

Long Lake Dissolved Oxygen (DO) & Temperature Rpt for Jun-Sept 2025 at Site 202 deepest area

Determined through the use of Hubbard County SWCD Specialized Toolset by Technician on Boat Taxi

Understanding the monthly DO / Temp charts and why it is important to understand:

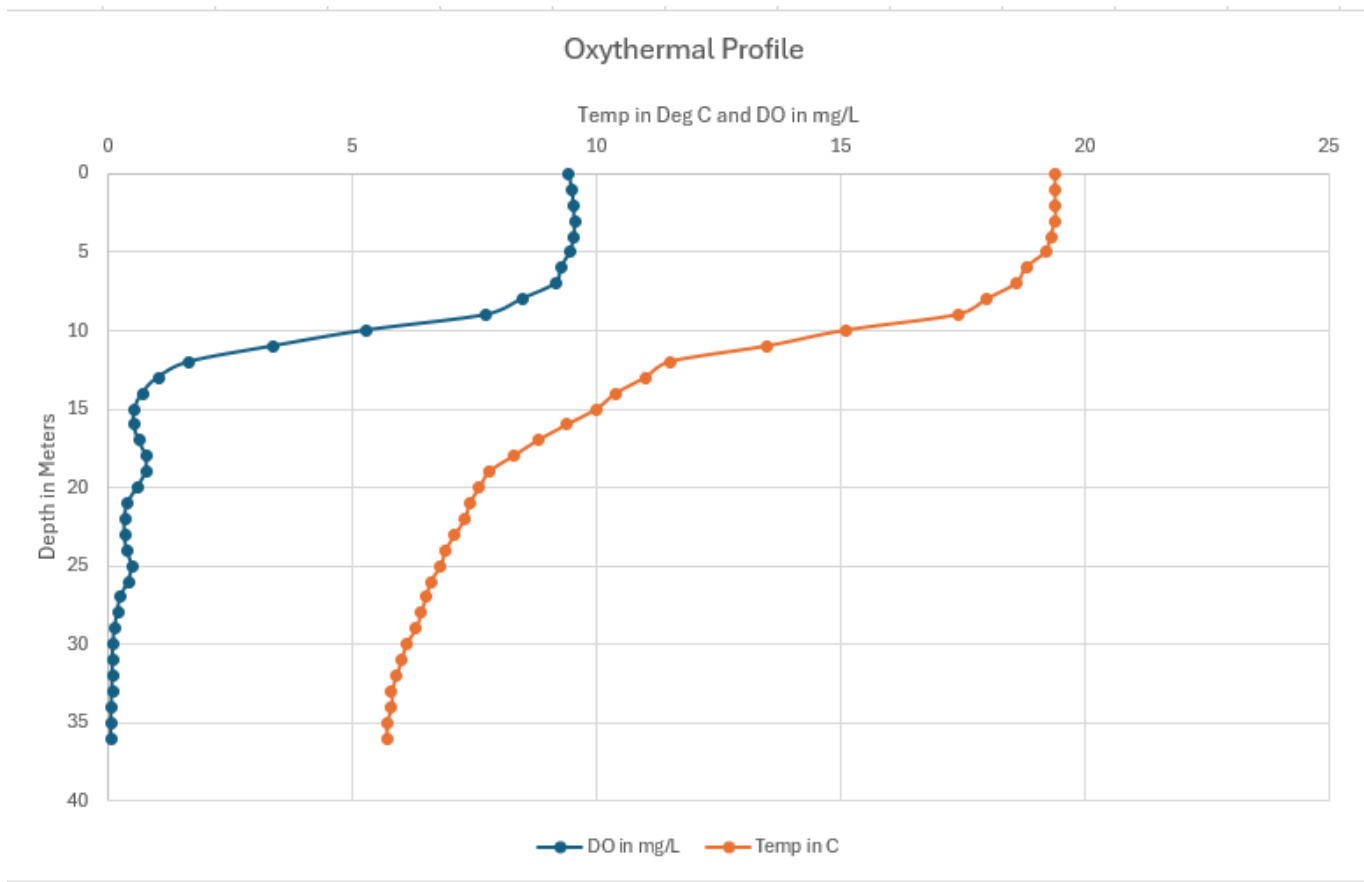
Cisco are the “canary in the gold mine” for DO and Temp requirements in a lake for cold-water fish. **Cisco need DO at 3 ppm or greater. Cisco need Temp below 68 degrees F (20 degrees C).** They do well in cold, deep lakes. Cisco are the preferred forage for our favored walleyes. Loons like them too. When cisco spawn in autumn, loons eat well before their long migration flight.

Our actions in the watershed and on our shorelines can help protect the lake water quality for the cisco by preventing runoff and erosion which can provide nutrients to wash into the lake and that cause excessive plant growth. Decaying plants in the lake where light is insufficient consume oxygen dissolved in the water.

This UMN article “Will lake warming in Minnesota drive cold-water fish to extinction?” Is very helpful in understanding the important variables.

