

REPORT
ON
MEDICAL LAKE
SPOKANE COUNTY
WASHINGTON
EPA REGION X
WORKING PAPER No. 871

WITH THE COOPERATION OF THE
WASHINGTON DEPARTMENT OF ECOLOGY
AND THE
WASHINGTON NATIONAL GUARD
JULY, 1977

REPORT ON MEDICAL LAKE
SPOKANE COUNTY, WASHINGTON
EPA REGION X

by

National Eutrophication Survey

Water and Land Quality Branch
Monitoring Operations Division
Environmental Monitoring & Support Laboratory
Las Vegas, Nevada

and

Special Studies Branch
Corvallis Environmental Research Laboratory
Corvallis, Oregon

Working Paper No. 871

OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY

July 1977

(a)



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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point source discharge reduction and nonpoint source pollution abatement in lake watersheds.

ANALYTIC APPROACH

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

- a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.
- b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.
- c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

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

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

ACKNOWLEDGMENTS

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

Ms. Barbara Blau, Lake Restoration Program, and the staff of the Washington Department of Ecology, Lake Restoration Program, 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.

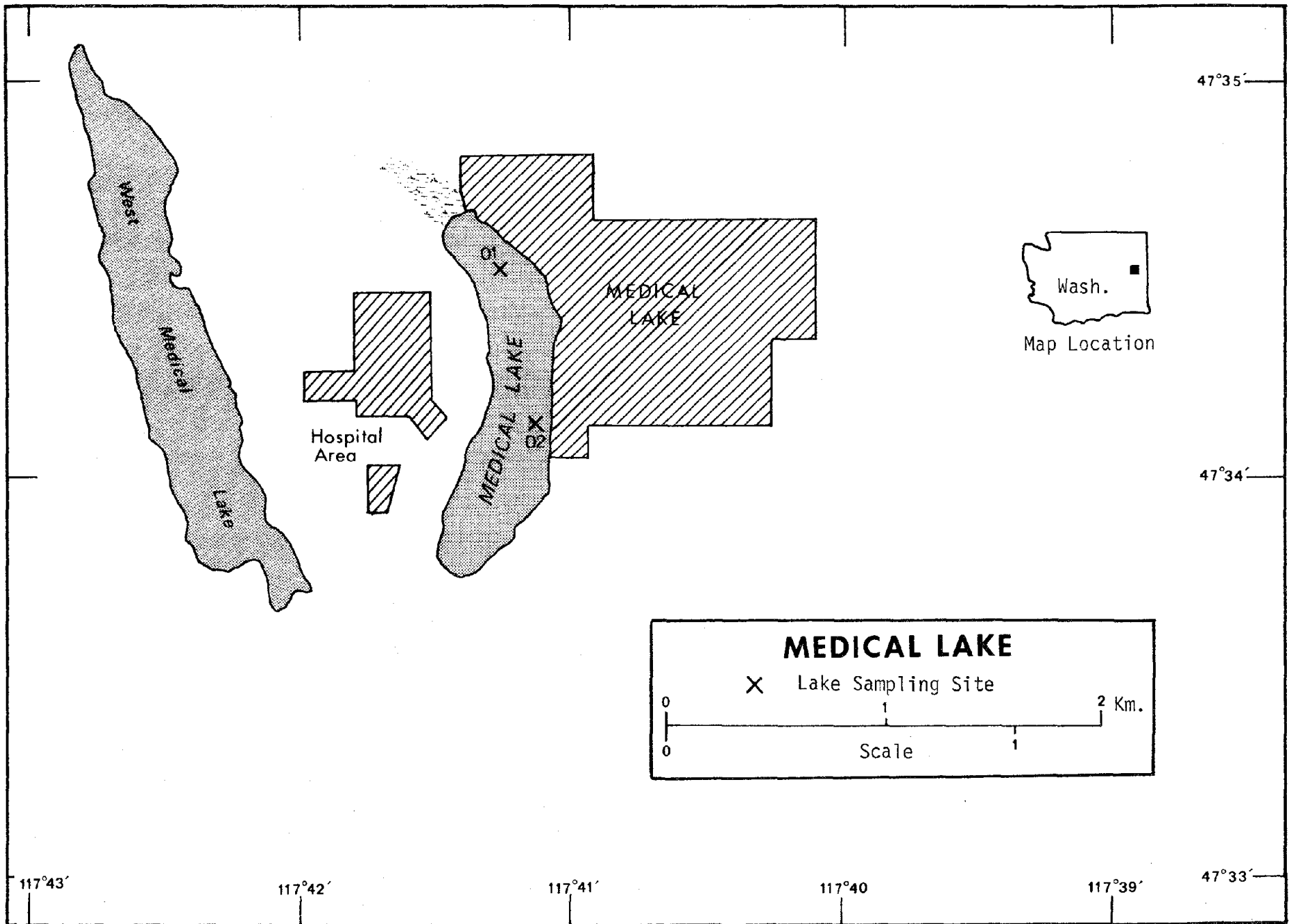
Major General Howard S. McGee, Adjutant General of Washington, and Project Officer Colonel Clinton C. Johnson, who directed the volunteer efforts of the Washington National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF WASHINGTON

