

2018 Hess Lake Aeration Water Quality Report

Prepared for: The Hess Lake Improvement Board

Prepared by: Savin Lake Services

Introduction:

The aeration system was installed on September 26th, 2014. The system was initially turned on April 28th, 2015. No bacterial was added to the water body during 2014 or 2015. However bacterial augmentation was used in 2016, 2017, and 2018 to help increase the degradation of organic muck. The purpose of the aeration project is to enhance water clarity, improve water quality, and remove organic muck. This is the 4th year the system has been active.

Sampling Methods:

Samples were collected from the surface by hand. Samples taken at depth were collected using a Van Dorn Sampler. Samples were collected at two sites in the cove of the aeration system. Site 1: (43°22.81N, 85°46.12W), Site 2: (43°22.95N, 85°46.12W). Samples were collected for each parameter except for Temperature, pH, and Dissolved Oxygen, which were measured by a probe that was calibrated before each sampling event. The 2018 sample dates were June 5th and September 24th. Samples were sent to various laboratories for analysis of the required parameters.

Summary:

This is the 4th year the aeration system has been active, however this is the 5th year we have taken water quality data from the aeration bay as the first year was for baseline numbers (which in itself 1 year is not very good for a true baseline, but was required by the DEQ). In summary from year to year: '14 to '15 saw an overall decrease in quality, with TP, Chlorophyll a, and TSS all being higher in values. From '15 to '16, secchi disk values worsen, chlorophyll a, TSS, and Ortho-P values increased as well. From '16 to '17 everything was much better with the exception of ortho-P. And finally from '17 to '18 the values reverted back close to 2015 values.

On an individual year basis only the total phosphorus and chlorophyll values are uniquely high. The other values are similar to many lakes in the area. The poor secchi disk values go without saying unfortunately. 2017 is interesting in it's lower values in the middle of the aeration system running, with 2018 reverting back to higher values.

Therefore in the scope of the project, it would seem that we are still holding to expected values, as this is a long term project and the current sediment conditions remain similar. With the aeration system's permit up for renew in 2019, additional testing will need to be completed. This will only strengthen our knowledge of the aeration system's change to Hess Lake. We await 2019 information and perhaps combining information from Progressive AE's study in the future for more analysis.