<https://cse.umn.edu/safl/news/will-lake-warming-minnesota-drive-cold-water-fish-extinction>

Sept 2025 Fish happy with dissolved oxygen & temp down to 11 meters or 36 feet, then DO lower than Ideal

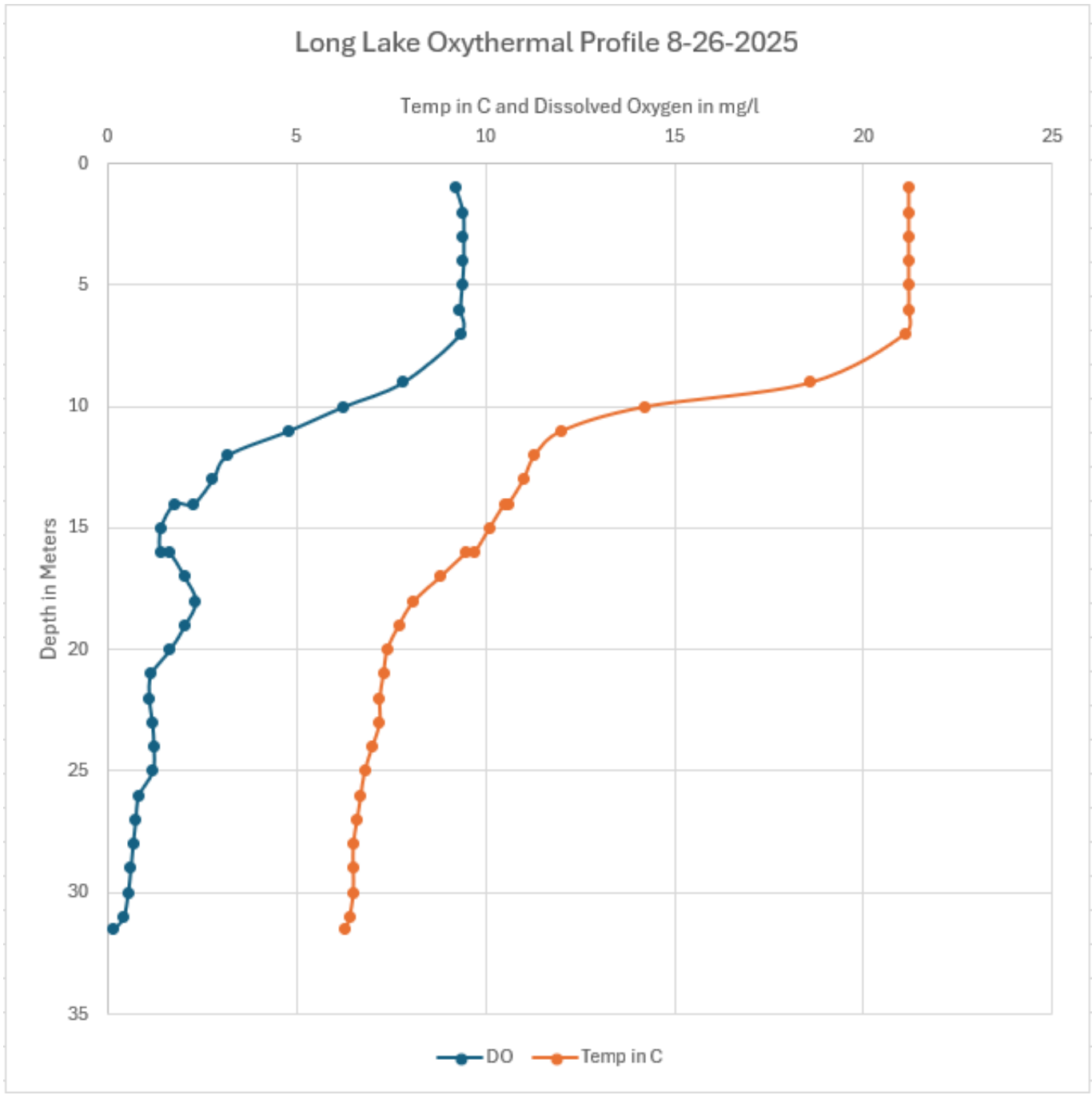


Sept 2025 Fish happy with dissolved oxygen & temp down to 11 meters or 36 feet, then DO lower than Ideal

