Little Pickerel Lake Aeration Implementation Project – Final Report WDNR Lake Protection Grant LPT53917

Introduction:

This is the final report for the completion of the Wisconsin Department of Natural Resources (WDNR) Lake Protection Grant LPT53917 for the Little Pickerel Lake Aeration Implementation Project. The grant period ran from April 15, 2017 to June 30, 2020.

Little Pickerel Lake is a 28-acre mesotrophic spring lake with a maximum depth of 26 feet, and is one of three interconnected lakes, which include Pickerel, Little Pickerel, and Smoke Lakes, all located in the Town of Townsend, Oconto County. Little Pickerel Lake drains into Pickerel Lake by way of a navigable channel. There is no inlet to any of the lakes in this chain. The chain flows into Pickerel Creek on the north end of Pickerel Lake. The elevation of the lakes is controlled by an earthen dam with a concrete overflow structure at the discharge location into Pickerel Creek.

The spring of 2013 saw this group of lakes experience a severe fish winterkill. These interconnected lakes have a past history of periodic winterkills, with the most recent prior documented winterkill having occurred in the spring of 1996. The fishery in the three lakes consisted mainly of Northern Pike, Small Mouth Bass, Bluegill, Black Crappie, and Perch. Prior to the fish kill, the quality of fishing on the lakes would likely have been considered good, especially for the Northern, Bass, and Bluegill species.

The Pickerel Chain Lake Association (PCLA) was formed in the fall of 2013 as a direct result of the latest winterkill and as an organized effort to restore and maintain the fishery in the lakes. The PCLA began to raise funds in 2013, initially to study possible causes behind the fish kill, and ultimately to install an aeration system or systems in one or more of the three lakes. A compressed air aeration system consisting of two compressors and six diffusers was initially installed in Pickerel Lake in the fall of 2014, and as recommended in a Dissolved Oxygen Study completed by Lake and Pond Solutions for the PCLA. The system was funded and installed by the PCLA, including several modifications to the system in subsequent year to add an addition compressor and three additional diffusers.

A WDNR grant sponsored comprehensive lake management study was completed for the PCLA in 2016 by Onterra. One of the recommended goals from the study identified that the lake association should also consider implementing an aeration system in both Little Pickerel and Smoke Lakes.

A WDNR water surface grant, a $9,220 donation awarded by the Lumberjack Resource Conservation and Development Council in February 2017, and various fund-raising efforts enabled the PCLA to install an aeration system in Little Pickerel Lake in the fall of 2017. Prior to the installation, the PCLA purchased a 66-foot-wide access lot abutting Little Pickerel Lake from the Town of Townsend for $5,000, using the lot as the site to provide electric power for the aerator system and to house the system compressors.

Aeration System Permit:

A WDNR water surface grant application to help fund the Little Pickerel Lake aeration system was prepared by the PCLA and submitted for consideration in January 2017. Following notification that the PCLA was awarded a grant for the project, a WDNR permit application was submitted on May 11, 2017

to authorize the installation of the Little Pickerel Lake aeration system. A public notice of the pending permit application was published in the Oconto Reporter and notification of the pending permit was sent to adjacent property owners of the proposed aeration system in June 2017. The PCLA received notice from the WDNR on July 10, 2017 that the permit for the Little Pickerel Lake aeration system was approved under WDNR Permit IP-NE-201-43-01530.

Aeration System Design:

The Little Pickerel Lake aeration system was designed by PCLA members. The design was based on input from the WDNR Diffused Air Aeration System Guidelines (Skip Sommerfeldt, 1991); input from the WDNR fisheries biologist, Christopher Long; from the review of aeration systems on other lakes in both northeast Wisconsin and in the Polk and Barron County area of northwest Wisconsin; and from experiences learned with the PCLA's installation and operation of the compressed air aeration system on Pickerel Lake.

An aeration system using ¾ horsepower, 230 volt, rocking piston compressors, 5/8-inch weighted airline, and duel disk diffusers was selected for the Little Pickerel Lake system. These materials were selected because they would provide the air output desired, could be purchased at a reasonable cost, and because they were similar to the materials the PCLA installed and operates with good success on Pickerel Lake.

The location for the aeration system in Little Pickerel Lake was selected to allow for the use of the 66 foot wide lake lot that the PCLA purchased. This location provided good accessibility for electric power to be provided to the site, was located near the deep area of the lake, and would provide a location where the aeration system could operate without having a negative impact on access and use of the lake in the winter months.

The rocking piston compressors were selected based on providing an acceptable noise level during operation, ability to provide operating pressures to perform with diffusers in up to 20 feet of water, and providing similarity with the PCLA's compressors on Pickerel Lake.

Two compressors and six diffusers, with three of the diffusers connected to each compressor, are used to provide the aeration for Little Pickerel Lake. The number of diffusers units per compressor is based on the maximum air output of each compressor when compared to the maximum air flow per diffuser unit, and from experiences learned from the operation of the Pickerel Lake aeration system. The location for the six diffuser units was designed in a layout or pattern to provide a single large open water area of desired size throughout the winter. The spacing between diffuser locations was based on the anticipated depth of placement, using a value of 6 times the depth to estimate the width of circular open water area each diffuser is expected to create. The location of the diffuser units was also based on locating the units in an area of the lake that is near the electric power supply and in desirable depths of water.

To assist in the design layout, the determination of airline lengths to order, and the determination of GPS coordinates for placement of the diffusers, the PCLA compiled a scaled map with lake depths, derived from measured depths with GPS location data taken through the ice the previous winter season.

Aeration System Installation:

The Little Pickerel Lake aeration system installation included the purchase of the aerator materials, providing electric power to the aerator site, and installation and testing of the aerator equipment.

The PCLA worked with the Wisconsin Public Service Corporation (WPS) to coordinate providing electric power to the aerator site. PCLA members cleared trees and brush as needed to provide an adequate path for the WPS contractor to install buried electric cable for the aeration system electric service. The PCLA installed a meter base and electric breaker panel for the electric service in July of 2017, and WPS connected electric service to the site on September 6, 2017.

Weyers Equipment, with Easy Pro Aeration Products as their supplier, was selected to provide the Little Pickerel Lake aeration system compressors, diffusers, and airlines based on their past business experience with the PCLA, their competitive pricing, and the PCLA's familiarity with the materials to be furnished. These suppliers were selected following the publication of requests for quotes in the Oconto County Reporter, and requesting quotes from three firms that the lake association had past aeration correspondence with.

Both of the Little Pickerel Lake aeration system compressors are housed in a single compressor cabinet. The cabinet was set in place, electric wiring was trenched between the compressor cabinet and the meter pedestal/breaker panel, and final electric connections to power the compressors were completed by the PCLA in September of 2017.

The WDNR fisheries staff for Oconto County assisted the PCLA to install the airlines and diffuser units in Little Pickerel Lake on October 18, 2017. The locations for the six diffusers were marked in the lake by PCLA members prior to the installation using plastic bottles held in place with weights. The markers were set in place based on pre-determined GPS coordinates that would provide the desired spacing between the diffusers.

