

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



REPORT
ON
COUNCIL GROVE RESERVOIR
MORRIS COUNTY
KANSAS
EPA REGION VII
WORKING PAPER No. 512

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

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ON
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MORRIS COUNTY
KANSAS
EPA REGION VII
WORKING PAPER No. 512

WITH THE COOPERATION OF THE
KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
AND THE
KANSAS NATIONAL GUARD
APRIL, 1977

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F O R E W O R D

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 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 EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

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

The staff of the Kansas Division of Environmental Health 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 Edward R. Fry, the Adjutant General of Kansas, and Project Officer Colonel Albin L. Lundquist, who directed the volunteer efforts of the Kansas National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY RESERVOIRS

STATE OF KANSASNAME

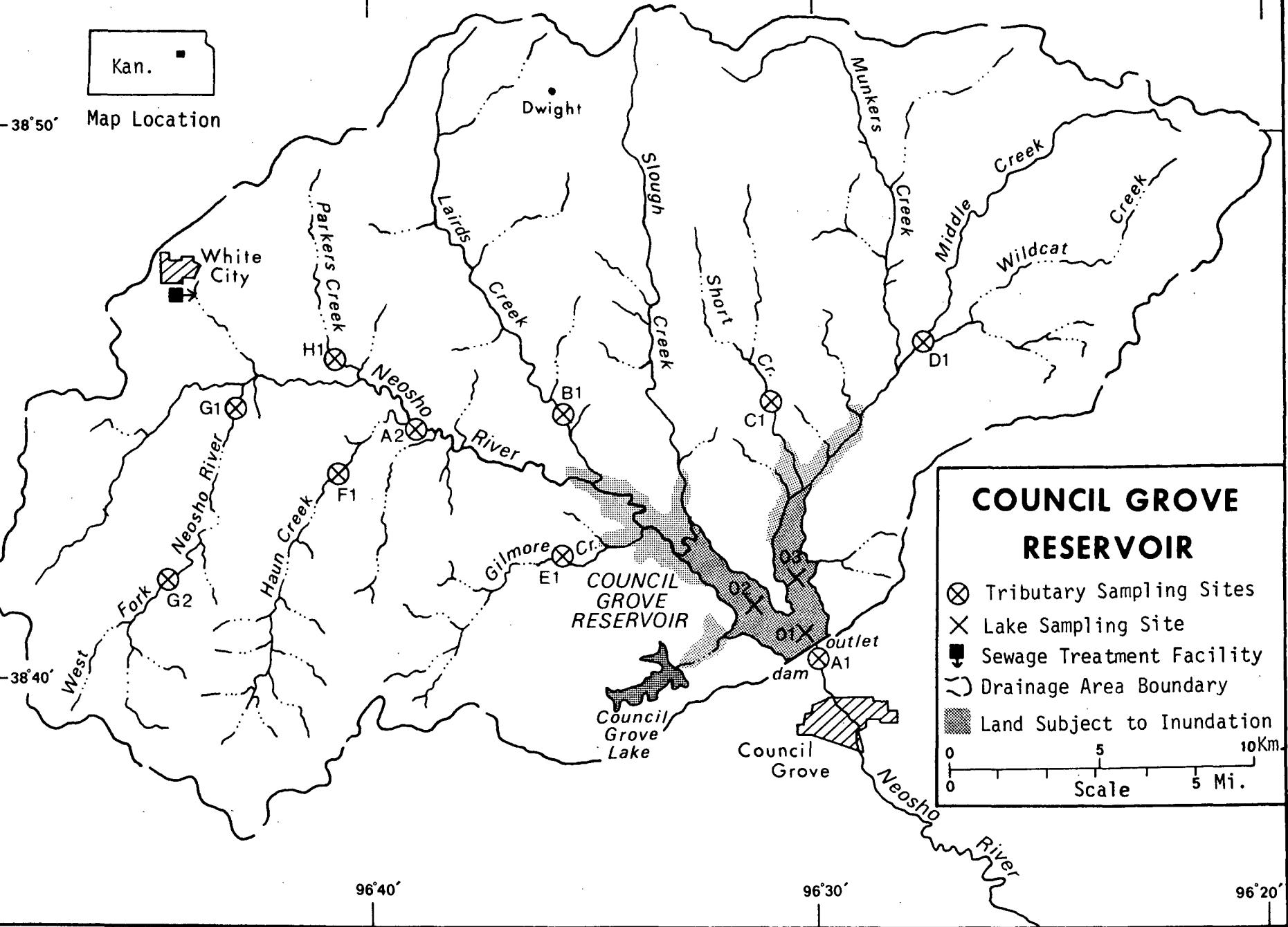
Cedar Bluff
Council Grove
Elk City
Fall River
John Redmond
Kanopolis
Marion
Melvern
Milford
Norton
Perry
Pomona
Toronto
Tuttle Creek
Wilson

COUNTY

Trego
Morris
Montgomery
Greenwood
Coffey, Lyon
Ellsworth
Marion
Osage
Clay, Geary
Norton
Jefferson
Osage
Greenwood, Woodson
Marshall, Pottawatomie, Riley
Russell

Kan.

Map Location



COUNCIL GROVE RESERVOIR

- Tributary Sampling Sites
- × Lake Sampling Site
- Sewage Treatment Facility
- Drainage Area Boundary
- ▨ Land Subject to Inundation

Scale 0 5 10 Km.

96°20'

96°30'

96°40'

COUNCIL GROVE RESERVOIR

STORET NO. 2002

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate Council Grove Reservoir is potentially eutrophic. However, the reservoir becomes quite turbid during periods of runoff, and primary productivity is intermittently light-limited (Kring, 1977).

This water body ranked twelfth in overall trophic quality when the 15 Kansas reservoirs sampled in 1974 were compared using a combination of six lake parameters*. Ten of the reservoirs had less median total phosphorus, median dissolved phosphorus, and median inorganic nitrogen, eight had less mean chlorophyll a, and nine had greater mean Secchi disc transparency.

Survey limnologists did not observe algal concentrations or aquatic macrophytes but noted that the Neosho River arm of the reservoir was quite turbid in April.

