U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

WORKING PAPER SERIES

REPORT

ON

INDIAN CREEK RESERVOIR

RAPIDES PARISH

LOUISIANA

EPA REGION VI

WORKING PAPER No. 541

CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON

and

ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA

☆G.P.O. 699-440

REPORT

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WITH THE COOPERATION OF THE

LOUISIANA WILD LIFE AND FISHERIES COMMISSION

AND THE

LOUISIANA NATIONAL GUARD

MARCH, 1977

REPORT ON INDIAN CREEK RESERVOIR

RAPIDES PARISH, LOUISIANA

EPA REGION VI

by

National Eutrophication Survey

Water and Land Quality Branch
Monitoring Operations Division
Environmental Monitoring & Support Laboratory
Las Vegas, Nevada

and

Special Studies Branch
Corvallis Environmental Research Laboratory
Corvallis, Oregon

Working Paper No. 541

OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY

March 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 nonpoint 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 freshwater 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 the U.S. Environmental Protection Agency and to augment plans implementation by the states.

ACKNOWLEDGMENTS

The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the Louisiana Wild Life and Fisheries Commission, Division of Water Pollution Control for professional involvement, to the Louisiana National Guard for conducting the tributary sampling phase of the Survey, and to those Louisiana wastewater treatment plant operators who provided effluent samples and flow data.

Robert A. Lafleur, Chief; J. Dale Givens, Assistant Chief; Lewis R. Still, Biologist; Louis Johnson, Biologist; Lee Caubarreaux, Biologist; Darrell Reed, Engineer; Dempsey Alford, Biologist; and Elwood Goodwin, Water Quality Control Technician, all of the Louisiana Wild Life and Fisheries Commission, Division of Water Pollution Control reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper Series.

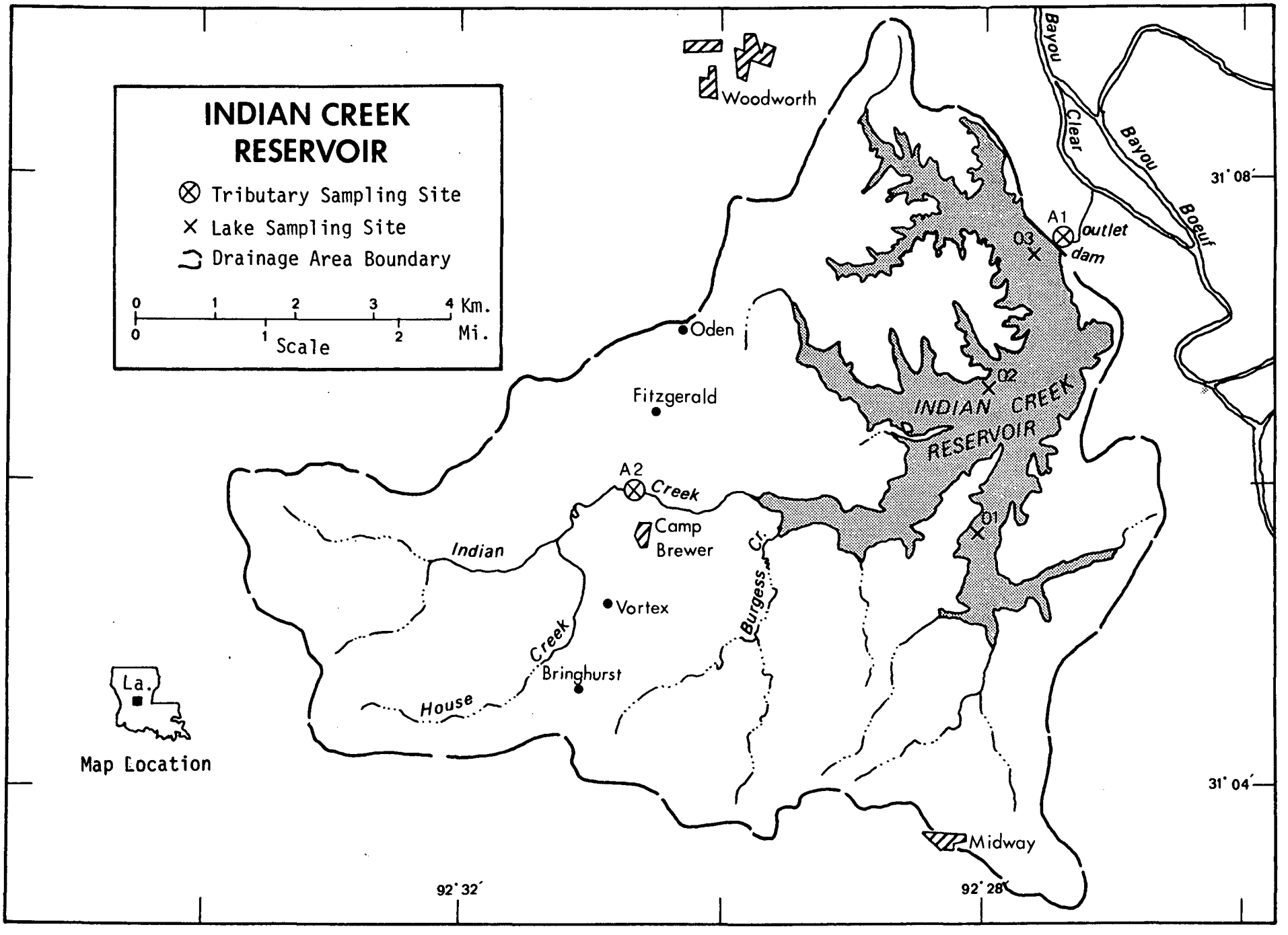
Major General O'Neil Daigle, Jr., the Adjutant General of Louisiana, and Project Officer Colonel Lawrence P. Dupre, who directed the volunteer efforts of the Louisiana National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF LOUISIANA

