Suitability of Ponds Formed by Strip Mining in Eastern Oklahoma for Public Water Supply, Aquatic Life, Waterfowl Habitat, Livestock Watering, Irrigation, and Recreation

By Renee S. Parkhurst

Prepared in cooperation with the
Oklahoma Geological Survey

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CONVERSION FACTORS AND ABBREVIATED WATER-QUALITY UNITS

Multiply	By	To obtain
inch (in.)	2.53807	centimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
square mile (mi^2)	2.590	square kilometer
acre	0.4047	hectare
ounce	29.5858	milliliter
acre-feet (acre-ft)	1233	cubic meters

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:

$$°C=5/9\ (°F-32)$$

The following terms and abbreviations also are used in this report:

microsiemens per centimeter	(µS/cm)
milliequivalents per liter	(meq/L)
milligrams per liter	(mg/L)
micrograms per liter	(µg/L)
micrometer	(µm)

SUITABILITY OF PONDS FORMED BY STRIP MINING IN EASTERN OKLAHOMA FOR PUBLIC WATER SUPPLY, AQUATIC LIFE, WATERFOWL HABITAT, LIVESTOCK WATERING, IRRIGATION, AND RECREATION

By Renee S. Parkhurst

Abstract

A study of coal ponds formed by strip mining in eastern Oklahoma included 25 ponds formed by strip mining from the Croweburg, McAlester, and Iron Post coal seams and 6 non-coal-mine ponds in the coal-mining area. Water-quality samples were collected in the spring and summer of 1985 to determine the suitability of the ponds for public water supply, aquatic life, waterfowl habitat, livestock watering, irrigation, and recreation. The rationale for water-quality criteria and the criteria used for each proposed use are discussed. The ponds were grouped by the coal seam mined or as non-coal-mine ponds, and the number of ponds from each group containing water that exceeded a given criterion is noted.

Water in many of the ponds can be used for public water supplies if other sources are not available. Water in most of these ponds exceeds one or more secondary standards, but meets all primary standards. Water samples from the epilimnion (shallow strata as determined by temperature) of six ponds exceeded one or more primary standards, which are criteria protective of human health. Water samples from five of eight Iron Post ponds exceeded the selenium criterion. Water samples from all 31 ponds exceeded one or more secondary standards, which are criteria for the protection of human welfare. The criteria most often exceeded were iron, manganese, dissolved solids, and sulfate, which are secondary standards. The criteria for iron and manganese were exceeded more frequently in the non-coal-mine ponds, whereas ponds formed by strip mining were more likely to exceed the criteria for dissolved solids and sulfate.

The ponds are marginally suited for aquatic life. Water samples from the epilimnion of 18 ponds exceeded criteria protective of aquatic life. The criteria for mercury and iron were exceeded most often. Little difference was detected between mine ponds and non-coal-mine ponds. Dissolved oxygen concentrations in the hypolimnion (deepest strata) of all the ponds were less than the minimum criterion during the summer. This decreases available fish habitat and affects the type and number of benthic invertebrates.

The ponds are generally well suited for use by wintering and migrating waterfowl. Thirteen of the ponds contained water that exceeded the pH, alkalinity, and selenium criteria. The non-coal-mine ponds had the largest percentage of ponds exceeding pH and alkalinity criteria. Water samples from five of eight Iron Post ponds exceeded the selenium criterion. All ponds are generally unsuitable as waterfowl habitat during the summer because of high temperatures and low dissolved oxygen.

Most of the ponds are well suited for livestock watering. Water samples from the epilimnion of 29 ponds met all chemical and physical criteria. Water samples from five ponds exceeded the criteria in the hypolimnion. Mine ponds exceeded chemical and physical criteria more often than non-coal-mine ponds. All the ponds contained phytoplankton species potentially toxic to livestock.

Water from most of the ponds is marginally suitable for irrigation of sensitive crops, but is more suitable for irrigation of semitolerant and tol-

erant crops. Most major cash crops grown in eastern Oklahoma are semitolerant and tolerant crops. Water from the epilimnion of 14 ponds was suitable for irrigation under almost all conditions. Water from the epilimnion of 20 ponds was suitable for irrigation of semitolerant crops, and water from the epilimnion of 25 ponds is suitable for irrigation of tolerant crops. The dissolved solids criterion was exceeded the most often.

Most of the ponds would not be suitable for swimming. The pH criterion was exceeded in 17 ponds and turbidity restricts visibility needed for diving in 23 ponds. Little difference was detected between mine ponds and non-coal-mine ponds. Many of the ponds formed by strip mining have steep banks that may be dangerous to swimmers.

INTRODUCTION

The objectives of this study are (1) to describe the limnological characteristics of ponds formed by strip mining and other ponds not associated with mining and (2) to develop an understanding of hydrologic, chemical, and biological processes occurring within the ponds and interrelationships between the ponds. Ponds were selected to determine if the characteristics are significantly different between ponds from different coal seams.

Identified coal resources are present in an area of approximately 8,000 mi^2 in eastern Oklahoma (fig. 1). Mining began in 1872 and early production was from underground mines. Strip mining became more advantageous with the development of large power equipment (Johnson, 1974). By 1944, 50 percent of annual production was from strip mines, and by 1964 strip mines produced 99 percent of Oklahoma's coal. In 1986, 2,969,523 tons of coal were produced from surface mines compared to 6,751 tons of coal produced from underground mines, with 7.9 billion short tons of coal remaining (Oklahoma Department of Mines, 1987).

Ponds formed by strip mining occupy an estimated area of 5,400 acres (Marcher and others, 1984 and 1987) and with an estimated average depth of 17 ft, the total amount of water stored in the ponds is approximately 91,800 acre-ft. A few of the ponds are used for public water supplies, stock watering, irrigation, and recreation, and many provide habitat for aquatic life.

A surface-mining operation involves digging a long, open trench through the overburden to expose and remove the coal. As each succeeding parallel cut is made, the overburden is placed as spoil material into the cut previously excavated. Successive cuts are mined until the overburden thickness becomes so great that the coal can no longer be mined economically. The final cut leaves an open trench bounded by the last spoil bank on one side and the highwall on the other. This trench may fill with water from precipitation, surface-water inflow, and ground-water seepage, and forms a last-cut pond. These ponds are generally long, narrow, and deep. Many of the last-cut ponds have arms or inlets created by inclined haul roads. These arms of a last-cut pond are shallow at one end and become deeper toward the main pond.

Prior to passage of Oklahoma's Open Cut Land Reclamation Act (effective January 1, 1968) and Mining Lands Reclamation Act of June 1971, most mined lands were left looking like a large washboard. Between 1968 and 1977 land strip-mined for coal was left partially reclaimed. The Surface Mining Control and Reclamation Act was signed into law in August, 1977. In areas strip mined after August 1977, ridges of spoil are graded, topsoil is replaced, the area is revegetated and high walls are graded. Some areas mined after August 1977 were not reclaimed because of financial and legal difficulties.

This trench may fill with water from precipitation, surface-water inflow, and ground-water seepage, and forms a last-cut pond. These ponds are generally long, narrow, and deep. Many of the last-cut ponds have arms or inlets created by inclined haul roads. These arms of a last-cut pond are shallow at one end and become deeper toward the main pond. Prior to passage of Oklahoma's Open Cut Land Reclamation Act (e in August, 1977. In areas strip mined after August 1977, ridges of spoil are graded, topsoil is replaced, the area is revegetated and high walls are graded. Some areas mined after August 1977 were not reclaimed because of financial and legal difficulties.

Purpose and Scope

This report describes the limnological characteristics of the ponds formed by strip mining and compares concentrations of selected inorganic constituents, nutrients, and biological species with water-quality criteria for public water supply, aquatic life, waterfowl habitat, livestock watering, irrigation, and recreation. Because often the usefulness of a pond is relative, other nearby ponds not associated with mining were also sampled. Many dissolved or suspended substances in

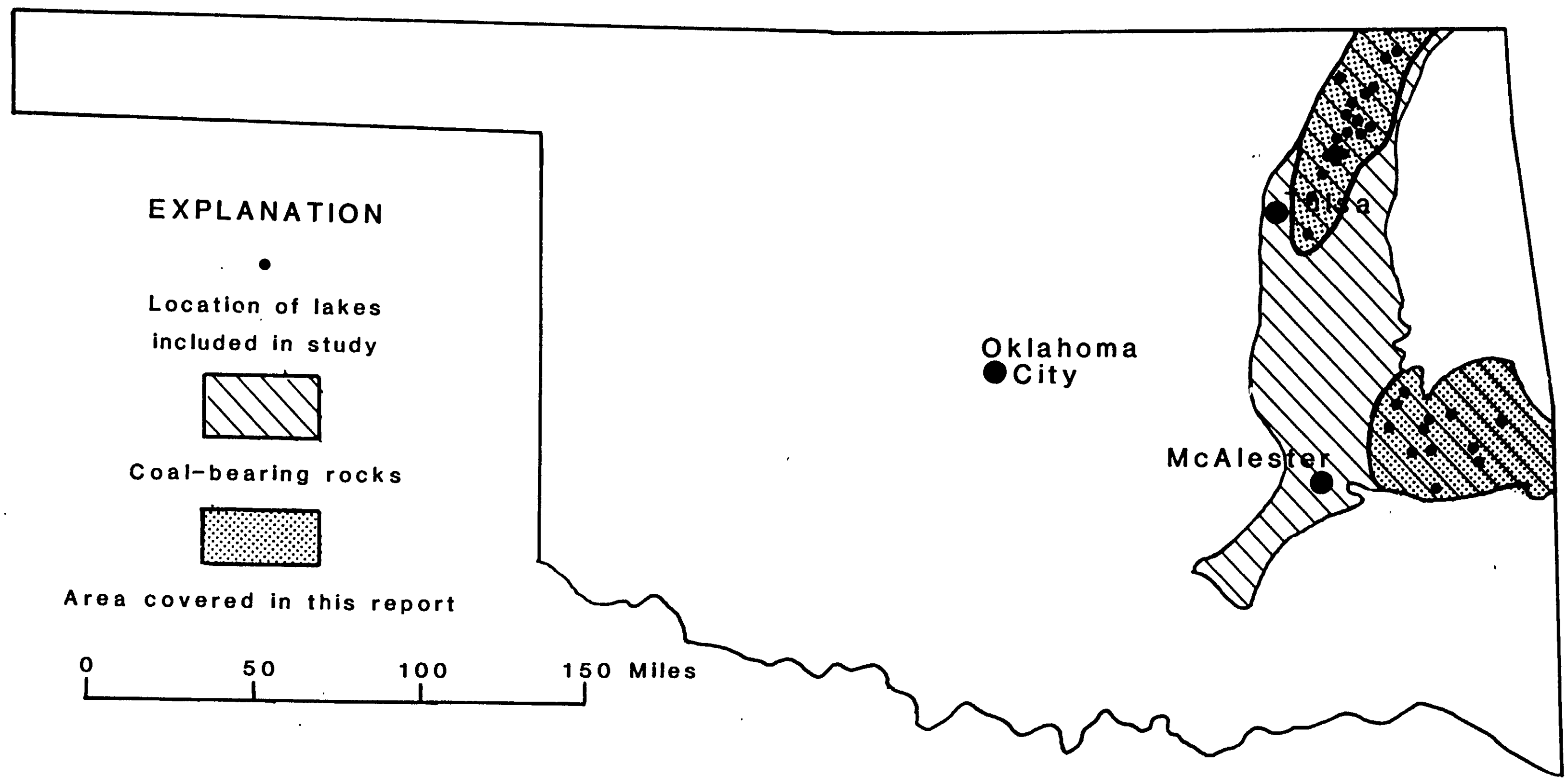

Figure 1. Index map showing the Oklahoma part of the Western Region of the Interior Coal Province, study area, and study ponds (Modified from Friedman, 1977).

water may be detrimental to a particular use. These substances include some inorganic elements and compounds, certain man-made organic compounds, pathogenic and parasitic organisms, herbicide and pesticide residues, some biologically produced toxins, and radionuclides (National Academy of Sciences and National Academy of Engineering, 1973). This study reports on the constituents that are related to the construction of the pond and not those constituents that may have been caused by other human activities.

The U.S. Geological Survey, in cooperation with the Oklahoma Geological Survey, collected water-quality data from 25 ponds associated with strip mining and 6 ponds from the same area that were not associated with strip mining. The ponds formed by strip mining will be referred to by the name of the coal seam from which the majority of the coal was mined. The ponds are located in northeast and east-central Oklahoma (fig. 1). Water-quality data were collected in the spring and summer of 1985. Twenty-three of the ponds formed by strip mining are last-cut ponds. Ten of these have highwalls and spoil ridges, six have highwalls with graded spoil, and seven have no highwall or spoil ridges. The remaining two ponds formed by strip mining are catchment-basin ponds or sedimentation ponds, created to catch runoff. These tend to be smaller and shallower, and look more like farm ponds. Both ponds were created on or near land mined for Iron Post coal.

The six ponds which were not created by strip mining are used as an experimental control, and will be referred to as control ponds. The control ponds include a limestone quarry, a sandstone quarry, an excavated farm pond with no inlet or outlet, and three farm ponds with spillways. The area near the spillways in the farm ponds was deepened by excavation and the opposite ends have intermittent streams as inlets. All six control ponds vary in shape and size.

Acknowledgments

The author wishes to express her appreciation to the landowners and coal companies for allowing access to ponds. The University of Iowa Hygienics Lab analyzed samples for chlorophyll, phytoplankton, and benthic invertebrates. Stephen Weber and the Oklahoma Geological Survey analytical-chemistry staff performed the laboratory analyses of the major ions and trace elements included in this report. Michael Johnson of Ducks Unlimited and formerly of the U.S. Fish and Wildlife service gave advice on the sections pertaining to waterfowl.

Stratigraphy of the Study Area

The bituminous coal deposits of eastern Oklahoma are in the southern part of the Western Interior Coal Basin (Averitt, 1975) (fig. 2). The coals in east-central Oklahoma are in an eroded structural and depositional basin called the Arkoma Basin (fig. 3). The basin contains the upper and lower Hartshorne, upper and lower McAlester (Stigler), upper and lower Cavanal, Lower Witteville, and Secor coals, all of Middle Pennsylvanian age. The northeastern part of the coal field is a depositional shelf referred to as the Northeast Oklahoma Shelf and contains more limestone than the coal-bearing rocks of the Arkoma basin. The shelf contains the Rowe, Drywood, Secor, Blue Jacket, Weir-Pittsburg, Mineral, Fleming, Croweburg, Bevier, and Iron Post coals of Middle Pennsylvanian age, and the Lexington, Jenks, and Dawson coals of Middle and Late Pennsylvanian age. Most of the shelf coals are suitable as fuel for electricity generation, and many of the coals of the basin area are suitable for coke manufacture (Friedman, 1974). The strip-mine ponds included in this study are associated with the Croweburg, Iron Post, and McAlester (Stigler) coal seams. Locations of the strip-mine pond and the control ponds are shown in figure 3. A generalized geologic column showing stratigraphic position of the coal seams is shown in figure 4.

The Croweburg coal, in the Northeast Oklahoma Shelf, has the lowest sulfur content of any coal in the shelf area, with 0.4 to 3.5 percent sulfur, averaging 1.9 percent. The coal seam is 0.2 to 3.4 feet thick. The 40 to 75 feet overburden consists of a thin black shale, a thick gray shale, a thick limestone and shale unit, and in some areas a sandstone unit (Friedman, 1974). The ponds created by mining Croweburg coal are referred to as Croweburg ponds 1 through 8.

The Iron Post coal is found mostly on hilltops in northeast Oklahoma and is 0.3 to 1.4 feet thick. The sulfur content is 3.5 to 5.0 percent, averaging 4.0 percent. The overburden consists of shale that contains pyrite and hard nodules, dense limestone, and dark gray shale. Because of the dense overburden, explosives are used in the mining process. The many limestone boulders created by blasting make reclamation difficult (Friedman, 1974). The ponds created by mining Iron Post coal are referred to as Iron Post ponds 1 through 8.

The McAlester (Stigler) coal is located in the Arkoma Basin and in some places is split into two separate coal beds (Friedman, 1978). The coal seam is from 0.1 to 5.0 feet thick. It contains 0.4 to 5.2 percent sulfur and averages 1.5 percent. The overburden consists of marine clay shales and lenticular sandstones (Karvelot, 1973). Contour mining is practiced in this area, therefore, the mined areas tend to be long and

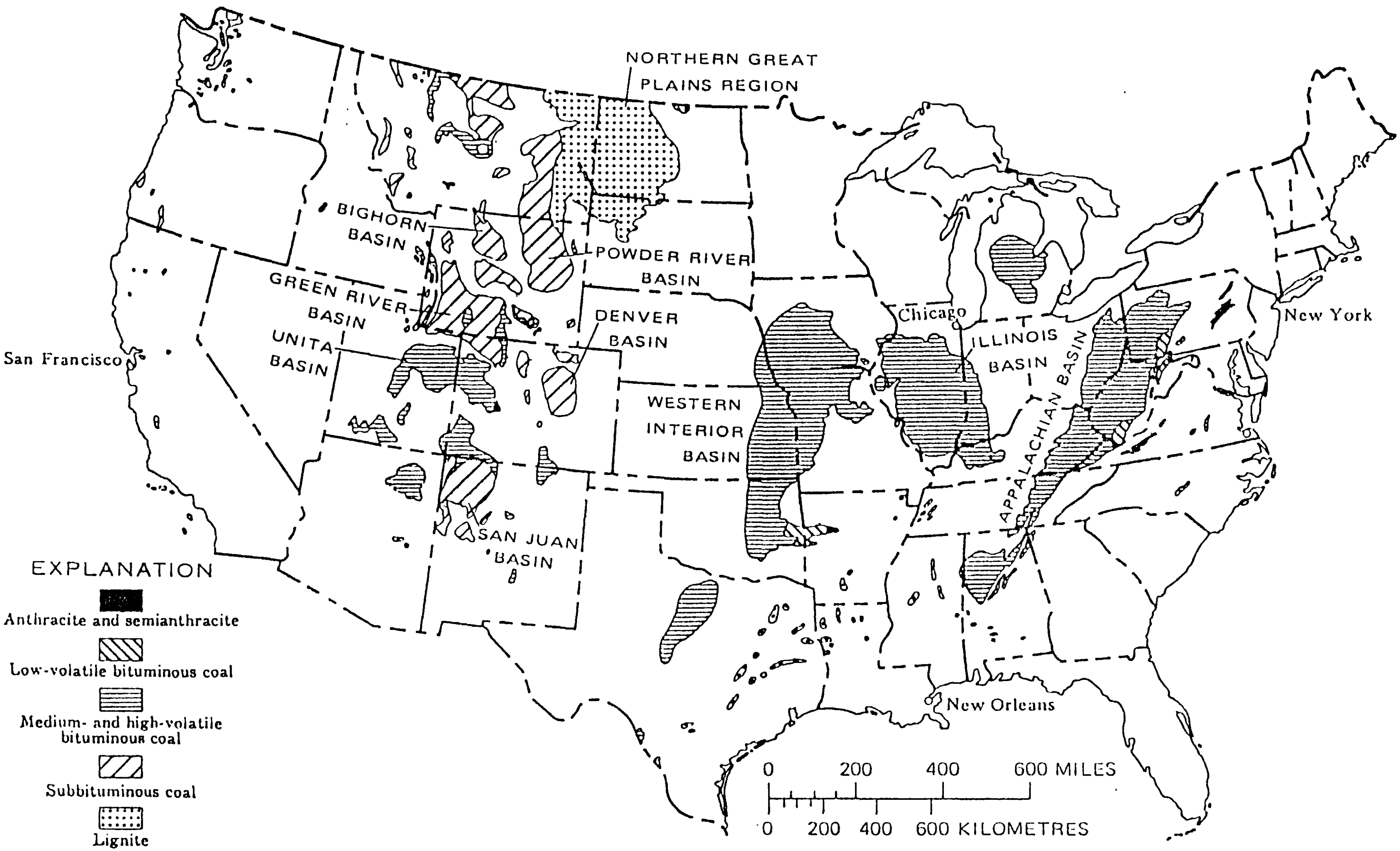

Figure 2. Locations of coal fields of the contiguous United States, after Averitt (1975).

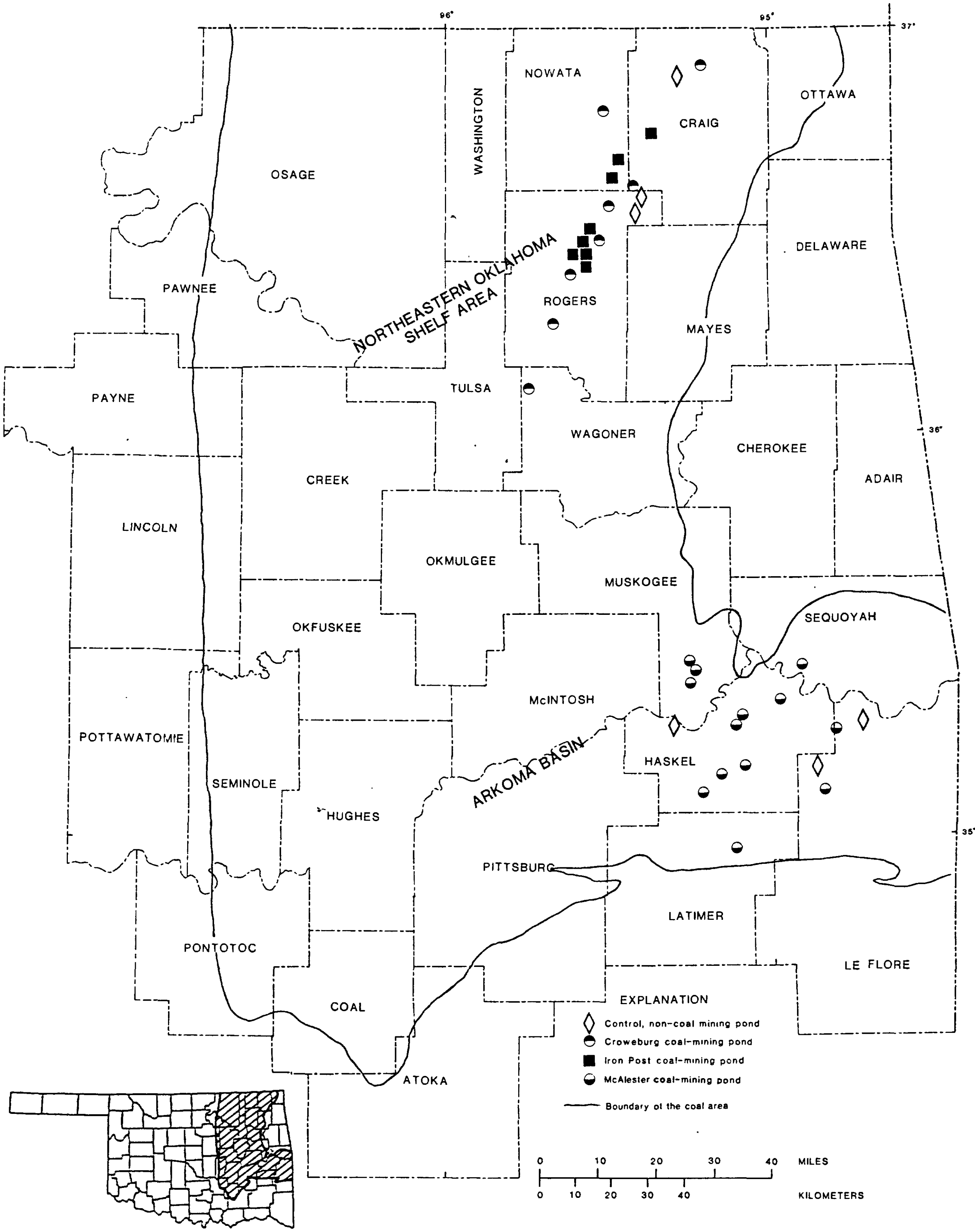

Figure 3. Location of coal areas in Oklahoma, coal-mine ponds, and control ponds.

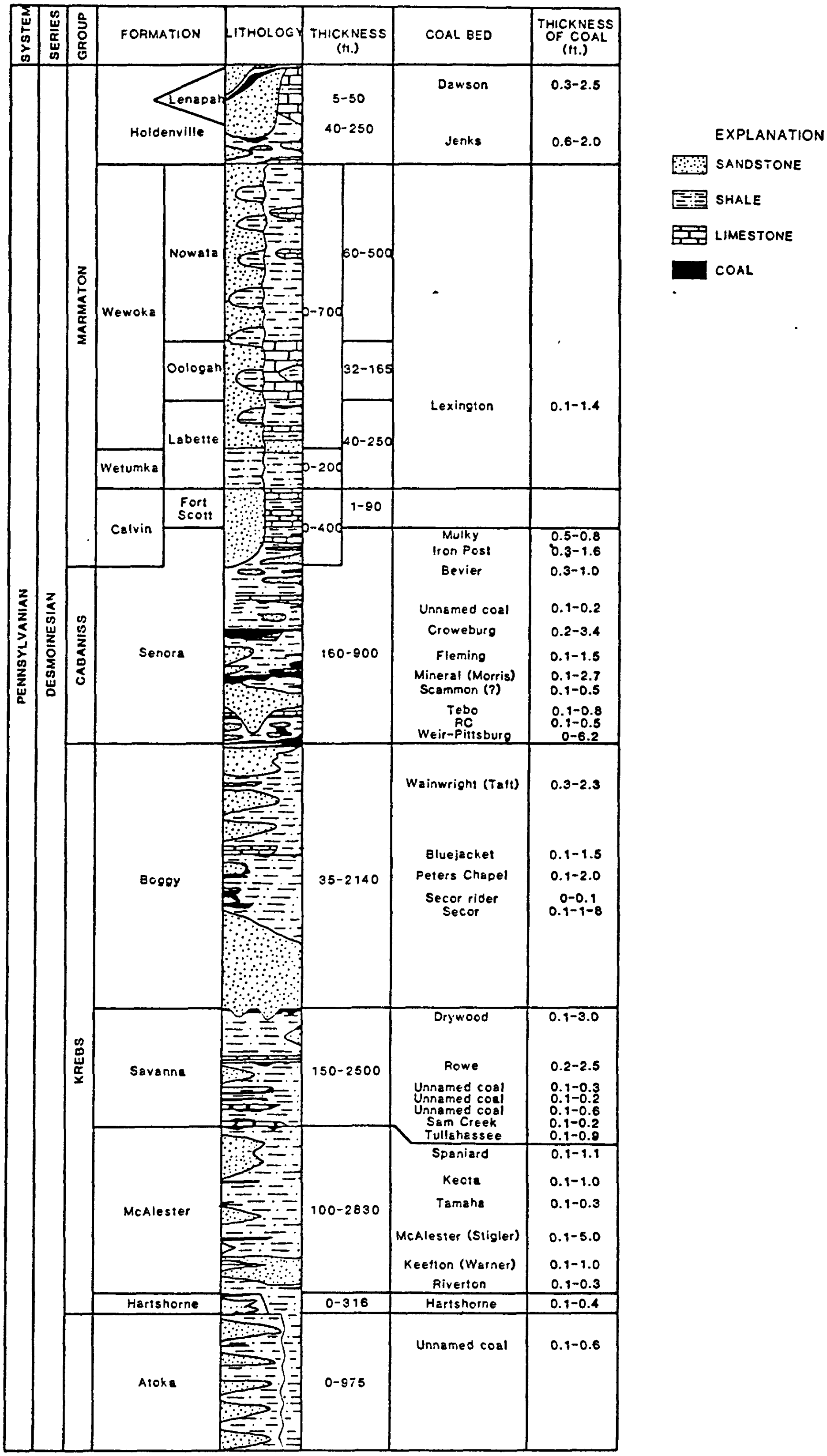

Figure 4. Generalized geologic column showing sequence of coal beds of Desmoinesian age in Oklahoma (Modified from Friedman, 1974, and Hemish, 1987).

thin. The ponds created by mining for McAlester (Stigler) coal are referred to as McAlester ponds 1 through 9.

Limnology of Ponds

Limnology is the study of lakes, streams, and ponds. Limnology has specialized terminology. Terms used in this report are defined below. Ponds and lakes have a number of zones or regions, each with its own physical and biological characteristics. The zones are defined by light penetration and temperature. Both the open water area and the bottom of the pond have regions with different characteristics. The areal extent of the different zones and the ratio of the area of one type of zone to the area of another may affect the biological and chemical characteristics of a pond.

The upper part of the pond where light penetrates is called the euphotic or photic zone (fig. 5). Photosynthesis occurs in this zone and the majority of the plankton live here. Below the euphotic zone is the aphotic zone where light cannot penetrate. Some shallow ponds do not have an aphotic zone (Goldman and Horne, 1983).

Ponds that thermally stratify or layer are subdivided into zones defined by temperature and dissolved-oxygen content. The upper zone is called the epilimnion, and is characterized by warm temperatures and large dissolved-oxygen content. Most of the plankton in a pond are within the epilimnion. This zone is subject to mixing by winds and is within the photic zone. Below this is a thin zone called the metalimnion or thermocline where temperature and dissolved oxygen decreases abruptly. It is often a barrier for wind mixing and for free-floating plankton. The deepest zone is the hypolimnion. Light cannot penetrate this zone and, because of the thermocline, the water does not mix with water from the upper zones. Therefore, the temperature is much lower and the oxygen content becomes depleted (Goldman and Horne, 1983). Ponds in Oklahoma that stratify tend to be monomictic; that is, they mix or turn over in the fall and remain mixed until the spring when warm weather causes stratification.

The bottom of a pond is called the benthic region. This region often has three distinct zones, the littoral, sublittoral, and profundal. The littoral zone extends from the shore to a depth where the light is barely sufficient for rooted aquatic plants to grow. The biologic community in this zone tends to have a higher diversity and higher annual production than the other benthic zones. The sublittoral zone is the zone beyond the littoral zone. It lacks rooted plants, but still is well oxygenated. The biologic community is less diverse because the available habitat is less diverse. The zone where light does not reach is the profundal zone. The temperature is nearly constant and under certain circumstances the dissolved oxygen content becomes depleted and methane and carbon dioxide are abundant. The sediments are usually fine and the biologic community is less abundant and less diverse (Cole, 1975).

Productivity is a term often used in limnology and refers to the sum total of energy-trapping processes, comprising all the photosynthetic and chemosynthetic processes in the system (Reid and Wood, 1976). There are several indices of productivity, including rooted submerged vegetation, plankton, benthic fauna, organic content, chlorophyll content (Welch, 1952), and oxygen deficit (Cole, 1975).

Organisms living in a pond also have specialized terms. The term plankton refers to all microscopic floating or swimming organisms. Phytoplankton are floating plants better known as algae. The zooplankton are floating invertebrates. Zooplankton are much more motile than the phytoplankton and graze on phytoplankton or other zooplankton. Animals living on the bottom or in the bottom sediments are benthos or, more specifically, benthic invertebrates.

METHODS

Site Selection

The ponds formed by strip mining were selected to be representative of ponds formed by strip mining in Oklahoma. To meet the objective of comparing ponds from different coal seams, ponds from three coal seams were selected to be representative of ponds formed by strip mining from all the coal seams in Oklahoma. Coal seams with the largest amount of area mined were used. The ponds formed by strip mining were chosen using a stratified random selection method. All known ponds from the three coal seams were identified using maps by Johnson (1974) and Friedman (1982). The ponds were numbered and a random numbers table was used to select six ponds from each coal seam. Field reconnaissance was conducted and if the pond selected was found to be inaccessible, or to be unsuitable because of draining, dumping of garbage, or influence from a nearby stream, the nearest suitable pond was used.

The 18 ponds selected by the above method were all excavated before 1972. To incorporate newly excavated ponds into the study a different method of selection was used. Two recently excavated ponds

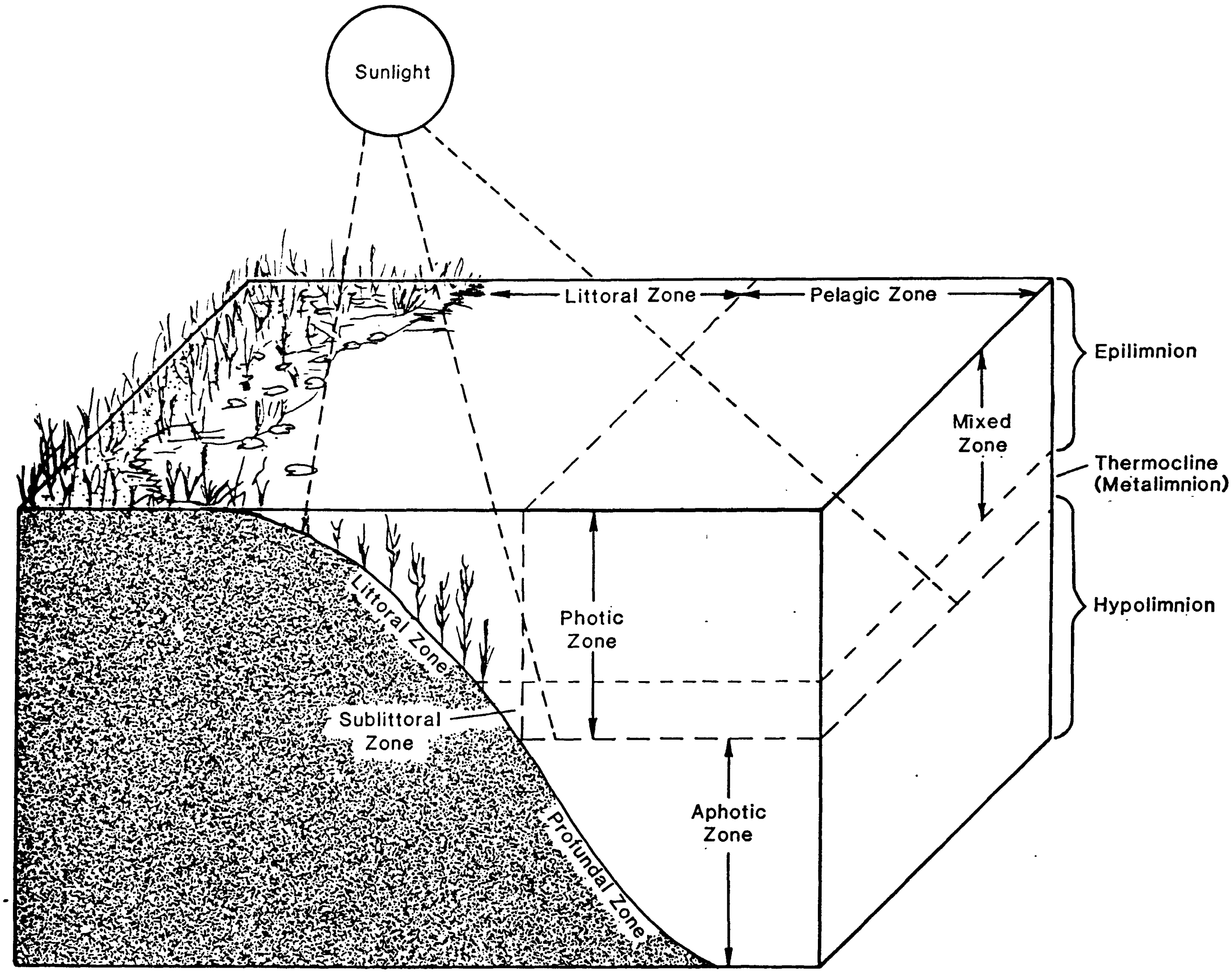

Figure 5. Generalized illustration of a pond and its limnologic zones.

were selected for each coal seam using U.S. Agricultural Stabilization and Conservation Service aerial photographs provided by county Soil Conservation offices. To decrease selection bias caused by personal preferences, the first ponds found in the photographs and verified in the field were used.

The six control ponds also were selected using aerial photographs. The control ponds had to meet several criteria including location, size and depth, and amount of inflow. The ponds had to be located in the coal-mining region but not receive water from mined land. The control ponds had to be similar to ponds formed by strip mining in size and depth. A criterion for selecting a control pond was that the pond have little or no surface inflow. The influence of stream biology on the biology of the ponds was minimized by this stipulation. Most of the ponds formed by strip mining are closed ponds, and those with inlets receive only intermittent inflow.

An additional McAlester mine pond (McAlester Pond 6), excavated before the Surface Mining Control and Reclamation Act act of 1977, was selected to compare with a mine pond 2 miles away (McAlester Pond 5), which was excavated soon after implementation of the reclamation act.

Data Collection and Analysis

The 26 ponds formed by strip mining and 6 control ponds were sampled in the spring and summer of 1985, because of possible differences in water quality between the seasons. During the spring the water level is usually at its maximum and the water diluted by spring rains. During the summer, the ponds usually stratify and the bottom becomes anoxic, releasing trace elements and sulfides. The water levels are low and constituent concentrations are larger. Both spring and summer samples were analyzed for major dissolved chemical constituents and dissolved and total recoverable phases of trace elements. Dissolved constituents are defined as particles passing through a 0.45 micron (μm) filter. Total recoverable constituents are those constituents in solution after acidic digestion and include all readily soluble substances attached to sediment particles. Samples collected in the summer also were analyzed for plant nutrients, chlorophyll, phytoplankton, and benthic invertebrates.

Three to five vertical profiles were measured in each pond during each sampling trip. Temperature, pH, dissolved oxygen, and specific conductance were measured at 1 to 5 foot intervals, depending on the total depth, using a multi-parameter meter. A Secchi disk was used to measure the relative transparency of the ponds. A Secchi disk is a black and white disk, 20 centimeters in diameter, that is lowered into the pond until it disappears from sight and then raised slowly until it reappears. The arithmetic mean of the distance at which the disk disappears and reappears is the Secchi-disk depth. This depth is not an actual measure of light penetration, but is a relative index of visibility and is useful in making comparisons (Reid and Wood, 1976).

A water sample was collected at mid depth on ponds that were not thermally stratified and where the specific conductance did not vary with depth by more than 25 percent. On ponds where the specific conductance changed by more than 25 percent, two samples were collected, one near the surface and one near the bottom. A horizontal polyvinylchloride (PVC) water sampler was used to collect the water sample. Alkalinity was analyzed on site by titrating the sample with a standard solution of 0.01639 Normal sulfuric acid to an inflection point. Samples for analysis of the remaining chemical constituents were pretreated following methods of the U.S. Geological Survey (Brown and others, 1970), and were analyzed at the Oklahoma Geological Survey laboratory in Norman, Oklahoma, using methods described by Skougstad and others (1979).

Dissolved-solids concentrations were determined from the weight of the dry residue remaining after evaporation of an aliquot of the water sample and calculated by summing major dissolved constituents. Specific conductance, which can be measured easily in the field, was used in the vertical profiles as a surrogate measure of dissolved solids. Total dissolved solids concentrations can be estimated from specific conductance.

Phytoplankton and chlorophyll samples were collected using a horizontal PVC water sampler at each site on the pond. A sample was collected at the point of largest oxygen concentration. This point often indicates an area of large algal productivity. A liter sample was preserved with Lugol's solution and sent to a private laboratory for identification of phytoplankton genera. Water samples to be analyzed for chlorophyll were filtered through a 0.45 μm-pore-size glass filter and frozen. As much of a 1.5-liter sample was filtered as possible before the filter clogged. The filtered sample was frozen and sent to private laboratory for analysis of chlorophyll A, B, and C using methods described in Standard Methods for the Examination of Water and Wastewater (American Public Health Association and others, 1985). Results of analysis for chlorophyll A, B, and C are given in table 1 (at back of report).

Benthic invertebrate samples were collected using a Ponar grab sampler with a sampling area of 36 in^2.

The Ponar samples for each pond were composited. The benthic invertebrates collected by the Ponar sampler were used to estimate the number of organisms per m^2 found on the bottom of the pond. A large component of the benthic population can be found near the shore. However, a Ponar sampler could not be used near the shore because of interference from rooted plants. A dip net was used to sample this area. A dip-net sample is a qualitative sample and does not allow for comparison of populations. The invertebrates collected using the dip net were listed only as being present. The data from the dip net sample were used to estimate the number of benthic invertebrate genera found in the pond. Both Ponar and dip-net samples were washed using a 520–µm-mesh wash frame, and preserved with formaldehyde. The samples were analyzed by a private laboratory.

RATIONALE FOR WATER-QUALITY CRITERIA

Water-quality criteria are recommended values for concentrations of constituents that, if not exceeded, are expected to result in an aquatic ecosystem suitable for a particular use. Criteria are not rules or regulations, and in this report are intended as guidelines only. The criteria recommended by the U.S. Environmental Protection Agency (EPA) were used where available. Where no criteria were listed by the EPA, other sources were used. Water-quality variables used as criteria differ for each water-use category.

Water-quality standards, which differ from criteria, exist for public water supplies and for the protection of aquatic life. These standards are regulations set by either the EPA or state regulatory agencies. In Oklahoma, the state agency responsible for establishing water-quality standards is the Oklahoma Water Resources Board. Where appropriate, the water-quality standards are used as criteria.

Secchi-disk Depth

All natural waters contain matter in either dissolved or suspended-particulate form. Although both forms can impart color to water, the suspended-particulate form has the greatest effect on water clarity (Wetzel, 1975). Suspended particulates may be either plankton or suspended sediments. The quantity of suspended-particulate matter can be estimated by the Secchi-disk depth. The Secchi-disk depth of eutrophic and muddy ponds ranges from 0 to 2 m, but may be as great as 40 m in highly oligotrophic ponds or the open ocean (Goldman and Horne, 1983).

As a matter of safety, a criterion for clarity of water for swimming is a Secchi-disk depth of 1.22 m or 48 inches. This value is more critical in areas where people might be diving (National Technical Advisory Committee to the Secretary of the Interior, 1968).

pH

An important factor in the chemical and biological processes of natural waters is pH. The abbreviation "pH" represents the negative base-10 log of the hydrogen-ion activity in moles per liter (Hem, 1985). The larger the concentration of hydrogen ions, the smaller the pH value. Large or small concentrations of hydrogen ions may adversely affect water for one or more uses. The hydrogen ion can be a pollutant by itself, but often controls the concentration of other substances (McKee and Wolf, 1963). The degree of disassociation of weak acids or bases is affected by changes in pH. The toxicity of many compounds is affected by the degree of disassociation. The solubility of metal compounds contained in bottom sediments or as suspended material is affected by pH (U.S. Environmental Protection Agency, 1986a).

The pH of public water supplies affects taste, corrosiveness, and the efficiency of chlorination and other treatment processes. The EPA (1986c) has suggested a pH range of 6.5 to 8.5 as a secondary standard for public water supplies.

Many physiological processes in fish are affected by low pH. The toxic effect of low pH differs among species, populations, and age groups of the same species. Low pH could increase susceptibility to disease, increase the chance of genetic damage, change predator-prey relationships, degrade habitat, decrease productivity, and increase the availability of toxic substances (Fritz, 1980). High pH also may be detrimental. The toxicity of ammonia increases as pH increases. A pH range of 6.5 to 9.0 has been set as the criterion for the protection of fish and other aquatic organisms (U.S. Environmental Protection Agency, 1986a).

The pH of water will have an indirect effect on waterfowl. The growth of aquatic plants used by waterfowl for food and cover is adversely affected by either a low or high pH. The pH criterion for waterfowl is 7.0 to 9.2, based on values at which submersed aquatic plants thrive (National Technical Advisory Committee to the Secretary of the Interior, 1968; Ferreira and Lambing, 1984). Aquatic invertebrates which may be used as food by some waterfowl also are affected by the pH of the water. The pH criterion for aquatic life is 6.5 to 9.0.

The pH of irrigation water is important in some situations. Soils generally have a large buffering capacity and the pH of the water applied is changed to that of the soil. However, in acid soils, metallic ions such as iron, manganese, and aluminum may be dissolved, resulting in concentrations in the water that are toxic to plants. Under alkaline conditions, sodium carbonates and bicarbonates may be dangerously toxic. To avoid these undesirable effects, the pH of irrigation water should not exceed a pH range of 4.5 to 9.0 (U.S. Environmental Protection Agency, 1986a).

The pH of the water also may affect swimmers. Documentation shows that water having extreme pH values may cause increased eye irritation. The lacrimal fluid of the human eye has a normal pH of 7.4. Although lacrimal fluid is strongly buffered, once buffering capacity is exhausted during swimming, eye irritation may result and lead to infection. In waters with pH values ranging from 6.5 to 8.3, the buffering capacity of tears will prevent irritation. If the water is relatively free of dissolved solids and has a low alkalinity, pH values from 5.0 to 9.0 may be acceptable to most swimmers. (National Academy of Sciences and National Academy of Engineering, 1973). In this report, a pH range of 6.5 to 8.3 is used as the criterion for recreational use.

Water Temperature

Water temperature affects the rate of both chemical and biological processes. The toxicity of a given substance will generally increase with increased temperature, and organisms subjected to stress from toxic materials are less tolerant to temperature extremes. Increased temperatures accelerate the biodegradation of organic material both in the water column and in bottom deposits, thus increasing demands on the dissolved oxygen resources of a pond. Temperature affects the amount of available dissolved oxygen in water, because the solubility of oxygen in water is inversely proportional to temperature. Temperature also affects the rate at which fish utilize oxygen. The lower the temperature, the less oxygen required (U.S. Environmental Protection Agency, 1986a).

Because aquatic organisms are poikilothermic or "cold-blooded", the temperature of the water regulates their metabolism and ability to survive and reproduce effectively. Temperature also affects respiration, behavior, distribution and migration, feeding rate, and growth of aquatic organisms. Elevated temperatures affect benthic invertebrates, periphyton, and fish, and may cause shifts in algal predominance. The number and distribution of bottom organisms decrease as water temperatures increase. The upper tolerance limit for a balanced benthic population structure is approximately 32°C (U.S. Environmental Protection Agency, 1986a).

The effect of temperature on fish varies with the species. Reproduction and survival of embryos is the most temperature sensitive of all life functions. Growth is the next most sensitive. Table 2 lists the values for maximum weekly average temperatures needed for growth and the short-term maximum for survival of juvenile and adult fish species. Maximum tolerable temperatures for spawning and embryo survival are given in table 3. The average of the maximum average

Table 2. Values for maximum weekly average temperatures for growth and short-term maximum temperature for survival of juvenile and adult fish species, in degrees Celsius
[--, no data available; modified from U.S. Environmental Protection Agency (1986a)]

Species	Growth	Survival
Black crappie	27	--
Bluegill	32	35
Channel catfish	32	35
Emerald shiner	30	--
Largemouth bass	32	34
White crappie	28	--
Yellow perch	29	--
Average	30	35

Table 3. Values for maximum weekly average temperatures for spawning and short-term maximum temperature for embryo survival, in degrees Celsius
[Modified from McKee and Wolf (1963) and U.S. Environmental Protection Agency (1986a)]

Species	Spawning	Embryo survival
Black crappie	17	20
Bluegill	25	34
Channel catfish	27	29
Emerald shiner	24	28
Largemouth bass	21	27
Striped bass	18	24
White crappie	18	23
Yellow perch	12	20
Average	20	26

temperatures for spawning is used as the spring temperature criterion for aquatic life. The average of the maximum average temperatures for growth is used as the summer temperature criterion.

Juvenile and adult fish usually seek water having a temperature closest to their thermal preference. (U.S. Environmental Protection Agency, 1986a). Fish may move to deeper parts of a pond to avoid warmer surface water temperatures. However, the coolest part of a pond, the hypolimnion, may be anoxic. In this report the coolest temperature in the area with a dissolved oxygen of 5 mg/L or greater is used for comparison with the maximum-temperature criterion of 20°C in the spring and 30°C in the summer.

High water temperatures also may adversely affect waterfowl. Conditions favorable for outbreaks of botulism tend to be associated with or affected by temperature above 21°C (National Academy of Sciences and National Academy of Engineering, 1973).

Increased water temperature does not have a detrimental effect on livestock watering, irrigation or recreation. Temperature may indirectly affect livestock watering and recreation as it affects growth of nuisance phytoplankton species and the amount of dissolved oxygen and, therefore, the existing aesthetic and sanitary qualities. No criterion has been suggested.

