Summary of Activities

Date: November 13th, 2018

To: Ian Kitch
MB Sustainable Development – Fisheries Branch
cc. Lloyd Rowe, Jonathon Stephens
SVSFE Board of Directors

From: Holly Urban, Brock Koutecky, Megan Paterson - Swan Valley Sport Fishing Enhancement Technical Staff

Contact Info:
swanvalleysportfish@gmail.com

Subject: 2018 Dissolved Oxygen Testing and Winterkill Investigations

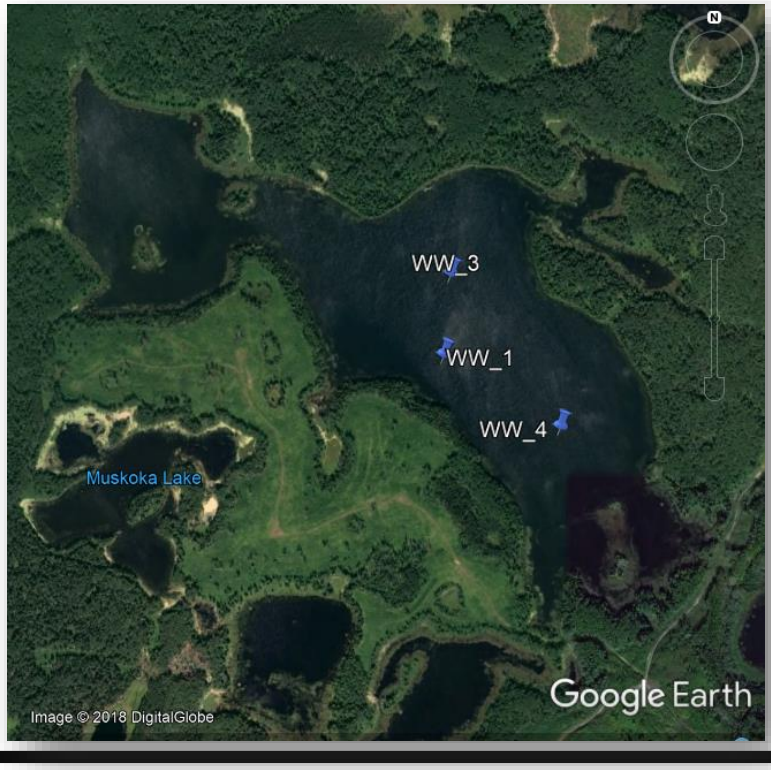
Locations:
- West Watjask Lake, East Watjask Lake, Mossberry Lake, Beautiful Lake, Line Lake & Black Beaver Lake, Duck Mountain Provincial Park, MB.
- Nick Lake & Gass Lake, Porcupine Provincial Forest.

Objective: During the winter of 2018, the Swan Valley Sport Fishing Enhancement board of directors requested technical staff to investigate the dissolved oxygen (DO) levels during the closed water season on various lakes within the Duck and Porcupine Mountains. Furthermore, the board requested any trout fisheries exhibiting low DO levels, that some form of reconnaissance work be completed in the spring. The results would assist in future stocking plans for 2018, provide collective data and offer insight on fish survival.

Summary: On March 23rd, 2018 DO testing was completed on West Watjask Lake, East Watjask Lake, Mossberry Lake and Beautiful Lake. On April 4th, 2018 levels were checked at Black Beaver following an investigation on Piasta Lake (see individual report). Line Lake was investigated on July 10th, 2018. On April 16th, 2018 surveys were completed on Gass and Nick Lake. Results are as follows:

West Watjask Lake: Dissolved oxygen profiles were collected at three sites replicated from previous years, site #1, #3 and #4. The average snow depth was 27cm with the average ice thickness of 82cm with little opaque ice between the three sites.

DO levels were fair for late in the season with an average of 3.5 mg/L at 2 meters below the surface. Levels were found to drop below 1 mg/L between 4 to 7 meters below the surface (Table 1).



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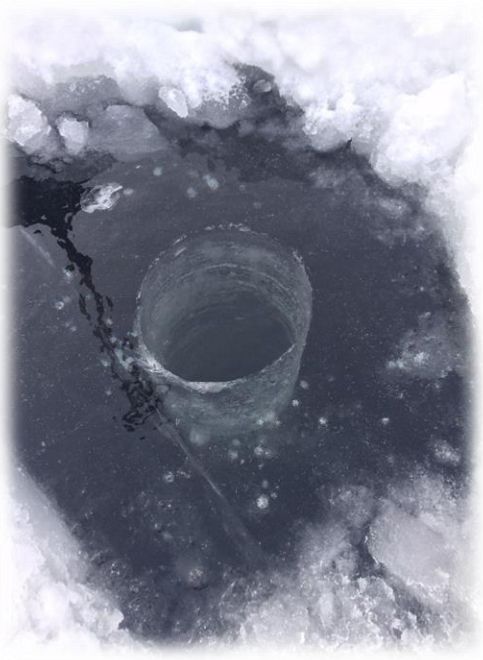
West Watjask Lake cont'd: Overall, good ice conditions (clear blue ice) and fair snow cover during the winter of 2018 resulted in good dissolved oxygen levels suitable for yellow perch and muskellunge survival.

