U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

WORKING PAPER SERIES

REPORT

ON

BIG STONE LAKE

BIG STONE COUNTY, MINNESOTA

AND

ROBERTS AND GRANT COUNTIES, SOUTH DAKOTA

EPA REGIONS V AND VIII

WORKING PAPER No. 85

PACIFIC NORTHWEST ENVIRONMENTAL RESEARCH LABORATORY

An Associate Laboratory of the

NATIONAL ENVIRONMENTAL RESEARCH CENTER - CORVALLIS, OREGON

and

NATIONAL ENVIRONMENTAL RESEARCH CENTER - LAS VEGAS, NEVADA

☆GPO—697-032

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WITH THE COOPERATION OF THE

MINNESOTA POLLUTION CONTROL AGENCY

AND THE

MINNESOTA NATIONAL GUARD

MAY, 1975

CONTENTS

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 nation-wide threat of accelerated eutrophication to fresh water 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.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Minnesota Pollution Control Agency and the South Dakota Department of Environmental Protection for professional involvement and to the Minnesota National Guard for conducting the tributary sampling phase of the Survey.

Grant J. Merritt, Director of the Minnesota Pollution Control Agency, John F. McGuire, Chief, and Joel G. Schilling, Biologist, of the Section of Surface and Groundwater, Division of Water Quality, provided invaluable lake documentation and counsel during the course of the Survey; and the staff of the Section of Municipal Works, Division of Water Quality, were most helpful in identifying Minnesota point sources and soliciting municipal participation in the Survey.

Allyn Lockner, Secretary, South Dakota Department of Environmental Protection; Blaine B. Barker, Chief, Water Quality Program; and James C. Andersen, District Sanitary Engineer, provided information on the South Dakota point sources and carefully reviewed the preliminary report with respect to the South Dakota portion of the lake drainage.

Major General Chester J. Moeglein, the Adjutant General of Minnesota, and Project Officer Major Adrian Beltrand, who directed the volunteer efforts of the Minnesota National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

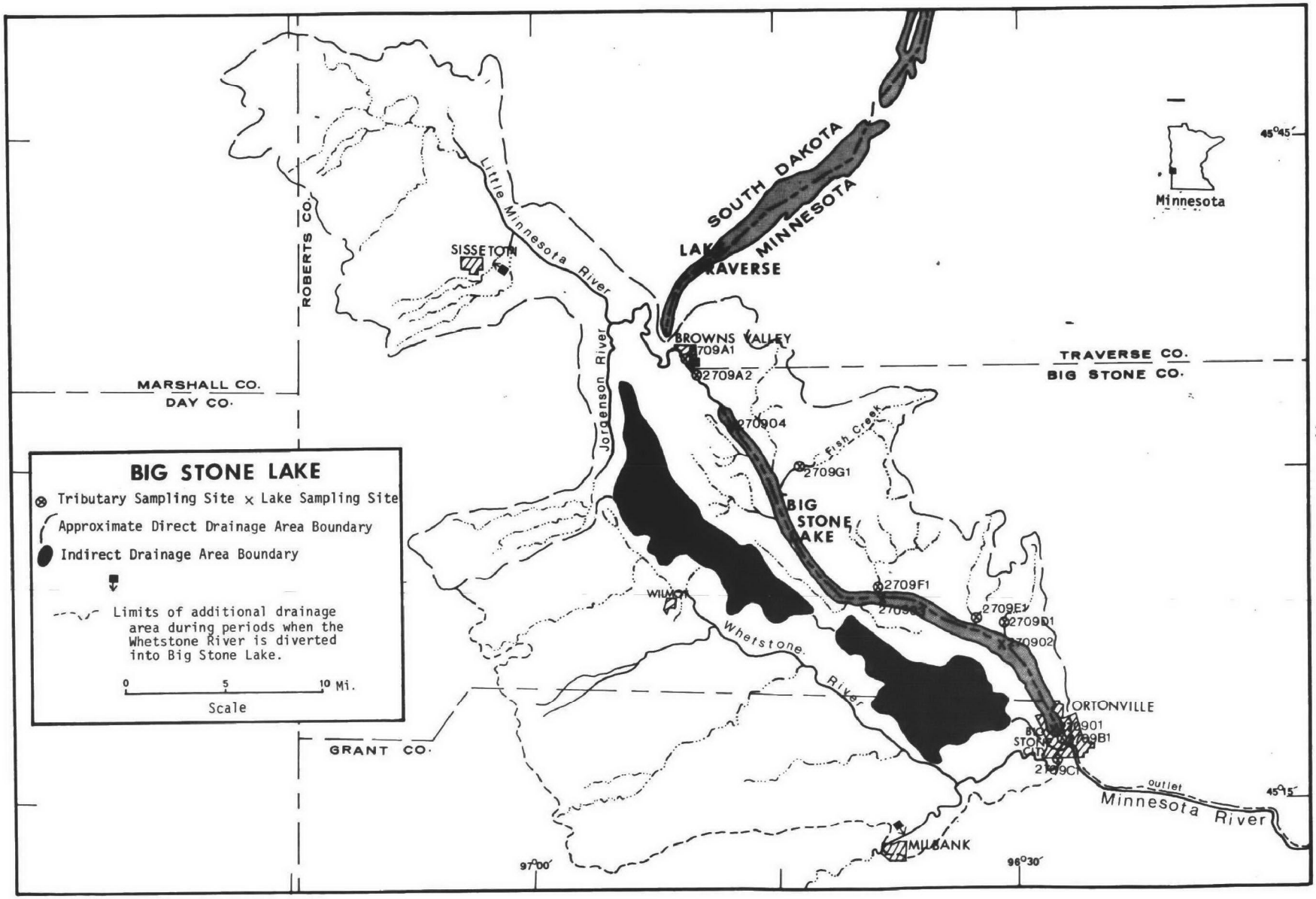
NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF MINNESOTA