Four airline reels, each with 500 feet of 5/8-inch weighted airline, were used for the airline installation in the lake. The airlines were laid on the lake bottom between the shoreline and the diffuser locations, with a separate airline laid to each diffuser. For installation, the airline rolls were supported in flat bottom boats provided by the WDNR and the airline unrolled from the shoreline to the desired diffuser locations marked prior in the lake. The diffuser units were connected to the airlines at the desired locations, and the diffuser units were lowered with guide ropes to the lake bottom. The airlines sections placed in the lake include one length at 270 feet, two lengths at 290 feet, 2 lengths at 340 feet, and one length at 390 feet. Twelve PCLA members assisted the WDNR fisheries staff to complete the airline and diffuser placement.

The compressor cabinet for the aeration system is located 65 feet from the shoreline of Little Pickerel Lake. This location was selected based on the ease of providing electric power to the compressor cabinet and to allow for the continued and unobstructed public use of the access to Little Pickerel Lake from the PCLA property. Six lengths of 5/8-inch non-weighted airline were used to connect the weighted airlines in the lake to the compressors. These airlines are laid along the ground surface and were placed inside of a pair of 4-inch corrugated tiles to help protect them from damage and rodents.

The aeration system was temporarily operated after the installation to verify all diffusers were providing air bubbles of desirable quantity to the lake surface. The system was found to be operating properly and the compressor units were shut down to await the formation of ice cover on the lake.

Photos of the aeration system installation and photos of the aeration system materials and components are included as Attachment A and Attachment B in the Attachment Section of this report.

In addition to the aeration system compressors, diffusers, and airlines, which remain in place year around, the PCLA also installs open water caution signs each fall at public and end of road access points to the three lakes, and installs an open water warning fencing system on the lake each winter to warn lake users of the presence of the open water area created by the aeration system.

Two signs are placed at five different locations, and these include a 24-inch wide by 18-inch high Caution /Open Water sign and an 18-inch wide by 24-inch high Location/Caution sign that shows a layout of the three lake chain and the general location of the aeration system in each lake. Photos showing the caution signing placed at the Little Pickerel Lake access location, at the Pickerel Lake boat landing access location, and at a Pickerel Lake snowmobile access location are shown in Attachment C in the Attachment Section of this report.

The open water warning fencing system consists of 11/16-inch diameter by 5-foot long fiberglass posts placed at approximately a 25 foot spacing, and connected with a 3/8-inch diameter nylon rope. The posts are placed such that the warning fence system surrounds the open water area at a distance of approximately 150 feet from the open water edge. The rope is connected to each post with a clip at about 4 foot from the lakes ice surface. Two aluminum plates, measuring 4-inch square in size, are evenly spaced and hung on the rope between each set of posts. Two foam floats, each 3-inch diameter by 3-inch high, are placed on each post to provide a means for maintaining the post height above the ice surface and to provide floatation for the posts following ice out in the spring. The posts are set in the ice using a hammer drill and a ¾ inch drill bit to provide a hole in the ice to set the posts. The lower of the two floats is set approximately 8-inches up from the bottom of the posts.

Reflective tape is used on each post and on the aluminum plates to help provide both daytime and nighttime visibility of the warning fencing system. The PCLA has applied two 6-inch lengths of reflective tape to each post, one at the top of the post and another at mid-height of each post. An additional strip of reflective tape has also been applied on the higher of the two floats on each post. Photos of the open water warning fence system installation and materials are shown in Attachment D in the Attachment Section of this report

The open water post and rope warning system is installed each winter once safe ice thickness for foot travel is present on the lake. PCLA members install the post and rope warning system, typically using 4 to 5 members to complete the work, and completing the work when the ice is a minimum of 6-inches thick.

Aeration Operation and Performance:

The Little Pickerel Lake aeration system is placed in operation each winter season just prior to or at the start of ice formation on the lake. Prior to energizing the aeration system for the winter season, the PCLA tests the compressor operation each fall to assure they are functioning properly and to allow time to make any modifications that may be required. The air filter element is replaced on each compressor

and they are checked to verify that they are operating with desired air intake and operating pressure. The diffuser locations in the lake are checked by operating the system and recording the GPS coordinates of each diffuser, and then checking the present diffuser coordinates against the desired diffuser location coordinates. The PCLA has a certified scuba diver on standby if any movement of diffusers occurred over the summer months and if a relocation for any of the diffusers is desired.

The aeration system is monitored on a weekly to bi-weekly basis by PCLA members throughout the winter season. This monitoring includes visual observation of the open water area to assure the size of the opening is remaining basically unchanged and that there is visual air bubble presence in the lake for each individual diffuser; monitoring of the open water warning fence condition; and the monitoring of each compressor's operation. Compressor monitoring includes observing the sound of each compressor, monitoring the amount of suction at the air in-take of each compressor, monitoring the operating pressure on a pressure gauge for each compressor, and monitoring that the cabinet fan is working properly.

The Little Pickerel Lake aeration system operated continually throughout each of its first three seasons of operation with no problems. The diffuser placements provided the desired single large open water area in the lake. The open water area remained basically unchanged in size throughout each season. The system operated continuously each season until the system was shut down with the onset of spring temperatures and deteriorated ice conditions on the lake. The compressor pressures remained between 9 and 10 psi throughout each winter season, with these valves in the expected range for the system based on the length of the airlines and depth of the diffusers. Photos showing the open water area created by the Little Pickerel Lake aeration system are shown in Attachment E in the Attachment Section of this report.

The following table shows the time frames during the first three seasons when the system was started in the early winter, when the system was shut down in the spring, when ice on and ice out occurred, and when the open water warning fence was removed.

Year of Operation	Start of Operation	Ice on Date	End of Operation	Ice Out Date	Fence Removed
2017/2018	11-08-2017	11-09-2017	4-23-2018	5-01-2018	5-01-2018
2018/2019	11-09-2018	11-13-2018	4-05-2019	4-22-2019	4-22-2019
2019/2020	11-06-2019	11-13-2019	4-01-2020	4-07-2020	4-07-2020

Each spring, following the aeration system being shut down, the compressors are disconnected from the airlines and run for a short time to purge any moisture from the units. The need for scheduled rebuilding of the compressors is evaluated during the compressor purge process by feeling the volume of air flow or output being produced. A strong air flow helps indicates if the compressors are functioning adequately at the end of the aeration season and if rebuilding is recommended.

The compressors will need to periodically have their piston seals replaced due to normal wear as part of a routine rebuild process. The work to rebuild the compressors, when the need arises, will be performed by PCLA members. The lake association has experience in this work from their operation and maintenance of the Pickerel Lake aeration system. The supplier of the compressors estimates that the time frame between rebuilding could be as long as five seasons.

Following the recently completed third season of operation, the air output on each of the Little Pickerel Lake compressors was evaluated and felt to be of sufficient volume such that any scheduled rebuilding will be delayed for a minimum of one more season.

The PCLA keeps rebuild kits on hand and has purchased a spare compressor in 2019, all to help assure the aeration systems on Pickerel and Little Pickerel Lakes can be run without unexpected compressor issues or failures for any extended period should an operation issue develop with any compressor during the winter months.

Each spring the open water warning fence system is removed following ice out on the lake. The system is set up so it can be removed from shore by hand. The rope and poles are pulled in as a unit, with the poles removed from the rope on shore. The poles are prepared for storage by bundling them with bungee straps in groups of 12 poles each. The rope is dried and rewound on spools holding 500 feet of rope per spool. The rope and poles for the warning fence system are stored in a PCLA storage shed for the off season. The warning fence can easily be removed with assistance from 3 to 4 people with no special equipment needs.