LAKE NAME	PARISH
Anacoco Lake	Vernon
Lake Bistineau	Bienville, Webster
Black Bayou	Caddo
Black Lake	Natchitoches and Red River
Bruin Lake	Tensas
Bundick Lake	Beauregard
Caddo Lake	Caddo (Menon and Harrison in Texas)
Cocodrie Lake	Concordia
Cocodrie Lake (Lower)	Rapides
Concordia Lake	Concordia
Cotile Lake	Rapides
Cross Lake	Caddo
D'Arbonne Lake	Union
False River Lake	Pointe Coupee
Indian Creek Reservoir	Rapides
Saline Lake	LaSalle
Turkey Creek Lake	Franklin
Lake Vernon	Vernon
Lake Verret	Assumption


INDIAN CREEK RESERVOIR
Tributary Sampling Site
Lake Sampling Site
Drainage Area Boundary
0 1 2 3 4 Km.
0 1 2 Mi.
Scale
Woodworth
Oden
Fitzgerald
Camp Brewer
Vortex
Bringhurst
Midway
A1
outlet
dam
A2
Creek
Indian
Creek
House
Creek
Burgess
Cr.
Bayou
Clear
Bayou
Boeuf
INDIAN CREEK RESERVOIR
01
02
03
La.
Map Location
31° 08'
31° 04'
92° 32'
92° 28'

REPORT ON INDIAN CREEK RESERVOIR, LOUISIANA

STORET NO. 2213

I. CONCLUSIONS

A. Trophic Condition:*

Survey data indicate Indian Creek Reservoir is eutrophic, i.e., nutrient rich and highly productive. Whether such nutrient enrichment is to be considered beneficial or deleterious is determined by its actual or potential impact upon designated beneficial water uses.

Chlorophyll a levels ranged from 5.7 µg/l in the spring to 63.8 µg/l in the summer with a mean of 21.5 µg/l. Secchi disc visibility and potential for primary production as measured by algal assay control yield was low. Of the 19 Louisiana lakes sampled by National Eutrophication Survey (NES) in 1974, 16 had higher median total phosphorus levels, 12 had higher median dissolved orthophosphorus values, but only 5 had higher median inorganic nitrogen levels than Indian Creek Reservoir.

Survey limnologists did not observe any concentrations of algae but did note abundant macrophytes in the shallows along coves and among the dead submerged trees near shore. Near-depletion of dissolved oxygen occurred in the hypolimnion at all stations in May.

*See Appendix E.

B. Rate-Limiting Nutrient:

Algal assay results indicate that Indian Creek Reservoir is limited by available phosphorus. Spikes with phosphorus or phosphorus and nitrogen simultaneously resulted in increased assay yields. The addition of nitrogen alone did not produce a growth response. The lake ratios of total available inorganic nitrogen to orthophosphorus (N/P) substantiate those results for the spring and summer sampling seasons, but indicate nitrogen limitation for the fall sampling season.

