

Hawk Creek Watershed headwaters lakes water quality assessment – 2008-2009

wq-iw7-43n

June 2017

Why?

- Baseline data
- Total Maximum Daily Load listing
- Trophic Status Index (eutrophication-algae)

What?

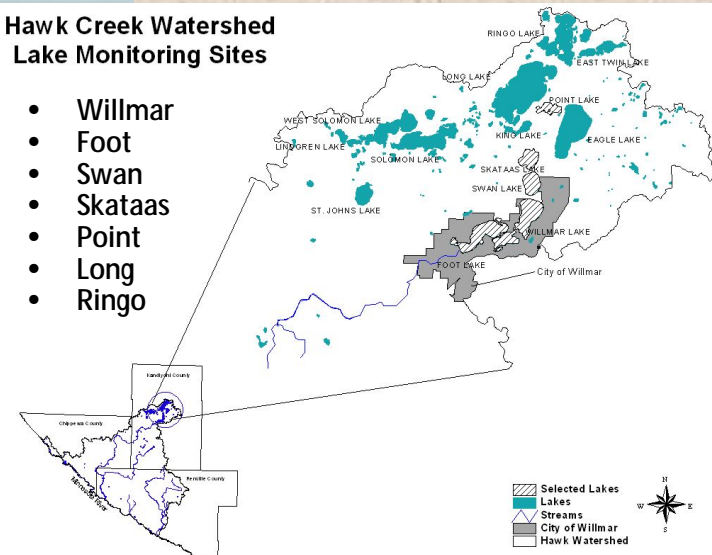
- Total Phosphorus
- Alkalinity
- Nitrates-Nitrites
- Total Suspended Solids
- Chlorophyll-a (algae)

- Total Kjeldahl nitrogen
- Transparency
- Lake profile
 - Dissolved oxygen
 - pH
 - Temperature
 - Conductivity



Hawk Creek Watershed Lake Monitoring Sites

- Willmar
- Foot
- Swan
- Skataas
- Point
- Long
- Ringo



2008-2009 Foot Lake Profile

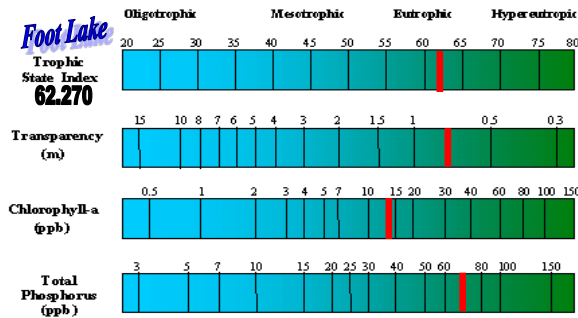
Date	DO	Water Temp	Sp. Cond.	Cond.	pH	TP	TP	TKN	NO2-NO3	TSS	Alkalinity	Chlorophyll-a	Turbidity	Secchi	Secchi	Bottom	Rec. Cond.	Phys. Cond.	
Depth	(mg/L)	(°F)	(us/cm ³)	(us/cm)		(mg/L)	(ug/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(NTU)	(ft)	(m)	(ft)	(1-5)	(1-5)	
6/10/2008	0	6.06	18.59	552	485	8.01	0.059	59	1.60	0.100	12	188	4	13.7	4.5	1.3716	7.10	4	3
6/25/2008	0	3.91	24.01	575	565	7.90	0.067	67	1.80	0.100	7	198	3	8.22	5.0	1.524	7.20	3	3
7/9/2008	0	6.93	24.08	596	586	8.38	0.092	92	1.40	0.060	17	212	23	20.7	2.6	0.79248	7.00	4	3
7/21/2008	0	7.65	25.38	621	616	8.37	0.077	77	< 0.20	< 0.01	14	221	31	17.3	2.7	0.82296	6.30	4	3
8/6/2008	0	7.91	25.25	599	602	8.42	0.091	91	1.60	< 0.01	19	209	19	31.3	1.6	0.48768	6.50	4	3
8/26/2008	0	9.60	21.07	548	507	8.76	0.088	88	1.60	< 0.05	24	178	25	21.9	1.6	0.48768	6.80	3	3
9/9/2008	0	13.54	16.92	528	447	8.99	0.075	75	1.30	< 0.01	19	170	21	17.4	1.4	0.42672	6.30	3	3
9/24/2008	0	9.08	18.59	521	457	8.99	0.064	64	1.40	< 0.01	17	172	13	15.3	1.8	0.54864	5.90	3	3
6/4/2009	0	9.68	18.40	510		7.38	0.065	65	1.80	< 0.01	11	177	11	13.7	2.5	0.762	6.6	3	3
6/25/2009	0	8.62	28.60	490		8.84	0.056	56	1.50	< 0.10	15	164	7	10.2	2.50	0.762	6.4	3	2
7/8/2009	0	8.16	24.66	491	488	8.88	0.071	71	1.60	< 0.01	17	155	14	18.0	1.50	0.4572	6.4	3	3
7/21/2009	0	9.60	22.60	489	466	8.97	0.081	81	1.70	< 0.01	17	154	14	19.2	2.00	0.6096	6.5	3	2
8/4/2009	0	9.56	23.11	487	469	9.13	0.062	62	1.60	< 0.01	15	153	11	14.8	2.00	0.6096	6.2	3	3
8/18/2009	0	9.03	22.57	448	427	9.14	0.064	64	1.50	< 0.01	16	133	16	13.7	1.70	0.51816	6.3	3	3
9/8/2009	0	8.67	21.41	452	421	9.12	0.051	51	1.30	< 0.01	17	143	9	19.0	1.80	0.54864	6.9	3	3
9/23/2009	0	9.50	22.36	484	459	8.74	0.046	46	1.40	< 0.01	7	154	14	7.98	3.00	0.9144	7.0	3	3