Sincerely,



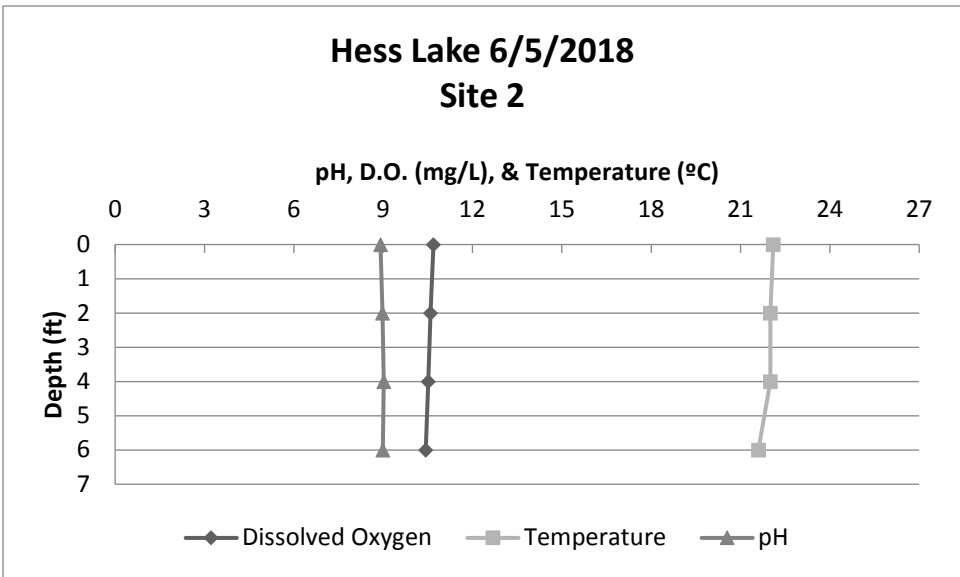
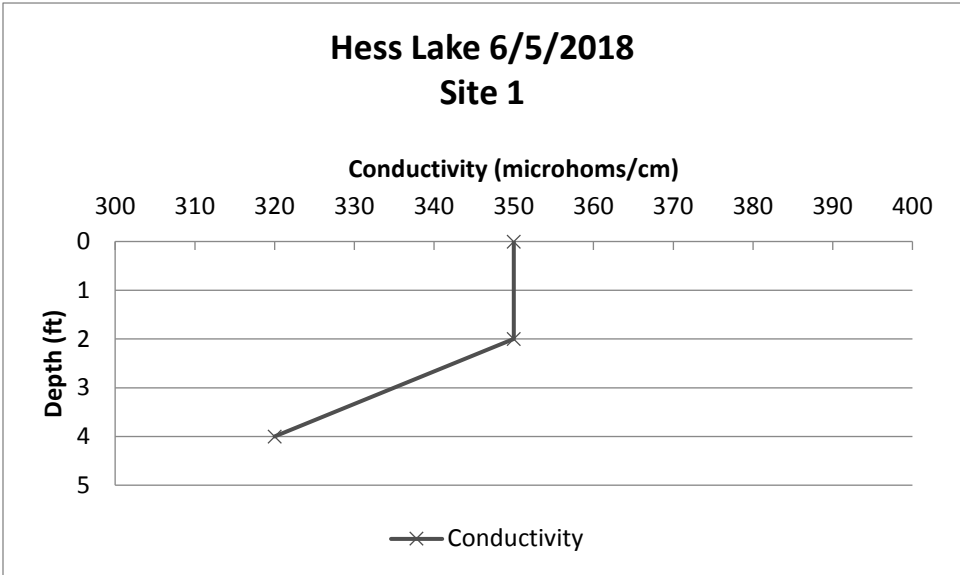
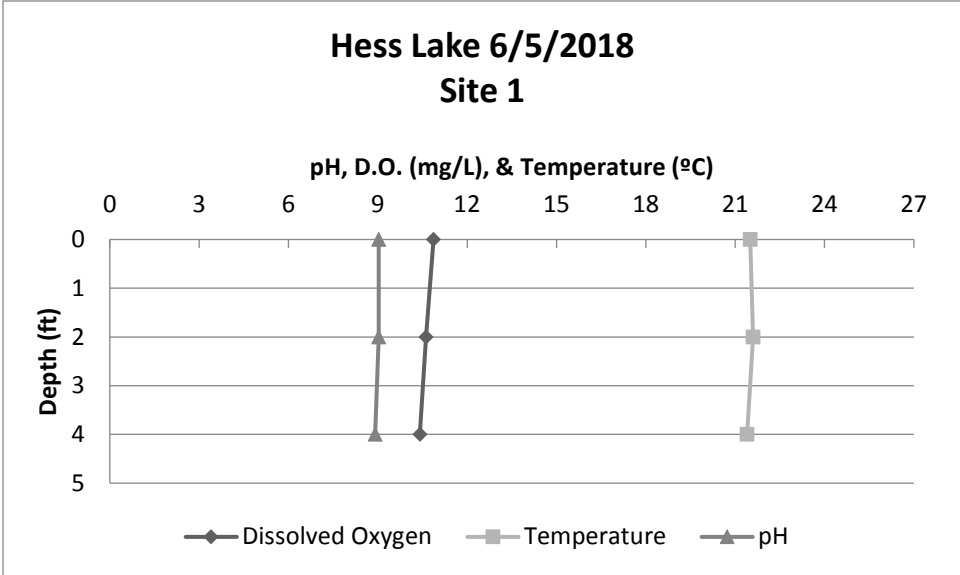
Matthew Novotny
Savin Lake Services