C. Nutrient Controllability:

1. Point sources -

There are no known point sources impacting Indian Creek Reservoir. The phosphorus loading of 0.06 g $P/m^2/yr$ is less than the "oligotrophic" level established by Vollenweider (1975) for a lake with such mean depth and detention time. However, loading calculations yield an apparent net export of phosphorus from the lake. This could be due to unknown and unmeasured point sources discharging directly to the lake, to insufficient sampling or to underestimation of the phosphorus load from septic tanks. Additional sampling is needed before an actual nutrient budget for Indian Creek Reservoir can be determined. However, regardless of the primary nutrient limitation suggested by either algal assay or nutrient ratios, the

most feasible approach to nutrient control, if desirable, is through available phosphorus control technology.

2. Nonpoint sources -

The phosphorus exports of nonpoint sources accounted for the entire phosphorus load to Indian Creek Reservoir during the sampling year. Indian Creek contributed 21.6% of the load, and ungaged tributaries were estimated to account for 49.6% of the total. The Indian Creek export rate of 8 kg $P/km^2/yr$ is somewhat lower than the rates of other streams in this area.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

Lake and drainage basin characteristics are itemized below. Lake morphometry data were provided by the State of Louisiana. Tributary flow data were provided by the Louisiana District Office of the U.S. Geological Survey (USGS). Outlet drainage area includes the lake surface area. Mean hydraulic retention time was obtained by dividing the lake volume by the mean flow of the outlet. Precipitation values are estimated by methods as outlined in NES Working Paper No. 175. A table of metric/English conversions is included as Appendix A.

A. Lake Morphometry:

1. Surface area: 9.11 km^2.
2. Mean depth: 3.4 meters.
3. Maximum depth: 6.6 meters.
4. Volume: 30.857 x 10^6 m^3.
5. Mean hydraulic retention time: 441 days.

B. Tributary and Outlet (see Appendix B for flow data):

1. Tributaries -

Name	Drainage area(km^2)	Mean flow (m^3/s)
A-2 Indian Creek	14.8	0.21
Minor tributaries and immediate drainage -	34.4	0.60
Totals	49.2	0.81

2. Outlet - A-1 Indian Creek 58.3 0.81

C. Precipitation:

1. Year of sampling: 187.9 cm.
2. Mean annual: 150.2 cm.

III. LAKE WATER QUALITY SUMMARY

Indian Creek Reservoir was sampled three times during the open-water season of 1974 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the lake and from a number of depths at each station (see map, page v). During each visit, depth-integrated samples were collected from each station for chlorophyll a analysis and phytoplankton identification and enumeration. During the first and last visits, 18.9-liter depth-integrated samples were composited for algal assays. Maximum depths sampled were 4.6 meters at Station 01, 4.6 meters at Station 02, and 6.1 meters at Station 03. For a more detailed explanation of NES methods, see NES Working Paper No. 175.

The results obtained are presented in full in Appendix C and are summarized in III-A for waters at the surface and at the maximum depth for each site. Results of the phytoplankton counts and chlorophyll a determinations are included in III-B. Results of the limiting nutrient study are presented in III-C.

