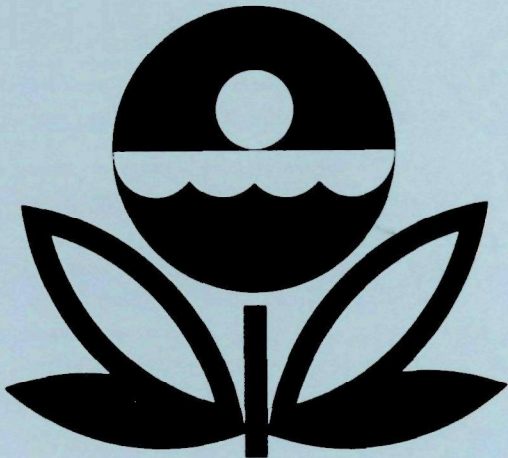


**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY
WORKING PAPER SERIES**



REPORT
ON
MOSES LAKE
GRANT COUNTY
WASHINGTON
EPA REGION X
WORKING PAPER No. 872

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

REPORT
ON
MOSES LAKE
GRANT COUNTY
WASHINGTON
EPA REGION X
WORKING PAPER No. 872

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

REPORT ON MOSES LAKE
GRANT 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. 872

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

July 1977

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FOREWORD

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

OBJECTIVES

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

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

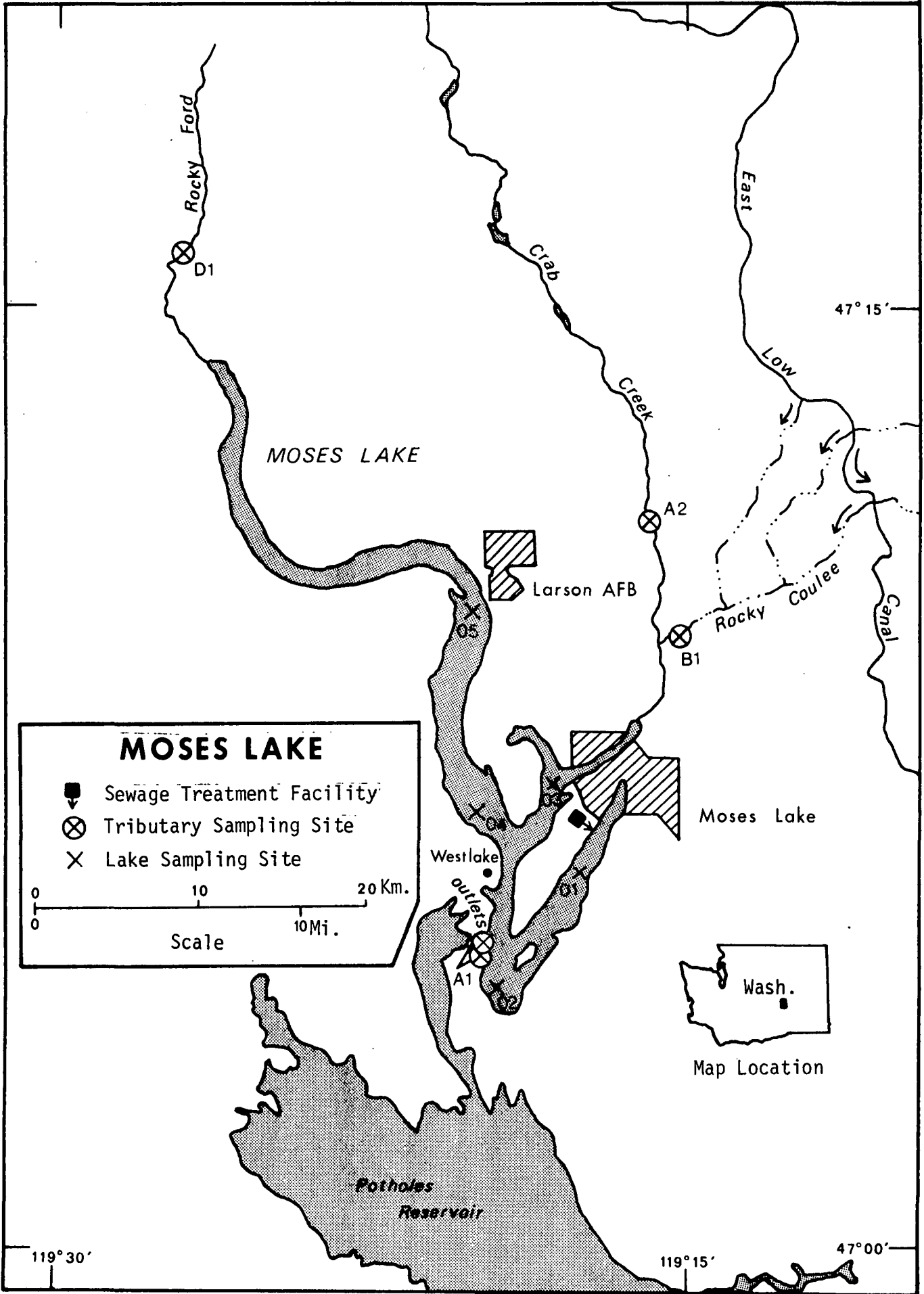
King

Lake Whatcom




Whatcom

Lower Granite Reservoir

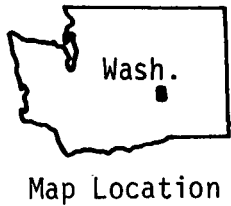
Garfield, Whatcom



MOSES LAKE

-  Sewage Treatment Facility
-  Tributary Sampling Site
-  Lake Sampling Site

0 10 20 Km.
0 10 Mi.
Scale

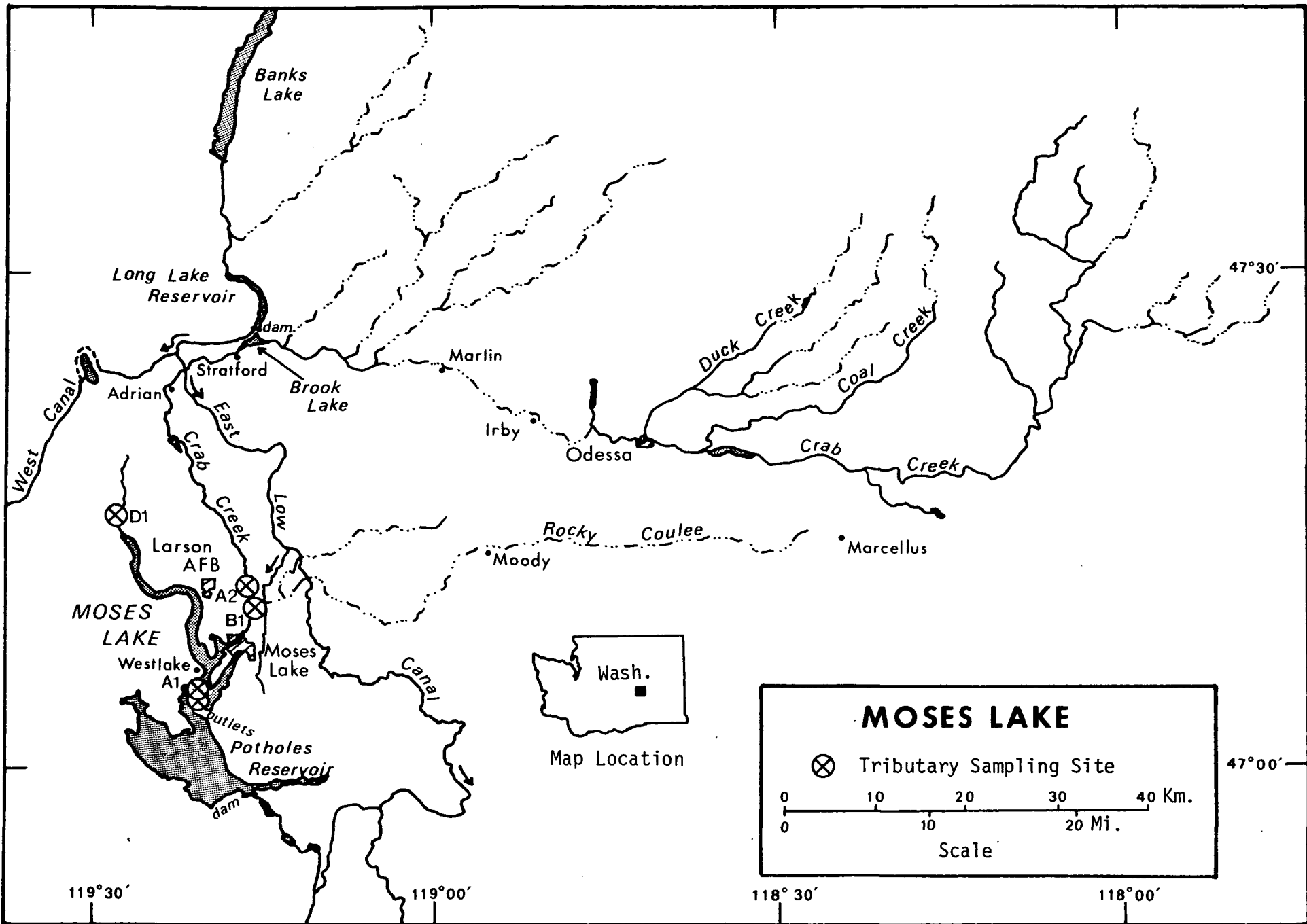


119° 30'

119° 15'