B. Rate-Limiting Nutrient:

The algal assay results indicate Council Grove Reservoir was phosphorus limited at the time the samples were taken (04/11/74 and 10/02/74). The reservoir data also indicate phosphorus limitation at those times. However, because of turbidity, the reservoir is intermittently light-limited rather than nutrient-limited.

* See Appendix A.

C. Nutrient Controllability:

1. Point sources--The only known point source, White City, contributed an estimated 2.1% of the total phosphorus load reaching Council Grove Reservoir during the sampling year.

The present phosphorus loading of $2.07 \text{ g/m}^2/\text{yr}$ is four times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (see page 13). On the basis of Survey data, it does not seem likely that control of phosphorus at the White City wastewater treatment plant would result in any significant improvement in the trophic condition of the reservoir.

2. Non-point sources--Non-point sources contributed 97.9% of the total phosphorus load to the reservoir during the sampling year. The Neosho River added 42.4% of the total; Short Creek, 3.9%; Gilmore Creek, 0.7%; and the ungaged tributaries contributed an estimated 50.1%.

The phosphorus export rates of the Neosho River, Short Creek, and Gilmore Creek were 60, 41, and $6 \text{ kg/km}^2/\text{yr}$, respectively (see page 12). The Neosho River and Short Creek rates were substantially higher than the rates of three tributaries of nearby Milford Reservoir* (6 , 26 , and $30 \text{ kg/km}^2/\text{yr}$).

* Working Paper No. 519.

II. RESERVOIR AND DRAINAGE BASIN CHARACTERISTICS[†]

A. Morphometry^{††}:

1. Surface area: 13.27 kilometers².
2. Mean depth: 3.9 meters.
3. Maximum depth: 12.8 meters.
4. Volume: 51.753×10^6 m³.
5. Mean hydraulic retention time: 218 days (based on outflow).

B. Tributary and Outlet:

(See Appendix C for flow data)

1. Tributaries -

<u>Name</u>	<u>Drainage area (km²)*</u>	<u>Mean flow (m³/sec)*</u>
Neosho River	192.7	0.900
Short Creek	26.2	0.129
Gilmore Creek	29.8	0.145
Minor tributaries & immediate drainage -	<u>385.5</u>	<u>2.050</u>
Totals	634.2	3.224

2. Outlet -

Neosho River	647.5**	2.750
--------------	---------	-------

C. Precipitation***:

1. Year of sampling: 82.3 centimeters.
2. Mean annual: 87.2 centimeters.

[†] Table of metric conversions--Appendix B.

^{††} Stoltzenberg, 1975.

^{*} For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".

^{**} Includes area of reservoir.

^{***} See Working Paper No. 175.

III. WATER QUALITY SUMMARY

Council Grove Reservoir was sampled three times during the open-water season of 1974 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from a number of depths at three stations on the reservoir (see map, page v). During each visit, a single depth-integrated (4.6 m or near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first and last visits, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 12.2 meters at station 1, 3.0 meters at station 2, and 4.6 meters at station 3.

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

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR COUNCIL GROVE
STORET CODE 2002

PARAMETER	1ST SAMPLING (4/11/74)				2ND SAMPLING (6/25/74)				3RD SAMPLING (10/ 2/74)			
	3 SITES				3 SITES				3 SITES			
	RANGE	MEAN	MEDIAN	RANGE	MEAN	MEDIAN	RANGE	MEAN	MEDIAN	RANGE	MEAN	MEDIAN
TEMP (C)	10.6 - 11.8	11.0	10.8	22.7 - 24.6	23.6	23.5	15.0 - 15.9	15.6	15.7			
DISS OXY (MG/L)	9.6 - 10.0	9.9	10.0	4.6 - 7.0	6.2	6.4	8.0 - 9.0	8.5	8.6			
CNDCTVY (MICROMHO)	257. - 278.	264.	260.	282. - 300.	292.	290.	277. - 283.	281.	282.			
PH (STAND UNITS)	8.1 - 8.3	8.2	8.2	7.8 - 8.3	8.1	8.1	8.2 - 8.4	8.3	8.2			
TOT ALK (MG/L)	150. - 170.	156.	153.	*****	*****	*****	155. - 159.	156.	156.			
TOT P (MG/L)	0.073 - 0.212	0.105	0.086	*****	*****	*****	0.027 - 0.065	0.037	0.035			
ORTHO P (MG/L)	0.030 - 0.038	0.032	0.031	*****	*****	*****	0.015 - 0.026	0.022	0.023			
N02+N03 (MG/L)	0.960 - 1.160	1.094	1.130	*****	*****	*****	0.530 - 0.580	0.554	0.550			
AMMONIA (MG/L)	0.070 - 0.090	0.083	0.080	*****	*****	*****	0.020 - 0.040	0.027	0.030			
KJEL N (MG/L)	0.500 - 1.100	0.711	0.600	*****	*****	*****	0.200 - 0.300	0.233	0.200			
INORG N (MG/L)	1.040 - 1.250	1.178	1.200	*****	*****	*****	0.550 - 0.620	0.581	0.580			
TOTAL N (MG/L)	1.640 - 2.110	1.806	1.760	*****	*****	*****	0.730 - 0.850	0.788	0.780			
CHLRPYL A (UG/L)	11.6 - 13.9	12.7	12.7	1.5 - 3.1	2.1	1.6	8.6 - 20.0	14.6	15.1			
SECCHI (METERS)	0.3 - 0.5	0.4	0.4	0.3 - 0.3	0.3	0.3	0.3 - 0.5	0.4	0.5			

