

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY
WORKING PAPER SERIES



REPORT
ON
GANTT LAKE
COVINGTON COUNTY
ALABAMA
EPA REGION IV
WORKING PAPER No. 227

CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON
and
ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA

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ON
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EPA REGION IV
WORKING PAPER No. 227

WITH THE COOPERATION OF THE
ALABAMA WATER IMPROVEMENT COMMISSION
AND THE
ALABAMA NATIONAL GUARD
JULY 1976

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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.

ACKNOWLEDGEMENTS

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

E. John Williford, Chief, Surveillance and Monitoring Section; and John C. Chitwood, Biologist, Surveillance and Monitoring Section; and Sam L. Coleman, Water Quality Planning Section; and M. H. Floyd, Engineer, Surveillance and Monitoring Section; and Truman Green, Engineer, Municipal Waste Control Section; and Tim McCartha, Biologist, Surveillance and Monitoring Section; and James E. McIndoe, Engineer, Water Quality Planning Section; and Richard T. Maddox, Engineer, Industrial Waste Control Section; and James T. White, Engineer, Municipal Waste Control Section provided invaluable lake documentation and counsel during the course of the Survey.

Major General Charles A. Rollo, Adjutant General of Alabama, and Project Officer Lt. Col. Wash B. Ray, who directed the volunteer efforts of the Alabama National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF ALABAMALAKE NAMECOUNTY

Bankhead

Walker

Gantt

Covington

Guntersville

Marshall, Johnson

Holt Lock and Dam

Tuscaloosa

Lay

Chilton, Coosa

Martin

Elmore, Tallapoosa

Mitchell

Coosa, Chilton

Pickwick

Colbert, Lauderdale
(Tishomingo in MS
and Hardin in TN)

