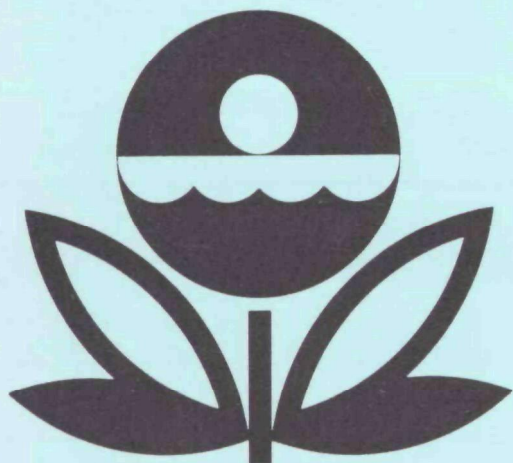


**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY
WORKING PAPER SERIES**



REPORT
ON
CASCADE RESERVOIR
VALLEY COUNTY
IDAHO
EPA REGION X
WORKING PAPER No. 777

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

REPORT
ON
CASCADE RESERVOIR
VALLEY COUNTY
IDAHO
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WORKING PAPER No. 777

WITH THE COOPERATION OF THE
IDAHO DEPARTMENT OF HEALTH AND WELFARE
AND THE
IDAHO NATIONAL GUARD
JULY, 1977

REPORT ON CASCADE RESERVOIR

VALLEY COUNTY, IDAHO

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. 777

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 Idaho Department of Health and Welfare for professional involvement, to the Idaho National Guard for conducting the tributary sampling phase of the Survey, and to those Idaho wastewater treatment plant operators who provided effluent samples and flow data.

The staff of the State of Idaho Department of Health and Welfare, Division of Environment, 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.

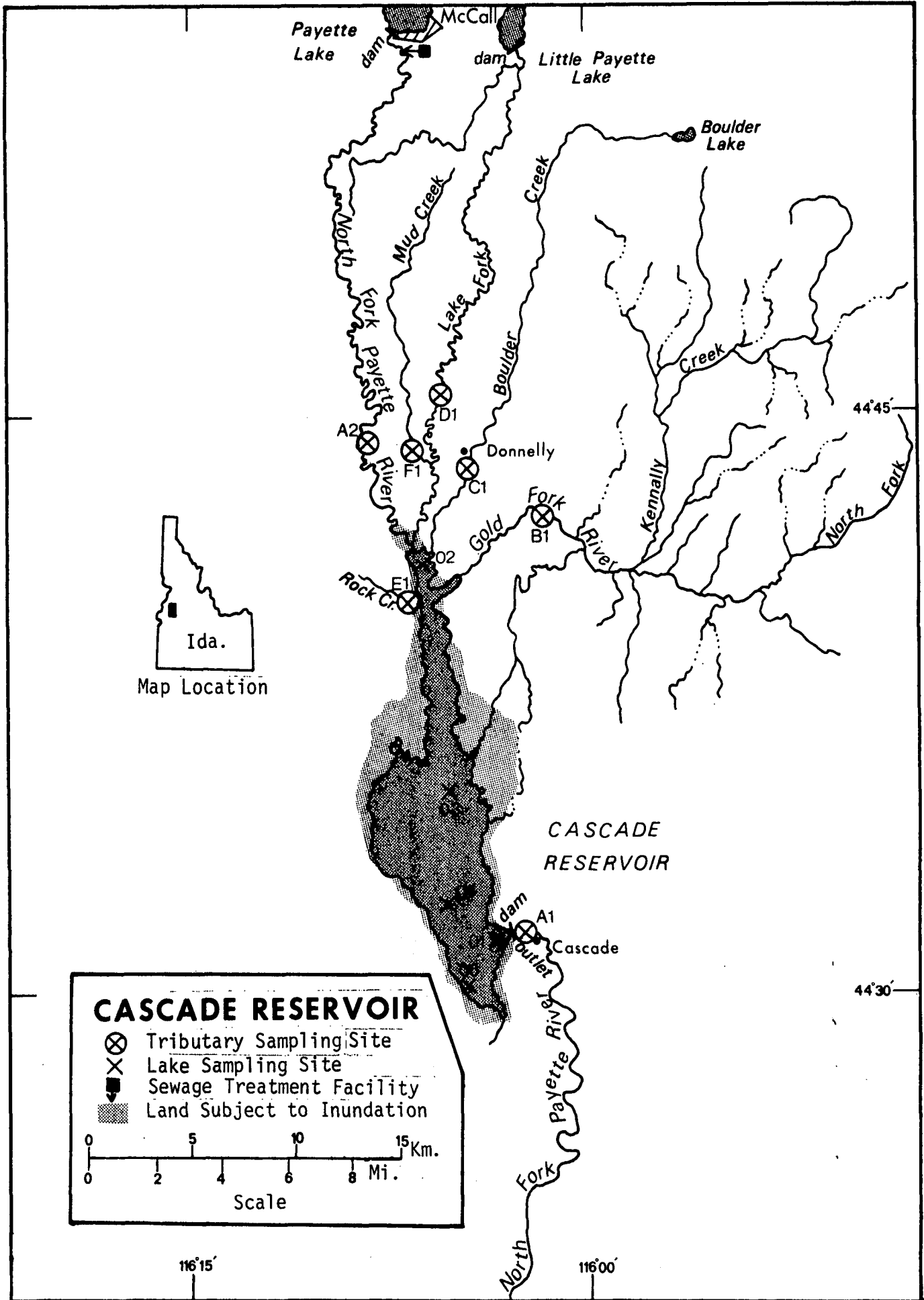
Major General James S. Brooks, Adjutant General of Idaho, and Project Officer Major Vestal L. Baker, who directed the volunteer efforts of the Idaho National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF IDAHO

<u>LAKE NAME</u>	<u>COUNTY</u>
American Falls Reservoir	Bannock, Bingham, Power
Cascade Reservoir	Valley
Coeur d'Alene Lake	Benewah, Kootenai
Dworshak Reservoir	Clearwater
Hauser Lake	Kootenai
Hayden Lake	Kootenai
Island Park Reservoir	Fremont
Lake Lowell (Deer Flat Reservoir)	Canyon
Magic Reservoir	Blaine, Camas
Palisades Reservoir	Bonneville (Lincoln in WY)
Payette Lake	Valley
Lower Twin Lake	Kootenai
Upper Twin Lake	Kootenai



REPORT ON CASCADE RESERVOIR, IDAHO

STORET NO. 1602

I. CONCLUSIONS

A. Trophic Condition:*

On the basis of Survey data, Cascade Reservoir is considered 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 each lake.