Table 1: West Watjask DO Profile

Dissolved Oxygen Monitoring						
Waterbody	West Watjask					
Date (Y M D)	2018-03-23					
Time	10:00 AM		10:25:00 AM		10:50:00 AM	
Station (#)	1		3		4	
Coordinate (UTM)	330202		330229		330507	
	5725092		5725309		5724890	
Total Ice Thickness (cm)	90		70		85	
Opaque Ice Thickness(cm)	0		0		2	
Average Snow Depth(cm)	30		40		10	
Snow Cover (%)	100		100		100	
Maximum Water Depth (m)	13		11.5		4.5	
Oxygen Profile						
Depth (m)	mg/L	Temp °C	mg/L	Temp °C	mg/L	Temp °C
Surface (just under ice)	5.67	2.2	5.92	0.5	5.62	0.4
1.0 m depth	5.67	2.2	5.75	1	5.55	1.2
1.5 m depth						
2.0 m depth	3.27	3	3.41	2.9	3.9	2.8
2.5 m depth	1.34	3.4				
3.0 m depth	1.23	3.3	1.04	3.3	2.04	3
4.0 m depth	1.08	3.3	0.88	3.3	1.12	3.4
4.5 m depth						
5.0 m depth	1.03	3.3	0.87	3.3		
6.0 m depth	1	3.5	0.86	3.4		
7.0 m depth	0.98	3.5	0.88	3.4		
8.0 m depth	0.95	3.6	0.86	3.4		
9.0 m depth	0.95	3.7	0.85	3.3		
10 m depth	0.93	4	0.92	3.1		
11 m depth	0.92	4.2	0.91	3.7		



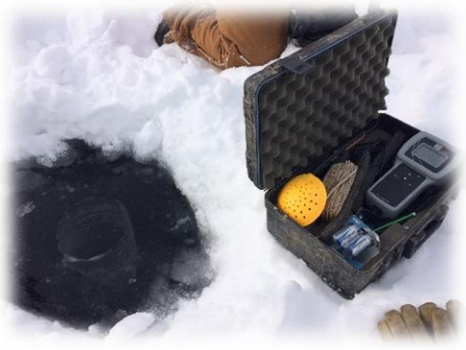


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Table 2: East Watjask DO Profile

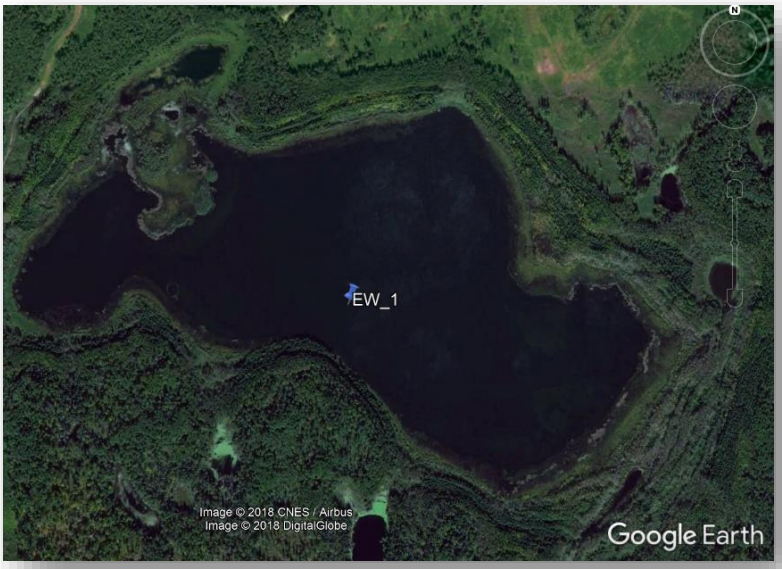
Dissolved Oxygen Monitoring	
Waterbody	East Watjask
Date (Y M D)	2017-03-15
Time	11:40 AM
Station (#)	1
Coordinate (UTM)	331723
	5724254
Total Ice Thickness (cm)	78
Opaque Ice Thickness(cm)	0
Average Snow Depth(cm)	43
Snow Cover (%)	100
Maximum Water Depth (m)	8.5

Oxygen Profile		
Depth (m)	mg/L	Temp °C
Surface (just under ice)	1.73	0.6
1.0 m depth	1.55	1.1
1.5 m depth		
2.0 m depth	1.13	3
3.0 m depth	1.01	3.8
4.0 m depth	0.97	3.9
5.0 m depth	0.92	4.2
6.0 m depth	0.91	4.3
7.0 m depth	0.88	4.3
8.0 m depth	0.85	4.4
8.5 m depth	0.83	4.5

East Watjask Lake: Dissolved oxygen profiles were collected at site #1, replicated from previous years. Ice conditions were not favorable (slush/water) at site #2, therefore no profile was collected. Results are listed in the Table 2.