Purdy

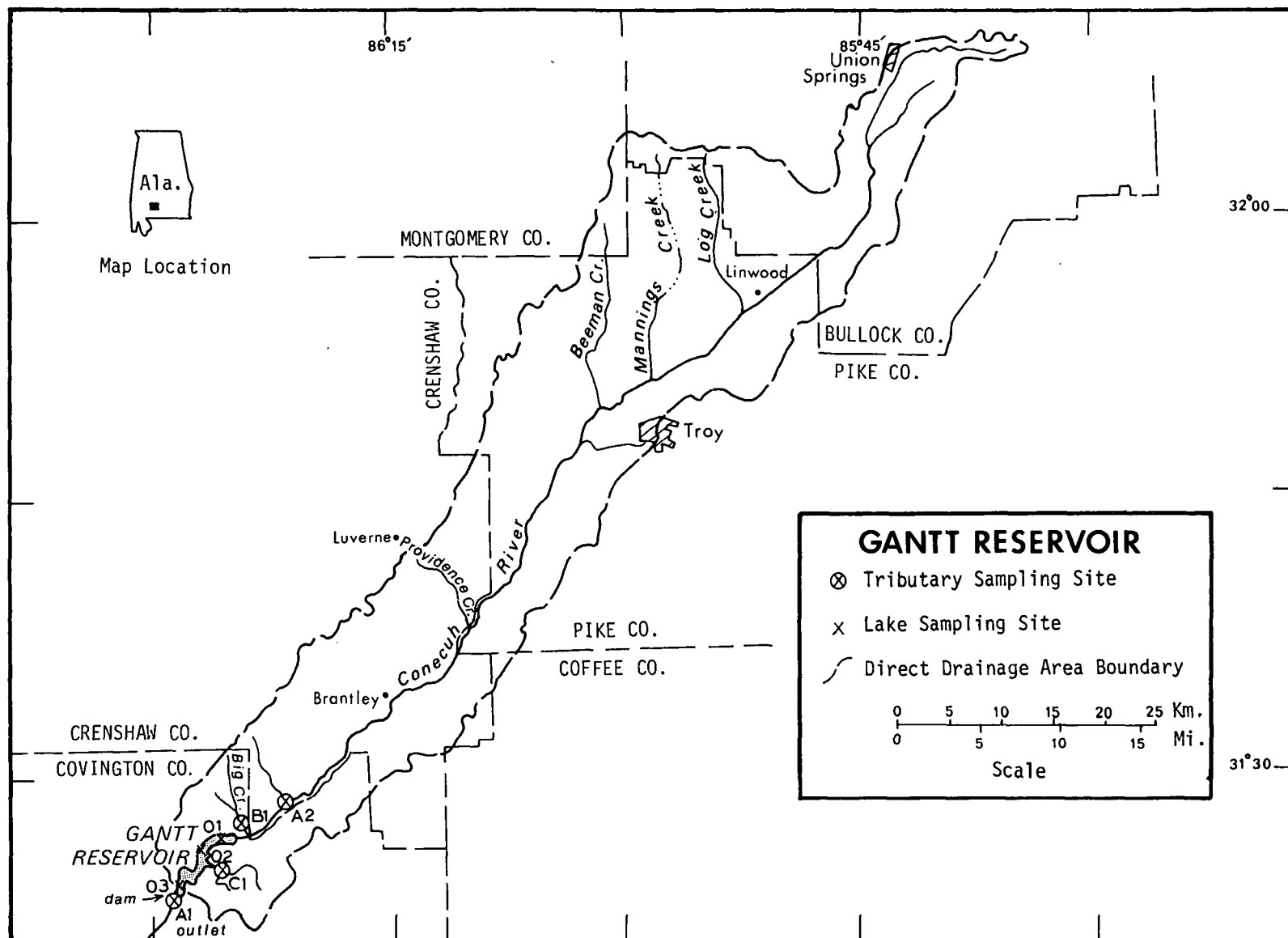
Jefferson, Shelby

Weiss

Cherokee

Wilson

Lauderdale, Colbert,
Lawrence



GANTT RESERVOIR, ALABAMA

STORET NO. 0103

I. CONCLUSIONS

A. Trophic Condition:*

Survey data indicate Gantt Reservoir is mesotrophic-eutrophic. The lake is characterized by low Secchi disc transparency and chlorophyll a values, and low potential for primary productivity as measured by algal assay control yields. Oxygen depression occurred below 4.6 m during August sampling of the lake.

Nutrient concentrations in the reservoir were moderately low, with total phosphorus not exceeding 0.054 mg/liter and inorganic nitrogen not exceeding 0.410 mg/liter in any of the samples. The increase in total phosphorus values during June sampling is probably a result of spring flooding, which would increase the levels of inorganic phosphorus in the water.

B. Rate-Limiting Nutrient:

Algal assay results indicate Gantt Reservoir was initially limited by phosphorus at the time of sample collection, but became nitrogen limited at higher phosphorus concentrations. Additions of nitrogen alone did not

*See Appendix E.

stimulate a growth response. The ratios of available inorganic nitrogen to orthophosphorus (N/P) in sampled waters (51/1, 33/1, and 22/1 for spring, summer, and fall sampling, respectively) were generally consistent with phosphorus limitation.

C. Nutrient Controllability:

1. Point sources -

There were no known point sources impacting Gantt Reservoir during the sampling year. The present loading rate of 2.68 g P/m²/yr is about twice that proposed by Vollenweider (1975) as a eutrophic rate. However, loading calculations based upon available nutrient concentrations and flow data yield a net export of both nitrogen and phosphorus from the reservoir, suggesting sampling was not adequate to depict actual loading and export rates. The A(2) inlet sampling site was approximately 8.0 km north of the actual lake inlet. Nutrient loading from the watershed surrounding that reach of Conecuh River has been omitted from lake loading calculations. The export could also be attributed to undetected discharges reaching the lake from unknown industrial or municipal sources.

Point sources from the cities of Union Springs and Troy are known to impact the Conecuh River upstream from Gantt Reservoir. These sources are not included in this report in the Gantt Reservoir nutrient budget due to their distance from the lake. However, it is expected that the high background loading (page 14) for the Conecuh River is due in part to unmeasured contributions from these sources.

2. Nonpoint sources -

The mean annual phosphorus loads from the three gaged tributaries amounted to 97.2% of the total load reaching the lake. The estimated phosphorus load from the ungaged drainage areas amounted to 2.1% of the total load. Additional sampling and an evaluation of current land use and lakeshore construction are required before a nutrient budget for the lake can be determined.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

Lake and drainage basin characteristics are itemized below.

Lake surface area and mean depth were provided by the Alabama Water Improvement Commission; maximum depth was estimated on the basis of National Eutrophication Survey (NES) sampling data; tributary flow data were provided by the Alabama 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 mean flow of the outlet. Precipitation values were 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: 11.20 km².
2. Mean depth: 1.4 meters.
3. Maximum depth: 10.7 meters.
4. Volume: 15.630 x 10⁶ m³.
5. Mean hydraulic retention time: 7 days.

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

1. Tributaries -

<u>Name</u>	<u>Drainage area(km²)</u>	<u>Mean flow (m³/sec)</u>
A(2) Conecuh River	1,489.2	21.52
B(1) Big Creek	25.9	0.19
C(1) Feagin Creek	45.3	0.49
Minor tributaries and immediate drainage -	<u>104.1</u>	<u>2.01</u>
Totals	1,664.5	24.21

2. Outlet - A(1) Conecuh River 1,675.7 27.56

C. Precipitation:

1. Year of sampling: 179.2 cm.
2. Mean annual: 146.4 cm.

III. LAKE WATER QUALITY SUMMARY

Gantt Reservoir was sampled three times during the open-water season of 1973 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 visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Maximum depths sampled were 3.4 m at Station 1, 4.6 m at Station 2, and 8.8 m at Station 3. 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.