Averages

0.069 69.3125 14.6875 2.388 0.728

TSI Secchi 64.580
 TSI TP 65.271
 TSI Chloro-a 56.959

AVG. TSI 62.270



Definitions:

- TSI - Trophic State Index: Biological condition due to algae-producing nutrients.
- TP - Total Phosphorus
- TSS - Total Suspended Solids
- TKN - Total Kjeldahl Nitrogen
- DO - Dissolved Oxygen
- Cond. - Conductivity
- Rec. Cond. - Suitability for recreation, 1-high, 5-low
- Phys. Cond. - Aesthetic appearance, 1-clear, 5-murky

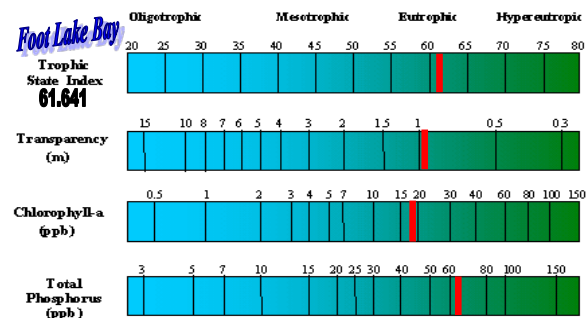
TP, Chlorophyll-a, and Secchi are the three main parameters used for assessment to determine impaired waters listings.

2008-2009 Foot Lake Bay Profile

Date	DO	Water Temp	Sp. Cond.	Cond.	pH	TP	TP	TKN	NO2-NO3	TSS	Alkalinity	Chlorophyll-a	Turbidity	Secchi	Secchi	Bottom	Rec. Cond.	Phys. Cond.	
Depth	(mg/L)	(°F)	(us/cm ³)	(us/cm)		(mg/L)	(ug/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(NTU)	(ft)	(m)	(ft)	(1-5)	(1-5)	
6/25/2008	0	8.45	23.78	541	528	8.43	0.049	49	1.60	0.16	4	182	6	4.81	5.7	1.737	17.00	2	2
7/9/2008	0	8.56	24.37	546	540	8.68	0.068	68	1.60	0.12	8	196	20	6.86	4.5	1.372	22.00	2	2
7/21/2008	0	10.25	25.33	529	532	8.65	0.063	63	1.30	< 0.01	15	182	31	11.1	2.7	0.823	22.40	3	3
8/6/2008	0	7.99	25.71	534	541	8.61	0.060	60	1.40	< 0.10	12	181	15	11.1	3.0	0.914	21.80	3	3
8/26/2008	0	8.86	22.16	538	509	8.63	0.065	65	1.30	< 0.01	11	180	22	10.5	3.0	0.914	22.20	3	3
9/9/2008	0	13.99	18.37	532	464	8.89	0.068	68	1.40	< 0.01	16	185	29	8.58	2.5	0.762	21.60	3	3
9/24/2008	0	8.83	18.87	525	464	8.88	0.061	61	1.30	< 0.01	11	184	11	5.49	3.7	1.128	22.30	2	2
6/4/2009	0	9.43	19.15	476		8.60	0.059	59	1.50	< 0.10	7	157	17	6.06	3.50	1.0668	22.40	2	2
6/25/2009	0	9.51	27.70	465		8.88	0.049	49	1.40	< 0.10	13	154	17	9.11	2.50	0.762	22.40	2	2
7/8/2009	0	8.22	24.00	492	483	8.69	0.065	65	1.50	< 0.01	11	160	12	11.4	2.50	0.762	22.10	2	2
7/21/2009	0	10.32	21.65	498	466	8.79	0.080	80	1.40	< 0.01	13	161	25	8.98	2.00	0.6096	22.00	3	2
8/4/2009	0	10.82	23.19	506	488	8.87	0.079	79	1.70	< 0.01	12	163	22	10.3	2.00	0.6096	22.00	2	2
8/18/2009	0	7.74	22.80	484	464	8.74	0.067	67	1.60	< 0.01	14	153	21	10.1	2.50	0.762	22.40	2	2
9/8/2009	0	10.13	21.10	483	447	8.83	0.070	70	1.70	< 0.01	12	158	15	9.90	2.50	0.762	22.20	2	2
9/23/2009	0	8.17	21.38	492	458	8.60	0.061	61	1.40	< 0.01	9	161	22	9.17	2.50	0.762	22.20	3	2
Averages						0.064	64.2667					19		3.007	0.916				