<u>LAKE NAME</u>	<u>COUNTY</u>
American Lake	Pierce
Banks Lake	Grant, Douglas
Chelan Lake	Chelan
Diamond Lake	Pend Oreille
Green Lake	King
Keechelus Lake	Kittitas
Mayfield Lake	Lewis
Medical Lake	Spokane
Moses Lake	Grant
Ozette Lake	Clallam
Sammamish Lake	King
Lake Whatcom	Whatcom
Lower Granite Reservoir	Garfield, Whatcom



MEDICAL LAKE

X Lake Sampling Site

0 1 2 Km.

0 1

Scale

REPORT ON MEDICAL LAKE, WASHINGTON

STORET NO. 5308

I. INTRODUCTION

Medical Lake was included in the National Eutrophication Survey (NES) as a water body of special interest to the Washington State Department of Ecology. Tributaries and nutrient sources were not sampled, and this report relates only to lake sampling data.

Medical Lake lies adjacent to the west side of the Town of Medical Lake in Spokane County. There is no surface-water outlet from the lake (McConnell, et al., 1976); Wolcott (1973) reports that the oxygen supply is inadequate to support a fish population, presumably due to a high level of organic material in the water. Rehabilitation treatments to the lake were applied by the Washington Department of Game in 1957 (Blau, personal communication). Present restoration efforts by the Town of Medical Lake include precipitation of phosphorus to reduce nuisance blue green algae blooms (Fiedler, personal communication).

II. CONCLUSIONS

A. Trophic Condition:*

Survey data indicate that Medical Lake is hypereutrophic.

Chlorophyll a values ranged from a low of 1.5 µg/l in June

*See Appendix C.

to a high of 36.5 $\mu\text{g/l}$ in July with a mean of 16.4 $\mu\text{g/l}$. Secchi disc visibility in the lake was relatively low on all but the June sampling date and the potential for primary productivity as measured by algal assay control yields was extremely high throughout the sampling year. Of the 13 Washington lakes sampled in 1975, none had greater total phosphorus levels (0.275 mg/l) or median dissolved orthophosphorus values (0.166 mg/l), and only one had higher median inorganic nitrogen levels (0.225 mg/l) than Medical Lake.

Survey limnologists reported an algal bloom on the July sampling date and emergent macrophytes during June and July. Other sources (Ketelle and Uttormark, 1971) note that Medical Lake is highly eutrophic and undergoes large blooms of Anacystis and Anabaena flos-aquae.

B. Rate-Limiting Nutrient:

Algal assay results indicate that Medical Lake was limited by available nitrogen levels during the sample collection times (06/03/75, 09/11/75, 10/22/75). The lake data generally substantiate nitrogen limitation throughout the sampling year.

III. LAKE CHARACTERISTICS

A. Lake Morphometry:*

1. Surface area: 0.64 km^2 .
2. Mean depth: 9.7 meters.
3. Maximum depth: 18.3 meters.
4. Volume: $6.241 \times 10^6 \text{ m}^3$.

B. Precipitation:

1. Year of sampling: 54.0 cm.
2. Mean annual: 44.2 cm.

*Wolcott, E.E., 1965.

