# U.S. ENVIRONMENTAL PROTECTION AGENCY
# NATIONAL EUTROPHICATION SURVEY

## WORKING PAPER SERIES

REPORT

ON

LAKE EFFIE

POLK COUNTY

FLORIDA

EPA REGION IV

WORKING PAPER No. 224

**CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON**

**and**

**ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA**

☆G.P.O. 699-440

# REPORT
# ON
# LAKE EFFIE
# POLK COUNTY
# FLORIDA
# EPA REGION IV
# WORKING PAPER NO. 224

WITH THE COOPERATION OF THE
FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
AND THE
FLORIDA NATIONAL GUARD

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CONTENTS

# FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

## OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

## ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

## LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Florida Department of Environmental Regulation for professional involvement and to the Florida National Guard for conducting the tributary sampling phase of the Survey.

Joseph W. Landers, Jr., Secretary of the Department of Environmental Regulation; John A Redmond, former Director of the Division of Planning, Technical Assistance, and Grants; and Dr. Tim S. Stuart, Chief of the Bureau of Water Quality, provided invaluable lake documentation and counsel during the survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

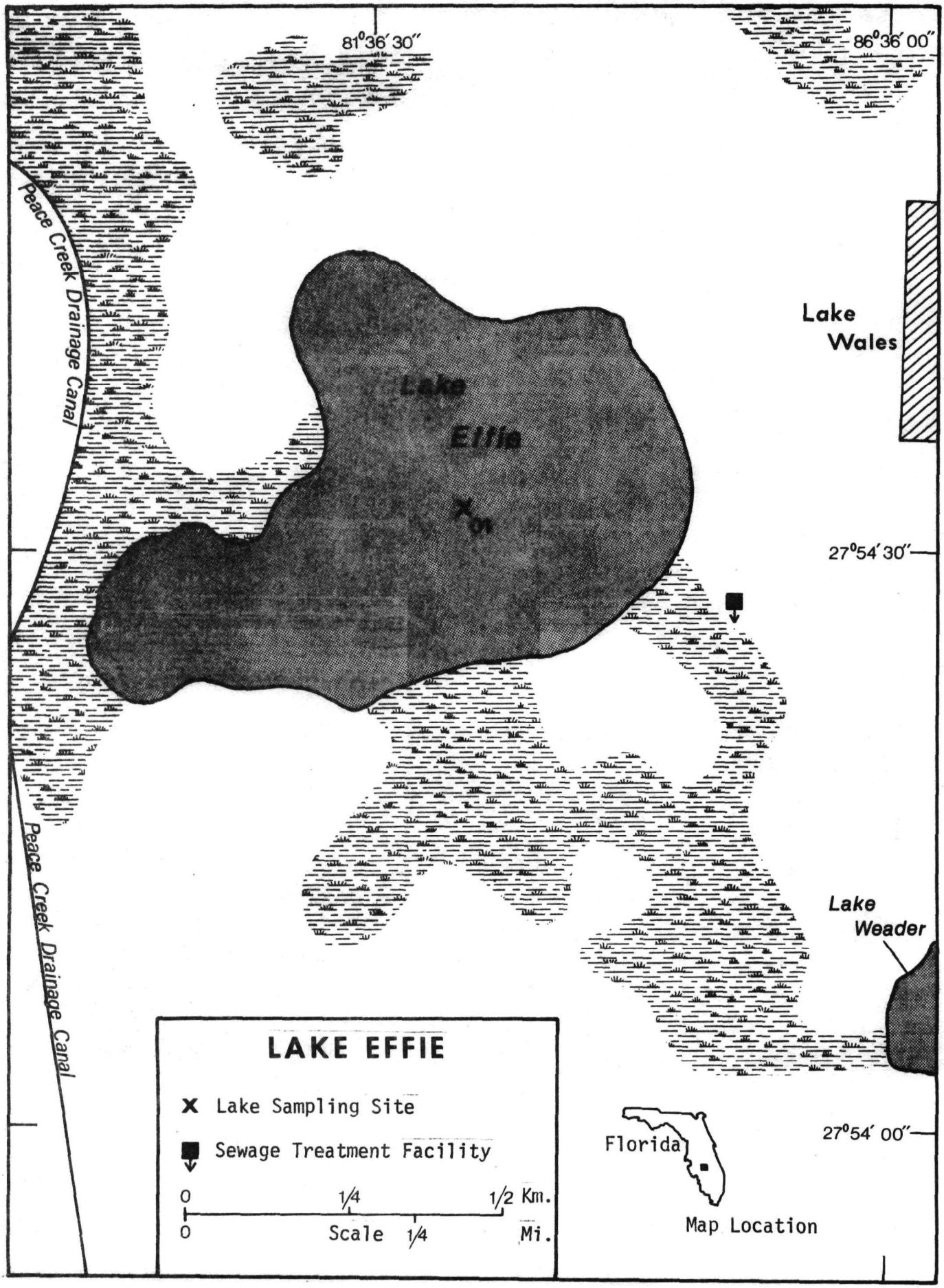
Major General Henry W. McMillan (Retired), then the Adjutant General of Florida, and Project Officer Colonel Hugo F. Windham, who directed the volunteer efforts of the Florida National Guard, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF FLORIDA