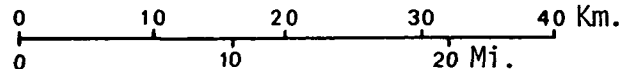
47° 00'

47° 15'



MOSES LAKE

⊗ Tributary Sampling Site



Scale



Map Location

REPORT ON MOSES LAKE, WASHINGTON

STORET NO. 5309

I. CONCLUSIONS

A. Trophic Condition:*

Survey data indicate that Moses Lake is eutrophic, i.e., nutrient rich and highly productive. Whether such nutrient enrichment is to be considered beneficial or deleterious is determined by its actual or potential impact upon designated beneficial water uses of the lake.

Chlorophyll a values in the lake ranged from 1.6 $\mu\text{g/l}$ in April to 84.6 $\mu\text{g/l}$ in September, with a mean of 29.1 $\mu\text{g/l}$. Lake water transparency was low and potential for primary production as measured by algal assay control yield was high in both spring and fall. Severe hypolimnetic oxygen depression was observed at several stations in the lake during July and September samplings. Of the 13 Washington lakes sampled in 1975, only 1 had higher median total phosphorus levels (0.115 mg/l), 3 had higher median inorganic nitrogen levels (0.150 mg/l) and 1 had higher median orthophosphorus levels (0.038 mg/l) than Moses Lake.

