

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

WORKING PAPER SERIES



REPORT

ON

GRAND LAKE O' THE CHEROKEES
OTTAWA, MAYES, DELAWARE, AND
CRAIG COUNTIES, OKLAHOMA
EPA REGION VI

WORKING PAPER No. 589

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

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WITH THE COOPERATION OF THE
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REPORT ON GRAND LAKE O' THE CHEROKEES
OTTAWA, MAYES, DELAWARE, AND CRAIG COUNTIES, OKLAHOMA
EPA REGION VI

by

National Eutrophication Survey

Water and Land Monitoring Branch
Monitoring Applications Laboratory
Environmental Monitoring & Support Laboratory
Las Vegas, Nevada

and

Eutrophication Survey Branch
Corvallis Environmental Research Laboratory
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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.

ACKNOWLEDGMENTS

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

Dr. Denver Talley, Director, Oklahoma Department of Pollution Control; the staff of the Oklahoma Water Resources Board; and the staff of the Oklahoma State Department of Health reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper Series.

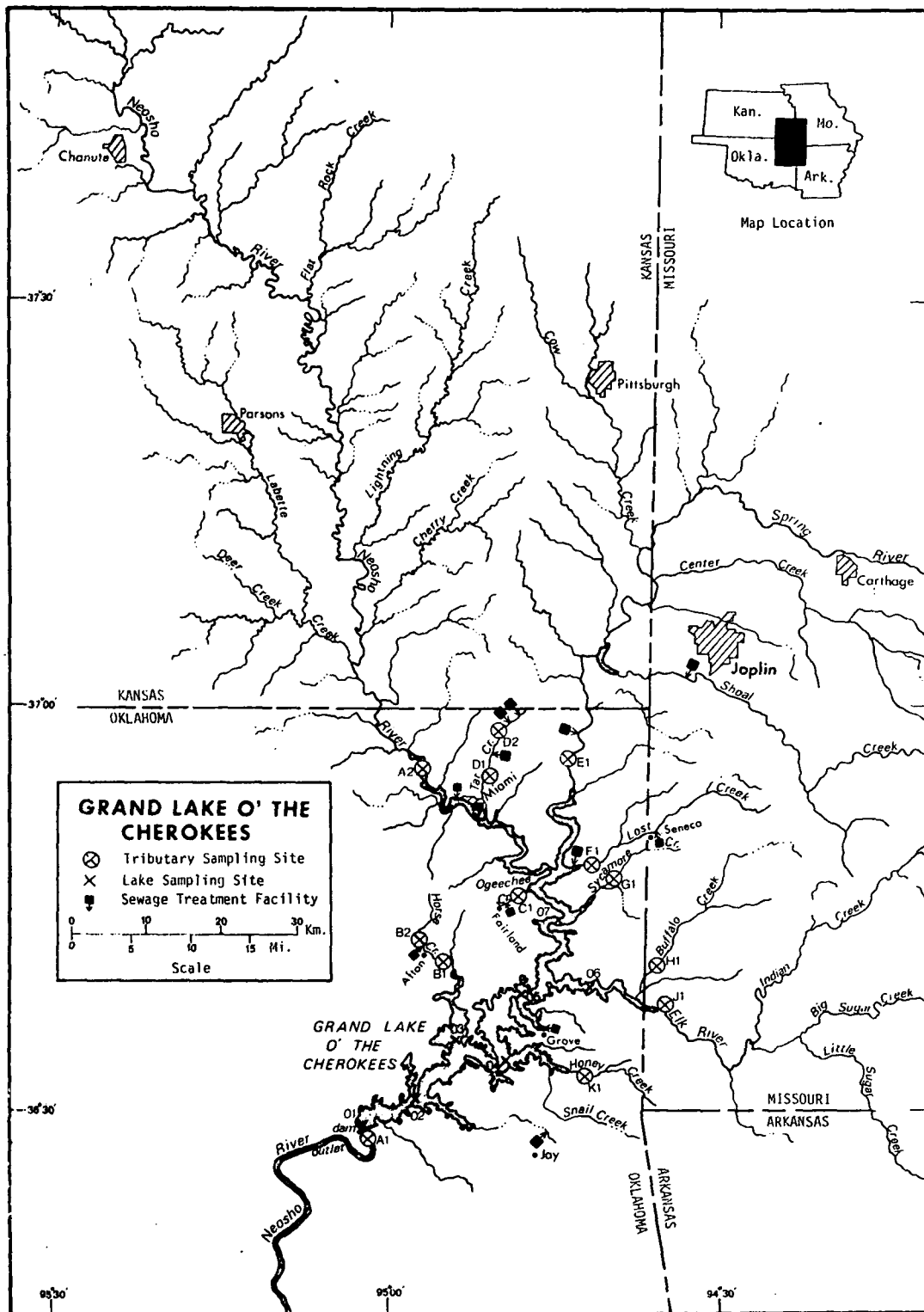
Major General John Coffey, Jr., the Adjutant General of Oklahoma, and Project Officers Colonel Curtis W. Milligan and Major James O. Haney, Jr., who directed the volunteer efforts of the Oklahoma National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF OKLAHOMA

<u>LAKE NAME</u>	<u>COUNTY</u>
Altus Reservoir	Greer, Kiowa
Arbuckle Lake	Murray
Lake Elsworth	Caddo, Comanche
Lake Eufaula	Haskell, McIntosh, Okmulgee, Pittsburg
Fort Cobb Reservoir	Caddo
Fort Supply Reservoir	Woodward
Foss Dam Reservoir	Custer
Lake Frances	Adair
Grand Lake O' The Cherokees	Mayes, Delaware, Craig Ottawa
Lake Hefner	Oklahoma
Keystone Reservoir	Tulsa, Creek, Osage, Pawnee
Oologah Lake	Nowata, Rogers
Tenkiller Ferry Reservoir	Cherokee, Sequoyah
Lake Thunderbird	Cleveland
Wister Reservoir	LeFlore



REPORT ON GRAND LAKE O' THE CHEROKEES

STORET NO. 4009

I. CONCLUSIONS

A. Trophic Condition:*

Grand Lake o' the Cherokees is considered eutrophic, i.e., nutrient rich and highly productive, on the basis of field observations and Survey data. Whether such nutrient enrichment is to be considered beneficial or deleterious is determined by its actual or potential impact upon designated beneficial water uses of each lake.

Nutrient levels in the lake were extremely high; of the 16 Oklahoma lakes (including Lake Texoma) sampled in 1974, only 2 had higher median total phosphorus levels, 1 had higher median inorganic nitrogen values, and 2 had higher median orthophosphorus levels than Grand Lake. Chlorophyll a levels in the lake ranged from 0.4 $\mu\text{g/l}$ to 26.9 $\mu\text{g/l}$, with a mean of 6.8 $\mu\text{g/l}$. Potential for primary production as measured by algal assay control yields was high on all sampling occasions.

Survey limnologists reported no problem algal blooms or aquatic macrophyte growths during their visits to the lake. However, low Secchi disc values in the lake coupled with high nutrient levels suggest primary productivity is light-limited in Grand Lake o' the Cherokees during much of the year.

*See Appendix E.

B. Rate-Limiting Nutrient:

Algal assay results for Stations 01-04 in Grand Lake o' the Cherokees indicate that nitrogen was the primary limiting nutrient in the spring, and phosphorus the limiting nutrient at Stations 05-07 at that time. The autumn assay suggest phosphorus limitation. The lake data indicate phosphorus limitation at all sampling times. However, primary growth limitation is more likely due to low light than limiting nutrient levels.

C. Nutrient Controllability:

1. Point sources -

During the sampling year, point sources were estimated to contribute approximately 3.7% of the total phosphorus load to Grand Lake o' the Cherokees. The city of Miami contributed approximately 1.1% from four municipal and industrial plants, and the city of Joplin contributed 0.6%.

The present overall phosphorus loading of $6.90 \text{ g P/km}^2/\text{yr}$ is about six times that proposed by Vollenweider (1975) as "eutrophic" for lakes with such volume and hydraulic retention time. In addition to the known point sources impacting Grand Lake o' the Cherokees, Ketelle and Uttormark (1971) report that large quantities of nutrients enter the lake from feedlot runoff in Kansas, a poultry boiler production in southwestern Missouri, and septic tank drainage from residences around the lake,

houseboats, and other pleasure craft. Also included in the loading for the lake are upstream municipal and industrial sources (such as those from the city of Carthage) not presented in the lake nutrient budget due to their distance from the reservoir, and at least one fish hatchery (impacting Snail Creek) for which no nutrient loading data is available. The loading data indicate that total elimination of known point sources would still leave high nutrient inputs, and further reduction in nutrient contributions, including nonpoint, would probably be necessary to affect demonstratable water quality improvement.

2. Nonpoint sources -

The total annual phosphorus load not attributable to nearby point sources was about 96.3% of the total reaching the lake. The Neosho River contributed 62.7%, the Spring River contributed 28.2%, and ungaged minor tributaries and immediate drainage were estimated to have contributed 1.2%.

The annual phosphorus export rates for several of the tributaries to Grand Lake o' the Cherokees were inordinately high. In the cases of Horse Creek (B-1) and Tar Creek (D-1), these high export rates probably have resulted from underestimation of the point source contributions impacting each creek. In the Neosho River (A-2) and Spring Creek (E-1), high background loadings may be due to upstream unidentified and/or unmeasured point sources rather than nonpoint contribution.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

Lake and drainage basin characteristics are itemized below.

Lake surface area and mean depth were provided by the Oklahoma Department of Pollution Control; maximum depth was provided by the Oklahoma Water Resources Board. Tributary flow data were provided by the Oklahoma 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 are estimated by methods as outlined in National Eutrophication Survey (NES) Working Paper No. 175. A table of metric/English conversions is included as Appendix A.

A. Lake Morphometry:

1. Surface area: 188.18 km².
2. Mean depth: 10.9 meters.
3. Maximum depth: 50.0 meters.
4. Volume: 2,051.162 x 10⁶ m³.
5. Mean hydraulic retention time: 129 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 Neosho River	15,218.8	100.55
B-1 Horse Creek	64.5	0.46
D-1 Tar Creek	88.8	0.55
E-1 Spring River	6,682.2	51.81
F-1 Lost Creek	233.4	1.65
H-1 Buffalo Creek	250.5	1.90
J-1 Elk River	2,258.5	21.36
K-1 Honey Creek	124.1	0.88
Minor tributaries and immediate drainage -	<u>1,562.6</u>	<u>15.52</u>
Totals	26,483.4	194.68

2. Outlet - A-1 Neosho River 26,671.5 183.86

C. Precipitation:

1. Year of sampling: 139.2 cm.
2. Mean annual: 106.8 cm.

III. LAKE WATER QUALITY SUMMARY

Grand Lake of the Cherokees was sampled four 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 seven 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 37.2 meters at Station 01, 27.4 meters at Station 02, 20.7 meters at Station 03, 18.3 meters at Station 04, 14.3 meters at Station 05, 9.1 meters at Station 06, and 7.6 meters at Station 07. 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.