INDIAN CREEK
STORET CODE 2213

PHYSICAL AND CHEMICAL CHARACTERISTICS

PARAMETER	N*	(3/22/74) S*** = 3 RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	N*	(5/30/74) S*** = 3 RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	N*	(11/12/74) S*** = 3 RANGE	MEDIAN	MAX DEPTH RANGE (METERS)
TEMPERATURE (DEG CENT)												
0.-1.5 M DEPTH	3	19.1- 20.2	19.9	0.0- 0.0	6	27.7- 28.3	28.0	0.0- 1.5	6	17.5- 19.1	18.5	0.0- 1.5
MAX DEPTH**	3	17.4- 18.9	18.6	4.3- 6.1	3	23.4- 24.8	23.8	4.6- 5.2	3	17.2- 18.9	18.4	3.0- 4.6
DISSOLVED OXYGEN (MG/L)												
0.-1.5 M DEPTH	0	*****-*****	*****	*****-*****	3	6.2- 7.0	6.4	1.5- 1.5	6	6.6- 7.2	6.8	0.0- 1.5
MAX DEPTH**	3	2.0- 7.0	6.8	4.3- 6.1	3	0.2- 1.4	0.4	4.6- 5.2	3	6.2- 7.2	6.8	3.0- 4.6
CONDUCTIVITY (UMHOS)												
0.-1.5 M DEPTH	3	34.- 37.	37.	0.0- 0.0	5	45.- 56.	49.	0.0- 1.5	6	29.- 44.	38.	0.0- 1.5
MAX DEPTH**	3	38.- 43.	38.	4.3- 6.1	3	63.- 85.	74.	4.6- 5.2	3	31.- 42.	38.	3.0- 4.6
PH (STANDARD UNITS)												
0.-1.5 M DEPTH	3	6.4- 6.9	6.7	0.0- 0.0	6	7.3- 8.1	7.5	0.0- 1.5	6	6.1- 6.3	6.2	0.0- 1.5
MAX DEPTH**	3	6.1- 6.3	6.3	4.3- 6.1	3	6.6- 7.2	6.7	4.6- 5.2	3	6.0- 6.2	6.1	3.0- 4.6
TOTAL ALKALINITY (MG/L)												
0.-1.5 M DEPTH	3	10.- 14.	10.	0.0- 0.0	6	16.- 20.	19.	0.0- 1.5	6	17.- 20.	18.	0.0- 1.5
MAX DEPTH**	3	10.- 21.	11.	4.3- 6.1	3	22.- 27.	23.	4.6- 5.2	3	17.- 19.	18.	3.0- 4.6
TOTAL P (MG/L)												
0.-1.5 M DEPTH	3	0.023-0.033	0.025	0.0- 0.0	6	0.021-0.039	0.031	0.0- 1.5	6	0.031-0.037	0.035	0.0- 1.5
MAX DEPTH**	3	0.022-0.033	0.025	4.3- 6.1	3	0.026-0.037	0.027	4.6- 5.2	3	0.031-0.037	0.035	3.0- 4.6
DISSOLVED ORTHO P (MG/L)												
0.-1.5 M DEPTH	3	0.010-0.017	0.011	0.0- 0.0	6	0.002-0.011	0.004	0.0- 1.5	6	0.005-0.020	0.015	0.0- 1.5
MAX DEPTH**	3	0.007-0.014	0.007	4.3- 6.1	3	0.003-0.007	0.003	4.6- 5.2	3	0.006-0.016	0.012	3.0- 4.6
NO2+NO3 (MG/L)												
0.-1.5 M DEPTH	3	0.100-0.130	0.100	0.0- 0.0	6	0.020-0.100	0.030	0.0- 1.5	6	0.060-0.060	0.060	0.0- 1.5
MAX DEPTH**	3	0.090-0.110	0.090	4.3- 6.1	3	0.020-0.030	0.030	4.6- 5.2	3	0.060-0.070	0.060	3.0- 4.6
AMMONIA (MG/L)												
0.-1.5 M DEPTH	3	0.050-0.060	0.050	0.0- 0.0	6	0.040-0.100	0.040	0.0- 1.5	6	0.100-0.120	0.110	0.0- 1.5
MAX DEPTH**	3	0.050-0.170	0.060	4.3- 6.1	3	0.040-0.050	0.040	4.6- 5.2	3	0.090-0.110	0.110	3.0- 4.6
KJELDAHL N (MG/L)												
0.-1.5 M DEPTH	3	0.500-0.500	0.500	0.0- 0.0	6	0.500-1.200	0.650	0.0- 1.5	6	0.400-0.800	0.600	0.0- 1.5
MAX DEPTH**	3	0.400-0.500	0.400	4.3- 6.1	3	0.500-0.600	0.600	4.6- 5.2	3	0.500-0.500	0.500	3.0- 4.6
SECCHI DISC (METERS)												
	3	0.1- 1.7	1.5		3	1.0- 1.4	1.1		3	0.6- 1.1	1.0	

* N = NO. OF SAMPLES
** MAXIMUM DEPTH SAMPLED AT EACH SITE
*** S = NO. OF SITES SAMPLED ON THIS DATE

B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
03/22/74	1. Merismopedia	2,990
	2. Melosira	2,036
	3. Schizochlamys	867
	4. Cyclotella	737
	5. Flagellates	693
	Other genera	2,599
	Total	9,922
05/30/74	1. Lunate celled colony	979
	2. Flagellates	287
	3. Kirchneriella	276
	4. Nitzschia	270
	5. Chlamydomonas	260
	Other genera	2,224
	Total	4,296
11/12/74	1. Cyclotella	1,685
	2. Melosira	956
	3. Merismopedia	697
	4. Cryptomonas	494
	5. Kirchneriella	387
	Other genera	936
	Total	5,155

2. Chlorophyll *a* -

Sampling Date	Station Number	Chlorophyll *a* (µg/l)
03/22/74	01	5.7
	02	9.3
	03	7.5
05/30/74	01	42.5
	02	30.5
	03	63.8
11/12/74	01	9.9
	02	12.5
	03	11.5

