	1.5 miles S of St. David
Deepest Point	Latitude 40°27'30"
	Longitude 90°03'24"
Lake Surface Area, acres	35.8
Length of Shoreline, miles	2.2
Maximum Depth, feet	25
Average Depth, feet	10.8
Lake Storage Capacity, acre-feet	389
Watershed Drainage Area, acres	1556
Hydraulic Retention Time, years	-
Lake Type	Dammed stream
Year Constructed	1965
Ownership	Public
Inflowing Streams	Sister Creek
Outflowing Streams	Sister Creek
Unique Features	Shallower than other strip mine lakes in Fulton County Camping & Recreation Area. Land around the area was used for WRDGC treated sludge disposal in the past

Usages and Impairments

Public Access	Yes
Entire lake bottom publicly owned and entire shoreline public access, daily entrance fee (\$4.00/car for fishing), seasonal pass (\$60/calendar year), fishing 24hours/day, only electric trawling motors allowed	
No. of Visitors per Year	<25,000
Designated Uses and Impairments	
Aquatic life	S
General recreation	S

Non-recreational Lake Usage

Recreational Lake Usage

Fishing - (3)	No power boating - (3)
Camping - (4)	Low power boating - (3)
Picnicking - (4)	

Recreational Facilities

Boat ramp, camping facilities, park, picnic area
Heavily used for fishing and camping.

Shoreline Usage, %

Pasture	50
Woodland	45
Wetland	5

Watershed Drainage Area Usage, %

Cropland	60
Pasture/grassland	10
Woodland	20
Wetland	10

Water Quality Problems

Problems	
Suspended sediment	M
Sediment deposition	M
Algal blooms	M
Aquatic macrophytes'	M

* Grass carp are used to control macrophytes; put in every 5 years.

Differences in Turbidity and Water Quality

In different portions of lake?	No
At different times of the year?	No

Fishing

Major Types of Fish

Largemouth bass, channel catfish, bluegill, redbear, muskie (lake is stocked yearly as funds permit)

Causes of Quality Problems

Potential Pollution Sources

Runoff (cropland, pasture/grassland, woodland)

Causes of Impairment

Siltation	M
Organic enrichment/DO depletion	M
Thermal modification	M
Noxious aquatic plants	M

Sources of Impairment

Agriculture	S
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Little Sister Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	Grassed waterways, acre	20
	Grade stabilization structures	3
	Ponds	8
	Diversion, linear ft	8000
	<u>Tillage: %</u>	
	No-till	10
	Mulch till	30
	Moldboard plow	15
	Chisel or disc - <30% residue	5
	Woodland	20
	Hayland/pasture	10
	Other - wetland	10

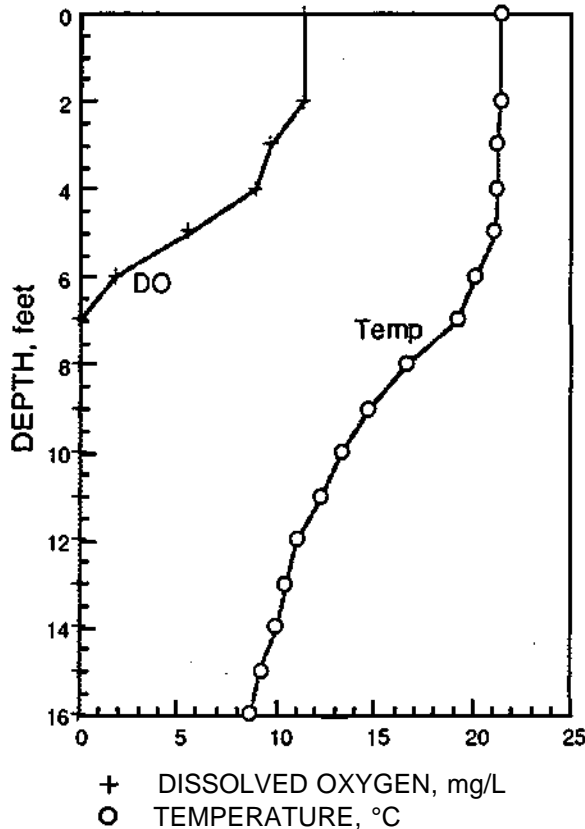
Water and Sediment Qualities

Sampling Date	07/08/92
Site Number	1
Water Depth of Site, feet	19
Secchi Disc Transparency, inches	52
Chlorophyll a, µg/L	45.52
Chlorophyll b, µg/L	4.03
Chlorophyll c, µg/L	6.57
Pheophytin a, µg/L	0.00
Trophic State Index	61
Trophic State	Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	17
Total Suspended Solids, mg/L	4	7
Volatile Suspended Solids, mg/L	2	5
Turbidity, NTU	0.8	60
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	0.04	2.2
Total Kjeldahl Nitrogen, mg/L	0.9	9.1
Total Phosphorus, mg/L	0.060	0.957
Dissolved Phosphorus, mg/L	0.023	0.023
Alkalinity, mg CaCO ₃ /L		
Total	119	256
Phenolphthalein	12	0
Field pH	8.6	7.5
Chemical Oxygen Demand, mg/L	25	32

DO & Temperature Profiles (Time, 16:00)



Sediment Quality

(mg/kg; ppm, K: less than detection value)

Phosphorus-P, ppm	662
Kjeldahl-N, ppm	3630
Solids, % wet	21.1
Vol. solids, %	10.0
TOC, %	-
Arsenic, ppm	9.9
Barium, ppm	228
Cadmium, ppm	9
Chromium, ppm	22
Copper, ppm	28
Iron, ppm	36000
Lead, ppm	36
Manganese, ppm	1300
Mercury, ppm	0.04
Nickel, ppm	48
Potassium, ppm	1700
Silver, ppm	1K
Zinc, ppm	949

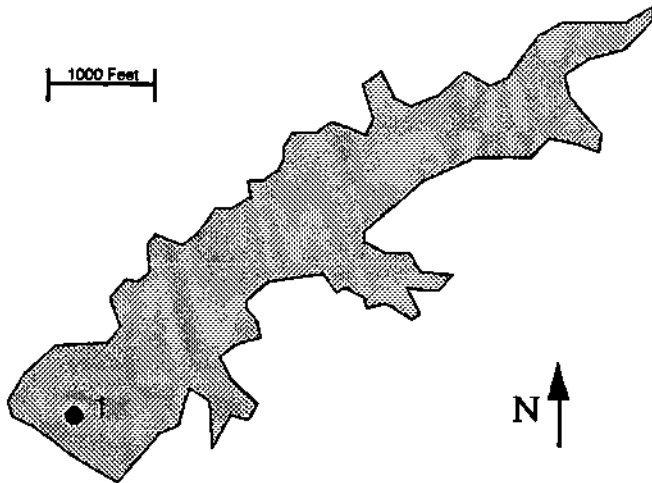
Nashville City Reservoir

Washington County

Map Code: ROO

City of Nashville
116 East Court St., Nashville, IL
618/327-3058

General



Lake Location	0.1 miles E of Nashville	
Deepest Point	Latitude	38°20'48"
	Longitude	89°21'48"
Lake Surface Area, acres	36	
Length of Shoreline, miles	1.8	
Maximum Depth, feet	12.5	
Average Depth, feet	8	
Lake Storage Capacity, acre-feet	288	
Watershed Drainage Area, acres	890	
Hydraulic Retention Time, years	0.353	
Lake Type	Dammed stream	
Year Constructed	1936	
Ownership	Public	
Inflowing Streams	Unnamed	
Outflowing Streams	Drains to Nashville Creek	
Unique Features	The lake serves as a water-supply source and has a destratifier.	

Usages and Impairments

Public Access Yes
Entire lake bottom publicly owned and entire shoreline public access, unlimited free access, power boats limited to 10hp

No. of Visitors per Year <25,000

Designated Uses and Impairments

Domestic water supply	S
Agriculture - hog farming	M
Aquatic life	S

Non-recreational Lake Usage

- Potable water supply - (2)
- Industrial water supply - (3)

Recreational Lake Usage

Fishing - (3)
No power boating - (1)

Recreational Facilities

One boat ramp

Shoreline Usage, %

Pasture/grassland	25
Woodland	75

Watershed Drainage Area Usage, %

Cropland	50
Pasture/grassland	25
Woodland	25

Water Quality Problems

Problems

Suspended sediment	M
Sediment deposition	M
Algal blooms	M
Fishkills	MN

Differences in Turbidity and Water Quality

In different portions of lake?	No
At different times of the year?	Yes
Fishing	Fair

Major Types of Fish

Channel catfish, bass, bluegill, crappie

Causes of Quality Problems

Potential Pollution Sources

Runoff (feedlot - hogs 1/2-mile away, cropland, pasture/grassland, woodland), septic tanks, sediment in lake

Causes of Impairment

Nutrients	M	Siltation	M
Thermal modification	M	Taste & odor	M
Organic enrichment/DO depletion			M

Sources of Impairment

Municipal (houses)	S	Pastureland	S
Nonpoint Sources	M	Feedlot-hog	S

Nashville City Reservoir

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
1986	Terraces - linear ft 10,000	Erosion control
	Conservation cropping, acre 600	Erosion control

Comments:

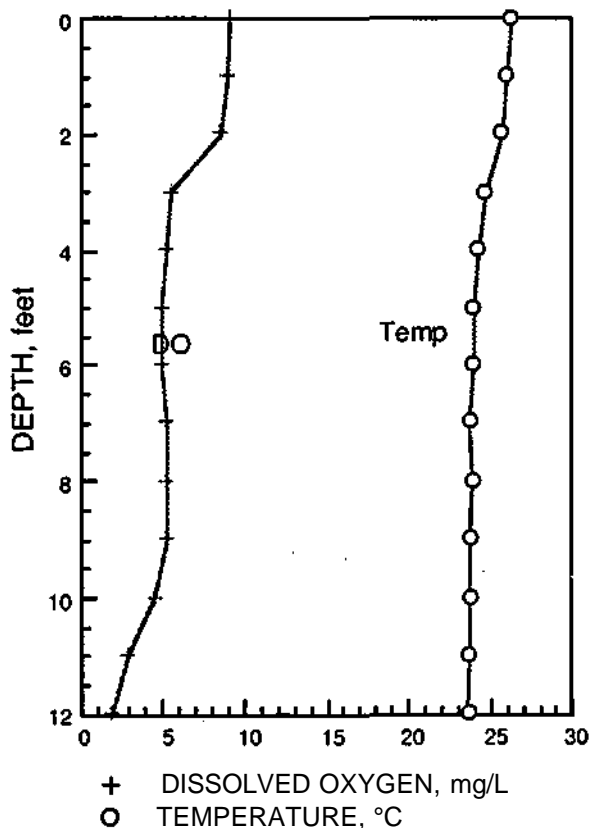
Water and Sediment Qualities

Sampling Date	08/03/92
Site Number	1
Water Depth of Site, feet	12
Secchi Disc Transparency, inches	25
Chlorophyll a, $\mu\text{g/L}$	29.90
Chlorophyll b, $\mu\text{g/L}$	8.95
Chlorophyll c, $\mu\text{g/L}$	0.00
Pheophytin a, $\mu\text{g/L}$	2.99
Trophic State Index	82
Trophic State	hypereutrophic

Water Quality

Depth, feet	1	10
Total Suspended Solids, mg/L	8	47
Volatile Suspended Solids, mg/L	6	10
Turbidity, NTU	2.5	6.7
NO ₂ /NO ₃ -Nitrogen, mg/L	0.013	0.02
Ammonia Nitrogen, mg/L	0.11	0.44
Total Kjeldahl Nitrogen, mg/L	1.3	1.5
Total Phosphorus, mg/L	2.27	1.81
Dissolved Phosphorus, mg/L	1.67	1.90
Alkalinity, mg CaCO ₃ /L		
Total	100	97
Phenolphthalein	4	0
Field pH	8.4	7.7
Chemical Oxygen Demand, mg/L	36	35

DO & Temperature Profiles (Time, 12:00)



