

Good Spirit Lake Water Quality Report 2007

Prepared for
The Friends of Good Spirit Lake Association

Monitoring and Assessment Branch
Stewardship Division
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1. Introduction and Background

The protection of water quality in Good Spirit Lake is of interest to the provincial government, stakeholders and residents of Saskatchewan. The *Friends of Good Spirit Lake Association*. (FGSLA) stewardship group was formed in order to monitor lake water quality. Their mission: “To understand and protect the water resources within the watershed, which will help sustain for future generations the natural beauty of the lake and surrounding shoreline environment.” The FGSLA incorporated as a non-profit organization in 1998 and have been monitoring lake water quality in cooperation with Saskatchewan Watershed Authority (SWA; formerly SaskWater) since 1997. SWA provides technical and administrative assistance to support the activities of the group through the *Lake Stewardship Program* and provides a summary Water Quality Report to FGSLA.

1.1. General Description, Geology, Hydrogeology

Good Spirit Lake is a popular recreational lake with many attractions including Good Spirit Lake Provincial Park, walking and cross country ski trails, camping, fishing and boating. There are also a number of villages, hamlets and resort communities surrounding Good Spirit Lake. Located approximately 60 kilometers northwest of Yorkton, Good Spirit Lake is on the Whitesand Plain of the Assiniboine River Watershed. Area soils are characterized as loamy sand to very fine sandy loam. Agriculture is the major industry in the area.

Good Spirit Lake has a large surface area of approximately 44 square kilometers. The maximum depth is approximately 6 meters (based on regulated water levels of 484.25 – 484.4 m). Annual precipitation and spring/fall water level information has been provided by Bill Anaka and Jim Hupka (Table 1).

Table 1: Water levels at time of spring runoff and fall freeze-up as well as summer precipitation accumulation between April and October from 1998 to 2007.

Year	Water Level at Spring Runoff (m)	Water Level at Fall Freeze-up (m)	Summer Precipitation April – October (mm) *
1998	484.16	484.30	517.0
1999	484.67	484.41	433.2
2000	484.11	483.81	329.4
2001	484.00	483.64	234.2
2002	483.67	483.46	415.9
2003	483.79	483.35	319.0
2004	483.30	483.47	410.4
2005	483.78	483.78	564.6
2006	484.44	484.44	482.0
2007	485.00	484.45	419.0

* Source: Saskatchewan Agriculture 2007 Crop Report

2. Water Quality Sampling

Water quality sampling allows background (normal or average) water quality values for Good Spirit Lake baseline to be established. Once adequate water quality information has been recorded for a lake's water quality, water sampling can become less frequent. Though water quality sampling through the Lake Stewardship Program ceases in 2008, the baseline data collected on Good Spirit Lake will be of great service to all parties interested in understanding their lake's water quality or to make more informed decisions on the management or activities in and around the lake.

The standard lake sampling schedule for Saskatchewan Watershed Authority's *Lake Stewardship Program* included two winter (January to March) and four summer samples (May to October) per year. Samples sites are divided into *Baseline Stations* and *Shoreline Stations*.

Baseline Station: Baseline stations are generally deep, centrally located sites chosen to represent typical water quality conditions in the lake. Certain parameters (i.e. dissolved oxygen and temperature) are recorded at intervals throughout the depth of the site. Baseline stations are sampled on all six sample dates during the year. Water quality results from baseline stations are used to calculate the Water Quality Index (WQI) score.

3. Water Quality Index: Assessing General Water Quality

The Water Quality Index (WQI) provides a means of assessing the overall quality of lake water in Saskatchewan. To calculate the WQI, analytical results of the water quality sampling are compared to provincial objectives for specific water uses such as irrigation and the protection of aquatic life. The WQI combines key chemical and biological aspects of water quality (including major ions, nutrients, heavy metals, herbicides, bacteria, dissolved oxygen and pH) to define overall water quality and summarize these parameters in a single score.

