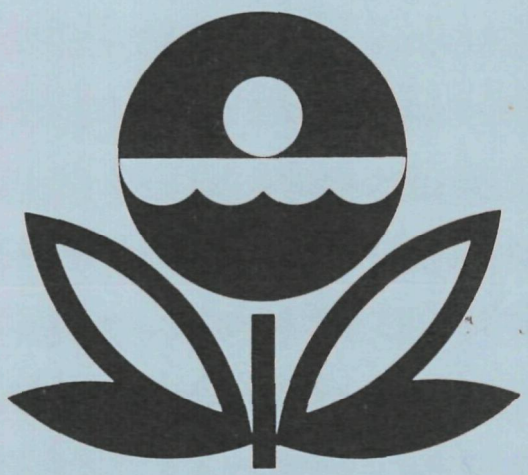
# U.S. ENVIRONMENTAL PROTECTION AGENCY
# NATIONAL EUTROPHICATION SURVEY

## WORKING PAPER SERIES



REPORT

ON

LAKE JESSIE

POLK COUNTY

FLORIDA

EPA REGION IV

WORKING PAPER No. 259

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

**and**

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

☆G.P.O. 699-440

# REPORT
# ON
# LAKE JESSIE
# POLK COUNTY
# FLORIDA
# EPA REGION IV
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WITH THE COOPERATION OF THE

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

AND THE

FLORIDA NATIONAL GUARD

DECEMBER, 1977

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 freshwater 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.

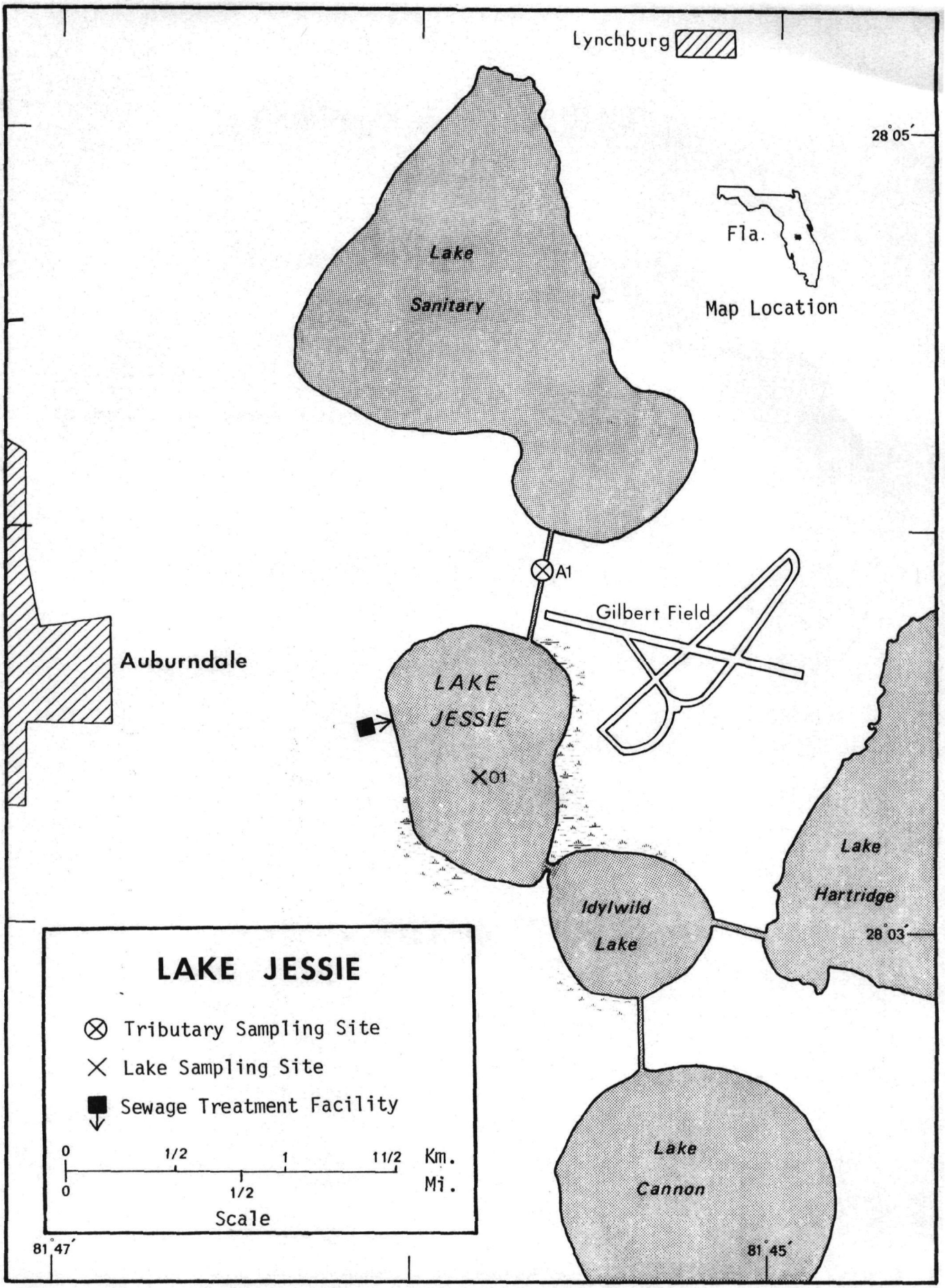
Major General Henry W. McMillan (Retired), then the Adjutant General of Florida, and Project Officer Colonel Hugo F. Windham, who directed the volunteer efforts of the Florida National Guard, are also gratefully acknowledged for their assistance to the Survey.