Sediment Quality

(mg/kg; ppm, K: less than detection value)	
Phosphorus-P, ppm	1594
Kjeldahl-N, ppm	4770
Solids, % wet	17.4
Vol. solids, %	13.2
TOC, %	-
Arsenic, ppm	7.3
Barium, ppm	263
Cadmium, ppm	1
Chromium, ppm	18
Copper, ppm	734
Iron, ppm	30000
Lead, ppm	33
Manganese, ppm	2000
Mercury, ppm	0.1K
Nickel, ppm	16
Potassium, ppm	2000
Silver, ppm	1K
Zinc, ppm	88

Oakland City Lake

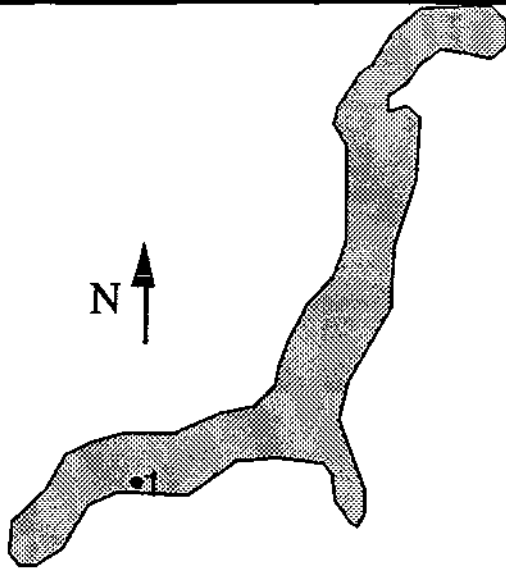
Coles County

Map Code: RBP

City Hall
8 East Main, Oakland City, IL 61943-999

217/346-2651

General



Lake Location	3/4 miles NE of Oakland	
Deepest Point	Latitude	39°39'48"
	Longitude	88°01'12"
Lake Surface Area, acres	26	
Length of Shoreline, miles	1.7	
Maximum Depth, feet	10	
Average Depth, feet	5.3	
Lake Storage Capacity, acre-feet	138	
Watershed Drainage Area, acres	9158	
Hydraulic Retention Time, years	0.017	
Lake Type	Dammed stream	
Year Constructed	1938	
Ownership	Public	
Inflowing Streams	Hog Branch (Embarass)	
Outflowing Streams	Hog Branch	
Unique Features	Other publicly owned lakes in the county (Charleston, Paradise, Matton)	

Usages and Impairments

Public Access Yes

A portion of lake bottom publicly owned and portion of shoreline public access (3 acres and 12% are privately owned), unlimited free access, only electric & paddle boats are allowed

No. of Visitors per Year <25,000

Designated Uses and Impairments

Aquatic life S
Public water supply S

Non-recreational Lake Usage

Public water supply - (4), P

Recreational Lake Usage

Fishing - (4)
No power boating - (3)

Recreational Facilities

One boat ramp, park, picnic area, ice skating

Shoreline Usage, %

Residential (including lawns) 20
Woodland 60
Recreation development - park 20

Watershed Drainage Area Usage, %

Residential 5
Cropland 85
Pasture/grassland 5
Woodland 5

Water Quality Problems

Problems

Suspended sediment H
Sediment deposition H
Aquatic macrophytes M/N
Taste/odor M
Water level fluctuation S
Fishkills M/N

Differences in Turbidity and Water Quality

In different portions of lake? No
At different times of the year? Yes

Fishing

Good

Major Types of Fish

Channel catfish, crappie, bluegill, largemouth bass

Causes of Quality Problems

Potential Pollution Sources

Runoff (cropland, pasture), livestock operations, erosion (streambank, shoreline), sediment in lake, waterfowl, rough fish (shad, carp)

Causes of Impairment

Siltation H Taste/odor M
Suspended solids M
Organic enrichment/DO depletion H

Sources of Impairment

Nonirrigated crop production M Agriculture M
Feedlots S
Animal holding/management areas S

Oakland City Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
1970's	Dredged by mud cat	Increase lake volume
	Tillage, %	
	No-till	10
	Mulch till	30
	Moldboard plow	3
	Chisel/disc - < 30% residue	57

Comments:

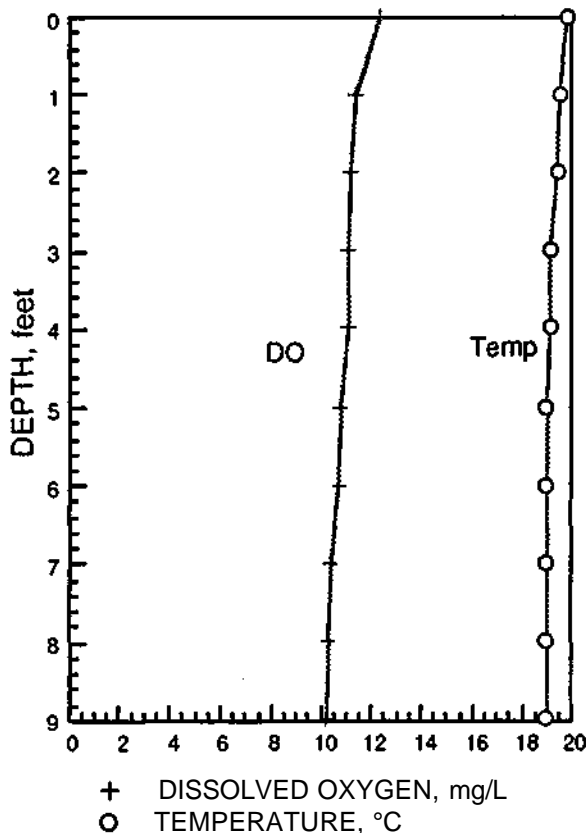
Water and Sediment Qualities

Sampling Date	06/22/92
Site Number	1
Water Depth of Site, feet	9
Secchi Disc Transparency, inches	13
Chlorophyll a, µg/L	81.88
Chlorophyll b, µg/L	13.21
Chlorophyll c, µg/L	1.09
Pheophytin a, µg/L	0.36
Trophic State Index	74
Trophic State	Hypereutrophic

Water Quality

	1	7
Depth, feet		
Total Suspended Solids, mg/L	156	178
Volatile Suspended Solids, mg/L	26	28
Turbidity, NTU	11	34
NO ₂ /NO ₃ -Nitrogen, mg/L	2.0	2.1
Ammonia Nitrogen, mg/L	0.28	0.19
Total Kjeldahl Nitrogen, mg/L	1.3	1.5
Total Phosphorus, mg/L	0.113	0.164
Dissolved Phosphorus, mg/L	0.022	0.018
Alkalinity, mg CaCO ₃ /L		
Total	157	171
Phenolphthalein	0	0
Field pH	8.2	8.2
Chemical Oxygen Demand, mg/L	22	24

DO & Temperature Profiles (Time, 11:00)



Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	760
Kjeldahl-N, ppm	3130
Solids, % wet	33.2
Vol. solids, %	8.6
TOC, %	-
Arsenic, ppm	7.3
Barium, ppm	179
Cadmium, ppm	1K
Chromium, ppm	17
Copper, ppm	24
Iron, ppm	22000
Lead, ppm	19
Manganese, ppm	926
Mercury, ppm	0.04
Nickel, ppm	18
Potassium, ppm	1400
Silver, ppm	1K
Zinc, ppm	93

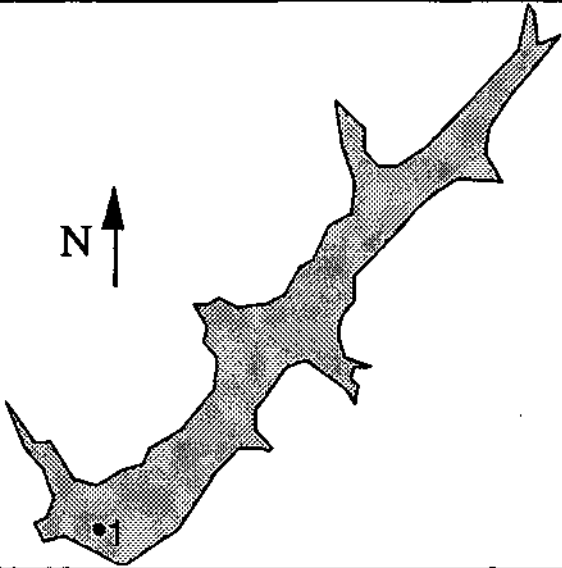
Ramsey Lake

Fayette County

Map Code: RBP

IL Dept. of Conservation
 Box 97, Ramsey, IL 62080
 618/423-2215

General



Lake Location	1.5 miles NW of Ramsey
Deepest Point	Latitude 39°09'36"
	Longitude 89°08'06"
Lake Surface Area, acres	46.6
Length of Shoreline, miles	3.4
Maximum Depth, feet	22
Average Depth, feet	7
Lake Storage Capacity, acre-feet	326
Watershed Drainage Area, acres	1,439
Hydraulic Retention Time, years	0.272
Lake Type	Dammed stream
Year Constructed	1949
Ownership	State
Inflowing Streams	Unnamed
Outflowing Streams	Unnamed
Unique Features	

State park, other publicly owned lakes in the county (Vandalia City, Nellie, St. Elmo City)

Usages and Impairments

Public Access Yes
 Entire lake bottom publicly owned and entire shoreline public access, unlimited free access

No. of Visitors per Year >200,000

Designated Uses and Impairments

Aquatic life	M
General recreation	S

Non-recreational Lake Usage
 None

Recreational Lake Usage

Fishing - (4), P,I
 Low power boating - (4)
 Camping - (4), P
 Picnicking - (4), P

Recreational Facilities

Camping facilities, park, picnic area, concession stand, boat ramp, boat rental, cross country skiing, snow mobiling, horseback riding

Shoreline Usage, %

Woodland 99

Watershed Drainage Area Usage, %

Cropland	10	Woodland	66
Water	4	Recreation development	20

*80% owned by the state.

Water Quality Problems

Problems

Suspended sediment	M
Sediment deposition	M
Algal blooms	H
Fishkills (August 1988, everything)	S

Differences in Turbidity and Water Quality

In different portions of lake? Yes
 At different times of the year? Yes

Fishing Excellent

Major Types of Fish

Largemouth bass, bluegill, redear sunfish, channel catfish

Causes of Quality Problems

Potential Pollution Sources
 Runoff (cropland, pasture, woodland), erosion (streambank, shoreline), sediment in lake

Causes of Impairment

Siltation	M
Organic enrichment/DO depletion	M
Thermal modification	M

Sources of Impairment

Nonpoint sources	M
Nonirrigated crop production	S
Herbicide/Algicide applications	S
Agriculture	M

Ramsey Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	Terrace, linear ft	20,500
	Grass waterway, acre	5
	Structure	3
	Ponds	5
	<u>Tillage, %</u>	
	No-till	30
	30% mulch till	20
Comments:	>30% mulch till	50