B. Biological characteristics:

1. Phytoplankton -

<u>Sampling Date</u>	<u>Dominant Genera</u>	<u>Algal Units per ml</u>
04/11/74	1. <u>Ankistrodesmus sp.</u> 2. <u>Chroomonas sp.</u> 3. <u>Stephanodiscus sp.</u> 4. <u>Melosira sp.</u> 5. <u>Cryptomonas sp.</u> Other genera	1,140 1,020 900 330 270 <u>331</u>
	Total	3,991
06/25/74	1. <u>Chroomonas sp.</u> 2. <u>Melosira sp.</u> 3. <u>Stephanodiscus sp.</u> 4. <u>Closterium sp.</u> 5. <u>Skeletonema sp.</u> Other genera	527 176 70 35 35 <u>36</u>
	Total	879
10/02/74	1. <u>Cyclotella sp.</u> 2. <u>Chroomonas sp.</u> 3. <u>Stephanodiscus sp.</u> 4. <u>Ankistrodesmus sp.</u> 5. <u>Cryptomonas sp.</u> Other genera	1,583 762 293 59 59 <u>59</u>
	Total	2,815

2. Chlorophyll a -

<u>Sampling Date</u>	<u>Station Number</u>	<u>Chlorophyll a ($\mu\text{g}/\text{l}$)</u>
04/11/74	1	11.6
	2	13.9
	3	12.7
06/25/74	1	1.6
	2	3.1
	3	1.5
10/02/74	1	8.6
	2	20.0
	3	15.1

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

a. April sample -

<u>Spike (mg/l)</u>	<u>Ortho P Conc. (mg/l)</u>	<u>Inorganic N Conc. (mg/l)</u>	<u>Maximum yield (mg/l-dry wt.)</u>
Control	0.020	0.865	6.1
0.050 P	0.070	0.865	17.3
0.050 P + 1.0 N	0.070	1.865	25.3
1.0 N	0.020	1.865	5.5

b. October sample -

<u>Spike (mg/l)</u>	<u>Ortho P Conc. (mg/l)</u>	<u>Inorganic N Conc. (mg/l)</u>	<u>Maximum yield (mg/l-dry wt.)</u>
Control	0.030	0.575	9.6
0.050 P	0.080	0.575	16.9
0.050 P + 1.0 N	0.080	1.575	17.7
1.0 N	0.030	1.575	10.9

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential primary productivity of Council Grove Reservoir was high at the times the assay samples were collected (04/11/74 and 10/02/74). In both assays, an increase in yield occurred when phosphorus was added alone, but no significant increase occurred when only nitrogen was added. These results indicate the reservoir was phosphorus limited at the times the samples were taken.

The reservoir data also indicate phosphorus limitation. The mean inorganic nitrogen to orthophosphorus ratios were 37 to 1 in April and 26 to 1 in October, and phosphorus limitation would be expected. However, the reservoir is intermittently light-limited rather than nutrient-limited (Kring, 1977).

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Kansas 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 July when two or three samples were collected. Sampling was begun in October, 1974, and was completed in September, 1975.

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

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in kg/km²/year, at stations A-2, C-1, and E-1 and multiplying the means by the ZZ area in km².

The operator of the White City wastewater treatment plant provided monthly effluent samples but could not provide flow data. Therefore, nutrient loads were estimated at 1.134 P and 3.401 N/capita/year, and flows were estimated at 0.3785 m³/capita/day.

* See Working Paper No. 175.

A. Waste Sources:

1. Known municipal* -

<u>Name</u>	<u>Pop. Served</u>	<u>Treatment</u>	<u>Mean Flow (m³/d)</u>	<u>Receiving Water</u>
White City	517	tr. filter + pond	195.7	Dry Creek

2. Known industrial - None

* Treatment plant questionnaire.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

<u>Source</u>	<u>kg P/ yr</u>	<u>% of total</u>
a. Tributaries (non-point load) -		
Neosho River	11,650	42.4
Short Creek	1,065	3.9
Gilmore Creek	180	0.7
b. Minor tributaries & immediate drainage (non-point load) -	13,760	50.1
c. Known municipal STP's -		
White City	585	2.1
d. Septic tanks - Unknown	?	-
e. Known industrial - None	-	-
f. Direct precipitation* -	<u>230</u>	<u>0.8</u>
Total	27,470	100.0

2. Outputs -

Reservoir outlet - Neosho River 9,010

3. Net annual P accumulation - 18,460 kg.

* See 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 (non-point load) -		
Neosho River	134,250	29.8
Short Creek	23,010	5.1
Gilmore Creek	14,190	3.1
b. Minor tributaries & immediate drainage (non-point load) -	263,565	58.4
c. Known municipal STP's -		
White City	1,760	0.4
d. Septic tanks - Unknown	?	-
e. Known industrial - None	-	-
f. Direct precipitation* -	<u>14,325</u>	<u>3.2</u>
Total	451,100	100.0

2. Outputs -

Reservoir outlet - Neosho River 165,745

3. Net annual N accumulation - 285,355 kg.

D. Non-point Nutrient Export by Subdrainage Area:

<u>Tributary</u>	<u>kg P/km²/yr</u>	<u>kg N/km²/yr</u>
Neosho River	60	697
Short Creek	.41	878
Gilmore Creek	6	476

* See Working Paper No. 175.

E. Mean Nutrient Concentrations in Ungaged Streams:

<u>Tributary</u>	<u>Mean Total P Conc. (mg/l)</u>	<u>Mean Total N Conc. (mg/l)</u>
Lairds Creek	0.146	2.654
Middle Creek	0.192	2.951
Haun Creek	0.086	2.520
W. Fk. Neosho River (G-1)	0.158	2.690
W. Fk. Neosho River (G-2)	0.167	2.788

F. 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	2.07	1.39	34.0	21.5

Vollenweider phosphorus loadings (g/m²/yr) based on mean depth and mean hydraulic retention time of Council Grove Reservoir:

"Dangerous" (eutrophic loading)	0.50
"Permissible" (oligotrophic loading)	0.25

V. LITERATURE REVIEWED

- Kring, R. Lynn, 1977. Personal communication (primary productivity in reservoir). KS Dept. of Health & Environment, Topeka.
- Stoltenberg, Gerald A., 1975. Personal communication (reservoir morphometry). KS Dept. of Health & Environment, Topeka.
- 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.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P
2001	CEDAR BLUFF RESERVOIR	0.017	0.055	431.667	4.217	10.800	0.004
2002	COUNCIL GROVE	0.069	0.830	485.889	9.789	10.400	0.028
2003	ELK CITY	0.030	0.590	490.400	3.212	14.000	0.003
2004	FALL RIVER RESERVOIR	0.053	0.470	488.667	7.683	9.200	0.016
2005	JOHN REDMOND RESERVOIR	0.118	1.250	492.667	9.467	8.200	0.066
2006	KANOPOLIS RESERVOIR	0.056	0.640	487.000	16.033	10.200	0.011
2007	MARION RESERVOIR	0.052	0.430	483.667	12.400	9.000	0.010
2008	MELVERN RESERVOIR	0.034	0.265	459.111	30.400	14.400	0.007
2009	MILFORD RESERVOIR	0.079	0.710	466.333	18.883	12.800	0.036
2010	NORTON RESERVOIR	0.122	0.110	476.750	21.360	8.000	0.036
2011	PERRY RESERVOIR	0.055	0.970	478.571	5.614	13.400	0.017
2012	POMONA RESERVOIR	0.040	1.240	481.333	8.312	13.000	0.021
2013	TORONTO RESERVOIR	0.067	0.425	488.500	6.583	13.000	0.011
2014	TUTTLE CREEK RESERVOIR	0.162	0.970	470.667	11.278	13.600	0.067
2015	WILSON RESERVOIR	0.023	0.265	445.222	8.867	13.400	0.004

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	2001	CEDAR BLUFF RESERVOIR	539
2	2015	WILSON RESERVOIR	439
3	2007	MARION RESERVOIR	357
4	2003	ELK CITY	350
5	2004	FALL RIVER RESERVOIR	328
6	2008	MELVERN RESERVOIR	326
7	2013	TORONTO RESERVOIR	303
8	2010	NORTON RESERVOIR	292
9	2011	PERRY RESERVOIR	279
10	2006	KANOPOLIS RESERVOIR	271
11	2012	POMONA RESERVOIR	267
12	2002	COUNCIL GROVE	230
13	2009	MILFORD RESERVOIR	214
14	2005	JOHN REDMOND RESERVOIR	164
15	2014	TUTTLE CREEK RESERVOIR	139

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
2001	CEDAR BLUFF RESERVOIR	100 (14)	100 (14)	100 (14)	93 (13)	57 (8)	89 (12)	539
2002	COUNCIL GROVE	29 (4)	29 (4)	36 (5)	43 (6)	64 (9)	29 (4)	230
2003	ELK CITY	86 (12)	50 (7)	7 (1)	100 (14)	7 (1)	100 (14)	350
2004	FALL RIVER RESERVOIR	57 (8)	57 (8)	14 (2)	71 (10)	79 (11)	50 (7)	328
2005	JOHN REDMOND RESERVOIR	14 (2)	0 (0)	0 (0)	50 (7)	93 (13)	7 (1)	164
2006	KANOPOLIS RESERVOIR	43 (6)	43 (6)	29 (4)	21 (3)	71 (10)	64 (9)	271
2007	MARION RESERVOIR	64 (9)	64 (9)	43 (6)	29 (4)	86 (12)	71 (10)	357
2008	MELVERN RESERVOIR	79 (11)	82 (11)	86 (12)	0 (0)	0 (0)	79 (11)	326
2009	MILFORD RESERVOIR	21 (3)	36 (5)	79 (11)	14 (2)	50 (7)	14 (2)	214
2010	NORTON RESERVOIR	7 (1)	93 (13)	64 (9)	7 (1)	100 (14)	21 (3)	292
2011	PERRY RESERVOIR	50 (7)	18 (2)	57 (8)	86 (12)	25 (3)	43 (6)	279
2012	POMONA RESERVOIR	71 (10)	7 (1)	50 (7)	64 (9)	39 (5)	36 (5)	267
2013	TORONTO RESERVOIR	36 (5)	71 (10)	21 (3)	79 (11)	39 (5)	57 (8)	303
2014	TUTTLE CREEK RESERVOIR	0 (0)	18 (2)	71 (10)	36 (5)	14 (2)	0 (0)	139
2015	WILSON RESERVOIR	93 (13)	82 (11)	93 (13)	57 (8)	25 (3)	89 (12)	439

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-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 KANSAS

05/03/76

LAKE CODE 2002 COUNCIL GROVE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 637.1

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS)												MEAN
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
2002A1	647.5	1.76	1.93	2.49	5.10	3.96	4.53	5.95	1.81	1.39	2.29	0.88	0.85	2.75
2002A2	192.7	0.42	0.54	1.22	1.30	1.59	1.56	1.50	0.51	0.65	0.74	0.40	0.40	0.90
2002C1	26.2	0.062	0.076	0.212	0.173	0.249	0.187	0.229	0.059	0.076	0.108	0.048	0.065	0.129
2002E1	29.8	0.071	0.085	0.238	0.198	0.261	0.215	0.261	0.068	0.088	0.122	0.057	0.071	0.145
2002Z1	388.5	0.91	1.16	2.38	2.80	3.40	3.68	3.40	1.42	1.81	1.70	0.99	0.88	2.05

SUMMARY

TOTAL DRAINAGE AREA OF LAKE =	637.1	TOTAL FLOW IN =	38.62
SUM OF SUB-DRAINAGE AREAS =	637.1	TOTAL FLOW OUT =	32.93

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2002A1	10	74	0.340	13	0.538				
	11	74	4.134	9	0.368				
	12	74	1.470	13	1.189				
	1	75	2.410	12	2.605				
	2	75	3.483	9	7.646				
	3	75	2.376	9	3.115				
	4	75	6.966	13	12.459				
	5	75	1.068	2	1.501	16	0.963	29	0.793
	6	75	6.796	16	13.139				
	7	75	11.355	11	13.366	25	0.221		
2002A2	8	75	0.105	4	0.105				
	9	75	0.122	23	0.002				
	10	74	1.841	13	56.634				
	11	74	1.699	9	0.368				
	12	74	0.340	13	0.198				
	1	75	0.481	12	0.708				
	2	75	1.133	9	0.425				
	3	75	0.906	9	0.311				
	4	75	2.095	13	1.133				
	5	75	0.934	2	0.283	16	0.255	29	0.283
	6	75	4.248	16	0.227				
	7	75	0.850	11	0.127	12	0.127	25	0.014
	8	75	0.221	4	0.051				
	9	75	0.396	23	0.028				