| LAKE NAME | COUNTY |
|---|---|
| Alligator | Columbia |
| Apopka | Lake, Orange |
| Banana | Polk |
| Crescent | Flagler, Putnam |
| Doctors | Clay |
| Dora | Lake |
| East Tohopekaliga | Osceola |
| Effie | Polk |
| Eloise | Polk |
| George | Putnam, Volusia |
| Gibson | Polk |
| Glenada | Highlands |
| Griffin | Lake |
| Haines | Polk |
| Hancock | Polk |
| Horseshoe | Seminole |
| Howell | Orange, Seminole |
| Istokpoga | Highlands |
| Jessie | Polk |
| Jessup | Seminole |
| Kissimmee | Osceola |
| Lawne | Orange |
| Lulu | Polk |
| Marion | Polk |
| Minnehaha | Orange |
| Minneola | Lake |
| Monroe | Seminole, Volusia |
| Munson | Leon |
| Okeechobee | Glades, Hendry, Martin, Okeechobee, Palm Beach |
| Poinsett | Brevard, Orange, Osceola |
| Reedy | Polk |
| Seminole | Jackson, FL; Decatur, Seminole, GA |
| Seminole | Pinellas |
| South | Brevard |
| Talquin | Gladsden, Leon |
| Tarpon | Pinellas |
| Thonotosassa | Hillsborough |
| Tohopekaliga | Osceola |
| Trout | Lake |
| Weohyakapka | Polk |
| Yale | Lake |


81°36′30″
86°36′00″
Peace Creek Drainage Canal
Lake Effie
Lake Wales
27°54′30″
Lake Weader
Peace Creek Drainage Canal
LAKE EFFIE
Lake Sampling Site
Sewage Treatment Facility
0 1/4 1/2 Km.
0 Scale 1/4 Mi.
Florida
27°54′00″
Map Location

LAKE EFFIE

STORET NO. 1209

## I. INTRODUCTION

Lake Effie was included in the National Eutrophication Survey as a water body of interest to the Florida Department of Environmental Regulation. The lake receives effluents from two sewage treatment plants having a combined flow of about 6,800 $m^3$/day*.

Surface water leaves the western side of the lake, enters the Peace Creek drainage canal, and eventually flows to the Peace River. Lake Effie was surveyed from 1966 to 1972 by the Florida Game and Fresh Water Fish Commission (Dingell-Johnson project reports, 1966-1972).

## II. CONCLUSIONS

### A. Trophic Condition:

Survey data indicate that Lake Effie is hypereutrophic. It ranked last in trophic quality when the 41 Florida lakes sampled in 1973 were compared using an index of six parameters**. Thirty-eight of the lakes had less median total phosphorus, 36 had less median orthophosphorus and inorganic nitrogen, all of the others had less mean chlorophyll a, and 39 had greater mean Secchi disc transparency. Near-surface depletion of dissolved oxygen occurred in March and August.

Survey limnologists observed algal blooms in March and August and some emergent aquatic vegetation.

### B. Rate-Limiting Nutrient:

There was a significant loss of inorganic nitrogen in the algal

* Anonymous, 1971.
** See Appendix A.

assay sample during transport to the laboratory, and the assay results are not representative of conditions in the lake at the time the sample was collected (03/14/73).

The lake data indicate nitrogen limitation at all sampling stations and times.

## III. LAKE CHARACTERISTICS†

### A. Lake Morphometry*:

1. Surface area: 0.41 kilometers$^2$.
2. Mean depth: 1.0 meter.
3. Maximum depth: 1.5 meters.
4. Volume: 0.41 x $10^6$ $m^3$.