Survey limnologists reported algal blooms during July and October sampling. Other sources (Dion, N.P., 1976; Kettle and Uttormark, 1971) report that this historically

*See Appendix E.

eutrophic lake receives heavy recreational use and nuisance blue-green algae blooms throughout the summer.

B. Rate-Limiting Nutrient:

The algal assay results indicate that Moses Lake was limited by available nitrogen in the eastern arm during both spring and fall sampling, and phosphorus- or colimited in the western arms of the lake at those times. The lake data suggest primary limitation by nitrogen throughout the lake on all three sampling occasions except at Stations 03-05 in the spring, where phosphorus limitation is suggested.

C. Nutrient Controllability:

1. Point sources -

During the sampling year, the city of Moses Lake contributed 31.8% of the total phosphorus load to Moses Lake from a single sewage treatment plant. Exceedingly high phosphorus levels at lake Stations 01 and 02 reflect the discharges from the plant in the northeastern arm of the lake.

The calculated annual phosphorus loading of $1.13 \text{ g P/m}^2/\text{yr}$ is more than twice that proposed by Vollenweider (1975) as "eutrophic" for a lake with such volume and hydraulic retention time (289 days). Elimination of the Moses Lake sewage treatment plant discharges would be expected to effect some water quality improvement in the lake; however, further reduction

in nutrient loadings, including nonpoint, would be necessary to reduce the annual phosphorus loading to below Vollenweider's "eutrophic" level.

In March 1977, the Moses Lake Irrigation and Rehabilitation District began periodically diverting water from the Columbia River into Parker Horn (Welch and Lindell, 1977). It has not yet been determined what long term effects will result from the addition of low nutrient water into Moses Lake, nor at what rate nutrient concentrations will increase to predilution levels. Nevertheless, substantial improvement in water quality in Parker Horn and the southwestern arm of Moses Lake can probably be expected.

2. Nonpoint sources -

Nonpoint sources, including precipitation, contributed 68.2% of the total phosphorus load to Moses Lake during the sampling year. Rocky Ford Creek contributed 35.5% of the total, Crab Creek and Rocky Coulee Wasteway contributed 15.4% and 12.3%, respectively, and ungaged drainage areas contributed an estimated 3.4% of the total phosphorus load. Welch and Lindell (1977) report that high phosphorus and nitrogen loading to the lake can primarily be attributed to irrigation return flow.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

Lake and drainage basin characteristics are itemized below. Lake morphometry data were provided by Wolcott (1965). Tributary flow data were provided by the Washington District Office of the U.S. Geological Survey (USGS). Outlet drainage area includes the lake surface area. Mean hydraulic retention time was obtained by dividing the lake volume by mean flow of the outlet. Precipitation values are estimated by methods as outlined in National Eutrophication Survey (NES) Working Paper No. 175. A table of metric/English conversions is included as Appendix A.

A. Lake Morphometry:

1. Surface area: 27.58 km².
2. Mean depth: 5.9 meters.
3. Maximum depth: 11.6 meters.
4. Volume: 161.587 x 10⁶ m³.
5. Mean hydraulic retention time: 289 days.

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

1. Tributaries -

<u>Name</u>	<u>Drainage area (km²)</u>	<u>Mean flow (m³/sec)</u>
A-2 Crab Creek	5770.5	2.01
B-1 Rocky Coulee Wasteway	764.0	0.00
D-1 Rocky Ford Creek	1217.3	2.55
Minor tributaries and immediate drainage -	<u>210.7</u>	<u>0.00</u>
Totals	7962.5	4.56

2. Outlet - A-1 Crab Creek 7990.1 6.48

C. Precipitation:

1. Year of sampling: 17.0 cm.
2. Mean annual: 20.0 cm.

III. LAKE WATER QUALITY SUMMARY

Moses Lake was sampled three 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 five stations on the lake and from a number of depths at each station (see maps, pages v, vi). During each visit, depth-integrated samples were collected from each station for chlorophyll a analysis and phytoplankton identification and enumeration. During the first and last visits, 18.9-liter depth-integrated samples were composited for algal assays. Maximum depths sampled were 2.1 meters at Station 01, 9.1 meters at Station 02, 4.0 meters at Station 03, 6.7 meters at Station 04, and 6.4 meters at Station 05. For a more detailed explanation of NES methods, see NES Working Paper No. 175.

