Florence County Aquatic Invasive Species Prevention and Management Program

Aquatic Invasive Species Education, Prevention and Planning Project

Grant Number: AEPP-451-15

2015-2016 Final Report

Image from Google Earth

Prepared by
Rich Wolosyn
Florence County Conservationist,

Scott W. Goodwin
Conservation Technician,
&
Carolyn Weber-Starling
AIS Coordinator

Florence County Land Conservation Department

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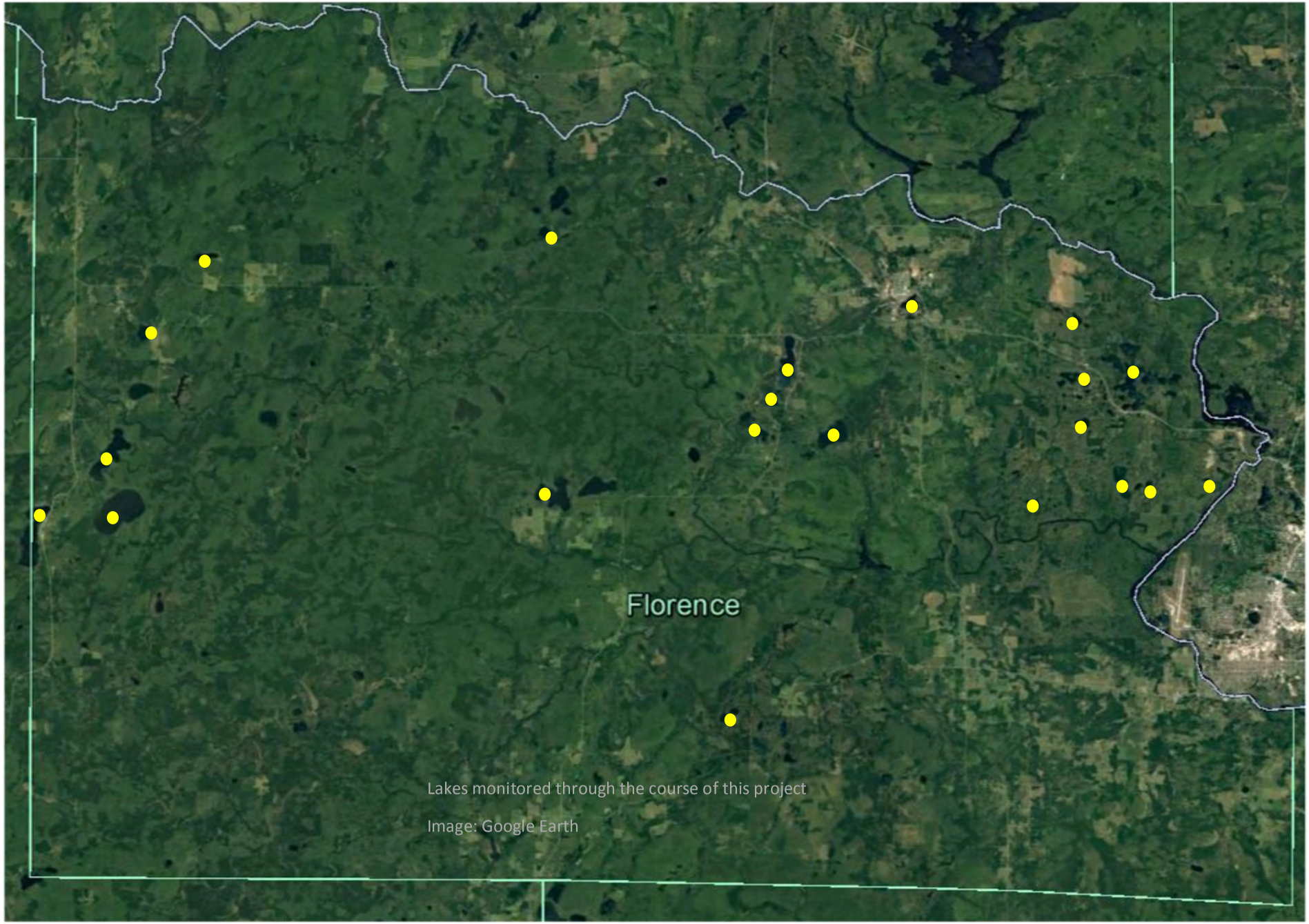


Lakes monitored through the course of this project

Image: Google Earth

Project Description

Funding for this two-year project was awarded in 2015 which utilizes local, regional, and state support for implementation of a county-wide invasive species prevention and management strategy whose primary focus is aimed at reducing risk factors associated with further AIS introduction into outstanding and exceptional waters of Florence County. Over the course of the project four seasonal staff were hired to conduct AIS absence/presence monitoring along with collecting water chemistry data at source waters locations and at pristine water bodies in addition to quality trout streams, rivers and creeks, including significant segments of two of Wisconsin's Wild Rivers, the Pine and Popple. In conjunction with a separate watercraft inspection project where paid inspectors and volunteers are stationed at multiple priority boat landings following the state's Clean Boat, Clean Waters program protocols, two boater decontamination stations were staffed with resources donated by local lake association members. Efforts to protect lakes, river and wetlands from invasive species impacts are coordinated through the newly organized Florence County Invasive Species Council and the formal partners and members of the Wild Rivers Invasive Species Coalition (WRISC), the local Cooperative Invasive Species Management Area (CISMA).

Problems to be addressed

Florence County is home to over 250 inland lakes, many miles of high quality streams, and thousands of acres of wetlands. Several waterbodies have now been impacted by AIS such as the 2003 Eurasian watermilfoil/hybrid (*Myriophyllum* spicatum) found in Lake Ellwood and Frog Lake, and more recently in Seidel Lake, Barrens Lake, North Lake and Sea Lion Lakes. Zebra mussels (*Dreissena polymorpha*) were first noted in Keyes Lake in 2010, have since spread throughout the neighboring Spread Eagle Chain of Lakes. Phragmites (*Phragmites australis*) were first documented at the Menominee River bridge a few years previous to this project, and now show a population growing on nearby Cosgrove Lake. Spiny water flea (*Bythotrephes longimanus*), curly leaf pondweed (*Potamogeton crispus*) and yellow floating heart (*Nymphoides peltata*) are on the radar in neighboring communities. Limited Term Employment positions were requested to be dedicated toward public education and presence/absence monitoring in these AIS free and source waters and will also support volunteer/staff efforts following CBCW state initiatives that provide clear directions to the public to help slow the spread of invasive species. Specimen collection and vouchering were also part of these summer positions, along with participation in the AIS Action Team of the Wild Rivers Invasive Species Coalition (WRISC). Presentations were given to raise the public's awareness of AIS and offer BMPs to better reach Clean, Drain and Dry objectives and related state laws.

Goals and Objectives

Develop an AIS Control Plan
Provide Local AIS Education
Participate in Statewide AIS Education Initiatives
Prevent the Spread of AIS
Conduct Early Detection Monitoring

Activities and Methods

Lake monitoring was most often conducted by boat. Water quality samples (D.O., pH, Conductivity, and temperatures) were gathered using a Hach HQ40d handheld multi-meter. Secchi disk readings were also taken and surface samples were collected for total phosphorus testing at the State Laboratory of Hygiene. Visual surveys from boats and with snorkel equipment were also conducted on the lakes. Rake samples were taken on some lakes, but this did not reach the level of a point intercept survey. In the 2016 season water hardness tests were added to the monitoring protocol as a way to assess the potential for the tested lake to be habitat for zebra mussels or other calcium-demanding invasive species.

During the 2015 and 2016 seasons Florence County AIS staff also participated in:

- WDNR's AIS Gear-up Workshop (2015)
- WDNR's AIS Coordinators Meeting (2016 pre and post season meetings)
- Coordinated with WRISC in training CBCW staff and volunteers (2015 & 2016)
- AIS Bridge Snapshot Day (2015 & 2016)
- Presented current AIS and on-going control efforts at annual FCLARA meetings (2015 & 2016)
- Hand-pulling of Eurasian water-milfoil on Barrens Lake (2015)
- Hand-pulling of Eurasian water-milfoil on Keyes Lake in partnership with FCLARA and WRISC (2015 & 2016)
- AIS removal on Spread Eagle Chain of Lakes in partnership with White Water Associates, Inc. (2015 & 2016)
- Aided WDNR work on East Bass and Keyes Lakes (2015)
- Collected water samples for eDNA testing on Keyes Lake (2015)
- Electro-fishing with WDNR Fisheries Biologists to gain a deeper knowledge of the local fisheries (2015 & 2016)
- AIS-themed participation in Fourth of July parades in Iron Mountain and Long Lake (2015 & 2016)
- Painted stop AIS messages at paved boat landings in the county (2016)

2015 Plankton Tow Report Error

Due to a misreading of the 2015 WDNR's plankton tow results The Florence County Land Conservation Department mistakenly thought there were zebra mussels and spiny waterflea found in some county lakes in 2015. The LCD went into the 2016 season determined to get the word out, and to see the extent of these new invasions. At the start of the 2016 season the LCD placed zebra mussel substrate tests in three lakes, Patten, Emily and Loon, and was attempting to find locations on Fay Lake when the mistake was found by DNR staff and alerted LCD staff.

As erroneous information had been disseminated to the public Conservation Technician Scott Goodwin sent the following e-mail to members of the public, local officials and state DNR staff involved.

Ladies and Gentlemen,

I am contacting you as you are associated with three Florence County lakes that the Land Conservation Department, and I in my capacity as AIS Coordinator for Florence County, have discussed with you regarding the findings of Zebra Mussel veliger and/or Spiny Waterflea in plankton tows conducted by the DNR in 2015. Specifically, Lake Emily, Fay Lake, and Patten Lake.

My dissemination of this report was in error. The WI DNR results did not show the presence of these invasive species in your lakes. On behalf of myself, the Florence County Land Conservation Department and the members of the Florence County AIS and CBCW Staff, I sincerely apologize for any concern or stress you may have been caused by this incorrect information.

After discussion with the DNR it is my understanding that the Excel spreadsheet that was sent to me was a preliminary report missing a column that showed either a positive or a negative result for the lakes tested. I misinterpreted this data initially as a positive finding. Then, as the AIS Coordinator is a Limited Term Employment position, my 2015 term had ended and I was no longer in the office when the final report—the report that showed either positive or negative results—was sent out, and therefore I never saw the final report. When I returned to work in April of 2016 I did so with the belief that we had new potential infestations and we needed to get to work on them as soon as possible.

That the discovery of this error coincided with the Land Conservation Department's staff transition, with me leaving as AIS Coordinator to take the position of Land Conservation Technician, and Carolyn Weber-Starling taking over as AIS Coordinator, only added to the problem as e-mail communications were confused and delayed.

Again, I apologize for this error. The positive side of this is that Lakes Emily, Fay, and Patten probably do not have new AIS infestations. However, as we already have Zebra Mussel substrate test plates installed on two of the three lakes I would suggest we keep those in place and continue to monitor them through the season.

If you have any questions please contact me at sgoodwin@co.florence.wi.us or call me at (715) 528-3484.

Thank you.

Scott W. Goodwin

Florence County Land Conservation Technician
Florence County Land Conservation Department
P.O. Box 410; 501 Lake Ave.
Florence, WI 54121
Phone: (715) 528-3484; Cell: (715) 889-2972

Barrens Lake (WBIC 602400)

Contained within the Spread Eagle Barrens State Natural Area, Barrens Lake is an approximately 9 acre lake with a depth of 23 feet (WDNR 2015A). The unpaved, one-lane trail leading to the lake and rough dirt boat landing restricts the size and type of watercraft that can be used on the lake.

Eurasian (*Myriophyllum spicatum*) and hybrid water-milfoil are present in Barrens Lake. Florence County AIS Technicians (AIST) Crago and Brunette conducted the 2015 assessment of the lake. They observed invasive water-milfoil predominantly along the east and north side of the lake, with the growth along the east shore as densest.

The 2016 monitoring was conducted by AIS Coordinator (AISC) Weber-Starling, and AIST Crago. No significant changes in the invasive milfoil populations was seen. No additional invasive species were found.

On July 28, 2015 four county AIS staff members conducted an exercise to hand-pull the invasive water-milfoil in the lake. This was largely unsuccessful due to numerous factors including the depth, bottom muck, loss of visibility, and number of the plants present. Removal of the invasive water-milfoil in Barrens Lake will require different methods, possibly a Diver Assisted Suction Harvesting (DASH) system, to make any headway. However, due to the difficulty in launching watercraft on this lake makes a standard pontoon boat-based DASH system impossible to use on this lake. Limited access is a problem on other Florence County lakes with EWM, such as Frog Lake.