Ideal
Not Ideal

Date	Time	Site	Unit ID	°C	mmHg	DO %	DO mg/L	SPC-uS/cm	pH	DEP m
9/15/2025	09:18:38AM	29*0161*00	Long	19.4	724	102.6	9.43	314.5	8.37	0
9/15/2025	09:19:09AM	29*0161*00	Long	19.4	724	103.4	9.5	314.6	8.33	1
9/15/2025	09:19:43AM	29*0161*00	Long	19.4	724	103.7	9.53	314.5	8.34	2
9/15/2025	09:20:22AM	29*0161*00	Long	19.4	724	103.8	9.55	314.5	8.38	3
9/15/2025	09:20:49AM	29*0161*00	Long	19.3	723.9	103.6	9.54	314.3	8.41	4
9/15/2025	09:21:24AM	29*0161*00	Long	19.2	724	102.4	9.46	315	8.41	5
9/15/2025	09:21:52AM	29*0161*00	Long	18.8	724.1	99.5	9.27	316.2	8.39	6
9/15/2025	09:22:15AM	29*0161*00	Long	18.6	724.1	98	9.16	315.9	8.38	7
9/15/2025	09:22:44AM	29*0161*00	Long	18	724	89.7	8.47	318.9	8.32	8
9/15/2025	09:23:11AM	29*0161*00	Long	17.4	724.1	80.9	7.74	323.7	8.16	9
9/15/2025	09:23:34AM	29*0161*00	Long	15.1	724.1	52.4	5.27	356.9	7.76	10
9/15/2025	09:23:58AM	29*0161*00	Long	13.5	723.9	32.5	3.38	369.6	7.56	11
9/15/2025	09:24:46AM	29*0161*00	Long	11.5	724	15.3	1.67	375.8	7.47	12
9/15/2025	09:25:10AM	29*0161*00	Long	11	724	9.3	1.03	376.7	7.45	13
9/15/2025	09:25:40AM	29*0161*00	Long	10.4	723.9	6.3	0.71	377.5	7.44	14
9/15/2025	09:26:06AM	29*0161*00	Long	10	723.9	4.9	0.55	377.4	7.43	15
9/15/2025	09:26:32AM	29*0161*00	Long	9.4	724.1	4.7	0.54	377.1	7.42	16
9/15/2025	09:26:57AM	29*0161*00	Long	8.8	723.9	5.4	0.63	376.8	7.41	17
9/15/2025	09:27:20AM	29*0161*00	Long	8.3	724	6.6	0.78	376.6	7.4	18
9/15/2025	09:27:54AM	29*0161*00	Long	7.8	724	6.5	0.78	376.4	7.38	19
9/15/2025	09:28:28AM	29*0161*00	Long	7.6	724.1	5.1	0.61	376.7	7.37	20
9/15/2025	09:28:51AM	29*0161*00	Long	7.4	724	3.4	0.41	376.7	7.36	21
9/15/2025	09:29:14AM	29*0161*00	Long	7.3	723.9	2.9	0.35	376.7	7.36	22
9/15/2025	09:30:58AM	29*0161*00	Long	7.1	724	2.9	0.35	376.8	7.35	23
9/15/2025	09:31:21AM	29*0161*00	Long	6.9	723.9	3.2	0.39	376.5	7.36	24
9/15/2025	09:32:14AM	29*0161*00	Long	6.8	723.9	4	0.49	376.4	7.35	25
9/15/2025	09:32:47AM	29*0161*00	Long	6.6	723.9	3.4	0.42	376.6	7.35	26
9/15/2025	09:33:09AM	29*0161*00	Long	6.5	723.9	2.1	0.26	377.3	7.34	27
9/15/2025	09:33:25AM	29*0161*00	Long	6.4	723.9	1.6	0.2	377.6	7.34	28
9/15/2025	09:33:57AM	29*0161*00	Long	6.3	723.9	1.1	0.14	378	7.34	29
9/15/2025	09:34:26AM	29*0161*00	Long	6.1	723.9	0.9	0.11	379	7.34	30
9/15/2025	09:34:45AM	29*0161*00	Long	6	723.9	0.8	0.1	379.9	7.33	31
9/15/2025	09:35:00AM	29*0161*00	Long	5.9	723.9	0.8	0.1	381.6	7.32	32
9/15/2025	09:35:25AM	29*0161*00	Long	5.8	723.8	0.7	0.09	382.9	7.32	33
9/15/2025	09:35:49AM	29*0161*00	Long	5.8	723.9	0.7	0.08	384	7.31	34
9/15/2025	09:36:26AM	29*0161*00	Long	5.7	723.8	0.6	0.07	387.8	7.27	35
9/15/2025	09:36:40AM	29*0161*00	Long	5.7	723.9	0.6	0.07	393.4	7.03	36

Aug 2025 Fish happy with dissolved oxygen & temp starting at 9 meters through 12 meters. So happy between 29 feet and 39 feet deep.



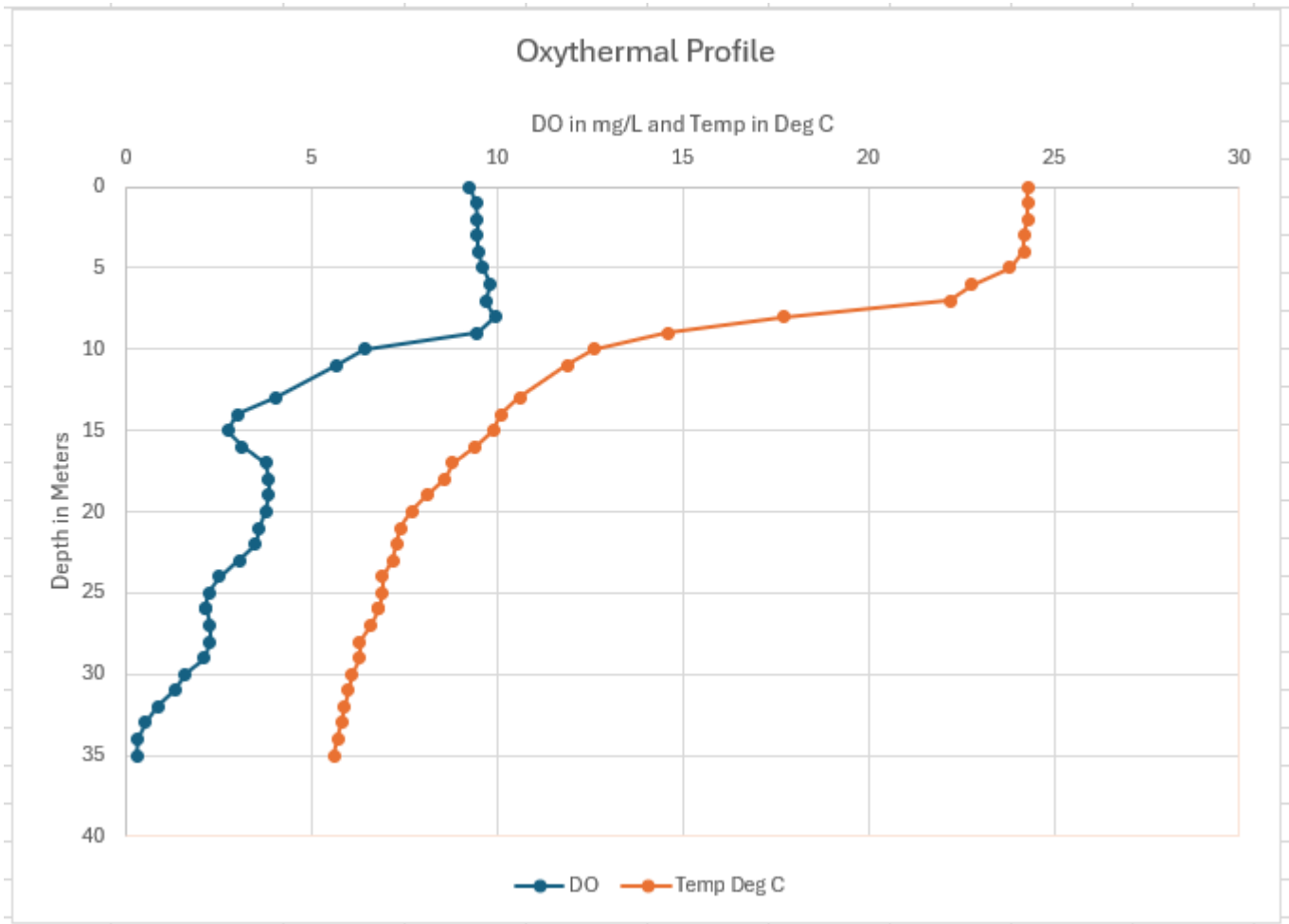
Aug 2025 Fish happy with dissolved oxygen & temp starting at 9 meters through 12 meters. So happy between 29 feet and 39 feet deep. Temp Limited down to 29 feet – too warm. Dissolved Oxygen Limited below 39 feet.