TSI Secchi TSI TP TSI Chloro-a
61.258 64.181 59.485

Avg. TSI 61.641



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Rec. Cond. - Suitability for recreation, 1-high, 5-low

Phys. Cond. - Aesthetic appearance, 1-clear, 5-murky

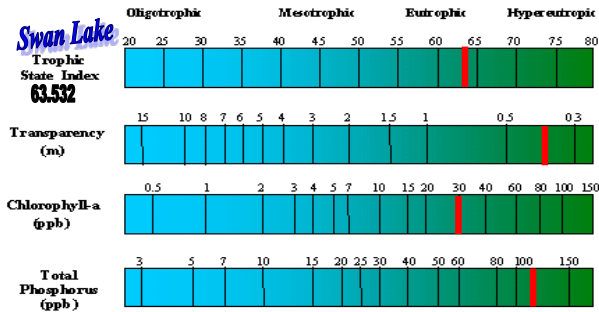
TP, Chlorophyll-a, and Secchi are the three main parameters used for assessment to determine impaired waters listings.

2008-2009 Swan Lake Profile

Date	Depth	DO (mg/L)	Water Temp (°F)	Sp. Cond. (us/cm ³)	Cond. (us/cm)	pH	TP (mg/L)	TP (ug/L)	TKN (mg/L)	NO2-NO3 (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Chlorophyll-a (ug/L)	Turbidity (NTU)	Secchi (ft)	Secchi (m)	Bottom (ft)	Rec. Cond. (1-5)	Phys. Cond. (1-5)
6/10/2008	0	9.80	19.43	533	476	8.61	0.069	69	1.50	< 0.10	18	196	10	25.7	1.50	0.457	4.00	2	2
6/23/2008	0	7.86	25.37	577	581	8.13	0.076	76	2.40	0.01			24	26.2	1.20	0.366	3.60	3	3
7/7/2008	0	6.98	24.31	612	604	8.33	0.183	183	3.50	< 0.10	50	247	41	71.9	0.70	0.213	3.30	4	3
7/22/2008	0	6.03	25.05	599	599	8.25	0.173	173	2.30	< 0.01	54	240	41	87.8	0.50	0.152	3.40	3	3
8/4/2008	0	6.76	23.76	588	574	8.37	0.123	123	2.70	0.06	79	240	56	127	0.50	0.152	3.10	3	3
9/3/2008	0	12.21	18.04	590	512	8.72	0.183	183	2.80	< 0.01	57	218	69	63.4	0.60	0.183	2.70	3	3
9/9/2008	0	14.21	15.83	596	491	8.84	0.141	141	2.40	< 0.01	46	223	39	56.9	0.80	0.244	2.90	4	3
9/24/2008	0	9.74	17.56	587	504	8.88	0.155	155	2.60	< 0.01	49	221	47	41.5	0.80	0.244	2.90	4	3
6/4/2009	0	6.14	21.50	543		8.85	0.062	62	1.40	< 0.10	8	193	1	13.2	2.00	0.6096	3.40	3	3
6/25/2009	0	4.88	27.70	578		8.06	0.042	42	1.30	< 0.10	5	198	1	4.94	3.30	1.00584	3.30	3	2
7/8/2009	0	7.18	24.67	572	569	8.41	0.074	74	1.70	< 0.01	11	188	9	12.2	2.50	0.762	2.80	3	2
7/21/2009	0	8.78	22.76	537	514	8.81	0.085	85	1.40	< 0.01	16	152	16	17.4	1.50	0.4572	3.10	3	2
8/4/2009	0	8.77	22.46	586	558	8.73	0.112	112	1.80	< 0.01	34	180	12	41.8	0.75	0.2286	2.80	3	3
8/18/2009	0	9.27	21.75	526	494	8.91	0.106	106	1.90	0.01	28	166	36	31.8	1.00	0.3048	3.00	3	2
9/8/2009	0	8.99	21.04	537	497	8.97	0.083	83	1.40	< 0.01	15	175	10	14.2	2.00	0.6096	3.60	2	2
9/23/2009	0	11.01	20.31	562	511	8.86	0.074	74	1.50	< 0.01	11	187	21	15.1	2.50	0.762	3.20	2	2
Averages							0.109	108.81					27.06		1.384	0.422			