Chlorophyll a levels in the lake ranged from 4.1 $\mu\text{g/l}$ to 14.3 $\mu\text{g/l}$ with a mean of 8.1 $\mu\text{g/l}$. Potential for primary productivity as measured by algal assay control yields was high. Of the 13 Idaho lakes sampled in 1975, 4 had greater median total phosphorus levels, 6 had greater median inorganic nitrogen values, and 5 had greater median orthophosphorus levels than Cascade Reservoir.

Survey limnologists reported moderate concentrations of algae in the lake during August and September sampling, and severe oxygen depression with hydrogen sulfide production was reported during September at Station 01. Other studies (Idaho Department of Water Resources et al. 1975; Idaho Department of Health and Welfare, 1975 and 1976; Bureau of Reclamation, 1975) indicate

*See Appendix E.

that seepage of shoreline recreational homes, and excessive algal growths, low oxygen levels in deeper waters, minor fish kills, and shoreline macrophyte growths due to nutrient contamination from agricultural runoff are problems of increasing significance in Cascade Reservoir.

B. Rate-Limiting Nutrient:

Algal assay results indicate that Cascade Reservoir was limited by available phosphorus during both spring and fall sampling (06/04/75, 09/16/75). The lake data suggest primary productivity was limited by available nitrogen during all three sampling rounds.

C. Nutrient Controllability:

1. Point Sources -

Point sources were calculated to have contributed 3.8% of the total phosphorus loading to Cascade Reservoir during the sampling year. The city of McCall, discharging into the North Fork Payette River, contributed this entire load. Wastes from a fish hatchery on the North Fork Payette River, and raw domestic discharges from the community of Donnelly also impact Cascade Reservoir; however, annual nutrient contributions from these sources are not known.

The annual phosphorus loading of $0.38 \text{ g P/m}^2/\text{yr}$ is less than Vollenweider's "eutrophic" level but greater than his

proposed "oligotrophic" loading for a lake with such volume and retention time. However, the lake is obviously eutrophic, and removal of inputs from point and nonpoint sources would probably be necessary to effect lake water quality improvement. A waste treatment plant has recently been completed at Donnelly and should substantially improve water quality flowing from Boulder Creek into Cascade Reservoir. The Bureau of Reclamation (1975) has also recommended monitoring those lake areas affected by rapid development of recreational homesites, and suggested a switch from use of individual septic tanks to back-set sewage disposal lagoons to reduce the impact of the rapidly expanding domestic development around the lake.

2. Nonpoint sources -

Nonpoint sources, including precipitation, contributed 96.2% of the total phosphorus loading to Cascade Reservoir. The Gold Fork River contributed 25.0% of the total load, the North Fork Payette River, 21.3%, and Lake Fork Creek contributed 15.1%. Ungaged drainage areas were estimated to have contributed 24.8% of the total phosphorus load.

Phosphorus export rates of all four tributaries to Cascade Reservoir were higher than would be expected from nonpoint

contribution alone (Section IV-D), and excessive algal growths have been reported in most of them (Bureau of Reclamation, 1975). The Bureau has recommended that management practices in the Cascade watershed be modified by reducing grazing during spring high runoff periods and preventing cattle from reaching the lake to help lower nutrient levels and micro-organism counts in Cascade Reservoir.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

Lake and drainage basin characteristics are itemized below. Lake surface area, mean depth and volume were provided by the U.S. Geological Survey (USGS) (1972), and Martin and Hanson (1966). Maximum depth was estimated on the basis of National Eutrophication Survey (NES) sampling data. Tributary flow data were provided by the Idaho District Office of the 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 (NES) Working Paper No. 175. A table of metric/English conversions is included as Appendix A.

A. Lake Morphometry:

1. Surface area: 107.24 km²
2. Mean depth: 8.1 meters
3. Maximum depth: 18.3 meters
4. Volume: 867.390 x 10⁶ m³
5. Mean hydraulic retention time: 339 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 North Fork Payette River	440.3	10.19
B-1 Gold Fork River	388.5	5.91
C-1 Boulder Creek	99.7	0.95
D-1 Lake Fork Creek	198.4	3.35
Minor tributaries and immediate drainage -	<u>387.2</u>	<u>6.86</u>
Totals	1514.1	27.26

2. Outlet - A-1 North Fork Payette River	1621.3	29.64
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C. Precipitation:

1. Year of sampling: 77.7 cm.
2. Mean annual: 71.6 cm.

III. LAKE WATER QUALITY SUMMARY

Cascade Reservoir 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 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 and last visits, 18.9-liter depth-integrated samples were composited for algal assays. Maximum depths sampled were 16.8 meters at Station 01, 5.8 meters at Station 02, 8.5 meters at Station 03, 11.9 meters at Station 04, and 8.5 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 determinations are included in III-B. Results of the limiting nutrient study are presented in III-C.