A single score for each year allows easy comparison of general water quality trends over time as well as identifies parameters considered important to overall lake health. The WQI score is adjusted for each parameter that exceeds its objective, taking into account the magnitude and frequency of exceedances. Deviation from objective values does not necessarily indicate poor lake health or that water quality is worsening. Certain parameters (*i.e.* arsenic, chloride and pH) may naturally exceed the WQI objectives in Saskatchewan lakes due to geological and hydrological history. The WQI does not differentiate natural sources deviation or exceedances which are a result of human influences. As such, it is important to examine lake water quality over time in order to assess if human activity may be impacting lake water quality.¹

¹ For a more complete explanation about the Water Quality Index (WQI) or the parameters used to determine WQI scores, please refer to the "Lake Stewardship Water Quality Guide" online at www.swa.ca.

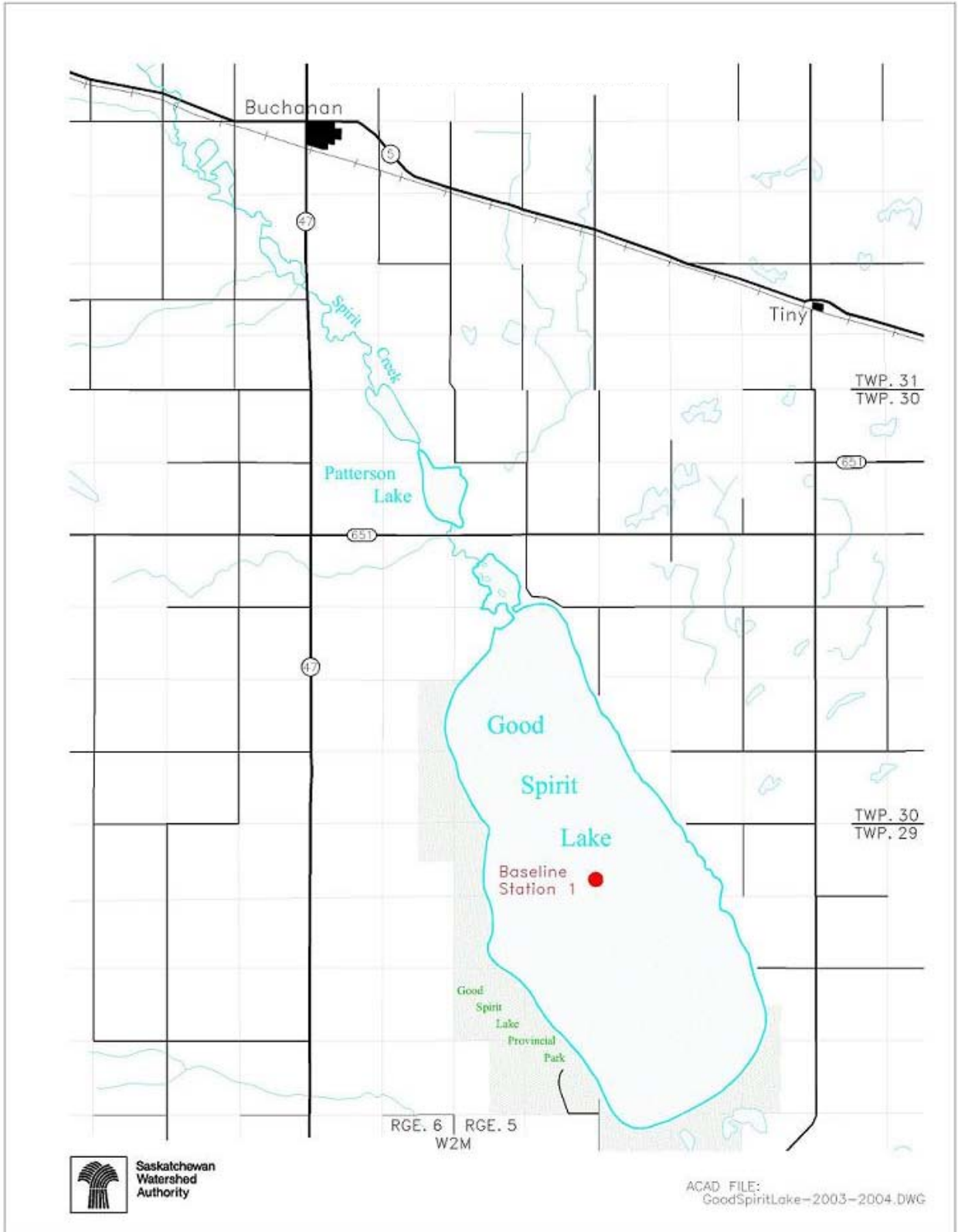


Figure 1: Map of Good Spirit Lake showing sampling stations.