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

MOSES LAKE
 STOPT CODE 5309

PHYSICAL AND CHEMICAL CHARACTERISTICS

PARAMETER	N*	(4/ 3/75)			MAX DEPTH RANGE (METERS)	N*	(7/21/75)			MAX DEPTH RANGE (METERS)	N*	(9/10/75)		
		RANGE	MEDIAN	*** S = 5			RANGE	MEDIAN	*** S = 5			RANGE	MEDIAN	*** S = 5
TEMPERATURE (DEG CFNT)														
0.-1.5 M DEPTH	9	6.3- 7.2	6.8	0.0- 1.5	8	22.0- 25.5	23.0	0.0- 1.5	9	20.2- 23.9	22.5	0.0- 1.5		
MAX DEPTH**	5	6.3- 7.1	6.4	1.8- 9.1	5	17.3- 24.8	18.3	2.1- 9.1	5	19.2- 21.8	19.5	2.1- 8.5		
DISSOLVED OXYGEN (MG/L)														
0.-1.5 M DEPTH	8	10.6- 12.2	11.3	0.0- 1.5	8	8.4- 13.6	12.6	0.0- 1.5	9	5.2- 19.8	13.8	0.0- 1.5		
MAX DEPTH**	5	11.0- 12.0	11.6	1.8- 9.1	5	0.4- 7.8	1.8	2.1- 9.1	5	0.6- 10.8	7.8	2.1- 8.5		
CONDUCTIVITY (UMHOS)														
0.-1.5 M DEPTH	9	266.- 307.	275.	0.0- 1.5	8	430.- 571.	439.	0.0- 1.5	9	357.- 507.	377.	0.0- 1.5		
MAX DEPTH**	5	265.- 303.	277.	1.8- 9.1	5	456.- 579.	465.	2.1- 9.1	5	362.- 437.	381.	2.1- 8.5		
PH (STANDARD UNITS)														
0.-1.5 M DEPTH	8	8.5- 9.4	8.7	0.0- 1.5	8	8.9- 9.2	9.1	0.0- 1.5	9	8.6- 9.4	9.0	0.0- 1.5		
MAX DEPTH**	5	8.5- 9.3	8.6	1.8- 9.1	5	8.0- 9.2	8.8	2.1- 9.1	5	8.3- 9.1	8.9	2.1- 8.5		
TOTAL ALKALINITY (MG/L)														
0.-1.5 M DEPTH	8	177.- 192.	182.	0.0- 1.5	8	155.- 193.	166.	0.0- 1.5	9	174.- 270.	184.	0.0- 1.5		
MAX DEPTH**	5	176.- 188.	183.	1.8- 9.1	5	185.- 238.	202.	2.1- 9.1	5	182.- 300.	191.	2.1- 8.5		
TOTAL P (MG/L)														
0.-1.5 M DEPTH	8	0.041-0.394	0.082	0.0- 1.5	8	0.040-0.650	0.104	0.0- 1.5	9	0.110-1.140	0.170	0.0- 1.5		
MAX DEPTH**	5	0.069-0.339	0.088	1.8- 9.1	5	0.055-0.950	0.211	2.1- 9.1	5	0.089-1.050	0.198	2.1- 8.5		
DISSOLVED ORTHO P (MG/L)														
0.-1.5 M DEPTH	8	0.010-0.127	0.018	0.0- 1.5	8	0.015-0.424	0.032	0.0- 1.5	9	0.026-0.805	0.062	0.0- 1.5		
MAX DEPTH**	5	0.010-0.098	0.018	1.8- 9.1	5	0.028-0.630	0.185	2.1- 9.1	5	0.031-0.665	0.155	2.1- 8.5		
NO2+NO3 (MG/L)														
0.-1.5 M DEPTH	8	0.020-0.880	0.370	0.0- 1.5	8	0.020-0.020	0.020	0.0- 1.5	9	0.020-0.060	0.020	0.0- 1.5		
MAX DEPTH**	5	0.020-0.680	0.400	1.8- 9.1	5	0.020-0.020	0.020	2.1- 9.1	5	0.020-0.100	0.060	2.1- 8.5		
AMMONIA (MG/L)														
0.-1.5 M DEPTH	8	0.020-0.060	0.045	0.0- 1.5	8	0.020-0.080	0.045	0.0- 1.5	9	0.020-0.300	0.040	0.0- 1.5		
MAX DEPTH**	5	0.030-0.070	0.040	1.8- 9.1	5	0.060-0.650	0.360	2.1- 9.1	5	0.050-0.620	0.190	2.1- 8.5		
KJELDAHL N (MG/L)														
0.-1.5 M DEPTH	8	0.600-1.400	0.750	0.0- 1.5	8	0.700-2.300	1.600	0.0- 1.5	9	0.800-2.600	1.200	0.0- 1.5		
MAX DEPTH**	5	0.400-1.500	0.700	1.8- 9.1	5	0.700-1.700	0.900	2.1- 9.1	5	0.800-1.700	1.200	2.1- 8.5		
SECCHI DISC (METERS)														
	5	0.4- 1.1	1.1		5	0.6- 1.5	0.6		5	0.5- 2.5	0.6			

* N = NO. OF SAMPLES
 ** MAXIMUM DEPTH SAMPLED AT EACH SITE
 *** S = NO. OF SITES SAMPLED ON THIS DATE

B. Biological Characteristics:

1. Phytoplankton -

<u>Sampling Date</u>	<u>Dominant Genera</u>	<u>Algal Units per ml</u>
04/02,03/75	1. <u>Stephanodiscus</u>	37,485
	2. <u>Scenedesmus</u>	813
	3. <u>Cryptomonas</u>	642
	4. <u>Chroomonas</u>	428
	5. <u>Melosira</u>	342
	Other genera	<u>1,241</u>
	Total	40,951
07/21/75	1. <u>Aphanizomenon</u>	5,406
	2. <u>Oocystis</u>	2,806
	3. <u>Scenedesmus</u>	1,471
	4. <u>Melosira</u>	753
	5. <u>Chroomonas</u>	479
	Other genera	<u>1,472</u>
	Total	12,387
09/10/75	1. <u>Aphanizomenon</u>	7,171
	2. <u>Oocystis</u>	850
	3. <u>Cryptomonas</u>	702
	4. <u>Melosira</u>	481
	5. <u>Oscillatoria</u>	444
	Other genera	<u>923</u>
	Total	10,571