### B. Precipitation**:

1. Year of sampling: 103.6 centimeters.
2. Mean annual: 130.5 centimeters.

† Table of metric conversions--Appendix B.
* No bathymetric map available (surface area obtained from U.S.G.S. quadrangle map; depths estimated from soundings reported in Appendix C).
** See Working Paper No. 175, "...Survey Methods, 1973-1976".

## IV. WATER QUALITY SUMMARY

Lake Effie was sampled three times in 1973 by means of a pontoon-equipped Huey helicopter. Each time, a near-surface sample for physical and chemical parameters was collected from one station on the lake (see map, page v). During each visit, a single depth-integrated sample (near bottom to surface) was taken for phytoplankton identification and enumeration; and a similar sample was collected for chlorophyll a analysis. During the first visit, an 18.9-liter depth-integrated sample was taken for algal assays.

The sampling results are presented in full in Appendix C and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR LAKE EFFIE
STORET CODE 1209

| PARAMETER | 1ST SAMPLING ( 3/14/73) 1 SITES RANGE | MEAN | MEDIAN | 2ND SAMPLING ( 9/ 5/73) 1 SITES RANGE | MEAN | MEDIAN | 3RD SAMPLING (11/ 7/73) 1 SITES RANGE | MEAN | MEDIAN |
|---|---|---|---|---|---|---|---|---|---|
| TEMP (C) | ****** - ********** | | | 28.3 - 28.3 | 28.3 | 28.3 | 25.6 - 25.6 | 25.6 | 25.6 |
| DISS OXY (MG/L) | 0.0 - 0.0 | 0.0 | 0.0 | 0.0 - 0.0 | 0.0 | 0.0 | 4.0 - 4.0 | 4.0 | 4.0 |
| CNDCTVY (MCROMO) | 300. - 300. | 300. | 300. | 353. - 353. | 353. | 353. | 368. - 368. | 368. | 368. |
| PH (STAND UNITS) | 9.0 - 9.0 | 9.0 | 9.0 | 7.2 - 7.2 | 7.2 | 7.2 | 7.6 - 7.6 | 7.6 | 7.6 |
| TOT ALK (MG/L) | 196. - 196. | 196. | 196. | 123. - 123. | 123. | 123. | 134. - 134. | 134. | 134. |
| TOT P (MG/L) | 1.260 - 1.260 | 1.260 | 1.260 | 1.600 - 1.600 | 1.600 | 1.600 | 1.480 - 1.480 | 1.480 | 1.480 |
| ORTHO P (MG/L) | 0.399 - 0.399 | 0.399 | 0.399 | 0.950 - 0.950 | 0.950 | 0.950 | 1.100 - 1.100 | 1.100 | 1.100 |
| NO2+NO3 (MG/L) | 0.200 - 0.200 | 0.200 | 0.200 | 0.210 - 0.210 | 0.210 | 0.210 | 0.180 - 0.180 | 0.180 | 0.180 |
| AMMONIA (MG/L) | 0.510 - 0.510 | 0.510 | 0.510 | 0.200 - 0.200 | 0.200 | 0.200 | 0.070 - 0.070 | 0.070 | 0.070 |
| KJEL N (MG/L) | 4.700 - 4.700 | 4.700 | 4.700 | 5.700 - 5.700 | 5.700 | 5.700 | 4.000 - 4.000 | 4.000 | 4.000 |
| INORG N (MG/L) | 0.710 - 0.710 | 0.710 | 0.710 | 0.410 - 0.410 | 0.410 | 0.410 | 0.250 - 0.250 | 0.250 | 0.250 |
| TOTAL N (MG/L) | 4.900 - 4.900 | 4.900 | 4.900 | 5.910 - 5.910 | 5.910 | 5.910 | 4.180 - 4.180 | 4.180 | 4.180 |
| CHLRPYL A (UG/L) | 116.7 - 116.7 | 116.7 | 116.7 | 595.0 - 595.0 | 595.0 | 595.0 | 72.6 - 72.6 | 72.6 | 72.6 |
| SECCHI (METERS) | 0.1 - 0.1 | 0.1 | 0.1 | 0.3 - 0.3 | 0.3 | 0.3 | 0.5 - 0.5 | 0.5 | 0.5 |

