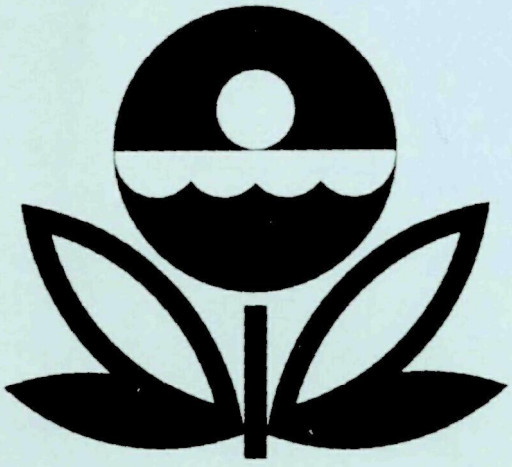
# U.S. ENVIRONMENTAL PROTECTION AGENCY
# NATIONAL EUTROPHICATION SURVEY

## WORKING PAPER SERIES



REPORT

ON

O. C. FISHER (SAN ANGELO) RESERVOIR

TOM GREEN COUNTY

TEXAS

EPA REGION VI

WORKING PAPER No. 656

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

**and**

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

☆G.P.O. 699-440

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WITH THE COOPERATION OF THE

TEXAS WATER QUALITY BOARD

AND THE

TEXAS NATIONAL GUARD

MARCH, 1977

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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 non-point source pollution abatement in lake watersheds.

## ANALYTIC APPROACH

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

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

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

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

## LAKE ANALYSIS

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

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

ACKNOWLEDGEMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Texas Water Quality Board for professional involvement, to the Texas National Guard for conducting the tributary sampling phase of the Survey, and to those Texas wastewater treatment plant operators who voluntarily provided effluent samples.

Hugh C. Yantis, Jr., Executive Director of the Texas Water Quality Board, and John B. Latchford, Jr., Director, and the staff of the Field Operations Division provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

Major General Thomas Bishop, the Adjutant General of Texas, and Project Officer Colonel William L. Seals, who directed the volunteer efforts of the Texas National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

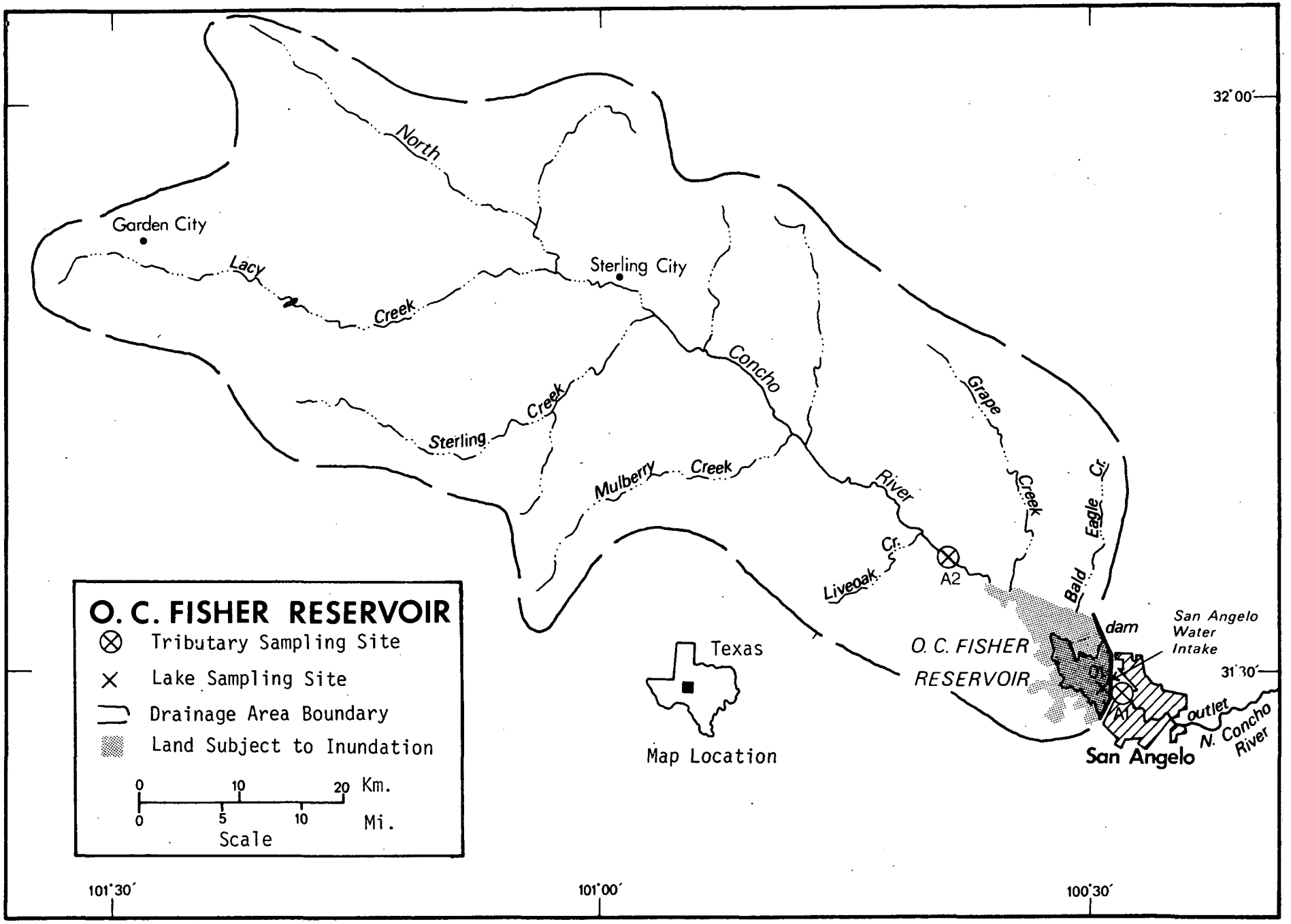
NATIONAL EUTROPHICATION SURVEY

STUDY RESERVOIRS

State of Texas

| NAME | COUNTY |
|---|---|
| Amistad | Val Verde |
| Bastrop | Bastrop |
| Belton | Bell, Coryell |
| Braunig | Bexar |
| Brownwood | Brown |
| Buchanan | Burnet, Llano |
| Caddo | Harrison, Marion, TX; Caddo Parish, LA |
| Calaveras | Bexar |
| Canyon | Comal |
| Colorado City | Mitchell |
| Corpus Christi | Jim Wells, Live Oak, San Patricio |
| Diversion | Archer, Baylor |
| Eagle Mountain | Tarrant, Wise |
| Fort Phantom Hill | Jones |
| Houston | Harris |
| Kemp | Baylor |
| Lake O'The Pines | Camp, Marion, Morris, Upshur |
| Lavon | Collin |
| Lewisville (Garza-Little Elm) | Denton |
| Livingston | Polk, San Jacinto, Trinity, Walker |