TRIBUTARY FLOW INFORMATION FOR KANSAS

05/03/76

LAKE CODE 2002 COUNCIL GROVE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2002C1	10	74	0.088	13	0.156				
	11	74	0.207	7	0.059				
	12	74	0.057	13	0.028				
	1	75	0.074	12	0.110				
	2	75	0.159	9	0.108				
	3	75	0.159	9	0.042				
	4	75	0.278	13	0.099				
	5	75	0.136	2	0.040	16	0.040	29	0.040
	6	75	0.510	16	0.045				
	7	75	0.127	11	0.023	25	0.0		
	8	75	0.025	4	0.0				
	9	75	0.048	23	0.0				
2002E1	10	74	0.099	13	0.283				
	11	74	0.244	9	0.170				
	12	74	0.062	13	0.142				
	1	75	0.082	12	0.311				
	2	75	0.178	9	0.142				
	3	75	0.178	9	0.079				
	4	75	0.311	13	0.368				
	5	75	0.153	2	0.065	16	0.028	29	0.085
	6	75	0.595	16	0.085				
	7	75	0.147	11	0.034	25	0.006		
	8	75	0.028	4	0.003				
	9	75	0.054	23	0.0				
2002Z2	10	74	1.359						
	11	74	4.248						
	12	74	0.765						
	1	75	1.048						
	2	75	2.435						
	3	75	1.784						
	4	75	4.531						
	5	75	2.010						
	6	75	10.194						
	7	75	1.897						
	8	75	0.595						
	9	75	1.133						

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 76/05/03

200201
 38 41 00.0 096 30 00.0 4
 COUNCIL GROVE
 20127 KANSAS

100491

11EPALES 2111202
 0042 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	WATER TEMP CENT	00010 DO MG/L	00300 TRANSP SECCHI INCHES	00077 CNDUCTVY FIELD MICROMHO	00094	00400 PH SU	00410 TALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00071 PHOS-DIS ORTHO MG/L P
74/04/11	16 10	0000	10.6			15	257	8.20	153	0.070	0.900	1.130	0.030
	16 10	0005	10.6	10.0			257	8.20	152	0.090	0.600	1.090	0.030
	16 10	0015	10.6	10.0			259	8.20	154	0.090	0.600	1.160	0.030
	16 10	0037	10.6	10.0			257	8.20	154	0.090	0.600	1.040	0.031
74/06/25	09 30	0000	23.7	6.6		12	287	7.90					
	09 30	0005	23.5	6.4			290	7.80					
	09 30	0015	23.5	6.4			290	8.20					
	09 30	0025	23.5	6.0			290	7.90					
	09 30	0030	23.4	5.6			289	8.10					
	09 30	0035	23.2	5.6			287	8.10					
	09 30	0040	22.7	4.6			282	8.00					
	74/10/02	10 55	0000	15.9	8.0		18	282	8.30	155	0.020K	0.300	0.550
10 55		0005	15.9	8.2			283	8.20	156	0.040	0.200	0.580	0.026
10 55		0015	15.8	8.2			282	8.20	157	0.030	0.200	0.580	0.026
10 55		0030	15.8	8.4			282	8.20	156	0.020K	0.200	0.580	0.023

DATE FROM TO	TIME OF DAY	DEPTH FEET	PHOS-TOT MG/L P	00665 CHLRPHYL A UG/L	32217 INCOT LT REMNING PERCENT	00031	
74/04/11	16 10	0000	0.073		11.6		
	16 10	0005	0.101				
	16 10	0015	0.101				
	16 10	0037	0.086				
74/06/25	09 30	0000			1.6		
	74/10/02	10 55	0000	0.035		8.6	
		10 55	0003				1.0
		10 55	0005	0.027			
10 55		0015	0.030				
10 55	0030	0.030					

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/05/03

200202
38 41 40.0 096 31 30.0 4
COUNCIL GROVE
20127 KANSAS

100491

11EPALES
0010 FEET DEPTH CLASS 00
2111202

DATE FROM TO	TIME OF DAY	DEPTH FEET	WATER TEMP CENT	00010 DO MG/L	00300 TRANSP SECCHI INCHES	00077 CNDUCTVY FIELD MICROMHO	00094 PH	00400 TALK CACO3 MG/L	00410 NH3-N TOTAL MG/L	00610 TOT KJEL N MG/L	00625 N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/11	15 40	0000	11.8		10	277	8.20	170	0.080	1.100	1.010	0.038	
	15 40	0002	11.8	9.6		277							
	15 40	0006	11.7	9.8		278	8.15	168	0.080	0.800	0.960	0.038	
74/06/25	10 10	0000	24.6	7.0	11	300	8.10						
	10 10	0005	24.4	7.0		300	8.30						
	10 10	0010	24.3	7.0		300	8.00						
74/10/02	11 25	0000	15.0	8.8	12	277	8.40	155	0.030	0.200	0.530	0.020	
	11 25	0003	15.0	9.0		278	8.40	155	0.020K	0.300	0.530	0.022	

DATE FROM TO	TIME OF DAY	DEPTH FEET	PHOS-TOT MG/L P	00665 CHLRPHYL A UG/L	32217 INCDLT REMNING PERCENT	00031
74/04/11	15 40	0000	0.133		13.9	
	15 40	0006	0.212			
74/06/25	10 10	0000			3.1	
74/10/02	11 25	0000	0.039		20.0	
	11 25	0002			1.0	
	11 25	0003	0.037			

