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by

H. Theodore Smith¹
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This report is part of the Idaho Bureau of Mines and Geology's geologic mapping project on Priest Lake state lands. The water quality study was conducted by IBMG in cooperation with Dexter Gill, supervisor of the Idaho Department of Lands office at Priest Lake. This study characterizes the chemistry of streams in the area and provides some base-line information for future comparisons. Twenty-two drinking water parameters along with stream stage and discharge were analyzed. Three categories of elemental constituents were analyzed. Basic species (anions) included chloride (Cl), fluoride (F) and sulfate (SO₄). Nutrients analyzed were ammonia (NH₃), nitrate (NO₃) and phosphate (PO₄). Ammonia and nitrate analyses were converted from total nitrogen. Trace metals analyzed were silver (Ag), aluminum (Al), calcium (Ca), copper (Cu), iron (Fe), potassium (K), magnesium (Mg), manganese (Mn), sodium (Na), and zinc (Zn).

All water samples were collected according to the recommended procedures of the U. S. Geological Survey and the Environmental Protection Agency. Collection sites were near the mouths of each creek above the

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bridges and culverts on the lake access road. Samples to be analyzed for trace metals were prefiltered through .45 micron paper and preserved with nitric acid (5 ml acid per 100 ml sample). Nutrient analyses were performed in the field using Hach analysis kits. Chloride and fluoride concentrations were determined using specific ion electrodes. The remaining water quality parameters were analyzed at IBMG's laboratory in accordance with EPA procedures for atomic absorption. Sulfate was determined on the atomic absorption unit by using a secondary method of precipitation from a barium sulfate solution.

Water samples were collected at four different periods from July 25 to October 29, 1978. The sample locations are shown on Figure 1. The chemical analyses are given in Tables 1 through 4. All parameters analyzed were well within their recommended limits for drinking water quality.

Fecal coliform bacteria were not analyzed, but the most probable area for pathogenic bacteria in streams is along East River. Significant algal growth at the lake shore near Hunt Creek may represent a bacterial degradation.

Although not comprehensive, these water analyses should serve as base-line data and aid in the assessment of potential impacts in this area from increasing recreational use and other resource development.