B. Biological Characteristics:

1. Phytoplankton -

| Sampling Date | Dominant Genera | Algal Units per ml |
|---|---|---|
| 03/14/73 | 1. Selenastrum sp. | 41,532 |
| | 2. Kirchneriella sp. | 2,343 |
| | 3. Schroederia sp. | 2,162 |
| | 4. Raphidiopsis sp. | 1,441 |
| | 5. Lyngbya sp. | 1,261 |
| | Other genera | 2,342 |
| | Total | 51,081 |
| 09/05/73 | 1. Scenedesmus sp. | 36,977 |
| | 2. Cyclotella sp. | 36,383 |
| | 3. Flagellates | 12,320 |
| | 4. Pediastrum sp. | 9,049 |
| | 5. Kirchneriella sp. | 8,855 |
| | Other genera | 47,153 |
| | Total | 150,737 |
| 11/07/73 | 1. Cyclotella sp. | 18,883 |
| | 2. Merismopedia sp. | 17,046 |
| | 3. Scenedesmus sp. | 12,093 |
| | 4. Flagellates | 11,733 |
| | 5. Oscillatoria sp. | 8,063 |
| | Other genera | 22,914 |
| | Total | 90,732 |

2. Chlorophyll a -

| Sampling Date | Station Number | Chlorophyll a (µg/l) |
|---|---|---|
| 03/14/73 | 1 | 116.7 |
| 09/05/73 | 1 | 595.0 |
| 11/07/73 | 1 | 72.6 |

C. Limiting Nutrient Study:

A 65% loss of inorganic nitrogen occurred in the algal assay sample during shipment to the laboratory, and the assay results are not considered representative of conditions in the lake at the time the sample was taken (03/14/73). However, the lake data indicate nitrogen limitation at all sampling times (the mean inorganic nitrogen to orthophosphorus ratios were 2 to 1 or less at all sampling times).

## V. LITERATURE REVIEWED

Anonymous, 1971. Inventory of municipal waste facilities. EPA Publ. OWP-1, vol. 4, Wash., DC.

Florida Game & Fresh Water Fish Commission, 1966-1967. Final completion report, Dingell-Johnson project F-21-R-1. Tallahassee.

_____, 1967-1968. Final completion report, Dingell-Johnson project F-21-R-2. Tallahassee.

_____, 1969-1970. Final completion report, Dingell-Johnson project F-21-4. Tallahassee.

_____, 1971-1972. Final completion report, Dingell-Johnson project F-21-6. Tallahassee.

# VI. APPENDICES

## APPENDIX A

## LAKE RANKINGS

AKE DATA TO BE USED IN RANKINGS

| AKE ODE | LAKE NAME | MEDIAN TOTAL P | MEDIAN INORG N | 500- MEAN SEC | MEAN CHLORA | 15- MIN DO | MEDIAN DISS ORTHO P |
|---|---|---|---|---|---|---|---|
| 240 | LAKE THONOTOSASSA | 0.695 | 0.095 | 466.167 | 37.700 | 10.200 | 0.565 |
| 241 | LAKE TOHOPEKALIGA | 0.246 | 0.200 | 472.917 | 30.633 | 10.500 | 0.152 |
| 242 | TROUT LAKE | 1.110 | 0.650 | 472.000 | 76.967 | 12.900 | 0.970 |
| 243 | LAKE WEOHYAKAPKA | 0.047 | 0.080 | 458.667 | 7.767 | 8.200 | 0.011 |
| 246 | LAKE YALE | 0.027 | 0.160 | 441.000 | 25.367 | 7.600 | 0.014 |
| 247 | LAKE MUNSON | 1.475 | 0.925 | 486.667 | 140.317 | 12.200 | 0.852 |
| 248 | LAKE SEMINOLE | 0.234 | 0.175 | 473.833 | 102.000 | 8.600 | 0.026 |
| 249 | LAKE LAWNE | 2.560 | 1.350 | 494.667 | 84.900 | 10.400 | 0.117 |
| 250 | LAKE TARPON | 0.041 | 0.070 | 400.889 | 6.867 | 9.000 | 0.027 |
| 252 | LAKE ELOISE | 0.486 | 0.170 | 465.333 | 70.233 | 12.200 | 0.339 |
| 258 | LAKE JESSIE | 0.051 | 0.090 | 452.667 | 26.300 | 10.800 | 0.011 |
| 261 | EAST LAKE TOHOPEKALIGA | 0.042 | 0.070 | 440.833 | 5.167 | 9.400 | 0.007 |
| 264 | PAYNE'S PRAIRIE LAKE (NO | 1.260 | 0.140 | 476.000 | 88.200 | 7.400 | 1.210 |