Dissolved Oxygen

Dissolved oxygen is of major concern because it is important for the maintenance of aquatic life and the protection of waterfowl. The solubility of oxygen in water is a function of water temperature, barometric pressure, and dissolved-solids concentration. Oxygen diffuses from the atmosphere and is produced by photosynthesis. Photosynthesis can cause an increase in the dissolved-oxygen concentration in water to supersaturated levels. Decreases in oxygen can be attributed to the respiration of plants and animals, an increase in temperature, and aerobic decomposition of organic matter.

The oxygen requirement of fish varies with species and with temperature. A minimum concentration of 5.0 mg/L has been set by U.S. Environmental Protection Agency (1986a) as the dissolved oxygen criterion for the maintenance of aquatic life. This concentration will support a diverse fish population, although some species of fish require a larger concentration of dissolved oxygen. Oklahoma's standard for the protection of warm-water fisheries is 5.0 mg/L (Oklahoma Water Resources Board, 1993), and that criterion is used in this report.

Dissolved oxygen also is important for waterfowl protection. Botulism, which annually can cause significant mortality to waterfowl populations, is caused by a toxin produced by bacteria under anaerobic conditions (Smith, 1976). Outbreaks of botulism also have been associated with insect die-offs, water temperature above 21°C, fluctuating water levels, and elevated concentrations of dissolved solids (National Academy of Sciences and National Academy of Engineering, 1973). Ponds in which the dissolved oxygen concentration is zero somewhere in the water column are less desirable to waterfowl than ponds that have a greater concentration of oxygen throughout the water column. Hydrogen sulfide production is an indicator of bacterial decomposition in the absence of oxygen (U.S. Environmental Protection Agency, 1986a). Where hydrogen sulfide is present, dissolved oxygen is absent at equilibrium. However, at very low concentrations of dissolved oxygen, the precision of dissolved-oxygen meters is poor. Dissolved-oxygen concentrations as high as 0.5 mg/L may be read on meters when a hydrogen sulfide smell is present, indicating anaerobic decomposition. Therefore, 0.5 mg/L of dissolved oxygen is used as the criterion for waterfowl protection.

Alkalinity and Hardness

The alkalinity of a solution is the capacity of its constituents to react with and neutralize acid. Therefore, alkalinity buffers the solution against changes in pH. Because pH has a direct effect on organisms as well as an indirect effect on the toxicity of other constituents, the buffering capacity is important. In most natural waters, alkalinity is produced by the dissolved carbon dioxide species bicarbonate and carbonate. Hydroxide, silicate, borate, and organic ligands also contribute to alkalinity (Hem, 1985).

Alkalinity is important for aquatic life because it buffers pH changes that occur naturally as a result of photosynthesis. Components of alkalinity such as carbonate and bicarbonate will react with some toxic heavy metals and reduce their toxicity (National Academy of Sciences and National Academy of Engineering, 1973). A minimum alkalinity of 20 mg/L reported as calcium carbonate ($CaCO_3$) is recommended for the protection of aquatic life (U.S. Environmental Protection Agency, 1986a).

Ponds with low total alkalinities generally have fewer nutrients and therefore cannot support extensive growth of aquatic plants. Aquatic plants are an important component of waterfowl habitat. A total alkalinity of 25 mg/L as $CaCO_3$ or more is recommended for waterfowl habitat (National Technical Advisory Committee to the Secretary of the Interior, 1968).

An excessive alkalinity will affect the desirability of the water for recreation. High alkalinity can cause problems for swimmers by altering the pH of the lacrimal fluid (see section on pH), but no criterion has been set by State or federal regulations.

The concept of hardness was derived from water-supply practice. It is measured by soap requirements for adequate lather formation and is used as an indicator of the rate of scale formation (U.S. Environmental Protection Agency, 1986a). Total hardness was calculated from calcium, magnesium, and barium concentrations and converted to an equivalent concentration of calcium carbonate (Brown and others, 1970). Strontium is often included in the hardness calculation but no analysis was made for it in this study. Many public water supplies soften the water to fewer than 100 mg/L. As hardness in water can be removed and is not a health hazard, it is not regulated by the EPA. A hardness criterion of 100 mg/L is used in this report as a basis for comparison. A commonly used classification for hardness is given in table 4.

Table 4. Classification of water by hardness concentration
[Hardness is given in mg/L $CaCO_3$; modified from Sawyer (1960); U.S. Environmental Protection Agency (1986a)

Hardness range	Classification
0–75	soft
75–150	moderately hard
150–300	hard
over 300	very hard

Dissolved Solids and Specific Conductance

Where available, the total dissolved-solids concentration derived from the residue on evaporation at 180°C is used to compare water-quality data from the ponds to the dissolved-solids criterion. Where no dissolved-solids data are available, the specific conductance data are compared to a specific conductance criterion estimated from the total dissolved-solids criterion. The ratio of total dissolved-solids concentration to specific conductance usually falls between 0.55 and 0.75 for natural waters. The larger values generally are associated with water that have larger sulfate concentrations (Hem, 1985). The mean ratio of total dissolved-solids concentration to specific conductance for the study ponds with paired data was 0.75. This ratio is used to calculate a specific conductance criterion from the total dissolved-solids criterion. When a water sample from a pond has a dissolved-solids concentration close to the criterion it is possible for the dissolved-solids concentration to be higher than the criterion and the specific conductance lower than the corresponding criterion, or vice versa. In this case the total dissolved-solids criterion will be used for comparison.

Many plant and animal species are affected by dissolved-solids concentrations, although tolerance varies considerably among different species. Dissolved-solids concentrations are regulated by the EPA as a secondary drinking-water standard. Large concentrations of dissolved solids are objectionable in drinking water because of possible physiological effects, unpalatable mineral tastes, and higher production costs for a water supply necessitated by replacement of corroded water lines or additional treatment of the water. The recommended dissolved-solids limit is 500 mg/L where other sources are not available (U.S. Environmental Protection Agency, 1986c)

Large concentrations of dissolved solids can cause detrimental physiological effects in fish. The concentrations that fish can tolerate vary with the species. Dissolved-solids concentrations in excess of 15,000 mg/L are reported as unsuitable for most species of freshwater fish (U.S. Environmental Protection Agency, 1986a). However, concentrations in excess of 5,000 mg/L are unsuitable for spawning of largemouth bass (Ferreira and Lambing, 1984), a species stocked in many strip-mine and farm ponds in Oklahoma. Therefore, a dissolved-solids concentration of 5,000 mg/L and a specific conductance of 6,700 μS/cm are used as the criteria.

Water with excessive concentrations of dissolved solids can cause physiological damage and death of livestock. Among the functions of animals, reproduction and lactation are affected first. The maximum amount tolerated by livestock varies with species (table 5). The concentration of total dissolved solids tolerated by livestock also depends on the type of dissolved constituents present, climate, and other factors. Some species can tolerate higher concentrations of dissolved solids than those listed in table 5 for short periods of time (Oklahoma Water Resources Board, 1993). Two criteria are used, one of 2,860 mg/L for livestock sensitive to dissolved solids, and a criterion of 15,600 mg/L for livestock with high tolerance.

The suitability of water for irrigation also depends on the dissolved-solids concentration. Both the osmotic effect of dissolved solids and the ratio of the various cations present are important. The EPA has set levels for dissolved solids to use as a guide for irrigation (table 6). The criterion for sensitive crops is 500 mg/L total dissolved solids (670 µS/cm specific conductance). The criterion used for semitolerant plants is 1,000 mg/L total dissolved solids (1,330 µS/cm specific conductance). The criterion for tolerant crops is 2,000 mg/L total dissolved solids (2,670 µS/cm specific conductance). Most crops in Oklahoma are semitolerant to dissolved solids, but crops from all categories are grown here. The sensitive crops include strawberries, beans, and fruit trees. The semitolerant crops include most vegetables, corn, sorghum, and alfalfa. The most tolerant crops are barley and cotton.

Table 5. Maximum concentration of dissolved solids recommended for various livestock
[mg/L, milligrams per liter; modified from McKee and Wolf (1963)]

Animal	Concentration (mg/L)
Poultry	2,860
Pigs	4,290
Horses	6,435
Dairy cattle	7,150
Beef cattle	10,100
Adult sheep	12,900

Table 6. Suitability of water for irrigation based on dissolved-solids concentrations in arid and semiarid regions
[Modified from U.S. Environmental Protection Agency (1986a)]

Suitability	Dissolved solids concentration in mg/L
Water from which no detrimental effects will usually be noticed	under 500
Water that may have detrimental effects on sensitive crops	500–1,000
Water that may have detrimental effects on crops and requires careful management practices	1,000–2,000
Water that may be used for tolerant plants on permeable soils with careful management practices	2,000–5,000

Sodium, Sulfate, and Chloride

Sodium (Na), sulfate, and chloride are the only major constituents in water for which water-quality criteria currently have been established. Chloride and sulfate have secondary maximum contamination levels (SMCL's) which means the constituents are not considered a health risk. Large sulfate concentrations may be detrimental to livestock, and sodium concentration is a limiting factor for irrigation water.

Both chloride and sulfate in large concentrations are detectable by taste. Sulfate also has a laxative effect for people who are not acclimated to the water. The criterion for both sulfate and chloride is 250 mg/L (U.S. Environmental Protection Agency, 1986a). Water with larger concentrations of sulfate and chloride is acceptable for domestic use when no other source is available. Livestock will tolerate larger concentrations of sulfate. It is recommended that water used for livestock watering not have a sulfate concentration greater than 2,500 mg/L (Ferreira and Lambing, 1984)

The amount of sodium and the ratio of sodium to other cations is important for irrigation water. Sodium-adsorption ratio (SAR) is the parameter most often used to measure the sodium hazard of irrigation water.

$$SAR = \frac{Na^{+}}{1/2[Ca^{2}+Mg^{2}]}$$ where Na, Ca, and Mg are expressed in milliequivalents per liter (Hem, 1985). For sensitive crops, such as fruits, the tolerance for sodium in irrigation water is a SAR of 4. The acceptable range for general crops and forage is a SAR of 8 to 18 (U.S. Environmental Protection Agency, 1986a). This report uses a SAR of 4 as the criterion for sensitive crops and a SAR of 18 as the criterion for tolerant crops.

Nitrogen and Phosphorus

Nitrogen and phosphorus are common elements and plant nutrients. They are essential for plant growth, but both are pollutants when present in certain forms and in large concentrations. Nitrogen in the form of nitrate and ammonium ions is converted to protein by plants, but both forms may be toxic to man, animals, and fish. Large concentrations of phosphorus as phosphate may cause nuisance aquatic growths.

Both nitrate and nitrite are considered toxic, although nitrite is considered more toxic. Although natural waters often contain high levels of nitrate, the nitrite content is usually very low (National Academy of Sciences and National Academy of Engineering, 1973). Nitrate becomes toxic when it is reduced to nitrite. Nitrate can be reduced to nitrite in the gastrointestinal tract. Nitrite reacts with hemoglobin in the body to produce methemoglobin, which impairs oxygen transport. This impairment can be hazardous to infants. Therefore nitrate and nitrite is regulated in public water supplies. Limits of 10 mg/L of nitrate and 1 mg/L of nitrite are the criteria for public water supplies.

protection of aquatic life. The criteria of 90 mg/L nitrate and 5 mg/L nitrite are used in this report.

Ammonia in the un-ionized form also is detrimental to aquatic life, including fish and invertebrate species. The toxicity of ammonia is affected by temperature, pH, previous acclimation to ammonia, carbon dioxide concentration, salinity, and the presence of other toxicants. EPA's (1986a) recommended water-quality standard for ammonia, based on the protection of aquatic life, is calculated using temperature and pH. Table 7 shows total ammonia values recommended for the protection of aquatic life for specific pH and temperature values. Total ammonia refers to total dissolved ammonia species. This table applies to all species other than salmonids, which rarely are found in ponds.

Table 7. Maximum total ammonia concentrations recommended for the protection of aquatic life, in milligrams per liter
[°C, degrees Celsius; Modified from U.S. Environmental Protection Agency (1986a)]

	Concentration (mg/L as N), for indicated values of pH and temperature						
	Temperature						
pH	0°C	5°C	10°C	15°C	20°C	25°C	30°C
6.50	2.06	1.97	1.81	1.81	1.73	1.20	0.85
6.75	2.06	1.97	1.81	1.81	1.73	1.21	0.85
7.00	2.06	1.97	1.81	1.81	1.73	1.21	0.85
7.25	2.06	1.97	1.81	1.81	1.73	1.22	0.86
7.50	2.06	1.97	1.81	1.81	1.73	1.22	0.87
7.75	1.89	1.81	1.73	1.64	1.63	1.14	0.82
8.00	1.26	1.18	1.13	1.09	1.08	0.76	0.55
8.25	0.72	0.67	0.64	0.62	0.62	0.44	0.33
8.50	0.40	0.39	0.37	0.36	0.37	0.27	0.21
8.75	0.23	0.22	0.21	0.22	0.22	0.17	0.13
9.00	0.13	0.13	0.13	0.13	0.14	0.12	0.09

The presence of ammonia may be indicative of pollution. Ammonia reduces the effectiveness of chlorination. It also may be corrosive to copper. The National Academy of Sciences and National Academy of Engineering (1973) recommends that dissolved ammonia in public water supplies not exceed 0.5 mg/L as nitrogen (N). Ammonia in drinking water is not considered hazardous to human health.

Nitrates and nitrites also are dangerous to aquatic life. Nitrate concentrations above a level of 90 mg/L and nitrite concentrations above a level of 5 mg/L are considered detrimental to warm-water fish. Salmonids such as trout are more sensitive to and are adversely affected by nitrite at a level above 0.06 mg/L. These levels are unlikely to occur in nature and therefore the EPA (1986a) has not included them in the criteria for

Livestock poisoning by nitrate or nitrite is dependent on the intake of these ions from all sources. Nitrite is formed in the rumen of cattle and sheep, in forage, in moistened feeds, and in contaminated water. In order to provide a reasonable margin of safety for unusual situations, such as extremely large water intake or nitrite formation in slurries, the recommended limit of nitrate plus nitrite content in drinking water for livestock is 100 mg/L, and the limit for nitrite concentration alone is 10 mg/L (National Academy of Sciences and National Academy of Engineering, 1973).

Total phosphorus as phosphate is considered a pollutant when in large concentrations because it stimulates excessive algal growth. Excessive algal growth may impart a taste and odor to the water, may clog intake valves, may interfere with water treatment, and may alter the chemistry of the water. Excessive algal growth contributes to cultural eutrophication (U.S. Environmental Protection Agency, 1986a), which is rapid and unnatural aging of lakes because of man's activities. To prevent cultural eutrophication, the EPA recommends that total phosphate not exceed 25 mg/L. This report is concerned with naturally occurring water-use limitations rather than man-made problems. However, ponds that are man-made may age faster than those created naturally, therefore, this criterion is used to gauge the level of eutrophication in the lakes. Large concentrations of phosphate in a pond may be caused by nearby land use rather than naturally occurring phosphates.

Trace Elements

Trace elements are those that naturally occur in waters in concentrations of less than a few mg/L. These elements are generally reported in µg/L. Micrograms per liter is equivalent to parts per billion in fresh water. Many trace elements, in small concentrations, are necessary for plant and animal growth, but become toxic at larger concentrations. Concentrations of trace elements are included in criteria for different uses of water because of the toxicity of different elements to plants, animals, and man at large concentrations. The toxicity of an element often is affected by other characteristics of the water, such as pH, hardness, and the presence of other elements (U.S. Environmental Protection Agency, 1986a). Many of the criteria set for trace elements change as new information becomes available on their toxicity. The trace elements with criteria for various water uses are given in table 8.

Table 8. Trace elements with criteria for various water uses
[MCL, maximum contaminant level; SMCL, secondary maximum contaminant level]

Trace element	Water use					
	Public MCL	Public SMCL	Aquatic life	Waterfowl	Livestock	Irrigation
Aluminum					X	X
Arsenic	X		X		X	X
Barium	X					
Boron					X	X
Cadmium	X				X	X
Chromium	X		X		X	X
Copper		X	X		X	X
Iron		X	X			X
Lead	X		X		X	X
Manganese		X				X
Mercury	X		X		X	
Selenium	X		X	X	X	X
Zinc		X	X		X	X

Both maximum contamination limits and secondary contamination limits consist of some trace element concentrations (table 8). The analytical detection limit for total recoverable lead in the water samples collected in the spring of 1985 is different from the detection limit for lead in the water samples collected in the summer, because of a change in analytical methods. Both detection limits are larger than the criterion for lead in public water supplies.

The levels at which an element is toxic to aquatic life differ from species to species and differ for specific life cycles of the same species. The pH and hardness of the water often affect the toxicity of an element, therefore, the criteria given may be functions of these constituents rather than a fixed amount. The criteria for cadmium, chromium, copper, lead, and zinc are functions of hardness. The greater the hardness, the larger the concentration of the element can be before being considered toxic to aquatic species. The water-quality criteria developed by the EPA (1986a) are not intended to provide 100–percent protection of all species and all uses of aquatic life all of the time, but are intended to protect most species in a balanced, healthy aquatic community. When a criterion is given as an equation, the detection limit may be greater than the criterion for one pond and less than the criterion for another pond. Also, the national water-quality criteria for the protection of aquatic life set by the EPA often have more than one recommended concentration for a given trace element. The criteria are used for streams, rivers, and effluent as well as lakes and ponds. Therefore, the criterion may be a 4-day average concentration or a 1-hour average concentration. This report uses the 4-day average concentration as the criterion because water quality in ponds does not change as quickly as in flowing water.

The criteria for the protection of waterfowl include the trace element selenium. Dissolved selenium becomes concentrated in fish, invertebrates, and plants, particularly bottom-rooting plants, on which waterfowl feed. Large selenium concentrations in plants and animals may cause waterfowl mortality and reproduction problems (Brown, 1987). The State of Oklahoma has no criterion for selenium, possibly because information concerning the impact of selenium on waterfowl is fairly recent. The State of California has proposed a standard of between 2 and 10 μg/L of selenium (Brown, 1987). This report uses a criterion of 2 μg/L.

Ten trace elements are included in water-quality criteria for the protection of livestock (table 7). These elements may be in both feed and water, so both should be considered. The National Academy of Sciences and National Academy of Engineering (1973) recommends using the criteria as guidelines for diagnosing livestock losses, since a large margin of safety normally is factored into the criteria and other factors such as interaction with other ions, water intake, temperature of the environment, and age, sex, species, and physiological state of the animal are important.

Eleven trace elements are included in water-quality criteria for irrigation (table 8). The most important of these elements is boron. Plants vary in their sensitivity to boron. Water may be classified not only according to its boron content, but also according to the tolerance of the crops to which it is applied. The most sensitive crops are citrus, nuts, and deciduous fruits; semitolerant are truck crops, cereals, and cotton; most tolerant are lettuce, onion, alfalfa, beets, and asparagus (McKee and Wolf, 1963). The Environmental Protection Agency (1986a) suggests a criterion of 0.75 mg/L for long-term irrigation on sensitive crops. National Academy of Sciences and National Academy of Engineering (1973) recommends maximum boron concentrations of 1 and 2 mg/L for semitolerant and tolerant plants respectively.

Manganese also may be toxic to some plants at a concentration slightly less than 1 mg/L when applied to soils with pH values less than 6.0. For acidophilic crops a criterion of 0.2 mg/L has been suggested. Problems may develop with long-term (approximately 20 years) continuous irrigation on other soils with water containing about 10 mg/L of manganese. However, because surface waters rarely have concentrations greater than 1 mg/L, the EPA (1986a) has not set a specific criterion for manganese. Water in Oklahoma tends to contain relatively large concentrations of manganese. Therefore, this report uses 1 mg/L as a criterion for irrigation.

Phytoplankton, Macrophytes, and Benthic Invertebrates

Biological constituents also are used to evaluate the quality of a water body. A healthy population of phytoplankton, macrophytes, and benthic invertebrates are necessary for the health and propagation of fish.

Phytoplankton can be both beneficial and detrimental to the water quality of a pond. Phytoplankton can be beneficial because they produce oxygen, remove carbon dioxide, are significant in self-purification processes, and serve as food for other aquatic fauna, such as zooplankton and some fish. Phytoplankton growths have been known to foster increased growth of insect larvae and water fleas. Phytoplankton also can be damaging to a pond. Some species are toxic to stock, others cause taste and odor problems in public water supplies and clog filters. Phytoplankton can be detrimental to fish. Some species add toxins to the water that poison certain species of fish. Phytoplankton also may cause dissolved oxygen imbalances resulting in mortality through oxygen depletion or supersaturation. Large concentrations of dead phytoplankton can cause fish deaths by clogging their gills and can smother benthic fauna (McKee and Wolf, 1963).

Table 9. Water-quality criteria and standards for public water supply
[EPA, U.S. Environmental Protection Agency; NAS/NAE, National Academy of Sciences and National Academy of Engineering; OWRB, Oklahoma Water Resources Board; MCL, Maximum contaminant level; SMCL, Secondary maximum contaminant level; mg/L, milligrams/liter; μS/cm, microsiemens per centimeter; min, minimum; max, maximum; TR, total recoverable; mL, milliliter; Primary standards are regulations for the protection of human health; Secondary standards are recommended for human welfare]

Constituent	Water-quality criteria	State standard (OWRB,1993)	Drinking water standards (EPA,1986; * EPA, 1993)	Source for water-quality standard
Primary standards (MCL):				
Nitrate, dissolved as N	10 mg/L	10 mg/L	10 mg/L	EPA (1986b)
Nitrite, dissolved as N	1 mg/L		* 1 mg/L	EPA (1986b)
Arsenic, TR	0.05 mg/L	0.1 mg/L	.05 mg/L	EPA (1986b)
Barium, TR	1.0 mg/L	1.0 mg/L	* 2.0 mg/L	EPA (1986b)
Cadmium, TR	0.01 mg/L	0.02 mg/L	* .005 mg/L	EPA (1986b)
Chromium, TR	0.05 mg/L	0.05 mg/L	* .1 mg/L	EPA (1986b)
Copper, TR	1.0 mg/L	1.0 mg/L	Treatment technique	EPA (1986c)
Lead, TR	0.05 mg/L	0.10 mg/L	Treatment technique	EPA (1986b)
Mercury, TR	0.002 mg/L	0.002 mg/L	.002 mg/L	EPA (1986c)
Selenium, TR	0.01 mg/L	0.01 mg/L	* .05 mg/L	EPA (1986c)
Secondary standards (SMCL):				
pH	6.5-8.5, min-max		6.5–8.5	EPA (1986c)
Dissolved oxygen	5.0 mg/L			EPA (1986c)
Hardness, as $CaCO_3$	100 mg/L			See text
Sulfate, dissolved	250 mg/L		* 250 mg/L	EPA (1986c)
Chloride, dissolved	250 mg/L		* 250 mg/L	EPA (1986c)
Dissolved solids	500 mg/L		500 mg/L	EPA (1986c)
Specific conductance	670 mS/cm			See text
Ammonia, dissolved	0.5 mg/L			NAS/NAE (1973)
Copper, TR	1.0 mg/L	1.0 mg/L	* 1.0 mg/L	EPA (1986c)
Iron, TR	0.3 mg/L		* .3 mg/L	EPA (1986c)
Manganese, TR	0.05 mg/L		* .05 mg/L	EPA (1986c)
Zinc, TR	5 mg/L	5 mg/L	* 5 mg/L	EPA (1986c)
Phytoplankton:				McKee and Wolf (1963)
Aphanizomenon	1,000 cells/ml			
Anabaena	600 cells/ml			
Cryptomonas	200 cells/ml			
Chlamydomonas	10 cells/ml			
Dinobryon	500 cells/ml			
Synura	200 cells/ml			
Ureglenopsis	200 cells/ml			

The phytoplankton *Aphanizomenon, Anabaena, Cryptomonas, Chlamydomonas, Dinobryon, Synura,* and *Uroglenopsis* have been noted to cause odor and taste problems (McKee and Wolf, 1963) in domestic water. Only *Anabaena, Chlamydomonas,* and *Dinobryon* were found in the ponds in this study. These taxa and the allowable limits are listed in table 9.

Anacystis, Anabaena, Aphanizomenon, Coelosphaerium, Gloeotrichia, Gomphosphaeria, Nostoc, and *Nodularia* are considered toxic to stock (National Academy of Sciences and National Academy of Engineering, 1973). *Anacystis* and *Anabaena* were found in the ponds in the study. The concentration of these taxa necessary to cause toxic reactions in stock is unknown. Therefore, the presence of the taxon or taxa is noted, but no numerical limit is used as a criterion.

The presence of benthic invertebrates in a pond is generally beneficial to fish as it indicates a food source. However, some genera of benthic invertebrates, particularly midges, mosquitoes, and biting flies may be considered a nuisance in large numbers and will detract from the aesthetics of a pond. The total number of invertebrates and the number of genera are used to compare ponds. The presence of benthic invertebrates is used as a criterion for aquatic life.

Macrophytes generally are considered beneficial to the aquatic life of a pond. Macrophytes are a source of habitat and food for fish, invertebrates, and waterfowl. However, an overabundance may be considered a pollution source. Macrophytes may affect the color and taste of water, may cause problems by clogging pipes, and may affect the dissolved-oxygen content of the water. Decaying macrophytes will lower dissolved oxygen. Macrophyte concentrations were not analyzed quantitatively and will be used only for comparison and not as a criterion.

COMPARISON OF POND DATA TO WATER-QUALITY CRITERIA

Water-quality data collected from the study ponds were analyzed statistically for the maximum, minimum, and mean values of each constituent for each pond. These values were used for comparison with water-quality criteria. The number of ponds per group with a water sample containing constituent concentrations that exceeded a criterion and the total number of ponds with data per group are noted.

Samples were collected in the spring and summer in an attempt to give a best- and worst-case sample. Two samples are not sufficient to show true seasonal changes. Concentrations of dissolved oxygen, pH, and specific conductance were obtained in vertical profiles (table 10, at back of report) to provide values from the entire water column, rather than from just one point, which could be compared with criteria where appropriate. Concentrations of dissolved oxygen, pH, temperature, and specific conductance obtained from the hypolimnion of the vertical profiles were used to compare with criteria when similar data from the hypolimnion were not available. These data are presented in the comparison tables (tables 11, 17, 21, 23, 25, 27, 28).

The phytoplankton data should be used qualitatively, rather than quantitatively. A pond may have been sampled during a plankton bloom, whereas the next pond may have been sampled before or after a similar bloom. Therefore, the data should be reviewed for types of plankton and number and diversity of genera, rather than for total number of plankton.

Public Water Supply

Water-quality criteria for public water supply are the most closely monitored and regulated criteria. The EPA sets maximum contaminant levels (MCL's) for constituents considered harmful to human health. Secondary maximum contaminant levels (SMCL's) are set for those constituents that are not harmful to human health, but may affect human welfare, such as domestic uses other than ingestion. This report also uses criteria for substances that are not regulated by the EPA. These are grouped with the SMCL's.

The water-quality criteria used in this report, Federal water-quality standards and State water-quality standards, are presented in table 9. Comparison of water-quality data from the ponds to water-quality criteria for public water supplies is given in table 11.

Water samples from six ponds exceeded a standard for the protection of human health in the epilimnion. A water sample from the epilimnion of one Iron Post pond exceeded the lead criterion of 50 µg/L with a concentration of 160 µg/L. Water samples from other ponds had lead concentrations less than the detection limit. The detection limit for total recoverable lead of 100 µg/L is lower than the criterion. Therefore, it is possible that the water in some ponds with lead concentrations less than the detection limit had lead concentrations that exceeded the criterion. A water sample from the epilimnion of a McAlester pond had a total recoverable mercury concentration of 50 µg/L that exceeded the MCL of 2 µg/L. Only one of the two samples collected during the study for each of these two ponds had concentrations exceeding the criterion mentioned. The other samples collected from these ponds contained

Table 11. Comparison of pond-water quality to water-quality criteria for public water supply

[min, minimum; max, maximum; *, detection limit is higher than criterion; TR, total recoverable; NA, not applicable. The fraction used is the number of ponds exceeding the criterion over the total number of ponds with data; shallow samples were collected from the epilimnion; deep samples were collected from the hypolimnion]

Variable	Pond type and location of sample							
	Control		Croweburg		Iron Post		McAlester	
	Shallow	Deep	Shallow	Deep	Shallow	Deep	Shallow	Deep
PRIMARY STANDARDS								
Nitrate, dissolved	0/4	0/4	0/8	0/8	0/8	0/3	0/8	0/5
Nitrite, dissolved	0/4	0/4	0/8	0/8	0/8	0/3	0/8	0/5
Arsenic, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Barium, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Cadmium, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Chromium, TR	0/6	1/2	0/8	0/6	0/8	0/5	0/8	0/6
Lead, TR	*0/6	*0/2	*0/8	*0/6	*1/8	*0/5	*0/8	*0/6
Mercury, TR	0/5	0/2	0/8	0/7	0/8	0/5	1/9	0/7
Selenium, TR	0/6	0/2	0/8	0/6	5/8	2/5	0/8	0/6
SECONDARY STANDARDS								
pH (min)	1/6	3/6	0/8	1/8	0/8	1/8	0/9	1/9
pH (max)	1/6	0/6	1/8	1/8	0/8	0/8	2/9	0/9
Dissolved oxygen	0/6	6/6	0/8	8/8	0/8	8/8	0/9	9/9
Hardness, as $CaCO_3$	2/6	0/2	8/8	7/7	8/8	5/5	7/9	6/7
Sulfate, dissolved	1/6	0/2	4/8	5/7	7/8	5/5	3/9	5/7
Chloride, dissolved	0/6	0/2	0/8	0/7	0/8	0/5	0/9	0/7
Dissolved solids	1/6	0/2	4/8	6/7	7/8	5/5	3/9	4/7
Specific conductance	1/6	1/6	4/8	6/8	7/8	7/8	4/9	6/9
Ammonia, dissolved	0/4	2/4	0/8	7/8	0/8	1/3	1/8	3/6
Copper, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Iron, TR	4/6	2/2	2/8	6/6	3/8	3/5	4/8	5/6
Manganese, TR	4/6	2/2	3/8	6/6	5/8	5/5	3/8	6/6
Zinc, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Phytoplankton:								
Anabaena	1/6	NA	1/8	NA	0/8	NA	2/9	NA
Chlamydomonas	2/6	NA	0/8	NA	3/8	NA	0/9	NA
Dinobryon	1/6	NA	0/8	NA	1/8	NA	0/9	NA

concentrations less than the criterion. A water sample from the hypolimnion of one control pond had a total chromium concentration of 130 μg/L that exceeded the MCL of 100 μg/L.

Water samples from the epilimnion of all 31 ponds exceeded one or more SMCL's. Water samples from 27 of these exceeded two SMCL's, including criteria for pH, phytoplankton, and hardness, which are easily treatable.

Water samples from all ponds had pH values within the recommended range for pH somewhere in the water column. The pH often changes with depth, so it is possible for a pond to be outside the range for pH somewhere in the water column, but be within the range elsewhere in the water column. The pH was measured at depth increments, so changes in pH were noted. Water from six ponds did not meet the minimum pH of 6.5 somewhere in the water column and water from five ponds exceeded the maximum pH of 8.5 somewhere in the water column. When the median pH was used, water in all of the ponds had pH values within the recommended range.

Hardness concentrations in water samples from the epilimnion of 25 of 31 ponds exceeded the criterion of 100 mg/L. Applying the commonly used hardness chart (table 4), water with hardnesses greater than 100 mg/L are classified as moderately hard or harder. Water samples from 4 of 6 control ponds and 2 of 9 McAlester ponds had hardnesses of less than 75 mg/L, which is classified as soft water. The mean hardness for samples from the six control ponds was 100 mg/L, compared to mean hardnesses of 370, 940, and 200 mg/L for samples from Croweburg, Iron Post, and McAlester ponds.

None of the water samples contained dissolved-chloride concentrations in excess of the SMCL of 250 mg/L. Water samples from the epilimnion of 15 of 31 ponds had dissolved sulfate concentrations in excess of the SMCL of 250 mg/L. Large dissolved-sulfate concentrations are common in water from ponds formed by strip mining. Water samples from the epilimnion of 4 of 8 Croweburg ponds, 7 of 8 Iron Post ponds, and 3 of 9 McAlester ponds contained sulfate concentrations greater than the SMCL, with maximum concentrations ranging from 270 to 1,800 mg/L (table 12). Dissolved sulfate concentrations in a water sample from one of the six control ponds exceeded the SMCL, with a maximum concentration of 390 mg/L (table 12, at back of report). Sulfate concentrations in water samples from the hypolimnion of 15 of 21 ponds exceeded the SMCL.

Water in the epilimnion of 15 ponds had concentrations exceeding the SMCL for dissolved solids. A limit of 500 mg/L is the recommended maximum concentration for dissolved solids unless more suitable supplies are unavailable. Dissolved-solids concentrations in water samples from control ponds exceeded the dissolved-solids criterion the least often, and concentrations in water samples from Iron Post ponds exceeded this criterion the most often. Water samples from 1 of 6 control ponds had total dissolved-solids concentrations exceeding the criterion with a maximum dissolved-solids concentration of 616 mg/L (table 12). Water samples from 7 of 8 Iron Post ponds contained dissolved-solids concentrations ranging from 890 to 3030 mg/L (table 12). Water samples from the hypolimnion of all the ponds exceeded one or more SMCL's.

The ammonia concentration in a water sample from the epilimnion of one pond exceeded the ammonia criterion of 0.5 mg/L, with a concentration of 0.95 mg/L of dissolved ammonia (table 13). Ammonia concentrations in water samples from the hypolimnion of 13 of 21 ponds exceeded the criterion, with concentrations ranging from 0.52 to 6.7 mg/L (table 13, at back of report). Water samples from Croweburg ponds were the most likely to exceed the criterion. Water samples from 7 of 8 ponds exceeded the criterion.

Water samples from the epilimnion of 13 of 31 ponds contained total recoverable iron in excess of the SMCL of 0.3 mg/L and water samples from the epilimnion of 15 of 31 ponds contained total recoverable manganese in excess of the SMCL of 0.05 mg/L. The concentrations of total recoverable iron and manganese in the water samples exceeding the criteria ranged from 0.31 to 1.7 mg/l and 0.07 to 0.84 mg/L (table 14). Control ponds had the highest percentage of ponds with samples from the epilimnion exceeding the criteria. Samples from 4 of 6 control ponds exceeded the criteria for both iron and manganese, with concentrations ranging from 0.4 to 1.5 mg/L and 0.1 to 0.84 mg/L (table 14). Croweburg ponds had the smallest percentage of ponds with water samples exceeding the criteria. Samples from 2 of 8 ponds exceeded the iron criterion, and samples from 3 of 8 ponds exceeded the manganese in the epilimnion. A greater percentage of water samples from the hypolimnion contained iron and manganese concentrations in excess of the criteria. Water samples from the hypolimnion of 16 of 19 ponds contained iron concentrations in excess of the criterion. All of the ponds sampled in the hypolimnion contain water with manganese concentrations exceeding the criterion. Concentrations ranged from 3.3 to 34 mg/L of iron and 0.4 to 23 mg/L of manganese (table 14, at back of report).

Water samples from 1 of 6 control ponds had populations of *Anabaena* and *Dinobryon* in excess of the criteria of 600 and 500 cells per mL, and samples from 2 of 6 control ponds had populations of *Chlamydomonas* in excess of the criterion of 10 cells per mL. Water samples from three Iron Post ponds exceeded the criteria for *Chlamydomonas*, and water from one Iron Post pond exceeded the criteria for *Dinobryon*. Water samples from two McAlester ponds and one Croweburg pond had algal populations in excess of the criteria for *Anabaena*. None of the water samples contained populations of *Aphanizomenon*, *Crypotomonas*, *Synura*, or *Uregenopsis* in excess of the criteria.

Table 15. Water-quality criteria for the protection of aquatic life
[* See tables 2 and 3 in text; mg/L, milligrams per liter; µg/L,micrograms per liter; °C, degrees Celsius; min, minimum; max, maximum; TR, total recoverable; EPA, U.S. Environmental Protection Agency; ln (hardness), natural log of carbonate hardness in milligrams per liter; where applicable the four-day average concentration was used as the criterion]

Constituent	Water-quality criteria	Source
pH	6.5–9.0	OWRB (1985)
Temperature (spring)	20°C *	EPA (1986a)
Temperature (summer)	30°C *	EPA (1986a)
Dissolved oxygen	5.0 mg/L (min)	EPA (1986a)
Alkalinity, total as $CaCO_3$	20 mg/L (min)	EPA (1986a)
Dissolved solids	5,000 mg/L	McKee and Wolf 1963)
Specific conductance	6,700 mS/cm	See text
Nitrate, dissolved	90 mg/L	EPA (1986a)
Nitrite, dissolved	5 mg/L	EPA (1986a)
Ammonia, dissolved	see table 6	EPA (1986a)
Arsenic	0.19 mg/L	EPA (1986a)
Cadmium, TR	e(0.7852[ln(hardness)]–3.49) mg/L	EPA (1986a)
Chromium (VI), TR	11 mg/L	EPA (1986a)
Chromium (III), TR	e(0.8190[ln(hardness)]+1.561) mg/L	EPA (1986a)
Copper, TR	e(0.8545[ln(hardness)]–1.465) mg/L	EPA (1986a)
Iron, TR	1.0 mg/L	EPA (1986a)
Lead, TR	e(1.273[ln(hardness)]–4.705) mg/L	EPA (1986a)
Mercury, TR	0.012 mg/L	EPA (1986a)
Selenium, TR	0.035 mg/L (24–hr. ave.)	EPA (1986a)
Zinc, TR	e(0.8473[ln(hardness)]+0.7614) mg/L	EPA (1987)

Aquatic Life

Aquatic life is particularly sensitive to the dissolved constituents in a pond. A large response variation exists among aquatic organisms. Different aquatic organisms do not exhibit the same degree of susceptibility to a given concentration of toxicant. When establishing a criterion, the response of the more sensitive species was used where possible. Water-quality standards set by the U.S. Environmental Protection Agency (1986a) are not intended to offer the same degree of safety for survival and propagation at all times to all organisms within a given ecosystem. Therefore, not all species are protected by these criteria. The criteria for the protection of aquatic life are given in table 15.

The criteria for five constituents are functions of hardness. Therefore, each pond has its own unique criteria for these constituents. It is possible for one pond to exceed a criterion and another to be within the limit, yet both have the same concentration of a constituent. Table 16 shows those constituents with criteria that are dependent on hardness and the associated values for various levels of hardness. The comparison of the water-quality data from the ponds to the water-quality criteria for the protection of aquatic life is given in table 17.

Water from 25 of the ponds had pH values within the recommended range in either the epilimnion or hypolimnion or both. Of the six ponds containing water with minimum pH's below the recommended minimum of 6.5, all had water with pH values within .7 units of 6.5 (table 10). In five of these ponds, the pH dropped below the minimum in the hypolimnion only. When the median pH per site per pond is used, water from sites on three ponds were below the minimum pH. One control pond contained water with a pH above the maximum of

9.0. This pond was sampled during an algal bloom and the elevated pH was probably caused by increased photosynthesis. Photosynthesis affects the amount of oxygen and carbon dioxide dissolved in the water which in turn affects the pH (Hem, 1985).

ponds, one was a McAlester pond, and one was a Croweburg pond. The concentration of alkalinity in ponds not meeting the criterion ranged from 5 to 18 mg/L (table 12).

All the ponds met the dissolved nitrate and nitrite criteria for the protection of aquatic life. Ammonia concentrations of a water sample from the epilimnion of one McAlester pond exceeded the criterion. Dissolved ammonia concentrations in water samples from the hypolimnion of one control pond, two Croweburg ponds and three McAlester ponds exceeded the criterion (table 7). The ponds were sampled for nutrients in the summer.

Table 16. Water-quality criteria for the protection of aquatic life that are dependent on hardness
[All concentrations in micrograms per liter]

Total recoverable trace element	$CaCO_3$ hardness						
	50	100	200	300	400	500	1,000
Cadmium	.66	1.1	2.0	2.7	3.4	4.0	6.9
Chromium	120	210	360	510	640	770	1,400
Copper	6.5	12	21	30	39	47	85
Lead	1.3	3.2	7.7	13	19	25	60
Zinc	59	110	190	270	340	410	750

Temperature data from vertical profiles were used to compare with the criterion (table 10). The criterion requires that the temperature be equal or less than 20.0°C during the spring and 30.0°C during the summer at some point in the epilimnion where the dissolved oxygen is greater than 5 mg/L. Water samples from all the ponds met the criterion for protection of spawning during the spring. Most of the ponds had temperatures less than the criterion somewhere in the epilimnion when sampled in the summer. Two control ponds, one Croweburg pond, and three McAlester ponds exceeded the criterion in the summer.

Dissolved-oxygen levels are regulated by the State for streams but not for ponds or lakes. This criterion for streams of 5.0 mg/L of dissolved oxygen is used in this report. Water from all of the ponds had sufficient dissolved oxygen in the epilimnion to sustain aquatic life. All ponds had dissolved oxygen levels in the hypolimnion less than the criterion for the protection of aquatic life (table 10). These low values usually were found during summer sampling. Fish could survive by staying in the epilimnion. However, low dissolved-oxygen levels in the hypolimnion decrease the available habitat for fish, affect the type and number of benthic invertebrates, and may cause low dissolved-oxygen levels in the fall during turnover.

Alkalinities from water samples from 4 of 31 ponds were below the recommended minimum concentration of 20 mg/L. Two of these ponds were control

Water samples from 26 ponds exceeded one or more trace element criteria either in the epilimnion, hypolimnion, or both. Water samples from 16 ponds exceeded one or more trace-element criteria in the epilimnion. Water samples from 9 of these ponds exceeded one trace-element criterion and 6 exceeded two criteria. Total recoverable mercury criterion was exceeded the most often. Total mercury concentrations in water samples from the epilimnion of 12 of 31 ponds and the hypolimnion of 15 of 21 ponds exceeded the mercury criterion of 0.012 μg/L. These ponds had mercury in excess of the detection limit of 0.5 μg/L in the spring and 0.1 μg/L in the summer. Water samples from the other ponds had mercury levels below the detection limit, which is greater than the criterion. Total cadmium concentration in water samples from the epilimnion of five ponds exceeded the calculated criterion. Water samples from three more ponds had concentrations less than the detection limit, which was higher than the calculated criterion. Water samples from all except one pond had total recoverable copper concentrations below the calculated criterion.

Table 17. Comparison of pond-water quality to water-quality criteria for the protection of aquatic life
[min, minimum; max, maximum; *, detection limit is higher than the criterion for some or all samples; NA, not applicable; TR, total recoverable. The fraction used is the number of ponds exceeding the criterion over the total number of ponds with data; shallow samples were collected from the epilimnion; deep samples were collected from the hypolimnion]

Variable	Pond type and location of sample							
	Control		Croweburg		Iron Post		McAlester	
	Shallow	Deep	Shallow	Deep	Shallow	Deep	Shallow	Deep
pH (min)	1/6	3/6	0/8	1/8	0/8	1/8	0/9	1/9
pH (max)	1/6	0/6	0/8	0/8	0/8	0/8	0/9	0/9
Temperature (spring)	0/6	NA	0/8	NA	0/8	NA	0/9	NA
Temperature (summer)	2/6	NA	1/8	NA	0/8	NA	3/9	NA
Dissolved oxygen	0/6	6/6	0/8	8/8	0/8	8/8	0/9	9/9
Alkalinity	2/6	2/2	1/8	0/7	0/8	0/5	1/9	0/7
Dissolved solids	0/6	0/2	0/8	0/7	0/8	0/5	0/9	0/9
Specific conductance	0/6	0/6	0/8	0/8	0/8	0/8	0/9	0/9
Nitrate, dissolved	0/4	0/4	0/8	0/8	0/8	0/3	0/8	0/5
Nitrite, dissolved	0/4	0/4	0/8	0/8	0/8	0/3	0/8	0/5
Ammonia, dissolved	0/4	1/4	0/8	3/8	0/8	0/3	1/8	2/6
Arsenic, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Cadmium, TR	*2/6	*1/2	1/8	0/6	1/8	1/5	1/8	0/6
Chromium, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Copper, TR	*1/6	*1/2	*0/8	0/6	0/8	0/5	*0/8	*0/6
Iron, TR	1/6	2/2	1/8	4/6	1/8	2/5	2/8	3/6
Lead, TR	*0/6	*0/2	*0/8	*0/6	*1/4	*0/5	*0/8	*0/6
Mercury, TR	*3/5	2/2	*1/8	7/8	*3/8	*2/5	*5/9	*6/8
Selenium, TR	0/6	0/2	0/8	0/6	1/8	0/5	0/8	0/6
Zinc, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6

For water samples from nine of these ponds the detection limit is greater than the calculated criterion (table 16). Five of these were control ponds. Total iron concentration in water samples from the epilimnion of five ponds exceeded the criterion for iron of 1 mg/L, with iron concentrations ranging from 1.2 to 1.7 mg/L. Total iron concentrations in water samples from the hypolimnion of 11 ponds exceeded the criterion, with concentrations ranging from 1.1 mg/L to 34 mg/L (table 12). Water samples from 30 ponds had total recoverable lead concentrations below the analytical detection limit of 0.1 mg/L. In most instances the detection limit is greater than the calculated criterion (table 16). Water samples from all ponds had total recoverable chromium and zinc concentrations less than the criteria.

Water samples from one control pond had large phytoplankton populations that may be detrimental to fish. The dissolved-oxygen concentration below the layer containing the algal bloom was less than 5.0 mg/L. Algal blooms on other ponds may have been missed, because of sample timing.

Balanced phytoplankton and benthic invertebrate communities are essential for fish survival and growth. The phytoplankton concentrations in water samples from ponds sampled during the summer of 1985 ranged from 790 cells per mL at a site on an Iron Post pond to 291,300 cells per mL at a site on a control pond (table 18, at back of report). The concentration of phytoplankton and benthic invertebrates varied widely from pond to pond. The mean concentration of phytoplankton in the six control ponds ranged from 5,130 to 173,500 cells per mL. The concentration of phytoplankton from site to site within a pond varied widely. The concentration from sites in Control Pond 2 varied from 3,600 to 291,300 cells per mL. The mean benthic invertebrate population ranged from 120 organisms per m^2 to 4,310 organisms per m^2 (table 19, at back of report). It is difficult to relate the phytoplankton or benthic invertebrate population size to suitability for fish habitat, because of sample variability and interrelationships between phytoplankton and vertebrates and invertebrates. A low total phytoplankton count may indicate heavy utilization by vertebrates and invertebrates.

The number of phytoplankton genera found in pond water samples ranged from 2 per pond to 18 per pond. A larger number of genera may indicate a more diverse phytoplankton population, which may support a more diverse population of invertebrates and vertebrates. The total number of benthic invertebrate genera found ranged from 2 to 30 per pond (table 19).

Macrophytes are a source of food and habitat for invertebrates and fish. The control ponds sampled were observed to have a higher percentage of macrophytes per area of pond. Many of the older ponds formed by strip mining were observed to have more macrophytes than the younger ponds. Many of the older ponds had shallow arms where macrophytes could grow. Macrophyte populations were not measured, so no conclusions can be drawn about macrophyte growth and a pond's suitability.

Waterfowl Habitat

Aquatic habitats in eastern Oklahoma, part of the Eastern Plains corridor of the Central flyway (Bellrose, 1976), are heavily utilized during the winter and migration periods by loons, grebes, pelicans, geese, ducks, gulls, and shore birds. The most abundant wintering species in eastern Oklahoma are mallards, gadwalls, common mergansers, and American coots (Schnell and others, 1979). The mallard population, estimated at 160,000 in 1968, winter on artificial reservoirs in Oklahoma (Bellrose, 1968). Most species of dabbling duck use winter habitat for more than 7 months. Conditions on the wintering grounds can influence the welfare of birds using them and also the breeding condition of birds departing from them in the spring (Chabbreck, 1979).

The water-quality criteria for the protection of waterfowl are often the criteria applicable to the growth of plants and invertebrates utilized by waterfowl, rather than the criteria for ingestion of water by waterfowl. The water-quality criteria for protection of waterfowl are given in table 20.

