

Phase I Diagnostic / Feasibility Study



Lake Paradise Coles County Illinois

**Illinois
Environmental
Protection
Agency**

**Clean Lakes
Program**

March 2004



Prepared For:



Prepared by:



**Phase I
Diagnostic / Feasibility
Study**

Clean Lakes Program

**Lake Paradise
Coles County, Illinois**

**Prepared for
City of Mattoon
Illinois EPA**

Prepared by

Crawford, Murphy, and Tilly, Incorporated

In association with

Goodpaster & Associates, Incorporated

Illinois Department of Natural Resources – State Water Survey

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PART I – DIAGNOSTIC STUDY.....	1
INTRODUCTION	2
STUDY AREA	3
Location	3
Morphometric Characteristics.....	3
Environmental Setting	3
Climate.....	3
Drainage Area	6
Physiography and Topography	7
Geology.....	7
Groundwater Hydrology	11
Soils.....	13
Water Discharges	15
Point Source Pollution Discharges.....	15
Nonpoint Pollutant Loadings	17
Watershed Land Use	17
Nonpoint Pollution Sources	18
LAKE USES	22
Historical Lake Uses	22
Public Water Supply	22
Recreational Uses.....	24
Residential Uses.....	24
Public Access	24
User Population.....	27
Comparison to Other Lakes in the Region.....	37
Publicly Owned Lakes Within 50 Miles of Lake Paradise	
Population Segments Adversely Affected by Lake Degradation	37
EXISTING LAKE CONDITIONS	40
Limnology.....	40
Shoreline	40
Water Quality.....	42
Methods.....	42
Chemical Parameters	42
Biological Parameters	43
Chemical Parameters	45
Transparency.....	45
Suspended Solids and Turbidity	48
Specific Conductance, pH, and Alkalinity.....	53
Nitrogen and Phosphorus.....	58
Chlorophyll	64
Dissolved Oxygen / Temperature	69

Table of Contents

Inorganic and Organic Material	72
Biological Parameters	77
Indicator Bacteria.....	77
Phytoplankton	80
Macrophytes.....	83
Fisheries	85
Influent and Effluent Waters.....	87
Trophic State Index.....	88
Lake Budgets	91
Hydrologic Budget.....	91
Sediment Budget.....	93
Nutrient Budget.....	96
Limiting Nutrient	96
 BIOLOGICAL RESOURCES & ECOLOGICAL RELATIONSHIPS	 113
 REFERENCES	 114
 PART II – FEASIBILITY STUDY	 118
 PROBLEMS IDENTIFIED FROM THE DIAGNOSTIC STUDY	 119
 OBJECTIVES OF THE LAKE PARADISE RESTORATION PROGRAM	 120
 POTENTIAL RESTORATION MEASURES	 121
Shoreline Enhancement and Protection	121
Septic System Inspection and Maintenance Program.....	121
Fish Crib Installation.....	122
Lake Education Program.....	122
Wetland Development	122
Aeration/Destratification.....	123
Sediment Retention Basin.....	123
Watershed Nutrient Management Program	123
Streambank and Channel Protection.....	124
Lake Sediment Removal	124
 RECOMMENDED RESTORATION MEASURES	 126
A – Shoreline Enhancement and Protection	126
B – Lake Septic Inspection and Maintenance Program	126
C – Fish Crib Installation.....	126
D – Lake Education Program.....	127
E – Wetland Development.....	127
F – Additional Destratifier / Aerator.....	127
G – Sediment Retention Basin.....	127
 BENEFITS EXPECTED FROM IMPLEMENTATION	 130

Table of Contents

PHASE II MONITORING PROGRAM.....	131
BUDGET AND SCHEDULE	132
SOURCES OF MATCHING FUNDS.....	134
RELATIONSHIP TO OTHER POLLUTION CONTROL PROGRAMS	135
PUBLIC PARTICIPATION	136
NECESSARY PERMITTING	137
OPERATIONAL RESPONSIBILITY AND MAINTENANCE PLAN	138
A – Shoreline Enhancement and Protection	138
B – Lake Septic System Inspection and Maintenance Program	138
C – Fish Crib Installation.....	138
D – Lake Education Program.....	138
E – Wetland Development Near the Upper Reaches of the Lake.....	139
F – Destratification and Aeration.....	139
G – Sediment Retention Basin near Upper Reaches of the Lake	139
ENVIRONMENTAL EVALUATION.....	140
Displacement of People	140
Defacement of Residential Areas.....	140
Changes in Land Use Patterns	140
Impacts on Prime Agricultural Land.....	140
Impacts on Parkland, Other Public Land, and Scenic Resources	141
Impacts on Historic, Architectural, Archaeological or Cultural Resources.....	141
Long-Range Increases in Energy Demand	141
Changes in Ambient Air Quality or Noise Levels	141
Adverse Effects of Chemical Treatment.....	141
Compliance with Executive Order 11988 on Floodplain Management.....	142
Dredging and Other Channel, Bed, or Shoreline Modifications.....	142
Adverse Effects on Wetlands and Related Resources	142
Feasible Alternatives to Proposed Project	142
Other Necessary Mitigative Measures	142
APPENDICES	143
o Appendix A. Water Quality Data	
o Appendix B. 2000 Phytoplankton Report	
o Appendix C. Recent Fish Management Records	
o Appendix D. Sedimentation Survey of Lake Paradise & Lake Mattoon – Mattoon, Illinois	
o Appendix E. Example Riprap Installation Specifications	
o Appendix F. Example Septic Ordinances	
o Appendix G. Example Education Pamphlet	
o Appendix H. Public Hearing	

List of Tables

Table 1. Lake Paradise Lake Identification	4
Table 2. Land Slope in Lake Paradise Watershed	11
Table 3. Soils in the Lake Paradise Watershed.....	14
Table 4. Mattoon Water Treatment Plant Effluent	15
Table 5. Lake Paradise Watershed Land Use	17
Table 6. Soil Losses in the Lake Paradise Watershed Due to Precipitation Runoff	20
Table 7. Estimated Nonpoint Nutrient Loading Rates.....	21
Table 8. Per Capita Income of Counties Within a 50-mile Radius*	29
Table 9. Educational Attainment of Persons Living Within a 50-Mile Radius	30
Table 10. Population Percentages by Age Group with a 50-Mile Radius	31
Table 11. Populations of Counties Within a 50-Mile Radius	32
Table 12. Population of Municipalities Within 50-Mile Radius.....	33
Table 13. Economic Data of Counties Within a 50-Mile Radius	34
Table 14. Employment Categories for Areas Near Lake Paradise	35
Table 15. Comparison of Lake Uses to Other Lakes Within 50-Mile Radius.....	38
Table 16. Mean Secchi Depths 1977-2001 (inches)	46
Table 17. Mean Annual Secchi Depths 1977-2001 (inches)	46
Table 18. Total and Volatile Suspended Solids and Turbidity Mean Values 1977-2001.....	49
Table 19. Annual Means for Total and Volatile Suspended Solids and Turbidity 1977-2001.....	50
Table 20. Specific Conductance, pH, and Alkalinity Mean Values 1977-2001	55
Table 21. Annual Means for Specific Conductance, pH, and Alkalinity 1977-2001	56
Table 22. Mean Nitrogen Values 1977-2001.....	60
Table 23. Annual Means for Nitrogen 1977-2001.....	61
Table 24. Phosphorus Mean Values 1977-2001	62
Table 25. Annual Phosphorus Means 1977-2001	62
Table 26. Chlorophyll Mean Values 1977-2001 (µg/L)	65
Table 27. Annual Means for Uncorrected Chlorophyll 1977-2001 (µg/L)	66
Table 28. Annual Means for Corrected Chlorophyll(a) and Pheophytin(a) 1977-2001 (µg/L) ...	67
Table 29. Dissolved Oxygen, Temperature, and Percent Oxygen Saturation Mean Values Expressed by Month and Depth at Site 1.....	71
Table 30. Summary of Inorganic Parameters Tested in Collected Water Samples (µg/L)	73
Table 31. Summary of Organic Parameters Tested for Site 1 Water Samples (µg/L)	74
Table 32. Summary of Lake Paradise Inorganic Sediment Classification.....	75
Table 33. Summary of Lake Paradise Organic Sediment Classification.....	76
Table 34. Summary of Coliform Counts at Sampling Sites	79
Table 35. Plankton Species Density 1979 vs. 2000	81
Table 36. Tributary Mean Sampling Values 2000-2001	87
Table 37. Comparisons of Tributary and Lake Parameter Means	87
Table 38. Annual Mean Secchi Trophic State Indices.....	89
Table 39. Annual Mean Chlorophyll (a) Trophic State Indices.....	89
Table 40. Annual Mean Total Phosphorus Trophic State Indices	90
Table 41. Lake Paradise Trophic State Index	90
Table 42. Lake Paradise Hydrological Budget	92
Table 43. Lake Paradise Sediment Budget	95

Table of Contents

Table 44. Lake Paradise Nitrogen Budget	97
Table 45. Lake Paradise Phosphorus Budget.....	98
Table 46. Total Nitrogen to Total Phosphorus Ratios	99
Table 47. Proposed Budget for Recommended Measures	132
Table 48. Proposed Implementation Schedule.....	133
Table 49. Summary of Anticipated Annual O&M Costs.....	139

List of Figures

Figure 1. Lake Paradise Watershed	5
Figure 2. Illinois Physiographic Divisions.....	8
Figure 3. Illinois Glacial Map.....	9
Figure 4. Thickness of Surficial Deposits.....	10
Figure 5. Geological Stack Map	12
Figure 6. Lake Paradise Feature Identification	16
Figure 7. Lake Paradise Public Access	26
Figure 8. Coles County Population Dynamics.....	28
Figure 9. Lakes Within a 50-mile Radius (Over 150 ac in size).....	39
Figure 10. Lake Paradise Shoreline Erosion Potential.....	41
Figure 11. Mean Secchi Depths 1977-2001.....	47
Figure 12. Mean Annual Secchi Depths, Site 1 vs. Site 3 1977-2001.....	47
Figure 13. Total Suspended Solids Mean Values 1977-2001.....	51
Figure 14. Volatile Suspended Solids Mean Values 1977-2001	51
Figure 15. Annual Total Suspended Solids Mean Values – Site 1 vs. Site 3	52
Figure 16. Annual Volatile Suspended Solids Mean Values – Site 1 vs. Site 3.....	52
Figure 17. Alkalinity and Specific Conductance Annual Means 1977-1998	57
Figure 18. Annual Mean Nitrogen Levels 1979-2001	63
Figure 19. Annual Mean Total Phosphorus Levels – Site 1 vs. Site 3	63
Figure 20. Mean Annual Uncorrected Chlorophyll Levels 1979-2001	68
Figure 21. 1979 Mean Algal Concentrations by Phylum	82
Figure 22. 2000 Mean Algal Concentrations by Phylum	82
Figure 23. Lake Paradise Macrophyte Populations	84
Figure 24. Total Nitrogen to Total Phosphorus Ratios 1977-2001.....	99
Figure 25. Lake Paradise Bathymetry Map	100
Figure 26. Lake Paradise Bathymetry Cross Section Locations.....	101
Figure 27. Lake Paradise Cross Section R21-R1.....	102
Figure 28. Lake Paradise Cross Section R2-R1.....	103
Figure 29. Lake Paradise Cross Section R4-R3.....	104
Figure 30. Lake Paradise Cross Section R6-R5.....	105
Figure 31. Lake Paradise Cross Section R8-R7.....	106
Figure 32. Lake Paradise Cross Section R10-R9.....	107
Figure 33. Lake Paradise Cross Section R12-R11.....	108
Figure 34. Lake Paradise Cross Section R14-R13.....	109
Figure 35. Lake Paradise Cross Section R16-R15.....	110
Figure 36. Lake Paradise Cross Section R18-R17.....	111
Figure 37. Lake Paradise Cross Section R17-R24.....	112
Figure 38. Visible Restoration Measures for Lake Paradise.....	129

PART I – DIAGNOSTIC STUDY

Lake Paradise

Coles County

Mattoon, Illinois

INTRODUCTION

The City of Mattoon applied for and received a grant to conduct a diagnostic-feasibility study on Lake Paradise commencing in May 2000.

The diagnostic study was designed to characterize existing lake conditions, examine the extent and causes of use impairment, and provide the basis for selection of restoration and management techniques

The project was funded (60 percent) by the Illinois Environmental Protection Agency (Illinois EPA) through the Illinois Clean Lakes Program under Conservation 2000 with cost sharing by the City of Mattoon. The Illinois EPA was responsible for grant administration and program management. The Diagnostic-Feasibility Study was conducted by Crawford, Murphy & Tilly, Inc. (CMT), the Watershed Science Section of the Illinois State Water Survey (ISWS), and Goodpaster and Associates, Inc. (GAI).

STUDY AREA

Location

Lake Paradise is located approximately 4.5 miles southwest of Mattoon, in the southwest corner of Coles County (see Figure 1). The dam site is located in the SW1/4 of NE1/4, Section 8, Township 11N, Range 7E, Third Principal Meridian. Location information is summarized in Table 1. Lake Paradise is one of two water supply reservoirs owned by the City of Mattoon, Illinois.

The City of Mattoon is located in the southwest part of Coles County. US Highway 45 and Illinois Routes 16 and 121 go through the center of the city. Interstate 57 is located around the east side of the city.

Morphometric Characteristics

Lake Paradise is an impoundment behind a constructed dam across the Little Wabash River. The main inflow tributary for Lake Paradise is the Little Wabash River, which is also the primary outfall. Two unnamed perennial streams form the other main inflows to the lake. The coordinates of the deepest location of the reservoir are latitude 39°25'09"N and longitude 88°25'57"E. Morphometric data for Lake Paradise are summarized in Table 1.

Environmental Setting

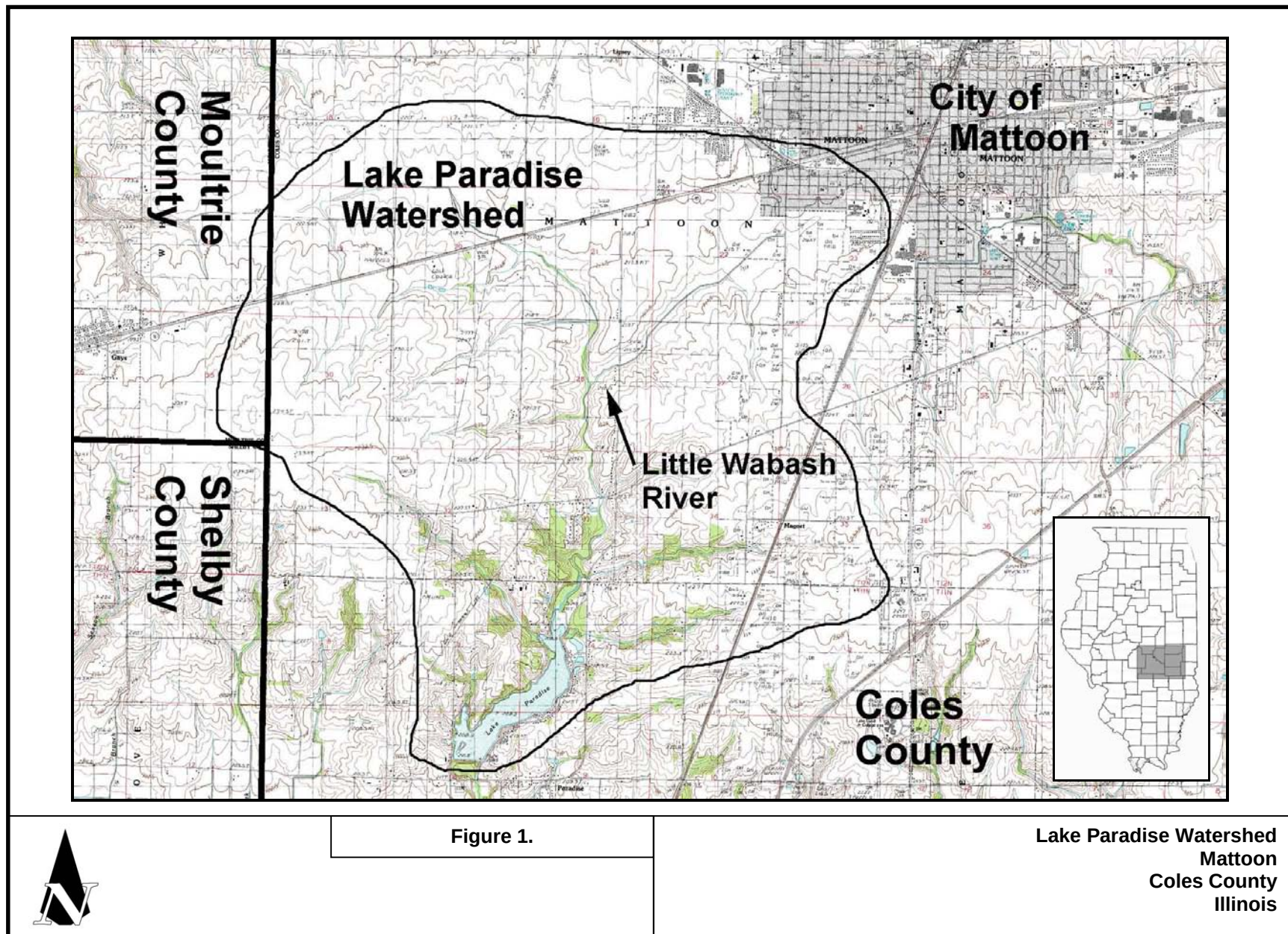
Climate

Mattoon has a temperate continental climate dominated by maritime tropical air from the Gulf of Mexico from about April through October; maritime polar air from the Pacific Ocean in spring, fall, and winter; and short-duration incursions of continental polar air from Canada in winter. The following climatologic summary for Mattoon and Charleston, Illinois is based on a National Weather Service period of record of 1961 to 2000. Mid-winter high temperatures are typically between 3 and 6° Celsius (°C); summer highs are usually in the 30°C range, with lows about 17°C lower. Spring and fall are a mix of winter- and summer-like days, with rather large day-to-day temperature fluctuations common. The greatest day-to-day changes in temperature occur in late fall, winter, and early spring.

Table 1. Lake Paradise Lake Identification

Lake name:	Lake Paradise
IEPA/STORET lake code:	RCG
State:	Illinois
County:	Coles
Ownership:	City of Mattoon
Nearest municipalities:	Mattoon, Charleston, Effingham, Decatur, and Champaign
Latitude:	39° 24' 47" N
Longitude:	88° 26' 23" E
USEPA region:	V
USEPA major basin name and code:	Ohio River (05)
Major tributary:	Little Wabash River
Outflowing Stream:	Little Wabash River
Receiving water body:	Wabash River and Ohio River via Little Wabash River
Water quality standards:	General standards promulgated by the Illinois Pollution Control Board and applicable to water designated for aquatic life and whole body contact recreation: Title 35, Section C, Chapter 1, Part 302, Subpart B
Surface Area	166 acres
Watershed Area	11,500 acres
Shoreline Length	2.7 miles
Maximum Depth	19 feet
Mean Depth	7.5 feet
Normal Pool Elevation	684 ft above msl
Storage Capacity	1,252 acre-feet
Hydraulic Retention Time	0.11 years

Notes: IEPA - Illinois Environmental Protection Agency
STORET - Storage and Retrieval
USEPA - U.S. Environmental Protection Agency



In winter, the average temperature is -1.6°C and the average daily minimum temperature is -6.1°C . The lowest temperature on record at Mattoon (-30.6°C) occurred on January 20, 1985. The winter is usually punctuated with two to five cold, dry arctic outbreaks, in which daily lows drop into the -25°C range. These outbreaks generally persist for three to five days, and are often preceded by a winter storm that can reach severe proportions consisting of snowfalls of 6 inches (15 centimeters or cm) or more with strong winds or freezing precipitation.

In summer, the average temperature is 23.6°C and the average daily maximum temperature is 29.4°C . The highest recorded temperature at Mattoon was 43.9°C , which occurred on July 14, 1954. Usually about 30 days per year have temperatures greater than 28°C ; temperatures greater than 30°C are infrequent. Summers are humid with dew points between 16°C and 20°C .

Average annual precipitation at Mattoon is 39.05 inches (992 millimeters, mm). Of this, 24.47 inches (622 mm), or 62.7 percent, usually falls in April through September. However, there is considerable variability from year to year. In two out of ten years, the rainfall in April through September is less than 15.50 inches (384 mm). The growing season for most crops falls within this period. On average, precipitation is most frequent and greatest in magnitude during the warmer half of the year.

Thunderstorms are common in the afternoon and evening, primarily during spring and summer. Tornadoes and hail occur occasionally. Severe thunderstorms, tornadoes, and hail generally are of small extent and of short duration and cause damage in narrow belts or localized areas.

The average seasonal snowfall is 18.6 inches (472 mm). The greatest snow depth at any one time during the period of record (February 8 to 10, 1982) was 21 inches (838 mm). On the average, 30 days of the year have at least 1 inch (25 mm) of snow on the ground (USDA, 1993). The number of those days varies greatly from year to year.

The average relative humidity in mid-afternoon is about 64 percent. Humidity is higher at night, and the average relative humidity at dawn is about 83 percent. The sun shines 70 percent of the time possible in summer and 43 percent in winter. The prevailing wind is from the southwest. Average wind speed is highest, 13.8 miles per hour (22.2 kilometers, km per hour), in March (USDA, 1993).

Drainage Area

The Lake Paradise watershed covers approximately 11,500 acres including the reservoir (USDA, 1987). The ratio of the drainage area to the lake storage capacity is approximately nine (9) acres per acre-ft. The Lake Paradise watershed is located in the southwest corner of Coles County (Figure 1) and covers all or portions of Sections 15 through 23, and Sections 27 through 34 of T12N, Range 7E, (Mattoon West); Sections 4 through 6 of T11N, R7E; and Sections 24 and 25 of T12N, R6E (a small portion in Moultrie County). The Little Wabash River, the major Lake

Paradise tributary, originates about two miles southwest of the city of Mattoon at the confluence with one small unnamed tributary. From this point, the Little Wabash River flows in a general southerly direction for about two miles before entering Lake Paradise. Several other small intermittent tributaries flow directly into Lake Paradise and into the Little Wabash River prior to its entry into the lake. Most are extremely small drainage courses originating as ditches or grassed waterways in surrounding agricultural areas.

Physiography and Topography

Lake Paradise and its watershed are located in the Bloomington Ridged Plain subsection of the Till Plains Section of the Central Lowland physiographic province (Figure 2). The lake is located near the southern boundary of the Bloomington Ridged plain, which is the southernmost extent of the Wisconsinan glaciation in Illinois. This southern boundary is marked by a broad, prominent ridge known as the Shelbyville moraine. The topography of the Wisconsinan deposits is characterized by undulating to rolling areas that are deeply dissected along major drainage ways (Figure 3).

Landscape topography within the Lake Paradise watershed consists of gentle slopes, generally toward the Little Wabash River and Lake Paradise. Relief within the watershed is slight. It ranges from 684 feet above MSL along the lake to 770 feet above MSL near the Coles, Shelby, and Moultrie county line. The maximum elevation in the drainage basin is located at the west end of the watershed. The minimum elevation of 684 feet above MSL is the normal lake level at the spillway crest.

As shown in Table 2, over 87 percent of the land in the drainage basin has a slope in the range of zero to 2 percent. Areas along the tributaries and the lake shoreline have greater slopes, in the range of 5 to 10 percent. Steep slopes (>15%) exist only along creek banks and eroded sections of the lake shoreline (USDA, 1998).

Geology

The following discussion is based on information available from geological publications and maps. Most of the available information is mapped over a broad scale. These maps are meant to represent the broad patterns in the geologic deposits and do not capture all of the details. Thus, it is possible that some local conditions may vary from the published data and maps.

Drift is a term that describes the glacial, alluvial, and other nonlithified deposits that are deposited on top of bedrock. According to Piskin and Bergstrom (1975), the drift across the Lake Paradise watershed varies from less than twenty-five to greater than two hundred feet in thickness, and is greater than one hundred feet thick over most of the watershed (see Figure 4).

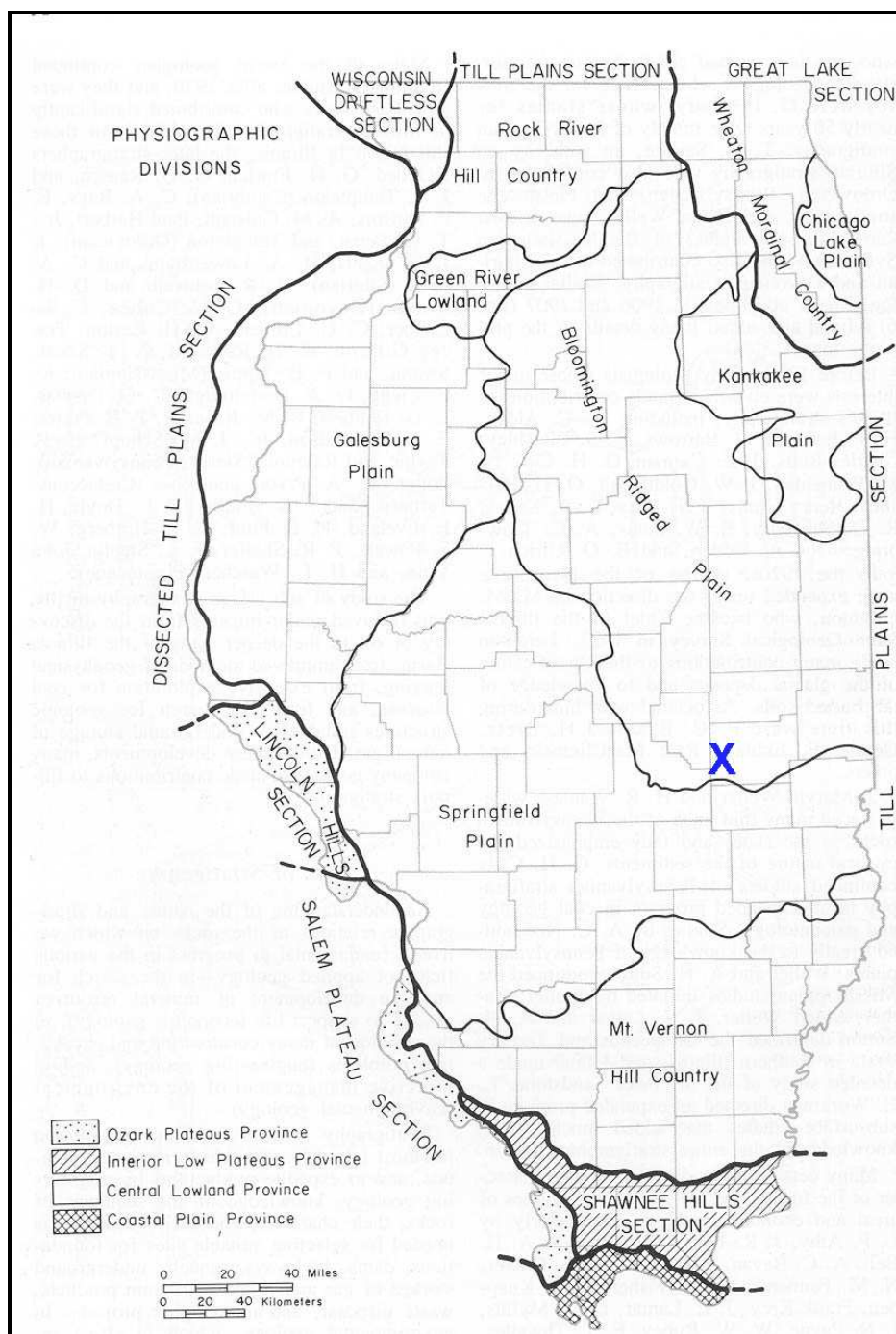


Figure 2.

**Illinois Physiographic Divisions
Lake Paradise
Mattoon
Coles County
Illinois**



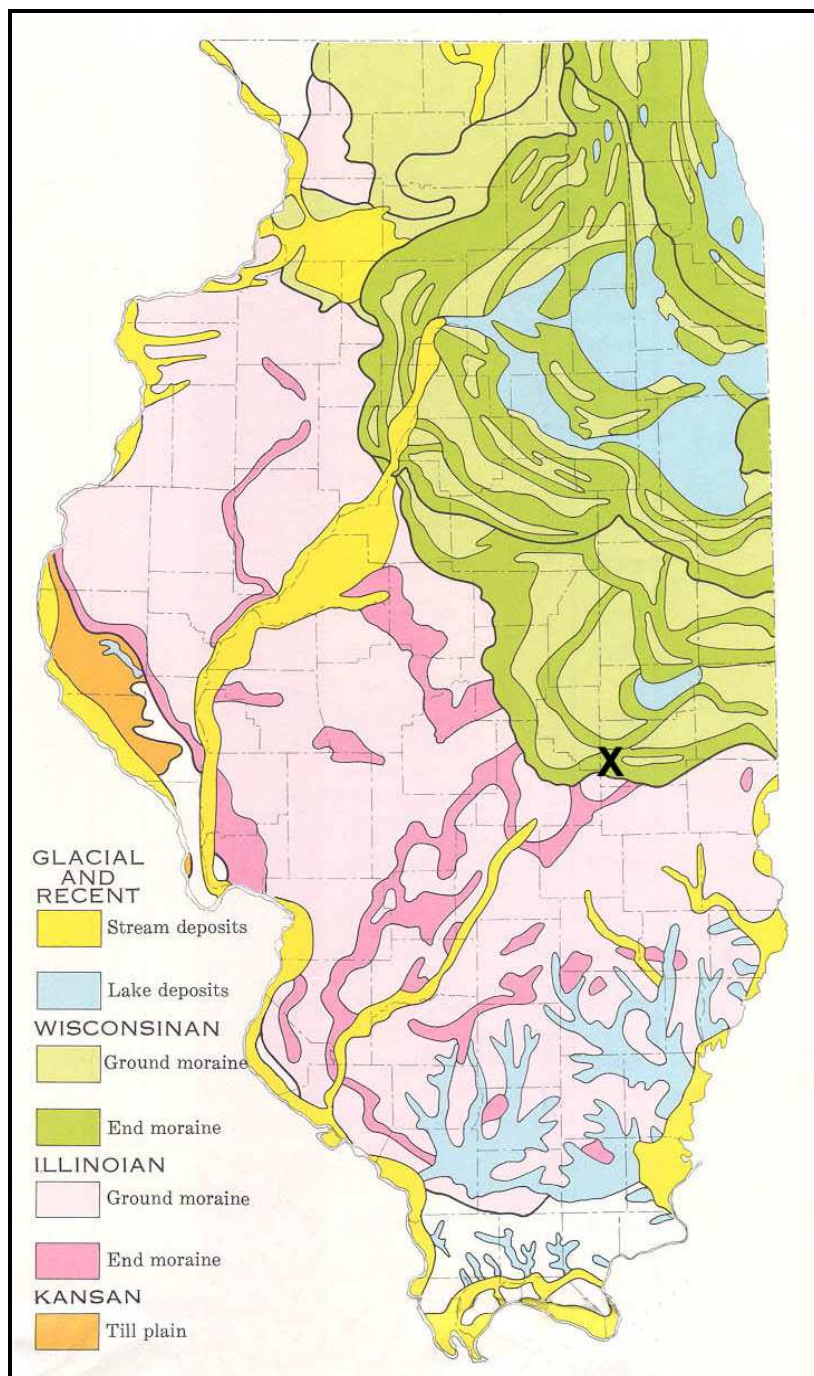


Figure 3.



**Illinois Glacial Map
Lake Paradise
Mattoon
Coles County
Illinois**

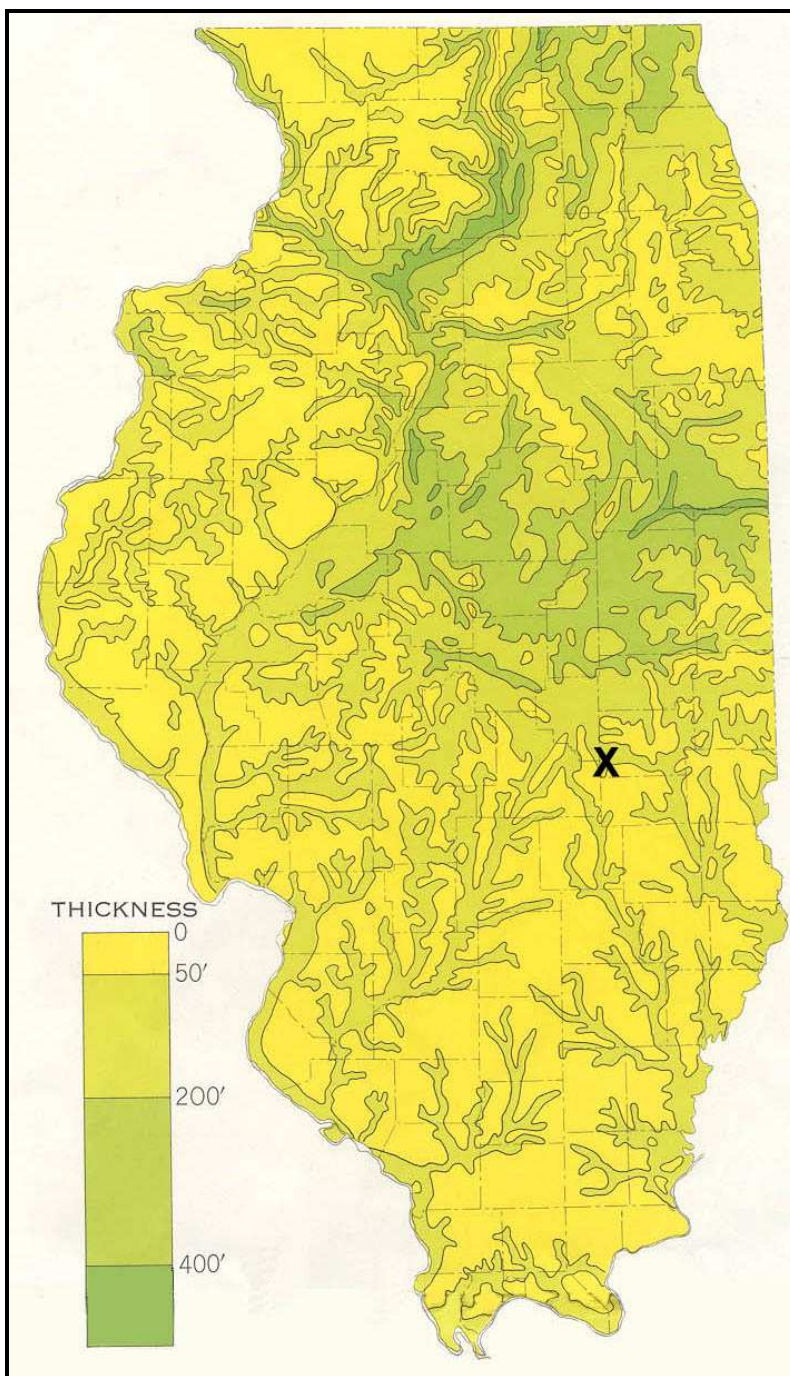


Figure 4.

**Thickness of Surficial Deposits
(Glacial Drift, Loess, and Alluvium)
Lake Paradise
Mattoon
Coles County
Illinois**

Table 2. Land Slope in Lake Paradise Watershed

<i>Land slope</i>	<i>Area (acres)</i>	<i>Percent of total drainage area (%)</i>
0% - 2%	10,086.7	87.4
2% - 5%	582.6	5.1
5% - 10%	664.9	5.6
10% - 15%	23.4	0.2
>15 %	25.3	0.2
Other water	9.3	0.1
Lake Paradise	166.0	1.4
Total	11,500.0	100.0

Source: USDA, 1998

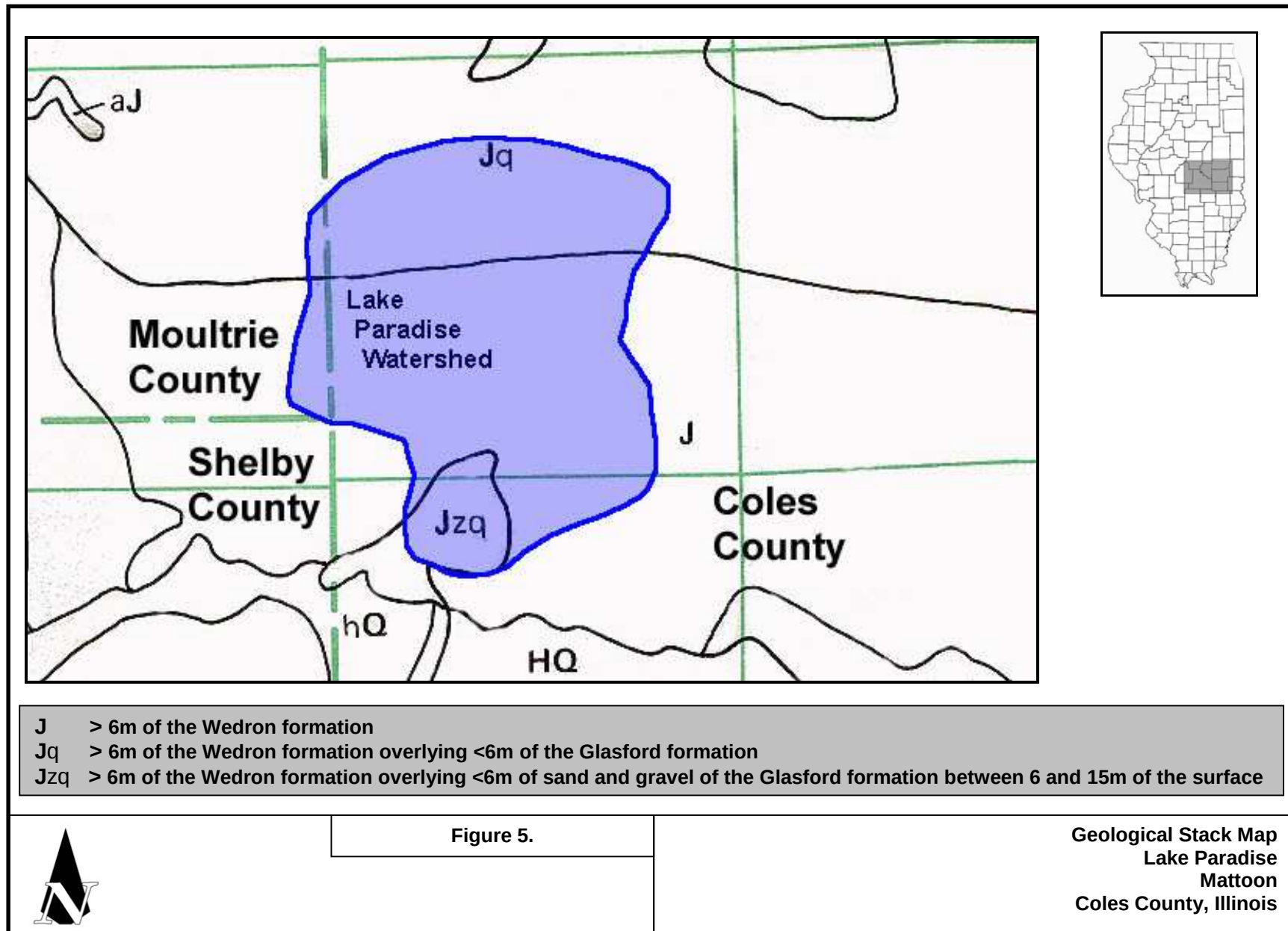
The surficial deposits within the Lake Paradise watershed are comprised predominantly of loamy and sandy diamictos of the Wedron Formation, generally greater than twenty feet (about six meters) thick (see Figure 5). The Wedron Formation consists primarily of till, with intercalated beds of outwash gravel, sand and silt (Willman et al., 1975). Within the lake basin and the adjoining watershed to the west, the Wedron deposits are underlain by less than twenty feet of loamy and sandy diamictos of the Glasford Formation.

The uppermost bedrock throughout the watershed is mapped as the Pennsylvanian aged Mattoon Formation (Willman et al., 1967), which is comprised of gray and black limestones, coals and sandstones. The Mattoon Formation is approximately three to four hundred feet thick in this area. The Mattoon Formation is part of the McLeansboro Group and is the youngest Pennsylvanian formation in Illinois (Lineback, 1979).

Groundwater Hydrology

According to Selkregg and Kempton (1958), the probability of occurrence of sand and gravel aquifers in the watershed is rated as fair to good. Sand and gravel aquifers in the drift have variable hydraulic conductivity and are scattered and discontinuous. This is consistent with the drift thickness map and the map of surficial deposits. Small groundwater supplies are also obtained from sandstone, limestone and fractured shales in the bedrock.

Based on the available information, it appears that the shallow geologic materials (<50 feet) in this township have variable hydraulic conductivity. Sand and gravel would be expected to be found most consistently in the areas mapped as Jzq on Figure 5, but thin, discontinuous sand and gravel units could be found almost anywhere.



The interaction between surface water in the reservoir and groundwater in the watershed appears to be variable, but may be important in limited areas where the streams have eroded into sand and gravel layers in the glacial drift or where sand and gravel layers intersect the lake.

Soils

The soil in Coles County formed in loess, glacial till, alluvium, lacustrine sediments, and residuum, (USDA, 1993). Loess is the most extensive parent material in the county. In most areas the loess occurs as two layers. The upper layer, or Peoria Loess, was deposited during the Woodfordian Substage of the Wisconsin age, about 22,000 to 12,500 years ago. The Roxana Silt underlies the Peoria Loess. The Roxana Silt was deposited more than 28,000 years ago (Willman and Frye, 1970). The loess on summits in the western part of the county is generally more than 60 inches thick.

The major soil associations in the Lake Paradise watershed and surrounding area are the Drummer-Raub-Dana Association, the Xenia-Fincastle-Toronto Association, and the Miami-Russell Association.

The Drummer-Raub-Dana Association includes nearly level and gently sloping ridges, poorly drained to moderately well drained, silty soils formed in loess and glacial outwash or in loess and glacial till on till plains. The soils on ridges have slopes that are 100 to 800 feet long. The low areas are nearly level to depressional. This association makes up 82 percent of the watershed at the north of the watershed. Within Coles County, this association is comprised of about 52 percent Drummer soils, 26 percent Raub soils, 21 percent Dana soils, and 1 percent soils of minor extent. Slopes range from 0 to 5 percent. However, the Dana soils do not comprise a significant portion of the Lake Paradise watershed. Most of this association is used for cultivated crops, but some areas are used for hay and pasture.

The Xenia-Fincastle-Toronto Association is comprised of nearly level and gently sloping, moderately well drained and somewhat poorly drained, silty soils that formed in loess and glacial till on till plains. This association consists of soils on crests, interfluvies, side slopes, head slopes, and broad summits on till plains. Slopes range from 0 to 10 percent. This association makes up about 12 percent of the watershed and is found on both the east and west sides of the lake. It is comprised of about 38 percent Xenia soils, 22 percent Fincastle soils, 19 percent Toronto soils, and 21 percent soils of minor extent. The gently sloping, moderately well drained Xenia soils are found on the sides of ridges below the nearly level, somewhat poorly drained Fincastle and Toronto soils. Most of this association is used for cultivated crops, but some areas are used for hay, pasture, or woodland.

The Miami-Russell Association is comprised of gently sloping to very steep, well drained, loamy and silty soils formed in glacial till or in loess and glacial till on till plains. This association makes up 6 percent of the watershed. It is comprised of about 64 percent Miami soils, 12 percent Russell soils, and 24 percent soils of minor extent. The moderated sloping to very

steep, loamy Miami soils are found on side slopes below the Russell soils. Most of this association is used as woodland, but some areas are used for hay and pasture.

Table 3. Soils in the Lake Paradise Watershed

<i>Soil Symbol</i>	<i>Soil Type</i>	<i>Slope (%)</i>	<i>Area (acres)</i>
27C2	Miami loam, eroded	5 – 10	570.7
27C3	Miami loam, severely eroded	5 – 10	23.5
27D2	Miami loam, eroded	10 – 15	22.5
27D3	Miami loam, severely eroded	10 - 15	0.9
27E	Miami loam,	15 –30	25.3
73	Ross loam		30.0
134B	Camden silt loam	1 - 5	9.3
152	Drummer silty clay loam		3,351.9
153	Pella silty clay loam		1.9
291B	Xenia silt loam	1 – 5	1,037.2
322B	Russell silt loam	1 - 5	7.5
322C2	Russell silt loam, eroded	5 – 10	50.7
330	Peotone silty clay loam		2.8
348B	Wingate silt loam	2 –5	337.9
353	Toronto silt loam		2,367.2
451	Lawson silt loam		23.5
481	Raub silt loam		2,309.1
496	Fincastle silt loam		269.4
2152	Drummer-Urban land complex		200.9
2481	Raub-Urban land complex		682.4
Lake Paradise			166.0
Other Waters			9.3
Total			11,500.0

Notes: Slope: A - 0 to 2 percent
 B - 2 to 5 percent
 C - 5 to 10 percent
 D - 10 to 15 percent
 E - 15 to 30 percent

Erodibility: 2 - Eroded
 3 - Severely Eroded

Source: USDA, 1993

Soil types and slopes in the Lake Paradise watershed are shown in Table 3. The NRCS has assigned each soil type an alphanumeric symbol (such as 27C2), where the first number (27) indicates the soil name, the capital letter (C) gives slope range, and the third part (2) describes the degree of erosion.

Water Discharges

Point Source Pollution Discharges

Point source discharges are effluents released at concentrated outfalls into a body of water by municipal wastewater treatment plants or industrial treatment facilities. Point source discharges fall under the United States Environmental Protection Agency's (USEPA) National Pollutant Discharge Elimination System (NPDES) permit program.

The only point source discharge within the Lake Paradise watershed is the settling lagoon effluent from the Mattoon Water Treatment Plant. The NPDES permit number for this discharge is IL0074527. Effluent is discharged directly to Lake Paradise west of the water treatment plant near monitoring Site 2 (see Figure 6). Effluent is sampled and analyzed on a monthly basis for flow, pH, total suspended solids and total residual chlorine. The results of monthly effluent monitoring for 2000-2001 are summarized in Table 4. With the exception of total suspended solids, all monitoring results are within permit limits.

In addition, there are over one hundred houses located on or near the shore of the lake that use septic tanks to treat their wastewater. Many of these residences are over 50 years old. In general, the septic systems are the same age as the houses. There is no monitoring, inspection or replacement program in place for these systems. Although septic systems were not monitored as part of this investigation, it is believed that many of these systems do not adequately treat these effluents prior to discharging them to the lake.

Table 4. Mattoon Water Treatment Plant Effluent

	<i>Flow, mgd</i>	<i>pH</i>	<i>Total Suspended Solids, mg/L</i>	<i>Total Residual Chlorine, mg/L</i>
Maximum	6.50	11.50	40.00	0.03
Minimum	0.00	8.60	2.00	0.00
Average	1.29	9.38	11.70	0.01
NPDES permit limit		6.0<pH<12.0	15	0.05
% exceeding limit		0.0	13.6	0.0

Note: mgd – million gallons per day

NPDES – National Pollutant Discharge Elimination System

Source: Illinois Environmental Protection Agency, 2001

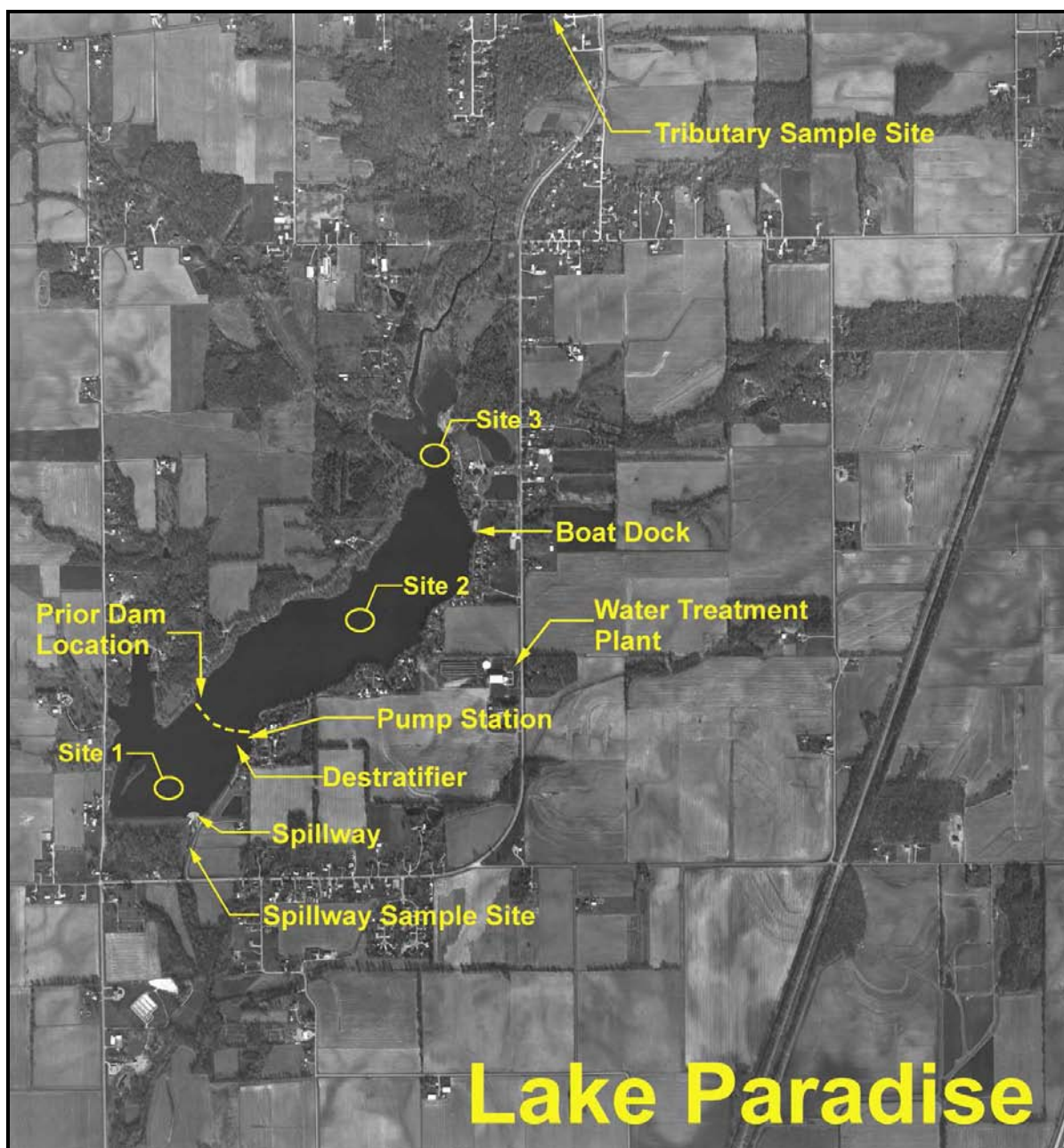


Figure 6.

Lake Paradise
Feature Identification
Mattoon
Coles County
Illinois

Nonpoint Pollutant Loadings

Watershed Land Use

Land use is contingent on many factors, including geology, topography, soils, geography, population, and ownership. In Illinois, the predominant land use is agriculture, with approximately 70 percent of the acreage in the state in cropland and pasture. Major crops include corn, soybeans, wheat, and hay.

Land use in the Lake Paradise watershed is summarized in Table 5. Over 70 percent of the watershed is in row crop production; an additional 1.7 percent is in pasture or hay production. Roads and railroads occupy 10.7 percent. Forest, wetland, wildlife, and recreational areas make up 8.3 percent. Residences and farmsteads take up only 5 percent of the acreage of the watershed. However, as described previously, the residences located adjacent to the Lake Paradise shoreline may have a more significant impact on lake water quality than the land use breakdown would suggest.

There are 73 farms in the Lake Paradise watershed, with an average farm size of 158 acres. The major type of farming is cash grain. According to the 1992 USDA Census of Agriculture, grain sales accounted for over 60 percent of agricultural income in Coles County: over 98 percent of grain sales were for corn and soybeans.

Similar to other watersheds in Illinois, subsurface drainage systems are common in the Lake Paradise watershed. Subsurface drainage using clay tile or polyvinyl chloride pipes can lower the water table enough to aerate the root zone and improve plant growth. Of the 8,375 acres of cropland in the watershed, approximately 420 acres (5 percent) have a whole-field subsurface drainage system. As is true with other watersheds in Illinois, field tiles have been identified as potential conduits for nutrients and pesticides from agricultural land to surface water.

Table 5. Lake Paradise Watershed Land Use

<i>Land Use</i>	<i>Area (acres)</i>	<i>Percent of Watershed</i>
Cropland	8,375	72.8
Pasture and hayland	200	1.7
Forest/woodland	950	8.3
Transportation (roads and railroads)	1,234	10.7
Urban and built-up	575	5.0
Water	166	1.5
Total	11,500	100.0

Source: Andrew Cerven, USDA, personal communication, 2001

Nonpoint Pollution Sources

The primary source of nonpoint pollution in the watershed is row-crop agriculture. There are no large livestock operations in the watershed. However, small numbers of livestock are found in small fields throughout the watershed. Many large residential lots ranging from 2 to 5 acres in size are located near the north and west sides of Lake Paradise. These lots frequently include horse pastures that may be inadequately managed for pasture maintenance, which may result in excessive erosion and nutrient runoff.

In 1987 an Environmental Assessment / Watershed Plan was completed for the Lake Mattoon Watershed (of which the Lake Paradise watershed composes approximately one-third) by the United States Department of Agriculture - Soil Conservation Service (currently known as Natural Resource Conservation Service) local field offices of Coles, Cumberland, and Shelby counties. The purpose of the report was to identify land treatment measures to improve water quality and protection of water quantity by reducing sediment yields within the watershed while preserving and/or enhancing net income of local agriculture. The Watershed Plan called for the enrollment of 5,800 acres of farmland into the conservation tillage program, creation of 125 acres of grassed waterways or outlets, 250 acres of changed land use, 80,000 feet of parallel underground tile outlet terraces, 900 acres of contour farming, 45 grade stabilization structures, 25 acres of critical area planning, and 306 water and sediment control basins.

The 1987 report implementation measures were completed in 2000. The original plan has been tailored to fit closer with local landowner goals. The proposed 306 water and sediment structures were not constructed but the amount of acreage treated through grassed waterways, grade stabilization structures, and terracing was increased. The Coles County NRCS stated that through the implemented measures, the goal of reducing the annual sediment yield by 23,700 tons (42%) has been achieved. The reduction of sediment is based on estimated erosion factors and not on collected field data.

Rainfall-based cropland soil losses for the Lake Paradise watershed were estimated using the Universal Soil Loss Equation (USLE) developed by Wischmeier and Smith (1978) as adapted for Illinois soils by Walker and Pope (1980). The USLE accounts for a series of factors that are the most significant influences on the erosion of soil by precipitation.

The USLE is a calculation of in-field soil losses and does not account for deposition from the field to the stream or lake. Redeposition within the field or drainage system is accounted for by a sediment delivery ratio that defines the proportion of the upstream soil losses that actually pass through the stream. Because the Lake Paradise watershed is predominantly field tile drained the sediment delivery ratio is probably low. The NRCS estimated average sediment yield for the overall Lake Mattoon watershed (which includes the Lake Paradise watershed) at 24 percent in 1987. This yield has been reduced through the implementation of the watershed protection measures.

Briefly, the USLE is: $A = R * K * SL * C * P$

where

A = average annual soil loss rate in tons per acre per year

R = rainfall factor

K = soil erodibility factor

SL = slope-length factor

S = slope steepness factor

L = slope length

C = cropping factor

P = conservation practice factor (=1 for most areas now)

The following values were used to calculate soil loss for the Lake Paradise watershed:

- o The rainfall factor (R) was set to 180, the value applicable for central Illinois.
- o Soil types and slopes are presented in Table 3.
- o The soil erodibility factor (K), slope-length factor (SL), and the cropping factor (C) provided in Table 6
- o The conservation factor (P) is one.

The average soil loss for each soil type in the Lake Paradise watershed is presented in Table 6. This analysis shows that the average annual soil loss in the watershed is 3.7 tons per acre per year, resulting in a total soil loss of about 42,690 tons per year. Soil loss rates range from 1.3 (soil type 27D2 and 27D3 Miami loam) to 14.3 tons per acre (soil type 322C2, Russell silt loam). The highest annual soil losses occur in soil types 291B Xenia silt loam, 481 Raub silt loam, 353 Toronto silt loam, 27C2 Miami loam, and 152 Drummer silt clay loam. These five types of soils produce over 82 percent of the watershed soil losses.

Nutrient contributions from the Lake Paradise watershed are shown in Table 7.

Table 6. Soil Losses in the Lake Paradise Watershed Due to Precipitation Runoff

<i>Soil Type</i>	<i>Acres</i>	<i>K</i>	<i>SL</i>	<i>C</i>	<i>Annual Soil Loss Rate A=RKLSLSC, (tons/acre)</i>	<i>Total Annual Loss (tons)</i>
27C2	570.7	0.37	0.85	0.18	10.2	5,815.3
27C3	23.5	0.37	1.00	0.18	12.0	281.7
27D2	22.5	0.37	0.97	0.02	1.3	29.1
27D3	0.9	0.37	0.97	0.02	1.3	1.2
27E	25.3	0.37	1.89	0.02	2.5	63.7
73	30.0	0.32	0.19	0.22	2.4	72.2
134B	9.3	0.37	0.18	0.22	2.6	24.5
152	3351.9	0.28	0.13	0.22	1.4	4,831.6
153	1.9	0.28	0.13	0.22	1.4	2.7
291B	1037.2	0.37	0.70	0.22	10.3	10,637.9
322B	7.5	0.37	0.16	0.22	2.3	17.6
322C2	50.7	0.38	0.95	0.22	14.3	724.8
330	2.8	0.28	0.13	0.22	1.4	4.0
348B	337.9	0.32	0.73	0.22	9.3	3,125.8
353	2367.2	0.32	0.22	0.22	2.8	6,599.4
451	23.5	0.28	0.20	0.22	2.2	52.1
481	2309.1	0.28	0.28	0.22	3.1	7,168.9
496	269.4	0.37	0.21	0.22	3.1	828.9
2152	200.9	0.28	0.13	0.22	1.4	289.6
2481	682.4	0.28	0.28	0.22	3.1	2,118.6
					Total	42,689.7

Note: A – soil loss per unit area
R - 180
K - soil erodibility factor
SL - slope-length factor
C - cropping factor

Source: Values of R, K, SL, and C were obtained from the USDA, Coles County Soil and Water

Table 7. Estimated Nonpoint Nutrient Loading Rates

Land use	Acres	<i>Total nitrogen*</i>		<i>Total phosphorus*</i>	
		Export rate, lb/a/y	Loading rate, lb/y	Export rate, lb/a/y	Loading rate, lb/y
Cropland	8,375	3.7	30,988	0.4	3,350
Pasture and Hayland	200	1.8	360	0.2	40
Forest / Woodland	950	1.2	1,140	0.1	95
Urban	575	1.2	690	0.1	57.5
Roads and Railroads	1,234		0		0
Water	166		0		0
Total	11,500		33,178		3,543

Notes: lb/a/y - pounds per acre per year
Blank space - not applicable

Sources: *USDA, Coles County Soil and Water Conservation District, 2000

LAKE USES

Historical Lake Uses

In the early 1900's, Mattoon, Illinois served as the terminal center for the "Big Four" Railroads. In 1908, private interests from the city constructed a small reservoir southwest of town to meet the demands of the railroads for a reliable, high quality source of water. The dam for this reservoir was located just north of the current dam and spillway for Lake Paradise (see Figure 6). The original surface area of the reservoir in 1908 was 138 acres and its storage capacity was 150 million gallons (460 acre-feet) (Mitchell et al., 1983). The spillway of this reservoir was raised 2.5 feet in 1914 and 2.0 feet in 1922. At that time, the lake was known as Lake Mattoon.

In 1931, a second dam was built, enlarging the lake to approximately 176 acres (IEPA, 1979). Based on the 1931 spillway level of 684.1 feet above mean sea level (MSL), Lake Paradise had a storage capacity of 1,905 acre-feet (621 million gallons) (Mitchell et al., 1983). The original dam was almost totally inundated as a result. Sections of the crest of the former dam can still be seen near the south end of the lake.

Lake Paradise, or old Lake Mattoon, was a privately owned drinking water supply for the City of Mattoon until 1936 when the city purchased the lake and supporting water supply systems. Lake Paradise was the sole source of potable water for the City of Mattoon until the new Lake Mattoon was constructed in the 1950s.

After World War II, the city of Mattoon began to attract industry and its population grew until Lake Paradise was unable to meet the area's water demands, especially during periods of low rainfalls. The drought of the mid-1950s depleted the lake and led to concerns regarding the adequacy of the city's water supply. A new reservoir was constructed south of the existing lake in 1958 to provide a safe and reliable source of long-term water supply for the City of Mattoon. The new lake was named Lake Mattoon, and old Lake Mattoon was renamed Lake Paradise. Initially, the operating plan was to use Lake Paradise for the city's water supply and to pump from Lake Mattoon to maintain the level of Lake Paradise. However, facilities now exist for pumping Lake Mattoon water directly to both the treatment plant and into Lake Paradise.

Public Water Supply

Lake Paradise was the sole source of water supply for the City of Mattoon until the construction of Lake Mattoon in the 1950's. Lake Mattoon now serves as an auxiliary water supply for the City of Mattoon. Raw water can be pumped directly from Lake Paradise and Lake Mattoon to the treatment plant. Water can also be pumped from Lake Mattoon to Lake Paradise.

Under normal operating procedures, water is pumped from Lake Mattoon to Lake Paradise only as needed, since it is more economical to pump from Lake Paradise to the treatment plant.

The Mattoon water treatment facility was originally constructed in 1935-1936. It was unable to meet the increasingly stringent water quality requirements of the US EPA's 1993 Safe Drinking Water Act. In 1998, construction began on the first water treatment plant constructed under the Illinois EPA's Public Water Supply Loan Program. The new 7-million gallon per day (MGD) Lake Paradise Water Treatment Plant began operation in 1999.

The raw water is pretreated with activated carbon to control taste and odor and then pumped from the new intake located southeast of the old dam to the new water purification plant through a high-service transmission water main. The head tank (vessel) of the plant provides the necessary hydraulic head to operate the treatment processes, eliminate backflow, remove gas bubbles, and provide an open feed point for cationic polymer and liquid alum coagulation.

Water from the head tank flows into the two clarifiers, where lime and anionic polymer is dosed to increase pH values, which precipitates the turbidity, color, and hardness of the water. The water spirals upward in a helical path through a rotating reaction zone of chemical precipitates in the clarifier. Chlorine is added to the clear softened water in the upper level of the clarifier to disinfect the water. Precipitants are drawn off through the inner cones to the trench lagoons adjacent to the plant.

The softened and clarified water from the clarifier enters the helicarbs, where carbon dioxide is applied to lower the pH and stabilize the water chemistry. Fluoride is added at this point to reduce dental decay.

The filters provide the final polishing of the water as it flows through the deep beds of anthracite coal and silica sand filter media. The filters are back washed periodically by reversing and accelerating flow through the media. This design provides highly efficient filtration.

The clearwells provide final disinfection contact time by utilizing a long hydraulic flow pattern through a one million gallon tank. Finished water storage is also provided to stabilize plant flow at varying high service pumping rates.

Finally, the softened, filtered, and disinfected clear water is pumped to the water tower and then through the water distribution system to the consumers.

In 1995, a lake destratifier was installed near the water intake tower to aid in the prevention of taste and odor problems occurring from high algal populations.

Recreational Uses

Lake Paradise was formerly a popular recreational destination for the population of the Mattoon area. Recreational activities included boating, fishing, wildlife observation, and aesthetic enjoyment. It is estimated that 10,000 people visited the lake annually prior to 1958.

Since the completion of Lake Mattoon in 1958, use of Lake Paradise has decreased dramatically. The estimated use of Lake Paradise has declined to 500 visits per year. Most visitors use only the park and three small ponds located east of the north end of the lake.

The following fishing rules are currently in place for Lake Paradise:

- ✓ 6 channel catfish daily creel limit
- ✓ 18 inches minimum length on largemouth or smallmouth bass
- ✓ All other fish - no limit
- ✓ Two pole and line fishing only (per person)
- ✓ Two hooks or lures per pole
- ✓ \$50 fine for any rule infraction

Residential Uses

The City of Mattoon has allowed residential development mainly on the east side of the lake. There are approximately 80 houses surrounding the lake, with only ten located on the west side. While some homes are used only as weekend or summer cottages, the majority of these residences are occupied year-round. Home sites are leased on a long-term basis with annual lease fees.

Public Access

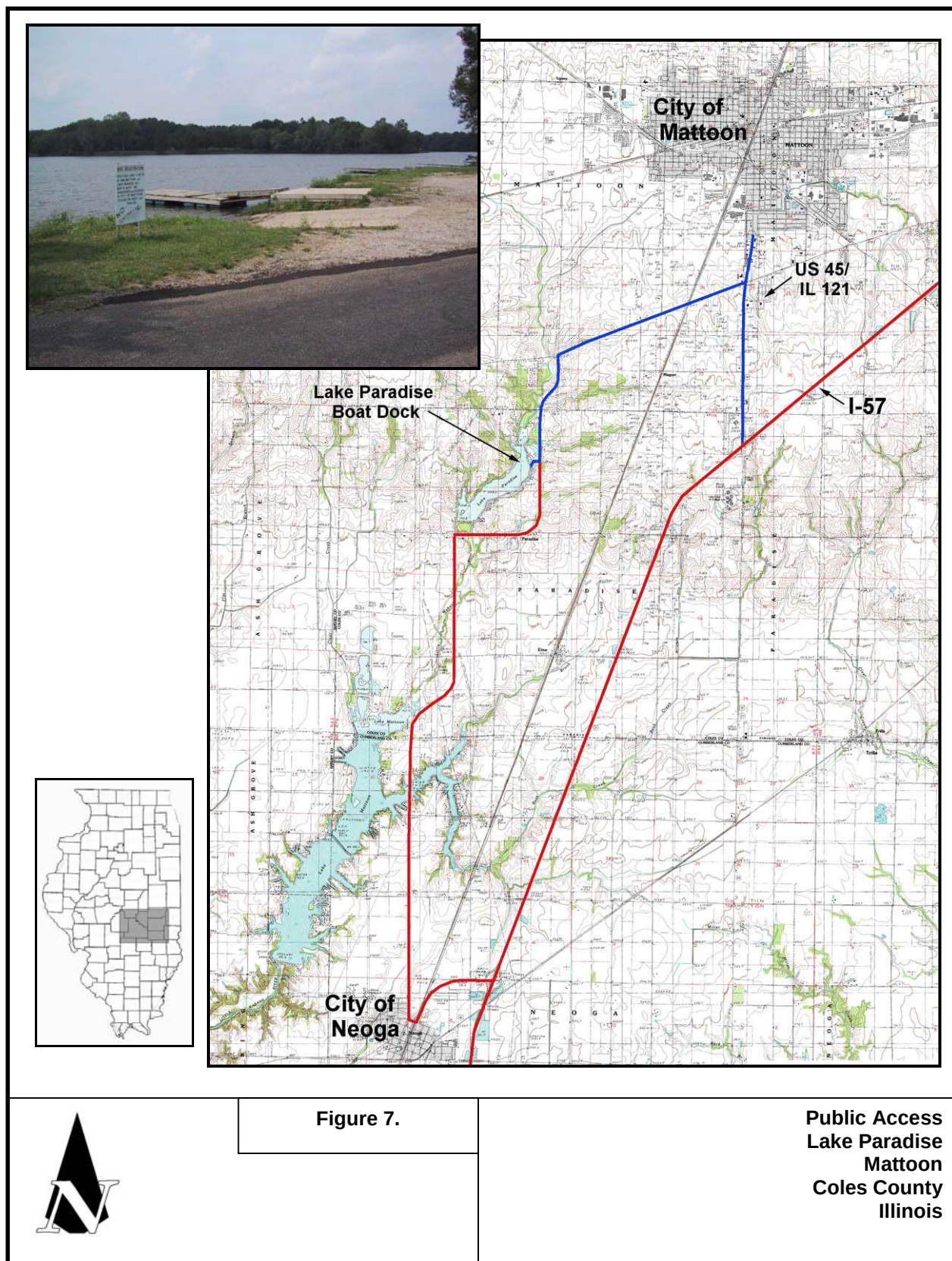
Access to Lake Paradise is illustrated in Figure 7. The lake is accessible from I-57 or US Highway 45 (Illinois Route 121) through Paradise Road or from Illinois Route 16 through Lake Road.

The City of Mattoon maintains one boat dock/launch that is located at the northeast end of the lake. It can be reached from Lake Road, which encircles the lake. The boat dock area has parking facilities for eight (8) vehicles and three (3) trailers. The distance from downtown Mattoon to the access point is approximately five (5) miles. There is no public transportation to the lake site.

Access to Lake Paradise is open to anyone year round. There is a park at the north of the lake with shelters, a public picnic area, and rest-room facilities, but no campgrounds are present

at the lake. Swimming and hunting are not permitted. Hiking, bicycling, boating and fishing are permitted and no fee is charged for boating or fishing. There is no speed limit, but motors are limited to 10 horsepower. Bank fishing is also available.

Approximately 60 percent of the 4.1-mile shoreline is residential. Woodland makes up 20 percent of the shoreline on the west side of the lake. The remaining 20 percent of the shoreline is in pasture and grassland.



User Population

Socioeconomic characteristics such as income, education and age play an important role in the selection of recreational activities. For example, the more income that one has, the more likely he or she is to participate in certain recreational activities, such as boating. Similarly, an increase in an individual's age most often results in a decrease in active outdoor activities such as hiking.

Table 8 compares the per capita income in the 20 Illinois counties within a 50-mile radius of Lake Paradise to the statewide average. Residents of Coles County have a per capita income (\$22,843) below the statewide per capita income of Illinois (\$23,928). According to the 2000 U.S. Census Bureau statistics, Coles County had an individual poverty rate of 17.5 percent in comparison to the Illinois rate of 10.7 percent.

Table 9 compares the educational attainment levels of persons living in the 20 Illinois counties within a 50-mile radius of Lake Paradise to statewide data. Coles County has a comparable percentage of high school graduates (82.9 percent) to that of Illinois (81.4 percent). Coles County has 20.8 percent of its population with a Bachelor's degree or higher. The State of Illinois residents have achieved a 26.1 percent attainment for Bachelor's degrees or higher.

Table 10 presents the 2000 population by age group of counties within a 50-mile radius of Lake Paradise. Populations within the targeted counties were generally older than the statewide populations.

In 2000, Coles County had 53,196 housing units, which translates to 2.3 persons per unit. The State of Illinois had 2.5 persons per unit. Based on the 2000 Census, Coles County's racial composition is 95.8 percent white, 2.1 percent black, 1.1 percent Hispanic, 1 percent other. The racial composition for Illinois is 80.1 percent white, 14.3 percent black, and 5.6 percent other (Figure 8).

The 2000 census for Coles County counted a population of 53,196. The estimated 2001 census for Coles County was 52,629 (Table 11). Within Coles County, the two most populated cities are Mattoon and Charleston, comprising approximately 75 percent of the population of the county. The nearest municipalities to Lake Paradise are Mattoon, Charleston and Effingham. Mattoon had a population of over 18,000 in 1999. Charleston, with a population of 20,000 in 1999, is less than 15 miles northeast of Lake Paradise. Effingham had a population of 12,000 in 1999 and is less than 20 miles south of Lake Paradise. Decatur had a population of 85,000 in 1999 and is approximately 40 miles northwest of Lake Paradise. Champaign had a population of 63,000 in 1999 and is approximately 50 miles northeast of Lake Paradise (Table 12).

Coles County had an average labor force of 27,141 in 1999 and an average unemployment rate of 3.4 percent, which was lower than the state average of 4.3 percent. Approximately 74 percent (20,024) of the labor force is in non-farm employment. Agriculture and agribusiness are the major enterprises in Coles County. A few light industrial plants, an

underground coal mine, and several producing oil fields also contribute to the economy. The major transportation facilities in Coles County include railroads, Interstate 57, U.S. Highway 45, and State Highways 16, 121, and 130. Tables 13 and 14 summarize economic data and employment categories for counties surrounding Mattoon.

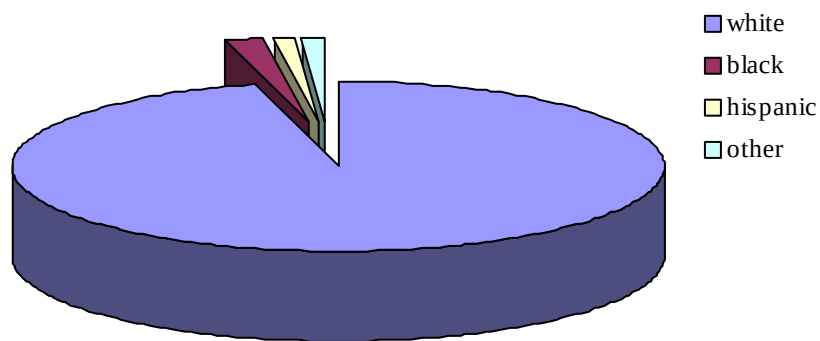


Figure 8. Coles County Population Dynamics

Table 8. Per Capita Income of Counties Within a 50-mile Radius*

Illinois Counties	Per Capita Income (Dollars)	Percent Change 1990 - 2000
Champaign	25,331	48.2
Christian	23,647	38.0
Clark	21,286	45.9
Clay	22,331	54.8
Coles	22,843	50.9
Crawford	21,105	36.2
Cumberland	22,613	58.8
Douglas	24,061	53.6
Edgar	23,722	60.0
Effingham	25,555	52.9
Fayette	18,757	52.7
Jasper	20,851	45.0
Macon	27,516	52.3
Marion	22,917	53.2
Montgomery	21,839	50.0
Moultrie	22,905	49.8
Piatt	28,631	54.2
Richland	23,615	59.3
Shelby	21,203	48.3
Vermillion	21,509	40.7
State of Illinois	23,928	50.6

* Based on 2000 local area personal income estimated by the Bureau of Economic Analysis

Table 9. Educational Attainment of Persons Living Within a 50-Mile Radius

County	Percent of High School Graduates or Higher	Percent with Bachelor's Degree or Higher
Champaign	91.0	38.0
Christian	81.0	10.6
Clark	80.0	13.6
Clay	75.9	9.7
Coles	82.9	20.8
Crawford	79.3	10.3
Cumberland	80.2	10.1
Douglas	79.3	13.8
Edgar	81.4	13.3
Effingham	83.4	15.1
Fayette	72.2	9.1
Jasper	82.6	11.2
Macon	87.0	26.9
Marion	83.2	16.9
Montgomery	77.1	11.2
Moultrie	78.8	14.7
Piatt	88.7	21.1
Richland	83.4	15.2
Shelby	83.1	12.1
Vermillion	78.8	12.5
State of Illinois	81.4	26.1

* Total population surveyed were above the age of 25

Table 10. Population Percentages by Age Group with a 50-Mile Radius

County	under 5 yrs.	5 to 19 yrs.	20 to 34 yrs.	35 to 64 yrs.	over 65 yrs.
Champaign	5.8	22.7	30.3	31.5	9.7
Christian	6.0	20.4	17.4	38.7	17.2
Clark	6.0	21.3	16.2	38.4	18.2
Clay	5.9	20.7	17.0	37.3	19.2
Coles	5.3	21.2	27.8	32.5	13.2
Crawford	5.4	20.0	18.9	38.9	16.6
Cumberland	6.4	23.0	17.7	37.3	15.8
Douglas	6.9	22.5	17.1	37.5	15.8
Edgar	5.7	20.7	17.3	38.3	17.7
Effingham	7.2	24.1	17.5	37.0	13.9
Fayette	6.0	20.5	19.5	38.2	15.8
Jasper	5.7	23.0	16.4	38.2	16.5
Macon	6.4	21.4	18.2	38.9	15.4
Marion	6.3	21.8	16.9	38.3	16.5
Montgomery	5.8	20.6	19.0	37.5	17.0
Moultrie	6.5	21.7	16.4	37.9	17.5
Piatt	6.1	21.4	15.1	41.7	15.5
Richland	6.1	21.2	16.9	38.2	17.6
Shelby	5.9	21.7	16.0	38.6	17.7
Vermillion	6.6	20.9	18.3	38.3	15.9
State of Illinois	7.1	22.0	21.3	37.5	11.9

Table 11. Populations of Counties Within a 50-Mile Radius

Illinois Counties	2000 Area (sq. mile)	2001 Estimated Population	Estimated 2001 Population Density (per sq. mile) based on 2000 Land Area
Champaign	998	179,643	180
Christian	716	35,350	49
Clark	505	16,964	34
Clay	470	14,262	30
Coles	510	52,629	103
Crawford	446	20,251	45
Cumberland	347	11,173	32
Douglas	418	19,887	48
Edgar	624	19,410	31
Effingham	480	34,352	72
Fayette	726	21,710	30
Jasper	498	10,037	20
Macon	586	112,964	193
Marion	576	41,446	72
Montgomery	710	30,462	43
Moultrie	345	14,307	41
Piatt	441	16,315	37
Richland	362	16,042	44
Shelby	768	22,681	30
Vermillion	902	83,300	92

* Data Source: U.S. Census Bureau

Table 12. Population of Municipalities Within 50-Mile Radius

Town / City	Total	% Under 18 Years	% Over 65 Years	Number of Households	Number Per Household
Altamont	2,283	28.4	19.1	867	2.54
Arcola	2,652	25.5	17.4	1,009	2.54
Arthur	2,203	24.0	22.1	858	2.38
Atwood	1,290	25.9	13.7	505	2.48
Bement	1,784	25.1	18.2	615	2.61
Bethany	1,287	27.5	17.0	532	2.57
Casey	2,942	22.9	27.5	1,252	2.22
Cerro Gordo	1,436	27.8	14.8	554	2.59
Champaign	67,518	18.4	8.2	24,173	2.30
Charleston	21,039	14.1	10.3	6,358	2.35
Decatur	81,960	25.1	16.1	34,013	2.39
Effingham	12,384	26.0	17.9	4,803	2.39
Flora	5,086	23.4	23.0	2,107	2.28
Greenup	1,532	22.3	24.1	698	2.23
Louisville	1,242	23.9	25.4	459	2.26
Lovington	1,222	24.1	18.3	470	2.40
Macon	1,213	25.5	20.4	473	2.58
Mahomet	4,877	32.1	8.0	1,098	2.83
Marshall	3,771	23.9	21.0	1,483	2.32
Martinsville	1,225	22.7	21.7	501	2.32
Mattoon	18,291	23.7	18.7	7,824	2.30
Monticello	5,138	23.5	17.8	1,816	2.44
Neoga	1,854	33.8	11.9	625	2.68
Newton	3,069	24.9	24.8		
Nokomis	2,389	24.8	25.7	1,042	2.35
Oblong	1,580	22.2	24.3	730	2.21
Olney	8,631	24.4	20.7	3,598	2.32
Pana	5,614	25.0	22.7	2,319	2.39
Paris	9,077	24.7	21.2	3,752	2.33
Rantoul	12,857	29.0	5.8	5,461	2.75
Robinson	6,822	22.4	21.6	2,148	2.59
Savoy	4,476	23.1	16.5	1,039	2.35
Shelbyville	4,971	22.7	23.3	2,050	2.32
St. Elmo	1,456	25.0	21.1	584	2.43
Sullivan	4,326	23.9	22.5	1,782	2.35
Taylorville	11,427	23.7	19.5	4,717	2.31
Teutopolis	1,559	33.9	14.6	454	3.10
Toledo	1,166	28.6	18.0	495	2.42
Tolono	2,700	28.0	9.8	1,005	2.59
Tuscola	4,448	25.0	15.5	1,708	2.43
Urbana	36,395	16.1	9.0	13,210	2.20
Vandalia	6,975	18.8	22.0	2,163	2.24
Villa Grove	2,553	28.9	12.9	1,022	2.68
Warrensburg	1,289	30.8	9.1	428	2.81
Windsor	1,125	25.0	22.2	483	2.37

Source: University of Illinois, 1999; Illinois Highway Map 2001-2002

Blank spaces – no recent data

Table 13. Economic Data of Counties Within a 50-Mile Radius

County	<i>Manufacturing 1992</i>					Number of Establishments 1996	Number of Employees 1997
	Wholesale (thousands \$)	Number of Establishments	Units	Number of Employees	Value Added (thousands \$)		
Champaign	2,033,468	173	940	11,000	1,333,600	256	115,921
Christian	306,058	27	62	1,400	88,500	68	17,230
Clark	90,175	32	71	1,300	101,000	26	8,208
Clay	82,994	26	108	1,500	153,100	32	8,259
Coles	370,765	56	429	5,600	609,900	74	33,589
Crawford	150,718	23	174			31	10,406
Cumberland	21,181	10	7	200	9,800	20	3,730
Douglas	211,349	59	64	1,500	91,400	47	11,255
Edgar	135,159	28	36	1,000	51,700	46	8,816
Effingham	323,086	60	231	4,200	329,200	72	26,717
Fayette	129,405	22	27	1,100	38,600	44	10,124
Jasper	130,900	18	24	1,100	33,600	25	4,963
Macon	2,044,929	149	950	13,200	1,351,500	209	69,971
Marion	179,875	64	211	4,500	300,100	74	23,373
Montgomery	192,901	44	95	2,100	135,700	59	16,049
Moultrie	84,693	23	46	1,100	65,000	34	6,150
Piatt	249,449	16	20	500	27,800	41	6,119
Richland	92,548	26	55	1,800	78,900	46	11,294
Shelby	259,493	14	9	300	13,400	53	9,766

Sources: Rand McNally Company, 2001
University of Illinois, 1999
Blank space - data not available

Table 14. Employment Categories for Areas Near Lake Paradise

County/County seat - Major employment categories

Champaign/Urbana

Education; governments; services (business, education, health, hotels, social); retail trade; finance, insurance, and real estate; manufacturing (food and kindred products, textile and fiber products, primary metal industries, electrical equipment, and components); transportation and public utilities; construction; trucking; wholesale and retail trade; construction; agriculture.

Christian/Taylorville

Services (business, education, health, motels and hotels); mining; construction; manufacturing (non-durable goods, electrical equipment and components); retail trade; real estate; agriculture.

Clark/Marshall

Manufacturing (textile and fiber products, primary metal industries, electrical equipment, and components); retail trade; professional and related services; governments; construction; trucking; agriculture.

Clay/Louisville

Services (business, education, health, social); manufacturing (non-durable goods, electrical equipment and components); retail trade; real estate; mining; construction; agriculture.

Coles/Charleston

Manufacturing (non-durable goods, electrical equipment and components); governments; services (business, education, health, social); retail trade; real estate; construction; agriculture.

Crawford/Robinson

Manufacturing (paper and allied products, printing and publishing, chemical and allied products, primary metal industries); services (business, education, health, hotels, social); governments; transportation and public utilities; retail trade (foods, finance, insurance; real estate); finance, insurance, and real estate; construction; mining; agriculture.

Cumberland/Toledo

Services (business, engineering, financial, hotels and motels, health,); retail trade (food and kindred products); governments; construction; manufacturing (printing and publishing, rubber and plastics, industrial machinery, and equipment); and kindred products, wholesale trade; agriculture.

Douglas/Tuscola

Manufacturing (lumber); retail trade; services (automotive, food, finance, health); governments; finance, insurance, and real estate; construction; agriculture.

Edgar/Paris

General and professional services; manufacturing (food, rubber and plastics); retail trade; governments; agriculture.

Table 14 Continued

Effingham/Effingham

Manufacturing (food and kindred products, textile products, chemical and allied products, fabricated metal products, electronic equipment); services (business, education, engineering, hotels and motels, health) governments; retail trade; transportation and public utilities (tracking and communication); financial; wholesale trade; construction; mining; agriculture.

Fayette/Vandalia

General and professional services; manufacturing (food, rubber and plastics); retail trade; wholesale trade; construction; mining; agriculture.

Jasper/Newton

Professional and related services; manufacturing (food and kindred products, paper, plastics, rubber); retail trade; finance; mining; construction; agriculture.

Macon/Decatur

Professional and personal services (finance, hotels, engineering, health, amusement, legal, membership, social); manufacturing (food and kindred products, printing and publishing, chemical and allied products, rubber and plastics, stone, electrical); retail trade (general, foods, automotive, apparel, eating); governments; transportation and public utility; wholesale trade; construction; finance; agriculture.

Marion/Salem

Services (finance, health, membership, organizations); manufacturing (food and kindred products, apparel, textile, lumber and wood products); retail trade (eating, automotive); governments; transportation and public utility; finance; construction; agriculture.

Montgomery/Hillsboro

Professional and related services; manufacturing (food and kindred products, paper, plastics, rubber); trucking and transportation; retail trade; finance; construction; mining; agriculture.

Moultrie/Sullivan

Governments; services (financial, health, membership, social, organization); retail trade (automotive, eating); manufacturing (food and kindred products, chemical and allied products,); construction; wholesale trade; agriculture.

Piatt/Monticello

Services (business, engineering, financial, hotels and motels, health,); retail trade; governments; finance; manufacturing (paper and allied products, printing, chemical and allied products, primary metal industries); transportation and public utilities; wholesale trade; agriculture.

Richland/Olney

Manufacturing (lumber and wood products); services (financial, health, social); retail trade; governments; wholesale trade; transportation and public utilities; mining, construction; agriculture.

Shelby/Shelbyville

Professional and related services (health, business, auto repair, social, membership); retail trade (general, food, automotive, eating); construction; manufacturing (industrial machinery), paper, plastics, and rubber); governments; wholesale trade; transportation and public utilities; trucking; finance; insurance; agriculture.

Comparison to Other Lakes in the Region

The area within a 50 mile radius of Lake Paradise (Figure 9) extends as far north as Champaign, as far south as Flora, as far west as Taylorville, and as far east as Paris. Located within this circular area are portions of 20 counties within the state of Illinois. An inventory of publicly owned lakes having a surface area of 10 acres or more within a 50-mile radius of Lake Paradise is shown in Table 15. There are approximately 30 lakes within this radius.

Uses for most of these lakes include recreation, boating, fishing, picnicking and swimming. Approximately half of the lakes are used as a water supply source. A few of the lakes are used for boating and fishing events that attract many people from the surrounding areas.

Comparing Lake Paradise's uses to other lakes of around the same size, recreational uses are very limited. The main use for Lake Paradise is as a water supply for the City of Mattoon.

Population Segments Adversely Affected by Lake Degradation

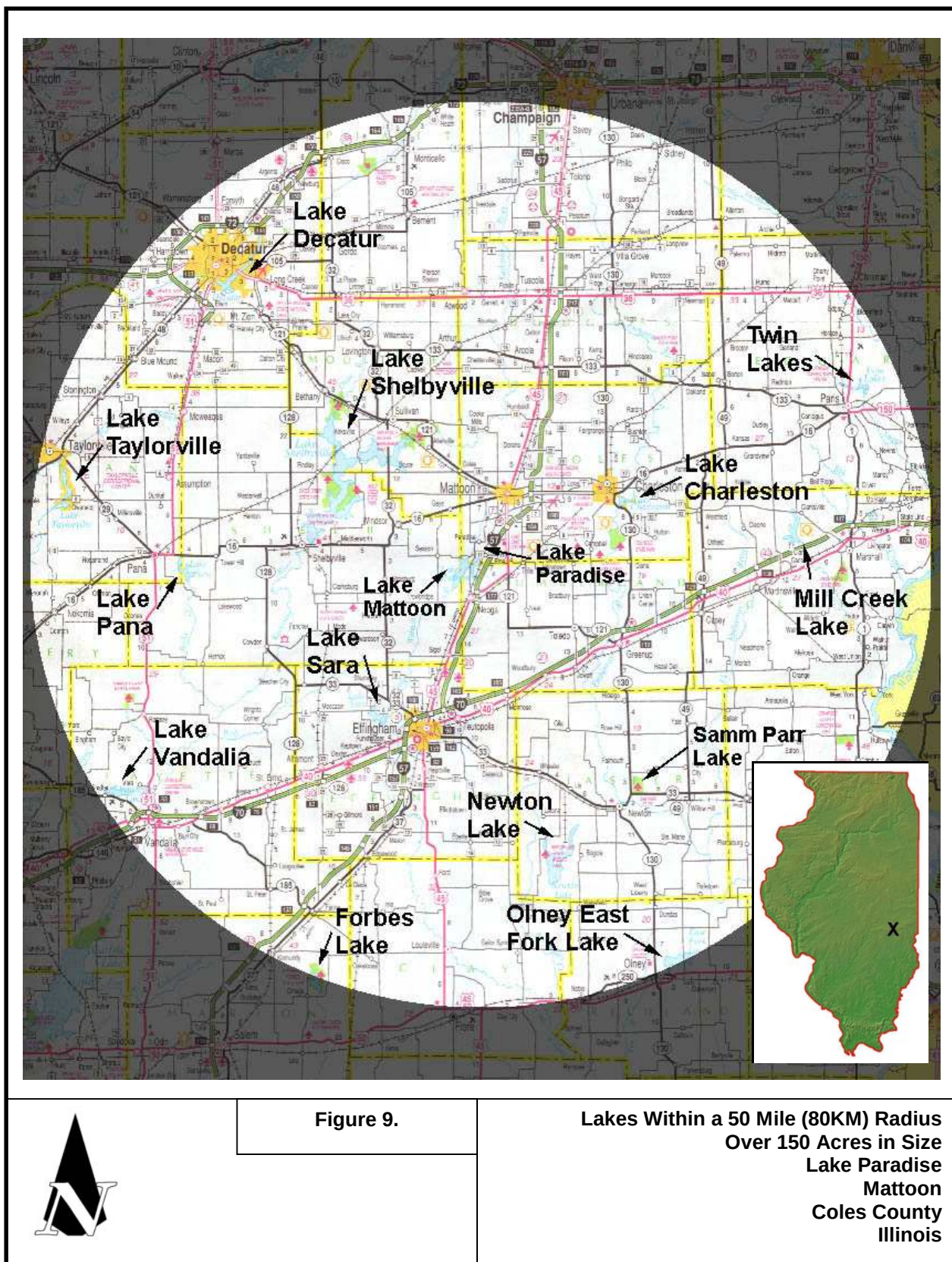
Quantifying the effects of lake degradation on the Lake Paradise user population is difficult. Degradation of the lake affects water treatment, fishing, and property values. Due to Lake Paradise's use as a public drinking water source for Mattoon and several surrounding communities, water quality is of utmost concern for the City of Mattoon and its customers. The degraded water quality of the lake water increases the cost of drinking water treatment, and these increased costs are passed on to water customers. A deteriorating fish population may potentially affect a limited number of economically disadvantaged persons who fish to supplement family food supplies. Lake residents may be impacted financially through declining property values as the quality of the lake deteriorates. The close proximity of Lake Mattoon, less than five miles, to Lake Paradise serves to further complicate quantifying impacts of lake degradation on the user population.

Table 15. Comparison of Lake Uses to Other Lakes Within 50-Mile Radius

Lake Name	County	Surface Area (acres)	Maximum Depth (ft)	Average Depth (ft)	Boat Ramp	Uses Available to Public
Altamont New	Effingham	60	30	17	1	WS,F
Bertinetti	Christian	55	18	6	1	WS,C,P,S,F
Borah (Olney New)	Richland	137	32	11		C,P,S,F
Charleston	Coles	359	14	3	1	
Charleston Side Chan	Coles	346	20	10	1	WS,P,PK,S,F
Decatur	Macon	3093	23	7.2	1	WS,BR,C,P,S,F
Kinmundy	Marion	17	22	8	1	P,F
Lincoln Trail	Clark	146	41	12.4	1	BR,C,P,PK,F
Mattoon	Coles/Shelby/Cumberland	765	35	10.5	1	WS,BR,C,P,S,F
Mill Creek	Clark	811	55	20	1	P,F
Newton	Jasper	1750	40	16	1	P,F
Oakland	Coles	24	10	5.5	1	WS,P,F
Olney East Fork	Richland	935	40	15	1	C,P,S,F
Pana	Shelby/Christian	220	38	13.8		WS,F
Paradise	Coles	166	23	7.5	1	WS,P,F
Paris Twin East	Edgar	163	26.5	10.2	1	WS,BR,P,S,F
Paris Twin West	Edgar	57	8.5	3.3	1	BR,P,F
Ramsey	Fayette	47	25	8.6	1	BR,C,P,F
Ridge	Coles	15	24.9	13		
Sam Parr	Jasper	180	23	10	1	C,P,F
Sara	Effingham	586	52	20	1	WS,BR,C,P,F
Shelbyville	Shelby/Moultrie	11100	65	8.9	1	BR,C,CN,P,S,F
St. Elmo New	Fayette	68	28	9.5	1	C,P,F
St. Elmo Old	Fayette	25	11	5.2		WS,WH,F
Stanberry	Fayette	12	10	5		
Stephen A. Forbes	Marion	525	28	14	1	P,F
Taylorville	Christian	1148	19	6.9	1	WS,C,P,S,F
Vandalia	Fayette	660	37	14	1	C,P,S,F
Vernor	Richland	36	45	15	1	WS,C,CN,P,F
Walnut Point	Douglas	59	31	11.5	1	C,P,PK,F

Notes: BR = boat rental, C = camping area, CN = concession, F = fishing/boating, P = picnic area, PK = park
S = swimming/beach, WH = waterfowl hunting, and WS = water supply
Blank spaces = no data available

Source: Steven Kolsto, IEPA, personal communication, 2001, Sefton and Little, 1984



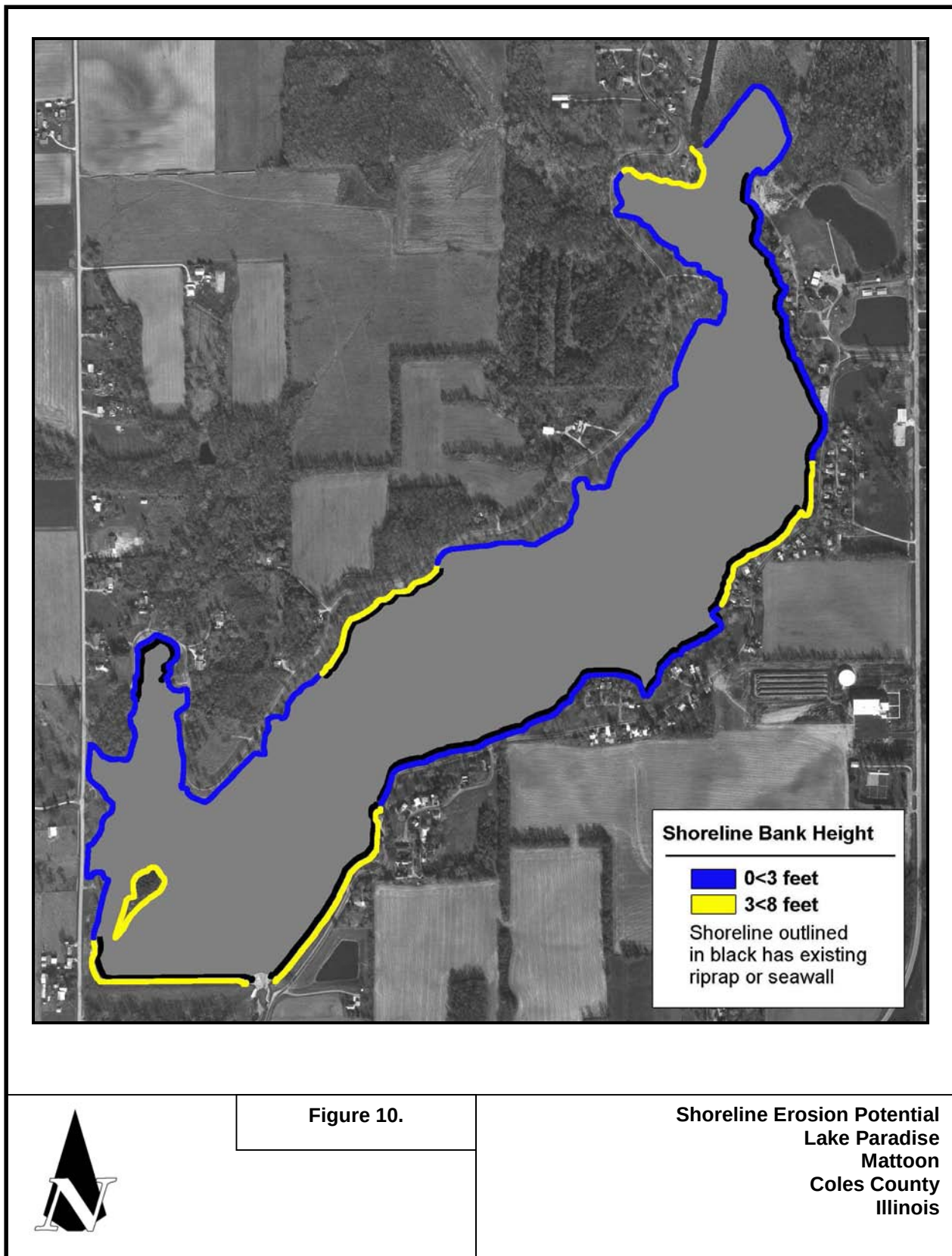
EXISTING LAKE CONDITIONS

Limnology

Shoreline

During site visits in May and August the existing conditions of the entire 4.1-mile shoreline at Lake Paradise was observed for the study. More than 50 percent of the shoreline had some form of structural protection (riprap, seawall, or other). City employees stated riprap was placed by the City, not residents, and is comprised primarily of broken concrete. No ordinances are currently in place to control the type or placement of structural shoreline protection, but the City must approve any proposed shoreline protection measures.

Shoreline erosion was evaluated on the basis of exposed bank height. Shoreline banks between zero and three feet are considered to have minimal erosion, three to eight feet of exposure is considered moderate erosion, and banks with greater than eight feet of exposure are considered to be severely eroded. No part of the Lake Paradise shoreline had banks with greater than eight feet of exposure. Approximately thirty percent of the shoreline had bank heights between three and eight feet. Of this shoreline, only the island on the southwest end and a small section on the northwest end of the lake are currently unprotected. The remaining shoreline (approximately seventy percent) had bank heights of less than three feet. Riprap or some other form of shoreline protection measure was present along approximately thirty percent of these banks, primarily those sections along the eastern shoreline. Residences are confined almost entirely to the eastern shoreline. Figure 10 summarizes the shoreline conditions.



Water Quality

Methods

Chemical Parameters

Historic water quality data for Lake Paradise for the period from 1977 to 1998 were obtained from the IEPA STORET database. Water quality samples for the 2000/2001 sampling period (May 31, 2000 through May 24, 2001) were collected twice a month from April to October and monthly from November to March. No samples were collected in December 2000 and January 2001 due to ice cover. The samples were collected under the Ambient Lake Monitoring Program (ALMP) and Volunteer Lake Monitoring Program (VLMP). Lake samples were taken from the same three (3) locations in all years (see Figure 6). The historic water quality data include one (1) sampling event in 1977, six (6) sampling events in 1979, two (2) sampling events in 1981, six (6) sampling events in 1991, one (1) sampling event in 1993, five (5) sampling events in 1994, five (5) sampling events in 1995, six (6) sampling events in 1997, nine (9) sampling events in 1998, fourteen (14) sampling events in 2000, and seven (7) sampling events in 2001. May of 2001 was the end period for the collection of data for this project. Data are still being collected for Lake Paradise under the VLMP but recent information has not been incorporated into this report.

Samples were collected either by IEPA personnel or by Mattoon city personnel. All samples were collected using water sample collection protocols established by the IEPA. All samples were analyzed at the IEPA laboratory in Champaign, Illinois. The tabulated analytical results from the three (3) in-lake sampling stations are shown in Appendix A.

In addition to the three (3) in-lake sampling sites, twenty-one (21) samples were collected directly downstream (approximately 250 feet) of the spillway and thirty (30) samples were collected off the Old State Road bridge on the Little Wabash River upstream of Lake Paradise during the 2000/2001 sampling period. These grab samples were collected to determine water quality characteristics of influent and effluent stream water in comparison with in-lake characteristics. Samples were collected on the same dates as the in-lake sites, but some additional samples were collected during or immediately after rainfall events. All of the samples collected were analyzed for Total Suspended Solids, Volatile Suspended Solids, Ammonia-Nitrogen, Total Kjeldahl Nitrogen, Nitrites and Nitrates, and Total Phosphorus. These data are presented in Appendix A.

Measured parameters included Transparency (Secchi Depth in inches), Specific Conductance ($\mu\text{mho/cm}$ @25C), pH (standard units), Alkalinity (Mg/L as CaCO_3), Suspended Solids (Total and Volatile as Mg/L), Nitrogen (Ammonia, Nitrate-Nitrite, and Total Kjeldahl as Mg/L as N), Phosphorus (Total and Dissolved as Mg/L as P), Dissolved Oxygen (Mg/L at 2 ft intervals throughout the water column), and Chlorophyll (Corrected A, Uncorrected A,

Uncorrected B, Uncorrected C, and Pheophytin A as $\mu\text{g/L}$). Turbidity was analyzed for the sampling years between 1977 and 1998, but not for the 2000 and 2001 samples because differing analytical techniques were used.

Inorganic and organic compounds were analyzed in both the water column and in the lake bottom sediments. Water samples for these compounds were tested four times over the 25-year sampling period (1979, 93, 95, 98): samples were collected from just under the water's surface. The 2000 water samples were taken at a mid-depth sample, or half way between the surface and bottom. The sediment samples were collected once in 1979 and again in 2000. The 2000 sediment samples were collected using an epoxy-coated Ekman dredge. Portions of each sample were placed in a 250-mL plastic bottle for metal and nutrient analyses and in a specially prepared 200-mL glass bottle for trace organics analyses according to the Illinois EPA guidelines (1987).

All chemical data were statistically analyzed for mean, maximum and minimum recorded values, and standard deviations. Parameters were broken down by site, depth, year, and by month for dissolved oxygen readings. A 'K' follows some laboratory data. A 'K' value indicates that the reported concentration of the analyzed parameter is less than the detection limit established for the analytical method used. For the purpose of data analysis, reported 'K' values were used in place of a zero value since the true value is unknown.

Biological Parameters

Densities of indicator bacteria were measured at least once a month over the 2000/2001 sampling period except for December and January, for a total of 16 sampling dates. Grab water samples were analyzed for Total Coliform (TC), Fecal Coliform (FC), and Fecal Streptococcus (FS). Densities are expressed in number per one hundred milliliters. Densities for the dates sampled were analyzed for maximum and minimum values and geometric means (geometric means differ from the arithmetic means used in the other water quality data).

Phytoplankton samples were collected by the Illinois EPA in 2000 and analyzed by Professor Lawrence M. O'Flaherty of Western Illinois University. Phytoplankton samples were collected at Sites 1, 2, and 3 on May 10, June 28, July 26, September 6, and October 19 in 2000. The 2000 samples were compared to historical phytoplankton counts completed in 1979. Samples from the 1979 study were analyzed using the membrane filter technique while those from 2000 were analyzed using the Sedgewick-Rafter counting cell (sweep) method. Phytoplankton density and biovolume were recorded by species and phylum. The phytoplankton data and report are provided in Appendix B.

IEPA staff conducted a macrophyte survey on September 6, 2000 to determine the aerial extent and abundance of macrophytes in Lake Paradise. The entire perimeter of the lake was surveyed. Visible macrophyte areas were sketched onto the lake map with indication of the size and density of each macrophyte zone. Macrophytes were identified to species, where possible. Specimens of unidentifiable species were collected for laboratory identification. In addition, Goodpaster and Associates noted macrophyte species and abundance during site visits in the summer of 2002.

The Illinois Department of Natural Resources (IDNR) prepares biannual Lake Management Status Reports for fish populations in Lake Paradise. The 2000 IDNR biological survey for this lake was conducted on September 27 and 29 and included sampling by electrofishing for a total of 120 minutes, setting three trap nets, and two 125-foot experimental mesh gill nets. All nets were set overnight. Species and length were recorded for each individual prior to release. A sub-sample of each fish species was weighed and scales were collected for ageing. A creel survey completed in 1998 at Lake Paradise was used for comparison with the 2000 biological survey.

Chemical Parameters

Transparency

Water transparency is one of the most limiting factors affecting photosynthetic organisms such as aquatic plants and phytoplankton. When high amounts of particles become suspended in the water column, they cause light to be absorbed closer to the water's surface and thus limit the available habitat of photosynthetic organisms. Lower levels of transparency also favor the prey in predator-prey relationships, as the predator has to expend more energy to find and capture its prey.

Water transparency is tested through a simple method. A disc, called a Secchi disc, is submerged under the water's surface until it can no longer be seen. The depth, in inches, at which the disc can no longer be seen, is recorded. Recorded Secchi depths generally represent the top one-third of the euphotic zone. The euphotic zone is defined as the depth of penetration of one percent of incidental surface light; in general, photosynthesis does not occur below this zone.

Lakes are categorized as either oligotrophic, mesotrophic, or eutrophic depending upon productivity levels. Oligotrophic lakes have low production while eutrophic lakes have high production. Transparency is one parameter used to determine the trophic status of a body of water. Lakes with water transparency less than 6 to 7 feet are classified as eutrophic. In general, lakes in the southern 2/3 of Illinois fall into the eutrophic category based on transparency.

Transparency levels at Lake Paradise have gradually decreased over the last twenty-five years. Table 16 shows mean Secchi depths for all years sampled (also see Figure 11). Table 17 shows mean annual Secchi depths for each year sampled. The lake average for all years sampled (12 inches) is one inch deeper than the average depth for the 2000-2001 sampling seasons and one inch shallower than the 1977-1979 sampling seasons. Looking at individual sampling sites, Secchi depths for Sites 2 and 3 have fluctuated over the 25-year period but have shown little net change. Site 1 is located in the deepest part of the lake and furthest from the main tributary inflow. In addition, Site 1 is located on the 'downstream' side of the original dam location. The 1908 dam embankment was left in place when the current (1931) dam was constructed (Figure 6). The old dam embankment currently acts as a sediment trap within the lake, partially shielding Site 1 from sediment encroachment. However, Site 1 was found to have a seven-inch decline in Secchi depths between the 1977 and 2001 sampling seasons. Figure 12 shows the gradual decrease in secchi depths at Site 1 versus fluctuating secchi depths at Site 3.

Table 16. Mean Secchi Depths 1977-2001 (inches)

	Site 1	Site 2	Site 3	Lake Average
N Value	187	185	186	558
Mean	15.9	12.5	8.4	12.3
Maximum	36	26	20	36
Minimum	2	2	3	2
St Dev	5.2	4.2	3.2	5.3

Table 17. Mean Annual Secchi Depths 1977-2001 (inches)

	Site 1	Site 2	Site 3	Lake Average
1977	20	10	8	13
1979	20	15	10	15
1981	18	14	11	15
1982	16	11	7	11
1983	17	16	9	14
1984	21	18	13	17
1985	21	14	9	15
1986	20	16	9	15
1987	23	14	12	16
1990	15	12	9	12
1991	16	13	10	13
1992	16	12	8	12
1993	16	13	9	13
1994	13	9	6	10
1995	14	12	6	10
1996	11	8	6	8
1997	14	12	7	11
1998	15	12	9	12
2000	13	11	8	11
2001	13	10	9	11

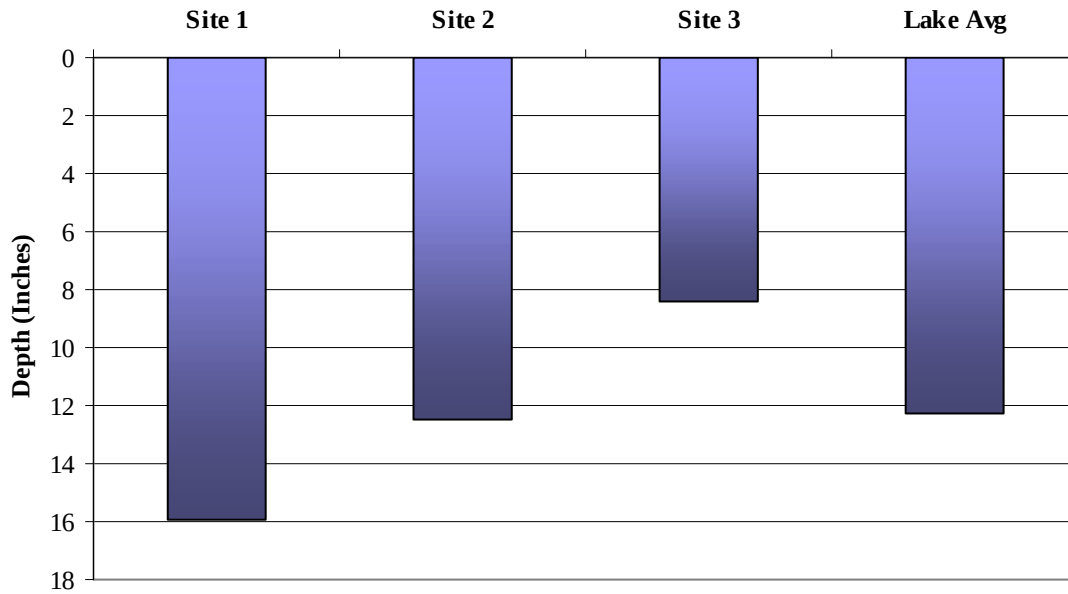


Figure 11. Mean Secchi Depths 1977-2001

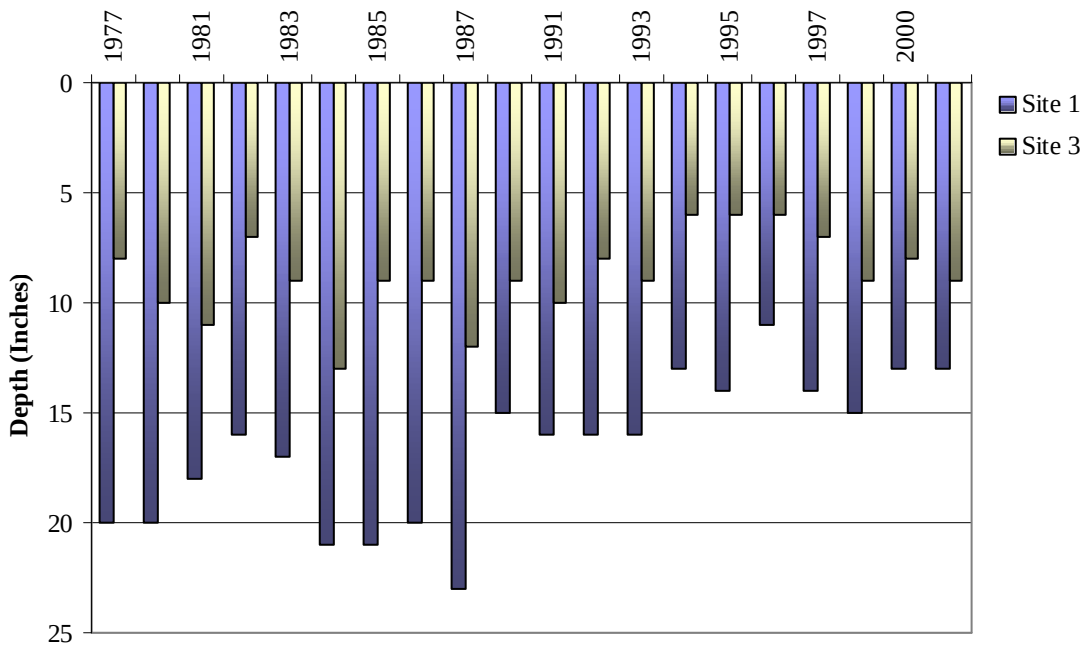


Figure 12. Mean Annual Secchi Depths, Site 1 vs. Site 3 1977-2001

Suspended Solids and Turbidity

Suspended solids is a term used to describe materials floating in the water column. To measure these solids, water samples are filtered through a 2µm filter with the remaining material weighed. Suspended solids are broken down into two categories, total and volatile. Total suspended solids are comprised of all nonfilterable inorganic and organic matter that is suspended in the water column while volatile suspended solids include suspended organic matter that is removed by combustion at 500 + 50°C (APHA et al., 1998). Suspended solids are either delivered to a lake through its watershed, bottom materials that are resuspended through wave action and/or animal activity (predominantly bottom feeding fish such as carp), or result from plant/animal growth and decomposition within the lake body. Suspended solids not only affect water transparency but also affect nutrient levels within a body of water. As sediments are carried into a lake from its watershed, adsorbed nutrients are carried along. The size and density of the suspended solids, as well as the strength of water currents within the lake determine the time it takes for inorganic solids to settle out of the water column. The organic portion, or volatiles, represents a key element in lake productivity. The organic portion of the suspended solids includes living organisms such as phytoplankton and zooplankton as well as organic detritus. An increase in volatiles can correlate with an increase in plankton production, thus representing a higher productivity level within a body of water.

Generally, the higher the TSS concentration, the lower the Secchi disc reading. A high TSS concentration results in decreased water transparency, which can reduce photosynthetic activities beyond a certain depth in the lake and subsequently decrease the amount of oxygen produced by algae, possibly creating anoxic conditions. Anaerobic water may limit fish habitats and potentially cause taste and odor problems by releasing noxious substances such as hydrogen sulfide, ammonia, iron, and manganese from the lake bottom sediments. A high concentration of TSS also may cause aesthetic problems in the lake.

The amount of suspended solids found in impounded waters such as Lake Paradise is typically smaller as compared with the amount found in their contributing streams because solids tend to settle out of the water column once they reach the slower moving waters in the lake. However, in shallow lakes, the settling action can be greatly modified by wave actions caused by wind and human recreational activities.

Turbidity is an expression of the property of water that causes light to be scattered and absorbed by materials within the water column. Turbidity in water is caused by colloidal and suspended matter; such as silt, clay, finely divided inorganic and organic materials, soluble colored organic compounds, plankton, and other microorganisms. Simply put, turbidity is a measure of the cloudiness of the water. Although turbidity is related to the levels of suspended solids, turbidity is not equal to measurements of suspended solids. Since suspended solids concentrations are equal to the dry weight of particles filtered out of a water sample, a few large and dense particles will outweigh many small and fine particles. A greater amount of finer particles can cause the water to be cloudier than a smaller amount of larger, denser particles, but the latter may yield greater concentrations of suspended solids. Turbidity is plotted on a scale of

light absorption. For Lake Paradise, the Formaz Turbidity Unit (FTU) was used for the 1977 thru 1998 sampling period, with higher numbers representing more turbid samples. The 2000/2001 sampling used the nephelometric turbidity unit (NTU). These analytical techniques are not comparable and there is no accepted conversion factor. Therefore, the data for the 2000/2001 were not included in this analysis.

Suspended solids for surface samples at Lake Paradise averaged 35 mg/L (Total) and 11 mg/L (Volatile) over the 25-year sampling period (Figures 13 and 14). Due to what is believed to be sampling interference, the February 26, 2001 samples were disregarded. As expected, total and volatile suspended solids had higher annual fluctuations at Site 3 than at Sites 1 and 2 (Table 18). The standard deviation (measure of variability) was twice as high for volatiles and four times as high for total suspended solids at Site 3 as compared to Sites 1 or 2 (Table 19). Seasonal variability and land use practices play a large role in suspended solid values but the current trend is that both TSS and VSS values are decreasing at Site 3 and increasing at Site 1 (Figures 15 and 16).

Turbidity (FTU) data are presented in Tables 18 and 19. Turbidity measurements were not taken with the regularity that suspended solids were. Over the 25-year period only 53 samples from 5 sampling seasons were collected. The data that were collected tend to reflect the same trends as the suspended solids data.

Table 18. Total and Volatile Suspended Solids and Turbidity Mean Values 1977-2001

	Site 1	Site 2	Site 3	Lake Average	Site 1 Bottom
TSS (mg/L)					
N Value	53	35	45	133	34
Mean	19	25	60	35	22
Maximum	58	51	210	210	49
Minimum	5	7	12	5	9
St Dev	10	9	42	32	9
VSS (mg/L)					
N Value	53	35	45	133	34
Mean	8	9	16	11	7
Maximum	21	19	70	70	14
Minimum	2	3	3	2	1
St Dev	5	4	11	8	3
Turbidity (FTU)					
N Value	18	18	17	53	18
Mean	8.4	10.5	17.2	12	10.6
Maximum	16	22	50	50	28
Minimum	1.7	0.5	2.2	0.5	1.7
St Dev	4.8	6.6	14.2	9.9	7.5

Table 19. Annual Means for Total and Volatile Suspended Solids and Turbidity 1977-2001

	Site 1	Site 2	Site 3	Lake Average	Site 1 Bottom
TSS (mg/L)					
1977	9	39	50	33	
1979	20	28	89	46	25
1981	15	26	32	24	21
1991	20		35	27	
1993	10	27		19	18
1994	27		106	67	
1995	22	25	76	41	28
1997	23			23	
1998	19	32	39	29	24
2000	15	21	47	27	19
2001	17	25	53	32	19
VSS (mg/L)					
1977	3	7	9	6	
1979	8	11	28	16	7
1981	8	10	13	10	3
1991	11		14	12	
1993	6	13		10	7
1994	11		24	17	
1995	11	13	20	15	10
1997	12			12	
1998	6	8	10	8	7
2000	6	8	10	8	7
2001	7	9	11	9	7
Turbidity (FTU)					
1977					
1979	10	15	28	18	16
1981	7	12	15	11	12
1991					
1993	2	0.5		1	1.7
1994					
1995	5	4	7	5	4
1997					
1998	12	14	15	14	11
2000					
2001					

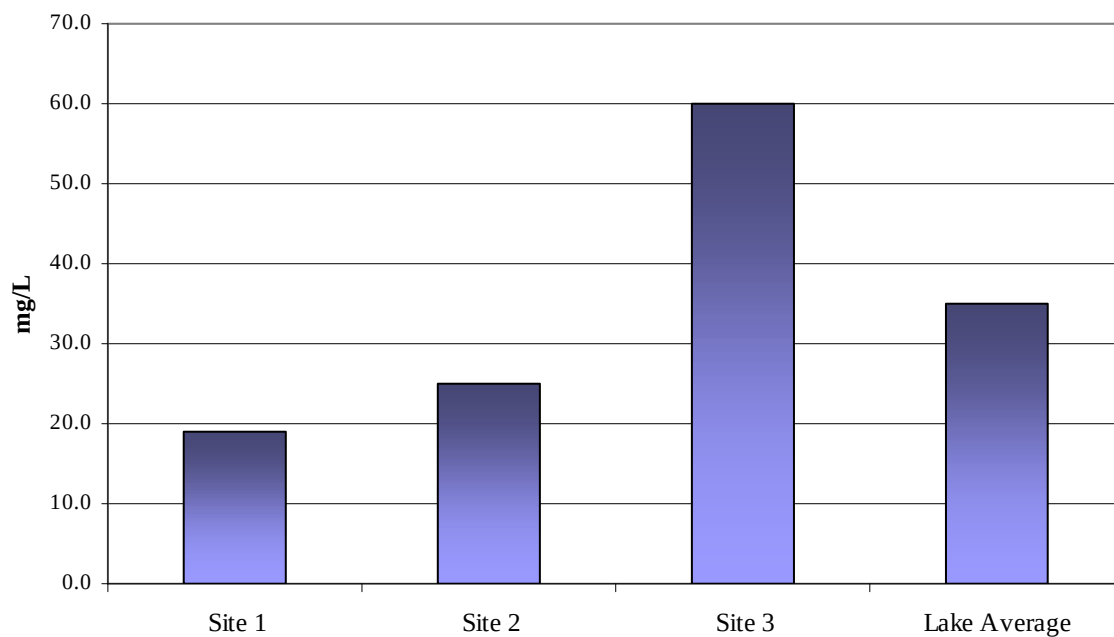


Figure 13. Total Suspended Solids Mean Values 1977-2001

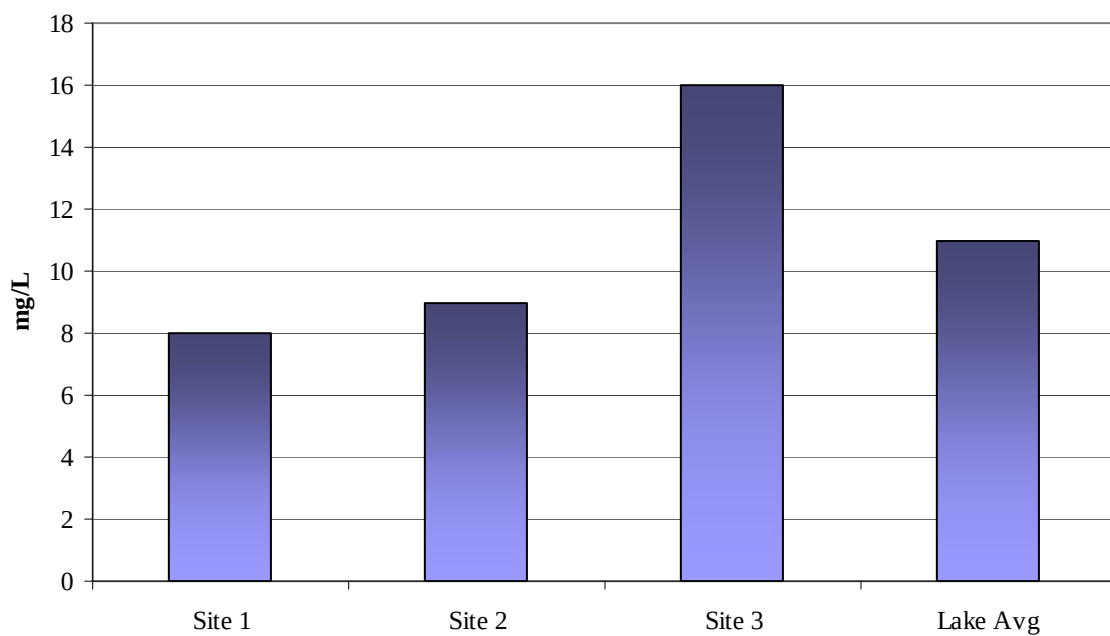


Figure 14. Volatile Suspended Solids Mean Values 1977-2001

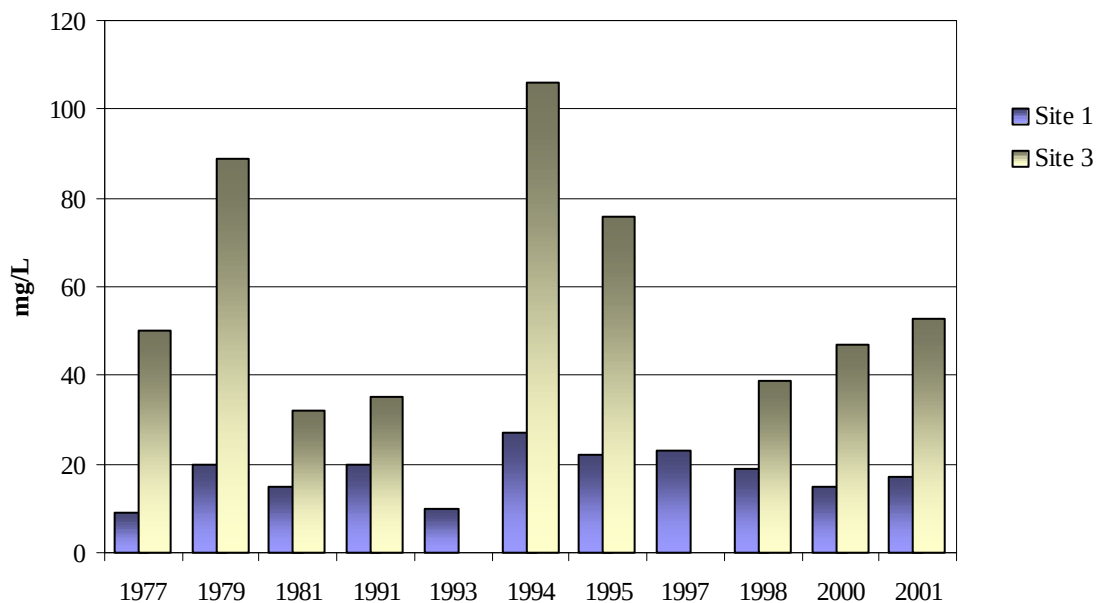


Figure 15. Annual Total Suspended Solids Mean Values – Site 1 vs. Site 3

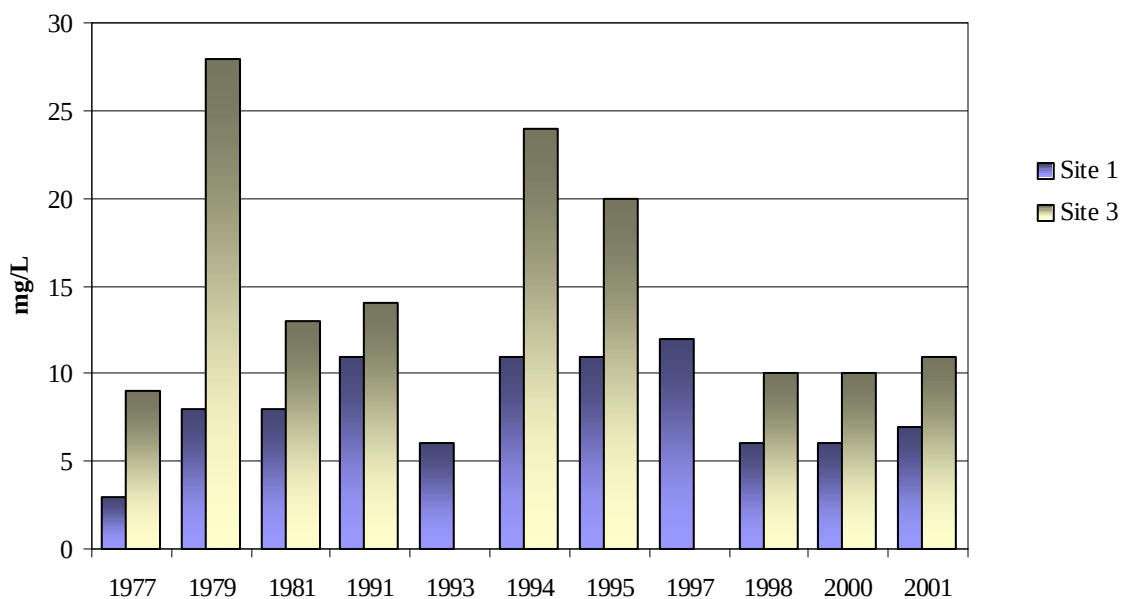


Figure 16. Annual Volatile Suspended Solids Mean Values – Site 1 vs. Site 3

Specific Conductance, pH, and Alkalinity

Specific conductance is a measurement of water's ability to conduct electricity. pH is a measurement of free hydrogen ions, or acidity. Alkalinity is a measurement of the system's buffering capacity. These three variables create the baseline for an aquatic ecosystem.

Specific conductance provides a measure of the water's capacity to convey electric current and is used as an estimate of the quantity of dissolved minerals in water. This property is a function of the total concentration of ionized substances in water and temperature. Conductivity is recorded in micromhos per centimeter at twenty-five degrees centigrade ($\mu\text{mho/cm @25C}$). The higher the conductivity reading, the higher the concentration of dissolved minerals in the lake water. The geochemistry of the soils in the drainage basin is the major factor determining the conductivity of lake waters.

Dissolved minerals are important to aquatic organisms because of their affect on biological activities on a cellular level. Water with little to no dissolved minerals is a poor conductor of electricity and prevents certain ionic exchanges from occurring between a living cell and its surrounding aquatic environment. Vice versa, water with excessive dissolved minerals can interfere with ionic exchanges.

The pH scale is a logarithmic reciprocal of the hydrogen ion concentration that is used to measure the degree of acidity or alkalinity of water. The basis of the pH scale is the amount of free H^+ ions: the more free H^+ ions present, the more acidic the water. The scale ranges from 1 to 14, with 1 being the most acidic value, 14 being the most basic or alkaline value, and 7 being neutral. Most Illinois lakes fall in the 7 to 9 pH range.

The pH directly affects the amount of unionized ammonia in water. An increase in pH values above 10 combined with high water temperatures will result in higher levels of unionized ammonia and increased toxicity to fish. In general, pH values above 8.0 in surface waters are produced by a photosynthetic rate that demands more carbon dioxide than the quantities furnished by respiration and decomposition (Mackenthun, 1969). Although rainwater in Illinois is acidic (pH typically 5 to 6), most lakes offset this acidic input by an abundance of natural buffering compounds in the lake water and the watershed.

Acidic water has an affinity for accepting electrons (leaving more free H^+ protons) while basic water has an affinity for accepting protons (absorbing free H^+ protons). Bicarbonate, carbonate, and hydroxide compounds are 'proton loving' compounds which influence pH by absorbing free hydrogen protons. One form of carbonate, carbonic acid, forms as a result of the conversion of dissolved carbon dioxide by the photosynthetic activity of algae and other aquatic plants. A rise in pH can occur due to photosynthetic uptake of carbonic acid, causing water to become more basic. Decomposition and respiration of biota tend to reduce pH and increase bicarbonates.

The carbonate equilibrium, in which carbonate and bicarbonate ions and carbonic acid are in equilibrium, is the natural system that maintains a suitable habitat for aquatic organisms. In order to measure a lake's buffering capacity, or ability to maintain the carbonate equilibrium, alkalinity is expressed in terms of the amount of calcium carbonate (CaCO_3) present in the water. Lakes with low alkalinity are, or have the potential to be, susceptible to acid rain damage. However, Midwest lakes usually have a high alkalinity and thus are well buffered from the impacts of acid rain. The average concentration of calcium carbonate in Illinois lakes ranges from 100 to 200 mg/L (Cochran & Wilken, Inc., undated).

The 2000/2001 sampling period did not include sampling for specific conductance, pH, or alkalinity. The historical data include 57 samples collected over 5 sampling seasons for specific conductance, 53 samples collected over 5 sampling seasons for pH, and 57 samples collected over 6 sampling seasons for alkalinity. Information on these parameters is provided in Tables 20 and 21. The most consistent parameter was pH with an average value of 8 and only a 0.3 standard deviation. The pH unit is a logarithmic reciprocal of a calculated value, which is not directly subject to averaging. Therefore a true mean of a pH dataset is not expressed. For the purposes of this report, the 'mean' value of pH is an expression by way of ranking pH values to assess trends.

Specific conductance and alkalinity appear to be on opposing trends. Between 1977 and 1998, alkalinity showed a marginal increase while specific conductance showed a substantial decrease (Figure 17).

The Illinois General Use Water Quality Standards for total dissolved solids is 1,000 mg/L (IEPA, 1999), which is approximately equivalent to a conductivity of 1,700 $\mu\text{mho}/\text{cm}@25\text{C}$. No sampled values exceeded this criterion. Because either overly acidic or overly basic water can be toxic, the Illinois Pollution Control Board has designated a pH range of 6.5 to 9.0 as acceptable for general use (www.ipcb.state.il.us). All sampled values fell within this range.

Table 20. Specific Conductance, pH, and Alkalinity Mean Values 1977-1998

	Site 1	Site 2	Site 3	Lake Average	Site 1 Bottom
Specific Conductance (µmho/cm@25C)					
N Value	19	19	19	57	18
Mean	419	424	445	429	409
Maximum	640	600	620	640	525
Minimum	317	319	320	317	318
St Dev	83	82	84	82	58
pH (Standard Units)					
N Value	18	18	17	53	18
Mean	8.2	8.4	8.4	8.3	7.8
Maximum	9.1	9.1	10.3	10.3	8.5
Minimum	6.4	6.6	6.8	6.4	6.7
St Dev	0.6	0.5	0.7	0.6	0.4
Alkalinity (mg/L as CaCO₃)					
N Value	20	18	19	57	19
Mean	127	129	139	132	128
Maximum	164	164	192	192	152
Minimum	95	100	95	95	95
St Dev	19	16	25	21	19

Table 21. Annual Means for Specific Conductance, pH, and Alkalinity 1977-1998

	Site 1	Site 2	Site 3	Lake Average	Site 1 Bottom
Specific Conductance (µmho/cm@25C)					
1977	640	600	620	620	
1979	449	465	470	461	449
1981	434	438	450	440	405
1991					
1993					
1994					
1995	366	361	402	376	384
1997					
1998	387	396	420	401	388
2000					
2001					
pH (Standard Units)					
1977					
1979	8	8	9	8	8
1981	8	9	9	8	7
1991					
1993	9	9		8	8.5
1994					
1995	8	8	8	8	8
1997					
1998	8	8	8	8	8
2000					
2001					
Alkalinity (mg/L as CaCO₃)					
1977	130	132	136	133	
1979	122	123	137	127	121
1981	98	110	100	101	100
1991					
1993	130	132		131	134
1994					
1995	131	133	144	136	137
1997					
1998	140	137	154	144	137
2000					
2001					

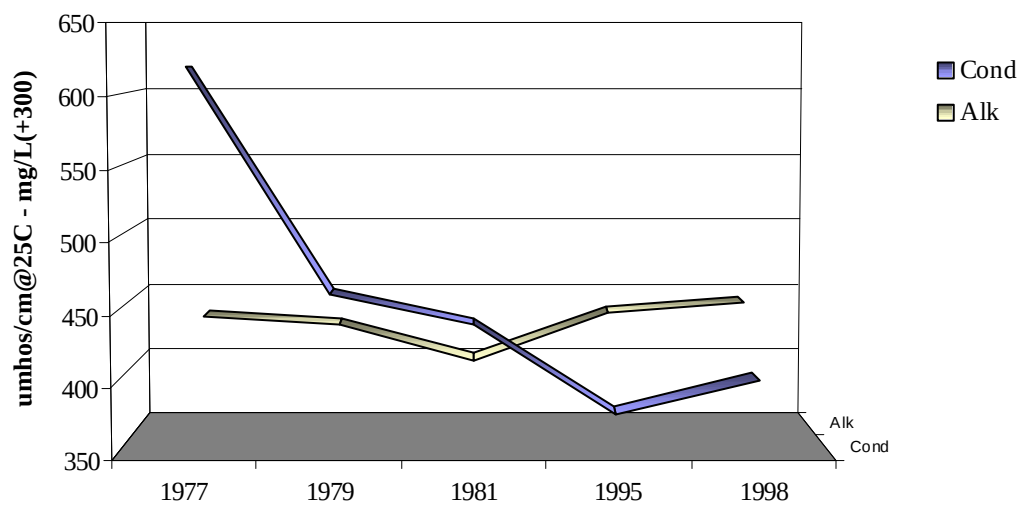


Figure 17. Alkalinity and Specific Conductance Annual Means 1977-1998

Nitrogen and Phosphorus

Nitrogen and phosphorus are two of the most important variables in terms of lake productivity. Plant growth, algal blooms in particular, are highly dependent upon the concentrations of these two compounds. Nitrogen is generally found in surface waters in the form of ammonia (NH₃), nitrite (NO₂), nitrate (NO₃), and organic nitrogen. Phosphorus is more variable than nitrogen and exists in both particulate and dissolved forms.

Nitrogen is one of the principal elemental constituents of amino acids, peptides, proteins, urea, and other organic matter. The various forms of nitrogen found in waters cannot be used to the same extent by different groups of aquatic plants and algae. Organic nitrogen, for example, is not known to be used by plants directly, but ammonia-nitrogen and nitrites can be derived from them. Nitrites, once formed from organic nitrogen, are unstable and quickly transform into nitrates. Nitrates and ammonia are the end products of the stabilization of organic nitrogen.

Vollenweider (1968) reports that, in laboratory tests, the two inorganic forms of ammonia and nitrate are, as a general rule, used by planktonic algae to roughly the same extent. However, Wang et al. (1973) reported that, during periods of maximum algal growth under laboratory conditions, ammonium-nitrogen was the source of nitrogen preferred by plankton. With higher initial concentrations of ammonium salts, yields were noted to be lower than with equivalent concentrations of nitrates (Vollenweider, 1968). This was attributed to the toxic effects of ammonium salts. The use of nitrogenous organic compounds by algae has been studied by several investigators (Hutchinson, 1957), however, Vollenweider (1968) cautions that the direct use of organic nitrogen by plankton has not been established definitely, citing that not 1 of 12 amino acids tested with green algae and diatoms was a source of nitrogen when bacteria-free cultures were used. But the amino acids were completely used up after a few days when the cultures were inoculated with a mixture of bacteria isolated from water. Vollenweider (1968) has stated that, in view of the fact there are always bacterial fauna active in nature, the question of the use of organic nitrogen sources is of more interest to physiology than to ecology.

The concerns about nitrogen as a contaminant in water bodies are twofold. First, because of adverse physiological effects on infants and because the traditional water treatment processes have no effect on the removal of nitrates, the Illinois Pollution Control Board (IPCB) has set a limit of 10 mg/L of nitrites plus nitrates in public water supplies. Second, a concentration in excess of 0.3 mg/L is considered sufficient to stimulate nuisance algal blooms (Sawyer, 1952). The IEPA (1999) stipulates that ammonia-nitrogen and nitrite plus nitrate as nitrogen should not exceed 1.5 and 10.0 mg/L, respectively.

Phosphorus as phosphate may occur in surface water or ground water as a result of leaching from minerals or ores, natural processes of degradation, or agricultural drainage. Phosphorus is an essential nutrient for plant and animal growth and, as is true of nitrogen, it passes through cycles of decomposition and photosynthesis. Because phosphorus is essential to the plant growth process, it has become the focus of attention in the entire eutrophication issue. With phosphorus being singled out as probably the most limiting nutrient and the one most easily

controlled by removal techniques, various facets of phosphorus chemistry and biology have been extensively studied in the natural environment.

Unlike nitrate-nitrogen, phosphorus applied to the land as a fertilizer is held tightly to the soil. The majority of phosphorus carried into streams and lakes from runoff is locked in particulate forms adsorbed by soil particles. However, the major portion of phosphate-phosphorus generated from aerobic or anaerobic degradation of organic matter is in dissolved form. Consequently, the form of phosphorus, particulate or dissolved, is typically indicative of source. Dissolved phosphorus is readily available for algae and macrophyte growth. However, the dissolved phosphorus concentration can vary widely over short periods of time as plants take up and release this nutrient.

Nitrogen and phosphorus were monitored in Lake Paradise as nitrogen-ammonia (NH_3), nitrogen-nitrite plus nitrate (NO_2/NO_3), nitrogen-Kjeldahl (TKN), phosphorus-total (TP), and phosphorus-dissolved (DP). Data for these parameters are presented in Tables 22 through 25. Kjeldahl nitrogen is a measure of organic nitrogen plus ammonia nitrogen. Organic nitrogen, as expected, comprised ninety-plus percent of the Kjeldahl nitrogen concentrations in the samples analyzed. Ammonia nitrogen levels were found to be highest at Site 1 (0.14 mg/L) but averaged 0.11 mg/L for the 25-year sampling period for all samples. The 1997 and 1998 sampling seasons produced the highest measured annual averages of 0.32 mg/L at Site 1. The Illinois General Use Water Quality Standards (IEPA, 1999) for $\text{NH}_3\text{-N}$ vary according to water temperature and pH value, with the allowable concentration of $\text{NH}_3\text{-N}$ decreasing as temperature and pH rise. High water temperatures and pH increase the toxicity of $\text{NH}_3\text{-N}$ to fish and other aquatic organisms. The water quality standard for $\text{NH}_3\text{-N}$ for Lake Paradise varied from 1.5-13.0 mg/L, depending on the observed temperature and pH values. Recorded concentrations of $\text{NH}_3\text{-N}$ were below the water quality standard for all years. The highest value for ammonia nitrogen occurred in August of 1998 (0.61 mg/L) but was still below the standard.

Nitrites plus nitrates were found in fairly high levels in Lake Paradise. Figure 18 shows the relative abundance of nitrites plus nitrates as compared to Kjeldahl and ammonia nitrogen. Although no annual mean value during the 25-year sampling period exceeded the 10 mg/L limit set by the IPCB, the standard was exceeded on two sampling dates. On June 4, 1981 sampling Sites 1, 2, and 3 yielded nitrite plus nitrate values of 11, 11, and 12 mg/L respectively. The February 26, 2001 sample yielded a value of 10 mg/L at Site 3.

The term total phosphorus (TP) represents all forms of phosphorus in water, both in particulate and dissolved forms, including three chemical types: reactive, acid-hydrolyzed, and organic. Dissolved phosphorus (DP) is the soluble form of TP (filterable through a 0.45- μm filter). Dissolved phosphorus was analyzed only four sampling seasons during the 25-year sampling period. Because of this paucity of data, dissolved phosphorus data are presented but not discussed.

The mean concentration of total phosphorus for the sampling period was 0.175 mg/L. The 1993 annual average was the lowest value of all years sampled (0.02 mg/L), but that annual average is based on only one sample. According to the Illinois Pollution Control Board (IEPA, 1999, Title 35) "Phosphorus as P shall not exceed a concentration of 0.05 mg/L in any reservoir

or lake with a surface area of 20 acres (8.1 ha) or more or in any stream at the point where it enters any reservoir or lake.” The annual averages total phosphorus concentrations exceeded the IPCB standard at all sites in all years except 1993. As was found with suspended solids, the trend for phosphorus is that of decreasing values at Site 3 and increasing values at Site 1 (Figure 19).

From his experience with Wisconsin lakes, Sawyer (1952) concluded that aquatic blooms are likely to develop in lakes during summer months when concentrations of inorganic nitrogen and inorganic phosphorus exceed 0.3 and 0.01 mg/L, respectively. These critical levels for nitrogen and phosphorus concentrations have been accepted and widely quoted in scientific literature. All years sampled exceeded both concentrations, resulting in conditions that favor algal blooms.