Similar to its sister lake, East Watjask had little opaque ice. In contrary, DO levels were much lower. This is a similar trend to other years. Levels ranged from 1.73 to 1.01 mg/L in the first three meters.

Yellow perch are the only game fish present at this time. Perch have been found to be more tolerant of low dissolved oxygen levels and may be able to survive winterkill conditions better than other panfish species (Herman et al. 1959). If introducing another game species becomes a priority in future years, managers should consider a fish which can tolerate low dissolved oxygen levels.



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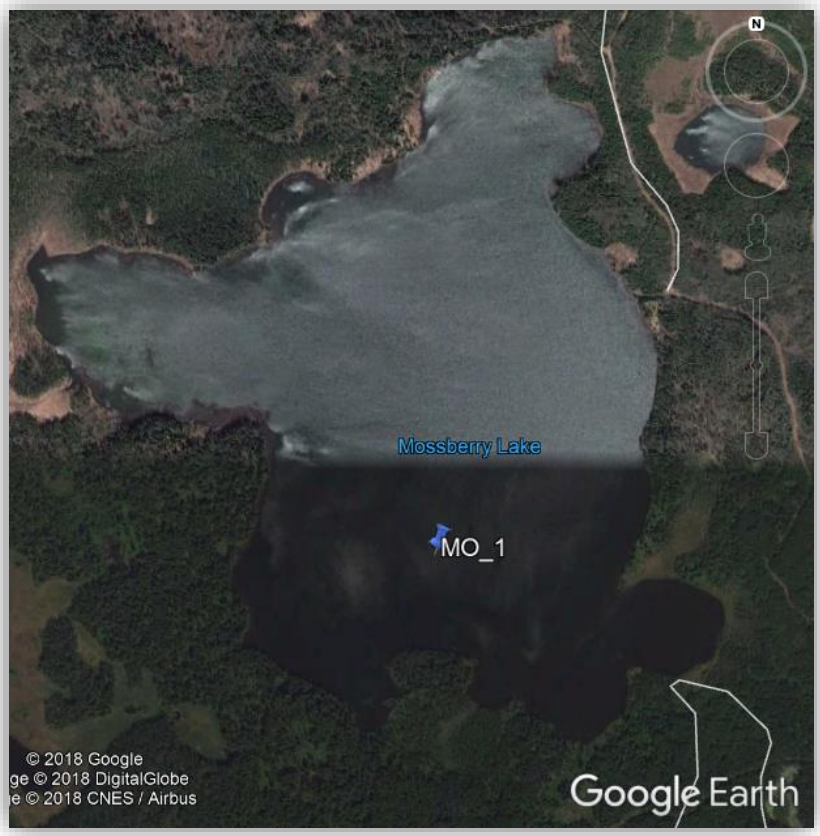
Mossberry Lake: One dissolved oxygen profile was collected at the deepest point on Mossberry Lake. Results are listed in the table below. DO levels remained favorable at 2.5 to 6 mg/L in the first two meters below the surface and did not drop below 1 mg/L. It is anticipated the recently stocked walleye would fair well under these conditions.

Table 3: Mossberry DO Profile

Dissolved Oxygen Monitoring		
Waterbody	Mossberry Lake	
Date (Y M D)	2017-03-23	
Time	3:15 PM	
Station (#)	1	
Coordinate (UTM)	360673	
	5719030	
Notes	Deep Hole	
Total Ice Thickness (cm)	78	
Opaque Ice Thickness(cm)	10	
Average Snow Depth(cm)	26	
Snow Cover (%)	100	
Maximum Water Depth (m)	5.4	
Oxygen Profile		
Depth (m)	mg/L	Temp °C
Surface (just under ice)	6.01	1.1
1.0 m depth	5.65	1.8
1.5 m depth	4.7	2.9
2.0 m depth	2.54	3.5
2.5 m depth		
3.0 m depth	1.4	3.8
4.0 m depth	1.33	3.6
4.5 m depth		
5.0 m depth	1.28	3.7



Summary of Activities

Subject: 2018 Dissolved Oxygen Testing and Winterkill Investigations

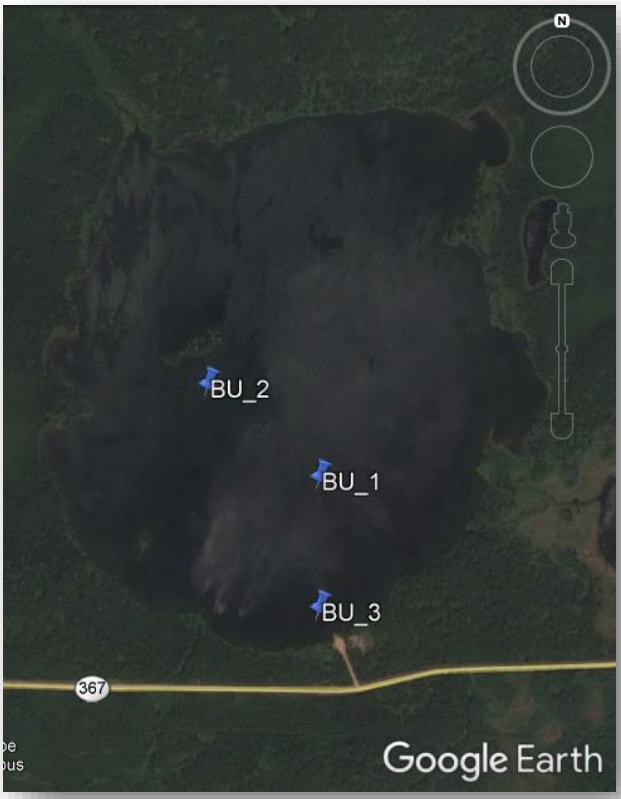
Beautiful Lake: Dissolved oxygen profiles were replicated at three pre-established sites. These sites were determined by Fisheries Branch years previous (see figure). Between the three sites, the average snow depth was 32 cm with the average ice thickness of 75 cm with minimal opaque ice.