Public Notice and Awareness:

Aeration systems create an open water area in an otherwise ice covered body of water, and thereby introduce a potentially hazardous condition on an ice covered lake in the vicinity of the aeration system. The PCLA uses a number of ways to help inform the public of the presence of their aeration systems and the need to use caution when using Pickerel, Little Pickerel, or Smoke Lakes during ice cover.

The following methods are completed each year by the PCLA to provide awareness of the potential hazard that the aeration systems create:

1. PCLA members and all non-member land abutting property owners of the three lakes are notified each November by e-mail, or letter if no e-mail address is available, that the PCLA will be operating the aeration systems during the upcoming winter months. A copy of the letter that was sent in 2019 is included as Attachment F in the Attachment Section of this report.
2. The PCLA informs its members and all non-member land abutting property owners of their plan to operate the aeration systems in the fall version of the lake association quarterly newsletter. The newsletter is sent by e-mail, or letter if no e-mail address is available. A copy of the aeration article from the 2019 Fall Edition of the PCLA Newsletter is included as Attachment G in the Attachment Section of this report.
3. The PCLA has an informational kiosk located at the Pickerel Lake boat landing, which is the main access point to the lakes during the winter months for the general public. A notice is posted in the kiosk during the fall and winter seasons to alert readers of the hazardous condition present on the lakes due to the aeration systems and the need to use caution on the lakes due to the presence of the systems. A copy of the kiosk notice posted in 2019 is included as Attachment H in the Attachment Section of this report.
4. The PCLA prepares a draft news article and submits it to two regional newspapers each fall for publication consideration. The article addresses the lake associations plan to operate aeration systems during the upcoming winter months and informs readers of the need to use caution if

using the lakes while there is ice cover. Desired language for the news article is submitted to the Lakes/Forest County Beacon and to the Pioneer Express each November. Both newspapers have published an article each year in mid-November and just prior to the lakes forming an ice cover. A copy of the news article published in November 2019 in the Lakes-Forest Beacon is included as Attachment I in the Attachment Section of this report.

5. Caution signs warning of the presence of open water and the operation of aeration systems are placed at all locations where the public typically accesses the three lakes by foot, ATV, snowmobile, or vehicle.

Cost:

Installation cost: The Little Pickerel Lake aeration system installation cost, including providing electric service, compressors and airline, open water fencing, and signing, amounted to $10,516. The PCLA received a $9,220 in-kind donation from the Lumberjack Resource Conservation and Development Council toward the project. A WDNR water protection grant reimbursed the PCLA $1,296 toward the project.

Operational cost: Operational costs include the cost to provide electric service and power, and the cost for routine maintenance. The cost for electric power to operate the aeration system includes a monthly meter charge plus the cost to provide the power required to run the compressors during the winter months. The monthly meter charge currently cost the PCLA $28 per month, or $336 for a yearly meter cost. The two ¾ HP rocking piston compressors for the Little Pickerel Lake aeration system use an average of 28 kwh of electricity per day for their operation, which currently relates to a cost of $2.90 per day of operation based on the WPS electricity rates for the last three winter seasons.

The following is a summary of the cost for electric power to operate the Little Pickerel Lake aeration system for the three years of its operation.

Season of Operation	Dates of Operation	Days of Operation	Electricity Cost
2017/2018	11/8/2017 – 4/23/2018	166	$485
2018/2019	11/9/2017 – 4/05/2019	148	$430
2019/2020	11/4/2019 – 4/01/2020	150	$435

The total electric cost to operate the Little Pickerel Lake aeration system, including both the monthly meter charge and the electric power usage cost averaged just under $800 per year for each of the first three seasons of operation.

Typical maintenance costs associated with the compressed air aeration system at Little Pickerel Lake include the purchase of replacement air filter elements and the purchase of compressor rebuild kits for periodic compressor rebuilding. The air filter elements are replaced on a yearly basis and have a current replacement element cost $5 per compressor. Compressor rebuild kits currently cost $150 per kit., with an estimated rebuild period of 3 to 5 years.

In addition to typical maintenance costs, the PCLA budgets dollars on a yearly basis into a compressor replacement fund to cover the cost for compressor replacement in future years when needed. The PCLA currently budgets $100 per year in their compressor replacement fund for each compressor, based on an anticipated 8-year replacement schedule.

Dissolved Oxygen and Water Temperature Level Monitoring:

Dissolved oxygen (DO) and temperature readings of the Little Pickerel Lake water column were taken throughout each winter season, beginning in the 2015/2016 season, to monitor the change in DO and temperature levels as the winter progressed. Readings were taken by lake association members using a YSI Pro ODO meter that was purchased under a WDNR sponsored Lake Management Planning Grant. DO data is measured and recorded in milligram per liter (mg/l) units, and the water temperatures are measured and recorded in degree Centigrade, with all data entered into the WDNR's "SWIMS" database.

During the 2015/2016 and the 2016/2017 winter seasons, and prior to the installation of the aeration system, DO and water column temperature readings were taken at the 'deep hole' test location of the lake. Following the aeration system installation, DO and water temperature readings were taken at three separate locations in Little Pickerel Lake during the 2017/2018 season, and at two separate locations during the 2018/2019 season and the 2019/2020 winter seasons. These readings included one at a deep hole location near the open water area, and the others at shallower locations more remote from the open water area.

DO levels recorded in the years prior to the aeration system installation were found to drop to low DO levels within a relatively short time frame following ice formation on the lake. By mid-January in both 2016 and in 2017 the Little Pickerel Lake DO levels were already below 2 mg/l in the top 3 feet of the water column, and below 0.5 mg/l in the mid to lower depths of the water column.

With the aeration system in place and operating, the DO levels in Little Pickerel Lake were found to drop at an average rate of 0.2 mg/l per week through the winter until approximately late February/early March, at which time the DO levels were seen to then hold steady or show a minor increase. During the first three years of the aeration system operation in Little Pickerel Lake, the DO levels for the majority of the water column remained between 4 and 6 mg/l at the lowest recorded DO level for the winter. This remained true for DO readings at the 22-24 foot 'deep hole' location as well as the other shallower locations with depths of 14 feet and 8 feet.

Water column temperature readings in the 'deep hole' recording location during the 2015/2016 and 2016/2017 winter seasons, and prior to the installation and operation of the aeration system, ranged between 36 and 42 degrees Fahrenheit from top to bottom of the water column in 22 to 24 feet of water. Following the operation of the aeration system, temperature readings were more uniform from the top to the bottom of the water column. The water column temperatures ranged between 35 to 36 degrees Fahrenheit in the 2017/2018 winter season; between 32 to 37 degrees Fahrenheit in the 2018/2019 winter season, and between 34 to 37 degrees Fahrenheit in the 2019/2020 winter season.

Spreadsheets showing the DO and water temperature readings for the days sampled during each of the winter seasons from the 2015/2016 winter season through the 2019/2020 winter season are included in Attachment J in the Attachment Section of this report.

A graph is included as Attachment K in the Attachment Section of this report that shows how the DO levels changed over time during the five winter seasons between 2015/2016 and 2019/2020.

Conclusion:

The PCLA members have successfully installed, operated and maintained the Little Pickerel Lake aeration system, and the system has operated effectively over the last three winter seasons. Numerous members have assisted in carrying out the many activities associated with this work.