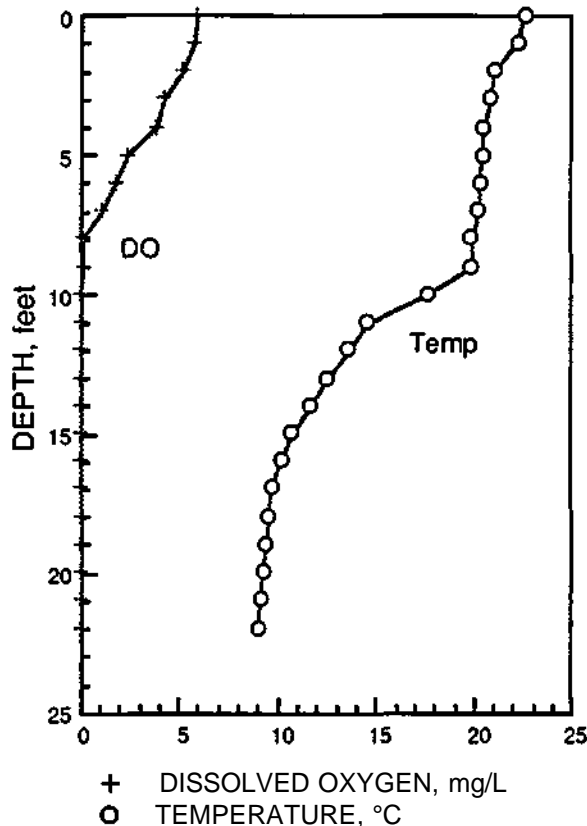
Water and Sediment Qualities

Sampling Date	06/23/92
Site Number	1
Water Depth of Site, feet	22
Secchi Disc Transparency, inches	29
Chlorophyll a, µg/L	39.16
Chlorophyll b, µg/L	6.23
Chlorophyll c, µg/L	2.68
Pheophytin a, µg/L	0.00
Trophic State Index	69
Trophic State	Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	20
Total Suspended Solids, mg/L	7	15
Volatile Suspended Solids, mg/L	6	10
Turbidity, NTU	5.6	76
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	0.08	5.6
Total Kjeldahl Nitrogen, mg/L	1.7	6.62
Total Phosphorus, mg/L	0.147	1.218
Dissolved Phosphorus, mg/L	0.090	1.152
Alkalinity, mg CaCO ₃ /L		
Total	177	102
Phenolphthalein	12	0
Field pH	8.8	7.3
Chemical Oxygen Demand, mg/L	36	38

DO & Temperature Profiles (Time, 15:00)



Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	712
Kjeldahl-N, ppm	3420
Solids, % wet	25.9
Vol. solids, %	10.6
TOC, %	-
Arsenic, ppm	9.5
Barium, ppm	247
Cadmium, ppm	1
Chromium, ppm	18
Copper, ppm	25
Iron, ppm	28000
Lead, ppm	26
Manganese, ppm	980
Mercury, ppm	0.05
Nickel, ppm	21
Potassium, ppm	1200
Silver, ppm	1K
Zinc, ppm	90

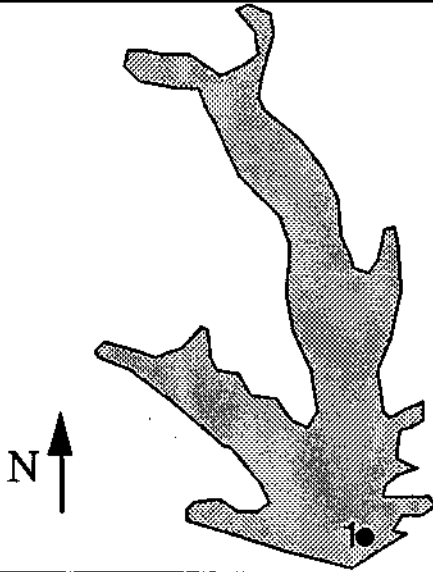
Randolph County Lake

Randolph County

Map Code: RIB

Site Superintendent
RR1, Box 345A, Chester, IL 62233
618/826-2706

General



Lake Location	5 miles NE of Chester	
Deepest Point	Latitude	38°06'18"
	Longitude	89°41'42"
Lake Surface Area, acres	65	
Length of Shoreline, miles	3.4	
Maximum Depth, feet	35	
Average Depth, feet	19	
Lake Storage Capacity, acre-feet	1235	
Watershed Drainage Area, acres	2000	
Hydraulic Retention Time, years	0.617	
Lake Type	Dammed stream	
Year Constructed	1961	
Ownership	State	
Inflowing Streams	Unnamed	
Outflowing Streams	Unnamed	
Unique Features	Very deep for a small lake, tributary waterfall	

Usages and Impairments

Public Access Yes
Entire lake bottom publicly owned and entire shoreline public access, unlimited free access

No. of Visitors per Year 100,000 - 200,000

Designated Uses and Impairments

Aquatic life	S
Cool water fishing	S
General recreation	S

Non-recreational Lake Usage
None

Recreational Lake Usage

Fishing - (3), I Low power (<10hp) boating-(1)
Camping - (2), D Picnicking - (4), I
Waterfowl observation - (1)

Recreational Facilities

Camping facilities, concession stand, boat ramp, park, marina, picnic area, boatrental, bicycle trail. 6 Picnic shelters, 2 handicapped camping pads, equestrian trails, bow hunting (deer), shotgun hunting (squirrels, rabbits, quails)

Shoreline Usage, %

Woodland	75
Pasture	20
Recreation development	5

Watershed Drainage Area Usage, %

Cropland	30
Pasture/grassland	20
Woodland	50

Water Quality Problems

Problems

Suspended sediment	S
Sediment deposition	S
Algal blooms	M
Aquatic macrophytes	M
Water level fluctuation	MN
Fishkills	MN

Differences in Turbidity and Water Quality

In different portions of lake? Yes
At different times of the year? No

Fishing Good

Major Types of Fish

Largemouth and smallmouth bass, catfish, bluegill, red ear & green sunfish, crappie, walleye (lake was stocked with grass carp)

Causes of Quality Problems

Potential Pollution Sources
Runoff (cropland, pasture, woodland), erosion (streambank, shoreline), sediment in lake

Causes of Impairment

Nutrients	M	Siltation	M
Suspended solids	M	Filling/drainage	M

Sources of Impairment

Agriculture	M
Range land	M
Nonirrigated crop production	M
Pasture	M

Randolph County Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
7/6/1992	Grassed waterway, linear ft 2200	Erosion control
	<u>Tillage. %</u>	
	No-till .	25 Erosion control, economics
	Chisel/disc >30% res.	5 Erosion control
	Chisel/disc <30% res.	50 -
	Crop rotation (wheat)	20 Erosion control, pest management

Comments:

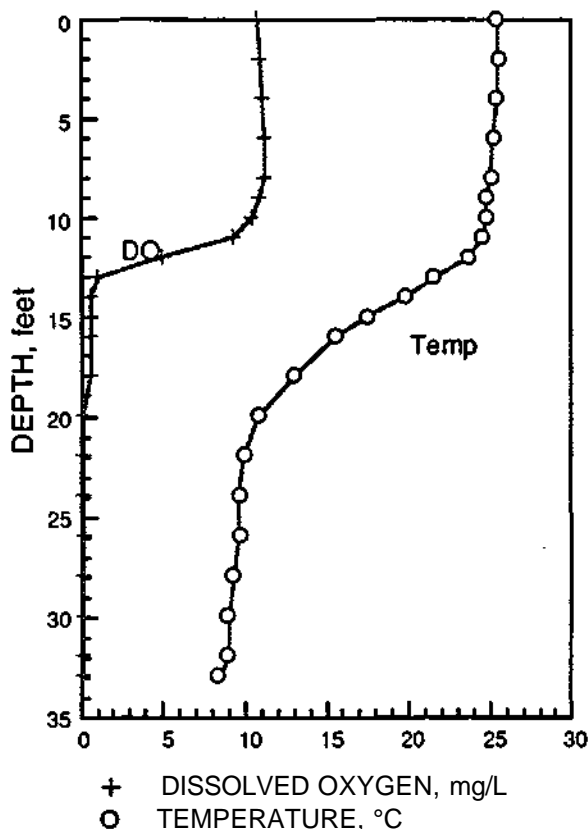
Water and Sediment Qualities

Sampling Date	08/04/92
Site Number	1
Water Depth of Site, feet	33
Secchi Disc Transparency, inches	84
Chlorophyll a, µg/L	38.27
Chlorophyll b, µg/L	0.43
Chlorophyll c, µg/L	0.61
Pheophytin a, µg/L	0.00
Trophic State Index	55
Trophic State	Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	21
Total Suspended Solids, mg/L	7	21
Volatile Suspended Solids, mg/L	6	9
Turbidity, NTU	0.6	5.8
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	0.06	2.9
Total Kjeldahl Nitrogen, mg/L	0.7	3.3
Total Phosphorus, mg/L	0.022	0.735
Dissolved Phosphorus, mg/L	0.015	-
Alkalinity, mg CaCO ₃ /L		
Total	118	169
Phenolphthalein	15	0
Field pH	9.2	7.4
Chemical Oxygen Demand, mg/L	22	22

DO & Temperature Profiles (Time, 14:00)



Sediment Quality

(mg/kg: ppm, K: less than detection value)	
Phosphorus-P, ppm	1102
Kjeldahl-N, ppm	3600
Solids, % wet	20.6
Vol. solids, %	11.8
TOC, %	-
Arsenic, ppm	11.6
Barium, ppm	256
Cadmium, ppm	1
Chromium, ppm	26
Copper, ppm	31
Iron, ppm	42000
Lead, ppm	26
Manganese, ppm	1700
Mercury, ppm	0.1K
Nickel, ppm	30
Potassium, ppm	1900
Silver, ppm	1K
Zinc, ppm	103

Reed City Lake

Peoria County

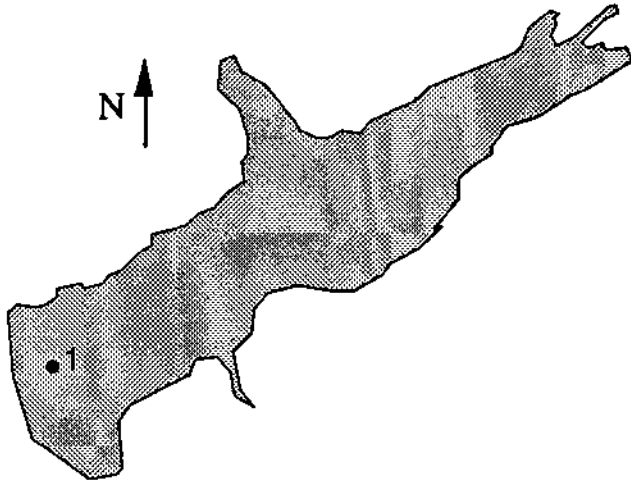
Map Code: UPO

Timber Hollis Park District

9424 S. Mapleton Road, Mapleton, IL 61547

309/697-2944

General



Lake Location	1.5 miles SW of Mapleton	
Deepest Point	Latitude	40°34'39"
	Longitude	89°44'48"
Lake Surface Area, acres	18	
Length of Shoreline, miles	1.19	
Maximum Depth, feet	23	
Average Depth, feet	11	
Lake Storage Capacity, acre-feet	198	
Watershed Drainage Area, acres	500	
Hydraulic Retention Time, years	-	
Lake Type	Dammed stream	
Year Constructed	1973	
Ownership	Public	
Inflowing Streams	Unnamed	
Outflowing Streams	Unnamed	
Unique Features		

Lake spillway level was reduced 14 feet because dam leaked. Lake was stocked with 50 triploid carp in 1989. Macrophyte coverage decreased to 1% of lake in 1992 compared to 25% earlier.