Table 20. Water-quality criteria for the protection of waterfowl
[mg/L, milligrams per liter; min, minimum; max, maximum; °C, degrees Celsius; TR, total recoverable; >, greater than; NAS/NAE, National Academy of Sciences and National Academy of Engineering; EPA, U.S. Environmental Protection Agency]

Constituent	Water-quality criteria	Source
pH	7.0–9.2, min-max	NAS/NAE (1973)
Temperature	21°C	NAS/NAE (1973)
Dissolved oxygen	> 0.5	See text
Alkalinity, bicarbonate	25 mg/L min	EPA (1986a)
Selenium, TR	.002 mg/L	Brown (1987)

The comparison of the water-quality data from the ponds to the water-quality criteria is given in table 21.

Water depth is a possible criteria that is not listed in the table. The type of duck (diving or dabbling) and the species of duck affect the applicability of a depth criterion. However, depth does need to be considered when discussing the suitability of a water body for use by waterfowl. The depth of the water affects the type and amount of edible vegetation. Too much or too little may affect food availability. A lake in central Louisiana was reported to have tremendous concentrations of most species during the fall and early winter when depths were less than 0.5 m (1.6 ft) and favorable for feeding. Deeper flooding in late winter caused most

Table 21. Comparison of pond-water quality to water-quality criteria for the protection of waterfowl
[max, maximum; min, minimum; NA, not applicable; *, detection limit is higher than the criterion for some or all samples; TR, total recoverable. The fraction used is the number of ponds exceeding the criterion over the total number of ponds with data; shallow samples were collected from the epilimnion; deep samples were collected from the hypolimnion]

Variable	Pond type and location of sample							
	Control		Croweburg		Iron Post		McAlester	
	Shallow	Deep	Shallow	Deep	Shallow	Deep	Shallow	Deep
pH (min)	4/6	NA	0/8	NA	0/8	NA	2/9	NA
pH (max)	1/6	NA	0/8	NA	0/8	NA	0/9	NA
Temperature	6/6	0/6	8/8	0/8	8/8	0/8	9/9	0/9
Dissolved oxygen	0/6	5/6	0/8	6/8	0/8	4/8	0/9	5/9
Alkalinity (min)	2/6	0/2	1/8	0/7	0/8	0/5	1/9	1/7
Selenium, TR	*/6	*/2	*/8	*/6	*5/8	*2/5	*/9	*/6

dabbling ducks to abandon the area (Chabbreck, 1979). Diving ducks, which feed on invertebrates, will tolerate deeper depths (Michael J. Johnson, oral commun., 1990). Deeper ponds may be utilized by dabbling ducks for resting. Mallards and pintail often use lakes in Oklahoma as resting areas, and feed in nearby fields (Chabbreck, 1979).

All of the ponds in the study are deeper than 1.6 ft (table 12). Farm ponds in the area may be shallower, but were not used for the study, because depth was a consideration in control-pond selection. Many of the ponds, both control and strip mine, have areas shallower than 1.6 ft, with considerable macrophyte growth. The older ponds formed by strip mining had more shallow areas than newer ponds. The Iron Post sedimentation ponds had more shallow areas and more macrophyte growth than the last-cut ponds formed by strip mining.

Data from the epilimnion were used to compare pH values, because the pH criterion is protective of plants utilized by waterfowl. Water from all of the ponds except for one control pond met the criterion for maximum pH of 9.2. This criterion was exceeded in the summer only. Water samples from six ponds had pH levels less than the suggested minimum pH of 7.0. Four of the six ponds were control ponds and two were McAlester ponds. Two of the control ponds had pH levels less than the criterion in the summer only. Most water from ponds formed by strip mining had pH values within the recommended range. However, the ponds formed by strip mining tend to have a lower percentage of littoral zone and therefore less area available for macrophyte growth than the control ponds.

The temperature criterion of 20°C was exceeded in all of the ponds during the summer sampling. Water in all ponds met the temperature criterion during the spring, and probably would meet the criterion during the winter months when the ponds are heavily utilized by waterfowl.

Dissolved-oxygen levels were 0.5 mg/L or less in the water column in 21 of the 31 ponds, usually at or near the bottom. In many of these ponds a hydrogen sulfide odor, which indicates anaerobic conditions, was detected when water samples were collected from the bottom of the pond. The largest percentage of ponds with low dissolved-oxygen concentrations in the water column were control ponds. The smallest percentage were Iron Post. The low dissolved-oxygen concentrations occurred in the summer when few wild waterfowl are present. Therefore, these findings are not as applicable to wintering and migration habitat.

Water samples from 22 ponds meet the criteria for alkalinity and selenium. Twenty ponds meet the criteria in the spring. Water samples from 4 of the 31 ponds had minimum alkalinities in the epilimnion that were less than the recommended criterion of 25 mg/L. Two of these were from control ponds. Alkalinities of water samples from one Croweburg pond and one McAlester pond also exceeded the criterion of minimum alkalinity. Water samples from these ponds had alkalinities ranging from 5 to 18 mg/L (table 12). Five Iron Post ponds exceeded the criterion for selenium of 2 µg/L with concentrations ranging from 11 to 78 µg/L (table 14).

Livestock Watering

The major types of livestock raised in Eastern Oklahoma are milk cows, beef cattle, hogs, and chickens (Oklahoma Water Resources Board, 1970 and 1971). Stock watering is probably the largest use of strip-mine pond water in Oklahoma. The toxicity of any element may render a pond undesirable for stock watering. The concentration at which an element is toxic depends upon the age, sex, species, physiological state of the animals, water intake, diet and its composition, the chemical form of the element, and the temperature of the water.

The water-quality criteria for the protection of livestock are shown in table 22. The comparison of the water-quality data from the ponds to the water-quality criteria is given in table 23.

Table 22. Water-quality criteria for the protection of livestock
[mg/L, milligrams per liter; TR, total recoverable; µS/cm, microsiemens per centimeter; NAS/NAE, National Academy of Sciences and National Academy of Engineering]

Constituent	Water-quality criteria	Source
Sulfate, dissolved	2500 mg/L	Ferreira, 1984
Dissolved solids	2,860 mg/L (low tolerance)	McKee and Wolf,
	12,900 mg/L (high tolerance)	1963
Specific conductance	3,810 mS/cm (low tolerance)	See text
	17,200 mS/cm (high tolerance)	
Nitrate plus nitrite, dissolved	100 mg/L	NAS/NAE, 1973
Nitrite, dissolved	10 mg/L	NAS/NAE, 1973
Aluminum, TR	5 mg/L	NAS/NAE, 1973
Arsenic, TR	0.2 mg/L	NAS/NAE, 1973
Boron, TR	5.0 mg/L	NAS/NAE, 1973
Cadmium, TR	.05 mg/L	NAS/NAE, 1973
Chromium, TR	1.0 mg/L	NAS/NAE, 1973
Copper, TR	0.5 mg/L	NAS/NAE, 1973
Lead, TR	0.1 mg/L	NAS/NAE, 1973
Mercury, TR	0.01 mg/L	NAS/NAE, 1973
Selenium, TR	.05 mg/l	NAS/NAE, 1973
Zinc, TR	25 mg/L	NAS/NAE, 1973
Presence of the following phytoplankton genera:		NAS/NAE, 1973; McKee and Wolf, 1963
Anacystis (Microcystis)		
Aphanizomenon		
Nostoc		
Nodularia		
Gloeotrichia		
Gomphosphaeria		
Anabaena		
Coelosphaerium		

Table 23. Comparison of pond-water quality to water-quality criteria for the protection of livestock

[min, minimum; max, maximum; TDS, total dissolved solids; NA, not applicable; TR, total recoverable. The fraction used is the number of ponds exceeding the criterion over the total number of ponds with data; *, TDS criterion is used instead of the specific conductance criterion; shallow samples were collected from the epilimnion; deep samples were collected from the hypolimnion]

Variable	Pond type and location of sample							
	Control		Croweburg		Iron Post		McAlester	
	Shallow	Deep	Shallow	Deep	Shallow	Deep	Shallow	Deep
Sulfate, dissolved	0/6	0/2	0/8	0/7	0/8	0/5	0/9	0/7
TDS (low tolerance)	0/6	0/2	0/8	2/7	1/8	1/5	0/9	1/7
Specific conductance (low tolerance)	*/6	0/6	*/8	0/8	*/8	1/8	*/9	1/9
TDS (high tolerance)	0/6	0/2	0/8	0/7	0/8	0/5	0/9	0/7
Specific conductance (high tolerance)	*/6	0/6	*/8	0/8	*/8	0/8	*/9	0/9
Nitrate plus nitrite, dissolved	0/4	0/4	0/8	0/8	0/8	0/3	0/8	0/5
Nitrite, dissolved	0/4	0/4	0/8	0/8	0/8	0/3	0/8	0/5
Aluminum, TR	0/6	1/2	0/8	0/6	0/8	0/5	0/8	0/6
Arsenic, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Boron, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Cadmium, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Chromium, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Copper, TR	0/6	0/2	0/7	0/6	0/8	0/5	0/8	0/6
Lead, TR	0/6	0/2	0/7	0/6	1/7	0/5	0/8	0/6
Mercury, TR	0/5	0/2	0/8	0/7	0/8	0/5	1/9	0/7
Selenium, TR	0/6	0/2	0/8	0/6	1/8	0/5	0/8	0/6
Zinc, TR	0/6	0/2	0/9	0/6	0/8	0/5	0/8	0/6
Phytoplankton toxic taxa present	6/6	NA	8/8	NA	8/8	NA	8/8	NA

Most of the ponds are well suited for livestock watering. Water samples from eight ponds exceeded one or more chemical criteria for the protection of livestock. Water samples from five of these ponds exceeded the criteria in the hypolimnion only. Maximum dissolved-solids concentrations in water samples from the epilimnion of one Iron Post pond exceeded the criterion for poultry watering of 2,860 mg/L. Maximum dissolved-solids concentrations or corresponding specific conductances in water samples from the hypolimnion of five ponds formed by strip mining exceeded this criterion. This would be pertinent only if the stock water were pumped from the hypolimnion. The range for dissolved-solids concentrations exceeding the criterion in water samples from the hypolimnion was 2,930 to 3,760 mg/L (table 10). The dissolved solids and corresponding specific-conductance criteria for other livestock species were met by all the ponds in both the epilimnion and hypolimnion.

Total recoverable cadmium, chromium, copper, and zinc concentration in water samples from all the ponds met the criteria. The lead concentration in a water sample from the epilimnion of one Iron Post pond exceeded the criterion of 0.1 mg/L, and the mercury concentration in a water sample from the epilimnion of one McAlester pond exceeded the criterion of 0.01 mg/L. The aluminum concentration in a water sample from the hypolimnion of one control pond exceeded the criterion of 5 mg/L.

Water samples from all the ponds had algal species present that are considered toxic to livestock. Wa-

Table 24. Water-quality criteria for irrigation
[mg/L, milligrams/liter; µS/cm, microsiemens per centimeter; min, minimum; max, maximum; SAR, Sodium adsorption ratio; TR, total recoverable; EPA, U.S. Environmental Protection Agency; NAS/NAE,National Academy of Sciences and National Academy of Engineering; OWRB, Oklahoma Water Resources Board]

Constituent	Water-quality criteria	Source
pH	4.5–9.0, min-max	EPA, 1986a
SAR	4 (sensitive crops)	EPA, 1986a
	18 (tolerant crops)	
Dissolved solids	500 mg/L (sensitive crops)	OWRB, 1985
	1,000 mg/L (semitolerant crops)	
	2,000 mg/L (tolerant crops)	
Specific conductance	670; 1330; 2,670 µS/cm	See text
Aluminum, TR	5.0 mg/L	NAS/NAE, 1973
Arsenic, TR	0.10 mg/L	EPA, 1976b
Boron, TR	0.75 mg/L (sensitive crops)	EPA, 1986a
	1 mg/L (semitolerant crops)	NAS/NAE, 1973
	2 mg/L (tolerant crop)	
Cadmium, TR	0.010 mg/L	NAS/NAE, 1973
Chromium, TR	0.10 mg/L	NAS/NAE, 1973
Copper, TR	0.20 mg/L	NAS/NAE, 1973
Iron, TR	5.0 mg/L	NAS/NAE, 1973
Lead, TR	5.0 mg/L	NAS/NAE, 1973
Manganese, TR	10 mg/L	EPA, 1986a
Selenium, TR	0.02 mg/L	NAS/NAE, 1973
Zinc, TR	2.0 mg/L	NAS/NAE, 1973

ter samples from all the ponds contained the phytoplankton species *Anacystis*, in concentrations ranging from 780 to 170,000 cells per mL (table 18). A water sample from a control pond had the largest concentration of *Anacystis* and a water sample from a McAlester pond had the smallest concentration. Water samples from two McAlester ponds and one Croweburg pond had concentrations over 10,000 cells per mL, the largest of which was 21,000 cells per mL. Water samples from three ponds contained *Anabaena* concentrations ranging from 1,200 to 17,500 cells per mL.

Irrigation

When an element in solution enters the soil, it may combine with the soil to decrease its concentration in solution and increase the content of that elementthe soil. Prolonged application of water containing large concentrations of the element will diminish and eventually exhaust the capacity of the soil to react with the element. Many soils have large capacities to react with trace elements. Therefore, irrigation water with large trace-element concentrations may be applied to some soils for many years before a steady state is approached. The application time depends on soil and plant factors and on the concentration of trace elements in the water. The suggested maximum concentration for continuous use on all soils are set for sandy soils that have low capacities to react with the element in question (National Academy of Sciences and National Academy of Engineering, 1973). These concentrations are used as criteria in this report, although some soils may have larger capacities.

Major cash crops in eastern Oklahoma are barley, corn, cotton, soybeans, peanuts, hay, sorghum, and oats (Oklahoma Water Resources Board, 1970 and 1971). These crops are semitolerant of boron and total dissolved-solids concentrations and tolerant of SAR, with the exception of barley and cotton, which are tolerant of total dissolved solids. Strawberries, fruit trees, and other sensitive crops are grown in eastern Oklahoma, although they are not major cash crops.

The water-quality criteria for irrigation are given in table 24. The comparison of the water-quality data from the ponds to the water-quality criteria are given in table 25. Water from the epilimnion of 14 of the ponds is suitable for irrigation under almost all conditions. Water from the epilimnion of 20 ponds is suitable for irrigation of semitolerant crops, and water from the epilimnion of 25 ponds is suitable for irrigation of tolerant crops.

Measured pH's from all of the ponds except one control pond were within the recommended range of pH. Measured pH in this pond exceeded the upper limit of 9.0 during summer sampling, which may be because of an algal bloom. Photosynthesis affects the amount of oxygen and carbon dioxide dissolved in the water which in turn affects the pH (Hem, 1985).

Only the McAlester group had ponds containing water with SAR's greater than the criterion. Water samples from the epilimnion in 3 of 9 ponds exceeded the SAR criterion of 4 for irrigation water for sensitive plants. The SAR's ranged from 5.5 to 32. Water samples from the hypolimnion of 2 of 7 ponds exceeded this criterion, with SAR values of 7.6 and 19 (table 12). A water sample from one pond exceeded the criterion of 18 for high-tolerance crops in both zones.

The criterion most often exceeded for all crop categories was total dissolved-solids concentration. Of the 17 ponds containing water in the epilimnion that exceeded one or more criteria protective of sensitive crops, 15 ponds contained water with total dissolved-solids concentrations exceeding the criterion of 500 mg/L. One control pond, 4 Croweburg ponds, 7 Iron Post ponds, and 3 McAlester ponds exceeded this criterion. The dissolved-solids concentrations in water samples from the epilimnion of 10 ponds exceeded the criterion protective of semitolerant plants of 1,000 mg/L. Dissolved-solids concentrations in water samples from 2 Croweburg ponds, 5 Iron Post ponds, and 3 McAlester ponds exceeded this criterion. The dissolved-solids concentrations in water samples from the epilimnion of four ponds exceeded the criterion for dissolved solids protective of tolerant plants of 2,000 mg/L. Dissolved-solids concentrations in water samples from 3 Iron Post ponds and 1 McAlester pond had dissolved-solids concentrations ranging from 2,210 to 2,770 mg/L (table 12).

For the water in the hypolimnion, specific conductance values are used for comparison instead of dissolved solids because of the greater number of values. Water samples from 20 ponds had specific conductances greater than the criterion of 670 μS/cm for sensitive crops, which corresponds to 500 mg/L of dissolved solids. Water samples from 6 of 8 Croweburg ponds, 7 of 8 Iron Post ponds, 6 of 9 McAlester ponds, and 1 of 6 control ponds had specific conductances greater than the acceptable limit for sensitive crops. Water samples from 13 ponds exceeded the criterion of 1,330 μS/cm for semitolerant crops. Six of these ponds were Iron Post ponds. Water samples from six ponds exceeded the criterion of 2,670 μS/cm for tolerant crops. Water samples from two ponds from each of the strip-mine categories exceeded this criterion. The specific conductances of water samples from these six ponds ranged from 3,270 to 5,330 μS/cm (table 10).

Water samples from the epilimnion of all the ponds met the criteria for aluminum, cadmium, chromium, copper, iron, lead, manganese, and zinc. The trace element concentrations exceeding the criteria in one or more water sample from the epilimnion were boron and selenium. A water sample from one McAlester pond had a total recoverable boron concentration exceeding the criterion for sensitive plants of 0.75 mg/L in both zones. Water samples from all ponds were within the boron criterion for semitolerant plants of 1 mg/L. Water samples from three Iron Post ponds exceeded the selenium criterion of 20 μg/L, with concentrations ranging from 26 μg/L to 78 μg/L (table 14).

Water samples from the hypolimnion exceeded more of the trace element criteria than water samples from the epilimnion. Water from one control pond had a maximum total recoverable aluminum concentration in excess of the criterion of 5 mg/L, with a concentration of 6.6 mg/L (table 14). A water sample from another control pond had a maximum chromium concentration in excess of the criterion of 0.1 mg/L of total recoverable chromium with a concentration of 0.13 mg/L in the hypolimnion (table 14). These two ponds were resampled twice the following year and total recoverable aluminum and chromium concentra

Table 25. Comparison of pond-water quality to water-quality criteria for irrigation

[min, minimum; max, maximum; TDS, total dissolved solids; SAR, sodium-absorption ratio; TR, total recoverable. The fraction used is the number of ponds exceeding the criterion over the total number of ponds with data; shallow samples were collected from the epilimnion; deep samples were collected from the hypolimnion]

Variable	Pond type and location of sample							
	Control		Croweburg		Iron Post		McAlester	
	Shallow	Deep	Shallow	Deep	Shallow	Deep	Shallow	Deep
pH (min)	0/6	0/6	0/8	0/8	0/8	0/8	0/9	0/9
pH (max)	1/6	0/6	0/8	0/8	0/8	0/8	0/9	0/9
SAR (sensitive)	0/6	0/2	0/8	0/7	0/8	0/5	3/9	2/7
SAR (tolerant)	0/6	0/2	0/8	0/7	0/8	0/5	1/9	1/7
TDS (sensitive)	1/6	0/2	4/8	6/7	7/8	5/5	3/9	4/7
Specific conductance	1/6	1/6	4/8	6/8	7/8	7/8	4/9	6/9
TDS (semi-tolerant)	0/6	0/2	2/8	3/7	5/8	4/5	3/9	4/7
Specific conductance	0/6	0/6	2/8	3/8	5/8	6/8	3/9	4/9
TDS (tolerant)	0/6	0/2	0/8	2/7	3/8	2/5	1/9	2/7
Specific conductance	0/6	0/6	0/8	2/8	2/8	2/8	1/9	2/9
Aluminum, TR	0/6	1/2	0/8	0/6	0/8	0/5	0/8	0/6
Arsenic, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Boron, TR (sensitive)	0/6	0/2	0/8	0/6	0/8	0/5	1/8	1/6
Boron (semi-tolerant)	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Boron (tolerant)	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Cadmium, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Chromium, TR	0/6	1/2	0/8	0/6	0/8	0/5	0/8	0/6
Copper, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Iron, TR	0/6	2/2	0/8	0/6	0/8	0/5	0/8	1/6
Lead, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6
Manganese, TR	0/6	2/2	0/8	2/6	0/8	0/5	0/8	1/6
Selenium, TR	0/6	0/2	0/8	0/6	3/8	0/5	0/8	0/6
Zinc, TR	0/6	0/2	0/8	0/6	0/8	0/5	0/8	0/6

tions were within the allowable limits in both water samples. Water samples collected from the hypolimnion of the 2 control ponds sampled and 1 of 6 McAlester ponds contained total recoverable iron and manganese concentrations in excess of the criteria of 5 and 10 mg/L. Water samples from the hypolimnion of two of six Croweburg ponds contained manganese in excess of the criterion. The iron concentration in water samples from these ponds ranged from 6.2 to 34 mg/L (table 14). The manganese concentration ranged from 11 to 23 mg/L (table 14). Water samples from the epilimnion in all of the ponds met iron and manganese criteria.

Recreation

Recreation consists mainly of swimming and fishing as the ponds generally are too small for boating or sailing. The water-quality criteria for recreation are given in table 26. The comparison of the water-quality data from the ponds to the water-quality criteria are given in table 27

Table 26. Water-quality criteria for recreation
[in., inches; mg/L, milligram per liter; EPA, U.S. Environmental Protection Agency; NTAC, National Technical Advisory Committee to the Secretary of the Interior; NAS/NAE, National Academy of Sciences and National Academy of Engineering]

Constituent	Water-quality criteria	Source
pH	6.5-8.3	NAS/NAE, 1973
Secchi disk depth	48 in.	NTAC, 1968
Phosphate, total as P	.025 mg/L	EPA, 1987

seasonally for some of the ponds. When the mean Secchi-disk depth per pond per visit was used, water from 20 ponds exceeded the criterion. The mean or average Secchi depth for all study ponds is 48 in. The mean Secchi depths for the control, Croweburg, Iron Post, and McAlester ponds were 57, 49, 575, and 36 in., respectively.

The EPA recommends a criterion for total phosphate reported as phosphorus of 0.025 mg/L. Using total phosphorus reported as phosphorus and, assuming that the total phosphorus is an estimate of total phosphate, water samples from the epilimnion of 9 of 29 ponds contained total phosphate in excess of the criterion protective of recreation. A water sample from one control pond had a total phosphorus concentration of 0.42 mg/L in the epilimnion. Total phosphate in water samples from the epilimnion of the other ponds that exceeded the criterion ranged from 0.03 to 0.10 mg/L (table 13). Total phosphate concentration in water

Table 27. Comparison of pond-water quality to water-quality criteria for recreation
[NA, not applicable; min, minimum; max, maximum; TR, total recoverable. The fraction used is the number of ponds exceeding the criterion over the total number of ponds with data; shallow samples were collected from the epilimnion; deep samples were collected from the hypolimnion]

Variable	Pond type and location of sample							
	Control		Croweburg		Iron Post		McAlester	
	Shallow	Deep	Shallow	Deep	Shallow	Deep	Shallow	Deep
pH (min)	1/6	3/6	0/8	1/8	0/8	1/8	0/9	1/9
pH (max)	3/6	0/6	4/8	0/8	3/8	0/8	4/9	0/9
Secchi depth	4/6	NA	7/8	NA	4/8	NA	7/9	NA
Phosphate, TR	1/5	3/4	2/8	5/8	4/8	3/4	2/8	4/6

Water samples from 29 ponds exceeded one or more criteria protective of swimming. Measured pH in 15 ponds was outside the water-quality criterion range protective of swimming. Measured pH in ponds from all groups contained water with pH values outside the recommended range of 6.5 to 8.3. The maximum pH in water from most of these ponds exceeded the upper limit of 8.3, with pH values ranging from 8.4 to 10.0 (table 10). Croweburg ponds most often exceeded the criterion, with 4 of 8 ponds containing water exceeding this criterion.

Sites from 22 ponds had minimum Secchi-disk depths less than the recommended depth of 48 in. The Secchi-disk depth often changed from one site to another within a pond and varied by 50 percent or more

samples from the hypolimnion of 15 of 22 ponds exceeded the criterion. Total phosphate concentrations in water samples from the ponds exceeding the criterion in the hypolimnion ranged in concentration from 0.03 to 1.6 mg/L. Some ponds in all groups contained water that exceeded the phosphate criterion.

Some ponds formed by strip mining may not be suited for swimming for safety reasons. According to the Oklahoma Conservation Commission (1987), some ponds formed by strip mining are safety hazards because of the depth of water and steep vertical banks. Unreclaimed ponds formed by coal mining tend to have steeper banks than reclaimed ponds or control ponds.

SUMMARY

Water in many of the ponds can be used for public water supplies if other sources are not available. Water in many of these ponds exceeds one or more SMCL's, but meets all MCL's. In general, most of the ponds are well suited for use by wintering and migrating waterfowl, livestock watering, and for irrigation of semitolerant and tolerant crops. Many ponds are marginally suited for aquatic life and irrigation of sensitive crops, but may be unsuitable for swimming.

Water samples from six of the ponds exceeded one of the MCL's in the epilimnion (table 28). Total lead and mercury criteria were exceeded by one sample each. Water samples from five Iron Post ponds exceeded the selenium criteria. Water samples from the epilimnion of 29 ponds exceeded one or more SMCL's. This water is less desirable for domestic use, but often can be used if a better supply is not available. The water-quality criteria most often exceeded were dissolved solids, sulfate, and total iron and manganese. Water samples from 15 ponds exceeded dissolved-solids and sulfate criteria in the epilimnion. Iron Post ponds had the highest percentage of water samples exceeding dissolved solids and sulfate criteria, while control ponds had the smallest percentage of water samples exceeding the criteria. The epilimnion has better water quality and meets more of the criteria than the hypolimnion. All samples from the hypolimnion exceeded one or more SMCL's.

Many ponds are marginally suited for aquatic life. Water samples from 18 ponds exceeded one or more criteria in the epilimnion. Water samples from five ponds exceeded only one criteria. Dissolved oxygen concentrations were less than the recommended

Table 28. Comparison of the number of ponds with samples exceeding one or more water-quality criteria for each water use

[MCL, maximum contamination level; SMCL, secondary maximum contamination level; biological criteria were not used; shallow samples were collected from the epilimnion; deep samples were collected from the hypolimnion]

Water use	Pond type and location of sample							
	Control		Croweburg		Iron Post		McAlester	
	Shallow	Deep	Shallow	Deep[1]	Shallow	Deep[1]	Shallow	Deep[1]
Domestic:								
One or more MCL	0/6	1/2	0/8	4/7	6/8	3/5	1/9	2/7
One or more SMCL[2]	5/6	3/3	8/8	7/7	8/8	7/7	8/9	7/7
Aquatic life[2 3]	5/6	4/4	3/8	8/8	4/8	5/6	6/9	6/8
Waterfowl[4]	5/6	5/6	1/8	6/8	5/8	5/8	1/9	7/9
Livestock:[5]								
Sensitive	0/6	1/2	0/8	2/6	2/8	1/5	1/9	1/6
Tolerant	0/6	1/2	0/8	0/7	2/8	0/5	1/9	0/6
Irrigation:								
Sensitive	2/6	3/3	4/8	6/6	7/8	7/7	4/8	6/8
Semi-tolerant	1/6	2/2	2/8	4/6	5/8	6/7	3/8	5/7
Tolerant	1/6	2/2	0/8	3/6	4/8	3/6	1/8	3/6
Recreation	5/6	3/4	6/8	6/8	7/8	3/4	9/9	5/7

[1] Sites that exceeded a criterion, and contained incomplete data were counted in the total. Sites with data that did not exceed any criteria but did not have enough data to compare to all of the criteria were not counted in the total.

[2] The summation does not include the dissolved oxygen criterion because all of the ponds exceed this criterion.

[3] Concentrations that were less than the detection limit were not used in the summation.

[4] The summation does not use the temperature criterion, because all of the ponds exceed this criterion during the summer. The number of ponds exceeding a criterion in the shallow strata best approximate the number of ponds exceeding a criteria in the wintering and migration period.

[5] The summation does not count phytoplankton because all ponds contain phytoplankton that may be toxic to livestock.

minimum in the hypolimnion of all ponds during the summer. Fish could survive by staying in the epilimnion. However, low dissolved-oxygen levels in the hypolimnion decrease the available habitat for fish and affects the type and number of benthic invertebrates found. Water samples from 26 ponds exceeded one or more trace element criteria in either the epilimnion, the hypolimnion, or both. The mercury criterion was exceeded the most often.

Water from many of the ponds met the criteria protective of waterfowl during the early spring. Water samples from 18 ponds met the criteria for pH, alkalinity, and selenium in the spring. Control ponds had the highest percentage of ponds with water exceeding the pH and alkalinity criteria. However, control ponds tend to be shallower and have more macrophytes, which favor waterfowl utilization. Water samples from 5 of 8 Iron Post ponds exceeded the criteria for selenium. The study ponds generally are not suited for year-round raising of waterfowl because of high temperatures and low dissolved oxygen during the summer months.

Most of the ponds contained water suited for livestock watering. Water samples from the epilimnion of 28 ponds met all of the chemical and physical criteria. Water samples from five ponds exceeded one or more criteria in the hypolimnion. All of the ponds contained the phytoplankton genus *Anacystis*, which is toxic to livestock. The concentrations of *Anacystis* ranged from 780 cells per milliliter to 170,000 cells per milliliter. Three ponds also contained *Anabaena* in concentrations ranging from 1,200 to 17,500 cells per milliliter. The toxicity level of these phytoplankton species is unknown.

Water from most of the ponds is marginally suitable for irrigation of sensitive crops, but more suitable for irrigation of semitolerant and tolerant crops. Water samples from the epilimnion of 14 ponds were suitable for irrigation under almost all soil conditions and crops. Water samples from the epilimnion of 20 ponds were suitable for irrigation of semitolerant crops and water samples from the epilimnion of 25 ponds were suitable for irrigation of tolerant crops. The criterion most often exceeded for all crop categories was total dissolved solids. Of the 17 ponds with water exceeding criteria for sensitive crops, water samples from 15 ponds exceeded this criterion. A larger percentage of water samples from Iron Post ponds exceeded the criterion than did the other groups. Water samples from control ponds exceeded the criterion the least. Water samples from 10 ponds exceeded the dissolved-solids criterion protective of semitolerant crops in the epilimnion and water samples from 4 ponds exceeded the dissolved-solids criterion protective of tolerant crops. Water samples from the epilimnion of three McAlester ponds exceeded the SAR criterion. Water samples from the epilimnion of three Iron Post ponds exceeded the selenium criterion. Water samples from all of the ponds met the criteria for iron and manganese in the epilimnion. Water samples from the hypolimnion of 3 of 19 ponds sampled exceeded the criterion for iron. Water samples from the hypolimnion from five ponds exceeded the criterion for manganese.

Recreation consists mainly of swimming and fishing, as the ponds are generally too small for boating or sailing. Most of the ponds are not suited for swimming. Water samples from the epilimnion of 15 ponds had pH values outside the range protective of swimming. Water samples from most of these ponds exceeded the maximum recommended pH. Water samples from 22 ponds had minimum Secchi-disk depth measurements less than the recommended depth for diving during either the summer or spring. The total phosphate criterion was exceeded in water samples from the epilimnion of 9 of 29 ponds and in water samples from the hypolimnion of 15 of 22 ponds. Swimming in some of the ponds formed by strip mining may be dangerous because of steep banks.

SELECTED REFERENCES

American Public Health Association, American Water Works Association, and Water Pollution Control Federation, 1985, Standard methods for the examination of water and wastewater (16th ed.): Washington D.C., 1,268 p.

Averitt, Paul, 1975, Coal resources of the United States, January 1, 1974: U.S. Geological Survey Bulletin 1412, 131 p.

Bellrose, F.C., 1968, Waterfowl migration corridors east of the Rocky Mountains in the United States: Illinois Natural History Survey Biological Notes, no. 61, 24 p.

———1976, Ducks, geese, and swans of North American (2d ed.): Harrisburg, Pa., Stackpole Books, 544 p.

Brown, Eugene, Skougstad, M.W., and Fishman M.J., 1970, Methods for collection and analysis of water samples for dissolved minerals and gases: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chapter A1, 160 p.

Brown, Randall, 1987, Selenium threatens irrigators, wildlife: Civil Engineering, v. 57, no. 2, p. 40.

Chabbreck, R.H., 1979, Winter habitat of dabbling ducks - physical, chemical, and biological aspects., *in* T.A. Bookout, ed., Waterfowl and wetlands, an integrated review: Proceedings of 1977

Symposium, Madison, Wis., The Wildlife Society, p. 133–141.

Cole, G.E., 1975, Textbook of limnology: St. Louis, Mo., C.V. Mosby Co., 283 p.

Digesti, R.S., and Weeth, A.J., 1973, Effects of sulfate water on cattle: Proceedings of West Section, American Society of Animal Science, v. 24, p. 259–263.

Ferreira, R.F., and Lambing J.H., 1984, Suitability of water quality for fish propagation, waterfowl habitat, livestock watering, and recreational use at 12 reservoirs in eastern Montana: U.S. Geological Survey Water-Resources Investigations Report 84–4085, 96 p.

Fritz, E.S., 1980, Potential impacts of low pH on fish and shellfish populations: National Power Plant Team, Office of Biological Service, FWS/OBS–80/40.2, 14 p.

Friedman, S.A., 1974, Investigation of the coal reserves in the Ozarks Section of Oklahoma and their potential uses: Final Report To the Ozarks Regional Commission July 1974, 115 p.

———1978, Field description and characterization of coals sampled by the Oklahoma Geological Survey, 1971–1976: *in* Dutcher, R.R., ed., Field Description of Coal: American Society for Testing and Materials, Special Technical Publication 661, p. 58–63.

———1982, Map of eastern Oklahoma showing locations of active coal mines, 1977–79: Oklahoma Geological Survey Map GM–24, scale 1:500,000, 1 sheet

Goldman, C.R., and Horne, A.J., 1983, Limnology: New York, McGraw-Hill, 464 p.

Hem, J.D., 1985, Study and interpretation of the chemical characteristics of natural water (3d ed.): U.S. Geological Survey Water-Supply Paper 2254, 263 p.

Hemish, L.A., 1987, Names of coal beds in the northeastern Oklahoma shelf area: Oklahoma Geological Survey Geology Notes, v. 47, no.3, p. 96–113.

Johnson, K.S., 1974, Maps and description of disturbed and reclaimed surface-mined coal lands in eastern Oklahoma, showing acreage disturbed and reclaimed through June 1973: Oklahoma Geological Survey Map GM–17, 3 sheets, scale 1:125,000, 21 p.

Johnson, K.S., Kidd, C.M., and Butler, R.C., 1981, Bibliography of abandoned coal-mine lands in Oklahoma: Oklahoma Geological Survey Special Publication 81–2, 84 p.

Karvelot, M.D., 1973, The Stigler coal and collateral strata in parts of Haskell, Le Flore, McIntosh, and Muskogee Counties, Oklahoma: Oklahoma City Geological Society Shale Shaker, v. 23, no. 5, p.108–199 and v. 23, no. 6, p.128–141.

McKee, J.E.and Wolf, H.W., 1963, Water Quality Criteria, Second Edition: California Water Resources Control Board Publication 3–A, 548 p.

Marcher, M.V., Bergman, D.L., Slack, L.J., and Blumer, S.P., 1987, Hydrology of Area 41, Western Region, Interior Coal Province, Oklahoma, and Arkansas: U.S. Geological Survey Water-Resources Investigations Open-File Report 84–129, 86 p.

Marcher, M.V., Kenny J.F., and others, 1984, Hydrology of Area 40, Western Region, Interior Coal Province, Kansas, Oklahoma, and Missouri: U.S. Geological Survey Water-Resources Investigations Open-File Report 83–266, 97 p.

National Academy of Sciences and National Academy of Engineering, 1973, Water-quality criteria 1972: U.S. Environmental Protection Agency, Environmental Research Series, Washington, D.C., U.S. Government Printing Office, 594 p.

National Technical Advisory Committee to the Secretary of the Interior, 1968, Water-quality criteria: Washington, D.C., U.S. Government Printing Office, 234 p.

Oklahoma Conservation Commission, 1987, Reclaiming Oklahoma's abandoned mine land; A ten-year progress report: Norman, Okla., Oklahoma University Printing Services, 24 p.

Oklahoma Department of Mines, 1987, Annual report of the Oklahoma Mining Commission for 1985 and 1986: Oklahoma City, Okla., Oklahoma Department of Mines, 61 p.

Oklahoma Water Resources Board, 1970, Appraisal of the water and related land resources of Oklahoma; Region Seven: Oklahoma Water Resources Board Publication 29, 141 p.

———1971, Appraisal of the water and related land resources of Oklahoma; Region Nine: Oklahoma Water Resources Board Publication 36, 149 p.

———1985, Oklahoma's water-quality standards, 1985: Research and Standards Section, Water-Quality Division, Oklahoma Water Resources Board, 110 p.

———1993, Water quality standards, as of June 25, 1993: OAC 785:45, no pagination.

Rawson, D.S., and Moore, J.E., 1944, The saline ponds of Saskatchewan: Canadian Journal of Research, v. 22, 141 p.

Reid, G.K., and Wood, R.D., 1976, Ecology of inland waters and Estuaries (2d ed.): New York, Van Nostrand, 485 p.

Sawyer, C.N., 1960, Chemistry of sanitary engineers: New York, McGraw-Hill.

Schnell, G.D., Johnson F.L., and Gentry J.L., 1979, Flora and fauna of Oklahoma abandoned mine lands: Oklahoma Biological Survey, 132 p.

Skougstad, M.W., Fishman, M.J., Friedman, L.C., Erdmann, D.E., and Duncan, S.S., eds., 1979, Methods for determination of inorganic substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chapter A1, 625 p.

Slack, L.J., and Blumer, S.P., 1987, Physical and chemical characteristics of water in coal-mine ponds, Eastern Oklahoma, June to November 1977–81: Oklahoma Geological Survey Special Publication 87–2, 116 p.

Smith, G.R., 1976, Botulism in waterfowl: Wildfowl, v. 49, p. 129–138

U.S. Environmental Protection Agency, 1986a, Quality criteria for water, 1986: Washington, D.C., Office of Water Regulations and Standards, EPA 440/5–86–001,

———1986b, Maximum contaminant levels (subpart B of part 141, National interim primary drinking-water regulations): U.S. Code of Federal Regulations, Title 40, Parts 100 to 149, revised as of July 1, 1986, p. 524–528

———1986c, Secondary maximum contaminant levels (section 143.3 of part 143, National secondary drinking-water regulations): U.S. Code of Federal Regulations, Title 40, Parts 100 to 149, revised as of July 1, 1986, p. 587–590.

———1987, Quality criteria for water, 1986, updated September 1987: Office of Water Regulations and Standards, Washington, D.C., EPA 440/5–86–001,

———1993, Drinking water regulations and health advisories: Office of Water, U.S. Environmental Protection Agency, Safe Drinking Water Hotline, no pagination.

Welch, Paul S., 1952, Limnology: New York, McGraw-Hill Book, 538 p.

Wetzel, R.G., 1983, Limnology: Philadelphia, Saunders College Publishing, 743 p.

Table 1.—Concentrations of chlorophyll A, B, and C in water samples from study ponds

[All results are in micrograms per liter; <, less than]

Control Pond 1 Collected 07/23/85			
Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
5	16.0	2.00	7.00
7	173	13.0	76.0
7	180	29.0	112
8	20.0	4.00	10.0
10	5.00	2.00	<1.00
10	6.00	2.00	3.00
Median	18.0	3.00	8.00

Control Pond 2 Collected 07/17/85			
Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
1	179	66.0	123
3	122	68.0	134
4	46.0	33.0	46.0
6	70.0	16.0	36.0
7	143	20.0	14.0
Median	122	33.0	46.0

Control Pond 3 Collected 07/25/85			
Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
3	7.00	9.00	12.0
3	2.00	<1.00	<1.00
5	1.00	<1.00	<1.00
5	1.00	1.00	<1.00
6	1.00	1.00	<1.00
6	1.00	<1.00	<1.00
10	1.00	<1.00	<1.00
10	1.00	2.00	<1.00
11	2.00	2.00	<1.00
11	3.00	1.00	<1.00
Median	1.00	1.00	<1.00

Table 1.—Concentrations of chlorophyll A, B, and C in water samples from study ponds—Continued

Control Pond 4
Collected 08/16/85

Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
2	2.00	<1.00	<1.00
3	2.00	1.00	1.00
4	2.00	<1.00	1.00
5	1.00	1.00	1.00
6	3.00	<1.00	1.00
Median	2.00	<1.00	1.00

Control Pond 5
Collected 08/16/85

Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
2	3.00	2.00	3.00
3	4.00	1.00	3.00
5	5.00	2.00	3.00
7	9.00	4.00	6.00
Median	4.00	2.00	3.00

Control Pond 6
Collected 08/15/85

Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
1	3.00	1.00	1.00
2	4.00	1.00	3.00
5	4.00	1.00	2.00
6	4.00	1.00	3.00
7	4.00	1.00	1.00
8	3.00	1.00	2.00
10	3.00	1.00	2.00
Median	4.00	1.00	2.00

Croweburg Coal Pond 1
Collected 08/13/85

Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
2	13.0	2.00	1.00
4	52.0	6.00	3.00
5	51.0	6.00	4.00
7	39.0	8.00	6.00
8	65.0	6.00	5.00
10	71.0	11.0	1.00
Median	52.0	6.00	4.00

Table 1.—Concentrations of chlorophyll A, B, and C in water samples from study ponds—Continued

Crowebur Coal Pond 2 Collected 08/01/85			
Site	**Chlorophyll A**	**Chlorophyll B**	**Chlorophyll C**
1	2.00	1.00	<1.00
3	2.00	<1.00	<1.00
5	2.00	1.00	1.00
Median	2.00	1.00	<1.00

Croweburg Coal Pond 3 Collected 08/01/85			
Site	**Chlorophyll A**	**Chlorophyll B**	**Chlorophyll C**
1	4.00	1.00	<1.00
2	5.00	2.00	2.00
3	5.00	1.00	<1.00
4	3.00	1.00	1.00
7	1.00	1.00	<1.00
Median	4.00	1.00	<1.00

Croweburg Coal Pond 4 Collected 08/07/85			
Site	**Chlorophyll A**	**Chlorophyll B**	**Chlorophyll C**
1	3.00	2.00	1.00
3	3.00	2.00	1.00
4	3.00	2.00	2.00
6	2.00	1.00	1.00
7	4.00	2.00	<1.00
9	3.00	3.00	<1.00
9	4.00	2.00	<1.00
Median	3.00	2.00	1.00

Croweburg Coal Pond 5 Collected 08/14/85			
Site	**Chlorophyll A**	**Chlorophyll B**	**Chlorophyll C**
1	1.00	<1.00	2.00
2	<1.00	1.00	1.00
4	2.00	1.00	2.00
6	2.00	1.00	1.00
Median	2.00	1.00	2.00

Table 1.—Concentrations of chlorophyll A, B, and C in water samples from study ponds—Continued

Croweburg Coal Pond 6
Collected 08/13/85

Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
4	1.00	1.00	1.00
5	2.00	1.00	1.00
6	<1.00	1.00	2.00
7	<1.00	<1.00	<1.00
8	1.00	1.00	2.00
Median	1.00	1.00	1.00

Croweburg Coal Pond 7
Collected 08/21/85

Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
1	2.00	3.00	<1.00
1	2.00	4.00	<1.00
3	1.00	1.00	1.00
5	2.00	1.00	1.00
6	1.00	1.00	1.00
7	1.00	1.00	2.00
9	1.00	2.00	<1.00
Median	1.00	1.00	1.00

Croweburg Coal Pond 8
Collected 08/15/85

Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
2	2.00	<1.00	2.00
6	2.00	1.00	1.00
7	2.00	1.00	2.00
8	2.00	<1.00	1.00
10	2.00	1.00	<1.00
Median	2.00	1.00	2.00

Iron Post Coal Pond 1
Collected 08/08/85

Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
1	8.00	7.00	<1.00
1	2.00	5.00	<1.00
3	5.00	4.00	<1.00
4	4.00	3.00	2.00
6	5.00	4.00	<1.00
6	5.00	3.00	<1.00
7	5.00	3.00	<1.00
Median	5.00	4.00	<1.00

Table 1.—Concentrations of chlorophyll A, B, and C in water samples from study ponds—Continued

Iron Post Coal Pond 2 Collected 08/12/85			
Site	**Chlorophyll A**	**Chlorophyll B**	**Chlorophyll C**
1	1.00	2.00	1.00
2	3.00	2.00	2.00
3	1.00	1.00	3.00
4	3.00	1.00	<1.00
5	2.00	1.00	1.00
Median	2.00	1.00	1.00

Iron Post Coal Pond 3 Collected 08/12/85			
Site	**Chlorophyll A**	**Chlorophyll B**	**Chlorophyll C**
2	4.00	2.00	<1.00
3	7.00	2.00	4.00
4	3.00	1.00	3.00
5	4.00	2.00	4.00
6	6.00	2.00	5.00
Median	4.00	2.00	4.00

Iron Post Coal Pond 4 Collected 08/06/85			
Site	**Chlorophyll A**	**Chlorophyll B**	**Chlorophyll C**
1	18.0	2.00	4.00
3	32.0	2.00	<1.00
4	21.0	4.00	4.00
6	22.0	3.00	8.00
7	24.0	3.00	8.00
Median	22.0	3.00	4.00

Iron Post Coal Pond 5 Collected 08/06/85			
Site	**Chlorophyll A**	**Chlorophyll B**	**Chlorophyll C**
2	2.00	1.00	2.00
2	2.00	1.00	3.00
3	4.00	4.00	3.00
4	5.00	2.00	5.00
4	3.00	1.00	2.00
4	3.00	1.00	1.00
Median	2.00	1.00	2.00

Table 1.—Concentrations of chlorophyll A, B, and C in water samples from study ponds—Continued

Iron Post Coal Pond 6 Collected 08/20/85			
Site	**Chlorophyll A**	**Chlorophyll B**	**Chlorophyll C**
1	3.00	1.00	1.00
3	2.00	1.00	1.00
5	4.00	1.00	3.00
6	4.00	1.00	1.00
8	4.00	2.00	1.00
9	2.00	1.00	6.00
Median	4.00	1.00	1.00

Iron Post Coal Pond 7 Collected 08/20/85			
Site	**Chlorophyll A**	**Chlorophyll B**	**Chlorophyll C**
1	15.0	8.00	<1.00
2	9.00	5.00	<1.00
3	6.00	6.00	<1.00
4	11.0	5.00	1.00
Median	10.0	6.00	<1.00

Iron Post Coal Pond 8 Collected 08/19/85			
Site	**Chlorophyll A**	**Chlorophyll B**	**Chlorophyll C**
1	7.00	2.00	5.00
2	3.00	1.00	5.00
3	2.00	1.00	3.00
Median	3.00	1.00	5.00

McAlester Coal Pond 1 Collected 07/18/85			
Site	**Chlorophyll A**	**Chlorophyll B**	**Chlorophyll C**
1	1.00	1.00	<1.00
2	9.00	2.00	1.00
2	6.00	2.00	1.00
4	2.00	1.00	1.00
6	5.00	2.00	<1.00
8	2.00	1.00	<1.00
Median	4.00	2.00	1.00

Table 1.—Concentrations of chlorophyll A, B, and C in water samples from study ponds—Continued

McAlester Coal Pond 2
Collected 07/30/85

Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
1	1.00	<1.00	<1.00
3	2.00	<1.00	<1.00
7	1.00	1.00	<1.00
11	2.00	1.00	<1.00
13	3.00	1.00	1.00
Median	2.00	1.00	<1.00

McAlester Coal Pond 3
Collected 07/30/85

Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
1	<1.00	<1.00	<1.00
4	1.00	1.00	<1.00
6	1.00	<1.00	<1.00
8	<1.00	<1.00	<1.00
13	2.00	<1.00	<1.00
Median	1.00	<1.00	<1.00

McAlester Coal Pond 4
Collected 07/23/85

Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
3	1.00	1.00	<1.00
5	3.00	1.00	1.00
6	<1.00	1.00	<1.00
7	2.00	1.00	<1.00
10	2.00	<1.00	<1.00
Median	2.00	1.00	<1.00

McAlester Coal Pond 5
Collected 07/24/85

Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
2	<1.00	<1.00	<1.00
3	1.00	1.00	1.00
6	1.00	<1.00	1.00
7	<1.00	<1.00	<1.00
9	<1.00	<1.00	<1.00
12	<1.00	<1.00	<1.00
Median	<1.00	<1.00	<1.00

Table 1.—Concentrations of chlorophyll A, B, and C in water samples from study ponds—Continued