GANTT RESERVOIR
STORET CODE 0103

PHYSICAL AND CHEMICAL CHARACTERISTICS

PARAMETER	(6/19/73)					(8/30/73)					(11/ 3/73)				
	N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)		N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)		N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	
TEMPERATURE (DEG CENT)															
0.-1.5 M DEPTH	4	25.6- 28.8	27.7	0.0- 1.2		5	29.2- 31.1	30.2	0.0- 1.5		6	16.8- 21.4	18.9	0.0- 1.5	
MAX DEPTH**	3	25.2- 25.8	25.6	1.2- 8.8		3	27.5- 28.3	28.2	1.8- 7.6		3	15.9- 19.0	17.9	3.0- 7.6	
DISSOLVED OXYGEN (MG/L)															
0.-1.5 M DEPTH	1	5.4- 5.4	5.4	1.2- 1.2		3	5.0- 6.0	5.4	0.0- 1.5		3	8.0- 8.6	8.2	1.5- 1.5	
MAX DEPTH**	3	3.2- 5.4	5.0	1.2- 8.8		3	1.0- 6.6	2.6	1.8- 7.6		3	8.4- 9.0	8.6	3.0- 7.6	
CONDUCTIVITY (UMHOS)															
0.-1.5 M DEPTH	4	45.- 47.	46.	0.0- 1.2		5	60.- 70.	63.	0.0- 1.5		6	64.- 87.	68.	0.0- 1.5	
MAX DEPTH**	3	40.- 48.	47.	1.2- 8.8		3	68.- 73.	70.	1.8- 7.6		3	64.- 87.	69.	3.0- 7.6	
PH (STANDARD UNITS)															
0.-1.5 M DEPTH	4	6.8- 6.9	6.8	0.0- 1.2		5	7.3- 8.0	7.6	0.0- 1.5		6	7.3- 7.8	7.5	0.0- 1.5	
MAX DEPTH**	3	6.7- 6.8	6.8	1.2- 8.8		3	7.1- 7.8	7.4	1.8- 7.6		3	7.3- 7.7	7.5	3.0- 7.6	
TOTAL ALKALINITY (MG/L)															
0.-1.5 M DEPTH	4	19.- 33.	20.	0.0- 1.2		5	17.- 24.	20.	0.0- 1.5		6	22.- 34.	26.	0.0- 1.5	
MAX DEPTH**	3	17.- 20.	20.	1.2- 8.8		3	18.- 25.	23.	1.8- 7.6		3	23.- 37.	28.	3.0- 7.6	
TOTAL P (MG/L)															
0.-1.5 M DEPTH	4	0.045-0.052	0.047	0.0- 1.2		5	0.022-0.027	0.023	0.0- 1.5		6	0.016-0.032	0.020	0.0- 1.5	
MAX DEPTH**	3	0.049-0.054	0.049	1.2- 8.8		3	0.025-0.029	0.027	1.8- 7.6		3	0.019-0.037	0.029	3.0- 7.6	
DISSOLVED ORTHO P (MG/L)															
0.-1.5 M DEPTH	4	0.005-0.012	0.008	0.0- 1.2		5	0.007-0.010	0.009	0.0- 1.5		6	0.007-0.014	0.008	0.0- 1.5	
MAX DEPTH**	3	0.005-0.006	0.006	1.2- 8.8		3	0.006-0.013	0.008	1.8- 7.6		3	0.008-0.010	0.009	3.0- 7.6	
NO2+NO3 (MG/L)															
0.-1.5 M DEPTH	4	0.180-0.200	0.195	0.0- 1.2		5	0.110-0.180	0.130	0.0- 1.5		6	0.120-0.250	0.150	0.0- 1.5	
MAX DEPTH**	3	0.200-0.200	0.200	1.2- 8.8		3	0.090-0.160	0.130	1.8- 7.6		3	0.130-0.280	0.140	3.0- 7.6	
AMMONIA (MG/L)															
0.-1.5 M DEPTH	4	0.140-0.190	0.160	0.0- 1.2		5	0.120-0.180	0.130	0.0- 1.5		6	0.040-0.070	0.050	0.0- 1.5	
MAX DEPTH**	3	0.140-0.210	0.170	1.2- 8.8		3	0.100-0.300	0.200	1.8- 7.6		3	0.040-0.060	0.050	3.0- 7.6	
KJELDAHL N (MG/L)															
0.-1.5 M DEPTH	4	0.400-0.600	0.550	0.0- 1.2		5	0.400-0.700	0.500	0.0- 1.5		6	0.200-1.000	0.300	0.0- 1.5	
MAX DEPTH**	3	0.400-0.400	0.400	1.2- 8.8		3	0.300-0.600	0.400	1.8- 7.6		3	0.200-0.200	0.200	3.0- 7.6	
SECCHI DISC (METERS)															
	3	0.5- 0.6	0.5			3	0.8- 1.0	0.9			3	0.9- 1.5	1.2		