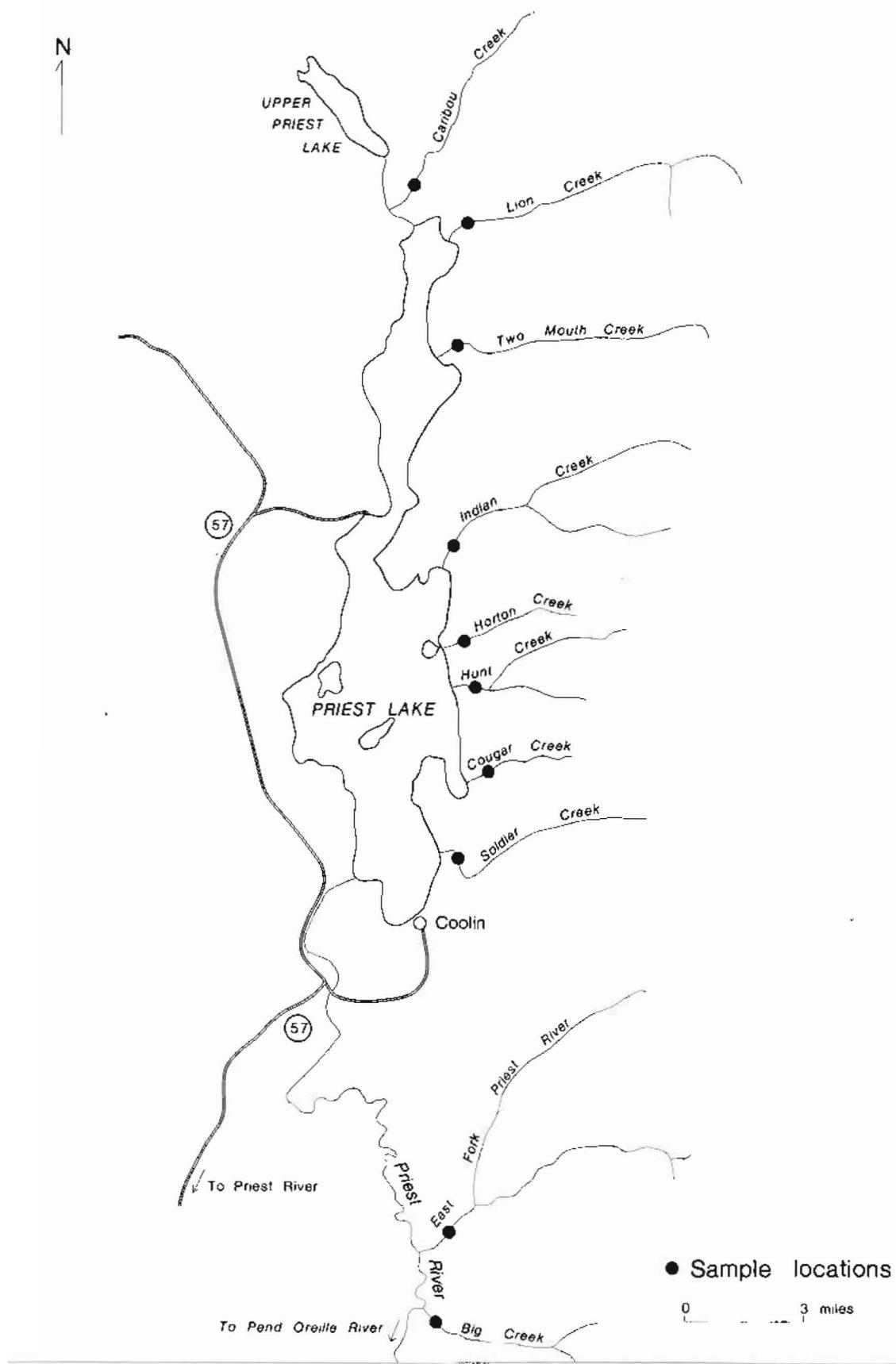


Figure 1. Location of Stream Samples in Priest Lake Area

Table 1: Priest Lake Water Quality Study--July 25-28, 1978, Collection

Parameter	Caribou Creek	Lion Creek	Two Mouth Creek	Indian Creek	Horton Creek	Hunt Creek	Cougar Creek	Soldier Creek	East River	Big Creek	Recommended Drinking Water Limits
Temperature, °C	14.5	18.0	15.0	13.0	12.5	12.5	9.0	13.0	16.0	18.0	----
pH	----	----	----	----	----	----	----	----	----	----	5.0-9.0
Conductivity, umhos/cm	13.5	12.5	11.4	13.0	22.9	21.8	23.9	19.8	27.0	35.4	----
Alkalinity, ppm CaCO ₃	13.7	15.7	13.7	13.7	20.5	17.1	20.5	20.5	20.5	27.4	----
Hardness, ppm CaCO ₃	5.0	3.5	3.0	4.0	7.0	6.0	9.0	7.5	11.0	12.5	----
Dissolved Oxygen, ppm	----	----	----	----	----	----	----	----	----	----	----
Cl ⁻ , ppm	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	250
F ⁻ , ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.4-2.4
SO ₄ ²⁻ , ppm	----	----	----	----	----	----	----	----	----	----	250
NH ₃ /N	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5
NO ₃ ⁻ /N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	10
PO ₄ ³⁻ , ppm	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	----
Ag ⁺ , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
Al ⁺⁺⁺ , ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5.0
Ca ⁺⁺ , ppm	2.07	0.83	1.22	0.94	1.98	1.62	2.94	2.03	2.67	3.29	200
Cu ⁺⁺ , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.00
Fe ⁺⁺ , ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3
Mg ⁺⁺ , ppm	0.40	0.23	0.25	0.26	0.46	0.35	0.55	0.53	0.68	0.90	125
Mn ⁺⁺ , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
K ⁺ , ppm	0.26	0.22	0.36	0.26	0.55	0.37	0.64	0.60	0.65	0.94	----
Na ⁺ , ppm	0.98	1.01	1.19	1.13	2.55	1.54	2.37	1.68	1.78	2.19	200
Zn ⁺⁺ , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	5.00
Stream Stage, ft.	----	1.05	----	0.53	2.02	0.70	1.85	0.85	8.20	6.00	----
Stream Discharge, ft ³ /sec	32	49	29	49	4	39	----	30	52	10	----