2018 Results

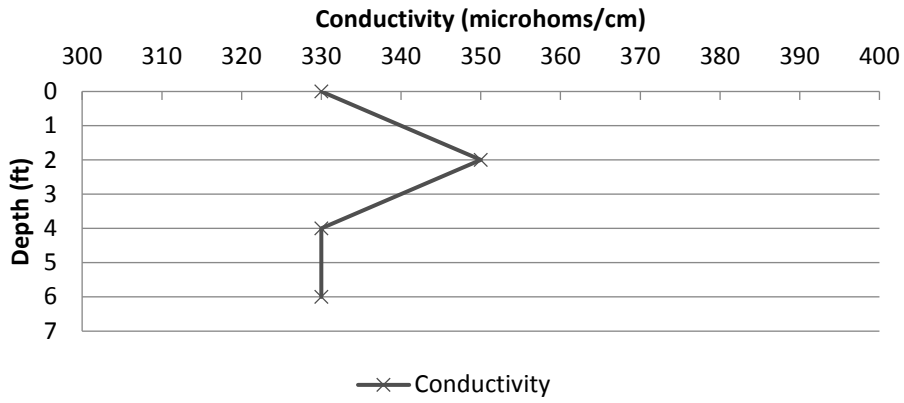
Hess Lake Aeration 2018 Data				
Date	Site	Total Suspended Solids (mg/L)	Total Phosphorus (ug/L)	Orthophosphorus (ug/L)
6/5/2018	1 Surface	14	66	14
6/5/2018	1 Mid	25	91	<10
6/5/2018	1 Deep	18	42	<10
6/5/2018	2 Surface	15	46	<10
6/5/2018	2 Mid	14	41	<10
6/5/2018	2 Deep	16	47	<10
9/24/2018	1 Surface	14	27	<10
9/24/2018	1 Mid	14	30	12
9/24/2018	1 Deep	12	32	<10
9/24/2018	2 Surface	13	36	<10
9/24/2018	2 Mid	14	39	<10
9/24/2018	2 Deep	12	32	<10

Date	Site	Secchi Disk (ft)	Chlorophyll a (ug/L)
6/5/2018	1	2.5	17
6/5/2018	2	3	6.8
9/24/2018	1	2.5	12
9/24/2018	2	2.5	11

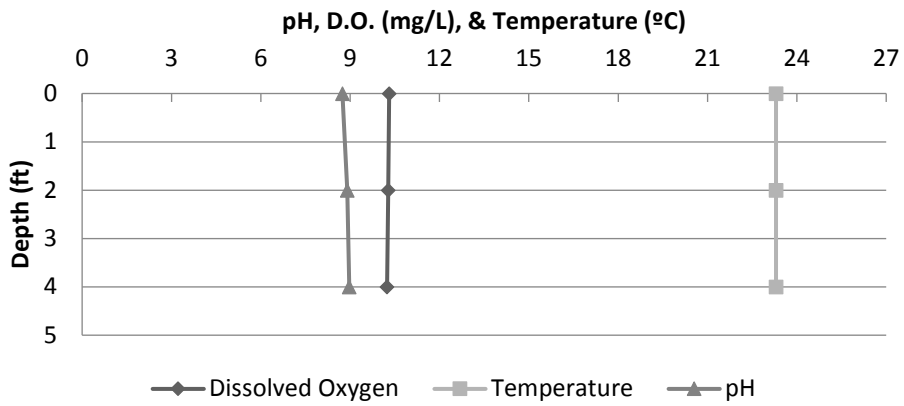
Date	Site	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity (microhoms/cm)	Depth (ft)
6/5/2018	1	21.5	10.87	9.03	350	0
		21.6	10.62	9.03	350	2
		21.4	10.41	8.91	320	4
6/5/2018	2	22.1	10.69	8.91	330	0
		22	10.59	8.98	350	2
		22	10.52	9.02	330	4
		21.6	10.43	8.99	330	6
9/24/2018	1	23.3	10.31	8.74	280	0
		23.3	10.28	8.9	280	2
		23.3	10.24	8.97	260	4
9/24/2018	2	23.8	9.78	8.88	270	0
		23.8	9.79	8.96	290	2
		23.8	9.79	9.03	290	4
		23.6	9.84	9	280	6