TSI Secchi 63.916764 TSI TP 66.2146 TSI Chloro-A 60.4667651

Avg. TSI 63.5327



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Rec. Cond. - Suitability for recreation, 1-high, 5-low

Phys. Cond. - Aesthetic appearance, 1-clear, 5-murky

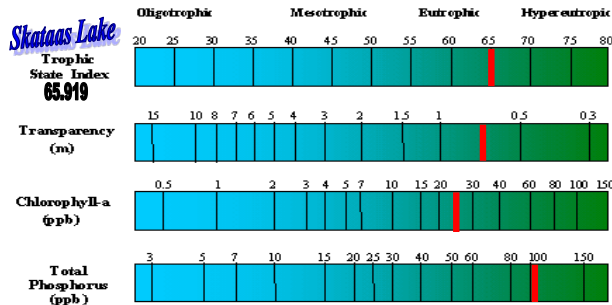
TP, Chlorophyll-a, and Secchi are the three main parameters used for assessment to determine impaired waters listings.

2008-2009 Skataas Lake Profile

Date	DO	Water Temp	Sp. Cond.	Cond.	pH	TP	TP	TKN	NO2-NO3	TSS	Alkalinity	Chlorophyll-a	Turbidity	Secchi	Secchi	Bottom	Rec. Cond.	Phys. Cond.	
Depth	(mg/L)	(°F)	(us/cm ³)	(us/cm)		(mg/L)	(ug/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(NTU)	(ft)	(m)	(ft)	(1-5)	(1-5)	
6/12/2008	0	7.96	18.20	508	442.2	8.78	0.065	65	1.80	0.10	10	180	7	39.8	3.00	0.914	10.00	2	2
6/23/2008	0	9.33	24.33	546	539	8.47	0.053	53	2.00	0.09			15	10.8	5.00	1.524	9.80	4	3
7/7/2008	0	8.30	24.43	567	561	8.56	0.091	91	2.50	0.06	19	207	21	19.5	2.20	0.671	10.00	3	3
7/22/2008	0	9.76	25.91	560		8.68	0.102	102	1.60	0.01	14	200	31	20.5	2.50	0.762	9.50	3	3
8/4/2008	0	7.66	25.07	563	564	8.45	0.172	172	2.00	0.07	24	209	52	34.9	1.50	0.457	9.20	3	3
9/3/2008	0	11.38	20.71	536	492	8.63	0.099	99	1.90	< 0.01	27	184	29	22.6	1.30	0.396	9.80	3	3
9/9/2008	0	14.23	17.64	515	442	8.91	0.080	80	1.00	0.01	24	188	18	19.3	1.20	0.366	8.80	3	3
9/24/2008	0	8.55	18.68	537	472	8.98	0.07	70	1.80	< 0.01	21	197	27	20.9	1.30	0.396	9.00	3	3
6/4/2009	0	5.08	21.50	568		8.12	0.082	82	2.10	< 0.01	8	181	6	12.1	3.00	0.9144	10.00	3	3
6/25/2009	0	7.36	26.70	577		8.48	0.053	53	1.90	< 0.10	4	196	4	3.62	7.50	2.286	9.60	2	2
7/8/2009	0	8.25	24.47	597	591	8.53	0.085	85	2.10	0.06	11	200	24	14.1	3.00	0.9144	9.40	3	3
7/21/2009	0	9.95	22.12	588	556	8.76	0.229	229	3.00	< 0.01	27	204	31	31.3	1.50	0.4572	9.70	3	3
8/4/2009	0	8.82	22.11	588	556	8.76	0.136	136	2.30	< 0.01	24	200	29	30.0	1.00	0.3048	9.60	3	3
8/18/2009	0	8.16	22.54	551	525	8.73	0.137	137	2.20	< 0.01	22	188	42	29.9	1.40	0.42672	9.70	4	4
9/8/2009	0	9.01	21.27	561	521	8.78	0.095	95	1.60	< 0.01	20	196	34	21.5	1.50	0.4572	9.70	3	3
9/23/2009	0	10.06	21.41	559	521	8.82	0.087	87	1.80	< 0.01	15	191	42	17.9	1.75	0.5334	9.60	3	3
Averages						0.102		102.250				25.75		2.416		0.736			

TSI Secchi 64.411
 TSI TP 70.877
 TSI Chloro-A 62.467

Avg. TSI 65.919



Definitions:

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Phys. Cond. - Aesthetic appearance, 1-clear, 5-murky

TP, Chlorophyll-a, and Secchi are the three main parameters used for assessment to determine impaired waters listings.