Table 22. Mean Nitrogen Values 1977-2001

	Site 1	Site 2	Site 3	Lake Average	Site 1 Bottom
Nitrite plus Nitrate (mg/L)					
N Value	58	37	47	142	36
Mean	2.59	3.26	3.74	3.15	3.17
Maximum	11	11	12	12	9.3
Minimum	0.01	0.005	0.005	0.005	0.01
St Dev	2.49	2.55	3.45	2.88	2.37
Ammonia (mg/L)					
N Value	58	37	47	142	36
Mean	0.14	0.09	0.1	0.11	0.13
Maximum	0.61	0.42	1	1	0.39
Minimum	0	0.01	0.01	0	0
St Dev	0.15	0.11	0.17	0.15	0.12
Kjeldahl (mg/L)					
N Value	36	36	35	107	36
Mean	1.25	1.33	1.42	1.33	1.18
Maximum	2.46	2.62	2.5	2.62	2.11
Minimum	0.49	0.48	0.44	0.44	0.1
St Dev	0.46	0.43	0.53	0.47	0.43

Table 23. Annual Means for Nitrogen 1977-2001

	Site 1	Site 2	Site 3	Lake Average	Site 1 Bottom
Nitrite plus Nitrate (mg/L)					
1977	0.9	0.7	0.7	0.77	
1979	2.64	2.43	2.33	2.47	2.54
1981	6.65	6.85	7.4	6.97	6.1
1991	0.56		0.54	0.55	
1993	1.3	1.1		1.2	1.3
1994	1.44		1.48	1.46	
1995	2.98	2.99	3.35	3.11	3.06
1997	1.17			1.17	
1998	3.22	3.38	3.79	3.41	3.4
2000	2.66	2.86	5.34	3.62	2.32
2001	4.67	4.53	6.9	5.37	4.6
Ammonia (mg/L)					
1977	0.2	0.2	0.2	0.2	
1979	0.09	0.08	0.07	0.08	0.2
1981	0.05	0.02	0.51	0.19	0.21
1991	0.06		0.06	0.06	
1993	0.05	0.07		0.06	0.09
1994	0.2		0.16	0.18	
1995	0.04	0.03	0.06	0.04	0.07
1997	0.32			0.32	
1998	0.32	0.25	0.21	0.27	0.24
2000	0.04	0.03	0.03	0.04	0.07
2001	0.08	0.1	0.02	0.07	0.09
Kjeldahl (mg/L)					
1977					
1979	1.1	1.28	1.72	1.37	1.07
1981	1.3	1.55	1.9	1.58	1.05
1991					
1993	0.58	0.73		0.66	0.57
1994					
1995	1.53	1.28	1.83	1.55	1.35
1997					
1998	1	1.16	1.19	1.12	1.04
2000	1.27	1.4	1.21	1.43	1.25
2001	1.46	1.43	1.18	1.17	1.3

Table 24. Phosphorus Mean Values 1977-2001

	Site 1	Site 2	Site 3	Lake Average	Site 1 Bottom
Total (mg/L)					
N Value	58	37	47	142	36
Mean	0.143	0.171	0.216	0.175	0.127
Maximum	0.317	0.9	0.74	0.9	0.288
Minimum	0.022	0.013	0.048	0.013	0.014
St Dev	0.066	0.143	0.12	0.112	0.064
Dissolved (mg/L)					
N Value	18	18	17	53	18
Mean	0.029	0.038	0.052	0.04	0.027
Maximum	0.102	0.2	0.2	0.2	0.079
Minimum	0.007	0.003	0.003	0.003	0
St Dev	0.025	0.049	0.05	0.043	0.019

Table 25. Annual Phosphorus Means 1977-2001

	Site 1	Site 2	Site 3	Lake Average	Site 1 Bottom
Total (mg/L)					
1977	0.07	0.14	0.18	0.13	
1979	0.08	0.29	0.32	0.23	0.09
1981	0.08	0.1	0.13	0.1	0.1
1991	0.17		0.21	0.19	
1993	0.02	0.013		0.02	0.014
1994	0.18		0.29	0.24	
1995	0.14	0.14	0.24	0.18	0.13
1997	0.19			0.19	
1998	0.14	0.19	0.21	0.17	0.15
2000	0.15	0.15	0.18	0.16	0.15
2001	0.14	0.17	0.14	0.15	0.14
Dissolved (mg/L)					
1977					
1979	0.02	0.06	0.07	0.05	0.02
1981	0.05	0.01	0.003	0.03	0.02
1991					
1993					
1994					
1995	0.02	0.02	0.04	0.03	0.02
1997					
1998	0.04	0.05	0.05	0.04	0.04
2000					
2001					

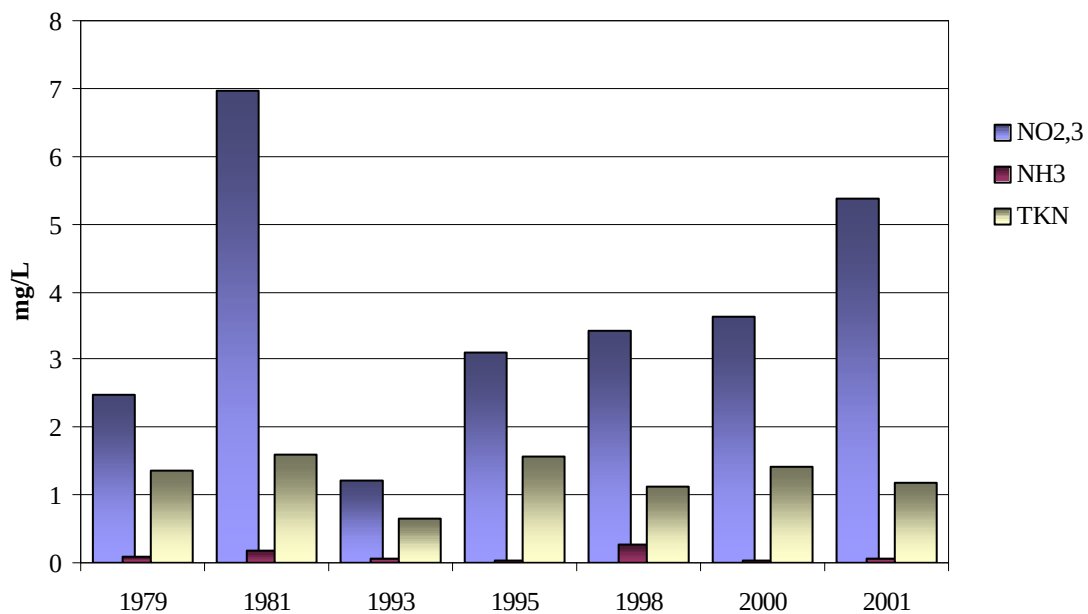


Figure 18. Annual Mean Nitrogen Levels 1979-2001

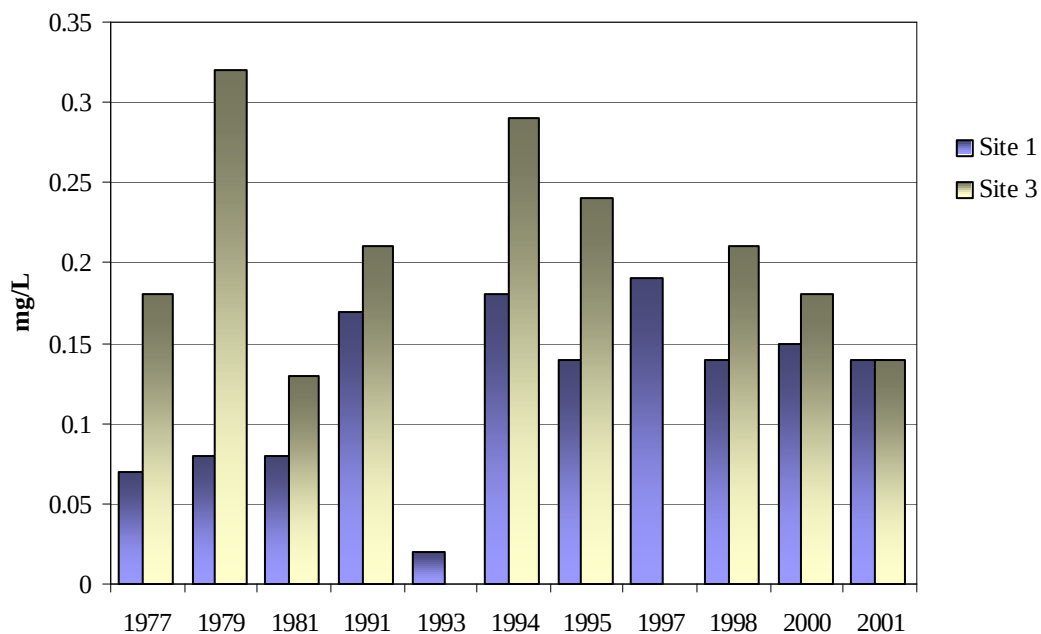


Figure 19. Annual Mean Total Phosphorus Levels – Site 1 vs. Site 3

Chlorophyll

All green plants contain chlorophyll. Chlorophyll is the molecule in photosynthetic organisms that allows light to be converted into usable energy. Chlorophyll has several different molecular forms, which have been categorized as chlorophyll a, b, c, and d. Each form of the molecule allows for absorption within a specific spectrum of light. The concentration of photosynthetic pigments is used extensively to estimate phytoplankton biomass. The presence or absence of the various photosynthetic pigments is used, among other features, to identify the major algal groups present in the water.

Chlorophyll (a) is the primary photosynthetic pigment in all oxygen-evolving photosynthetic organisms. Concentrations of other algae pigments, particularly chlorophyll (b) and (c), can give information on the extent of algal diversity and productivity. Chlorophyll (b) is most common in the green species and serves as an auxiliary pigment for photosynthesis. Chlorophyll (c) is common in diatom species and also serves as an auxiliary pigment for photosynthesis. Blue-green algae (Cyanophyta) contain only chlorophyll (a), and lack chlorophyll (b) and (c). High concentrations of only chlorophyll (a) in a particular sample may indicate that blue-green algae are dominant. Both the green algae (Chlorophyta) and the euglenoids (Euglenophyta) contain chlorophyll (a) and (b). High concentrations of both chlorophyll (a) and (b) suggest green algal species are dominating the phytoplankton population. Chlorophyll (a) and (c) are present in the diatoms, yellow-green and yellow-brown (Chrysophyta) algae, as well as in the dinoflagellates (Pyrrhophyta). High levels of both Chlorophyll (a) and (c) may indicate that diatoms are dominating the phytoplankton population. Pheophytin (a) results from the breakdown of chlorophyll (a), and a large amount indicates a stressed algal population or a recent algal die-off. Pheophytin (a) also tends to interfere with measurements of chlorophyll (a). Pheophytin concentrations are determined and used to correct measured chlorophyll (a) concentrations.

Since chlorophyll (a) pigment is present in green algae, blue-green algae, and also in diatoms, chlorophyll (a) is often used to indicate the degree of eutrophication in a lake. In Illinois, concentrations of chlorophyll (a) exceeding 20 µg/L indicate that a lake may be eutrophic (Illinois EPA, 2000). The averaged corrected chlorophyll (a) values for Lake Paradise for all years sampled were at least double the 20 µg/L guideline. Results of chlorophyll monitoring are provided in Tables 26 through 28. Concentrations of Chlorophyll (a), (b), and (c) all fluctuated widely, but exhibited an overall trend of increasing concentrations over the 25-year sampling period (Figure 20). Chlorophyll (c) had the largest increase of the three forms with an approximate three-fold increase between 1979 and 2001. Chlorophyll (a) increased at Sites 1 and 2 but decreased at Site 3, while chlorophyll (b) and (c) concentrations increased at all sites. The average chlorophyll concentrations for the sampling period were 73 µg/L corrected (a), 80.9 µg/L uncorrected (a), 14.8 µg/L uncorrected (b), and 17.3 µg/L uncorrected (c). Chlorophyll (b) and (c) concentrations ranged from 15 to 50 percent of chlorophyll (a) concentrations, indicating a diverse algal population in the lake.

Table 26. Chlorophyll Mean Values 1977-2001 (µg/L)

	Site 1	Site 2	Site 3	Lake Average
Chlorophyll (a) – Corrected				
N Value	47	37	36	120
Mean	59.6	74.2	89.2	73
Maximum	176	170	305.1	305.1
Minimum	0	2.4	0	0
St Dev	40.7	47.8	73.4	55.4
Pheophytin (a)				
N Value	47	37	36	120
Mean	17.7	15.2	9.9	14.6
Maximum	139	135	71.2	139
Minimum	0	0	0	0
St Dev	34	24.8	15.1	26.6
Chlorophyll (a) – Uncorrected				
N Value	47	37	36	120
Mean	69.1	83.7	93.3	80.9
Maximum	185	185	305.5	305.5
Minimum	3	13.5	2.2	2.2
St Dev	39.2	48.1	74.1	54.9
Chlorophyll (b) – Uncorrected				
N Value	47	37	36	120
Mean	11.5	13.2	20.8	14.8
Maximum	74.9	70.9	206	206
Minimum	0.4	0	0.7	0
St Dev	13	12.6	35.6	22.4
Chlorophyll (c) – Uncorrected				
N Value	47	37	36	120
Mean	11.8	18.6	23.4	17.3
Maximum	88.1	144	159	159
Minimum	0	0	0	0
St Dev	16.4	25.5	33	25.4

Table 27. Annual Means for Uncorrected Chlorophyll 1977-2001 (µg/L)

	Site 1	Site 2	Site 3	Lake Average
Chlorophyll (a)				
1977				
1979	30.5	56.9	94	60.5
1981	38.2	37.4	76.2	50.6
1991				
1993	82.6	84.5		83.6
1994				
1995	106.3	120.1	153.8	126.7
1997	86.3			86.3
1998	73.7	73	63.1	70.9
2000	69.2	90.6	89	82.9
2001	61.1	87.9	77.4	75.5
Chlorophyll (b)				
1977				
1979	5.7	8.8	11.8	8.8
1981	1.8	2.1	5	2.9
1991				
1993	11.2	13.6		12.4
1994				
1995	13.3	16.6	25.9	18.6
1997	9.2			9.2
1998	10.2	11.1	10.2	10.4
2000	17.9	17.3	34.1	23.1
2001	9.4	11	9.4	9.9
Chlorophyll (c)				
1977				
1979	6.7	10.9	6.6	8.1
1981	6.1	6.6	12	8.2
1991				
1993	2.3	2.3		2.3
1994				
1995	9	15.1	29.3	17.8
1997	1.3			1.3
1998	4.7	2.3	2.5	3.5
2000	20.7	28.4	38.6	29.2
2001	23.1	25.6	19.8	22.8

Table 28. Annual Means for Corrected Chlorophyll(a) and Pheophytin(a) 1977-2001 (µg/L)

	Site 1	Site 2	Site 3	Lake Average
Chlorophyll (a)				
1977				
1979	21.1	43.3	87.6	50.7
1981	31.6	30	68.3	43.3
1991				
1993	82.2	86.3		84.3
1994				
1995	90.7	118.4	152	120.4
1997	85.2			85.2
1998	71.9	70.1	63.4	69.3
2000	50.7	77.2	87.2	71.7
2001	54.7	77	67.2	66.3
Pheophytin (a)				
1977				
1979	15.8	21.8	11.5	16.4
1981	10.5	11.8	12.2	11.5
1991				
1993	0	0		0
1994				
1995	23.6	3.4	6.9	11.3
1997	0.1			0.1
1998	3.2	5.6	2.2	3.5
2000	39.7	20.6	10.1	23.5
2001	9.5	16.9	14.7	13.7

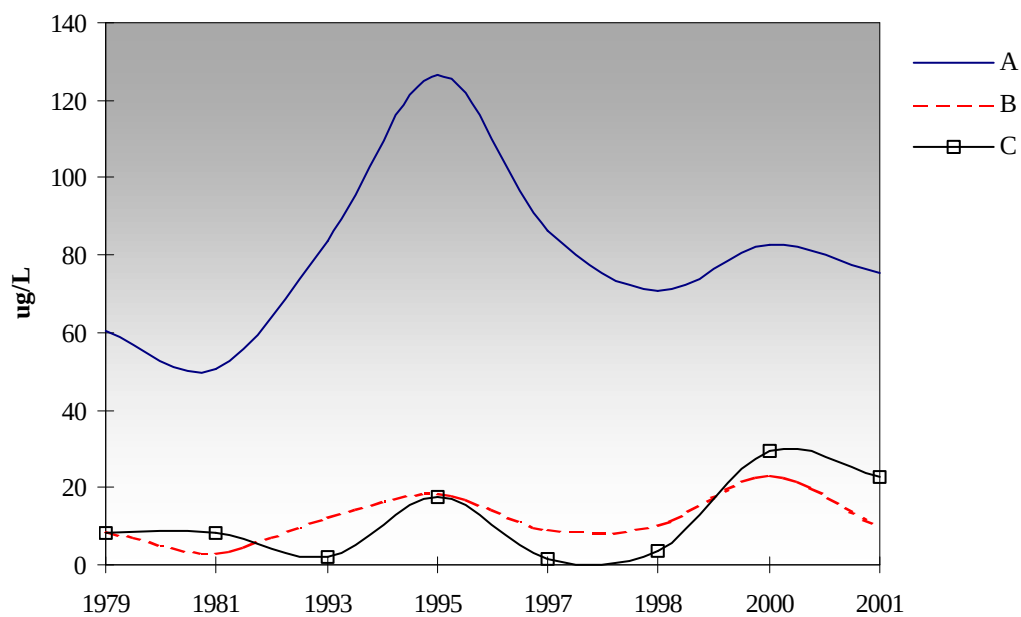


Figure 20. Mean Annual Uncorrected Chlorophyll Levels 1979-2001

Dissolved Oxygen / Temperature

According to Reid (1961), the thermal properties of water and attending relationships are the most important factors in maintaining the fitness of water as an environment. Biologically, temperature regulates the composition and metabolism of aquatic communities. All aquatic organisms have definite upper and lower thermal tolerance limits and optimum temperatures for growth and reproduction. Limnologically, temperature plays a vital role in the rate of chemical reactions in water and such physical phenomena as density, viscosity, and solubility.

One of the most outstanding and biologically significant phenomena of lakes is the seasonal variation in the relationship between water and temperature (Reid, 1971). In Illinois, lakes with depths in excess of 18 ft typically undergo summer stratification (Kothandaraman and Evans, 1971), which results in the formation of three distinct layers in the water column: (1) the warm upper layer known as the epilimnion; (2) the thermocline or metalimnion, a zone of rapid temperature change, and (3) the cold lower layer known as the hypolimnion.

Dissolved oxygen solubility in water displays an inverse relationship with temperature, and like temperature, influences the composition and distribution of aquatic communities. There are three major sources of dissolved oxygen in lake water: direct exchange from the atmosphere, photosynthesis in the lake, and contributions from tributary flow. The isolation of the bottom waters by thermal and density differences during summer stratification or by ice cover during winter stratification prevents oxygenation of the hypolimnion by atmospheric sources. Therefore, oxygen trapped in the hypolimnion at the beginning of stratification will generally not be renewed until turnover. Bacterial metabolism of organic matter located in the lake's water column and the sediments may deplete the dissolved oxygen in the hypolimnion. Oxygen depletion changes the reduction/oxidation potential of the water and may allow chemical constituents to be reintroduced into the water column from the bottom sediments. These chemical constituents include ammonia nitrogen, phosphorus, heavy metals, and hydrogen sulfide.

During the fall circulation period, the lake water becomes mixed, and the nutrient-rich hypolimnetic waters are redistributed. These nutrients are available during the following growing season. Therefore, a continuous supply of plant nutrients from the drainage basin is not mandatory for sustained plant production. After an initial stimulus, the recycling of nutrients within a lake might be sufficient to sustain highly productive conditions for several years.

The amount of oxygen that can be dissolved in water is a function of water temperature. The warmer the water is, the less oxygen it can hold. One hundred percent saturation values for specific water temperatures can be calculated using the following formula (Committee on Sanitary Engineering Research, 1960):

$$DO = 14.652 - (0.410022 * T) + (0.0079910 * T^2) - (0.000077774 * T^3)$$

where

DO = 100% oxygen saturation, mg/L

T = water temperature, °C

The measured dissolved oxygen levels (in mg/L) must then be divided by the 100% oxygen saturation values to determine the percent saturation values for the collected data. Water with dissolved oxygen saturation levels greater than one hundred percent are considered *hypersaturated*.

Dissolved oxygen concentrations in lake waters are extremely variable on a daily basis and are affected by a number of factors including weather, flow rate, depth, and biological activity. Dissolved oxygen concentrations typically decrease with depth, as the water's surface is the primary location for oxygen uptake in lakes. The Illinois Pollution Control Board (IPCB) has established a General Use water quality standard of 5 mg/l for dissolved oxygen. Table 29 shows dissolved oxygen levels by month at depths for data collected at Site 1 between 1977 and 2000. During the summer months, dissolved oxygen concentrations at Site 1 were at or below the 5 mg/L minimum below a depth of ten feet. Sites 2 and 3 are not shown because the shallow depths at these locations limit stratification.

The City of Mattoon installed one Baker style lake destratifier in the southern portion of the lake near the water intake tower in 1995. This type of destratifier works by spinning a propeller vertically in the water column which either forces warm surface water down or pulls cooler bottom water up, depending on the direction of the spin. The temperature and dissolved oxygen data indicate that the water column is well mixed thermally, but due to an inadequate amount of dissolved oxygen, anoxic conditions still exist near the water/sediment interface, allowing continued reduction of nutrients and metals from the sediment surface. Table 29 shows the mean values of dissolved oxygen, temperature, and percent saturation profiles by month. Observing dissolved oxygen profiles, the depth at which dissolved oxygen levels fall below the IPCB five (5) mg/L minimum can be seen.

Table 29. Dissolved Oxygen, Temperature, and Percent Oxygen Saturation Mean Values Expressed by Month and Depth at Site 1

Depth (ft)	April	May	June	July	August	September	October
Dissolved Oxygen (mg/L)*							
0	12.5	11.2	10.1	9.1	9.7	8.5	8
1	12.4	11.2	9.6	9.7	9.6	8.6	7.9
3	12.3	9.9	9.1	8.1	8	8.3	7.7
5	11.8	8.9	8.3	7.6	7.2	8.1	6.7
7	11.4	7.8	7.5	7	5.2	7.8	6
9	10.3	7.1	6.5	5.8	4.6	6	5.8
11	10.1	6.9	5.6	5.4	4.2	5.7	5.5
13	9.8	5.3	4.6	5	3.9	5.4	5.3
15	9.4	3.2	2.9	4.5	3.1	5.2	4.2
17	8.3	1.8	2.1	2	2.7		
19		0.1	0		0.4		
Temperature (°C)							
0	15.3	21.5	23.6	26.4	27.2	19.6	15.6
1	15.3	21.5	23.5	26.9	27.1	19.6	15.6
3	15.2	21	23.2	26.5	26.6	19.3	15.4
5	15	20.4	22.9	26.4	26.4	19	15.2
7	14.9	20.1	22.7	26.3	25.8	18.7	15
9	14.5	19.8	22.4	26.1	25.7	18.4	14.9
11	14.4	19.7	21.9	26	25.6	18.2	14.8
13	14.4	19.4	21.4	25.9	25.5	18.1	14.7
15	14.2	18.6	20.5	25.8	24.9	18.1	15
17	14	13	18.1	24.2	25.6		
19		12.2	12.2		25.8		
% Saturation							
0	125%	128%	120%	114%	124%	93%	81%
1	124%	128%	114%	123%	122%	95%	80%
3	123%	112%	108%	102%	101%	91%	77%
5	118%	99%	97%	95%	90%	88%	67%
7	113%	87%	88%	88%	65%	84%	60%
9	102%	78%	76%	72%	57%	64%	58%
11	99%	76%	64%	67%	52%	61%	55%
13	96%	58%	52%	62%	48%	58%	52%
15	92%	34%	32%	56%	38%	55%	42%
17	81%	17%	22%	24%	33%		
19		1%	0%		5%		

*Dissolved oxygen levels at or below 5.0 mg/L are in bold

Note: Results collected between 1977 and 2000

Inorganic and Organic Material

Industrial, commercial, and agricultural practices can often result in the release of harmful pollutants into the environment. These pollutants filter through the watershed with some portions settling out near streambanks, some portions settling out in lakebeds, and some portions continuing on into larger order streams and rivers.

Chlorinated hydrocarbon compounds include pesticides that are no longer in use but are persistent in the environment. These compounds, such as chlordane, dieldrin, and dichloro-diphenyl trichloroethane (DDT) present a somewhat unique problem in aquatic systems because of their potential for bioaccumulation in fish from the food web. Organochlorine compounds are relatively insoluble in water but highly soluble in lipids, in which they are retained and accumulate. Minute and undetectable concentrations of these compounds in water and sediment may ultimately pose a threat to aquatic life.

The IPCB has promulgated maximum contaminant levels (MCLs) for drinking water for numerous contaminants. The data collected for 1979 surface water samples and 2000 mid-depth water samples for organic and inorganic compounds are summarized in Tables 30 and 31. The concentrations of most organic and inorganic compounds analyzed were below method detection limits. All compounds detected were below maximum contaminant levels.

Contaminant levels in sediments are not regulated directly in Illinois, but sediment quality may be assessed using data from Kelly and Hite (1981), who collected 273 sediment samples from 63 lakes across Illinois during the summer of 1979. They defined “elevated levels” as concentrations of one to two standard deviations greater than the mean value, and ‘highly elevated levels’ as concentrations greater than two standard deviations from the mean. The Illinois EPA has further revised classification since 1979. In this classification, lake sediment concentrations are considered to be elevated based on a statistical comparison of levels found in a 20-year record and not on toxicity data. Therefore, elevated or highly elevated levels of parameters do not necessarily indicate a human health risk.

The data collected for organic and inorganic compounds in sediment samples are summarized in Tables 32 and 33. None of the inorganic compounds analyzed in sediment samples were elevated. However, Hexachlorobenzene (HCB), Aldrin and Dieldrin concentrations were ‘elevated’ under the IEPA classification system. HCB was in the ‘highly elevated’ classification based on the results of one sample from Site 3 in 1998. No other site or sample year produced detectable levels of HCB. Alachlor and Dichloro-diphenyl dichloroethane, which are not listed under the IEPA classification system, were also found at concentrations above method detection limits.

Table 30. Summary of Inorganic Parameters Tested in Collected Water Samples (µg/L)

	Site 1	Site 2	Site 3	Site 1 Bottom	Site 2 Bottom
1979 Samples⁺					
Arsenic	K	K	K	K	6
Cadmium	K	K	K	K	K
Chromium	K	30	K	K	K
Copper	15	10	10	13	10
Iron	328	485	1,190	467	568
Lead	K	K	K	K	K
Manganese	77	100	183	98	105
Mercury	K	K	K		
Zinc	15	10	13	10	10
2000 Samples⁺					
Boron	32				
Calcium Hardness*	1,550				
Aluminum	190				
Barium	46				
Beryllium	K				
Cadmium	K				
Calcium*	33				
Chromium	6				
Cobalt	K				
Copper	11				
Iron	270				
Magnesium*	17				
Manganese	82				
Nickel*	K				
Potassium*	4				
Silver	K				
Sodium*	9				
Strontium	76				
Vanadium	6				
Zinc	K				

*mg/L

⁺ 1979 single surface sample, 2000 average of 4 mid-depth samples

Note: "K" means that result is below the detection limit of the laboratory test method.

Table 31. Summary of Organic Parameters Tested for Site 1 Water Samples (µg/L)

	1979 ⁺	2000	MCL*
2,4-D		K	70
Pentachlorophenol (PCP)		K	1
2,4,5-TP (Silvex)		K	50
Dalapon		K	200
Dicamba		K	
Dinoseb		K	7
Picloram		K	500
Acifluorfen		K	
Hexachlorocyclopentadiene		K	50
Propachlor		K	
Trifluralin (Treflan)		K	
Hexachlorobenzene		K	1
Simazine		K	4
Atrazine		2.6	3
Lindane	K	K	0.2
Metribuzin		K	2
Alachlor		K	0.1
Heptachlor	K	K	
Metochlor		0.54	
Cyanazine		K	
Dacthal		K	
Aldrin	K	K	1
Heptachlor Epoxide	K	K	0.1
Chlordane	K	K	2
Butachlor		K	
Total DDT	K	K	50
Dieldrin	0.042	K	1
Endrin	K	K	2
DI (2-Ethylhexyl) Adipate		K	400
Methoxychlor	K	K	40
DI (2-Ethylhexyl) Phthalate		3.4	6
BENZ(A)Pyrene		K	0.2
Acetochlor		K	
Toxaphene		K	3
Total PCB	K	K	0.5

+ 1979 single surface sample, 2000 single mid-depth sample

* Maximum Contaminant Level

Table 32. Summary of Lake Paradise Inorganic Sediment Classification

mg/kg	Detection Limit	Lake Average	Normal Range*	Classify
Arsenic	0.5	6.4	4.1 - 14	normal
Barium	1	141	94 - 271	normal
Cadmium	0.1	K	5 or less	normal
Chromium	10	21	13 - 27	normal
Copper	1	25	16.7 - 100	normal
Iron	10	25,447	16,000 - 37,000	normal
Lead	0.1	27	14 - 59	normal
Manganese	10	552	500 - 1700	normal
Mercury	0.1	0.12	0.15 or less	normal
Nickel	1	17	14.3 - 31	normal
Potassium	1	1,700	410 - 2100	normal
Silver	0.1	K	0.1 or less	normal
Zinc	10	84	59 - 145	normal

*Source: J. Mitzelfelt, Illinois EPA 1996

Note: Sampling in years 1979, 1993, 1995, 1998 and 200

Table 33. Summary of Lake Paradise Organic Sediment Classification

$\mu\text{g/kg}$	Detection Limit	Lake Average	Normal Range*	Classify
Aldrin	1	1.5	less than 1	elevated
Alachlor		19		
Atrazine	50	K		
BHC-Alpha Isomer	1	K	less than 1	normal
Bladex (Cyanazine)	25	K		
Captan	10	K		
Chlordane	5	K	less than 5	normal
Chlordane CIS Isomer	2	K		
Chlordane Trans Isomer	2	K		
DDT	10	K	less than 10	normal
Dieldrin	1	4	less than 3.4	elevated
Endrin	1	K	less than 1	normal
Heptachlor Epoxide	1	K	less than 1	normal
Heptachlor	1	K	less than 1	normal
Hexachlorobenzene (HCB)	1	1.5	less than 1	elevated
Lindane	1	K		
Lindane (Gamma-BHC)	1	K	less than 1	normal
Methoxychlor	5	K	less than 5	normal
Metochlor	25	K		
Metribuzin	10	K		
P'P' DDD	1	1.9		
P'P' DDE	1	K		
P'P' DDT	1	K		
PCB	10	K	less than 10	normal
Penoxalin	10	K		
Treflan (Trifluralin)	10	K		

*Source: J. Mitzelfelt, Illinois EPA 1996

Note: Sampling years 1979, 1993, 1998 and 2000

Biological Parameters

Indicator Bacteria

Pathogenic bacteria, pathogenic protozoan cysts, and viruses have been isolated from wastewaters and natural waters. The sources of these pathogens are the feces of humans and of wild and domestic animals. Identification and enumeration of these disease-causing organisms in water and wastewater are not recommended because no single technique is currently available to isolate and identify all the pathogens. In fact, concentrations of these pathogens are generally low in water and wastewater. In addition, the methods for identification and enumeration of pathogens are labor intensive and expensive.

Instead of direct isolation and enumeration of pathogens, total coliform (TC) has long been used as an indicator of contamination of the water that poses a potential public health risk. Fecal coliform (FC), which is more fecal-specific, has been adopted as a standard indicator of contamination in natural water in Illinois and many other states. Both TC and FC are used in standards for drinking water and natural waters. Fecal streptococcus (FS) is used as a pollution indicator in Europe. FC/FS ratios have been employed for identifying pollution sources in the United States. Fecal streptococci are present in the intestines of warm-blooded animals and of insects, and they are present in the environment (water, soil, and vegetation) for long periods of time.

The Illinois Pollution Control Board has adopted the following general-use water quality standards for FC in lakes and streams are (Section 302.209, IEPA, 1999):

- “a. During the months May through October, based on a minimum of five samples taken over not more than a 30-day period, fecal coliforms (STORET number 31616) shall not exceed a geometric mean of 200 per 100 mL, nor shall more than 10 percent of the samples during any 30-day period exceed 400 per 100 mL in protected waters. Protected waters are defined as water that, due to natural characteristics, aesthetic value, or environmental significance, are deserving of protection from pathogenic organisms. Protected waters must meet one or both of the following conditions:
- 1) They presently support or have the physical characteristics to support primary contact.
 - 2) They flow through or adjacent to parks or residential areas.”

Table 34 presents the results of analyses for indicator bacteria for samples collected from the tributary (inflow), in-lake, and spillway of Lake Paradise. All sampling locations are shown in Figure 6. One per 100 mL was used instead of zero for non-detect samples in calculating geometric mean for data collected during the study period.

Ten of the 16 tributary bacterial samples were taken during routine in-lake sampling events. The other six samples (6/12, 7/17, 7/26, 8/23, 11/13, and 11/30/2000) were collected after storm events to sample during high flow periods. Several of the ten (10) routine sampling efforts occurred within 3 days of storm events. The maximum densities of Total Coliform (200,000/100 mL), Fecal Coliform (49,000/100 mL), and Fecal Streptococcus (92,000/100 mL) were all observed on September 11, 2000 and occurred at the tributary (inflow) site. These high counts were likely related to run-off from 2.6 inches of rain that fell in the watershed on September 10, 2000. Minimal bacterial densities were observed throughout the spring of 2001. Bacterial densities in the lake remained high throughout the fall and peaked in February. This peak could be caused by the combination of snowmelt and waterfowl. According to city employees, large populations of waterfowl remain in the lake area during the winter because the destratifier prevents the area surrounding the intake tower from freezing over. Lake Paradise is one of the few open water areas in the region.

The fecal coliform results obtained during the one-year monitoring period could not be evaluated for compliance with the IPCB's moving geometric mean standard since a five-sample minimum was not collected over the prescribed 30-day period. The geometric means calculated used the entire sampling data. The geometric means calculated in this report can be used to assess annual trends. Several fecal coliform samples exceeded the 400 per 100 mL density limit set by the IPCB (see Appendix A).

Table 34. Summary of Coliform Counts at Sampling Sites

		N Value	Maximum	Minimum	Geometric Mean
Tributary (Inflow)					
	TC	16	200,000	100	9,540
	FC	16	49,000	2	888
	FS	16	92,000	20	1,244
Site 3					
	TC	14	55,000	160	2,603
	FC	14	3,800	1	108
	FS	14	5,600	5	178
Site 2					
	TC	14	43,000	20	563
	FC	14	4,200	2	44
	FS	14	3,800	1	32
Site 1					
	TC	14	42,000	40	573
	FC	14	1,400	2	22
	FS	14	2,000	3	27
Site 1 (Bottom)					
	TC	12	37,000	40	510
	FC	12	2,200	4	37
	FS	12	4,900	1	30
Spillway (Outflow)					
	TC	11	55,000	500	2,384
	FC	11	950	1	100
	FS	11	860	5	92

Phytoplankton

The detailed discussion of algal density and diversity prepared by Dr. O’Flaherty (2001) is presented in Appendix B and summarized below.

During this study, total phytoplankton density peaked on July 26, 2000 at all three sites (30,400 cells/mL at Site 1, 32,500/mL at Site 2, and 45,100/mL at Site 3). A summary of total algal densities on the five dates sampled is presented in Table 35.

Blue-green algae (Phylum Cyanophyta) were dominant on all dates at Site 3 and on every date but May 19 at Sites 1 and 2. The dominant blue-greens were *Anabaena spiroides* var. *crassa*, *Aphanizomenon flos-aquae*, and *Microcystis aeruginosa*. These three blue-greens are indicative of eutrophic conditions. However, none of these algae reached bloom density (one million or more/L) at any site in Lake Paradise during 2000. *Raphidiopsis curvata* was at bloom concentrations on September 6, 2000 at Station 1 (1,010/mL) and at Station 2 (1,300/mL). The presence of *Raphidiopsis curvata* is indicative of elevated water temperature during this period. The peak density of blue-green algae was 7,110 cells/mL at Station 1 with a biovolume of 4,442,700 cubic micrometers/mL on July 26, 2000.

These data contrast with samples collected in 1979, when total algal concentrations were one to two orders of magnitude lower for every phylum, and the assemblage was generally dominated by green algae, with the exception of the June sampling event, which was dominated by eugleophytes at all sampling locations. The algal data are strongly indicative of worsening eutrophication in Lake Paradise between 1979 and 2000 (Figures 21 and 22). Unfortunately, the data are insufficient to determine whether there has been any improvement in the algal community in the period since the installation of widespread watershed best management practices in the late 1980s and early 1990s.

Table 35. Plankton Species Density 1979 vs. 2000

Species / Site	<i>May</i>		<i>June</i>		<i>July</i>		<i>September</i>		<i>October</i>	
	1979	2000	1979	2000	1979	2000	1979	2000	1979	2000
Bacillariophyta										
1	122	1,890	0	2,381	255	1,801	633	6,176	90	1,116
2	68	1,786	29	3,571	158	2,500	626	7,664	163	1,935
3	29	1,741	85	1,414	195	3,065	1,029	6,146	171	938
Average	73	1,806	38	2,455	203	2,455	763	6,662	141	1,330
Chlorophyta										
1	84	8,943	0	2,232	398	6,711	441	4,732	70	610
2	11	10,223	42	3,438	256	7,515	1,070	5,476	0	1,176
3	226	6,369	0	2,068	795	16,444	76	5,580	193	789
Average	107	8,512	14	2,579	483	10,223	529	5,263	88	858
Cryptophyta										
1	0	1,607	0	833	0	4,226	0	2,574	0	1,116
2	0	1,116	0	1,012	0	2,366	0	2,113	0	1,414
3	0	461	0	402	0	7,113	0	2,589	0	1,935
Average	0	1,061	0	749	0	4,568	0	2,425	0	1,488
Cyanophyta										
1	0	5,833	105	19,539	203	15,982	0	12,574	15	7,887
2	11	9,449	134	16,756	23	19,420	44	15,566	0	8,467
3	0	13,914	125	19,911	135	17,694	0	16,518	0	10,000
Average	4	9,732	121	18,735	120	17,699	15	14,886	5	8,785
Euglenophyta										
1	80	1,890	961	2,381	300	1,801	248	6,176	155	1,116
2	11	1,786	1,050	3,571	300	2,500	182	7,664	63	1,935
3	188	1,741	1,561	1,414	150	3,065	0	6,146	332	938
Average	93	1,806	1,191	2,455	250	2,455	143	6,662	183	1,330
Combined										
1	286	20,163	1,066	27,366	1,156	30,521	1,322	32,232	330	11,845
2	101	24,360	1,255	28,348	737	34,301	1,922	38,483	226	14,927
3	443	24,226	1,771	25,209	1,275	47,381	1,105	36,979	696	14,600
Average	277	22,916	1,364	26,974	1,056	37,401	1,450	35,898	417	13,791

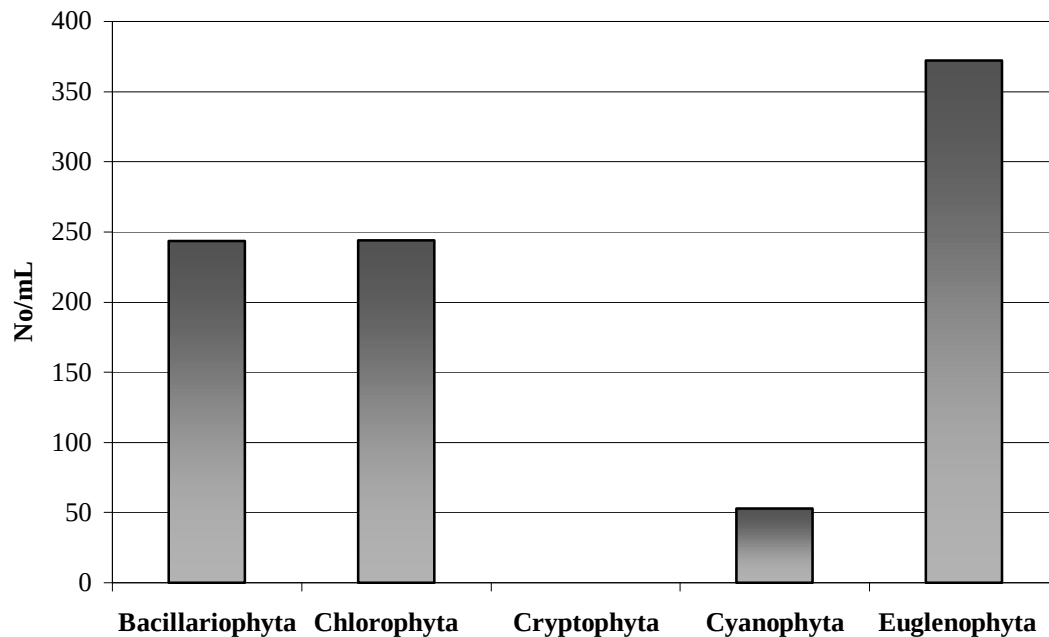


Figure 21. 1979 Mean Algal Concentrations by Phylum

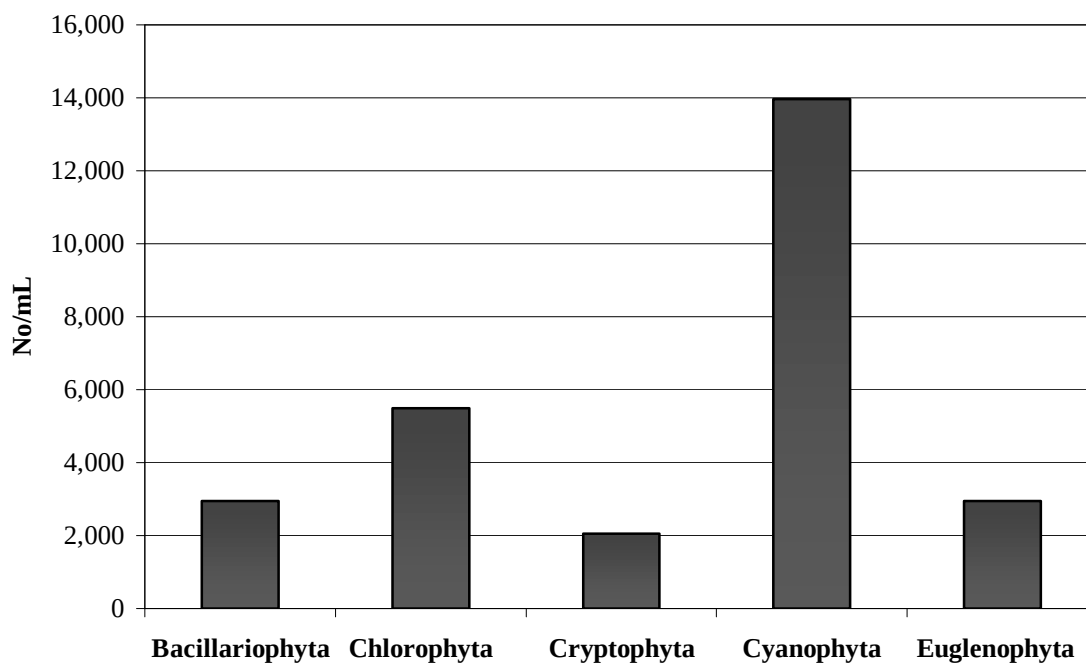


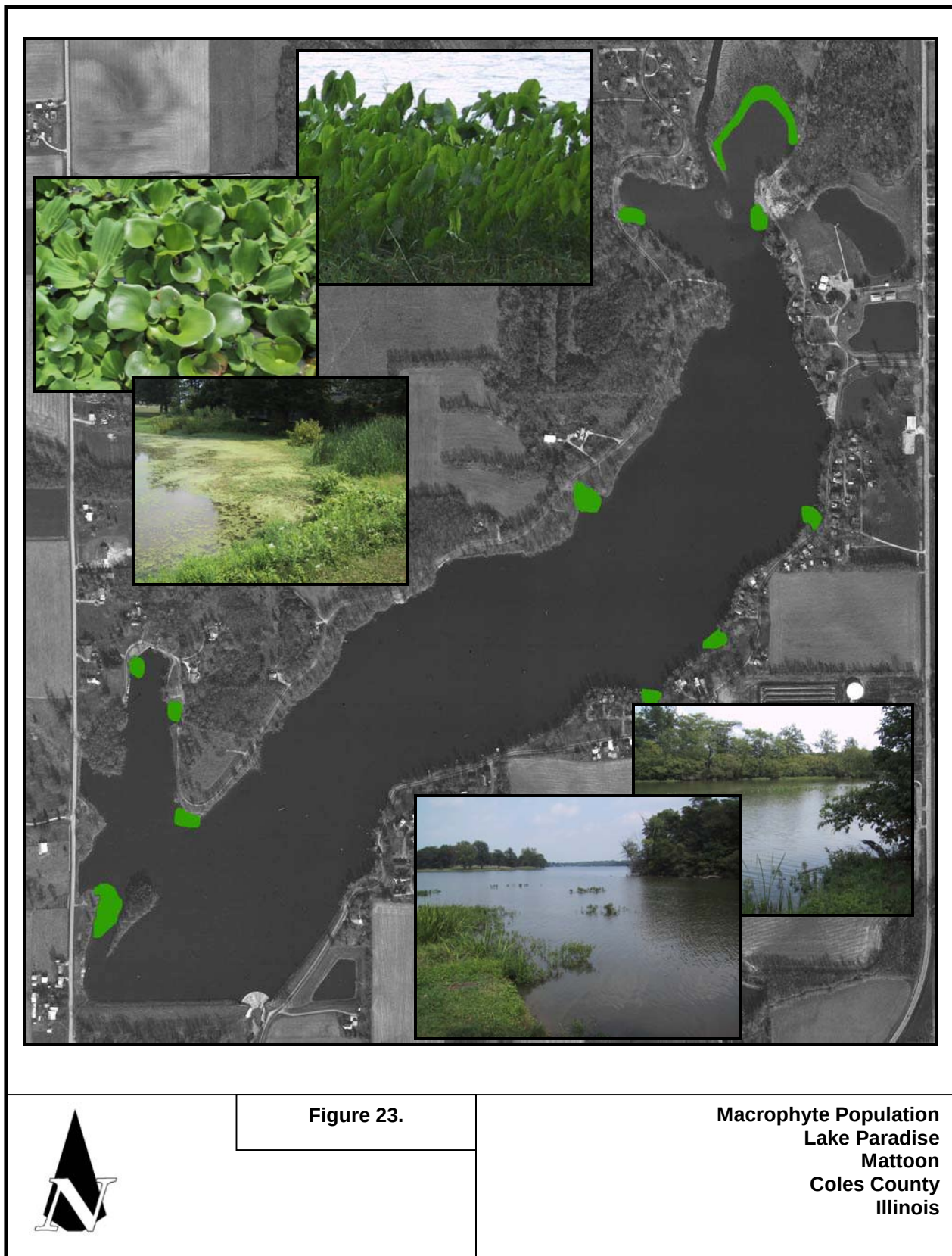
Figure 22. 2000 Mean Algal Concentrations by Phylum

Macrophytes

Macrophytes consist of aquatic vascular flowering plants, including aquatic mosses, liverworts, ferns, and larger macroalgae (APHA et al., 1998). Macrophytes may include submerged, emerged, and floating plants and filamentous algae. Aquatic vegetation can be beneficial or detrimental to an aquatic ecosystem depending on specie quality and quantity. Reasonable amounts of aquatic vegetation improve water clarity by preventing shoreline erosion, stabilizing sediment, absorbing wave action, storing nutrients, and providing habitat and hiding places for many small fish (fingerlings, bluegill, sunfish, etc.). Aquatic plants not only provide food, shade, and oxygen for aquatic organisms but also use a considerable amount of nutrients in the water, thereby reducing the availability of those nutrients for excessive growth of phytoplankton. Excessive growth of aquatic vegetation, however, can cause problems for lake users. Some species of macrophytes, often non-native, aggressively invade shoreline areas and crowd out or displace all the other plant species. Many of these species grow in such thick stands that fish and other aquatic organisms cannot access the shoreline. These stands can also prevent access to the water for anglers.

The Illinois EPA survey conducted on September 6, 2000 found three species of macrophytes at Lake Paradise: waterwillow (*Justicia americana*), cattails (*Typha spp.*) and American lotus (*Nelumbo lutea*). Waterwillow, a perennial plant, was the dominant macrophyte around much of the lakeshore but grew in patches too small to map. Cattails were found in four areas along the eastern side of the lake. One patch of American lotus, approximately fifty feet in length, was found south of the boat ramp. The northern tip and the southwest corner of the lake were too shallow to map. Macrophytes in Lake Paradise generally grow along the shoreline in one-foot wide patches.

Goodpaster and Associates, Inc. and Crawford, Murphy, and Tilly, Inc. conducted site visits in May and August of 2002 and observed the following species of macrophytes. waterwillow (*Justicia americana*), cattails (*Typha spp.*), water lettuce (*Pistia stratiotes*), water hyacinth (*Eichhornia crappies*), and an abundance of arrowhead or arrowleaf (*Sagittaria latifolia*). The locations of macrophyte beds observed are shown on Figure 23.



Fisheries

When construction of the lake was originally completed in 1908, a fish hatchery was built at the northeast corner of Lake Paradise by the Illinois Department of Conservation (currently the Department of Natural Resources) to provide the Department with fish for stocking lakes throughout the state. The fish hatchery no longer exists.

Since 1940, IDNR has conducted fish stocking in Lake Paradise. The records of fish stocking and other lake management activities are summarized in Appendix C. Lake Paradise has been stocked with bluegill, largemouth bass, crappie, channel catfish, tiger muskellunge, muskellunge, and other mixed fish. The most recent stocking was with channel catfish and largemouth bass in 1996.

The IDNR has conducted five standard fall fish population surveys at Lake Paradise during the past decade: in 1990, 1994, 1996, 1998, and 2000. The lake was surveyed for 2 hours with an electrofishing boat and two trap nets on all occasions. The species collected were enumerated, weighed, and measured. Species were then categorized into groups by length. Each length group was given a condition factor rating to estimate the overall health. The condition factor is a constant that relates height and width to length for estimation of growth rates. A general summary of the major fish species (largemouth bass, bluegill, channel catfish) collected from the 2000 survey follows.

The largemouth bass population has been increased from the previous (1998) survey, but there are no significant changes in the density or quality of this population. The survey collected 71 fish during 120 minutes of sampling, ranging in length from 3.9 to 19.7 inches. The catch is well below the desired range. The optimal goal would be to collect at least 1-fish per minute of sampling. Also, the distribution of fish is weak in the 8 to 12 inches length range. The lack of suitable nursery habitat has likely contributed to this problem. Several thousand fingerling bass were stocked and CPUE (catch per unit effort) has increased to 46 per hour, which meets the Lake Management Program (LMP) goal. The IDNR recommendation was to continue stocking 300 bass of 6- to 8-inches per year in order to increase the population.

The white crappie population has somewhat improved. Catch rates were higher in recent creel surveys as compared to the previous surveys. The angling quality of crappie likely fluctuates periodically but continued strong recruitment should maintain this fishery in the near future.

The population structure of bluegill is poor to moderate quality. No preferred size (greater than 8 inches) fish have been collected in the fish population survey, but several were recorded in angler catch. Numerous other species of sunfish were collected and do not appear to contribute significantly to a quality fishery.

The channel catfish population appeared to be suffering from low recruitment. However, reasonable numbers of large channel catfish exist and appear to be providing a fishery of moderate quality.

Other species found during the 2000 survey included bullheads, muskellunge, tiger muskellunge, white bass, gizzard shad, freshwater drum, and carp.

It was concluded that the lake needs significant management attention. Significant attention should be made to improve aquatic plant communities that would provide nursery habitat. More progressive regulations such as a maximum size limits and restricting the harvest of large fish would be required to attempt improving crappie and bluegill populations. Channel catfish recruitment may be improved by deploying spawning structures. However, predation on fry or small fingerlings may play a large role in the lack of recruitment. Longear sunfish, yellow bass, freshwater drum, carp, and golden shiners all provide competition with gamefish for food and are of limited interests to anglers.

Influent and Effluent Waters

The inflow and spillway outflow water quality was also monitored. The inflow site (RCG-02/Tributary) is located on the main tributary (Little Wabash River) at the bridge on Paradise Road. The outflow site (RCG-01/Spillway) is located approximately 240 feet downstream of the dam. Grab water samples were taken at both sites during the regular sampling schedule. In addition, tributary water (grab) samples were also collected during or after rainfall events. All of the samples collected were analyzed for total suspended solids (TSS), volatile suspended solids (VSS), ammonia-nitrogen ($\text{NH}_3\text{-N}$), kjeldahl-nitrogen (TKN), nitrites plus nitrates ($\text{NO}_2/\text{NO}_3\text{-N}$), and total phosphorus (TP). Table 36 summarizes the data for both sites. Based on a comparison of inflow and outflow, water quality generally improves as water flows downstream (Table 37). Total suspended solids and nitrites plus nitrates concentrations dropped 60 and 50 percent, respectively from the inflow site to the outflow site. Volatile suspended solids increased from inflow site to outflow site, as did ammonia nitrogen. Ammonia nitrogen concentrations increased from 0.05 mg/L at the inflow site to 0.1 mg/L at the outflow site.

Table 36. Tributary Mean Sampling Values 2000-2001

	Depth	Nitrates	Ammonia	TKN	TP	VSS	TSS
Tributary (influent)							
N Value	33	34	30	29	34	33	33
Mean	2.1	8.41	0.05	0.9	0.2	8	59
Maximum	8.5	18	0.44	1.82	0.543	28	224
Minimum	0.25	0.01	0.01	0.18	0.017	1	2
St Dev	2.1	4.84	0.04	0.52	0.15	8	64
Spillway (effluent)							
N Value	22	22	22	19	22	22	22
Mean	2.8	3.1	0.1	1.34	0.17	7.9	30
Maximum	8.5	7	1	2.79	0.708	16	70
Minimum	0.5	0.29	0.01	0.25	0.059	2	8
St Dev	2	2.05	0.22	0.55	0.14	3	16

Table 37. Comparisons of Tributary and Lake Parameter Means

	Nitrates	Ammonia	TKN	TP	VSS	TSS
Influent	8.41	0.05	0.9	0.2	8	59
Lake	3.15	0.11	1.33	0.175	11	36
Effluent	3.1	0.1	1.34	0.17	7.9	30

Trophic State Index

Lakes are generally classified by limnologists into one of four trophic states: oligotrophic, mesotrophic, eutrophic, or hypereutrophic. Oligotrophic lakes are known for their clean and cold waters and limited quantities of aquatic vegetation and algae due to low nutrient levels. At the other end, eutrophic lakes are high in nutrient levels and are likely to be very productive in terms of aquatic vegetation and algal blooms. Eutrophic lakes can support large fish populations, but the fish tend to be rougher species that can better tolerate depleted levels of dissolved oxygen. Mesotrophic lakes are in an intermediate stage between oligotrophic and eutrophic. The majority of Midwestern lakes are eutrophic. A hypereutrophic lake is one that has undergone extreme eutrophication to the point of having developed undesirable aesthetic qualities (e.g., odors, algal mats, and fish kills) and water-use limitations (e.g., extremely dense growth of vegetation). The natural aging process causes all lakes to progress to the eutrophic condition over time, but this eutrophication process can be accelerated by certain land uses in the contributing watershed (e.g., agricultural activities, application of lawn fertilizers, and erosion from construction sites). Given enough time, a lake will grow shallower and eventually will fill in with trapped sediments and decayed organic matter, until only a shallow marsh or emergent wetland exists.

A wide variety of indices of lake trophic conditions have been proposed. These indices have been based on Secchi disc transparency; nutrient concentrations; hypolimnetic oxygen depletion, and biological parameters, including chlorophyll a, species abundance, and diversity.

The USEPA (1980) suggests the use of four parameters as trophic indicators: Secchi disc transparency, chlorophyll (a), surface water total phosphorus (TP), and total organic carbon. In addition, the lake trophic state index (TSI) developed by Carlson (1977) on the basis of Secchi disc transparency, chlorophyll (a), and surface water total phosphorus can be used to calculate a lake's trophic state. The TSI can be calculated from secchi disc transparency (SD) in meters, chlorophyll-a (CHL) in micrograms per liter ($\mu\text{g/L}$), and total phosphorus (TP) in micrograms per liter ($\mu\text{g/L}$) as follows:

$$\text{on the basis of SD, } \text{TSI} = 60 - 14.4 * (\ln(\text{SD})) \quad (1)$$

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

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

The TSI is based on the amount of algal biomass in surface water, generally using a scale of 0 to 100. Each increment of ten in the TSI represents a theoretical doubling of biomass in the lake. Hudson et al. (1992) discussed the advantages and disadvantages of using the TSI. Water coloration or suspended solids other than algae often diminish the accuracy of Carlson's index. Conversely, applying TSI classification to lakes that are dominated by rooted aquatic plants may indicate less eutrophication than actually exists.

The values of TSI for Lake Paradise were calculated for each station using equations 1-3, for each year data were collected (Tables 38-40). In addition, TSI results were compared for the first two years of data collection, last two years of data collection, and a mean average for all years sampled (Table 41). The results of the TSI analysis show the overall trophic status of Lake Paradise to be hypereutrophic for the first two years (73), last two years (75), and all years combined (74). The breakdown of the TSI calculations by year and site reveal that Sites 2 and 3 remained fairly consistent, but Site 1 has increased at least 10 points in each category over the period analyzed

Table 38. Annual Mean Secchi Trophic State Indices

	Site 1	Site 2	Site 3	Lake Average
1977	69	80	82	77
1979	70	74	80	75
1981	72	75	79	76
1982	74	79	85	79
1983	73	75	83	77
1984	69	71	77	72
1985	69	75	82	76
1986	70	74	82	75
1987	68	75	77	73
1990	74	78	82	78
1991	73	76	80	76
1992	73	77	83	78
1993	73	76	82	77
1994	76	81	88	82
1995	75	78	88	81
1996	80	83	89	84
1997	75	78	85	79
1998	75	78	82	78
2000	77	79	84	80
2001	79	83	84	82

Table 39. Annual Mean Chlorophyll (a) Trophic State Indices

	Site 1	Site 2	Site 3	Lake Average
1979	58	63	74	65
1981	63	64	72	66
1993	74	74		74
1995	74	77	79	77
1997	74			74
1998	71	73	71	71
2000	66	70	70	69
2001	69	69	69	69

Table 40. Annual Mean Total Phosphorus Trophic State Indices

	Site 1	Site 2	Site 3	Lake Average
1977	65	75	79	73
1979	65	81	85	78
1981	65	71	75	71
1991	71		81	79
1993	68	41		45
1994	71		84	80
1995	66	75	82	77
1997	64			80
1998	71	78	81	77
2000	71	74	77	76
2001	78	77	74	75

Table 41. Lake Paradise Trophic State Index

	Site 1	Site 2	Site 3	Lake Average
First 2 Sampling Seasons				
Secchi	70	77	81	76
Chlorophyll (a)	61	64	73	66
Total Phosphorus	65	78	82	76
Last 2 Sampling Seasons				
Secchi	78	81	84	81
Chlorophyll (a)	68	70	70	69
Total Phosphorus	75	76	76	76
All Sampling Seasons				
Secchi	73	77	83	78
Chlorophyll (a)	69	70	73	71
Total Phosphorus	69	72	80	74
Overall Trophic Status (Using Lake Average)*				
First 2 Sampling Seasons	73	Hypereutrophic		
Last 2 Sampling Seasons	75	Hypereutrophic		
All Sampling Seasons	74	Hypereutrophic		

*based on 4 categories
 oligotrophic = 0-40
 mesotrophic = 40-50
 eutrophic = 50-70
 hypereutrophic = 70-100

Lake Budgets

Hydrologic Budget

A hydrologic budget for Lake Paradise for the period of May 2000 to April 2001 provides an estimate of the total water inflow and outflow from the lake. Theoretically, the volume of inflow should equal the volume of outflow plus the change in volume of water stored in the lake.

The hydrological budget was calculated based on methods presented in Lin (2001). Inflow to the lake was comprised of precipitation directly on the lake, groundwater inflow and surface inflow. Inflow from the Little Wabash (major tributary inflow) was not gauged and therefore included as surface inflow. Inflow to Lake Paradise is tabulated in Table 42.

Precipitation that fell on Lake Paradise was computed by multiplying the surface area of the lake by the precipitation each month to yield a volume of water in acre-feet. Precipitation readings were taken daily by the city, and the data were checked against NOAA data from a gauging station in Mattoon. Where storms were missing from City records, NOAA data were added.

Groundwater inflow for each month of the budget year was estimated by selection of a period in each month with no spillway discharge and no rain. Daily groundwater inflow was computed by adding the daily storage change, the daily water supply withdrawal and the daily evaporation, and then computing an average over the number of days. The daily groundwater was applied over the whole month and a monthly total was then calculated.

Surface inflow was the balancing factor in the hydrological budget. Therefore it was calculated by adding the daily spillway discharge, the daily water supply withdrawal, the daily evaporation and the daily storage change and subtracting the daily precipitation and the daily groundwater inflow. The total surface inflow was calculated for each month.

Outflow from Lake Paradise included evaporation from the lake, discharge over the spillway and raw water usage. Evaporation from the lake surface was estimated. Multiplying the area of the lake by the evaporation in feet produced a volume of evaporation in acre-feet. Discharge over the spillway was estimated from daily water levels recorded and the discharge rating equation presented in the Water and Wastewater Calculations Manual (Lin, 2001). Outflow through the raw water intake was derived from the monthly records from the Mattoon Water Treatment Plant. Outflow from Lake Paradise is tabulated in Table 42.

Table 42. Lake Paradise Hydrological Budget

		INPUTS			OUTPUTS			BALANCE
Date	Storage change (acre-ft)	Direct precipitation (acre-ft)	Groundwater inflow/outflow(-) (acre-ft)	Surface inflow (acre-ft)	Spillway discharge (acre-ft)	Monthly evaporation (acre-ft)	Water supply withdrawal (acre-ft)	+ In - Out (acre-ft)
2000								
May	89.9	41.8	273.4	140.0	0.0	59.5	305.8	89.9
June	6.9	126.6	187.5	2,545.4	2,499.1	73.3	280.2	6.9
July	-41.5	92.0	203.0	3,084.0	3,050.7	83.0	286.8	-41.5
August	27.7	85.8	3.9	301.2	0.0	69.2	294.1	27.7
September	17.3	80.2	65.3	2,400.2	2,203.6	48.4	276.4	17.3
October	-17.3	79.5	159.6	4,116.2	4,083.2	30.4	259.0	-17.3
November	13.8	49.5	154.5	1,306.9	1,557.2	14.5	-74.6	13.8
December								
2001								
January								
February	-27.7	32.9	23.7	2,347.5	2,185.8	10.4	235.6	-27.7
March	-20.8	12.0	246.5	35.1	39.2	22.8	252.3	-20.7
April	0.0	24.2	241.0	252.7	235.5	39.4	243.1	0.0
Annual	48.4	624.5	1,558.5	16,529.3	15,854.2	451.0	2,358.7	48.4
Total Inflow (acre-ft)								18,712.3
Total Outflow (acre-ft)								18,663.9
Net Loading (acre-ft)								48.4

* Note: Due to the lake being frozen in December and January, samples could not be taken therefore were eliminated from the study.

The difference between the outflow and the inflow is the net hydrologic loading. This difference indicates either a greater inflow or greater outflow exists. The hydrologic budget presented in Table 42 reveals that during the baseline year, there was a net inflow of approximately 80 acre-feet. Looking at the data, the difference in the water level from the beginning of the study period to the end was approximately 6.5 inches, which is about 90 acre-feet. This difference can be attributed to the estimation of inflow and outflow.

Sediment Budget

Using the monthly inflow volumes calculated in the hydrologic budget and total suspended solids (TSS) concentrations from the tributary sampling, the quantity of sediment entering Lake Paradise was calculated and summarized in Table 43. For estimating the amount of sediment leaving the lake, the outflow volumes in the hydrologic budget for spillway discharge and raw water supply were used. Water quality data taken at the spillway were used for spillway discharge. For the raw water supply, the water quality data from the Site 1 Bottom samples was used due to the proximity to the intake tower where water is withdrawn.

No sampling was conducted in December of 2000 and January of 2001 because the lake was frozen; therefore these two months were excluded from the analysis. When there was more than one sample taken during a particular month, the results were averaged for a monthly concentration.

Based on the information in Table 43, a total of 1,571 tons of sediment entered Lake Paradise while a total of 871 tons left the lake, yielding a trap efficiency of 46% for the current year.

Based on the two Lake Paradise sedimentation surveys in 1979 and 2001, an average sedimentation rate of 7,913 tons per year was calculated for the period 1931 to 2001. The conversion of lake volume lost to weight of sediment is based on an average measured density of 36.7 lbs per cubic feet based on the two sedimentation surveys (ISWS, 1982 and 2001). This is equivalent to 0.7 tons per year per acre of drainage area accumulating in the lake since 1931.

The difference between the average annual sedimentation rate and the current year budget sediment inflow is a ratio of eleven to one. This difference/decline in sediment inflow should be attributed to the watershed protection measures implemented since 1987. However, several other factors may also contribute to this substantial difference:

- o The current year had below normal precipitation,
- o No data were collected in the months of December and January; therefore the budget reflects only 10 months worth of data,
- o The peak suspended solids concentrations during high flows may not have been sampled because only two or three samples per month were obtained, and
- o The two different methods of calculating the sedimentation rates involve approximate methods, which can result in differences.

In addition to completing a sediment budget, sedimentation surveys conducted for Lake Paradise in 1979 and 2001 by the Illinois State Water Survey were analyzed. The sedimentation report is included in Appendix D. The sediment transects are shown in Figure 26 at the end of this section. In the initial survey, sounding data were collected at 25-foot intervals on each cross section to measure both the original and current depths of water in the lakes at the current spillway elevation. Depth measurements were made with a 2-inch diameter aluminum pole marked in tenths of feet. The pole was first lowered until it touched the current lake bottom and a depth measurement was made. The pole was then pushed through the accumulated sediment to a point of refusal. This depth was determined to be the solid original lakebed and another depth measurement was made.

The 2001 survey followed the survey plan of the initial survey as closely as possible. Selected survey monuments established at the time of the initial surveys was recovered and located using a Global Positioning System (GPS). The 2001 survey was conducted using an Odom Hydrographic Systems MK II fathometer for depth measurement and a differentially corrected Geodetic Position Systems (GPS) for horizontal control across the transect.

The depth to refusal sounding data from the initial surveys were used to calculate the original (1908) storage capacity of the lake at the current spillway levels and at the 1931 lake surface area. The water depth soundings from the initial survey, using the sounding pole, and the 2001 depth soundings from the depth sounder were used to calculate the corresponding capacities at the time of the survey. The difference between these storage capacities is the lake volume that has been lost to sedimentation since construction of the reservoir or between surveys. Figure 25 summarizes the result of the 2001 Bathymetric survey. Figures 27 to 37 show the amount of sedimentation that has occurred at each transect line by showing a cross section of the lakebed (please refer to the photo in upper right hand side of the figure for transect location). In these figures, the original lake bottom, the 1979 lake bottom, and the current lake bottom can be seen.

According the ISWS surveys, Lake Paradise has lost 835 acre-feet of its capacity as a result of sedimentation between 1908 and 2001. Approximately 481 acre-feet of this loss has occurred since 1931. This gives a sedimentation rate of 9.9 acre-feet per year since 1931. If this rate of sedimentation continues, the volume of Paradise Lake will be approximately half of the potential 1908 volume in the year 2013 and will be completely filled by sediment in the year 2118. However, because of the decreasing volume of the lake, the trap efficiency of the lake will tend to decrease with age and this will very likely extend the life of the lake considerably.

The ISWS report also included a comparison of aerial photographs of the lake from 1938, 1953, 1966, 1979 and 1998. This analysis indicated that over 30 acres, or 15% of the original area of the lake had been completely filled by sediment by 1979, creating a large sediment delta on the north end of the lake. Comparison of the 1979 aerial photograph to the 1998 photograph indicates that this process has continued.

Table 43. Lake Paradise Sediment Budget

Date	<i>Inputs</i>	<i>Outputs</i>		<i>Balance</i>
	(lbs)	Spillway Discharge (lbs)	Raw Water Usage (lbs)	+ In - Out (lbs)
2000				
May	4,950	0	17,463	-12,512
June	456,845	237,855	12,191	206,798
July	1,473,231	188,043	11,698	1,273,489
August	53,449	0	7,197	46,251
September	208,863	212,726	21,797	-25,660
October	453,334	427,494	9,156	16,683
November	85,295	67,753	-3,247	20,789
December				
2001				
January				
February	363,872	416,075	74,319	-126,522
March	381	4,479	15,780	-19,878
April	42,612	10,884	10,577	21,150
Total (lbs)	3,142,836	1,565,314	176,933	1,400,588
Total (tons)	1,571	782	88	700
Total Inflow (lbs)				3,142,836
Total Inflow (tons)				1,571
Total Outflow (lbs)				1,742,247
Total Outflow (tons)				871
Net Loading (lbs)				1,400,588
Net Loading (tons)				700

Nutrient Budget

Nitrogen and phosphorus are the principal nutrients affecting the lake eutrophication process. The hydrologic budget was correlated with the Total Nitrogen (TN) (nitrate-nitrogen plus Kjeldahl-nitrogen) and Total Phosphorus (TP) concentrations obtained from the sampling to develop nitrogen and phosphorus budgets for Lake Paradise. Nitrogen and phosphorus concentrations were based on monthly samples taken during the current baseline year. In the event a sample was not obtained for a particular month, the month before and the month after were averaged to produce a concentration. When there was more than one sample taken during a particular month, the results were averaged for a monthly concentration.

Inflow for the nitrogen and phosphorus budgets was based on measurements from the Little Wabash River. Outflow for the nitrogen and phosphorus budgets is based on nutrient concentrations in discharge over the spillway and raw water. Subtracting the outflow from inflow gives the net loading for the baseline year. The nitrogen budget had a net loading of 55 tons, whereas the phosphorus budget had a net loading of 1.7 tons, meaning that more nitrogen and phosphorus entered Lake Paradise than left it. The nutrient budgets for Lake Paradise are presented in Tables 44 and 45.

Limiting Nutrient

Algal blooms are partially a result of excess nutrient levels in bodies of water. The nutrient budgets reveal the net loading or the amount of nutrients added to the lake each year from external sources. The two most important ‘ingredients’ regarding algal blooms are nitrogen and phosphorus. The nutrient budgets give the annual loading but to further pinpoint potential cause for algal blooms, total nitrogen (TN) to total phosphorus (TP) ratios are defined from the collected data. Living cells do not utilize nitrogen and phosphorus to the same extent. In living algal cells, nitrogen typically exists in a quantity seven times greater than phosphorus (Horne, 1994). Because of this natural ratio, it is assumed that phosphorus is the limiting nutrient to algal blooms when nitrogen exists in quantities greater than ten times that of phosphorus. In other words, even if there is an over abundance of nitrogen in the water column, algal cells will lack an essential building block if little to no phosphorus is present and cannot produce a bloom.

Total nitrogen levels were greater than twenty times more than phosphorus levels at all three sampling sites for the mean of the 25-year sampling period (Table 46). This ratio was even greater for the 2000 data: total nitrogen concentrations were at least forty times higher at each sampling site than total phosphorus (Figure 24). These data confirm that Lake Paradise is a phosphorus limited lake.

Table 44. Lake Paradise Nitrogen Budget

Date	<i>Inputs</i>	<i>Outputs</i>		<i>Balance</i>
	(lbs)	Spillway Discharge (lbs)	Raw Water Usage (lbs)	+ In – Out (Lbs)
2000				
May	7,311	0	2,835	4,475
June	61,445	28,803	3,108	29,533
July	52,458	38,548	4,141	9,768
August	3,948	0	967	2,980
September	3,948	18,426	2,207	-16,685
October	82,944	50,355	2,796	29,793
November	45,013	16,514	-898	29,397
December				
2001				
January				
February	73,923	42,796	4,484	26,642
March	1,046	807	5,186	-4,948
April	8,094	3,844	4,174	74
Total (lbs)	340,133	200,097	29,004	111,031
Total (tons)	170	100	14	55
Total Inflow (lbs)				340,133
Total Inflow (tons)				170
Total Outflow (lbs)				229,101
Total Outflow (tons)				114
Net Loading (lbs)				111,031
Net Loading (tons)				55

Table 45. Lake Paradise Phosphorus Budget

Date	<i>Inputs</i>	<i>Outputs</i>		<i>Balance</i>
	(lbs)	Spillway Discharge (lbs)	Raw Water Usage (lbs)	+ In – Out (Lbs)
2000				
May	23	0	114	-91
June	1,515	731	108	676
July	2,859	743	53	2,062
August	198	0	48	149
September	1,353	1,084	142	126
October	3,302	2,320	144	836
November	746	249	-15	511
December				
2001				
January				
February	849	1,474	184	-809
March	1.6	16	87	-102
April	76	53	59	-36
Total (lbs)	10,925	6,675	927	3,322
Total (tons)	5.5	3.3	0.46	1.7
Total Inflow (lbs)				10,925
Total Inflow (tons)				5.5
Total Outflow (lbs)				7,602
Total Outflow (tons)				3.8
Net Loading (lbs)				3,322
Net Loading (tons)				1.7

Table 46. Total Nitrogen to Total Phosphorus Ratios

	TKN	NO ₂ +NO ₃	Total N	Total P	Ratio
1977-2001					
Site 1	1.25	2.59	3.84	0.143	27
Site 2	1.33	3.26	4.59	0.171	27
Site 3	1.42	3.74	5.16	0.216	24
Lake Average	1.33	3.15	4.48	0.175	26
2000					
Site 1	1.27	4.67	5.94	0.15	40
Site 2	1.4	4.53	5.93	0.15	40
Site 3	1.21	6.9	8.11	0.18	45
Lake Average	1.43	5.37	6.8	0.16	43

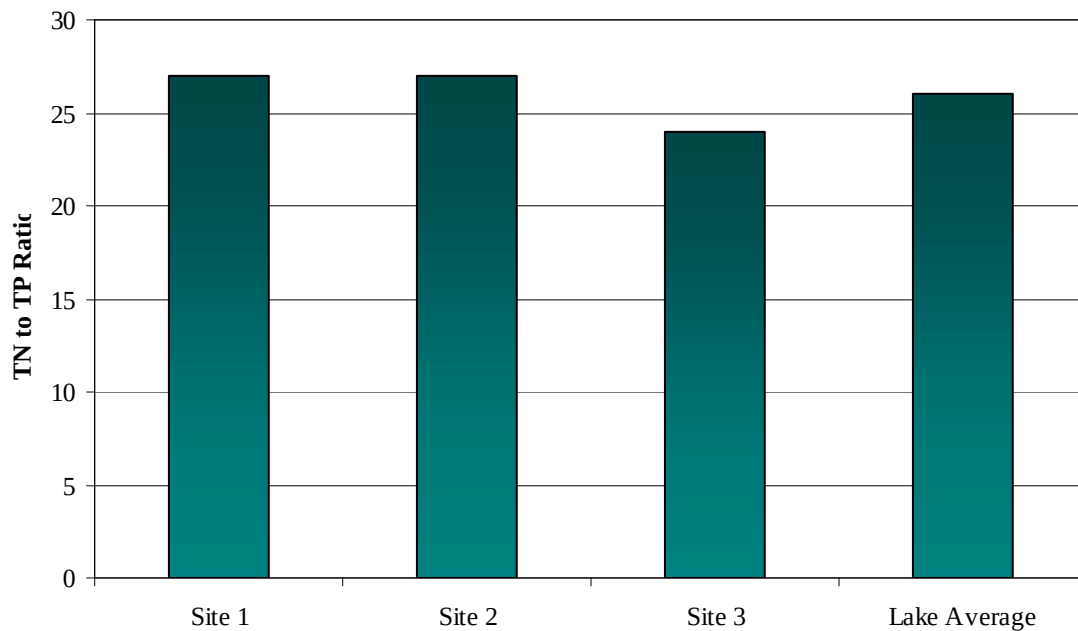


Figure 24. Total Nitrogen to Total Phosphorus Ratios 1977-2001

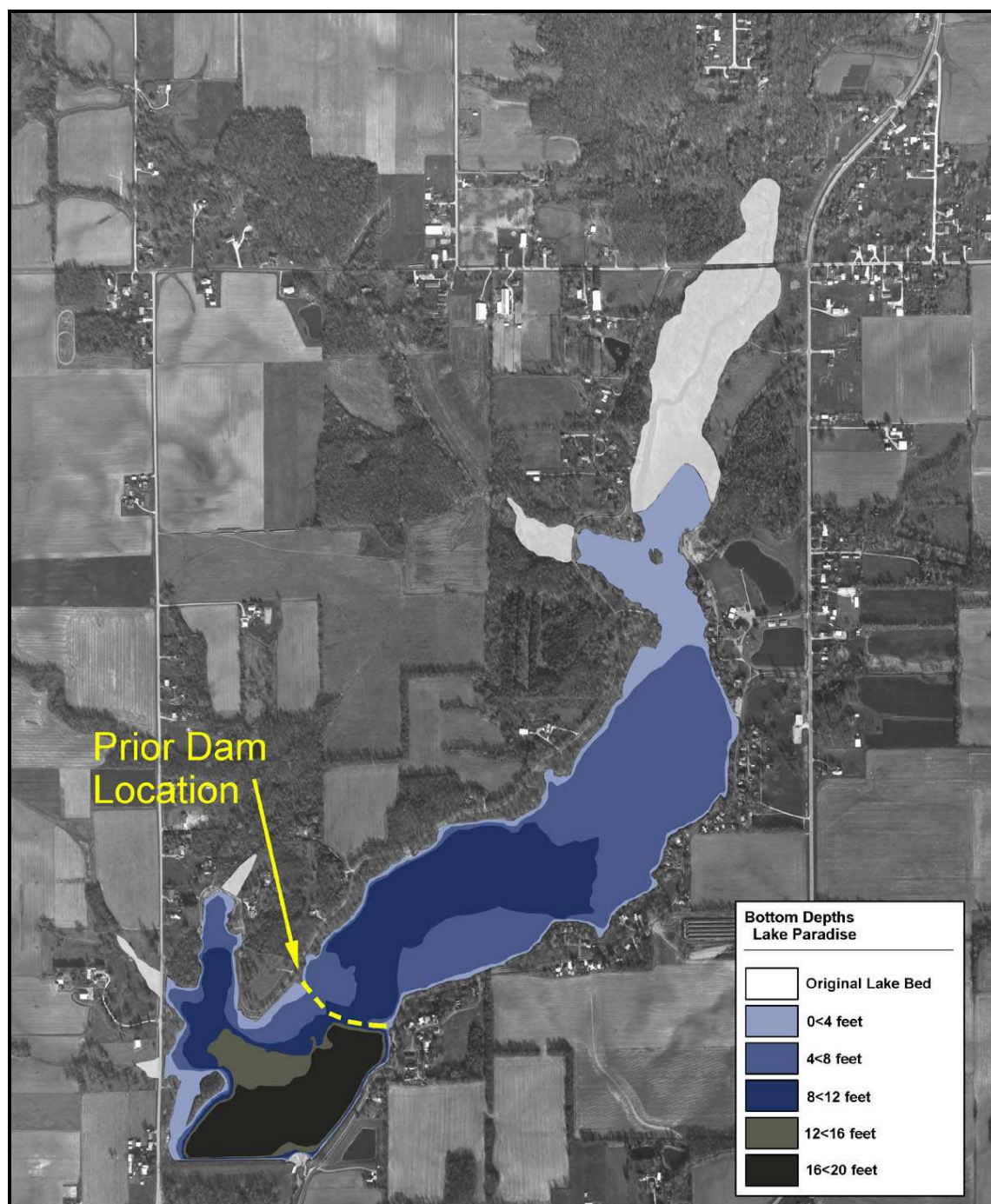


Figure 25.

**Bathymetry
Lake Paradise
Mattoon
Coles County
Illinois**

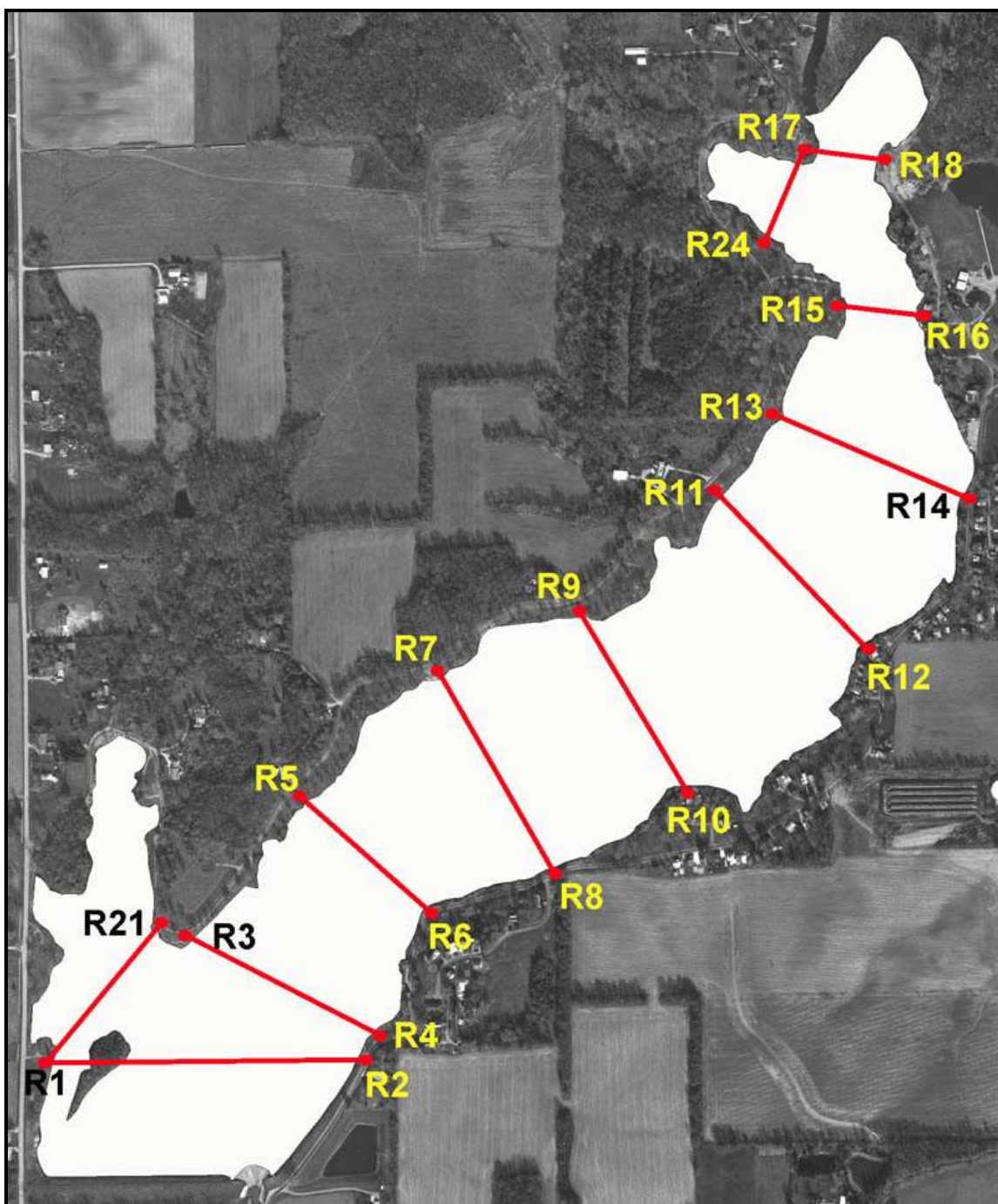
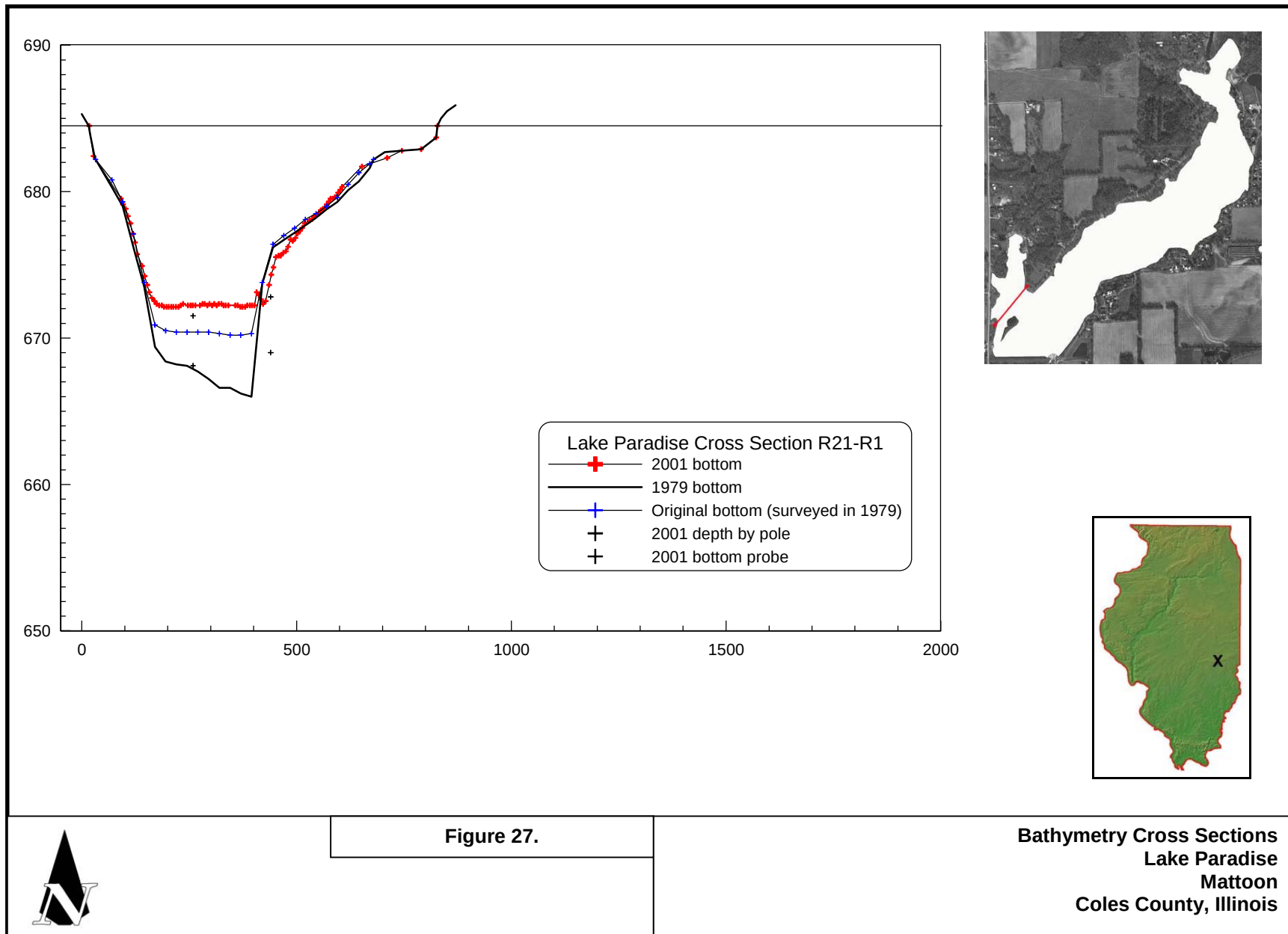
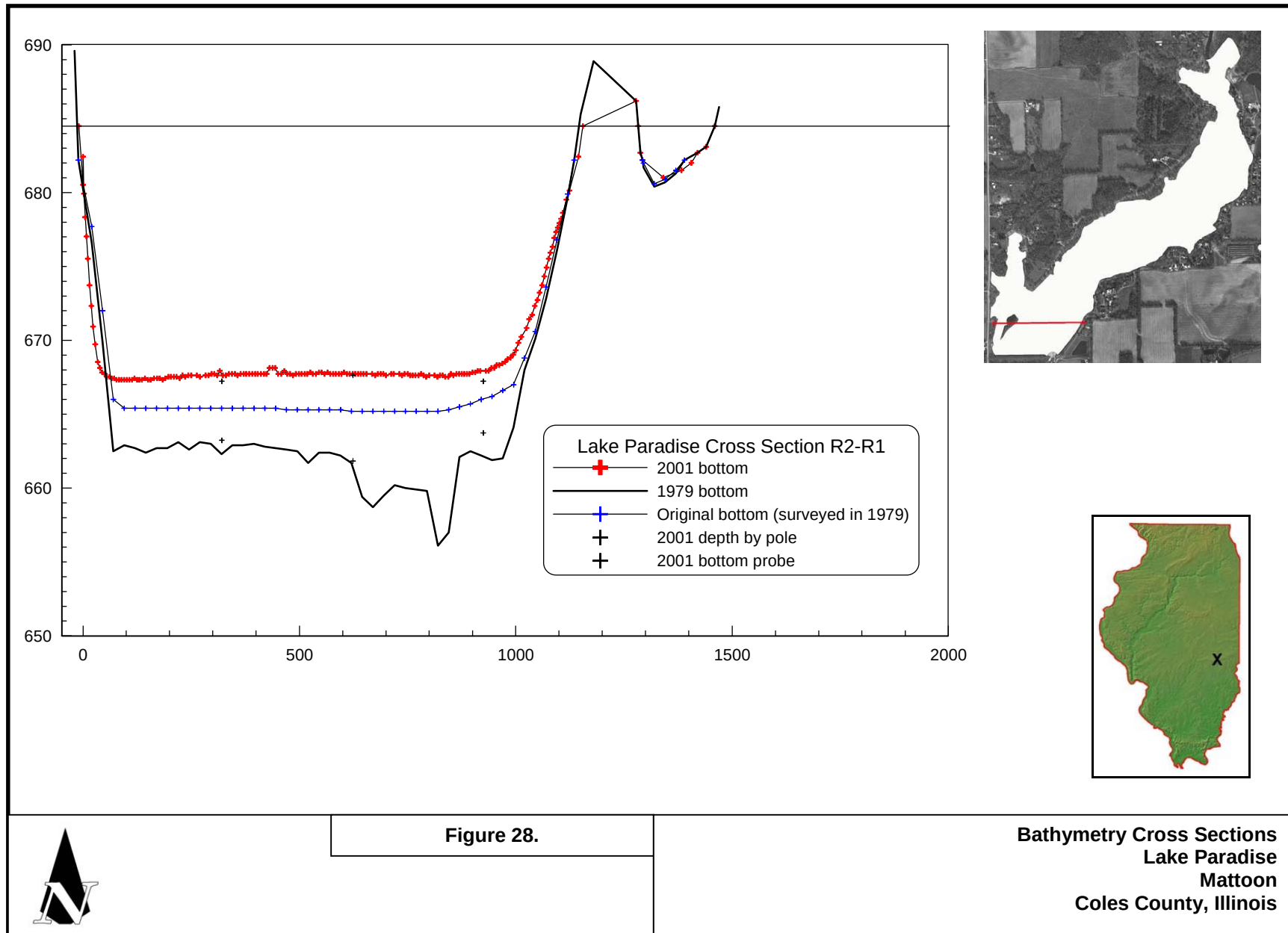
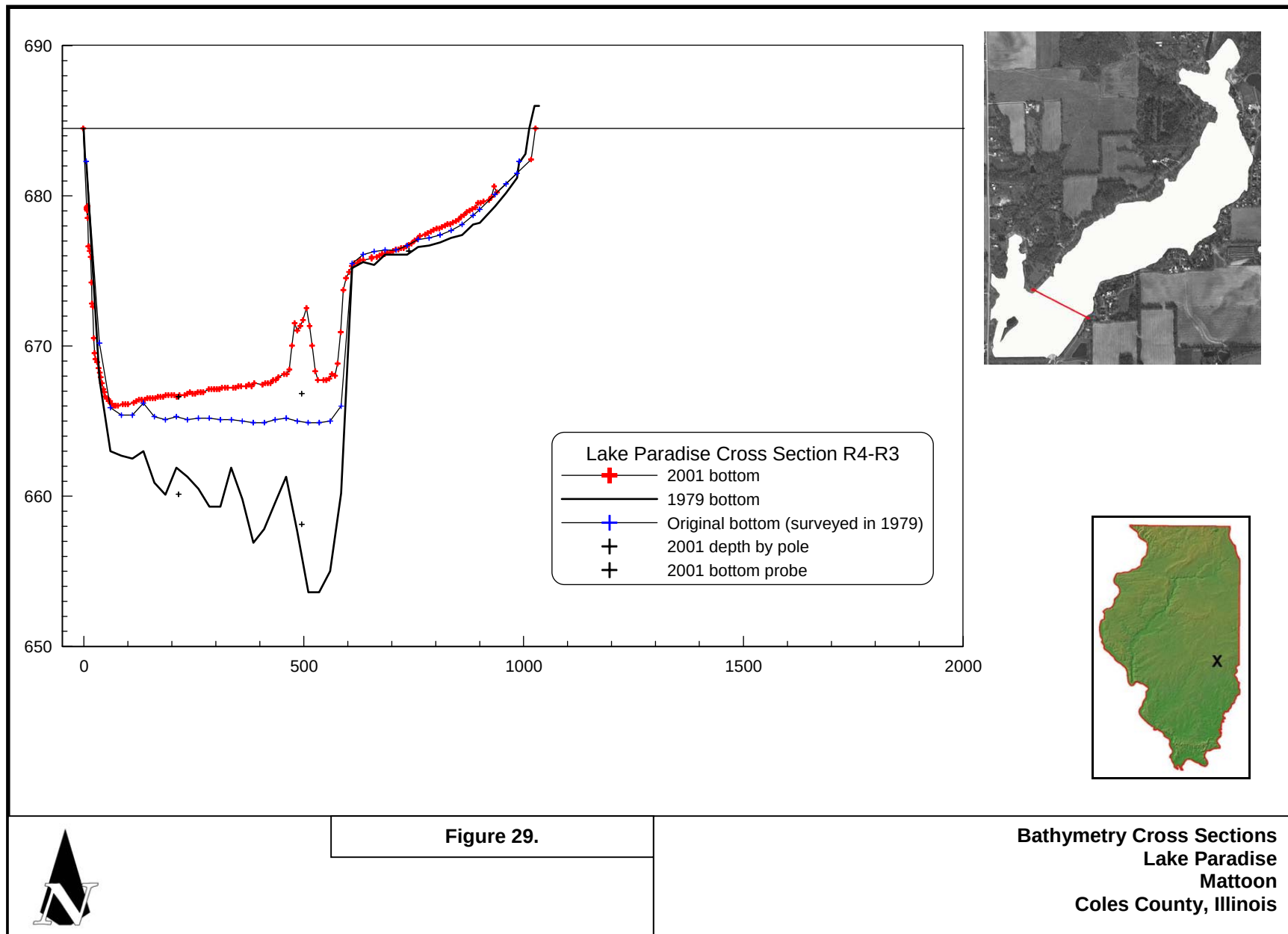


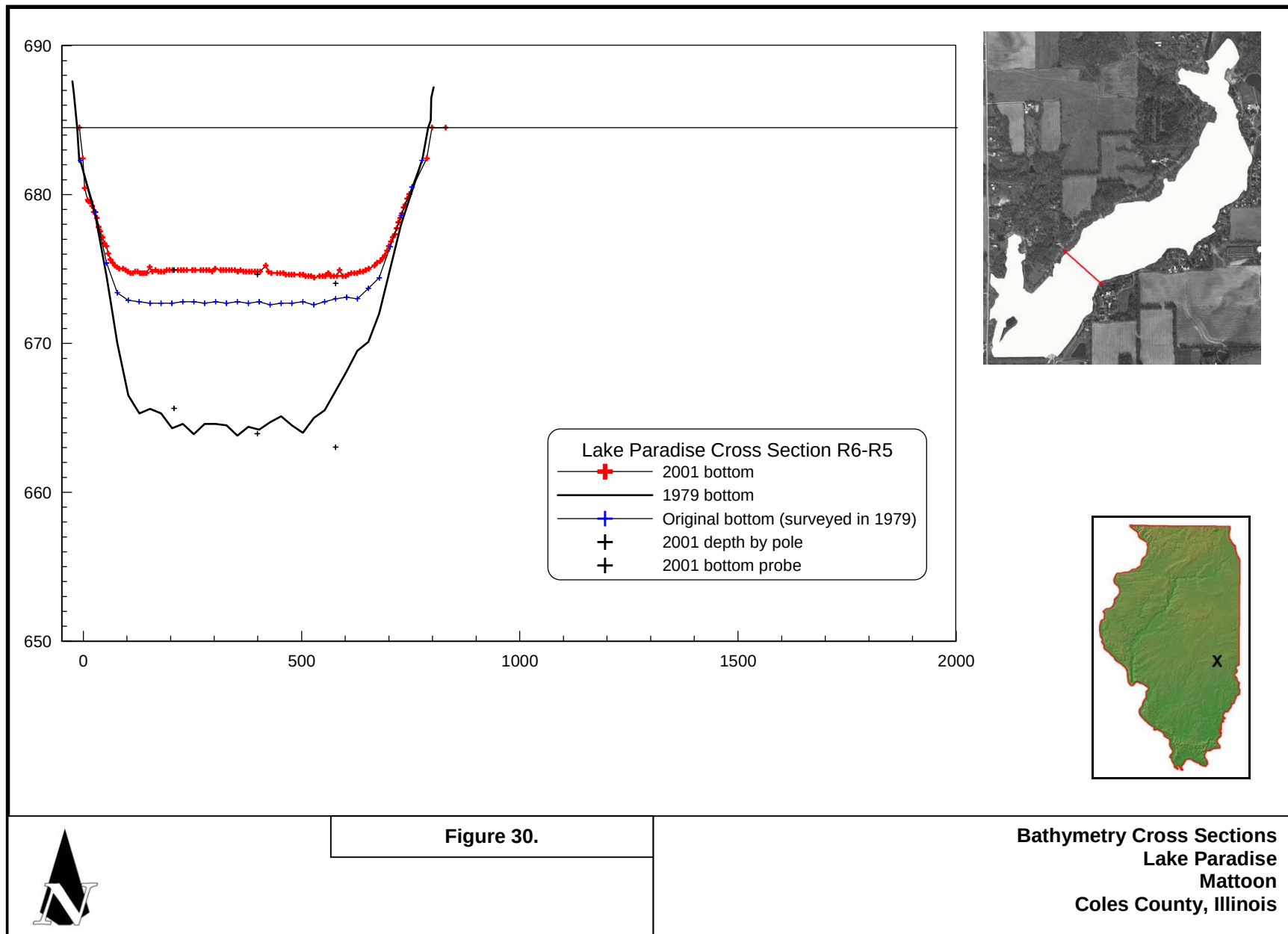
Figure 26.

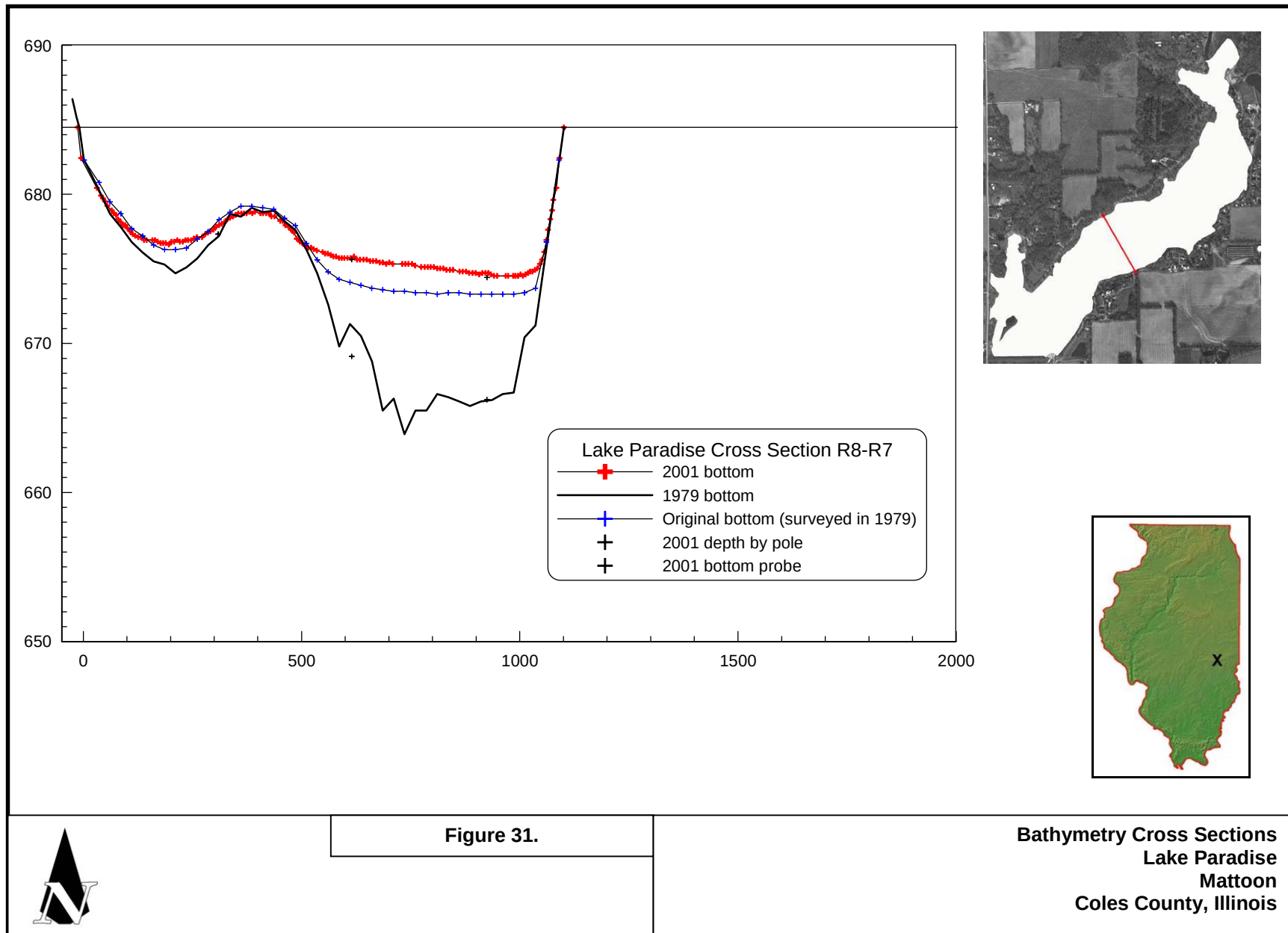
Bathymetry Cross Sections
Lake Paradise
Mattoon
Coles County
Illinois

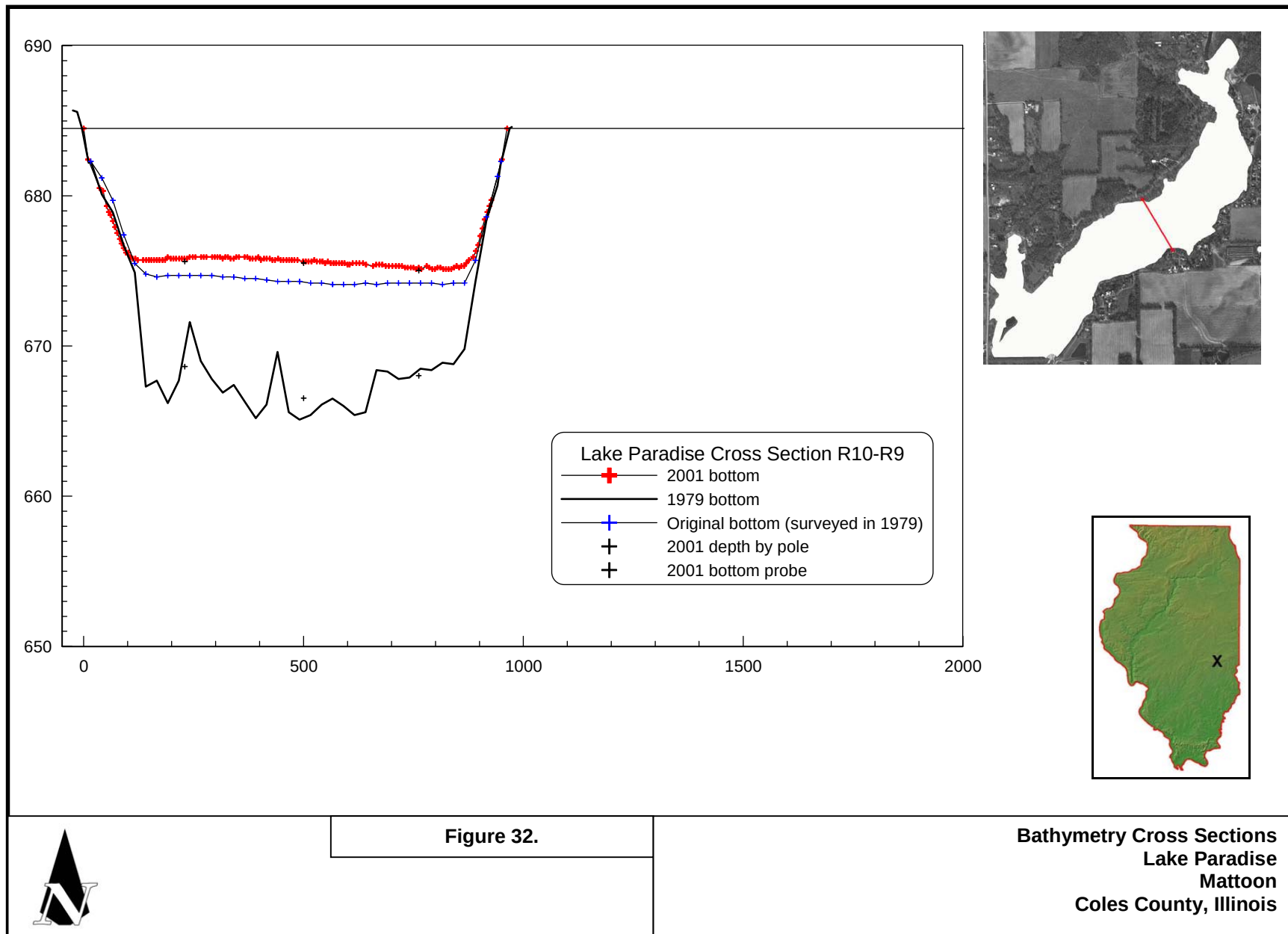


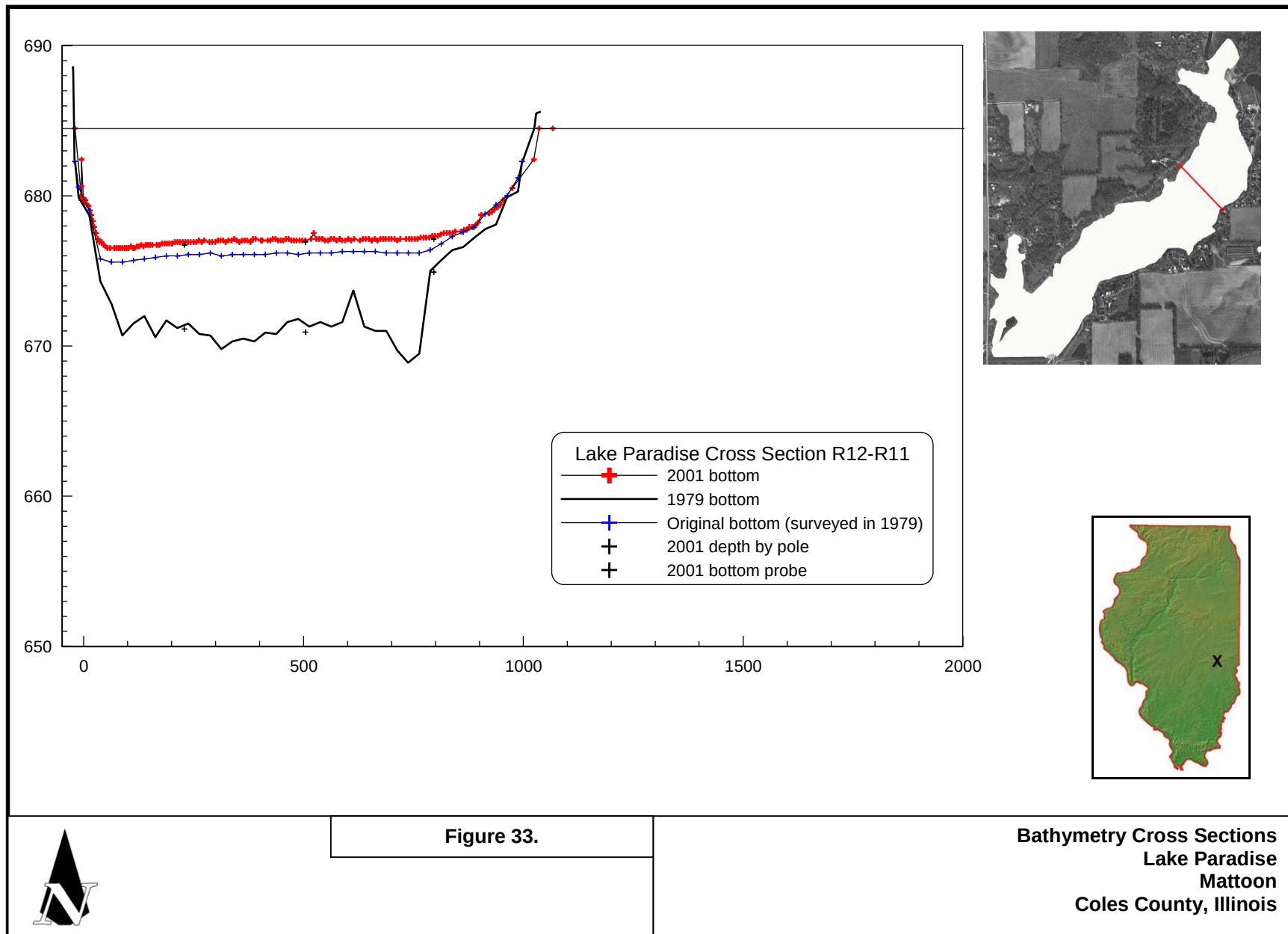


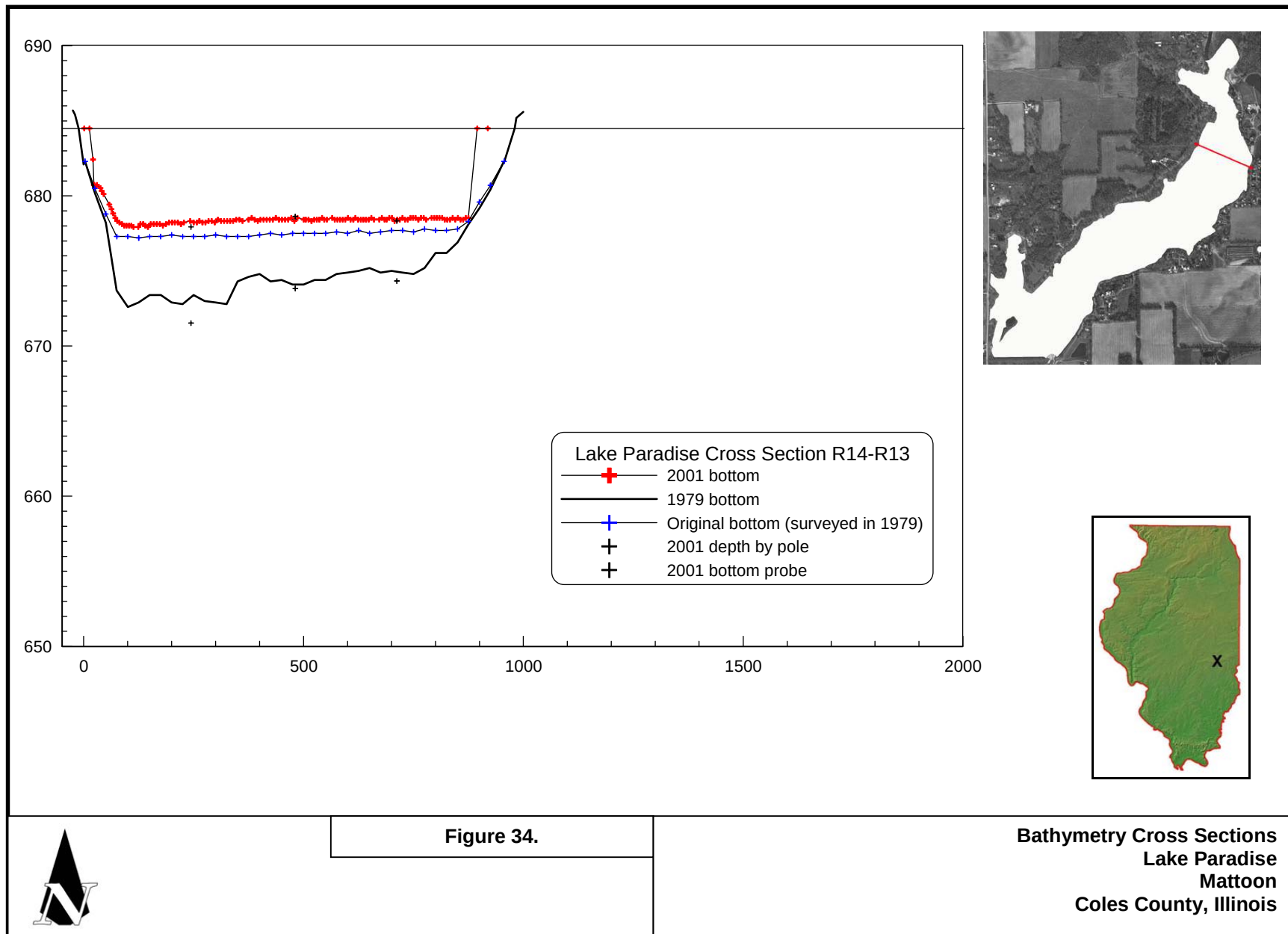


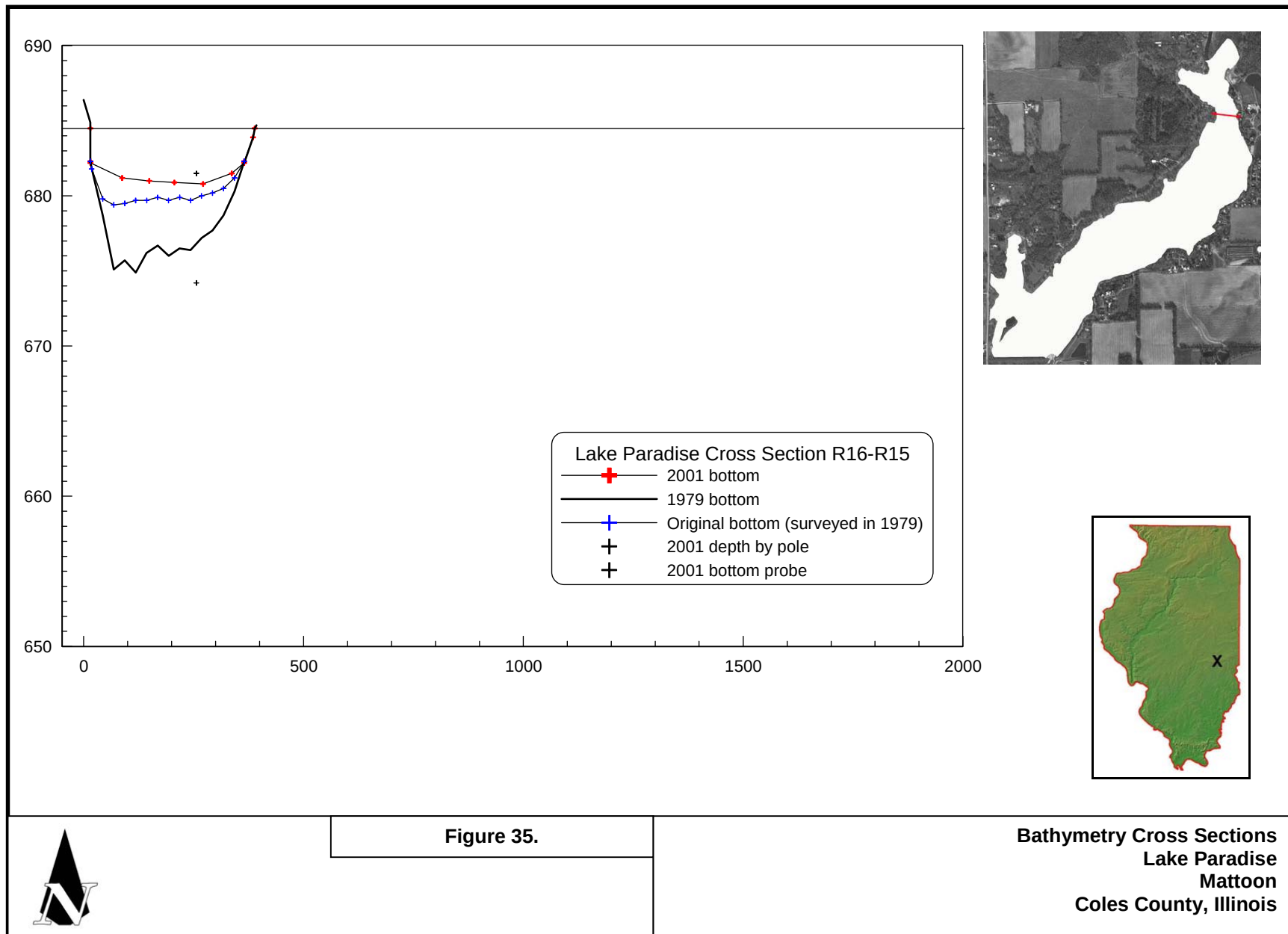


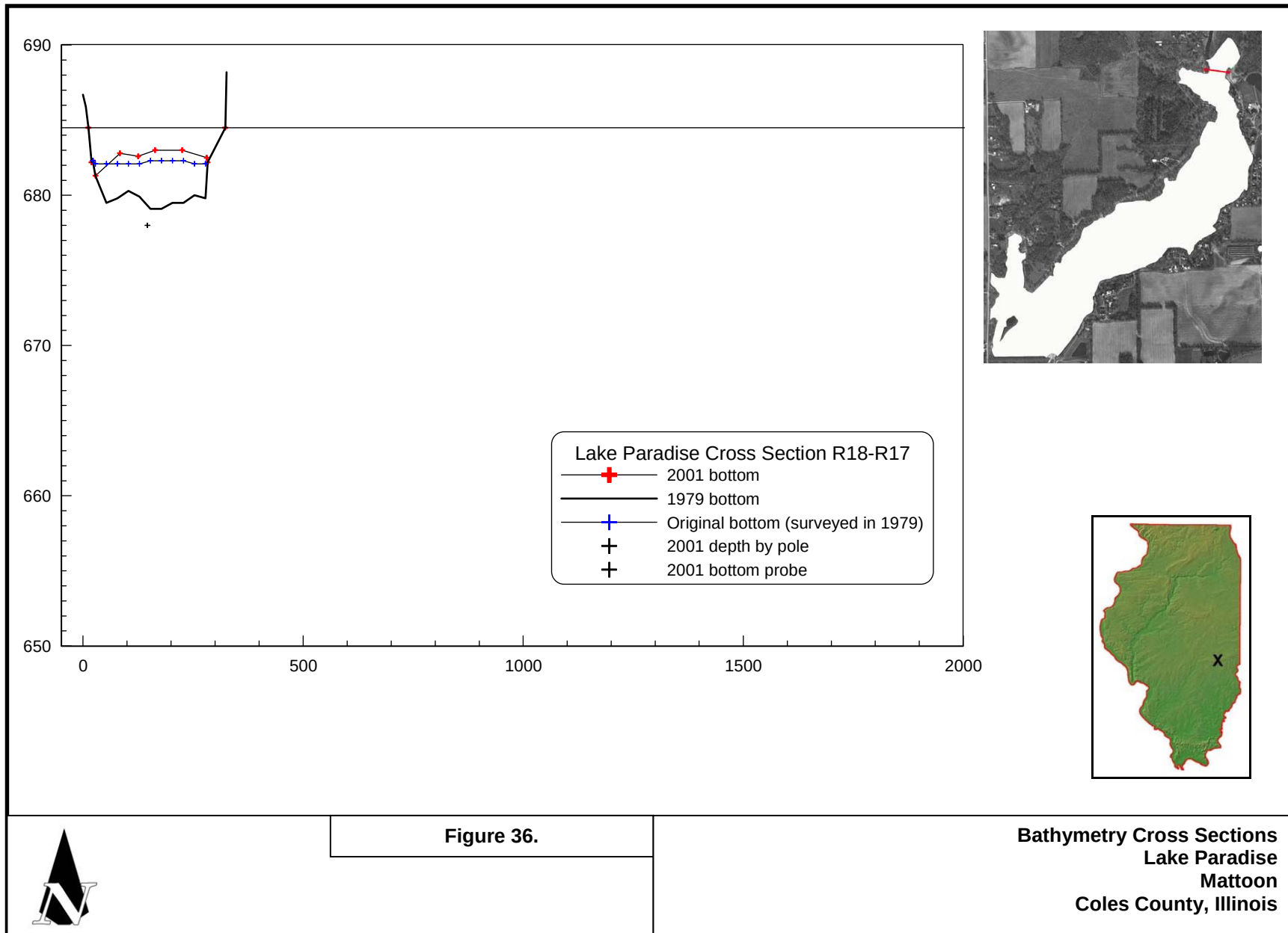


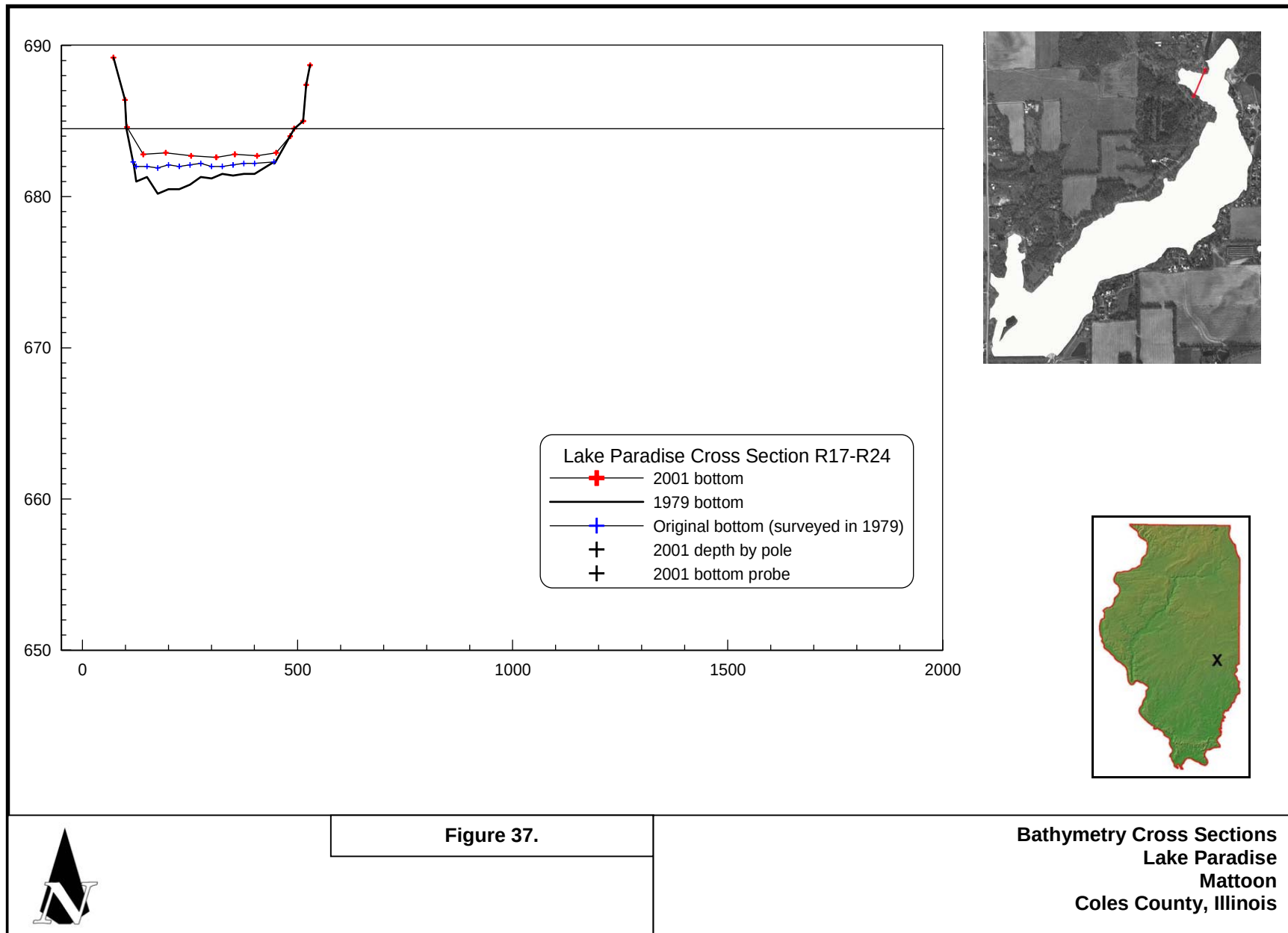












BIOLOGICAL RESOURCES & ECOLOGICAL RELATIONSHIPS

Lake Paradise and its surrounding watershed provide habitat for fish, waterfowl, shorebirds, and other wildlife. The total area managed by the city and park district is approximately 300 acres, of which 166 acres is water surface. The abundance of wildlife is a significant attraction to many users of the area.

The Illinois DNR has not conducted waterfowl surveys for Lake Paradise. According to city employees, there are about 30 resident ducks and 300 migrant geese around Lake Paradise. It is not known whether these are dabbling or diving ducks. Birds, herpetological species, and mammals have been surveyed for the nearby Charleston side-channel reservoir by Ron Bradley and Professors Edward Moll and Richard Andrews of Eastern Illinois University.

Over 210 species of birds have been recorded at the Charleston side-channel reservoir by Ron Bradley, including the common loon, pied-bill grebe, great blue heron, Canada goose, mallard, gadwall, American widgeon, northern shoveler, wood duck, lesser scaup, common goldeneye, ruddy duck, veery, European starling, American redstart, northern cardinal, and house finch.

Fourteen species of amphibians have been reported in the Charleston area. Common amphibians include *Bufo americanus*, *Bufo woodhousei*, *Acris crepitans*, *Pseudacris triseriata*, *Hyla crucifera*, and *Rana catesbeiana*. Twenty-three species of reptiles were also reported by Dr. Moll (City of Charleston, 1992).

Professor Andrews reported 42 species of mammals in the vicinity of the Charleston reservoir. Commonly observed mammals include opossum, eastern mole, northern short-tailed shrew, little brown bat, eastern pipistrelle, big brown bat, red bat, raccoon, coyote, woodchuck, eastern chipmunk, eastern gray squirrel, eastern fox squirrel, white-footed mouse, prairie vole, muskrat, barn rat, house mouse, eastern cottontail rabbit, and white-tailed deer.

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PART II – FEASIBILITY STUDY

Lake Paradise

Coles County

Mattoon, Illinois

PROBLEMS IDENTIFIED FROM THE DIAGNOSTIC STUDY

The Diagnostic Study identified the following concerns for Lake Paradise:

- o Approximately 40% of the lake's original storage capacity has been lost due to accumulation of sediments and approximately 0.51% more capacity is lost each year,
- o Phosphorus and nitrate levels in the lake are excessive and contribute to nuisance algal blooms, degraded raw water quality and aesthetic problems,
- o Lake waters contain very low levels of dissolved oxygen below depths of 10 feet during summer months,
- o The fishery is of low quality and recruitment of desirable species is low,
- o Approximately 40 percent of the shoreline is unprotected.

The causes of these problems include excessive erosion during flood events, stream bank and shoreline erosion, resuspension of sediments by flood flows and wave action, over fertilization (excessive nutrient release) of cropland in the watershed, poor pasturing practices near the lake, improperly maintained septic systems along the shoreline, summer hypolimnetic deoxygenation, poor aquatic plant density and diversity, and poor habitat for aquatic fauna, including sport fish.

OBJECTIVES OF THE LAKE PARADISE RESTORATION PROGRAM

The objectives of the Lake Paradise restoration program are to correct existing lake problems and to restore and protect beneficial uses, including cultural uses such as fishing and aesthetics, as well as water quality for public water supply and wildlife habitat. Major specific goals of the restoration program include:

- Protect and enhance the storage volume of the lake for water supply,
- Reduce external and internal sediment delivery to the lake,
- Reduce nutrient delivery to the lake,
- Eliminate nutrient cycling within the lake,
- Improve fishery productivity,
- Promote biodiversity,
- Improve aesthetics,
- And provide public education on lake and watershed protection.

POTENTIAL RESTORATION MEASURES

Shoreline Enhancement and Protection

Sediment derived from shoreline erosion and slumping of the shoreline below the water surface increases the nutrient load in the lake, increases the concentrations of total suspended solids and turbidity of the lake water, decreases the depth of the lake, and can potentially undermine the support for manmade structures surrounding the lake. Furthermore, sloughing of shoreline sediments and denuded banks reduces the aesthetic appeal of the lake and contributes to a negative view of the lake as a whole.

The primary factors affecting shoreline erosion at Lake Paradise are fluctuating water levels and wave action. High lake levels are typically present in the spring after snowmelt and heavy spring rains. High water levels may result, however, at any time after storm events. High water levels saturate the shoreline soils and promote sloughing when the water level falls (Quigley and others, 1977). In addition, thaw failure caused by penetration of frost into joints in the sediment may be an important factor in shoreline erosion and slumping (Reid, 1985). Low water levels promote shoreline erosion through erosion of the exposed, non-vegetated banks to wave action (Quigley and others, 1977).

In unprotected areas of Lake Paradise shoreline (approximately forty percent), the absence of near-shore vegetation and/or structural protection allows waves to break directly onto the exposed shoreline rather than being attenuated further offshore, thereby dissipating the wave energy. To address this issue, a two-prong approach is warranted. First, the City of Mattoon will require that future structural shoreline protection conform to a city specification that requires properly sized and applied protection measures. Second, selected unprotected areas along the western shoreline will be planted from the shoreline back approximately fifty feet with deep-rooted vegetation to absorb wave action and control overland and subsurface drainage.

Septic System Inspection and Maintenance Program

All lake residences are currently using septic systems to treat their wastewater. Based on the age of these systems, it is likely that a high percentage of lakeside septic systems are not functioning properly. Non-functioning or improperly functioning lakeside septic systems potentially become point sources of pollution that can deposit a significant amount of nutrients and pathogenic bacteria in the lake.

To address this issue, the City of Mattoon in cooperation with the Coles County Health Department will develop an ordinance for the protection of the public water supply source. The ordinance will apply to private sewage disposal systems on marginal properties of Lake Paradise.

The ordinance will include standard and enforceable criteria for maintaining functioning systems and for repairing and/or replacing nonfunctioning systems.

Fish Crib Installation

Lake Paradise is currently unable to sustain productive fish recruitment. Due to high sediment inflow, high numbers of nuisance species such as carp, limited habitat, and limited spawning areas, game fish have had to be continually restocked to maintain populations. The placement of artificial habitat structures on the lake bottom can be extremely beneficial for fish populations. Artificial structures provide habitat for smaller fish to hide and evade potential predators. These structures aid young-of-the-year fish and allow larger / healthier size classes to develop.

Lake Education Program

Public education is a key component of any environmental restoration program. In order for restoration to be successful in the long term, the surrounding population must be transformed from users of the lake into stewards of the lake and its watershed. This user population includes the City of Mattoon, lake residents, recreational lake users, and farmers within the watershed. Components of a public education program to address the needs of these varying interests could include preparation and distribution of a homeowners guide for lake residents, providing workshops on landscaping for lake homeowners, organizing lake festivals to reinforce the natural and cultural value of the lake to the community, organizing lake cleanup or restoration days, developing a nature trail through restored shoreline areas, providing information to farmers within the watershed on fertilizer use and maintenance of riparian buffers, and providing better signage for lake improvements and pollution prevention.

Wetland Development

Wetlands act as natural wastewater treatment systems. Aquatic plants take up nutrients directly from the water column as well as lake sediments. Thick beds of aquatic plants can also slow the water current and cause sediments to fall out of the water column. Roots of established wetland plants serve to stabilize lake sediments, thus reducing the amount of sediment that can be resuspended through wave action. Wetland areas are also natural spawning habitat for fish.

Selected areas in Lake Paradise, primarily near the upper reaches of the lake, would be planted with a diverse assortment of emergent and floating macrophytes to provide shoreline protection, stabilize sediment, remove nutrients, and improved aquatic habitat.

Aeration/Destratification

A destratifier was installed in the southern basin of Lake Paradise in 1995 to prevent thermal stratification from occurring during the summer and winter months. The current study has found that this installed destratifier has helped to prevent thermal stratification from occurring, but during summer months very low dissolved oxygen levels are still present below depths of ten feet. The lack of oxygenated waters near the bottom of the lake allows anaerobic decomposition to take place, thus releasing additional nutrients into the lake.

Destratifiers have been successful in other lakes in central Illinois. A destratifier in Lake Eureka (227 acre feet) eliminated the stratification and maintained D.O. levels in the deepest portion of the lake (18 feet). Iron and manganese levels were reduced by 97 percent in the bottom waters, and chlorine demand was reduced in half (Kothandaraman and Evans, 1982). A shift away from the blue green algae species was also noted.

The installation of an aeration system or an additional destratifier will increase the dissolved oxygen levels in the deepest part of Lake Paradise. Replenishment of the oxygen would improve fishery conditions, reduce the release of nutrients from the sediments, and reduce taste and odor problems in drinking water.

Sediment Retention Basin

Creation of a sediment retention basin at the upper end of Lake Paradise would provide a means of trapping incoming sediment before reaching the main body of the lake. The sediment basin would not only serve to lengthen the lifespan of the lake, but would also reduce the amount of suspended solids within the water column. The sediment basin will be located within the lakebed of the original Lake Paradise.

Watershed Nutrient Management Program

Nutrient management programs evaluate, monitor, and regulate nutrient applications throughout watersheds to reduce the amount of nutrients entering a lake without reducing agricultural productivity. Communities throughout central Illinois that are dependent upon clean lake waters for a safe public water supply source have been developing watershed nutrient management programs over the past several years. These programs are managed by the local USDA-NRCS offices in cooperation with the agricultural producers within a given watershed.

Streambank and Channel Protection

The Coles County NRCS has worked closely with farmers in the Lake Paradise watershed to implement measures that are intended to control in-field erosion and to reduce the amount of sediment delivered to the lake. These measures have resulted in additional erosion protection over a large portion of the watershed. However, very little protection has been put into place for the streams entering Lake Paradise. Streambanks are actively eroding in many sections, contributing to sediment and nutrient loading to the lake. The measures described for shoreline erosion protection may also be applied to eroding streambanks. In general, non structural measures are preferred, although structural measures such as revetments may be required in areas of high scouring.

A large proportion of the stream miles contributing to Lake Paradise have a very limited or no riparian corridor. When out of bank flows occur, adjacent fields may be inundated, resulting in suspension of sediments that are carried into the lake.

Riparian buffers have been called a "conservation bargain" because they provide so many important ecological and recreational benefits. These narrow belts of vegetation insulate a stream from surrounding land uses. Near bank vegetation shades the stream and provides inputs of woody debris and leaf litter to the stream. These inputs are the natural food sources for many aquatic organisms. Streamside plants also protect the streambanks from erosion and scour. In addition, riparian zones are natural conduits for the movement of terrestrial species such as migratory birds, and can provide a natural framework for establishing greenway systems within urban areas.

A healthy riparian zone often consists of a mosaic of natural habitats including floodplain forest, wetlands, meadows, and upland forest. Riparian zones also act as filters for many pollutants that would otherwise enter waterways unimpeded. Buffer zones trap sediment, absorb nutrients, and break down harmful chemicals such as pesticides and volatile organics.

Providing a 100 foot or greater corridor of deep-rooted perennial vegetation along either side of the streams entering Lake Paradise would reduce delivery of sediments and nutrients to the lake while enhancing aquatic and terrestrial habitat and aesthetics.

Lake Sediment Removal

Based on the sediment survey performed by the Illinois State Water Survey in 2000, it has been determined that Lake Paradise has lost water volume at the rate of 9.9 Ac-Ft/year due to sedimentation. Since initial construction, approximately 40 percent of the original lake volume has been lost. One method of restoring a portion of the volume lost to sedimentation is to dredge the lake.

The most economical means of dredging Lake Paradise is by hydraulic dredging. Hydraulic dredging would be performed with the lake at its normal water level. Sediment is loosened and pumped as slurry to a retention pond where the sediment settles out and the clarified effluent water is returned to the lake. Selecting a site for the detention pond is a key factor in implementing this alternative action. The City would need to find a permanent storage site for the dredged material.

Dredging the main body of the lake would significantly increase the storage capacity of the lake and increase the water depth. It is estimated that half of the accumulated sediment in the main body of the lake can be removed by hydraulic dredging. In addition to dredging the main body of Lake Paradise another measure is to dredge only the upper reaches of the lake. Based on the sediment survey performed by the Illinois State Water Survey in 2000, the upper reaches of the lake have lost approximately 75 percent of their original capacity. Dredging the upper reaches would restore some of the capacity and also restore the trap efficiency for incoming sediment.

RECOMMENDED RESTORATION MEASURES

Due to limited available resources, not all of the potential restoration measures can be implemented under this grant. This section presents the recommended measures for restoration of Lake Paradise under the Clean Lakes Program. Recommended measures are shown in Figure 38 and summarized below.

A – Shoreline Enhancement and Protection

Nonstructural shoreline enhancement and protection is recommended for selected areas along the western shoreline. Approximately 800 linear feet of the western shoreline will be planted in a combination of emergent and deep-rooted upland vegetation. The estimated cost of this vegetative stabilization is \$3,000.

Riprap placement is not included in the restoration measures; however, it is recommended that the City of Mattoon adopt a policy to control future structural measures for shoreline protection. The policy would apply to leaseholders on Lake Paradise and to the City for any project to install new structural shoreline protection or replacement of existing structural shoreline protection. Any project would require approval by the City of Mattoon. Appendix E contains specifications for shoreline protection measures.

To facilitate the permitting of shoreline protection projects, it is recommended that the City of Mattoon obtain at one time the appropriate governmental permits for the entire lake. The permit would include specific types of shoreline protection as listed in Appendix E.

B – Lake Septic Inspection and Maintenance Program

The City of Mattoon will draft an ordinance requiring regular inspection and maintenance of septic systems surrounding the lake. The estimated cost of this effort is \$3,000. This cost is primarily for the commitment of time by city employees and for legal counsel. An example of a current city ordinance (Springfield, IL) is shown in Appendix F.

C – Fish Crib Installation

The installation of fish cribs is recommended for providing habitat and will be coordinated with the regional IDNR biologist. Based on an estimated cost of \$500 per structure, six units could be placed for \$3,000. The type and cost of the structures chosen for construction will determine the actual number of installed units.

D – Lake Education Program

The City of Springfield has prepared a pamphlet entitled Lake Springfield Ecology and Management: A Leaseholder and Community Guide (Skelly et al., 1992) that is distributed to every new lake homeowner. This pamphlet explains the lake ecosystem and provides guidance on a number of lake issues including septic system maintenance, yard maintenance, erosion control and other topics of interest to lake residents. A similar publication would be prepared for Lake Paradise and distributed to all current lake residents. A system would be established by the City of Mattoon to ensure that new residents receive a copy of the pamphlet. The Springfield pamphlet is shown in Appendix G. The estimated cost to prepare and distribute this pamphlet is \$10,000.

E – Wetland Development

Wetland areas will be developed in the locations shown in Figure 38. The planting specifications will be developed during Phase II. Plantings will occur annually in the spring over a period of four to five years. Each spring, the previous year's plantings will be evaluated for possible adjustments to the planting plan. The estimated cost of the proposed wetland development is \$252,000.

