Arkansas Water Resources Center

CLASSIFICATION AND RANKING OF SELECTED ARKANSAS LAKES

For

State of Arkansas Department of Pollution Control and Ecology

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September 1981

Publication No. MSC-23

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ACKNOWLEDGEMENTS

The authors are grateful to Mr. Ed Dunn of the Arkansas Department of Pollution Control and Ecology for various assistance throughout this study. Assistance provided by Mr. J. Doyle, M. Khan and Dr. K. Ladner in field collections is hereby acknowledged.

We are deeply grateful to Mr. Mark Schram for the genesis of the zooplankton species inventory which constitutes Table VI. We are further indebted to Mr. Schram for technical assistance and to Ms. Susan M. Heinrichs for editorial assistance.

The 1980 rotenone field work was made possible through the cooperation of the Arkansas Game and Fish Commission. The Commission also provided records of all previous fish population samples on the 10 lakes studied. William E. Keith, Chief of Fisheries of the Game and Fish Commission, coordinated the 1980 sampling activity, aided in interpreting the fisheries data, and was instrumental in developing the lake classification index. The following Game and Fish Commission fisheries personnel cooperated in scheduling and conducting the 1980 rotenone samples: Jim Ahlert, Don Brader, Allen Carter, Leslie Claybrook, John Cloud, Mike Gibson, Sam Henry, Bob Limbird, Carl Perrin, Larry Rider, Ken Shirley, Jerry Smith, Don Turman and Drew Wilson. Tim Scott of the University of Arkansas at Monticello also assisted in the field work.

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INTRODUCTION

Trophic-state related problems associated with waters in the United States have generated tremendous public interest and concern, particularly during the past decade. These interests and concerns led to Public Law 92-500, the mandate by Congress known as the Federal Water Pollution Control Act. Various sections of PL 92-500 directly address the need for trophic-state analyses, particularly Section 314 referred to as the Clean Lakes Program which assigns states the responsibility for classifying their lakes according to water quality, identifying methods of pollution control and restoring those lakes which have become degraded.

The lakes of Arkansas, including the few natural lakes--all oxbows--and numerous impoundments and reservoirs, present a variety of use-related problems which require trophic-state analyses for solution. As with non-Arkansas aquatic systems, interaction and interdependency of numerous factors ultimately determine the qualitative, quantitative and distributional aspects of biotas and nutrients, and essentially qualify the productivity state or trophic nature of each particular body of water. This rationale, first expressed by Rawson (1939), has served as the basis for not only recent water quality definition, but also for past and projected considerations. Various indices have been proposed which purportedly establish and describe the trophic status of a particular body of water. The precise meaning of qualifying terms such as oligotrophic, mesotrophic, eutrophic and dystrophic have presented, and will continue to present various interpretations and difficulties. Thus, trophic-state analyses are comparatively limited by the types of indices (approaches) employed as well as the inherent difficulties associated with qualifying descriptors

Maloney, 1979); Taylor et al., 1980). Trophic classification techniques range from statistically complex multivariate models, which require expensive and time consuming data gathering and analytical programs. to single parameter evaluations which are subject to tremendous interpretive errors. The report which follows and which deals with a trophic ranking system for Arkansas lakes is designed to alleviate the difficulties associated with the extremes found in the aforementioned techniques.

MATERIALS & METHODS

I. LAKE SELECTION

Ten lakes were chosen to be included in the Arkansas Clean Lakes Study, in part because of their presumed eutrophic nature as well as historical problems, e.g., previous fish kills, siltation, etc. In selecting these lakes, special attention was given in order that the lakes be representative of the entire State. Therefore, all major drainage basins (Red River, Ouachita River, Arkansas River, White River, St. Francis River, & Mississippi River) are represented. Lakes selected, in alphabetical order, were Bailey, Calion, Upper Chicot, Enterprise, June, Lou Emma, Newport, Old Town, Reynolds and Wallace. The approximate location within the state for each lake is found in Fig. 1, which also indicates the associated drainage basin for each lake. A general description of each lake (see below) includes, in order, the following: legal name of the lake; county and quadrangle location; previous NES inclusion, if applicable; owner/public access, if applicable; sources of pollution; designated responsible agency (see Appendix Table I); morphological features; inflows and outflows; general topography of watershed; land use; soil type. Also included in this descriptive section are individual lake maps (Figs. 2-11). Quadrangle coordinates for individual sampling stations are found in Appendix Table II.

In addition to the above ten lakes, three lakes, Hamilton, Maumelle and Pine Bluff are included (Fig. 1). These additional lakes are not treated *per se* in the text but are discussed in more detail in the Appendix.

II. Methodology

A. Field procedures

MAJOR DRAINAGE BASIN AND STATE LOCATION

OF ARKANSAS LAKES INCLUDED IN THE CLEAN LAKES REPORT

1 - Bailey
2 - Calion
3 - Upper Chicot
4 - Enterprise
5 - June
6 - Lou Emma
7 - Newport
8 - Old Town
9 - Reynolds
10 - Wallace

A - Hamilton
B - Maumelle
C - Pine Bluff

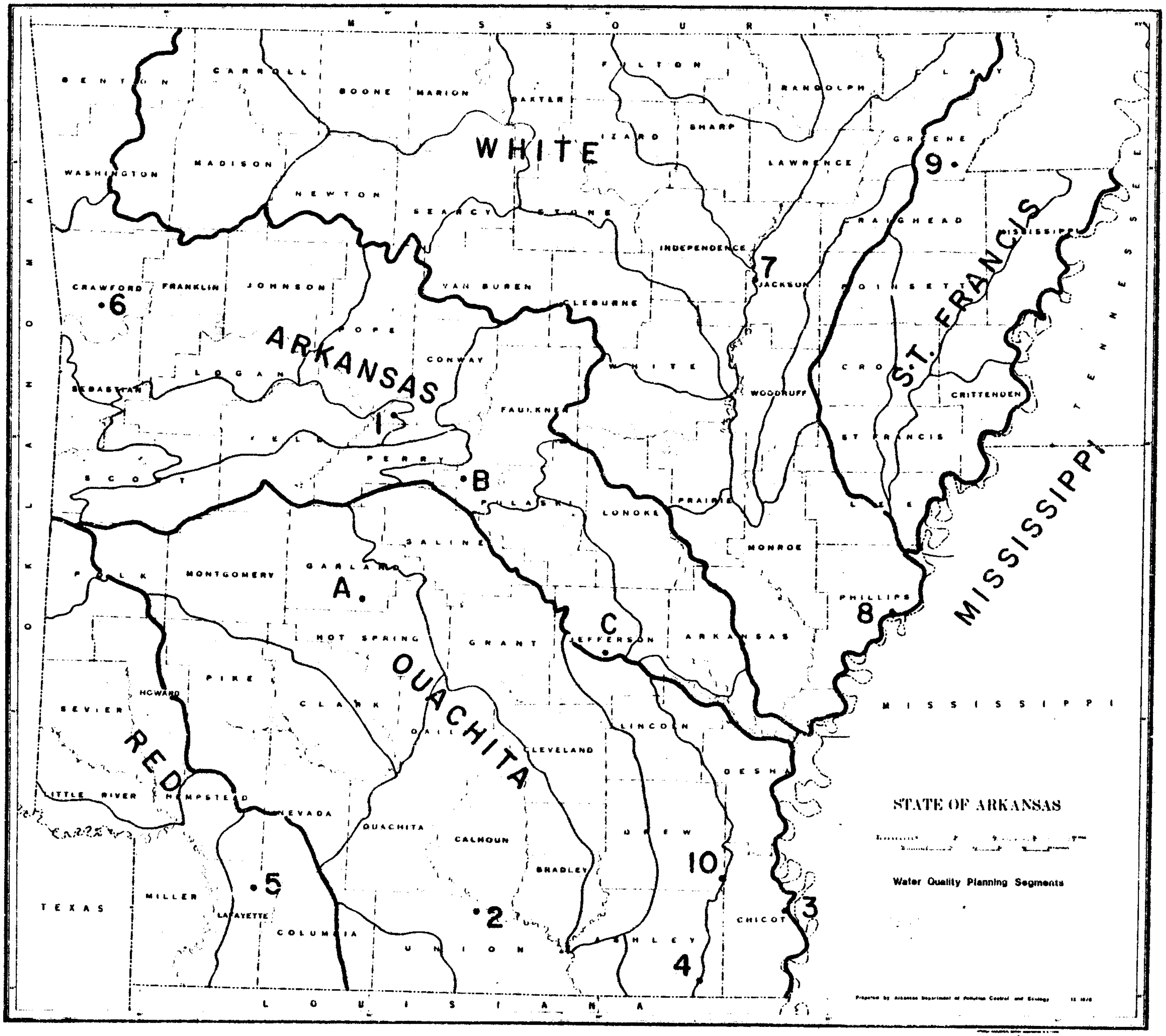
STATE OF ARKANSAS
Water Quality Planning Segments
WHITE
ARKANSAS
OUACHITA
RED
ST. FRANCIS
MISSISSIPPI
MISSOURI
OKLAHOMA
TEXAS
LOUISIANA
TENNESSEE
MISSISSIPPI
1
2
3
4
5
6
7
8
9
10
A
B
C
BENTON
CARROLL
BOONE
MARION
BAXTER
FULTON
RANDOLPH
CLAY
IZARD
SHARP
LAWRENCE
GREENE
WASHINGTON
MADISON
NEWTON
SEARCY
STONE
INDEPENDENCE
CRAIGHEAD
MISSISSIPPI
CRAWFORD
FRANKLIN
JOHNSON
VAN BUREN
CLEBURNE
JACKSON
POINSETT
POPE
CONWAY
WHITE
WOODRUFF
CROSS
CRITTENDEN
SEBASTIAN
LOGAN
FAULKNER
ST FRANCIS
YELL
PERRY
SCOTT
PULASKI
LONOKE
PRAIRIE
LEE
SALINE
MONROE
POLK
MONTGOMERY
GARLAND
PHILLIPS
HOT SPRING
GRANT
JEFFERSON
ARKANSAS
PIKE
HOWARD
CLARK
SEVIER
LINCOLN
DALLAS
CLEVELAND
DESHA
LITTLE RIVER
HEMPSTEAD
NEVADA
OUACHITA
CALHOUN
DREW
BRADLEY
MILLER
LAFAYETTE
COLUMBIA
UNION
ASHLEY
CHICOT

FIGURE 1

Each of the ten lakes was sampled three times, (except Enterprise which was sampled the last two sampling runs) at each of three different locations (inflow, mid-lake & outflow areas). The first series of samples was taken 11 April - 14 May, the second series 23-26 June and the third series 16-23 October, 1980.

Water samples were taken with a brass Kemmerer sampler, or simply a 1-gal plastic jug at very shallow stations. Only a single sample was taken at each station due to the absence of stratified conditions in the classical sense. Each station was checked for stratification on every sampling date.

Measurements of temperature, dissolved oxygen (DO), specific conductance and pH were taken with a Hydrolab 8000 unit, or with individual meters and/or titrations (e.g., Winkler titration for DO). Equivalent bicarbonate alkalinity was determined at each station using the standard sulfuric titration at pH endpoints of 8.3 and 4.5 respectively. Turbidity was measured using a Hach 2100A nephlometer; color measured with a Hach color-comparator disc. Secchi disc readings were also made at each sample point.

B. Laboratory procedures

All chemical analyses were performed using either filtered-acidified, filtered unacidified or unfiltered-unacidified aliquots in accordance with techniques outlined by EPA (1979), or as in the case of chloride and total organic carbon (TOC) determinations, by techniques outlined by Standard Methods (1975). Laboratory determinations included analyses for total solids (TS), total dissolved solids (TDS), total organic carbon (TOC), ammonia nitrogen, nitrate nitrogen, total Kjeldahl nitrogen, ortho-phosphate, total phosphorus, sulfate, chloride, sodium, potassium, calcium, magnesium, iron and manganese.

C. Biological procedures

a) Phytoplankton

Twenty ml samples were collected at each station at each date and immediately preserved in 2% M_3 fixative (Meyer, 1971). Sample composition was identified to the generic level and quantified using the standard inverted microscope techniques recommended by EPA.

Biomass estimates were made using filtered samples of various quantities (based on ease of filterability) through precombusted glass fiber filters (Whatman, 2.4 cm GF/C). Prior to precombustion weighting, zooplankton and debris were microsurgically removed under a dissecting microscope at 20-50 diameters. Phytoplankton biomass was determined by the difference in weight between post- and pre-combusted filters with a Cahn Electrobalance (Model 4100).

Chlorophyll-a and phaeophytin-a concentrations were determined spectrophotometrically using glass-fiber filtered volumes of sample and their subsequent acetone extracts, both acidified and unacidified, with a B&L spectronic 70. Extracts were analysed for optical densities at 663 nm, after correction for turbidity at 750nm. Data were reported according to the following formulas:

$$\text{chlorophyll-a} = 26.7\ (OD_{663\text{-unacidified}} - OD_{663\text{-acidified}}):$$

$$\text{phaeophytin-a} = 26.7\ (1.7\ OD_{663\text{-acidified}} - OD_{663\text{-unacidified}}),$$

and after appropriate volumetric correction to arrive at ug/l concentrations.

b) Zooplankton

Zooplankton samples were taken simultaneously with the field physical-chemical data. At sites less than 2.5 m in depth, collections were made with a zooplankton sampling tube described by Jackson (1978) as modified after Pennak (1962) -- except when the tube sampler was ineffective for obtaining sufficiently large samples for zooplankton dry weight determinations. However, Nitex #20 mesh (80-um aperture) was used instead of #25 (64 um aperture). Where water depth exceeded 2.5 m, a continuous vertical sample was taken from the bottom to the surface with a standard Wisconsin net (12-cm mouth) equipped with Nitex #20 mesh. All samples were preserved in 3% formalin and concentrated to 100 ml in the field.

In the laboratory, the 100-ml samples were further concentrated or diluted as necessary for qualitative and quantitative analyses. Concentrations were adjusted so that a minimum of 100 organisms per subsample were counted. Two 1-ml subsamples were taken from each sample with a Hensen-Stemple pipette and placed into a Sedgwick-Rafter cell for direct enumeration. Identifications were made while counting, but only to taxonomic levels compatible with the enumeration procedure. If organisms were so sparse that the sample had to be concentrated to 10 ml, the entire sample was counted.

All counts were converted to organisms per liter (o/l).

A species inventory was compiled for each lake after zooplankton enumeration was completed. Identifications were made at the specific level, or to the lowest taxonomic level possible.

Entomostraca to rotifer ratios (E/R) were determined in two ways for each lake. One procedure averaged the E/R ratios for each sample taken from a lake. The other method gave an E/R value based on the total entromostraca to the total rotifers for a given lake. Both of these procedures yielded only single values for each lake, and do not indicate seasonal variations and/or differences among collecting stations (for detailed data relevant to individual samples and collecting sites, see Appendix) obtained by using the totals of individuals representing the respective taxa from each lake.

For zooplankton dry weight determinations, the procedure of Schmitz & McCraw (1981) was modified and utilized as follows.[1] Three sucrose solutions of 25%, 35% and 50% were prepared by weight; e.g., 25% solutions were made by adding 75 ml of distilled water to 25 g sucrose. Eleven ml of each solution were pipetted into a 50-ml centrifuge tube so that the 35% solution was above the 50% and below the 25% solution.

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[1] When zooplankters were too sparse for this procedure to be effective, they were hand-sorted from the sample using Irwin loops and with the aid of a binocular dissecting microscope.

Zooplankton samples were concentrated and suspended in 3% formalin, following which 5-ml subsamples were pipetted into the centrifuge tubes prepared with sucrose gradients. These preparations were centrifuged using an ICC centrifuge (Model HN-S) equipped with a horizontal head at 148.8 x *g* for 30 sec., 516.8 x *g* for 30 sec., 650 x *g* for 11 min., and 128.8 x *g* for 60 sec. The zooplankton fractions were pipetted from the tubes immediately, thoroughly washed in 3% formalin, carefully washed into 25-ml specimen bottles containing 3% formalin and stored. Fifteen-mm diameter glass fiber filters (Reeve-Angel, grade 934 AH) were predried under vacuum (500-600 mm Hg) at 60°C for a minimum of 9 h, removed to a desiccator for 30 min., and tared to the nearest 0.1 ug on a Cahn Electrobalance (Model 25).

Zooplankton fractions were filtered with the aid of a hand vacuum pump (250-300 mm Hg) in conjunction with a 1,000-ml vacuum flask. Tared filters were wetted in distilled water prior to the filtration process. Filtered zooplankton fractions were dried under vacuum (500-600 mm Hg) at 60°C for a minimum of 9 h, removed to a desiccator for 30 min., and weighted to the nearest 0.1 ug.

c) Fish

The fish population of the 10 publicly owned Arkansas lakes were studied to determine what population characteristics were most suitable for ranking and categorizing the lakes. Information was obtained on standing crop estimates, species present, abundance, community diversity and other population parameters.

Fish population samples were collected after rotenone treatment by the Arkansas Game and Fish Commission during July and August, 1980. One sample was taken from each lake, with an average area sampled of 0.4 hectare. Data from population samples collected by the Game and Fish Commission in previous years from the 10 lakes were also used. Game and Fish Commission records of past lake management practices were also examined.

Fishes from each population sample were grouped into categories based upon trophic level and/or economic significance. Included under "gamefish" were: black basses (Micropterus), crappie (Pomoxis), sunfish (Centrarchus and Lepomis), catfish (Ictalurus furcatus, Ictalurus punctatus and Pylodictis olivaris), and others (less widespread game species such as chain pickerel, Esox niger, and the temperate basses, Morone). The "total edible forage" category included all edible nonpredators: sunfishes (Centrarchus and Lepomis), paddlefish (Polyodon spathula), buffalo (Ictiobus), carp (Cyprinus), grass carp (Ctenopharyngodon), bullhead catfish (Ictalurus natalis, I. nebulosus, and I. melas), freshwater drum (Aplodinotus) and spotted suckers (Minytreme). "Nonedible forage" species included the nonedible nonpredators, primarily shad (Dorosoma), minnows

(*Notemigonus* and *Notropis*) and other small species such as silversides (*Labidesthes* and *Menidia*), madtoms (Noturus) and darters (*Etheostoma* and *Percina*). Fishes designated as "predators" for calculating F/C ratios were: blackbasses, crappie, channel catfish, blue catfish, flathead catfish, gars (*Lepisosteus*), bowfin (*Amia*), pickerels (*Esox americanus* and *E. niger*) and temperate basses (*Morone*). "Nonpredators" included both the edible and nonedible forage fish categories described above.

Standing crop biomass data were compiled for each of the above categories for each lake rotenone population sample available. Also calculated for each sample were: the ratio of nonpredators to predators (F/C), the percentage of the total fish biomass comprised by harvestable size fishes (A_t, Swingle, 1953) and the percentage of the total fish biomass comprised by harvestable size gamefish (A_g).

LAKE BAILEY

Lake Bailey (Fig. 2) located in Conway County on Petit Jean Mountain, is on the Atkins Quadrangle at 35°07'48" (North latitude),[1] 92°54'50" (West longitude). It has not been surveyed by the National Eutrophication Survey (NES). Lake Bailey is owned by the Arkansas Department of Parks and Tourism and was constructed in 1935 as a Public Works Administration project. At present no major point source of pollution has been indicated. Non-point sources include residential and park facilities. The designated responsible agency is listed in Appendix Table I.

Physical features of Lake Bailey include: maximum depth (4 m); mean depth (2.5 m); surface area (50 ha); volume (1.25×10^6 m^3); shoreline development index (1.640). Stratified conditions were not observed during the course of this study. Many mountain streams enter the lake from the north; major inflows include Cedar Creek and several other creeks which run parallel to Petit Jean Park Airport. The main outflow discharges from the west side of the lake into Roosevelt Lake immediately below.

In general, the topography of the Lake Bailey watershed is depressiona and level with nearly level flood plains of local streams; gently sloping to steep hills, mountains and ridge tops. The watershed area is 2431 ha, approximately 49 times the surface area of the lake. Land use consists of 50% forest, 45% cleared fields, 3% residential and 2% state park. Located in the Conway County Soil District, Lake Bailey's watershed has three soil

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[1]All coordinates for lake location are based on the approximate location of the mid-lake sampling point. See Appendix Table II.

LAKE BAILEY

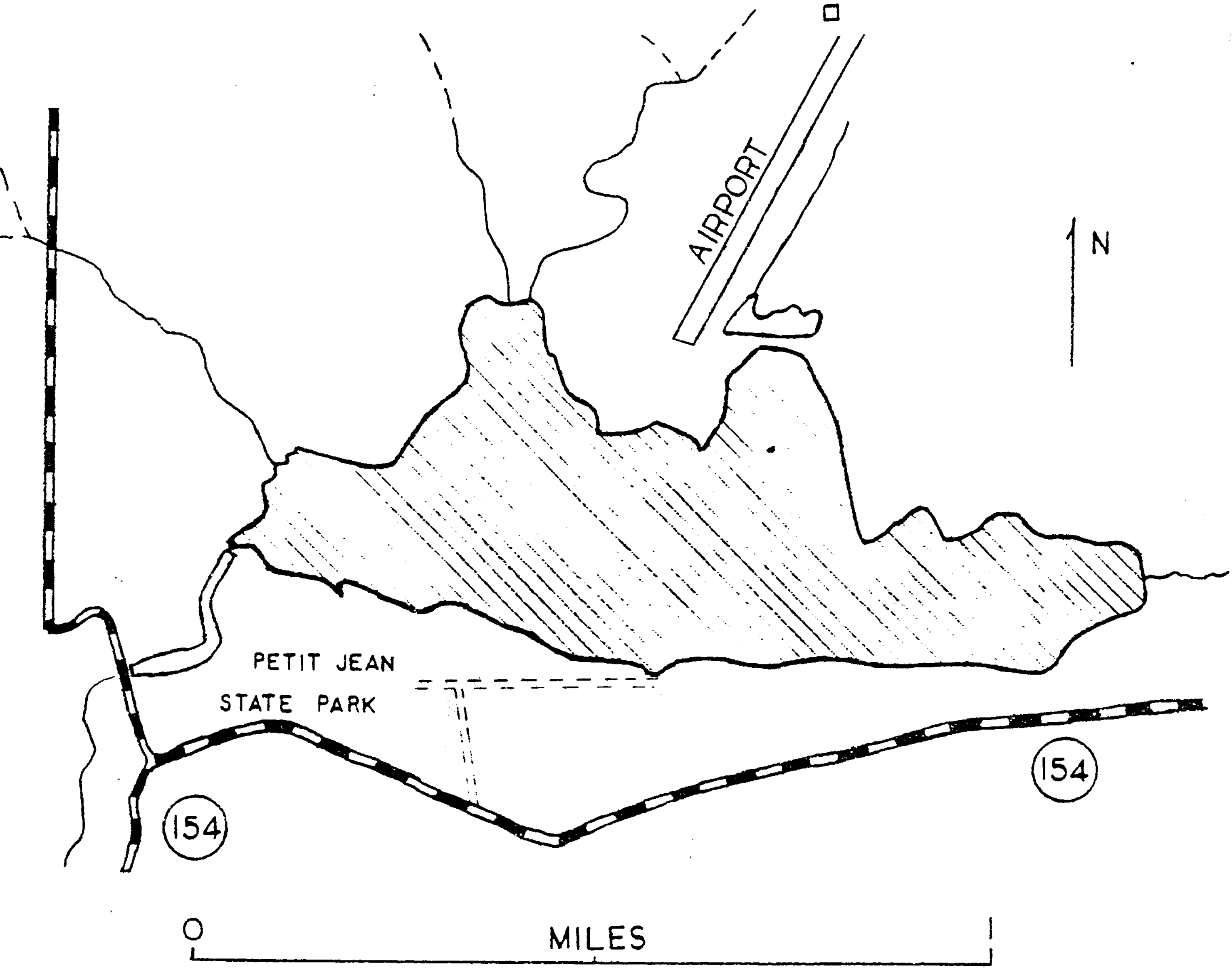

FIGURE 2

type components: 1) Mountainburg-Enders Association - well drained gently sloping to steep, loamy soils on low hills that have narrow to broad winding ridgetops, steep side slopes and narrow drainage ways; 2) Linker-Mountainburg Association - well drained, nearly level to moderately sloping loamy soils on broad plateaus, mountains, hilltops and benches; 3) Gutherie-Barling-Spadra Association - poorly drained, moderately well drained and well drained, depressional and level to nearly level, loamy soils in depressions and on terraces and flood plains of local streams.

CALION LAKE

Calion Lake (Fig. 3), located at the town of Calion in Union County, is found on the Calion Quadrangle at 33°19'15" (North latitude), 92°32'00" (West longitude). It has not been surveyed by NES. The lake is owned by Union County, although in 1955 the county donated easement rights to the Arkansas Game and Fish Commission, who now manages the lake. Public access is provided and a centrally located boat launch and parking area is presently maintained by the county. At present, no major point source of pollution has been indicated although it appears that Calion Lake receives non-point source pollution from oil field drainage and acid bogs. The designated responsible agency is listed in Appendix Table I.

Physical features of Calion Lake include: maximum depth (2 m); mean depth (1.7 m); surface area (182 ha); volume (3×10^6 m^3); shoreline development index (2.762). Stratified conditions were not observed during the course of this study. The lake essentially has two watershed areas - an area south of the lake with two primary inflows, Tom Creek and Dry Creek, which drain ca. 55% of the watershed into the southern

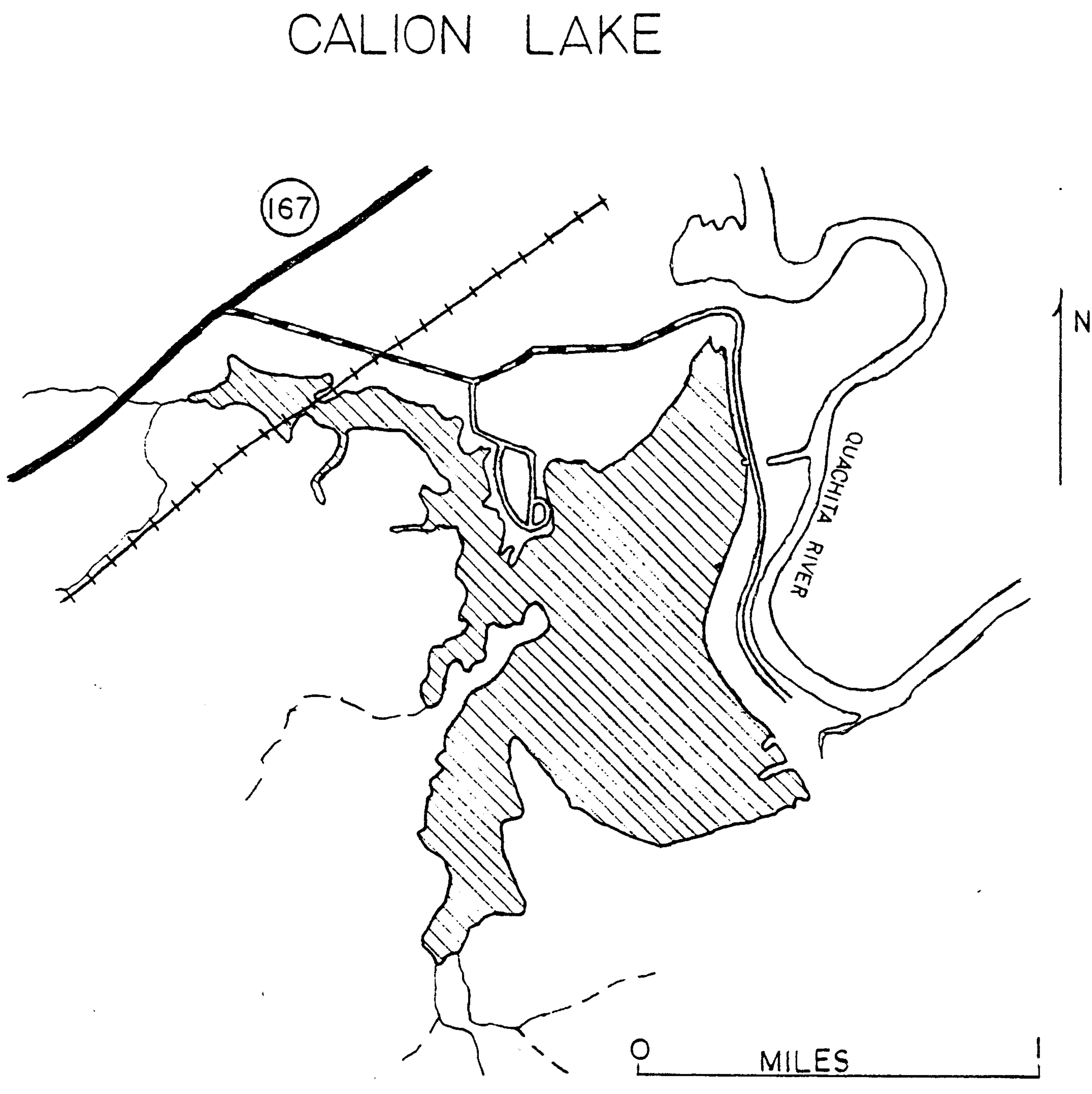

FIGURE 3

arm of the lake; an area west of the lake with two primary inflows, Amason Creek and Goodman Creek, which drain the remainder of the watershed. A single outflow discharges at the spillway into the Ouachita River below.

The watershed of Calion Lake topographically consists of broad flats and nearly level to moderately steep hilltops and ridges on rolling coastalplain uplands, and has an area of 4603 ha, approximately 25 times the surface area of the lake. Land use consists of 90% forest, 7% cleared fields and 3% residential. Located in the Union County Soil District, the watershed is composed of three soil types: 1) Alaga-Kirvin Association - deep, rapidly and moderately flowly permeable, somewhat excessively and well drained, acid, sandy and loamy soils on gently sloping to moderately steep hilltops and ridges on rolling coastal-plain uplands; 2) Amy-Smithton Association - deep, slowly and moderately permeable, poorly drained acid, loamy soils on broad flats on coastal-plain uplands; 3) Norfolk-Sacul Association - deep, moderately slowly permeable, well and moderately well drained acid, loamy soils on nearly level to moderately steep hilltops and ridges on rolling coastal-plain uplands.

UPPER LAKE CHICOT

Upper Lake Chicot (Fig. 4), located in Chicot County, combined with Lower Lake Chicot is the largest natural oxbow lake in Arkansas. It is found on the Luma Quadrangle at 33° 22' 30" (North latitude), 91° 31' 30" (West longitude). Upper Lake Chicot was surveyed during the National Euthrophication Survey (1974 and 1975); data was obtained from two sample points (one near the mouth of Ferry Bayou and the other at midlake). The lake is managed by the Arkansas Game and Fish Commission.

There is one public access (concrete launching ramp and adequate adjacent parking facilities) located in Lake Chicot State Park. Presently, no major point source of pollution has been indicated although it appears the lake receives large amounts of non-point source agricultural pollution and some residential pollution. The designated responsible agency is listed in Appendix Table I.

Physical features of Upper Lake Chicot include: maximum depth (6 m); mean depth (5 m); surface area (514 ha); volume (2.57 x 10^7 m^3); shoreline development index (2.696). Stratified conditions were not observed during the course of this study. The lake is associated with three major watershed areas, two with the upper end and one with the midportion of the oxbow. Southern drainage to the upper end comprises 35% of the watershed; an area east by northeast of the lake, including Lake Chicot State Park contributes 30% of the watershed drainage. An area directly north of the lake including Ferry Bayou contains the remaining 35% of the watershed area. A single outflow drains into Lower Lake Chicot at the dam. Upper Lake Chicot is the most voluminous natural lake basin in the state.

Topographically, the watershed is delta land, level to gently undulating. The watershed area is 4874 ha, approximately 8.5 times the surface area of the lake. Land use consists of 85% agricultural crops, 9% forest, 3% residential, 2% State Park and 1% tree orchards. Upper Lake Chicot is located in the Chicot County Soil District and has two soil types within its watershed: 1) Sharkey-Bowdre Association - level to gently undulating, poorly drained to moderately well drained clayey soils; 2) Commerce-Dandee Association - level to gently undulating, somewhat poorly drained to moderately well drained silty soils that formed in Mississippi River alluvium.

UPPER LAKE CHICOT

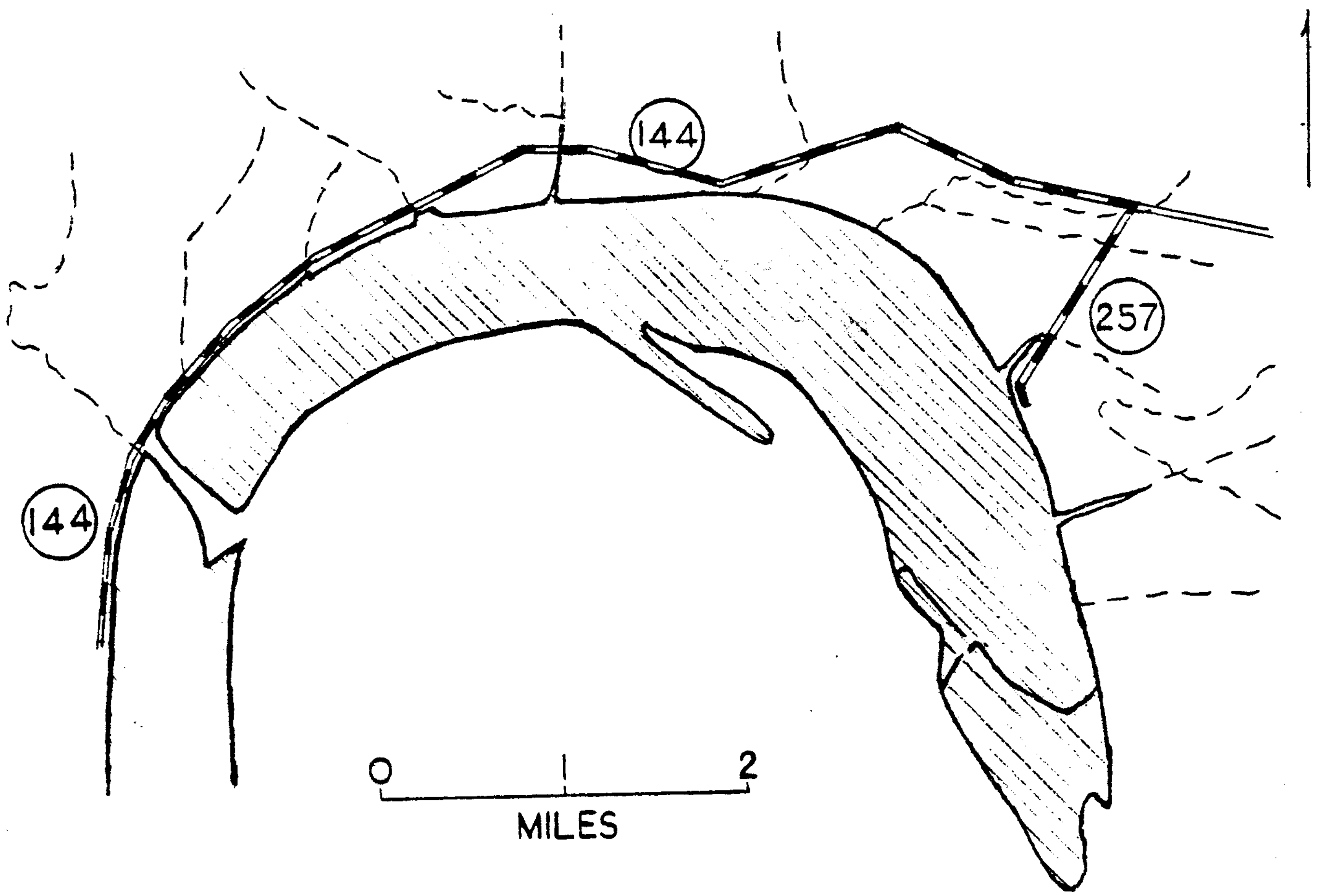

FIGURE 4

LAKE ENTERPRISE

Lake Enterprise (Fig. 5) is located in the southeast corner of Ashley County at the town of Wilmont, ca 8 km from the Arkansas-Louisiana border. An old oxbow of Bayou Bartholomew, the lake is found on the Wilmont Quadrangle at 33°03'48" (North latitude), 91°35'50" (West longitude). Lake Enterprise has not been included in the National Eutrophication Survey. All land surrounding the lake is privately owned, except for two public access areas maintained by the Arkansas Game and Fish Commission. At present, no major point source of pollution has been indicated, although in our field collections we noticed a large number of livestock (hogs) directly adjacent to the lake (south shore near mid-lake). Non-point sources of pollution include residential, agricultural and urban runoff. The designated responsible agency is listed in Appendix Table I.

Physical features of the lake include: maximum depth (5 m); mean depth (4.5 m); surface area (77 ha); volume (3.5×10^6 m^3); shoreline development index (5.341). Stratified conditions were not observed during the course of this study. Lake Enterprise has no major inflows or outflows.

In general, the topography of the watershed is level to undulating bottom land. The area of the watershed is 471 ha, approximately 5.1 times the surface area of the lake. Land use consists of 40% agriculture, 30% forest and 30% residential. Approximately 95% of the watershed is under cultivation, mostly for cotton crops. Locating in the Ashley County Soil District, the Lake Enterprise watershed exhibits a single soil type, the Rilla-Herbert Association - well drained to somewhat poorly drained loamy soil.

LAKE ENTERPRISE

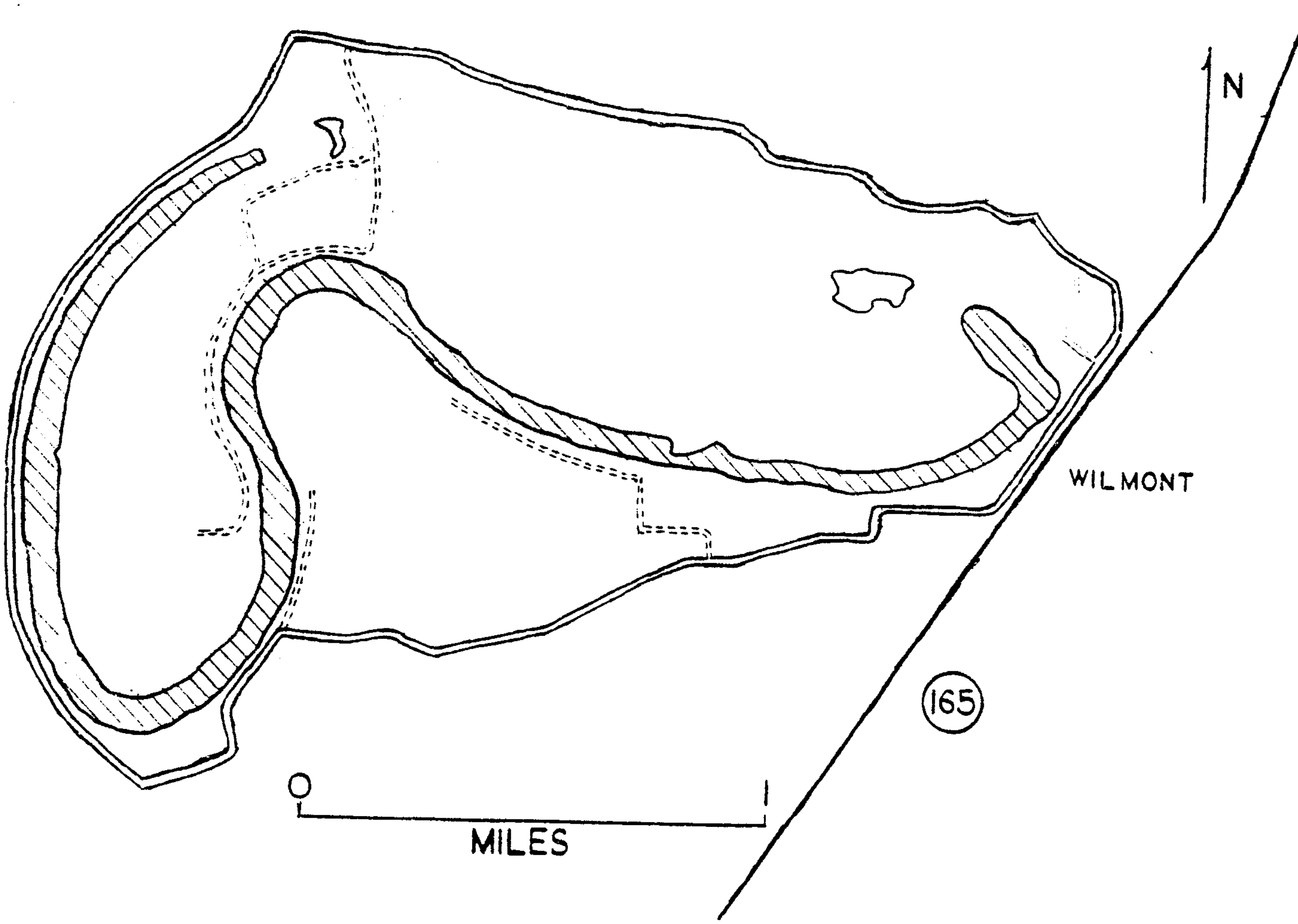

FIGURE 5

LAKE JUNE

Lake June (Fig. 7), locating within the corporate limits of Stamps in Lafayette County is found on the Bucknew Quadrangle at 33°21'30" (North latitude), 93°29'35" (West longitude). The lake has not been included in the National Eutrophication Survey. Public access is provided on the east side of the lake and is furnished with a concrete launching ramp. While no point sources of pollution have been indicated, several non-point sources are present. These include residential, urban and agricultural runoffs, animal waste and oilfield overflows. The designated responsible agency is listed in Appendix Table I.

Physical features of Lake June include: maximum depth (2 m); mean depth (1.7 m); surface area (26 ha); volume (4.4×10^5 m^3); shoreline development index (2.871). Stratified conditions were not observed during the study. Lake June has one major inflow which enters the lake from the northeast and one outflow at the southwest corner which forms the headwater of Crooked Branch Creek. This outflow is ca 2.5 km above the confluence of Crooked Branch Creek and Bodcaw Creek which flows into Lake Erling to the south.

Topographically the surrounding watershed consists of nearly level to moderately steep hilltops and ridges on rolling coastal-plain uplands. The watershed area (1629 ha) is approximately 63 times the surface area of the lake. Land use is primarily forest (60%) with the remainder cattle grazing and agriculture (25%) and residential (15%). One principle soil type, the Bleving-Sacul Association, is found in the watershed. This type consists of deep, moderately and flowly permeable, well to moderately well drained acid loamy soil. The lake is included in the Nevada-Lafayette

LAKE JUNE

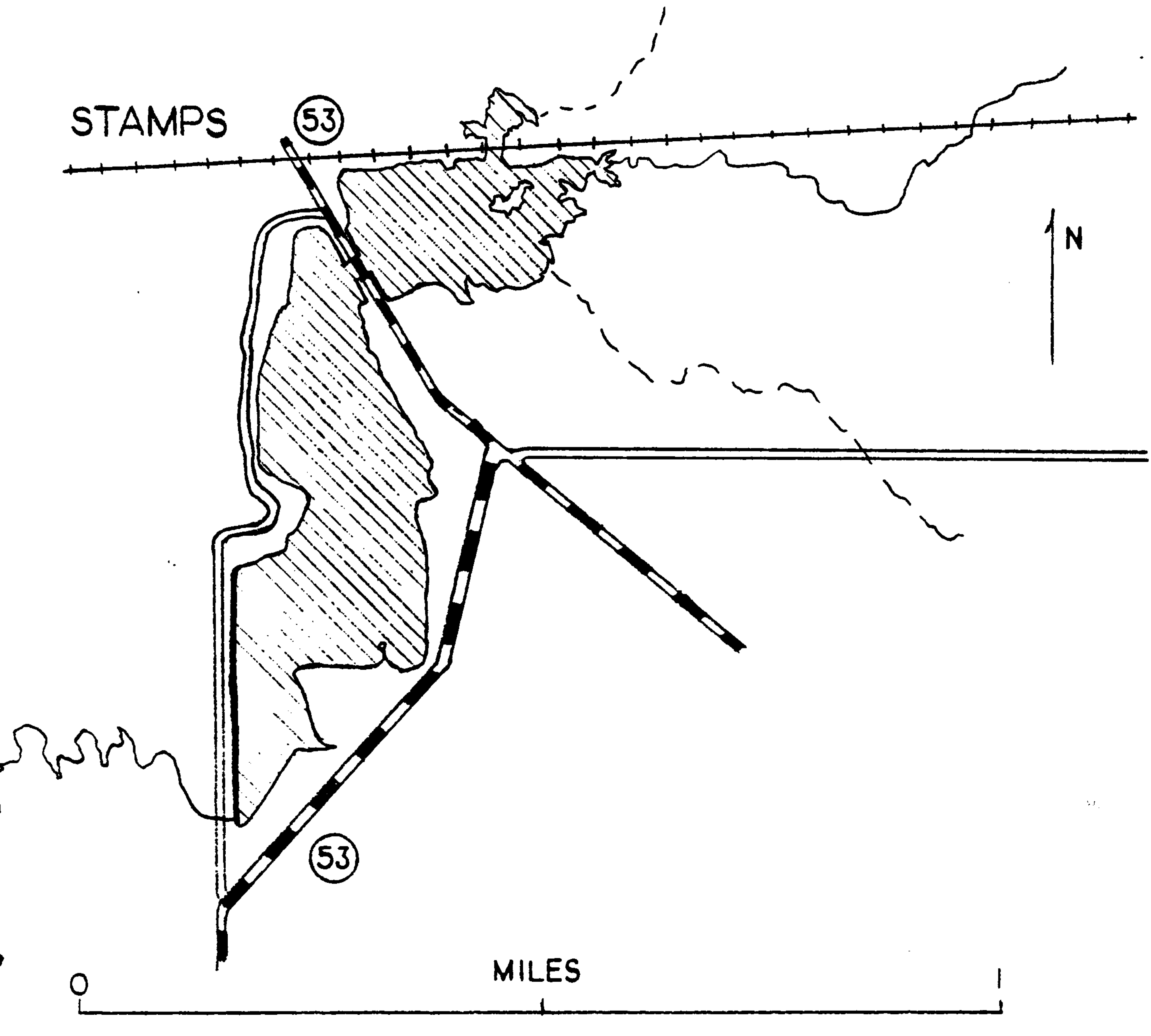

FIGURE 6

Soil District.

LAKE LOU EMMA

This lake (Fig. 6), the smallest of the lakes included in the Clean Lakes survey, is located entirely within the corporate limits of the city of Van Buren in Crawford Co. and on the Van Buren Quadrangle at 35°27'51" (North latitude), 94°21'25" (West longitude). Lake Lou Emma has not been surveyed under the National Eutrophication Survey. Public access is available around the entire lake. A major point source discharge enters the lake via a sewage pump station bypass owned by the city of Van Buren (NPDES permit No. AR0021482 and state permit No. 549-W). The designated responsible agencies are listed in Appendix Table I.

Physical features of the lake include: maximum depth (3.1 m); mean depth (2 m); surface area (2 ha); volume (4.0×10^4 m^3); shoreline development index (1.214). Stratified conditions were not observed during the study. Lake Lou Emma has one major inflow which enters from the south, and one outflow, at the spillway area of the northeastern corner of the lake.

In terms of topography, the watershed of Lake Lou Emma consists of gently sloping to very steep hills and mountains. The watershed area of 228 ha is 114 times the surface area of the lake. Land use consists of 80% residential, 10% grassland and 10% forest areas. A single soil type is present in the watershed, the Enders Association - well drained, deep loamy and stony soils. The lake is included in the Crawford County Soil District.

NEWPORT LAKE

Newport Lake (Fig. 8), located entirely within the corporate limits of the city of Newport in Jackson County, is found on the Newport Quadrangle

LAKE LOU EMMA

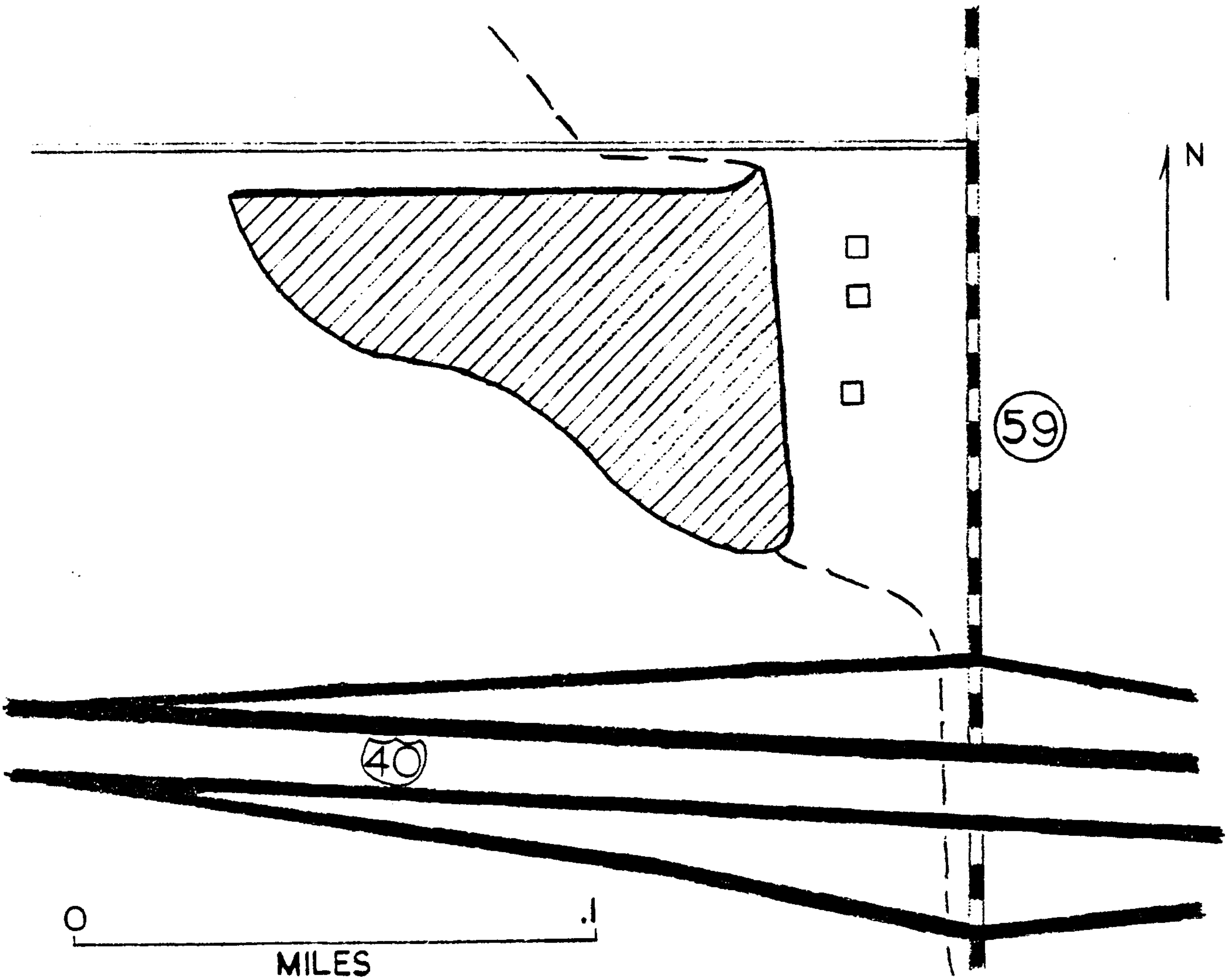

FIGURE 7

at 35°36'12" (North latitude), 91°16'30" (West longitude). The lake was not included in the National Eutrophication Survey. Newport Lake is owned by the city of Newport which provides a boat access from a natural bank at the northeast corner of the lake. Point source pollution is ascribed to the municipal water treatment plant which directly discharges backwash waters into the lake (NPDES permit No. AR0037915; state permit No. 2047 W). Non-point sources of pollution include urban runoff and residential pollution. The designated responsible agency is listed in Appendix Table I.

Physical features include: maximum depth (4.5 m); mean depth (3 m); surface area (7 ha); volume (2.1×10^5 m^3); shoreline development index (2.852). Stratified conditions were not observed during this study. Newport Lake has one inlet at the north end of the lake and one outlet at the south end of the lake.

Topographically, the watershed of Newport Lake consists of level to undulating flood plains with old natural levees. The watershed area (310 ha) is approximately 44 times the surface area of the lake. Land use is approximately 50% residential, 40% fields and 10% industrial. Two soil types are found in the watershed area: 1) Dundee-Forestdale-Amagon Association - somewhat poorly drained and poorly drained loamy soils; 2) Egam-Sharkey-Stazer Association - well drained to poorly drained, level, loamy soils. The watershed is located in the Jackson County Soil District.

<u>OLD TOWN LAKE</u>

Old Town Lake (Fig. 9), is located in Phillips County ca. 24 km south of Helena-West Helena along State Highway 44. The towns of Lake View and Wabash are located in close proximity to the lake, which is the largest single-basin natural oxbow lake by area, in Arkansas (Lake Chicot, combining

[redacted]

NEWPORT LAKE

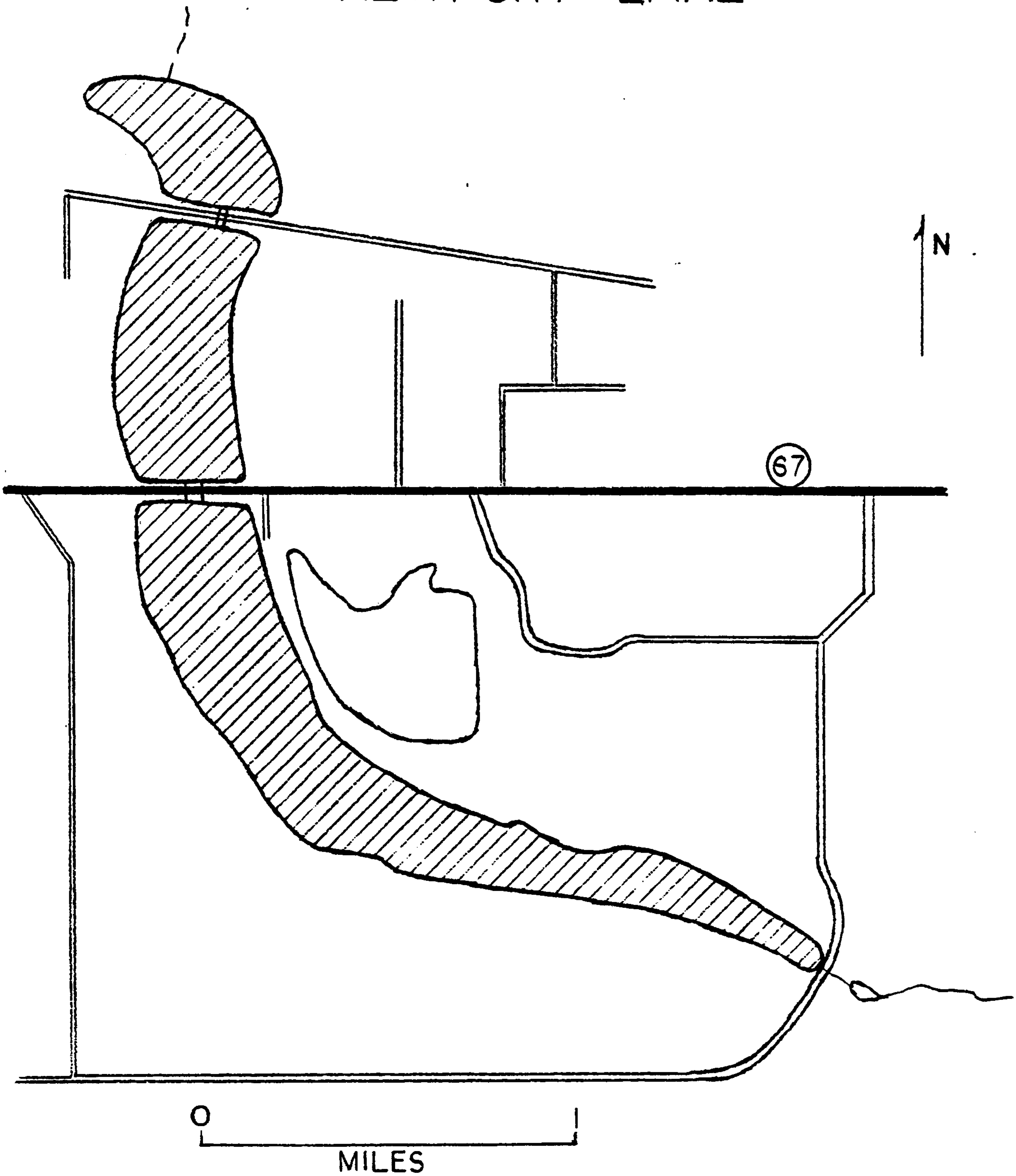

FIGURE 8

both the lower and upper basins is the largest natural lake). The center of the lake is located on the Modoc Quadrangle at 34°24'30" (North latitude), 90°47'30" (West longitude). The lake has not been included in the National Eutrophication Survey. Access to the lake is provided at several locations along State Highway 44. A concrete boat ramp and camping facilities are located at the north end of the lake; launching and bank fishing are available at the town of Lake View; boat launching is provided at Merritt's Boat Dock; boat launching and bank fishing are also available at the floor-gates. Helena's oxidation ponds along Highway 49 enters, as effluent, Old Town Lake via Long Lake Bayou (NPDES permit No. AR 0034240). In addition, non-point source pollution via agricultural runoff and residential pollution. The designated responsible agency is listed in Appendix Table I.

Physical features of Old Town Lake include: maximum depth (1.5 m); mean depth (1.3 m); surface area (564 ha); volume (7.3×10^6 m^3); shoreline development index (3.975). Stratified conditions were not observed during the study. The lake has two major inflows: one at the upper end of the lake which serves as drainage for the northeast portion of the watershed accounting for ca 40% of the watershed area; the other inflow, draining ca 55% of the watershed area, accumulates from the inner area formed by the oxbow of the lake. A single outflow is located ca 1.6 km north of Wabash on the western end of the oxbow.

In general, the topography of the watershed surrounding Old Town Lake consists of level and gently undulating to flat delta land. The watershed area (4399 ha) is approximately 6.8 times the surface area of the lake. Land use consists of 50% agriculture, 40% forest and 10% residential. Located in the Phillips County Soil District, the watershed of Old Town Lake consists of two soil types: 1) Sharkey Association - poorly drained, level, clayey soils; 2) Dubbs-Dundee Assocation - well drained and somewhat poorly drained loamy soils.

REYNOLDS LAKE

Also referred to as Reynold's Park Lake, this lentic system is located in Green County ca. 3 km west of the city of Paragould, on the Gainesville Quadrangle at 36°04'21" (North latitude), 90°31'41" (West longitude). It has not been included in the National Eutrophication Survey. The lake is provided with a city park which furnishes access to bank fishing and a concrete boat launching area. Outboard motors are not allowed on the lake. No point source of pollution has yet been indicated although non-point sources include residential pollution, park facilities and perhaps livestock waste. The designated responsible agency is listed in Appendix Table I.

Physical features of Reynolds Lake include: maximum depth (1.5 m); mean depth (1 m); surface area (20 ha); volume (2.0 x 10^5 m^3); shoreline development index (1.707). Stratified conditions were not observed during this study. The lake has one major inflow, a creek which enters from the west, and one major outflow, at the dam at the southeastern end of the lake.

Generally, the topography of the surrounding watershed is nearly level to occasionally steep. The watershed has an area of 308 ha which is ca. 15.4 times the surface area of the lake. Land use estimates include 70% grazing land, 25% forest and 5% residential and park facilities. The watershed is located in the Greene County Soil District and exhibits one soil type, the Loring-Memphis Association - moderately well drained and well drained soils formed in a thick layer of silt.

REYNOLDS LAKE

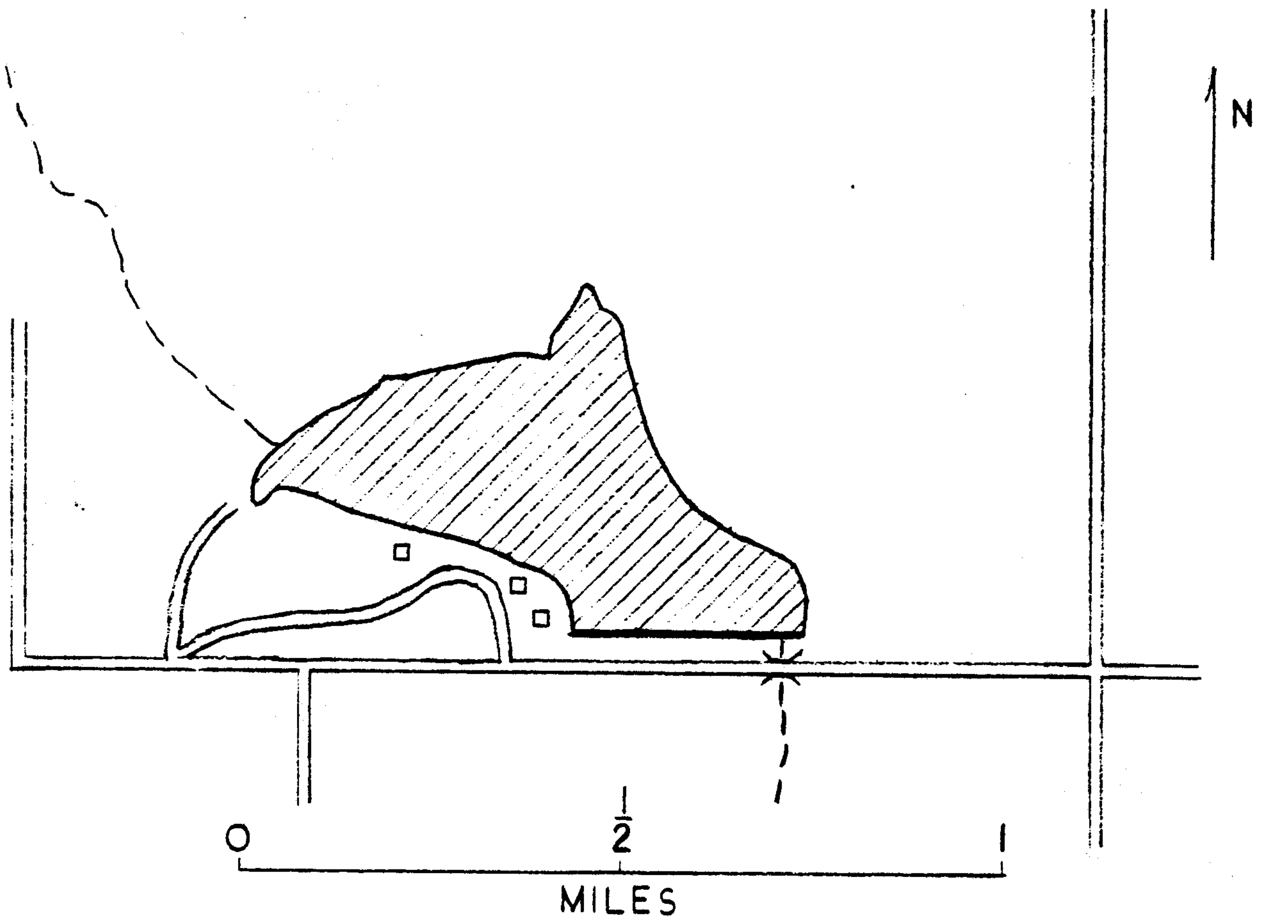

FIGURE 10

LAKE WALLACE

Lake Wallace is located in the southeast corner of Drew County and the northwest corner of Chicot County on the Lake Village Quadrangle at 35°36'12" (North latitude), 91°16'30" (West longitude). It has not been included in the National Eutrophication Survey. Lake Wallace is managed and controlled by the Arkansas Game and Fish Commission which provides three public access areas having concrete launching ramps and adequate parking. All three access areas are under easement by the Commission. At present, no point sources of pollution have been identified although non-point sources include agricultural runoff and residential pollution. The designated responsible agency is listed in Appendix Table I.

Physical features include: maximum depth (3.5 m); mean depth (2 m); surface area (140 ha); volume (2.8 x 10^6 m^3); shoreline development index (4.862). Stratified conditions were not observed during this study. Lake Wallace has only one major inflow, a low lying drainage area at the most northern part of the lake, and two major outflows, one at the dam and the other near the oxbow arm opposite the dam. Both outflows discharge into Bayou Bartholomew.

In general, the topography of the Lake Wallace watershed is level to nearly level with natural levees. The area of the watershed (995 ha) is ca. 6.1 times the surface area of the lake. Land use is primarily agricultural (65%), 30% forested and 5% residential. The watershed is located in the Drew-Chicot Soil Districts and is composed of two main soil types: 1) Callion-Lonoke Association - well drained sandy and silty soils formed in Arkansas River alluvium; 2) Rilla-Herbert Association - well drained and somewhat poorly drained, level and undulating, loamy soils on natural levees.