The use of aeration on Little Pickerel Lake, as well as on Pickerel and Smoke Lakes, appears to have been successful to help restore an improved fishery following the severe winter fish kill of 2013. Fish stocking was implemented following the formation of the PCLA and the initial aeration system installation on Pickerel Lake in the fall of 2014.

Fish stocking included fingerlings of Northern Pike, Black Crappie, Small Mouth Bass, and Bluegill, with fish being stocked each year from 2015 to 2017. No further fish stocking took place on the lakes in 2018 and 2019 in anticipation of a planned fish survey in 2020 by the WDNR to help evaluate the success of the stocking to date and following the introduction of aeration systems to the lakes.

The latest observations indication that the fish population is improving, with periodic reports of northern, bass, and bluegill being seen and caught. The lake association has promoted the use of catch and release following the 2013 winterkill through its newsletters and posting at the Pickerel Lake boat landing kiosk. Additional fish stocking is being considered in 2020 based on the results obtained from the planned WDNR spring 2020 fish survey.

Funds to operate and maintain the Little Pickerel Lake aeration system, along with the two other aeration systems the lake association operates, are raised each year through annual membership dues of $25, and from fund raising events that include several brat fries during the spring and summer and a fund raising picnic in mid-July.

The PCLA wishes to thank the following for their support, funding, and/or assistance with the Little Pickerel Lake aeration system.

- The Wisconsin DNR, including Christopher Long, Cory Wienandt, Brenda Nordin, Chrissy Kozik, and Crystal Von Holdt for their support of the project and their assistance with the design, installation, water surface grant application and funding, and WDNR permit preparation and approval.
- The Town of Townsend for their support of the lake association and the aeration project.
- The Oconto County Land Conservation Department for their support of the aeration project and their sponsorship of the Little Pickerel Lake Aeration Project for Lumberjack Resource Conservation & Development Council (RC&D) funding consideration.
- The Lumberjack RC&D for their donation of $9,220 toward the funding of the Little Pickerel Lake Aeration Project.
- The PCLA membership for their support of the lake association and the aeration projects, and for their work associated with the planning, design, installation, maintenance, operation, and funding of the Little Pickerel Lake aeration system.

Attachments:

A. Photographs of the Little Pickerel Lake aeration system installation process.
B. Photographs of the Little Pickerel Lake aeration system materials and components.
C. Photographs of the lake associations aerator system open water caution/warning signs
D. Photographs of the Little Pickerel Lake open water warning system post and rope fencing system.
E. Photographs showing the open water area created by the aeration system in Little Pickerel Lake.
F. Copy of a letter sent to lake front property owners and lake association members to inform them of the planned aeration system operation.
G. Copy of an article posted at Pickerel Lake boat landing kiosk to provide notice of the presence of the aeration systems and open water hazard in the lakes.
H. Copy of the aeration article published in November 2019 in the Lakes/Forest Beacon to inform the public of the aeration system operation and open water presence.
I. Copy of a graph to show how dissolved oxygen values changed over time during the five winter seasons between 2015/2016 and 2019/2020.
J. Copy of spreadsheets showing dissolved oxygen and temperature readings recorded at Little Pickerel Lake sampling sites from the 2015/2016 winter season through the 2019/2020 winter season.
    a. Pg. J – 1 : 2015 / 2016 Winter Season DO and Water Temp Readings
    b. Pg. J – 2 : 2016 / 2017 Winter Season DO and Water Temp Readings
    c. Pg. J – 3, 4, 5 : 2017 / 2018 Winter Season DO and Water Temp Readings
    d. Pg. J – 6, 7 : 2018 / 2019 Winter Season DO and Water Temp Readings
    e. Pg. J – 8, 9 : 2019 / 2020 Winter Season DO and Water Temp Readings
K. Graph showing the change in the DO level during the winter seasons from the 2015/2016 season through the 2019/2020 season.

Attachment A: Little Pickerel Lake Aeration System Installation

Loading Airline Reels onto WDNR Boats

Placement of Airline into Lake

Lowering Diffurer into Position

Connecting Weighted Airline in lake to Non-weighted Airline and 4-inch Tile on Shore

Attachment B: Photos of Little Pickerel Lake Aerator Equipment and Materials

Duel-disk Diffuser unit

Reels of Weighted Airline

Cabinet with Rocking Piston Compressors

Compressor Cabinet and Airlines to lake

Aerator Electric Service Panel

Attachment C: Photos of Open Water Caution Signing

Open Water Caution Signing at Little Pickerel Access

Open Water Caution Sign Wording

Open Water Caution and Location Sign Wording at Little Pickerel Lake Access

Open Water Caution Signing at Pickerel Lake Boat Landing

Open Water Caution Signing at Pickerel Lake Snowmobile Access

Attachment D: Photos of Little Pickerel Lake Open Water Warning Fencing System

Drilling Holes for Open Water Warning Fence Posts

Hanging Open Water Fence Rope and Plates

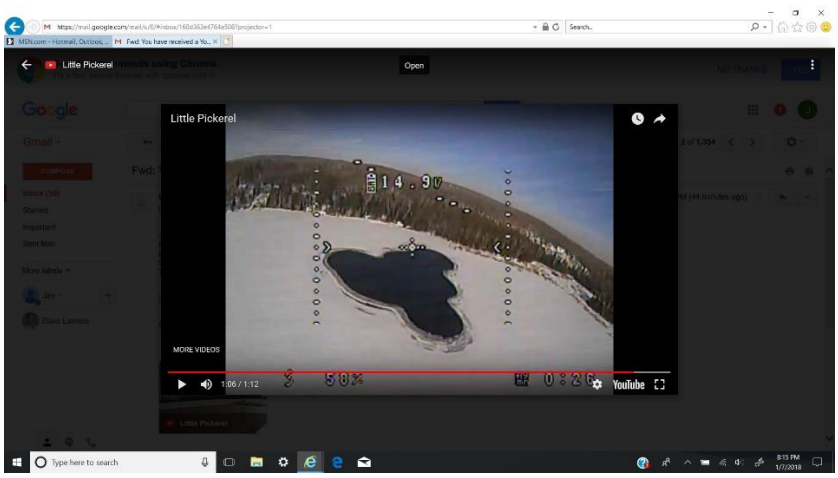
Open Water Fencing System – posts, plates, rope

Open Water Fence Post with Reflective Tape on Post and top Float

Attachment E: Photos of Little Pickerel Lake Aeration Open Water Area

Open Water – March 2018

Open Water Area – January 2020



Open Water – Little Pickerel Lake - Drone Photo – January 2018

Attachment G: Aeration Article from the Fall Edition of the PCLA Newsletter

The following article was included in the 2019 Fall Edition of the PCLA Newsletter:

Aeration fall 2019

This upcoming winter will see the second year that the Pickerel Chain Lake Association will be operating an aeration system in each of our three lakes. The Pickerel and Little Pickerel Lake systems, with airlines and diffusers already in the lakes, will be started up just prior to ice forming on the lakes in late November or early December. The Smoke Lake system, with a floating pump unit, will be placed in the lake once ice thickness has increased to approximately 8 inches in thickness. The Pickerel Lake system will again be operating with 3 compressors and 9 diffusers. One of the compressors was recently rebuilt and the system was started up to check that all the diffusers and compressors were operating.