# 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 | Gadsden, Leon |
| Tarpon | Pinellas |
| Thonotosassa | Hillsborough |
| Tohopekaliga | Osceola |
| Trout | Lake |
| Weohyakapka | Polk |
| Yale | Lake |


Lynchburg
28°05′
Fla.
Map Location
Lake
Sanitary
A1
Gilbert Field
Auburndale
LAKE
JESSIE
X01
Lake
Hartridge
28°03′
Idylwild
Lake
Lake
Cannon
81°47′
81°45′
LAKE JESSIE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
0 1/2 1 1 1/2 Km.
0 1/2 Mi.
Scale

LAKE JESSIE

STORET NO. 1258

## I. INTRODUCTION

Lake Jessie is one of the Winter Haven chain of lakes. The hydrology of this chain is complex, and the U.S. Geological Survey questions whether realistic analyses of nutrient loadings to the lakes can be made; i.e., depending on the operation of control gates, wind direction and velocity, and other factors, flows in the connecting canals may have reversed from one sampling time to the next (Anderson, 1974).

## II. CONCLUSIONS

### A. Trophic Condition:

Survey data indicate that Lake Jessie is eutrophic. It ranked ninth in overall trophic quality when the 41 Florida lakes sampled in 1973 were compared using a combination of six parameters*. Eleven lakes had less median total phosphorus, six had less and one had the same median dissolved phosphorus, five had less median inorganic nitrogen, 16 had less mean chlorophyll a, and five had greater mean Secchi disc transparency.

Survey limnologists noted that emergent aquatic vegetation was present in the shallows along about half of the shoreline in November.

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* See Appendix A.

B. Rate-Limiting Nutrient:

The algal assay results are not considered indicative of conditions in the lake at the time of sampling. The lake data indicate nitrogen limitation at all sampling times.

C. Nutrient Controllability:

1. Point sources--During the sampling year, the only known point source, the Flamingo Shores MHP wastewater treatment plant contributed an estimated 1.6% of the total phosphorus input to Lake Jessie.

The estimated sampling year phosphorus loading of 3.25 $g/m^2$ is more than eight times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading. Assuming non-point loading estimates are reasonable, it appears that complete phosphorus removal at the point source would still leave a loading well in excess of the eutrophic loading; and even though Florida lakes may assimilate phosphorus at higher levels than those suggested by Vollenweider (see page 12), it does not seem likely that point-source phosphorus reduction would result in a significant improvement in the trophic condition of the lake.

2. Non-point sources--It is estimated that 61% of the phosphorus input to Lake Jessie was contributed by the Lake Sanitary drainage basin. It is likely that control of phosphorus resulting from agricultural activities around Lake Sanitary would be necessary to significantly reduce this input to Lake Jessie.

Minor tributaries and immediate drainage contributed an estimated 36% of the total phosphorus loading to Lake Jessie. Some urban development is presently occurring on the south and west shores, and an airport is located near the east shore. Citrus groves are also located within the drainage basin.

## III. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

### A. Morphometry††:

1. Surface area: 0.77 kilometers$^2$.
2. Mean depth: 2.0 meters.
3. Maximum depth: 3.3 meters.
4. Volume: 1.540 x $10^6$ $m^3$.
5. Mean hydraulic retention time: 162 days.