* N = NO. OF SAMPLES

** MAXIMUM DEPTH SAMPLED AT EACH SITE

*** S = NO. OF SITES SAMPLED ON THIS DATE

B. Biological Characteristics:

1. Phytoplankton -

<u>Sampling Date</u>	<u>Dominant Genera</u>	<u>Algal Units per ml</u>
06/19/73	1. Flagellates	170
	2. Dinoflagellates	58
	3. Melosira	25
	4. Pennate diatom	25
	5. Oscillatoria	17
	Other genera	<u>104</u>
	Total	399
08/30/73	1. Flagellates	56
	2. Lyngbya	41
	3. Oscillatoria	32
	4. Dactylococcopsis	24
	5. Nitzschia	16
	Other genera	<u>67</u>
	Total	236
11/03/73	1. Flagellates	350
	2. Dactylococcopsis	110
	3. Centric diatom	46
	4. Nitzschia	46
	5. Oscillatoria	37
	Other genera	<u>92</u>
	Total	681

2. Chlorophyll a -

<u>Sampling Date</u>	<u>Station Number</u>	<u>Chlorophyll a ($\mu\text{g/liter}$)</u>
06/19/73	1	2.7
	2	2.4
	3	2.1
08/30/73	1	3.0
	2	1.7
	3	4.0
11/03/73	1	0.9
	2	1.1
	3	1.4

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

<u>Spike(mg/l)</u>	<u>Ortho P Conc.(mg/l)</u>	<u>Inorganic N Conc.(mg/l)</u>	<u>Maximum Yield (mg/l-dry wt.)</u>
Control	0.008	0.104	0.1
0.010 P	0.018	0.104	1.4
0.020 P	0.028	0.104	2.6
0.050 P	0.058	0.104	2.5
0.025 P + 0.5 N	0.033	0.604	10.2
0.050 P + 1.0 N	0.058	1.104	20.8
1.0 N	0.008	1.104	0.1

2. Filtered and nutrient spiked -

<u>Spike(mg/l)</u>	<u>Ortho P Conc.(mg/l)</u>	<u>Inorganic N Conc.(mg/l)</u>	<u>Maximum Yield (mg/l-dry wt.)</u>
Control	0.005	0.124	0.1
0.010 P	0.015	0.124	2.0
0.020 P	0.025	0.124	3.1
0.050 P	0.055	0.124	3.3
0.025 P + 0.5 N	0.030	0.624	11.3
0.050 P + 1.0 N	0.055	1.124	21.6
1.0 N	0.005	1.124	0.1

3. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential for primary production in Gantt Reservoir was low at the time of sample analysis. An increase in yield with increased levels of orthophosphate (to about 0.028 mg/l) as well as a lack of response when only nitrogen was added indicates phosphorus limitation. Maximum growth response was achieved with the simultaneous addition of both phosphorus and nitrogen.

The N/P ratios in the field were greater than 22/1 on all three sampling occasions, further indicating primary limitation by phosphorus in Gantt Reservoir (an N/P ratio of 14/1 or greater generally reflects phosphorus limitation).

IV. NUTRIENT LOADINGS

(See Appendix D for data)

For the determination of nutrient loadings, the Alabama National Guard collected monthly near-surface grab samples from each of the tributary sites indicated (see map), except for the high runoff months of January and February when two samples were collected. 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 Alabama District Office of USGS for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a 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 $\text{kg}/\text{km}^2/\text{yr}$, for Big Creek and Feagin Creek at Stations B(1) and C(1), respectively, and multiplying the means by the ZZ drainage area in km^2 .

A. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

<u>Source</u>	<u>kg P/yr</u>	<u>% of total</u>
a. Tributaries (nonpoint load) -		
A(2) Conecuh River	28,625	95.5
B(1) Big Creek	105	0.3
C(1) Feagin Creek	405	1.4
b. Minor tributaries and immediate drainage (nonpoint load) -	625	2.1
c. Known municipal STP's - None		
d. Septic tanks* -	20	0.1
e. Known industrial - None		
f. Direct precipitation** -	<u>195</u>	<u>0.6</u>
Totals	29,975	100.0

2. Outputs - A(1) Conecuh River 32,250

3. Net annual P export*** 2,275

*Estimate based on 70 lakeshore residences.