PHYSICAL AND CHEMICAL CHARACTERISTICS

PARAMETER	N*	(4/ 2/74)			N*	(6/17/74)			N*	(8/29/74)		
		RANGE	MEDIAN	MAX DEPTH RANGE (METERS)		RANGE	MEDIAN	MAX DEPTH RANGE (METERS)		RANGE	MEDIAN	MAX DEPTH RANGE (METERS)
TEMPERATURE (DEG CENT)												
0.-1.5 M DEPTH	14	10.6- 15.3	12.2	0.0- 1.5	14	23.0- 25.9	24.4	0.0- 1.5	13	25.2- 26.2	25.6	0.0- 1.5
MAX DEPTH**	7	9.7- 14.1	10.4	7.6- 36.6	7	13.5- 20.8	19.8	7.6- 37.2	7	16.4- 25.6	22.3	4.0- 35.1
DISSOLVED OXYGEN (MG/L)												
0.-1.5 M DEPTH	7	8.8- 9.8	8.9	1.5- 1.5	14	6.2- 10.3	8.2	0.0- 1.5	13	4.2- 6.6	5.8	0.0- 1.5
MAX DEPTH**	7	8.0- 10.0	8.6	7.6- 36.6	7	2.8- 6.0	4.8	7.6- 37.2	7	0.4- 5.4	0.5	4.0- 35.1
CONDUCTIVITY (UMHOS)												
0.-1.5 M DEPTH	14	165.- 354.	200.	0.0- 1.5	14	208.- 334.	315.	0.0- 1.5	13	265.- 417.	289.	0.0- 1.5
MAX DEPTH**	7	166.- 354.	204.	7.6- 36.6	7	173.- 227.	196.	7.6- 37.2	7	229.- 432.	265.	4.0- 35.1
PH (STANDARD UNITS)												
0.-1.5 M DEPTH	14	6.7- 8.0	7.3	0.0- 1.5	14	7.6- 8.8	8.5	0.0- 1.5	13	7.7- 8.3	7.9	0.0- 1.5
MAX DEPTH**	7	6.7- 7.8	7.3	7.6- 36.6	7	7.4- 7.7	7.5	7.6- 37.2	7	7.3- 7.8	7.6	4.0- 35.1
TOTAL ALKALINITY (MG/L)												
0.-1.5 M DEPTH	14	59.- 160.	68.	0.0- 1.5	14	32.- 123.	48.	0.0- 1.5	13	103.- 120.	112.	0.0- 1.5
MAX DEPTH**	7	59.- 144.	62.	7.6- 36.6	5	32.- 75.	41.	7.6- 37.2	7	110.- 122.	114.	4.0- 35.1
TOTAL P (MG/L)												
0.-1.5 M DEPTH	14	0.031-0.126	0.101	0.0- 1.5	13	0.048-0.140	0.086	0.0- 1.5	13	0.020-0.173	0.037	0.0- 1.5
MAX DEPTH**	7	0.041-0.134	0.114	7.6- 36.6	5	0.095-0.180	0.125	7.6- 37.2	7	0.074-0.184	0.170	4.0- 35.1
DISSOLVED ORTHO P (MG/L)												
0.-1.5 M DEPTH	14	0.021-0.074	0.065	0.0- 1.5	14	0.012-0.071	0.028	0.0- 1.5	13	0.002-0.070	0.005	0.0- 1.5
MAX DEPTH**	7	0.038-0.072	0.068	7.6- 36.6	5	0.046-0.065	0.059	7.6- 37.2	7	0.006-0.087	0.053	4.0- 35.1
NO2+NO3 (MG/L)												
0.-1.5 M DEPTH	14	0.830-1.400	1.125	0.0- 1.5	14	0.400-0.980	0.690	0.0- 1.5	13	0.200-0.970	0.460	0.0- 1.5
MAX DEPTH**	7	0.870-1.760	0.980	7.6- 36.6	5	0.480-0.820	0.540	7.6- 37.2	7	0.080-0.950	0.210	4.0- 35.1
AMMONIA (MG/L)												
0.-1.5 M DEPTH	14	0.030-0.200	0.130	0.0- 1.5	14	0.040-0.100	0.075	0.0- 1.5	13	0.020-0.220	0.090	0.0- 1.5
MAX DEPTH**	7	0.060-0.210	0.170	7.6- 36.6	5	0.070-0.140	0.090	7.6- 37.2	7	0.180-0.450	0.200	4.0- 35.1
KJELDAHL N (MG/L)												
0.-1.5 M DEPTH	14	0.200-0.800	0.550	0.0- 1.5	13	0.400-1.000	0.600	0.0- 1.5	13	0.300-1.000	0.500	0.0- 1.5
MAX DEPTH**	7	0.300-0.800	0.500	7.6- 36.6	5	0.300-0.500	0.400	7.6- 37.2	7	0.600-0.900	0.700	4.0- 35.1
SECCHI DISC (METERS)												
	7	0.3- 0.5	0.4		7	0.2- 1.1	0.5		7	0.5- 2.7	1.4	

* N = NO. OF SAMPLES

** MAXIMUM DEPTH SAMPLED AT EACH SITE

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

(10/21/74)

S*** = 7

MAX
DEPTH
RANGE
(METERS)

PARAMETER	N*	RANGE	MEDIAN	
TEMPERATURE (DEG CENT)				
0.-1.5 M DEPTH	14	16.0- 19.3	18.2	0.0- 1.5
MAX DEPTH**	7	15.1- 18.7	17.3	7.0- 36.0
DISSOLVED OXYGEN (MG/L)				
0.-1.5 M DEPTH	14	6.0- 9.2	7.3	0.0- 1.5
MAX DEPTH**	7	0.2- 8.6	5.0	7.0- 36.0
CONDUCTIVITY (UMHOS)				
0.-1.5 M DEPTH	14	184.- 281.	253.	0.0- 1.5
MAX DEPTH**	7	164.- 285.	252.	7.0- 36.0
PH (STANDARD UNITS)				
0.-1.5 M DEPTH	14	7.5- 10.1	7.9	0.0- 1.5
MAX DEPTH**	7	7.5- 14.3	7.6	7.0- 36.0
TOTAL ALKALINITY (MG/L)				
0.-1.5 M DEPTH	14	81.- 129.	98.	0.0- 1.5
MAX DEPTH**	7	83.- 129.	98.	7.0- 36.0
TOTAL P (MG/L)				
0.-1.5 M DEPTH	14	0.038-0.228	0.059	0.0- 1.5
MAX DEPTH**	7	0.053-0.224	0.160	7.0- 36.0
DISSOLVED ORTHO P (MG/L)				
0.-1.5 M DEPTH	14	0.014-0.094	0.032	0.0- 1.5
MAX DEPTH**	7	0.021-0.078	0.038	7.0- 36.0
NO2+NO3 (MG/L)				
0.-1.5 M DEPTH	14	0.530-1.280	0.720	0.0- 1.5
MAX DEPTH**	7	0.040-1.330	0.890	7.0- 36.0
AMMONIA (MG/L)				
0.-1.5 M DEPTH	14	0.020-0.150	0.025	0.0- 1.5
MAX DEPTH**	7	0.020-1.170	0.070	7.0- 36.0
KJELDAHL N (MG/L)				
0.-1.5 M DEPTH	14	0.200-1.200	0.500	0.0- 1.5
MAX DEPTH**	7	0.400-1.500	0.800	7.0- 36.0
SECCHI DISC (METERS)				
	7	0.3- 0.9	0.6	

* 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>
04/02/74	1. <u>Chroomonas</u>	306
	2. <u>Centric Diatom</u>	279
	3. <u>Melosira</u>	223
	4. <u>Scenedesmus</u>	112
	5. <u>Micractinium</u>	111
	Other genera	<u>139</u>
	Total	1,170
06/14,17/74	1. <u>Stephanodiscus</u>	1,387
	2. <u>Melosira</u>	1,040
	3. <u>Chlamydomonas</u>	231
	4. <u>Nitzschia</u>	116
	5. <u>Chroomonas</u>	92
	Other genera	<u>648</u>
	Total	3,514
08/29/74	1. <u>Oscillatoria</u>	1,430
	2. <u>Melosira</u>	786
	3. <u>Chroomonas</u>	286
	4. <u>Skeletonema</u>	191
	5. <u>Ankistrodesmus</u>	167
	Other genera	<u>929</u>
	Total	3,789
10/21,22/74	1. <u>Melosira</u>	413
	2. <u>Chroomonas</u>	275
	3. <u>Flagellate</u>	184
	4. <u>Ankistrodesmus</u>	46
	5. <u>Cryptomonas</u>	46
	Other genera	<u>344</u>
	Total	1,308

2. Chlorophyll a -

<u>Sampling Date</u>	<u>Station Number</u>	<u>Chlorophyll a ($\mu\text{g/l}$)</u>
04/02/74	01	0.4
	02	1.4
	03	3.1
	04	1.1
	05	5.8
	06	4.0
	07	10.5
06/14,17/74	01	11.1
	02	4.5
	03	5.6
	04	5.9
	05	2.2
	06	10.2
	07	8.7
08/29/74	01	2.9
	02	4.7
	03	4.9
	04	4.7
	05	5.8
	06	19.0
	07	26.9
10/21,22/74	01	1.8
	02	2.5
	03	6.2
	04	2.9
	05	12.4
	06	11.8
	07	8.5

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

<u>Spiked(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>
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a. 04/02/74 - Stations 01-04

Control	0.055	1.130	6.2
0.05 P	0.105	1.130	7.8
0.05 P + 1.0 N	0.105	2.130	22.6
1.00 N	0.055	2.130	15.9

Stations 05-07

Control	0.015	1.550	2.0
0.05 P	0.065	1.550	10.1
0.05 P + 1.0 N	0.065	2.550	13.2
1.00 N	0.015	2.550	2.9

b. 10/21/74 - Stations 01-04

Control	0.027	0.535	5.7
0.05 P	0.077	0.535	11.5
0.05 P + 1.0 N	0.077	1.535	23.4
1.00 N	0.027	1.535	6.2

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential for primary production in Grand Lake o' the Cherokees was high during both spring and fall sampling. In the spring sample for Stations 05-07, and in the autumn assay, the addition of phosphorus alone produced a significant increase in yield over that of the control, indicating those samples were phosphorus limited. The addition of nitrogen alone did not result in any increase in yield over that of the control. In the spring assay sample for lake Stations 01-04, nitrogen limitation was indicated, as the addition of nitrogen alone produced the significant increase in yield over that of the control. In all assays, the maximum increase in yield was achieved with the simultaneous addition of both nutrients.

The mean inorganic nitrogen to orthophosphorus (N/P) ratios in the lake data were 15/1 or greater on all sampling occasions, suggesting primary limitation by phosphorus (a mean 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 Oklahoma 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 May and June when two samples were collected at some stations. Sampling was begun in November 1974, and was completed in October 1975.

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

In this report, nutrient loads for sampled tributaries, except Lost Creek, F-1, 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) and Lost Creek, F-1, were estimated by using the mean annual nutrient loads, in $\text{kg}/\text{km}^2/\text{yr}$, in Buffalo Creek, Elk River, and Honey Creek, at Stations H-1, J-1, and K-1, and multiplying the means by the ZZ area in km^2 .

The operators of the Miami (2 plants), Fairland (2 plants), Grove, Milnot, and B.F. Goodrich wastewater treatment plants

provided monthly effluent samples and corresponding flow data. Nutrient loads for the Afton, Miami #3, Jay, Seneca (2 plants), Quapaw, Commerce, Cardin, Picher, and Joplin wastewater treatment plants were estimated at 1.134 kg P and 3.401 kg N/capita/yr.

A. Waste Sources:

1. Known municipal -

<u>Name</u>	<u>Population Served*</u>	<u>Treatment*</u>	<u>Mean Flow (m³/d x 10³)</u>	<u>Receiving Water</u>
Miami #1	13,800	Trickling filter	3.252	Neosho River
Miami #2		Activated sludge	1.223	Tar Creek/Neosho River
Miami #3	1,200	Stabilization pond	0.454**	Neosho River
Afton	800	Trickling filter/tertiary	0.303**	Horse Creek
Fairland #1	1,000	Imhoff tank	0.032	Ogeechee Creek
Fairland #2		Stabilization pond	0.488	Hudson Creek
Grove	1,300	Trickling filter	0.425	Grand Lake
Jay	875	Stabilization pond	0.331**	Muskrat Hollow/Drowning Creek
Seneca (Mo.)	1,700	Stabilization pond	0.643**	Lost Creek/Grand Lake
Seneca Indian School	200	Stabilization pond	0.076**	Lost Creek/Grand Lake
Quapaw	800	Trickling filter	0.303**	Spring River
Commerce	2,100	Imhoff tank/Trickling filter	0.795**	Tar Creek
Cardin	200	Stabilization pond	0.076**	Tar Creek
Picher	1,500	Stabilization pond	0.568**	Tar Creek
Joplin	7,000	Trickling filter	2.650**	Shoal Creek/Spring Creek

2. Known industrial -

<u>Name</u>	<u>Product</u>	<u>Treatment</u>	<u>Mean Flow (m³/d x 10³)</u>	<u>Receiving Water</u>
Milnot Company (Seneca)	Milk Processing	Trickling filter	1.418	Lost Creek
B.F. Goodrich (Miami)	Tires, Rubber	Stabilization pond	3.848	Neosho River

*Provided by plant operators and/or U.S.EPA (1971).