LAKE NAME	COUNTY
Albert Lea	Freeborn
Andrusia	Beltrami
Badger	Polk
Bartlett	Koochiching
Bear	Freeborn
Bemidji	Beltrami
Big	Stearns
Big Stone	Big Stone, MN; Roberts, Grant, SD
Birch	Cass
Blackduck	Beltrami
Blackhoof	Crow Wing
Budd	Martin
Buffalo	Wright
Calhoun	Hennepin
Carlos	Douglas
Carrigan	Wright
Cass	Beltrami, Cass
Clearwater	Wright, Stearns
Cokato	Wright
Cranberry	Crow Wing
Darling	Douglas
Elbow	St. Louis
Embarass	St. Louis
Fall	Lake
Forest	Washington
Green	Kandiyohi
Gull	Cass
Heron	Jackson
Leech	Cass
Le Homme Dieu	Douglas
Lily	Blue Earth
Little	Grant
Lost	St. Louis

LAKE NAME	COUNTY
Madison	Blue Earth
Malmedal	Pope
Mashkenode	St. Louis
McQuade	St. Louis
Minnetonka	Hennepin
Minnewaska	Pope
Mud	Itasca
Nest	Kandiyohi
Pelican	St. Louis
Pepin	Goodhue, Wabasha, MN; Pierce, Pepin, WI
Rabbit	Crow Wing
Sakatah	Le Sueur
Shagawa	St. Louis
Silver	McLeod
Six Mile	St. Louis
Spring	Washington, Dakota
St. Croix	Washington, MN; St. Croix, Pierce, WI
St. Louis Bay	St. Louis, MN; Douglas, WI
Superior Bay	St. Louis, MN; Douglas, WI
Swan	Itasca
Trace	Todd
Trout	Itasca
Wagonga	Kandiyohi
Wallmark	Chisago
White Bear	Washington
Winona	Douglas
Wolf	Beltrami, Hubbard
Woodcock	Kandiyohi
Zumbro	Olmstead, Wabasha


BIG STONE LAKE
Tributary Sampling Site
Lake Sampling Site
Approximate Direct Drainage Area Boundary
Indirect Drainage Area Boundary
Limits of additional drainage area during periods when the Whetstone River is diverted into Big Stone Lake.
0 5 10 Mi.
Scale
SOUTH DAKOTA
MINNESOTA
LAKE TRAVERSE
Minnesota
45°45'
45°15'
97°00'
96°30'
ROBERTS CO.
MARSHALL CO.
DAY CO.
GRANT CO.
TRAVERSE CO.
BIG STONE CO.
SISSETON
BROWNS VALLEY
Little Minnesota River
Jorgenson River
Fish Creek
Whetstone River
BIG STONE LAKE
WILMOT
ORTONVILLE
MILBANK
outlet
Minnesota River
2709A1
2709A2
2709G1
2709F1
2709E1
2709D1
2709C1
2709B1
2709901
2709902

BIG STONE LAKE

STORET NO. 2709

I. CONCLUSIONS

A. Trophic Condition:

Survey data and the records of others (Anonymous, 1967) show that Big Stone Lake is eutrophic. Of the 60 Minnesota lakes sampled three times, 41 had less mean total and dissolved phosphorus, and 37 had less mean inorganic nitrogen. For all Minnesota data, 34 lakes had less mean chlorophyll a, and 37 had greater mean Secchi disc transparency than Big Stone Lake.

Survey limnologists noted that emergent vegetation occupied much of the shoreline, and intensive algal blooms with decomposing mats of surface algae were observed.

Big Stone Lake is listed in "Problem lakes in the United States" (Ketelle and Uttormark, 1971).

B. Rate-Limiting Nutrient:

A significant loss of phosphorus occurred in the assay sample between the time of collection and the beginning of the assay, and the results are not representative of conditions in the lake at the time the sample was taken. The lake data indicate nitrogen limitation at all sampling times; N/P ratios were less than 4/1, and nitrogen limitation would be expected.

C. Nutrient Controllability:

1. Point sources--During the sampling year, Big Stone Lake received an estimated total phosphorus load at a rate just exceeding the rate proposed by Vollenweider (in press) as "dangerous"; i.e., a eutrophic rate (see page 15). Of this load, municipal point sources apparently contributed about 48%. However, it is likely that the estimated total load is too low and, proportionally, the municipal point source percentage contribution is too high.

It is known that there are livestock feedlots and barnyards with direct drainage to the lake, and livestock are pastured along the shoreline (Miller, 1967). In a previous study of Big Stone Lake (Anonymous, 1967), it was estimated that over 23% of the annual total phosphorus loading to the lake was from livestock operations; and Miller (op. cit.) estimated a daily livestock phosphorus contribution of 66 pounds in the Minnesota drainage of the lake alone.

It was not possible to quantify the actual livestock phosphorus contributions during the Survey sampling year; but, if the above estimates are correct, these sources are quite significant. Because of this, a more detailed study should be made to determine the relative importance of agricultural and municipal phosphorus contributions.

It is noted that even though the mean hydraulic retention time of Big Stone Lake is 1.7 years, the phosphorus accumulation was less than 1% of the estimated total loading; but with a retention time that long, a phosphorus accumulation on the order of 50 percent of the total loading would be expected.

At least part of the apparent minimal retention of phosphorus during the sampling year can be attributed to the difficulty in obtaining representative lake outlet samples (see page 10). However, it is likely that the unmeasured livestock loads noted above also account for part of the near imbalance of phosphorus during the sampling year; i.e., these loads contributed to the measured outlet phosphorus load but were not included in the measured and estimated phosphorus loads entering the lake.

2. Non-point sources--During the sampling year, the estimated phosphorus export rates of all of the sampled Big Stone Lake tributaries, except Fish Creek, were relatively low (see page 15) and compare well with the 18 lbs/mi^2/yr calculated for tributaries to nearby Lake Minnewaska. The Fish Creek export rate was about twice that of the other streams.

In all, non-point sources are estimated to have contributed about 45% of the total phosphorus load to Big Stone Lake.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry†:

1. Surface area: 12,610 acres.
2. Mean depth: 11 feet.
3. Maximum depth: 16 feet.
4. Volume: 138,710 acre-feet.
5. Mean hydraulic retention time: 1.7 years.