**Estimated (see NES Working Paper No. 175).

***Export probably due to unknown sources and/or sampling error.

B. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

<u>Source</u>	<u>kg N/yr</u>	<u>% of total</u>
a. Tributaries (nonpoint load) -		
A(2) Conecuh River	673,175	93.1
B(1) Big Creek	4,615	0.6
C(1) Feagin Creek	10,675	1.5
b. Minor tributaries and immediate drainage (nonpoint load) -	21,550	3.0
c. Known municipal STP's - None		
d. Septic tanks* -	745	0.1
e. Known industrial - None		
f. Direct precipitation** -	<u>12,090</u>	<u>1.7</u>
Totals	722,850	100.0
2. Outputs - A(1) Conecuh River	765,985	
3. Net annual N export*** -	43,135	

*Estimate based on 70 lakeshore residences.

**Estimated (see NES Working Paper No. 175).

***Export probably due to unknown sources and/or sampling error.

C. Mean Annual Nonpoint Nutrient Export by Subdrainage Area:

<u>Tributary</u>	<u>kg P/km²/yr</u>	<u>kg N/km²/yr</u>
Conecuh River	19	452
Big Creek	4	178
Feagin Creek	9	236

D. 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 remaining 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.

<u>Total Yearly Phosphorus Loading (g/m²/yr)</u>	
Estimated loading for Gantt Reservoir	2.68
Vollenweider's eutrophic loading	1.64
Vollenweider's oligotrophic loading	0.82

V. LITERATURE REVIEWED

- U.S. Environmental Protection Agency. 1975. National Eutrophication Survey Methods 1973-1976. National Eutrophication Survey 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 Final 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 ALABAMA

07/22/76

LAKE CODE 0103 GANTT RESERVOIR

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 1675.7

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS)													
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN	
0103A1	1675.7	38.79	39.36	60.88	49.84	23.50	14.16	18.12	22.37	12.88	9.49	18.69	23.22	27.55	
0103A2	1489.2	30.02	36.81	48.14	41.06	20.67	9.63	12.03	10.90	9.49	6.80	11.89	21.80	21.52	
0103B1	25.9	0.221	0.269	0.396	0.311	0.161	0.130	0.139	0.116	0.105	0.082	0.142	0.193	0.188	
0103C1	45.3	0.57	0.71	0.96	0.79	0.42	0.34	0.40	0.31	0.28	0.23	0.40	0.51	0.49	
0103Z2	115.3	2.32	2.75	3.62	3.00	1.81	1.53	1.64	1.39	1.30	1.05	1.67	2.10	2.01	

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 1675.7
SUM OF SUB-DRAINAGE AREAS = 1675.7

TOTAL FLOW IN = 291.61
TOTAL FLOW OUT = 331.31

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
0103A1	3	73	64.846	4	2.888				
	4	73	141.584	2	252.869				
	5	73	35.396	2	71.925				
	6	73	32.564	5	2.945				
	7	73	8.778	9	2.690				
	8	73	10.902	6	2.945				
	9	73	5.522	4	3.653				
	10	73	4.446	12	1.388				
	11	73	6.088	6	3.398				
	12	73	16.282	3	8.920				
	1	74	41.059	7	37.378	21	60.881		
	2	74	58.191	6	46.723	14	67.960		
0103A2	3	73	56.917	4	22.512				
	4	73	126.010	2	342.634				
	5	73	31.149	2	82.119				
	6	73	28.317	5	17.556				
	7	73	7.504	9	5.805				
	8	73	9.571	6	8.778				
	9	73	4.672	4	5.097				
	10	73	3.851	12	3.285				
	11	73	5.239	6	3.087				
	12	73	14.017	3	7.646				
	1	74	36.246	7	32.564	21	53.802		
	2	74	50.970	6	41.059	14	59.465		

TRIBUTARY FLOW INFORMATION FOR ALABAMA

07/22/76

LAKE CODE 0103 GANTT RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
0103B1	3	73	0.595	4	0.340				
	4	73	7.362	2	0.736				
	5	73	0.340	2	0.283				
	6	73	0.368	5	0.340				
	7	73	0.198	9	0.252				
	8	73	0.136	6	0.144				
	9	73	0.119	4	0.125				
	10	73	0.079	12	0.068				
	11	73	0.130	6	0.105				
	12	73	0.159	3	0.096				
	1	74	0.396	7	0.178	21	1.897		
	2	74	0.340	6	0.212	14	0.246		
0103C1	3	73	1.472	4	0.623				
	4	73	1.812	2	1.812				
	5	73	0.878	2	0.736				
	6	73	0.963	5	0.906				
	7	73	0.396	9	0.680				
	8	73	0.510	6	0.396				
	9	73	0.272	4	0.311				
	10	73	0.221	12	0.195				
	11	73	0.340	6	0.283				
	12	73	0.425	3	0.266				
	1	74	0.991	7	0.481	21	4.389		
	2	74	0.850	6	0.566	14	0.651		
0103Z2	3	73	5.182	4	3.398				
	4	73	6.286	2	6.088				
	5	73	3.370	2	2.888				
	6	73	3.568	5	3.341				
	7	73	1.926	9	2.605				
	8	73	1.586	6	1.671				
	9	73	1.416	4	1.416				
	10	73	1.019	12	0.906				
	11	73	1.529	6	1.274				
	12	73	1.812	3	1.189				
	1	74	3.681	7	1.954	21	13.734		
	2	74	3.256	6	2.265	14	2.549		