Usages and Impairments

Public Access

Yes

Entire lake bottom publicly owned, entire shoreline public access, free for Mapleton residents (\$50 license fee for others), significant use restrictions, fishing permitted only from 6am-9pm (Friday - Sunday). senior citizens on Wednesday

No. of Visitors per Year 25,000 - 100,000

Designated Uses and Impairments

Aquatic life	M
General recreation	M

Non-recreational Lake Usage

Firefighting use by filling up fire trucks - (3)

Recreational Lake Usage

Fishing - (2)
Low power boating - (2)

Recreational Facilities

Boat ramp, park, picnic area, picnic tables, stoves, toilet facilities for day visitors

Shoreline Usage, %

Woodland	99
Other	1

Watershed Drainage Area Usage, %

Cropland	34
Pasture/grassland	5
Woodland	61

Water Quality Problems

Problems

Suspended sediment	H
Sediment deposition	H
Algal blooms	H
Aquatic macrophytes	S
Water level fluctuation	M

Differences in Turbidity and Water Quality

In different portions of lake? Yes
At different times of the year? Yes

Fishing

Excellent

Major Types of Fish

Largemouth bass, bluegill, channel catfish, walleye, sunfish

Causes of Quality Problems

Potential Pollution Sources

Cropland runoff, sediment in lake

Causes of Impairment

Nutrients	H
Siltation	H
Thermal modification	H
Organic enrichment/DO depletion	H

Sources of Impairment

Nonpoint sources M

Reed City Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	Grassed waterway, acre	5 Erosion control
	<u>Tillage, %</u>	
	No-till	8
	Chisel/disc till - <30% residue	26
	Woodland	61
	Hayland/pasture	5

Comments:

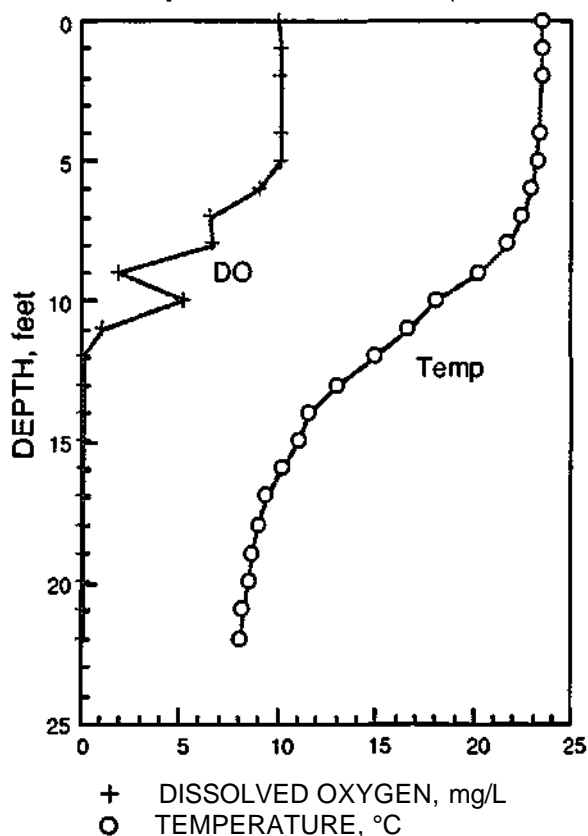
Water and Sediment Qualities

Sampling Date	07/06/92
Site Number	1
Water Depth of Site, feet	22
Secchi Disc Transparency, inches	57
Chlorophyll a, µg/L	20.63
Chlorophyll b, µg/L	2.23
Chlorophyll c, µg/L	1.08
Pheophytin a, µg/L	0.00
Trophic State Index	59
Trophic State	Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	20
Total Suspended Solids, mg/L	3	32
Volatile Suspended Solids, mg/L	1	11
Turbidity, NTU	0.2	12
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	0.12	3.8
Total Kjeldahl Nitrogen, mg/L	0.7	6.3
Total Phosphorus, mg/L	0.054	1.24
Dissolved Phosphorus, mg/L	0.040	1.20
Alkalinity, mg CaCO ₃ /L		
Total	201	318
Phenolphthalein	35	0
Field pH	8.9	7.5
Chemical Oxygen Demand, mg/L	20	28

DO & Temperature Profiles (Time, 10:00)



Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	920
Kjeldahl-N, ppm	2700
Solids, % wet	29.3
Vol. solids, %	7.6
TOC, %	-
Arsenic, ppm	15.8
Barium, ppm	242
Cadmium, ppm	1
Chromium, ppm	24
Copper, ppm	26
Iron, ppm	38000
Lead, ppm	26
Manganese, ppm	1200
Mercury, ppm	0.04
Nickel, ppm	29
Potassium, ppm	1800
Silver, ppm	1K
Zinc, ppm	120

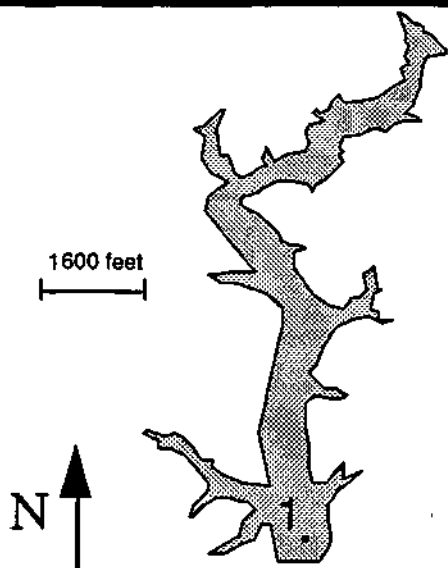
Schuy-Rush Lake

Schuyler County

Map Code: SDZC

City of Rushville
200 W. Washington, Rushville, IL 62681
217/323-3833

General



Lake Location	4 miles S. of Rushville	
Deepest Point	Latitude	40°03'43"
	Longitude	90°33'08"
Lake Surface Area, acres	191	
Length of Shoreline, miles	9.58	
Maximum Depth, feet	31	
Average Depth, feet	14	
Lake Storage Capacity, acre-feet	2674	
Watershed Drainage Area, acres	8499	
Hydraulic Retention Time, years	-	
Lake Type	Dammed stream	
Year Constructed	1977	
Ownership	Public	
Inflowing Streams	Crane Creek	
Outflowing Streams	Crane Creek	
Unique Features	-	

Usages and Impairments

Public Access Yes
Entire lake bottom publicly owned, entire shoreline public access, fee charged

No. of Visitors per Year <25,000

Designated Uses and Impairments

Agriculture	H
Irrigation	H
Industrial	H
Navigation	H

Non-recreational Lake Usage

Potable water supply - (1), P
Industrial water supply - (1), P
Agricultural water supply - (1), P
Road control - (3)
Stormwater detention - (3)

Recreational Lake Usage

Fishing - (2),P,D Swimming - (1),P,D
No power boating-(1) Camping - (1),P
Picnicking- (1), P

Recreational Facilities

Boat ramp, camping facilities, park, picnic area

Shoreline Usage, %

Residential (including lawns)	50
Woodland	50

Watershed Drainage Area Usage, %

Residential	2
Cropland	68
Pasture/grassland	20
Woodland	10

Water Quality Problems

Problems

Suspended sediment	S
Sediment deposition	H
Algal blooms	MN
Aquatic macrophytes	MN
Water level fluctuation	M
Fishkills	S

Differences in Turbidity and Water Quality

In different portions of lake? Yes
At different times of the year? No

Fishing

Major Types of Fish

Largemouth bass, bluegill, channelcatfish, blackcrappie, carp, shad

Causes of Quality Problems

Potential Pollution Sources

Urban storm drainage, runoffs (cropland, pasture, woodland), mining, streambank erosion

Causes of Impairment

Nutrients	S
Siltation	H

Sources of Impairment

Nonpoint sources	H
Agriculture	M

Schuy-Rush Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	Terraces, linear ft	27,800
	Grassed waterway, acre	40
	Structure/basins	220
	Pond/lake, acre	51
	Tillage, %	
	No-till	4
	Mulch till - >30% res.	68
	Reduced till - <30%	23
Comments:	Moldboard plow	5

Lake has a severe sedimentation problem and therefore reduces the quality of fishing and recreation.

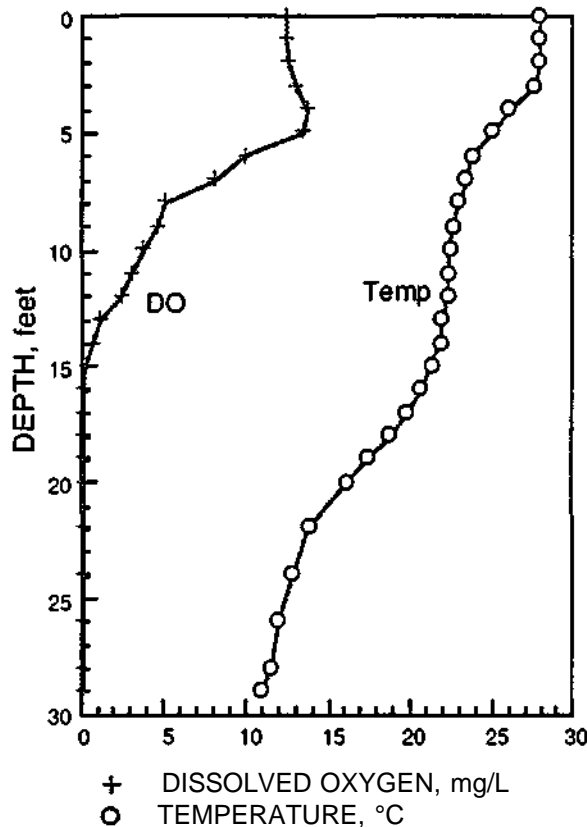
Water and Sediment Qualities

Sampling Date	08/01/92
Site Number	1
Water Depth of Site, feet	29
Secchi Disc Transparency, inches	42
Chlorophyll a, µg/L	17.36
Chlorophyll b, µg/L	4.33
Chlorophyll c, µg/L	3.59
Pheophytin a, µg/L	0.00
Trophic State Index	72
Trophic State	Hypereutrophic

Water Quality (K: less than detection value)

Depth, feet	1	27
Total Suspended Solids, mg/L	54	6
Volatile Suspended Solids, mg/L	18	3
Turbidity, NTU	16	0.5
NO ₂ /NO ₃ -Nitrogen, mg/L	0.02	0.01K
Ammonia Nitrogen, mg/L	3.6	0.03
Total Kjeldahl Nitrogen, mg/L	3.5	0.8
Total Phosphorus, mg/L	0.733	0.044
Dissolved Phosphorus, mg/L	0.601	0.020
Alkalinity, mg CaCO ₃ /L		
Total	114	208
Phenolphthalein	16	0
Field pH	9.0	7.2
Chemical Oxygen Demand, mg/L	20	18

DO & Temperature Profiles (Time, 15:30)



Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	1228
Kjeldahl-N, ppm	2410
Solids, % wet	37.7
Vol. solids, %	7.9
TOC, %	-
Arsenic, ppm	6.4
Barium, ppm	268
Cadmium, ppm	1
Chromium, ppm	27
Copper, ppm	32
Iron, ppm	39000
Lead, ppm	26
Manganese, ppm	1400
Mercury, ppm	0.1K
Nickel, ppm	31
Potassium, ppm	2200
Silver, ppm	1K
Zinc, ppm	115

Shovel Lake/Banner Marsh

Fulton County

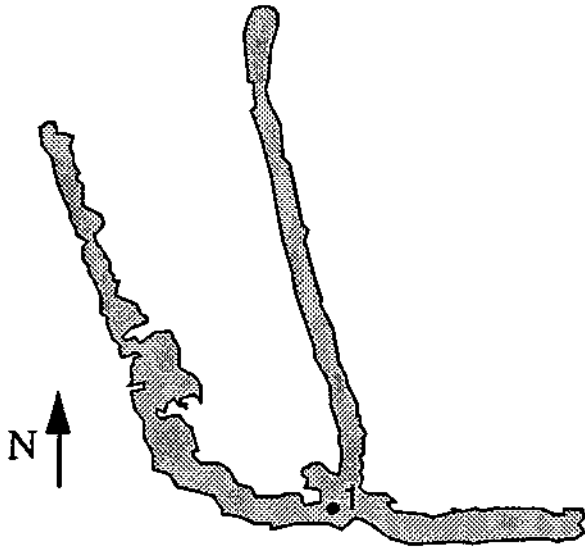
Map Code: UDP

IL Dept. of Conservation

Banner (R.R. Canton), IL

309/647-9184

General



Lake Location	1.5 mile SE of Banner	
Deepest Point	Latitude	40°29'50"
	Longitude	89°33'42"
Lake Surface Area, acres	78	
Length of Shoreline, miles	4.67	
Maximum Depth, feet	33	
Average Depth, feet	23	
Lake Storage Capacity, acre-feet	1794	
Watershed Drainage Area, acres	8000	
Hydraulic Retention Time, years	-	
Lake Type	Coal strip-mine	
Year Constructed	1973	
Ownership	State	
Inflowing Streams	-	
Outflowing Streams	-	
Unique Features		

The lake serves as a breeding source for Banner Marsh fisheries.