IV. LAKE WATER QUALITY SUMMARY

Medical Lake was sampled four times during the open-water season of 1975 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from two stations on the lake and from a number of depths at each station (see map, page v). During each visit, depth-integrated samples were collected from each station for chlorophyll a analysis and phytoplankton identification and enumeration. During the first, third, and fourth visits, 18.9-liter depth-integrated samples were composited for algal assays. Maximum depths sampled were 8.5 meters at Station 01, and 15.5 meters at Station 02. For a more detailed explanation of NES methods, see NES Working Paper No. 175.

The results obtained are presented in full in Appendix B and are summarized in III-A for waters at the surface and at the maximum depth for each site. Results of the phytoplankton counts and chlorophyll a determinations are included in III-B. Results of the limiting nutrient study are presented in III-C.

MEDICAL LAKE
STORET CODE 5309

PHYSICAL AND CHEMICAL CHARACTERISTICS

PARAMETER	N*	(6/3/75)			MAX DEPTH RANGE (METERS)	N*	(7/23/75)			MAX DEPTH RANGE (METERS)	N*	(9/11/75)			MAX DEPTH RANGE (METERS)
		RANGE	MEDIAN	S*** = 2			RANGE	MEDIAN	S*** = 2			RANGE	MEDIAN	S*** = 2	
TEMPERATURE (DEG CENT)															
0.-1.5 M DEPTH	4	15.7- 17.9	16.9	0.0- 1.5	2	20.5- 20.9	20.7	0.0- 0.0	4	14.8- 15.8	15.6	0.0- 1.5			
MAX DEPTH**	2	6.9- 12.2	9.5	6.1- 9.1	2	2.8- 12.8	7.8	6.1- 15.5	2	1.8- 12.9	7.3	6.1- 12.8			
DISSOLVED OXYGEN (MG/L)															
0.-1.5 M DEPTH	4	7.2- 7.5	7.2	0.0- 1.5	2	8.4- 9.8	9.1	0.0- 0.0	4	11.4- 12.4	11.9	0.0- 1.5			
MAX DEPTH**	2	0.6- 5.2	2.9	6.1- 9.1	2	0.0- 2.0	1.0	6.1- 15.5	2	0.1- 5.2	2.6	6.1- 12.8			
CONDUCTIVITY (UMHOS)															
0.-1.5 M DEPTH	4	1406.-1486.	1450.	0.0- 1.5	2	1901.-1903.	1902.	0.0- 0.0	4	1750.-1796.	1788.	0.0- 1.5			
MAX DEPTH**	2	1153.-1269.	1211.	6.1- 9.1	2	1342.-1567.	1455.	6.1- 15.5	2	1342.-1662.	1502.	6.1- 12.8			
PH (STANDARD UNITS)															
0.-1.5 M DEPTH	4	9.2- 9.2	9.2	0.0- 1.5	2	9.3- 9.6	9.4	0.0- 0.0	4	9.0- 9.4	9.3	0.0- 1.5			
MAX DEPTH**	2	9.2- 9.2	9.2	6.1- 9.1	2	9.0- 9.2	9.1	6.1- 15.5	2	9.4- 9.4	9.4	6.1- 12.8			
TOTAL ALKALINITY (MG/L)															
0.-1.5 M DEPTH	4	900.-1510.	1410.	0.0- 1.5	2	1240.-1690.	1465.	0.0- 0.0	4	920.-1370.	1335.	0.0- 1.5			
MAX DEPTH**	2	1320.-1460.	1390.	6.1- 9.1	2	1330.-1920.	1625.	6.1- 15.5	2	1380.-1390.	1385.	6.1- 12.8			
TOTAL P (MG/L)															
0.-1.5 M DEPTH	4	0.351-0.364	0.358	0.0- 1.5	2	0.157-0.169	0.162	0.0- 0.0	4	0.169-0.201	0.197	0.0- 1.5			
MAX DEPTH**	2	0.392-0.570	0.481	6.1- 9.1	2	0.431-1.740	1.085	6.1- 15.5	2	0.194-0.470	0.332	6.1- 12.8			
DISSOLVED ORTHO P (MG/L)															
0.-1.5 M DEPTH	4	0.300-0.315	0.308	0.0- 1.5	2	0.053-0.095	0.074	0.0- 0.0	4	0.068-0.091	0.089	0.0- 1.5			
MAX DEPTH**	2	0.347-0.437	0.392	6.1- 9.1	2	0.298-0.990	0.644	6.1- 15.5	2	0.091-0.142	0.116	6.1- 12.8			
NO2+NO3 (MG/L)															
0.-1.5 M DEPTH	4	0.340-0.350	0.345	0.0- 1.5	2	0.020-0.030	0.025	0.0- 0.0	4	0.020-0.020	0.020	0.0- 1.5			
MAX DEPTH**	2	0.120-0.300	0.210	6.1- 9.1	2	0.050-0.070	0.060	6.1- 15.5	2	0.020-0.020	0.020	6.1- 12.8			
AMMONIA (MG/L)															
0.-1.5 M DEPTH	4	0.280-0.350	0.335	0.0- 1.5	2	0.070-0.130	0.100	0.0- 0.0	4	0.020-0.060	0.020	0.0- 1.5			
MAX DEPTH**	2	0.430-0.730	0.580	6.1- 9.1	2	0.460-8.620	4.540	6.1- 15.5	2	0.020-0.830	0.425	6.1- 12.8			
KJELDAHL N (MG/L)															
0.-1.5 M DEPTH	4	2.500-2.700	2.650	0.0- 1.5	2	2.700-3.000	2.850	0.0- 0.0	4	2.100-2.600	2.450	0.0- 1.5			
MAX DEPTH**	2	2.700-3.400	3.050	6.1- 9.1	2	3.200-*****	7.550	6.1- 15.5	2	2.200-3.500	2.850	6.1- 12.8			
SECCHI DISC (METERS)															
	2	4.9- 5.0	4.9		1	2.1- 2.1	2.1		2	0.9- 0.9	0.9				