McAlester Coal Pond 6 Collected 07/25/85			
Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
1	3.00	2.00	3.00
2	<1.00	1.00	<1.00
3	2.00	1.00	2.00
6	23.0	8.00	<1.00
7	7.00	2.00	1.00
Median	3.00	2.00	1.00

McAlester Coal Pond 7 Collected 07/31/85			
Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
1	3.00	1.00	2.00
7	2.00	1.00	1.00
9	2.00	<1.00	<1.00
10	2.00	1.00	<1.00
Median	2.00	1.00	<1.00

McAlester Coal Pond 8 Collected 07/31/85			
Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
1	12.0	3.00	3.00
3	9.00	1.00	<1.00
7	9.00	2.00	4.00
11	10.0	1.00	2.00
12	9.00	2.00	2.00
Median	9.00	2.00	2.00

McAlester Coal Pond 9 Collected 07/22/85			
Site	Chlorophyll A	Chlorophyll B	Chlorophyll C
2	2.00	1.00	<1.00
4	1.00	1.00	2.00
8	1.00	<1.00	<1.00
10	2.00	1.00	<1.00
13	3.00	1.00	1.00
13	3.00	1.00	<1.00
Median	2.00	1.00	<1.00

Table 10. Vertical profiles of selected sites on study ponds

[mS/cm, microsiemens per centrimeter; °C; degrees Celsius; mg/L, milligrams per liter. The pond name is followed by a site ID, which is the latitude, longitude, and sequence number. The data are from one site per visit. Other vertical profiles were measured and the data are at the U.S. Geological Survey Oklahoma City office]

Sampling date	Time	Depth (ft)	Specific conductance (µS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
Control Pond 3 (86, Pond 2), Site 9 351720094430301							
April 1985							
23	1047	2.00	173	8.4	20.5	--	9.9
23	1050	4.00	173	8.4	20.0	--	9.9
23	1052	6.00	173	8.3	20.0	--	9.6
23	1055	8.00	174	8.2	19.0	--	10.4
23	1058	10.0	175	8.0	18.5	--	10.4
23	1100	12.0	178	7.8	18.0	--	10.0
23	1102	14.0	184	7.7	17.0	--	9.8
23	1105	16.0	190	7.7	16.5	--	9.8
23	1108	18.0	193	7.6	13.0	--	9.9
23	1110	20.0	199	7.3	10.0	--	4.6
23	1115	1.00	156	8.4	20.5	144	9.8
23	1120	18.0	193	7.6	13.0	144	9.9
July							
25	1030	0.0	103	7.3	31.0	108	8.0
25	1031	2.00	102	7.3	31.0	--	8.4
25	1032	4.00	102	7.3	31.0	--	8.3
25	1033	6.00	102	7.3	31.0	--	8.3
25	1034	8.00	102	7.3	31.0	--	8.3
25	1035	10.0	102	7.2	31.0	--	8.2
25	1036	12.0	102	7.0	31.0	--	6.3
25	1037	14.0	109	6.5	29.0	--	0.4
25	1038	16.0	114	6.3	27.0	--	0.1
25	1039	18.0	131	6.2	24.0	--	0.2
25	1040	2.00	102	7.3	31.0	108	8.4
25	1041	2.00	102	7.3	31.0	108	8.4
25	1045	18.0	131	6.2	24.0	108	0.2
25	1046	18.0	131	6.2	24.0	108	0.2
Control Pond 4, Site 3 363503095231901							
May 1985							
02	1215	0.0	672	7.2	20.0	24.0	8.0
02	1216	2.00	682	7.2	20.0	--	8.0
02	1217	5.00	683	7.2	20.0	--	8.0

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conductance (µS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
02	1218	10.0	684	7.9	19.5	--	7.2
02	1219	12.0	690	7.1	19.0	--	7.5
02	1220	15.0	701	7.0	16.5	--	5.1
02	1221	18.0	705	6.9	15.0	--	4.0
02	1222	20.0	717	6.9	15.0	--	2.5
02	1223	25.0	737	6.9	13.0	--	1.4
02	1224	29.0	752	7.0	12.5	--	1.2
02	1225	10.0	684	7.2	19.5	24.0	7.9
August							
16	0842	0.0	128	6.8	27.5	60.0	7.9
16	0843	3.00	129	6.8	27.5	--	7.9
16	0844	6.00	130	6.8	27.5	--	7.9
16	0845	9.00	130	6.8	27.5	--	7.9
16	0846	12.0	135	6.6	27.0	--	7.6
16	0847	15.0	135	6.7	22.5	--	4.4
16	0848	26.0	137	7.5	15.0	--	0.6
16	0905	3.00	130	6.8	27.5	60.0	7.9
16	0906	26.0	137	6.8	15.0	60.0	0.6
16	0906	3.00	130	6.8	27.5	60.0	7.9
16	1125	--	--	--	--	--	--
16	1140	6.00	--	--	--	--	--
			Control Pond 4, Site 4 363503095232301				
May 1985							
02	1200	0.0	669	7.0	20.0	24.0	8.1
02	1201	2.00	669	7.1	20.0	--	8.0
02	1202	4.00	669	7.1	20.0	--	8.0
02	1203	6.00	670	7.1	20.0	--	8.0
02	1204	8.00	670	7.1	20.0	--	8.0
02	1205	10.0	671	7.1	19.5	--	7.8
02	1206	12.0	676	7.1	19.5	--	6.3
02	1207	14.0	685	7.0	17.5	--	5.0
02	1208	16.0	689	6.9	16.0	--	4.6
02	1209	18.0	690	6.9	15.0	--	3.4
02	1210	20.0	697	6.9	14.5	--	2.6
02	1211	22.0	707	6.9	13.5	--	2.0
August							
16	0923	0.0	--	6.5	27.5	60.0	7.9
16	0924	3.00	--	6.5	27.5	--	7.9

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conductance (µS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
16	0925	6.00	--	6.5	27.5	--	7.9
16	0927	12.0	--	6.3	26.5	--	6.2
16	0928	15.0	--	6.3	22.5	--	4.8
16	0929	27.0	--	7.4	16.0	--	0.5
16	1205	6.00	--	--	--	--	--
16	1226	9.00	--	6.5	27.5	--	7.8
			Control Pond 5, Site 2	**363236095240201**			
August 1985							
16	0935	0.0	30	7.3	28.0	87.0	6.8
16	0937	2.00	29	7.4	28.0	--	6.6
16	0939	4.00	30	7.4	28.0	--	6.5
16	0943	8.00	30	7.2	28.0	--	6.6
16	0945	10.0	30	7.1	28.0	--	6.5
16	0947	12.0	32	6.8	27.0	--	1.2
16	0949	6.00	30	7.3	28.0	--	6.6
16	0950	14.0	43	6.6	25.0	--	0.5
16	1355	7.00	29	7.2	28.0	--	5.6
			Control Pond 5, Site 4	**363238095240201**			
May 1985							
02	0950	0.0	61	6.9	19.5	66.0	8.0
02	0952	2.00	60	6.9	19.5	--	7.9
02	0954	6.00	59	6.9	19.5	--	7.9
02	0956	6.00	59	6.9	19.5	--	7.9
02	0957	8.00	59	6.9	19.5	--	7.8
02	0959	10.0	59	6.8	19.0	--	6.4
02	1000	12.0	59	6.7	16.5	--	3.1
02	1001	14.0	67	6.5	14.5	--	1.6
02	1003	16.0	79	6.5	14.0	--	1.6
02	1005	17.0	82	6.5	13.0	--	1.6
August							
16	0955	0.0	30	7.4	28.0	84.0	7.2
16	0956	2.00	30	7.5	28.0	--	7.8
16	0958	4.00	30	7.5	28.0	--	7.5
16	1000	6.00	29	7.4	28.0	--	7.5
16	1002	8.00	28	7.2	28.0	--	7.5
16	1004	10.0	30	7.1	28.0	--	6.2
16	1005	12.0	32	6.7	27.5	--	3.2

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conductance (µS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
			Control Pond 6, Site 2 365253095185201				
August 1985							
15	1235	0.0	310	6.6	27.5	48.0	12.2
15	1236	2.00	310	6.6	27.5	--	12.2
15	1237	4.00	310	6.5	27.5	--	12.3
15	1238	6.00	320	6.5	27.5	--	12.1
15	1239	8.00	320	6.4	27.0	--	12.1
15	1241	12.0	320	6.2	27.0	--	12.1
15	1242	14.0	320	6.1	27.0	--	11.1
15	1243	16.0	320	5.8	26.5	--	6.4
15	1245	4.00	310	6.5	27.5	48.0	12.3
15	1246	4.00	310	6.5	27.5	48.0	12.3
15	1247	4.00	310	6.5	27.5	48.0	12.3
15	1250	16.0	320	5.8	27.0	48.0	6.4
			Control Pond 6, Site 3 365253095185401				
May 1985							
01	1356	0.0	278	8.3	19.5	36.0	8.8
01	1357	2.00	277	8.3	19.5	--	8.7
01	1359	6.00	277	8.4	19.5	--	8.8
01	1400	8.00	278	8.4	19.5	--	8.8
01	1401	12.0	278	8.3	19.5	--	8.7
01	1402	14.0	278	8.3	19.5	--	8.7
01	1403	16.0	279	8.3	19.5	--	8.6
01	1404	18.0	308	7.8	17.0	--	1.4
01	1405	19.0	314	7.7	15.5	--	0.8
01	1458	4.00	277	8.3	19.5	--	8.8
			Croweburg Coal Pond 1, Site 8 360704095433601				
April 1985							
04	1554	25.0	2980	6.5	4.5	--	0.2
04	1745	0.0	1180	7.5	10.0	42.0	10.0
04	1747	5.00	1180	7.4	10.0	--	9.8
04	1749	10.0	1500	7.3	7.0	--	8.4
04	1750	15.0	1900	6.9	5.5	--	4.0
04	1752	20.0	2780	6.6	5.0	--	0.5
August							

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (μS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
13	1115	--	--	--	--	--	--
13	1250	22.0	3270	6.9	17.0	15.0	0.3
13	1251	22.0	3270	6.9	17.0	15.0	0.3
13	1255	4.00	1420	8.7	30.5	15.0	10.9
13	1256	4.00	1420	8.7	30.5	15.0	10.9
13	1257	4.00	1420	8.7	30.5	15.0	10.9
			Croweburg Coal Pond 2, Site 3 361604095400601				
August 1985							
01	1235	4.00	653	8.2	31.5	--	6.2
01	1240	0.0	654	8.2	32.0	--	6.1
01	1241	2.00	652	8.2	31.5	--	6.2
01	1242	4.00	653	8.2	31.5	--	6.2
01	1243	6.00	656	8.1	31.0	--	6.0
01	1244	8.00	669	7.7	30.5	--	5.7
01	1245	10.0	710	7.4	29.5	--	4.6
01	1246	12.0	821	7.0	27.0	--	3.4
01	1247	14.0	880	6.9	23.0	--	2.9
01	1248	16.0	953	6.9	19.5	--	0.8
01	1249	18.0	1010	7.0	15.5	--	0.2
			Croweburg Coal Pond 2, Site 4 361605095400601				
April 1985							
05	1400	0.0	681	8.2	16.5	60.0	11.0
05	1401	2.00	704	8.1	16.0	--	11.0
05	1402	4.00	717	8.0	16.0	--	11.0
05	1403	6.00	683	8.0	15.0	--	12.2
05	1404	8.00	726	7.9	13.0	--	13.4
05	1405	10.0	756	7.8	11.0	--	9.4
05	1406	12.0	787	7.4	9.5	--	2.7
05	1407	14.0	812	7.4	9.5	--	1.2
05	1408	16.0	824	7.4	9.0	--	0.3
05	1409	18.0	857	7.2	9.5	--	0.2
05	1410	20.0	938	7.2	9.5	--	0.2

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conductance (μS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
Croweburg Coal Pond 3, Site 2 362332095365001							
August 1985							
01	1030	0.0	542	8.4	30.5	108	8.5
01	1031	2.00	533	8.4	30.5	--	8.4
01	1032	4.00	537	8.4	30.5	--	8.5
01	1033	6.00	535	8.3	30.5	--	8.4
01	1034	8.00	578	8.1	30.5	--	8.3
01	1035	10.0	882	7.6	26.5	--	9.8
01	1036	12.0	1030	7.5	23.0	--	5.9
01	1037	14.0	1150	7.6	18.0	--	4.3
01	1038	16.0	1280	8.1	15.0	--	3.7
01	1039	18.0	1320	7.7	13.0	--	0.6
01	1245	10.0	882	7.6	26.5	--	9.8
Croweburg Coal Pond 3, Site 3 362333095365101							
April 1985							
09	1131	2.00	518	7.9	15.5	--	10.7
09	1132	4.00	520	7.9	15.5	--	10.7
09	1133	6.00	525	7.7	15.0	--	9.5
09	1134	8.00	546	7.5	14.0	--	8.4
09	1135	10.0	579	7.4	12.5	--	7.7
09	1136	12.0	631	7.2	10.5	--	4.6
09	1137	14.0	719	7.1	9.5	--	2.4
09	1138	16.0	858	7.1	9.0	--	0.5
09	1139	18.0	962	7.0	8.5	--	0.3
09	1140	20.0	1030	7.0	8.5	--	0.2
09	1141	22.0	--	7.0	--	--	0.2
09	1151	2.00	518	7.9	15.5	22.0	10.7
09	1156	20.0	1030	7.0	8.5	22.0	0.2
Croweburg Coal Pond 4, Site 7 362845095312801							
August 1985							
07	1115	--	--	--	--	--	--
07	1215	0.0	729	8.3	29.5	33.0	10.4
07	1216	2.00	729	8.3	29.0	--	10.4
07	1217	4.00	725	8.3	28.5	--	10.4
07	1218	6.00	731	8.3	28.5	--	10.2

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conductance (μS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
07	1219	8.00	733	8.2	28.0	--	10.0
07	1220	10.0	756	8.0	28.0	--	9.2
07	1221	12.0	944	7.3	25.5	--	5.4
07	1222	14.0	1340	7.1	22.5	--	1.1
07	1223	16.0	1460	7.0	20.0	--	0.5
07	1224	18.0	1500	7.0	19.0	--	--
07	1230	5.00	734	8.3	28.5	33.0	10.5
07	1231	5.00	734	8.3	28.5	33.0	10.5
07	1232	5.00	734	8.3	28.5	33.0	10.5
07	1235	16.0	1460	7.0	20.0	33.0	0.5
07	1236	16.0	1460	7.0	20.0	33.0	0.5
			Croweburg Coal Pond 4, Site 8 362848095312801				
April 1985							
08	1600	0.0	883	8.1	15.0	96.0	9.8
08	1601	2.00	885	8.1	15.0	--	9.8
08	1602	4.00	885	8.1	15.0	--	9.6
08	1603	6.00	888	8.0	15.0	--	9.6
08	1604	8.00	889	8.0	15.0	--	9.6
08	1605	10.0	890	8.0	14.5	--	9.2
08	1606	12.0	893	8.0	14.5	--	9.2
08	1607	14.0	893	8.0	14.5	--	9.3
08	1608	10.0	890	8.0	14.5	--	9.2
08	1609	18.0	924	7.6	13.5	--	6.0
08	1610	20.0	960	7.4	12.5	--	1.1
08	1611	22.0	988	7.3	11.5	--	0.4
			Croweburg Coal Pond 5, Site 1363327095293101				
April 1985							
11	1200	0.0	1770	8.3	14.5	72.0	9.9
11	1200	0.0	1770	8.3	14.5	72.0	9.9
11	1202	3.00	1780	8.3	14.5	--	9.9
11	1202	3.00	1780	8.3	14.5	--	9.9
11	1204	6.00	1780	8.3	14.0	--	10.0
11	1204	6.00	1780	8.3	14.0	--	10.0
11	1205	9.00	1780	8.3	14.0	--	10.0
11	1205	9.00	1780	8.3	14.0	--	10.0
11	1206	12.0	1780	8.3	14.0	--	9.9

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conductance (µS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
11	1206	12.0	1780	8.3	14.0	--	9.9
11	1208	15.0	1790	8.3	14.0	--	9.8
11	1208	15.0	1790	8.3	14.0	--	9.8
11	1210	18.0	1800	8.3	13.5	--	9.6
11	1210	18.0	1800	8.3	13.5	--	9.6
11	1212	21.0	1940	8.0	10.0	--	10.8
11	1212	21.0	1940	8.0	10.0	--	10.8
11	1214	24.0	1960	8.0	9.0	--	12.0
11	1214	24.0	1960	8.0	9.0	--	12.0
11	1216	27.0	2030	7.7	8.5	--	9.8
11	1216	27.0	2030	7.7	8.5	--	9.8
11	1218	30.0	2410	7.4	8.5	--	5.8
11	1218	30.0	2410	7.4	8.5	--	5.8
11	1220	31.0	--	7.2	8.5	--	2.2
11	1220	31.0	--	7.2	8.5	--	2.2
11	1230	3.00	1780	8.3	14.5	72.0	9.9
11	1230	3.00	1780	8.3	14.5	72.0	9.9
11	1245	30.0	2410	7.4	8.5	72.0	5.8
11	1245	30.0	2410	7.4	8.5	72.0	5.8
August							
14	1025	0.0	1620	8.1	29.0	132	8.0
14	1025	0.0	1620	8.1	29.0	132	8.0
14	1026	2.00	1610	8.1	29.0	--	8.1
14	1026	2.00	1610	8.1	29.0	--	8.1
14	1027	4.00	1610	8.2	29.0	--	8.0
14	1027	4.00	1610	8.2	29.0	--	8.0
14	1028	6.00	1610	8.2	29.0	--	7.9
14	1028	6.00	1610	8.2	29.0	--	7.9
14	1029	8.00	1610	8.2	29.0	--	8.0
14	1029	8.00	1610	8.2	29.0	--	8.0
14	1030	10.0	1610	8.1	29.0	--	8.1
14	1030	10.0	1610	8.1	29.0	--	8.1
14	1031	12.0	1610	8.2	29.0	--	8.2
14	1031	12.0	1610	8.2	29.0	--	8.2
14	1032	13.0	1610	8.2	29.0	--	8.4
14	1032	13.0	1610	8.2	29.0	--	8.4
14	1033	14.0	1610	8.2	29.0	--	8.3
14	1033	14.0	1610	8.2	29.0	--	8.3
14	1034	16.0	1680	7.8	28.5	--	7.7
14	1034	16.0	1680	7.8	28.5	--	7.7

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conductance (µS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
14	1035	18.0	1910	7.4	26.5	--	7.0
14	1035	18.0	1910	7.4	26.5	--	7.0
14	1036	28.0	3470	6.9	15.5	--	1.7
14	1036	28.0	3470	6.9	15.5	--	1.7
14	1040	13.0	1610	8.2	29.0	132	8.4
14	1040	13.0	1610	8.2	29.0	132	8.4
14	1041	13.0	1610	8.2	29.0	132	8.4
14	1041	13.0	1610	8.2	29.0	132	8.4
14	1045	28.0	3470	6.9	15.5	132	1.7
14	1045	28.0	3470	6.9	15.5	132	1.7
14	1046	28.0	3470	6.9	15.5	132	1.7
14	1046	28.0	3470	6.9	15.5	132	1.7
14	1047	13.0	1610	8.2	29.0	132	8.4
14	1047	13.0	1610	8.2	29.0	132	8.4
			Croweburg Coal Pond 6, Site 3 363647095251401				
May 1985							
08	1500	0.0102	8.5	23.0	63.0	8.8	
08	1502	3.00	350	8.5	22.5	--	8.7
08	1504	6.00	350	8.5	22.0	--	8.8
08	1506	9.00	349	8.5	21.5	--	8.7
08	1508	12.0	352	8.3	20.5	--	7.9
08	1510	15.0	354	8.5	17.0	--	9.2
08	1511	16.0	--	8.5	--	--	9.0
08	1512	18.0	357	8.5	14.5	--	8.9
08	1514	21.0	360	8.1	13.0	--	5.6
08	1516	24.0	364	7.9	11.5	--	2.4
08	1518	27.0	367	7.6	10.5	--	1.4
08	1520	28.0	372	7.6	10.5	--	1.4
			Croweburg Coal Pond 6, Site 6 363650095251801				
August 1985							
13	1100	--	--	--	--	--	--
13	1105	0.0	379	8.0	29.0	36.0	12.7
13	1106	4.00	377	8.0	29.0	--	12.5
13	1107	8.00	376	8.0	29.0	--	12.4
13	1108	9.00	376	8.0	29.0	--	12.3
13	1109	10.0	378	7.8	28.5	--	10.5

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conductance (µS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
13	1110	12.0	379	7.7	26.0	--	5.3
13	1111	16.0	388	7.9	19.0	--	4.5
13	1112	20.0	394	8.4	15.5	--	4.4
13	1114	24.0	398	8.8	13.0	--	4.6
13	1116	26.0	390	8.7	12.5	--	4.5
13	1118	24.0	398	8.8	13.0	36.0	4.6
13	1120	4.00	377	8.0	29.0	36.0	12.5
13	1121	4.00	377	8.0	29.0	36.0	12.5
13	1215	4.00	377	8.0	29.0	36.0	12.5
Croweburg Coal Pond 7, Site 9 364754095174201							
May 1985							
16	1500	0.0	258	7.9	21.5	12.0	8.3
16	1501	2.00	258	7.9	21.5	--	8.4
16	1502	4.00	257	7.9	21.5	--	8.4
16	1503	6.00	254	7.8	19.0	--	7.4
16	1504	8.00	252	7.4	17.0	--	4.4
16	1505	10.0	250	7.2	13.5	--	2.5
16	1506	12.0	253	7.2	13.0	--	1.8
16	1507	14.0	254	7.2	12.5	--	1.6
16	1508	16.0	256	7.0	12.0	--	1.5
16	1509	18.0	258	7.0	11.5	--	1.5
16	1510	20.0	262	7.1	11.5	--	1.3
16	1511	22.0	263	7.1	11.5	--	1.3
16	1512	24.0	265	7.1	11.5	--	1.3
16	1513	26.0	270	7.1	11.0	--	1.3
16	1515	10.0	250	7.2	13.5	12.0	2.5
August							
21	1200	--	--	--	--	--	--
21	1215	0.0	255	8.1	27.5	30.0	8.4
21	1216	2.00	256	8.1	27.5	--	8.3
21	1217	4.00	256	8.1	27.0	--	8.4
21	1218	6.00	255	8.1	27.0	--	8.4
21	1219	8.00	255	8.1	26.5	--	8.2
21	1220	10.0	261	7.5	25.5	--	4.6
21	1221	12.0	289	7.3	21.0	--	0.6
21	1222	14.0	293	7.1	17.5	--	0.5
21	1223	16.0	298	7.0	14.5	--	0.4
21	1224	18.0	302	7.0	13.0	--	0.4

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conductance (μS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
21	1225	20.0	307	7.1	12.5	--	0.3
21	1226	22.0	313	7.1	12.5	--	0.3
21	1227	24.0	319	7.1	12.0	--	0.3
21	1235	22.0	313	7.1	12.5	30.0	0.3
21	1236	22.0	313	7.1	12.5	30.0	0.3
21	1240	6.00	255	8.1	27.0	30.0	8.4
21	1241	6.00	255	8.1	27.0	30.0	8.4
21	1242	6.00	255	8.1	27.0	30.0	8.4
			Croweburg Coal Pond 8, Site 2 365427095124001				
August 1985							
15	1120	--	--	--	--	--	--
15	1220	0.0	656	7.2	29.0	45.0	7.1
15	1221	2.00	653	7.1	29.0	--	7.7
15	1222	4.00	650	6.1	28.5	--	7.3
15	1223	6.00	647	6.1	28.5	--	7.2
15	1224	8.00	647	7.0	28.0	--	7.1
15	1225	10.0	646	6.9	28.0	--	7.0
15	1226	12.0	669	6.1	27.0	--	4.0
15	1227	14.0	701	6.2	23.0	--	1.1
15	1228	16.0	820	6.3	21.0	--	0.8
15	1229	18.0	968	6.3	19.0	--	0.3
15	1230	2.00	653	7.1	29.0	45.0	7.7
15	1231	2.00	653	7.1	29.0	45.0	7.7
15	1232	2.00	653	7.1	29.0	45.0	7.7
15	1235	18.0	968	6.3	19.0	45.0	0.3
15	1236	18.0	968	6.3	19.0	45.0	0.3
			Croweburg Coal Pond 8, Site 5 365433095124101				
May 1985							
16	1150	0.0	615	7.3	21.5	84.0	8.2
16	1151	2.00	616	7.3	21.5	--	8.2
16	1152	4.00	616	7.3	21.5	--	8.2
16	1153	6.00	616	7.2	21.5	--	8.2
16	1154	8.00	616	7.3	21.5	--	8.2
16	1155	10.0	616	7.2	21.5	--	8.2
16	1156	12.0	617	7.1	21.0	--	7.8
16	1157	14.0	614	7.1	20.5	--	7.6

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (µS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
16	1158	16.0	614	7.0	20.5	--	7.4
16	1159	18.0	623	7.0	19.5	--	6.9
16	1200	20.0	827	6.5	17.0	--	2.4
16	1205	6.00	616	7.2	21.5	84.0	8.2
			Iron Post Coal Pond 1, Site 5 363021095325201				
May 1985							
06	1415	0.0	2170	8.4	22.5	75.0	12.0
06	1416	2.00	2170	8.4	22.5	--	12.2
06	1417	4.00	2190	8.4	21.5	--	13.0
06	1418	6.00	2230	8.3	20.5	--	12.5
06	1419	8.00	2240	8.3	20.0	--	12.4
06	1420	10.0	2240	8.2	19.5	--	12.2
06	1421	12.0	2250	8.2	19.5	--	12.2
06	1422	14.0	2270	7.8	19.0	--	5.0
06	1423	15.0	2310	7.5	18.5	--	2.4
06	1425	14.0	2270	7.8	19.0	75.0	5.0
06	1430	4.00	2190	8.4	21.5	75.0	13.0
			Iron Post Coal Pond 1, Site 4 363022095325101				
August 1985							
08	1025	0.0	2580	7.9	30.0	48.0	7.7
08	1027	2.00	2580	7.9	30.0	--	7.6
08	1029	4.00	2580	7.9	30.0	--	7.5
08	1031	6.00	2590	7.8	30.0	--	7.2
08	1032	8.00	2590	7.5	29.5	--	4.2
08	1033	10.0	2590	7.2	28.0	--	0.6
08	1034	12.0	2590	7.0	25.5	--	0.5
08	1200	4.00	2570	7.9	30.0	48.0	7.5
			Iron Post Coal Pond 2, Site 4 362832095343101				
May 1985							
02	1507	16.0	1320	7.4	18.5	48.0	6.1
02	1508	2.00	1160	7.5	20.5	--	7.9
02	1509	4.00	1170	7.5	20.5	--	7.7
02	1510	6.00	1170	7.5	20.0	--	7.5
02	1511	8.00	1170	7.5	20.0	--	7.4

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (μS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
02	1512	10.0	1170	7.5	19.5	--	7.3
02	1513	12.0	1190	7.5	19.0	--	6.9
02	1514	14.0	1220	7.4	18.5	--	6.5
02	1515	16.0	1320	7.4	18.5	--	6.1
02	1516	18.0	1350	7.3	17.5	--	5.3
02	1517	20.0	1700	7.2	16.5	--	3.7
02	1518	21.0	1910	7.2	16.0	--	3.2
02	1520	20.0	1700	7.2	16.5	48.0	3.7
02	1525	4.00	1170	7.5	20.5	48.0	7.7
August							
12	1330	20.0	2110	7.3	24.0	48.0	--
12	1331	20.0	2110	7.3	24.0	48.0	--
12	1335	6.00	1800	7.9	29.0	48.0	7.1
Iron Post Coal Pond 2, Site 1 362833095343001							
August 1985							
12	1300	0.0	1790	7.9	29.5	45.0	6.9
12	1301	2.00	1790	7.9	29.5	--	6.9
12	1302	4.00	1790	7.9	29.5	--	6.9
12	1303	6.00	1790	7.9	29.5	--	7.0
12	1304	8.00	1790	7.9	29.0	--	6.8
12	1305	10.0	1790	7.6	29.0	--	5.2
12	1306	12.0	1790	7.3	27.5	--	1.2
12	1307	14.0	1940	7.3	27.5	--	1.8
12	1308	16.0	2080	7.3	27.0	--	1.8
12	1309	18.0	2050	7.2	25.0	--	1.3
12	1315	6.00	1790	7.9	29.5	--	7.0
Iron Post Coal Pond 3, Site 6 362648095334101							
April 1985							
09	1500	0.0	446	7.7	15.5	6.00	9.5
09	1500	0.0	446	7.7	15.5	6.00	9.5
09	1501	2.00	451	7.7	15.5	--	9.5
09	1501	2.00	451	7.7	15.5	--	9.5
09	1502	4.00	442	7.7	14.0	--	9.5
09	1502	4.00	442	7.7	14.0	--	9.5
09	1503	6.00	445	7.7	12.5	--	9.2
09	1503	6.00	445	7.7	12.5	--	9.2

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (µS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
09	1504	8.00	457	7.7	12.5	--	9.0
09	1504	8.00	457	7.7	12.5	--	9.0
09	1505	10.0	460	7.6	12.0	--	9.0
09	1505	10.0	460	7.6	12.0	--	9.0
09	1506	12.0	464	7.6	12.0	--	8.9
09	1506	12.0	464	7.6	12.0	--	8.9
09	1507	13.0	470	7.6	12.0	--	8.7
09	1507	13.0	470	7.6	12.0	--	8.7
August							
12	1335	0.0	382	8.5	30.0	30.0	12.2
12	1335	0.0	382	8.5	30.0	30.0	12.2
12	1336	2.00	382	8.5	29.5	--	12.2
12	1336	2.00	382	8.5	29.5	--	12.2
12	1337	3.00	382	8.5	29.5	--	12.2
12	1337	3.00	382	8.5	29.5	--	12.2
12	1338	4.00	382	8.4	29.5	--	12.2
12	1338	4.00	382	8.4	29.5	--	12.2
12	1339	5.00	383	8.4	29.5	--	11.9
12	1339	5.00	383	8.4	29.5	--	11.9
12	1340	6.00	384	8.4	29.0	--	11.7
12	1340	6.00	384	8.4	29.0	--	11.7
12	1341	8.00	385	8.0	27.0	--	4.9
12	1341	8.00	385	8.0	27.0	--	4.9
12	1342	10.0	388	7.8	26.0	--	3.4
12	1342	10.0	388	7.8	26.0	--	3.4
12	1345	4.00	382	8.4	29.5	--	12.2
12	1345	4.00	382	8.4	29.5	--	12.2
			Iron Post Coal Pond 4, Site 1	**362632095350201**			
August 1985							
06	1050	--	--	--	--	--	--
06	1100	14.0	1200	7.2	18.0	30.0	0.5
06	1105	0.0	1100	7.9	28.5	30.0	8.8
06	1106	2.00	1100	7.9	28.5	--	8.8
06	1107	4.00	1100	7.9	28.5	--	8.7
06	1108	6.00	1100	7.8	28.0	--	8.4
06	1109	8.00	1120	7.4	27.0	--	5.3
06	1110	10.0	1150	7.1	24.5	--	1.4
06	1111	12.0	1200	7.1	21.5	--	0.5

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (µS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
06	1112	14.0	1200	7.2	18.0	--	0.5
06	1113	16.0	1210	7.4	16.0	--	0.4
06	1120	4.00	1100	7.9	28.5	30.0	8.7
06	1121	4.00	1100	7.9	28.5	30.0	8.7
06	1122	6.00	1100	7.8	28.0	30.0	8.4
			Iron Post Coal Pond 4, Site 2 362634095350201				
May 1985							
14	1410	0.0	954	7.8	21.0	26.0	7.5
14	1411	2.00	958	7.8	21.0	--	7.5
14	1412	4.00	960	7.8	21.0	--	7.4
14	1413	6.00	961	7.8	21.0	--	7.4
14	1414	8.00	986	7.4	20.5	--	4.0
14	1415	10.0	978	7.3	18.0	--	1.5
14	1416	12.0	1080	7.3	14.5	--	1.4
14	1417	14.0	1130	7.4	13.0	--	1.4
14	1418	16.0	1180	7.4	12.0	--	1.4
14	1419	18.0	1220	7.4	11.0	--	1.4
14	1430	2.00	958	7.8	21.0	26.0	7.5
14	1435	16.0	1180	7.4	12.0	26.0	1.4
			Iron Post Coal Pond 5, Site 2 362609095342301				
May 1985							
10	1020	0.0	948	7.7	20.0	84.0	7.9
10	1022	2.00	947	7.7	20.0	--	8.0
10	1024	4.00	947	7.7	20.0	--	8.0
10	1026	6.00	1170	7.5	19.0	--	6.9
10	1027	8.00	1300	7.4	17.5	--	5.9
10	1028	10.0	1380	7.3	16.5	--	3.7
10	1029	12.0	1430	7.3	15.5	--	2.1
10	1030	13.0	1470	7.3	15.0	--	1.9
August							
06	1055	0.0	1250	8.0	28.0	63.0	8.4
06	1056	2.00	1240	8.0	28.0	--	8.5
06	1057	4.00	1240	8.0	28.0	--	8.5
06	1058	6.00	1240	8.0	27.5	--	8.4
06	1059	8.00	1300	7.3	25.5	--	4.6
06	1100	10.0	1350	7.1	23.5	--	1.1

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (µS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
06	1101	12.0	1340	7.1	22.0	--	0.6
06	1102	14.0	1440	7.1	21.5	--	0.6
06	1105	2.00	1240	8.0	28.0	63.0	8.5
06	1106	2.00	1240	8.0	28.0	63.0	8.5
06	1215	--	--	--	--	--	--
06	1245	3.00	1220	--	28.0	63.0	8.7
06	1246	3.00	1220	--	28.0	63.0	8.7
			Iron Post Coal Pond 6, Site 10 364051095274001				
May 1985							
08	1100	0.0	1560	8.4	21.5	96.0	9.2
08	1101	2.00	1570	8.4	21.5	--	9.2
08	1102	4.00	1580	8.4	21.0	--	9.0
08	1103	6.00	1580	8.3	20.5	--	8.8
08	1104	8.00	1790	7.8	20.0	--	7.0
08	1105	10.0	2000	7.6	19.0	--	7.7
08	1106	12.0	2320	7.4	18.0	--	4.9
08	1107	14.0	2400	7.3	17.0	--	3.4
08	1108	16.0	2480	7.2	17.0	--	1.7
08	1109	18.0	2690	7.2	16.0	--	5.2
08	1110	20.0	2740	7.2	15.0	--	1.6
08	1111	21.0	2780	--	14.0	--	--
08	1115	2.00	1570	8.4	21.5	96.0	9.2
08	1120	20.0	2740	7.2	15.0	96.0	1.6
August							
28	1130	--	--	--	--	--	--
			Iron Post Coal Pond 6, Site 5 364052095274001				
August 1985							
20	1250	0.0	2770	7.6	26.5	126	7.4
20	1251	2.00	2770	7.6	26.5	--	7.4
20	1252	4.00	2770	7.6	26.5	--	7.4
20	1253	6.00	2770	7.6	26.5	--	7.4
20	1254	8.00	2770	7.6	26.5	--	7.4
20	1255	10.0	2910	7.5	26.0	--	6.4
20	1256	12.0	3420	6.8	21.0	--	0.7
20	1257	13.0	3450	--	19.5	--	0.3
20	1310	12.0	3420	6.8	21.0	126	0.7

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conductance (µS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
20	1311	12.0	3420	6.8	21.0	126	0.7
20	1315	6.00	2770	7.6	26.5	126	7.4
20	1316	6.00	2770	7.6	26.5	126	7.4
20	1317	6.00	2770	7.6	26.5	--	7.4
Iron Post Coal Pond 7, Site 1 363825095284601							
May 1985							
15	1315	0.50	1420	7.6	23.0	22.0	7.2
15	1315	0.50	1420	7.6	23.0	22.0	7.2
15	1316	2.00	1440	7.6	21.0	--	7.0
15	1316	2.00	1440	7.6	21.0	--	7.0
15	1317	4.00	1440	7.5	20.0	--	5.4
15	1317	4.00	1440	7.5	20.0	--	5.4
15	1318	6.00	1400	7.5	19.0	--	4.6
15	1318	6.00	1400	7.5	19.0	--	4.6
15	1319	8.00	1850	7.2	19.5	--	1.8
15	1319	8.00	1850	7.2	19.5	--	1.8
15	1320	9.00	1930	7.2	19.0	--	1.7
15	1320	9.00	1930	7.2	19.0	--	1.7
15	1330	4.00	1440	7.5	20.0	22.0	5.4
15	1330	4.00	1440	7.5	20.0	22.0	5.4
August							
20	1120	0.50	1720	7.6	26.0	36.0	11.2
20	1120	0.50	1720	7.6	26.0	36.0	11.2
20	1122	2.00	1720	7.6	26.5	--	10.8
20	1122	2.00	1720	7.6	26.5	--	10.8
20	1124	3.00	1710	7.6	26.5	--	10.8
20	1124	3.00	1710	7.6	26.5	--	10.8
20	1126	4.00	1710	7.6	26.5	--	10.6
20	1126	4.00	1710	7.6	26.5	--	10.6
20	1128	5.00	1710	7.5	26.0	--	10.4
20	1128	5.00	1710	7.5	26.0	--	10.4
20	1130	6.00	1710	7.5	26.0	--	10.2
20	1130	6.00	1710	7.5	26.0	--	10.2
20	1132	7.00	1710	7.5	26.0	--	9.2
20	1132	7.00	1710	7.5	26.0	--	9.2
20	1134	8.00	1710	7.5	26.0	--	7.2
20	1134	8.00	1710	7.5	26.0	--	7.2
20	1136	9.00	1740	7.4	25.5	--	0.8

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (μS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
20	1136	9.00	1740	7.4	25.5	--	0.8
20	1255	2.00	1720	7.6	26.5	36.0	10.8
20	1255	2.00	1720	7.6	26.5	36.0	10.8
20	1256	2.00	1720	7.6	26.5	36.0	10.8
20	1256	2.00	1720	7.6	26.5	36.0	10.8
			Iron Post Coal Pond 8, Site 3 364329095221601				
May 1985							
09	1510	0.0	2000	7.1	16.5	>96.0	6.4
09	1511	2.00	2800	7.0	17.0	--	10.6
09	1512	4.00	2920	7.0	16.5	--	13.2
09	1513	6.00	2980	7.0	16.5	--	12.4
09	1514	8.00	2990	7.0	16.5	--	11.1
09	1520	4.00	2920	7.0	16.5	>96.0	13.2
August							
19	1300	0.0	3660	8.1	22.5	72.0	7.9
19	1302	2.00	3710	7.8	21.5	--	7.2
19	1304	4.00	3730	7.4	18.0	--	6.1
19	1305	6.00	3890	6.8	17.5	--	2.2
19	1306	8.00	4000	6.5	17.0	--	0.7
19	1307	10.0	4070	6.3	16.0	--	0.5
19	1310	--	--	--	--	--	--
19	1315	2.00	3710	7.8	21.5	72.0	7.2
19	1316	2.00	3710	7.8	21.5	72.0	7.2
19	1317	2.00	3710	7.8	21.5	72.0	7.2
			McAlester Coal Pond 1, Site 1 345906095042401				
July 1985							
18	1120	--	--	--	--	--	--
18	1250	0.0	271	8.6	31.0	21.0	6.9
18	1252	5.00	270	8.5	30.0	--	6.8
18	1254	10.0	277	8.4	27.5	--	9.0
18	1255	15.0	336	8.3	18.0	--	14.2
18	1256	16.0	357	8.7	16.0	--	17.1
18	1257	20.0	405	7.3	10.0	--	0.4
18	1258	25.0	416	7.2	8.5	--	0.3
18	1259	30.0	439	7.1	8.0	--	0.3
18	1300	35.0	499	7.1	8.0	21.0	0.2

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conductance (µS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
18	1301	38.0	596	7.0	8.0	--	0.2
18	1305	38.0	596	7.0	8.0	21.0	0.2
18	1306	5.00	270	8.5	30.0	21.0	6.8
18	1307	16.0	357	8.7	16.0	--	17.1
18	1310	5.00	270	8.5	30.0	21.0	6.8
18	1311	38.0	596	7.0	8.0	21.0	0.2
McAlester Coal Pond 1, Site 2 345906095043201							
March 1985							
14	1315	0.0	256	8.6	15.0	39.0	10.7
14	1317	3.00	258	8.6	14.5	--	10.8
14	1319	6.00	258	8.6	14.5	--	10.9
14	1320	9.00	252	8.5	13.5	--	10.9
14	1322	11.0	282	8.2	9.0	--	10.7
14	1323	12.0	291	8.1	6.5	--	11.5
14	1324	15.0	282	8.1	6.0	--	10.2
14	1325	18.0	290	8.1	5.5	--	10.0
14	1326	21.0	290	8.0	5.5	--	9.7
14	1327	24.0	292	8.0	5.5	--	9.2
14	1328	27.0	296	7.9	5.5	--	8.7
14	1329	30.0	306	7.9	5.5	--	7.5
14	1330	33.0	340	7.8	5.5	--	5.2
14	1331	36.0	--	--	--	--	3.2
14	1335	30.0	306	7.9	5.5	39.0	7.5
14	1340	3.00	258	8.6	14.5	39.0	10.8
July							
18	1107	5.00	277	8.4	30.0	--	6.1
18	1109	10.0	304	7.9	26.0	--	8.8
18	1110	15.0	362	8.2	16.5	--	13.4
18	1111	20.0	403	7.3	10.0	--	0.3
18	1113	25.0	441	7.1	8.5	--	0.2
18	1114	30.0	445	7.1	8.0	--	0.1
18	1115	32.0	461	7.0	8.0	--	0.1
18	1330	16.0	345	8.5	17.0	24.0	12.5
18	1331	--	--	--	--	--	--

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conductance (µS/cm)	pH Water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
			McAlester Coal Pond 2, Site 3 350926095091001				
March 1985							
19	1150	0.0	117	7.8	15.0	18.0	10.0
19	1151	4.00	116	7.8	14.5	--	10.0
19	1152	8.00	116	7.8	14.0	--	9.8
19	1153	12.0	119	7.8	12.5	--	8.2
19	1154	16.0	133	7.8	9.0	--	8.2
19	1155	20.0	136	7.9	7.5	--	7.8
19	1156	24.0	144	7.9	7.0	--	5.5
July							
30	1220	0.0	66	8.4	31.0	--	7.2
30	1221	2.00	66	8.4	31.0	--	7.2
30	1222	4.00	66	8.4	30.5	--	7.2
30	1223	6.00	66	8.4	30.5	--	7.2
30	1224	8.00	72	7.9	28.0	--	4.4
30	1225	10.0	80	7.6	24.5	--	2.1
30	1226	12.0	95	7.4	21.5	--	1.5
30	1227	14.0	117	7.3	17.0	--	1.3
30	1228	16.0	134	7.2	14.0	--	0.6
30	1229	18.0	139	7.2	13.5	--	0.5
30	1230	4.00	66	8.4	30.5	--	7.2
			McAlester Coal Pond 2, Site 10 350930095085901				
March 1985							
19	1220	0.0	117	8.0	15.0	18.0	10.2
19	1221	4.00	117	7.9	15.0	--	10.2
19	1222	8.00	117	7.9	14.5	--	10.0
19	1223	12.0	119	7.8	12.5	--	8.4
19	1224	14.0	126	7.8	10.0	--	8.2
19	1225	16.0	136	7.8	8.0	--	8.0
19	1226	20.0	138	7.9	7.0	--	7.0
19	1227	22.0	139	--	--	--	--
19	1228	24.0	141	7.9	7.0	--	6.2
19	1229	26.0	143	7.9	7.0	--	5.8
19	1235	2.00	117	7.9	15.0	18.0	10.2
19	1240	26.0	143	7.9	7.0	18.0	5.8

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (μS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
			McAlester Coal Pond 3, Site 3 351031095051501				
April 1985							
24	1115	0.50	583	8.1	22.5	3.00	9.6
24	1117	5.00	577	7.7	19.5	--	8.8
24	1118	10.0	578	7.6	19.0	--	8.5
24	1120	15.0	586	7.5	15.5	--	8.4
24	1122	20.0	601	7.3	15.0	--	8.2
24	1124	25.0	617	7.3	14.0	--	7.9
24	1126	30.0	630	7.3	13.0	--	7.7
24	1128	35.0	637	7.2	13.0	--	7.4
24	1140	40.0	639	7.1	12.5	--	7.3
			McAlester Coal Pond 3, Site 6 351038095051401				
July 1985							
30	1315	0.50	710	8.1	30.5	3.00	6.9
30	1316	4.00	707	8.0	29.5	--	7.2
30	1317	10.0	698	7.9	26.0	--	6.0
30	1318	15.0	709	7.9	20.0	--	4.6
30	1319	20.0	735	8.1	16.5	--	4.5
30	1320	25.0	741	8.1	15.0	--	4.2
30	1321	30.0	745	8.1	14.5	--	4.0
30	1322	35.0	735	7.9	14.5	--	3.7
30	1323	40.0	744	7.8	14.5	--	3.2
30	1327	--	--	--	--	--	--
			McAlester Coal Pond 4, Site 7 350708094502601				
July 1985							
23	1320	0.0	509	6.7	33.0	--	6.5
23	1321	2.00	498	6.7	33.0	--	6.5
23	1322	4.00	497	6.6	31.5	--	6.3
23	1323	6.00	495	6.6	30.5	--	6.3
23	1324	8.00	495	6.5	30.5	--	6.2
23	1325	10.0	496	6.5	30.5	--	6.1
23	1326	12.0	503	5.9	29.0	--	3.1
23	1327	14.0	594	5.8	24.0	--	3.0
23	1328	16.0	679	5.9	21.0	--	2.2
23	1329	18.0	793	6.2	18.0	--	2.1
23	1335	6.00	495	6.6	30.5	--	6.3

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (µS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
			McAlester Coal Pond 4, Site 9 350708094503201				
April 1985							
25	1045	0.0	491	6.5	22.0	42.0	9.0
25	1046	2.00	495	6.5	22.0	--	9.0
25	1047	4.00	495	6.6	21.5	--	9.0
25	1048	6.00	493	6.6	21.0	--	8.9
25	1049	8.00	493	6.6	21.0	--	8.9
25	1050	10.0	495	6.5	20.0	--	8.8
25	1051	12.0	503	6.3	18.0	--	9.4
25	1052	14.0	545	6.3	16.0	--	9.5
25	1053	16.0	611	6.0	14.0	--	10.3
25	1054	18.0	703	5.9	12.0	--	9.5
25	1055	20.0	739	5.9	12.5	--	8.4
			McAlester Coal Pond 5 (86, M4), Site 1 351637095065001				
April 1985							
25	1525	0.0	3100	8.0	22.0	66.0	10.2
25	1526	5.00	3200	8.0	22.0	--	10.3
25	1527	10.0	3200	7.4	20.5	--	8.9
25	1528	15.0	3300	7.3	19.0	--	8.3
25	1529	20.0	3400	7.2	18.0	--	6.4
25	1530	25.0	3500	7.1	17.5	--	5.4
25	1531	30.0	3600	7.1	17.5	--	5.0
25	1532	35.0	3700	7.1	17.0	--	4.8
25	1533	40.0	3800	7.3	16.0	--	5.8
25	1534	45.0	3900	7.3	13.0	--	3.6
25	1535	50.0	4100	7.3	9.5	--	4.9
25	1536	55.0	4200	7.5	8.5	--	5.7
25	1537	60.0	4300	7.7	7.5	--	6.0
25	1538	65.0	4400	7.5	7.5	--	3.4
25	1539	70.0	4450	7.4	8.0	--	3.0
25	1600	5.00	3200	8.0	22.0	66.0	10.3
25	1605	45.0	3900	7.3	13.0	66.0	3.6
			McAlester Coal Pond 5 (86, M4), Site 2 351639095064601				
July 1985							
24	1055	0.0	3790	8.6	30.5	84.0	8.1