4. Water Quality Results and Discussion

Since water sampling began in 1998, annual WQI scores for Good Spirit Lake have been consistently in the *good* to *excellent* range (Figure 2). The consistency in both the frequency and magnitude of the parameters identified as “exceeding” the WQI index indicates that these exceedances may not be due to human influences, but rather to natural processes, and may not impair the ecology of Good Spirit Lake.

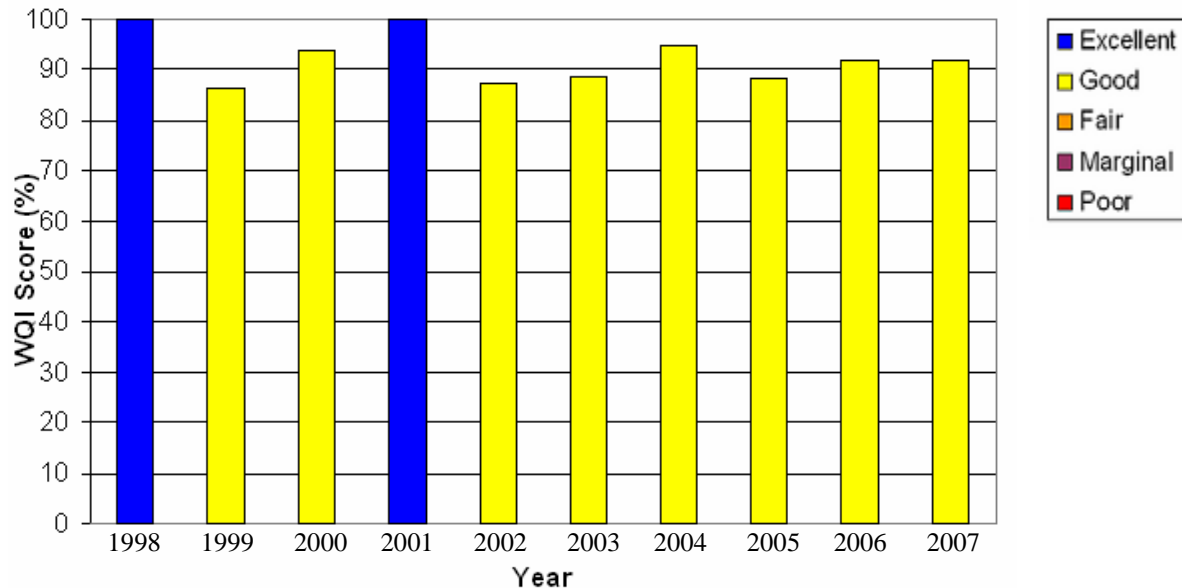


Figure 2: Water Quality Index (WQI) scores for Good Spirit Lake Baseline Station from 1998 to 2007. NOTE: Good Spirit Lake was sampled only twice in 2007 (January and March).

4.1. Parameters that Exceeded the WQI Objectives

In summary, phosphorous was the parameter that most often exceeded its WQI objectives at Good Spirit Lake, with pH, dissolved oxygen, chlorophyll *a* and chromium exceeded less often.

4.2. Phosphorous

Phosphorous is the nutrient that is most often associated with increased plant and algal growth in freshwater lakes. Although nutrients are necessary for foodweb functioning (and healthy fish populations), excess nutrients can lead to decreased dissolved oxygen, decreased water clarity and increased plant and algae growth (including cyanobacteria). Nutrients may enter the lake from upstream tributaries, rainstorms, die-off of aquatic plants or algae, direct runoff of lawn fertilizer and from leaky septic systems. Nutrient recycling from within the lake may also be a significant source of nutrients in Good Spirit Lake.

Saskatchewan's *Surface Water Quality Objectives* do not include an objective for total phosphorus, but because it is an important indicator of lake productivity, Saskatchewan Watershed Authority has adopted a target value of 0.1 mg/L for total phosphorus. Good Spirit Lake exceeded Saskatchewan Watershed Authority's target value for total phosphorous often in the summer from 1999 to 2007. Specifically, it was above the target value three times in 2005 and once in 2006.