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/05/03

200203
 38 42 30.0 096 30 15.0 4
 COUNCIL GROVE
 20127 KANSAS

1004.91

11EPALES 2111202
 0020 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	WATER TEMP CENT	00010 DO	00300 TRANSP	00077 SECCHI INCHES	00094 CONDCTVY FIELD MICROMHO	00400 PH	00410 TALK CACO ₃	00610 NH ₃ -N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO ₂ &NO ₃ N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/11	15 55	0000	10.8			20	261	8.20	152	0.080	0.600	1.160	0.031
	15 55	0005	10.8	10.0			260	8.20	150	0.090	0.500	1.150	0.031
	15 55	0015	10.8	10.0			260	8.25	153	0.080	0.700	1.150	0.031
74/06/25	10 30	0000	23.8	7.0		11	293	8.30					
	10 30	0005	23.5	6.4			292	7.90					
	10 30	0015	23.1	5.2			290	8.10					
74/10/02	11 40	0000	15.7	8.6		18	281	8.30	156	0.030	0.300	0.550	0.021
	11 40	0005	15.7	8.6			282	8.20	155	0.030	0.200	0.560	0.024
	11 40	0010	15.7	8.6			282	8.20	159	0.020K	0.200	0.530	0.025

DATE FROM TO	TIME OF DAY	DEPTH FEET	PHOS-TOT MG/L P	00665 CHLRPHYL UG/L	32217 INCDT LT A REMNING PERCENT
74/04/11	15 55	0000	0.074		12.7
	15 55	0005	0.084		
	15 55	0015	0.081		
74/06/25	10 30	0000			1.5
74/10/02	11 40	0000	0.065		15.1
	11 40	0003			
	11 40	0005	0.038		1.0
	11 40	0010	0.033		

K VALUE KNOWN TO BE
 LESS THAN INDICATED

APPENDIX E
TRIBUTARY AND WASTEWATER
TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/05/04

2002A1
 38 41 00.0 096 30 00.0 4
 NEOSHO RIVER
 20 MORRIS CO HWY MP
 0/COUNCIL GROVE RES 100491
 SEC RD BRDG AT BASE OF COUNCIL GROVE DAM
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N02&N03	00625 TOT KJEL	00610 NH3-N N	00671 PHOS-DIS TOTAL ORTHO	00665 PHOS-TOT MG/L P
			MG/L	MG/L	MG/L	MG/L P	
74/10/13	11 32		0.730	1.600	0.520	0.055	0.170
74/11/09	14 30		0.540	3.400	0.060	0.050	0.090
74/12/13	15 52		0.576	2.000	0.035	0.060	0.090
75/01/12	12 15		0.576	1.300	0.072	0.072	0.075
75/02/09	13 20		0.464	1.400	0.064	0.048	0.090
75/03/09	12 20		0.328	0.700	0.040	0.016	0.050
75/04/13	12 40		0.270	1.500	0.040	0.010	0.050
75/05/02	18 20		0.375	1.550	0.070	0.032	0.121
75/05/16	12 00		0.420	0.950	0.180	0.030	0.110
75/05/29	11 00		0.640	0.600	0.040	0.035	0.040
75/06/16	11 20		0.650	0.650	0.030	0.035	0.110
75/07/11	10 35		0.590	1.150	0.085	0.070	0.150
75/07/25	11 00		0.630	0.850		0.060	0.150
75/08/04	15 15		0.470	0.900	0.010	0.065	0.170
75/09/23			0.045	1.300	0.030	0.045	0.170

STORET RETRIEVAL DATE 76/05/04

2002A2
38 45 00.0 096 39 00.0 4
NEOSHO RIVER
20 MORRIS CO HWY MP
T/COUNCIL GROVE RES 100492
SEC RD 819 BRDG 1.1 MI SE OF PARKERVILLE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N02&N03	00625 TOT KJEL	00610 NH3-N	00671 PHOS-DIS	00665 TOTAL ORTHO	PHOS-TOT
			MG/L	MG/L	MG/L	MG/L P	MG/L P	
74/10/13	09 54		2.900	5.800	0.210	0.115	1.000	
74/11/09	09 15		1.200	2.900	0.160	0.325	0.420	
74/12/13	14 25		1.240	1.300	0.025	0.075	0.100	
75/01/12	10 55		1.480	5.600	0.232	0.240	0.540	
75/02/09	11 45		1.800	1.700	0.208	0.144	0.310	
75/03/09	10 35		2.000	1.200	0.172	0.104	0.150	
75/04/13	10 45		1.500	4.700	1.800	0.500	0.837	
75/05/02	16 50		0.890	1.150	0.030	0.100	0.170	
75/05/16	10 10		0.900	0.800	0.045	0.090	0.140	
75/05/29	09 45		0.460	6.990	3.300			
75/06/16	10 10		1.950	1.450	0.105	0.375	0.520	
75/07/11	09 15		0.440	1.150	0.040	0.105	0.180	
75/07/25	09 50		0.315	0.900	0.025	0.090	0.150	
75/08/04	14 10		0.190	0.900	0.025	0.100	0.190	
75/09/23	14 45		0.185	0.700	0.025	0.055	0.120	

STORET RETRIEVAL DATE 76/05/04

200281
38 45 10.6 096 35 40.0 4
LANDS CREEK
20 MORRIS CO HWY MP
T/COUNCIL GROVE RES 100492
SEC RD BRDG 1.8 MI NW OF KELSO
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE	TIME	DEPTH	00630 NO2&NO3	00625 TOT KJEL	00610 NH3-N	00671 PHOS-DIS	00665 PHOS-TOT
FROM	OF		N-TOTAL	N	TOTAL	ORTHO	
TO	DAY	FEET	MG/L	MG/L	MG/L	MG/L P	MG/L P
74/10/13	10	11	1.040	2.900	0.500	0.130	0.640
74/11/09	10	55	1.920	3.200	0.055	0.110	0.130
74/12/13	14	40	1.400	1.200	0.020	0.030	0.040
75/01/12	11	15	2.000	3.500	0.128	0.096	0.230
75/02/09	11	55	2.300	0.800	0.072	0.080	0.150
75/03/09	10	55	1.355	1.350	0.040	0.032	0.045
75/04/13	11	05	0.980	1.400	0.055	0.053	0.100
75/05/02	17	06	1.000	1.200	0.030	0.040	0.080
75/05/16	10	25	1.100	0.700	0.025	0.020	0.060
75/05/29	10	00	0.860	1.000	0.075	0.045	0.140
75/06/16	10	25	2.300	1.050	0.020	0.080	0.160
75/07/11	09	30	0.980	0.550	0.015	0.040	0.110
75/07/25	10	00	0.950	0.500	0.030	0.065	0.100
75/08/04	14	20	0.340	0.800	0.010	0.070	0.120
75/09/23	15	00	0.440	0.700	0.015	0.065	0.090