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

1. Tributaries -

Name	Drainage area*	Mean flow*
Little Minnesota River	472.0 mi^2	46.4 cfs
Whetstone River	400.0 mi^2	47.8 cfs
Unnamed Stream (D-1)	16.5 mi^2	1.7 cfs
Unnamed Stream (E-1)	11.1 mi^2	1.2 cfs
Unnamed Stream (F-1)	26.6 mi^2	2.8 cfs
Fish Creek	57.8 mi^2	5.3 cfs
Minor tributaries & immediate drainage -	156.3 mi^2	10.8 cfs
Totals	1,140.3 mi^2	116.0 cfs

2. Outlet -

Minnesota River	1,160.0 mi^2**	116.0 cfs

C. Precipitation***:

1. Year of sampling: 22.4 inches.
2. Mean annual: 22.7 inches.

† DNR lake survey map (1959).
* Drainage areas are accurate within ±5%; mean daily flows are accurate within ±10%; and ungaged flows are accurate within ±10 to 25% for drainage areas greater than 10 mi^2.
** Includes area of lake.
*** See Working Paper No. 1, "Survey Methods, 1972".

III. LAKE WATER QUALITY SUMMARY

Big Stone Lake was sampled three times during the open-water season of 1972 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from four stations on the lake and from a number of depths at each station (see map, page vi). During each visit, a single depth-integrated (near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the last visit, a single five-gallon 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 5 feet at station 1, 11 feet at station 2, 9 feet at station 3, and 4 feet at station 4.

The results obtained are presented in full in Appendix B, and the data for the fall sampling period, when the lake essentially was well-mixed, are summarized below. Note, however, the Secchi disc summary is based on all values.

For differences in the various parameters at the other sampling times, refer to Appendix B.

A. Physical and chemical characteristics:

Parameter	Minimum	Mean	Median	Maximum
		FALL VALUES (10/25/72)		
Temperature (Cent.)	4.8	5.5	5.7	5.9
Dissolved oxygen (mg/l)	8.2	11.0	11.6	12.4
Conductivity (μmhos)	800	844	800	980
pH (units)	8.1	8.5	8.6	8.7
Alkalinity (mg/l)	124	144	131	196
Total P (mg/l)	0.062	0.133	0.118	0.250
Dissolved P (mg/l)	0.038	0.092	0.063	0.225
NO_2 + NO_3 (mg/l)	0.060	0.129	0.090	0.270
Ammonia (mg/l)	0.110	0.187	0.180	0.260
		ALL VALUES		
Secchi disc (inches)	14	41	31	106

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Number per ml
07/05/72	1. Melosira	787
	2. Anabaena	678
	3. Dinobryon	326
	4. Cyclotella	307
	5. Ankistrodesmus	54
	Other genera	117
	Total	2,269
09/01/72	1. Anabaena	6,630
	2. Kirchneriella	1,340
	3. Microcystis	217
	4. Dinobryon	181
	5. Chroococcus	145
	Other genera	473
	Total	8,986
10/25/72	1. Anabaena	7,660
	2. Flagellates	2,187
	3. Chroococcus	604
	4. Fragilaria	566
	5. Dinobryon	377
	Other genera	2,229
	Total	13,623

2. Chlorophyll a -
(Because of instrumentation problems during the 1972 sampling, the following values may be in error by plus or minus 20 percent.)

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/07/72	01	5.0
	02	0.6
	03	2.4
	04	2.7
09/01/72	01	7.9
	02	6.8
	03	7.3
	04	12.4
10/25/72	01	54.0
	02	52.0
	03	43.8
	04	2.8

C. Limiting Nutrient Study:

A loss of over 56% of the dissolved phosphorus occurred in the assay sample between the time of collection and the beginning of the assay, and the results are not representative of conditions in the lake at the time the sample was taken.

The lake data indicate nitrogen limitation at all sampling times; i.e., all N/P ratios were less than 4/1, and nitrogen limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix C for data)

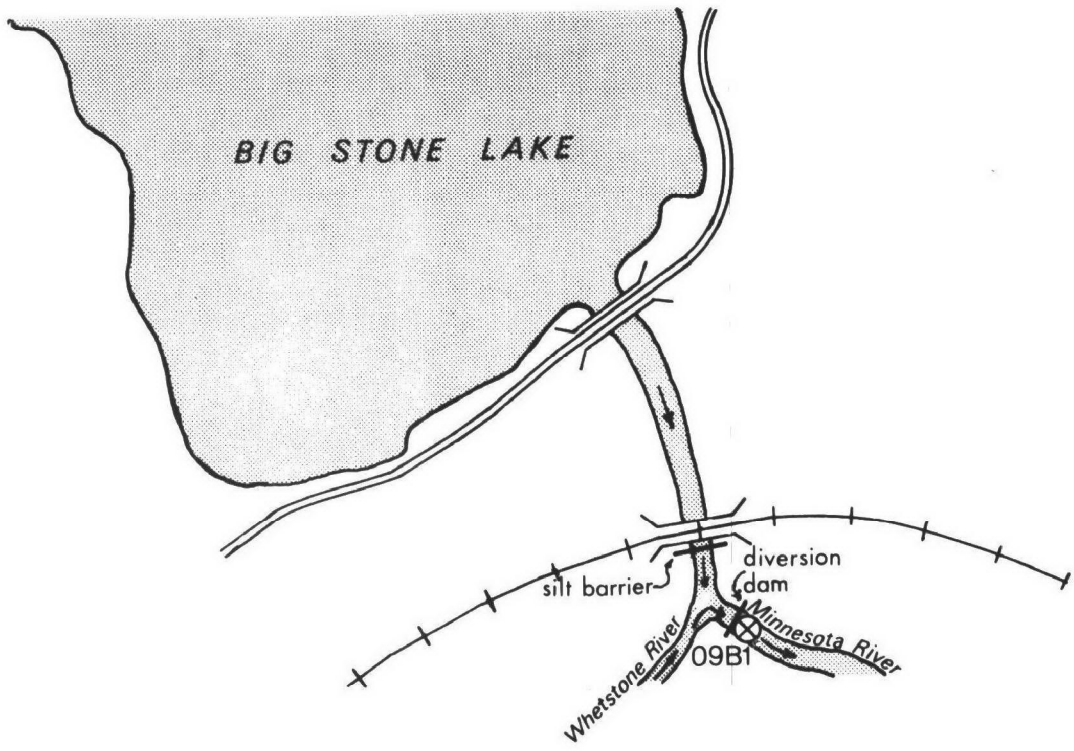
For the determination of nutrient loadings, the Minnesota National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page vi), except for the high runoff months of April and May when two samples were collected. Sampling was begun in October, 1972, and was completed in September, 1973.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Minnesota District Office of the U.S. Geological Survey for the tributary sites nearest the lake. However, the normalized flows provided for the Minnesota, Little Minnesota, and Whetstone Rivers differed significantly from those measured at gaging stations of 33 to 41 years of record (Anonymous, 1974; pages 129, 130, and 132), so the flows of record are used in this report (see page 4 and Appendix A).