2008-2009 Point Lake Profile

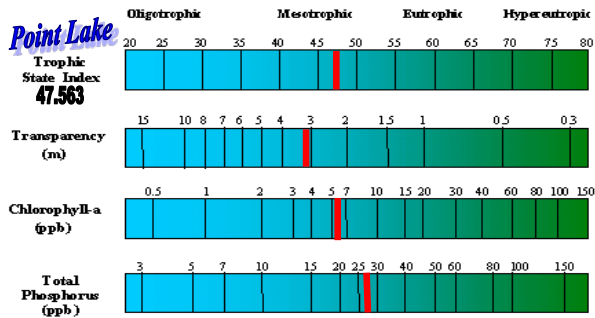
Date	Depth	DO (mg/L)	Water Temp (°F)	Sp. Cond. (us/cm ³)	Cond. (us/cm)	pH	TP (mg/L)	TP (ug/L)	TKN (mg/L)	NO2-NO3 (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Chlorophyll-a (ug/L)	Turbidity (NTU)	Secchi (ft)	Secchi (m)	Bottom (ft)	Rec. Cond. (1-5)	Phys. Cond. (1-5)
6/10/2008	0	9.04	18.75	820	722	8.63	0.035	35	1.40	< 0.1	3	265	3	3.91	7.00	2.134	31.6	2	2
6/25/2008	0	11.68	24.34	819	809	8.85	0.025	25	1.50	0.02	2	270	2	3.16	13.00	3.962	27.5	2	2
7/9/2008	0	9.00	25.12	827	829	8.90	0.019	19	0.70	< 0.01	4	281	5	2.81	11.00	3.353	32.6	2	2
7/21/2008	0	9.69	25.82	835	848	8.91	0.025	25	0.60	< 0.01	3	282	5	2.52	13.00	3.962	28.2	2	2
8/6/2008	0	8.16	26.11	853	871	8.89	0.020	20	1.50	< 0.10	3	278	7	3.08	11.50	3.505	29.2	2	2
9/3/2008	0	10.78	21.82	856	804	8.84	0.029	29	1.40	< 0.01	6	283	17	3.62	8.50	2.591	26.7	2	2
9/9/2008	0	12.21	18.76	863	760	8.96	0.022	22	1.10	< 0.01	3	289	5	2.00	11.20	3.414	30.0	2	2
9/24/2008	0	8.59	18.99	856	758	8.91	0.029	29	1.30	< 0.01	2	298	4	1.80	8.20	2.499	22.9	2	2
6/4/2009	0	8.92	20.50	868		8.60	0.048	48	1.50	< 0.01	< 2	283	2	1.64	20.00	6.096	27.50	2	2
6/25/2009	0	9.81	25.90	882		8.88	0.027	27	1.40	< 0.10	4	297	2	1.90	12.00	3.6576	27.30	2	2
7/8/2009	0	9.34	24.44	893	884	8.83	0.023	23	1.50	< 0.01	< 1	487	4	2.97	10.50	3.2004	28.20	2	2
7/21/2009	0	9.41	21.83	893	839	8.86	0.027	27	1.20	< 0.01	5	298	4	2.70	10.00	3.048	25.70	2	2
8/4/2009	0	8.90	22.66	906	865	8.93	0.026	26	1.60	< 0.01	3	303	6	3.90	10.00	3.048	28.3	2	2
8/18/2009	0	7.06	22.92	882	847	8.91	0.025	25	1.40	< 0.01	4	297	12	4.80	6.30	1.92024	28.40	2	2
9/8/2009	0	9.41	21.70	884	828	8.93	0.027	27	1.30	< 0.01	5	278	7	2.13	7.50	2.286	25.60	2	1
9/23/2009	0	8.25	21.02	892	824	8.86	0.026	26	1.40	< 0.01	3	298	7	3.27	8.50	2.5908	27.00	1	1

Averages

0.027 27.063 5.75 10.513 3.204

TSI Secchi 43.220 TSI TP 51.709 TSI Chloro-a 47.760

Avg. TSI 47.563



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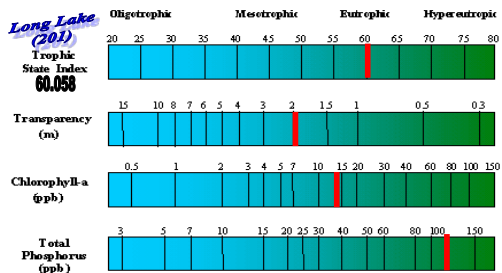
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2008-2009 Long Lake (201) Profile