2. Chlorophyll a -

<u>Sampling Date</u>	<u>Station Number</u>	<u>Chlorophyll <u>a</u> ($\mu\text{g}/\text{l}$)</u>
04/02,03/75	01	2.3
	02	1.6
	03	3.3
	04	11.4
	05	7.8
07/21/75	01	46.8
	02	9.3
	03	31.4
	04	31.4
	05	10.3
09/10/75	01	84.6
	02	80.1
	03	82.4
	04	31.2
	05	2.0

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

<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>
a. 04/03/75 Stations 01-03			
Control	0.088	0.296	13.7
0.05 P	0.138	0.296	12.8
0.05 P + 1.0 N	0.138	1.296	36.7
1.00 N	0.088	1.296	32.4
Stations 04,05			
Control	0.032	0.472	8.9
0.05 P	0.082	0.472	14.5
0.05 P + 1.0 N	0.082	1.472	18.3
1.00 N	0.032	1.472	9.1
b. 09/10/75 Stations 01,02			
Control	0.340	0.370	14.8
0.05 P	0.390	0.370	15.1
0.05 P + 1.0 N	0.390	1.370	43.3
1.00 N	0.340	1.370	41.8
Stations 03-05			
Control	0.075	0.395	7.7
0.05 P	0.125	0.395	7.0
0.05 P + 1.0 N	0.125	1.395	19.4
1.00 N	0.075	1.395	5.3

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential for primary productivity in Moses Lake was extremely high at both sample collection times (04/03/75, 09/10/75). In the May and September assays for Stations 01 and 02 (the Pelican Horn arm of the lake), a significant increase in yield over that of the control occurred when nitrogen alone was added, indicating nitrogen limitation. Addition of phosphorus alone did not stimulate growth significantly beyond the control yields. It should be noted that the mean orthophosphorus levels at Station 01 were substantially higher than those for the other four lake stations on each sampling date (0.112 mg/l in April, 0.527 mg/l in July, 0.735 mg/l in September). These inflated phosphorus levels, and subsequently the indicated primary limitation by nitrogen in the Pelican Horn arm, probably result from a sewage disposal outfall located directly upstream from lake sampling Station 01 (near Marsh Island).

Algal assay results from Stations 04 and 05 in May indicate primary limitation by phosphorus in the northwestern reaches of Moses Lake during May, but suggest colimitation during fall, when only the simultaneous addition of both phosphorus and nitrogen resulted in an increase in yield over that of the control.

The lake data yield extremely low mean inorganic nitrogen to orthophosphorus (N/P) ratios for Moses Lake during summer and fall (N/P=1), indicating nitrogen limitation in the lake at those times. During spring, the lake data suggest nitrogen limitation at Stations 01 and 02, and primary limitation by phosphorus at Station 03-05. (A mean N/P ratio of 14/1 or greater is generally considered to reflect phosphorus limitation).

IV. NUTRIENT LOADINGS
(See Appendix D for data)

For the determination of nutrient loadings, the Washington National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the maps (pages v,vi), except for the high runoff months of March and April when two samples were collected. Sampling was begun in September 1974, and was completed in August 1975.

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

In this report, nutrient loads for sampled tributaries were determined by using a modification of a USGS computer program for calculating stream loadings. Nutrient loads indicated for tributaries are those measured minus known point source loads, if any.

Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of USGS) were estimated by using the mean annual nutrient loads, in $\text{kg}/\text{km}^2/\text{year}$, in Crab Creek, Rocky Coulee Wasteway, and Rocky Ford Creek at Stations A-2, B-1, and D-1 and multiplying the means by the ZZ area in km^2 .

The operator of the Moses Lake wastewater treatment plant provided monthly effluent samples and corresponding flow data.

A. Waste Sources:

1. Known Municipal -

<u>Name</u>	<u>Pop.* Served</u>	<u>Treatment*</u>	<u>Mean Flow (m³/d x 10³)</u>	<u>Receiving Water</u>
Moses Lake	12,500	Trickling Filter	3.486	Moses Lake

2. Known industrial - None

*Provided by treatment plant operator.

D. Mean Annual Nonpoint Nutrient Export by Subdrainage Area:

<u>Tributary</u>	<u>kg P/km²/yr</u>	<u>kg N/km²/yr</u>
Crab Creek	1	16
Rocky Coulee Wasteway	5	79
Rocky Ford Creek	9	112

E. Yearly Loadings:

In the following table, the existing phosphorus annual loading is compared to the relationship proposed by Vollenweider (1975). Essentially, his "eutrophic" loading is that at which the receiving waters would become eutrophic or remain eutrophic; his "oligotrophic" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A "mesotrophic" loading would be considered one between "eutrophic" and "oligotrophic".

Note that Vollenweider's model may not apply to lakes with short hydraulic retention times or in which light penetration is severely restricted by high concentrations of suspended solids in the surface waters.