LAKE WALLACE

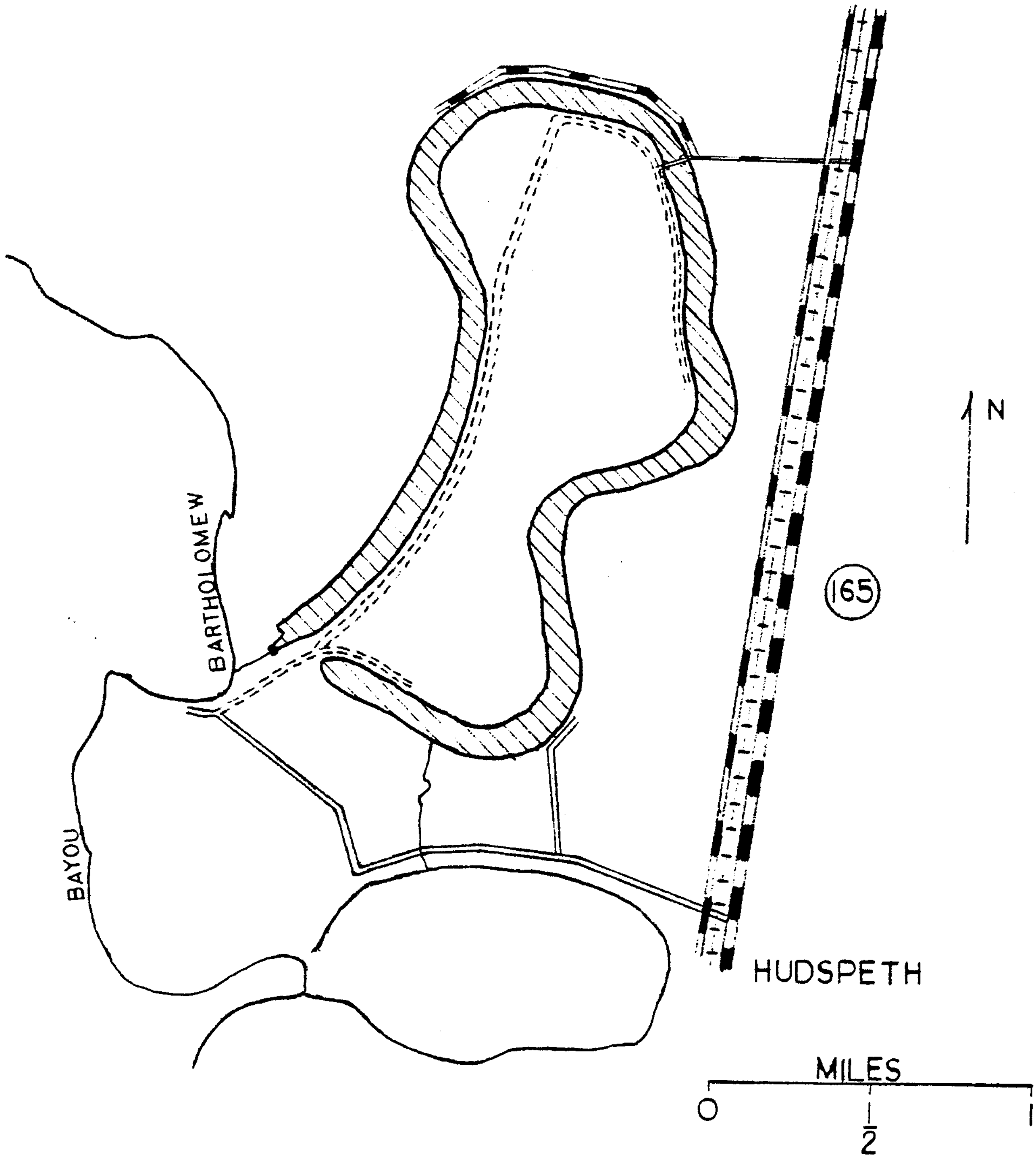

FIGURE 11

RESULTS

I. General

According to Moore (1963), aquatic habitats in Arkansas are perhaps the most diversified of the Central Gulf States because of extremes in topography and climate. Physico-chemical data (Table I) however, indicate remarkable similarities among the ten lakes surveyed. All except Lake Lou Emma (slightly basic) are essentially circumneutral, and all except for Upper Lake Chicot are relatively low in alkalinity. Except for Calion Lake and Lake June, specific conductance (and TDS) is relatively low in the remaining lakes. All lakes exhibit moderate, at times high, turbidities, are moderately colored and exhibit moderate and similar total organic carbon (TOC) values.

Specific chemical data are presented in Table II. Except for Calion Lake which exhibits low to moderately low total Kjedahl Nitrogen levels, all lakes exhibit moderately high levels of both total Kjedahl Nitrogen and total Phosphorus, and on this basis would be considered "eutrophic" as was assumed in the lake selection process. The majority of lakes exhibit only moderate Sulfate levels, although Lake Enterprise shows relatively low levels (less than 0.5 mg/l) and Lakes June, Lou Emma and Newport rather high levels (greater than 15 mg/l). For the most part, Lake Lou Emma consistently shows higher Sulfate levels than corresponding Chloride levels. As inferred from the relatively high specific conductances exhibited, Calion Lake and Lake June are Sodium and Chloride dominated systems. Table III, showing the monovalent:divalent cation ratios, indicates that the majority of lakes are dominated by divalent cations. Notable exceptions

TABLE I. COMPOSITE MEDIAN VALUES & RANGES OF PHYSICO-CHEMICAL DATA

	Temp. C	pH	Alk. (mg/l)	Sp. Cond. umhos/cm	D.O. (mg/l)	Turbidity NTU	Color APCU	Total Solids (mg/l)	TDS (mg/l)	TOC (mg/l)
Bailey										
Median	19.2	6.9	12	38	9.1	13.0	70	45	42	9.1
Range	9.0-29.5	4.7-7.3	1-16	22-65	0.2-11.2	6.5-18.5	50-75	35-78	36-79	8.4-13.4
Calion										
Median	23.5	6.6	8	305	7.2	8.0	55	184	170	13.2
Range	21-30.8	6.3-7.1	5-24	190-388	4.0-9.0	7.0-12.0	15-93	144-321	126-298	10.7-17.0
Chicot										
Median	23.5	7.2	90	185	6.8	31.0	68	179	123	11.0
Range	17-27.3	6.8-8.2	82-110	170-220	0.4-10.5	17.5-79.0	55-90	147-200	120-142	7.7-17.0
Enterprise										
Median	21	6.9	22	66	7.6	12.0	82	50	44	13.0
Range	15.0-27.5	6.6-7.2	18-28	49-105	0.0-10.0	9.0-21.0	75-84	47-67	30-60	10.4-16.2
June										
Median	22.5	6.7	16	400	7.4	11.0	90	281	260	14.2
Range	18.0-33.0	6.6-9.6	6-29	365-470	0.7-12.8	7.4-19.0	65-99	228-319	228-315	11.8-19.9
Lou Emma										
Median	18.5	8.4	28	182	6.6	18.0	90	114	120	11.6
Range	15.0-35.1	6.0-8.8	18-79	125-210	0.1-16.0	11.0-37.0	75-260	94-177	88-168	6.0-20.4
Newport										
Median	23.0	7.4	56	162	2.6	10.0	65	126	104	11.2
Range	12.5-31.0	6.2-8.7	37-69	85-300	0.0-13.0	5.9-23.5	40-100	78-160	68-128	8.7-21.0
Old Town										
Median	22.0	7.6	52	135	7.0	39	225	138	87	15.1
Range	20.0-26.0	6.7-9.2	8-64	108-200	0.2-10.6	23-729	60-1000+	99-883	79-120	12.4-20.0
Reynold's Park										
Median	21.0	7.2	32	95	8.4	21.0	91	92	63	12.3
Range	18.2-30.0	6.7-8.3	31-34	85-105	6.8-10.0	13.0-39.0	75-225	81-117	45-80	8.7-14.6
Wallace										
Median	24.0	7.0	20	55	3.8	24.0	45	73	43	11.4
Range	15.0-28.0	6.5-7.7	14-30	42-95	0.1-9.4	5.7-79.0	35-125	43-158	28-96	9.0-13.0

COMPOSITE MEDIAN VALUES AND RANGES FOR CHEMICAL DATA (all values in mg/l)

	NH_3-N	Total Kjedahl N	NO_3-N	Ortho-P	Total P	SO_4	Cl
Bailey	0.05 0.00-0.16	0.68 0.50-1.20	0.05 0.00-2.0	0.020 0.011-0.061	0.044 0.016-0.062	4.4 2.7-19	6.9 0.9-7.5
Calion	0.016 0.00-0.151	0.60 0.38-0.60	0.00 0.00-0.06	0.025 0.014-0.172	0.039 0.025-0.084	7.0 4.2-8.0	127 61-264
Chicot	0.019 0.00-0.15	0.61 0.5-1.2	0.04 0.00-0.31	0.085 0.014-0.241	0.109 0.086-0.188	8.1 3.5-9.5	7.5 0.6-17.5
Enterprise	0.13 0.011-0.16	1.2 0.52-1.4	0.01 0.00-0.09	0.119 0.008-0.342	0.155 0.083-0.200	0.3 0.0-1.9	23.1 1.8-26.2
June	0.047 0.00-0.133	0.7 0.54-1.7	0.00 0.00-0.20	0.027 0.005-0.086	0.097 0.065-0.129	15.2 10.1-51.3	208 110-325
Lou Emma	0.03 0.00-0.18	1.1 0.70-1.2	0.07 0.00-0.62	0.076 0.015-0.148	0.164 0.122-0.253	26.8 14.0-30.1	21.7 6.6-43.4
Newport	0.164 0.01-1.0	0.80 0.50-1.70	0.09 0.01-0.44	0.057 0.015-0.210	0.110 0.053-0.236	17.4 15.0-22.6	21.2 2.8-34.2
Old Town	0.025 0.01-0.40	0.90 0.59-1.70	0.01 0.00-0.57	0.072 0.015-0.778	0.184 0.141-0.942	6.7 3.8-39.0	16.7 0.3-54.2
Reynold's Park	0.02 0.00-0.07	0.9 0.56-1.1	0.00 0.00-0.02	0.022 0.001-0.032	0.090 0.054-0.119	3.1 0.4-3.8	8.4 1.1-16.0
Wallace	0.022 0.00-0.14	0.8 0.53-1.4	0.01 0.00-0.05	0.054 0.013-0.285	0.125 0.094-0.233	1.1 0.0-7.1	4.1 0.0-12.7

COMPOSITE MEDIAN VALUES AND RANGES FOR CHEMICAL DATA (all values in mg/l) (CON'T)

	Na	K	Ca	Mg	Fe	Mn
Bailey	2.1	1.5	1.7	1.0	0.7	0.2
	2.0-2.4	1.3-1.9	1.2-2.8	0.6-1.5	0.5-0.7	0.1-0.6
Calion	35	1.6	7.2	2.7	0.5	0.1
	26-52	1.2-2.1	5.9-9.0	1.9-3.6	0.5-1.6	0.1-0.2
Chicot	3.2	4.2	24.8	7.0	0.9	0.2
	3.1-3.6	3.6-4.4	10.8-28.0	5.9-9.0	0.5-3.6	0.0-0.3
Enterprise	4.0	4.2	3.0	1.4	0.6	0.3
	3.6-4.2	3.9-4.2	2.5-4.4	1.1-1.9	0.2-1.1	0.1-0.4
June	52	3.1	12.2	4.0	2.8	0.1
	46-55	1.8-5.3	9.2-13.5	0.8-5.4	0.7-3.1	0.1-0.4
Lou Emma	11.5	4.2	12.2	4.0	0.9	0.5
	8.9-18.9	3.7-5.4	9.3-15.2	4.0-5.2	0.2-1.3	0.2-0.6
Newport	4.4	4.4	16.8	3.2	0.3	0.3
	1.8-4.7	3.5-5.5	7.3-24.5	2.3-3.8	0.1-1.0	0.1-3.3
Old Town	4.8	4.5	13.2	4.5	0.8	0.3
	2.0-7.0	4.0-13.0	2.1-14.4	2.7-5.1	0.4-16.5	0.1-0.6
Reynold's Park	7.0	1.7	4.5	2.7	1.1	0.4
	6.3-8.7	1.0-2.1	3.4-4.8	2.0-2.7	0.5-1.4	0.2-0.6
Wallace	0.9	4.1	3.4	1.8	1.0	0.2
	0.9-1.2	3.4-4.7	3.0-4.0	1.5-1.9	0.3-5.2	0.1-0.4

Median Concentrations in Milliequivalents/l

Lake	Na	K	Ca	Mg	M:D Cation Ratio
Bailey	0.09	0.04	0.08	0.08	0.81
Calion	1.52	0.04	0.36	0.22	2.69
Upper Chicot	0.14	0.11	1.24	0.58	0.14
Enterprise	0.17	0.11	0.15	0.12	1.04
June	2.26	0.08	0.61	0.33	2.49
Lou Emma	0.50	0.11	0.61	0.33	0.65
Newport	0.19	0.11	0.84	0.26	0.27
Old Town	0.21	0.12	0.66	0.37	0.32
Reynolds	0.30	0.04	0.22	0.22	0.77
Wallace	0.04	0.10	0.17	0.15	0.44

LEGEND

TABLE III MONOVALENT:DIVALENT CATION RATIOS are Calion Lake, Lake Enterprise and Lake June. These three lakes are included in the Red and Ouachita River basins indicating perhaps a physiographic cation region dominated by monovalent cations, south and west of the Wallace Lake area of the drainage.

Ninety-six genera representing nine algal classes were observed in this study (Table IV). As expected, the greatest number of genera (36) is associated with the Green algae (Class Chlorophyceae), followed by diatoms (Bacillariophyceae) (22), and Bluegreen algae (Cyanophyceae) (19). The remaining six classes are represented by significantly fewer genera (2-4). The majority of Green algal genera are members of the Chlorococcalean group which Nygaard (1949) considered indicative of eutrophic waters.

All lakes appeared moderately productive in terms of algal cell numbers, biomass and chlorophyll concentrations (Table V). Diversity estimates, including number of genera, $\bar{H}'_{nits}$ (Shannon-Weiner diversity), and evenness (J) (Pielou's evenness component), while not in themselves indicators of trophic status (Taylor et al., 1979) are included since high diversities are biologically desirable and hence reflective of potential utility as quality parameters. Values in Table V indicate that the selected lakes exhibit only moderate diversities. Appendix Table III presents raw data used to calculate these estimates.

Zooplankton species composition and abundance data are useful in assessing the trophic status of lakes. Because zooplankters rapidly turn over, they are able to respond quickly to slight changes in water quality. Many species are eurytopic and have little value as indicator organisms, while others may be limited by physical-chemical factors (Gannon & Stemberger, 1978) and/or feeding ecology (McNaught, 1975).

TABLE IV.

ARKANSAS CLEAN LAKES PROJECT--PHYTOPLANKTON

CHLOROPHYCEAE
- Acanthospaera Lemmermann
- Actinastrum Lagerheim
- Ankistrodesmus Corda
- Asterococcus Scherffel
- Botryococcus Kützing
- Carteria Diesing
- Chlamydomonas Ehrenberg
- Chlorogonium Ehrenberg
- Chodatella Lemmermann
- Coelastrum Nägeli
- Conochaete Klebahn
- Crucigenia Morren
- Dictyosphaerium Nägeli
- Elakatothrix Wille
- Eudorina Ehrenberg
- Franceia Lemmermann
- Gloeocystis Nägeli
- Golenkinia Chodat
- Gonium Müller
- Kirchneriella Schmidle
- Micractinium Fresenius
- Monoraphidium Legnerová
- Oedegonium Link
- Oocystis Nägeli
- Pandorina Bory
- Pediastrum Meyen
- Polyedriopsis Schmidle
- Pteromonas Seligo
- Quadrigula Printz
- Radiococcus Schmidle
- Scenedesmus Meyen
- Schroederia Lemmermann
- Selenastrum Reinsch
- Tetraedron Kützing
- Tetrastrum Chodat
- Treubaria Bernard

CONJUGATOPHYCEAE
- Closterium Nitzsch
- Cosmarium Corda
- Staurastrum Meyen

EUGLENOPHYCEAE
- Euglena Ehrenberg
- Phacus Dujardin
- Trachelomonas Ehrenberg

PYRRHOPHYCEAE
- Ceratium Schrank
- Gymnodinium Stein
- Peridinium Ehrenberg

CRYPTOPHYCEAE
- Chilomonas Ehrenberg
- Chroomonas Hansgirg
- Cryptomonas Ehrenberg
- Cyanomonas Oltmanns

CYANOPHYCEAE
- Anabaena Bory
- Anabaenopsis (Woloszyńska) Miller
- Aphanizomenon Morren
- Aphanocapsa Nägeli
- Aphanothece Nägeli
- Chroococcus Nägeli
- Cyanarcus Pascher
- Dactylococcopsis Hansgrig
- Gloeothece Nägeli
- Gomphosphaeria Lagerheim
- Holopedium Lagerheim
- Lyngbya Agardh
- Marssoniella Lemmermann
- Merismopedia Meyen
- Microcystis Kützing
- Oscillatoria Vaucher
- Raphidiopsis Fritsch & Rich
- Rhabdoderma Schmidle & Lauterborn in Schmidle
- Spirulina Turpin

CHRYSOPHYCEAE
- Dinobryon Ehrenberg
- Mallomonas Perty
- Rhizochrysis Pascher
- Synura Ehrenberg

XANTHOPHYCEAE
- Centritractus Lemmermann
- Ophiocytium Nägeli

BACILLARIOPHYCEAE
- Acanthoceras Honigmann
- Achnanthes Bory
- Amphora Ehrenberg
- Asterionella Hassall
- Aulacosira Thwaites
- Caloneis Cleve
- Cyclotella Kützing
- Cymbella Agardh
- Epithemia Brébisson
- Eunotia Ehrenberg
- Frustulia Rabenhorst
- Gomphonema Ehrenberg
- Gyrosigma Hassall
- Navicula Bory
- Neidium Pfitzer
- Nitzschia Hassall
- Pinnularia Ehrenberg
- Rhizosolenia Brightwell
- Rhopalodia Müller
- Skeletonema Greville
- Surirella Turpin
- Synedra Ehrenberg

TABLE V.

MEDIAN VALUES & RANGES FOR SELECTED PHYTOPLANKTON PARAMETERS

	Cells/l	# Genera	H'	J	Biomass (mg/l)	Chlorophyll (µg/l)
Bailey	4.5×10^{6} $(9.4 \times 10^{5}-1.7 \times 10^{7})$	29 (27-32)	2.270 (1.171-2.412)	.6741 (.3556-.6959)	5.73 (4.50-8.74)	14.6 (5.6-53.6)
Calion	6.8×10^{6} $(4.9 \times 10^{6}-5.8 \times 10^{7})$	32 (31-40)	2.076 (1.103-2.498)	.5989 (.2290-.7274)	5.14 (0.51-7.78)	12.8 (3.0-23.9)
Chicot	5.2×10^{6} $(1.3 \times 10^{6}-2.5 \times 10^{7})$	25 (20-26)	2.145 (1.370-2.019)	.6274 (.4206-.7159)	9.76 (7.13-17.12)	15.0 (5.3-74.3)
Enterprise	2.7×10^{7} $(1.9 \times 10^{7}-2.7 \times 10^{7})$	30 (24-30)	2.163 (1.224-2.163)	.6360 (.3853-.6360)	12.02 (8.59-14.40)	50.5 (12.3-72.2)
June	2.6×10^{7} $(6.6 \times 10^{6}-1.6 \times 10^{8})$	32 (27-33)	2.167 (0.935-2.433)	.6196 (.2698-.7317)	8.66 (4.67-18.81)	18.7 (8.0-105.4)
Lou Emma	3.7×10^{7} $(2.6 \times 10^{7}-1.6 \times 10^{9})$	24 (16-25)	1.183 (0.054-2.217)	.3677 (.0193-.6974)	17.45 (6.68-19.89)	32.5 (24.6-73.4)
Newport	3.7×10^{6} $(1.1 \times 10^{6}-1.1 \times 10^{7})$	26 (22-28)	2.102 (2.082-2.521)	.6737 (.6450-.7568)	7.92 (3.84-16.46)	31.1 (0.1-48.2)
Old Town	1.8×10^{7} $(5.6 \times 10^{6}-1.9 \times 10^{7})$	28 (27-31)	1.627 (1.128-1.749)	.4892 (.3284-.5248)	21.54 (7.38-118.0)	19.0 (8.4-88.3)
Reynolds Park	2.5×10^{6} $(6.3 \times 10^{5}-5.2 \times 10^{6})$	22 (22-35)	2.242 (1.930-2.752)	.7258 (.6246-.7741)	9.76 (7.0-14.52)	21.0 (11.2-51.2)
Wallace	2.7×10^{6} $(2.5 \times 10^{6}-2.9 \times 10^{6})$	27 (26-29)	1.992 (1.960-2.207)	.6114 (.5823-.6701)	8.94 (7.44-13.94)	16.5 (6.2-62.6)

TABLE VI.
ARKANSAS CLEAN LAKES PROJECT -- ZOOPLANKTON

ROTATORIA

Asplanchna priodonta
Brachionus angularis
B. calyciflorus
B. caudatus
B. havanaensis
B. plicatilis
B. quadridentata
B. urceolaris
Brachionus sp.
Cephalodella sp.
Collotheca sp.
Conochiloides coenobasis
Conochilus unicornis
Euchlanis sp.
Filinia longiseta
F. opoliensis
F. terminalis
Gastropus sp.
Hexarthra mira
Kellicottia bostoniensis
Keratella cochlearis
K. valga
K. quadrata
Lecane luna
Lecane sp.
Lepadella sp.
Monostyla bulba
M. quadridentata
Monostyla sp.
Philodina sp.
Platyias patulus
P. quadricornis
Pleosoma hudsoni
P. truncatum
Polyarthra suryptera
P. vulgaris
Synchaeta pectinata
S. stylata
Synchaeta sp.
Testudinella patina
Trichocerca capucina
T. longiseta
T. similis
Trichocerca sp.

DIPTERA

Chaoborus sp.

CLADOCERA

Alonella sp.
Bosmina corregoni
B. longirostris
Ceriodaphnia lacustris
C. quadrangula
C. reticulata
Ceriodaphnia sp.
Chydorus sphaericus
Chydorus sp.
Daphnia ambigua
D. galeata
D. parvulum
Daphnia sp.
Diaphanosoma leuchtenbergianum
Holopedium gibberum
Holopedium sp.
Scapholeberis sp.

COPEPODA

Cyclops bicuspidatus thomasi
Diaptomus pallidus
D. reighardi
Diaptomus sp.
Ergasilus sp.
Mesocyclops edax

Patalas (1972), McNaught (1975) and Gannon & Stemberger (1978) found evidence of declining dominance by calanoid copepods concomitant with increasing abundance of cyclopoid copepods and cladocerans when they compared oligotrophic and eutrophic waters. Rotifer species also were reported to be indicators by Gannon & Stemberger (1978) and total densities of both rotifers and entomostracans were used as indicators by Porcella et al. (1980).

It must be recognized that most investigations of zooplankters as indicator organisms have been carried out in northern lakes, especially the Great Lakes. Accordingly, the findings emerging from such studies can be applied to lakes of another region only in a general sense. Moreover, changes in the composition of the zooplankton community can be influenced by toxicants (e.g., insecticides) or an abundance of planktivorous fish; changes do not necessarily indicate a change in the tophic status of a lake.

Of the 68 zooplankton species identified during this investigation, 44 are rotifers (Table VI). There are eight species of Brachionus. The rotifers Keratella cochlearis, Kellicottia bostoniensis, Polyartha vulgaris, P. euryptera, Asplanchna priodonta, Filinia longiseta, Conochiloides coenobasis, Conochilus unicornis, at least three species of Brachionus, and the chadocerans Bosmina longirostris and Chydorus sp. occur in all 10 lakes. In each sample, copepods are dominated numerically by nauplii; nauplii often represent the largest proportion of entomostraca. In eight lakes, nauplii comprise 80-84% of the Copepoda. In nine lakes, (Lou Emma being the exception), nauplii comprise over 50% of entostraca. Cladocera are dominated by Bosmina longirostris, Daphnia spp. and Diaphanosoma *leuchtenbergianum*. In general, the Copepods greatly outnumber the Cladocera, and the Rotatoria greatly outnumber the Copepoda.

In terms of species numbers, (Table VII) the majority of lakes exhibit moderate values with the low exception being Lake June (87.3/l) and the high exception Old Town Lake (982.4/l). Biomass (dry weight) estimates are also moderate and fairly consistent, although again two exceptions are evident: Calion Lake appears rather low (12.83 ug/l) and Lake Lou Emma rather high (386.12 ug/l). Diversity, in terms of species present, is rather similar for all the lakes, although Reynolds usually exhibits a greater number of taxa (Table VII).

Entomostraca/Rotifer (E/R) ratios are strikingly close together, except for three lakes with a ratio greater than 1.0; i.e., seven lakes yield E/R ratios between 0.2-0.4. Also, when E/R ratios are calculated using total organisms instead of averages thereof, it becomes apparent that only Lake Lou Emma supports larger numbers of entomostracans than rotifers and the E/R ratios for Lou Emma differ significantly (Table VII). This seeming discrepancy may be attributed to samples with low total zooplankton densities, but these nevertheless yield very high E/R ratios; such a situation has a much greater effect on ratios based on averages while having little effect on ratios based on total numbers of organisms. Lakes Newport, Chicot and Lou Emma (the only three lakes with E/R ratios greater than 1.0) all exhibit their lowest zooplankton densities (especially of rotifers) in October (see Appendix Table IV). Even so, these lakes yield much higher E/R ratios in October. The ratios from Lake Lou Emma range from 0.44-41.15 in April and October, respectively.

Lake Lou Emma exhibits the highest zooplankton dry weight (386 ug/l)

TABLE VII.

MEDIAN VALUES AND RANGES FOR SELECTED ZOOPLANKTON PARAMETERS

	#/l	Biomass ug/l	# Species	E/R
Bailey	320.1 (100.6-689.2)	61.66 (5.65-136.36)	15 (13-20)	0.22 (6.01-0.88)
Calion	177.0 (40.0-460.2)	12.83 (trace-207.8)	15 (9-21)	0.45 (.09-.61)
Chicot	108.3 (17.3-1229.8)	34.59 (12.72-78.38)	15 (8-21)	1.20 (0.18-41.90)
Enterprise	496.1 (109.4-611.7)	68.50 (11.28-83.37)	15 (13-16)	0.21 (0.04-0.32)
June	87.3 (35.01-2186.9)	22.37 (trace-138.94)	15 (8-29)	0.14 (0.02-0.52)
Lou Emma	544.7 (174.0-1349.4)	386.12 (65.31-927.08)	15 (12-17)	1.29 (0.28-68.83)
Newport	201.8 (68.6-534.5)	61.90 (1.75-157.51)	14 (9-19)	0.76 (0.30-6.42)
Old Town	982.4 (120.3-1791.0)	115.83 (50.3-172.92)	16 (7-19)	0.18 (6.02-2.09)
Reynolds Park	383.1 (133.2-629.0)	57.29 (trace-150.00)	20 (15-25)	0.19 (0.05-0.45)
Wallace	428.2 (71.9-683.3)	39.83 (trace-227.98)	19 (11-32)	0.18 (0.11-1.09)

peaking at 927 ug/l in June. All other lakes yield median dry weights ranging from 38-100 ug/l (Table VII).

The species composition and abundance of zooplankton in most of the lakes studied suggest some degree of eutrophication. Gannon & Stemberger (1978) noted that lakes in warmer regions naturally tend to be more eutrophic, and may not exhibit a range from oligotrophic to eutrophic which is as broad or well-defined as in cold-temperate regions. Nevertheless, using criteria developed for northern lakes, several of the lakes included in this study might be classified in a general way based upon their zooplankton characteristics.

All lakes yielded species, or combinations of species, usually considered to be indicative of eutrophic waters; e.g., Bosmina longirostris, Brachionus spp., Polyarthra euryptera and Filinia longiseta. "Oliotrophic indicators" were wanting. Calanoid to cyclopoid and cladoceran ratios were all less than 1.0 -- oligotrophic waters are assumed to have a ratio of about 1.0. However, the range of calanoid to cyclopoid and cladoceran ratios was nearly as great as the ratio reported by Gannon & Stemberger (1978); only Reynolds Park Lake yielded a ratio lower than recorded for the eutrophic waters of Lake Michigan.

Using criteria given by Porcella et al. (1980), rotifer and microcrustacean (entomostracan) densities also indicated varying degrees of eutrophication; i.e., concentrations in excess of 250 rotifers or 25 microcrustaceans per liter were considered to be indices of eutrophy. Over 50% of the samples taken from each lake studied by us yielded concentrations exceeding one of these values. It is generally held that more eutrophic waters would support greater densities, and thus greater biomass, of

Lake Lou Emma and Old Town Lake exhibited the clearest evidence of eutrophy when zooplankton characteristics alone are considered. In Lou Emma, zooplankton community composition and abundance fluctuated markedly from one sample collection to the next; a "bloom" was observed in June. Of the Cladocera, 66% were Bosmina longirostris. Brachionus angularis averaged 46.7 o/l in June. In October, relatively high entomostracan densities persisted, but rotifer densities had declined from 440 to 8.5 o/l. This instability contributed to the dramatic change in the E/R ratio from 0.44 in April to 41.15 in October (a factor of nearly 100!). Likewise, zooplankton dry weights varied nearly tenfold from April to June.

Old Town Lake was more stable than Lake Lou Emma, but exhibited some characteristics of eutrophy. Only two samples were collected during the entire study period in which rotifers and entomostraca did not exceed 250 and 25 o/l, respectively. Entomostraca averaged 128 o/l and rotifers 850 o/l. Bosmina longirostris comprised 26% of the Cladocera, and several species of Brachionus averaged 180 o/l.

In terms of fisheries information included in this report, the authors are reluctant to place much credence in their applicative value, specifically with reference to "baseline information", with certain exceptions. This reluctance is based on the fact that fish populations have been manipulated by management practices (stocking, removal, etc.) and therefore are not to be considered reliable indicators of trophic state in the "natural" sense. However, two parameters which intuitively would appear to be only minimally affected by management practives are forage fish biomass (total) and diversity.

A total of 47 species are found in our 1980 collections and 7 species are included from previous reports (Table VIII). In addition, a historical perspective of the fish composition of the selected lakes is presented (Appendix Tables VI-IX).

In terms of total forage fish biomass, the majority of lakes exhibit moderate levels (100-400 kg/ha) although Upper Lake Chicot and Reynolds Lake are substantially higher and Lake Lou Emma and Wallace Lake relatively low (less than 95 kg/ha) (Table IX). With the exception of Wallace Lake, the selected lakes exhibit modest diversity, Wallace Lake appearing to be significantly higher in spite of the low forage fish biomass (Table IX). A complete analyses of lake fisheries is shown in Appendix Fig. 1.

TABLE VIII.
ARKANSAS CLEAN LAKES PROJECT - FISH

AMIIDAE (Bowfins)
- _Amia calva_ (Bowfin)*

ANGUILLIDAE (Freshwater eels)
- _Anguilla rostrata_ (American eel)

APHREDODERIDAE (Pirate perches)
- _Aphredoderus sayanus_ (Pirate perch)*

ATHERINIDAE (Silversides)
- _Labidesthes sicculus_ (Brook silverside)
- _Menidia audens_ (Mississippi silverside)

CATOSTOMIDAE (Suckers)
- _Erimyzon sucetta_ (Lake chubsucker)*
- _Ictiobus bubalus_ (Smallmouth buffalo)*
- _I. cyprinellus_ (Bigmouth buffalo)**
- _I. niger_ (Black buffalo)*
- _Minytrema melanops_ (Spotted sucker)*

CENTRARCHIDAE (Sunfishes)
- _Centrarchus macropterus_ (Flier)**
- _Lepomis cyanellus_ (Green sunfish)*
- _L. gulosus_ (Warmouth)*
- _L. humilis_ (Orange-spotted sunfish)*
- _L. macrochirus_ (Bluegill)
- _L. megalotis_ (Longear sunfish)*
- _L. microlophus_ (Redear sunfish)
- _L. punctatus_ (Spotted sunfish)*
- _Micropterus punctulatus_ (Spotted bass)
- _M. salmoides_ (Largemouth bass)
- _Pomoxis annularis_ (White crappie)
- _P. nigromaculatus_ (Black crappie)*

CLUPEIDAE (Herrings)
- _Dorosoma cepediam_ (Gizzard shad)
- _D. petenese_ (Threadfin shad)*

CYPRINIDAE (Minnows & Carps)
- _Carassius auratus_ (Goldfish)
- _Ctenopharyngodon idella_ (Grass carp)*
- _Cyprinus carpio_ (Carp)
- _Hybognathus hayi_ (Cypress minnow)
- _Notemigonus crysoleucas_ (Golden shiner)*
- _Notropis emiliae_ (Pugnese minnow)
- _N. maculatus_ (Taillight shiner)

CYPRINODONTIDAE (Killifishes)
- _Fundulus chrysotus_ (Golden topminnow)
- _F. olivaceus_ (Blackspotted topminnow)*

ELASSOMATIDAE (Pygmy sunfishes)
- _Elassoma zonatum_ (Banded pygmy sunfish)**

ESOCIDAE (Pikes)
- _Esox americanus_ (Redfin pickerel)*
- _E. niger_ (Chain pickerel)**

ICTALURIDAE (Freshwater Catfishes)
- _Ictalurus furentus_ (Blue catfish)**
- _I. melas_ (Black bullhead)*
- _I. natilis_ (Yellow bullhead)*
- _I. nebulosus_ (Brown bullhead)**
- _I. punctatus_ (Channel catfish)*
- _Noturus gyrinus_ (Tadpole madtom)
- _Phylodictis olivaris_ (Flathead catfish)

LEPISTOSTEIDAE (Gars)
- _Lepisosteus oculatus_ (Spotted gar)*
- _L. osseus_ (Longnose gar)
- _L. platostomus_ (Shortnose gar)**

PERCICHTHYIDAE (Temperate basses)
- Morone mississippiensis (Yellow bass)

PERCIDAE (Perches)
- _Etheostoma chlorosomum_ (Bluntnose darter)
- _E. fusiforme_ (Swamp darter)
- _E. whipplei_ (Redfin darter)
- _Percina caproides_ (Logperch)*

POECILIIDAE (Livebearers)
- _Gambusia affinis_ (Mosquito fish)

POLYODONTIDAE (Paddlefishes)
- _Polyodon spathula_ (Paddlefish)

SCIAENIDAE (Drums)
- _Aplodinotus grunniens_ (freshwater drum)*

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*This study and previous reports

**Previous reports only

TABLE IX.

BIOMASS STANDING CROP DATA (KG./HA.)

FOR THE 1980 SAMPLES FROM ALL 10 LAKES

LAKE	Bailey	Calion	Chicot	Enter-prise	June	Lou Emma	Newport	Old Town	Reynolds Park	Wallace
Total Population (Kg/ha)	225.0	409.9	648.1	168.9	261.9	98.3	340.0	305.2	682.5	222.3
Total Gamefish	72.2	181.2	134.1	82.4	197.8	88.5	94.9	79.0	138.5	54.2
Bass	8.8	19.4	14.8	3.6	38.5	3.4	26.2	2.4	35.7	8.5
Crappie	2.5	0.2	10.1	6.7	1.6	0	0.3	1.0	7.4	7.4
Sunfish	43.3	134.5	25.9	72.1	157.7	54.9	47.8	10.8	55.6	17.0
Catfish	17.6	14.1	81.5	0	0	30.2	20.5	64.2	39.8	20.9
Other	0	13.0	1.8	0	0	0	0	0.7	0	0.3
Total Edible Forage	49.8	174.0	104.6	72.6	157.9	58.5	78.6	48.6	120.3	35.7
Total Nonedible Forage	145.9	185.2	349.4	86.0	63.6	6.3	207.6	147.5	474.9	57.1
Total Predator	29.2	50.6	194.1	10.3	40.3	33.6	53.8	109.1	87.4	129.5
Total Nonpredator	195.8	359.3	454.0	158.6	221.5	64.7	286.3	196.1	595.2	92.8
F/C	6.7	7.1	2.3	15.4	5.5	1.9	5.3	1.8	6.8	0.7
A_T	40.8	49.0	26.7	46.1	87.3	54.4	28.8	78.6	33.6	65.9
A_G	26.3	32.6	18.0	43.9	63.0	50.8	18.9	22.6	15.0	17.3
Diversity	0.61	0.78	0.46	0.43	0.59	0.61	0.53	0.72	0.41	0.98

II. Lake by Lake Results

LAKE BAILEY

A. Physico-chemical and chemical results:

Of all the lakes sampled, Lake Bailey consistently exhibits low ionic levels (as specific conductance), circumneutral pH, low alkalinity, high levels of dissolved oxygen and low levels of total organic carbon (TOC) (Table X). Little spatial differences occur among stations although temporal differences seem evident. The October sampling period shows the lowest pH, highest turbidity, total solids, TDS and TOC. Other physico-chemical features do not show this temporal change. Chemically (Table XI), there are no apparent spatial or temporal differences and nutrients are generally low.

B. Biological results:

In terms of biotic composition, Lake Bailey exhibits forty-five algal genera from eight of the nine algal classes observed throughout the ten lakes (Table XII). Of these, most are green algae (Chlorococcalean) and diatoms. Thirty-three genera of zooplankton occur, about 75% of which are rotifers. Fifteen species of fish, representing ten genera, inhabit the lake and nearly half of the species are members of the sunfish family.

Temporally, the April sampling yields the highest numbers of algal cells and the lowest biomass (Table XIII). Spatially, Station 1 appears to generally yield higher phytoplankton densities, regardless of the time period. The lake is dominated by the filamentous bluegreen alga Anabaena in April and June, this alga being replaced by the Chlorococcalean green alga Crucigenia in October (Table XIV). In general, diversity of algae is relatively high, and except for the April sampling period, number of individual taxa are well distributed.

LAKE BAILEY	Temp. C	pH	Alkalinity (mg $CaCO_3$/l)	Sp. Cond. (umhos/cm)	D.O. (mg/l)	Turbid-ity NTU	Color APCU	Total Solids (mg/l)	Total Dissolved Solids (mg/l)	Total Organi Carbon (mg/l)
Station 1										
15 April 1980	9.0-10.2	6.9	16	23-25	9.2-10.4	12.0	70	36	42	8.4
26 June 1980	21.0-30.0	6.5	9	50-65	0.2-8.4	7.5	65	67	42	9.0
16 Oct. 1980	19.5-19.9	5.3	11	38	8.4-9.2	17.5	70	NS	NS	NS
Station 2										
15 April 1980	10.2-10.7	7.0	16	22-23	10.8-11.2	13.0	70	37	42	9.0
26 June 1980	25.0-29.5	7.3	12	50-55	0.4-8.2	6.5	50	51	40	9.4
16 Oct. 1980	19.2	4.8	10	38	8.5-8.8	18.5	72	76	79	13.4
Station 3										
15 April 1980	9.3-10.0	7.0	16	25	10.6-11.0	13.0	68	35	43	9.0
26 June 1980	27.0-29.0	7.2	12	50-55	4.0-9.2	8.0	55	45	36	9.1
16 Oct. 1980	19.0	4.7	1	38	8.9-9.1	18.0	75	78	73	12.5

TABLE XI.

SUMMARY OF CHEMICAL DATA (laboratory) (all values in mg/l)

E BAILEY	NH_3-N	Total Kjeldahl-N	NO_3-N	Ortho-P	Total-P	SO_4	Cl	Na	K	Ca	Mg	Fe	Mn
tion 1													
April 1980	0.12	0.68	0.04	0.046	0.043	2.7	7.0	2.1	1.5	1.7	0.9	0.5	0.1
June 1980	0.16	1.1	0.15	0.061	0.056	4.4	1.4	2.4	1.9	2.8	1.5	0.7	0.6
Oct. 1980	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
tion 2													
April 1980	0.05	0.68	0.02	0.018	0.044	2.7	6.9	2.1	1.5	1.6	1.0	0.5	0.2
June 1980	0.05	1.2	2.0	0.017	0.037	2.8	0.9	2.0	1.7	2.4	1.4	0.7	0.2
Oct. 1980	.012	0.50	0.00	0.022	0.062	5.8	7.2	2.1	1.3	1.2	0.6	NS	NS
tion 3													
April 1980	0.00	0.66	0.05	0.011	0.033	19	7.5	2.1	1.4	1.5	0.9	0.6	0.1
June 1980	0.03	0.9	0.9	0.016	0.016	4.1	1.8	2.0	1.4	2.4	1.4	0.7	0.3
Oct. 1980	.006	0.52	0.03	0.020	0.062	5.8	6.2	2.2	1.3	1.2	0.6	NS	NS

TABLE XII.
BIOTIC INVENTORY - LAKE BAILEY

YTOPLANKTON

CHLOROPHYCEAE

Coelastrum
Conochaete
Crucigenia
Dictyosphaerium
Gloeocystis
Golenkinia
Kirchneriella
Oedegonium
Oocystis
Pediastrum
Radiococcus
Scenedesmus
Selenastrum
Tetraedron
Tetrastrum
Treubaria

CONJUGATOPHYCEAE

Staurastrum

LENOPHYCEAE

Euglena
Phacus
Trachelomonas

PYRRHOPHYCEAE

Ceratium
Peridinium

CRYPTOPHYCEAE

Chroomonas
Cryptomonas
Cyanomonas

CYANOPHYCEAE

Anabaena
Aphanothece
Chroococcus
Dactylococcopsis
Merismopedia

BACILLARIOPHYCEAE

Acatheceras
Asterionella
Aulacosira
Cyclotella
Cymbella
Eunotia
Navicula
Neidium
Nitzschia
Rhizosolenia
Surirella
Synedra

CHRYSOPHYCEAE

Dinobryon
Mallomonas
Synura

ZOOPLANKTON

ROTATORIA

Keratella cochlearis
K. quadrata
Kellicottia bostoniensis
Hexarthra mira
Trichocerca longiseta
T. capucina
T. similis
Ploesoma truncatum
Polyarthra vulgaris
P. euryptera
Synchaeta sp.
S. stylata
Asplanchna priodonta
Filinia longiseta
Conochiloides coenobasis
Conochilus unicornis
Collotheca sp.
Brachionus sp.
B. angularis
B. caudatus
B. havanaensis
B. quadridentata
Euchlanis sp.
Platyias patulus
Philodina sp.

CLADOCERA

Bosmina longirostris
Daphnia galeata
Ceriodaphnia lacustris
C. quadrangula
Chydorus sphaericus

COPEPODA

Cyclops bicuspidatus thomas
Diaptomus sp.
Ergasilus sp.

FISH

Dorosoma cepedianum
Ctenopharyngodon idella
Noturus gyrunus
Ictalurus natalis
Ictalurus punctatus
Fundulus olivaceus
Gambusia affinis
Micropterus salmoides
Pomoxis annularis
Pomoxis nigromaculatus
Lepomis macrochirus
Lepomis microlophus
Lepomis gulosus
Lepomis cyanellus
Etheostoma whipplei

	Cells (#/l)	Biomass (mg/l)	Chl-a (μg/l)	Pha-a (μg/l)	Total Chl-a (μg/l)	Biomass/Cell (mg)	Chlorophyll/Cell (μg)	Chlorophyll/Biomass
LAKE BAILEY								
15 April 1980								
1	20,943,800	4.81	0.8	22.7	23.5	2.3×10^{-7}	1.1×10^{-6}	.0048
2	17,246,450	4.70	0.8	24.8	25.6	1.7×10^{-7}	1.5×10^{-6}	.0054
3	13,329,300	4.50	11.2	-	11.2	3.4×10^{-7}	8.4×10^{-7}	.0024
26 June 1980								
1	1,129,050	5.18	10.1	5.9	16.0	4.6×10^{-6}	1.4×10^{-5}	.0031
2	740,025	6.55	10.7	3.9	14.6	8.9×10^{-6}	1.9×10^{-5}	.0022
3	765,250	8.74	42.7	10.9	53.6	9.1×10^{-6}	5.6×10^{-5}	.0061
16 Oct. 1980								
1	4,914,000	5.73	5.1	2.4	7.5	1.2×10^{-6}	1.5×10^{-7}	.0013
2	3,881,475	6.56	3.7	1.9	5.6	1.7×10^{-6}	1.4×10^{-7}	.0009
3	4,601,025	6.79	0.5	8.1	8.6	1.5×10^{-6}	1.9×10^{-7}	.0013

TABLE XIV.

LAKE BAILEY

	Sample Dates		
	4/15/80	6/26/80	10/16/80
Algal Class	Relative Abundance		
Chlorophyceae	.090	.146	.631
Conjugatophyceae	.0009	.0002	.0006
Euglenophyceae	.001	.011	.0002
Pyrrhophyceae	.0007	.033	-
Cryptophyceae	.0019	.008	.0017
Cyanophyceae	.623	.454	.2436
Bacillariophyceae	.012	.323	.1139
Chrysophyceae	.2646	.028	.0078
Xanthophyceae	-	-	-
Assemblage Characters			
$H_{(max)}$ (nits)	3.295	3.466	3.367
H' (nits)	1.171	2.4123	2.2698
N (number of taxa)	27	32	29
S (total cells/liter)	17,173,183	944,775	4,465,500
J (evenness)	.3556	.6959	.6741
Most abundant taxon	Anabaena	Anabaena	Crucigenia
Relative abundance	.617	.302	.248
Cells/liter	10,597,500	285,675	1,107,600

Zooplankton E/R ratios are relatively stable and reflect consistent predominance of rotifers (Appendix Table IV). *Diaphanosoma leuchtenbergianum* is the only Cladoceran present in June, while *Bosmina longirostris* comprises 83% of all Cladocerans taken from Lake Bailey during the study period.

Zooplankton dry weights are relatively stable temporally; the median biomass ranks sixth (Appendix Table V). The average phytoplankton to zooplankton dryweight ratio and calanoid to cyclopoid and cladoceran ratio ranks ninth and eighth, respectively (Table VII; Appendix Tables IV-V).

Only two rotenoned fish population samples (in 1965 and 1980) are available from Lake Bailey. Appendix Figures 1-2 and Appendix Table VII (see also Text Table IX) present gamefish biomass data. The 1980 fish population includes large numbers of young fish, probably the result of several consecutive drawdowns in recent years. The adult fish are in good condition, but numbers are small due to insufficient recruitment. Management practices applied to Lake Bailey include winter drawdowns and the introduction of grass carp for vegetation control. Periodic stocking of game and forage species has occurred, including stocking of catchable channel catfish which were fed supplementally.

CALION LAKE

A. Physico-chemical and chemical results:

Except for temporal temperature differences (June maximum values ca. 30 C) and increasing turbidity, Calion Lake shows little seasonal variation in physico-chemical and chemical parameters (Table XV). However spatially, there are consistent differences. Station 2 maintains higher pH than both stations 1 & 3. Interestingly, station 3 exhibits consistently higher specific conductance (and TDS), alkalinity and TOC. Station 1 maintains

TABLE XV.

SUMMARY OF PHYSICO-CHEMICAL DATA (field/laboratory)

CALION LAKE	Temp. C	pH	Alkalinity (mg $CaCO_3$/l)	Sp. Cond. (umhos/cm)	D.O. (mg/l)	Turbid-ity NTU	Color APCU	Total Solids (mg/l)	Total Dissolved Solids (mg/l)	Total Organic Carbon (mg/l)
Station 1										
13 May 1980	21.5-23.0	6.6	6	195-205	4.8-6.5	7.2	93	145	131	14.0
25 June 1980	27.5-30.0	7.1	8	305-311	4.0-9.0	7.5	15	184	169	11.1
22 Oct. 1980	22.0	6.6	24	365	8.9	7.5	55	308	298	15.8
Station 2										
13 May 1980	22.2-23.0	6.6	5	190-194	5.2-7.0	8.8	87	144	126	13.2
25 June 1980	29.1-30.5	7.1	8	290-302	7.6-9.0	8.0	15	175	170	10.7
22 Oct. 1980	21.0	6.3	18	388	NS	7.0	55	305	297	17.0
Station 3										
13 May 1980	22.8-23.5	6.5	6	190-195	6.1-7.2	9.8	90	160	142	13.2
25 June 1980	30.5-30.8	7.1	8	300-310	8.3-8.9	12.0	20	217	191	12.2
22 Oct. 1980	21.0	6.4	18	375-388	8.2	11.5	75	321	287	16.1

TABLE XVI.

SUMMARY OF CHEMICAL DATA (laboratory) (all values in mg/l)

LION LAKE	NH_3-N	Total Kjeldahl-N	NO_3-N	Ortho-P	Total-P	SO_4	Cl	Na	K	Ca	Mg	Fe	Mn
tion 1													
May 1980	0.04	0.6	0.06	0.023	0.026	7.3	107	29	1.4	6.0	2.1	1.6	0.1
June 1980	0.02	0.6	0.00	0.155	0.045	7.2	65	37	1.6	7.3	2.7	0.5	0.2
Oct. 1980	.151	0.44	0.00	0.017	0.084	6.2	260	51	2.0	8.6	3.6	NS	NS
tion 2													
May 1980	0.03	0.6	0.00	0.055	0.030	8.0	127	28	1.4	6.0	2.0	1.6	0.1
June 1980	0.14	0.6	0.00	0.155	0.040	6.5	61	35	1.6	7.2	2.7	0.5	0.2
Oct. 1980	.016	0.38	0.00	0.014	0.025	4.2	263	52	2.1	8.6	1.9	NS	NS
tion 3													
May 1980	0.00	0.6	0.01	0.025	0.035	7.0	153	26	1.4	5.9	2.0	1.6	0.1
June 1980	0.01	0.6	0.00	0.172	0.039	7.0	65	34	1.2	7.2	2.9	0.5	0.2
Oct. 1980	.006	0.43	0.00	0.016	0.074	5.8	264	51	2.1	9.0	3.6	NS	NS

high color values and station 2 rather low values with moderate values (15-20 APCU) occurring at station 3 (Table XV). Except for consistently high sodium and chloride levels, most chemical parameters are relatively low (Table XVI).

B. Biological results:

All algal classes encountered in this study occur in Calion Lake (Table XVII) and forty-seven genera are exhibited, primarily members of the Chlorophyceae (green algae), Cyanophyceae (bluegreen algae), and Bacillariophyceae (diatoms). Twenty-nine species of zooplankton are present and as in the case of the majority of lakes, composed chiefly of rotifers (Table XVII). Thirty-one species of fish are also found.

Temporally, the June sampling period exhibits the greatest density of algal cells (Table XVIII) although the biomass/cell is consistently low, due in part perhaps to the dominance in the system by a relatively small bluegreen alga species of Lyngbya. Temporal succession includes Chlorophyte dominance in May through strong bluegreen dominance in June, to a bluegreen-green dominance in October (Table XIX).

The greatest paucity of zooplankton species occurs in Calion Lake, although rotifers are consistently predominant. Bosmina longirostris makes up 72% of the cladoceran association; cladoceran densities fall below 1 per liter in October (Appendix Table IV). The median zooplankton density is one of the lowest observed in this study. Median zooplankton dry weight is the lowest of all the lakes, and average phytoplankton to zooplankton dry weight ratio ranks sixth (even though the average phytoplankton dry weight is next to lowest for all lakes) (Appendix Table V). The calanoid to cyclopoid and cladoceran ratio ranks fourth (Table VII).

TABLE XVII.
BIOTIC INVENTORY - CALION LAKE

PHYTOPLANKTON

LOROPHYCEAE

Acanthosphaera
Chlamydomonas
Chodatella
Coclastrum
Crucigenia
Distyosphaerium
Gloeocystis
Colenkinia
Kirchneriella
Oocystis
Pediastrum
Pteromonas
Scenedesmus
Tetraedron

CONJUGATOPHYCEAE

Cosmarium
Staurastrum

EUGLENOPHYCEAE

Euglena
Phacus
Trachelomonas

PYRRHOPHYCEAE

Peridinium

CRYPTOPHYCEAE

Chroomonas
Cryptomonas
Cyanomonas

CYANOPHYCEAE

Anabaena
Aphanizomenon
Aphanothece
Chroococcus
Dactylococcopsis
Lyngbya
Merismopedia

BACILLARIOPHYCEAE

Amphora
Asterionella
Acantheceras
Aulacosira
Cyclotella
Eunotia
Navicula
Nitzschia
Pinnularia
Rhizosolenia
Synedra

CHRYSOPHYCEAE

Dinolsryon
Mallomonas
Rhizochrysis
Synura

XANTHOPHYCEAE

Centritractus
Ophiocytium

ZOOPLANKTON

ROTATORIA

Keratella cochlearis
Kellicottia bostoniensis
Hexarthra mira
Trichocerca longiseta
Polyarthra vulgaris
P. euryptera
Synchaeta stylata
Asplanchna priodonta
Filinia longiseta
Conochiloides coenobasis
Conochilus unicornis
Collotheca sp.
Monostyla quadridentata
Brachionus sp.
B. angularis
B. caudatus
B. havanaensis
B. quadridentata
Euchlanis sp.
Platyias patulus

CLADOCERA

Bosmina longirostris
Daphnia galeata
Ceriodaphnia lacustris
Diaphanosoma leuchtenbergianum
Chydorus sp.

COPEPODA

Diaptomus sp.
D. reighardi
Ergasilus sp.

DIPTERA

Chaoborus sp.

FISH

Lepisosteus oculatus
Dorosoma cepedianum
Dorosoma petenense
Ctenopharyngodon idella
Hybognathus hayi
Notemigonus crysoleucas
Notropis emiliae
Notropis maculatus
Minytrema melanops
Erimyzon sucetta
Ictalurus natalis
Ictalurus punctatus
Noturus gyrinus
Fundulus olivaceus
Fundulus chrysotus
Gambusia affinis
Labidesthes sicculus
Anguilla rostrata
Aphredoderus sayanus
Morone mississippiensis
Micropterus salmoides
Pomoxis annularis
Lepomis macrochirus
Lepomis microlophus
Lepomis gulosus
Lepomis megalotis
Lepomis punctatus
Percina caprodes
Etheostoma chlorosomum
Etheostoma fusiforme
Aplodinotus grunniens

	Cells (#/l)	Biomass (mg/l)	Chl-a (µg/l)	Pha-a (µg/l)	Total Chl-a (µg/l)	Biomass / Cell (mg)	Chlorophyll / Cell (µg)	Chlorophyll / Biomass
CALION LAKE								
13 May 1980								
1	5,856,100	4.95	12.8	0.6	13.4	8.5×10^{-7}	2.3×10^{-6}	.0027
2	4,851,300	6.91	12.8	-	12.8	1.4×10^{-6}	2.6×10^{-6}	.0019
3	3,976,025	7.78	10.1	-	10.1	1.9×10^{-6}	2.5×10^{-6}	.0013
25 June 1980								
1	30,968,250	6.84	17.1	6.8	23.9	2.2×10^{-7}	7.7×10^{-7}	.0035
2	73,232,650	6.55	12.3	4.5	16.8	8.9×10^{-8}	2.3×10^{-7}	.0026
3	71,937,400	5.14	15.5	4.3	19.8	7.1×10^{-8}	2.8×10^{-7}	.0039
22 Oct. 1980								
1	6,825,575	0.52	0.5	3.4	3.9	7.6×10^{-8}	5.7×10^{-7}	.0075
2	6,221,125	0.51	2.1	1.2	3.3	8.2×10^{-8}	5.3×10^{-7}	.0065
3	7,337,700	0.55	1.6	1.4	3.0	7.5×10^{-8}	4.1×10^{-7}	.0055

TABLE XIX.

LAKE CALION

Algal Class	5/13/80	6/25/80	10/22/80
	Sample Dates		
	Relative Abundance		
Chlorophyceae	.6009	.0477	.3577
Conjugatophyceae	.0844	.0025	.0360
Euglenophyceae	.0089	.0006	.0105
Pyrrhophyceae	.0002	.0020	.0094
Cryptophyceae	.0053	.0001	.0144
Cyanophyceae	.1733	.9218	.5230
Bacillariophyceae	.0831	.0152	.0563
Chrysophyceae	.0401	.0019	.0071
Xanthophyceae	.0008	.0001	.0002

Assemblage Characters	5/13/80	6/25/80	10/22/80
$H_{(max)}$ (nits)	3.4657	3.6888	3.4339
H' (nits)	2.0757	1.1031	2.498
N (number of taxa)	32	40	31
S (total cells/liter)	4,894,475	58,712,767	6,761,467
J (evenness)	.5989	.2290	.7274
Most abundant taxon	*Scenedesmus*	*Lyngbya*	*Lyngbya*
Relative abundance	.446	.804	.232
Cells/liter	2,182,300	47,230,833	1,570,000

Twelve rotenoned population samples of fish were conducted on Calion Lake between 1957 and 1980. This lake possesses the largest fish inventory of any of the ten lakes with only Lake Wallace approaching it in fish richness. Appendix Table VII and Appendix Figures 1 and 3 present the gamefish biomass data for 1980 and previous years. The 1980 sample indicates a good gamefish population with a large standing crop. All game species are in good condition and apparently 1980 was a good sunfish spawning year. Past management practices in Calion have consisted of stocking gamefish species as well as grass carp for vegetation control. Infrequent drawdowns (every 7 or 8 years), selective shad kills and sectional fish kills have also been employed. One year of extensive liming of the lake was conducted and crushed limestone rock was placed in major tributaries of the lake in an attempt to correct a chronic low pH problem.

UPPER LAKE CHICOT

A. Physico-chemical and chemical results:

In spite of the large size of Upper Lake Chicot, little spatial or temporal variation in physico-chemical and chemical parameters occurs (Tables XX-XI), although total Kjeldahl nitrogen levels are consistently higher in October and chloride levels are consistently higher in May. In general, although nutrient levels are relatively moderate, pH, alkalinity, turbidity and specific conductance are relatively high.

B. Biological results:

Table XXII shows the organisms present in Lake Chicot during this study. Thirty-five algal genera (11 greens and 11 bluegreens) are present and are representative of eight algal classes. Nearly two-thirds of the thirty-one zooplankton species are Rotifers (six in the genus Brachionus).

TABLE XX.

SUMMARY OF PHYSICO-CHEMICAL DATA (field/laboratory)

ER LAKE CHICOT	Temp. C	pH	Alkalinity (mg $CaCO_3$/l)	Sp. Cond. (umhos/cm)	D.O. (mg/l)	Turbidity NTU	Color APCU	Total Solids (mg/l)	Total Dissolved Solids (mg/l)	Total Organic Carbon (mg/l)
tion 1										
May 1980	24.0-24.5	8.2	108	180-185	10.0-10.5	31.0	70	183	121	
June 1980	26.6	7.3	84	205	8.0-8.3	48.0	68	200	138	12.2
Oct. 1980	19.0	6.8	110	185	9.4	31.5	90	160	123	10.2
										11.8
tion 2										
May 1980	20.0-23.5	7.8	88	175	3.8-7.4	55.5	60	196	123	11.0
June 1980	26.2-27.3	7.2	90	211-220	5.2-6.8	27.0	55	165	142	9.9
Oct. 1980	19.0	6.8	110	180	NS	22.5	80	160	121	10.2
tion 3										
May 1980	17.0-22.0	7.6	86	170-175	0.4-6.8	79.0	65	179	127	17.0
June 1980	25.0-26.0	7.1	82	205-219	4.0-6.5	32.0	65	183	136	7.7
Oct. 1980	19.0	6.8	108	183	5.4	17.5	81	147	120	11.0

TABLE XXI.

SUMMARY OF CHEMICAL DATA (laboratory) (all values in mg/l)

UPPER LAKE CHICOT	NH_3-N	Total Kjeldahl-N	NO_3-N	Ortho-P	Total-P	SO_4	Cl	Na	K	Ca	Mg	Fe	Mn
Station 1													
13 May 1980	0.00	0.9	0.00	0.014	0.156	5.4	13.0	3.1	3.6	10.8	6.2	1.8	0.1
24 June 1980	0.15	1.2	0.04	0.125	0.109	8.1	0.8	3.2	4.4	25.0	7.0	0.5	0.2
22 Oct. 1980	.015	0.61	0.00	0.032	0.147	5.8	7.9	3.6	4.4	28.0	9.0	0.6	0.2
Station 2													
13 May 1980	0.00	0.6	0.23	0.085	0.126	8.1	17.5	3.1	4.4	20.0	5.9	3.6	0.0
24 June 1980	0.07	0.7	0.25	0.241	0.099	8.7	0.6	3.2	4.1	25.5	7.0	0.8	0.3
22 Oct. 1980	.019	0.54	0.00	0.033	0.086	4.6	7.5	3.5	4.1	24.8	8.5	0.7	0.2
Station 3													
13 May 1980	0.01	0.7	0.29	0.118	0.188	8.1	16.4	3.1	4.2	20.4	5.9	3.6	0.1
24 June 1980	0.04	0.5	0.31	0.221	0.101	9.5	0.6	3.2	4.3	19.5	7.0	0.9	0.3
22 Oct. 1980	.019	0.55	0.00	0.021	0.090	3.5	6.3	3.6	4.1	25.6	9.0	0.8	0.3

Nearly half of the twenty species of fish present are members of the sunfish family.

Temporally, algal densities increase nearly 20-fold from May to October (Table XXIII); spatially, station 1 consistently exhibits higher biomass and chlorophyll values although this is not correlated with algal density. Upper Lake Chicot can be considered a bluegreen dominated lake, although the density of the diatom Aulacosira (=Melosira) in June exceeds that of other genera, even though class dominance is still attributable to the Cyanophyceae (Table XXIV).

With respect to zooplankton densities, Lake Chicot exhibits relatively low values among all lakes studied, averaging 344/l. The E/R ratio of 7 is second highest among the lakes studied (Table VII).

Zooplankton dry weights are among the lowest and average 38 ug/l. Most entomostraca are copepod nauplii which do not contribute substantially to biomass but contribute to a high E/R ratio. Nauplii make up 82% of the copepods and 72% of all entomostraca. Also, the high mean E/R ratio is attributed to the high ratios in October (mean = 18.5), when actually zooplankton densities are lowest; i.e., less than 1 cladoceran/l, less than 6 rotifers/l, and nauplii alone represent 81.2% of all zooplankters. The E/R ratios for October might better be described as copepod nauplius to rotifer ratios. By contrast, June samples yield over 28 cladocerans/l and 610 rotifers/l, and the average E/R ratio is 0.35 (Table VII; Appendix Table IV). The phytoplankton to zooplankton dry weight ratio ranks third with an average value of 399 (Appendix Table V). Chicot exhibits the fourth highest calanoid to cyclopoid and cladoceran ratio (0.42) (Table VII; Appendix Table IV).

BIOTIC INVENTORY - UPPER LAKE CHICOT

PHYTOPLANKTON

CHLOROPHYCEAE

Coelastrum
Crucigenia
Dictyosphaerium
Eudorina
Kirchneriella
Oocystis
Pediastrum
Scenedesmus
Schroederia
Tetraedron
Tetrastrum

CONJUGATOPHYCEAE

Closterium

EUGLENOPHYCEAE

Euglena
acus
rachelomonas

PYRRHOPHYCEAE

Peridinium

CRYPTOPHYCEAE

Chroomonas
Cryptomonas

CYANOPHYCEAE

Anabaena
Anabaenopsis
Aphanizomenon
Aphanothece
Chroococcus
Dactylococcopsis
Merismopedia
Microcystis
Oscillatoria
Rhabdoderma
Raphidiopsis

BACILLARIOPHYCEAE

Aulacosiru
Cyclotella
Navicula
Nitzgchia
Synedra

CHRYSOPHYCEAE

Mallomonas

ZOOPLANKTON

ROTATORIA

Keratella cochlearis
Kellicottia bostoniensis
Hexarthra mira
Trichocerca sp.
T. capicina
T. similis
Polyarthra vulgaris
P. euryptera
Synchaeta sp.
Asplanchna priodonta
Conochiloides coenobasis
Conochilus unicornis
Filinia longiseta
Brachionus angularis
B. caudatus
B. calyciflorus
B. havanaensis
B. quadridentata
B. urceolaris
Platyias patulus

CLADOCERA

Bosmina longirostris
Daphnia galeata
Ceriodaphnia lacustris
C. reticulata
Diaphanosoma leuchtenbergianum
Chydorus sp.

COPEPODA

Mesocyclops edax
Diaptomus sp.
D. pallidus
Ergasilus sp.

DIPTERA

Chaoborus sp.

FISH

Lepisosteus oculatus
Amia calva
Dorosoma cepedianum
Dorosoma petenense
Ictalurus punctatus
Noturus gyrinus
Ictiobus bubalus
Notemigonus crysoleucas
Gambusia affinis
Menidia audens
Morone mississippiensis
Micropterus salmoides
Pomoxis annularis
Pomoxis nigromaculatus
Lepomis macrochirus
Lepomis microlophus
Lepomis megalotis
Lepomis cyanellus
Lepomis humilis
Aplodinotus grunniens

TABLE XXIII.
PHYTOPLANKTON CHARACTERS

	Cells (#/l)	Biomass (mg/l)	Chl-a (μg/l)	Pha-a (μg/l)	Total Chl-a (μg/l)	Biomass / Cell (mg)	Chlorophyll / Cell (μg)	Chlorophyll / Biomass
CHICOT LAKE								
13 May 1980								
1	2,347,150	12.16	55.0	2.2	57.2	5.2×10^{-6}	2.4×10^{-5}	.0047
2	1,271,700	7.85	4.3	1.0	5.3	6.2×10^{-6}	4.3×10^{-6}	.0007
3	341,475	9.70	5.3	-	5.3	2.8×10^{-5}	1.5×10^{-5}	.0005
24 June 1980								
1	8,576,125	17.12	57.1	17.2	74.3	2.0×10^{-7}	8.7×10^{-6}	.0043
2	5,177,075	7.33	12.8	5.1	17.9	1.4×10^{-6}	3.5×10^{-6}	.0024
3	1,931,100	7.13	11.2	4.9	16.1	3.7×10^{-6}	8.3×10^{-6}	.0022
22 Oct. 1980								
1	18,086,400	14.02	9.9	5.1	15.0	7.8×10^{-7}	8.3×10^{-7}	.0011
2	43,850,100	10.02	9.9	5.1	15.0	2.3×10^{-7}	3.4×10^{-7}	.0015
3	13,474,525	9.76	8.8	3.9	12.7	7.2×10^{-7}	9.4×10^{-7}	.0013

TABLE XXIV.