Date	DO	Water Temp	Sp. Cond.	Cond.	pH	TP	TP	OP	TKN	NO2-NO3	TSS	VSS	Alkalinity	Color	Chloride	Chlorophyll-a	Turbidity	Secchi	Secchi	Bottom	Rec. Cond.	Phys. Cond.	
Depth	(mg/L)	(°F)	(us/cm ³)	(us/cm)		(mg/L)	(ug/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(Pt-Co)	(mg/L)	(ug/L)	(NTU)	(ft)	(m)	(ft)	(1-5)	(1-5)	
6/10/2008	0	8.52	18.08	645	560	8.68	0.100	100	0.054	1.50	0.03	2	1	326	15	25	2	5.35	8.00	2.438	14.6	2	2
6/25/2008	0	8.87	23.42	636	617	8.73	0.084	84	0.020	1.70	0.04	3	2	317	50	25	1	2.5	13.50	4.115	13.9	2	2
7/9/2008	0	6.31	23.95	650	637	8.60	0.098	98	0.097	1.60	0.06	6	3	322	15	24	13	6.66	6.20	1.890	14.4	2	3
7/21/2008	0	7.44	24.59	583	588	8.52	0.099	99	0.053	0.80	0.02	5	3	321	20	25	6	5.52	8.50	2.591	14.3	4	3
8/6/2008	0	10.24	25.46	662	667	8.74	0.124	124	0.050	1.70	0.10	8	6	323	30	25	22	39.4	4.20	1.280	15.1	4	3
8/26/2008	0	8.83	22.19	662	626	8.73	0.126	126	0.046	2.30	0.03	11	6	327	70	26	18	9.74	3.00	0.914	14.2	3	3
9/9/2008	0	14.55	17.64	652	560	8.90	0.095	95	0.031	1.80	< 0.01	7	5	335	20	27.4	18	6.67	6.00	1.829	13.6	4	3
9/24/2008	0	8.47	18.38	642	561	8.93	0.121	121	0.026	2.10	0.02	15	8	340	20	26	39	10.2	2.60	0.792	13.3	3	3
6/4/2009	0	8.97	19.20	664		9.07	0.103	103	0.047	1.70	< 0.01	3	< 2	324	60	30	4	2.61	7.00	2.1336	14.80	2	2
6/25/2009	0	8.84	24.30	672		9.00	0.077	77	0.050	1.20	< 0.01	3	2	326	10	29	5	1.26	14.00	4.2672	14.50	2	2
7/8/2009	0	8.24	23.47	679	659	8.80	0.122	122		1.70	0.02	8	3	323	20	27	15	5.42	5.00	1.524	14.40	3	3
7/21/2009	0	9.19	20.89	683	629	8.81	0.145	145	0.181	1.70	0.03	5	3	326	20	28	12	3.16	8.50	2.5908	14.50	4	3
8/4/2009	0	9.52	21.62	688	643	8.92	0.154	154	0.181	1.90	< 0.01	6	4	329	30	28	17	7.72	6.50	1.9812	14.30	3	3
8/18/2009	0	6.73	22.12	683	645	8.85	0.190	190	0.115	1.90	0.02	19	6	339	30	28	16	14.1	2.70	0.82296	14.10	3	3
9/8/2009	0	9.20	20.89	677	624	8.93	0.159	159	0.101	1.60	< 0.01	5	3	336	20	27	5	4.26	6.50	1.9812	14.10	3	2
9/23/2009	0	9.73	21.19	685	635	8.89	0.194	194	0.102	2.30	0.05	8	6	335	30	28	34	5.40	4.00	1.2192	14.00	4	3
Averages						0.124	124.438						328.063	28.750	26.775	14.188		6.638	2.023				

TSI Secchi 49.846
TSI TP 73.709
TSI Chloro-A 56.620

Avg. TSI 60.058



Definitions:

TSI - Trophic State Index: Biological condition due to algae-producing nutrients.

TP - Total Phosphorus

TSS - Total Suspended Solids

TKN - Total Kjeldahl Nitrogen

DO - Dissolved Oxygen

Cond. - Conductivity

Rec. Cond. - Suitability for recreation, 1-high, 5-low

Phys. Cond. - Aesthetic appearance, 1-clear, 5-murky

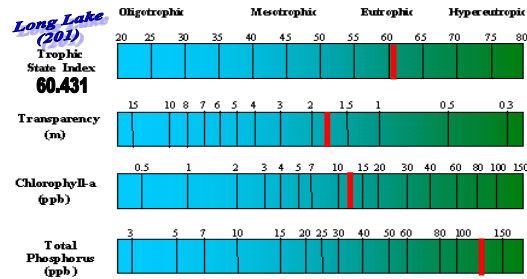
TP, Chlorophyll-a, and Secchi are the three main parameters used for assessment to determine impaired waters listings.