Image from Google Earth

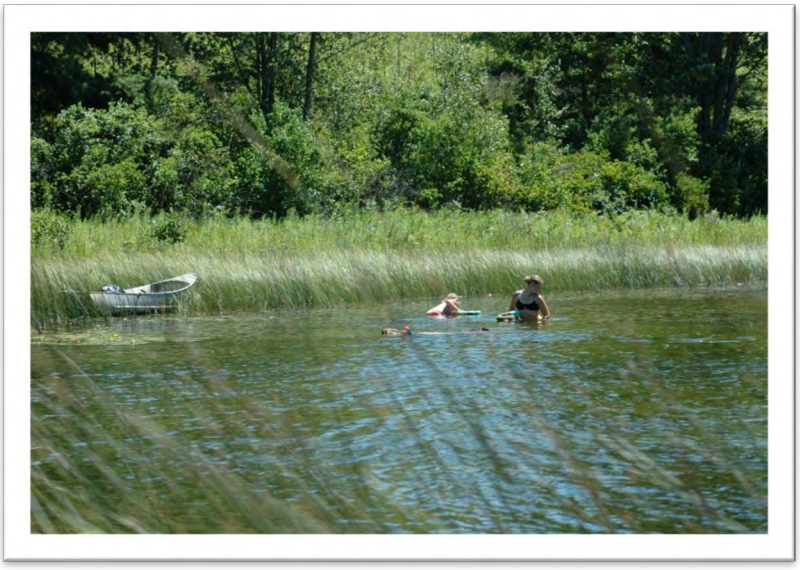
With this problem in mind, in 2015 the Florence County Land Conservation Department assessed options for the development of a DASH vessel and system based on the concept of being easily broken down, transported, and reassembled. While such a versatile DASH vessel was, and still is, beyond the current resources of Florence County LCD, the information was passed to the Wild Rivers Invasive Species Coalition (WRISC).

WRISC is a Cooperative Invasive Species Management Area (CISMA) operating in northeast Wisconsin and the Upper Peninsula of Michigan. WRISC covers five counties, including Florence. Florence County was a founding partner in WRISC, and Conservation Technician (CT) Goodwin currently serves on the WRISC Board of Directors.

AIS staff conduct hand-pulling of Eurasian Water Milfoil on Barrens Lake, 2015

Photo: Scott W. Goodwin

In January 2017 WRISC applied for a Great Lakes Restoration Initiative grant. A portion of this grant may be earmarked for the building of a versatile DASH vessel based on this concept of easy transport. If this funding is secured the Florence County Land Conservation Department anticipates its staff helping WRISC with the full design and construction of the DASH vessel and system. Once completed this DASH unit would be available for use on lakes within the five counties WRISC operates in. With limited activity, inside a State Natural Area, and with dense, mixed native and invasive plant growth, Barrens Lake may prove to be an ideal lake to test this new vessel and system out. If this project proceeds, the Florence County LCD will work with WRISC in communicating with the DNR to address questions, and secure permitting for mechanical removal of invasive plants in some Florence County lakes.

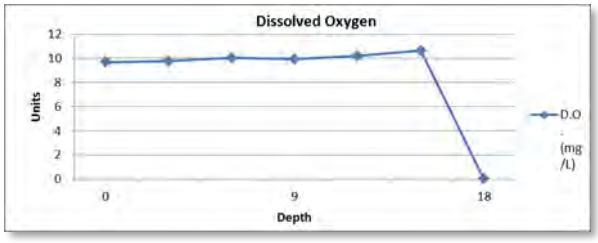


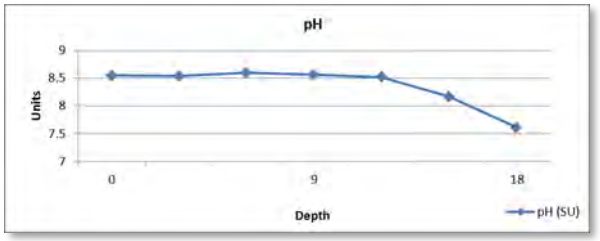
Problems with visibility and bottom muck made hand-pulling difficult

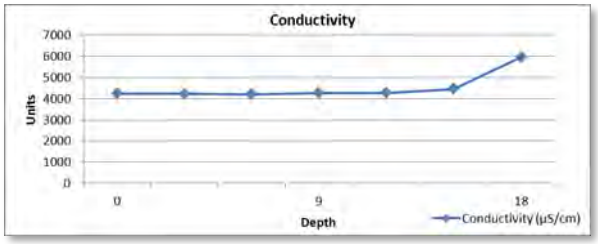
Photo: Scott W. Goodwin

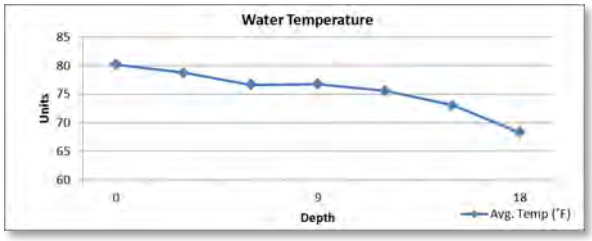
Barrens Lake Data 2015

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
12:45	18	Surface	1	3	1.2			
Chemistry Observation Period					Lat/Long	N45° 51.540' W88°06.044'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.68	125.8	79.7	8.55	81.2	4240	79.7	**80.20**
3	9.77	124.9	78.1	8.54	79.8	4220	78.4	**78.77**
6	10.04	126.9	77.1	8.6	75.4	4210	77.5	**76.67**
9	9.93	124.3	76.2	8.56	77.5	4270	76.6	**76.77**
12	10.19	126	74.9	8.52	76.3	4270	75.5	**75.57**
15	10.63	129.1	73.3	8.17	73	4450	72.8	**73.03**
18	0.024	2.7	67.9	7.61	69	5940	68.1	**68.33**



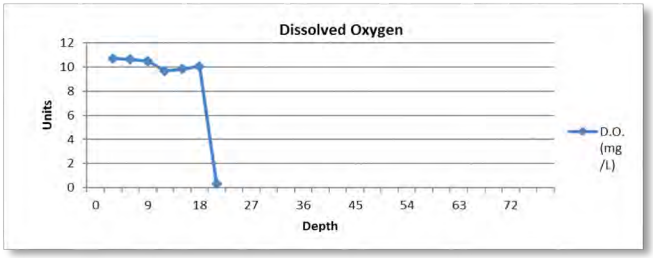


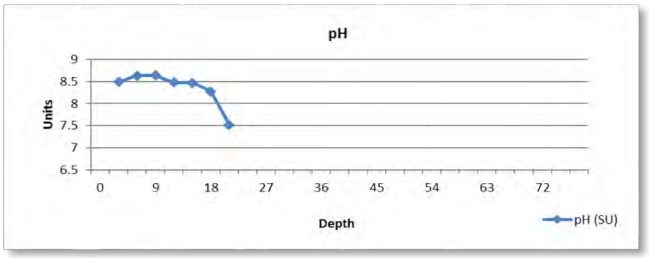


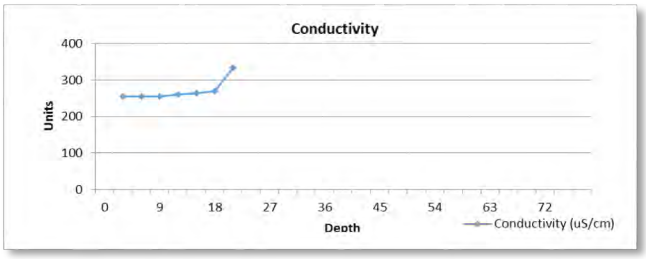


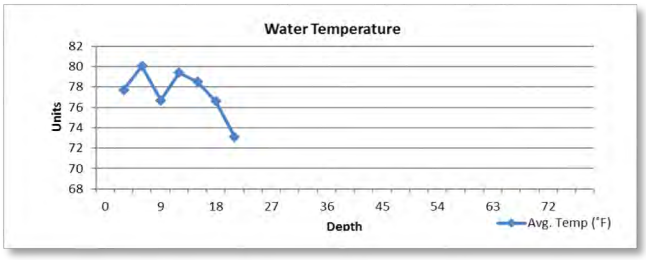
Barrens Lake Data 2016

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
N/A	18.5	20	1	3	1	1.5		4
Chemistry Observation Period			N/A		Lat/Long	N45° 51.540' W88° 06.044'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (uS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	10.7	138.4	72.9	8.49	80	255	80.2	**77.70**
3	10.64	138.5	79.5	8.63	80.3	255	80.3	**80.03**
6	10.49	137.2	80	8.64	70.1	255	80	**76.70**
9	9.68	125.7	79.4	8.48	79.4	261	79.4	**79.40**
12	9.82	123.4	78.5	8.47	78.3	264	78.7	**78.50**
15	10.07	127.5	76.9	8.28	76.5	269	76.4	**76.60**
18	0.35	4.3	73.4	7.52	72.6	334	73.3	**73.10**









Cosgrove Lake (WIBC 585100)

Cosgrove Lake is located in north-central Florence County. It is a 76 acre seepage lake with a maximum depth of 26 feet (WDNR 2015B). There is a 2.9 acre privately owned island in the west portion of the lake. The 2015 monitoring of Cosgrove Lake was conducted by Florence County AIS Staff Crago and Brunette on July 9, 2015.

Cosgrove Lake is one of two known locations in Florence County of the invasive grass Phragmites (*Phragmites australis*). In 2015 this infestation was estimated to be located on the south shore of the island and along the southeast shore of the lake. Ongoing fisheries research by the DNR has precluded the use of herbicide sprays to treat the infestation. The Wild Rivers Invasive Species Coalition (WRISC) had planned for hand removal of the Phragmites during the 2016 field season (Anderson, E., personal communication). As of December 2015 DNR Fisheries Biologist Greg Matzkie cleared WRISC to hand swipe the plants with herbicide as it was decided this would not affect the outcome of the fisheries research.

On August 6, 2016 WRISC Coordinator Emily Anderson and Florence County Conservation Technician (CT) Scott Goodwin conducted the lake monitoring of Cosgrove Lake and assessed the non-native Phragmites growth on the lake. Four additional sites were documented showing the invasive Phragmites was spreading around the lake. In addition to the Phragmites, a single stem of purple loosestrife was located by Anderson inside the large mass of Phragmites on the island (site 4).

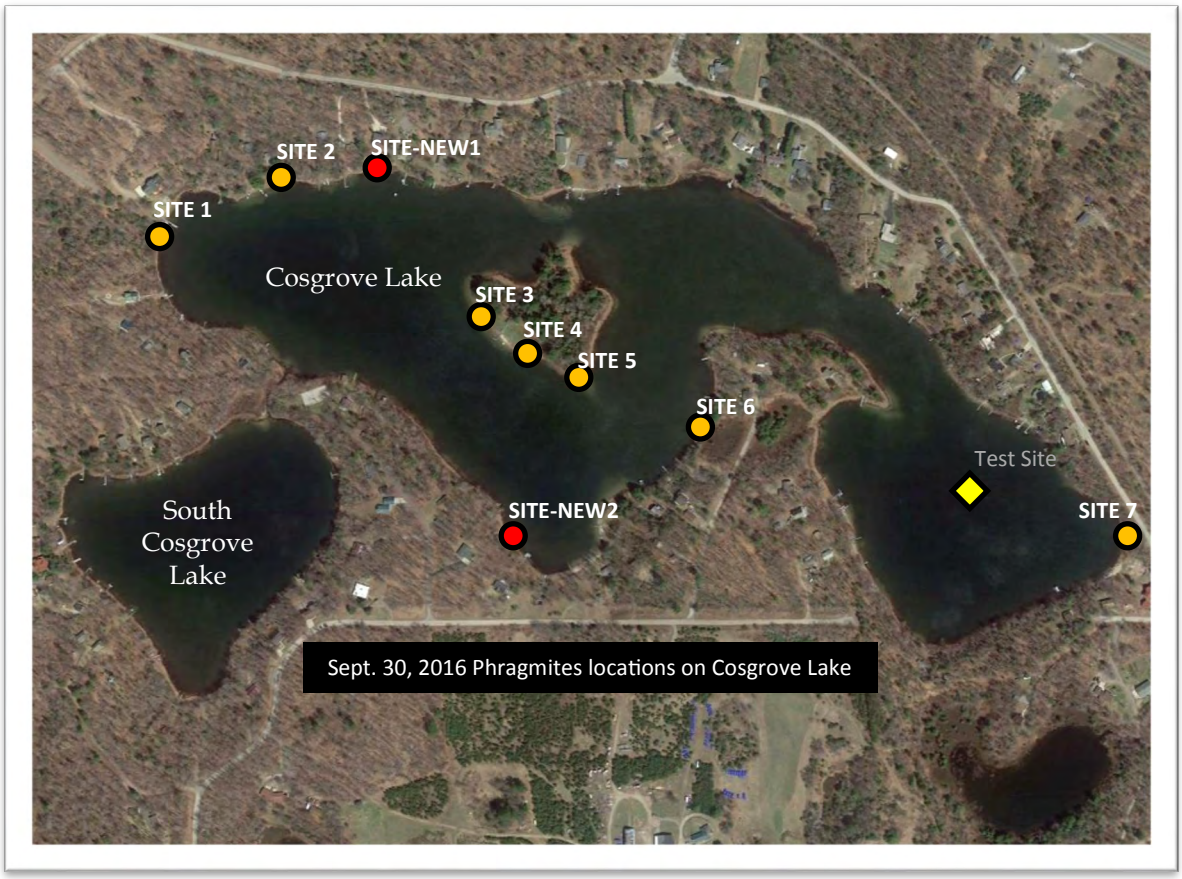


Image from Google Earth
Data: WRISC & FCLCD

South Cosgrove Lake is a small waterbody that is linked to the main body by a navigable channel. The public boat landing is located on the south shore of this lake. South Cosgrove Lake was also inspected for AIS at this time with no findings.