Table 2: Priest Lake Water Quality Study--August 23-25, 1978, Collection

Parameter	Caribou Creek	Lion Creek	Two Mouth Creek	Indian Creek	Horton Creek	Hunt Creek	Cougar Creek	Soldier Creek	East River	Big Creek	Recommended Drinking Water Limits
Temperature, °C	10.5	11.0	13.0	9.0	8.9	9.8	9.0	10.3	11.1	11.9	----
pH	----	----	----	----	----	----	----	----	----	----	5.0-9.0
Conductivity, $\mu\text{mhos}/\text{cm}$	11.4	10.4	10.4	11.4	20.8	17.7	23.9	20.8	26.0	30.2	----
Alkalinity, ppm CaCO_3	13.7	13.7	13.7	13.7	20.5	20.5	27.4	13.7	20.5	20.5	----
Hardness, ppm CaCO_3	5.5	4.0	4.0	4.0	8.0	6.0	11.0	6.0	12.0	13.0	----
Dissolved Oxygen, ppm	----	----	----	----	----	----	----	----	----	----	----
Cl^- , ppm	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	250
F^- , ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.4-2.4
$\text{SO}_4^{=}$, ppm	----	----	----	----	----	----	----	----	----	----	250
NH_3/N	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5
NO_3^-/N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	10
$\text{PO}_4^{=}$, ppm	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	----
Ag^+ , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
Al^{+++} , ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5.0
Ca^{++} , ppm	1.47	0.89	1.27	1.13	2.22	1.85	3.16	2.06	3.13	3.60	200
Cu^{++} , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.00
Fe^{++} , ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3
Mg^{++} , ppm	0.36	0.26	0.34	0.28	0.50	0.42	0.58	0.50	0.77	1.03	125
Mn^{++} , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
K^+ , ppm	0.27	0.27	0.34	0.29	0.55	0.40	0.63	0.55	0.63	1.07	----
Na^+ , ppm	1.19	1.15	1.31	1.26	2.80	1.90	2.46	1.73	1.86	2.40	200
Zn^{++} , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	5.00
Stream Stage, ft.	1.97	1.0	1.37	.43	2.1	0.5	2.02	0.33	8.2	5.96	----
Stream Discharge, ft^3/sec	45	48	22	35	4.8	26	----	22	38	9	----