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (µS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
24	1056	5.00	3790	8.5	30.5	--	8.0
24	1057	10.0	3800	8.4	30.5	--	7.9
24	1058	15.0	3820	8.2	30.0	--	8.5
24	1059	20.0	3950	7.1	24.0	--	8.3
24	1100	25.0	4040	7.1	22.0	--	4.4
24	1101	30.0	4130	7.1	20.5	--	1.8
24	1102	35.0	4150	7.2	19.5	--	0.4
24	1103	40.0	4280	7.2	18.0	--	0.2
24	1104	45.0	4630	7.3	16.0	--	0.2
24	1105	50.0	4660	7.4	14.5	--	0.2
24	1106	55.0	4640	7.4	13.5	--	0.2
24	1107	60.0	4690	7.6	11.5	--	0.2
24	1108	65.0	4700	7.8	10.0	--	0.2
24	1109	70.0	4660	7.8	9.5	--	0.2
24	1110	75.0	4930	7.8	9.5	--	0.2
24	1111	80.0	5330	7.6	10.0	--	0.2
24	1150	5.00	3790	8.5	30.5	84.0	8.0
24	1151	80.0	5330	7.6	10.0	84.0	0.2
24	1155	80.0	5330	7.6	10.0	84.0	0.2
24	1156	5.00	3790	8.5	30.5	84.0	8.0
24	1157	15.0	3820	8.2	30.0	84.0	8.5
			McAlester Coal Pond 6, Site 7 351743095054301				
April 1985							
24	1645	0.0	2230	8.4	24.0	84.0	8.6
24	1646	5.00	2220	8.4	21.0	--	9.1
24	1647	10.0	2260	8.3	19.5	--	8.9
24	1648	12.0	--	--	--	--	10.0
24	1649	15.0	2610	7.9	14.0	--	10.8
24	1650	20.0	2750	7.7	11.0	--	7.0
24	1651	25.0	3260	7.3	10.5	--	3.5
24	1652	29.0	3500	7.2	10.5	--	3.5
July							
25	1230	0.0	2060	8.0	30.0	--	7.7
25	1231	2.00	2060	8.0	30.0	--	7.7
25	1232	4.00	2070	8.0	30.0	--	7.8
25	1233	6.00	2070	8.0	29.5	--	7.8
25	1234	8.00	2070	7.9	29.5	--	7.7
25	1235	10.0	2140	7.3	28.0	--	9.0

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (µS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
25	1236	12.0	2240	7.3	25.0	--	8.4
25	1237	14.0	2390	7.3	22.0	--	10.1
25	1238	16.0	2530	7.3	20.5	--	14.7
25	1239	18.0	2840	7.3	18.0	--	19.1
25	1240	20.0	2960	7.2	17.0	--	13.1
25	1241	22.0	3050	7.1	15.5	--	0.7
25	1242	24.0	3200	7.1	14.5	--	0.3
25	1243	26.0	3260	7.1	14.0	--	0.3
25	1244	28.0	3270	7.1	14.0	--	0.3
25	1250	18.0	2840	7.3	18.0	--	19.1
			McAlester Coal Pond 7 (86,M6), Site 7 352001094583501				
July 1985							
31	1055	--	--	--	--	--	--
31	1100	0.0	322	8.1	31.0	36.0	11.2
31	1101	1.00	322	8.1	31.0	--	10.8
31	1102	2.00	327	8.0	31.0	--	10.8
31	1103	4.00	323	8.0	31.0	--	10.7
31	1104	6.00	323	7.8	30.5	--	9.8
31	1105	8.00	398	7.0	25.5	--	5.9
31	1106	10.0	495	6.6	20.5	--	2.8
31	1115	2.00	327	8.0	31.0	36.0	10.8
31	1116	2.00	327	8.0	31.0	36.0	10.8
31	1230	2.00	327	8.0	31.0	--	10.8
			McAlester Coal Pond 7 (86,M6), Site 10 352001094583701				
March 1985							
21	1420	0.0	238	7.4	12.5	12.0	9.7
21	1421	2.00	237	7.4	12.5	--	9.4
21	1422	4.00	237	7.4	12.5	--	9.4
21	1423	6.00	236	7.4	12.5	--	9.2
21	1424	8.00	237	7.2	12.5	--	8.0
21	1425	10.0	262	7.0	11.0	--	4.4
21	1426	12.0	275	6.7	10.0	--	1.8
21	1430	4.00	237	7.4	12.5	--	9.4
July							
31	1225	--	--	--	--	--	--

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (µS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
			McAlester Coal Pond 8, Site 2 352239095143901				
March 1985							
07	1238	1.00	815	6.6	12.0	24.0	9.6
07	1240	3.00	813	6.6	12.5	--	9.6
07	1242	5.00	813	6.6	12.5	--	9.6
07	1243	6.00	813	6.6	12.0	--	9.6
			McAlester Coal Pond 8, Site 7 352243095143201				
July 1985							
31	1000	0.50	1640	8.0	29.5	--	8.2
31	1001	3.00	1610	8.0	29.5	--	8.1
31	1002	6.00	1800	7.1	24.0	--	3.0
31	1003	9.00	1960	7.1	19.5	--	0.5
31	1004	12.0	2270	7.1	17.5	--	0.3
31	1006	15.0	2340	7.2	16.5	--	0.3
31	1007	18.0	2360	7.2	16.0	--	0.2
31	1008	21.0	2360	7.3	15.5	--	0.2
31	1009	24.0	2370	7.3	15.5	--	0.2
31	1230	4.00	1610	7.8	30.0	--	8.0
			McAlester Coal Pond 9, Site 10 352506095134101				
July 1985							
22	1200	--	--	--	--	--	--
22	1310	0.0	539	7.8	32.0	56.0	8.6
22	1311	2.00	537	7.8	31.0	--	8.5
22	1312	4.00	537	7.7	31.0	--	8.4
22	1313	6.00	537	7.7	30.5	--	8.4
22	1314	8.00	537	7.7	30.5	--	6.9
22	1315	10.0	579	6.9	28.5	--	2.3
22	1316	12.0	720	6.7	24.0	--	1.0
22	1317	14.0	943	7.0	21.0	--	1.1
22	1318	16.0	1160	6.9	15.5	--	1.2
22	1319	18.0	1350	6.9	15.0	--	1.2
22	1330	6.00	537	7.7	30.5	56.0	8.4
22	1331	6.00	537	7.7	30.5	56.0	8.4
22	1332	6.00	537	7.7	30.5	56.0	8.4
22	1335	18.0	1350	6.9	15.0	56.0	1.2
22	1336	18.0	1350	6.9	15.0	56.0	1.2

Table 10. Vertical profiles of selected sites on study ponds—Continued

Sampling date	Time	Depth (ft)	Specific conduct-ance (μS/cm)	pH Water whole field (standard units)	Temper-ature water (°C)	Transpar-ency (Secchi disk) (in.)	Oxygen, dissolved (mg/L)
McAlester Coal Pond 9, Site 16 352513095134301							
March 1985							
18	1530	0.0	397	7.9	17.0	15.0	10.3
18	1531	2.00	395	7.9	16.0	--	10.3
18	1532	4.00	394	7.9	16.0	--	10.5
18	1533	6.00	394	7.9	15.0	--	10.4
18	1535	8.00	392	7.9	14.0	--	10.2
18	1536	10.0	390	7.8	13.0	--	9.8
18	1537	12.0	404	7.5	11.5	--	8.1
18	1538	14.0	415	7.4	10.5	--	7.2
18	1540	16.0	435	7.3	10.5	--	6.8
18	1542	18.0	466	7.2	10.0	--	6.1

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds

[mg/L, milligrams per liter; µS/cm, microsiemens per centimeter; —, missing value; in., inch; °C, degrees Celsius; <, less than ;*, in some instances the dissolved cadmium concentration is larger than the total cadmium concentration, possibly because of a longer storage period for the total cadmium analysis]

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds

Pond name	Date	Sampling depth (feet)	Local identifier	Station number	Reservoir depth (feet)	Specific conductance (µS/cm)	pH water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)
Control Pond 1	04–23–85	2.0	08N–23E–10 D	351032094513301	17.5	85	7.1	22.5	72.0
Control Pond 1	04–23–85	16	08N–23E–10 D	351032094513301	17.5	136	6.7	12.0	72.0
Control Pond 1	07–23–85	4.0	08N–23E–10 D	351037094513301	6.5	88	7.0	29.0	48.0
Control Pond 1	07–23–85	16	08N–23E–10 D	351032094513401	16.0	311	7.1	16.5	42.0
Control Pond 2	03–14–85	0.5	09N–19E–09 A	351629095175201	8.5	92	6.9	14.0	18.0
Control Pond 2	07–17–85	0.5	09N–19E–09 A	351629095175201	5.0	37	10.0	33.5	3.0
Control Pond 3	04–23–85	1.0	09N–24E–01 B	351720094430301	20.0	156	8.4	20.5	144
Control Pond 3	04–23–85	18	09N–24E–01 B	351720094430301	20.0	193	7.6	13.0	144
Control Pond 3	07–25–85	2.0	09N–24E–01 B	351720094430301	18.5	102	7.3	31.0	108
Control Pond 3	07–25–85	18	09N–24E–01 B	351720094430301	18.5	131	6.2	24.0	108
Control Pond 4	05–02–85	10	24N–18E–04 D	363503095231901	29.0	684	7.2	19.5	24.0
Control Pond 4	08–16–85	3.0	24N–18E–04 D	363503095231901	27.0	130	6.8	27.5	60.0
Control Pond 5	05–02–85	4.0	24N–18E–20 D	363236095240101	17.0	59	6.9	19.5	66.0
Control Pond 5	08–16–85	2.0	24N–18E–20 D	363238095240401	12.0	30	7.5	28.0	84.0
Control Pond 6	05–01–85	2.0	28N–19E–30 B	365252095185301	15.0	271	8.3	20.0	--
Control Pond 6	08–15–85	4.0	28N–19E–30 B	365253095185201	16.5	310	6.5	27.5	48.0
Croweburg Coal Pond 1	04–04–85	2.0	19N–15E–20	360637095435501	22.0	1200	7.4	9.0	36.0
Croweburg Coal Pond 1	04–04–85	20	19N–15E–20	360637095435501	22.0	2560	6.7	4.0	36.0
Croweburg Coal Pond 1	08–13–85	4.0	19N–15E–20	360704095433601	23.0	1420	8.7	30.5	15.0
Croweburg Coal Pond 1	08–13–85	22	19N–15E–20	360704095433601	23.0	3270	6.9	17.0	15.0
Croweburg Coal Pond 2	04–05–85	2.0	21N–15E–25 C	361604095395901	12.0	667	8.1	16.5	48.0
Croweburg Coal Pond 2	04–05–85	10	21N–15E–25 C	361604095395901	12.0	—	7.3	11.5	48.0

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Oxygen, dissolved (mg/L)	Hardness total (mg/L as $CaCO_3$)	Acidity (mg/L as $CaCO_3$)	Calcium dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio	Potassium, dissolved (mg/L as K)
Control Pond 1	04–23–85	2.0	7.9	22	1.3	3.8	3.1	5.1	0.5	1.0
Control Pond 1	04–23–85	16	0.3	35	7.3	5.9	4.9	7.8	0.6	1.8
Control Pond 1	07–23–85	4.0	5.2	27	<0.1	3.8	4.3	6.6	0.6	2.0
Control Pond 1	07–23–85	16	0.3	66	<0.1	15	6.8	7.2	0.4	3.0
Control Pond 2	03–14–85	0.5	9.8	29	<0.1	7.8	2.4	5.8	0.5	5.5
Control Pond 2	07–17–85	0.5	13.6	24	1.1	6.8	1.6	4.9	0.4	6.8
Control Pond 3	04–23–85	1.0	9.8	63	<0.1	16	5.7	7.5	0.4	0.90
Control Pond 3	04–23–85	18	9.9	54	3.1	14	4.5	6.5	0.4	0.80
Control Pond 3	07–25–85	2.0	8.4	68	<0.1	17	6.3	16	0.8	0.80
Control Pond 3	07–25–85	18	0.2	99	<0.1	27	7.6	8.1	0.4	1.2
Control Pond 4	05–02–85	10	7.9	370	2.1	62	52	21	0.5	5.2
Control Pond 4	08–16–85	3.0	7.9	400	1.8	68	57	23	0.5	5.4
Control Pond 5	05–02–85	4.0	7.9	22	1.8	6.3	1.6	3.0	0.3	1.5
Control Pond 5	08–16–85	4.0	7.8	23	1.8	6.4	1.8	2.6	0.2	1.0
Control Pond 6	05–01–85	2.0	8.4	120	<0.1	36	7.6	7.9	0.3	2.3
Control Pond 6	08–15–85	4.0	12.3	110	<0.1	30	7.6	6.3	0.3	2.0
Croweburg Coal Pond 1	04–04–85	2.0	9.5	590	<0.1	140	59	23	0.4	4.1
Croweburg Coal Pond 1	04–04–85	20	0.4	1300	<0.1	300	140	38	0.5	4.8
Croweburg Coal Pond 1	08–13–85	4.0	10.9	780	2.6	160	92	32	0.5	4.7
Croweburg Coal Pond 1	08–13–85	22	0.3	1800	8.3	410	180	48	0.5	5.9
Croweburg Coal Pond 2	04–05–85	2.0	10.5	300	<0.1	66	34	28	0.7	3.9
Croweburg Coal Pond 2	04–05–85	10	5.6	360	<0.1	78	40	35	0.8	4.4

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Bicarbonate water wh fet field (mg/L as HCO_3)	Alkalinity wat wh tot fet field (mg/L as $CaCO_3$)	Sulfate dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Silica, dissolved (mg/L as SiO_2)	Solids, residue at 180 °C dissolved (mg/L)	Solids, sum of constituents, dissolved (mg/L)
Control Pond 1	04–23–85	2.0	22	18	14	4.6	0.50	56	44
Control Pond 1	04–23–85	16	48	39	24	6.8	2.8	106	82
Control Pond 1	07–23–85	4.0	68	56	12	8.8	2.8	68	74
Control Pond 1	07–23–85	16	150	125	4.3	5.4	7.0	146	154
Control Pond 2	03–14–85	0.5	40	33	13	6.1	5.9	80	67
Control Pond 2	07–17–85	0.5	20	34	<0.10	13	5.2	96	—
Control Pond 3	04–23–85	1.0	66	54	12	12	0.10	84	87
Control Pond 3	04–23–85	18	84	69	6.6	17	0.50	110	91
Control Pond 3	07–25–85	2.0	84	66	43	8.6	2.1	168	135
Control Pond 3	07–25–85	18	150	121	4.9	6.0	12	170	151
Control Pond 4	05–02–85	10	34	28	360	12	0.30	574	530
Control Pond 4	08–16–85	3.0	36	30	390	9.0	0.60	616	571
Control Pond 5	05–02–85	4.0	22	18	9.0	6.2	0.80	40	40
Control Pond 5	08–16–85	2.0	40	33	12	3.3	1.6	52	48
Control Pond 6	05–01–85	2.0	110	90	33	6.2	0.50	156	148
Control Pond 6	08–15–85	4.0	130	105	30	5.6	2.6	162	147
Croweburg Coal Pond 1	04–04–85	2.0	130	108	520	7.6	4.7	904	824
Croweburg Coal Pond 1	04–04–85	20	280	230	1200	9.0	8.8	2190	1840
Croweburg Coal Pond 1	08–13–85	4.0	70	61	770	8.6	5.7	1240	1110
Croweburg Coal Pond 1	08–13–85	22	590	485	1700	9.4	12	2980	2660
Croweburg Coal Pond 2	04–05–85	2.0	220	180	180	3.4	0.80	460	424
Croweburg Coal Pond 2	04–05–85	10	230	189	210	4.1	1.6	544	487

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Local identifier	Station number	Reservoir depth (feet)	Specific conductance (µS/cm)	pH water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)
Croweburg Coal Pond 2	04–05–85	18	21N–15E–25 C	361604095400401	18.0	894	7.2	9.5	60.0
Croweburg Coal Pond 2	08–01–85	2.0	21N–15E–25 C	361604095400401	17.0	655	8.2	31.0	108
Croweburg Coal Pond 2	08–01–85	15	21N–15E–25 C	361604095400401	17.0	950	6.9	17.5	108
Croweburg Coal Pond 3	04–09–85	2.0	22N–16E–16 B	362333095365101	22.0	518	7.9	15.5	22.0
Croweburg Coal Pond 3	04–09–85	20	22N–16E–16 B	362333095365101	22.0	1030	7.0	8.5	22.0
Croweburg Coal Pond 3	08–01–85	1.0	22N–16E–16 B	362335095364901	16.0	535	8.4	30.5	102
Croweburg Coal Pond 3	08–01–85	14	22N–16E–16 B	362335095364901	16.0	1240	7.6	19.0	102
Croweburg Coal Pond 4	04–08–85	4.0	23N–17E–17 B	362840095312701	13.0	885	8.1	15.0	84.0
Croweburg Coal Pond 4	08–07–85	5.0	23N–17E–17 B	362845095312801	18.0	734	8.3	28.5	33.0
Croweburg Coal Pond 4	08–07–85	16	23N–17E–17 B	362845095312801	18.0	1460	7.0	20.0	33.0
Croweburg Coal Pond 5	04–11–85	3.0	24N–17E–16 D	363327095293101	31.0	1780	8.3	14.5	72.0
Croweburg Coal Pond 5	04–11–85	30	24N–17E–16 D	363327095293101	31.0	2410	7.4	8.5	72.0
Croweburg Coal Pond 5	08–14–85	13	24N–17E–16 D	363327095293101	29.0	1610	8.2	29.0	132
Croweburg Coal Pond 5	08–14–85	28	24N–17E–16 D	363327095293101	29.0	3470	6.9	15.5	132
Croweburg Coal Pond 6	05–08–85	9.0	25N–18E–30 D	363649095251801	30.0	353	8.3	21.5	63.0
Croweburg Coal Pond 6	08–13–85	4.0	25N–18E–30 D	363650095251801	27.0	377	8.0	29.0	36.0
Croweburg Coal Pond 7	05–16–85	10	27N–19E–29 A	364754095174201	26.0	250	7.2	13.5	12.0
Croweburg Coal Pond 7	08–21–85	6.0	27N–19E–29 A	364754095174201	24.0	255	8.1	27.0	30.0
Croweburg Coal Pond 7	08–21–85	22	27N–19E–29 A	364754095174201	24.0	313	7.1	12.5	30.0
Croweburg Coal Pond 8	05–16–85	10	28N–20E–18	365433095124101	20.0	616	7.2	21.5	84.0
Croweburg Coal Pond 8	08–15–85	2.0	28N–20E–18	365427095124001	18.0	653	7.1	29.0	45.0
Croweburg Coal Pond 8	08–15–85	18	28N–20E–18	365427095124001	18.0	968	6.3	19.0	45.0
Iron Post Coal Pond 1	05–06–85	4.0	23N–16E–01 A	363021095325201	15.0	2190	8.4	21.5	75.0
Iron Post Coal Pond 1	05–06–85	14	23N–16E–01 A	363021095325201	15.0	2270	7.8	19.0	75.0
Iron Post Coal Pond 1	08–08–85	4.0	23N–16E–01 A	363022095324701	11.0	2590	7.9	30.0	54.0

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Oxygen, dissolved (mg/L)	Hardness total (mg/L as $CaCO_3$)	Acidity (mg/L as $CaCO_3$)	Calcium dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio	Potassium, dissolved (mg/L as K)
Croweburg Coal Pond 2	04–05–85	18	0.2	410	<0.1	90	45	40	0.9	4.5
Croweburg Coal Pond 2	08–01–85	2.0	—	270	<0.1	46	38	31	0.8	3.2
Croweburg Coal Pond 2	08–01–85	15	—	420	<0.1	88	49	40	0.8	4.6
Croweburg Coal Pond 3	04–09–85	2.0	10.7	240	<0.1	63	21	8.0	0.2	3.2
Croweburg Coal Pond 3	04–09–85	20	0.2	460	<0.1	110	46	20	0.4	3.4
Croweburg Coal Pond 3	08–01–85	1.0	8.5	260	<0.1	61	26	11	0.3	3.1
Croweburg Coal Pond 3	08–01–85	14	4.4	690	<0.1	150	77	26	0.4	4.0
Croweburg Coal Pond 4	04–08–85	4.0	9.6	390	<0.1	80	46	21	0.5	3.5
Croweburg Coal Pond 4	08–07–85	5.0	10.5	410	<0.1	77	54	20	0.4	4.1
Croweburg Coal Pond 4	08–07–85	16	0.5	800	<0.1	170	90	32	0.5	4.0
Croweburg Coal Pond 5	04–11–85	3.0	9.9	740	<0.1	130	100	86	1	5.9
Croweburg Coal Pond 5	04–11–85	30	5.8	990	<0.1	180	130	100	1	6.8
Croweburg Coal Pond 5	08–14–85	13	8.4	730	<0.1	130	99	91	1	6.6
Croweburg Coal Pond 5	08–14–85	28	1.7	1600	6.5	320	200	150	2	8.5
Croweburg Coal Pond 6	05–08–85	9.0	8.6	150	1.3	47	8.2	6.7	0.2	0.90
Croweburg Coal Pond 6	08–13–85	4.0	12.5	160	<0.1	48	8.6	6.5	0.2	0.80
Croweburg Coal Pond 7	05–16–85	10	2.5	120	2.1	37	6.0	3.4	0.1	1.6
Croweburg Coal Pond 7	08–21–85	6.0	8.4	120	<0.1	36	6.7	4.0	0.2	1.4
Croweburg Coal Pond 7	08–21–85	22	0.3	150	<0.1	45	8.0	4.8	0.2	1.4
Croweburg Coal Pond 8	05–16–85	10	8.2	300	2.1	84	23	6.5	0.2	1.7
Croweburg Coal Pond 8	08–15–85	2.0	7.4	330	2.1	91	24	7.1	0.2	2.4
Croweburg Coal Pond 8	08–15–85	18	0.3	460	1.3	130	32	11	0.2	3.8
Iron Post Coal Pond 1	05–06–85	4.0	13.0	1500	2.3	320	160	9.7	0.1	1.5
Iron Post Coal Pond 1	05–06–85	14	5.0	1500	<0.1	330	160	11	0.1	2.0
Iron Post Coal Pond 1	08–08–85	4.0	6.7	1600	<0.1	360	160	12	0.1	2.9

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Bicarbonate water wh fet field (mg/L as HCO_3)	Alkalinity wat wh tot fet field (mg/L as $CaCO_3$)	Sulfate dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Silica, dissolved (mg/L as SiO_2)	Solids, residue at 180 °C dissolved (mg/L)	Solids, sum of constituents, dissolved (mg/L)
Croweburg Coal Pond 2	04–05–85	18	280	230	250	4.4	6.7	634	584
Croweburg Coal Pond 2	08–01–85	2.0	190	153	170	4.7	1.8	440	386
Croweburg Coal Pond 2	08–01–85	15	220	184	190	4.5	12	542	519
Croweburg Coal Pond 3	04–09–85	2.0	98	80	160	5.9	0.80	358	310
Croweburg Coal Pond 3	04–09–85	20	140	115	320	30	5.4	646	607
Croweburg Coal Pond 3	08–01–85	1.0	96	79	170	11	3.6	368	333
Croweburg Coal Pond 3	08–01–85	14	210	172	500	25	5.5	1000	895
Croweburg Coal Pond 4	04–08–85	4.0	170	138	260	10	3.2	574	506
Croweburg Coal Pond 4	08–07–85	5.0	220	182	270	10	2.5	588	547
Croweburg Coal Pond 4	08–07–85	16	500	410	490	13	7.6	1010	1060
Croweburg Coal Pond 5	04–11–85	3.0	140	118	850	5.8	0.30	1440	1250
Croweburg Coal Pond 5	04–11–85	30	200	167	1100	6.2	1.0	1860	1630
Croweburg Coal Pond 5	08–14–85	13	130	110	820	7.4	0.30	1330	1220
Croweburg Coal Pond 5	08–14–85	28	490	391	1800	7.7	2.9	2940	2740
Croweburg Coal Pond 6	05–08–85	9.0	74	61	96	3.9	0.30	206	199
Croweburg Coal Pond 6	08–13–85	4.0	76	62	100	3.9	1.8	212	207
Croweburg Coal Pond 7	05–16–85	10	82	67	42	2.9	3.9	168	137
Croweburg Coal Pond 7	08–21–85	6.0	82	67	58	2.7	3.6	158	153
Croweburg Coal Pond 7	08–21–85	22	150	126	35	2.8	7.4	178	185
Croweburg Coal Pond 8	05–16–85	10	16	13	290	2.2	1.4	466	417
Croweburg Coal Pond 8	08–15–85	2.0	18	15	320	6.0	1.6	532	462
Croweburg Coal Pond 8	08–15–85	18	130	108	420	3.7	1.4	730	689
Iron Post Coal Pond 1	05–06–85	4.0	90	74	1500	5.2	2.0	2400	2040
Iron Post Coal Pond 1	05–06–85	14	130	108	1500	7.1	3.0	2450	2080
Iron Post Coal Pond 1	08–08–85	4.0	120	97	1600	8.8	6.1	2250	2210

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Local identifier	Station number	Reservoir depth (feet)	Specific conductance (µS/cm)	pH water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)
Iron Post Coal Pond 2	05–02–85	4.0	23N–16E–14 B	362832095343101	21.0	1170	7.5	20.5	48.0
Iron Post Coal Pond 2	05–02–85	20	23N–16E–14 B	362832095343101	21.0	1700	7.2	16.5	48.0
Iron Post Coal Pond 2	08–12–85	4.0	23N–16E–14	362834095342901	20.0	1790	7.8	29.5	51.0
Iron Post Coal Pond 2	08–12–85	20	23N–16E–14 B	362832095343101	21.0	2110	7.3	24.0	48.0
Iron Post Coal Pond 3	04–09–85	8.0	23N–16E–26 A	362644095334101	13.0	450	7.6	12.5	6.0
Iron Post Coal Pond 3	08–12–85	4.0	23N–16E–26 A	362644095334101	10.5	385	8.3	29.0	24.0
Iron Post Coal Pond 4	05–14–85	2.0	23N–16E–27 D	362634095350201	18.0	958	7.8	21.0	26.0
Iron Post Coal Pond 4	05–14–85	17	23N–16E–27 D	362634095350201	18.0	1180	7.4	12.0	26.0
Iron Post Coal Pond 4	08–06–85	4.0	23N–16E–27 D	362632095350201	16.5	1100	7.9	28.5	30.0
Iron Post Coal Pond 5	05–10–85	2.0	23N–16E–35 B	362605095342101	13.0	943	7.6	19.5	90.0
Iron Post Coal Pond 5	05–10–85	12	23N–16E–35 B	362605095342101	13.0	1420	7.2	15.5	90.0
Iron Post Coal Pond 5	08–06–85	2.0	23N–16E–35 B	362609095342301	14.0	1240	8.0	28.0	63.0
Iron Post Coal Pond 6	05–08–85	2.0	25N–17E–02 B	364051095274001	21.0	1570	8.4	21.5	96.0
Iron Post Coal Pond 6	05–08–85	20	25N–17E–02 B	364051095274001	21.0	2740	7.2	15.0	96.0
Iron Post Coal Pond 6	08–20–85	6.0	25N–17E–02	364052095274001	13.0	2770	7.6	26.5	126
Iron Post Coal Pond 6	08–20–85	12	25N–17E–02	364052095274001	13.0	3420	6.8	21.0	126
Iron Post Coal Pond 7	05–15–85	4.0	25N–17E–22 B	363825095284601	9.0	1440	7.5	20.0	22.0
Iron Post Coal Pond 7	08–20–85	2.0	25N–17E–22 B	363825095284601	9.5	1720	7.6	26.5	36.0
Iron Post Coal Pond 8	05–09–85	4.0	26N–18E–22 B	364329095221601	8.0	2920	7.0	16.5	>96.0
Iron Post Coal Pond 8	08–19–85	2.0	26N–18E–22 B	364329095221601	10.0	3710	7.8	21.5	72.0
McAlester Coal Pond 1	03–14–85	3.0	06N–21E–15 D	345906095043201	36.0	258	8.6	14.5	39.0
McAlester Coal Pond 1	03–14–85	30	06N–21E–15 D	345906095043201	36.0	306	7.9	5.5	39.0
McAlester Coal Pond 1	07–18–85	5.0	06N–21E–15 D	345906095042401	39.0	269	8.5	30.0	21.0
McAlester Coal Pond 1	07–18–85	38	06N–21E–15 D	345906095042401	39.0	595	7.0	8.0	21.0

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Oxygen, dissolved (mg/L)	Hardness total (mg/L as $CaCO_3$)	Acidity (mg/L as $CaCO_3$)	Calcium dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio	Potassium, dissolved (mg/L as K)
Iron Post Coal Pond 2	05–02–85	4.0	7.7	680	<0.1	150	74	47	0.8	2.5
Iron Post Coal Pond 2	05–02–85	20	3.7	1000	<0.1	220	120	53	0.7	2.6
Iron Post Coal Pond 2	08–12–85	4.0	7.2	950	<0.1	200	110	87	1	3.6
Iron Post Coal Pond 2	08–12–85	20	—	—	—	—	—	—	—	—
Iron Post Coal Pond 3	04–09–85	8.0	8.9	190	<0.1	56	11	8.0	0.3	1.4
Iron Post Coal Pond 3	08–12–85	4.0	12.3	170	<0.1	50	12	9.6	0.3	1.7
Iron Post Coal Pond 4	05–14–85	2.0	7.5	460	<0.1	100	52	25	0.5	3.0
Iron Post Coal Pond 4	05–14–85	17	1.4	580	13	120	68	46	0.8	3.2
Iron Post Coal Pond 4	08–06–85	4.0	8.7	620	<0.1	140	65	34	0.6	3.4
Iron Post Coal Pond 5	05–10–85	2.0	7.8	470	1.6	96	56	33	0.7	3.3
Iron Post Coal Pond 5	05–10–85	12	3.0	790	3.6	150	100	42	0.7	3.7
Iron Post Coal Pond 5	08–06–85	2.0	8.5	600	<0.1	110	80	42	0.7	4.2
Iron Post Coal Pond 6	05–08–85	2.0	9.2	950	2.1	190	120	14	0.2	1.4
Iron Post Coal Pond 6	05–08–85	20	1.6	1800	2.6	360	220	23	0.2	2.2
Iron Post Coal Pond 6	08–20–85	6.0	7.4	1700	<0.1	360	200	20	0.2	3.6
Iron Post Coal Pond 6	08–20–85	12	0.7	1800	<0.1	360	210	21	0.2	2.7
Iron Post Coal Pond 7	05–15–85	4.0	5.4	880	<0.1	240	68	11	0.2	3.6
Iron Post Coal Pond 7	08–20–85	2.0	10.8	1000	1.6	270	88	14	0.2	4.6
Iron Post Coal Pond 8	05–09–85	4.0	13.2	1600	15	360	160	96	1	3.4
Iron Post Coal Pond 8	08–19–85	2.0	7.2	1700	1.6	380	190	130	1	4.4
McAlester Coal Pond 1	03–14–85	3.0	10.8	120	<0.1	24	14	16	0.6	2.2
McAlester Coal Pond 1	03–14–85	30	7.5	140	<0.1	28	18	19	0.7	2.4
McAlester Coal Pond 1	07–18–85	5.0	6.8	99	<0.1	20	12	14	0.6	1.9
McAlester Coal Pond 1	07–18–85	38	0.2	220	<0.1	42	28	31	0.9	2.4

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Bicarbonate water wh fet field (mg/L as HCO_3)	Alkalinity wat wh tot fet field (mg/L as $CaCO_3$)	Sulfate dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Silica, dissolved (mg/L as SiO_2)	Solids, residue at 180 °C dissolved (mg/L)	Solids, sum of constituents, dissolved (mg/L)
Iron Post Coal Pond 2	05-02-85	4.0	220	179	600	11	6.8	1120	999
Iron Post Coal Pond 2	05-02-85	20	250	205	1100	12	6.8	1910	1640
Iron Post Coal Pond 2	08-12-85	4.0	270	225	890	17	7.5	1570	1450
Iron Post Coal Pond 2	08-12-85	20	—	—	—	—	—	—	—
Iron Post Coal Pond 3	04-09-85	8.0	140	116	90	4.9	7.1	268	248
Iron Post Coal Pond 3	08-12-85	4.0	150	126	68	5.6	4.8	246	228
Iron Post Coal Pond 4	05-14-85	2.0	160	131	400	9.9	2.4	756	671
Iron Post Coal Pond 4	05-14-85	17	310	251	420	12	7.0	928	835
Iron Post Coal Pond 4	08-06-85	4.0	150	120	540	12	3.6	—	870
Iron Post Coal Pond 5	05-10-85	2.0	200	164	360	9.4	3.5	708	660
Iron Post Coal Pond 5	05-10-85	12	240	197	680	9.1	5.0	1260	1110
Iron Post Coal Pond 5	08-06-85	2.0	250	204	470	8.7	5.0	890	843
Iron Post Coal Pond 6	05-08-85	2.0	68	56	920	5.8	2.0	1460	1280
Iron Post Coal Pond 6	05-08-85	20	190	154	1800	5.1	6.6	2930	2520
Iron Post Coal Pond 6	08-20-85	6.0	120	102	1600	4.9	12	2670	2260
Iron Post Coal Pond 6	08-20-85	12	230	189	1900	5.2	11	3080	2630
Iron Post Coal Pond 7	05-15-85	4.0	160	128	760	9.8	3.8	1350	1170
Iron Post Coal Pond 7	08-20-85	2.0	120	102	870	8.0	1.4	1500	1320
Iron Post Coal Pond 8	05-09-85	4.0	390	321	1600	15	5.2	2840	2430
Iron Post Coal Pond 8	08-19-85	2.0	500	407	1800	16	4.9	3030	2770
McAlester Coal Pond 1	03-14-85	3.0	120	100	32	4.4	1.2	168	152
McAlester Coal Pond 1	03-14-85	30	170	138	41	4.9	2.6	204	200
McAlester Coal Pond 1	07-18-85	5.0	128	109	30	8.3	0.80	168	150
McAlester Coal Pond 1	07-18-85	38	260	256	54	6.0	5.5	340	301

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Local identifier	Station number	Reservoir depth (feet)	Specific conductance (µS/cm)	pH water whole field (standard units)	Temperature water (°C)	Transparency (Secchi disk) (in.)
McAlester Coal Pond 2	03–19–85	2.0	08N–20E–24 B	350930095085901	29.0	117	7.9	15.0	18.0
McAlester Coal Pond 2	03–19–85	26	08N–20E–24 B	350930095085901	29.0	143	7.9	7.0	18.0
McAlester Coal Pond 2	07–30–85	3.0	08N–20E–24 B	350924095091801	24.0	133	8.2	30.5	—
McAlester Coal Pond 2	07–30–85	24	08N–20E–24 B	350924095091801	24.0	263	6.9	11.0	—
McAlester Coal Pond 3	04–24–85	0.5	08N–21E–10 C	351038095051401	37.0	570	7.7	22.5	3.0
McAlester Coal Pond 3	07–30–85	4.0	08N–21E–10 C	351038095051401	40.0	707	8.0	29.5	3.0
McAlester Coal Pond 4	04–25–85	2.0	08N–23E–35 D	350708094502901	20.0	495	6.5	22.0	42.0
McAlester Coal Pond 4	04–25–85	20	08N–23E–35 D	350708094503201	20.0	739	5.9	12.5	42.0
McAlester Coal Pond 4	07–23–85	6.0	08N–23E–35 D	350708094503201	19.0	495	6.7	31.0	—
McAlester Coal Pond 5	04–25–85	5.0	09N–21E–05 C	351637095065001	80.0	3200	8.0	22.0	66.0
McAlester Coal Pond 5	04–25–85	45	09N–21E–05 C	351637095065001	80.0	3900	7.3	13.0	66.0
McAlester Coal Pond 5	07–24–85	5.0	09N–21E–05 C	351639095064601	82.0	3790	8.5	30.5	84.0
McAlester Coal Pond 5	07–24–85	80	09N–21E–05 C	351639095064601	82.0	5330	7.6	10.0	84.0
McAlester Coal Pond 6	04–24–85	5.0	10N–21E–33 C	351743095054301	29.0	2220	8.4	21.0	84.0
McAlester Coal Pond 6	04–24–85	25	10N–21E–33 C	351743095054301	29.0	3260	7.3	10.5	84.0
McAlester Coal Pond 6	07–25–85	4.0	10N–21E–33 C	351743095053901	21.0	1990	8.1	30.0	—
McAlester Coal Pond 7	03–21–85	4.0	10N–22E–16 D	352001094583701	13.0	237	7.4	12.5	12.0
McAlester Coal Pond 7	07–31–85	2.0	10N–22E–16 D	352001094583501	11.0	327	8.0	31.0	36.0
McAlester Coal Pond 8	03–07–85	3.0	11N–19E–36 D	352244095143601	26.0	800	7.2	12.0	24.0
McAlester Coal Pond 8	03–07–85	20	11N–19E–36 D	352244095143601	26.0	—	—	—	24.0
McAlester Coal Pond 8	07–31–85	3.0	11N–19E–36 D	352244095143601	24.0	1600	8.0	29.5	—
McAlester Coal Pond 8	07–31–85	21	11N–19E–36 D	352244095143601	24.0	2360	7.3	15.5	—
McAlester Coal Pond 9	03–18–85	2.0	11N–20E–19 A	352507095134101	12.0	392	7.9	15.0	18.0
McAlester Coal Pond 9	07–22–85	6.0	11N–20E–19 A	352506095134101	18.5	537	7.3	30.5	56.0
McAlester Coal Pond 9	07–22–85	18	11N–20E–19 A	352506095134101	18.5	1350	6.9	15.0	56.0

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Oxygen, dissolved (mg/L)	Hardness total (mg/L as $CaCO_3$)	Acidity (mg/L as $CaCO_3$)	Calcium dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio	Potassium, dissolved (mg/L as K)
McAlester Coal Pond 2	03–19–85	2.0	10.2	49	1.8	10	5.8	9.1	0.6	2.2
McAlester Coal Pond 2	03–19–85	26	5.8	—	—	—	—	—	—	—
McAlester Coal Pond 2	07–30–85	3.0	7.6	41	<0.1	7.8	5.2	7.8	0.5	1.7
McAlester Coal Pond 2	07–30–85	24	0.3	88	<0.1	17	11	13	0.6	1.8
McAlester Coal Pond 3	04–24–85	0.5	8.8	55	12	10	7.4	94	5	1.8
McAlester Coal Pond 3	07–30–85	4.0	7.2	58	1.3	11	7.3	93	5	2.3
McAlester Coal Pond 4	04–25–85	2.0	9.0	170	2.9	32	23	20	0.7	2.1
McAlester Coal Pond 4	04–25–85	20	8.4	250	0.8	47	33	26	0.7	2.4
McAlester Coal Pond 4	07–23–85	6.0	6.4	200	1.3	36	26	23	0.7	2.7
McAlester Coal Pond 5	04–25–85	5.0	10.3	250	<0.1	51	30	820	23	2.4
McAlester Coal Pond 5	04–25–85	45	3.6	340	5.0	82	34	890	21	2.4
McAlester Coal Pond 5	07–24–85	5.0	8.0	160	<0.1	13	30	920	32	2.8
McAlester Coal Pond 5	07–24–85	80	0.2	520	<0.1	130	48	1000	19	2.9
McAlester Coal Pond 6	04–24–85	5.0	9.1	460	<0.1	64	72	360	7	2.6
McAlester Coal Pond 6	04–24–85	25	3.5	840	14	140	120	510	8	3.4
McAlester Coal Pond 6	07–25–85	4.0	7.8	490	<0.1	64	81	420	8	3.6
McAlester Coal Pond 7	03–21–85	4.0	9.4	—	1.3	—	—	—	—	—
McAlester Coal Pond 7	07–31–85	2.0	10.8	110	<0.1	17	16	18	0.8	3.5
McAlester Coal Pond 8	03–07–85	3.0	—	300	<0.1	56	38	74	2	2.8
McAlester Coal Pond 8	03–07–85	20	—	550	3.6	100	74	140	3	2.8
McAlester Coal Pond 8	07–31–85	3.0	8.1	620	<0.1	85	98	170	3	2.6
McAlester Coal Pond 8	07–31–85	21	0.2	870	<0.1	150	120	200	3	2.8
McAlester Coal Pond 9	03–18–85	2.0	10.6	170	1.6	38	18	20	0.7	2.1
McAlester Coal Pond 9	07–22–85	6.0	8.4	210	<0.1	48	23	25	0.7	2.2
McAlester Coal Pond 9	07–22–85	18	1.2	600	<0.1	130	67	48	0.9	2.5

Table 12. Concentrations of major dissolved chemical constituents and selected physical constituents for samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Bicarbonate water wh fet field (mg/L as HCO_3)	Alkalinity wat wh tot fet field (mg/L as $CaCO_3$)	Sulfate dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Silica, dissolved (mg/L as SiO_2)	Solids, residue at 180 °C dissolved (mg/L)	Solids, sum of constituents, dissolved (mg/L)
McAlester Coal Pond 2	03–19–85	2.0	52	43	22	4.4	7.0	108	88
McAlester Coal Pond 2	03–19–85	26	62	51	24	3.4	—	90	—
McAlester Coal Pond 2	07–30–85	3.0	68	56	18	8.2	2.4	94	85
McAlester Coal Pond 2	07–30–85	24	120	100	33	2.8	5.4	142	146
McAlester Coal Pond 3	04–24–85	0.5	40	33	160	33	8.0	370	337
McAlester Coal Pond 3	07–30–85	4.0	64	53	160	32	2.7	342	340
McAlester Coal Pond 4	04–25–85	2.0	6	5	220	6.7	0.30	352	308
McAlester Coal Pond 4	04–25–85	20	8	7	280	2.4	0.40	438	396
McAlester Coal Pond 4	07–23–85	6.0	10	8	230	1.9	1.8	352	327
McAlester Coal Pond 5	04–25–85	5.0	1100	905	1200	7.8	6.0	2770	2660
McAlester Coal Pond 5	04–25–85	45	1330	1090	1400	11	7.0	3300	3080
McAlester Coal Pond 5	07–24–85	5.0	1040	854	1200	7.9	6.9	2790	2690
McAlester Coal Pond 5	07–24–85	80	1450	1190	1800	12	8.9	3760	3720
McAlester Coal Pond 6	04–24–85	5.0	400	328	870	2.9	0.40	1640	1570
McAlester Coal Pond 6	04–24–85	25	840	692	1300	3.5	4.6	2510	2500
McAlester Coal Pond 6	07–25–85	4.0	450	405	980	12	2.9	1770	1780
McAlester Coal Pond 7	03–21–85	4.0	74	61	57	9.9	—	160	—
McAlester Coal Pond 7	07–31–85	2.0	92	75	55	13	4.2	188	172
McAlester Coal Pond 8	03–07–85	3.0	200	164	250	3.0	3.0	558	526
McAlester Coal Pond 8	03–07–85	20	420	344	480	3.3	4.2	1110	1010
McAlester Coal Pond 8	07–31–85	3.0	490	400	560	3.3	1.7	1110	1160
McAlester Coal Pond 8	07–31–85	21	750	615	730	3.6	5.7	1390	1590
McAlester Coal Pond 9	03–18–85	2.0	60	49	140	1.7	2.0	238	251
McAlester Coal Pond 9	07–22–85	6.0	98	80	190	2.0	1.2	376	340
McAlester Coal Pond 9	07–22–85	18	360	294	480	1.6	6.3	1010	937

Table 13. Concentrations of selected plant nutrients in water samples from study ponds
[mg/L, milligrams per liter; --, missing value]

Local identifier	Date	Sam-pling depth (feet)	Station number	Nitrogen, ammonia dissolved (mg/L as N)	Nitrogen, ammonia total (mg/L as N)	Nitrogen, ammonia + organic dis. (mg/L as N)	Nitrogen, ammonia + organic total (mg/L as N)	Nitrogen, ammonia dissolved (mg/L as NH_4)
Control Pond 1	07-23-85	4.00	351037094513301	0.050	--	0.40	--	0.06
Control Pond 1	07-23-85	16.0	351032094513401	2.60	--	4.2	--	3.3
Control Pond 2	07-17-85	0.50	351629095175201	--	0.060	--	4.4	--
Control Pond 3	07-25-85	2.00	351720094430301	0.070	--	0.40	--	0.09
	07-25-85	18.0		0.370	--	0.80	--	0.48
Control Pond 4	08-16-85	3.00	363503095231901	0.050	--	0.50	--	0.06
	08-16-85	26.0		1.60	--	2.2	--	2.1
Control Pond 6	08-15-85	4.00	365253095185201	0.050	--	0.60	--	0.06
	08-15-85	16.0		0.060	--	0.40	--	0.08
Croweburg Coal Pond 1	08-13-85	4.00	360704095433601	0.060	--	0.40	--	0.08
	08-13-85	22.0		6.70	--	7.1	--	8.6
Croweburg Coal Pond 2	08-01-85	2.00	361604095400401	0.030	--	<0.20	--	0.04
	08-01-85	15.0		0.520	--	1.8	--	0.67
Croweburg Coal Pond 3	08-01-85	1.00	362335095364901	0.070	--	1.0	--	0.09
	08-01-85	14.0		0.060	--	0.30	--	0.08
Croweburg Coal Pond 4	08-07-85	5.00	362845095312801	0.040	--	0.30	--	0.05
	08-07-85	16.0		1.80	--	1.9	--	2.3
Croweburg Coal Pond 5	08-14-85	13.0	363327095293101	0.060	--	0.30	--	0.08
	08-14-85	28.0		0.690	--	1.2	--	0.89
Croweburg Coal Pond 6	08-13-85	4.00	363650095251801	0.050	--	0.30	--	0.06
	08-13-85	24.0		0.820	--	1.1	--	1.1
Croweburg Coal Pond 7	08-21-85	6.00	364754095174201	0.030	--	0.30	--	0.04
	08-21-85	22.0	0.580	--	0.80	--	0.75	
Croweburg Coal Pond 8	08-15-85	2.00	365427095124001	0.070	--	0.40	--	0.09
	08-15-85	18.0		1.20	--	1.5	--	1.5

Table 13. Concentrations of selected plant nutrients in water samples from study ponds--Continued

Date	Nitrogen dis-solved (mg/L as N)	Nitrogen, organic dis-solved (mg/L as N)	Nitrogen, nitrate dis-solved (mg/L as N)	Nitrogen, nitrite dis-solved (mg/L as N)	Nitrogen, NO_2+NO_3 dis-solved (mg/L as N)	Nitrogen, NO_2+NO_3 total (mg/L as N)	Phos-phorus dis-solved (mg/L as P)	Phos-phorus total (mg/L as P)	Phos-phorus ortho, dis-solved (mg/L as P)	Phos-phorus ortho total (mg/L as P)	Phos-phorus total (mg/L as PO_4)
07-23-85	--	0.35	--	<0.010	<0.100	<0.100	<0.010	0.020	<0.010	--	--
07-23-85	--	1.6	--	<0.010	<0.100	<0.100	0.030	0.150	0.020	--	--
07-17-85	--	--	--	--	--	<0.100	--	0.420	--	0.070	1.3
07-25-85	--	0.33	--	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	--	--
07-25-85	--	0.43	--	<0.010	<0.100	<0.100	<0.010	0.050	<0.010	--	--
08-16-85	--	0.45	--	<0.010	<0.100	<0.100	<0.010	0.010	0.010	--	--
08-16-85	--	0.60	--	<0.010	<0.100	<0.100	0.010	0.030	<0.010	--	--
08-15-85	--	0.55	--	<0.010	<0.100	<0.100	0.020	0.010	<0.010	--	--
08-15-85	--	0.34	--	<0.010	<0.100	1.10	<0.010	0.010	<0.010	--	--
08-13-85	0.57	0.34	--	<0.010	0.170	<0.100	0.010	0.090	<0.010	--	0.28
08-13-85	--	0.40	--	0.010	<0.100	<0.100	1.50	1.60	1.20	--	4.9
08-01-85	--	--	--	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	--	--
08-01-85	2.3	1.3	--	<0.010	0.520	1.40	<0.010	0.090	<0.010	--	0.28
08-01-85	--	0.93	--	0.020	<0.100	<0.100	0.010	<0.010	<0.010	--	--
08-01-85	--	0.24	--	<0.010	<0.100	<0.100	<0.010	0.020	<0.010	--	0.06
08-07-85	0.40	0.26	--	<0.010	0.100	0.100	<0.010	0.010	0.010	--	--
08-07-85	--	0.10	--	<0.010	<0.100	<0.100	<0.010	0.060	0.010	--	--
08-14-85	--	0.24	--	<0.010	<0.100	<0.100	0.010	0.010	<0.010	--	--
08-14-85	--	0.51	--	<0.010	<0.100	<0.100	0.010	0.020	<0.010	--	--
08-13-85	--	0.25	--	<0.010	<0.100	<0.100	<0.010	0.020	<0.010	--	--
08-13-85	--	0.28	--	<0.010	<0.100	<0.100	0.010	0.020	<0.010	--	0.06
08-21-85	--	0.27	--	<0.010	<0.100	<0.100	0.020	0.040	<0.010	--	0.12
08-21-85	--	0.22	--	<0.010	<0.100	<0.100	0.040	0.150	<0.050	--	0.46
08-15-85	--	0.33	--	<0.010	<0.100	<0.100	0.010	0.010	0.010	--	--
08-15-85	--	0.30	--	<0.010	<0.100	<0.100	<0.010	0.050	<0.010	--	--