APPENDIX C
PHYSICAL AND CHEMICAL DATA

STORET RETRIEVAL DATE 76/07/22

010301
31 27 00.0 086 26 20.0 3
GANTT RESERVOIR
01039 ALABAMA

033392

11EPALES 2111202
0008 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 CAC03 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
73/06/19	15 15	0000	26.9		18	45	6.80	19	0.180	0.600	0.200	0.012
	15 15	0004	25.6	5.4		47	6.80	20	0.140	0.400	0.200	0.005
73/08/30	12 48	0000	29.2	6.0	30	70	8.00	24	0.120	0.700	0.180	0.007
	12 48	0006	28.2	6.6		70	7.80	25	0.100	0.300	0.160	0.013
73/11/03	12 00	0000	18.1		36	87	7.50	32	0.070	1.000	0.170	0.011
	12 00	0005	16.8	8.6		84	7.60	34	0.050	0.300	0.250	0.014
	12 00	0011	15.9	8.4		87	7.70	37	0.060	0.200	0.280	0.010

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/19	15 15	0000	0.052	2.7
	15 15	0004	0.049	
73/08/30	12 48	0000	0.022	3.0
	12 48	0006	0.027	
73/11/03	12 00	0000	0.030	0.9
	12 00	0005	0.032	
	12 00	0011	0.037	

STORET RETRIEVAL DATE 76/07/22

010302
31 26 15.0 086 28 45.0 3
GANTT RESERVOIR
01039 ALABAMA

033392

11EPALES 2111202
0018 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 CAC03 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
73/06/19	15 55	0000	28.5		18	46	6.90	19	0.190	0.500	0.190	0.006
	15 55	0006	27.0	5.4		46	6.90	19	0.140	0.300	0.180	0.006
	15 55	0014	25.8	5.0		40	6.80	17	0.170	0.400	0.200	0.006
73/08/30	13 10	0000	31.1		38	61	7.80	20	0.120	0.500	0.160	0.009
	13 10	0005	29.8	5.0		60	7.60	21	0.130	0.400	0.110	0.010
	13 10	0015	28.3	2.6		68	7.40	18	0.200	0.400	0.130	0.008
73/11/03	12 20	0000	19.6		48	68	7.70	25	0.050	0.500	0.230	0.009
	12 20	0005	18.4	8.0		66	7.80	26	0.050	0.300	0.130	0.008
	12 20	0010	17.9	8.6		69	7.50	28	0.040	0.200	0.140	0.009

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/19	15 55	0000	0.045	2.4
	15 55	0006	0.045	
	15 55	0014	0.054	
73/08/30	13 10	0000	0.026	1.7
	13 10	0005	0.023	
	13 10	0015	0.029	
73/11/03	12 20	0000	0.021	1.1
	12 20	0005	0.019	
	12 20	0010	0.029	

STORET RETRIEVAL DATE 76/07/22

010303
31 21 50.0 086 30 50.0 3
GANTT RESERVOIR
01039 ALABAMA

033391

11EPALES 2111202
0033 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 CONDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CAC03 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
73/06/19	16 15	0000	28.8		24	46	6.90	33	0.140	0.600	0.180	0.010
	16 15	0006	27.7	6.4		46	6.90	23	0.130	0.400	0.170	0.005
	16 15	0015	26.7	4.4		47	6.80	20	0.150	0.400	0.200	0.005
	16 15	0022	25.8	4.0		47	6.80	20	0.210	0.400	0.200	0.006
	16 15	0029	25.2	3.2		48	6.70	20	0.210	0.400	0.200	0.006
73/08/30	13 25	0000	31.0		36	63	7.40	18	0.180	0.600	0.130	0.009
	13 25	0005	30.2	5.4		63	7.30	17	0.160	0.400	0.130	0.008
	13 25	0015	28.2	1.4		64	7.20	18	0.200	0.400	0.110	0.008
	13 25	0025	27.5	1.0		73	7.10	23	0.300	0.600	0.090	0.006
73/11/03	12 40	0000	21.4		60	67	7.30	24	0.040	0.300	0.120	0.007
	12 40	0005	19.5	8.2		64	7.40	22	0.040	0.200	0.120	0.008
	12 40	0015	19.1	7.0		64	7.30	23	0.040	0.200	0.120	0.008
	12 40	0025	19.0	9.0		64	7.30	23	0.050	0.200	0.130	0.008