### B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

| Name | Drainage area km$^2$)* | Mean Flow ($m^3$/sec)** |
|---|---|---|
| Unnamed Canal A-1 | 7.4 | 0.07 |
| Minor tributaries & immediate drainage - | 4.4 | 0.04 |
| Totals | 11.8 | 0.11 |

2. Outlet -

| | | |
|---|---|---|
| Outlet Canal | 12.6*** | 0.11*** |

### C. Precipitation****:

1. Year of sampling: 112.8 centimeters.
2. Mean annual: 134.1 centimeters.

† Table of metric conversions--Appendix B.
†† Anonymous, 1971; depths estimated from soundings reported in Appendix D.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Based on net effects of factors affecting flows in connecting canals during the period of October, 1960, through September, 1968 (Anderson, 1974).
*** Includes area of lake; outflow assumed to equal sum of inflows.
**** See Working Paper No. 175.

## IV. WATER QUALITY SUMMARY

Lake Jessie was sampled three times during 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from two or more depths at one station on the lake (see map, page v). During each visit, a single depth-integrated (near bottom to surface) sample was collected for phytoplankton identification and enumeration, and a similar sample was taken for chlorophyll a analysis. During the first visit, a single 18.9-liter depth-integrated sample was collected for algal assays. The maximum depth sampled was 2.7 meters.

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

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR LAKE JESSIE
STORET CODE 1258

| PARAMETER | 1ST SAMPLING ( 3/ 8/73) 1 SITE RANGE | MEAN | MEDIAN | 2ND SAMPLING ( 9/ 4/73) 1 SITE RANGE | MEAN | MEDIAN | 3RD SAMPLING (11/ 6/73) 1 SITE RANGE | MEAN | MEDIAN |
|---|---|---|---|---|---|---|---|---|---|
| TEMP (C) | 20.5 - 24.0 | 22.5 | 23.1 | 28.8 - 29.1 | 28.9 | 28.9 | 23.7 - 23.8 | 23.8 | 23.8 |
| DISS OXY (MG/L) | 8.8 - 10.2 | 9.5 | 9.5 | 4.2 - 7.0 | 5.6 | 5.6 | 7.8 - 8.2 | 8.0 | 8.0 |
| CNDCTVY (MCROMO) | 200. - 200. | 200. | 200. | 196. - 199. | 198. | 198. | 170. - 170. | 170. | 170. |
| PH (STAND UNITS) | 8.3 - 9.0 | 8.7 | 8.9 | 8.7 - 9.2 | 8.9 | 8.9 | 6.9 - 7.1 | 7.0 | 7.0 |
| TOT ALK (MG/L) | 41. - 42. | 42. | 42. | 42. - 42. | 42. | 42. | 31. - 31. | 31. | 31. |
| TOT P (MG/L) | 0.036 - 0.051 | 0.042 | 0.039 | 0.049 - 0.055 | 0.052 | 0.052 | 0.059 - 0.071 | 0.065 | 0.065 |
| ORTHO P (MG/L) | 0.006 - 0.010 | 0.008 | 0.007 | 0.014 - 0.029 | 0.021 | 0.021 | 0.011 - 0.019 | 0.015 | 0.015 |
| NO2+NO3 (MG/L) | 0.040 - 0.050 | 0.047 | 0.050 | 0.060 - 0.090 | 0.075 | 0.075 | 0.020 - 0.030 | 0.025 | 0.025 |
| AMMONIA (MG/L) | 0.040 - 0.040 | 0.040 | 0.040 | 0.060 - 0.080 | 0.070 | 0.070 | 0.040 - 0.060 | 0.050 | 0.050 |
| KJEL N (MG/L) | 0.800 - 0.900 | 0.867 | 0.900 | 0.800 - 1.600 | 1.200 | 1.200 | 0.500 - 0.800 | 0.650 | 0.650 |
| INORG N (MG/L) | 0.080 - 0.090 | 0.087 | 0.090 | 0.120 - 0.170 | 0.145 | 0.145 | 0.060 - 0.090 | 0.075 | 0.075 |
| TOTAL N (MG/L) | 0.840 - 0.950 | 0.913 | 0.950 | 0.890 - 1.660 | 1.275 | 1.275 | 0.520 - 0.830 | 0.675 | 0.675 |
| CHLRPYL A (UG/L) | 20.8 - 20.8 | 20.8 | 20.8 | 32.6 - 32.6 | 32.6 | 32.6 | 25.5 - 25.5 | 25.5 | 25.5 |
| SECCHI (METERS) | 1.5 - 1.5 | 1.5 | 1.5 | 1.0 - 1.0 | 1.0 | 1.0 | 1.1 - 1.1 | 1.1 | 1.1 |