* N = NO. OF SAMPLES

** MAXIMUM DEPTH SAMPLED AT EACH SITE

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

MEDICAL LAKE
STORET CODE 5308

PHYSICAL AND CHEMICAL CHARACTERISTICS

(10/24/75)

S*** = 2 MAX
DEPTH
RANGE
(METERS)

PARAMETER	N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)
TEMPERATURE (DEG CENT)				
0.-1.5 M DEPTH	4	12.4- 12.5	12.4	0.0- 1.5
MAX DEPTH**	2	12.4- 12.5	12.4	7.9- 8.5
DISSOLVED OXYGEN (MG/L)				
0.-1.5 M DEPTH	4	5.4- 5.8	5.5	0.0- 1.5
MAX DEPTH**	2	5.6- 5.8	5.7	7.9- 8.5
CONDUCTIVITY (UMHOS)				
0.-1.5 M DEPTH	4	1217.-1223.	1221.	0.0- 1.5
MAX DEPTH**	2	1219.-1815.	1517.	7.9- 8.5
PH (STANDARD UNITS)				
0.-1.5 M DEPTH	4	9.2- 9.3	9.3	0.0- 1.5
MAX DEPTH**	2	9.3- 9.3	9.3	7.9- 8.5
TOTAL ALKALINITY (MG/L)				
0.-1.5 M DEPTH	4	1190.-1440.	1325.	0.0- 1.5
MAX DEPTH**	1	1640.-1640.	1640.	7.9- 7.9
TOTAL P (MG/L)				
0.-1.5 M DEPTH	4	0.263-0.305	0.270	0.0- 1.5
MAX DEPTH**	2	0.273-0.274	0.273	7.9- 8.5
DISSOLVED ORTHO P (MG/L)				
0.-1.5 M DEPTH	4	0.161-0.168	0.164	0.0- 1.5
MAX DEPTH**	1	0.159-0.159	0.159	7.9- 7.9
NO2+NO3 (MG/L)				
0.-1.5 M DEPTH	4	0.020-0.020	0.020	0.0- 1.5
MAX DEPTH**	1	0.020-0.020	0.020	7.9- 7.9
AMMONIA (MG/L)				
0.-1.5 M DEPTH	4	0.020-0.210	0.195	0.0- 1.5
MAX DEPTH**	2	0.180-0.220	0.200	7.9- 8.5
KJELDAHL N (MG/L)				
0.-1.5 M DEPTH	4	2.600-2.900	2.600	0.0- 1.5
MAX DEPTH**	2	2.400-2.600	2.500	7.9- 8.5
SECCHI DISC (METERS)				
	2	1.8- 1.8	1.8	