STORET RETRIEVAL DATE 76/05/04

2002C1
38 45 10.0 096 31 00.0 4
SHORT CREEK
20 MORRIS CO HWY MP
T/COUNCIL GROVE RES 100492
SEC RD BRDG 7 MI N OF COUNCIL GROVE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N026N03 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
74/10/13	10 51		3.680	2.700	0.290	0.175	0.550
74/11/09	13 00		1.360	3.700	0.050	0.075	0.110
74/12/13	15 15		0.960	1.400	0.020	0.030	0.040
75/01/12	11 45		2.000	4.800	0.064	0.060	0.220
75/02/09	12 26		1.800	0.600	0.048	0.048	0.100
75/03/09	11 45		0.715	0.250	0.024	0.016	0.160
75/04/13	11 40		1.400	1.250	0.035	0.020	0.050
75/05/02	17 50		0.575	1.200	0.030	0.030	0.050
75/05/16	11 15		0.610	0.600	0.035	0.020	0.060
75/05/29	10 30		0.650	0.550	0.090	0.045	0.130
75/06/16	10 50		1.720	0.550	0.025	0.060	0.120
75/07/11	10 00		0.910	0.800	0.020	0.050	0.060
75/07/25	10 50		0.400	0.600	0.015	0.040	0.075
75/08/04	14 55		0.125	0.400	0.025	0.050	0.110
75/09/23	15 32		0.175	0.700	0.025	0.010	0.060

STORET RETRIEVAL DATE 76/05/04

200201
38 46 20.0 096 27 00.0 4
MIDDLE CREEK
20 MORRIS CO HWY MP
T/COUNCIL GROVE RÉS 100492
SEC RD XING 2.5 MI E JCT KS HWY 55/177
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N02&N03 N-TOTAL MG/L	00625 TOT KJEL MG/L	00610 NH3-N N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/13	11 05		1.240	4.000	0.590	0.660	1.350
74/11/09	14 10		2.240	2.500	0.050	0.140	0.170
74/12/13	15 30		2.000	0.700	0.010	0.055	0.070
75/02/09			2.500	0.900	0.032	0.064	0.120
75/03/09	12 00		1.585	0.400	0.024	0.048	0.060
75/04/13	11 55		1.880	1.550	0.040	0.065	0.090
75/05/02	18 05		1.570	0.975	0.030	0.045	0.050
75/05/16	11 35		1.350	0.825	0.030	0.020	0.045
75/05/29	10 45		1.400	1.250	0.120	0.145	0.260
75/06/16	11 05		3.100	0.550	0.015	0.080	0.120
75/07/11	10 15		2.900	0.600	0.040	0.055	0.080
75/07/25	10 40		1.800	1.150	0.040	0.050	0.110
75/08/04	15 05		0.460	0.450	0.030	0.050	0.100
75/09/23			0.945	0.500	0.025	0.040	0.070

STORET RETRIEVAL DATE 76/05/04

2002E1
38 43 00.0 096 35 40.0 4
GILMORE CREEK
20 MORRIS CO HWY MP
T/COUNCIL GROVE RES 100491
SEC RD XING 2 MI SW OF KELSO
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&N03 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/13	10	32	5.920	2.800	0.340	0.100	0.270
74/11/09	11	10	2.080	4.000	0.050	0.040	0.040
74/12/13	15	00	1.760	1.300	0.015	0.015	0.015
75/01/12	11	30	2.160	2.300	0.024	0.008	0.040
75/02/09	12	10	1.800	0.300	0.032	0.020	0.040
75/03/09	11	10	1.465	0.900	0.024	0.008	0.020
75/04/13	11	20	1.570	1.700	0.040	0.010	0.030
75/05/02	17	30	1.150	1.050	0.030	0.025	0.030
75/05/16	11	00	1.000	0.150	0.030	0.020	0.020
75/05/29	10	15	0.990	0.850	0.030	0.030	0.060
75/06/16	10	40	0.910	0.250	0.005	0.025	0.060
75/07/11	09	50	0.820	0.600	0.015	0.030	0.060
75/07/25	10	00	1.300	1.950	0.055	0.025K	
75/08/04	14	35	0.870	0.750	0.020	0.030	0.070
75/09/23	15	10	3.000	0.900	0.032	0.015	0.110

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/05/04

2002F1
38 44 00.0 096 40 30.0 4
HAUN CREEK
20 MORRIS CO HWY MP
T/COUNCIL GROVE RES 100491
SEC RD XING 2.5 MI SSW OF PARKERVILLE
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
74/10/13	09 27		2.760	4.400	0.085	0.100	0.290
74/11/09	09 30		1.480	3.000	0.040	0.045	0.050
74/12/13	14 00		1.560	1.300	0.020	0.015	0.030
75/01/12	09 55		2.080	3.500	0.120	0.040	0.210
75/02/09	11 20		1.950	0.500	0.160	0.032	0.100
75/03/09	10 10		1.245	0.300	0.024	0.008	0.040
75/04/13	10 20		1.570	1.000	0.050	0.005	0.060
75/05/02	15 35		0.390	1.600	0.045	0.009	0.020
75/05/16	09 50		0.670	0.650	0.030	0.005	0.030
75/05/29	09 25		0.610	0.600	0.060	0.025	0.070
75/06/16	09 50		1.600	0.550	0.020	0.025	0.070
75/07/11	08 45		0.500	0.850	0.015	0.010	0.060
75/07/25	09 30		0.360	0.750	0.025	0.010	0.060
75/08/04	13 50		0.010	1.100	0.020	0.015	0.100
75/09/23	14 25		0.022	0.900	0.020	0.010	0.100