Nutrient loads for sampled tributaries were calculated using mean annual concentrations and mean annual flows. Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated by using the means of the concentrations at stations D-1, E-1, F-1, and G-1 and the mean ZZ flow.

During the sampling year, it appeared that there was less than 1% accumulation of phosphorus in Big Stone Lake; i.e., about as much phosphorus was measured leaving the lake as was estimated or measured entering the lake (see

page 13). However, since Big Stone Lake has a mean hydraulic retention time of 1.7 years, an accumulation or retention of about 50% of the phosphorus entering the lake would be expected. At least part of the minimal retention can be attributed to the difficulty in obtaining representative lake outlet samples. Because of the relationship of the Whetstone River diversion to the lake outlet, as shown in the diagram below, samples collected at the outlet station (09B1) may at times be largely Whetstone River water, depending on flow conditions. Since phosphorus concentrations in the Whetstone River generally are quite high because of the upstream nutrient point source (Milbank), outlet loads calculated from concentrations in such atypical samples would be higher than the actual lake outlet loads and thus more phosphorus would appear to be leaving the lake.



The operator of the Browns Valley, Minnesota, wastewater treatment plant provided monthly effluent samples and corresponding flow data; but Milbank and Sisseton (both in South Dakota) did not participate in the Survey, and nutrient loads were estimated at 2.5 lbs P and 7.5 lbs N/capita/yr. Note, however, that the Sisseton ponds were assumed to have overflowed only half of the sampling year (a considerably enlarged pond system was completed at or near the time the tributary sampling began).

In the following loading tables, the nutrient loads attributed to the Little Minnesota River are those measured at station A-1 (above the Browns Valley STP) minus the estimated Sisseton loads, and the loads given for the Whetstone River are those measured at station C-1 minus the estimated Milbank loads.

The overflow of the pond serving Wilmot, South Dakota is discharged to a slough and does not reach the North Fork of the Whetstone River; also, there is no discharge from the pond serving Big Stone City.

A. Waste Sources:

1. Known municipal -

Name	Pop. Served*	Treatment	Mean Flow (mgd)	Receiving Water
Browns Valley	906	trickling filter	0.150	Little Minnesota River
Sisseton	3,094	stab. ponds	0.310**	Little Minnesota River
Milbank	3,727	trickling filters + ponds	0.373**	S. Fk. Whetstone River

2. Known industrial† -

Name	Treatment	Mean Flow (mgd)	Receiving Water
Beardsley Locker Co., Beardsley, MN	septic tanks	?	(no discharge)
Frigo Cheese Co., Big Stone City, SD	land disposal	?	(no discharge)
Ottertail Power Co., Ortonville, MN	(cooling water)	?	Big Stone Lake

* 1970 Census.
** Estimated at 100 gal/capita/day
† Anonymous, 1967.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	lbs P/ yr	% of total
a. Tributaries (non-point load) -		
Little Minnesota River	4,990	14.2
Whetstone River	6,020	17.1
Unnamed Stream (D-1)	300	0.9
Unnamed Stream (E-1)	120	0.3
Unnamed Stream (F-1)	400	1.1
Fish Creek	1,810	5.1
b. Minor tributaries & immediate drainage (non-point load) -	2,060	5.9
c. Known municipal STP's -		
Browns Valley	3,780	10.8
Sisseton (estimated)	3,870	11.1
Milbank (estimated)	9,320	26.5
d. Septic tanks* -	470	1.3
e. Known industrial -		
Beardsley Locker Co.	None	-
Frigo Cheese Co.	None	-
Ottertail Power Co.	50**	0.1
f. Direct precipitation† -	1,970	5.6
Total	35,160	100.0

2. Outputs -

Lake outlet - Minnesota River 34,940

3. Net annual P accumulation - 220 pounds

* Estimate based on 614 shoreline dwellings and 14 resorts (Anonymous, 1967); see Working Paper No. 1.
** Anonymous, 1967.
† See Working Paper No. 1.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	lbs N/yr	% of total
a. Tributaries (non-point load) -		
Little Minnesota River	50,880	10.5
Whetstone River	168,720	34.9
Unnamed Stream (D-1)	3,610	0.7
Unnamed Stream (E-1)	7,230	1.5
Unnamed Stream (F-1)	7,890	1.6
Fish Creek	17,820	3.7
b. Minor tributaries & immediate drainage (non-point load) -	38,700	8.0
c. Known municipal STP's -		
Browns Valley	10,280	2.1
Sisseton (estimated)	11,600	2.4
Milbank (estimated)	27,950	5.8
d. Septic tanks* -	17,720	3.7
e. Known industrial -		
Beardsley Locker Co.	None	-
Frigo Cheese Co.	None	-
Ottertail Power Co.**	?	-
f. Direct precipitation† -	121,480	25.1
Total	483,880	100.0