PHYSICAL AND CHEMICAL CHARACTERISTICS

PARAMETER	N*	(6/ 4/75)			N*	(8/ 1/75)			N*	(9/16/75)		
		RANGE	MEDIAN	MAX DEPTH RANGE (METERS)		RANGE	MEDIAN	MAX DEPTH RANGE (METERS)		RANGE	MEDIAN	MAX DEPTH RANGE (METERS)
TEMPERATURE (DEG CENT)												
0.-1.5 M DEPTH	10	12.1- 14.2	13.2	0.0- 1.5	10	16.0- 17.6	16.6	0.0- 1.5	10	18.1- 19.6	18.8	0.0- 1.5
MAX DEPTH**	5	7.1- 12.1	7.4	1.5- 11.6	5	8.7- 16.1	11.3	4.3- 15.2	5	14.9- 18.3	16.8	4.6- 16.8
DISSOLVED OXYGEN (MG/L)												
0.-1.5 M DEPTH	10	9.0- 10.4	9.7	0.0- 1.5	10	4.6- 8.6	7.4	0.0- 1.5	10	8.0- 8.8	8.4	0.0- 1.5
MAX DEPTH**	5	7.2- 9.0	8.0	1.5- 11.6	5	1.8- 7.0	5.6	4.3- 15.2	5	0.2- 8.8	3.6	4.6- 16.8
CONDUCTIVITY (UMHOS)												
0.-1.5 M DEPTH	0	*****-*****	*****	*****-*****	10	16.- 35.	29.	0.0- 1.5	9	32.- 34.	33.	0.0- 1.5
MAX DEPTH**	0	*****-*****	*****	*****-*****	5	28.- 35.	30.	4.3- 15.2	5	32.- 48.	33.	4.6- 16.8
PH (STANDARD UNITS)												
0.-1.5 M DEPTH	10	6.9- 8.6	7.8	0.0- 1.5	9	7.6- 8.0	7.9	0.0- 1.5	10	7.5- 8.6	8.3	0.0- 1.5
MAX DEPTH**	5	6.9- 7.6	7.3	1.5- 11.6	5	7.3- 7.9	7.8	4.3- 15.2	5	6.9- 8.5	7.8	4.6- 16.8
TOTAL ALKALINITY (MG/L)												
0.-1.5 M DEPTH	10	12.- 23.	18.	0.0- 1.5	10	13.- 22.	17.	0.0- 1.5	10	14.- 21.	17.	0.0- 1.5
MAX DEPTH**	5	14.- 22.	20.	1.5- 11.6	5	15.- 22.	18.	4.3- 15.2	5	16.- 22.	19.	4.6- 16.8
TOTAL P (MG/L)												
0.-1.5 M DEPTH	10	0.025-0.047	0.039	0.0- 1.5	10	0.016-0.024	0.020	0.0- 1.5	10	0.025-0.041	0.032	0.0- 1.5
MAX DEPTH**	5	0.030-0.110	0.058	1.5- 11.6	5	0.020-0.057	0.024	4.3- 15.2	5	0.030-0.247	0.052	4.6- 16.8
DISSOLVED ORTHO P (MG/L)												
0.-1.5 M DEPTH	10	0.008-0.020	0.014	0.0- 1.5	10	0.007-0.019	0.009	0.0- 1.5	10	0.002-0.013	0.004	0.0- 1.5
MAX DEPTH**	5	0.015-0.030	0.020	1.5- 11.6	5	0.008-0.017	0.009	4.3- 15.2	5	0.002-0.118	0.006	4.6- 16.8
NO2+NO3 (MG/L)												
0.-1.5 M DEPTH	10	0.020-0.020	0.020	0.0- 1.5	10	0.020-0.030	0.020	0.0- 1.5	10	0.020-0.020	0.020	0.0- 1.5
MAX DEPTH**	5	0.020-0.020	0.020	1.5- 11.6	5	0.020-0.060	0.020	4.3- 15.2	5	0.020-0.020	0.020	4.6- 16.8
AMMONIA (MG/L)												
0.-1.5 M DEPTH	10	0.030-0.050	0.040	0.0- 1.5	10	0.020-0.040	0.030	0.0- 1.5	10	0.020-0.040	0.020	0.0- 1.5
MAX DEPTH**	5	0.040-0.060	0.040	1.5- 11.6	5	0.020-0.080	0.040	4.3- 15.2	5	0.020-0.400	0.090	4.6- 16.8
KJELDAHL N (MG/L)												
0.-1.5 M DEPTH	10	0.200-0.600	0.300	0.0- 1.5	10	0.200-0.400	0.300	0.0- 1.5	10	0.200-0.400	0.350	0.0- 1.5
MAX DEPTH**	5	0.200-0.400	0.300	1.5- 11.6	5	0.200-0.400	0.300	4.3- 15.2	5	0.300-0.700	0.300	4.6- 16.8
SECCHI DISC (METERS)												
	5	0.8- 1.2	1.1		5	1.8- 3.0	2.7		5	2.1- 3.4	3.0	

* 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>
06/04/75	1. <u>Asterionella</u>	5,069
	2. <u>Dinobryon</u>	870
	3. <u>Synedra</u>	605
	4. Centric diatom	151
	5. <u>Melosira</u>	151
	Other genera	<u>417</u>
	Total	7,263
08/01/75	1. <u>Fragilaria</u>	1,206
	2. <u>Aphanizomenon</u>	827
	3. <u>Melosira</u>	276
	4. <u>Chroomonas</u>	138
	5. <u>Aphanothece</u>	103
	Other genera	<u>277</u>
	Total	2,827
09/16/75	1. <u>Aphanizomenon</u>	979
	2. <u>Cryptomonas</u>	367
	3. <u>Fragilaria</u>	245
	4. <u>Chroomonas</u>	82
	5. <u>Melosira</u>	82
	Other genera	<u>40</u>
	Total	1,795

2. Chlorophyll a -

<u>Sampling Date</u>	<u>Station Number</u>	<u>Chlorophyll <u>a</u> ($\mu\text{g/l}$)</u>
06/04/75	01	8.1
	02	4.7
	03	6.7
	04	8.1
	05	7.6
08/01/75	01	8.7
	02	5.6
	03	11.2
	04	5.4
	05	4.6
09/16/75	01	6.7
	02	6.3
	03	9.8
	04	14.3
	05	13.4

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. 06/04/75 Stations 01-05			
Control	0.010	0.030	0.9
0.05 P	0.060	0.030	2.5
0.05 P + 1.0 N	0.060	1.030	20.3
1.00 N	0.010	1.030	1.2
b. 09/16/75 Stations 01,04,05			
Control	0.010	0.120	1.2
0.05 P	0.060	0.120	6.4
0.05 P + 1.0 N	0.060	1.120	21.1
1.00 N	0.010	1.120	1.0
Stations 02,03			
Control	0.010	0.085	0.6
0.05 P	0.060	0.085	3.1
0.05 P + 1.0 N	0.060	1.085	21.4
1.00 N	0.010	1.085	0.6

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential for primary production in Cascade Reservoir was moderate to high during the spring and fall samplings (06/04/75; 09/16/75). In all assays, the addition of orthophosphorus alone produced a significant increase in yield over that of the control, indicating phosphorus limitation. Note that the addition of nitrogen alone did not result in any substantial increase in yield over that of the control, and that maximum growth increases were achieved with the simultaneous addition of both nutrients.