| | |
|---|---|
| Lyndon B. Johnson | Burnet, Llano |
| Medina | Bandera, Medina |
| Meredith | Hutchinson, Moore, Potter |
| O. C. Fisher (San Angelo) | Tom Green |
| Palestine | Anderson, Cherokee, Henderson, Smith |
| Possum Kingdom | Palo Pinto, Stephens, Young |
| Sam Rayburn | Angelina, Jasper Nacogdoches, Sabine, San Augustine |
| Somerville | Burleson, Lee, Washington |
| E. V. Spence | Coke |
| Stamford | Haskell |
| Stillhouse Hollow | Bell |
| Tawakoni | Hunt, Rains, Van Zandt |
| Texoma | Cooke, Grayson TX; Bryan, Johnston, Love, Marshall, OK |
| Travis | Burnet, Travis |
| Trinidad | Henderson |
| Twin Buttes | Tom Green |
| White River | Crosby |
| Whitney | Bosque, Hill |
| Wright Patman (Texarkana) | Bowie, Cass |


O. C. FISHER RESERVOIR
Tributary Sampling Site
Lake Sampling Site
Drainage Area Boundary
Land Subject to Inundation
0 10 20 Km.
0 5 10 Mi.
Scale
Texas
Map Location
Garden City
Sterling City
San Angelo
North
Lacy
Creek
Concho
Sterling
Creek
Mulberry
Creek
River
Grape
Creek
Bald
Eagle
Cr.
Liveoak
Cr.
A2
A1
dam
San Angelo
Water
Intake
outlet
N. Concho
River
O. C. FISHER
RESERVOIR
32°00′
31°30′
101°30′
101°00′
100°30′

vi

# O. C. FISHER RESERVOIR

## STORET NO. 4826

## I. CONCLUSIONS

### A. Trophic Condition:

Survey data indicate that O. C. Fisher Reservoir is eutrophic; i.e., well supplied with nutrients and quite productive. Whether nutrient enrichment is beneficial or deleterious depends on the actual or potential effect on the uses of the reservoir. In this regard, no nuisance conditions are known to personnel of the Texas Water Quality Board and there is little or no impairment of the designated beneficial uses of this water body.

O. C. Fisher Reservoir ranked thirty-second in overall trophic quality when the 39 Texas reservoirs sampled in 1974 were compared using a combination of six parameters*. Thirty-three of the reservoirs had less median total phosphorus, 20 had less and one had the same median dissolved orthophosphorus, 21 had less median inorganic nitrogen, all of the other reservoirs had less chlorophyll a, and 35 had greater mean Secchi disc transparency.

Survey limnologists noted surface concentrations of algae in August.

### B. Rate-Limiting Nutrient:

The algal assay results indicate the reservoir was nitrogen limited at the time the sample was taken (10/29/74). The reservoir data indicate nitrogen limitation in March as well but phosphorus limitation in May.

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* See Appendix A.

C. Nutrient Controllability:

1. Point sources--No known municipal or industrial point sources impacted O. C. Fisher Reservoir during the sampling year.

There are no lakeshore septic tanks because construction of shoreline dwellings if prohibited*.

Based on the reservoir morphometry at the conservation-pool level, the present phosphorus loading of 0.06 $g/m^2/yr$ is about equal to that proposed by Vollenweider (Vollenweider and Dillon, 1974) as an oligotrophic loading (see page 12). If Vollenweider's oligotrophic level is applicable to Texas water bodies, non-point phosphorus loadings to the reservoir in past years must have been much greater than measured during the sampling year since Survey data indicate O. C. Fisher Reservoir is eutrophic.

2. Non-point sources--All of the phosphorus input to the reservoir was contributed by non-point sources during the sampling year. The North Concho River contributed 63.1% of the total load, and the ungaged minor tributaries and immediate drainage added an estimated 12.5%.

The phosphorus export rate of the North Concho River was less than 1 $kg/km^2/yr$) (see page 11). This rate compares favorably with the rates of three tributaries of nearby Twin Buttes Reservoir*** (also less than 1 $kg/km^2/yr$).

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* Koederitze, 1976.
** Anonymous, 1976.
*** Working Paper No. 666.

## II. RESERVOIR AND DRAINAGE BASIN CHARACTERISTICS†

### A. Morphometry (at conservation-pool level)††:

1. Surface area: 21.85 kilometers$^2$.
2. Mean depth: 6.5 meters.
3. Maximum depth: >8.5 meters.
4. Volume: 142.769 x $10^6$ $m^3$.
5. Mean hydraulic retention time: 11.0 years (based on outflow).

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

1. Tributaries -

| Name | Drainage area ($km^2$)* | Mean flow ($m^3$/sec)* |
|---|---|---|
| North Concho River | 3,234.9 | 0.665 |
| Minor tributaries & immediate drainage - | 599.5 | 0.131 |
| Totals | 3,834.4 | 0.796 |

2. Outlet -

| | | |
|---|---|---|
| San Angelo water supply** | 0.0 | 0.200 |
| North Concho River | 3,853.9*** | 0.210 |
| Total | 3,853.9*** | 0.410 |

### C. Precipitation****:

1. Year of sampling: 63.8 centimeters.
2. Mean annual: 44.5 centimeters.

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† Table of metric conversions--Appendix B.
†† Barrows, 1977.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Koederitze, 1976.
*** Includes area of reservoir.
**** See Working Paper No. 175.

## III. WATER QUALITY SUMMARY

O. C. Fisher Reservoir was sampled four times in 1974 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from a number of depths at one station on the reservoir (see map, page vi). During each visit, a single depth-integrated (4.6 m or near bottom to surface) sample was collected for phytoplankton identification and enumeration; and a similar sample was collected for chlorophyll a analysis. During the last visit, a single 18.9-liter depth-integrated sample was taken for algal assays. The maximum depth sampled was 8.5 meters.