LAKE DATA TO BE USED IN RANKINGS

| LAKE CODE | LAKE NAME | MEDIAN TOTAL P | MEDIAN INORG N | 500-MEAN SEC | MEAN CHLORA | 15-MIN DO | MEDIAN DISS ORTHO P |
|---|---|---|---|---|---|---|---|
| 1201 | ALLIGATOR LAKE | 0.620 | 0.260 | 474.000 | 87.733 | 13.100 | 0.386 |
| 1202 | LAKE APOPKA | 0.102 | 0.230 | 484.176 | 46.611 | 8.200 | 0.019 |
| 1203 | LAKE BANANA | 0.660 | 0.260 | 482.667 | 208.600 | 3.600 | 0.293 |
| 1206 | LAKE CRESCENT | 0.065 | 0.130 | 473.889 | 10.211 | 10.200 | 0.033 |
| 1207 | DOCTORS LAKE | 0.084 | 0.120 | 465.555 | 27.100 | 10.600 | 0.028 |
| 1208 | LAKE DORA | 0.102 | 0.240 | 482.889 | 59.978 | 7.400 | 0.022 |
| 1209 | LAKE EFFIE | 1.480 | 0.410 | 489.000 | 261.433 | 15.000 | 0.950 |
| 1210 | LAKE GEORGE | 0.129 | 0.165 | 469.308 | 35.000 | 11.000 | 0.063 |
| 1211 | LAKE GIBSON | 0.167 | 0.115 | 470.000 | 19.675 | 10.200 | 0.069 |
| 1212 | GLENADA LAKE | 0.134 | 0.165 | 454.167 | 27.667 | 14.700 | 0.072 |
| 1214 | LAKE GRIFFIN | 0.119 | 0.260 | 481.333 | 66.855 | 6.600 | 0.038 |
| 1215 | LAKE HAINES | 0.063 | 0.115 | 462.667 | 26.567 | 10.600 | 0.014 |
| 1217 | LAKE HANCOCK | 0.772 | 0.195 | 483.500 | 97.900 | 5.600 | 0.158 |
| 1219 | LAKE HORSESHOE | 0.034 | 0.130 | 459.000 | 12.067 | 11.500 | 0.023 |
| 1220 | LAKE HOWELL | 1.260 | 0.285 | 464.000 | 54.117 | 9.000 | 1.175 |
| 1221 | LAKE ISTOKPOGA | 0.039 | 0.120 | 464.222 | 6.594 | 8.600 | 0.010 |
| 1223 | LAKE JESSUP | 0.492 | 0.290 | 487.000 | 76.550 | 7.600 | 0.288 |
| 1224 | LAKE KISSIMMEE | 0.034 | 0.145 | 463.667 | 24.142 | 8.800 | 0.007 |
| 1227 | LAKE LULU | 1.490 | 1.065 | 483.000 | 276.566 | 14.300 | 1.030 |
| 1228 | LAKE MARION | 0.044 | 0.260 | 468.833 | 29.967 | 7.600 | 0.016 |
| 1229 | LAKE MINNEHAHA | 0.038 | 0.080 | 435.000 | 8.733 | 7.700 | 0.012 |
| 1230 | LAKE MINNEOLA | 0.018 | 0.070 | 406.333 | 3.333 | 7.400 | 0.009 |
| 1231 | LAKE MONROE | 0.188 | 0.300 | 474.555 | 14.225 | 10.800 | 0.128 |
| 1232 | LAKE OKEECHOBEE | 0.063 | 0.185 | 472.366 | 14.524 | 9.800 | 0.010 |
| 1234 | LAKE POINSETT | 0.085 | 0.150 | 469.000 | 6.500 | 10.600 | 0.051 |
| 1236 | LAKE REEDY | 0.033 | 0.330 | 468.500 | 34.837 | 10.600 | 0.008 |
| 1238 | LAKE SOUTH | 0.074 | 0.130 | 464.000 | 23.167 | 9.000 | 0.028 |
| 1239 | LAKE TALQUIN | 0.085 | 0.290 | 462.167 | 9.483 | 14.400 | 0.031 |