	Total Yearly Phosphorus Loading <u>(g/m²/yr)</u>
Estimated loading for Moses Lake	1.13
Vollenweider's "eutrophic" loading	0.54
Vollenweider's "oligotrophic" loading	0.27

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
TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR WASHINGTON

11/16/76

LAKE CODE 5309 MOSES LAKE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 7990.1

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS)												MEAN
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
5309A1	7990.1	6.54	6.23	6.12	5.01	5.04	3.82	3.54	5.83	7.33	9.26	11.61	7.45	6.48
5309A2	5770.5	1.92	4.02	6.17	2.48	1.17	1.28	1.35	1.56	1.63	1.35	0.86	0.50	2.01
5309B1	764.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5309D1	1217.3	2.04	1.98	2.21	2.61	2.80	2.83	2.89	2.92	2.83	2.69	2.49	2.27	2.55
5309Z7	238.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 7990.1
 SUM OF SUB-DRAINAGE AREAS = 7990.1
 TOTAL FLOW IN = 54.79
 TOTAL FLOW OUT = 77.79

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5309A1	9	74	8.835	22	8.750				
	10	74	9.911						
	11	74	18.406	2	11.072				
	12	74	10.251	8	12.912				
	1	75	9.231	14	9.005	19	9.231		
	2	75	12.290	5	11.270	16	12.629		
	3	75	13.366	3	13.196				
	4	75	15.291	2	14.187	27	15.971		
	5	75	7.787	5	15.716				
	6	75	6.088						
	7	75	6.938	1	7.023				
	8	75	9.486	13	9.118				
5309A2	9	74	3.511	22	3.455				
	10	74	3.115						
	11	74	1.860						
	12	74	1.161	8	1.303				
	1	75	0.810	14	0.736	19	0.765		
	2	75	0.765	5	0.651	16	0.765		
	3	75	5.720	3	1.218				
	4	75	7.306	3	8.212	27	6.513		
5	75	4.559	30	3.058					
6	75	2.209							
7	75	2.520	1	2.209					
8	75	2.888	13	2.888					

TRIBUTARY FLOW INFORMATION FOR WASHINGTON

11/16/76

LAKE CODE 5309 MOSES LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS (CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5309R1	9	74	1.982	22	1.926				
	10	74	1.699						
	11	74	1.359	2	1.359				
	12	74	0.934	8	1.019				
	1	75	0.850	14	0.878	19	0.793		
	2	75	1.416	5	0.878	16	0.708		
	3	75	0.623	3	0.510	18	0.651		
	4	75	0.708	2	0.680	27	0.736	21	0.733
	5	75	0.793	30	0.850	21	0.804		
	6	75	1.133	0	0.0				
	7	75	1.472	1	1.274	22	1.657		
	8	75	1.699	13	1.699	25	1.719		
	5309D1	9	74	3.115	22	3.115			
10		74	2.917						
11		74	2.633	2	2.775				
12		74	2.379	8	2.407				
1		75	2.067	15	2.237	19	2.124		
2		75	1.841	5	1.756	16	1.642		
3		75	1.756	3	1.699	18	1.642		
4		75	1.897	2	1.812	27	1.982		
5	75	2.152	30	2.322					
6	75	2.605							
7	75	2.832	1	2.888					
8	75	2.973	13	3.058					

APPENDIX C
PHYSICAL AND CHEMICAL DATA

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

530901
 47 06 10.0 119 17 49.0 3
 MOSES LAKE
 53025 WASHINGTON

130591

11EPALES 2111202
 0011 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CONDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CAC03 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2+NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/04/03	09 50	0000	7.2	11.8	18	307	9.40	192	0.020	1.400	0.020	0.127
	09 50	0006	7.1	11.6		303	9.25	187	0.030	1.500	0.020K	0.098
75/07/21	14 40	0000	25.5	13.6	24	571	9.20	193	0.050	1.800	0.020	0.424
	14 40	0007	24.8	5.8		579	9.20	238	0.060	1.700	0.020K	0.630
75/09/10	15 20	0000	23.8	13.6	23	507	9.10	270	0.040	2.600	0.020K	0.805
	15 20	0007	21.8	9.4		437	9.10	300	0.080	1.700	0.020K	0.665

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/04/03	09 50	0000	0.394	2.3	
	09 50	0006	0.339		
75/07/21	14 40	0000	0.650	46.8	
	14 40	0007	0.950		
75/09/10	15 20	0000	1.140	84.6	
	15 20	0007	1.050		

K VALUE KNOWN TO BE LESS
 THAN INDICATED

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

530902
 47 04 10.0 119 19 37.0 3
 MOSES LAKE
 53025 WASHINGTON

130591

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 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 OPTHO MG/L P
75/04/03	10 25	0000	6.5	12.0	42	281	8.95	190	0.030	0.800	0.120	0.012
	10 25	0005	6.5	12.2		281	8.90	189	0.040	0.800	0.120	0.010
	10 25	0015	6.5	12.2		281	8.90	186	0.040	1.000	0.130	0.015
	10 25	0030	6.4	12.0		281	8.90	188	0.040	0.800	0.130	0.011
75/07/21	14 55	0000	24.1	8.4	24	440	9.20	165	0.040	1.700	0.020K	0.046
	14 55	0005	23.8	9.6		437	9.10	167	0.040	1.700	0.020K	0.043
	14 55	0015	22.3	3.8		445	8.30	176	0.140	1.000	0.020K	0.101
	14 55	0030	18.3	0.4		470	8.30	204	0.550	1.200	0.020K	0.275
75/09/10	15 05	0000	23.9	19.8	23	389	9.40	184	0.020	2.400	0.020K	0.064
	15 05	0005	22.7	19.2		381	9.40	184	0.020K	2.400	0.020K	0.062
	15 05	0015	19.8	6.4		373	8.70	185	0.100	1.000	0.020K	0.084
	15 05	0028	19.3	0.8		381	8.40	191	0.560	1.400	0.020K	0.155