UPPER LAKE CHICOT

Algal Class	5/13/80	6/24/80	10/22/80
		Sample Dates	
		Relative Abundance	
Chlorophyceae	.1635	.0848	.0280
Conjugatophyceae	.0009	-	-
Euglenophyceae	.0485	.0114	.0094
Pyrrhophyceae	-	.0002	-
Cryptophyceae	.0108	.0027	.0125
Cyanophyceae	.6222	.5192	.9196
Bacillariophyceae	.1536	.3810	.0297
Chrysophyceae	-	.0005	.0001
Xanthophyceae	-	-	-

Assemblage Characters	5/13/80	6/24/80	10/22/80
$H_{(max)}$ (nits)	2.9957	3.218	3.258
H' (nits)	2.1447	2.0189	1.3704
N (number of taxa)	20	25	26
S (total cells/liter)	1,320,108	5,228,100	25,137,008
J (eveness)	.7159	.6274	.4206
Most abundant taxon	Raphidiopsis	Aulacosira	Oscillatoria
Relative abundance	.3538	.3440	.6729
Cells/liter	467,075	1,798,958	16,916,750

Upper Lake Chicot has been one of the Game and Fish Commission's most frequently sampled lakes, and fifteen rotenoned fish population samples have been made between 1959 and 1980. Gamefish biomass data are presented in Appendix Figures 1 and 4 and Appendix Table VII. The 1980 sample indicated a high total standing crop of fishes, a moderate gamefish standing crop and a favorable nonpredator to predator ratio. The primary management tool used on this relatively large lake has been the stocking of gamefish species. In addition to stocking of bass, *Lepomis*, and other catfish species, striped bass, *Morone saxatilis* and striped bass-white bass hybrids have been introduced. Grass carp have also been introduced for vegetation control purposes. Other management techniques have been employed, such as a 61 ha partial fish kill in 1975, and several rather ineffective small scale drawdowns. The lake has also been maintained at an unusually high spring level to stimulate gamefish reproduction.

LAKE ENTERPRISE

A. Physico-chemical and chemical results:

Temporally, Lake Enterprise exhibits similar physico-chemical and chemical values (Tables XXV-XXVI) with certain exceptions: slightly higher pH and alkalinity; decreased specific conductance, turbidity, calcium, phosphate levels; and significant increased total Kjedahl nitrogen and chloride, all during the October sampling period. No spatial differences seem evident.

B. Biological results:

Thirty-three genera of algae, including 14 greens and 10 bluegreens

TABLE XXV.

SUMMARY OF PHYSICO-CHEMICAL DATA (field/laboratory)

ENTERPRISE	Temp. C	pH	Alkalinity (mg $CaCO_3$/l)	Sp. Cond. (umhos/cm)	D.O. (mg/l)	Turbid-ity NTU	Color APCU	Total Solids (mg/l)	Total Dissolved Solids (mg/l)	Total Organic Carbon (mg/l)
Station 1										
25 June 1980	16.0-27.5	6.7	20	73-105	0.1-7.6	19.0	75	67	55	11.7
22 Oct. 1980	20.0	7.2	28	52	9.4	10.0	82	50	44	14.6
Station 2										
25 June 1980	15.0-26.5	6.7	22	65-95	0.0-8.6	21.0	80	65	60	13.0
22 Oct. 1980	21.0	7.0	28	50	NS	10.5	80	49	40	16.2
Station 3										
25 June 1980	16.0-26.5	6.6	18	66-102	0.1-7.8	12.0	84	47	30	10.4
22 Oct. 1980	21.0	6.9	27	49	10.0	9.0	84	49	39	13.6

TABLE XXVI.

SUMMARY OF CHEMICAL DATA (laboratory) (all values in mg/l)

:RPRISE	NH_3-N	Total Kjeldahl-N	NO_3-N	Ortho-P	Total-P	SO_4	Cl	Na	K	Ca	Mg	Fe	Mn
.ion 1													
une 1980	0.13	1.2	0.01	0.257	0.190	1.9	2.2	4.2	4.2	3.8	1.9	0.8	0.4
›ct. 1980	.039	0.52	0.04	0.008	0.105	0.4	26.2	4.0	4.2	2.6	1.4	0.2	0.1
.ion 2													
une 1980	0.16	1.2	0.00	0.342	0.200	0.1	2.0	3.8	4.0	4.4	1.4	1.1	0.3
›ct. 1980	.069	0.56	0.00	0.010	0.088	0.0	23.5	3.8	4.0	2.5	1.1	0.3	0.2
.ion 3													
une 1980	0.13	1.4	0.00	0.119	0.155	0.0	1.8	3.6	3.9	3.0	1.3	0.6	0.4
›ct. 1980	.011	0.58	0.09	0.011	0.083	0.3	23.1	4.1	4.2	2.5	1.3	0.3	0.1

are accounted for in this study (Table XXVII). In addition, twenty-six species of zooplankton (19 of which are rotifers) and eleven species of fish (seven of which belong to the sunfish family) are present in Lake Enterprise.

Although no temporal or spatial differences are evident in terms of algal diversity, the June sampling period exhibits consistently higher biomass and chlorophyll values (Table XXVIII). Bluegreen algae consistently dominate the phytoplankton as shown by *Anabaena* in June and *Aphanothece* in October. Also in October, members of the chlorococcalean green algae contribute significantly (Table XXIX).

As in the case with the majority of the ten lakes studies, cladoceran densities are minimal (ca. 1 per liter in June; 5 per liter in October) (Table VII; Appendix Table IV). Nauplii account for ca. 79% of the entomostraca. The median zooplankton density is ca. 0.2 and no ratio exceeds 0.32.

The average zooplankton dry weight (45 ug/l) ranks ninth (median ranks eighth), and the average phytoplankton to zooplankton dry weight ratio (540) ranks third (Appendix Table V). The average calanoid to cyclopoid and cladoceran ratio of 0.79 is considerably greater than for any other lake studied (Table VII; Appendix Table IV).

In terms of fisheries, sixteen rotenoned population samples were taken between 1960 and 1980. Appendix Figures 1 and 5 and Appendix Table VII present biomass data for Lake Enterprise. Conditions have limited the management possibilities in this lake. For example, drawdowns have not been used, because water would have to be pumped back into the lake to refill it. Frequent fish kills have been reported by the public. Stocking of gamefish (mainly bass) has been about the only management practice employed.

TABLE XXVIII.
PHYTOPLANKTON CHARACTERS

	Cells (#/l)	Biomass (mg/l)	Chl-a (µg/l)	Pha-a (µg/l)	Total Chl-a (µg/l)	Biomass / Cell (mg)	Chlorophyll / Cell (µg)	Chlorophyll / Biomass
LAKE ENTERPRISE								
25 June 1980								
1	18,184,525	12.02	31.0	19.5	50.5	6.6×10^{-7}	2.8×10^{-6}	.0042
2	16,143,525	12.02	36.3	33.2	69.5	7.4×10^{-7}	4.3×10^{-6}	.0058
3	23,683,450	14.40	43.3	28.0	72.2	6.1×10^{-7}	3.1×10^{-6}	.0050
22 Oct. 1980								
1	33,174,520	8.93	7.5	5.6	13.1	2.7×10^{-7}	3.9×10^{-7}	.0015
2	29,221,625	8.98	8.0	4.3	12.3	3.1×10^{-7}	4.2×10^{-7}	.0014
3	19,758,450	8.59	8.5	4.2	12.7	4.3×10^{-7}	6.4×10^{-7}	.0015

TABLE XXIX.

LAKE ENTERPRISE

	Sample Dates 6/25/80	10/22/80
Algal Class	Relative Abundance	
Chlorophyceae	.0189	.4014
Conjugatophyceae	.0007	.005
Euglenophyceae	.0008	.0028
Pyrrhophyceae	-	.0002
Cryptophyceae	.00106	.0056
Cyanophyceae	.942	.4671
Bacillariophyceae	.0006	.0040
Chrysophyceae	-	-
Xanthophyceae	-	-
Assemblage Characters		
$H_{(max)}$ (nits)	3.178	3.401
H' (nits)	1.224	2.163
N (number of taxa)	24	30
S (total cells/liter)	19,337,167	27,384,865
J (eveness)	.3853	.6360
Most abundant taxon	Anabaena	Aphanothece
Relative Abundance	.456	.1552
Cells/liter	8,831,250	4,252,083

LAKE JUNE

A. Physico-chemical and chemical results:

Lake June presents some rather interesting physico-chemical phenomenona. The June samples exhibit significantly higher temperatures, pH, nitrate nitrogen and usually higher turbidity; while total solids, TDS, TOC, ammonia nitrogen, total Kjeldahl nitrogen, sulfate and magnesium levels appear significantly higher in October (Tables XXX-XXXI). No apparent spatial differences are noted.

B. Biological results:

In terms of algal genera, Lake June exhibits a fairly rich flora with 53 genera represented from all nine classes of algae observed in this study, although nearly half (25) belong to the Chlorophyceae (Table XXXII). Of the 31 species of zooplankton, 22 are rotifers (six in the genus Brachionus); over half of the thirteen species of fish belong to the sunfish family.

No consistent spatial trends in phytoplankton density are evident although it would appear that greater biomass is usually associated with the mid-lake sampling area (Station 2) (Table XXXIII). Temporally, the June Collection period is associated with the highest phytoplankton densities and chlorophyll values.

Lake June is temporally quite erratic in terms of diversity, and exhibits rather high values in May and October and a rather low value in June (Table XXXIV). Although members of the Chlorophyceae account for over half the density of algae in the May collections, these collections are dominated by a chrysophyte (Synura). June collections are strongly dominated by bluegreens with Anabaena cells accounting for over 65% of cell densities. In October collections, members of the Chlorophyceae

TABLE XXX.

SUMMARY OF PHYSICO-CHEMICAL DATA (field/laboratory)

: JUNE	Temp. C	pH	Alkalinity (mg $CaCO_3$/l)	Sp. Cond. (umhos/cm)	D.O. (mg/l)	Turbid-ity NTU	Color APCU	Total Solids (mg/l)	Total Dissolved Solids (mg/l)	Total Organic Carbon (mg/l)
ion 1										
lay 1980	22.0-22.5	6.7	9	370	0.7-7.4	9.6	96	271	245	13.0
une 1980	26.0-31.0	8.4	10	365-400	1.5-12.8	12.0	90	251	256	13.5
ct. 1980	20.0	6.7	27	400	4.8	12.0	90	319	308	18.4
ion 2										
ay 1980	22.5	6.6	9	390-400	7.3-7.4	9.5	99	281	260	13.2
une 1980	32.5	9.6	20	400-415	11.6-12.8	15.0	93	228	228	14.2
ct. 1980	19.0	6.7	28	400	NS	11.0	88	315	310	16.1
ion 3										
ay 1980	22.0	6.6	6	380-450	5.5-6.5	7.4	98	289	264	11.8
une 1980	32.5-33.0	9.3	16	440-470	11.8-12.1	19.0	70	229	229	14.5
ct. 1980	18.0	6.8	29	400	6.8	9.0	65	310	315	19.9

TABLE XXXI.

SUMMARY OF CHEMICAL DATA (laboratory) (all values in mg/l)

LAKE JUNE	NH_3-N	Total Kjeldahl-N	NO_3-N	Ortho-P	Total-P	SO_4	Cl	Na	K	Ca	Mg	Fe	Mn
Station 1													
12 May 1980	0.00	0.8	0.01	0.051	0.080	10.5	268	50	2.8	9.2	3.7	3.1	0.4
25 June 1980	0.06	1.4	0.20	0.029	0.099	21.7	130	52	3.3	13.5	4.0	1.3	0.1
23 Oct. 1980	.133	0.64	0.00	0.005	0.129	33.4	233	55	4.6	9.2	4.8	NS	0.1
Station 2													
12 May 1980	0.07	0.7	0.00	0.043	0.097	10.1	318	51	1.8	9.6	3.8	2.8	0.3
25 June 1980	0.04	1.7	0.04	0.008	0.065	15.2	113	47	3.1	12.4	0.8	0.7	0.1
23 Oct. 1980	.047	0.52	0.00	0.027	0.129	38.1	208	54	5.0	13.0	5.4	NS	0.1
Station 3													
12 May 1980	0.08	0.7	0.00	0.086	0.108	12.0	325	54	2.8	9.8	4.0	2.9	0.4
25 June 1980	0.02	1.7	0.03	0.008	0.069	15.1	110	46	2.9	12.2	4.0	0.8	0.1
23 Oct. 1980	.028	0.54	0.00	0.025	0.095	51.3	205	53	5.3	12.6	4.5	NS	0.1

TABLE XXXII.
BIOTIC INVENTORY - LAKE JUNE

PHYTOPLANKTON

CHLOROPHYCEAE

Ankistrodesmus
Asterococcus
Carteria
Chlamydomonas
Chlorogonium
Coelastrum
Crucigenia
Dictyosphaerium
Elakotothrix
Franceia
Gloeocystis
Golenkinia
Gonium
Kirchneriella
Oocystis
Pandorina
Pediastrum
Polyedriopsis
Scenedesmus
Schroederia
lanastrum
Tetraedron
Tetrastrum
Treubaris
Unidentified "green"

CONJUGATOPHYCEAE

Cosmarium
Staurastrum

EUGLENOPHYCEAE

Euglena
Phacus
Trachelomonas

PYRRHOPHYCEAE

Peridinium

CRYPTOPHYCEAE

Chroomonas
Cryptomonas
Cyanomonas

CYANOPHYCEAE

Anabaena
Aphanizomenon
Aphanothece
Chroococcus
Cyanareus
Dactylococcopsis
Lyngbya

BACILLARIOPHYCEAE

Aulacosira
Cyclotella
Gamphonema
Gyrosigma
Navicula
Nitzschia
Rhizosolenia
Synedra

CHRYSOPHYCEAE

Dinobryon
Mallomonas
Synura

XANTHOPHYCEAE

Ophiocytium

ZOOPLANKTON

ROTATORIA

Keratella cochlearis
Kellicottia bostoniensis
Cephalodella sp.
Trichocerca similis
Polyarthra vulgaris
P. euryptera
Asplanchna priodonta
Lecane luna
Filinia longiseta
Conochiloides coenobasis
Conochilus unicornis
Collotheca sp.
Monostyla sp.
Brachionus sp.
B. angularis
B. caudatus
B. calyciflorus
B. havanaensis
B. quadridentata
Euchlanis sp.
Platyias patulus
Rotifer sp.

CLADOCERA

Bosmina longirostris
Daphnia galeata
D. ambigua
Ceriodaphnia lacustris
Diaphanosoma leuchtenbergianum
Chydorus sp.

COPEPODA

Diaptomus sp.
D. pallidus

DIPTERA

Chaoborus sp.

FISH

Lepisosteus osseus
Dorosoma cepedianum
Dorosoma petenense
Notemigonus crysoleucas
Ictalurus natalis
Gambusia affinis
Micropterus salmoides
Pomoxis annularis
Pomoxis nigromaculatus
Lepomis cyanellus
Lepomis gulosus
Lepomis macrochirus
Lepomis microlophus

TABLE XXXIII.
PHYTOPLANKTON CHARACTERS

	Cells (#/l)	Biomass (mg/l)	Chl-a (μg/l)	Pha-a (μg/l)	Total Chl-a (μg/l)	Biomass/Cell (mg)	Chlorophyll/Cell (μg)	Chlorophyll/Biomass
LAKE JUNE								
12 May 1980								
1	11,767,150	6.27	18.7	-	18.7	5.3×10^{-7}	1.6×10^{-6}	.0030
2	4,042,750	7.18	16.0	1.9	17.9	1.8×10^{-6}	4.4×10^{-6}	.0025
3	4,074,150	4.67	5.9	5.3	11.2	1.2×10^{-6}	2.8×10^{-6}	.0024
25 June 1980								
1	80,022,900	10.45	52.3	5.6	57.9	1.3×10^{-7}	7.2×10^{-7}	.0055
2	210,350,000	18.81	104.1	1.3	105.4	8.9×10^{-8}	5.0×10^{-7}	.0056
3	192,930,000	12.66	104.0	-	104.0	6.6×10^{-8}	5.4×10^{-7}	.0082
23 Oct. 1980								
1	25,740,150	8.66	12.0	9.1	21.1	3.4×10^{-7}	8.2×10^{-7}	.0024
2	28,676,050	10.82	2.7	9.1	11.8	3.8×10^{-7}	4.1×10^{-7}	.0011
3	24,649,000	8.31	3.2	4.8	8.0	3.4×10^{-7}	3.2×10^{-7}	.0010

TABLE XXXIV.

LAKE JUNE	5/12/80	Sample Dates 6/25/80	10/23/80
Algal Class		Relative Abundance	
Chlorophyceae	.5017	.0049	.4408
Conjugatophyceae	.0071	.00002	-
Euglenophyceae	.0011	.00008	.0301
Pyrrhophyceae	-	.00008	.0045
Cryptophyceae	.0422	.00125	.0302
Cyanophyceae	.0115	.9718	.4723
Bacillariophyceae	.1666	.02210	.00357
Chrysophyceae	.2787	-	.0179
Xanthophyceae	-	-	.00009
Assemblage Characters			
$H_{(max)}$ (nits)	3.325	3.4657	3.4965
H' (nits)	2.433	.9351	2.1665
N (number of taxa)	27	32	33
S (total cells/liter)	6,628,017	161,100,000	26,355,067
J (evenness)	.7317	.2698	.6196
Most abundant taxon	Synura	Anabaena	Chroococcus
Relative abundance	.2274	.6684	.3435
Cells/liter	1,507,200	107,680,000	9,053,667

and Cyanophyceae are most abundant, although the lake is still dominated by a bluegreen (Chroococcus).

In terms of zooplankton, rotifer densities are greatest at station 1 in May and June, in part due to high concentrations of Conochilus unicornis and Conochiloides coenobasis. While rotifers total over 1000 per liter in June and decline to 62 per liter in October, there is greater variety in rotifers present in October (Appendix Table IV). The average zooplankton density ranks third (median ranks first) but the average (and median) E/R ratio ranks last (Table VII). Cladocerans are especially sparse in October (less than one per liter) (Appendix Table IV).

The median zooplankton dry weight ranks second, presumably this low value may be attributed to the presence of predominantly small rotifers. The average phytoplankton to zooplankton dry weight (395) ranks fifth, and the average calanoid to cyclopoid and cladoceran ratio (0.36) ranks sixth (Appendix Table V).

This lake has been examined for fish only five times (between 1972 and 1980). It is a relatively small impoundment and has had numerous total fish kills in the winter months due to low pH. Biomass data are given in Appendix Figures 1 and 6 and Appendix Table VII. The 1980 population sample yielded the largest standing crop estimate ever determined for this lake. Many yearling bass were taken and reproduction appeared adequate for all other gamefish species. Management practices have included stocking of game and forage fishes, grass carp for vegetation control and liming during the winter months.

LAKE LOU EMMA

A. Physico-chemical and chemical results:

Lake Lou Emma exhibits temporally interesting physico-chemical and chemical phenomenona (Tables XXXV-XXXVI), although spatially appears relatively homogeneous. A general decline in pH, sulfate, and sodium, and an increase in alkalinity, turbidity, color, total solids, TDS, TOC Kjeldahl nitrogen, calcium, potassium and chloride are evident. Nonetheless, Lake Lou Emma is consistently high in most nutrients, particularly sulfate.

B. Biological results:

Forty-one genera of algae (23 Chlorophyceae -- mostly Chlorococcalean forms) are present in Lake Lou Emma (Table XXXVII). Of the thirty-four species of zooplankton, twenty-one are rotifers. Few species of fish are present (10), five of which are members of the sunfish family.

Lake Lou Emma consistently exhibits very dense stands of algae (Table XXXVIII), and at times, cell densities exceed 1 billion cells/l. High biomass and chlorophyll values are also the rule. These parameters are obviously correlated with the usually high nutrient levels in the lake (see above). The only temporal trend appears to be related to cell densities, the lowest occurring in April and the highest in October. No spatial trends seem evident in terms of phytoplankton parameters.

Structurally, Lake Lou Emma supports primarily green algae in April and June (Scenedesmus dominant and Coelastrum dominant, respectively) and bluegreen algae (98% Aphanizomenon) in October (Table XXXIX). Diversity and evenness decrease from April to October. In terms of desirable phytoplankton characters (low density, high diversity, low biomass and chlorophyll), Lake Lou Emma is consistently poor.

Of all lakes studied, Lake Lou Emma exhibits the most marked shift in zooplankton community composition. Species composition does not change noticeably until October when the number of rotifer species declined nearly

TABLE XXXV.

SUMMARY OF PHYSICO-CHEMICAL DATA (field/laboratory)

LAKE LOU EMMA	Temp. C	pH	Alkalinity (mg $CaCO_3$/l)	Sp. Cond. (umhos/cm)	D.O. (mg/l)	Turbid-ity NTU	Color APCU	Total Solids (mg/l)	Total Dissolved Solids (mg/l)	Total Organic Carbon (mg/l)
Station 1										
11 April 1980	15.0-18.5	8.4	26	125-140	1.0-13.3	11.0	85	94	88	11.4
26 June 1980	21.8-35.1	8.4	18	182-200	0.1-9.9	17.0	75	117	104	11.0
16 Oct. 1980	18.3-18.5	6.1	78	195-196	6.6-6.8	31.5	250	174	168	20.4
Station 2										
11 April 1980	17.0-18.0	8.8	28	130-132	4.4-15.8	17.0	90	110	105	6.0
26 June 1980	25.0-35.0	8.7	26	170-180	0.8-10.8	18.0	80	114	120	11.9
16 Oct. 1980	18.1-18.3	6.0	79	197-199	3.5-6.3	35.5	260	177	166	19.7
Station 3										
11 April 1980	18.7-18.9	NS	28	128-130	8.8-16.0	11.0	90	101	103	11.6
26 June 1980	22.3-34.5	8.5	32	182-210	0.1-9.7	18.0	78	108	129	11.1
16 Oct. 1980	18.2-18.4	6.0	77	196-197	5.3-6.2	37.0	260	171	160	20.2

TABLE XXXVI.

SUMMARY OF CHEMICAL DATA (laboratory) (all values in mg/l)

KE LOU EMMA	NH_3-N	Total Kjeldahl-N	NO_3-N	Ortho-P	Total-P	SO_4	Cl	Na	K	Ca	Mg	Fe	Mn
ation 1													
April 1980	0.18	1.0	0.20	0.128	0.253	30.1	24.7	11.5	3.7	9.3	4.0	0.2	0.2
June 1980	0.08	1.1	0.62	0.076	0.128	27.0	6.7	11.4	4.0	12.3	4.0	1.3	0.5
Oct. 1980	.020	0.70	0.00	0.015	0.168	15.9	37.3	9.0	5.4	15.2	5.0	0.9	NS
ation 2													
April 1980	0.06	1.1	0.49	0.076	0.232	28.3	21.0	13.0	3.7	9.5	4.0	0.4	0.4
June 1980	0.03	1.2	0.07	0.148	0.144	25.6	6.6	14.6	3.8	12.2	4.0	1.3	0.6
Oct. 1980	.018	0.71	0.00	0.015	0.164	14.0	39.4	8.9	5.3	15.2	5.2	0.9	NS
ation 3													
April 1980	0.00	1.1	0.32	0.061	0.237	28.5	21.7	13.0	4.8	9.3	4.0	0.3	0.3
June 1980	0.08	1.1	0.05	0.075	0.141	26.8	7.0	18.9	4.2	12.1	4.0	1.1	0.6
Oct. 1980	.015	0.70	0.00	0.044	0.122	15.1	43.4	9.1	5.3	15.2	5.1	1.2	NS

50%. Rotifer densities drop from a peak of 440/l in June to 8.5/l in October. Cladocerans achieve a peak density of 426/l in June and are dominated (66%) by Bosmina longirostris. The average number of zooplankters per liter are next to highest due to very high June densities (Table VII; Appendix Table IV). Changes in species composition and dominance within the zooplankton community are reflected by a shift in the average E/R ratio from 0.44 in April to 41.15 in October (Station 1 E/R ratio reaches 68.8 in October). Lake Lou Emma ranks first in E/R ratio among the ten lakes and was one of only three which averages greater than 1 in ratio value. Lou Emma also exhibits the highest average (and median) zooplankton biomass (numerically this average is four times the average of the next ranked lake (Old Town). Average zooplankton biomass range from 78.5-747 ug/l (Appendix Table V).

Lou Emma ranks last in its average phytoplankton to zooplankton biomass ratio, even though it yields the second highest average phytoplankton biomass (Appendix Table V). The calanoid to cyclopoid and cladoceran ratio of 0.1 ranks second to last (Table VII; Appendix Table IV). It may be noted also that Lake Lou Emma yields the lowest proportion of nauplii; nauplii represent only 27% of the entomostraca.

Only one sample of a rotenoned fish population from 1980 was available for analysis. Most of the fishes in Lake Lou Emma (which is actually more like a farm pond) have been previously stocked by the Arkansas Game and Fish Commission. Appendix Figures 1 and 7 and Appendix Table VII present gamefish biomass data. The 1980 sample shows a good standing crop of catfish and sunfish adults, however no young-of-the-year bass or catfish are present. The primary management practice for this lake has been stocking of young and catchable gamefish.

TABLE XXXVII.
BIOTIC INVENTORY - LAKE LOU EMMA

PHYTOPLANKTON

CHLOROPHYCEAE

Actinastrum
Shodatella
Coelastrum
Crucigenia
Dictyosphaerium
Elakatothrix
Franceia
Gloeocystis
Kirchneriella
Micractinium
Monoraphidium
Oocystis
Pandorina
Pediastrum
Pteromonas
Quadrigula
Scenedesmus
Schroederia
elanstrum
etraedron
Tetrastrum
Treubaria
Unidentified "green"

CONJUGATOPHYCEAE

Staurastrum

EUGLENOPHYCEAE

Trachelomonas

PYRRHOPHYCEAE

Peridinium

CRYPTOPHYCEAE

Chilomonas
Chroomonas
Cryptomonas

CYANOPHYCEAE

Aphanizomenon
Chroococcus
Dactylococcopsis
Gomphosphaeria
Microcystis
Oscillatoria
Rhabdoderma

BACILLARIOPHYCEAE

Aulacosira
Cyclotella
Nitzschia
Surirella
Synedra

ZOOPLANKTON

ROTATORIA

Keratella cochlearis
K. quadrata
Kellicottia bostoniensis
Trichocerca longiseta
T. capucina
Polyarthra vulgaris
P. euryptera
Gastropus sp.
Ploesoma hudsoni
Synchaeta stylata
Asplanchna priodonta
Filinia longiseta
Cephalodella sp.
Conochiloides coenobasis
Conochilus unicornis
Brachionus sp.
B. plicatilis
B. angularis
B. calyciflorus
Euchlanis sp.
Platyias patulus

CLADOCERA

Bosmina corregoni
B. longirostris
Daphnia galeata
Daphnia ambigua
Ceriodaphnia lacustris
C. quadrangula
Ceriodaphnia sp.
Diaphanosoma leuchtenbergianum
Chydorus sp.

COPEPODA

Mesocyclops edax
Cyclops bicuspidatus thomasi
Diaptomus sp.

DIPTERA

Chaoborus sp.

FISH

Carassius auratus
Notemigonus crysoleucas
Ictalurus natalis
Ictalurus punctatus
Gambusia affinis
Micropterus salmoides
Lepomis cyanellus
Lepomis gulosus
Lepomis macrochirus
Lepomis megalotis

TABLE XXXVIII.
PHYTOPLANKTON CHARACTERS

	Cells (#/l)	Biomass (mg/l)	Chl-a (µg/l)	Pha-a (µg/l)	Total Chl-a (µg/l)	Biomass / Cell (mg)	Chlorophyll / Cell (µg)	Chlorophyll / Biomass
LAKE LOU EMMA								
11 April 1980								
1	26,140,500	NS	19.4	12.9	32.3	-	1.2×10^{-6}	-
2	27,545,650	NS	24.6	7.9	32.5	-	1.2×10^{-6}	-
3	25,342,940	NS	59.8	13.6	73.4	-	2.9×10^{-6}	-
26 June 1980								
1	38,488,550	6.68	16.5	8.1	24.6	1.7×10^{-7}	6.4×10^{-7}	.0037
2	40,513,850	10.71	19.2	7.3	26.5	2.6×10^{-7}	6.5×10^{-7}	.0025
3	32,224,250	10.55	19.2	6.2	25.4	3.3×10^{-7}	7.9×10^{-7}	.0024
16 Oct. 1980								
1	1,523,831,750	17.45	3.37	8.1	41.8	1.1×10^{-8}	2.7×10^{-8}	.0024
2	1,439,333,250	19.89	31.8	7.8	39.6	1.4×10^{-8}	2.8×10^{-8}	.0020
3	1,744,542,250	18.91	32.6	8.1	40.7	1.1×10^{-8}	2.3×10^{-8}	.0022

TABLE XXXIX.

LAKE LOU EMMA

	Sample Dates 4/11/80	6/26/80	10/16/80
Algal Class	Relative Abundance		
Chlorophyceae	.7328	.9666	.0020
Conjugatophyceae	-	.0001	-
Euglenophyceae	.0020	.0011	.00002
Pyrrhophyceae	.0004	-	-
Cryptophyceae	.0249	.0003	.0002
Cyanophyceae	.2226	.0346	.9907
Bacillariophyceae	.0165	.00035	.0001
Chrysophyceae	-	-	-
Xanthophyceae	-	-	-
Assemblage Characters			
$H_{(max)}$ (nits)	3.178	3.218	2.772
H' (nits)	2.2165	1.183	0.0536
N (number of taxa)	24	25	16
S (total cells/liter)	26,343,030	37,075,550	1,569,235,833
J (evenness)	.6974	.3677	.0193
Most abundant taxon	Scenedesmus	Coelasfrum	Aphanizomenon
Relative abundance	.225	.744	.983
Cells/liter	5,930,413	27,590,133	1,541,800,000

NEWPORT LAKE

A. Physico-chemical and chemical results:

Spatially, physico-chemical and chemical data are indicative of a relatively homogeneous system (Tables XL-XLI). Temporally however, certain trends are apparent. Lower temperature, pH, alkalinity, specific conductance, color, total solids, TDS, magnesium and iron are associated with the October samples; higher turbidity and sulfate are also associated with October samples. Chloride levels are significantly lower in June samples when alkalinity, pH, specific conductance, total solids and TDS are generally highest.

B. Biological results:

Of the thirty-eight algal genera occuring in Newport Lake, nearly half (17) belong to the Chlorophyceae, and them mostly are Chlorococcalean in nature (Table XLII). All nine of the algal classes encountered in this study are present in the lake, but only greens, bluegreens and diatoms have much numerical importance (see below). The lake is clearly qualitatively dominated by rotifers which comprise twenty-five of the thirty-five species of zooplankton. Of the fifteen species of fish, nearly half are members of the sunfish family.

Spatially, station 1 supports consistently lower algal densities (Table XLIII) and pigment (Table XLIV). This phenomenon is not consistent with biomass estimates of the same period. Temporally, the October sampling period shows lower densities, biomass and pigment values. In May, phytoplankton are dominated by the Chlorophyte Scenedesmus and by greens in general although diatoms and bluegreens contribute 18.4% and 17.1% respectively (Table XLIV). In June diatoms are greatly reduced, bluegreens dominate and greens decline in importance. However, by October the greens

TABLE XI.

SUMMARY OF PHYSICO-CHEMICAL DATA (field/laboratory)

RT LAKE	Temp. C	pH	Alkalinity (mg $CaCO_3$/l)	Sp. Cond. (umhos/cm)	D.O. (mg/l)	Turbid-ity NTU	Color APCU	Total Solids (mg/l)	Total Dissolved Solids (mg/l)	Total Organic Carbon (mg/l)
on 1										
y 1980	12.5-23.0	7.0	56	140-185	0.3-8.0	21.0	83	135	107	21.0
ne 1980	20.5-31.0	7.5	69	180-300	0.0-13.0	11.5	83	160	128	11.1
t. 1980	18.0	6.6	37	85	1.8	23.5	40	78	68	11.2
on 2										
y 1980	19.0-24.0	7.4	63	165-205	0.4-10.6	8.8	100	126	104	13.2
ne 1980	23.0-31.0	8.5	67	200-290	0.2-13.0	6.0	63	146	122	9.9
t. 1980	18.0	6.2	46	120	NS	12.0	48	103	94	8.7
on 3										
y 1980	21.0-22.5	7.4	56	162-165	2.2-8.0	6.8	90	116	103	13.4
ne 1980	25.0-29.9	8.7	65	195-205	0.2-12.6	5.9	65	148	122	9.5
t. 1980	17.0	6.2	49	128	2.6	10.0	43	101	93	12.4

TABLE XLI.

SUMMARY OF CHEMICAL DATA (laboratory) (all values in mg/l)

NEWPORT LAKE	NH_3-N	Total Kjeldahl-N	NO_3-N	Ortho-P	Total-P	SO_4	Cl	Na	K	Ca	Mg	Fe	Mn
Station 1													
14 May 1980	0.25	0.9	0.14	0.039	0.138	16.7	34.2	4.1	5.2	14.8	3.2	1.0	0.9
23 June 1980	0.75	1.7	0.01	0.074	0.104	15.0	2.9	4.6	5.5	20.5	3.8	0.6	3.3
20 Oct. 1980	.164	0.56	0.44	0.210	0.236	21.8	16.2	1.8	4.4	8.2	2.3	0.3	NS
Station 2													
14 May 1980	0.09	0.9	0.09	0.042	0.135	15.5	28.1	4.4	3.7	17.2	3.2	1.0	0.2
23 June 1980	0.03	0.8	0.01	0.017	0.069	17.4	2.8	4.7	4.5	24.5	3.8	0.1	0.2
20 Oct. 1980	.170	0.50	0.32	0.136	0.144	22.6	21.9	3.1	4.4	17.2	2.9	0.2	NS
Station 3													
14 May 1980	1.00	0.8	0.07	0.057	0.104	16.7	23.7	4.4	3.5	15.2	3.0	0.6	0.1
23 June 1980	0.01	0.8	0.02	0.015	0.053	18.1	3.0	4.7	4.7	7.3	3.8	0.1	0.3
20 Oct. 1980	.137	0.50	0.39	0.093	0.110	22.6	21.2	3.3	4.2	16.8	2.8	0.2	NS

as a group nearly equal the bluegreens in abundance and in fact the dominant genus is again the Chlorophyte Scenedesmus. Although diversity values are not very high at any time, evenness is relatively high throughout.

The average zooplankton density is relatively low and the median value ranks fourth; the majority of entomostraca are nauplii and cladocerans average only 6.7/l (Table VII; Appendix Table IV). The average and median E/R ratio ranks third. As noted for several other lakes, Newport experiences its minimal zooplankton densities, especially of rotifers, in October (rotifer densities decline from ca. 200/l in May and June to ca. 20/l in October) (Appendix Table IV).

Average zooplankton biomass (70 ug/l) ranks fourth (Table VII; Appendix Table V). Presumably, a low-level but ubiquitous density of adult copepods contributes, at least in part, to higher biomass values. The greatest average phytoplankton to zooplankton biomass ratio (666) occurs in Newport Lake. The calanoid to cyclopoid and cladoceran ratio (average, 0.48) ranks second (Table VII).

Newport Lake has had six rotenoned fish population samples taken between 1955 and 1980 (two samples in 1955). Appendix Figures 1 and 8 present the biomass standing crop data. The 1980 sample from this lake shows a moderate gamefish standing crop and a good population of bass. A good bass and sunfish spawn occurred, but an unfavorable F/C ratio exists as in previous years. Recent management strategies have consisted of gamefish stocking and the stocking of grass carp.

TABLE XLII.

BIOTIC INVENTORY - NEWPORT LAKE

PHYTOPLANKTON

CHLOROPHYCEAE

Actinastrum
Botryococcus
Coelastrum
Crusigenia
Dictyosphaerium
Elakatothrix
Gloeocystis
Kirchneriella
Oocystis
Pandorina
Pediastrum
Pteromonas
Scenedesmus
Schroederia
Selanastrum
Tetraedron
Tetrastrum

CONJUGATOPHYCEAE

Staurastrum

EUGLENOPHYCEAE

Euglena
Phacus
Trachelomonas

PYRRHOPHYCEAE

Gymnodinium
Peridinium

CRYPTOPHYCEAE

Cryptomonas

CYANOPHYCEAE

Anabaena
Aphanothece
Chroococcus
Dactylococcopsis
Comphosphaeria
Merismopedia
Oscillatoria

BACILLARIOPHYCEAE

Aulacosira
Cyclotella
Nitzschia
Synedra

CHRYSOPHYCEAE

Mallomonas
Synura

XANTHOPHYCEAE

Centritractus

ZOOPLANKTON

ROTATORIA

Keratella cochlearis
K. quadrata
Kellicottia bostoniensis
Hexarthra mira
Trichocerca sp.
T. capucina
T. similis
Gastropus sp.
Polyarthra vulgaris
P. euryptera
Synchaeta stylata
S. pectinata
Asplanchna priodonta
Filinia longiseta
Conochiloides coenobasis
Conochilus unicornis
Collotheca sp.
Brachionus sp.
B. angularis
B. calyciflorus
B. caudatus
B. quadridentata
Platyias quadricornis
Philodina sp.
Rotifer sp.

CLADOCERA

Bosmina longirostris
Daphnia parvula
Daphnia sp.
Ceriodaphnia sp.
C. lacustris
Disphanosoma leuchtenbergianum
Chydorus sp.

COPEPODA

Mesocyclops edax
Diaptomus sp.

DIPTERA

Chaoborus sp.

FISH

Dorosoma cepedianum
Ctenopharyngodon idella
Ictalurus melas
Ictalurus punctatus
Noturus gyrinus
Ictiobus bubalus
Ictiobus niger
Micropterus salmoides
Pomoxis annularis
Lepomis macrochirus
Lepomis microlophus
Lepomis megalotis
Lepomis gulosus
Lepomis cyanellus
Aplodinotus grunniens

TABLE XLIII.
PHYTOPLANKTON CHARACTERS

	Cells (#/l)	Biomass (mg/l)	Chl-a (µg/l)	Pha-a (µg/l)	Total Chl-a (µg/l)	Biomass / Cell (mg)	Chlorophyll / Cell (µg)	Chlorophyll / Biomass
NEWPORT LAKE								
14 May 1980								
1	1,715,225	11.14	17.6	5.6	23.2	6.5×10^{-6}	1.4×10^{-5}	.0021
2	3,713,050	11.11	44.3	3.5	47.8	3.0×10^{-6}	1.3×10^{-5}	.0043
3	5,797,225	7.46	31.0	0.1	31.1	1.3×10^{-6}	5.4×10^{-6}	.0042
23 June 1980								
1	5,447,900	10.64	8.5	39.7	48.2	2.0×10^{-6}	8.9×10^{-6}	.0045
2	13,427,425	16.46	25.8	8.0	33.8	1.2×10^{-6}	2.5×10^{-6}	.0021
3	16,685,175	7.92	32.0	6.8	38.8	4.7×10^{-7}	2.3×10^{-6}	.0049
20 Oct. 1980								
1	616,225	4.55	0.1	-	0.1	7.4×10^{-6}	1.6×10^{-7}	.00002
2	1,538,600	4.05	0.3	-	0.3	2.6×10^{-6}	1.9×10^{-7}	.00007
3	1,134,325	3.84	1.3	2.2	3.5	3.4×10^{-6}	3.1×10^{-6}	.0009

TABLE XLIV.

LAKE NEWPORT

Algal Class	5/14/80	6/23/80	10/22/80
		Relative Abundance	
Chlorophyceae	.494	.311	.404
Conjugatophyceae	-	.0008	.001
Euglenophyceae	.009	.01	.016
Pyrrhophyceae	.059	.04	-
Cryptophyceae	.044	.08	.095
Cyanophyceae	.171	.760	.465
Bacillariophyceae	.184	.014	.087
Chrysophyceae	.041	-	.046
Xanthophyceae	-	.0002	-

Sample Dates

Assemblage Characters	5/14/80	6/23/80	10/22/80
$H_{(max)}$ (nits)	3.331	3.358	3.090
H' (nits)	2.521	2.1016	2.082
N (number of taxa)	28	26	22
S (total cells/liter)	3,741,833	11,853,500	1,096,383
J (evenness)	.7568	.6450	.6737
Most abundant taxon	Scenedesmus	Aphanothece	Scenedesmus
Relative abundance	.285	.464	.1646
Cells/liter	1,067,600	5,495,000	180,550

OLD TOWN LAKE

A. Physico-chemical and chemical results:

Except for the result of a major storm event at station 3 during the June sampling period, physico-chemical and chemical parameters are fairly homogeneous both spatially and temporally with certain exceptions (Tables XLV-XLVI). Total organic carbon (TOC), sulfate, sodium and iron appear significantly higher in May, progressively declining to the lowest values in October. A progressive and significant increase in total Kdeldahl nitrogen from May to October is also apparent.

B. Biological results:

Seven classes of algae are presented in collections of Old Town Lake (Table XLVII). Of the forty-six genera, green algae (14) and diatoms (13) are qualitatively dominant and closely followed by ten genera of bluegreens. Approximately three-fourths of the thirty-four species of zooplankton present are rotifers, seven of which belong to the genus *Brachionus*. Of the nineteen species of fish present seven are members of the sunfish family.

In terms of phytoplankton density, biomass and pigment, Old Town Lake exhibits no apparent trends either temporally or spatially (Table XLVIII). Further, no explanation can be given for the irregular relationship between density and biomass, particularly at station three, throughout the study. Phytoplankton diversity estimates are consistently low and progressively decrease from May to October (Table XLIX). Old Town Lake is dominated by the diatom *Aulacosira* (=*Melosira*) during the May sampling period. Bluegreens dominate in June and October with *Aphanothece* and *Anabaena*, respectively.

TABLE XLV.

SUMMARY OF PHYSICO-CHEMICAL DATA (field/laboratory)

OLD TOWN LAKE	Temp. C	pH	Alkalinity (mg $CaCO_3$/l)	Sp. Cond. (umhos/cm)	D.O. (mg/l)	Turbid-ity NTU	Color APCU	Total Solids (mg/l)	Total Dissolved Solids (mg/l)	Total Organic Carbon (mg/l)
Station 1										
14 May 1980	21.5	7.6	55	140-153	8.4-8.8	40.0	60	157	105	20.0
24 June 1980	25.0	7.6	48	142-198	6.8-7.0	45.0	220	155	120	13.8
21 Oct. 1980	20.0	8.2	64	115	8.2	39.0	225	109	87	12.4
Station 2										
14 May 1980	21.8	7.6	52	118-128	9.2-9.4	39.0	80	138	94	16.0
24 June 1980	26.0	8.1	50	130-135	6.0-6.4	24.5	125	123	101	13.0
21 Oct. 1980	20.0	9.2	64	112	NS	23.0	260	99	84	15.1
Station 3										
14 May 1980	22.0	7.1	46	120-125	3.8-4.1	220.0	500	343	NS	18.6
24 June 1980	25.0-26.0	6.7	8	135-200	0.2-6.8	729.0	1000+	883	79	13.4
21 Oct. 1980	20.0	9.1	60	108	10.6	25.0	290	99	80	15.6

TABLE XLVI.

SUMMARY OF CHEMICAL DATA (laboratory) (all values in mg/l)

TOWN LAKE	NH_3-N	Total Kjeldahl-N	NO_3-N	Ortho-P	Total-P	SO_4	Cl	Na	K	Ca	Mg	Fe	Mn
ion 1													
ay 1980	0.05	0.9	0.00	0.072	0.184	9.7	20.7	7.0	4.4	13.8	5.1	2.6	0.1
ıne 1980	0.02	1.7	0.00	0.202	0.260	5.1	0.7	5.0	5.8	2.1	4.6	0.6	0.5
ct. 1980	.023	0.60	0.01	0.039	0.177	4.4	16.7	3.4	4.7	14.4	4.4	0.8	0.3
ion 2													
ay 1980	0.03	0.9	0.01	0.059	0.182	7.3	19.7	5.0	4.0	11.4	4.5	2.6	0.2
ıne 1980	0.01	1.4	0.01	0.138	0.203	6.7	1.0	4.8	4.5	14.0	3.0	0.6	0.3
ct. 1980	.025	0.60	0.00	0.020	0.166	4.5	13.3	3.5	4.4	14.0	4.5	0.4	0.3
ion 3													
ay 1980	0.40	1.0	0.21	0.133	0.548	39.0	20.8	5.5	7.5	10.2	4.6	16.5	0.4
ıne 1980	0.27	1.5	0.57	0.778	0.942	14.0	0.3	2.0	13.0	5.9	2.7	8.4	0.6
ct. 1980	.017	0.59	0.00	0.015	0.141	3.8	54.2	3.3	4.3	13.2	4.2	0.5	0.2

TABLE XLVII.
BIOTIC INVENTORY - OLD TOWN LAKE

PHYTOPLANKTON

CHLOROPHYCEAE

Chlamgdomonas
Coelastrum
Crucigenia
Dictyosphaerium
Elakatothrix
Gloeocystis
Oocystis
Pediastrum
Scenedesmus
Schroederia
Selenastrum
Tetraedron
Tetrastrum
Treubaria

EUGLENOPHYCEAE

Euglena
Phacus
Trachelomonas

PYRRHOPHYCEAE

Peridinium

CRYPTOPHYCEAE

Chroomonas
Cryptomonas
Cyanomonas

CYANOPHYCEAE

Anabaena
Aphanizomenon
Aphanocapsa
Aphanothece
Chroococcus
Cyanarcus
Dactylococcopsis
Marsoniella
Merismopedia
Spirulina

BACILLARIOPHYCEAE

Achnanthes
Aulacosira
Caloneis
Cyclotella
Fragilaria
Gyrosigma
Navicula
Nitzschia
Pinnularia
Rhopalodia
Skeletonema
Stephanodiscus
Synedra

CHRYSOPHYCEAE

Dinobryon
Mallomonas

ZOOPLANKTON

ROTATORIA

Keratella cochlearis
K. valga
Kellicottia bostoniensis
Hexarthra mira
Trichocerca longiseta
T. capucina
T. similis
Polyarthra vulgaris
P. euryptera
Synchaeta stylata
Asplanchna priodonta
Filinia longiseta
F. opoliensis
Conochiloides coenobasis
Conochilus unicornis
Collotheca sp.
Monostyla bulba
Brachionus angularis
B. bidentata
B. caudatus
B. calyciflorus
B. havanaensis
B. quadridentata
B. urceolaris
Platyias patulus
Philodina sp.

CLADOCERA

Bosmina longirostris
Daphnia galeata
D. parvula
Ceriodaphnia lacustris
Diaphanosoma leuchtenbergianum
Chydorus sp.

COPEPODA

Diaptomus sp.
Ergasilus sp.

FISH

Lepisosteus oculatus
Amia calva
Dorosoma cepedianum
Cyprinus carpio
Ictalurus natalis
Ictalurus punctatus
Noturus gyrinus
Ictiobus cyprinellus
Ictiobus bubalus
Morone mississippiensis
Micropterus salmoides
Pomoxis annularis
Lepomis macrochirus
Lepomis megalotis
Lepomis humilis
Lepomis gulosus
Lepomis cyanellus
Gambusia affinis
Aplodinotus grunniens

TABLE XLVIII.
PHYTOPLANKTON CHARACTERS

	Cells (#/l)	Biomass (mg/l)	Chl-a (μg/l)	Pha-a (μg/l)	Total Chl-a (μg/l)	Biomass / Cell (mg)	Chlorophyll / Cell (μg)	Chlorophyll / Biomass
OLD TOWN LAKE								
14 May 1980								
1	4,042,750	10.05	31.5	-	31.5	2.5×10^{-6}	7.8×10^{-6}	.0031
2	12,187,125	7.38	42.7	-	42.7	6.1×10^{-7}	3.5×10^{-6}	.0058
3	589,100	36.31	12.0	-	12.0	6.2×10^{-5}	2.0×10^{-5}	.0003
24 June 1980								
1	4,231,150	25.80	73.2	15.1	88.3	6.1×10^{-6}	2.1×10^{-5}	.0034
2	50,294,950	19.14	75.3	9.9	85.2	3.8×10^{-7}	1.7×10^{-6}	.0045
3	157,000	118.00	4.0	4.4	8.4	7.5×10^{-4}	5.4×10^{-5}	.00007
21 Oct. 1980								
1	19,110,825	21.14	17.3	1.7	19.0	1.1×10^{-6}	9.9×10^{-7}	.0009
2	11,264,750	21.54	8.3	9.7	18.0	1.9×10^{-6}	1.6×10^{-6}	.0008
3	26,568,325	19.17	10.1	4.4	14.5	7.2×10^{-7}	5.5×10^{-7}	.0007

TABLE XLIX.

LAKE OLD TOWN

	Sample Dates		
	5/14/80	6/24/80	10/21/80
Algal Class		Relative Abundance	
Chlorophyceae	.1779	.0298	.0255
Conjugatophyceae	-	-	-
Euglenophyceae	.0038	.0021	.0029
Pyrrhophyceae	.0011	.0001	.0001
Cryptophyceae	.0120	.0020	.0053
Cyanophyceae	.2703	.7403	.9163
Bacillariophyceae	.5275	.2081	.0479
Chrysophyceae	.0002	-	.0001
Xanthophyceae	-	-	-
Assemblage Characters			
$H_{(max)}$ (nits)	3.332	3.325	3.434
H' (nits)	1.749	1.627	1.128
N (number of taxa)	28	27	31
S (total cells/liter)	5,606,325	18,227,700	18,981,300
J (evenness)	0.5248	0.4892	0.3284
Most abundant taxon	Aulacosira	Aphanothece	Anabaena
Relative abundance	.4374	.3624	.7409
Cells/liter	2,452,208	6,607,083	14,064,583

Old Town Lake yields the highest average zooplankton density (987/l) of all the lakes studied (Table VII). At the same time, this lake does not experience marked changes in community composition. The average E/R ratio is relatively stable and ranges from 0.03-0.25, except for one station which exhibits a ratio of 2.09 in May (Appendix Table IV). However, in spite of this stability, there is a shift in the rotifer association exhibited in the October collections. Diversity declines and Conochilus unicornis represents 93% of the rotifer association with densities of nearly 1000/l.

Zooplankton biomass range from 50.3-172 ug/l. The average value (100 ug/l) ranks second among all lakes studied (Table VII; Appendix Table V). The average phytoplankton to zooplankton biomass ratio (306) ranks seventh, although Old Town yields much higher phytoplankton biomass values than any other lake. This lake also ranks seventh with the average value for a calanoid to cyclopoid and cladoceran ratio (9.27) (Appendix Table IV).

Old Town Lake has had six rotenoned fish population samples taken between 1961 and 1980. Biomass standing crop data are presented in Appendix Figures 1 and 9 and Appendix Table VII. The lake is suited mainly for catfish production, and large numbers of channel catfish of all sizes are found in the 1980 sample. Poor populations of bass, crappie and bluegill are present, and a poor spawn of these species was apparent. Management practices have included gamefish stocking and maintenance of adequate water levels. Sectional fish kills with subsequent re-stocking of predators have also been employed.

REYNOLDS LAKE

A. Physic-chemical and chemical results:

Tables L-LI indicate that while no spatial differences are apparent

TABLE L.

SUMMARY OF PHYSICO-CHEMICAL DATA (field/laboratory)

REYNOLDS PARK	Temp. C	pH	Alkalinity (mg $CaCO_3$/l)	Sp. Cond. (umhos/cm)	D.O. (mg/l)	Turbidity NTU	Color APCU	Total Solids (mg/l)	Total Dissolved Solids (mg/l)	Total Organic Carbon (mg/l)
Station 1										
15 May 1980	20.0	7.2	31	85	8.0-8.4	15.0	92	90	70	14.6
23 June 1980	28.0-30.0	8.0	32	90	8.9-9.6	23.0	90	93	57	8.8
20 Oct. 1980	18.2	6.7	34	98	NS	39.0	210	117	80	13.4
Station 2										
15 May 1980	20.0-21.0	7.2	32	85	8.5-8.8	13.0	91	83	63	13.4
23 June 1980	27.0-30.0	8.1	32	93-95	6.8-10.0	21.0	82	92	68	8.7
20 Oct. 1980	18.2	6.7	34	104	NS	35.0	225	108	51	11.9
Station 3										
15 May 1980	20.0-21.0	7.3	32	85-92	7.5-8.2	15.0	91	81	61	13.0
23 June 1980	28.0-30.0	8.3	32	95-100	8.0-10.0	17.0	75	89	71	9.0
20 Oct. 1980	18.3	6.7	34	105	NS	36.0	225	104	45	12.3

TABLE LI.

SUMMARY OF CHEMICAL DATA (laboratory) (all values in mg/l)

NOLDS PARK	NH_3-N	Total Kjeldahl-N	NO_3-N	Ortho-P	Total-P	SO_4	Cl	Na	K	Ca	Mg	Fe	Mn
tion 1													
May 1980	0.07	0.9	0.00	0.009	0.079	2.7	8.4	6.5	1.7	4.5	2.7	1.3	0.4
June 1980	0.00	1.1	0.01	0.025	0.093	1.4	1.8	7.7	1.8	4.7	2.7	0.5	0.4
Oct. 1980	.013	0.59	0.00	0.032	0.112	3.5	14.1	6.3	2.0	3.4	2.0	1.4	0.3
tion 2													
May 1980	0.05	0.9	0.00	0.006	0.054	3.1	8.3	7.0	1.8	4.5	2.7	1.0	0.4
June 1980	0.01	1.0	0.00	0.019	0.090	0.4	1.1	8.7	1.7	4.7	2.7	0.5	0.4
Oct. 1980	.003	0.56	0.00	0.022	0.119	3.8	16.0	6.4	2.1	3.6	2.0	1.3	0.3
tion 3													
May 1980	0.02	0.8	0.00	0.001	0.072	3.5	8.4	7.0	1.7	4.8	2.6	1.1	0.6
June 1980	0.02	0.9	0.00	0.021	0.070	3.2	1.5	7.5	1.7	4.8	2.7	0.5	0.4
Oct. 1980	.016	0.56	0.02	0.017	0.104	3.1	14.7	6.4	1.0	3.5	2.0	1.2	0.2

concerning the physico-chemical and chemical parameters associated with Reynolds Lake, numerous temporal differences occur in an otherwise homogeneous system. May samples consistently show intermediate pH, color, chloride, sodium and iron, relatively, low specific conductance, turbidity, total solids, total Kjeldahl nitrogen and ortho phosphate and relatively high TOC. With the exceptions of pH, sodium and ortho phosphate, the above low or intermediate parameters are associated with corresponding October maxima.

B. Biological results:

Forty genera of algae, thirty-three species of zooplankton, and fourteen species of fish occur in Reynolds Lake (Table LII). The majority of algal genera are members of the Chlorophyceae although bluegreens and diatoms contribute substantially. As is the case in most of the lakes surveyed, zooplankton are qualitatively strongly dominated by rotifers; half of the fish species belong to genera in the sunfish family.

In terms of phytoplankton parameters (Table LIII), no spatial or temporal trends are evident except that the May samples consistently exhibit relatively lower algal densities and the October samples lower biomass values. Structurally, Reynolds Lake seems quite complex since three different algal classes have representatives as dominants (Pyrrhophyceae, Bacillariophyceae and Cyanophyceae respectively) on a temporal basis (Table LIV). In addition, the highest median diversity and lowest median cell density are associated with Reynolds Lake -- both parameters being desirable and usually associated with water of high quality.

While maxima are experienced in May, zooplankton densities remain

TABLE LII.
BIOTIC INVENTORY - REYNOLD'S LAKE

PHYTOPLANKTON

CHLOROPHYCEAE

Acanthosphaera
Coelastrum
Crucigenia
Dictyosphaerium
Glococystis
Golenkinia
Oocystis
Pediastrum
Pteromonas
Scenedesmus
Tetraedron
Tetrastrum

CONJUGATOPHYCEAE

Cosmarium
Staurastrum

EUGLENOPHYCEAE

Euglena
Phacus
Trachelomonas

PYRRHOPHYCEAE

Peridinium

CRYPTOPHYCEAE

Cryptomonas
Cyanomonas

CYANOPHYCEAE

Anabaena
Aphanothece
Chroococcus
Cyanarcus
Dactylococcopsis
Marsoniella
Merismopedia
Oscillatoria
Rhabdoderma

BACILLARIOPHYCEAE

Aulacosira
Cyclotella
Frustulia
Gyrosigma
Navicula
Nitzschia
Pinnularia
Synedra

CHRYSOPHYCEAE

Sinobryon
Mallomonas

XANTHOPHYCEAE

Centritractus

ZOOPLANKTON

ROTATORIA

Keratella cochlearis
K. quadrata
Kellicottia bostoniensis
Lepadella sp.
Hexarthra mira
Trichocerca longiseta
T. capucina
T. similis
Polyarthra vulgaris
P. auryptera
Synchaeta sp.
Asplanchna priodonta
Lecane sp.
Filinia longiseta
Conochiloides coenobasis
Conochilus unicornis
Monostyla sp.
Brachionus angularis
B. caudatus
B. calyciflorus
B. havanaensis
Platyias patulus
Philodina sp.
Rotifer sp.

CLADOCERA

Bosmina corregoni
B. longirostris
Ceriodaphnia lacustris
C. quadrangula
Diaphanosoma leuchtenbergianum
Chydorus sp.

COPEPODA

Diaptomus sp.
Ergasilus sp.

DIPTERA

Chaoborus sp.

FISH

Amia calva
Dorosoma cepedianum
Ctenopharyngodon idella
Notemigonus crysoleucas
Minytreme melanops
Ictalurus natalis
Ictalurus punctatus
Micropterus salmoides
Pomoxis annularis
Lepomis macrochirus
Lepomis microlophus
Lepomis megalotis
Lepomis gulosus
Lepomis cyanellus

TABLE LIII.
PHYTOPLANKTON CHARACTERS

	Cells (#/1)	Biomass (mg/1)	Chl-a (μg/1)	Pha-a (μg/1)	Total Chl-a (μg/1)	Biomass / Cell (mg)	Chlorophyll / Cell (μg)	Chlorophyll / Biomass
REYNOLD'S PARK LAKE								
15 May 1980								
1	628,000	14.52	29.4	-	29.4	2.3×10^{-5}	4.7×10^{-5}	.0020
2	710,425	9.76	3.7	36.6	44.3	1.4×10^{-5}	6.2×10^{-5}	.0045
3	565,200	10.54	19.8	0.4	20.2	1.9×10^{-5}	3.6×10^{-5}	.0019
23 June 1980								
1	3,340,175	11.10	51.2	-	51.2	3.3×10^{-6}	1.5×10^{-5}	.0046
2	1,880,075	10.16	20.8	7.2	28.0	5.4×10^{-6}	1.5×10^{-5}	.0028
3	2,413,875	9.49	16.6	4.4	21.0	3.9×10^{-6}	8.7×10^{-6}	.0022
20 Oct. 1980								
1	3,643,575	7.63	9.1	4.4	13.5	2.1×10^{-6}	3.7×10^{-6}	.0018
2	6,570,450	7.00	8.8	2.4	11.2	1.1×10^{-6}	1.7×10^{-6}	.0016
3	5,506,775	8.29	8.5	3.6	12.1	1.5×10^{-6}	2.2×10^{-6}	.0015

TABLE LIV.

LAKE REYNOLDS PARK

	Sample Dates		
	5/15/80	6/23/80	10/20/80
Algal Class		Relative Abundance	
Chlorophyceae	.293	.374	.1669
Conjugatophyceae	.010	.0085	.0555
Euglenophyceae	.234	.0275	.040
Pyrrhophyceae	.284	.038	.0067
Cryptophyceae	.004	.0045	.0157
Cyanophyceae	.094	.300	.5778
Bacillariophyceae	.043	.156	.1426
Chrysophyceae	.033	.041	-
Xanthophyceae	-	.003	-
Assemblage Characters			
$H_{(max)}$ (nits)	3.090	3.555	3.090
H' (nits)	2.242	2.752	1.930
N (number of taxa)	22	35	22
S (total cells/liter)	634,542	2,544,708	5,240,267
J (evenness)	.7258	.7741	.6246
Most abundant taxon	*Peridinium*	*Aulacosira*	*Merismopedia*
Relative abundance	.284	.147	.543
Cells/liter	180,550	374,183	2,846,933

TABLE LV.
SUMMARY OF PHYSICO-CHEMICAL DATA (field/laboratory)

LAKE WALLACE	Temp. C	pH	Alkalinity (mg $CaCO_3$/l)	Sp. Cond. (umhos/cm)	D.O. (mg/l)	Turbid-ity NTU	Color APCU	Total Solids (mg/l)	Total Dissolved Solids (mg/l)	Total Organic Carbon (mg/l)
Station 1										
13 May 1980	20.0-22.0	6.5	18	50	1.0-3.9	79.0	125	158	87	12.8
24 June 1980	26.0-27.5	7.2	20	60-95	1.0-8.8	17.0	45	69	43	12.2
21 Oct. 1980	20.0	6.9	30	42	8.0	20.0	35	73	39	9.0
Station 2										
13 May 1980	15.0-25.0	7.1	16	50-70	0.1-9.4	22	70	73	39	12.6
24 June 1980	24.0-28.0	7.1	14	55-90	0.2-8.0	26.5	45	67	58	10.4
21 Oct. 1980	22.0	7.0	29	50	NS	24.0	40	77	40	10.6
Station 3										
13 May 1980	21.0-27.0	7.7	23	50-55	0.2-8.5	5.7	55	43	28	13.0
24 June 1980	24.0-25.0	6.7	14	60	0.2-3.8	56.5	85	125	96	11.4
21 Oct. 1980	22.0	6.9	26	45	7.7	27.5	42	69	44	9.8

TABLE LVI.

SUMMARY OF CHEMICAL DATA (laboratory) (all values in mg/l)

LAKE WALLACE	NH_3-N	Total Kjeldahl-N	NO_3-N	Ortho-P	Total-P	SO_4	Cl	Na	K	Ca	Mg	Fe	Mn
Station 1													
13 May 1980	0.00	0.8	0.02	0.075	0.233	1.1	12.7	0.9	4.7	3.0	1.9	5.2	0.1
24 June 1980	0.00	1.4	0.00	0.058	0.130	0.8	0.0	0.9	4.1	3.9	1.9	0.3	0.2
21 Oct. 1980	.022	0.57	0.00	0.018	0.125	0.3	7.9	1.1	3.8	3.1	1.6	0.5	0.2
Station 2													
13 May 1980	0.03	0.7	0.01	0.054	0.139	7.1	7.1	0.9	3.7	3.3	1.6	1.2	0.1
24 June 1980	0.01	1.1	0.01	0.202	0.123	2.6	0.2	0.9	3.7	3.0	1.6	1.0	0.2
21 Oct. 1980	.023	0.57	0.04	0.013	0.094	2.7	3.1	1.2	4.5	3.4	1.8	1.2	0.4
Station 3													
13 May 1980	0.05	0.8	0.00	0.026	0.098	0.0	12.2	0.9	3.4	4.0	1.9	0.5	0.1
24 June 1980	0.14	1.0	0.05	0.285	0.180	3.9	0.2	1.0	4.7	3.9	1.5	3.4	0.2
21 Oct. 1980	.016	0.53	0.00	0.052	0.095	0.3	4.1	0.9	4.4	3.4	1.9	0.8	0.3

B. Biological results:

Table LVII shows Lake Wallace to be a relatively rich system in terms of species composition, although algal diversity is rather low at each sampling period (see also Table LIX). This discrepancy is no doubt due to the successional patterns exhibited by the algal flora throughout the study. The largest single class of algae, qualitatively, is the Chlorophyceae (19 of 43 genera). Zooplankton are qualitatively strongly dominated by rotifers (30 of 42 species) and there are twenty-five species of fish (8 of which are members of the sunfish family).

No spatial or temporal trends are evident from the phytoplankton data presented in Table LVIII. However, in general, Lake Wallace exhibits rather low phytoplankton densities and chlorophyll and only moderate biomass values.

Although the majority of algal genera associated with Lake Wallace are members of the Chlorophyceae, May and June sampling periods are dominated by bluegreen algae, *Anabaena* and *Aphanizomenon* respectively (Table LIX). Only in October does this numerical dominance shift toward the Chlorophyceae when *Scenedesmus* is the dominant genus. Mean estimates of cell densities for each sampling period are remarkably similar although the actual range of values indicates much greater variability (Table LVIII).

Lake Wallace yields the greatest variety of zooplankton species although the average zooplankton density (352/l) is the fourth lowest, and the average E/R ratio (0.38) ranks fifth (median E/R ranks ninth) (Table VII and Appendix Table IV). Entomostraca are least abundant in October, perhaps demonstrating a seasonal preference. The average zooplankton biomass (76 ug/l) ranks third (median is fourth from the

TABLE LVII.