F – Additional Destratifier / Aerator

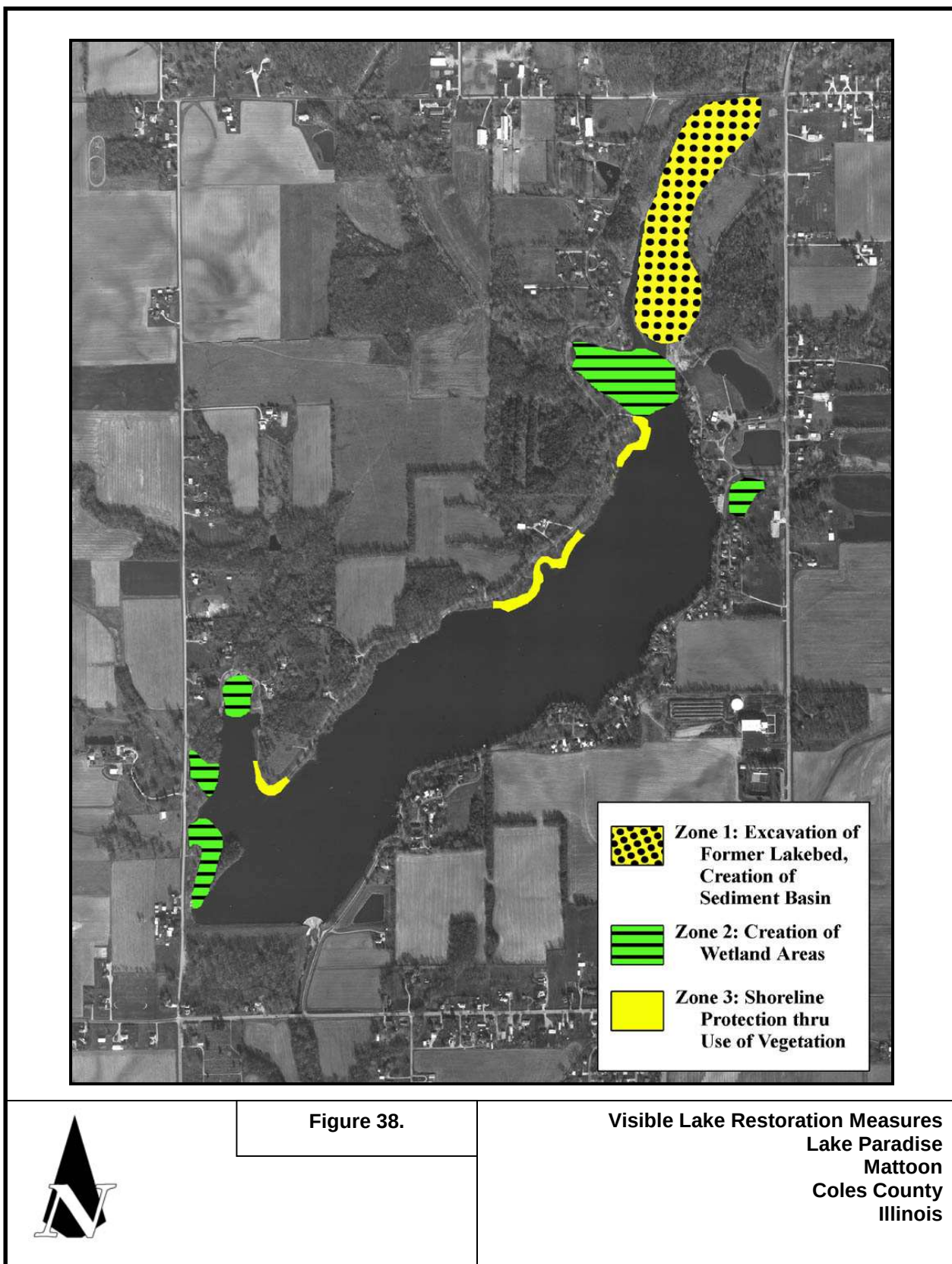
An additional destratifier will be installed in the deepest location in the lake. This destratifier will be the same type as presently in operation near the water intake tower. The option of installing an aeration system to introduce oxygen into the hypolimnion is a viable alternative to a destratifier. The aeration method would possibly be more effective because the deepest portion of the lake is separated from the rest of the lake by the 1908 dam. An aeration system would consist of a compressor near the shoreline and a network of piping on the lake bottom to release air. Either method would be designed to concentrate on aerating only the part of the lake basin between the 1908 dam and the current dam. Either method is estimated to cost \$60,000.

G – Sediment Retention Basin

A sediment retention basin would be constructed by dry excavation of the area of former lakebed on the northern most end of the lake. The material removed would be placed in selected locations within this zone to create islands of upland habitat with surrounding wetland habitat.

Placement of the excavated material within the former lake area will reduce costs by eliminating the need for upland disposal. The estimated cost of this restoration measure is \$350,000.

Further investigation is required to determine the feasibility of this alternative and to develop the most efficient process for performing the work.



BENEFITS EXPECTED FROM IMPLEMENTATION

Benefits from the completion of the recommended restoration measures should be far reaching. From a largemouth bass swimming in the lake to a person getting a drink of water, the effects should be felt. The reduction in sediments and nutrients entering and recycling within the lake will create a healthier environment for aquatic organisms, reduce nuisance algal blooms and the associated taste and odor in drinking water, and reduce the cost of water treatment. The reintroduction of diversified macrophytes will increase the aesthetic value of the lake and these wetland areas will provide improved fish spawning areas resulting in increased fishery production. The creation of the sediment basin will lengthen the lifespan of Lake Paradise for water supply.

PHASE II MONITORING PROGRAM

Post-implementation monitoring will be conducted upon completion to measure the effectiveness of the proposed treatment measures. The recommended Phase II monitoring program includes the same water quality parameters (and techniques) as the Phase I monitoring program minus sampling for organic and inorganic compounds in both the water column and sediments. Water quality parameters monitored include the following:

- o Transparency (Secchi Depth in inches),
- o Specific Conductance ($\mu\text{mho}/\text{cm}$ @25C),
- o pH (standard units),
- o Alkalinity (Mg/L as CaCO_3),
- o Suspended Solids (Total and Volatile as Mg/L),
- o Nitrogen (Ammonia, Nitrate-Nitrite, and Total Kjeldahl as Mg/L as N),
- o Phosphorus (Dissolved and Total as Mg/L as P),
- o Dissolved Oxygen (Mg/L) and water temperature (C), at 2 ft intervals throughout the water column,
- o Chlorophyll (Corrected A, Uncorrected A, Uncorrected B, Uncorrected C, and Pheophytin A as $\mu\text{g}/\text{L}$)
- o Inorganic parameters for water (One time at 3 in-lake sites, top and bottom),
- o Organic parameters for water (One time at in-lake Site 1),
- o Inorganic parameters for sediment (One time at 3 in-lake sites),
- o Organic parameters for sediment (One time at 1 in-lake site).

Sampling will be conducted only at the three in-lake sampling points, except as noted above. The monitoring program will extend for two (2) years with sampling occurring once a month from April to September each year for a total of 12 sampling months, except as noted above.

During the second year of water quality sampling, a fish creel and macrophyte survey will be conducted. In addition, phytoplankton samples will be collected monthly May – September of the second sampling year and analyzed using the Sedgewick-Rafter counting cell method. Phytoplankton densities and biovolume will be recorded by species and phylum.

BUDGET AND SCHEDULE

The schedule and budget for the restoration plan are based on the IEPA providing the requested funding in 2004. Estimated costs for each action are shown in Table 47. The proposed implementation schedule is shown in Table 48. The overall plan spans a six-year period.

Table 47. Proposed Budget for Recommended Measures

Restoration Measure	Estimated Cost
A. Shoreline Enhancement and Protection	
Planning	2,000
Implementing	3,000
B. Lake Septic System Inspection & Maintenance Program	3,000
C. Fish Crib Installation	3,000
D. Lake Education Program	10,000
E. Wetland Development	
Implementation	252,000
Monitoring	15,000
F. Additional Destratifier / Aerator	60,000
G. Sediment Retention Basin	
Planning	50,000
Implementation	350,000
Post Restoration Monitoring	2,000
Phase II Project Report	65,000
Total Estimated Project Costs	815,000
Other measures as discussed under the Potential Restoration Measures Section that are outside of the scope or budget of this Program are summarized below. The City may pursue these measures in the future under additional programs.	
1. Watershed Nutrient Management Program	Unknown
2. Streambank Erosion Control & Riparian Buffer Zones	Unknown
3. Lake Sediment Removal – Upper End	1,300,000
4. Lake Sediment Removal – Main Body	3,100,000

Table 48. Proposed Implementation Schedule

Restoration Measure	Calendar Year									
	2003	2004	2005	2006	2007	2008	2009	2010	2011	
A. Shoreline Enhancement and Protection										
Planning										
Implementation										
B. Septic System Inspection & Maintenance Program										
C. Fish Crib Installation										
D. Lake Education Program										
E. Wetland Development										
Implementation										
Monitoring										
F. Additional Destratifier / Aerator										
G. Sediment Retention Basin										
Planning										
Implementation										
Post Restoration Monitoring										
Phase II Project Report										

SOURCES OF MATCHING FUNDS

The Clean Lakes Program will fund 50% of the project cost up to \$300,000. Any additional costs are to be funded by the City as described below.

The City of Mattoon will provide the matching funds for the Phase II grant from the Clean Lakes Program of the IEPA. The matching funds will include both monetary amounts and in-kind services. The City will include corporate funds in its annual budgets over a multi-year period. The City may internally generate funds and/or grants from other sources. In-kind services will be provided by the City employees and by volunteers.

RELATIONSHIP TO OTHER POLLUTION CONTROL PROGRAMS

Effluent from the water treatment plant discharge is regulated by the IEPA under the National Pollutant Discharge Elimination System (NPDES) program. Watershed runoff is not regulated under any current program. However, the NRCS has worked closely with agricultural producers in the watershed to reduce erosion and sedimentation from fields. Those efforts have been partially funded through the federal Watershed Protection and Flood Prevention Act, Public Law 83-566. The Illinois Clean Lakes Program is one of several potential funding sources for lake and watershed restoration. The coordination of multiple programs and funding sources may ease the financial burden on communities and allow for more comprehensive and wide-ranging restoration measures. The Lake Paradise restoration project is not currently coordinated with other programs but the City of Mattoon may pursue additional programs in the future. Potential sources of technical assistance and/or funding include the Section 319 program administered by the Illinois EPA, the Streambank Stabilization and Restoration Program administered by the Illinois Department of Agriculture, landowner assistance programs through the USDA-NRCS, and the Illinois Department of Natural Resources Ecosystems Program and Wildlife Habitat Incentives Program.

PUBLIC PARTICIPATION

A public hearing was held on October 3, 2002 at the City Hall in Mattoon. The meeting was advertised in the Charleston Times Courier and provided information on the Clean Lakes Program, the problems identified for Lake Paradise, and the proposed restoration measures. Sixteen persons registered their attendance at the meeting. A formal presentation was made by the City's consultants and was followed by a question and answer period. A fact sheet and questionnaire were given to all attendees. Presentation materials and additional copies of the handouts were left with the City and made available for public review at City Hall following the meeting. Comments received from the public on the proposed restoration plan were favorable; no recommendations for alternative measures were received. Information relating to the Public Hearing is included in Appendix H.

NECESSARY PERMITTING

Excavation and placement of accumulated sediment from the north end of the lake will require a Section 404 permit from the U.S. Army Corps of Engineers and Section 401 Water Quality Certification from the IEPA. If any of this material is removed from the area of the former lakebed and redeposited in an upland location, archaeological clearance will also be required from the Illinois Historic Preservation Agency for the sediment disposal area. The Illinois Department of Natural Resources (IDNR) will also review the planned restoration measures for conformance to the Illinois Endangered Species Protection Act and the Illinois Interagency Wetlands Policy Act. The IDNR Office of Water Resources will review the placement of fill in the former lakebed for compliance with state regulations for construction in floodways.

OPERATIONAL RESPONSIBILITY AND MAINTENANCE PLAN

This section describes responsibilities for implementation and periodic maintenance of the recommended restoration measures.

A – Shoreline Enhancement and Protection

The process of establishing a diverse plant population can take several years. Perennial plants can often take several growing seasons for their root systems to fully develop. During the establishment period, fast growing invasive species can move in and crowd out the plantings. For the first five years, the areas planted should be burned or mown by the City once a year, either prior to April 15th or after October 15th. After the first five years, the areas need only be burned or mown every 2 to 3 years.

B – Lake Septic System Inspection and Maintenance Program

The lake septic system inspection and maintenance will require enactment of a County ordinance. The Coles County Health Department should coordinate inspection and enforcement of this ordinance.

C – Fish Crib Installation

Installation of the fish bedding would be accomplished by the city with the assistance of the Department of Natural Resources for placement guidance. No maintenance costs are anticipated after the beds have been set.

D – Lake Education Program

The City of Mattoon will be responsible for development and continued implementation of this program. Coordination with local community groups, government agencies, lake residents, and lake users will be necessary for the long term effectiveness of this program.

E – Wetland Development Near the Upper Reaches of the Lake

Wetland development, similar to the shoreline plantings, will take several years to establish viable self-sustaining populations. Annual inspections over the first five years will be necessary to record species development. Additional plantings may be required to firmly establish the desired vegetation. Once established, the only maintenance required will be to prevent upland vegetation (i.e. shrubs and trees) from growing within the wetland areas.

F – Destratification and Aeration

All operational and maintenance costs will be incurred by the City of Mattoon.

G – Sediment Retention Basin near Upper Reaches of the Lake

No O&M cost are associated with this alternative.

Table 49. Summary of Anticipated Annual O&M Costs

Restoration Measure	Annual Costs
A. Shoreline Enhancement and Protection	- 0 -
B. Lake Septic System Inspection and Maintenance Program	- \$200 -
C. Fish Crib Installation	- 0 -
D. Lake Education Program	- 0 -
E. Wetland Development in Upper End of Lake	- 0 -
F. Destratification and Aeration	- \$6,400 -
G. Sediment Retention Basin at Upper End of Lake	- 0 -
Total	\$6,600
Funding	City of Mattoon

ENVIRONMENTAL EVALUATION

This section provides information on potential environmental impacts of the proposed restoration program. This evaluation follows the guidelines in the IEPA's Protocol for Phase I Diagnostic-Feasibility Studies and Environmental Evaluations.

Displacement of People

The project will not displace any residences or businesses.

Defacement of Residential Areas

The project will not deface residences located near the project area. The area of proposed sediment removal at the upper end of the lake is not proximal to homes or other development.

Changes in Land Use Patterns

The proposed improvement measures will not result in any changes in land use in the area of the lake. This project does not have any potential to cause development pressure in the Mattoon area. However, improved aesthetics and recreational opportunities will positively impact the lake residences and lake users.

Impacts on Prime Agricultural Land

None of the proposed in-lake treatment measures will directly or indirectly impact prime agricultural land. Excavation and recontouring of accumulated sediments in the upper end of the lake will not impact surrounding agricultural uses. However, if more sediment is generated than can be used for creating island habitat within the former lake basin, some sediment material may be removed from this area and redeposited in an upland area. These sediments are fine-grained and are rich in adsorbed nutrients. Surface application of these materials would not adversely impact the underlying agricultural soils.

Impacts on Parkland, Other Public Land, and Scenic Resources

This project will not directly impact parkland. The proposed lake restoration measures will provide long-term enhancement of the environmental, aesthetic, and recreational values of the lake and adjacent area.

Impacts on Historic, Architectural, Archaeological or Cultural Resources

There are no known historical, architectural, archaeological, or cultural resources in the project area. If an upland site is required for application of excess materials from excavation of the in-lake detention area, the proposed sediment application area will be surveyed in accordance with Illinois Historic Preservation Agency guidelines and submitted to IHPA for clearance prior to application of sediments.

Long-Range Increases in Energy Demand

The proposed lake restoration measures will improve water quality in Lake Paradise, reducing the need to pump water directly from Lake Mattoon and reducing long-term energy use. Operation of the aeration/destratification system will require increased energy use. The net effect on energy use at the lake should be minimal.

Changes in Ambient Air Quality or Noise Levels

There will be a short term increase in noise levels during excavation of the in-lake detention basin. No other noise or air quality impacts are expected from implementation of the proposed lake restoration program.

Adverse Effects of Chemical Treatment

No chemical treatments are planned as part of the restoration plan.

Compliance with Executive Order 11988 on Floodplain Management

The proposed restoration program complies with the Executive Order on Floodplain Management.

Dredging and Other Channel, Bed, or Shoreline Modifications

No structural shoreline protection measures or shoreline grading are proposed as part of this restoration program. Shoreline protection will be limited to planting macrophytes along the shore and revegetation of selected riparian zones with prairie species.

The restoration program includes excavation of sediments from within the former lakebed at the upstream end of the lake to provide an in-lake sedimentation basin. The materials removed from this area will be used to form islands in this area. If excess materials are generated, they will be transported to an upland site. The lake will be maintained at low water level to assist with mechanical removal of the sediment and to reduce the transport of resuspended materials into the lake body. Other erosion and sedimentation controls will be used, as necessary, to prevent adverse impacts to lake water quality.

Adverse Effects on Wetlands and Related Resources

The lake restoration program includes the creation of emergent wetlands in shallow areas of the lake to enhance wildlife habitat, reduce nutrients in the water column, stabilize accumulated sediments and filter sediments entering the lake, and enhance the overall aesthetics of the lake. These efforts will significantly enhance wetland resources at Lake Paradise.

Feasible Alternatives to Proposed Project

The diagnostic study characterized the lake system and problems associated with the lake. The feasibility study evaluated a range of reasonable alternatives for lake management and restoration. The proposed restoration program maximizes benefits to the lake system and lake users which minimizing adverse environmental impacts and costs.

Other Necessary Mitigative Measures

None

APPENDICES

- o **Appendix A. Water Quality Data**
- o **Appendix B. 2000 Phytoplankton Report**
- o **Appendix C. Recent Fish Management Records**
- o **Appendix D. 1982 and 2000 Sediment Reports**
- o **Appendix E. Example Riprap Installation Specifications**
- o **Appendix F. Example Septic Ordinances**
- o **Appendix G. Example Education Pamphlet**
- o **Appendix H. Public Hearing**



Appendix A

Water Quality Data

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-1	1-Jul-77	0	5.6	24	65.8823
RCG-1	1-Jul-77	2	5.6	24.3	65.8823
RCG-1	1-Jul-77	4	5.5	24.1	64.7059
RCG-1	1-Jul-77	6	5.5	24.1	64.7059
RCG-1	1-Jul-77	8	4.9	24	57.647
RCG-1	1-Jul-77	10	4.6	24	54.1176
RCG-1	1-Jul-77	12	3.6	24	42.3529
RCG-1	1-Jul-77	14	2	23.5	22.9885
RCG-1	1-Jul-77	16	1.2	23.5	13.7931
RCG-1	1-Jul-77	18	0.2	21.9	2.27273
RCG-1	22-May-79	0	17	20.6	188.889
RCG-1	22-May-79	1	17.2	20.6	191.193
RCG-1	22-May-79	3	14.6	19.5	155.319
RCG-1	22-May-79	5	13.6	18.7	144.681
RCG-1	22-May-79	7	11.6	18.3	122.105
RCG-1	22-May-79	9	11.5	18.2	121.053
RCG-1	22-May-79	11	11.4	18.2	120
RCG-1	22-May-79	13	9.4	17.8	98.9473
RCG-1	22-May-79	15	4.6	16	46
RCG-1	22-May-79	17	1.8	13	16.9869
RCG-1	22-May-79	19	0.1	12.2	0.925926
RCG-1	21-Jun-79	0	9.1	26.2	110.976
RCG-1	21-Jun-79	1	8.9	26	108.59
RCG-1	21-Jun-79	3	8.1	25.5	96.4285
RCG-1	21-Jun-79	5	6.6	24.6	78.5714
RCG-1	21-Jun-79	7	6	24.4	70.5882
RCG-1	21-Jun-79	9	5.3	24.2	62.3529
RCG-1	21-Jun-79	11	4.7	24.1	55.2941
RCG-1	21-Jun-79	13	3.7	24	43.5294
RCG-1	21-Jun-79	15	1.7	22.7	19.5402
RCG-1	21-Jun-79	17	0.6	21.1	6.66666
RCG-1	21-Jun-79	18	0.4	19	4.25731
RCG-1	24-Jul-79	0	7.5	26.9	92.5926

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-1	24-Jul-79	1	7.2	26.8	88.9345
RCG-1	24-Jul-79	3	6	26	73.1707
RCG-1	24-Jul-79	5	5.6	26	68.2926
RCG-1	24-Jul-79	7	5	25.7	60.9756
RCG-1	24-Jul-79	9	5	25.7	60.9756
RCG-1	24-Jul-79	11	4.7	25.5	55.9523
RCG-1	24-Jul-79	13	4.3	25.5	51.1904
RCG-1	24-Jul-79	15	4	25.5	47.619
RCG-1	24-Jul-79	16	3.9	25.4	46.4516
RCG-1	20-Aug-79	0	11.4	26.4	139.024
RCG-1	20-Aug-79	1	11.5	26.4	140.279
RCG-1	20-Aug-79	3	11.2	26.2	136.585
RCG-1	20-Aug-79	5	10.2	26	124.39
RCG-1	20-Aug-79	7	4	23.8	47.0588
RCG-1	20-Aug-79	9	3.1	23.3	35.6322
RCG-1	20-Aug-79	11	2.3	23.2	26.4368
RCG-1	20-Aug-79	13	1.9	22.9	21.8391
RCG-1	20-Aug-79	15	1.3	22.7	14.9425
RCG-1	20-Aug-79	16	0.6	22.6	6.89814
RCG-1	19-Sep-79	0	9.3	22.8	106.897
RCG-1	19-Sep-79	1	9.4	22.7	108.072
RCG-1	19-Sep-79	3	9.1	22.5	103.409
RCG-1	19-Sep-79	5	8.9	22.1	101.136
RCG-1	19-Sep-79	7	8.6	21.6	97.7272
RCG-1	19-Sep-79	9	6.8	21.5	75.5555
RCG-1	19-Sep-79	11	6.5	21.3	72.2222
RCG-1	19-Sep-79	13	6.1	21.2	67.7777
RCG-1	19-Sep-79	15	6.1	21.2	67.7954
RCG-1	19-Sep-79	16	6.1	21.2	67.7777
RCG-1	31-Oct-79	0	9.5	12.8	89.6226
RCG-1	31-Oct-79	1	9.4	12.7	88.7059
RCG-1	31-Oct-79	3	9.2	12.7	86.7924
RCG-1	31-Oct-79	5	8.8	12.7	83.0188
RCG-1	31-Oct-79	7	8.4	12.7	79.2453

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-1	31-Oct-79	9	8.2	12.6	77.3585
RCG-1	31-Oct-79	11	8	12.6	75.4717
RCG-1	31-Oct-79	13	8	12.5	74.0741
RCG-1	31-Oct-79	14	7.9	12.4	73.1705
RCG-1	4-Jun-81	0	13.1	22.8	150.575
RCG-1	4-Jun-81	1	13.1	22.8	150.575
RCG-1	4-Jun-81	3	12.8	22.4	145.455
RCG-1	4-Jun-81	5	11.7	22	132.955
RCG-1	4-Jun-81	7	9.6	21	106.667
RCG-1	4-Jun-81	9	7.6	20	82.6087
RCG-1	4-Jun-81	11	4.7	18	49.4736
RCG-1	4-Jun-81	13	1.9	15.7	19
RCG-1	4-Jun-81	15	0.9	12.9	8.49056
RCG-1	4-Jun-81	17	0.1	12.2	0.925926
RCG-1	4-Jun-81	19	0	12.2	0
RCG-1	24-Aug-81	0	18.4	27.5	227.16
RCG-1	24-Aug-81	1	18.2	27	224.691
RCG-1	24-Aug-81	3	11.4	24.6	135.714
RCG-1	24-Aug-81	5	10.2	24.2	120
RCG-1	24-Aug-81	7	7.3	23.8	85.8823
RCG-1	24-Aug-81	9	5.4	23.5	62.0689
RCG-1	24-Aug-81	11	4.4	23.3	50.5747
RCG-1	24-Aug-81	13	3.8	23.2	43.6781
RCG-1	24-Aug-81	15	3.5	23.2	40.2299
RCG-1	24-Aug-81	17	3.2	23.2	36.7816
RCG-1	24-Aug-81	18	3.1	23.1	35.6322
RCG-1	10-Aug-93	0	7.4	26	90.2439
RCG-1	10-Aug-93	1	7.3	26	89.0244
RCG-1	10-Aug-93	2	7.2	26	87.8048
RCG-1	10-Aug-93	3	6.8	26	82.9268
RCG-1	10-Aug-93	4	6.8	26	82.9268
RCG-1	10-Aug-93	5	6.5	26	79.2683
RCG-1	10-Aug-93	6	6.1	25.9	74.3902
RCG-1	10-Aug-93	7	6.1	25.9	74.3902

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-1	10-Aug-93	8	6.1	25.9	74.3902
RCG-1	10-Aug-93	9	6	25.9	73.1707
RCG-1	10-Aug-93	10	6	25.9	73.1707
RCG-1	10-Aug-93	11	5.9	25.9	71.9512
RCG-1	10-Aug-93	12	5.9	25.9	71.9512
RCG-1	10-Aug-93	13	5.8	25.9	70.7317
RCG-1	10-Aug-93	14	5.6	25.9	68.2926
RCG-1	10-Aug-93	15	4.8	25.9	58.5365
RCG-1	10-Aug-93	16	4.1	25.9	50
RCG-1	10-Aug-93	17	2.8	25.8	34.1463
RCG-1	10-Aug-93	18	1.2	25.9	14.6341
RCG-1	10-Aug-93	19	0.4	25.8	4.87805
RCG-1	17-Apr-95	0	15.1	14.9	148.039
RCG-1	17-Apr-95	1	15.1	14.9	148.039
RCG-1	17-Apr-95	3	15	14.7	147.059
RCG-1	17-Apr-95	5	14	14.3	134.615
RCG-1	17-Apr-95	7	13.2	14.2	126.923
RCG-1	17-Apr-95	9	11.1	13.4	104.717
RCG-1	17-Apr-95	11	10.7	13.2	100.943
RCG-1	17-Apr-95	13	10.1	13.1	95.283
RCG-1	17-Apr-95	15	9.5	12.7	89.6226
RCG-1	17-Apr-95	17	8	12.3	74.0741
RCG-1	6-Jun-95	0	14.5	23.3	166.667
RCG-1	6-Jun-95	1	11.6	22.9	133.333
RCG-1	6-Jun-95	3	10.1	22	114.773
RCG-1	6-Jun-95	5	9	21.9	102.273
RCG-1	6-Jun-95	7	8.1	21.9	92.0454
RCG-1	6-Jun-95	9	7.9	21.8	89.7727
RCG-1	6-Jun-95	11	7.5	21.7	85.2273
RCG-1	6-Jun-95	13	7.2	21.6	81.8182
RCG-1	6-Jun-95	15	6.1	21.4	67.7777
RCG-1	6-Jun-95	17	5.6	21.1	62.2222
RCG-1	10-Jul-95	0	12.6	26.1	153.659
RCG-1	10-Jul-95	1	12.6	26.1	153.659

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-1	10-Jul-95	3	12.2	25.8	148.78
RCG-1	10-Jul-95	5	11.3	25.6	137.805
RCG-1	10-Jul-95	7	10.4	25.6	126.829
RCG-1	10-Jul-95	9	6.3	24.9	75
RCG-1	10-Jul-95	11	5.6	24.8	66.6666
RCG-1	10-Jul-95	13	5	24.7	59.5238
RCG-1	10-Jul-95	15	4.4	24.5	51.7647
RCG-1	10-Jul-95	17	2	24.2	23.5294
RCG-1	10-Aug-95	0	5.7	27.9	72.1519
RCG-1	10-Aug-95	1	5.7	27.9	72.1519
RCG-1	10-Aug-95	3	5.4	27.9	68.3544
RCG-1	10-Aug-95	5	4.4	27.8	55.6962
RCG-1	10-Aug-95	7	3.9	27.7	49.3671
RCG-1	10-Aug-95	9	3.8	27.7	48.1012
RCG-1	10-Aug-95	11	3.6	27.7	45.5696
RCG-1	10-Aug-95	13	3.5	27.7	44.3038
RCG-1	10-Aug-95	15	2.9	27.7	36.7088
RCG-1	10-Aug-95	17	2.2	27.7	27.8481
RCG-1	13-Oct-95	0	7.1	18.1	74.7368
RCG-1	13-Oct-95	1	7	18.1	73.6842
RCG-1	13-Oct-95	3	6.7	18	70.5263
RCG-1	13-Oct-95	5	6.3	17.9	66.3158
RCG-1	13-Oct-95	7	6.2	17.9	65.2631
RCG-1	13-Oct-95	9	6.2	17.9	65.2631
RCG-1	13-Oct-95	11	6.2	17.9	65.2631
RCG-1	13-Oct-95	13	6.5	17.9	68.4211
RCG-1	13-Oct-95	14	6.7	17.9	70.5263
RCG-1	13-Oct-95	15	6.7	17.9	70.5263
RCG-1	13-Oct-95	16	6.7	17.9	70.5263
RCG-1	27-Apr-98	0	9.8	15.6	98
RCG-1	27-Apr-98	1	9.6	15.6	96
RCG-1	27-Apr-98	3	9.6	15.6	96
RCG-1	27-Apr-98	5	9.6	15.6	96
RCG-1	27-Apr-98	7	9.5	15.6	95

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-1	27-Apr-98	9	9.5	15.6	95
RCG-1	27-Apr-98	11	9.5	15.6	95
RCG-1	27-Apr-98	13	9.5	15.6	95
RCG-1	27-Apr-98	15	9.2	15.6	92
RCG-1	27-Apr-98	17	8.6	15.6	86
RCG-1	10-Jun-98	0	9.5	20.5	103.261
RCG-1	10-Jun-98	1	9.4	20.5	102.174
RCG-1	10-Jun-98	3	9.2	20.5	100
RCG-1	10-Jun-98	5	9	20.5	97.8261
RCG-1	10-Jun-98	7	8.6	20.4	93.4782
RCG-1	10-Jun-98	9	7.8	20.3	84.7826
RCG-1	10-Jun-98	11	7.4	20.1	80.4348
RCG-1	10-Jun-98	13	7.2	19.9	78.2608
RCG-1	10-Jun-98	14	6.9	19.8	75
RCG-1	20-Jul-98	0	6.9	29	88.4615
RCG-1	20-Jul-98	1	6.4	28.8	82.0513
RCG-1	20-Jul-98	3	5.5	28.7	70.5128
RCG-1	20-Jul-98	5	5	28.6	64.1026
RCG-1	20-Jul-98	7	4.4	28.5	55.6962
RCG-1	20-Jul-98	9	4	28.4	50.6329
RCG-1	20-Jul-98	11	3.6	28.3	45.5696
RCG-1	20-Jul-98	13	3.3	28.2	41.7721
RCG-1	20-Jul-98	14	3.1	28.1	39.2405
RCG-1	20-Jul-98	15	2.5	27.8	31.6456
RCG-1	20-Jul-98	16	0.6	27.6	7.59493
RCG-1	27-Aug-98	0	5.6	28.3	70.886
RCG-1	27-Aug-98	1	5.2	28.3	65.8228
RCG-1	27-Aug-98	3	5	28.2	63.2911
RCG-1	27-Aug-98	5	4.9	28.1	62.0253
RCG-1	27-Aug-98	7	4.6	28	58.2278
RCG-1	27-Aug-98	9	4.5	27.9	56.962
RCG-1	27-Aug-98	11	4.6	27.9	58.2278
RCG-1	27-Aug-98	13	4.6	27.9	58.2278
RCG-1	21-Oct-98	0	6.9	16.6	71.134

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-1	21-Oct-98	1	6.9	16.6	71.134
RCG-1	21-Oct-98	3	7	16.6	72.1649
RCG-1	21-Oct-98	5	6.8	16.6	70.1031
RCG-1	21-Oct-98	7	6.9	16.6	71.134
RCG-1	21-Oct-98	9	7.1	16.6	73.1958
RCG-1	21-Oct-98	11	6.7	16.6	69.0721
RCG-1	21-Oct-98	13	7.1	16.6	73.1958
RCG-1	21-Oct-98	15	7.1	16.6	73.1958
RCG-1	10-May-00	0	8.4	22.3	97.4
RCG-1	10-May-00	1	8.4	22.2	97.3
RCG-1	10-May-00	3	7	21.9	80.6
RCG-1	10-May-00	5	5.6	21	63.3
RCG-1	10-May-00	7	4.9	20.6	55
RCG-1	10-May-00	9	4.7	20.1	52.2
RCG-1	10-May-00	11	4.4	20	48.8
RCG-1	10-May-00	13	3.3	19.7	36.3
RCG-1	10-May-00	15	2.1	19.3	23
RCG-1	31-May-00	0	8.3	21.7	95.2
RCG-1	31-May-00	1	8.1	21.7	92.9
RCG-1	31-May-00	3	8	21.6	91.5
RCG-1	31-May-00	5	7.6	21.5	86.9
RCG-1	31-May-00	7	7	21.4	79.8
RCG-1	31-May-00	9	5.2	21.1	59
RCG-1	31-May-00	11	5	21	56.6
RCG-1	31-May-00	13	3.3	20.7	37.1
RCG-1	31-May-00	15	2.8	20.5	31.4
RCG-1	12-Jun-00	0	8.4	24.4	101.6
RCG-1	12-Jun-00	1	8.4	24.4	101.6
RCG-1	12-Jun-00	3	8.3	24.4	100.4
RCG-1	12-Jun-00	5	7.6	24.3	91.7
RCG-1	12-Jun-00	7	6.9	24.2	83.1
RCG-1	12-Jun-00	9	4.6	23.8	55
RCG-1	12-Jun-00	11	3.2	23.6	38
RCG-1	12-Jun-00	13	1.9	23.3	22.5

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-1	12-Jun-00	15	0.4	22.6	4.7
RCG-1	21-Jun-00	0	6.2	24.2	74.7
RCG-1	21-Jun-00	1	6	24.2	72.3
RCG-1	21-Jun-00	3	6	24.2	72.3
RCG-1	21-Jun-00	5	6	24.2	72.3
RCG-1	21-Jun-00	7	6	24.2	72.3
RCG-1	21-Jun-00	9	5.9	24.2	71.1
RCG-1	21-Jun-00	11	6	24	72
RCG-1	21-Jun-00	13	5.9	23.7	70.4
RCG-1	21-Jun-00	15	5.5	22.8	65.3
RCG-1	26-Jul-00	0	12.7	25.9	158
RCG-1	26-Jul-00	1	12.6	25.8	156.5
RCG-1	26-Jul-00	3	8.8	25.4	108.5
RCG-1	26-Jul-00	5	8.3	25.3	102.1
RCG-1	26-Jul-00	7	8.1	25.3	99.6
RCG-1	26-Jul-00	9	7.9	25.3	97.2
RCG-1	26-Jul-00	11	7.8	25.3	95.9
RCG-1	26-Jul-00	13	7.5	25.2	92.1
RCG-1	26-Jul-00	15	7.2	25.2	88.5
RCG-1	29-Sep-00	0	7.7	16.4	79.1
RCG-1	29-Sep-00	1	7.7	16.4	79.1
RCG-1	29-Sep-00	3	7.4	16	75.4
RCG-1	29-Sep-00	5	7.2	15.9	73.2
RCG-1	29-Sep-00	7	7	15.8	71
RCG-1	29-Sep-00	9	5.1	15.2	51.1
RCG-1	29-Sep-00	11	4.9	15.1	49
RCG-1	29-Sep-00	13	4.6	15	45.9
RCG-1	29-Sep-00	15	4.2	15	41.9
RCG-1	11-Oct-00	0	4.4	12.5	41.4
RCG-1	11-Oct-00	1	4.4	12.5	41.4
RCG-1	11-Oct-00	3	4.4	12.3	41.2
RCG-1	11-Oct-00	5	4.3	12.3	40.3
RCG-1	11-Oct-00	7	4.3	12.3	40.3
RCG-1	11-Oct-00	9	4.5	12.3	42.2

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-1	11-Oct-00	11	4.7	12.4	44.1
RCG-1	11-Oct-00	13	4.7	12.3	44
RCG-1	11-Oct-00	15	4.7	12.3	44
RCG-1	19-Oct-00	0	6.3	15.2	63.1
RCG-1	19-Oct-00	1	6	15.1	59.9
RCG-1	19-Oct-00	3	5.6	14.7	55.4
RCG-1	19-Oct-00	5	5.4	14.6	53.4
RCG-1	19-Oct-00	7	4.9	14.5	48.3
RCG-1	19-Oct-00	9	4.4	14.4	43.3
RCG-1	19-Oct-00	11	4.1	14.2	40.1
RCG-1	19-Oct-00	13	3.4	14	33.1
RCG-1	19-Oct-00	15	1.6	13.7	15.5
RCG-1	25-Oct-00	0	13.7	18.3	146.7
RCG-1	25-Oct-00	1	13.7	18.3	146.7
RCG-1	25-Oct-00	3	13.3	18.2	142.1
RCG-1	25-Oct-00	5	8.4	16.8	87
RCG-1	25-Oct-00	7	5.5	16	56
RCG-1	25-Oct-00	9	4.1	15.5	41.3
RCG-1	25-Oct-00	11	3.3	15	32.9
RCG-1	25-Oct-00	13	2.1	14.6	20.8
RCG-1	25-Oct-00	15	0.7	14.3	6.9
RCG-1	13-Nov-00	0	8.4	9.8	74.1
RCG-1	13-Nov-00	1	8.3	9.8	73.3
RCG-1	13-Nov-00	3	8.3	9.8	73.3
RCG-1	13-Nov-00	5	8.3	9.8	73.3
RCG-1	13-Nov-00	7	8.2	9.8	72.4
RCG-1	13-Nov-00	9	8.2	9.8	72.4
RCG-1	13-Nov-00	11	8.2	9.8	72.4
RCG-1	13-Nov-00	13	8.2	9.8	72.4
RCG-1	13-Nov-00	15	8.2	9.8	72.4
RCG-2	1-Jul-77	0	6.2	24.9	73.8095
RCG-2	1-Jul-77	2	6.1	24.9	72.619
RCG-2	1-Jul-77	4	6.1	24.9	72.619
RCG-2	1-Jul-77	6	6.1	24.7	72.619

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-2	1-Jul-77	8	5.3	24.3	62.3529
RCG-2	1-Jul-77	9	4.9	24	57.647
RCG-2	23-May-79	0	16.6	19.6	180.435
RCG-2	23-May-79	1	16.6	19.5	176.679
RCG-2	23-May-79	3	16.5	19.4	175.532
RCG-2	23-May-79	5	16.2	19.3	172.34
RCG-2	23-May-79	7	14.4	19.1	153.191
RCG-2	23-May-79	8	9.9	18.5	104.26
RCG-2	21-Jun-79	0	8.1	27	100
RCG-2	21-Jun-79	1	7.8	26.5	95.1684
RCG-2	21-Jun-79	3	7.2	26	87.8048
RCG-2	21-Jun-79	5	6	25.5	71.4286
RCG-2	21-Jun-79	7	5.4	25	64.2857
RCG-2	21-Jun-79	9	5	25	59.5238
RCG-2	21-Jun-79	10	5	25	59.5522
RCG-2	24-Jul-79	0	10	27	123.457
RCG-2	24-Jul-79	1	10.1	27	124.758
RCG-2	24-Jul-79	3	8.2	26.5	100
RCG-2	24-Jul-79	5	7.6	26.3	92.6829
RCG-2	24-Jul-79	7	6.8	25.9	82.9705
RCG-2	24-Jul-79	9	6.6	25.9	80.4878
RCG-2	20-Aug-79	0	9	26.4	109.756
RCG-2	20-Aug-79	1	9.3	26.4	113.444
RCG-2	20-Aug-79	3	9.2	26.2	112.195
RCG-2	20-Aug-79	5	8.7	26.2	106.098
RCG-2	20-Aug-79	7	4.7	24.8	55.9523
RCG-2	20-Aug-79	8	3.8	24.3	44.7172
RCG-2	19-Sep-79	0	12.8	22.8	147.126
RCG-2	19-Sep-79	1	12.8	22.8	147.163
RCG-2	19-Sep-79	3	11.8	22.3	134.091
RCG-2	19-Sep-79	5	9.8	21.8	111.364
RCG-2	19-Sep-79	7	8.7	21.1	96.6927
RCG-2	19-Sep-79	8	8.4	21.1	93.3333
RCG-2	31-Oct-79	0	10.4	13	98.1132

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-2	31-Oct-79	1	10.4	13	98.1448
RCG-2	31-Oct-79	3	10.2	13	96.2264
RCG-2	31-Oct-79	5	9.8	12.9	92.4528
RCG-2	31-Oct-79	6	9.2	12.9	86.8195
RCG-2	4-Jun-81	0	13	23.8	152.941
RCG-2	4-Jun-81	1	13	23.8	152.941
RCG-2	4-Jun-81	3	12.2	23	140.23
RCG-2	4-Jun-81	5	11.3	22.7	129.885
RCG-2	4-Jun-81	7	9.7	22.2	110.227
RCG-2	4-Jun-81	9	3.7	20	40.2174
RCG-2	24-Aug-81	0	18.4	27.5	227.16
RCG-2	24-Aug-81	1	18.2	27.2	224.691
RCG-2	24-Aug-81	3	16.3	25.9	198.78
RCG-2	24-Aug-81	5	6.8	23.8	80
RCG-2	24-Aug-81	7	2.6	22.6	29.885
RCG-2	24-Aug-81	9	0.8	22.1	9.09091
RCG-2	10-Aug-93	0	9.8	26.8	120.988
RCG-2	10-Aug-93	1	9.9	26.7	122.222
RCG-2	10-Aug-93	2	8.8	26.4	107.317
RCG-2	10-Aug-93	3	7.8	26.1	95.1219
RCG-2	10-Aug-93	4	7.6	26	92.6829
RCG-2	10-Aug-93	5	7.4	26	90.2439
RCG-2	10-Aug-93	6	7.1	26	86.5853
RCG-2	10-Aug-93	7	7	26	85.3658
RCG-2	10-Aug-93	8	7	26	85.3658
RCG-2	10-Aug-93	9	6.9	25.9	84.1463
RCG-2	10-Aug-93	10	6.9	25.9	84.1463
RCG-2	10-Aug-93	11	6.9	25.9	84.1463
RCG-2	10-Aug-93	12	6.9	25.9	84.1463
RCG-2	10-Aug-93	13	6.9	25.9	84.1463
RCG-2	10-Aug-93	14	6.9	25.9	84.1463
RCG-2	10-Aug-93	15	6.9	25.9	84.1463
RCG-2	17-Apr-95	0	14.2	15.8	142
RCG-2	17-Apr-95	1	14.2	15.7	142

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-2	17-Apr-95	3	14.5	15.7	145
RCG-2	17-Apr-95	5	13.4	15	131.373
RCG-2	17-Apr-95	7	11.7	14.5	112.5
RCG-2	17-Apr-95	9	8.3	13.4	78.3019
RCG-2	6-Jun-95	0	17	25.1	202.381
RCG-2	6-Jun-95	1	17	25	202.381
RCG-2	6-Jun-95	3	17	24.6	202.381
RCG-2	6-Jun-95	5	10.7	21.8	121.591
RCG-2	6-Jun-95	7	5	20.4	54.3478
RCG-2	6-Jun-95	9	0.4	20	4.34782
RCG-2	10-Jul-95	0	12.4	26.6	153.086
RCG-2	10-Jul-95	1	12.4	26.6	153.086
RCG-2	10-Jul-95	3	11.8	25.9	143.902
RCG-2	10-Jul-95	5	11.1	25.8	135.366
RCG-2	10-Jul-95	7	6.7	25.3	79.7619
RCG-2	10-Jul-95	8	3.6	24.8	42.8571
RCG-2	10-Aug-95	0	8.5	28	107.595
RCG-2	10-Aug-95	1	8.5	28	107.595
RCG-2	10-Aug-95	3	8.2	28	103.797
RCG-2	10-Aug-95	5	7.8	27.9	98.7341
RCG-2	10-Aug-95	7	7.4	27.7	93.6709
RCG-2	10-Aug-95	9	5.5	26.5	67.0732
RCG-2	13-Oct-95	0	10.6	18.8	112.766
RCG-2	13-Oct-95	1	10.6	18.7	112.766
RCG-2	13-Oct-95	3	10.2	18.7	108.511
RCG-2	13-Oct-95	5	9.4	18.6	100
RCG-2	13-Oct-95	7	3.6	18	37.8947
RCG-2	27-Apr-98	0	10.4	15.9	104
RCG-2	27-Apr-98	1	10.3	15.8	103
RCG-2	27-Apr-98	3	10.2	15.8	102
RCG-2	27-Apr-98	5	10.1	15.8	101
RCG-2	27-Apr-98	7	10.1	15.8	101
RCG-2	27-Apr-98	8	10.1	15.8	101
RCG-2	10-Jun-98	0	9.8	21	108.889

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-2	10-Jun-98	1	9.6	21	106.667
RCG-2	10-Jun-98	3	9.4	20.8	104.444
RCG-2	10-Jun-98	5	9.2	20.8	102.222
RCG-2	10-Jun-98	7	7.9	20.4	85.8695
RCG-2	20-Jul-98	0	7.5	29.9	98.6842
RCG-2	20-Jul-98	1	7.5	29.9	98.6842
RCG-2	20-Jul-98	3	6.5	29.5	83.3333
RCG-2	20-Jul-98	5	6.1	29.3	78.2051
RCG-2	20-Jul-98	7	5.7	29.2	73.0769
RCG-2	20-Jul-98	8	3.5	28.9	44.8718
RCG-2	27-Aug-98	0	5.2	28.7	66.6666
RCG-2	27-Aug-98	1	5	28.5	63.2911
RCG-2	27-Aug-98	3	4.5	28	56.962
RCG-2	27-Aug-98	4	4.4	27.6	55.6962
RCG-2	21-Oct-98	0	7.7	16.4	77
RCG-2	21-Oct-98	1	7.7	16.4	77
RCG-2	21-Oct-98	3	7.6	16.4	76
RCG-2	21-Oct-98	5	7.6	16.4	76
RCG-2	21-Oct-98	6	7.7	16.4	77
RCG-2	10-May-00	0	7.8	22.2	90.4
RCG-2	10-May-00	1	7.5	22	86.5
RCG-2	10-May-00	3	7.2	21.6	82.4
RCG-2	10-May-00	5	6	20.7	67.4
RCG-2	31-May-00	0	11.5	22.4	133.7
RCG-2	31-May-00	1	10.9	22.4	126.7
RCG-2	31-May-00	3	10.8	22.3	125.3
RCG-2	31-May-00	5	10.6	22.3	123
RCG-2	31-May-00	7	6.2	21.5	70.9
RCG-2	12-Jun-00	0	8.5	25	103.9
RCG-2	12-Jun-00	1	8.4	25	102.7
RCG-2	12-Jun-00	3	8.5	25	103.9
RCG-2	12-Jun-00	5	8.4	25	102.7
RCG-2	12-Jun-00	7	7	24.9	85.5
RCG-2	21-Jun-00	0	6.8	23.9	81.4

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-2	21-Jun-00	1	6.6	23.9	79
RCG-2	21-Jun-00	3	6.5	23.9	77.8
RCG-2	21-Jun-00	5	6.5	23.8	77.7
RCG-2	21-Jun-00	7	6.6	23.5	78.4
RCG-2	21-Jun-00	9	5.5	20.5	65.3
RCG-2	26-Jul-00	0	16	25.9	199
RCG-2	26-Jul-00	1	15.8	25.8	196.3
RCG-2	26-Jul-00	3	12.3	25.5	151.9
RCG-2	26-Jul-00	5	9.8	25.2	120.4
RCG-2	26-Jul-00	7	7.2	24.9	87.9
RCG-2	29-Sep-00	0	7.9	16.6	81.5
RCG-2	29-Sep-00	1	7.9	16.5	81.4
RCG-2	29-Sep-00	3	7.6	16.3	77.9
RCG-2	29-Sep-00	5	7.3	16.1	74.6
RCG-2	29-Sep-00	7	6.8	16	69.2
RCG-2	11-Oct-00	0	5.8	12.4	54.5
RCG-2	11-Oct-00	1	5.7	12.3	53.4
RCG-2	11-Oct-00	3	5.7	12.2	53.3
RCG-2	11-Oct-00	5	2.7	12.2	25.2
RCG-2	11-Oct-00	7	5.7	12.2	53.3
RCG-2	19-Oct-00	0	6.9	16	70.3
RCG-2	19-Oct-00	1	6.7	16	68.2
RCG-2	19-Oct-00	3	6	15.6	60.6
RCG-2	19-Oct-00	5	5.5	15.1	54.9
RCG-2	19-Oct-00	7	5.4	15	53.8
RCG-2	25-Oct-00	0	14.4	18.6	155
RCG-2	25-Oct-00	1	14.6	18.6	157.2
RCG-2	25-Oct-00	3	14.1	18.5	151.6
RCG-2	25-Oct-00	5	7.9	17.1	82.5
RCG-2	25-Oct-00	7	4.5	16.6	46.4
RCG-2	13-Nov-00	0	8.8	9.3	76.7
RCG-2	13-Nov-00	1	8.8	9.3	76.7
RCG-2	13-Nov-00	3	8.7	9.3	75.9
RCG-2	13-Nov-00	5	8.7	9.4	76

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-2	13-Nov-00	7	8.7	9.4	76
RCG-3	1-Jul-77	0	6.6	25	78.5714
RCG-3	1-Jul-77	2	6.6	25	78.5714
RCG-3	1-Jul-77	4	6.5	25	77.381
RCG-3	1-Jul-77	6	6.4	24.9	76.1904
RCG-3	23-May-79	0	20	21	222.222
RCG-3	23-May-79	1	20	20.9	222.342
RCG-3	23-May-79	3	17.5	20	190.217
RCG-3	21-Jun-79	0	9.9	27	122.222
RCG-3	21-Jun-79	1	9.7	27	119.812
RCG-3	21-Jun-79	3	5.2	25	61.9047
RCG-3	24-Jul-79	0	10	28.2	126.582
RCG-3	24-Jul-79	1	9.6	27.6	121.594
RCG-3	24-Jul-79	2	9.5	27.2	117.284
RCG-3	20-Aug-79	0	13.1	28.1	165.823
RCG-3	20-Aug-79	1	13.4	28.1	169.67
RCG-3	20-Aug-79	2	13.4	28	169.62
RCG-3	19-Sep-79	0	10.9	23	125.287
RCG-3	19-Sep-79	1	9.8	21.8	111.392
RCG-3	19-Sep-79	2	8.8	21	97.7777
RCG-3	31-Oct-79	0	10.2	14	98.0769
RCG-3	31-Oct-79	1	10.1	13.9	97.1434
RCG-3	4-Jun-81	0	13.2	24	155.294
RCG-3	4-Jun-81	1	12.8	23.7	150.588
RCG-3	4-Jun-81	3	10	22.7	114.943
RCG-3	24-Aug-81	0	20	28.6	256.41
RCG-3	24-Aug-81	1	20	28.4	253.165
RCG-3	24-Aug-81	3	19.2	27.3	237.037
RCG-3	17-Apr-95	0	9.4	16.6	96.9072
RCG-3	17-Apr-95	1	9.3	16.6	95.8763
RCG-3	17-Apr-95	3	7.3	14.1	70.1923
RCG-3	6-Jun-95	0	17	25.2	202.381
RCG-3	6-Jun-95	1	17	25.2	202.381
RCG-3	6-Jun-95	3	15.5	24.4	182.353

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-3	10-Jul-95	0	10.4	25.9	126.829
RCG-3	10-Jul-95	1	10.4	25.9	126.829
RCG-3	10-Jul-95	2	9.9	25.6	120.732
RCG-3	10-Aug-95	0	10.4	27.3	128.395
RCG-3	10-Aug-95	1	10.4	27.3	128.395
RCG-3	10-Aug-95	2	7	24	82.3529
RCG-3	13-Oct-95	0	10.3	18.5	108.421
RCG-3	13-Oct-95	1	10.2	18.5	107.368
RCG-3	27-Apr-98	0	11.3	14.9	110.784
RCG-3	27-Apr-98	1	11.2	14.8	109.804
RCG-3	27-Apr-98	2	10.9	14.7	106.863
RCG-3	10-Jun-98	0	10.4	21.3	115.556
RCG-3	10-Jun-98	1	10.1	21	112.222
RCG-3	10-Jun-98	2	9.2	20.5	100
RCG-3	20-Jul-98	0	8.7	30.4	114.474
RCG-3	20-Jul-98	1	7.4	30	97.3684
RCG-3	20-Jul-98	2	7.5	30	98.6842
RCG-3	27-Aug-98	0	6.2	28.9	79.4872
RCG-3	27-Aug-98	1	5.9	28.6	75.641
RCG-3	21-Oct-98	0	8.1	15.4	79.4117
RCG-3	21-Oct-98	1	8.1	15.4	79.4117
RCG-3	10-May-00	0	9.2	21.9	106
RCG-3	10-May-00	1	9.2	21.8	105.7
RCG-3	31-May-00	0	11	22.1	127.2
RCG-3	31-May-00	1	11	22	126.9
RCG-3	12-Jun-00	0	8.1	25	99.02
RCG-3	12-Jun-00	1	8.1	25	99.02
RCG-3	21-Jun-00	0	6.1	20.8	68.7
RCG-3	21-Jun-00	1	6	20.5	67.2
RCG-3	26-Jul-00	0	15.5	25.1	190
RCG-3	26-Jul-00	1	13.2	24	158.5
RCG-3	29-Sep-00	0	7.6	16	77.4
RCG-3	29-Sep-00	1	7.6	16	77.4
RCG-3	11-Oct-00	0	7.9	11.5	72.7

Location	Date	Depth	Dissolved Oxygen (mg/L)	Temperature (Centigrade)	Percent Saturation
RCG-3	11-Oct-00	1	8.2	11.4	75.2
RCG-3	19-Oct-00	0	8.1	16	82.5
RCG-3	19-Oct-00	1	6.8	16	69.2
RCG-3	25-Oct-00	0	12.4	18	131.9
RCG-3	25-Oct-00	1	11.2	17.9	118.9
RCG-3	13-Nov-00	0	8.4	10.6	75.6
RCG-3	13-Nov-00	1	8.3	10.6	74.7

Location	Date	Sample Depth	Parameter	Value
RCG-1	22-May-79	4	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	12.1
RCG-1	21-Jun-79	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	19.2
RCG-1	24-Jul-79	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	3
RCG-1	20-Aug-79	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	24
RCG-1	19-Sep-79	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	37
RCG-1	31-Oct-79	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	31
RCG-1	4-Jun-81	5	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	13.43
RCG-1	24-Aug-81	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	49.71
RCG-1	10-Aug-93	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	82.24
RCG-1	17-Apr-95	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	50.06
RCG-1	6-Jun-95	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	102.85
RCG-1	10-Jul-95	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	66.75
RCG-1	10-Aug-95	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	137.81
RCG-1	13-Oct-95	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	96.12
RCG-1	29-May-97	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	64.08
RCG-1	19-Jun-97	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	96.12
RCG-1	21-Jul-97	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	76.1
RCG-1	4-Aug-97	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	93.45
RCG-1	22-Sep-97	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	85.44
RCG-1	20-Oct-97	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	96.12
RCG-1	27-Apr-98	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	48.06
RCG-1	28-May-98	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	56.07
RCG-1	10-Jun-98	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	45.39
RCG-1	30-Jun-98	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	24
RCG-1	20-Jul-98	4	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	46.7
RCG-1	3-Aug-98	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	104
RCG-1	9-Sep-98	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	176
RCG-1	21-Oct-98	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	74.8
RCG-1	10-May-00	4	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	13.4
RCG-1	31-May-00	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	66.8
RCG-1	12-Jun-00	4	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	94.8
RCG-1	28-Jun-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	48.1
RCG-1	11-Jul-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	85.4

Location	Date	Sample Depth	Parameter	Value
RCG-1	26-Jul-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	37.4
RCG-1	8-Aug-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	120
RCG-1	6-Sep-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	135
RCG-1	11-Sep-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	29-Sep-00	1.5	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	11-Oct-00	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0.71
RCG-1	19-Oct-00	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	30.5
RCG-1	13-Nov-00	4	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	27.3
RCG-1	26-Feb-01	0.5	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	22.4
RCG-1	19-Mar-01	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	43.1
RCG-1	9-Apr-01	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	26.4
RCG-1	24-Apr-01	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	110
RCG-1	14-May-01	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	58.9
RCG-1	29-May-01	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	67.6
RCG-2	23-May-79	4	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	2.39
RCG-2	21-Jun-79	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	26.4
RCG-2	24-Jul-79	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	84
RCG-2	20-Aug-79	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	27
RCG-2	19-Sep-79	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	95
RCG-2	31-Oct-79	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	25
RCG-2	4-Jun-81	4	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	20.37
RCG-2	24-Aug-81	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	39.67
RCG-2	10-Aug-93	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	86.26
RCG-2	17-Apr-95	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	126.83
RCG-2	6-Jun-95	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	102.16
RCG-2	10-Jul-95	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	98.305
RCG-2	10-Aug-95	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	154.04
RCG-2	13-Oct-95	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	110.62
RCG-2	27-Apr-98	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	80.1
RCG-2	10-Jun-98	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	69.42
RCG-2	20-Jul-98	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	58.74
RCG-2	21-Oct-98	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	72.1
RCG-2	10-May-00	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	26.7
RCG-2	31-May-00	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	166

Location	Date	Sample Depth	Parameter	Value
RCG-2	12-Jun-00	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	56.1
RCG-2	28-Jun-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	48.1
RCG-2	11-Jul-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	112
RCG-2	26-Jul-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	77.4
RCG-2	8-Aug-00	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	166
RCG-2	6-Sep-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	155
RCG-2	11-Sep-00	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	75.4
RCG-2	29-Sep-00	1.5	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	60.2
RCG-2	11-Oct-00	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	9.64
RCG-2	19-Oct-00	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	37.4
RCG-2	13-Nov-00	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	13.8
RCG-2	26-Feb-01	0.5	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	5.89
RCG-2	19-Mar-01	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	67.4
RCG-2	9-Apr-01	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	38
RCG-2	24-Apr-01	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	170
RCG-2	14-May-01	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	85.6
RCG-2	29-May-01	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	95.1
RCG-3	23-May-79	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	143
RCG-3	21-Jun-79	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	69.7
RCG-3	24-Jul-79	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	85
RCG-3	20-Aug-79	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	110
RCG-3	19-Sep-79	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	59
RCG-3	31-Oct-79	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	59
RCG-3	4-Jun-81	4	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	47.2
RCG-3	24-Aug-81	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	89.36
RCG-3	17-Apr-95	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	72.09
RCG-3	6-Jun-95	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	107.99
RCG-3	10-Jul-95	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	121.63
RCG-3	10-Aug-95	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	305.14
RCG-3	13-Oct-95	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	152.92
RCG-3	27-Apr-98	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	74.76
RCG-3	10-Jun-98	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	42.72
RCG-3	20-Jul-98	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	61.4
RCG-3	21-Oct-98	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	74.8

Location	Date	Sample Depth	Parameter	Value
RCG-3	10-May-00	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	34.7
RCG-3	31-May-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	187
RCG-3	12-Jun-00	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	214
RCG-3	28-Jun-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	34.7
RCG-3	11-Jul-00	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	37.4
RCG-3	26-Jul-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	235
RCG-3	8-Aug-00	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	112
RCG-3	6-Sep-00	1.5	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	211
RCG-3	11-Sep-00	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	29-Sep-00	1.5	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	26.2
RCG-3	11-Oct-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	18.9
RCG-3	19-Oct-00	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	15
RCG-3	13-Nov-00	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	7.22
RCG-3	26-Feb-01	0.5	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	19-Mar-01	3	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	8.23
RCG-3	9-Apr-01	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	61.3
RCG-3	24-Apr-01	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	117
RCG-3	14-May-01	1	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	176
RCG-3	29-May-01	2	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH.	40.8
RCG-1	22-May-79	4	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	32.2
RCG-1	21-Jun-79	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	34.7
RCG-1	24-Jul-79	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	3
RCG-1	20-Aug-79	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	29
RCG-1	19-Sep-79	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	47
RCG-1	31-Oct-79	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	37
RCG-1	4-Jun-81	5	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	21.16
RCG-1	24-Aug-81	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	55.19
RCG-1	10-Aug-93	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	82.63
RCG-1	17-Apr-95	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	105.12
RCG-1	6-Jun-95	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	99.89
RCG-1	10-Jul-95	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	70.325
RCG-1	10-Aug-95	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	145.28
RCG-1	13-Oct-95	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	110.84
RCG-1	29-May-97	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	65.24

Location	Date	Sample Depth	Parameter	Value
RCG-1	19-Jun-97	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	97.16
RCG-1	21-Jul-97	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	78.49
RCG-1	4-Aug-97	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	95.43
RCG-1	22-Sep-97	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	86.27
RCG-1	20-Oct-97	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	95.12
RCG-1	27-Apr-98	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	41.09
RCG-1	28-May-98	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	60.01
RCG-1	10-Jun-98	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	46.53
RCG-1	30-Jun-98	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	22.7
RCG-1	20-Jul-98	4	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	46.8
RCG-1	3-Aug-98	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	114
RCG-1	9-Sep-98	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	185
RCG-1	21-Oct-98	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	73.5
RCG-1	10-May-00	4	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	46.9
RCG-1	31-May-00	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	79
RCG-1	12-Jun-00	4	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	99.5
RCG-1	28-Jun-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	46.1
RCG-1	11-Jul-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	94
RCG-1	26-Jul-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	105
RCG-1	8-Aug-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	125
RCG-1	6-Sep-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	140
RCG-1	11-Sep-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	33.5
RCG-1	29-Sep-00	1.5	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	52.6
RCG-1	11-Oct-00	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	17
RCG-1	19-Oct-00	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	32
RCG-1	13-Nov-00	4	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	28.8
RCG-1	26-Feb-01	0.5	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	18.7
RCG-1	19-Mar-01	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	56
RCG-1	9-Apr-01	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	35
RCG-1	24-Apr-01	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	121
RCG-1	14-May-01	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	64.9
RCG-1	29-May-01	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	71
RCG-2	23-May-79	4	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	31.5
RCG-2	21-Jun-79	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	42.1

Location	Date	Sample Depth	Parameter	Value
RCG-2	24-Jul-79	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	95
RCG-2	20-Aug-79	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	36
RCG-2	19-Sep-79	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	108
RCG-2	31-Oct-79	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	29
RCG-2	4-Jun-81	4	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	30.77
RCG-2	24-Aug-81	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	43.96
RCG-2	10-Aug-93	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	84.49
RCG-2	17-Apr-95	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	121.77
RCG-2	6-Jun-95	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	94.6
RCG-2	10-Jul-95	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	106.45
RCG-2	10-Aug-95	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	161.99
RCG-2	13-Oct-95	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	115.59
RCG-2	27-Apr-98	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	75.75
RCG-2	10-Jun-98	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	69.29
RCG-2	20-Jul-98	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	68
RCG-2	21-Oct-98	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	79
RCG-2	10-May-00	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	33.6
RCG-2	31-May-00	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	179
RCG-2	12-Jun-00	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	133
RCG-2	28-Jun-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	45
RCG-2	11-Jul-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	114
RCG-2	26-Jul-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	115
RCG-2	8-Aug-00	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	174
RCG-2	6-Sep-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	164
RCG-2	11-Sep-00	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	76.7
RCG-2	29-Sep-00	1.5	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	64.4
RCG-2	11-Oct-00	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	13.5
RCG-2	19-Oct-00	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	42.5
RCG-2	13-Nov-00	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	22.7
RCG-2	26-Feb-01	0.5	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	19.8
RCG-2	19-Mar-01	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	61.3
RCG-2	9-Apr-01	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	64
RCG-2	24-Apr-01	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	185
RCG-2	14-May-01	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	91.5

Location	Date	Sample Depth	Parameter	Value
RCG-2	29-May-01	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	106
RCG-3	23-May-79	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	144
RCG-3	21-Jun-79	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	67.8
RCG-3	24-Jul-79	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	104
RCG-3	20-Aug-79	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	130
RCG-3	19-Sep-79	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	66
RCG-3	31-Oct-79	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	52
RCG-3	4-Jun-81	4	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	57.81
RCG-3	24-Aug-81	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	94.56
RCG-3	17-Apr-95	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	83.99
RCG-3	6-Jun-95	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	101.55
RCG-3	10-Jul-95	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	130.76
RCG-3	10-Aug-95	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	305.47
RCG-3	13-Oct-95	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	147.27
RCG-3	27-Apr-98	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	72.2
RCG-3	10-Jun-98	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	38.39
RCG-3	20-Jul-98	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	67.1
RCG-3	21-Oct-98	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	74.6
RCG-3	10-May-00	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	46.2
RCG-3	31-May-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	196
RCG-3	12-Jun-00	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	224
RCG-3	28-Jun-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	34.8
RCG-3	11-Jul-00	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	39.8
RCG-3	26-Jul-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	226
RCG-3	8-Aug-00	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	108
RCG-3	6-Sep-00	1.5	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	215
RCG-3	11-Sep-00	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	2.15
RCG-3	29-Sep-00	1.5	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	20.8
RCG-3	11-Oct-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	16.2
RCG-3	19-Oct-00	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	21.4
RCG-3	13-Nov-00	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	6.75
RCG-3	26-Feb-01	0.5	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	2.64
RCG-3	19-Mar-01	3	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	9.31
RCG-3	9-Apr-01	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	85.4

Location	Date	Sample Depth	Parameter	Value
RCG-3	24-Apr-01	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	139
RCG-3	14-May-01	1	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	187
RCG-3	29-May-01	2	CHLOROPHYLL-A UG/L TRICHROMATIC UNCORRECTED	41.3
RCG-1	22-May-79	4	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	8.66
RCG-1	21-Jun-79	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	13.3
RCG-1	24-Jul-79	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	1
RCG-1	20-Aug-79	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	5
RCG-1	19-Sep-79	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	3
RCG-1	31-Oct-79	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	3
RCG-1	4-Jun-81	5	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	1.28
RCG-1	24-Aug-81	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	2.22
RCG-1	10-Aug-93	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	11.21
RCG-1	17-Apr-95	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	21.31
RCG-1	6-Jun-95	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	13.02
RCG-1	10-Jul-95	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	5.9
RCG-1	10-Aug-95	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	14.325
RCG-1	13-Oct-95	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	11.743
RCG-1	29-May-97	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	11.31
RCG-1	19-Jun-97	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	12.14
RCG-1	21-Jul-97	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	10.59
RCG-1	4-Aug-97	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	5.61
RCG-1	22-Sep-97	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	6.01
RCG-1	20-Oct-97	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	9.55
RCG-1	27-Apr-98	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	0.42
RCG-1	28-May-98	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	4.05
RCG-1	10-Jun-98	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	3.21
RCG-1	30-Jun-98	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	1.22
RCG-1	20-Jul-98	4	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	6.88
RCG-1	3-Aug-98	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	30.2
RCG-1	9-Sep-98	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	28.1
RCG-1	21-Oct-98	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	7.25
RCG-1	10-May-00	4	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	49.6
RCG-1	31-May-00	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	10
RCG-1	12-Jun-00	4	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	10.5

Location	Date	Sample Depth	Parameter	Value
RCG-1	28-Jun-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	8.72
RCG-1	11-Jul-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	7.19
RCG-1	26-Jul-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	74.9
RCG-1	8-Aug-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	15.4
RCG-1	6-Sep-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	5.67
RCG-1	11-Sep-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	14
RCG-1	29-Sep-00	1.5	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	17.2
RCG-1	11-Oct-00	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	14.7
RCG-1	19-Oct-00	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	2.48
RCG-1	13-Nov-00	4	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	1.8
RCG-1	26-Feb-01	0.5	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	21.2
RCG-1	19-Mar-01	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	16.1
RCG-1	9-Apr-01	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	7.41
RCG-1	24-Apr-01	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	3.91
RCG-1	14-May-01	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	3.25
RCG-1	29-May-01	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	4.36
RCG-2	23-May-79	4	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	19.4
RCG-2	21-Jun-79	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	6.56
RCG-2	24-Jul-79	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	6
RCG-2	20-Aug-79	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	5
RCG-2	19-Sep-79	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	14
RCG-2	31-Oct-79	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	2
RCG-2	4-Jun-81	4	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	2.49
RCG-2	24-Aug-81	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	1.65
RCG-2	10-Aug-93	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	13.62
RCG-2	17-Apr-95	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	31.99
RCG-2	6-Jun-95	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	13.47
RCG-2	10-Jul-95	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	10.865
RCG-2	10-Aug-95	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	15.445
RCG-2	13-Oct-95	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	11.129
RCG-2	27-Apr-98	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	8.53
RCG-2	10-Jun-98	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	4.44
RCG-2	20-Jul-98	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	21
RCG-2	21-Oct-98	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	10.6

Location	Date	Sample Depth	Parameter	Value
RCG-2	10-May-00	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	7.08
RCG-2	31-May-00	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	17.9
RCG-2	12-Jun-00	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	70.9
RCG-2	28-Jun-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	7.16
RCG-2	11-Jul-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	12.9
RCG-2	26-Jul-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	38
RCG-2	8-Aug-00	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	20.9
RCG-2	6-Sep-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	14.3
RCG-2	11-Sep-00	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	16.8
RCG-2	29-Sep-00	1.5	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	9.12
RCG-2	11-Oct-00	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	6.37
RCG-2	19-Oct-00	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	0
RCG-2	13-Nov-00	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	3.4
RCG-2	26-Feb-01	0.5	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	21.5
RCG-2	19-Mar-01	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	10.7
RCG-2	9-Apr-01	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	13.2
RCG-2	24-Apr-01	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	7.22
RCG-2	14-May-01	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	7.72
RCG-2	29-May-01	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	5.47
RCG-3	23-May-79	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	3.36
RCG-3	21-Jun-79	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	11.4
RCG-3	24-Jul-79	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	17
RCG-3	20-Aug-79	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	26
RCG-3	19-Sep-79	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	10
RCG-3	31-Oct-79	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	3
RCG-3	4-Jun-81	4	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	3.82
RCG-3	24-Aug-81	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	6.08
RCG-3	17-Apr-95	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	63.36
RCG-3	6-Jun-95	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	16.72
RCG-3	10-Jul-95	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	12.978
RCG-3	10-Aug-95	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	23.978
RCG-3	13-Oct-95	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	12.495
RCG-3	27-Apr-98	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	10.42
RCG-3	10-Jun-98	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	5.18

Location	Date	Sample Depth	Parameter	Value
RCG-3	20-Jul-98	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	16.5
RCG-3	21-Oct-98	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	8.81
RCG-3	10-May-00	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	18.4
RCG-3	31-May-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	46.7
RCG-3	12-Jun-00	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	75.7
RCG-3	28-Jun-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	6.28
RCG-3	11-Jul-00	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	14
RCG-3	26-Jul-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	206
RCG-3	8-Aug-00	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	13
RCG-3	6-Sep-00	1.5	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	10.6
RCG-3	11-Sep-00	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	7.63
RCG-3	29-Sep-00	1.5	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	10.7
RCG-3	11-Oct-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	19.3
RCG-3	19-Oct-00	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	7.3
RCG-3	13-Nov-00	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	7.09
RCG-3	26-Feb-01	0.5	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	3.75
RCG-3	19-Mar-01	3	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	3.52
RCG-3	9-Apr-01	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	32.1
RCG-3	24-Apr-01	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	12.8
RCG-3	14-May-01	1	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	3.63
RCG-3	29-May-01	2	CHLOROPHYLL-B UG/L TRICHROMATIC UNCORRECTED	0.68
RCG-1	22-May-79	4	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	15.3
RCG-1	21-Jun-79	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	9.98
RCG-1	24-Jul-79	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	1
RCG-1	20-Aug-79	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	4
RCG-1	19-Sep-79	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	4
RCG-1	31-Oct-79	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	6
RCG-1	4-Jun-81	5	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	4.32
RCG-1	24-Aug-81	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	7.91
RCG-1	10-Aug-93	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	2.34
RCG-1	17-Apr-95	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	17.14
RCG-1	6-Jun-95	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	8.52
RCG-1	10-Jul-95	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	4.7654
RCG-1	10-Aug-95	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	8.9852

Location	Date	Sample Depth	Parameter	Value
RCG-1	13-Oct-95	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	5.706
RCG-1	29-May-97	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	5.47
RCG-1	19-Jun-97	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	2.07
RCG-1	21-Jul-97	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	0
RCG-1	4-Aug-97	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	0
RCG-1	22-Sep-97	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	0
RCG-1	20-Oct-97	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	0
RCG-1	27-Apr-98	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	0
RCG-1	28-May-98	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	5.2
RCG-1	10-Jun-98	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	0.44
RCG-1	30-Jun-98	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	0
RCG-1	20-Jul-98	4	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	1.28
RCG-1	3-Aug-98	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	13.3
RCG-1	9-Sep-98	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	10.4
RCG-1	21-Oct-98	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	6.75
RCG-1	10-May-00	4	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	55.3
RCG-1	31-May-00	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	11
RCG-1	12-Jun-00	4	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	6.64
RCG-1	28-Jun-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	5.51
RCG-1	11-Jul-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	7.3
RCG-1	26-Jul-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	88.1
RCG-1	8-Aug-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	10.7
RCG-1	6-Sep-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	13.7
RCG-1	11-Sep-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	22
RCG-1	29-Sep-00	1.5	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	22
RCG-1	11-Oct-00	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	11
RCG-1	19-Oct-00	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	11.4
RCG-1	13-Nov-00	4	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	4.31
RCG-1	26-Feb-01	0.5	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	28.3
RCG-1	19-Mar-01	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	52.4
RCG-1	9-Apr-01	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	8.69
RCG-1	24-Apr-01	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	32.1
RCG-1	14-May-01	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	9.45
RCG-1	29-May-01	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	7.55

Location	Date	Sample Depth	Parameter	Value
RCG-2	23-May-79	4	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	30.8
RCG-2	21-Jun-79	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	9.36
RCG-2	24-Jul-79	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	8
RCG-2	20-Aug-79	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	3
RCG-2	19-Sep-79	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	10
RCG-2	31-Oct-79	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	4
RCG-2	4-Jun-81	4	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	7.44
RCG-2	24-Aug-81	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	5.77
RCG-2	10-Aug-93	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	2.27
RCG-2	17-Apr-95	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	47.36
RCG-2	6-Jun-95	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	8.7
RCG-2	10-Jul-95	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	5.8014
RCG-2	10-Aug-95	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	5.8754
RCG-2	13-Oct-95	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	7.6764
RCG-2	27-Apr-98	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	3.21
RCG-2	10-Jun-98	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	0
RCG-2	20-Jul-98	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	0
RCG-2	21-Oct-98	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	6.09
RCG-2	10-May-00	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	3.03
RCG-2	31-May-00	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	23.3
RCG-2	12-Jun-00	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	144
RCG-2	28-Jun-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	6.44
RCG-2	11-Jul-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	10.5
RCG-2	26-Jul-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	42.7
RCG-2	8-Aug-00	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	16.6
RCG-2	6-Sep-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	13.2
RCG-2	11-Sep-00	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	57.6
RCG-2	29-Sep-00	1.5	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	13.9
RCG-2	11-Oct-00	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	22.2
RCG-2	19-Oct-00	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	7.42
RCG-2	13-Nov-00	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	7.71
RCG-2	26-Feb-01	0.5	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	31.7
RCG-2	19-Mar-01	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	29.4
RCG-2	9-Apr-01	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	15.3

Location	Date	Sample Depth	Parameter	Value
RCG-2	24-Apr-01	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	43.9
RCG-2	14-May-01	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	20.5
RCG-2	29-May-01	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	12.5
RCG-3	23-May-79	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	12.6
RCG-3	21-Jun-79	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	0
RCG-3	24-Jul-79	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	8
RCG-3	20-Aug-79	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	8
RCG-3	19-Sep-79	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	7
RCG-3	31-Oct-79	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	4
RCG-3	4-Jun-81	4	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	8.73
RCG-3	24-Aug-81	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	15.32
RCG-3	17-Apr-95	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	106.25
RCG-3	6-Jun-95	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	8.3
RCG-3	10-Jul-95	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	6.9978
RCG-3	10-Aug-95	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	16.837
RCG-3	13-Oct-95	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	8.2318
RCG-3	27-Apr-98	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	1.26
RCG-3	10-Jun-98	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	0
RCG-3	20-Jul-98	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	2.86
RCG-3	21-Oct-98	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	5.83
RCG-3	10-May-00	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	22.9
RCG-3	31-May-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	74.7
RCG-3	12-Jun-00	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	83
RCG-3	28-Jun-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	5.32
RCG-3	11-Jul-00	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	19.5
RCG-3	26-Jul-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	159
RCG-3	8-Aug-00	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	17
RCG-3	6-Sep-00	1.5	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	26.5
RCG-3	11-Sep-00	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	29.9
RCG-3	29-Sep-00	1.5	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	13.8
RCG-3	11-Oct-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	23.9
RCG-3	19-Oct-00	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	12.4
RCG-3	13-Nov-00	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	14.4
RCG-3	26-Feb-01	0.5	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	9.36

Location	Date	Sample Depth	Parameter	Value
RCG-3	19-Mar-01	3	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	8.58
RCG-3	9-Apr-01	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	27.2
RCG-3	24-Apr-01	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	49
RCG-3	14-May-01	1	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	19.2
RCG-3	29-May-01	2	CHLOROPHYLL-C UG/L TRICHROMATIC UNCORRECTED	5.72
RCG-1	22-May-79	4	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	34.9
RCG-1	21-Jun-79	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	27.7
RCG-1	24-Jul-79	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	1
RCG-1	20-Aug-79	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	7
RCG-1	19-Sep-79	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	15
RCG-1	31-Oct-79	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	9
RCG-1	4-Jun-81	5	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	12.79
RCG-1	24-Aug-81	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	8.14
RCG-1	10-Aug-93	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	17-Apr-95	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	90.11
RCG-1	6-Jun-95	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	10-Jul-95	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	2.5588
RCG-1	10-Aug-95	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	5.6845
RCG-1	13-Oct-95	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	19.758
RCG-1	29-May-97	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	19-Jun-97	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	21-Jul-97	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0.53
RCG-1	4-Aug-97	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	22-Sep-97	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	20-Oct-97	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	27-Apr-98	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	28-May-98	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	3.74
RCG-1	10-Jun-98	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	30-Jun-98	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	20-Jul-98	4	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	3-Aug-98	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	13.6
RCG-1	9-Sep-98	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	6.94
RCG-1	21-Oct-98	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	1
RCG-1	10-May-00	4	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	61.4

Location	Date	Sample Depth	Parameter	Value
RCG-1	31-May-00	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	17.4
RCG-1	12-Jun-00	4	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	3.34
RCG-1	28-Jun-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	11-Jul-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	9.88
RCG-1	26-Jul-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	120
RCG-1	8-Aug-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	3.2
RCG-1	6-Sep-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0.24
RCG-1	11-Sep-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	139
RCG-1	29-Sep-00	1.5	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	130
RCG-1	11-Oct-00	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	28.8
RCG-1	19-Oct-00	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	1.17
RCG-1	13-Nov-00	4	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	1.07
RCG-1	26-Feb-01	0.5	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	19-Mar-01	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	21.5
RCG-1	9-Apr-01	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	13.4
RCG-1	24-Apr-01	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	13.1
RCG-1	14-May-01	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	6.7
RCG-1	29-May-01	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	2.07
RCG-2	23-May-79	4	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	52.3
RCG-2	21-Jun-79	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	26.6
RCG-2	24-Jul-79	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	15
RCG-2	20-Aug-79	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	14
RCG-2	19-Sep-79	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	17
RCG-2	31-Oct-79	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	6
RCG-2	4-Jun-81	4	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	17.26
RCG-2	24-Aug-81	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	6.32
RCG-2	10-Aug-93	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-2	17-Apr-95	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-2	6-Jun-95	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-2	10-Jul-95	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	8.7382
RCG-2	10-Aug-95	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	5.5454
RCG-2	13-Oct-95	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	2.8607
RCG-2	27-Apr-98	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-2	10-Jun-98	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0

Location	Date	Sample Depth	Parameter	Value
RCG-2	20-Jul-98	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	14.2
RCG-2	21-Oct-98	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	8.28
RCG-2	10-May-00	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	10.7
RCG-2	31-May-00	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	13.9
RCG-2	12-Jun-00	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	135
RCG-2	28-Jun-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-2	11-Jul-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-2	26-Jul-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	62.7
RCG-2	8-Aug-00	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	6.41
RCG-2	6-Sep-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	7.06
RCG-2	11-Sep-00	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0.66
RCG-2	29-Sep-00	1.5	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	4.62
RCG-2	11-Oct-00	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	6.97
RCG-2	19-Oct-00	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	6.1
RCG-2	13-Nov-00	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	14.3
RCG-2	26-Feb-01	0.5	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	25.8
RCG-2	19-Mar-01	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-2	9-Apr-01	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	42.3
RCG-2	24-Apr-01	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	15.8
RCG-2	14-May-01	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	4.16
RCG-2	29-May-01	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	13.1
RCG-3	23-May-79	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	2.28
RCG-3	21-Jun-79	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	24-Jul-79	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	28
RCG-3	20-Aug-79	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	29
RCG-3	19-Sep-79	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	9
RCG-3	31-Oct-79	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	1
RCG-3	4-Jun-81	4	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	17.08
RCG-3	24-Aug-81	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	7.25
RCG-3	17-Apr-95	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	25.1
RCG-3	6-Jun-95	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	10-Jul-95	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	9.1967
RCG-3	10-Aug-95	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	13-Oct-95	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0

Location	Date	Sample Depth	Parameter	Value
RCG-3	27-Apr-98	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	10-Jun-98	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	20-Jul-98	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	7.74
RCG-3	21-Oct-98	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	1
RCG-3	10-May-00	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	19.5
RCG-3	31-May-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	11.2
RCG-3	12-Jun-00	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	14.4
RCG-3	28-Jun-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	11-Jul-00	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	3.74
RCG-3	26-Jul-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0.534
RCG-3	8-Aug-00	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	6-Sep-00	1.5	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	11-Sep-00	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	71.2
RCG-3	29-Sep-00	1.5	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	11-Oct-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	19-Oct-00	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	10.7
RCG-3	13-Nov-00	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-3	26-Feb-01	0.5	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	5.81
RCG-3	19-Mar-01	3	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	1.87
RCG-3	9-Apr-01	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	40.3
RCG-3	24-Apr-01	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	31.6
RCG-3	14-May-01	1	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	8.48
RCG-3	29-May-01	2	PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	0
RCG-1	1-Jul-77	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	130
RCG-1	22-May-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	120
RCG-1	21-Jun-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	140
RCG-1	24-Jul-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	100
RCG-1	20-Aug-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	115
RCG-1	19-Sep-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	115
RCG-1	31-Oct-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	140
RCG-1	4-Jun-81	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	100
RCG-1	24-Aug-81	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	95
RCG-1	10-Aug-93	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	130
RCG-1	17-Apr-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	120

Location	Date	Sample Depth	Parameter	Value
RCG-1	6-Jun-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	135
RCG-1	10-Jul-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	145
RCG-1	10-Aug-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	120
RCG-1	13-Oct-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	135
RCG-1	27-Apr-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	158
RCG-1	10-Jun-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	164
RCG-1	20-Jul-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	150
RCG-1	27-Aug-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	110
RCG-1	21-Oct-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	120
RCG-2	1-Jul-77	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	132
RCG-2	23-May-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	115
RCG-2	21-Jun-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	140
RCG-2	24-Jul-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	100
RCG-2	20-Aug-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	120
RCG-2	19-Sep-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	115
RCG-2	31-Oct-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	150
RCG-2	4-Jun-81	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	110
RCG-2	10-Aug-93	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	132
RCG-2	17-Apr-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	130
RCG-2	6-Jun-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	125
RCG-2	10-Jul-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	145
RCG-2	10-Aug-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	130
RCG-2	13-Oct-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	135
RCG-2	10-Jun-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	164
RCG-2	20-Jul-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	148
RCG-2	27-Aug-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	115
RCG-2	21-Oct-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	120
RCG-3	1-Jul-77	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	136
RCG-3	23-May-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	130
RCG-3	21-Jun-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	170
RCG-3	24-Jul-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	105
RCG-3	20-Aug-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	135
RCG-3	19-Sep-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	125
RCG-3	31-Oct-79	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	155

Location	Date	Sample Depth	Parameter	Value
RCG-3	4-Jun-81	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	105
RCG-3	24-Aug-81	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	95
RCG-3	17-Apr-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	130
RCG-3	6-Jun-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	135
RCG-3	10-Jul-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	170
RCG-3	10-Aug-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	140
RCG-3	13-Oct-95	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	145
RCG-3	27-Apr-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	192
RCG-3	10-Jun-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	160
RCG-3	20-Jul-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	162
RCG-3	27-Aug-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	125
RCG-3	21-Oct-98	surface	ALKALINITY, TOTAL (MG/L AS CaCO3)	130
RCG-1	22-May-79	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	125
RCG-1	21-Jun-79	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	140
RCG-1	24-Jul-79	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	95
RCG-1	20-Aug-79	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	110
RCG-1	19-Sep-79	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	115
RCG-1	31-Oct-79	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	140
RCG-1	4-Jun-81	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	105
RCG-1	24-Aug-81	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	95
RCG-1	10-Aug-93	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	134
RCG-1	17-Apr-95	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	140
RCG-1	6-Jun-95	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	150
RCG-1	10-Jul-95	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	150
RCG-1	10-Aug-95	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	110
RCG-1	13-Oct-95	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	135
RCG-1	27-Apr-98	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	146
RCG-1	10-Jun-98	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	152
RCG-1	20-Jul-98	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	146
RCG-1	27-Aug-98	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	120
RCG-1	21-Oct-98	bottom	ALKALINITY, TOTAL (MG/L AS CaCO3)	120
RCG-1	22-May-79	surface	PH (STANDARD UNITS)	9.1
RCG-1	21-Jun-79	surface	PH (STANDARD UNITS)	6.4
RCG-1	24-Jul-79	surface	PH (STANDARD UNITS)	8.1

Location	Date	Sample Depth	Parameter	Value
RCG-1	20-Aug-79	surface	PH (STANDARD UNITS)	8.6
RCG-1	19-Sep-79	surface	PH (STANDARD UNITS)	8.2
RCG-1	4-Jun-81	surface	PH (STANDARD UNITS)	8
RCG-1	24-Aug-81	surface	PH (STANDARD UNITS)	8.8
RCG-1	10-Aug-93	surface	PH (STANDARD UNITS)	7.3
RCG-1	17-Apr-95	surface	PH (STANDARD UNITS)	8.9
RCG-1	6-Jun-95	surface	PH (STANDARD UNITS)	8.7
RCG-1	10-Jul-95	surface	PH (STANDARD UNITS)	8
RCG-1	10-Aug-95	surface	PH (STANDARD UNITS)	7.4
RCG-1	13-Oct-95	surface	PH (STANDARD UNITS)	8.2
RCG-1	27-Apr-98	surface	PH (STANDARD UNITS)	8.19
RCG-1	10-Jun-98	surface	PH (STANDARD UNITS)	8.3
RCG-1	20-Jul-98	surface	PH (STANDARD UNITS)	8.04
RCG-1	27-Aug-98	surface	PH (STANDARD UNITS)	8.43
RCG-1	21-Oct-98	surface	PH (STANDARD UNITS)	8.06
RCG-2	23-May-79	surface	PH (STANDARD UNITS)	9.1
RCG-2	21-Jun-79	surface	PH (STANDARD UNITS)	6.6
RCG-2	24-Jul-79	surface	PH (STANDARD UNITS)	8.5
RCG-2	20-Aug-79	surface	PH (STANDARD UNITS)	8.3
RCG-2	19-Sep-79	surface	PH (STANDARD UNITS)	8.5
RCG-2	4-Jun-81	surface	PH (STANDARD UNITS)	8.7
RCG-2	24-Aug-81	surface	PH (STANDARD UNITS)	8.8
RCG-2	10-Aug-93	surface	PH (STANDARD UNITS)	8.2
RCG-2	17-Apr-95	surface	PH (STANDARD UNITS)	9
RCG-2	6-Jun-95	surface	PH (STANDARD UNITS)	9
RCG-2	10-Jul-95	surface	PH (STANDARD UNITS)	8.1
RCG-2	10-Aug-95	surface	PH (STANDARD UNITS)	8.2
RCG-2	13-Oct-95	surface	PH (STANDARD UNITS)	8.6
RCG-2	27-Apr-98	surface	PH (STANDARD UNITS)	8.47
RCG-2	10-Jun-98	surface	PH (STANDARD UNITS)	8.4
RCG-2	20-Jul-98	surface	PH (STANDARD UNITS)	8.12
RCG-2	27-Aug-98	surface	PH (STANDARD UNITS)	8.5
RCG-2	21-Oct-98	surface	PH (STANDARD UNITS)	8.21
RCG-3	23-May-79	surface	PH (STANDARD UNITS)	10.3

Location	Date	Sample Depth	Parameter	Value
RCG-3	21-Jun-79	surface	PH (STANDARD UNITS)	6.8
RCG-3	24-Jul-79	surface	PH (STANDARD UNITS)	8.4
RCG-3	20-Aug-79	surface	PH (STANDARD UNITS)	8.7
RCG-3	19-Sep-79	surface	PH (STANDARD UNITS)	8.4
RCG-3	4-Jun-81	surface	PH (STANDARD UNITS)	8.6
RCG-3	24-Aug-81	surface	PH (STANDARD UNITS)	9.3
RCG-3	17-Apr-95	surface	PH (STANDARD UNITS)	8.1
RCG-3	6-Jun-95	surface	PH (STANDARD UNITS)	8.8
RCG-3	10-Jul-95	surface	PH (STANDARD UNITS)	7.6
RCG-3	10-Aug-95	surface	PH (STANDARD UNITS)	8.3
RCG-3	13-Oct-95	surface	PH (STANDARD UNITS)	8.4
RCG-3	27-Apr-98	surface	PH (STANDARD UNITS)	8.39
RCG-3	10-Jun-98	surface	PH (STANDARD UNITS)	8.4
RCG-3	20-Jul-98	surface	PH (STANDARD UNITS)	8
RCG-3	27-Aug-98	surface	PH (STANDARD UNITS)	8.69
RCG-3	21-Oct-98	surface	PH (STANDARD UNITS)	8.23
RCG-1	22-May-79	bottom	PH (STANDARD UNITS)	7.7
RCG-1	21-Jun-79	bottom	PH (STANDARD UNITS)	6.7
RCG-1	24-Jul-79	bottom	PH (STANDARD UNITS)	7.8
RCG-1	20-Aug-79	bottom	PH (STANDARD UNITS)	8.3
RCG-1	19-Sep-79	bottom	PH (STANDARD UNITS)	8
RCG-1	4-Jun-81	bottom	PH (STANDARD UNITS)	7.7
RCG-1	24-Aug-81	bottom	PH (STANDARD UNITS)	7.6
RCG-1	10-Aug-93	bottom	PH (STANDARD UNITS)	7.2
RCG-1	17-Apr-95	bottom	PH (STANDARD UNITS)	8.5
RCG-1	6-Jun-95	bottom	PH (STANDARD UNITS)	7.8
RCG-1	10-Jul-95	bottom	PH (STANDARD UNITS)	7.5
RCG-1	10-Aug-95	bottom	PH (STANDARD UNITS)	7.5
RCG-1	13-Oct-95	bottom	PH (STANDARD UNITS)	8.1
RCG-1	27-Apr-98	bottom	PH (STANDARD UNITS)	8.27
RCG-1	10-Jun-98	bottom	PH (STANDARD UNITS)	8.1
RCG-1	20-Jul-98	bottom	PH (STANDARD UNITS)	7.6
RCG-1	27-Aug-98	bottom	PH (STANDARD UNITS)	8.4
RCG-1	21-Oct-98	bottom	PH (STANDARD UNITS)	7.9

Location	Date	Sample Depth	Parameter	Value
RCG-1	1-Jul-77	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	640
RCG-1	22-May-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	478
RCG-1	21-Jun-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	550
RCG-1	24-Jul-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	453
RCG-1	20-Aug-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	410
RCG-1	19-Sep-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	420
RCG-1	31-Oct-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	380
RCG-1	4-Jun-81	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	507
RCG-1	24-Aug-81	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	360
RCG-1	17-Apr-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	402
RCG-1	6-Jun-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	385
RCG-1	10-Jul-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	373
RCG-1	10-Aug-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	319
RCG-1	13-Oct-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	349
RCG-1	27-Apr-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	465
RCG-1	10-Jun-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	435
RCG-1	20-Jul-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	396
RCG-1	27-Aug-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	317
RCG-1	21-Oct-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	322
RCG-2	1-Jul-77	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	600
RCG-2	23-May-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	468
RCG-2	21-Jun-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	550
RCG-2	24-Jul-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	511
RCG-2	20-Aug-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	430
RCG-2	19-Sep-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	430
RCG-2	31-Oct-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	400
RCG-2	4-Jun-81	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	515
RCG-2	24-Aug-81	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	360
RCG-2	17-Apr-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	391
RCG-2	6-Jun-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	370
RCG-2	10-Jul-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	378
RCG-2	10-Aug-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	320
RCG-2	13-Oct-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	344
RCG-2	27-Apr-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	493

Location	Date	Sample Depth	Parameter	Value
RCG-2	10-Jun-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	447
RCG-2	20-Jul-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	401
RCG-2	27-Aug-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	319
RCG-2	21-Oct-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	322
RCG-3	1-Jul-77	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	620
RCG-3	23-May-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	521
RCG-3	21-Jun-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	550
RCG-3	24-Jul-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	480
RCG-3	20-Aug-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	440
RCG-3	19-Sep-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	431
RCG-3	31-Oct-79	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	400
RCG-3	4-Jun-81	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	545
RCG-3	24-Aug-81	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	355
RCG-3	17-Apr-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	418
RCG-3	6-Jun-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	435
RCG-3	10-Jul-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	429
RCG-3	10-Aug-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	343
RCG-3	13-Oct-95	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	387
RCG-3	27-Apr-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	531
RCG-3	10-Jun-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	509
RCG-3	20-Jul-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	417
RCG-3	27-Aug-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	322
RCG-3	21-Oct-98	surface	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	320
RCG-1	22-May-79	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	483
RCG-1	21-Jun-79	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	525
RCG-1	24-Jul-79	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	452
RCG-1	20-Aug-79	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	420
RCG-1	19-Sep-79	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	423
RCG-1	31-Oct-79	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	390
RCG-1	4-Jun-81	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	450
RCG-1	24-Aug-81	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	360
RCG-1	17-Apr-95	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	434
RCG-1	6-Jun-95	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	414
RCG-1	10-Jul-95	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	401

Location	Date	Sample Depth	Parameter	Value
RCG-1	10-Aug-95	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	322
RCG-1	13-Oct-95	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	350
RCG-1	27-Apr-98	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	467
RCG-1	10-Jun-98	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	437
RCG-1	20-Jul-98	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	398
RCG-1	27-Aug-98	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	318
RCG-1	21-Oct-98	bottom	SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)	320
RCG-1	22-May-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	6
RCG-1	21-Jun-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	7.1
RCG-1	24-Jul-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	15
RCG-1	20-Aug-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	15
RCG-1	19-Sep-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	10
RCG-1	31-Oct-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	9
RCG-1	4-Jun-81	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	4.8
RCG-1	24-Aug-81	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	10
RCG-1	10-Aug-93	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	1.7
RCG-1	17-Apr-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	11
RCG-1	6-Jun-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	2.6
RCG-1	10-Jul-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	3.6
RCG-1	10-Aug-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	3.9
RCG-1	13-Oct-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	2.2
RCG-1	27-Apr-98	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	16
RCG-1	10-Jun-98	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	12
RCG-1	20-Jul-98	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	6.7
RCG-1	27-Aug-98	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	15
RCG-2	23-May-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	7.4
RCG-2	21-Jun-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	18
RCG-2	24-Jul-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	17
RCG-2	20-Aug-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	22
RCG-2	19-Sep-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	15
RCG-2	31-Oct-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	9.2
RCG-2	4-Jun-81	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	8.4
RCG-2	24-Aug-81	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	15
RCG-2	10-Aug-93	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	0.5

Location	Date	Sample Depth	Parameter	Value
RCG-2	17-Apr-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	8.1
RCG-2	6-Jun-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	2.3
RCG-2	10-Jul-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	2.9
RCG-2	10-Aug-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	4.4
RCG-2	13-Oct-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	3.7
RCG-2	27-Apr-98	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	18
RCG-2	10-Jun-98	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	11
RCG-2	20-Jul-98	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	7.6
RCG-2	27-Aug-98	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	19
RCG-3	23-May-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	9.9
RCG-3	21-Jun-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	18
RCG-3	24-Jul-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	43
RCG-3	20-Aug-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	32
RCG-3	19-Sep-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	15
RCG-3	31-Oct-79	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	50
RCG-3	4-Jun-81	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	11
RCG-3	24-Aug-81	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	19
RCG-3	17-Apr-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	22
RCG-3	6-Jun-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	2.2
RCG-3	10-Jul-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	2.5
RCG-3	10-Aug-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	4.2
RCG-3	13-Oct-95	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	4.4
RCG-3	27-Apr-98	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	26
RCG-3	10-Jun-98	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	3.8
RCG-3	20-Jul-98	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	7.4
RCG-3	27-Aug-98	surface	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	22
RCG-1	22-May-79	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	28
RCG-1	21-Jun-79	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	11
RCG-1	24-Jul-79	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	23
RCG-1	20-Aug-79	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	18
RCG-1	19-Sep-79	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	13
RCG-1	31-Oct-79	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	5.9
RCG-1	4-Jun-81	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	6.5
RCG-1	24-Aug-81	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	18

Location	Date	Sample Depth	Parameter	Value
RCG-1	10-Aug-93	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	1.7
RCG-1	17-Apr-95	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	7.2
RCG-1	6-Jun-95	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	2.3
RCG-1	10-Jul-95	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	3.9
RCG-1	10-Aug-95	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	4.7
RCG-1	13-Oct-95	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	3
RCG-1	27-Apr-98	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	10
RCG-1	10-Jun-98	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	10
RCG-1	20-Jul-98	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	8
RCG-1	27-Aug-98	bottom	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)	16
RCG-1	1-Jul-77	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	9
RCG-1	22-May-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	39
RCG-1	21-Jun-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	12
RCG-1	24-Jul-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20
RCG-1	20-Aug-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	19
RCG-1	19-Sep-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	18
RCG-1	31-Oct-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	12
RCG-1	4-Jun-81	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	10
RCG-1	24-Aug-81	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	19
RCG-1	28-May-91	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	10
RCG-1	24-Jun-91	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	36
RCG-1	15-Jul-91	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	12
RCG-1	27-Aug-91	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	11
RCG-1	17-Sep-91	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	34
RCG-1	8-Oct-91	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	19
RCG-1	10-Aug-93	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	10
RCG-1	27-May-94	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	16
RCG-1	29-Jun-94	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20
RCG-1	20-Jul-94	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	22
RCG-1	10-Aug-94	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	21
RCG-1	1-Sep-94	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	58
RCG-1	17-Apr-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	30
RCG-1	6-Jun-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	24
RCG-1	10-Jul-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	26

Location	Date	Sample Depth	Parameter	Value
RCG-1	10-Aug-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	14
RCG-1	13-Oct-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	17
RCG-1	29-May-97	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	21
RCG-1	19-Jun-97	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	15
RCG-1	21-Jul-97	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	12
RCG-1	4-Aug-97	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	22
RCG-1	22-Sep-97	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	40
RCG-1	20-Oct-97	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	28
RCG-1	27-Apr-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	22
RCG-1	28-May-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20
RCG-1	10-Jun-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	18
RCG-1	20-Jul-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	13
RCG-1	27-Aug-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	22
RCG-1	31-May-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	10
RCG-1	12-Jun-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	10
RCG-1	28-Jun-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	28
RCG-1	11-Jul-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	17
RCG-1	8-Aug-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	7
RCG-1	6-Sep-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	18
RCG-1	11-Sep-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	34
RCG-1	29-Sep-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	5
RCG-1	11-Oct-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	15
RCG-1	19-Oct-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	6
RCG-1	13-Nov-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	14
RCG-1	19-Mar-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	24
RCG-1	9-Apr-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	14
RCG-1	24-Apr-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	18
RCG-1	14-May-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20
RCG-1	24-May-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	7
RCG-2	1-Jul-77	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	39
RCG-2	23-May-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	23
RCG-2	21-Jun-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	28
RCG-2	24-Jul-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	40
RCG-2	20-Aug-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	30

Location	Date	Sample Depth	Parameter	Value
RCG-2	19-Sep-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	29
RCG-2	31-Oct-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	17
RCG-2	4-Jun-81	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	32
RCG-2	24-Aug-81	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20
RCG-2	10-Aug-93	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	27
RCG-2	17-Apr-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20
RCG-2	6-Jun-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	30
RCG-2	10-Jul-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	22
RCG-2	10-Aug-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	30
RCG-2	13-Oct-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	24
RCG-2	27-Apr-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	37
RCG-2	10-Jun-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	29
RCG-2	20-Jul-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	23
RCG-2	27-Aug-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	39
RCG-2	31-May-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	23
RCG-2	12-Jun-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20
RCG-2	28-Jun-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	21
RCG-2	11-Jul-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	18
RCG-2	8-Aug-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	8
RCG-2	6-Sep-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	28
RCG-2	11-Sep-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	51
RCG-2	29-Sep-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	12
RCG-2	11-Oct-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20
RCG-2	19-Oct-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	7
RCG-2	13-Nov-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	18
RCG-2	19-Mar-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	30
RCG-2	9-Apr-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	17
RCG-2	24-Apr-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	24
RCG-2	14-May-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	32
RCG-2	24-May-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	23
RCG-3	1-Jul-77	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	50
RCG-3	23-May-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	82
RCG-3	21-Jun-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	32
RCG-3	24-Jul-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	95

Location	Date	Sample Depth	Parameter	Value
RCG-3	20-Aug-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	59
RCG-3	19-Sep-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	57
RCG-3	31-Oct-79	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	210
RCG-3	4-Jun-81	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	28
RCG-3	24-Aug-81	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	36
RCG-3	28-May-91	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	17
RCG-3	24-Jun-91	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	46
RCG-3	15-Jul-91	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	15
RCG-3	27-Aug-91	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	30
RCG-3	17-Sep-91	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	42
RCG-3	8-Oct-91	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	57
RCG-3	27-May-94	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	28
RCG-3	29-Jun-94	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	170
RCG-3	20-Jul-94	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	118
RCG-3	10-Aug-94	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	134
RCG-3	1-Sep-94	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	78
RCG-3	17-Apr-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	110
RCG-3	6-Jun-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	36
RCG-3	10-Jul-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	102
RCG-3	10-Aug-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	42
RCG-3	13-Oct-95	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	90
RCG-3	27-Apr-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	46
RCG-3	10-Jun-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	24
RCG-3	20-Jul-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	44
RCG-3	27-Aug-98	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	42
RCG-3	31-May-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	18
RCG-3	12-Jun-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	60
RCG-3	28-Jun-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	31
RCG-3	11-Jul-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	119
RCG-3	8-Aug-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	50
RCG-3	6-Sep-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	70
RCG-3	11-Sep-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	43
RCG-3	29-Sep-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	48
RCG-3	11-Oct-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	16

Location	Date	Sample Depth	Parameter	Value
RCG-3	19-Oct-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	27
RCG-3	13-Nov-00	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	32
RCG-3	19-Mar-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	12
RCG-3	9-Apr-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	43
RCG-3	24-Apr-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	36
RCG-3	14-May-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	117
RCG-3	24-May-01	surface	RESIDUE, TOTAL NONFILTRABLE (MG/L)	59
RCG-1	22-May-79	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	49
RCG-1	21-Jun-79	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	13
RCG-1	24-Jul-79	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	30
RCG-1	20-Aug-79	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	14
RCG-1	19-Sep-79	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	22
RCG-1	31-Oct-79	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20
RCG-1	4-Jun-81	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	15
RCG-1	24-Aug-81	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	26
RCG-1	10-Aug-93	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	18
RCG-1	17-Apr-95	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	40
RCG-1	6-Jun-95	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	26
RCG-1	10-Jul-95	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	28
RCG-1	10-Aug-95	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	14
RCG-1	13-Oct-95	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	30
RCG-1	27-Apr-98	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	23
RCG-1	10-Jun-98	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20
RCG-1	20-Jul-98	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	19
RCG-1	27-Aug-98	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	35
RCG-1	31-May-00	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	21
RCG-1	12-Jun-00	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	12
RCG-1	28-Jun-00	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20
RCG-1	11-Jul-00	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	15
RCG-1	8-Aug-00	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	9
RCG-1	6-Sep-00	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	27
RCG-1	11-Sep-00	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	45
RCG-1	29-Sep-00	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	15
RCG-1	11-Oct-00	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20

Location	Date	Sample Depth	Parameter	Value
RCG-1	19-Oct-00	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	10
RCG-1	13-Nov-00	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	16
RCG-1	19-Mar-01	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	23
RCG-1	9-Apr-01	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	14
RCG-1	24-Apr-01	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	18
RCG-1	14-May-01	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	20
RCG-1	24-May-01	bottom	RESIDUE, TOTAL NONFILTRABLE (MG/L)	19
RCG-1	1-Jul-77	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	3
RCG-1	22-May-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	14
RCG-1	21-Jun-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	4
RCG-1	24-Jul-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-1	20-Aug-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-1	19-Sep-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	31-Oct-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-1	4-Jun-81	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	4
RCG-1	24-Aug-81	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	11
RCG-1	28-May-91	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-1	24-Jun-91	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	21
RCG-1	15-Jul-91	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	27-Aug-91	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	17-Sep-91	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	20
RCG-1	8-Oct-91	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	9
RCG-1	10-Aug-93	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	27-May-94	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	29-Jun-94	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-1	20-Jul-94	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	9
RCG-1	10-Aug-94	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	12
RCG-1	1-Sep-94	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	20
RCG-1	17-Apr-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	14
RCG-1	6-Jun-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	16
RCG-1	10-Jul-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	11
RCG-1	10-Aug-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	9
RCG-1	13-Oct-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	29-May-97	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10

Location	Date	Sample Depth	Parameter	Value
RCG-1	19-Jun-97	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-1	21-Jul-97	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-1	4-Aug-97	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-1	22-Sep-97	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	18
RCG-1	20-Oct-97	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	14
RCG-1	27-Apr-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	28-May-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	10-Jun-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	4
RCG-1	20-Jul-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-1	27-Aug-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-1	31-May-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	3
RCG-1	12-Jun-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	28-Jun-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	11
RCG-1	11-Jul-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-1	8-Aug-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-1	6-Sep-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	11
RCG-1	11-Sep-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-1	29-Sep-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	3
RCG-1	11-Oct-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	4
RCG-1	19-Oct-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	2
RCG-1	13-Nov-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	4
RCG-1	19-Mar-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	9-Apr-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	24-Apr-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-1	14-May-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-1	24-May-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-2	1-Jul-77	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-2	23-May-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-2	21-Jun-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-2	24-Jul-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	19
RCG-2	20-Aug-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-2	19-Sep-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	11
RCG-2	31-Oct-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-2	4-Jun-81	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10

Location	Date	Sample Depth	Parameter	Value
RCG-2	24-Aug-81	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	9
RCG-2	10-Aug-93	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	13
RCG-2	17-Apr-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-2	6-Jun-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	18
RCG-2	10-Jul-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	11
RCG-2	10-Aug-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	18
RCG-2	13-Oct-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-2	27-Apr-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-2	10-Jun-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-2	20-Jul-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-2	27-Aug-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	12
RCG-2	31-May-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	13
RCG-2	12-Jun-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	9
RCG-2	28-Jun-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-2	11-Jul-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-2	8-Aug-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-2	6-Sep-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	14
RCG-2	11-Sep-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	12
RCG-2	29-Sep-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-2	11-Oct-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-2	19-Oct-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	3
RCG-2	13-Nov-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	4
RCG-2	19-Mar-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-2	9-Apr-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-2	24-Apr-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-2	14-May-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-2	24-May-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-3	1-Jul-77	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	9
RCG-3	23-May-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	34
RCG-3	21-Jun-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-3	24-Jul-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	26
RCG-3	20-Aug-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	17
RCG-3	19-Sep-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	15
RCG-3	31-Oct-79	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	70

Location	Date	Sample Depth	Parameter	Value
RCG-3	4-Jun-81	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-3	24-Aug-81	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	18
RCG-3	28-May-91	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-3	24-Jun-91	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	20
RCG-3	15-Jul-91	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	12
RCG-3	27-Aug-91	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-3	17-Sep-91	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	18
RCG-3	8-Oct-91	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	16
RCG-3	27-May-94	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-3	29-Jun-94	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	30
RCG-3	20-Jul-94	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	24
RCG-3	10-Aug-94	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	34
RCG-3	1-Sep-94	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	20
RCG-3	17-Apr-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	18
RCG-3	6-Jun-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	20
RCG-3	10-Jul-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	22
RCG-3	10-Aug-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	18
RCG-3	13-Oct-95	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	22
RCG-3	27-Apr-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-3	10-Jun-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-3	20-Jul-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	11
RCG-3	27-Aug-98	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	13
RCG-3	31-May-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-3	12-Jun-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	17
RCG-3	28-Jun-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-3	11-Jul-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	16
RCG-3	8-Aug-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	12
RCG-3	6-Sep-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	20
RCG-3	11-Sep-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-3	29-Sep-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-3	11-Oct-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	4
RCG-3	19-Oct-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-3	13-Nov-00	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	4
RCG-3	19-Mar-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	3

Location	Date	Sample Depth	Parameter	Value
RCG-3	9-Apr-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-3	24-Apr-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-3	14-May-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	20
RCG-3	24-May-01	surface	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	11
RCG-1	22-May-79	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	9
RCG-1	21-Jun-79	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	3
RCG-1	24-Jul-79	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-1	20-Aug-79	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-1	19-Sep-79	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-1	31-Oct-79	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-1	4-Jun-81	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-1	24-Aug-81	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	1
RCG-1	10-Aug-93	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-1	17-Apr-95	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	14
RCG-1	6-Jun-95	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-1	10-Jul-95	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-1	10-Aug-95	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-1	13-Oct-95	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-1	27-Apr-98	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-1	10-Jun-98	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-1	20-Jul-98	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-1	27-Aug-98	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-1	31-May-00	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	14
RCG-1	12-Jun-00	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-1	28-Jun-00	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	11-Jul-00	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	7
RCG-1	8-Aug-00	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-1	6-Sep-00	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	10
RCG-1	11-Sep-00	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	13
RCG-1	29-Sep-00	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	5
RCG-1	11-Oct-00	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	4
RCG-1	19-Oct-00	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	3
RCG-1	13-Nov-00	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	4
RCG-1	19-Mar-01	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6

Location	Date	Sample Depth	Parameter	Value
RCG-1	9-Apr-01	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	24-Apr-01	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-1	14-May-01	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	8
RCG-1	24-May-01	bottom	RESIDUE, VOLATILE NONFILTRABLE (MG/L)	6
RCG-1	1-Jul-77	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
RCG-1	22-May-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
RCG-1	21-Jun-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
RCG-1	24-Jul-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.1
RCG-1	20-Aug-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.085
RCG-1	19-Sep-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.1
RCG-1	31-Oct-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.075
RCG-1	4-Jun-81	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.064
RCG-1	24-Aug-81	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.102
RCG-1	28-May-91	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.102
RCG-1	24-Jun-91	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.167
RCG-1	15-Jul-91	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.164
RCG-1	27-Aug-91	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.198
RCG-1	17-Sep-91	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.206
RCG-1	8-Oct-91	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.155
RCG-1	10-Aug-93	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.022
RCG-1	27-May-94	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.043
RCG-1	29-Jun-94	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.145
RCG-1	20-Jul-94	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.195
RCG-1	10-Aug-94	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.284
RCG-1	1-Sep-94	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.255
RCG-1	17-Apr-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.105
RCG-1	6-Jun-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.164
RCG-1	10-Jul-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.086
RCG-1	10-Aug-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.172
RCG-1	13-Oct-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.196
RCG-1	29-May-97	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.139
RCG-1	19-Jun-97	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.153
RCG-1	21-Jul-97	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.18
RCG-1	4-Aug-97	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.203

Location	Date	Sample Depth	Parameter	Value
RCG-1	22-Sep-97	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.282
RCG-1	20-Oct-97	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.185
RCG-1	27-Apr-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.104
RCG-1	28-May-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.077
RCG-1	10-Jun-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.0969999
RCG-1	20-Jul-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.132
RCG-1	20-Jul-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.102
RCG-1	3-Aug-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.104
RCG-1	27-Aug-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.222
RCG-1	9-Sep-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.251
RCG-1	21-Oct-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.16
RCG-1	31-May-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.125
RCG-1	12-Jun-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.061
RCG-1	28-Jun-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.188
RCG-1	11-Jul-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.133
RCG-1	8-Aug-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.126
RCG-1	6-Sep-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.178
RCG-1	11-Sep-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.208
RCG-1	29-Sep-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.159
RCG-1	11-Oct-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.276
RCG-1	19-Oct-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.138
RCG-1	13-Nov-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.076
RCG-1	26-Feb-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.317
RCG-1	19-Mar-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.128
RCG-1	9-Apr-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.069
RCG-1	24-Apr-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.118
RCG-1	14-May-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.119
RCG-1	24-May-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.11
RCG-2	1-Jul-77	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.14
RCG-2	23-May-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.9
RCG-2	21-Jun-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.12
RCG-2	24-Jul-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.18
RCG-2	20-Aug-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.275
RCG-2	19-Sep-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.14

Location	Date	Sample Depth	Parameter	Value
RCG-2	31-Oct-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.112
RCG-2	4-Jun-81	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.089
RCG-2	24-Aug-81	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.11
RCG-2	10-Aug-93	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.013
RCG-2	17-Apr-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.103
RCG-2	6-Jun-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.0919999
RCG-2	10-Jul-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.089
RCG-2	10-Aug-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.22
RCG-2	13-Oct-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.219
RCG-2	27-Apr-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.144
RCG-2	10-Jun-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.113
RCG-2	20-Jul-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.173
RCG-2	27-Aug-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.318
RCG-2	21-Oct-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.185
RCG-2	31-May-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.1
RCG-2	12-Jun-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.061
RCG-2	28-Jun-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.238
RCG-2	11-Jul-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.058
RCG-2	8-Aug-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.173
RCG-2	6-Sep-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.118
RCG-2	11-Sep-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.268
RCG-2	29-Sep-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.143
RCG-2	11-Oct-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.231
RCG-2	19-Oct-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.115
RCG-2	13-Nov-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.092
RCG-2	26-Feb-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.339
RCG-2	19-Mar-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.138
RCG-2	9-Apr-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.076
RCG-2	24-Apr-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.157
RCG-2	14-May-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.144
RCG-2	24-May-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.159
RCG-3	1-Jul-77	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.18
RCG-3	23-May-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.18
RCG-3	21-Jun-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.16

Location	Date	Sample Depth	Parameter	Value
RCG-3	24-Jul-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.43
RCG-3	20-Aug-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.74
RCG-3	19-Sep-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.14
RCG-3	31-Oct-79	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.27
RCG-3	4-Jun-81	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.116
RCG-3	24-Aug-81	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.141
RCG-3	28-May-91	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.137
RCG-3	24-Jun-91	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.232
RCG-3	15-Jul-91	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.249
RCG-3	27-Aug-91	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.244
RCG-3	17-Sep-91	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.241
RCG-3	8-Oct-91	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.186
RCG-3	27-May-94	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.079
RCG-3	29-Jun-94	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.39
RCG-3	20-Jul-94	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.336
RCG-3	10-Aug-94	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.363
RCG-3	1-Sep-94	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.293
RCG-3	17-Apr-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.309
RCG-3	6-Jun-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.108
RCG-3	10-Jul-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.2
RCG-3	10-Aug-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.302
RCG-3	13-Oct-95	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.293
RCG-3	27-Apr-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.165
RCG-3	10-Jun-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.166
RCG-3	20-Jul-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.18
RCG-3	27-Aug-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.361
RCG-3	21-Oct-98	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.2
RCG-3	31-May-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.104
RCG-3	12-Jun-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.086
RCG-3	28-Jun-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.205
RCG-3	11-Jul-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.344
RCG-3	8-Aug-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.198
RCG-3	6-Sep-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.197
RCG-3	11-Sep-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.278

Location	Date	Sample Depth	Parameter	Value
RCG-3	29-Sep-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.101
RCG-3	11-Oct-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.109
RCG-3	19-Oct-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.104
RCG-3	13-Nov-00	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.207
RCG-3	26-Feb-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.154
RCG-3	19-Mar-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.048
RCG-3	9-Apr-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.11
RCG-3	24-Apr-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.124
RCG-3	14-May-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.234
RCG-3	24-May-01	surface	PHOSPHORUS, TOTAL (MG/L AS P)	0.15
RCG-1	22-May-79	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.15
RCG-1	21-Jun-79	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
RCG-1	24-Jul-79	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.075
RCG-1	20-Aug-79	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
RCG-1	19-Sep-79	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
RCG-1	31-Oct-79	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.082
RCG-1	4-Jun-81	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.079
RCG-1	24-Aug-81	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.116
RCG-1	10-Aug-93	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.014
RCG-1	17-Apr-95	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.099
RCG-1	6-Jun-95	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.115
RCG-1	10-Jul-95	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.082
RCG-1	10-Aug-95	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.169
RCG-1	13-Oct-95	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.186
RCG-1	27-Apr-98	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.101
RCG-1	10-Jun-98	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.109
RCG-1	20-Jul-98	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.112
RCG-1	27-Aug-98	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.246
RCG-1	21-Oct-98	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.178
RCG-1	31-May-00	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.138
RCG-1	12-Jun-00	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.056
RCG-1	28-Jun-00	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.228
RCG-1	11-Jul-00	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.068
RCG-1	8-Aug-00	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.061

Location	Date	Sample Depth	Parameter	Value
RCG-1	6-Sep-00	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.184
RCG-1	11-Sep-00	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.226
RCG-1	29-Sep-00	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.159
RCG-1	11-Oct-00	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.271
RCG-1	19-Oct-00	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.14
RCG-1	13-Nov-00	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.076
RCG-1	26-Feb-01	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.288
RCG-1	19-Mar-01	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.127
RCG-1	9-Apr-01	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.073
RCG-1	24-Apr-01	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.107
RCG-1	14-May-01	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.139
RCG-1	24-May-01	bottom	PHOSPHORUS, TOTAL (MG/L AS P)	0.098
RCG-1	22-May-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
RCG-1	21-Jun-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
RCG-1	24-Jul-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.025
RCG-1	20-Aug-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.015
RCG-1	19-Sep-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
RCG-1	31-Oct-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
RCG-1	4-Jun-81	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.007
RCG-1	24-Aug-81	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.102
RCG-1	17-Apr-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.019
RCG-1	6-Jun-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.029
RCG-1	10-Jul-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.012
RCG-1	10-Aug-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.026
RCG-1	13-Oct-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.032
RCG-1	27-Apr-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.016
RCG-1	10-Jun-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
RCG-1	20-Jul-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.011
RCG-1	27-Aug-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.075
RCG-1	21-Oct-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.059
RCG-2	23-May-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.2
RCG-2	21-Jun-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.04
RCG-2	24-Jul-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
RCG-2	20-Aug-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03

Location	Date	Sample Depth	Parameter	Value
RCG-2	19-Sep-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
RCG-2	31-Oct-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.025
RCG-2	4-Jun-81	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.003
RCG-2	24-Aug-81	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.012
RCG-2	17-Apr-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.014
RCG-2	6-Jun-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.015
RCG-2	10-Jul-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.009
RCG-2	10-Aug-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.024
RCG-2	13-Oct-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.031
RCG-2	27-Apr-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
RCG-2	10-Jun-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.013
RCG-2	20-Jul-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.024
RCG-2	27-Aug-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.123
RCG-2	21-Oct-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.058
RCG-3	23-May-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
RCG-3	21-Jun-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.05
RCG-3	24-Jul-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.2
RCG-3	20-Aug-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.075
RCG-3	19-Sep-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.04
RCG-3	31-Oct-79	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.045
RCG-3	4-Jun-81	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.003
RCG-3	17-Apr-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.095
RCG-3	6-Jun-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.011
RCG-3	10-Jul-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.013
RCG-3	10-Aug-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.06
RCG-3	13-Oct-95	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.034
RCG-3	27-Apr-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.011
RCG-3	10-Jun-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.015
RCG-3	20-Jul-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.027
RCG-3	27-Aug-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.125
RCG-3	21-Oct-98	surface	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.061
RCG-1	22-May-79	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
RCG-1	21-Jun-79	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
RCG-1	24-Jul-79	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02

Location	Date	Sample Depth	Parameter	Value
RCG-1	20-Aug-79	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.025
RCG-1	19-Sep-79	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
RCG-1	31-Oct-79	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0
RCG-1	4-Jun-81	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.008
RCG-1	24-Aug-81	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.041
RCG-1	17-Apr-95	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.012
RCG-1	6-Jun-95	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.034
RCG-1	10-Jul-95	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.007
RCG-1	10-Aug-95	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.032
RCG-1	13-Oct-95	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.033
RCG-1	27-Apr-98	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.014
RCG-1	10-Jun-98	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.016
RCG-1	20-Jul-98	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.024
RCG-1	27-Aug-98	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.079
RCG-1	21-Oct-98	bottom	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.063
RCG-1	1-Jul-77	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.9
RCG-1	22-May-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6.4
RCG-1	21-Jun-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4
RCG-1	24-Jul-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.3
RCG-1	20-Aug-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.7
RCG-1	19-Sep-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.2
RCG-1	31-Oct-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.23
RCG-1	4-Jun-81	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	11
RCG-1	24-Aug-81	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.3
RCG-1	28-May-91	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.2
RCG-1	24-Jun-91	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.12
RCG-1	15-Jul-91	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	27-Aug-91	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	17-Sep-91	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.03
RCG-1	8-Oct-91	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	10-Aug-93	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.3
RCG-1	27-May-94	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.6
RCG-1	29-Jun-94	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.3
RCG-1	20-Jul-94	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.28

Location	Date	Sample Depth	Parameter	Value
RCG-1	10-Aug-94	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	1-Sep-94	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.03
RCG-1	17-Apr-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.1
RCG-1	6-Jun-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.9
RCG-1	10-Jul-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.4
RCG-1	10-Aug-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.48
RCG-1	13-Oct-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	29-May-97	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.86
RCG-1	19-Jun-97	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.5
RCG-1	21-Jul-97	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.51
RCG-1	4-Aug-97	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.12
RCG-1	22-Sep-97	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	20-Oct-97	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	27-Apr-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	7.44
RCG-1	28-May-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6.27
RCG-1	10-Jun-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.23
RCG-1	20-Jul-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4
RCG-1	20-Jul-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.06
RCG-1	3-Aug-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.94
RCG-1	27-Aug-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	9-Sep-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.03
RCG-1	21-Oct-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	31-May-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	12-Jun-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.5
RCG-1	28-Jun-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.4
RCG-1	11-Jul-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4
RCG-1	8-Aug-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.35
RCG-1	6-Sep-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.04
RCG-1	11-Sep-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4
RCG-1	29-Sep-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.5
RCG-1	11-Oct-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.8
RCG-1	19-Oct-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4
RCG-1	13-Nov-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.7
RCG-1	26-Feb-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6

Location	Date	Sample Depth	Parameter	Value
RCG-1	19-Mar-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6.5
RCG-1	9-Apr-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.2
RCG-1	24-Apr-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.8
RCG-1	14-May-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.9
RCG-1	24-May-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.6
RCG-2	1-Jul-77	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.7
RCG-2	23-May-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6.2
RCG-2	21-Jun-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.6
RCG-2	24-Jul-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.2
RCG-2	20-Aug-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.7
RCG-2	19-Sep-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.87
RCG-2	31-Oct-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.005
RCG-2	4-Jun-81	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	11
RCG-2	24-Aug-81	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.7
RCG-2	10-Aug-93	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.1
RCG-2	17-Apr-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.9
RCG-2	6-Jun-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6.2
RCG-2	10-Jul-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.4
RCG-2	10-Aug-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.44
RCG-2	13-Oct-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-2	27-Apr-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	7.9
RCG-2	10-Jun-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.26
RCG-2	20-Jul-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.7
RCG-2	27-Aug-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-2	21-Oct-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-2	31-May-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.66
RCG-2	12-Jun-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.44
RCG-2	28-Jun-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5
RCG-2	11-Jul-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4
RCG-2	8-Aug-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.99
RCG-2	6-Sep-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.06
RCG-2	11-Sep-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.92
RCG-2	29-Sep-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.2
RCG-2	11-Oct-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.1

Location	Date	Sample Depth	Parameter	Value
RCG-2	19-Oct-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.5
RCG-2	13-Nov-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.6
RCG-2	26-Feb-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.8
RCG-2	19-Mar-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6.5
RCG-2	9-Apr-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.1
RCG-2	24-Apr-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.3
RCG-2	14-May-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.5
RCG-2	24-May-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3
RCG-3	1-Jul-77	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.7
RCG-3	23-May-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6.2
RCG-3	21-Jun-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.8
RCG-3	24-Jul-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.87
RCG-3	20-Aug-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.2
RCG-3	19-Sep-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.92
RCG-3	31-Oct-79	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.005
RCG-3	4-Jun-81	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	12
RCG-3	24-Aug-81	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.8
RCG-3	28-May-91	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.2
RCG-3	24-Jun-91	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-3	15-Jul-91	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-3	27-Aug-91	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-3	17-Sep-91	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-3	8-Oct-91	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-3	27-May-94	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6.1
RCG-3	29-Jun-94	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.16
RCG-3	20-Jul-94	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.11
RCG-3	10-Aug-94	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-3	1-Sep-94	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.02
RCG-3	17-Apr-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.6
RCG-3	6-Jun-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	7
RCG-3	10-Jul-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5
RCG-3	10-Aug-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.14
RCG-3	13-Oct-95	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.02
RCG-3	27-Apr-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	8.78

Location	Date	Sample Depth	Parameter	Value
RCG-3	10-Jun-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6.36
RCG-3	20-Jul-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.78
RCG-3	27-Aug-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-3	21-Oct-98	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-3	31-May-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	8.4
RCG-3	12-Jun-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3
RCG-3	28-Jun-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.5
RCG-3	11-Jul-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.9
RCG-3	8-Aug-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.87
RCG-3	6-Sep-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.08
RCG-3	11-Sep-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.8
RCG-3	29-Sep-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	9.3
RCG-3	11-Oct-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	8.3
RCG-3	19-Oct-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.8
RCG-3	13-Nov-00	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	7.8
RCG-3	26-Feb-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	10
RCG-3	19-Mar-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	8
RCG-3	9-Apr-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.6
RCG-3	24-Apr-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.8
RCG-3	14-May-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4
RCG-3	24-May-01	surface	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	9
RCG-1	22-May-79	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.9
RCG-1	21-Jun-79	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.8
RCG-1	24-Jul-79	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.3
RCG-1	20-Aug-79	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.8
RCG-1	19-Sep-79	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.2
RCG-1	31-Oct-79	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.235
RCG-1	4-Jun-81	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	9.3
RCG-1	24-Aug-81	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.9
RCG-1	10-Aug-93	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.3
RCG-1	17-Apr-95	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.2
RCG-1	6-Jun-95	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6.1
RCG-1	10-Jul-95	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.5
RCG-1	10-Aug-95	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.51

Location	Date	Sample Depth	Parameter	Value
RCG-1	13-Oct-95	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	27-Apr-98	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	7.47
RCG-1	10-Jun-98	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.21
RCG-1	20-Jul-98	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.23
RCG-1	27-Aug-98	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.1
RCG-1	21-Oct-98	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	31-May-00	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.58
RCG-1	12-Jun-00	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	1.43
RCG-1	28-Jun-00	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.8
RCG-1	11-Jul-00	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.9
RCG-1	8-Aug-00	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.01
RCG-1	6-Sep-00	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.03
RCG-1	11-Sep-00	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	0.52
RCG-1	29-Sep-00	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.5
RCG-1	11-Oct-00	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3
RCG-1	19-Oct-00	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4
RCG-1	13-Nov-00	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	3.8
RCG-1	26-Feb-01	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6
RCG-1	19-Mar-01	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	6.5
RCG-1	9-Apr-01	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	5.3
RCG-1	24-Apr-01	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	4.4
RCG-1	14-May-01	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.8
RCG-1	24-May-01	bottom	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	2.6
RCG-1	1-Jul-77	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.2
RCG-1	22-May-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	21-Jun-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.15
RCG-1	24-Jul-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.24
RCG-1	20-Aug-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0
RCG-1	19-Sep-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	31-Oct-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.11
RCG-1	4-Jun-81	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.08
RCG-1	24-Aug-81	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.014
RCG-1	28-May-91	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.02
RCG-1	24-Jun-91	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.13

Location	Date	Sample Depth	Parameter	Value
RCG-1	15-Jul-91	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.07
RCG-1	27-Aug-91	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.03
RCG-1	17-Sep-91	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	8-Oct-91	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.12
RCG-1	10-Aug-93	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.05
RCG-1	27-May-94	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.12
RCG-1	29-Jun-94	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.39
RCG-1	20-Jul-94	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.17
RCG-1	10-Aug-94	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	1-Sep-94	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.31
RCG-1	17-Apr-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.03
RCG-1	6-Jun-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.08
RCG-1	10-Jul-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.04
RCG-1	10-Aug-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.04
RCG-1	13-Oct-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	29-May-97	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.51
RCG-1	19-Jun-97	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.17
RCG-1	21-Jul-97	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.4
RCG-1	4-Aug-97	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.17
RCG-1	22-Sep-97	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.4
RCG-1	20-Oct-97	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.26
RCG-1	27-Apr-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.35
RCG-1	28-May-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.4
RCG-1	10-Jun-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.26
RCG-1	20-Jul-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.25
RCG-1	20-Jul-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.24
RCG-1	3-Aug-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.61
RCG-1	27-Aug-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.22
RCG-1	9-Sep-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.43
RCG-1	21-Oct-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.14
RCG-1	31-May-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.06
RCG-1	12-Jun-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	28-Jun-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	11-Jul-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.14

Location	Date	Sample Depth	Parameter	Value
RCG-1	8-Aug-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	6-Sep-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	11-Sep-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	29-Sep-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	11-Oct-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	19-Oct-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	13-Nov-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.21
RCG-1	26-Feb-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.03
RCG-1	19-Mar-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	9-Apr-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.04
RCG-1	24-Apr-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.06
RCG-1	14-May-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.08
RCG-1	24-May-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.25
RCG-2	1-Jul-77	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.2
RCG-2	23-May-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.02
RCG-2	21-Jun-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.26
RCG-2	24-Jul-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.1
RCG-2	20-Aug-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.06
RCG-2	19-Sep-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.02
RCG-2	31-Oct-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.04
RCG-2	4-Jun-81	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.03
RCG-2	24-Aug-81	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	10-Aug-93	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.07
RCG-2	17-Apr-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.03
RCG-2	6-Jun-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.04
RCG-2	10-Jul-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	10-Aug-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.07
RCG-2	13-Oct-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	27-Apr-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.33
RCG-2	10-Jun-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.13
RCG-2	20-Jul-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.42
RCG-2	27-Aug-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.22
RCG-2	21-Oct-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.14
RCG-2	31-May-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.08

Location	Date	Sample Depth	Parameter	Value
RCG-2	12-Jun-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	28-Jun-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	11-Jul-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	8-Aug-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	6-Sep-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	11-Sep-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	29-Sep-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	11-Oct-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	19-Oct-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	13-Nov-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.2
RCG-2	26-Feb-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.3
RCG-2	19-Mar-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.03
RCG-2	9-Apr-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-2	24-Apr-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.06
RCG-2	14-May-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.16
RCG-2	24-May-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	1-Jul-77	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.2
RCG-3	23-May-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	21-Jun-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.18
RCG-3	24-Jul-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.08
RCG-3	20-Aug-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.06
RCG-3	19-Sep-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.04
RCG-3	31-Oct-79	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.06
RCG-3	4-Jun-81	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	1
RCG-3	24-Aug-81	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.02
RCG-3	28-May-91	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	24-Jun-91	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.17
RCG-3	15-Jul-91	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.09
RCG-3	27-Aug-91	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.02
RCG-3	17-Sep-91	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.02
RCG-3	8-Oct-91	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.03
RCG-3	27-May-94	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	29-Jun-94	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.06
RCG-3	20-Jul-94	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.11

Location	Date	Sample Depth	Parameter	Value
RCG-3	10-Aug-94	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	1-Sep-94	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.61
RCG-3	17-Apr-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.12
RCG-3	6-Jun-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.03
RCG-3	10-Jul-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.05
RCG-3	10-Aug-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.09
RCG-3	13-Oct-95	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	27-Apr-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.36
RCG-3	10-Jun-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.15
RCG-3	20-Jul-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.26
RCG-3	27-Aug-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.16
RCG-3	21-Oct-98	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.12
RCG-3	31-May-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	12-Jun-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	28-Jun-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	11-Jul-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.16
RCG-3	8-Aug-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	6-Sep-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	11-Sep-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.07
RCG-3	29-Sep-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	11-Oct-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	19-Oct-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	13-Nov-00	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	26-Feb-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	19-Mar-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-3	9-Apr-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.05
RCG-3	24-Apr-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.03
RCG-3	14-May-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.03
RCG-3	24-May-01	surface	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	22-May-79	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.32
RCG-1	21-Jun-79	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.32
RCG-1	24-Jul-79	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.38
RCG-1	20-Aug-79	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0
RCG-1	19-Sep-79	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.03

Location	Date	Sample Depth	Parameter	Value
RCG-1	31-Oct-79	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.15
RCG-1	4-Jun-81	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.39
RCG-1	24-Aug-81	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.02
RCG-1	10-Aug-93	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.09
RCG-1	17-Apr-95	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.1
RCG-1	6-Jun-95	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.13
RCG-1	10-Jul-95	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.09
RCG-1	10-Aug-95	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.02
RCG-1	13-Oct-95	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	27-Apr-98	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.33
RCG-1	10-Jun-98	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.22
RCG-1	20-Jul-98	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.26
RCG-1	27-Aug-98	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.23
RCG-1	21-Oct-98	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.18
RCG-1	31-May-00	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.18
RCG-1	12-Jun-00	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.04
RCG-1	28-Jun-00	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.26
RCG-1	11-Jul-00	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	8-Aug-00	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	6-Sep-00	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	11-Sep-00	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	29-Sep-00	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	11-Oct-00	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	19-Oct-00	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.01
RCG-1	13-Nov-00	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.2
RCG-1	26-Feb-01	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.09
RCG-1	19-Mar-01	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.04
RCG-1	9-Apr-01	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.02
RCG-1	24-Apr-01	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.07
RCG-1	14-May-01	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.14
RCG-1	24-May-01	bottom	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	0.16
RCG-1	22-May-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.1
RCG-1	21-Jun-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.1
RCG-1	24-Jul-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.3

Location	Date	Sample Depth	Parameter	Value
RCG-1	20-Aug-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1
RCG-1	19-Sep-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1
RCG-1	31-Oct-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.1
RCG-1	4-Jun-81	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.4
RCG-1	24-Aug-81	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.2
RCG-1	10-Aug-93	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.58
RCG-1	17-Apr-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.7
RCG-1	6-Jun-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	2.29
RCG-1	10-Jul-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.8
RCG-1	10-Aug-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.3
RCG-1	13-Oct-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.58
RCG-1	27-Apr-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.2
RCG-1	10-Jun-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.1
RCG-1	20-Jul-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.64
RCG-1	27-Aug-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.96
RCG-1	21-Oct-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.1
RCG-1	31-May-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.32
RCG-1	12-Jun-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.93
RCG-1	28-Jun-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.12
RCG-1	11-Jul-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.33
RCG-1	8-Aug-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.22
RCG-1	6-Sep-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.51
RCG-1	11-Sep-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.58
RCG-1	29-Sep-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	2.02
RCG-1	11-Oct-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.63
RCG-1	19-Oct-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.81
RCG-1	13-Nov-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.49
RCG-1	26-Feb-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.02
RCG-1	19-Mar-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	2.46
RCG-1	9-Apr-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.96
RCG-1	24-Apr-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.52
RCG-1	14-May-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.34
RCG-1	24-May-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.45
RCG-2	23-May-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.4

Location	Date	Sample Depth	Parameter	Value
RCG-2	21-Jun-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.4
RCG-2	24-Jul-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.3
RCG-2	20-Aug-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.9
RCG-2	19-Sep-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.4
RCG-2	31-Oct-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.3
RCG-2	4-Jun-81	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.5
RCG-2	24-Aug-81	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.6
RCG-2	10-Aug-93	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.73
RCG-2	17-Apr-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.6
RCG-2	6-Jun-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.73
RCG-2	10-Jul-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.6
RCG-2	10-Aug-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.9
RCG-2	13-Oct-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.55
RCG-2	27-Apr-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.4
RCG-2	10-Jun-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.3
RCG-2	20-Jul-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1
RCG-2	27-Aug-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1
RCG-2	21-Oct-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.1
RCG-2	31-May-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.67
RCG-2	12-Jun-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	2.62
RCG-2	28-Jun-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.99
RCG-2	11-Jul-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.56
RCG-2	8-Aug-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.73
RCG-2	6-Sep-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.52
RCG-2	11-Sep-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.35
RCG-2	29-Sep-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.78
RCG-2	11-Oct-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.82
RCG-2	19-Oct-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.93
RCG-2	13-Nov-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.48
RCG-2	26-Feb-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.35
RCG-2	19-Mar-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.09
RCG-2	9-Apr-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.3
RCG-2	24-Apr-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.76
RCG-2	14-May-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.44

Location	Date	Sample Depth	Parameter	Value
RCG-2	24-May-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.65
RCG-3	23-May-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	2.4
RCG-3	21-Jun-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.5
RCG-3	24-Jul-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.7
RCG-3	20-Aug-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.7
RCG-3	19-Sep-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.2
RCG-3	31-Oct-79	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.8
RCG-3	4-Jun-81	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	2
RCG-3	24-Aug-81	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.8
RCG-3	17-Apr-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.8
RCG-3	6-Jun-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.78
RCG-3	10-Jul-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	2.5
RCG-3	10-Aug-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	2.3
RCG-3	13-Oct-95	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.78
RCG-3	27-Apr-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.5
RCG-3	10-Jun-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.3
RCG-3	20-Jul-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.2
RCG-3	27-Aug-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.99
RCG-3	21-Oct-98	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.96
RCG-3	31-May-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.31
RCG-3	12-Jun-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.23
RCG-3	28-Jun-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.78
RCG-3	11-Jul-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.57
RCG-3	8-Aug-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	2.06
RCG-3	6-Sep-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.94
RCG-3	11-Sep-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.89
RCG-3	29-Sep-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.96
RCG-3	11-Oct-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.92
RCG-3	19-Oct-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.15
RCG-3	13-Nov-00	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.53
RCG-3	26-Feb-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.58
RCG-3	19-Mar-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.44
RCG-3	9-Apr-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.56
RCG-3	24-Apr-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.62

Location	Date	Sample Depth	Parameter	Value
RCG-3	14-May-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.51
RCG-3	24-May-01	surface	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.38
RCG-1	22-May-79	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.7
RCG-1	21-Jun-79	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.1
RCG-1	24-Jul-79	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.1
RCG-1	20-Aug-79	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.9
RCG-1	19-Sep-79	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.8
RCG-1	31-Oct-79	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.8
RCG-1	4-Jun-81	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.4
RCG-1	24-Aug-81	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.7
RCG-1	10-Aug-93	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.57
RCG-1	17-Apr-95	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.6
RCG-1	6-Jun-95	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.61
RCG-1	10-Jul-95	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.6
RCG-1	10-Aug-95	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.4
RCG-1	13-Oct-95	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.55
RCG-1	27-Apr-98	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.2
RCG-1	10-Jun-98	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.2
RCG-1	20-Jul-98	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.7
RCG-1	27-Aug-98	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1
RCG-1	21-Oct-98	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.1
RCG-1	31-May-00	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.83
RCG-1	12-Jun-00	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	2.11
RCG-1	28-Jun-00	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.82
RCG-1	11-Jul-00	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.41
RCG-1	8-Aug-00	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.2
RCG-1	6-Sep-00	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.48
RCG-1	11-Sep-00	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.39
RCG-1	29-Sep-00	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.89
RCG-1	11-Oct-00	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.1
RCG-1	19-Oct-00	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.84
RCG-1	13-Nov-00	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	0.63
RCG-1	26-Feb-01	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1
RCG-1	19-Mar-01	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.06

Location	Date	Sample Depth	Parameter	Value
RCG-1	9-Apr-01	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.43
RCG-1	24-Apr-01	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.5
RCG-1	14-May-01	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.53
RCG-1	24-May-01	bottom	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)	1.3
RCG-1	1-Jul-77		TRANSPARENCY, SECCHI DISC (INCHES)	20.4
RCG-1	22-May-79		TRANSPARENCY, SECCHI DISC (INCHES)	25
RCG-1	21-Jun-79		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	24-Jul-79		TRANSPARENCY, SECCHI DISC (INCHES)	23
RCG-1	20-Aug-79		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	19-Sep-79		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	31-Oct-79		TRANSPARENCY, SECCHI DISC (INCHES)	15.6
RCG-1	5-May-81		TRANSPARENCY, SECCHI DISC (INCHES)	24
RCG-1	4-Jun-81		TRANSPARENCY, SECCHI DISC (INCHES)	28
RCG-1	6-Jul-81		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	6-Aug-81		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	22-Aug-81		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	24-Aug-81		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	9-Oct-81		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	27-May-82		TRANSPARENCY, SECCHI DISC (INCHES)	26
RCG-1	18-Jun-82		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-1	26-Jul-82		TRANSPARENCY, SECCHI DISC (INCHES)	22
RCG-1	27-Aug-82		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	10-Sep-82		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	1-Oct-82		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-1	27-Oct-82		TRANSPARENCY, SECCHI DISC (INCHES)	21
RCG-1	12-Jun-83		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-1	25-Jun-83		TRANSPARENCY, SECCHI DISC (INCHES)	36
RCG-1	10-Jul-83		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	31-Jul-83		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	2-Sep-83		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	16-Sep-83		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	20-May-84		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	1-Jul-84		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	9-Aug-84		TRANSPARENCY, SECCHI DISC (INCHES)	26