Cosgrove Lake (WIBC 585100)

Lindsay Peterson (WRISC) hand-swiping Phragmites at Cosgrove Lake Site 2

All photos: Scott W. Goodwin

On September 30, 2016 CT Goodwin, and Project Manager Lindsay Peterson of WRISC conducted eradication efforts on the documented stands of non-native Phragmites. This work was conducted under WDNR Permit Number NO-2016-19-1119. Peterson (Applicator Certification Number: 314975-RA)used a 2% Rodeo™+1% Cygnet Plus™ solution to hand-swipe stems on multiple sites around the lake.

Phragmites at Cosgrove Lake Site 4

During this work two additional small stands of non-native Phragmites were located, bringing the total number of Phragmites locations on the lake to nine. The plants at these two sites had bolted between the August assessment and the September eradication work. As neither FCLCD nor WRISC had secured land-owner permission to treat these new locations they were left untreated. It is anticipated that after securing land-owner clearance these two sites will be treated in the 2017 season when additional treatment of the known sites is conducted.

Phragmites at Cosgrove Lake Site 7

Cosgrove Lake (WIBC 585100)

With the expansion of non-native Phragmites to new areas of Cosgrove Lake the Florence County Land Conservation Department and the Wild Rivers Invasive Species Coalition are concerned the invasive will also spread to nearby ponds bordering Cosgrove Lake. Such pond-hopping could allow non-native Phragmites to enter Lake Anna to the south and the Spread Eagle Chain of Lakes to the east.

An attempt was made to inspect these ponds late in the 2016 season, but they are surrounded by private property with no public access. The Florence County Land Conservation Department and the Wild Rivers Invasive Species Coalition will attempt to secure permission from land-owners to allow for inspection and possible treatment of these ponds during the 2017 season.

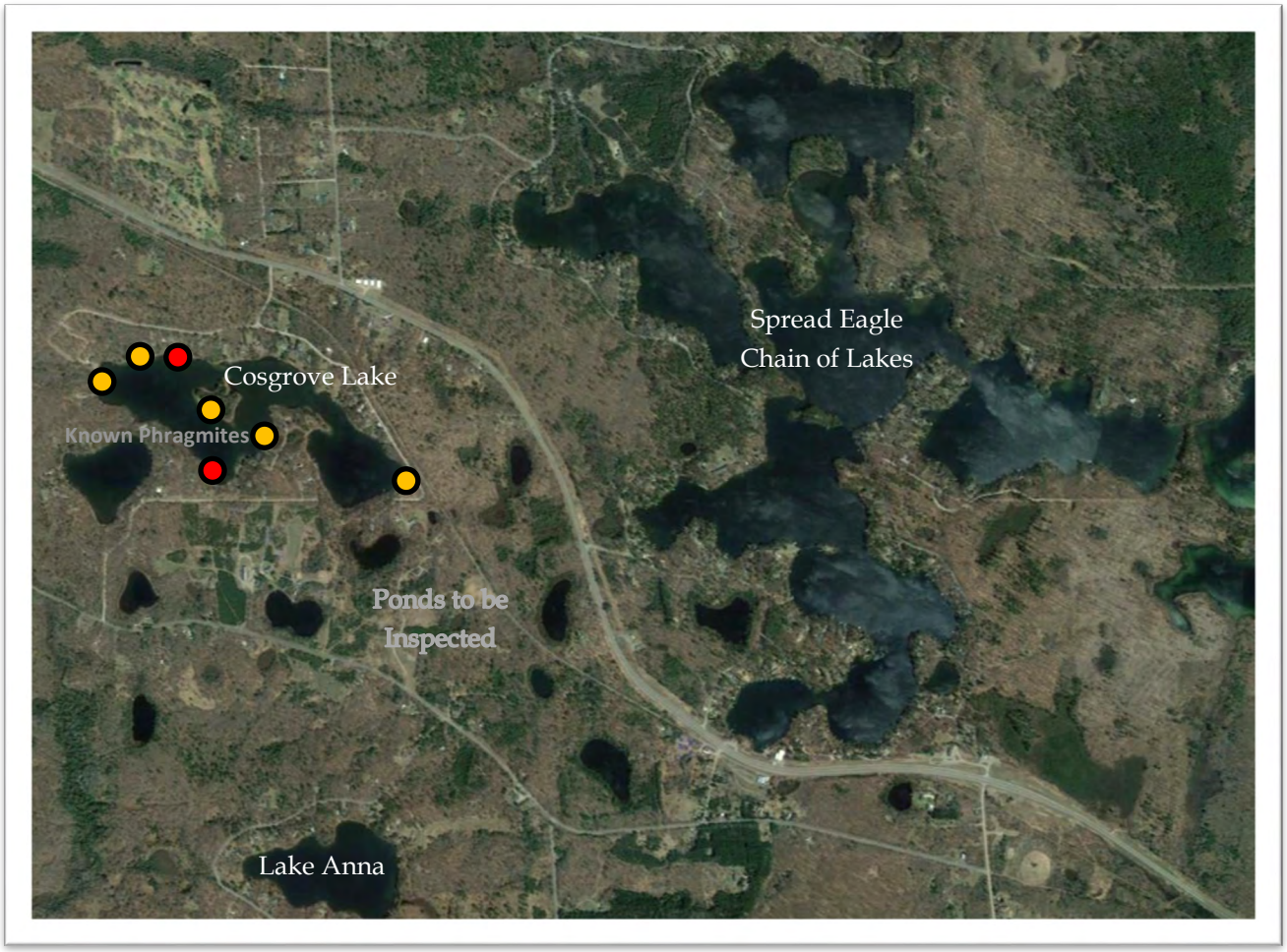
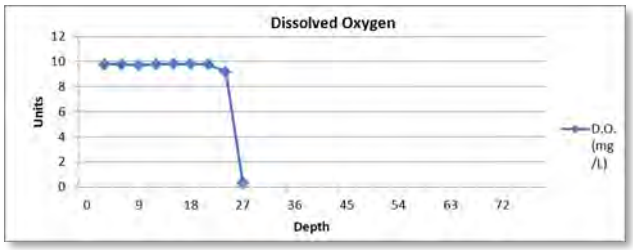
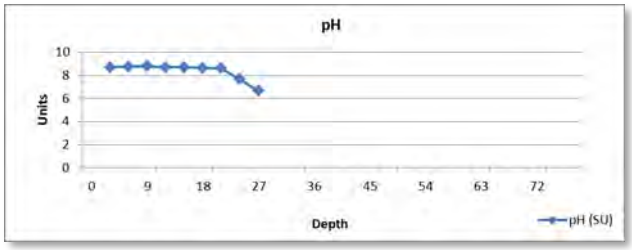


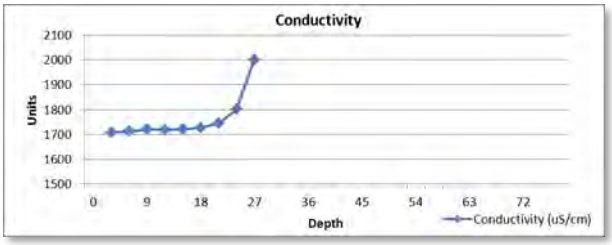
Image from Google Earth

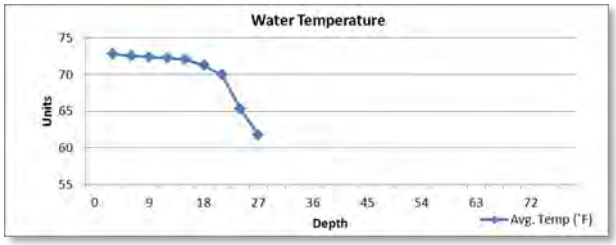
2015 Cosgrove Lake Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
10:00	10.3	25	1	3	2	2		2
Chemistry Observation Period			10:15-11:00 am		Lat/Long	N45.89251° W88.16849°		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.77	118.8	73	8.69	72.6	1709	72.8	**72.80**
3	9.77	118.4	72.6	8.75	72.5	1713	72.6	**72.55**
6	9.72	117.4	72.4	8.78	72.4	1720	72.4	**72.40**
9	9.76	117.9	72.3	8.71	72.2	1719	72.3	**72.25**
12	9.79	117.9	72.1	8.7	71.9	1720	72.2	**72.00**
15	9.8	117.1	71.3	8.65	71.3	1727	71.2	**71.30**
18	9.76	115	70	8.6	69.9	1745	70	**69.95**
21	9.16	103.4	66.2	7.67	64.6	1801	65.2	**65.40**
24	0.34	3.6	61.5	6.64	62.7	2002	61	**62.10**



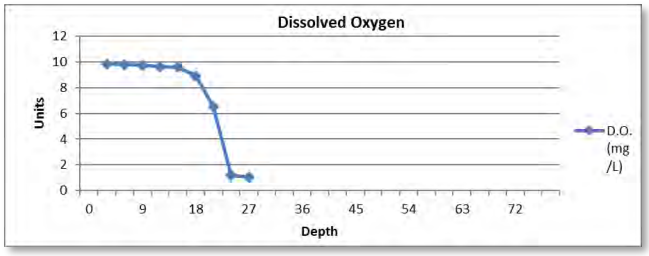


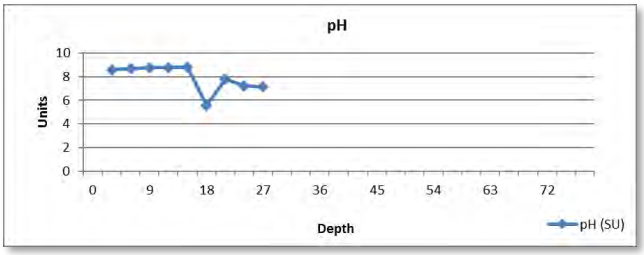


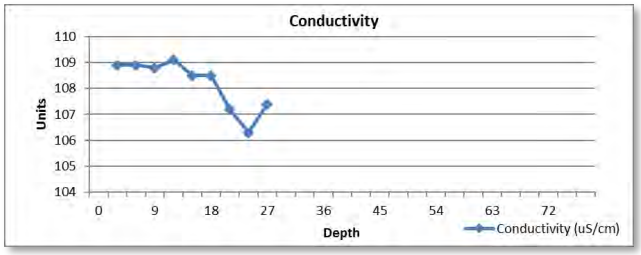


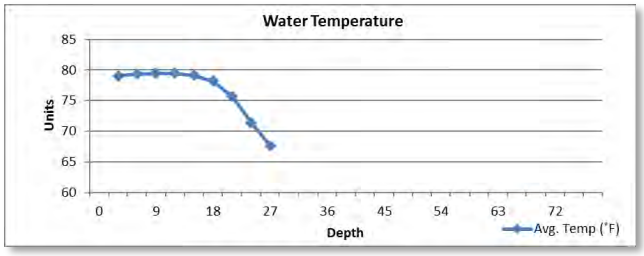
2016 Cosgrove Lake Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
9:50 AM	12	25.6	2	3	1	2		2
Chemistry Observation Period			9:15-9:50 AM		Lat/Long			
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.84	127.1	78.4	8.58	79.3	108.9	79.5	**79.07**
3	9.78	127	78.9	8.68	79.5	108.9	79.6	**79.33**
6	9.72	126.6	79.1	8.78	79.6	108.8	79.7	**79.47**
9	9.62	125.3	79.2	8.78	79.6	109.1	79.6	**79.47**
12	9.6	124.8	79	8.8	79.2	108.5	79.2	**79.13**
15	8.92	115	78.2	5.57	78.3	108.5	78.1	**78.20**
18	6.53	82.3	76	7.8	75.6	107.2	75.5	**75.70**
21	1.2	14.5	71.7	7.24	71	106.3	71.6	**71.43**
24	1.06	12.3	68.3	7.13	67.4	107.4	67.3	**67.67**









Edith Lake (WBIC 706000)

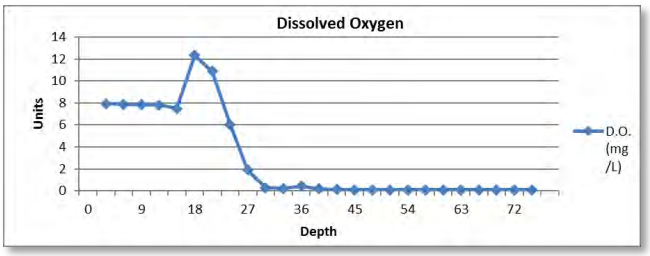
Located in the north-central Florence County Edith Lake is a 42 acre drainage lake. Much of the land surrounding Edith Lake is either Federal or State owned, and with only one camp along its shoreline, the lake retains a high natural status. Though the lake is not particularly large, LCD staff recorded a depth of 79 feet at the test site, slightly deeper than the DNR's listed depth of 72 feet.