BIOTIC INVENTORY - LAKE WALLACE

PHYTOPLANKTON

CHLOROPHYCEAE

Acanthosphaera
Actinastrum
Chodatella
Coelastrum
Crucigenia
Dictyosphaerium
Eudorina
Gonium
Micractinium
Oocystis
Pandorina
Pediastrum
Pteromonas
Scenedesmus
Schroederia
Selenastrum
Tetraedron
Tetrastrum
eubaria

CONJUGATOPHYCEAE

Cormarium
Staurastrum

EUGLENOPHYCEAE

Euglena
Phacus
Trachelomonas

CRYPTOPHYCEAE

Chroomonas
Cryptomonas

CYANOPHYCEAE

Anabaena
Aphanizomenon
Aphanothece
Chroococcus
Dactylococcopsis
lopedium
.erismopedia

BACILLARIOPHYCEAE

Aulacosira
Cyclotella
Epithemia
Navicula
Nitzschia
Pinnularia
Synedra

CHRYSOPHYCEAE

Dinobryon
Mallomonas

XANTHOPHYCEAE

Ophiocytium

ZOOPLANKTON

ROTATORIA

Keratella cochlearis
K. quadrata
Kellicottia bostoniensis
Hexarthra mira
Trichocerca sp.
T. capucina
T. similis
Ploesoma truncatum
Polyarthra vulgaris
P. euryptera
Synchaeta sp.
Asplanchna priodonta
Lecane sp.
Filinia longiseta
F. terminalis
Conochiloides coenobasis
Conochilus unicornis
Collotheca sp.
Monostyla quadridentata
Brachionus sp.
B. angularis
B. caudatus
B. calyciflorus
B. havanaensis
B. quadridentata
Euchlanis sp.
Platyias quadricornis
P. patulus
Philodina sp.
Rotifer sp.

CLADOCERA

Bosmina longirostris
Daphnia galeata
Ceriodaphnia lacustris
C. quadrangula
Diaphanosoma leuchtenbergianu
Chydorus sp.
Holopedium sp.
Alonella sp.
Scapholeberis sp.

COPEPODA

Diaptomus sp.
D. pallidus

DIPTERA

Chaoborus sp.

FISH

Polyodon spathula
Lepisosteus oculatus
Lepisosteus osseus
Amia calva
Esox americanus
Dorosoma cepedianum
Dorosoma petenense
Notemigonus crysoleucas
Notropis emiliae
Notropis maculatus
Erimyzon sucetta
Ictiobus bubalus
Ictalurus natalis
Ictalurus punctatus
Noturus gyrinus
Labidesthes sicculus
Micropterus salmoides
Pomoxis annularis
Pomoxis nigromaculatus
Lepomis macrochirus
Lepomis humilis
Lepomis gulosus
Lepomis microlophus
Centrarchus macropterus
Etheostoma chlorosomum

TABLE LVIII.
PHYTOPLANKTON CHARACTERS

	Cells (#/l)	Biomass (mg/l)	Chl-a (μg/l)	Pha-a (μg/l)	Total Chl-a (μg/l)	Biomass / Cell (mg)	Chlorophyll / Cell (μg)	Chlorophyll / Biomass
LAKE WALLACE								
13 May 1980								
1	561,275	7.78	13.4	3.1	16.5	1.4×10^{-5}	2.9×10^{-5}	.0021
2	3,238,125	8.36	15.5	2.5	18.0	2.6×10^{-6}	5.6×10^{-6}	.0022
3	4,187,975	7.44	5.9	2.7	8.6	1.8×10^{-6}	2.1×10^{-6}	.0012
24 June 1980								
1	1,989,975	13.94	45.5	17.1	62.6	7.0×10^{-6}	3.1×10^{-5}	.0045
2	5,212,400	9.76	28.3	10.9	39.2	1.9×10^{-6}	7.5×10^{-6}	.0040
3	1,538,600	10.18	19.2	-	19.2	6.6×10^{-6}	1.2×10^{-5}	.0019
21 Oct. 1980								
1	2,060,625	11.36	8.0	5.6	13.6	5.5×10^{-6}	6.6×10^{-6}	.0012
2	2,307,900	8.94	6.4	3.1	9.5	3.9×10^{-6}	4.1×10^{-6}	.0011
3	3,140,000	8.86	2.7	3.5	6.2	2.8×10^{-6}	2.0×10^{-6}	.0007

TABLE LIX.

LAKE WALLACE

	Sample Dates		
	5/13/80	6/24/80	10/21/80
Algal Class		Relative Abundance	
Chlorophyceae	.2598	.1732	.476
Conjugatophyceae	.0049	-	.006
Euglenophyceae	.0264	.0780	.071
Pyrrhophyceae	-	-	-
Cryptophyceae	.0088	.0134	.136
Cyanophyceae	.7117	.725	.151
Bacillariophyceae	.0400	.0106	.049
Chrysophyceae	.0092	.0008	-
Xanthophyceae	.0004	-	-
Assemblage Characters			
$H_{(max)}$ (nits)	3.367	3.258	3.295
H' (nits)	1.960	1.992	2.207
N (number of taxa)	29	26	27
S (total cells/liter)	2,662,458	2,913,658	2,502,841
J (evenness)	.5823	.6114	.6701
Most abundant taxon	Anabaena	Aphanizomenon	Scenedesmus
Relative abundance	.565	.359	.287
Cells/liter	1,504,583	1,046,667	719,583

lowest) (Table VII and Appendix Table V). Large entomostraca occur fairly consistently, and no doubt contribute to higher dry weights even though densities are relatively low (Daphnia comprises 44% of the cladoceran assemblage). The average phytoplankton to zooplankton biomass ratio (220) ranks eighth, while the calanoid to cyclopoid and cladoceran ratio (0.40) ranks fifth (Table VII).

Lake Wallace was the most frequently sampled of the ten lakes, with 19 rotenoned fish population samples collected between 1956 and 1980 (two samples in 1973). Biomass and standing crop data are presented in Appendix Figures 1 and 11 and Appendix Table VII. Although Lake Wallace has the second largest fish species inventory, the 1980 sample shows rather low standing crop estimates and low gamefish population estimates. Previous management practices include stocking grass carp for vegetation control, stocking game and forage species, fishing regulation, sectional fish kills and small drawdowns to manipulate water levels.

RANKING OF SELECTED ARKANSAS LAKES

I. Rationale

Consideration of trophic status and associated indices has been the subject of recent exhaustive reviews (Maloney, 1979); Taylor et al., 1979). Reduced to its simplest philosophical form, the whole "state of the art" realm of current investigations deals with an attempt to place static "labels," i.e., oligotrophic or eutrophic, on dynamic systems (lakes), and to do so in a statistically convincing manner. Hence the gamut of indices extends from single parameter measures e.g., Trophic State Indices (Carlson, 1977), to multivariate estimates e.g., Brezonik and Shannon (1971). Both approaches present limitations, yet both also appear to be strongly correlated and "work."

As Carlson (1979) has suggested, a compromise view of trophic state analysis, namely the multivariate concept, should be included as a plausible alternative to either "nutrient-biased" or "biologically-biased" estimates. Since lakes represent dynamic systems, it would appear that the multivariate concept would be more desirable, regardless of the fact that single parameter measures do apparently "work" i.e., are able to "label" the trophic nature of the system with fewer analyses. One only need measure secchi disc transparency of distilled water, ethyl alcohol or india ink to see the flaw associated with single parameter "labeling" of trophic state. Clearly the relationship of many parameters should be examined to more adequately define trophic state.

Our efforts in this study have been influenced by the ranking necessity associated with current lake restoration priorities, i.e., which system is "worst" and in the most need of restoration. Clealy a multivariate index which allows for ranking of individual parameters as well as clustering the lakes into similar groups is desirable. This approach has been used before e.g., Michalski and Conroy (1972), and seems a most plausible type of approach, in spite of the objections raised by Carlson (1979) regarding lack of consideration for correlated variables and assumed linearity. Given the general limitations of both temporal and spatial sampling in dynamic systems, it seems further presumptous to attempt greater statistical resolution of correlations which effectively require an infinite data base. It is our hope not to associate trophic labels with the ten lakes in question, but rather to rank the lakes as to their "trophically" desirable features.

The ranking scheme which was employed in this study is based on ten "nutrient-biased" variables (physico-chemical & morphometric) and ten "biologically-biased" variables (production and diversity. Median values were ranked, and by inspection, clustered into low, medium, and high categories. The sum of the ranks for both "nutrient-biased" and "biologically-biased" variables was then weighted by multiplying the number of occurrences in each cluster category. The theoretical minimum value in such a scheme is 100 (most desirable) and the maximum is 3000 (least desirable). "Nutrient-biased" weighted ranks (designated R') and "biologically-biased" weighted ranks (designated R") could then be added and compared. In the former situation, a general "distance" expression is generated with a theoretical minimum of 200 and a maximum of 6000. The later situation allows for comparison of linear relationships between grouped variables.

II. Selection of "nutrient-biased" variables (composition of R')

The following ten variables were considered because of their supposed predictive value toward "trophic analyses" and their availability from at-hand data: dissolved oxygen; total nutrient status; turbidity, pH-alkalinity; total dissolved solids-specific conductance; ortho-phosphate; total organic carbon; total Kjedahl nitrogen; watershed:lake area; shoreline development index.

III. Selection of "biologically-biased" variables (composition of R")

The following ten variables were considered because of their supposed predictive value toward "trophic analyses" and their availability from at-hand data: phytoplankton cell number; phytoplankton biomass; chlorophyll; phytoplankton diversity; zooplankton cell number; zooplankton biomass; zooplankton diversity (as number of species); E/R (Entomostraca/Rotifer) ratio; forage fish biomass; fish diversity.

IV. Results

A. Physico-chemical & chemical (R')

Based on the median values of physico-chemical and chemical parameters presented in Tables I-II, the ten Arkansas lakes are ranked according to the selected parameter as shown in Table LX. These ranks are arranged in order of increasing median value with the lowest median value receiving a rank of 1 and the highest a rank of 10. A notable exception to this approach is the rank scheme associated with dissolved oxygen i.e., the ranking is reversed since higher dissolved oxygen values are considered to be more desirable; for dissolved oxygen a rank of 1 indicates the highest median value and a rank of 10 indicates the convert median value. In addition, the differences in median values allow for arranging ranks into similar categories. Therefore ranks which are based on similar median values are clustered. Ranks with similar low median values are grouped into category "A", ranks with similarly medium median values are grouped into category "B", and ranks of similarly high median values are grouped into category "C". Each of these categories are then assigned an arbitrary weighting value, i.e., A=1, B=2, C=3 to reflect the relative "desirability" of the medium value used to generate the rank assignment. It becomes apparent that even though a lake may assume a relatively low absolute composite rank, each parameter's similarity is taken into account which modifies the value of the rank. Of the ten parameters employed, Lake Bailey consistently has low ranks based on highly desirable low median values (the lowest cumulative absolute rank (26) as well as the lowest cumulative category value (11)). The

TABLE LX (a).
RANKS OF MEDIAN VALUES FOR PHYSICO-CHEMICAL DATA

	Temp.	pH	Alk.	Sp. Cond.	D.O.*	Turb.	Color	Total Solids	TDS	TOC	E(Rank)
Bailey	2	4	2	1	1	5	5	1	1	1	23 (1)
Calion	9	1	1	9	5	1	2	9	9	8	54 (5)
Chicot	9	7	10	8	7	9	4	8	8	2	72 (9)
Enterprise	4	4	5	3	3	4	6	2	3	7	41 (2)
June	6	2	3	10	4	3	8	10	10	9	65 (8)
Lou Emma	1	10	6	7	8	6	8	5	7	5	63 (7)
Newport	7	8	9	6	10	2	3	6	6	3	60 (6)
Old Town	5	9	8	5	6	10	10	7	5	10	75 (10)
Reynold's Park	4	7	7	4	2	7	9	4	4	6	54 (5)
Wallace	10	5	4	2	9	8	1	3	2	4	48 (3)

1 → 10 Lowest → Highest * Reverse rank

TABLE LX (a). Cont.
RANKS OF MEDIAN VALUES FOR CHEMICAL DATA

	NH_3-N	Total Kjedahl N	NO_3-N	Ortho-P	Total P	SO_4	Cl	Na	K	Ca	Mg	Fe	Mn	E(Rank)
Bailey	6	7	8	1	2	4	2	2	1	1	1	4	5	44 (1)
Calion	2	1	3	3	1	6	9	9	2	5	5	2	2	50 (2)
Chicot	6	3	7	9	5	7	3	3	8	10	10	7	5	83 (6)
Enterprise	8	10	6	10	8	1	8	4	8	2	2	3	8	78 (5)
June	6	9	3	4	4	8	10	10	4	7	8	10	2	85 (7)
Lou Emma	7	7	9	8	9	10	7	8	8	7	8	7	10	105(10)
Newport	10	3	10	6	6	9	6	5	9	9	6	1	8	88 (8)
Old Town	9	8	6	7	10	5	5	6	10	8	9	5	8	96 (9)
Reynold's Park	2	4	3	2	3	3	4	7	3	4	5	9	9	58 (4)
Wallace	3	7	6	5	7	2	1	1	5	3	3	8	5	56 (3)

1 → 10 Lowest → Highest

TABLE LX (b).
SELECTED RANKS OF PHYSICO-CHEMICAL PARAMETERS

	D.O.*	Nutrient Station	Turbidity	pH-Alkalinity	Cond.	Ortho P	ToC	Total Kiedahl N
Bailey	1A	1A	5A	3A	1A	1A	1A	3A
Calion	5B	2A	1A	1A	9C	3A	8B	1A
Chicot	7B	5B	9C	10C	8B	9C	2A	2A
Enterprise	3B	6B	4A	5B	3A	10C	7B	10C
June	4B	7B	3A	2A	10C	4A	9C	4A
Lou Emma	8B	10C	6B	7C	7B	8C	5A	9C
Newport	10C	8C	2A	10C	6B	6B	3A	6B
Old Town	6B	9C	10C	10C	5B	7C	10C	8B
Reynolds Park	2A	4A	7C	6C	4A	2A	6B	8B
Wallace	9C	3A	8C	5B	2A	5B	4A	6B

* reverse rank

TABLE LX (b). Cont.
SELECTED RANKS OF PHYSICO-CHEMICAL PARAMETERS (con't)

	Watershed Lake Area	SID*	Σ Ranks (1)	CLUSTERS # Low A's	# Medium B's	# High C's	Weighted Value A=1 B=2 C=3 (2)	R' (1x2)
Bailey	8B	2A	26	9	1	0	11	286
Calion	6B	5B	41	5	4	1	16	656
Chicot	4A	4B	60	3	4	3	20	1200
Enterprise	1A	10C	59	3	4	3	20	1180
June	9B	7B	59	4	4	2	18	1062
Lou Emma	10C	1A	71	2	3	5	23	1633
Newport	7B	6B	64	2	5	3	21	1344
Old Town	3A	8C	76	1	3	6	25	1900
Reynolds Park	5B	3A	47	5	3	2	17	799
Wallace	2A	9C	53	4	3	3	19	1007

* Shoreline Diversity Index

product of these two components yields the convert value (R^1=286) for any of the ten lakes. Although Lakes Enterprise and June have identical cumulative absolute ranks, their respective cumulative category values differentiate their "desirability" and generate different respective R' values. Similarly Upper Lake Chicot and Lake Enterprise have identical cumulative category values but different cumulative absolute rank values and hence different respective R' values. In terms of strictly physico-chemical and chemical R' values, and hence desirability, the "best" lake is Bailey (> Calion > Reynold's Park > Wallace > June > Enterprise > Chicot > Newport > Lou Emma > Old Town) (Table LX).

B. Biological (R")

Based on the median value of biological parameters found in Tables V, VII, values in Table IX, the ten Arkansas lakes are ranked according to the selected parameters as shown in Table LXI. Rank procedure is essentially the same as used for physico-chemical & chemical parameters (see above) where "desirability" is equated with "lowest" rank value. However in certain instances, e.g., phytoplankton density, chlorophyll, phytoplankton diversity, zooplankton species richness and fish diversity, any moderate or low and moderate similarity clusters are used because of the closeness of actual parameter values.

Biologically, lakes are clustered in about the same manner as they appear when ranks based on physico-chemical & chemical are employed. However the order within these clusters appears to be quite different than the R' ordering. In terms of biological desirability the "best" lake is Calion > (Wallace > Bailey > Chicot >

TABLE LXI.
SELECTED RANKS OF BIOLOGICAL PARAMETERS

	PHYTOPLANKTON				ZOOPLANKTON			
	Cells/l	Biomass	Chlorophyll	Diversity*	Cells/l	Biomass	Species*	E/R
Bailey	4A	2A	2A	2A	5B	6B	9B	5C
Calion	6A	1A	1A	7A	3A	1A	9B	4B
Chicot	5A	7B	3A	5A	2A	3A	9B	2A
Enterprise	9B	8B	10C	4A	8B	8B	9B	6C
June	8B	4B	5A	3A	1A	2A	9B	10C
Lou Emma	10B	9C	9B	10B	9B	10C	9B	1A
Newport	3A	3B	8B	6A	4A	7B	10B	3B
Old Town	7B	10C	6A	9B	10C	9C	3B	9C
Reynolds Park	1A	7B	7A	1A	6B	5B	1A	7C
Wallace	2A	5B	4A	8B	7B	4A	2A	9C

*reverse rank

TABLE LXI. Cont.
SELECTED RANKS OF BIOLOGICAL PARAMETERS (con't)

	FISH							
	Fish Forage Biomass	Diversity*	E Ranks (1)	# Low As	# Medium Bs	# High Cs	Weighted Value A=1 B=2 C=3 (2)	R" (1x2)
Bailey	4B	5B	44	4	5	1	17	765
Calion	8C	2B	42	6	3	1	15	630
Chicot	9C	8B	53	6	3	1	15	795
Enterprise	3B	9B	74	1	7	2	21	1554
June	6B	6B	54	4	5	1	17	918
Lou Emma	1A	5B	73	2	6	2	20	1460
Newport	7B	7B	58	3	7	0	17	986
Old Town	5B	3B	71	1	5	4	23	1633
Reynolds Park	10C	10B	55	4	4	2	18	990
Wallace	2A	1B	44	5	4	1	16	704

June > Newport > Reynold's Park > Lou Emma > Enterprise > Old Town) (Table LXI).

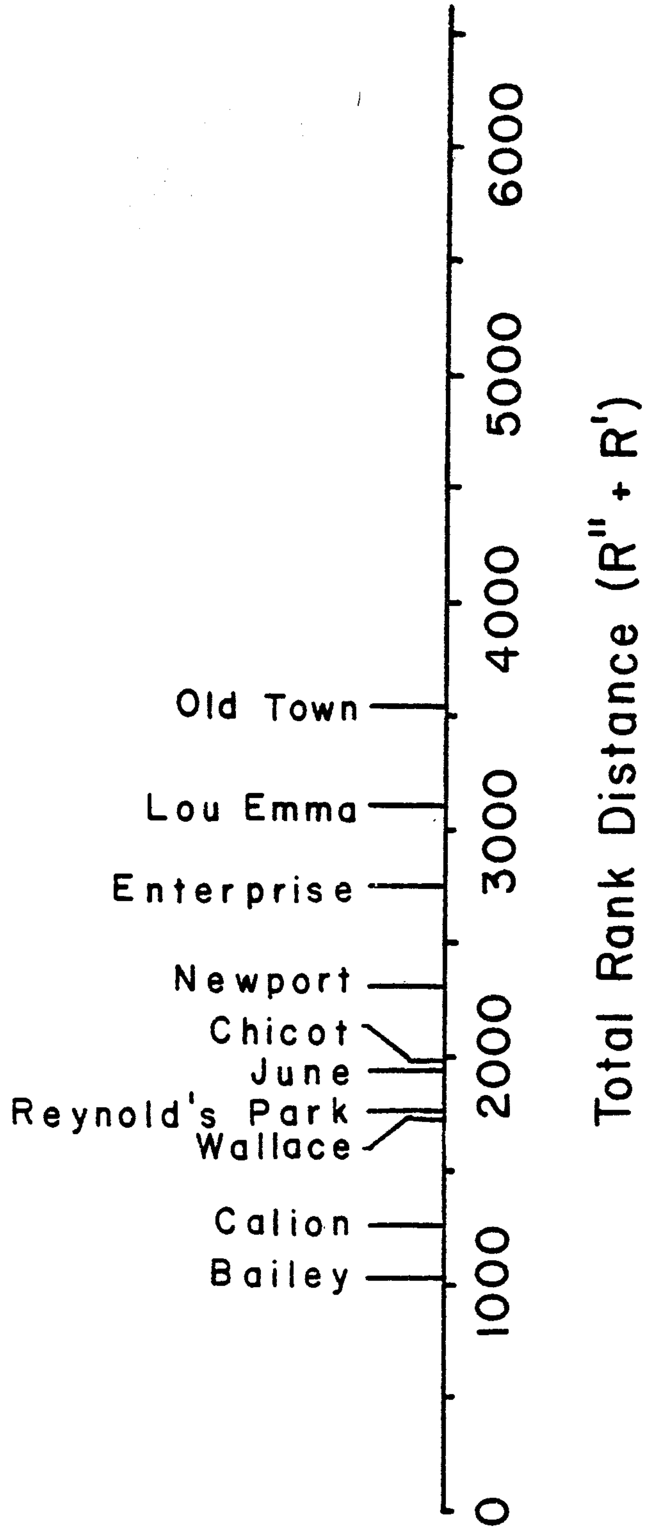
C. Composite Ranks R' & R"

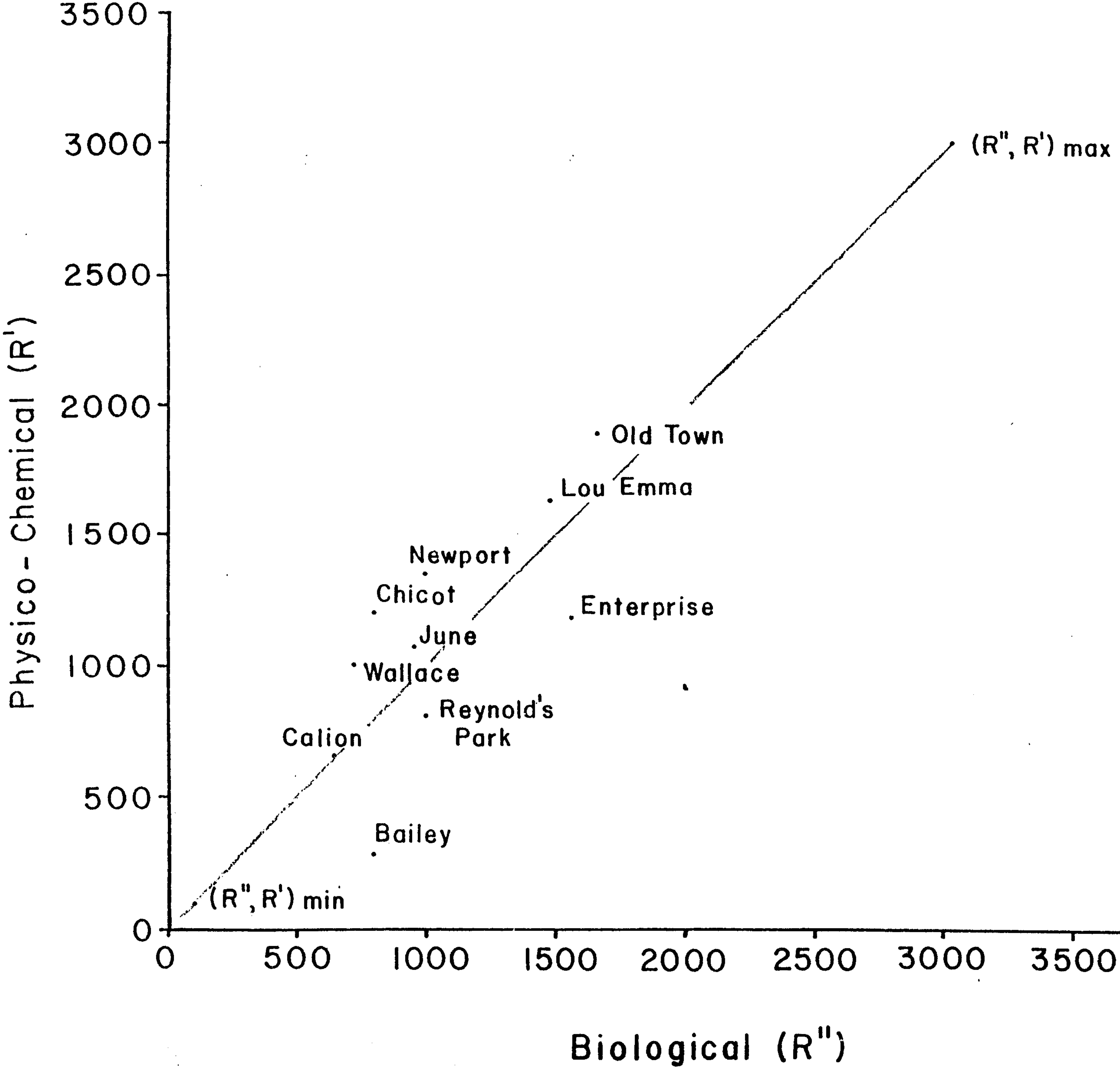
The combination of both physico-chemical and chemical and biological evaluations is presented in Fig. 12. Essentially the ten lakes can be grouped into three categories, and assuming that all lakes involved are "eutrophic" in nature (see below), these categories are slightly eutrophic, moderately eutrophic or strongly eutrophic. Lakes Bailey and Calion are considered slightly eutrophic and the "best" of the ten lakes considered. Wallace, Reynold's Park, June, Upper Chicot and Newport are considered moderately eutrophic while Enterprise, Lou Emma and Old Town strongly eutrophic. Considering the very high value (3533) attained by Old Town Lake, this body of water probably could be considered a "hypereutrophic" system.

Figure 13 presents the relationship between R' & R" and indicates which set of parameters (abiotic or biotic) are more responsible for the trophic ranking assigned. The further the lake is above the $(R", R')_{min} - (R", R')_{max}$ line indicates that abiotic parameters are more responsible for the relative rank; while below the line lakes are ranked primarily with biotic parameters. Any point along the line indicates that biotic and abiotic parameters are of equal importance in the determination of lake rank and ultimately the trophic states.

Certain inconsistencies are associated with this scheme, notably the turbidity/productivity relationship. Relating high

FIGURE 12.


Total Rank Distance (R'' + R')
0
1000
2000
3000
4000
5000
6000
Bailey
Calion
Wallace
Reynold's Park
June
Chicot
Newport
Enterprise
Lou Emma
Old Town



Physico - Chemical (R')
Biological (R")
0
500
1000
1500
2000
2500
3000
3500
(R", R') max
(R", R') min
Old Town
Lou Emma
Newport
Chicot
Enterprise
June
Wallace
Reynold's Park
Calion
Bailey

FIGURE 13.

turbidity would cause a lake to appear above the line due in part to the decreased phytoplankton productivity. This inconsistency however, only further explains that there are clear differences in chemical eutrophic and biological eutrophication; both aspects should be taken into consideration.

D. Comparing both other rank schemes

One of the most currently widely used indicator parameters in lake studies is the secchi disc transparency (Weiss and Kuenzler, 1976; Maloney, 1979). Table LXII presents a summary of secchi disk values obtained in this study. Median values for all the lakes indicate that all lakes are eutrophic when this single parameter is employed (see Weiss and Kuenzler, 1976) since values less than 1 meter are associated with eutrophy. Carlson's Trophic State Indices which employ secchi disc (SD), chlorophyll (Ch) and total phosphorus (TP) are also widely used trophic estimators (Taylor et al. 1979). Table LXIII presents TSI values for the Arkansas lakes as well as cumulative and relative rank for each lake.

Interestingly, three lake groupings are again recognized using this estimation. By rank Calion and Bailey are at the lower end of the eutrophic scale; Enterprise, Lou Emma and Old Town are at the higher end of the scale; and the remaining lakes are somewhat of intermediate eutrophy. (Using the TSI, Calion Lake would be relating the "best" of the eutrophic lakes (Bailey June Newport Reynolds Chicot Wallace Enterprise Lou Emma Old Town)
This corresponds quite well with our ranking scheme,

TABLE LXII.
SECCHI DISC MEASUREMENTS (meters)[1]

	Station 1	Station 2	Station 3
Bailey (0.76)			
15 April	0.91	0.76	0.76
26 June	0.61	1.12	0.76
16 Oct.	0.51	0.48	0.46
Calion (0.76)			
13 May	0.84	0.76	0.69
25 June	0.91	0.76	0.61
22 Oct.	0.76	0.71	0.61
Upper Chicot (0.25)			
13 May	0.20	0.20	0.20
24 June	0.18	0.53	0.38
22 Oct.	0.25	0.46	0.46
Enterprise (0.66)			
25 June	0.76	0.66	0.69
22 Oct.	0.61	0.61	0.61
June (0.61)			
12 May	0.61	0.76	0.76
25 June	0.43	0.46	0.58
23 Oct.	0.56	0.61	0.76
Lou Emma (0.51)			
11 April	0.61	0.67	0.71
26 June	0.53	0.38	0.51
16 Oct.	0.25	0.25	0.25
Newport (0.70)			
14 May	0.25	0.53	0.61
23 June	0.91	0.91	0.70
20 Oct.	0.46	0.76	0.76
Old Town (0.25)			
14 May	0.25	0.25	0.10
24 June	0.23	0.30	0.23
21 Oct.	0.23	0.25	0.30
Reynolds (0.40)			
15 May	0.40	0.40	0.43
23 June	0.40	0.46	0.52
20 Oct.	0.19	0.23	0.28
Wallace (0.33)			
13 May	0.20	0.61	0.76
24 June	0.38	0.36	0.28
21 Oct.	0.33	0.30	0.33

[1]Median value in parenthesis following lake name

TABLE LXIII.
Carlson's Trophic State Indices

	TSI (SD)[1]	TSI (Ch)[2]	TSI (TP)[3]	"consensus"
Bailey	63.9	56.8	54.4	(6) 2
Calion	63.9	55.5	52.7	(4) 1
Upper Chicot	80.0	57.1	67.4	(18) 6
Enterprise	66.0	68.9	72.6	(22) 8
June	67.1	59.2	65.8	(14) 3
Lou Emma	69.7	64.6	73.3	(24) 9
Newport	65.1	63.9	67.6	(17) 5
Old Town	80.0	59.4	75.0	(26) 10
Reynolds	71.3	59.6	64.7	(17) 5
Wallace	71.5	58.0	69.5	(19) 7

[1] $$TSI\ (SD) = 10\ 6 - \frac{\ln SD}{\ln 2}$$

[2] $$TSI\ (Ch) = 10\ \ 6 - \frac{2.04 - 0.68 \ln Ch}{\ln 2}$$

[3] $$TSI\ (TP) = 10\ \ 6 - \frac{\ln \frac{64.9}{TP}}{\ln 2}$$

[4] using accumulated for all TSIs employed ranks ( )

particularly in terms of the three lake groupings. However we feel that the use of R'R" ranking affords much greater resolution with only slightly greater effort, and is particularly well suited for systems receiving high allochthonous import of sediment (as secchi disc or turbidity) (see discussion on turbidity/productivity inconsistency above).

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APPENDIX TABLE I. Lakes and Their Designated Responsible Agencies.

LAKE	AGENCY
Bailey	West Central Arkansas Planning & Development District, P.O. Box 1558, Hot Springs, AR 71901
Calion	Southwest Arkansas Planning & Development District, P.O. Box 767, Magnolia, AR 71753
Upper Chicot	Southeast Arkansas Planning & Development District, P.O. Box 6806, Pine Bluff, AR 71601
Enterprise	Southeast Arkansas Planning & Development District, P.O. Box 6806, Pine Bluff, AR 71601
June	Southwest Arkansas Planning & Development District, P.O. Box 767, Magnolia, AR 71753
Lou Emma	Western Arkansas Planning & Development District, P.O. Box 2067, Ft. Smith, AR 72902
	208 Planning Agency: Arkhoma Regional Planning Commission, Ward/Garrison Bldg., Ft. Smith, AR 72902
Newport	White River Planning & Development District, P.O. Box 2396, Batesville, AR 72501
Old Town	East Arkansas Planning & Development District, P.O. Box 1403, 706 Main St., Jonesboro, AR 72401
Reynolds	East Arkansas Planning & Development District, P.O. Box 1403, 706 Main St., Jonesboro, AR 72401
Wallace	Southeast Arkansas Planning & Development District, P.O. Box 6806, Pine Bluff, AR 71601

Appendix Table II

LOCATION OF SAMPLING SITES FOR ARKANSAS CLEAN LAKES

	Station 1	Station 2	Station 3
Bailey	35°07'48"N 92°55'12"W	35°07'48"N 92°54'50"W	35°07'48"N 92°54'10"W
Calion	33°19'00"N 92°32'28"W	33°19'15"N 92°32'00"W	33°19'30"N 92°31'40"W
Chicot	33°21'20"N 91°11'45"W	33°22'30"N 91°31'30"W	33°21'55"N 91°15'05"W
Enterprise	33°03'28"N 91°34'30"W	33°03'48"N 91°35'50"W	33°03'43"N 91°36'38"W
June	33°21'20"N 93°29'32"W	33°21'30"N 93°29'35"W	33°22'32"N 93°29'25"W
Lou Emma	35°27'56"N 94°21'30"W	35°27'51"N 94°21'25"W	35°27'56"N 94°21'25"W
Newport	35°36'25"N 91°16'36"W	35°36'12"N 91°16'30"W	35°36' 5"N 91°16'15"W
Old Town	34°23'00"N 90°48'00"W	34°24'30"N 90°47'30"W	34°24'00"N 90°44'00"W
Reynolds Park	36°04'21"N 90°31'44"W	36°04'21"N 90°31'41"W	36°04'21"N 90°31'38"W
Wallace	33°27'30"N 90°28'30"W	33°28'50"N 90°27'10"W	33°27'20"N 90°28'30"W

APPENDIX TABLE III.

LAKE BAILEY PHYTOPLANKTON

cells/liter

Taxon	#1 4/15/80	#2 4/15/80	#3 4/15/80	#1 6/26/80	#2 6/26/80	#3 6/26/80	#1 10/16/80	#2 10/16/80	#3 10/16/80
Coelastrum				46800			374400	140400	187200
Conochaete							2925	2925	5850
Crucigenia	31400	188400	31400	81900			1415700	1017900	889200
Dictyosphaerium	1381600	596600	62800			23400	5850	81900	210600
Glococystis				46800	46800	70200	14625		35100
Golenkinia					2925	2925	2925		
Kirchneriella			125600				117000	514800	690300
Oedegonium			133450						
Oocystis	109900	23550	23550				78975	20475	
Pediastrum				11700			17550	52650	
Radiococcus	439600	282600	54950						
Scenedesmus	157000	172700	141300	26325		11700	877500	403650	526500
Selenastrum								5850	
Tetraedron	47000	78500	23550	2925	14625	17550	198900	184275	257400
Tetrastrum							35100	35100	58500
Treubaria					2925				
Staurastrum	15700	15700	15700	2925		2925	2925	5850	

Lake Bailey Phytoplankton (Con't)

Taxon	#1 4/15/80	#2 4/15/80	#3 4/15/80	#1 6/26/80	#2 6/26/80	#3 6/26/80	#1 10/16/80	#2 10/16/80	#3 10/16/80
Euglena				8775					
Phacus						5850			
Trachelomonas			7850	11700		5850		2925	
Ceratium				2925					
Peridinium	31400	7850		35100	38025	17550			
Chroomonas	23550		23550			2925	2925		
Cryptomonas	7850	7850	39250		2925		20475		
Cyanomonas				2925	8775	5850			
Anabaena	12560000	10597500	8635000	272025	272025	312975			
Aphanothece				234000	117000		862875	585000	438750
Chroococcus		125600				5850	304200	251550	482625
Dactylococcopsis	47100	117750	39250	11700	14625	23400	49725	131625	111150
Merismopedia									46800
Asterionella	62800	47100	70650						
Acanthoceras				8775	20475	20475			
Aulacosira	47100	23550	141300	140400	40950	149175		11700	32175
Cyclotella				81900	102375	128700	2925		5850
Cymbella	7850	7850							

Taxon	#1 4/15/80	#2 4/15/80	#3 4/15/80	#1 6/26/80	#2 6/26/80	#3 6/26/80	#1 10/16/80	#2 10/16/80	#3 10/16/80
Eunotia			15700	29250	32175	78975	450450	406575	596700
Navicula							5850	5850	2925
Neidium			7850						
Nitzschia	15700		7850	2925	8775	5850	5850		
Rhizosolenia	7850	7850	7850			5850			
Surirella			7850	2925					
Synedra	125600	86350	196250	23400	11700	29250	2925		
Dinobryon	47100	86350	188400	40950		38025	8775		
Mallomonas					2925		52650	20475	23400
Synura	5777600	4772800	2763200						

APPENDIX TABLE III. Continued.
CALION LAKE PHYTOPLANKTON
Cells/Liter

Taxon	#1 5/13/80	#1 Rep 5/13/80	#2 5/13/80	#3 5/13/80	#1 6/25/80	#1 Rep 6/25/80
Acanthosphaeria				3925		
Chlamydomonas						
Chodatella					7850	
Coelastrum	251200	251200	376800	251200		
Crucigenia	141300	172700	282600	345400		
Dictyosphaerium			31400	62800	1004800	1130400
Gloeocystis	125600		70650		125600	62800
Golenkinia	7850				19625	11775
Kirchneriella						
Oocystis	7850	11775	15700		184475	223725
Pediastrum	15700	62800		31400		
Pteromonas					47100	35325
Scenedesmus	2504150	2339300	2331450	1711300	423900	345400
Tetraedron	121675	105975	78500	54950	90275	133450
Cosmarium						
Staurastrum	490625	573050	447450	302225	145225	200175
Euglena	27475	31400	19625	27475	27475	35325

Calion Lake Phytoplankton (Con't)

#2 6/25/80	#3 6/25/80	#1 10/22/80	#3 10/22/80	#3 10/22/80	#3 Rep 10/22/80
31400	23550				
251200	125600				
439600	659400	345400	800700	78500	737900
1130400	1648500	345400	117750	769300	816400
			62800	502400	251200
31400	23550	3925		7850	3925
62800					
486700	368950	105975	168775	54950	39250
125600	125600				
78500					
376800	502400	1350200	1099000	832100	737900
455300	565200	302225	239425	70650	82425
	15700	109900	188400	141300	109900
109900	180550	129525	74575	109900	145225
15700	7850	43175	27475	35325	19625

Calion Lake Phytoplankton (Con't)

Taxon	#1 5/13/80	#1 Rep 5/13/80	#2 5/13/80	#3 5/13/80	#1 6/25/80	#1 Rep 6/25/80
Phacus	15700	7850	11775		3925	
Trachelomonas	11775	7850	7850	11775	11775	3925
Peridinium			3925		172700	211950
Cryptomonas	27475	11775	11775	7850		3925
Chroomonas	11775		19625			
Cyanomonas					3925	3925
Anabaena					4710000	4710000
Aphanizomenon						
Aphanothece	588750	294375	196250	196250	3532500	4317500
Chroococcus	62800	94200	31400	47100	125600	125600
Dactylococcopsis	635850	404275	392500	365025	416050	380725
Lyngbya					18840000	20017500
Merismopedia	31400				62800	31400
Amphora						
Asterionella					31400	
Acanthoceras						
Aulacosira			19625	7850	7850	19625

Calion Lake Phytoplankton (Con't)

#2 6/25/80	#3 6/25/80	#1 10/22/80	#2 10/22/80	#3 10/22/80	#3 Rep 10/22/80
		11775		27475	11775
15700	39250	3925	15700	15700	27475
78500	109900	74575	74575	43175	51025
7850	7850	153075	66725	54950	15700
		7850	7850	3925	
					11775
1099000	1648500				
588750	510250				
1962500	1962500	2060625	451375	981250	883125
502400	251200	235500	188400	376800	329700
1240300	1570000	317925	262975	471000	404275
62800000	60052500	471000	1884000	2355000	1884000
376800	125600	376800	125600	62800	125600
		3925			
47100	31400				
	23550	31400	31400		7850

Calion Lake Phytoplankton (Con't)

Taxon	#1 5/13/80	#1 Rep 5/13/80	#2 5/13/80	#3 5/13/80	#1 6/25/80	#1 Rep 6/25/80
Cyclotella	31400	15700	43175	19625	19625	23550
Eunotia	172700	102050	35325	15700	341475	239425
Navicula						3925
Nitzschia	7850	3925	11775	3925	3925	3925
Pinnularia				3925		3925
Rhizosolenia	3925	3925	7850	3925	47100	66725
Synedra	278675	341475	223725	353250	231250	282600
Dinobryon	7850	11775	35325	11775	325775	208025
Mallomonas	11775	15700	19625	11775	3925	3925
Synura	251200	251200	125600	125600		
Rhizochrysis						
Ophiocytium	11775					
Centritractus						

Calion Lake Phytoplankton (Con't)

#2 6/25/80	#3 6/25/80	#1 10/22/80	#2 10/22/80	#3 10/22/80	#3 Rep 10/22/80
47100	39250	27475	15700	39250	31400
580900	761450			23550	11775
31400	7850	74575	51025	70650	54950
31400	15700	31400		27475	19625
62800	23550				
164850	125600	208025	200175	306150	317925
		35325	51025	47100	43175
15700	7850		3925	3925	
			7850		
15700	7850		3925		

APPENDIX TABLE III. Continued.
UPPER LAKE CHICOT PHYTOPLANKTON

Cells/Liter

Taxon	#1 5/13/80	#2 5/13/80	#3 5/13/80	#1 6/24/80	#1A 6/24/80	#2 6/24/80	#3 6/24/80	#1 10/22/80	#2 10/22/80	#3 10/22/80	#3 Rep 10/22/80
lastrum	62800	125600							62800		
:igenia	62800	251200		188400	62800		78500	251200	149150	306150	329700
tyosphaerium						188400	314000		62800	62800	125600
orina						62800					
chneriella				31400	47100						
ystis		11775		31400	62800	66725	11775				
iastrum		31400		125600	125600		125600	62800		125600	62800
iedesmus	39250	39250	7850	62800	31400		31400	94200	266900	62800	62800
roederia		7850	3925			3925					
caedron						3925	3925	19625	27475	35325	27475
castrum	3925								533800		
sterium		3925									
lena				35325	23550	3925	3925	270825	51025	66725	78500
:us				3925	11775		3925				
chelomonas	137375	47100	7850	90275	62800	27475	11775	149150	82425	98125	121675
idinium				3925	7850						
otomonas	11775	3925		19625	11775	15700	7850	109900	639775	192325	208025

CC 3a

pper Lake Chicot Phytoplankton (Con't)

Taxon	#1 5/13/80	#2 5/13/80	#3 5/13/80	#1 6/24/80	#1A 6/24/80	#2 6/24/80	#3 6/24/80	#1 10/22/80	#2 10/22/80	#3 10/22/80	#3 Rep 10/22/80
hroomonas		19625	7850					3925			
nabaenopsis								392500	3571750	2551250	2355000
nabaena				1373750	843875	1766250	196250			306150	196250
phanizomenon				588750	392500	785000	196250				
phanothece				588750	392500	294375	98125	392500		314000	588750
hroococcus	235500							588750		176625	39250
actylococcopsis	35325							137375	105975	82425	105975
erismopedia	314000	259050		31400	2237250				6028800		
icrocystis				1766250				1962500		1757400	1962500
scillatoria				157000	196250	298300		12756250	31400000	6594000	5887500
habdoderma	219800										
aphidiopsis	741825	408200	251200	3925	3925			149150		86350	74575
ulacosira	337550	62800	35325	3206725	2614050	1444400	745750	196250	349325	259050	278675
yclotella	35325		23550				7850	58875	58875	113825	117750
avicula			3925					3925			
itzschia	109900			266900	153075	215875	90275	471000	388575	278675	314000
ynedra								15700	66725		
allomonas					3925		3925		3925	3925	

CC 3b

APPENDIX TABLE III. Continued.

LAKE ENTERPRISE PHYTOPLANKTON

Cells/Liter

Taxon	$\bar{x}$	#1 6/25/80	#2 6/25/80	#3 6/25/80	#1 10/22/80	#1 Rep 10/22/80	#2 10/22/80	#3 10/22/80	#1 Rep $\bar{x}$ exc
Botryococcus					1687750	1530750	2001750	1138250	1609250
Coelastrum	57567	47100	125600		4710000	628000	376800	376800	408200
Crucigenia	143917	149150	109900	172700	3140000	3768000	5871800	2794600	3935467
Dictyosphaerium	94200	47100		235500	1648500	1570000	2786750	769300	1734850
Elakatothrix					23550	31400			7850
Gloeocystis					62800	62800			20933
Kirchneriella							176625		58875
Micractinium	26167	15700	62800				102050		34017
Oocystis	7850	7850		15700	98125	121675			32708
Pediastrum	20933		62800				1507200	1256000	1925867
Scenedesmus	7850	7850	15700		785000	942000	785000	706500	758833
Selenastrum					1884000	2001750	2029225	2339300	2084175
Tetraedron	7850	7850	11775	3925	105975	66725	105975	11775	74575
Tetrastrum							125600		41867
Staurastrum	14392	11775	3925	27475	82425	98125	51025	19625	139991
Euglena	1308			3925			31400		10467
Trachelomonas	14392	15700	7850	19625	184475	204100	15700	11775	70650

CC 4a

Lake Enterprise Phytoplankton (Con't)

Taxon	$\bar{x}$	#1 6/25/80	#2 6/25/80	#3 6/25/80	#1 10/22/80	#1 Rep 10/22/80	#2 10/22/80	#3 10/22/80	#1 Rep $\bar{x}$ exc
Peridinium							11775	11775	7850
Cryptomonas	19625	15700	27475	15700	317925	380725	47100	102050	155692
Chilomonas	1308		3925						
Anabaena	8831250	8831250	8831250	8831250	231570	2551250	5495000	2060625	2595731
Aphanizomenon	2326217	3140000	3532500	3061500					
Aphanothece	3663333	3140000	1471875	6378125	5298750	5495000	5887500	1570000	4252083
Chroococcus	45792	98125	39250				215875		71958
Coelosphaerium	425208	294375	392500	588750					
Dactylococcopsis	58875	54950	51025	70650	105975	90275	90275	86350	94200
Holopedium	3271		98125						
Merismopedia	1784567	1884000	1271700	2198000	3532500	3391200	1413000	6476250	3807250
Microcystis	1072833	392500		2041000	5887500	5298750			1962500
Spirulina	10467	11775		19625	19625	70650	7850		9158
Cyclotella					27475	43175	23550		17008
Nitzschia	11775	11775	23550		149150	113825		7850	52333
Synedra					47100	66725	62800	19625	43175

APPENDIX TABLE III. Continued.

LAKE JUNE PHYTOPLANKTON

Cells/Liter

Taxon	#1 5/12/80	#2 5/12/80	#3 5/12/80	#1 6/25/80	#2 6/25/80	#3 6/25/80	#1 10/23/80	#2 10/23/80	#3 10/23/80
Ankistrodesmus					7850				
Asterococcus			23550						
Carteria							15700		
Chlamydomonas		3925							
Chlorogonium							204100	109900	147150
Coelastrum	1758400	251200	628000				7526000	4521600	4804200
Crucigenia	219800		62800			282600	2041000	2826000	2307900
Dictyosphaerium	1193200	879200	1303100		31400				125600
Elakatothrix							23550		
Franceia				15700			15700		
Glococystis	251200	408200	314000						
Golenkinia				7850			39250	54950	70650
Gonium						125600			
Kirchneriella						23550	157000	125600	125600
Oocystis	117750	105975	54950				39250	62800	54950
Pandorina				125600				251200	125600
Pediastrum	384650	353250	62800						

Lake June Phytoplankton (Con't)

Taxon	#1 5/12/80	#2 5/12/80	#3 5/12/80	#1 6/25/80	#2 6/25/80	#3 6/25/80	#1 10/23/80	#2 10/23/80	#3 10/23/80
Polyedriopsis				15700	7850				
Scenedesmus	596600	329700	188400	580900	266900	690800	1177500	1570000	1318800
Schroederia	259050	74575	31400						
Selenastrum				62800	23550	7850	102050	125600	117750
Tetraedron	47100	3925	7850	23550	7850	39250	368950	706500	682950
Tetrastrum			62800			31400	125600	125600	125600
Treubaria						23550			
Unid greens							824250	1004800	659400
Cosmarium				7850					
Staurastrum	86350	27475	27475			7850			
Euglena							47100	62800	86350
Phacus							15700	47100	39210
Trachelomomas		11775	11775	39250			439600	753600	887050
Peridinium				23550	7850	7850	62800	164850	125600
Chroomonas	329700	98125	109900	125600	94200	15700			
Cryptomonas	219800	43175	39250	133450	117750	39250	1263850	471000	659400
Cyanomonas				31400	7850	47100	7850		
Anabaena				60052500	134630000	128350000			

Lake June Phytoplankton (Con't)

Taxon	#1 5/12/80	#2 5/12/80	#3 5/12/80	#1 6/25/80	#2 6/25/80	#3 6/25/80	#1 10/23/80	#2 10/23/80	#3 10/23/80
Aphanizomenon			215875						
Aphanothece				2826000	12167500	16877500	3532500	1766250	1570000
Chroococcus						376800	6201500	11932000	9027500
Cyanarcus						31400	227650	376800	235500
Dactylococcoysis		11775	3925	117750	211950		431750	1051900	1004800
Lyngbya				10597500	60445000	42782500			
Aulacosira	1554300	573050	231575	5008300	2190150	3085050	39250	109900	54950
Cyclotella				219800	62800	31400	23550	31400	15700
Gomphonema	7850								
Cyrosigma		3925	3925						
Navicula	7850					7850			7850
Nitzschia						23550			7850
Rhizosolenia	565200	204100	141300						
Synedra	23550			7850	70650	23550			
Ophiocytium							7850		
Dinobryon	533800	145225	47100						
Mallomonas	94200	11775					266900	298300	227650
Synura	3516800	502400	502400				502400	125600	

CC 5c

APPENDIX TABLE III. Continued.

LAKE LOU EMMA PHYTOPLANKTON

Cells/Liter

Taxon	#1 4/11/80	#2 4/11/80	#3 4/11/80	#1 6/26/80	#1 Rep 6/26/80	#2 6/26/80	#3 6/26/80	#1 10/16/80	#2 10/16/80	#3 10/16/80
Actinastrum				1020500	675100	871350	808550			
Chodatella				15700						
Coelastrum	753600	1130400	376800	28385600	21477600	31023200	23361600	628000		3532500
Crucigenia				376800	675100	800700	1632800	628000	157000	942000
Dictyospharium	2292200	6217200	7253400							314000
Elakatothrix	3281300	6374200	4270400							
Franceia	7850									
Gloeocystis		251200		2300050	753600	3077200	1758400			
Kirchneriella	321850	337550	298300				125600			
Micractinium	188400	125600	125600							
Monoraphidium		235500	54950	86350	7850	31400	62800			
Oocystis	251200	1130400	910600	1475800	628000	2198000	910600			
Pandorina				188400	455300	188400	580900			
Pediastrum				635850	400350	502400	413000			
Pteromonas										39250
Quadrigula						31400				
Scenedesmus	11272600	5903200	615440	1169650	329700	376800	494550	157000	157000	471000

Lake Lou Emma Phytoplankton (Con't)

Taxon	#1 4/11/80	#2 4/11/80	#3 4/11/80	#1 6/26/80	#1 Rep 6/26/80	#2 6/26/80	#3 6/26/80	#1 10/16/80	#2 10/16/80	#3 10/16/80
Schroederia	518100	439600	549500							
Selanastrum	39250									
Tetraedron	7850		15700	15700	39250	23550	70650			
Tetrastrum	345400	565200	533800	777150	306150	879200	973400			
Treubaria				7850	15700	7850				
unid.flag.									39250	117750
Staurastrum				15700	39250					
Trachelomonas	54950	39250	70650		78500	70650	76800	39250	39250	39250
Peridinium	23550		15700							
Chilomonas		23550	31400							
Chroomonas		54950	94200	31400	15700		7850	117750	157000	314000
Cryptomonas	337550	518100	926300						157000	78500
Aphanizomenon				541650	722200	219800	808550	1.5077B	1.4170B	1.7007B
Chroococcus	5809000	3925000	7693000					274750	157000	
Dactylococcopsis	31400		15700	219800	125600	133450	141300	314000	235500	314000
Gomphosphaeria				839950						
Merismopedia				211950						

Lake Lou Emma Phytoplankton (Con't)

Taxon	#1 4/11/80	#2 4/11/80	#3 4/11/80	#1 6/26/80	#1 Rep 6/26/80	#2 6/26/80	#3 6/26/80	#1 10/16/80	#2 10/16/80	#3 10/16/80
Microcystis								2551250	14915000	13345000
Oscillatoria								12049750	6201500	23942500
Rhabdoderma	133450			172700		39250	109900			
Aulacosira						31400				
Cyclotella	463150	447450	337550						117750	353250
Nitzschia						7850				
Surirella										39250
Synedra	7850	39250	23550							

APPENDIX TABLE III. Continued.

NEWPORT LAKE PHYTOPLANKTON

Cells/Liter

Taxon	#1 5/14/80	#2 5/14/80	#3 5/14/80	#1 6/23/80	#2 6/23/80	#3 6/23/80	#1 10/22/80	#2 10/22/80	#3 10/22/80
Actinastrum				35325	541650				
Botryococcus							298300		
Coelastrum	62800				376800				
Crucigenia	157000	219800	832100	345400	251200	345400	31400	329700	15700
Dictyosphaerium	141300	31400	188400	3768000	408200	471000		78500	
Elakotothrix		23550							
Gloeocystis									15700
Kirchneriella	157000	15700							
Oocystis		39250	35325						
Pandorium					502400	2260800			
Pediastrum						251200			
Pteromonas					11775				
Scenedesmus	361100	942000	1899700	109900	596600	125600	164850	259050	117750
Schroederia							3925		
Selenastrum	3925		43175				11775		
Tetraedron			23550	7850	11775	51025			3925
Tetrastrum		62800	31400		188400	125600			

Newport Lake Phytoplankton (Con't)

Taxon	#1 5/14/80	#2 5/14/80	#3 5/14/80	#1 6/23/80	#2 6/23/80	#3 6/23/80	#1 10/22/80	#2 10/22/80	#3 10/22/80
Staurastrum				19625	11775			3925	
Euglena			27474		43175	70650			
Phacus	7850		7850				3925		
Trachelomonas			58875	90275	90275	70650		27475	23550
Gymnodinium	82425	518100	35325						
Peridinium	11775		15700	105975		31400			
Cryptomonas	231575	184475	74575	51025	51025	168775	11775	15700	286525
Anabaena	145225				981250	686875		196250	196250
Aphanothece					3532500	12952500		196250	196250
Chroococcus	157000		392500	23550					
Dactylococcopsis			90275	43175	19625	7850	7850	15700	31400
Gomphosphaeria			196250						
Merismopedia			376800	596600		1193200		298300	
Oscillatoria		172700	384650	168775	5495000				
Aulacosira	74575	329700	439600	31400	43175	39250	27475	82425	74575
Cyclotella	121675	667250	380725	43175	90275	51025	39250	11775	15700
Nitzschia			3925		27475	19625	7850	11775	7850

Newport Lake Phytoplankton (Con't)

Taxon	#1 5/14/80	#2 5/14/80	#3 5/14/80	#1 6/23/80	#2 6/23/80	#3 6/23/80	#1 10/22/80	#2 10/22/80	#3 10/22/80
Synedra		19625	27475		153075	23550		7850	3925
Mallomonas		204100	7850				7850	3925	7850
Synura			251200						137375
Centritractus				7850					

APPENDIX TABLE III. Continued.
OLD TOWN LAKE PHYTOPLANKTON
Cells/Liter

Taxon	#1 5/14/80	#1 Rep 5/14/80	#2 5/14/80	#3 5/14/80	#1 6/24/80	#2 6/24/80	#3 6/24/80	#1 10/21/80	#2 10/21/80	#3 10/21/80
Chlamydomonas						7850				3925
Coelastrum	282600	376800	879200			125600				
Crucigenia					188400	125600		15700		62800
Dictyosphaerium	251200	188400	219800			502400		31400	125600	
Elakatothrix			31400							
Gloeocystis										31400
Oocystis	62800	251200	262975	13700	23550	141300		27475	7850	15700
Pediastrum	251200	188400	129525		62800			62800	125600	
Scenedesmus	172700	164850	243350	109600	62800	376800		266900	172700	408200
Schroederia	23550	19625	15700							
Selenastrum	31400	27475								
Tetraedron	11775	19625	11775		19625	94200		15700	11775	39250
Tetrastrum									31400	
Treubaria			19625							
Euglena	7850	7850	15700		23550	23550		3925		58875
Phacus				13700						
Trachelomonas	47100	43175	47100	27400	11775	62800		15700	27475	62800

Old Town Lake Phytoplankton (Con't)

Taxon	#1 5/14/80	#1 Rep 5/14/80	#2 5/14/80	#3 5/14/80	#1 6/24/80	#2 6/24/80	#3 6/24/80	#1 10/21/80	#2 10/21/80	#3 10/21/80
Peridinium	11775	3925	7850		7850					7850
Cryptomonas	54950	43175	66725	13700	3925	23550		66725	62800	109900
Chroomonas	23550	19625	31400	13700	3925	39250	39250	11775	7850	39250
Cyanomonas									7850	
Anabaena					1373750	6280000		14326250	7850000	20017500
Aphanocapsa								168775	125600	251200
Apahnothece			4513750		196250	19625000		785000	588750	1373750
Chroococcus						942000		431750	255125	628000
Cyanoarcus						94200			47100	
Dactylococcopsis			3925		15700	54950		70650	62800	74575
Marsoniella	31400								62800	
Merismopedia					188400	12560000		1884000	753600	2512000
Spirulena									19625	31400
Achnanthes									7850	
Aulacosira	2249025	2190150	4819900	287700	1915400	8258200		588750	514175	565200
Caloneis							39250			
Cyclotella	306150	247275	706500	13700	86350	612300	39250	11775		15700
Fragilnium										15700

Old Town Lake Phytoplankton (Con't)

Taxon	#1 5/14/80	#1 Rep 5/14/80	#2 5/14/80	#2 5/14/80	#1 6/24/80	#2 6/24/80	#3 6/24/80	#1 10/21/80	#2 10/21/80	#3 10/21/80
Gyrosigma	15700	19625	3925	13700	3925					
Navicula	39250	62800	23550	13700						
Nitzschia	62800	82425	105975	54800	23550	172700		325775	353250	208025
Pinnularia					7850		39250			
Rhopalodia				13700						
Skeletonenia	105975	82425								
Stephanodiscus						117750				
Synedra			23550	13700	11775	54950		62800	51025	27475
Dinobryon			3925							
Mallomonas										7850

APPENDIX TABLE III. Continued.

REYNOLD'S PARK LAKE PHYTOPLANKTON

Cells/Liter

Taxon	#1 5/15/80	#1 Rep 5/15/80	#2 5/15/80	#3 5/15/80	#1 6/23/80	#2 6/23/80	#3 6/23/80	#1 10/20/80	#2 10/20/80	#3 10/20/80
Acanthosphaeria								3925		
Coelastrum							62800			376800
Crucigenia		62800	15700		314000	314000	172700	62800	408200	282600
Dictyosphaerium	31400				62800	329700	219800	62800	251200	141300
Gloeocystis							15700			
Golenkinia						3925				
Oocystis			11775			31400	31400			62800
Pediastrum	125600	62800	7850	125600	251200	62800	125600		251200	
Pteromonas						3925				
Scenedesmus		15700	109900	94200	306150	125600	353250	78500	94200	282600
Tetraedron	3925	7850	11775	7850	35325	7850	51025	27475	74575	78500
Tetrastrum			15700						94200	
Cosmarium					3925					
Staurastrum			15700	3925		35325	27475	27475	506325	341475
Euglena	172700	239425	66725	121675	184475	94200			129525	211950
Phacus		7850		7850	7850	11775	3925	3925	31400	58875
Trachelomonas	35325	11775	35325	7850		74575	105975	15700	58875	121675

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Reynold's Park Lake Phytoplankton (Con't)

Taxon	#1 5/15/80	#1 Rep 5/15/80	#2 5/15/80	#3 5/15/80	#1 6/23/80	#2 6/23/80	#3 6/23/80	#1 10/20/80	#2 10/20/80	#3 10/20/80
Peridinium	168775	255125	306150	66725	168775	94200	27475		43175	62800
Cryptomonas		3925		7850	7850	15700	7850	35325	105975	105975
Cyanomonas						3925				
Anabaena	90275				345400					
Apahnothece					294375		490625			
Chroococcus							137375			
Cyanarcus							11775			
Dactylococcopsis		7850	27475		82425	7850	23550	223725	31400	200175
Marsoniella					102050			90275		
Merismopedia				62800			125600	2669000	3611000	2260800
Oscillatoria					471000	188400	31400			
Rhabdoderma						11775				
Aulacosira			19625	31400	478850	357175	286525	164850	620150	502400
Cyclotella					11775	3925	11775	74575	145225	105975
Frustulia			3925							
Gyrosigma			3925	3925						
Navicula					11775					

Reynold's Park Lake Phytoplankton (Con't)

Taxon	#1 5/15/80	#1 Rep 5/15/80	#2 5/15/80	#3 5/15/80	#1 6/23/80	#2 6/23/80	#3 6/23/80	#1 10/20/80	#2 10/20/80	#3 10/20/80
Nitzschia			3925	11775	19625	7850		105975	113825	243350
Pinnularis			3925							
Synedra					7850		11775			66725
Dinobryon			51025	11775	168775	70650	62800			
Mallomonas					3925	7850	3925			
Centritractus						15700	11775			

APPENDIX TABLE III. Continued.

LAKE WALLACE PHYTOPLANKTON

Cells/Liter

Taxon	#1 5/13/80	#2 5/13/80	#3 5/13/80	#1 6/24/80	#2 6/24/80	#3 6/24/80	#1 10/21/80	#2 10/21/80	#3 10/21/80
Acanthosphaera		7850							
Actinastrum								15700	
Chodatella				7850					
Coelastrum	502400	62800						62800	62800
Crucigenia	266900	329700		392500	141300	94200	219800	188400	329700
Dictyosphaerium		62800	62800			31400		62800	266900
Eudorina			125600						
Donium					125600			62800	
Micractinium				90275				11775	
Oocystis	27475	27475	15700	19625					15700
Pandorina					125600			31400	
Pediastrum		31400		15700	15700	188400	314000	31400	62800
Pteromonas					7850				
Scenedesmus	15700	235500	235500	196250	47100		243350	439600	1475800
Schroederia						3925	3925	7850	3925
Selenastrum			11775				3925	62800	172700
Tetraedron		11775	35325	27475	23550		31400	39250	3925

Taxon	#1 5/13/80	#2 5/13/80	#3 5/13/80	#1 6/24/80	#2 6/24/80	#3 6/24/80	#1 10/21/80	#2 10/21/80	#3 10/21/80
Tetrastrum								15700	
Treubaria			11775						
Cosmarium								7850	
Staurastrum		19625	19625					23550	15700
Euglena			3925	3925	105975				
Phacus								3925	
Trachelomonas	19625	27475	160925	98125	380725	94200	262975	239425	27475
Cryptomonas	11775	7850	23550	62800	39250	11775	733975	270825	15700
Chroomonas	7850	19625				3925	105975	27475	
Anabaena	196250	1766250	2551250	588750	981250	785000		168775	196250
Aphanizomenon					3140000				
Aphanothece		196250	7850	98125		98125			
Chroococcus			117750						
Dactylococcopsis		35325	251200	11775	11775	3925	47100	54950	23550
Holopedium								282600	
Merismopedia		282600	282600	345400		219800			376800
Aulacosira	15700	86350	153075	31400	54950		35325	109900	39250
Cyclotella			7850						

Lake Wallace Phytoplankton (Con't)

Taxon	#1 5/13/80	#2 5/13/80	#3 5/13/80	#1 6/24/80	#2 6/24/80	#3 6/24/80	#1 10/21/80	#2 10/21/80	#3 10/21/80
Epithemia			3925						
Navicula					3925				
Nitzschia		19625	23550				51025	66725	19625
Pinnularia						3925			
Synedra		7850	3925				7850	19625	31400
Dinobryon			70650		3925				
Mallomonas			3925		3925				
Ophiocytium			3925						

APPENDIX TABLE IV

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Bailey

Taxon	4/15/80 Station 1	2	3	6/26/80 Station 1	2	3	10/16/80 Station 1	2	3
Rotatoria									
Keratella sp.									
K. cochlearis	109.5	88.0	54.0	53.5	432.3	313.7	5.2	24.5	17.5
K. quadrata	0.8								
Kellicottia boston.	24.8	22.0	3.8	11.0	7.0	2.1			
Hexarthra mira				4.5	3.5				1.7
Trichocerca longiseta									
T. capucina									
Trichocerca sp.		3.3	0.8	2.0	5.3	10.3	0.7		
Polyarthra vulgaris	10.5	23.1	0.8	7.5	15.8	4.1	19.5	42.0	29.7
P. euryptera				0.5					
Synchaeta stylata	3.8	5.5	1.8	5.5	24.5	22.6			
Asplanchna priodonta	55.5	70.4	15.6	5.5	22.8	57.4	2.2	3.5	5.2
Lecane sp.									
Conochiloides coenob.	27.0	15.4	3.6	4.5	26.3	49.2	1.5		1.7
Conochilus unicornis	30.0	12.1	1.6	72.0	45.5	137.4	115.5	327.2	199.5
Collotheca sp.				4.0	12.3	41.0			
Monostyla sp.									
Brachionus sp.			0.4						
B. havanaensis				5.5	14.0	4.1			
B. plicatilis									
B. calyciflorus									
B. quadridentata								1.7	
B. angularis				12.0	36.8	10.3	21.7	12.2	3.5
B. caudatus				0.5					
Filinia sp.			0.2	2.0	8.8	6.1	2.2		5.2
Ploesoma truncatum				1.5					
Total Rotatoria	261.9	239.8	82.6	192.0	654.9	658.3	168.5	411.1	264.0

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Calion

Taxon	5/13/80 Station 1 (A/B)	5/13/80 Station 2	5/13/80 Station 3	6/25/80 Station 1 (A/B)	6/25/80 Station 2	6/25/80 Station 3	10/22/80 Station 1	10/22/80 Station 2	10/22/80 Station 3 (A/B)
Rotatoria									
Keratella sp.									
K. cochlearis	1.0/1.6		3.0	214.5/153.4	7.9	8.1	1.5	1.7	0.4/0.3
K. quadrata									
Kellicottia boston.	2.6/0.6	4.2	1.2	7.8/2.6	0.2	0.6			/0.2
Hexarthra mira									
Trichocerca longiseta									
T. capucina									
T. similis							0.2		/0.2
Trichocerca sp.	0.4/		1.6						
Polyarthra vulgaris	5.0/4.4	12.6	3.7	29.9/14.3	1.2	1.7	0.6	0.6	0.6/3.0
P. euryptera				1.3/	0.2	0.2		0.4	
Synchaeta stylata				6.5/	0.2	0.4	0.2	0.4	/0.2
Asplanchna priodonta	2.8/3.2	23.1	5.8	2.6/11.7	2.8	3.9			
Lecane sp.									
Conochiloides coenob.		2.1		29.9/27.3	10.7	7.3	1.1	0.4	1.3/1.2
Conochilus unicornis	146.4/176.8	243.6	97.5	119.6/83.2	32.5	11.6	34.2	19.2	42.5/62.8
Collotheca sp.					0.2				
Monostyla sp.					0.1				
Brachionus sp.	/0.2		0.5						0.9/
B. havanaensis				6.5/19.5	0.6	1.1	0.6	1.5	0.3/2.5
B. plicatilis									
B. calyciflorus									
B. quadridentata							0.4		
B. angularis				1.3/2.6	0.7	1.5	0.4	0.7	0.6/0.2
B. caudatus				1.3/1.3	0.1				
Filinia sp.				/2.6	0.9	0.4	0.1	0.1	6.6/0.2
Hexarthra sp.				1.3/2.6	0.2		0.2		0.3/0.7
Euchlanis sp.						0.1			
Platyias patulus									/0.1
tal Rotatoria	158.2/186.8	285.6	113.3	422.5/321.1	58.5	36.9	39.5	25.0	53.5/71.6

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/ NDIX TABLE IV. Cont.