B. Biological characteristics:

1. Phytoplankton -

| Sampling Date | Dominant Genera | Algal Units per ml |
|---|---|---|
| 03/08/73 | 1. *Raphidiopsis sp.* | 23,636 |
| | 2. *Microcystis sp.* | 3,273 |
| | 3. *Tetraedron sp.* | 2,181 |
| | 4. *Synedra sp.* | 2,181 |
| | 5. *Crucigenia sp.* | 1,818 |
| | Other genera | 10,366 |
| | Total | 43,455 |
| 09/04/73 | 1. *Oscillatoria sp.* | 2,406 |
| | 2. Flagellates | 2,406 |
| | 3. *Cryptomonas sp.* | 2,406 |
| | 4. *Dactylococcopsis sp.* | 1,636 |
| | 5. *Cyclotella sp.* | 1,540 |
| | Other genera | 11,647 |
| | Total | 22,041 |
| 11/06/73 | 1. Flagellates | 9,121 |
| | 2. Pennate diatoms | 5,568 |
| | 3. *Microcystis sp.* | 4,383 |
| | 4. Centric diatoms | 3,317 |
| | 5. *Dactylococcopsis sp.* | 2,843 |
| | Other genera | 18,472 |
| | Total | 43,704 |

2. Chlorophyll *a* -

| Sampling Date | Station Number | Chlorophyll *a* (µg/l) |
|---|---|---|
| 03/08/73 | 1 | 20.8 |
| 09/04/73 | 1 | 32.6 |
| 11/06/73 | 1 | 25.5 |

C. Limiting Nutrient Study:

The algal assay results are not considered indicative of conditions in Lake Jessie at the time of sampling (03/08/74) because of substantial changes in nutrient concentrations in the sample between the time of collection and the beginning of the assay.

The lake data indicate nitrogen limitation; i.e., mean inorganic nitrogen/orthophosphorus ratios were 11/1 or less at all sampling times.

## V. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Florida National Guard collected monthly near-surafce grab samples from each of the tributary sites indicated on the map (page v). Sampling was begun in March, 1973, and was completed in February, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Florida District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for Unnamed Canal A-1 were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads in the unsampled outlet canal were calculated with the estimated mean outflow and the mean nutrient concentrations in the lake.

Nutrient loads for unsamples "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the nutrient loads, in $kg/km^2/year$, at station A-1 and multiplying by the ZZ area in $km^2$.

The operator of the Flamingo Shores wastewater treatment plant provided monthly effluent samples and corresponding flow data.

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* See Working Paper No. 175.

A. Waste Sources:

1. Known municipal -

| Name | Pop. Served | Treatment | Mean Flow ($m^3/d$) | Receiving Water |
|---|---|---|---|---|
| Flamingo Shores MHP | 140 | act. sludge + pond | 12.6 | Lake Jessie |

2. Known industrial - None

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

| Source | kg P/yr | % of total |
|---|---|---|
| a. Tributaries (non-point load) - | | |
| Unnamed Canal A-1 | 1,525 | 61.0 |
| b. Minor tributaries & immediate drainage (non-point load) - | 905 | 36.2 |
| c. Known municipal STP's - | | |
| Flamingo Shores MHP | 40 | 1.6 |
| d. Septic tanks - Unknown | ? | - |
| e. Known industrial - None | - | - |
| f. Direct precipitation* - | 30 | 1.2 |
| Total | 2,500 | 100.0 |

2. Outputs -

Outlet Canal - 160

3. Net annual P accumulation - 2,340 kg.

* Brezonik and Shannon, 1971.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

| Source | kg N/yr | % of total |
|---|---|---|
| a. Tributaries (non-point load) - | | |
| Unnamed Canal A-1 | 4,195 | 57.7 |
| b. Minor tributaries & immediate drainage (non-point load) - | 2,495 | 34.3 |
| c. Known municipal STP's - | | |
| Flamingo Shores MHP | 125 | 1.7 |
| d. Septic tanks - Unknown | ? | - |
| e. Known industrial - None | - | - |
| f. Direct precipitation* - | 450 | 6.2 |
| Total | 7,265 | 100.0 |

2. Outputs -

Outlet Canal - 2,990

3. Net annual N accumulation - 4,275 kg.

D. Non-point Nutrient Export by Subdrainage Area:

| Tributary | kg $P/km^2/yr$ | kg $N/km^2/yr$ |
|---|---|---|
| Unnamed Canal A-1 | 206 | 567 |

* Brezonik and Shannon, 1971.

E. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). However, note that Florida lakes may be able to assimilate phosphorus at a somewhat higher level than that suggested by Vollenweider (Shannon and Brezonik, 1972).

Essentially, Vollenweider's "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

| | Total Phosphorus | | Total Nitrogen | |
|---|---|---|---|---|
| | Total | Accumulated | Total | Accumulated |
| grams/$m^2$/yr | 3.25 | 3.04 | 9.4 | 5.6 |

| Vollenweider phosphorus loadings ($g/m^2/yr$) based on estimated mean depth and hydraulic retention time of Lake Jessie: | |
|---|---|
| "Dangerous" (eutrophic loading) | 0.40 |
| "Permissible" (oligotrophic loading) | 0.20 |

## VI. LITERATURE REVIEWED

Anderson, Warren, 1974. Personal communication (hydrology of Winter Haven chain of lakes). U.S. Geol. Surv., Winter Park.

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Shannon, Earl E., and Patrick L. Brezonik, 1972. Relationships between lake trophic state and nitrogen and phosphorus loading rates. Env. Sci. & Techn. 6(8): 719-725.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

# VII. APPENDICES

## APPENDIX A

## LAKE RANKINGS

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 | 0.138 | 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 | 0.006 |
| 1238 | LAKE SOUTH | 0.074 | 0.130 | 464.000 | 23.167 | 9.000 | 0.028 |

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 |
|---|---|---|---|---|---|---|---|
| 1240 | LAKE THONOTOSASSA | 0.695 | 0.095 | 466.167 | 37.700 | 10.200 | 0.565 |
| 1241 | LAKE TOHOPEKALIGA | 0.246 | 0.200 | 472.917 | 30.633 | 10.500 | 0.152 |
| 1242 | TROUT LAKE | 1.110 | 0.650 | 472.000 | 76.967 | 12.900 | 0.970 |
| 1243 | LAKE WEOHYAKAPKA | 0.047 | 0.080 | 458.667 | 7.767 | 8.200 | 0.011 |
| 1246 | LAKE YALE | 0.027 | 0.160 | 441.000 | 25.367 | 7.600 | 0.014 |
| 1247 | LAKE MUNSON | 1.475 | 0.925 | 486.667 | 140.317 | 12.200 | 0.852 |
| 1248 | LAKE SEMINOLE | 0.234 | 0.175 | 473.833 | 102.000 | 8.600 | 0.026 |
| 1249 | LAKE LAWNE | 2.560 | 1.350 | 494.667 | 84.900 | 10.400 | 0.117 |
| 1250 | LAKE TARPON | 0.041 | 0.070 | 400.889 | 6.867 | 9.000 | 0.027 |
| 1252 | LAKE ELOISE | 0.486 | 0.170 | 465.333 | 70.233 | 12.200 | 0.339 |
| 1258 | LAKE JESSIE | 0.051 | 0.090 | 452.667 | 26.300 | 10.800 | 0.011 |
| 1261 | EAST LAKE TOHOPEKALIGA | 0.042 | 0.070 | 440.833 | 5.167 | 9.400 | 0.007 |
| 1264 | PAYNE'S PRAIRIE LAKE (NO | 1.260 | 0.140 | 476.000 | 88.200 | 7.400 | 1.210 |

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 |

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) | 265 |
| 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 |

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 |

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 |

# 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

## TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR FLORIDA 8/25/75

LAKE CODE 1258 LAKE JESSIE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 11.8

| TRIBUTARY | SUB-DRAINAGE AREA(SQ KM) | NORMALIZED FLOWS(CMS) JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | MEAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1258A1 | 7.4 | 0.05 | 0.05 | 0.10 | 0.07 | 0.03 | 0.06 | 0.08 | 0.08 | 0.13 | 0.12 | 0.06 | 0.06 | 0.07 |
| 1258ZZ | 4.4 | 0.03 | 0.03 | 0.06 | 0.04 | 0.02 | 0.03 | 0.05 | 0.05 | 0.08 | 0.07 | 0.04 | 0.03 | 0.04 |