2. Outputs -

Lake outlet - Minnesota River 472,020

3. Net annual N accumulation - 11,860 pounds

* Estimate based on 614 shoreline dwellings and 14 resorts (Anonymous, 1967); see Working Paper No. 1.
** Anonymous, 1967.
† See Working Paper No. 1.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	lbs P/mi^2/yr	lbs N/mi^2/yr
Little Minnesota River	11	108
Whetstone River	15	422
Unnamed Stream (D-1)	18	219
Unnamed Stream (E-1)	11	651
Unnamed Stream (F-1)	15	297
Fish Creek	31	308

E. Yearly Loading Rates:

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

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

	Total Phosphorus		Total Nitrogen	
Units	Total	Accumulated	Total	Accumulated
lbs/acre/yr	2.8	<0.1	38.4	0.9
grams/m^2/yr	0.31	-	4.3	0.1

Vollenweider loading rates for phosphorus (g/m^2/yr) based on mean depth and mean hydraulic retention time of Big Stone Lake:

"Dangerous" (eutrophic rate)	0.28
"Permissible" (oligotrophic rate)	0.14

V. LITERATURE REVIEWED

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VII. APPENDICES

APPENDIX A

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR MINNESOTA 10/30/74

LAKE CODE 2709 BIG STONE LAKE

TOTAL DRAINAGE AREA OF LAKE 1160.00

TRIBUTARY	SUB-DRAINAGE AREA	NORMALIZED FLOWS JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
2709A1	472.00	1.23	2.32	103.00	230.00	104.00	92.40	38.80	8.44	4.44	5.10	5.67	2.77	49.87
2709B1	1160.00	25.60	28.10	127.10	448.90	284.10	255.40	140.40	66.20	44.70	26.10	26.10	27.10	125.03
2709C1	400.00	3.47	7.43	114.00	181.00	85.20	85.60	37.20	12.20	8.09	8.86	9.52	5.82	46.59
2709D1	16.50	0.05	0.11	2.61	6.05	4.05	4.65	1.65	0.34	0.31	0.36	0.23	0.14	1.71
2709E1	11.10	0.06	0.10	1.82	3.98	2.86	3.14	1.18	0.26	0.25	0.30	0.18	0.12	1.19
2709F1	26.60	0.10	0.19	5.13	9.98	6.31	7.46	2.56	0.50	0.46	0.52	0.33	0.22	2.82
2709G1	57.80	0.15	0.24	8.30	20.80	12.20	13.30	4.97	1.11	1.01	0.86	0.57	0.40	5.33
2709ZZ	176.00	0.91	1.82	37.80	61.10	36.70	42.00	16.40	3.66	2.83	2.96	2.07	1.66	17.52

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 1160.00
SUM OF SUB-DRAINAGE AREAS = 1160.00
TOTAL FLOW IN = 1498.93
TOTAL FLOW OUT = 1499.80

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2709A1	10	72	2.59	14	1.90				
	11	72	6.53	19	5.90				
	12	72	4.61	16	4.80				
	1	73	2.57	13	2.30				
	2	73	6.03	10	0.60				
	3	73	110.00	18	1.40				
	4	73	39.50	2	68.00	15	34.00		
	5	73	49.80	1	28.00	19	12.00		
	6	73	18.00	3	52.00				
	7	73	1.04	12	0.58				
	8	73	0.15	5	0.10				
	9	73	0.60	18	0.58				
2709B1	10	72	2.33	14	1.80				
	11	72	1.98	19	1.90				
	12	72	1.65	16	1.40				
	1	73	30.70	13	4.60				
	2	73	70.10	10	66.00				
	3	73	355.00	18	416.00				
	4	73	112.00	2	413.00	15	81.00		
	5	73	239.00	1	154.00	19	19.00		
	6	73	179.00	3	512.00				
	7	73	8.48	12	11.00				
	8	73	3.31	5	3.30				
	9	73	4.78	18	3.50				

LAKE CODE 2709 HIG STONE LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2709C1	10	72	14.50	14	12.00				
	11	72	30.60	19	22.00				
	12	72	18.80	16	19.00				
	1	73	14.10	13	10.00				
	2	73	38.70	10	29.00				
	3	73	294.00	18	214.00				
	4	73	74.10	2	105.00	15	64.00		
	5	73	232.00	1	70.00	19	38.00		
	6	73	40.30	3	95.00				
	7	73	7.47	12	5.50				
	8	73	5.04	5	5.70				
	9	73	8.33	18	4.70				
2709D1	10	72	0.38	14	0.30				
	11	72	0.50	19	0.40				
	12	72	0.34	16	0.30				
	1	73	0.15	16	0.10				
	2	73	0.42	10	0.30				
	3	73	4.75	18	4.90				
	4	73	1.75	2	2.70	15	1.50		
	5	73	6.48	1	2.70	19	1.30		
	6	73	1.53	3	2.40				
	7	73	0.20	12	0.13				
	8	73	0.07	5	0.06				
	9	73	0.11	18	0.11				
2709E1	10	72	0.32	14	0.30				
	11	72	0.39	19	0.30				
	12	72	0.29	16	0.30				
	1	73	0.18	16	0.10				
	2	73	0.39	10	0.20				
	3	73	3.31	18	3.40				
	4	73	1.15	2	1.80	15	1.00		
	5	73	4.58	1	1.90	19	0.90		
	6	73	1.04	3	1.60				
	8	73	0.06	5	0.05				
	9	73	0.09	18	0.09				
2709F1	10	72	0.55	14	0.50				
	11	72	0.72	16	0.50				
	12	72	0.54	19	0.60				
	1	73	0.31	16	0.20				
	2	73	0.74	10	0.50				
	3	73	9.33	18	9.70				
	4	73	2.89	2	4.40	15	2.40		
	5	73	10.10	1	4.20	19	2.00		
	6	73	2.46	3	3.80				
	7	73	0.31	12	0.13				
	7	73	0.14	12	0.09				
	8	73	0.11	5	0.10				
	9	73	0.17	18	0.17				