The mean inorganic nitrogen to orthophosphorus ratios (N/P) in the lake data were less than 8/1 on all sampling occasions, suggesting primary limitation by nitrogen (a mean N/P ratio of 14/1 or greater generally reflects phosphorus limitation).

IV. NUTRIENT LOADINGS
(See Appendix D for data)

For the determination of nutrient loadings, the Idaho National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of June and July when two samples were collected. Sampling was begun in October, 1974, and was completed in September, 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Idaho 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 Gold Fork River at Station B-1, and multiplying the means by the ZZ area in km^2 .

Nutrient loads for the McCall wastewater treatment plant were calculated using estimated flows and provided monthly effluent samples.

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>
McCall	2500	Stabilization pond	0.946*	North Fork Payette River

2. Known industrial - None

*Estimated at 0.3785 m³/capita/day.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

<u>Source</u>	<u>kg P/yr</u>	<u>% of total</u>
a. Tributaries (nonpoint load) -		
A-2 North Fork Payette River	8,620	21.3
B-1 Gold Fork River	10,140	25.0
C-1 Boulder Creek	2,195	5.4
D-1 Lake Fork Creek	6,130	15.1
b. Minor tributaries and immediate drainage (nonpoint load) -	10,065	24.8
c. Known municipal STP's -		
McCall	1,520	3.8
d. Septic tanks* -	<5	<0.1
e. Known industrial - None		
f. Direct precipitation -	<u>1,875</u>	<u>4.6</u>
Totals	40,545	100.0%
2. Output - A-1 North Fork Payette River	25,985	
3. Net annual P accumulation -	14,560	

*Estimate based on 5 lakeshore residences and 1 park.

**Estimated (See NES Working Paper No. 175).

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

<u>Source</u>	<u>kg N/yr</u>	<u>% of total</u>
a. Tributaries (nonpoint load) -		
A-2 North Fork Payette River	171,490	32.9
B-1 Gold Fork River	83,975	16.1
C-1 Boulder Creek	20,420	3.9
D-1 Lake Fork Creek	41,690	8.0
b. Minor tributaries and immediate drainage (nonpoint load) -	83,635	16.0
c. Known municipal STP's -		
McCall	4,600	0.9
d. Septic tanks* -	90	<0.1
e. Known industrial - None		
f. Direct precipitation** -	<u>115,775</u>	<u>22.2</u>
Totals	521,675	100.0%
2. Outputs - A-1 North Fork Payette River	829,205	
3. Net annual N export*** -	307,530	

*Estimate based on 5 lakeshore residences and 1 park.

**Estimated (See NES Working Paper No. 175).

***Export probably due to unknown sources and/or sampling error.

D. Mean Annual Nonpoint Nutrient Export by Subdrainage Area:

<u>Tributary</u>	<u>kg P/km²/yr</u>	<u>kg N/km²/yr</u>
North Fork Payette River	20	389
Gold Fork River	26	216
Boulder Creek	22	205
Lake Fork Creek	31	210

E. Mean Nutrient Concentrations in Ungaged Streams:

<u>Tributary</u>	<u>Mean Total P (mg/l)</u>	<u>Mean Total N (mg/l)</u>
E-1 Rock Creek	0.034	0.486
F-1 Mud Creek	0.052	0.939

F. Yearly Loadings:

In the following table, the existing phosphorus 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 be applicable to water bodies with very short retention times or in which light penetration is severely restricted from high concentrations of suspended solids in the surface waters.

	Total Yearly Phosphorus Loading <u>(g/m²/yr)</u>
Estimated loading for Cascade Reservoir	0.38
Vollenweider's "eutrophic" loadings	0.58
Vollenweider's "oligotrophic" loading	0.29

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 IDAHO

08/23/76

LAKE CODE 1602 CASCADE RESERVOIR

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 1621.3

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS)												MEAN
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1602A1	1621.3	23.05	27.58	27.47	20.22	13.39	37.94	38.23	51.54	53.80	28.09	14.87	19.57	29.64
1602A2	440.3	2.46	2.69	2.72	8.78	40.21	41.34	8.69	4.70	2.78	2.94	2.21	2.46	10.19
1602B1	388.5	2.18	2.21	2.49	6.99	21.61	23.59	3.62	0.48	1.13	1.87	2.29	2.46	5.91
1602C1	99.7	0.34	0.45	1.25	4.59	2.55	0.62	0.23	0.17	0.14	0.20	0.25	0.57	0.95
1602D1	198.4	1.30	1.22	1.10	1.93	9.85	14.44	2.97	1.78	1.02	1.36	1.81	1.44	3.35
1602Z7	494.4	2.58	2.69	4.02	12.15	21.58	23.02	4.39	1.95	1.56	2.24	2.92	3.17	6.86

SUMMARY

TOTAL DRAINAGE AREA OF LAKE =	1621.3	TOTAL FLOW IN =	326.78
SUM OF SUB-DRAINAGE AREAS =	1621.3	TOTAL FLOW OUT =	355.74

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW
1602A1	10	74	25.740	19	5.352		
	11	74	16.962	15	23.531		
	12	74	27.609	13	29.166		
	1	75	25.032	18	21.634		
	2	75	18.774	15	13.960		
	3	75	30.894	14	28.289		
	4	75	46.808	19	46.440		
	5	75	38.143	17	35.962		
	6	75	11.242	6	13.451	22	8.042
1602A2	7	75	23.107	6	8.099	20	29.166
	8	75	49.385	16	53.519		
	9	75	52.471	13	53.519		
	10	74	5.663	19	4.248		
	11	74	2.407	15	2.294		
	12	74	2.435	13	2.209		
	1	75	2.747	18	2.917		
	2	75	3.171	15	3.596		
	3	75	3.200	14	2.718		
	4	75	3.115	18	2.832		
	5	75	20.020	17	23.786		
6	75	67.960	6	69.376	22	45.307	
7	75	31.149	6	65.129	20	9.288	
8	75	7.929	16	12.233			
9	75	9.628	13	10.109			