**Estimated at 0.3785 m³/capita/day.

B. 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 Neosho River	813,170	62.7
B-1 Horse Creek	4,970	0.4
D-1 Tar Creek	15,115	1.2
E-1 Spring River	366,700	28.2
F-1 Lost Creek	2,335	0.2
H-1 Buffalo Creek	1,510	0.1
J-1 Elk River	26,555	2.0
K-1 Honey Creek	1,330	0.1
b. Minor tributaries and immediate drainage (nonpoint load) -	15,625	1.2
c. Known municipal STP's -		
Miami #1	9,355	0.7
Miami #2	3,585	0.3
Miami #3	1,360	0.1
Afton	905	0.1
Fairland #1	75	<0.1
Fairland #2	830	0.1
Grove	2,195	0.2
Jay	990	0.1
Seneca (Mo.)	1,930	0.2
Seneca Indian School	225	<0.1
Quapaw	905	0.1
Commerce	2,380	0.2
Cardin	225	<0.1
Picher	1,700	0.1
Joplin	7,940	0.6
d. Septic tanks* -	60	<0.1
e. Known industrial -		
Milnot Co.	12,030	0.9
B.F. Goodrich (Miami)	555	<0.1
f. Direct precipitation** -	3,295	0.2
Totals	1,297,850	100.0
2. Output - A-1 Neosho River	684,480	
3. Net annual P accumulation -	613,370	

*Estimate based on 219 lakeshore residences.

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

C. 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 Neosho River	6,645,785	48.9
B-1 Horse Creek	38,360	0.3
D-1 Tar Creek	60,365	0.4
E-1 Spring River	4,750,590	35.0
F-1 Lost Creek	87,525	0.6
H-1 Buffalo Creek	81,440	0.6
J-1 Elk River	983,280	7.2
K-1 Honey Creek	45,210	0.3
b. Minor tributaries and immediate drainage (nonpoint load) -	585,975	4.3
c. Known municipal STP's -		
Miami #1	23,270	0.2
Miami #2	10,270	0.1
Miami #3	4,080	<0.1
Afton	2,720	<0.1
Fairland #1	145	<0.1
Fairland #2	1,785	<0.1
Grove	3,975	<0.1
Jay	2,975	<0.1
Seneca (Mo.)	5,780	<0.1
Seneca Indian School	680	<0.1
Quapaw	2,720	<0.1
Commerce	7,140	0.1
Carden	680	<0.1
Picher	5,100	<0.1
Joplin	23,805	0.2
d. Septic tanks* -	2,335	<0.1
e. Known industrial -		
Milnot Company	2,005	<0.1
B.F. Goodrich (Miami)	2,020	<0.1
f. Direct precipitation** -	203,160	1.5
Totals	13,583,175	100.0
2. Output - A-1 Neosho River	10,157,185	
3. Net annual N accumulation -	3,425,990	

*Estimate based on 219 lakeshore residences.

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

D. Mean Annual Nonpoint Nutrient Export by Subdrainage Area:

<u>Tributary</u>	<u>kg P/km²/yr</u>	<u>kg N/km²/yr</u>
Neosho River	53	437
Horse Creek	77	595
Tar Creek	170	680
Spring River	55	711
Lost Creek	10	375
Buffalo Creek	6	325
Elk River	12	435
Honey Creek	11	364

E. Mean Nutrient Concentrations in Ungaged Streams:

<u>Tributary</u>	<u>Mean Total P (mg/l)</u>	<u>Mean Total N (mg/l)</u>
C-1 Ogeechee Creek	0.117	1.181
G-1 Sycamore Creek	1.516	5.484

Phosphorus levels for both Ogeechee and Sycamore Creeks, and nitrogen levels for Sycamore Creek were substantially higher than the unimpacted gaged tributaries (Buffalo Creek, Elk River, Honey Creek) to Grand Lake o' the Cherokees. Ogeechee Creek receives input from the Fairland sewage treatment facilities; the reason for inflated nutrient levels in Sycamore Creek is not known.

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 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 be applicable to water bodies with very short retention times or in which light penetration is severely restricted from high concentrations of suspended solids in the surface waters.

	<u>Total Yearly Phosphorus Loading (g/m²/yr)</u>
Estimated loading for Grand Lake o' the Cherokees	6.90
Vollenweider's "eutrophic" loading	1.08
Vollenweider's "oligotrophic" loading	0.54

V. LITERATURE REVIEWED

- Ketelle, Martha J. and Paul D. Uttormark. 1971. Problem Lakes in the United States. U.S. Environmental Protection Agency, Project #16010 EHR. University of Wisconsin, Madison, Wisconsin.
- U.S. Environmental Protection Agency. 1971. "Inventory of Wastewater Treatment Facilities", EPA Publication No. OWP-1, Volume 6. Office of Media Programs, Office of Water Programs, Washington, D.C.
- 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 OKLAHOMA

03/25/77

LAKE CODE 4009 GRAND LAKE OF THE CHEROKEES

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 26671.5

TRIBUTARY	SUR-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS)												
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
4009A1	26671.5	98.54	129.41	143.57	259.38	334.14	286.00	270.43	121.20	154.89	175.28	132.81	98.54	183.86
4009A2	15218.8	46.16	54.09	99.68	151.50	181.79	158.29	175.56	46.16	101.66	94.01	57.77	37.66	100.55
4009B1	64.5	0.28	0.40	0.57	0.65	1.36	0.45	0.37	0.18	0.34	0.37	0.25	0.25	0.46
4009D1	88.8	0.31	0.42	0.59	0.79	1.64	0.65	0.45	0.28	0.42	0.42	0.28	0.28	0.55
4009E1	6682.2	29.17	45.02	54.93	84.95	103.92	87.22	50.40	24.35	35.40	48.99	34.26	23.50	51.81
4009F1	233.4	0.99	1.47	2.04	2.46	4.53	1.78	1.36	0.91	1.16	1.25	0.88	0.91	1.65
4009H1	250.5	1.30	1.90	2.69	2.69	4.70	1.98	1.59	0.96	1.36	1.47	0.99	1.16	1.90
4009J1	2258.5	13.88	21.80	29.73	45.02	52.67	24.64	14.72	9.06	8.50	12.46	12.18	11.89	21.36
4009K1	124.1	0.59	0.85	1.22	1.19	2.32	0.79	0.76	0.45	0.68	0.71	0.45	0.54	0.88
4009ZZ	1750.8	10.05	15.57	21.35	30.58	39.08	17.56	11.04	6.80	7.36	9.63	8.50	8.78	15.52

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 26671.5
SUM OF SUB-DRAINAGE AREAS = 26671.5

TOTAL FLOW IN = 2334.40
TOTAL FLOW OUT = 2204.18

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4009A1	11	74	849.505	2	368.119				
	12	74	362.456	15	359.624				
	1	75	251.170	2	353.960				
	2	75	424.753	15	356.792				
	3	75	651.287	15	798.535				
	4	75	368.119	19	359.624				
	5	75	143.566	17	71.075				
	6	75	481.386	15	356.792	23	529.525		
	7	75	198.218	27	128.275				
	8	75	99.109	9	101.374				
4009A2	9	75	93.729	6	1.161				
	10	75	82.119	19	5.097				
	11	74	444.291	9	866.495				
	12	74	100.525	15	114.683				
	1	75	79.287	4	148.947				
	2	75	254.852	13	154.044				
	3	75	219.739	14	171.317				
	4	75	127.709	18	137.054				
	5	75	78.154	17	48.988				
	6	75	339.802	7	311.485	23	291.663		
	7	75	97.693	26	13.904				
	8	75	19.749	9	6.541				
	9	75	20.303	6	23.984				
	10	75	5.097	19	0.425				

TRIBUTARY FLOW INFORMATION FOR OKLAHOMA

03/25/77

LAKE CODE 4009 GRAND LAKE OF THE CHEROKEES

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4009B1	11	74	8.948	2	4.814				
	12	74	0.765	15	0.481				
	1	75	1.048	2	1.501				
	2	75	1.671	15	0.252				
	3	75	1.897	14	0.906				
	4	75	0.246	19	0.167				
	5	75	0.198	15	0.024	17	0.022		
	6	75	0.623	15	0.096	23	0.076		
	7	75	0.028	27	0.028				
	8	75	0.026	9	0.003				
4009D1	9	75	0.057	6	0.002				
	10	75	0.062	19	0.003				
	11	74	3.511	9	2.633				
	12	74	1.161	14	1.586				
	1	75	1.133	4	1.642				
	2	75	2.832	15	0.878				
	3	75	3.370	14	4.955				
	4	75	1.189	18	0.765				
	5	75	0.623	17	0.510				
	6	75	0.878	7	0.481				
4009E1	7	75	0.272	26	0.261				
	8	75	0.207	9	0.161				
	9	75	0.311	6	0.195				
	10	75	0.272	19	0.003				
	11	74	257.966	9	191.705				
	12	74	84.951	14	115.533				
	1	75	82.968	4	119.214				
	2	75	207.562	15	64.279				
	3	75	247.489	14	362.456				
	4	75	87.499	18	56.067				
4009F1	5	75	44.741	17	38.228				
	6	75	63.713						
	7	75	19.822	26	19.001				
	8	75	15.150	9	11.723				
	9	75	22.682	6	14.300				
	10	75	19.822	19	14.158				
	11	74	12.063	9	7.447				
	12	74	3.200	14	5.154				
	1	75	3.794	4	5.862				
	2	75	5.607	15	2.917				
	3	75	9.684	15	9.471				
	4	75	3.313	18	2.350				
	5	75	2.690	17	1.869				
	6	75	1.614						
	7	75	0.991	26	0.878				
	8	75	0.623	9	0.425				
	9	75	0.821	6	0.425				
	10	75	0.736	19	0.680				

TRIBUTARY FLOW INFORMATION FOR OKLAHOMA

03/25/77

LAKE CODE 4009 GRAND LAKE OF THE CHEROKEES

MEAN MONTHLY FLOWS AND DAILY FLOWS (CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4009H1	11	74	12.941	9	8.014				
	12	74	3.455	14	5.522				
	1	75	4.049	4	6.286				
	2	75	6.003	15	3.143				
	3	75	10.392	15	10.081				
	4	75	4.984	18	2.520				
	5	75	2.888	17	2.010				
	6	75	1.727						
	7	75	1.048	26	0.934				
	8	75	0.680	9	0.453				
4009J1	9	75	0.878	6	0.453				
	10	75	0.793	19	0.736				
	11	74	116.665	9	72.208				
	12	74	31.149	14	49.838				
	1	75	36.529	4	56.634				
	2	75	54.085	15	28.260				
	3	75	93.729	15	90.897				
	4	75	31.998	18	22.823				
	5	75	26.023	17	18.010				
	6	75	15.574						
4009K1	7	75	9.571	26	8.495				
	8	75	6.003	9	4.163				
	9	75	7.872	6	4.106				
	10	75	7.079	19	6.513				
	11	74	6.400	2	3.993				
	12	74	1.699	15	2.747				
	1	75	2.010	2	3.115				
	2	75	2.973	15	1.557				
	3	75	5.154	15	4.984				
	4	75	1.756	19	1.246				
4009ZZ	5	75	1.416	17	0.991	23	0.0		
	6	75	1.359	15	0.0				
	7	75	0.538	27	0.453				
	8	75	0.340	9	0.229				
	9	75	0.425	6	0.227				
	10	75	0.396	19	0.368				
	11	74	90.614						
	12	74	24.069						
	1	75	28.317						
	2	75	41.909						
4009ZZ	3	75	72.774						
	4	75	24.919						
	5	75	20.105						
	6	75	12.176						
	7	75	7.362						
	8	75	4.531						
	9	75	6.230						
	10	75	5.380						