The sampling results are presented in full in Appendix D and are summarized in the following table (the August nutrient samples were not preserved properly and were not analyzed).

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR SAN ANGELO RESERVOIR
STORET CODE 4826

| PARAMETER | 1ST SAMPLING ( 3/ 4/74) 1 SITES RANGE | MEAN | MEDIAN | 2ND SAMPLING ( 5/15/74) 1 SITES RANGE | MEAN | MEDIAN | 3RD SAMPLING ( 8/ 5/74) 1 SITES RANGE | MEAN | MEDIAN |
|---|---|---|---|---|---|---|---|---|---|
| TEMP (C) | 15.1 - 15.3 | 15.2 | 15.3 | 25.6 - 25.8 | 25.7 | 25.6 | 25.4 - 25.6 | 25.5 | 25.5 |
| DISS OXY (MG/L) | 9.8 - 10.4 | 10.1 | 10.1 | 7.8 - 8.0 | 7.9 | 7.9 | 4.8 - 5.0 | 4.9 | 4.8 |
| CNDCTVY (MCROMO) | 454. - 459. | 456. | 455. | 607. - 607. | 607. | 607. | 641. - 642. | 642. | 642. |
| PH (STAND UNITS) | 8.3 - 8.3 | 8.3 | 8.3 | 8.3 - 8.4 | 8.3 | 8.3 | 7.9 - 8.0 | 8.0 | 8.0 |
| TOT ALK (MG/L) | 167. - 168. | 168. | 168. | 154. - 154. | 154. | 154. | ****** - ****** | | |
| TOT P (MG/L) | 0.041 - 0.053 | 0.047 | 0.048 | 0.108 - 0.117 | 0.111 | 0.108 | ****** - ****** | | |
| ORTHO P (MG/L) | 0.010 - 0.011 | 0.011 | 0.011 | 0.006 - 0.007 | 0.007 | 0.007 | ****** - ****** | | |
| NO2+NO3 (MG/L) | 0.040 - 0.080 | 0.060 | 0.060 | 0.050 - 0.080 | 0.067 | 0.070 | ****** - ****** | | |
| AMMONIA (MG/L) | 0.030 - 0.040 | 0.033 | 0.030 | 0.050 - 0.070 | 0.063 | 0.070 | ****** - ****** | | |
| KJEL N (MG/L) | 0.800 - 1.000 | 0.900 | 0.900 | 1.000 - 1.200 | 1.067 | 1.000 | ****** - ****** | | |
| INORG N (MG/L) | 0.070 - 0.110 | 0.093 | 0.100 | 0.100 - 0.150 | 0.130 | 0.140 | ****** - ****** | | |
| TOTAL N (MG/L) | 0.880 - 1.060 | 0.960 | 0.940 | 1.050 - 1.270 | 1.133 | 1.080 | ****** - ****** | | |
| CHLRPYL A (UG/L) | 13.1 - 13.1 | 13.1 | 13.1 | 24.7 - 24.7 | 24.7 | 24.7 | 42.6 - 42.6 | 42.6 | 42.6 |
| SECCHI (METERS) | 0.6 - 0.6 | 0.6 | 0.6 | 0.3 - 0.3 | 0.3 | 0.3 | 0.3 - 0.3 | 0.3 | 0.3 |

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR SAN ANGELO RESERVOIR
STORET CODE 4826

4TH SAMPLING (10/29/74)

1 SITES

| PARAMETER | RANGE | MEAN | MEDIAN |
|---|---|---|---|
| TEMP (C) | 18.1 - 18.5 | 18.4 | 18.4 |
| DISS OXY (MG/L) | 5.6 - 5.6 | 5.6 | 5.6 |
| CNDCTVY (MCROMO) | 217. - 231. | 224. | 224. |
| PH (STAND UNITS) | 7.9 - 8.3 | 8.0 | 8.0 |
| TOT ALK (MG/L) | 112. - 113. | 112. | 112. |
| TOT P (MG/L) | 0.090 - 0.134 | 0.105 | 0.098 |
| ORTHO P (MG/L) | 0.044 - 0.054 | 0.050 | 0.050 |
| NO2+NO3 (MG/L) | 0.120 - 0.240 | 0.157 | 0.135 |
| AMMONIA (MG/L) | 0.020 - 0.040 | 0.032 | 0.035 |
| KJEL N (MG/L) | 0.500 - 1.400 | 0.800 | 0.650 |
| INORG N (MG/L) | 0.140 - 0.280 | 0.190 | 0.170 |
| TOTAL N (MG/L) | 0.640 - 1.520 | 0.957 | 0.835 |
| CHLRPYL A (UG/L) | 18.3 - 18.3 | 18.3 | 18.3 |
| SECCHI (METERS) | 0.8 - 0.8 | 0.8 | 0.8 |

B. Biological characteristics:

1. Phytoplankton -

| Sampling Date | Dominant Genera | Algal Units per ml |
|---|---|---|
| 03/04/74 | 1. Nitzschia sp. | 9,005 |
| | 2. Ankistrodesmus sp. | 4,407 |
| | 3. Chroomonas sp. | 2,810 |
| | 4. Dactylococcopsis sp. | 2,363 |
| | 5. Kirchneriella sp. | 2,299 |
| | Other genera | 9,265 |
| | Total | 30,149 |
| 05/15/74 | 1. Nitzschia sp. | 3,289 |
| | 2. Cyclotella sp. | 2,388 |
| | 3. Raphidiopsis sp. | 1,172 |
| | 4. Scenedesmus sp. | 902 |
| | 5. Stephanodiscus sp. | 901 |
| | Other genera | 7,119 |
| | Total | 15,771 |
| 08/05/74 | 1. Oscillatoria sp. | 25,208 |
| | 2. Raphidiopsis sp. | 10,905 |
| | 3. Dactylococcopsis sp. | 8,355 |
| | 4. Pennate diatoms | 5,381 |
| | 5. Merismopedia sp. | 3,044 |
| | Other genera | 19,332 |
| | Total | 72,225 |
| 10/29/74 | 1. Chlamydomonas sp. | 3,512 |
| | 2. Cyclotella sp. | 1,115 |
| | 3. Cryptomonas sp. | 725 |
| | 4. Chroomonas sp. | 502 |
| | 5. Nitzschia sp. | 502 |
| | Other genera | 2,005 |
| | Total | 8,361 |

2. Chlorophyll a -

| Sampling Date | Station Number | Chlorophyll a (µg/l) |
|---|---|---|
| 03/04/74 | 1 | 13.1 |
| 05/15/74 | 1 | 24.7 |
| 08/05/74 | 1 | 42.6 |
| 10/29/74 | 1 | 18.3 |

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

| Spike (mg/l) | Ortho P Conc. (mg/l) | Inorganic N Conc. (mg/l) | Maximum yield (mg/l-dry wt.) |
|---|---|---|---|
| Control | 0.035 | 0.109 | 5.2 |
| 0.050 P | 0.085 | 0.109 | 4.9 |
| 0.050 P + 1.0 N | 0.085 | 1.109 | 23.8 |
| 1.0 N | 0.035 | 1.109 | 15.4 |

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of O. C. Fisher Reservoir was high at the time the sample was collected (10/29/74). The increased yield with the addition of nitrogen and the lack of response to phosphorus added alone indicate the reservoir was nitrogen limited at that time.