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/19	16 15	0000	0.045	2.1
	16 15	0006	0.044	
	16 15	0015	0.046	
	16 15	0022	0.049	
	16 15	0029	0.049	
73/08/30	13 25	0000	0.027	4.0
	13 25	0005	0.023	
	13 25	0015	0.026	
	13 25	0025	0.025	
73/11/03	12 40	0000	0.017	1.4
	12 40	0005	0.016	
	12 40	0015	0.019	
	12 40	0025	0.019	

APPENDIX D

TRIBUTARY DATA

STORET RETRIEVAL DATE 76/07/22

0103A1 LS0103A1
 31 24 00.0 086 29 00.0 4
 CONECUH RIVER
 01 MAP COVINGTON CO
 0/GANTT LAKE (RESVR) 033392
 US 29 BRDG SE EDGE OF VLG OF GANTT
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&N03 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
73/03/04	10 30		0.091	0.340	0.032	0.008	0.025
73/04/02	09 30		0.054	0.980	0.240	0.013	0.045
73/05/02	13 50		0.069	1.380	0.068	0.012	0.045
73/06/05	13 45		0.154	2.200	0.168	0.018	0.045
73/07/09	15 20		0.096	1.400	0.130	0.013	0.035
73/08/06	10 45		0.120	0.380	0.096	0.010	0.040
73/09/04	09 00		0.050	0.540	0.136	0.005K	0.030
73/10/12	09 15		0.067	0.400	0.054	0.005K	0.020
73/11/06	14 15		0.100	0.650	0.038	0.005K	0.025
73/12/03	10 00		0.152	0.400	0.036	0.005	0.020
74/01/07	09 30		0.116	0.700	0.040	0.012	0.045
74/01/21	15 30		0.192	0.200	0.056	0.008	0.035
74/02/06	10 00		0.080	0.400	0.045	0.015	0.040
74/02/14	10 30		0.108	0.400	0.030	0.015	0.055

K VALUE KNOWN TO BE
 LESS THAN INDICATED

STORET RETRIEVAL DATE 76/07/22

0103A2 LS0103A2
 31 29 30.0 086 21 30.0 4
 CONECUH RIVER
 01 MAP COVINGTON CO
 1/GANTT LAKE (RESVR) 033392
 CO HWY 77 BRDG .75 MI SE OF DOZIER
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

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
73/03/04	11 10		0.132	1.000	0.042	0.008	0.030
73/04/02	10 15		0.075	1.150	0.060	0.028	0.075
73/05/02	14 20		0.066		0.063	0.011	0.045
73/06/05	14 25		0.168	2.100	0.110	0.014	0.060
73/07/09	15 45		0.336	0.690	0.069	0.012	0.020
73/08/06	11 15		0.270	0.800	0.080	0.009	0.035
73/09/04	09 30		0.280	0.360	0.048	0.005K	0.020
73/10/12	09 45		0.250	0.270	0.037	0.008	0.030
73/11/06	15 00		0.264	0.550	0.054	0.008	0.020
73/12/03	10 40		0.116	0.400	0.024	0.012	0.012
74/01/07	10 00		0.088	1.400	0.036	0.012	0.050
74/01/21	15 45		0.140	0.500	0.048	0.012	0.080
74/02/06	10 50		0.080	0.400	0.040	0.015	0.040
74/02/14	11 20		0.048	0.500	0.030	0.015	0.060

K VALUE KNOWN TO BE
 LESS THAN INDICATED

STORET RETRIEVAL DATE 76/07/22

010381 LS010381
 31 28 00.0 086 24 30.0 4
 BIG CREEK
 01 MAP COVINGTON CO
 T/GANTT LAKE (RESVR) 033392
 US 29 BRDG 6.5 MI NE OF GANTT
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

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
73/03/04	10 50		0.160	1.500	0.110	0.005K	0.017
73/04/02	10 30		0.105	0.800	0.046	0.005K	0.010
73/05/02	14 40						0.020
73/06/05	14 40		0.130	1.470	0.110	0.005K	0.025
73/07/09	16 00		0.176	2.000	0.105	0.006	0.015
73/08/06	11 00		0.160	0.260	0.054	0.005K	0.020
73/09/04	09 10		0.115	0.350	0.048	0.009	0.025
73/10/12	09 30		0.132	0.320	0.054	0.005K	0.030
73/11/06	14 30		0.092	0.300	0.042	0.005K	
73/12/03	10 20		0.152	0.300	0.052	0.005K	0.015
74/01/07	09 50		0.156	0.500	0.032	0.005K	0.010
74/01/21	15 45		0.208	0.350	0.060	0.005K	0.035
74/02/06	10 20		0.216	0.100K	0.035	0.005	0.005
74/02/14	10 50		0.208	0.200	0.040	0.005K	0.010