Usages and Impairments

Public Access No

Entire lake bottom publicly owned, entire shoreline not public access, but will become accessible in three years according to Banner Marsh Master Plan

No. of Visitors per Year <25,000

Designated Uses and Impairments

Aquatic life	S
Cool water fishery	S

Non-recreational Lake Usage
None

Recreational Lake Usage
No

Recreational Facilities
Not yet

Shoreline Usage, %

Pasture or grassland	80
Wetland	20

Watershed Drainage Area Usage, %

Pasture or grassland	90
Wetland	10

Water Quality Problems

Problems
Sediment deposition S

Differences in Turbidity and Water Quality
In different portions of lake? No
At different times of the year? Yes

Fishing Good

Major Types of Fish
Largemouth and smallmouth bass, walleye, channel catfish, bluegill (walleye are caught for Jake Wolf Fish Hatchery - 4 x 10⁶ eggs were collected in 1992)

Causes of Quality Problems

Potential Pollution Sources
Livestock operation

Causes of Impairment
Nutrients S

Sources of Impairment
Nonpoint sources S

Shovel Lake/Banner Marsh

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	Tillage. %	
	Moldboard plow	5
	Wildlife conservation	95

Comments:

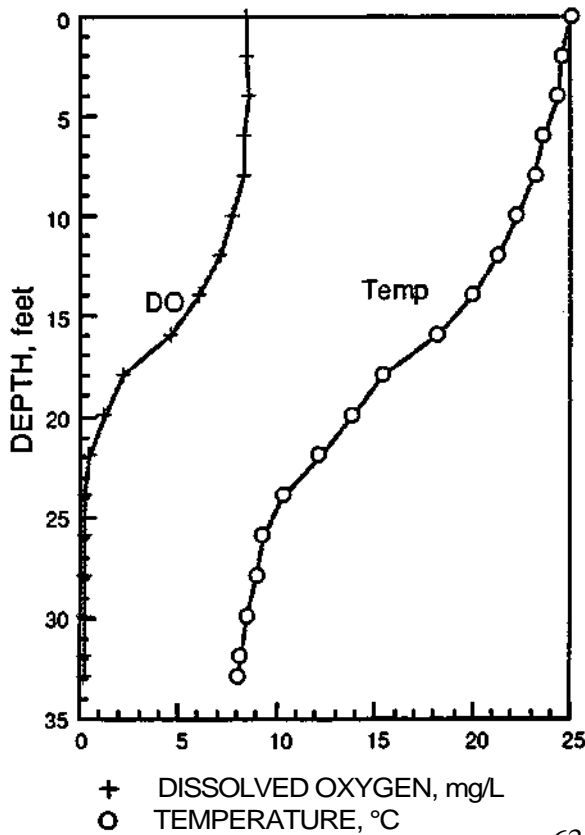
Water and Sediment Qualities

Sampling Date	07/06/92
Site Number	1
Water Depth of Site, feet	33
Secchi Disc Transparency, inches	66
Chlorophyll a, µg/L	3.74
Chlorophyll b, µg/L	0.06
Chlorophyll c, µg/L	0.00
Pheophytin a, µg/L	0.00
Trophic State Index	45
Trophic State	Mesotrophic

Water Quality (K: less than detection value)

Depth, feet	1	31
Total Suspended Solids, mg/L	3	20
Volatile Suspended Solids, mg/L	1	6
Turbidity, NTU	0.1	1.6
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	0.03	0.39
Total Kjeldahl Nitrogen, mg/L	0.2	0.5
Total Phosphorus, mg/L	0.012	0.018
Dissolved Phosphorus, mg/L	0.008	0.008
Alkalinity, mg CaCO ₃ /L		
Total	165	236
Phenolphthalein	4	0
Field pH	8.34	7.6
Chemical Oxygen Demand, mg/L	9	10

DO & Temperature Profiles (Time, 11:00)



Sediment Quality

(mg/kg; ppm, K: less than detection value)

Phosphorus-P, ppm	757
Kjeldahl-N, ppm	1820
Solids, % wet	37.2
Vol. solids, %	6.6
TOC, %	-
Arsenic, ppm	8.9
Barium, ppm	177
Cadmium, ppm	2
Chromium, ppm	20
Copper, ppm	23
Iron, ppm	36000
Lead, ppm	20
Manganese, ppm	1000
Mercury, ppm	0.03
Nickel, ppm	35
Potassium, ppm	1500
Silver, ppm	1K
Zinc, ppm	103

Spring Lake

McDonough County

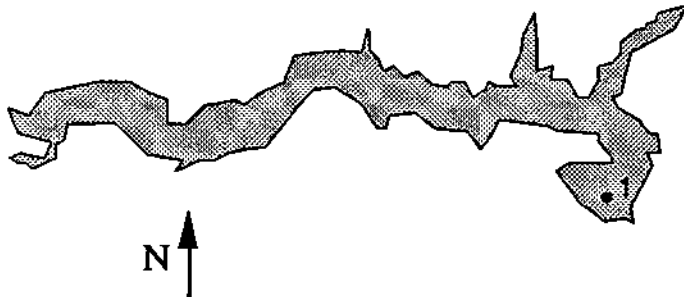
Map Code: RDR

City of Macomb

232 E. Jackson, Macomb, IL 61455

309/837-0501

General



Lake Location	4 miles NW of Macomb	
Deepest Point	Latitude	40°30'18"
	Longitude	90°43'18"
Lake Surface Area, acres	277	
Length of Shoreline, miles	7.16	
Maximum Depth, feet	28	
Average Depth, feet	10.4	
Lake Storage Capacity, acre-feet	2881	
Watershed Drainage Area, acres	12966	
Hydraulic Retention Time, years	0.287	
Lake Type	Dammed stream	
Year Constructed	1927	
Ownership	Public	
Inflowing Streams	Spring Creek	
Outflowing Streams	Spring Creek	
Unique Features		

Destratifier was installed in 1988. Lake is partly spring fed (600-800 gpd during droughts). The watershed has approximately 130 farms, averaging 100 acres each.

Usages and Impairments

Public Access Yes
 Entire lake bottom publicly owned, entire shoreline public access, unlimited free access, park gates close between 10pm and 6 am

No. of Visitors per Year 25,000 - 100,000

Designated Uses and Impairments

Aquatic life	S
Domestic water supply	-
Agriculture	-
Industrial	-
General recreation	S

Non-recreational Lake Usage

- Potable water supply - (4), P
- Industrial water supply - (4)
- Agricultural water supply - (1)

Recreational Lake Usage

Fishing - (3)	Low power boating - (3)
Sailboating - (3)	Waterfowl hunting - (3)
Waterfowl observation - (2)	

Recreational Facilities

Camping facilities, boat ramp, boat rental, picnic area (heavily used for the size of the lake)

Shoreline Usage, %

Pasture or grassland	20	Woodland	70
Wetland	5	Recreation Dev.	5

Watershed Drainage Area Usage, %

Cropland	77
Pasture or grassland	12
Woodland	6
Water	5

Water Quality Problems

Problems

Suspended sediment	M
Sediment deposition	M
Algal blooms	S
Aquatic macrophytes	S
Taste/odor	MN
Water level fluctuation	H
Fishkills	S

Differences in Turbidity and Water Quality

In different portions of lake?	Yes
At different times of the year?	Yes

Fishing

Good

Major Types of Fish

Catfish, bass, striper, crappie, bluegill (lake was stocked annually, but not in 1992)

Causes of Quality Problems

Potential Pollution Sources

Runoffs (cropland, pasture, woodland, 1 feedlot), streambank erosion, sediment in lake

Causes of Impairment

Organic enrichment/DO depletion	M
---------------------------------	---

Sources of Impairment

Pasture	S
---------	---

Spring Lake

Lake Protection Management

Treatment Date Type and Extent of Treatment Reason for Treatment

Terrace, linear ft.	58,313	Erosion control
Grassed waterways, acre	41.6	
Grade stabilization structures	69	
Diversions, linear ft.	20,889	
Tillage, %		
No-till	38	
Mulch till	22	
Moldboard plow	2	
Chisel/disc - <30% residue	15	
Woodland	6	
Hayland or Pasture	12	
Other	5	

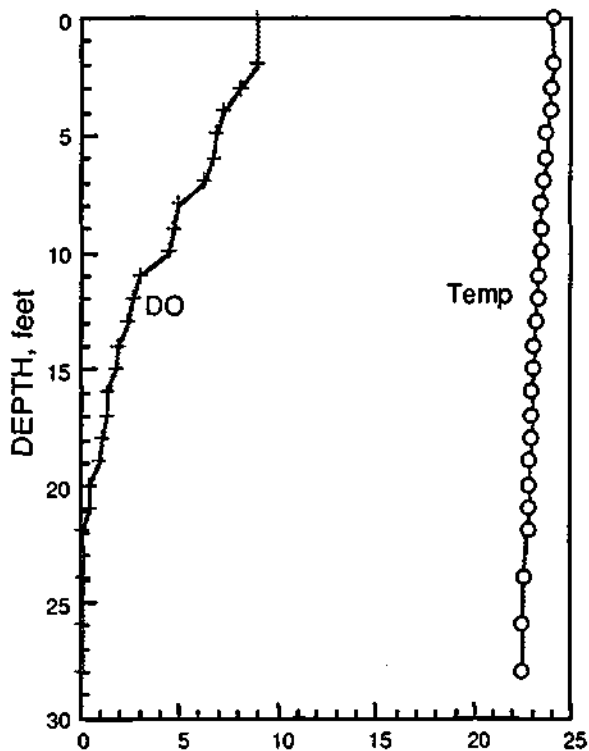
Water and Sediment Qualities

Sampling Date	08/12/92
Site Number	1
Water Depth of Site, feet	28
Secchi Disc Transparency, inches	42
Chlorophyll a, µg/L	18.16
Chlorophyll b, µg/L	0.99
Chlorophyll c, µg/L	0.00
Pheophytin a, µg/L	0.00
Trophic State Index	63
Trophic State	Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	26
Total Suspended Solids, mg/L	27	9
Volatile Suspended Solids, mg/L	16	3
Turbidity, NTU	4.1	0.7
NO ₂ /NO ₃ -Nitrogen, mg/L	1.72	1.86
Ammonia Nitrogen, mg/L	0.73	0.25
Total Kjeldahl Nitrogen, mg/L	1.3	1.2
Total Phosphorus, mg/L	0.096	0.070
Dissolved Phosphorus, mg/L	0.023	0.027
Alkalinity, mg CaCO ₃ /L		
Total	122	130
Phenolphthalein	12	0
Field pH	8.7	7.7
Chemical Oxygen Demand, mg/L	20	13

DO & Temperature Profiles (Time, 13:30)



+ DISSOLVED OXYGEN, mg/L
 O TEMPERATURE, °C

Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	1217
Kjeldahl-N, ppm	4040
Solids, % wet	27.8
Vol. solids, %	10.5
TOC, %	-
Arsenic, ppm	7.2
Barium, ppm	306
Cadmium, ppm	1
Chromium, ppm	20
Copper, ppm	166
Iron, ppm	31000
Lead, ppm	25
Manganese, ppm	1600
Mercury, ppm	0.1K
Nickel, ppm	22
Potassium, ppm	1800
Silver, ppm	1K
Zinc, ppm	90

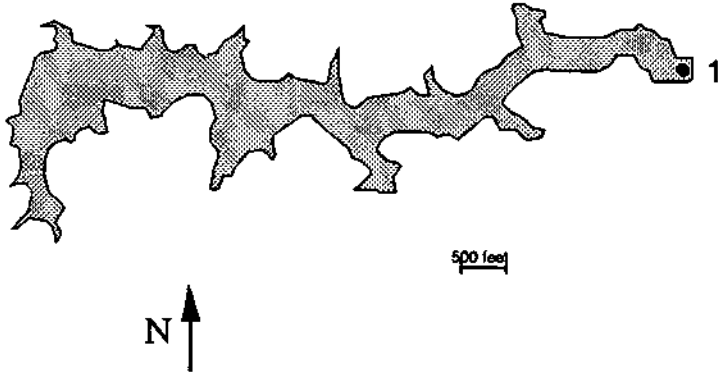
Storey Lake

Knox County

Map Code: RLB

City of Galesburg
55 W. Tompkins, Galesburg, IL 61401
309/343-9151 x244

General



Lake Location	1 mile N of Galesburg	
Deepest Point	Latitude	40°59'24"
	Longitude	90°24'24"
Lake Surface Area, acres	132.5	
Length of Shoreline, miles	5.8	
Maximum Depth, feet	33	
Average Depth, feet	13.9	
Lake Storage Capacity, acre-feet	1842	
Watershed Drainage Area, acres	4524	
Hydraulic Retention Time, years	0.773	
Lake Type	Dammed stream	
Year Constructed	1929	
Ownership	Public	
Inflowing Streams	Fork of the Henderson Creek	
Outflowing Streams	-	
Unique Features	-	