DO levels varied by site. The highest level of dissolved oxygen at 2.6 mg/L was found near the deep hole. This level was slightly below the tolerable parameters for walleye and trout and only within the first meter of water. The other two sites exhibited levels of 1.8 mg/L or less, not favorable for fish survival (Table 4). Levels at this rate indicated winterkill conditions in the past and it was believed fish survival would be minimal.

Table 4: Beautiful Lake DO Profile

Dissolved Oxygen Monitoring			
Waterbody	Beautiful Lake		
Date (Y M D)	2017-03-23		
Time	1:50 PM	2:15:00 PM	2:30:00 PM
Station (#)	1	2	3
Coordinate (UTM)	361386	361105	361375
	5714149	5714395	5713813
Notes	Deep Hole	Island	Boat Launch
Total Ice Thickness (cm)	78	62	85
Opaque Ice Thickness(cm)	3	2	2
Average Snow Depth(cm)	25	31	39
Snow Cover (%)	100	100	100
Maximum Water Depth (m)	18+	3.5	3.2

Oxygen Profile						
Depth (m)	mg/L	Temp °C	mg/L	Temp °C	mg/L	Temp °C
Surface (just under ice)	2.6	0.8	1.8	0.3	1.55	1.1
1.0 m depth	2.42	1.2	1.3	1.9	1.46	1.7
1.5 m depth						
2.0 m depth	1.57	3.5	0.88	3.3	1.2	3
2.5 m depth			0.78	3.6		
3.0 m depth	1.4	3.9			0.82	4
4.0 m depth	1.31	4.1				
4.5 m depth						
5.0 m depth	1.16	4.1				
6.0 m depth	1.1	4.1				
7.0 m depth	1.06	4.2				
8.0 m depth	1.02	4.2				
9.0 m depth	1	4.2				
10 m depth	0.95	4.2				
11 m depth	0.93	4.3				
12 m depth	0.92	4.4				
13 m depth	0.89	4.4				
14 m depth	0.86	4.4				



Following the DO testing and reports from anglers observing dead walleye under the ice (via fish cameras), it was determined to follow up with an investigation to determine the degree of winterkill.

Summary of Activities

Subject: 2018 Dissolved Oxygen Testing and Winterkill Investigations

Beautiful Lake cont'd: On May 31st, 2018, short-set gill nets were set at two different locations in efforts to catch fish which may have survived the winter (BU-GI-001 & 002). Nets were fished for 1.5 hours and set in depths ranging from 0.5 – 3.5 m. One walleye measuring 250 mm was caught at site #001 near the island. Angling was also executed, with no bites.

On September 11th, 2018, technicians utilized the Smith-Root electrofishing boat to further determine walleye survival. Beautiful Lake was not stocked with fry in the spring as it was recommended to give the lake "a break" for a year and the project would transfer walleye overwintered from last year's stocking. The goal was to move walleye to Beaver Lake, one of the main recipient lakes from the annual transfer project. Areas along the island and west/northwest shore were sampled (BU-ES). This area typically yields high catches of walleye, but came up empty netted.

Technicians did catch several healthy rainbow and brown trout (Table 5). All were recently stocked trout (18+cm) from the spring of 2018 and displayed exceptional growth. Between the spring and fall investigations, it was determined Beautiful Lake experienced winterkill with abundant die-offs and little survival over the winter of 2018. This is unfortunate as there were sizable trout present in 2017 (up to 500mm) and a fair population of walleye within the system that could have been transferred in 2018. On the lighter side, the decrease in biomass and competition for future stocked fish may provide an adequate break the lake requires to continue providing this multi-purpose fishery; a fishery which can rear walleye while creating a trophy trout destination.