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

| LAKE CODE | LAKE NAME | MEDIAN TOTAL P | MEDIAN INORG N | 500-MEAN SEC | MEAN CHLORA | 15-MIN DO | MEDIAN DISS ORTHO P | INDEX NO |
|---|---|---|---|---|---|---|---|---|
| 1240 | LAKE THONOTOSASSA | 20 ( 8) | 85 ( 34) | 58 ( 23) | 40 ( 16) | 48 ( 18) | 15 ( 6) | 266 |
| 1241 | LAKE TOHOPEKALIGA | 33 ( 13) | 40 ( 16) | 38 ( 15) | 48 ( 19) | 40 ( 16) | 30 ( 12) | 229 |
| 1242 | TROUT LAKE | 15 ( 6) | 8 ( 3) | 43 ( 17) | 23 ( 9) | 13 ( 5) | 8 ( 3) | 110 |
| 1243 | LAKE WEOHYAKAPKA | 75 ( 30) | 91 ( 36) | 83 ( 33) | 88 ( 35) | 74 ( 29) | 84 ( 33) | 495 |
| 1246 | LAKE YALE | 98 ( 39) | 58 ( 23) | 90 ( 36) | 63 ( 25) | 83 ( 32) | 75 ( 30) | 467 |
| 1247 | LAKE MUNSON | 8 ( 3) | 5 ( 2) | 8 ( 3) | 8 ( 3) | 16 ( 6) | 13 ( 5) | 58 |
| 1248 | LAKE SEMINOLE | 35 ( 14) | 48 ( 19) | 35 ( 14) | 10 ( 4) | 69 ( 27) | 63 ( 25) | 260 |
| 1249 | LAKE LAWNE | 0 ( 0) | 0 ( 0) | 0 ( 0) | 20 ( 8) | 43 ( 17) | 35 ( 14) | 98 |
| 1250 | LAKE TARPON | 83 ( 33) | 98 ( 38) | 100 ( 40) | 90 ( 36) | 60 ( 23) | 60 ( 24) | 491 |
| 1252 | LAKE ELOISE | 30 ( 12) | 50 ( 20) | 63 ( 25) | 28 ( 11) | 16 ( 6) | 20 ( 8) | 207 |
| 1258 | LAKE JESSIE | 73 ( 29) | 88 ( 35) | 88 ( 35) | 60 ( 24) | 26 ( 10) | 84 ( 33) | 419 |
| 1261 | EAST LAKE TOHOPEKALIGA | 80 ( 32) | 98 ( 38) | 93 ( 37) | 98 ( 39) | 55 ( 22) | 99 ( 39) | 523 |
| 1264 | PAYNE'S PRAIRIE LAKE (NO | 11 ( 4) | 65 ( 26) | 25 ( 10) | 15 ( 6) | 90 ( 35) | 0 ( 0) | 206 |