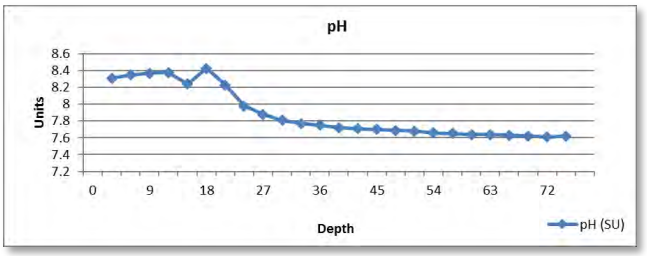
Image from Google Earth

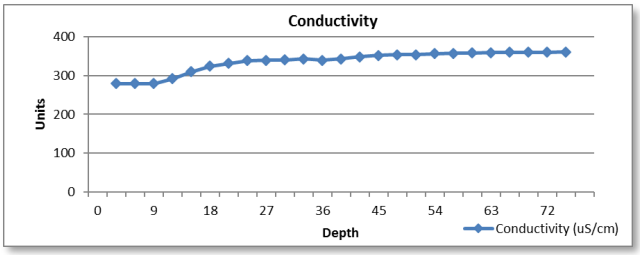
Monitoring on this fairly remote lake was conducted on August 11, 2016 by Florence County AIS Coordinator (AISC) Carolyn Weber-Staring and AIS Technician (AIST) Bryce Crago. There were no AIS found, and the lake appeared to be very healthy. A large wetland on the east shore was assessed for invasives with no findings.

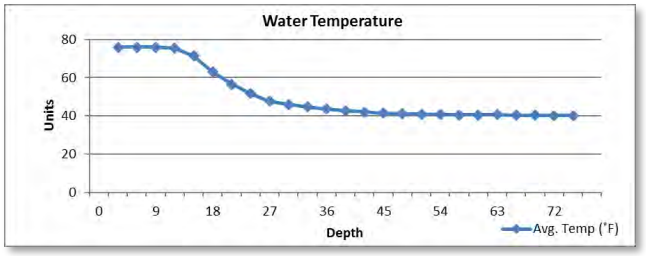
2016 Edith Lake Data

Secchi Obs. Tim+A15:I45 e	Secchi Depth	Sampled Lake Depth	Hit Bottom	Lake Level	Appearance	Water Color		Perception
			1=yes 2=no	1=high 2=low 3=normal	1=clear 2=murky	1=blue 2=green 3=brown 4=red 5=yellow		1(best) - 5 (worst)
11:40 AM	17	79	2	3	1	2		1
Chemistry Observation Period			11:40 AM-12:45 PM		Lat/Long			
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	7.94	103	75.7	8.31	76.3	279	76	**76.00**
3	7.87	99.6	75.8	8.35	76.2	279	76	**76.00**
6	7.85	99.3	75.9	8.37	76.1	279	76	**76.00**
9	7.8	98.7	75.9	8.38	76.1	292	74.4	**75.47**
12	7.5	93.3	74.3	8.24	73.5	310	66.2	**71.33**
15	12.32	137.9	64.7	8.43	65.9	324	58.3	**62.97**
18	10.88	114.1	59.2	8.23	58.5	331	52.1	**56.60**
21	6.04	58.1	52.1	7.98	53.6	338	49.4	**51.70**
24	1.89	16.9	47	7.88	49.6	339	46.4	**47.67**
27	0.28	2.5	45.3	7.81	47.8	340	44.7	**45.93**
30	0.21	1.8	44.5	7.77	46.4	343	43.3	**44.73**
33	0.44	3.7	42.9	7.75	44.8	339	43.3	**43.67**
36	0.17	1.5	42.1	7.72	43.7	343	42.3	**42.70**
39	0.12	1	41.3	7.71	43	348	41.5	**41.93**
42	0.1	0.8	41	7.7	42.3	352	40.9	**41.40**
45	0.09	0.8	40.5	7.69	42	354	40.5	**41.00**
48	0.09	0.7	40.3	7.68	41.7	354	40.6	**40.87**
51	0.09	0.7	40.1	7.66	41.5	356	40.3	**40.63**
54	0.09	0.7	40	7.65	41.3	357	40.3	**40.53**
57	0.09	0.7	39.9	7.64	41.4	358	40.2	**40.50**
60	0.08	0.7	39.9	7.64	41.1	359	41.2	**40.73**
63	0.08	0.7	39.9	7.63	41	360	40.1	**40.33**
66	0.08	0.7	39.8	7.62	40.9	360	40.1	**40.27**
69	0.08	0.6	39.8	7.61	40.8	360	40.1	**40.23**
72	0.08	0.6	39.7	7.62	40.7	361	40	**40.13**





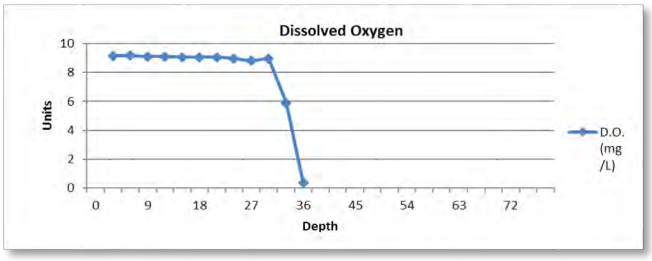




Lake Anna (WBIC 587400)

Lake Anna is a 33 acre seepage lake located at 45.87856750, -88.16113740 in the central region of Florence County. Lake monitoring was conducted in 2016 by AISC Weber-Starling and AIST Crago. Lake Anna has a non-verified report of freshwater jellyfish. Florence County staff did not find any of this species, nor were any new AIS infestations documented for this lake.

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
11:14 AM	16.5	40	2	3	1	2		3
Chemistry Observation Period				10:40 AM	Lat/Long	45.87835 -88.16273		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.15	100.1	64.5	7.22	63.9	22.1	64.6	**64.33**
3	9.17	99.9	64.2	7.2	64.1	22.1	64.6	**64.30**
6	9.1	99.1	64.2	7.17	64.1	22.1	64.5	**64.27**
9	9.1	98.9	64.1	7.22	64	22.1	64.4	**64.17**
12	9.06	98.5	64	7.24	64	22.1	64.4	**64.13**
15	9.06	98.4	64	7.3	64	22.1	64.3	**64.10**
18	9.05	98.3	64	7.29	64	22.1	64.2	**64.07**
21	8.96	97.2	63.9	7.33	64	22	64.2	**64.03**
24	8.81	95.2	63.5	7.3	63.4	22	63.7	**63.53**
27	8.96	88.6	56.2	7.11	56.6	23.4	56.1	**56.30**
30	5.89	55.2	51.9	6.95	52.5	24.2	51.8	**52.07**
33	0.36	3.3	50	6.49	50.8	66	50.9	**50.57**



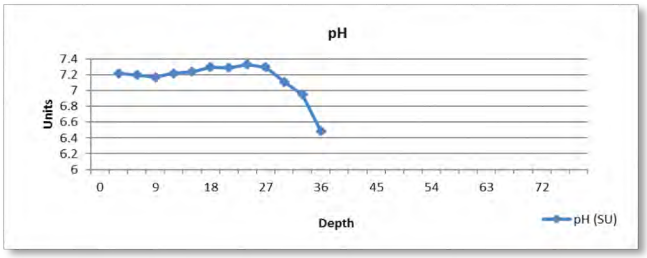
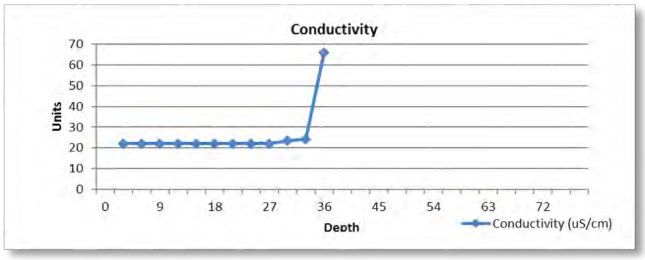
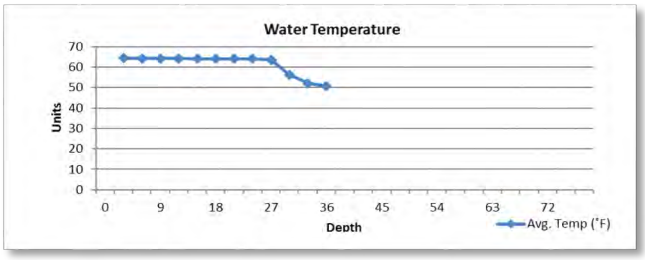


Image from Google Earth





Lake Ellwood (WBIC 650500)

Located in central Florence County Lake Ellwood is a known source-water for Eurasian and hybrid water-milfoil (*Myriophyllum spicatum*). This 130 acre seepage lake (WDNR 2015C) also has banded mystery snail (*Viviparus georgianus*), and rusty crayfish (*Orconectes rusticus*) populations. The Lake Ellwood Association has been contracting on-going mitigation of the invasive water-milfoil infestation for multiple seasons as part of their Lake Management Plan.

Lake monitoring on Ellwood was conducted on July 23, 2015 by Florence County AIS Staff Crago and Brunette. They documented Eurasian watermilfoil floating on the surface near the public boat landing as well as snails thought to be banded mystery snails, but not confirmed.

The 2016 monitoring of Lake Ellwood was conducted by CT Goodwin and AISC Weber-Starling on October 11, 2016. A full meandering shoreline survey was conducted. Locations of Eurasian/hybrid water-milfoil were documented.

Site 1: N45° 51.424' W88° 08.650'

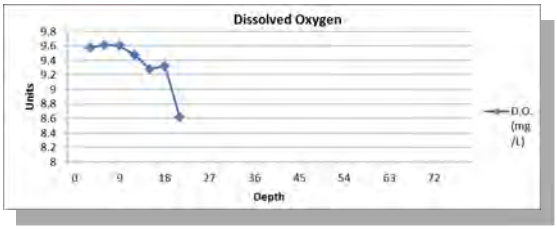
Site 2: N45° 51.809' W88° 08.739'

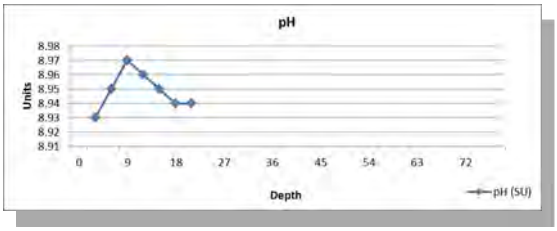
Site 3:N45° 51.661' W88° 08.448'

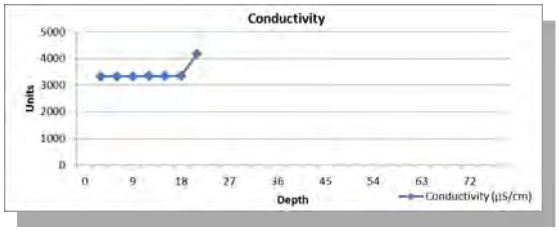
Image from Google Earth

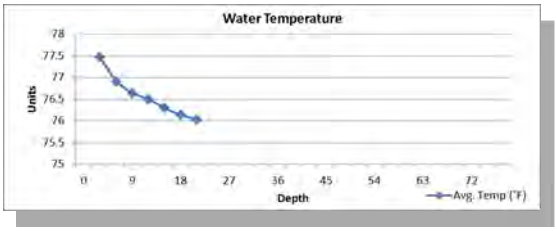
2015 Lake Ellwood Data

Depth (feet)	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
10:45	14.5	Surface	1	2	1	1.5		
Chemistry Observation Period					Lat/Long	N45° 51.272' W88° 08.420'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.57	120.4	76.7	8.93	78.1	3330	77.6	**77.47**
3	9.61	120.5	76.3	8.95	77.7	3330	76.7	**76.90**
6	9.6	120.3	76.2	8.97	77.1	3330	76.6	**76.63**
9	9.47	118.6	76.2	8.96	76.9	3340	76.4	**76.50**
12	9.28	116	76	8.95	76.6	3340	76.3	**76.30**
15	9.32	116.4	75.9	8.94	76.4	3350	76.1	**76.13**
18	8.62	107.6	75.8	8.94	76.4	4170	75.9	**76.03**