K VALUE KNOWN TO BE
 LESS THAN INDICATED

STORET RETRIEVAL DATE 76/07/22

0103C1 LS0103C1
 31 25 00.0 086 26 30.0 4
 FEAGIN CREEK
 01 MAP COVINGTON CO
 T/GANTT LAKE (RESVR) 033392
 XING OF RD HEADIN NE OFF US29
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

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
73/03/04	11 45		0.168	0.660	0.043	0.005K	0.020
73/04/02	09 55		0.189	1.000	0.084	0.007	0.025
73/05/02	14 00		0.180	0.780	0.072	0.007	0.025
73/06/05	14 00		0.138	1.980	0.118	0.013	0.055
73/07/09	15 30		0.168	0.330	0.042	0.005K	0.022
73/08/06	11 30		0.120	0.320	0.036	0.012	0.020
73/09/04	09 50		0.092	0.300	0.044	0.005K	0.020
73/10/12	10 00		0.115	0.480	0.052	0.005K	0.025
73/11/06	15 45		0.067	0.250	0.024	0.005K	0.020
73/12/03	11 00		0.112	0.300	0.040	0.005K	0.015
74/01/07	10 30		0.200	0.300	0.044	0.005K	0.020
74/01/21	16 15		0.300	0.300	0.052	0.016	0.065
74/02/06	11 15		0.224	0.200	0.045	0.005	0.015
74/02/14	11 45		0.216	0.300	0.070	0.005	0.020

K VALUE KNOWN TO BE
 LESS THAN INDICATED

APPENDIX E

PARAMETRIC RANKINGS OF LAKES
SAMPLED BY NES IN 1974
STATE OF ALABAMA

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
0101	BANKHEAD LAKE	0.029	0.770	452.667	4.017	14.900	0.007
0103	GANTT RESERVOIR	0.029	0.300	465.778	2.144	14.000	0.008
0104	GUNTERSVILLE RESERVOIR	0.044	0.480	461.111	8.567	12.200	0.014
0105	HOLT LOCK AND DAM	0.018	0.835	449.417	2.183	13.600	0.006
0106	LAY LAKE	0.076	0.390	470.778	7.056	13.000	0.032
0107	MARTIN LAKE	0.017	0.170	435.250	6.407	15.000	0.004
0108	MITCHELL LAKE	0.053	0.290	466.000	6.211	12.400	0.022
0109	PICKWICK LAKE	0.056	0.535	455.000	2.450	11.900	0.035
0112	WEISS RESERVOIR	0.092	0.260	478.389	11.261	14.900	0.034
0114	WILSON LAKE	0.053	0.460	447.714	7.400	10.200	0.022
0115	LAKE PURDY	0.049	0.170	437.889	12.711	15.000	0.014

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 CHLOROPH	15- MIN DO	MEDIAN DISS ORTHO P	INDEX NO
0101	BANKHEAD LAKE	75 (7)	10 (1)	60 (6)	70 (7)	25 (2)	80 (8)	320
0103	GANTT RESERVOIR	75 (7)	60 (6)	30 (3)	100 (10)	40 (4)	70 (7)	375
0104	GUNTERSVILLE RESERVOIR	60 (6)	30 (3)	40 (4)	20 (2)	80 (8)	55 (5)	285
0105	HOLT LOCK AND DAM	90 (9)	0 (0)	70 (7)	90 (9)	50 (5)	90 (9)	390
0106	LAY LAKE	10 (1)	50 (5)	10 (1)	40 (4)	60 (6)	20 (2)	190
0107	MARTIN LAKE	100 (10)	95 (9)	100 (10)	50 (5)	5 (0)	100 (10)	450
0108	MITCHELL LAKE	40 (4)	70 (7)	20 (2)	60 (6)	70 (7)	35 (3)	295
0109	PICKWICK LAKE	20 (2)	20 (2)	50 (5)	80 (8)	90 (9)	0 (0)	260
0112	WEISS RESERVOIR	0 (0)	80 (8)	0 (0)	10 (1)	25 (2)	10 (1)	125
0114	WILSON LAKE	30 (3)	40 (4)	80 (8)	30 (3)	100 (10)	35 (3)	315
0115	LAKE PURDY	50 (5)	95 (9)	90 (9)	0 (0)	5 (0)	55 (5)	295

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	0107	MARTIN LAKE	450
2	0105	HOLT LOCK AND DAM	390
3	0103	GANTT RESERVOIR	375
4	0101	BANKHEAD LAKE	320
5	0114	WILSON LAKE	315
6	0115	LAKE PURDY	295
7	0108	MITCHELL LAKE	295
8	0104	GUNTERSVILLE RESERVOIR	285
9	0109	PICKWICK LAKE	260
10	0106	LAY LAKE	190
11	0112	WEISS RESERVOIR	125