TRIBUTARY FLOW INFORMATION FOR IDAHO

08/23/76

LAKE CODE 1602

CASCADE RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1602B1	10	0.793						
	11	0.878	15	0.736				
	12	0.963	13	0.921				
	1	5.833	18	12.884				
	2	3.596	15	3.313				
	3	2.718	14	2.237				
	4	4.927	19	4.248				
	5	11.836	17	19.482				
	6	25.542	6	35.113	22	21.662		
	7	13.281	6	26.618	20	5.550		
	8	2.917	16	1.727				
	9	1.388	13	1.331				
1602C1	10	0.142	19	0.142				
	11	0.170	15	0.198				
	12	0.170	13	0.170				
	1	0.340	18	0.453				
	2	0.311	15	0.198				
	3	8.637	14	7.929				
	4	4.361	18	5.663				
	5	6.853	17	12.884				
	6	1.274	7	1.359	22	1.331		
	7	1.388	6	1.388	20	1.189		
	8	0.708	16	0.396				
	9	0.170	13	0.170				
1602D1	10	0.595	19	0.566				
	11	0.623	15	0.595				
	12	0.623	13	0.623				
	1	0.623	18	0.623				
	2	0.595	15	0.765				
	3	0.906	14	0.821				
	4	2.067	18	2.350				
	5	3.710	17	5.097				
	6	1.671	7	2.039	22	1.246		
	7	0.821	6	0.850	20	0.793		
	8	0.708	16	0.595				
	9	0.651	13	0.623				

APPENDIX C
PHYSICAL AND CHEMICAL DATA

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA-LAS VEGAS

160201
 44 31 57.0 116 03 09.0 3
 CASCADE LAKE
 16085 IDAHO

130791

11EPALES 2111202
 0042 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 CNDUCTVY 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
75/06/04	12 05	0000	13.8	10.4	47		7.30	17	0.030	0.600	0.020	0.014
	12 05	0005	13.4	9.4			7.90	18	0.030	0.400	0.020K	0.015
	12 05	0015	12.3	9.4			7.60	21	0.040	0.400	0.020K	0.009
	12 05	0038	7.4	7.2			7.10	22	0.060	0.400	0.020	0.015
75/08/01	10 20	0000	17.3	7.5	84	29	7.80	19	0.030	0.200	0.020K	0.009
	10 20	0005	17.2	7.0			7.95	22	0.040	0.400	0.020K	0.019
	10 20	0020	17.1	7.0			7.35	21	0.040	0.400	0.020K	0.012
	10 20	0030	10.5	4.0			7.00	22	0.070	0.300	0.050	0.017
	10 20	0050	8.7	1.8			7.80	22	0.030	0.300	0.020K	0.011
	10 05	0000	19.4	8.0			126	34	8.60	21	0.030	0.300
10 05	0005	19.1	8.0	8.15	21	0.040			0.300	0.020K	0.005	
10 05	0016	17.0	5.8	7.60	19	0.050			0.200	0.020K	0.004	
10 05	0035	16.3	4.0	7.35	20	0.140			0.300	0.020K	0.011	
10 05	0055	14.9	0.2	6.90	21	0.400			0.700	0.020K	0.118	

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/06/04	12 05	0000	0.038	8.1	
	12 05	0005	0.044		
	12 05	0015	0.045		
	12 05	0038	0.058		
75/08/01	10 20	0000	0.019	8.7	
	10 20	0005	0.024		
	10 20	0020	0.021		
	10 20	0030	0.027		
	10 20	0050	0.057		
	10 05	0000	0.026		
10 05	0005	0.029			
10 05	0016	0.024			
10 05	0035	0.037			
10 05	0055	0.247			

K VALUE KNOWN TO BE LESS
 THAN INDICATED

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA-LAS VEGAS

160202
 44 40 40.0 116 06 30.0 3
 CASCADE LAKE
 16085 IDAHO

130791

11EPALES 2111202
 0012 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
75/06/04	14 10	0000	12.5	9.0	30		7.00	15	0.040	0.300	0.020	0.009
	14 10	0005	12.1	9.0			6.90	14	0.040	0.200	0.020	0.015
75/08/01	09 15	0000	16.4	8.6	108	16		14	0.020	0.200K	0.020K	0.016
	09 15	0005	16.5	7.4		28	7.75	13	0.030	0.300	0.020K	0.008
	09 15	0019	11.3	5.6		29	7.35	15	0.050	0.200	0.060	0.009
75/09/16	11 25	0000	18.8	8.6	132	32	8.30	17	0.020K	0.300	0.020K	0.002
	11 25	0005	18.6	8.0		33	8.05	17	0.020K	0.200	0.020K	0.002
	11 25	0015	18.3	8.8		32	8.00	16	0.020K	0.300	0.020K	0.002

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/06/04	14 10	0000	0.025	4.7	
	14 10	0005	0.030		
75/08/01	09 15	0000	0.020	5.6	
	09 15	0005	0.020		
	09 15	0019	0.026		
75/09/16	11 25	0000	0.025	6.3	
	11 25	0005	0.032		
	11 25	0015	0.032		

K VALUE KNOWN TO BE LESS
 THAN INDICATED

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA-LAS VEGAS

160203
 44 36 09.0 116 05 57.0 3
 CASCADE LAKE
 16085 IDAHO

130791

11EPALES 2111202
 0032 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 OPTHO MG/L P
75/06/04	14 30	0000	13.9	10.0	44		7.60	14	0.030	0.300	0.020K	0.016
	14 30	0005	13.7	9.4			8.00	12	0.030	0.200	0.020K	0.008
	14 30	0015	8.0	8.8			7.40	16	0.040	0.300	0.020K	0.017
	14 30	0028	7.2	8.0			7.40	15	0.040	0.400	0.020K	0.030
75/08/01	09 35	0000	16.3	7.4	108	32	7.60	13	0.020	0.200	0.020K	0.009
	09 35	0005	16.2	7.2		35	8.00	16	0.020	0.300	0.020K	0.009
	09 35	0014	16.1	7.0		30	7.85	17	0.020	0.300	0.020K	0.008
75/09/16	11 05	0000	18.9	8.4	108	33	8.50	15	0.020K	0.400	0.020K	0.004
	11 05	0005	18.8	8.6		32	8.40	14	0.020K	0.300	0.020K	0.003
	11 05	0015	18.2	8.6		31	7.90	14	0.020K	0.300	0.020K	0.002
	11 05	0024	17.5	7.6		32	8.50	16	0.020	0.300	0.020K	0.002