APPENDIX C
PHYSICAL AND CHEMICAL DATA

STORET RETRIEVAL DATE 77/03/24

400901
36 28 30.0 095 02 06.0 4
GRAND LAKE OF THE CHEROKEES
40097 OKLAHOMA

100491

/TYPA/AMBNT/LAKE

11EPALES 04001002
0126 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&N03 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/02	09 40	0000	10.8		13	168	7.00	64	0.150	0.800	1.030	0.074
	09 40	0005	10.6	8.8		167	6.70	63	0.150	0.500	0.830	0.063
	09 40	0015	10.6	8.4		167	6.70	62	0.160	0.500	1.060	0.072
	09 40	0040	10.4	8.0		165	6.70	63	0.160	0.400	0.940	0.073
	09 40	0070	9.8	8.0		160	6.60	62	0.200	0.700	0.980	0.070
	09 40	0120	9.7	8.0		166	6.70	62	0.170	0.500	0.870	0.071
74/06/17	10 20	0000	23.8	7.8	42	325	8.40	48	0.080	1.000	0.400	0.017
	10 20	0005	23.8	7.6		327	8.30	49	0.100		0.440	0.019
	10 20	0015	22.7	6.6		329	8.00	49	0.070	0.400	0.460	0.028
	10 20	0035	21.1	4.4		279	7.60	42	0.060		0.520	0.060
	10 20	0060	20.1	5.8		220	7.70	36	0.070	0.400	0.500	0.065
	10 20	0095	15.4	3.0		237	7.60	42	0.060	0.300	0.570	0.059
	10 20	0122	13.5	2.8		209	7.50	37	0.070	0.400	0.540	0.056
74/08/29	09 40	0000	25.3	5.0	108	278	7.70	120	0.020K	0.400	0.560	0.002K
	09 40	0010	25.2	5.4		279	7.70	101	0.020	0.200	0.570	0.002
	09 40	0025	25.0	4.6		278	7.65	100	0.040	0.200	0.580	0.012
	09 40	0045	21.8	0.4		239	7.50	97	0.020	0.200	0.790	0.051
	09 40	0060	21.1	0.4		230	7.40	98	0.040	0.300	0.690	0.053
	09 40	0085	17.5	0.4		216	7.35	98	0.640	0.400	0.420	0.071
	09 40	0115	17.3	0.4		230	7.30	114	0.200	0.900	0.290	0.053
74/10/21	15 10	0000	19.3	6.4	25	258	7.90	94	0.020	0.400	0.560	0.031
	15 10	0005	19.1	6.0		251	7.85	93	0.020K	0.200K	0.570	0.029
	15 10	0015	19.2	6.2		252	7.80	94	0.020K	0.200K	0.570	0.028
	15 10	0035	19.1	6.0		254	7.80	93	0.020K	0.200	0.570	0.028
	15 10	0055	19.1	6.2		256	7.80	92	0.020K	0.300	0.560	0.027
	15 10	0072	19.1	6.2		256	7.75	95	0.020K	0.300	0.570	0.028
	15 10	0090	18.8	2.2		263	7.55	99	0.020	0.400	0.580	0.029
	15 10	0100	18.4	0.2		263	7.50	99	0.070	0.500	0.500	0.030
	15 10	0118	15.1	0.2		285	7.60	129	1.170	1.500	0.040	0.053

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 77/03/24

400901
36 28 30.0 095 02 06.0 4
GRAND LAKE OF THE CHEROKEES
40097 OKLAHOMA
100491

/TYP/AMBT/LAKE

11EPALES 04001002
0126 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/02	09 40	0000	0.114	0.4	
	09 40	0005	0.107		
	09 40	0015	0.104		
	09 40	0040	0.107		
	09 40	0070	0.209		
	09 40	0120	0.114		
74/06/17	10 20	0000	0.070	11.1	
	10 20	0009			1.0
	10 20	0015	0.061		
	10 20	0060	0.117		
	10 20	0095	0.103		
	10 20	0122	0.104		
74/08/29	09 40	0000	0.020	2.9	
	09 40	0010	0.021		
	09 40	0025	0.029		
	09 40	0045	0.078		
	09 40	0060	0.034		
	09 40	0085	0.116		
	09 40	0115	0.180		
74/10/21	15 10	0000	0.061	1.8	
	15 10	0001			50.0
	15 10	0004			5.0
	15 10	0005	0.052		
	15 10	0008			1.0
	15 10	0015	0.056		
	15 10	0035	0.053		
	15 10	0055	0.054		
	15 10	0072	0.061		
	15 10	0090	0.106		
	15 10	0100	0.102		
	15 10	0118	0.160		

STORET RETRIEVAL DATE 77/03/24

400902
36 30 36.0 094 51 36.0 4
GRAND LAKE OF THE CHEROKEES
40041 OKLAHOMA

100491

/TYP/AMBNT/LAKE

11EPALES 04001002
0080 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
74/04/02	10 30	0000	12.0		14	246	7.10	65	0.140	0.600	1.110	0.063
	10 30	0005	12.0	8.8		244	7.10	64	0.140	0.500	1.110	0.064
	10 30	0015	11.8	8.6		255	7.10	64	0.150	0.600	0.970	0.064
	10 30	0040	10.7	9.6		248	7.10	62	0.150	0.500	1.090	0.064
	10 30	0075	10.1	8.4		241	7.20	59	0.180	0.600	0.980	0.066
74/06/14	15 30	0000	25.6	10.3	36	334	8.80	123	0.050	0.600	0.980	0.023
	15 30	0005	23.9	8.6		327	8.80	48	0.050	0.500	0.440	0.026
	15 30	0015	22.4	5.6		305	8.00	41	0.050	0.300	0.500	0.055
	15 30	0025	21.9	4.8		272	7.80	41	0.050	0.300	0.500	0.059
	15 30	0045	20.8	4.6		224	7.60	35	0.080	0.400	0.500	0.064
	15 30	0067	20.2	6.0		196	7.70	32	0.100	0.400	0.490	0.061
74/08/29	10 20	0000	25.9	6.2	90	282	8.10	103	0.030	0.400	0.420	0.002
	10 20	0005	25.9	5.8		282	8.10	103	0.020	0.400	0.440	0.003
	10 20	0020	25.7	6.4		283	7.95	99	0.060	0.300	0.580	0.003
	10 20	0040	24.6	2.4		279	7.70	101	0.060	0.300	0.580	0.012
	10 20	0055	20.6	0.4		233	7.60	100	0.220	0.400	0.420	0.065
	10 20	0070	19.0	0.6		223	7.50	102	0.290	0.500	0.310	0.077
	10 20	0090	16.4	0.4		229	7.40	110	0.450	0.700	0.190	0.083
74/10/21	15 30	0000	19.1	7.0	24	209	7.90	94	0.030	0.500	0.550	0.033
	15 30	0005	19.1	7.2		210	7.90	93	0.020K	0.300	0.570	0.029
	15 30	0015	19.0	7.2		203	7.90	94	0.020K	0.300	0.560	0.029
	15 30	0030	19.0	7.4		191	7.90	94	0.020K	0.300	0.570	0.028
	15 30	0045	19.0	7.4		173	7.90	96	0.020K	0.300	0.580	0.034
	15 30	0060	18.9	7.2		192	7.90	95	0.020K	0.200	0.570	0.030
	15 30	0075	18.9	5.8		181	7.70	95	0.020K	0.300	0.610	0.029
	15 30	0085	18.7	4.0		164	7.60	86	0.020	0.400	0.540	0.028

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 77/03/24

400902
36 30 36.0 094 51 36.0 4
GRAND LAKE OF THE CHEROKEES
40041 OKLAHOMA
100491

/TYP/AMBN/LAKE

11EPALES 04001002
0080 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/02	10 30	0000	0.102	1.4	
	10 30	0005	0.097		
	10 30	0015	0.111		
	10 30	0040	0.109		
	10 30	0075	0.133		
74/06/14	15 30	0000	0.076	4.5	
	15 30	0005	0.066		
	15 30	0006			1.0
	15 30	0015	0.093		
	15 30	0025	0.110		
	15 30	0045	0.119		
	15 30	0067	0.125		
74/08/29	10 20	0000	0.022	4.7	
	10 20	0003			50.0
	10 20	0005	0.021		
	10 20	0020	0.021		1.0
	10 20	0040	0.035		
	10 20	0055	0.099		
	10 20	0070	0.138		
	10 20	0090	0.182		
74/10/21	15 30	0000	0.050	2.5	
	15 30	0001			50.0
	15 30	0005	0.047		5.0
	15 30	0009			1.0
	15 30	0015	0.045		
	15 30	0030	0.046		
	15 30	0045	0.047		
	15 30	0060	0.046		
	15 30	0075	0.067		
	15 30	0095	0.105		

STORET RETRIEVAL DATE 77/03/24

400903
36 35 42.0 094 54 00.0 4
GRAND LAKE OF THE CHEROKEES
40041 OKLAHOMA
100491

/TYPA/AMBNT/LAKE

11EPALES 04001002
0070 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 CONDUCTIVITY 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
74/04/02	11 05	0000	12.7		13	182	7.40	68	0.110	0.600	1.140	0.065
	11 05	0005	12.6	8.8		182	7.30	67	0.110	0.500	1.100	0.067
	11 05	0015	12.7	9.0		182	7.30	67	0.110	0.500	1.020	0.060
	11 05	0045	10.2	8.8		156	7.15	58	0.180	0.500	0.950	0.063
	11 05	0065	10.0	8.8		204	7.20	59	0.200	0.600	0.960	0.072
74/06/14	14 55	0000	25.0	9.8	36	324	8.60	119	0.060	0.600	0.820	0.012
	14 55	0005	24.1	9.2		319	8.60	118	0.050	0.500	0.830	0.013
	14 55	0015	22.6	5.6		288	8.10	108	0.040	0.500	0.940	0.034
	14 55	0025	21.7	4.4		269	7.60	78	0.060	0.500	0.800	0.069
	14 55	0045	20.5	4.6		194	7.50	78	0.070	0.500	0.820	0.069
	14 55	0068	20.2	4.0		196	7.60	75	0.080	0.500	0.820	0.065
74/08/29	11 00	0000	26.2	6.6	54	288	8.25	105	0.080	0.400	0.330	0.006
	11 00	0005	26.2	6.4		289	8.30	105	0.090	0.300	0.340	0.005
	11 00	0015	26.2	6.6		290	8.30	106	0.070	0.400	0.340	0.006
	11 00	0030	25.9	6.2		289	8.25	105	0.080	0.300	0.360	0.006
	11 00	0045	23.9	0.2		279	7.75	110	0.150	0.500	0.390	0.024
	11 00	0064	20.9	0.4		253	7.60	114	0.440	0.800	0.080	0.044
74/10/22	09 25	0000	18.2	8.0	36	184	7.95	97	0.040	0.700	0.530	0.032
	09 25	0005	18.2	8.0		209	7.90	98	0.030	0.500	0.540	0.029
	09 25	0015	18.2	7.6		207	7.90	95	0.020	0.400	0.530	0.027
	09 25	0030	18.2	8.0		204	7.90	97	0.030	0.400	0.540	0.027
	09 25	0045	18.2	7.6		202	7.90	97	0.030	0.400	0.540	0.026
	09 25	0061	18.2	7.6		193	7.90	98	0.030	0.500	0.540	0.025

STORET RETRIEVAL DATE 77/03/24

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36 35 42.0 094 54 00.0 4
GRAND LAKE OF THE CHEROKEES
40041 OKLAHOMA
100491

/TYPA/AMBNT/LAKE

11EPALES 04001002
0070 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/02	11 05	0000	0.103	3.1	
	11 05	0005	0.101		
	11 05	0015	0.106		
	11 05	0045	0.114		
	11 05	0065	0.121		
74/06/14	14 55	0000	0.067	5.6	
	14 55	0005	0.048		
	14 55	0007			1.0
	14 55	0015	0.079		
	14 55	0025	0.123		
	14 55	0045	0.122		
	14 55	0068	0.150		
74/08/29	11 00	0000	0.037	4.9	
	11 00	0005	0.035		
	11 00	0010			1.0
	11 00	0015	0.039		
	11 00	0030	0.037		
	11 00	0045	0.067		
	11 00	0064	0.111		
74/10/22	09 25	0000	0.060	6.2	
	09 25	0004			5.0
	09 25	0005	0.052		
	09 25	0008			1.0
	09 25	0015	0.051		
	09 25	0030	0.053		
	09 25	0045	0.053		
	09 25	0061	0.053		