Location	Date	Sample Depth	Parameter	Value
RCG-1	21-Sep-84		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	30-Oct-84		TRANSPARENCY, SECCHI DISC (INCHES)	24
RCG-1	3-May-85		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	7-Jun-85		TRANSPARENCY, SECCHI DISC (INCHES)	28
RCG-1	25-Jun-85		TRANSPARENCY, SECCHI DISC (INCHES)	28
RCG-1	12-Jul-85		TRANSPARENCY, SECCHI DISC (INCHES)	28
RCG-1	18-Jul-85		TRANSPARENCY, SECCHI DISC (INCHES)	24
RCG-1	1-Aug-85		TRANSPARENCY, SECCHI DISC (INCHES)	24
RCG-1	8-Aug-85		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	17-Aug-85		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	29-Aug-85		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	5-Sep-85		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	19-Sep-85		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	12-Oct-85		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	21-Oct-85		TRANSPARENCY, SECCHI DISC (INCHES)	22
RCG-1	9-May-86		TRANSPARENCY, SECCHI DISC (INCHES)	26
RCG-1	24-May-86		TRANSPARENCY, SECCHI DISC (INCHES)	22
RCG-1	30-May-86		TRANSPARENCY, SECCHI DISC (INCHES)	30
RCG-1	6-Jun-86		TRANSPARENCY, SECCHI DISC (INCHES)	22
RCG-1	12-Jun-86		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	28-Jun-86		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	5-Jul-86		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	16-Jul-86		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	1-Aug-86		TRANSPARENCY, SECCHI DISC (INCHES)	26
RCG-1	7-Aug-86		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	31-Aug-86		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	5-Sep-86		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	26-Sep-86		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	3-Oct-86		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	17-Oct-86		TRANSPARENCY, SECCHI DISC (INCHES)	24
RCG-1	15-May-87		TRANSPARENCY, SECCHI DISC (INCHES)	23
RCG-1	14-May-90		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	30-May-90		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	12-Jun-90		TRANSPARENCY, SECCHI DISC (INCHES)	15

Location	Date	Sample Depth	Parameter	Value
RCG-1	25-Jul-90		TRANSPARENCY, SECCHI DISC (INCHES)	17
RCG-1	27-Sep-90		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	9-May-91		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	28-May-91		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	6-Jun-91		TRANSPARENCY, SECCHI DISC (INCHES)	22
RCG-1	24-Jun-91		TRANSPARENCY, SECCHI DISC (INCHES)	11
RCG-1	15-Jul-91		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	24-Jul-91		TRANSPARENCY, SECCHI DISC (INCHES)	17
RCG-1	15-Aug-91		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	27-Aug-91		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	11-Sep-91		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-1	17-Sep-91		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	8-Oct-91		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-1	17-Oct-91		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	14-May-92		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	26-May-92		TRANSPARENCY, SECCHI DISC (INCHES)	17
RCG-1	10-Jun-92		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	23-Jun-92		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	15-Jul-92		TRANSPARENCY, SECCHI DISC (INCHES)	19
RCG-1	7-May-93		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	20-May-93		TRANSPARENCY, SECCHI DISC (INCHES)	17
RCG-1	3-Jun-93		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	14-Jun-93		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	24-Jun-93		TRANSPARENCY, SECCHI DISC (INCHES)	21
RCG-1	22-Jul-93		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	28-Jul-93		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	5-Aug-93		TRANSPARENCY, SECCHI DISC (INCHES)	19
RCG-1	10-Aug-93		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	26-Aug-93		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	10-Sep-93		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	30-Sep-93		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-1	14-Oct-93		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	25-Oct-93		TRANSPARENCY, SECCHI DISC (INCHES)	17
RCG-1	5-May-94		TRANSPARENCY, SECCHI DISC (INCHES)	4

Location	Date	Sample Depth	Parameter	Value
RCG-1	27-May-94		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-1	15-Jun-94		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	29-Jun-94		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	20-Jul-94		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	27-Jul-94		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-1	10-Aug-94		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	17-Aug-94		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	1-Sep-94		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-1	21-Sep-94		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	14-Oct-94		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	28-Oct-94		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	17-Apr-95		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	17-Apr-95		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	15-May-95		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	31-May-95		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-1	6-Jun-95		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	15-Jun-95		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-1	29-Jun-95		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-1	10-Jul-95		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	14-Jul-95		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	27-Jul-95		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	3-Aug-95		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	10-Aug-95		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	24-Aug-95		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-1	14-Sep-95		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	29-Sep-95		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-1	12-Oct-95		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	13-Oct-95		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	27-Oct-95		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	30-May-96		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-1	13-Jun-96		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-1	28-Jun-96		TRANSPARENCY, SECCHI DISC (INCHES)	19
RCG-1	10-Jul-96		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	25-Jul-96		TRANSPARENCY, SECCHI DISC (INCHES)	13

Location	Date	Sample Depth	Parameter	Value
RCG-1	7-Aug-96		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	30-Aug-96		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	13-Sep-96		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-1	25-Sep-96		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-1	11-Oct-96		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-1	25-Oct-96		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-1	15-May-97		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	29-May-97		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	19-Jun-97		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	2-Jul-97		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	16-Jul-97		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	21-Jul-97		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	4-Aug-97		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	11-Aug-97		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	29-Aug-97		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	11-Sep-97		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	22-Sep-97		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-1	3-Oct-97		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-1	8-Oct-97		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	20-Oct-97		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	23-Apr-98		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	27-Apr-98		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-1	27-Apr-98		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-1	14-May-98		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-1	28-May-98		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	10-Jun-98		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	12-Jun-98		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	30-Jun-98		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	10-Jul-98		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	20-Jul-98		TRANSPARENCY, SECCHI DISC (INCHES)	24
RCG-1	20-Jul-98		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	3-Aug-98		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	17-Aug-98		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	27-Aug-98		TRANSPARENCY, SECCHI DISC (INCHES)	18

Location	Date	Sample Depth	Parameter	Value
RCG-1	9-Sep-98		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-1	24-Sep-98		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-1	12-Oct-98		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	21-Oct-98		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	28-Oct-98		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	31-May-00		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-1	12-Jun-00		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	28-Jun-00		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	11-Jul-00		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	8-Aug-00		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	6-Sep-00		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	11-Sep-00		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-1	29-Sep-00		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-1	11-Oct-00		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-1	19-Oct-00		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-1	13-Nov-00		TRANSPARENCY, SECCHI DISC (INCHES)	22
RCG-1	26-Feb-01		TRANSPARENCY, SECCHI DISC (INCHES)	2
RCG-1	19-Mar-01		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-1	9-Apr-01		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-1	24-Apr-01		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-1	14-May-01		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-2	1-Jul-77		TRANSPARENCY, SECCHI DISC (INCHES)	9.6
RCG-2	23-May-79		TRANSPARENCY, SECCHI DISC (INCHES)	23
RCG-2	21-Jun-79		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	24-Jul-79		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-2	20-Aug-79		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	19-Sep-79		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	31-Oct-79		TRANSPARENCY, SECCHI DISC (INCHES)	14.4
RCG-2	5-May-81		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-2	4-Jun-81		TRANSPARENCY, SECCHI DISC (INCHES)	22
RCG-2	6-Jul-81		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-2	6-Aug-81		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	22-Aug-81		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-2	24-Aug-81		TRANSPARENCY, SECCHI DISC (INCHES)	15

Location	Date	Sample Depth	Parameter	Value
RCG-2	9-Oct-81		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-2	27-May-82		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	18-Jun-82		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	26-Jul-82		TRANSPARENCY, SECCHI DISC (INCHES)	11
RCG-2	27-Aug-82		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	10-Sep-82		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	1-Oct-82		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	27-Oct-82		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	12-Jun-83		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	25-Jun-83		TRANSPARENCY, SECCHI DISC (INCHES)	26
RCG-2	10-Jul-83		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	31-Jul-83		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	2-Sep-83		TRANSPARENCY, SECCHI DISC (INCHES)	24
RCG-2	16-Sep-83		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-2	20-May-84		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-2	1-Jul-84		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	9-Aug-84		TRANSPARENCY, SECCHI DISC (INCHES)	22
RCG-2	21-Sep-84		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-2	30-Oct-84		TRANSPARENCY, SECCHI DISC (INCHES)	24
RCG-2	3-May-85		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	7-Jun-85		TRANSPARENCY, SECCHI DISC (INCHES)	26
RCG-2	25-Jun-85		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	12-Jul-85		TRANSPARENCY, SECCHI DISC (INCHES)	24
RCG-2	18-Jul-85		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-2	1-Aug-85		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	8-Aug-85		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	17-Aug-85		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	29-Aug-85		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-2	5-Sep-85		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	19-Sep-85		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	12-Oct-85		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	21-Oct-85		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	9-May-86		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-2	24-May-86		TRANSPARENCY, SECCHI DISC (INCHES)	18

Location	Date	Sample Depth	Parameter	Value
RCG-2	30-May-86		TRANSPARENCY, SECCHI DISC (INCHES)	24
RCG-2	6-Jun-86		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-2	12-Jun-86		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	28-Jun-86		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	5-Jul-86		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	16-Jul-86		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	1-Aug-86		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-2	7-Aug-86		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	31-Aug-86		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	5-Sep-86		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	26-Sep-86		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-2	3-Oct-86		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	17-Oct-86		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-2	15-May-87		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	14-May-90		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-2	30-May-90		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	12-Jun-90		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-2	25-Jul-90		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	27-Sep-90		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-2	9-May-91		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-2	28-May-91		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-2	6-Jun-91		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-2	24-Jun-91		TRANSPARENCY, SECCHI DISC (INCHES)	11
RCG-2	15-Jul-91		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	24-Jul-91		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	15-Aug-91		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-2	27-Aug-91		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-2	11-Sep-91		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	17-Sep-91		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	8-Oct-91		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	17-Oct-91		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	14-May-92		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-2	26-May-92		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	10-Jun-92		TRANSPARENCY, SECCHI DISC (INCHES)	10

Location	Date	Sample Depth	Parameter	Value
RCG-2	23-Jun-92		TRANSPARENCY, SECCHI DISC (INCHES)	11
RCG-2	15-Jul-92		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	7-May-93		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-2	20-May-93		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-2	3-Jun-93		TRANSPARENCY, SECCHI DISC (INCHES)	11
RCG-2	14-Jun-93		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	24-Jun-93		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-2	22-Jul-93		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	28-Jul-93		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-2	5-Aug-93		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-2	10-Aug-93		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-2	26-Aug-93		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	10-Sep-93		TRANSPARENCY, SECCHI DISC (INCHES)	11
RCG-2	30-Sep-93		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-2	14-Oct-93		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	25-Oct-93		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	5-May-94		TRANSPARENCY, SECCHI DISC (INCHES)	5
RCG-2	27-May-94		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	15-Jun-94		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	29-Jun-94		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-2	20-Jul-94		TRANSPARENCY, SECCHI DISC (INCHES)	7
RCG-2	27-Jul-94		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-2	10-Aug-94		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-2	17-Aug-94		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	1-Sep-94		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-2	21-Sep-94		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	14-Oct-94		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	28-Oct-94		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-2	17-Apr-95		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-2	15-May-95		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	31-May-95		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	6-Jun-95		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-2	15-Jun-95		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-2	29-Jun-95		TRANSPARENCY, SECCHI DISC (INCHES)	8

Location	Date	Sample Depth	Parameter	Value
RCG-2	10-Jul-95		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-2	14-Jul-95		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	27-Jul-95		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	3-Aug-95		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-2	10-Aug-95		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	24-Aug-95		TRANSPARENCY, SECCHI DISC (INCHES)	11
RCG-2	14-Sep-95		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	29-Sep-95		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-2	12-Oct-95		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	13-Oct-95		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	27-Oct-95		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	30-May-96		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-2	13-Jun-96		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	28-Jun-96		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	10-Jul-96		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	25-Jul-96		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	7-Aug-96		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	30-Aug-96		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	13-Sep-96		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-2	25-Sep-96		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-2	11-Oct-96		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	25-Oct-96		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	15-May-97		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	29-May-97		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	19-Jun-97		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-2	2-Jul-97		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	16-Jul-97		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	21-Jul-97		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-2	4-Aug-97		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	11-Aug-97		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	29-Aug-97		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	11-Sep-97		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-2	22-Sep-97		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	3-Oct-97		TRANSPARENCY, SECCHI DISC (INCHES)	8

Location	Date	Sample Depth	Parameter	Value
RCG-2	8-Oct-97		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	20-Oct-97		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	23-Apr-98		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	27-Apr-98		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	14-May-98		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	28-May-98		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	10-Jun-98		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	12-Jun-98		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	30-Jun-98		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	10-Jul-98		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	20-Jul-98		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	20-Jul-98		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	3-Aug-98		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	17-Aug-98		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	27-Aug-98		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	9-Sep-98		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-2	24-Sep-98		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	12-Oct-98		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	21-Oct-98		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-2	28-Oct-98		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	31-May-00		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	12-Jun-00		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-2	28-Jun-00		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	11-Jul-00		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	8-Aug-00		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-2	6-Sep-00		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	11-Sep-00		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-2	29-Sep-00		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-2	11-Oct-00		TRANSPARENCY, SECCHI DISC (INCHES)	7
RCG-2	19-Oct-00		TRANSPARENCY, SECCHI DISC (INCHES)	18
RCG-2	13-Nov-00		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-2	26-Feb-01		TRANSPARENCY, SECCHI DISC (INCHES)	2
RCG-2	19-Mar-01		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-2	9-Apr-01		TRANSPARENCY, SECCHI DISC (INCHES)	14

Location	Date	Sample Depth	Parameter	Value
RCG-2	24-Apr-01		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-2	14-May-01		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	1-Jul-77		TRANSPARENCY, SECCHI DISC (INCHES)	8.4
RCG-3	23-May-79		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-3	21-Jun-79		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	24-Jul-79		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	20-Aug-79		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	19-Sep-79		TRANSPARENCY, SECCHI DISC (INCHES)	13
RCG-3	31-Oct-79		TRANSPARENCY, SECCHI DISC (INCHES)	8.4
RCG-3	5-May-81		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-3	4-Jun-81		TRANSPARENCY, SECCHI DISC (INCHES)	17
RCG-3	6-Jul-81		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	6-Aug-81		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	22-Aug-81		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	24-Aug-81		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	9-Oct-81		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	27-May-82		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	18-Jun-82		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	26-Jul-82		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	27-Aug-82		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	10-Sep-82		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	1-Oct-82		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	27-Oct-82		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	12-Jun-83		TRANSPARENCY, SECCHI DISC (INCHES)	5
RCG-3	25-Jun-83		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-3	10-Jul-83		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	31-Jul-83		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	2-Sep-83		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	16-Sep-83		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	20-May-84		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-3	1-Jul-84		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	9-Aug-84		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-3	21-Sep-84		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	30-Oct-84		TRANSPARENCY, SECCHI DISC (INCHES)	12

Location	Date	Sample Depth	Parameter	Value
RCG-3	3-May-85		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	7-Jun-85		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-3	25-Jun-85		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	12-Jul-85		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	18-Jul-85		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	1-Aug-85		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	8-Aug-85		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	17-Aug-85		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	29-Aug-85		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	5-Sep-85		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	19-Sep-85		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	12-Oct-85		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	21-Oct-85		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	9-May-86		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-3	24-May-86		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	30-May-86		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	6-Jun-86		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	12-Jun-86		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	28-Jun-86		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	5-Jul-86		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	16-Jul-86		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	1-Aug-86		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	7-Aug-86		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	31-Aug-86		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	5-Sep-86		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	26-Sep-86		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	3-Oct-86		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	17-Oct-86		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	15-May-87		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	14-May-90		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	30-May-90		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-3	12-Jun-90		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-3	25-Jul-90		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	27-Sep-90		TRANSPARENCY, SECCHI DISC (INCHES)	12

Location	Date	Sample Depth	Parameter	Value
RCG-3	9-May-91		TRANSPARENCY, SECCHI DISC (INCHES)	11
RCG-3	28-May-91		TRANSPARENCY, SECCHI DISC (INCHES)	11
RCG-3	6-Jun-91		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	24-Jun-91		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	15-Jul-91		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	24-Jul-91		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	15-Aug-91		TRANSPARENCY, SECCHI DISC (INCHES)	11
RCG-3	27-Aug-91		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	11-Sep-91		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-3	17-Sep-91		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-3	8-Oct-91		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	17-Oct-91		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	14-May-92		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-3	26-May-92		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	10-Jun-92		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	23-Jun-92		TRANSPARENCY, SECCHI DISC (INCHES)	5
RCG-3	15-Jul-92		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	7-May-93		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	20-May-93		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	3-Jun-93		TRANSPARENCY, SECCHI DISC (INCHES)	7
RCG-3	14-Jun-93		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	24-Jun-93		TRANSPARENCY, SECCHI DISC (INCHES)	5
RCG-3	22-Jul-93		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	28-Jul-93		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	5-Aug-93		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	26-Aug-93		TRANSPARENCY, SECCHI DISC (INCHES)	5
RCG-3	10-Sep-93		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	30-Sep-93		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	14-Oct-93		TRANSPARENCY, SECCHI DISC (INCHES)	15
RCG-3	25-Oct-93		TRANSPARENCY, SECCHI DISC (INCHES)	16
RCG-3	5-May-94		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	27-May-94		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-3	15-Jun-94		TRANSPARENCY, SECCHI DISC (INCHES)	7
RCG-3	29-Jun-94		TRANSPARENCY, SECCHI DISC (INCHES)	3

Location	Date	Sample Depth	Parameter	Value
RCG-3	20-Jul-94		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	27-Jul-94		TRANSPARENCY, SECCHI DISC (INCHES)	5
RCG-3	10-Aug-94		TRANSPARENCY, SECCHI DISC (INCHES)	5
RCG-3	17-Aug-94		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	1-Sep-94		TRANSPARENCY, SECCHI DISC (INCHES)	5
RCG-3	21-Sep-94		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	14-Oct-94		TRANSPARENCY, SECCHI DISC (INCHES)	7
RCG-3	28-Oct-94		TRANSPARENCY, SECCHI DISC (INCHES)	7
RCG-3	17-Apr-95		TRANSPARENCY, SECCHI DISC (INCHES)	3
RCG-3	17-Apr-95		TRANSPARENCY, SECCHI DISC (INCHES)	3
RCG-3	15-May-95		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-3	31-May-95		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	6-Jun-95		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-3	15-Jun-95		TRANSPARENCY, SECCHI DISC (INCHES)	7
RCG-3	29-Jun-95		TRANSPARENCY, SECCHI DISC (INCHES)	3
RCG-3	10-Jul-95		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	10-Jul-95		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	14-Jul-95		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	27-Jul-95		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	3-Aug-95		TRANSPARENCY, SECCHI DISC (INCHES)	5
RCG-3	10-Aug-95		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	24-Aug-95		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	14-Sep-95		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	29-Sep-95		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	12-Oct-95		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	13-Oct-95		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	27-Oct-95		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	30-May-96		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	13-Jun-96		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	28-Jun-96		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	10-Jul-96		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	25-Jul-96		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	7-Aug-96		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	30-Aug-96		TRANSPARENCY, SECCHI DISC (INCHES)	4

Location	Date	Sample Depth	Parameter	Value
RCG-3	13-Sep-96		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	25-Sep-96		TRANSPARENCY, SECCHI DISC (INCHES)	5
RCG-3	11-Oct-96		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	25-Oct-96		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	15-May-97		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	29-May-97		TRANSPARENCY, SECCHI DISC (INCHES)	5
RCG-3	19-Jun-97		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	2-Jul-97		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	16-Jul-97		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	21-Jul-97		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	4-Aug-97		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	11-Aug-97		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	29-Aug-97		TRANSPARENCY, SECCHI DISC (INCHES)	7
RCG-3	11-Sep-97		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	22-Sep-97		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	3-Oct-97		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	8-Oct-97		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	20-Oct-97		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	23-Apr-98		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-3	27-Apr-98		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	14-May-98		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	28-May-98		TRANSPARENCY, SECCHI DISC (INCHES)	14
RCG-3	10-Jun-98		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	12-Jun-98		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	30-Jun-98		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	10-Jul-98		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	20-Jul-98		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	20-Jul-98		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	3-Aug-98		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	17-Aug-98		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	27-Aug-98		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	9-Sep-98		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	24-Sep-98		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	12-Oct-98		TRANSPARENCY, SECCHI DISC (INCHES)	8

Location	Date	Sample Depth	Parameter	Value
RCG-3	21-Oct-98		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	28-Oct-98		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	31-May-00		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	12-Jun-00		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	28-Jun-00		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	11-Jul-00		TRANSPARENCY, SECCHI DISC (INCHES)	3
RCG-3	8-Aug-00		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	6-Sep-00		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	11-Sep-00		TRANSPARENCY, SECCHI DISC (INCHES)	6
RCG-3	29-Sep-00		TRANSPARENCY, SECCHI DISC (INCHES)	9
RCG-3	11-Oct-00		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	19-Oct-00		TRANSPARENCY, SECCHI DISC (INCHES)	12
RCG-3	13-Nov-00		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	26-Feb-01		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-3	19-Mar-01		TRANSPARENCY, SECCHI DISC (INCHES)	20
RCG-3	9-Apr-01		TRANSPARENCY, SECCHI DISC (INCHES)	10
RCG-3	24-Apr-01		TRANSPARENCY, SECCHI DISC (INCHES)	8
RCG-3	14-May-01		TRANSPARENCY, SECCHI DISC (INCHES)	4
RCG-1	21-Jun-79	surface	ALDRIN IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-2	21-Jun-79	surface	ALDRIN IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-3	21-Jun-79	surface	ALDRIN IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-1	21-Jun-79	bottom	ALDRIN IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-2	21-Jun-79	bottom	ALDRIN IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-1	22-May-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	4
RCG-1	21-Jun-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	3
RCG-1	24-Jul-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	7
RCG-1	20-Aug-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	5
RCG-1	19-Sep-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	5
RCG-1	31-Oct-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	6
RCG-2	23-May-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	4
RCG-2	21-Jun-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	6
RCG-2	24-Jul-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	8
RCG-2	20-Aug-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	5
RCG-2	19-Sep-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	8

Location	Date	Sample Depth	Parameter	Value
RCG-2	31-Oct-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	11
RCG-3	23-May-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	9
RCG-3	21-Jun-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	10
RCG-3	24-Jul-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	9
RCG-3	20-Aug-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	11
RCG-3	19-Sep-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	6
RCG-3	31-Oct-79	surface	CARBON, TOTAL ORGANIC (MG/L AS C)	13
RCG-1	22-May-79	bottom	CARBON, TOTAL ORGANIC (MG/L AS C)	10
RCG-1	21-Jun-79	bottom	CARBON, TOTAL ORGANIC (MG/L AS C)	3
RCG-1	24-Jul-79	bottom	CARBON, TOTAL ORGANIC (MG/L AS C)	10
RCG-1	20-Aug-79	bottom	CARBON, TOTAL ORGANIC (MG/L AS C)	5
RCG-1	19-Sep-79	bottom	CARBON, TOTAL ORGANIC (MG/L AS C)	4
RCG-1	31-Oct-79	bottom	CARBON, TOTAL ORGANIC (MG/L AS C)	11
RCG-2	23-May-79	bottom	CARBON, TOTAL ORGANIC (MG/L AS C)	6
RCG-2	21-Jun-79	bottom	CARBON, TOTAL ORGANIC (MG/L AS C)	5
RCG-2	24-Jul-79	bottom	CARBON, TOTAL ORGANIC (MG/L AS C)	7
RCG-2	20-Aug-79	bottom	CARBON, TOTAL ORGANIC (MG/L AS C)	7
RCG-2	19-Sep-79	bottom	CARBON, TOTAL ORGANIC (MG/L AS C)	6
RCG-2	31-Oct-79	bottom	CARBON, TOTAL ORGANIC (MG/L AS C)	8
RCG-1	21-Jun-79	surface	CHLORDANE(TECH MIX & METABS),WHOLE WATER,UG/L	0.02
RCG-2	21-Jun-79	surface	CHLORDANE(TECH MIX & METABS),WHOLE WATER,UG/L	0.02
RCG-3	21-Jun-79	surface	CHLORDANE(TECH MIX & METABS),WHOLE WATER,UG/L	0.02
RCG-1	21-Jun-79	bottom	CHLORDANE(TECH MIX & METABS),WHOLE WATER,UG/L	0.02
RCG-2	21-Jun-79	bottom	CHLORDANE(TECH MIX & METABS),WHOLE WATER,UG/L	0.02
RCG-1	22-May-79	surface	CHLORIDE,TOTAL IN WATER MG/L	43
RCG-1	21-Jun-79	surface	CHLORIDE,TOTAL IN WATER MG/L	50
RCG-1	24-Jul-79	surface	CHLORIDE,TOTAL IN WATER MG/L	52
RCG-1	20-Aug-79	surface	CHLORIDE,TOTAL IN WATER MG/L	26
RCG-1	19-Sep-79	surface	CHLORIDE,TOTAL IN WATER MG/L	26
RCG-1	31-Oct-79	surface	CHLORIDE,TOTAL IN WATER MG/L	29
RCG-2	23-May-79	surface	CHLORIDE,TOTAL IN WATER MG/L	49
RCG-2	21-Jun-79	surface	CHLORIDE,TOTAL IN WATER MG/L	50
RCG-2	24-Jul-79	surface	CHLORIDE,TOTAL IN WATER MG/L	54
RCG-2	20-Aug-79	surface	CHLORIDE,TOTAL IN WATER MG/L	27

Location	Date	Sample Depth	Parameter	Value
RCG-2	19-Sep-79	surface	CHLORIDE,TOTAL IN WATER	MG/L 27
RCG-2	31-Oct-79	surface	CHLORIDE,TOTAL IN WATER	MG/L 31
RCG-3	23-May-79	surface	CHLORIDE,TOTAL IN WATER	MG/L 54
RCG-3	21-Jun-79	surface	CHLORIDE,TOTAL IN WATER	MG/L 50
RCG-3	24-Jul-79	surface	CHLORIDE,TOTAL IN WATER	MG/L 61
RCG-3	20-Aug-79	surface	CHLORIDE,TOTAL IN WATER	MG/L 29
RCG-3	19-Sep-79	surface	CHLORIDE,TOTAL IN WATER	MG/L 28
RCG-3	31-Oct-79	surface	CHLORIDE,TOTAL IN WATER	MG/L 30
RCG-1	22-May-79	bottom	CHLORIDE,TOTAL IN WATER	MG/L 33
RCG-1	21-Jun-79	bottom	CHLORIDE,TOTAL IN WATER	MG/L 49
RCG-1	24-Jul-79	bottom	CHLORIDE,TOTAL IN WATER	MG/L 52
RCG-1	20-Aug-79	bottom	CHLORIDE,TOTAL IN WATER	MG/L 25
RCG-1	19-Sep-79	bottom	CHLORIDE,TOTAL IN WATER	MG/L 26
RCG-1	31-Oct-79	bottom	CHLORIDE,TOTAL IN WATER	MG/L 30
RCG-2	23-May-79	bottom	CHLORIDE,TOTAL IN WATER	MG/L 50
RCG-2	21-Jun-79	bottom	CHLORIDE,TOTAL IN WATER	MG/L 50
RCG-2	24-Jul-79	bottom	CHLORIDE,TOTAL IN WATER	MG/L 54
RCG-2	20-Aug-79	bottom	CHLORIDE,TOTAL IN WATER	MG/L 27
RCG-2	19-Sep-79	bottom	CHLORIDE,TOTAL IN WATER	MG/L 27
RCG-2	31-Oct-79	bottom	CHLORIDE,TOTAL IN WATER	MG/L 30
RCG-1	4-Jun-81	surface	COD, .025N K2CR2O7	MG/L 26
RCG-1	24-Aug-81	surface	COD, .025N K2CR2O7	MG/L 27
RCG-1	10-Aug-93	surface	COD, .025N K2CR2O7	MG/L 10
RCG-2	4-Jun-81	surface	COD, .025N K2CR2O7	MG/L 21
RCG-2	24-Aug-81	surface	COD, .025N K2CR2O7	MG/L 25
RCG-2	10-Aug-93	surface	COD, .025N K2CR2O7	MG/L 10
RCG-3	4-Jun-81	surface	COD, .025N K2CR2O7	MG/L 45
RCG-3	24-Aug-81	surface	COD, .025N K2CR2O7	MG/L 36
RCG-1	4-Jun-81	bottom	COD, .025N K2CR2O7	MG/L 16
RCG-1	24-Aug-81	bottom	COD, .025N K2CR2O7	MG/L 17
RCG-1	10-Aug-93	bottom	COD, .025N K2CR2O7	MG/L 12
RCG-2	10-Aug-93	bottom	COD, .025N K2CR2O7	MG/L 11
RCG-1	21-Jun-79	surface	DDT IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-2	21-Jun-79	surface	DDT IN WHOLE WATER SAMPLE (UG/L)	0.01

Location	Date	Sample Depth	Parameter	Value
RCG-3	21-Jun-79	surface	DDT IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-1	21-Jun-79	bottom	DDT IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-2	21-Jun-79	bottom	DDT IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-1	21-Jun-79	surface	ENDRIN IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-2	21-Jun-79	surface	ENDRIN IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-3	21-Jun-79	surface	ENDRIN IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-1	21-Jun-79	bottom	ENDRIN IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-2	21-Jun-79	bottom	ENDRIN IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-1	21-Jun-79	surface	HEPTACHLOR EPOXIDE IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-2	21-Jun-79	surface	HEPTACHLOR EPOXIDE IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-1	21-Jun-79	bottom	HEPTACHLOR EPOXIDE IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-2	21-Jun-79	bottom	HEPTACHLOR EPOXIDE IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-1	21-Jun-79	surface	HEPTACHLOR IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-2	21-Jun-79	surface	HEPTACHLOR IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-3	21-Jun-79	surface	HEPTACHLOR IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-1	21-Jun-79	bottom	HEPTACHLOR IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-2	21-Jun-79	bottom	HEPTACHLOR IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-1	21-Jun-79	surface	LINDANE IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-2	21-Jun-79	surface	LINDANE IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-3	21-Jun-79	surface	LINDANE IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-1	21-Jun-79	bottom	LINDANE IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-2	21-Jun-79	bottom	LINDANE IN WHOLE WATER SAMPLE (UG/L)	0.01
RCG-1	21-Jun-79	surface	METHOXYCHLOR IN WHOLE WATER SAMPLE (UG/L)	0.05
RCG-2	21-Jun-79	surface	METHOXYCHLOR IN WHOLE WATER SAMPLE (UG/L)	0.05
RCG-3	21-Jun-79	surface	METHOXYCHLOR IN WHOLE WATER SAMPLE (UG/L)	0.05
RCG-1	21-Jun-79	bottom	METHOXYCHLOR IN WHOLE WATER SAMPLE (UG/L)	0.05
RCG-2	21-Jun-79	bottom	METHOXYCHLOR IN WHOLE WATER SAMPLE (UG/L)	0.05
RCG-1	21-Jun-79	surface	PCBS IN WHOLE WATER SAMPLE (UG/L)	0.1
RCG-2	21-Jun-79	surface	PCBS IN WHOLE WATER SAMPLE (UG/L)	0.1
RCG-3	21-Jun-79	surface	PCBS IN WHOLE WATER SAMPLE (UG/L)	0.1
RCG-1	21-Jun-79	bottom	PCBS IN WHOLE WATER SAMPLE (UG/L)	0.1
RCG-2	21-Jun-79	bottom	PCBS IN WHOLE WATER SAMPLE (UG/L)	0.1
RCG-1	22-May-79	19	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-1	22-May-79	19	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1

Location	Date	Sample Depth	Parameter	Value
RCG-1	10-Aug-93	19	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-1	20-Jul-98	16	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-1	26-Jul-00	15	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1.1
RCG-2	23-May-79	10	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-2	23-May-79	10	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-2	10-Aug-93	15	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-2	26-Jul-00	7	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-3	23-May-79	3	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-3	23-May-79	3	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-3	20-Jul-98	2	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1.5
RCG-3	26-Jul-00	4	ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-1	20-Jul-98	16	ALACHLOR (LASSO),BOTTOM DEPOSITS,DRY WGT,UG/KG	33
RCG-1	26-Jul-00	15	ALACHLOR (LASSO),BOTTOM DEPOSITS,DRY WGT,UG/KG	28
RCG-2	26-Jul-00	7	ALACHLOR (LASSO),BOTTOM DEPOSITS,DRY WGT,UG/KG	10
RCG-3	20-Jul-98	2	ALACHLOR (LASSO),BOTTOM DEPOSITS,DRY WGT,UG/KG	11
RCG-3	26-Jul-00	4	ALACHLOR (LASSO),BOTTOM DEPOSITS,DRY WGT,UG/KG	12
RCG-1	20-Jul-98	16	ATRAZINE IN BOTTOM DEPOS (UG/KG DRY SOLIDS)	50
RCG-1	26-Jul-00	15	ATRAZINE IN BOTTOM DEPOS (UG/KG DRY SOLIDS)	50
RCG-2	26-Jul-00	7	ATRAZINE IN BOTTOM DEPOS (UG/KG DRY SOLIDS)	50
RCG-3	20-Jul-98	2	ATRAZINE IN BOTTOM DEPOS (UG/KG DRY SOLIDS)	50
RCG-3	26-Jul-00	4	ATRAZINE IN BOTTOM DEPOS (UG/KG DRY SOLIDS)	50
RCG-1	22-May-79	19	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1
RCG-1	22-May-79	19	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1
RCG-1	10-Aug-93	19	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1
RCG-1	20-Jul-98	16	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1
RCG-1	26-Jul-00	15	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1
RCG-2	23-May-79	10	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1
RCG-2	23-May-79	10	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1
RCG-2	10-Aug-93	15	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1
RCG-2	26-Jul-00	7	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1
RCG-3	23-May-79	3	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1
RCG-3	23-May-79	3	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1
RCG-3	20-Jul-98	2	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1
RCG-3	26-Jul-00	4	BHC-ALPHA ISOMER, BOTTOM DEPOS (UG/KG DRY SOL)	1

Location	Date	Sample Depth	Parameter	Value
RCG-1	20-Jul-98	16	BLADEX (CYANAZINE) IN SEDIMENT DRY WEIGHT MG/KG	25
RCG-1	26-Jul-00	15	BLADEX (CYANAZINE) IN SEDIMENT DRY WEIGHT MG/KG	25
RCG-2	26-Jul-00	7	BLADEX (CYANAZINE) IN SEDIMENT DRY WEIGHT MG/KG	25
RCG-3	20-Jul-98	2	BLADEX (CYANAZINE) IN SEDIMENT DRY WEIGHT MG/KG	25
RCG-3	26-Jul-00	4	BLADEX (CYANAZINE) IN SEDIMENT DRY WEIGHT MG/KG	25
RCG-1	20-Jul-98	16	CAPTAN, DRY WEIGHT, SEDIMENT UG/KG	10
RCG-3	20-Jul-98	2	CAPTAN, DRY WEIGHT, SEDIMENT UG/KG	10
RCG-1	26-Jul-00	15	CAPTAN, DRY WEIGHT, SEDIMENT UG/KG	10
RCG-2	26-Jul-00	7	CAPTAN, DRY WEIGHT, SEDIMENT UG/KG	10
RCG-3	26-Jul-00	4	CAPTAN, DRY WEIGHT, SEDIMENT UG/KG	10
RCG-1	10-Aug-93	19	CHLORDANE(TECH MIX&METABS),SEDIMENTS,DRY WGT,UG/KG	5
RCG-1	20-Jul-98	16	CHLORDANE(TECH MIX&METABS),SEDIMENTS,DRY WGT,UG/KG	5
RCG-1	26-Jul-00	15	CHLORDANE(TECH MIX&METABS),SEDIMENTS,DRY WGT,UG/KG	5
RCG-2	23-May-79	10	CHLORDANE(TECH MIX&METABS),SEDIMENTS,DRY WGT,UG/KG	5
RCG-2	10-Aug-93	15	CHLORDANE(TECH MIX&METABS),SEDIMENTS,DRY WGT,UG/KG	5
RCG-2	26-Jul-00	7	CHLORDANE(TECH MIX&METABS),SEDIMENTS,DRY WGT,UG/KG	5
RCG-3	20-Jul-98	2	CHLORDANE(TECH MIX&METABS),SEDIMENTS,DRY WGT,UG/KG	5
RCG-3	26-Jul-00	4	CHLORDANE(TECH MIX&METABS),SEDIMENTS,DRY WGT,UG/KG	5
RCG-1	10-Aug-93	19	CHLORDANE-CIS ISOMER BOTTOM DEPOS (UG/KG DRY SOL	2
RCG-1	20-Jul-98	16	CHLORDANE-CIS ISOMER BOTTOM DEPOS (UG/KG DRY SOL	2
RCG-1	26-Jul-00	15	CHLORDANE-CIS ISOMER BOTTOM DEPOS (UG/KG DRY SOL	2
RCG-2	10-Aug-93	15	CHLORDANE-CIS ISOMER BOTTOM DEPOS (UG/KG DRY SOL	2
RCG-2	26-Jul-00	7	CHLORDANE-CIS ISOMER BOTTOM DEPOS (UG/KG DRY SOL	2
RCG-3	20-Jul-98	2	CHLORDANE-CIS ISOMER BOTTOM DEPOS (UG/KG DRY SOL	2
RCG-3	26-Jul-00	4	CHLORDANE-CIS ISOMER BOTTOM DEPOS (UG/KG DRY SOL	2
RCG-1	10-Aug-93	19	CHLORDANE-TRANS ISOMER,BOTTOM DEPOS(UG/KG DRY SL	2
RCG-1	20-Jul-98	16	CHLORDANE-TRANS ISOMER,BOTTOM DEPOS(UG/KG DRY SL	2
RCG-1	26-Jul-00	15	CHLORDANE-TRANS ISOMER,BOTTOM DEPOS(UG/KG DRY SL	2
RCG-2	10-Aug-93	15	CHLORDANE-TRANS ISOMER,BOTTOM DEPOS(UG/KG DRY SL	2
RCG-2	26-Jul-00	7	CHLORDANE-TRANS ISOMER,BOTTOM DEPOS(UG/KG DRY SL	2
RCG-3	20-Jul-98	2	CHLORDANE-TRANS ISOMER,BOTTOM DEPOS(UG/KG DRY SL	2
RCG-3	26-Jul-00	4	CHLORDANE-TRANS ISOMER,BOTTOM DEPOS(UG/KG DRY SL	2
RCG-1	22-May-79	19	COD, BOTTOM DEPOSITS, DRY WEIGHT MG/KG	89000
RCG-1	22-May-79	19	COD, BOTTOM DEPOSITS, DRY WEIGHT MG/KG	74000

Location	Date	Sample Depth	Parameter	Value
RCG-2	23-May-79	10	COD, BOTTOM DEPOSITS, DRY WEIGHT MG/KG	79000
RCG-2	23-May-79	10	COD, BOTTOM DEPOSITS, DRY WEIGHT MG/KG	80000
RCG-3	23-May-79	3	COD, BOTTOM DEPOSITS, DRY WEIGHT MG/KG	60000
RCG-3	23-May-79	3	COD, BOTTOM DEPOSITS, DRY WEIGHT MG/KG	63000
RCG-1	22-May-79	19	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	5
RCG-1	22-May-79	19	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	5
RCG-1	10-Aug-93	19	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	10
RCG-1	20-Jul-98	16	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	10
RCG-1	26-Jul-00	15	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	10
RCG-2	23-May-79	10	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	5
RCG-2	23-May-79	10	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	5
RCG-2	10-Aug-93	15	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	10
RCG-2	26-Jul-00	7	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	10
RCG-3	23-May-79	3	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	5
RCG-3	23-May-79	3	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	5
RCG-3	20-Jul-98	2	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	10
RCG-3	26-Jul-00	4	DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	10
RCG-1	10-Aug-93	19	DIELDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOL.)	3.4
RCG-1	20-Jul-98	16	DIELDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOL.)	5.2
RCG-1	26-Jul-00	15	DIELDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOL.)	5.2
RCG-2	10-Aug-93	15	DIELDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOL.)	1
RCG-2	26-Jul-00	7	DIELDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOL.)	2.3
RCG-3	20-Jul-98	2	DIELDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOL.)	5.5
RCG-3	26-Jul-00	4	DIELDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOL.)	4.4
RCG-1	22-May-79	19	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-1	22-May-79	19	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-1	10-Aug-93	19	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-1	20-Jul-98	16	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-1	26-Jul-00	15	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-2	23-May-79	10	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-2	23-May-79	10	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-2	10-Aug-93	15	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-2	26-Jul-00	7	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-3	23-May-79	3	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1

Location	Date	Sample Depth	Parameter	Value
RCG-3	23-May-79	3	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-3	20-Jul-98	2	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-3	26-Jul-00	4	ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)	1
RCG-1	10-Aug-93	19	HEPTACHLOR EPOXIDE IN BOT. DEP. (UG/KG DRY SOL.)	1
RCG-1	20-Jul-98	16	HEPTACHLOR EPOXIDE IN BOT. DEP. (UG/KG DRY SOL.)	1
RCG-1	26-Jul-00	15	HEPTACHLOR EPOXIDE IN BOT. DEP. (UG/KG DRY SOL.)	1
RCG-2	23-May-79	10	HEPTACHLOR EPOXIDE IN BOT. DEP. (UG/KG DRY SOL.)	1
RCG-2	10-Aug-93	15	HEPTACHLOR EPOXIDE IN BOT. DEP. (UG/KG DRY SOL.)	1
RCG-2	26-Jul-00	7	HEPTACHLOR EPOXIDE IN BOT. DEP. (UG/KG DRY SOL.)	1
RCG-3	20-Jul-98	2	HEPTACHLOR EPOXIDE IN BOT. DEP. (UG/KG DRY SOL.)	1
RCG-3	26-Jul-00	4	HEPTACHLOR EPOXIDE IN BOT. DEP. (UG/KG DRY SOL.)	1
RCG-1	10-Aug-93	19	HEPTACHLOR IN BOT. DEP. (UG/KILOGRAM DRY SOLIDS)	1
RCG-1	20-Jul-98	16	HEPTACHLOR IN BOT. DEP. (UG/KILOGRAM DRY SOLIDS)	1
RCG-1	26-Jul-00	15	HEPTACHLOR IN BOT. DEP. (UG/KILOGRAM DRY SOLIDS)	1
RCG-2	23-May-79	10	HEPTACHLOR IN BOT. DEP. (UG/KILOGRAM DRY SOLIDS)	1
RCG-2	10-Aug-93	15	HEPTACHLOR IN BOT. DEP. (UG/KILOGRAM DRY SOLIDS)	1
RCG-2	26-Jul-00	7	HEPTACHLOR IN BOT. DEP. (UG/KILOGRAM DRY SOLIDS)	1
RCG-3	23-May-79	3	HEPTACHLOR IN BOT. DEP. (UG/KILOGRAM DRY SOLIDS)	1
RCG-3	20-Jul-98	2	HEPTACHLOR IN BOT. DEP. (UG/KILOGRAM DRY SOLIDS)	1
RCG-3	26-Jul-00	4	HEPTACHLOR IN BOT. DEP. (UG/KILOGRAM DRY SOLIDS)	1
RCG-1	10-Aug-93	19	HEXACHLOROBENZENE IN BOT DEPOS (UG/KG DRY SOLIDS)	1
RCG-1	20-Jul-98	16	HEXACHLOROBENZENE IN BOT DEPOS (UG/KG DRY SOLIDS)	1
RCG-1	26-Jul-00	15	HEXACHLOROBENZENE IN BOT DEPOS (UG/KG DRY SOLIDS)	1
RCG-2	10-Aug-93	15	HEXACHLOROBENZENE IN BOT DEPOS (UG/KG DRY SOLIDS)	1
RCG-2	26-Jul-00	7	HEXACHLOROBENZENE IN BOT DEPOS (UG/KG DRY SOLIDS)	1
RCG-3	20-Jul-98	2	HEXACHLOROBENZENE IN BOT DEPOS (UG/KG DRY SOLIDS)	4.8
RCG-3	26-Jul-00	4	HEXACHLOROBENZENE IN BOT DEPOS (UG/KG DRY SOLIDS)	1
RCG-1	22-May-79	19	LINDANE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-1	22-May-79	19	LINDANE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-2	23-May-79	10	LINDANE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-2	23-May-79	10	LINDANE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-3	23-May-79	3	LINDANE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-3	23-May-79	3	LINDANE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-1	10-Aug-93	19	(LINDANE)GAMMA-BHC,SEDIMENTS,DRY WGT,UG/KG	1

Location	Date	Sample Depth	Parameter	Value
RCG-1	20-Jul-98	16	(LINDANE)GAMMA-BHC,SEDIMENTS,DRY WGT,UG/KG	1
RCG-1	26-Jul-00	15	(LINDANE)GAMMA-BHC,SEDIMENTS,DRY WGT,UG/KG	1
RCG-2	10-Aug-93	15	(LINDANE)GAMMA-BHC,SEDIMENTS,DRY WGT,UG/KG	1
RCG-2	26-Jul-00	7	(LINDANE)GAMMA-BHC,SEDIMENTS,DRY WGT,UG/KG	1
RCG-3	20-Jul-98	2	(LINDANE)GAMMA-BHC,SEDIMENTS,DRY WGT,UG/KG	1
RCG-3	26-Jul-00	4	(LINDANE)GAMMA-BHC,SEDIMENTS,DRY WGT,UG/KG	1
RCG-1	22-May-79	19	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-1	22-May-79	19	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-1	10-Aug-93	19	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-1	20-Jul-98	16	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-1	26-Jul-00	15	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-2	23-May-79	10	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-2	23-May-79	10	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-2	10-Aug-93	15	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-2	26-Jul-00	7	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-3	23-May-79	3	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-3	23-May-79	3	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-3	20-Jul-98	2	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-3	26-Jul-00	4	METHOXYCHLOR IN BOTTOM DEPOSITS (UG/KG DRY SOL.)	5
RCG-1	20-Jul-98	16	METOLACHLOR (DUAL) IN BOTTOM SEDIMENT DRYWT UG/KG	25
RCG-1	26-Jul-00	15	METOLACHLOR (DUAL) IN BOTTOM SEDIMENT DRYWT UG/KG	25
RCG-2	26-Jul-00	7	METOLACHLOR (DUAL) IN BOTTOM SEDIMENT DRYWT UG/KG	25
RCG-3	20-Jul-98	2	METOLACHLOR (DUAL) IN BOTTOM SEDIMENT DRYWT UG/KG	25
RCG-3	26-Jul-00	4	METOLACHLOR (DUAL) IN BOTTOM SEDIMENT DRYWT UG/KG	25
RCG-1	20-Jul-98	16	METRIBUZIN (SENCOR), SEDIMENT, DRY WEIGHT, UG/KG	10
RCG-1	26-Jul-00	15	METRIBUZIN (SENCOR), SEDIMENT, DRY WEIGHT, UG/KG	10
RCG-2	26-Jul-00	7	METRIBUZIN (SENCOR), SEDIMENT, DRY WEIGHT, UG/KG	10
RCG-3	20-Jul-98	2	METRIBUZIN (SENCOR), SEDIMENT, DRY WEIGHT, UG/KG	10
RCG-3	26-Jul-00	4	METRIBUZIN (SENCOR), SEDIMENT, DRY WEIGHT, UG/KG	10
RCG-1	10-Aug-93	19	P,P' DDD IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-1	20-Jul-98	16	P,P' DDD IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-1	26-Jul-00	15	P,P' DDD IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	2.3
RCG-2	10-Aug-93	15	P,P' DDD IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-2	26-Jul-00	7	P,P' DDD IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1

Location	Date	Sample Depth	Parameter	Value
RCG-3	20-Jul-98	2	P,P' DDD IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-3	26-Jul-00	4	P,P' DDD IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1.4
RCG-1	10-Aug-93	19	P,P' DDE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-1	20-Jul-98	16	P,P' DDE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-1	26-Jul-00	15	P,P' DDE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-2	10-Aug-93	15	P,P' DDE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-2	26-Jul-00	7	P,P' DDE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-3	20-Jul-98	2	P,P' DDE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-3	26-Jul-00	4	P,P' DDE IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-1	10-Aug-93	19	P,P' DDT IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-1	20-Jul-98	16	P,P' DDT IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-1	26-Jul-00	15	P,P' DDT IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-2	10-Aug-93	15	P,P' DDT IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-2	26-Jul-00	7	P,P' DDT IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-3	20-Jul-98	2	P,P' DDT IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-3	26-Jul-00	4	P,P' DDT IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	1
RCG-1	22-May-79	19	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-1	22-May-79	19	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-1	10-Aug-93	19	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-1	20-Jul-98	16	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-1	26-Jul-00	15	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-2	23-May-79	10	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-2	23-May-79	10	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-2	10-Aug-93	15	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-2	26-Jul-00	7	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-3	23-May-79	3	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-3	23-May-79	3	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-3	20-Jul-98	2	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-3	26-Jul-00	4	PCBS IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)	10
RCG-1	20-Jul-98	16	PENOXALIN IN SEDIMENT (PROWL) DRY WEIGHT UG/KG	10
RCG-3	20-Jul-98	2	PENOXALIN IN SEDIMENT (PROWL) DRY WEIGHT UG/KG	10
RCG-1	20-Jul-98	16	TREFLAN(TRIFLURALIN) IN SEDIMENT DRY WEIGHT UG/KG	10
RCG-1	26-Jul-00	15	TREFLAN(TRIFLURALIN) IN SEDIMENT DRY WEIGHT UG/KG	10
RCG-2	26-Jul-00	7	TREFLAN(TRIFLURALIN) IN SEDIMENT DRY WEIGHT UG/KG	10

Location	Date	Sample Depth	Parameter	Value
RCG-3	20-Jul-98	2	TREFLAN(TRIFLURALIN) IN SEDIMENT DRY WEIGHT UG/KG	10
RCG-3	26-Jul-00	4	TREFLAN(TRIFLURALIN) IN SEDIMENT DRY WEIGHT UG/KG	10
RCG-1	22-May-79	surface	ARSENIC, TOTAL (UG/L AS AS)	5
RCG-1	21-Jun-79	surface	ARSENIC, TOTAL (UG/L AS AS)	2
RCG-1	24-Jul-79	surface	ARSENIC, TOTAL (UG/L AS AS)	1
RCG-1	20-Aug-79	surface	ARSENIC, TOTAL (UG/L AS AS)	2
RCG-1	19-Sep-79	surface	ARSENIC, TOTAL (UG/L AS AS)	5
RCG-1	31-Oct-79	surface	ARSENIC, TOTAL (UG/L AS AS)	1
RCG-2	23-May-79	surface	ARSENIC, TOTAL (UG/L AS AS)	5
RCG-2	21-Jun-79	surface	ARSENIC, TOTAL (UG/L AS AS)	2
RCG-2	24-Jul-79	surface	ARSENIC, TOTAL (UG/L AS AS)	1
RCG-2	20-Aug-79	surface	ARSENIC, TOTAL (UG/L AS AS)	2
RCG-2	19-Sep-79	surface	ARSENIC, TOTAL (UG/L AS AS)	4
RCG-2	31-Oct-79	surface	ARSENIC, TOTAL (UG/L AS AS)	1
RCG-3	23-May-79	surface	ARSENIC, TOTAL (UG/L AS AS)	5
RCG-3	21-Jun-79	surface	ARSENIC, TOTAL (UG/L AS AS)	2
RCG-3	24-Jul-79	surface	ARSENIC, TOTAL (UG/L AS AS)	2
RCG-3	20-Aug-79	surface	ARSENIC, TOTAL (UG/L AS AS)	3
RCG-3	19-Sep-79	surface	ARSENIC, TOTAL (UG/L AS AS)	5
RCG-3	31-Oct-79	surface	ARSENIC, TOTAL (UG/L AS AS)	2
RCG-1	22-May-79	bottom	ARSENIC, TOTAL (UG/L AS AS)	5
RCG-1	21-Jun-79	bottom	ARSENIC, TOTAL (UG/L AS AS)	2
RCG-1	24-Jul-79	bottom	ARSENIC, TOTAL (UG/L AS AS)	1
RCG-1	20-Aug-79	bottom	ARSENIC, TOTAL (UG/L AS AS)	2
RCG-1	19-Sep-79	bottom	ARSENIC, TOTAL (UG/L AS AS)	4
RCG-1	31-Oct-79	bottom	ARSENIC, TOTAL (UG/L AS AS)	1
RCG-2	23-May-79	bottom	ARSENIC, TOTAL (UG/L AS AS)	5
RCG-2	21-Jun-79	bottom	ARSENIC, TOTAL (UG/L AS AS)	2
RCG-2	24-Jul-79	bottom	ARSENIC, TOTAL (UG/L AS AS)	1
RCG-2	20-Aug-79	bottom	ARSENIC, TOTAL (UG/L AS AS)	2
RCG-2	19-Sep-79	bottom	ARSENIC, TOTAL (UG/L AS AS)	6
RCG-2	31-Oct-79	bottom	ARSENIC, TOTAL (UG/L AS AS)	1
RCG-1	22-May-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-1	21-Jun-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5

Location	Date	Sample Depth	Parameter	Value
RCG-1	24-Jul-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-1	20-Aug-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-1	19-Sep-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-1	31-Oct-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-2	23-May-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-2	21-Jun-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-2	24-Jul-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-2	20-Aug-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-2	19-Sep-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-2	31-Oct-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-3	23-May-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-3	21-Jun-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-3	24-Jul-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-3	20-Aug-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-3	19-Sep-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-3	31-Oct-79	surface	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-1	22-May-79	bottom	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-1	21-Jun-79	bottom	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-1	24-Jul-79	bottom	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-1	20-Aug-79	bottom	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-1	19-Sep-79	bottom	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-1	31-Oct-79	bottom	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-2	23-May-79	bottom	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-2	21-Jun-79	bottom	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-2	24-Jul-79	bottom	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-2	20-Aug-79	bottom	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-2	19-Sep-79	bottom	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-2	31-Oct-79	bottom	CADMIUM, TOTAL (UG/L AS CD)	5
RCG-1	22-May-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-1	21-Jun-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	10
RCG-1	24-Jul-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-1	20-Aug-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-1	19-Sep-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-1	31-Oct-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5

Location	Date	Sample Depth	Parameter	Value
RCG-2	23-May-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-2	21-Jun-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	10
RCG-2	24-Jul-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-2	20-Aug-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	30
RCG-2	19-Sep-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-2	31-Oct-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-3	23-May-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-3	21-Jun-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	10
RCG-3	24-Jul-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-3	20-Aug-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-3	19-Sep-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-3	31-Oct-79	surface	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-1	22-May-79	bottom	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-1	21-Jun-79	bottom	CHROMIUM, TOTAL (UG/L AS CR)	10
RCG-1	24-Jul-79	bottom	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-1	20-Aug-79	bottom	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-1	19-Sep-79	bottom	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-1	31-Oct-79	bottom	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-2	23-May-79	bottom	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-2	21-Jun-79	bottom	CHROMIUM, TOTAL (UG/L AS CR)	10
RCG-2	24-Jul-79	bottom	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-2	20-Aug-79	bottom	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-2	19-Sep-79	bottom	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-2	31-Oct-79	bottom	CHROMIUM, TOTAL (UG/L AS CR)	5
RCG-1	22-May-79	surface	COPPER, TOTAL (UG/L AS CU)	5
RCG-1	21-Jun-79	surface	COPPER, TOTAL (UG/L AS CU)	20
RCG-1	24-Jul-79	surface	COPPER, TOTAL (UG/L AS CU)	5
RCG-1	20-Aug-79	surface	COPPER, TOTAL (UG/L AS CU)	10
RCG-1	19-Sep-79	surface	COPPER, TOTAL (UG/L AS CU)	5
RCG-1	31-Oct-79	surface	COPPER, TOTAL (UG/L AS CU)	5
RCG-2	23-May-79	surface	COPPER, TOTAL (UG/L AS CU)	5
RCG-2	21-Jun-79	surface	COPPER, TOTAL (UG/L AS CU)	10
RCG-2	24-Jul-79	surface	COPPER, TOTAL (UG/L AS CU)	5
RCG-2	20-Aug-79	surface	COPPER, TOTAL (UG/L AS CU)	5

Location	Date	Sample Depth	Parameter	Value
RCG-2	19-Sep-79	surface	COPPER, TOTAL (UG/L AS CU)	5
RCG-2	31-Oct-79	surface	COPPER, TOTAL (UG/L AS CU)	5
RCG-3	23-May-79	surface	COPPER, TOTAL (UG/L AS CU)	5
RCG-3	21-Jun-79	surface	COPPER, TOTAL (UG/L AS CU)	10
RCG-3	24-Jul-79	surface	COPPER, TOTAL (UG/L AS CU)	10
RCG-3	20-Aug-79	surface	COPPER, TOTAL (UG/L AS CU)	5
RCG-3	19-Sep-79	surface	COPPER, TOTAL (UG/L AS CU)	5
RCG-3	31-Oct-79	surface	COPPER, TOTAL (UG/L AS CU)	5
RCG-1	22-May-79	bottom	COPPER, TOTAL (UG/L AS CU)	5
RCG-1	21-Jun-79	bottom	COPPER, TOTAL (UG/L AS CU)	20
RCG-1	24-Jul-79	bottom	COPPER, TOTAL (UG/L AS CU)	10
RCG-1	20-Aug-79	bottom	COPPER, TOTAL (UG/L AS CU)	10
RCG-1	19-Sep-79	bottom	COPPER, TOTAL (UG/L AS CU)	5
RCG-1	31-Oct-79	bottom	COPPER, TOTAL (UG/L AS CU)	5
RCG-2	23-May-79	bottom	COPPER, TOTAL (UG/L AS CU)	5
RCG-2	21-Jun-79	bottom	COPPER, TOTAL (UG/L AS CU)	10
RCG-2	24-Jul-79	bottom	COPPER, TOTAL (UG/L AS CU)	10
RCG-2	20-Aug-79	bottom	COPPER, TOTAL (UG/L AS CU)	5
RCG-2	19-Sep-79	bottom	COPPER, TOTAL (UG/L AS CU)	5
RCG-2	31-Oct-79	bottom	COPPER, TOTAL (UG/L AS CU)	5
RCG-1	22-May-79	surface	IRON, TOTAL (UG/L AS FE)	120
RCG-1	21-Jun-79	surface	IRON, TOTAL (UG/L AS FE)	260
RCG-1	24-Jul-79	surface	IRON, TOTAL (UG/L AS FE)	340
RCG-1	20-Aug-79	surface	IRON, TOTAL (UG/L AS FE)	380
RCG-1	19-Sep-79	surface	IRON, TOTAL (UG/L AS FE)	430
RCG-1	31-Oct-79	surface	IRON, TOTAL (UG/L AS FE)	440
RCG-2	23-May-79	surface	IRON, TOTAL (UG/L AS FE)	130
RCG-2	21-Jun-79	surface	IRON, TOTAL (UG/L AS FE)	590
RCG-2	24-Jul-79	surface	IRON, TOTAL (UG/L AS FE)	440
RCG-2	20-Aug-79	surface	IRON, TOTAL (UG/L AS FE)	650
RCG-2	19-Sep-79	surface	IRON, TOTAL (UG/L AS FE)	600
RCG-2	31-Oct-79	surface	IRON, TOTAL (UG/L AS FE)	500
RCG-3	23-May-79	surface	IRON, TOTAL (UG/L AS FE)	260
RCG-3	21-Jun-79	surface	IRON, TOTAL (UG/L AS FE)	630

Location	Date	Sample Depth	Parameter	Value
RCG-3	24-Jul-79	surface	IRON, TOTAL (UG/L AS FE)	1300
RCG-3	20-Aug-79	surface	IRON, TOTAL (UG/L AS FE)	960
RCG-3	19-Sep-79	surface	IRON, TOTAL (UG/L AS FE)	990
RCG-3	31-Oct-79	surface	IRON, TOTAL (UG/L AS FE)	3000
RCG-1	22-May-79	bottom	IRON, TOTAL (UG/L AS FE)	560
RCG-1	21-Jun-79	bottom	IRON, TOTAL (UG/L AS FE)	320
RCG-1	24-Jul-79	bottom	IRON, TOTAL (UG/L AS FE)	560
RCG-1	20-Aug-79	bottom	IRON, TOTAL (UG/L AS FE)	380
RCG-1	19-Sep-79	bottom	IRON, TOTAL (UG/L AS FE)	540
RCG-1	31-Oct-79	bottom	IRON, TOTAL (UG/L AS FE)	440
RCG-2	23-May-79	bottom	IRON, TOTAL (UG/L AS FE)	390
RCG-2	21-Jun-79	bottom	IRON, TOTAL (UG/L AS FE)	770
RCG-2	24-Jul-79	bottom	IRON, TOTAL (UG/L AS FE)	480
RCG-2	20-Aug-79	bottom	IRON, TOTAL (UG/L AS FE)	670
RCG-2	19-Sep-79	bottom	IRON, TOTAL (UG/L AS FE)	690
RCG-2	31-Oct-79	bottom	IRON, TOTAL (UG/L AS FE)	410
RCG-1	22-May-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-1	21-Jun-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-1	24-Jul-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-1	20-Aug-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-1	19-Sep-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-1	31-Oct-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-2	23-May-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-2	21-Jun-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-2	24-Jul-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-2	20-Aug-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-2	19-Sep-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-2	31-Oct-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-3	23-May-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-3	21-Jun-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-3	24-Jul-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-3	20-Aug-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-3	19-Sep-79	surface	LEAD, TOTAL (UG/L AS PB)	50
RCG-3	31-Oct-79	surface	LEAD, TOTAL (UG/L AS PB)	50

Location	Date	Sample Depth	Parameter	Value
RCG-1	22-May-79	bottom	LEAD, TOTAL (UG/L AS PB)	50
RCG-1	21-Jun-79	bottom	LEAD, TOTAL (UG/L AS PB)	50
RCG-1	24-Jul-79	bottom	LEAD, TOTAL (UG/L AS PB)	50
RCG-1	20-Aug-79	bottom	LEAD, TOTAL (UG/L AS PB)	50
RCG-1	19-Sep-79	bottom	LEAD, TOTAL (UG/L AS PB)	50
RCG-1	31-Oct-79	bottom	LEAD, TOTAL (UG/L AS PB)	50
RCG-2	23-May-79	bottom	LEAD, TOTAL (UG/L AS PB)	50
RCG-2	21-Jun-79	bottom	LEAD, TOTAL (UG/L AS PB)	50
RCG-2	24-Jul-79	bottom	LEAD, TOTAL (UG/L AS PB)	50
RCG-2	20-Aug-79	bottom	LEAD, TOTAL (UG/L AS PB)	50
RCG-2	19-Sep-79	bottom	LEAD, TOTAL (UG/L AS PB)	50
RCG-2	31-Oct-79	bottom	LEAD, TOTAL (UG/L AS PB)	50
RCG-1	22-May-79	surface	MANGANESE, TOTAL (UG/L AS MN)	20
RCG-1	21-Jun-79	surface	MANGANESE, TOTAL (UG/L AS MN)	40
RCG-1	24-Jul-79	surface	MANGANESE, TOTAL (UG/L AS MN)	70
RCG-1	20-Aug-79	surface	MANGANESE, TOTAL (UG/L AS MN)	40
RCG-1	19-Sep-79	surface	MANGANESE, TOTAL (UG/L AS MN)	70
RCG-1	31-Oct-79	surface	MANGANESE, TOTAL (UG/L AS MN)	220
RCG-2	23-May-79	surface	MANGANESE, TOTAL (UG/L AS MN)	40
RCG-2	21-Jun-79	surface	MANGANESE, TOTAL (UG/L AS MN)	80
RCG-2	24-Jul-79	surface	MANGANESE, TOTAL (UG/L AS MN)	80
RCG-2	20-Aug-79	surface	MANGANESE, TOTAL (UG/L AS MN)	60
RCG-2	19-Sep-79	surface	MANGANESE, TOTAL (UG/L AS MN)	90
RCG-2	31-Oct-79	surface	MANGANESE, TOTAL (UG/L AS MN)	250
RCG-3	23-May-79	surface	MANGANESE, TOTAL (UG/L AS MN)	60
RCG-3	21-Jun-79	surface	MANGANESE, TOTAL (UG/L AS MN)	80
RCG-3	24-Jul-79	surface	MANGANESE, TOTAL (UG/L AS MN)	270
RCG-3	20-Aug-79	surface	MANGANESE, TOTAL (UG/L AS MN)	110
RCG-3	19-Sep-79	surface	MANGANESE, TOTAL (UG/L AS MN)	130
RCG-3	31-Oct-79	surface	MANGANESE, TOTAL (UG/L AS MN)	450
RCG-1	22-May-79	bottom	MANGANESE, TOTAL (UG/L AS MN)	80
RCG-1	21-Jun-79	bottom	MANGANESE, TOTAL (UG/L AS MN)	60
RCG-1	24-Jul-79	bottom	MANGANESE, TOTAL (UG/L AS MN)	90
RCG-1	20-Aug-79	bottom	MANGANESE, TOTAL (UG/L AS MN)	50

Location	Date	Sample Depth	Parameter	Value
RCG-1	19-Sep-79	bottom	MANGANESE, TOTAL (UG/L AS MN)	90
RCG-1	31-Oct-79	bottom	MANGANESE, TOTAL (UG/L AS MN)	220
RCG-2	23-May-79	bottom	MANGANESE, TOTAL (UG/L AS MN)	70
RCG-2	21-Jun-79	bottom	MANGANESE, TOTAL (UG/L AS MN)	90
RCG-2	24-Jul-79	bottom	MANGANESE, TOTAL (UG/L AS MN)	90
RCG-2	20-Aug-79	bottom	MANGANESE, TOTAL (UG/L AS MN)	70
RCG-2	19-Sep-79	bottom	MANGANESE, TOTAL (UG/L AS MN)	90
RCG-2	31-Oct-79	bottom	MANGANESE, TOTAL (UG/L AS MN)	220
RCG-1	24-Jul-79	surface	MERCURY, TOTAL (UG/L AS HG)	0.05
RCG-1	20-Aug-79	surface	MERCURY, TOTAL (UG/L AS HG)	0.05
RCG-1	19-Sep-79	surface	MERCURY, TOTAL (UG/L AS HG)	0.05
RCG-1	31-Oct-79	surface	MERCURY, TOTAL (UG/L AS HG)	0.05
RCG-2	24-Jul-79	surface	MERCURY, TOTAL (UG/L AS HG)	0.05
RCG-2	20-Aug-79	surface	MERCURY, TOTAL (UG/L AS HG)	0.05
RCG-2	19-Sep-79	surface	MERCURY, TOTAL (UG/L AS HG)	0.05
RCG-2	31-Oct-79	surface	MERCURY, TOTAL (UG/L AS HG)	0.05
RCG-3	24-Jul-79	surface	MERCURY, TOTAL (UG/L AS HG)	0.05
RCG-3	20-Aug-79	surface	MERCURY, TOTAL (UG/L AS HG)	0.05
RCG-3	19-Sep-79	surface	MERCURY, TOTAL (UG/L AS HG)	0.05
RCG-3	31-Oct-79	surface	MERCURY, TOTAL (UG/L AS HG)	0.05
RCG-1	22-May-79	surface	ZINC, TOTAL (UG/L AS ZN)	10
RCG-1	21-Jun-79	surface	ZINC, TOTAL (UG/L AS ZN)	10
RCG-1	24-Jul-79	surface	ZINC, TOTAL (UG/L AS ZN)	5
RCG-1	20-Aug-79	surface	ZINC, TOTAL (UG/L AS ZN)	20
RCG-1	19-Sep-79	surface	ZINC, TOTAL (UG/L AS ZN)	20
RCG-1	31-Oct-79	surface	ZINC, TOTAL (UG/L AS ZN)	5
RCG-2	23-May-79	surface	ZINC, TOTAL (UG/L AS ZN)	10
RCG-2	21-Jun-79	surface	ZINC, TOTAL (UG/L AS ZN)	5
RCG-2	24-Jul-79	surface	ZINC, TOTAL (UG/L AS ZN)	5
RCG-2	20-Aug-79	surface	ZINC, TOTAL (UG/L AS ZN)	10
RCG-2	19-Sep-79	surface	ZINC, TOTAL (UG/L AS ZN)	10
RCG-2	31-Oct-79	surface	ZINC, TOTAL (UG/L AS ZN)	5
RCG-3	23-May-79	surface	ZINC, TOTAL (UG/L AS ZN)	5
RCG-3	21-Jun-79	surface	ZINC, TOTAL (UG/L AS ZN)	5

Location	Date	Sample Depth	Parameter	Value
RCG-3	24-Jul-79	surface	ZINC, TOTAL (UG/L AS ZN)	5
RCG-3	20-Aug-79	surface	ZINC, TOTAL (UG/L AS ZN)	10
RCG-3	19-Sep-79	surface	ZINC, TOTAL (UG/L AS ZN)	10
RCG-3	31-Oct-79	surface	ZINC, TOTAL (UG/L AS ZN)	20
RCG-1	22-May-79	bottom	ZINC, TOTAL (UG/L AS ZN)	10
RCG-1	21-Jun-79	bottom	ZINC, TOTAL (UG/L AS ZN)	5
RCG-1	24-Jul-79	bottom	ZINC, TOTAL (UG/L AS ZN)	5
RCG-1	20-Aug-79	bottom	ZINC, TOTAL (UG/L AS ZN)	10
RCG-1	19-Sep-79	bottom	ZINC, TOTAL (UG/L AS ZN)	10
RCG-1	31-Oct-79	bottom	ZINC, TOTAL (UG/L AS ZN)	5
RCG-2	23-May-79	bottom	ZINC, TOTAL (UG/L AS ZN)	5
RCG-2	21-Jun-79	bottom	ZINC, TOTAL (UG/L AS ZN)	5
RCG-2	24-Jul-79	bottom	ZINC, TOTAL (UG/L AS ZN)	5
RCG-2	20-Aug-79	bottom	ZINC, TOTAL (UG/L AS ZN)	5
RCG-2	19-Sep-79	bottom	ZINC, TOTAL (UG/L AS ZN)	10
RCG-2	31-Oct-79	bottom	ZINC, TOTAL (UG/L AS ZN)	5
RCG-1	22-May-79	19	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	8.6
RCG-1	22-May-79	19	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	8
RCG-1	10-Aug-93	19	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	6.9
RCG-1	10-Jul-95	17	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	9.2
RCG-1	20-Jul-98	16	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	8.3
RCG-1	26-Jul-00	15	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	4.6
RCG-2	23-May-79	10	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	7.6
RCG-2	23-May-79	10	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	7.4
RCG-2	10-Aug-93	15	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	2.5
RCG-2	26-Jul-00	7	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	8.3
RCG-3	23-May-79	3	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	4.3
RCG-3	23-May-79	3	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	4.6
RCG-3	10-Jul-95	2	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	4.1
RCG-3	20-Jul-98	2	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	4.7
RCG-3	26-Jul-00	4	ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)	7.5
RCG-1	10-Aug-93	19	BARIUM IN BOTTOM DEPOSITS (MG/KG AS BA DRY WGT)	208
RCG-1	10-Jul-95	17	BARIUM IN BOTTOM DEPOSITS (MG/KG AS BA DRY WGT)	193
RCG-1	20-Jul-98	16	BARIUM IN BOTTOM DEPOSITS (MG/KG AS BA DRY WGT)	220

Location	Date	Sample Depth	Parameter	Value
RCG-1	26-Jul-00	15	BARIUM IN BOTTOM DEPOSITS (MG/KG AS BA DRY WGT)	94
RCG-2	10-Aug-93	15	BARIUM IN BOTTOM DEPOSITS (MG/KG AS BA DRY WGT)	15
RCG-2	26-Jul-00	7	BARIUM IN BOTTOM DEPOSITS (MG/KG AS BA DRY WGT)	170
RCG-3	10-Jul-95	2	BARIUM IN BOTTOM DEPOSITS (MG/KG AS BA DRY WGT)	93
RCG-3	20-Jul-98	2	BARIUM IN BOTTOM DEPOSITS (MG/KG AS BA DRY WGT)	100
RCG-3	26-Jul-00	4	BARIUM IN BOTTOM DEPOSITS (MG/KG AS BA DRY WGT)	180
RCG-1	22-May-79	19	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	1
RCG-1	22-May-79	19	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	1
RCG-1	10-Aug-93	19	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	1
RCG-1	10-Jul-95	17	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	1
RCG-1	20-Jul-98	16	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	0.5
RCG-1	26-Jul-00	15	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	0.3
RCG-2	23-May-79	10	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	1
RCG-2	23-May-79	10	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	1
RCG-2	10-Aug-93	15	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	1
RCG-2	26-Jul-00	7	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	0.3
RCG-3	23-May-79	3	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	1
RCG-3	23-May-79	3	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	1
RCG-3	10-Jul-95	2	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	1
RCG-3	20-Jul-98	2	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	0.5
RCG-3	26-Jul-00	4	CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	0.3
RCG-1	22-May-79	19	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	30
RCG-1	22-May-79	19	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	30
RCG-1	10-Aug-93	19	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	23
RCG-1	10-Jul-95	17	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	23
RCG-1	20-Jul-98	16	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	29
RCG-1	26-Jul-00	15	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	13
RCG-2	23-May-79	10	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	27
RCG-2	23-May-79	10	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	28
RCG-2	10-Aug-93	15	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	5
RCG-2	26-Jul-00	7	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	22
RCG-3	23-May-79	3	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	19
RCG-3	23-May-79	3	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	22
RCG-3	10-Jul-95	2	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	12

Location	Date	Sample Depth	Parameter	Value
RCG-3	20-Jul-98	2	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	16
RCG-3	26-Jul-00	4	CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	22
RCG-1	22-May-79	19	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	29
RCG-1	22-May-79	19	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	28
RCG-1	10-Aug-93	19	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	25
RCG-1	10-Jul-95	17	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	29
RCG-1	20-Jul-98	16	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	38
RCG-1	26-Jul-00	15	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	19
RCG-2	23-May-79	10	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	26
RCG-2	23-May-79	10	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	23
RCG-2	10-Aug-93	15	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	5
RCG-2	26-Jul-00	7	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	34
RCG-3	23-May-79	3	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	19
RCG-3	23-May-79	3	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	20
RCG-3	10-Jul-95	2	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	15
RCG-3	20-Jul-98	2	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	28
RCG-3	26-Jul-00	4	COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)	38
RCG-1	22-May-79	19	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	35,000
RCG-1	22-May-79	19	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	35,000
RCG-1	10-Aug-93	19	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	31,000
RCG-1	10-Jul-95	17	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	48,000
RCG-1	20-Jul-98	16	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	32,000
RCG-1	26-Jul-00	15	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	14,000
RCG-2	23-May-79	10	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	29,000
RCG-2	23-May-79	10	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	30,000
RCG-2	10-Aug-93	15	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	6,300
RCG-2	26-Jul-00	7	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	26,000
RCG-3	23-May-79	3	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	19,400
RCG-3	23-May-79	3	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	21,000
RCG-3	10-Jul-95	2	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	13,000
RCG-3	20-Jul-98	2	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	16,000
RCG-3	26-Jul-00	4	IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)	26,000
RCG-1	22-May-79	19	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	40
RCG-1	22-May-79	19	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	40

Location	Date	Sample Depth	Parameter	Value
RCG-1	10-Aug-93	19	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	27
RCG-1	10-Jul-95	17	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	21
RCG-1	20-Jul-98	16	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	24
RCG-1	26-Jul-00	15	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	16
RCG-2	23-May-79	10	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	40
RCG-2	23-May-79	10	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	30
RCG-2	10-Aug-93	15	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	10
RCG-2	26-Jul-00	7	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	21
RCG-3	23-May-79	3	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	40
RCG-3	23-May-79	3	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	40
RCG-3	10-Jul-95	2	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	12
RCG-3	20-Jul-98	2	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	17
RCG-3	26-Jul-00	4	LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)	22
RCG-1	22-May-79	19	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	840
RCG-1	22-May-79	19	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	800
RCG-1	10-Aug-93	19	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	748
RCG-1	10-Jul-95	17	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	854
RCG-1	20-Jul-98	16	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	750
RCG-1	26-Jul-00	15	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	320
RCG-2	23-May-79	10	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	660
RCG-2	23-May-79	10	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	720
RCG-2	10-Aug-93	15	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	148
RCG-2	26-Jul-00	7	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	620
RCG-3	23-May-79	3	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	360
RCG-3	23-May-79	3	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	380
RCG-3	10-Jul-95	2	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	323
RCG-3	20-Jul-98	2	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	33
RCG-3	26-Jul-00	4	MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	720
RCG-1	22-May-79	19	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.12
RCG-1	22-May-79	19	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.08
RCG-1	10-Aug-93	19	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.1
RCG-1	10-Jul-95	17	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.1
RCG-1	20-Jul-98	16	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.1
RCG-1	26-Jul-00	15	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.1

Location	Date	Sample Depth	Parameter	Value
RCG-2	23-May-79	10	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.14
RCG-2	23-May-79	10	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.1
RCG-2	10-Aug-93	15	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.1
RCG-2	26-Jul-00	7	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.1
RCG-3	23-May-79	3	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.26
RCG-3	23-May-79	3	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.17
RCG-3	10-Jul-95	2	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.1
RCG-3	20-Jul-98	2	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.1
RCG-3	26-Jul-00	4	MERCURY,TOT. IN BOT. DEPOS. (MG/KG AS HG DRY WGT)	0.1
RCG-1	10-Aug-93	19	NICKEL, TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	23
RCG-1	10-Jul-95	17	NICKEL, TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	22
RCG-1	20-Jul-98	16	NICKEL, TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	25
RCG-1	26-Jul-00	15	NICKEL, TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	13
RCG-2	10-Aug-93	15	NICKEL, TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	5
RCG-2	26-Jul-00	7	NICKEL, TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	20
RCG-3	10-Jul-95	2	NICKEL, TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	12
RCG-3	20-Jul-98	2	NICKEL, TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	14
RCG-3	26-Jul-00	4	NICKEL, TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)	21
RCG-1	10-Aug-93	19	POTASSIUM IN BOTTOM DEPOSITS (MG/KG AS K DRY WGT)	2,100
RCG-1	10-Jul-95	17	POTASSIUM IN BOTTOM DEPOSITS (MG/KG AS K DRY WGT)	2,100
RCG-1	20-Jul-98	16	POTASSIUM IN BOTTOM DEPOSITS (MG/KG AS K DRY WGT)	2,400
RCG-1	26-Jul-00	15	POTASSIUM IN BOTTOM DEPOSITS (MG/KG AS K DRY WGT)	1,100
RCG-2	10-Aug-93	15	POTASSIUM IN BOTTOM DEPOSITS (MG/KG AS K DRY WGT)	1,000
RCG-2	26-Jul-00	7	POTASSIUM IN BOTTOM DEPOSITS (MG/KG AS K DRY WGT)	2,100
RCG-3	10-Jul-95	2	POTASSIUM IN BOTTOM DEPOSITS (MG/KG AS K DRY WGT)	1,000
RCG-3	20-Jul-98	2	POTASSIUM IN BOTTOM DEPOSITS (MG/KG AS K DRY WGT)	1,500
RCG-3	26-Jul-00	4	POTASSIUM IN BOTTOM DEPOSITS (MG/KG AS K DRY WGT)	2,000
RCG-1	10-Aug-93	19	SILVER IN BOTTOM DEPOSITS (MG/KG AS AG DRY WGT)	1
RCG-1	10-Jul-95	17	SILVER IN BOTTOM DEPOSITS (MG/KG AS AG DRY WGT)	1
RCG-1	20-Jul-98	16	SILVER IN BOTTOM DEPOSITS (MG/KG AS AG DRY WGT)	0.5
RCG-1	26-Jul-00	15	SILVER IN BOTTOM DEPOSITS (MG/KG AS AG DRY WGT)	0.3
RCG-2	10-Aug-93	15	SILVER IN BOTTOM DEPOSITS (MG/KG AS AG DRY WGT)	1
RCG-2	26-Jul-00	7	SILVER IN BOTTOM DEPOSITS (MG/KG AS AG DRY WGT)	0.3
RCG-3	10-Jul-95	2	SILVER IN BOTTOM DEPOSITS (MG/KG AS AG DRY WGT)	1

Location	Date	Sample Depth	Parameter	Value
RCG-3	20-Jul-98	2	SILVER IN BOTTOM DEPOSITS (MG/KG AS AG DRY WGT)	0.5
RCG-3	26-Jul-00	4	SILVER IN BOTTOM DEPOSITS (MG/KG AS AG DRY WGT)	0.3
RCG-1	22-May-79	19	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	120
RCG-1	22-May-79	19	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	120
RCG-1	10-Aug-93	19	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	90
RCG-1	10-Jul-95	17	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	87
RCG-1	20-Jul-98	16	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	100
RCG-1	26-Jul-00	15	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	53
RCG-2	23-May-79	10	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	110
RCG-2	23-May-79	10	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	110
RCG-2	10-Aug-93	15	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	15
RCG-2	26-Jul-00	7	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	83
RCG-3	23-May-79	3	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	84
RCG-3	23-May-79	3	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	93
RCG-3	10-Jul-95	2	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	49
RCG-3	20-Jul-98	2	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	59
RCG-3	26-Jul-00	4	ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)	81

Date	Location	Sample Depth	Site Depth	NO2 + NO3 (mg/L)	NH3 (mg/L)	TKN (mg/L)	Phosphorus Total (mg/L)	VSS (mg/L)	TSS (mg/L)
(RCG-01)									
6/21/00	SPILLWAY	1	4.5	1.24	0.15		0.076	16	46
6/24/00	SPILLWAY	1	1.5	3.9	0.01		0.129	8	24
6/25/00	SPILLWAY	1	5.5	3	0.01		0.118	8	35
7/3/00	SPILLWAY	1	5	5	0.01	1.34	0.086	7	24
7/5/00	SPILLWAY	1	6	0.36	0.22	1.97	0.084	8	23
7/11/00	SPILLWAY	1	2	3.9	0.01	1.37	0.099	6	21
8/24/00	SPILLWAY	1	1.5	0.29	0.1	1.22	0.203	10	24
8/27/00	SPILLWAY	1	2	0.33	0.01	0.25	0.192	11	33
8/3/00	SPILLWAY	1.0	3.0	0.3	1	2.79	0.708	2	8
9/11/00	SPILLWAY	1	3	0.71	0.01	1.33	0.237	10	44
9/26/00	SPILLWAY	1	3	2.3	0.02	1.81	0.125	8	27
10/5/00	SPILLWAY	1	8.5	4	0.02	1.55	0.146	8	54
10/11/00	SPILLWAY	1	1	2.8	0.01	0.72	0.272	6	23
11/10/00	SPILLWAY	1	2	2.9	0.18	1	0.059	5	16
1/13/01	SPILLWAY	1	2	3.6	0.26	0.72	0.074	4	15
1/30/01	SPILLWAY	1	3	7	0.01	0.97	0.098	3	10
2/26/01	SPILLWAY	1	1.5	6.2	0.01	1	0.248	10	70
3/19/01	SPILLWAY	1	0.5	6.4	0.06	1.17	0.158	8	42
4/11/01	SPILLWAY	1	2.5	4.9	0.1	1.26	0.077	6	18
4/24/01	SPILLWAY	0.5	0.5	4.3	0.11	1.55	0.09	7	16
5/18/01	SPILLWAY	1	1	2.4	0.43	1.6	0.2	11	45
5/29/01	SPILLWAY	1	1	2.6	0.01	1.87	0.154	12	41

Date	Location	Sample Depth	Site Depth	NO2 + NO3 (mg/L)	NH3 (mg/L)	TKN (mg/L)	Phosphorus Total (mg/L)	VSS (mg/L)	TSS (mg/L)
(RCG-02)									
5/31/00	TRIB #2	1		18	0.03	1.2	0.061	2	13
6/12/00	TRIB #2	1	1	0.01	0.01	1.28	0.042	4	33
6/16/00	TRIB #2	1	2	13	0.01	0.43	0.11	2	14
6/21/00	TRIB #2	1	4.5	7.3	0.08		0.435	18	138
6/24/00	TRIB #2	1	2	14	0.01		0.152	10	64
6/25/00	TRIB #2	1	5	5.8	0.01		0.356	13	81
6/28/00	TRIB #2	1.0	2.0	16.0	0.01	0.94	0.099	2	27
7/3/00	TRIB #2	1	4.5	4.3	0.01	0.91	0.357	28	194
7/5/00	TRIB #2	1	7	2.1	0.01	1.4	0.39	28	206
7/11/00	TRIB #2	1	2	8.7	0.01	1.56	0.276	15	127
7/26/00	TRIB #2	1.0	1.2	12.0	0.01	0.45	0.087	3	7
8/3/00	TRIB #2	1	1	3.3	0.07	0.61	0.195	2	14
8/8/00	TRIB #2	1	0.5	5.1	0.01	0.23	0.119	2	5
8/22/00	TRIB #2	1	2	2.1	0.01	1.36	0.407	21	178
8/24/00	TRIB #2	1	1	6.3	0.01	0.23	0.145	3	15
8/27/00	TRIB #2	1	2	2.9	0.01	0.67	0.345	10	64
9/6/00	TRIB #2	1.0	0.3	6.5	0.01	.10K	0.074	1	2
9/10/00	TRIB #2	1	0.5	3.6	0.17	1.79	0.286	8	57
9/11/00	TRIB #2	1	3.5	4.2	0.01		0.283	6	34
9/29/00	TRIB #2	1	1.5	12	0.01	0.43	0.053	1	5
10/5/00	TRIB #2	1	8.5	1.48	0.01	1.7	0.543	10	79
10/11/00	TRIB #2	1	1	11	0.01	0.76	0.047	1	2
10/19/00	TRIB #2	1.0	1.0	10.0	0.01	0.18	0.057	1K	1K
11/10/00	TRIB #2	1	2	10	0.05	0.63	0.21	3	24
1/13/01	TRIB #2	1	2	9.4	0.01	0.43	0.119	2	19
1/30/01	TRIB #2	1	2.5	5.7	0.01	1.34	0.497	11	80
2/26/01	TRIB #2	1	1.5	11	0.01	0.58	0.133	7	57
3/19/01	TRIB #2	1	1	10	0.03	0.96	0.017	1	4
4/9/01	TRIB #2	0.5	0.5	9.1	0.07	0.71	0.04	3	16
4/11/01	TRIB #2	1	2	11	0.44	1.72	0.257	16	117
4/24/01	TRIB #2	0.5	0.5	9.9	0.01	0.6	0.035	3	7
5/14/01	TRIB #2	1	1	11	0.05	0.62	0.059	3	14

Date	Location	Sample Depth	Site Depth	NO2 + NO3 (mg/L)	NH3 (mg/L)	TKN (mg/L)	Phosphorus Total (mg/L)	VSS (mg/L)	TSS (mg/L)
5/18/01	TRIB #2	1	2	16	0.42	1.82	0.389	25	224
5/29/01	TRIB #2	1	1	13	0.01	0.59	0.045	2	15

Coliform Counts, Lake Paradise

Date	<i>Tributary - Inflow</i>			<i>Spillway - Outflow</i>		
	TC	FC	FS	TC	FC	FS
5/31/00	2,200	320	370			
6/12/00	19,000	4,000	4,100	1,600	540	350
7/17/00	4,100	1,100	1,100			
7/26/00	14,000	2,200	2,200			
8/8/00	11,000	2,100	3,600			
8/23/00	98,000	30,000	33,000	6,400	950	860
9/11/00	200,000	49,000	92,000	3,100	300	20
10/11/00	11,000	500	1,000	2,500	230	280
11/13/00	38,000	1,500	6,100	1,100	130	200
11/30/00	40,000	4,500	13,000	55,000	600	200
2/26/01	22,000	240	400	2,000	22	5
3/19/01	1,000	150	40	500	1	nd
4/9/01	100	2	20	540	22	18
4/24/01	3,300	130	35	840	37	36
5/14/01	7,500	880	540	6,500	210	200
5/29/01	10,000	560	1,700			

Notes: Density in number of bacteria per 100 mL;

TC = total coliform; FC = fecal coliform; FS = fecal Streptococcus;

nd = not detected; Blank spaces = no sample.

Coliform Counts, Lake Paradise

<i>Site 1 - Surface</i>				<i>Site 1 - Bottom</i>		
Date	TC	FC	FS	TC	FC	FS
5/31/00	110	8	25			
6/12/00	1,100	84	4	120	25	13
7/17/00	52	13	22	100	23	32
7/26/00	180	6	nd			
8/8/00	40	4	5	140	6	92
8/23/00						
9/11/00	5,800	1,400	2,000	8,800	2,200	4,900
10/11/00	1,600	95	16	1,500	130	44
11/13/00	2,600	230	320	2,100	280	300
11/30/00						
2/26/01	42,000	220	830	37,000	300	470
3/19/01	4,400	nd	nd	400	11	7
4/9/01	230	2	nd	40	20	1
4/24/01	110	2	3	60	4	3
5/14/01	260	5	4	460	6	2
5/29/01	310	9	5	410	16	12

Notes: Density in number of bacteria per 100 mL;

TC = total coliform; FC = fecal coliform; FS = fecal Streptococcus;

nd = not detected; Blank spaces = no sample.

<i>Site 2</i>				<i>Site 3</i>		
Date	TC	FC	FS	TC	FC	FS
5/31/00	240	19	13	1,300	140	170
6/12/00	20	7	1	1,600	420	560
7/17/00	400	1,100	19	840	130	20
7/26/00	200	7	4	160	2	nd
8/8/00	120	16	45	2,300	160	380
8/23/00						
9/11/00	21,000	4,200	3,800	24,000	3,800	4,200
10/11/00	2,300	300	82	6,400	540	450
11/13/00	5,000	260	530	41,000	2,500	5,600
11/30/00						
2/26/01	43,000	290	1,000	55,000	600	200
3/19/01	1,000	110	2	2,000	22	5
4/9/01	80	2	nd	500	1	nd
4/24/01	140	2	nd	540	22	18
5/14/01	110	8	7	840	39	36
5/29/01	550	16	12	6,500	210	200

Notes: Density in number of bacteria per 100 mL;

TC = total coliform; FC = fecal coliform; FS = fecal Streptococcus;

nd = not detected; Blank spaces = no sample.



Appendix B

2000 Phytoplankton Report

August 18, 2001

Lake Paradise Report-2000

Lake Paradise was sampled at three sites on 23 May, 21 June, 24 July, 20 August, 19 September and 31 October, 1979 and on 10 May, 28 June, 26 July, 6 September and 19 October, 2000. Comparisons in this report will involve all of the dates sampled except the 20 August, 1979 date since no sample was taken in August, 2000 (Tables: Phytoplankton Totals-Site 1; Site 2; Site 3, Phytoplankton Totals-2000; Numbers and Biovolumes of Individual Taxa-2000, Site 1; Site 2; Site 3, Summary of Numbers and Biovolumes of Organisms-2000, Site 1; Site 2; Site 3, List of Taxa-2000; Figures: Total Phytoplankton-Site 1; Site 2; Site 3, Bacillariophyta-Site 1; Site 2; Site 3, Chlorophyta-Site 1; Site 2; Site 3, Cryptophyta-Site 1; Site 2; Site 3, Cyanophyta-Site 1; Site 2; Site 3, Euglenophyta-Site 1; Site 2; Site 3, Total Phytoplankton-2000, Bacillariophyta-2000, Chlorophyta-2000, Cryptophyta-2000, Cyanophyta-2000, Euglenophyta-2000). Samples from 1979 were analyzed using the membrane filter technique and those from 2000 using the sweep method. At some sites in 1979, it was not possible to filter a sufficient amount of lake water to obtain optimum counts. In spite of this problem, numbers from 1979 are included in the tables and graphs for each site as are the taxa present.

Phytoplankton reached their maximum density in both years for all three sites at Site 3 on 26 July, 2000 at 45,119/mL (Table: Phytoplankton Totals-Site 1; Site 2; Site 3; Phytoplankton Totals-2000; Figures: Total Phytoplankton-Each Site; Total Phytoplankton-2000). Peak production occurred at the other two sites on 26 July, 2000 (Site 1-30,387/mL; Site 2-32,483/mL) as well. Blue-greens (Phylum Cyanophyta) dominated the phytoplankton on every date in 2000 at Site 3 and every date but 10 May at sites 1 and 2 (Tables: Phytoplankton Totals-2000; Figures: Total Phytoplankton-2000, Cyanophyta-2000). At sites 1 and 2 on 10 May, the

dominant organisms were the green algae (Chlorophyta) (Figures: Total Phytoplankton-2000, Chlorophyta-2000).

In 2000, diatoms (Bacillariophyta) reached their maximum density at each site on 6 September (6176/mL-Site 1; 7664/mL-Site 2; 6146/mL-Site 3) and were in high densities (1000 or more/mL) on most of the other dates as well (Table: Phytoplankton Totals-2000; Figures: Total Phytoplankton-2000, Bacillariophyta-2000). In 1979, diatoms had produced their highest densities on 19 September (633/mL-Site 1; 626/mL-Site 2; 1029/mL-Site 3) (Tables: Phytoplankton Totals, Each Site; Figures: Bacillariophyta, Each Site). At Site 1 in 1979, the most abundant diatom on 22 May was a *Cyclotella* sp. (it produced all of the total density of 122/mL). It along with two other species in that genus was responsible for most of the total density on 24 July, 1979 (150/mL out of 255/mL) with the remainder coming from *Melosira* spp. (105/mL). Nearly all of the total density of diatoms on 19 September, 1979 (619/mL out of 633/mL) was from the *Cyclotella* spp. as was all of the density (90/mL) on 31 October. At Site 1 in 2000, *Cyclotella meneghiniana* dominated the diatom density on every date (10 May-1652/mL out of a total of 1890/mL; 28 June-2188/mL out of 2381/mL; 26 July-1458/mL out of 1801/mL; 6 September-5283/mL out of 6176/mL; 19 October-923/mL out of 1116/mL) (Tables: Phytoplankton Totals-Site 1, Numbers and Biovolumes-Taxa, 2000, Site 1). Other taxa present in a density of 100 or more/mL (termed abundant) on different dates in 2000 were *C. chaetoceros* at 238/mL on 10 May, *Nitzschia palea* at 104/mL on 28 June, *N. linearis* at 119/mL and *N. palea* at 491/mL on 6 September and again *N. palea* at 164/mL on 19 October. As was the case at Site 1, *Cylotella* sp. formed all of the total density (68/mL) on 23 May, 1979 at Site 2. Unlike Site 1 where no diatom was in countable numbers on 21 June, 1979, *Melosira* spp. totaled

29/mL on that date. *C. spp.* were at a lower density (53/mL) on 24 July, 1979 at Site 2 than they were at Site 1, but *M. spp.* were at the same density (105/mL). On 19 September, 1979 at Site 2, *C. spp.* produced all of the total density (626/mL) and the same was true on 31 October (163/mL). *C. meneghiniana* formed most of the total density of diatoms on each date in 2000 at Site 2 (10 May-1518/mL out of a total of 1786/mL; 28 June-3065/mL out of 3571/mL; 26 July-1964/mL out of 2500/mL; 6 September-6265/mL out of 7664/mL; 19 October-1577/mL out of 1935/mL) as it had at Site 1 (Tables: Phytoplankton Totals-Site 2, Numbers and Biovolumes-Taxa, 2000, Site 2). As at Site 1, it was accompanied by the same taxa at Site 2. These included *C. chaetoceros* on 10 May at 253/mL, *C. chaetoceros* (179/mL), *Nitzschia linearis* (119/mL) and *N. palea* (179/mL) on 28 June, *N. palea* at 402/mL on 26 July, *N. acicularis* (208/mL), *N. linearis* (313/mL) and *N. palea* (863/mL) on 6 September and again on 19 October at 298/mL.

In 1979 at Site 3, the basic pattern was the same as at sites 1 and 2 with *C. sp.* forming all of the density (29/mL) on 23 May, *C. spp.* (at 35/mL) and *M. spp.* (at 50/mL) on 21 June and 24 July (former at 150/mL and latter at 45/mL), *C. spp.* at 901/mL, *M. spp.* at 53/mL and *N. palea* at 75/mL on 19 September and *C. spp.* at 107/mL, *M. spp.* at 32/mL and *Synedra spp.* at 32/mL on 31 October. In 2000 at Site 3, *C. meneghiniana* again dominated the total diatom density on all dates (10 May-1533/mL out of 1741/mL; 28 June-1101/mL out of 1414/mL; 26 July-1935/mL out of 3065/mL; 6 September-4658/mL out of 6145/mL; 19 October-878/mL out of 938/mL) (Tables: Phytoplankton Totals-2000, Site 3, Numbers and biovolumes-Taxa, 2000, Site 3) as it had at sites 1 and 2. *C. chaetoceros* was next most numerous on 10 May (119/mL), *N. palea* on 28 June (283/mL), 26 July (923/mL) and 6 September (759/mL) with *Navicula cryptocephala* (at 104/mL), *Nitzschia acicularis* (at 432/mL) and *N. linearis* (at 193/mL) all abundant (100 or

more/mL) and finally, none of these diatoms was abundant on 19 October. In fact, only two (*N. linearis* at 15/mL and *N. palea* at 45/mL) were in the samples with *C. meneghiniana* on that date. All of these diatoms are those indicative of eutrophic conditions in lakes (Table: List of Taxa-2000). Furthermore, the *Nitzschia* species are tolerant of high concentrations of organic materials. They may have entered the lake from stream effluents or they may have developed on the bottom of shallow areas of the lake. In either case, they continued their development as part of the phytoplankton community.

Green algae (Chlorophyta) were in high densities (1000 or more/mL) on all dates in 2000 except 19 October at Site 1 when they were only abundant (610/mL) (Tables: Phytoplankton Totals-2000, Numbers and Biovolumes-Organisms, 2000, Each Site; Figures: Total Phytoplankton-2000, Chlorophyta-2000). As was mentioned, they replaced the blue-greens as the dominant members of the phytoplankton on 10 May at sites 1 and 2. In 1979 at Site 1, they were abundant and dominant on 24 July (398/mL) and 19 September (441/mL) and in densities of less than 100/mL on the other dates sampled (84/mL-23 May; Zero-21 June; 70/mL-31 October) (Table: Phytoplankton Totals-2000, Site 1; Figure: Chlorophyta-Site 1). A *Chlamydomonas* sp. produced all of the total density (84/mL) seen on 23 May, 1979. On 24 July, 1979, *Phacotus lenticularis* was the most abundant green at 263/mL and *C. sp.* second at 135/mL. On 19 September, 1979, an unknown green was dominant (296/mL) accompanied by *Phacotus* at 145/mL. Both an unknown colonial green and *Phacotus* were in countable numbers (35/mL each) on 31 October, 1979. In 2000 at Site 1, many of the green algae were abundant on different dates and the total density was distributed among a number of taxa with different ones dominating on each date. *Ankistrodesmus falcatus* var. *acicularis* was the most numerous on 10

May at 3423/mL with *Kirchneriella lunaris* var. *lunaris* second at 1518/mL (out of a total density of 8943/mL) (Tables: Phytoplankton Totals-Site 1; Numbers and Biovolumes-Taxa, 2000, Site 1). On 28 June, 2000, *Scenedesmus abundans* was most abundant at 759/mL with *Carteria multifilis* second (491/mL). *C. multifilis* was in first place (at 2143/mL) on 26 July accompanied by *Carteria* sp. (No. 1) at 1399/mL (out of 6711/mL). *Scenedesmus abundans* was again most numerous on 6 September at 1414/mL with *Ankistrodesmus* second at 655/mL and the same ranking was there for 19 October (*Scenedesmus* at 238/mL; *Ankistrodesmus* at 104/mL). No *Chlamydomonas* species were in the samples from Site 1 in 2000, but *Phacotus lenticularis* was in a countable number on every date (10 May-45/mL; 28 June-89/mL; 26 July-417/mL; 6 September-134/mL; 19 October-45/mL). At Site 2 in 1979 as at Site 1, green algae were abundant at 256/mL on 26 July and dominant at 1070/mL on 6 September (Table: Phytoplankton Totals-Site 2; Figure: Chlorophyta-Site 2). They were at 11/mL on 23 May, at 42/mL on 21 June and zero on 31 October, 1979. *Chlamydomonas* sp. formed all of the total on 23 May, a “colonial” green was at 29/mL and *Golenkinia radiata* at 13/mL on 21 June, *Phacotus lenticularis* at 233/mL and the “colonial” green at 23/mL on 24 July, a green unicell at 751/mL and *Phacotus* at 319/mL on 19 September. At Site 2 in 2000, *Ankistrodesmus falcatus* var. *acicularis* was most numerous at 3631/mL as it was at Site 1 on 10 May with *Scenedesmus abundans* second at 2173/mL and *Kirchneriella lunaris* var. *lunaris* a close third at 2068/mL (Table: Numbers and Biovolumes-Taxa, 2000, Site 2). On 28 June, 2000, *Carteria multifilis* was most abundant at 789/mL and *Scenedesmus abundans* second at 714/mL. As was the case at Site 1, *C. multifilis* was in first place at 2277/mL and *Carteria* sp. (No. 1) in second at 1667/mL on 26 July. *Scenedesmus abundans* was the most numerous at Site 2 (at 1384/mL) on 6 September

and *Ankistrodesmus* second at 670/mL as they were at Site 1. This ranking was present on 19 October just as it was at Site 1 (*Scenedesmus*-387/mL; *Ankistrodesmus*-208/mL). For comparison at Site 2 between 1979 and 2000, no *Chlamydomonas* spp. were in the samples from 2000, *Golenkinia radiata* was at 45/mL on 10 May and 15/mL on 28 June and *Phacotus lenticularis* at 417/mL on 10 May, 15/mL on 28 June, 432/mL on 26 July, 208/mL on 6 September and 104/mL on 19 October. In 1979 at Site 3, green algae dominated the phytoplankton totals at 226/mL on 23 May and 795/mL on 24 July (Table: Phytoplankton Totals-Site 3; Figure: Chlorophyta-Site 3). *Chlamydomonas* sp. was the green in the highest density (213/mL) on 23 May, 1979 with *Phacotus lenticularis* at 13/mL. The latter was dominant on 24 July at 525/mL with a green “unicell” at 270/mL. *Phacotus* was in the highest density of the greens on 19 September at 53/mL with the “unicell” at 23/mL. On 31 October, *Phacotus* was the only green in countable numbers at 193/mL. In 2000 at Site 3, chlorophytes were at 1000 or more/mL on 10 May-6369/mL, 28 June-2068/mL, 26 July-16,444/mL, 6 September-5580/mL and abundant (789/mL) on 19 October (Table: Phytoplankton Totals-2000; Chlorophyta-2000). The total on 26 July, 2000 (16,444/mL) was the highest for all sites in 1979 and 2000 (Tables: Phytoplankton Totals-2000, Phytoplankton Totals-Site 1; Site 2; Site 3). On 10 May, 2000 at Site 3, *Ankistrodesmus falcatus* var. *acicularis* was most numerous at 2321/mL and *Scenedesmus abundans* second at 1667/mL as they were at Site 2 (Table: Numbers and Biovolumes-Taxa, 2000, Site 3). The ranking on 28 June at Site 3 was the same as at Site 2 on that date with *Carteria multifilis* at 536/mL and *S. abundans* at 417/mL. Unlike the case at sites 1 and 2 on 26 July, *Carteria* sp. (No. 1) was first at 5565/mL and *Carteria multifilis* second at 4241/mL. *Scenedesmus abundans* at 1488/mL and *Ankistrodesmus* at 149/mL were in the same

ranking at Site 3 as they were at sites 1 and 2 on 6 September. *Scenedesmus abundans* was the most abundant green on 19 October at 298/mL with *Actinastrum hantzschii* var. *fluviatile* and *Carteria multifilis* in second place (both at 149/mL). A comparison of 2000 with 1979 in terms of taxa shows no *Chlamydomonas* sp. in samples from 2000 as it was in 1979 and *Phacotus* was at 193/mL on 10 May, 45/mL on 28 June, 387/mL on 26 July, 327/mL on 6 September and 89/mL on 19 October. All of the taxa seen in samples from both years at all sites are typical of eutrophic lakes (Table: List of Taxa-2000).

Cryptomonads (Cryptophyta) were numerous (1000 or more/mL) on all dates at sites 1 and 2 except on 28 June at Site 1 (833/mL). The highest (7113/mL-26 July; 2589/mL-6 September; 1935/mL-19 October) and lowest densities (461/mL-10 May; 402/mL-28 June) for each date were registered at Site 3 (Table: Phytoplankton Totals-2000; Figure: Cryptophyta-2000).

Cryptomonads characteristically reach their peak densities when temperatures and competition are both low. These two factors were not in place in 2000 since they reached their peaks when blue-greens and greens were at some of their highest densities. Cryptomonads were not discernible in samples from 1979 due to the limitations of the membrane filter method.

As was mentioned, blue-greens (Cyanophyta) dominated the phytoplankton on all dates in 2000 except for 10 May when the green algae were the most numerous at sites 1 and 2 (Table: Phytoplankton Totals-2000; Figures: Total Phytoplankton-2000; Cyanophyta-2000).

Blue-greens did not dominate at any site in 1979 as they did in 2000 (Tables: Phytoplankton Totals-Site 1; Site 2; Site 3; Figures: Total Phytoplankton-Site 1; Site 2; Site 3, Cyanophyta-Site 1; Site 2; Site 3). At Site 1 in 1979, *Aphanizomenon flos-aquae*, *Dactylococcopsis raphidioides*, an *Anabaena* and *Schizothrix calcicola* were in the sample from 23 May. *Anabaena spiroides* (at

15/mL) and *Aphanizomenon* (at 90/mL) were in countable numbers on 21 June. They were accompanied by a number of other taxa including *Anacystis montana*, the *Dactylococcopsis*, *Merismopedia quadruplicata*, *Schizothrix* and *Spirulina subsala*. On 24 July, 1979 at Site 1, *Anabaena helicoidea* was at 75/mL and *Aphanizomenon* at 53/mL. *Microcystis aeruginosa* was in this sample as well along with *Dactylococcopsis* and *Schizothrix*. None of the blue-greens was in a countable number on 19 September, but many of the same taxa were present including *Aphanizomenon*, *Dactylococcopsis*, *Microcystis* and *Schizothrix*. *Aphanizomenon* was the only blue-green in a countable number (15/mL) on 31 October. All of these taxa except *Anabaena helicoidea*, *A. spiroides* and *Spirulina subsala* were seen in samples from 2000 at Site 1 (Table: List of Taxa-2000). An innocuous blue-green, *Gomphosphaeria lacustris*, dominated the density on 10 May, 2000 at 3244/mL with another innocuous blue-green, *Anacystis montana*, second at a density of 1771/mL (Table: Numbers and Biovolumes-Taxa, 2000, Site 1). They reversed their positions on 28 June (*Anacystis*-13,676/mL; *Gomphosphaeria*-4911/mL) and on 19 October (*Anacystis*-5432/mL; *Gomphosphaeria*-2366/mL). Two organisms that develop in the shallow areas of a lake, *Schizothrix calcicola* (at 9955/mL) and *Merismopedia quadruplicata* (at 2634/mL) were the most abundant on 26 July. The same ranking was present on 6 September with the former at 4479/mL and the latter at 3006/mL. Two species indicative of high water temperatures were in samples from 2000. *Anabaenopsis elenkinii* was in a concentrated sub-sample from 6 September (Table: List of Taxa-2000) and *Raphidiopsis curvata* was in a “bloom” concentration (1000 or more/mL or 1 Million or more/L) on 6 September (1012/mL) and at lower densities on all the other dates except 10 May when it was not present (Table: Number and Biovolumes-Taxa, 2000, Site 1). Other taxa seen in 1979 at Site 1 were in samples

from 2000 with *Aphanizomenon* at 134/mL on 10 May, 30/mL on 28 June and 45/mL on 26 July and *Dactylococcopsis* at 104/mL on 10 May, “Present” on 28 June and 60/mL on 26 July and *Microcystis* at 104/mL on 6 September. All of the taxa seen in 1979 and 2000 are indicative of eutrophic conditions in lakes. At Site 2 on 23 May, 1979, an *Anabaena* sp. was in the sample along with *Aphanizomenon flos-aquae* at 11/mL or the total density of blue-greens for that date. On 21 June, 1979, *Anabaena spiroides* was at 42/mL and *Aphanizomenon* at 92/mL in numbers close to those at Site 1 on this date. In addition, *Anacystis montana*, *Dactylococcopsis raphidioides* and *Schizothrix calcicola* were present as they were at Site 1. *Aphanizomenon* at 23/mL was the only blue-green in a countable number on 24 July. Other blue-greens present included *Anabaena flos-aquae*, *A. helicoidea*, *Dactylococcopsis*, *Microcystis aeruginosa* and *Schizothrix calcicola*. *Aphanizomenon* was again the only blue-green in a countable number (44/mL) on 19 August. It was accompanied by an *Anabaena* sp. and by *A. helicoidea*, *Microcystis* and *Schizothrix tenerrima* (actually a misidentified *S. calcicola*). None of the blue-greens was in countable numbers on 31 October, 1979, but *Anabaena* sp., *Aphanizomenon*, *Dactylococcopsis* and *Schizothrix calcicola* were all in the sample. Neither *Anabaena helicoidea* or *A. spiroides* was in samples from Site 2 in 2000 (Table: List of Taxa-2000). In 2000 at Site 2, dominance by different taxa followed a pattern similar to that at Site 1 (Table: Numbers and Biovolumes-Taxa, 2000, Site 2). *Gomphosphaeria lacustris* dominated on 10 May at 4717/mL with *Anacystis montana* second at 3824/mL. On 28 June, their positions were reversed with the latter most numerous at 11,577/mL and the former at 3601/mL. *Schizothrix calcicola* was most numerous at 11,652/mL and *Merismopedia quadruplicata* second at 3110/mL on 26 July as they were at Site 1. They were again the most numerous blue-greens on 6 September (*Schizothrix-*

6875/mL; *Merismopedia*-3185/mL). The ranking on 19 October was the same as on 28 June with *Anacystis* at 6265/mL and *Gomphosphaeria* at 2009/mL. Two major eutrophic indicator taxa, *Aphanizomenon flos-aquae* and *Microcystis aeruginosa* were in samples from Site 2 in 2000 as they were at Site 1. *Aphanizomenon* was at 238/mL on 10 May, 30/mL on 28 June, 45/mL on 26 July and 15/mL on 19 October and *Microcystis* was at 15/mL on both 28 June and 6 September. The two indicators of water with high temperatures were present with *Anabaenopsis elenkinii* at 104/mL and in a countable number on 6 September and *Raphidiopsis curvata* at 30/mL on 10 May, 134/mL on 26 July, a “bloom” on 6 September at 1295/mL and at 30/mL on 19 October. At Site 3 on 23 May, 1979, no blue-greens were in countable numbers, but once again as at sites 1 and 2, *Anabaena* sp. and *Aphanizomenon flos-aquae* were in the sample. On 21 June, *Anabaena spiroides* was at 35/mL and *Aphanizomenon* at 90/mL and these densities were close to those at sites 1 and 2 on that date. They were accompanied by *Anacystis montana*, *Dactylococcopsis raphidioides*, *Microcystis aeruginosa* and *Schizothrix calcicola*. Both *Anabaena spiroides* and *Schizothrix* were at 45/mL on 24 July. *Anacystis cyanea*, *Aphanizomenon*, *Dactylococcopsis*, *Merismopedia quadruplicata* and *Microcystis* were in that sample as well. No blue-greens were in countable numbers on 19 September, but an *Anabaena* sp., *Anabaena helicoidea*, *Dactylococcopsis*, *Gomphosphaeria*, *Microcystis* and *Schizothrix tenerrima* (actually *S. calcicola*) were in the sample. On 31 October, *Aphanizomenon*, *Dactylococcopsis* and *Schizothrix* were present but not in countable numbers. *Anabaena helicoidea*, *Anabaenopsis elenkinii* and *Anacystis cyanea* were not in samples from any date in 2000 at Site 3 (Table: List of Taxa-2000). *Anacystis montana* dominated the total blue-green density at 8229/mL and *Gomphosphaeria lacustris* was second at 4985/mL on 10 May, 2000 at

Site 3 (Table: Numbers and Biovolumes-Taxa, 2000, Site 3). The same ranking was in place on 28 June with *Anacystis* at 14,747/mL and *Gomphosphaeria* at 4449/mL. On 26 July, *Schizothrix calcicola* was at 11,979/mL and *Merismopedia quadruplicata* was at 3423/mL and this ranking is the same as was observed at sites 1 and 2 on this date. They held the same positions on 6 September as they had at sites 1 and 2 with *Schizothrix* at 7202/mL and *Merismopedia* at 3095/mL. On 19 October, *Anacystis* again dominated at 5952/mL and *Gomphosphaeria* was second at 3899/mL and this ranking was again the same as it was at sites 1 and 2 on 19 October. At Site 3 in 2000, the only blue-green indicative of high water temperatures that was present was *Raphidiopsis curvata*. It was at 15/mL on 28 June, 60/mL on 26 July, 952/mL on 6 September and 15/mL on 19 October. All three of the eutrophic indicator taxa were in samples from 2000. *Anabaena spiroides* var. *crassa* (not seen at Site 1 or Site 2) was in the sample from 6 September at Site 3 in a density of 15/mL. *Aphanizomenon* was at 223/mL on 10 May and at 45/mL on 26 July. *Microcystis* was at 15/mL on 26 July and at 104/mL on 6 September.

Euglenoids (Euglenophyta) were the more abundant than the blue-greens on all dates and at all sites in 1979 (Tables: Phytoplankton Totals-Site 1; Site 2; Site 3; Figures: Euglenophyta-Each Site). In 2000, the ranking of densities on most dates was Site 1, Site 2 and finally Site 3 (Table: Phytoplankton Totals-2000; Figure: Euglenophyta-2000). Site 2 had more euglenoids than the other two only on 19 October and Site 3 only on 6 September, 2000. At Site 1 in 1979 they were in higher densities on 21 June (961/mL) than on 28 June, 2000 (253/mL). The same was true in October (155/mL-31 October, 2000; 45/mL-19 October, 2000). On the remaining dates, densities in 2000 exceeded those in 1979 with the peak occurring on 26 July at 1518/mL (Table: Phytoplankton Totals-Site 1; Figure: Euglenophyta-Site 1). The determination of euglenoids was

not as accurate in 1979 as in 2000, but on 21 June when these algae reached their peak, most of the density was from *Euglena* spp. On 26 July, 2000 at Site 1 when euglenoids reached their peak, *Euglena viridis* contributed a majority (893/mL) of the total density (1518/mL) with a *E. sp.* (11.0 x 25.0 μm) second at 298/mL (Table: Numbers and Biovolumes-Taxa, 2000, Site 1).

The remaining portion of the total density was distributed among a number of species of *Euglena* and *Trachelomonas*. *Trachelomonas volvocina* dominated the euglenoid total density on 10 May (298/mL out of a total of 432/mL), 28 June (119/mL out of 253/mL), 6 September (238/mL out of 357/mL) and 19 October (30/mL out of 45/mL) (Table: Numbers and Biovolumes-Taxa, 2000, Site 1). This species was in samples from 1979. At Site 2 on 21 June, 1979 as was the case at Site 1, the total density (1050/mL) was greater than that on 28 June, 2000 (283/mL). The reverse was the case for the remaining comparable dates in these years (Table: Phytoplankton Totals-Site 2; Figure: Euglenophyta-Site 1). Species of *Euglena* and *Trachelomonas* accounted for the densities on each date in 1979. When euglenoids were at their peak on 21 June (at the aforementioned 1050/mL), *Euglena* spp. accounted for 550/mL of the total and *Trachelomonas* spp. (including *T. hispida*, *T. schauinslandii* and *T. volvocina*) were at 500/mL. On 26 July, 2000 when euglenoids reached their maximum density for the year at Site 2, *Euglena viridis* formed most of that density at 327/mL (Table: Numbers and Biovolumes-Taxa, 2000, Site 2). The same was true on 28 June (128/mL out of 283/mL) and 19 October (164/mL out of 342/mL). *Trachelomonas volvocina* dominated the euglenoid densities on 10 May (268/mL out of a total of 402/mL) and 6 September (208/mL out of 342/mL). The remaining portions of the total densities were distributed among a number of taxa on the different dates as they were at Site 1. *Trachelomonas hispida* was in the samples from 2000 at Site 2 on 10 May (at 15/mL). *T.*

schauinslandii was not seen in 2000. As was the case at sites 1 and 2, euglenoids reached their peak density (1561/mL) in 1979 at Site 3 on 21 June (Table: Phytoplankton Totals-Site 3; Figure: Euglenophyta-Site 3). They were abundant (100 or more/L) on all the other dates in 1979 except 19 September when they were not in a countable number. Species of *Euglena* and *Trachelomonas* (including *T. schauinslandii* and *T. volvocina*, but not *T. hispida*) again accounted for the majority of the total density on each date. On 26 July, 2000 when euglenoids reached their maximum density (551/mL) at Site 3, a *Euglena* sp. (11.0 x 25.0 µm) at 164/mL and *E. viridis* at 134/mL formed a majority of the total (Table: Numbers and Biovolumes-Taxa, 2000, Site 3). No euglenoid was abundant (100 or more/mL) on 10 May, but *Trachelomonas volvocina* at 60/mL had the highest density. *E. viridis* was responsible for all of the total density of 74/mL on 28 June and a majority (238/mL) of the total (446/mL) on 6 September. No euglenoids were present in the sample from 19 October.

Dinoflagellates (Pyrrhophyta) reached their highest densities on 26 July, 2000 at sites 1 (149/mL) and 3 (253/mL) and were not found in any of the samples from Site 2 (Tables: Numbers and Biovolumes-Organisms, 2000, Each Site). In 1979, none was present on 23 May at any of the sites. On 21 June, 1979, *Glenodinium gymnodinium* was at 50/mL at Site 1, 42/mL at Site 2 and at 50/mL at Site 3 and was accompanied by *Ceratium hirundinella* at both sites 1 and 2. Both *Ceratium* and *Glenodinium gymnodinium* were at all three sites on 26 July, 1979 and 19 September but not in countable numbers. *Ceratium* was in the samples from sites 1 and 3 on 31 October, but not in countable densities and no dinoflagellates were in the samples from Site 2 on that date. In 2000, Site 1 had the most diverse dinoflagellate group with *Glenodinium gymnodinium* (only on 26 July at 30/mL), *G. sp.* (on 26 July at 74/mL; 6 September-45/mL; 19

October), *Hemidinium nasutum* (at 15/mL only on 26 July), *Peridinium penardiforme* (15/mL only on 26 July) and *P. sp.* (15/mL only on 26 July) (Table: Numbers and Biovolumes-Taxa, 2000, Site 1). Only *Glenodinium gymnodinium* (at 15/mL on both 26 July and 6 September) and *G. sp.* (at 238/mL on 26 July; 15/mL on 6 September) were in samples from Site 3 (Table: Numbers and Biovolumes-Taxa, 2000, Site 3). As was the case with most lakes analyzed in 2000 and in 1979, dinoflagellates did not contribute much density to the total production of phytoplankton.

Summary

Lake Paradise was eutrophic in 2000 just as it was in 1979. This conclusion is based on the taxa present, the densities of taxa typical of eutrophic lakes and the overall high densities of phytoplankton on each date. The most abundant diatom was *Cyclotella meneghiniana* which is characteristically found in eutrophic lakes. The presence of *Nitzschia* spp. and the high densities of euglenoids especially on 26 July, 2000 showed that the concentration of organic materials was high in the lake on that date and other dates in the year. All of the green algal taxa were those typically found in eutrophic lakes as well. One positive feature for the lake was the dominance of green algae over blue-greens on at least one date in 2000 (10 May at sites 1 and 2) and their high densities (1000 or more/mL) on a majority of the dates. All three blue-greens that give the best indication of the eutrophic condition were present in 2000 as they were in 1979, but they were never at a “bloom” (1 Million or more/L) level. These three are *Anabaena spiroides* var. *crassa*, *Aphanizomenon flos-aquae* and *Microcystis aeruginosa*. An abundance (100 or more/mL) of *Microcystis* at each site on 6 September, 2000 does give concern since it generally does not appear in as high a density as the other two taxa. Four blue-green species indicative of

extensive shallow areas and high water temperatures were present in 2000. Even though *Anabaenopsis elenkinii* reached only a maximum density of 104/mL on 6 September at Site 2 and was in a concentrated sub-sample from Site 1 on that same date, its presence helped to support the suggestion that high water temperatures existed in the lake on that date. Further verification comes from the “bloom” of *Raphidiopsis curvata* on 6 September at Site 1 (1012/mL) and Site 2 (1295/mL) and its high density (952/mL) on that date as well. This blue-green characteristically develops in bodies of water with high water temperatures. Neither of these two blue-greens was seen in 1979. This lack of their presence in that year may be due to the method of analysis although they were seen in samples from other lakes at that time. The remaining two of the four blue-greens were *Merismopedia quadruplicata* and *Schizothrix calcicola*. Both of these were in high densities (>1000/mL) on 6 September and 19 October, 2000. They were in samples from 1979, but at much lower densities. *Schizothrix* forms mats of filaments on the bottom of the shallow areas, forms air bubbles under these mats causing them to break loose from the sediments and float into the water column where the filaments increase in number and form part of the phytoplankton. The penetration of light to the bottom warms the sediments and mats of *Schizothrix* and this warming in turn increases the temperature of the water over the bottom. *Merismopedia* develops in the shallows where the light is better and the water warmer.

The final point about the lake is that it was probably not much worse in 2000 than in 1979 except for a possible expansion of the shallow areas and the higher late summer water temperatures. The lack of “blooms” of *Anabaena spiroides* var. *crassa*, *Aphanizomenon flos-aquae* and *Microcystis aeruginosa* and the high densities of green algae are both positive

signs for the lake.

Summary of numbers and biovolumes of organisms for
Lake Paradise (RCG) Site 1 in 2000.

<u>Date</u>	<u>PHYLUM</u>	<u>No./mL</u>	<u>Volume</u>
5-10-00	Bacillariophyta	1889.887	693615.3
	Chlorophyta	8943.481	4512326.9
	Chrysophyta	0	0
	Cryptophyta	1607.148	408392.6
	Cyanophyta	5833.352	3033795.4
	Euglenophyta	431.549	1752562.1
	Pyrrhophyta	0	0
	Total	18705.417	10400692.3
	Arthropoda	0	0
	Protozoa	14.881	121744.4
	Rotatoria	0	0
6-28-00	Total	14.881	121744.4
	Bacillariophyta	2380.960	573811.4
	Chlorophyta	2232.150	2271087.7
	Chrysophyta	14.881	2324.4
	Cryptophyta	833.336	157082.3
	Cyanophyta	19538.753	10229750.0
	Euglenophyta	252.977	1496425.9
	Pyrrhophyta	0	0
	Total	25253.057	14730481.7
	Arthropoda	0	0
	Protozoa	44.643	2045311.5
	Rotatoria	0	0
	Total	44.643	2045311.5

Lake Paradise (Site 1) Summary (2000) p. 2

<u>DATE</u>	<u>PHYLUM</u>	<u>No./mL</u>	<u>VOLUME</u>
7-26-00	Bacillariophyta	1800.601	455546.1
	Chlorophyta	6711.331	8966653.6
	Chrysophyta	0	0
	Cryptophyta	4226.204	2545109.2
	Cyanophyta	15982.194	6197323.3
	Euglenophyta	1517.862	18401152.2
	Pyrrhophyta	148.810	1632097.4
	Total	30387.002	38197881.8
	Arthropoda	0	0
	Gastrotricha	29.762	1788187.2
	Protozoa	178.572	1826656.1
	Rotatoria	14.881	1538366.5
	Total	223.215	5153209.8
9-6-00	Bacillariophyta	6174.615	1509384.3
	Chlorophyta	4732.158	6411831.5
	Chrysophyta	0	0
	Cryptophyta	2574.413	1457339.4
	Cyanophyta	12574.445	10912083.9
	Euglenophyta	357.144	1096863.3
	Pyrrhophyta	44.643	187911.3
	Total	26458.418	21115261.0
	Arthropoda	0	0
	Protozoa	29.762	418681.4
	Rotatoria	44.643	1049244.4
	Total	74.405	1467925.8

Lake Paradise (Site 1) Summary (2000) p. 3

<u>DATE</u>	<u>PHYLUM</u>	<u>No./mL</u>	<u>VOLUME</u>
10-19-00	Bacillariophyta	1116.075	255621.3
	Chlorophyta	610.121	534327.6
	Chrysophyta	0	0
	Cryptophyta	1116.075	198729.8
	Cyanophyta	7886.930	4206409.2
	Euglenophyta	119.048	119734.0
	Pyrrhophyta	44.643	62637.1
	Total	10788.275	5316141.8
	Arthropoda	0	0
	Protozoa	0	0
	Rotatoria	0	0
	Total	0	0

Summary of numbers and biovolumes of organisms for
Lake Paradise (RCG) Site 2 in 2000.

<u>Date</u>	<u>PHYLUM</u>	<u>No./mL</u>	<u>Volume</u>
5-10-00	Bacillariophyta	1785.720	710270.1
	Chlorophyta	10223.247	5253854.3
	Chrysophyta	59.524	9297.6
	Cryptophyta	1116.075	233061.8
	Cyanophyta	9449.435	4924402.7
	Euglenophyta	401.787	1990766.7
	Pyrrhophyta	0	0
	Total	23035.788	13121653.2
	Arthropoda	0	0
	Gastrotricha	44.643	3650882.2
	Protozoa	14.881	121744.4
	Rotatoria	0	0
	Total	59.524	3772626.6
6-28-00	Bacillariophyta	3571.440	1091304.1
	Chlorophyta	3437.511	2844283.0
	Chrysophyta	0	0
	Cryptophyta	1011.905	458041.6
	Cyanophyta	16756.006	9799459.9
	Euglenophyta	282.739	3121329.8
	Pyrrhophyta	0	0
	Total	25059.601	17314418.4
	Arthropoda	0	0
	Protozoa	104.167	4146142.5
	Rotatoria	0	0
	Total	104.167	4146142.5

Lake Paradise (Site 2) Summary (2000) p. 2

<u>DATE</u>	<u>PHYLUM</u>	<u>No./mL</u>	<u>VOLUME</u>
7-26-00	Bacillariophyta	2500.008	594074.8
	Chlorophyta	7414.905	10779931.7
	Chrysophyta	0	0
	Cryptophyta	2366.079	1241154.3
	Cyanophyta	19419.705	7673618.0
	Euglenophyta	684.526	7127604.6
	Pyrrhophyta	0	0
	Total	32485.223	27416383.4
	Arthropoda	0	0
	Protozoa	44.643	815202.0
	Rotatoria	29.762	432993.9
9-6-00	Total	74.405	1248195.9
	Bacillariophyta	7663.715	1925925.8
	Chlorophyta	5476.208	7517553.6
	Chrysophyta	0	0
	Cryptophyta	2113.102	620247.5
	Cyanophyta	15565.526	12982450.6
	Euglenophyta	342.263	941133.9
	Pyrrhophyta	0	0
	Total	31160.814	23987311.4
	Arthropoda	0	0
	Gastrotricha	14.881	1419666.7
	Protozoa	14.881	62333.5
	Rotatoria	0	0
	Total	29.762	1482000.2

Lake Paradise (Site 2) Summary (2000) p. 3

<u>DATE</u>	<u>PHYLUM</u>	<u>No./mL</u>	<u>VOLUME</u>
10-19-00	Bacillariophyta	1934.530	415296.0
	Chlorophyta	1175.599	1073079.3
	Chrysophyta	0	0
	Cryptophyta	1413.695	276901.2
	Cyanophyta	8467.289	4465852.0
	Euglenophyta	193.453	2983243.1
	Pyrrhophyta	0	0
	Total	13184.566	9214371.6
	Arthropoda	0	0
	Protozoa	0	0
	Rotatoria	0	0
	Total	0	0

Summary of numbers and biovolumes of organisms for
Lake Paradise (RCG) Site 3 in 2000.