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/06/04	14 30	0000	0.047	6.7	
	14 30	0005	0.037		
	14 30	0015	0.051		
	14 30	0028	0.110		
75/08/01	09 35	0000	0.017	11.2	
	09 35	0005	0.020		
	09 35	0014	0.020		
75/09/16	11 05	0000	0.033	9.8	
	11 05	0005	0.029		
	11 05	0015	0.028		
	11 05	0024	0.067		

K VALUE KNOWN TO BE LESS
 THAN INDICATED

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA-LAS VEGAS

160204
 44 34 15.0 116 06 57.0 3
 CASCADE LAKE
 16085 IDAHO

130791

11EPALES 2111202
 0035 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&N03 N-TOTAL MG/L	00671 PHOS-DIS ORTHO M6/L P
75/06/04	14 50	0000	13.0	9.6	45		7.90	23	0.040	0.300	0.020K	0.017
	14 50	0005	12.6	9.8			7.80	23	0.050	0.300	0.020K	0.020
	14 50	0015	12.0	9.4			7.30	18	0.040	0.300	0.020K	0.017
	14 50	0031	7.1	8.4			7.60	20	0.040	0.300	0.020K	0.020
75/08/01	10 00	0000	16.7	7.8	120	29	7.90	16	0.030	0.300	0.020K	0.008
	10 00	0005	16.0	7.2		31	7.90	18	0.030	0.200	0.020K	0.007
	10 00	0020	16.6	6.2		35	7.12	18	0.030	0.200	0.020K	0.007
	10 00	0026	14.9	5.2		35	7.25	19	0.040	0.300	0.020K	0.009
75/09/16	10 25	0000	19.5	8.4	120	33	8.30	16	0.040	0.400	0.020K	0.013
	10 25	0005	19.6	8.4		33	8.60	15	0.040	0.400	0.020K	0.006
	10 25	0015	18.3	8.0		31	7.90	16	0.040	0.400	0.020K	0.003
	10 25	0030	16.4	4.8		32	7.40	17	0.090	0.300	0.020K	0.008
	10 25	0039	16.3	3.6		34	7.80	19	0.090	0.300	0.020K	0.012

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/06/04	14 50	0000	0.040	8.1	
	14 50	0005	0.042		
	14 50	0015	0.044		
	14 50	0031	0.049		
75/08/01	10 00	0000	0.016	5.4	
	10 00	0005	0.022		
	10 00	0020	0.022		
	10 00	0026	0.024		
75/09/16	10 25	0000	0.035	14.3	
	10 25	0005	0.032		
	10 25	0015	0.032		
	10 25	0030	0.034		
	10 25	0039	0.052		

K VALUE KNOWN TO BE LESS
 THAN INDICATED

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA-LAS VEGAS

160205
 44 30 40.0 116 04 50.0 3
 CASCADE LAKE
 16085 IDAHO

130791

11EPALES 2111202
 0030 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
75/06/04	15 15	0000	14.2	10.0	46		8.60	21	0.040	0.400	0.020K	0.014
	15 15	0005	13.1	9.8			8.15	18	0.040	0.300	0.020K	0.013
	15 15	0015	11.3	9.2			7.60	16	0.040	0.300	0.020K	0.016
	15 15	0026	7.5	7.6			7.30	22	0.050	0.300	0.020K	0.027
75/08/01	10 45	0000	17.6	8.0	72	30	7.70	17	0.030	0.300	0.030	0.015
	10 45	0005	17.5	4.6		29	8.00	17	0.030	0.400	0.020K	0.014
	10 45	0015	17.4	4.2		36	7.30	16	0.050	0.400	0.020K	0.012
	10 45	0028	10.2	7.0		28	7.90	18	0.080	0.400	0.030	0.017
75/09/16	09 45	0000	18.1	8.6	84	33	7.50	19	0.020K	0.400	0.020	0.006
	09 45	0005	18.1	8.8		32	7.50	20	0.020K	0.400	0.020K	0.004
	09 45	0015	17.1	6.6		31	7.30	19	0.040	0.300	0.020K	0.004
	09 45	0021	16.8	2.4		33	6.95	22	0.100	0.300	0.020K	0.006

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/06/04	15 15	0000	0.040	7.6	
	15 15	0005	0.037		
	15 15	0015	0.041		
	15 15	0026	0.058		
75/08/01	10 45	0000	0.021	4.6	
	10 45	0005	0.021		
	10 45	0015	0.046		
	10 45	0028	0.023		
75/09/16	09 45	0000	0.034	13.4	
	09 45	0005	0.041		
	09 45	0015	0.037		
	09 45	0021	0.030		

K VALUE KNOWN TO BE LESS
 THAN INDICATED

APPENDIX D
TRIBUTARY AND WASTEWATER
TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA- LAS VEGAS

1602A1
 44 31 30.0 116 02 40.0 4
 N FK PAYETTE RIVER
 16 15 CASCADE
 O/CASCADE RESERVOIR 130791
 BRDG BELO DAM .6 MI N OF DWNTWN CASCADE
 11EPALES 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
74/10/19	12	00	0.040	0.500	0.035	0.010	0.035
74/11/15	17	30	0.336	0.200	0.025	0.005	0.025
74/12/13	17	00	0.010	0.900	0.025	0.010	0.020
75/01/18			0.016	1.000	0.030	0.010	0.020
75/02/15	10	00	0.016		0.040	0.008K	0.020
75/03/14	16	45	0.055	0.350	0.020	0.010	0.030
75/04/19	15	30	0.065	1.200	0.030	0.020	0.020
75/05/17	08	15	0.005	4.300	0.065	0.005	0.040
75/06/06	13	00	0.010	0.700	0.020	0.010	0.040
75/06/22	18	00	0.005	0.600	0.027	0.005	0.050
75/07/06	20	00	0.020	0.200	0.010	0.010	0.020
75/07/20	16	00	0.035	0.400	0.035	0.010	0.020
75/08/16	07	30	0.015	0.500	0.005	0.010	0.030
75/09/14	12	00	0.030	0.500	0.030	0.030	0.050