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

a. 03/22/74

Spike(mg/l)	Ortho P Conc.(mg/l)	Inorganic N Conc.(mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.010	0.133	0.2
0.05 P	0.060	0.133	5.2
0.05 P + 1.0 N	0.060	1.133	19.6
1.00 N	0.010	1.133	0.2

b. 11/21/74

Spike(mg/l)	Ortho P Conc.(mg/l)	Inorganic N Conc.(mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.009	0.154	0.8
0.05 P	0.059	0.154	5.4
0.05 P + 1.0 N	0.059	1.154	16.1
1.00 N	0.009	1.154	0.7

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential for primary productivity was low in Indian Creek Reservoir during the spring sampling season and moderate during the fall. The lake was phosphorus limited at those times, as indicated by increased yields of the test alga in response to additions of orthophosphorus. Spikes with phosphorus and nitrogen simultaneously resulted in maximum yields. In both assays, spikes with nitrogen alone did not produce any responses beyond the control yields.

The N/P in the spring and summer lake data was 17/1 indicating phosphorus limitation. The ratio for the fall data was 13/1 suggesting that nitrogen and phosphorus were colimiting.

It should be noted that significant chemical changes took place in Louisiana lake samples between collection and assay analysis. The assay data should be considered in this context and until such differences are resolved, used with caution for any prediction of actual lake conditions. Such chemical changes are likely to alter the control yield as well as modifying the N/P ratio.

IV. NUTRIENT LOADINGS
(See Appendix D for data)

For the determination of nutrient loadings, the Louisiana National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of March and April (also February for Station 2213A1) when two samples were collected. Sampling was begun in June 1974, and was completed in May 1975.

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

In this report, nutrient loads for sampled tributaries were determined by using a modification of the USGS computer program for calculating stream loadings. Nutrient loads indicated for tributaries are those measured minus known point source loads, if any.

Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of USGS) were estimated by using the mean annual nutrient loads, in $kg/km^2/yr$ in Indian Creek A-1 and multiplying the means by the ZZ area in km^2.

A. Waste Sources:

1. Known municipal - None

2. Known industrial - None

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/yr	% of total
a. Tributaries (nonpoint load) -		
A-2 Indian Creek	120	21.6
b. Minor tributaries and immediate drainage (nonpoint load) -	275	49.6
c. Known municipal STP's - None		
d. Septic tanks* -	<5	<0.1
e. Known industrial - None		
f. Direct precipitation** -	160	28.8
Total	555	100.0%

2. Outputs - A-1 Indian Creek 1,085

3. Net Annual P export*** - 530

*Estimate based on 1 lakeside camp.
**Estimated (See NES Working Paper No. 175).
***Export probably due to unknown sources and/or sampling error.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (nonpoint load) -		
A-2 Indian Creek	2,660	14.2
b. Minor tributaries and immediate drainage (nonpoint load) -	6,190	33.0
c. Known municipal STP's - none		
d. Septic tanks* -	70	0.4
e. Known industrial - none		
f. Direct precipitation*** -	9,835	52.4
Total	18,755	100.0
2. Outputs - A-1 Indian Creek	18,030	
3. Net Annual N Accumulation	725	

D. Mean Annual Nonpoint Nutrient Export by Subdrainage Area:

Tributary	kg P/km^2/yr	kg N/km^2/yr
Indian Creek	8	180

*Estimate based on 1 lakeside camp.
**Estimated (See NES Working Paper No. 175).

F. Yearly Loadings:

In the following table, the existing phosphorus annual loading is compared to the relationship proposed by Vollenweider (1975). Essentially, his "eutrophic" loading is that at which the receiving waters would become eutrophic or remain eutrophic; his "oligotrophic" loading is that which would result in the receiving water remaing oligotrophic or becoming oligotrophic if morphometry permitted. A "mesotrophic" loading would be considered one between "eutrophic" and "oligotrophic".

Note that Vollenweider's model may not apply to lakes with short hydraulic retention times or in which light penetration is severely restricted by high concentrations of suspended solids in the surface waters.

	Total Yearly Phosphorus Loading ($g/m^2/yr$)
Estimated loading for Indian Creek Reservoir	0.06
Vollenweider's "eutrophic" loading	0.33
Vollenweider's "oligotrophic" loading	0.16

V. LITERATURE REVIEWED

U.S. Environmental Protection Agency. 1975. National Eutrophication Survey Methods 1973-1976. Working Paper No. 175. National Environmental Research Center, Las Vegas, Nevada, and Pacific Northwest Environmental Research Laboratory, Corvallis, Oregon.