Ideal

Not Ideal

Date	Time	Site	°C	mmHg	DO %	DO mg/L	SPC-uS/cm	pH	DEP m
8/26/2025	09:17:44AM	29*0161*00 Long	21.2	730.1	103.6	9.2	309.2	8.25	1
8/26/2025	09:18:31AM	29*0161*00 Long	21.2	730.1	105.8	9.39	309.7	8.28	2
8/26/2025	09:18:49AM	29*0161*00 Long	21.2	730.1	106	9.41	309.7	8.27	3
8/26/2025	09:19:23AM	29*0161*00 Long	21.2	730.2	106	9.41	309.9	8.25	4
8/26/2025	09:19:51AM	29*0161*00 Long	21.2	730.1	105.5	9.37	310.4	8.26	5
8/26/2025	09:20:21AM	29*0161*00 Long	21.2	730	105	9.32	310.9	8.26	6
8/26/2025	09:20:49AM	29*0161*00 Long	21.1	730	104.9	9.33	310.6	8.25	7
8/26/2025	09:21:35AM	29*0161*00 Long	18.6	730.1	83.5	7.81	347.8	7.76	9
8/26/2025	09:22:16AM	29*0161*00 Long	14.2	730.1	60.8	6.24	368.7	7.59	10
8/26/2025	09:22:37AM	29*0161*00 Long	12	730.1	44.4	4.78	370.9	7.47	11
8/26/2025	09:23:02AM	29*0161*00 Long	11.3	730.2	29.1	3.18	371.9	7.37	12
8/26/2025	09:23:20AM	29*0161*00 Long	11	730	25.2	2.78	372.8	7.35	13
8/26/2025	09:23:42AM	29*0161*00 Long	10.6	730	20.4	2.26	373.8	7.32	14
8/26/2025	09:24:01AM	29*0161*00 Long	10.5	730.1	15.8	1.76	374.9	7.3	14
8/26/2025	09:24:23AM	29*0161*00 Long	10.1	730.1	12.4	1.4	375.5	7.29	15
8/26/2025	09:25:02AM	29*0161*00 Long	9.7	730.1	12.3	1.39	374.9	7.29	16
8/26/2025	09:25:39AM	29*0161*00 Long	9.5	730.1	14.3	1.63	374.2	7.29	16
8/26/2025	09:26:05AM	29*0161*00 Long	8.8	730.1	17.5	2.03	373	7.3	17
8/26/2025	09:26:25AM	29*0161*00 Long	8.1	730.1	19.7	2.33	373.2	7.3	18
8/26/2025	09:26:55AM	29*0161*00 Long	7.7	730.1	17.1	2.04	374.8	7.27	19
8/26/2025	09:28:12AM	29*0161*00 Long	7.4	730.1	13.8	1.65	373.8	7.22	20
8/26/2025	09:28:42AM	29*0161*00 Long	7.3	730.1	9.5	1.15	374.8	7.2	21
8/26/2025	09:29:08AM	29*0161*00 Long	7.2	730.1	9.1	1.1	374	7.2	22
8/26/2025	09:29:19AM	29*0161*00 Long	7.2	730	9.7	1.18	374	7.2	23
8/26/2025	09:30:43AM	29*0161*00 Long	7	730.1	10.1	1.22	374.2	7.22	24
8/26/2025	09:31:28AM	29*0161*00 Long	6.8	730.1	9.8	1.19	374.2	7.22	25
8/26/2025	09:33:07AM	29*0161*00 Long	6.7	730.1	6.7	0.82	374.3	7.21	26
8/26/2025	09:33:54AM	29*0161*00 Long	6.6	730.1	6	0.74	374.6	7.21	27
8/26/2025	09:34:38AM	29*0161*00 Long	6.5	730.1	5.5	0.67	374.8	7.21	28
8/26/2025	09:35:09AM	29*0161*00 Long	6.5	730.1	5	0.61	374.7	7.21	29
8/26/2025	09:35:26AM	29*0161*00 Long	6.5	730.2	4.4	0.54	375.1	7.21	30
8/26/2025	09:35:44AM	29*0161*00 Long	6.4	730.1	3.4	0.42	375.9	7.2	31
8/26/2025	09:37:46AM	29*0161*00 Long	6.3	730.1	1.3	0.16	381	7.14	31.5