K VALUE KNOWN TO BE LESS
 THAN INDICATED

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA- LAS VEGAS

1602A2
 44 47 35.0 116 08 30.0 4
 N FK PAYETTE RIVER
 16 VALLEY CO HWY MP
 T/CASCADE RESERVOIR
 SEC RD BRDG 6 MI NW OF DONNELLY
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/19	15 00		0.096	0.100	0.015	0.010	0.020
74/11/15	15 00		0.288	0.100K	0.050	0.015	0.020
74/12/13	14 00		0.312	0.300	0.035	0.025	0.040
75/01/18	13 00		0.296	0.700	0.075	0.020	0.050
75/02/15	07 30		0.024	0.900	0.032	0.008	0.030
75/03/14	11 15		0.010	0.400	0.025	0.005K	0.010K
75/04/18	13 15		0.230	0.750	0.040	0.040	0.060
75/05/17	14 00		0.100	0.800	0.045	0.015	0.070
75/06/06	16 30		0.015	0.200	0.015	0.005	0.027
75/06/22	12 00		0.010	0.850	0.035	0.005K	0.030
75/07/06	18 00		0.015	0.100	0.025		0.020
75/07/20	13 00		0.030	0.150	0.030	0.010	0.020
75/08/16	16 30		0.010	0.250	0.010	0.010	0.020
75/09/13	15 00		0.040	0.300	0.010	0.045	0.045

K VALUE KNOWN TO BE LESS
 THAN INDICATED

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA- LAS VEGAS

160281
 44 42 20.0 116 46 30.0 4
 GOLD FORK RIVER
 16 15 CASCADE
 T/CASCADE RESERVOIR 130792
 BNK 3.5 MI SE OF DONNELLY
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&N03 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
75/01/18	15 00		0.048	0.200	0.012	0.010	0.020
75/02/15	14 00		0.048	0.400	0.016	0.016	0.050
75/03/14	14 30		0.030	0.400	0.015	0.015	0.030
75/04/19	14 30		0.060	0.750	0.025	0.015	0.030
75/05/17	08 40		0.085	0.650	0.025	0.025	0.100
75/06/06	14 00		0.025	0.500	0.025	0.010	0.160
75/06/22	17 00		0.010	0.400	0.030	0.005	0.090
75/07/06	18 00		0.005	0.300	0.010	0.010	0.020
75/07/20	16 50		0.035	0.200	0.035	0.015	0.020
75/08/16	11 00		0.125	0.400	0.100	0.050	0.060
75/09/13	12 30		0.040	0.100	0.005K	0.050	0.050

K VALUE KNOWN TO BE LESS
 THAN INDICATED

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA- LAS VEGAS

1602C1
 44 43 08.0 116 04 35.0 4
 BOULDER CREEK
 16 15 CASCADE
 T/CASCADE RESERVOIR 130791
 RR BRDG 1 MI S OF DONNELLY
 11EPALES 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
74/10/19	13	30	0.024	0.300	0.015	0.035	0.055
74/11/15	16	45	0.064	0.100	0.015	0.040	0.050
74/12/13	15	00	0.064	0.500	0.020	0.030	0.050
75/01/18	14	30	0.144	0.400	0.045	0.030	0.050
75/02/15	09	00	0.136	0.700	0.072	0.040	0.070
75/03/14	16	15	0.060	0.500	0.045	0.065	0.080
75/04/18	11	00	0.090	1.250	0.045	0.040	0.100
75/05/17	09	00	0.010	1.150	0.065	0.030	0.070
75/06/07	15	00	0.010	0.250	0.015	0.025	0.080
75/06/22	16	00	0.005	0.650	0.025	0.035	0.080
75/07/06	17	00	0.010	0.450	0.020	0.050	0.070
75/07/20	16	00	0.010	0.500	0.030	0.075	0.110
75/08/16	13	00	0.005	0.500	0.030	0.070	0.110
75/09/13	13	00	0.030	0.450	0.005	0.085	0.090

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA- LAS VEGAS

160201
 44 46 30.0 116 05 00.0 4
 LAKE FORK CREEK
 16 VALLEY CO HWY MP
 T/CASCADE RESERVOIR
 SEC RD BRDG .4 MI W OF JCT W HWY 55
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/19	14 15		0.016	0.200	0.005	0.005K	0.005
74/11/15	16 30		0.056	0.100K	0.015	0.005	0.005
74/12/13	13 00		0.032	0.400	0.035	0.005K	0.010
75/01/18	10 45		0.096	0.100	0.015	0.005K	0.010K
75/02/15	15 00		0.104	0.600	0.025	0.008K	0.010
75/03/14	13 00		0.090	0.600	0.020	0.005	0.020
75/04/18	12 45		0.060	0.700	0.020	0.005	0.010K
75/05/17	09 30		0.075	0.450	0.035	0.010	0.050
75/06/07	16 20		0.035	0.350	0.030	0.005K	0.040
75/06/22	11 00		0.020	0.200	0.020	0.005K	0.030
75/07/06	13 00		0.010	0.100	0.015	0.005	0.020
75/07/20	11 00		0.005	0.150	0.020	0.015	0.020
75/08/16	15 00		0.005	0.300	0.400	0.010	
75/09/13	17 45		0.030	0.200	0.005K	0.045	0.052

K VALUE KNOWN TO BE LESS
 THAN INDICATED

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA- LAS VEGAS

1602E1
 44 39 50.0 116 06 35.0 4
 ROCK CREEK
 16 15 CASCADE
 T/CASCADE RESERVOIR 130791
 SEC RD BRDG 8 MI NE RT 15 JCT AT DONELLY
 11EPALES 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 P
			MG/L	MG/L	MG/L	MG/L P	MG/L P
74/10/19	16	00	0.024	0.200	0.035	0.015	0.015
74/11/15	15	30	0.056	0.100K	0.017	0.015	0.015
74/12/13	14	30	0.096	0.100	0.010	0.010	0.010
75/01/18	13	45	0.112	0.100	0.010	0.010	0.020
75/02/15	11	00	0.135	0.800	0.032	0.025	0.030
75/03/14	14	40	0.120	0.200	0.015	0.020	0.030
75/04/18	12	10	0.085	0.800	0.030	0.010	0.020
75/05/17	15	00	0.130	1.100	0.045	0.020	0.090
75/06/07	16	00	0.040	0.150	0.015	0.010	0.060
75/06/22	14	00	0.005	0.050K	0.020	0.010	0.030
75/07/06	15	00	0.010	0.100	0.005	0.015	0.030
	16	00	0.040	0.300	0.025	0.030	0.040
75/07/20	14	00	0.015	0.800	0.020	0.025	0.030
75/08/16	08	00	0.005	0.550	0.015	0.030	0.060
75/09/13	14	00	0.002	0.300		0.015	0.025