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Bailey

Taxon	4/15/80 Station 1	4/15/80 Station 2	4/15/80 Station 3	6/26/80 Station 1	6/26/80 Station 2	6/26/80 Station 3	10/16/80 Station 1	10/16/80 Station 2	10/16/80 Station 3
Copepoda									
Nauplius	24.8	25.3	5.2	9.5	7.0	22.6	128.2	115.5	101.5
Copepodid			0.4	1.0		2.1	3.7	7.0	26.2
Cyclopoida	1.5	4.4	0.2	3.0				1.7	1.7
Calanoida	0.8	1.1	0.2	2.5		6.2	6.0	5.2	7.0
Ergasilus sp.								3.5	
Total Copepoda	27.1	30.8	6.0	16.0	7.0	30.9	137.9	132.9	136.4
Cladocera									
Bosmina longirostris	6.8	42.9	9.0				9.0	38.5	17.5
B. coregoni									
Daphnia spp.	0.8	6.6	2.2					1.7	3.5
Daphnia parvula								1.7	1.7
Cladocera spp.									
Ceriodaphnia lacustris			0.2						
C. quadrangula								1.7	
Ceriodaphnia sp.									
Diaphanasoma leucht.			0.4		1.8				
Cladocera (immature)							1.5	7.0	1.7
Chydorus sp.	3.0		0.2						
Total Cladocera	10.6	49.5	12.0		1.8		10.5	50.6	24.4
Chaoborus sp.									
Total Organisms	299.6	320.1	100.6	208.0	663.7	689.2	316.9	594.6	424.8

PPENDIX TABLE IV Cont.

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Calion

Taxon	5/13/80 Station A/B 1	5/13/80 Station 2	5/13/80 Station 3	6/25/80 Station A/B 1	6/25/80 Station 2	6/25/80 Station 3	10/22/80 Station 1	10/22/80 Station 2	10/22/80 Station A/B 3
Copepoda									
Nauplius	44.0/2.8	69.3	42.3	35.1/55.9	5.5	15.1	7.3	13.4	23.6/36.3
Copepodid	2.0/2.2		1.2		0.2	0.1	0.5	0.1	2.3/1.2
Cyclopoida	0.6/0.4		2.1			0.3	0.2		0.6/0.2
Calanoida	9.8/7.2	29.4	2.1		0.3	0.9			
Ergasilus sp.							0.9	1.4	5.6/5.0
Total Copepoda	56.4/12.6	98.7	47.7	35.1/55.9	6.0	16.4	8.9	14.9	32.1/42.7
Cladocera									
Bosmina longirostris	13.2/11.0	23.1	12.0	2.6/6.5	2.3	1.8	0.3	0.1	0.5/0.8
B. coregoni									/0.1
Daphnia spp.	3.8/4.0	6.3	3.5						
Cladocera spp.					0.2	0.1			
Ceriodaphnia lacustris	0.2/0.2								
C. quadrangula									
Ceriodaphnia sp.									
Diaphanasoma leucht.	1.4/		0.5	1.3/3.9	2.0	0.6	0.1		/0.2
Cladocera (immature)									0.2/
Chydorus sp.	0.2/						0.1		/0.1
Total Cladocera	18.8/15.2	29.4	16.0	3.9/10.4	4.5	2.5	0.5	0.1	0.7/1.2
Chaoborus sp.						1.0	0.1		
Total Organisms	233.4/214.6	413.7	177.0	460.2/387.4	69.0	55.8	49.0	40.0	86.3/115.5

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Chicot

Taxon	5/13/80 Station 1	5/13/80 Station 2	5/13/80 Station 3	6/24/80 Station A/B 1	6/24/80 Station 2	6/24/80 Station 3	10/22/80 Station 1	10/22/80 Station 2	10/22/80 Station A/B 3
Rotatoria									
Keratella sp.									
K. cochlearis	16.9	2.8	1.3	88.4/83.2	39.8	14.2	0.7	0.3	/0.3
K. quadrata									
Kellicottia boston.	1.0	1.7	0.7				0.2		
Hexarthra mira									
Trichocerca longiseta									
T. capucina						0.9			
T. similis				10.4/5.2					
Trichocerca sp.	0.4			7.8/			0.8		/0.3
Polyarthra vulgaris	1.0	5.5	0.4	57.2/52.0	92.0	77.9	0.1	0.3	3.0/2.7
P. euryptera							0.07		
Synchaeta stylata	0.4			2.6/2.6	1.8		0.2		/0.3
Asplanchna priodonta	1.7	200.4		23.4/20.8	0.9	0.9			
Lecane sp.									
Conochiloides coenob.	0.3			104.4/88.4	13.3	9.7			1.1/0.5
Conochilus unicornis	11.1		11.2		3.5		0.2		0.5/
Collotheca sp.									
Monostyla sp.									
Brachionus sp.	0.7						0.1		
B. havanaensis				5.2/	4.4	2.7			/0.3
B. calyciflorus				57.2/36.4					
B. quadridentata							0.07		
B. angularis				33.8/46.8	3.5		2.3	1.4	3.6/1.1
B. caudatus				548.6/600.6	0.9		0.07		/0.3
Filinia sp.		0.6	0.7	10.4/20.8	0.9		0.07		
Platyias patulus				2.6/			0.07		
Hexarthra sp.				28.6/80.6	112.4	45.1			
Total Rotatoria	33.5	211.0	14.3	980.2/1037.4	273.4	151.4	4.95	2.0	8.2/5.8

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Chicot

Taxon	5/13/80 Station 1	5/13/80 Station 2	5/13/80 Station 3	6/24/80 Station A/B 1	6/24/80 Station 2	6/24/80 Station 3	10/22/80 Station 1	10/22/80 Station 2	10/22/80 Station A/B 3
Copepoda									
Nauplius	23.0	48.4	40.5	132.6/127.4	42.8	68.1	10.2	67.1	88.3/92.7
Copepodid		0.6		7.8/7.8	2.7	2.7	0.1	10.4	6.6/5.8
Cyclopoida	0.7	3.9	4.2	7.8/		2.7	0.4	3.0	1.9/0.5
Calanoida	4.1	18.7	4.2	23.4/15.6	6.2	10.6	0.07		
Ergasilus sp.								2.7	3.3/1.9
Total Copepoda	27.8	71.6	48.9	171.6/150.8	51.7	84.1	10.77	83.2	100.1/100.9
Cladocera									
Bosmina longirostris	3.1	7.2	2.4		2.7	0.9	0.8		
B. coregoni									
Daphnia spp.	8.8	16.0	9.0	/5.2	2.7	7.1		0.3	
Cladocera spp.						0.9			
Ceriodaphnia lacustris					2.7	10.6			
C. quadrangula									
Ceriodaphnia sp.					0.9				
Diaphanasoma leucht.	0.7	0.6		28.6/31.2	6.2	13.3	0.5	0.3	/0.3
Cladocera (immature)							0.2		
Chydorus sp.							0.1		
Total Cladocera	12.6	23.8	11.4	28.6/36.4	15.2	32.8	1.6	0.6	/0.3
Chaoborus sp.						0.1			
Total Organisms	73.9	306.4	74.6	1180.4/1229.8	340.3	268.4	17.32	85.8	108.3/107.0

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Enterprise

Taxon	Station			6/25/80 Station			10/22/80 Station		
	1	2	3	1	2	3	A/B 1	2	3
Rotatoria									
Keratella sp.									
K. cochlearis				119.9	10.5	24.8	3.7/4.5	6.7	21.0
K. quadrata									
Kellicottia boston.				13.2	33.0	16.5			
Hexarthra mira									
Trichocerca longiseta									
T. capucina							4.5/	1.5	
T. similis				4.4			1.5/		
Trichocerca sp.						0.6	/5.2		5.2
Polyarthra vulgaris				3.3	1.7	3.3	123.0/156.7	44.2	1.5
P. euryptera									
Synchaeta stylata				2.2			3.0/2.2	6.0	6.7
Asplanchna priodonta					0.6				
Lecane sp.									
Conochiloides coenob.				3.3	2.2	3.9	3.0/2.2	6.0	6.0
Conochilus unicornis				9.9	4.9	33.6	366.7/308.2	318.7	385.5
Collotheca sp.									
Monostyla sp.							/0.7		
Brachionus sp.									
B. havanaensis				101.2			0.7/0.7		
B. plicatilis									
B. calyciflorus									
B. quadridentata									
B. angularis				28.6	9.9	25.3		0.7	
B. caudatus				23.1	0.6	0.6		1.5	
Filinia sp.				12.1	8.8	9.4			0.7
Hexarthra sp.						1.1			
Total Rotatoria				321.2	82.2	119.1	506.1/485.6	385.3	426.6

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Enterprise

				6/25/80			10/22/80		
	Station			Station			Station		
Taxon	1	2	3	1	2	3	A/B 1	2	3
Copepoda									
Nauplius				8.8	22.0	16.0	87.0/85.5	78.0	70.5
Copepodid				1.1	0.6		11.2/9.0	18.7	3.7
Cyclopoida				1.1	0.6	1.7	0.7/0.7		0.7
Calanoida						1.1	3.0/4.5	4.5	8.9
Ergasilus sp.							/1.5	0.7	
Total Copepoda				11.0	23.2	18.8	101.9/101.2	101.9	83.8
Cladocera									
Bosmina longirostris					0.6	1.1			
B. coregoni									
Daphnia spp.							2.2/3.0	3.7	0.7
Daphnia parvula							1.5/0.7	3.7	0.7
Cladocera spp.									
Ceriodaphnia lacustris									
C. quadrangula									
Ceriodaphnia sp.					1.7				
Diaphanasoma leucht.					0.6				
Cladocera (immature)									
Chydorus sp.							/0.7	1.5	
Total Cladocera					2.9	1.1	3.7/4.4	8.9	1.4
Chaoborus sp.				0.7	1.1	0.1			
Total Organisms				332.9	109.4	139.1	611.7/591.2	496.1	511.8

APPENDIX TABLE IV Cont.

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: June

	5/12/80 Station			6/25/80 Station			10/23/80 Station		
Taxon	1	2	3	1	2	3	1	2	3
Rotatoria									
Keratella sp.									
K. cochlearis	77.7	80.0	7.6	264.0	38.2	790.4	0.07	0.16	
K. quadrata									
Kellicottia boston.	4.2	3.6		88.0	0.2			0.08	
Hexarthra mira									
Trichocerca longiseta									
T. capucina									
T. similis									
Trichocerca sp.					0.1	2.6	0.5	0.49	0.42
Polyarthra vulgaris	18.9	11.8	0.2				2.5	20.16	10.1
P. euryptera							0.6	0.33	
Synchaeta stylata		1.6					0.07	0.25	
Asplanchna priodonta	2.1	1.6	0.6		1.0	20.8	0.03	0.16	
Lecane sp.									
Conochiloides coenob.				798.6	6.7	7.8	0.2	0.33	
Conochilus unicornis	275.1	182.0	15.6	732.6	1.8	7.8	0.07	0.49	
Collotheca sp.									
Monostyla sp.									
Brachionus sp.		0.2					0.03	0.41	0.1
B. havanaensis				103.4	15.6	65.0	3.0	5.62	5.2
B. plicatilis									
B. calyciflorus							1.0	1.57	9.58
B. quadridentata								0.08	
B. angularis				11.0	1.8	36.4	20.8	47.44	49.1
B. caudatus				2.2	7.8	52.0			
Filinia sp.				19.8	1.4	23.4	0.1	1.24	0.1
Platyias sp.				4.4				0.08	
Hexarthra sp.					0.2			0.16	1.46
Euchlanis sp.								0.99	
Rotifer sp.								1.57	
Total Rotatoria	378.0	280.8	24.0	2,024.0	74.8	1,006.2	28.97	81.61	76.06

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ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: June

Taxon	5/12/80 Station 1	5/12/80 Station 2	5/12/80 Station 3	6/25/80 Station 1	6/25/80 Station 2	6/25/80 Station 3	10/23/80 Station 1	10/23/80 Station 2	10/23/80 Station 3
Copepoda									
Nauplius	33.6	41.2	6.4	110.0	6.6	18.2	3.9	3.8	8.64
Copepodid		1.0		4.4			0.4	0.41	0.42
Cyclopoida		0.8	0.8	2.2	0.2	2.6	0.7	0.16	0.21
Calanoida		0.2	0.2	41.8	2.4		0.2	0.25	0.31
Ergasilus sp.							0.07		
Total Copepoda	33.6	43.2	7.4	158.4	9.2	20.8	5.27	4.62	9.58
Cladocera									
Bosmina longirostris	2.1	36.0	1.4	4.4	0.5		0.07	0.08	0.42
B. coregoni									
Daphnia spp.	21.0	38.8	3.2				0.07	0.25	0.21
Daphnia galeata							0.03		
D. ambigua							0.1	0.25	
Cladocera spp.								0.08	
Ceriodaphnia lacustris		3.6							
C. quadrangula									
Ceriodaphnia sp.		2.8	0.2						
Diaphanasoma leucht.			0.2		0.2		0.3	0.25	
Cladocera (immature)		0.4							0.1
Chydorus sp.									
Total Cladocera	23.1	81.6	5.0	4.4	0.7		0.57	0.91	0.73
Chaoborus sp.		0.2		0.1			0.2	0.16	
Total Organisms	434.7	405.8	36.4	2,186.9	84.7	1,027.0	35.01	87.3	86.37

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APPENDIX TABLE IV Cont.

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Lou Emma

Taxon	4/11/80 Station 1	4/11/80 Station 2	4/11/80 Station 3	6/26/80 Station 1 (A/B)	6/26/80 Station 2	6/26/80 Station 3	10/16/80 Station 1	10/16/80 Station 2	10/16/80 Station 3
Rotatoria									
Keratella sp.									
K. cochlearis	8.1	4.0	2.2	20.7/23.0	36.4	20.7		0.1	
K. quadrata									
Kellicottia boston.	0.4		0.2	158.7/172.5		26.6			1.0
Hexarthra mira									
Trichocerca longiseta									
T. capucina							1.3		
T. similis									
Polyarthra vulgaris	1.8	0.4	0.4					0.2	
P. euryptera								0.1	
Synchaeta stylata			0.2						
Asplanchna priodonta	65.7	222.9	153.2	29.9/32.2	153.4	47.2			
Lecane sp.									
Conochiloides coenob.	75.6	54.3	1.4	50.6/103.5	327.6	123.9	6.5	5.7	9.4
Conochilus unicornis	9.0	6.4	16.2	43.7/82.8	57.2	56.0		0.1	1.0
Collotheca sp.									
Monostyla sp.									
Brachionus sp.		1.5	1.6		2.6				
B. havanaensis									
B. plicatilis									
B. calyciflorus	0.9								
B. quadridentata									
B. angularis				46.0/55.2	44.2	41.3			
B. plicatilis	1.8								
Filinia sp.	0.9		0.2						
Euchlanis sp.		5.3							
Platyias patulus					2.6				
Total Rotatoria	164.2	294.8	175.6	349.6/469.2	624.0	315.7	7.8	6.2	11.4

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Lou Emma

	4/11/80			6/26/80			10/16/80		
	Station			Station			Station		
Taxon	1	2	3	A/B 1	2	3	1	2	3
Copepoda									
Nauplius	62.1	97.0	33.0	142.6/128.8	189.8	180.8	81.9	68.6	58.1
Copepodid	11.7	11.9	6.0	6.9/2.3			16.9	11.4	23.1
Cyclopoida	7.2	9.7	0.8	34.5/43.7	13.0	14.8	24.7	4.7	5.2
Calanoida	3.6	4.8	4.2	13.8/23.0	23.4	8.9	66.3	41.3	50.4
Total Copcpoda	84.6	123.4	44.0	197.8/197.8	226.2	203.7	189.8	126.0	136.8
Cladocera									
Bosmina longirostris	2.7	16.5	4.4	172.5/296.7	335.4	413.0	137.8	24.1	79.8
B. coregoni				2.3/					
Daphnia spp.	0.9	4.5	0.2	34.5/32.2	20.8	26.6		0.2	
D. parvula							1.3	0.4	1.0
Cladocera spp.									
Ceriodaphnia lacustris				9.2/9.2	7.8	5.9	104.0	9.1	39.9
C. quadrangula							62.4		28.3
Ceriodaphnia sp.				/9.2	20.8	14.8			
Diaphanasoma leucht.		0.2	0.2	34.5/55.2	114.4	88.5	11.7	3.2	16.8
Cladocera (immature)							29.9	4.8	11.5
Chydorus sp.		0.9	0.4						
Total Cladocera	3.6	22.1	5.2	253.0/402.5	499.2	548.8	347.1	41.8	177.3
Chaoborus sp.		0.2							1.0
Total Organisms	252.4	440.5	224.8	800.4/1069.5	1349.4	1068.2	544.7	174.0	326.5

APPENDIX TABLE IV Cont.

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Newport

Taxon	5/14/80 Station 1	5/14/80 Station 2	5/14/80 Station 3	6/23/80 Station 1	6/23/80 Station 2	6/23/80 Station 3	10/20/80 Station 1	10/20/80 Station 2	10/20/80 Station 3
Rotatoria									
Keratella sp.									
K. cochlearis	12.1	85.0	9.3	21.5	4.2	18.0	0.3		3.2
K. quadrata	1.1								
Kellicottia boston.	141.9	106.2	9.3	3.3	2.4	7.5			
Hexarthra mira									1.3
Trichocerca longiseta									
T. capucina									
T. similis				0.6					
Trichocerca sp.		1.8	0.4				0.8		1.3
Polyarthra vulgaris			3.2	2.8			0.3	1.1	0.6
P. euryptera			0.2						
Synchaeta stylata	9.9	28.3	2.3				0.3		
Asplanchna priodonta	3.3		1.3						
Lecane sp.									
Conochiloides coenob.				24.2	125.4	6.0	0.3		
Conochilus unicornis	37.4	67.3	37.1	60.5	140.4	127.5	6.9	13.1	31.0
Collotheca sp.									
Monostyla sp.									
Brachionus sp.			7.3						
B. havanaensis									
B. plicatilis								0.7	
B. calyciflorus									
B. quadridentata									
B. angularis	3.3	12.4		2.8		1.5		0.4	0.6
B. caudatus				2.2	1.2	6.0			0.6
Filinia sp.	1.1		0.5						
Platyias quadricornis							0.3		
Total Rotatoria	210.1	301.0	70.9	117.9	273.6	166.5	9.2	15.3	38.6

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Newport

Taxon	5/14/80 Station 1	5/14/80 Station 2	5/14/80 Station 3	6/23/80 Station 1	6/23/80 Station 2	6/23/80 Station 3	10/20/80 Station 1	10/20/80 Station 2	10/20/80 Station 3
Copepoda									
Nauplius	49.5	207.0	36.6	75.9	166.8	97.5	36.0	78.5	75.5
Copepodid	2.2		1.8	1.7	5.4	4.5	0.5	0.7	5.2
Cyclopoida	4.4	17.7	2.8	2.2	9.0	9.0	3.0	4.0	5.8
Calanoida	4.4	8.8	1.9	3.3	7.8	6.0	7.1	12.8	4.5
Total Copepoda	60.5	233.5	43.1	83.1	189.0	117.0	46.6	96.0	91.0
Cladocera									
Bosmina longirostris	1.1		0.3				0.8		
B. coregoni									
Daphnia spp.			0.6		0.6	3.0	3.8	4.4	3.2
Daphnia parvula							6.3	9.5	11.6
Cladocera spp.									
Ceriodaphnia lacustris			0.2		0.6	4.5	0.5	0.7	
C. quadrangula									
Ceriodaphnia sp.									
Diaphanasoma leucht.	1.1		0.2	0.6		1.5	0.3		
Cladocera (immature)							0.8	1.1	2.6
Chydorus sp.			0.2						
Total Cladocera	2.2		1.5	0.6	1.2	9.0	12.5	15.7	17.4
Chaoborus sp.				0.2	0.2	0.2	0.3	0.1	0.4
Total Organisms	272.8	534.5	115.6	201.8	464.0	292.7	68.6	127.1	147.4

APPENDIX TABLE IV Cont.

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Old Town

Taxon	5/14/80 Station A/B 1	5/14/80 Station 2	5/14/80 Station 3	6/23/80 Station 1	6/23/80 Station 2	6/23/80 Station 3	10/21/80 Station 1	10/21/80 Station 2	10/21/80 Station 3
Rotatoria									
Keratella sp.									
K. cochlearis	54.4/160.0	657.8	12.1	31.2	20.4	6.9			
K. quadrata									
Kellicottia boston.	6.4/								
Hexarthra mira									
Trichocerca longiseta									
T. capucina									
T. similis									
Trichocerca sp.	3.2/6.4	2.6	2.2		3.7	6.9			
Polyarthra vulgaris	201.6/195.2	153.4	5.5	2.6	6.8	24.2	3.9		
P. euryptera				2.6	1.7	3.6			
Synchaeta stylata	28.8/51.2	23.4							
Asplanchna priodonta	28.8/28.8	5.2	3.3	10.4	18.7	3.6	59.8		
Lecane sp.									
Conochiloides coenob.	12.8/48.8	7.8		184.6	102.0	62.1	26.0	24.0	13.8
Conochilus unicornis	102.4/140.8	210.6		226.2	185.3	248.4	642.2	1684.5	669.3
Collotheca sp.				7.8					
Monostyla sp.									
Brachionus sp.	320.0/406.4	218.4	14.3					29.2	
Brachionus urceolaris							1.3		
B. havanaensis				223.6	34.0	100.0	1.3		
B. plicatilis									
B. calyciflorus						13.8			
B. quadridentata			0.5						
B. angularis				104.0	68.0	27.6	75.4	7.5	
B. caudatus				83.2	102.0	51.8			
Filinia sp.	28.8/28.8	15.6	0.5	18.2	54.4	17.3	5.2		3.4
Platyias patulus			0.5						
Hexarthra sp.				5.2	8.5	24.2			
Total Rotatoria	787.2/1066.4	1294.8	38.9	899.6	605.5	590.4	815.1	1716.0	689.9

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ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Old Town

Taxon	5/14/80 Station 1 (A/B)	5/14/80 Station 2	5/14/80 Station 3	6/23/80 Station 1	6/23/80 Station 2	6/23/80 Station 3	10/21/80 Station 1	10/21/80 Station 2	10/21/80 Station 3
Copepoda									
Nauplius	134.4/179.2	156.0	39.6	65.0	90.1	79.4	36.4	42.0	6.9
Copepodid	9.6/3.2	7.8	0.5		1.7		6.5	13.5	10.3
Cyclopoida	3.2/3.2		4.4	7.8	3.4		2.6	10.5	
Calanoida	3.2/3.2	5.2	2.8	18.2	23.8	10.4			
Ergasilus sp.							46.8	69.0	17.2
Total Copepoda	150.4/188.8	169.0	47.3	91.0	119.0	89.8	46.8	69.0	17.2
Cladocera									
Bosmina longirostris	16.0/35.2	13.0	3.8	2.6	3.4			1.5	
B. coregoni									
Daphnia spp.	25.6/44.8	18.2	7.8	15.6	6.8		2.6		
Daphnia schødleri							1.3		
D. parvula							1.3		
Cladocera spp.			13.2						
Ceriodaphnia lacustris			2.7						
C. quadrangula							1.3		
Ceriodaphnia sp.									
Diaphanasoma leucht.			6.6	18.2	13.6	17.3	5.2	4.5	3.4
Cladocera (immature)							1.3		
Chydorus sp.	3.2								
Total Cladocera	44.8/80.0	31.2	34.1	36.4	23.8	17.3	13.0	6.0	3.4
Chaoborus sp.									
Total Organisms	982.4/1335.2	1495.0	120.3	1027.0	748.3	697.5	874.9	1791.0	710.5

APPENDIX TABLE IV Cont.

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Reynolds

	5/15/80			6/23/80			10/20/80		
	Station			Station			Station		
Taxon	A/B 1	2	3	1	2	3	1	2	3
Rotatoria									
Keratella sp.									
K. cochlearis	64.5/2.5	3.7	3.0	0.4	0.4		1.6		
K. quadrata					0.1				
Kellicottia boston.	19.0/2.0	1.7				0.9			
Hexarthra mira					30.7				
Trichocerca longiseta									
T. capucina									
T. similis									
Trichocerca sp.	20.5/18.0	11.9	6.5	6.3	2.6		0.5	2.6	7.0
Polyarthra vulgaris	38.0/27.5	71.7	79.2	9.2	10.5	3.4	0.5	1.3	3.5
P. euryptera		0.3		0.2	0.3	0.9			
Synchaeta stylata	9.0/	0.7	1.0						
Asplanchna priodonta	22.0/19.0	26.2	19.0	2.5	2.1	4.3	6.2	14.3	22.7
Lecane sp.		0.3		0.2					
Conochiloides coenob.	/5.5			2.3	2.3	4.3	0.1		
Conochilus unicornis	141.0/68.5	199.9	162.5		0.3		105.3	302.9	304.5
Collotheca sp.									
Monostyla sp.							0.1		
Brachionus sp.							0.1		
B. havanaensis	211.5/153.5			0.4	1.4				
B. plicatilis									
B. calyciflorus							0.9	1.3	1.7
B. quadridentata									
B. angularis		105.0	70.0	6.5	7.6	15.3	2.2	13.0	1.7
B. caudatus				43.3	47.6	135.2	1.5	6.5	7.0
Filinia sp.	25.5/21.0	11.9	10.2	11.8	3.6	5.1	2.0	7.8	10.5
Hexarthra sp.	1.5/		1.0	16.2		6.0	1.0	1.3	1.7
Platyias patulus	0.5/								
Lepadella sp.					0.1				
Platyias sp.							0.1		
Total Rotatoria	553.0/317.5	433.3	352.4	99.3	109.6	175.4	122.1	351.0	360.3

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Reynolds

Taxon	5/15/80 Station A/B 1	5/15/80 Station 2	5/15/80 Station 3	6/23/80 Station 1	6/23/80 Station 2	6/23/80 Station 3	10/20/80 Station 1	10/20/80 Station 2	10/20/80 Station 3
Copepoda									
Nauplius	53.5/24.5	13.9	16.3	18.9	32.8	37.4	4.6	23.4	10.5
Copepodid	1.5/1.5	0.7	0.4	1.7	0.9		0.7	5.2	1.7
Cyclopoica	2.0/2.5	0.3	0.7	0.6	0.6		0.2	1.3	
Calanoida	2.0/1.5	1.0	1.0	0.4	0.6	0.9	0.1	1.3	
Ergasilus sp.							0.5	7.8	8.7
Total Copepoda	59.0/30.0	15.9	18.4	21.6	34.9	38.3	6.1	39.0	20.9
Cladocera									
Bosmina longirostris	7.5/4.0	5.1	7.8	2.1	0.7		0.3	1.3	5.2
B. coregoni						0.9			
Daphnia spp.	2.5/1.0			0.8	0.7	1.7	0.4	1.3	
Cladocera spp.	1.0/				0.2				
Ceriodaphnia lacustris							1.0	9.1	
C. quadrangula							1.5	3.9	1.7
Ceriodaphnia sp.	1.0/		1.4	4.4					
Diaphanasoma leucht.	5.0/1.5	1.4	2.7	10.5	13.1	21.3	1.1	6.5	15.7
Cladocera (immature)						1.7	0.7	5.2	1.7
Chydorus sp.	/1.0		0.4						
Total Cladocera	17.0/7.5	6.5	12.3	17.8	14.7	25.6	5.0	27.3	24.3
Chaoborus sp.					0.4				
Total Organisms	629.0/355.0	455.7	383.1	138.7	159.6	239.3	133.2	417.3	405.5

APPENDIX TABLE IV Cont.

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Wallace

	5/13/80 Station			6/24/80 Station			10/21/80 Station		
Taxon	1	2	3	1	2	3	1	2	3
Rotatoria									
Keratella cochlearis	13.3	19.2	148.0	7.7	2.0	1.5	3.8	4.5	9.4
K. quadrata							0.1		
Kellicottia boston.	7.0	60.5	52.2		7.0	4.5	0.2		
Hexarthra mira									
Platyias sp.							0.1		
P. quadricornis							0.2		
P. patulus			0.2				0.1		
Polyarthra vulgaris	0.5	5.9	8.4	51.0	17.5	6.0	0.2	6.0	
P. euryptera		1.5	1.2	6.8	3.0				
Synchaeta stylata			0.4		3.0			18.0	3.1
Asplanchna priodonta	0.7		2.6	1.7	1.5				
Lecane sp.			0.2						
Conochiloides coenob.					9.5	3.0	2.0	8.2	2.1
Conochilus unicornis	17.9	199.1	74.0	10.2	12.5	133.5	22.3	141.0	162.7
Ploesoma truncatum							0.1		
Monostyla sp.							2.4		
Brachionus sp.	2.0		44.4				1.2	1.5	
B. havanaensis				92.7	38.5	10.5	1.4	35.2	
B. plicatilis									
B. calyciflorus									3.1
B. quadridentata							0.2	1.5	1.0
B. angularis		3.0		94.4	17.0		1.1	36.0	5.2
B. caudatus				320.5	154.4	51.0	4.2	13.5	15.7
Trichocerca sp.			1.0	17.0	2.0	3.0	1.9	6.0	1.0
Hexarthra sp.									
Filinia sp.	0.9	91.5	26.2	10.2	6.0	4.5	0.2	1.5	
Euchlanis sp.							4.0		
Rotifer sp..							5.5		
Total Rotatoria	43.7	380.7	358.8	615.6	397.9	219.0	51.2	272.9	203.3

ZOOPLANKTON DENSITIES (Organisms/Liter)

Lake: Wallace

	5/13/80			6/24/80			10/21/80		
	Station			Station			Station		
Taxon	1	2	3	1	2	3	1	2	3
Copepoda									
Nauplius	16.2	28.0	47.4	48.5	41.5	93.0	13.1	28.5	27.3
Copepodid	2.0		0.8		3.5	12.0	1.9		4.2
Cyclopoida	1.2		1.0	1.7	4.0	4.5	0.7	2.2	3.1
Calanoida	3.6	7.4	4.8	2.6	7.0	43.5	0.2	0.7	
Ergasilus sp.								0.7	
Total Copepoda	23.0	35.4	54.0	52.8	56.0	153.0	15.9	32.1	34.6
Cladocera									
Bosmina longirostris	1.4		4.0		0.5		1.1		
B. coregoni									
Daphnia spp.	16.2	11.8	2.2	1.7	3.0	33.0		1.5	
Cladocera spp.			0.4				0.2		
Ceriodaphnia lacustris						10.5	0.1	3.0	
C. quadrangula									
Ceriodaphnia sp.			0.4	12.6	1.5	12.0			
Diaphanasoma leucht.	7.2		8.2		10.5	9.0	0.8	0.7	
Cladocera (immature)						1.5	0.1		
Chydorus sp.							1.7		
Scapholeberis sp.							0.1		
Total Cladocera	24.8	11.8	15.2	14.3	15.5	66.0	4.1	5.2	
Chaoborus sp.		0.3	0.6	0.6	1.4	6.0	0.7	1.2	1.2
Total Organisms	91.5	428.2	428.6	683.3	470.8	444.0	71.9	311.4	239.1

Appendix Table V.

PHYTOPLANKTON/ZOOPLANKTON RATIOS

LAKE	DATE	STATION	PHYTOPLANKTON µg/l	ZOOPLANKTON µg/l	PHYTO/ ZOOPLANKTON
Bailey	4/15/80	1	4,810.00	42.12	114.20
		2	4,700.00	101.77	46.18
		3	4,500.00	61.66	72.98
	6/26/80	1	5,180.00	21.01	246.55
		2	6,550.00	69.58	94.14
		3	8.740.00	136.36	64.10
	10/16/80	1	3,930.00	5.68	691.90
		2	6,560.00	73.88	88.79
		3	6,790.00	34.44	197.15
Callion	5/13/80	1	9,580.00	207.08	46.26
		2	6,910.00	42.03	164.41
		3	7,780.00	tr.	---
	6/25/80	1	6,875.00	16.88	407.29
		2	6,550.00	9.90	661.62
		3	5,140.00	35.17	146.15
	10/22/80	1	5,210.00	12.83	406.08
		2	5,120.00	tr.	---
		3	5,570.00	12.40	449.19
Chicot	5/13/80	1	12,160.00	78.38	155.14
		2	7,850.00	29.20	268.84
		3	9,700.00	34.59	280.43
	6/24/80	1	17,760.00	50.31	353.01
		2	7,330.00	41.59	176.24
		3	7,130.00	56.46	126.28
	10/22/80	1	14,020.00	12.72	1,102.20
		2	10,020.00	27.26	367.57
		3	11,040.00	14.44	764.54

PHYTOPLANKTON/ZOOPLANKTON RATIOS

LAKE	DATE	STATION	PHYTOPLANKTON µg/l	ZOOPLANKTON µg/l	PHYTO/ ZOOPLANKTON
Enterprise	6/25/80	1	12,020.00	14.07	854.30
		2	12,020.00	15.84	758.84
		3	14,400.00	11.28	1,276.60
	10/22/80	1	9,400.00	83.37	112.75
		2	8,980.00	68.50	131.09
		3	8,590.00	74.78	114.87
June	5/12/80	1	6,270.00	22.37	280.29
		2	7,180.00	120.82	59.43
		3	4,670.00	tr.	---
	6/25/80	1	10,450.00	138.94	75.21
		2	18,810.00	43.64	431.03
		3	12,660.00	70.00	180.86
	10/23/80	1	8,660.00	10.24	845.70
		2	10,820.00	17.19	629.44
		3	8,310.00	12.50	664.80
Lou Emma	4/11/80	1	ns	97.12	---
		2	ns	73.04	---
		3	ns	65.31	---
	6/26/80	1	6,925.00	445.86	15.53
		2	10,710.00	927.08	11.55
		3	10,550.00	868.05	12.15
	10/16/80	1	17,450.00	613.68	28.44
		2	19,890.00	147.11	135.20
		3	18,910.00	386.12	48.97

PHYTOPLANKTON/ZOOPLANKTON RATIOS

LAKE	DATE	STATION	PHYTOPLANKTON µg/l	ZOOPLANKTON µg/l	PHYTO/ ZOOPLANKTON
Newport	5/14/80	1	11,140.00	24.82	448.83
		2	11,110.00	88.11	126.09
		3	7,460.00	1.75	4,262.86
	6/23/80	1	10,640.00	25.11	423.74
		2	16,460.00	31.88	516.31
		3	7,920.00	61.90	127.95
	10/20/80	1	4,545.00	102.77	44.22
		2	4,054.14	142.56	28.44
		3	3,835.98	157.51	24.35
Reynolds Park	5/15/80	1	13,200.00	150.00	88.00
		2	9,760.00	tr.	——
		3	10,540.00	2.71	3,889.30
	6/23/80	1	11,100.00	57.29	193.75
		2	10,160.00	84.37	120.43
		3	9,490.00	21.52	440.99
	10/20/80	1	7,630.00	47.50	160.63
		2	7,000.00	96.25	72.73
		3	8,290.00	58.89	140.77
Town	5/14/80	1	9,790.00	50.77	192.83
		2	7,380.00	118.75	62.15
		3	36,310.00	128.89	281.71
	6/24/80	1	25,800.00	172.92	149.20
		2	19,140.00	80.69	237.20
		3	118,000.00	135.83	868.73
	10/21/80	1	21,141.80	115.83	182.52
		2	21.541.78	50.30	428.27
		3	19,170.47	52.78	363.21

Appendix Table V. (cont.)

PHYTOPLANKTON/ZOOPLANKTON RATIOS

LAKE	DATE	STATION	PHYTOPLANKTON µg/l	ZOOPLANKTON µg/l	PHYTO/ ZOOPLANKTON
Wallace	5/13/80	1	7,780.00	103.06	75.49
		2	8,360.00	36.64	228.17
		3	7,440.00	tr.	---
	6/24/80	1	13,740.00	25.65	535.67
		2	9,760.00	39.83	245.04
		3	10,180.00	227.98	44.65
	10/21/80	1	11,360.00	53.22	213.45
		2	8,940.00	26.98	331.36
		3	8,860.00	98.18	90.24

APPENDIX TABLE VI.

ADDITIONAL FISH SPECIES FROM PREVIOUS YEARS

CALION LAKE
- Esox niger
- Amia calva
- Cyprinus carpio
- Ictiobus bubalus
- Ictiobus cyprinellus
- Ictalurus furcatur
- Ictalurus melas
- Lepomis humilis
- Micropterus punctulatus
- Pomoxis nigromaculatus

UPPER LAKE CHICOT
- Cyprinus carpio
- Ctenopharyngodon idella
- Ictiobus cyprinellus
- Ictalurus natalis
- Ictalurus nebulosus
- Pylodictis olivaris
- Ictalurus melas
- Anguilla rostrata
- Lepomis gulosus
- Lepomis punctatus

LAKE ENTERPRISE
- Lepisosteus oculatus
- Amia calva
- Esox americanus
- Esox niger
- Ctenopharyngodon idella
- Cyprinus carpio
- Notemigonus crysoleucas
- Erimyzon sucetta
- Ictiobus bubalus
- Ictiobus cyprinellus
- Minytrema melanops
- Ictalurus melas
- Ictalurus punctatus
- Pylodictis olivaris
- Aphredoderus sayanus
- Elassoma zonatum
- Centrarchus macropterus
- Lepomis megalotis
- Lepomis humilis
- Pomoxis nigromaculatus
- Percina carprodes

LAKE JUNE
- Lepisosteus oculatus
- Esox americanus
- Ctenopharyngodon idella
- Erimyzon sucetta
- Ictalurus nebulosus
- Ictalurus punctatus
- Lepomis humilis

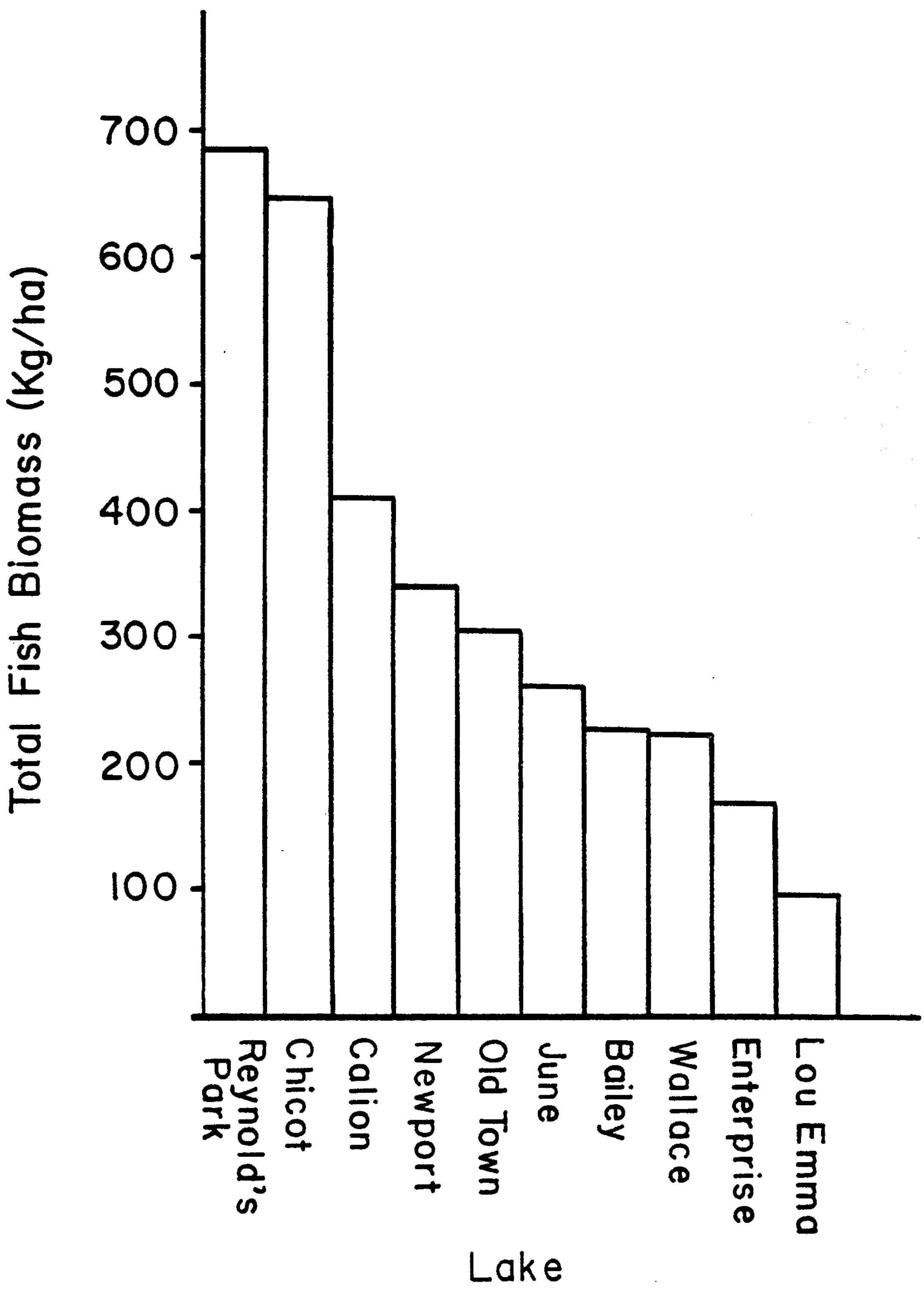
LAKE LOU EMMA
- Pomoxis nigromaculatus

NEWPORT LAKE
- Lepisosteus oculatus
- Lepisosteus platostomus
- Amia calva
- Esox americanus
- Esox niger
- Cyprinus carpio
- Notemigonus crysoleucas
- Ictiobus cyprinellus
- Minytrema melanops
- Ictalurus natalis
- Fundulus olivaceus
- Aphredoderus sayanus
- Centrarchus macropterus
- Lepomis humilis
- Pomoxis nigromaculatus

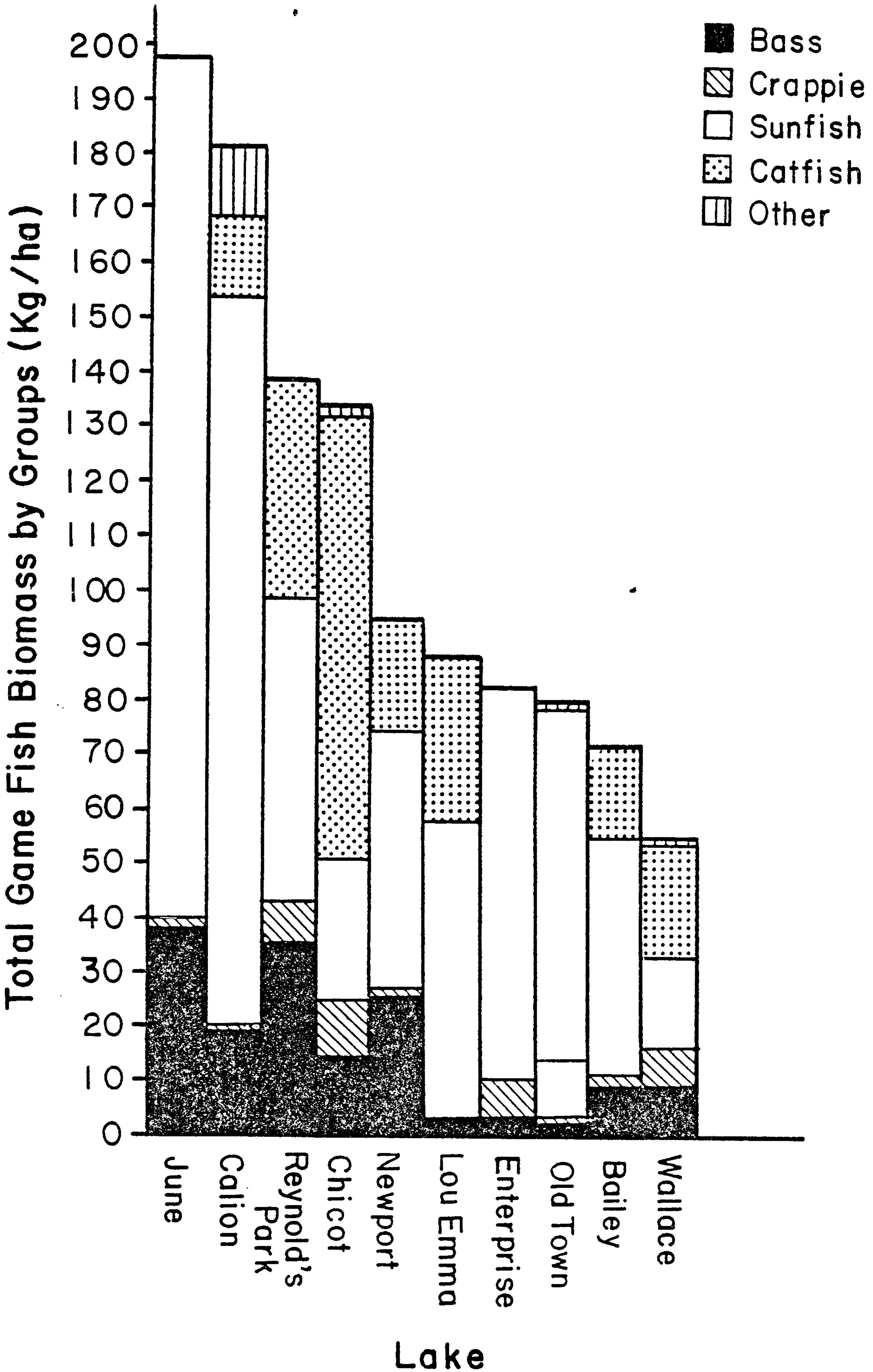
OLD TOWN LAKE
- Lepisosteus platostomus
- Dorosoma petenense
- Ictiobus niger
- Ictalurus furcatus
- Ictalurus melas
- Pomoxis nigromaculatus

LAKE WALLACE
- Lepisosteus platostomus
- Esox niger
- Ctenopharyngodon idella
- Cyprinus carpio
- Ictiobus cyprinellus
- Ictiobus niger
- Ictalurus melas
- Gambusia affinis
- Aphredoderus sayanus
- Morone mississippiensis
- Lepomis cyanellus
- Lepomis megalotis
- Percina caprodes
- Aplodinotus grunniens

APPENDIX FIGURE 1.
TOTAL FISH BIOMASS - 1980

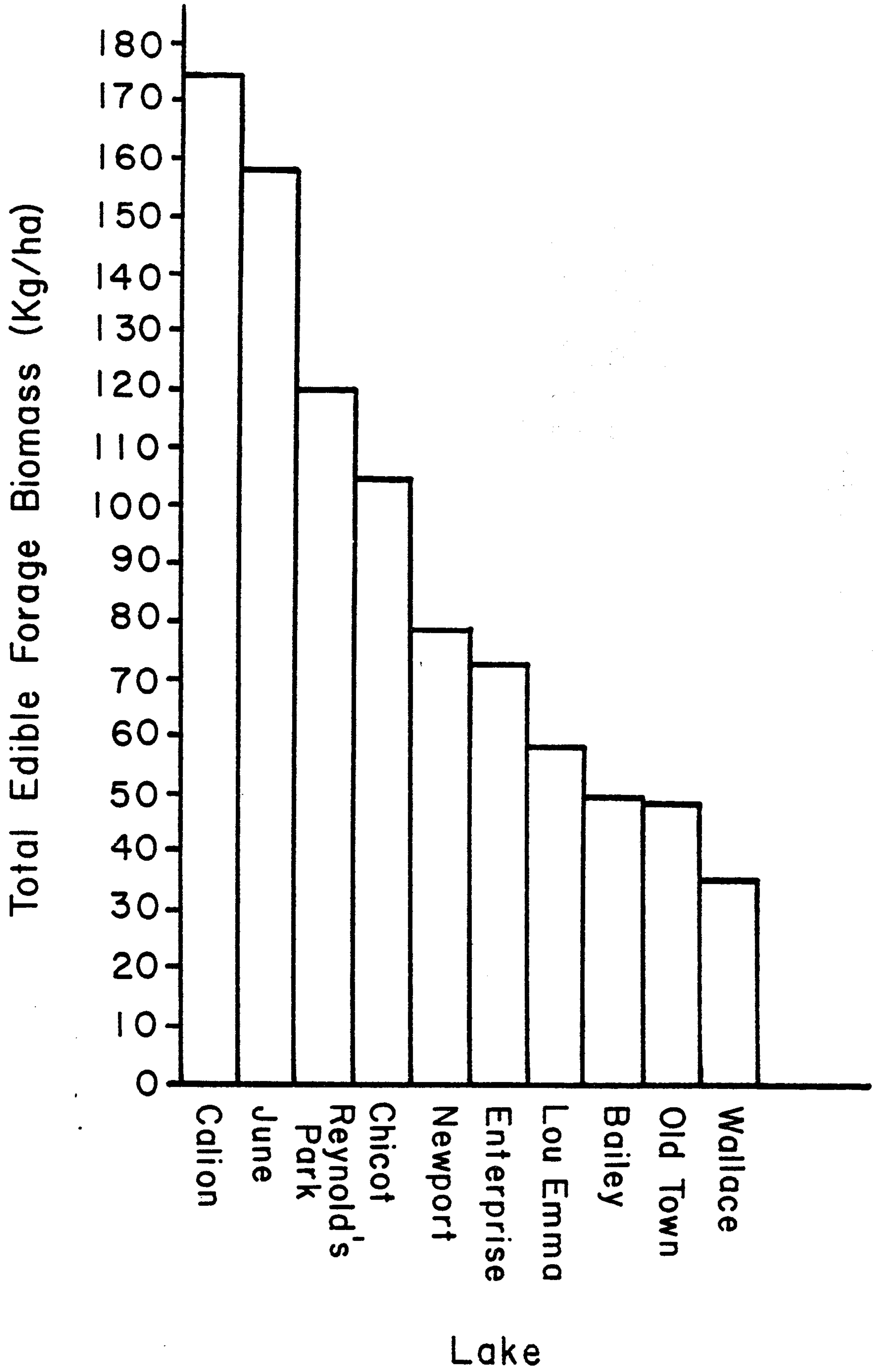


APPENDIX FIGURE 1. Cont.
TOTAL GAMEFISH BIOMASS BY GROUPS - 1980

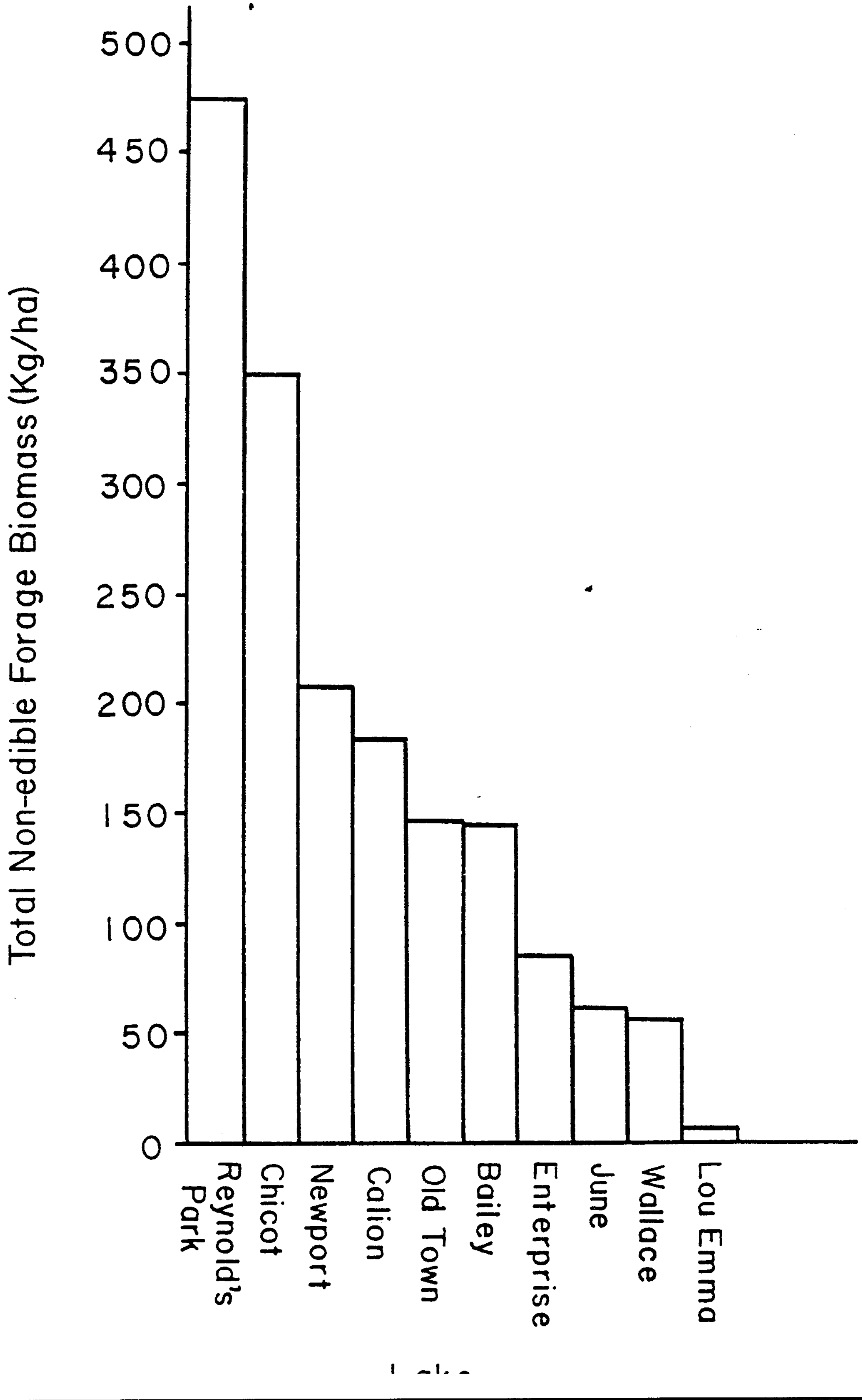


APPENDIX FIGURE 1. Cont.

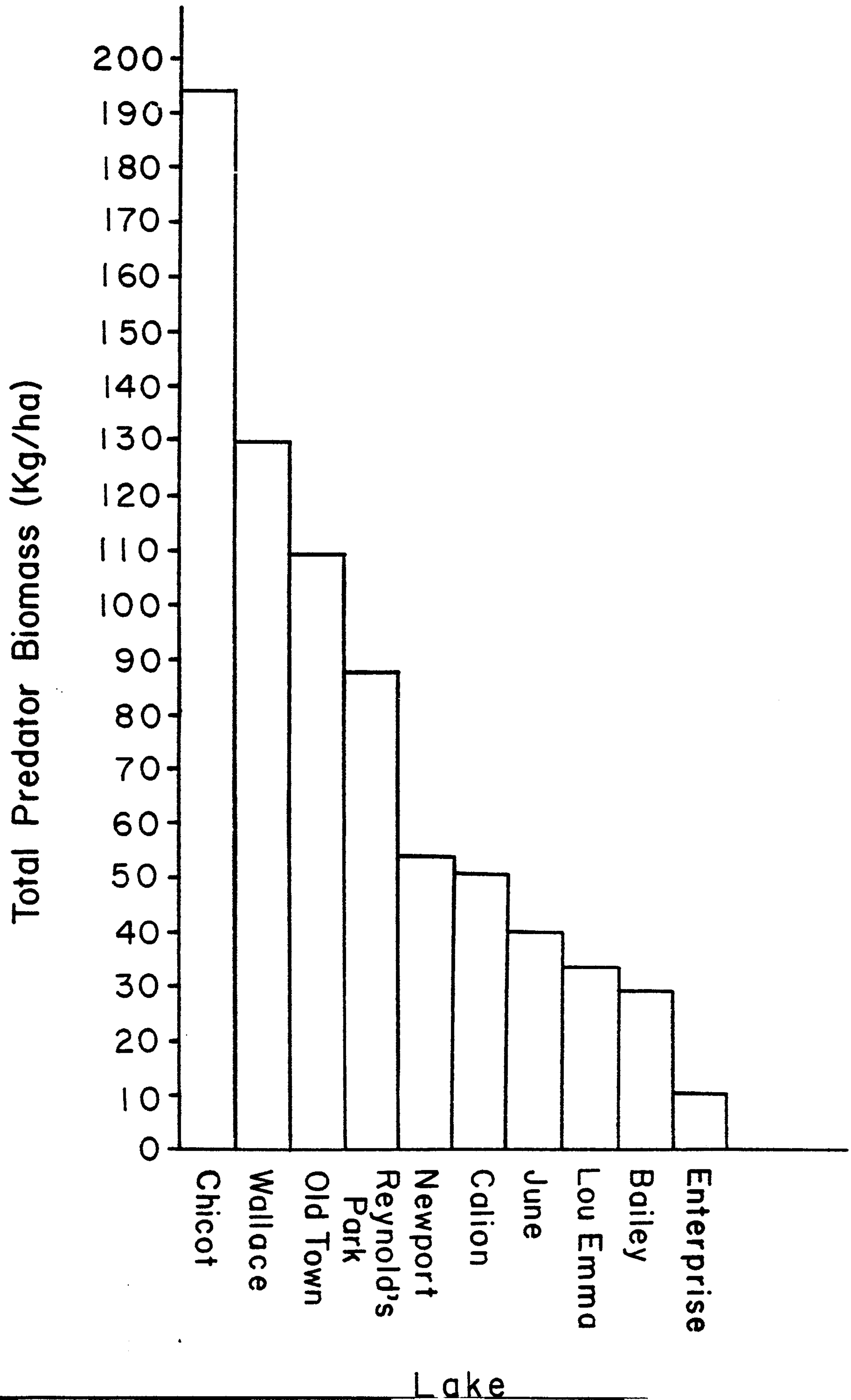
TOTAL EDIBLE FORAGE BIOMASS - 1980



APPENDIX FIGURE 1. Cont.
TOTAL NON-EDIBLE FORAGE BIOMASS - 1980

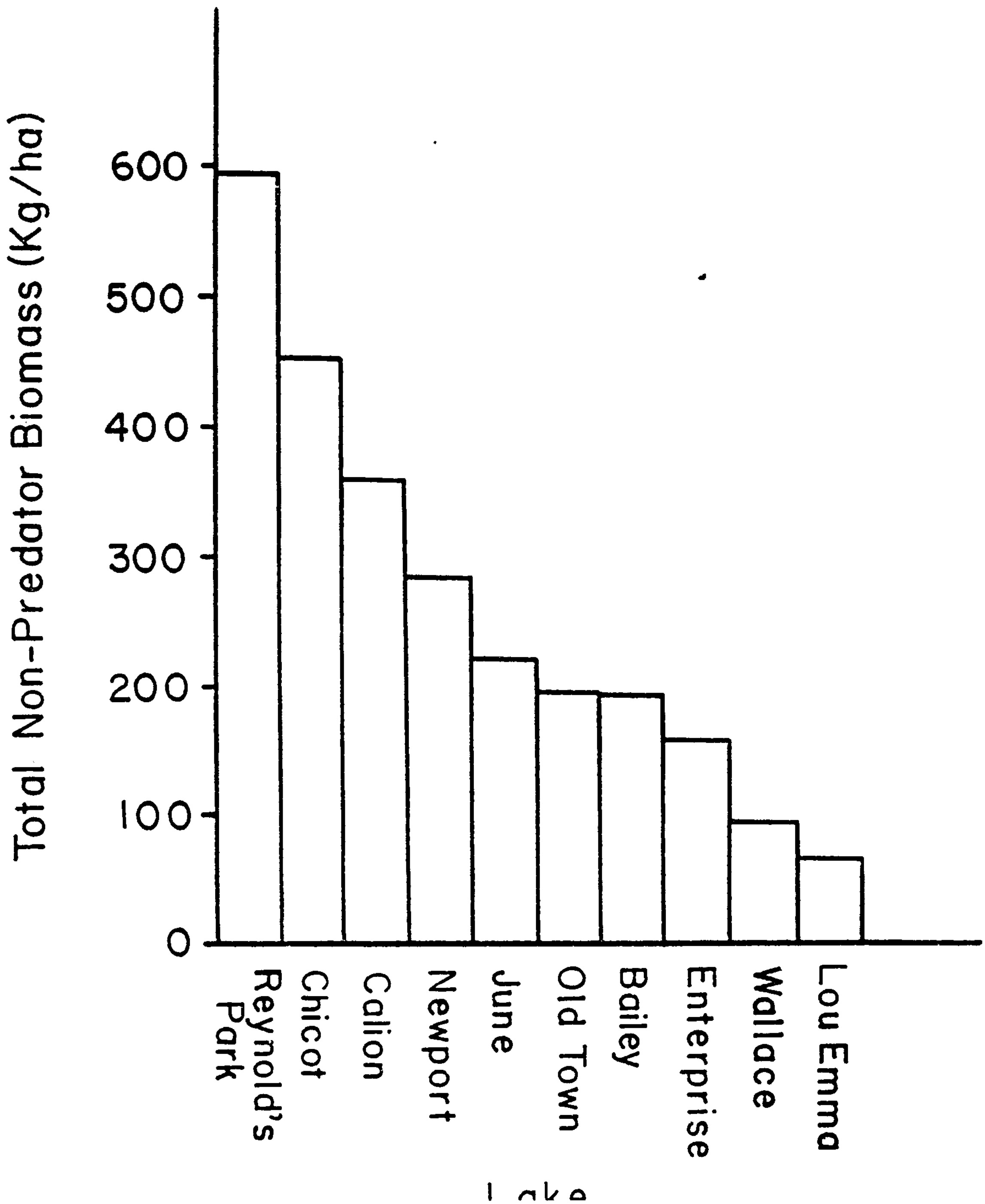


APPENDIX FIGURE 1. Cont.
TOTAL PREDATOR BIOMASS - 1980

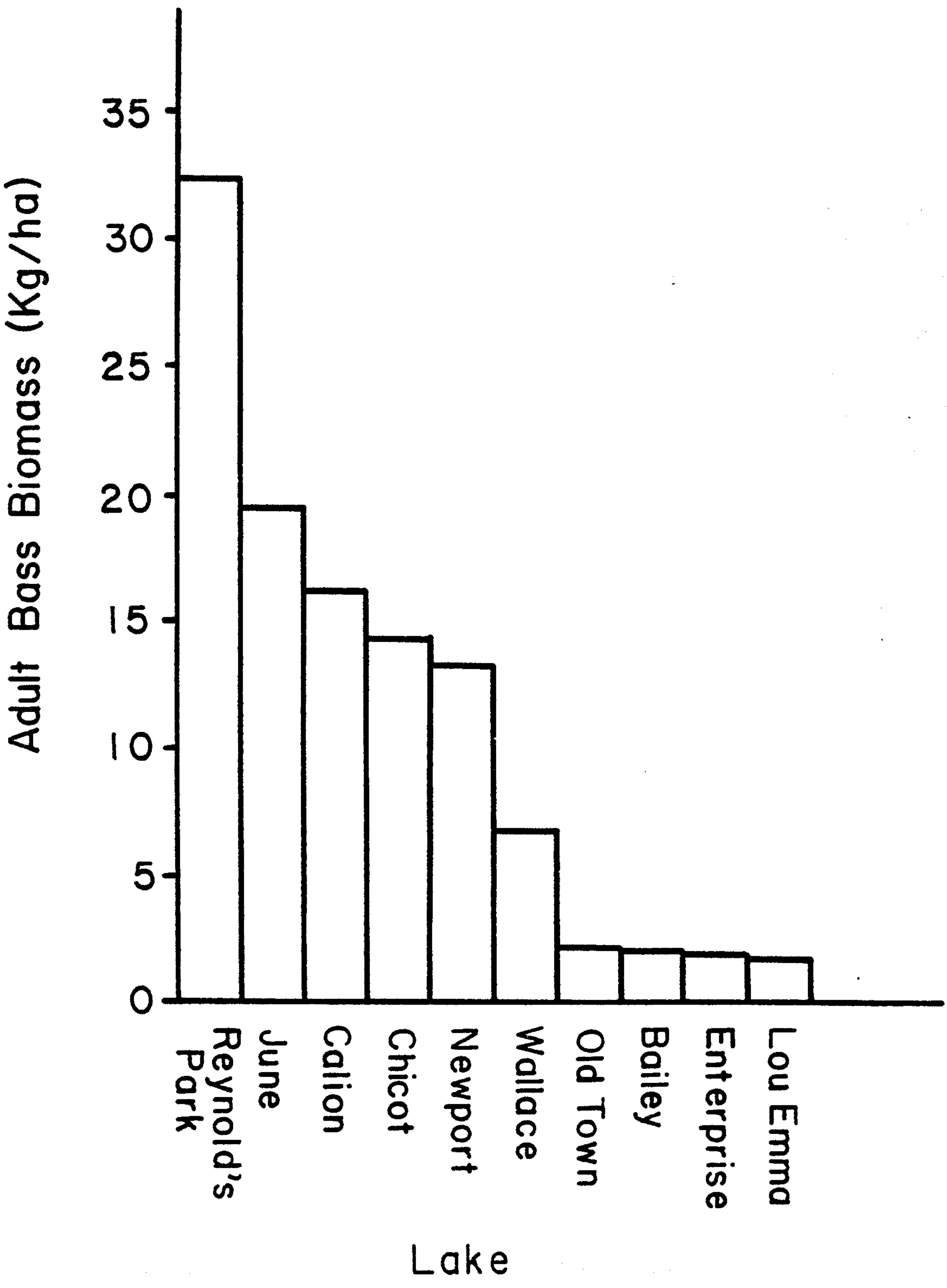


APPENDIX FIGURE 1. Cont.