2008-2009 Long Lake (203) Profile

Date	DO	Water Temp	Sp. Cond.	Cond.	pH	TP	TP	OP	TKN	NO2-NO3	TSS	VSS	Alkalinity	Color	Chloride	Chlorophyll-a	Turbidity	Secchi	Secchi	Bottom	Rec. Cond.	Phys. Cond.	
Depth	(mg/L)	(°F)	(us/cm ²)	(us/cm)		(mg/L)	(ug/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(Pt-Co)	(mg/L)	(ug/L)	(NTU)	(ft)	(m)	(ft)	(1-5)	(1-5)	
6/10/2008	0	9.34	18.58	642	563	8.74	0.086	86	0.050	1.30	0.02	4	1	322	10	25	3	4.55	6.5	1.9812	12.9	2	2
6/25/2008	0	8.35	22.96	634	609	8.74	0.143	143	0.038	2.00	0.01	3	2	315	10	26	< 1	3.0	12.0	3.658	13.5	2	2
7/9/2008	0	6.20	23.98	653	640	8.60	0.141	141	0.079	1.80	0.05	8	3	322	15	25	12	6.22	5.5	1.676	12.3	2	3
7/21/2008	0	8.16	24.93	658	657	8.61	0.124	124	0.043	1.10	0.03	10	4	325	30	25	20	16.4	3.0	0.914	12.3	4	3
8/6/2008	0	12.30	25.76	657	666	8.84	0.159	159	0.069	2.20	< 0.10	18	10	323	20	24	36	75.0	2.0	0.610	12.3	4	3
8/26/2008	0	7.83	22.04	666	628	8.74	0.135	135	0.104	2.10	0.03	17	7	329	70	26	7	14.5	2.1	0.640	10.6	3	3
9/9/2008	0	14.32	17.44	653	558	8.94	0.082	82	0.017	1.70	0.01	6	3	336	20	27.6	10	5.46	5.6	1.707	11.6	3	3
9/24/2008	0	8.50	18.42	644	563	8.97	0.094	94	0.031	1.70	0.02	10	5	321	20	24	21	12.7	4.0	1.219	11.4	3	3
6/4/2009	0	9.19	19.55	664		8.69	0.106	106	0.051	1.60	< 0.01	2	2	324	20	29	4	2.78	7.00	2.1336	12.30	3	2
6/25/2009	0	8.67	24.00	665		8.80	0.065	65	0.033	1.30	< 0.01	2	< 4	324	20	29	3	1.36	12.00	3.6576	12.00	2	2
7/8/2009	0	9.13	23.42	674	653	8.84	0.122	122	0.049	1.60	< 0.01	10	5	328	20	28	12	8.54	4.00	1.2192	11.60	3	3
7/21/2009	0	7.78	20.21	683	621	8.78	0.151	151		1.80	0.04	6	4	329	20	28	9	4.31	6.50	1.9812	11.80	4	3
8/4/2009	0	8.10	21.50	692	646	8.84	0.145	145	0.116	1.60	0.01	6	3	331	30	28	8	4.48	6.00	1.8288	11.90	3	2
8/18/2009	0	6.91	22.06	688	649	8.78	0.199	199	0.129	1.70	0.02	16	4	322	20	27	5	14.2	2.30	0.70104	11.20	3	2
9/8/2009	0	9.47	20.82	675	621	8.92	0.144	144	0.112	1.60	0.01	9	4	336	20	27	12	8.80	5.00	1.524	11.60	3	2
9/23/2009	0	7.53	20.67	691	634	8.83	0.171	171	0.115	2.00	0.04	7	4	338	30	28	15	10.5	6.50	1.9812	11.70	4	3
Averages						0.129	129.188						326.563	23.438	26.663	11.800		5.625	1.715				

TSI Secchi TSI TP TSI Chloro-a
52.231 74.249 54.812

Avg. TSI 60.431



Definitions:

TSI - Trophic State Index: Biological condition due to algae-producing nutrients.

TP - Total Phosphorus

TSS - Total Suspended Solids

TKN - Total Kjeldahl Nitrogen

DO - Dissolved Oxygen

Cond. - Conductivity

Rec. Cond. - Suitability for recreation, 1-high, 5-low

Phys. Cond. - Aesthetic appearance, 1-clear, 5-murky

TP, Chlorophyll-a, and Secchi are the three main parameters used for assessment to determine impaired waters listings.