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 11.8
SUM OF SUB-DRAINAGE AREAS = 11.8
TOTAL FLOW IN = 1.42
TOTAL FLOW OUT = 0.0

NOTE *** SEE WRITE UP ON WINTER HAVEN CHAIN OF LAKES

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

| TRIBUTARY | MONTH | YEAR | MEAN FLOW | DAY | FLOW | DAY | FLOW | DAY | FLOW |
|---|---|---|---|---|---|---|---|---|---|
| 1258A1 | 3 | 73 | 0.02 | 18 | 0.01 | | | | |
| | 4 | 73 | 0.02 | 15 | 0.02 | | | | |
| | 5 | 73 | 0.00 | 18 | 0.00 | | | | |
| | 6 | 73 | 0.02 | 17 | 0.00 | | | | |
| | 7 | 73 | 0.01 | 14 | 0.02 | | | | |
| | 8 | 73 | 0.01 | 17 | 0.01 | | | | |
| | 9 | 73 | 0.03 | 16 | 0.02 | | | | |
| | 10 | 73 | 0.02 | 13 | 0.02 | | | | |
| | 11 | 73 | 0.00 | 18 | 0.00 | | | | |
| | 12 | 73 | 0.01 | 16 | 0.01 | | | | |
| | 1 | 74 | 0.01 | 20 | 0.01 | | | | |
| | 2 | 74 | 0.00 | 17 | 0.00 | | | | |
| 1258ZZ | 3 | 73 | 0.01 | 18 | 0.01 | | | | |
| | 4 | 73 | 0.01 | 15 | 0.01 | | | | |
| | 5 | 73 | 0.00 | 18 | 0.0 | | | | |
| | 6 | 73 | 0.01 | 17 | 0.0 | | | | |
| | 7 | 73 | 0.01 | 14 | 0.01 | | | | |
| | 8 | 73 | 0.01 | 17 | 0.01 | | | | |
| | 9 | 73 | 0.02 | 16 | 0.01 | | | | |
| | 10 | 73 | 0.01 | 13 | 0.01 | | | | |
| | 11 | 73 | 0.00 | 18 | 0.0 | | | | |
| | 12 | 73 | 0.01 | 16 | 0.00 | | | | |
| | 1 | 74 | 0.01 | 20 | 0.00 | | | | |
| | 2 | 74 | 0.0 | 17 | 0.0 | | | | |

# APPENDIX D

## PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/08/25

125801
28 03 23.0 081 45 48.0
LAKE JESSIE
12105 FLORIDA

11EPALES 2111202
3 0011 FEET DEPTH

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 73/03/08 | 12 00 | 0000 | 24.0 | | 60 | 200 | 9.00 | 41 | 0.040 | 0.900 | 0.050 | 0.007 |
| | 12 00 | 0004 | 23.1 | 10.2 | | 200 | 8.90 | 42 | 0.040 | 0.800 | 0.040 | 0.006 |
| | 12 00 | 0007 | 20.5 | 8.8 | | 200 | 8.30 | 42 | 0.040 | 0.900 | 0.050 | 0.010 |
| 73/09/04 | 17 20 | 0000 | 29.1 | 4.2 | 40 | 199 | 9.20 | 42 | 0.060 | 1.600 | 0.060 | 0.014 |
| | 17 20 | 0009 | 28.8 | 7.0 | | 196 | 8.70 | 42 | 0.080 | 0.800 | 0.090 | 0.029 |
| 73/11/06 | 13 14 | 0000 | 23.8 | | 42 | 170 | 7.10 | 31 | 0.060 | 0.800 | 0.030 | 0.019 |
| | 13 14 | 0001 | 23.8 | 8.2 | | 170 | | | | | | |
| | 13 14 | 0007 | 23.7 | 7.8 | | 170 | 6.90 | 31 | 0.040 | 0.500 | 0.020 | 0.011 |

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00665 PHOS-TOT MG/L P | 32217 CHLRPHYL A UG/L |
|---|---|---|---|---|
| 73/03/08 | 12 00 | 0000 | 0.039 | 20.8 |
| | 12 00 | 0004 | 0.036 | |
| | 12 00 | 0007 | 0.051 | |
| 73/09/04 | 17 20 | 0000 | 0.049 | 32.6 |
| | 17 20 | 0009 | 0.055 | |
| 73/11/06 | 13 14 | 0000 | 0.071 | 25.5 |
| | 13 14 | 0007 | 0.059 | |