<u>Date</u>	<u>PHYLUM</u>	<u>No./mL</u>	<u>Volume</u>
5-10-00	Bacillariophyta	1741.077	506867.7
	Chlorophyta	6369.068	3018969.2
	Chrysophyta	14.881	2324.4
	Cryptophyta	461.311	67951.1
	Cyanophyta	13913.735	7221457.5
	Euglenophyta	119.048	485390.1
	Pyrrhophyta	0	0
	Total	22619.120	11302960.0
	Arthropoda	0	0
	Gastrotricha	29.762	3365998.8
	Protozoa	0	0
	Rotatoria	14.881	349748.1
	Total	44.643	3715745.9
6-28-00	Bacillariophyta	1413.695	309782.3
	Chlorophyta	2068.459	1944038.9
	Chrysophyta	0	0
	Cryptophyta	401.787	196511.0
	Cyanophyta	19910.778	10604587.3
	Euglenophyta	74.405	1346068.0
	Pyrrhophyta	0	0
	Total	23869.124	14400987.5
	Arthropoda	0	0
	Gastrotricha	14.881	64281.5
	Protozoa	14.881	547851.4
	Rotatoria	0	0
	Total	29.762	612132.9

Lake Paradise (Site 3) Summary (2000) p. 2

<u>DATE</u>	<u>PHYLUM</u>	<u>No./mL</u>	<u>VOLUME</u>
7-26-00	Bacillariophyta	3065.486	770765.9
	Chlorophyta	16443.505	27073453.7
	Chrysophyta	0	0
	Cryptophyta	7113.118	3245007.3
	Cyanophyta	17693.505	7433307.9
	Euglenophyta	550.597	4207732.2
	Pyrrhophyta	252.977	1145494.7
	Total	45119.188	43875761.7
	Arthropoda	0	0
	Gastrotricha	14.881	788905.8
	Protozoa	193.453	3271891.1
	Rotatoria	14.881	349748.1
	Total	223.215	4410545.0
9-6-00	Bacillariophyta	6145.853	1574109.2
	Chlorophyta	5580.375	7647826.0
	Chrysophyta	0	0
	Cryptophyta	2589.294	930714.3
	Cyanophyta	16517.910	11833725.3
	Euglenophyta	446.430	4710531.4
	Pyrrhophyta	29.762	519108.8
	Total	31309.624	27216015.0
	Arthropoda	0	0
	Gastrotricha	29.762	1577811.5
	Protozoa	0	0
	Rotatoria	14.881	349748.1
	Total	44.643	1927559.6

Lake Paradise (Site 3) Summary (2000) p. 3

<u>DATE</u>	<u>PHYLUM</u>	<u>No./mL</u>	<u>VOLUME</u>
10-19-00	Bacillariophyta	937.503	202883.0
	Chlorophyta	788.693	454169.5
	Chrysophyta	0	0
	Cryptophyta	1934.530	456616.0
	Cyanophyta	10000.032	5192394.0
	Euglenophyta	0	0
	Pyrrhophyta	0	0
	Total	13660.758	6306063.0
	Arthropoda	0	0
	Protozoa	0	0
	Rotatoria	0	0
	Total	0	0

LAKE ParadiseDATE 5-10-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. chaetoceros	12.5	1534.0	238.096	365239.3
C. meneghiniana	11.2 (diam.)	198.8	1651.791	328376.0
Melosira				
M. varians	15.0 x 20.0	35342.9	Present	
CHLOROPHYTA				
Actinastrum				
A. hantzschii var. fluviatile	25.0 (col.-diam.)	8181.4	104.167	852211.1
Ankistrodesmus				
A. convolutus	2.5 x 15.0	73.0	29.762	2172.6
A. falcatus var. acicularis	1.25 x 18.0	22.1	3422.630	75640.1
Carteria				
C. multifilis	7.5 (diam.)	220.9	267.858	59169.8
Chodatella				
C. quadriseta	5.0 x 10.0	196.3	74.405	14605.7
C. wratislawiensis	2.5 x 7.5	36.8	29.762	1095.2
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	178.572	748002.4
Cosmarium				
C. sp.	10.0 x 10.0	785.4	372.025	292188.4
Dictyosphaerium				
D. pulchellum	20.0 (col.-diam.)	4188.8	59.524	249334.1
Golenkinia				
G. radiata	15.0 (diam.)	1767.2	29.762	52595.4

LAKE ParadiseDATE 5-10-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (µm)</u>	<u>UNIT VOL. (µm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Kirchneriella				
K. lunaris var. lunaris	5.0 x 12.5	245.4	1517.862	372483.3
Micractinium				
M. pusillum	15.0 (col.-diam.)	1767.2	119.048	210381.6
Oocystis				
O. borgei	12.5 (diam.)	1022.7	59.524	60875.2
Phacotus				
P. lenticularis	7.5 x 12.5	552.2	44.643	24651.9
Scenedesmus				
S. abundans	7.5 x 15.0	577.3	2098.221	1211302.9
S. dimorphus	12.5 x 10.0	1227.2	163.691	200881.6
Schroederia				
S. setigera	2.5 x 52.5	257.7	178.572	46018.0
Tetraedron				
T. regulare var. incus	15.0 x 15.0 x 1.0	225.0	14.881	3348.2
T. trigonum var. trigonum	26.0	239.0	44.643	10669.7
Tetrastrum				
T. heterocanthum	10.0 x 10.0 x 1.0	100.0	89.286	8928.8
T. staurogeniaeforme	8.0	268.1	29.762	7979.2
Treubaria				
T. triappendiculata	10.0	523.6	14.881	7791.2
CHRYSTOPHYTA-None				
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	74.405	182619.6
C. sp.	5.0 x 7.5	147.3	1532.743	225773.0

LAKE ParadiseDATE 5-10-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
CYANOPHYTA				
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	1770.839	927211.3
Aphanizomenon				
A. flos-aquae	5.0 x 50.0	981.7	133.929	131478.1
Dactylococcopsis				
D. raphidioides	2.5 x 15.0	73.6	104.167	7666.7
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	3244.058	1698588.7
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	163.691	255767.2
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	416.668	13083.4
EUGLENOPHYTA				
Euglena				
E. viridis	22.5 x 45.5	18091.1	59.524	1076854.6
Phacus				
P. acuminatus	20.0 x 28.8	9047.8	14.881	134640.3
Trachelomonas				
T. volvocina	11.2 (diam.)	735.6	297.620	218929.3
T. sp. (cyl.- Gran.-short neck)	17.5 x 22.5	5411.9	59.524	322137.9
PYRRHOPHYTA-None				
ANIMAL MATERIAL				
PROTOZOA-Sub-Phylum Ciliophora-Class Ciliata- Order Oligotrichida-Family Halteriidae				
Halteria				
H. sp.	25.0 (diam.)	8181.2	14.881	121744.4

LAKE ParadiseDATE 6-28-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. chaetoceros	12.5	1534.0	74.405	114137.3
C. meneghiniana	11.2 (diam.)	198.8	2187.507	434876.4
Nitzschia				
N. acicularis	2.5 x 87.5	429.5	14.881	6391.4
N. palea	3.0 x 25.0	176.7	104.167	18406.3
CHLOROPHYTA				
Actinastrum				
A. hantzschii				
var. fluviatile	25.0 (col.-diam.)	8181.4	104.167	852211.1
Ankistrodesmus				
A. falcatus var.				
acicularis	1.25 x 18.0	22.1	401.787	8879.5
Carteria				
C. multifilis	7.5 (diam.)	220.9	491.073	108478.0
C. sp. (No. 1)	15.0 x 20.0	3534.3	89.286	315563.5
Chlorogonium				
C. elongatum var.				
elongatum	5.0 x 20.0	392.7	178.572	70125.2
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	29.762	124667.1
Cosmarium				
C. sp.	10.0 x 10.0	785.4	29.762	23375.1
Dictyosphaerium				
D. pulchellum	20.0 (col.-diam.)	4188.8	74.405	311667.7
Golenkinia				
G. radiata	15.0 (diam.)	1767.2	14.881	26297.7

LAKE ParadiseDATE 6-28-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (µm)</u>	<u>UNIT VOL. (µm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Kirchneriella				
K. lunaris var. lunaris	5.0 x 12.5	245.4	44.643	10955.4
Nephrocytium				
N. limneticum	8.75	350.8	14.881	5220.3
Oocystis				
O. borgei	12.5 (diam.)	1022.7	14.881	15218.8
Phacotus				
P. lenticularis	7.5 x 12.5	552.2	89.286	49303.7
Scenedesmus				
S. abundans	7.5 x 15.0	577.3	535.716	309268.8
S. dimorphus	12.5 x 10.0	1227.2	14.881	18262.0
Schroederia				
S. setigera	2.5 x 52.5	257.7	44.643	11504.5
Tetraedron				
T. trigonum var. trigonum	26.0 (arm to arm)	239.0	29.762	7113.1
Tetrastrum				
T. heterocanthum	10.0 x 10.0 x 1.0	100.0	29.762	2976.2
CHRYSOPHYTA				
Heliopsis				
H. mutabilis	12.5 x 12.5 x 1.0	156.2	14.881	2324.4
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	14.881	35623.9
C. sp.	5.0 x 7.5	147.3	818.455	120558.4
CYANOPHYTA				
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	13675.639	7160564.5

LAKE ParadiseDATE 6-28-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Aphanizomenon				
A. flos-aquae	5.0 x 50.0	981.7	29.762	29217.4
Dactylococcopsis				
D. raphidioides	2.5 x 15.0	73.6	Present	
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	4910.730	2571258.2
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	282.739	441779.7
Raphidiopsis				
R. curvata	5.0 x 25.0	490.9	14.881	7305.1
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	625.002	19625.1
EUGLENOPHYTA				
Euglena				
E. viridis	22.5 x 45.5	18091.1	59.524	1076854.6
Trachelomonas				
T. volvocina	11.2 (diam.)	735.6	119.048	87571.7
T. sp.				
(cyl.-gran.)	15.0 x 25.0	4417.9	14.881	65742.8
T. sp. (cyl.-				
gran.-short neck)	17.5 x 22.5	5411.9	29.762	161069.0
T. sp.				
(cyl.-smooth)	15.0 x 20.0	3534.3	14.881	52593.9
T. sp.				
(cyl.-smooth-				
short neck)	15.0 x 20.0	3534.3	14.881	52593.9
PYRRHOPHYTA-None				
ANIMAL MATERIAL				

LAKE ParadiseDATE 6-28-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm3)</u>	<u>No./mL</u>	<u>VOLUME</u>
PROTOZOA-Sub-Phylum Ciliophora-Class Ciliata-				
Order Odontostomatida-Family Tintinnidae				
Codonella				
C. sp.	25.0 x 90.0	44178.6	29.762	1314843.4
C. sp.	25.0 x 100.0	49087.3	14.881	730468.1

LAKE ParadiseDATE 7-26-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. chaetoceros	12.5	1534.0	29.762	45654.9
C. meneghiniana	11.2 (diam.)	198.8	1458.338	289917.6
Melosira				
M. italica var. tenuissima	5.0 x 14.0	2748.9	Present	
Nitzschia				
N. acicularis	2.5 x 87.5	429.5	44.643	19174.2
N. linearis	5.0 x 7.0	1374.4	44.643	61357.3
N. palea	3.0 x 25.0	176.7	223.215	39442.1
CHLOROPHYTA				
Actinastrum				
A. hantzschii var. fluviatile	25.0 (col.-diam.)	8181.4	104.167	852211.1
Ankistrodesmus				
A. falcatus var. acicularis	1.25 x 18.0	22.1	386.906	8550.6
Carteria				
C. multifilis	7.5 (diam.)	220.9	2142.864	473358.6
C. sp. (No. 1)	15.0 x 20.0	3534.3	1398.814	4943828.3
Chlorogonium				
C. elongatum var. elongatum	5.0 x 20.0	392.7	386.906	151938.0
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	104.167	436334.7
Cosmarium				
C. sp.	10.0 x 10.0	785.4	59.524	46750.1

LAKE ParadiseDATE 7-26-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Dictyosphaerium D. pulchellum	20.0 (col.-diam.)	4188.8	252.977	1059670.0
Elakatothrix E. viridis	2.5 x 15.0	73.6	29.762	2190.5
Gonium G. pectorale	20.0 x 20.0 x 2.0	800.0	14.881	11904.8
Kirchneriella K. lunaris var. lunaris	5.0 x 12.5	245.4	104.167	25562.6
Micractinium M. pusillum	15.0 (col.-diam.)	1767.2	14.881	26297.7
Oocystis O. borgei	12.5 (diam.)	1022.7	59.524	60875.2
Phacotus P. lenticularis	7.5 x 12.5	552.2	416.668	230084.1
Polyedriopsis P. spinulosa	2.5 x 10.0 x 17.5	437.5	29.762	13020.9
Scenedesmus S. abundans	7.5 x 15.0	577.3	758.931	438130.9
S. denticulatus	7.0 x 15.0	577.3	14.881	8590.8
S. dimorphus	12.5 x 10.0	1227.2	74.405	91309.8
Schroederia S. setigera	2.5 x 52.5	257.7	44.643	11504.5
Tetraedron T. caudatum var. Caudatum	10.0 x 10.0 x 2.0	200.0	14.881	2976.2
T. trigonum var. trigonum	26.0 (arm to arm)	239.0	282.739	67574.6
Tetrastrum T. staurogeniaeforme	8.0	268.1	14.881	3989.6

LAKE ParadiseDATE 7-26-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (µm)</u>	<u>UNIT VOL. (µm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
CHRYSTOPHYTA-None				
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	833.336	2045339.8
C. sp.	5.0 x 7.5	147.3	3392.868	499769.4
CYANOPHYTA				
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	1235.123	646710.4
Aphanizomenon				
A. flos-aquae	5.0 x 50.0	981.7	44.643	43826.0
Dactylococcopsis				
D. raphidioides	2.5 x 15.0	73.6	59.524	4381.0
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	2023.816	1059670.0
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	2633.937	4115526.5
Raphidiopsis				
R. curvata	5.0 x 25.0	490.9	29.762	14610.2
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	9955.389	312599.2
EUGLENOPHYTA				
Euglena				
E. viridis	22.5 x 45.5	18091.1	892.860	16152819.0
E. sp.	5.0 x 20.0	392.7	44.643	17531.3
E. sp.	7.5 x 22.5	994.0	29.762	29583.4
E. sp.	11.0 x 25.0	2375.8	297.620	707085.6
E. sp.	15.0 x 35.0	6185.0	104.167	644272.9

LAKE ParadiseDATE 7-26-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Trachelomonas				
T. volvocina	11.2 (diam.)	735.6	59.524	43785.9
T. sp. (cyl.- gran.-short neck)	17.5 x 22.5	5411.9	29.762	161069.0
T. sp. (cyl.-smooth- short neck)	15.0 x 25.0	4417.9	14.881	65742.8
T. sp. (urn-shape)	17.5 x 35.0	8418.5	29.762	250551.4
T. sp. (urn-shape)	25.0 x 45.0	22089.3	14.881	328710.9
PYRRHOPHYTA				
Glenodinium				
G. gymnodinium	31.0 x 42.5	32077.8	29.762	954699.5
G. sp.	17.5 x 17.5	4209.2	74.405	313185.5
Hemidinium				
H. nasutum	20.0 x 35.0	10995.6	14.881	163625.5
Peridinium				
P. penardiforme	22.5 x 25.0	10386.9	14.881	154567.4
P. sp.	15.0 x 17.5	3092.5	14.881	46019.5
ANIMAL MATERIAL				
GASTROTRICHA				
Unknown Gastrotrich	30.0 x 85.0	60082.9	29.762	1788187.2
PROTOZOA-Sub-Phylum Ciliophora-Class Ciliata				
Unknown Ciliate	10.0 (diam.)	523.6	14.881	7791.7
Order Odontostomatida-Family Tintinnidae				

LAKE ParadiseDATE 7-26-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (µm)</u>	<u>UNIT VOL. (µm3)</u>	<u>No./mL</u>	<u>VOLUME</u>
Codonella				
C. sp.	25.0 x 90.0	44178.6	14.881	657421.7
Order Oligotrichida-Family Halteriidae				
Halteria				
H. sp.	25.0 (diam.)	8181.2	133.929	1095699.9
-Sub-Phylum Mastigophora-Class Zoomastigophora				
Unknown Flagellate	15.0 x 25.0	2650.7	14.881	65742.8
ROTATORIA-Class Monogonata-Order Ploima				
Unknown Rotifer	45.0 x 65.0	103377.9	14.881	1538366.5

LAKE ParadiseDATE 9-6-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. chaetoceros	12.5 (diam.)	1534.0	74.405	114137.3
C. meneghiniana	11.2 (diam.)	198.8	5282.755	1050211.6
Melosira				
M. italica var. tenuissima	5.0 x 14.0	2748.9	Present	
Navicula				
N. cryptocephala	6.15 x 20.3	603.0	29.762	17946.5
Nitzschia				
N. acicularis	2.5 x 87.5	429.5	178.572	76696.7
N. linearis	5.0 x 7.0	1374.4	119.048	163619.6
N. palea	3.0 x 25.0	176.7	491.073	86772.6
CHLOROPHYTA				
Actinastrum				
A. hantzschii var. fluviatile	25.0 (col.-diam.)	8181.4	133.929	1095699.9
Ankistrodesmus				
A. convolutus	2.5 x 15.0	73.0	59.524	4345.3
A. falcatus var. acicularis	1.25 x 18.0	22.1	654.764	14470.3
Carteria				
C. multifilis	7.5 (diam.)	220.9	193.453	42733.8
C. sp. (No. 1)	15.0 x 20.0	3534.3	178.572	631127.0
Chlorogonium				
C. elongatum var. elongatum	5.0 x 20.0	392.7	431.549	169469.3
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	193.453	810335.9

LAKE ParadiseDATE 9-6-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Conochaete C. comosa	20.0	4188.8	14.881	62333.5
Cosmarium C. sp.	10.0 x 10.0	785.4	14.881	11687.5
Dictyosphaerium D. pulchellum	20.0 (col.-diam.)	4188.8	550.597	2306340.7
Elakatothrix E. viridis	2.5 x 15.0	73.6	29.762	2190.5
Kirchneriella K. lunaris var. lunaris	5.0 x 12.5	245.4	163.691	40169.8
Nephrocytium N. limneticum	8.75	350.8	14.881	5220.3
Oocystis O. borgei	12.5 (diam.)	1022.7	14.881	15218.8
Phacotus P. lenticularis	7.5 x 12.5	552.2	133.929	73955.6
Polyedriopsis P. spinulosa	2.5 x 10.0 x 17.5	437.5	29.762	13020.9
Scenedesmus S. abundans	7.5 x 15.0	577.3	1413.695	816126.1
S. dimorphus	12.5 x 10.0	1227.2	148.810	182619.6
S. opoliensis	12.5 x 15.0	1840.8	14.881	27392.9
Schroederia S. setigera	2.5 x 52.5	257.7	163.691	42183.2
Tetraedron T. minimum	7.5	421.8	14.881	6276.8
T. regulare var. incus	15.0 x 15.0 x 1.0	225.0	14.881	3348.2

LAKE ParadiseDATE 9-6-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Tetraedron				
T. trigonum var. trigonum	26.0 (arm to arm)	239.0	148.810	35565.6
CHRYSTOPHYTA-None				
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	267.858	657430.7
C. sp.	5.0 x 7.5	147.3	2306.555	339755.6
CYANOPHYTA				
Anabaena				
A. sp.	5.0 x 50.0	981.7	14.881	14608.7
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	1741.077	911627.9
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	2217.269	1160962.0
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	3005.962	4696815.6
Microcystis				
M. aeruginosa	40.0 (col.-diam.)	33510.4	104.167	3490677.8
Raphidiopsis				
R. curvata	5.0 x 25.0	490.9	1011.908	496745.6
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	4479.181	140646.3
EUGLENOPHYTA				
Euglena				
E. viridis	22.5 x 45.5	18091.1	29.762	538427.3
E. sp.	7.5 x 20.0	883.6	14.881	13148.9
E. sp.	15.0 x 35.0	6185.0	44.643	276117.0

LAKE ParadiseDATE 9-6-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Trachelomonas				
T. volvocina	11.2 (diam.)	735.6	238.096	175143.4
T. sp.				
(cyl.-gran.)	11.0 x 20.0	1900.7	14.881	28284.3
T. sp. (cyl.-gran.-neck)	15.0 x 25.0	4417.9	14.881	65742.8
PYRRHOPHYTA				
Glenodinium				
G. sp.	17.5 x 17.5	4209.2	44.643	187911.3
ANIMAL MATERIAL				
PROTOZOA-Sub-Phylum Ciliophora-Class Ciliata				
Unknown Ciliate	10.0	523.6	14.881	7791.7
Order Sessilia-Family Vorticellidae				
Vorticella				
V. sp.	37.5 (diam.)	27611.7	14.881	410889.7
ROTATORIA-Class Monogonata-Order Ploima-Family Synchaetidae				
Polyarthra				
P. sp.	50.0 x 110.0	215984.5	Present	
-Order Ploima-Family Trichocercidae				
Trichocerca				
T. sp.	15.0 x 133.0	23503.0	44.643	1049244.4

LAKE ParadiseDATE 10-19-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. chaetoceros	12.5 (diam.)	1534.0	14.881	22827.5
C. meneghiniana	11.2 (diam.)	198.8	922.622	183417.2
Melosira				
M. italica var. Tenuissima	5.0 x 14.0	2748.0	Present	
Nitzschia				
N. linearis	5.0 x 7.0	1374.4	14.881	20452.4
N. palea	3.0 x 25.0	176.7	163.691	28924.2
CHLOROPHYTA				
Ankistrodesmus				
A. falcatus var. acicularis	1.25 x 18.0	22.1	104.167	2302.1
Carteria				
C. multifilis	7.5 (diam.)	220.9	14.881	3287.2
Closterium				
C. acutum	2.5 x 62.5	306.8	14.881	4565.5
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	59.524	249334.1
Dictyosphaerium				
D. pulchellum	20.0 (col.-diam.)	4188.8	14.881	62333.5
Kirchneriella				
K. lunaris var. lunaris	5.0 x 12.5	245.4	44.643	10955.4
Micractinium				
M. pusillum	15.0 (col.-diam.)	1767.2	14.881	26297.7
Phacotus				
P. lenticularis	7.5 x 12.5	552.2	44.643	24651.9

LAKE ParadiseDATE 10-19-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Scenedesmus				
S. abundans	7.5 x 15.0	577.3	238.096	137452.8
Schroederia				
S. setigera	2.5 x 52.5	257.7	29.762	7669.7
Tetrastrum				
T. heterocanthum	10.0 x 10.0 x 1.0	100.0	14.881	1488.1
T. staurogeniaeforme	8.0	268.1	14.881	3989.6
CHRYSTOPHYTA-None				
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	14.881	36523.9
C. sp.	5.0 x 7.5	147.3	1101.194	162205.9
CYANOPHYTA				
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	5431.565	2843967.4
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	2366.079	1238878.9
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	74.405	116257.8
Raphidiopsis				
R. curvata	5.0 x 25.0	490.9	14.881	7305.1
EUGLENOPHYTA				
Trachelomonas				
T. volvocina	11.2 (diam.)	735.6	29.762	21892.9
T. sp. (cyl.-gran.)	12.5 x 20.0	2454.4	14.881	36523.9
PYRRHOPHYTA				

LAKE ParadiseDATE 10-19-00 SITE: RCG-1

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm3)</u>	<u>No./mL</u>	<u>VOLUME</u>
Glenodinium G. sp.	17.5 x 17.5	2806.2	14.881	62637.1

ANIMAL MATERIAL -None

LAKE ParadiseDATE 5-10-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. chaetoceros	12.5	1534.0	252.977	388066.7
C. meneghiniana	11.2 (diam.)	198.8	1517.862	301751.0
Nitzschia				
N. linearis	5.0 x 70.0	1374.4	14.881	20452.4
CHLOROPHYTA				
Actinastrum				
A. hantzschii				
var. fluviatile	25.0 (col.-diam.)	8181.4	89.286	730466.6
Ankistrodesmus				
A. falcatus var.				
acicularis	1.25 x 18.0	22.1	3630.964	80244.3
Carteria				
C. multifilis	7.5 (diam.)	220.9	119.048	26297.7
Chodatella				
C. quadriseta	5.0 x 10.0	196.3	104.167	20448.0
C. wratislawiensis	2.5 x 7.5	36.8	148.810	5476.2
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	297.620	1246670.6
Cosmarium				
C. sp.	10.0 x 10.0	785.4	59.524	46750.1
C. sp.	10.0 x 10.0	785.4	282.739	222063.2
Dictyosphaerium				
D. pulchellum	20.0 (col.-diam.)	4188.8	59.524	249334.1
Golenkinia				
G. radiata	15.0 (diam.)	1767.2	44.643	78893.1

LAKE ParadiseDATE 5-10-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (µm)</u>	<u>UNIT VOL. (µm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Kirchneriella				
K. lunaris var. lunaris	5.0 x 12.5	245.4	2068.459	507599.8
Micractinium				
M. pusillum	15.0 (col.-diam.)	1767.2	133.929	236679.3
Oocystis				
O. borgei	12.5 (diam.)	1022.7	89.286	91312.8
Phacotus				
P. lenticularis	7.5 x 12.5	552.2	416.668	230084.1
Scenedesmus				
S. abundans	7.5 x 15.0	577.3	2172.626	1254256.9
S. dimorphus	12.5 x 10.0	1227.2	104.167	127833.7
Schroederia				
S. setigera	2.5 x 52.5	257.7	208.334	53687.7
Tetraedron				
T. caudatum var. Caudatum	10.0 x 10.0 x 2.0	200.0	14.881	2976.2
T. minimum	7.5	421.8	29.762	12553.6
T. trigonum var. trigonum	26.0	239.0	74.405	17782.8
Tetrastrum				
T. heterocanthum	10.0 x 10.0 x 1.0	100.0	44.643	4464.3
T. staurogeniaeforme	8.0	268.1	29.762	7979.2
CHRYSOPHYTA				
Heliopsis				
H. mutabilis	12.5 x 12.5 x 1.0	156.2	59.524	9297.6
CRYPTOPHYTA				

LAKE ParadiseDATE 5-10-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	29.762	73047.9
C. sp.	5.0 x 7.5	147.3	1086.313	160013.9
CYANOPHYTA				
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	3824.417	2002464.7
Aphanizomenon				
A. flos-aquae	5.0 x 50.0	981.7	238.096	233738.9
Dactylococcopsis				
D. raphidioides	2.5 x 15.0	73.6	29.762	2190.5
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	4717.277	2469966.2
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	119.048	186012.5
Raphidiopsis				
R. curvata	5.0 x 25.0	490.9	29.762	14610.2
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	491.073	15419.7
EUGLENOPHYTA				
Euglena				
E. viridis	22.5 x 45.5	18091.1	59.524	1076854.6
Phacus				
P. acuminatus	20.0 x 28.8	9047.8	29.762	269280.6
Trachelomonas				
T. hispida	25.0 x 30.0	14726.2	14.881	219140.6
T. volvocina	11.2 (diam.)	735.6	267.858	197036.3
T. sp. (cyl.-gran.)	22.5 x 25.0	9940.2	14.881	147920.1

LAKE ParadiseDATE 5-10-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm3)</u>	<u>No./mL</u>	<u>VOLUME</u>
Trachelomonas (Cont.)				
T. sp.				
(urn-shape)	17.5 x 22.5	5411.9	14.881	80534.5
PYRRHOPHYTA-None				
ANIMAL MATERIAL				
GASTROTRICHA				
Unknown Gastrotrich	35.0 x 85.0	81779.5	44.643	3650882.2
PROTOZOA-Sub-Phylum Ciliophora-Class Ciliata- Order Oligotrichida-Family Halteriidae				
Halteria				
H. sp.	25.0 (diam.)	8181.2	14.881	121744.4

LAKE ParadiseDATE 6-28-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. chaetoceros	12.5	1534.0	178.572	273929.4
C. meneghiniana	11.2 (diam.)	198.8	3065.486	609418.6
Nitzschia				
N. acicularis	2.5 x 87.5	429.5	29.762	12782.8
N. linearis	5.0 x 70.0	1374.4	119.048	163619.6
N. palea	3.0 x 25.0	176.7	178.572	31553.7
CHLOROPHYTA				
Actinastrum				
A. hantzschii				
var. fluviatile	25.0 (col.-diam.)	8181.4	74.405	608722.2
Ankistrodesmus				
A. falcatus var.				
acicularis	1.25 x 18.0	22.1	580.359	12825.9
Carteria				
C. multifilis	7.5 (diam.)	220.9	788.693	174222.3
C. sp. (No. 1)	15.0 x 20.0	3534.3	89.286	315563.5
Chlorogonium				
C. elongatum var.				
elongatum	5.0 x 20.0	392.7	282.739	111031.6
Conochaete				
C. comosa	20.0	4188.8	14.881	62333.5
Cosmarium				
C. sp.	10.0 x 10.0	785.4	29.762	23375.1
Dictyosphaerium				
D. pulchellum	20.0 (col.-diam.)	4188.8	208.334	872669.4
Golenkinia				
G. radiata	15.0 (diam.)	1767.2	14.881	26297.7

LAKE ParadiseDATE 6-28-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (µm)</u>	<u>UNIT VOL. (µm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Kirchneriella				
K. lunaris var. lunaris	5.0 x 12.5	245.4	163.691	40169.8
Micractinium				
M. pusillum	15.0 (col.-diam.)	1767.2	29.762	52595.4
Pediastrum				
P. duplex var. gracilimum	17.0 x 2.0	454.0	14.881	6756.0
Phacotus				
P. lenticularis	7.5 x 12.5	552.2	14.881	8217.3
Scenedesmus				
S. abundans	7.5 x 15.0	577.3	714.288	412358.5
S. dimorphus	12.5 x 10.0	1227.2	14.881	18262.0
Schroederia				
S. setigera	2.5 x 52.5	257.7	178.572	46018.0
Tetraedron				
T. caudatum var. longispinum	10.0 x 10.0 x 2.0	200.0	14.881	2976.2
T. trigonum var. trigonum	26.0 (arm to arm)	239.0	119.048	28452.5
Tetrastrum				
T. heterocanthum	10.0 x 10.0 x 1.0	100.0	14.881	1488.1
T. staurogeniaeforme	8.0	268.1	74.405	19948.0
CHRYSTOPHYTA-None				
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	133.929	328715.3
C. sp.	5.0 x 7.5	147.3	877.979	129326.3
CYANOPHYTA				

LAKE ParadiseDATE 6-28-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	11577.418	6061936.0
Aphanizomenon				
A. flos-aquae	5.0 x 50.0	981.7	29.762	29217.4
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	3610.202	1885589.3
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	833.336	1302087.5
Microcystis				
M. aeruginosa	40.0 (col.-diam.)	33510.4	14.881	498668.3
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	699.407	21961.4
EUGLENOPHYTA				
Euglena				
E. viridis	22.5 x 45.5	18091.1	104.167	1884495.6
E. sp.	5.0 x 35.0	687.2	14.881	10226.2
E. sp.	15.0 x 22.5	3976.1	14.881	59168.3
Trachelomonas				
T. volvocina	11.2 (diam.)	735.6	44.643	32839.4
T. sp. (cyl.-gran.-neck)	17.5 x 22.5	5411.9	14.881	80534.5
T. sp. (cyl.-gran.-short neck)	22.5 x 30.0	11928.2	44.643	532510.6
T. sp. (urn-shape)	10.0 x 40.0	3141.6	14.881	46750.1
T. sp. (urn-shape)	25.0 x 32.5	15953.4	29.762	474805.1
PYRRHOPHYTA-None				

LAKE ParadiseDATE 6-28-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
ANIMAL MATERIAL				
PROTOZOA-Sub-Phylum Ciliophora-Class Ciliata				
Unknown Ciliate	50.0 (diam.)	65450.0	14.881	973961.4
Order Odontostomatida-Family Tintinnidae				
Codonella				
C. sp.	30.0 x 60.0	42411.5	14.881	631125.5
C. sp.	30.0 x 75.0	53014.3	14.881	788905.8
C. sp.	30.0 x 75.0	53014.3	29.762	1577811.5
Order Oligotrichida-Family Halteriidae				
Halteria				
H. sp.	25.0 (diam.)	8181.2	14.881	121744.4
Sub-Phylum Sarcodina-Class Actinopoda-Order Heliozoida				
Unknown Actinopod	15.0 x 20.0	3534.3	14.881	52593.9

LAKE ParadiseDATE 7-26-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. chaetoceros	12.5	1534.0	29.762	45654.9
C. meneghiniana	11.2 (diam.)	198.8	1964.292	390501.2
Nitzschia				
N. acicularis	2.5 x 87.5	429.5	59.524	25565.6
N. linearis	5.0 x 7.0	1374.4	44.642	61357.3
N. palea	3.0 x 25.0	176.7	401.787	70995.8
CHLOROPHYTA				
Actinastrum				
A. hantzschii				
var. fluviatile	25.0 (col.-diam.)	8181.4	148.810	1217444.3
Ankistrodesmus				
A. convolutus	2.5 x 15.0	73.0	44.643	3258.9
A. falcatus var. acicularis	1.25 x 18.0	22.1	416.668	9208.4
Carteria				
C. multifilis	7.5 (diam.)	220.9	2276.793	502943.6
C. sp. (No. 1)	15.0 x 20.0	3534.3	1666.672	5890518.8
Chlorogonium				
C. elongatum var. elongatum	5.0 x 20.0	392.7	520.835	204531.9
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	119.048	498668.3
Conochaete				
C. comosa	20.0	4188.8	14.881	62333.5
Cosmarium				
C. sp.	10.0 x 10.0	785.4	14.881	11687.5

LAKE ParadiseDATE 7-26-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Dictyosphaerium D. pulchellum	20.0 (col.-diam.)	4188.8	297.620	1246670.6
Elakatothrix E. viridis	2.5 x 15.0	73.6	59.524	4381.0
Gonium G. pectorale	20.0 x 20.0 x 2.0	800.0	74.405	59524.0
Kirchneriella K. lunaris var. lunaris	5.0 x 12.5	245.4	59.524	14607.2
Micractinium M. pusillum	15.0 (col.-diam.)	1767.2	14.881	26297.7
Nephrocytium N. limneticum	8.75	350.8	14.881	5220.3
Oocystis O. borgei	12.5 (diam.)	1022.7	44.643	45656.4
Phacotus P. lenticularis	7.5 x 12.5	552.2	431.549	238301.4
Scenedesmus S. abundans	7.5 x 15.0	577.3	818.455	472494.1
S. dimorphus	12.5 x 10.0	1227.2	148.810	182619.6
Schroederia S. setigera	2.5 x 52.5	257.7	104.167	26843.8
Tetraedron T. minimum	7.5	421.8	29.762	12553.6
T. trigonum var. trigonum	26.0 (arm to arm)	239.0	178.572	42678.7
Tetrastrum T. heterocanthum	10.0 x 10.0 x 1.0	100.0	14.881	1488.1

LAKE ParadiseDATE 7-26-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
CHRYSTOPHYTA-None				
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	386.906	949622.1
C. sp.	5.0 x 7.5	147.3	1979.173	291532.2
CYANOPHYTA				
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	2008.935	1051878.3
Aphanizomenon				
A. flos-aquae	5.0 x 50.0	981.7	44.643	43826.0
Dactylococcopsis				
D. raphidioides	2.5 x 15.0	73.6	14.881	1095.2
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	2455.365	1285629.1
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	3110.129	4859576.5
Raphidiopsis				
R. curvata	5.0 x 25.0	490.9	133.929	65745.7
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	11651.823	365867.2
EUGLENOPHYTA				
Euglena				
E. viridis	22.5 x 45.5	18091.1	327.382	5922700.5
E. sp.	10.0 x 25.0	1963.5	44.643	87656.5
E. sp.	15.0 x 22.5	3976.1	252.977	1005861.8
Phacus				
P. acuminatus	20.0 x 28.8	9047.8	Present	

LAKE ParadiseDATE 7-26-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Phacus (Cont.)				
P. pyrum	10.0 x 32.5	2552.5	14.881	37983.8
Trachelomonas				
T. volvocina	11.2 (diam.)	735.6	14.881	10946.5
T. sp.				
(cyl.-smooth)	12.5 x 15.0	1840.8	14.881	27392.9
T. sp.				
(urn-shape)	10.0 x 30.0	2356.2	14.881	35062.6
PYRRHOPHYTA-None				
ANIMAL MATERIAL				
PROTOZOA-Sub-Phylum Ciliophora-Class Ciliata				
Order Odontostomatida-Family Tintinnidae				
Codonella				
C. sp.	15.0 x 45.0	7952.1	14.881	236670.4
C. sp.	30.0 x 55.0	38877.2	14.881	578531.6
ROTATORIA-Class Monogonata-Order Ploima				
Order Flosculariacea-Family Testudinellidae				
Tetramastix				
T. opoliensis	13.3 x 126.5	5594.1	14.881	83245.8
Order Ploima-Family Trichocericidae				
Trichocerca				
T. sp.	15.0 x 133.0	23503.0	14.881	349748.1

LAKE ParadiseDATE 9-6-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. meneghiniana	11.2 (diam.)	198.8	6264.901	1245462.3
Melosira				
M. italica var. tenuissima	5.0 x 14.0	2748.9	Present	
Navicula				
N. cryptocephala	6.15 x 20.3	603.0	14.881	8973.2
Nitzschia				
N. acicularis	2.5 x 87.5	429.5	208.334	89479.5
N. linearis	5.0 x 7.0	1374.4	312.501	429501.4
N. palea	3.0 x 25.0	176.7	863.098	152509.4
CHLOROPHYTA				
Actinastrum				
A. hantzschii var. fluviatile	25.0 (col.-diam.)	8181.4	104.167	852211.1
Ankistrodesmus				
A. convolutus	2.5 x 15.0	73.0	89.286	6517.9
A. falcatus var. acicularis	1.25 x 18.0	22.1	669.645	14799.2
Carteria				
C. multifilis	7.5 (diam.)	220.9	193.453	42733.8
C. sp. (No. 1)	15.0 x 20.0	3534.3	625.002	2208944.5
Chlorogonium				
C. elongatum var. elongatum	5.0 x 20.0	392.7	610.121	239594.5
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	312.501	1309004.1

LAKE ParadiseDATE 9-6-00SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Conochaete C. comosa	20.0	4188.8	14.881	62333.5
Cosmarium C. sp.	10.0 x 10.0	785.4	14.881	11687.5
Dictyosphaerium D. pulchellum	20.0 (col.-diam.)	4188.8	327.382	1371337.7
Elakatothrix E. viridis	2.5 x 15.0	73.6	59.524	4381.0
Kirchneriella K. lunaris var. lunaris	5.0 x 12.5	245.4	208.334	51125.2
Micractinium M. pusillum	15.0 (col.-diam.)	1767.2	14.881	26297.7
Oocystis O. borgei	12.5 (diam.)	1022.7	89.286	91312.8
Phacotus P. lenticularis	7.5 x 12.5	552.2	208.334	115042.0
Scenedesmus S. abundans	7.5 x 15.0	577.3	1383.933	798944.5
S. arcuatus var. platydisca	7.0 x 10.0	441.8	14.881	6574.4
S. dimorphus	12.5 x 10.0	1227.2	163.691	200881.6
Schroederia S. setigera	2.5 x 52.5	257.7	133.929	34513.5
Tetraedron T. minimum	7.5	421.8	44.643	18830.4
T. regulare var. incus	15.0 x 15.0 x 1.0	225.0	29.762	6696.4

LAKE ParadiseDATE 9-6-00SITE: RCG-2

<u>TAXA</u>	<u>SIZE (µm)</u>	<u>UNIT VOL. (µm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Tetraedron (Cont.)				
T. trigonum var. trigonum	26.0 (arm to arm)	239.0	133.929	32009.0
Tetrastrum				
T. staurogeniaeforme	8.0	268.1	14.881	3989.6
Treubaria				
T. triappendiculata	10.0	523.6	14.881	7791.7
CHRYSTOPHYTA-None				
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	133.929	328715.3
C. sp.	5.0 x 7.5	147.3	1979.173	291532.2
CYANOPHYTA				
Anabaena				
A. sp.	5.0 x 50.0	981.7	29.762	29217.4
Anabaenopsis				
A. elenkinii	5.0 x 50.0	981.7	104.167	102260.7
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	1711.315	896044.5
Aphanizomenon				
A. flos-aquae	5.0 x 50.0	981.7	14.881	14608.7
Dactylococcopsis				
D. raphidioides	2.5 x 15.0	73.6	59.524	4381.0
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	2142.864	1122003.5
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	3184.534	4975834.3
Microcystis				
M. aeruginosa	40.0 (col.-diam.)	33510.4	148.810	4986682.6

LAKE ParadiseDATE 9-6-00SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Raphidiopsis				
R. curvata	5.0 x 25.0	490.9	1294.647	635542.2
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	6875.022	215875.7
EUGLENOPHYTA				
Euglena				
E. viridis	22.5 x 45.5	18091.1	29.762	538427.3
E. sp.	10.0 x 25.0	1963.5	59.524	116875.4
Trachelomonas				
T. volvocina	11.2 (diam.)	735.6	208.334	153250.5
T. sp.				
(cyl.-gran.)	15.0 x 20.0	1900.7	29.762	105187.8
T. sp. (cyl.-Smooth)	12.5 x 15.0	1840.8	14.881	27392.9
PYRRHOPHYTA-None				
ANIMAL MATERIAL				
GASTROTRICHA				
Unknown Gastrotrich	32.5 x 115.0	95401.3	14.881	1419666.7
PROTOZOA-Sub-Phylum Ciliophora-Class Ciliata				
Unknown Ciliate	20.0	4188.8	14.881	62333.5
Order Gymnostomatida-Family Trachelidae				
Paradileptus				
P. sp.	90.0 x 100.0	636172.0	Present	
Order Oligotrichida-Family Halteriidae				
Halteria				
H. sp.	25.0 (diam.)	8181.2	Present	

LAKE ParadiseDATE 10-19-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. chaetoceros	12.5 (diam.)	1534.0	14.881	22827.5
C. melosiroides	10.0 x 2.5	196.3	29.762	5842.3
C. meneghiniana	11.2 (diam.)	198.8	1577.386	313584.3
Melosira				
M. italica var. Tenuissima	5.0 x 14.0	2748.0	Present	
Nitzschia				
N. linearis	5.0 x 7.0	1374.4	14.881	20452.4
N. palea	3.0 x 25.0	176.7	297.620	52589.5
CHLOROPHYTA				
Ankistrodesmus				
A. falcatus var. acicularis	1.25 x 18.0	22.1	208.334	4604.2
Carteria				
C. multifilis	7.5 (diam.)	220.9	74.405	16436.1
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	44.643	187000.6
Cosmarium				
C. sp.	10.0 x 10.0	785.4	14.881	11687.5
Dictyosphaerium				
D. pulchellum	20.0 (col.-diam.)	4188.8	119.048	498668.3
Elakatothrix				
E. viridis	2.5 x 15.0	73.6	14.881	1095.2
Kirchneriella				
K. lunaris var. lunaris	5.0 x 12.5	245.4	59.524	14607.2

LAKE ParadiseDATE 10-19-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Micractinium				
M. pusillum	15.0 (col.-diam.)	1767.2	14.881	26297.7
Phacotus				
P. lenticularis	7.5 x 12.5	552.2	104.167	57521.0
Scenedesmus				
S. abundans	7.5 x 15.0	577.3	386.906	223360.8
S. dimorphus	12.5 x 10.0	1227.2	Present	
Schroederia				
S. setigera	2.5 x 52.5	257.7	29.762	7669.7
Tetraedron				
T. minimum	7.5	421.8	29.762	12553.6
T. trigonum var. trigonum	26.0	239.0	29.762	7113.1
Tetrastrum				
T. heterocanthum	10.0 x 10.0 x 1.0	100.0	44.643	4464.3
CHRYSTOPHYTA-None				
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	29.762	73047.9
C. sp.	5.0 x 7.5	147.3	1383.933	203853.3
CYANOPHYTA				
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	6264.901	3280302.1
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	2008.935	1051878.3
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	74.405	116257.8

LAKE ParadiseDATE 10-19-00 SITE: RCG-2

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm3)</u>	<u>No./mL</u>	<u>VOLUME</u>
Raphidiopsis				
R. curvata	5.0 x 25.0	490.9	29.762	14610.2
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	89.286	2803.6
EUGLENOPHYTA				
Euglena				
E. viridis	22.5 x 45.5	18091.1	163.691	2961350.2
Trachelomonas				
T. volvocina	11.2 (diam.)	735.6	29.762	21892.9
PYRRHOPHYTA-None				
ANIMAL MATERIAL-None				

LAKE ParadiseDATE 5-10-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. chaetoceros	12.5	1534.0	119.048	182619.6
C. meneghiniana	11.2 (diam.)	198.8	1532.743	304709.3
Nitzschia				
N. acicularis	2.5 x 87.5	429.5	14.881	6391.4
N. palea	3.0 x 25.0	176.7	74.405	13147.4
CHLOROPHYTA				
Actinastrum				
A. hantzschii				
var. fluviatile	25.0 (col.-diam.)	8181.2	44.643	365233.3
Ankistrodesmus				
A. falcatus var.				
acicularis	1.25 x 18.0	22.1	2321.436	51303.7
Carteria				
C. multifilis	7.5 (diam.)	220.9	163.691	36159.3
Chodatella				
C. quadriseta	5.0 x 10.0	196.3	29.762	5842.3
C. wratislawiensis	2.5 x 7.5	36.8	89.286	3285.7
Closterium				
C. acutum	2.5 x 62.5	306.8	Present	
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	104.167	436334.7
Cosmarium				
C. sp.	10.0 x 10.0	785.4	238.096	187000.6
Dictyosphaerium				
D. pulchellum	20.0 (col.-diam.)	4188.8	44.643	187000.6

LAKE ParadiseDATE 5-10-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (µm)</u>	<u>UNIT VOL. (µm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Kirchneriella				
K. lunaris var. lunaris	5.0 x 12.5	245.4	892.860	219107.8
Micractinium				
M. pusillum	15.0 (col.-diam.)	1767.2	119.048	210381.6
Oocystis				
O. borgei	12.5 (diam.)	1022.7	59.524	60875.2
Phacotus				
P. lenticularis	7.5 x 12.5	552.2	193.453	106824.7
Scenedesmus				
S. abundans	7.5 x 15.0	577.3	1666.672	962169.7
S. dimorphus	12.5 x 10.0	1227.2	89.286	109571.8
Schroederia				
S. setigera	2.5 x 52.5	257.7	223.215	57522.5
Tetraedron				
T. minimum	7.5	421.8	14.881	6276.8
T. trigonum var. trigonum	26.0	239.0	29.762	7113.1
Tetrastrum				
T. heterocanthum	10.0 x 10.0 x 1.0	100.0	29.762	2976.2
T. staurogeniaeforme	8.0	268.1	14.881	3989.6
CHRYSTOPHYTA				
Heliopsis				
H. mutabilis	12.5 x 12.5 x 1.0	156.2	14.881	2324.4
CRYPTOPHYTA				
Cryptomonas				
C. sp.	5.0 x 7.5	147.3	461.311	67951.1
CYANOPHYTA				

LAKE ParadiseDATE 5-10-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (µm)</u>	<u>UNIT VOL. (µm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	8229.193	4308805.4
Aphanizomenon				
A. flos-aquae	5.0 x 50.0	981.7	223.215	219130.2
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	4985.135	2610216.6
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	44.643	69754.7
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	431.549	13550.6
EUGLENOPHYTA				
Euglena				
E. viridis	22.5 x 45.5	18091.1	14.881	269213.7
Phacus				
P. pyrum	10.0 x 32.5	2552.5	14.881	37983.8
Trachelomonas				
T. volvocina	11.2 (diam.)	735.6	59.524	43785.9
T. sp.				
(cyl.-gran.)	10.0 x 15.0	1178.1	14.881	17531.3
T. sp. (cyl.-				
Smooth-short neck)	20.0 x 25.0	7854.0	14.881	116875.4
PYRRHOPHYTA-None				
ANIMAL MATERIAL				
GASTROTRICHA				
Unknown Gastrotrich	40.0 x 90.0	113097.8	29.762	3365998.8
ROTATORIA-Class Monogonata-Order Ploima-Family Trichocercidae				
Trichocerca				
T. sp.	15.0 x 133.0	23503.0	14.881	349748.1

LAKE ParadiseDATE 6-28-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. meneghiniana	11.2 (diam.)	198.8	1101.194	218917.4
Nitzschia				
N. linearis	5.0 x 70.0	1374.4	29.762	40904.9
N. palea	3.0 x 25.0	176.7	282.739	49960.0
CHLOROPHYTA				
Actinastrum				
A. hantzschii				
var. fluviatile	25.0 (col.-diam.)	8181.4	14.881	121744.4
Ankistrodesmus				
A. falcatus var.				
acicularis	1.25 x 18.0	22.1	401.787	8879.5
Carteria				
C. multifilis	7.5 (diam.)	220.9	535.716	118339.7
C. sp. (No. 1)	15.0 x 20.0	3534.3	119.048	420751.3
Chlorogonium				
C. elongatum var.				
elongatum	5.0 x 20.0	392.7	89.286	35062.6
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	14.881	62333.5
Conochaete				
C. comosa	20.0	4188.8	14.881	62333.5
Cosmarium				
C. sp.	10.0 x 10.0	785.4	44.643	35062.6
Dictyosphaerium				
D. pulchellum	20.0 (col.-diam.)	4188.8	178.572	748002.4

LAKE ParadiseDATE 6-28-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Kirchneriella				
K. lunaris var. lunaris	5.0 x 12.5	245.4	14.881	3651.8
Oocystis				
O. borgei	12.5	1022.7	14.881	15218.8
Pandorina				
P. morum	7.5 x 12.5	552.2	29.762	16434.6
Phacotus				
P. lenticularis	7.5 x 12.5	552.2	44.643	24651.9
Scenedesmus				
S. abundans	7.5 x 15.0	577.3	416.668	240542.4
Schroederia				
S. setigera	2.5 x 52.5	257.7	89.286	23009.0
Tetraedron				
T. caudatum var. caudatum	10.0 x 10.0 x 2.0	200.0	14.881	2976.2
T. trigonum var. trigonum	26.0 (arm to arm)	239.0	14.881	3556.6
Tetrastrum				
T. heterocanthum	10.0 x 10.0 x 1.0	100.0	14.881	1488.1
CHRYSOPHYTA-None				
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	59.524	146095.7
C. sp.	5.0 x 7.5	147.3	342.263	50415.3
CYANOPHYTA				
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	14747.071	7721566.3

LAKE ParadiseDATE 6-28-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Gomphosphaeria G. lacustris	10.0 (col.-diam.)	523.6	4449.419	2329715.7
Merismopedia M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	342.263	534785.9
Raphidiopsis R. curvata	5.0 x 25.0	490.9	14.881	7305.1
Schizothrix S. calcicola	2.0 x 10.0	31.4	357.144	11214.3
EUGLENOPHYTA				
Euglena E. viridis	22.5 x 45.5	18091.1	74.405	1346068.0
PYRRHOPHYTA-None				
ANIMAL MATERIAL				
NEMATODA				
Unknown Nematode	10.0 x 55.0	4319.7	14.881	64281.5
PROTOZOA-Sub-Phylum Ciliophora-Class Ciliata- Order Odontostomatida-Family Tintinnidae				
Codonella C. sp.	25.0 x 75.0	36815.5	14.881	547851.4

LAKE ParadiseDATE 7-26-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. chaetoceros	12.5	1534.0	44.643	68482.4
C. meneghiniana	11.2 (diam.)	198.8	1934.530	384584.6
Nitzschia				
N. acicularis	2.5 x 87.5	429.5	74.405	31956.9
N. linearis	5.0 x 7.0	1374.4	89.286	122714.7
N. palea	3.0 x 25.0	176.7	922.622	163027.3
CHLOROPHYTA				
Actinastrum				
A. hantzschii var. fluviatile	25.0 (col.-diam.)	8181.4	267.858	2191399.8
Ankistrodesmus				
A. convolutus	2.5 x 15.0	73.0	89.286	6517.9
A. falcatus var. acicularis	1.25 x 18.0	22.1	848.217	18745.6
Carteria				
C. multifilis	7.5 (diam.)	220.9	4241.085	936855.7
C. sp. (No. 1)	15.0 x 20.0	3534.3	5565.494	1970125.0
Chlorogonium				
C. elongatum var. elongatum	5.0 x 20.0	392.7	2038.697	800596.3
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	29.762	124667.1
Cosmarium				
C. sp.	10.0 x 10.0	785.4	163.691	128562.9
Dictyosphaerium				
D. pulchellum	20.0 (col.-diam.)	4188.8	386.906	1620671.8

LAKE ParadiseDATE 7-26-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Elakatothrix E. viridis	2.5 x 15.0	73.6	14.881	1095.2
Gonium G. pectorale	20.0 x 20.0 x 2.0	800.0	446.430	357144.0
Kirchneriella K. lunaris var. lunaris	5.0 x 12.5	245.4	208.334	51125.2
Oocystis O. borgei	12.5 (diam.)	1022.7	59.524	60875.2
Pediastrum P. tetras var. tetraodon	24.0 x 2.0	904.8	14.881	13464.3
Phacotus P. lenticularis	7.5 x 12.5	552.2	386.906	213649.5
Scenedesmus S. abundans	7.5 x 15.0	577.3	1071.432	618537.7
S. dimorphus	12.5 x 10.0	1227.2	89.286	109571.8
Schroederia S. setigera	2.5 x 52.5	257.7	104.167	26843.8
Tetraedron T. caudatum var. longispinum	10.0 x 10.0 x 2.0	200.0	29.762	5952.4
T. minimum	7.5	421.8	14.881	6276.8
T. muticum fa. punctulatum	25.0	1562.5	14.881	23251.6
T. trigonum var. trigonum	26.0 (arm to arm)	239.0	327.382	78244.3
Tetrastrum T. heterocanthum	10.0 x 10.0 x 1.0	100.0	14.881	1488.1

LAKE ParadiseDATE 7-26-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (µm)</u>	<u>UNIT VOL. (µm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Treubaria				
T. triappendiculata	10.0	523.6	14.881	7791.7
CHRYSTOPHYTA-None				
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	952.384	2337531.2
C. sp.	5.0 x 7.5	147.3	6160.734	907476.1
CYANOPHYTA				
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	550.597	288292.6
Aphanizomenon				
A. flos-aquae	5.0 x 50.0	981.7	44.643	43826.0
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	1622.025	849294.4
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	3422.630	5347859.3
Microcystis				
M. aeruginosa	40.0 (col.-diam.)	33510.4	14.881	498668.3
Raphidiopsis				
R. curvata	5.0 x 25.0	490.9	59.524	29220.3
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	11979.205	376147.0
EUGLENOPHYTA				
Euglena				
E. viridis	22.5 x 45.5	18091.1	133.929	2422922.9
E. sp.	11.0 x 25.0	1963.5	163.691	388897.1

LAKE ParadiseDATE 7-26-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Euglena E. sp.	15.0 x 35.0	6185.0	89.286	552233.9
Phacus P. pyrum	10.0 x 32.5	2552.5	74.405	189918.8
Trachelomonas T. volvocina	11.2 (diam.)	735.6	14.881	10946.5
T. sp. (cyl.-gran.)	20.0 x 30.0	9424.8	29.762	280500.9
T. sp. (urn-shape)	10.0 x 30.0	2356.2	29.762	70125.2
T. sp. (urn-shape)	25.0 x 40.0	19634.9	14.881	292186.9
PYRRHOPHYTA				
Glenodinium G. gymnodinium	31.0 x 42.5	32077.8	14.881	477349.7
G. sp.	17.5 x 17.5	2806.2	238.096	668145.0
ANIMAL MATERIAL				
GASTROTRICHA				
Unknown Gastrotrich	30.0 x 75.0	53014.3	14.881	788905.8
PROTOZOA-Sub-Phylum Ciliophora-Class Ciliata				
Unknown Ciliate	60.0 x 70.0	197920.2	14.881	2945250.4
Order Gymnostomatida-Family Didiniidae				
Didinium D. sp.	22.5 x 30.0	11928.2	14.881	177503.5
Order Oligotrichida-Family Halteriidae				
Halteria H. sp.	25.0 (diam.)	8181.2	148.810	1217444.3

LAKE ParadiseDATE 7-26-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm3)</u>	<u>No./mL</u>	<u>VOLUME</u>
-Sub-Phylum Mastigophora-Class Zoomastigophorea				
Unknown Flagellate	12.5 x 15.0	1840.8	14.881	27392.9
ROTATORIA-Class Monogonata-Order Ploima				
Order Ploima-Family Trichocericidae				
Trichocerca				
T. sp.	15.0 x 133.0	23503.0	14.881	349748.1

LAKE ParadiseDATE 9-6-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. meneghiniana	11.2 (diam.)	198.8	4657.753	925961.3
Melosira				
M. italica var. tenuissima	5.0 x 14.0	2748.9	Present	
Navicula				
N. cryptocephala	6.15 x 20.3	603.0	104.167	62812.7
Nitzschia				
N. acicularis	2.5 x 87.5	429.5	431.549	185350.3
N. linearis	5.0 x 7.0	1374.4	193.453	265881.8
N. palea	3.0 x 25.0	176.7	758.931	134103.1
CHLOROPHYTA				
Actinastrum				
A. hantzschii var. fluviatile	25.0 (col.-diam.)	8181.4	148.810	1217444.3
Ankistrodesmus				
A. convolutus	2.5 x 15.0	73.0	29.762	2172.6
A. falcatus var. acicularis	1.25 x 18.0	22.1	595.240	13154.8
Carteria				
C. multifilis	7.5 (diam.)	220.9	357.144	78893.1
C. sp. (No. 1)	15.0 x 20.0	3534.3	476.192	1683005.3
Chlorogonium				
C. elongatum var. elongatum	5.0 x 20.0	392.7	639.883	251282.0
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	282.739	1184337.1

LAKE ParadiseDATE 9-6-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Cosmarium C. sp.	10.0 x 10.0	785.4	44.643	35062.6
Dictyosphaerium D. pulchellum	20.0 (col.-diam.)	4188.8	431.549	1807672.4
Elakatothrix E. viridis	2.5 x 15.0	73.6	14.881	1095.2
Kirchneriella K. lunaris var. lunaris	5.0 x 12.5	245.4	119.048	29214.4
Oocystis O. borgei	12.5 (diam.)	1022.7	44.643	45656.4
Phacotus P. lenticularis	7.5 x 12.5	552.2	327.382	180780.3
Polyedriopsis P. spinulosa	2.5 x 10.0 x 17.5	437.5	14.881	6510.4
Scenedesmus S. abundans	7.5 x 15.0	577.3	1488.100	859080.1
S. dimorphus	12.5 x 10.0	1227.2	104.167	127833.7
Schroederia S. setigera	2.5 x 52.5	257.7	223.215	57522.5
Tetraedron T. gracile	25.0 x 25.0 x 1.0	625.0	14.881	9300.6
T. regulare var. Incus	15.0 x 15.0 x 1.0	225.0	14.881	3348.2
T. trigonum var. trigonum	26.0 (arm to arm)	239.0	178.572	42678.7
Tetrastrum T. staurogeniaeforme	8.0	268.1	14.881	3989.6
Treubaria T. crassispina	10.0	523.6	14.881	7791.7

LAKE ParadiseDATE 9-6-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
CHRYSTOPHYTA-None				
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	238.096	584382.8
C. sp.	5.0 x 7.5	147.3	2351.198	346331.5
CYANOPHYTA				
Anabaena				
A. spiroides var. crassa	10.0 100.0	7854.0	14.881	116875.4
A. sp.	5.0 x 50.0	981.7	29.762	29217.4
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	2529.770	1324587.5
Dactylococcopsis				
D. raphidioides	2.5 x 15.0	73.6	29.762	2190.5
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	2559.532	1340170.9
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	3095.248	4836325.0
Microcystis				
M. aeruginosa	40.0 (col.-diam.)	33510.4	104.167	3490677.8
Raphidiopsis				
R. curvata	5.0 x 25.0	490.9	952.384	467525.3
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	7202.404	226155.5
EUGLENOPHYTA				
Euglena				
E. viridis	22.5 x 45.5	18091.1	238.096	4307418.5
E. sp.	15.0 x 35.0	6185.0	44.643	276117.0

LAKE ParadiseDATE 9-6-00SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Trachelomonas				
T. volvocina	11.2 (diam.)	735.6	148.810	109464.6
T. sp.				
(cyl.-gran.)	10.0 x 20.0	1178.1	14.881	17531.3
PYRRHOPHYTA				
Glenodinium				
G. gymnodinium	31.0 x 42.5	32077.8	14.881	477349.7
G. sp.	17.5 x 17.5	2806.2	14.881	41759.1
ANIMAL MATERIAL				
GASTROTRICHA				
Unknown Gastrotrich	30.0 x 75.0	53014.3	29.762	1577811.5
ROTATORIA-Class Monogonata-Order Ploima-Family Trichocercidae				
Trichocerca				
T. sp.	15.0 x 133.0	23503.0	14.881	349748.1

LAKE ParadiseDATE 10-19-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
BACILLARIOPHYTA				
Cyclotella				
C. meneghiniana	11.2 (diam.)	198.8	877.979	174542.2
Melosira				
M. italica var.				
Tenuissima	5.0 x 14.0	2748.0	Present	
Nitzschia				
N. linearis	5.0 x 7.0	1374.4	14.881	20452.4
N. palea	3.0 x 25.0	176.7	44.643	7888.4
CHLOROPHYTA				
Ankistrodesmus				
A. falcatus var.				
acicularis	1.25 x 18.0	22.1	148.810	3288.7
Carteria				
C. multifilis	7.5 (diam.)	220.9	148.810	32872.1
Chlorogonium				
C. elongatum var.				
elongatum	5.0 x 20.0	392.7	14.881	5843.8
Coelastrum				
C. microporum	20.0 (col.-diam.)	4188.8	14.881	62333.5
Dictyosphaerium				
D. pulchellum	20.0 (col.-diam.)	4188.8	14.881	62333.5
Micractinium				
M. pusillum	15.0 (col.-diam.)	1767.2	14.881	26297.7
Phacotus				
P. lenticularis	7.5 x 12.5	552.2	89.286	49303.7
Scenedesmus				
S. abundans	7.5 x 15.0	577.3	297.620	171816.0
S. dimorphus	12.5 x 10.0	1227.2	29.762	36523.9

LAKE ParadiseDATE 10-19-00 SITE: RCG-3

<u>TAXA</u>	<u>SIZE (μm)</u>	<u>UNIT VOL. (μm³)</u>	<u>No./mL</u>	<u>VOLUME</u>
Tetraedron				
T. trigonum var.				
trigonum	26.0	239.0	14.881	3556.6
CHRYSTOPHYTA-None				
CRYPTOPHYTA				
Cryptomonas				
C. erosa	12.5 x 20.0	2454.4	74.405	182619.6
C. sp.	5.0 x 7.5	147.3	1860.125	273996.4
CYANOPHYTA				
Anacystis				
A. montana	10.0 (col.-diam.)	523.6	5952.400	3116676.6
Gomphosphaeria				
G. lacustris	10.0 (col.-diam.)	523.6	3898.822	2041423.1
Merismopedia				
M. quadruplicata	25.0 x 25.0 x 2.5	1562.5	14.881	23251.6
Raphidiopsis				
R. curvata	5.0 x 25.0	490.9	14.881	7305.1
Schizothrix				
S. calcicola	2.0 x 10.0	31.4	119.048	3738.1
EUGLENOPHYTA-None				
PYRRHOPHYTA-None				
ANIMAL MATERIAL-None				

List of taxa found in samples from Lake Paradise (RCF) during 2000.

<u>Taxa</u>	<u>Site and Date Found</u>
BACILLARIOPHYTA	
<i>Cyclotella</i>	
<i>C. chaetoceros</i> Lemm.	5-10(1,2,3), 6-28(1,2), 7-26(1,2,3), 9-6(1), 10-19(1,2) (All C)
<i>C. melosiroides</i> (Kirch.) Lemm.	10-19(2-C)
<i>C. meneghiniana</i> Kuetz.	5-10, 6-28, 7-26, 9-6, 10-19 (All C, All Sites)
<i>Melosira</i>	
<i>M. italica</i> (Ehr.) Kuetz. var. <i>tenuissima</i> (Grun.) Muell.	7-26(1), 9-6(1,2,3), 10-26(1,2,3) (All C)
<i>M. varians</i> Ag.	5-10(1-C)
<i>Navicula cryptocephala</i> (Kuetz.) Wm. Sm. var. <i>cryptocephala</i>	9-6(1,2,3) (All C)
<i>Nitzschia</i>	
<i>N. acicularis</i> (Kuetz.) Wm. Sm.	5-10(3), 6-28(1,2), 7-26(1,2,3), 9-6(1,2,3) (All C)
<i>N. linearis</i> (Ag.) Wm. Sm.	5-10(2), 6-28(2,3), 7-26(1,2,3), 9-6(1,2,3), 10-19(1,2,3) (All C)
<i>N. palea</i> (Kuetz.) Wm. Sm.	5-10(3), 6-28(1,2,3), 7-26(1,2,3), 9-6(1,2,3), 10-19(1,2,3) (All C)
CHLOROPHYTA	
<i>Actinastrum hantzschii</i> Lag. var. <i>fluviatile</i> Schroed.	5-10(1,2,3), 6-28(1,2,3), 7-26(1,2,3) 9-6(1,2,3) (All C)
<i>Ankistrodesmus</i>	
<i>A. convolutus</i> Corda	5-10(1), 7-26(2,3), 9-6(1,2,3) (All C)
<i>A. falcatus</i> (Corda) Ralfs var. <i>acicularis</i> (A. Br.) G. S. West	5-10, 6-28, 7-26, 9-6, 10-19 (All Sites, All C)

<u>Taxa</u>	<u>Site and Date Found</u>
<i>Carteria</i>	
<i>C. multifilis</i> (Fres.) Dill.	5-10, 6-28, 7-26, 9-6, 10-19 (All Sites, All C)
<i>C. sp.</i> (No. 1)	6-28(1,2,3), 7-26(1,2,3), 9-6(1,2,3) (All C)
<i>Chlorogonium elongatum</i> (Dang.) Franze var. <i>elongatum</i>	6-28(1,2,3), 7-26(1,2,3), 9-6(1,2,3), 10-19(3) (All C)
<i>Chodatella</i>	
<i>C. quadriseta</i> Lemm.	5-10(1,2,3) (All C)
<i>C. wratislawiensis</i> (Schroed.) Ley	5-10(1,2,3) (All C)
<i>Closterium acutum</i> (Lyngb.) Breb.	5-10(3), 10-19(1) (Both C)
<i>Coelastrum microporum</i> Naeg.	5-10(1,2,3), 6-28(1,3), 7-26(1,2,3), 9-6(1,2,3), 10-19(1,2,3) (All C)
<i>Conochaete comosa</i> Kleb.	6-28(2,3), 7-26(2), 9-6(1,2) (All C)
<i>Cosmarium</i>	
<i>C. sp.</i> (10.0 x 10.0 µm)	5-10(2), 9-6(2) (Both C)
<i>C. sp.</i> (10.0 x 10.0 µm)	5-10(1,2,3), 6-28(1,2,3), 7-26(1,2), 10-19(2) (All C)
<i>C. sp.</i> (10.0 x 10.0 µm)	9-6(1-C)
<i>C. sp.</i> (10.0 x 10.0 µm)	7-26(3), 9-6(3) (Both C)
<i>Dictyosphaerium pulchellum</i> Fres.	5-10, 6-28, 7-26, 9-6, 10-19 (All Sites, All C)
<i>Elakatothrix viridis</i> (Snow) Printz	7-26(1,2,3), 9-6(1,2,3), 10-19(2) (All C)
<i>Golenkinia radiata</i> Chod.	5-10(1,2), 6-28(1,2) (All C)
<i>Gonium pectorale</i> Muell.	7-16(1,2,3) (All C)

<u>Taxa</u>	<u>Site and Date Found</u>
<i>Kirchneriella lunaris</i> (Kirch.) Moeb. var. <i>lunaris</i>	5-10(1,2,3), 6-28(1,2,3), 7-26(1,2,3), 9-6(1,2,3), 10-19(1,2) (All C)
<i>Micractinium pusillum</i> Fres.	5-10(1,2,3), 6-28(2), 7-26(1,2,3), 9-6(2), 10-19(1,2,3) (All C)
<i>Nephrocytium limneticum</i> (G. M. Sm.) G. M. Sm.	6-28(1), 7-26(2), 9-6(1) (All C)
<i>Oocystis borgei</i> Snow	5-10(1,2,3), 6-28(1,3), 7-26(1,2,3), 9-6(1,2,3) (All C)
<i>Pandorina morum</i> Bory	6-28(3-C)
<i>Pediastrum</i> <i>P. duplex</i> Meyen var. <i>gracilimum</i> West & West	6-28(2-C), 9-6(1-P)
<i>P. tetras</i> (Ehr.) Ralfs var. <i>tetraodon</i> (Corda) Hansg.	7-26(3-C)
<i>Phacotus lenticularis</i> (Ehr.) Stein	5-10, 6-28, 7-26, 9-6, 10-19 (All Sites, All C)
<i>Polyedriopsis spinulosa</i> Schmid.	7-26(1), 9-6(1,3) (All C)
<i>Scenedesmus</i> <i>S. abundans</i> (Kirch.) Chod.	5-10, 6-28, 7-26, 9-6, 10-19 (All C, All Sites)
<i>S. arcuatus</i> Lemm. var. <i>platydisca</i> G. M. Sm.	9-6(2-C)
<i>S. denticulatus</i> Lag.	7-26(1-C)
<i>S. dimorphus</i> (Turp.) Kuetz.	5-10(1,2,3), 6-28(1,2), 7-26(1,2,3), 9-6(1,2,3), 10-19(2,3) (All C)
<i>S. opoliensis</i> Rich	9-6(1-C)
<i>Schroederia setigera</i> (Schroed.) Lemm.	5-10(1,2,3), 6-28(1,2,3), 7-26(1,2,3), 9-6(1,2,3), 10-19(1,2,3-P) (All C except as noted.

<u>Taxa</u>	<u>Site and Date Found</u>
<i>Tetraedron</i>	
<i>T. caudatum</i> (Corda) Hansg. var. <i>caudatum</i>	5-10(2), 6-28(3), 7-26(1) (All C)
<i>T. caudatum</i> var. <i>longispinum</i> Lemm.	6-28(2), 7-26(3) (Both C)
<i>T. gracile</i> (Rein.) Hansg.	9-6(3-C)
<i>T. minimum</i> (A. Br.) Hansg.	5-10(2,3), 7-26(2,3), 9-6(1,2), 10-19(2) (All C)
<i>T. muticum</i> (A.Br.) Hansg. fa. <i>punctulatum</i> (Rein.) deToni	7-26(3-C)
<i>T. regulare</i> Kuetz. var. <i>incus</i> Teiling	5-10(1), 9-6(1,2,3) (All C)
<i>T. trigonum</i> (Naeg.) Hansg. var. <i>trigonum</i>	5-10(1,2,3), 6-28(1,2,3), 7-26(1,2,3), 9-6(1,2,3), 10-19(2,3) (All C)
<i>Tetrastrum</i>	
<i>T. heterocanthum</i> (Nordst.) Chod.	5-10(1,2,3), 6-28(1,2,3), 7-26(2,3), 10-19(1,2) (All C)
<i>T. staurogeniaeforme</i> (Schroed.) Lemm.	5-10(1,2,3), 6-28(2), 7-26(1), 9-6(2,3), 10-19(1) (All C)
<i>Treubaria</i>	
<i>T. crassispina</i> G. M. Sm.	9-6(3-C)
<i>T. triappendiculata</i> Bern.	5-10(1), 7-26(3), 9-6(2) (All C)
CHRYSTOPHYTA	
<i>Heliopsis mutabilis</i> Pascher	5-10(1,2,3) (All C)
CRYPTOPHYTA	
<i>Cryptomonas</i>	
<i>C. erosa</i> Ehr.	5-10(1,2), 6-28(1,2,3), 7-26(1,2,3), 9-6(1,2,3), 10-19(1,2,3) (All C)
<i>C. sp.</i> (No. 1)	5-10, 6-28, 7-26, 9-6, 10-19 (All C, All Sites)

TaxaSite and Date Found**CYANOPHYTA***Anabaena**A. spiroides* Kleb. var. *crassa* Lemm.

9-6(3-C)

A. sp. (5.0 x 50.0 µm)

9-6(1,2,3) (All C)

Anabaenopsis elenkinii Miller

9-6(1-P,2-C)

Anacystis montana (Lightf.) Dr. & Daily5-10, 6-28, 7-26, 9-6, 10-19
(All C, All Sites)*Aphanizomenon flos-aquae* Born. et Flah.5-10(1,2,3), 6-28(1,2), 7-26(1,2,3)
9-6(2) (All C)*Dactylococcopsis raphidioides* Hansg.5-10(1,2), 6-28(1), 7-26(1,2), 9-6(2,3)
(All C)*Gomphosphaeria lacustris* Chod.5-10, 6-28, 7-26, 9-6, 10-19
(All C, All Sites)*Merismopedia quadruplicata* Trev.5-10, 6-28, 7-26, 9-6, 10-19
(All C)*Microcystis aeruginosa* Kuetz.

6-28(2), 7-26(3), 9-6(1,2,3) (All C)

Raphidiopsis curvata Fritsch & Rich5-10(2), 6-28(1,3), 7-26(1,2,3), 9-6(1,2,3),
10-19(1,2,3) (All C)
(All C)*Schizothrix calcicola* Gom.5-10(1,2,3), 6-28(1,2,3), 7-26(1,2,3),
9-6(1,2,3), 10-19(2,3) (All C)**EUGLENOPHYTA***Euglena**E. viridis* Ehr.5-10(1,2,3), 6-28(1,2,3), 7-26(1,2,3),
9-6(1,2,3), 10-19(2) (All C)*E. sp.* (5.0 x 20.0 µm)

7-26(1-C)

E. sp. (5.0 x 35.0 µm)

6-28(2-C)

<u>Taxa</u>	<u>Site and Date Found</u>
<i>Euglena</i> (Cont.)	
<i>E. sp.</i> (7.5 x 20.0 µm)	9-6(1-C)
<i>E. sp.</i> (7.5 x 22.5 µm)	7-26(1-C)
<i>E. sp.</i> (10.0 x 25.0 µm)	7-26(1,2,3), 9-6(1,2,3) (All C)
<i>E. sp.</i> (11.0 x 25.0 µm)	7-26(1,3) (Both C)
<i>E. sp.</i> (15.0 x 22.5 µm)	6-28(2), 7-26(2) (Both C)
<i>Phacus</i>	
<i>P. acuminatus</i> Stokes	5-10(1,2), 7-26(2) (All C)
<i>P. pyrum</i> (Ehr.) Stein	5-10(3), 7-26(2,3) (All C)
<i>Trachelomonas</i>	
<i>T. hispida</i> (Perty) Stein	5-10(2-C)
<i>T. volvocina</i> Ehr.	5-10(1,2,3), 6-28(1,2), 7-26(1,2,3), 9-6(1,2,3), 10-19(1,2) (All C)
<i>T. sp.</i> (cyl.-gran) (10.0 x 15.0 µm)	5-10(3), 9-6(3) (Both C)
<i>T. sp.</i> (cyl.-gran) (11.0 x 20.0 µm)	9-6(1-C)
<i>T. sp.</i> (cyl.-gran) (12.5 x 20.0 µm)	10-19(1-C)
<i>T. sp.</i> (cyl.-gran) (15.0 x 20.0 µm)	9-6(2-C)
<i>T. sp.</i> (cyl.-gran) (15.0 x 25.0 µm)	6-28(1-C)
<i>T. sp.</i> (cyl.-gran) (20.0 x 30.0 µm)	7-26(3-C)
<i>T. sp.</i> (cyl.-gran) (22.5 x 25.0 µm)	5-10(2-C)
<i>T. sp.</i> (cyl.-gran.-neck) (15.0 x 25.0 µm)	9-6(1-C)
<i>T. sp.</i> (cyl.-gran.-neck) (17.5 x 22.5 µm)	6-28(2-C)
<i>T. sp.</i> (cyl.-gran.-short neck) (17.5 x 22.5 µm)	5-10(1), 6-28(1), 7-26(1) (All C)

<u>Taxa</u>	<u>Site and Date Found</u>
<i>Trachelomonas</i> (Cont.)	
<i>T. sp.</i> (cyl.-gran.-short neck) (22.5 x 30.0 µm)	6-28(2-C)
<i>T. sp.</i> (cyl.-smooth) (12.5 x 15.0 µm)	7-26(2), 9-6(2) (Both C)
<i>T. sp.</i> (cyl.-smooth) (15.0 x 20.0 µm)	6-28(1-C)
<i>T. sp.</i> (cyl.-smooth-short neck) (15.0 x 20.0 µm)	6-28(1-C)
<i>T. sp.</i> (cyl.-smooth-short neck) (15.0 x 25.0 µm)	7-26(1-C)
<i>T. sp.</i> (cyl.-smooth-short neck) (20.0 x 25.0 µm)	5-10(3-C)
<i>T. sp.</i> (urn-shape) (10.0 x 30.0 µm)	7-26(2-C)
<i>T. sp.</i> (urn-shape) (10.0 x 30.0 µm)	7-26(3-C)
<i>T. sp.</i> (urn-shape) (10.0 x 40.0 µm)	6-28(2-C)
<i>T. sp.</i> (urn-shape) (17.5 x 22.5 µm)	5-10(2-C)
<i>T. sp.</i> (urn-shape) (17.5 x 35.0 µm)	7-26(1-C)
<i>T. sp.</i> (urn-shape) (17.5 x 22.5 µm)	5-10(2-C)
<i>T. sp.</i> (urn-shape) (25.0 x 32.5 µm)	6-28(2-C)
<i>T. sp.</i> (urn-shape) (25.0 x 40.0 µm)	7-26(3-C)
<i>T. sp.</i> (urn-shape) (25.0 x 45.0 µm)	7-26(1-C)

PYRRHOPHYTA

Glenodinium

<i>G. gymnodinium</i> Penard	7-26(1,3), 9-6(3) (All C)
<i>G. sp.</i> (17.5 x 17.5 µm)	7-26(1,3), 9-6(1,3), 10-19(1) (All C)

Hemidinium

<i>H. nasutum</i> Stein	7-26(1-C)

<u>Taxa</u>	<u>Site and Date Found</u>
<i>Peridinium</i>	
<i>P. penardiforme</i> Lindem.	7-26(1-C)
<i>P. sp.</i> (15.0 x 17.5 µm)	7-26(1-C)
GASTROTRICHA	
Unknown Gastrotrich (30.0 x 75.0 µm)	7-26(3), 9-6(3) (Both C)
Unknown Gastrotrich (30.0 x 85.0 µm)	7-26(1-C)
Unknown Gastrotrich (32.5 x 115.0 µm)	9-6(2-C)
Unknown Gastrotrich (35.0 x 85.0 µm)	5-10(2-C)
Unknown Gastrotrich (35.0 x 85.0 µm)	5-10(2-C)
Unknown Gastrotrich (35.0 x 115.0 µm)	6-28(2-P)
Unknown Gastrotrich (40.0 x 90.0 µm)	5-10(1-P)
Unknown Gastrotrich (40.0 x 90.0 µm)	5-10(3-C)
NEMATODA	
Unknown Nematode (10.0 x 55.0 µm)	6-28(3-C)
PROTOZOA-Sub-Phylum Ciliophora- Class Ciliata-	
Unknown Ciliate (10.0 µm)	7-26(1), 9-6(1) (Both C)
Unknown Ciliate (20.0 µm)	9-6(2-C)
Unknown Ciliate (50.0 µm)	6-28(2-C)
Unknown Ciliate (60.0 x 70.0 µm)	7-26(3-C)
Unknown Ciliate (107.5 µm)	5-10(2-P)
Order Gymnostomatida-Family Didiniidae	

<u>Taxa</u>	<u>Site and Date Found</u>
<i>Didinium</i> sp. (22.5 x 30.0 µm)	7-26(3-C)
-Family Trachelidae	
<i>Paradileptus</i> sp. (90.0 x 100 µm)	5-10(1-P), 9-6(2-C)
Order Odontostomatida-Family Tintinnidae	
<i>Codonella</i>	
<i>C.</i> sp. (15.0 x 45.0 µm)	7-26(2-C)
<i>C.</i> sp. (25.0 x 75.0 µm)	6-28(3-C)
<i>C.</i> sp. (25.0 x 90.0 µm)	6-28(1-C)
<i>C.</i> sp. (25.0 x 90.0 µm)	7-26(1-C)
<i>C.</i> sp. (25.0 x 100.0 µm)	6-28(1-C)
<i>C.</i> sp. (30.0 x 55.0 µm)	7-26(2-C)
<i>C.</i> sp. (30.0 x 60.0 µm)	6-28(2-C)
<i>C.</i> sp. (30.0 x 75.0 µm)	6-28(2-C)
<i>C.</i> sp. (30.0 x 75.0 µm)	6-28(2-C)
Order Oligotrichida-Family Halteriidae	
<i>Halteria</i>	
<i>H.</i> sp. (25.0 µm)	5-10(1,2), 6-28(2), 7-26(1,3), 9-6(2) (All C)
Order Sessilia-Family Vorticellidae	
<i>Vorticella</i>	
<i>V.</i> sp. (35.0 µm)	6-28(2-P)
<i>V.</i> sp. (37.5 µm)	9-6(1-C)
-Sub-Phylum Mastigophora- Class Zoomastigophorea	

<u>Taxa</u>	<u>Site and Date Found</u>
Unknown Flagellate (12.5 x 15.0 µm)	7-26(1,3) (Both C)
-Sub-Phylum Sarcodina- Class Actinopoda-Order Heliozoidea	
Unknown Actinopod (15.0 x 20.0 µm)	6-28(2-C)
ROTATORIA -Class Monogonata- Order Flosculariacea-Family Testudinellidae	
<i>Tetramastix opoliensis</i>	7-26(2-C)
Order Ploima-	
Unknown Rotifer (45.0 x 65.0 µm)	7-26(1-C)
Order Ploima-Family Synchaetidae	
<i>Polyarthra</i> sp. (50.0 x 110.0 µm)	9-6(1-C)
Family Trichocercidae	
<i>Trichocerca</i> sp. (15.0 x 133.0 µm)	5-10(3), 7-26(2,3), 9-6(1,3) (All C)
Unknown Animal (25.0 x 25.0 x 2.0 µm)	8-24(3-C)

(C) indicates taxon was found in counts and (P) indicates it was found in a concentrated subsample.



Appendix C

Recent Fish Management Records

COUNTY Coles

CUMULATIVE HISTORY

WATER (NAME) Paradise Lake

DATE	ENTRY
10-28-40	250,000 bass & bluegill fingerlings stocked
8-21-41	320 mixed fish stocked. (rescued)
11-15-41	Mixed fingerlings stocked from Mattoon (150,000)
10-19-42	Stocked 25,000 bass and bluegills from Mattoon
11-15-43	Stocked 150,000 bass & bluegills " "
9-25-44	" 20,000 " " " " (50,000 each same day)
3-27-45	Crappies (10,000) stocked from Mattoon
4-3-46	4500 bass, bluegill, crappie rescued.
7-28-49	400 crappie stocked from Havana
5-11-50	Stocked 50 crappie (41 were tagged) from Mattoon
4-14, 22-54	Lake Mattoon lowered to 5 acre feet - fish rescued by Division of Fisheries. Lake rotenoned and restocked with fish rescued previously
3-16-55	Brehmer recommended 50 IM brdr bass he stocked early enough to get spring spawn
4-15-55	Stocked 40 breeder bass from Ramsey
10-17-55	Stocked 1000 bluegill from Mattoon
3-6-56	Stocked 2,000 channel catfish from Havana.
4/27/59	Stocked 1500 Channel Catfish
9-30-59 & 10-1-59	Lake survey and fish population analysis
11-13-58	Lake survey
11-9-66	Supplemental survey, fish population analysis
4-19-67	Sounding map & Supplemental Survey
8/25/69	Supplemental Survey - check watershed
8/4/69	Supplemental survey, fish population analysis, length frequency graph
2/21/73	General inspection
2/21/73	Memo to Central Office requesting cost sharing on rotenone
3/23/73	Mixed fish stocking by fish dealer

F.M. 1.0
1/66

Distribution: State and Public - District, Area, Central Office

CUMULATIVE HISTORY

COUNTY ColesWATER (NAME) Paradise Lake

DATE	ENTRY
5/29/73	Fish population analysis survey
6/20/73	Letter of recommendation to Richard Hagen (city commissioner)
5/25/79	Fish Population Analysis survey - Supplemental
7-20-79	Collected flesh samples for EPA - Supplemental
7-5-79	Letter to Mike Smyser, Gen. Mgr. City of Mattoon
7-7-80	Letter to Susan Deo from Gary Erickson
8-13-80	Meeting in Mattoon
5-1-81	Memo to Director Kerry from Glenn Harper
7/8/83	Fishery Management Agreement signed by DOC
7/23/84	Fish population analysis
1/1/85	Pole and Line Fishing only regulation by A.O. 810 go in
1/23/85	Periodic Report
2/8/85	Lake Management Plan Written
8/28/85	176 - 8 inch tiger muskie were stocked. Their condition was good.
3/25/86	Discussed the signing for the new A.O. 810 length limit on largemouth bass with Mike Smyser, City of Mattoon Water Department.
4/1/86	14 inch minimum length limit for LMB into effect.
8/19/86	176 - 8 inch tiger muskie were stocked - condition good.
8/21/86	The biennial fish population survey was conducted.
1/24/87	Periodic report was written
6/12/87	5" TGM Stocked - fin clipped left pec
8-27-87	8 TGM Stocked - Not fin clipped
5-9-88	Muskie Voluntary Cvel Signs & Forms distributed in Mattoon area
7-15-88	Biennial fish population survey was conducted
8-23	8" TGM Stocked - Not fin clipped
1-27-88	Investigated Reported fish kill of CCF - only 3 were found
2-16-88	Periodic Report was written



LAKE MANAGEMENT PLAN

REGION	DISTRICT	COUNTY	LAKE NAME	ACREAGE
3	9	Coles	Lake Paradise	176

INTRODUCTION

Lake Paradise is located approximately four miles southwest of Mattoon in southwest Coles County and impounds the headwaters of the Little Wabash River. The artificial impoundment was originally completed in 1908. In 1931, a second dam was completed, enlarging the lake to approximately 176 acres. The original dam was left in place and sections of the crest are visible at lowlake levels. Aerial photographs of the lake made in August 1979, revealed that siltation of upper portions of the lake had reduced the surface area to about 156 acres and maximum length to 1.3 miles.

MORPHOMETRY

At normal pool elevation of 684 ft msl the lake has a maximum depth of 23 feet, mean depth of 7.5 feet, length of shoreline of 4.1 miles, storage volume of 1,320 acre-feet, and a retention time of 0.137 year. The shoreline is moderately developed with numerous permanent homes on the east side of the lake. The watershed consists of 11,580 acres.

SPECIES MANAGEMENT OBJECTIVES

Largemouth bass: Of the fish collected during the biological survey, catch per unit of effort (CPUE) will be 1.0 fish, 1+ years of age and older, per minute of electrofishing; Proportional Stock Density (PSD) or the ratio of bass that are 8 inches in total length that are also 12 inches in total length, shall be between 40 - 60%; the average relative weights (Wr) of individuals weighed and measured within a given length group, shall be within 90 - 110%; Relative Stock Density (RSD₁₄) or the percentage of the largemouth bass in the sample that are 8 inches, that are also 14 inches in total length, shall be 10 - 25%; growth rates compared to the Illinois average weight shall be average or good.

Bluegill: Of the bluegill collected during the major biological survey, the PSD or percentage of fish that are 3 inches and larger that are also 6 inches or larger in total length shall be 20 - 40%; RSD₈ shall be 5 - 20%; Wr values shall be 90 - 110%; growth rates compared to Illinois average shall be average or good.

Channel catfish: Of the channel catfish collected during the major biological survey, the PSD or percentage of fish that are 11 inches and larger that are also 16 inches or larger in total length shall be 20 - 40%; Wr values shall be 90 - 110%.

White crappie: Of the white crappie collected during the major biological survey, the PSD or percentage of fish that are 5 inches and larger that are also 8 inches or larger in total length shall be 20 - 40%; Wr values shall be 90 - 110%; growth rates compared to Illinois average shall be average plus.

Other species: Fishable populations of tiger muskie shall also be maintained.

12-14-88
1-3-91 DWD
4/23/97
JH

STATE AND PUBLIC
LAKE INVENTORY REPORT

Lake name: Lake Paradise Classification: State , Public x
County: Coles, Township: 11N, Range: 7E, 1/4 Section: NE 8 (of dam)
Distance & direction from nearest town: 4 miles SW of Mattoon
Owner: City of Mattoon, Lessee:
Name of Park (if applicable):

LAKE DATA:

Surface acres: 138, Max. depth (ft.): 16.0, Av. depth (ft.): 8.5
Year built: 1908, Year rebuilt: 1931, Shoreline length (mi.): 3.9
Watershed size (acres): 11,579, Size of drain (inches):
Siltation: Severe x, Moderate , or Light
Total Alkalinity (ppm): 152, Specific Conductance (umho/cm): 454, TDS (ppm):
Type of Lake: Natural: Bottomland lake , Glacial , Sink hole
Artificial: Dug , ~~Dug~~ & dammed x, Quarry , Gravel Pit ,
Borrow Pit , Stripmine .
Use of Lake (check): Potable water supply x, Industrial water supply x, Cooling
lake , Flood control , Erosion control , Recreation x,
Other (list): .

Recreational Uses of Lake (check):

Fishing x, Trotline fishing , Motorboating x, Motor
size limit none H.P., Speed limit none MPH, Water-
skiing x, Number launching ramps 1, Boat rental ,
Campgrounds , Picnicking , Waterfowl hunting ,
Swimming beach .

(Continued on reverse side)

Lake Management Status Report

Date of Report: 4/22/97	Fisheries Manager: Michael J. Mounce	District No.: 14
Lake Name: Lake Paradise	County: Coles	Water No.: 119
Ownership (STATE,PUBC,PUBO): PUCO		Acreage: 138

LM STATUS REPORTS WILL INCLUDE THE FOLLOWING SECTIONS:

1. Listing of the Sport Fish Regulations In Effect
2. Listing of Fisheries Management Activities Completed with Evaluation of Success
3. Lake Management Plan Progress Table
4. Recommendations for Observed Problem Trends

1. Listing of Sport Fish Regulations in Effect.

Site specific sportfishing regulations that are more restrictive than statewide regulations include the following:

A. Two pole and line fishing only. Each pole may not have more than two hooks or lures attached while fishing.

B. All largemouth and smallmouth bass taken must be greater than 14 inches in total length.

2. Listing of Fisheries Management Activities Completed with Evaluation of Success.

A. Tiger Muskellunge stocking:

Jake Wolf Memorial Fish Hatchery stocked 887 11-inch tiger muskellunge on September 12, 1995. This was a stocking rate of 6.4 per acre. Their condition looked good at stocking.

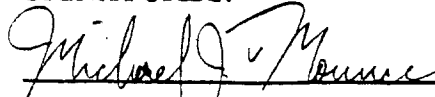
Jake Wolf Memorial Fish Hatchery stocked 528 10.0-inch tiger muskellunge on September 11, 1996. This was a stocking rate of 3.8 per acre. The condition of these fish was good at the time of stocking.

B. Muskellunge stocking:

Jake Wolf Memorial Fish Hatchery stocked 888 10.5-inch muskellunge on September 12, 1995. This was a stocking rate of 6.4 per acre. The condition of these fish was good at the time of stocking.

None were stocked in 1996, due to the ending of the stocking

SIGNATURES:

 4/22/97
 District Fisheries Manager Date

 Regional Fisheries Administrator

 Date

success research project.

C. Largemouth bass stocking:

Jake Wolf Memorial Fish Hatchery stocked 8800 2.6-inch largemouth bass on August 15, 1996. This was a stocking rate of 64 per acre. The condition of these fish was good at the time of stocking. This represents a one-time stocking of excess bass produced at the hatchery.

D. Level one, long term, standardized fish population survey:

The standardized fish population survey was conducted on October 2-4, 1994. It consisted of two daytime electrofishing runs totaling 120 minutes (E1, E2); one standard trap net (I2); and two standard gill nets (G1, G2). One trap net (I1) was found collapsed and not included in data analysis. All nets were set overnight. Success for the various equipment was excellent to good. This survey will be discussed in the section entitled: Discussion of Biological Surveys and Creels Completed.

3. Lake Management Plan Progress:

TABLE A. Population structural index values from standardized fall population surveys on Lake Paradise 1986-1996.

	LMP Objective	1986 Sample	1988 Sample	1990 Sample	1994 ^a Sample	1996 Sample
Largemouth bass						
# Collected	>120	105	84	65	112	53
PSD	40-60	36	68	72	73	69
RSD14	10-25	18	41	41	46	54
Wr	90-100	97	97	103	100	98
CPUE ($\geq 1+$)	1.0+	0.77	0.74	0.29	0.87	0.42
YAR	1-10	0.4	0.1	1.3	0.1	0.0
Harvest ^b	~~5-10~~ 15-25				3.8	
Catch ^c	>0.25				0.09	
White crappie						
# Collected	>80	79	73	106	252	231
PSD	20-40	53	11	4	24	13
RSD10	5-20	30	7	3	4	6
Wr	90-110	91	84	86	85	88
Harvest ^b	~~10-15~~ 15-30				10.6	
Catch ^c	~~>1.0~~ 0.5				0.79	
Bluegill						
# Collected	>400	399	552	169	667	938
PSD	20-40	53	53	38	64	49
RSD8	5-20	0.0	0.0	0.0	0.0	0.0
Wr	90-110	115	106	108	100	91
Harvest ^b	10-20				5.8	
Catch ^c	~~>1.0~~				0.42	

Lake Management Status Report

TABLE A Continued

Channel catfish						
# Collected	>20	13	18	19	8	15
PSD	20-40	69	61	82	88	60
RSD18	5-40 <i>5-20</i>	62	34	53	88	60
Wr	90-110	116	108	104	114	104
Harvest ^b	10-15				9.8	
Catch ^c	>0.25				0.15	
Tiger Muskellunge						
# Collected	>4 (age 1+)	1	0	0	9	2
PSD	20-40	0.0	-	-	0.0	0.0
RSD30	5-20	-	-	-	-	0.0
Wr	90-110	-	-	-	-	-
Harvest ^b	>5				not recorded	
Catch ^c	>0.02 (direct pressure)				0.000 (3 MUE? caught)	

* First year for fall survey.

^b lbs./acre

^c Number/hour

4. Recommendations for Observed Problem Trends.

A. Largemouth bass densities are not as high as desired due to recent poor recruitment success. If this trend continues, supplemental stocking may need to be considered to help improve the quality of this population.

B. Bluegill PSD is high, however, the population is of low angling quality, with very few fish collected in the biological survey over 7-inches. It is unlikely that much can be done to improve this situation.

C. High PSD estimates for channel catfish are of concern because of their persistent nature. It appears that recruitment may be limited. I do not think action is warranted at this time. Creel survey results indicate that harvest rates are acceptable and catch rates are only slightly below management goals for this lake.

D. A strong 1992 year class of white crappie was observed in the last survey, but doesn't appear to have contributed to the quality of the fishery as much as I would have expected. The 1994 year class appears to be strong as well, with slightly better growth rates. It will be interesting to see if they will contribute to the fishery any better than the 1992 year class. Regulations may need to be considered to distribute the harvest more evenly among years if possible. I am not sure that minimum length limits, however, will be appropriate for this population.

E. The lack of diversity of aquatic vegetation continues to be a problem in this lake. Water willow is abundant, with spatterdock and some cattails present. The future introduction of other desirable species of aquatic vegetation should develop additional desirable habitat when time permits.

Lake Management Plan

Period: 4/21/98	Fisheries Manager: Michael Mounce	District No.: 11
Lake Name: Lake Paradise	County: Coles	Water No.: 0119
Ownership (STATE,PUBC,PUBO): PUBC		Acreage: 138

LM PLANS WILL INCLUDE THE FOLLOWING SECTIONS:

1. Introduction or Brief Historical Perspective
2. Lake Physical-Chemical Characteristics
3. Identification of Problems Limiting Management with Potential Solutions
4. Overall Long-Term Lake Management Goals
5. Recommended Lake Management Activities with Rationale for Implementation
6. Recommended Angling Regulations with Rationale for Implementation
7. Managed or Stocked Fish Species Population Objectives

1. INTRODUCTION OR BRIEF HISTORICAL PERSPECTIVE

Lake Paradise was formed by damming the headwaters of the Little Wabash River. Construction of the dam was completed in 1908. In 1931, a second dam was built, enlarging the lake to approximately 176 acres. The old dam was left in place. Recent estimates by the Natural Resource Conservation Service indicate that the lake's surface acreage has been reduced to approximately 138 acres. Lake Paradise, owned by the City of Mattoon, is located approximately four miles southwest of Mattoon, in Coles County. The lake is the primary water supply for the City of Mattoon, and receives recreational use by fishermen and boaters. A 10 h.p. boat motor restriction is enforced. A large portion of the lake shoreline has been developed for residential use.

2. LAKE PHYSICAL-CHEMICAL CHARACTERISTICS

Lake Paradise currently has a surface area of 138 acres, maximum depth of 16 feet, with an average depth of 8.5 feet. Storage capacity is 1,173 acre-feet with a retention time 0.1 years. Spillway elevation is 684 feet above mean sea level. With 3.95 miles of shoreline, the lake has a moderate Shoreline Development Index (SDI = 2.36).

SIGNATURES:

Michael J. Mounce 4/21/98
District Fisheries Manager Date

Regional Fisheries Administrator Date

SIGNATURES:

Impoundment Program Manager Date

Management Section Head Date

gmm 5/25/98

Lake Paradise Management Plan continued

2

Secchi disk visibility averages 1.3 feet and pH 8.1 in late summer. Conductivity and alkalinity average 454 umhos/cm and 152 mg/l, respectively, in late summer. Based on conductivity averages, total dissolved solids can be expected to be near 335 ppm.

3. IDENTIFICATION OF PROBLEMS LIMITING MANAGEMENT WITH POTENTIAL SOLUTIONS

Problems affecting the management of this lake are common to most every city-owned lake in Central Illinois; siltation and pesticide introduction due to agricultural and residential practices within the water shed, residential development along a large part of the shoreline with associated septic systems and vegetation removal, and the presence of common carp, yellow bass, freshwater drum, and high densities of gizzard shad. The solutions to these problems are complicated and expensive, or impossible to correct. For example, rotenone cannot be used to remove undesirable fish species because the lake is used as a primary water supply for the City of Mattoon.

Largemouth bass densities appear to be lower than desired. This is likely due to recruitment which has been highly variable, but on average, lower than desirable in recent years. CPUE has averaged 0.62 bass/minute of electrofishing and YAR averaged 0.38 over the past five years. Poor recruitment may be in part to degraded spawning substrate, a lack in diversity of aquatic vegetation, and interspecific competition with freshwater drum and/or yellow bass, and habitat degradation by carp. A 14-inch minimum length limit is in effect to protect small bass from over harvest, due to poor recruitment. The condition of the bass population has remained good ($Wr = 99$), suggesting continued good growth rates under current management activities and regulations. I believe this value also indicates that this population is at or slightly below carrying capacity for this lake. I would prefer to see a lower average relative weight, indicating a population slightly above carrying capacity. The most recent level one, long term, standardized fish population survey (fall 1996) indicated that PSD and RSD14 remain above management objectives, exemplifying the poor recruitment. It is likely that largemouth bass will require annual stocking of fingerlings in order to develop this fishery to it's greatest potential. Aquatic plant diversification would likely help promote natural bass recruitment.

Both, white crappie and black crappie exist, with white crappie being dominant in surveys in this lake. The crappie population has exhibited fair condition and variable recruitment success. Recent fall surveys, have provided good catch rates and sizes structure indices that indicate that recruitment is adequate.

Lake Paradise Management Plan continued

3

Several strong year classes have recently been recruited, however the 1992 year class did not recruit to larger sizes as well as I expected. I do not believe that anything should be done at this point to improve the quality of this fishery.

Very few bluegill have been collected over seven inches. Poor condition of bluegill greater than 5.5 inches, indicates slow growth rates of large bluegill. Fishing pressure for this species does not appear to be high enough to account for over harvest of larger bluegill. I believe that interspecific and intraspecific competition for food resources is limiting growth rates. Due to the presence of gizzard shad, yellow bass, freshwater drum, a wide variety of other sunfish species, the lack in diversity of aquatic vegetation, and high turbidity, management objectives and a quality bluegill fishery will be unlikely obtainable.

The presence of many undesirable species provides intense competition for desirable sport fishes. Yellow bass, freshwater drum, longear sunfish, green sunfish, warmouth, black bullhead, and yellow bullhead all contribute little to the angling quality of this lake. They are likely a major factor along with gizzard shad in the poor fishery for bluegill. Carp are present in large numbers and are likely responsible, at least in part, for low diversity of aquatic vegetation. Due to the fact that this is a primary water source, it is unlikely that rehabilitation will be approved to remove these species. Excessive siltation due to poor agricultural practices in the water shed have likely had a significant effect on bass reproductive success and natural aquatic vegetation. Improvements in soil erosion control in the watershed along with the removal of silt in the lake by dredging would help this situation, but dredging has not been proposed for the near future. Conservation 2000 and other agricultural incentive programs may have a positive effect in reducing sediment movement into streams and the lake, however, these programs have not proven to provide any long-term (≥ 10 yrs.) benefits.

Poor condition of the boat launching ramp has likely hindered angler use of this lake. I have received reports of boat trailers being severely damaged while launching. Mike Smyser, general manager, has been approached about upgrading this ramp and has forwarded the appropriate forms for DJ assistance to city engineers. I will continue to pursue the upgrading of this facility.

4. OVERALL LONG-TERM LAKE MANAGEMENT GOALS

This lake is best managed for a quality largemouth bass, crappie, and channel catfish fishery, due to the gizzard shad forage base. It is likely that largemouth bass will require annual stocking of fingerlings in order to develop this fishery to it's

Lake Paradise Management Plan continued

4

greatest potential. Eventually structuring the crappie harvest may increase the quality of this fishery, however I do not believe that minimum length limits or small creel limits are effective or desirable. The channel catfish fishery seems to be holding it's own.

As with most lakes in District 11, the diversity of aquatic plants is low. Increasing the density and diversity of aquatic vegetation in this lake would be beneficial in increasing the quality of this fishery.

5. RECOMMENDED LAKE MANAGEMENT ACTIVITIES WITH RATIONAL FOR IMPLEMENTATION

Level one, long-term, standardized fish population surveys should be performed every other year, and more frequent surveys performed as needed or as time permits. This survey will be conducted in fall in an attempt to obtain a more representative sample of game fish relative abundance and size structure. Sampling should be comprised of two 60-minute electrofishing surveys, two to four frame nets, and two gill nets.

Eventually, largemouth bass fingerlings should be stocked on an annual basis at minimum rates of 50/acre for three inch fingerlings and 3-5/acre for six inch or larger fingerlings to supplement poor natural recruitment. Ideally, the larger fingerlings should be stocked, as they have proven to be effective in establishing self-supporting populations. If stocked, the larger fingerlings should be given a year specific fin clip so stocking success of different year classes or size groups can be assessed.

Stocking additional predators should be considered in the future, however competition with crappie and bass is not desirable at this point in time. Striped bass hybrids and saugeye fingerlings could be stocked on an annual basis in order to establish and maintain fisheries for these two hybrids. These fingerlings should be stocked at a minimum rate of 40/acre and 10/acre for saugeye and striped bass hybrids, respectively. These fish would possibly provide increased angler success.

Increasing the diversity of aquatic vegetation would be beneficial in providing permanent habitat for game fish. A "bloom" of small pondweed in nearby Lake Mattoon was observed to dramatically increase numbers of naturally produced largemouth bass. Desirable aquatic plants, obtained through the State Mason Nursery, would not only provide fish habitat, but would stabilize the shoreline, and likely increase the diversity of forage for fish. Water willow and spatterdock are currently found in this lake. I have found the spatterdock in an isolated cove, east of the dam.

Lake Paradise Management Plan continued

Angler use would likely increase by upgrading the boat launching ramp. I will continue to encourage the City of Mattoon to pursue applying for DJ funds to upgrade this facility.

6. RECOMMENDED ANGLING REGULATIONS WITH RATIONALE FOR IMPLEMENTATION

No new regulations are being proposed at this time for Lake Paradise. The current regulations are:

- Anglers must not use more than 2 poles and each pole must not have more than 2 hooks or lures attached while fishing.
- Six fish daily creel for black bass.
- All largemouth bass or smallmouth bass kept must be greater than 14 inches in total length.
- One fish daily creel limit for tiger muskellunge or muskellunge.
- All tiger muskellunge or muskellunge kept must be 36 inches or greater in total length.

7. MANAGED OR STOCKED FISH SPECIES OBJECTIVES

Largemouth bass: Of the fish collected in the level one, long term, standardized fish population survey, catch per unit effort (CPUE) for largemouth bass will equal or exceed 1.0 fish, age I+ or older, per minute of electrofishing; Proportional Stock Density (PSD) shall be between 40-60%; Relative Stock Density (RSD14) shall be between 10-25%; the average relative weight (Wr) of individuals weighed and measured within a given length group, shall be within 90-100; and the Young-Adult Ratio (YAR) shall be between 1-10. These estimates shall be based upon a minimum sample size of 75 bass.

Of the bass harvested by anglers, the average weight shall be 1.25 pounds with a total harvest of 15-25 pounds per acre. Angling success rate should be a minimum of 0.25 bass per hour for bass harvested and released combined.

White crappie: Of the white crappie collected in the level one, long term, standardized fish population survey, Proportional Stock Density (PSD) shall be between 20-40%; Relative Stock Density (RSD10) shall be between 5-20%; the average relative weight (Wr) of individuals weighed and measured within a given length group, shall be within 90-100. These estimates shall be based upon a minimum sample size of 50 crappie.

Of the white crappie harvested by anglers, the average weight

Lake Paradise Management Plan continued

6

shall be 0.5 pounds with a total harvest of 15-30 pounds per acre. Angling success rate should be a minimum of 0.50 per hour for harvested and released fish combined.

Bluegill: Of the bluegill collected in the level one, long term, standardized fish population survey, Proportional Stock Density (PSD) shall be between 20-40%; Relative Stock Density (RSD8) shall be between 5-20; the average relative weight (Wr) of individuals weighed and measured within a given length group, shall be ≥ 105 . These estimates shall be based upon a minimum sample size of 250 bluegill.

Of the bluegill harvested by anglers, the average weight shall be 0.20 pounds with a total harvest of 20-40 pounds per acre. Angling success rate should be a minimum of 1 bluegill per hour for harvested and released fish combined.

Channel catfish: Of the channel catfish collected in the level one, long term, standardized fish population survey, Proportional Stock Density (PSD) shall be 20-40%; Relative Stock Density (RSD24) shall be 5-20%; the average relative weight (Wr) of individuals weighed and measured within a given length group, shall be 90+. These estimates shall be based upon a minimum sample size of 15 channel catfish, however, ideally more would be included.

Of the channel catfish harvested by anglers, the average weight shall be 1.25 pounds with a total harvest of 15-30 pounds per acre. Angling success rate should be a minimum of 0.25 channel catfish per hour for harvested and released fish combined.

Other species: Tiger muskellunge shall be monitored to determine if they meet stocking criterion. Analysis of this information will determine whether or not they are kept on or deleted from the stocking list.

Lake Management Status Report

Date of Report: 5/7/99	Fisheries Manager: Michael J. Mounce	District No.: 11
Lake Name: Lake Paradise	County: Coles	Water No.: 119
Ownership (STATE,PUBC,PUBO): PUCO		Acreage: 138

LM STATUS REPORTS WILL INCLUDE THE FOLLOWING SECTIONS:

1. Listing of the Sport Fish Regulations In Effect
2. Listing of Fisheries Management Activities Completed with Evaluation of Success
3. Lake Management Plan Progress Table
4. Recommendations for Observed Problem Trends

1. Two pole and line fishing only. Each pole may not have more than two hooks or lures attached while fishing.

All largemouth and smallmouth bass taken must be greater than 14 inches in total length.

2. Level one, long term, standardized fish population survey: The standardized fish population survey was conducted on September 30 and October 2, 1998. It consisted of two daytime electrofishing runs totaling 120 minutes (E1, E2); two standard trap nets (I1, I2); and two standard gill nets (G1, G2). All nets were set overnight. This survey will be discussed in the section entitled: Discussion of Biological Surveys and Creels Completed.

3. See pages 3 & 4.

4. Largemouth bass densities are not as high as desired due to chronically poor recruitment success. Nursery habitat is lacking in this lake. There has been a significant decrease in the water willow population recently due to unknown causes. A population of both spatterdock and broadleaf arrowhead exists on the lake, but do not cover very large areas.

Two strong year class of white crappie ('92 & '94) have contributed to the quality of the fishery as much as I would have expected. A strong year class from 1996 has developed, I will follow this and see how it contributes. Regulations may need to be considered to distribute the harvest more evenly among years if possible. I am not sure that minimum

SIGNATURES:

Michael J. Mounce 5/7/99
District Fisheries Manager Date

Regional Fisheries Administrator Date

LAKE MATTOON CONTINUED

length limits, however, will be appropriate for this population.

Bluegill PSD fell within management goals, however I believe that this population is of low angling quality, with very few fish collected in the biological survey over 7-inches. It is unlikely that much can be done to improve this situation without a drastic improvement in the bass population or establishment of significant quantities of aquatic plants.

Chronically high PSD estimates for channel catfish are of concern. It appears that recruitment may be limited, although creel survey results indicate that anglers were catching good numbers of both small and large catfish.

The lack of diversity of aquatic vegetation continues to be a problem in this lake. The future introduction of other desirable species of aquatic vegetation should develop additional desirable habitat when time permits.

LAKE MATTOON CONTINUED

3. TABLE 1. Population structural index values from standardized fall population surveys on Lake Paradise 19886-1998.

	LMP Objective	1988 Sample	1990 Sample	1994 ^a Sample	1996 Sample	1998 Sample
Largemouth bass						
# Collected	>120	84	65	112	53	68
CPUE ($\geq 1+$)	1.0+	0.74	0.29	0.87	0.42	0.57
PSD	40-60	68	72	73	69	76
RSD14	10-25	41	41	46	54	41
Wr ($\geq 1+$)	90-100	97	103	100	98	96
YAR	1-10	0.1	1.3	0.1	0.0	0.1
Harvest ^b	5-10			3.8		
Catch ^c	>0.25			0.09		
White crappie						
# Collected	>80	73	106	252	231	366
PSD	20-40	11	4	24	13	13
RSD10	5-20	7	3	4	6	2
Wr ($\geq 1+$)	90-110	84	86	85	88	92
Harvest ^b	10-15			10.6		
Catch ^c	>1.0			0.79		
Bluegill						
# Collected	>400	552	169	667	938	638
PSD	20-40	53	38	64	49	38
RSD8	5-20	0.0	0.0	0.0	0.0	0.0
Wr ($\geq 1+$)	90-110	106	108	100	91	106
Harvest ^b	10-20			5.8		
Catch ^c	>2.0			0.42		cont.

LAKE MATTOON CONTINUED

TABLE 1 Continued

Channel catfish		1988	1990	1994 ^a	1996	1998
# Collected	>20	18	19	8	15	11
PSD	20-40	61	82	88	60	73
RSD18	5-40	34	53	88	60	36
Wr (≥1+)	90-110	108	104	114	104	101
Harvest ^b	10-15			9.8		
Catch ^c	>0.25			0.15		
Tiger Muskellunge						
# Collected	>4 (age 1+)	0	0	9	2	2
PSD	20-40	-	-	0.0	0.0	-
RSD30	5-20	-	-	-	0.0	-
Wr (≥1+)	90-110	-	-	-	-	82
Harvest ^b	>5			not recorded		
Catch ^c	>0.02 (direct pressure)			0.000 (3 MUE? caught)		

^a First year for fall survey.^b lbs./acre^c Number/hour



ILLINOIS
DEPARTMENT OF
NATURAL RESOURCES

524 South Second Street, Springfield 62701-1787

George H. Ryan, Governor ● Brent Manning, Director

April 26, 2001
Illinois Department of Natural Resources
1660 W. Polk Ave.
Charleston, Illinois 61920

Chris Hartbank
Water Department
1201 Marshall
Mattoon, Illinois 61938

Dear Chris,

Enclosed is the report I completed for the fish population surveys performed last fall on Lake Mattoon & Paradise. Things are looking pretty good on the lakes. There is a synopsis at the end of Section 5. If you have any questions regarding the content, please do not hesitate to give me a call.

Sincerely,

Michael J. Mounce,
District 11 Fisheries Manager

cc Jim Mick
File

Lake Management Status Report

Date of Report: 4/25/01	Fisheries Manager: Michael J. Mounce	District No.: 11
Lake Name: Lake Paradise	County: Coles	Water No.: 119
Ownership (STATE,PUBC,PUBO): PUBC		Acreage: 176

LM STATUS REPORTS WILL INCLUDE THE FOLLOWING SECTIONS:

1. Listing of the Sport Fish Regulations In Effect
2. Listing of Fisheries Management Activities Completed with Evaluation of Success
3. Lake Management Plan Progress Table
4. Recommendations for Observed Problem Trends

1. Two pole and line fishing only. Each pole may not have more than two hooks or lures attached while fishing.

All largemouth and smallmouth bass taken must be greater than 14 inches in total length.

2. Level one, long term, standardized fish population survey: The standardized fish population survey was conducted on September 27 and September 29, 2000.

A creel survey was completed in 1998. The survey was performed from March 15 through October 31. A total of 879 anglers were interviewed during this survey.

3. See pages 3 & 4.

4. Improvements to the boat ramp are planned by the City of Mattoon for the near future. This may attract more angling attention from boat anglers.

Largemouth bass densities are not as high as desired due to chronically poor recruitment success. Nursery habitat is lacking in this lake. This population may require supplemental stocking of advanced (≥ 6 inches) fingerling bass to establish a self-reproducing population and improve angling quality through increased catch and harvest rates. However, I will not recommend bass stockings until Lake Mattoon bass densities have improved significantly.

More progressive regulations such a maximum size limits, restricting the harvest of large fish would be required to

SIGNATURES:

Michael J. Mounce 4/25/01
 District Fisheries Manager Date

 Regional Fisheries Administrator Date

Lake Paradise Continued

2

attempt to improve crappie and bluegill population size structure and fishing quality. Aquatic vegetation establishment would likely be beneficial as well.

Chronically high PSD estimates (until 2000) and low catch rates for channel catfish are of concern. It appears that recruitment is limited, although creel survey results indicate that anglers were catching fair numbers of both small and large catfish. Channel catfish recruitment may be improved by deploying spawning structures, however predation on fry or small fingerlings likely play a larger factor in the lack of recruitment.

Longear sunfish, yellow bass, freshwater drum, carp, and golden shiners all provide competition with gamefish for food, provide very limited forage for gamefish, and are of limited interests to anglers. At this point in time little can be done to impact this, other than improve predator densities.

Hybrid striped bass stockings might be considered to boot predator densities and provide additional angling opportunities. Potentially some that are stocked in Lake Mattoon could be stocked in Lake Paradise, assuming they would eventually go over the spillway and make their way to Lake Mattoon (Ecosystem Management?).

The lack of diversity of aquatic vegetation continues to be a problem in this lake. Significant attention to developing an improved aquatic plant community will be slow in originating due to low propagule availability and time constraints. There has been a significant decrease in the water willow population recently due to unknown causes. A population of both spatterdock and broadleaf arrowhead exists on the lake, but do not cover very large areas.

Lake Management Status Report

Lake Paradise Continued

3

3. TABLE 1. Population structural index values from standardized fall population surveys on Lake Paradise 1990-2000.

LMP Objective		1990 Sample	1994* Sample	1996 Sample	1998 Sample	2000 Sample
Electrofishing effort/ min		120	120	120	120	120
Largemouth bass						
# Collected	>120	65	112	53	68	71
CPUE($\geq 1+$)	1.0+	0.29	0.87	0.42	0.57	0.48
PSD	40-60	72	73	69	76	88
RSD14	10-25	41	46	54	41	70
Wr($\geq 1+$)	90-100	103	100	98	96	102
YAR	1-10	1.3	0.1	0.0	0.1	0.3
Harvest ^b	5-10		3.8			0.16
Catch ^c	>0.25		0.09			0.02
White crappie						
# Collected	>80	106	252	231	366	296
PSD	20-40	4	24	13	13	15
RSD10	5-20	3	4	6	2	6
Wr($\geq 1+$)	90-110	86	85	88	92	90
Harvest ^b	10-15		10.6			7.0
Catch ^c	>1.0		0.79			0.83
Bluegill						
# Collected	>400	169	667	938	638	377
PSD	20-40	38	64	49	38	52
RSD8	5-20	0	0	0	0	0
Wr($\geq 1+$)	90-110	108	100	91	106	106
Harvest ^b	10-20		5.8			0.9
Catch ^c	>2.0		0.42			0.10

cont.

Lake Management Status Report

Lake Paradise Continued

4

TABLE 1 Continued

Channel catfish		1990	1994 ^a	1996	1998	2000
# Collected	>20	19	8	15	11	7
PSD	20-40	82	88	60	73	0
RSD18	5-40	53	88	60	36	0
Wr ($\geq 1+$)	90-110	104	114	104	101	91
Harvest ^b	10-15		9.8			3.3
Catch ^c	>0.25		0.15			0.08
Tiger Muskellunge						
# Collected	>4 (age 1+)	0	9	2	2	0
PSD	20-40	-	0.0	0.0	-	-
RSD30	5-20	-	-	0.0	-	-
Wr ($\geq 1+$)	90-110	-	-	-	82	-
Harvest ^b	>5		not recorded			0.3 2 legal TGM recorded harvested
Catch ^c	>0.02 (direct pressure)		0.000 3 MUE? caught			0.00 TGM & MUE caught

^a First year for fall survey.^b lbs./acre^c Number/hour

5. Discussion of Biological Surveys and Creels Completed.

TABLE 2. Lake Paradise limnology summary.

Station #: 1 Season: Fall Date: 9/29/00
Time: 1415 Air Temp.: 71 (F)

Total Alkalinity (mg/l):	120
Conductivity (u-omhs):	411
Secchi Disk Transparency (ft):	1.0
Surface Water Temp. (F)	61
Dissolved Oxygen	-
Surface pH:	7.5

The level one, long term, standardized fall fish population survey was conducted on September 27 and 29, 2000. The water level was only slightly below normal pool elevation. Surface water temperature was slightly lower than the 1998 survey (68°F).

The fish population was sampled by daytime AC electrofishing for 120 minutes, three trap nets, and two 125-foot experimental-mesh gill nets. The nets were set overnight. Gear efficiency was average for electrofishing for most species. Gill net efficiency was average to good and trap net efficiency was good. A total of 1365 fish representing 17 species and two hybrids were collected, measured and released (Table 3). This is a lower number of fish as was collected in the previous survey, but more species. A subsample of each species was weighed and scales collected for aging. Various population indices are illustrated in Table 14. Mike Warnick, Gary Lutterbie, Mike Garthaus, Trent Thomas, and Randy Sauer, assisted with this survey.

A creel survey was conducted from 3/15/98 to 10/31/98. 867 fisherman interviews were completed of which 220 were completed trip interviews. Shoreline anglers were more prevalent than boat anglers. The average distance reported traveled to the lake was 15.9 miles with a maximum distance traveled reported as 200 miles. Creel results indicate that 63 hour of angling effort are expended per acre on Lake Paradise. Catch and harvest rates were below lake management plan objectives for all species and below estimates obtained in 1994 for all species. The success rating for this lake averaged 4.1 out of a range from 1-10. I would expect a value near this, as I do not consider this lake a high quality fishery for any species except occasionally white crappie.

LARGEMOUTH BASS (LMB) - 71 collected

A similar number of largemouth bass were collected as compared to the previous survey or the average of the four previous surveys (74). The size of the bass collected ranged from 10 through 49 cm (3.9-19.7 in., Table 4, Figure 1). Catch per minute of electrofishing (CPUE = 0.48) of bass 1+ or older is well below the desirable range (≥ 1 /minute), and was somewhat lower than the previous survey and the average of the four previous surveys (0.54). Catch rates have varied considerably among recent surveys.

The Proportional Stock Density (PSD) estimate was significantly higher than the previous survey and the average of the four previous surveys (72) (Table 1, Table 14). This increase is due in part to a significant decrease in the number of 20 through 29 cm bass collected ($n=7$) as compared to the number collected in 1998 ($n=22$). This decrease is likely due to poor recruitment, as the number of young-of-the-year (YOY) bass collected in 1998 was low, or could be due to poor gear efficiency. This coupled with higher catch rates of bass ≥ 30 cm resulted in this increase in size structure indices. Relative Stock Density (RSD_{14}) increased significantly in comparison with the previous survey and was higher than the estimate obtained from the averages of 1990 through 1998. These values indicate that recruitment is problematic, but that there is good recruitment to larger sizes. RSD_{16} and RSD_{18} estimates were significantly higher as well, 43 and 14 respectively (Table 14). A moderate to high quality fishery exists for larger bass.

The Young-Adult-Ratio (YAR) was higher than the two previous surveys and 22 young-of-the-year bass were collected during this survey (Table 1, Table 14). Suitable nursery habitat is lacking in this lake due to the absence of submersed and lack of emergent vegetation. Sparse spatterdock and water willow are present in the lake.

Mean relative weight ($Wr = 102$) estimates for bass ≥ 15 cm are well within the management plan objectives (90-110). Means for bass 15 through 34 cm and bass ≥ 35 cm were 96 and 105, respectively. This indicates that densities of bass are below carrying capacity in this lake above and below the 14-inch length limit. Shad down to 7 cm were collected indicating that appropriate forage size and density were likely available. I would like to see mean Wr drop, indicating higher densities of bass. This may require supplemental stocking and/or aquatic vegetation rehabilitation and/or introductions.

Although too few bass were collected to accurately estimate growth rates, YOY bass appear to be growing below average, and age-1+ and age-3+ growing slightly above average as compared to bass growth rates statewide.

Creel survey results indicate that only 4.5% of angling effort was directed specifically for largemouth bass making bass the third most specifically sought after species on this lake. This lake may get an usually low rate of bass effort due to the poor condition of the boat ramp, limited parking, a 10 h.p. motor limit, and only a moderate density bass population. Of the estimated 315 bass reported caught, 92% were released. Only 13 bass were estimated harvested. Three bass were observed harvested, all were legal fish which is an unusually low number.

Angler catch rates are very poor (0.02 bass/hr) compared to other lakes which have been creeled within this district. I would expect higher catch rates on the lake due in part to the low fishing effort on the lake. My standard lake management goals are catch rates of at least 0.25 bass/hr. Harvest rates were estimated at 0.16 lbs/acre which is much lower than lake management goals. Of the parties observed harvesting bass (n=3), all only had one bass per member in possession. I am very surprised these rates are as low as this, as catch rates were four times higher in the 1994 angler survey and harvest rates 24 times higher (Table 1).

The size structure of the population of bass reported in the creel survey as released by anglers, although potentially inaccurate due to angler estimation of size (and at times number), runs lower than estimates from the electrofishing survey performed in 1998 or 2000. The estimated size structure indices were calculated as; PSD (69), RSD₁₄ (27), RSD₁₆ (10), and RSD₁₈ (3). Too few bass were harvested bass to calculate size structure indices. Creel survey estimates of size structure, lower than those obtained from electrofishing surveys, would indicate that recruitment might be somewhat better than that suggested from electrofishing surveys. This may also be due in part to higher vulnerability of smaller bass to angling.

Recently, largemouth bass recruitment appears to be limiting the development of this population into a higher quality fishery. The lack of suitable nursery habitat likely contributes significantly to this problem. This population may require supplemental stocking of advanced (≥ 6 inches) fingerling bass to establish a self-reproducing population and improve angling quality through increased catch and harvest rates. Bass densities may be somewhat higher than previously indicated by

standardized fish population surveys. However, all population structural statistics indicate that this population is well below carrying capacity and bass fishing quality is unsuitable.

WHITE CRAPPIE (WHC) - 296 collected

A lower number of white crappie were collected than in the previous survey, but slightly higher than the average (231) from the four previous surveys. The sizes collected ranged from 9 through 30 cm (3.5-12.2 inches, Table 5, Figure 2). Catch rates are lower than the in the previous survey than numbers alone would indicate due to the use of an additional trap net (more effort) for this survey.

The PSD (15) estimate fell below management plan goals (Table 1, Table 14) for the third survey in a row, due to high numbers of 13 through 19 cm (sub-quality size) crappie having been collected. One or two strong year classes comprised primarily of smaller fish is dominating this fishery as usual. The RSD₁₀ estimate from this survey is with management plan goals, but lower than desired. A higher number (n=16) of white crappie over 25 cm were collected as compared to the previous survey (n=7). The RSD₁₂ estimate was essentially the same as the previous survey (Table 14).

In recent years, white crappie recruitment in Lake Paradise appears to be variable, but periodically very high. Recruitment into larger sizes however seems to be somewhat limited, possibly due to excessive harvest, however creel data does not support this. Natural mortality likely plays a larger role. Mean Wr (90) fell within lake management objectives and is similar to the previous survey. The Wr of the 18 through 20 cm groups is significantly lower than most other cm groups, indicating crowding at that size range. These crappie may not have been able to effectively forage on the YOY gizzard shad available, nor adequately sustain themselves on insect larvae and pupae.

Creel survey results indicate that 20.2% of angling effort, approximately 13 hrs/acre was directed specifically for crappie. A fair percentage of white crappie anglers (6.1%) were lumped in the "crappie spp" category for fishing for black and white crappie simultaneously. I would suggest that this effort is primarily directed at white crappie, as black crappie appear to be relatively rare in this lake. This makes white crappie the single most popularly sought species by anglers in this survey.

Catch rates fell below lake management plan objectives,

however, catch rates were slightly higher than during the previous creel survey. Of all completed trip interviews, 74% of the anglers reported releasing zero (no) crappie, 17% of anglers released from 1 to 10 crappie per trip (26% released one or more crappie), 5% of anglers released 11 to 15 crappie per trip (9% released more than 10 crappie), 1% of anglers released 16 to 20 crappie per trip (5% released more than 15 crappie), 3% of anglers released 21 to 30 crappie per trip (3% released more than 20 crappie), and less than 1% of anglers released more than 30 crappie per trip. Catch data was not available to analyze in this form.

White crappie harvest rates were somewhat lower than in the 1994 creel survey. Of the estimated 11,622 white crappie caught, an estimated 3,946 (34%) were harvested. Angler harvest rates (7.0 lbs/acre) are below management objectives, but higher than some area lakes that have been creeled. White crappie represent the highest estimated total pounds harvested (1240), by species, in this lake. Harvest rates fell within management objectives during the previous angler survey and likely continue to do so on an irregular basis. Of ALL completed trip interviews, an estimated 81% of anglers harvested zero (no) crappie per trip, 15% of anglers harvested 1 to 10 crappie per trip (19% harvested one or more crappie per trip), 3% of anglers harvested 11 to 15 crappie per trip (5% harvested more than 10 crappie per trip), 1% of anglers harvested 16 to 20 crappie per trip (2% harvested more than 15 crappie per trip), less than 0.3% of anglers harvested 21 to 30 crappie per trip (less than 1% harvested more than 20 crappie per trip), and less than 1% of anglers harvested more than 30 crappie per trip. This indicates that creel limits restricting crappie harvest to 10 or less fish would only impact 5% of the anglers on Lake Paradise. Creel limits alone would not affect a significant portion of crappie caught.

Creel information indicates that the all of white crappie over 24 cm (9 inches) were harvested (see table below). With fishing pressure as low as it is in this lake, I doubt regulations limiting the harvest of larger crappie would have a significant impact on this fishery. Almost one-half of the 8"

White Crappie Harvest Rates	Size Groups (inches)								
	3	4	5	6	7	8	9	10	11
% Harvested	100?	23?	0	4	29	43	100	100	100

crappie were harvested and one-third of the 7" inch crappie were harvested. This is probably of little impact to the quality of

this fishery due to the high recruitment rates of crappie. The harvest of these smaller crappie may, in-fact, improve recruitment to the "preferred" range. I am skeptical of the harvest of 3" and 4" crappie reported in the creel data.

Due to limited time and data I will not calculate the PSD and RSD₁₀ from this information. Obviously the RSD₁₂ estimates would be zero as no 12 inch fish were recorded.

BLACK CRAPPIE (BLC) - 2 collected

A few more black crappie were collected in this survey than in the previous survey (n=0), although they have been collected in earlier surveys. The sizes collected ranged from 17 through 23 cm (6.7-9.4 inches). A recruitment problem exists for this species, but can be expected due to the usually turbid water due to agricultural run-off and a lack of aquatic vegetation. Black crappie were not recorded in the creel survey.

BLUEGILL (BLG) - 377 collected

A much reduced sample of bluegill was collected as compared to the previous survey (n=638) and the mean number collected in the past four surveys (603). This may be in part due to variances associated with subsampling more than direct effects of population density variations. The sizes of bluegill collected ranged from 3 through 19 cm (1.2-7.9 inches, Table 6, Figure 3).

PSD was significantly higher than the 1998 estimate and similar to the 1996 survey. This estimate falls well above lake management objectives, but is comprised primarily of 4.7-7.1 inch fish. No fish over 8-inches have been collected in the past five surveys (RSD₈ = 0.0). This population is of moderate to poor angling quality. Only 14 fish over seven inches were collected. We averaged 106 for all size classes and decreased somewhat for fish over 15 cm (5.9 inches). Despite this high condition, I do not expect growth rates to improve significantly.

Creel survey results indicate that 2% of angling effort was directed specifically for bluegill, although many "all species" fishermen were likely using methods appropriate for bluegill. This ranks bluegill as the one of the least sought individual sportfish in this lake, just ahead of tiger muskie and muskellunge. An estimated 50% of the bluegill reported caught (n = 2221) were harvested (n = 1104).

Angler catch rates (0.10 bluegill/hr) are much lower than lake management plan objectives and significantly lower than estimates from the previous creel survey. I would prefer to see catch rates of at least 2.0 bluegill/hr. Of ALL completed trip interviews, an estimated 88% of anglers released zero (no) bluegill per trip, 11% of anglers released from 1 to 5 bluegill per trip (12% released one or more bluegill per trip), less than 1% released more than 5 bluegill per trip. No anglers interviewed after a completed trip reported releasing more than 8 bluegill in a trip. Catch data was not available to analyze in this form.

Bluegill harvest rates were estimated at 0.9 lbs/acre, which is much lower than lake management goal objectives (10-20 lbs/acre). Of ALL completed trip interviews, an estimated 96% of anglers harvested zero (no) bluegill per trip, 3% of anglers harvested 1 to 4 bluegill per trip (3% harvested one or more bluegill per trip). No fishermen interviewed after a completed trip harvested more than 4 bluegill per trip during this creel survey.

Most of the bluegill over 6-inches were harvested, with bluegill as small as 2-inches and as large as 8-inches recorded harvested. Bluegill as large as 8-inches were reported released, however these fish were not measured by the creel clerk and the size was estimated by anglers. The size structure of the population of bluegill reported in the creel survey is much higher than that estimated from the electrofishing survey.

Due to limited time and data I will not calculate the PSD and RSD_g from this information. Obviously the RSD_g estimates from creel survey data is higher than standard fish population sampling methods would indicate. Although the percentage of bluegill over 8-inches are likely under lake management plan objectives, maximum size-limit regulations protecting these few larger bluegill might increase their numbers such as to make this a higher quality fishery. In time these regulations could be adjusted to protect larger fish while allowing some low rate of harvest of bluegill over 8-inches, while allowing the liberal harvest of bluegill under 8-inches to prevent stacking below the size limit due to slowed growth rates.

OTHER SUNFISH

One black crappie X white crappie hybrid (BWH), 22 cm (8.9 inches), 92 green sunfish (GSF), ranging from 5 through 18 cm (2.0-7.5 inches, Table 7), 16 longear sunfish (LOS), ranging from

11 through 14 cm (4.3-5.9 inches, Table 8), 9 warmouth (WAM), ranging from 10 through 16 cm (3.9-6.7 inches), 5 orangespotted sunfish (ORS), ranging from 6 through 8 cm (2.4-3.5 inches), and four longear sunfish X bluegill (LBH), all 11 cm (4.5 inches) were collected.

Green sunfish, longear, warmouth, and longear sunfish X bluegill hybrids were record in the anglers catch from the creel survey. None of these species were caught at a rate higher than 0.001 fish/hr. Only longear and longear sunfish X bluegill hybrids were recorded harvested. An estimated 8 longear sunfish X bluegill hybrids were harvested at a rate of 0.004 lbs/acre. Longear were not separated from other miscellaneous species.

CHANNEL CATFISH (CCF) - 7 collected

Only a slightly lower number of channel catfish were collected in this survey as compared to the previous survey (n=11) or the average of the past four surveys (13). Sizes of channel catfish collected ranged from 10 cm through 38 cm (3.9-15.4 inches, Table 9). One YOY channel catfish was collected in this survey. Channel catfish recruitment appears to be chronically low as indicated by persistently high PSD and RSD estimates from previous surveys (Table 1, Table 14). Wr (91) fell within management objectives, but is the lowest observed in recent years and well below the average of the four previous surveys (106). It is likely that changes in population density account for this relatively poor condition.

Creel survey results indicate that 17% of angling effort was directed specifically for channel catfish. This would rank them as the second most popularly sought individual species on this lake. An estimated 60% of the channel catfish reported caught (n=1077) were harvested (n=642).

Angler catch rates are much lower than desired (0.08 channel catfish/hr). Lake management plan objectives are 0.25 channel catfish/hr (Table 1). Of ALL completed trip interviews, an estimated 93% released zero (no) bluegill per trip, 7% released one or two channel catfish per member. Catch data was not available to analyze in this form.

Harvest rates were estimated at 3.3 lbs/acre which is lower than lake management goals, but similar to results obtained from the Pana Lake in 1998. Of ALL completed trip interviews, an estimated 94% of anglers harvested no channel catfish per trip, 6% of anglers harvested 1 to 6 channel catfish per trip (6%

harvested one or more channel catfish per trip). No fishermen harvested more than 6 channel catfish per trip during this creel survey. Most channel catfish over 13 inches were harvested. Channel catfish as small as 5-inches and as large as 25-inches were reported harvested.

Too few channel catfish were collected in the electrofishing survey to compare the size structure of the population to the size structure of channel catfish reported in the creel. Due to limited time and data I will not calculate the PSD and RSD from creel information.

OTHER CATFISH

Five yellow bullhead (YEB), ranging from 10 through 23 cm (3.9-9.4 inches) and 4 black bullhead (BLB), ranging from 23 through 25 cm (9.1-10.2 inches) were collected. The condition of these fish was poor. No brown bullheads were collected in this survey. Flathead catfish have not been collected since 1990.

The creel survey indicates that bullheads were caught at combined rate of 0.022 fish/ hr and were harvested at a combined rate of 0.33 lbs/acre, which is higher than largemouth bass.

MUSKELLUNGE (MUE) - 0 collected

Four muskellunge were collected during the previous survey (Table 1), ranging from 64 through 81 cm (25.2-32.3 inches).

The creel survey indicates that 0.1% of angling effort, approximately 0.06 hrs/acre, was directed specifically for muskies. Muskellunge were reported in the catch and harvest, but not separated from the miscellaneous species.

TIGER MUSKELLUNGE (TGM) - 0 collected

Only two tiger muskellunge were collected during the previous survey (Table 1), ranging from 56 through 59 cm (22.0-23.6 inches).

The creel survey indicates that 0.1% of angling effort, approximately 0.06 hrs/acre, was directed specifically for tiger muskies. An estimated 56% of the channel catfish reported caught (n=19) were harvested (n=11). Tiger muskie were reported caught at a rates less than 0.001/hr and harvested at the rate of 0.261

lbs/acre. One "group" reported harvesting an average on 2 tiger muskies per member. Although "no illegal fish" were reported by the creel clerk, all tiger muskies reported harvested in the creel survey were below the legal length limit. Two 24-inch tiger muskies were reported released.

OTHER SPECIES

One white bass (WHB), 29 cm (11.6 inches), 23 yellow bass (YLB), ranging from 10 through 16 cm (3.9-6.7 inches, Table 10), 391 gizzard shad (GZS), ranging from 7 through 28 cm (2.8-11.4 inches, Table 11, Figure 4), 24 freshwater drum (FRD), ranging from 12 through 46 cm (4.7-18.9 inches, Table 12), and 36 carp (CAP) ranging from 34 through 70 cm (13.4-28.3 inches, Table 13), and 1 golden shiner (GOS), 11 cm (4.5 inches) were collected.

White bass were collected for the first time in this lake. No white bass were reported in the creel survey. Yellow bass comprised an insignificant portion of the angler catch and harvest. No yellow bass longer than 6-inches was measured in the harvest. The length range of gizzard shad observed would have provided better forage observed than in previous years. Freshwater drum and common carp comprised an insignificant portion of the angler effort, catch, and harvest.

Synopsis

Although the numbers of largemouth bass collected were higher than the previous survey, I do not believe that there has been any significant changes in the density or quality of this population. Spawning success has been chronically low over the last four surveys and is reflected in low catch rates, and high size structure indices and body condition. The lack of suitable nursery habitat likely contributes significantly to this problem as angling pressure is low. All population structural statistics and angler catch and harvest rates indicate that this population is well below carrying capacity and bass fishing quality is unsuitable. This population may require habitat improvement and/or supplemental stocking of advanced (≥ 6 inches) fingerling bass to establish a self-reproducing population and improve angling quality through increased catch and harvest rates.

The quality of the white crappie population appears to have changed little and may have improved somewhat as a higher percentage of crappie over 9 inches were collected. Continued strong recruitment should maintain this fishery in the near

future. Although harvest rates were lower than the previous creel survey and lower than lake management plan objectives, they are not poor. Catch rates were actually higher in this creel survey as compared to the previous creel survey. However, catch rates are also below lake management plan objectives for this lake. The angling quality of this fishery likely fluctuates periodically.

The bluegill fishery is of poor to moderate quality. No "preferred" size fish (>8 inches) have been collected in standardized fish population surveys, but several were recorded in the angler harvest. It would be interesting to investigate the benefits of a maximum size limit on this lake. However, I believe that compliance would likely be limited based on creel survey results from Pana Lake. Numerous other species of sunfish were collected and do not appear to contribute significantly to a quality fishery.

The channel catfish population appears to be suffering from low recruitment. However, reasonable numbers of larger fish exists and appear to be providing a fishery of moderate quality. Some fair sized bullheads were collected. Angler catch and harvest rates are lower than the results from the previous creel survey and lake management plan objectives.

The muskellunge and tiger muskellunge stockings appear to be contributing little to this fishery. Angler interest and catch rates are insufficient to warrant continued stockings.

A white bass was collected for the first time. It was likely stocked by anglers from Lake Shelbyville. Yellow bass are abundant, but are in reasonable condition. The creel survey suggests that a few yellow bass are attaining sizes that would interest anglers. However, yellow bass are likely providing significant undesirable competition with other more desirable species for food resources.

The young-of-the-year gizzard shad grew more slowly and provided better forage than observed in the two previous surveys. It is possible that variable shad growth rates may be effecting sportfish recruitment.

Primarily small freshwater drum and carp were collected in this survey, although carp up to 27 inches were collected.

This lake needs significant management attention. Improvements to the boat ramp are planned by the City of Mattoon for the near future. This may attract more angling attention

from boat anglers. I will not recommend bass stockings until Lake Mattoon bass densities are improved significantly. Significant attention to developing an improved aquatic plant community will be slow in completing due to low propagule availability and time constraints. More progressive regulations such as a maximum size limits, restricting the harvest of large fish would be required to attempt to improve crappie and bluegill population size structure and fishing quality. Channel catfish recruitment may be improved by deploying spawning structures, however predation on fry or small fingerlings may play a larger factor in the lack of recruitment. Longear sunfish, yellow bass, freshwater drum, carp, and golden shiners all provide competition with gamefish for food, provide very limited forage for gamefish, and are of limited interests to anglers.

TABLE 3. Species catch summary for the standardized survey, conducted on Lake Paradise, Coles Co., Illinois, September 28 and 29, 2000. Number collected is adjusted for subsampling.

<u>Species Code</u>	<u>Common Name</u>	<u># Collected</u>
BGH	Bluegill X Green sunfish hybrid	0
BLB	Black Bullhead	4
BLC	Black crappie	2
BLG	Bluegill	377
BWH	Black crappie X white crappie hybrid	1
CAP	Common carp	36
CCF	Channel catfish	7
FCF	Flathead catfish	0
FRD	Freshwater drum	24
GOS	Golden shiner	1
GSF	Green sunfish	37
GZS	Gizzard shad	391
LBH	Longear sunfish X bluegill hybrid	4
LMB	Largemouth bass	71
LOS	Longear sunfish	16
MUE	Muskellunge	0
ORS	Orangespotted sunfish	5
TGM	Tiger muskie	0
WAM	Warmouth	9
WHB	White bass	1
WHC	White crappie	296
YEB	Yellow bullhead	5
YLB	Yellow bass	23
Total		1365

COUNTY Coles

FISH STOCKING RECORD

WATER (NAME) Paradise Lake

DATE	SPECIES	NO.	Size Range or Avr. Wgt.	CONDITION	SOURCE	REMARKS
10-28-40	LM Bass & Bluegill	250,000	fing.			
8-21-41	Mixed	320			Rescued	
11-15-41	Mixed	150,000	"		Mattoon	
10-19-42	LM Bass & Bluegill	25,000			Mattoon	
11-15-43	LM Bass & Bluegill	150,000			Mattoon	
9-25-44	LM Bass & Bluegill	20,000			Mattoon	
9-25-44	LM Bass & Bluegill	50,000			Mattoon	
3-27-45	Crappie	10,000			Mattoon	
4- 3-46	Bass, Blue- gill, Crappie	4,500			Rescued	
7-28-49	Crappie	400			Havana	
5-11-50	Crappie	50	(41 were tagged)		Mattoon	
4-15-55	LM Bass	40	breeder		Ramsey	
10-17-55	Bluegill	1,000			Mattoon	
3- 6-56	Ch. Catfish	2,000			Havana	
4-27-59	Ch. Catfish	1,500			Havana	
3-23-73	White Bass	75	3/4 - 1 lb.		Opal's Fisheries Worden, IL.	
3-23-73	Ch. Catfish	500	1/2 - 4 lb.		" "	
3-23-73	Bluegill	125	7 inches		" "	
3-23-73	Crappie	350	1/2 - 1 lb.		" "	
8-29-85	TGM	176	8 inch	good	Sand Ridge	
8-19-86	TGM	176	8 inch	good	Jake Wolf	
6-12-87	TGM	176	5 inch	good	Jake Wolf	fin clipped with left Pectoral
8-27-87	TGM	176	8 inch	good	Jake Wolf	not fin clipped.
8-23-88	TGM	176	8 inch	good	Jake Wolf	not fin clipped.
7-25-89	TGM	176	8 inch	good	Jake Wolf	

WATER (NAME) Lake Paradise

WATER (NAME) Lake Paradise

COUNTY

WATER (NAME)

Coles

Lake Paradise

F.M. 2.0 Distribution: State and Public—District, Area, Central Offices (8/70)



Appendix D

1982 and 2000 Sediment Reports

Sedimentation Survey of Lake Paradise and Lake Mattoon,
Mattoon, Illinois

by

William C. Bogner

Prepared for:

CMT Engineering Company
The City of Mattoon
and
Illinois Environmental Protection Agency

Illinois State Water Survey
Champaign, Illinois

This report was printed on recycled and recyclable papers.

Table of Contents

	<i>Page</i>
Introduction.....	1
Acknowledgments.....	2
Lake and Watershed Information.....	2
Lake Locations.....	2
Watershed	2
Historical Background	4
Lake Sedimentation Surveys	4
Lake Basin Volumes	12
Results and Analysis	13
Sedimentation Rates	14
Bathymetric Surveys.....	20
Comparison of Results.....	23
Sediment Particle Size Distribution.....	23
Summary	27
References.....	28
Appendix I. Cross-Section Plots of the Lake Paradise Transects.....	29
Appendix II. Cross-Section Plots of the Lake Mattoon Transects	43
Appendix III. Lake Paradise Sediment Core Sample Unit Weight Results.....	71
Appendix IV. Lake Mattoon Sediment Core Sample Unit Weight Results	71
Appendix V. Lake Paradise Sediment Particle Size Distribution Sample Results	72
Appendix V. Lake Mattoon Sediment Particle Size Distribution Sample Results.....	73

Abstract

The Illinois State Water Survey (ISWS) conducted sedimentation surveys of Lake Paradise and Lake Mattoon during 2001 in support of an Illinois Clean Lakes Program diagnostic/feasibility study to provide information on the storage and sedimentation conditions of the lakes. Both lakes are owned and operated by the City of Mattoon, which withdraws water from Lake Paradise as the raw water source for distribution of finished water and generally uses withdrawals from Lake Mattoon to maintain a more stable water level in Lake Paradise. The village of Neoga also withdraws water from Lake Mattoon for treatment and distribution. Since June 2001, Reliant Energy has operated a peaker power plant that has withdrawn water from Lake Mattoon for cooling systems.

Lake Paradise and Lake Mattoon are located on the main stem of the Little Wabash River, a tributary to the Wabash River. The watershed is a portion of Hydrologic Unit 05120114. The dam for Lake Paradise is about 4 miles southwest of the City of Mattoon at 39° 24' 47" north latitude and 88° 26' 23" west longitude in Section 8, Township 11N., Range 7E., Coles County. The dam for Lake Mattoon is about 12 miles southwest of the City of Mattoon at 39° 20' 00" north latitude and 88° 28' 56" west longitude in Section 1, Township 10N., Range 6E., Shelby County. Lake Paradise was surveyed in 1979 and Lake Mattoon in 1980 as part of a previous cooperative study by the ISWS, the Illinois Department of Transportation - Division of Water Resources (DoWR), the Illinois Water Resources Center, and several departments at the University of Illinois at Urbana-Champaign.

Lake Paradise lost 835 acre-feet (ac-ft) of its capacity as a result of sedimentation between 1908 and 2001. Approximately 481 ac-ft of this loss has occurred since 1931, which gives an annual sedimentation rate of 9.9 ac-ft since 1931. If this rate of sedimentation continues, the volume of Paradise Lake will be approximately half of the potential 1908 volume in the year 2013 and will be filled completely by sediment in the year 2118.

Lake Mattoon lost 1,705 ac-ft of its 1958 capacity as a result of sedimentation between 1958 and 2001, a sedimentation rate of 39.7 ac-ft per year since 1958. If this rate of sedimentation continues, the volume of Lake Mattoon will be approximately half of the 1958 capacity by 2124 and will be completely filled in the year 2291.

The sedimentation rates for Lake Paradise and its watershed for the periods 1931-1979, 1979-2001, and 1931-2001 were stable and ranged from 9.5 to 10 ac-ft. The long-term average annual sediment yield from 1931-2001 was 9.85 ac-ft. These sedimentation rates correspond to a rate of loss of lake capacity of 0.51 percent per year (1931-2001).

The sedimentation rates for Lake Mattoon and its watershed for the periods 1958-1980, 1980-2001, and 1958-2001 indicate a reduction in net sediment yield from 66.9 ac-ft per year for 1958-1980 to 10.7 ac-ft per year (1980-2001). The long-term average annual sediment yield was 39.5 ac-ft (1958-2001). These sedimentation rates correspond to rates of loss of lake capacity of 0.51 percent per year (1958-1980) and 0.08 percent per year (1980-2001). The long-term average sedimentation rate for the lake is 0.30 percent per year (1958-2001).

SEDIMENTATION SURVEY OF LAKE PARADISE AND LAKE MATTOON, MATTOON, ILLINOIS

Introduction

The Illinois State Water Survey (ISWS) conducted sedimentation surveys of Lake Paradise and Lake Mattoon during 2001 in support of an Illinois Clean Lakes Program diagnostic/feasibility study to provide information on the storage and sedimentation conditions of the lakes. Both lakes are owned and operated by the City of Mattoon, which withdraws water from Lake Paradise as the raw water source for distribution of finished water and generally uses withdrawals from Lake Mattoon to maintain a more stable water level in Lake Paradise. The village of Neoga also withdraws water from Lake Mattoon for treatment and distribution. Since June 2001, Reliant Energy has operated a peaker power plant that has withdrawn water from Lake Mattoon for cooling systems.

Sedimentation detracts from the use of any water-supply lake by reducing depth and volume, with an accompanying reduction of reserve water-supply capacity and burying of intake structures. Sedimentation of a reservoir is a natural process that can be accelerated or slowed by human activities in the watershed. In general, sedimentation of a lake is presumed to be accelerated unintentionally as a secondary impact of other developments within the watershed. For example, construction and agricultural activities generally are presumed to increase sediment delivery to the lake due to increased exposure of soil material to erosive forces.

Reductions of the sedimentation rate in a lake due to human impacts almost always are the result of programs intentionally designed to reduce soil and streambank erosion, and they are often the result of implementing lake remediation programs. These programs might include, but are not limited to, the implementation of watershed erosion control practices, streambank and lakeshore stabilization, and stream energy dissipaters. Lake dredging often is employed to remove previously accumulated sediments.

Sedimentation of a reservoir is the final stage of a three-step sediment transport process: watershed erosion by sheet, rill, gully, and/or streambank erosion; sediment transport in a defined stream system; and deposition of the sediment. In the latter process stream energy is reduced such that the sediment can no longer be transported either in suspension or as bed load. Sediment deposition can occur throughout the stream system.

Lake sedimentation occurs when sediment-laden water in a stream enters the reduced flow velocity regime of a lake. As water velocity is reduced, suspended sediment is deposited in patterns related to the size and fall velocity of each particle. During this process, soil particles are sorted partially by size along the longitudinal axis of the lake. Larger and heavier sand and coarse silt particles are deposited in the upper (inlet) end of the lake; finer silts and clay particles tend to be carried further into the lake (outlet).

Several empirical methods have been developed for estimating sedimentation rates in Illinois (ISWS, 1967; Upper Mississippi River Basin Commission, 1970; Singh and Durgunoglu,

1990). These methods use regionalized relationships between watershed size and lake sedimentation rates. As estimates, they serve well within limits. A more precise measure of the sedimentation rate is provided by conducting a sedimentation survey of the reservoir. The sedimentation survey provides detailed information on distribution patterns within the lake and defines temporal changes in overall sedimentation rates.

Acknowledgments

The project was funded by a grant from the Illinois Clean Lakes Program to the city of Mattoon. Cristie Crites of CMT Engineering was the project manager.

The views expressed in this report are those of the author and do not necessarily reflect the views of the sponsor or the Illinois State Water Survey.

This project was conducted by the authors as part of his regular duties at the Illinois State Water Survey under the administrative guidance of Derek Winstanley, Chief, and Mike Demissie, Head of the Watershed Science Section. Erin Bauer, Mark Johansen, and Richard Cahill (Illinois State Geological Survey) assisted with field data collection. Yi Han analyzed the sediment samples. Laura Keefer and Sally McConkey provided technical review. Eva Kingston edited the report, and Linda Hascall reviewed the graphics.

Lake and Watershed Information

Lake Locations

Lake Paradise and Lake Mattoon (figure 1) are located on the main stem of the Little Wabash River, a tributary to the Wabash River. The watershed is a portion of Hydrologic Unit 05120114 as defined by the U.S. Geological Survey (USGS, 1974).

The dam for Lake Paradise is about 4 miles southwest of the City of Mattoon at 39° 24' 47" north latitude and 88° 26' 23" west longitude in Section 8, Township 11N., Range 7E., Coles County. The lake lies entirely in Coles County.

The dam for Lake Mattoon is about 12 miles southwest of the City of Mattoon at 39° 20' 00" north latitude and 88° 28' 56" west longitude in Section 1, Township 10N., Range 6E., Shelby County. The lake lies in Shelby, Cumberland, and Coles Counties.

Watershed

The Lake Paradise watershed lies in Coles and Moultrie Counties. It is a sub-basin of the Lake Mattoon watershed, which consists of portions of Shelby, Cumberland, Coles, and Moultrie Counties. Agriculture is the principal land use in both watersheds. The topography of the area is dominated by low slopes with deeply incised, well-developed waterways.

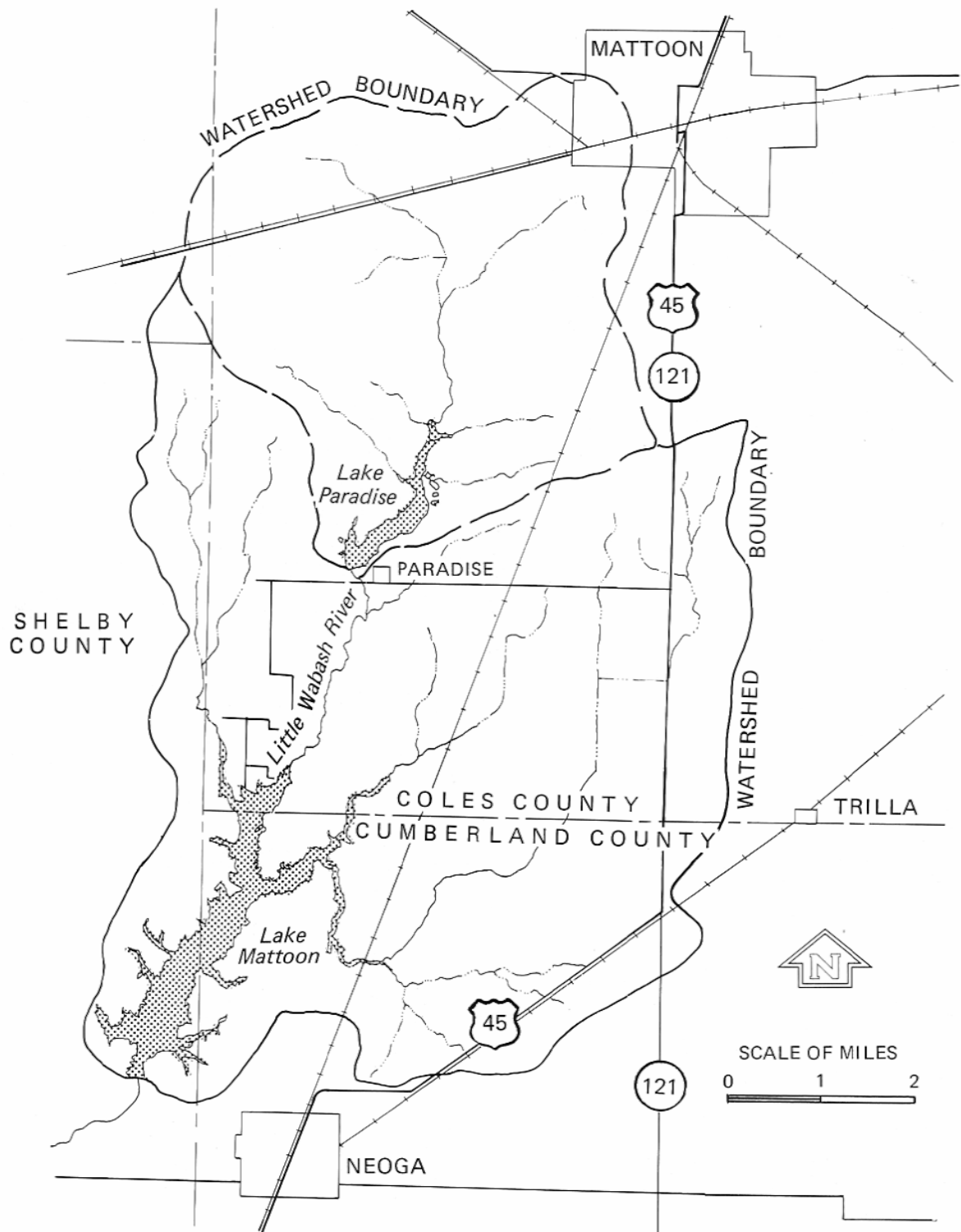


Figure 1. Watershed and location map of Lake Paradise and Lake Mattoon

Geologically, there is a striking difference in the history of the two watersheds. The Lake Mattoon watershed is bisected approximately east to west by the end moraine of the first advance of the Wisconsin glacier. As a result, the northern half of the watershed, including the watershed of Lake Paradise, is primarily glacial till materials, while the southern portion is primarily glacial outwash and loess materials.