The Little Pickerel Lake system will have two compressors and 6 diffusers in operation. This system was checked for operation recently as well, including a GPS coordinate check of the diffuser positions to verify their locations against their previous locations to see if any movement had occurred during the year. Some movement had been noticed in 2018, but no further movement was noticed this year.

Airline and diffuser location information was provided in last spring's newsletter and at our annual meeting. Hopefully this information was helpful to provide guidance to boaters to help prevent the accidental moving of an airline and diffuser with anchors. This information will be provided again next spring.

The Smoke Lake pump operated well last winter in its first year of operation. The pump shaft, however, was making a noticeable noise and had excess movement at the propeller when the pump was removed from the lake last spring. The supplier was notified and repair parts were sent to correct what was believed to be the cause of the problem. However, upon dissembling the shaft and propeller we realized there were other issues with the unit. After discussion with the supplier, the entire pump unit was returned to the supplier for their inspection and repair. The pump was recently returned and is ready for installation when we have sufficient ice thickness. The repairs to the Smoke Lake aerator unit were made under warranty by the supplier.

Dissolved oxygen (DO) readings will be taken throughout the upcoming winter season to monitor the DO levels in each of the lakes as the winter progresses.

Each of the aerator systems will create a large open water area in the lake in the vicinity of the diffusers and or pump unit. The open water areas that are created will be marked on the ice using a rope and post warning system. The rope and posts will be placed on Pickerel and Little Pickerel Lakes once there is safe ice thickness for our members to install the systems. The rope and post system on Smoke Lake will be placed the same day that the pump is placed on that lake.

Caution should always be used on the ice during the winter months, and this is especially true in the areas near the open water locations created by the aerator systems. Signs will be posted at all public access points to the lakes warning lake users of the presence of open water locations on each lake. Please be sure to inform any users to the lakes that gain access from your property of the open water conditions that will be present.

Attachment H: Pickerel Lake Boat Landing Kiosk Posting - Notice of Aeration System Operation – 2019/2020 Winter Season

ATTENTION / CAUTION: Pickerel, Smoke, and Little Pickerel Lake Users

From: Pickerel Chain Lake Association Inc. Board of Directors

Subject: Aeration System Operation on Pickerel, Smoke, and Little Pickerel Lakes

Users of the waters of Pickerel, Smoke, and Little Pickerel Lakes should be aware that the Pickerel Chain Lake Association (PCLA) will operate an aeration system on both Pickerel Lake, Little Pickerel Lake, and Smoke Lake during the 2019/2020 winter season. CAUTION should be used if and when using the lakes this winter season because the aeration systems will create large open water areas, and thin ice conditions can be expected as you extend out beyond the open water locations.

The Pickerel Lake aeration system is located on the north side of Pickerel Lake. The Little Pickerel Lake aeration system is located on the north end of Little Pickerel Lake. The Smoke Laker system is located in the northeast quadrant of Smoke Lake.

The open water areas on each lake will be roped off to warn lake users of the hazard. A post and rope warning system surrounding the open water areas will be placed by lake association members once the ice is at least 6 inches thick and considered safe for foot travel.

Use extreme caution if using the lakes prior to the roped off areas being erected around the open water areas.

The roped off areas will be located approximately 100 feet beyond the open water. Lake users should not assume the ice is safe at the rope location and should always check conditions prior to travel near the aeration systems or elsewhere on the lakes. Ice conditions and ice thickness will vary based on weather, wind, temperature, and other conditions and should never be assumed to be safe.

The lake association placed signs at public access points to the lakes to alert lake users of the aeration systems and to use caution if using the lakes.

The PCLA has authority to operate the aeration systems under Wisconsin DNR permits and Wisconsin State Statute 167.26.

If you have any questions regarding the aeration system, please contact any of the PCLA board of director members.

Sincerely,
Pickerel Chain Lake Association Inc. Board of Directors

Attachment I: Aeration Article in Lakes/Forest Beacon for 2019/2020 Winter Season

LAKES/FOREST BEACON
NOV. 11, 2019 EDITION

Use caution traveling on Pickerel, Little Pickerel, Smoke lakes this winter

From Staff Reports Oconto County Reporter
USA TODAY NETWORK – WISCONSIN

TOWNSEND — The Pickerel Chain Lake Association in Townsend is planning to operate aeration systems this upcoming winter season on Pickerel, Little Pickerel and Smoke lakes.

The association urges everyone who is planning to travel by foot or vehicle on these lakes this winter to use extreme caution as the aeration systems will create a large open water area in a portion of each lake.

The aeration system in each of the lakes will operate in the same location as in past seasons. The Pickerel Lake aerator is located off the north shore and across the lake from the boat landing at Townsend's Oughton Park.

The Little Pickerel Lake aerator is located on the north end of that lake, and the Smoke Lake aerator will be located in the northeast quadrant of that lake.

Several methods will be used to alert lake users of the presence of the open water hazard created by the aeration systems. Caution signs will be posted at the Pickerel Lake boat landing and at other locations where fishermen, snow-

See LAKES, Page 8

Lakes

Continued from Page 5

mobilers and other lake users typically access the lakes.

A post-and-rope warning system surrounding each of the open water areas will be placed by the lake association after ice on the lakes is at least 6 inches thick and considered safe for foot travel.

The aeration systems can be expected to cause thin ice conditions to extend out beyond the open water area created by the aeration. The lake association reminds all lake users not to assume the ice is safe at the warning rope location and to always check ice conditions prior to travel near the aeration systems or elsewhere on the lakes.

Lake users should also use extreme caution if they travel on the ice prior to the post and rope warning system being erected.

Attachment J - 1

WINTER DO AND WATER TEMP READINGS - LITTLE PICKEREL LAKE - 2015/2016 WINTER SEASON

Date:	1/21/2016	Site:	Deep Hole	Date:	1/30/2016	Site:	Deep Hole	Date:	2/13/2016	Site:	Deep Hole
Depth	Temp, C	DO, mg/l		Depth	Temp, C	DO, mg/l		Depth	Temp, C	DO, mg/l	
1	4.2	6.7		1	3.7	5.5		1	4.2	6.7	
3	4.7	1.8		3	3.9	1.3		3	4.9	0.5	
6	4.8	0.2		6	4	0.2		6	4.8	0.1	
9	5.1	0.1		9	4.4	0.1		9	4.8	0	
12	5.2	0.1		12	4.9	0.1		12	5.2	0	
15	5.4	0.1		15	5.1	0.1		15	5.4	0	
18	5.5	0.1		18	5.4	0.1		18	5.2	0	
21	5.5	0		21	5.5	0.1		21	5.4	0	

Date:	2/16/2016	Site:	Deep Hole	Date:	2/26/2016	Site:	Deep Hole	Date:	3/16/2016	Site:	Deep Hole
Depth	Temp, C	DO, mg/l		Depth	Temp, C	DO, mg/l		Depth	Temp, C	DO, mg/l	
1	2.9	5		1	2.3	0.3		1	2.1	7.2	
3	3.2	1.3		3	4.2	0.1		3	4	1.9	
6	4.2	0.2		6	4.6	0.1		6	4.6	0.8	
9	4.6	0		9	4.9	0.1		9	5	0.4	
12	4.9	0		12	5.1	0.1		12	5.2	0.2	
15	5.1	0		15	5.2	0.1		15	5.1	0.1	
18	5.1	0		18	5.1	0.2		18	5.2	0.1	
21	5.5	0.1		21	5.1	0.2		21	5.3	0.1	
24	5.6	0.1									