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYLA UG/L	00031 INCDT I.T REMNING PERCENT
75/04/03	10 25	0000	0.066	1.6	
	10 25	0005	0.080		
	10 25	0015	0.095		
	10 25	0030	0.088		
75/07/21	14 55	0000	0.218	9.3	
	14 55	0005	0.124		
	14 55	0015	0.177		
	14 55	0030	0.290		
75/09/10	15 05	0000	0.252	80.1	
	15 05	0005	0.221		
	15 05	0015	0.131		
	15 05	0028	0.220		

K VALUE KNOWN TO BE LESS
 THAN INDICATED

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

530903
 47 07 22.0 119 18 29.0 3
 MOSES LAKE
 53025 WASHINGTON

130591

11EPALES 2111202
 0015 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
75/04/03	11 05	0000	6.8	10.6	14	282	8.50	183	0.040	0.800	0.880	0.056
	11 05	0005	6.3	11.0		275	8.50	181	0.050	0.700	0.700	0.040
	11 05	0011	6.4	11.0		272	8.50	183	0.040	0.700	0.680	0.036
75/07/21	14 10	0000	25.2	12.4	24	444	9.20	169	0.060	2.300	0.020K	0.036
	14 10	0006	24.1	9.8		453	8.80	177	0.050	1.500	0.020	0.036
	14 10	0013	22.1	7.8		456	8.80	185	0.060	0.700	0.020	0.028
75/09/10	14 50	0000	23.9	13.8	18	377	9.00	174	0.030	1.000	0.020K	0.035
	14 50	0005	22.5	14.8		377	9.10	183	0.040	1.400	0.040	0.026
	14 50	0011	21.1	10.8		383	8.90	190	0.050	0.800	0.100	0.031

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/04/03	11 05	0000	0.135	3.3	
	11 05	0005	0.082		
	11 05	0011	0.100		
75/07/21	14 10	0000	0.111	31.4	
	14 10	0006	0.120		
	14 10	0013	0.055		
75/09/10	14 50	0000	0.170	82.4	
	14 50	0005	0.220		
	14 50	0011	0.089		

K VALUE KNOWN TO BE LESS
 THAN INDICATED

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

530904
 47 07 01.0 119 20 18.0 3
 MOSES LAKE
 53025 WASHINGTON

130591

11EPALES 211202
 0026 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CONDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CAC03 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/04/02	11 35	0000	7.0		42	269	8.65	181	0.060	0.600	0.450	0.019
		0005	6.8	11.0		270						
		0014	6.6	11.0		267	8.60	182	0.060	0.600	0.430	0.019
75/07/21	13 50	0000	7.0	11.0	48	277	8.60	176	0.070	0.400	0.400	0.018
		0005	22.0	13.4		438	9.20	165	0.050	1.000	0.020K	0.019
		0005	22.1	8.8		430	9.00	169	0.090	1.500	0.020	0.028
75/09/10	14 25	0015	20.4	10.4		442	8.90	178	0.040	0.600	0.020K	0.020
		0022	18.2	1.8		465	9.20	202	0.360	0.900	0.020K	0.185
		0000	22.5	14.2	42	366	9.00	179	0.040	0.800	0.020K	0.035
	14 25	0005	21.4	12.0		360	9.00	183	0.040	1.200	0.020K	0.040
		0022	19.5	7.8		362	8.90	182	0.190	0.900	0.070	0.065

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/04/02	11 35	0000	0.082	11.4	
		0014	0.074		
		0022	0.070		
75/07/21	13 50	0000	0.040	31.4	
		0005	0.097		
		0005	0.039		
75/09/10	14 25	0022	0.211		
		0000	0.150	31.2	
		0005	0.140		
	14 25	0022	0.090		

K VALUE KNOWN TO BE LESS THAN INDICATED

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

530905
 47 10 06.0 119 20 02.0 3
 MOSES LAKE
 53025 WASHINGTON

130591

11EPALES 2111202
 0025 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00019 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CONDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CAC03 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORPHO MG/L P
75/04/03	13 45	0000	6.9	11.4	44	270	8.70	177	0.050	0.600	0.360	0.017
		0005	6.7	11.2		266	8.70	178	0.060	0.600	0.380	0.012
		0013	6.5	11.4		265	8.70	179	0.050	0.600	0.380	0.012
		0021	6.3	11.6		265	8.65	180	0.050	0.600	0.400	0.010
75/07/21	13 15	0000	22.1	12.8	60	430	8.90	155	0.040	1.500	0.020K	0.016
		0005	22.2	13.2		442	9.00	159	0.020	0.700	0.020K	0.015
		0015	18.5	5.6		450	8.50	180	0.250	0.600	0.020K	0.098K
		0020	17.3	0.8		459	8.00	194	0.420	0.800	0.020K	0.183
75/09/10	14 05	0000	20.2	5.6	100	363	8.60	184	0.270	0.800	0.060	0.075
		0005	20.2	5.2		357	8.60	184	0.300	0.900	0.060	0.076
		0021	19.2	0.6		365	8.25	193	0.620	1.200	0.060	0.158

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PFCENT
75/04/03	13 45	0000	0.041	7.8	
		0005	0.086		
		0013	0.065		
		0021	0.069		
75/07/21	13 15	0000	0.042	10.3	
		0005	0.044		
		0015	0.083		
		0020	0.202		
75/09/10	14 05	0000	0.110	2.0	
		0005	0.123		
		0021	0.198		