# APPENDIX E

## TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 75/08/25

1258A1
28 04 00.0 081 45 30.0
UNNAMED TRIBUTARY
12105 7.5 AUBURNDALE
T/LAKE JESSIE
US HWY 92 BRDG
11EPALES 2111204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P |
|---|---|---|---|---|---|---|---|
| 73/03/18 | 10 00 | | 0.105 | 0.490 | 0.020 | 0.035 | 0.055 |
| 73/04/15 | 15 45 | | 0.024 | 0.595 | 0.030 | 0.040 | 0.080 |
| 73/05/18 | 12 22 | | 0.084 | 1.440 | 0.390 | 0.115 | 0.620 |
| 73/06/17 | 14 15 | | 0.115 | 4.950 | 0.399 | 0.240 | 4.200 |
| 73/07/14 | 11 40 | | 0.074 | 2.310 | 0.450 | 0.315 | 1.880 |
| 73/08/17 | 14 05 | | 0.080 | 1.760 | 0.160 | 0.024 | 0.075 |
| 73/09/16 | 09 55 | | 0.075 | 0.750 | 0.044 | 0.008 | 0.050 |
| 73/10/13 | 11 05 | | 0.038 | 3.200 | 1.230 | 0.017 | 0.040 |
| 73/11/18 | 11 27 | | 0.120 | 0.550 | 0.020 | 0.016 | 0.050 |
| 73/12/16 | 15 00 | | 0.088 | 1.100 | 0.052 | 0.048 | 0.075 |
| 74/01/20 | 14 52 | | 0.088 | 0.600 | 0.036 | 0.025 | 0.072 |
| 74/02/17 | 15 00 | | 0.160 | 1.800 | 0.085 | 0.070 | 0.310 |

STORET RETRIEVAL DATE 75/08/25

1258DC AS1258DC P000100
28 03 30.0 081 46 20.0
FLAMINGO SHORES MOBILE HOME PARK
12 7.5 AUBURNDALE
D/LAKE JESSIE
LAKE JESSIE
11EPALES 2141204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P | 50051 FLOW RATE INST MGD | 50053 CONDUIT FLOW-MGD MONTHLY |
|---|---|---|---|---|---|---|---|---|---|
| 73/04/16 | 11 00 | | | | | | | | |
| CP(T)- | | | 33.000 | 1.000 | 1.000 | 7.900 | 7.900 | 0.005 | 0.005 |
| 73/04/16 | 16 00 | | | | | | | | |
| 73/05/15 | 11 00 | | | | | | | | |
| CP(T)- | | | 39.600 | 1.300 | 0.175 | 11.000 | 11.500 | 0.004 | 0.004 |
| 73/05/15 | 16 00 | | | | | | | | |
| 73/06/17 | 11 00 | | | | | | | | |
| CP(T)- | | | 31.400 | 1.000 | 0.066 | | 8.800 | 0.002 | 0.002 |
| 73/06/17 | 16 00 | | | | | | | | |
| 73/07/18 | 11 00 | | | | | | | | |
| CP(T)- | | | 11.400 | 0.260 | 0.190 | 8.300 | 8.600 | 0.002 | 0.002 |
| 73/07/18 | 16 00 | | | | | | | | |
| 73/08/20 | 11 00 | | | | | | | | |
| CP(T)- | | | 15.200 | 1.260 | 0.080 | 7.000 | 7.500 | 0.002 | 0.002 |
| 73/08/20 | 16 00 | | | | | | | | |
| 73/09/17 | 11 00 | | | | | | | | |
| CP(T)- | | | 0.030 | 6.430 | 0.170 | 6.425 | 6.430 | 0.003 | 0.003 |
| 73/09/17 | 16 00 | | | | | | | | |
| 73/10/14 | 11 00 | | | | | | | | |
| CP(T)- | | | 24.000 | 0.500K | 0.029 | 8.400 | 8.600 | 0.003 | 0.003 |
| 73/10/14 | 16 00 | | | | | | | | |
| 73/11/15 | 11 00 | | | | | | | | |
| CP(T)- | | | 32.000 | 0.300 | 0.011 | 8.950 | 8.950 | 0.005 | 0.005 |
| 73/11/15 | 16 00 | | | | | | | | |

K VALUE KNOWN TO BE
LESS THAN INDICATED