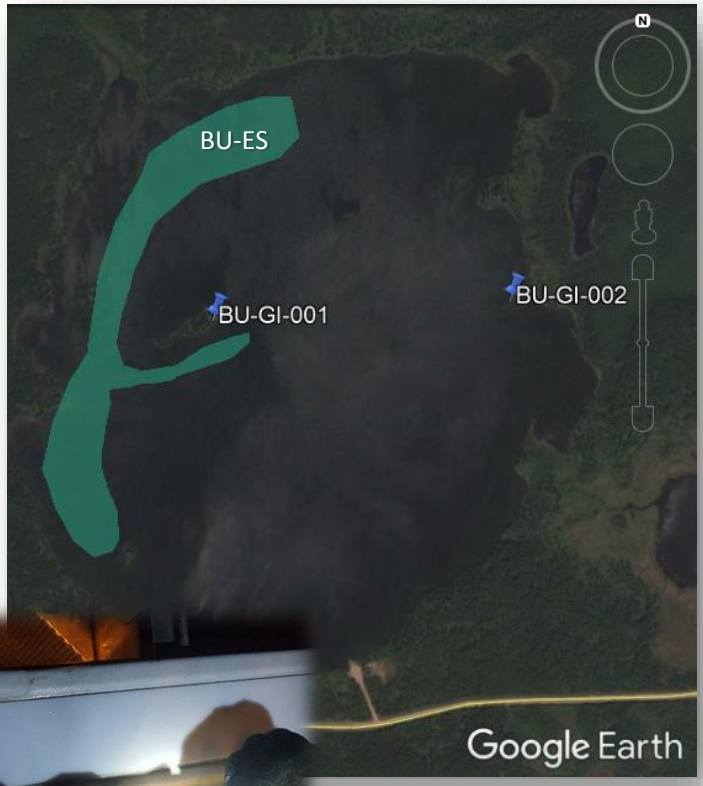
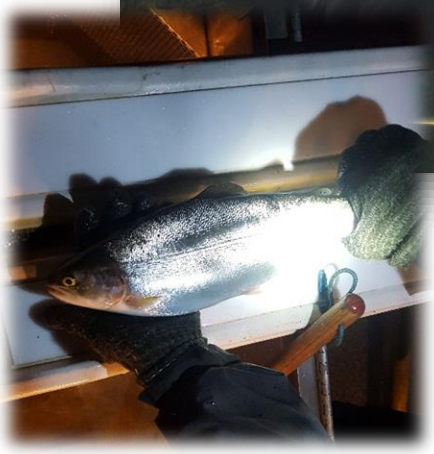


Table 5: Beautiful Lake Trout

Fish #	Species	Fork Length
BU-18-0002	RNTR	334
BU-18-0003	RNTR	309
BU-18-0004	RNTR	289
BU-18-0005	RNTR	300
BU-18-0006	RNTR	330
BU-18-0007	BNTR	257
BU-18-0008	BNTR	280
BU-18-0009	BNTR	280



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Subject: 2018 Dissolved Oxygen Testing and Winterkill Investigations

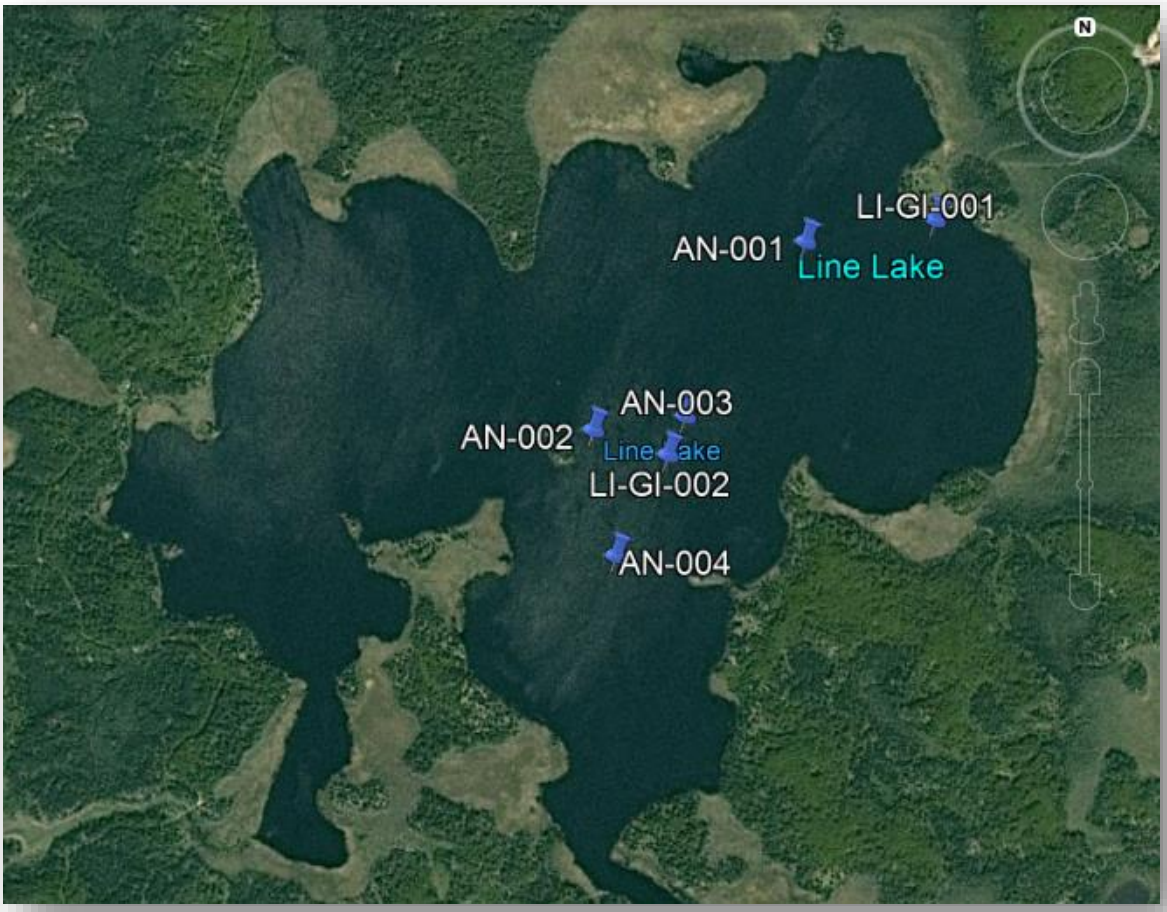
Line Lake: Due to time restrictions and unfavourable ice conditions, dissolved oxygen testing was not completed on Line Lake in 2018. There were reports of poor angling quality in the later half of the winter, therefore the SVSFE board requested technicians evaluate fish survival. The lake was scheduled for a bathymetry survey, therefore technicians included the investigation during the July survey.