K VALUE KNOWN TO BE LESS
 THAN INDICATED

APPENDIX D
TRIBUTARY AND WASTEWATER
TREATMENT PLANT DATA

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

5309A1
 47 05 00.0 119 20 00.0 4
 CRAB CREEK
 53 7.5 MOSES LAKE S
 O/MOSES LAKE 130591
 BNK 50 FT E SEC RD BRDG 1.8 M S WESTLAKE
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/09/22	13 00		0.068	1.600	0.045	0.135	0.210
74/12/08	12 30		0.304	0.700	0.030	0.030	0.070
75/01/14	17 00		0.232	0.400	0.112	0.027	0.030
75/01/19	09 45		0.256	0.450	0.024	0.016	0.025
75/02/05	15 30		0.288	0.400	0.032	0.024	0.040
75/02/16	12 35		0.432	0.900	0.040	0.040	0.050
75/03/03	14 40		0.352	0.800	0.088	0.064	0.090
75/03/18	17 10		0.300	0.700	0.055	0.040	0.090
75/04/02	16 45		0.095	1.000	0.080	0.025	0.080
75/04/27	12 50		0.140	0.800	0.075	0.045	0.080
75/05/05	19 00		0.040	0.950	0.050	0.055	0.090
75/07/01	20 30		0.020	1.100	0.070	0.085	0.140
75/08/13	20 00		0.005	1.050	0.025	0.025	0.090

K VALUE KNOWN TO BE LESS
 THAN INDICATED

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

5309A2
 47 11 23.0 119 27 18.0 4
 CRAR CREEK
 53 7.5 MOSES LAKE N
 T/MOSES LAKE 130591
 SCNDRY ROAD BRDG 4.5 MI NE OF MOSES LAKE
 IIEPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE	TIME	DEPTH	00630	00625	00610	00671	00665
FROM	OF		NO2&NO3	TOT KJEL	NH3-N	PHOS-DIS	PHOS-TOT
TO	DAY	FEET	N-TOTAL	N	TOTAL	ORTHO	
			MG/L	MG/L	MG/L	MG/L P	MG/L P
74/09/22	10	30	0.860	0.400	0.007	0.015	0.037
74/12/08	11	40	1.200	1.000	0.060	0.050	0.060
75/01/14	19	15	1.360	0.400	0.056	0.056	0.070
75/01/19	10	20	1.240	0.600	0.080	0.064	0.070
75/02/05	16	50	1.200	0.500	0.064	0.056	0.080
75/02/16	13	20	1.010	1.100	0.096	0.076	0.080
75/03/03	15	25	0.448	0.900	0.024	0.048	0.090
75/03/18	16	15	1.050	1.100	0.100	0.125	0.220
75/04/02	18	05	0.910	1.150	0.017	0.105	0.220
75/04/27	13	35		1.150	0.040	0.035	0.140
75/05/30	20	00	1.150	0.675	0.135	0.085	0.115
75/07/01	18	45	0.740	0.450	0.025	0.020	0.040
75/08/13	18	50	0.770	0.600	0.025	0.030	0.060

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

5309B1
 47 09 45.0 119 15 20.0 4
 GROCKY COULEE WASTEWAY
 53 7.5 MOSES LAKE N
 T/MOSES LAKE 130591
 BRIDGE ON BRDWAY AVE 1.8 M NE JCT HWY 11
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/09/22	11 20		1.600	0.200	0.025	0.080	0.095
74/12/08	11 55		1.760	0.300	0.030	0.100	0.110
75/01/14	18 50		1.760	0.700	0.176	0.120	0.160
75/01/19	10 00		1.760	0.500	0.064	0.088	0.100
75/02/05	16 30		1.200	0.300	0.064	0.080	0.110
75/02/16	13 05		1.780	0.700	0.112	0.144	0.220
75/03/03	15 25		1.760	0.350	0.016	0.120	0.130
75/03/18	17 25		1.500	0.300	0.025	0.055	0.080
75/04/02	17 50		1.450	0.300	0.025	0.150	0.180
75/04/27	13 30		0.800	0.500	0.045	0.074	0.153
75/05/30			0.440	1.290	0.070	0.035	0.070
75/07/01	19 00		1.300	0.350	0.040	0.075	0.100
75/08/13	19 00		1.450	0.400	0.025	0.065	0.080

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

5309D1
49 15 42.0 119 27 18.0 4
ROCKY FORD CREEK
53 7.5 GRANT ORCHDS
T/MOSES LAKE
BRDG ON HWY 11G 8.2 MI NW OF LARSON AFB
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/09/22	10	00	1.260	0.200	0.025	0.085	0.120
74/12/08	11	13	1.360	0.300	0.045	0.130	0.150
75/01/15	10	15	1.320	0.500	0.080	0.128	0.150
75/01/19	12	00	1.320	0.300	0.032	0.120	0.120
75/02/05	17	30	1.720	0.200	0.040	0.120	0.120
75/02/16	14	00	1.280	1.400	0.104	0.104	0.130
75/03/03	11	20	1.320	0.600	0.072	0.144	0.170
75/03/18	16	40	1.300	0.450	0.070	0.120	0.150
75/04/02	18	30	1.200	0.225	0.035	0.105	0.130
75/04/27	14	15	1.250	0.475	0.028	0.116	0.152
75/05/30	18	30	1.200	0.350	0.055	0.105	0.130
75/07/01	18	00	1.250	0.350	0.030	0.095	0.120
75/08/13	18	20	1.300	0.350	0.015	0.105	0.160

APPENDIX E

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)