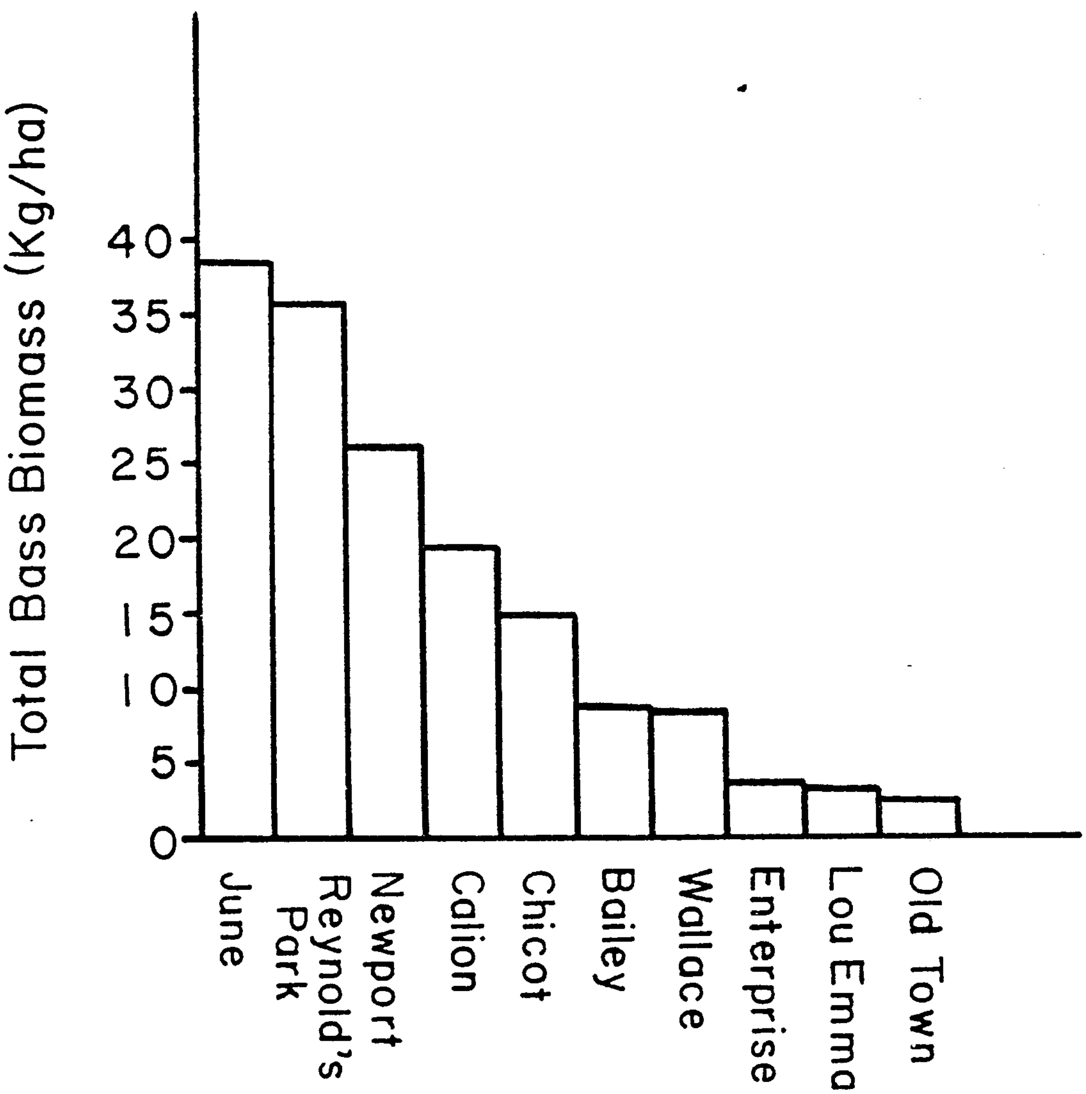
TOTAL NON-PREDATOR BIOMASS - 1980



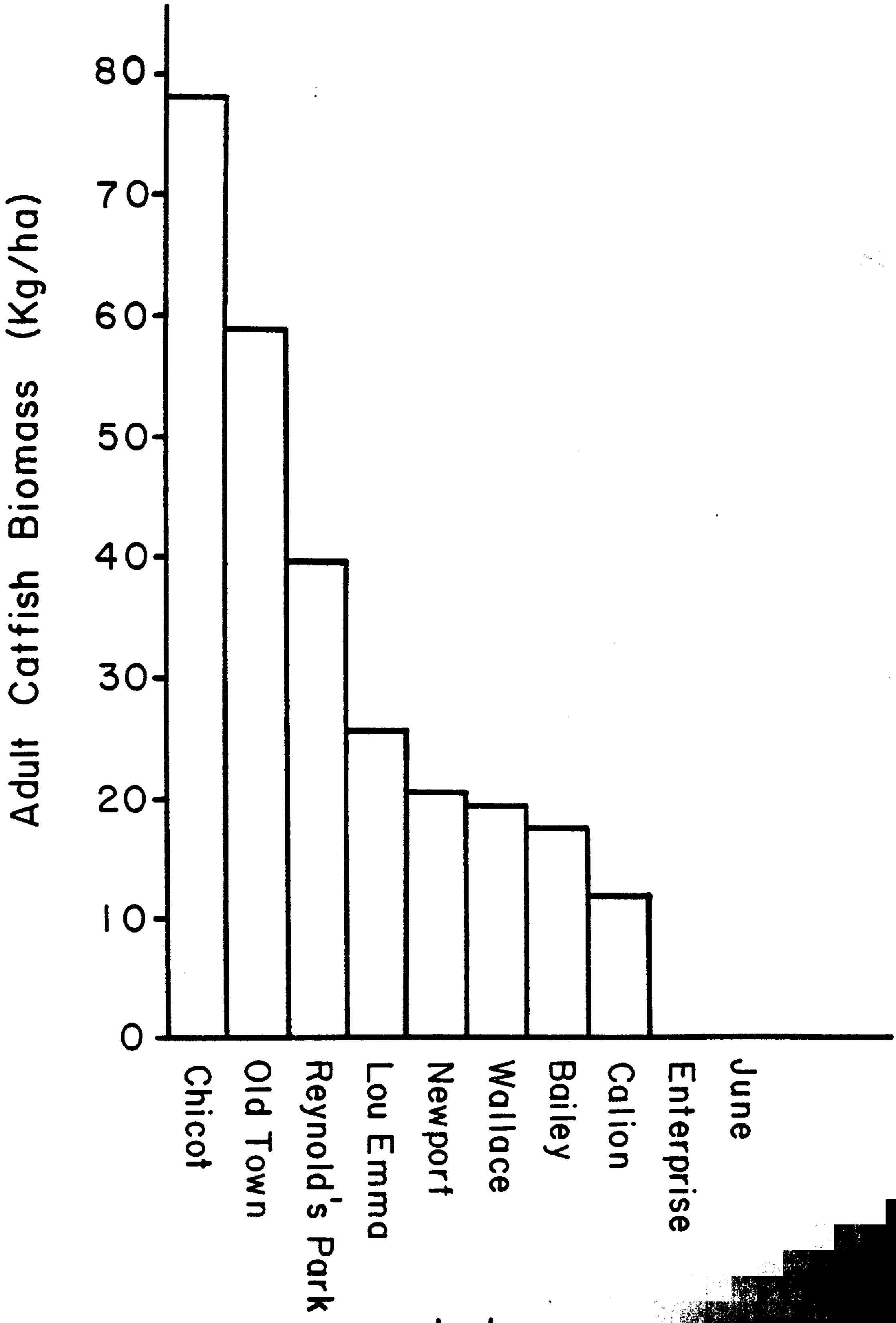
APPENDIX FIGURE 1. Cont.
ADULT BASS BIOMASS - 1980



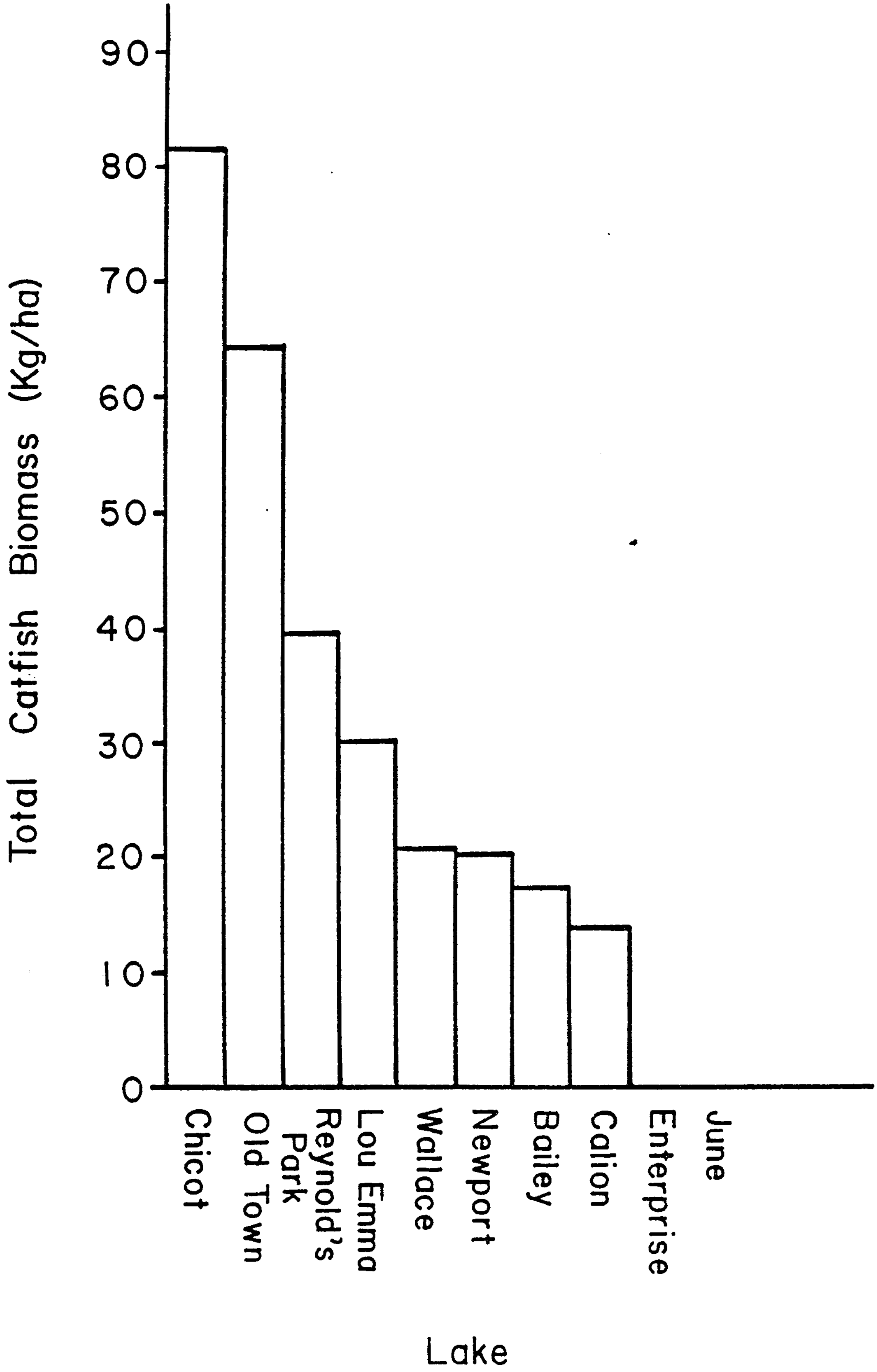
APPENDIX FIGURE 1. Cont.
BASS BIOMASS - 1980



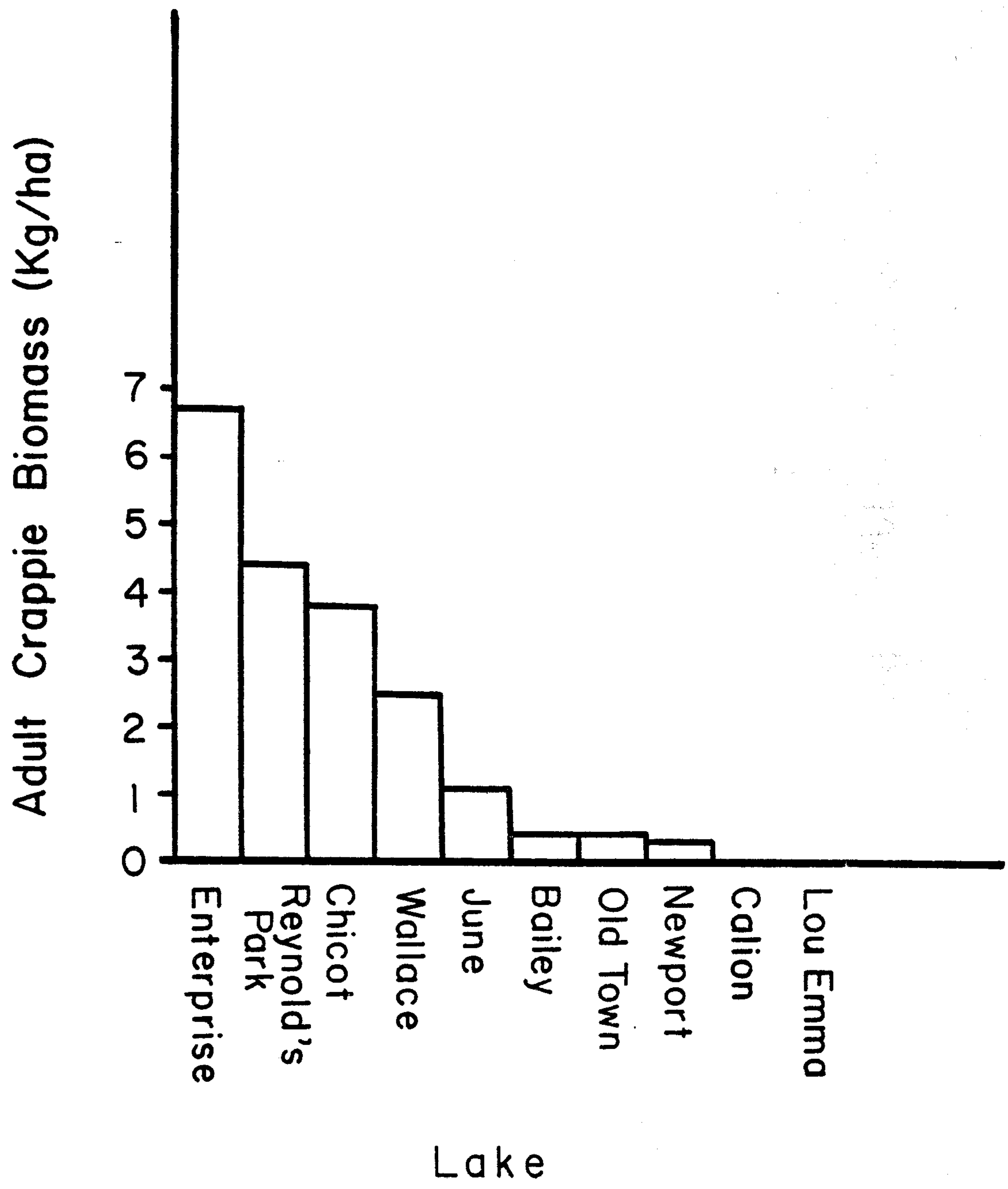
APPENDIX FIGURE 1. Cont.
ADULT CATFISH BIOMASS - 1980



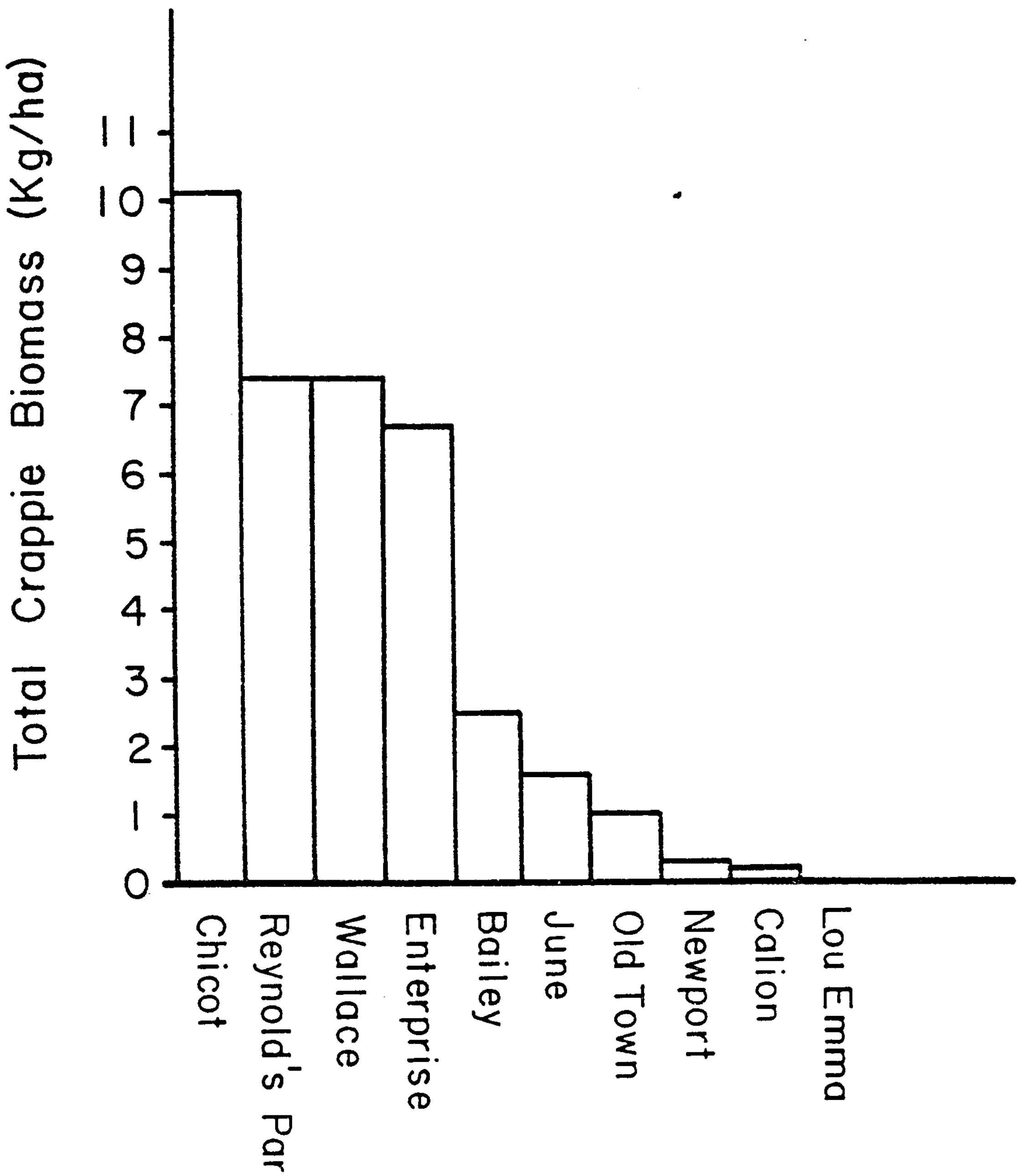
APPENDIX FIGURE 1. Cont.
CATFISH BIOMASS - 1980



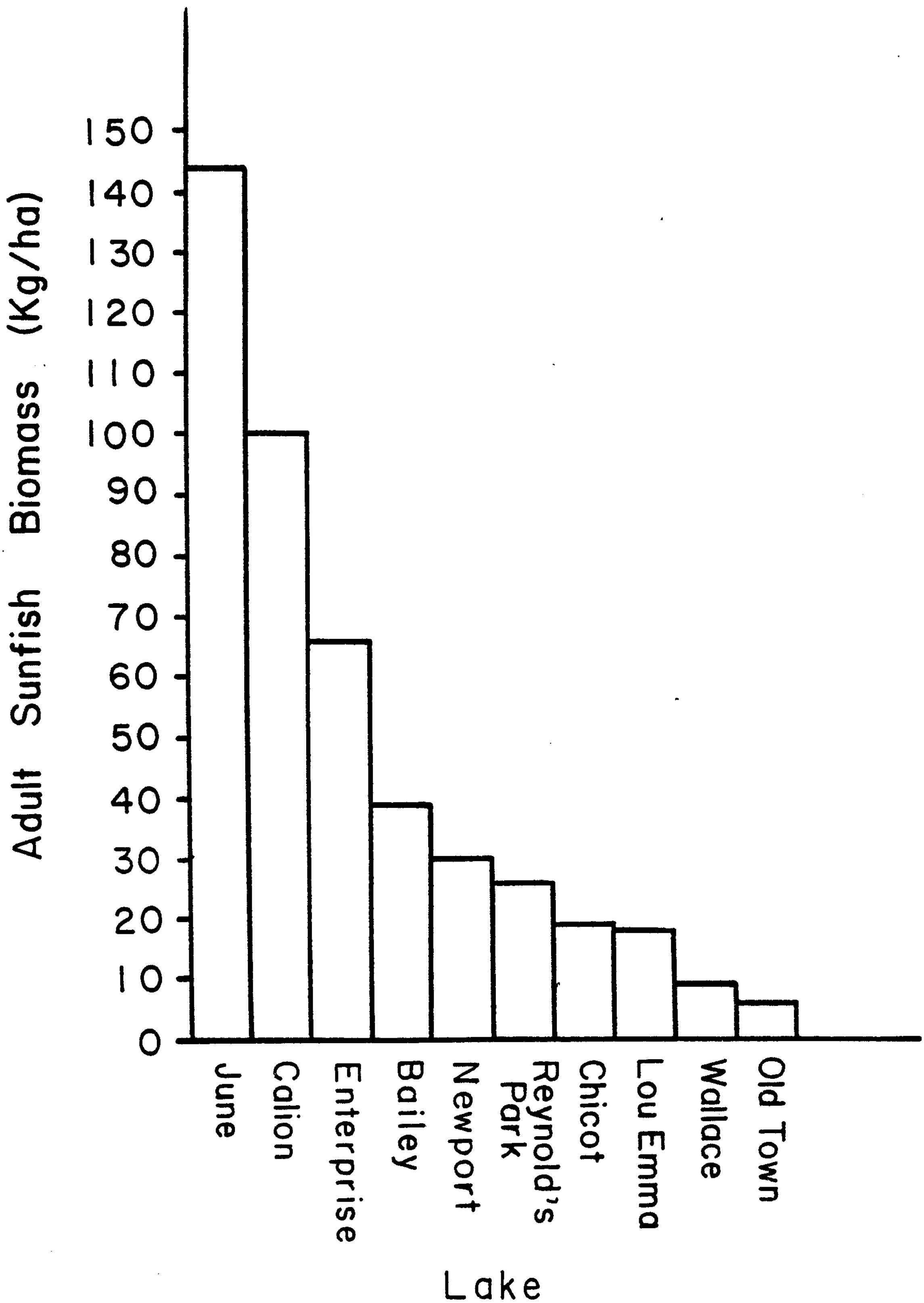
APPENDIX FIGURE 1. Cont.
ADULT CRAPPIE BIOMASS - 1980



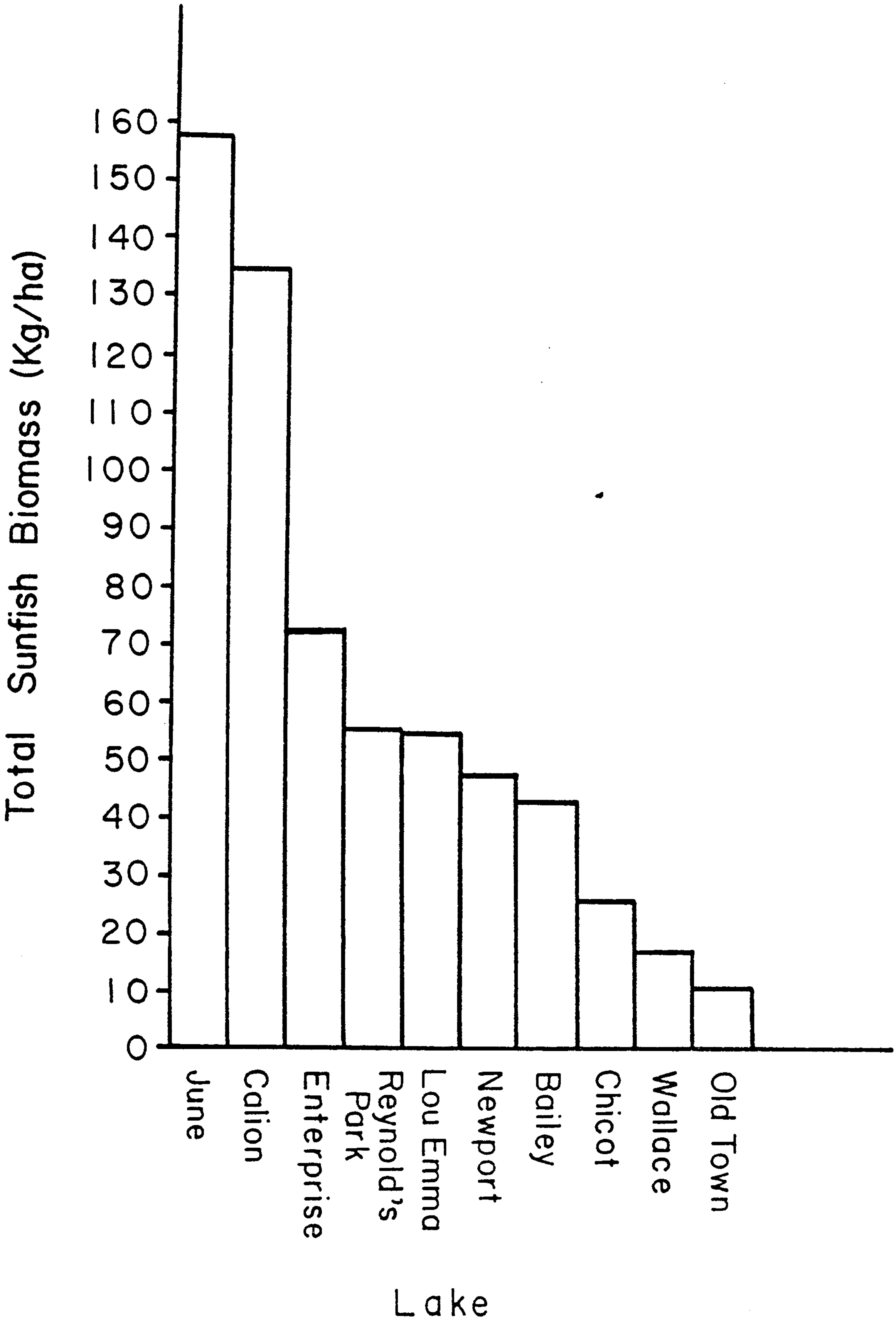
APPENDIX FIGURE 1. Cont.
CRAPPIE BIOMASS - 1980



APPENDIX FIGURE 1. Cont.
ADULT SUNFISH BIOMASS - 1980



APPENDIX FIGURE 1. Cont.
SUNFISH BIOMASS - 1980



APPENDIX TABLE VII.

MEAN BIOMASS STANDING CROP BIOMASS VALUES (KG./HA.)

BASED ON ALL AVAILABLE SAMPLES FROM EACH LAKE

	Bailey	Calion	Chicot	Enter-prise	June	Lou Emma	Newport	Old Town	Reynolds Park	Wallace
N*	2	12	15	16	5	1	5	6	1	18
Total Population (kg/ha)	135.6	283.4	483.5	220.9	111.9	98.3	829.8	465.8	682.5	298.3
Total Gamefish	58.9	77.5	205.2	120.3	222.8	88.5	100.5	110.2	138.5	103.5
Bass	12.0	9.5	25.0	14.9	14.6	3.4	18.6	4.5	35.7	16.2
Crappie	1.5	2.4	18.7	5.4	0.7	0	11.6	5.2	7.4	15.2
Sunfish	35.8	52.9	106.3	93.7	97.9	54.9	56.6	71.8	55.6	61.8
Catfish	9.7	6.2	41.8	5.5	9.7	30.2	10.9	24.2	39.8	9.7
Other	0	6.3	13.3	0.9	0	0	2.9	4.7	0	0.4
Total Edible Forage	39.4	78.5	146.6	116.1	115.2	58.5	366.6	184.7	120.3	126.7
Total Nonedible Forage	73.0	173.8	220.0	75.7	16.6	6.3	368.3	167.8	474.9	110.5
Total Predator	23.3	31.0	116.9	29.0	25.1	33.6	94.9	113.5	87.4	61.0
Total Nonpredator	112.3	252.3	366.7	191.9	133.1	64.7	735.1	352.5	595.2	237.2
F/C	4.2	15.1	4.4	13.0	4.7	1.9	15.6	2.6	6.8	6.3
A_T	52.6	48.9	49.6	48.2	70.1	54.4	42.5	75.7	33.6	57.2
A_G	45.3	19.0	34.0	34.5	56.4	50.8	10.7	26.8	15.0	22.6

* N is the number of years for which population samples are available

All Years

All Lakes

Average Biomass kg/ha

APPENDIX TABLE VII. Continued.

PER CENT OF THE TOTAL FISH STANDING CROP

COMPRISED BY GAMEFISH BIOMASS OF HARVESTABLE SIZE

FOR EACH LAKE POPULATION SAMPLE

YEAR	Bailey	Calion	Chicot	Enter-prise	June	Lou Emma	Newport	Old Town	Reynolds Park	Wallace
1980	26.3	32.6	18.0	43.9	63.0	50.8	18.9	22.6	15.0	17.3
1979			34.9		63.6					16.6
1978			46.1	32.1	62.7					24.3
1977		27.1	36.1	48.5						8.9
1976		17.2	35.0							16.7
1975		21.3		38.7			9.8			10.7
1974		16.4	21.9	37.4						26.2
1973		42.5	34.3	46.1	41.7			25.8		13.4
1972				19.3	51.0			18.3		
1971			47.1	39.7						
1970		17.3	46.6	25.6						33.9
1969				37.7						40.7
1968			40.1	20.2						33.0
I		28.3								
1966			41.7	24.9						
1965	64.3	5.7	31.2					32.4		
1964								51.1		18.4
1963				23.1						52.5
1962		10.7	25.2	50.1						11.4
1961				30.3			2.9	10.6		
1960			17.9							15.6
1959		5.7	33.5							13.8
1958										
1957		2.6					17.4			28.3
1956										24.6
1955							4.4			
$\bar{X}$	45.3	19.0	34.0	34.5	56.4	50.8	10.7	26.8	15.0	22.6

APPENDIX TABLE VII. Continued.

PER CENT OF THE TOTAL FISH STANDING CROP

COMPRISED BY THE GAMEFISH BIOMASS

FOR EACH LAKE POPULATION SAMPLE

YEAR	Bailey	Calion	Chicot	Enter-prise	June	Lou Emma	Newport	Old Town	Reynolds Park	Wallace
1980	32.1	44.2	20.7	48.8	75.5	90.0	27.9	25.9	20.3	24.4
[illegible]			39.2		72.1					25.6
1978			72.9	64.7	73.8					43.1
1977		34.1	44.5	54.3						24.6
1976		39.3	42.2							22.6
1975		29.7		45.6			15.2			15.2
1974		31.8	32.4	66.1						36.5
1973		58.3	38.8	84.1	86.1			31.1		21.0
1972				33.3	100.0			20.0		
1971			51.8	50.0						
1970		33.3	53.9	88.8						40.3
1969				81.0						56.7
1968			65.6	42.2						66.4
1		52.1								
1966			48.1	70.5						
1965	98.5	22.0	53.0					45.3		
1964								69.4		31.0
1963				50.6						72.0
1962		22.1	35.8	92.7						17.5
1961				24.6			3.2	13.5		
1960			29.3	51.2						26.6
1959		11.5	42.7							22.5
1958										
1957		7.2					33.1			72.4
1956										63.4
1955							8.0			
λ	65.3	32.1	44.7	59.3	81.5	90.0	17.5	34.2	20.3	37.9

APPENDIX TABLE VII. Continued.

THE NUMBER OF BLACKBASS INTERMEDIATES (NO./HA.)

FOR EACH LAKE POPULATION SAMPLE

YEAR	Bailey	Calion	Chicot	Enter-prise	June	Lou Emma	Newport	Old Town	Reynolds Park	Wallace
1980	0.8	27	0	4	36	2.8	2.8	0	3.2	4.5
1979			0		0					8.1
1978			1.6	16	19					17
1977		4.5	1.1	16						0
1976		2	0							0.4
1975		1.6		1.6			1.6			0
1974		4.5	0	0						0
1973		2	0	6	1.1			0		0.2
1972				4.9	0			0		
1971			5.9	0.4						
1970		13	2.4	0						1.6
1969				0						18
1968			4	20						13
1		6								
1966			.8	4.5						
1965	13	5.3	1.6					2.4		
1964								8		16
1963				15						1.6
1962		6.5	4	3.2						2
1961				2.8			3.1	0		
1960			4.5	11						7.3
1959		4	7.7							1.6
1958										
1957		3.5					1.9			1.2
1956										6.4
1955							2.6			
x	6.9	6.7	2.2	6.6	11.2	2.8	7.4	1.7	3.2	5.6

APPENDIX TABLE VII. Continued.

THE NUMBER OF BLACKBASS YOUNG-OF-THE-YEAR (NO./HA.)

FOR EACH LAKE POPULATION SAMPLE

YEAR	Bailey	Calion	Chicot	Enter-prise	June	Lou Emma	Newport	Old Town	Reynolds Park	Wallace
1980	102	38	3.2	6.9	29	0	49	1.2	15.4	2.8
1979			0		40					10
1978			4.9	32	69					25
1977		99	6	71						27
1976		38	.8							0
1975		32		0			83			.4
1974		8.5	2	0						6
1973		31	0	2	207			0		0
1972				8.9	0			0		
1971			3.2	1.6						
1970		62	6.9	1.6						6.9
1969				1.2						12.5
1968			16	29						41
1[illegible]		33								
1966			8.7	6						
1965	10	70	28					49		
1964								32		5.3
1963				23						218
1962		35	21	44						22
1961				2			.9	3.2		
1960			58	49						21
1959		55	20							81
1958										
1957		21					49			6.9
1956										0
1955							6			
$\bar{x}$	56.0	43.5	11.9	17.4	69.0	0	37.6	14.2	15.4	27.0

APPENDIX TABLE VIII.

GAMEFISH DIVERSITY INDEXES, BASED ON BIOMASS, FOR ALL AVAILABLE POPULATION SAMPLES FROM EACH LAKE

YEAR	Bailey	Calion	Chicot	Enter-prise	June	Lou Emma	Newport	Old Town	Reynolds Park	Wallace
1	.642	.620	.551	.380	.474	.543	.655	.336	.611	.751
1979			.394		.594					.588
1978			.454	.593	.554					.602
1977		.759	.703	.684						.477
1976		.622	.686							.631
1975		.469		.296			.435			.674
1974		.703	.867	.290						.610
1973		.637	.689	.413	.479			.380		.477
1972				.760	.317			.422		
1971			.719	.427						
1970		.727	.713	.337						.466
1969				.487						.679
1968			.741	.469						.669
19[illegible]		.706								
1966			.528	.523						
1965	.599	.659	.417					.538		
1964								.499		.638
1963				.479						.521
1962		.596	.554	.590						.616
1961				.415			.517	.635		
1960			.725	.299						.664
1959		.579	.568							.540
1958										
1957		.542					.825			.593
1956										
1[illegible]							.636			.317
$\bar{X}$	.621	.635	.621	.465	.484	.543	.614	.412	.611	.585

APPENDIX TABLE VIII. Continued.

GAMEFISH DIVERSITY INDEXES, BASED ON NUMBERS,

FOR ALL AVAILABLE POPULATION SAMPLES FROM EACH LAKE

YEAR	Bailey	Calion	Chicot	Enter-prise	June	Lou Emma	Newport	Old Town	Reynolds Park	Wallace
1980	.530	.463	.719	.223	.450	.478	.408	.456	.399	.670
1[illegible]			.618		.362					.490
1978			.648	.322	.361					.369
1977		.708	.713	.465						.301
1976		.721	.607							.555
1975		.567		.135			.440			.206
1974		.493	.670	.360						.378
1973		.490	.364	.252	.501			.358		.538
1972				.433	.334			.385		
1971			.635	.140						
1970		.314	.722	.224						.386
1969				.210						.322
1968			.551	.287						.492
1[illegible]		.544								
1966			.333	.196						
1965	.598	.338	.192					.306		
1964								.394		.429
1963				.253						.579
1962		.481	.350	.255						.407
1961				.130			.630	.551		
1960			.639	.216						.409
1959		.417	.356							.345
1958										
1957		.411					.686			.518
1956										.223
1955							.463			
λ	.564	.496	.541	.256	.402	.478	.525	.408	.399	.423

APPENDIX TABLE IX.

NUMERICAL LIMITS AND THE POINTS ASSIGNED

FOR THE "POOR", "FAIR", AND "GOOD" CATEGORIES

FOR EACH OF FIVE POPULATION PARAMETERS

USED IN COMPUTING THE LAKE CLASSIFICATION INDEX

	POPULATION PARAMETER	CATEGORY LIMITS	POINTS ASSIGNED
1)	Gamefish Diversity	Poor .350	0
		Fair .350-.700	1
		Good .700	2
2)	Black Bass Young-of-the-Year	Poor 20/ha.	0
		Fair 20-40/ha.	1
		Good 40/ha.	2
3)	Black Bass Intermediates	Poor 4/ha.	0
		Fair 20-40/ha.	1
		Good 40/ha.	2
4)	Total Gamefish Standing Crop Biomass	Poor 35%	0
		Fair 35-70%	1
		Good 70%	2
5)	Harvestable Gamefish Standing Crop Biomass	Poor 20%	0
		Fair 20-40%	1
		Good 40%	2

APPENDIX TABLE IX. Continued.

RANKING OF ALL LAKE POPULATION SAMPLES

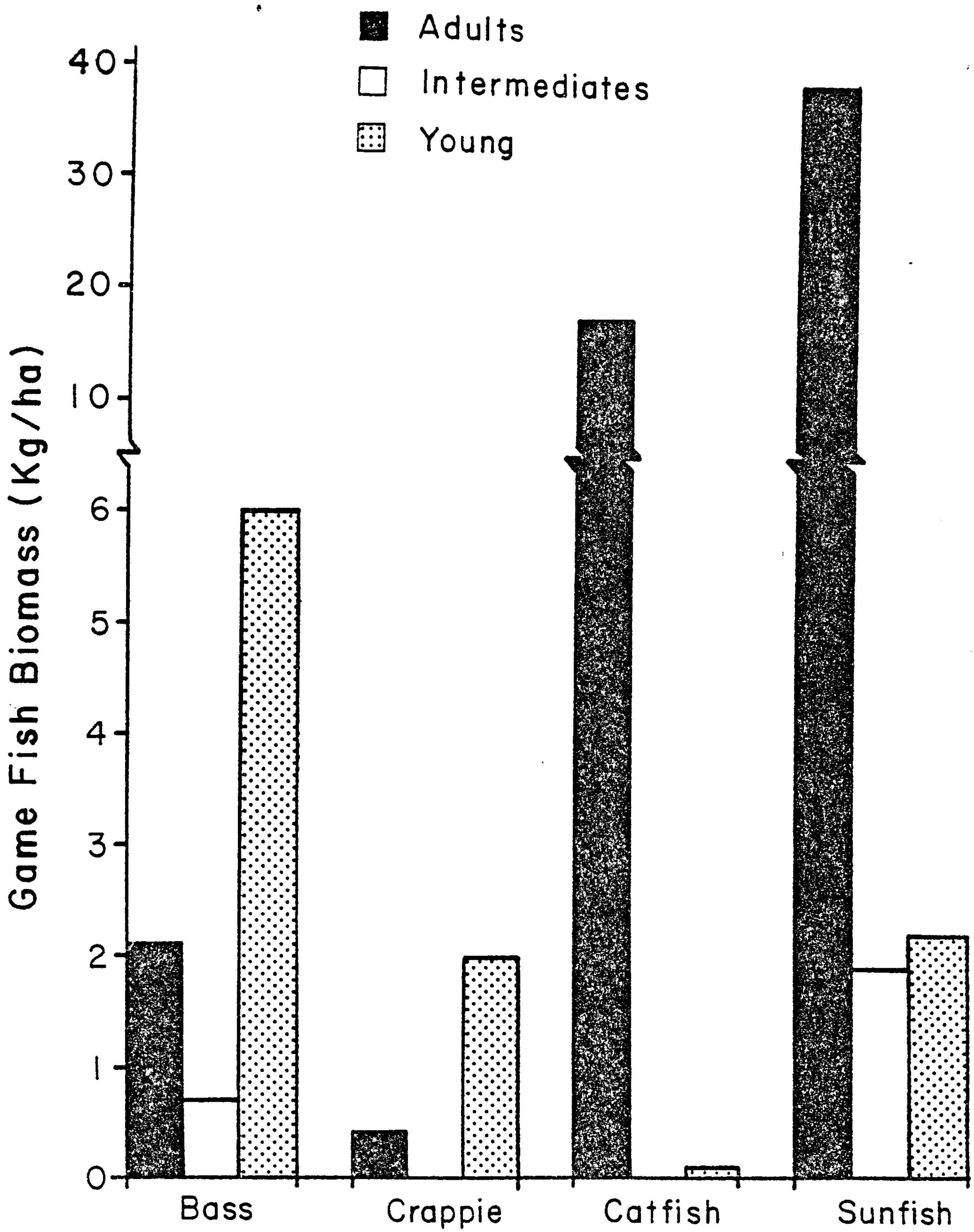
ACCORDING TO THE LAKE CLASSIFICATION INDEX

Y	Bailey	Calion	Chicot	Enter-prise	June	Lou Emma	Newport	Old Town	Reynolds Park	Wallace
1980	4	6	2	4	8	5	5	2	1	2
1979			3		7					2
1978			5	5	9					6
1977		6	4	8						1
1976		4	3							1
1975		2		2			3			0
1974		4	2	3						3
1973		5	2	5	8			2		1
1972				2	4			1		
1971			5	2						
1970		3	5	3						3
1969				3						5
1[illegible]			5	5						6
1967		5								
1966			3	4						
1965	6	1	3					4		
1964								6		3
1963				4						7
1962		3	5	6						2
1961				1			1	1		
1960			4	5						2
1959		4	6							2
1958										
1957		2					3			4
1[illegible]										3
1955							1			
$\overline{X}$	5.0	3.8	3.8	3.8	7.2	5	2.6	2.7	1	2.9

APPENDIX FIGURE 2.

GAMEFISH BIOMASS BY AGE GROUP - 1980

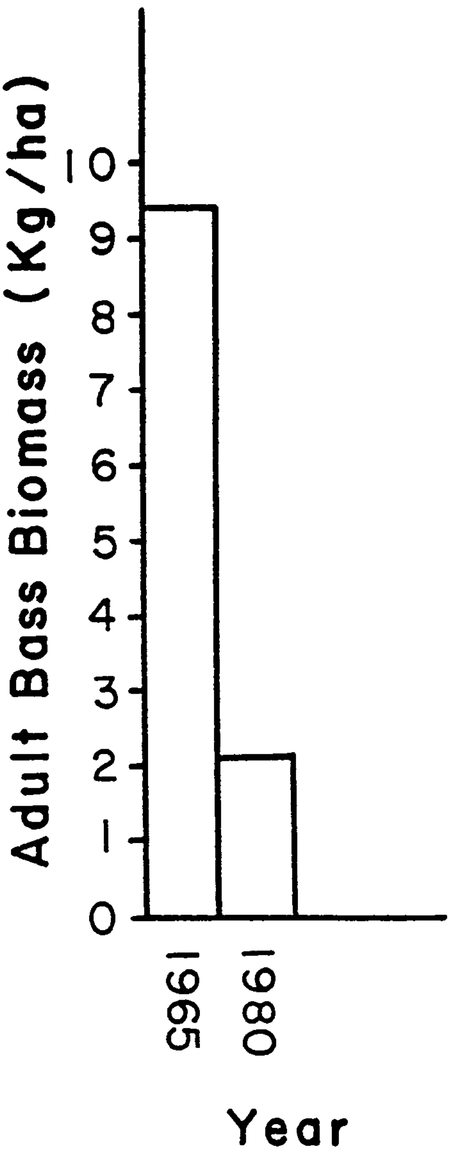
BAILEY


Adults
Intermediates
Young
Game Fish Biomass (Kg/ha)
40
30
20
10
6
5
4
3
2
1
0
Bass
Crappie
Catfish
Sunfish

APPENDIX FIGURE 2. Continued.

ADULT BASS BIOMASS FOR ALL YEARS SAMPLED

BAILEY

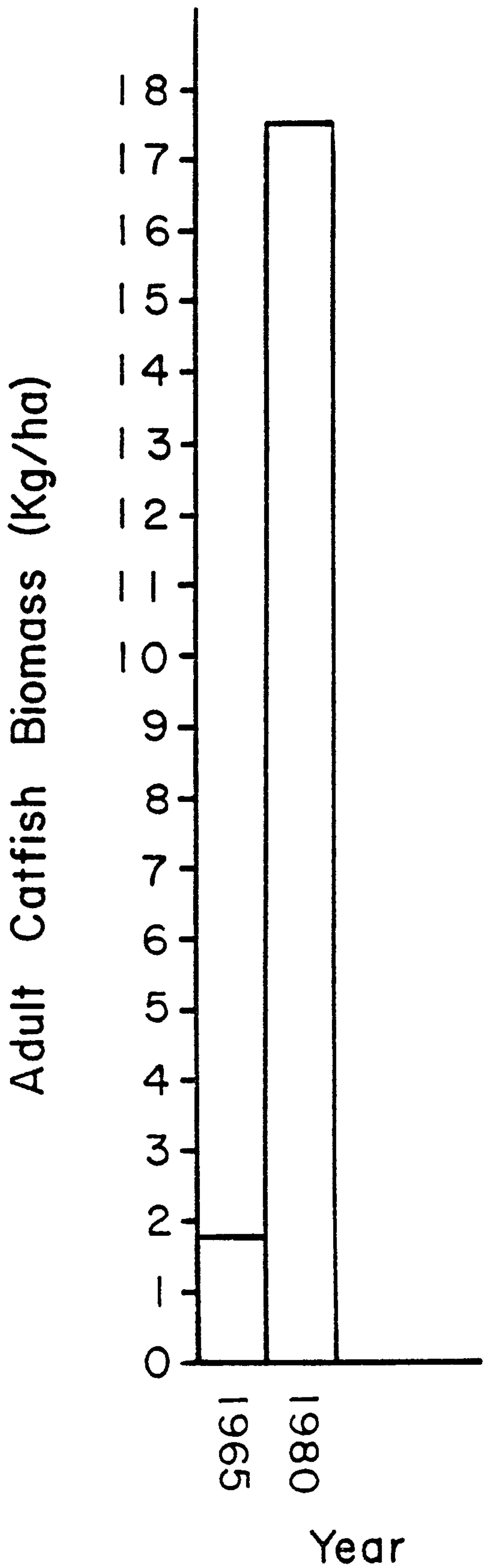


Adult Bass Biomass (Kg/ha)
0
1
2
3
4
5
6
7
8
9
10
1965
1980
Year

APPENDIX FIGURE 2. Continued.

ADULT CATFISH BIOMASS FOR ALL YEARS SAMPLED

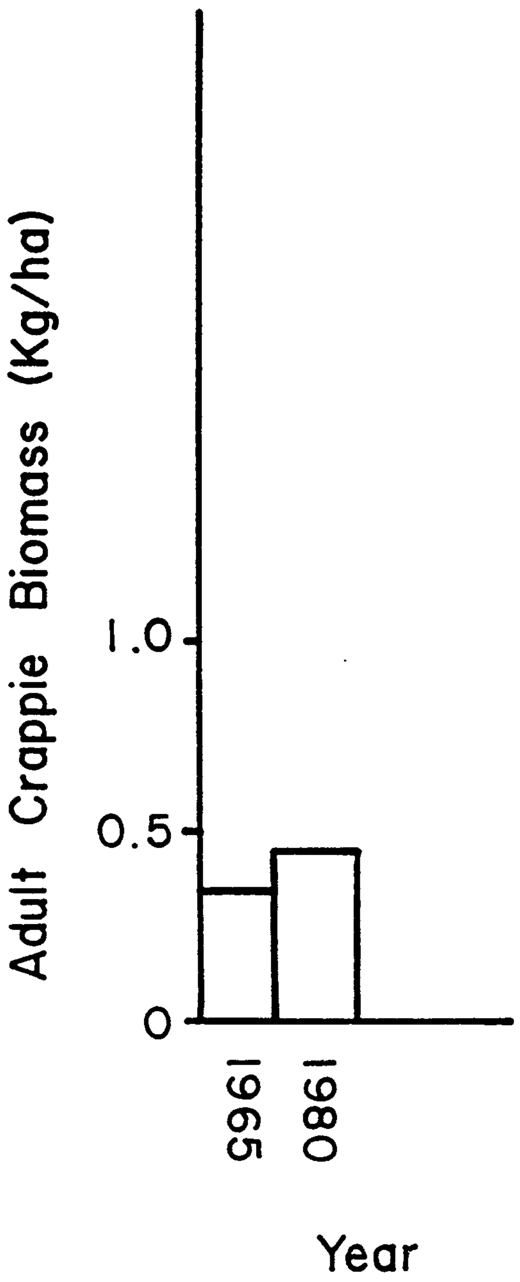
BAILEY


Adult Catfish Biomass (Kg/ha)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
1965
1980
Year

APPENDIX FIGURE 2. Continued.

ADULT CRAPPIE BIOMASS FOR ALL YEARS SAMPLED

BAILEY

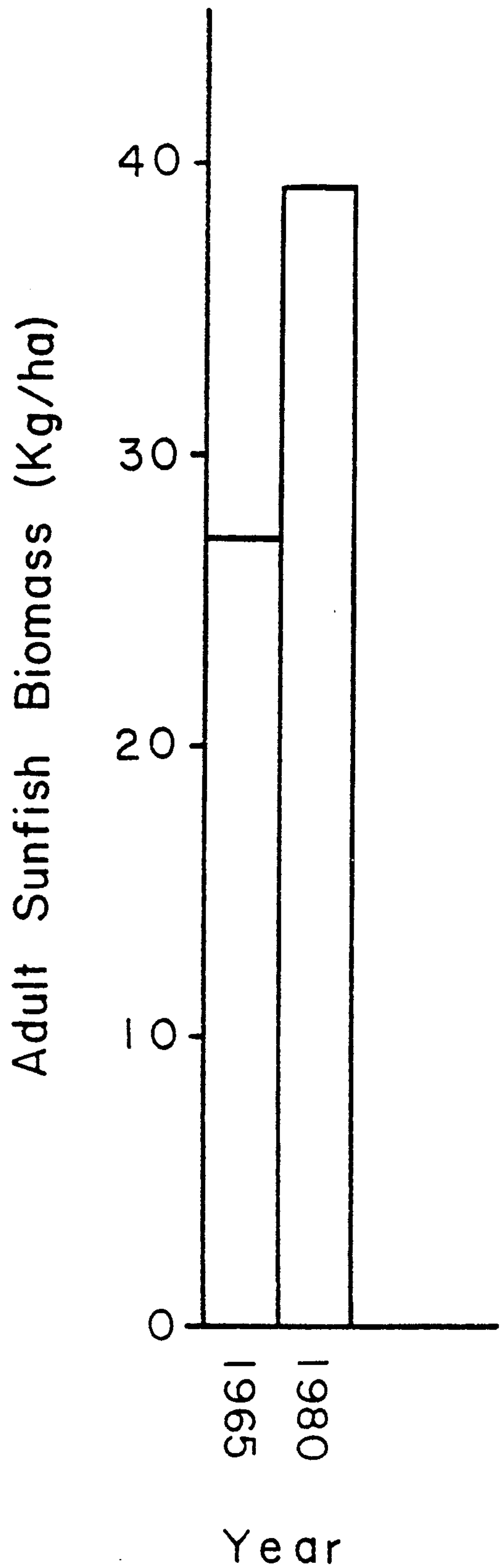


Adult Crappie Biomass (Kg/ha)
1.0
0.5
0
1965
1980
Year

APPENDIX FIGURE 2. Continued.

ADULT SUNFISH BIOMASS FOR ALL YEARS SAMPLED

BAILEY

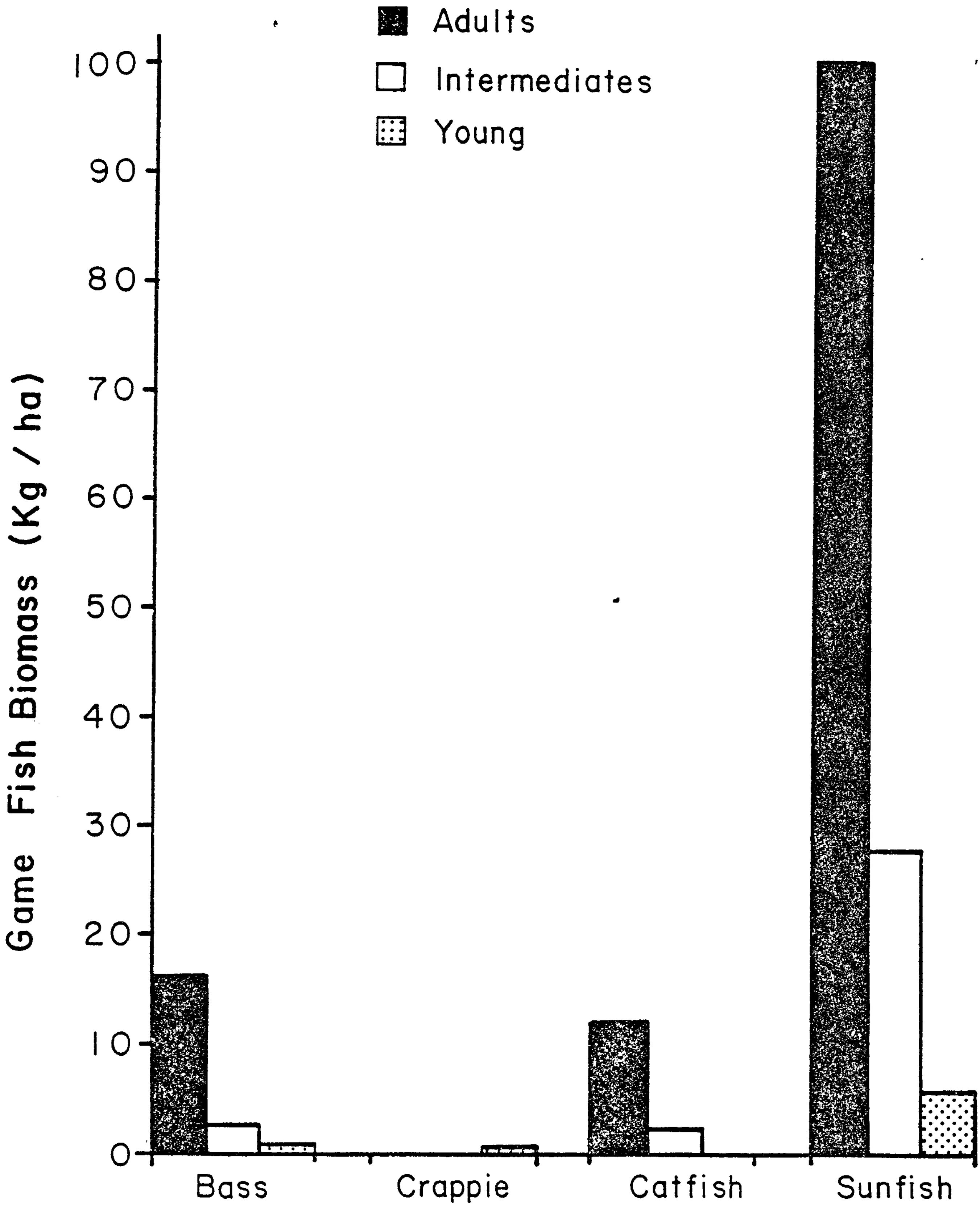


Adult Sunfish Biomass (Kg/ha)
40
30
20
10
0
1965
1980
Year

APPENDIX FIGURE 3.

GAMEFISH BIOMASS BY AGE GROUP - 1980

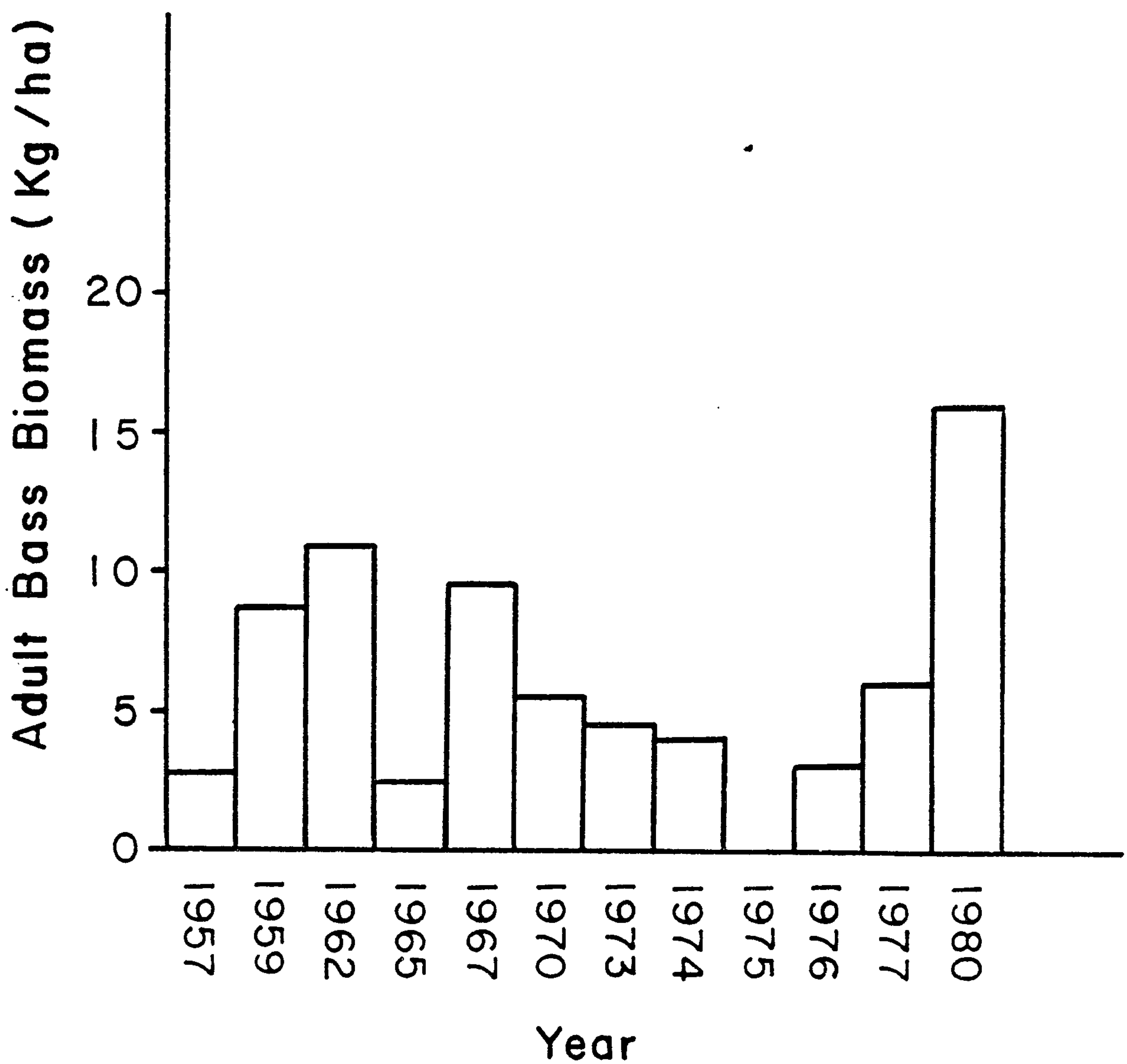
CALION


Adults
Intermediates
Young
Game Fish Biomass (Kg / ha)
100
90
80
70
60
50
40
30
20
10
0
Bass
Crappie
Catfish
Sunfish

APPENDIX FIGURE 3. Continued.

ADULT BASS BIOMASS FOR ALL YEARS SAMPLED

CALION

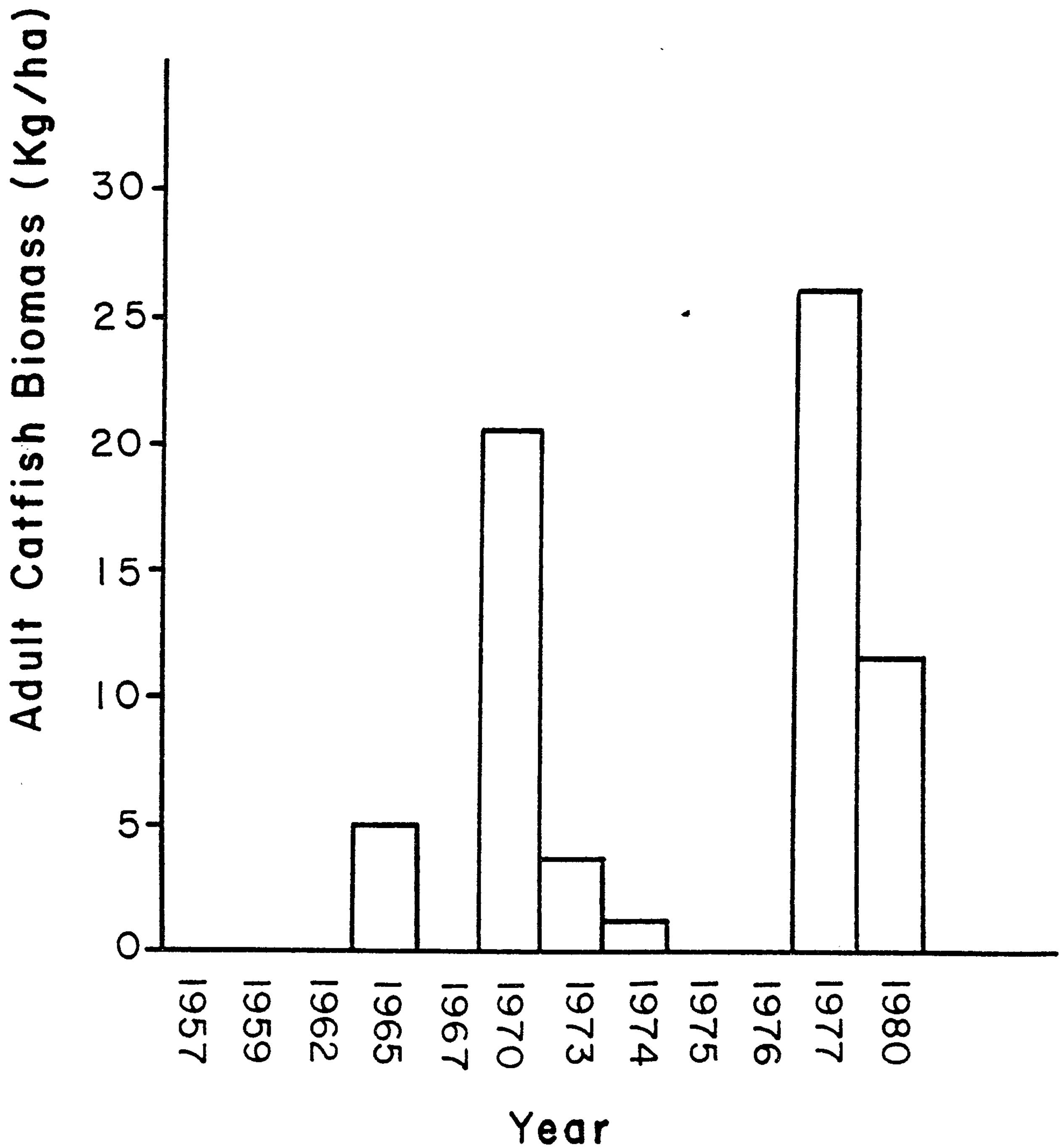


Adult Bass Biomass (Kg/ha)
0
5
10
15
20
1957
1959
1962
1965
1967
1970
1973
1974
1975
1976
1977
1980
Year

APPENDIX FIGURE 3. Continued.