4.3. pH

pH is an important water quality parameter that affects chemical and biological reactions within lakes. Extremes in pH or rapid changes in pH can negatively impact aquatic life. Saskatchewan lakes demonstrate a variety of pH levels from basic to acidic. Typical of prairie lakes, Good Spirit Lake is basic with pH ranging from 8.6 – 9.0 in 2005 – 2007. The objective range used to calculate the WQI score is 6.5 – 9.0 pH units.

4.4. Dissolved Oxygen

Dissolved oxygen is important to aquatic life and tends to be at its lowest in the late winter due to lack of exchange with the atmosphere. Increased lake productivity (plant and algae growth) can affect dissolved oxygen levels as plants die back and decay in winter. The CCME objective *for the Protection of Aquatic Life* is 5.5mg/L dissolved oxygen. The baseline station at Good Spirit Lake was below this objective (value at 4.3mg/L) in March of 2007.

4.1 Chlorophyll *a*

Chlorophyll *a* (the primary pigment of green plants and algae) is a way to assess the relative amount of algae present in surface water as a way of comparing the productivity of a lake. The chlorophyll *a* concentrations in Good Spirit Lake exceeded the objective used in the WQI in late summer of 2005.

4.5. Metals

Arsenic, chromium and aluminum are natural elements found in soil and bedrock. They may enter surface water supplies through natural rock weathering, discharge of industrial wastewater, agricultural pollution, and dissolution in rain, snow or groundwater. It is difficult to trace the source of metals in surface water since there are many natural and human sources. Given that Saskatchewan is rich in many minerals, it is not unusual to find these minerals in surface water.

Trace metal analysis was included in the Good Spirit Lake samples since 2003 and the objective for chromium has been exceeded twice since then (both in 2006). Since the

concentration of these trace metals is usually low and fairly consistent, it is possible that these metals are from natural sources.

5. Recommendations

To maintain the water quality of Good Spirit Lake, it is recommended that recreational users and upstream stakeholders minimize nutrient additions to the lake. Fertilizer use and disruption of natural vegetation and shoreline should be kept to a minimum. Enhancement of shoreline buffer zones to slow erosion and slow the flow of surface runoff to Good Spirit Lake will help reduce the amount of nutrients and other contaminants entering the lake.

Water quality for Good Spirit Lake has been recorded consistently since 1998. Though Saskatchewan Watershed Authority's *Lake Stewardship Program* has ceased in 2008, the information collected thus far provides important baseline information about the water quality. The Saskatchewan Watershed Authority encourages the continuation of public education and outreach by the *Friends of Good Spirit Lake Association* to teach lake users and stakeholders to follow healthy shoreline living practices such as those outlined in *On the Living Edge – Your Handbook for Waterfront Living* (see references cited).

6. References Cited

- Canadian Council of Ministers of the Environment. 1999. Canadian water quality guidelines for the protection of aquatic life: 2006 Update. Canadian Council of Ministers of the Environment, Winnipeg.
- Canadian Council of Ministers of the Environment. 1999. Water Quality Index 1.0, Technical Report. In: Canadian environmental quality guidelines. 1999. Canadian Council of Ministers of the Environment, Winnipeg.
- Kipp, S. and C. Gallaway. 2003. On the Living Edge – Your handbook for water front living. Saskatchewan/Manitoba Edition. Federation of British Columbia Naturalist: British Columbia. Available through Nature Saskatchewan.