Usages and Impairments

Public Access Yes
Entire lake bottom publicly owned, entire shoreline public access, unlimited free access

No. of Visitors per Year 25,000 - 100,000

Designated Uses and Impairments
Aquatic life S
General recreation S

Non-recreational Lake Usage
None

Recreational Lake Usage

Fishing - (3), D Swimming - (3), D
Camping - (3), D Picnicking - (3), D
Waterfowl observation - (1), D

Recreational Facilities

Swimming beach, camping facilities, 2 boat ramps, 2 parks, picnic area, boat rental, bicycle trail

Shoreline Usage, %

Woodland 65
Recreation development 35

Watershed Drainage Area Usage, %

Industrial/residential 15
Cropland 76
Pasture 4
Woodland 5

Water Quality Problems

Problems
Suspended sediment M
Sediment deposition M
Algal blooms S

Differences in Turbidity and Water Quality

In different portions of lake? Yes
At different times of the year? Yes

Fishing

Major Types of Fish

Catfish, bluegill, crappie, bass

Causes of Quality Problems

Potential Pollution Sources
Runoff (cropland, woodland, golf course), streambank erosion, shoreline erosion

Causes of Impairment

Nutrients S
Organic enrichment/DO depletion S

Sources of Impairment

Municipal S
Nonpoint source M
Agriculture M

Storey Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	Grassed waterways, acre	50
	Grade stabilization structures	10
	Ponds	4
	Tillage, %	
	No-till	8
	Ridge till	0.1
	Mulch till	32
	Moldboard plow	4
	Chisel/disc - <30% residue	32
	Woodland	5
	Hayland or Pasture	3.9
	Other	15

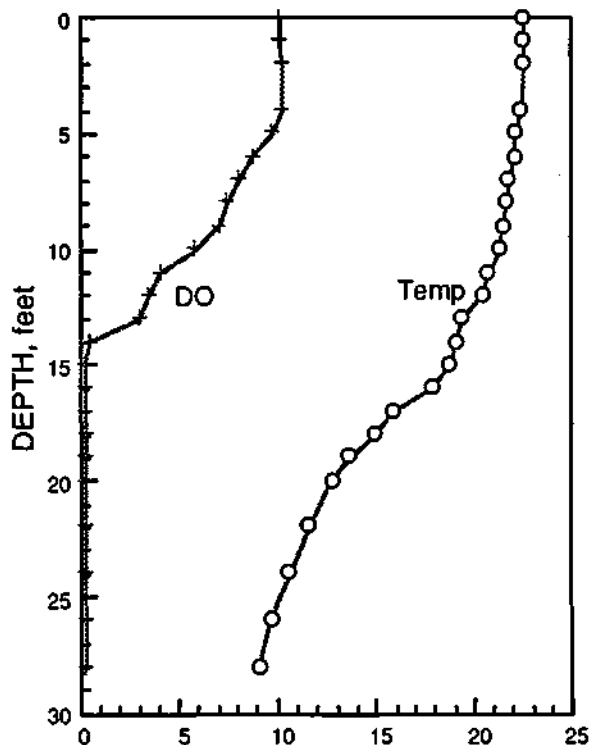
Water and Sediment Qualities

Sampling Date	07/09/92
Site Number	1
Water Depth of Site, feet	28
Secchi Disc Transparency, inches	78
Chlorophyll a, µg/L	18.69
Chlorophyll b, µg/L	0.79
Chlorophyll c, µg/L	1.51
Pheophytin a, µg/L	0.00
Trophic State Index	54
Trophic State	Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	26
Total Suspended Solids, mg/L	3	20
Volatile Suspended Solids, mg/L	2	10
Turbidity, NTU	0.4	0.1
NO ₂ /NO ₃ -Nitrogen, mg/L	0.59	0.01K
Ammonia Nitrogen, mg/L	0.20	2.1
Total Kjeldahl Nitrogen, mg/L	1.1	3.2
Total Phosphorus, mg/L	0.030	3.2
Dissolved Phosphorus, mg/L	0.014	0.212
Alkalinity, mg CaCO ₃ /L		
Total	130	212
Phenolphthalein	12	0
Field pH	8.8	7.6
Chemical Oxygen Demand, mg/L	20	21

DO & Temperature Profiles (Time, 11:00)



+ DISSOLVED OXYGEN, mg/L
 O TEMPERATURE, °C

Sediment Quality

(mg/kg; ppm, K: less than detection value)

Phosphorus-P, ppm	1034
Kjeldahl-N, ppm	3230
Solids, % wet	24.7
Vol. solids, %	11.3
TOC, %	-
Arsenic, ppm	9.9
Barium, ppm	286
Cadmium, ppm	1
Chromium, ppm	22
Copper, ppm	28
Iron, ppm	31000
Lead, ppm	27
Manganese, ppm	873
Mercury, ppm	0.09
Nickel, ppm	32
Potassium, ppm	1600
Silver, ppm	1K
Zinc, ppm	117

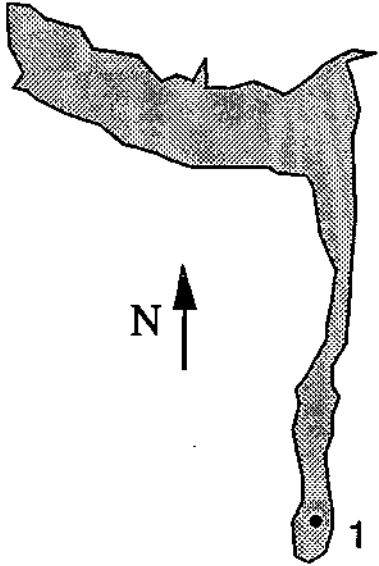
Strode Lake

Fulton County

Map Code: UDAQ

Canton Park District
250 S. Avenue, Canton, IL 61520
309/647-1345

General



Lake Location	1 mile NW of Canton	
Deepest Point	Latitude	40°34'38"
	Longitude	90°02'55"
Lake Surface Area, acres	30	
Length of Shoreline, miles	1.93	
Maximum Depth, feet	38	
Average Depth, feet	21.8	
Lake Storage Capacity, acre-feet	654	
Watershed Drainage Area, acres	425	
Hydraulic Retention Time, years	-	
Lake Type	Coal strip-mine	
Year Constructed	1965 (reclaimed in 1975)	
Ownership	Public	
Inflowing Streams	None	
Outflowing Streams	Big Creek	
Unique Features	-	

Usages and Impairments

Public Access Yes

Entire lake bottom publicly owned, entire shoreline public access, unlimited free access, daily fee: boating (\$0.50/resident, \$1.00/non-resident), fishing (\$2/resident; \$3.00/non-resident)

No. of Visitors per Year >25,000 to <100,000

Designated Uses and Impairments

Aquatic life	S
Cool water fishery	S
General recreation	M

Non-recreational Lake Usage

Agricultural water supply - (2), D
Irrigation - (2)

Recreational Lake Usage

Fishing - (4),P,I	Sail boating - (1),P,I
Picnicking - (3),D	Waterfowl hunting-(1),D
Low power (electric only) boating - (4),P,I	

Recreational Facilities

Concession stand, boat ramp, boat rental, park, picnic area, bicycle trail (2 more miles of bicycle trails are being constructed total 55 miles. 450 acres total park area with 5 lakes.

Shoreline Usage, %

Pasture or grassland	85
Wetland	15

Watershed Drainage Area Usage, %

Pasture or grassland	95
Recreation development	5

Water Quality Problems

Problems

Suspended sediment	MN
Sediment deposition	S
Algal blooms	MN
Aquatic macrophytes	S
Taste/odor	MN
Water level fluctuation	S
Fishkills	S

Differences in Turbidity and Water Quality

In different portions of lake?	No
At different times of the year?	No

Fishing

Good

Major Types of Fish

Channel catfish, largemouth bass, bluegill, hybrid redbreast sunfish, green sunfish, walleye

Causes of Quality Problems

Potential Pollution Sources

Runoffs (cropland, pasture), mining, livestock operation, shoreline erosion, waterfowl

Causes of Impairment

Nutrients	S
Siltation	S

Sources of Impairment

Nonpoint sources	S
Pasture	S
Waterfowl	M

Strode Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	None	

Comments:

95% of the watershed is hayland or pasture

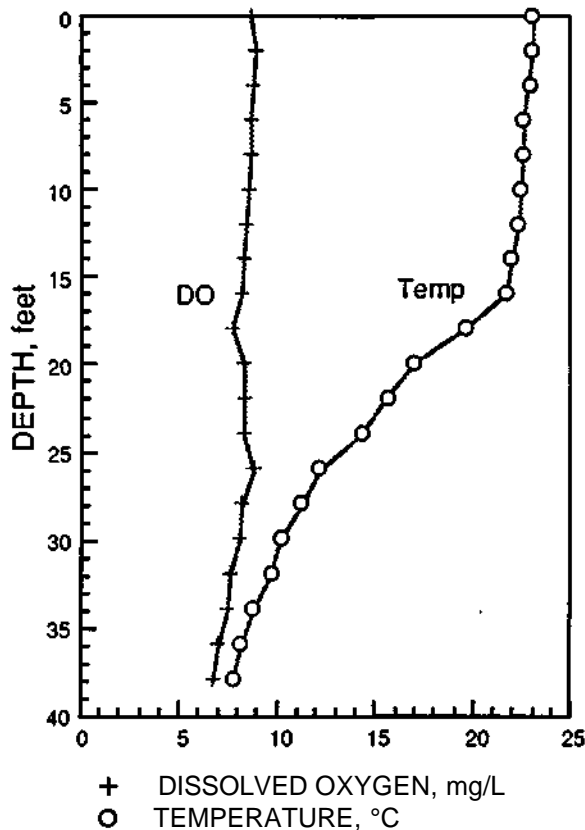
Water and Sediment Qualities

Sampling Date	07/09/92
Site Number	1
Water Depth of Site, feet	65
Secchi Disc Transparency, inches	186
Chlorophyll <i>a</i> , $\mu\text{g/L}$	3.74
Chlorophyll <i>b</i> , $\mu\text{g/L}$	0.33
Chlorophyll <i>c</i> , $\mu\text{g/L}$	0.50
Pheophytin <i>a</i> , $\mu\text{g/L}$	0.00
Trophic State Index	44
Trophic State	Mesotrophic

Water Quality (K: less than detection value)

Depth, feet	1	40
Total Suspended Solids, mg/L	3	24
Volatile Suspended Solids, mg/L	2	3
Turbidity, NTU	1.6	0.5
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.22
Ammonia Nitrogen, mg/L	0.33	0.22
Total Kjeldahl Nitrogen, mg/L	0.7	0.6
Total Phosphorus, mg/L	0.025	0.027
Dissolved Phosphorus, mg/L	0.008	0.010
Alkalinity, mg CaCO ₃ /L		
Total	130	177
Phenolphthalein	5	0
Field pH	8.6	7.6
Chemical Oxygen Demand, mg/L	21	11

DO & Temperature Profiles (Time, 14:20)



Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	564
Kjeldahl-N, ppm	1290
Solids, % wet	40.2
Vol. solids, %	4.3
TOC, %	-
Arsenic, ppm	5.1
Barium, ppm	142
Cadmium, ppm	1K
Chromium, ppm	18
Copper, ppm	17
Iron, ppm	23000
Lead, ppm	15
Manganese, ppm	759
Mercury, ppm	0.1K
Nickel, ppm	21
Potassium, ppm	1000
Silver, ppm	1K
Zinc, ppm	61

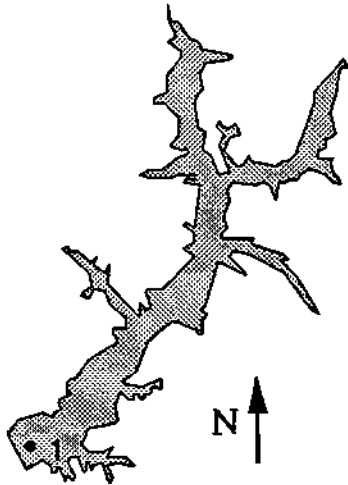
Washington County Lake

Washington County

Map Code: RNM

IL Dept. of Conservation
RR #3. Nashville, IL 62263
618/327-3137

General



Lake Location	4 miles S of Nashville	
Deepest Point	Latitude	38°16'10"
	Longitude	89°21'37"
Lake Surface Area, acres	295	
Length of Shoreline, miles	12.3	
Maximum Depth, feet	18	
Average Depth, feet	8.9	
Lake Storage Capacity, acre-feet	2625	
Watershed Drainage Area, acres	6800	
Hydraulic Retention Time, years	0.421	
Lake Type	Dammed stream	
Year Constructed	1962	
Ownership	State	
Inflowing Streams	An unnamed & Locust Creek	
Outflowing Streams	Locust Creek	
Unique Features	State park.	