STORET RETRIEVAL DATE 77/03/24

400904
36 33 36.0 094 49 30.0 4
GRAND LAKE OF THE CHEROKEES
40041 OKLAHOMA

100491

/TYP/AMBNT/LAKE

11EPALES 04001002
0060 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&N03 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/02	15 50	0000	11.6		13	165	7.30	59	0.200	0.800	1.000	0.069
	15 50	0005	11.6	8.9		165	7.30	59	0.200	0.800	0.960	0.071
	15 50	0015	11.5	9.0		167	7.30	60	0.190	0.700	0.980	0.065
	15 50	0035	11.4	9.2		166	7.25	59	0.210	0.700	1.000	0.075
	15 50	0055	10.4	8.6		175	7.25	59	0.210	0.800	0.960	0.072
74/06/14	14 20	0000						110	0.070	0.600	0.870	0.033
	14 20	0005						115	0.040	0.600	0.940	0.031
	14 20	0015						88	0.060	0.500	0.840	0.067
	14 20	0025						79	0.050	0.500	0.800	0.071
	14 20	0045						74	0.050	0.400	0.940	0.006
	14 20	0060						80	0.090	0.400	0.960	0.058
74/06/19	14 20	0000	25.9	7.8	14	320	8.70					
	14 20	0005	24.2	9.4		310	8.70					
	14 20	0015	22.3	4.8		274	7.80					
	14 20	0025	21.2	4.8		214	7.60					
	14 20	0045	20.3	4.8		185	7.60					
	14 20	0060	19.6	4.8		173	7.40					
74/08/29	15 50	0000	25.6	5.4	72	291	8.00	104	0.060	0.500	0.460	0.005
	15 50	0005	25.6	5.8		291	8.00	104	0.050	0.500	0.460	0.004
	15 50	0016	25.6	5.8		292	7.95	105	0.040	0.300	0.460	0.005
	15 50	0045	25.4	4.8		293	7.90	106	0.070	0.300	0.470	0.011
	15 50	0058	22.3	6.5		275	7.55	121	0.180	0.700	0.090	0.087
74/10/22	10 00	0000	18.4	6.8	24	258	7.80	104	0.020	0.500	0.720	0.037
	10 00	0005	18.4	7.4		254	7.80	103	0.020	0.400	0.720	0.035
	10 00	0015	18.4	7.0		253	7.80	102	0.020	0.400	0.720	0.034
	10 00	0035	18.4	7.4		252	7.80	101	0.020	0.300	0.720	0.035
	10 00	0045	18.4	7.4		253	7.80	100	0.030	0.400	0.730	0.035
	10 00	0060	17.9	5.0		273	7.60	105	0.070	0.800	0.940	0.038

STORET RETRIEVAL DATE 77/03/24

400904
36 33 36.0 094 49 30.0 4
GRAND LAKE OF THE CHEROKEES
40041 OKLAHOMA
100491

/TYP/AMNT/LAKE

11EPALES 04001002
0060 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/02	15 50	0000	0.126	1.1	
	15 50	0005	0.124		
	15 50	0015	0.116		
	15 50	0035	0.119		
	15 50	0055	0.134		
74/06/14	14 20	0000	0.086		
	14 20	0005	0.087		
	14 20	0015	0.115		
	14 20	0025	0.125		
	14 20	0045	0.119		
	14 20	0060	0.122		
74/06/19	14 20	0000		5.9	
	14 20	0005			1.0
74/08/29	15 50	0000	0.026	4.7	
	15 50	0005	0.026		
	15 50	0016	0.025		1.0
	15 50	0045	0.032		
	15 50	0058	0.170		
74/10/22	10 00	0000	0.063	2.9	
	10 00	0004			5.0
	10 00	0005	0.059		
	10 00	0008			1.0
	10 00	0015	0.060		
	10 00	0035	0.061		
	10 00	0045	0.063		
	10 00	0060	0.208		

STORET RETRIEVAL DATE 77/03/24

400905
36 38 24.0 094 48 18.0 4
GRAND LAKE OF THE CHEROKEES
40041 OKLAHOMA

100491

/TYP/AMBNT/LAKE

11EPALES 04001002
0050 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 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
74/04/02	15 15	0000	12.2		24	253	7.70	102	0.130	0.600	1.310	0.060
	15 15	0005	12.2	9.2		254	7.70	160	0.130	0.500	1.400	0.067
	15 15	0015	12.2	10.0		253	7.70	107	0.130	0.400	1.570	0.065
	15 15	0030	12.2	10.0		313	7.70	106	0.140	0.500	1.700	0.067
	15 15	0045	12.2	10.0		327	7.70	100	0.130	0.500	1.680	0.063
74/06/17	11 05	0000	24.7	6.6	11	227	7.70	32	0.090	0.600	0.500	0.071
	11 05	0005	24.6	6.6		227	7.90	33	0.080	0.400	0.560	0.070
	11 05	0015	23.5	5.4		210	7.20	31	0.100	0.500	0.520	0.075
	11 05	0035	19.9	5.4		178	7.50	36	0.090	0.400	0.490	0.060
	11 05	0047	19.2	5.0		177	7.60	41	0.090	0.300	0.480	0.046
74/08/29	15 25	0000	25.9	5.0	36	315	7.85	113	0.120	0.500	0.580	0.023
	15 25	0005	25.9	4.2		314	7.85	112	0.110	0.500	0.540	0.021
	15 25	0015	25.9	5.2		316	7.85	113	0.150	0.500	0.540	0.023
	15 25	0040	25.6	2.6		312	7.70	114	0.190	0.600	0.440	0.030
74/10/22	10 35	0000	17.6	7.4	24	281	7.90	105	0.030	0.800	0.900	0.062
	10 35	0005	17.5	7.4		280	7.85	106	0.040	0.700	0.920	0.059
	10 35	0015	17.5	7.4		280	7.80	105	0.030	0.600	0.900	0.060
	10 35	0028	17.4	6.8		277	7.80	105	0.060	0.600	0.930	0.058
	10 35	0042	17.3	4.8		264	7.55	96	0.110	0.900	0.920	0.061

STORET RETRIEVAL DATE 77/03/24

400905
36 38 24.0 094 48 18.0 4
GRAND LAKE OF THE CHEROKEES
40041 OKLAHOMA
100491

/TYP/AMBNT/LAKE

11EPALES 04001002
0050 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCU LT REMNING PERCENT
74/04/02	15 15	0000	0.084	5.8	
	15 15	0005	0.077		
	15 15	0015	0.080		
	15 15	0030	0.081		
	15 15	0045	0.085		
74/06/17	11 05	0000	0.140	2.2	
	11 05	0005	0.125		
	11 05	0015	0.129		
	11 05	0035	0.106		
	11 05	0047	0.095		
74/08/29	15 25	0000	0.053	5.8	
	15 25	0005	0.054		
	15 25	0007			1.0
	15 25	0015	0.054		
	15 25	0040	0.098		
74/10/22	10 35	0000	0.109	12.4	
	10 35	0005	0.111		5.0
	10 35	0007			1.0
	10 35	0015	0.102		
	10 35	0028	0.108		
	10 35	0042	0.216		

STORET RETRIEVAL DATE 77/03/24

400906
36 38 30.0 094 42 54.0 4
GRAND LAKE OF THE CHEROKEES
40041 OKLAHOMA
100491

/TYP/ANAL/LAKE

11EPALES 04001002
0030 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 CONDUCTV 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 ORTH0 MG/L P
74/04/02	14 50	0000	15.3		30	200	8.00	140	0.040	0.400	1.350	0.022
	14 50	0005	15.2	9.8		199	8.00	104	0.030	0.200	1.320	0.021
	14 50	0015	13.2	9.8		191	7.80	101	0.040	0.200	1.390	0.028
	14 50	0025	11.7	8.0		185	7.75	100	0.060	0.300	1.380	0.038
74/06/17	11 35	0000						39	0.090	1.000	0.440	0.031
	11 35	0005						45	0.060	0.400	0.440	0.020
	11 35	0015						55	0.050	0.200	0.580	0.020
	11 35	0020						57	0.080	0.200K	0.630	0.022
	11 35	0030						56	0.160	0.300	0.580	0.029
	11 39	0000	25.1	9.4	18	208	8.60					
	11 39	0005	24.7	8.8		214	8.30					
	11 39	0015	21.9	6.2		232	7.60					
	11 39	0020	20.9	5.8		233	7.70					
	11 39	0030	19.8	5.0		225	7.50					
74/08/29	13 25	0000	25.4	5.4	24	267	7.80	116	0.110	0.700	0.200	0.007
	13 25	0005	25.4	5.0		265	7.80	119	0.130	0.600	0.200	0.005
	13 25	0015	25.3	5.0		269	7.80	120	0.160	0.600	0.200	0.006
	13 25	0020	25.3	5.0		265	7.80	122	0.180	0.600	0.210	0.006
74/10/22	11 10	0000	16.9	9.2	30	239	8.10	128	0.020K	0.500	1.190	0.014
	11 10	0005	16.5	9.0		238	8.00	129	0.020K	0.900	1.280	0.016
	11 10	0015	16.4	9.0		242	7.95	126	0.020K	0.400	1.300	0.019
	11 10	0024	16.4	8.6		242	7.90	127	0.020K	0.400	1.330	0.021

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 77/03/24

400906
36 38 30.0 094 42 54.0 4
GRAND LAKE OF THE CHEROKEES
40041 OKLAHOMA

100491

/TYPA/AMBNT/LAKE

11EPALES 04001002
0030 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCUT LT REMNING PERCENT
74/04/02	14 50	0000	0.031	4.0	
	14 50	0005	0.032		
	14 50	0015	0.029		
	14 50	0025	0.041		
74/06/17	11 35	0000	0.119		
	11 35	0005	0.068		
	11 35	0015	0.047		
	11 35	0020	0.038		
	11 35	0030	0.065		
	11 39	0000		10.2	
	11 39	0004			1.0
74/08/29	13 25	0000	0.073	19.0	
	13 25	0005	0.062		
	13 25	0006			1.0
	13 25	0015	0.076		
	13 25	0020	0.074		
74/10/22	11 10	0000	0.038	11.8	
	11 10	0005	0.039		
	11 10	0015	0.049		
	11 10	0024	0.062		

STORE RETRIEVAL DATE 77/03 24

400907
36 43 48.0 094 45 00.0 4
GRAND LAKE OF THE CHEROKEES
40115 OKLAHOMA
100491

/TYP/AMBNT/LAKE

11EPALES 04001002
0031 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 CONDUCTIV 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
74/04/02	14 10	0000	14.5		24	354	7.80	140	0.090	0.600	1.330	0.066
	14 10	0005	14.5	9.2		354	7.80	141	0.100	0.400	1.340	0.069
	14 10	0015	14.3	9.4		352	7.70	143	0.100	0.500	1.650	0.070
	14 10	0025	14.1	9.0		354	7.70	144	0.120	0.500	1.760	0.068
74/06/17	14 20	0000	23.3	6.2	9	287	7.60	46	0.090	0.500	0.860	0.069
	14 20	0005	23.1	6.2		289	7.60	47	0.090	0.400	0.830	0.068
	14 20	0015	22.9	5.6		283	7.50	46	0.120	0.400	0.840	0.066
	14 20	0025	20.2	3.6		227	7.40	41	0.140	0.500	0.670	0.059
74/08/29	15 05	0000	25.2	6.0	18	416	7.95	118	0.220	1.000	0.920	0.070
	15 05	0005	25.2	5.8		417	7.90	118	0.220	0.900	0.970	0.068
	15 05	0013	25.1	5.4		432	7.80	121	0.270	0.900	0.950	0.064
74/10/22	11 35	0000	16.3	6.4	10	254	7.55	82	0.130	1.000	0.960	0.094
	11 35	0005	16.0	6.2		255	7.50	81	0.150	1.200	0.920	0.085
	11 35	0015	15.7	7.0		253	7.50	82	0.130	1.000	0.900	0.085
	11 35	0023	15.7	6.6		252	7.50	83	0.120	1.100	0.890	0.078

STORET RETRIEVAL DATE 77/03/24

400907
36 43 48.0 094 45 00.0 4
GRAND LAKE OF THE CHEROKEES
40115 OKLAHOMA
100491

/TYPA/AMBNT/LAKE

11EPALES 04001002
0031 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/02	14 10	0000	0.102	10.5	
	14 10	0005	0.094		
	14 10	0015	0.096		
	14 10	0025	0.105		
74/06/17	14 20	0000	0.138	8.7	
	14 20	0003			1.0
	14 20	0005	0.130		
	14 20	0015	0.144		
	14 20	0025	0.180		
74/08/29	15 05	0000	0.173	26.9	
	15 05	0002			1.0
	15 05	0005	0.173		
	15 05	0013	0.184		
74/10/22	11 35	0000	0.228	8.5	
	11 35	0005	0.217		
	11 35	0015	0.215		
	11 35	0023	0.224		