Historical Background

In the early 1900s, Mattoon, Illinois served as the terminal center for the "Big Four" Railroads. In 1908, the demands of the railroads for a reliable, high-quality source of water forced private interests from the city to construct a small reservoir southwest of town. The dam for this reservoir was just north of the current dam and spillway for Lake Paradise. The spillway of this reservoir was raised 2.5 feet in 1914 and 2.0 feet in 1922.

In 1931, the current dam and spillway were built with the spillway crest at an elevation of 684.5 feet above National Geodetic Vertical Datum (ft-NGVD). This spillway elevation resulted in almost total inundation of the original dam, the remnants of which can still be seen in segment 3 of the lake (figure 2). Prior to the construction of the present Lake Mattoon, Lake Paradise was known as Lake Mattoon.

The City of Mattoon bought Lake Paradise in the mid-1930s. In order to guarantee a reliable water source through the Twentieth Century, the city constructed Lake Mattoon in 1958 as a backup supply during periods of drought. Initially, the operating plan was to use Lake Paradise for the city's water supply and Lake Mattoon to maintain the level of Lake Paradise. However, facilities now exist for pumping Lake Mattoon water directly to the treatment plant. The spillway elevation of Lake Mattoon is 632.3 ft-NGVD.

Lake Sedimentation Surveys

Lake Paradise was surveyed in 1979 as part of a cooperative study by the ISWS, the Illinois Department of Transportation - Division of Water Resources (DoWR), the Illinois Water Resources Center, and several departments at the University of Illinois at Urbana-Champaign. The same agencies cooperated in a survey of Lake Mattoon in 1980. The DoWR is now the Illinois Department of Natural Resources Office of Water Resources. This report will refer to the 1979 survey of Lake Paradise and the 1980 survey of Lake Mattoon as the "initial" surveys of these lakes.

Survey plans for the initial surveys are shown for Lake Paradise (figure 2) and Lake Mattoon (figure 3). Endpoints for these transects were monumented with concrete posts embedded with either a DoWR cap or a railroad spike. Endpoint locations were determined by surveyed traverse.

Field data for the initial surveys were collected by the Division of Waterways using equipment provided by the ISWS. The ISWS also provided the survey plan, collected samples of accumulated sediments, analyzed survey data, and prepared a report summarizing findings of both surveys (Bogner, 1982).

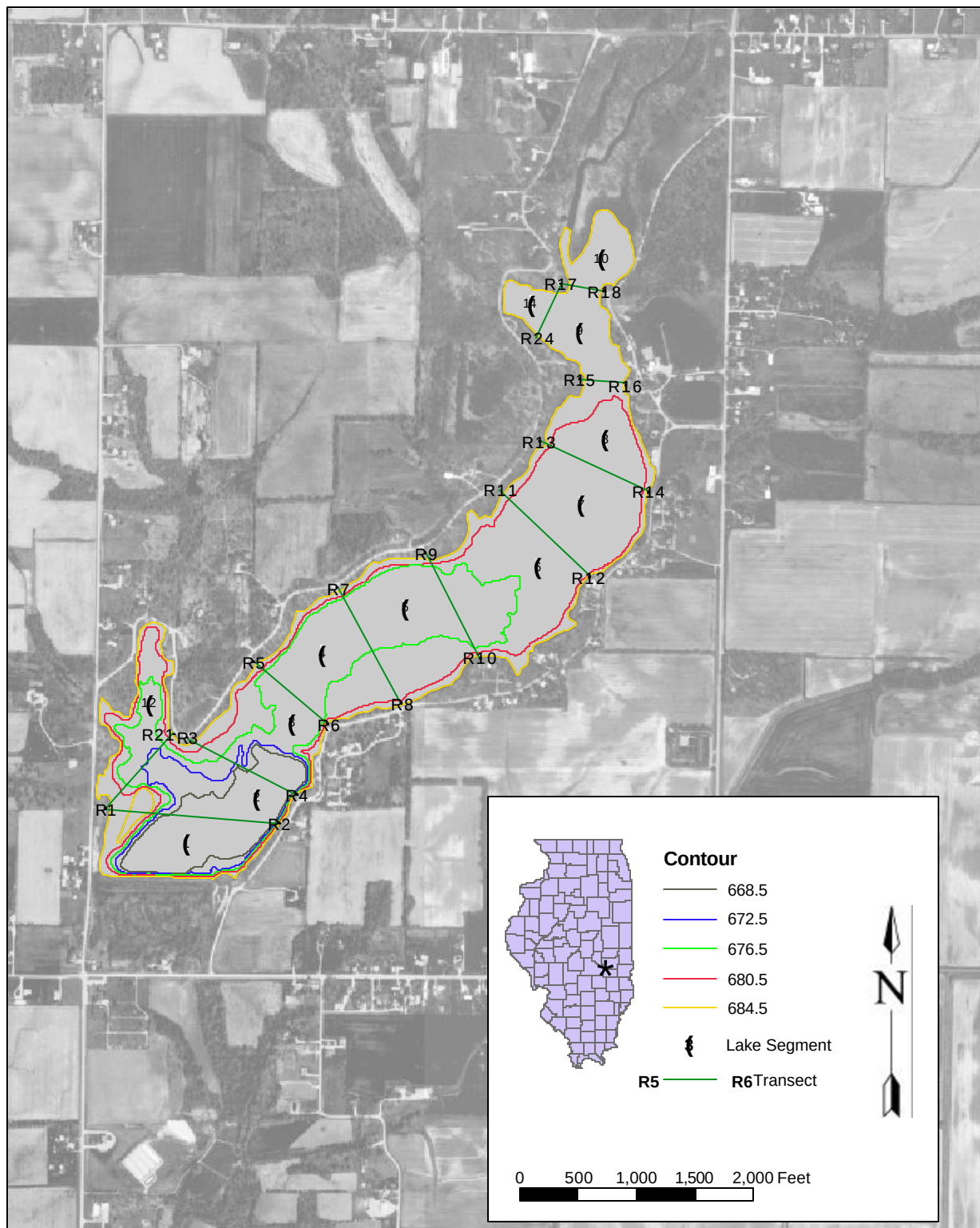


Figure 2. Lake Paradise survey plan and bathymetry

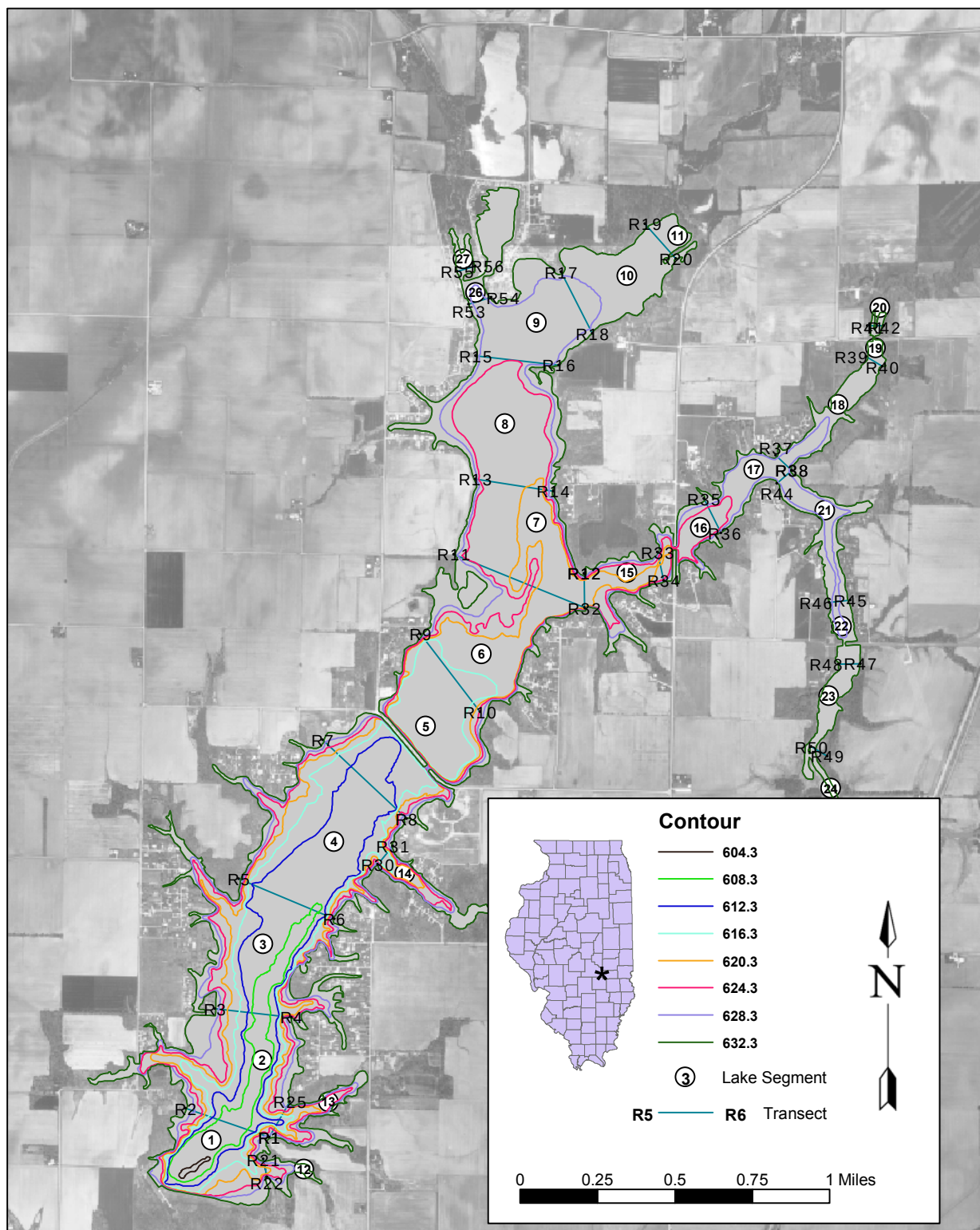


Figure 3. Lake Mattoon survey plan and bathymetry

For the initial surveys, sounding data were collected at 25-foot intervals on each cross section to measure both the original and time-of-survey depths of water in the lakes at the spillway elevations. All depth measurements were made with a 2-inch diameter aluminum pole marked in tenths of feet. The pole was lowered until it touched the current lake bottom, and a depth measurement was made. The pole then was pushed through the accumulated sediment to a point of refusal that was determined to be the solid original lakebed, and another depth measurement was made. Horizontal control on each cross section was maintained with a marked plastic cable between the transect endpoints.

For the 2001 survey, the survey plan of the initial surveys was followed as closely as possible. Selected survey monumentation established during the initial surveys was recovered, and the location coordinates were established using a Global Positioning System (GPS). Differential corrections for these GPS measurements were determined using U.S. Coast Guard correction signals (Radio Technical Commission for Maritime Services or RTCM). These selected location records were used with the survey traverse records collected in earlier surveys to determine GPS positions for all transect ends established for the lakes. These endpoint locations were verified in the field, and corrections to the original survey were made as needed. Several angular discrepancies were noted and corrected. Table 1 (Lake Paradise) and Table 2 (Lake Mattoon) list the endpoint coordinates used for the 2001 surveys.

The 2001 survey was conducted using an Odom Hydrographic Systems MK II fathometer for depth measurement and a differentially corrected GPS for horizontal control across the transect. The GPS system unit used was a Leica 9600 System. All navigation and data logging functions were controlled using HYPACK[®], hydrographic survey software. The GPS positions were differentially corrected using RTCM correction signals broadcast by the U.S. Coast Guard from St. Louis, Missouri, or Rock Island, Illinois.

The fathometer was calibrated daily prior to initiating measurements. Calibration checks at the end of most work days showed daily variations of 0.1-0.2 feet for each reading in a profile at one-foot depth intervals. For each main lake cross section, up to five physical measurements of the water depth and sediment thickness were made with an aluminum sounding pole.

The GPS locations of the transect endpoints were entered into the HYPACK[®] software for the field survey. The depth sounder and the GPS unit were connected to a laptop computer operating HYPACK[®] software, which provided navigation guidance and data logging for the survey of each line. Plots of cross-section profiles of each transect appear in appendix I (Lake Paradise) and appendix II (Lake Mattoon).

Samples of the accumulated sediments were collected and analyzed for particle size distribution and unit weight. Results of the laboratory analyses for these samples appear in appendices III and IV (unit weight analysis) and appendices V and VI (particle size distribution). A detailed discussion of particle size distributions is presented in the section "Sediment Particle Size Distribution."

**Table 1. Lake Paradise Range End Coordinates
1927 Illinois State Plane – East Projection (feet)**

<i>Traverse point</i>	<i>East coordinate</i>	<i>North coordinate</i>
R1	468,959.2	1,000,471.0
R2	470,450.9	1,000,366.0
R3	469,649.0	1,001,092.0
R4	470,597.4	1,000,617.0
R5	470,212.1	1,001,747.0
R6	470,851.9	1,001,222.0
R7	470,919.7	1,002,395.0
R8	471,485.6	1,001,409.0
R9	471,672.6	1,002,700.0
R10	472,155.2	1,001,810.0
R11	472,308.9	1,003,251.0
R12	473,078.2	1,002,518.0
R13	472,636.0	1,003,673.0
R14	473,572.4	1,003,256.0
R15	472,974.0	1,004,210.0
R16	473,364.1	1,004,162.0
R17	472,797.0	1,005,023.0
R18	473,170.5	1,004,965.0
R21	469,539.9	1,001,119.0
R24	472,604.5	1,004,557.0

**Table 2. Lake Mattoon Range End Coordinates
1927 Illinois State Plane – East Projection (feet)**

<i>Traverse point</i>	<i>East coordinate</i>	<i>North coordinate</i>	<i>Traverse point</i>	<i>East coordinate</i>	<i>North coordinate</i>
R1	459319.6	972122.3	R33	465811.1	982218.2
R2	457884.8	972591.5	R34	465922.5	981730.3
R3	458359.1	974302.1	R35	466590.7	983141.4
R4	459667.4	974175.0	R36	466888.4	982557.5
R5	458736.7	976526.2	R37	467801.8	983897.2
R6	460377.4	975867.0	R38	468081.6	983644.5
R7	460135.3	978925.5	R39	469328.6	985610.8
R8	461584.0	977596.0	R40	469604.5	985447.5
R9	461779.9	980758.5	R41	469338.6	986134.4
R10	462813.5	979444.2	R42	469621.2	986140.2
R11	462327.4	982127.7	R44	467831.8	983417.8
R12	464559.8	981832.5	R45	469112.5	981445.7
R13	462676.0	983419.3	R46	468755.2	981401.1
R14	464010.8	983229.8	R47	469302.6	980359.6
R15	462653.6	985527.0	R48	468931.2	980346.7
R16	464070.9	985385.3	R49	468759.9	978771.6
R17	464090.9	986981.4	R50	468486.2	978930.9
R18	464640.5	985934.1	R51	469441.2	977199.5
R19	465513.1	987820.9	R52	469489.3	977258.9
R20	466050.8	987237.7	R53	462520.0	986404.0
R21	459223.8	971745.3	R54	462905.8	986525.8
R22	459293.0	971440.1	R55	462315.4	986961.6
R25	459667.7	972734.3	R56	462620.0	987059.0
R30	461107.5	976807.6			
R31	461363.8	977129.8			

Lake Basin Volumes

Depth to refusal sounding data from the initial surveys were used to calculate the original storage capacities in 1908 (Lake Paradise) and in 1958 (Lake Mattoon) at current spillway levels and also the 1931 lake surface area for Lake Paradise. Water depth soundings from the initial surveys, using the sounding pole, and the 2001 depth soundings from the depth sounder were used to calculate capacities for the date of construction and at the time of each survey. The difference between these storage capacities is the lake volume that has been lost to sedimentation since reservoir construction or between surveys.

Lake capacities were calculated using a method described in *the National Engineering Handbook* of the U.S. Soil Conservation Service (USDA-SCS, 1968). This method can determine the original and present volume of each segment by using the surface area of the lake segments, the cross-sectional area and widths of their bounding segments, and a shape factor. These volumes are then summed to determine the total lake volume. Reference elevations used were the top of the spillway for each lake, 684.5 ft-NGVD for Lake Paradise and 632.3 ft-NGVD for Lake Mattoon. These spillway elevations differ from values presented in the 1982 report (684.1 ft-NGVD for Lake Paradise and 632.0 ft-NGVD for Lake Mattoon) due to discrepancies discovered during the 2001 survey.

Volumes determined by the sedimentation survey were the 1979 water volume contained in the reservoir and the 1979 volume of sediment contained in the reservoir. The sum of these values is the potential water volume of the reservoir if the 1931 dam and spillway had been constructed in 1908.

However, when the dam and spillway were constructed in 1931, a portion of this volume already had been filled by sediment from the original (1908) dam and spillway. To develop a 1931-1979 sedimentation rate for Paradise Lake, it was necessary to estimate volume losses due to sedimentation from 1908 to 1931. This was accomplished by prorating sediment accumulations in segments 3-9 between 1908-1931 and 1931-1979.

The 1931 water volume in each segment was determined by using the formula:

$$\text{Water volume (1931)} = \text{potential water volume (1908)} - \text{sediment volume (1908-1931)}$$

By this method, the lake volume at the 1931 spillway elevation was reduced 6.7 percent due to sedimentation during the period 1908-1931. This approximate adjustment cannot be used to determine a 1908-1931 sedimentation rate.

Results and Analyses

Lake Paradise

Table 3 summarizes results of the 1979 and 2001 surveys of Lake Paradise. The lake lost 835 acre-feet (ac-ft) of its capacity as a result of sedimentation between 1908 and 2001. Approximately 481 ac-ft of this loss has occurred since 1931, which gives an annual sedimentation rate of 9.9 ac-ft since 1931.

If this rate of sedimentation continues, the volume of Paradise Lake will be approximately half of the potential 1908 volume in the year 2013 and will be filled completely by sediment in the year 2118. However, because of decreasing lake volume, trap efficiency of the lake will tend to decrease with age, which very likely will extend the life of the lake.

Table 3. Reservoir Capacity and Capacity Loss Analysis for Lake Paradise

<i>Period</i>	<i>Capacity</i>	<i>Capacity loss</i>	<i>Cumulative capacity loss</i>	<i>Period annual capacity loss rate</i>	<i>Cumulative annual capacity loss rate</i>
<i>a) Analysis in units of acre-feet</i>					
1908	2,087				
1931	1,942				
1931-1979	1,461	481	481	10.0	10.0
1979-2001	1,252	209	690	9.5	9.9
<i>b) Analysis in units of million gallons</i>					
1908	680				
1931	633				
1931-1979	476	156.6	156.6	3.3	3.3
1979-2001	408	68.1	224.7	3.1	3.2

Notes:

Lake surface area was 196 acres in 1931 (as determined for the 1979 survey).

Lake surface area was 166 acres in 1979.

Visual comparison of the 2001 shoreline with 1979 aerial photography did not indicate any significant change in surface area.

Capacity shown is for the sedimentation survey conducted at the end of the period.

Spillway elevation was 684.5 ft-NGVD.

See report text for details on the adjustment of segment volumes for 1908-1931 period sedimentation.

The 1931 volume is an interpolated value derived from 1908 and 1978 volumes.

Table 4 shows the variation in sediment accumulation in Paradise Lake by segments. Locations of these segments are shown in figure 2. In the computation of the weight of total sediment shown, the unit weights of samples of deposited sediments were used. The average dry unit weight of the deposited sediment was 33.2 pounds per cubic foot based on the samples collected in 2001.

A 1979 analysis of aerial photographic records for Paradise Lake indicated that sediment had completely filled 15 percent of the original area of the lake (30 acres out of 200 acres). Comparison of 1979 aerial photography and 1998 aerial photography indicates that this process has not continued.

Photographs were available from five different years: 1938, 1953, and 1966 (University of Illinois Map Library); 1979 (DoWR); and 1998 (Digital Orthophoto Quadrangles prepared by the USGS National Mapping Division). Changes in lake surface area are indicated in figure 2. Delta formations shown indicate that with periodic dry dredging it may be feasible to use the area upstream of transect R17-R18 as a sediment basin to reduce sedimentation in Lake Paradise.

Lake Mattoon

Table 5 summarizes results of the 1980 and 2001 surveys of Lake Mattoon. The lake has lost 1,705 ac-ft of its 1958 capacity as a result of sedimentation between 1958 and 2001, a sedimentation rate of 39.7 ac-ft per year since 1958.

If this rate of sedimentation continues, the volume of Lake Mattoon will be approximately half of the 1958 capacity by 2124 and will be completely filled in the year 2291. As with Paradise Lake, as lake volume decreases, the sedimentation rate also decreases, thus extending the life of the lake.

Table 6 shows the variation of sedimentation accumulations in Lake Mattoon by segments. Figure 3 shows segment locations. Dry unit weights of samples of deposited sediments were used to compute sediment weights shown in figure 6. The average unit weight of the deposited sediment was 27.4 pounds per cubic foot based on the samples collected in 2001.

Sedimentation Rates

Sedimentation rates for Lake Paradise and Lake Mattoon were analyzed in terms of delivery rates from the watershed and from accumulation rates in the reservoir. The in-lake accumulation rate provides a means of extrapolating future lake conditions from past and present lake conditions to evaluate the integrity of the lake as a water-supply source and as a recreational resource. Watershed delivery rates are the link between soil erosion processes in the watershed, sediment transport processes, and water-supply quantity impacts in the reservoir. These delivery rates measure the actual sediment yield from the watershed, including reduced sediment transport due to field and in-stream redeposition.

Table 4. Sediment Distribution in Paradise Lake

	<i>Segment</i>	<i>Area (acres)</i>	<i>Volume</i>				<i>2001 sediment</i>			
			<i>1908 (ac-ft)</i>	<i>1931 (ac-ft)</i>	<i>1979 (ac-ft)</i>	<i>2001 (ac-ft)</i>	<i>Accumulation (ac-ft)</i>	<i>Weight (tons)</i>	<i>Thickness (feet)</i>	<i>Per segment acre (tons)</i>
15	1	13.8	246.4	246.4	206.3	184.8	61.7	28,606	4.5	2,073
	2	14.2	250.9	250.9	207.0	187.6	63.2	29,339	4.5	2,066
	3	15.3	234.0	212.1	166.3	145.9	88.1	56,979	5.8	3,724
	4	16.6	221.3	198.6	151.3	134.6	86.7	56,107	5.2	3,380
	5	19.9	251.2	224.2	168.0	153.6	97.5	54,371	4.9	2,732
	6	25.4	315.6	279.0	202.4	183.5	132.2	73,684	5.2	2,901
	7	18.4	182.6	164.1	125.5	109.6	73.1	64,150	4.0	3,486
	8	11.3	89.4	80.0	60.4	48.2	41.1	36,095	3.6	3,194
	9	9.1	54.5	45.3	26.1	20.1	34.4	41,171	3.8	4,524
	10-11	30.5	89.6	89.6	29.2	24.0	65.6	78,630	2.2	2,578
	12-13	20.2	131.3	131.3	111.1	55.1	76.2	66,906	3.8	3,312
	14	5.7	20.5	20.5	7.7	5.4	15.2	18,154	2.7	3,185
	Totals	196	2,087	1,942	1,461	1,252	835.0	604,193	4.3	3,089

Table 5. Reservoir Capacity and Capacity Loss Analysis for Lake Mattoon

<i>Period</i>	<i>Capacity</i>	<i>Capacity loss for period</i>	<i>Cumulative capacity loss</i>	<i>Period annual capacity loss rate</i>	<i>Cumulative annual capacity loss rate</i>
<i>a) Analysis in units of acre-feet</i>					
1958	13,293				
1958-1980	11,812	1,482	1,482	67.3	67.3
1980-2001	11,588	224	1,705	10.6	39.7
<i>b) Analysis in units of million gallons</i>					
1958	4,331				
1958-1980	3,849	482.7	482.7	21.9	21.9
1980-2001	3,776	72.8	555.6	3.5	12.9

Notes:

Lake surface area was 1,027 acres in 1958 (as determined for the 1980 survey).

Visual comparison of the 2001 shoreline and 1980 aerial photography did not indicate any significant change in 1980-2001 surface area.

Capacity shown is for the sedimentation survey conducted at the end of the period.

Spillway elevation was 632.3 ft-NGVD.

Lake Paradise

Changes in spillway elevation of Paradise Lake, and consequent changes in surface area and volume, considerably complicated the calculation of the sedimentation rate of the lake.

Increasing lake capacity improves lake efficiency as a sediment trap because the given inflow into the lake will be held longer, allowing more sediments to settle out of suspension. This increase in trap efficiency varies considerably, depending on the original and new volumes of the lake.

The most widely used method for determining trap efficiency is the graph developed by Brune (1953), shown in figure 4. This curve shows trap efficiency as a function of the Capacity/Inflow (C/I) ratio where capacity and annual inflow are in acre-feet.

For Lake Paradise, the variation in capacity has been from 460 ac-ft in 1908 to 2040 ac-ft in 1931. Average annual discharge for the Little Wabash River at Effingham is 11.6 inches (USGS, 1999). Assuming 12 inches of annual runoff from the 11,400-acre watershed of

Table 6. Sediment Distribution in Lake Mattoon

<i>Segment</i>	<i>Area (acres)</i>	<i>Volume</i>			<i>2001 sediment</i>			
		<i>1958 (ac-ft)</i>	<i>1980 (ac-ft)</i>	<i>2001 (ac-ft)</i>	<i>Accumulation (ac-ft)</i>	<i>Weight (tons)</i>	<i>Thickness (feet)</i>	<i>Per segment acre (tons)</i>
1	52.1	885	816	825	59.8	28,135	1.1	540.0
2	88.3	1,445	1,342	1,360	84.4	40,591	1.0	459.7
3	105.8	1,902	1,769	1,767	134.7	66,154	1.3	625.3
4	123.0	2,322	2,180	2,175	147.1	73,781	1.2	599.8
5	99.4	1,777	1,630	1,630	147.0	75,235	1.5	756.9
6	92.9	1,382	1,205	1,168	213.5	109,983	2.3	1,183.9
7	45.2	581	508	488	93.6	48,498	2.1	1,073.0
8	87.2	806	695	699	107.0	62,209	1.2	713.4
9	58.5	342	280	287	54.5	35,133	0.9	600.6
10	40.9	172	128	121	51.2	59,766	1.3	1,461.3
11	12.0	18	10	8	10.4	17,579	0.9	1,464.9
12	5.9	31	27	26	5.2	3,493	0.9	592.0
13	16.4	112	101	97	14.9	9,927	0.9	605.3
14	14.2	129	118	113	15.7	10,472	1.1	737.5
15	26.1	322	273	257	64.9	43,276	2.5	1,658.1
16	21.6	234	190	169	65.1	43,404	3.0	2,009.5
17	22.6	218	162	135	83.3	55,508	3.7	2,456.1
18	19.1	128	80	62	65.6	43,717	3.4	2,288.8
19	3.9	12	6	4	8.3	5,553	2.1	1,423.8
20	3.7	3	1	1	2.2	1,489	0.6	402.5
21	23.8	174	126	99	75.0	49,998	3.2	2,100.7
22	9.3	62	39	25	36.6	24,424	3.9	2,626.2
23	12.9	69	33	14	55.8	37,217	4.3	2,885.0
24	10.8	41	19	1	39.4	26,260	3.6	2,431.5
25	0.5	2	1	0	1.6	1,058	3.1	2,033.9
26	22.7	102	63	50	52.3	34,835	2.3	1,534.6
27	8.4	23	11	7	15.7	10,494	1.9	1,249.3
Total	1,027	13,293	11,812	11,588	1,705.1	1,018,188	1.7	991.2

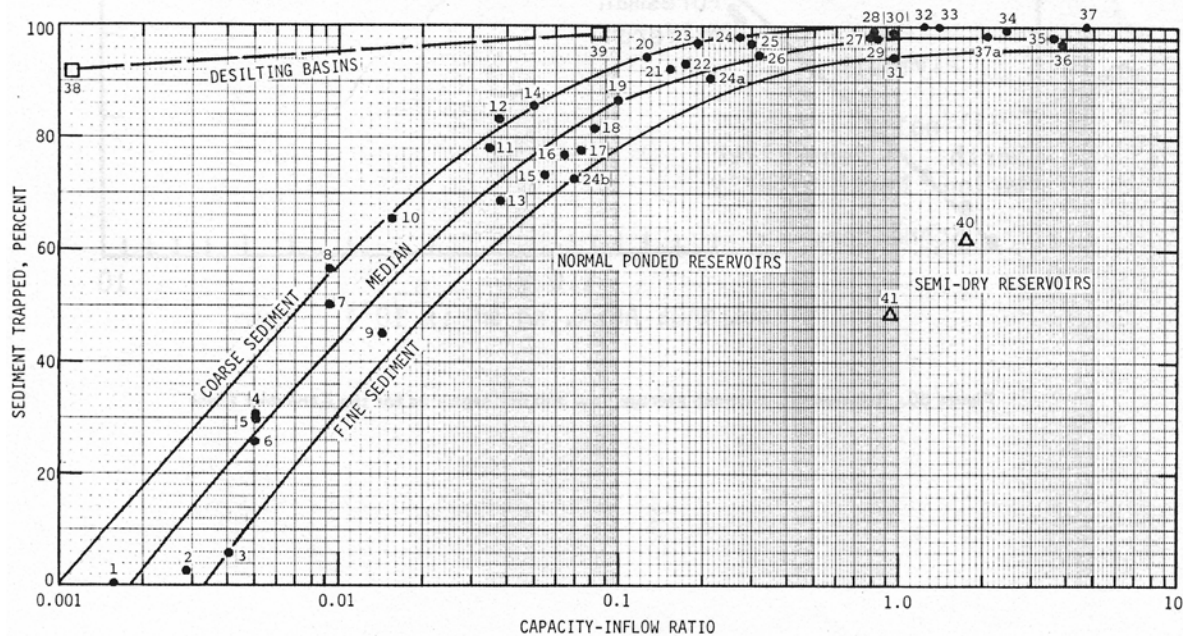


Figure 4. Trap efficiency of a man-made lake (after Brune, 1953).

Lake Paradise, inflow becomes 11,400 ac-ft/year with a C/I ratio of 0.04 for 1908 and 0.18 for 1931. For these C/I ratios, the trap efficiencies are 69 percent for 1908 and 87 percent for 1931, based on the graph in figure 4. This analysis indicates that the trap efficiency of the lake increased approximately 25 percent from 1908 to 1931, when the existing dam was constructed.

To reduce the effects of these variations in the trap efficiency on calculations, the sedimentation rate of Lake Paradise was determined by adjusting the calculated results to a 1931-1979 sedimentation period, as previously discussed.

Tables 7 and 8 give the sedimentation rates for Lake Paradise and its watershed for the periods 1931-1979, 1979-2001, and 1931-2001. These rates indicate a stable 1931-2001 net sediment yield of 9.5 to 10 ac-ft. The long-term average annual sediment yield from 1931-2001 was 9.85 ac-ft.

These sedimentation rates correspond to a rate of loss of lake capacity of 0.51 percent per year (1931-2001).

**Table 7. Computed Sediment Delivery Rates
from Watershed for Lake Paradise**

<i>Period</i>	<i>Annual deposition rates</i>			
	<i>Acre-feet</i>	<i>per square mile</i>	<i>Cubic feet per acre</i>	<i>Tons per acre</i>
1931-1979	10.02	0.55	37.7	
1979-2001	9.50	0.52	35.7	
1931-2001	9.85	0.54	37.0	0.56

Note:

Total watershed area is 18.1 square miles.

**Table 8. Capacity Loss Rates (percent) for Lake Paradise
Relative to 1931 Lake Capacity**

<i>Period</i>	<i>Per period</i>	<i>Period annual loss</i>
1931-1979	24.8	0.52
1979-2001	10.8	0.49
1931-2001	35.5	0.51
(Relative to potential 1908 capacity)		
1908-2001	40.0	

Lake Mattoon

Tables 9 and 10 give the sedimentation rates for Lake Mattoon and its watershed for the periods 1958-1980, 1980-2001, and 1958-2001. These rates indicate a reduction in net sediment yield from 66.9 ac-ft per year for 1958-1980 to 10.7 ac-ft per year (1980-2001). The long-term average annual sediment yield was 39.5 ac-ft (1958-2001).

These sedimentation rates correspond to rates of loss of lake capacity of 0.51 percent per year (1958-1980) and 0.08 percent per year (1980-2001). The long-term average sedimentation rate for the lake is 0.30 percent per year (1958-2001).

**Table 9. Computed Sediment Delivery Rates
from Watershed for Lake Mattoon**

<i>Period</i>	<i>Acre-feet</i>	<i>Annual deposition rates</i>		
		<i>Acre-feet per square mile</i>	<i>Cubic feet per acre</i>	<i>Tons per acre</i>
1958-1980	66.9	1.19	81.3	
1980-2001	10.7	0.19	13.0	
1958-2001	39.5	0.70	48.0	0.66

Note:

Total watershed area is 56 square miles.

**Table 10. Capacity Loss Rates (percent) for Lake Mattoon
Relative to the 1958 Lake Capacity**

<i>Period</i>	<i>Per period</i>	<i>Period annual loss</i>
1958-1980	11.2	0.51
1980-2001	1.7	0.08
1958-2001	12.9	0.30

Bathymetric Surveys

The 2001 water depths for the lakes were used to generate the bathymetric maps in figure 2 (Lake Paradise) and figure 3 (Lake Mattoon). Lakebed elevation contours were used to develop the volume distribution curve data (figures 5 and 6). These plots can be used to determine reservoir capacity below a given elevation. For example, the water volume below the 4-foot depth contour in Lake Paradise (dashed line in figure 5) is 671 ac-ft. With time and continued sedimentation, relationships shown in figures 5 and 6 will become obsolete. Alteration of the spillway elevation or implementation of a dredging program likewise would alter these relationships.

The tabular presentations of volumes for this report were prepared using the results of an average end area type of calculation for volumes, while the stage-volume-area graphs (figures 5 and 6) were developed on the basis of the contour method of calculation. The two calculation methods process the same basic data but result in different values for the lake volume. The range method calculation is a detailed methodology that results in a consistent set of lake volume calculations for the series of lake volumes (original, initial survey, and 2001). The contour volume method includes a larger data set and yields a more accurate estimate of the volume but is not as

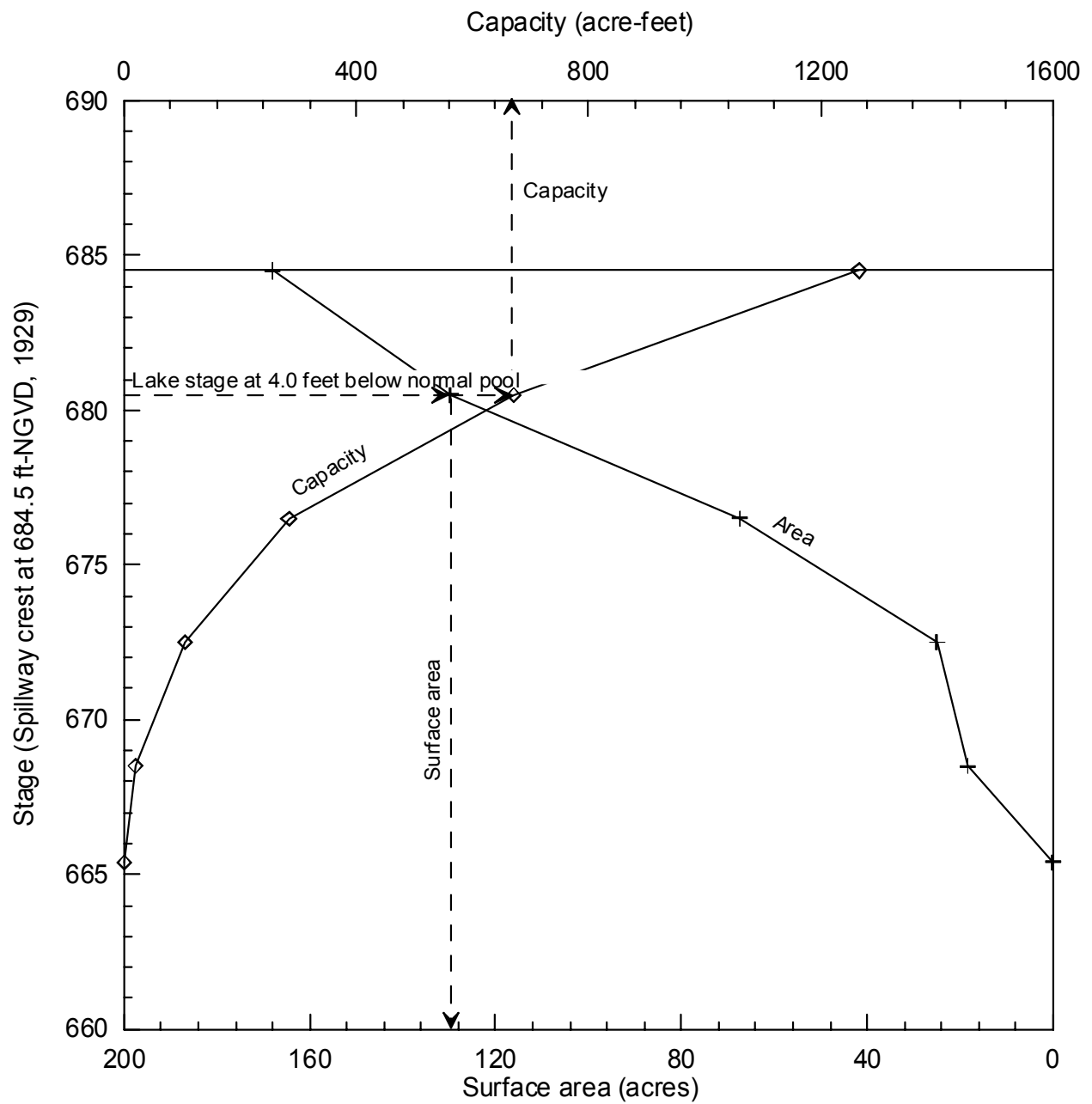


Figure 5. Stage-volume-area relationship for Lake Paradise

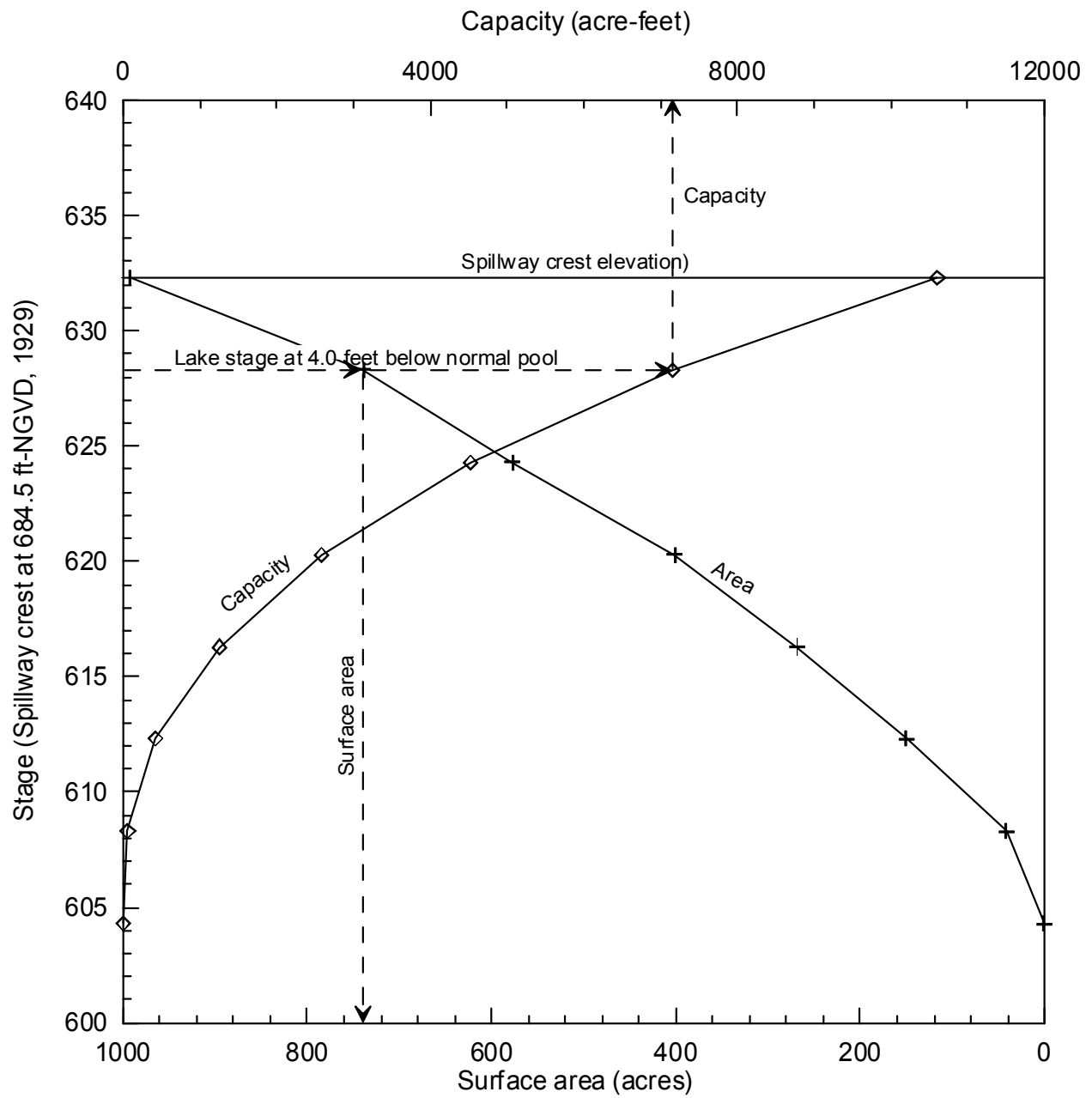


Figure 6. Stage-volume-area relationship for Lake Mattoon

reproducible. The calculation difference for Lake Paradise was 1.0 percent and the difference for Lake Mattoon was 9.5 percent.

Comparison of Results

The long-term sedimentation rates are 0.51 percent per year for Lake Paradise and 0.30 percent per year for Lake Mattoon. These rates are similar to the general trend of sedimentation rates for other Illinois reservoirs determined in the ISWS lake sedimentation program.

Lake Paradise sedimentation rates show a very stable sedimentation condition (0.5 percent per year) over the two sedimentation periods available. The Lake Mattoon sedimentation record shows a significant reduction in the rate of sediment accumulation from 0.08 percent for the most recent sedimentation period (1980-2001) to 0.51 percent for the initial period (1958-1980).

Sediment Particle Size Distribution

Particle size distribution of the samples can show the variability of sedimentation patterns in the lake both longitudinally and with depth. Longitudinally, it is common to see coarse materials deposited in the upstream areas of the lake and increasingly finer materials further into the lake. With depth (core samples), comparison of older sediments collected from the bottom of a core to the more recent surface sediments often shows that the more recent materials are coarser. This trend reflects the lost trap efficiency of the upper end of the lake and the gradual transition of the inflow area of the lake to downstream areas.

Ten lakebed sediment samples were collected from Lake Paradise for particle size distribution analysis. Figure 7 and appendix V present the laboratory analyses for these samples. Samples plotted in black were collected from the lake sediment surface; samples plotted in red were collected from core samples. A shift down or to the left would indicate coarser sediments. These samples do show both the smaller particle sizes with distance into the lake and the shift of the coarser materials downstream with time.

Thirteen lakebed sediment samples were collected from Lake Mattoon for particle size distribution analysis. Figure 8 and appendix VI present the laboratory analyses for these samples. Samples plotted in black were collected from the lake sediment surface; samples plotted in red were collected from core samples. A shift down or to the left would indicate coarser sediments.

Figure 8a shows particle size distribution plots for samples collected from the main body of the lake between the dam and the Bush Creek confluence (cross section R11-R12). These samples show very little variability with either location or over time.

Figure 8b shows particle size distribution plots for main lake areas upstream of R11-R12 and at the confluence of Bush and Brush Creeks. These plots show distinct changes both longitudinally and with time. Shifts in size distributions show the general trend of sediments deposited at a point in the lake becoming coarser with time. Similarly, the combination of the two plots would show the general trend of finer sediment accumulating in downstream areas of the lake.

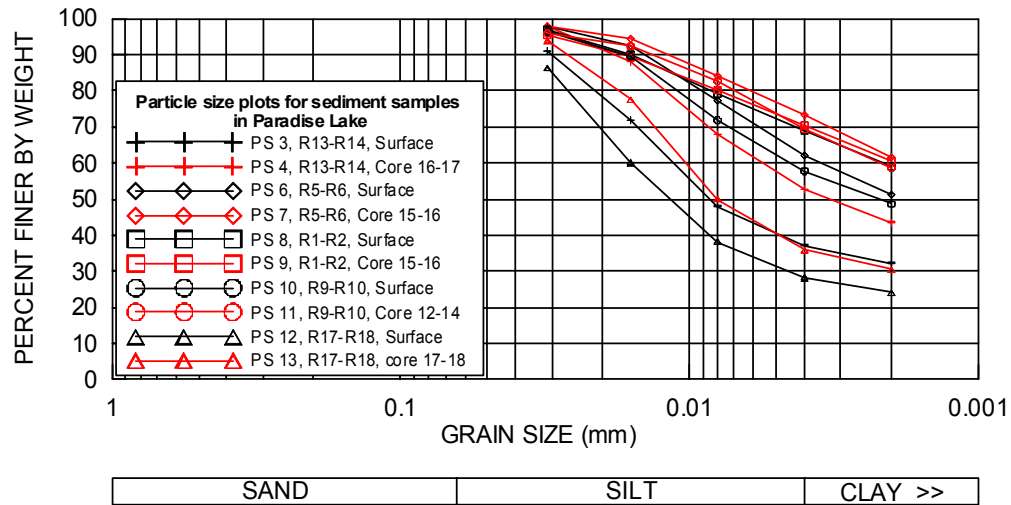


Figure 7. Particle size distributions for Lake Paradise sediment samples

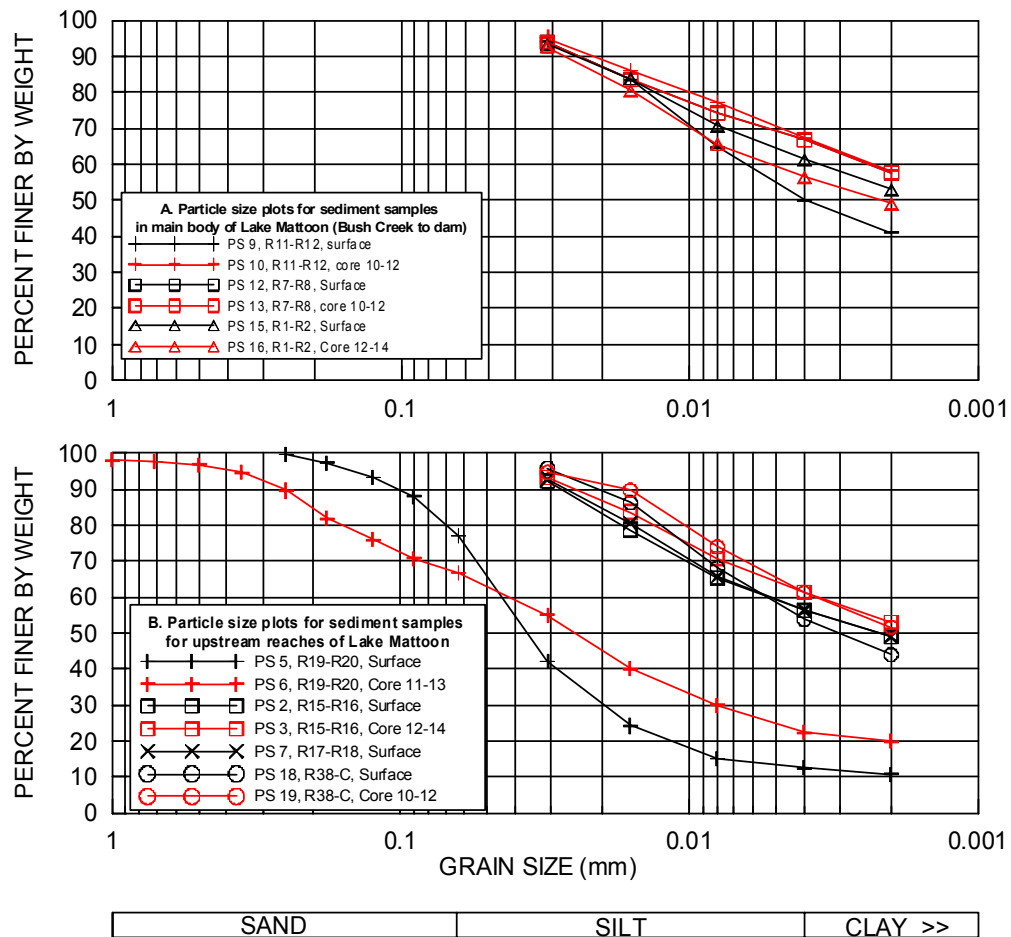


Figure 8. Particle size distributions for Lake Mattoon sediment samples

Summary

The Illinois State Water Survey has conducted sedimentation surveys of Lake Paradise and Lake Mattoon near Mattoon, Illinois. Lake Paradise originally was constructed in 1908, and Lake Mattoon was constructed in 1958. Together, the lakes serve as the raw water source for the Mattoon water supply. The village of Neoga also takes raw water from Lake Mattoon. Previous lake sedimentation surveys were conducted in 1979 for Lake Paradise and 1980 for Lake Mattoon.

Spillway levels for the lakes are 584.4 ft-NGVD, 1927 for Lake Paradise and 532.3 ft-NGVD, 1927 for Lake Mattoon. Lake Paradise has been modified several times in terms of spillway level, and the original dam, constructed in 1908, has been inundated by the existing impoundment.

Sedimentation has reduced the potential capacity of Lake Paradise from 2,087 ac-ft (680 million gallons) in 1908 to 1,252 ac-ft (408 million gallons) in 2001. The sediment accumulation rates in the lake have averaged 9.9 ac-ft per year from 1931 to 2001. Annual sedimentation rates for two separate periods, 1931-1979 and 1979-2001, were 10.0 and 9.5 ac-ft, respectively.

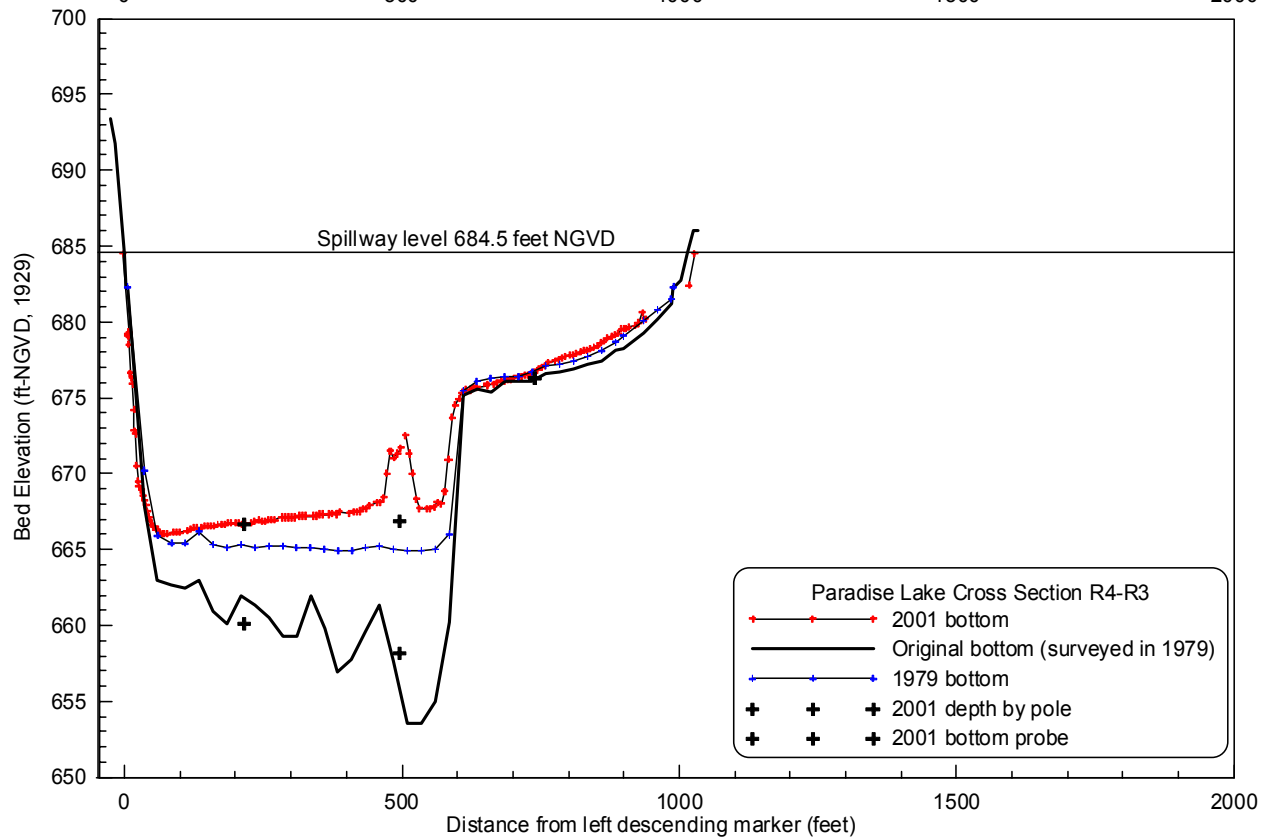
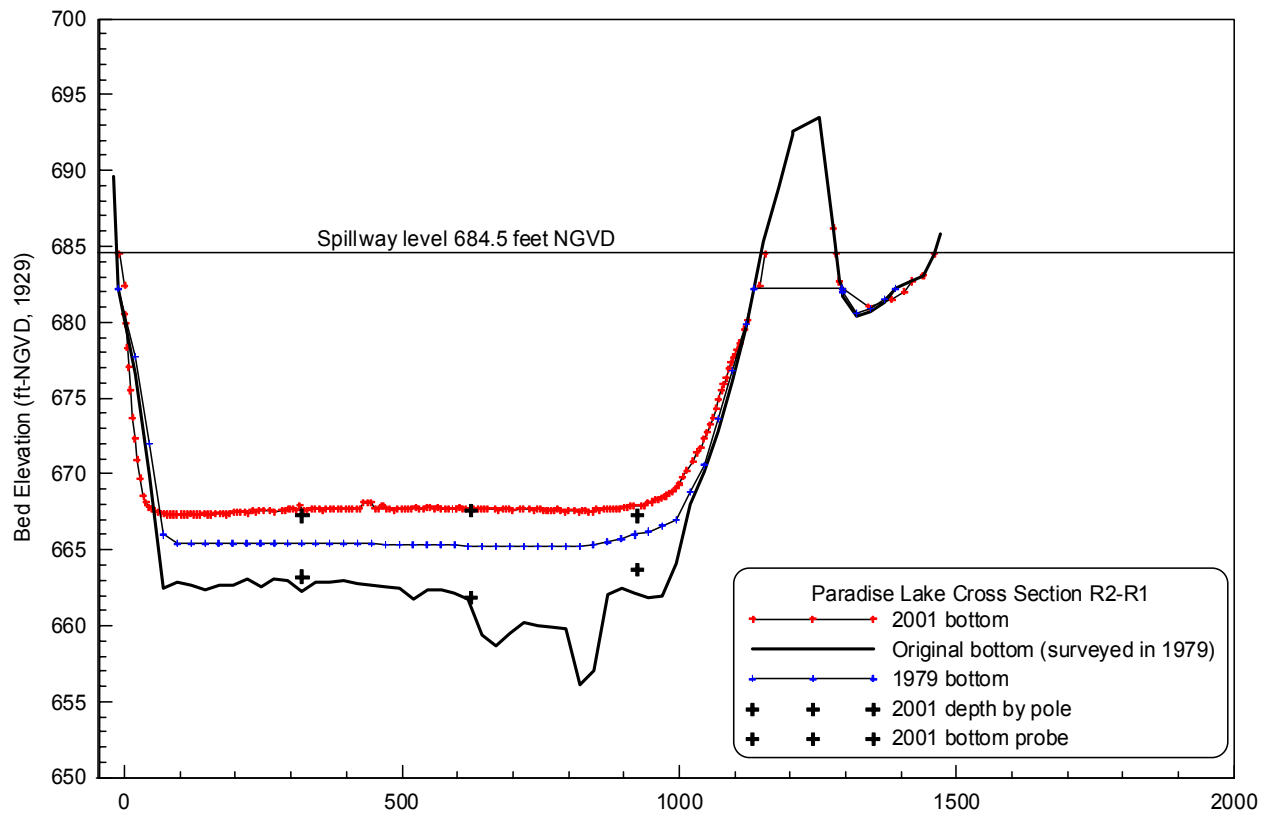
The 1908 structure (the old dam) impounded water in what is now part of the present lake. This structure caused an undocumented amount of sedimentation in the affected lake segments. The volume of the lake was adjusted to account for this pre-1931 sedimentation.

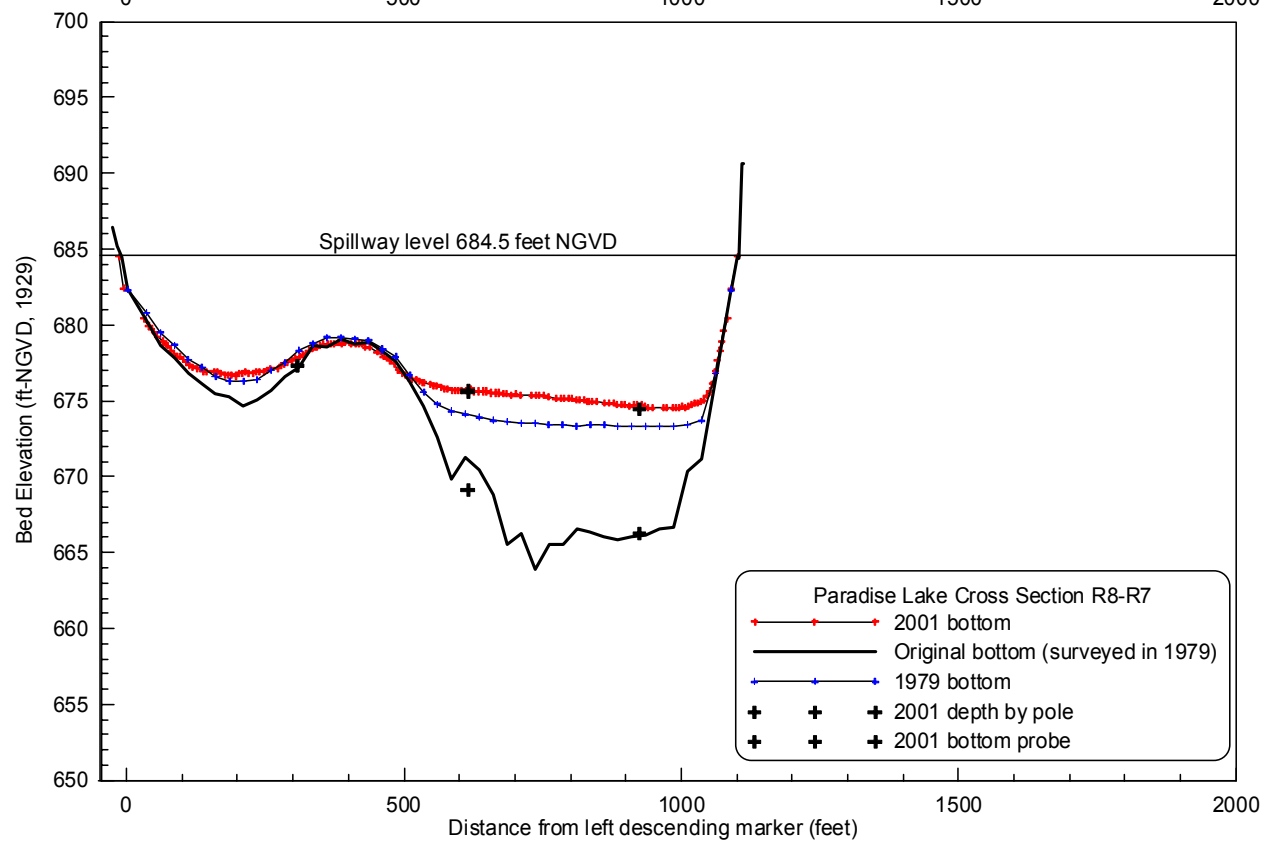
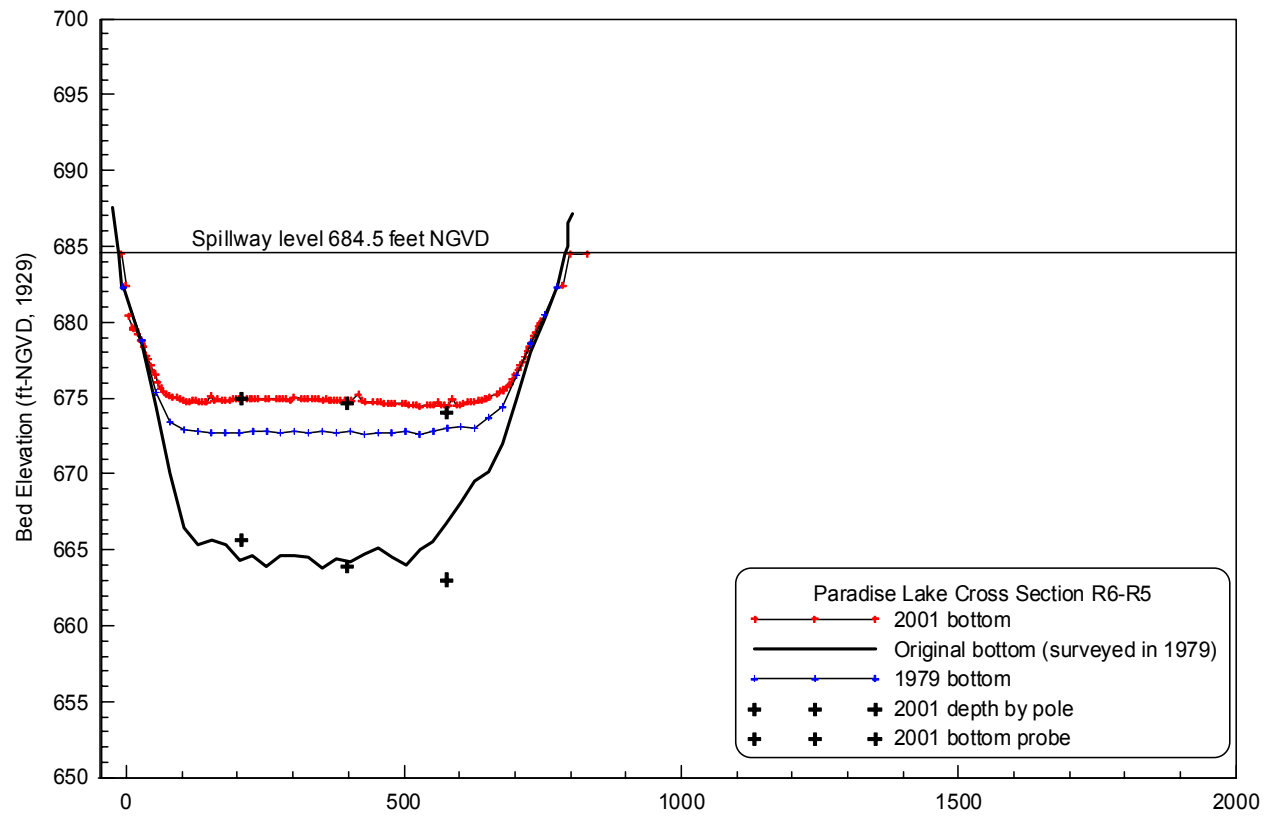
Sedimentation has reduced the potential capacity of Lake Mattoon from 13,293 ac-ft (4,331 million gallons) in 1958 to 11,588 ac-ft (3,776 million gallons) in 2001. Sediment accumulation rates in the lake have averaged 39.7 ac-ft per year (1958-2001). Annual sedimentation rates for two separate periods, 1958-1980 and 1980-2001, were 67.3 and 10.6 ac-ft, respectively. The results of the 2001 sedimentation survey indicate a significant reduction in the sedimentation rate between the two survey periods.

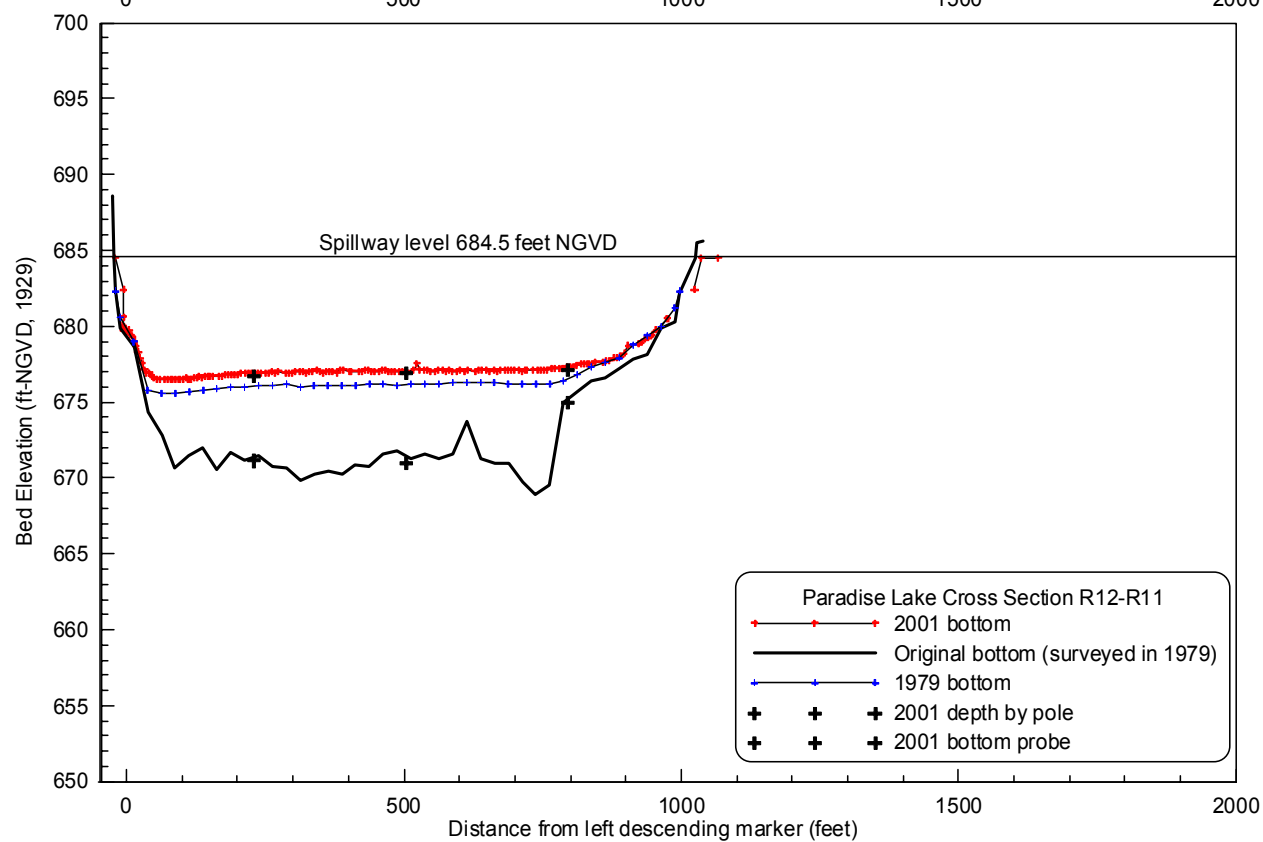
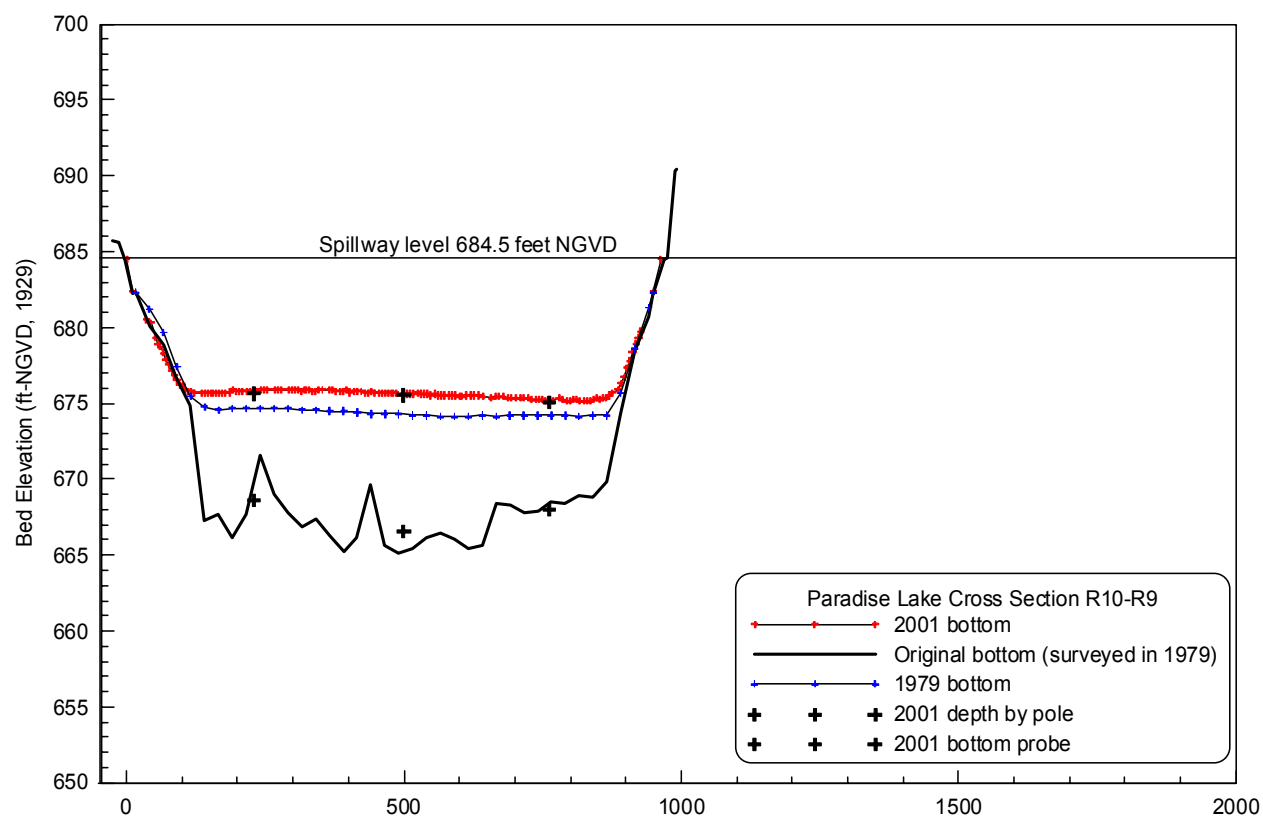
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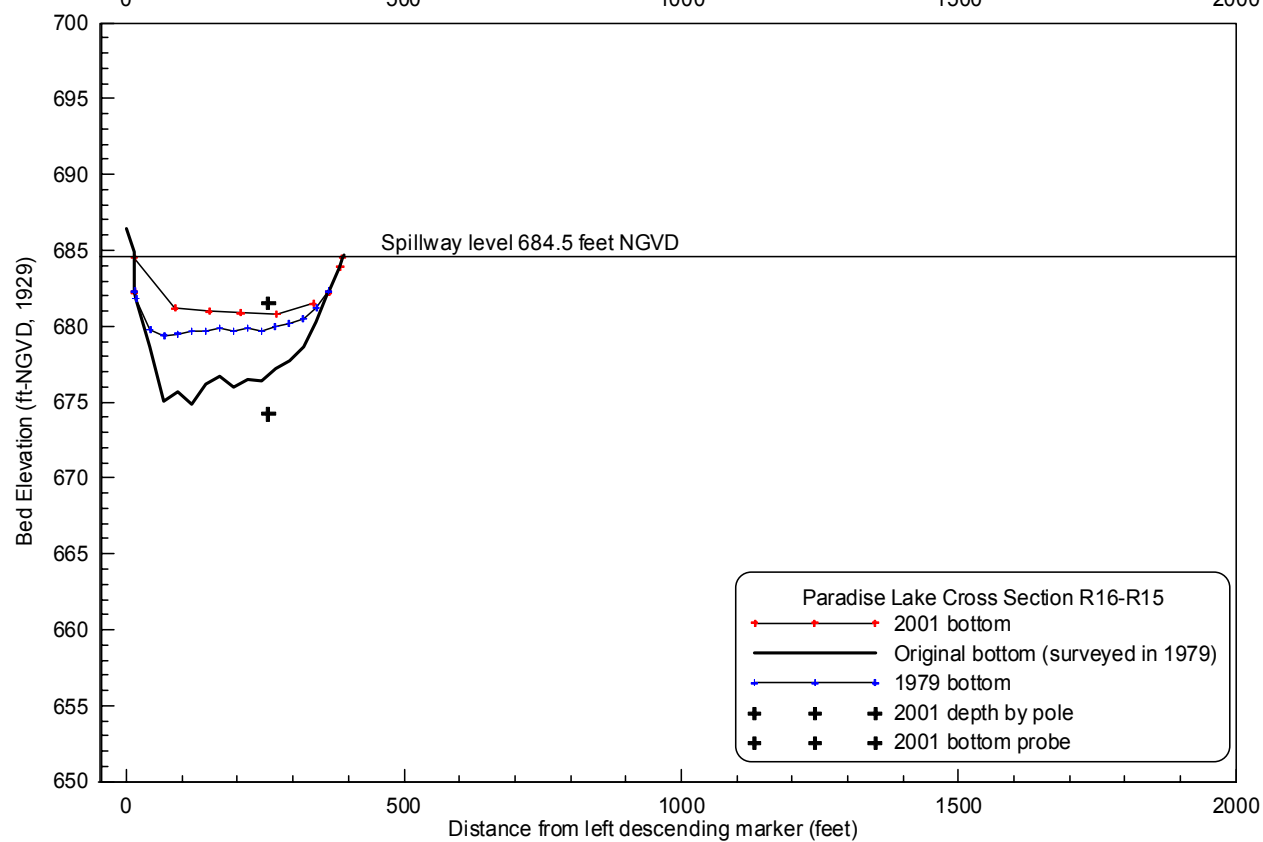
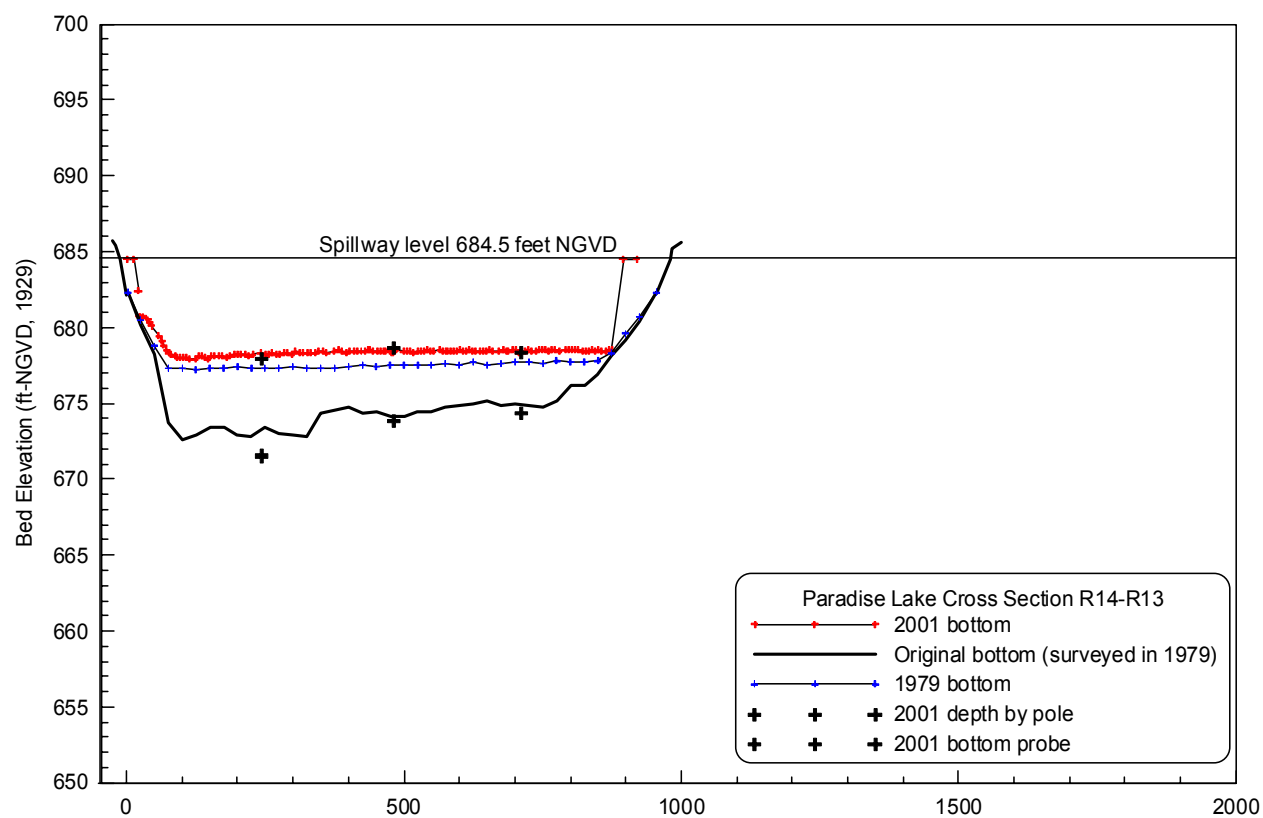
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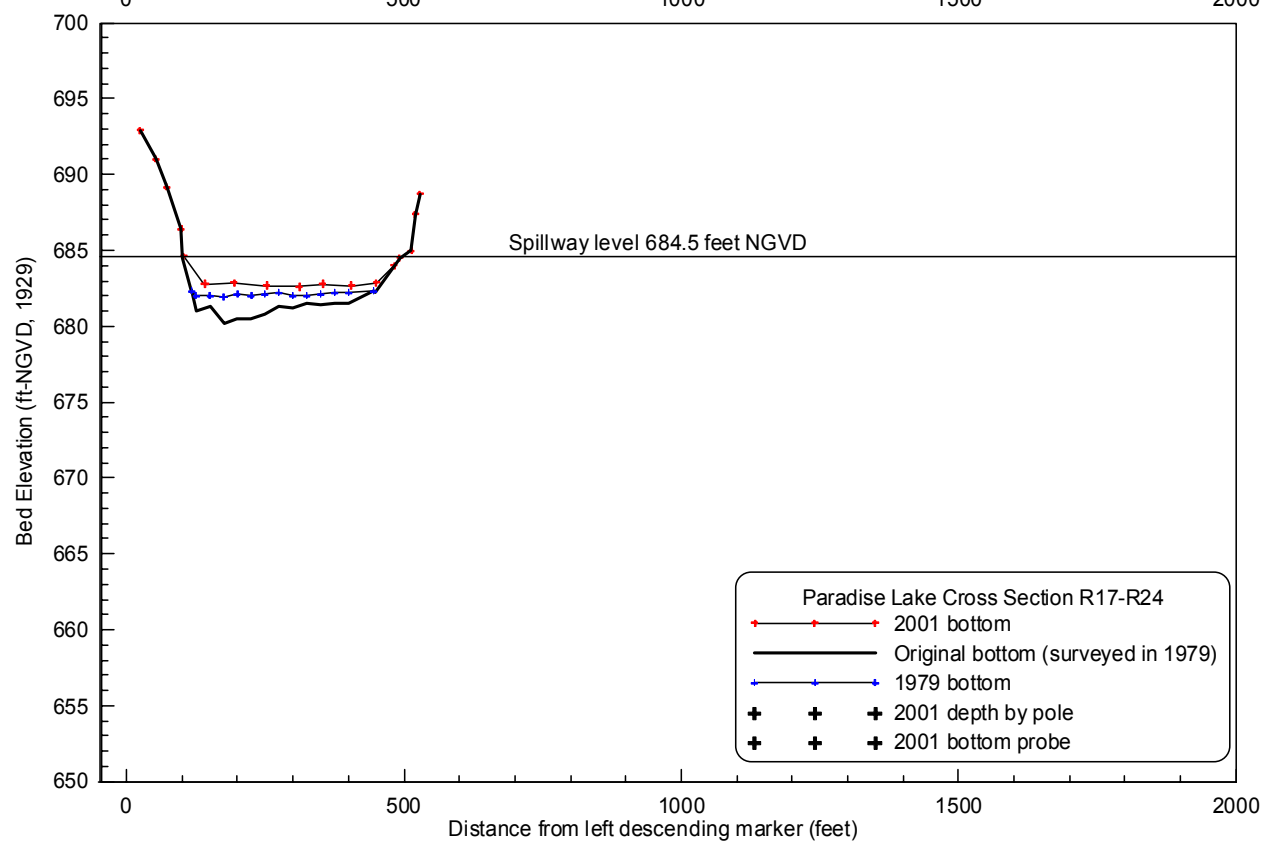
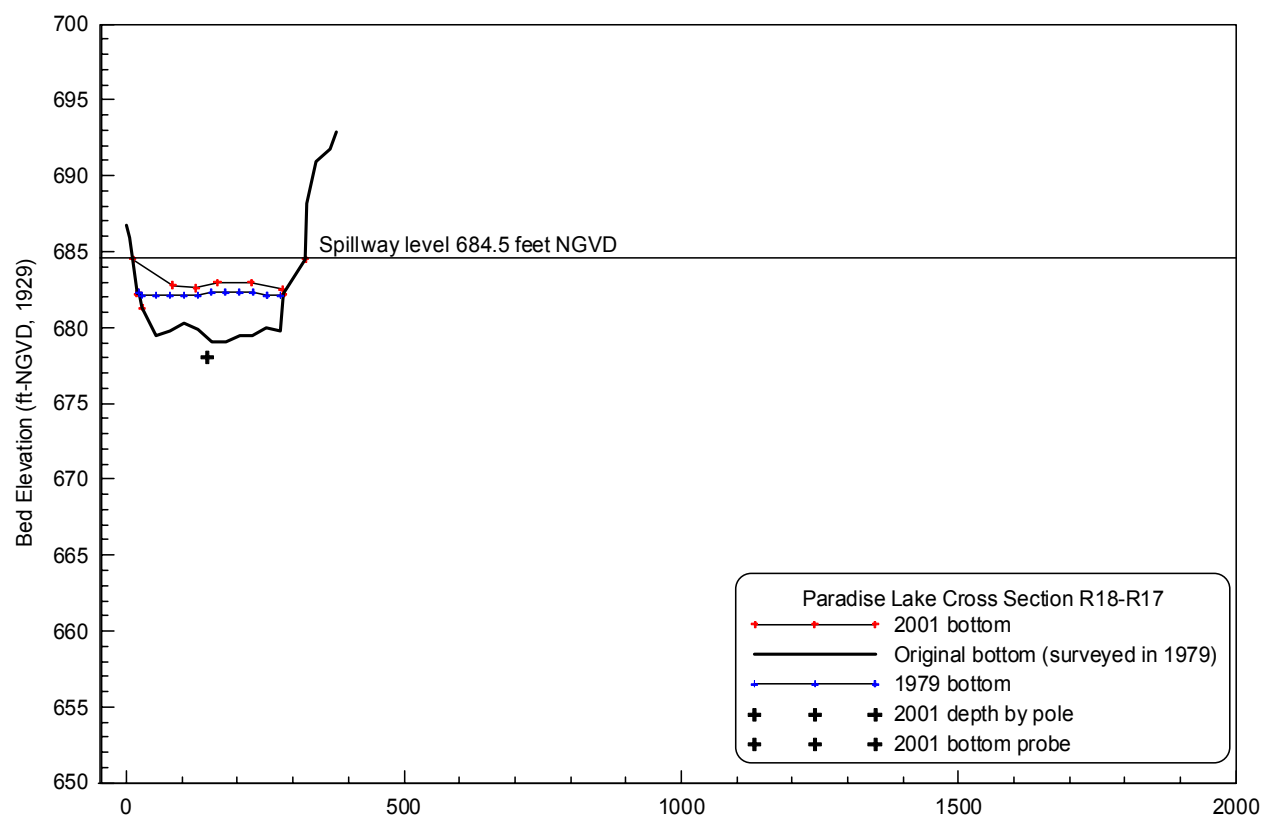
Appendix I. Cross-Section Plots of the Lake Paradise Transects

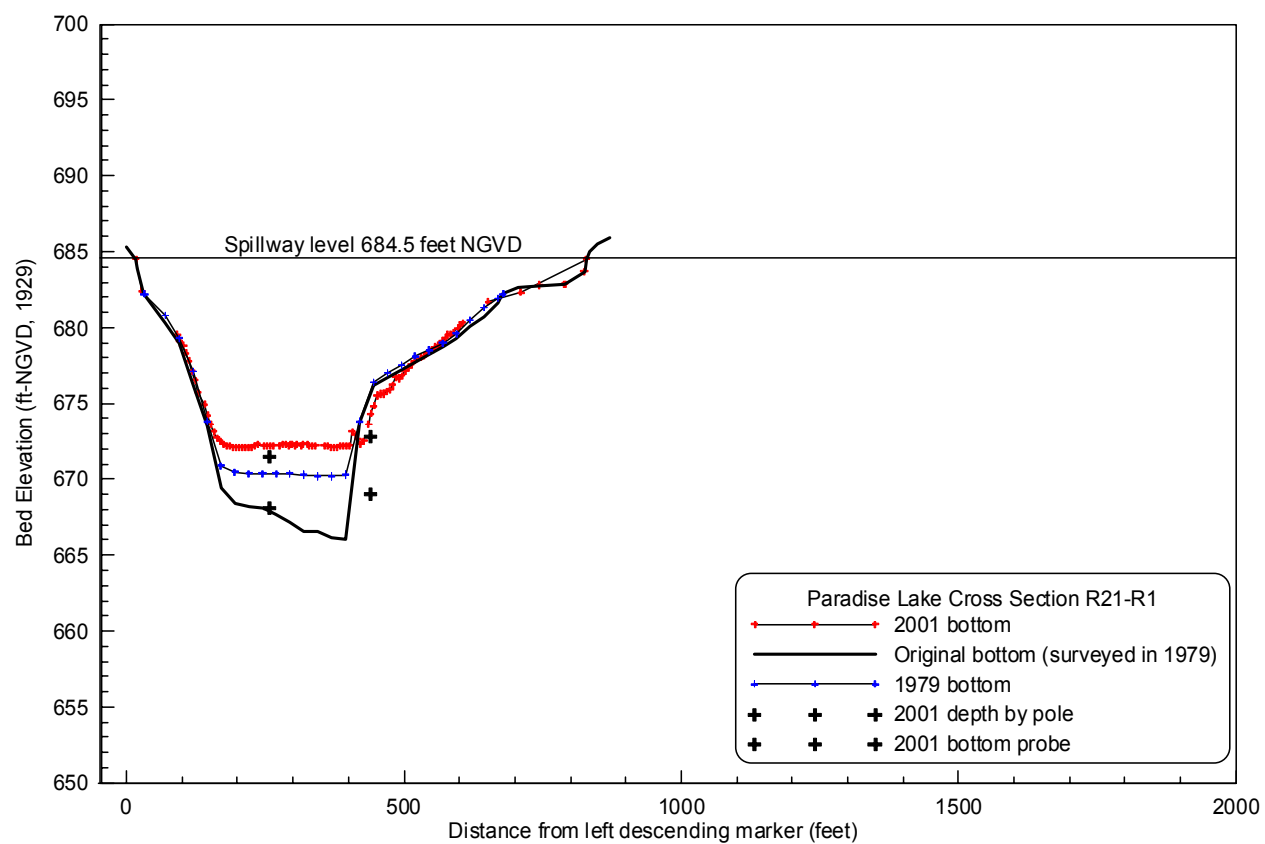




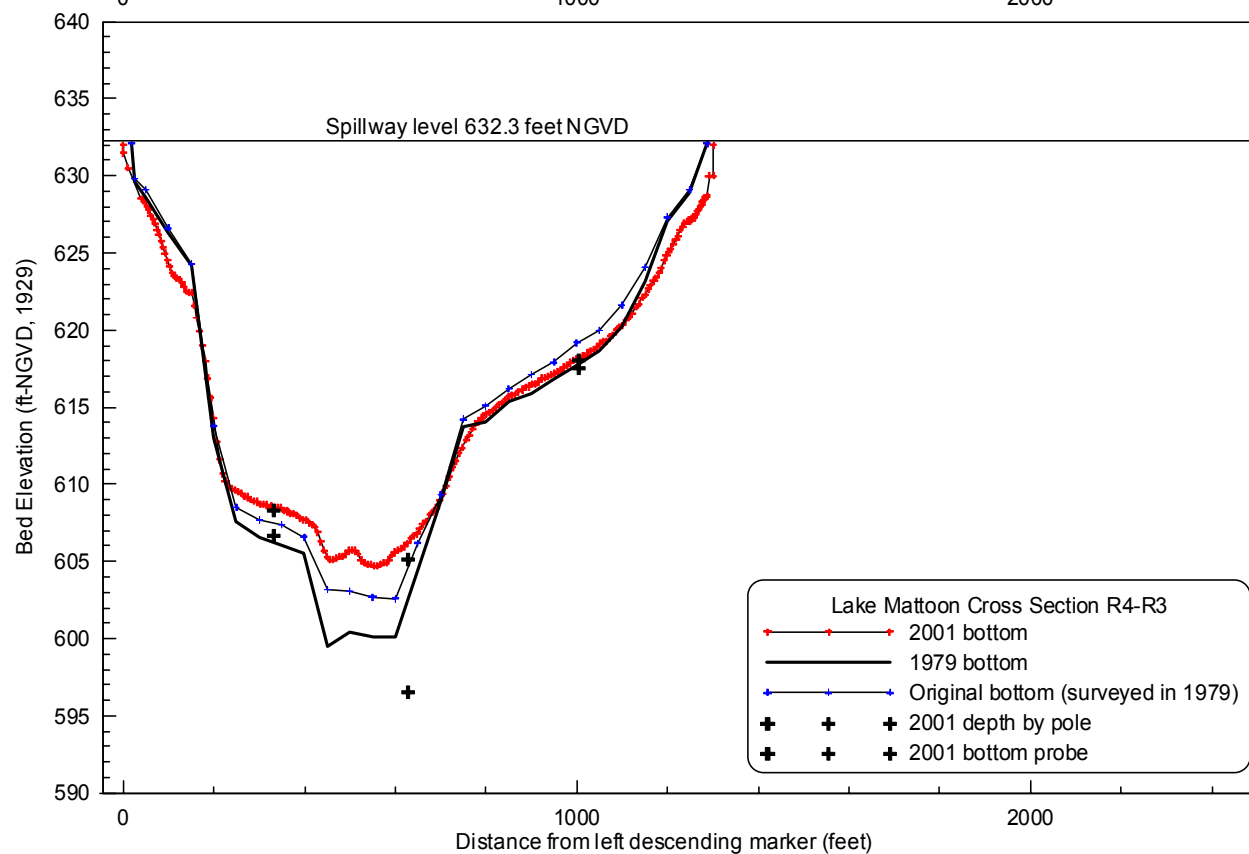
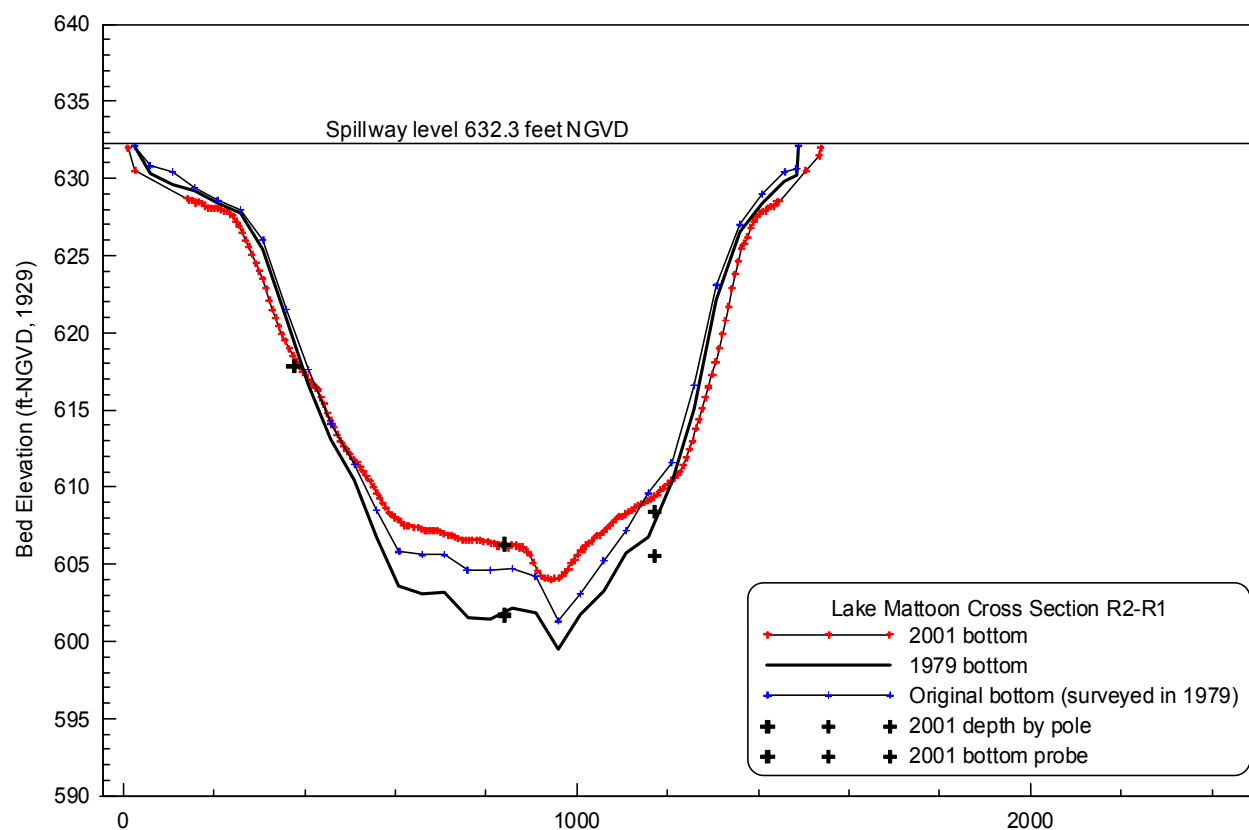


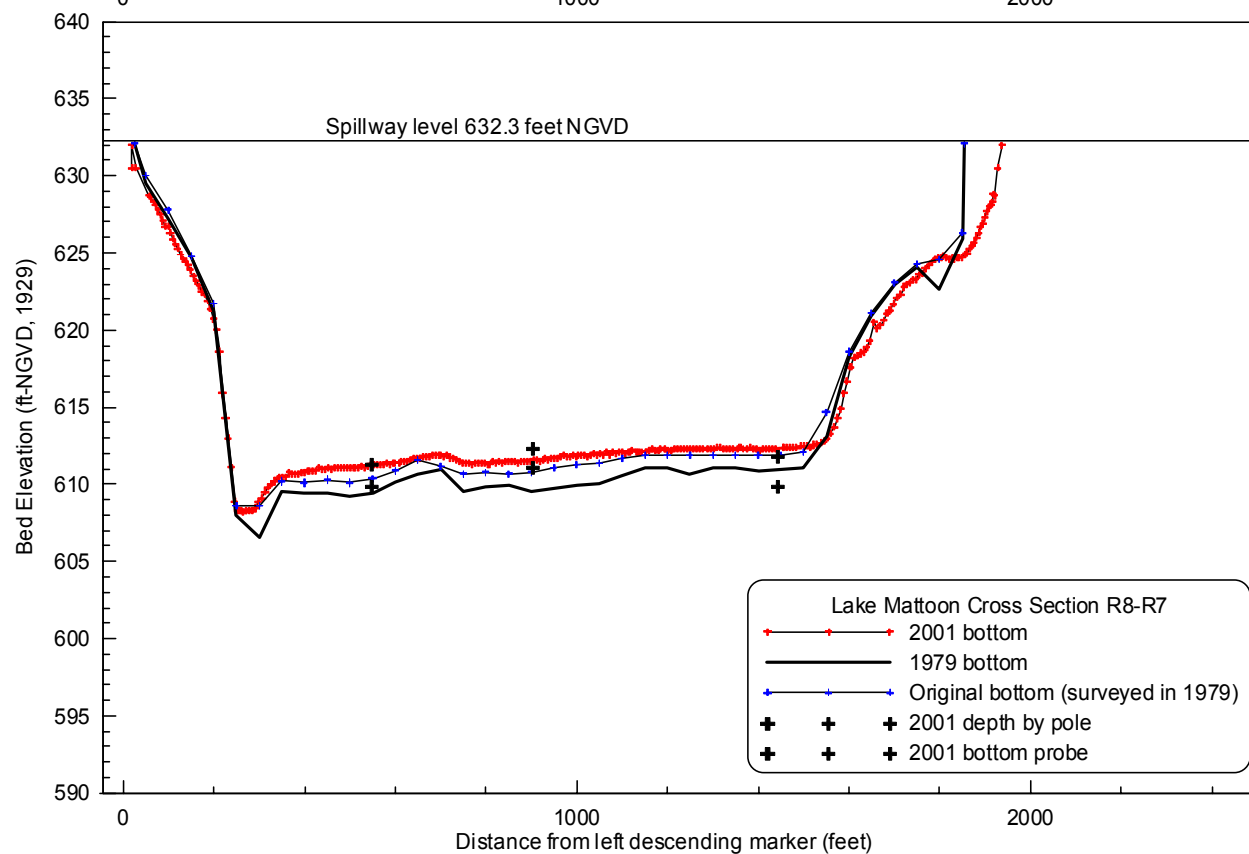
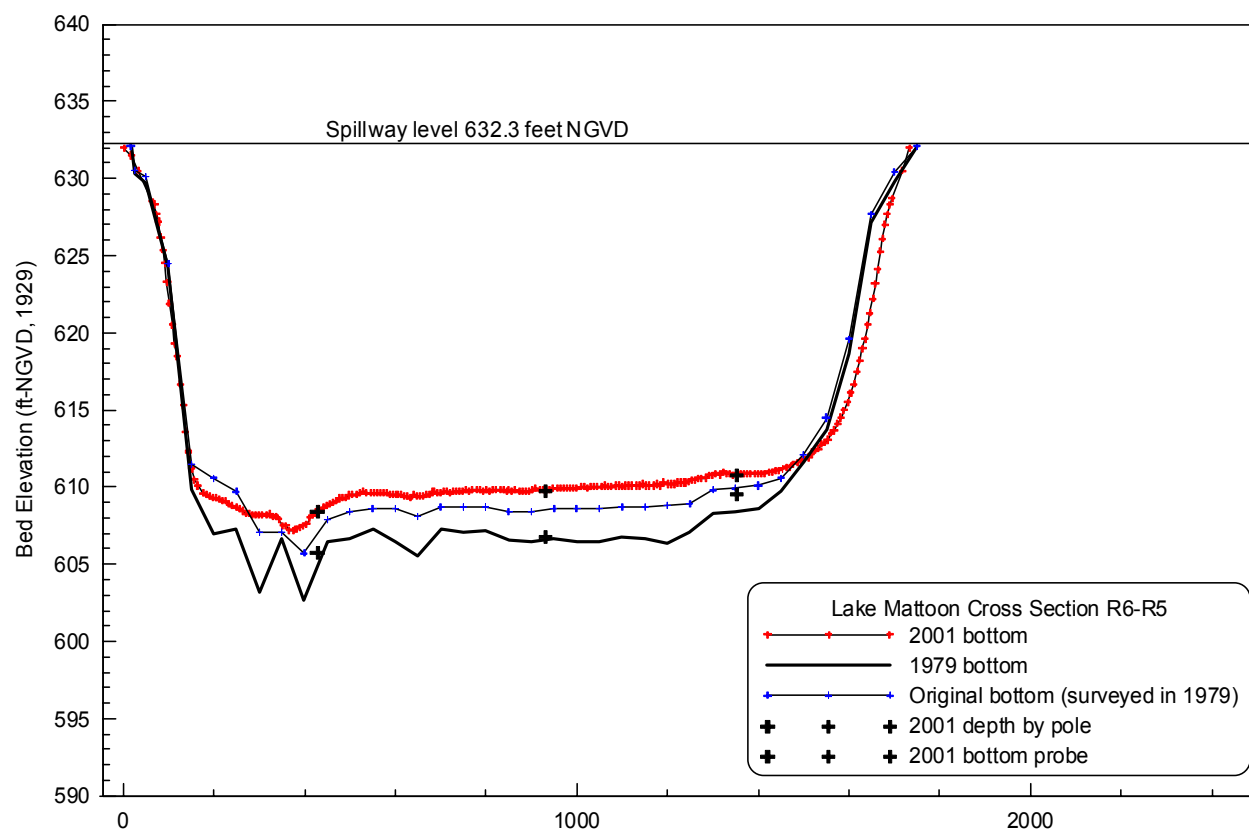


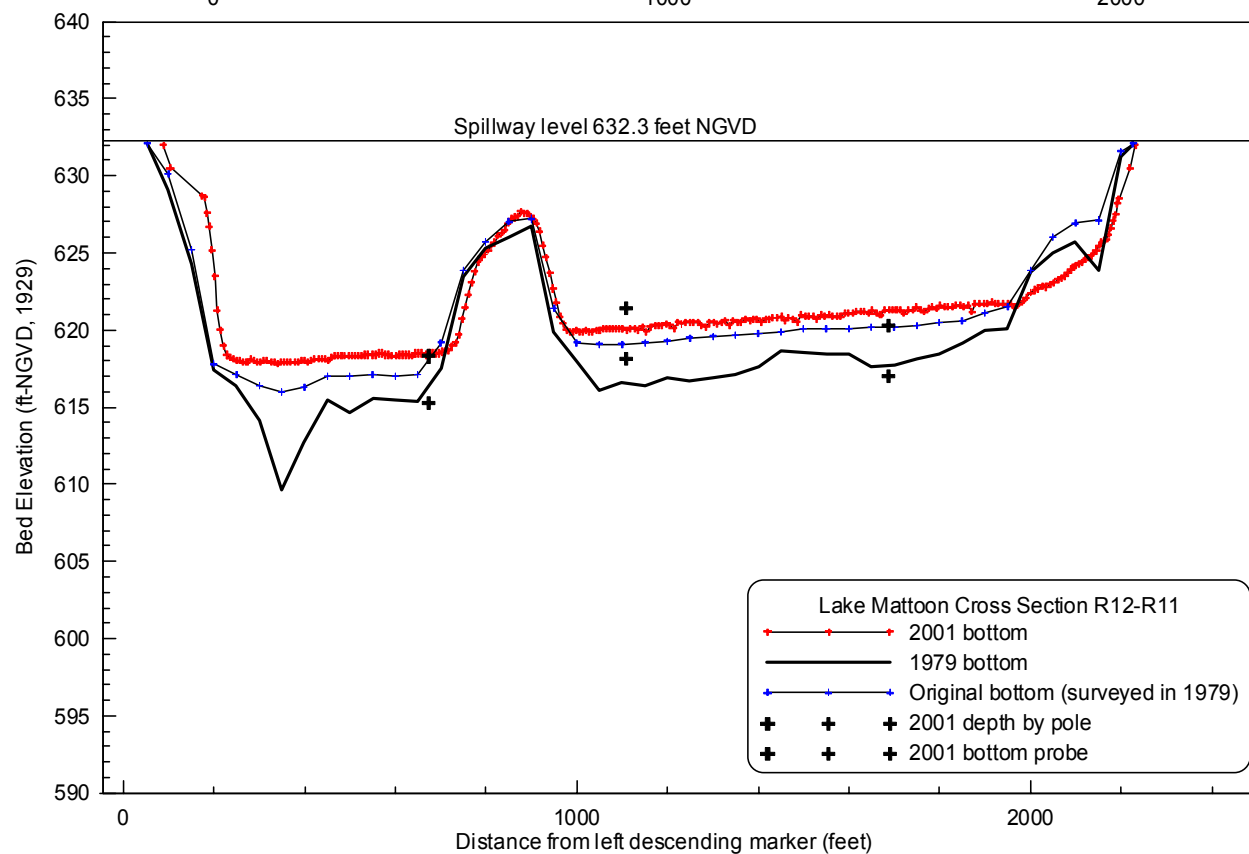
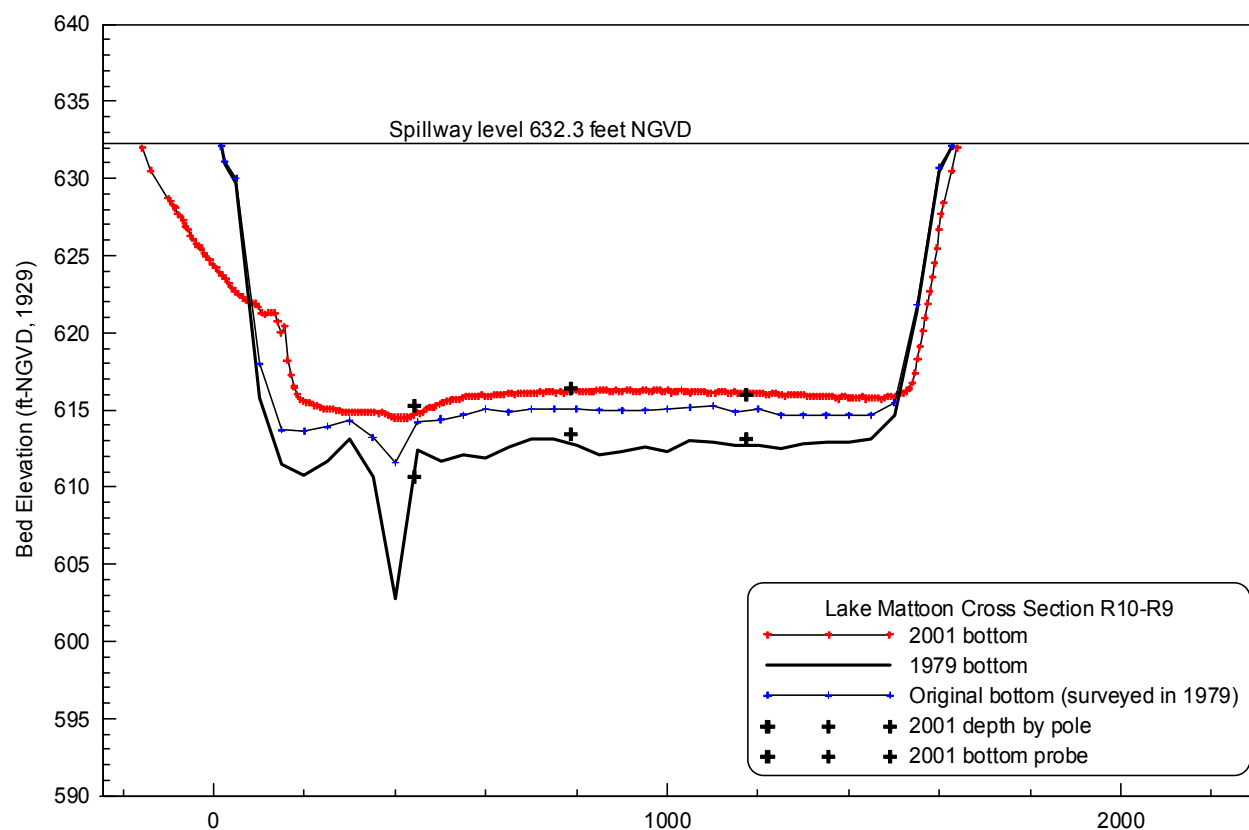


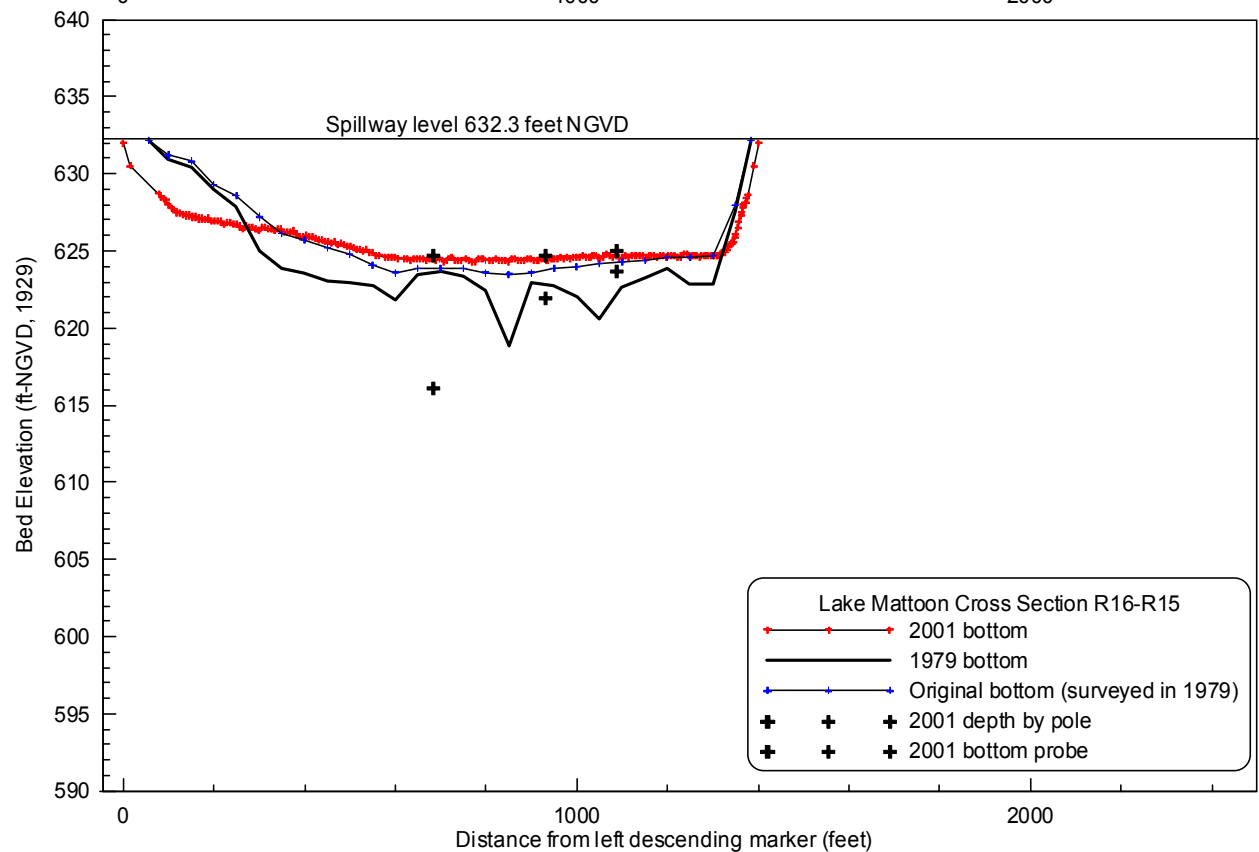
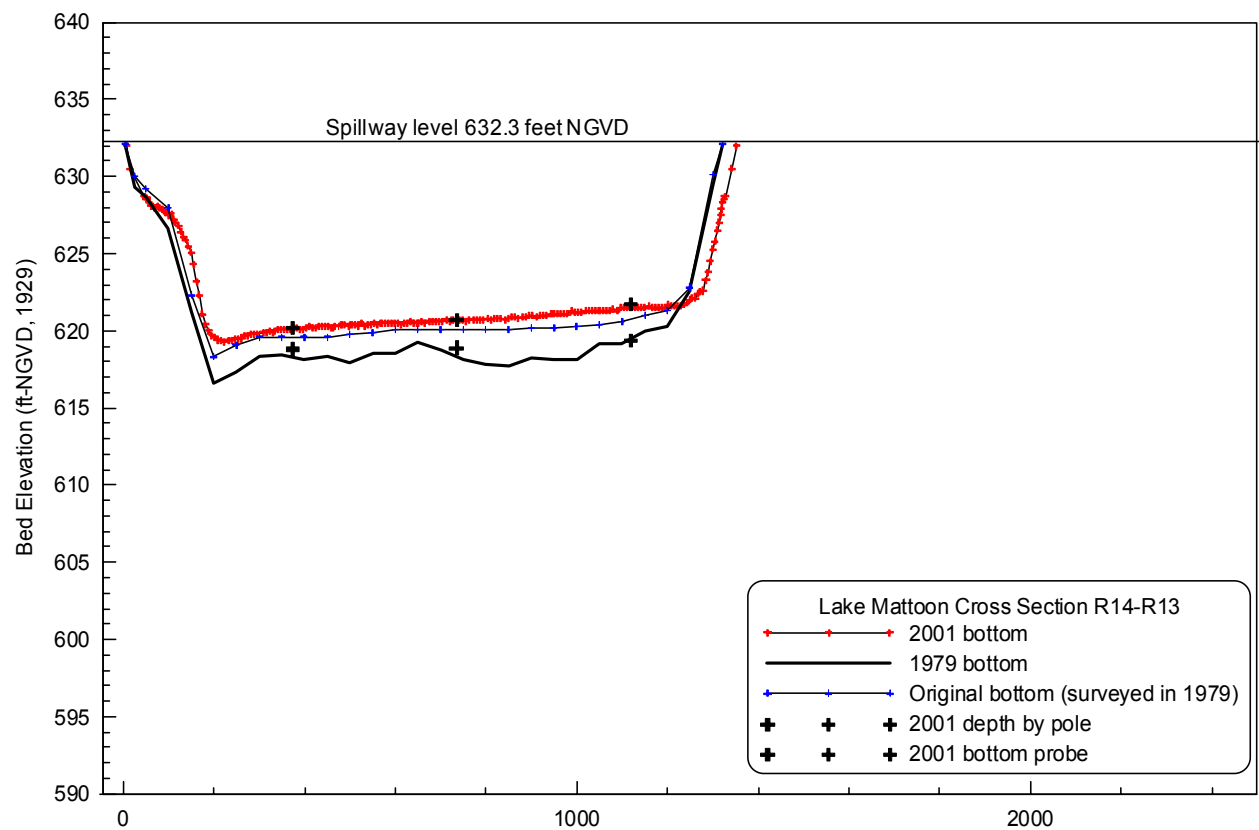


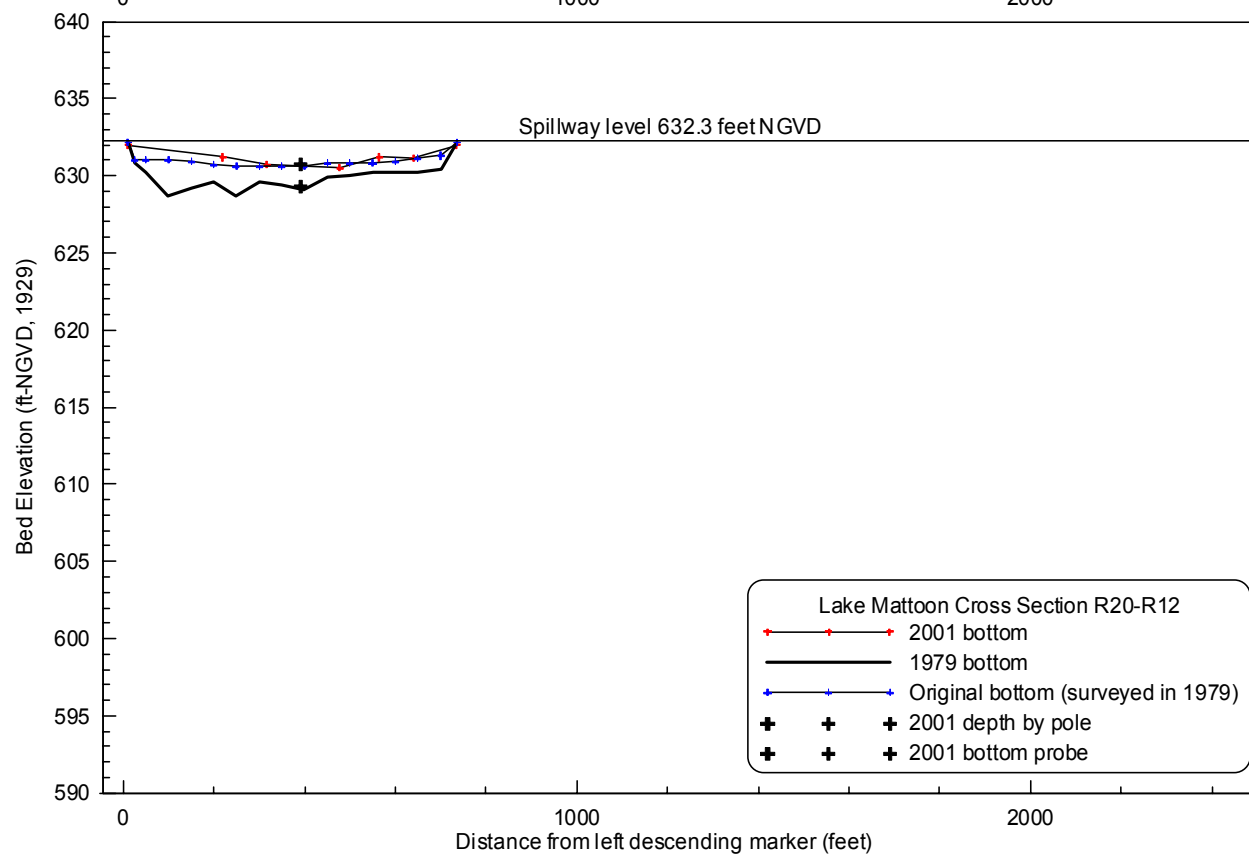
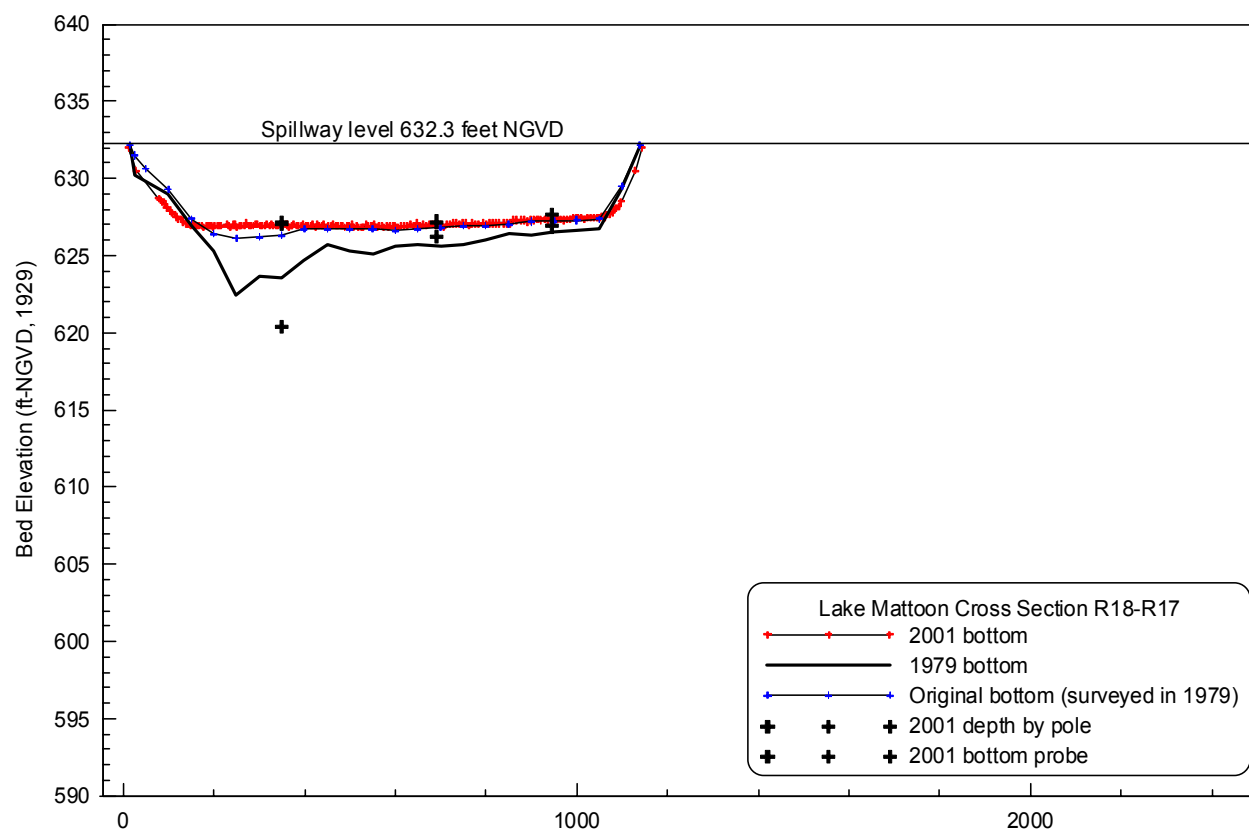
Appendix II. Cross-Section Plots of the Lake Mattoon Transects

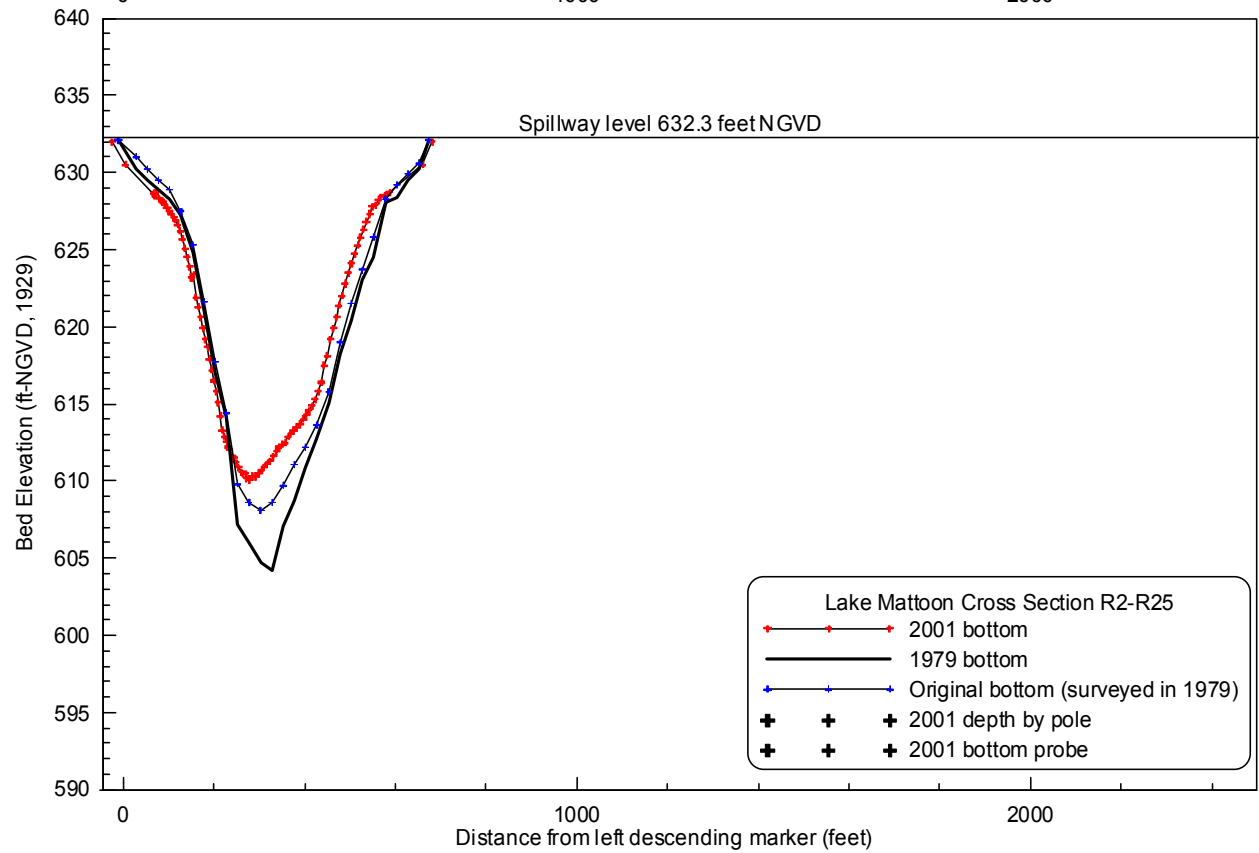
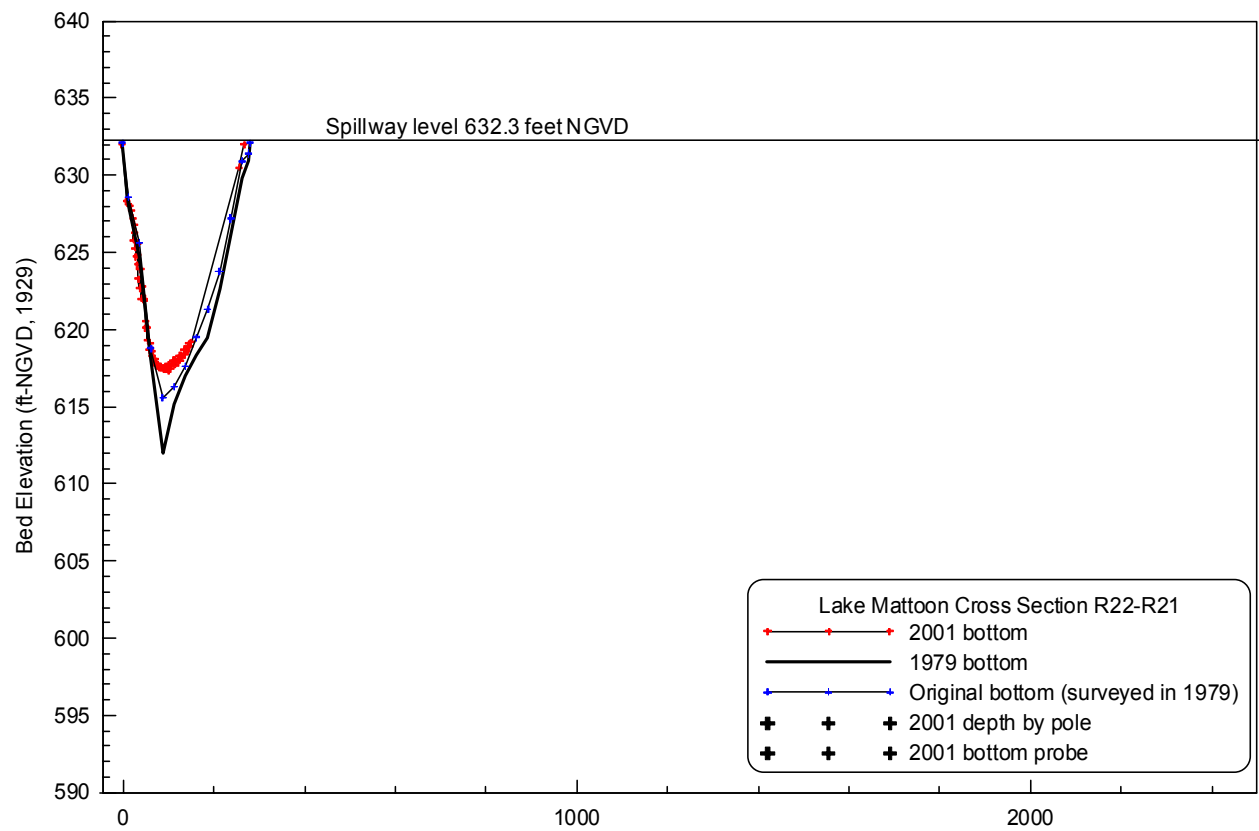


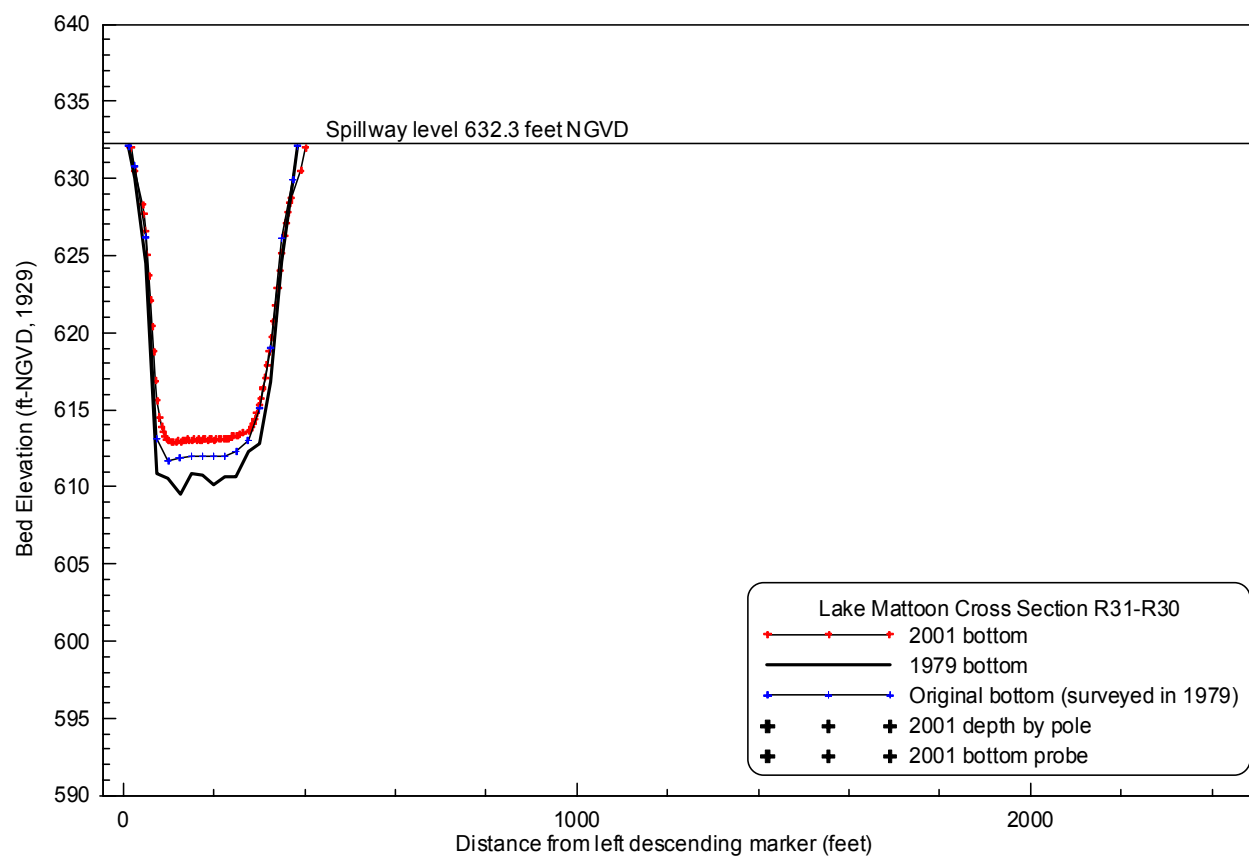


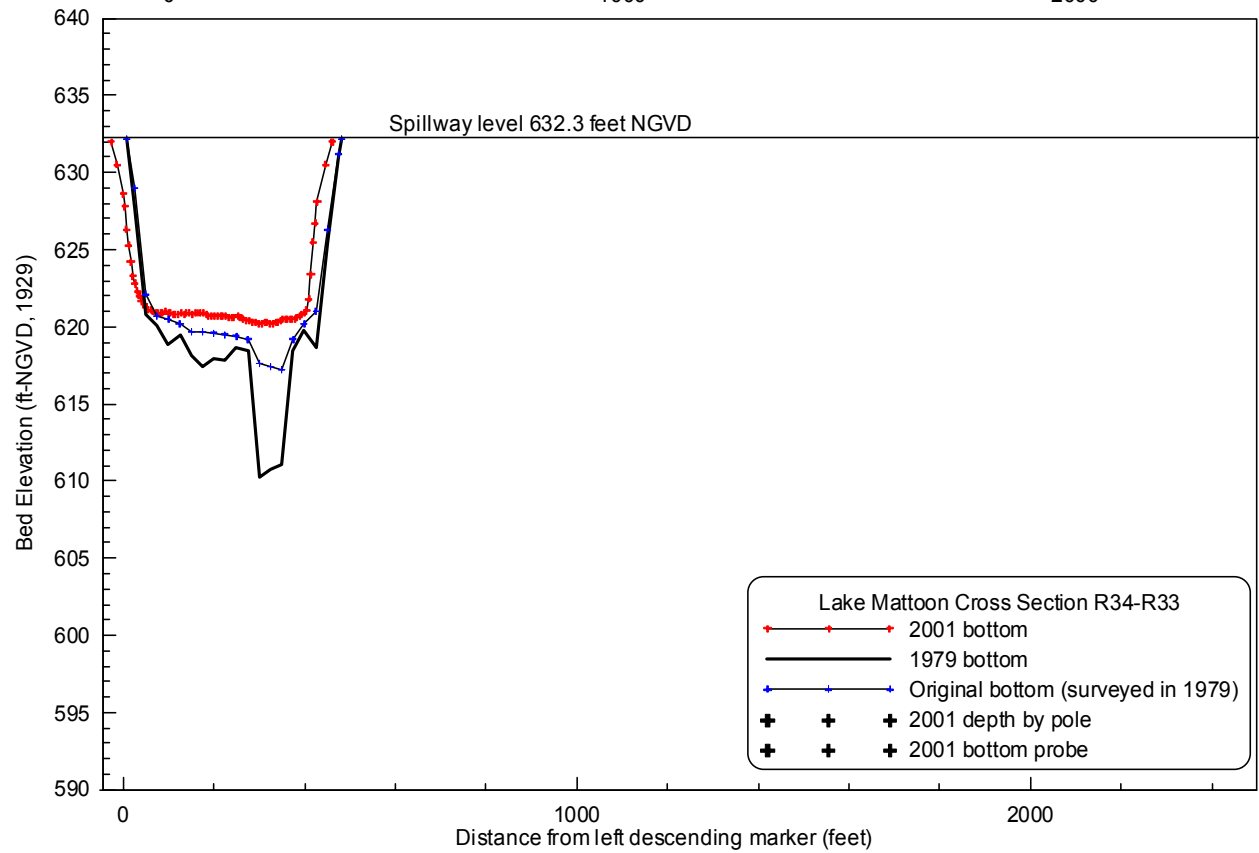
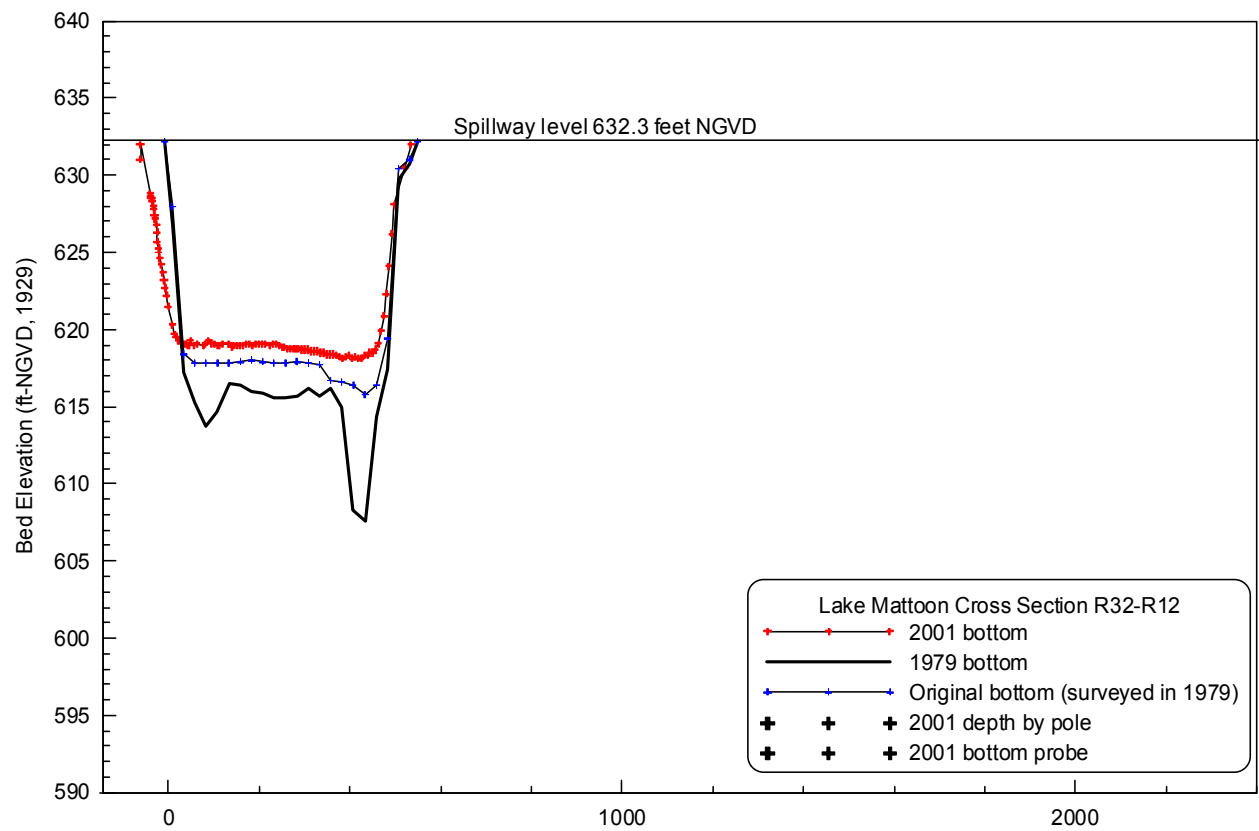