TRIBUTARY FLOW INFORMATION FOR MINNESOTA 10/30/74

LAKE CODE 2709 BIG STONE LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2709G1	10	72	0.91	14	0.30				
	11	72	1.24	16	1.10				
	12	72	0.98	19	1.00				
	1	73	0.46	16	0.40				
	2	73	0.93	10	0.60				
	3	73	15.10	18	16.00				
	4	73	6.03	2	9.30	15	16.00		
	5	73	19.50	1	8.20	19	3.90		
	6	73	4.39	3	6.80				
	7	73	0.60	12	0.39				
	8	73	0.24	5	0.22				
	9	73	0.36	18	0.36				
2709ZZ	10	72	3.14	14	1.80				
	11	72	4.51	16	3.70				
	12	72	4.05	19	4.10				
	1	73	2.80	16	2.30				
	2	73	7.10	10	4.60				
	3	73	68.80	18	72.00				
	4	73	17.70	2	27.00	15	15.00		
	5	73	58.70	1	25.00	19	12.00		
	6	73	13.90	3	21.00				
	7	73	1.97	12	1.30				
	8	73	0.81	5	0.73				
	9	73	1.02	18	1.00				

APPENDIX B

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 74/10/30

270901
45 18 30.0 096 27 24.0
BIG STONE LAKE
27 MINNESOTA

11EPALES 2111202
3 0008 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	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/07/05	08 10	0000	22.0	7.1	23	770	7.90	165	0.060	0.300	0.131	0.108
	08 10	0005	21.5	6.6		740	7.90	164	0.080	0.300	0.270	0.099
72/09/01	10 20	0000	19.3	8.8	47	810	8.50	161	0.130	0.250	0.207	0.182
	10 20	0004	19.3	8.8		850	8.50	168	0.130	0.280	0.216	0.175
72/10/25	10 15	0000	5.2	12.4	31	800	8.50	124	0.060	0.110	0.118	0.047

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/07/05	08 10	0000	5.0J
72/09/01	10 20	0000	7.9J
72/10/25	10 15	0000	54.0J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/10/30

270902
45 22 24.0 096 31 03.0
BIG STONE LAKE
27 MINNESOTA

11EPALES 2111202
3 0012 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	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/07/05	08 45	0000	21.5	6.6	106	730	7.90	164	0.070	0.260	0.139	0.128
	08 45	0011	21.5	6.0		750	7.80	164	0.060	0.250	0.143	0.125
72/09/01	10 45	0000			46	800	8.53	160	0.120	0.160	0.166	0.162
	10 45	0004	20.2	8.6		800	8.55	158	0.150	0.180	0.171	0.142
	10 45	0008	20.2	8.6		800	8.55	158	0.150	0.180	0.168	0.140
72/10/25	10 45	0000			31	800	8.60	127	0.080	0.170	0.079	0.044
	10 45	0004	5.9	12.2		800	8.70	126	0.090	0.160	0.098	0.066
	10 45	0008	5.9	12.0		800	8.70	126	0.080	0.160	0.125	0.056

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/07/05	08 45	0000	0.6J
72/09/01	10 45	0000	6.8J
72/10/25	10 45	0000	52.0J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/10/30

270903
45 24 36.0 096 38 33.0
BIG STONE LAKE
27 MINNESOTA

11EPALES 2111202
3 0010 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	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/07/05	09 05 0000		21.5	8.7	45	800	8.20	179	0.050	0.080	0.098	0.072
	09 05 0009		21.5	6.8		800	8.10	176	0.140	0.270	0.127	0.100
72/09/01	11 05 0000				53	840	8.35	150	0.150	0.640	0.203	0.185
	11 05 0004		20.4	7.4		850	8.31	152	0.140	0.660	0.224	0.179
	11 05 0008		20.3	8.6		825	8.40	161	0.160	0.640	0.217	0.174
72/10/25	11 00 0000				31	820	8.70	131	0.090	0.180	0.062	0.038
	11 00 0004		5.7	11.2		800	8.70	131	0.100	0.180	0.103	0.063
	11 00 0008		5.8	8.2		850	8.50	141	0.130	0.210	0.122	0.066

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/07/05	09 05 0010		2.4J
72/09/01	11 05 0000		7.3J
72/10/25	11 00 0000		43.8J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/10/30

270904
45 47 42.0 096 32 12.0
BIG STONE LAKE
27 MINNESOTA

11EPALES 2111202
3 0006 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	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/07/05	09	25 0000	20.0	7.6	31	870	8.10	181	0.060	0.110	0.153	0.081
72/09/01	11	25 0000	19.4		14	930	7.97	193	0.340	0.760	0.339	0.302
	11	25 0004	19.4	7.0		940	7.97	192	0.360	0.780	0.360	0.294
72/10/25	11	20 0000			30	980	8.10	194	0.260	0.250	0.241	0.223
	11	20 0004	4.8	10.0		950	8.10	196	0.270	0.260	0.250	0.225

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/07/05	09	25 0000	2.7J
72/09/01	11	25 0000	12.4J
72/10/25	11	20 0000	2.9J

J VALUE KNOWN TO BE IN ERROR

APPENDIX C

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 74/10/30

27094A1 LS2709A1
45 35 30.0 096 50 00.0
LITTLE MINNESOTA RIVER
27 15 PEEVER
1/BIG STONE LAKE
CO HWY BRDG IN BROWNS VALLEY ABOVE STP
11EPALES 2111204
4 0000 FEET DEPTH

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
72/10/14	09 30		0.036	0.590	0.056	0.080	0.130
72/11/19	11 45		0.022	0.660	0.047	0.007	0.042
72/12/16	11 00		0.350	0.717	0.270	0.014	0.027
73/01/13	11 30		0.460	1.200	0.550	0.025	0.050
73/02/10	10 45		0.610	1.600	0.880	0.160	0.232
73/03/18	10 50		0.450	2.100	0.210	0.084	0.210
73/04/02	14 45		0.023	2.100	0.147	0.033	0.065
73/04/15	14 50		0.014	0.730	0.015	0.018	0.040
73/05/01	12 00		0.022	0.560	0.006	0.026	0.045
73/05/19	11 45		0.010K	1.800	0.079	0.021	0.050
73/06/03	10 30		0.390	1.890	0.365	0.099	0.170
73/07/12	14 30		0.125	1.760	0.115	0.066	0.105
73/08/05	15 30		0.084	1.050	0.100	0.044	0.105
73/09/18	14 30		0.029	1.201	0.075	0.039	0.090