K VALUE KNOWN TO BE LESS
 THAN INDICATED

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA- LAS VEGAS

1602F1
 44 43 40.0 116 06 30.0 4
 MUD CREEK
 16 15 CASCADE
 T/CASCADE RESERVOIR 130791
 LGHT DTY RD PRDG 2 MI WNW OF DONNELLY
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/19	14 45		0.160	0.100	0.020	0.010	0.020
74/11/15	16 00		0.304	0.100K	0.040	0.010	0.010
74/12/13	14 50		0.464	0.400	0.015	0.010	0.020
75/01/18	14 00		0.504	0.400	0.035	0.015	0.020
75/02/15	12 30		0.464	0.700	0.064	0.016	0.040
75/03/14	15 30		0.440	1.100	0.070	0.020	0.060
75/04/18	11 30		0.310	1.600	0.180	0.035	0.100
75/05/17	15 30		0.440	1.150	0.055	0.025	0.110
75/06/07	15 30		0.115	0.500	0.025	0.020	0.060
75/06/22	14 30		0.055	0.700	0.035	0.010	0.060
75/07/20	16 00		0.080	0.400	0.015	0.035	0.070
75/08/16	09 30		0.060	0.650	0.010	0.025	0.070
75/09/13	13 30		0.080	0.400	0.020	0.020	0.040

K VALUE KNOWN TO BE LESS
 THAN INDICATED

STORET RETRIEVAL DATE 76/08/25
 NATL EUTROPHICATION SURVEY
 EPA- LAS VEGAS

1602AA PD1602AA P002500
 44 54 00.0 116 09 00.0 4
 MCCALL
 16 VALLEY CO MAP
 T/CASCADE RES
 NF PAYETTE RIVER
 11EPALES 2141204
 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	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/01/13	09 00		0.080	17.000	9.100	4.700	5.400		
75/02/26	09 00		0.080	18.500	13.000	5.040	5.600		
75/04/14	08 15		0.560	13.500	0.150	0.210	4.400		
75/05/12	08 30		0.200	6.400	1.500	0.970	1.400		
75/06/09	08 00		0.100	4.900	1.450	1.550	2.100		
75/08/12	08 00		0.250	7.600	1.800	3.400	3.800		
75/09/08	08 00		0.375	9.600	2.000	4.000	5.200		
75/10/14			0.200	12.000	2.900	4.300	5.000		
75/11/12	08 00		0.175	17.000	5.200	4.000	5.600		
75/12/08	08 00		0.100	24.500	6.400	4.050	5.450		

APPENDIX E
PARAMETRIC RANKINGS OF LAKES
SAMPLED BY NES IN 1975
STATE OF IDAHO

Mean or median values for six of the key parameters evaluated in establishing the trophic conditions of Idaho 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 CHLOKA	15- MIN DO	MEDIAN DISS ORTHO P
1601	AMERICAN FALLS RESERVOIR	0.105	0.080	463.800	15.379	14.700	0.035
1602	CASCADE LAKE	0.032	0.060	415.067	8.081	14.800	0.009
1603	LAKE COEUR D'ALENE	0.017	0.040	380.348	10.391	12.200	0.005
1604	DWORSHAK RESERVOIR	0.010	0.080	401.866	2.420	7.400	0.009
1605	HAUSER	0.028	0.075	366.286	11.112	14.800	0.013
1606	HAYDEN LAKE	0.010	0.040	243.500	2.787	11.800	0.003
1607	ISLAND PARK RESERVOIR	0.034	0.050	391.778	9.322	12.800	0.012
1608	LAKE LOWELL	0.070	0.070	477.111	25.389	14.600	0.015
1609	MAGIC RESERVOIR	0.062	0.130	400.750	7.322	14.700	0.020
1610	PALISADES RESERVOIR	0.024	0.080	345.428	2.067	12.800	0.007
1611	LOWER PAYETTE	0.013	0.060	234.000	4.600	9.600	0.007
1612	LOWER TWIN LAKES	0.016	0.050	370.000	2.318	13.600	0.009
1613	UPPER TWIN LAKES	0.017	0.045	369.143	4.986	8.200	0.004

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
1601	AMERICAN FALLS RESERVOIR	0 (0)	17 (1)	8 (1)	8 (1)	21 (2)	0 (0)
1602	CASCADE LAKE	33 (4)	54 (6)	17 (2)	42 (5)	4 (0)	50 (5)
1603	LAKE COEUR D'ALENE	67 (8)	96 (11)	50 (6)	25 (3)	67 (8)	83 (10)
1604	DWORSHAK RESERVOIR	96 (11)	17 (1)	25 (3)	83 (10)	100 (12)	50 (5)
1605	HAUSER	42 (5)	33 (4)	75 (9)	17 (2)	4 (0)	25 (3)
1606	HAYDEN LAKE	96 (11)	96 (11)	92 (11)	75 (9)	75 (9)	100 (12)
1607	ISLAND PARK RESERVOIR	25 (3)	71 (8)	42 (5)	33 (4)	54 (6)	33 (4)
1608	LAKE LOWELL	8 (1)	42 (5)	0 (0)	0 (0)	33 (4)	17 (2)
1609	MAGIC RESERVOIR	17 (2)	0 (0)	33 (4)	50 (6)	21 (2)	8 (1)
1610	PALISADES RESERVOIR	50 (6)	17 (1)	83 (10)	100 (12)	54 (6)	75 (9)
1611	LOWER PAYETTE	83 (10)	54 (6)	100 (12)	67 (8)	83 (10)	67 (8)
1612	LOWER TWIN LAKES	75 (9)	71 (8)	58 (7)	92 (11)	42 (5)	50 (5)
1613	UPPER TWIN LAKES	58 (7)	83 (10)	67 (8)	58 (7)	92 (11)	92 (11)