Good Spirit Lake Data Tables 2005 - 2007

Good Spirit Lake - Top Surface Baseline 2005					
Parameters	Feb 22	May 30	June 29	Aug 2	Sept 19
Nutrients (mg/L)					
Dissolved Organic Carbon	42.2	28.6	31.9	32.5	31.3
Nitrate, as Nitrogen	<0.04	<0.04	<0.04	<0.04	<0.04
Ammonia, as Nitrogen	0.22	0.05	0.08	0.05	0.06
Total Kjeldahl Nitrogen	2.6	2.8	3.6	2.3	3.1
Total Phosphorous	0.08	0.14	0.12	0.09	0.14
Ortho-Phosphate, as P	0.08	<0.02	0.02	0.03	<0.02
Solids (mg/L)					
Total Dissolved Solids	1,076	806	832	799	837
Suspended Solids, Fixed	4	12	13	11	23
Suspended Solids, Volatile	4	45	49	32	51
Suspended Solids, Total	4	57	62	43	74
Bacteria (orgs/100 mL)					
Fecal Coliform	<10	<10	<10	<10	<10
Total Coliform	<10	<10	<10	<10	100
Major Ions (mg/L)					
Alkalinity, Total	276	232	238	234	236
Alkalinity, Phenol	6	14	18	28	14
Bicarbonate	322	249	246	217	254
Calcium	48	37	42	39	39
Carbonate	7.2	16.8	21.6	33.6	16.8
Chloride	12.3	9.4	9.6	9.2	10.1
Hardness, Total	717	512	533	517	542
Magnesium	145	102	104	102	108
Potassium	36	26	27	26	28
Sodium	33	23	24	23	24
Sulphate	472.3	342.5	357.4	349.3	356.9
Other					
Chlorophyll <i>a</i> (µg/L)	1.04	6.89	27.55	30.63	52.33
Conductivity (µS/cm)	1,286	1,049	1,020	1,032	1,036
pH (pH units)	8.4	8.6	8.6	8.9	8.6
Turbidity (N.T.U.)	1.9	21.0	28.0	21.0	45.0
Biochemical Oxygen Demand (mg/L)	<2.0	3.6	3.6	3.0	3.0
Chemical Oxygen Demand (mg/L)	115	143	145	141	155
Field Data					
Air Temperature (°C)	15	15	15	20	15
pH (pH units)	8.60	8.82	8.71	9.02	8.74
Secchi Disk (meters)	na	0.3	0.4	0.4	0.2
Turbidity (NTU)	1.44	16.6	25.5	18.4	46.1
Wind Speed (km/hr)	na	calm	N 25	25	SW 20
Cloud Cover (%)	na	35	100	0	na

Good Spirit Lake - Bottom Baseline 2005	
Parameters	February 22
Nutrients (mg/L)	
Dissolved Organic Carbon	42.5
Nitrate, as Nitrogen	<0.04
Ammonia, as Nitrogen	0.20
Total Kjeldahl Nitrogen	2.6
Total Phosphorous	0.08
Ortho-Phosphate, as P	0.08
Solids (mg/L)	
Total Dissolved Solids	1,098
Suspended Solids, Fixed	1
Suspended Solids, Volatile	4
Suspended Solids, Total	5
Bacteria (orgs/100 mL)	
Fecal Coliform	<10
Total Coliform	<10
Major Ions (mg/L)	
Alkalinity, Total	282
Alkalinity, Phenol	8
Bicarbonate	325
Calcium	50
Carbonate	9.6
Chloride	12.4
Hardness, Total	743
Magnesium	150
Potassium	38
Sodium	33
Sulphate	479.7
Other	
Conductivity (µS/cm)	1,299
pH (pH units)	8.4
Turbidity (N.T.U.)	2
Biochemical Oxygen Demand (mg/L)	<2
Chemical Oxygen Demand (mg/L)	113

Good Spirit Lake - Dissolved Oxygen, Temperature & Conductivity 2005.				
Date (d/m/y)	Depth (m)	Dissolved Oxygen (mg/L)	Water Temperature (°C)	Conductivity (µS/cm)
Feb 22	0	11.12	0.1	541
	1	11.03	0.4	581
	2	10.72	1.7	693
	3	12.40	2.3	720
	4	7.16	3.1	771
May 30	0	11.60	12.1	1,029
	1	11.50	10.7	1,031
	2	10.42	10.6	1,035
	3	9.83	10.5	1,038
	4	9.26	10.1	1,037
June 29	0	7.50	18.0	935
	1	7.25	18.0	935
	2	7.36	18.0	934
	3	7.24	18.0	934
	4	7.29	18.0	934
August 2	0	9.74	19.8	991
	1	9.52	19.8	993
	2	9.67	19.8	994
	3	9.55	19.7	994
	4	9.32	19.7	994
Sept 19	0	10.20	13.1	993
	1	10.09	13.1	997
	2	10.10	13.0	997
	3	9.99	13.0	998
	4	9.98	13.0	999

