Guidance from WDNR Fisheries Biologist Joseph Gerbyshak

Attached are the dissolved oxygen measurements from 2018-2019 in and adjacent the County Forest. There are many lakes that are prone to winterkill in the county forest, so WDNR typically monitors a few of the higher profile lakes in the area such as North Shattuck, South Shattuck, Horseshoe, Townline, Riley, Triple, Two Island, Plummer, and Firth. Typically dissolved oxygen measurements are taken late into the winter just prior to ice-off because that is when dissolved oxygen levels are lowest. Based on those measurements WDNR then goes back to evaluate via electrofishing after ice-off to see if any fish survived and whether there are enough to repopulate the lake.

As far as the data from fish surveys for winterkill investigations, fish are not collected, just observed and recorded. This allows WDNR to complete surveys on multiple lakes in the same day. The data recorded are just what species were observed and if they were abundant or scarce.

Just because the dissolved oxygen measurements are low, it doesn't mean a complete winterkill will occur. For example, based on the dissolved oxygen measurements on Plummer Lake last year it appeared there was no oxygen left in the lake and complete winter kill was expected; however, survey results showed plenty of fish, so the fish found refuge where there was oxygen somewhere in the lake. In and adjacent to County Forest last year WDNR stocked North Shattuck, Horseshoe, Townline and Riley because, based on survey results, those lakes were pretty much a complete kill.

Typically, bass and bluegill will succumb to dissolved oxygen measurements below of 2.0mg/l. The measurement at the first foot below the ice is generally disregarded because it is likely influenced by atmospheric oxygen from drilling the hole. Lakes that have dissolved oxygen levels less than 2.0mg/l from a depth of 2ft and greater are determined not to have enough dissolved oxygen to support bass and bluegill.

Dissolved oxygen levels start decreasing at the bottom first then gradually increase up the water column as winter progresses. This is the reason that later in the winter anglers will only be able to catch fish high in the water column or right below the ice. Dissolved oxygen levels are lowest at the bottom of the lake due to organic matter, mainly vegetation, decomposing. The sooner a lake freezes up and the quicker the aquatic vegetation dies, the more prone a lake is to winterkill. Heavy snow cover will block light from penetrating through the ice, which will kill aquatic vegetation quicker and lakes with more aquatic vegetation will consume more oxygen once they die. However, open water caused by springs or inlets or outlets will allow oxygen to enter the lake throughout the winter months making it less likely to winterkill.

Based on the dissolved oxygen measurements that were taken a few weeks ago, it looks like many of the lakes in the County Forest may have winterkilled again. WDNR will follow up with surveys later this spring or summer when things get back to normal. If these lakes continue to winterkill on a frequent basis, then it is not a good use of funds to continue with stocking efforts.

Aeration is a good method to prevent winterkill from occurring. The initial setup, ongoing maintenance and electrical costs are just a few things to consider when contemplating whether to install an aeration system. Lakes where aeration would be the 'biggest bang for your buck' are usually relatively large and already have recreational infrastructure developed on that waterbody.

Dissolved Oxygen Investigation

Waterbody _____ **County** CHIPPEWA

Investigation Date 3-19-19 **Investigator** ANDRG, HACKER

Location	Water Depth	Dissolved Oxygen	Water Temp	Snow Depth	Ice Thickness
TRIPLE ~~LAKES~~	UNDER ICE	4.0 mg/l	32.9 °F	1"	24"
	1'	3.0 "	34.5		
	2'	1.6	36.3		
	4'	0.9	38.1		
	6'	0.3	38.9		
RILEY	UNDER ICE	1.1	32.8	2"	25"
	1'	0.4	34.6		
	2'	0.5	36.0		
	3'	0.3	37.2		
TOWNLINE	UNDER ICE	0.9	33.7	5"	25"
	1'	0.4	35.5		
	2'	0.3	36.4		
	4'	0.2	38.7		
HORSESHOE	UNDER ICE	3.7	33.0	1"	24"
	1'	1.0	34.4		
	2'	0.4	35.5		
	3'	0.3	37.0		
	5	0.2	38.8		

Dissolved Oxygen Investigation

Waterbody _____ **County** CHIPPEWA

Investigation Date 3-19-19 **Investigator** ANDRE, HACKER

Location	Water Depth	Dissolved Oxygen	Water Temp	Snow Depth	Ice Thickness
S. Shattuck	UNDER ICE	4.4 mg/l	33.7 °F	1"	23"
	1'	2.0	35.9		
	2'	0.8	38.8		
	4'	0.7	39.1		
	6'	0.6	39.2		
KNICKERBACKER	UNDER ICE	3.6	33.3	0.5"	25"
	1'	3.8	34.7		
	2'	2.4	36.0		
	4'	1.0	37.7		
	6'	0.4	38.4		
TWO ISLAND	UNDER ICE	5.2	33.8	1"	23"
	1'	3.4	36.7		
	2'	1.6	39.3		
	4'	1.5	39.3		
	6'	1.5	39.3		
	8'	1.4	39.3		
	10'	1.4	39.3		
	12'	1.2	39.4		
	14'	0.7	39.6		

Dissolved Oxygen Investigation

Waterbody _____ **County** CHIPPEWA

Investigation Date 3-19-19 **Investigator** ANDRES, HACKER

Location	Water Depth	Dissolved Oxygen	Water Temp	Snow Depth	Ice Thickness
PLUMMER	UNDER ICE	0.9	33.0	1"	25"
	1'	0.5	35.3		
	2'	0.3	36.7		
	4'	0.3	38.0		
FIRTH	UNDER ICE	4.1	35.2	2"	23"
	1'	3.7	36.0		
	2'	1.8	36.7		
	3'	1.5	37.2		
	5'	0.3	38.5		
	7'	0.2	39.4		