APPENDIX D
TRIBUTARY AND WASTEWATER
TREATMENT PLANT DATA

STORET RETRIEVAL DATE 77/03/24

4009A1
36 28 05.0 095 02 25.0 4
NEOSHO CREEK
40 7.5 SPAVINAW
O/GRAND LK O' CHEROKEES 100491
TURBINE DISCH AT PENSACOLA DAM
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE	TIME	DEPTH	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
FROM TO	OF DAY	FEET					
74/11/02	10 15		0.690	1.000	0.025	0.040	0.050
74/12/15	15 00		0.704	1.100	0.030	0.085	0.140
75/01/02	18 30		0.810	0.469	0.050	0.075	0.110
75/02/15	13 50		1.100	1.000	0.128	0.064	0.120
75/03/15	14 30		1.060	0.900	0.056	0.056	0.180
75/04/19	14 20		1.050	1.000	0.040	0.050	0.080
75/05/17	13 40		1.000	1.400	0.040	0.035	0.100
75/06/15	12 05		0.850	0.350	0.045	0.020	0.050
75/06/23	10 30		0.860	2.200	0.060	0.040	0.420
75/07/27	10 20		0.720	1.000	0.035	0.050	0.120
75/08/09	10 15		0.450	0.550	0.035	0.020	0.050
75/09/06	12 50		0.380	0.650	0.045	0.045	0.150
75/10/19	15 30		0.210	0.600	0.010	0.030	0.050

STORET RETRIEVAL DATE 77/03/24

4009A2
 36 55 45.0 095 57 30.0 4
 NEOSHO CREEK
 40 7.5 MIAMI NW
 T/GRAND LK O' CHEROKEES 100391
 2NDRY RD BRDG 5 MI W OF COMMERCE
 11EPALES 04001004
 0000 FEET DEPTH CLASS 00

/TYP/AMBNT/STREAM

DATE	TIME	DEPTH	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
FROM	OF						
TO	DAY	FEET					
74/11/09	09	07	0.264	1.300	0.060	0.145	0.270
74/12/15	09	30	0.736	2.200	0.075	0.075	0.340
75/01/04	09	50	0.617	1.830	0.080	0.057	0.240
75/02/13	09	30	0.690	1.100	0.016	0.024	0.130
75/03/14	18	25	0.704	1.200	0.116	0.048	0.180
75/04/18	11	10	0.330	1.550	0.070	0.020	0.180
75/05/17	10	45	0.160	1.600	0.025	0.035	0.170
75/06/07	18	00	1.200	3.600	0.020	0.055	0.780
75/07/26	11	40	0.010	0.750	0.025	0.030	0.120
75/08/09	10	00	0.005	0.600	0.020	0.040	0.130
75/09/06	10	25	0.570	1.300	0.015	0.085	0.270
75/10/18	15	00	0.180	1.200	0.055	0.065	0.180

STORET RETRIEVAL DATE 77/03/24

400981
36 41 00.0 094 55 35.0 4
HORSE CREEK
40 7.5 AFTON
T/GRAND LK 01 CHEROKEES 100491
2NDRY RD BRDG 2.0 MI SE AFTON BELOW STP
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYP/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
74/11/02	09 20		0.272	1.500	0.123	0.100	0.210
74/12/15	10 00		0.624	1.900	0.185	0.125	0.260
75/01/02	15 20		0.040	3.500	0.065	0.240	0.720
75/02/15	10 00		1.200	2.100	0.416	0.200	0.440
75/03/14	10 00		0.830	2.200	0.296	0.120	0.290
75/04/19	08 30		0.150	0.900	0.045	0.015	0.080
75/05/17	09 00		0.300	1.900	0.140	0.035	0.140
75/06/15	12 45		1.500	2.150	0.035	0.060	0.230
75/06/23	11 20		0.260	1.350	0.375	0.220	0.384
75/07/27	11 00		0.195	3.450	1.200	0.630	1.400
75/08/09	11 25		0.015	2.350	0.120	0.230	0.715
75/09/06	09 30		0.105	2.700	0.115	0.175	0.580
75/10/19	10 15		0.010	2.000	0.020	0.110	0.460

STORET RETRIEVAL DATE 77/03/24

400982
36 41 45.0 097 30 00.0 4
HORSE CREEK
40 7.5 AFTON
T/GRAND LK 01 CHEROKEES 100291
BRDG NE AFTON AT HWYS 66/69/60 ABV STP
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE	TIME	DEPTH	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
FROM	OF						
TO	DAY	FEET					
74/11/02	09	00	0.144	1.900	0.090	0.060	0.190
74/12/14	09	45	0.384	1.400	0.100	0.055	0.160
75/01/02	15	00	0.920	3.110	0.725	0.175	0.515
75/02/15	09	30	0.540	1.100	0.248	0.032	0.140
75/03/15	09	50	0.368	1.450	0.168	0.040	0.175
75/04/19	08	55	0.990	1.600	0.020	0.160	0.300
75/05/17	09	22	0.860	4.060	0.510	0.175	0.420
75/06/15	12	30	0.525	1.850	0.090	0.085	0.260
75/06/23	11	03	0.220	1.250	0.165	0.060	0.170
75/07/27	10	40	0.580	1.800	0.330	0.230	0.400
75/08/09	11	05	0.015	1.350	0.030	0.070	0.270
75/09/06	09	10	0.075	1.250	0.080	0.080	0.240
75/10/19	09	45	0.015	1.200	0.015	0.105	0.320

STORET RETRIEVAL DATE 77/03/24

4009C1
36 45 55.0 094 48 30.0 4
OGEECHEE CREEK
40 7.5 MIAMI SE
TAGRAND LK 0.1 CHEROKEES 100491
2NDRY RD BRDG 2.5 MI NE OF FAIRLAND
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYP/AMBNT/STREAM

DATE	TIME	DEPTH	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
FROM	OF						
TO	DAY	FEET					
74/11/09	10	50	0.800	0.500	0.025	0.085	0.110
74/12/14	09	42	0.690	1.000	0.030	0.065	0.090
75/01/04	16	15	0.480	1.550	0.028	0.064	0.120
75/02/15	09	52	0.590	0.300	0.052	0.048	0.080
75/03/15	10	16	0.528	0.700	0.104	0.040	0.070
75/04/18	10	05	0.020	0.600	0.010	0.010	0.020
75/05/17	14	47	0.025	0.600	0.015	0.025	0.060
75/07/26	10	20	0.035	1.700	0.080	0.040	0.160
75/09/06	10	30	0.055	1.030	0.060	0.040	0.150
75/10/18	15	25	0.005	0.600	0.015	0.175	0.310

STORET RETRIEVAL DATE 77/03/24

4009D1
36 52 55.0 094 53 15.0 4
TAR CREEK
40 7.5 PICHER
T/GRAND LK O' CHEROKEES 100491
BANK SAMPLE NE OF MTAMI BELO STP
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYP/AMBNT/STREAM

DATE	TIME	DEPTH	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
FROM	OF						
TO	DAY	FEET					
74/11/09	08 45		0.240	1.300	0.240	0.010	0.220
74/12/14	10 00		0.416	1.050	0.105	0.050	0.265
75/01/04	10 15		0.384	1.175	0.084	0.054	0.225
75/02/15	10 00		0.448	1.400	0.384		0.420
75/03/14	18 45		0.464	0.900	0.104	0.056	0.170
75/04/18	10 45		1.250	1.950	0.045	0.080	0.610
75/05/17	11 15		4.500	2.300	0.040	1.150	1.570
75/07/26	12 00		4.200	2.200	0.330	2.000	2.100
75/08/09	09 00		7.400	1.350	0.055	3.400	3.900
75/09/06	11 00		9.800	2.100	0.045	4.100	4.700
75/10/18	13 30		5.500	10.000	2.750	1.950	2.500

STORET RETRIEVAL DATE 77/03/24

400902
36 56 40.0 094 53 45.0 4
TAR CREEK
40 7.5 PICHER
T/GRAND LK 01 CHEROKEES 100491
BANK SAMPLE 1.3 MI NE COMMERCE BELO STP
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYP/AMBNT/STREAM

DATE	TIME	DEPTH	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
FROM	OF						
TO	DAY	FEET					
74/11/09	09 27		0.216	1.000	0.185	0.010	0.150
74/12/14	09 00		0.504	1.500	0.775	0.025	0.290
75/01/04	09 30		0.328	1.600	0.124	0.040	0.170
75/02/15	09 15		0.336	1.000	0.432	0.056	0.230
75/03/14	18 15		0.288	0.900	0.112	0.040	0.150
75/04/18	11 40		0.340	3.150	1.150	0.040	0.690
75/05/17	10 30		0.860	4.710	2.500	0.520	1.100
75/06/07	18 20		0.470	2.300	1.200	0.295	1.450
75/07/26	11 24		5.100	13.500	6.900	8.300	12.000
75/08/09	09 45		1.100	11.000	1.900	2.500	11.000
75/09/06	10 00		2.900	8.500	6.100	10.500	10.800
75/10/18	12 00		2.850	8.000	4.800	1.500	3.100

STORET RETRIEVAL DATE 77/03/24

4009E1
36 56 00.0 095 00 00.0 4
SPRING RIVER
40 7.5 PEURIA
T/GRAND LK O' CHEROKEES 100491
2NDRY RD BPDG 2 MI ESE QUOPAW
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE	TIME	DEPTH	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
FROM	OF						
TO	DAY	FEET					
74/11/09	09 45		1.920	0.900	0.110	0.090	0.140
74/12/14	08 50		1.520	1.300	0.130	0.110	0.260
75/01/04	09 10		1.540	1.500	0.304	0.075	0.195
75/02/15	09 00		2.400	0.900	0.112	0.096	0.170
75/03/14	17 45		1.200	1.000	0.200	0.072	0.190
75/04/18	11 55		1.880	1.150	0.030	0.085	0.130
75/05/17	10 00		2.200	1.150	0.040	0.155	0.200
75/07/26	11 05		2.200	1.250	0.050	0.270	0.370
75/08/09	09 30		2.300	0.600	0.015	0.280	0.340
75/09/06	09 30		1.500	0.700	0.020	0.260	0.350
75/10/18	12 00		2.400	1.000	0.080	0.260	0.380

STORET RETRIEVAL DATE 77/03/24

4009F1
36 48 10.0 094 48 00.0 4
LOST CREEK
40 7.5 WYANDOTTE
T/GRAND LK 01 CHEROKEES 100491
HWY 60 BRDG 1.5 MI NE OF WYANDOTTE
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYP/AMBNT/STREAM

DATE	TIME	DEPTH	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
FROM	OF						
TO	DAY	FEET					
74/11/09	11	12	1.600	0.200	0.020	0.045	0.070
74/12/14	09	23	1.520	0.300	0.015	0.035	0.050
75/01/04	09	06	1.680	0.550	0.044	0.050	0.055
75/02/15	09	30	1.700	0.300	0.024	0.048	0.075
75/03/15	09	53	1.300	0.500	0.024	0.032	0.050
75/04/18	09	40	1.500	0.650	0.015	0.035	0.040
75/07/26	10	00	1.100	0.400	0.040	0.110	0.150
75/08/09	10	15	0.840	0.350	0.025	0.113	0.140
75/09/06	10	05	0.810	0.300	0.015	0.125	0.150
75/10/18	15	00	0.580	0.400	0.015	0.110	0.140

STORET RETRIEVAL DATE 77/03/24

4009G1
 36 46 40.0 094 40 50.0 4
 SYCAMORE CREEK
 40 7.5 WYANDOTTE
 T/GRAND LK O' CHEROKEES 100491
 2NDRY RD BRDG 2.6 MI SE OF WYANDOTTE
 11EPALES 04001004
 6000 FEET DEPTH CLASS 00