Good Spirit Lake Baseline - Top Surface Metal Parameters, 2005				
Parameters	May 30	June 29	Aug 2	Sept 19
Metals (mg/L)				
Mercury (µg/L)	<0.05	<0.05	<0.05	<0.05
Aluminum	<0.005	<0.005	<0.005	<0.005
Arsenic (µg/L)	2.6	2.9	3.0	2.9
Barium	0.046	0.055	0.056	0.054
Beryllium	<0.001	<0.001	<0.001	<0.001
Boron	0.080	0.079	0.081	0.080
Cadmium	<0.001	<0.001	<0.001	<0.001
Chromium	<0.001	<0.001	<0.001	<0.001
Cobalt	0.001	<0.001	<0.001	<0.001
Copper	0.002	<0.001	<0.001	<0.001
Iron	0.044	0.070	0.047	0.073
Lead	<0.002	<0.002	<0.002	<0.002
Manganese	0.019	0.030	0.021	0.033
Molybdenum	<0.001	<0.001	<0.001	0.001
Nickel	<0.001	<0.001	<0.001	<0.001
Phosphorous	0.02	0.03	0.02	0.02
Silicon, Soluble	2.4	2.3	2.2	1.8
Silver	<0.001	<0.001	<0.001	<0.001
Strontium	0.21	0.24	0.25	0.24
Titanium	<0.001	<0.001	<0.001	<0.001
Vanadium	<0.001	<0.001	<0.001	<0.001
Zinc	<0.005	<0.005	<0.005	<0.005
Zirconium	<0.001	<0.001	<0.001	<0.001
Herbicides (µg/L)				
2,4,5-T	<0.5	<0.5	<0.5	<0.5
2,4,5-TP (silvex)	<0.5	<0.5	<0.5	<0.5
2,4-D	<0.5	<0.5	<0.5	<0.5
Bromoxynil (Buctril)	<0.5	<0.5	<0.5	<0.5
Dicamba (Banvel)	<0.5	<0.5	<0.5	<0.5
Diclofop-methyl (HoeGrass)	<1	<1	<1	<1
MCPA	<0.5	<0.5	<0.5	<0.5
Picloram (Tordon)	<1	<1	<1	<1

Good Spirit Lake Surface Baseline 2006					
Parameters	Feb 13	Mar 22	May 31	July 11	Aug 28
Nutrients (mg/L)					
Dissolved Organic Carbon	41.2	na	26.6	29.1	31.6
Nitrate, as Nitrogen	<0.04	<0.04	<0.04	<0.04	<0.04
Ammonia, as Nitrogen	0.08	0.14	0.02	0.03	0.08
Total Kjeldahl Nitrogen	2.5	2.5	2.1	2.5	2.3
Total Phosphorous	0.04	0.03	0.11	0.09	0.05
Ortho-Phosphate, as P	<0.02	<0.02	<0.02	<0.02	0.02
Solids (mg/L)					
Total Dissolved Solids	983	1,038	705	775	734
Suspended Solids, Fixed	<1	<1	3	7	2
Suspended Solids, Volatile	5	4	21	22	7
Suspended Solids, Total	5	4	24	28	9
Bacteria (orgs/100 mL)					
E. Coli	2	<1	<10	<10	20
Total Coliform	2	<1	<10	63	74
Major Ions (mg/L)					
Alkalinity, Total	268	316	218	268	242
Alkalinity, Phenol	12	16	10	14	20
Bicarbonate	298	346	242	293	246
Calcium	48	44	44	50	50
Carbonate	14.4	19.2	12.0	16.8	24.0
Chloride	11.9	12.8	8.3	8.5	8.6
Hardness, Total	647	596	460	479	483
Magnesium	128	118	85	86	87
Potassium	33	30	23	23	23
Sodium	29	26	19	19	20
Sulphate	421.0	441.7	272.1	278.6	275.0
Other					
Chlorophyll <i>a</i> (µg/L)	17.05	4.55	25.18	21.04	14.45
Conductivity (µS/cm)	1,198	1,248	919	931	967
pH (pH units)	8.5	8.5	8.5	8.6	8.7
Turbidity (N.T.U.)	2.50	1.78	14.00	11.00	4.20
Biochemical Oxygen Demand (mg/L)	<2.0	<2.0	3.2	3.8	2.5
Chemical Oxygen Demand (mg/L)	112	120	103	111	101
Field Data					
Air Temperature (°C)	-12	-2	15	21	20
pH (pH units)	na	8.610	8.595	20.800	8.610
Secchi Disk (meters)	1.30	2.25	0.50	0.90	0.70
Turbidity (NTU)	1.87	0.75	14.90	4.10	13.80
Wind Speed (km/hr)	0	0	18	0	25
Cloud Cover (%)	100	10	40	10	0