Attachment J-2

WINTER DO AND WATER TEMP READINGS - LITTLE PICKEREL LAKE - 2016 / 2017 WINTER SEASON

Date:	12/21/2016	Site:	Deep Hole
	Ice:	7"	
	Snow:	3"	
	Weather:		
Depth	Temp, C	DO, mg/l	
1	1.9	11.7	
4	2.3	11.5	
7	2.6	10.3	
10	2.9	8	
13	3.1	7.2	
16	3.4	5	
18	3.6	3.7	
20	4	2.7	
22	4.8	1.8	

Date:	12/29/2016	Site:	Deep Hole
	Ice:	9"	28 deg F
2:30 PM	Snow:	0"	
	Weather:	cloudy, light snow	
Depth	Temp, C	DO, mg/l	
1	1.4	9.8	
4	2.9	7.4	
7	3.2	5.1	
10	3.4	4.7	
13	3.6	3.8	
16	3.8	3	
19	4.4	0.6	
20	4.6	0.3	
21	4.8	0.2	
	Depth - 22'		

Date:	1/9/2017	Site:	Deep Hole
	Ice:	10"	
2:00 PM	Snow:	3"	
	Weather:	Pty cloudy, light breeze	
Depth	Temp, C	DO, mg/l	
1	0.7	9.1	
4	3.5	4.7	
7	3.5	3.7	
10	3.7	2.4	
13	4	1.3	
16	4.2	0.5	
19	4.6	-0.1	
21	5.2	0	
	Depth - 22'		

Date:	1/23/2017	Site:	Deep Hole	34 deg F
	Ice	11"		
10:00 AM	Snow	3"		
	Weather	Cloudy, calm		
Depth	Temp, C	DO, mg/l		
1	0.7	6.9		
4	3.7	1.8		
7	3.9	1.4		
10	4.1	0.3		
13	4.2	-0.2		
16	4.5	-0.2		
19	5	-0.2		
21	5.4	-0.2		
	Depth - 22'			

Date:	2/17/2017	Site:	Deep Hole
	Ice	13"	
2:30 PM	Snow	2"	
	Weather	Sunny, calm	
Depth	Temp, C	DO, mg/l	
1	1	-0.3	
4	4.2	-0.3	
7	4.6	-0.3	
10	4.7	-0.3	
13	4.8	-0.2	
16	4.9	-0.2	
19	5.3	-0.2	
21	5.6	-0.1	
22	5.8	-0.1	
	Depth - 23'		

Date:	2/27/2017	Site:	Deep Hole
	Ice	14"	
2:30 PM	Snow	2"	39 deg F
	Weather:	Clear, breezy	
Depth	Temp, C	DO, mg/l	
1	1.5	5.8	
2	3	4	
3	4.5	0.5	
4	4.8	-0.2	
7	4.9	-0.2	
10	4.9	-0.2	
13	4.9	-0.1	
16	5	-0.1	
19	5.4	0	
21	5.5	0.5	

Date:	2/27/2017	Site:	Remote
	Ice:	14"	
3:00 PM	Snow:	2"	39 deg F
	Weather:	Clear, breezy	
Depth	Temp, C	DO, mg/l	
1	1	3.9	
2	3.3	1.1	
3	4.5	0.3	
4	4.8	-0.1	
7	4.9	-0.1	
10	5.1	0	
13	5	0.4	
	Depth - 15'		

Attachment J-3

WINTER DO AND WATER TEMP READINGS - LITTLE PICKEREL LAKE - 2017 / 2018 WINTER SEASON PG 1 OF 3

Site:	#1	Date:	1/1/2018		Site:	#2	Date:	1/1/2018		Site:	#3	Date:	1/1/2018
Ice	11"	Snow	2"		Ice:	11"	Snow:	2"		Ice:	11"	Snow:	2"
Weather:	sunny, calm				Weather	sunny, calm				Weather:	sunny, calm		
Air Temp	2 deg F				Air Temp	2 deg F				Air temp	2 deg F		
Depth	Temp, C	DO, mg/l			Depth	Temp, C	DO, mg/l			Depth	Temp, C	DO, mg/l	
1	1.1	9.4			1	0.8	10.6			1	0	10.2	
4	1.7	8.9			4	1.2	8.9			3	1	9.1	
7	1.7	8.7			7	1.6	8.9			5	1.6	8.2	
10	1.7	8.6			10	1.7	8.9			7	2.4	2.9	
13	1.8	8.5			13	3.1	2.5						
16	1.8	8.5									Depth= 8'		
19	2.1	7.9				Depth= 14'							
21	2.7	4.6											
23	4	0.6											
	Depth=24'												

Site:	#1	Date:	1/8/2018		Site	#2	Date:	1/8/2018		Site:	#3	Date:	1/8/2018
Ice:	13"	Snow:	2"		Ice:	13"	Snow:	2"		Ice:	13"	Snow:	2"
Weather:	Clear, windy				Weather:	Clear, windy				Weather:	Clear, windy		
Air temp	26 deg F				Air temp	26 deg F				Air temp	26 deg F		
Depth	Temp, C	DO, mg/l			Depth	Temp, C	DO, mg/l			Depth	Temp, C	DO, mg/l	
1	0.6	8.9			1	0.4	9			1	0.8	8.7	
4	1.4	8.5			4	1.4	8.5			3	1.4	8.4	
7	1.4	8.4			7	1.5	8.4			5	1.5	8.3	
10	1.5	8.3			10	1.5	8.3			7	2.2	4.2	
13	1.5	8.2			13	2.5	1.8						
16	1.6	8.2									Depth= 8'		
19	1.9	7				Depth= 14'							
21	2.7	3.5											
23	3.3	0.2											
	Depth = 24'												

Site:	#1	Date:	1/16/2018		Site:	#2	Datew:	1/16/2018		Site:	#3	Date:	1/16/2018
Ice:	16"	Snow:	4"		Ice:	17"	Snow:	4"		Ice: 16"	Snow:	3"	
Weather:	cloudy, light breeze				Weather:	cloudy, light breeze				Weather:	cloudt, light breeze		
Air temp:	18 deg F		3:30 PM		Air Temp:	18 deg F		3:45 PM		Air temp	18 deg F		4:00 PM
Depth	Temp, C	DO, mg/l			Depth	Temp, C	DO, mg/l			Depth	Temp, C	DO, mg/l	
1	0.8	8.6			1	0.3	9			1	0.4	8.6	
4	1.5	8.1			4	1.4	8.2			3	1.3	8.2	
7	1.5	8.1			7	1.5	8.1			5	1.4	8	
10	1.5	8			10	1.5	8			7	2.5	1.1	
13	1.5	8			13	2.4	1.9						
16	1.6	7.9									Depth= 8'		
19	1.9	6.4				Depth= 14'							
21	2.1	4.7											
23	2.7	0.6											
	Depth= 24'												