/TYP/AMBNT/STREAM

DATE	TIME	DEPTH	00630 NO2&NO3 N-TOTAL MG/L	00625 TUT KJEL N MG/L	03610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
FROM	OF						
TO	DAY	FEET					
74/11/09	11	25	2.320	0.200	0.015	0.030	0.030
74/12/14	09	11	2.320	0.400	0.025	0.020	0.020
75/01/04	16	34	2.240	0.300	0.016	0.020	0.020
75/02/15	09	15	2.300	0.600	0.032	0.024	0.040
75/03/15	09	30	1.950	0.200	0.016	0.016	0.050
75/04/18	09	18	2.400	0.200	0.010	0.015	0.020
75/05/17	14	08	2.300	0.800	0.020	0.030	0.040
75/07/26	09	52	1.400	0.900	0.035	0.040	0.050
75/08/09	10	00	1.100	0.300	0.030	0.045	0.060
75/09/06	09	50	1.050	0.100	0.040	0.050	0.060
75/10/18	14	45	1.250	0.100	0.025	0.025	0.030

STORET RETRIEVAL DATE 77/03/24

4009H1
36 40 15.0 094 38 45.0 4
BUFFALO CREEK
40 7.5 TIFF CITY
T/GRAND LK O' CHEROKEES 100491
MO HWY 76143 BRDG 0.7 MI NE OF TIFF CITY
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYP/AMBNT/STREAM

DATE	TIME	DEPTH	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
FROM	OF						
TO	DAY	FEET					
74/11/09	11	56	1.520	0.100	0.020	0.020	0.020
74/12/14	08	37	1.320	0.300	0.015	0.015	0.015
75/01/04	08	39	1.280	0.600	0.008	0.015	0.015
75/02/15	08	41	1.200	0.400	0.016	0.016	0.030
75/03/15	09	54	1.200	0.100K	0.008	0.016	0.020
75/04/18	08	40	0.930	0.275	0.025	0.005	0.010K
75/05/17	13	30	0.975	0.400	0.025	0.015	0.020
75/07/26	09	30	0.700	0.950	0.030	0.020	0.030
75/08/09	09	25	0.550	0.100	0.020	0.030	0.040
75/09/06	09	17	0.550	0.550	0.020	0.035	0.050
75/10/18	14	10	0.470	0.200	0.020	0.015	0.050

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 77/03/24

4009J1
36 37 50.0 394 35 15.0 4
ELK RIVER
40 .5 TIFF CITY
T/GRAND LK OF CHEROKEES 100491
MO HWY 43 BRDG 2.3 MI N OF JCT W MO 10
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYP4/AMBT/STREAM

DATE	TIME	DEPTH	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
FROM	OF						
TO	DAY	FEET					
74/11/09	12	25	1.600	0.300	0.030	0.025	0.040
74/12/14	08	30	1.120	0.300	0.015	0.015	0.020
75/01/04	17	07	1.110	0.650	0.016	0.020	0.030
75/02/15	08	23	1.150	0.500	0.040	0.016	0.050
75/03/15	08	34	1.100	0.450	0.032	0.016	0.040
75/04/18	08	25	0.870	0.750	0.020	0.005	0.010K
75/05/17	13	12	0.630	0.300	0.020	0.010	0.030
75/07/26	09	15	0.710	1.050	0.060	0.035	0.050
75/08/09	09	10	0.490	0.250	0.045	0.030	0.050
75/09/06	04	00	0.560	0.400	0.015	0.040	0.070
75/10/18	13	53	0.525	0.300	0.025	0.020	0.040

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 77/03/24

4009K1
36 32 36.0 094 42 55.0 4
HONEY CREEK
40 7.5 DUDGE
T/GRAND LK O' CHEROKEES 100491
UNIMPROVED RD XING 4 MI SE OF GROVE
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYP/AMBT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TUT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/12/15	11 15		1.040	0.600	0.025	0.020	0.020
75/01/02	16 00		1.480	0.167	0.020	0.035	0.035
75/02/15	11 00		1.600	0.900	0.010	0.044	0.080
75/03/15	11 00		1.300	0.500	0.016	0.032	0.050
75/04/19	09 45		1.350	0.250	0.020	0.020	0.020
75/05/17	10 15		1.150	0.370	0.055	0.035	0.040
75/05/23	12 05		1.250	0.275	0.015	0.035	0.040
75/06/15	13 20		1.200	1.000	0.030		0.070
75/07/27	11 30		0.670	1.200	0.100		
75/08/09	12 20		0.790	0.300	0.025	0.040	0.050
75/09/06	10 10		0.880	0.300	0.015	0.050	0.085
75/10/18	11 30		0.900	0.200	0.020	0.025	0.060

STORET RETRIEVAL DATE 77/03/24

40091L
36 19 05.0 094 50 10.0 4
DRY CREEK
40 7.5 LAKE EUCHA E
T/GRAND LK 01 CHERUKEES 190491
2NDRY RD XING 3 MI SW OF JCT W HWY 59
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYP/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
74/11/02	12 50		0.448	0.300	0.015	0.015	0.015
74/12/15	13 15		0.320	0.300	0.025	0.010	0.010
75/01/02	17 40		0.008	0.211	0.005	0.010	0.010
75/02/15	12 35		0.240	0.200	0.005	0.010	0.030
75/03/15	12 50		0.230	0.100K	0.008	0.008	0.020
75/04/19	10 50		0.150	0.450	0.010	0.005	0.010K
75/05/17	10 45		0.210	2.200	0.040	0.010	0.010
75/05/23	13 20		0.220	0.450	0.022	0.007	0.040
75/06/15	14 25		0.300	0.150	0.025	0.015	0.030
75/07/27	12 30		0.230	0.150	0.025	0.020	0.030
75/08/09	13 30		0.290	0.050K	0.015	0.015	0.015
75/09/06	10 50		0.360	0.575	0.015	0.025	0.045
75/10/19	13 00		0.270	0.100K	0.005K	0.010	0.010

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 77/03/24

40091M
36 18 58.0 094 58 55.0 4
SALINE CREEK
40 7.5 LAKE EUCHA W
T/GRAND LK O' CHEROKEES 100491
2NDRY RD XING JUST ENE OF KENWOOD
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYP/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
74/11/02	13 30		0.520	0.200	0.010	0.006	0.010K
74/12/15	13 40		0.280	0.100K	0.015	0.005	0.010K
75/01/02	18 00		0.264	0.232	0.015	0.005	0.010K
75/02/15	12 35		0.250	0.100K	0.008	0.008	0.020
75/03/15	13 20		0.280	0.600	0.008	0.008K	0.010
75/04/19	12 55		0.157	0.400	0.010	0.005K	0.010K
75/05/17	11 20		0.190	0.550	0.025	0.010	0.010
75/06/15	14 00		0.220	0.150	0.080	0.005	0.020
	14 45		0.280	1.400	0.025	0.010	0.030
75/07/27	13 45		0.400	0.050K	0.015	0.010	0.020
75/08/09	14 30		0.230	0.150	0.025	0.010	0.010
75/09/06	11 50		0.315	0.500	0.010	0.022	0.040
75/10/19	14 15		0.330	0.100	0.005	0.010	0.010

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 77/03/24

40092M
 36 18 58.0 094 54 15.0 4
 SALINE CREEK
 40 7.5 LAKE EUCHA W
 T/GRAND LK O' CHEROKEES 100491
 2NDRY RD XING JUST W OF ESTELLE CHURCH
 11EPALES 04001004
 0000 FEET DEPTH CLASS 00

/TTPA/AMBN/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
74/11/02	13 45		0.480	0.200	0.090	0.015	0.015
74/12/15	13 25		0.256	0.100K	0.010	0.005	0.010K
75/01/02	17 50		0.336	0.101	0.015	0.005	0.010K
75/02/15	12 35		0.264	0.200	0.008	0.008	0.020
75/03/15	13 00		0.272	0.500	0.064	0.008K	0.010
75/04/14	12 05		0.155	0.800	0.020	0.010	0.010
75/05/17	11 50		0.200	0.450	0.025	0.005	0.010K
75/06/15	13 30		0.300	0.050K	0.025	0.010	0.030
	14 35		0.310	0.300	0.020	0.010	0.030
75/07/27	13 00		0.345	0.050K	0.015	0.010	0.025
75/09/06	11 20		0.360	0.100	0.010	0.020	0.030
75/10/14	13 30		0.330	0.150	0.005	0.010	0.010

K VALUE KNOWN TO BE
 LESS THAN INDICATED

STORET RETRIEVAL DATE 77/03/24

400921 TF400921 P001300
 36 21 00.0 094 45 00.0 4
 GROVE
 40 DELAWARE CO MAP
 D/GRAND LAKE CHEROKEES 100491
 GRAND LAKE CHEROKEES
 11EPALES 00001004
 0000 FEET DEPTH CLASS 00

/AMBN/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	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/05/08	08 30		1.300	22.000	6.100	6.400	17.000	0.040	0.116
75/05/29	08 30		2.000	14.000	1.750	11.000	11.000	0.010	0.015
75/06/19	08 30		5.750	7.300	0.260	7.600	8.900	0.040	0.080
75/07/16	09 10		9.600	15.000	2.000	13.000	14.400	0.110	0.250
75/07/31	08 45		4.730	11.500	1.300	13.500	15.000	0.100	0.150
75/08/21	09 00		5.200	14.500	1.380	15.000	16.000	0.010	0.200
75/09/11	09 10		6.200	7.300	0.640	13.000	15.000	0.074	0.077
75/10/02	10 30		8.100	27.500	10.000	8.500	10.500	0.019	0.020
75/10/23	09 25		8.700	23.000	6.100	11.000	12.300	0.013	0.012
75/11/13	09 15		5.600	27.000	11.000	12.600	14.500	0.124	0.115
75/12/04	09 00		4.500	28.000	17.000	14.000	18.500	0.113	0.115
75/12/26	09 15		2.500	23.000	7.200	6.900	9.900	0.130	0.125
76/01/15	09 35		0.350	32.000	20.000	11.000	14.500	0.115	0.185

STORET RETRIEVAL DATE 77/03/24

4009AA TF4009AA
 36 54 00.0 094 53 00.0 4
 MIAMI TRICKLING FIL.
 40 7.5 MIAMI
 T/GRAND LAKE CHEWOKES 100491
 NEOSHO RIVER
 11EPALES 00001004
 0000 FEET DEPTH CLASS 00

/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2AN03 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
75/05/20	11 00		10.000	8.100	0.068	7.700	7.850	0.500	0.650
75/06/10	11 00								
CP(T)-			8.000	16.000	0.160	6.100	10.000	0.600	0.600
75/06/10	16 00								
75/07/01	11 00								
CP(T)-			11.000	5.000	0.225	7.100	7.700	0.300	0.600
75/07/01	16 00								
75/07/22	11 00								
CP(T)-			10.000	6.100	0.350	8.100	8.300	1.400	0.700
75/07/22	16 00								
75/08/12	11 00								
CP(T)-			10.500	6.300	0.390	6.950	8.000	0.800	0.800
75/08/12	16 00								
75/09/04	11 00								
CP(T)-			9.900	7.800	0.475	7.800	8.400	1.000	1.000
75/09/04	16 00								
75/09/23	11 00								
CP(T)-			8.400	14.000	2.300	7.900	8.500	0.950	1.000
75/09/23	16 00								
75/10/14	11 00								
CP(T)-			9.500	10.500	2.100	7.900	8.800	1.000	1.000
75/10/14	16 00								
75/11/04	11 00								
CP(T)-			11.000	1.600	1.540	6.900	7.400	1.300	0.900
75/11/04	16 00								
75/11/25	11 00								
CP(T)-			11.500	18.000	5.200	8.500	9.200	0.950	0.900
75/11/25	16 00								
75/12/16	11 00								
CP(T)-			9.800	12.000	1.140	4.000	5.800	2.200	1.300
75/12/16	16 00								
76/02/23			5.800	18.000	3.900	6.300	7.800		

STORET RETRIEVAL DATE 77/03/24

4009AB AS4009AB
36 54 00.0 094 53 00.0 4
MIAMI ACTIVATED SL.
40 7.5 MIAMI
T/GRAND LAKE CHEROKEES 100491
NEOSHO RIVER
11EPALES 00001004
0000 FEET DEPTH CLASS 00

/AMBNT/STREAM

DATE	TIME	DEPTH	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
FROM	OF								
TO	DAY	FEET							
76/01/27	11	00							
CP(T)-			1.700	17.000	9.000	6.100	7.500	0.350	0.300
76/01/27	16	00							