July 2025 Fish happy with dissolved oxygen & temp starting at 8 meters through 23 meters. So happy between 26 feet and 75 feet deep.



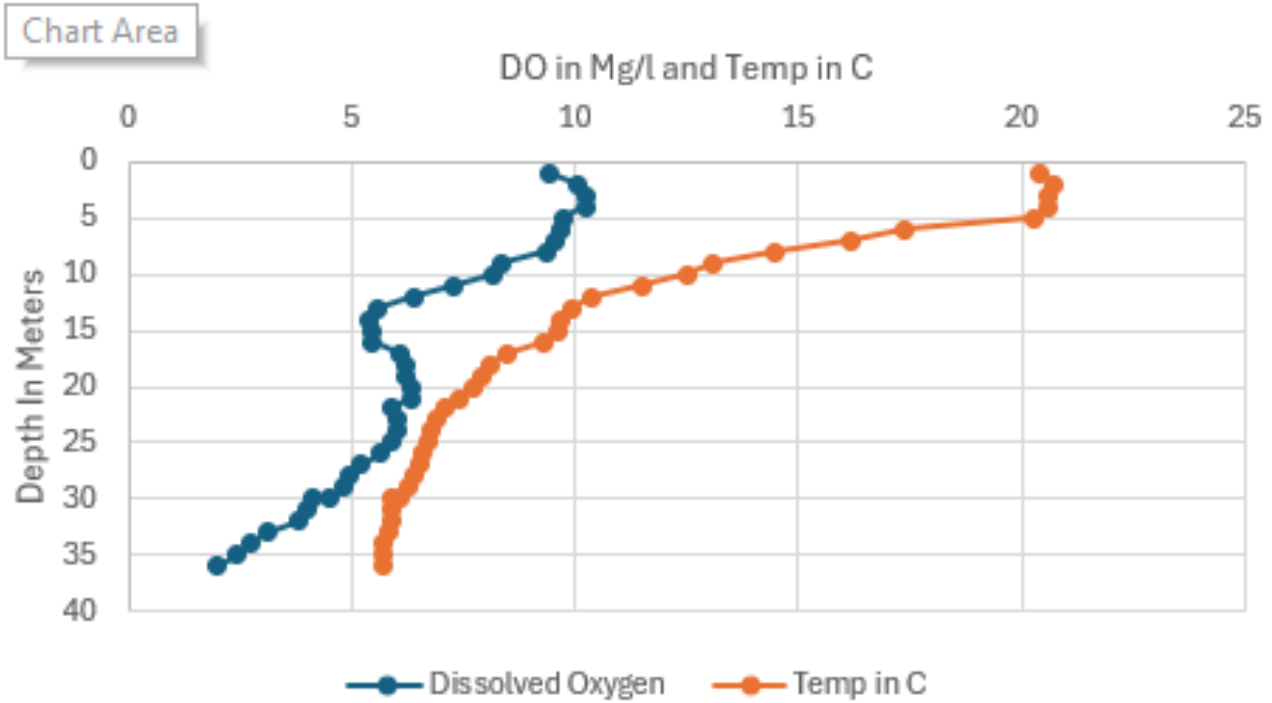
July 2025 Fish happy with dissolved oxygen & temp starting at 8 meters through 23 meters. So happy between 26 feet and 75 feet deep.