Good Spirit Lake - Dissolved Oxygen, Temperature & Conductivity 2006.				
Date (d/m/y)	Depth (m)	Dissolved Oxygen (mg/L)	Water Temperature (°C)	Conductivity (µS/cm)
13/02/06	1	16.02	0.4	638
	2	15.75	1.4	658
	3	14.71	3.1	675
	4	6.38	3.8	734
22/03/06	0	14.21	0.2	676
	1	14.23	0.3	676
	2	13.45	1.5	699
	3	13.24	2.7	728
	4	0.59	4.2	789
31/05/06	0	9.65	13.7	906
	1	9.55	13.5	913
	2	9.24	13.3	916
	3	8.81	13.1	918
	4	8.71	12.9	917
	5	8.35	12.8	917
7/11/06	0	10.20	13.1	993
	1	10.09	13.1	997
	2	10.10	13.0	997
	3	9.99	13.0	998
	4	9.98	13.0	999
28/08/06	0	na	20.8	1,023
	1	na	19.5	1,020
	2	na	19.2	1,022
	3	na	19.1	1,022
	4	na	19.0	1,017
	5	na	19.0	1,013

Good Spirit Lake Baseline Surface Metal Parameters, 2006					
Parameters	Feb 13	Mar 22	May 31	July 11	Aug 22
Metals (mg/L)					
Mercury (µg/L)	<0.05	<0.05	<0.05	<0.05	<0.05
Aluminum	na	<0.005	<0.005	<0.005	<0.005
Arsenic (µg/L)	na	3.4	2.1	2.4	2.4
Barium	na	0.058	0.053	0.062	0.052
Beryllium	na	<0.001	<0.001	<0.001	<0.001
Boron	na	0.087	0.084	0.066	0.064
Cadmium	na	<0.001	<0.001	<0.001	<0.001
Chromium	na	0.002	0.004	<0.001	<0.001
Cobalt	na	<0.001	<0.001	<0.001	<0.001
Copper	na	<0.001	<0.001	<0.001	<0.001
Iron	na	0.004	0.069	0.052	0.017
Lead	na	<0.002	<0.002	<0.002	<0.002
Manganese	na	0.007	0.036	0.040	0.028
Molybdenum	na	0.003	<0.001	0.001	0.003
Nickel	na	<0.001	<0.001	<0.001	<0.001
Phosphorous	na	0.03	0.06	0.02	<0.01
Silicon, Soluble	na	0.11	1.20	1.6	1.4
Silver	na	<0.001	<0.001	<0.001	<0.001
Strontium	na	0.28	0.22	0.22	0.22
Titanium	na	<0.001	<0.001	<0.001	<0.001
Vanadium	na	<0.001	<0.001	<0.001	<0.001
Zinc	na	<0.005	0.005	<0.005	<0.005
Zirconium	na	<0.001	0.003	<0.001	<0.001
Herbicides (µg/L)					
2,4,5-T	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,5-TP (silvex)	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-D	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoxynil (Buctril)	<0.5	<0.5	<0.5	<0.5	<0.5
Dicamba (Banvel)	<0.5	<0.5	<0.5	<0.5	<0.5
Diclofop-methyl (HoeGrass)	<1	<1	<1	<1	<1
MCPA	<0.5	<0.5	<0.5	<0.5	<0.5
Picloram (Tordon)	<1	<1	<1	<1	<1