The reservoir data indicate nitrogen limitation in March also (the mean inorganic nitrogen/orthophosphorus ratio was 8/1) but phosphorus limitation in May (the mean N/P ratio was 19/1).

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

For the determination of nutrient loadings, the Texas National Guard collected monthly near-surface grab samples from the tributary site indicated on the map (page vi), except for the high runoff months of April and May when two samples were collected. Sampling was begun in September, 1974, and was completed in August, 1975.

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

In this report, nutrient loads for the sampled tributary were calculated using mean annual concentrations and mean annual flows. Nutrient loads for the outlet (A-1) and the San Angelo water supply withdrawal were estimated using the mean reservoir concentrations at station 1 and the mean annual flows. Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the mean concentrations in Concho River at station A-2 and the mean annual ZZ flow.

No known wastewater treatment plants impacted O. C. Fisher Reservoir during the sampling year.

A. Waste Sources:

1. Known municipal - None

2. Known industrial - None

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

| Source | kg P/ yr | % of total |
|---|---|---|
| a. Tributaries (non-point load) - | | |
| North Concho River | 880 | 63.1 |
| b. Minor tributaries & immediate drainage (non-point load) - | 173 | 12.5 |
| c. Known municipal STP's - None | - | - |
| d. Septic tanks - None* | - | - |
| e. Known industrial - None | - | - |
| f. Direct precipitation** - | 340 | 24.4 |
| Total | 1,395 | 100.0 |

2. Outputs -

| | |
|---|---|
| Lake outlet - San Angelo water supply | 565 |
| North Concho River | 595 |
| Total | 1,160 |

3. Net annual P accumulation - 235 kg.

* Koederitze, 1976.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

| Source | kg N/yr | % of total |
|---|---|---|
| a. Tributaries (non-point load) - | | |
| North Concho River | 40,850 | 58.4 |
| b. Minor tributaries & immediate drainage (non-point load) - | 8,050 | 11.5 |
| c. Known municipal STP's - None | - | - |
| d. Septic tanks - None* | - | - |
| e. Known industrial - None | - | - |
| f. Direct precipitation** - | 21,010 | 30.1 |
| Total | 69,910 | 100.0 |

2. Outputs -

| | |
|---|---|
| Lake outlet - San Angelo water supply | 6,375 |
| North Concho River | 6,695 |
| Total | 13,070 |

3. Net annual N accumulation - 56,840 kg.

D. Non-point Nutrient Export by Subdrainage Area:

| Tributary | kg P/km$^2$/yr | kg N/km$^2$/yr |
|---|---|---|
| North Concho River | <1 | 13 |

* Koederitze, 1976.
** See Working Paper No. 175.

E. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

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

| | Total Phosphorus | | Total Nitrogen | |
|---|---|---|---|---|
| | Total | Accumulated | Total | Accumulated |
| grams/$m^2$/yr | 0.06 | 0.01 | 3.2 | 2.6 |

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of O. C. Fisher Reservoir at conservation-pool level:

| | |
|---|---|
| "Dangerous" (eutrophic loading) | 0.16 |
| "Permissible" (oligotrophic loading) | 0.08 |

## V. LITERATURE REVIEWED

Barrows, David, 1977. Personal communication (reservoir morphometry and hydraulic retention time). Canyon Proj. Off., Fort Worth Distr., Corps of Engrs., New Braunfels, TX.

Koederitze, Thomas (Supt.), 1976. Personal communication (municipal water withdrawal from O. C. Fisher Reservoir and description of lakeshore development). Water Department, San Angelo.

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

Yost, I. D., 1976. Personal communication (estimate of evaporation from central Texas lakes). U.S. Geol. Surv., Austin.

# VI. APPENDICES

## APPENDIX A

## LAKE RANKINGS

LAKES RANKED BY INDEX NOS.

| RANK | LAKE CODE | LAKE NAME | INDEX NO |
|---|---|---|---|
| 1 | 4809 | CANYON RESERVOIR | 445 |
| 2 | 4823 | LAKE MEREDITH | 441 |
| 3 | 4813 | EAGLE MOUNTAIN LAKE | 430 |
| 4 | 4816 | KEMP LAKE | 423 |
| 5 | 4801 | AMISTAD LAKE | 402 |
| 6 | 4805 | BROWNWOOD LAKE | 394 |
| 7 | 4802 | BASTROP LAKE | 393 |
| 8 | 4838 | WHITE RIVER RESERVOIR | 390 |
| 9 | 4825 | POSSUM KINGDOM RESERVOIR | 387 |
| 10 | 4835 | TRAVIS LAKE | 384 |
| 11 | 4803 | BELTON RESERVOIR | 384 |
| 12 | 4831 | STILLHOUSE HOLLOW RESERV | 372 |
| 13 | 4812 | DIVERSION LAKE | 372 |
| 14 | 4808 | CALAVERAS LAKE | 362 |
| 15 | 4839 | WHITNEY LAKE | 357 |
| 16 | 4822 | MEDINA LAKE | 342 |
| 17 | 4827 | SAM RAYBURN RESERVOIR | 322 |
| 18 | 4828 | E V SPENCE RESERVOIR | 321 |
| 19 | 4837 | TWIN BUTTES RESERVOIR | 311 |
| 20 | 4810 | LAKE COLORADO CITY | 310 |
| 21 | 4824 | PALESTINE LAKE | 302 |
| 22 | 4818 | LAKE OF THE PINES | 298 |
| 23 | 4807 | CADDO LAKE | 297 |
| 24 | 4814 | FT PHANTOM HILL LAKE | 296 |
| 25 | 4806 | LAKE BUCHANAN | 261 |
| 26 | 4830 | STAMFORD LAKE | 259 |
| 27 | 4819 | LAVON RESERVOIR | 258 |
| 28 | 4832 | TAWAKONI LAKE | 253 |