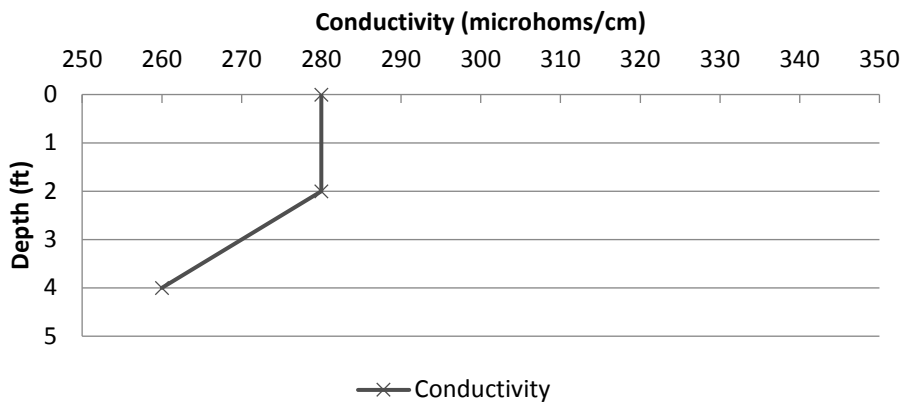
Hess Lake 6/5/2018 Site 2



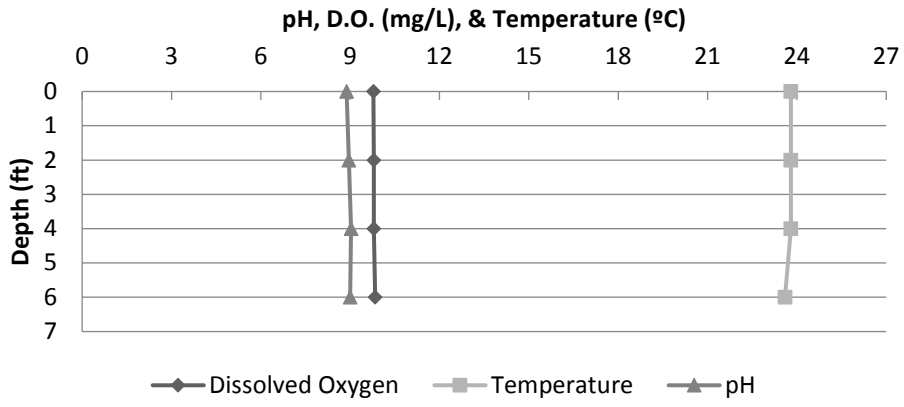
Hess Lake 9/24/2018 Site 1



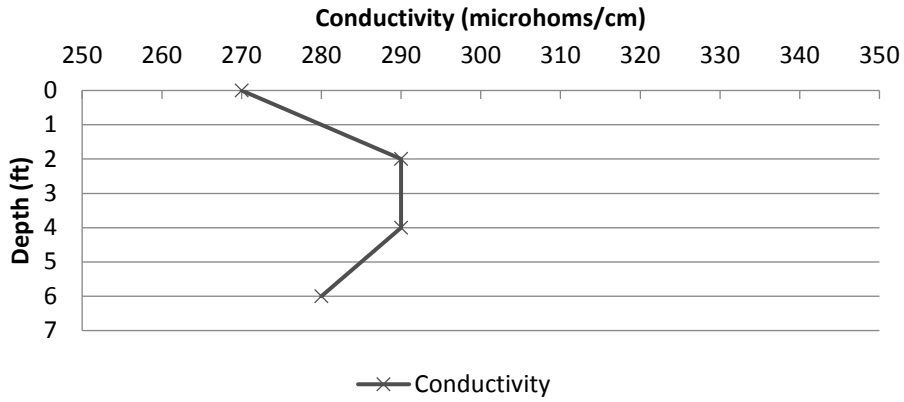
Hess Lake 9/24/2018 Site 1



Hess Lake 9/24/2018 Site 2



Hess Lake 9/24/2018 Site 2



Past Results:

2014 Results:

Hess Lake Aeration 2014 Data				
Date	Site	Total Suspended Solids (mg/L)	Total Phosphorus (ug/L)	Orthophosphorus (ug/L)
7/14/2014	1 Surface	10.3	21.5	7.6
7/14/2014	1 Mid	14.8	28.9	11
7/14/2014	1 Deep	104	23.5	9.3
7/14/2014	2 Surface	10.8	18.3	5.9
7/14/2014	2 Mid	11.5	24.1	9.3
7/14/2014	2 Deep	12.8	21.3	10.2
9/15/2014	1 Surface	11	<20	<20
9/15/2014	1 Mid	12	<20	<20
9/15/2014	1 Deep	13	<20	<20
9/15/2014	2 Surface	12	<20	<20
9/15/2014	2 Mid	10	<20	<20
9/15/2014	2 Deep	10	<20	<20

Date	Site	Secchi Disk (ft)	Chlorophyll a (ug/L)
7/14/2014	1	2.5	6.42
7/14/2014	2	3	7.37
9/15/2014	1	2.5	5.23
9/15/2014	2	3	3.01

Date	Site	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity (microhoms/cm)
7/14/2014	1	25.6	11.06	8.94	309
		24.7	10.31	8.88	331
		24.5	9.63	8.85	330
7/14/2014	2	25.9	10.79	8.95	332
		25.8	10.81	8.96	332
		24.9	10.26	8.93	338
		24.4	9.15	8.84	335
9/15/2014	1	17.6	11.47	8.91	336
		17.3	11.37	8.87	341
		17.1	11.42	8.84	347
9/15/2014	2	17.7	11.13	8.89	338
		17.6	11.19	8.86	339
		17.5	11.23	8.84	343
		17.4	11.24	8.83	339

2015 Results:

Hess Lake Aeration 2015 Data				
Date	Site	Total Suspended Solids (mg/L)	Total Phosphorus (ug/L)	Orthophosphorus (ug/L)
6/8/2015	1 Surface	19	50	6
6/8/2015	1 Mid	23	47	5
6/8/2015	1 Deep	20	48	5
6/8/2015	2 Surface	15	43	6
6/8/2015	2 Mid	22	53	6
6/8/2015	2 Deep	21	59	6
7/15/2015	1 Surface	18	30	6
7/15/2015	1 Mid	19	30	ND
7/15/2015	1 Deep	18	30	ND
7/15/2015	2 Surface	19	20	ND
7/15/2015	2 Mid	15	30	ND
7/15/2015	2 Deep	17	50	ND
9/14/2015	1 Surface	24	30	4.4
9/14/2015	1 Mid	23	40	5
9/14/2015	1 Deep	24	40	8.6
9/14/2015	2 Surface	21	40	4.8
9/14/2015	2 Mid	21	40	6.1
9/14/2015	2 Deep	29	50	4.4

Date	Site	Secchi Disk (ft)	Chlorophyll a (ug/L)
6/8/2015	1	2	22
6/8/2015	2	2.5	15
7/15/2015	1	1.5	13
7/15/2015	2	2	14
9/14/2015	1	2	8.5
9/14/2015	2	2	29

Date	Site	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity (microhms/cm)
6/8/2015	1	20.1	11.33	9.15	340
		20.1	11.4	9.13	340
		20.1	11.34	9.15	340
6/8/2015	2	19.8	10.73	9.13	340
		19.7	10.73	9.11	350
		19.6	10.76	9.11	350
		19.4	10.7	9.11	350
7/15/2015	1	23.7	8.64	9.26	320
		23.5	8.65	9.13	320
		23.4	8.67	9.12	320
7/15/2015	2	23.8	8.97	9.12	320
		24	8.93	9.1	320
		23.6	8.93	9.09	320
		23.2	8.58	9.06	320
9/14/2015	1	20	9.72	8.95	330
		19.9	9.77	8.95	330
		19.7	9.65	8.95	330
9/14/2015	2	20.3	9.74	8.94	330
		20.3	9.71	8.94	330
		20	9.37	8.92	330
		19.9	8.62	8.88	330