* N = NO. OF SAMPLES

** MAXIMUM DEPTH SAMPLED AT EACH SITE

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

B. Biological Characteristics:

1. Phytoplankton -

<u>Sampling Date</u>	<u>Dominant Genera</u>	<u>Algal Units per ml</u>
06/03/75	1. <u>Chroomonas</u>	769
	2. <u>Schroederia</u>	678
	3. <u>Phormidium</u>	271
	4. <u>Cryptomonas</u>	226
	Other genera	---
	Total	1,944
07/23/75	1. <u>Nitzschia</u>	2,267
	2. <u>Microcystis</u>	599
	3. <u>Cryptomonas</u>	385
	4. <u>Chroomonas</u>	342
	5. <u>Aphanocapsa</u>	257
	Other genera	384
Total	4,234	
09/11/75	1. <u>Microcystis</u>	1,560
	2. <u>Phormidium</u>	1,147
	3. <u>Fragilaria</u>	551
	4. <u>Cryptomonas</u>	229
	5. <u>Pennate Diatom</u>	229
	Other genera	277
Total	3,993	
10/24/75	1. <u>Fragilaria</u>	2,032
	2. <u>Anabaena</u>	290
	3. <u>Microcystis</u>	145
	Other genera	---
Total	2,467	

2. Chlorophyll a -

<u>Sampling Date</u>	<u>Station Number</u>	<u>Chlorophyll a ($\mu\text{g/l}$)</u>
06/03/75	01	1.5
	02	1.9
07/23/75	01	14.3
	02	36.5
09/11/75	01	29.0
	02	16.0
10/24/75	01	17.1
	02	15.1

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

a. 06/03/75

<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	0.315	0.380	30.5
0.05 P	0.365	0.380	41.7
0.05 P + 1.0 N	0.365	1.380	70.9
1.00 N	0.315	1.380	69.1

b. 09/11/75

<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	0.075	0.135	9.0
0.05 P	0.125	0.135	8.6
0.05 P + 1.0 N	0.125	1.135	31.4
1.00 N	0.075	1.135	22.0

c. 10/22/75

<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	0.105	0.275	13.4
0.05 P	0.155	0.275	13.4
0.05 P + 1.0 N	0.155	1.275	47.4
1.00 N	0.105	1.275	44.8

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential for primary production at the times of sampling (06/03/75, 09/11/75, 10/22/75) in Medical Lake was extremely high. In each sample, a significant increase in growth over that of the control was produced by the addition of nitrogen alone, indicating nitrogen limitation. The addition of phosphorus alone stimulated growth beyond the control yield only in the June assay. Spikes with nitrogen and phosphorus simultaneously resulted in maximum growth yields in all three samples.

The mean inorganic nitrogen to orthophosphorus ratios (N/P) in sampled waters of 2/1 in June, 5/1 in July, 2/1 in September, and 1/1 in October further suggest nitrogen limitation (a mean N/P ratio of 14/1 or greater generally reflects phosphorus limitation).

V. LITERATURE REVIEWED

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VI. APPENDICES

APPENDIX A
CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX B
PHYSICAL AND CHEMICAL DATA