Table 13. Concentrations of selected plant nutrients in water samples from study ponds--Continued

Local identifier	Date	Sam-pling depth (feet)	Station number	Nitrogen, ammonia dissolved (mg/L as N)	Nitrogen, ammonia total (mg/L as N)	Nitrogen, ammonia + organic dis. (mg/L as N)	Nitrogen, ammonia + organic total (mg/L as N)	Nitrogen, ammonia dissolved (mg/L as NH_4)
Iron Post Coal Pond 1	08-08-85	4.00	363022095324701	0.090	--	0.50	--	0.12
Iron Post Coal Pond 2	08-12-85	4.00	362834095342901	0.050	--	0.40	--	0.06
	08-12-85	20.0	362832095343101	--	0.100	--	0.50	--
Iron Post Coal Pond 3	08-12-85	4.00	362644095334101	0.030	--	0.50	--	0.04
	08-12-85	8.00		0.050	--	0.40	--	0.06
Iron Post Coal Pond 4	08-06-85	4.00	362632095350201	0.140	--	2.4	--	0.18
	08-06-85	14.0		1.10	--	1.4	--	1.4
Iron Post Coal Pond 5	08-06-85	2.00	362609095342301	0.040	--	0.40	--	0.05
Iron Post Coal Pond 6	08-20-85	6.00	364052095274001	0.090	--	0.50	--	0.12
	08-20-85	12.0		0.160	--	0.40	--	0.21
Iron Post Coal Pond 7	08-20-85	2.00	363825095284601	0.060	--	0.60	--	0.08
Iron Post Coal Pond 8	08-19-85	2.00	364329095221601	0.160	--	0.90	--	0.21
McAlester Coal Pond 1	07-18-85	5.00	345906095042401	--	0.030	--	0.40	--
	07-18-85	38.0		--	2.40	--	2.6	--
McAlester Coal Pond 2	07-30-85	3.00	350924095091801	0.030	--	0.20	--	0.04
McAlester Coal Pond 2	07-30-85	24.0	350924095091801	0.370	--	1.2	--	0.48
McAlester Coal Pond 3	07-30-85	4.00	351046095050801	0.330	--	0.70	--	0.42
	07-30-85	22.0		0.140	--	3.1	--	0.18
McAlester Coal Pond 4	07-23-85	6.00	350708094502901	0.020	--	0.20	--	0.03
McAlester Coal Pond 5	07-24-85	5.00	351639095064601	0.070	--	0.40	--	0.09
	07-24-85	80.0		1.90	--	1.9	--	2.4
McAlester Coal Pond 6	07-25-85	4.00	351743095053901	0.040	--	0.80	--	0.05
McAlester Coal Pond 7	07-31-85	2.00	352001094583501	0.950	--	2.0	--	1.2
McAlester Coal Pond 8	07-31-85	3.00	352244095143601	0.010	--	0.30	--	0.01
	07-31-85	21.0		0.600	--	1.6	--	0.77
McAlester Coal Pond 9	07-22-85	6.00	352506095134101	0.030	--	0.40	--	0.04
	07-22-85	18.0		2.60	--	2.8	--	3.3

Table 13. Concentrations of selected plant nutrients in water samples from study ponds--Continued

Date	Nitrogen dis-solved (mg/L as N)	Nitrogen, organic dis-solved (mg/L as N)	Nitrogen, nitrate dis-solved (mg/L as N)	Nitrogen, nitrite dis-solved (mg/L as N)	Nitrogen, NO_2+NO_3 dis-solved (mg/L as N)	Nitrogen, NO_2+NO_3 total (mg/L as N)	Phos-phorus dis-solved (mg/L as P)	Phos-phorus total (mg/L as P)	Phos-phorus ortho, dis-solved (mg/L as P)	Phos-phorus ortho total (mg/L as P)	Phos-phorus total (mg/L as PO_4)
08-08-85	--	0.41	--	<0.010	<0.100	<0.100	<0.010	0.020	0.010	--	0.06
08-12-85	--	0.35	--	<0.010	<0.100	<0.100	<0.010	0.010	0.010	--	--
08-12-85	--	--	--	--	--	<0.100	--	0.010	--	0.010	--
08-12-85	0.62	0.47	0.110	0.010	0.120	0.100	0.010	0.030	0.010	--	--
08-12-85	0.60	0.35	0.170	0.030	0.200	0.200	<0.010	0.070	<0.010	--	--
08-06-85	3.0	2.3	0.540	0.020	0.560	0.500	0.050	0.020	0.030	--	0.06
08-06-85	--	0.30	--	0.010	<0.100	<0.100	0.010	0.030	0.010	--	--
08-06-85	--	0.36	--	<0.010	<0.100	<0.100	<0.010	0.010	0.010	--	--
08-20-85	--	0.41	--	<0.010	<0.100	<0.100	0.020	0.040	<0.010	--	0.12
08-20-85	--	0.24	--	<0.010	<0.100	<0.100	0.060	0.050	<0.010	--	0.15
08-20-85	--	0.54	--	<0.010	<0.100	<0.100	0.020	0.030	<0.010	--	0.09
08-19-85	2.1	0.74	1.19	0.010	1.20	1.30	0.020	0.030	<0.010	--	0.09
07-18-85	--	--	--	--	--	<0.100	--	0.020	--	0.010	0.06
07-18-85	--	--	--	--	--	<0.100	--	0.060	--	0.010	0.18
07-30-85	--	0.17	--	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	--	--
07-30-85	2.8	0.83	--	<0.010	1.60	<0.100	<0.010	0.040	<0.010	--	0.12
07-30-85	4.0	0.37	3.19	0.110	3.30	3.20	0.010	0.100	<0.010	--	0.31
07-30-85	6.1	3.0	2.98	0.020	3.00	3.00	0.080	0.370	0.020	--	1.1
07-23-85	--	0.18	--	<0.010	<0.100	--	0.010	--	<0.010	--	--
07-24-85	--	0.33	--	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	--	--
07-24-85	--	--	--	<0.010	<0.100	<0.100	0.020	0.020	0.010	--	--
07-25-85	--	0.76	--	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	--	--
07-31-85	2.1	1.0	0.070	0.060	0.130	<0.100	0.020	0.010	0.010	--	0.03
07-31-85	1.1	0.29	0.800	0.020	0.820	0.900	<0.010	0.030	0.010	--	0.09
07-31-85	2.3	1.0	0.730	0.010	0.740	0.700	0.020	<0.010	0.010	--	--
07-22-85	--	0.37	--	<0.010	<0.100	<0.100	<0.010	<0.010	<0.010	--	--
07-22-85	--	0.20	--	<0.010	<0.100	<0.100	<0.010	0.070	<0.010	--	--

Table 14. Concentrations of trace elements in water samples from study ponds
[mg/L, micrograms per liter; --, missing value; <, less than]

Pond name	Date	Sampling depth (feet)	Local identifier	Station number	Aluminum, total recoverable (µg/L as Al)	Aluminum, dissolved (µg/L as Al)	Arsenic total (µg/L as As)	Arsenic dissolved (µg/L as As)	Barium, total recoverable (µg/L as Ba)
Control Pond 1	04–23–85	2.0	08N–23E–10 D	351032094513301	<140	<140	<10	<10	20
	04–23–85	16	08N–23E–10 D		380	<140	<10	<10	90
Control Pond 1	07–23–85	4.0	08N–23E–10 D	351037094513301	150	<140	<10	<10	40
Control Pond 1	07–23–85	16	08N–23E–10 D	351032094513401	2,200	<140	<10	<10	600
Control Pond 2	03–14–85	0.5	09N–19E–09 A	351629095175201	1,100	380	<10	<10	70
	07–17–85	0.5	09N–19E–09 A		230	<140	<10	<10	70
Control Pond 3	04–23–85	1.0	09N–24E–01 B	351720094430301	<140	<140	<10	<10	20
	04–23–85	18	09N–24E–01 B		<140	<140	<10	<10	60
	07–25–85	2.0	09N–24E–01 B		<140	<140	<10	<10	30
	07–25–85	18	09N–24E–01 B		6,600	<140	<10	<10	200
Control Pond 4	05–02–85	10	24N–18E–04 D	363503095231901	510	<140	<10	<10	30
	08–16–85	3.0	24N–18E–04 D		230	<140	<10	<10	60
	08–16–85	26	24N–18E–04 D		--	--	--	--	--
Control Pond 5	05–02–85	4.0	24N–18E–20 D	363236095240101	<140	<140	<10	<10	20
Control Pond 5	08–16–85	2.0	24N–18E–20 D	363238095240401	<140	<140	<10	<10	10
Control Pond 6	05–01–85	2.0	28N–19E–30 B	365252095185301	--	<140	--	<10	--
Control Pond 6	08–15–85	4.0	28N–19E–30 B	365253095185201	210	<140	<10	<10	60
	08–15–85	14	28N–19E–30 B		--	--	--	--	--
Croweburg Coal Pond 1	04–04–85	2.0	19N–15E–20	360637095435501	280	<140	<10	<10	60
	04–04–85	20	19N–15E–20		230	150	<10	<10	60
	08–13–85	4.0	19N–15E–20	360704095433601	<140	--	<10	<10	40
	08–13–85	22	19N–15E–20		<140	<140	<10	<10	60
Croweburg Coal Pond 2	04–05–85	2.0	21N–15E–25 C	361604095395901	150	<140	<10	<10	80
	04–05–85	10	21N–15E–25 C		390	<140	<10	<10	100

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Barium, dissolved (µg/L as Ba)	Boron, total recoverable (µg/L as B)	Boron, dissolved (µg/L as B)	Cadmium total recoverable (µg/Las Cd)	Cadmium dissolved (µg/L as Cd)	Chromium, total recoverable (µg/L as Cr)	Chromium, dissolved (µg/L as Cr)
Control Pond 1	04–23–85	2.0	40	30	<10	<1	<0.5	<31	<10
	04–23–85	16	90	30	<10	<1	<0.5	130	<10
Control Pond 1	07–23–85	4.0	20	40	30	1	<0.5	<14	<10
Control Pond 1	07–23–85	16	360	30	40	<1	0.6	<14	<10
Control Pond 2	03–14–85	0.5	40	50	30	<1	1.2	<14	<10
	07–17–85	0.5	20	60	40	1	<0.5	<14	<10
Control Pond 3	04–23–85	1.0	30	40	40	<1	<0.5	<31	<10
	04–23–85	18	30	40	40	<1	1.9	<31	<10
	07–25–85	2.0	30	40	50	<1	<0.5	<14	<10
	07–25–85	18	110	40	40	2	<0.5	27	<10
Control Pond 4	05–02–85	10	40	70	60	<1	<0.5	<31	<10
	08–16–85	3.0	50	70	50	<1	<0.5	<14	<10
	08–16–85	26	--	--	--	--	--	--	--
Control Pond 5	05–02–85	4.0	20	30	30	<1	<0.5	<31	<10
Control Pond 5	08–16–85	2.0	20	30	30	<1	<0.5	<14	<10
Control Pond 6	05–01–85	2.0	50	--	40	--	<0.5	--	<10
Control Pond 6	08–15–85	4.0	50	40	30	<1	0.5	<14	<10
	08–15–85	14	--	--	--	--	--	--	--
Croweburg Coal Pond 1	04–04–85	2.0	50	120	320	<1	<0.5	<31	<10
	04–04–85	20	40	220	280	<1	1.0	<31	<10
	08–13–85	4.0	40	170	160	2	4.0	<14	<10
	08–13–85	22	40	360	320	2	5.5	<14	<10
Croweburg Coal Pond 2	04–05–85	2.0	60	90	110	<1	<0.5	<31	<10
	04–05–85	10	70	130	120	3	<0.5	<31	<10

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Copper, total recoverable (µg/L as Cu)	Copper, dissolved (µg/L as Cu)	Iron, total recoverable (µg/L as Fe)	Iron, dissolved (µg/L as Fe)	Lead, total recoverable (µg/L as Pb)	Lead, dissolved (µg/L as Pb)	Manganese, total recoverable (µg/L as Mn)
Control Pond 1	04–23–85	2.0	<35	<14	330	230	<180	<100	190
	04–23–85	16	<35	<14	110	1,900	<180	<100	3,000
Control Pond 1	07–23–85	4.0	<14	<14	790	70	<100	<100	820
Control Pond 1	07–23–85	16	<14	<14	34,000	16,000	<100	<100	16,000
Control Pond 2	03–14–85	0.5	<14	<14	1,200	590	<100	<100	110
	07–17–85	0.5	<14	<14	1,500	20	<100	<100	450
Control Pond 3	04–23–85	1.0	<35	<14	70	<10	<180	<100	10
	04–23–85	18	<35	<14	190	40	<180	<100	70
	07–25–85	2.0	<14	<14	80	10	<100	<100	30
	07–25–85	18	18	<14	28,000	1,100	<100	<100	11,000
Control Pond 4	05–02–85	10	<35	<14	450	<10	<180	<100	840
	08–16–85	3.0	<14	<14	160	<10	<100	<100	60
	08–16–85	26	--	--	--	--	--	--	--
Control Pond 5	05–02–85	4.0	<35	<14	400	180	<180	<100	100
Control Pond 5	08–16–85	2.0	<14	<14	260	80	<100	<100	40
Control Pond 6	05–01–85	2.0	--	<14	--	10	--	<100	--
Control Pond 6	08–15–85	4.0	28	<14	170	<10	<100	<100	40
	08–15–85	14	--	--	--	--	--	--	--
Croweburg Coal Pond 1	04–04–85	2.0	<35	<14	280	<10	<180	<100	250
	04–04–85	20	<35	<14	910	240	<180	<100	4,200
	08–13–85	4.0	<14	<14	70	<10	<100	<100	90
	08–13–85	22	<14	<14	1,300	220	<100	<100	5,400
Croweburg Coal Pond 2	04–05–85	2.0	<35	<14	250	<10	<180	<100	30
	04–05–85	10	<35	<14	310	18	<180	<100	670

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Manganese, dissolved (µg/L as Mn)	Mercury total recoverable (µg/L as Hg)	Mercury dissolved (µg/L as Hg)	Selenium, total (µg/L as Se)	Selenium, dissolved (µg/L as Se)	Zinc, total recoverable (µg/L as Zn)	Zinc, dissolved (µg/L as Zn)
Control Pond 1	04–23–85	2.0	400	<0.50	<0.5	<5	<5	<20	<12
	04–23–85	16	2,900	<0.50	<0.5	<5	<5	20	<12
Control Pond 1	07–23–85	4.0	100	0.20	--	<5	<5	20	<12
Control Pond 1	07–23–85	16	14,000	0.10	--	<5	<5	20	<12
Control Pond 2	03–14–85	0.5	40	--	--	<5	<5	20	110
	07–17–85	0.5	<10	0.50	--	<5	<5	20	<12
Control Pond 3	04–23–85	1.0	<10	<0.50	<0.5	<5	<5	20	<12
	04–23–85	18	50	<0.50	<0.5	<5	<5	<20	13
	07–25–85	2.0	10	0.30	--	<5	<5	<10	<12
	07–25–85	18	10,000	0.30	--	<5	<5	90	<12
Control Pond 4	05–02–85	10	650	<0.50	<0.5	<5	<5	<20	<12
	08–16–85	3.0	50	--	<0.1	<5	<5	10	<12
	08–16–85	26	--	0.20	--	--	--	--	--
Control Pond 5	05–02–85	4.0	70	<0.50	<0.5	<5	<5	<20	<12
Control Pond 5	08–16–85	2.0	<10	--	--	<5	<5	<10	<12
Control Pond 6	05–01–85	2.0	<10	--	<0.5	--	<5	--	<12
Control Pond 6	08–15–85	4.0	<10	--	<0.1	<5	<5	10	<12
	08–15–85	14	--	<0.10	--	--	--	--	--
Croweburg Coal Pond 1	04–04–85	2.0	180	<0.50	<0.5	<5	<5	20	<12
	04–04–85	20	3,600	<0.50	<0.5	<5	<5	30	<12
	08–13–85	4.0	<10	<0.10	<0.1	<5	<5	<10	<12
	08–13–85	22	5,400	0.30	--	<5	<5	130	<12
Croweburg Coal Pond 2	04–05–85	2.0	10	<0.50	<0.5	<5	<5	10	<12
	04–05–85	10	600	<0.50	<0.5	<5	<5	20	<12

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Local identifier	Station number	Aluminum, total recoverable (µg/L as Al)	Aluminum, dissolved (µg/L as Al)	Arsenic total (µg/L as As)	Arsenic dissolved (µg/L as As)	Barium, total recoverable (µg/L as Ba)
Croweburg Coal Pond 2	04–05–85	18	21N–15E–25 C	361604095400401	<140	<140	<10	<10	100
	08–01–85	2.0	21N–15E–25 C		<140	<140	<10	<10	60
	08–01–85	15	21N–15E–25 C		370	<140	<10	<10	200
Croweburg Coal Pond 3	04–09–85	2.0	22N–16E–16 B	362333095365101	--	<140	--	<10	--
	04–09–85	20	22N–16E–16 B		<140	<140	<10	<10	80
	08–01–85	1.0	22N–16E–16 B	362335095364901	<140	<140	<10	<10	60
	08–01–85	14	22N–16E–16 B		230	<140	<10	<10	70
Croweburg Coal Pond 4	04–08–85	4.0	23N–17E–17 B	362840095312701	180	<140	<10	<10	60
	08–07–85	5.0	23N–17E–17 B	362845095312801	280	<140	<10	<10	60
	08–07–85	16	23N–17E–17 B		<140	<140	<10	<10	70
Croweburg Coal Pond 5	04–11–85	3.0	24N–17E–16 D	363327095293101	<140	<140	<10	<10	90
	04–11–85	30	24N–17E–16 D		290	<140	<10	<10	80
	08–14–85	13	24N–17E–16 D		<140	<140	<10	<10	70
	08–14–85	28	24N–17E–16 D		<140	150	<10	<10	70
Croweburg Coal Pond 6	05–08–85	9.0	25N–18E–30 D	363649095251801	170	<140	<10	<10	60
	08–13–85	4.0	25N–18E–30 D	363650095251801	380	<140	<10	<10	80
Croweburg Coal Pond 6	08–13–85	24	25N–18E–30 D	363650095251801	--	--	--	--	--
Croweburg Coal Pond 7	05–16–85	10	27N–19E–29 A	364754095174201	960	<140	<10	<10	50
	08–21–85	6.0	27N–19E–29 A		410	<140	<10	<10	80
	08–21–85	22	27N–19E–29 A		460	<140	<10	<10	90
Croweburg Coal Pond 8	05–16–85	10	28N–29E–18	365433095124101	<140	<140	<10	<10	30
	08–15–85	2.0	28N–29E–18	365427095124001	260	<140	<10	<10	70
	08–15–85	18	28N–29E–18		--	<140	--	<10	--
Iron Post Coal Pond 1	05–06–85	4.0	23N–16E–01 A	363021095325201	<140	250	10	<10	30
	05–06–85	14	23N–16E–01 A		170	190	10	<10	30

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Barium, dissolved (µg/L as Ba)	Boron, total recoverable (µg/L as B)	Boron, dissolved (µg/L as B)	Cadmium total recoverable (µg/Las Cd)	Cadmium dissolved (µg/L as Cd)	Chromium, total recoverable (µg/L as Cr)	Chromium, dissolved (µg/L as Cr)
Croweburg Coal Pond 2	04–05–85	18	90	130	130	<1	<0.5	<31	<10
	08–01–85	2.0	60	120	120	1	1.8	<14	<10
	08–01–85	15	210	140	120	2	2.6	<14	<10
Croweburg Coal Pond 3	04–09–85	2.0	50	--	60	--	<0.5	--	<10
	04–09–85	20	70	70	60	<1	<0.5	<31	<10
	08–01–85	1.0	70	80	70	1	0.6	<14	<10
	08–01–85	14	70	110	100	<1	2.1	<14	<10
Croweburg Coal Pond 4	04–08–85	4.0	60	60	60	<1	<0.5	<31	<10
	08–07–85	5.0	60	90	80	2	3.2	<14	<10
	08–07–85	16	70	90	90	2	2.4	<14	<10
Croweburg Coal Pond 5	04–11–85	3.0	60	320	360	<1	<0.5	<31	<10
	04–11–85	30	50	360	420	<1	<0.5	<31	<10
	08–14–85	13	70	310	320	2	2.4	<14	<10
	08–14–85	28	60	620	580	3	3.2	<14	<10
Croweburg Coal Pond 6	05–08–85	9.0	50	40	40	<1	<0.5	<31	<10
	08–13–85	4.0	80	60	40	<1	1.2	<14	<10
Croweburg Coal Pond 6	08–13–85	24	--	--	--	--	--	--	--
Croweburg Coal Pond 7	05–16–85	10	40	40	40	<1	<0.5	<31	<10
	08–21–85	6.0	70	50	40	<1	<0.5	<14	<10
	08–21–85	22	80	50	40	<1	<0.5	<14	<10
Croweburg Coal Pond 8	05–16–85	10	40	40	40	<1	<0.5	<31	<10
	08–15–85	2.0	60	40	30	6	6.0	<14	<10
	08–15–85	18	90	--	60	--	<0.5	--	<10
Iron Post Coal Pond 1	05–06–85	4.0	30	50	40	1	<0.5	<31	<10
	05–06–85	14	30	40	50	<1	<0.5	<31	<10

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Copper, total recoverable (µg/L as Cu)	Copper, dissolved (µg/L as Cu)	Iron, total recoverable (µg/L as Fe)	Iron, dissolved (µg/L as Fe)	Lead, total recoverable (µg/L as Pb)	Lead, dissolved (µg/L as Pb)	Manganese, total recoverable (µg/L as Mn)
Croweburg Coal Pond 2	04–05–85	18	<35	<14	580	180	<180	<100	4,800
	08–01–85	2.0	<14	<14	20	<10	<100	<100	20
	08–01–85	15	<14	<14	830	90	<100	<100	20,000
Croweburg Coal Pond 3	04–09–85	2.0	--	<14	--	10	--	<100	--
	04–09–85	20	<35	<14	610	200	<180	<100	3,000
	08–01–85	1.0	<14	<14	50	10	<100	<100	20
	08–01–85	14	<14	<14	360	<10	<100	<100	3,900
Croweburg Coal Pond 4	04–08–85	4.0	<35	<14	150	<10	<180	<100	30
	08–07–85	5.0	<14	<14	230	<10	<100	<100	40
	08–07–85	16	<14	<14	1,400	600	<100	<100	6,500
Croweburg Coal Pond 5	04–11–85	3.0	<35	<14	110	<10	<180	<100	30
	04–11–85	30	<35	<14	260	<10	<180	<100	2,100
	08–14–85	13	<14	<14	20	10	<100	<100	30
	08–14–85	28	<14	<14	3,400	1,000	<100	<100	12,000
Croweburg Coal Pond 6	05–08–85	9.0	<35	<14	160	<10	<180	<100	20
	08–13–85	4.0	<14	<14	440	40	<100	<100	40
Croweburg Coal Pond 6	08–13–85	24	--	--	--	--	--	--	--
Croweburg Coal Pond 7	05–16–85	10	<35	<14	1,700	20	<180	<100	70
	08–21–85	6.0	<14	<14	430	20	<100	<100	30
	08–21–85	22	<14	<14	2,000	450	<100	<100	5,100
Croweburg Coal Pond 8	05–16–85	10	<35	<14	130	<10	<180	<100	220
	08–15–85	2.0	<14	<14	250	10	<100	<100	760
	08–15–85	18	--	<14	--	720	--	<100	--
Iron Post Coal Pond 1	05–06–85	4.0	<35	<14	120	<10	<180	<100	60
	05–06–85	14	<35	<14	120	<10	<180	<100	3,000

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Manganese, dissolved (µg/L as Mn)	Mercury total recoverable (µg/L as Hg)	Mercury dissolved (µg/L as Hg)	Selenium, total (µg/L as Se)	Selenium, dissolved (µg/L as Se)	Zinc, total recoverable (µg/L as Zn)	Zinc, dissolved (µg/L as Zn)
Croweburg Coal Pond 2	04–05–85	18	4,600	<0.50	<0.5	<5	<5	<20	<12
	08–01–85	2.0	<10	--	0.2	<5	<5	20	<12
	08–01–85	15	20,000	0.30	--	<5	<5	<10	<12
Croweburg Coal Pond 3	04–09–85	2.0	<10	<0.50	<0.5	--	<5	--	<12
	04–09–85	20	2,900	<0.50	<0.5	<5	<5	10	<12
	08–01–85	1.0	10	--	--	<5	<5	<10	<12
	08–01–85	14	4,000	0.10	--	<5	<5	<10	<12
Croweburg Coal Pond 4	04–08–85	4.0	30	<0.50	<0.5	<5	<5	20	35
	08–07–85	5.0	10	--	0.1	<5	<5	<10	<12
	08–07–85	16	6,700	0.20	--	<5	<5	20	<12
Croweburg Coal Pond 5	04–11–85	3.0	20	<0.50	<0.5	<5	<5	--	<12
	04–11–85	30	2,000	<0.50	<0.5	<5	<5	20	16
	08–14–85	13	10	--	<0.1	<5	<5	<10	<12
	08–14–85	28	12,000	0.40	--	<5	<5	30	<12
Croweburg Coal Pond 6	05–08–85	9.0	<10	<0.50	<0.5	<5	<5	20	<12
	08–13–85	4.0	10	<0.10	--	<5	<5	10	<12
Croweburg Coal Pond 6	08–13–85	24	--	<0.10	--	--	--	--	--
Croweburg Coal Pond 7	05–16–85	10	10	<0.50	<0.5	<5	<5	<20	<12
	08–21–85	6.0	110	0.40	<0.1	<5	<5	<10	<12
	08–21–85	22	4,800	0.20	--	<5	<5	<10	<12
Croweburg Coal Pond 8	05–16–85	10	190	<0.50	<0.5	<5	<5	<20	<12
	08–15–85	2.0	740	<0.10	0.3	<5	<5	<10	<12
	08–15–85	18	21,000	0.20	--	--	<5	--	<12
Iron Post Coal Pond 1	05–06–85	4.0	20	<0.50	<0.5	35	36	30	<12
	05–06–85	14	2,200	<0.50	<0.5	15	18	20	<12

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Local identifier	Station number	Aluminum, total recoverable (µg/L as Al)	Aluminum, dissolved (µg/L as Al)	Arsenic total (µg/L as As)	Arsenic dissolved (µg/L as As)	Barium, total recoverable (µg/L as Ba)
Iron Post Coal Pond 1	08–08–85	4.0	23N–16E–01 A	363022095324701	<140	160	10	<10	40
Iron Post Coal Pond 2	05–02–85	4.0	23N–16E–14 B	362832095343101	340	<140	<10	<10	30
	05–02–85	20	23N–16E–14 B		--	210	--	<10	--
	08–12–85	4.0	23N–16E–14	362834095342901	<140	<140	<10	<10	40
	08–12–85	20	23N–16E–14 B	362832095343101	210	--	<10	--	40
Iron Post Coal Pond 3	04–09–85	8.0	23N–16–26 A	362644095334101	2,500	<140	<10	<10	60
	08–12–85	4.0	23N–16–26 A		350	<140	<10	<10	80
	08–12–85	8.0	23N–16–26 A		--	--	--	--	--
Iron Post Coal Pond 4	05–14–85	2.0	23N–16E–27 D	362634095350201	410	<140	<10	<10	200
	05–14–85	17	23N–16E–27 D		330	<140	<10	<10	80
	08–06–85	4.0	23N–16E–27 D	362632095350201	<140	<140	<10	<10	80
	08–06–85	14	23N–16E–27 D		--	--	--	--	--
Iron Post Coal Pond 5	05–10–85	2.0	23N–16E–35 B	362605095342101	<140	<140	<10	<10	30
	05–10–85	12	23N–16E–35 B		1100	<140	<10	<10	80
	08–06–85	2.0	23N–16E–35 B	362609095342301	--	<140	--	<10	--
Iron Post Coal Pond 6	05–08–85	2.0	25N–17E–02 B	364051095274001	<140	<140	<10	<10	30
	05–08–85	20	25N–17E–02 B		690	180	<10	<10	40
	08–20–85	6.0	25N–17E–02	364052095274001	<140	<140	<10	<10	50
	08–20–85	12	25N–17E–02		<140	180	<10	<10	40
Iron Post Coal Pond 7	05–15–85	4.0	25N–17E–22 B	363825095284601	250	<140	<10	<10	70
	08–20–85	2.0	25N–17E–22 B		<140	<140	<10	<10	40
Iron Post Coal Pond 8	05–09–85	4.0	26N–18E–22 B	364329095221601	230	210	<10	<10	20
	08–19–85	2.0	26N–18E–22 B		<140	220	<10	<10	40
McAlester Coal Pond 1	03–14–85	3.0	06Nê21E–15 D	345906095043201	260	<140	<10	<10	40
	03–14–85	30	06Nê21E–15 D		<140	<140	<10	<10	70

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Barium, dissolved (µg/L as Ba)	Boron, total recoverable (µg/L as B)	Boron, dissolved (µg/L as B)	Cadmium total recoverable (µg/Las Cd)	Cadmium dissolved (µg/L as Cd)	Chromium, total recoverable (µg/L as Cr)	Chromium, dissolved (µg/L as Cr)
Iron Post Coal Pond 1	08–08–85	4.0	40	60	40	1	2.3	<14	<10
Iron Post Coal Pond 2	05–02–85	4.0	40	160	150	1	<0.5	<31	<10
	05–02–85	20	30	--	150	--	<0.5	--	<10
	08–12–85	4.0	40	250	230	8	7.4	<14	<10
	08–12–85	20	--	240	--	10	--	<14	--
Iron Post Coal Pond 3	04–09–85	8.0	50	60	40	<1	<0.5	<31	<10
	08–12–85	4.0	70	70	40	<1	0.9	<14	<10
	08–12–85	8.0	--	--	--	--	--	--	--
Iron Post Coal Pond 4	05–14–85	2.0	60	100	90	<1	<0.5	<31	<10
	05–14–85	17	70	140	120	<1	<0.5	<31	<10
	08–06–85	4.0	80	120	120	<1	1.0	<14	<10
	08–06–85	14	--	--	--	--	--	--	--
Iron Post Coal Pond 5	05–10–85	2.0	30	130	120	<1	<0.5	<31	<10
	05–10–85	12	40	140	120	<1	<0.5	<31	<10
	08–06–85	2.0	40	--	150	--	2.0	--	<10
Iron Post Coal Pond 6	05–08–85	2.0	40	40	40	<1	<0.5	<31	<10
	05–08–85	20	30	50	40	<1	<0.5	<31	<10
	08–20–85	6.0	40	40	40	<1	<0.5	<14	<10
	08–20–85	12	30	50	30	2	<0.5	<14	<10
Iron Post Coal Pond 7	05–15–85	4.0	30	50	40	<1	<0.5	<31	<10
	08–20–85	2.0	30	60	50	<1	<0.5	<14	<10
Iron Post Coal Pond 8	05–09–85	4.0	10	220	180	3	3.2	<31	<10
	08–19–85	2.0	30	270	260	3	2.1	<14	<10
McAlester Coal Pond 1	03–14–85	3.0	30	100	90	<1	0.8	<31	<10
	03–14–85	30	50	140	200	<1	<0.5	<31	<10

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Copper, total recoverable (µg/L as Cu)	Copper, dissolved (µg/L as Cu)	Iron, total recoverable (µg/L as Fe)	Iron, dissolved (µg/L as Fe)	Lead, total recoverable (µg/L as Pb)	Lead, dissolved (µg/L as Pb)	Manganese, total recoverable (µg/L as Mn)
Iron Post Coal Pond 1	08–08–85	4.0	<14	<14	60	<10	<100	<100	130
Iron Post Coal Pond 2	05–02–85	4.0	<35	<14	270	<10	<180	<100	10
	05–02–85	20	--	<14	--	<10	<180	<100	--
	08–12–85	4.0	17	<14	80	10	<100	<100	40
	08–12–85	20	<14	--	260	--	<100	--	400
Iron Post Coal Pond 3	04–09–85	8.0	<35	<14	1,300	10	<180	<100	50
	08–12–85	4.0	<14	<14	280	<10	<100	<100	20
	08–12–85	8.0	--	--	--	--	--	--	--
Iron Post Coal Pond 4	05–14–85	2.0	<35	<14	310	<10	<180	<100	110
	05–14–85	17	<35	<14	1,700	1,200	<180	<100	6,300
	08–06–85	4.0	<14	<14	100	<10	<100	<100	60
	08–06–85	14	--	--	--	--	--	--	--
Iron Post Coal Pond 5	05–10–85	2.0	<35	<14	60	<10	<180	<100	50
	05–10–85	12	<35	<14	1,700	20	<180	<100	840
	08–06–85	2.0	--	<14	--	20	--	<100	--
Iron Post Coal Pond 6	05–08–85	2.0	<35	<14	10	<10	<180	<100	150
	05–08–85	20	<35	<14	600	<10	<180	<100	9,200
	08–20–85	6.0	<14	<14	120	30	<100	<100	240
	08–20–85	12	<14	<14	310	150	<100	<100	2,400
Iron Post Coal Pond 7	05–15–85	4.0	<35	<14	330	<10	<180	<100	840
	08–20–85	2.0	<14	<14	100	<10	160	<100	370
Iron Post Coal Pond 8	05–09–85	4.0	<35	<14	80	10	<180	<100	260
	08–19–85	2.0	<14	<14	80	<10	<100	<100	60
McAlester Coal Pond 1	03–14–85	3.0	<35	<14	230	<10	<180	<100	20
	03–14–85	30	<35	<14	100	<10	<180	<100	1,200

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Manganese, dissolved (µg/L as Mn)	Mercury total recoverable (µg/L as Hg)	Mercury dissolved (µg/L as Hg)	Selenium, total (µg/L as Se)	Selenium, dissolved (µg/L as Se)	Zinc, total recoverable (µg/L as Zn)	Zinc, dissolved (µg/L as Zn)
Iron Post Coal Pond 1	08–08–85	4.0	10	--	<0.1	8	8	<10	<12
Iron Post Coal Pond 2	05–02–85	4.0	10	<0.50	<0.5	26	37	20	<12
	05–02–85	20	490	--	<0.5	--	34	--	<12
	08–12–85	4.0	10	<0.10	<0.1	21	21	20	<12
	08–12–85	20	--	<0.10	--	14	--	20	--
Iron Post Coal Pond 3	04–09–85	8.0	10	<0.50	<0.5	<5	<5	20	<12
	08–12–85	4.0	30	0.20	--	<5	<5	<10	<12
	08–12–85	8.0	--	0.20	--	--	--	--	--
Iron Post Coal Pond 4	05–14–85	2.0	10	<0.50	<0.5	<5	<5	<20	<12
	05–14–85	17	6,600	<0.50	<0.5	<5	<5	<20	13
	08–06–85	4.0	10	--	0.1	11	10	<10	<12
	08–06–85	14	--	<0.10	--	--	--	--	--
Iron Post Coal Pond 5	05–10–85	2.0	40	<0.50	<0.5	<5	<5	<20	<12
	05–10–85	12	780	<0.50	<0.5	<5	<5	20	12
	08–06–85	2.0	30	--	0.1	--	<5	--	<12
Iron Post Coal Pond 6	05–08–85	2.0	100	<0.50	<0.5	15	17	<20	<12
	05–08–85	20	8,600	<0.50	<0.5	<5	<5	30	<12
	08–20–85	6.0	220	--	<0.1	<5	<5	<10	<12
	08–20–85	12	2,200	0.30	--	<5	<5	<10	<12
Iron Post Coal Pond 7	05–15–85	4.0	420	<0.50	<0.5	<5	<5	<20	<12
	08–20–85	2.0	20	0.30	0.2	<5	<5	<10	<12
Iron Post Coal Pond 8	05–09–85	4.0	240	<0.50	<0.5	27	--	70	87
	08–19–85	2.0	60	0.10	<0.1	78	85	120	130
McAlester Coal Pond 1	03–14–85	3.0	10	<0.50	<0.5	<5	<5	<20	18
	03–14–85	30	950	<0.50	<0.5	<5	<5	20	<12

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Local identifier	Station number	Aluminum, total recoverable (μg/L as Al)	Aluminum, dissolved (μg/L as Al)	Arsenic total (μg/L as As)	Arsenic dissolved (μg/L as As)	Barium, total recoverable (μg/L as Ba)
McAlester Coal Pond 1	07–18–85	5.0	06N–21E–15 D	345906095042401	340	<140	<10	<10	60
	07–18–85	38	06N–21E–15 D		280	<140	<10	<10	100
McAlester Coal Pond 2	03–19–85	2.0	08N–20E–24 B	350930095085901	4,000	1400	<10	<10	50
	03–19–85	26	08N–20E–24 B		--	--	--	--	--
	07–30–85	3.0	08N–20E–24 B	350924095091801	270	<140	<10	<10	30
	07–30–85	24	08N–20E–24 B		--	<140	--	<10	--
McAlester Coal Pond 3	04–24–85	0.5	08N–21E–10 C	351038095051401	--	2,500	--	<10	--
	07–30–85	4.0	08N–21E–10 C		--	<140	--	<10	--
	07–30–85	22	08N–21E–10 C		--		--	--	--
McAlester Coal Pond 4	04–25–85	2.0	08N–23E–35 D	350708094502901	210	<140	<10	<10	30
	04–25–85	20	08N–23E–35 D	350708094503201	<140	<140	<10	<10	30
	07–23–85	6.0	08N–23E–35 D		160	<140	<10	<10	50
McAlester Coal Pond 5	04–25–85	5.0	09N–21E–05 C	351637095065001	<140	<140	<10	<10	20
	04–25–85	45	09N–21E–05 C		160	<140	<10	<10	20
	07–24–85	5.0	09N–21E–05 C	351639095064601	<140	<140	<10	<10	30
	07–24–85	80	09N–21E–05 C		<140	<140	<10	<10	30
McAlester Coal Pond 6	04–24–85	5.0	10N–21E–33 C	351743095054301	<140	<140	<10	<10	40
	04–24–85	25	10N–21E–33 C		<140	<140	<10	<10	50
	07–25–85	4.0	10N–21E–33 C	351743095053901	<140	<140	<10	<10	20
McAlester Coal Pond 7	03–21–85	4.0	10N–22E–16 D	352001094583701	3,000	--	<10	--	60
	07–31–85	2.0	10N–22E–16 D	352001094583501	140	<140	<10	<10	40
McAlester Coal Pond 8	03–07–85	3.0	11N–19E–36 D	352244095143601	1,000	<140	<10	<10	70
	03–07–85	20	11N–19E–36 D		3,400	<140	<10	<10	80
	07–31–85	3.0	11N–19E–36 D		680	<140	<10	<10	60
	07–31–85	21	11N–19E–36 D		<140	<140	<10	<10	50

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Barium, dissolved (µg/L as Ba)	Boron, total recoverable (µg/L as B)	Boron, dissolved (µg/L as B)	Cadmium total recoverable (µg/Las Cd)	Cadmium dissolved (µg/L as Cd)	Chromium, total recoverable (µg/L as Cr)	Chromium, dissolved (µg/L as Cr)
McAlester Coal Pond 1	07–18–85	5.0	50	120	110	<1	<0.5	<14	<10
	07–18–85	38	100	200	190	<1	<0.5	<14	<10
McAlester Coal Pond 2	03–19–85	2.0	20	40	30	<1	<0.5	<31	<10
	03–19–85	26	--	--	--	--	--	--	--
	07–30–85	3.0	20	50	40	1	1.3	<14	<10
	07–30–85	24	50	--	50	--	1.2	--	<10
McAlester Coal Pond 3	04–24–85	0.5	40	--	80	--	2.6	--	<10
	07–30–85	4.0	30	--	80	--	9.2	--	<10
		22	--	--	--	--	--	--	--
McAlester Coal Pond 4	04–25–85	2.0	30	50	20	<1	<0.5	<31	<10
	04–25–85	20	40	60	50	<1	<0.5	<31	<10
	07–23–85	6.0	30	70	50	<1	<0.5	<14	<10
McAlester Coal Pond 5	04–25–85	5.0	20	780	730	<1	<0.5	<31	<10
	04–25–85	45	20	850	810	<1	<0.5	<31	<10
	07–24–85	5.0	10	880	820	1	<0.5	<14	<10
	07–24–85	80	20	900	850	<1	<0.5	<14	<10
McAlester Coal Pond 6	04–24–85	5.0	40	300	280	<1	<0.5	<31	<10
	04–24–85	25	40	460	470	<1	<0.5	<31	<10
	07–25–85	4.0	20	390	400	<1	<0.5	<14	<10
McAlester Coal Pond 7	03–21–85	4.0	--	50	--	<1	--	<31	--
	07–31–85	2.0	40	60	60	<1	<0.5	<14	<10
McAlester Coal Pond 8	03–07–85	3.0	60	240	150	<1	1.4	<31	<10
	03–07–85	20	60	140	510	<1	0.5	<31	<10
	07–31–85	3.0	50	300	280	<1	<0.5	<14	<10
	07–31–85	21	40	380	350	1	0.9	<14	<10

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Copper, total recoverable (µg/L as Cu)	Copper, dissolved (µg/L as Cu)	Iron, total recoverable (µg/L as Fe)	Iron, dissolved (µg/L as Fe)	Lead, total recoverable (µg/L as Pb)	Lead, dissolved (µg/L as Pb)	Manganese, total recoverable (µg/L as Mn)
McAlester Coal Pond 1	07–18–85	5.0	<14	<14	300	20	<100	<100	26
	07–18–85	38	<14	<14	1,100	400	<100	<100	3,300
McAlester Coal Pond 2	03–19–85	2.0	<35	<14	1,600	730	<180	<100	20
	03–19–85	26	--	--	--	--	--	--	--
	07–30–85	3.0	<14	<14	170	40	<100	<100	10
	07–30–85	24	--	<14	--	20	--	<100	--
McAlester Coal Pond 3	04–24–85	0.5	--	<14	--	970	--	<100	--
	07–30–85	4.0	--	<14	--	60	--	<100	--
		22	--	--	--	--	--	--	--
McAlester Coal Pond 4	04–25–85	2.0	<35	<14	220	<10	<180	<100	550
	04–25–85	20	<35	<14	80	<10	<180	<100	1,000
	07–23–85	6.0	<14	<14	220	10	<100	<100	680
McAlester Coal Pond 5	04–25–85	5.0	<35	<14	110	<10	<180	<100	40
	04–25–85	45	<35	<14	130	<10	<180	<100	430
	07–24–85	5.0	<14	<14	90	10	<100	<100	10
	07–24–85	80	<14	<14	740	230	<100	<100	4,500
McAlester Coal Pond 6	04–24–85	5.0	<35	<14	90	<10	<180	<100	10
	04–24–85	25	<35	<14	330	<10	<180	<100	470
	07–25–85	4.0	<14	<14	20	10	<100	<100	30
McAlester Coal Pond 7	03–21–85	4.0	<35	--	1,200	--	<180	--	100
	07–31–85	2.0	<14	<14	130	40	<100	<100	100
McAlester Coal Pond 8	03–07–85	3.0	<35	<14	660	40	<180	<100	550
	03–07–85	20	<35	<14	2,100	<10	<180	<100	250
	07–31–85	3.0	<14	<14	600	20	<100	<100	300
	07–31–85	21	<14	<14	1,100	20	<100	<100	5,700

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Manganese, dissolved (µg/L as Mn)	Mercury total recoverable (µg/L as Hg)	Mercury dissolved (µg/L as Hg)	Selenium, total (µg/L as Se)	Selenium, dissolved (µg/L as Se)	Zinc, total recoverable (µg/L as Zn)	Zinc, dissolved (µg/L as Zn)
McAlester Coal Pond 1	07–18–85	5.0	<10	--	--	<5	<5	50	<12
	07–18–85	38	3,200	0.20	--	<5	<5	<10	16
McAlester Coal Pond 2	03–19–85	2.0	10	<0.50	<0.5	<5	<5	<20	<12
	03–19–85	26	--	<0.50	--	--	--	--	--
	07–30–85	3.0	<10	--	0.1	<5	<5	<10	<12
	07–30–85	24	2,100	0.20	--	--	<5	--	<12
McAlester Coal Pond 3	04–24–85	0.5	10	<0.50	<0.5	--	<5	--	<12
	07–30–85	4.0	10	--	--	--	<5	--	<12
		22	--	0.1	--	--	--	--	--
McAlester Coal Pond 4	04–25–85	2.0	490	<0.50	<0.5	<5	<5	<20	<12
	04–25–85	20	1,000	<0.50	<0.5	<5	<5	20	<12
	07–23–85	6.0	550	--	--	<5	<5	60	<12
McAlester Coal Pond 5	04–25–85	5.0	10	<0.50	<0.5	<5	<5	<20	<12
	04–25–85	45	340	<0.50	<0.5	<5	<5	<20	<12
	07–24–85	5.0	10	0.20	--	<5	<5	10	<12
	07–24–85	80	4,200	0.20	--	<5	<5	<10	<12
McAlester Coal Pond 6	04–24–85	5.0	<10	<0.50	<0.5	<5	<5	20	<12
	04–24–85	25	320	<0.50	<0.5	<5	<5	<20	<12
	07–25–85	4.0	<10	0.10	--	<5	<5	<10	<12
McAlester Coal Pond 7	03–21–85	4.0	--	<0.50	--	<5	--	<20	--
	07–31–85	2.0	10	0.20	--	<5	<5	<10	<12
McAlester Coal Pond 8	03–07–85	3.0	180	<0.50	<0.5	<5	<5	20	20
	03–07–85	20	530	<0.50	<0.5	<5	<5	20	12
	07–31–85	3.0	60	--	0.1	<5	<5	<10	<12
	07–31–85	21	5,400	0.10	--	<5	<5	10	<12

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Local identifier	Station number	Aluminum, total recoverable (µg/L as Al)	Aluminum, dissolved (µg/L as Al)	Arsenic total (µg/L as As)	Arsenic dissolved (µg/L as As)	Barium, total recoverable (µg/L as Ba)
McAlester Coal Pond 9	03–18–85	2.0	11N–20E–29 A	352507095134101	1,100	<140	<10	<10	80
	07–22–85	6.0	11N–20E–29 A	352506095134101	150	<140	<10	<10	80
	07–22–85	18	11N–20E–29 A		320	<140	<10	<10	200

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Barium, dissolved (µg/L as Ba)	Boron, total recoverable (µg/L as B)	Boron, dissolved (µg/L as B)	Cadmium total recoverable (µg/Las Cd)	Cadmium dissolved (µg/L as Cd)	Chromium, total recoverable (µg/L as Cr)	Chromium, dissolved (µg/L as Cr)
McAlester Coal Pond 9	03–18–85	2.0	60	40	30	<1	0.8	<31	<10
	07–22–85	6.0	70	60	20	<1	<0.5	<14	<10
	07–22–85	18	210	90	100	1	0.6	<14	<10