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

| LAKE CODE | LAKE NAME | MEDIAN TOTAL P | MEDIAN INORG N | 500-MEAN SEC | MEAN CHLORA | 15-MIN DO | MEDIAN DISS ORTHO P | INDEX NO |
|---|---|---|---|---|---|---|---|---|
| 1201 | ALLIGATOR LAKE | 25 ( 10) | 29 ( 10) | 30 ( 12) | 18 ( 7) | 10 ( 4) | 18 ( 7) | 130 |
| 1202 | LAKE APOPKA | 50 ( 20) | 38 ( 15) | 10 ( 4) | 38 ( 15) | 74 ( 29) | 70 ( 28) | 280 |
| 1203 | LAKE BANANA | 23 ( 9) | 29 ( 10) | 20 ( 8) | 5 ( 2) | 100 ( 40) | 23 ( 9) | 200 |
| 1206 | LAKE CRESCENT | 65 ( 26) | 70 ( 27) | 33 ( 13) | 80 ( 32) | 48 ( 18) | 50 ( 20) | 346 |
| 1207 | DOCTORS LAKE | 60 ( 24) | 76 ( 30) | 60 ( 24) | 55 ( 22) | 34 ( 12) | 56 ( 22) | 341 |
| 1208 | LAKE DORA | 53 ( 21) | 35 ( 14) | 18 ( 7) | 33 ( 13) | 90 ( 35) | 68 ( 27) | 297 |
| 1209 | LAKE EFFIE | 5 ( 2) | 10 ( 4) | 3 ( 1) | 3 ( 1) | 0 ( 0) | 10 ( 4) | 31 |
| 1210 | LAKE GEORGE | 45 ( 18) | 54 ( 21) | 48 ( 19) | 43 ( 17) | 23 ( 9) | 43 ( 17) | 256 |
| 1211 | LAKE GIBSON | 40 ( 16) | 81 ( 32) | 45 ( 18) | 70 ( 28) | 48 ( 18) | 40 ( 16) | 324 |
| 1212 | GLENADA LAKE | 43 ( 17) | 54 ( 21) | 85 ( 34) | 53 ( 21) | 3 ( 1) | 38 ( 15) | 276 |
| 1214 | LAKE GRIFFIN | 48 ( 19) | 29 ( 10) | 23 ( 9) | 30 ( 12) | 95 ( 38) | 48 ( 19) | 273 |
| 1215 | LAKE HAINES | 70 ( 28) | 81 ( 32) | 75 ( 30) | 58 ( 23) | 34 ( 12) | 78 ( 31) | 396 |
| 1217 | LAKE HANCOCK | 18 ( 7) | 43 ( 17) | 13 ( 5) | 13 ( 5) | 98 ( 39) | 28 ( 11) | 213 |
| 1219 | LAKE HORSESHOE | 93 ( 37) | 70 ( 27) | 80 ( 32) | 78 ( 31) | 20 ( 8) | 65 ( 26) | 406 |
| 1220 | LAKE HOWELL | 11 ( 4) | 23 ( 9) | 69 ( 27) | 35 ( 14) | 60 ( 23) | 3 ( 1) | 201 |
| 1221 | LAKE ISTOKPOGA | 85 ( 34) | 76 ( 30) | 65 ( 26) | 93 ( 37) | 69 ( 27) | 89 ( 35) | 477 |
| 1223 | LAKE JESSUP | 28 ( 11) | 18 ( 7) | 5 ( 2) | 25 ( 10) | 83 ( 32) | 25 ( 10) | 184 |
| 1224 | LAKE KISSIMMEE | 90 ( 36) | 63 ( 25) | 73 ( 29) | 65 ( 26) | 65 ( 26) | 99 ( 39) | 455 |
| 1227 | LAKE LULU | 3 ( 1) | 3 ( 1) | 15 ( 6) | 0 ( 0) | 8 ( 3) | 5 ( 2) | 34 |
| 1228 | LAKE MARION | 78 ( 31) | 29 ( 10) | 53 ( 21) | 50 ( 20) | 83 ( 32) | 73 ( 29) | 366 |
| 1229 | LAKE MINNEHAHA | 88 ( 35) | 91 ( 36) | 95 ( 38) | 85 ( 34) | 78 ( 31) | 80 ( 32) | 517 |
| 1230 | LAKE MINNEOLA | 100 ( 40) | 98 ( 38) | 98 ( 39) | 100 ( 40) | 90 ( 35) | 93 ( 37) | 579 |
| 1231 | LAKE MONROE | 38 ( 15) | 15 ( 6) | 28 ( 11) | 75 ( 30) | 26 ( 10) | 33 ( 13) | 215 |
| 1232 | LAKE OKEECHOBEE | 68 ( 27) | 45 ( 18) | 40 ( 16) | 73 ( 29) | 53 ( 21) | 89 ( 35) | 368 |
| 1234 | LAKE POINSETT | 58 ( 23) | 60 ( 24) | 50 ( 20) | 95 ( 38) | 34 ( 12) | 45 ( 18) | 342 |
| 1236 | LAKE REEDY | 95 ( 38) | 13 ( 5) | 55 ( 22) | 45 ( 18) | 34 ( 12) | 95 ( 38) | 337 |
| 1238 | LAKE SOUTH | 63 ( 25) | 70 ( 27) | 69 ( 27) | 68 ( 27) | 60 ( 23) | 56 ( 22) | 386 |
| 1239 | LAKE TALQUIN | 55 ( 22) | 20 ( 8) | 78 ( 31) | 83 ( 33) | 5 ( 2) | 53 ( 21) | 294 |

LAKES RANKED BY INDEX NOS.