K VALUE KNOWN TO BE LESS
THAN INDICATED

STORET RETRIEVAL DATE 74/10/30

2709A2 LS2709A2
45 34 30.0 096 49 00.0
LITTLE MINNESOTA RIVER
27 15 PEEVER
1/BIG STONE LAKE
.9 MI SSE BROWNS VALLEY BELO STP
11EPALES 2111204
4 0000 FEET DEPTH

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
72/10/14	10 00		0.480	3.300	0.338	0.323	0.600
72/11/19	11 45		0.200	0.760	0.252	0.200	0.294
72/12/16	11 00		0.410	2.200	0.670	0.270	0.530
73/01/13	11 35		0.420	3.800	2.000	0.400	0.730
73/02/10	11 10		0.630	3.000	1.370	0.290	0.460
73/03/18	11 00		0.510	1.760	0.340	0.105	0.240
73/04/02	15 00		0.035	1.150	0.065	0.056	0.135
73/04/15	15 00		0.035	0.865	0.075	0.044	0.085
73/05/01	12 15		0.067	1.300	0.100	0.063	0.110
73/05/19	11 55		0.031	0.920	0.068	0.073	0.130
73/06/03	10 40		0.770	2.100	0.080	0.029	0.200
73/07/12	14 40		0.273	2.900	0.680	0.740	0.960
73/08/05	15 45		0.760	2.900	0.990	1.300	1.650
73/09/18	14 45		1.700	3.150	0.176	1.060	1.250

STORET RETRIEVAL DATE 74/10/30

2709R1 LS2709R1
45 18 10.0 096 27 00.0
MINNESOTA RIVER
27 15 ORTONVILLE
U/HIG STONE LAKE
DAM SW OF ORTONVILLE
11EPALES 2111204
4 0000 FEET DEPTH

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
72/10/14	11	35	0.069	2.450	0.105	0.011	0.169
72/11/19	12	20	0.130	1.300	0.210	0.014	0.050
72/12/16	11	00	0.300	1.600	0.440	0.052	0.100
73/01/13	14	00	0.315	2.000	0.670	0.098	0.165
73/02/10	14	00	0.138	2.200	0.750	0.042	0.090
73/03/18	11	40	0.380	1.890	0.680	0.056	0.125
73/04/02	15	45	0.010K	2.300	0.015	0.026	0.190
73/04/15	15	45	0.010K	2.100	0.012	0.025	0.210
73/05/01	13	10	0.018	1.640	0.138	0.056	0.175
73/05/19	13	15	0.056	1.540	0.198	0.038	0.130
73/06/03	11	43	0.340	2.310	0.120	0.092	0.125
73/07/12	15	30	0.048	1.980	0.313	0.070	0.170
73/08/05	16	10	0.140	2.000	0.450	0.134	0.255
73/09/18	17	05	0.031	1.600	0.057	0.126	0.195

K VALUE KNOWN TO BE LESS
THAN INDICATED

STORET RETRIEVAL DATE 74/10/30

2709C1 LS2709C1
45 17 30.0 096 27 30.0
WHETSTONE RIVER
27 15 ORTONVILLE
I/BIG STONE LAKE
US 12 BRDG BELO MILBANK SD
11EPALES 211120
4 0000 FEET DEPTH

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
72/11/19	14 00			1.600	0.160		
73/03/18	11 50		1.360	2.000	0.330	0.105	0.250
73/04/02	15 50		0.294	1.600	0.220	0.091	0.150
73/04/15	15 55		0.011	1.150	0.013	0.050	0.115
73/05/01	13 20		0.027	3.150	0.060	0.037	0.080
73/05/19	13 40		0.010K	0.280	0.018	0.027	0.100
73/06/03	11 35		0.390	1.100	0.105	0.007	0.165
73/07/12	15 45		0.010K	3.300	0.140	0.039	0.130
73/08/05	16 45		0.017	1.300	0.036	0.040	0.185
73/09/18	18 00		0.010K	2.200	0.032	0.056	0.290

K VALUE KNOWN TO BE LESS
THAN [illegible]ED

STORET RETRIEVAL DATE 74/10/30

270901 LS270901
45 23 30.0 096 31 00.0
UNNAMED STREAM
27 15 BIG STONE LAK
T/BIG STONE LAKE
ST HWY 7 XING 6.5 MI NW OF ORTONVILLE
11EPALES 2111204
4 0000 FEET DEPTH

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
72/10/14	11 00		0.086	0.550	0.092	0.029	0.105
72/11/19	09 45		0.053	0.330	0.115	0.025	0.056
72/12/16	09 00		0.080	0.540	0.240	0.017	0.050
73/01/13	10 30		0.088	0.540	0.240	0.014	0.070
73/02/10	09 30		0.052	0.330	0.132	0.016	0.045
73/03/18	09 40		3.300	1.470	0.245	0.042	0.140
73/04/02	13 20		0.200	1.100	0.060	0.022	0.067
73/04/15	13 50		0.015	0.520	0.026	0.026	0.065
73/05/01	10 45		0.017	0.700	0.016	0.035	0.080
73/05/19	10 10		0.010K	0.480	0.073	0.027	0.075
73/06/03	09 40		0.610	0.750	0.063	0.028	0.085
73/07/12	13 30		0.018	2.200	0.470	0.044	0.125
73/08/05	14 00		0.018	1.050	0.042	0.063	0.170
73/09/18	14 50		0.022	1.100	0.056	0.046	0.115