Attachment J-4

WINTER DO AND TEMP READINGS - LITTLE PICKEREL LAKE - 2017 / 2018 WINTER SEASON PG 2 OF 3

Site:	#1	Date:	1/25/2018			Site:	#2	Date:	1/25/2018			Site:	#3	Date:	1/25/2018
Ice	17"	Snow	4"			Ice:	17"	Snow:	4"			Ice:	17"	Snow:	4"
Weather:	cloudy, light breeze					Weather	cloudy, light breeze					Weather:	cloudy, light breeze		
Air Temp	24 deg F					Air Temp	24 deg F					Air temp	24 deg F		
Depth	Temp, C	DO, mg/l				Depth	Temp, C	DO, mg/l				Depth	Temp, C	DO. mg/l	
1	0.6	7.7				1	0.3	8.3				1	0.8	7.5	
4	1.3	7.4				4	1.4	7.4				3	1.4	7.4	
7	1.4	7.2				7	1.5	7.3				5	1.4	7.3	
10	1.5	7.2				10	1.5	7.1				7	2	2.9	
13	1.5	7.2				13	2.1	1.8							
16	1.5	7											Depth= 8'		
19	1.8	6.1					Depth= 14'								
21	2.1	4.2													
23	2.7	0.7													
	Depth=24'														
Site:	#1	Date:	2/4/2018			Site	#2	Date:	2/4/2018			Site:	#3	Date:	
Ice:	19"	Snow:	7"			Ice:	19"	Snow:	7"			Ice:		Snow:	
Weather:	clear, windy					Weather:	clear, windy					Weather:			
Air temp	8 deg F					Air temp	8 deg F					Air temp			
Depth	Temp, C	DO, mg/l				Depth	Temp, C	DO, mg/l				Depth	Temp	DO	
1	0.4	7.3				1	-0.1	7.5							
4	1.2	6.9				4	0.2	7.1				No site #3	readings	on 2/4/18	
7	1.3	6.7				7	1.2	6.7							
10	1.4	6.6				10	1.3	6.7							
13	1.4	6.6				11	1.7	4.7							
16	1.4	6.4				13	2.3	1							
19	1.5	6.3													
21	2	3.6					Depth= 14'								
23	2.5	0.7													
	Depth = 24'														
Site:	#1	Date:	2/19/2018			Site:	#2	Datew:	2/19/2018			Site:	#3	Date:	2/19/2018
Ice:	22"	Snow:	3"			Ice:	22"	Snow:	3"			Ice:	18"	Snow:	4"
Weather:	cloudy, windy					Weather:	cloudy, windy					Weather:	cloudy, windy		
Air temp:	23 deg F		10:30 AM			Air Temp:	23 deg F		10:00 AM			Air temp	23 deg F		11:00 AM
Depth	Temp, C	DO, mg/l				Depth	Temp, C	DO, mg/l				Depth	Temp, C	DO, mg/l	
1	0.3	6.7				1	0.6	6.6				1	0.5	6.6	
4	1.2	6.2				4	1.3	6.3				3	1.1	6.4	
7	1.3	6.1				7	1.4	6.2				5	1.2	6.3	
10	1.3	6.1				10	1.4	6				7	1.7	3.5	
13	1.3	6.1				12	1.8	1.9							
16	1.4	6				13	2	0.8					Depth= 8'		
19	1.5	5.5													
21	1.7	3.4					Depth= 14'								
23	2.4	0.2													
	Depth= 24'														

Attachment J-5

WINTER DO AND WATER TEMP READINGS - LITTLE PICKEREL LAKE - 2017 / 2018 WINTER SEASON PG 3 OF 3

Site:	#1	Date:	3/4/2018			Site:	#2	Date:	3/4/2018			Site:	#3	Date:	3/4/2018
Ice	21"	Snow	4"			Ice:	21"	Snow:	4"			Ice:	21"	Snow:	4"
Weather:	cloudy, light breeze					Weather	Cloudy, light breeze					Weather:	Cloudy, light breeze		
Air Temp:	34 deg F		1:15 PM			Air Temp:	34 deg F		1:30 PM			Air Temp:3	34 deg F		1:45 PM
Depth	Temp, C	DO, mg/l				Depth	Temp, C	DO, mg/l				Depth	Temp, C	DO, mg/l	
1	1.4	7.1				1	0.3	7.2				1	0.5	7.1	
4	2.1	6.6				4	1.5	6.5				3	1.5	6.6	
7	1.9	6.3				7	1.6	6.4				5	1.7	6.3	
10	1.9	6.2				10	1.7	6.1				7	2	2.9	
13	1.8	6.3				12	1.9	4.5							
16	1.8	6.1				13	2.1	2					Depth= 8'		
19	1.9	5.1													
21	2	3.6					Depth= 14'								
23	2.4	1.5													
	Depth= 24'														

Site:	#1	Date:	3/16/2018			Site	#2	Date:	3/16/2018			Site:	#3	Date:	3/16/2018
Ice:	19"	Snow:	4"			Ice:	22"	Snow:	4"			Ice:	19"	Snow:	4"
Weather:	sunny, clear, calm					Weather:	sunny, clear, calm					Weather:	sunny, clear, calm		
Air temp:	32 deg F		1:00 PM			Air temp:	32 deg F		1:30 PM			Air temp:	32 deg F		2:00 PM
Depth	Temp, C	DO, mg/l				Depth	Temp, C	DO, mg/l				Depth	Temp, C	DO, mg/l	
1	1.5	7.5				1	0.3	8.2				1	1	7.3	
4	2.2	6.8				4	1.6	7.1				3	1.8	7	
7	2.1	6.7				7	1.7	6.7				5	1.9	6.9	
10	2	6.5				10	1.8	6.6				7	2.1	4.7	
13	1.9	6.5				12	2	5.5							
16	1.9	6.6				13	2.3	2.1					Depth= 8'		
19	2	6.2													
21	2.1	4.6					Depth= 14'								
23	2.5	0.6													
	Depth= 24'														

Site:	#1	Date:	4/8/2018			Site:	#2	Date:	4/8/2018						.
Ice:	19"	Snow:	5"			Ice:	21"	Snow:	6"						
Weather:	Sunny, cklear, calm					Weather:	Sunny, clear, calm								
Air Temp:	30 deg F		11:30 AM			Air Temp:	30 deg F		12:00 PM						
Depth	Temp, C	DO, mg/l				Depth	Temp, C	DO, mg/l							
1	1.6	9.2				1	0.8	7.8							
4	3	9.2				4	2.7	9.1							
7	3	9.2				7	2.8	9.2							
10	2.9	9.2				10	2.9	9.1							
13	2.9	9.1				12	3.1	6.5							
16	2.9	9				13	3.4	1							
19	3	8.6													
21	3.1	6.8					14' depth								
	22' depth														

Attachment J - 6

WINTER DO AND WATER TEMP READINGS - LITTLE PICKEREL LAKE - 2018 / 2019 WINTER SEASON PG 1 of 2

Date:	12/17/2018	Site:	#1	Date:	1/2/2019	Site:	#1	Date:	1/18/2019	Site	#1
	Ice:	8"	30 deg		Ice:	12"	22 deg		Ice:	14"	12 deg F
3:15 PM	Snow:	1"		2:30 PM	Snow:	1"		11:45 AM	Snow:	2"	
Weather:	sunny	light breeze			Weather:	cloudy, light breeze			Weather:	Pty cloudy, light breeze	
Depth	Temp	DO		Depth	Temp	DO		Depth	Temp	DO	
2	2.7	8.2		2	1.7	7.4		2	2	6.3	
4	2.7	8		4	2	7.2		4	2.1	6.1	
7	2.6	8		7	2	6.9		7	2	5.9	
10	2.6	8		10	2.1	6.9		10	2	5.9	
13	2.6	8		13	2.2	6.8		13	2	5.9	
16	2.6	7.7		16	2.2	6.8		16	1.9	5.9	
19	2.7	7.7		19	2.3	6.6		19	2	5.8	
21	3.4	4.3		21	2.8	3.8		21	2.4	3	
	22' water				22' water				22' water		