On July 10th, 2018 two standard gang gill nets (LI-GI-001 & 002) were set for 2 and 1.6 hours respectively (figure). In addition, technicians angled various locations while mapping and while nets were fishing in efforts to assess the pike survival.

No pike were caught in gill nets but several were angled (Table 6). The fish were similar in size ranging from 455 – 555 mm and were noted as healthy. It is suspected dissolved oxygen levels were low over the winter, but pike populations remain present.

Table 6: Line Lake northern pike

Fish #	Species	Fork Length	Total Length	Site
LI-18-0001	NRPK	555	595	AN-001
LI-18-0002	NRPK	500	535	AN-002
LI-18-0003	NRPK	455	480	AN-004
LI-18-0004	NRPK	548	585	AN-004



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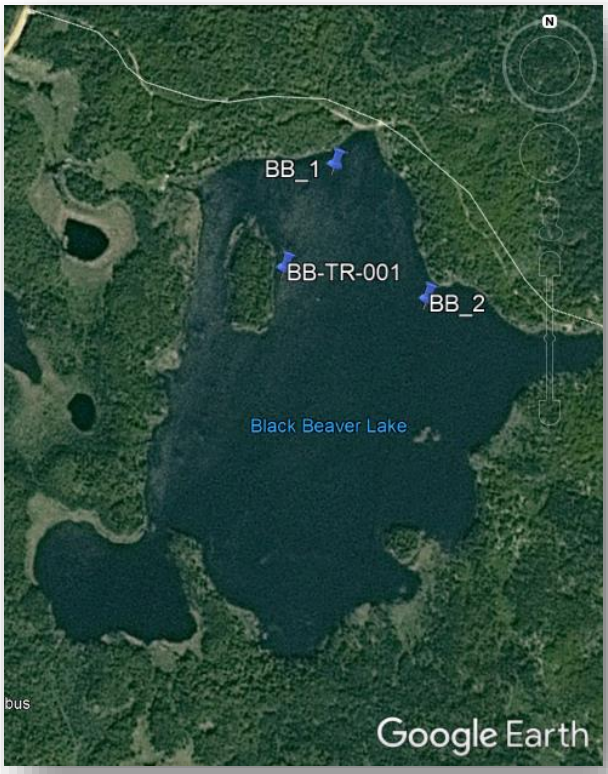
Subject: 2018 Dissolved Oxygen Testing and Winterkill Investigations

Black Beaver Lake: Dissolved oxygen profiles were collected at two locations on April 4th, 2018; BB_1 - the north shore and BB_2 – Palmer's Point. These sites typically yield fair to excellent DO levels compared to any other locations on the lake. Results are listed in the table below.

The snow depth was minimal at 10 cm, but the ice was thick at both sites and average of 31 cm of opaque ice, limiting sunlight penetration below the surface. In addition, there were several areas of the lake that had a deep layer of slush.

Table 7: Black Beaver DO Profile

Dissolved Oxygen Monitoring				
Waterbody	Black Beaver Lake			
Date (Y M D)	2018-04-04			
Total Ice Thickness (cm)	80		90	
Opaque Ice Thickness(cm)	25		37	
Average Snow Depth(cm)	10		10	
Snow Cover (%)	100		100	
Maximum Water Depth (m)	1.8		2.5	
Station (#)	1		2	
Comment	North Shore		Palmer's Point	
Coordinate (UTM)	14 U 369694 5738021		14 U 369890 5737718	
Oxygen Profile				
Depth (m)	p.p.m	Temp °C	p.p.m	Temp °C
Surface (just under ice)	1.68	0.5	1.3	1.3
1.0 m depth	1.73	1.2		
1.5 m depth	1.72	2.2	1.1	4.2



Following the DO testing and reports of poor angling quality, it was suggested to complete a complementary investigation to determine the degree of possible winterkill.