STOPPET RETRIEVAL DATE 76/11/16
 NATL EUTROPHICATION SURVEY
 EPA-LAS VEGAS

530801
 47 34 31.0 117 41 10.0 3
 MEDICAL LAKE
 53063 WASHINGTON

130892

11EPALES 2111202
 0024 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CONDUCVTY FIELD MICROMHO	00400 PH SU	00410 T ALK CAC03 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/06/03	14 55	0000	17.9	7.5	196	1486	9.20	900	0.280	2.500	0.340	0.302
	14 55	0005	17.6	7.2		1472	9.20	1420	0.330	2.600	0.350	0.300
	14 55	0020	12.2	5.2		1269	9.20	1460	0.430	2.700	0.300	0.347
75/07/23	09 40	0000	20.9	8.4		1901	9.30	1690	0.130	3.000	0.020	0.095
	09 40	0010	19.9	10.0		1819	9.50	1400	0.110	2.900	0.020	0.093
	09 40	0015	14.5	1.4		1600	9.20	1440	0.090	2.800	0.100	0.214
	09 40	0020	12.8	2.0		1567	9.20	1330	0.460	3.200	0.050	0.298
75/09/11	15 40	0000	15.4	11.4	36	1780	9.00	920	0.060	2.100	0.020K	0.068
	15 40	0005	14.8	11.6		1750	9.30	1370	0.020	2.600	0.020K	0.089
	15 40	0015	13.2	7.4		1705	9.20	1100	0.040	2.200	0.020K	0.130
	15 40	0020	12.9	5.2		1662	9.40	1390	0.020	2.200	0.020K	0.091
75/10/24	10 15	0000	12.4	5.4	72	1217	9.20	1190	0.200	2.600	0.020	0.166
	10 15	0005	12.4	5.4		1219	9.30	1240	0.020K	2.600	0.020K	0.168
	10 15	0015	12.4	5.2		1215	9.30	1500	0.210	2.700	0.020K	0.167
	10 15	0028	12.4	5.6		1815	9.35		0.180	2.400		

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/06/03	14 55	0000	0.351	1.5	
	14 55	0005	0.357		
	14 55	0020	0.392		
75/07/23	09 40	0000	0.168	14.3	
	09 40	0010	0.199		
	09 40	0015	0.333		
	09 40	0020	0.431		
75/09/11	15 40	0000	0.169	29.0	
	15 40	0005	0.198		
	15 40	0015	0.222		
	15 40	0020	0.194		
75/10/24	10 15	0000	0.271	17.1	
	10 15	0005	0.269		
	10 15	0015	0.274		
	10 15	0028	0.273		

K VALUE KNOWN TO BE LESS THAN INDICATED

15

STORET RETRIEVAL DATE 76/11/16
 NATL EUTROPHICATION SURVEY
 EPA-LAS VEGAS

530802
 47 33 58.0 117 41 22.0 3
 MEDICAL LAKE
 53063 WASHINGTON

130892

11EPALES 2111202
 0034 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CONDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/06/03	15 15	0000	16.3	7.2	192	1427	9.20	1510	0.350	2.700	0.350	0.315
	15 15	0005	15.7	7.2		1406	9.20	1400	0.340	2.700	0.340	0.315
	15 15	0018	11.9	6.4		1281	9.20	1430	0.600	3.300	0.230	0.380
	15 15	0030	6.9	0.6		1153	9.20	1320	0.730	3.400	0.120	0.437
75/07/23	09 20	0000	20.5	9.8	84	1903	9.60	1240	0.070	2.700	0.030	0.053
	09 20	0010	20.4	0.0		1828	9.50	1340	0.060	2.700	0.030	0.068
	09 20	0015	12.9	0.0		1597	9.25	1410	0.140	3.600	0.050	0.213
	09 20	0040	2.9	0.0		1323	9.20	1260	3.470	6.700	0.060	0.720
	09 20	0051	2.8	0.0		1342	9.05	1920	8.620	11.900	0.070	0.990
75/09/11	16 05	0000	15.8	12.4	36	1796	9.40	1370	0.020K	2.400	0.020K	0.089
	16 05	0005	15.8	12.2		1795	9.40	1300	0.020	2.500	0.020K	0.091
	16 05	0015	14.5	6.0		1658	9.00	1250		3.700	0.020K	0.359
	16 05	0042	1.8	0.1		1342	9.40	1380	0.830	3.500	0.020K	0.142
75/10/24	10 40	0000	12.5	5.8	72	1223	9.35	1410	0.210	2.600	0.020K	0.161
	10 40	0005	12.5	5.6		1223	9.35	1440	0.190	2.900	0.020K	0.163
	10 40	0015	12.5	5.6		1223	9.30	1350	0.210	2.800	0.020K	0.163
	10 40	0026	12.5	5.8		1219	9.35	1640	0.220	2.600	0.020K	0.159