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Copper, total recoverable (µg/L as Cu)	Copper, dissolved (µg/L as Cu)	Iron, total recoverable (µg/L as Fe)	Iron, dissolved (µg/L as Fe)	Lead, total recoverable (µg/L as Pb)	Lead, dissolved (µg/L as Pb)	Manganese, total recoverable (µg/L as Mn)
McAlester Coal Pond 9	03–18–85	2.0	<35	<14	550	<10	<180	<100	40
	07–22–85	6.0	<14	<14	130	<10	<100	<100	50
	07–22–85	18	<14	<14	6,200	3,800	<100	<100	23,000

Table 14. Concentrations of trace elements in water samples from study ponds—Continued

Pond name	Date	Sampling depth (feet)	Manganese, dissolved (µg/L as Mn)	Mercury total recoverable (µg/L as Hg)	Mercury dissolved (µg/L as Hg)	Selenium, total (µg/L as Se)	Selenium, dissolved (µg/L as Se)	Zinc, total recoverable (µg/L as Zn)	Zinc, dissolved (µg/L as Zn)
McAlester Coal Pond 9	03–18–85	2.0	<10	<0.50	--	<5	<5	40	<12
	07–22–85	6.0	<10	0.30	--	<5	<5	20	<12
	07–22–85	18	21,000	0.20	--	<5	<5	<10	12

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds

[mL, milliliter; ft, foot: Percent, percent of total cells found in samples; <, less than]

	CONTROL POND 1 Collected July 23, 1985							
	Location 1		Location 2		Location 3		Location 4	
Site ID	351034094513001		351037094513301		351037094513301		351037094513301	
Time	1100		1205		1140		1227	
Depth	4.0 ft		4.0 ft		4.0 ft		4.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA (Green Algae)								
Chlorophyceae								
Chlorococcales								
Characiaceae								
Schroederia	0	0	250	<1	0	0	0	0
Chlorococcaceae								
Oocystaceae								
Ankistrodesmus	0	0	0	0	0	0	250	2
Chlorella	4,700	34	990	4	3,000	20	3,500	27
Volvocales								
Volvocaceae								
Gonium	250	2	0	0	0	0	0	0
Pandorina	250	2	0	0	0	0	990	8
Zygnematales								
Desmidiaceae								
Staurastrum	250	2	0	0	0	0	0	0
CYANOPHYTA (Blue-green Algae)								
Cyanophyceae								
Chroococcales								
Chroococcaceae								
Anacystis	4,000	29	6,900	25	5,900	39	7,200	55
Oscillatoriales	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0
Oscillatoria	0	0	0	0	250	2	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds —Continued

[mL, milliliter; ft, foot: Percent, percent of total cells found in samples; <, less than]

	CONTROL POND 1 Collected July 23, 1985							
	Location 1		Location 2		Location 3		Location 4	
Site ID	351034094513001		351037094513301		351037094513301		351037094513301	
Time	1100		1205		1140		1227	
Depth	4.0 ft		4.0 ft		4.0 ft		4.0 ft	
	Cells/mL	**Percent**	**Cells/mL**	**Percent**	**Cells/mL**	**Percent**	**Cells/mL**	**Percent**
PYRRHOPHYTA								
(Fire Algae)								
Dinophyceae								
Dinokontae								
Glenodiniaceae								
Glenodinium	4,400	31	20,000	71	5,700	38	1,200	9
Peridiniales								
Total cells/mL	14,000		28,000		15,000		13,000	
Total genra/mL	6		4		4		5	
Total genera in Control Pond 1: 9								

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CONTROL POND 2 Collected July 17, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	351625095175601		351625095175601		351625095175601		351625095175601		351625095175601	
Time	1200		1230		1252		1310		1320	
Depth	0.5 ft		0.5 ft		0.5 ft		0.5 ft		0.5 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)										
Bacillariophyceae										
Eupodiscales										
Coscinodiscaceae										
Melosira	2,200	<1	0	0	0	0	0	0	250	<1
Fragilariales										
Fragilariaceae										
Tabellaria	0	0	490	<1	0	0	0	0	0	0
Naviculales	0	0	0	0	0	0	0	0	0	0
Naviculaceae	0	0	0	0	0	0	0	0	0	0
Navicula	740	<1	990	<1	740	<1	250	<1	0	0
CHLOROPHYTA (Green Algae)										
Chlorophyceae										
Chlorococcales										
Characiaceae										
Schroederia	1,500	<1	4,000	2	4,700	2	2,200	<1	1,500	<1
Chlorococcaceae										
Hydrodictyaceae										
Pediastrum	0	0	1,200	<1	0	0	0	0	0	0
Oocystaceae										
Ankistrodesmus	9,5000	40	57,000	32	62,000	21	50,000	17	63,000	29
Chlorella	5,9000	25	53,000	29	170,000	59	180,000	62	68,000	31
Oocystis	3000	1	2,700	2	2,700	<1	3,000	1	0	0
Scenedesmaceae										
Scenedesmus	23,000	10	15,000	8	16,000	6	15,000	5	26,000	12
Tetrasporales										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CONTROL POND 2 Collected July 17, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	351625095175601		351625095175601		351625095175601		351625095175601		351625095175601	
Time	1200		1230		1252		1310		1320	
Depth	0.5 ft		0.5 ft		0.5 ft		0.5 ft		0.5 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
Gloeocystaceae										
Gloeocystis	0	0	0	0	0	0	1,200	<1	740	<1
Palmellaceae										
Volvocales										
Volvocaceae										
Gonium	0	0	4,200	2	4,400	2	4,700	2	2,700	1
Pleodorina	0	0	4,900	3	3,200	1	8,400	3	11,000	5
Volvox	1,200	<1	2,200	1	0	0	250	<1	0	0
Zygnematales										
Desmidiaceae										
Closterium	0	0	3,000	2	0	0	0	0	0	0
Staurastrum	1,200	<1	0	0	250	<1	490	<1	0	0
CHRYSOPHYTA (Yellow-green Algae)										
Bacillariophyceae										
Centrales										
Coscinodiscaceae										
Melosira	0	0	0	0	0	0	0	0	0	0
Pennales										
Naviculaceae	0	0	0	0	0	0	0	0	0	0
Navicula	0	0	0	0	0	0	0	0	0	0
Tabellariaceae										
Tabellaria	0	0	0	0	0	0	0	0	0	0
CYANOPHYTA (Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Anacystis	8,200	3	6,400	4	6,700	2	3,700	1	5,900	3
Nostocales										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CONTROL POND 2 Collected July 17, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	351625095175601		351625095175601		351625095175601		351625095175601		351625095175601	
Time	1200		1230		1252		1310		1320	
Depth	0.5 ft		0.5 ft		0.5 ft		0.5 ft		0.5 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
Nostocaceae										
Anabaena	3,500	1	1,200	<1	740	<1	250	<1	250	<1
Anabaenopsis	0	0	0	0	0	0	0	0	0	0
Oscillatoriales										
Anabaena	0	0	0	0	0	0	0	0	0	0
Anabaenopsis	14,000	6	10,000	6	13,000	4	12,000	4	13,000	6
PYRRHOPHYTA (Fire Algae)										
Dinophyceae										
Dinokontae										
Ceratiaceae										
Ceratium	0	0	0	0	0	0	0	0	0	0
Glenodiniaceae										
Glenodinium	0	0	0	0	0	0	0	0	0	0
Peridiniales										
Ceratiaceae										
Ceratium	4,200	2	0	0	250	<1	0	0	0	0
Glenodiniaceae										
Glenodinium	20,000	8	11,000	6	6,400	2	4,700	2	24,000	11
Total cells/mL	240,000		180,000		290,000		290,000		220,000	
Total genera/mL	14		16		14		15		12	
Total genera in Control Pond 2: 19										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CONTROL POND 3 Collected July 25, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	351718094430301		351718094430301		351719094430101		351719094430001		351719094430001	
Time	1220		1230		1240		1255		1310	
Depth	9.0 ft		8.0 ft		7.0 ft		6.0 ft		6.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA										
(Green Algae)										
Chlorophyceae										
Chlorococcales										
Hydrodictyaceae										
Pediastrum	200	2	0	0	0	0	0	0	0	0
Oocystaceae										
Chlorella	2,200	27	2,000	31	980	13	1,200	18	1,200	24
Scenedesmaceae										
Scenedesmus	0	0	0	0	200	3	0	0	0	0
Tetrasporales										
Gloeocystaceae										
Gloeocystis	3,300	40	2,000	31	1,600	22	2,000	29	1,600	32
Palmellaceae										
Volvocales										
Chlamydomonadaceae										
Chlamydomonas	390	5	390	6	780	11	780	11	0	0
Volvocaceae										
Volvox	200	2	200	3	0	0	0	0	0	0
Zygnematales										
Desmidiaceae										
Staurastrum	390	5	200	3	390	5	980	14	590	12

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CONTROL POND 3 Collected July 25, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	351718094430301		351718094430301		351719094430101		351719094430001		351719094430001	
Time	1220		1230		1240		1255		1310	
Depth	9.0 ft		8.0 ft		7.0 ft		6.0 ft		6.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CYANOPHYTA										
(Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Anacystis	1,200	14	1,600	25	1,800	25	1,800	26	1,400	28
EUGLENOPHYTA										
(Euglenoids)										
Euglenophyceae										
Euglenales	0	0	0	0	0	0	0	0	0	0
Euglenaceae	0	0	0	0	0	0	0	0	0	0
Euglena	0	0	0	0	390	5	0	0	200	4
Euglenamorpha	0	0	0	0	0	0	0	0	0	0
Phacus	390	5	0	0	0	0	0	0	0	0
PYRRHOPHYTA										
(Fire Algae)										
Dinophyceae										
Dinokontae										
Ceratiaceae										
Ceratium	0	0	0	0	0	0	0	0	0	0
Peridiniales										
Total cells/mL	8,300		6,400		7,300		6,800		5,000	
Total genrea/mL	8		6		8		5		5	
Total genera in Control Pond 3: 11										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CONTROL POND 4 Collected August 16, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	363503095231901		363503095231901		363503095231901		363503095231901		363503095232301	
Time	1120		1130		1140		1155		1205	
Depth	6.0 ft		6.0 ft		6.0 ft		6.0 ft		6.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA										
(Green Algae)										
Chlorophyceae										
Chlorococcales										
Oocystaceae										
Chlorella	1,800	40	3,900	64	4,100	65	2,500	61	3,700	63
CYANOPHYTA										
(Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Anacystis	2,500	56	2,200	36	2,200	35	1,600	39	2,200	37
PYRRHOPHYTA										
(Fire Algae)										
Dinophyceae										
Dinokontae										
Ceratiaceae										
Ceratium	200	4	0	0	0	0	0	0	0	0
Peridiniales										
Total cells/mL	4,500		6,100		6,300		4,100		5,900	
Total genera/mL	3		2		2		2		2	
Total genera in Control Pond 4: 3										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CONTROL POND 5 Collected August 16, 1985							
	Location 1		Location 2		Location 3		Location 4	
Site ID	363238095240401		363238095240401		363237095240101		363237095240101	
Time	1155		1220		1240		1300	
Depth	7.0 ft		7.0 ft		7.0 ft		6.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)								
Bacillariophyceae								
Fragilariales	0	0	0	0	0	0	0	0
Fragilariaceae	0	0	0	0	0	0	0	0
Fragilaria	0	0	0	0	590	8	0	0
Naviculales								
Cymbellaceae	0	0	0	0	0	0	0	0
Cymbella	0	0	0	0	200	3	0	0
CHLOROPHYTA (Green Algae)								
Chlorophyceae								
Chlorococcales								
Oocystaceae								
Ankistrodesmus	200	4	0	0	0	0	0	0
Chlorella	1,600	32	1,600	62	2,000	27	3,700	40
Volvocales								
Volvocaceae								
Eudorina	780	16	0	0	1,200	16	980	11
Zygnematales								
Desmidiaceae								
Cosmarium	0	0	0	0	590	8	590	6
Staurastrum	390	8	0	0	390	5	390	4

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CONTROL POND 5 Collected August 16, 1985							
	Location 1		Location 2		Location 3		Location 4	
Site ID	363238095240401		363238095240401		363237095240101		363237095240101	
Time	1155		1220		1240		1300	
Depth	7.0 ft		7.0 ft		7.0 ft		6.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHRYSOPHYTA								
(Yellow-green Algae)								
Bacillariophyceae								
Pennales								
Cymbellaceae	0	0	0	0	0	0	0	0
Cymbella	0	0	0	0	0	0	0	0
Fragilariaceae	0	0	0	0	0	0	0	0
Fragilaria	0	0	0	0	0	0	0	0
CYANOPHYTA								
(Blue-green Algae)								
Cyanophyceae								
Chroococcales								
Chroococcaceae								
Anacystis	2,000	40	980	38	1,800	24	2,500	27
Gloeocapsa	0	0	0	0	0	0	590	6
Gloeothece	0	0	0	0	590	8	590	6
Total cells/mL	5,000		2,600		7,400		9,300	
Total genera/mL	5		2		8		7	
Total genera in Control Pond 5: 10								

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CONTROL POND 6 Collected August 15, 1985													
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6		Location 7	
Site ID	365255095185301		365255095185301		365252095185101		365252095185101		365252095185101		365255095185101		365255095185101	
Time	1140		1145		1210		1225		1250		1310		1315	
Depth	4.0 ft		4.0 ft		4.0 ft		4.0 ft		4.0 ft		6.0 ft		1.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)														
Bacillariophyceae														
Fragilariales	0	0	0	0	0	0	0	0			0	0	0	0
Fragilariaceae	0	0	0	0	0	0	0	0			0	0	0	0
Fragilaria	0	0	200	4	0	0	0	0			0	0	0	0
Naviculales														
Naviculaceae	0	0	0	0	0	0	0	0			0	0	0	0
Navicula	0	0	200	4	0	0	0	0	200	5	200	3	200	3
CHLOROPHYTA (Green Algae)														
Chlorophyceae														
Chlorococcales														
Oocystaceae														
Chlorella	980	22	1,400	25	200	7	1,400	26	1,400	35	1,600	24	1,800	27
Scenedesmaceae														
Scenedesmus	0	0	0	0	0	0	0	0			200	3	0	0
Volvocales														
Chlamydomonadaceae														
Chlamydomonas	0	0	390	7	0	0	200	4			0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CONTROL POND 6 Collected August 15, 1985													
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6		Location 7	
Site ID	365255095185301		365255095185301		365252095185101		365252095185101		365252095185101		365255095185101		365255095185101	
Time	1140		1145		1210		1225		1250		1310		1315	
Depth	4.0 ft		4.0 ft		4.0 ft		4.0 ft		4.0 ft		6.0 ft		1.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHRYSOPHYTA (Yellow-green Algae)														
Bacillariophyceae														
Pennales														
Fragilariaceae	0	0	0	0	0	0	0	0			0	0	0	0
Fragilaria	0	0	0	0	0	0	0	0			0	0	0	0
Naviculaceae														
Navicula	0	0	0	0	0	0	0	0			0	0	0	0
Chrysophyceae														
Chromulinales														
Ochromonadaceae														
Dinobryon	780	18	780	14	780	26	980	18	1,600	40	1,800	27	980	15
Ochromonadales														
Dinobryaceae														
CYANOPHYTA (Blue-green Algae)														
Cyanophyceae														
Chroococcales														
Chroococcaceae														
Anacystis	2,200	50	2,700	47	2,000	67	2,000	37	200	5	1,600	24	2,900	43
Nostocales														
Nostocaceae														
Anabaena	200	5	0	0	0	0	0	0			0	0	200	3
Oscillatoriales	0	0	0	0	0	0	0	0			0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0			0	0	0	0
Oscillatoria	200	5	0	0	0	0	200	4			0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CONTROL POND 6 Collected August 15, 1985													
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6		Location 7	
Site ID	365255095185301		365255095185301		365252095185101		365252095185101		365252095185101		365255095185101		365255095185101	
Time	1140		1145		1210		1225		1250		1310		1315	
Depth	4.0 ft		4.0 ft		4.0 ft		4.0 ft		4.0 ft		6.0 ft		1.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
PYRRHOPHYTA (Fire Algae)														
Dinophyceae														
Dinokontae														
Peridiniaceae														
Peridinium	0	0	0	0	0	0	0	0	590	17	1,200	18	590	9
Peridiniales														
Total cells/mL	4,400		5,700		3,000		5,400		4,000		6,700		6,700	
Total genera/mL	5		6		3		6		5		6		6	
Total genera in Control Pond 6: 10														

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 1 Collected August 13, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	360655095435401		360655095435401		360704095433601		360704095433601		360704095433601		360709095433001	
Time	1115		1135		1200		1220		1257		1315	
Depth	2.0 ft		3.0 ft		4.0 ft		3.0 ft		4.0 ft		4.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)												
Bacillariophyceae												
Fragilariales												
Fragilariaceae												
Fragilaria	980	3	780	4	590	3	1,600	7	590	2	390	2
Naviculales												
Naviculaceae												
Navicula	0	0	200	1	0	0	0	0	0	0	0	0
CHLOROPHYTA (Green Algae)												
Chlorophyceae												
Chlorococcales												
Oocystaceae												
Ankistrodesmus	0	0	0	0	0	0	200	<1	0	0	0	0
Chlorella	9,800	34	4,500	24	590	3	0	0	4900	17	980	4
Ulotrichales												
Ulotrichaceae												
Geminella	0	0	0	0	390	2	0	0	0	0	0	0
Zygnematales												
Desmidiaceae												
Closterium	200	<1	200	1	390	2	200	<1	200	<1	0	0
CHRYSOPHYTA (Yellow-green Algae)												
Bacillariophyceae												
Pennales												
Fragilariaceae												
Fragilaria												
Naviculaceae												
Navicula												

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 1 Collected August 13, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	360655095435401		360655095435401		360704095433601		360704095433601		360704095433601		360709095433001	
Time	1115		1135		1200		1220		1257		1315	
Depth	2.0 ft		3.0 ft		4.0 ft		3.0 ft		4.0 ft		4.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CYANOPHYTA												
(Blue-green Algae)												
Cyanophyceae												
Chroococcales												
Chroococcaceae												
Anacystis	2,200	8	980	5	590	3	1,200	5	1,600	6	780	4
Nostocales												
Nostocaceae												
Anabaena	2,700	9	3,700	19	6,300	32	8,400	35	9,200	32	7,800	35
Aphanocapsa	0	0	0	0	590	3	590	3	390	1	0	0
Oscillatoriales												
Oscillatoriaceae												
Oscillatoria	13,000	45	8,600	45	11,000	55	12,000	50	13,000	45	12,000	55
Total cells/mL	29,000		19,000		20,000		24,000		29,000		22,000	
Total genera/mL	6		7		8		7		7		5	
Total genera in Croweburg Coal Pond 1: 10												

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 2 Collected August 01, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	361604095395901		361604095395901		361604095400401		361604095400401		361605952400701	
Time	1210		1220		1230		1235		1300	
Depth	5.0 ft		6.0 ft		5.0 ft		4.0 ft		5.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)										
Bacillariophyceae										
Naviculales										
Naviculaceae	0	0	0	0	0	0	0	0	0	0
Navicula	200	2	0	0	0	0	0	0	0	0
Pinnularia	0	0	0	0	0	0	0	0	200	1
CHLOROPHYTA (Green Algae)										
Chlorophyceae										
Chlorococcales										
Oocystaceae										
Ankistrodesmus	0	0	200	2	0	0	0	0	0	0
Chlorella	9,800	82	10,000	91	10,000	90	14,000	93	15,000	79
Ulotrichales										
Ulotrichaceae										
Geminella	980	8	0	0	0	0	0	0	590	3
CHRYSOPHYTA (Yellow-green Algae)										
Bacillariophyceae										
Pennales										
Naviculaceae										
Navicula	0	0	0	0	0	0	0	0	0	0
Pinnularia	0	0	0	0	0	0	0	0	0	0
CYANOPHYTA (Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Anacystis	590	5	590	5	980	8	1,400	9	1,400	7

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 2 Collected August 01, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	361604095395901		361604095395901		361604095400401		361604095400401		361605952400701	
Time	1210		1220		1230		1235		1300	
Depth	5.0 ft		6.0 ft		5.0 ft		4.0 ft		5.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
PYRRHOPHYTA										
(Fire Algae)										
Dinophyceae										
Dinocapsales										
Gloeodiniaceae										
Urococcus	0	0	0	0	0	0	0	0	200	1
Dinokontae										
Ceratiaceae										
Ceratium	0	0	0	0	0	0	0	0	0	0
Glenodiniaceae										
Glenodinium	0	0	0	0	0	0	0	0	0	0
Peridiniales										
Ceratiaceae										
Ceratium	0	0	0	0	200	2	0	0	980	5
Glenodiniaceae										
Glenodinium	0	0	0	0	0	0	0	0	390	2
Total cells/mL	12,000		11,000		11,000		15,000		19,000	
Total genera/mL	4		3		3		2		7	
Total genera in Croweburg Coal Pons 2: 9										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 3 Collected August 01, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	362335095364901		362335095364901		362335095364901		362335095364901		362331095365001		362331095365001	
Time	1215		1230		1220		1240		1245		1255	
Depth	4.0 ft		6.0 ft		10.0 ft		6.0 ft		10.0 ft		10.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)												
Bacillariophyceae												
Naviculales												
Naviculaceae	0	0	0	0	0	0	0	0	0	0	0	0
Navicula	390	5	590	6	390	4	390	5	0	0	0	0
Pleurosigma	0	0	590	6	1,200	11	0	0	0	0	0	0
CHLOROPHYTA (Green Algae)												
Chlorophyceae												
Chlorococcales												
Oocystaceae												
Ankistrodesmus	0	0	0	0	0	0	0	0	390	5	0	0
Chlorella	2,200	26	4,900	51	1,800	16	3,300	39	2,900	36	1,600	13
Scenedesmaceae												
Scenedesmus	0	0	0	0	0	0	0	0	0	0	200	2
Tetrasporales												
Gloeocystaceae												
Gloeocystis	980	12	0	0	0	0	980	12	0	0	0	0
Palmellaceae												
Ulotrichales												
Ulotrichaceae												
Geminella	1,600	19	1,400	14	1,600	15	1,800	21	1,800	22	780	7
Volvocales												
Volvocaceae												
Eudorina	0	0	200	2	0	0	0	0	0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 3 Collected August 01, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	362335095364901		362335095364901		362335095364901		362335095364901		362331095365001		362331095365001	
Time	1215		1230		1220		1240		1245		1255	
Depth	4.0 ft		6.0 ft		10.0 ft		6.0 ft		10.0 ft		10.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHRYSOPHYTA (Yellow-green Algae)												
Bacillariophyceae												
Pennales												
Naviculaceae												
Navicula	0	0	0	0	0	0	0	0	0	0	0	0
Pleurosigma	0	0	0	0	0	0	0	0	0	0	0	0
CYANOPHYTA (Blue-green Algae)												
Cyanophyceae												
Chroococcales												
Chroococcaceae												
Anacystis	3,100	36	1,800	19	5,500	50	2,000	24	2,200	27	9,600	80
Nostocales												
Nostocaceae												
Anabaena	200	2	200	2	0	0	0	0	0	0	0	0
Oscillatoriales	0	0	0	0	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0	0	0	0	0
Oscillatoria	0	0	0	0	390	4	0	0	0	0	0	0
EUGLENOPHYTA (Euglenoids)												
Euglenophyceae												
Euglenales	0	0	0	0	0	0	0	0	0	0	0	0
Euglenaceae	0	0	0	0	0	0	0	0	0	0	0	0
Euglena	0	0	0	0	0	0	0	0	390	5	0	0
Euglenamorpha	0	0	0	0	0	0	0	0	0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 3 Collected August 01, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	362335095364901		362335095364901		362335095364901		362335095364901		362331095365001		362331095365001	
Time	1215		1230		1220		1240		1245		1255	
Depth	4.0 ft		6.0 ft		10.0 ft		6.0 ft		10.0 ft		10.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
PYRRHOPHYTA (Fire Algae)												
Dinophyceae												
Dinokontae												
Ceratiaceae												
Ceratium	0	0	0	0	0	0	0	0	0	0	0	0
Peridiniales												
Total cells/mL	8,500		9,700		11,000		8,500		8,100		12,000	
Total genera/mL	6		7		6		5		6		4	
Total genera in Croweburg Coal Pond 3: 13												

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 4 Collected August 07, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	362832095312801		362835095312801		362845095312801		362845095312801		362845095312801		362849095312801	
Time	1115		1130		1151		1200		1232		1300	
Depth	6.0 ft		6.0 ft		6.0 ft		7.0 ft		5.0 ft		5.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA												
(Green Algae)												
Chlorophyceae												
Chlorococcales												
Oocystaceae												
Chlorella	2,500	26	1,600	17	1,200	12	2,200	23	1,800	19	1,400	14
Scenedesmaceae												
Scenedesmus	980	10	1,200	13	2,500	25	1,400	15	980	10	780	8
Ulotrichales												
Ulotrichaceae												
Geminella	780	8	590	6	980	10	590	6	1,400	15	980	10
CYANOPHYTA												
(Blue-green Algae)												
Cyanophyceae												
Chroococcales												
Chroococcaceae												
Agmenellum	1,600	17	2,700	29	2,200	22	2,500	26	3,300	35	3,100	31
Anacystis	3,700	39	3,100	34	3,100	31	2,900	30	2,000	21	4,100	41
PYRRHOPHYTA												
(Fire Algae)												
Dinophyceae												
Dinokontae												
Peridiniaceae												
Peridinium	0	0	0	0	0	0	0	0	0	0	0	0
Peridiniales												
Total cells/mL	9,600		9,200		10,000		9,600		9,500		10,000	
Total genera/mL	5		5		6		5		5		5	
Total genera in Croweburg Coal Pond 4: 6												

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 5 Collected August 14, 1985							
	Location 1		Location 2		Location 3		Location 4	
Site ID	363327095293101		363335095292601		363335095292601		363335095292601	
Time	1047		1100		1400		1405	
Depth	13 ft		12 ft		9.0 ft		9.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA								
(Green Algae)								
Chlorophyceae								
Chlorococcales								
Oocystaceae								
Chlorella	2,500	49	2,200	73	3,900	80	2,700	63
Ulotrichales								
Ulotrichaceae								
Geminella	590	12	0	0	0	0	200	5
CYANOPHYTA								
(Blue-green Algae)								
Cyanophyceae								
Chroococcales								
Chroococcaceae								
Anacystis	1,600	31	780	26	980	20	1,400	33
Oscillatoriales	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0
Oscillatoria	200	4	0	0	0	0	0	0
EUGLENOPHYTA								
(Euglenoids)								
Euglenophyceae								
Euglenales	0	0	0	0	0	0	0	0
Euglenaceae	0	0	0	0	0	0	0	0
Euglena	200	4	0	0	0	0	0	0
Euglenamorpha	0	0	0	0	0	0	0	0
Total cells/mL	5,100		3,000		4,900		4,300	
Total genera/mL	5		2		2		3	
Total genera in Croweburg Coal Pond 5: 5								

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 6 Collected August 13, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	363650095251801		363650095251801		363650095251801		363650095251801		363652095251901	
Time	1235		1221		1100		1215		1200	
Depth	3.0 ft		4.0 ft		4.0 ft		4.0 ft		4.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA										
(Diatoms)										
Bacillariophyceae										
Fragilariales										
Fragilariaceae										
Synedra	0	0	0	0	200	2	200	2	0	0
CHLOROPHYTA										
(Green Algae)										
Chlorophyceae										
Chlorococcales										
Oocystaceae										
Ankistrodesmus	0	0	200	2	0	0	0	0	0	0
Chlorella	9,200	58	4,700	43	7,800	60	4,700	47	7,100	55
Scenedesmaceae										
Scenedesmus	200	1	200	2	0	0	0	0	0	0
Ulotrichales										
Ulotrichaceae										
Geminella	780	5	780	7	590	5	590	6	780	6
Zygnematales										
Desmidiaceae										
Closterium	0	0	0	0	0	0	0	0	390	3
CHRYSOPHYTA										
(Yellow-green Algae)										
Bacillariophyceae										
Pennales										
Fragilariaceae										
Synedra	0	0	0	0	0	0	0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 6 Collected August 13, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	363650095251801		363650095251801		363650095251801		363650095251801		363652095251901	
Time	1235		1221		1100		1215		1200	
Depth	3.0 ft		4.0 ft		4.0 ft		4.0 ft		4.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CYANOPHYTA (Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Agmenellum	200	1	0	0	0	0	0	0	0	0
Anacystis	5,300	33	5,100	46	4,100	32	4,900	49	4,300	33
EUGLENOPHYTA (Euglenoids)										
Euglenophyceae										
Euglenales	0	0	0	0	0	0	0	0	0	0
Euglenaceae	0	0	0	0	0	0	0	0	0	0
Euglena	0	0	0	0	0	0	0	0	200	2
Euglenamorpha	0	0	0	0	0	0	0	0	0	0
PYRRHOPHYTA (Fire Algae)										
Dinophyceae										
Dinokontae										
Ceratiaceae										
Ceratium	0	0	0	0	0	0	0	0	0	0
Peridiniaceae										
Peridinium	0	0	0	0	0	0	0	0	0	0
Peridiniales										
Ceratiaceae										
Ceratium	0	0	200	2	200	2	0	0	0	0
Peridiniaceae										
Peridinium	0	0	0	0	0	0	0	0	390	3
Total cells/mL	16,000		11,000		13,000		10,000		13,000	
Total genera/mL	5		6		5		4		6	
Total genera in Croweburg Coal Pond 6: 11										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 7 Collected August 21, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	364754095174201		364754095174201		364800095174501		364800095174501		364800095174501	
Time	1150		1242		1300		1320		1335	
Depth	6.0 ft		6.0 ft		4.0 ft		3.0 ft		4.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA										
(Green Algae)										
Chlorophyceae										
Chlorococcales										
Oocystaceae										
Chlorella	390	9	0	0	390	10	0	0	590	13
Scenedesmaceae										
Scenedesmus	0	0	0	0	0	0	0	0	200	4
Tetrasporales										
Gloeocystaceae										
Gloeocystis	200	5	0	0	0	0	200	8	0	0
Palmellaceae										
Ulotrichales										
Ulotrichaceae										
Geminella	0	0	0	0	0	0	200	8	590	13
CYANOPHYTA										
(Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Anacystis	3,700	86	3,300	100	3,500	90	2,200	85	3,100	69
Total cells/mL	4,300		3,300		3,900		2,600		4,500	
Total genera/mL	3		1		2		3		4	
Total genera in Croweburg Coal Pond 7: 5										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	CROWEBURG COAL POND 8 Collected August 15, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	365434095124201		365434095124201		365427095124001		365427095124001		365427095124001		365427095124001	
Time	1300		1140		1200		1210		1232		1255	
Depth	2.0 ft		4.0 ft		4.0 ft		3.5 ft		2.0 ft		2.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA												
(Green Algae)												
Chlorophyceae												
Chlorococcales												
Oocystaceae												
Chlorella	780	9	0	0	0	0	0	0	390	5	390	7
Ulotrichales												
Ulotrichaceae												
Geminella	0	0	0	0	200	5	0	0	0	0	0	
Volvocales												
Volvocaceae												
Eudorina	200	2	0	0	0	0	0	0	0	0	0	0
CYANOPHYTA												
(Blue-green Algae)												
Cyanophyceae												
Chroococcales												
Chroococcaceae												
Anacystis	7,800	89	6,700	100	4,100	95	11,000	100	6,700	94	5,100	89
PYRRHOPHYTA												
(Fire Algae)												
Dinophyceae												
Dinokontae												
Ceratiaceae												
Ceratium	0	0	0	0	0	0	0	0	0	0	200	4
Peridiniales												
Total cells/mL	8,800		6,700		4,300		11,000		7,100		5,700	
Total genera/mL	3		1		2		1		2		3	
Total genera in Croweburg Coal Pond 8: 5												

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 1 Collected August 08, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	363022095325101		363022095325101		363022095324701		363021095325401		363021095325401		363021095325401	
Time	1145		1200		1210		1220		1230		1240	
Depth	5.0 ft		4.0 ft		4.0 ft		4.0 ft		4.0 ft		4.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)												
Bacillariophyceae												
Fragilariales	0	0	0	0	0	0	0	0	0	0	0	0
Fragilariaceae	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria	0	0	0	0	200	3	0	0	200	2	200	3
CHLOROPHYTA (Green Algae)												
Chlorophyceae												
Chlorococcales												
Chlorococcaceae												
Tetraedron	0	0	0	0	0	0	200	3	200	2	0	0
Coelastraceae												
Coelastrum	0	0	0	0	0	0	0	0	0	0	0	0
Oocystaceae												
Chlorella	3,500	35	1,400	20	2,400	32	1,400	23	2,900	35	2,000	26
Tetraedron	0	0	0	0	0	0	0	0	0	0	0	0
Scenedesmaceae												
Coelastrum	0	0	200	3	0	0	0	0	0	0	0	0
Scenedesmus	980	10	590	8	980	13	390	7	1,400	17	980	13
Ulotrichales												
Ulotrichaceae												
Geminella	2,400	24	1,600	23	1,400	18	1,800	30	1,600	19	1,400	18
Zygnematales												
Desmidiaceae												
Cosmarium	0	0	590	8	390	5	390	7	390	5	390	5

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 1 Collected August 08, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	363022095325101		363022095325101		363022095324701		363021095325401		363021095325401		363021095325401	
Time	1145		1200		1210		1220		1230		1240	
Depth	5.0 ft		4.0 ft		4.0 ft		4.0 ft		4.0 ft		4.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHRYSOPHYTA												
(Yellow-green Algae)												
Bacillariophyceae												
Pennales												
Fragilariaceae	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria	0	0	0	0	0	0	0	0	0	0	0	0
CYANOPHYTA												
(Blue-green Algae)												
Cyanophyceae												
Chroococcales												
Chroococcaceae												
Agmenellum	1,800	18	780	11	0	0	590	10	0	0	390	5
Anacystis	1,200	12	1,600	23	2,200	29	1,200	20	1,600	19	2,200	28
Oscillatoriales	0	0	0	0	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0	0	0	0	0
Oscillatoria	200	2	0	0	0	0	0	0	0	0	200	3
EUGLENOPHYTA												
(Euglenoids)												
Euglenophyceae												
Euglenales	0	0	0	0	0	0	0	0	0	0	0	0
Euglenaceae	0	0	0	0	0	0	0	0	0	0	0	0
Euglena	0	0	200	3	0	0	0	0	0	0	0	0
Euglenamorpha	0	0	0	0	0	0	0	0	0	0	0	0
Total cells/mL	10,000		7,000		7,600		6,000		8,300		7,800	
Total genera/mL	6		8		6		7		7		8	
Total genera in Iron Post Pond 1: 11												

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 2 Collected August 12, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	362833095343001		362833095343001		362832095343101		362832095343101		362834095342901	
Time	1230		1245		1215		1335		1402	
Depth	6.0 ft		5.0 ft		6.0 ft		6.0 ft		4.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)										
Bacillariophyceae										
Naviculales										
Naviculaceae	0	0	0	0	0	0	0	0	0	0
Navicula	590	2	200	1	0	0	0	0	200	2
CHLOROPHYTA (Green Algae)										
Chlorophyceae										
Chlorococcales										
Oocystaceae										
Ankistrodesmus	9,600	38	4,700	28	2,400	18	3,700	26	2,700	21
Chlorella	11,000	44	8,200	48	6,300	48	5,400	39	7,300	56
Scenedesmaceae										
Scenedesmus	0	0	0	0	200	2	0	0	200	2
Volvocales										
Chlamydomonadaceae										
Chlamydomonas	1,800	7	980	6	590	5	780	6	390	3
Volvocaceae										
Eudorina	0	0	980	6	980	8	780	6	390	3
CHRYSOPHYTA (Yellow-green Algae)										
Bacillariophyceae										
Pennales										
Naviculaceae										
Navicula	0	0	0	0	0	0	0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 2 Collected August 12, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	362833095343001		362833095343001		362832095343101		362832095343101		362834095342901	
Time	1230		1245		1215		1335		1402	
Depth	6.0 ft		5.0 ft		6.0 ft		6.0 ft		4.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CYANOPHYTA (Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Anacystis	2,400	10	1,800	11	2,000	15	2,500	18	2,200	17
Oscillatoriales	0	0	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0	0	0
Oscillatoria	0	0	200	1	390	3	0	0	0	0
EUGLENOPHYTA (Euglenoids)										
Euglenophyceae										
Euglenales	0	0	0	0	0	0	0	0	0	0
Euglenaceae	0	0	0	0	0	0	0	0	0	0
Euglena	0	0	0	0	200	2	390	3	0	0
Euglenamorpha	0	0	0	0	0	0	0	0	0	0
Phacus	0	0	0	0	390	3	0	0	0	0
Total cells/mL	2,5000		17,000		13,000		14,000		13,000	
Total genera/mL	5		7		9		6		7	
Total genera in Iron Post Coal Pond 2: 10										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 3 Collected August 12, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	362644095334101		362644095334101		362644095334101		362648095334101		362648095334101	
Time	1225		1231		1302		1310		1345	
Depth	2.0 ft		3.0 ft		4.0 ft		3.0 ft		4.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA (Green Algae)										
Chlorophyceae										
Chlorococcales										
Oocystaceae										
Chlorella	590	12	390	9	0	0	0	0	0	0
CHRYSOPHYTA (Yellow-green Algae)										
Chrysophyceae										
Chromulinales										
Ochromonadaceae										
Dinobryon	0	0	0	0	0	0	0	0	0	0
Ochromonadales										
Dinobryaceae										
CYANOPHYTA (Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Agmenellum	590	12	390	9	590	11	390	11	200	7
Anacystis	3,500	71	3,100	72	3,500	64	2,400	67	2,400	86
EUGLENOPHYTA (Euglenoids)										
Euglenophyceae										
Euglenales	0	0	0	0	0	0	0	0	0	0
Euglenaceae	0	0	0	0	0	0	0	0	0	0
Euglena	0	0	0	0	0	0	200	6	0	0
Euglenamorpha	0	0	0	0	0	0	0	0	0	0
Total cells/mL	4,900		4,300		5,500		3,600		2,800	
Total genera/mL	4		4		3		4		3	
Total genera in Iron Post Coal Pond 3: 5										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 4 Collected August 06, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	362628095350101		362632095350201		362632095350201		362632095350701		362632095350701	
Time	1200		1205		1122		1145		1222	
Depth	2.0 ft		5.0 ft		6.0 f		6.0 ft		5.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)										
Bacillariophyceae										
Fragilariales	0	0	0	0	0	0	0	0	0	0
Fragilariaceae	0	0	0	0	0	0	0	0	0	0
Fragilaria	0	0	0	0	390	2	200	<1	390	1
Naviculales										
Naviculaceae	0	0	0	0	0	0	0	0	0	0
Navicula	590	1	390	<1	0	0	0	0	0	0
CHLOROPHYTA (Green Algae)										
Chlorophyceae										
Chlorococcales										
Coelastraceae										
Coelastrum	0	0	0	0	0	0	0	0	0	0
Oocystaceae										
Ankistrodesmus	2500	4	390	<1	980	4	780	3	390	1
Chlorella	21000	37	19000	43	11000	50	11000	37	14000	47
Oocystis	0	0	200	<1	0	0	0	0	0	0
Selenastrum	1200	2	780	2	0	0	390	1	0	0
Scenedesmaceae										
Coelastrum	0	0	200	<1	200	<1	200	<1	590	2
Scenedesmus	1600	3	200	<1	0	0	200	<1	200	<1
Ulotrichales										
Ulotrichaceae										
Geminella	590	1	0	0	200	<1	390	1	200	<1
Volvocales										
Volvocaceae										
Eudorina	1800	3	780	2	0	0	200	<1	590	2

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 4 Collected August 06, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	362628095350101		362632095350201		362632095350201		362632095350701		362632095350701	
Time	1200		1205		1122		1145		1222	
Depth	2.0 ft		5.0 ft		6.0 f		6.0 ft		5.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHRYSOPHYTA										
(Yellow-green Algae)										
Bacillariophyceae										
Pennales										
Fragilariaceae	0	0	0	0	0	0	0	0	0	0
Fragilaria	0	0	0	0	0	0	0	0	0	0
Naviculaceae										
Navicula	0	0	0	0	0	0	0	0	0	0
CRYPTOPHYTA										
Monomastix	0	0	0	0	0	0	0	0	2,200	7
CYANOPHYTA										
(Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Agmenellum	780	1	590	1	200	<1	390	1	0	0
Anacystis	7300	13	2500	6	1600	7	2400	8	2900	10
Oscillatoriales	0	0	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0	0	0
Oscillatoria	16000	28	18000	41	6500	30	13000	43	10000	33
EUGLENOPHYTA										
(Euglenoids)										
Euglenophyceae										
Euglenales	0	0	0	0	0	0	0	0	0	0
Euglenaceae	0	0	0	0	0	0	0	0	0	0
Euglena	1400	2	980	2	780	4	390	1	200	<1
Euglenamorpha	0	0	0	0	0	0	0	0	0	0
Phacus	980	2	0	0	0	0	0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 4 Collected August 06, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	362628095350101		362632095350201		362632095350201		362632095350701		362632095350701	
Time	1200		1205		1122		1145		1222	
Depth	2.0 ft		5.0 ft		6.0 f		6.0 ft		5.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
PYRRHOPHYTA										
(Fire Algae)										
Dinophyceae										
Dinokontae										
Ceratiaceae										
Ceratium	0	0	0	0	0	0	0	0	0	0
Peridiniaceae										
Peridinium	0	0	0	0	0	0	0	0	0	0
Peridiniales										
Ceratiaceae										
Ceratium	0	0	200	<1	0	0	0	0	200	<1
Peridiniaceae										
Peridinium	1600	3	0	0	200	<1	390	1	390	1
ROTIFERA (Rotifers)										
Monogononta										
Ploima										
Notommatidae										
Monommata	0	0	0	0	0	0	0	0	0	0
Total cells/mL	57000		44000		22000		30000		30,000	
Total genera/mL	13		13		10		13		13	
Total genera in Iron Post Coal Pond 4: 17										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 5 Collected August 06, 1985							
	Location 1		Location 2		Location 3		Location 4	
Site ID	362603095341901		362605095342001		362609095342301		362611095342401	
Time	1210		1230		1245		1300	
Depth	3.0 ft		3.0 ft		3.0 ft		4.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA (Green Algae)								
Chlorophyceae								
Chlorococcales								
Oocystaceae								
Chlorella	18,000	95	9,200	92	14,000	93	12,000	92
Scenedesmaceae								
Scenedesmus	0	0	0	0	0	0	200	2
Ulotrichales								
Ulotrichaceae								
Radiofilum	200	1	0	0	0	0	0	0
Volvocales								
Volvocaceae								
Eudorina	0	0	200	2	200	1	0	0
CYANOPHYTA (Blue-green Algae)								
Cyanophyceae								
Chroococcales								
Chroococcaceae								
Anacystis	1,200	6	590	6	590	4	390	3
Total cells/mL	19,000		10,000		15,000	0	13,000	
Total genera/mL	3		3		3		3	
Total genera in Iron Post Coal Pond 5: 5								

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 6 Collected August 20, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	364035095274001		364101095273601		364101095273601		364101095273601		364101095273601		364101095273601	
Time	1125		1155		1220		1320		1330		1345	
Depth	1,0 ft		6.0 ft		7.0 ft		6.0 ft		6.0 ft		5.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA												
(Green Algae)												
Chlorophyceae												
Chlorococcales												
Oocystaceae												
Ankistrodesmus	200	25	0	0	0	0	0	0	0	0	0	0
Chlorella	0	0	980	41	980	35	200	9	390	20	0	0
Volvocales												
Chlamydomonadaceae												
Chlamydomonas	0	0	0	0	390	14	200	9	390	20	590	33
CYANOPHYTA												
(Blue-green Algae)												
Cyanophyceae												
Chroococcales												
Chroococcaceae												
Anacystis	590	75	1,400	58	1,400	50	1,800	82	1,200	60	1,200	67
Total cells/mL	790		2,400		2,800		2,200		2,000		1,800	
Total genera/mL	2		2		3		3		3		2	
Total genera in Iron Post Coal Pond 6: 4												

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 7 Collected August 20, 1985							
	Location 1		Location 2		Location 3		Location 4	
Site ID	363826095285801		363826095285801		363826095285801		363826095285801	
Time	1230		1240		1255		1315	
Depth	--		--		--		--	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)								
Bacillariophyceae								
Fragilariales	0	0	0	0	0	0	0	0
Fragilariaceae	0	0	0	0	0	0	0	0
Fragilaria	590	6	0	0	0	0	200	3
Naviculales								
Naviculaceae	0	0	0	0	0	0	0	0
Navicula	0	0	390	5	0	0	0	0
CHLOROPHYTA (Green Algae)								
Chlorophyceae								
Chlorococcales								
Oocystaceae								
Ankistrodesmus	980	10	200	3	590	8	0	0
Chlorella	2,400	24	2,200	30	1,600	22	1,200	16
Scenedesmaceae								
Scenedesmus	590	6	0	0	0	0	0	0
CHRYSOPHYTA (Yellow-green Algae)								
Bacillariophyceae								
Pennales								
Fragilariaceae	0	0	0	0	0	0	0	0
Fragilaria	0	0	0	0	0	0	0	0
Naviculaceae								
Navicula	0	0	0	0	0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 7 Collected August 20, 1985							
	Location 1		Location 2		Location 3		Location 4	
Site ID	363826095285801		363826095285801		363826095285801		363826095285801	
Time	1230		1240		1255		1315	
Depth	–		–		–		–	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CYANOPHYTA (Blue-green Algae)								
Cyanophyceae								
Chroococcales								
Chroococcaceae								
Anacystis	1,800	18	1,400	19	1,800	25	1,600	21
Nostocales								
Nostocaceae								
Anabaena	0	0	0	0	200	3	0	0
Oscillatoriales	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0
Oscillatoria	3,400	34	2,800	38	2,400	33	4,100	53
EUGLENOPHYTA (Euglenoids)								
Euglenophyceae								
Euglenales	0	0	0	0	0	0	0	0
Euglenaceae	0	0	0	0	0	0	0	0
Euglena	200 2	390	5	590	8	590	8	
Euglenamorpha	0	0	0	0	0	0	0	0
Total cells/mL	10,000		7,400		7,200		7,700	
Total genera/mL	7		6		6		5	
Total genera in Iron Post Coal Pond 7: 9								

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 8 Collected August 19, 1985					
	Location 1		Location 2		Location 3	
Site ID	364329095221601		364328095221601		364328095221601	
Time	1317		1330		1345	
Depth	2.0 ft		1.0 ft		1.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)						
Bacillariophyceae						
Fragilariales	0	0	0	0		
Fragilariaceae	0	0	0	0	0	0
Fragilaria	0	0	0	0	200	6
Naviculales						
Naviculaceae	0	0	0	0	0	0
Navicula	0	0	0	0	200	6
CHLOROPHYTA (Green Algae)						
Chlorophyceae						
Chlorococcales						
Oocystaceae						
Chlorella	390	24	590	60	590	18
Volvocales						
Chlamydomonadaceae						
Chlamydomonas	200	13	200	20	390	12
Zygnematales						
Zygnemataceae						
Spirogyra	0	0	0	0	200	6
CHRYSOPHYTA (Yellow-green Algae)						
Bacillariophyceae						
Pennales						
Fragilariaceae	0	0	0	0	0	0
Fragilaria	0	0	0	0	0	0
Naviculaceae						
Navicula	0	0	0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	IRON POST COAL POND 8 Collected August 19, 1985					
	Location 1		Location 2		Location 3	
Site ID	364329095221601		364328095221601		364328095221601	
Time	1317		1330		1345	
Depth	2.0 ft		1.0 ft		1.0 ft	
	Cells/mL	**Percent**	**Cells/mL**	**Percent**	**Cells/mL**	**Percent**
CYANOPHYTA						
(Blue-green Algae)						
Cyanophyceae						
Chroococcales						
Chroococcaceae						
Agmenellum	200	13	0	0	0	0
Anacystis	780	49	200	20	1,600	50
Total cells/mL	1,600		990		3,200	
Total genera/mL	4		3		6	
Total genera in Iron Post Coal Pond 8: 7						