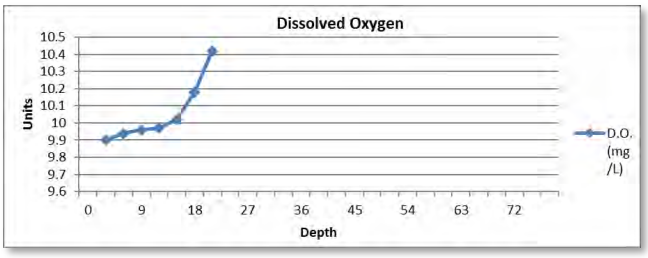


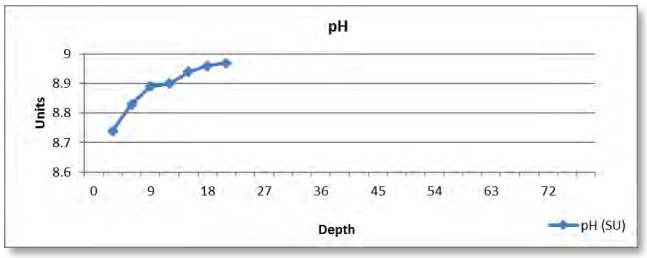


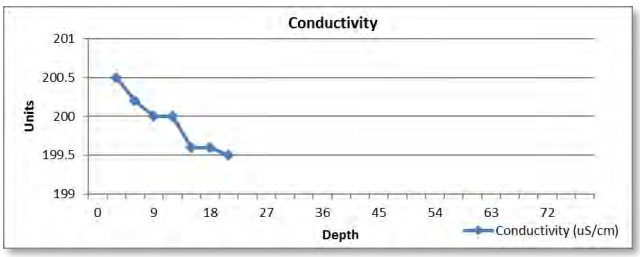


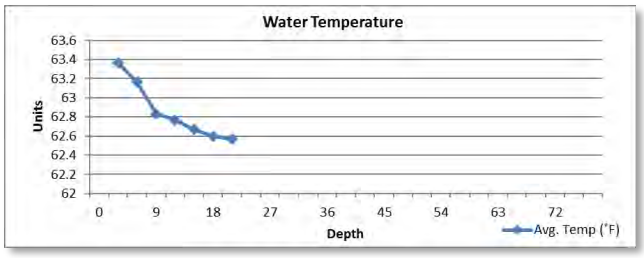
2016 Lake Ellwood Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
1:20 PM	15	20.2	2	3	1	2		2
Chemistry Observation Period					Lat/Long			
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.9	107.7	63.4	8.74	63.4	200.5	63.3	**63.37**
3	9.94	107.8	63.2	8.83	63.2	200.2	63.1	**63.17**
6	9.96	107.6	62.8	8.89	62.9	200	62.8	**62.83**
9	9.97	107.6	62.7	8.9	62.8	200	62.8	**62.77**
12	10.02	108	62.6	8.94	62.7	199.6	62.7	**62.67**
15	10.18	109.6	62.5	8.96	62.7	199.6	62.6	**62.60**
18	10.42	112.2	62.5	8.97	62.6	199.5	62.6	**62.57**









Lake Emily (WBIC 651600)

Lake Emily is a 183 acre drainage lake with a maximum depth of 43 feet (WDNR 2015D). Analysis of the 2015 Clean Boats Clean Waters project conducted by Florence County showed Lake Emily to be one of the more busy public boat landings (Goodwin Unpublished). Known invasives before 2015 included the Chinese mystery snail (*Cipangopaludina chinensis*) and rusty crayfish (*Orconectes rusticus*).

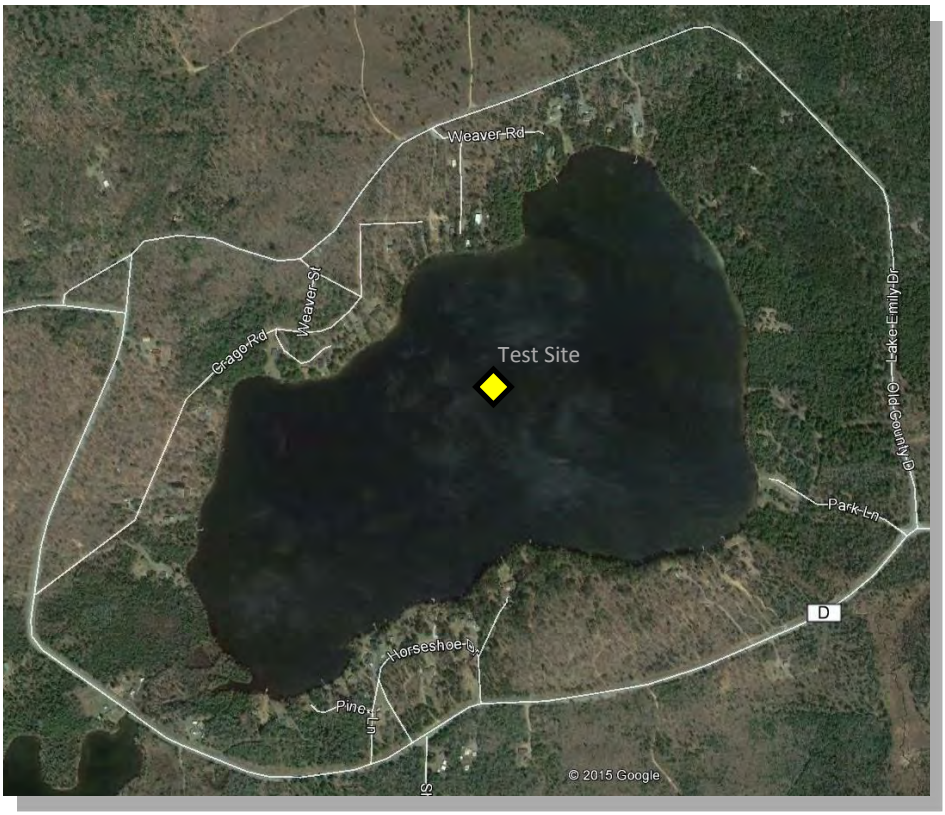


Image from Google Earth

The 2015 monitoring was conducted on June 13, 2015 by CT Goodwin and AIST Crago. No new invasives were located. The 2016 monitoring was conducted by AISC Weber-Starling and AIST Crago on July 19, 2016.

This work included a meandering shoreline survey. No new AIS were found.

Due to the confusion with the 2015 DNR plankton tow results (see pg. 7 this report) at the start of the 2016 season the LCD placed zebra mussel substrate tests in Lake Emily. After it was determined the tow was negative it was decided to keep the tests in place and monitor them. No zebra mussels were found on the test plates at any time through the course of the 2016 season.

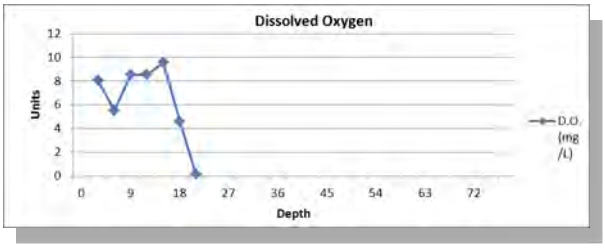
As one of the popular boat landings in the county the LCD will return to conducting regular Clean Boats, Clean Waters inspections at Lake Emily in 2017. The lake was not included in the LCD's 2016 CBCW program, but WRISC did have CBCW staff and a boatwash at Lake Emily periodically in 2016 as part of their CBCW project.

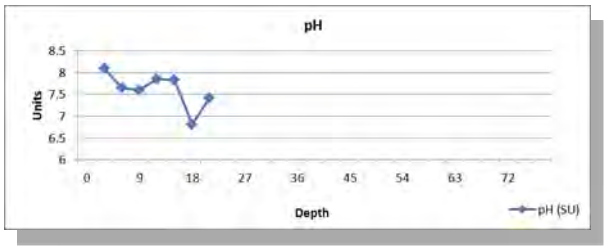
AIS Tech Crago conducts a Secchi disk reading on Lake Emily, 2015

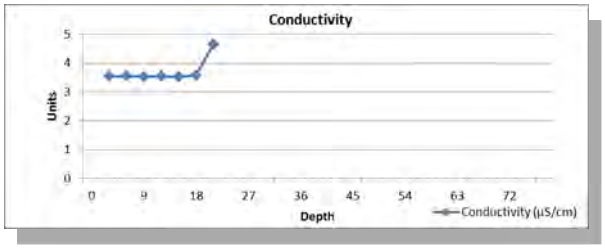
Photo: Scott W. Goodwin

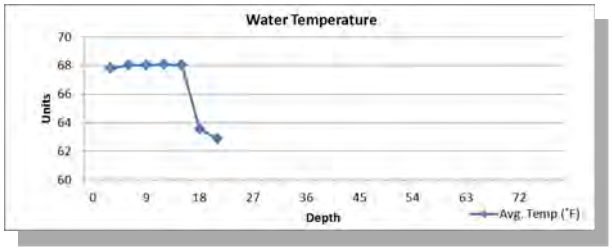
Lake Emily 2015 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
9:50 AM	12.5	20	2	3	1	2		2
Chemistry Observation Period			10:00-12:00		Lat/Long	N45° 52.530' W88° 17.073'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.06	98.3	67.8	8.1		3.54	67.8	**67.80**
3	5.53	97.9	68.1	7.65	68.1	3.54	67.9	**68.03**
6	8.56	98.2	68.1	7.6	68.1	3.53	67.9	**68.03**
9	8.56	98.3	68.2	7.85	68.1	3.54	67.9	**68.07**
12	9.58	98.5	68.1	7.83	68.1	3.52	67.9	**68.03**
15	4.61	50.6	64.2	6.81	62.5	3.57	64	**63.57**
18	0.13	1.4	61.9	7.42	63.8	4.65	63	**62.90**



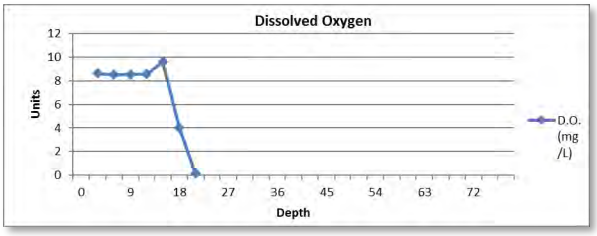


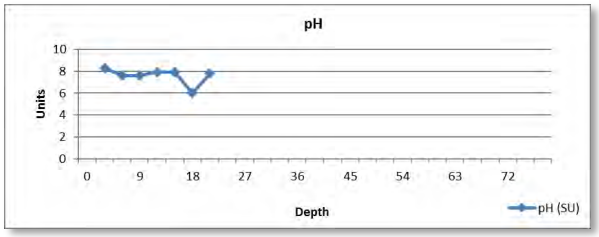


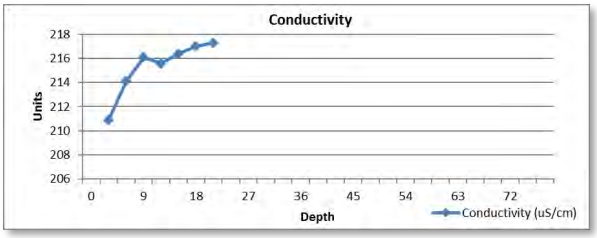


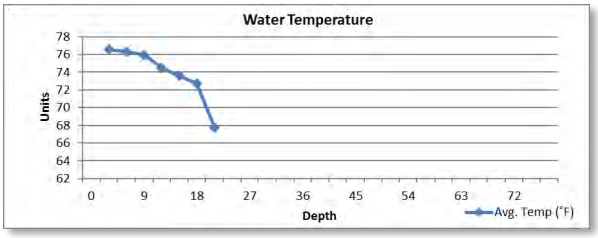
Lake Emily 2016 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom	Lake Level	Appearance	Water Color		Perception
			1=yes 2=no	1=high 2=low 3=normal	1=clear 2=murky	1=blue 2=green 3=brown 4=red 5=yellow		1(best) - 5 (worst)
10:00 AM	11	20	2	3	1	2		2
Chemistry Observation Period					Lat/Long			
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.62	100	76.5	8.3	76.6	210.9	76.6	**76.57**
3	8.52	98	76.3	7.6	76.3	214.1	76.3	**76.30**
6	8.54	98.3	76.1	7.6	75.8	216.1	75.9	**75.93**
9	8.56	98.5	74.6	7.95	74.5	215.6	74.4	**74.50**
12	9.6	90	73.6	7.9	73.5	216.4	73.6	**73.57**
15	4	60	72.8	6	72.7	217	72.7	**72.73**
18	0.15	1.5	67.8	7.8	67.7	217.3	67.7	**67.73**









Fay Lake (WBIC 677100)

Fay Lake is a 272 acre drainage lake (WDNR 2015E) located in west Florence County. Fay receives water from Long Lake and Halsey Lake and drains into the Pine River. Fay Lake is a shallow lake, with a maximum depth of ten feet.