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/06/03	15 15	0000	0.359	1.9	
	15 15	0005	0.364		
	15 15	0018	0.480		
	15 15	0030	0.570		
75/07/23	09 20	0000	0.157	36.5	
	09 20	0010	0.199		
	09 20	0015	0.479		
	09 20	0040	1.220		
	09 20	0051	1.740		
75/09/11	16 05	0000	0.201	16.0	
	16 05	0005	0.197		
	16 05	0015	0.648		
	16 05	0042	0.470		
75/10/24	10 40	0000	0.263	15.1	
	10 40	0005	0.305		
	10 40	0015	0.276		
	10 40	0026	0.274		

K VALUE KNOWN TO BE LESS THAN INDICATED

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APPENDIX C
PARAMETRIC RANKINGS OF LAKES
SAMPLED BY NES IN 1975
STATE OF WASHINGTON

Mean or median values for six of the key parameters evaluated in establishing the trophic conditions of Washington lakes sampled are presented to allow direct comparison of the ranking, by parameter, of each lake relative to the others. Median total phosphorus, median inorganic nitrogen and median dissolved orthophosphorus levels are expressed in mg/l. Chlorophyll a values are expressed in $\mu\text{g/l}$. To maintain consistent rank order with the preceding parameters, the mean Secchi disc depth, in inches, is subtracted from 500. Similarly, minimum dissolved oxygen values are subtracted from 15 to create table entries.

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
5301	AMERICAN LAKE	0.027	0.105	343.000	4.822	15.000	0.007
5302	BANKS LAKE	0.021	0.040	364.533	7.373	10.800	0.007
5303	CHELAN LAKE	0.005	0.070	111.900	0.905	6.400	0.003
5304	DIAMOND LAKE	0.014	0.060	303.667	14.537	14.200	0.010
5305	GREEN LAKE	0.027	0.050	415.000	2.983	10.600	0.009
5306	KEECHELUS LAKE	0.007	0.040	280.250	1.400	9.200	0.002
5307	MAYFIELD LAKE	0.014	0.100	402.000	4.250	10.600	0.007
5308	MEDICAL LAKE	0.275	0.225	401.714	16.425	15.000	0.166
5309	MOSES LAKE	0.115	0.150	463.600	29.060	14.600	0.038
5310	OZETTE LAKE	0.010	0.110	403.333	1.225	7.200	0.009
5311	SAMMAMISH LAKE	0.015	0.210	374.000	7.290	14.600	0.006
5312	WHATCOM LAKE	0.009	0.320	288.000	3.422	10.800	0.009
5313	LOWER GRANITE RESERVOIR	0.033	0.150	435.500	4.875	7.200	0.022

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
5301	AMERICAN LAKE	29 (3)	50 (6)	67 (8)	50 (6)	4 (0)	58 (7)
5302	BANKS LAKE	42 (5)	100 (12)	58 (7)	25 (3)	46 (5)	71 (8)
5303	CHELAN LAKE	100 (12)	67 (8)	100 (12)	100 (12)	100 (12)	92 (11)
5304	DIAMOND LAKE	62 (7)	75 (9)	75 (9)	17 (2)	33 (4)	25 (3)
5305	GREEN LAKE	29 (3)	83 (10)	17 (2)	75 (9)	62 (7)	46 (5)
5306	KEECHELUS LAKE	92 (11)	92 (11)	92 (11)	83 (10)	75 (9)	100 (12)
5307	MAYFIELD LAKE	62 (7)	58 (7)	33 (4)	58 (7)	62 (7)	71 (8)
5308	MEDICAL LAKE	0 (0)	8 (1)	42 (5)	8 (1)	4 (0)	0 (0)
5309	MOSES LAKE	8 (1)	29 (3)	0 (0)	0 (0)	21 (2)	8 (1)
5310	OZETTE LAKE	75 (9)	42 (5)	25 (3)	92 (11)	87 (10)	33 (4)
5311	SAMMAMISH LAKE	50 (6)	17 (2)	50 (6)	33 (4)	21 (2)	83 (10)
5312	WHATCOM LAKE	83 (10)	0 (0)	83 (10)	67 (8)	46 (5)	46 (5)
5313	LOWER GRANITE RESERVOIR	17 (2)	29 (3)	8 (1)	42 (5)	87 (10)	17 (2)

TECHNICAL REPORT DATA
(Please read instructions on the reverse before completing)

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16. ABSTRACT Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.					
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