Table 3: Priest Lake Water Quality Study--October 6-8, 1978, Collection

Parameter	Caribou Creek	Lion Creek	Two Mouth Creek	Indian Creek	Horton Creek	Hunt Creek	Cougar Creek	Soldier Creek	East River	Big Creek	Recommended Drinking Water Limits
Temperature, °C	5.0	5.5	8.5	4.8	5.5	6.0	6.5	6.0	7.0	7.5	----
pH	7.4	7.1	7.25	7.0	7.2	7.05	7.3	7.1	7.2	7.25	5.0-9.0
Conductivity, $\mu\text{mhos/cm}$	10.4	9.4	10.4	9.4	20.8	15.6	22.9	15.6	22.9	28.1	----
Alkalinity, ppm CaCO_3	13.7	13.7	13.7	13.7	20.5	13.7	27.4	20.5	27.4	30.8	----
Hardness, ppm CaCO_3	5.0	3.5	4.0	4.0	7.0	6.0	11.0	7.0	11.0	13.0	----
Dissolved Oxygen, ppm	11.4	11.6	10.4	11.4	11.5	10.6	11.2	11.6	11.3	11.3	----
Cl^- , ppm	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	250
F^- , ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.4-2.4
$\text{SO}_4^{=}$, ppm	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	250
NH_3/N	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5
NO_3^-/N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	10
$\text{PO}_4^{=}$, ppm	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	----
Ag^+ , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
Al^{+++} , ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5.0
Ca^{++} , ppm	1.55	1.02	1.05	1.11	2.20	1.89	3.21	1.97	3.22	3.46	200
Cu^{++} , ppm	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	1.00
Fe^{++} , ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.5
Mg^{++} , ppm	0.35	0.24	0.41	0.27	0.48	0.37	0.57	0.44	0.74	0.99	125
Mn^{++} , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
K^+ , ppm	0.28	0.24	0.30	0.28	0.53	0.42	0.63	0.53	0.60	0.92	----
Na^+ , ppm	1.46	1.42	1.61	1.50	2.92	2.18	2.50	1.97	1.81	2.38	200
Zn^{++} , ppm	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	5.0
Stream Stage, ft.	0.85	0.82	1.52	0.36	2.16	0.43	2.07	0.7	8.32	6.1	----
Stream Discharge, ft^3/sec	30	28	15	30	3.5	19	----	24	32	6.6	----

Table 4: Priest Lake Water Quality Study--October 28-29, 1978, Collection

Parameter	Caribou Creek	Lion Creek	Two Mouth Creek	Indian Creek	Horton Creek	Hunt Creek	Cougar Creek	Soldier Creek	East River	Big Creek	Recommended Drinking water Limits
Temperature, °C	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.7	5.0	5.5	----
pH	6.8	7.0	7.2	7.4	7.1	7.5	7.6	7.2	7.45	7.5	5.0-9.0
Conductivity, $\mu\text{mhos}/\text{cm}$	10.4	10.4	10.4	10.4	18.7	14.6	21.8	13.5	21.8	15.6	----
Alkalinity, ppm CaCO_3	20.5	20.5	20.5	27.4	27.4	27.4	27.4	27.4	27.4	27.4	----
Hardness, ppm CaCO_3	6.0	4.0	4.0	5.0	9.0	9.0	13.0	9.0	13.0	12.0	----
Dissolved Oxygen, ppm	12.0	12.4	12.2	11.8	11.9	12.0	11.9	11.7	11.4	11.6	----
Cl^- , ppm	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	250
F^- , ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.4-2.4
SO_4^{2-} , ppm	----	----	----	----	----	----	----	----	----	----	250
NH_3^+/N	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5
NO_3^-/N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	10
PO_4^{2-} , ppm	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	----
Ag^+ , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
Al^{+++} , ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5.0
Ca^{++} , ppm	1.67	1.04	1.04	1.10	2.21	1.89	3.18	2.00	3.27	3.38	200
Cu^{++} , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.00
Fe^{++} , ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3
Mg^{++} , ppm	0.34	0.26	0.26	0.26	0.48	0.44	0.58	0.47	0.75	0.97	125
Mn^{++} , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
K^+ , ppm	0.28	0.24	0.31	0.31	0.56	0.44	0.62	0.62	0.64	1.04	----
Na^+ , ppm	1.51	1.24	1.39	1.39	2.92	1.79	2.42	1.72	1.84	2.37	200
Zn^{++} , ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	5.0
Stream Stage, ft.	0.70	0.77	1.45	7.7	----	0.4	----	0.67	8.31	6.08	----
Stream Discharge, ft^3/sec	18	30	15	16	----	19	----	16	30	2	----