The 2016 monitoring was conducted by CT Goodwin and AIST Crago on August 11, 2016. At this time the lake was very low. Most of the monitored depth was less than five feet, including at the test location. A full shoreline survey was attempted, as the LCD had records from a previous AIS Coordinator that non-native Phragmites might be in this lake. While the low water level made access to some areas of shoreline impossible, no Phragmites was located. Goodwin did note possible reed canary grass (*Phalaroides arundinacea*), but due to the low water level and dense aquatic plant growth extending well out from the shore the team was not able to get close enough to make a positive identification. This will be added to the list for possible work in 2017.

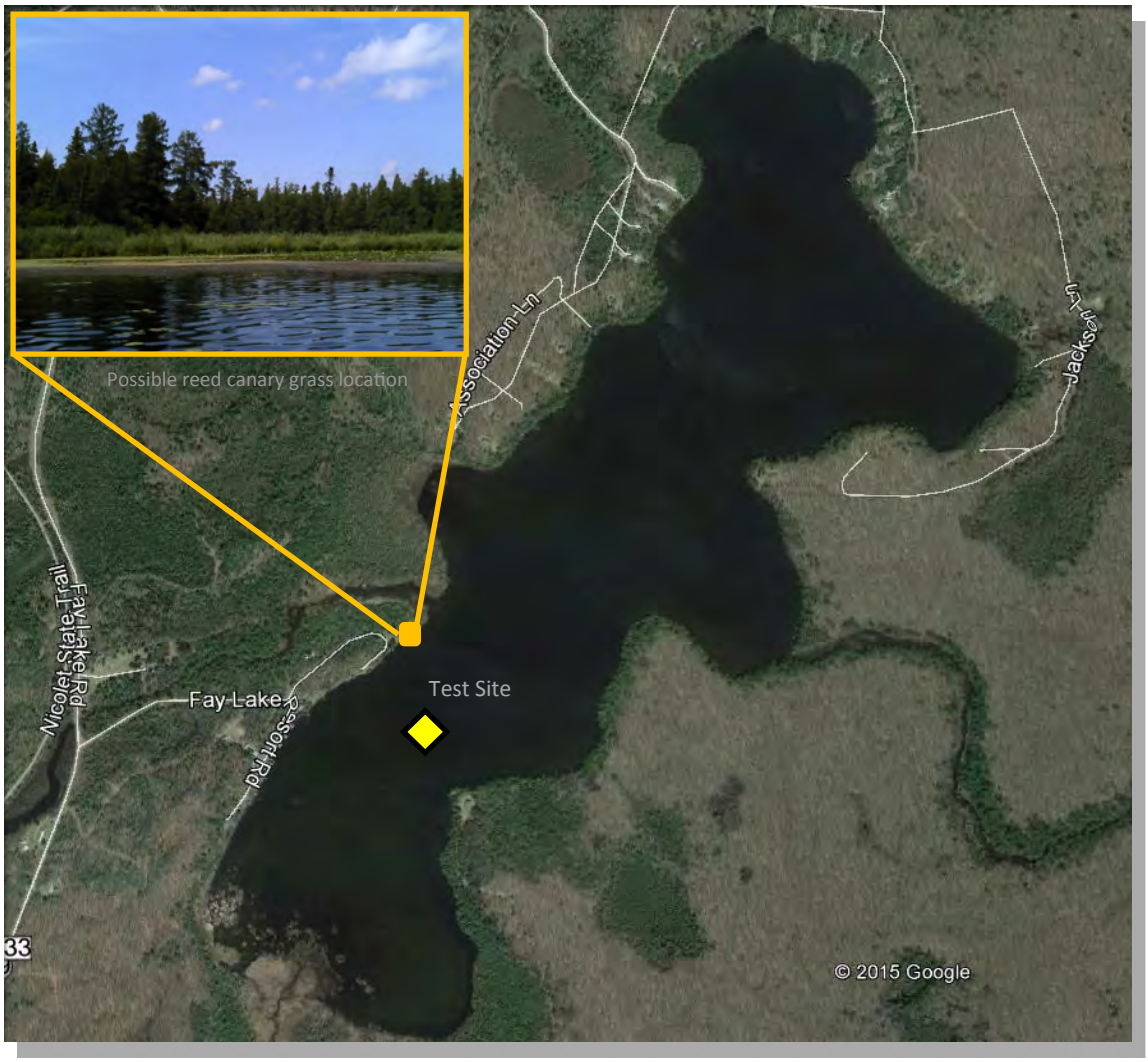
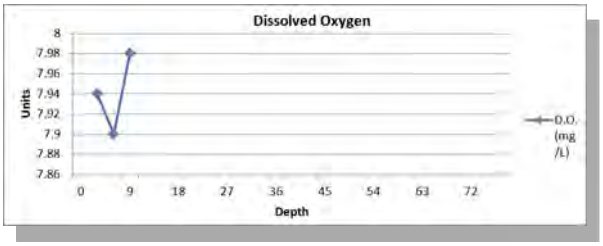


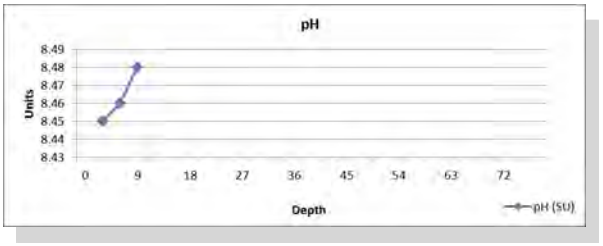
Image from Google Earth

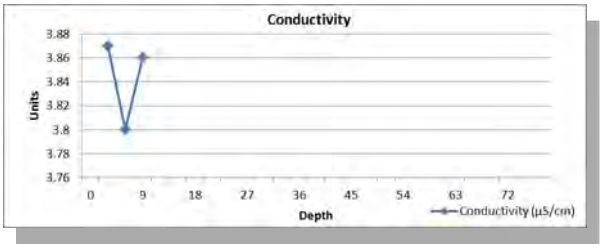
Inset: Scott W. Goodwin

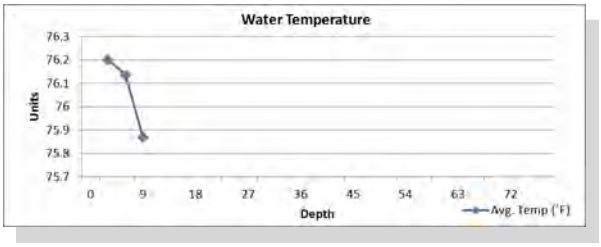
2015 Fay Lake Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
11:30	7	Surface	1	3	1.5	3		
Chemistry Observation Period					Lat/Long	N45° 51.826' W88° 38.524'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	7.94	101.3	76.3	8.45	76.3	3.87	76	**76.20**
3	7.9	100.8	76.2	8.46	76.3	3.8	75.9	**76.13**
6	7.98	101.2	75.7	8.48	76.3	3.86	75.6	**75.87**





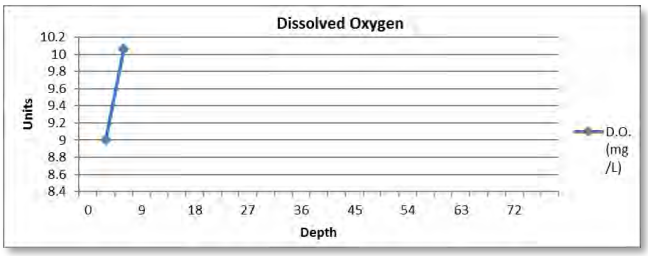


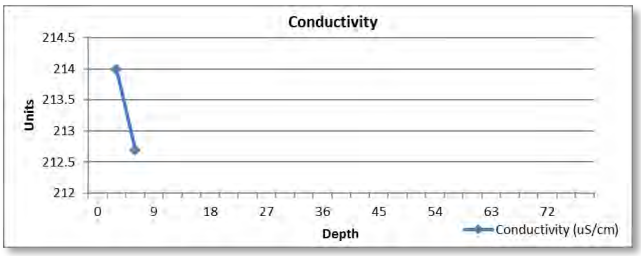


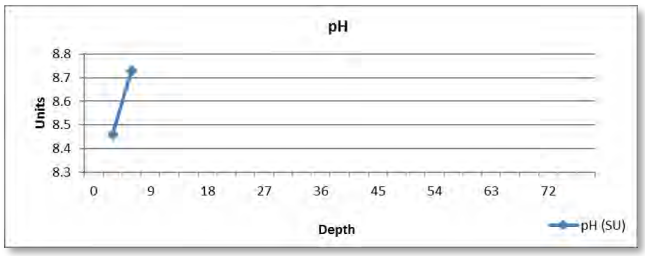
2016 Fay Lake Data

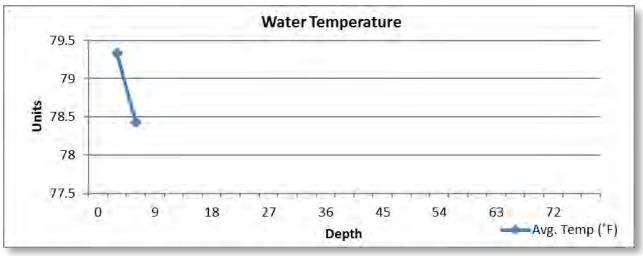
Lake was very low, depth only a few feet. Very heavy plant growth made access difficult. Located possible reed canary grass, but could not get close to make possitive identification. Despite previous AIS Coordinator report, no non-native Phragmites was found.

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
2:00 PM	4.5	4.5	1	2	2	3		3
Chemistry Observation Period			1:40-1:55 PM		Lat/Long	N45° 51.826' W88° 38.524'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9	118.4	79.6	8.46	79.5	214	78.9	**79.33**
3	10.06	130.5	78.5	8.73	78.6	212.7	78.2	**78.43**









South shore of Fay Lake with dense plant growth, 2016

Photo: Scott W. Goodwin

Fisher Lake (WBIC 704200)

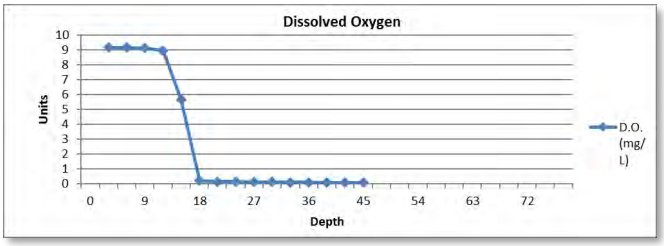
This 50 acre drainage lake (WDNR 2016A) is located in the Town of Florence, within sight of the historic County Courthouse and Jail (NRHP-ID#85003029). Monitoring was conducted by AISC Weber-Starling and AIST Crago. Fisher Lake was not found to have invasive species at this time.

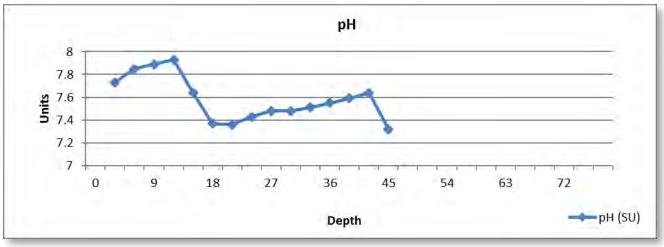
As this lake is located within the largest population center in the county, and with a public park, ORV trails, and easy boat access this lake will be monitored closely in the future for AIS. The Land Conservation Department will also assess Fisher Lake for possible inclusion in future Clean Boats, Clean Waters programs.