Temp Limited
Ideal Habitat
Oxygen Limited

Date	Time	Site	Unit ID	°C	mmHg	DO %	DO mg/L	SPC-uS/cm	pH	Depth in M
7/30/2025	09:15:43A	29*0161*00	Long	24.3	731.6	110.5	9.25	326.5	8.32	0
7/30/2025	09:16:17A	29*0161*00	Long	24.3	731.6	112.6	9.43	326.6	8.33	1
7/30/2025	09:16:30A	29*0161*00	Long	24.3	731.5	112.9	9.45	326.6	8.33	2
7/30/2025	09:16:46A	29*0161*00	Long	24.2	731.5	113.1	9.47	326.6	8.33	3
7/30/2025	09:17:01A	29*0161*00	Long	24.2	731.5	113.4	9.5	326.4	8.34	4
7/30/2025	09:17:18A	29*0161*00	Long	23.8	731.6	114	9.61	326.1	8.33	5
7/30/2025	09:17:35A	29*0161*00	Long	22.8	731.5	114	9.81	330.5	8.32	6
7/30/2025	09:17:51A	29*0161*00	Long	22.2	731.5	111.7	9.7	332.2	8.29	7
7/30/2025	09:18:09A	29*0161*00	Long	17.7	731.5	104.5	9.95	367.8	8.12	8
7/30/2025	09:18:37A	29*0161*00	Long	14.6	731.5	93.1	9.45	377.8	7.99	9
7/30/2025	09:19:22A	29*0161*00	Long	12.6	731.4	60.5	6.43	379.1	7.64	10
7/30/2025	09:19:36A	29*0161*00	Long	11.9	731.4	52.7	5.68	380.4	7.61	11
7/30/2025	09:20:36A	29*0161*00	Long	10.6	731.4	36.3	4.04	382.5	7.48	13
7/30/2025	09:21:07A	29*0161*00	Long	10.1	731.5	26.8	3.01	384	7.44	14
7/30/2025	09:21:29A	29*0161*00	Long	9.9	731.4	24.4	2.76	383.3	7.44	15
7/30/2025	09:22:15A	29*0161*00	Long	9.4	731.4	27.3	3.12	383	7.45	16
7/30/2025	09:22:51A	29*0161*00	Long	8.8	731.5	32.5	3.78	382	7.46	17
7/30/2025	09:23:00A	29*0161*00	Long	8.6	731.5	32.9	3.84	382.6	7.46	18
7/30/2025	09:23:17A	29*0161*00	Long	8.1	731.4	32.7	3.85	383.4	7.46	19
7/30/2025	09:23:47A	29*0161*00	Long	7.7	731.4	31.6	3.77	383.6	7.45	20
7/30/2025	09:24:26A	29*0161*00	Long	7.4	731.5	29.9	3.59	383.4	7.44	21
7/30/2025	09:24:52A	29*0161*00	Long	7.3	731.4	29.1	3.5	384.9	7.43	22
7/30/2025	09:25:03A	29*0161*00	Long	7.2	731.5	25.3	3.05	385.4	7.4	23
7/30/2025	09:25:20A	29*0161*00	Long	6.9	731.6	20.7	2.52	386.1	7.37	24
7/30/2025	09:25:34A	29*0161*00	Long	6.9	731.5	18.4	2.24	386	7.36	25
7/30/2025	09:25:58A	29*0161*00	Long	6.8	731.5	17.5	2.13	385.8	7.36	26
7/30/2025	09:26:24A	29*0161*00	Long	6.8	731.4	17.8	2.17	385.8	7.36	26
7/30/2025	09:26:51A	29*0161*00	Long	6.6	731.4	18.4	2.25	386.1	7.37	27
7/30/2025	09:27:14A	29*0161*00	Long	6.3	731.5	18.2	2.25	386.8	7.37	28
7/30/2025	09:27:33A	29*0161*00	Long	6.3	731.5	17.2	2.12	387.2	7.37	29
7/30/2025	09:28:05A	29*0161*00	Long	6.1	731.4	12.9	1.59	388.1	7.34	30
7/30/2025	09:28:21A	29*0161*00	Long	6	731.4	10.6	1.31	388.9	7.33	31
7/30/2025	09:28:45A	29*0161*00	Long	5.9	731.4	6.8	0.85	389.6	7.32	32
7/30/2025	09:29:07A	29*0161*00	Long	5.8	731.5	4.2	0.53	390.4	7.31	33
7/30/2025	09:29:39A	29*0161*00	Long	5.7	731.6	2.6	0.32	394.6	7.31	34
7/30/2025	09:29:50A	29*0161*00	Long	5.6	731.4	2.3	0.29	396.5	7.31	35

June 2025 Fish happy with dissolved oxygen & temp starting at 6 meters through 33 meters. So happy between 20 feet deep and 108 feet deep

Oxythermal Profile



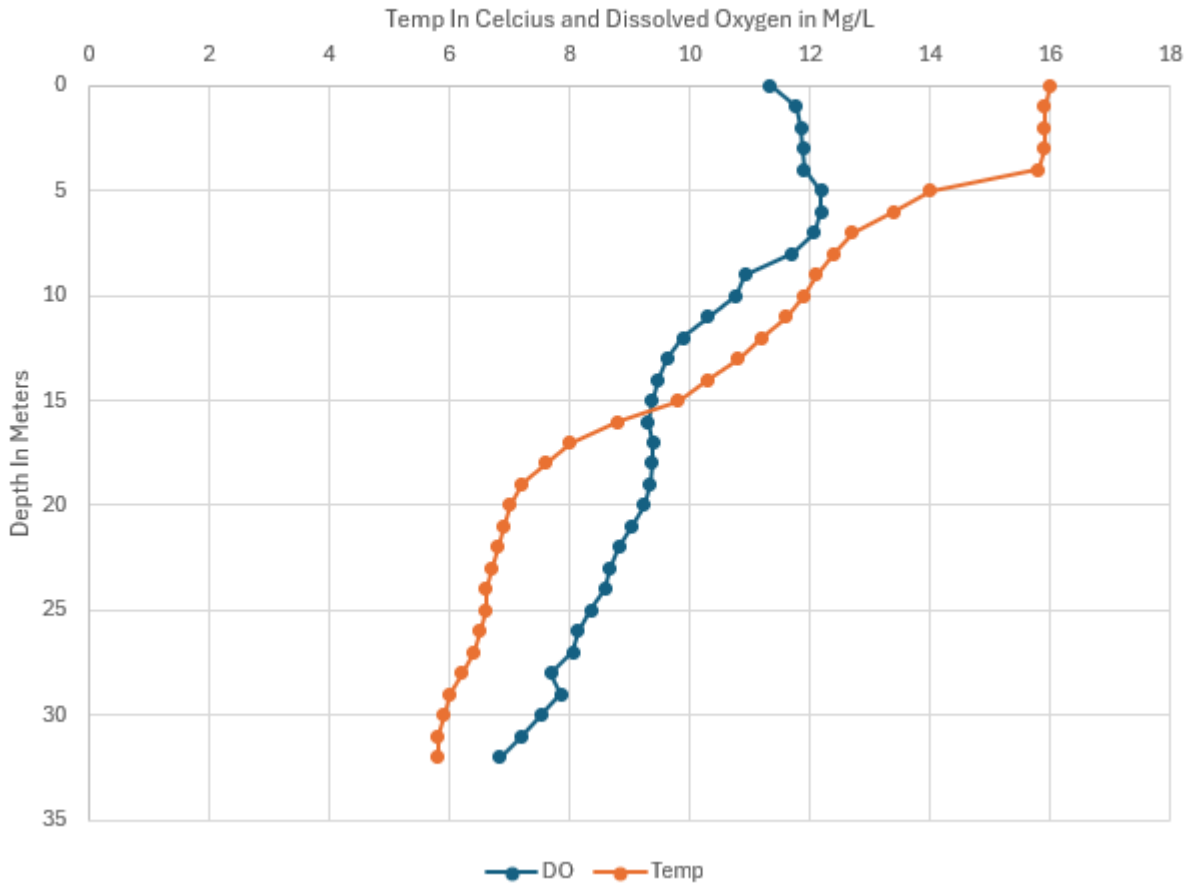
June 2025 Fish happy with dissolved oxygen & temp starting at 6 meters through 33 meters. So happy between 20 feet deep and 108 feet deep