Vollenweider, R. A. 1975. Input-Output Models With Special Reference to the Phosphorus Loading Concept in Limnology. Schweiz. Z. Hydrol. 37:53-84.

VI. APPENDICES

APPENDIX A

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-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 B

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR LOUISIANA 04/11/77

LAKE CODE 2213 INDIAN CREEK RES.

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 58.3

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
2213A1	58.3	1.05	1.05	1.10	0.99	0.71	0.62	0.51	0.48	0.59	0.54	0.82	1.22	0.81
2213A2	14.8	0.27	0.27	0.28	0.25	0.18	0.16	0.13	0.12	0.15	0.14	0.21	0.31	0.21
2213ZZ	43.5	0.79	0.79	0.82	0.74	0.54	0.45	0.37	0.37	0.45	0.40	0.62	0.91	0.60

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 58.3
SUM OF SUB-DRAINAGE AREAS = 58.4
TOTAL FLOW IN = 9.72
TOTAL FLOW OUT = 9.68

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2213A1	6	74	0.680	8	0.566				
	7	74	0.538	6	0.566				
	8	74	0.510	10	0.453				
	9	74	0.510	7	0.425				
	10	74	0.425	3	0.425				
	11	74	0.850	9	0.425				
	12	74	1.359	8	0.0				
	1	75	1.019	11	0.0				
	2	75	0.680	8	0.0	28	0.0		
	3	75	1.019	8	0.340	22	0.736		
	4	75	0.934	4	0.425	19	0.538		
	5	75	2.718	3	8.297				
2213A2	6	74	0.176	8	0.144				
	7	74	0.142	6	0.142				
	8	74	0.130	10	0.116				
	9	74	0.133	7	0.110				
	10	74	0.110	3	0.110				
	11	74	0.212	9	0.119				
	12	74	0.340	8	0.113				
	1	75	0.255	11	0.680				
	2	75	0.170	8	0.144	28	0.133		
	3	75	0.255	8	0.147	22	0.184		
	4	75	0.227	4	0.139	19	0.139		
	5	75	0.680	3	2.124				

APPENDIX C

PHYSICAL AND CHEMICAL DATA

STORET RETRIEVAL DATE 75/12/11
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

221301
31 16 45.0 092 45 45.0
INDIAN CREEK
22 LOUISIANA

11EPALES 2111202
4 0021 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
74/03/22	14 20	0000	19.1		5	34	6.90	10K	0.060	0.500	0.130	0.017
	14 20	0006	18.9	6.6		37	6.45	10K	0.070	0.400	0.100	0.010
	14 20	0015	18.9	6.8		38	6.35	10K	0.060	0.400	0.090	0.007
74/05/30	09 30	0000	28.1		45	49	7.30	16	0.100	1.200	0.100	0.011
	09 30	0005	27.9	6.4			7.50	17	0.040	0.600	0.040	0.004
	09 30	0015	23.8	0.4		74	6.70	23	0.040	0.500	0.030	0.003
74/11/12	12 00	0000	17.5	6.6	39	29	6.26	18	0.120	0.600	0.060	0.005
	12 00	0005	17.7	6.6		36	6.24	18	0.110	0.500	0.060	0.014
	12 00	0015	17.2	6.2		31	6.20	19	0.110	0.500	0.060	0.016

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/03/22	14 20	0000	0.033	5.7	
	14 20	0006	0.023		
	14 20	0015	0.023		
74/05/30	09 30	0000	0.039	42.5	
	09 30	0005	0.032		
	09 30	0015	0.027		
74/11/12	12 00	0000	0.031	9.9	
	12 00	0005	0.032		
	12 00	0015	0.031		

___K VALUE KNOWN TO BE LESS THAN INDICATED ___

STORET RETRIEVAL DATE 75/12/11
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

221302
31 16 45.0 092 45 45.0
INDIAN CREEK
22 LOUISIANA

11EPALES 2111202
4 0019 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
74/03/22	14 30	0000	20.2		66	37	6.45	10K	0.050	0.500	0.100	0.011
	14 30	0006	19.3	8.0		35	6.50	10K	0.050	0.400	0.100	0.010
	14 30	0014	18.6	7.0		38	6.25	11	0.060	0.400	0.090	0.007
74/05/30	09 45	0000	27.7		39	47	7.60	18	0.040	0.700	0.030	0.003
	09 45	0005	27.7	6.2		53	7.90	19	0.040	0.500	0.030	0.002
	09 45	0015	24.8	0.2		63	6.60	27	0.050	0.600	0.030	0.007
74/11/12	12 20	0000	18.4	7.2	42	39	6.08	17	0.100	0.800	0.060	0.020
	12 20	0005	18.5	7.0		36	6.20	17	0.100	0.600	0.060	0.016
	12 20	0011	18.4	7.2		38	6.08	17	0.090	0.500	0.060	0.006