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	McALESTER COAL POND 1 Collected July 18, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	345909095040701		345908095042001		345908095042001		345906095042401		345909095041401	
Time	1330		1410		1230		1307		1350	
Depth	16.0 ft		13.0 ft		16.0 ft		16.0 ft		9.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA										
(Green Algae)										
Chlorophyceae										
Chlorococcales										
Oocystaceae										
Chlorella	1,200	17	390	2	1,600	22	980	23	390	7
CYANOPHYTA										
(Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Anacystis	2,200	31	21,000	88	2,500	34	1,400	33	4,700	89
Oscillatoriales	0	0	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0	0	0
Oscillatoria	3,800	53	2,600	11	3,300	45	1,800	43	200	4
Total cells/mL	7,200		24,000		7,400		4,200		5,300	
Total genera/mL	3		3		3		3		3	
Total genera in McAlester Coal Pond 1: 3										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	McALESTER COAL POND 2 Collected July 30, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	350924095091801		350928095090201		350930095085801		350930095085801		350931095085101		350931095085101	
Time	1200		1230		1245		1300		1310		1340	
Depth	3.0 ft		4.0 ft		4.0 ft		3.0 ft		3.0 ft		3.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)												
Bacillariophyceae												
Naviculales												
Naviculaceae	0	0	0	0	0	0	0	0	0	0	0	0
Navicula	0	0	0	0	0	0	0	0	0	0	250	2
CHLOROPHYTA (Green Algae)												
Chlorophyceae												
Chlorococcales												
Oocystaceae												
Ankistrodesmus	3,500	27	0	0	250	3	0	0	250	2	0	0
Chlorella	490	4	0	0	0	0	2,000	22	3,500	25	4,200	32
Scenedesmaceae												
Scenedesmus	490	4	2,200	31	3,700	41	2,500	28	4,900	35	4,200	32
Volvocales												
Volvocaceae												
Pandorina	0	0	250	4	0	0	490	6	0	0	250	2
Volvox	250	2	0	0	0	0	0	0	0	0	0	0
CHRYSOPHYTA (Yellow-green Algae)												
Bacillariophyceae												
Pennales												
Naviculaceae												
Navicula	0	0	0	0	0	0	0	0	0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	McALESTER COAL POND 2 Collected July 30, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	350924095091801		350928095090201		350930095085801		350930095085801		350931095085101		350931095085101	
Time	1200		1230		1245		1300		1310		1340	
Depth	3.0 ft		4.0 ft		4.0 ft		3.0 ft		3.0 ft		3.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CYANOPHYTA (Blue-green Algae)												
Cyanophyceae												
Chroococcales												
Chroococcaceae												
Anacystis	3,500	27	1,700	24	2,200	24	2,700	30	3,200	23	2,500	19
Nostocales												
Nostocaceae												
Anabaena	1,700	13	2,200	31	990	11	0	0	0	0	0	0
Oscillatoriales	0	0	0	0	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0	0	0	0	0
Oscillatoria	3,500	27	0	0	2,000	22	1,200	13	2,200	16	1,700	13
PYRRHOPHYTA (Fire Algae)												
Dinophyceae												
Dinokontae												
Glenodiniaceae												
Glenodinium	0	0	790	11	0	0	0	0	0	0	0	0
Peridiniales												
Total cells/mL	13,000		7,100		9,100		8,900		14,000		13,000	
Total genera/mL	7		5		5		5		5		6	
Total genera in McAlester Coal Pond 2: 10												

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	McALESTER COAL POND 3 Collected July 30, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	351047095051301		351038095051401		351029095051501		351029095051501		351029095051501	
Time	1250		1300		1327		1340		1400	
Depth										
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA										
(Green Algae)										
Chlorophyceae										
Chlorococcales										
Oocystaceae										
Chlorella	16,000	98	25,000	96	19,000	99	18,000	95	17,000	100
CYANOPHYTA										
(Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Anacystis	390	2	780	3	200	1	590	3	0	0
Total cells/mL	16,000		26,000		19,000		19,000		17,000	
Total genera/mL	2		2		2		2		1	
Total genera in McAlester Coal Pond 3: 2										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	McALESTER COAL POND 4 Collected July 23, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	350707094503201		350708094502901		350708094502901		350708094502601		350708094502601	
Time	1225		1235		1302		1325		1335	
Depth	6.0 ft		6.0 ft		6.0 ft		6.0 ft		6.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA										
(Green Algae)										
Chlorophyceae										
Chlorococcales										
Oocystaceae										
Ankistrodesmus	250	2	0	0	250	2	0	0	200	2
Chlorella	3,500	32	7,800	60	7,700	51	7,400	77	7,400	62
Scenedesmaceae										
Scenedesmus	490	4	0	0	0	0	0	0	0	0
CYANOPHYTA										
(Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Anacystis	6,900	63	4,900	38	7,200	48	2,200	23	4,500	38
Total cells/mL	11,000		13,000		15,000		9,600		12,000	
Total genera/mL	4		2		3		2		3	
Total number of genera in McAlester Coal Pond 4: 4										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	McALESTER COAL POND 5 Collected July 24, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	351639095064601		351641095063801		351635095064901		351635095064901		351633095064901		351633095064901	
Time	1157		1218		1250		1305		1340		1345	
Depth	15.0 ft		15.0 ft		17.0 ft		17.0 ft		16.0 ft		9.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)												
Bacillariophyceae												
Fragilariales	0	0	0	0	0	0	0	0	0	0	0	0
Fragilariaceae	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria	0	0	0	0	0	0	0	0	390	4	0	0
Naviculales												
Naviculaceae	0	0	0	0	0	0	0	0	0	0	0	0
Navicula	0	0	0	0	200	2	590	5	590	6	200	3
Pinnularia	0	0	0	0	0	0	0	0	0	0	200	3
CHLOROPHYTA (Green Algae)												
Chlorophyceae												
Chlorococcales												
Oocystaceae												
Ankistrodesmus	1,600	13	590	6	0	0	0	0	390	4	200	3
Chlorella	8,400	70	4,100	43	3,300	37	3,700	31	2,500	27	2,000	32
Scenedesmaceae												
Scenedesmus	0	0	0	0	0	0	980	8	1,200	13	590	10
Volvocales												
Volvocaceae												
Pandorina	200	2	0	0	590	7	390	3	0	0	0	0
Volvox	0	0	200	2	0	0	0	0	0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	McALESTER COAL POND 5 Collected July 24, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	351639095064601		351641095063801		351635095064901		351635095064901		351633095064901		351633095064901	
Time	1157		1218		1250		1305		1340		1345	
Depth	15.0 ft		15.0 ft		17.0 ft		17.0 ft		16.0 ft		9.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHRYSOPHYTA												
(Yellow-green Algae)												
Bacillariophyceae												
Pennales												
Fragilariaceae	0	0	0	0	0	0	0	0	0	0	0	0
Fragilaria	0	0	0	0	0	0	0	0	0	0	0	0
Naviculaceae												
Navicula	0	0	0	0	0	0	0	0	0	0	0	0
Pinnularia	0	0	0	0	0	0	0	0	0	0	0	0
CYANOPHYTA												
(Blue-green Algae)												
Cyanophyceae												
Chroococcales												
Chroococcaceae												
Anacystis	1,400	12	4,100	43	2,700	30	3,500	29	2,700	29	2,200	35
Nostocales												
Nostocaceae												
Anabaena	0	0	0	0	390	4	1,200	10	780	8	780	13
Aphanizomenon	0	0	0	0	0	0	0	0	390	4	0	0
Oscillatoriales	0	0	0	0	0	0	0	0	0	0	0	0
Anabaena	0	0	0	0	0	0	0	0	0	0	0	0
Nostocaceae												
Aphanizomenon	0	0	0	0	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0	0	0	0	0
Oscillatoria	0	0	390	4	390	4	0	0	0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	McALESTER COAL POND 5 Collected July 24, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	351639095064601		351641095063801		351635095064901		351635095064901		351633095064901		351633095064901	
Time	1157		1218		1250		1305		1340		1345	
Depth	15.0 ft		15.0 ft		17.0 ft		17.0 ft		16.0 ft		9.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
EUGLENOPHYTA (Euglenoids)												
Euglenophyceae												
Euglenales	0	0	0	0	0	0	0	0	0	0	0	0
Euglenaceae	0	0	0	0	0	0	0	0	0	0	0	0
Euglena	0	0	0	0	0	0	0	0	390	4	0	0
Euglenamorpha	0	0	0	0	0	0	0	0	0	0	0	0
PYRRHOPHYTA (Fire Algae)												
Dinophyceae												
Dinokontae												
Glenodiniaceae												
Glenodinium	390	3	200	2	1,400	16	1,800	15	0	0	0	0
Peridiniales												
Total cells/mL	12,000		9,600		9,000		12,000		9,300		6,200	
Total genera/mL	5		6		7		7		9		7	
Total genera in McAlester Coal Pond 5: 14												

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	351743095052901 - McALESTER COAL POND 6 Collected July 25, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	351743095052901		351743095053401		351743095053401		351743095053901		351742095054301		351742095054301	
Time	1100		1120		1150		1217		1250		1300	
Depth	0		12.0 ft		12.0 ft		16.0 ft		18.0 ft		0	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)												
Bacillariophyceae												
Naviculales												
Naviculaceae	0	0	0	0	0	0	0	0	0	0	0	0
Navicula	0	0	0	0	0	0	0	0	760	6	0	0
CHLOROPHYTA (Green Algae)												
Chlorophyceae												
Chlorococcales												
Oocystaceae												
Ankistrodesmus	2,000	21	8,400	42	13,000	52	9,200	66	7,400	57	1,400	17
Chlorella	2,900	31	5,100	26	5,300	21	2,200	16	2,500	19	2,700	33
Oocystis	0	0	200	1	0	0	0	0	0	0	0	0
Scenedesmaceae												
Scenedesmus	200	2	0	0	0	0	0	0	0	0	0	0
Ulotrichales												
Ulotrichaceae												
Geminella	1,800	19	3,300	17	3,300	13	1,200	9	1,400	11	2,000	25
Volvocales												
Volvocaceae												
Gonium	0	0	0	0	0	0	200	1	0	0	0	0
Pandorina	0	0	0	0	200	<1	0	0	0	0	0	0
CHRYSOPHYTA (Yellow-green Algae)												
Bacillariophyceae												
Pennales												
Naviculaceae												
Navicula	0	0	0	0	0	0	0	0	0	0	0	0

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	351743095052901 - McALESTER COAL POND 6 Collected July 25, 1985											
	Location 1		Location 2		Location 3		Location 4		Location 5		Location 6	
Site ID	351743095052901		351743095053401		351743095053401		351743095053901		351742095054301		351742095054301	
Time	1100		1120		1150		1217		1250		1300	
Depth	0		12.0 ft		12.0 ft		16.0 ft		18.0 ft		0	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CYANOPHYTA (Blue-green Algae)												
Cyanophyceae												
Chroococcales												
Chroococcaceae												
Anacystis	2,000	21	2,400	12	2,700	11	1,400	10	790	6	2,000	25
Nostocales												
Nostocaceae												
Anabaena	590	6	0	0	0	0	0	0	390	3	0	0
Oscillatoriales	0	0	0	0	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0	0	0	0	0
Oscillatoria	0	0	0	0	200	<1	0	0	0	0	0	0
EUGLENOPHYTA (Euglenoids)												
Euglenophyceae												
Euglenales	0	0	0	0	0	0	0	0	0	0	0	0
Euglenaceae	0	0	0	0	0	0	0	0	0	0	0	0
Euglena	0	0	200	1	0	0	0	0	0	0	0	0
Euglenamorpha	0	0	0	0	0	0	0	0	0	0	0	0
Phacus	0	0	390	2	0	0	0	0	0	0	0	0
PYRRHOPHYTA (Fire Algae)												
Dinophyceae												
Dinokontae												
Glenodiniaceae												
Glenodinium	0	0	0	0	200	<1	0	0	0	0	0	0
Peridiniales												
Total cells/mL	9,500		20,000		25,000		14,000		13,000		8,100	
Total genera/mL	6		7		7		5		6		4	
Total genera in McAlester Coal Pond 6: 14												

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	MCALESTER COAL POND 7 Collected July 31, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	352001094583901		352001094583501		352001094583501		352001094582801		352001094582801	
Time	1215		1225		1230		1240		1140	
Depth	2.0 ft		2.0 ft		2.0 ft		2.0 ft		2.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA (Green Algae)										
Chlorophyceae										
Chlorococcales										
Oocystaceae										
Ankistrodesmus	590	7	980	18	0	0	0	0	0	0
Chlorella	2,400	30	1,800	33	1,400	32	980	27	1,200	32
Oocystis	390	5	0	0	0	0	0	0	0	0
Scenedesmaceae										
Scenedesmus	0	0	0	0	390	9	0	0	0	0
Volvocales										
Volvocaceae										
Volvox	0	0	0	0	200	5	0	0	0	0
CYANOPHYTA (Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Anacystis	4,100	52	2,200	41	2,200	50	2,200	61	2,400	63
Oscillatoriales	0	0	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0	0	0
Oscillatoria	200	3	0	0	0	0	0	0	0	0
PYRRHOPHYTA (Fire Algae)										
Dinophyceae										
Dinokontae										
Glenodiniaceae										
Glenodinium	200	3	390	7	200	5	390	11	200	5
Peridiniales										
Total cells/mL	7,900		5,400		4,400		3,600		3,800	
Total genera/mL	6		4		5		3		3	
Total genera in McAlester Coal Pond 7: 8										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	MCALESTER COAL POND 8 Collected July 31, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	352243095143201		352243095143201		352243095143201		352240095143901		352240095143901	
Time	1215		1225		1230		1240		1250	
Depth	4.0 ft		4.0 ft		4.0 ft		4.0 ft		2.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
BACILLARIOPHYTA (Diatoms)										
Bacillariophyceae										
Naviculales										
Naviculaceae	0	0	0	0	0	0	0	0	0	0
Navicula	490	3	1,500	8	990	5	1,700	9	900	5
CHLOROPHYTA (Green Algae)										
Chlorophyceae										
Chlorococcales										
Oocystaceae										
Ankistrodesmus	0	0	250	1	490	2	0	0	0	0
Chlorella	2,200	13	4,000	21	4,400	22	4,400	23	3,500	18
Scenedesmaceae										
Scenedesmus	2,000	12	2,500	13	2,500	13	3,500	18	3,000	16
Volvocales										
Volvocaceae										
Eudorina	250	1	0	0	0	0	0	0	0	0
CYANOPHYTA (Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Anacystis	12,000	71	10,000	53	10,000	50	8,400	44	11,000	58
Oscillatoriales	0	0	0	0	0	0	0	0	0	0
Oscillatoriaceae	0	0	0	0	0	0	0	0	0	0
Oscillatoria	0	0	740	4	490	2	990	5	740	4

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	MCALESTER COAL POND 8 Collected July 31, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	352243095143201		352243095143201		352243095143201		352240095143901		352240095143901	
Time	1215		1225		1230		1240		1250	
Depth	4.0 ft		4.0 ft		4.0 ft		4.0 ft		2.0 ft	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
EUGLENOPHYTA (Euglenoids)										
Euglenophyceae										
Euglenales	0	0	0	0	0	0	0	0	0	0
Euglenaceae										
Euglena	0	0	0	0	490	2	250	1		
Euglenamorpha	0	0	0	0	0	0	0	0	0	0
PYRRHOPHYTA (Fire Algae)										
Dinophyceae										
Dinokontae										
Glenodiniaceae										
Glenodinium	0	0	0	0	0	0	0	0	0	0
Peridiniales										
Glenodiniaceae										
Glenodinium	0	0	0	0	250	1	0	0	0	0
Total cells/mL	17,000		19,000		20,000		19,000		19,000	
Total genera/mL	5		6		8		6		5	
Total genera in McAlester Coal Pond 8: 9										

Table 18. Taxa and concentrations of phytoplankton in water samples from study ponds—Continued

	MCALESTER COAL POND 9 Collected July 22, 1985									
	Location 1		Location 2		Location 3		Location 4		Location 5	
Site ID	352454095134301		352458095134201		352506095134101		352506095134101		352512095134301	
Time	1210		1245		1300		1332		1410	
Depth	5.0 ft		6.0 ft		4.0 ft		6.0 ft		0	
	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent	Cells/mL	Percent
CHLOROPHYTA										
(Green Algae)										
Chlorophyceae										
Chlorococcales										
Oocystaceae										
Ankistrodesmus	0	0	5,900	12	4,400	13	1,700	7	2,700	14
Chlorella	30,000	88	36,000	75	26,000	76	19,000	76	12,000	63
Scenedesmaceae										
Scenedesmus	250	<1	490	1	0	0	490	2	0	0
Volvocales										
Volvocaceae										
Pleodorina	0	0	0	0	250	<1	0	0	0	0
CYANOPHYTA										
(Blue-green Algae)										
Cyanophyceae										
Chroococcales										
Chroococcaceae										
Anacystis	3,500	10	5,200	11	3,500	10	4,200	17	4,400	23
PYRRHOPHYTA										
(Fire Algae)										
Dinophyceae										
Dinokontae										
Ceratiaceae										
Ceratium	0	0	0	0	0	0	0	0	0	0
Peridiniales										
Total cells/mL	34,000		48,000		34,000		25,000		19,000	
Total genera/mL	3		5		4		4		3	
Total genera in McAlester Coal Pond 9: 6										

Table 19. Taxa and concentrations of benthic invertebrates in samples from study ponds

[*, organisms are present in sample; **, cannot calculate because of missing data; ***, may be low because of missing data; <, less than; NA, not applicable; cells/mL, cells per milliliter]

	351037094513301 - CONTROL POND 1 Collected 07-23-85			
	Dip-net sample		Ponar sample	
	Organisms present	Percent	Cells /mL	Percent
Arthropoda (Arthropods)				
Crustacea				
Amphipoda				
Talitridae				
Hyallela	*	11	14	<1
Acaria (Water Mites)				
Hydrachnellae				
Hydrachna	*	<1	0	0
Oxus	*	1	0	0
Insecta				
Coleoptera				
Hydrophilidae				
Berosus	*	1	0	0
Diptera				
Ceratopogonidae = Heleidae				
Palpomyia	*	2	14	<1
Chaoboridae				
Chaoborus	0	0	1,100	61
Chironomidae				
Chironomus	0	0	57	3
Endochironomus	*	10	0	0
Pentaneura	*	13	160	9
Procladius	*	5	350	19
Tanypus	*	6	0	0
Culicidae				
Aedes	*	<1	0	0
Tabanidae				
Chrysops	*	2	0	0
Ephemeroptera				
Baetidae				
Baetis	*	3	0	0
Callibaetis	*	19	29	2
Odonata				
Coenagrionidae				
Anomalagrion	*	5	0	0
Ischnura	*	9	0	0
Gomphidae				
Gomphus	0	0	14	<1
Libellulidae				
Erythemis	*	3	0	0
Libellula	*	1	0	0
Nannothemis	*	3	14	<1
Neurocordulia	*	2	0	0
Trichoptera				
Hydroptilidae				
Oxyethira	*	4	0	0
Psychomyiidae				
Polycentropus	0	0	14	<1
Mollusca (Molluscs)				

Table 19. Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	351037094513301 - CONTROL POND 1 Collected 07–23–85			
	Dip-net sample		Ponar sample	
	Organisms present	Percent	Cells /mL	Percent
Gastropoda				
Basommatophora				
Physidae				
Physa	*	<1	0	0
Planorbidae				
Promenetus	*	<1	0	0
Total cells/mL:	NA			1,800
Total number of genera found:	22			10
Total number of genera found in Control Pond 1: 26				

Table 19. Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	351629095175201 - CONTROL POND 2 Collected 07–17–85			
	Dip-net sample		Ponar sample	
	Organisms present	Percent	Cells /mL	Percent
Annelida				
Hirudinea (Leeches)				
Erpobdellidae				
Mooreobdella	*	<1	0	0
Arthropoda (Arthropods)				
Insecta				
Diptera				
Ceratopogonidae = Heleidae				
Palpomyia	0	0	57	2
Chaoboridae				
Chaoborus	0	0	300	8
Chironomidae				
Ablabesmyia	0	0	29	<1
Clinotanypus	*	3	0	0
Coelotanypus	0	0	72	2
Glyptotendipes	*	<1	0	0
Polypedilum	*	2	0	0
Tanypus	0	0	29	<1
Ephemeroptera				
Baetidae				
Callibaetis	0	0	29	<1
Caenidae				
Caenis	*	75	3,100	82
Hemiptera				
Corixidae				
Trichocorixa	*	15	14	<1
Odonata				
Gomphidae				
Gomphus	*	3	0	0
Libellulidae				
Libellula	0	0	72	2
Nannothemis	0	0	43	1
Neurocordulia	0	0		
Trichoptera				
Leptoceridae				
Oecetis	*	3	29	<1
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	0	0	14	<1
Total cells/mL	NA			3,800
Total number of genera found:	8			13
Total number of genera found in Control Pond 2: 18				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	351718094430301 - CONTROL POND 3 Collected 07-25-85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Insecta				
Coleoptera				
Dytiscidae				
Uvarus	*	1		
Hydrophilidae				
Berosus	*	3		
Ephemeroptera				
Baetidae				
Callibaetis	*	1		
Caenidae				
Caenis	*	60		
Heptageniidae				
Heptagenia	*	2		
Odonata				
Coenagrionidae				
Anomalagrion	*	4		
Argia	*	1		
Corduliidae				
Epitheca	*	3		
Gomphidae				
Gomphus	*	2		
Libellulidae				
Miathyria	*	1		
Nannothemis	*	1		
Mollusca (Molluscs)				
Bivalvia				
Nuculoidea				
Sphaeriidae				
Sphaerium	*	1		
Gastropoda				
Basommatophora				
Lymnaeidae				
Lymnaea	*	1		
Physidae				
Physa	*	4		
Planorbidae				
Helisoma	*	17		
Total cells/mL:	NA			**
Total number of genera found:	15			**

Total number of genera found in Control Pond 3: 15 ***

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	363503095231901 - CONTROL POND 4 Collected 08–16–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Insecta				
Coleoptera				
Hydrophilidae				
Berosus	0	0	14	3
Diptera				
Ceratopogonidae = Heleidae				
Palpomyia	*	8	14	3
Chaoboridae				
Chaoborus	0	0	230	47
Chironomidae				
Chironomus	*	11	0	0
Endochironomus	*	21	29	6
Pentaneura	0	0	57	12
Ephemeroptera				
Caenidae				
Caenis	*	6	57	12
Ephemeridae				
Hexagenia	*	7	57	12
Hemiptera				
Corixidae (Water boatmen)				
Female or immature	*	1	0	0
Gerridae				
Rheumatobates	*	1	0	0
Mesoveliidae				
Mesovelia	*	21	0	0
Ochteridae				
Ochterus	*	3	0	0
Odonata				
Gomphidae				
Gomphus	*	11	0	0
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	7	29	6
Planorbidae				
Planorbula	*	1	0	0
Total cells/mL:	NA		490	
Total number of genera found:	12		8	
Total number of genera found in Control Pond 4: 14				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	363238095240401 - CONTROL POND 5 Collected 08–16–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Annelida (Segmented Worms)				
Oligochaeta				
Prosopora				
Lumbriculidae				
Eclipdrilus	*	27	0	0
Arthropoda (Arthropods)				
Arachnida				
Acaria (Water mites)				
Hydrachnellae				
Hydrachna	*	2	0	0
Crustacea				
Amphipoda				
Talitridae				
Hyallela	*	6	0	0
Cladocera				
Daphnidae				
Daphnia	*	2	0	0
Insecta				
Diptera				
Chaoboridae				
Chaoborus	0	0	1,500	94
Chironomidae				
Ablabesmyia	*	2	97	6
Glyptotendipes	*	2	0	0
Natarsia	0	0	22	1
Pentaneura	*	6	0	0
Procladius	*	2	0	0
Ephemeroptera				
Baetidae				
Callibaetis	*	4	0	0
Caenidae				
Caenis	*	23	0	0
Odonata				
Coenagrionidae				
Enallagma	*	4	0	0
Corduliidae				
Epitheca	*	6	0	0
Libellulidae				
Nannothemis	*	13	0	0
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	2	0	0
Total cells/mL:	NA		1,600	
Total number of genera found:	14		3	
Total number of genera found in Control Pond 5: 16				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	360704095433601 - CROWEBURG POND 1 Collected 08–13–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Crustacea				
Amphipoda				
Talitridae				
Hyallela	*	3	0	0
Insecta				
Coleoptera				
Hydrophilidae				
Berosus	*	2	0	0
Diptera				
Chaoboridae				
Chaoborus	0	0	2,400	99
Chironomidae				
Chironomus	*	5	0	0
Dicrotendipes—Microtendipes	*	2	0	0
Endochironomus*	*	3	0	0
Rheotanytarsus	*	8	0	0
Ephemeroptera				
Caenidae				
Caenis	*	20	0	0
Hemiptera				
Corixidae (Water boatmen)				
Female or immature	*	3	0	0
Pleidae (False back swimmers)				
Neoplea	0	0	22	<1
Odonata				
Coenagrionidae				
Anomalagrion	*	30	0	0
Ischnura	*	3	0	0
Libellulidae	*	7	0	0
Neurocordulia	*	3	0	0
Somatochlora	*	3	0	0
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	8	0	0
Total cells/mL:	NA		2,400	
Total number of genera found:	14		2	
Total number of genera found in Croweburg Pond 1: 16				

Table 19. Tablͅe 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	361604095400401 - CROWEBURG POND 2 Collected 08–01–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Insecta				
Coleoptera				
Dytiscidae				
Hydrovatus	*	5	0	0
Haliplidae				
Peltodytes	*	3	0	0
Diptera				
Ceratopogonidae = Heleidae				
Palpomyia	*	4	0	0
Chaoboridae				
Chaoborus	0	0	2,200	54
Chironomidae				
Cryptochironomus	*	2	0	0
Microtendipes	*	5	150	4
Pentaneura	*	9	0	0
Procladius	*	2	0	0
Culicidae				
Culex	*	1	0	0
Ephemeroptera				
Baetidae				
Callibaetis	*	1	0	0
Caenidae				
Caenis	*	11	0	0
Megaloptera				
Sialidae				
Sialis	*	2	0	0
Odonata				
Coenagrionidae				
Anomalagrion	*	5	0	0
Argia	*	2	0	0
Corduliidae				
Epitheca	*	2	0	0
Gomphidae				
Gomphus	*	4	0	0
Libellulidae				
Miathyria	*	2	0	0
Nannothemis	*	2	0	0
Macromiidae				
Didymops	*	1	0	0
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	37	780	19
Planorbidae				
Promenetus	*	4	1,000	24
Total cells/mL:	NA		4,100	
Total number of genera found:	20		4	

Total number of genera found in Croweburg Pond 2: 21

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	362335095364901 - CROWEBURG POND 3 Collected 08–01–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Annelida (Segmented Worms)				
Oligochaeta				
Plesiopora				
Tubificidae				
Branchiura	0	0	130	4
Arthropoda (Arthropods)				
Crustacea				
Amphipoda				
Talitridae				
Hyallela	*	5	0	0
Insecta				
Coleoptera				
Chrysomelidae				
Donacia	*	1	0	0
Elmidae				
Dubiraphia	*	5	0	0
Stenelmis	*	1	0	0
Haliplidae				
Peltodytes	*	1	0	0
Hydrophilidae				
Berosus	*	2	0	0
Diptera				
Ceratopogonidae = Heleidae				
Palpomyia	*	1	0	0
Chaoboridae				
Chaoborus	0	0	43	1
Chironomidae				
Chironomus	0	0	560	18
Pentaneura	*	1	470	15
Polypedilum	*	7	0	0
Procladius	0	0	220	7
Tanypus	0	0	220	7
Culicidae				
Culex	*	2	0	0
Tabanidae				
Tabanus	*	1	0	0
Ephemeroptera				
Baetidae				
Callibaetis	*	2	0	0
Caenidae				
Caenis	*	19	170	5
Ephemeridae				
Hexagenia	0	0	22	<1
Hemiptera				
Veliidae				
Microvelia	*	1	350	11
Megaloptera				
Sialidae				
Sialis	0	0	43	1
Odonata				
Gomphidae				
Gomphus	0	0	22	<1
Lestidae				
Lestes	0	0	22	<1
Macromiidae				
Macromia	0	0	22	<1

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	362335095364901 - CROWEBURG POND 3 Collected 08–01–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Mollusca (Molluscs)				
Bivalvia				
Schizodonta				
Unionidae				
Anodonta	*	1	0	0
Gastropoda				
Basommatophora				
Physidae				
Physa	*	47	540	17
Planorbidae				
Promenetus	*	1	350	11
Total cells/mL:	NA		3,200	
Total number of genera found:	17		15	
Total number of genera found in Croweburg Pond 3: 27				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	362845095312801 - CROWEBURG POND 4 Collected 08–07–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Insecta				
Coleoptera				
Elmidae				
Stenelmis	*	8	0	0
Diptera				
Ceratopogonidae = Heleidae				
Bezzia	*	2	0	0
Palpomyia	*	2	0	0
Chaoboridae				
Chaoborus	0	0	320	74
Chironomidae				
Orthocladius	*	2	0	0
Pentaneura	*	2	0	0
Polypedilum	*	2	0	0
Procladius	*	8	0	0
Tanypus	0	0	97	23
Tribelos	*	2	0	0
Tabanidae				
Tabanus	0	0	11	3
Ephemeroptera				
Caenidae				
Caenis	*	39	0	0
Odonata				
Coenagriidae—Coenagrionidae				
Anomalagrion	*	2	0	0
Argia	*	6	0	0
Gomphidae				
Gomphus	*	10	0	0
Libellulidae				
Miathyria	*	6	0	0
Neurocordulia	*	4	0	0
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	6	0	0
Total cells/mL:	NA		430	
Total number of genera found:	15		3	
Total number of genera found in Croweburg Pond 4: 18				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	363337095292501 - CROWEBURG POND 5 Collected 08–14–85			
	Dip-net sample		Ponar sample	
	Organisms present	Percent	Cells /mL	Percent
Arthropoda (Arthropods)				
Crustacea				
Amphipoda				
Talitridae				
Hyallela	*	3		
Insecta				
Coleoptera				
Hydrophilidae				
Berosus	*	1		
Diptera				
Chironomidae				
Chironomus	*	1		
Clinotanypus	*	1		
Polypedilum	*	3		
Procladius	*	3		
Ephemeroptera				
Caenidae				
Caenis	*	40		
Odonata				
Coenagrionidae				
Anomalagrion	*	31		
Ischnura	*	1		
Corduliidae				
Epitheca	*	1		
Gomphidae				
Gomphus	*	3		
Libellulidae				
Erythemis	*	1		
Libellula	*	4		
Somatochlora	*	3		
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	5		
Total cells/mL:	NA		**	
Total number of genera found:	15			

Total number of genera found in Croweburg Pond 5: 15

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	363650095251801 - CROWEBURG POND 6 Collected 08–13–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Crustacea				
Amphipoda				
Talitridae				
Hyallela	*	6	0	0
Insecta				
Coleoptera				
Dytiscidae				
Hydrovatus	*	3	0	0
Diptera				
Chaoboridae				
Chaoborus	0	0	86	61
Chironomidae				
Procladius	*	3	0	0
Ephemeroptera				
Caenidae				
Caenis	*	15	0	0
Ephemeridae				
Hexagenia	0	0	14	10
Hemiptera				
Macroveliidae				
Macrovelia	*	3	0	0
Odonata				
Coenagrionidae				
Ischnura	*	12	0	0
Gomphidae				
Gomphus	*	21	0	0
Libellulidae				
Miathyria	*	9	0	0
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	24	0	0
Planorbidae				
Promenetus	*	3	43	31
Total cells/mL:	NA		140	
Total number of genera found:	10		3	
Total number of genera found in Croweburg Pond 6: 12				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	364754095174201 - CROWEBURG POND 7 Collected 08-21-85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Insecta				
Diptera				
Chaoboridae				
Chaoborus	0	0	280	60
Chironomidae				
Chironomus	*	3	0	0
Endochironomus	*	6	0	0
Procladius	*	3	43	9
Ephemeroptera				
Caenidae				
Caenis	*	12	43	9
Ephemeridae				
Hexagenia	*	3	65	14
Odonata				
Coenagrionidae				
Ischnura	*	6	0	0
Gomphidae				
Gomphus	*	3	0	0
Libellulidae				
Miathyria	*	6	0	0
Neurocordulia	*	12	0	0
Trichoptera				
Psychomyiidae				
Polycentropus	*	3	0	0
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	30	22	5
Planorbidae				
Helisoma	*	3	0	0
Promenetus	*	9	22	5
Total cells/mL:	NA		480	
Total number of genera found:	13		6	

Total number of genera found in Croweburg Pond 7: 14

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	365427095124001 - CROWEBURG POND 8 Collected 08-15-85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Crustacea				
Amphipoda				
Talitridae				
Hyallela	*	4	29	3
Insecta				
Diptera				
Chaoboridae				
Chaoborus	0	0	220	22
Chironomidae				
Chironomus	*	2	0	0
Coelotanypus	0	0	43	4
Procladius	*	10	14	1
Rheotanytarsus	0	0	14	1
Tanypus	0	0	72	7
Ephemeroptera				
Caenidae				
Caenis	*	10	14	1
Ephemeridae				
Hexagenia	*	20	490	49
Megaloptera				
Sialidae				
Sialis	*	2	14	1
Odonata				
Gomphidae				
Gomphus	*	4	14	1
Trichoptera				
Hydroptilidae				
Oxyethira	*	2	0	0
Leptoceridae				
Ceraclea	*	2	0	0
Mollusca (Molluscs)				
Bivalvia				
Nuculoidea				
Sphaeriidae				
Sphaerium	*	20	0	0
Gastropoda				
Basommatophora				
Physidae				
Physa	*	24	43	4
Planorbidae				
Helisoma	0	0	43	4
Total cells/mL:	NA		1,000	
Total number of genera found:	11		12	
Total number of genera found in Croweburg Pond 8: 16				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	363022095324701 - IRON POST COAL POND 1, Collected 08–08–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Crustacea				
Amphipoda				
Talitridae				
Hyallela	*	15	57	29
Insecta				
Coleoptera				
Haliplidae				
Haliplus	*	6	0	0
Hydrophilidae				
Berosus	*	12	0	0
Diptera				
Chironomidae				
Chironomus	0	0	14	7
Clinotanypus	0	0	14	7
Labrundinia	0	0	14	7
Pentaneura	*	3	0	0
Polypedilum	*	9	0	0
Procladius	*	6	0	0
Hemiptera				
Gerridae				
Rheumatobates	0	0	14	7
Odonata				
Coenagrionidae				
Anomalagrion	*	12	0	0
Argia	*	3		
Ischnura	*	12	14	7
Libellulidae				
Libellula	*	3	0	0
Miathyria	*	6	0	0
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	12	72	36
Total cells/mL:	NA		200	
Total number of genera found:	12		7	
Total number of genera found in Iron Post Pond 1: 16				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	IRON POST POND 2 Collected 08–12–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Amphipoda				
Decapoda				
Astracidae (Crayfish)				
Unknown genus	*	67		
Insecta				
Diptera				
Chironomidae				
Endochironomus	*	33		
Total cells/mL:	NA		**	
Total number of genera found:	2		**	
Total number of genera found in Iron Post Pond 2: 2 ***				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	362644095334101 - IRON POST COAL POND 3 Collected 08–12–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Crustacea				
Amphipoda				
Talitridae				
Hyallela	*	20	0	0
Insecta				
Coleoptera				
Dytiscidae				
Hydaticus	*	2	0	0
Elmidae				
Dubiraphia	*	1	0	0
Haliplidae				
Haliplus	*	2	0	0
Diptera				
Chaoboridae				
Chaoborus	0	0	1,300	100
Chironomidae				
Endochironomus	*	4	0	0
Procladius	*	4	0	0
Ephemeroptera				
Baetidae				
Callibaetis	*	4	0	0
Caenidae				
Caenis	*	27	0	0
Hemiptera				
Gerridae				
Rheumatobates	*	2	0	0
Odonata				
Coenagrionidae				
Anomalagrion	*	4	0	0
Argia	*	1	0	0
Ischnura	*	6	0	0
Gomphidae				
Gomphus	*	1	0	0
Libellulidae				
Miathyria	*	4	0	0
Nannothemis	*	1	0	0
Mollusca (Molluscs)				
Bivalvia				
Nuculoidea				
Sphaeriidae				
Pisidium	*	1	0	0
Sphaerium	*	10	0	0
Gastropoda				
Basommatophora				
Physidae				
Physa	*	7	0	0
Planorbidae				
Helisoma	*	1	0	0
Total cells/mL:	NA		1,300	
Total number of genera found:	19		1	

Total number of genera found in Iron Post Pond 3: 20

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	362632095350201 - IRON POST COAL POND 4 Collected 08-06-85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Annelida (Segmented Worms)				
Oligochaeta				
Plesiopora				
Tubificidae				
Branchiura	0	0	29	2
Arthropoda (Arthropods)				
Crustacea				
Amphipoda				
Gammaridae				
Gammarus	*	1	0	0
Insecta				
Coleoptera				
Elmidae				
Dubiraphia	*	2	0	0
Diptera				
Ceratopogonidae=heleidae				
Bezzia	*	17	0	0
Palpomyia	*	3	0	0
Chaoboridae				
Chaoborus	0	0	560	43
Chironomidae				
Endochironomus	*	5	0	0
Pentaneura	*	8	160	12
Polypedilum	*	4	14	1
Procladius	0	0	29	2
Tanypus	*	5	130	10
Culicidae				
Anopheles	*	1	0	0
Ephemeroptera				
Baetidae				
Callibaetis	*	10	0	0
Caenidae				
Caenis	*	22	0	0
Ephemeridae				
Hexagenia	0	0	200	15
Hemiptera				
Corixidae				
Trichocorixa	*	1	0	0
Gerridae				
Trepobates	*	1	0	0
Megaloptera				
Sialidae				
Sialis	0	0	29	2
Odonata				
Coenagrionidae				
Anomalagrion	*	3	0	0
Libellulidae				
Libellula	*	2	0	0
Nannothemis	*	5	0	0
Trichoptera				
Hydroptilidae				
Oxyethira	*	1	0	0

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	362632095350201 - IRON POST COAL POND 4 Collected 08–06–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per- cent	Cells /mL	Per- cent
Mollusca (Molluscs)				
Bivalvia				
Nuculoidea				
Sphaeriidae				
Sphaerium	0	0	57	4
Gastropoda				
Basommatophora				
Physidae				
Physa	*	11	43	3
Planorbidae				
Promenetus	0	0	29	2
Total cells/mL:	NA		1,300	
Total number of genera found:	18		11	
Total number of genera found in Iron Post Pond 4: 26				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	362609095342301 - IRON POST COAL POND 5 Collected 08–06–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Crustacea				
Amphipoda				
Talitridae				
Hyallela	*	21	0	0
Insecta				
Coleoptera				
Dytiscidae				
Hydrovatus	*	13	0	0
Diptera				
Ceratopogonidae = Heleidae				
Palpomyia	*	1	57	4
Chaoboridae				
Chaoborus	0	0	460	33
Chironomidae				
Chironomus	*	5	200	14
Clinotanypus	*	2	0	0
Pentaneura	0	0	43	3
Phaenopsectra	0	0	57	4
Procladius	*	6	0	0
Tribelos	0	0	29	2
Culicidae				
Aedes	*	7	0	0
Culex	0	0	14	1
Tabanidae				
Chrysops	*	2	0	0
Tabanus	*	1	0	0
Ephemeroptera				
Baetidae				
Callibaetis	*	5	14	1
Caenidae				
Caenis	*	2	0	0
Hemiptera				
Veliidae				
Microvelia	0	0	29	2
Odonata				
Coenagrionidae				
Anomalagrion	*	7	43	3
Argia	*	1		
Enallagma	*	1		
Ischnura	*	7	14	1
Gomphidae				
Gomphus	*	1	0	0
Libellulidae				
Erythemis	*	2	86	6
Libellula	*	3	0	0
Miathyria	*	1	0	0
Nannothemis	*	6	0	0
Tramea	*	1	0	0
Mollusca (Molluscs)				
Bivalvia				
Nuculoidea				
Sphaeriidae				
Pisidium	*	1	0	0

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	362609095342301 - IRON POST COAL POND 5 Collected 08–06–85			
	Dip-net sample		Ponar sample	
	Organisms present	Percent	Cells /mL	Percent
Gastropoda				
Basommatophora				
Physidae				
Physa	*	5	320	23
Planorbidae				
Promenetus	*	1	43	3
Total cells/mL:	NA		1,400	
Total number of genera found:	24		14	
Total number of genera found in Iron Post Pond 5: 30				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	364051095274001 - IRON POST COAL POND 6 Collected 08–28–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Insecta				
Coleoptera				
Dytiscidae				
Coptotomus	*	1	0	0
Diptera				
Chironomidae				
Chironomus	*	25	0	0
Rheotanytarsus	0	0	14	6
Tanypus	*	16	14	6
Xenochironomus	*	12	0	0
Ephemeroptera				
Caenidae				
Caenis	*	1	0	0
Odonata				
Coenagrionidae				
Ischnura	*	3	0	0
Corduliidae				
Epitheca	*	3	0	0
Libellulidae				
Erythemis	*	3	0	0
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	38	200	87
Total cells/mL:	NA		230	
Total number of genera found:	9		3	

Total number of genera found in Iron Post Pond 6: 10

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	362605095342001 - IRON POST COAL POND 7, SITE 4 Collected 08–20–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Insecta				
Diptera				
Chironomidae				
Pseudochironomus	*	2		
Stictochironomus	*	1		
Ephemeroptera				
Baetidae				
Callibaetis	*	1		
Caenidae				
Caenis	*	87		
Odonata				
Coenagrionidae				
Ischnura	*	1		
Corduliidae				
Epitheca	*	1		
Neurocordulia	*	1		
Libellulidae				
Libellula	*	1		
Nannothemis	*	2		
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	1		
Total cells/mL:	NA		**	
Total number of genera found:	10		**	

Total number of genera found in Iron Post Pond 7: 10 ***

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	364329095221601 - IRON POST COAL POND 8, Collected 08–19–85			
	Dip-net sample		Ponar sample	
	Organisms present	Percent	Cells /mL	Percent
Annelida				
Oligochaeta				
Naididae				
Unknown Genus	*	22	0	0
Arthropoda (Arthropods)				
Crustacea				
Amphipoda				
Talitridae				
Hyallela	*	3	0	0
Insecta				
Coleoptera				
Hydrophilidae				
Berosus	*	2	0	0
Ephemeroptera				
Baetidae				
Callibaetis	*	28	0	0
Odonata				
Coenagrionidae				
Anomalagrion	*	3	0	0
Ischnura	*	2	0	0
Libellulidae				
Tramea	*	2	0	0
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Lymnaeidae				
Lymnaea	*	17	0	0
Physidae				
Physa	*	15	130	100
Total cells/mL:	NA		130	
Total number of genera found:	10		1	

Total number of genera found in Iron Post Pond 8: 10

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	345906095042401 - MCALESTER POND 1 Collected 07–18–85			
	Dip-net sample		Ponar sample	
	Organisms present	Percent	Cells /mL	Percent
Arthropoda (Arthropods)				
Arachnida				
Acaria				
Hydrachnellae				
Oxus	*	67	0	0
Insecta				
Diptera				
Chaoboridae				
Chaoborus	0	0	43	36
Chironomidae				
Chironomus	0	0	29	24
Procladius	0	0	43	36
Ephemeroptera				
Caenidae				
Caenis	*	33	0	0
Total cells/mL:	NA		120	
Total number of genera found:	2		3	

Total number of genera found in McAlester Pond 1: 5

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	351046095050801 - MCALESTER POND 3 Collected 07–30–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Insecta				
Ephemeroptera				
Ephemeridae				
Hexagenia			14	100
Total cells/mL:	NA		14	
Total number of genera found:	**		1	
Total number of genera found in McAlester Pond 3: 1 ***				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	350708094502901 - MCALESTER POND 4 Collected 07-23-85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Insecta				
Diptera				
Chaoboridae				
Chaoborus			43	11
Chironomidae				
Procladius			72	18
Ephemeroptera				
Caenidae				
Caenis			57	14
Ephemeridae				
Hexagenia			200	50
Megaloptera				
Sialidae				
Sialis			29	7
Total cells/mL:	NA		400	
Total number of genera found:	**		5	
Total number of genera found in McAlester Pond 4: 5 ***				

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	MCALESTER POND 5 Collected 07–24–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Insecta				
Coleoptera				
Hydrophilidae				
Berosus	*	29		
Diptera				
Chaoboridae				
Chaoborus	*	2		
Chironomidae				
Chironomus	*	5		
Pentaneura	*	2		
Zavrelia	*	3		
Ephemeroptera				
Caenidae				
Caenis	*	44		
Odonata				
Corduliidae				
Epitheca	*	2		
Libellulidae				
Libellula	*	5		
Miathyria	*	2		
Nannothemis	*	3		
Perithemis	*	2		
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	2		
Total cells/mL:	NA		**	
Total number of genera found:	12		**	

Total number of genera found in McAlester Pond 5: 12 ***

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	352001094583501 - MCALESTER POND 7 Collected 07–31–85			
	Dip-net sample		Ponar sample	
	Organisms present	Per-cent	Cells /mL	Per-cent
Arthropoda (Arthropods)				
Insecta				
Coleoptera				
Dytiscidae				
Hygrotus	0	0	150	3
Haliplidae				
Brychius	*	2	0	0
Glyptotendipes	*	1	22	<1
Peltodytes	*	6	0	0
Hydrophilidae				
Berosus	*	7	86	2
Diptera				
Chaoboridae				
Chaoborus	0	0	3,100	73
Chironomidae				
Coelotanypus	*	1	0	0
Glyptotendipes	0	0	22	<1
Microtendipes	*	1	0	0
Procladius	0	0	65	2
Culicidae				
Culex	*	<1	0	0
Ephemeroptera				
Baetidae				
Callibaetis	*	8	370	9
Caenidae				
Caenis	*	8	86	2
Ephemeridae				
Hexagenia	*	<1	0	0
Hemiptera				
Corixidae				
Sigara	0	0	65	2
Trichocorixa	*	1	0	0
Female or immature	*	2	43	1
Megaloptera				
Sialidae				
Sialis	*	1	22	<1
Odonata				
Gomphidae				
Gomphus	*	6	22	<1
Libellulidae				
Erythemis	*	1	0	0
Neurocordulia	*	3	130	3
Plathemis	*	1	0	0
Somatochlora	*	1	43	1
Mollusca (Molluscs)				
Gastropoda				
Basommatophora				
Physidae				
Physa	*	50	22	<1
Total cells/mL:	NA		4,300	
Total number of genera found:	19		16	

Total number of genera found in McAlester Pond 7: 25

Table 19. Table 19.—Taxa and concentrations of benthic invertebrates in samples from study ponds—Continued

	352506095134101 - MCALESTER POND 9 Collected 07–22–85			
	Dip-net sample		Ponar sample	
	Organisms present	Percent	Cells /mL	Percent
Annelida (Segmented Worms)				
Oligochaeta				
Plesiopora				
Tubificidae				
Branchiura	*	10	0	0
Arthropoda (Arthropods)				
Insecta				
Coleoptera				
Elmidae				
Dubiraphia	*	3	0	0
Diptera				
Ceratopogonidae = Heleidae				
Palpomyia	*	8	0	0
Chaoboridae				
Chaoborus	0	0	1,500	100
Chironomidae				
Coelotanypus	*	10	0	0
Cryptochironomus	*	3	0	0
Glyptotendipes	*	7	0	0
Polypedilum	*	2	14	<1
Tanypus	*	3	0	0
Tribelos	*	16	0	0
Ephemeroptera				
Caenidae				
Caenis	*	16	0	0
Ephemeridae				
Hexagenia	*	2	0	0
Hemiptera				
Corixidae				
Female or immature	*	2	0	0
Megaloptera				
Sialidae				
Sialis	*	3	0	0
Odonata				
Coenagrionidae				
Ischnura	*	3	0	0
Corduliidae				
Epitheca	*	2	0	0
Libellulidae				
Neurocordulia	*	7	0	0
Tramea	*	2	0	0
Mollusca (Molluscs)				
Bivalvia				
Nuculoidea				
Sphaeriidae				
Sphaerium	*	2	0	0
Total cells/mL:	NA		1,500	
Total number of genera found:	18		2	
Total number of genera found in McAlester Pond 9: 19				