2008-2009 Ringo Lake Profile

Date	DO	Water Temp	Sp. Cond.	Cond.	pH	TP	TP	OP	TKN	NO2-NO3	TSS	VSS	Alkalinity	Color	Chloride	Chlorophyll-a	Turbidity	Secchi	Secchi	Bottom	Rec. Cond.	Phys. Cond.	
Depth	(mg/L)	(°F)	(us/cm ²)	(us/cm)		(mg/L)	(ug/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(Pt-Co)	(mg/L)	(ug/L)	(NTU)	(ft)	(m)	(ft)	(1-5)	(1-5)	
6/10/2008	0	10.22	18.61	372	326	9.01	0.116	116	0.023	2.30	< 0.10	46	30	181	15	18	34	41.9	1.00	0.305	7.9	3	3
6/25/2008	0	9.38	24.13	368	361	8.95	0.108	108	0.015	2.10	0.08	60	42	178	20	19	42	55.8	1.00	0.305	7.9	3	3
7/9/2008	0	9.89	24.57	371	368	9.05	0.123	123	0.074	1.90	< 0.01	75	53	184	25	19	53	60.4	1.00	0.305	7.3	3	3
7/21/2008	0	11.40	25.21	364	365	9.11	0.044	44	0.004	1.80	0.04	80	60	180	20	19	60	67.5	0.70	0.213	7.2	3	3
8/6/2008	0	12.34	25.52	364	368	9.29	0.141	141	0.016	3.00	0.10	80	80	176	20	20	60	61.4	0.60	0.183	7.3	3	3
8/26/2008	0	10.00	21.16	362	335	9.31	0.125	125	0.026	3.10	0.07	90	80	174	30	22	74	52.2	0.60	0.183	6.7	3	3
9/9/2008	0	15.10	16.31	360	300	9.20	0.117	117	0.007	3.60	0.04	90	70	173	20	22.8	52	47.8	0.70	0.213	6.6	3	3
9/24/2008	0	8.37	18.33	360	314	9.33	0.141	141	0.018	3.50	0.07	92	75	180	30	22	90	50.7	0.50	0.152	6.8	3	3
6/4/2009	0	9.19	19.55	664		8.69	0.106	106	0.051	1.60	< 0.01	2	2	324	20	29	4	2.78	7.00	2.1336	12.30	3	2
6/25/2009	0	8.67	24.00	665		8.80	0.065	65	0.033	1.30	< 0.01	2	< 4	324	20	29	3	1.36	12.00	3.6576	12.00	2	2
7/8/2009	0	9.13	23.42	674	653	8.84	0.122	122	0.049	1.60	< 0.01	10	5	328	20	28	12	8.54	4.00	1.2192	11.60	3	3
7/21/2009	0	7.78	20.21	683	621	8.78	0.151	151	0.294	1.80	0.04	6	4	329	20	28	9	4.31	6.50	1.9812	11.80	4	3
8/4/2009	0	8.10	21.50	692	646	8.84	0.145	145	0.116	1.60	0.01	6	3	331	30	28	8	4.48	6.00	1.8288	11.90	3	2
8/18/2009	0	6.91	22.06	688	649	8.78	0.199	199	0.129	1.70	0.02	16	4	322	20	27	5	14.2	2.30	0.70104	11.20	3	2
9/8/2009	0	9.47	20.82	675	621	8.92	0.144	144	0.112	1.60	0.01	9	4	336	20	27	12	8.80	5.00	1.524	11.60	3	2
9/23/2009	0	7.53	20.67	691	634	8.83	0.171	171	0.115	2.00	0.04	7	4	338	30	28	15	10.5	6.50	1.9812	11.70	4	3

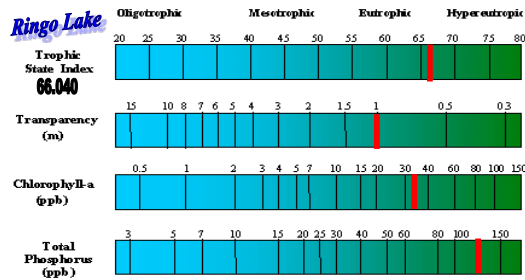
Averages

0.126 126.125 253.625 22.500 24.113 33.313 3.463 1.055

Standard deviat 36.9592

TSI Secchi TSI TP TSI Chloro-a
59.223 73.903 64.993

Avg. TSI 66.040



Definitions:

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- Rec. Cond. - Suitability for recreation, 1-high, 5-low
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TP, Chlorophyll-a, and Secchi are the three main parameters used for assessment to determine impaired waters listings.