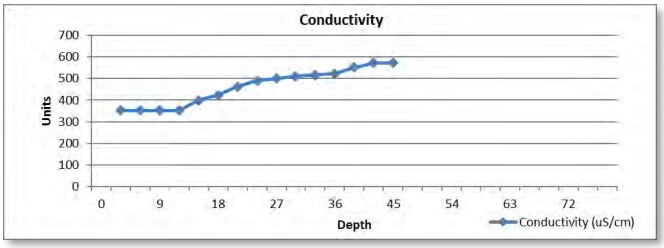
Images from Google Earth

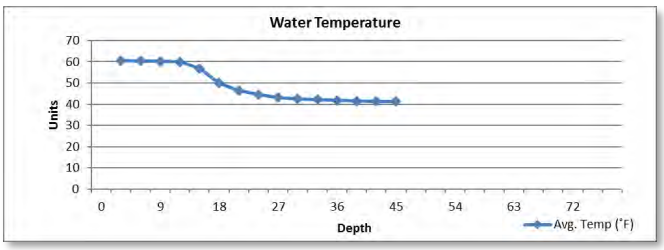
Fisher Lake 2016 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
12:34	5	43	1	3	2	3		3.5
Chemistry Observation Period					Lat/Long	N45° 55.125' W88° 14.798'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.18	95.8	60.2	7.73	60.8	352	60.6	**60.53**
3	9.17	95.5	59.9	7.85	60.5	352	60.5	**60.30**
6	9.14	95.1	59.8	7.89	60.3	352	60.4	**60.17**
9	8.98	93.1	59.6	7.93	60.1	352	60.1	**59.93**
12	5.67	57.2	57.4	7.64	58.2	399	55.1	**56.90**
15	0.21	1.9	49.8	7.37	51.3	423	48.8	**49.97**
18	0.16	1.4	46.7	7.36	46.9	463	45.7	**46.43**
21	0.14	1.2	45	7.43	44.8	490	43.8	**44.53**
24	0.12	1	42.8	7.48	43.7	500	43	**43.17**
27	0.12	1	42.2	7.48	42.9	510	42.3	**42.47**
30	0.11	1	42	7.51	42.6	517	42.2	**42.27**
33	0.11	0.9	41.6	7.55	42	522	41.9	**41.83**
36	0.09	0.8	41.1	7.59	41.8	552	41.5	**41.47**
39	0.09	0.8	41	7.64	41.6	573	41.5	**41.37**
42	0.08	0.7	40.9	7.32	41.6	573	41.5	**41.33**









Frog Lake (WBIC 585700)

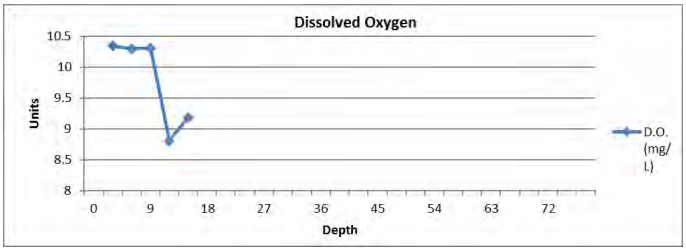
Frog Lake is a small, 28 acre seepage lake (WDNR 2016B). The public boat landing is difficult to access and is only useable by paddle-craft as the walk-in and location in a wetland area allows entry only on foot. The 2016 monitoring of Frog Lake was conducted by AISC Weber-Starling and AIST Crago. The lake was found to have dense population of aquatic plants. Like the closely neighboring Lake Ellwood, and nearby Barren's Lake, Frog Lake has both documented Eurasian and hybrid water-milfoil populations. At the time of the monitoring no additional AIS were found.

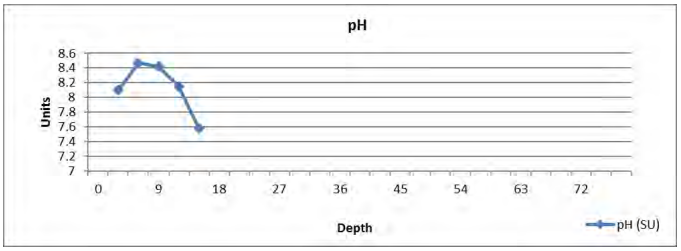
Images from Google Earth

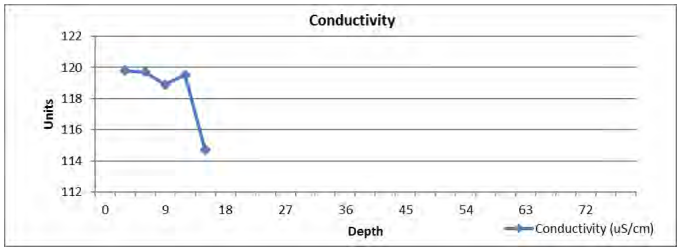
Neighboring lakes Ellwood, Frog and Barrens all have Eurasian water-milfoil

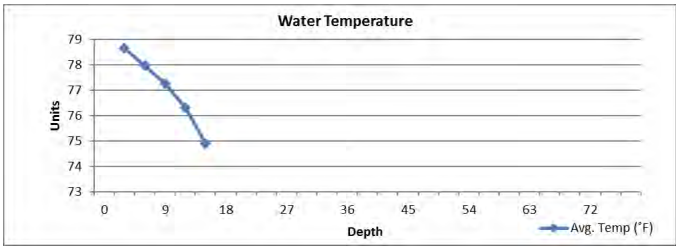
Frog Lake 2016 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
11:50 AM	5.5	15	1	3	2	3		3.5
Chemistry Observation Period					Lat/Long	N45° 51.444' W88° 07.781'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	10.35	132.3	78.4	8.1	78.8	119.8	78.9	**78.70**
3	10.3	130.8	77.7	8.47	78.1	119.7	78.1	**77.97**
6	10.31	130.4	77.2	8.42	77.4	118.9	77.2	**77.27**
9	8.81	110.5	76.3	8.15	76.4	119.5	76.2	**76.30**
12	9.19	113.3	74.8	7.58	75	114.7	74.9	**74.90**









Halsey Lake (WBIC 679300)

Halsey Lake is a 506 acre drainage lake located in the western portion of Florence County (WDNRM). While this is the largest lake by area in Florence County, it is a shallow lake, with a maximum depth of ten feet. Halsey Lake drains into Fay Lake to the north.

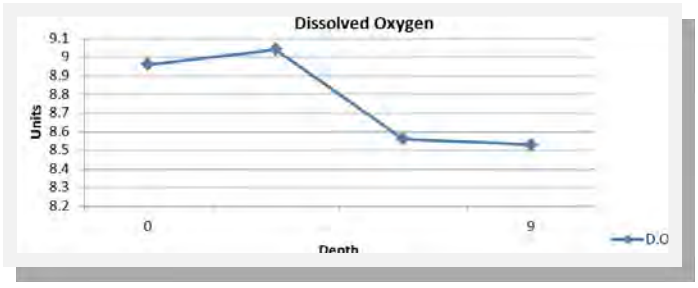
There are currently no documented invasive species in Halsey, and none were reported in 2015 by Florence County staff at the time of the monitoring.

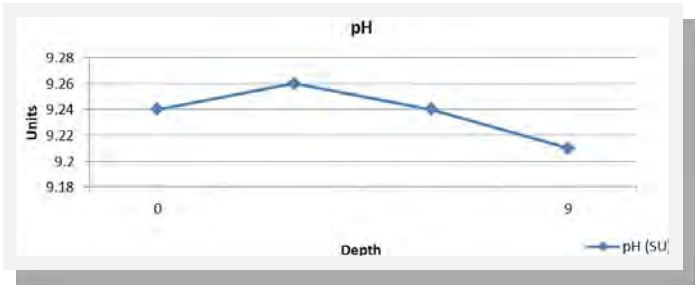
Image from Google Earth

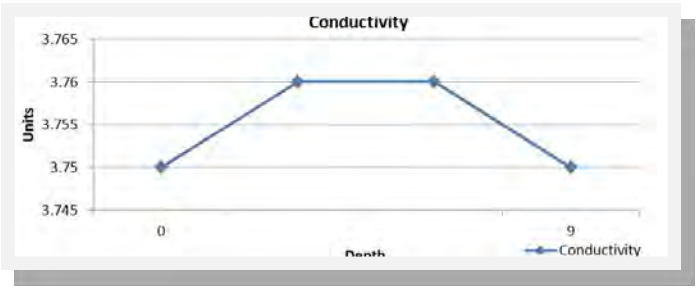
The 2016 survey of Halsey Lake was conducted on August 11, 2016 by CT Goodwin and AIST Crago. At the time of monitoring the lake level was lower than normal, with much of the lake less than four feet deep. The testing location (the same as in 2015) was approximately five feet deep. It should be acknowledged that the low Secchi disk reading may have been due to the boat stirring up the bottom of the shallow lake. No AIS were documented in Halsey Lake in 2016.

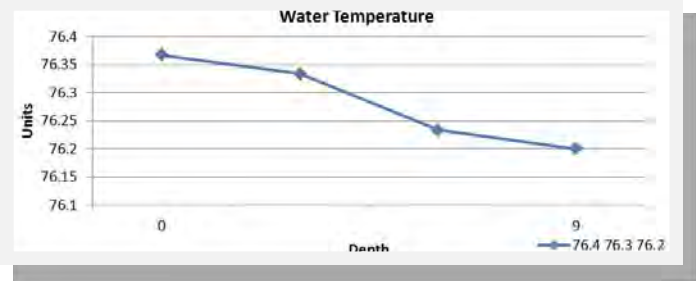
2015 Halsey Lake Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
10:30	2.5	Surface	1	3	2	3		
Chemistry Observation Period					Lat/Long	N45° 50.867' W88° 37.498'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.96	115.2	76.6	9.24	76.1	3.75	76.4	**76.37**
3	9.04	116.1	76.5	9.26	76.2	3.76	76.3	**76.33**
6	8.56	109.7	76.3	9.24	76.2	3.76	76.2	**76.23**
9	8.53	109.3	76.2	9.21	76.2	3.75	76.2	**76.20**





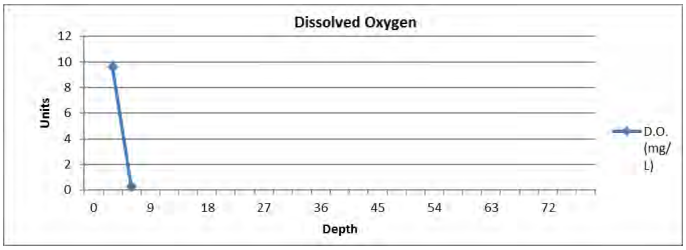


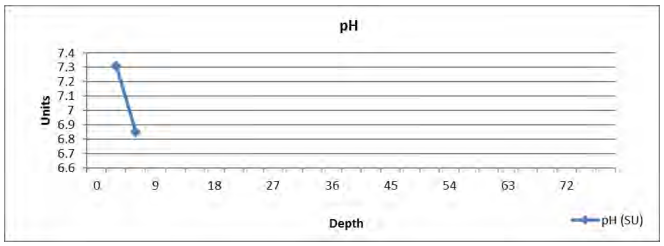


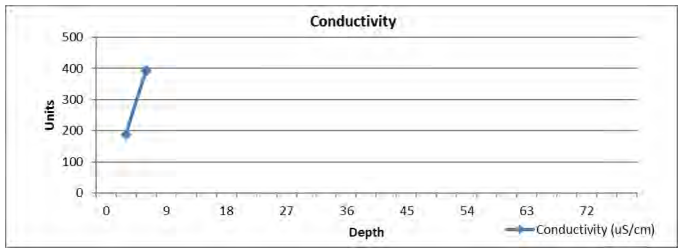
2016 Halsey Lake Data

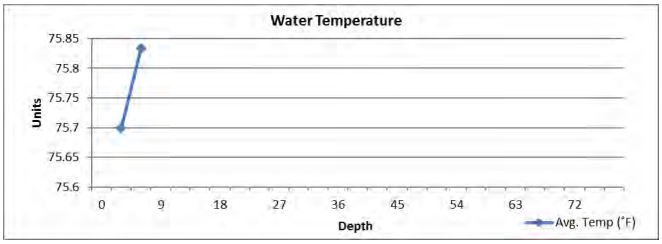
Lake was very low making access difficult. Water depth for much of the lake was less than 4 feet.

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
9:45 AM	4.3	5	2	2	2	3		3
Chemistry Observation Period			9:45-10:00 AM		Lat/Long	N45° 50.867' W88° 37.498'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.59	120.7	75.7	7.31	75.9	187.6	75.5	**75.7**
3	0.28	3.5	75.7	6.85	76	393	75.8	**75.83**









Keyes Lake (WBIC 672900)

This 195 acre spring lake (WDNR 2015F) in the central region of the county is potentially a major source water for zebra mussels (*Dreissena polymorpha*) and other invasive species. Zebra mussels have colonized nearly all the hard substrate in the lakes including docks and vessels. As such, on weekends and other predicted busy days, there is a Clean Boats, Clean Waters boatwash stationed at the public landing throughout the summer. This boatwash is owned by the Florence County Lakes and Rivers Association (FCLARA) and operated by Florence County AIS staff and volunteers.

Keyes Lake also has the invasives Chinese mystery snail (*Cipangopaludina chinensis*), and rainbow smelt *(Osmerus mordax*). In the 2015 season hybrid/Eurasian water-milfoil (*Myriophyllum spicatum)* was confirmed in three locations in Keyes Lake, by Michelle Nault with the DNR. (Nault, personal communication).

Keyes Lake remains both a problematic source water, and a lake likely to receive new invasive species. It is a popular lake for residents and visitors, with a resort and other amenities nearby. The outflow from Keyes Lake ties to Loon Lake, Grass Lake, and flows into Sea Lion Lake, and from there to the Pine River. Though it cannot be confirmed, it is possible this outflow was the method for zebra mussels to enter Loon Lake.