Date	1/2/2019	Site	#2	Date	1/18/2019	Site	#2
	Ice	11"	22 deg		Ice	14"	
2:45 PM	Snow	1"		12:00,PM	Snow	2"	12 deg F
	Weather	cloudy, light breeze			Weather	Pty cloudy,light breeze	
Depth	Temp	DO		Depth	Temp	DO	
2	1.6	7.5		2	1.2	6.6	
4	2	7.1		4	1.7	6.1	
7	2.1	6.9		7	1.8	6	
10	2.2	6.8		10	1.9	5.9	
12	3.1	2.2		12	2.4	2.5	
13	3.8	0.5		13	3.2	0.3	
	13.7' water				13.5' water		

Attachment J - 7

WINTER DO AND TEMP READINGS - LITTLE PICKEREL LAKE - 2018 / 2019 WINTER SEASON PG 2 OF 2

Date:	2/3/2019	Site	#1		Date	2/19/2019	Site:	#1		Date	3/17/2019	Site	#1	
	Ice:	18"	38 deg F			Ice	18"	15 deg F		Ice	26" w/ 4" surface ice over 3" water/slush			
2:15 PM	Snow:	4"			11:15 AM	Snow	8"			Snow	1"			40 deg F
	Weather:	cloudy, calm, foggy				Slush	5"			Weather	sunny, clear, light breeze			2:30 PM
						Weather: clear, light breeze								
Depth	Temp	DO			Depth	Temp	DO			Depth	Temp	DO		
2	1.3	5.5			2	-0.1	5			2	1.4	5.6		
4	1.3	5			4	0.8	4.8			4	1.5	4.9		
7	1.3	4.9			7	1	4.7			7	1.4	4.8		
10	1.3	4.9			10	1	4.6			10	1.4	4.8		
13	1.3	4.8			13	1.1	4.5			13	1.4	4.7		
16	1.3	4.8			16	1.1	4.5			16	1.4	4.7		
19	1.5	4.3			19	1.2	4			19	1.5	3.5		
21	1.7	1.9			21	1.4	2.9			21	1.7	1.9		
	22' water					22' water					22.5' water			

Date	2/3/2019	Site	#2							Date	3/17/2019	Site	#2	
	Ice	18"								Ice	28" w/ 6" surface ice over 4" water/slush			
2:30 PM	Snow	4"	38 deg F							Snow	1"			
	Weather	cloudy, calm, foggy								Weather	Sunny, clear, light breeze			
Depth	Temp	DO								Depth	Temp	DO		
2	0.9	6.1								2	0.5	4.6		
4	1.1	5.1								4	1.2	4.7		
7	1.2	4.9								7	1.3	4.8		
10	1.2	4.8								10	1.3	4.7		
12	1.6	2.3								12	1.7	1.9		
13	2.4	0.4												
	14.5' water										13' water			

Attachment J - 8

WINTER DO AND WATER TEMP READINGS - LITTLE PICKEREL LAKE - 2019 / 2020 WINTER SEASON

Date:	1/9/2020	Site:	#1	Date:	1/17/2020	Site:	#1	Date:	1/31/2020	Site:	#1	Date:	2/17/2020	Site	#1	Date	3/5/2020	Site	#1
	Ice:	10"			Ice:	11"			Ice:	10"	34 deg		Ice:	14"	25 deg		Ice	16"	35 deg F
8:30 AM	Snow:	2"	25 deg	12:50 PM	Snow:	2"	18 deg	1:30 PM	Snow:	2" snow o	ver 4" slush	11:30 AM	Snow:	3"		12:30 PM	Snow	3"	
	Weather:	Cloudy, breezy			Weather:	Cloudy, light breeze			Weather:	Cloudy, light breeze			Weather:	Partly cloudy, light breeze			Weather	Cloudy, calm, light snow/drizzle	
Depth	Temp	DO		Depth	Temp	DO		Depth	Temp	DO		Depth	Temp	DO			Depth	Temp	DO
2	1.7	5.4		2	1.4	5.3		2	2.3	5		2	1.2	4.6			2	1.6	5
4	1.9	5.1		4	1.7	5		4	2	4.5		4	1.4	4.5			4	1.8	4.9
7	2	5.1		7	1.8	4.9		7	1.9	4.5		7	1.5	4.4			7	1.9	4.9
10	2	5		10	1.9	4.8		10	1.9	4.4		10	1.6	4.4			10	1.9	4.8
13	2.1	5		13	1.9	4.7		13	1.9	4.4		13	1.6	4.3			13	1.9	4.8
16	2.1	4.9		16	1.9	4.7		16	1.9	4.4		16	1.6	4.2			16	1.9	4.6
19	2.3	4.8		19	2.1	4.6		19	2	4.5		19	1.8	4.2			19	2.1	4.4
21	2.8	1.6		21	2.9	1.5		21	2.4	1.9		21	2.2	4.1			21	2.3	2.3
	Depth - 22.5'				Depth - 22'				Depth - 22.5'				Depth: 22.2'					Depth - 22.2'	

Date	1/9/2020	Site:	#2 South	Date	1/17/2020	Site	#2 South	Date	1/31/2020	Site:	#2 South	Date	2/17/2020	Site:	#2	Date	3/5/2020	Site:	#2
	Ice	11"			Ice	11"			Ice	11"	34 deg		Ice	14"			Ice	16"	
9:00 AM	Snow	2"	25 deg	1:15 PM	Snow	2"	18 deg	1:45 PM	Snow	5" snow over 3" slush		1:45 AM	Snow	5"	25 deg	12:50 PM	Snow	3"	
	Weather	Cloudy, breezy			Weather	Cloudy, light breeze			Weather	Cloudy, light breeze			Weather	Partly cloudy, light breeze			Weather	Cloudy, calm	
Depth	Temp	DO		Depth	Temp	DO		Depth	Temp	DO		Depth	Temp	DO			Depth	Temp	DO
2	2.6	5.4		2	1.1	4.8		2	1.6	4.6		2	0.8	4.3			2	1.2	4.7
4	2.4	5.1		4	1.6	4.9		4	1.8	4.5		4	1.4	4.4			4	1.7	4.7
7	2.3	5		7	1.8	4.8		7	1.8	4.4		7	1.6	4.3			7	1.8	4.7
10	2.3	5		10	1.9	4.7		10	1.9	4.2		10	1.6	4.3			10	1.9	4.6
11	2.5	3.9		13	3	0.7		13	2.6	0.6		13	2.5	0.8			13	2.4	0.6
12	3.2	0.9																	
	Depth - 12.5'				Depth - 14'				Depth - 14.5'				Depth - 14'				Depth - 13.5'		

Attachment K