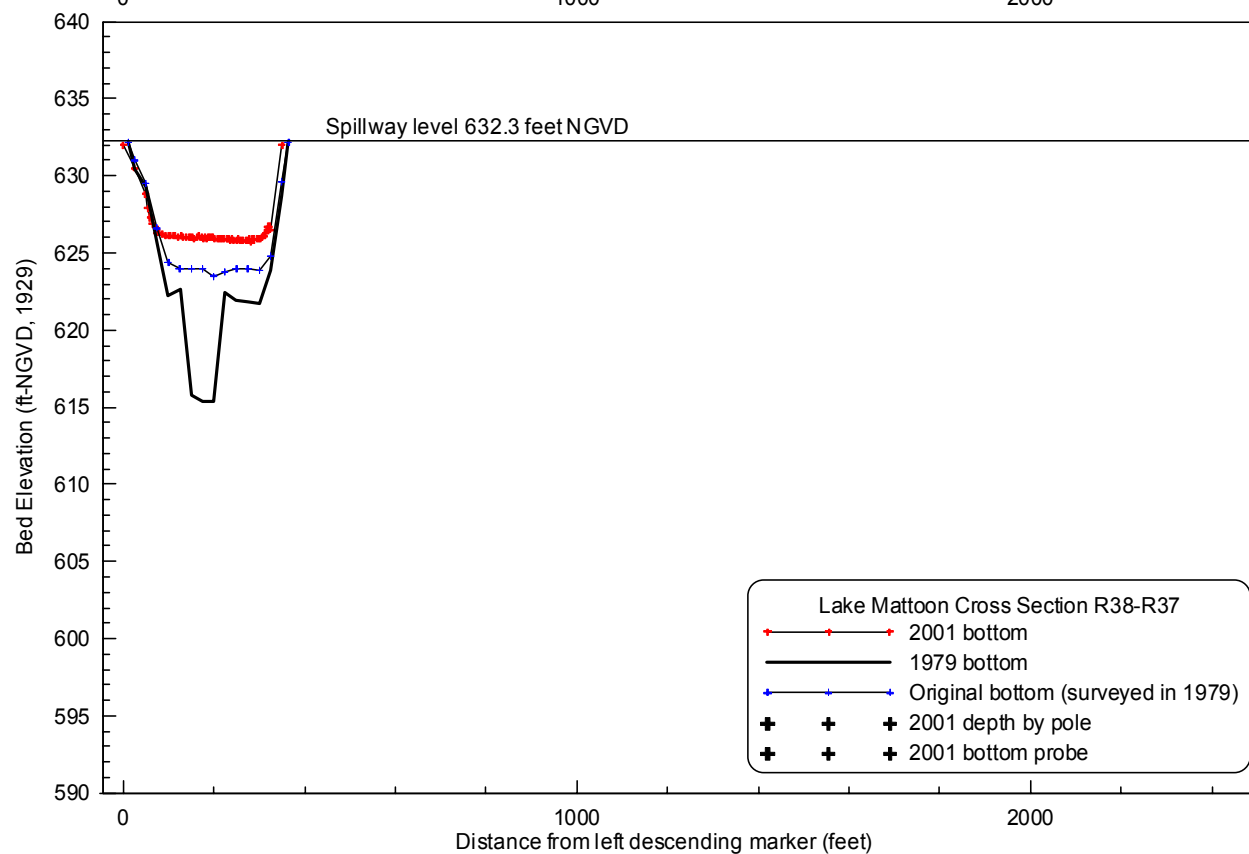
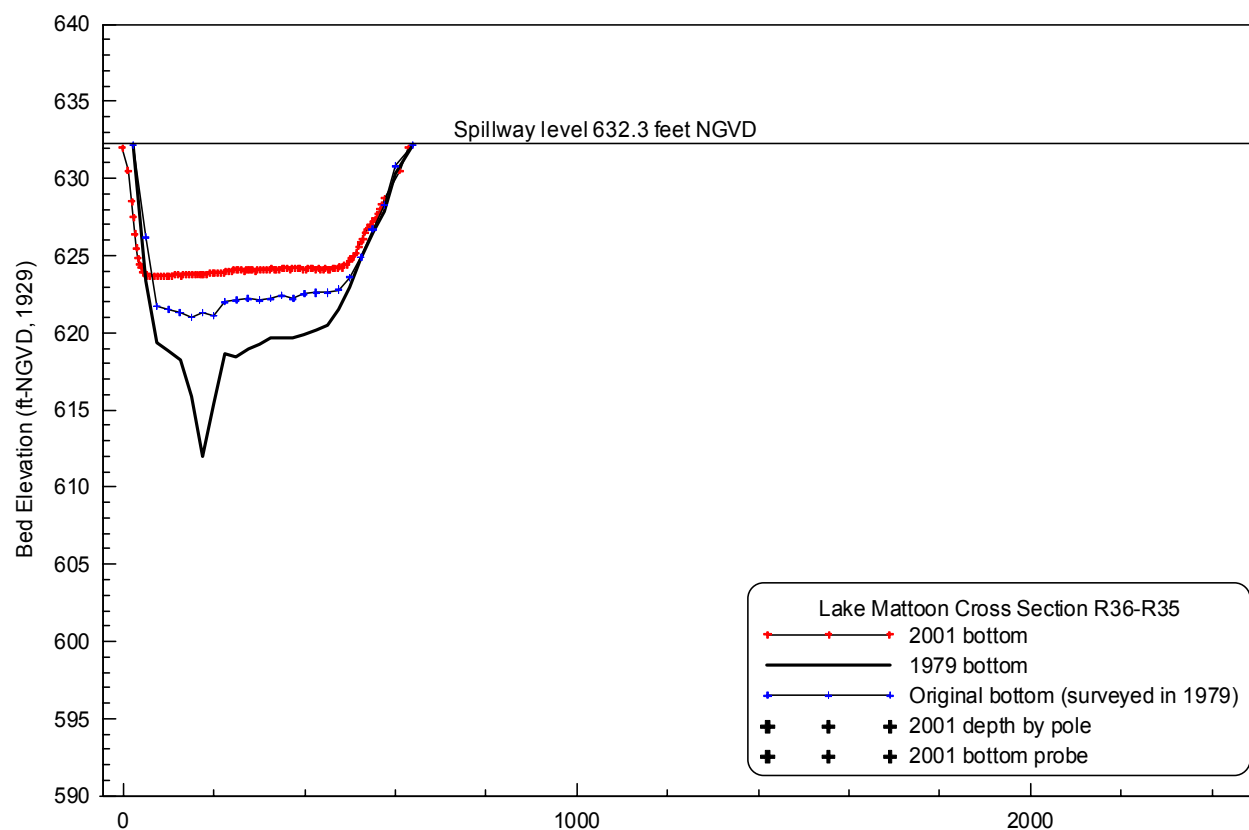


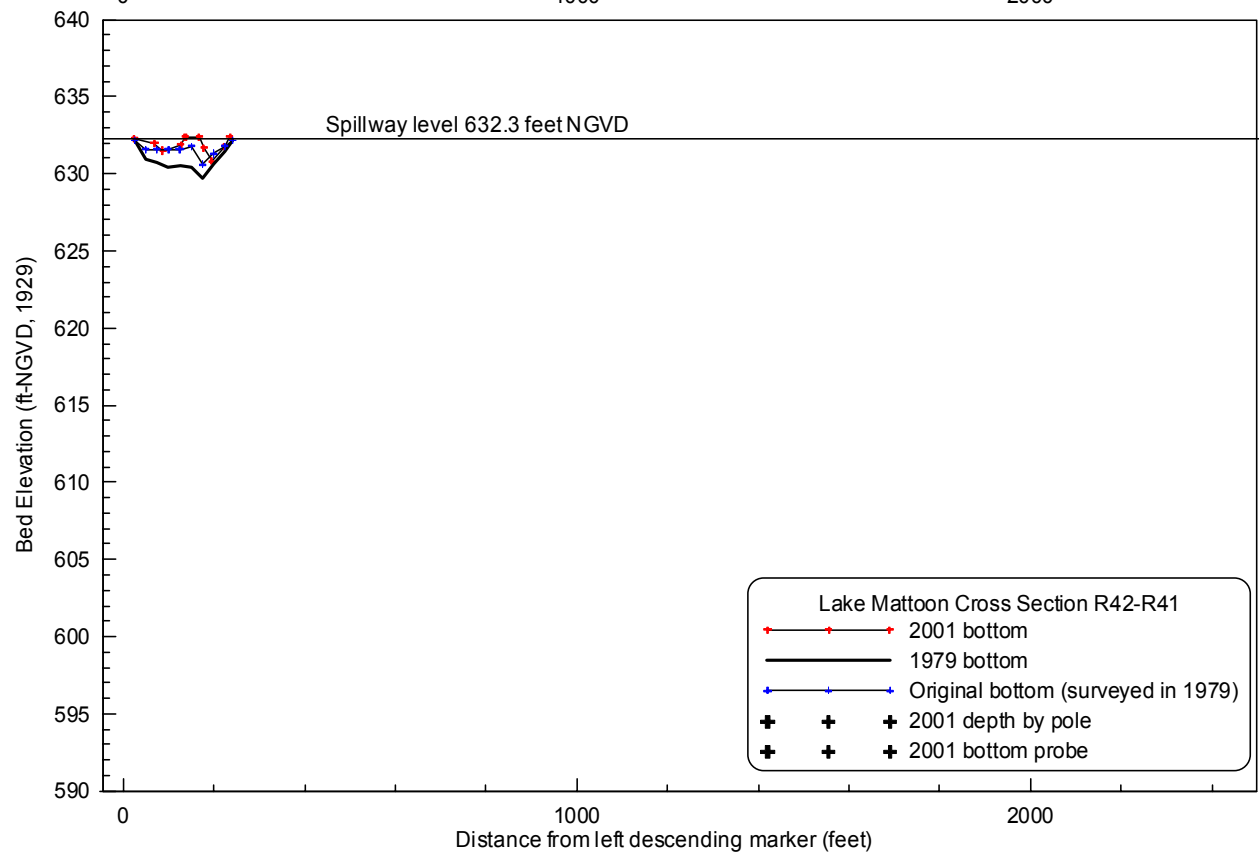
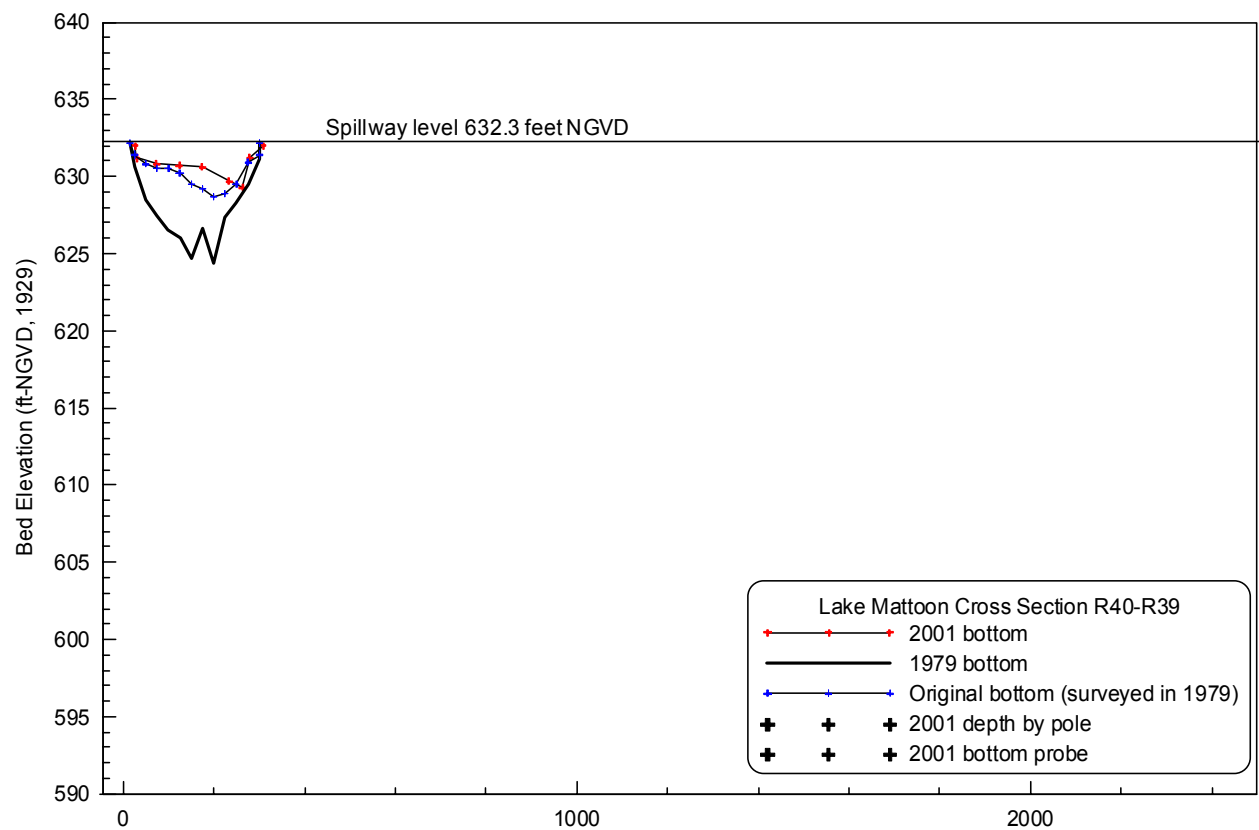


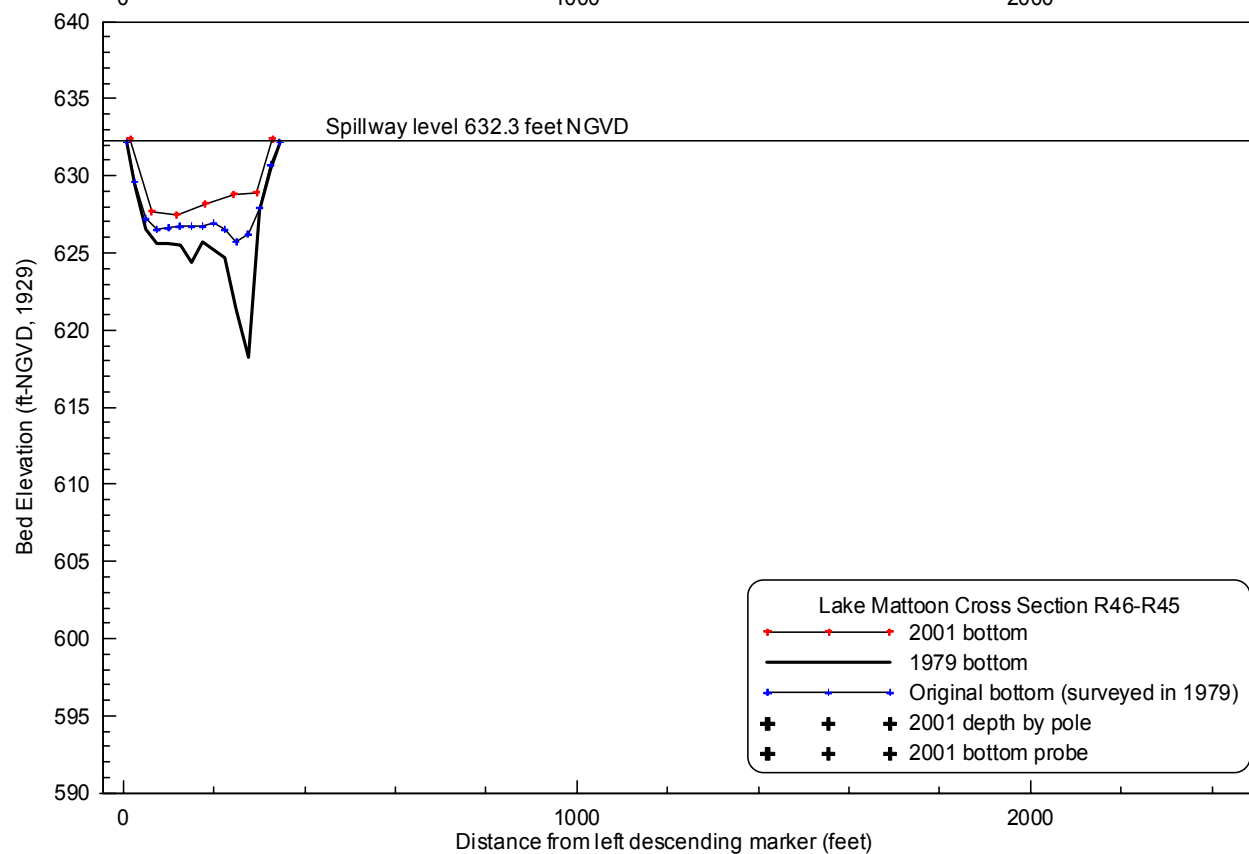
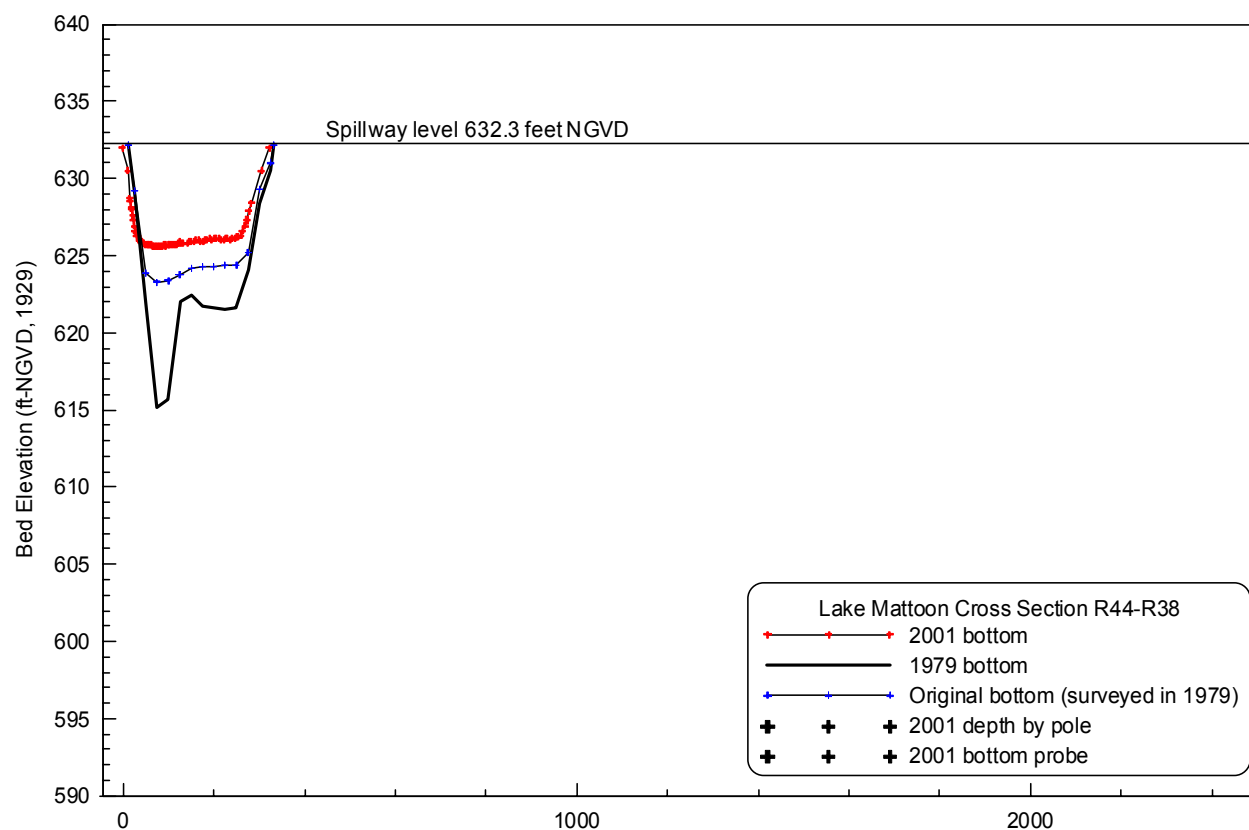


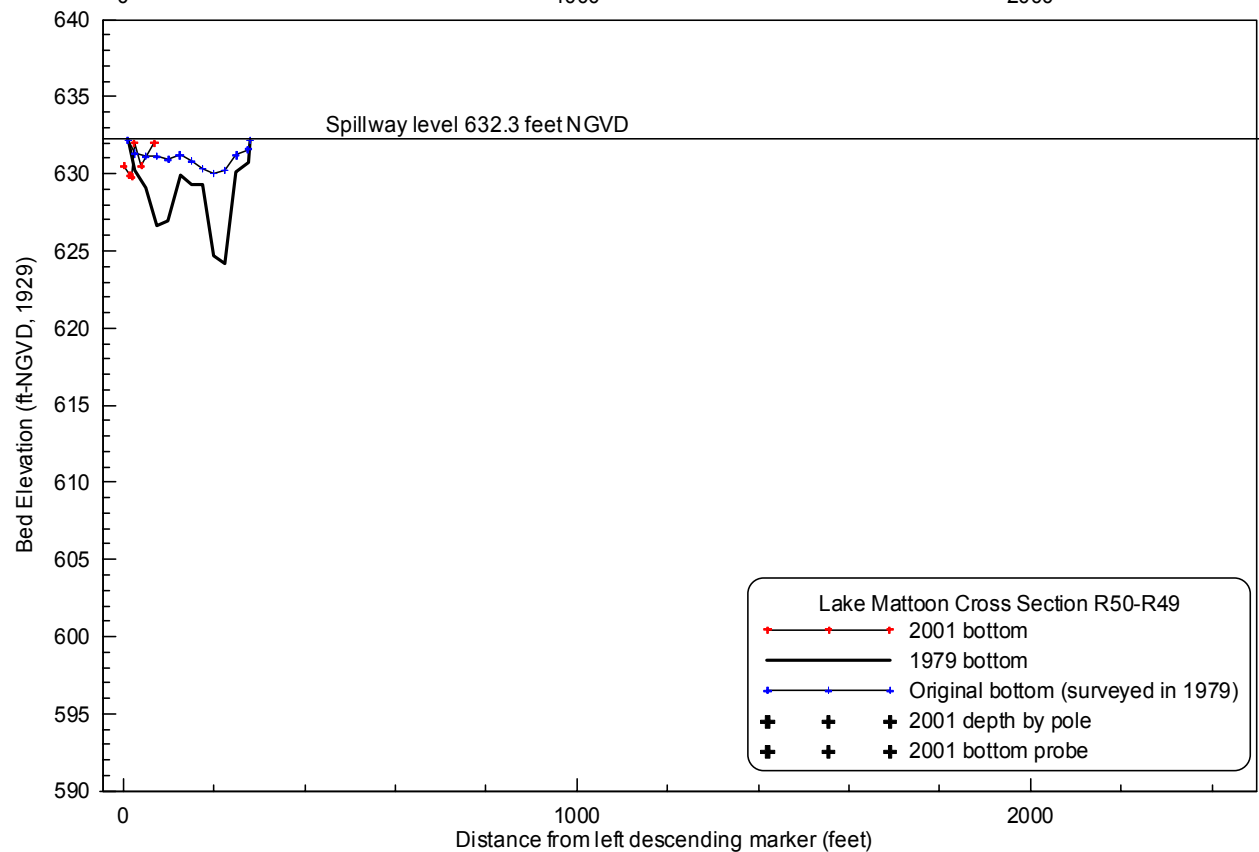
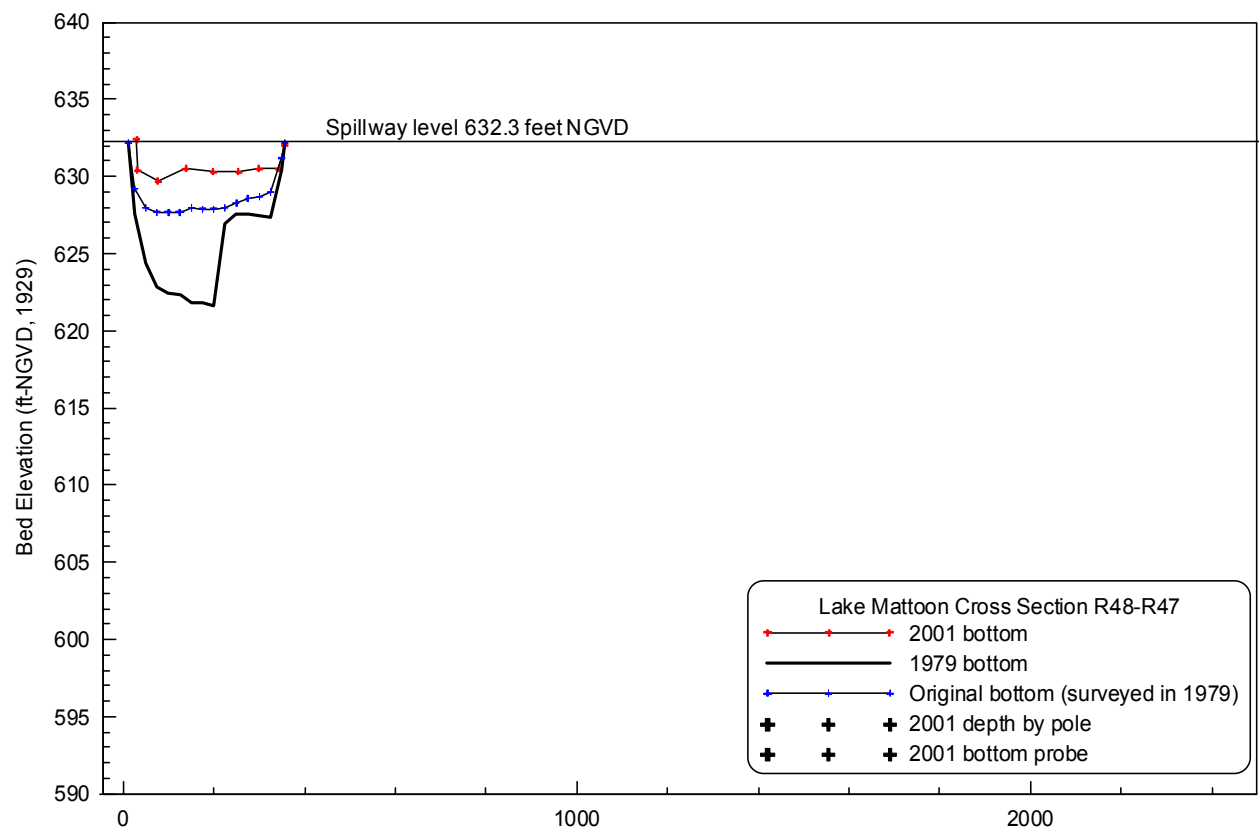


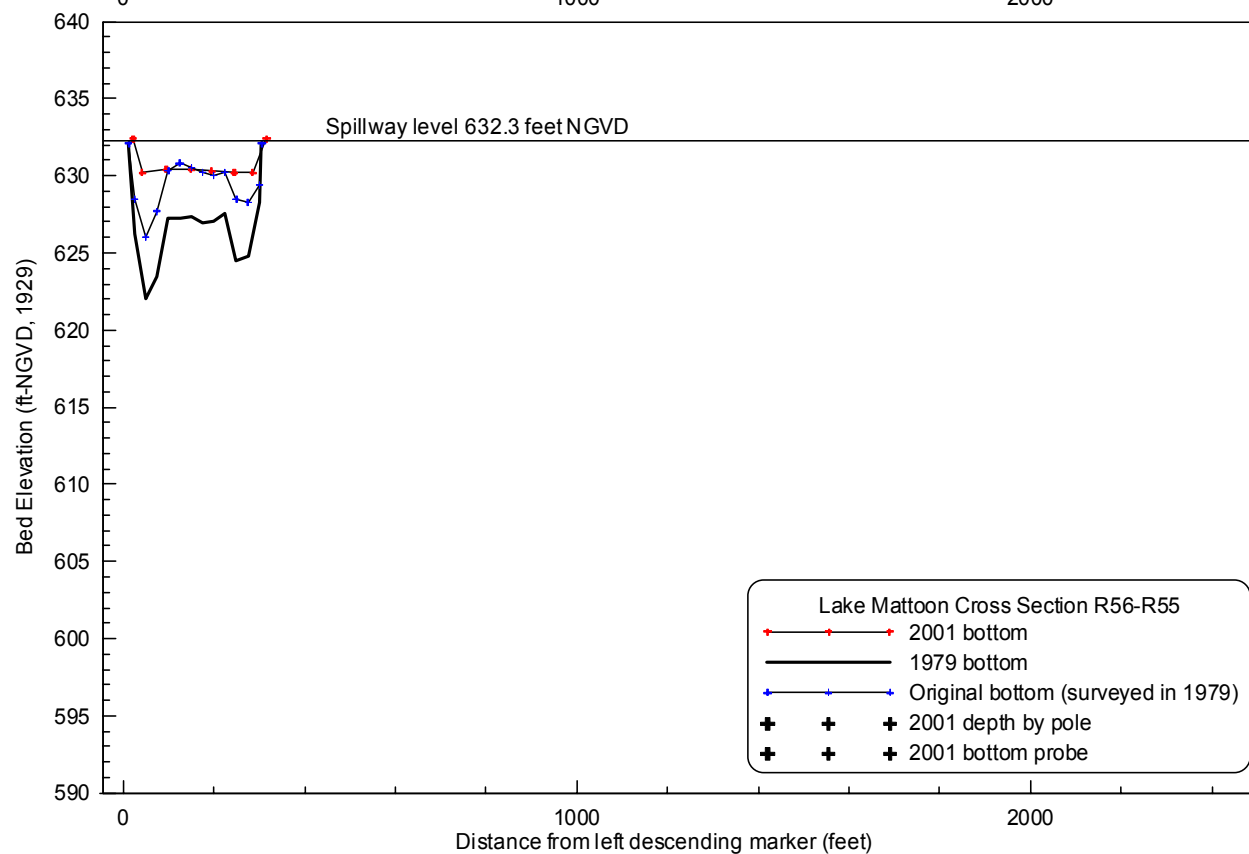
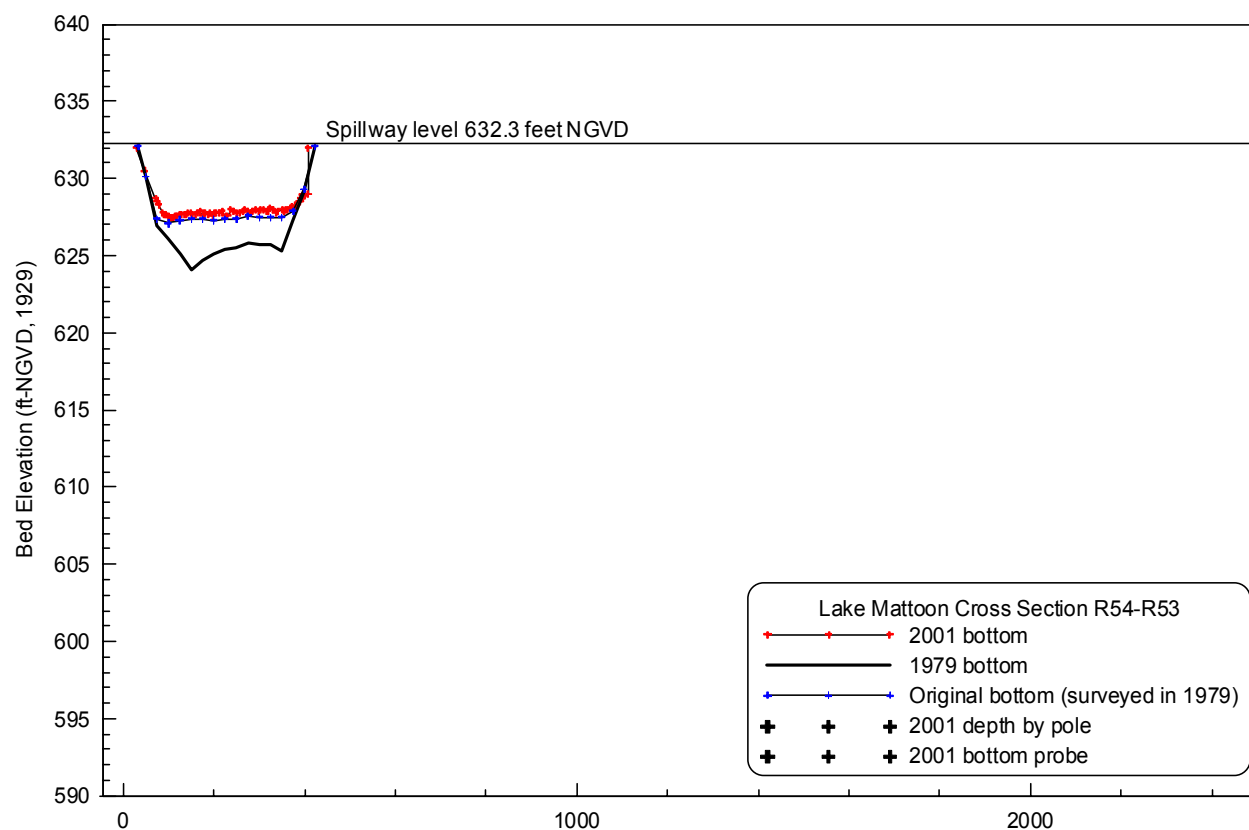












**Appendix III. Lake Paradise Sediment Core
Sample Unit Weight Results**

<i>Sample number</i>	<i>Location</i>	<i>Sediment layers</i>	<i>Unit weight (pounds per cubic foot)</i>
1	R14-R13	0-3	34.5
2	R14-R13	13-16	48.1
5	R6-R5	12-15	29.7
6	R2-R1	4-7	19.1
7	R2-R1	12-15	23.5
8	R10-R9	7-10	25.6
9	R18-R17	3-6	48.1
10	R18-R17	14-17	61.9

**Appendix IV. Lake Mattoon Sediment Core
Sample Unit Weight Results**

<i>Sample number</i>	<i>Location</i>	<i>Sediment layers</i>	<i>Unit weight (pounds per cubic foot)</i>
1	R16-R15	6-9	29.6
4	R20-R19	5-8	77.5
8	R12-R11	5-8	23.8
11	R8-R7	5-8	23.5
14	R2-R1	6-9	21.6
17	R38	5-8	30.6

Appendix V. Lake Paradise Sediment Particle Size Distribution Sample Results

<i>Particle size (millimeters)</i>	<i>Sample number</i>									
	<i>PS 3</i>	<i>PS4</i>	<i>PS 6</i>	<i>PS 7</i>	<i>PS 8</i>	<i>PS 9</i>	<i>PS 10</i>	<i>PS 11</i>	<i>PS 12</i>	<i>PS 13</i>
	<i>R13-R14</i>	<i>R13-R14</i>	<i>R5-R6</i>	<i>R5-R6</i>	<i>R1-R2</i>	<i>R1-R2</i>	<i>R9-R10</i>	<i>R9-R10</i>	<i>R17-R18</i>	<i>R17-R18</i>
	<i>Surface</i>	<i>Section 16-17</i>	<i>Surface</i>	<i>Section 15-16</i>	<i>Surface</i>	<i>Section 15-16</i>	<i>Surface</i>	<i>Section 12-14</i>	<i>Surface</i>	<i>Section 17-18</i>
0.031	91.1	97.8	97.6	97.8	96.9	95.5	96.4	95.8	86.4	94.0
0.016	71.8	88.2	92.4	94.3	90.0	89.3	89.4	92.3	60.1	77.6
0.008	48.0	68.0	77.3	84.0	79.0	80.0	71.8	82.7	38.2	50.0
0.004	37.2	52.8	62.1	73.1	69.1	70.5	57.8	69.2	28.3	35.8
0.002	32.3	43.6	51.1	61.7	59.2	60.6	48.6	58.6	24.1	30.5

Appendix VI. Lake Mattoon Sediment Particle Size Distribution Sample Results

Particle size (millimeters)	Sample number												
	PS 5	PS 6	PS 2	PS 3	PS 7	PS 9	PS 10	PS-12	PS-13	PS 15	PS 16	PS 18	PS 19
	R19-R20	R19-R20	R15-R16	R15-R16	R18-R17	R11-R12	R11-R12	R7-R8	R7-R8	R1-R2	R1-R2	R38	R38
	Section	Section	Section	Section	Section	Section	Section	Section	Section	Section	Section	Section	Section
	Surface	11-13	Surface	12-14	Surface	Surface	10-12	Surface	10-12	Surface	12-14	Surface	10-12
2		98.6											
1		97.9											
0.710		97.6											
0.5		96.7											
0.355		94.5											
0.25	99.6	89.5											
0.18	97.2	81.8											
0.125	93.2	75.9											
0.09	87.9	70.7											
0.063	77.0	66.7											
0.031	42.1	55.0	93.5	94.0	78.0	83.4	95.1	93.7	92.2	93.2	92.6	95.8	94.6
0.016	24.2	40.0	76.7	83.4	69.4	76.3	86.0	83.4	78.7	83.6	80.5	86.2	89.6
0.008	15.1	30.0	53.1	64.7	49.1	76.3	77.2	74.1	65.4	70.7	65.6	68.1	73.9
0.004	12.6	22.3	40.6	50.0	38.0	65.7	67.3	66.7	56.3	61.3	56.4	53.7	61.2
0.002	10.8	19.9	34.4	41.0	33.0	56.6	58.2	57.6	48.8	53.0	49.0	44.0	51.6



Appendix E

Example Riprap Installation Specification

EXAMPLE SHORELINE PROTECTION SPECIFICATIONS

Protection of shorelines from eroding may require a structural measure to provide a barrier between the lake and the shoreline. The more common types of shoreline protection are as follows.

- ◆ Riprap
- ◆ Gabions
- ◆ Concrete Revetment Mats
- ◆ Sheet piling (Seawall)

Attached are specifications for the construction and material requirements for riprap, gabions and revetment mats.

Gabions, revetment mats and sheet piling walls are more complex methods than the riprap method.

A leaseholder shall obtain approval from the City of Mattoon prior to installation of these three methods. Construction shall be done by a contractor experienced in such work.

removed at the direction of the Engineer and become the property of the Contractor at the completion of the contract; and be properly disposed of, off the job site.

If the Contractor is required to install any temporary erosion control system for which the contract does not include a bid item, such system(s) will be paid for according to Article 109.04.

SECTION 281. RIPRAP

281.01 Description. This item shall consist of furnishing and placing a protective course of stone, broken concrete or precast concrete blocks laid as riprap for erosion protection, sediment control or rock fill on slopes or in channels.

281.02 Materials. Materials shall meet the requirements of the following Articles of Section 1000 - Materials:

Item	Article/Section
(a) Stone for Erosion Protection, Sediment Control and Rockfill	1005.01
(b) Concrete Block, Broken Concrete, Concrete Mats for Riprap	1005.02
(c) Filter Fabric.....	1080.03

CONSTRUCTION REQUIREMENTS

281.03 Foundation Preparation. The bed for the riprap shall be trimmed and shaped to allow the finished surface to conform to the lines specified. At the toe of the slope, the riprap shall commence on a continuation of the slope after excavation to accommodate the full depth of fabric, bedding layer, and riprap specified.

281.04 Placing. No riprap shall be placed until the foundation preparation has been approved by the Engineer. Installation of the filter fabric will be required under stone riprap gradations 4, 5, 6, and 7 for all uses, and under concrete block, broken concrete, and stone or broken concrete dumped riprap when used for erosion protection. The fabric shall be installed according to the plans and as specified in Section 282. A bedding layer will be required for stone riprap gradations 4, 5, 6, and 7, and for concrete block, broken concrete, and stone or broken concrete dumped riprap when used for erosion protection. No bedding layer will be required for concrete block riprap, broken concrete riprap or for stone or broken concrete dumped riprap when used for sediment control or rockfill.

- (a) **Stone Riprap.** Gradation 1 shall be used as the bedding material for Gradations 4 and 5. Gradation 2 shall be used as the bedding material for Gradations 6 and 7. When filter fabric is used, coarse aggregate Gradation CA 1 may be used in lieu of Gradation 2, and coarse aggregate Gradation CA 3 may be used in lieu of Gradation 1. Bedding material shall be spread uniformly on the filter fabric in a satisfactory manner to the neat lines specified. Placing of material by methods which will tend to segregate particle sizes within the bedding will not be permitted. Any damage to the surface of the bedding base or the filter fabric during placing of the bedding shall be repaired before proceeding with the work. Compaction of the bedding layers will not be required but it shall be finished to present a

reasonably even surface free from mounds, windrows, or depressions. The thickness of the stone riprap layer shall be according to the following table:

Gradation	Min. Thickness	Bedding Thickness
1 & 2	150 mm (6 in.)	-
3	200 mm (8 in.)	-
4	400 mm (16 in.)	150 mm (6 in.)
5	550 mm (22 in.)	200 mm (8 in.)
6	650 mm (26 in.)	250 mm (10 in.)
7	750 mm (30 in.)	300 mm (12 in.)

Stone shall be placed on the bedding layer in such manner as to produce a reasonably well-graded mass of rock with the minimum practicable percentage of voids providing maximum interlocking of stones and shall be constructed to the lines and grades shown.

The riprap shall not be placed or dropped from a height of more than 300 mm (1 ft). The stone riprap shall be placed to its full course thickness in one operation and in such a manner as to avoid displacing the bedding material. Placing of material shall begin at the lower elevations, progressing up the slope and, from the center outward, unless otherwise determined by the Engineer. The larger stones shall be well distributed and the entire mass of stones in their final position shall be roughly graded to conform to the gradation specified. There shall be no abrupt changes in the riprap surface. All tapers between minimum thickness and any high points shall be at a uniform rate. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Placing riprap in layers will not be permitted. Placing riprap by dumping into chutes or by similar methods likely to cause segregation of the various sizes will not be permitted. The desired distribution of the various sizes of stones throughout the mass shall be obtained by selective loading of the material at the quarry or other source, by controlled dumping of successive loads during final placing, or by other methods of placement which will produce the specified results. Rearranging of individual stones by mechanical equipment or by hand will be required to the extent necessary to obtain a reasonably well-graded distribution of stone sizes as specified above.

- (b) Concrete Block Riprap. Bedding placement, when required, shall be as described for stone riprap in (a). Concrete blocks shall be laid with the joints perpendicular to the slope. The individual blocks in each horizontal course shall be placed when possible so that they will break joints with the blocks in the course below. For non-interlocking blocks, each tenth course shall be embedded into the slope with the long dimension of the blocks perpendicular to the slope.
- (c) Broken Concrete Riprap. Bedding placement, when required, shall be as described for stone riprap in (a). The individual pieces of broken concrete shall be placed by hand, flat upon the slope. The pieces shall be laid with close joints, the larger pieces being placed in the lower courses. Any open joints shall be filled with spalls thoroughly rammed into place. The finished

surface of the riprap shall present an even, close surface, true to the lines, grades and sections given.

- (d) Stone or Broken Concrete Dumped Riprap. Bedding placement, when required, shall be as described for stone riprap in (a). The dumped riprap shall be a minimum of 300 mm (12 in.) thick. Placement shall begin at the lower elevations and progress up the slope. Dumped riprap of stone or broken concrete, as specified, shall be placed on slopes or in channels by mechanical means. End dumping of material using mechanical equipment will be permitted provided the larger stone or pieces of broken concrete are well-distributed and the entire mass, in final position, is roughly graded to conform to the gradation specified. Placement by dumping into chutes or other methods likely to cause segregation will not be permitted.

The finished riprap shall be reasonably free from objectionable pockets of small pieces and clumps of large pieces, and the surface shall be shaped to follow the grade of the slope or channel. Rearranging of the dumped stone or broken concrete by mechanical equipment or by hand will be required only to the extent necessary to remove objectionable pockets or clumps of small or large material, and to obtain a surface reasonably true to line and grade.

- (e) Concrete Mat Riprap. Laying of the concrete mats shall commence at the downstream end and proceed upstream. As mats are placed, the attached filter fabric shall be overlapped and the mats shall be clamped together and anchored. The upstream leading edge and the outside edges of the concrete matted area shall be trenched at least one block deep and backfilled. After placement, the voids between blocks in the mat shall be filled as shown on the plans.

SECTION 282. FILTER FABRIC FOR USE WITH RIPRAP

282.01 Description. This work shall consist of furnishing and installing geotechnical filter fabric in conjunction with riprap on prepared subgrades or embankment foundations.

282.02 Materials. Materials shall meet the requirements of the following Article of Section 1000 - Materials:

Item	Article/Section
(a) Filter Fabric.....	1080.03

CONSTRUCTION REQUIREMENTS

282.03 General. The weight of the filter fabric used will depend on the gradation of riprap specified. For riprap gradations 4 and 5, a fabric weight of 200 g/sq m (6 oz/sq yd) shall be used. A fabric weight of 270 g/sq m (8 oz/sq yd) shall be used with riprap gradations 6 and 7. The filter fabric shall be stored above the ground inside and away from sunlight at temperatures less than 60 °C (140 °F) and protected from any and all damage. The exposure of the filter fabric to the elements between laydown and cover shall be a maximum of 14 days.

282.04 Subgrade Preparation. The depth and area of excavation for the filter placement shall not exceed the dimensions necessary to properly place the filter fabric. Prior to the installation of the fabric, the foundation surface shall be cleared of debris, sharp objects and trees. Tree stumps shall be cut to the level of the prepared ground surface. If stumps cannot be cut to the ground level, they shall be completely removed. All wheel tracks, ruts, or surface irregularities in excess of 50 mm (2 in.) in depth shall be graded smooth or otherwise filled with soil to provide a reasonably smooth surface. The filter fabric shall not be placed until the prepared bed has been approved by the Engineer.

282.05 Placement. Filter fabric shall be placed in the manner and at the locations shown on the plans or as directed by the Engineer. At the time of installation, fabric shall be rejected if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation or storage.

The fabric shall be unrolled directly over the area as shown on the plans. Fabric may be installed either by hand or mechanical methods provided the surface is not rutted. The fabric shall be laid loosely and free of tension, stress, folds, wrinkles, or creases. The fabric shall be turned down and buried 600 mm (2 ft) at all exterior limits, except where a stone filled key trench is provided below natural ground. As the riprap proceeds up the grade, the top edge of the fabric shall be buried as a part of the last operation. The fabric shall be placed with the long dimension parallel to the centerline of the channel or shoreline unless otherwise directed by the Engineer. Overlaps in the fabric should be placed so that any upstream strip of fabric will overlap the downstream strip, and the upslope roll should overlap the downslope roll.

Fabric of insufficient width or length to fully cover the specified area shall be lapped or sewn. The minimum laps for lap only areas are 300 mm (12 in.) and for sewn areas are 100 mm (4 in.).

If sewn, the fabric shall be stitched at a minimum rate of four stitches per 25 mm (1 in.) with high-strength polyester, polypropylene, or kevlar thread. The seam strength shall be equal to or more than the minimum grab tensile strength of the fabric when tested wet according to ASTM D 4632.

282.06 Securing Pins. Securing pins for anchoring filter fabric shall be nominally 5 mm (3/16 in.) diameter steel bars, pointed at one end and fabricated with a head to retain a steel washer having an outside diameter of not less than 40 mm (1 1/2 in.). The length of the pin shall not be less than 300 mm (12 in.). Securing pins shall be inserted through both strips of overlapped cloth at not greater than the following intervals along a line through the midpoint of the overlap.

Slope	Pin Spacing
Steeper than 1:3(V:H)	600 mm (2 ft)
1:3(V:H) to 1:4(V:H)	900 mm (3 ft)
Flatter than 1:4(V:H)	1.5 m (5 ft)

Each securing pin shall be pushed through the fabric until the washer bears against the fabric and secures it firmly to the foundation. Additional pins regardless of location shall be installed as necessary to prevent any slippage of the filter fabric. If the Engineer determines that the proper lap is not being maintained by the use of pins, then sewing will be required at no extra cost to the Department.

282.07 Protection. The fabric shall be protected at all times during construction from contamination by surface runoff and any fabric so contaminated shall be removed and replaced with uncontaminated fabric. Any damage to the fabric during its installation or during placement of riprap shall be replaced or repaired by the Contractor at his/her own expense. If the fabric is damaged during installation, the material around the rupture shall be removed and the damaged area covered with patch of fabric using an overlap of 1.2 m (4 ft) in each direction. The patch shall be held in position with securing pins.

SECTION 284. GABIONS AND SLOPE MATTRESS

284.01 Description. This item shall consist of furnishing and placing a protective course of stone confined by wire baskets used as retaining walls, slope paving, bank protection, weirs, drop structures or outfall structures.

284.02 Materials. Materials shall meet the requirements of the following Articles of Section 1000 - Materials:

Item	Article/Section
(a) Stone for Erosion Control (Note 1)	1005.01
(b) Gabions and Slope Mattress	1006.35
(c) Wire Fasteners	1006.36
(d) Anchor Stakes	1006.04, 1006.18
(e) Filter Fabric.....	1080.03

Note 1. The stone shall meet the requirements of Quality Designation A and shall not contain objectionable quantities of dirt, sand, clay or rock fines. The stone shall be well graded with maximum stone dimensions ranging between 100 mm and 200 mm (4 in. and 8 in.). No stone shall have minimum dimension less than 75 mm (3 in.) and the ratio of maximum to minimum dimension shall not be greater than two.

CONSTRUCTION REQUIREMENTS

284.03 Fabricating Gabions and Slope Mattresses. Baskets shall be fabricated in such a manner that the sides, ends, lid, and diaphragms can be assembled at the construction site into rectangular baskets of the sizes specified and shown on the drawings. Baskets furnished by the manufacturer shall be of uniform size. Baskets shall be of single unit construction, i.e., the base, lid, ends, and sides shall be either woven into a single unit or one edge of these members connected to the base section of the basket in such a manner that strength and flexibility at the point of connection is at least equal to that of the mesh. Where the length of the basket exceeds 1 1/2 its horizontal width, the basket shall be equally divided by diaphragms, of the same mesh and gauge as the body of the baskets, into cells whose length does not exceed the horizontal width. The basket shall be furnished with the necessary diaphragms secured in proper position on the base in such a manner that no additional tying at this juncture will be necessary. Baskets shall be assembled by tying or fastening all untied edges. The tying wire shall be tightly laced around every fabric opening along the seams in such a manner that single and double loops are alternated. If wire fasteners are used, they shall be installed at approximately 100 mm (4 in.) to 150 mm (6 in.) intervals, but not less than one fastener for each fabric opening along the joint.

Sufficient wire fasteners, lacing, and connecting wire to match the basket material shall be supplied with the baskets for all fastening operations carried out in the construction of the gabion and mattress work.

All perimeter edges of the baskets, including end panels and the diaphragms, if any, shall be mechanically selvaged in such a way as to prevent any unravelling of the fabric and to develop the full strength of the fabric. The wire used for the selvedge shall have a diameter greater than that of the wire used to form the fabric.

284.04 Foundation Preparation. The bed for the gabions or slope mattress shall be trimmed and shaped to conform to the line and grade shown on the plans and as directed by the Engineer.

284.05 Placing. After the Engineer has approved the foundation preparation, a layer of filter fabric shall be installed. Installation of the filter fabric will be required under both the gabions and the slope mattress, and behind the gabions. The filter fabric shall be installed according to the plans.

The baskets shall be placed to conform with plan details. The stone material shall be placed in close contact in the unit so that maximum fill is obtained.

Empty basket units shall be assembled individually and placed on the approved surface to the lines and grades as shown on the drawings or as directed by the Engineer, with the sides, ends, and diaphragms erected in such a manner to insure the correct position of all creases and that the tops of all sides are level. All adjoining empty gabion units shall be secured to the adjoining unit in order to obtain a monolithic structure. Wire fasteners may be used in lieu of lacing wire for forming individual baskets, joining empty baskets together and closing lids. Binding wire or wire fasteners shall be used along vertical reinforced edges and top selvages. When baskets are stacked, the base of the top basket shall be tightly wired or fastened to the lower basket at front and back. Lacing of adjoining basket units shall be accomplished by continuous stitching with alternating single and double loops at intervals of not more than 125 mm (5 in.). All lacing wire terminals shall be securely fastened. If wire fasteners are used, a fastener shall be provided at each fabric opening along the joint. A minimum of six fasteners are required per 1 m (3 ft) seam, three fasteners are required per 450 mm (18 in.) seam and two fasteners per 300 mm (1 ft) seam.

The initial line of basket units shall be placed on the prepared surface in a direction parallel to stream flow, and partially filled to provide anchorage against deformation and displacement during filling operations. After adjoining empty basket units are set to line and grade and common sides with adjacent units thoroughly laced or fastened, baskets shall be placed in tension and stretched to remove any kinks from the fabric and to a uniform alignment. The stretching of empty basket units shall be accomplished in such a manner as to prevent any possible unraveling.

Stone filling operations shall carefully proceed with placement by hand or machine so as not to damage the wire coating, to assure a minimum of voids between the stones, and the maintenance of alignment throughout the filling process. Undue deformation and bulging of the fabric shall be corrected prior to further stone filling. To avoid localized deformation, the basket units in any row are to be filled in stages consisting of maximum 300 mm (12 in.) courses. Baskets 450 mm (18 in.) tall or more shall use connecting wires in each internal compartment after each 225 mm (9 in.) or 300 mm (12 in.) layer except when the lid is closed over the last layer. For baskets 450 mm (18 in.) tall, the connecting wires shall be installed between the 225 mm (9 in.) layers of stone. The 1 m (3 ft) tall baskets shall have connecting wires installed between each 300 mm (12 in.) layer of stone. These wires shall connect the front face to the back face. All connecting wires shall be looped around two fabric openings and the ends of the wires securely twisted to prevent loosening. For end units, two additional connecting wires shall be placed at each level perpendicular to the normally required connecting wires.

At no time shall any cell be filled to a depth exceeding 300 mm (12 in.) more than the adjoining cell. The maximum height from which the stone may be dropped into the basket units shall be 1 m (3 ft).

Along all exposed faces, the outer layer of stone shall be carefully placed and arranged by hand to insure a neat and compact appearance. The last layer of stone shall be leveled with the top of the gabion to allow for the proper closing of the lid and to provide an even surface that is uniform in appearance. Lids shall be stretched tight over the stone fill using only an approved lid closing tool, until the lid meets the perimeter edges of the front and end panels. Using crowbars or other single point leverage bars for lid closing shall be prohibited. The lid shall then be tightly tied with lacing wire along all edges, ends, and internal cell diaphragms by continuous stitching with alternating single and double loops at intervals not more than 125 mm (5 in.). Wire fasteners may be used in lieu of lacing wire. Special attention shall be given to see that a projections or wire ends are turned into the baskets. Where shown on the drawings or as directed by the Engineer, or where a complete gabion unit cannot be installed because of space limitations, the basket unit shall be cut, folded, and wired together to suit existing site conditions. The fabric must be cleanly cut and the surplus fabric cut out completely, or folded back and neatly wired to an adjacent gabion face. The assembling, installation, filling, lid closing, and lacing of the reshaped gabion units shall be carried out as specified above.

The slope mattress shall be anchored as shown on the plans. If the Contractor elects to drill for the soil anchor stakes, care shall be taken to avoid drilling holes to a greater depth than is necessary to place the top of the finished stake slightly above the top of the finished mattress.

The Contractor may assemble, partially fill and tie together mattress units on the subgrade provided they can be placed on the slope without abrading the zinc or vinyl coating on the wire mattress or permanently distorting the shape of the mattress in transporting and installing the units on the slope. All prefabrication procedures shall be subject to the approval of the Engineer.

The Contractor shall maintain the gabions or slope mattress until final acceptance and any material displaced by any cause shall be replaced by the Contractor at his/her own expense.

284.06 Disposal of Surplus Material. Surplus or waste material resulting from the gabion or slope mattress operations shall be disposed of by the Contractor according to Article 202.03.

SECTION 285. CONCRETE REVETMENT MATS

285.01 Description. This work shall consist of constructing and placing fabric formed concrete revetment mats, precast block revetment mats, and articulated block mats as shown on the plans.

285.02 Materials. Materials shall meet the requirements of the following Articles of Section 1000 - Materials:

Item	Article/Section
(a) Portland Cement (Note 1)	1001
(b) Fine Aggregate (Note 2)	1003.02
(c) Water	1002
(d) Pozzolan	1010
(e) Concrete Admixtures	1021.03
(f) Filter Fabric	1080.03
(g) Fabric	1080.04
(h) Precast Block Revetment Mat	1081.11
(i) Articulated Block Revetment Mat	1081.12

Note 1. Portland cement shall be Type I or Type II.

Note 2. Aggregate grading shall be reasonably consistent and shall be well graded from the maximum size which can be conveniently handled with available pumping equipment.

285.03 Equipment

- (a) Fabric Formed Concrete Revetment Mat. Mixing and pumping equipment used in preparation and handling of the grout shall be approved by the Engineer. All oil or other rust inhibitors shall be removed from the mixing drums, stirring mechanisms, and other portions of the equipment in contact with the grout before the mixers are used. The pumping equipment shall have a variable flow rate to provide enough pressure for pumping without breaking the fabric.
- (b) Precast Block Revetment Mat and Articulated Block Revetment Mat. Equipment used to place preassembled mats shall be approved by the Engineer.

CONSTRUCTION REQUIREMENTS

285.04 Fabric Formed Concrete Revetment Mats. The slopes or surfaces to be protected shall be prepared and graded to such an extent that they are normally stable in the absence of erosive forces. Any fill material required to restore the slopes to original condition shall be approved by the Engineer.

The structural grout shall consist of a mixture of Portland Cement, fine aggregate and water so proportioned and mixed as to provide a pumpable slurry. Pozzolan and grout fluidizer may be used at the option of the Contractor. The structural grout shall have an air content of not less than 6.0 percent nor more than 9.0 percent of the volume of the grout. The mix shall obtain a compressive strength of 17,000 kPa

(2500 psi) at 28 days according to Article 1020.09. All materials shall be accurately measured by volume or mass (weight) as they are fed into the mixer. The quantity of water shall be such as to produce a grout having a pumpable consistency. Time of mixing shall be not less than one minute. If agitated continuously, the grout may be held in the mixer or agitator for a period not exceeding 2 1/2 hours in temperatures below 21 °C (70 °F), and for a period not exceeding two hours at higher temperatures. If there is a lapse in a pumping operation, the grout shall be recirculated through the pump or through the mixer drum (or agitator) and pump.

Prior to grout injection, the fabric shall be positioned at its design location. Each panel shall be a continuous or monolithic unit for its full width, including the trench portion.

Each panel shall consist of two or more mill-widths of open selvage construction; the two upper layers shall be joined together by sewing, and the two bottom layers shall be sewn together at the edges. Where adjacent panels cannot be joined in this manner, they shall be lapped a minimum of 600 mm (2 ft). In no case will simple butt-joints, either sewn or unsewn, be permitted. The ends and upper limits of the fabric shall be placed in a trench of suitable width as shown on the plans.

Small cuts shall be made in the fabric to allow for the insertion of the grout hose or grout nozzle. Grout shall be introduced into the space between the layers of fabric and shall be injected in such a way that excessive pressure on the fabric envelope is avoided. Starting at the lowest elevation and working up the slope, the grout shall be injected in such a way that the distance from the point of injection to the end of the panel is not greater than 9 m (30 ft). After grouting has been completed, the void between the trench wall and filled fabric shall be backfilled.

Holes in the fabric left by the removal of the grout hose or inserts shall be temporarily closed by inserting a piece of burlap or similar material. The burlap shall be removed when the mortar is no longer fluid and the surface is firm to hand pressure. Foot traffic on the filled revetment mats shall be limited to an absolute minimum for one hour after pumping in order to reduce indentation.

285.05 Precast Block Revetment Mats. The banks shall be graded as shown on the plans. A filter fabric shall be placed and fastened down prior to placing the precast blocks.

The blocks may be placed individually by hand or they may be preassembled in mats and placed using heavy equipment. Care shall be taken while placing the blocks on the fabric. After the precast blocks have been placed, the voids between the blocks shall be filled using the excavated earth or other acceptable material. The material used to fill the voids may or may not be seeded, as specified in the plans.

285.06 Articulated Block Mats. The banks shall be graded as shown on the plans. A filter fabric shall be placed and fastened down to placing the articulated block mat.

The preassembled mats will be placed individually by using heavy equipment. Care shall be taken while placing the mats on the filter fabric. After the mats have been placed, the voids between the blocks shall be filled using the excavated earth or other acceptable material. The material used to fill the voids may or may not be seeded, as specified in the plans.

SECTION 1005. STONE, CONCRETE BLOCKS AND BROKEN CONCRETE FOR EROSION PROTECTION, SEDIMENT CONTROL, AND ROCKFILL

1005.01 Stone for Erosion Protection, Sediment Control, and Rockfill.

Stone, sediment, and rockfill shall meet the following requirements:

- (a) Description. The material shall be stone quarried from undisturbed, consolidated deposits of rock reasonably free of shale and shaly stone. The ledges shall be sufficiently thick to produce the desired dimensions. The stone shall be reasonably free of laminations, seams, cracks and other structural defects or imperfections tending to destroy its resistance to weather. Field stone or boulders will not be accepted. Bedding material shall be crushed stone, crushed gravel, crushed sandstone, or crushed slag. The crushed slag shall meet the Department's "Test for Leachate".
- (b) Quality. Stone for erosion protection, sediment control or rockfill shall be quarried from ledges meeting one of the listed quality designations. All ledges shall be sufficiently thick to produce the desired dimensions. Ledges shall be checked with rock samples sized to CA-7/11 and run in the IDOT sodium sulfate soundness test. Bedding material shall be tested in its manufactured gradation in the Department's sodium sulfate soundness test.

<u>Quality Designation</u>	<u>Definition</u>

A	The stone shall not exceed 15 percent sodium sulfate soundness loss. Elongated pieces (length is greater than five times Average thickness) shall not exceed 10 percent by weight. The stone shall have a specific gravity (dry) greater than 2.45 when checked in a full gradation product.
B	The stone shall not exceed 25 percent sodium sulfate soundness loss. Elongated pieces (length is greater than five times average thickness) shall not exceed 10 percent by weight.
C	The stone shall only have to conform to the above paragraph (a), Description.

- (c) Gradation. Stone for erosion protection or sediment control shall meet one of the gradation number designations listed in the following table. All gradations produced shall be well graded. A minimum of one gradation check for each gradation produced shall be run during initial production each year. Additional checks may be done by visual inspection if no gradation problem exists.

BEDDING MATERIAL					
Sieve Size Percent Passing					
GRAD. NO.	100 mm	75 mm	50 mm	37.5 mm	4.75 mm
1		100		53±23	8±8
2	100		53±23		8±8

BEDDING MATERIAL (ENGLISH)					
Sieve Size Percent Passing					
GRAD. NO.	4 in.	3 in.	2 in.	1 1/2 in.	No. 4
1		100		53±23	8±8
2	100		53±23		8±8

EROSION PROTECTION, SEDIMENT CONTROL, AND ROCKFILL														
Rock Size (kg) Percent Passing														
Grad. No.	455 ^{1/2}	270 ^{1/2}	180 ^{1/2}	135	75	70 ^{1/2}	40	20 ^{1/2}	18	5	4	3	1	0.5
3 ^{2/3}								100			50±20			8±8
4		100				100			50±20					8±8
5								50±20						8±8
6		100				50±20							8±8	
7	100				50±20							8±8		

EROSION PROTECTION, SEDIMENT CONTROL, AND ROCKFILL (ENGLISH)														
Rock Size (lb)														
Percent Passing														
Grad. No.	1000 ^{1/}	600 ^{1/}	400 ^{1/}	300	170	150 ^{1/}	90	50 ^{1/}	40	12	10	6	3	1
3 ^{2/}								100			50±20			8±8
4						100			50±20					8±8
5			100				50±20							8±8
6		100			50±20								8±8	
7	100			50±20						8±8				

1/ Five percent by weight may be oversize. Each oversize piece shall not exceed the maximum size of the gradation by more than 20 percent.

2/ When used for aggregate ditch check, Gradation 3 may be modified as follows: Percent Passing: 20 kg (50 lb) - 100; 1.5 kg (3 lb) - 50±20; 0.5 kg (1 lb) - 8±8.

- (d) Usage. Stone for use as erosion protection and sediment control shall be designated by class. The class shall be a combination of a quality designation and a gradation designation. The various uses with their allowable classes shall be specified by the designer according to the latest Bureau of Materials and Physical Research policy memorandum.

Rockfill shall meet Quality Designation #C and may be shot rock, primary crusher run, or other specified gradations.

1005.02 Concrete Blocks, Broken Concrete, and Concrete Mats for Riprap.

The concrete blocks shall be cast solid; shall be made from aggregates meeting all requirements for physical properties, soundness, and wear specified in Articles 1003.02 and 1004.02 and shall contain not less than 340 kg (565 lb) of portland cement per cubic meter (cubic yard) of concrete. The concrete shall have a minimum compressive strength of not less than 24,000 kPa (3500 psi) at the age of 14 days, as determined by the Engineer, either from tests of entire blocks or from tests of blocks subdivided by sawing or drilling into prisms or cylinders. Specimens for testing will be selected by the Engineer at such intervals as will ensure control of the production of blocks. The blocks may be made from plastic concrete, or they may be machine made, utilizing the type of equipment ordinarily employed in the fabrication of building blocks.

- (a) Blocks Produced from Plastic Concrete. The blocks shall be made from concrete containing not less than 4.0 nor more than 7.0 percent entrained air and having a slump of not more than 40 mm (1 1/2 in.). The concrete shall be consolidated in the molds by vibratory equipment and in a manner meeting the approval of the Engineer. The blocks shall be finished to uniform and true dimensions.
- (b) Machine Made Blocks. The concrete shall be made with aggregate sizes and of a consistency suitable for production of the blocks by machine

methods. The concrete shall have an air-entrainment (Note 1) meeting the approval of the Engineer. The blocks shall be of uniform and true dimensions.

Note 1. The experience in the manufacture, inspection and use of machine made blocks for riprap is very limited. It is known that air-entrained concrete of the type and consistency suitable for manufacture of the blocks will also contain entrapped air. Available test methods do not differentiate between the two, and some experimentation may be necessary at the beginning of the production. Manufacturers in general have had little experience in the manufacture of blocks from mixtures having cement contents as high as specified herein, and some adjustment of the usual proportion of fine to coarse aggregate may be required, in order that the equipment may work satisfactorily.

- (c) Size of Blocks. The concrete blocks shall conform, to the minimum dimensions, 200 mm x 200 mm x 400 mm (8 in. x 8 in. x 16 in.) concrete building block.
- (d) Broken Concrete. The material shall be made from newly broken, sound concrete pavement or other suitable concrete debris from demolished concrete construction having a minimum thickness of 150 mm (6 in.) between unbroken surfaces. Concrete showing excessive popping, spalling, cracking or any other type of disintegration indicating poor resistance to weathering will not be acceptable. No reinforcing steel or other such material shall be protruding from the broken pieces. The gradation or sizing of the pieces shall conform to Article 1005.01(c).
- (e) Concrete Mats. Concrete mats shall be made from plastic concrete. Concrete mats shall consist of a grid of interconnected concrete blocks of sufficient size to meet or exceed the unit weight required in the hydraulic design. The blocks in the mat shall be connected by cast-in-place stainless steel cables of sufficient size and strength to maintain the structural integrity of the mat throughout its design life. The mats shall be supplied with a filter fabric meeting the requirements of Section 282 permanently attached to the bottom of the blocks without the use of adhesives. The dimensions of the filter fabric shall exceed the mat dimensions by an amount equal or greater than the recommended overlap width. Individual mats shall be tied together using corrosion resistant clamps recommended by the mat manufacturer. The mats shall be anchored at the frequency and depth required in the hydraulic design using approved anchors.

1006.35 Gabions and Slope Mattresses. The material shall conform to the following requirements:

- (a) Fabric. The baskets shall be constructed of galvanized, aluminized, or PVC-coated galvanized or aluminized steel wire.

- (1) Gabion baskets shall be constructed of one of the following two types:
 - a. Hexagonal mesh fabric with at least three half twists. The fabric opening shall have nominal dimensions of 82 mm x 115 mm (3.25 in. x 4.50 in.).
 - b. Welded wire fabric with a minimum average weld shear value of 2600 N (584 lb) with no value less than 2000 N (450 lb). The fabric opening shall have nominal dimensions of 76 mm x 76 mm (3.00 in. x 3.00 in.).
- (2) Slope mattress baskets shall be constructed of one of the following two types:
 - a. Hexagonal mesh fabric with at least three half twists. The fabric opening shall have nominal dimensions of 60 mm x 82 mm (2.50 in. x 3.25 in.).
 - b. Welded wire fabric with a minimum average weld shear value of 1300 N (290 lb) with no value less than 1000 N (225 lb). The fabric opening shall have nominal dimensions of 38 mm x 76 mm (1.50 in. x 3.00 in.).
- (b) Wires for Selvedges, Lacing, and Internal Connections. All wires shall be of the same material and coating finish as the fabric.
- (c) Galvanized Steel Wire. The wire shall conform to the requirements of ASTM A 641M (A 641), Class 3, Soft.
- (d) Aluminized Steel Wire. The wire shall conform to the requirements of ASTM A 809, Soft.
- (e) PVC-Coated Galvanized or Aluminized Steel Wire. The PVC coating shall be applied to wire conforming to ASTM A 641M (A 641), Class 3, Soft, or ASTM A 809, Soft. The PVC shall be extruded and adhered (bonded), shall conform to the requirements of ASTM D 2287 and shall be 0.500 mm (± 0.127 mm) [0.020 in. (± 0.005 in.)]. The color of the PVC material shall be gray. The PVC coating shall be self-extinguishing and shall not support combustion when subject to the horizontal flame test of ASTM A 470.
- (f) Wire Diameter. The minimum diameter of wires after coating for gabions and slope mattresses shall be according to the following tables:

	GABIONS Aluminized and Galvanized	PVC
Fabric Wire	3.0 mm (0.118 in.)	3.5 mm (0.136 in.)
Selvedge Wire ^{1/}	3.8 mm (0.150 in.)	4.1 mm (0.163 in.)
Lacing and Internal Connecting Wires	2.2 mm (0.087 in.)	3.0 mm (0.117 in.)

SLOPE MATTRESSES		
	Aluminized and Galvanized	PVC
Fabric Wire	2.2 mm (0.087 in.)	3.0 mm (0.117 in.)
Selvedge Wire ^{1/}	2.7 mm (0.106 in.)	3.5 mm (0.136 in.)
Lacing and Internal Connecting Wires	2.2 mm (0.087 in.)	3.0 mm (0.117 in.)

1/ Does not apply to welded wire fabric.

1006.36 Wire Fasteners. Wire fasteners shall be made of galvanized steel wire, aluminized steel wire or stainless steel wire. Galvanized wire fasteners shall be used on galvanized baskets, aluminized wire fasteners shall be used on aluminized baskets, and stainless steel wire fasteners shall be used on PVC coated baskets. Wire fasteners shall resist a force of at least 2700 N (600 lb) while remaining in a closed position when subjected to a directional tension force along any axis of the fastener.

- (a) Galvanized Steel Wire. Coating requirements shall conform to ASTM A 764, Type 3.
- (b) Aluminized Steel Wire. Coating requirements shall conform to ASTM A 809.
- (c) Stainless Steel Wire. The wire shall conform to ASTM A 313, 302 grade.

1080.03 Filter Fabric For Use With Riprap. The filter fabric material shall consist of nonwoven filaments formed from a plastic yarn of a long chain synthetic polymer composed of at least 85 percent by weight of polyolefins, or polyesters, and

shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure. After forming, the fabric shall be processed so that the filaments retain their relative positions with respect to each other. The fabric shall be free of defects or flaws which significantly affect its physical and/or filtering properties.

The filter fabric shall be formed in widths of not less than 2 m (6 ft). Sheets of fabric may be sewn together with thread of a material meeting the chemical requirements given for the plastic yarn to form fabric widths as required. The sheets of filter fabric shall be sewn together at the point of manufacturer or another approved location.

The texture of the fabric shall be such that the bedding and riprap will remain in an equilibrium state and not slip or slide. The filter fabric shall be rot proof, mildew proof, insect resistant, have a high dimensional stability when set, have good soil filtration characteristics, have a high resistance to tear propagation in all directions, and meet the following minimum conditions and ASTM Tests for the gradation of riprap specified:

METRIC UNITS	Gradation 4 & 5	Gradation 6 & 7
Weight of Fabric (g/sq m), ASTM D 3776 (Mod.)	200	270
Burst Strength (kPa), ASTM D 3786 (Note 1)	1720	2070
Trapezoidal Tear Strength (N), ASTM D 1117 (Note 2)	265	335
Grab Tensile Strength (N), ASTM D 4632 (Note 2)	700	900
Grab Tensile Elongation (%), ASTM D 4632 (Note 2)	20	20

ENGLISH UNITS	Gradation 4 & 5	Gradation 6 & 7
Weight of Fabric (oz/sq yd), ASTM D 3776 (Mod.)	6.0	8.0
Burst Strength (psi), ASTM D 3786 (Note 1)	250	300
Trapezoidal Tear Strength (lb), ASTM D 1117 (Note 2)	60	75
Grab Tensile Strength (lb), ASTM D 4632 (Note 2)	160	200
Grab Tensile Elongation (%), ASTM D 4632 (Note 2)	20	20

Note 1. Manufacturer's certification of fabric to meet requirements.

Note 2. Test sample shall be tested wet.

The vendor shall furnish certified test reports with each shipment of material attesting that the fabric meets the above requirements.

A sample of 4.0 sq m (5 sq yd) of the fabric shall be furnished from each shipment for verification testing.

The fabric shall meet the requirements noted in the following and provide an AOS (apparent opening size) determined by the Engineer after an on site investigation of the soil to be protected, based on the following criteria:

(a) Piping Resistance. (soil retention) (Note 1)

- (1) Soil with 50 percent or less particles by mass (weight) passing U.S. 75 μ m (No. 200) Sieve. AOS less than 0.6 mm [greater than 300 μ m (No. 30) Sieve] TF25 Method 6.
- (2) Soil with more than 50 percent particles by mass (weight) passing U.S. 75 μ m (No. 200) Sieve. AOS less than 0.3 mm [greater than 300 μ m (No. 50) Sieve] TF25 Method 6.

(b) Permeability. (cm/sec)(Note 1). K of fabric greater than 10K of soil - ASTM D 4491.

Note 1. Certification from the manufacturer of fabric is required stating that the product meets the piping resistance and permeability requirements.

1080.04 Fabric Formed Concrete Revetment Mats. Fabric forming material shall consist of specially woven, double layer, open selvage fabric joined in mat configuration. The fabric shall consist of uncoated synthetic yarns with sufficient grab tensile strength and porosity to withstand the pressure of the grout injection pump without breaking the layers of fabric. Each fabric layer shall exhibit minimum grab tensile strength of 900 N (200 lb) in both warp and fill directions when tested according to ASTM D 4632, Grab Tests, Method 16, using a 100 x 200 mm (4 x 8 in.) sample, 75 mm (3 in.) gage length, clamped in a 25 mm (1 in.) wide by 50 mm (2 in.) long grip, tested at a strain rate of 300 mm/minute (12 in./min) in a CRE testing machine. The average of five tests in each direction shall meet the minimum value given above. The fabric shall be tested wet.

Hydrostatic uplift pressure relief shall be provided by installing 40 mm (1 1/2 in.) diameter sewn filter points woven in such a manner as to permit passage of water through the filter points spaced approximately at 200 mm (8 in.) centers for the Filter Point style mat with average thickness of 90 mm (3.5 in.), and at 2.4 m (8 ft) centers for the Uniform Cross Section style mat with average thickness of 100 mm (4 in.). All filter points shall be checked and cleaned for free passage of water through the filter points after the mat has been pumped and the cement grout has set. When uniform cross section style mat is specified, the Contractor shall have the option of substituting filter point style mat.

1081.11 Precast Block Revetment Mat. Materials. Precast block revetment mats are an erosion control system consisting of three directional interlocking precast concrete blocks, 200 mm (8 in.) thick, with a woven polypropylene fabric constructed on a prepared slope. The general shape of the interlocking units shall be as shown on the plans. The interlocks shall be beveled to enable the system to conform to changing land contours and grades. The concrete components shall be precast units constructed in accordance with the applicable portions of Articles of the Standard Specifications, except that the concrete compressive strength shall not be less than 20,600 kPa (3,000 psi) in 28 days. Cement content shall not be less than 360 kg/cu m (6.00 hundredweight/cu yd). In addition to the coarse aggregate gradations allowed under Articles 1004.02 and 1020.04, gradation CA 16 will be permitted. The concrete blocks may be fabricated in the field or at the factory.

1081.12 Articulated Block Mat. Materials. The articulated block mat will consist of open concrete blocks interconnected by flexible cables which provide articulation and flexibility between adjacent blocks. The concrete blocks will have a minimum of 20 percent open area to allow vegetation to grow and eventually cover the concrete. The articulated block mat shall handle a flow of 1.2 to 1.4 m/s (4.0 to 4.5 fps).

√ **1081.13 Bracing.**

- (a) **Steel Posts.** Steel posts for bracing shall be of a type normally used for agricultural fencing; have a steel anchor plate welded or riveted to each post approximately 450 mm (18 in.) from the bottom of the post, be 1.8 m (6 ft) minimum in length, and shall weigh not less than 1.5 kg/m (1 lb/ft). The post shall be finished with a suitable paint of acceptable color or galvanizing unless specified for use as selective mowing stakes. When specified for selective mowing stakes, the steel posts shall be finished in an acceptable color of green paint. For delineating seedling plantings, the posts shall have the top 250 mm (10 in.) painted with two coats of State equipment orange paint. For delineating native grass, wildflower and ornamental herbaccons plantings, the top 250 mm (10 in.) of the posts shall be painted with two coats of white paint.



Appendix F

Example Septic Ordinance

Article XVI. Private Sewage Disposal Systems

§95.500. Adoption of State Rules and Regulations by Reference

The State of Illinois Private Sewage Disposal Licensing Act and Code 1996, such as are now in force and effect, or as may hereafter be revised or amended, promulgated by the State of Illinois Department of Public Health pursuant to an act in relation to public health, as amended, are adopted and incorporated herein by reference.

States reference -Private sewage disposal licensing, 225 ILCS 225/1 et. seq.

Cross reference Sewers Chapter 51 & Lake Springfield Chapter 96.

(Ord. No. 518-10-98, § 1, (Exh. A), 10-6-98)

§ 95.501. Jurisdiction

This article shall apply within the corporate limits of the city and in order to protect the public water supply, shall apply to the marginal lands of Lake Springfield, in a manner consistent with the provisions of Chapter 96 of this code. Properties which are included in the marginal lands of Lake Springfield, but are outside the corporate limits of the City of Springfield shall be permitted and inspected by the Sangamon County Department of Public Health pursuant to the Illinois Private Sewage Disposal Licensing Act and Code of 1996 and the extra requirements of the 1988 Springfield City Code of Ordinances, as amended

Cross reference Sewers Chapter 51 & Lake Springfield Chapter 96.

(Ord. No. 518-10-98, § 1, (Exh. A), 10-6-98)

§ 95.502. General Maintenance

The department shall require that the owner of record of a private sewage disposal system initiate and keep in force an agreement for inspection and maintenance of the private sewage disposal system in accordance with sections 95.503 through 95.507 as applicable, and that the owner take action to repair, replace, modify, or maintain a private sewage disposal system to ensure its proper operation.

(Ord. No. 518-10-98, § 1, (Exh. A), 10-6-98)

§ 95.503. Aerobic Unit Maintenance

a. The owner of record of any private sewage disposal system which employs an aerobic unit for treatment of wastewater shall initiate and keep in force an agreement for inspection and maintenance of the aerobic unit with an authorized representative of the manufacturer of the aerobic unit or licensed private sewage disposal contractor.

b. The agreement shall provide for inspections of the aerobic unit a minimum of two (2) times per year, and shall provide for the repair, replacement, adjustment, pumping or modification of the aerobic unit and for additional inspections as are necessary to ensure the proper operation of the unit. Inspections intervals shall be at least 120 days apart. Inspections shall meet criteria of the Illinois Department of Public Health Private Sewage Disposal Licensing Act and Code, Service Requirements.

(Ord. No. 518-10-98, § 1, (Exh. A), 10-6-98)

§ 95.504. Surface Discharge

a. Agreement: The owner of record of any system which is approved to discharge effluent to the surface shall initiate and keep in force an agreement for inspection and maintenance of the system as required in this section.

b. System inspection: Any surface discharging system which does not employ an aerobic unit shall be covered by an agreement with a licensed private sewage disposal system contractor which shall provide for inspection of the system a minimum of two (2) times per year, and shall provide for the repairs, replacement, adjustment, pumping or modification to the system as is necessary to ensure proper operation. Inspection intervals shall be at least 120 days apart. Inspections shall meet criteria of the Illinois Department of Public Health Private Sewage Disposal Licensing Act and Code.

(Ord. No. 518-10-98, § 1, (Exh. A), 10-6-98)

§95.505. Septic Tank-Subsurface Seepage Field

a. The owner of record of a septic tank/subsurface seepage field shall initiate and keep in force an agreement for inspection and maintenance of the system with a licensed private sewage disposal contractor.

b. The agreement shall provide for an inspection of the system once every three (3) years by a licensed private sewage disposal contractor and shall provide for the repair, replacement or pumping of the system to ensure the proper operation of the system.

(Ord. No. 518-10-98, § 1, (Exh. A), 10-6-98)

§ 95.506. Reporting

a. Maintenance activities conducted on private sewage disposal systems subject to the requirements of this section shall be reported as outlined in this section.

b. Contractors who provided maintenance to private sewage disposal system shall submit to the Springfield Department of Public Health reports as follows:

1. Maintenance activity: A report of maintenance activity which includes, the repair, replacement, modification, adjustment or pumping of a private sewage disposal system or component where necessary to ensure its proper operation.

2. Malfunction: A report of an observed malfunction of a private sewage disposal system contracted for maintenance where the malfunction allows effluent which is or may be inadequately treated to discharge to the ground surface or to a surface water.

3. Contract cancellation or non-renewal: A report of a cancellation or failure to renew an established maintenance contract, or a refusal of an owner of an private sewage disposal system to undertake necessary repair, replacement, modification, or adjustment to the system.

c. Reports: Reports shall be submitted within ten (10) days following the maintenance intervals established by this chapter. Excepting that a report of a discharge of inadequately treated effluent to the ground surface or a surface water shall be reported within twenty-four (24) hours.

d. Form specification: Reports submitted to the Springfield Department of Public Health as required by this section shall be on a form provided or approved by the department.

(Ord. No. 518-10-98, § 1, (Exh. A), 10-6-98)

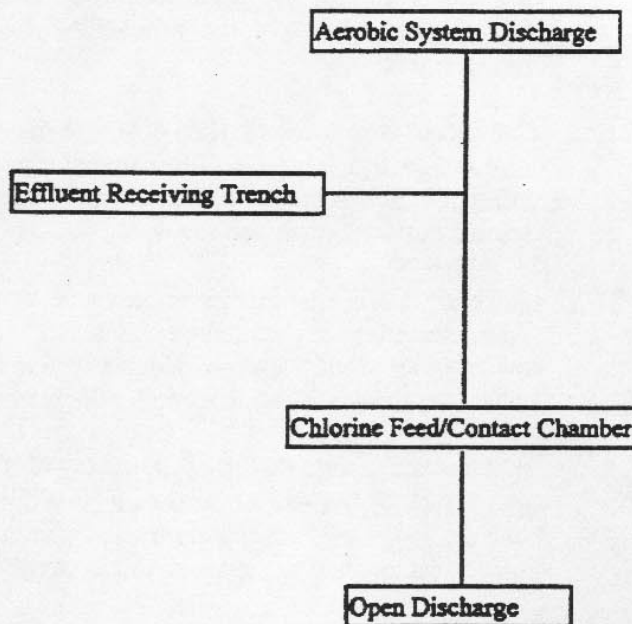
§ 95.507 Aerobic Systems: Additional Requirements

a. An effluent receiving trench shall be required for all Class 1 aerobic systems installed after October 16, 1998. Systems installed prior to this date will upon sale of the property, be required to meet the guidelines of this section.

1. The effluent receiving trench shall be designed at three (3) gallons per square foot of trench bottom area based on the daily design flow of the system.

2. Effluent receiving trenches or beds shall not be greater than 36 inches below the ground surface and shall have a minimum earth cover of 6 inches and a maximum earth cover of 12 inches.
3. The effluent receiving trench system shall be designed so the entire trench or bed is the first component to be filled with effluent. Any excess effluent shall be directed to the chlorine feed/contact chamber prior to discharge. The effluent receiving trench shall not be installed in direct series with the open-discharge. (see diagram #1)

Diagram #1



(Ord. No. 518-10-98, § 1, (Exh. A), 10-6-98; Ord. No. 586-11-98, § 1, 11-17-98)

'95.999. Penalty for violation of chapter

(a) Any person who shall violate any provisions of this chapter or fail to comply with any notice given by the department of public health as aforementioned shall, on conviction thereof, be punished by a fine of not less than \$75 and no more than \$750 for each violation, provided that for the second conviction of any violation of any provision of this chapter within one calendar year, the mandatory minimum fine shall be \$250. Each day during which a violation continues beyond the specified time for correction shall constitute a separate punishable offense.

(b) If the city corrects a violation itself or causes a violation to be corrected on its behalf, a lien for the amount of time and expense involved in correcting the violation shall be filed against the land where the violation occurred unless the owner or occupant of that land shall reimburse the city its expenses upon request. A minimum charge of \$250 for each hour, or part of an hour, shall be levied for work performed by or on behalf of the city in correcting a violation. An additional \$50 administrative fee shall be levied upon the lien for costs incurred by the City. Said lien shall be recorded with the Sangamon County Records Division and may be foreclosed upon according to Illinois Law.

(c) If the city corrects the violation itself or causes the violation to be corrected on its behalf, the violator shall nevertheless be subject to the above specified fine, in addition to a lien being placed on the violator's property.

(Ord. No. 97-2-96, § 1(Exh. A), 2-6-96, Ord. No. 105-3-98, § 1, 3-3-98; Ord. No. 30-01-00, 01-18-00)



Appendix G

Example Education Pamphlet

Lake Springfield Ecology and Management:
A Leaseholder and Community Guide

Prepared by

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City Water, Light and Power
Springfield, Illinois
1992

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Lake Springfield Ecology and Management: A Leaseholder and Community Guide

1. INTRODUCTION	6
2. LAKE HISTORY AND BASIC STATISTICS	6
A. Historical Perspective	6
B. The Lake	8
C. The Watershed	8
D. Lake Water Levels	9
3. LAKE ECOLOGY BASICS	11
A. Physical Factors	11
1. The Water	11
2. Morphology	12
B. Biological Factors	12
1. Plankton	12
2. Macrophytes-Wetlands	13
3. Fish	14
C. Chemical Factors	14
4. DETAILS OF THE LAKE SPRINGFIELD ECOSYSTEM AND ECOSYSTEM MANAGEMENT	15
A. Physical and Chemical Parameters	15
1. Stratification, Temperature, and Dissolved Oxygen	15
2. Nutrients	15
3. Suspended Solids-Transparency	16
B. Aquatic Plants	16
1. Algae	16
2. Macrophytes	16
a. Floating Plants	16
b. Emersed Plants	16
c. Submersed Plants	17
3. Control of Aquatic Vegetation	17
4. Exotic Plants	17
C. Aquatic Animals	18
1. Fish	18
a. Fish Management	18
b. Fish Consumption Advisory	19
c. Fish Kills	20
2. Insects	20
3. Snakes	21
4. Crayfish	22
5. Muskrats	23
6. Birds	23

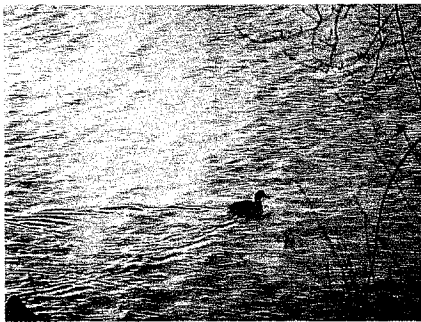
5. LAKE SPRINGFIELD AREA MANAGEMENT

	24
A. Permits	24
1. Introduction to Permitting	24
2. Septic Systems	24
3. Shoreline Stabilization	24
4. Dredging	25
5. Leasehold Construction	25
6. Fuel Storage Tanks	25
a. Underground Storage Tanks	26
b. Aboveground Storage Tanks	26
B. Septic Systems	26
1. Overview: Septic Systems vs. Sewers	26
2. Conventional Septic System	26
3. Aerobic Treatment Unit	28
4. Buried Sand Filter	28
5. System Failures	29
C. Sedimentation and Dredging	30
1. Sedimentation Surveys	30
2. Dredging	30
D. Erosion Control	31
1. Shoreline Stabilization	31
a. Principles and Installation of Riprap	31
b. Riprap Materials	33
c. Alternative Methods	33
1. Gabions	34
2. Building Block Revetments	34
3. Interlocking Concrete Blocks	34
4. Seawalls	34
5. Vegetative Stabilization	34
d. Licensed Contractors	34
e. Beaches	35
2. Agricultural Conservation Programs	35
3. Urban Erosion	37
4. Leaseholder Properties - Construction Activities	37
E. Yard Maintenance	38
1. Disposal of Yard Vegetation	38
2. Vegetated Shoreline Borders	38
3. Desirable/Undesirable Plants	39
4. Fertilizers	39
5. Pesticides	39
6. Drainage	40
7. Swimming Pools	40
F. Fuel Storage Tanks	41
1. Underground Storage Tanks	41
2. Aboveground Storage Tanks	42
3. Bulk Sales Restriction - Portable Containers	42

G. Boating	42
1. Operation	42
2. Maintenance	42
3. Cleaning	42
4. Waste Disposal	43
5. Trailering	43
6. Docks	43
7. Littering	43
6. LITERATURE CITED AND RECOMMENDED READING	44
7. ILLUSTRATION CREDITS	46
8. APPENDICES	
A. Fish Consumption Advisory	46
B. Detergents and Their Phosphate Content	48
9. GLOSSARY OF LAKE ECOLOGY AND MANAGEMENT TERMS	52
10. IMPORTANT PHONE NUMBERS	56

1. INTRODUCTION

Lake Springfield is a constantly changing, living system - much more than simply a basin filled with water. This guide to lake ecology and management at Lake Springfield is intended to inform lake area residents and homeowners, club members, camp managers, and other interested individuals about the physical and biological components of the lake. Moreover, the guide illustrates how our human presence affects Lake Springfield, and how we, as stewards, can best manage our activities in the lake area to positively interact as part of that system.



Many topics within this guide overlap, which might be expected when one tries to describe an integrated system. Cross references are given throughout the document to help outline the details of specific relationships. General concepts of lake



ecology are presented first to give the reader a feeling of the dynamics involved in a lake. Greater detail about the Lake Springfield ecosystem and management of its biological resources is then given. Specific guidelines follow that detail management strategies and regulation of activities in the lake area. All terms in bold typeface are defined in the glossary of this document for easy reference. Agency names, their abbreviated names, and phone numbers are found in Section 10.

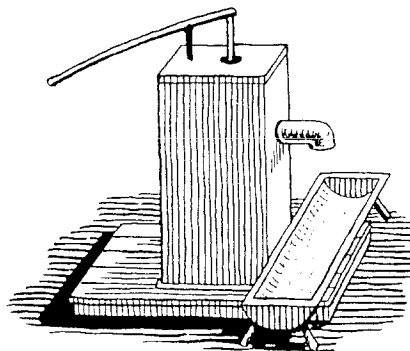
This publication primarily addresses those issues that affect the integrity of the lake. Topics regarding lake lease management and lake use policies can be addressed by talking with City Water, Light and Power (CWLP) Real Estate and Lake Security staff.

Read on, discover some new information, and make use of these ideas. We hope that this document is informative and answers many often asked questions. As lake managers, we welcome additional questions. An informed public is what this document is all about.

2. LAKE HISTORY AND BASIC STATISTICS

Historical Perspective

Springfield's water and electric utilities have come a long way since the first hand pumps and water troughs were in service around the town square and coal oil or gas lamps lighted city streets in the mid-1800's. In 1857, the city was greatly in need of an expanded water supply, and the digging of **artesian wells** was attempted in downtown Springfield. No ground-



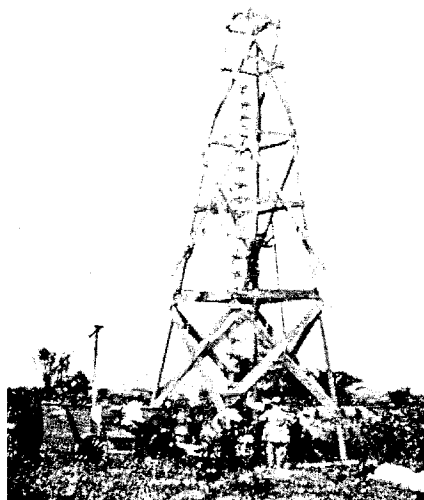
1839—TOWN PUMP

CWLP 1939

water was found (only a vein of coal) and the city turned to the Sangamon River as a water source. A new water works, the second ever in Illinois, was constructed in 1868. Throughout the late 1800's and early 1900's well galleries were established in the Sangamon River Valley to supplement the river source. Each of these successive developments resulted in greatly improved water quality,



Large supply well being built at the Sangamon River Waterworks in 1884 (above). Wells drilled in 1911-1912 in the Sangamon River Valley served as a supplemental source of water (right). (Both from CWLP, 1939.)



dramatically reducing the death rate from waterborne diseases.

Along with the development of the water utility, the electric operations similarly evolved from the first electric light in the city in 1881, lights on the square in 1882, to the first traffic lights in 1922. Generating facilities expanded rapidly at the river site adjacent to the water works.

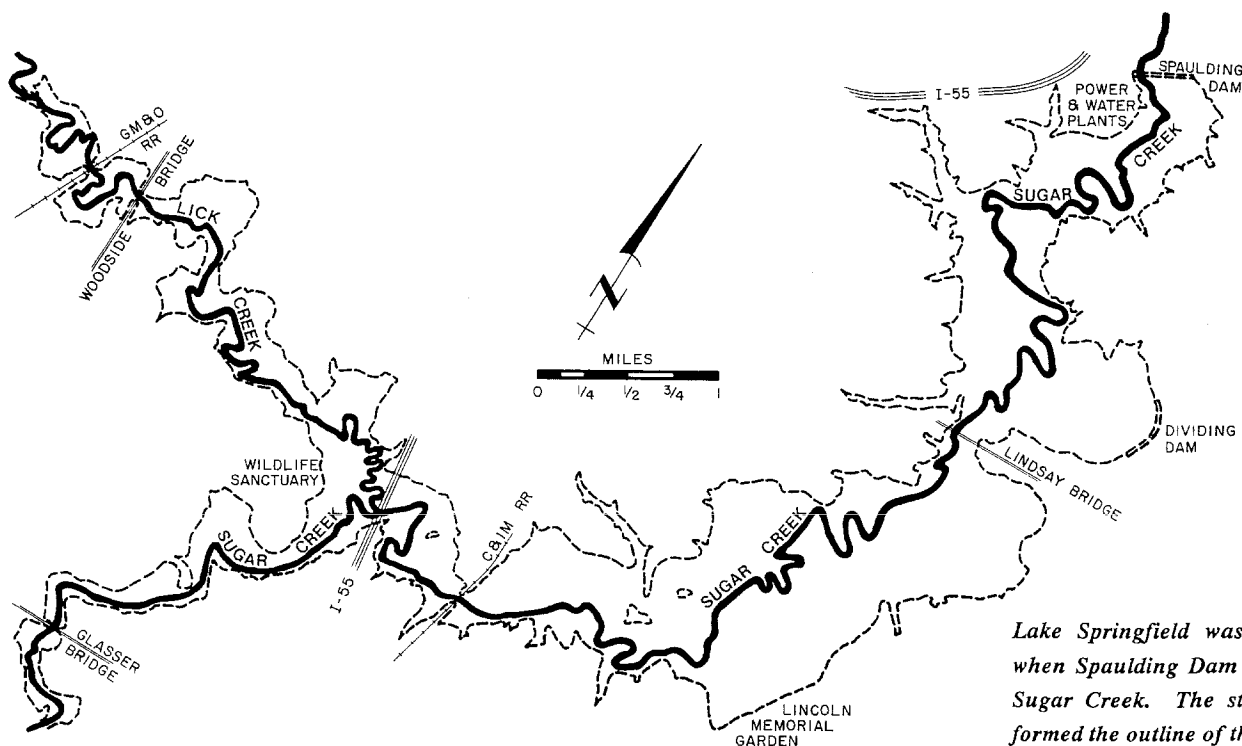
In response to the needs of a growing Springfield community, a

\$2.5 million bond issue was passed in 1930 for the construction of Lake Springfield as a new water supply. Several possible locations were considered for the lake, including a **main stem reservoir** on the Sangamon River similar to Lake Decatur, sites on the South Fork of the Sangamon, and on various creeks. It was decided to place the dam on Sugar Creek, a **tributary** to the South Fork, because this was most cost-effective. A second major tributary, Lick Creek, joined

Sugar Creek at a point where I-55 crosses the lake today. These two stream valleys formed the two arms of the lake west of that bridge.

At a cost of about \$109 per acre, the city purchased 8,500 acres of property for the lake. About 3,000 men comprising crews of Civilian Conservation Corps workers labored six days a week at a wage of 50 cents per hour to complete the job of bridge and road building, dam construction, riprap placement, and tree clearing and planting. Horse and wagon teams were part of the construction equipment of the time. The dam began impounding water three years after the bonds were issued for its construction. Spaulding Dam remains a marvel of engineering design, and Lindsay Bridge is, architecturally, a beautiful span.

Lake construction was finished in 1933, but 18 months passed before the basin filled completely with water. This prompted numerous taunts that the project was "Spaulding's folly" and "Spaulding's Frog Pond" mocking Willis Spaulding, the city's first Commissioner of Public Property. Spaulding served for 32 years from



Lake Springfield was constructed when Spaulding Dam was built on Sugar Creek. The stream valleys formed the outline of the lake basin.



Horse and wagon teams haul materials for the construction of Spaulding Dam. (Sangamon Valley Collection photo.)

1911 to 1943. In retrospect, people have recognized his foresight that led to the construction of the lake. On May 2, 1935, water first flowed over the spillway marking the completion of the reservoir. During dedication ceremonies on July 12 to 14, 1935, water from lakes and rivers all over the world was brought to Springfield to christen Lake Springfield's completion. Use of the Sangamon River as a source of water ended in 1936. Rededication ceremonies and special events at Lake Springfield held throughout the summer of 1985, marked 50 years of the new age in water supplies for the City of Springfield.

The Lake

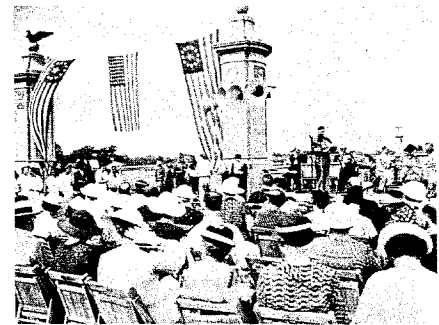
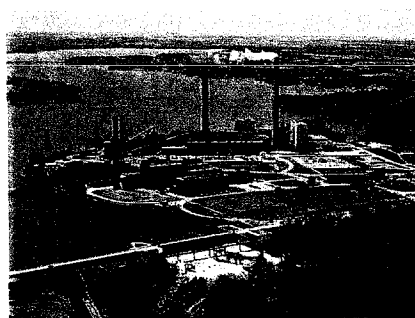
Spaulding Dam, which impounds Sugar Creek near the power plants, was actually only one of two dams constructed to form Lake Springfield. The narrow divide between Horse Creek, to the east, and Sugar Creek was relatively low in elevation requiring an earthen "dividing dam" to be built just south of the Muni Opera location on East Lake Drive. This structure keeps impounded water from

Providing drinking water and cooling water for the City's electric generating plants is the primary function of Lake Springfield. (Photo by Michael S. Wells Photography.)

overflowing into Horse Creek.

The lake's principal functions are to serve as the city's drinking water source and as condenser cooling water for the city's power plant complex. Also, the lake area has developed into a major recreational and residential area. Initially, few people lived near the lake, because it was "too far from town". People had summer cottages rather than permanent homes in the early years.

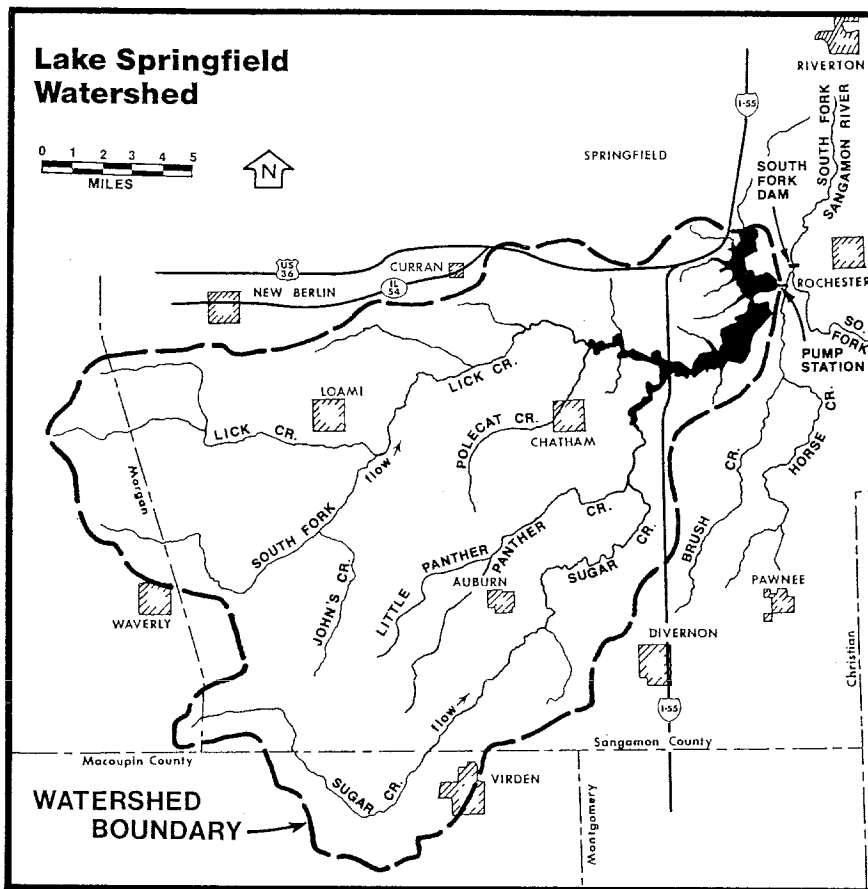
When constructed, the lake encompassed 4,300 surface acres holding 19.5 billion gallons with an average depth of 14.4 feet. The deepest point in the lake was approximately 30 feet near the dam. In 1984, when the last lake bottom survey was taken, the lake volume had decreased to 17 billion gallons with an average depth of 12.5 feet. The loss in volume was due to **sedimentation** (see Section 5C). The dredging west of the I-55 bridge in 1987-90 restored 652 million gallons of that lost capacity.



Ceremonies changed little over time (except for the hats) for dedication (1935) and rededication (1985) events at Lake Springfield. (Top photo courtesy of the Herbert Georg Studio and the Sangamon Valley Collection.)

The Watershed

Where does our water come from? This is a simple question, but the answer is not commonly understood. Rain falling directly on the reservoir is one source of water, but this is a minor fraction of total input. The greatest source is the stream system on which the lake is built, the Lick and Sugar Creek basins. These streams reach as far south as the towns of Thayer and Virden and as far west as Waverly. Some of the tributaries feeding Sugar and Lick Creeks are Johns Creek, Little Panther Creek, Panther Creek, Polecat Creek and the South Fork of Lick Creek. Water flowing in these creeks ultimately flows into Lake Springfield. All land that drains into the stream systems entering Lake Springfield is collectively referred to as the lake **watershed**. It has to rain in the 265-square-mile area (watershed) southwest of the actual lake, and that rainwater has to run off to these creeks for Lake Springfield to incur a substantial inflow of water. In



The source of water for the lake is its 265-square-mile watershed, primarily southwest of the lake. The major feeder streams are Lick and Sugar Creeks which flow northeast into the lake.

addition to the major tributaries to the lake, small ditches around the entire perimeter of the lake and a few larger drainages such as those which form the Hazel Dell-area bays, Long Bay, and Maple Grove Bay, contribute some runoff to the lake. A torrential rainfall in downtown Springfield will have no effect on the lake water level. The downtown area is not in the Lake Springfield watershed; rain falling there drains north to the Sangamon River. Stevenson Drive in the city and Route 54 to the west between Curran and New Berlin form the approximate northern limit of the watershed that drains south toward the lake.

The watershed boundaries can be viewed in the same sense as the Continental Divide. Runoff will flow east toward the Mississippi River or west toward the Pacific Ocean depending on which side of the Rocky Mountains that rain falls. Elevation also divides stream systems surrounding the Lake

Springfield watershed. It is from one of these other systems to the east, the South Fork of the Sangamon River and Horse Creek, that the City has gained the ability to obtain additional water in times of need. During the severe drought of 1953 to 1955, the City built a movable dam on the South Fork immediately downstream from its confluence with Horse Creek. A



The movable South Fork Dam can be raised to back water into Horse Creek (center) for pumping into Lake Springfield when the water level drops in the lake.

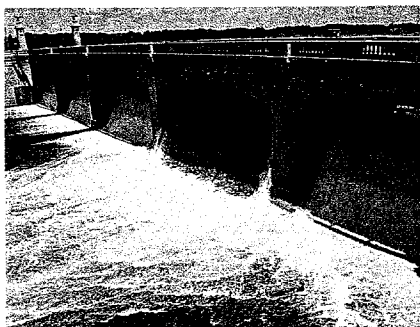
channel was constructed from Horse Creek to the dividing dam where a pump station was placed. The pump station is not readily visible, since it is located below the eastern sideslope of the dividing dam. The large green pipe entering the lake conveys water from that station. In times of low water in Lake Springfield, the South Fork channel dam can be raised to back water up to the pumps. These streams pick up drainage between Springfield and Taylorville, and when adequate quantities of water are flowing, two pumps can deliver as much as 70 million gallons per day into the lake.

Lake Water Levels

What is a normal lake level? The lake is full when the water surface is at the nominal pool elevation of 560 feet above mean sea level. Lake level is reported daily in the newspaper weather section based on this 560-foot full pool. For example, if the lake is 1.5 feet below full pool the lake elevation will be registered as 558.5.

Full pool is the 560-foot mark where water begins to flow over the dam spillway if no gates are lowered. Normal lake elevations are usually at some point less than full pool and are seasonally variable. How full the lake stays is largely up to mother nature. A full pool elevation is not normal except for possibly a few weeks in the spring. The lowest normal elevations are in the fall and early winter months after a long hot summer, and highest lake levels occur in springtime after the seasonal rains. For example, while full pool elevation may be at 560 feet, normal September elevations are nearly two feet below full pool.

It simply has to rain in the lake watershed for lake levels to stay high. During a hot, dry summer, Sugar and Lick Creeks often dry up into a series of disconnected pools and contribute little or no water to the lake. Demand for water continues and is usually high due to outdoor water use.



Water crests at Spaulding Dam when the water level reaches 560 feet above mean sea level. Gates are lowered to let out more water if the lake level is six inches above the full pool mark.

Furthermore, warmer weather increases evaporation at the lake. This combination of factors results in a reduced lake level in late summer and autumn. Many believe that the State Fair activity causes the lake level to fall. It is, rather, merely a coincidence that the State Fair and hot weather happen to occur at the same time, notwithstanding the small additional demand for water that the State Fair creates. When the creeks run low because of the hot weather, subsequent declines in water level occur more rapidly because there is little recharge of the lake from inflow.

When the creeks run dry, this generally means that soil moisture in the watershed is low. It may take several rains over a couple of weeks or a hard



Lake water level is determined by flow from its feeder creeks. In Lick Creek shown here, spring storms bring the stream to flood stage (above), whereas it can dry up into a series of disconnected pools in summer (below).



rain over a few hours for water to run off to the creeks. Croplands usually soak up all the small rains, and the lake never receives any of that water. Continuous gentle rainfall over a long period is preferable to a driving rain, because soil erosion and subsequent sedimentation to the lake is lessened during such rainfalls. Runoff to the lake is influenced by amount of crop cover and crop residue, season, slope of land, soil types and moisture levels, and quantity of rainfall.

In the past, the lake was kept a foot or more below full pool during winter time. Now, to help insure that sufficient water is present in the springtime, the lake is kept to within six inches of full pool when possible. This serves as a hedge against a spring drought while keeping the lake low enough to forestall damage to facilities from ice. Dam gates are lowered if water exceeds six inches above full pool.

The lowest water elevation at the lake was at 547.44 during the 1953-55 drought, and the highest level was during the storm event of December 1982 when the lake crested at 564 feet.

Average lake level during each month based on average monthly levels each year from 1936-1990. Full pool elevation is 560.00 feet above mean sea level.

<u>Months</u>	<u>Average Surface Elevation</u>
January	557.94
February	557.99
March	558.47
April	559.07
May	559.46
June	559.59
July	559.29
August	558.87
September	558.39
October	558.09
November	557.89
December	557.89

The original Sugar and Lick Creek channels near the current I-55 bridge were exposed during the 1953-55 drought when lake levels dropped 13 feet. (Photo courtesy of Chuck Laswell.)



3. LAKE ECOLOGY BASICS

Unlike natural lakes created by glaciers or other grand natural events, Lake Springfield falls into a category of lakes called **impoundments**. Impoundments or reservoirs are manmade lakes constructed from existing streambeds and floodplains. The natural features of the aquatic system that is created begin to develop as the basin fills with water. In all lakes, natural development or succession is a continuing process.

Beneath the water surface there is much going on in the lake **ecosystem**. An ecosystem is a community of organisms and its environment. Climate, lake shape (**morphology**) and structure (rocks, sediments, trees, etc.), watershed characteristics, biological factors, and water are the major components in a lake ecosystem. The biological players include rooted aquatic plants (**macrophytes**), **algae**, bacteria, fish, insects, and other organisms which live in and around the lake. Different combinations of these biological, chemical, and physical components allow every lake to be unique; however, underlying scientific principles involving these factors dictate similarities between comparable lakes.

Physical Factors

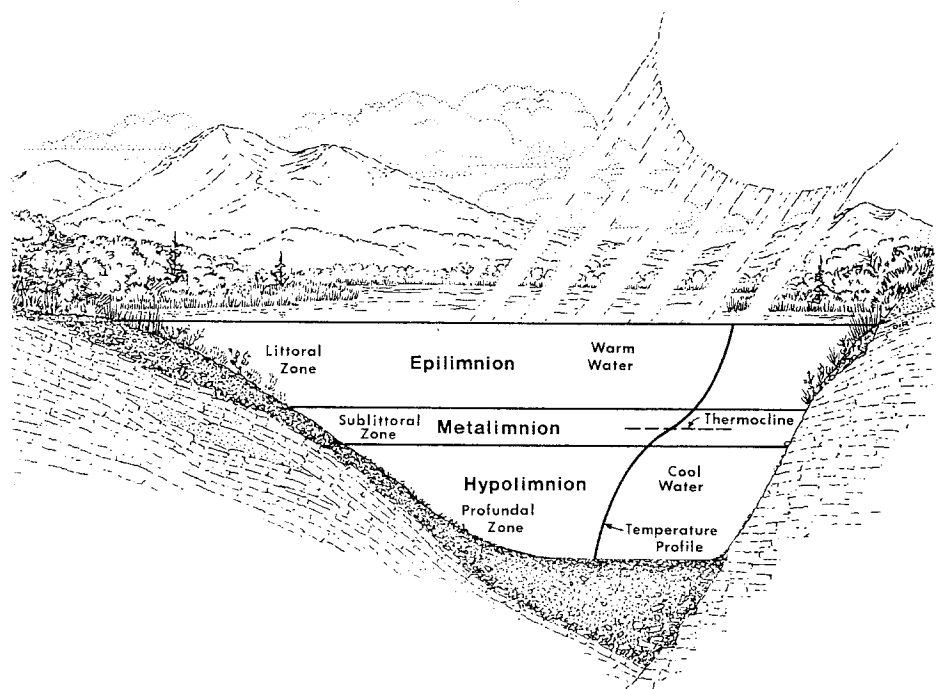
The Water

Perhaps the most important factors affecting any lake are the physical properties of water itself. Many lakes in Illinois **stratify** during warm weather forming several layers of different temperature water within the lake. The layer of warmer water near the surface, heated by the sun, is called the **epilimnion**. This zone of the lake usually contains enough oxygen for the survival of fish and

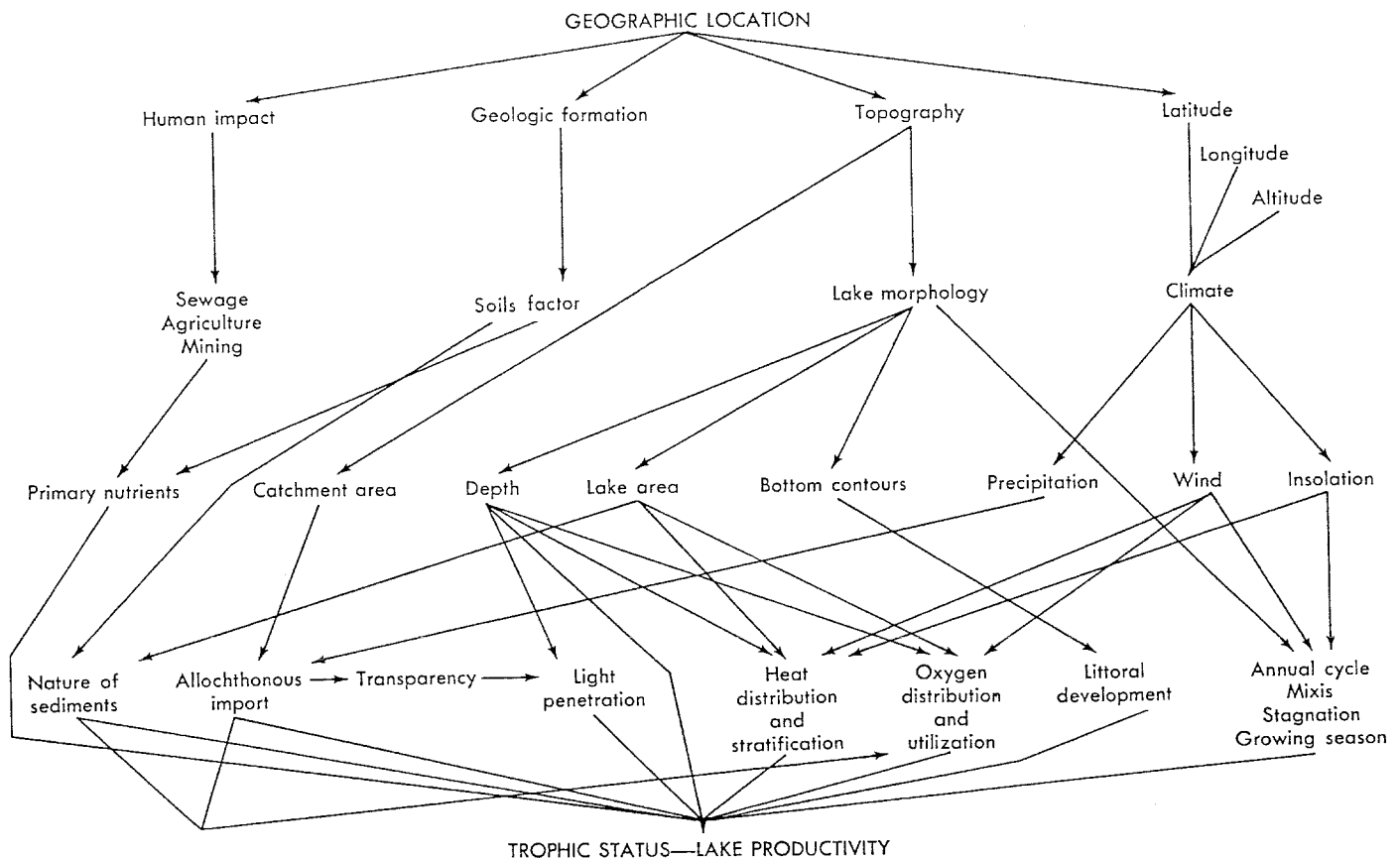
other aquatic animals. Oxygen is present because this layer receives abundant light and supports the growth of free-floating algae, called **phytoplankton**. Oxygen is produced by these plants through **photosynthesis**, and it also diffuses directly into the water from the atmosphere.

Beneath the upper layer is the **metalimnion**, which represents the transition zone between the warm surface layer and the cooler, more dense and, therefore, heavier **hypolimnion** layer at the bottom of the lake. The plane of greatest temperature change within the metalimnion is called the **thermocline**. Water in the hypolimnion is prevented from mixing with surface waters by the thermocline, and this area often does not receive enough sunlight to support the growth of rooted plants or algae. As summer progresses, the bacteria involved with **decomposition** of organic matter in

the lake sediment and other organisms may consume all of the oxygen present in the hypolimnion. This causes conditions where oxygen is no longer present (an **anaerobic** state) in this water layer or the uppermost layers of lake sediment. Fortunately, nature prevents these anaerobic conditions from continuing forever. During fall, the warmer surface layer slowly cools until it is the same temperature as the hypolimnion. When this occurs, the thermocline density barrier breaks down, and wind forces are able to mix the lake from top to bottom. This phenomenon, called lake turnover, can sometimes lead to a brief **algae bloom** as nutrient-rich waters from the hypolimnion are brought to the lake surface where there is sufficient sunlight to stimulate phytoplankton growth. The water becomes turbid during this mixing period. A similar circulation period occurs in the spring



Many lakes in the midwest stratify into layers of different temperature water during the warm months of summer. The lake bottom is described in terms of the various zones often indicative of levels of biological productivity based on differences in substrate, light, and oxygen present. (Modified from Cole, 1983 and NALMS, 1988. See credit on p. 46.)



Interactions of many factors determine the composition, distribution, and amount of biota, the rates at which nutrients are recycled, and the general productivity of the lake. (From Cole, 1983. See credit on p. 46.)

when ice melt opens the lake once again to mixing by wave action.

From wave action to stream flow, water movement keeps the lake in a state of change. Subtle changes in the basin occur as water entering the lake from the watershed carries in soil, fertilizers, and other products of erosion. The heavier sand and silt particles settle out in the upper arms of the lake, while smaller particles, such as **colloidal clay**, can remain suspended in the water almost indefinitely.

The clarity of the water has importance beyond how "nice" the water looks to us. Sediment-laden runoff from tributaries, shoreline erosion, resuspended sediments, and dense blooms of algae can make the lake water less transparent. Muddy or algae-green waters block sunlight from reaching submerged oxygen-producing

plants, and it makes finding dinner for sight-feeding fish, such as largemouth bass, more difficult.

Morphology

Morphology is one major geographic factor influencing lake functions. Basin shape and size affect the patterns of wave action on the shoreline. Shorelines with gradually sloping beaches don't erode nearly as rapidly as those areas where there's a steep drop off right next to shore. In shallow water, most of the energy in waves is dissipated by the lake bottom before the waves break on shore; but, in areas of deeper water, little wave energy is expended before the breakers crash. Shoreline areas particularly susceptible to erosion are located where waves have the opportunity to develop considerable energy by

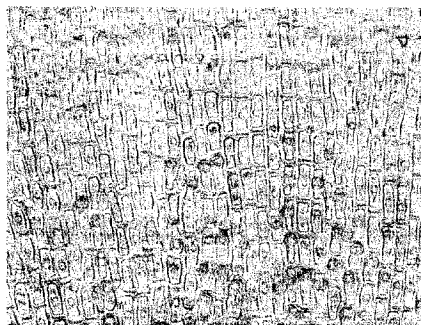
traveling a long distance or **fetch** across the lake. Shorelines exposed to the prevailing winds and long fetches are most vulnerable to the erosive forces of wave action. Water depth also influences biological activity by defining an aspect of habitat that may be appropriate for certain species and not others.

Biological Factors

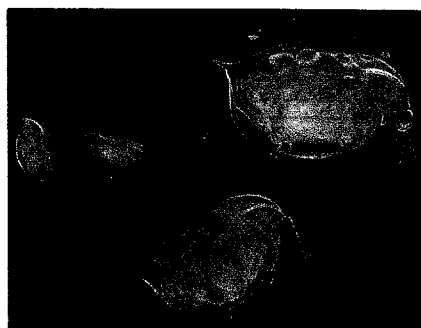
Plankton

The biological building blocks at the base of the lake **food chain** are the microscopic plants (phytoplankton) and animals (zooplankton). The phytoplankton and filamentous algae, as well as the rooted aquatic plants, use their pigments (**chlorophyll**) to produce oxygen through photosynthesis

from water, carbon dioxide, and sunlight. Algae are the smallest known plants. Algae possess no true leaves, stems, or roots and are carried through the water by wind and currents. The zooplankton are tiny crustaceans that consume bacteria, **detritus**, and phytoplankton, and in turn serve as a food supply for small fish.



Algae, the primary producers (top), and the zooplankton, like these small crustaceans (bottom), are the building blocks of biological productivity in a lake. (Top photo by L. Coutant.)



Given the appropriate **habitat** and food, small animals of all sorts mature and reproduce over time, and the cycle begins anew. The food chain is most active in the **littoral** (shallow, near-shore) and upper **limnetic** (open water) zones of the lake during the summer when the plant and animal growth rates are stimulated by abundant sunlight and warm water. As sunlight decreases in the fall, the plant communities of the lake begin to diminish. Many of the plants will die over the winter and settle to the bottom as organic detritus. Rooted plants and algae that survive through winter play an important role in maintaining oxygen levels needed by fish during ice cover.

Macrophytes-Wetlands

Macrophytes are large water plants that have flowers, true leaves, stems, and roots. Depending on where they grow, macrophytes are classified into three separate categories: floating, emersed, and submersed. Macrophytes typically characterize wetland areas of lakes. The periodic, if not constant, presence of water and the existence of **hydric soils** are also evident in wetland sites. There are numerous varieties of wetlands each typified by a characteristic hydrology, soil type, and dominant vegetation.

Wetlands provide food and shelter for a diversity of aquatic life and are among the richest and most productive ecosystems in the world. Forty percent of Illinois' threatened and endangered species live in wetlands. Many fish use this protective cover as a nursery or spawning ground. Vegetation is an important food source for many species. Insects also live on the vegetation and serve as food for fish and birds. Dead leaves and stems break off into the water forming small bits of decaying plant matter, known as detritus. This detritus serves as food for foraging fish and insects, which in turn provide food for the larger, predatory fish. This description illustrates the concept of an aquatic food chain with wetland plants forming the foundation.

Another important value of wetlands is their ability to function as natural

water treatment facilities. They take up excess nutrients and filter out chemical and organic wastes. Aquatic vegetation in Lake Springfield filters out some suspended solids by slowing down water currents in the lake's upper reaches. Wetland vegetation is an excellent buffer against shoreline deterioration. The roots of the plants strengthen the soils along the shore, thereby decreasing erosion. This is especially helpful during heavy storms when waves are the highest and erosion is often the most severe. Homeowners are encouraged to leave a band of vegetation at their shoreline both in and out of the water (see Section 5E) to prevent erosion.

Wetlands present a resource for numerous recreational activities, including boating and fishing, a backdrop for hiking and camping, and nature study. Fishermen, hunters, and nature lovers depend on wetlands to produce the animals they catch or watch. The aesthetic qualities of wetlands are abundant.

A lake with considerable plant growth usually will support abundant and diverse animal life because of the food and habitat provided. However, excessive plant growth can be detrimental. Plants consume oxygen in the process of respiration. The effects of this process are masked during the daytime because plants produce great quantities of oxygen during photosynthesis. If plants consume more oxygen than they produce when they respire at



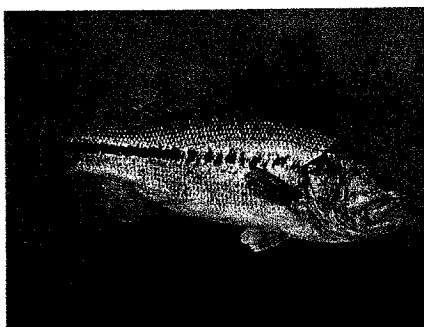
The near-shore, shallow, littoral areas of a lake are active centers of biological activity in a lake; a feeding ground in this case for a great blue heron (left). The production of aquatic vegetation in the littoral zone also buffers shoreline areas from intense wave action (right).

night or on cloudy days, low oxygen concentrations in the water can result. An overabundance of decomposing plant matter also can cause a lake to become devoid of oxygen, resulting in fish kills. A moderate amount of plant growth is best.

Fish

Each fish species has preferences for certain environmental conditions, such as bottom substrate (e.g. sand, gravel, mud, or rocks), temperature, and water depth. Combinations of these parameters comprise a preferred habitat or niche for a given fish species. Fish location in the reservoir also is influenced by the behavior patterns of feeding and spawning activities. One defensive strategy among fish is the schooling behavior of many minnow species and gizzard shad (safety in numbers).

Feeding habits differ among species. Adult fish, like largemouth bass, tiger muskie, and walleve, are piscivorous,



The largemouth bass is a top predator in lake ecosystems, eating other fish for the bulk of its diet.

that is, they eat other fish. The gizzard shad, falling prey as one of the most common foods of adult largemouth bass, can often be seen as silver flashes in shallow water, scraping algae off of rocks for their meals. Channel catfish eat a variety of plant and animal foods. The diet of fish larvae or juvenile fish of the piscivorous species may first include

plankton and insects before they become primarily fish eaters. The strategies of individual fish may be species specific; however, all are ultimately related to survival in the complex network of their environment.

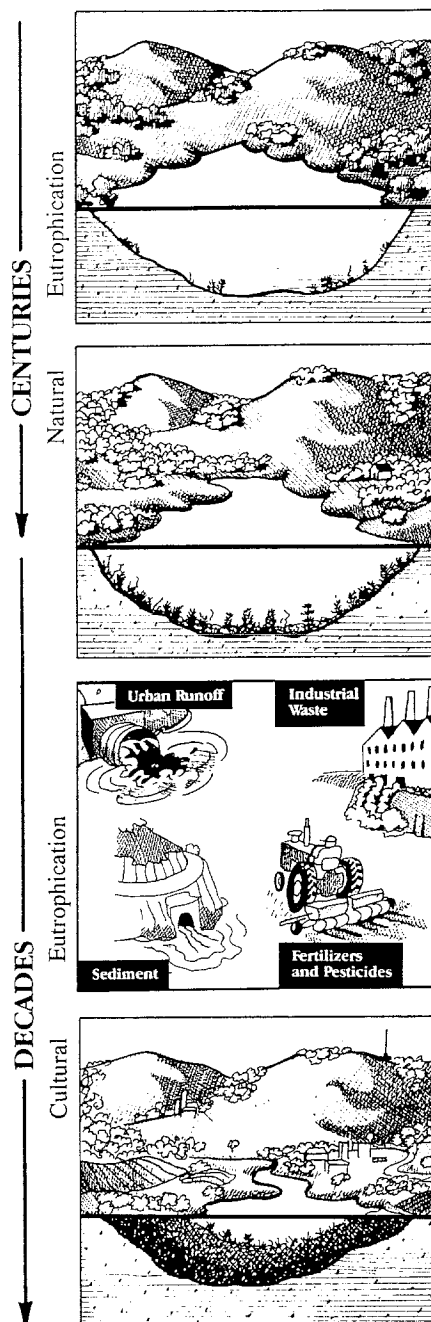
Chemical Factors

Like all living things, aquatic plants and animals require **nutrients** for growth, the two most important being nitrogen and phosphorus. Nitrogen is used in the synthesis of proteins, which are critical for the structure and function of living material. Phosphorus is needed in the energy systems of all cells used to do the work of building protein. This is the principle behind the use of plant foods (fertilizers) in agricultural fields, lawns, and gardens. The growth of algae and macrophytes in the lake uses nutrients in the same manner.

An **oligotrophic** lake is one that has few nutrients, resulting in low biological **production**. A **eutrophic** (nutrient-rich) lake will support the growth of large amounts of algae and macrophytes. The process of lake aging (often accelerated by human activities) whereby a lake fills in and is enriched with materials from its watershed is called **eutrophication**. Fertilizers applied to agricultural lands and residential lawns, failing **septic systems**, and urban runoff can all contribute significant amounts of phosphorus and other unwanted plant nutrients to the lake.

Other chemical factors, including **alkalinity**, **ammonia-nitrogen**, **chlorophyll**, **heavy metals**, **nitrate-nitrogen**, **pesticides**, **pH**, and **water color**, are monitored at many lakes. Results tell us much about the quality of a lake and provide a basis for lake management programs and decisions.

LAKE EUTROPHICATION



The natural process by which lakes form, evolve and disappear takes thousands of years. Human activities, however, can change these lakes -- for better or worse-- in less than a single generation. (From: The Freshwater Foundation and Minnesota Pollution Control Agency, 1985. See credit on p. 46.)

4. DETAILS OF THE LAKE SPRINGFIELD ECOSYSTEM AND ECOSYSTEM MANAGEMENT

Historical studies of biological and chemical characteristics, and continued monitoring of these parameters at locations throughout the lake, supply the necessary data to evaluate present and changing conditions at Lake Springfield. A few major points are discussed here, and a thorough evaluation of the lake (Hinsman and Skelly, 1987) is available in the Lincoln Library.

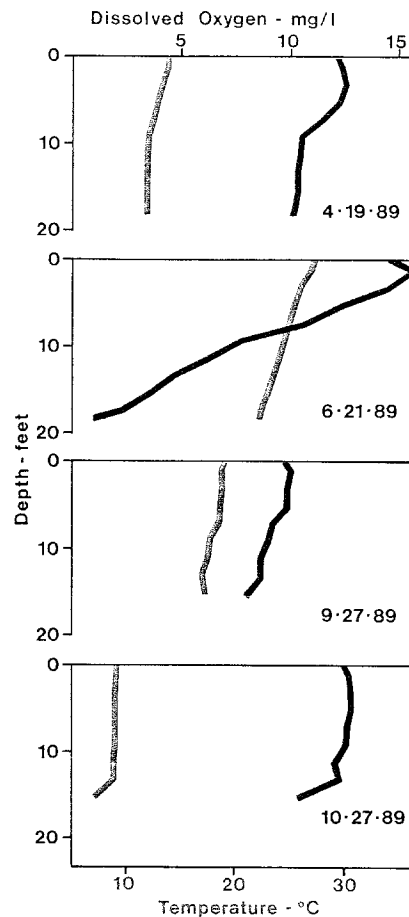
Physical and Chemical Parameters

Stratification, Temperature, and Dissolved Oxygen

The stratification patterns at Lake Springfield differ slightly from textbook examples. The relatively shallow water of the lake allows good mixing of surface and bottom waters, except during extremely hot periods with little wind. Also, the northern basin has a modified temperature and stratification pattern due to the circulating cooling waters of the power plants. Significant ice cover in the north basin during winter is an uncommon occurrence due to the warm water effluent. Regardless of power plant effects, water temperature throughout the lake will rarely differ more than nine degrees fahrenheit from top to bottom. Typical seasonal temperature and dissolved oxygen profiles monitored south of Lindsay Bridge in 1989 illustrate the formation of a distinct gradient of dissolved oxygen during the hot days of summer, whereas profile values are relatively constant the remainder of the year.

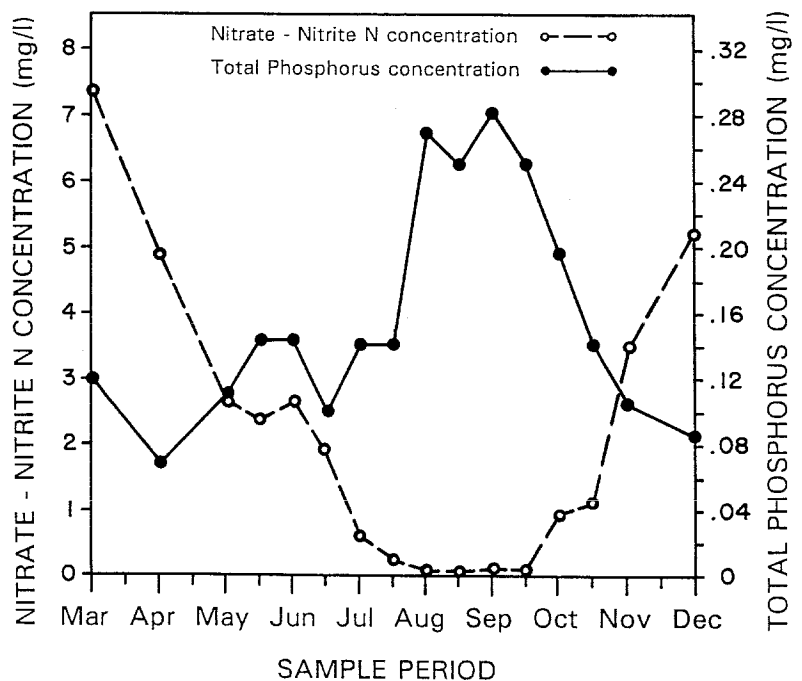
Nutrients

Lake Springfield reflects the character of its agricultural watershed. Extremely high levels of phosphorus cause excessive algae growths at



certain times of the year. Water in a lake with moderate productivity would have an average concentration of about 0.015 milligrams per liter (mg/l) total phosphorus. Lake Springfield water averages about 0.16 mg/l or 10 times the moderate amount. Nitrogen values, monitored in the form of nitrate-nitrite nitrogen, average about 20 to 40 times higher than needed for moderate production. Nitrogen becomes scarce late in the summer because its uptake is extensive in the spring and early summer. Algae production will then slow down, because one of the needed elements (nitrogen) is missing, regardless of how much phosphorus is available. Production of algae can continue when supplies of nitrogen increase. Based on nutrient concentrations, Lake Springfield is

Temperature and dissolved oxygen in a lake change seasonally and affect the rates of biological activity (left). The levels of nitrogen and phosphorus, two important nutrients in the lake water, depend on inputs from sources and uptake by the plants and animals (below).



considered hypereutrophic or excessively productive. Simply stated, the lake has more nutrients than it needs.

Suspended Solids- Transparency

Algae produced within the lake and suspended sediments from runoff comprise the bulk of suspended solids. These elements cause the water to look cloudy or turbid. In addition to using the analytical method of determining suspended solids, a simple field procedure using a Secchi disc gives us a similar interpretation in measuring transparency or how deep one can see into the water. The statewide average Secchi depth for lakes monitored in 1989 was 42 inches (depths ranged from seven to 151 inches). The Lake Springfield value, an average of three sampling locations, was 23 inches.

The upper arms of Lake Springfield generally have the lowest clarity of about 14 inches or less depending on the sediment load of water that has just entered the lake from Lick and Sugar Creeks. Suspended sediments begin to settle out in the upper areas of the lake, so transparency increases progressively through the lake to as much as 46 inches near the dam. Clarity is usually best during the coldest months when wind and rainfall are low. It is lowest during the summer times of abundant algae populations and heavy boat traffic, as well as when rainfall events occur while few crops are in the fields and erosion is excessive.



Aquatic Plants

Algae

Phosphorus and nitrogen are used for growth by algae just like they are used by our lawns and houseplants. Algae blooms (excessive growths) often seen at Lake Springfield in late summer are caused by high nutrient levels in the water. Algae blooms are seen as bright green water, or as yellow and reddish-brown films floating on the water surface. Other filamentous types of algae often form thick mats when they grow rapidly. There are many different, seasonally abundant species of algae at the lake. Blue-green algae are typical of eutrophic (overly productive) lakes and are the dominant algae found at Lake Springfield throughout the year. While some base level concentration of algae is essential to the lake ecosystem, a large bloom can cause taste and odor problems in the drinking water. This necessitates the use of additional treatment measures at the water filtration plant.

Macrophytes

In Lake Springfield, most of the wetlands are located in the shallow upper reaches of the Lick and Sugar Creek arms and in most shallow coves and bays. Littoral zones of the lake (those areas between the shoreline and deep water) also support wetland vegetation; however, areas subject to continuous wave action usually will not sustain vegetation due to the physical pounding of the water.

Floating Plants

Free-floating, surface plants take up nutrients directly from the water by means of rootlets or through cell walls. These plants are very small and are

A common "yardstick" of water clarity is the Secchi disc reading. The disc is lowered into the water until it can no longer be seen, and that depth is recorded for comparison to data from other lakes and to this lake at other times.



Too many nutrients in a lake can lead to over production by the algae to form a "bloom". Various colors within the bloom are often indicative of different species of algae present. Fertilizers applied to lawns near the lake can be partly responsible for localized blooms of algae.

often mistaken for algae. They reproduce rapidly forming thick layers, and concentrate in quiet water areas of the lake. Wind and currents determine the drifting and layering of these plants. A typical specimen found in Lake Springfield is duckweed, usually seen with several small leaflets. It is often washed into the lake in great quantities from the intermittent summer pools of the feeder creeks.



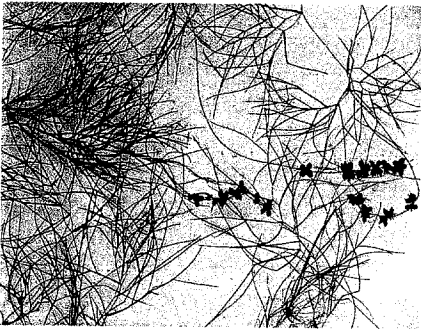
The duckweed is a common floating aquatic plant at Lake Springfield. Some species of ducks do consume duckweed as part of their diet.

Emersed Plants

Most plant species in Lake Springfield are referred to as emersed plants, which grow above the water, but root themselves to the lake bottom. The most prevalent species include: American lotus (commonly called lily pads), cattails, reed canary grass, swamp dock, and water willow. Patches of arrowhead, creeping water primrose, and water smartweed also have been found.

Submersed Plants

Little submersed vegetation has been found in Lake Springfield. This is due to the lake's shallow **euphotic zone** (the zone of light penetration into the water). Algae and other suspended solids keep the sun from penetrating to the bottom. Without the needed sunlight, the plants will not grow. This absence of clear lake water, however, does help to inhibit excessive weed growth that causes problems at many lakes where chemical, biological, or physical removal of vegetation is needed.



Sago pondweed is a common submersed plant found in Illinois lakes and ponds. These plants provide habitat and food for many aquatic animals. An overabundance of these macrophytes, however, can cause lake management problems. (Photo courtesy of James Langbein.)

Control of Aquatic Vegetation

The large surface area of Lake Springfield precludes the application of algicides or alum typically used to control algae on small ponds. In quiet areas around boat docks, cheesecloth screens may be used to corral films of algae and garden rakes can be employed to physically remove filamentous mats. If the harvest is added to the vegetable garden, fertilization requirements might be lessened next season. The only viable long-term control is to reduce the nutrient input promoting the excessive growths at the sources. The City's efforts to promote **soil conservation** in the lake watershed, regulate septic system installation, and discourage fertilizer use on near-shore yards are aimed at this goal.

Aquatic herbicides have use restric-



tions for public water supplies like Lake Springfield and should never be applied by lakeside leaseholders. Because aquatic vegetation provides food and cover for aquatic organisms, produces oxygen, and stabilizes shorelines, it should be left alone. If severe restrictions to boat docks occur, one of the following methods may be an acceptable means of control.

Hand pulling works well for shoreline plants such as cattails. Small plants should be uprooted as soon as possible to avoid encountering heavy root systems. Clipping cattails at the sediment surface also will work, and is much less labor intensive. This technique depletes the plant's nutrient sources, and with occasional cutting, the cattails will remain in check.

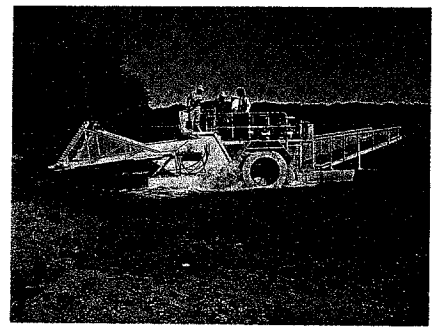
Common garden rakes with long handles are good tools for weed control. Several varieties of weed rakes and cutters suitable for the individual user are available. Shallow areas should be raked in early spring to cut down summer growth and again in fall to remove species like cattails that will survive throughout the winter. These plants also will serve as a good source of mulch and organic matter for the garden. Plant remnants disposed away from the water also will not leach the phosphorus, accumulated during growth, back into the water when they decompose.

CWLP owns a weed harvester, a combine-like machine, to cut and collect aquatic weeds as it paddle wheels itself through the water. It can reach most areas that have two feet of



Familiar to many lake residents, the American lotus (above), commonly called a lily pad, is typical of emerged macrophytes. Arrowhead (nestled here among the reed canary grass) (left) is another emerged plant becoming common in the lake's upper reaches.

water depth. CWLP's Lake Services Office can be contacted if the harvester is needed to remove weeds from an area.



CWLP's aquatic weed harvester is available to cut weed growth when it reaches nuisance proportions. Residents are urged to leave a band of vegetation along shorelines to protect the bank and enhance the biological integrity of the area.

Exotic Plants

Introduction of new aquatic plant species into the environment can be detrimental to native habitat. Some can be very invasive, destroying natural communities of plants and animals and impeding recreational uses of a lake. Gardening catalogs and local gardening centers offer many kinds of water lilies and other exotic (non-native) aquatic plants. Never stock or plant any of these exotic plants into Lake Springfield or any other natural area. Refer to Section 5F for tips on checking boat trailers, so non-native plants from other lakes are not brought to Lake Springfield.

Aquatic Animals

Although Lake Springfield is a manmade reservoir, it still provides habitat for all shapes, sizes, and types of creatures that live in or near an aquatic environment. The area also attracts significant numbers of terrestrial wildlife species because of the greenbelt of trees and other vegetation around the lake and the presence of a water source. Migratory waterfowl and other animals use Lake Springfield as a stopping off and refueling area on the way to other destinations.

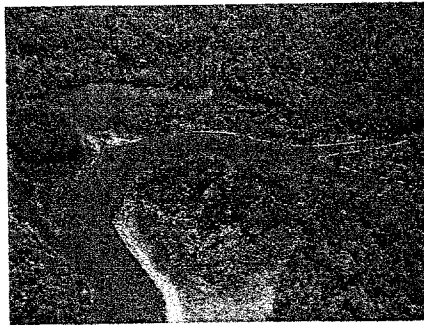


The common areas or green spaces surrounding the lake form an important buffer from developed areas. The buffer also provides habitat for a variety of terrestrial wildlife species to complement the diversity of aquatic animals found in the lake.

The types of animals present are largely a reflection of the habitats that are available; the greater the diversity of habitats, the more species of animals will be found. The upstream wetland areas in the Lick and Sugar Creek arms of the lake are physically quite different from the large open expanses of the main lake basins. Also, the nooks and crannies along shoreline areas provide important habitat for fish and other aquatic organisms.

Fish

Lake Springfield is host to approximately 39 species and several hybrid fish. Some of the most common sport-fish species are bluegill, carp, channel catfish, largemouth bass, white bass, and white crappie.



The upper lake areas in Sugar and Lick Creeks host an array of wildlife habitats formed by various vegetation types, including cypress trees. Green-backed herons, kingfishers, and wood ducks are common in these upper reaches.

Fish Management

Sport fishing is one factor that can influence a lake fishery. Fishing at Lake Springfield is an important recreational pursuit for area citizens. Also, sport fishing generates about one million dollars for the local economy

the lake and to maximize public enjoyment.