Good Spirit Lake Baseline Surface 2007		
Parameters	January 23	March 19
Nutrients (mg/L)		
Dissolved Organic Carbon	32.1	36.5
Nitrate, as Nitrogen	<0.04	<0.04
Ammonia, as Nitrogen	0.39	0.83
Total Kjeldahl Nitrogen	2.6	2.6
Total Phosphorous	0.02	0.03
Ortho-Phosphate, as P	<0.02	0.02
Solids (mg/L)		
Total Dissolved Solids	880	921
Suspended Solids, Fixed	1	1
Suspended Solids, Volatile	2	2
Suspended Solids, Total	3	2
Bacteria (orgs/100 mL)		
E. Coli	<1	<1
Total Coliform	<1	<1
Major Ions (mg/L)		
Alkalinity, Total	300	284
Alkalinity, Phenol	8	na
Bicarbonate	346	346
Calcium	57	61
Carbonate	9.6	na
Chloride	9.4	10.2
Hardness, Total	562	601
Magnesium	102	109
Potassium	26	28
Sodium	22	24
Sulphate	308.0	343.1
Other		
Chlorophyll <i>a</i> (µg/L)	2.19	<0.20
Conductivity (µS/cm)	1,090	1,109
pH (pH units)	8.4	8.1
Turbidity (NTU)	1.3	0.9
Biochemical Oxygen Demand (mg/L)	<2	<2
Chemical Oxygen Demand (mg/L)	94.9	97.6
Field Data		
Air Temperature (°C)	-15	-12
Water Temperature (°C)	0.4	0.5
pH (pH units)	8.670	8.567
Secchi Disk (meters)	1.800	1.175
Turbidity (NTU)	na	0.80
Wind Speed (km/hr)	20	10
Cloud Cover (%)	100	10
Ice Thickness (cm)	50	70

Good Spirit Lake Baseline Bottom 2007		
Parameters	January 23	March 19
Nutrients (mg/L)		
Dissolved Organic Carbon	32.3	36.4
Nitrate, as Nitrogen	<0.04	<0.04
Ammonia, as Nitrogen	0.85	0.71
Total Kjeldahl Nitrogen	2.9	2.7
Total Phosphorous	0.04	0.03
Ortho-Phosphate, as P	<0.02	0.02
Solids (mg/L)		
Total Dissolved Solids	885	918
Suspended Solids, Fixed	<1	<1
Suspended Solids, Volatile	2	3
Suspended Solids, Total	2	3
Bacteria (orgs/100 mL)		
E. Coli	<1	<1
Total Coliform	<1	<1
Major Ions (mg/L)		
Alkalinity, Total	306	282
Bicarbonate	373	344
Calcium	54	61
Chloride	9.2	10.1
Hardness, Total	534	601
Magnesium	97	109
Potassium	25	28
Sodium	21	24
Sulphate	305.6	341.6
Other		
Chlorophyll <i>a</i> (µg/L)	3.85	<0.20
Conductivity (µS/cm)	1,086	1,107
pH (pH units)	8.1	8.1
Turbidity (NTU)	2.6	1.1
Biochemical Oxygen Demand (mg/L)	<2	<2
Chemical Oxygen Demand (mg/L)	94.6	95.9

Good Spirit Lake - Dissolved Oxygen, Temperature & Conductivity 2007.				
Date (d/m/y)	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)
23/01/07	1	0.4	11.8	580
	2	1.4	11.38	599
	3	2.7	9.07	625
	4	3.9	0.42	660
19/03/07	1	0.5	4.3	na
	2	2.3	4.6	na
	3	3.3	4.5	na
	4	3.9	0.4	na
	5	4.3	0.2	na

Good Spirit Lake Baseline Surface Metal Parameters, 2007		
Parameters	January 23	March 19
Metals (mg/L)		
Mercury (µg/L)	<0.05	<0.05
Aluminum	<0.005	<0.005
Arsenic (µg/L)	3.2	3.0
Barium	0.062	0.069
Beryllium	<0.001	<0.001
Boron	0.074	0.077
Cadmium	<0.001	<0.001
Chromium	<0.001	<0.001
Cobalt	<0.001	<0.001
Copper	<0.001	<0.001
Iron	0.008	0.005
Lead	<0.002	<0.002
Manganese	0.023	0.027
Molybdenum	<0.001	<0.001
Nickel	<0.001	<0.001
Phosphorous	0.02	<0.01
Silicon, Soluble	0.37	0.79
Silver	<0.001	<0.001
Strontium	0.26	0.28
Titanium	<0.001	<0.001
Vanadium	<0.001	<0.001
Zinc	<0.005	<0.005
Zirconium	<0.001	<0.001
Herbicides (µg/L)		
2,4,5-T	<0.5	<0.5
2,4,5-TP (silvex)	<0.5	<0.5
2,4-D	<0.5	<0.5
Bromoxynil (Buctril)	<0.5	<0.5
Dicamba (Banvel)	<0.5	<0.5
Diclofop-methyl (HoeGrass)	<1	<1
MCPA	<0.5	<0.5
Picloram (Tordon)	<1	<1