Temp Limited
 Ideal Conditions
 Oxygen Limited

Date	Time	Site	°C	mmHg	DO %	DO mg/L	SPC-uS/cm	pH	DEP m
6/27/2025	01:21:47PM	29*0161*00 Long	20.4	723.8	104.3	9.41	367.4	8.76	1
6/27/2025	01:22:14PM	29*0161*00 Long	20.7	723.8	112.2	10.05	364.4	8.77	2
6/27/2025	01:22:43PM	29*0161*00 Long	20.6	723.7	114.3	10.25	364.6	8.76	3
6/27/2025	01:23:13PM	29*0161*00 Long	20.6	723.8	113.8	10.22	365	8.74	4
6/27/2025	01:23:50PM	29*0161*00 Long	20.3	723.7	107.8	9.73	368.4	8.64	5
6/27/2025	01:24:41PM	29*0161*00 Long	17.4	723.8	101.2	9.69	383.2	8.52	6
6/27/2025	01:25:01PM	29*0161*00 Long	16.2	723.8	97.4	9.56	388.9	8.49	7
6/27/2025	01:25:21PM	29*0161*00 Long	14.5	723.8	91.7	9.35	394.9	8.35	8
6/27/2025	01:26:01PM	29*0161*00 Long	13.1	723.8	79.6	8.37	398.4	8.22	9
6/27/2025	01:26:27PM	29*0161*00 Long	12.5	723.8	76.9	8.19	401.1	8.22	10
6/27/2025	01:26:50PM	29*0161*00 Long	11.5	723.8	67	7.29	402.2	7.99	11
6/27/2025	01:27:10PM	29*0161*00 Long	10.4	723.7	57.2	6.38	403.4	7.9	12
6/27/2025	01:27:35PM	29*0161*00 Long	9.9	723.8	49.6	5.61	403.8	7.81	13
6/27/2025	01:27:50PM	29*0161*00 Long	9.7	723.9	47.3	5.37	403.2	7.8	14
6/27/2025	01:28:13PM	29*0161*00 Long	9.6	723.7	47.9	5.46	402.8	7.8	15
6/27/2025	01:28:33PM	29*0161*00 Long	9.3	723.8	47.8	5.48	403.2	7.8	16
6/27/2025	01:29:13PM	29*0161*00 Long	8.5	723.7	52	6.08	402	7.82	17
6/27/2025	01:29:38PM	29*0161*00 Long	8.1	723.7	52.7	6.22	402.9	7.81	18
6/27/2025	01:29:58PM	29*0161*00 Long	7.9	723.8	52.1	6.18	402.7	7.8	19
6/27/2025	01:30:25PM	29*0161*00 Long	7.7	723.7	53.2	6.34	402.8	7.81	20
6/27/2025	01:30:45PM	29*0161*00 Long	7.4	723.7	52.8	6.33	403.4	7.8	21
6/27/2025	01:31:36PM	29*0161*00 Long	7.1	723.7	48.6	5.88	403.5	7.77	22
6/27/2025	01:31:50PM	29*0161*00 Long	6.9	723.7	49.6	6.02	403.4	7.78	23
6/27/2025	01:32:21PM	29*0161*00 Long	6.8	723.7	49.5	6.04	404	7.77	24
6/27/2025	01:32:48PM	29*0161*00 Long	6.7	723.6	48.2	5.89	404.7	7.76	25
6/27/2025	01:33:03PM	29*0161*00 Long	6.6	723.7	46.1	5.65	405.4	7.74	26
6/27/2025	01:33:28PM	29*0161*00 Long	6.5	723.7	42.2	5.19	406.1	7.72	27
6/27/2025	01:33:47PM	29*0161*00 Long	6.4	723.7	40.4	4.97	406.4	7.71	28
6/27/2025	01:34:03PM	29*0161*00 Long	6.3	723.8	39.2	4.84	406.5	7.7	29
6/27/2025	01:34:25PM	29*0161*00 Long	6.1	723.7	36.5	4.53	407.6	7.68	30
6/27/2025	01:34:59PM	29*0161*00 Long	5.9	723.7	33.1	4.13	407.7	7.66	30
6/27/2025	01:35:22PM	29*0161*00 Long	5.9	723.7	32.3	4.03	407.8	7.65	31
6/27/2025	01:35:40PM	29*0161*00 Long	5.9	723.7	30.5	3.81	408.5	7.64	32
6/27/2025	01:36:13PM	29*0161*00 Long	5.8	723.7	24.9	3.11	409.3	7.61	33
6/27/2025	01:36:56PM	29*0161*00 Long	5.7	723.7	21.9	2.74	409.1	7.6	34
6/27/2025	01:37:30PM	29*0161*00 Long	5.7	723.7	19.5	2.44	409.7	7.58	35
6/27/2025	01:38:06PM	29*0161*00 Long	5.7	723.7	15.8	1.98	412.9	7.57	36