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/03/22	14 30	0000	0.025	9.3	
	14 30	0006	0.023		
	14 30	0014	0.022		
74/05/30	09 45	0000	0.021	30.5	
	09 45	0005	0.021		
	09 45	0015	0.037		
74/11/12	12 20	0000	0.035	12.5	
	12 20	0005	0.036		
	12 20	0011	0.037		

__K VALUE KNOWN TO BE LESS THAN INDICATED __

STORE. RETR.EVAL DATE 75/12/11
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

221303
31 16 45.0 092 45 45.0
INDIAN CREEK
22 LOUISIANA

11EPALES
4

2111202
0025 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
74/03/22	14 40	0000	19.9		60	37	6.70	14	0.050	0.500	0.100	0.010
	14 40	0006	19.0	7.2		39	6.40	17	0.060	0.400	0.100	0.007
	14 40	0020	17.4	2.0		43	6.10	21	0.170	0.500	0.110	0.014
74/05/30	10 00	0000	28.3		54	45	8.10	20	0.040	0.700	0.020	0.005
	10 00	0005	28.3	7.0		56	7.50	20	0.040	0.600	0.030	0.004
	10 00	0017	23.4	1.4		85	7.20	22	0.040	0.600	0.020	0.003
74/11/12	12 45	0000	18.7	6.8	25	43	6.31	20	0.110	0.700	0.060	0.015
	12 45	0005	19.1	6.8		44	6.10	19	0.110	0.400	0.060	0.015
	12 45	0010	18.9	6.8		42	6.01	18	0.110	0.500	0.070	0.012

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/03/22	14 40	0000	0.023	7.5	
	14 40	0006	0.020		
	14 40	0020	0.033		
74/05/30	10 00	0000	0.033	63.8	
	10 00	0005	0.030		
	10 00	0017	0.026		
74/11/12	12 45	0000	0.037	11.5	
	12 45	0005	0.036		
	12 45	0010	0.035		

APPENDIX D

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 77/04/11

2213A1
31 07 25.0 092 27 30.0 4
INDIAN CREEK
22 15 LECOMPTE
O/INDIAN CREEK RESERVOIR 101691
SPILLWAY OF DAM .75 MI SE OF FOREST HOUS
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

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
74/06/08	14	00	0.012	0.700	0.010	0.015	0.080
74/07/06	08	40	0.044	0.600	0.025	0.005K	0.045
74/08/10	09	53	0.012	0.500	0.010	0.015	0.035
74/09/07	12	25	0.040	0.700	0.030	0.005K	0.020
74/10/03	17	00	0.064	0.400	0.097	0.005K	0.015
74/11/09	10	35	0.056	0.600	0.055	0.010	0.040
75/03/08	11	45	0.112	1.200	0.024	0.016	0.080
75/03/22	13	15	0.122	0.650	0.014	0.009	0.020
75/04/04	10	30	0.005	0.450	0.005K	0.005	0.020
75/04/19	11	05	0.015	0.800	0.025	0.010	0.100
75/05/03	12	45	0.020	0.575	0.035	0.005K	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 77/04/11

2213A2
31 05 55.0 092 30 45.0 4
INDIAN CREEK
22 15 FOREST HILL
T/INDIAN CREEK RESERVOIR 101993
BRDG ON US RT 165 1.5 M NE JCT HWY 112
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

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
74/06/08	14	35	0.040	0.200	0.020	0.010	0.015
74/07/06	10	10	0.052	0.200	0.040	0.015	0.020
74/08/10	10	20	0.044	0.350	0.045	0.005	0.027
74/09/07	13	30	0.140	0.400	0.200	0.010	0.020
74/10/03	17	30	0.056	0.400	0.095	0.005	0.010
74/11/09	11	10	0.048	0.200	0.020	0.015	0.030
74/12/08	14	00	0.048	0.900	0.020	0.005	0.020
75/01/11	11	45	0.032	0.700	0.048	0.015	0.030
75/02/08	10	40	0.040	0.100	0.024	0.008	0.010K
75/02/28	17	35	0.024	0.400	0.032	0.008K	0.010
75/03/08	12	40	0.024	0.300	0.008	0.008K	0.020
75/03/22	11	00	0.033	0.300	0.015	0.005	0.010
75/04/04	11	30	0.005	0.100	0.005K	0.005	0.020
75/04/19	09	30	0.040	0.150	0.025	0.005K	0.010
75/05/03	13	30	0.105	0.700	0.105	0.010	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