STORET RETRIEVAL DATE 77/03/24

4009AC PD4009AC
36 54 00.0 094 53 00.0 4
MIAMI LAGOON
40 7.5 MIAMI
T/GRAND LAKE CHEROKEES 100491
NEOSHO RIVER
11EPALES 00001004
0000 FEET DEPTH CLASS 00

/AMBN/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	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/05/20	11 00								
CP(T)-			0.413	6.500	0.050K	2.250	2.600		
75/05/20	16 00								
75/06/10	11 00								
CP(T)-			0.050	3.100	0.050K	0.860	1.400		
75/06/10	16 00								
75/07/01	11 00								
CP(T)-			0.025	4.700	0.100	0.480	0.840		
75/07/01	16 00								
75/07/22	11 00								
75/08/12	11 00								
CP(T)-			0.125	4.500	0.120	0.590	1.100		
75/08/12	16 00								
75/09/04	11 00								
CP(T)-			0.100	3.400	0.075	0.410	0.580		
75/09/04	16 00								
75/09/23	11 00								
CP(T)-			0.025	5.900	0.150	0.490	0.800		
75/09/23	16 00								
75/10/14	11 00								
CP(T)-			0.050	4.600	0.120	0.900	1.700		
75/10/14	16 00								
75/11/04	11 00								
CP(T)-			0.100	8.500	0.062	2.630	3.500		
75/11/04	16 00								
75/11/25	11 00								
CP(T)-			0.025	12.000	0.390	4.500	5.400		
75/11/25	16 00								
75/12/16	11 00								
CP(T)-			0.100	11.000	0.394	4.450	5.800		
75/12/16	16 00								
76/01/06	11 00								
CP(T)-			0.250	9.300	0.230	4.100	4.800		
76/01/06	16 00								

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 77/03/24

4009AD PD4009AD P000000*
 36 54 00.0 094 54 00.0 4
 B.F. GOODRICH CO.
 40 7.5 MIAMI
 T/GRAND LAKE CHEROKEES 100491
 NEOSHO RIVER
 11EPALES 00001004
 0000 FEET DEPTH CLASS 00

/AMBNT/STREAM

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	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/06/04	08 30		0.100	0.500K	0.160	0.340	0.470	1.000	1.000
75/06/18	08 00		0.050	2.900	0.060	0.280	0.360	1.000	1.000
75/07/02	08 00		0.025	1.000	0.084	0.295	0.382	1.000	1.000
75/07/16	09 00		0.025	0.310	0.025K	0.400	0.470	0.200	0.200
75/07/30	08 00		0.025	0.400	0.025K		0.300	1.000	1.000
75/08/13	08 30		0.075	1.300	0.075	0.200	0.250	1.000	1.000
75/08/27	08 00		0.100	1.500	0.025K	0.730	1.100	1.000	1.000
75/09/10	08 00		0.075	0.770	0.082	0.440	0.440	1.000	1.000
75/09/24	08 15		0.025	0.420	0.133	0.300	0.420	1.000	1.000
75/10/08	08 00		0.025	1.400	0.025	0.080	0.330	1.000	1.000
75/10/22	08 00		0.070	2.000	0.100	0.130	0.290	1.000	1.000
75/11/05	09 00		0.050	2.300	0.025K	0.330		2.000	

K VALUE KNOWN TO BE
 LESS THAN INDICATED

STORET RETRIEVAL DATE 77/03/24

4009BA TF4009BA P000800
36 43 00.0 094 58 00.0 4
AFTON
40 7.5 AFTON
T/GRAND LAKE CHEROKEES 100491
HORSE CREEK
11EPALES 00001004
0000 FEET DEPTH CLASS 00

/AMBNT/STREAM

DATE	TIME	DEPTH	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
FROM	OF								
TO	DAY	FEET							
75/06/09			4.700	5.300	0.059	2.600	3.600		
75/07/11	08 30		0.050	8.500	11.500	8.200	9.100	0.100	

STORET RETRIEVAL DATE 77/03/24

4009CA PR4009CA
 36 45 00.0 094 50 50.0 4
 FAIRLAND IMHOFF
 40 7.5 MIAMI SE
 T/GRAND LAKE CHEROKEES 100491
 OGEECHEE CREEK
 11EPALES 00001004
 0000 FEET DEPTH CLASS 00

/AMBN/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N02&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	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/05/22	13 25		15.800	4.800	0.050K	9.030	9.700	0.009	0.010
75/06/13	14 45		4.000	4.300	0.280	6.700	7.400	0.019	0.017
75/12/01	08 50		6.600	7.000	0.120	4.200	4.700	0.010	0.006
75/12/22	14 00		8.400	7.000	0.025K	4.100	5.000	0.010	0.010
76/01/13	15 30		6.900	11.000	2.300	6.300	8.400	0.007	0.008
76/02/23	08 30		10.500	3.000	0.300	6.000	6.200	0.006	0.006
76/03/15	10 00		0.400	3.600	0.075	3.300	4.300	0.006	0.006
76/04/07	09 30		0.240	2.200	0.040	6.200	6.300	0.007	0.008
76/05/10	10 00			1.500			5.600	0.006	0.005

K VALUE KNOWN TO BE
 LESS THAN INDICATED

STORET RETRIEVAL DATE 77/03/24

4009FA TF4009FA P000000*
 36 48 00.0 094 36 00.0 4
 MILNOT DAIRY CO.
 40 7.5 SENECA
 T/GRAND LAKE CHEROKEES 100491
 LOST CREEK
 11EPALES 00001004
 0000 FEET DEPTH CLASS 00

/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	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
65/05/08	09 00								
CP(T)-								0.540	0.410
75/05/08	09 00								
75/05/08	09 00		0.050	3.700	0.160	22.000	22.000	0.540	0.410
75/05/30	10 30								
CP(T)-			0.050	2.200	0.066	21.000	25.000	0.042	0.042
75/05/31	10 30								
75/06/19	09 00								
CP(T)-			0.050	3.100	0.050K	20.000	22.000	0.058	0.045
75/06/20	09 00								
75/07/10	09 00								
CP(T)-			0.025	1.600	0.025K	19.000	22.000	0.550	0.440
75/07/11	09 00								
75/08/08	09 00								
CP(T)-			0.025	3.400	0.025K	23.000	27.000	0.570	0.470
75/08/09	09 00								
75/08/21	09 00								
CP(T)-			0.025	4.600	0.025K	14.500	15.500	0.590	0.475
75/08/22	09 00								
75/09/18	09 00								
CP(T)-			0.025	6.000	0.088	17.500	22.000	0.550	0.460
75/09/19	09 00								
75/10/10	00 00								
CP(T)-			0.070	4.000	0.025K	22.000	23.000		0.520
75/10/10	24 00								
75/11/13	00 00								
CP(T)-			0.025	4.500	0.025	17.500	21.700	0.450	0.437
75/11/14	24 00								
75/12/11	00 00								
CP(T)-			0.052	3.000	0.025K	27.000	35.000	0.443	0.448
75/12/12	24 00								

K VALUE KNOWN TO BE
 LESS THAN INDICATED

STORET RETRIEVAL DATE 77/03/24

4009XA PD4009XA
 36 45 00.0 094 51 10.0 4
 FAIRLAND LAGOON
 40 7.5 MIAMI SE
 T/GRAND LAKE CHEROKEES 100491
 HUDSON CREEK
 11EPALES 00001004
 0000 FEET DEPTH CLASS 00

/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	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/05/17	09 30		0.100	13.500	0.064	2.950	4.200	0.018	0.020
75/06/13	15 05		0.100	7.200	0.050K	1.300	4.400	0.720	0.050
75/11/07	12 00		0.125	17.000	0.035	3.200	5.300		0.030
75/12/01	09 00		0.350	16.000	0.140	5.800	7.500	0.100	0.030
75/12/22	14 10		0.375	15.000	0.800	5.000	7.400	0.030	0.030
76/02/01	10 00		0.275	12.000	0.067	4.800	6.700	0.100	0.150
	10 30		0.300	5.700	0.094	4.800	9.400	0.008	0.008
76/02/23	09 00		0.350	14.000	0.075	3.000	4.500	0.075	0.100
76/03/15	09 00		0.470	7.200	0.150	3.000	4.000	0.100	0.750
76/04/07	09 00		0.075	12.500	0.150		3.400	0.125	0.150
76/05/10	09 45			5.500			2.800	0.100	

K VALUE KNOWN TO BE
 LESS THAN INDICATED

APPENDIX E
PARAMETRIC RANKINGS OF LAKES
SAMPLED BY NES IN 1974
STATE OF OKLAHOMA

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
4001	ALTUS RESERVOIR	0.041	0.060	468.625	14.750	8.400	0.010
4002	ARBUCKLE LAKE	0.020	0.070	443.600	7.027	14.600	0.008
4003	LAKE ELLSWORTH	0.037	0.070	459.400	8.430	9.400	0.009
4004	LAKE EUFAULA	0.081	0.405	482.513	4.383	14.200	0.029
4005	FORT COBB RESERVOIR	0.038	0.110	454.667	14.967	8.400	0.012
4006	FORT SUPPLY RESERVOIR	0.070	0.135	485.167	9.733	7.800	0.014
4007	FOSS DAM RESERVOIR	0.027	0.090	463.857	4.862	8.400	0.006
4008	LAKE FRANCES	0.142	1.780	484.333	7.973	8.200	0.093
4009	GRAND LAKE OF THE CHEROK	0.087	0.740	468.857	6.768	14.800	0.038
4010	LAKE HEFNER	0.057	0.250	461.000	5.667	9.000	0.036
4011	KEYSTONE RESERVOIR	0.136	0.690	484.303	21.427	14.900	0.096
4012	OOLOGAH LAKE	0.059	0.580	483.000	5.137	14.600	0.031
4013	TENKILLER FERRY RESERVOIR	0.039	0.550	435.500	6.646	15.000	0.016
4014	LAKE THUNDERBIRD	0.027	0.150	465.000	8.422	12.000	0.009
4015	WISTER RESERVOIR	0.080	0.230	478.500	4.812	15.000	0.016
4834	TEXOMA LAKE	0.045	0.160	460.875	12.325	14.600	0.016

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
4001	ALTUS RESERVOIR	60 (9)	100 (15)	47 (7)	13 (2)	80 (11)	73 (11)
4002	ARBUCKLE LAKE	100 (15)	90 (13)	93 (14)	53 (8)	33 (4)	93 (14)
4003	LAKE ELLSWORTH	80 (12)	90 (13)	80 (12)	33 (5)	60 (9)	87 (13)
4004	LAKE EUFAULA	20 (3)	33 (5)	27 (4)	100 (15)	47 (7)	33 (5)
4005	FORT COBB RESERVOIR	73 (11)	73 (11)	87 (13)	7 (1)	80 (11)	67 (10)
4006	FORT SUPPLY RESERVOIR	33 (5)	67 (10)	0 (0)	27 (4)	100 (15)	60 (9)
4007	FOSS DAM RESERVOIR	93 (14)	80 (12)	60 (9)	87 (13)	80 (11)	100 (15)
4008	LAKE FRANCES	0 (0)	0 (0)	7 (1)	47 (7)	93 (14)	7 (1)
4009	GRAND LAKE OF THE CHEROK	13 (2)	7 (1)	40 (6)	60 (9)	20 (3)	13 (2)
4010	LAKE HEFNER	47 (7)	40 (6)	67 (10)	73 (11)	67 (10)	20 (3)
4011	KEYSTONE RESERVOIR	7 (1)	13 (2)	13 (2)	0 (0)	13 (2)	0 (0)
4012	OOLOGAH LAKE	40 (6)	20 (3)	20 (3)	80 (12)	33 (4)	27 (4)
4013	TENKILLER FERRY RESERVOIR	67 (10)	27 (4)	100 (15)	67 (10)	3 (0)	50 (7)
4014	LAKE THUNDERBIRD	87 (13)	60 (9)	53 (8)	40 (6)	53 (8)	80 (12)
4015	WISTER RESERVOIR	27 (4)	47 (7)	33 (5)	93 (14)	3 (0)	40 (6)
4834	TEXOMA LAKE	53 (8)	53 (8)	73 (11)	20 (3)	33 (4)	50 (7)