2016 Results:

Hess Lake Aeration 2016 Data				
Date	Site	Total Suspended Solids (mg/L)	Total Phosphorus (ug/L)	Orthophosphorus (ug/L)
5/25/2016	1 Surface	33	64	<8
5/25/2016	1 Mid	33	84	<8
5/25/2016	1 Deep	42	63	<8
5/25/2016	2 Surface	30	55	<8
5/25/2016	2 Mid	29	81	<8
5/25/2016	2 Deep	30	97	<8
8/23/2016	1 Surface	17	46	14
8/23/2016	1 Mid	18	43	<10
8/23/2016	1 Deep	18	41	<10
8/23/2016	2 Surface	17	35	<10
8/23/2016	2 Mid	17	40	<10
8/23/2016	2 Deep	17	38	<10
9/27/2016	1 Surface	17	45	<10
9/27/2016	1 Mid	21	58	18
9/27/2016	1 Deep	21	57	12
9/27/2016	2 Surface	19	39	<10
9/27/2016	2 Mid	19	44	10
9/27/2016	2 Deep	19	45	<10

Date	Site	Secchi Disk (ft)	Chlorophyll a (ug/L)
5/25/2016	1	1	30
5/25/2016	2	1	35
8/23/2016	1	2.5	30
8/23/2016	2	2	23
9/27/2016	1	1.5	6.1
9/27/2016	2	1.5	19

Date	Site	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity (microhoms/cm)	Depth (ft)
5/25/2016	1	19.6	11.67	9.15	320	0
		19.4	11.66	9.14	320	2
		19.2	11.57	9.14	320	4
5/25/2016	2	20.3	12.27	9.08	320	0
		19.8	12.15	9.11	320	2
		18.8	10.14	9.03	320	4
		18	9.59	9.01	320	6
8/23/2016	1	23.6	9.79	8.66	320	0
		23.4	9.81	8.62	320	2
		23.1	9.6	8.66	320	4
8/23/2016	2	24.1	9.83	8.77	320	0
		24.1	9.81	8.79	320	2
		23.9	9.74	8.7	320	4
		23.5	9.8	8.73	330	6
9/27/2016	1	17.4	11.17	8.69	300	0
		17.3	11.25	8.79	320	2
		17.2	11.25	8.75	330	4
9/27/2016	2	18.1	11.52	8.67	320	0
		18	11.48	8.84	320	2
		17.4	10.78	8.67	320	4
		17.3	10.5	8.75	320	6

2017 Results:

Hess Lake Aeration 2017 Data				
Date	Site	Total Suspended Solids (mg/L)	Total Phosphorus (ug/L)	Orthophosphorus (ug/L)
5/3/2017	1 Surface	6	29	<10
5/3/2017	1 Mid	6	43	19
5/3/2017	1 Deep	7	44	15
5/3/2017	2 Surface	6	35	26
5/3/2017	2 Mid	8	55	28
5/3/2017	2 Deep	8	56	36
9/22/2017	1 Surface	10	19	<10
9/22/2017	1 Mid	12	17	12
9/22/2017	1 Deep	11	27	<10
9/22/2017	2 Surface	9	21	<10
9/22/2017	2 Mid	11	31	10
9/22/2017	2 Deep	13	43	<10

Date	Site	Secchi Disk (ft)	Chlorophyll a (ug/L)
5/3/2017	1	4	1.2
5/3/2017	2	4.5	0.95
9/22/2017	1	2	4.7
9/22/2017	2	2	6.9

Date	Site	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity (microhoms/cm)	Depth (ft)
5/3/2017	1	12.6	9.54	7.76	340	0
		12.1	9.55	8.00	340	2
		11.8	9.59	8.08	350	4
5/3/2017	2	12.9	9.57	8.05	350	0
		12.5	9.55	8.03	350	2
		11.3	9.43	8.01	350	4
		11.1	9.40	7.99	350	6
9/22/2017	1	21.6	11.27	8.71	300	0
		21.2	11.3	8.69	310	2
		21.0	11.38	8.78	310	4
9/22/2017	2	21.2	11.54	8.67	320	0
		21.1	11.56	8.66	310	2
		20.8	11.61	8.69	310	4
		19.6	8.68	8.59	320	6