APPENDIX E

PARAMETRIC RANKINGS OF LAKES SAMPLED BY NES IN 1974

STATE OF LOUISIANA

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
2201	ANACOCO LAKE	0.031	0.080	455.833	8.700	10.400	0.007
2202	BRUIN LAKE	0.057	0.250	450.333	16.350	15.000	0.012
2203	LAKE BISTINEAU	0.061	0.100	458.000	12.933	13.200	0.018
2204	BLACK BAYOU	0.046	0.090	453.417	17.818	12.200	0.009
2205	BUNDICK LAKE	0.157	0.135	469.667	20.467	10.600	0.073
2207	COCODRIE LAKE	0.090	0.400	479.000	35.300	7.700	0.026
2208	COTILE LAKE	0.037	0.100	442.333	12.650	14.000	0.011
2209	CONCORDIA LAKE	0.076	0.080	468.333	32.950	14.800	0.009
2210	CROSS LAKE	0.057	0.080	475.250	38.385	11.400	0.010
2211	D'ARBONNE LAKE	0.038	0.100	458.250	6.800	13.200	0.011
2212	FALSE RIVER LAKE	0.082	0.130	442.500	24.550	14.900	0.023
2213	INDIAN CREEK	0.031	0.150	458.333	21.467	14.800	0.010
2214	SALINE LAKE	0.111	0.350	493.000	15.333	9.600	0.025
2215	TURKEY CREEK LAKE	0.176	0.170	477.833	21.967	14.600	0.033
2216	LAKE VERRET	0.163	0.100	481.428	62.028	12.000	0.056
2217	LAKE VERNON	0.018	0.120	436.667	4.900	14.400	0.007
2219	BLACK LAKE	0.077	0.150	454.000	12.733	11.600	0.015
2220	COCODRIE	0.106	0.050	478.333	33.433	11.800	0.014
4807	CADDO LAKE	0.049	0.070	463.562	20.125	10.000	0.008

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
2201	ANACOCO LAKE	92 (16)	83 (14)	67 (12)	89 (16)	83 (15)	94 (17)
2202	BRUIN LAKE	61 (11)	11 (2)	83 (15)	61 (11)	0 (0)	50 (9)
2203	LAKE BISTINEAU	50 (9)	58 (9)	61 (11)	72 (13)	42 (7)	33 (6)
2204	BLACK BAYOU	72 (13)	72 (13)	78 (14)	56 (10)	50 (9)	81 (14)
2205	BUNDICK LAKE	11 (2)	33 (6)	33 (6)	44 (8)	78 (14)	0 (0)
2207	COCODRIE LAKE	28 (5)	0 (0)	11 (2)	11 (2)	100 (18)	17 (3)
2208	COTILE LAKE	83 (15)	58 (9)	94 (17)	83 (15)	33 (6)	61 (11)
2209	CONCORDIA LAKE	44 (8)	83 (14)	39 (7)	22 (4)	14 (2)	81 (14)
2210	CROSS LAKE	56 (10)	83 (14)	28 (5)	6 (1)	72 (13)	69 (12)
2211	D'ARBONNE LAKE	78 (14)	58 (9)	56 (10)	94 (17)	42 (7)	56 (10)
2212	FALSE RIVER LAKE	33 (6)	39 (7)	89 (16)	28 (5)	6 (1)	28 (5)
2213	INDIAN CREEK	92 (16)	28 (5)	50 (9)	39 (7)	14 (2)	69 (12)
2214	SALINE LAKE	17 (3)	6 (1)	0 (0)	67 (12)	94 (17)	22 (4)
2215	TURKEY CREEK LAKE	0 (0)	17 (3)	22 (4)	33 (6)	22 (4)	11 (2)
2216	LAKE VERRET	6 (1)	58 (9)	6 (1)	0 (0)	56 (10)	6 (1)
2217	LAKE VERNON	100 (18)	44 (8)	100 (18)	100 (18)	28 (5)	100 (18)
2219	BLACK LAKE	39 (7)	22 (4)	72 (13)	78 (14)	67 (12)	39 (7)
2220	COCODRIE	22 (4)	100 (18)	17 (3)	17 (3)	61 (11)	44 (8)
4807	CADDO LAKE	67 (12)	94 (17)	44 (8)	50 (9)	89 (16)	89 (16)