LAKES RANKED BY INDEX NOS.

| RANK | LAKE CODE | LAKE NAME | INDEX NO |
|---|---|---|---|
| 29 | 4821 | LYNDON B JOHNSON LAKE | 238 |
| 30 | 4834 | TEXOMA LAKE | 217 |
| 31 | 4829 | SOMERVILLE LAKE | 208 |
| 32 | 4826 | SAN ANGELO RESERVOIR | 200 |
| 33 | 4833 | TEXARKANA LAKE | 176 |
| 34 | 4815 | GARZA LITTLE ELM RESERVO | 173 |
| 35 | 4836 | TRINIDAD | 169 |
| 36 | 4804 | BRAUNIG LAKE | 159 |
| 37 | 4811 | CORPUS CRISTI LAKE | 155 |
| 38 | 4817 | HOUSTON LAKE | 139 |
| 39 | 4820 | LIVINGSTON LAKE | 91 |

PERCENT OF LAKES EXCEEDING CRITERIA AND SET OF LAKES

| LAKE CODE | LAKE NAME | MEDIAN TOTAL P | MEDIAN INORG N | 500-MEAN SEC | MEAN CHLORA | 15-MIN DO | MEDIAN DISS ORTHO P | INDEX NO |
|---|---|---|---|---|---|---|---|---|
| 4801 | AMISTAD LAKE | 95 ( 36) | 5 ( 2) | 100 ( 38) | 100 ( 38) | 39 ( 14) | 63 ( 21) | 402 |
| 4802 | BASTROP LAKE | 79 ( 30) | 76 ( 28) | 82 ( 31) | 47 ( 18) | 17 ( 0) | 92 ( 34) | 393 |
| 4803 | BELTON RESERVOIR | 92 ( 35) | 26 ( 10) | 97 ( 37) | 68 ( 26) | 17 ( 0) | 84 ( 31) | 384 |
| 4804 | BRAUNIG LAKE | 5 ( 2) | 42 ( 16) | 50 ( 19) | 8 ( 3) | 49 ( 17) | 5 ( 2) | 159 |
| 4805 | BROWNWOOD LAKE | 66 ( 25) | 70 ( 26) | 29 ( 11) | 87 ( 33) | 58 ( 22) | 84 ( 31) | 394 |
| 4806 | LAKE BUCHANAN | 47 ( 18) | 21 ( 7) | 74 ( 28) | 63 ( 24) | 17 ( 0) | 39 ( 14) | 261 |
| 4807 | CADDO LAKE | 26 ( 10) | 91 ( 33) | 42 ( 16) | 32 ( 12) | 76 ( 29) | 30 ( 10) | 297 |
| 4808 | CALAVERAS LAKE | 45 ( 17) | 100 ( 38) | 47 ( 18) | 11 ( 4) | 67 ( 25) | 92 ( 34) | 362 |
| 4809 | CANYON RESERVOIR | 99 ( 37) | 8 ( 3) | 95 ( 36) | 97 ( 37) | 49 ( 17) | 97 ( 37) | 445 |
| 4810 | LAKE COLORADO CITY | 39 ( 14) | 76 ( 28) | 26 ( 10) | 42 ( 16) | 88 ( 33) | 39 ( 14) | 310 |
| 4811 | CORPUS CRISTI LAKE | 8 ( 3) | 47 ( 18) | 18 ( 7) | 13 ( 5) | 61 ( 23) | 8 ( 3) | 155 |
| 4812 | DIVERSION LAKE | 68 ( 26) | 83 ( 31) | 32 ( 12) | 29 ( 11) | 97 ( 37) | 63 ( 21) | 372 |
| 4813 | EAGLE MOUNTAIN LAKE | 71 ( 27) | 91 ( 33) | 34 ( 13) | 79 ( 30) | 79 ( 30) | 76 ( 28) | 430 |
| 4814 | FT PHANTOM HILL LAKE | 24 ( 9) | 66 ( 25) | 21 ( 8) | 74 ( 28) | 95 ( 36) | 16 ( 6) | 296 |
| 4815 | GARZA LITTLE ELM RESERVO | 34 ( 13) | 13 ( 5) | 16 ( 6) | 34 ( 13) | 55 ( 21) | 21 ( 7) | 173 |
| 4816 | KEMP LAKE | 76 ( 29) | 61 ( 22) | 55 ( 21) | 55 ( 21) | 84 ( 32) | 92 ( 34) | 423 |
| 4817 | HOUSTON LAKE | 16 ( 6) | 16 ( 6) | 0 ( 0) | 24 ( 9) | 72 ( 27) | 11 ( 4) | 139 |
| 4818 | LAKE OF THE PINES | 54 ( 20) | 76 ( 28) | 66 ( 25) | 39 ( 15) | 17 ( 0) | 46 ( 17) | 298 |
| 4819 | LAVON RESERVOIR | 21 ( 8) | 29 ( 11) | 3 ( 1) | 84 ( 32) | 100 ( 38) | 21 ( 7) | 258 |
| 4820 | LIVINGSTON LAKE | 3 ( 1) | 3 ( 1) | 39 ( 15) | 26 ( 10) | 17 ( 0) | 3 ( 1) | 91 |
| 4821 | LYNDON B JOHNSON LAKE | 39 ( 14) | 11 ( 4) | 53 ( 20) | 66 ( 25) | 39 ( 14) | 30 ( 10) | 238 |
| 4822 | MEDINA LAKE | 99 ( 37) | 0 ( 0) | 89 ( 34) | 37 ( 14) | 17 ( 0) | 100 ( 38) | 342 |
| 4823 | LAKE MEREDITH | 82 ( 31) | 91 ( 33) | 71 ( 27) | 95 ( 36) | 39 ( 14) | 63 ( 21) | 441 |
| 4824 | PALESTINE LAKE | 54 ( 20) | 32 ( 12) | 63 ( 24) | 53 ( 20) | 49 ( 17) | 51 ( 19) | 302 |
| 4825 | POSSUM KINGDOM RESERVOIR | 74 ( 28) | 91 ( 33) | 84 ( 32) | 58 ( 22) | 17 ( 0) | 63 ( 21) | 387 |
| 4826 | SAN ANGELO RESERVOIR | 13 ( 5) | 45 ( 17) | 8 ( 3) | 0 ( 0) | 88 ( 33) | 46 ( 17) | 200 |
| 4827 | SAM RAYBURN RESERVOIR | 59 ( 22) | 39 ( 15) | 68 ( 26) | 76 ( 29) | 17 ( 0) | 63 ( 21) | 322 |
| 4828 | E V SPENCE RESERVOIR | 50 ( 19) | 83 ( 31) | 45 ( 17) | 50 ( 19) | 17 ( 0) | 76 ( 28) | 321 |