One strategy has involved management of the largemouth bass population at Lake Springfield. In the mid-1980's, the largemouth bass population was stable, but at a relatively low density. Adult bass were of good size, but there were fewer numbers of adult and juvenile bass than a lake of this size could support. One reason for this population structure was poor recruitment, which is reproduction with subsequent survival of young brought into the population. This could be related to factors such as the few numbers of adult fish or egg mortality caused by high turbidity in the lake in the springtime. To resolve this problem, a largemouth bass length limit of 15 inches was implemented. Under this regulation, a fisherman who catches a fish less than 15 inches long (measured from the tip of the snout to the end of the tail fin at its longest point) must return that fish to the

Fish Collected From Lake Springfield

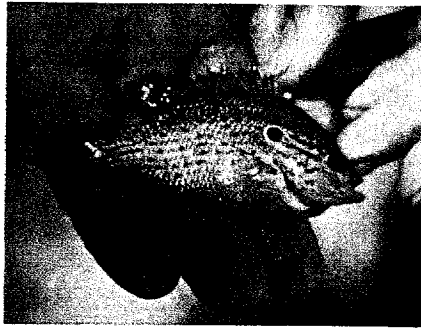
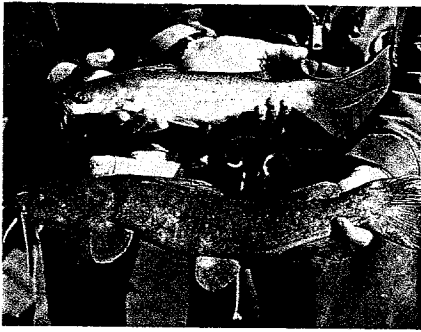
Gizzard Shad	Smallmouth Buffalo	White Bass
Threadfin Shad	Bigmouth Buffalo	Yellow Bass
Tiger Muskie	River Carpsucker	Largemouth Bass
Carp	Quillback	Green Sunfish
Golden Shiner	Highfin Carpsucker	Orangespotted Sunfish
Creek Chub	Golden Redhorse	Bluegill
Emerald Shiner	White Sucker	Longear Sunfish
Red Shiner	Black Bullhead	Redear Sunfish
Redfin Shiner	Yellow Bullhead	Bluegill Hybrid
Sand Shiner	Channel Catfish	White Crappie
Steelcolor Shiner	Flathead Catfish	Black Crappie
Bluntnose Minnow	Madtom	Walleye
Fathead Minnow	Blackstripe Topminnow	Freshwater Drum
Bullhead Minnow	Brook Silverside	

each year. Given the high demand in central Illinois for resources like Lake Springfield, careful management of fishery resources is needed.

The City relies on the Illinois Department of Conservation (IDOC), with whom a fisheries management agreement was established in 1984, to manage the lake fishery. IDOC fisheries biologists analyze the composition and quality of fish stocks, provide management recommendations and implement strategies to keep a balanced fishery for the well-being of

water. The purpose of this management practice is to allow adult bass less than 15 inches to remain in the lake for at least one more year prior to being vulnerable to harvest. This allows them to produce more offspring and help bolster the overall lake bass population.

This fishery management effort can be greatly assisted by the responsible actions of fishermen regarding the catching of large, female bass during the spring spawning season. Persons catching large females full of eggs are



A variety of fish are found in the lake, including the commonly caught channel and flathead catfish (above), and the seldom seen orangespotted sunfish (above, right). The trophy tiger muskie (right), which is a hybrid between the muskellunge and northern pike, is stocked into the lake by the IDOC.

urged to return these fish to the lake, even if they are longer than the 15-inch minimum length. Their spawn can then help add bass to the lake. An ethical fisherman also will not harvest small crappie in large numbers, so that these, too, may mature and reproduce at a larger size. Current length-limit regulations are posted at all boat ramps and major fishing areas, and are listed, along with other fishing regulations, on the official Lake Springfield map and in similar brochures.

Lake users should be aware that it is illegal to stock fish brought from other lakes into Lake Springfield. IDOC biologists are trained so that when stocking is needed, the correct species and stocks of fish are used. For example, while the Florida largemouth bass and the native northern largemouth bass are the same species, they are, genetically, quite different stocks of fish, each adapted to its own set of climatic conditions. Unused bait fish also should not be dumped into the water. Bait fish are often imported from out of state, and exotic species not native to these waters could be introduced. For the well-being of our reservoir, its stocking should be left to the biologists.

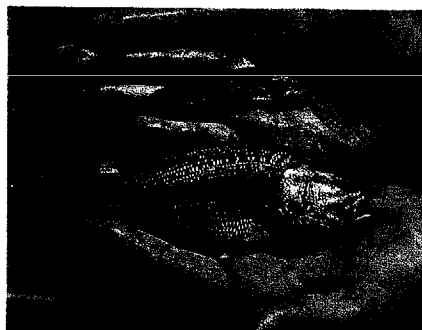
One additional management effort by the City and IDOC has been the use of a rearing pond to raise largemouth bass. Bass fry, spawned at an IDOC hatchery, are raised in the City's pond to a fingerling stage and then



stocked into Lake Springfield. These larger fish have a much better chance of survival than when the fry are stocked directly into the lake.

Fish Consumption Advisory

One of the drawbacks of having a lake with an agricultural watershed is soil erosion. Erosion facilitates the transport of fertilizers and other agricultural chemicals to the lake. Lake Springfield is still being influenced by the widespread use of chlordane, heptachlor, and aldrin as agricultural insecticides in the late 1960's and early 1970's. It was



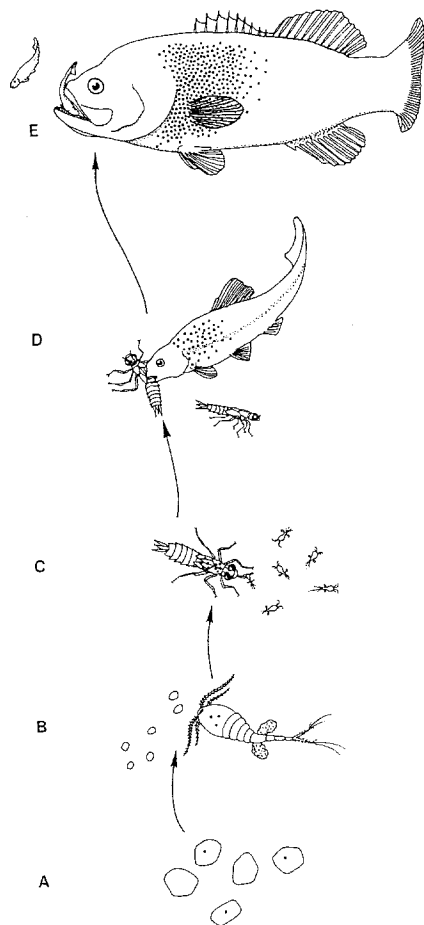
ultimately discovered that chlordane, heptachlor epoxide, and dieldrin (heptachlor and aldrin's initial breakdown products) are very persistent in the environment; that is, they can take up to 30 years to break down to harmless components. Furthermore, these chemicals are believed to be **carcinogenic** to humans, since they have been shown to cause cancer in laboratory animals. These compounds adhere to soil particles, so they wash into the lake with eroded soils during storm events. While the concentrations of the pesticides found in the lake sediment are very small (compared to what may be found on surrounding land), the concern is that some aquatic animals and fish **bioaccumulate** these compounds. This means that if the fish eat enough insects or other fish that contain small quantities of these substances, they also will have a tendency to accumulate these compounds. Typically these pesticides will be concentrated in the fatty tissues, like the belly fat and skin of a fish.

As the next consumer in the food chain, humans also can accumulate these chemicals. An advisory was issued jointly by the IDOC, the Illinois Environmental Protection Agency (IEPA), and the Illinois Department of Public Health (IDPH) as a precaution, especially for those people who make Lake Springfield fish a regular component of their diet.

The carcinogenic potential of these chemicals is not totally understood, and the science of fish analyses for these advisories is not exact, since factors such as fish species and size greatly influence the results. However, given the available information on concentrations of pesticides in the flesh of Lake Springfield fish, the advisories provide some guidance so individuals can make their own choices about consumption. The advisory for Lake

These two bass, raised at the City's rearing pond for stocking into Lake Springfield, are the same age. Size gains occur quickly when the fish convert from eating insects as fingerlings to eating other fish as they grow larger. The larger fish could now easily eat the smaller members of its cohort for dinner.

Springfield is presented in Appendix A of this report. Contact the CWLP Water Resources Office, the IDOC, IEPA, or IDPH for additional information and updates on the status of the advisory. Based on annual



Fish have the ability to concentrate compounds, such as persistent pesticides (shown here conceptually as red dots) in their tissues as they eat food items that have also accumulated these substances through the food chain. Humans (next in the food chain) should evaluate the possible long-term risks of eating fish listed on consumption advisories (From Keeton, W.T. 1972. See credit on p. 46.)

samples, the levels of these compounds in fish flesh have declined. Hopefully one day, Lake Springfield will be rid of these contaminants.

Fish Kills

Anyone who has spent time near the lake shoreline has had the occasion to see a dead fish washed up on the

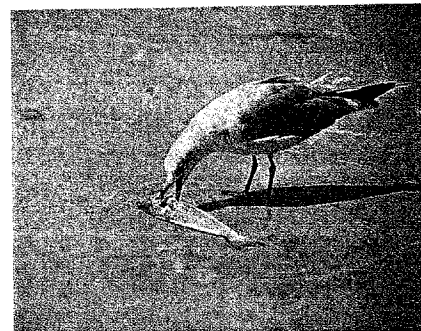
rocks. The causes of fish mortality are always related to some type of stress that may be natural or induced by man. The occasional single large catfish found may likely have died due to old age, commonly referred to as natural mortality. During the drought of 1988, species-specific stress on the white crappie was observed, possibly due to the reduced lake levels and high water temperatures.

Another natural mortality often seen in the spring or fall is that of large groups of gizzard shad. These fish are not well adapted to the changing temperatures of northern climes, since they are originally a more southern species. Because of the shutdown of certain enzyme systems, the shad may, literally, starve to death despite what appears to be adequate fat reserves. Add this maladaptive trait to other natural stresses, and mass die-offs can occur. There are literally millions of shad in Lake Springfield, so losses even in the tens of thousands will not hurt the population. These die-offs may even help the population by weeding out the weaker fish. Nature never wastes materials. These dead shad often function as a food source for scavenging ducks, raccoons, fish, or gulls.

A shad kill is nearly always limited to that single species; however, a greater concern is the die-off of several species of fish at the same time. These types of kills may be caused by agricultural, industrial, or other human concerns. Evidence of such a kill should be reported immediately to the CWLP Water Resources Office or the IDOC. When uncertain of the species involved, it is always best to call for confirmation.

Insects

People often think of biting mosquitos and blackflies when it comes to moist environments, but few realize that thousands of species of insects depend on lakes and streams for most of their life cycle. If one were to pull a rock out of the water and turn it upside down, little creatures often will be seen scurrying around. These may



Nature never wastes materials. Fish occasionally found dead along the shorelines will be consumed by gulls or raccoons, or recycled within the ecosystem in other ways.

be mayfly nymphs or the small worm-like midge larvae. One might also see a small clump of what looks like vegetation or rock fragments glued together. This may be the case that caddis flies or midge larvae build.

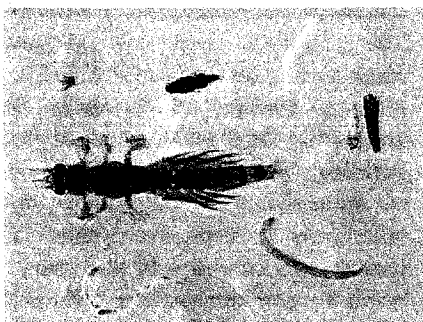
Mayflies are an example of a common insect at the lake that may live only a few days as an adult on land, their sole purpose being to mate and lay the eggs of the next generation. These insects, from the order Ephemeroptera (meaning short-lived), may actually live for several years in the water as nymphs feeding on algae and detritus after hatching from the egg stage. These nymphs and other insect larvae breathe with the aid of various gill structures. The nymphs mature, and ultimately emerge as winged adults from the water in remarkable synchrony with many individuals of the same species. These are found in great swarms near the shoreline clinging to tree trunks. Often, they also are attracted to window lights.

Homeowners sometimes find the cast skins that the subadult mayflies leave behind. These are frequently found in great masses floating in shoreline areas. Each individual cast is a shell, legs and all, that the insect has left behind. Dragonflies and the more delicate damselflies, occasionally seen flying in tandem, have a similar life cycle. The adults are usually longer lived, because, unlike adult mayflies, which have no functional mouth parts, the dragonfly adults are active predators that eat other flying

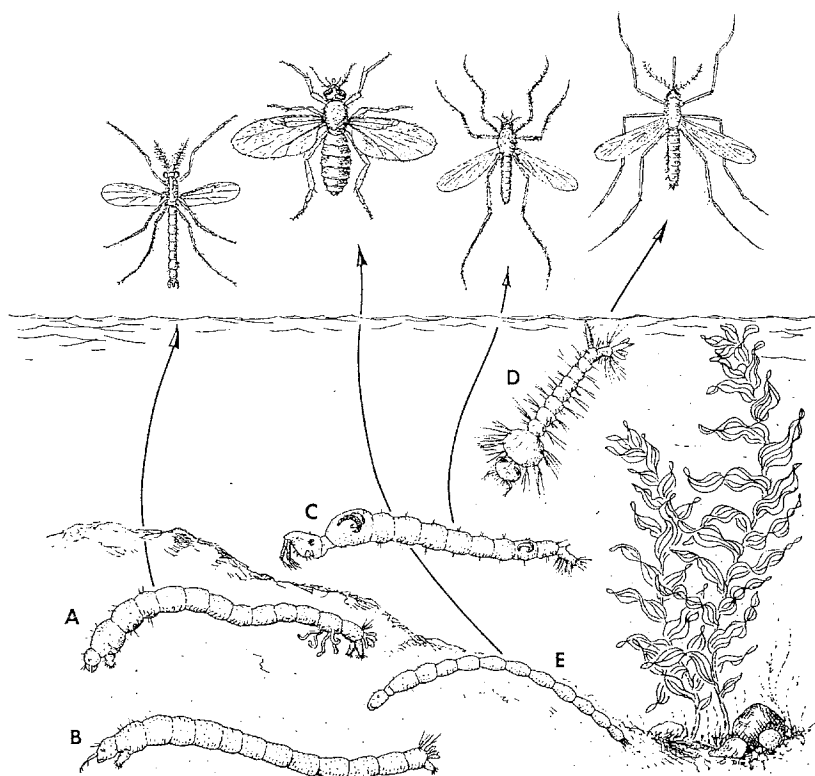
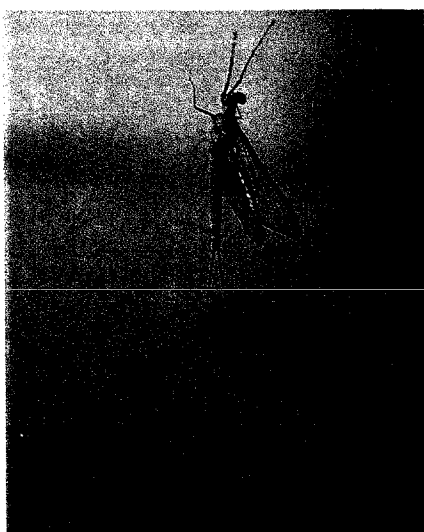
insects. A dragonfly will occasionally be seen bobbing its abdomen in and out of shallow water, laying its eggs with each bob.

There are many other insects at the lake like caddis flies, midges, and water beetles with slightly different life cycles. These include a pupal stage similar to the familiar butterfly chrysalis or moth cocoon where the metamorphosis from larvae to adult insect occurs.

Despite their often bizarre shapes, the aquatic insects as larvae are harmless to humans. Many of the adult midges and crane flies look like mosquitos (some are gigantic), but they are not. These types of insects are all related as members of the fly family, but these relatives do not have a taste for blood or the skin-piercing mouth parts of their counterparts.



Lake substrates support numerous invertebrates, including insect larvae and worms (above). The adult mayfly (below) may live for only a few days, but it had been developing for several years in the water as a nymph (center on above photo). (Above photo by G. Warren.)



Numerous insects in the fly family have an immature larval stage that lives in the water. Many are approximately one-half inch long. The common midges (A and B) and phantom midge (C) emerge into non-biting adults. The mosquitos (D) and "no-see-ums" (E) while harmless as larvae, develop into the familiar scourges of summer. (From Cole, 1983. See credit on p. 46.)

While adult mosquitos, horseflies, and phantom midges can be a nuisance, they, along with all the aquatic insects, add to the diversity of natural communities. The adult insects are true survivors, since immature insects are an important part of the aquatic food chain. Many fish consume larval insects as a regular component of their diet.

One common household management practice to help keep local mosquito populations in check is to keep containers, used tires, uncovered boats, and other waterside recreational equipment free of standing water. Mosquito larvae do not like the moving water along wave-lapped shorelines, but they thrive in the motionless waters found in these various containers in which adult mosquitos might lay their eggs.

Snakes

There is probably no animal on earth that evokes greater feelings of fear and hatred than the snake. These emotions are largely irrational, especially in an area like Lake Springfield where the snakes are essentially harmless. While one should not say that poisonous snakes will never be found at Lake Springfield, there are no verified collections locally of any of the four poisonous snakes native to Illinois. Among these are the copperhead, cottonmouth or water moccasin, timber rattlesnake, and swamp rattlesnake. The swamp rattlesnake, also known as the eastern massasauga, is the most likely of the four to be found here, since there is a known population at Allerton Park near Monticello. Sangamon County is also well within its range of occurrence in Illinois.

The other three snakes are more prevalent in southern Illinois counties and along the Mississippi and Illinois rivers.

At Lake Springfield, the specimens most often encountered are collectively known as water snakes. Three or four species could be found at the lake. These cold-blooded animals are often seen sunning themselves on the warm riprap boulders along the shoreline. In the spring and autumn months when the snakes are cool they move very slowly, unlike in the summertime when only the tip of their tail will be seen as the snakes disappear into the water. They also are not slimy, as many people think; the scales are smooth and dry.

Chances of being bitten are remote unless an adventurous child is a novice at catching them. Knowledge about what species are being caught is vital before pursuing such a hobby. If a rattlesnake is encountered (Note: many snakes shake their tails when annoyed, not just the rattlers), the City or Illinois State Museum biologists may be contacted for verification.



Non-poisonous water snakes like this Graham's water snake are commonly found sunning at the lake shoreline. Being cold-blooded animals, they absorb heat from the sunbaked rocks.

Any snake caught off guard, stepped on or cornered may strike. The reaction is merely a survival technique, since biting is one of only a few defense mechanisms snakes have against a large "predator". Humans

are much too big to be considered ideal dinner fare. The snake would much prefer a mouse, fish, or insect for a daily meal. Snakes also prefer flight over fight.

While the water snakes don't have the two fangs or venom that poisonous snakes possess, they do have rows of small, sharp, recurved teeth that can draw blood. A doctor's checkup may be appropriate if infection after a bite is a concern. There should be little chance of an encounter with a snake if the shoreline is checked closely and careful attention is paid to the placement of hands and feet when rambling around the riprap.

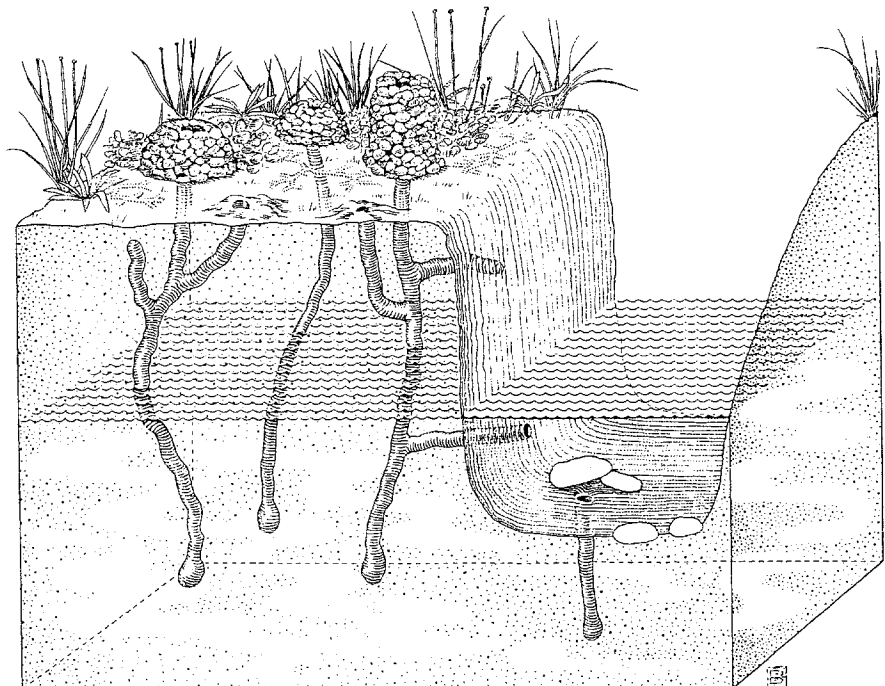
People talk about having snake holes near their shorelines. Cavities are occasionally used by snakes, but most likely, these were constructed by a crayfish or chipmunk, since snakes don't excavate dens on their own. Away from the lake, several terrestrial, non-poisonous species including the black rat snake, blue racer, eastern garter snake, or prairie king snake may be found. Snakes should never be killed if found. They are an integral part of the ecosystem. Several of these species feed on mice, thereby helping to keep small rodent populations under control. These, along with

the water snakes, are all members of the community that makes Lake Springfield the natural area that it is, and they will be harmless if left alone.

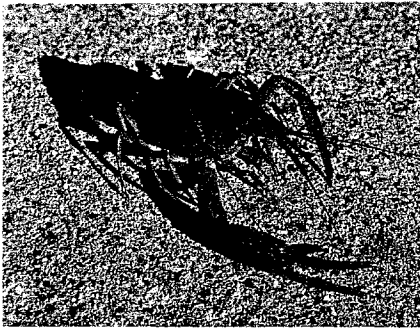
Crayfish

Crayfish, crawfish, crawdads, or whatever one might call them, are common characters found at the lake. With the whip of their tail, they can move more quickly backwards than forwards. These miniature lobster-like creatures act as scavengers in the aquatic ecosystem. They also serve as forage for a variety of animals including fish, wading birds, and frogs. The chela or claws, also suitably called pincers, are used in feeding and defense.

Crayfish at Lake Springfield might be most often noted for the holes and chimneys that some species construct. The chimneys serve no particular purpose, but are the result of the most efficient method of disposing mud pellets that the crayfish excavate while building their burrows. Since construction usually occurs at night, work will rarely be seen in progress. The burrows go as deep as necessary to reach the groundwater level where the chambers are constructed to be filled



Some species of crayfish in the lake area form chimneys as a result of their burrowing activities. The burrows reach below the groundwater level so chambers will be filled with water. (From Hobbs, 1981. See credit on p. 46.)



Crayfish, often found among the rocks and crevices at the shoreline, act as scavengers in the aquatic ecosystem and serve as forage for other animals.

with water. If sufficient groundwater is present, some chimneys can be found a long distance from the lake.

If enough crayfish infiltrate a shoreline area, small cave-ins of the shorelines are possible. If a border of vegetation is established along the shoreline, as recommended in Section 5E, and the shoreline is properly stabilized, the tunnels will go unnoticed. There are several chemical treatments available if an extremely serious problem is presented; however, some of the tunnels are connected to the lake, so care must be taken when treatments are applied. Alternatively, tunnels may be filled or recompacted with new soil and subsequently reseeded. The shoreline is a transition zone between aquatic and terrestrial environments, and it can be a fragile area. Foot traffic can be more destructive to a shoreline than a group of energetic crayfish.

Muskrats

Muskrats are rabbit-sized rodents with rich brown fur. They are most common in the upper reaches of the lake, west of the I-55 bridge, and are noted for the haystack-like homes that they build in shallow water. The home or lodge, used for feeding or nesting, has entrances underwater. This animal, breathing with lungs like all mammals, will make its living chamber above the water line within the structure. The lodges are built from available vegetation in the fall when the water level is usually low. The houses are commonly broken

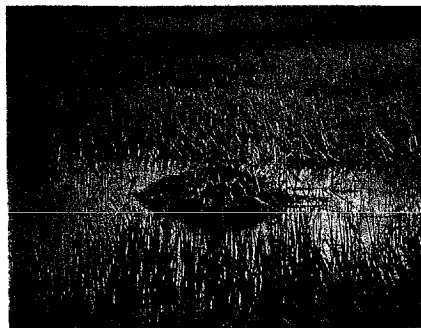
down by the ice and the rising waters of springtime. Muskrats may also burrow into the bank at shoreline areas. Entrances to these burrows are below the water line, but they may become exposed at low water levels.

The muskrat feeds on green material like cattail as well as roots and tubers. These animals will usually be seen swimming in quiet water, avoiding the high boat traffic areas near clubs and residences.

Birds

Lake Springfield attracts a large number of bird species that otherwise would not be attracted to this urban area. The vast expanse of open water, extensive shoreline areas of shallow water, and a forested lake perimeter with its common areas and prairie restoration sites are attractive to many kinds of birds. The lake in the vicinity of the Wildlife Sanctuary, west of I-55, provides additional diversity in habitat. Quiet undeveloped areas and vegetated near-shore, shallow-water zones are important for the large wading birds like great blue herons, commonly seen fishing there. See Section 4B for a description of the importance of this littoral zone to the lake.

Many shorebirds prefer an area of shallow mud flats where they can forage for insects at the edge of the water. Declining water levels in the summer months each year open up new habitats and food sources for these birds. Many ducks also like relatively shallow water for feeding. Bird feeders at the lake attract many



Muskrats build their chambers above the high water mark within these haystack-like structures made of vegetation. The entrance is underwater.

species of resident songbirds and migrants that pass through the Lake Springfield area at various times during the year.

Wood duck boxes have been placed in trees along the Lick and Sugar Creek arms. These boxes simulate the cavities in trees required as nesting sites by these ducks. Hopefully, the boxes will help produce broods that will return year after year to the lake.



Many species of waterfowl stop over at Lake Springfield during migration flights. The mallard (above) will often be found nesting in the lake area. (Below) Wood duck boxes, placed in trees around the lake, mimic natural cavities in which the wood ducks will nest.



These boxes have been used by wood ducks and other animals, including screech owls and raccoons. The relative lack of nesting cavities in trees around the lake probably accounts for the success of these artificial cavities.

Lake Springfield is somewhat of an oasis in the sense that it provides food and shelter in an area of limited habitat, given our location in the middle of the corn belt.

5. LAKE SPRINGFIELD AREA MANAGEMENT

There are many ways one's activities can enhance or degrade the quality of our waterways. The management objective at Lake Springfield is to coordinate and regulate activities in an environmentally sound manner for the enhancement, protection, and restoration of the lake. The following sections describe strategies to achieve these goals.

Permits

Introduction to Permitting

Permit systems regulate certain activities at Lake Springfield. All permits aim to protect the lake from polluting entities such as leaky storage tanks and failing septic systems, or the destruction of wetland areas from unnecessary fill activities like the creation of a rock or concrete jetty or earthen pier.

Lake residents should contact the CWLP Real Estate or Water Resources Office early in the project planning stage for advice regarding projects in the lake area. Many unforeseen hurdles can be overcome with a single phone call or office visit. Permit review usually requires a minimum notice of 48 hours prior to project initiation. Seven to 10 days is the norm for most projects requiring site visits or other City department sign-offs. Few



Environmental regulatory and permit systems help combat the activities of illegal fills that have accounted for thousands of acres of lost wetlands nationwide.

projects proposed by homeowners will require federal review, but if this is necessary, the process can take several months. Plan ahead. This will likely save time in the long run, and possibly the effort of removing or rebuilding a noncompliant project.

The permit systems are authorized either through federal, state, or local laws or by City policy to assure compliance with those laws. One of the primary federal regulations affecting Lake Springfield is Section 404 of the Clean Water Act of 1977 (reauthorized in 1987), as amended from the Federal Water Pollution Control Act of 1972. The IEPA has permit review authority under Section 401 of the same act, which requires water quality certification for the discharge of dredged or fill materials into Illinois waters. Lake Springfield is considered such a water. Generally, any project that would create land where there is now water at Lake Springfield will require a permit. Under this law, activities which are not water dependent (i.e. projects which do not by their nature need to be located in or near the water) are reviewed more critically and may not receive authorization.

Regulations exist to protect the quality and source of the City's drinking water. The laws also are designed to protect the value and diversity of aquatic environments that have disappeared at a rate of nearly one-half million acres nationwide every year. Wetland importance is discussed in the lake ecology section of this document (Section 3B-2). Since regulations can change over time, contact the Water Resources Office for updates on permit requirements.

Several projects at Lake Springfield that require permits are: septic systems, shoreline stabilization, dredging, leasehold construction, and fuel storage tanks.

Septic Systems

As the lake homes and clubs continue to age, more and more septic system failures are observed each year. Replacement or alteration of an existing septic system requires that a permit be obtained from the Springfield Department of Public Health. The CWLP Water Resources Office reviews permit applications and proposed plans before they are submitted to the health department. These permits satisfy the regulations set forth under laws of the State of Illinois, Sangamon County, and City of Springfield. Residences in the areas



Installation of or modification to septic systems around the lake requires a permit issued through the CWLP Water Resources Office.

served by the Springfield Sanitary District sewers are required to connect to the sewer if it is available. Availability is defined as being within 150 feet of the property line. (See Section 5B.)

Shoreline Stabilization

Preventing shorelines from eroding often requires the placement of some type of "fill" material in the water to

keep waves from washing away the shoreline. (See Section 5D.) The U.S. Army Corps of Engineers (Corps) and IEPA have issued permits to the City for various shoreline stabilization methods at Lake Springfield.

Riprap: The City holds federal and state permits for the placement of rock materials at lake shorelines, provided that clean materials are used. Asphalt or broken concrete containing reinforcing bars cannot be used. No major reshaping or reclaiming of eroded shorelines is allowed.

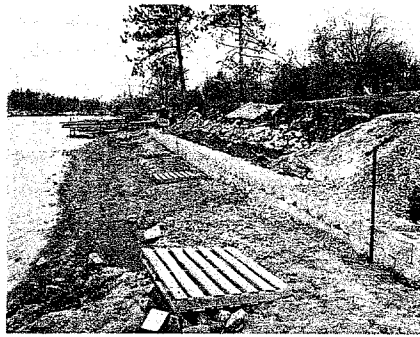
Alternative erosion control: The City also has permits for more complex methods of shoreline erosion control, including gabions and steel or concrete seawalls. Only those contractors licensed by the City for installation of these structures are allowed to perform work. An individual project permit must be obtained through the CWLP Real Estate or Water Resources Office by the contractor prior to beginning work at any leasehold. This allows for project review to evaluate compliance with the Corps and EPA permits, and to suggest changes where necessary.

Dredging

The City's major dredging effort west of I-55 required permits from numerous agencies. Homeowners might be interested in smaller projects such as the dredging of a boat slip or



The disposition of dredged material is a critical factor in the review of projects for dredging lake areas like boat slips and coves. Disposal must be in upland, non-wetland areas.



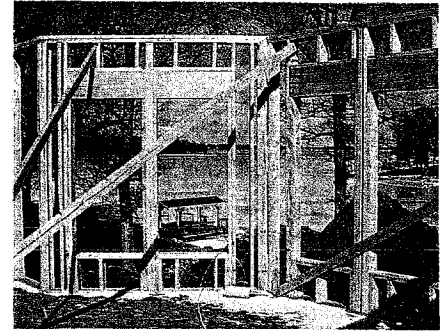
Shorewalls of all types are considered to be "fill" material by law. These may be installed only by contractors licensed by CWLP who work in compliance with the City's Corps and IEPA permits. (Photo by M. Wothke.)

small cove with a large backhoe. The critical factor in these projects is disposal of the dredged material. Homeowners must contact the CWLP Water Resources Office prior to the initiation of any dredging project, at which time appropriate upland, non-wetland disposal areas and erosion control plans can be evaluated. Known utility locations also can be identified. Often small quantities of dredged material can be used as garden soil enhancements, or the material can be trucked off site. The many ravines characterizing the lake area are natural drainages and are not to be used as disposal areas. Dredged material also cannot be raked or moved from one point in the lake to another part of the lake. If sediment is moved, it must be removed to a place where it will not erode back into the water.

Leasehold Construction

All construction plans on leased lake property must be approved by the CWLP Real Estate Officer prior to initial construction. Example activities regulated are beach construction, dock installation, drainage modifications, home additions, swimming pool construction, and tree removal. All plans requiring a building permit must first be approved by CWLP. In

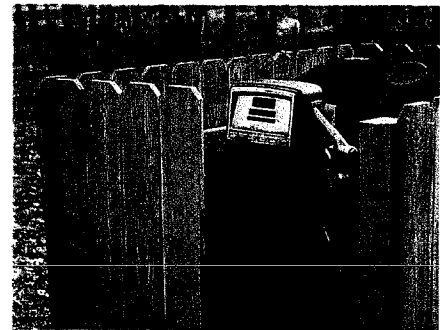
general, plans will be reviewed for city policy and environmental compliance. Topics such as erosion control during construction, provisions for sewage treatment, and setbacks are evaluated. For swimming pool installations, backwash disposal methods also will be reviewed. Pool installation on a club lease is considered to be a public facility and will require Illinois Department of Public Health approval as well.



Prior to initiation, all leaseholder construction projects require review and approval by the CWLP Real Estate Office. Environmental criteria such as erosion control and waste disposal will be evaluated.

Fuel Storage Tanks

Some leaseholds at the lake maintain lakeside boat or vehicle fueling facilities. Regulation of these facilities is critical due to their potential hazard to the city's drinking water supply and the groundwater.



As many as 25 percent of all underground storage tanks may be leaking. Protection of our water supply is ample reason for regulation of fuel tanks. (Photo by M. Bodamer.)

Underground Storage Tanks

A permit from the Illinois Office of the State Fire Marshal (OSFM) is required for the installation of any underground storage tank (UST) for non-residential use (club, camp, or marina) that is greater than 110 gallons, as well as for the installation of residential UST's greater than 1,100 gallons. A permit is also required for the removal of these tanks. Individuals planning to install or remove such tanks must first notify the OSFM, the Springfield Fire Department, and the CWLP Environmental Affairs Office.

A permit from the Springfield Fire Department also is required for the installation or removal of UST's less than 1,100 gallons that are used for residential purposes. Individuals planning to install or remove such tanks must first notify the Springfield Fire Department and the CWLP Environmental Affairs Office.

Permit applications may be obtained from the OSFM or the Springfield Fire Department. Regulations concerning storage tanks are discussed in Section 5F.

Aboveground Storage Tanks

Aboveground storage tanks are prohibited in the Lake Springfield area, except in those areas zoned I-2.

Septic Systems

Overview: Septic Systems vs. Sewers

Only 298 of the 765 leases on Lake Springfield are served by conventional sewers. That leaves 467 leaseholders asking the perennial question, "When am I going to get sewers in my area?" The Springfield Sanitary District and local developers have been gradually extending service closer to the lake, but it is unlikely that a major sewer

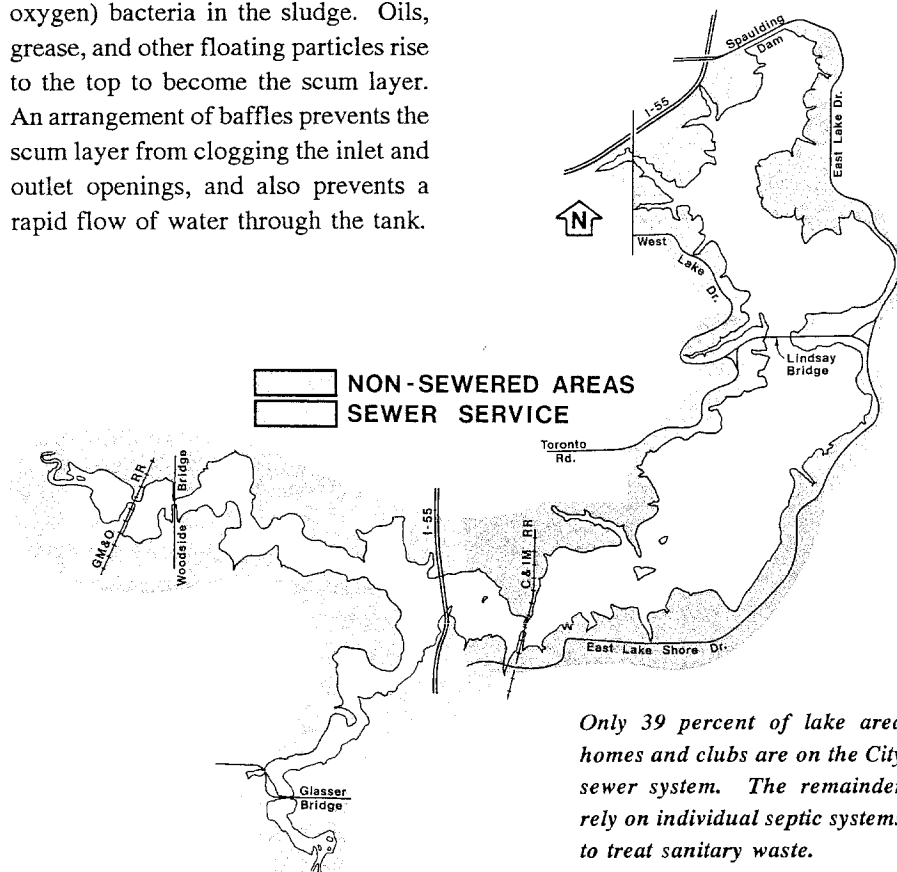
network in the Lake Springfield area will be installed in the near future. The low density of homes and hilly terrain, requiring numerous pump stations, reduces the cost effectiveness of sewer installation. As a result, the use of small on-site sewage disposal systems, or septic systems, will remain a necessity for most of the homeowners around the lake.

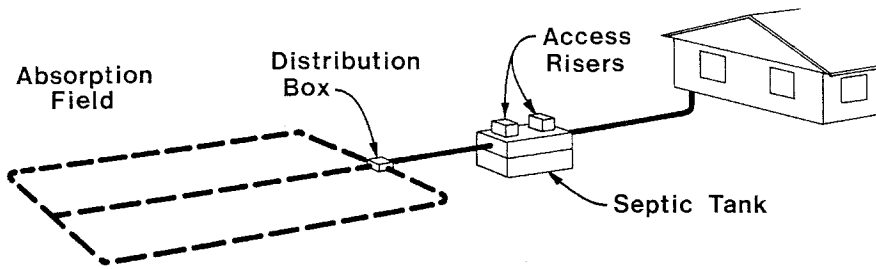
Conventional Septic System

The most common system in use around Lake Springfield is the conventional septic system. This system uses two key components - a septic tank and a soil absorption system. The septic tank is nothing more than a large underground container, generally made of concrete, which receives wastewater from the kitchen, bathrooms, and laundry room. Most solids settle to the bottom of the tank and form the sludge layer. The solids are partially broken down by anaerobic (thriving in the absence of oxygen) bacteria in the sludge. Oils, grease, and other floating particles rise to the top to become the scum layer. An arrangement of baffles prevents the scum layer from clogging the inlet and outlet openings, and also prevents a rapid flow of water through the tank.

The soil absorption system, or drainfield, receives the fluid portion of the wastewater from the septic tank. The fluid is distributed for infiltration over a suitably large area by an arrangement of underground perforated pipes. Soils purify this effluent by filtering bacteria, viruses, and remaining solids in the spaces between individual soil particles (pores), and by chemical attachment to the soil particles themselves (adsorption).

Only certain types of soils are suitable for this use. A soil with many large pores (e.g. high sand content) will permit the effluent to pass through too rapidly to allow purification. Soils with small pores, like the clays that are common around Lake Springfield, may not absorb the effluent quickly enough. As a result, water can seep to the ground surface or back up into the home. The lake can be contaminated if the effluent runs into it, and the surface seepage represents a health hazard. One method used to determine soil suitability is the percolation or





A conventional septic system will have a tank for solids accumulation and an absorption field to distribute the liquid portion of the wastewater.

"perc" test, which measures the rate that the soil can absorb water. The size of the soil absorption system is determined on the basis of this test and the anticipated water use. The primary advantage of the conventional system is its relatively passive nature - it has no moving parts. Gravity and nature do all the work. The soil absorption system can be designed to fit most situations, including moderate hillsides.

If the soil absorption system becomes clogged by solids accumulation, the system has failed and a new drainfield must be constructed. This costly occurrence can be avoided or delayed by following some simple, logical practices that will add years of life to the system:

1. The solids accumulation should be pumped from the septic tank on a regular basis. The most common failure is a clogged drainfield caused by excess solids passing through the septic tank. If leaseholders wait until this point to have the tank pumped, it is generally too late. Pumping frequency is a factor of how the

system is used; a two-person household could possibly require pumping on a five-year interval, while a large family may need annual service. It is good practice to have the tank inspected annually for solids accumulation. At the same time, the inlet and outlet baffles can be checked to make sure they are in place. A broken baffle will not contain solids within the septic tank, and drainfield failure will surely follow. Garbage disposals should not be used. They add up to 50 percent more organic solids to the system, requiring more frequent pumping.

2. The location of all system components should be identified. The system cannot be maintained if its location is unknown. Heavy vehicles must be restricted from driving on the drainfield. They can cause damage to the pipes and compact the soil, reducing its infiltration capability. Trees and shrubs should never be planted over the drainfield - roots will clog the distribution pipes. When landscaping, fill dirt should not be placed over the absorption field, because the laterals must be kept within 24 inches of the ground surface to function properly. No patios, driveways, or similar improvements should be constructed over

All septic systems (conventional, aerobic, etc.) require periodic solids removal. The frequency of pumping depends on usage, but units should be checked annually for solids buildup. (Photo by M. Luepke.)



a drainfield. Laterals covered in this fashion will not operate correctly.

3. Water conservation will prolong system life. Water saved is water that your system does not have to treat. Overuse of water leads to the second most common failure, hydraulic overload. This type of failure can exhibit any of the symptoms of a clogged drainfield, but by reducing the water load, the soil absorption system will recover.

Watersaving devices such as flow restrictors should be installed on faucets and showerheads. A toilet dam or similar conservation device placed in each toilet tank will save that volume of water with every flush. Enough water should remain in the toilet tank to do the job with one flush. Flushing twice defeats the purpose. Water conservation devices (toilet dams, faucet aerators, etc.) are available to CWLP water customers free of charge by calling the CWLP Energy Services Office.

Clothes washing spread throughout the week will help prevent the overload of the lateral field with too much water on one day. Full loads are best because they use water most efficiently. Leaseholders should check for plumbing leaks, and be sure that no deck drains, downspouts, footing drains, sump pumps, swimming pool backwash, or any other clear water sources are entering the system. Surface runoff should be diverted away from the drainfield.

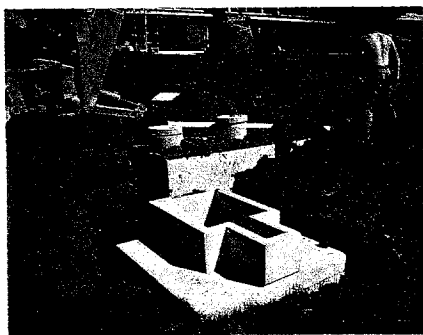
4. Chemicals or medicines should never be discarded by pouring or flushing them down the drain. Proper functioning of the septic tank depends upon live bacteria. Small amounts of household cleansers can be tolerated, but large doses of these items must be avoided. The toilet is not a trash can. Bulky or foreign objects (disposable diapers, sanitary napkins, cigarette butts, paper towels, etc.) will not be broken down in the septic tank and

will only accelerate the solids buildup. Medicines and bulky items should be disposed in the garbage with other household wastes.

5. Additives are not needed to start septic tank bacterial activity or to clean the tank when having it pumped out. No chemical supplements will alleviate the need to have the tank pumped out periodically. Some additives may actually harm the system. All the bacteria necessary for proper system functioning are present in the wastewater.

Aerobic Treatment Unit

In recent years, the homesized sewage treatment plant has become available. Known as "aerobic" treatment units, they are sold under a variety of brand names. These systems are scaled-down versions of the large municipal sewage treatment plants. The physical appearance and



The aerobic treatment units are downsized sewage treatment plants. These systems are complex. Monthly inspection, at a minimum, is required.

arrangement of components varies widely among brands, but they all function in essentially the same manner. Wastewater from the home enters the unit, where the heavier solids settle out. Oxygen is introduced within the unit via motors or compressors. The oxygen supports a population of aerobic (thriving in an oxygen rich environment) bacteria. It is these bacteria that break down the organic matter in wastewater, thereby

accelerating the natural purification process. After this stage, the remaining solids are allowed to settle out and the flow is passed through a mechanical filter, which also supports bacterial populations to consume or trap any remaining solids. Finally, the flow is chlorinated. Chlorine is a powerful **disinfectant** that will destroy any remaining harmful bacteria and viruses. At this point, the effluent is, ideally, clean enough to be returned directly to the lake, be discharged to a downsized drainfield, or even used for irrigation.

If this sounds rather complicated, that's because these units are mechanically complex. Alarm systems, compressors, motors, pumps, and timers are part of the package with these units. They require power to operate, and the various mechanical units are subject to failure. The units do overcome two problems that are quite common around Lake Springfield, namely tight clay soils that do not drain, and steep slopes that make drainfield installations impractical. They are not, however, the answer to all our problems. Besides mechanical maintenance, these units require periodic solids removal and chlorine addition. Component failure or a prolonged power outage could result in the discharge of raw or partially treated sewage directly to the lake. One further drawback is the fact that nutrients are not removed from the waste stream. For this reason alone, these systems are outlawed for use by some states. (See Sections 3 and 4A on nutrients.) CWLP will not permit the use of these systems if a conventional system can be adapted to the site. Following the water conservation guidelines given for the conventional system, and avoiding the use of phosphate detergents (see Appendix B) will help reduce this nutrient source. Leaseholders who have an aerobic unit should discontinue water use in the home during an extended power failure. The motor or compressor should never be disconnected; its use is critical for the unit to

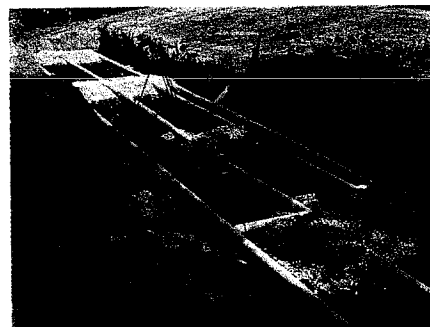
function properly.

Buried Sand Filter

One alternative to the aerobic treatment unit is the buried sand filter. This treatment method uses a conventional septic tank followed by a filter bed of specifically sized sand. The effluent from the septic tank is distributed over the sand bed by an arrangement of perforated pipes. As the effluent passes through the sand, it is purified by bacteria contained within the filter. Additional perforated pipes at the bottom of the filter collect the treated water. It is then chlorinated to kill any remaining viruses and bacteria. At this point, the treated water can be discharged to any of the locations mentioned for the mechanical units. The obvious advantage of the buried sand filter is that it contains no moving parts. Again, gravity and nature do all the work.

Drawbacks to this method include lack of nutrient removal from the waste stream, just as with the aerobic units. Sand filters also require considerable area for installation - 200 square feet per bedroom. As with all systems, keeping the septic tank pumped on a regular basis is a must. Solids washing through the tank will clog the sand filter.

The buried sand filter, like the aerobic unit, is an alternative where soils are unsuitable for a conventional system. An advantage of the sand filter is that it has no moving parts. The sand filter and aerobic unit, however, both have an open discharge to the lake that may be high in nutrients. (Photo by M. Luepke.)



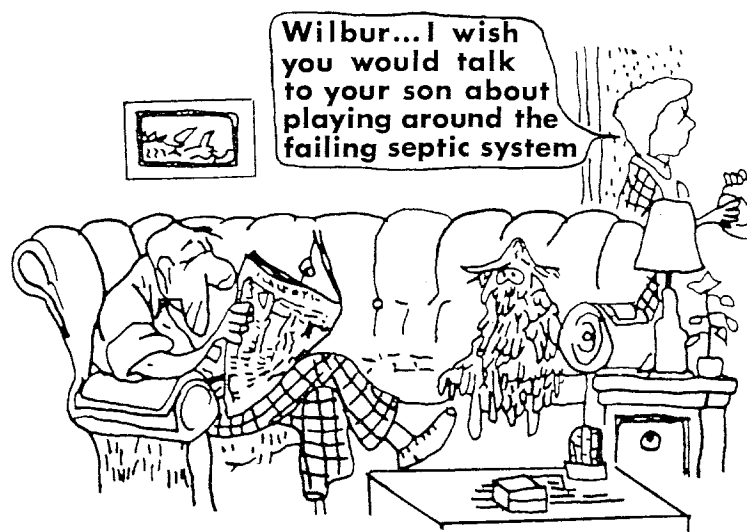
Various other systems of waste treatment are approved for use, but none have been installed at Lake Springfield to date. Most of these methods are variations or combinations of the systems described here.

System Failures

Reaction to a system failure should be guided by the type of failure. It should not be assumed that the entire system will need to be replaced. Plumbing backups, such as when the lowest fixture in the home drains slowly or not at all, are a common problem. Backups can be caused by pipe blockage or collapse, soil clogging, and/or low soil permeability in the drainfield.

Surfacing or ponding of effluent over the drainfield can be caused by many of the same factors that cause plumbing backups. Many soil absorption systems have a distribution box, which distributes the wastewater evenly to the drainfield pipes. If the distribution box settles or shifts position (after being run over by a vehicle for instance), all the wastewater can be directed to a small portion of the field, overloading it. Surface seepages are a serious health hazard; children and pets should be kept away from the location.

If any of these problems are experienced, the septic tank should be pumped out, and the baffles and pipes checked. A plumber will generally be needed to clear pipe obstructions. If there is no obvious reason for the failure, the CWLP Water Resources Office should be contacted for advice and alternatives before any decisions about replacement are made. The Springfield Department of Public Health, the Sangamon County Department of Public Health, and the Illinois Department of Public Health may also be contacted for information. A permit for the alteration or replacement of a septic system is required before proceeding with the work. Only con-



All kidding aside, if a failing unit is discovered, keep children and pets away from a ponded surface seepage. The seepage represents a health hazard. (Illustration courtesy of the Wisconsin Department of Industry, Labor, and Human Relations.)

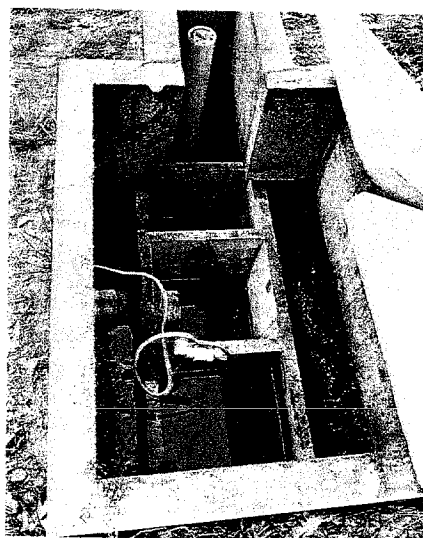
tractors licensed by the State of Illinois are allowed to install, modify, or repair these systems. (See Section 5A on permits.)

Major system failures on aerobic units will usually be indicated by a warning light or alarm on the system panel. A service representative should be called to check the unit if the alarm activates. A malfunction can occur without triggering the alarm. Units functioning properly will have a clear effluent. If it's cloudy, this is a good indication of a system problem in need of attention. The effluent should be

checked every week to verify that the system is in proper working condition. Failing units discharging raw or partially treated sewage to the lake at the shoreline, boat docks, and adjacent areas present a potential health threat.



One test to check if an aerobic septic system is working properly is to sample the effluent in a clear jar. If the effluent is not perfectly clear, like the sample on the far right, the system is malfunctioning and should be serviced immediately. These samples were all collected from Lake Springfield area aerobic units. Frequent checks will help prevent localized contamination of the lakeshore waters.



Some aerobic system failures won't trigger the alarm system on these units. If the system filter looks dirty like this one, servicing is long overdue.

The guidelines presented as standard operating procedures for conventional units are generally applicable to all individual septic systems. Failures can be avoided by good system maintenance. Many years of service will be the reward.

Sedimentation and Dredging

Sedimentation was the focus of the most extensive effort of lake restoration ever undertaken at Lake Springfield. During 1987 to 1990, the dredging of the upper reaches of the lake, west of the I-55 bridge, removed over three million cubic yards of accumulated sediment from the lake. This restoration project received national attention and has been the topic of several publications. (See Recommended Reading.)

Sedimentation Surveys

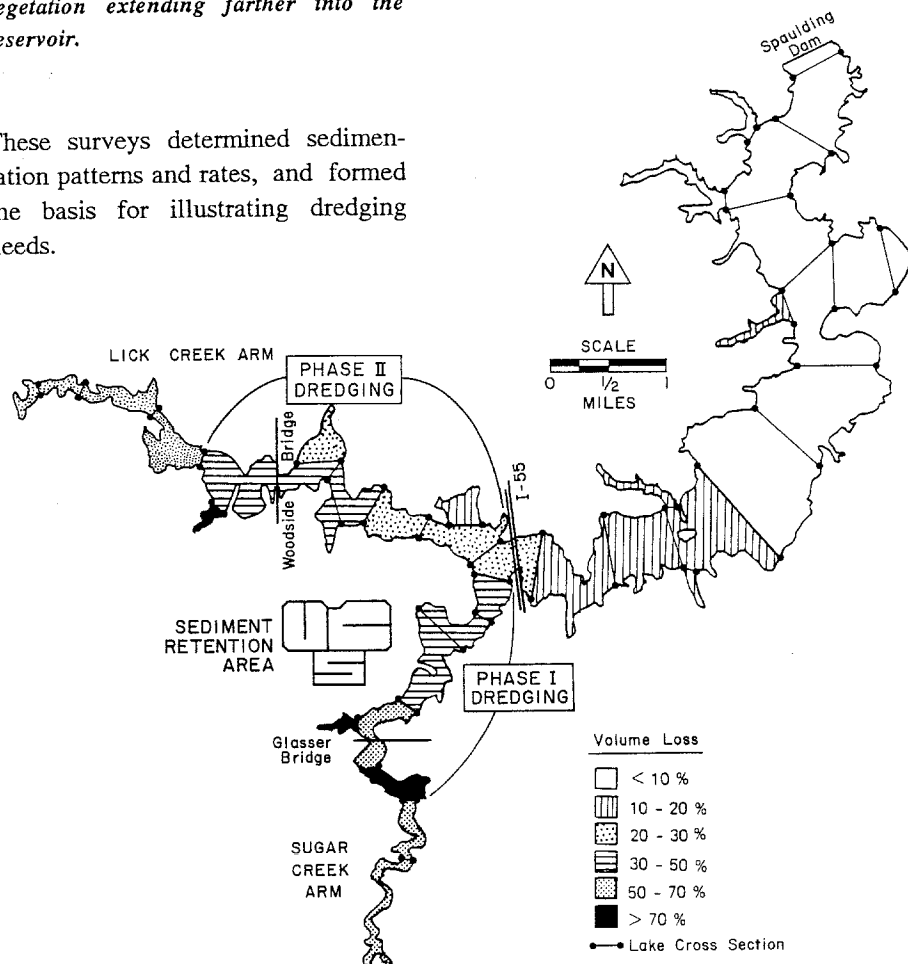
Sedimentation surveys have been conducted periodically to monitor sediment deposition in the lake. The Illinois State Water Survey set up cross sections throughout the lake when the first survey was conducted in 1948. Some leaseholders have monuments in their yards that mark a cross-section endpoint near the lake shoreline.

The 1984 sedimentation survey demonstrated that the Lick and Sugar Creek arms of the lake had filled in extensively and that sediment was encroaching into the major basins east of the I-55 bridge (Fitzpatrick, et al., 1985). The lake had lost 13 percent of its original 19.5-billion-gallon storage capacity. The Lick and Sugar Creek basins, which comprised only 13 percent of the lake water storage capacity, had trapped over 50 percent of the incoming sediment. The upper arms filled in so extensively because these are the areas of the lake where the water of Lick and Sugar Creeks first encounters reduced water velocity. Eroded soils, held in suspension by the flowing creek water, begin to settle when they reach the quiet water of the lake. At this rate, theoretically, the reservoir would have had a life-span of approximately 385 years before being completely filled with sediment.



Prior to 1980, there was no emergent vegetation in the upper Sugar Creek arm of the lake. This photo taken in 1987 shows the results of sedimentation and the rapid encroachment of nuisance aquatic vegetation extending farther into the reservoir.

These surveys determined sedimentation patterns and rates, and formed the basis for illustrating dredging needs.



The 1984 sedimentation survey illustrated the extent of sediment deposition in the reservoir. In two phases over three years, 3.2 million cubic yards of sediment were removed from the arms of the lake and deposited in a central retention area.

Dredging

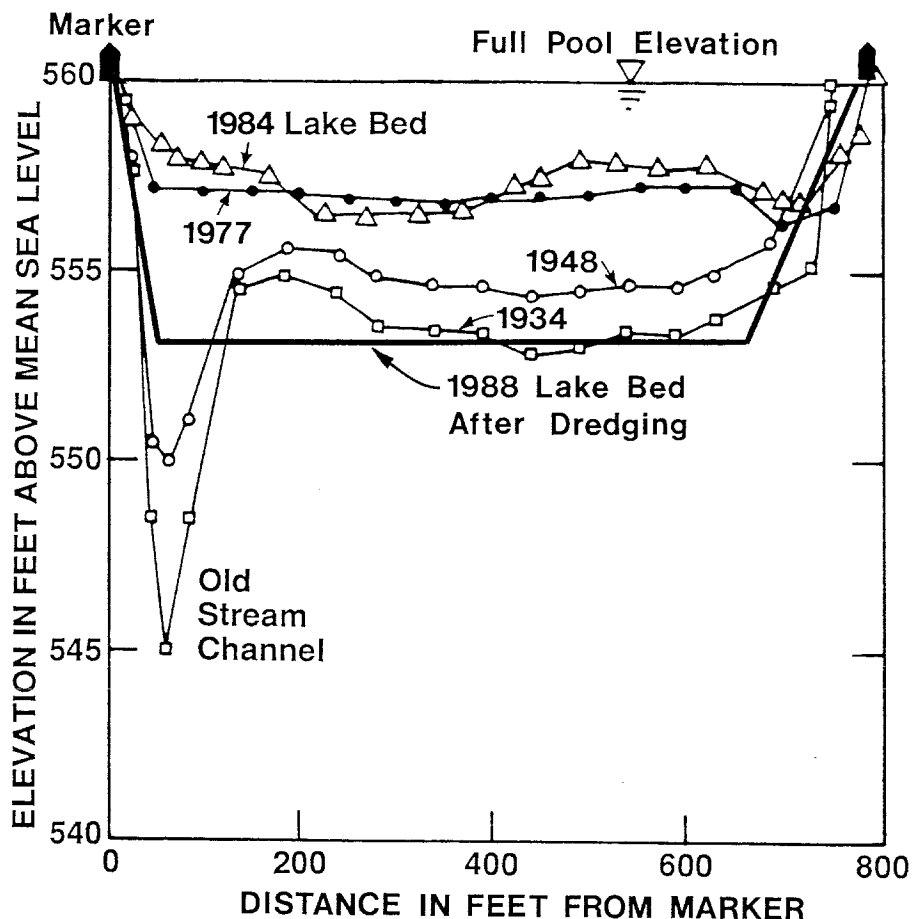
The purpose of the dredging was to restore capacity in those areas of the lake that had effectively functioned as sedimentation traps. A 652-million-gallon recovery of water storage capacity and restored recreational opportunities were also benefits of the project. This restoration effort was intended to protect the long-term viability of Lake Springfield as the City's water supply. It did not, however, alleviate the possible need for supplementary long-term water sources for the City.

The dredging was designed to excavate back to the valley floor of the old stream floodplain, i.e., the original

lake basin, excluding the old creek channel. Depending on the depth of accumulation, two to six feet of sediment was removed from dredged areas. The dredging design called for cuts to come no closer than 30 feet to the shoreline, except in areas maintained for bank fishing. Dredging in this fashion helped assure that the integrity of the existing shoreline would be maintained. This 30-foot buffer also forms the littoral zone of the lake (see Sections 3 and 4B), which is an important physical and biological transition between the land and open water areas of the lake. The dredged sediment was pumped via



The dredge cutterhead (above) rotates to loosen sediment from the lake bottom. The material is then drawn up and pumped in slurry form from the dredge (below) through a pipeline to the sediment retention area for deposit. A minimum 30-foot buffer zone of aquatic vegetation was retained at the lake margins to maintain shoreline integrity and littoral zone habitat.



A lake cross section from the Sugar Creek arm shows the pattern outlined after each sedimentation survey and the profile after dredging.

pipeline as a slurry and deposited in a 400-acre diked facility between the two lake arms, west of the Wildlife Sanctuary.

Nearly all inlet areas around the lake that have small drainage ditches feeding them have sediment buildups. When it comes to remedial action in the largest of the bays, logistical problems and expense of sediment excavation and disposal make these projects difficult. The smallest inlets and boat slips often can be easily mechanically dredged (with approval from CWLP) by the leaseholder. See Permit Section 5A for more information on homeowner dredging.

The need to repeat major dredging efforts will depend primarily on future sedimentation rates, which are determined by the season and severity of storm events and the success of soil conservation efforts in the watershed.

The logistics of sediment disposal for future efforts will, however, become more difficult as the now largely rural face of the lake vicinity becomes more urbanized.

Erosion Control

Shoreline Stabilization

Principles and Installation of Riprap

For many homeowners around Lake Springfield, restacking the riprap along their shoreline is an annual event. While some people may find this to be an enjoyable exercise, most would prefer to direct their energy toward more productive pursuits. The primary reasons for movement of riprap are soil loss from behind the riprap, wave action, and the forces of

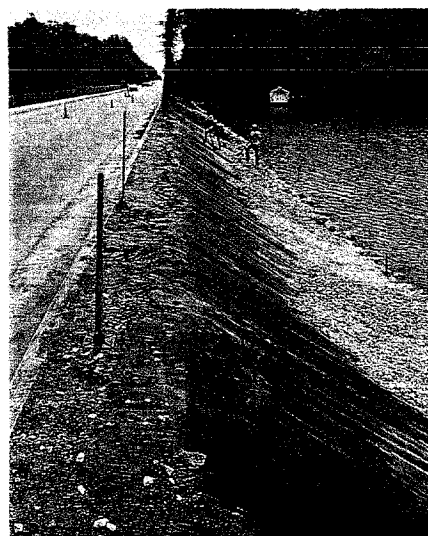
ice during the winter months. Each of these problems can be addressed.

As waves impact the shoreline, the riprap absorbs the force of the wave. Water passes around and under the riprap and saturates the bank soil. When the water retreats, it takes some of the soil with it. Over a period of time, enough soil is lost to allow the riprap to slump. This mechanism is not limited to wave action. Runoff from upland areas results in the same situation, soil being carried through the riprap and out into the lake. Several construction tips will help prevent the loss of shoreline property.

Providing a filter behind the riprap will contain the bank soil, yet allow free passage of water. Two approaches have been used by CWLP in recent years with good success. One method incorporates a filtering layer of smaller crushed stone between the riprap and the bank soil. A four- to six-inch layer is sufficient to retain the soil yet allows unrestricted water flow. Ideally, the filter stone should be graded from sand size at the soil interface, gradually increasing to two- or three-inch size at the riprap interface. As a practical matter, this is difficult to accomplish. A simpler approach is to use a single gradation of stone that varies between one-half

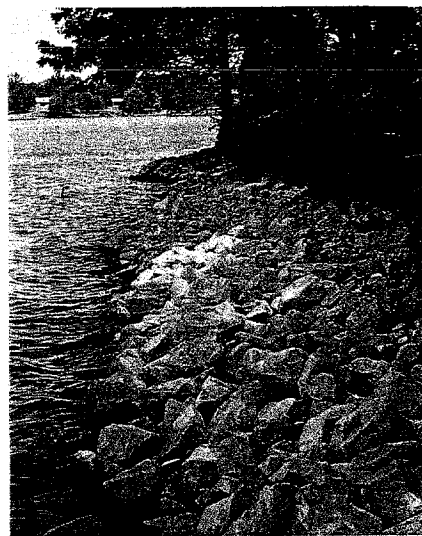


Soil and trees wash away from behind improperly riprapped shorelines. Before the area was properly stabilized in 1986, low water levels revealed how the old shoreline was relegated to a pile of flattened riprap on the west face of Marine Island.

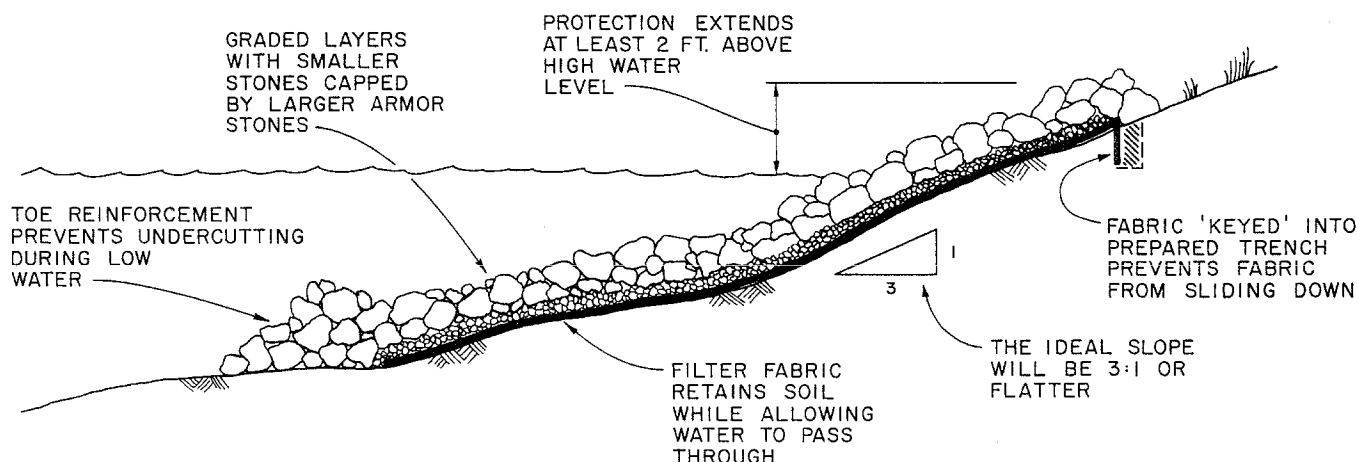


inch and two inches. The variation in size permits good interlocking of the stone particles, and the two-inch top size is large enough to be retained by the riprap.

Another method commonly used is to place a synthetic filter fabric between the bank soil and the riprap. The polypropylene and polyethylene fabrics available are either woven or non-woven, and can be obtained in a variety of weights and strengths. A layer of fabric will provide the filtering medium needed behind the riprap.



Providing filter fabric or stone behind riprap boulders (left) prevents soil from washing out from behind the larger stones. Restabilizing eroded shorelines with the proper filter and proper slope of rock (right) will prevent further losses of shoreline property.



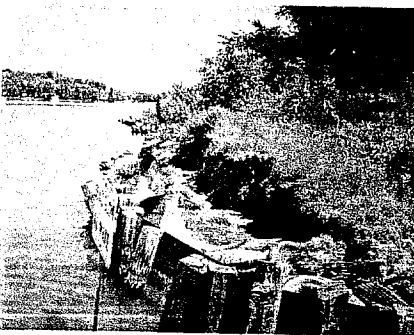
Properly designed riprap stabilization projects will include the considerations of slope, filter medium, toe protection, and height above the high water mark.

Riprap installed from the shoreline toe to three feet above the full pool level should stabilize the shoreline from the most forceful waves in those areas with the longest fetches. Less protection is needed in coves where wave height is lower. Twelve-inch riprap is the stone size most appropriate for Lake Springfield. Vegetative stabilization is encouraged in all areas where wave action is not severe.

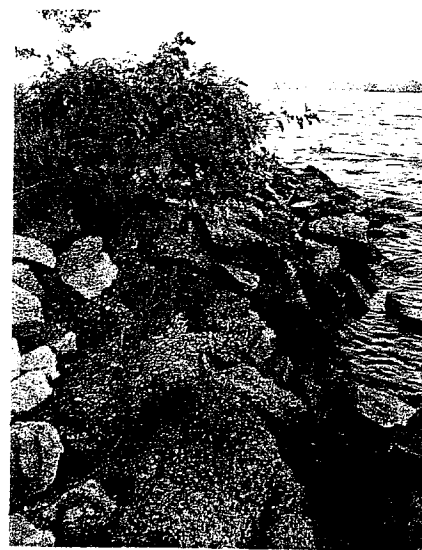
Several factors should be taken into account when selecting a method. Availability of materials, bank condition, cost, site access, and location are all considerations that must be evaluated.

Ice movement and wave action are other problems confronting the homeowner. The slope of the riprap is extremely important in maintaining stability. A gentle slope of 3:1 (horizontal to vertical) is recommended. Steeply sloped installations tend to seek a flatter angle after being dislodged by ice or waves, requiring replacement or restacking every year. Stacking rocks steeply into the face of gravity is a futile effort. In some areas, the bank has actually buckled from ice pressure on a steep or near

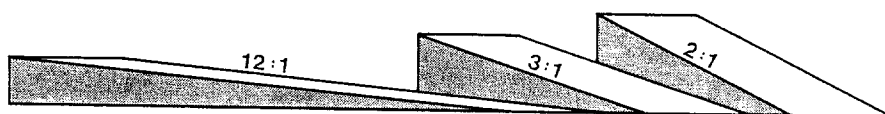
these break apart easily and leach petroleum products into the water. No major reshaping or reclaiming of eroded shorelines is allowed. Large



slabs of rock dumped along shorelines, concrete poured among the rocks, and other seemingly innovative measures don't prevent soil from washing from beneath or around them. They do not



It is illegal to use asphalt (above) to protect shorelines because it breaks up and leaches petroleum products into the water. Large slabs of concrete dumped along the shoreline (above left) and other seemingly innovative methods (left) are inappropriate because they lack a suitable filter material to prevent soil wash out. (Left photo by H. Sutton.)



Maximum (steepest) slope for a riprap installation should be 2:1 (horizontal to vertical). A more shallow slope of at least 3:1 is better. Beaches require at least 12:1 shoreline slope for stability.

vertical face. Flatter slopes will increase the chances for an ice sheet to slip up and over the bank face without damage.

Riprap Materials

Only durable materials like quarried rock and broken concrete (without reinforcing bars) should be used for riprap-type installations. Asphalt and similar materials are not allowed since

provide adequate bank stabilization and are prone to failure.

CWLP has historically offered broken concrete from Lake Services as a source of inexpensive riprap for the lake leaseholders. Leaseholders may still acquire broken concrete, but only relatively small quantities are available. Lake Services should be contacted for information on the current availability and for placement on the waiting list for delivery of broken

concrete. Leaseholders wishing to load and haul broken concrete themselves may pick up the material from Lake Services free of charge when it is available.

CWLP also has two-inch filter stone, 12-inch limestone riprap, and filter fabric available for purchase. CWLP purchases large quantities of limestone riprap from local quarries, and the rock is made available only to lake leaseholders at the City's cost (sales cannot be made to the general public). The CWLP Water Resources Office handles orders of this material and can provide leaseholders with technical information on installation.

Alternative Methods

CWLP uses riprap because of its availability, low cost, relative ease of installation, and durability. There are numerous alternatives available for special situations or for those who desire a more finished appearance. Several systems are presented here.

Gabions are wire baskets filled with rock. They are available in a variety of sizes and are assembled on site. They are filled (by hand) with three- to six-inch rock and wired together in building block fashion to form virtually any size or shape wall. Gabions are suitable for sheer bank and retaining wall applications. They



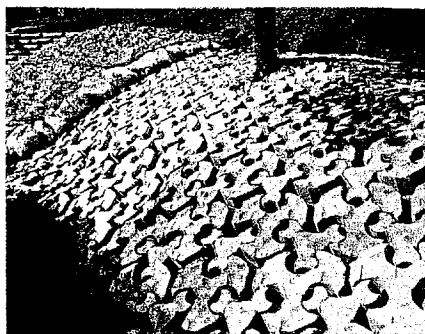
require foundation and site preparation. A similar, mattress-like basket about eight inches thick is also available for areas with gentle (3:1) prepared slopes. Construction equipment will generally be required to prepare the slope, though the mattress itself can be assembled and filled by hand.

Building Block Revetments are suitable for vertical or near vertical installations. Concrete filled bags or precast concrete blocks are available in a variety of styles and finishes. Most are mechanically interlocked, but some rely on gravity alone. All variations can conform to the bank shape. As with most alternatives, adequate foundation preparation is crucial.

Interlocking Concrete Blocks (slope pavers) are available in a variety of shapes and finishes. They are applicable where prepared slopes are

available, as with the mattress-type gabions. The interspaces can be planted in grass or other shallow rooted vegetation.

Seawalls made of aluminum, plastic, precast concrete, steel, and timber have been used with success. Seawalls require construction equipment for installation and must be carefully designed and built to insure long-term



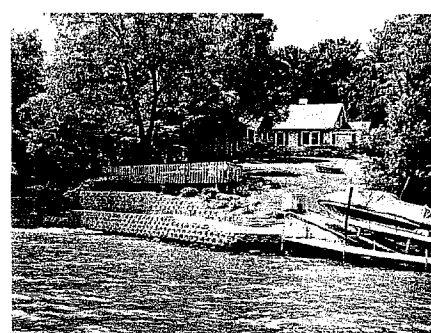
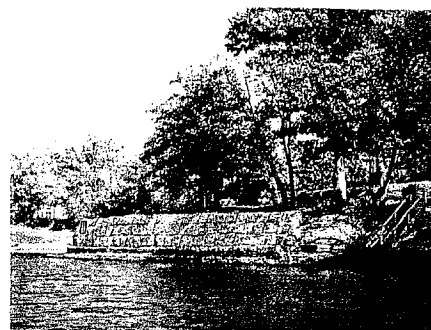
Functional alternatives to riprap include (clockwise from lower left) vegetative stabilization, seawalls (note sandbox above the high water mark), interlocking blocks, gabions and building block revetments. (Vegetative slide courtesy of North American Green.)

stability. Railroad ties treated with creosote and other chemically treated lumber should not be used below the high water mark to avert the leaching of these carcinogenic chemicals into the water.

Vegetative Stabilization with a riprap toe uses interwoven dormant willow branches and post cuttings as stock for the establishment of dense root growth to stabilize shoreline soils. This natural method of shoreline stabilization employs a degradable plastic fiber mesh with straw or coconut fiber mulch to help stabilize a prepared slope prior to root growth. Other desired tree species can be interplanted with the willow posts. Nylon fiber blankets also have been used on prepared shorelines as an alternative to riprap. Grass can be established through the mat above the high water mark where wave action is not too

extensive. These methods complement the vegetated buffer recommended for all shorelines. (See Section 5E.)

With the possible exception of some seawalls and vegetative stabilization, all of these methods include the use of a filter fabric or filter stone at the soil interface. Its importance cannot be overstated.



CWLP has installed a variety of these methods behind the Property Management Center at 200 East Lake Drive. Interested individuals are welcome to visit this demonstration area to compare methods.

Licensed Contractors

These various structural methods of shoreline stabilization are available through companies that have obtained a license from the City to perform shoreline work. The license agreement guarantees that the contractor will comply with the Shoreline Stabilization Permits the City has received from the U.S. Army Corps of Engineers and IEPA. The leaseholder and the contractor may install only those structures that are authorized under the permit. Installation of other types of projects in the water will require separate permit review and authority.

(See Section 5A.) A list of licensed contractors is available from the Water Resources Office. The leaseholder and the chosen contractor are required to contact the CWLP Water Resources Office to obtain a permit before any construction begins. City personnel will conduct on-site inspections to evaluate the project with the leaseholder and contractor, and check progress during installation.

Beaches

Homeowners who envision an inviting beach along their shoreline must consider the laws of physics, if the beach is to remain where it is intended. Sand particles are moved by any wave, even the smallest ripple. Beaches are stable only where shorelines are at a 12:1 slope or flatter and where no concentrated runoff occurs. Usually sand is found naturally at these locations. Steeper slopes result in sand being washed away and the need for constant replenishing. This slope requirement severely restricts the potential sites where stable beaches may be located. Sites must be carefully evaluated in order to recognize and avoid unsuitable areas at the outset. Considerable aggravation, money, and work can be saved in the process. Even if shoreline conditions are appropriate for a beach, sand may still be dumped only above the high-water mark. Sand placed into the water is considered a fill material by the Corps and IEPA, requiring permit review. Sand washing into the lake from inappropriately placed beaches can be detrimental to aquatic organisms, since many are not tolerant of shifting, sandy substrates. A sand box built above the high-water mark on properties without the proper slope may be the best alternative.

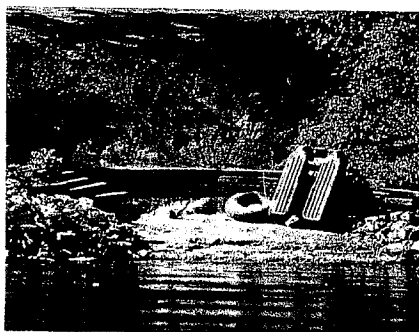
Agricultural Conservation Programs

Dredging at Lake Springfield is a maintenance effort that merely treats

the symptoms of a greater problem - that of soil erosion in the lake watershed. It has been estimated that 20 to 30 percent of all eroding soils in the Lake Springfield watershed ultimately reaches the lake.

The federal Soil Conservation Service (SCS) works with the local Sangamon County Soil and Water Conservation District (SCSWCD) to implement SCS programs and give technical assistance to landowners for the reduction of soil losses. Individuals from the SCS and SCSWCD organizations interact directly with farmers and landowners to design structures like **grassed waterways**, ponds, and **terraces**. They also give advice on reduced tillage practices, such as **no-till** and **ridge-till** operations.

The structures are designed to slow the flow of water and protect the soil in areas of concentrated flow, so the soil holds firm. In the absence of such structures, **rills** and **gullies** may be observed where water flow has washed away some of the soil. Without



An inappropriate beach location (top) at the base of a steep slope below the high water mark will never be stable. Beaches require a 12:1 slope for stability (bottom).



Raindrops hitting bare soil (above) easily break up clods of dirt allowing it to be washed away. Twenty to 30 percent of all eroded soil in the Lake Springfield watershed ultimately reaches the lake. (Top photo courtesy of the SCS.)

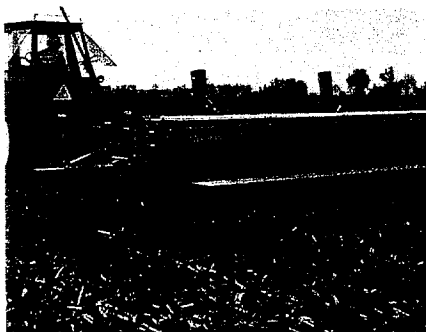


remedial action, the rill or gully will become larger, thereby increasing the chance that eroded soil will be transported to the lake.

Tillage practices are important because the crop canopy protects the fields from erosive rainfalls for only three or four months during the growing season. By having crop residue (leaf and stalk fragments) from the previous growing season remain on the field after harvest, i.e., no moldboard plowing (the old conventional way of completely turning the soil), the erosive potential of those raindrops is reduced in two ways. First, the energy of a falling raindrop is strong enough to break up clods of soil. If the raindrop first hits a piece

of leaf or cornstalk, that energy is dissipated. Second, the residue acts as numerous small check dams, slowing the flow of water and trapping the soil during a rainfall event. This keeps the soil from migrating.

The SCS and SCSWCD have been working in the county for many years. The City became actively involved in 1983 with the initiation of a grant program to fund conservation efforts in the Lake Springfield watershed. Administered by the SCSWCD, grants from CWLP, averaging \$25,000 per year, have been used to purchase no-till machinery, fund cost-share conservation structure construction, and seed highly erodible land into grasses. A no-till planter (primarily for corn) and a no-till drill (mainly for soybeans) were made available to area farmers so they could try the no-till system of planting before purchasing this expensive equipment on their own. This equipment differs from conventional planters in that it is capable of planting through the crop residue of the previous season without plowing. These educational efforts were successful in converting numerous farmers to the no-till system. Subsequently, these planters were exchanged for a no-till



Water samples taken at regular intervals from Lick and Sugar Creeks during a rainfall event show high suspended solids loadings during the early runoff periods after a storm. The top jars hold water leaving the lake at Spaulding Dam during the rain. Most of the soil will settle out as sediment in the lake.

grass seed drill capable of planting erodible hillsides, roadsides, and waterways with cool-season or warm-season (prairie) grasses.

City monies have been used to help fund the construction of dry dams, ponds, terraces, and waterways. Projects funded are prioritized based on their proximity to the lake or stream, status of current erosion, and steepness of slope. Similar to other SCS programs, City cost-share dollars have paid for 50 to 65 percent of the cost of construction with a \$3,500 maximum payment. The landowner is responsible for the additional cost and maintenance.

There has been a high level of conservation activity in the Lick Creek watershed of the lake. The City's nutrient, sediment, and water budget

Farming no-till calls for elimination of moldboard plow use, the old conventional plow method that completely overturns the soil and subjects it to extensive erosion. Grants from CWLP were used to purchase a no-till drill (above left) and planter for trial use by farmers in the Lake Springfield watershed. Residue on this no-till corn field (left) will reduce soil losses by absorbing the erosive energy of the falling raindrops, and by acting as numerous small check dams during the water runoff. (Both photos courtesy of the SCSWCD.)

studies of Lake Springfield showed that the Lick Creek erosion rate was 22 percent lower than the Sugar Creek rate (Fitzpatrick and Keefer, 1988).

Conservation efforts are important for their soil savings, as well as for keeping the fertilizers and pesticides attached to those soil particles out of our waters. Those nutrients retained on the farmlands are used for growing crops, rather than fertilizing the growth of algae in the lake. See Sections 3C, 4A, and 4B for discussions about nutrients as they affect the lake, and Section 4C for information about fish



Conservation grants from CWLP to area farmers have been used to build grassed waterways (above) to convey runoff water while minimizing the soil losses often seen in areas of concentrated flow (below).



contamination by agricultural pesticides.

The City's active participation in these projects also has been viewed favorably by several federal and state agencies. They have awarded over \$2 million for additional soil conservation efforts and lake restoration activities at Lake Springfield, including the development and printing of this

publication. Sustained farm productivity and improved water quality in our lakes and streams are benefits of soil conservation.

Urban Erosion

Similar to agricultural runoff, urban erosion contains nitrogen, phosphorus, and suspended solids. Other urban pollutants frequently washed into our waterways include bacteria, grease, household chemicals, oil, road salts, and trace metals. Development increases the amount of non-porous surfaces. The construction of driveways, homes, parking lots, and roads changes the hydrology of an area, increasing the amount of surface water runoff.

The Springfield land subdivision ordinance requires evaluation of surface water drainage patterns and runoff rates for new developments and temporary surface storage for water from storms exceeding a five-year frequency event. Erosion control at outlet structures also is necessary. These provisions, while needed, are all related to the physical handling of water, and are not necessarily designed



Oil, heavy metals, phosphorus, and suspended solids are among the pollutants in runoff water from developed areas. Stormwater detention basins can be designed to absorb some of these substances before they reach waterways.

to address the chemical quality of drainwater. The IEPA rules state that erosion control practices are to be employed during the construction of new sewer connections, but their authority ends upon completion of that effort. The City also requires erosion and sediment control during construc-

tion of public improvements. Erosion during other construction phases, including preliminary grading, excavation, and home construction, is not currently regulated.

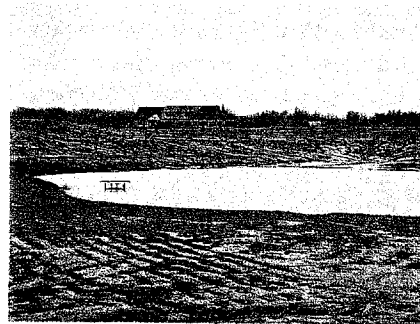
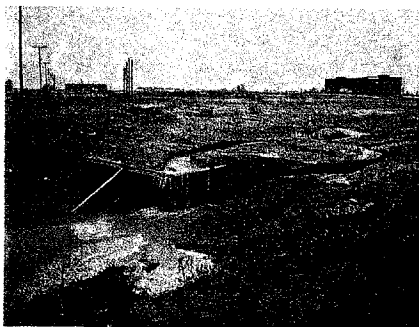
Formulating regulations regarding construction site erosion control and the quality of urban runoff, as well as increased enforcement of existing regulations, are important at both city and county level. The design and implementation of best management practices is successfully employed in several states. Model ordinances are available and could be adapted for any community.

Leaseholder Properties - Construction Activities

When new homes or additions to existing facilities are constructed on lake leaseholds, erosion control planning conforming to the IEPA's "Standards and Specifications for Soil Erosion and Sediment Control" of 1987 must be included as part of the construction site drawings. Other guides also are available. (See Recommended Reading.)

Site grading should occur in two stages. No more than 20 feet surrounding a proposed structure (as measured from the foundation) should be graded in the first stage, leaving all surrounding vegetative cover. Temporary erosion control methods, including sediment traps, silt fences, and staked straw bale barriers, should be employed to prevent transport of sediment to the lake. Soil stockpiles should be covered, temporarily seeded, or surrounded with silt fence or straw bales. No area within 100 feet of the shoreline should be denuded of vegetation at any time. Upon completion of construction, final grading should be followed immediately by complete seeding and mulching of the disturbed areas. Revegetation with other landscape materials is also desirable.

Temporary erosion control methods should be installed prior to excavation



Erosion from commercial (above left) and residential (left) developments result in the sedimentation of lakes, creeks, ditches, and sewers. Use of appropriate erosion control measures, such as retention ponds (above) prior to and during construction, will trap these pollutants before they reach the lake. Revegetation of disturbed areas soon after construction will prevent continued soil loss.



and examined after every rainfall to check for needed repairs. Control methods can be removed upon complete restabilization of the upslope areas.



Only a minimal band of vegetation, as above, should be disturbed in the initial phase of home reconstruction. Final grading, followed immediately by seeding, mulching, and other landscaping, should occur only after the home is completed. These guidelines, along with other temporary erosion control methods, will prevent serious erosion problems.

Yard Maintenance

Landscaping and yard care practices on lakeside leaseholds directly affect the quality of Lake Springfield. By following a few simple guidelines, homeowners can help reduce water pollution and enhance the environmental quality of lakeside property.

Disposal of Yard Vegetation

Discarded grass cuttings and leaves that make their way into the lake reduce light penetration and add organic material and excess nutrients to the lake. Vegetation placed in the lake will be decomposed by bacteria and other organisms in a process that consumes oxygen in the water. Oxygen, needed by fish and other aquatic animals, may then be in short supply. These stresses on the aquatic environment can be avoided by never discarding yard wastes into the lake. The

vegetation should be composted or disposed properly off site.

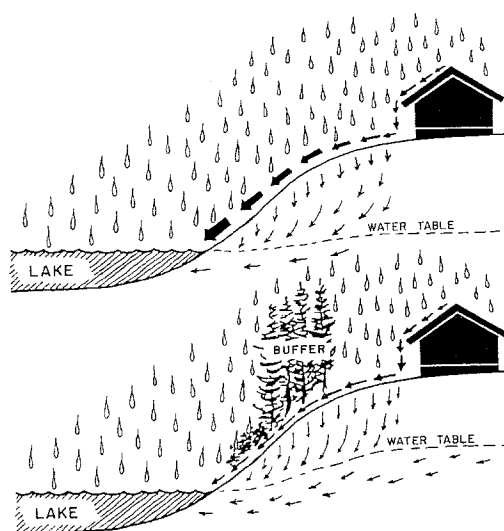
When leaf burning was legal in the Springfield area, many lake homeowners chose to burn leaves in the dry lake bed when the lake level was low. While this was a way to eliminate burn areas in the yard, considerable amounts of unwanted organic matter, and some potassium and phosphorus remained in that ash. To the lake's detriment, these unwanted materials washed into the water. The ash should have been removed from the lake bed and properly discarded.

Vegetated Shoreline Borders

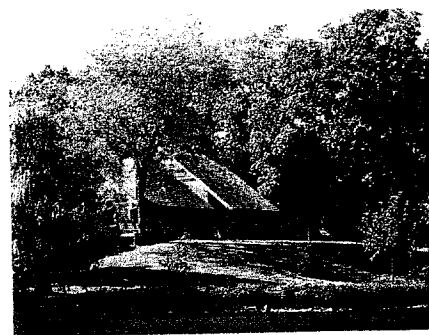
The best way to protect fragile shoreline areas is with an established vegetative buffer. Refer to Section 5D for shoreline stabilization at the water's edge. Extensive plant root systems and vegetative cover above ground help bind soils in shoreline areas. The exclusion of foot traffic in fragile areas also is helpful in stabilizing near-shore grounds above the water line. The buffer will also function as an interceptor, absorbing runoff from driveways, sidewalks, and yards that may carry fertilizers, pesticides, and sediments before these waters reach the lake. A general rule of thumb is that a minimum of 25 feet (more is better) of low maintenance, natural and ornamental vegetation (trees, shrubs, ground covers) requiring little, if any, fertilization should be established uphill from the water's edge. Wider buffers are needed where the slopes are steep or the soils are shallow or primarily clay. A shoreline area should never be denuded of existing vegetative cover. Severe erosion problems that are extremely difficult and expensive to correct will result.

Grass is good for stabilizing the soil, but one has a tendency to fertilize grass, and this near-shore area itself may then contribute nutrients to the lake. Also it will not absorb excess

fertilizer and pesticide-rich water that might run off from other yard areas. No more than 30 feet per 100 feet of shore land should be open space.

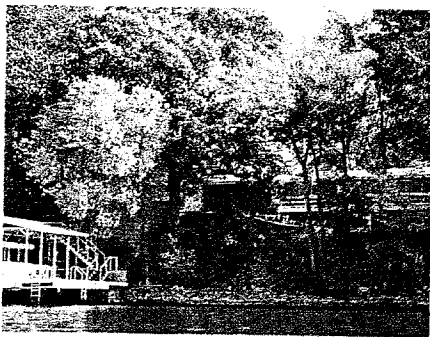


Buffer strips of vegetation along a shoreline protect water quality by absorbing and filtering the water. Without a vegetative buffer strip, surface water accumulates rapidly and carries phosphorus directly to the lake. (From the Southern Maine Regional Planning Commission, et.al. See credit on p. 46.)



This good start at a vegetated buffer could be enhanced with additional plantings for a distance of 25 feet (more is better) up from the shoreline.

Appropriate pruning and trimming of vegetation can keep the view to the lake enhanced and appreciably unobstructed. Eliminating a monoculture of mowed grass near the shoreline also will reap additional wildlife benefits.



This buffer of vegetation provides valuable erosion control on this steep bank. Never denude a shoreline area of its vegetative cover; severe erosion problems that are difficult and expensive to correct will result. See photo on page 35 for an example of bank erosion due to devegetation.

Desirable/Undesirable Plants

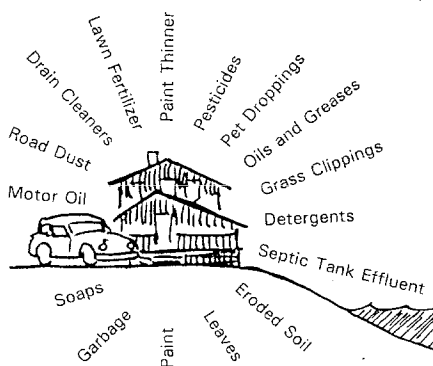
Grass, shrubs, trees, and other plants should be selected for a particular yard and soil type. A little research before buying will help identify plants that are native to the Lake Springfield area. These plants will already be pre-adapted to conditions encountered in this environment.

The characteristics of a plant should be known before it is introduced to the lake area. For example, the attractive ornamental, purple loosestrife, has overrun many wetland areas in Illinois. It outcompetes, and therefore threatens the survival of, many native Illinois plants. It is now illegal to sell or plant purple loosestrife, multiflora rose, and Japanese honeysuckle in Illinois because of their invasive nature. Another example of a problem exotic is crown vetch, which has been promoted as an excellent soil stabilizer. It does not provide effective erosion control and is extremely invasive. Also, no aquatic plants should be introduced to the lake without approval from the CWLP Water Resources Office. (See Section 4B.)

Fertilizers

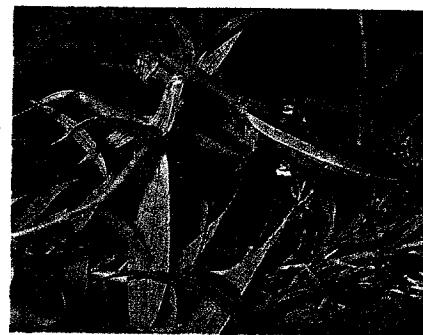
The nutrients found in fertilizers that help make yards grow also will feed aquatic plants like the lily pads and algae. The resultant algae blooms create aesthetic problems and can cause foul odors and unpleasant tastes in the drinking water.

The numbers on the fertilizer bag refer to the percentage of three nutrients by weight. A bag of 5-10-10, for example, would consist of 5 percent nitrogen, 10 percent phosphorus, and 10 percent potassium. A soil test should be performed to determine individual soil fertility levels. Only fertilize when the lawn needs it, feed during the active growing season and fertilize with the appropriate formulation, according to manufacturer's directions. Always completely clean up spilled fertilizer. The phosphorus in fertilizers will adhere to soil particles when applied to the lawn. Nitrogen forms are soluble in water and do not bind to the soil. Excess nitrogen will percolate below the root zone, be unavailable to the plants and enter the groundwater. Excess soluble fertilizer won't be immediately used by plants and, if washed into the lake, will assist only in growing more algae. The use of slow-release fertilizers are recommended for long-term lawn care because they make nutrients available consistent with plant needs, and the nutrients will not leach below the root zone.



Pesticides

When thinking of pest control, a person might automatically consider chemicals. The problem with chemicals is that not only are the pests affected, but sometimes non-target species are impacted as well. Beneficial insects, such as ladybugs and praying mantises, eat undesirable insects, but the desirable bugs can be eliminated along with the pests when insecticides are used. Windblown herbicide also can kill non-target vegetation.



Beneficial insects like lady bugs and this praying mantis eat other insects that are pests to ornamental and vegetable crops. These insects will be killed along with the harmful ones if insecticides are used to control pests in the yard. Use alternative methods of pest control when possible.

If chemicals are the chosen method of control, warning labels and instructions should be read carefully before application. Pesticides with the least toxicity will read "caution" instead of "warning". While crabgrass concerns can only be alleviated with preemergent chemical treatments (or hand pulling), and fungicides are similarly used for fruit trees and roses, other pesticides should never be applied on a "preventive schedule", such as quarterly or at the same time each year. Apply only as problems arise.

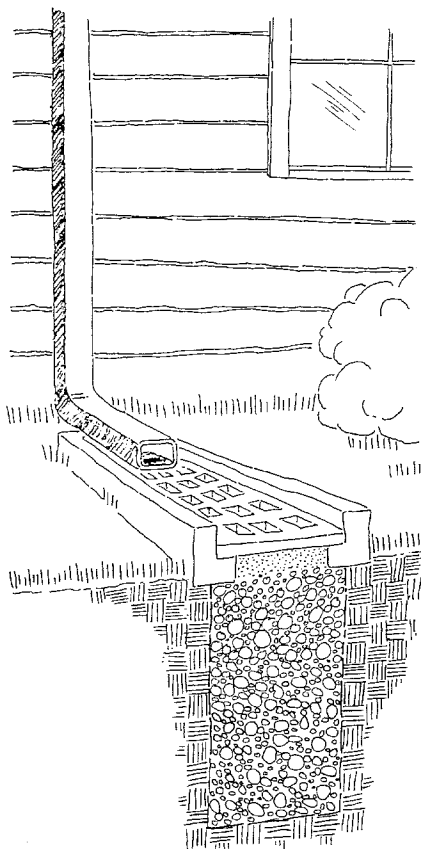
The home environment has many sources of phosphorus and other contaminants that can reach the lake, unless precaution is exercised in each regard. (From the Southern Maine Regional Planning Commission, et.al. See credit on p. 46.)

Discarded pesticides should never be poured down the drain or toilet. Sewage treatment facilities, especially individual septic systems, are not equipped to handle these chemicals. Pesticides can kill the bacteria in these systems that are required to break down the sewage. Also, pesticides should never be poured into storm drains or ditches, since these are direct conduits to the lake. The best method for disposing of pesticides is to buy only what will be used for two years and make sure it is used. Community chemical collection days are an alternative method of disposal or, as a last resort, they may be wrapped in newspaper and thrown in the garbage. Never apply pesticides near the lake or on bare ground where they can erode easily into the water.

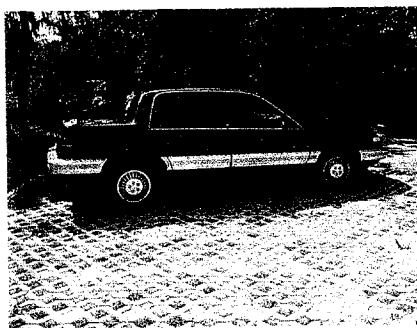
Pesticides can kill at all levels in the aquatic food chain from the smallest bacteria, algae, or crustacean up to the birds, fish, and mammals. Please consider the alternatives of hand weeding or picking insect eggs, larvae, etc., before the chemical strategy. The use of insecticidal soap, milky spore, pyrethrins, insect attractants, and the bacterial insecticide, Bacillus thuringiensis can be obtained from garden shops to cure some problems with reduced potential for environmental damage. Think about the lake environment and the City's drinking water supply before pesticides are applied.

Drainage

Water from rooftops, downspouts, and driveways usually contains various chemicals and suspended solids. This water and that from sump pumps should never be piped to run directly to the lake or into a septic system. This drainage should be allowed to filter through vegetated areas of the landscape or into seepage pits. Phosphate-free cleansers should be used to wash home exteriors, boats, cars, etc., so that the runoff from the



Seepage pits (above), 12-inches wide and three-feet deep, constructed next to driveways and at downspout outlets hold and filter contaminated runoff from paved areas and roofs before this water reaches the lake. (From Citizens Program for the Chesapeake Bay, Inc. 1987. See credit on p. 46.) Porous pavements (below) allow rainwater to soak into the landscape, reducing runoff.



home area doesn't fertilize the lake with additional phosphorus. (See Appendix B.) Motor oil and other petroleum products also contain phosphorus and should be thoroughly cleaned up if spills or drips occur in driveways and garages.

Gullies forming in the yard can be

modified to include measures such as gentle swales or terracing to slow down water runoff to allow infiltration prior to reaching the shoreline. Natural ravines are sensitive drainage areas that will quickly develop erosion problems if vegetative cover is removed or covered. Nutrient and sediment delivery to the lake is greatly accelerated on bare or disturbed areas.



Terraces, swales, berms, and detention ponds are methods to modify runoff patterns by slowing down water velocity and promoting infiltration in areas of erosion and concentrated flow.

Vegetation should be quickly reestablished on modified areas, and the use of embedded and staked straw bales or mulch in the interim will prevent erosion. Plans for drainage modifications must be presented to the CWLP Real Estate Office prior to implementation.

Swimming Pools

Swimming pools require chlorine and other chemical treatment to keep the water bacteria-free and clear. During pool draining, care must be taken to prevent localized chlorine contamination of the lake water. Since chlorine dissipates rapidly into the atmosphere, letting pool water sit for a few days without chlorine contact before draining will reduce the chlorine concentration. Pool water emptied directly onto the lawn can first filter into the soil. Pool water should not be drained near septic system lateral fields and never into the septic

system itself. Backwash water for residential pools may be similarly disposed. Backwash from public pools at camps and clubs may need to be treated before discharging to the lake area depending on the type of filtration system. (See Section 5A on leasehold construction permits.)

Fuel Storage Tanks

Leaking fuel storage tanks pose a hazard to our groundwater and drinking water supply. One gallon of gasoline can render one million gallons of water unsuitable for drinking (Cheremisinoff, 1991). Petroleum can also contaminate the soil, and vapors can accumulate in confined spaces, such as septic tanks and basements, creating the potential for a fire or explosion. As many as 25 percent of all underground storage tanks (UST's) may now be leaking (USEPA, 1988). Storage tank regulations have been designed to help prevent leaks from occurring. Gravity-flow systems (now prohibited) are of great concern since there is nothing to prevent a free flow of fuel from a defective hose or fuel delivery nozzle. The possibility of a spill near or into the water is high, since many tanks are located less than 10 feet from the shoreline next to boathouses.

Underground Storage Tanks

A UST is defined as any tank system that has at least 10 percent of its volume underground. All UST's greater than 110 gallons, storing either petroleum or certain hazardous chemicals for non-residential use, must be registered through the Illinois Office of the State Fire Marshal (OSFM). Any facility such as a club, camp, or marina with such tanks must have them registered. Individuals using residential tanks for non-commercial purposes are required to register their UST's that are 1,100

gallons or greater in size. Included on this notification is the tank age, contents, location, size, and type. Notification forms may be obtained from the OSFM in Springfield. There are additional requirements for leak detection, leak prevention, financial responsibility, and corrective action for these tanks.

Most residential tanks located near Lake Springfield are less than 1,100 gallons in size. These smaller tanks are exempt from UST regulations governed by the OSFM, but are regulated by the City of Springfield.



It only takes one gallon of gasoline to contaminate one million gallons of drinking water. Stringent regulations now apply to all fuel tanks in the lake area. (Photo by M. Bodamer.)

Tanks less than 1,100 gallons must be registered with the CWLP Environmental Affairs Office. All tanks, regardless of size, must be UL or FM approved and protected from corrosive conditions by one of the following methods: 1) the use of an engineered, properly installed and maintained cathodic protection system, or 2) the use of tanks constructed from approved corrosion-resistant materials, such as special alloys, nonmetallics, reinforced plastic coatings, composites, or equivalent systems.

Dispensing devices that discharge by gravity flow are prohibited. A UL or FM approved, permanently mounted pump must be installed to control the flow of liquid and prevent leakage or accidental discharge. All wiring of such pumps and all other electrical

equipment must conform with the National Electrical Code. Spill and overflow protection also must be installed. Leak detection, such as the use of monitoring wells, is required for both tanks and piping. All piping must be double-walled and constructed of either coated and cathodically protected steel or fiberglass. Pressurized piping systems must have either an automatic flow restrictor, automatic shutoff device, or a continuous alarm system. Setbacks from the shoreline are 30 feet for tanks; 10 feet for dispensing pumps. Twenty foot setbacks from buildings, sewers, septic tanks, property lines, wells, etc., also are required for tanks. The maximum hose length on the fuel dispenser is 18 feet; 30 feet if the hose is installed on a retractable reel. All UST's not in compliance with these regulations must be upgraded or removed from the lake area.

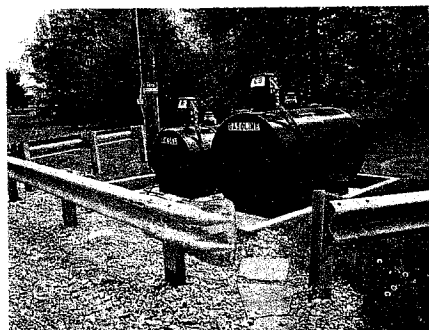
The city may require a tank or piping to be tested for leakage, at the owner's expense, if there is reason to believe a leak exists. If a leak is discovered in any UST, the owner is financially responsible for the cost of cleaning up the spill and related damages. The CWLP Environmental Affairs Office must be contacted immediately if an emergency spill situation occurs. The owner also must notify the Emergency Services and Disaster Agency (ESDA) within 24 hours after discovering a leak.

Any UST no longer in service must be removed from the lake area. Individuals who plan to install or remove non-residential tanks greater than 110 gallons, or residential tanks greater than 1,100 gallons must first notify the OSFM, the Springfield Fire Department, and the CWLP Environmental Affairs Office. If the residential tank is less than 1,100 gallons, only the Springfield Fire Department and the CWLP Environmental Affairs Office must be notified. The removal of all tanks must be in accordance with the rules and regulations of the

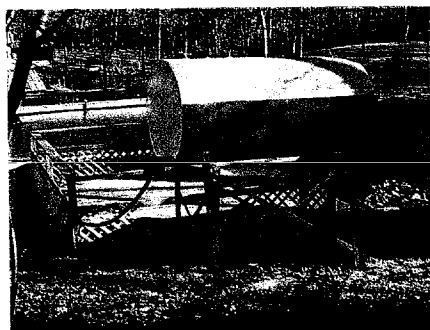
City of Springfield Fire Safety Division and the OSFM. These removal procedures must be followed to avoid explosions from concentrated vapors.

Aboveground Storage Tanks

The storage of flammable or combustible liquids in outside above-ground tanks is prohibited in all areas around Lake Springfield, except those zoned I-2. Existing above-ground tanks must be removed from the lake area in accordance with the rules and regulations of the Springfield Fire Safety Division. Leaseholders are responsible for the cleanup of contaminated soil or water caused by their leaking tanks.



State and City fire regulations do not allow installation of aboveground tanks in any areas except those like the CWLP Power Plant and Lake Services fleeting areas (top) and only then when appropriate safeguards are installed. For environmental and safety concerns, no tanks (aboveground or underground) are allowed to have gravity flow dispensing devices (below). Gravity flow tanks and hoses are prone to failure. (Bottom photo by M. Bodamer.)



Bulk Sales Restriction - Portable Containers

For safety reasons, 12 gallons is the maximum quantity of motor fuel that may be sold to any one individual for transportation in a vehicle, provided it is stored in an approved portable container. Leaseholders wishing to store a larger quantity of motor fuel should consider installing an approved underground tank. (See Section 5A for permit information.)

More information on aboveground and underground storage dispensing tanks and required permits can be obtained from the Illinois Office of the State Fire Marshal, the Springfield Fire Department, or the CWLP Environmental Affairs Office.

Boating

Most of the regulations regarding boating and other lake uses are in effect primarily for public safety reasons. Chapter 96 of the Springfield City Code, the lake boating rules pamphlet, the emergency rapid response map, the lake map, and similar publications outline these important policies. Boating practices that affect the quality of the water or physical integrity of the lake are outlined here.

Operation

Boat wakes can be very destructive to unprotected lake shorelines. By always observing the 200-foot, no-wake zone, this distance allows most boat-generated waves to dampen sufficiently before they reach the shoreline and cause soil erosion problems.

Maintenance

Petroleum products discharged to the water can be detrimental to the City water supply and toxic to aquatic

animals. Oil and gasoline interfere with insect and fish respiration when contacted or with digestion when consumed. All oil or gasoline spills should be reported immediately to Lake Security. Lake Security can arrange for personnel to respond with absorbent pads or booms to soak up spilled material.

The amount of waste oil released from outboard motors can be reduced by having these engines serviced at least once a year. By servicing engines once in the fall, they can be winterized and checked over in one visit, and be ready for the next boating season. More frequent service checks are advised for active boaters. Worn or broken seals should be replaced to prevent engine oil from reaching the water. Fishermen should never discard excess monofilament line into the water, since this line often is caught on prop shafts, leading to deterioration of the prop shaft seal. Use of the manufacturer's recommended oils also will assure proper function of outboard motors.

Boaters should always wipe up excess oil or gasoline that has dripped while filling gas cans or oil reservoirs. Invariably there is excess fluid in the nozzle of gasoline hoses. Extreme caution is needed when refueling near the lake so that excess gas in the pump nozzle is not allowed to drip into the water. The nozzle should be held up until the tip reaches the opening of the can or fueling port on the boat. Bilge water that has been contaminated with oil or gasoline should not be pumped into the lake, but rather soaked up with rags and then disposed in a waste can.

Cleaning

Phosphate detergents that reach the lake can lead to increased algae production. Soaps in general can detrimentally affect aquatic animals similar to petroleum products. See Appendix B for a listing of detergents and their phosphate content.

Boats should never be washed with detergents at boat ramps or in drive-ways or other areas that will drain directly to the lake. Frequent wet sponging will reduce the need for detergent washing. Trailering boats to a car wash or washing them on the lawn (not over the septic drainfield) will assure that the soapy water doesn't reach the lake. Caustic stain removers should never be used near the water, and these should always be thoroughly rinsed, or the residue of these compounds wiped off before the craft is placed back in the lake.

Waste Disposal

No boat or craft with toilet facilities can be operated on the lake, unless these facilities are plugged and incapable of discharging their contents to the water. No insanitary condition should be created by any lake user. Public health concerns related to our drinking water supply, human contact, and nutrient concerns for the reservoir are ample reasons for these regulations.

Trailering

Extreme caution should be exercised when boats are taken on vacation, so that no exotic aquatic plants or animals are brought back to Lake Springfield. Bits of plants and animals have a remarkable tendency to get stuck on axles, props, and between the boat and trailer pads. Boats should always be taken to a car wash before returning to Lake Springfield and meticulously inspected for foreign material. Live wells and minnow buckets should be emptied on location (not into the water) before leaving any given lake. Unwanted species of aquatic vegetation or plankton can reproduce in nuisance proportions and be disastrous for the lake. For example, the exotic zebra mussel, now found throughout Lake Erie and in some Illinois waters,



Special care should be taken by boaters to empty live wells and clean plant material from axles, props, trailer pads, etc. before trailering to a different lake. These precautions are taken so no exotic plants or animals contaminate the next lake visited.

is a European pest that reproduces rapidly, overwhelms native fauna and clogs power plant water intake lines. This small clam could easily be brought back attached to trailers or anchor lines. These cleaning practices should be employed after each lake or river visited.

Docks

Docks with pressure-treated support posts or other parts in constant contact with the water may leach these treatment compounds into the water. Pressure treatment processes frequently use one of three families of compounds, including arsenic compounds, creosote (coal tar derivatives), and pentachlorophenol. Given the carcinogenic concern about these chemicals, materials containing them should be used only on dock decks and other surfaces that are never submerged. Resilient woods like cedar or redwood, any stout untreated wood, steel, or plastic posts should be used instead. Floating docks that can be removed each season or cantilever docks with boat lifts are highly recommended. Floating and cantilever docks are further unaffected by ice movements on the lake.

Littering

Littering has no place in our society, but it is especially tragic in our natural areas. Most trash is not biodegradable and will last many years when discarded in the environment. All cans, plastic wrappers, foam cups, and other debris can be easily disposed at home or in the trash barrels at the boat ramps and parks. The collection and disposal of any litter found floating around the lake is greatly appreciated.

CWLP lake managers can provide more detailed information about many of the topics presented in this book, if further explanation is desired. Following these guidelines will make us better stewards of the landscape, and help to insure that Lake Springfield remains a quality environment.

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7. ILLUSTRATION CREDITS

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8. APPENDIX A.

LAKE SPRINGFIELD SPORT FISH HEALTH ADVISORY April 1991

Chemical contaminants are often found in our environment. Some reach lakes and streams where they accumulate in sediments, aquatic organisms, and fish. Consumption of contaminated fish can represent a major source of chemical exposure for humans. Therefore, to provide uniform advisories on this subject, officials from the Illinois Department of Public Health in cooperation with the Illinois Department of Conservation and the Illinois Environmental Protection Agency have jointly reviewed all available contaminant monitoring data for Lake Springfield sport fish.

Table 1 ranks popular sport fish species from Lake Springfield on the basis of whether or not these fish comply with the action levels established by the United States Food and Drug Administration to regulate the commercial sale of fish and shellfish. Action levels were exceeded in a number of fish for Chlordane, Dieldrin, and Heptachlor Epoxide as well as one PCB excursion identified in the largest carp sampled.

Health officials recommend the following advice concerning consumption of Lake Springfield sport fish:

Group I - Fish with the Lowest Level of Contaminants

Ninety percent or more of the fish tested in Group I met Food and Drug Administration action levels. Eating Group I fish poses the lowest risk of exposure to contaminants.

Group II - Fish with Moderate Levels of Contaminants

One or more contaminants were found to be above the Food and Drug Administration action level in 50 percent or more of the fish tested in Group II. Pregnant women, women who expect to bear children, nursing mothers, and small children should not eat these fish. Others should limit their consumption to no more than one meal per week and heed the preparation and cooking recommendations below.

Group III - Fish with High Levels of One or More Contaminants

One or more contaminants were found to be above the Food and Drug Administration action levels in 90 percent or more of the fish tested in Group III. NO ONE should eat Group III fish.

Table 1. Levels Of Contaminants Found In Sport Fish

	Group I Low	Group II Medium	Group III High
FISH SPECIES	White Crappie Carp under 26 inches Largemouth Bass Flathead Catfish under 16 inches Channel Catfish under 15 inches	Bigmouth Buffalo	Channel Catfish over 15 inches Carp over 26 inches Flathead Catfish over 16 inches

It should be noted that those who do consume sport fish should prepare and cook the fish in ways which reduce the presence of fat soluble contaminants in the edible portion. These techniques include the removal of the skin and fatty tissues associated with the belly, lateral line, and dorsal area of large fish, and cooking by baking, broiling on a rack, or barbecuing so the fatty oil can drip away from the finished meal and be discarded.

In general, fish which contain more toxic chemicals than permitted under current Food and Drug Administration action levels should not be eaten or sold for human consumption. It should be noted that any food containing fat soluble contaminants potentially represents an additional exposure to toxic chemicals which accumulate in the human body, concentrate in breast milk, and therefore, represent some degree of risk. These risks to health are not well defined at this time and are long-term risks. Sport caught fish, even those with low contaminant levels, can represent a major source of exposure if eaten often enough. Women who might breast feed should heed the advice given for fish in Groups II and III and should not make Lake Springfield fish a major part of their regular diet. Eliminating or reducing the frequency of consumption or eating smaller-sized fish can also reduce the degree of exposure and, accordingly, any health risks which may be associated with exposure. This represents the basis for the advice concerning consumption of the sport caught fish cited in the table above.

Food And Drug Administration Action Levels For Contaminants Tested For Fish Cited In The Table Above.

Chlordane	0.3 parts per million
Dieldrin	0.3 parts per million
Heptachlor Epoxide	0.3 parts per million
PCB	2.0 parts per million

It should be noted that the historical trends in fish flesh monitoring data indicate contaminant levels for Lake Springfield are declining.

8. APPENDIX B.

GUIDE TO PHOSPHORUS CONTENT IN AVAILABLE CLEANING PRODUCTS

Excess phosphorus in our lakes and streams leads to an overabundance of algae and other plant materials. These tables show the phosphate content of cleaning products in **grams per use (g/USE)** according to the manufacturer's specifications on the package. The lower this value, the less the product will contribute to the pollution and eutrophication of Lake Springfield. These products were surveyed during the summer of 1991. New products are frequently introduced to the marketplace, and old products are often changed. Please examine the label for phosphate content before purchasing a product. Many products have a code stamped on each box which represents the phosphate content. Examine the product for this code carefully before purchasing the item. Products with no phosphate are widely available. Use these tables to select products that will be the least harmful to the environment.

POWDERED LAUNDRY DETERGENTS

PRODUCT	MANUFACTURER	RECOMMENDED VOLUME/USE	PHOSPHATE g/USE	PRODUCT* CODE
AJAX	Colgate-Palmolive	1 C.*	no phosphate	
ALL	Lever Brothers	3/4-1 C.	no phosphate	
ARM & HAMMER	Church & Dwight	1 C.	no phosphate	
BI-RITE	Glendale Foods, Inc.	1 C.	.5	
BOLD (careful: there are at least two kinds)*	Proctor & Gamble	1 C.	.5	O
		1 C.	6.0	P
CHEER (with color-guard)	Proctor & Gamble	1 C.	.5	O
(careful: there are at least three kinds)*		1 C.	5.5	L
		1 C.	7.0	P
DREFT (with enriched borax)	Proctor & Gamble	1 C.	.5	O
(careful: there are at least two kinds)*		1 C.	4.7	L
DUTCH (heavy-duty)	The Dial Corp.	1 C.	no phosphate	
FAB (careful: there are are at least two kinds)*	Colgate-Palmolive	1 C.	.5	O
		1 C.	6.0	P
FAB 1 SHOT	Colgate-Palmolive	1 packet	no phosphate	
FRESH START (concentrated)	Colgate-Palmolive	1/4 C.	.5	O
(careful: there are at least two kinds)*		1/4 C.	7.0	P
INSTANT FELS	The Dial Corp.	1 C.	no phosphate	
IVORY SNOW	Proctor & Gamble	3/4-1 C.	no phosphate	
JEWEL (all temperature)	Jewel, Inc.	1 C.	no phosphate	
LADY LEE (heavy-duty)	LKS Products, Inc.	1 C.	no phosphate	
LADY LEE (low suds)	LKS Products, Inc.	1 C.	.4	
LEMON DASH	Proctor & Gamble	3/4-1 C.	no phosphate	
NATIONAL GENERIC BRAND	Sunfresh, Inc.	1 C.	.4	
OXYDOL (with bleach)	Proctor & Gamble	1 C.	.5	O
(careful: there are at least two kinds)*		1 C.	4.9	L
PUREX (heavy-duty)	Purex Corp.	1 C.	no phosphate	
RINSO (heavy-duty)	Lever Brothers	1 C.	trace	
SURF (careful: there are at least two kinds)*	Lever Brothers	1 C.	no phosphate	
		1 C.	6.0	
TIDE (with bleach)	Proctor & Gamble	1 C.	.5	O
(careful: there are at least two kinds)*		1 C.	7.0	P
TIDE (clothesline fresh)	Proctor & Gamble	1 C.	.5	O
(careful: there are at least two kinds)*		1 C.	5.6	L
TIDE (unscented)	Proctor & Gamble	1 C.	.5	O
(careful: there are at least two kinds)*		1 C.	5.6	L
TREND	The Dial Corp.	1 C.	no phosphate	
ULTRA CHEER (with color-guard)	Proctor & Gamble	1 scoop	no phosphate	
ULTRA GAIN	Proctor & Gamble	1 scoop	no phosphate	
ULTRA OXYDOL (with bleach)	Proctor & Gamble	1 scoop	no phosphate	
ULTRA TIDE (careful: there are at least two kinds)*	Proctor & Gamble	1 scoop	no phosphate	O
		1 scoop	7.2	P
ULTRA TIDE (unscented)	Proctor & Gamble	1 scoop	no phosphate	O
(careful: there are at least two kinds)*		1 scoop	5.8	P

LIQUID LAUNDRY DETERGENTS

<u>PRODUCT</u>	<u>MANUFACTURER</u>	<u>RECOMMENDED VOLUME/USE</u>	<u>PHOSPHATE g/USE</u>	<u>PRODUCT* CODE</u>
AJAX	Colgate-Palmolive	1/2 C.	no phosphate	
ALL	Lever Bros.	1/2 C.	no phosphate	
ALLWAYS RITE (heavy-duty)	Wetterau	1/2 C.	no phosphate	
ARM & HAMMER	Church & Dwight	1/2 C.	no phosphate	
BI-RITE (heavy-duty)	Glendale Foods, Inc.	1/2 C.	no phosphate	
BOLD	Proctor & Gamble	1/2 C.	no phosphate	
CHEER (with color-guard)	Proctor & Gamble	1/2 C.	no phosphate	
CHEER FREE	Proctor & Gamble	1/2 C.	no phosphate	
DASH (heavy-duty)	Proctor & Gamble	1/2 C.	no phosphate	
DREFT	Proctor & Gamble	1/2 C.	no phosphate	
DYNAMO II	Colgate-Palmolive	1/2 C.	no phosphate	
EARTH'S CHOICE	Brittco Inc.	1/2 C.	no phosphate	
ERA	Proctor & Gamble	1/2 C.	no phosphate	
FAB (with fabric softener)	Colgate-Palmolive	1/2 C.	no phosphate	
IVORY SNOW	Proctor & Gamble	1/2 C.	no phosphate	
LADY LEE (heavy-duty)	Milan Dist., Inc.	1/2 C.	no phosphate	
LADY LEE (premium)	Milan Dist., Inc.	1/2 C.	no phosphate	
LEMON DASH	Proctor & Gamble	1/2 C.	no phosphate	
NATIONAL BRAND (heavy-duty)	Sunfresh, Inc.	1/2 C.	no phosphate	
NATIONAL GENERIC BRAND	Sunfresh, Inc.	1/2 C.	no phosphate	
PUREX	The Dial Corp.	1/2 C.	no phosphate	
SOLO	Proctor & Gamble	1/2 C.	no phosphate	
SURF	Lever Brothers	1/2 C.	no phosphate	
SURF (new system)	Lever Brothers	1/2 C.	no phosphate	
TIDE (clothesline fresh)	Proctor & Gamble	1/2 C.	no phosphate	
TIDE (unscented)	Proctor & Gamble	1/2 C.	no phosphate	
WISK	Lever Brothers	1/2 C.	no phosphate	
YES	Dow Brands	1/2 C.	no phosphate	

DELICATE CYCLE

<u>PRODUCT</u>	<u>MANUFACTURER</u>	<u>RECOMMENDED VOLUME/USE</u>	<u>PHOSPHATE g/USE</u>	<u>PRODUCT* CODE</u>
DELICARE	Benckiser	1/2 cap	no phosphate	
SILK & WASH	Royal Silk, Ltd.	1 cap	no phosphate	
WOOLITE LIQUID	Boyle Midway, Inc.	1 cap	no phosphate	
WOOLITE POWDER	Boyle Midway, Inc.	1 C.	no phosphate	

PRE-WASH

<u>PRODUCT</u>	<u>MANUFACTURER</u>	<u>RECOMMENDED VOLUME/USE</u>	<u>PHOSPHATE g/USE</u>	<u>PRODUCT* CODE</u>
CLOROX PRE-WASH	Clorox Co.	as directed	no phosphate	
EASY WASH	Airwick Industries	as directed	no phosphate	
GREASE RELIEF	Dow Brands	as directed	no phosphate	
SPRAY & WASH	Dow Brands	as directed	no phosphate	

POWDER WHITENERS, BRIGHTENERS, & BOOSTERS

<u>PRODUCT</u>	<u>MANUFACTURER</u>	<u>RECOMMENDED VOLUME/USE</u>	<u>PHOSPHATE g/USE</u>	<u>PRODUCT* CODE</u>
ARM & HAMMER (all-fabric bleach)	Church & Dwight	1/2 C.	no phosphate	
ARM & HAMMER WASHING SODA	Church & Dwight	1/2 C.	no phosphate	
AXION	Colgate-Palmolive	1/2-3/4 C.	no phosphate	
BIZ BLEACH (careful: there are at least two kinds)*	Proctor & Gamble	1/2 C.	.3	O
BORATEEM (all-fabric bleach)	The Dial Corp.	1/2 C.	10.6	P
CALGON (water softener)	Benckiser	1/2 C.	no phosphate	
CLOROX 2	Clorox Co.	1/2-3/4 C.	12.8	R
			no phosphate	

<u>PRODUCT</u>	<u>MANUFACTURER</u>	<u>RECOMMENDED VOLUME/USE</u>	<u>PHOSPHATE g/USE</u>	<u>PRODUCT* CODE</u>
LADY LEE (all-fabric bleach)	LKS Products, Inc.	1/2-3/4 C.	no phosphate	
LA FRANCE	The Dial Corp.	1/2 C.	no phosphate	
LYSOL (sanitizing bleach)	Lehn & Fink Products	1/2 C.	no phosphate	
NATIONAL BRAND (all-fabric bleach)	Sunfresh, Inc.	1/4-1/2 C.	no phosphate	
PUREX BLUE RAIN DROPS	The Dial Corp.	1/2 C.	5.9	
SNOWY BLEACH	Airwick Industries	1/2-3/4 C.	no phosphate	
20 MULE TEAM BORAX	The Dial Corp.	as directed	no phosphate	

LIQUID WHITENERS, BRIGHTENERS, AND BOOSTERS

<u>PRODUCT</u>	<u>MANUFACTURER</u>	<u>RECOMMENDED VOLUME/USE</u>	<u>PHOSPHATE g/USE</u>	<u>PRODUCT* CODE</u>
CLOROX (fresh-scent)	Clorox Co.	1 C.	no phosphate	
CLOROX (lemon-scent)	Clorox Co.	1 C.	no phosphate	
CLOROX (regular)	Clorox Co.	1 C.	no phosphate	
CLOROX 2	Clorox Co.	1 C.	no phosphate	
JEWEL (color-safe bleach)	Jewel Co., Inc.	1 C.	no phosphate	
LADY LEE (chlorine-free bleach)	LKS Products, Inc.	1 C.	no phosphate	
MIRACLE WHITE	Kiwi Brands	1 C.	no phosphate	
NATIONAL BRAND BLEACH	Sunfresh, Inc.	1 C.	no phosphate	
PUREX BLEACH	The Dial Corp.	1 C.	no phosphate	
SNOWY (all-fabric bleach)	Airwick Industries	1 C.	no phosphate	
VIVID	Dow Brands	1/2-3/4 C.	no phosphate	

POWDERED AUTOMATIC DISHWASHING

<u>PRODUCT</u>	<u>MANUFACTURER</u>	<u>RECOMMENDED VOLUME/USE</u>	<u>PHOSPHATE g/USE</u>	<u>PRODUCT* CODE</u>
ALL	Lever Bros.	2 Tbsp.**	1.6	
CASCADE (lemon)	Proctor & Gamble	2 Tbsp.	2.2	
CASCADE (regular)	Proctor & Gamble	2 Tbsp.	2.2	
ELECTROSOL	Benckiser	2 Tbsp.	2.4	
JEWEL	Jewel Co., Inc.	2 Tbsp.	2.1	
LADY LEE	Milan Dist. Co.	2 Tbsp.	2.2	
NATIONAL BRAND (lemon)	Sunfresh, Inc.	2 Tbsp.	2.1	
SHOPPERS VALUE	Preferred Products	2 Tbsp.	2.4	
SUNLIGHT	Lever Bros.	2 Tbsp.	1.6	

LIQUID AUTOMATIC DISHWASHING

<u>PRODUCT</u>	<u>MANUFACTURER</u>	<u>RECOMMENDED VOLUME/USE</u>	<u>PHOSPHATE g/USE</u>	<u>PRODUCT* CODE</u>
CASCADE (lemon)	Proctor & Gamble	2 Tbsp.	2	
CASCADE (regular)	Proctor & Gamble	2 Tbsp.	2	
CASCADE LIQUI GEL (regular)	Proctor & Gamble	2 Tbsp.	1.8	
CASCADE LIQUI GEL (lemon)	Proctor & Gamble	2 Tbsp.	1.8	
PALMOLIVE (fresh-scent)	Colgate-Palmolive	2 Tbsp.	2.6	
PALMOLIVE (lemon)	Colgate-Palmolive	2 Tbsp.	2.6	
PALMOLIVE LIQUID GEL	Colgate-Palmolive	2 Tbsp.	2.4	
SUNLIGHT	Lever Brothers	2 Tbsp.	1.6	

LIQUID DISHWASHING

<u>PRODUCT</u>	<u>MANUFACTURER</u>	<u>RECOMMENDED VOLUME/USE</u>	<u>PHOSPHATE g/USE</u>	<u>PRODUCT* CODE</u>
AJAX	Colgate-Palmolive	as directed	no phosphate	
ALLWAYS RITE	Wetterau, Inc.	as directed	no phosphate	
DAWN	Proctor & Gamble	as directed	no phosphate	
DERMASSAGE	Colgate-Palmolive	as directed	no phosphate	

<u>PRODUCT</u>	<u>MANUFACTURER</u>	<u>RECOMMENDED VOLUME/USE</u>	<u>PHOSPHATE g/USE</u>	<u>PRODUCT* CODE</u>
DOVE	Lever Brothers	as directed	no phosphate	
EAGLE STORE GENERIC BRAND	Milan Dist. Co.	as directed	no phosphate	
IVORY	Proctor & Gamble	as directed	no phosphate	
JOY	Proctor & Gamble	as directed	no phosphate	
LUX	Lever Brothers	as directed	no phosphate	
NATIONAL STORE GENERIC BRAND	Sunfresh, Inc.	as directed	no phosphate	
NATIONAL BRAND (blue)	Sunfresh, Inc.	as directed	no phosphate	
NATIONAL BRAND (lemon)	Sunfresh, Inc.	as directed	no phosphate	
PALMOLIVE	Colgate-Palmolive	as directed	no phosphate	
SUNLIGHT	Lever Brothers	as directed	no phosphate	
TRYST	Milan Dist. Co.	as directed	no phosphate	

LIQUID CLEANERS

<u>PRODUCT</u>	<u>MANUFACTURER</u>	<u>RECOMMENDED VOLUME/USE</u>	<u>PHOSPHATE g/USE</u>	<u>PRODUCT* CODE</u>
DOW BATHROOM CLEANER	Dow Brands	as directed	no phosphate	
FANTASTIK	Dow Brands	as directed	no phosphate	
FANTASTIK S'WIPES	Colgate-Palmolive	as directed	no phosphate	
JEWEL LIQUID CLEANER (mild)	Jewel Co., Inc.	as directed	no phosphate	
LIMEAWAY (careful: there are at least two kinds)*	Benckiser	as directed	18.0	
LYSOL BASIN TUB & TILE CLEANER	Lehn & Fink Products	as directed	no phosphate	
LYSOL DEODORIZING CLEANER	Lehn & Fink Products	as directed	no phosphate	
LYSOL PINE FRESH CLING (toilet-bowl cleaner)	Lehn & Fink Products	as directed	no phosphate	
MR. CLEAN	Proctor & Gamble	as directed	no phosphate	
MURPHY OIL SOAP	Murphy-Phoenix Co.	as directed	no phosphate	
SCRUB FREE	Benckiser	as directed	no phosphate	
SOFT SCRUB	Clorox Co.	as directed	no phosphate	
SPIC & SPAN	Proctor & Gamble	as directed	no phosphate	
TACKLE	Clorox Co.	as directed	no phosphate	
TOP JOB (with ammonia 2000)	Proctor & Gamble	as directed	no phosphate	
409	Clorox Co.	as directed	no phosphate	

POWDERED CLEANERS

<u>PRODUCT</u>	<u>MANUFACTURER</u>	<u>RECOMMENDED VOLUME/USE</u>	<u>PHOSPHATE g/USE</u>	<u>PRODUCT* CODE</u>
AJAX	Colgate-Palmolive	as directed	no phosphate	
BON AMI	Faultless Starch/Bon Ami Co.	as directed	no phosphate	
CAMEO (aluminum & stainless steel cleaner)	The Dial Corp.	as directed	no phosphate	
CAMEO (copper cleaner)	The Dial Corp.	as directed	no phosphate	
COMET	Proctor & Gamble	as directed	no phosphate	
JEWEL CLEANER	Jewel Co., Inc.	as directed	no phosphate	
REVERE WARE (copper & stainless steel cleaner)	Copper Clad Products, Inc.	as directed	no phosphate	
SPIC & SPAN (careful: there are at least two kinds)*	Proctor & Gamble	1/4 C.	.1	O
ZUD	Boyle-Midway Household Products	1/4 C. as directed	1.9	P

* Same type of box. Each box gives a full explanation of the product codes. There are normally three codes to each product which represents three different phosphate concentrations. The codes listed were found in the six Springfield stores that were surveyed (Cub Foods, Eagle, IGA, Jewel, National and Shop & Save). These codes varied from store to store; therefore, please read the code carefully.

+. C = Cup

++. Tbsp. = Tablespoon

9. GLOSSARY

Aerator: A mechanical device to increase the oxygen content in water. An aerator is used to stimulate bacterial activity for **decomposition** in **aerobic septic systems**.

Aerobic: Conditions characterized by the presence of oxygen.

Algae: Single-celled, colony-forming, or filamentous aquatic plants. These plants are often microscopic.

Algae Bloom: An unusual or excessive abundance of **algae**.

Alkalinity: A measure of a lake's buffering capacity against acidic inputs such as acid rain.

Ammonia-Nitrogen: A form of nitrogen that can act as a nutrient for aquatic plants. At elevated concentrations in high **pH** waters, it can be toxic to fish and other aquatic life.

Anaerobic: Conditions characterized by the lack of oxygen.

Artesian Well: A well which freely flows by internal pressures from within the ground.

Benthos: A general term for the community of organisms (insects, worms, protozoans, snails, etc.) that lives on the bottom of a lake or stream.

Bioaccumulation: The process by which chemical substances can increase their concentration in organisms at increasingly higher levels along the **food chain**.

Carcinogenic: Relating to a substance or agent producing or inciting cancer.

Chlorophyll: A green pigment of plants which traps the energy of light for the conversion to chemical energy in the process of **photosynthesis**.

Colloidal Clay: Soil particles of such small size that their molecular forces cause them to stay suspended in water indefinitely. Particles can give water a milky brown appearance.

Condenser Cooling Water: Water which is withdrawn from a lake or river and used to cool various industrial processes; for power plants it is used to cool steam back into water.

CRP: An acronym for the Conservation Reserve Program, a federal subsidy program which encourages landowners to discontinue row-crop farming on highly erodible land.

Decomposition: The process by which bacteria and other microorganisms break down organic substances; often occurs in the sediments at the bottom of a lake.

Detritus: Minute organic and inorganic materials largely comprised of partially decomposed animal and plant materials suspended in the water, or accumulated on a lake bottom or shoreline.

Disinfectant: An agent which destroys, neutralizes, or inhibits the growth of harmful microorganisms.

Drought: An extended period with below-average rainfall.

Ecology: The scientific study of the relationships between organisms and their environment.

Ecosystem: An interacting community of living organisms, together with the physical and chemical environment in which they live.

Effluent: The discharge of water from an industrial process or a treatment facility.

Epilimnion: The uppermost, warmest layer of a lake above the **metalimnion** that is thoroughly mixed by wind.

Erosion: The wearing away of soil by such forces as rainfall, waves, and wind.

Euphotic Zone: The zone delimited by the vertical range of light penetration in a lake.

Eutrophic: A lake which is rich in nutrients and sustains high levels of biological **productivity**.

Fetch: The linear distance across a lake; often used in relation to the maximum distance on a lake across which wind-generated waves can travel.

Food Chain: The progression of food, energy, and materials beginning with the lower plants (algae) and continuing through increasingly higher forms of animals.

Full Pool: The elevation of a reservoir equal to the spillway elevation of the dam, i.e., the maximum level of water in a reservoir with no water being discharged over or through the dam.

Gabion: A wire basket enclosure containing rocks used to prevent shoreline erosion.

Grassed Waterways: Vegetated drainages which convey runoff from agricultural fields and urban areas.

Gully Erosion: An erosion process whereby concentrated water flow forms relatively deep channels.

Habitat: The physical, chemical, and biological environment in which an organism lives.

Heavy Metals: Natural elements such as lead, zinc, cadmium, and nickel which can accumulate in lakes and biological tissues; these elements are often found in elevated concentrations in urban areas and can pose toxicity risks to living organisms.

Hydric soil: Soil that is wet long enough to periodically produce anaerobic conditions. Areas with these soils are often characterized by the presence of hydrophytes (aquatic plants).

Hypolimnion: The denser (and therefore cooler), poorly illuminated layer of a lake below the **metalimnion** during summer **stratification**.

Impoundment: A basin of standing water created by a dam.

Inorganic: An elemental substance or compound such as free nitrogen or ammonia containing no carbon-containing (organic) materials.

Leach: The percolation of substances dissolved in water through another medium such as soil. Example: Water passing through the drain fields of a septic system.

Limnetic Zone: The area of open water in a lake with sufficient habitat quality (light, oxygen, nutrients) to support plankton and fish.

Littoral Zone: The shallow, highly **productive** areas of water along a lake shoreline; usually where most rooted aquatic plants grow.

Macrophyte: A large plant which can be seen easily with the unaided eye.

Main Stem Reservoir: A reservoir created by the construction of a dam along the main channel of a stream or river.

Metalimnion: The water layer in a stratified lake of relatively rapid temperature change below the **epilimnion** and above the **hypolimnion**.

Morphology: The topographic features, the physical contours and dimensions, of a lake.

Nitrate-Nitrogen: The preferred form of nitrogen (NO_3) for uptake as a nutrient by aquatic plants. Elevated concentrations in drinking waters can cause health problems in human infants.

No-till: A farming practice which eliminates tillage (plowing) in a cropped field leaving crop residue on the soil surface which effectively reduces soil erosion.

Nonpoint Source Pollution: Runoff containing nutrients, sediments, and other chemical pollutants such as from agricultural fields or urban areas which is not discharged from a single point or pipe.

Nutrient: A chemical element or compound which is needed for growth by living organisms.

Oligotrophic: A lake with low concentrations of plant nutrients and therefore low rates of biological productivity.

Organic: Any carbon-containing substance. Carbohydrates, fats, and proteins are all organic compounds that form the structure of living organisms.

Overturn: The process by which lake water mixes from top to bottom after a period of **stratification**; usually occurs in the spring and fall when water temperatures at the surface are the same as those at the bottom of the lake.

Pesticides: Chemicals used to control nuisance organisms, such as herbicides (plants) and insecticides (insects).

pH: An index from 0 to 14 units that indicates whether a liquid is acidic (values less than seven), alkaline (values greater than seven), or neutral (exactly seven).

Photosynthesis: The process by which plants use **chlorophyll** to convert carbon dioxide, water, and sunlight into oxygen and cellular products (carbohydrates).

Phytoplankton: **Algae** which float or are freely suspended in the water of lakes and rivers.

Plankton: Plant and animal organisms, generally microscopic, that float or drift in the **limnetic** zone.

Production: The accumulation of organic matter in the form of plants and animals.

Profundal Zone: The lake water below the **limnetic** zone which does not receive sunlight; aquatic life is usually dominated by bacteria and fungi.

Respiration: The consumption of oxygen by organisms for their use in the process of breakdown and utilization of **organic** matter. The process releases energy, carbon dioxide, and water.

Revetment: A structure used to support or protect an embankment or shoreline.

Ridge-till: A reduced tillage method where the seedbed is prepared on the top of constructed ridges. Crop residue remains on the field throughout the non-growing season. Ridges are rebuilt during cultivation.

Rill Erosion: An erosion process in which numerous small channels only several inches deep are formed.

Riprap: Large rocks and other stone materials placed along shorelines to prevent erosion.

Sedimentation: The accumulation of **organic** and **inorganic** materials at the bottom of a lake.

Septic System: A system used to process domestic wastewater from individual homes where sewer systems are not available.

Sheet Erosion: The removal of a fairly uniform layer of soil from the land surface by runoff water.

Soil Conservation: The practice of reducing erosion and the transport of soil, nutrients, and other substances from land surfaces.

Soil Permeability: The ability of water to percolate through a particular soil.

Stratify: During summertime, the process by which a lake may form a warm, upper layer of water (**epilimnion**) and a cooler, lower layer (**hypolimnion**); a middle layer (the **metalimnion, or thermocline**) separates the two.

Terraces: An agricultural practice which breaks steeply sloping fields into a series of steps in an effort to reduce water runoff and soil erosion.

Thermocline: The plane of greatest temperature change within the **metalimnion**.

Tributary: A small stream or creek which flows into a lake or another larger waterway.

Vegetative Buffer: An essentially undisturbed area of plants adjoining a water body, managed to reduce the delivery of soil and nutrients in stormwater runoff to the lake or stream.

Virus: A submicroscopic pathogen which can only replicate inside a living cell.

Water Color: The color of natural waters as affected by suspended and dissolved substances.

Watershed: The surrounding area of land which drains into a water body by surface or subsurface flow.

Wetlands: Areas which, at least periodically, have standing water, and which have soil types and plant growth indigenous to saturated conditions.

Zooplankton: Microscopic animals in a lake or stream.

10. IMPORTANT PHONE NUMBERS

City Water, Light and Power (CWLP)	217-789-2116
Real Estate	217-757-8660
Energy Services	217-789-2070
Environmental Health and Safety	217-757-8610
Lake Services	217-786-4020
Lake Security	217-757-8600
Water Resources	217-757-8660
Springfield Fire Department - Fire Safety Division	217-789-2170
Springfield Department of Public Health - Septic System	217-789-2182
Springfield Department of Building and Zoning	217-789-2171
Sangamon County Department of Public Health - Septic System	217-535-3101
Illinois Office of the State Fire Marshal (OSFM)	217-785-5878
Illinois Department of Conservation - District Biologists	217-632-3841
Currently Department of Natural Resources (IDNR)	
Illinois Department of Public Health - Septic Systems	217-782-5830
Illinois Emergency Services and Disaster Agency (ESDA)	217-782-7860
Currently Illinois Emergency Management Agency (IEMA)	
Illinois Environmental Protection Agency (IEPA)	217-782-2829
Water Pollution Control	217-782-1654
Emergency Response	217-782-3637
Illinois State Museum - Collections Center	217-785-0037
U.S. Army Corps of Engineers (Corps)	309-794-5373



Appendix H

Public Hearing

Minutes
Clean Lakes Project Public Meeting
Lake Paradise Restoration Program
October 3, 2002

A public meeting was held Thursday October 3, 2002 at 6:00 P.M. in the Mattoon City Hall Council Chambers to discuss the results of the diagnostic/feasibility study of Lake Paradise.

Edward Labelle of Crawford, Murphy, Tilly and Associates and Mary Lou Goodpaster of Goodpaster and Associates outlined the results of the two-year study and a 1.1 million dollar plan to improve the quality of the lake.

Upon completion of the presentation, Labelle and Goodpaster addressed the floor for questions and comments.

The meeting adjourned at 7:15 P.M.

*List of attendees attached

SIGN-IN SHEET
PUBLIC HEARING
LAKE PARADISE RESTORATION PROJECT
OCTOBER 3, 2002

Jim Lang - Mattoon Water	
TIM GIVER - PUB. WORKS ADV.	
Mark Lenny PUB. WORKS	
Dean Coleman " "	
Dick Johnson	
Madonna Johnson	
Joe McKee	
DAVE STAPLETON	
Lee Hansen w/ Friends of Lake Mattoon	
Bruce Miller " " " "	
Chris H. H. H.	
Bill King	
Harold Lambill	
Ken Underkoffel? City of Mattoon	
LEROY HARRINGTON CITY OF MATTOON	
Don Lawrence PUB WORKS	