Usages and Impairments

Public Access Yes
Entire lake bottom publicly owned, entire shoreline public access, unlimited free access

No. of Visitors per Year 100,000 - 200,000

Designated Uses and Impairments

Aquatic life	S
Potable water supply	S
Industrial	S
General recreation	S

Non-recreational Lake Usage

Potable water supply - (3)
Industrial water supply - (3)

Recreational Lake Usage

Fishing - (4)	Low power boating - (3)
Sailboating-(1)	Camping-(4)
Picnicking - (4)	Waterfowl hunting- (2)

Recreational Facilities

Camping facilities, concession stand, boat ramp, boat rental, park, marina, picnic area (facilities are well used and very good)

Shoreline Usage, %

Woodland	70
Recreation development	30

Watershed Drainage Area Usage, %

Cropland	75
Pasture	10
Woodland	10
Recreation development and lake (3%)	5

Water Quality Problems

Problems

Suspended sediment	M
Sediment deposition	M
Aquatic macrophytes	S

Differences in Turbidity and Water Quality

In different portions of lake?	Yes
At different times of the year?	Yes

Fishing Good

Major Types of Fish

Channel catfish, largemouth bass, bluegill, crappie, sunfish, crap (fish stocking - channel cat only; bass reproduce well)

Causes of Quality Problems

Potential Pollution Sources

Woodland runoff, shoreline erosion, sediment in lake

Causes of Impairment

Siltation	M
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Sources of Impairment

Nonpoint sources	M
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Washington County Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
1989	Pond constructed	Livestock water
1990-91	800 acre conservation cropping system	Erosion control

Comments:

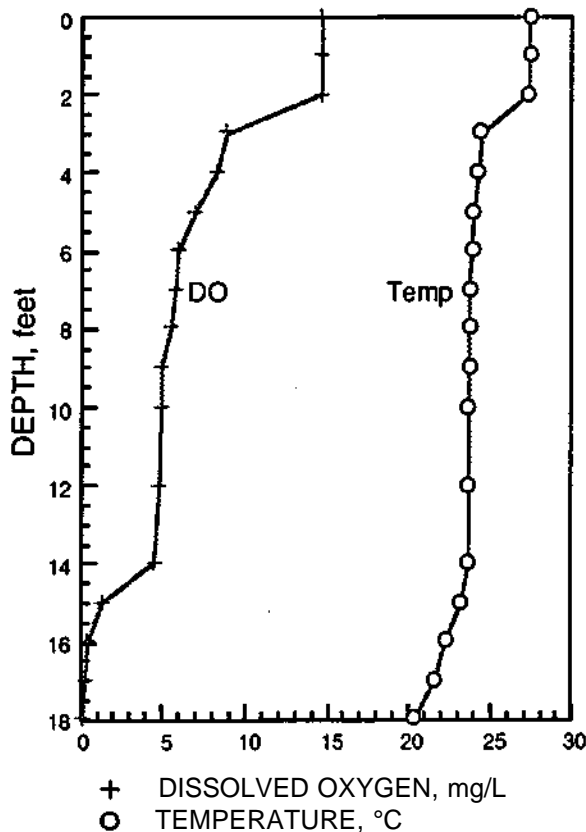
Water and Sediment Qualities

Sampling Date		08/03/92
Site Number		1
Water Depth of Site, feet		18
Secchi Disc Transparency, inches		15
Chlorophyll a, µg/L		106.8
Chlorophyll b, µg/L		8.50
Chlorophyll c, µg/L		0.00
Pheophytin a, µg/L		0.00
Trophic State Index		77
Trophic State		Hypereutrophic

Water Quality (K: less than detection value)

Depth, feet	1	16
Total Suspended Solids, mg/L	16	20
Volatile Suspended Solids, mg/L	12	12
Turbidity, NTU	3.7	2.5
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01K
Ammonia Nitrogen, mg/L	0.23	0.23
Total Kjeldahl Nitrogen, mg/L	1.9	1.6
Total Phosphorus, mg/L	0.199	0.189
Dissolved Phosphorus, mg/L	0.102	0.112
Alkalinity, mg CaCO ₃ /L		
Total	106	93
Phenolphthalein	20	0
Field pH	9.3	7.5
Chemical Oxygen Demand, mg/L	38	25

DO & Temperature Profiles (Time, 14:30)



Sediment Quality

(mg/kg: ppm, K: less than detection value)

Phosphorus-P, ppm	1393
Kjeldahl-N, ppm	2990
Solids, % wet	27.1
Vol. solids, %	4.7
TOC, %	-
Arsenic, ppm	9.8
Barium, ppm	283
Cadmium, ppm	1
Chromium, ppm	23
Copper, ppm	23
Iron, ppm	39000
Lead, ppm	32
Manganese, ppm	1800
Mercury, ppm	0.1K
Nickel, ppm	22
Potassium, ppm	2100
Silver, ppm	1K
Zinc, ppm	93

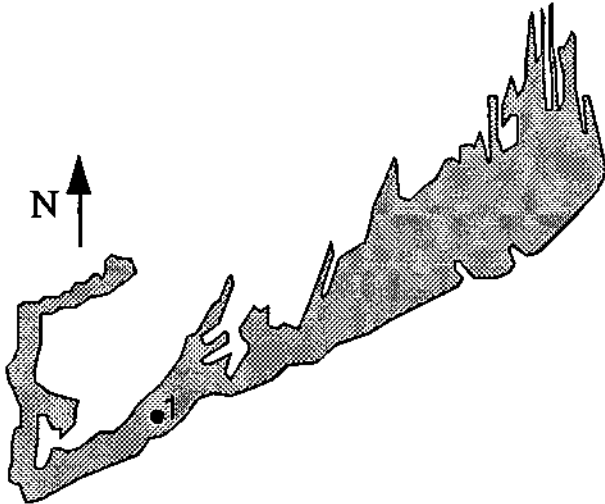
Wheel Lake

Peoria County

Map Code: UDR

IL Dept. of Conservation
RR #3, Box 91, Canton, IL 61520
309/647-9184

General



Lake Location	9 miles NE of Banner	
Deepest Point	Latitude	40°32'12"
	Longitude	89°49'44"
Lake Surface Area, acres	45	
Length of Shoreline, miles	7.3	
Maximum Depth, feet	28	
Average Depth, feet	14	
Lake Storage Capacity, acre-feet	630	
Watershed Drainage Area, acres	8000	
Hydraulic Retention Time, years	-	
Lake Type	Coal strip-mine	
Year Constructed	1971	
Ownership	state	
Inflowing Streams	-	
Outflowing Streams	-	
Unique Features		

Wheel cut procedure was used for mining coal, and hence the name for the lake.

Usages and Impairments

Public Access Yes
Entire lake bottom publicly owned, entire shoreline public access, unlimited free access

No. of Visitors per Year <25,000
Designated Uses and Impairments
Aquatic life S
General recreation S

Non-recreational Lake Usage
None

Recreational Lake Usage

- Fishing - (2)
- Low power boating - (1)
- Picnicing-(1)
- Waterfowl observation - (3)

Recreational Facilities

None, fishing is allowed, hunting (pheasant, quail, rabbit, coyote) bow hunting (deer and dove) in designated areas

Shoreline Usage, %

Grassland	90
Wetland	10

Watershed Drainage Area Usage, %

Pasture or grassland	85
Wetland	5
Cropland	10

Water Quality Problems

Problems

Differences in Turbidity and Water Quality

- In different portions of lake? No
- At different times of the year? No

Fishing

Good

Major Types of Fish

Largemouth bass, walleye, northern pike, crappie, bluegill, & channel catfish (lake stocked annually)

Causes of Quality Problems

Potential Pollution Sources

Slag, used as base for constructing road along lake, tends to depress pH after a storm event

Causes of Impairment

pH S

Sources of Impairment

Nonpoint sources (road along the lake) S

Wheel Lake

Lake Protection Management

Treatment Date	Type and Extent of Treatment	Reason for Treatment
	None	

Comments:

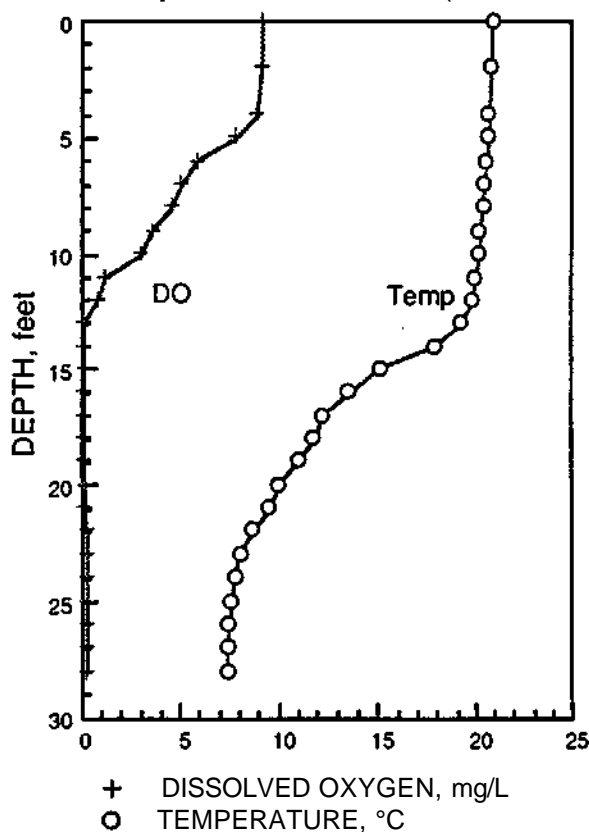
Water and Sediment Qualities

Sampling Date		08/18/92
Site Number		1
Water Depth of Site, feet		28
Secchi Disc Transparency, inches		34
Chlorophyll a, µg/L		45.92
Chlorophyll b, µg/L		2.93
Chlorophyll c, µg/L		2.83
Pheophytin a, µg/L		0.00
Trophic State Index		65
Trophic State		Eutrophic

Water Quality (K: less than detection value)

Depth, feet	1	26
Total Suspended Solids, mg/L	12	9
Volatile Suspended Solids, mg/L	8	5
Turbidity, NTU	3.1	0.3
NO ₂ /NO ₃ -Nitrogen, mg/L	0.01K	0.01
Ammonia Nitrogen, mg/L	0.06	1.7
Total Kjeldahl Nitrogen, mg/L	1.0	2.4
Total Phosphorus, mg/L	0.067	0.690
Dissolved Phosphorus, mg/L	0.021	0.041
Alkalinity, mg CaCO ₃ /L		
Total	110	259
Phenolphthalein	2	0
Field pH	8.4	7.6
Chemical Oxygen Demand, mg/L	20	23

DO & Temperature Profiles (Time, 11:00)



Sediment Quality

(mg/kg; ppm, K: less than detection value)