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

| LAKE CODE | LAKE NAME | MEDIAN TOTAL P | MEDIAN INORG N | 500-MEAN SEC | MEAN CHLORA | 15-MIN DO | MEDIAN DISS ORTHO P | INDEX NO |
|---|---|---|---|---|---|---|---|---|
| 4829 | SOMERVILLE LAKE | 29 ( 11) | 55 ( 21) | 24 ( 9) | 3 ( 1) | 67 ( 25) | 30 ( 10) | 208 |
| 4830 | STAMFORD LAKE | 18 ( 7) | 97 ( 37) | 5 ( 2) | 18 ( 7) | 82 ( 31) | 39 ( 14) | 259 |
| 4831 | STILLHOUSE HOLLOW RESERV | 88 ( 33) | 37 ( 14) | 87 ( 33) | 92 ( 35) | 17 ( 0) | 51 ( 19) | 372 |
| 4832 | TAWAKONI LAKE | 32 ( 12) | 70 ( 26) | 37 ( 14) | 21 ( 8) | 63 ( 24) | 30 ( 10) | 253 |
| 4833 | TEXARKANA LAKE | 11 ( 4) | 51 ( 19) | 13 ( 5) | 16 ( 6) | 72 ( 27) | 13 ( 5) | 176 |
| 4834 | TEXOMA LAKE | 39 ( 14) | 34 ( 13) | 61 ( 23) | 45 ( 17) | 17 ( 0) | 21 ( 7) | 217 |
| 4835 | TRAVIS LAKE | 88 ( 33) | 21 ( 7) | 92 ( 35) | 82 ( 31) | 17 ( 0) | 84 ( 31) | 384 |
| 4836 | TRINIDAD | 0 ( 0) | 61 ( 22) | 11 ( 4) | 5 ( 2) | 92 ( 35) | 0 ( 0) | 169 |
| 4837 | TWIN BUTTES RESERVOIR | 59 ( 22) | 21 ( 7) | 58 ( 22) | 61 ( 23) | 49 ( 17) | 63 ( 21) | 311 |
| 4838 | WHITE RIVER RESERVOIR | 84 ( 32) | 61 ( 22) | 76 ( 29) | 89 ( 34) | 17 ( 0) | 63 ( 21) | 390 |
| 4839 | WHITNEY LAKE | 63 ( 24) | 51 ( 19) | 79 ( 30) | 71 ( 27) | 17 ( 0) | 76 ( 28) | 357 |

| LAKE CODE | LAKE NAME | MEDIAN TOTAL P | MEDIAN INORG N | 500-MEAN SEC | MEAN CHLORA | 15-MIN DO | MEDIAN DISS ORTHO P |
|---|---|---|---|---|---|---|---|
| 4801 | AMISTAD LAKE | 0.013 | 0.500 | 371.474 | 2.[illegible]42 | 14.900 | 0.009 |
| 4802 | BASTROP LAKE | 0.022 | 0.090 | 419.917 | 12.392 | 15.000 | 0.007 |
| 4803 | BELTON RESERVOIR | 0.016 | 0.185 | 378.312 | 8.025 | 15.000 | 0.007 |
| 4804 | BRAUNIG LAKE | 0.134 | 0.150 | 461.625 | 22.762 | 14.800 | 0.062 |
| 4805 | BROWNWOOD LAKE | 0.027 | 0.100 | 470.375 | 4.887 | 14.400 | 0.007 |
| 4806 | LAKE BUCHANAN | 0.036 | 0.250 | 437.625 | 8.606 | 15.000 | 0.012 |
| 4807 | CADDO LAKE | 0.055 | 0.070 | 463.333 | 14.808 | 11.400 | 0.013 |
| 4808 | CALAVERAS LAKE | 0.038 | 0.060 | 461.667 | 22.500 | 13.000 | 0.007 |
| 4809 | CANYON RESERVOIR | 0.010 | 0.450 | 384.812 | 2.500 | 14.800 | 0.006 |
| 4810 | LAKE COLORADO CITY | 0.042 | 0.090 | 473.625 | 12.675 | 10.200 | 0.012 |
| 4811 | CORPUS CRISTI LAKE | 0.113 | 0.130 | 475.187 | 19.756 | 14.000 | 0.050 |
| 4812 | DIVERSION LAKE | 0.025 | 0.080 | 470.111 | 15.867 | 9.000 | 0.009 |
| 4813 | EAGLE MOUNTAIN LAKE | 0.024 | 0.070 | 469.625 | 5.662 | 11.000 | 0.008 |
| 4814 | FT PHANTOM HILL LAKE | 0.060 | 0.105 | 474.909 | 6.317 | 9.800 | 0.022 |
| 4815 | GARZA LITTLE ELM RESERVO | 0.045 | 0.380 | 475.782 | 14.156 | 14.600 | 0.018 |
| 4816 | KEMP LAKE | 0.023 | 0.110 | 455.000 | 10.217 | 10.400 | 0.007 |
| 4817 | HOUSTON LAKE | 0.097 | 0.260 | 486.187 | 16.650 | 12.400 | 0.036 |
| 4818 | LAKE OF THE PINES | 0.031 | 0.090 | 440.000 | 12.919 | 15.000 | 0.011 |
| 4819 | LAVON RESERVOIR | 0.063 | 0.180 | 485.333 | 5.400 | 8.800 | 0.018 |
| 4820 | LIVINGSTON LAKE | 0.196 | 0.555 | 465.469 | 16.112 | 15.000 | 0.128 |
| 4821 | LYNDON B JOHNSON LAKE | 0.042 | 0.420 | 456.500 | 8.100 | 14.900 | 0.013 |
| 4822 | MEDINA LAKE | 0.010 | 0.600 | 403.562 | 12.944 | 15.000 | 0.004 |
| 4823 | LAKE MEREDITH | 0.021 | 0.070 | 439.312 | 3.037 | 14.900 | 0.009 |
| 4824 | PALESTINE LAKE | 0.031 | 0.180 | 442.625 | 10.619 | 14.800 | 0.010 |
| 4825 | POSSUM KINGDOM RESERVOIR | 0.023 | 0.070 | 419.045 | 9.495 | 15.000 | 0.009 |
| 4826 | SAN ANGELO RESERVOIR | 0.098 | 0.140 | 481.000 | 24.675 | 10.200 | 0.011 |
| 4827 | SAM RAYBURN RESERVOIR | 0.029 | 0.150 | 439.458 | 6.267 | 15.000 | 0.009 |
| 4828 | E V SPENCE RESERVOIR | 0.036 | 0.080 | 462.583 | 11.775 | 15.000 | 0.008 |