On July 4th, 2018, technicians set one overnight small mesh (1/4") trap net on the northeast side of the island (BB-TR-001). The trap fished for 20.5 hours. Results indicate low survival of the existing trout population. A total of 13 small brook trout were caught ranging from 150 – 187 mm. All brook trout caught were from the May 31st stocking.

Due to time restraints, technicians were unable to conduct additional investigations (angling and/or gill netting), but were fairly confident that the lake experienced a degree of winterkill with minimal trout survival.

Summary of Activities

Subject: 2018 Dissolved Oxygen Testing and Winterkill Investigations

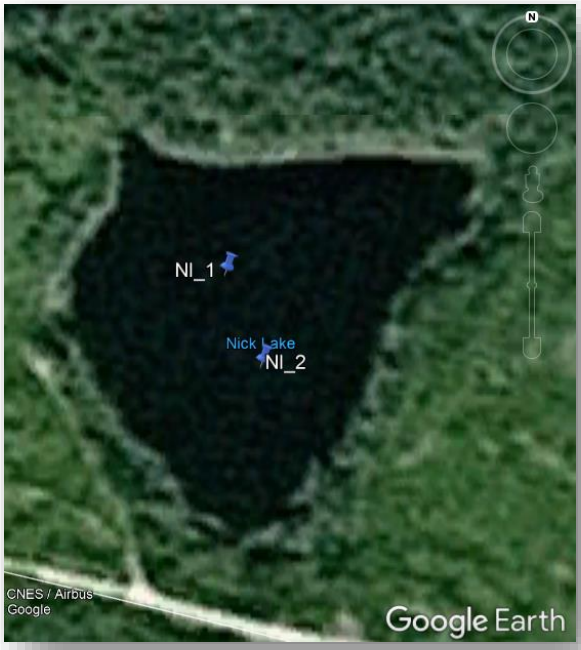
Nick Lake: Dissolved oxygen profiles were collected at two locations on April 16th, 2018 (NI_1 & NI_2) to provide collective data on the small, 3.4 hectare trout fishery. Results are listed in the table below.

The average snow depth was minimal at 13.5 cm, but there was a significant amount of opaque ice occupying approximately 50% of the total ice.

Levels just below the surface were near the lowest tolerable for trout, and dropped near or below 1 mg/L at approximately 2 meters.

Table 8: Nick Lake DO Profile

Dissolved Oxygen Monitoring				
Waterbody	Nick Lake			
Date (Y M D)	2018-04-16			
Total Ice Thickness (cm)	80		75	
Opaque Ice Thickness(cm)	40		38	
Average Snow Depth(cm)	15		12	
Snow Cover (%)	100		100	
Maximum Water Depth (m)	9.2		4.2	
Station (#)	1		2	
Coordinate (UTM)	14 U 335010 5831987		14 U 335028 5831936	
Oxygen Profile				
Depth (m)	p.p.m	Temp °C	p.p.m	Temp °C
Surface (just under ice)	3.35	0.5	3.8	0.4
1.0	1.85	2.8	2.08	2.8
2.0	1.02	3.4	0.9	3.4
2.5			0.84	3.5
3.0	0.81	3.5		
4.0	0.79	3.6		
5.0	0.76	3.6		
6.0	0.74	3.6		
7.0	0.74	3.6		
8.0	0.74	3.6		



Results are comparative to 2016 tests, supporting the idea, even though Nick Lake is fairly deep for its size (>16m deep), the lake offers only a portion of the epilimnetic zone as refuge for trout during the late winter. The 2018 testing was completed fairly late in the year and should provide insight on the lower range of DO levels.

The lake appears it could support trout but with a high probability of winterkill. Therefore, future stocking rates should remain low.

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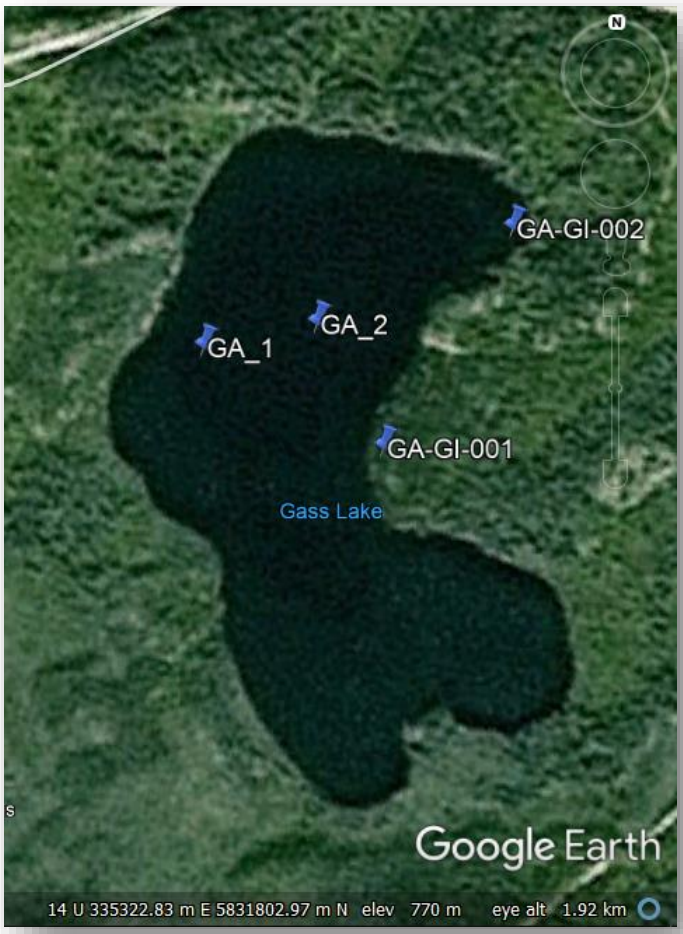
Gass Lake: Gass Lake is one of two established tiger trout fisheries in the Western Region. Dissolved oxygen profiles were collected at two locations on April 16th, 2018 (GA_1 & GA_2) to evaluate conditions over the winter of 2018. Results are listed in the Table 9.