Phosphorus-P, ppm	510
Kjeldahl-N, ppm	1650
Solids, % wet	45.9
Vol. solids, %	7.2
TOC, %	2.5
Arsenic, ppm	5.1
Barium, ppm	182
Cadmium, ppm	4
Chromium, ppm	23
Copper, ppm	31
Iron, ppm	33000
Lead, ppm	29
Manganese, ppm	1028
Mercury, ppm	0.12
Nickel, ppm	65
Potassium, ppm	1450
Silver, ppm	1K
Zinc, ppm	154

**Appendix A. Water Temperature (°C) and Dissolved Oxygen (mg/L) Data
for 25 Illinois Lakes**

<i>Depth</i>	<i>Altamont</i> 6/22/92		<i>Anna</i> 8/5/92		<i>Avondale</i> 7/8/92		<i>Carlton</i> 7/7/92		<i>Coulterville</i> 8/4/92	
	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>
0	23.0	12.9	25.0	8.2	23.0	9.2	21.5	8.1	24.0	7.5
1	23.0	13.1	25.1	8.2	22.5	8.1			24.0	7.5
2	23.0	12.8	25.1	8.2	22.4	7.8	21.5	8.1	24.0	7.5
3	22.1	10.0	25.1	8.2	22.3	7.8			24.0	7.1
4	22.0	9.4	25.0	8.2	22.2	6.6	21.4	8.0	24.0	7.1
5	21.9	9.3	24.8	7.6	22.1	5.7			24.0	7.1
6	21.8	9.0	24.7	7.3	21.9	5.2	21.3	8.1	24.0	6.9
7	21.8	9.0	24.5	6.0	21.9	4.8			24.0	6.7
8	21.7	9.0	24.1	1.8			21.1	8.4	23.7	4.2
9	21.7	9.0	23.3	0.4					23.7	3.4
10	21.7	9.0	21.2	0.3			21.2	7.5	23.7	3.4
11	21.6	9.0	20.3	0.2					23.6	1.9
12	21.6	8.9	19.5	0.2			20.5	1.7	23.4	1.2
13	21.6	8.8	19.3	0.2					23.4	0.3
14	21.6	8.8	19.1	0.2			19.4	0.8	23.4	0.2
15	21.5	8.8							23.1	0.1
16	21.5	8.8					19.4	0.2	23.0	0.1
17									22.9	0.1
18	21.5	8.8					17.5	0.2		
19										
20	21.5	8.8					14.8	0.2		
21										
22	21.5	8.8					13.8	0.2		
23	21.3	8.5								
24	21.1	8.2								
25										
26	20.7	8.2								
27										
28	20.6	8.0								
29	20.6	1.6								

Appendix A. Continued

<i>Depth</i>	<i>Fitch 7/9/92</i>		<i>Gladstone 8/12/92</i>		<i>Greenfield 8/10/92</i>		<i>Johnson 7/6/92</i>		<i>Kinmundy City 6/23/92</i>	
	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>
0	23.5	9.7	23.9	11.9	24.4	7.2	24.3	8.2	21.4	11.3
1			23.9	11.9	24.4	7.2				
2	23.5	9.8	23.9	11.9	24.4	7.0	23.8	8.3	21.4	11.3
3			24.0	11.9	24.4	6.2			21.2	9.7
4	23.5	9.8	24.0	12.0	24.3	5.1	23.4	8.3	21.2	9.0
5			24.0	11.9	24.0	4.5			21.1	5.6
6	23.5	9.8	24.0	12.0	24.0	3.4	23.2	8.1	20.1	1.9
7			24.0	11.9	23.7	2.9			19.2	0.1
8	22.6	10.0	24.0	12.0	23.7	2.9	23.0	7.3	16.6	0.1
9			23.9	11.9	23.7	2.9			14.7	0.1
10	22.3	9.7	23.7	11.1	23.7	2.8	22.1	6.6	13.3	0.1
11	22.1	9.2	23.3	9.3	23.7	2.8			12.3	0.1
12	22.0	8.7	23.2	8.2	23.7	2.8	21.2	5.5	11.0	0.1
13	21.9	8.4	22.6	3.3	23.6	2.9			10.5	0.1
14	21.6	7.9	22.4	1.8	23.6	3.1	19.0	3.8	10.0	0.1
15	21.5	7.7			23.5	3.1			9.2	0.1
16	20.9	7.8			23.5	3.0	16.3	1.0	8.7	0.1
17	19.4	6.9			23.5	2.6				
18	18.1	6.1			23.4	1.6	14.5	0.3		
19	17.6	3.4			21.8	0.2				
20	16.6	2.0			21.5	0.1	13.0	0.2		
21										
22	15.5	1.5					11.9	0.2		
23	15.0	1.0								
24							11.2	0.3		
26							10.6	0.2		
28							9.9	0.2		
30							9.4	0.2		
32							8.8	0.2		
34							8.3	0.2		
36							7.8	0.2		
38							7.5	0.2		

Appendix A. Continued

<i>Depth</i>	<i>Levings 8/18/92</i>		<i>Little Sister 7/8/92</i>		<i>Nashville City 8/3/92</i>		<i>No. 3/FCCRA 7/8/92</i>		<i>Oakland City 6/22/92</i>	
	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>
0	18.3	13.6	25.6	11.8	26.3	9.1	25.6	13.4	19.8	12.4
1	18.0	13.7	24.6	10.7	25.0	9.0			19.5	11.4
2	17.7	13.5	24.4	10.5	25.7	8.6	24.6	14.5	19.4	11.2
3	17.0	10.0	23.3	8.6	24.7	5.6			19.1	11.1
4	16.9	7.8	23.1	8.6	24.3	5.2	23.4	13.3	19.1	11.1
5	16.1	7.4	22.8	7.9	24.0	5.0			19.0	10.8
6	15.2	8.4	22.6	3.5	24.0	4.9	23.0	13.4	19.0	10.7
7			22.3	3.3	23.9	5.3			19.0	10.4
8			22.1	2.4	23.9	5.3	22.7	13.1	19.0	10.3
9			21.7	0.5	23.8	5.3			19.0	10.2
10			21.5	0.3	23.8	4.6	21.7	16.6		
11			20.2	0.3	23.7	3.0				
12			19.7	0.3	23.6	2.0	20.0	16.1		
13			18.8	0.3			19.0	10.8		
14			18.1	0.3			17.3	5.5		
15			16.5	0.3			16.4	1.4		
16			14.5	0.3			15.3	1.1		
17			13.0	0.3			14.3	0.5		
18			11.1	0.3			13.3	0.3		
19							12.2	0.3		
20							11.3	0.3		
21										
22							10.6	0.3		
23										
24							10.2	0.4		
25										
26							9.4	0.4		
27										
28							9.3	0.4		

Appendix A. Continued

<i>Depth</i>	<i>Ramsey 6/23/92</i>		<i>Randolph Co. 8/4/92</i>		<i>Reed City 7/6/92</i>		<i>Schuy-Rush 8/10/92</i>		<i>Shovel 7/6/92</i>	
	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>
0	22.6	5.9	25.4	10.8	23.4	10.0	27.9	12.4	25.0	8.5
1	22.2	5.8			23.4	10.2	27.9	12.5		
2	21.0	5.2	25.5	10.9	23.4	10.2	27.9	12.6	24.5	8.5
3	20.8	4.3					27.6	13.0		
4	20.5	3.9	25.4	11.0	23.3	10.2	26.0	13.7	24.3	8.6
5	20.4	2.4			23.2	10.2	25.0	13.5		
6	20.3	1.8	25.2	11.1	22.9	9.1	23.8	10.0	23.6	8.4
7	20.2	1.1			22.4	6.6	23.4	8.1		
8	19.9	0.2	25.1	11.2	21.7	6.7	23.0	5.1	23.2	8.4
9	19.9	0.2	24.8	10.9	20.2	2.0	22.6	4.7		
10	17.7	0.1	24.8	10.5	18.9	5.2	22.5	3.8	22.3	7.7
11	14.6	0.1	24.6	9.3	16.6	1.1	22.3	3.1		
12	13.6	0.1	23.7	5.0	14.9	0.2	22.3	2.5	21.3	7.2
13	12.5	0.1	21.5	1.0	13.0	0.2	22.0	1.2		
14	11.7	0.1	19.8	0.7	11.6	0.2	21.9	0.8	20.0	6.1
15	10.7	0.1	17.4	0.6	11.0	0.2	21.3	0.3		
16	10.2	0.1	15.6	0.6	10.2	0.2	20.7	0.2	18.2	4.6
17	9.7	0.1			9.4	0.2	19.8	0.2		
18	9.5	0.1	13.0	0.6	9.0	0.2	18.8	0.2	15.4	2.2
19	9.4	0.1			8.7	0.2	17.4	0.2		
20	9.2	0.1	10.8	0.2	8.5	0.2	16.2	0.2	13.7	1.2
21	9.0	0.1			8.2	0.2				
22	9.0	0.1	9.9	0.2	8.1	0.2	13.8	0.2	12.2	0.5
23										
24			9.6	0.2			12.9	0.2	10.3	0.3
25										
26			9.6	0.2			12.0	0.2	9.3	0.3
27										
28			9.3	0.2			11.6	0.2	9.0	0.3
29							11.6	0.2		
30			9.0	0.2					8.5	0.3
31										
32			9.0	0.2					8.2	0.3
33			8.4	0.2					8.0	0.3

Appendix A. Concluded

<i>Depth</i>	<i>Spring 8/12/92</i>		<i>Storey 7/9/92</i>		<i>Strode 7/9/92</i>		<i>Washington Co. 8/3/92</i>		<i>Wheel 8/18/92</i>	
	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>	<i>Temp</i>	<i>DO</i>
0	24.0	9.0	22.5	10.2	23.0	8.7	27.4	14.6	20.9	9.2
1			22.5	10.2			27.4	14.6		
2	24.1	9.0	22.5	10.3	23.0	8.9	27.3	14.6	20.8	9.2
3	23.9	8.1					24.4	8.9		
4	23.9	7.3	22.4	10.3	22.8	8.8	24.3	8.3	20.7	9.0
5	23.7	6.9	22.1	9.8			24.0	7.0	20.7	7.9
6	23.7	6.8	22.1	8.8	22.5	8.7	23.9	6.0	20.6	5.9
7	23.6	6.3	21.8	8.1			23.8	5.8	20.5	5.1
8	23.5	5.0	21.7	7.5	22.5	8.7	23.8	5.5	20.4	4.6
9	23.4	4.7	21.5	7.2			23.8	5.0	20.2	3.7
10	23.4	4.5	21.3	5.8	22.4	8.6	23.7	4.9	20.2	3.0
11	23.3	3.0	20.7	4.1					20.0	1.3
12	23.3	2.7	20.4	3.5	22.3	8.5	23.7	4.8	19.9	0.9
13	23.2	2.4	19.4	3.0					19.3	0.2
14	23.1	2.0	19.1	0.5	21.9	8.3	23.7	4.5	17.9	0.1
15	23.1	1.8	18.8	0.3			23.3	1.4	15.1	0.1
16	23.0	1.4	17.9	0.3	21.7	8.2	22.3	0.5	13.6	0.2
17	23.0	1.4	15.9	0.3			21.7	0.3	12.3	0.3
18	23.0	1.1	14.9	0.3	19.6	7.8	20.4	0.2	11.8	0.3
19	22.9	1.0	13.6	0.3					11.0	0.3
20	22.9	0.5	12.7	0.3	17.0	8.3			10.0	0.3
21	22.9	0.5							9.5	0.3
22	22.8	0.2	11.6	0.3	15.6	8.4			8.7	0.3
23										
24	22.6	0.2	10.6	0.3	14.3	8.4			7.8	0.3
25										
26	22.5	0.2	9.7	0.3	12.2	8.8			7.5	0.3
27									7.4	0.3
28	22.5	0.2	9.1	0.3	11.2	8.2			7.4	0.3
29										
30					10.2	8.1				
32					9.7	7.6				
34					8.8	7.5				
36					8.2	7.0				
38					7.8	6.8				