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 |
|---|---|---|---|---|---|---|---|
| 4829 | SOMERVILLE LAKE | 0.053 | 0.115 | 473.833 | 24.491 | 13.000 | 0.013 |
| 4830 | STAMFORD LAKE | 0.073 | 0.060 | 482.714 | 18.457 | 10.600 | 0.012 |
| 4831 | STILLHOUSE HOLLOW RESERV | 0.018 | 0.160 | 406.250 | 3.917 | 15.000 | 0.010 |
| 4832 | TAWAKONI LAKE | 0.046 | 0.100 | 466.417 | 18.246 | 13.200 | 0.013 |
| 4833 | TEXARKANA LAKE | 0.106 | 0.120 | 478.500 | 19.119 | 12.400 | 0.030 |
| 4834 | TEXOMA LAKE | 0.042 | 0.160 | 451.321 | 12.493 | 15.000 | 0.018 |
| 4835 | TRAVIS LAKE | 0.018 | 0.250 | 389.913 | 5.595 | 15.000 | 0.007 |
| 4836 | TRINIDAD | 0.389 | 0.110 | 479.500 | 24.300 | 10.000 | 0.240 |
| 4837 | TWIN BUTTES RESERVOIR | 0.029 | 0.250 | 454.917 | 8.708 | 14.800 | 0.009 |
| 4838 | WHITE RIVER RESERVOIR | 0.020 | 0.110 | 434.500 | 4.333 | 15.000 | 0.009 |
| 4839 | WHITNEY LAKE | 0.028 | 0.120 | 430.500 | 6.912 | 15.000 | 0.008 |

# APPENDIX B

# CONVERSION FACTORS

## CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

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

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

# APPENDIX C

## TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR TEXAS 07/02/76

LAKE CODE 4826 O. C. FISHER

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 3853.9

| TRIBUTARY | SUB-DRAINAGE AREA(SQ KM) | NORMALIZED FLOWS(CMS) JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | MEAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4826A1 | 3853.9 | 0.057 | 0.028 | 0.028 | 0.085 | 0.142 | 0.198 | 0.255 | 0.255 | 0.142 | 1.133 | 0.113 | 0.057 | 0.210 |
| 4826A2 | 3234.9 | 0.011 | 0.065 | 0.093 | 0.708 | 1.784 | 0.481 | 0.425 | 0.396 | 1.557 | 2.350 | 0.025 | 0.023 | 0.665 |
| 4826ZZ | 619.0 | 0.065 | 0.011 | 0.017 | 0.136 | 0.340 | 0.093 | 0.079 | 0.076 | 0.283 | 0.453 | 0.006 | 0.006 | 0.131 |

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 3853.9
SUM OF SUB-DRAINAGE AREAS = 3853.9
TOTAL FLOW IN = 9.49
TOTAL FLOW OUT = 2.49

NOTE *** SAME AS SAN ANGELO LAKE.

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

| TRIBUTARY | MONTH | YEAR | MEAN FLOW | DAY | FLOW | DAY | FLOW | DAY | FLOW |
|---|---|---|---|---|---|---|---|---|---|
| 4826A1 | 9 | 74 | 0.0 | 7 | 0.0 | | | | |
| | 10 | 74 | 0.0 | 5 | 0.0 | | | | |
| | 11 | 74 | 0.0 | 2 | 0.0 | | | | |
| | 12 | 74 | 0.0 | 8 | 0.0 | | | | |
| | 1 | 75 | 0.0 | 5 | 0.0 | | | | |
| | 2 | 75 | 0.0 | 1 | 0.0 | | | | |
| | 3 | 75 | 0.0 | 2 | 0.0 | | | | |
| | 4 | 75 | 0.0 | 6 | 0.0 | 20 | 0.0 | | |
| | 5 | 75 | 0.0 | 4 | 0.0 | 25 | 0.0 | | |
| | 6 | 75 | 0.0 | 7 | 0.0 | | | | |
| | 7 | 75 | 0.0 | 20 | 0.0 | | | | |
| | 8 | 75 | 0.0 | 3 | 0.0 | | | | |
| 4826A2 | 9 | 74 | 22.512 | 7 | 0.0 | | | | |
| | 10 | 74 | 1.897 | 5 | 0.198 | | | | |
| | 11 | 74 | 0.340 | 2 | 0.623 | | | | |
| | 12 | 74 | 0.198 | 8 | 0.198 | | | | |
| | 1 | 75 | 0.142 | 5 | 0.170 | | | | |
| | 2 | 75 | 0.142 | 1 | 0.142 | | | | |
| | 3 | 75 | 0.085 | 2 | 0.113 | | | | |
| | 4 | 75 | 0.085 | 6 | 0.170 | 20 | 0.057 | | |
| | 5 | 75 | 0.736 | 4 | 0.085 | 25 | 0.311 | | |
| | 6 | 75 | 0.003 | 22 | 0.003 | | | | |
| | 7 | 75 | 0.003 | 20 | 0.003 | | | | |
| | 8 | 75 | 0.014 | 3 | 0.0 | | | | |