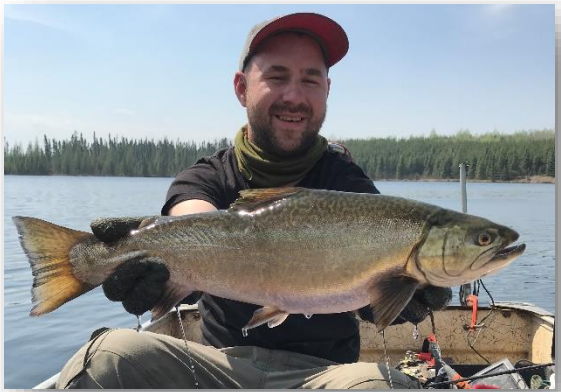
The average snow depth was 10 cm, over a thick layer of ice (80 cm), with 33 cm of opaque ice. DO levels at both sites, were below the tolerable levels for trout, indicating high chance of winterkill.

It was suggested to follow up with an investigation to determine the degree of winterkill. Upon arrival on May 22nd, 2018 technicians noted many gulls in the area and fish remains in the shallows.

During investigations, two short-set gill nets (GA-GI-001 & GA-GI-002) were set in depths ranging from 0.2 - 8.8 m and fished for 1 and 1.5 hours, respectively. Both nets yielded zero fish.

As the nets were fishing, technicians angled while conducting a shoreline cruise. It was presumed the lake had suffered a severe winterkill. Surprisingly, two master angler tiger trout were angled; one male measuring 510 mm and one female at 500 mm. It was evident that the lake did undergo a severe die-off, but as luck would have it, there are always a few that survive.





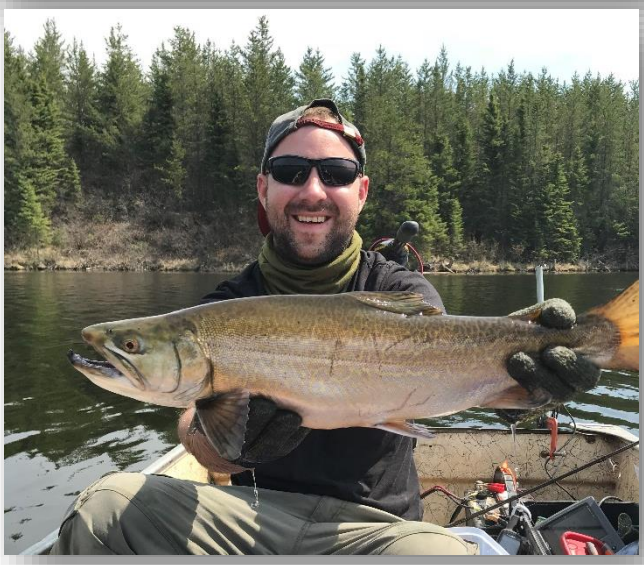


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Table 9: Gass Lake DO Profile

Dissolved Oxygen Monitoring				
Waterbody	Gass Lake			
Date (Y M D)	2018-04-16			
Total Ice Thickness (cm)	80		80	
Opaque Ice Thickness(cm)	35		31	
Average Snow Depth(cm)	10		10	
Snow Cover (%)	100		100	
Maximum Water Depth (m)	3.5		12	
Station (#)	1		2	
Comments	West Shore		Deep Hole	
Coordinate (UTM)	14 U 335534 5831523		14 U 335632 5831543	
Oxygen Profile				
Depth (m)	p.p.m	Temp °C	p.p.m	Temp °C
Surface (just under ice)	2.65	0.4	2.37	1
1.0 m depth	1.6	1.9	1.82	2
2.0 m depth	1.48	2	1.39	2.7
3.0 m depth			1.34	2.9
4.0 m depth			1.32	3.2
5.0 m depth			1.32	3.2
6.0 m depth			1.32	3
7.0 m depth			1.31	3
8.0 m depth			1.31	3
9.0 m depth			1.29	3
10.0 m depth			1.28	3.1
11 m depth			1.28	3.1
12 m depth			1.28	3.1