ADULT CATFISH BIOMASS FOR ALL YEARS SAMPLED

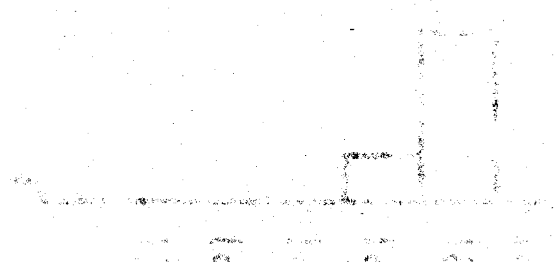
CALION

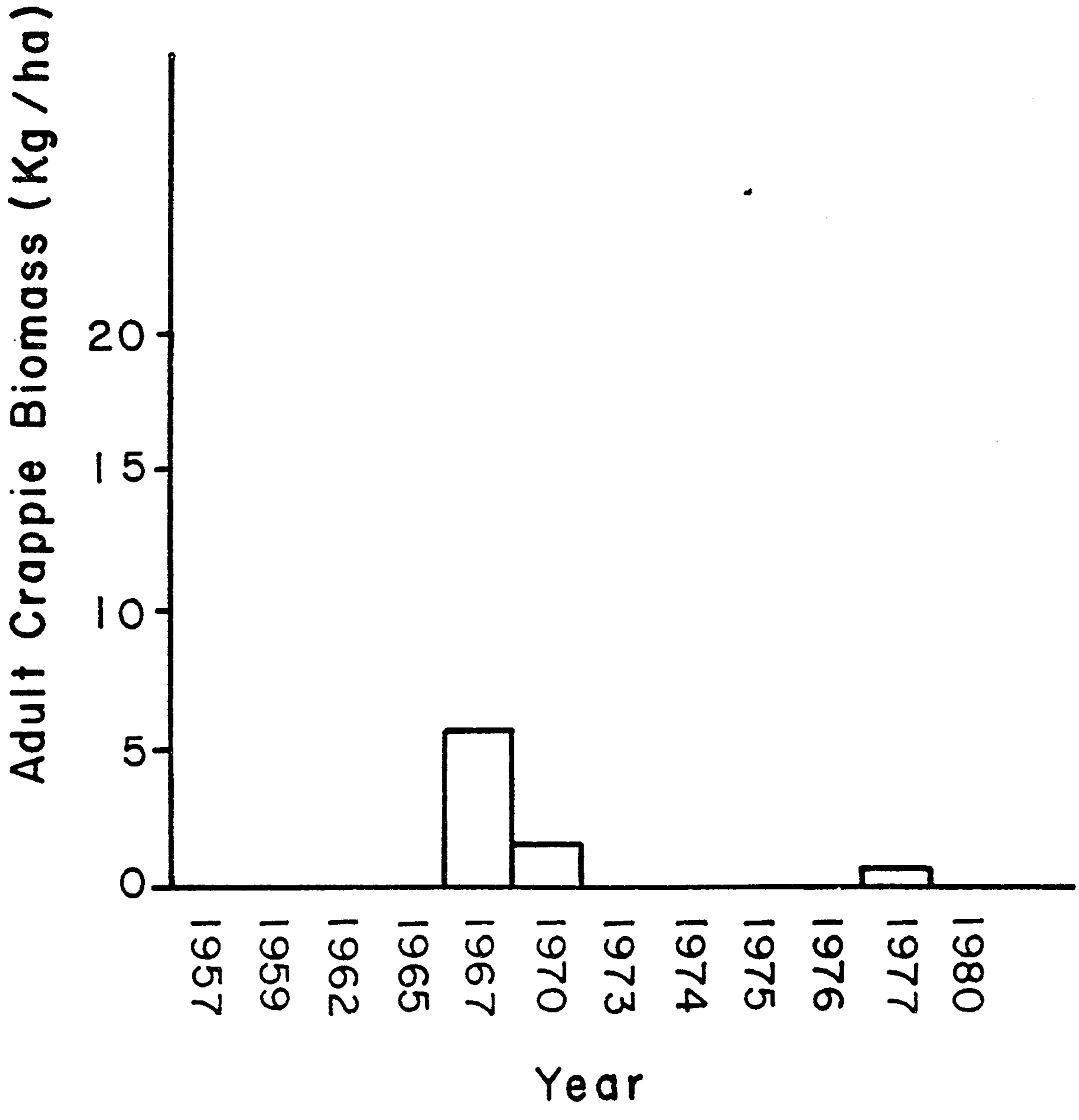

Adult Catfish Biomass (Kg/ha)
30
25
20
15
10
5
0
1957
1959
1962
1965
1967
1970
1973
1974
1975
1976
1977
1980
Year

APPENDIX FIGURE 3. Continued.

ADULT CRAPPIE BIOMASS FOR ALL YEARS SAMPLED

CALION

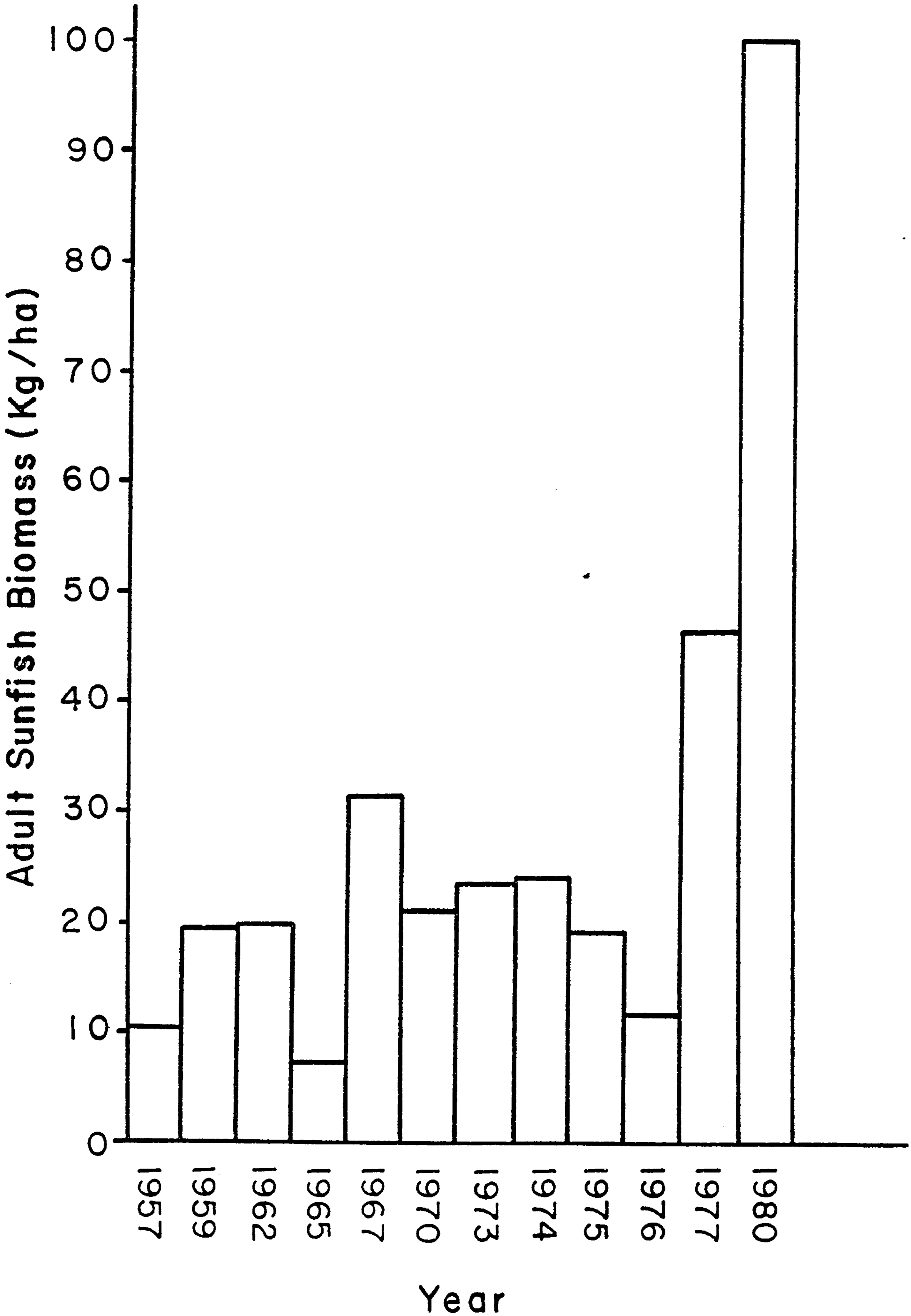



Adult Crappie Biomass (Kg/ha)
20
15
10
5
0
1957
1959
1962
1965
1967
1970
1973
1974
1975
1976
1977
1980
Year

APPENDIX FIGURE 3. Continued.

ADULT SUNFISH BIOMASS FOR ALL YEARS SAMPLED

CALION

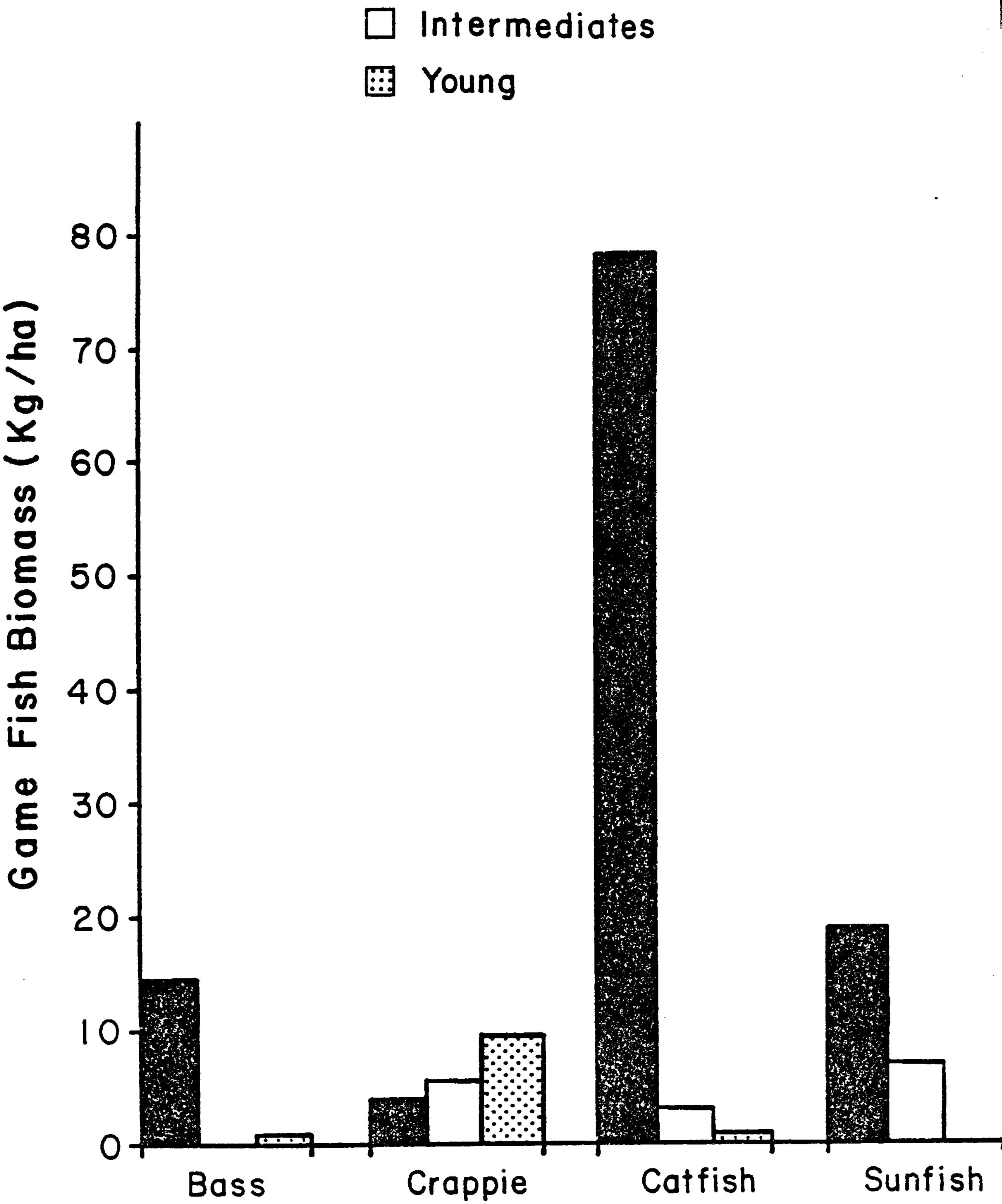


Adult Sunfish Biomass (Kg/ha)
0
10
20
30
40
50
60
70
80
90
100
1957
1959
1962
1965
1967
1970
1973
1974
1975
1976
1977
1980
Year

APPENDIX FIGURE 4.

GAMEFISH BIOMASS BY AGE GROUP - 1980

CHICOT

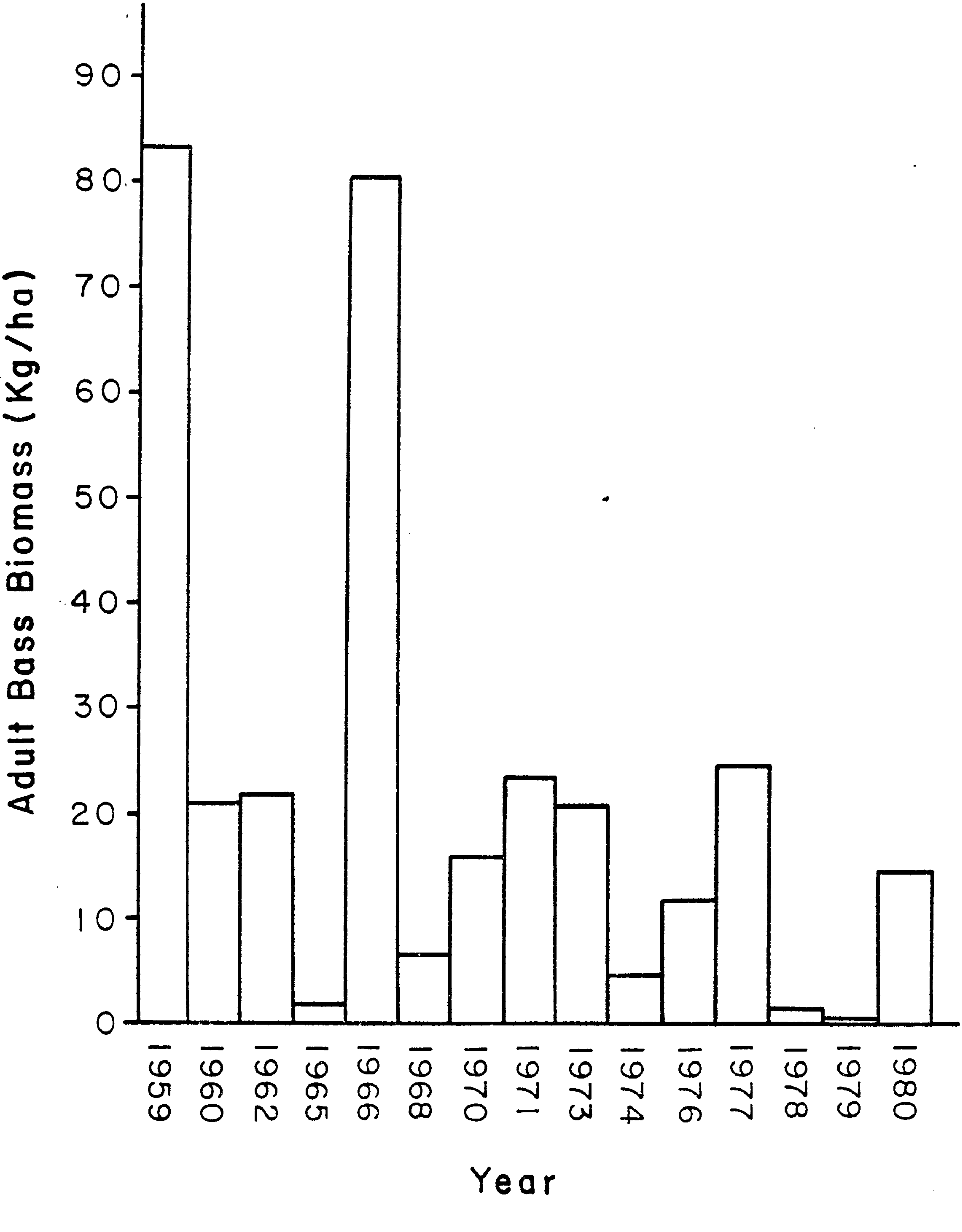


Intermediates
Young
Game Fish Biomass (Kg/ha)
0
10
20
30
40
50
60
70
80
Bass
Crappie
Catfish
Sunfish

APPENDIX FIGURE 4. Continued.

ADULT BASS BIOMASS FOR ALL YEARS SAMPLED

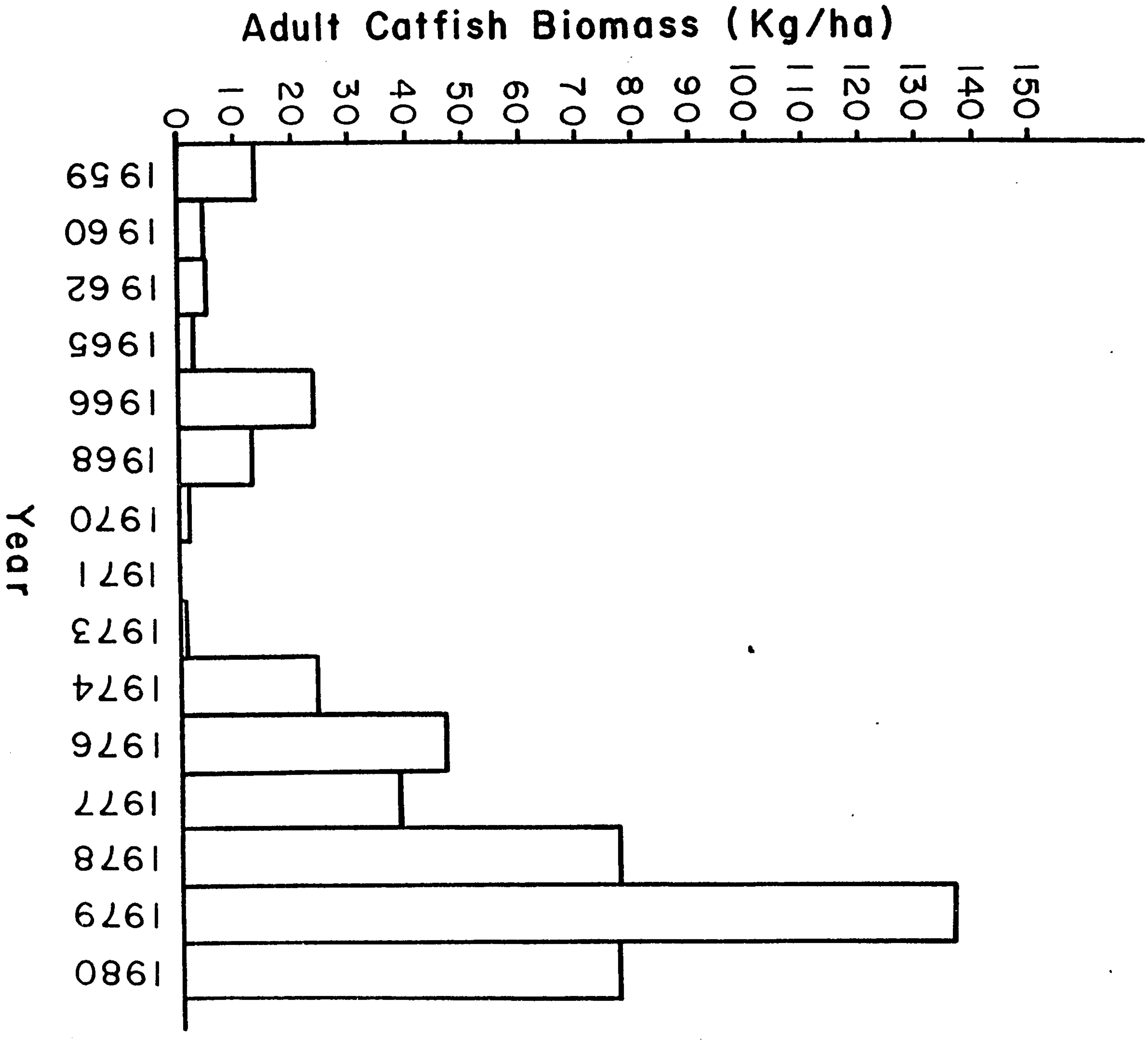
CHICOT


Adult Bass Biomass (Kg/ha)
0
10
20
30
40
50
60
70
80
90
1959
1960
1962
1965
1966
1968
1970
1971
1973
1974
1976
1977
1978
1979
1980
Year

APPENDIX FIGURE 4. Continued.

ADULT CATFISH BIOMASS FOR ALL YEARS SAMPLED

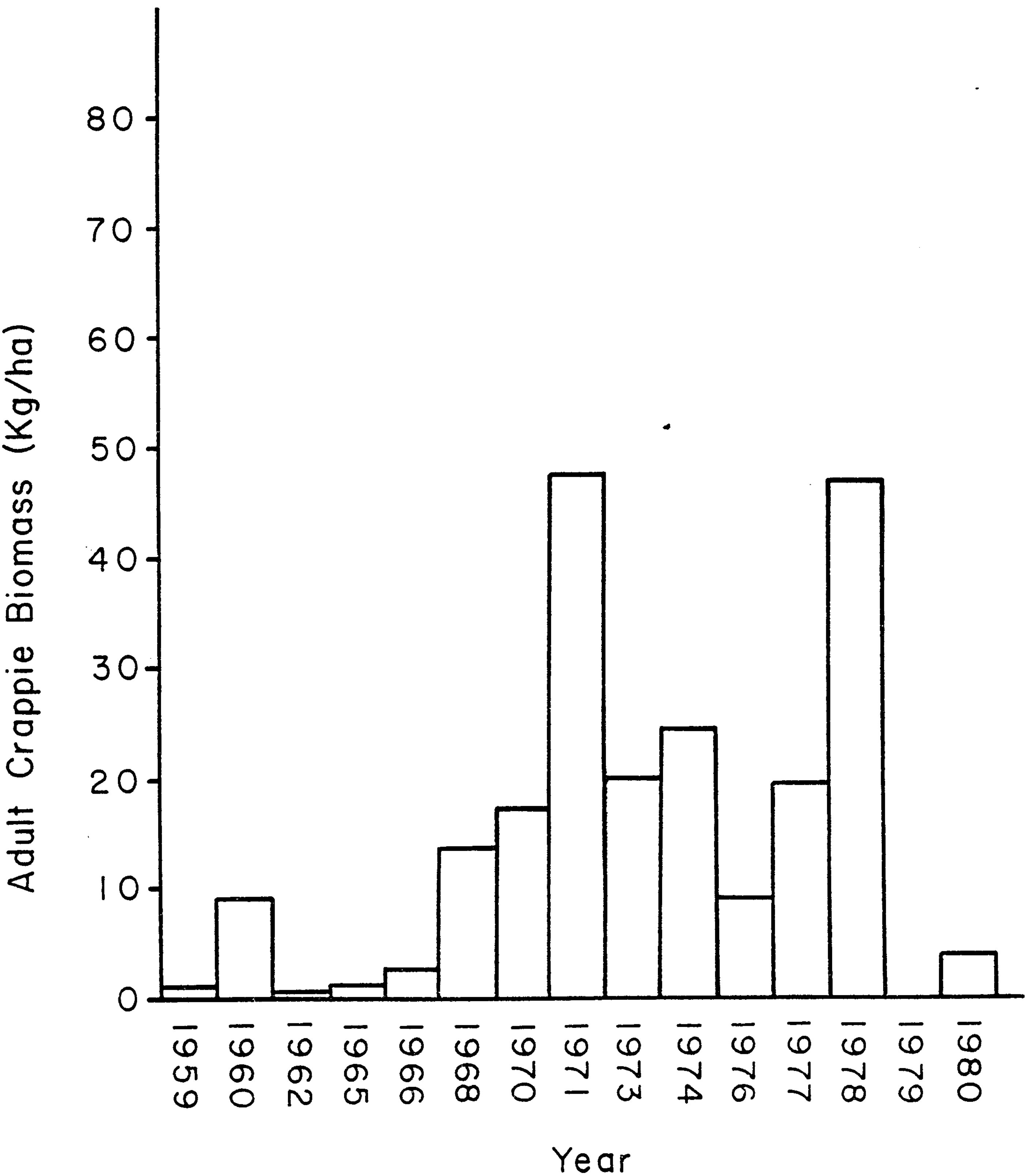
CHICOT


Adult Catfish Biomass (Kg/ha)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
Year
1959
1960
1962
1965
1966
1968
1970
1971
1973
1974
1976
1977
1978
1979
1980

APPENDIX FIGURE 4. Continued.

ADULT CRAPPIE BIOMASS FOR ALL YEARS SAMPLED

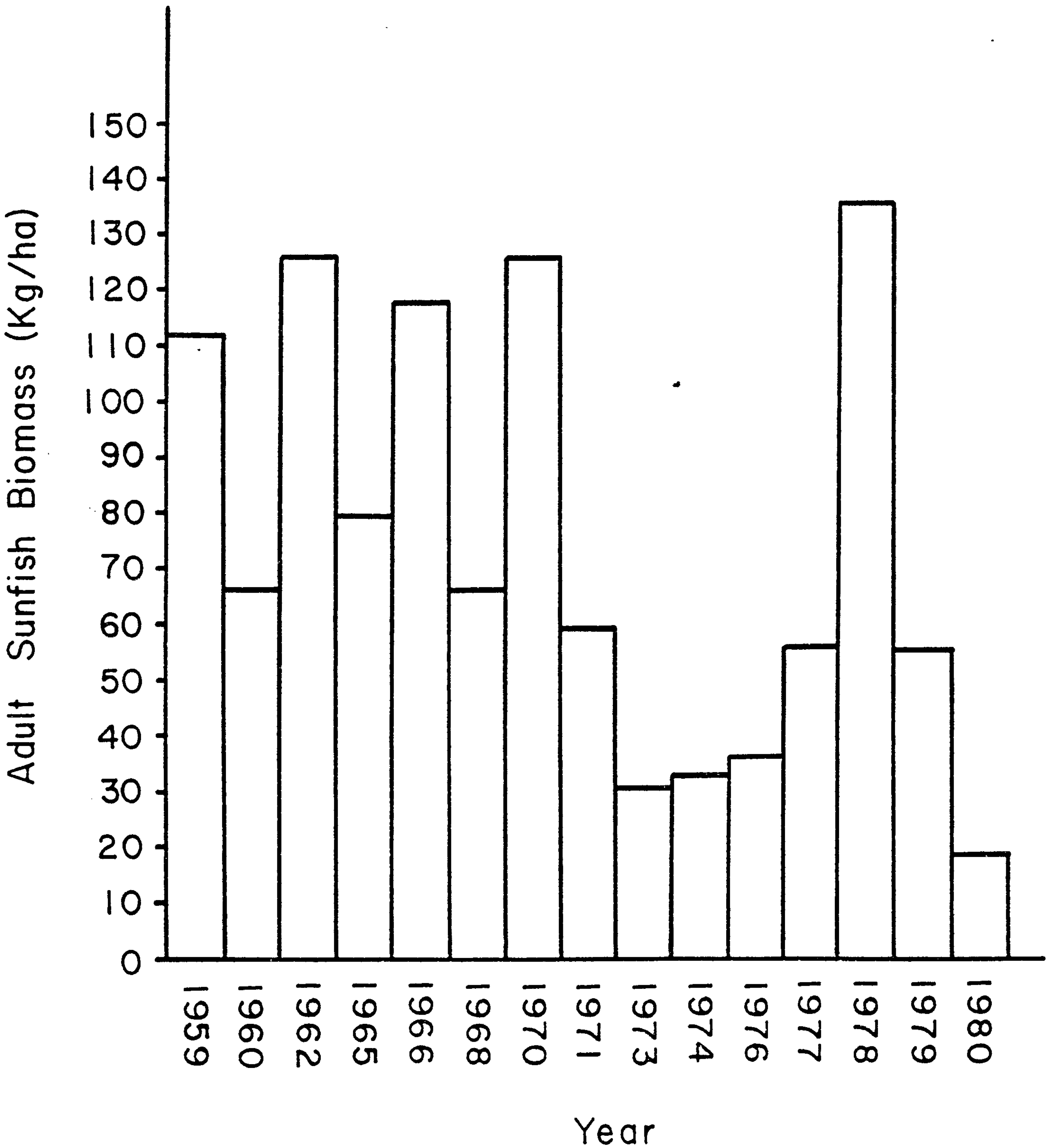
CHICOT


Adult Crappie Biomass (Kg/ha)
80
70
60
50
40
30
20
10
0
1959
1960
1962
1965
1966
1968
1970
1971
1973
1974
1976
1977
1978
1979
1980
Year

APPENDIX FIGURE 4. Continued.

ADULT SUNFISH BIOMASS FOR ALL YEARS SAMPLED

CHICOT

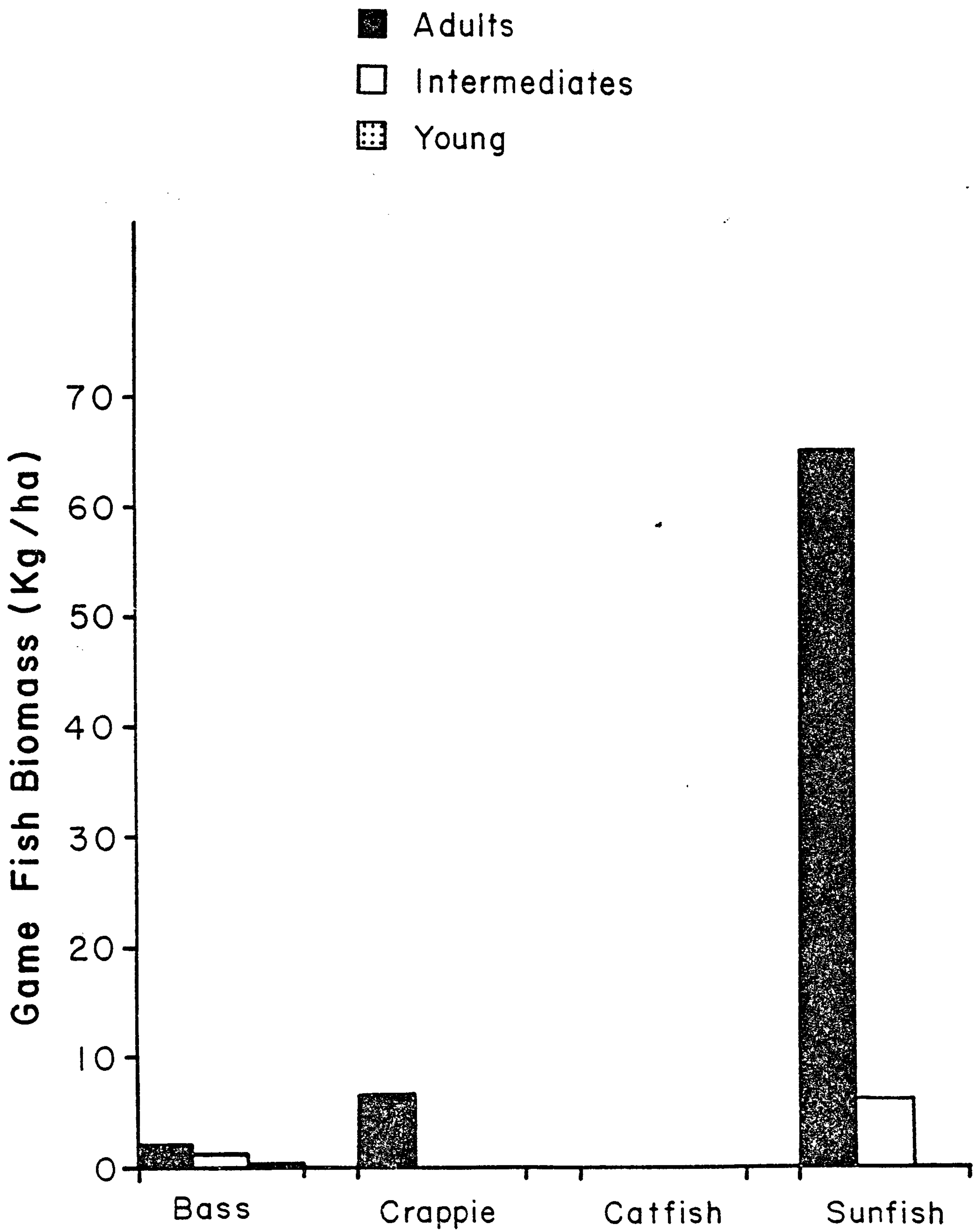


Adult Sunfish Biomass (Kg/ha)
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1959
1960
1962
1965
1966
1968
1970
1971
1973
1974
1976
1977
1978
1979
1980
Year

APPENDIX FIGURE 5.

GAMEFISH BIOMASS BY AGE GROUP - 1980

ENTERPRISE

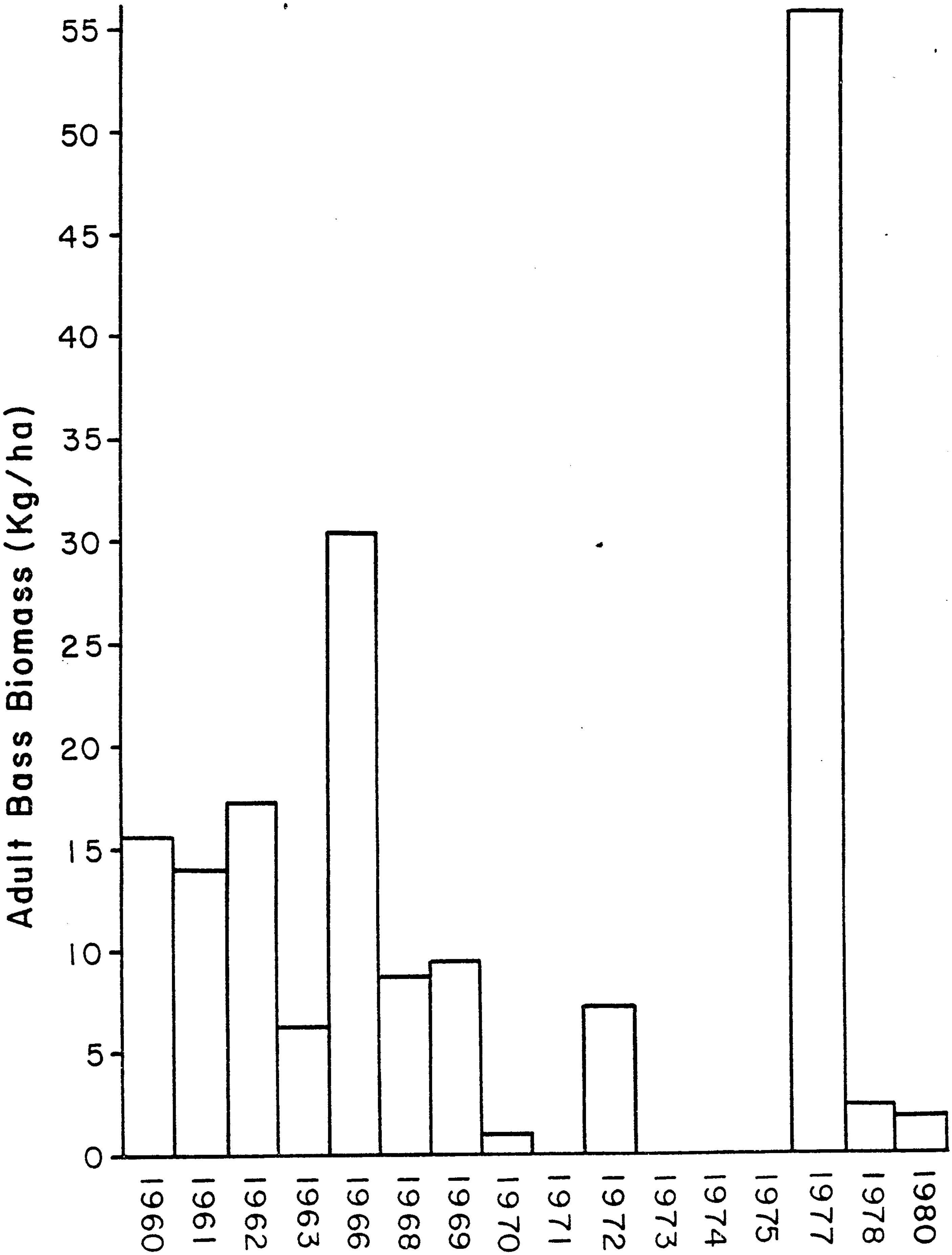


Adults
Intermediates
Young
Game Fish Biomass (Kg/ha)
70
60
50
40
30
20
10
0
Bass
Crappie
Catfish
Sunfish

APPENDIX FIGURE 5. Continued.

ADULT BASS BIOMASS FOR ALL YEARS SAMPLED

ENTERPRISE

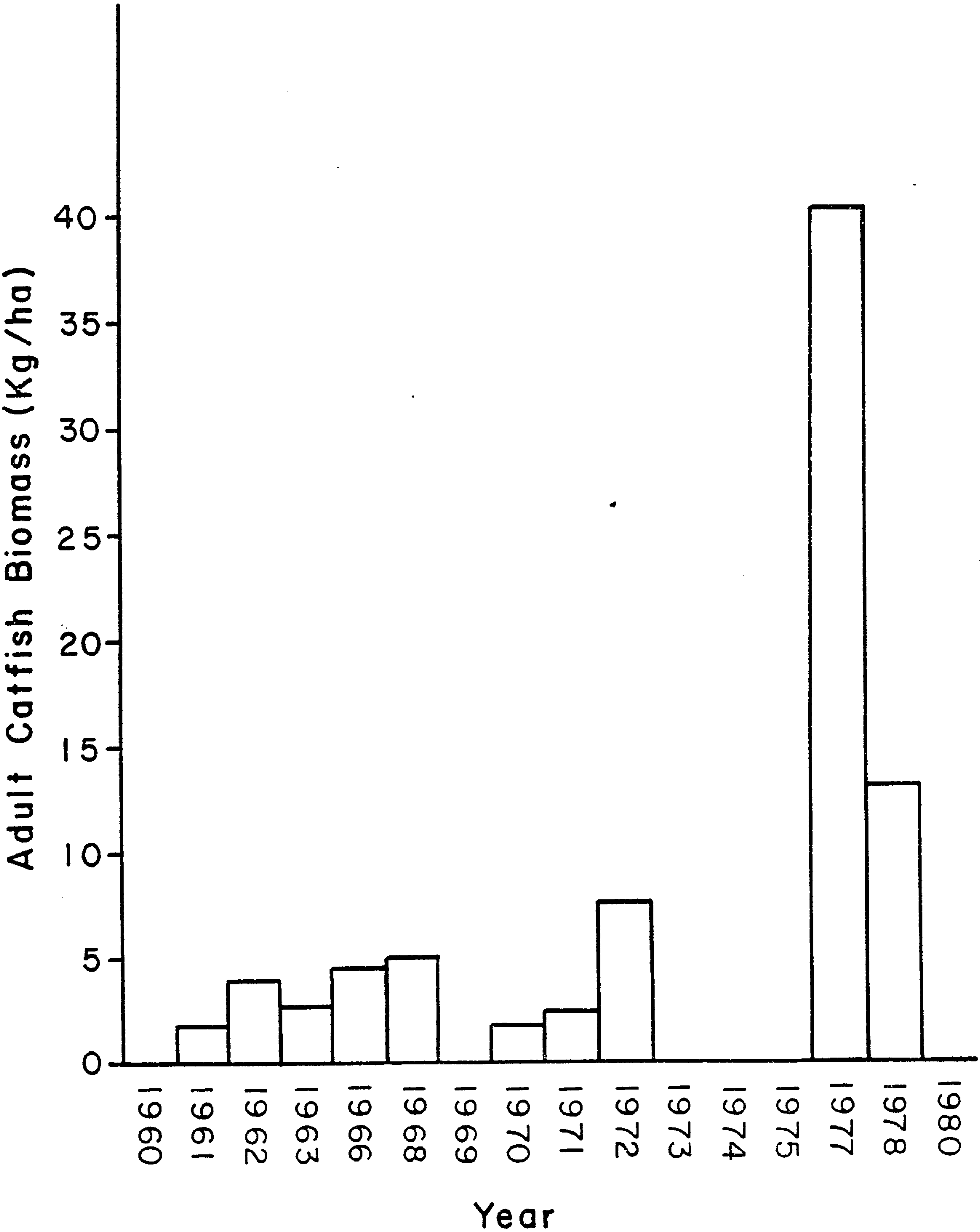


Adult Bass Biomass (Kg/ha)
55
50
45
40
35
30
25
20
15
10
5
0
1960
1961
1962
1963
1966
1968
1969
1970
1971
1972
1973
1974
1975
1977
1978
1980

APPENDIX FIGURE 5. Continued.

ADULT CATFISH BIOMASS FOR ALL YEARS SAMPLED

ENTERPRISE

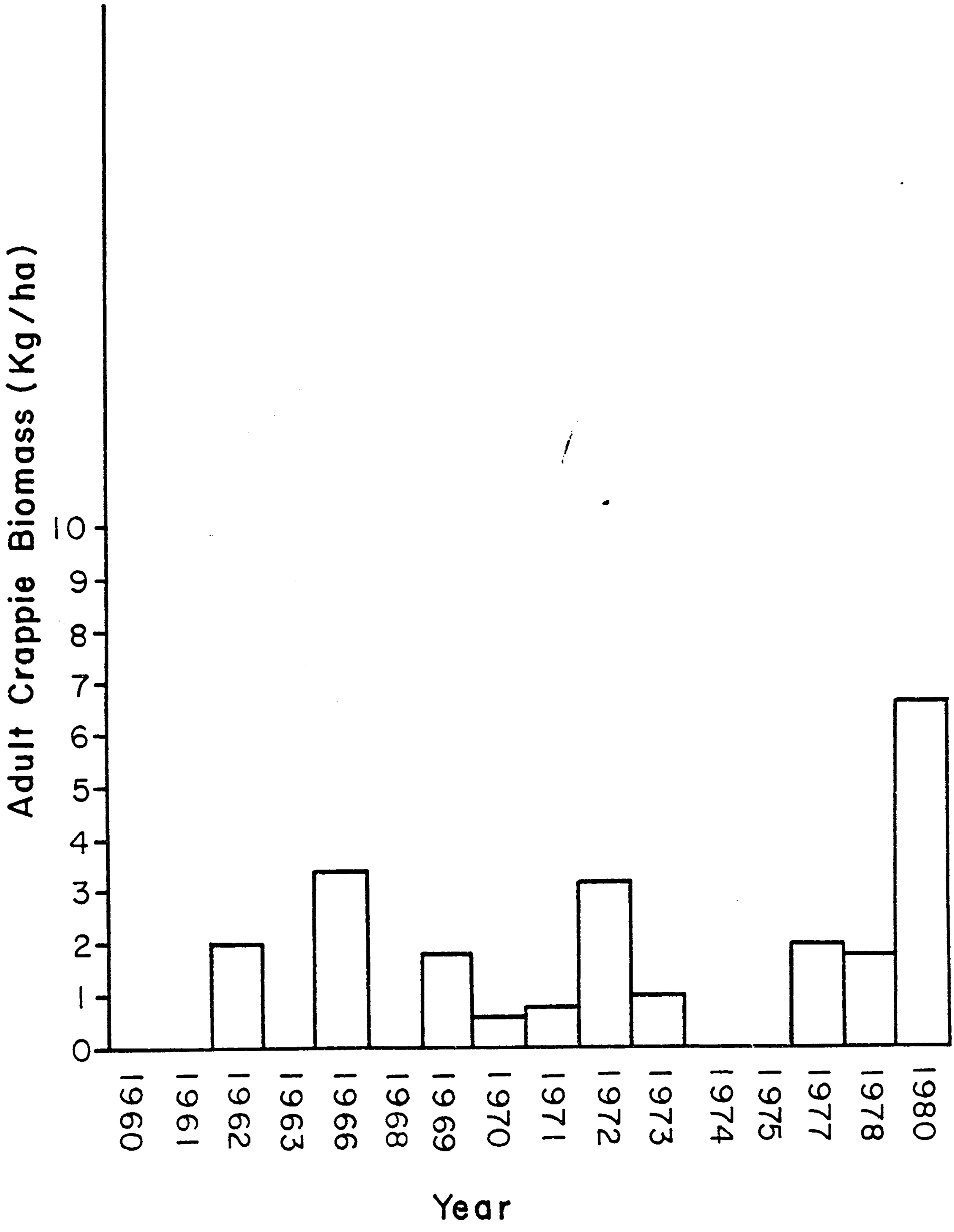


Adult Catfish Biomass (Kg/ha)
0
5
10
15
20
25
30
35
40
1960
1961
1962
1963
1966
1968
1969
1970
1971
1972
1973
1974
1975
1977
1978
1980
Year

APPENDIX FIGURE 5. Continued.

ADULT CRAPPIE BIOMASS FOR ALL YEARS SAMPLED

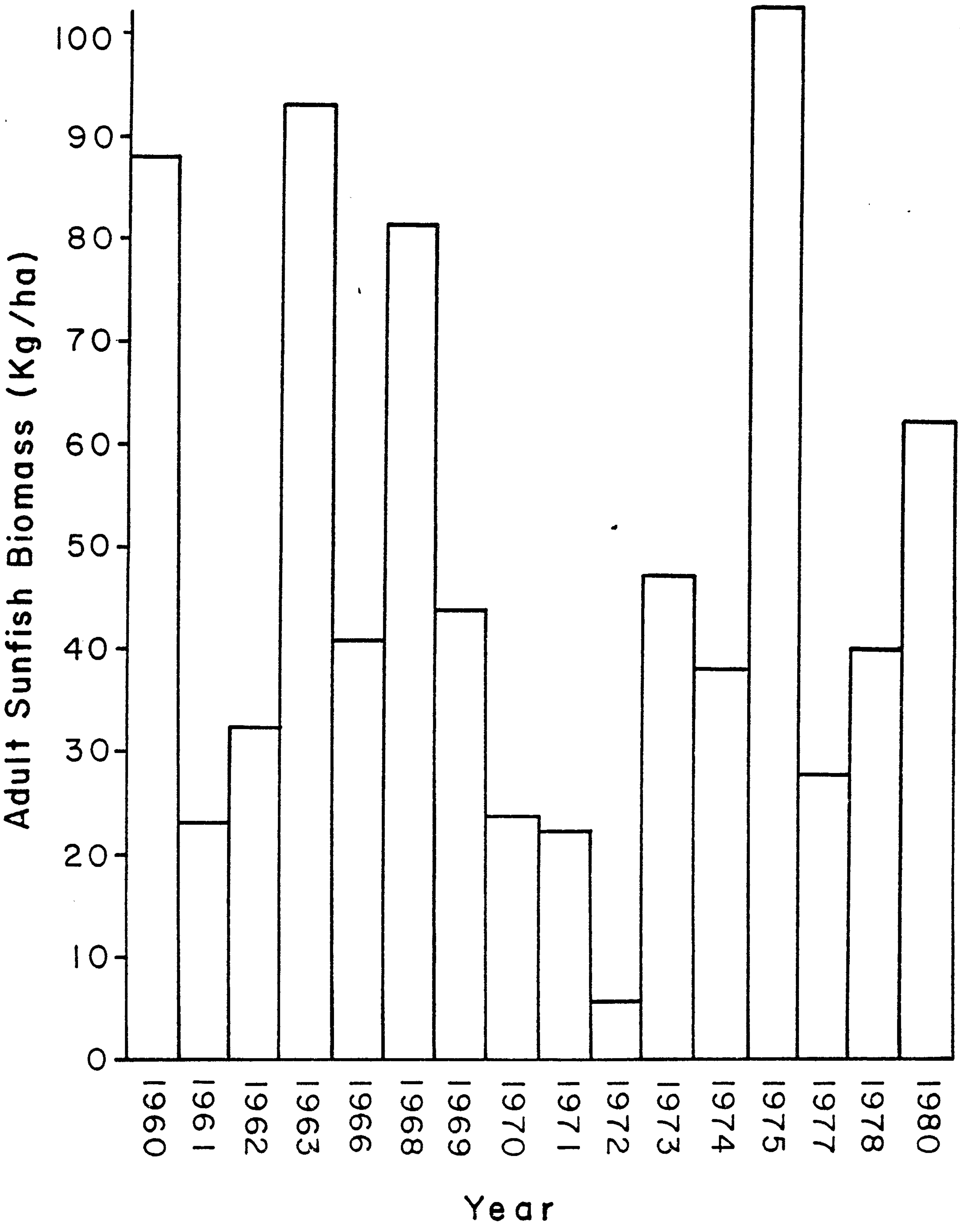
ENTERPRISE


Adult Crappie Biomass (Kg/ha)
0
1
2
3
4
5
6
7
8
9
10
1960
1961
1962
1963
1966
1968
1969
1970
1971
1972
1973
1974
1975
1977
1978
1980
Year

APPENDIX FIGURE 5. Continued.

ADULT SUNFISH BIOMASS FOR ALL YEARS SAMPLED

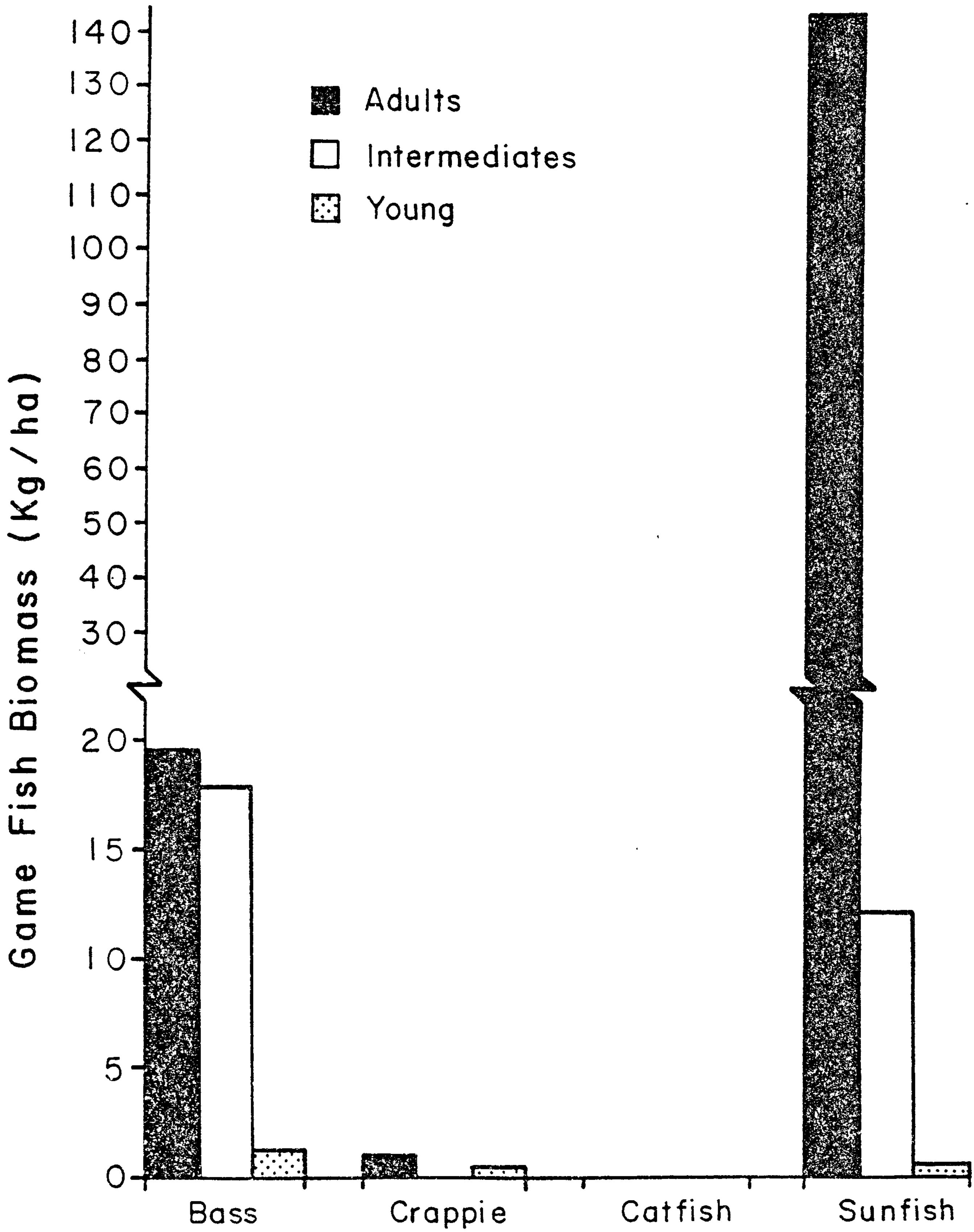
ENTERPRISE


Adult Sunfish Biomass (Kg/ha)
100
90
80
70
60
50
40
30
20
10
0
1960
1961
1962
1963
1966
1968
1969
1970
1971
1972
1973
1974
1975
1977
1978
1980
Year

APPENDIX FIGURE 6.

GAMEFISH BIOMASS BY AGE GROUP - 1980

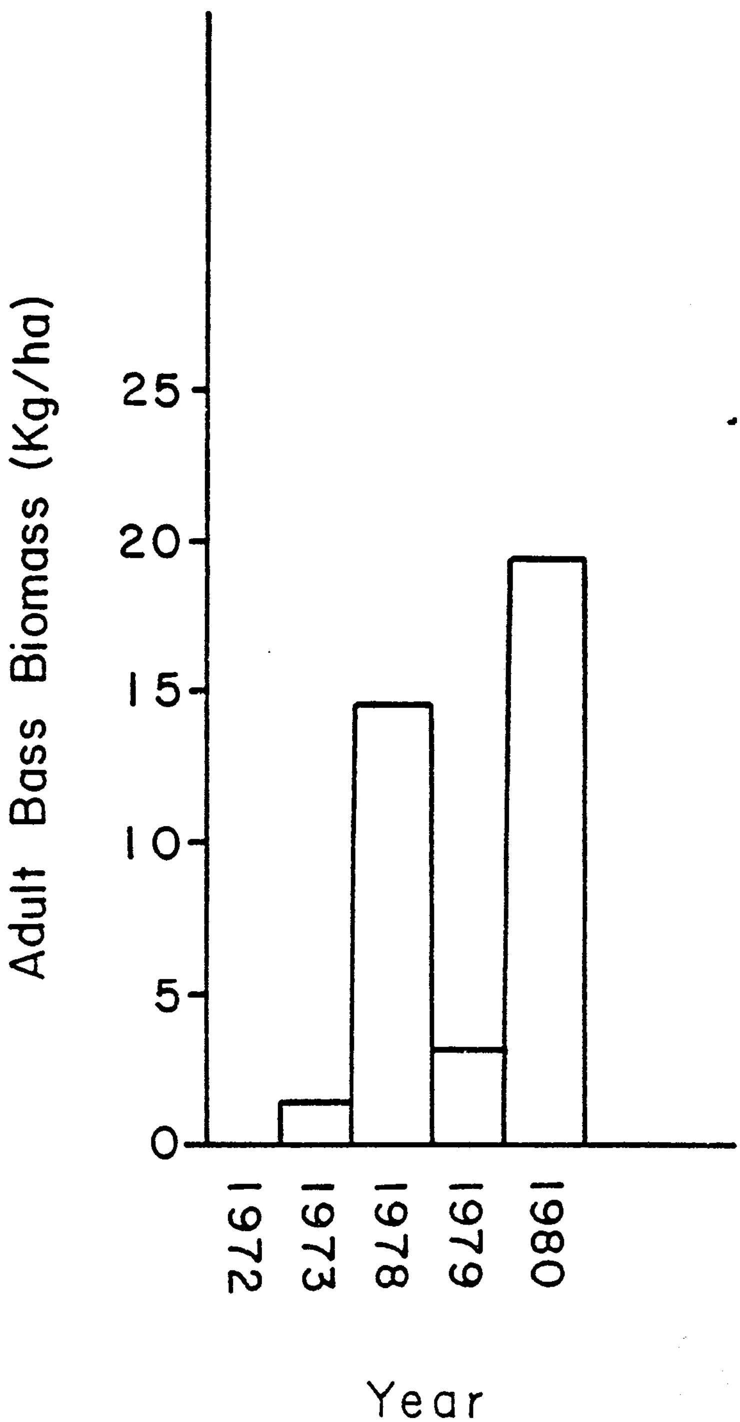
LAKE JUNE


Adults
Intermediates
Young
Game Fish Biomass (Kg/ha)
140
130
120
110
100
90
80
70
60
50
40
30
20
15
10
5
0
Bass
Crappie
Catfish
Sunfish

APPENDIX FIGURE 6. Continued.

ADULT BASS BIOMASS FOR ALL YEARS SAMPLED

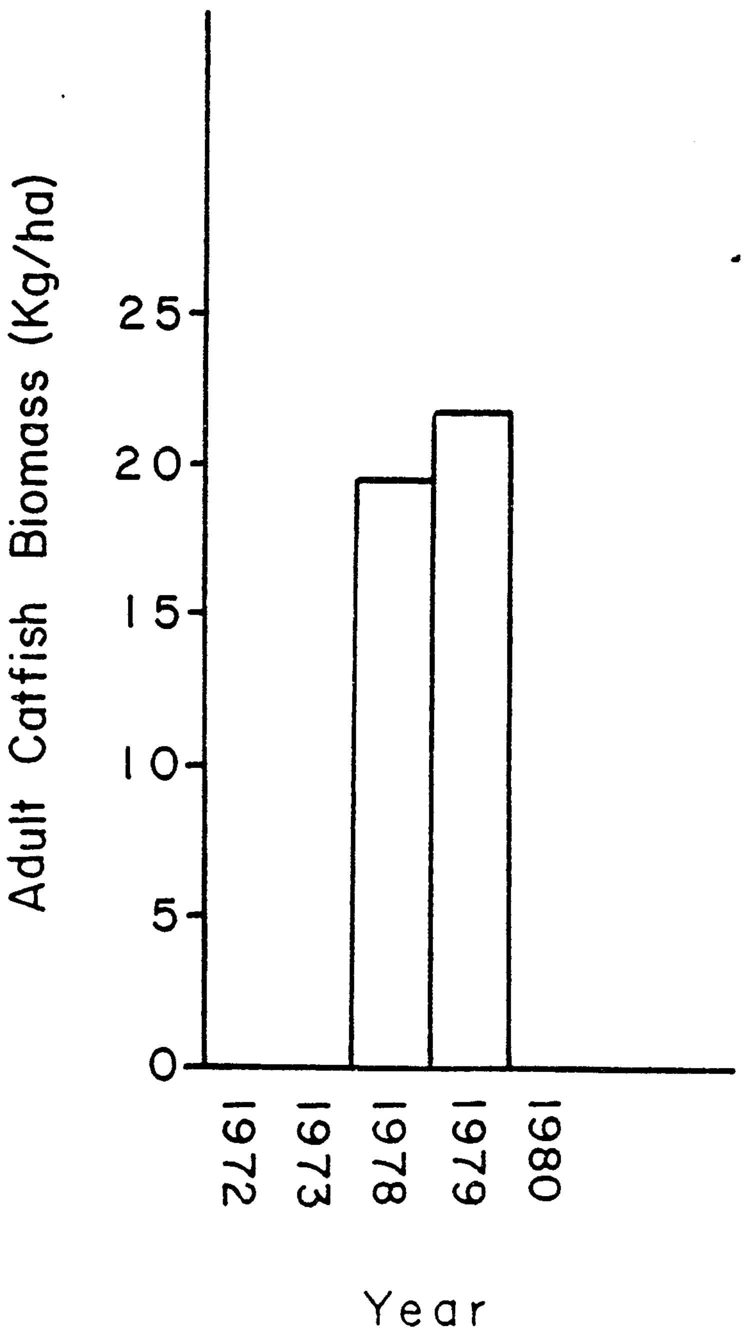
LAKE JUNE


Adult Bass Biomass (Kg/ha)
25
20
15
10
5
0
1972
1973
1978
1979
1980
Year

APPENDIX FIGURE 6. Continued.

ADULT CATFISH BIOMASS FOR ALL YEARS SAMPLED

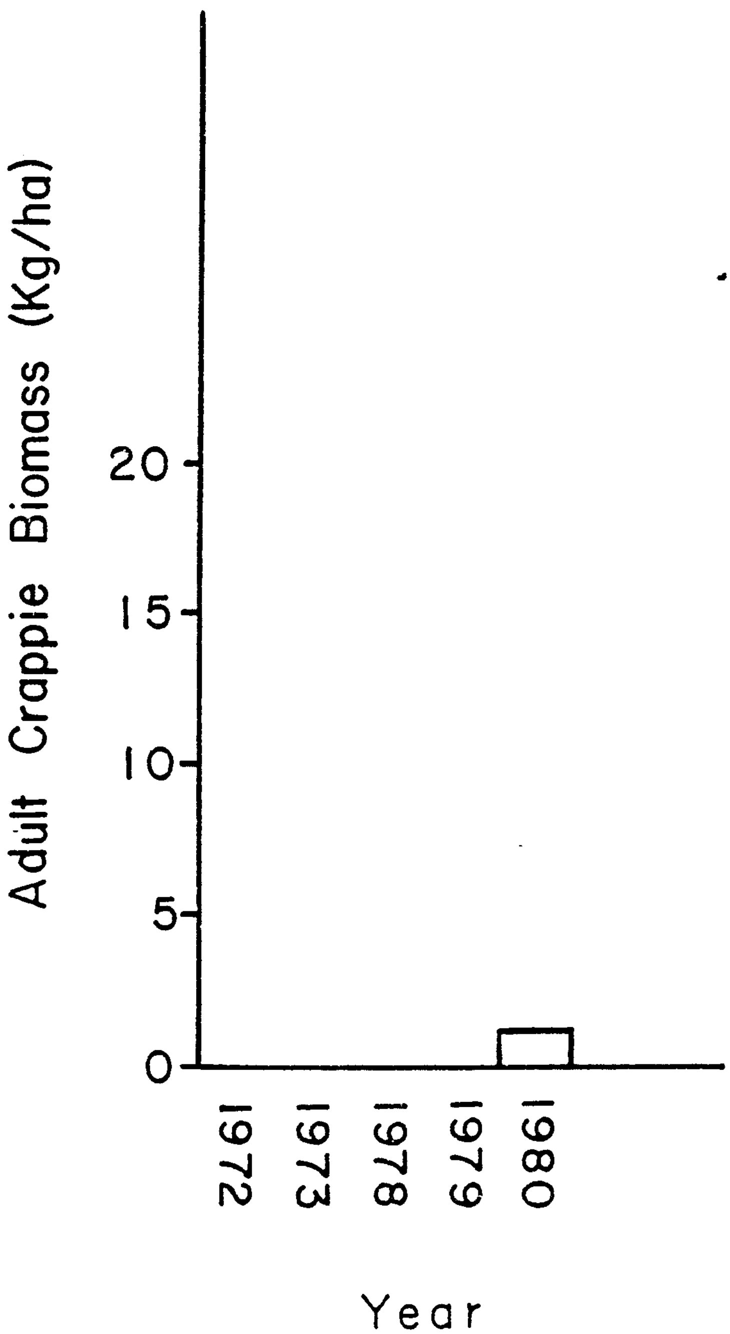
LAKE JUNE


Adult Catfish Biomass (Kg/ha)
25
20
15
10
5
0
1972
1973
1978
1979
1980
Year

APPENDIX FIGURE 6. Continued.