STORET RETRIEVAL DATE 76/05/04

2002G1
38 45 10.0 096 43 00.0 4
W FORK NEOSHO RIVER
20 MORRIS CO HWY MP
T/COUNCIL GROVE RES 100492
SEC RD XING 3 MI W OF PARKERVILLE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

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
74/10/13	09 15		2.320	4.600	0.075	0.210	0.900
74/12/13	14 40		0.780	1.600	0.020	0.015	0.030
75/01/12	09 40		1.560	4.200	0.072	0.072	0.300
75/02/09	11 10		1.880	2.700	0.096	0.064	0.260
75/03/09	09 55		1.860	1.200	0.044	0.024	0.040
75/04/13	10 05		1.450	1.000	0.065	0.060	0.120
75/05/02	15 10		0.670	0.900	0.085	0.022	0.040
75/05/16	09 20		0.760	0.650	0.040	0.015	0.060
75/05/29	09 10		0.870	1.200	0.105	0.055	0.110
75/06/16	09 40		1.900	0.700	0.030	0.070	0.140
75/07/11	09 00		0.690	0.800	0.025	0.025	0.030
75/07/25	09 30		0.360	0.550	0.020	0.020	0.050
75/08/04	13 40		0.230	0.800	0.045	0.040	0.080
75/09/23	14 20		0.630	0.800	0.030	0.020	0.050

STORET RETRIEVAL DATE 76/05/04

200262
38 42 30.0 096 44 30.0 4
W FORK NEOSHO RIVER
20 MORRIS CO HWY MP
T/COUNCIL GROVE RES 100491
KS HWY 149 BRDG 5.6 MI S OF WHITE CITY
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N02&N03 MG/L	00625 TOT KJEL MG/L	00610 NH3-N N MG/L	00671 PHOS-DIS TOTAL MG/L	00665 PHOS-TOT MG/L P
74/10/13	09 00		1.680	3.600	0.070	0.210	0.500
74/11/09	08 20		1.000	4.200	0.060	0.080	0.120
74/12/13	13 00		0.960	1.300	0.020	0.035	0.070
75/01/12	09 15		1.520	4.400	0.160	0.080	0.260
75/02/09	11 00		1.800	2.100	0.064	0.072	0.300
75/03/09	09 45		2.220	1.500	0.320	0.032	0.130
75/04/13	09 55		1.100	2.300	0.065	0.055	0.170
75/05/02	15 00		0.750	1.300	0.055	0.030	0.060
75/05/16	08 55		0.500	0.550	0.025	0.020	0.060
75/05/29	09 00		0.700	1.050	0.070	0.040	0.120
75/06/16	09 30		1.650	1.000	0.070	0.070	0.160
75/07/11	08 30		0.420	0.850	0.030	0.070	0.080
75/07/25	09 10		0.195	0.700	0.050	0.050	0.080
75/08/04	13 30		0.200	1.000	0.050	0.170	0.240
75/09/23	13 32		0.270	1.000	0.030	0.045	0.150

STORET RETRIEVAL DATE 76/05/04

2002M1
 38 46 00.0 096 40 30.0 4
 PARKERS CREEK
 20 MORRIS CO HWY MP
 T/COUNCIL GROVE RES 100492
 SEC RD XING .6 MI WNW OF PARKERVILLE
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N02&N03 N-TOTAL	00625 TOT KJEL MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
			0.104	1.600	0.035	0.045	0.095
74/10/13	09 45						
74/11/09	10 35		1.400	3.300	0.050	0.045	0.045
74/12/13	14 15		0.940	1.200	0.020	0.020	0.030
75/01/12	10 45		1.520	2.900	0.032	0.024	0.070
75/02/09	11 30		1.570	0.500	0.024	0.024	0.060
75/03/09	10 25		1.150	0.900	0.044	0.008	0.020
75/04/13	10 25		1.350	1.050	0.045	0.010	0.030
75/05/02			0.890	1.200	0.045	0.016	0.038
75/05/16	10 00		0.780	0.600	0.030	0.010	0.040
75/05/29	09 35		0.700	0.300	0.045	0.005	0.060
75/06/16	10 00		1.150	0.675	0.020	0.015	0.055
75/07/11	08 37		0.450	1.000	0.035	0.105	0.165
75/07/25	09 37		0.260	0.700	0.025	0.025	0.060
75/08/04	14 09		0.040	0.500	0.030	0.035	0.070
75/09/23	14 35		0.040	0.700	0.015	0.020	0.040

STORET RETRIEVAL DATE 76/05/04

2002AA TF2002AA P000517
 38 45 30.0 096 43 15.0 4
 WHITE CITY
 20 MORRIS COUNTY
 T/COUNCIL GROVE RES. 100492
 DRY CREEK TO NEOSHO RIVER
 11EPALES 2141204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N026N03	00625 TOT KJEL	00610 NH3-N	00671 PHOS-DIS	00665 PHOS-TUT	50051 FLOW	50053 CONDUIT
			N-TOTAL	N	TOTAL	ORTHO	MG/L P	MG/L P	RATE FLOW-MGD
			MG/L	MG/L	MG/L			INST MGD	MONTHLY
75/01/06	10 15		0.080	42.000	23.000	4.100		11.000	
75/02/07	09 45		0.240	33.000	15.600	6.000		9.900	
75/03/03	10 00		0.122	34.000	7.830	1.720		10.500	
75/04/04	14 00		0.080	28.000	0.160	0.130		8.300	
75/05/09			11.600	5.200	0.130	5.200		5.200	
75/06/06	10 00		5.600	4.400	0.150	7.000		7.300	
75/07/02	09 45		12.000	4.400	0.034	7.100		7.100	
75/08/01	13 30		0.425	47.000		4.700		13.000	
75/09/10	10 00		18.000	4.900	0.050	6.400		6.700	
75/10/03	13 20		19.800	3.800	0.025K	8.200		8.200	
75/11/05	10 10		17.600	3.700	0.065	8.000		8.100	
75/12/03	10 00		0.050	39.000	19.000	8.750		9.500	
76/01/02	10 00		0.100	49.000	22.000	1.400		12.000	

K VALUE KNOWN TO BE
LESS THAN INDICATED