# APPENDIX D

## PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 76/02/11

482601
31 29 03.0 100 29 01.0
SAN ANGELO RESERVOIR
48451 TEXAS

11EPALES
3

2111202
0015 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00010 WATER TEMP CENT | 00300 DO MG/L | 00077 TRANSP SECCHI INCHES | 00094 CNDUCTVY FIELD MICROMHO | 00400 PH SU | 00410 T ALK CACO3 MG/L | 00610 NH3-N TOTAL MG/L | 00625 TOT KJEL N MG/L | 00630 NO2&NO3 N-TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 74/03/04 | 15 00 | 0000 | 15.3 | | 22 | 454 | 8.30 | 168 | 0.040 | 1.000 | 0.060 | 0.010 |
| | 15 00 | 0005 | 15.3 | 9.8 | | 455 | 8.30 | 167 | 0.030 | 0.900 | 0.040 | 0.011 |
| | 15 00 | 0010 | 15.1 | 10.4 | | 459 | 8.30 | 168 | 0.030 | 0.800 | 0.080 | 0.011 |
| 74/05/15 | 16 10 | 0000 | 25.8 | | 12 | 607 | 8.40 | 154 | 0.070 | 1.200 | 0.070 | 0.007 |
| | 16 10 | 0005 | 25.6 | 8.0 | | 607 | 8.35 | 154 | 0.050 | 1.000 | 0.050 | 0.006 |
| | 16 10 | 0010 | 25.6 | 7.8 | | 607 | 8.30 | 154 | 0.070 | 1.000 | 0.080 | 0.007 |
| 74/08/05 | 11 50 | 0000 | 25.6 | 5.0 | 12 | 642 | 8.05 | | | | | |
| | 11 50 | 0004 | 25.5 | 4.8 | | 642 | 8.00 | | | | | |
| | 11 50 | 0008 | 25.4 | 4.8 | | 641 | 7.90 | | | | | |
| 74/10/29 | 11 25 | 0000 | 18.5 | 5.6 | 30 | 217 | 8.25 | 112 | 0.020 | 1.400 | 0.120 | 0.048 |
| | 11 25 | 0005 | 18.4 | 5.6 | | 224 | 8.00 | 112 | 0.030 | 0.800 | 0.130 | 0.054 |
| | 11 25 | 0015 | 18.4 | 5.6 | | 223 | 8.00 | 112 | 0.040 | 0.500 | 0.140 | 0.053 |
| | 11 25 | 0028 | 18.1 | | | 231 | 7.90 | 113 | 0.040 | 0.500 | 0.240 | 0.044 |

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00665 PHOS-TOT MG/L P | 32217 CHLRPHYL A UG/L | 00031 INCDT LT REMNING PERCENT |
|---|---|---|---|---|---|
| 74/03/04 | 15 00 | 0000 | 0.041 | 13.1 | |
| | 15 00 | 0005 | 0.048 | | |
| | 15 00 | 0010 | 0.053 | | |
| 74/05/15 | 16 10 | 0000 | 0.108 | 24.7 | |
| | 16 10 | 0003 | | | 1.0 |
| | 16 10 | 0005 | 0.108 | | |
| | 16 10 | 0010 | 0.117 | | |
| 74/08/05 | 11 50 | 0000 | | 42.6 | |
| 74/10/29 | 11 25 | 0000 | 0.134 | 18.3 | |
| | 11 25 | 0003 | | | 5.0 |
| | 11 25 | 0005 | 0.101 | | |
| | 11 25 | 0006 | | | 1.0 |
| | 11 25 | 0015 | 0.096 | | |
| | 11 25 | 0028 | 0.090 | | |

LAKE CODE 4826 O. C. FISHER

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

| TRIBUTARY | MONTH | YEAR | MEAN FLOW | DAY | FLOW | DAY | FLOW | DAY | FLOW |
|---|---|---|---|---|---|---|---|---|---|
| 4826ZZ | 9 | 74 | 4.248 | | | | | | |
| | 10 | 74 | 0.283 | | | | | | |
| | 11 | 74 | 0.057 | | | | | | |
| | 12 | 74 | 0.028 | | | | | | |
| | 1 | 75 | 0.028 | | | | | | |
| | 2 | 75 | 0.028 | | | | | | |
| | 3 | 75 | 0.028 | | | | | | |
| | 4 | 75 | 0.028 | | | | | | |
| | 5 | 75 | 0.142 | | | | | | |
| | 6 | 75 | 0.006 | | | | | | |
| | 7 | 75 | 0.0 | | | | | | |
| | 8 | 75 | 0.0 | | | | | | |

# APPENDIX E

# TRIBUTARY DATA

STORET RETRIEVAL DATE 76/03/10

4826A1
31 29 00 ^ 100 28 45.0 4
N CONCHO RIVER
48363 7.5 SAN ANGELO S
O/SAN ANGELO LAKE
AT BOTTOM OF SAN ANGELO DAM SPILLWAY
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 |
|---|---|---|---|---|---|---|---|
| 74/09/07 | 14 30 | | 0.016 | 2.100 | 0.010 | 0.025 | 0.130 |

STORET RETRIEVAL DATE 78/03/10

482BA2
31 35 35.0 100 38 15.0 4
N CONCHO RIVER
48 15 CARLSBAD
T/SAN ANGELO LAKE
2NDRY RD BRDG 0.5 MI SW JCT HWY 87
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 |
|---|---|---|---|---|---|---|---|
| 74/10/05 | 15 45 | | 4.900 | 0.725 | 0.005 | 0.010 | 0.040 |
| 74/11/02 | 14 20 | | 1.160 | 0.700 | 0.025 | 0.050 | 0.110 |
| 74/12/08 | 11 30 | | 3.210 | 0.900 | 0.032 | 0.008 | 0.030 |
| 75/01/05 | 10 00 | | 2.760 | 1.600 | 0.040 | 0.005K | 0.030 |
| 75/02/01 | 16 00 | | 2.040 | 0.500 | 0.024 | 0.016 | 0.040 |
| 75/03/02 | 10 30 | | 0.810 | 0.600 | 0.015 | 0.005 | 0.020 |
| 75/04/06 | 12 30 | | 0.185 | 0.900 | 0.045 | 0.010 | 0.010 |
| 75/04/20 | 11 25 | | 0.090 | 0.800 | 0.045 | 0.005 | 0.010 |
| 75/05/04 | 11 15 | | 0.052 | 0.650 | 0.025 | 0.010 | 0.010 |
| 75/05/25 | 13 45 | | 0.075 | 0.625 | 0.015 | 0.005 | 0.070 |
| 75/06/22 | 11 30 | | 0.010 | 1.050 | 0.020 | 0.015 | 0.070 |
| 75/07/20 | 12 00 | | 0.005 | 0.500 | 0.025 | 0.010 | 0.050 |
| 75/08/03 | 11 45 | | 0.025 | 0.450 | 0.035 | 0.010 | 0.060 |

K VALUE KNOWN TO BE
LESS THAN INDICATED