| RANK | LAKE CODE | LAKE NAME | INDEX NO |
|---|---|---|---|
| 29 | 1231 | LAKE MONROE | 215 |
| 30 | 1217 | LAKE HANCOCK | 213 |
| 31 | 1252 | LAKE ELOISE | 207 |
| 32 | 1264 | PAYNE'S PRAIRIE LAKE (NO | 206 |
| 33 | 1220 | LAKE HOWELL | 201 |
| 34 | 1203 | LAKE BANANA | 200 |
| 35 | 1223 | LAKE JESSUP | 184 |
| 36 | 1201 | ALLIGATOR LAKE | 130 |
| 37 | 1242 | TROUT LAKE | 110 |
| 38 | 1249 | LAKE LAWNE | 98 |
| 39 | 1247 | LAKE MUNSON | 58 |
| 40 | 1227 | LAKE LULU | 34 |
| 41 | 1209 | LAKE EFFIE | 31 |

LAKES RANKED BY INDEX NOS.

| RANK | LAKE CODE | LAKE NAME | INDEX NO |
|---|---|---|---|
| 1 | 1230 | LAKE MINNEOLA | 579 |
| 2 | 1261 | EAST LAKE TOHOPEKALIGA | 523 |
| 3 | 1229 | LAKE MINNEHAHA | 517 |
| 4 | 1243 | LAKE WEOHYAKAPKA | 495 |
| 5 | 1250 | LAKE TARPON | 491 |
| 6 | 1221 | LAKE ISTOKPOGA | 477 |
| 7 | 1246 | LAKE YALE | 467 |
| 8 | 1224 | LAKE KISSIMMEE | 455 |
| 9 | 1258 | LAKE JESSIE | 419 |
| 10 | 1219 | LAKE HORSESHOE | 406 |
| 11 | 1215 | LAKE HAINES | 396 |
| 12 | 1238 | LAKE SOUTH | 386 |
| 13 | 1232 | LAKE OKEECHOBEE | 368 |
| 14 | 1228 | LAKE MARION | 366 |
| 15 | 1206 | LAKE CRESCENT | 346 |
| 16 | 1234 | LAKE POINSETT | 342 |
| 17 | 1207 | DOCTORS LAKE | 341 |
| 18 | 1236 | LAKE REEDY | 337 |
| 19 | 1211 | LAKE GIBSON | 324 |
| 20 | 1208 | LAKE DORA | 297 |
| 21 | 1239 | LAKE TALQUIN | 294 |
| 22 | 1202 | LAKE APOPKA | 280 |
| 23 | 1212 | GLENADA LAKE | 276 |
| 24 | 1214 | LAKE GRIFFIN | 273 |
| 25 | 1240 | LAKE THONOTOSASSA | 266 |
| 26 | 1248 | LAKE SEMINOLE | 260 |
| 27 | 1210 | LAKE GEORGE | 256 |
| 28 | 1241 | LAKE TOHOPEKALIGA | 229 |

# APPENDIX B

# CONVERSION FACTORS

## CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x $8.107 \times 10^{-4}$ = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

# APPENDIX C

# PHYSICAL and CHEMICAL DATA

120901
27 54 33.0 081 36 22.0 3
LAKE EFFIE
12105 FLORIDA

032592

11EPALES 2111202
0005 FEET DEPTH CLASS 00

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00010 WATER TEMP CENT | 00300 DO MG/L | 00077 TRANSP SECCHI INCHES | 00094 CNDUCTVY FIELD MICROMHO | 00400 PH SU | 00410 T ALK CACO3 MG/L | 00610 NH3-N TOTAL MG/L | 00625 TOT KJEL N MG/L | 00630 NO2&NO3 N-TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 73/03/14 | 11 30 | 0000 | | 0.0 | 3 | 300 | 9.00 | 196 | 0.510 | 4.700 | 0.200 | 0.399 |
| 73/09/05 | 09 50 | 0000 | 28.3 | 0.0 | 12 | 353 | 7.20 | 123 | 0.200 | 5.700 | 0.210 | 0.950 |
| 73/11/07 | 12 45 | 0000 | 25.6 | | 14 | 368 | 7.60 | 134 | 0.070 | 4.000 | 0.180 | 1.100 |
| | 12 45 | 0001 | 25.6 | 4.0 | | 368 | | | | | | |

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00665 PHOS-TOT MG/L P | 32217 CHLRPHYL A UG/L |
|---|---|---|---|---|
| 73/03/14 | 11 30 | 0000 | 1.260 | 116.7 |
| 73/09/05 | 09 50 | 0000 | 1.600 | 595.0 |
| 73/11/07 | 12 45 | 0000 | 1.480 | 72.6 |