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/10/30

2709E1 LS2709E1
45 23 30.0 096 32 30.0
UNNAMED STREAM
27 15 BIG STONE LAK
T/BIG STONE LAKE
ST HWY 7 XING 8 MI NW OF ORTONVILLE
11EPALES 2111204
4 0000 FEET DEPTH

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
72/10/14	10 55		1.340	0.550	0.060	0.044	0.085
72/11/19	10 00		2.500	0.360	0.040	0.016	0.043
72/12/16	09 30		3.900	0.340	0.082	0.027	0.036
73/01/13	10 40		3.900	0.160	0.100	0.022	0.040
73/02/10	09 40		3.650	0.490	0.042	0.019	0.035
73/03/18	09 55		2.500	0.500	0.105	0.021	0.050
73/04/02	13 40		2.600	0.750	0.030	0.030	0.055
73/04/15	14 15		3.025	0.900	0.058	0.020	0.035
73/05/01	10 55		1.900	0.401	0.046	0.022	0.040
73/05/19	10 30		2.600	0.500	0.051	0.020	0.045
73/06/03	09 50		1.250	1.320	0.315	0.069	0.085
73/07/12	13 40		3.000	0.700	0.120	0.039	0.070
73/08/05	14 20		2.900	0.650	0.037	0.031	0.055
73/09/18	16 40		3.000	0.655	0.028	0.038	0.055

STORET RETRIEVAL DATE 74/10/30

2709F1 LS2709F1
45 25 00.0 096 38 30.0
UNNAMED STREAM
27 15 BIG STONE LAK
T/BIG STONE LAKE
ST HWY XING 13 MI NW OF ORTONVILLE
11EPALES 2111204
4 0000 FEET DEPTH

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
72/10/14	10	40	0.034	0.450	0.070	0.035	0.060
72/11/19	10	10	0.154	0.720	0.069	0.005K	0.022
72/12/16	10	00	0.273	0.330	0.120	0.027	0.036
73/01/13	10	50	0.252	0.420	0.138	0.005K	0.015
73/02/10	09	55	0.270	0.220	0.088	0.011	0.015
73/03/18	10	10	0.680	0.720	0.115	0.020	0.055
73/04/02	14	05	0.029	0.380	0.035	0.016	0.030
73/04/15	14	00	2.600	1.890	0.067	0.030	0.110
73/05/01	11	15	0.075	1.980	0.520	0.168	0.300
73/05/19	10	45	0.023	0.370	0.033	0.026	0.050
73/06/03	10	10	0.378	2.260	0.063	0.011	0.070
73/07/12	13	45	0.086	3.150	0.210	0.068	0.123
73/08/05	14	30	0.094	0.760	0.075	0.030	0.067

K VALUE KNOWN TO BE LESS
THAN INDICATED

STORET RETRIEVAL DATE 74/10/30

2709G1 LS2709G1
45 30 30.0 096 43 00.0
FISH CREEK
27 15 BEARDSLEY
T/RIG STONE LAKE
CO HWY 51 XING 3 MI S OF BEARDSLEY
11EPALES 2111204
4 0000 FEET DEPTH

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
72/10/14	10 30		0.120	1.700	0.078	0.063	0.138
72/11/19	10 30		0.760	0.320	0.078	0.031	0.094
72/12/16	10 20		0.700	0.560	0.185	0.064	0.132
73/01/13	11 00		0.600	1.300	0.190	0.084	0.140
73/02/10	10 15		0.810	0.580	0.168	0.031	0.080
73/03/18	10 30		13.200	2.800	0.290	0.154	0.270
73/04/02	14 25		3.500	1.540	0.071	0.032	0.080
73/04/15	14 40		0.150	1.100	0.052	0.042	0.105
73/05/01	11 40		0.330	0.780	0.034	0.066	0.130
73/05/19	11 10		0.046	0.910	0.072	0.200	0.300
73/06/03	11 00		0.770	1.200	0.147	0.021	0.280
73/07/12	14 00		0.120	1.260	0.280	0.070	0.110
73/08/05	14 50		0.058	0.790	0.048	0.320	0.390
73/09/18	14 00		0.098	2.100	0.310	0.085	0.175

STORET RETRIEVAL DATE 74/10/30

270951 TF270951 P000906
45 35 20.0 096 50 00.0
BROWNS VALLEY
27 15 PEEVER,SD
T/BIG STONE LAKE
MINNESOTA RIVER
11EPALES 2141204
4 0000 FEET DEPTH

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
73/01/31	11 00								
CP(T)-			1.200	38.000	7.600	4.200	8.400	0.150	
73/01/31	13 00								
73/02/26	11 00								
CP(T)-			1.370	25.000	5.700	3.200			0.150
73/02/26	13 00								
73/03/27	09 00								
CP(T)-			1.900	7.300	0.190	0.870	1.650	0.100	
73/03/27	11 00								
73/04/24	11 00								
CP(T)-			0.900	25.200	6.500	3.500	6.500		0.100
73/04/24	13 00								
73/05/29	10 00								
CP(T)-			1.580	12.000	0.450	2.200	6.800	0.200	
73/05/29	13 00								
73/06/19	11 00								
CP(T)-			2.500	11.600	0.198	3.000	6.200	0.200	
73/06/19	13 00								
73/07/27	11 00								
CP(T)-			2.310	30.000	9.000	3.780	8.100	0.200	
73/07/27	13 00								
73/12/12	08 00								
CP(T)-			5.000	16.000	4.500	4.800	8.100	0.125	0.147
73/12/12	15 30								
74/01/14	08 00								
CP(T)-			0.880	22.000	5.400	4.000	8.300	0.188	0.144
74/01/14	14 00								
74/02/20	09 00								
CP(T)-			0.880	19.000	4.300	3.520	7.800	0.184	0.150
74/02/20	15 00								
74/03/13	08 00								
CP(T)-			1.150	24.000	7.200	3.600	7.700	0.190	0.180
74/03/13	14 30								
74/05/15	09 00								
CP(T)-			0.960	22.000	4.650	3.080	10.000	0.120	0.130
74/05/15	15 00								