ADULT CRAPPIE BIOMASS FOR ALL YEARS SAMPLED

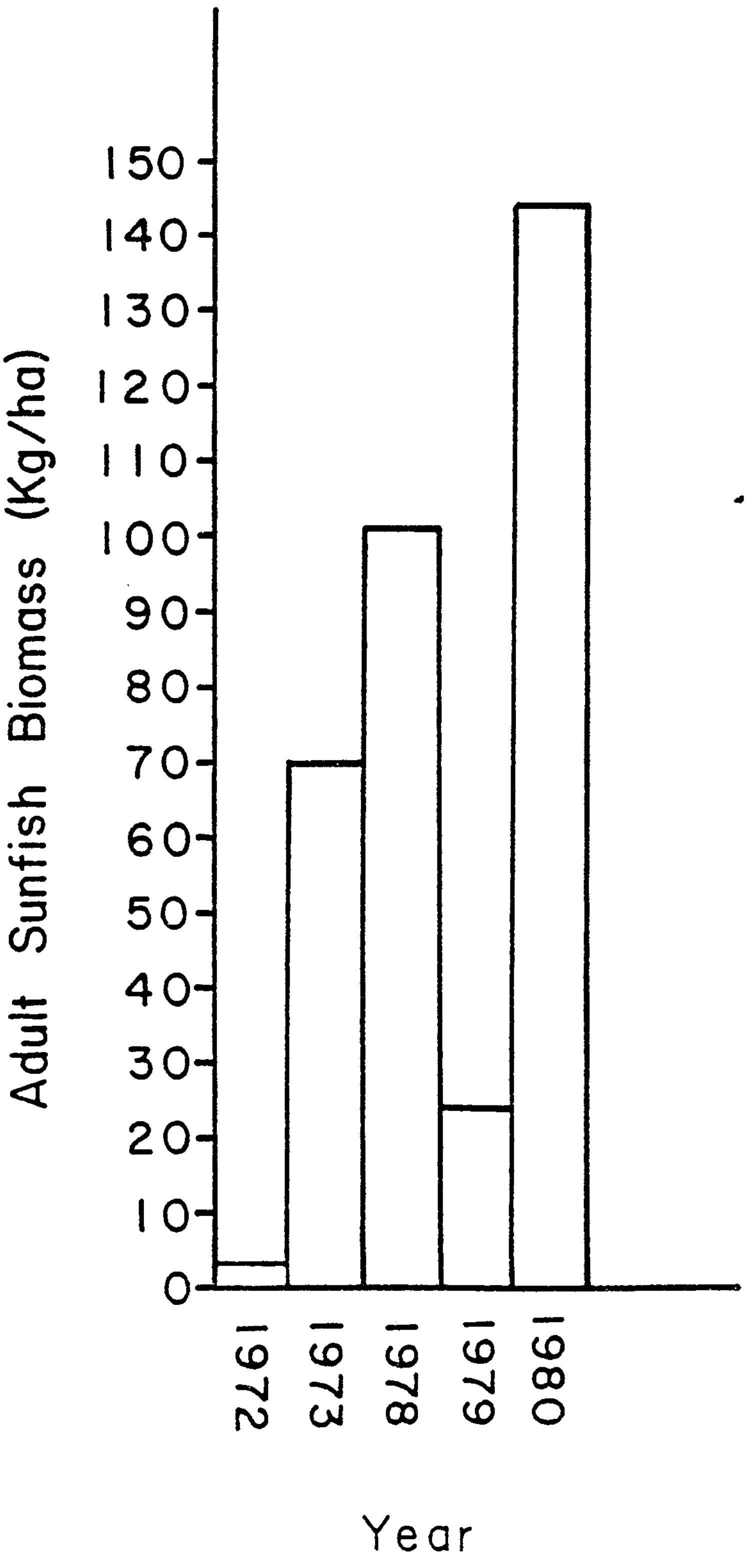
LAKE JUNE


Adult Crappie Biomass (Kg/ha)
20
15
10
5
0
1972
1973
1978
1979
1980
Year

APPENDIX FIGURE 6. Continued.

ADULT SUNFISH BIOMASS FOR ALL YEARS SAMPLED

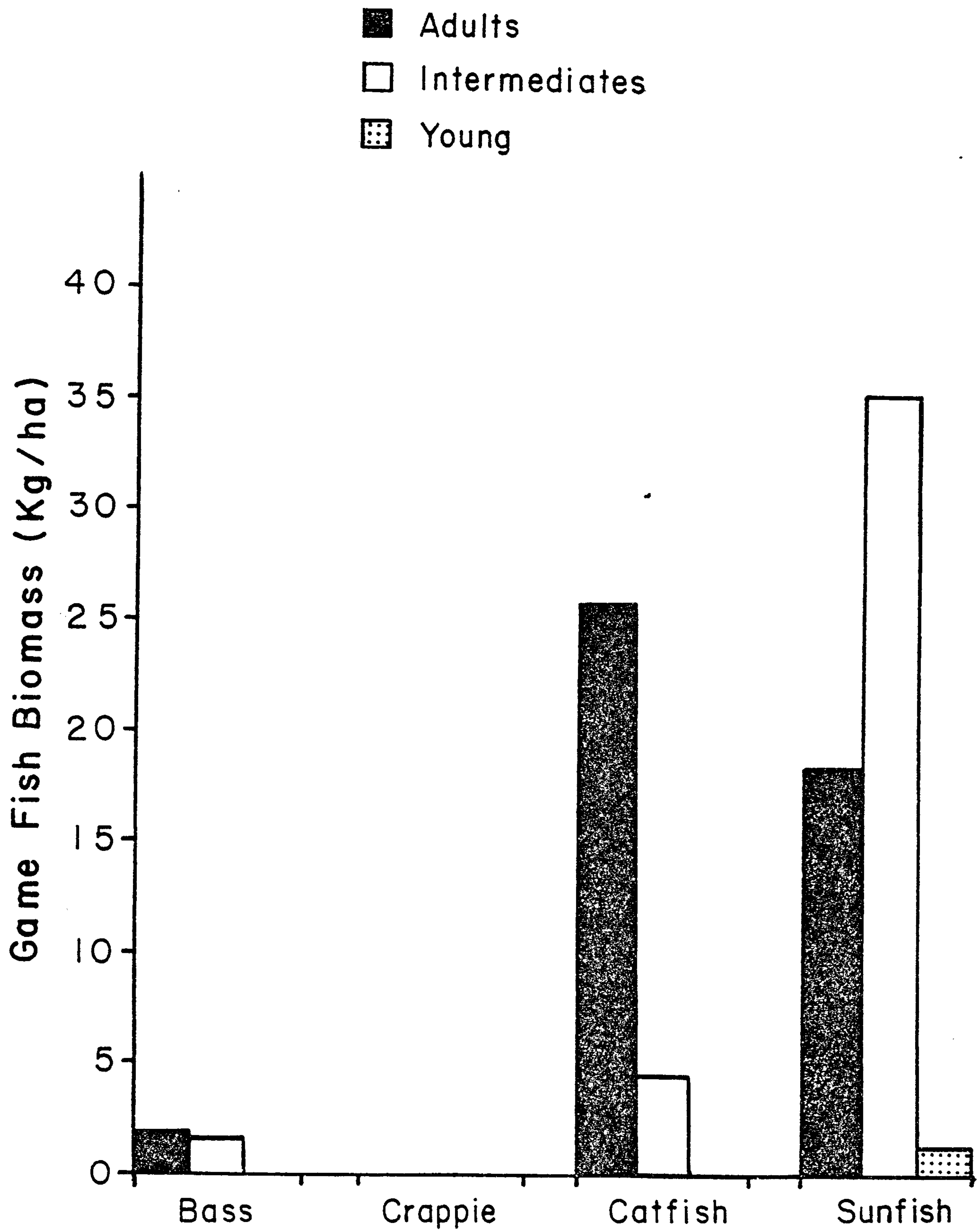
LAKE JUNE


Adult Sunfish Biomass (Kg/ha)
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1972
1973
1978
1979
1980
Year

APPENDIX FIGURE 7.

GAMEFISH BIOMASS BY AGE GROUP - 1980

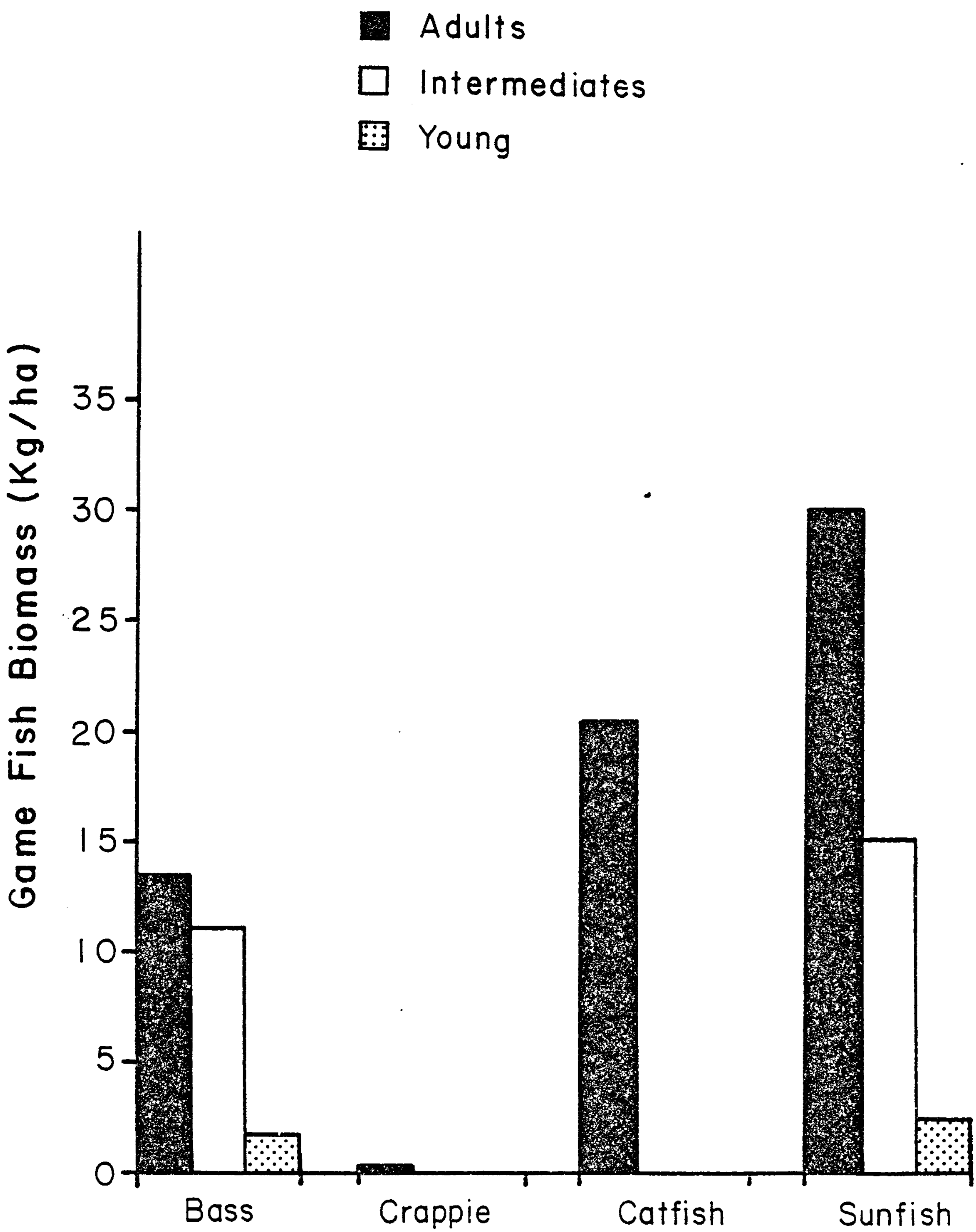
LOU EMMA


Adults
Intermediates
Young
Game Fish Biomass (Kg/ha)
40
35
30
25
20
15
10
5
0
Bass
Crappie
Catfish
Sunfish

APPENDIX FIGURE 8.

GAMEFISH BIOMASS BY AGE GROUP - 1980

NEWPORT

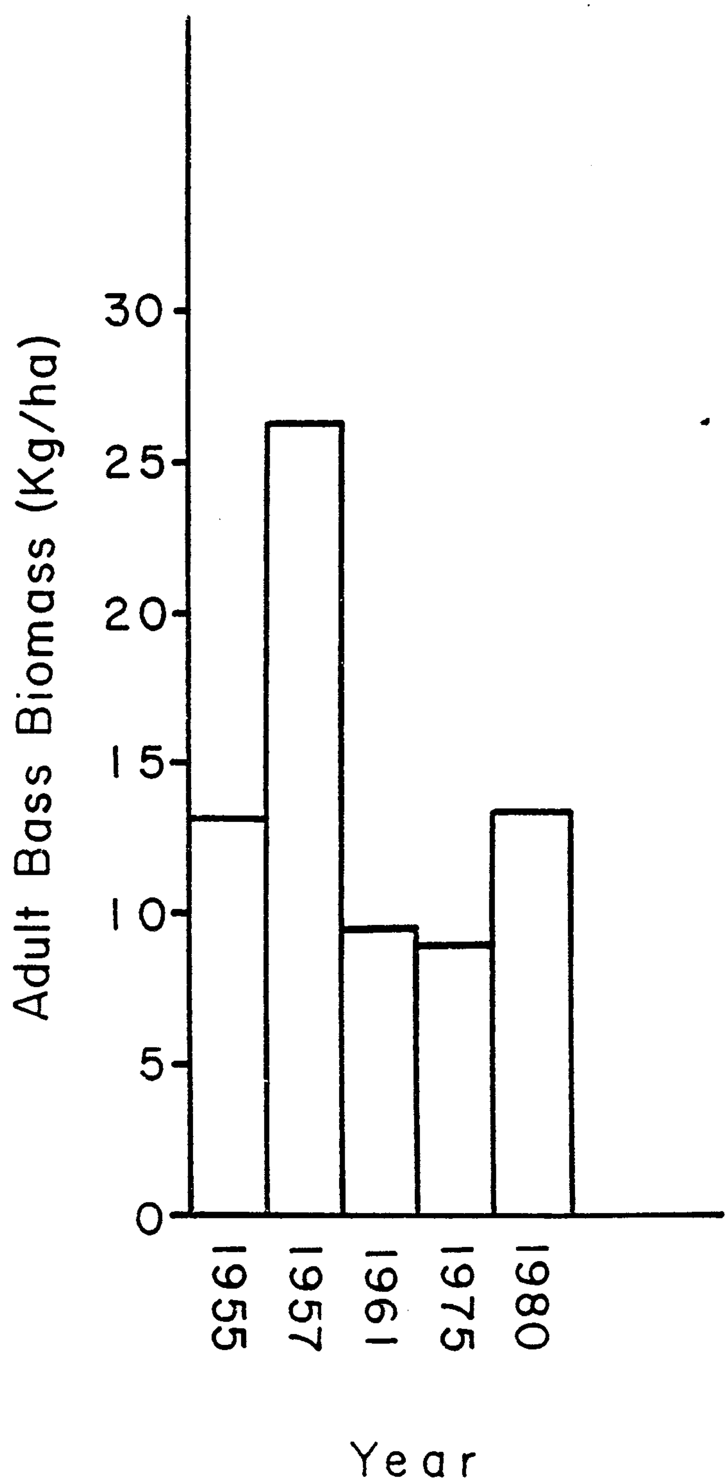


Adults
Intermediates
Young
Game Fish Biomass (Kg/ha)
35
30
25
20
15
10
5
0
Bass
Crappie
Catfish
Sunfish

APPENDIX FIGURE 8. Continued.

ADULT BASS BIOMASS FOR ALL YEARS SAMPLED

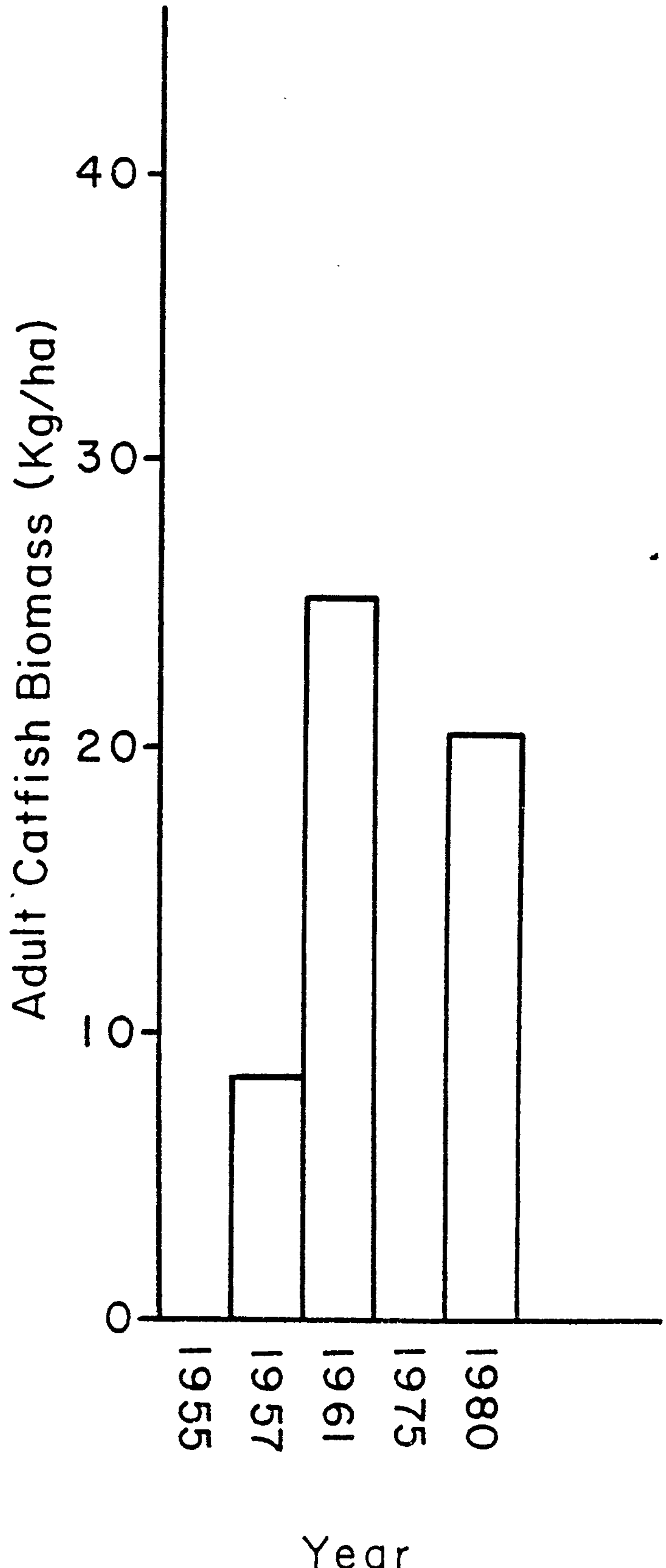
NEWPORT


Adult Bass Biomass (Kg/ha)
30
25
20
15
10
5
0
1955
1957
1961
1975
1980
Year

APPENDIX FIGURE 8. Continued.

ADULT CATFISH BIOMASS FOR ALL YEARS SAMPLED

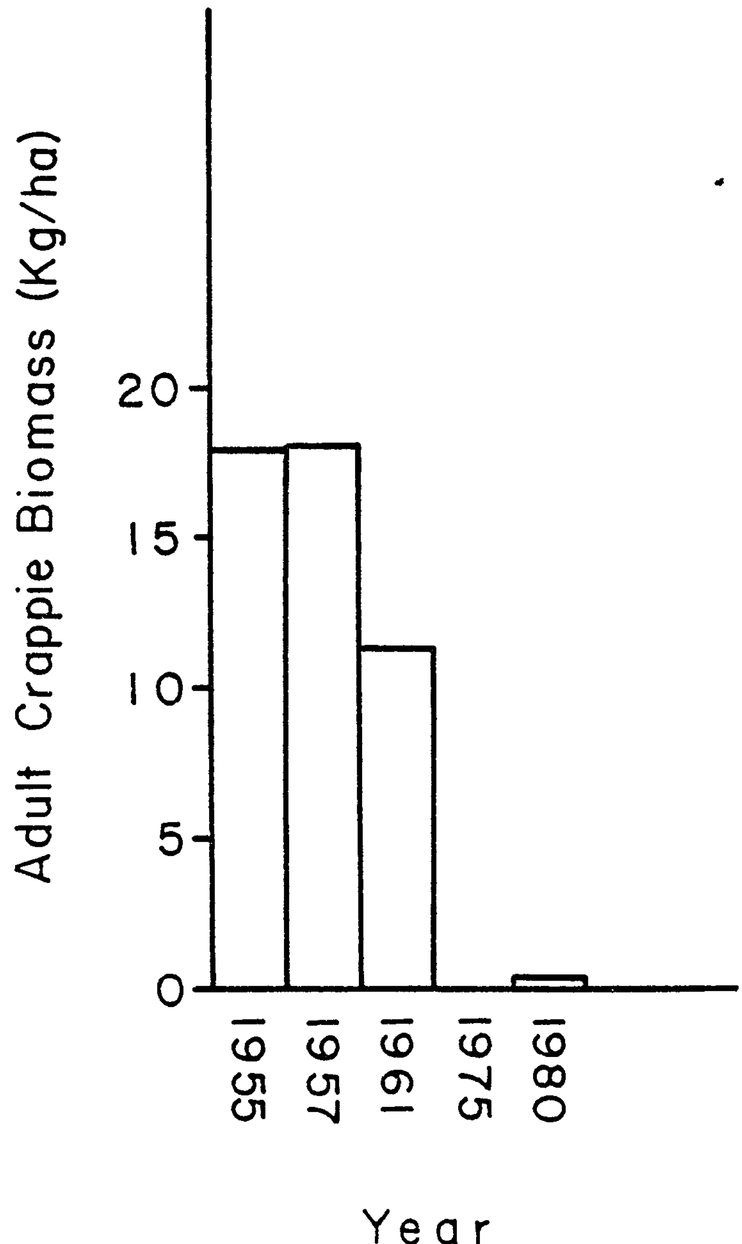
NEWPORT


Adult Catfish Biomass (Kg/ha)
40
30
20
10
0
1955
1957
1961
1975
1980
Year

APPENDIX FIGURE 8. Continued.

ADULT CRAPPIE BIOMASS FOR ALL YEARS SAMPLED

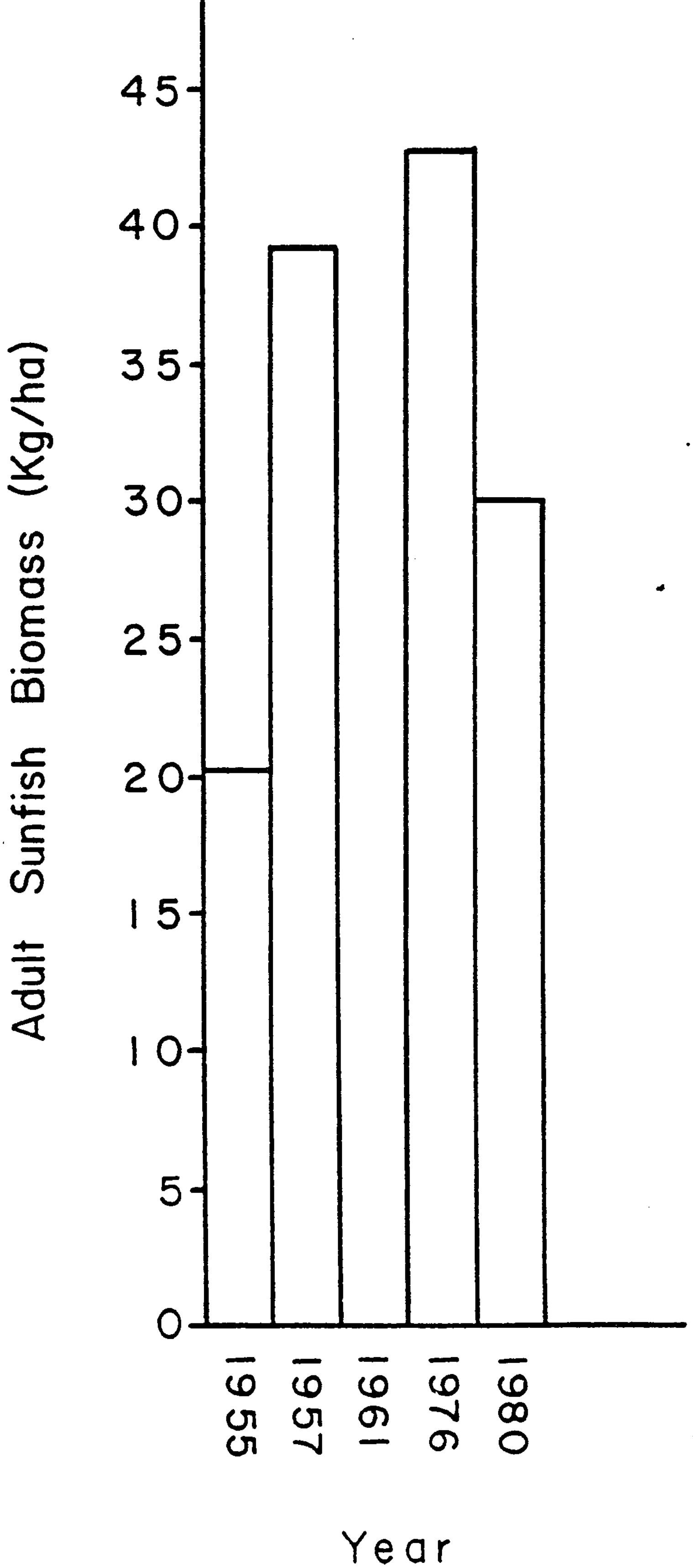
NEWPORT


Adult Crappie Biomass (Kg/ha)
20
15
10
5
0
1955
1957
1961
1975
1980
Year

APPENDIX FIGURE 8. Continued.

ADULT SUNFISH BIOMASS FOR ALL YEARS SAMPLED

NEWPORT

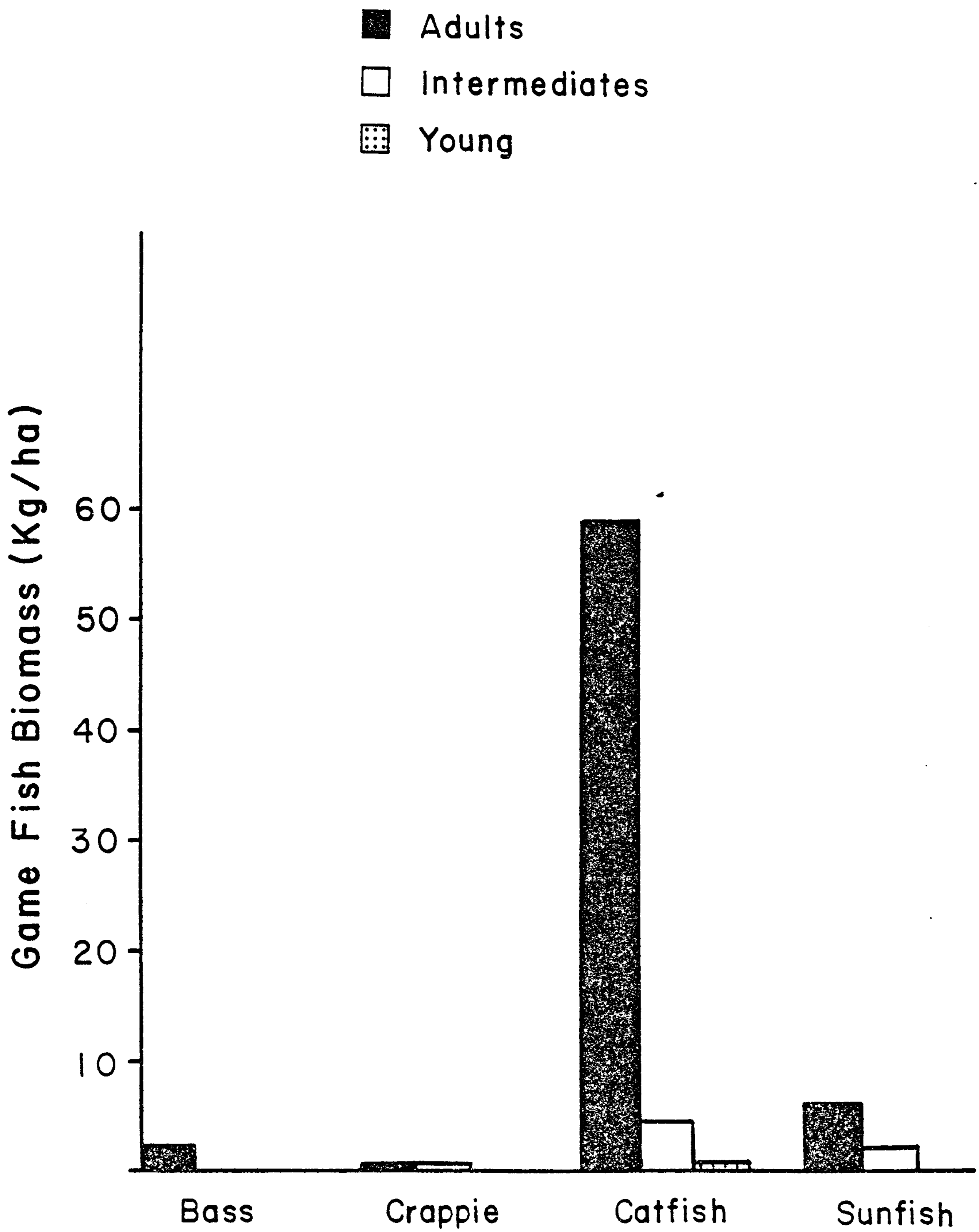


Adult Sunfish Biomass (Kg/ha)
45
40
35
30
25
20
15
10
5
0
1955
1957
1961
1976
1980
Year

APPENDIX FIGURE 9.

GAMEFISH BIOMASS BY AGE GROUP - 1980

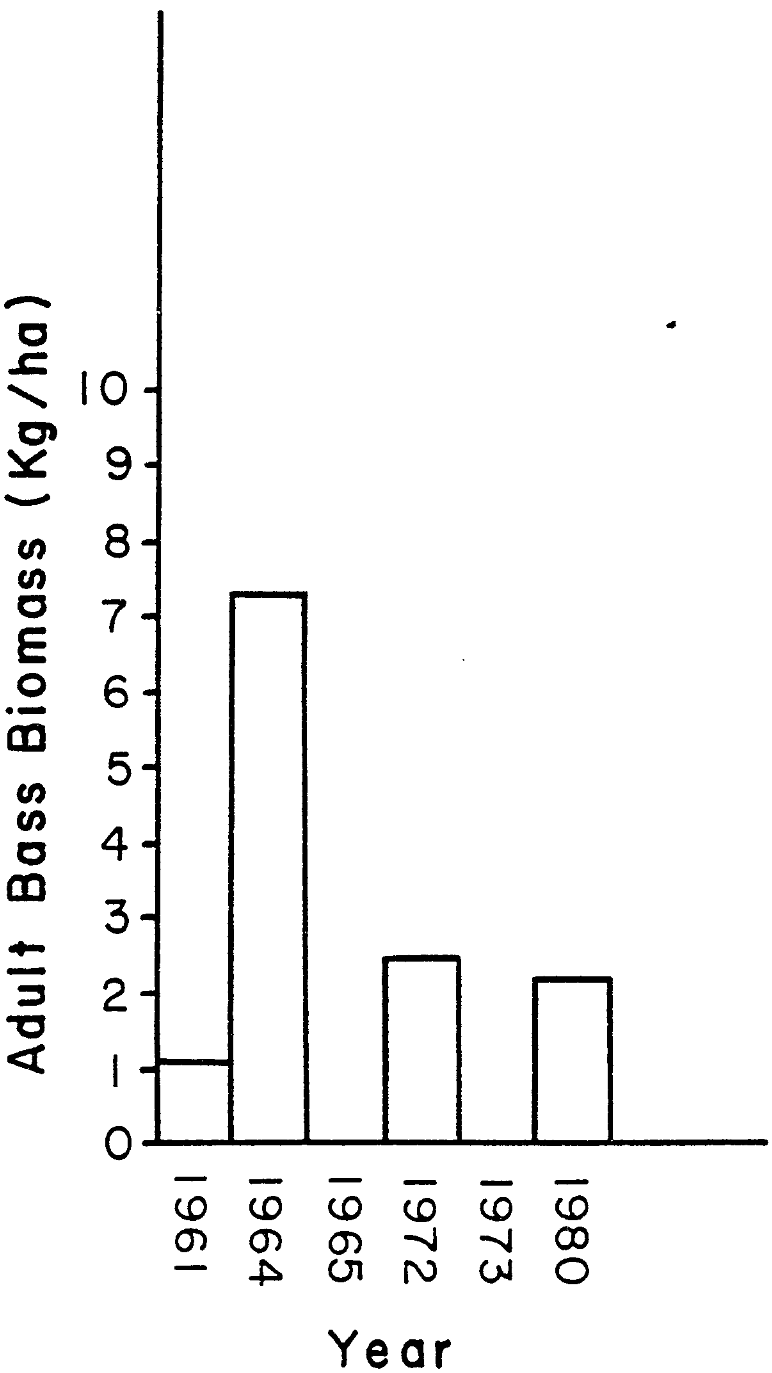
OLD TOWN


Adults
Intermediates
Young
Game Fish Biomass (Kg/ha)
60
50
40
30
20
10
Bass
Crappie
Catfish
Sunfish

APPENDIX FIGURE 9. Continued.

ADULT BASS BIOMASS FOR ALL YEARS SAMPLED

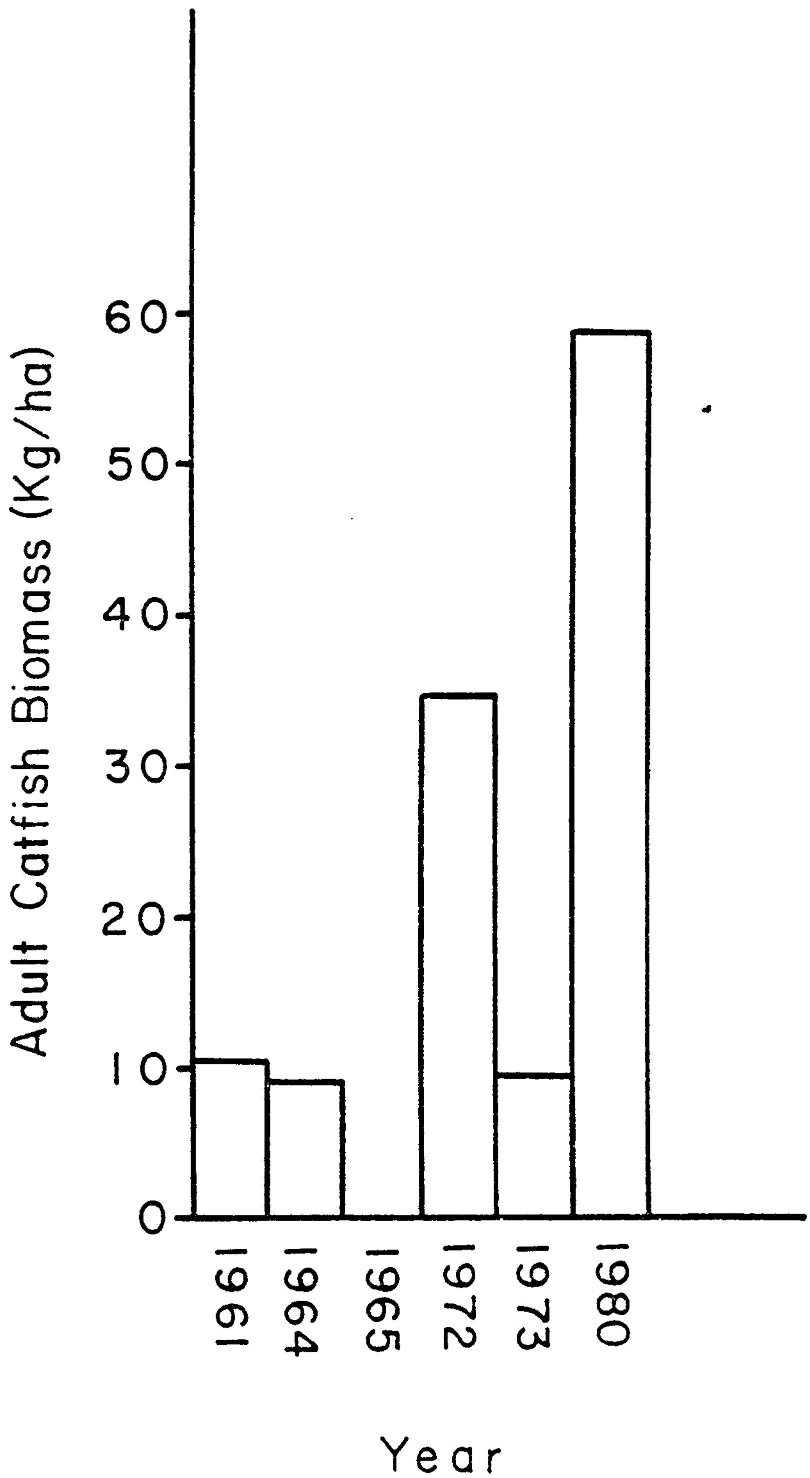
OLD TOWN


Adult Bass Biomass (Kg/ha)
0
1
2
3
4
5
6
7
8
9
10
1961
1964
1965
1972
1973
1980
Year

APPENDIX FIGURE 9. Continued.

ADULT CATFISH BIOMASS FOR ALL YEARS SAMPLED

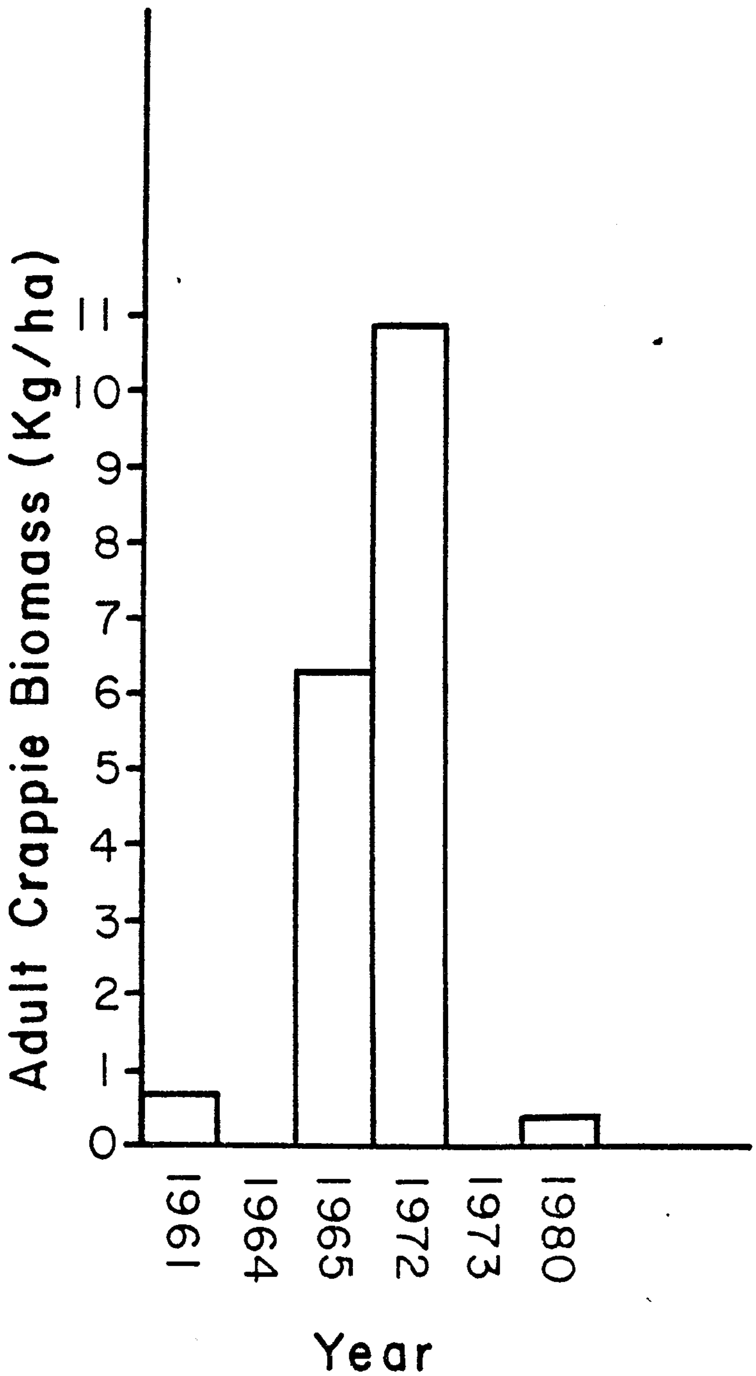
OLD TOWN


Adult Catfish Biomass (Kg/ha)
60
50
40
30
20
10
0
1961
1964
1965
1972
1973
1980
Year

APPENDIX FIGURE 9. Continued.

ADULT CRAPPIE BIOMASS FOR ALL YEARS SAMPLED

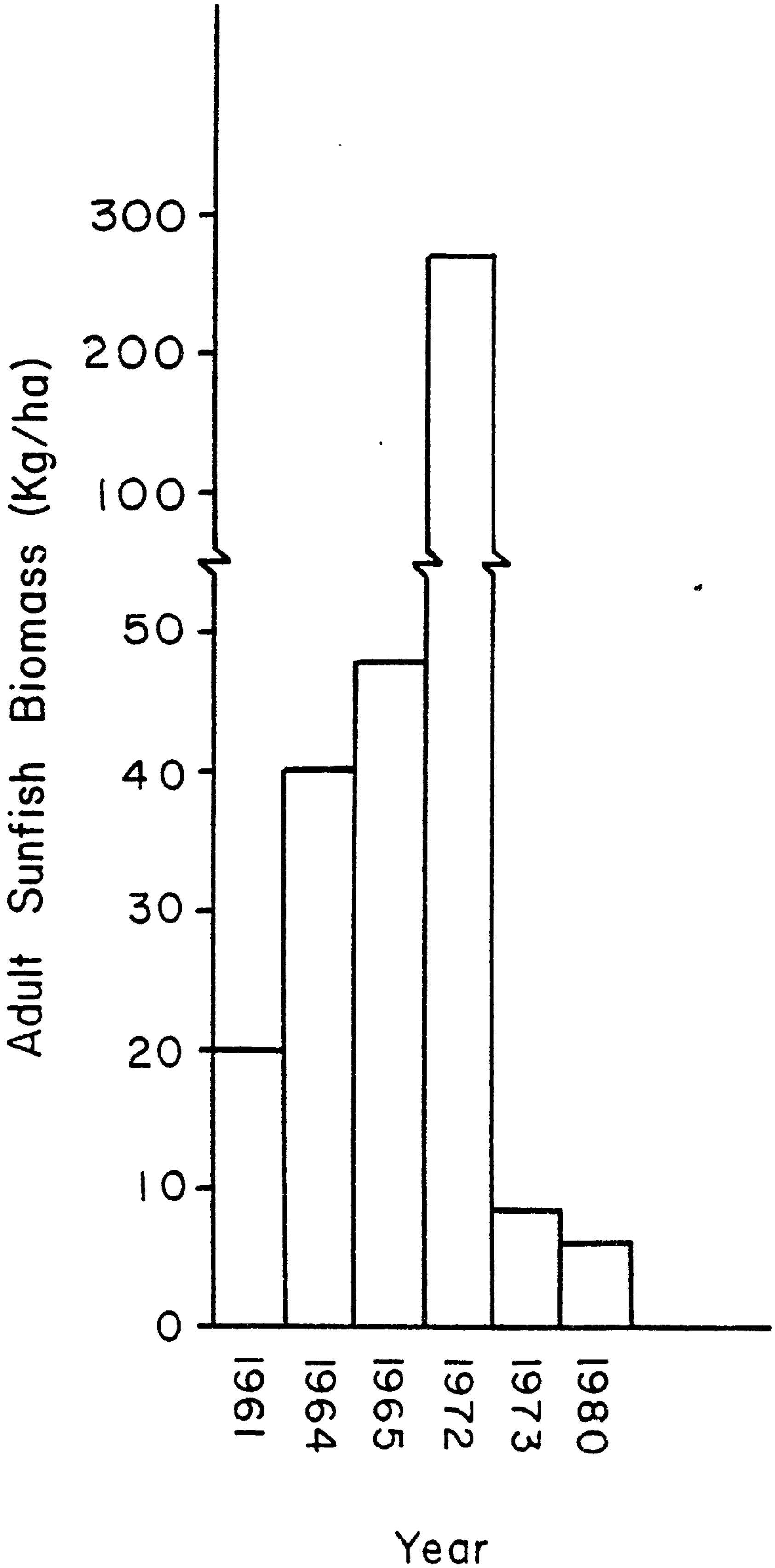
OLD TOWN


Adult Crappie Biomass (Kg/ha)
0
1
2
3
4
5
6
7
8
9
10
11
1961
1964
1965
1972
1973
1980
Year

APPENDIX FIGURE 9. Continued.

ADULT SUNFISH BIOMASS FOR ALL YEARS SAMPLED

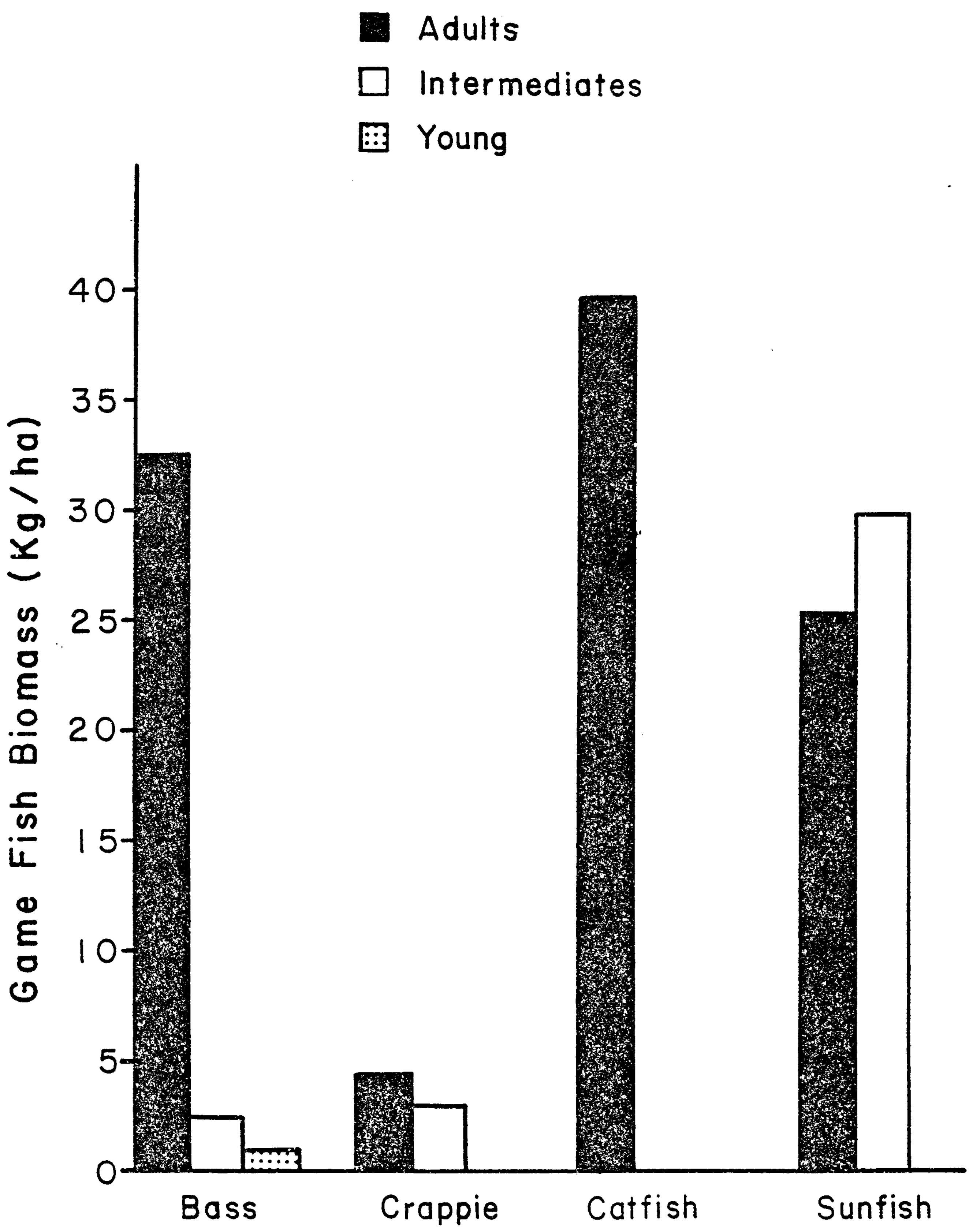
OLD TOWN


Adult Sunfish Biomass (Kg/ha)
300
200
100
50
40
30
20
10
0
1961
1964
1965
1972
1973
1980
Year

APPENDIX FIGURE 10.

GAMEFISH BIOMASS BY AGE GROUPS - 1980

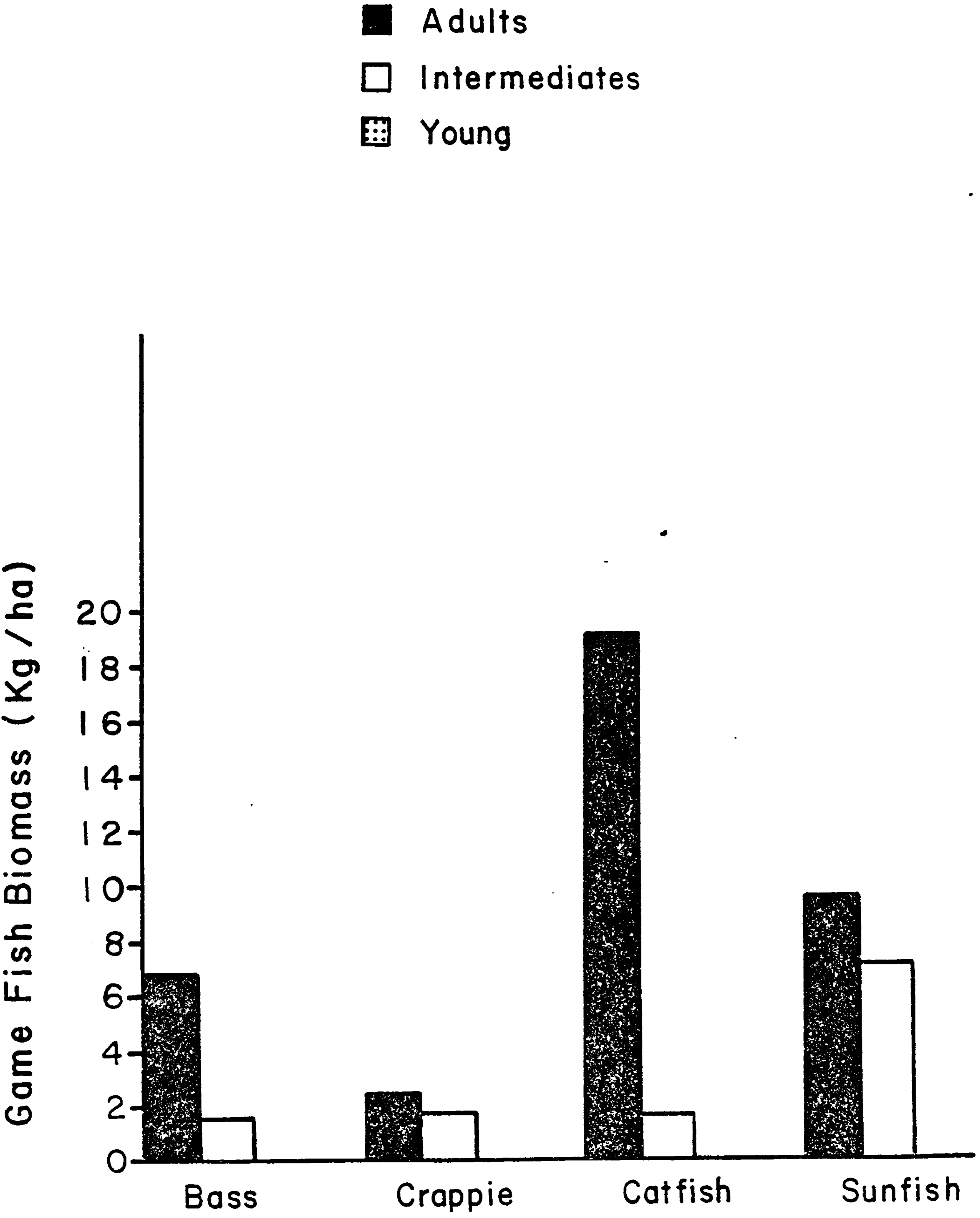
REYNOLD'S PARK


Adults
Intermediates
Young
Game Fish Biomass (Kg/ha)
40
35
30
25
20
15
10
5
0
Bass
Crappie
Catfish
Sunfish

APPENDIX FIGURE 11.

GAMEFISH BIOMASS BY AGE GROUP - 1980

LAKE WALLACE


Adults
Intermediates
Young
Game Fish Biomass (Kg / ha)
20
18
16
14
12
10
8
6
4
2
0
Bass
Crappie
Catfish
Sunfish

APPENDIX FIGURE 11. Continued.

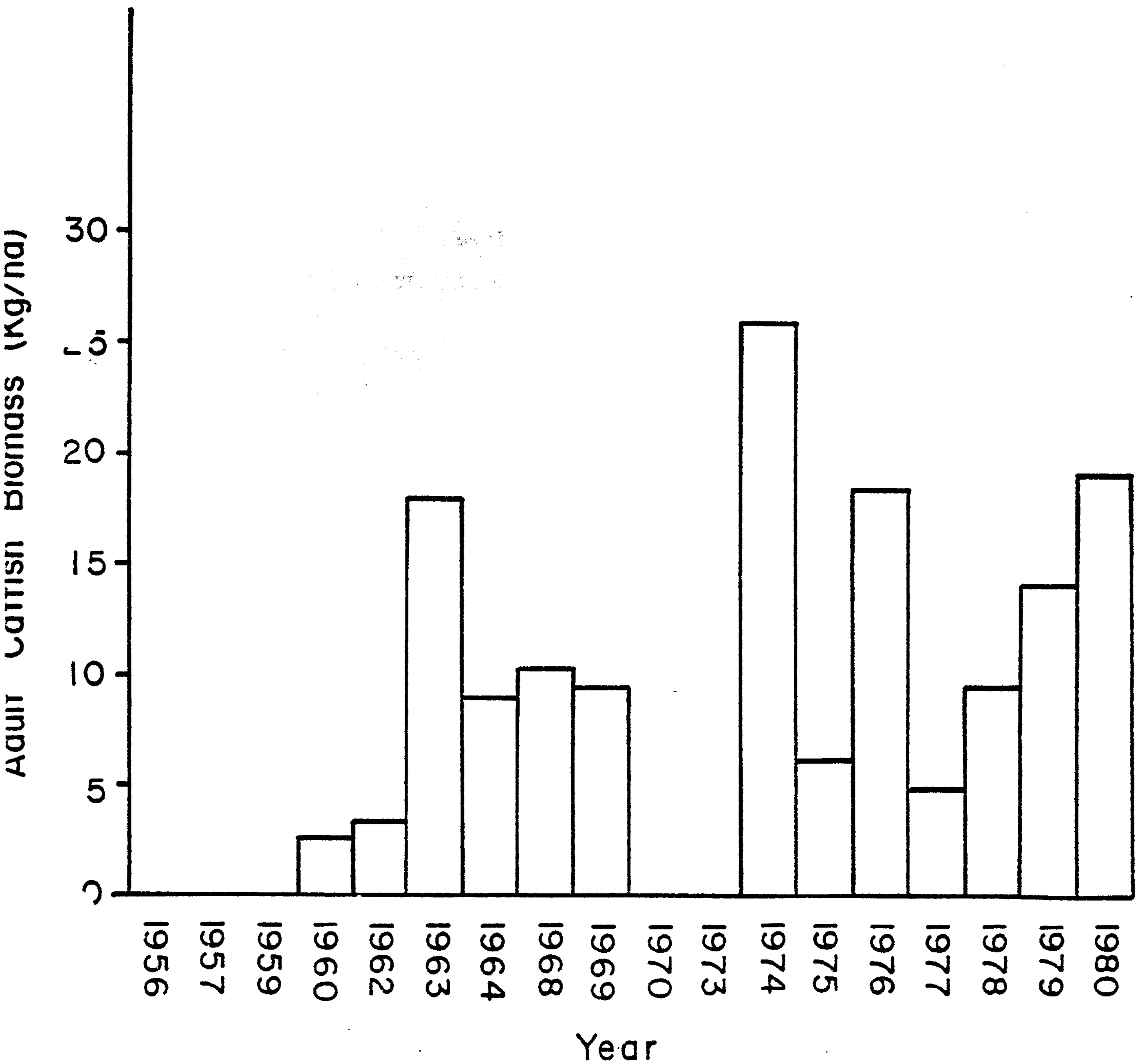
ADULT BASS BIOMASS FOR ALL YEARS SAMPLED

LAKE WALLACE

APPENDIX FIGURE 11. Continued.

ADULT CATFISH BIOMASS FOR ALL YEARS SAMPLED

LAKE WALLACE

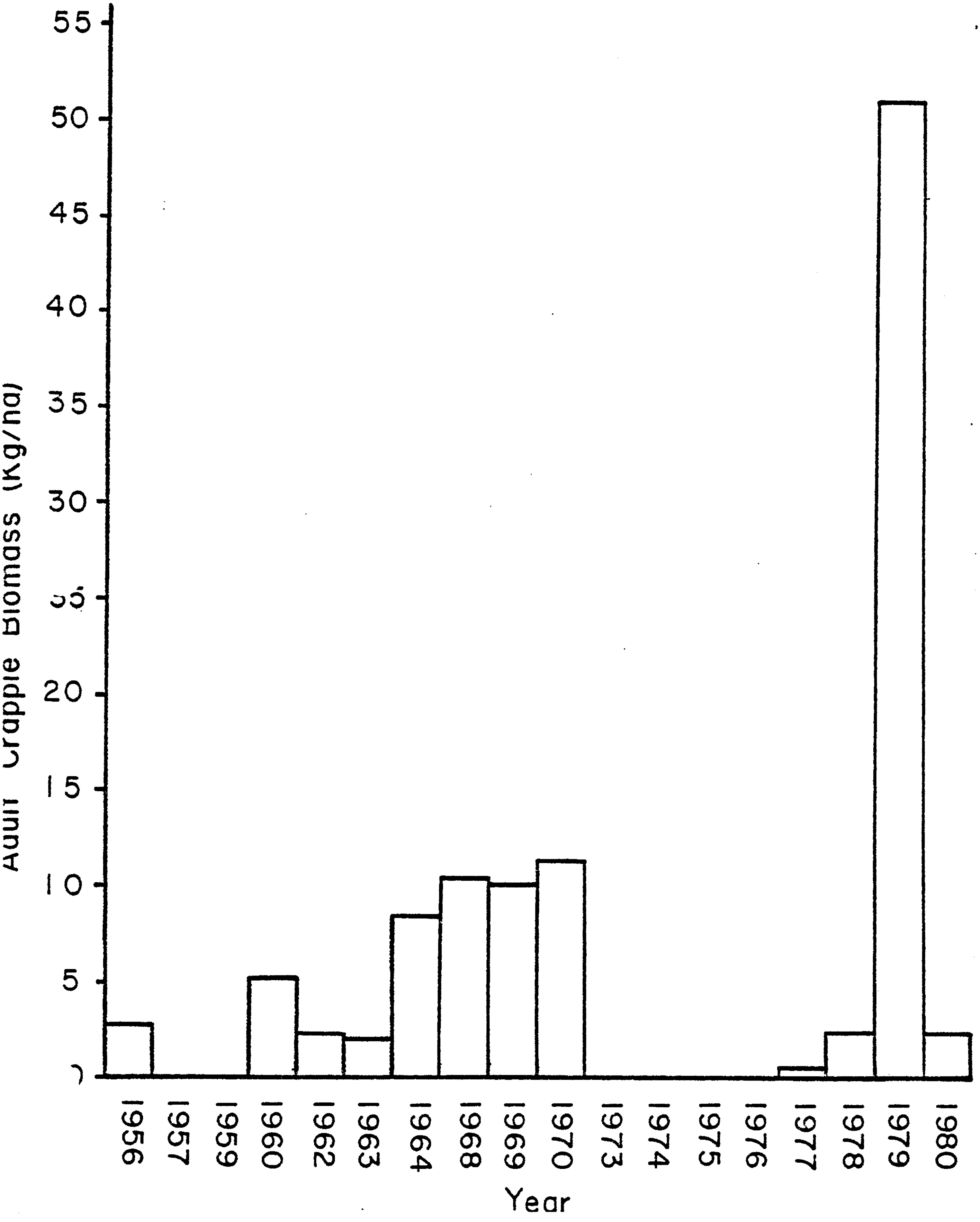

30
20
15
10
5
0
1956
1957
1959
1960
1962
1963
1964
1968
1969
1970
1973
1974
1975
1976
1977
1978
1979
1980
Year

APPENDIX FIGURE 11. Continued.

ADULT CRAPPIE BIOMASS FOR ALL YEAR SAMPLED

LAKE WALLACE

CC 149

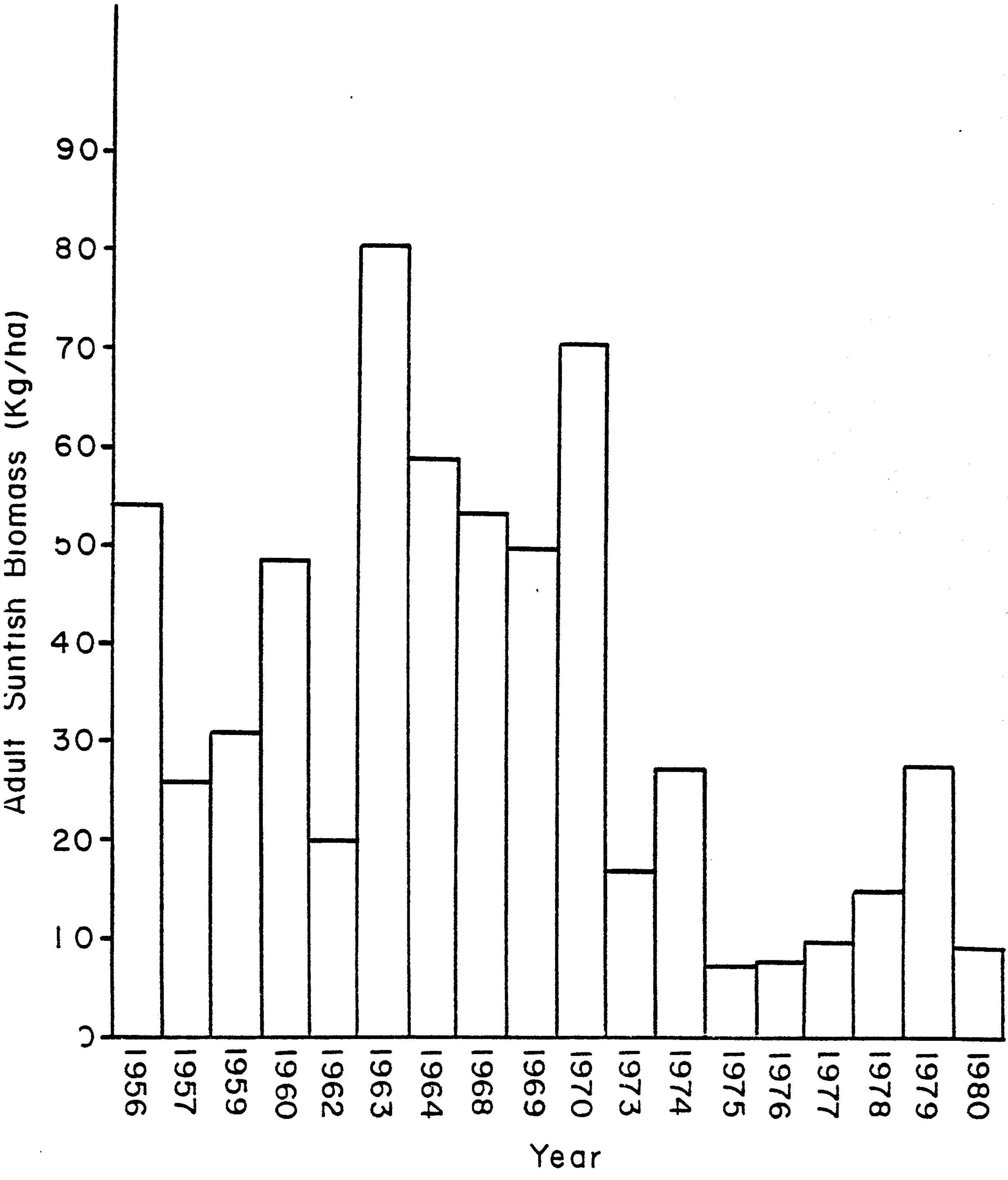


Adult Crappie Biomass (Kg/ha)
55
50
45
40
35
30
20
15
10
5
1956
1957
1959
1960
1962
1963
1964
1968
1969
1970
1973
1974
1975
1976
1977
1978
1979
1980
Year

APPENDIX FIGURE 11. Continued.

ADULT SUNFISH BIOMASS FOR ALL YEARS SAMPLED

LAKE WALLACE


90
80
70
60
50
40
30
20
10
0
Adult Sunfish Biomass (Kg/ha)
1956
1957
1959
1960
1962
1963
1964
1968
1969
1970
1973
1974
1975
1976
1977
1978
1979
1980
Year