May 2025 Fish happy with dissolved oxygen & temp no matter where they are in water!

Oxythermal Profile



May 2025 Fish happy with dissolved oxygen & temp no matter where they are in water!

Ideal Habitat

Date	Time	Site	Unit ID	°C	mmHg	DO %	DO mg/L	SPC-uS/cm	pH	DEP m
5/30/2025	09:09:47AM	29*0161*00	Long	16	724.1	114.8	11.33	374.7	8.49	0
5/30/2025	09:10:15AM	29*0161*00	Long	15.9	723.9	119.3	11.77	375	8.48	1
5/30/2025	09:10:29AM	29*0161*00	Long	15.9	724	119.9	11.85	375.1	8.48	2
5/30/2025	09:10:41AM	29*0161*00	Long	15.9	724.2	120.2	11.88	375.2	8.48	3
5/30/2025	09:10:54AM	29*0161*00	Long	15.8	724	120.2	11.9	375.3	8.47	4
5/30/2025	09:11:05AM	29*0161*00	Long	14	724.1	118.5	12.18	379.7	8.47	5
5/30/2025	09:11:18AM	29*0161*00	Long	13.4	724	116.9	12.19	373	8.46	6
5/30/2025	09:11:33AM	29*0161*00	Long	12.7	723.9	113.9	12.07	373.6	8.42	7
5/30/2025	09:12:07AM	29*0161*00	Long	12.4	724	109.7	11.7	374.4	8.38	8
5/30/2025	09:12:46AM	29*0161*00	Long	12.1	724.1	101.7	10.92	375.7	8.28	9
5/30/2025	09:12:58AM	29*0161*00	Long	11.9	724.1	99.9	10.76	376.6	8.26	10
5/30/2025	09:13:17AM	29*0161*00	Long	11.6	724.2	94.9	10.3	377.3	8.16	11
5/30/2025	09:13:42AM	29*0161*00	Long	11.2	723.9	90.1	9.88	377.4	8.07	12
5/30/2025	09:14:04AM	29*0161*00	Long	10.8	724	87	9.62	378.1	8	13
5/30/2025	09:14:17AM	29*0161*00	Long	10.3	723.9	84.6	9.47	378.7	7.86	14
5/30/2025	09:14:31AM	29*0161*00	Long	9.8	723.9	82.6	9.36	379	7.85	15
5/30/2025	09:14:55AM	29*0161*00	Long	8.8	724	80.2	9.3	379.3	7.81	16
5/30/2025	09:15:28AM	29*0161*00	Long	8	723.9	79.3	9.38	379.1	7.78	17
5/30/2025	09:15:40AM	29*0161*00	Long	7.6	723.9	78.4	9.36	379	7.78	18
5/30/2025	09:15:56AM	29*0161*00	Long	7.2	723.9	77.4	9.34	379.4	7.76	19
5/30/2025	09:16:14AM	29*0161*00	Long	7	723.9	76.1	9.23	379.6	7.74	20
5/30/2025	09:16:36AM	29*0161*00	Long	6.9	724	74.5	9.04	379.6	7.72	21
5/30/2025	09:16:54AM	29*0161*00	Long	6.8	724	72.4	8.81	380.5	7.7	22
5/30/2025	09:17:18AM	29*0161*00	Long	6.7	723.9	70.9	8.66	380.1	7.7	23
5/30/2025	09:17:33AM	29*0161*00	Long	6.6	723.9	70.3	8.59	380.8	7.69	24
5/30/2025	09:17:48AM	29*0161*00	Long	6.6	723.9	68.1	8.35	381.3	7.67	25
5/30/2025	09:18:19AM	29*0161*00	Long	6.5	723.9	66.2	8.13	381.3	7.67	26
5/30/2025	09:18:38AM	29*0161*00	Long	6.4	723.9	65.4	8.05	381.7	7.66	27
5/30/2025	09:19:03AM	29*0161*00	Long	6.2	723.9	62.2	7.69	382.9	7.63	28
5/30/2025	09:24:21AM	29*0161*00	Long	6	724	63.2	7.86	383.3	7.64	29
5/30/2025	09:24:34AM	29*0161*00	Long	5.9	724.1	60.3	7.52	383.9	7.62	30
5/30/2025	09:24:46AM	29*0161*00	Long	5.8	724	57.7	7.21	384.2	7.6	31
5/30/2025	09:25:05AM	29*0161*00	Long	5.8	724.1	54.6	6.83	384.4	7.58	32