In 2015 environmental DNA (eDNA) testing was positive for spiny waterflea (*Bythotrephes longimanus*) (Kronlein, personal communication). As of the time of this report, no spiny waterflea populations have been detected.

After the confirmation of hybrid water-milfoil on Keyes Lake a hand-pulling effort was launched. In 2015 Florence County AIS Staff, WRISC staff, and volunteers from the Florence County Lakes and Rivers Association (FCLARA) spent four hours hand pulling EWF in the three locations.

Image: Google Earth, Eurasian Water-milfoil locations from M. Nault WDNR

This resulted in approximately 7 kilograms (dry weight) of the invasive plant being removed. Additional hand-pulling was conducted in 2016 by staff and volunteers from the same organizations.

The depth of the hybrid/Eurasian water-milfoil infestations in Keyes Lake run from two feet to ten feet. This makes snorkeling borderline effective in the deeper areas. An additional 10 kilograms (dry weight) was removed in 2016, but late-season assessment by Cary Anderson (FCLARA) found pockets of the EWM still present at the three sites (Anderson, C. personal communication). These plants were either missed during the hand-pulling, or have gown back after as the workers were not able to remove all of the roots.

2015 hand pulling of Hybrid/Eurasian Water Milfoil

Inset: Underwater photograph of Hybrid Eurasian Water Milfoil in Keyes Lake

While the hand-pulling may have been effective at keeping this invasive from spreading throughout the lake up to this time, it is clear this method is limited in ability to eradicate the EWM. The Florence County Land Conservation Department will work with WDNR, WRISC, FCLARA, and the Keyes Lake Association to determine a plan. This could include the use of SCUBA equipment, a Diver Assisted Suction Harvesting (DASH) system, or benthic mats to control the EWM.

2016 The hand-pulling continues

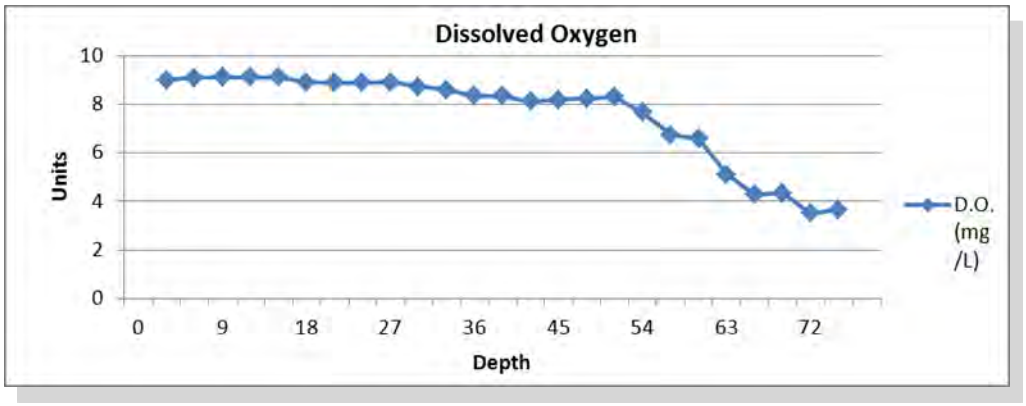
While conducting the 2015 lake monitoring work on Keyes Florence County LCD's pH probe (Hach model PHC10103) malfunctioned. As a result pH data is not available for this lake.

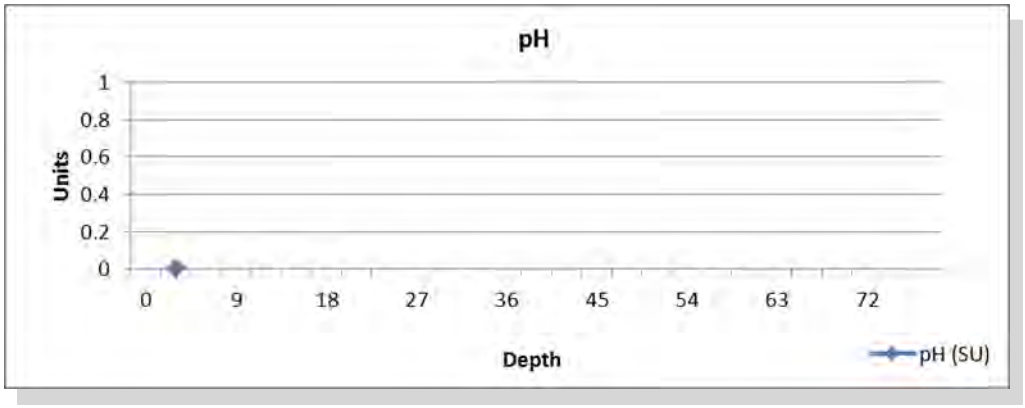
The 2016 monitoring was conducted by CT Goodwin and AIST Crago. An assessment was made of the known invasive milfoil locations, and plants missed during the hand-pulling operations were noted. No additional locations, or new AIS were found at this time.

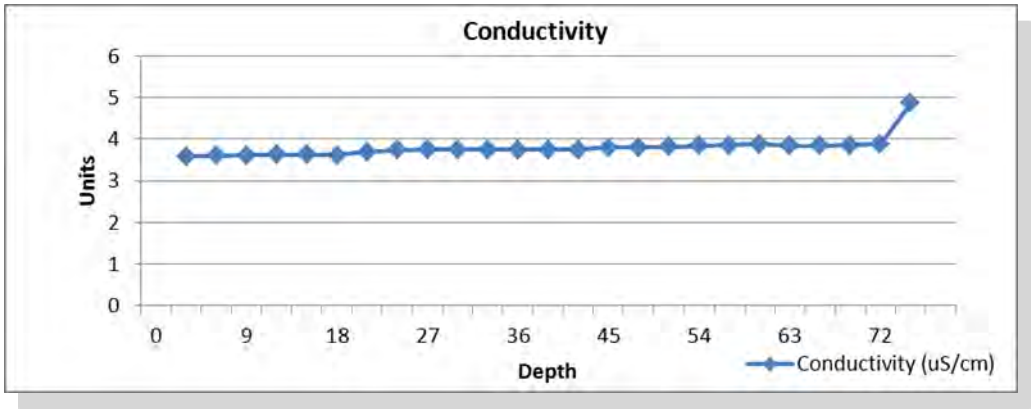
Keyes Lake 2015 Data

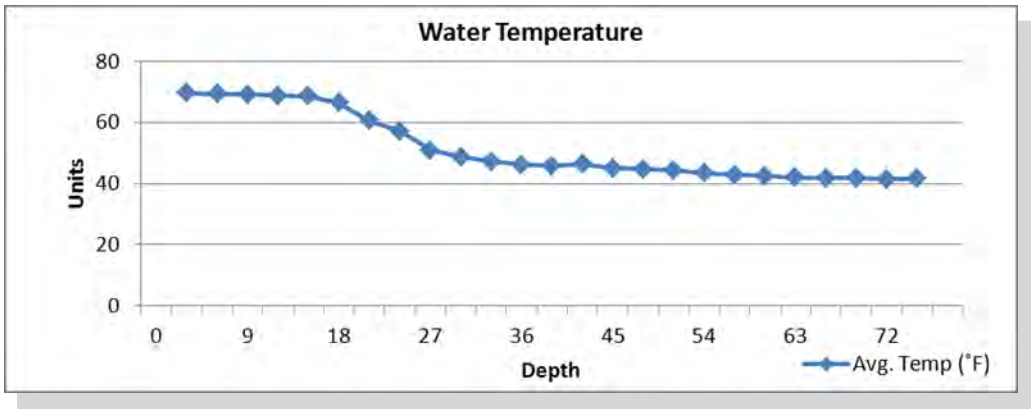
Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
10:10	13.5	79	1	3	1	2		3
Chemistry Observation Period			10:20-12:00		Lat/Long	N45° 53.636' W88° 18.410'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.01	106.2	69.7	Probe Malfunction		3.59	69.6	**69.65**
3	9.08	106.5	69.2			3.6	69.5	**69.35**
6	9.11	106.5	69.1			3.61	69.2	**69.15**
9	9.11	106.3	68.8			3.63	68.8	**68.80**
12	9.12	101	68.5			3.63	68.6	**68.55**
15	8.9	101.8	66.9			3.62	66	**66.45**
18	8.89	95	61.1			3.7	60.2	**60.65**
21	8.88	91	57.5			3.74	56.8	**57.15**
24	8.91	84.8	51.6			3.75	50.4	**51.00**
27	8.73	80.3	49			3.75	48.3	**48.65**
30	8.6	76.9	46.9			3.75	47.8	**47.35**
33	8.34	73.8	46.1			3.75	46.4	**46.25**
36	8.35	72.9	45.3			3.75	46.2	**45.75**
39	8.11	72.8	47.3			3.75	45.3	**46.30**
42	8.19	72.3	46			3.81	44.1	**45.05**
45	8.23	72.2	45.7			3.81	43.7	**44.70**
48	8.3	72.3	45.1			3.82	43.6	**44.35**
51	7.66	66	44.3			3.85	42.7	**43.50**
54	6.74	57.3	43.3			3.86	42.3	**42.80**
57	6.58	55.6	42.9			3.88	42	**42.45**
60	5.11	42.5	41.5			3.84	42.5	**42.00**
63	4.27	35.4	41.4			3.85	42.2	**41.80**
66	4.35	36.1	41.4			3.86	42.1	**41.75**
69	3.51	28.9	41.1			3.88	41.8	**41.45**
72	3.66	30.2	41			4.86	42.3	**41.65**

Keyes Lake Data



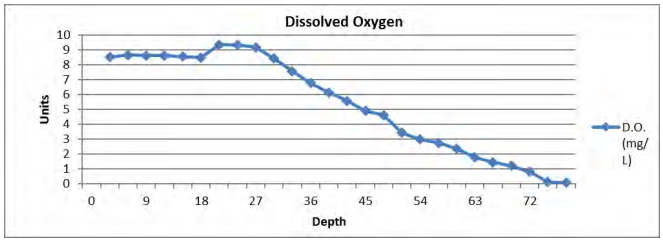


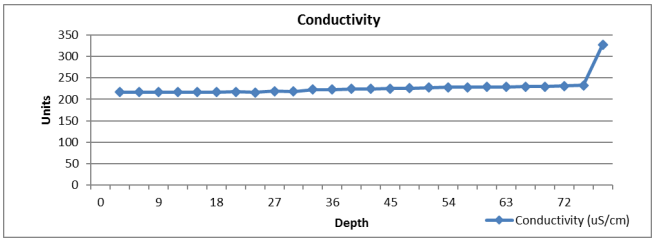


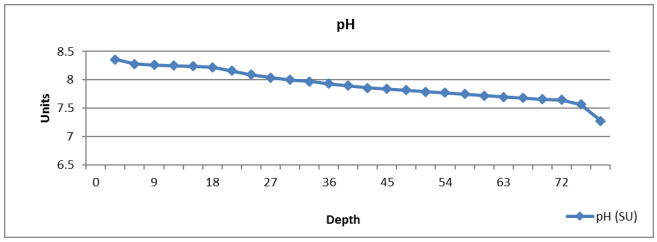


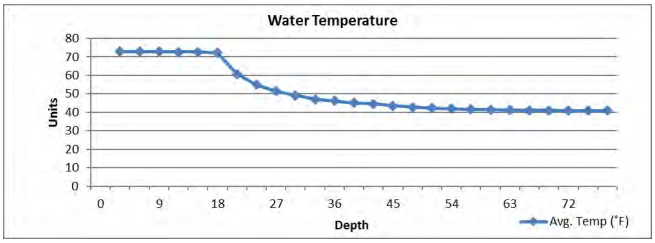
Keyes Lake 2016 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
2:45 PM	16.5	76	2	3	1	2		3
Chemistry Observation Period				2:00 PM	Lat/Long	N45° 53.636' W88° 18.410'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.52	105.8	72.7	8.36	73	216.6	72.9	**72.87**
3	8.67	105.2	72.7	8.28	73	216.8	72.9	**72.87**
6	8.64	104.8	72.7	8.26	73	216.8	72.8	**72.83**
9	8.62	104.4	72.6	8.25	72.9	216.8	72.7	**72.73**
12	8.57	103.7	72.5	8.24	72.9	216.7	72.6	**72.67**
15	8.5	102.7	72.4	8.22	72.6	216.6	71.5	**72.17**
18	9.37	98.4	59.9	8.16	62.7	217.3	59.7	**60.77**
21	9.35	91.9	54.5	8.09	55.9	216.2	54.6	**55.00**
24	9.19	86.9	51.4	8.04	52.2	219.4	50.7	**51.43**
27	8.44	76.9	48.6	8	50	218	49	**49.20**
30	7.58	67.2	46.5	7.97	48.5	223	46.3	**47.10**
33	6.79	59.3	45.4	7.93	47.4	223	45.5	**46.10**
36	6.16	53.2	44.6	7.9	46.5	224	44	**45.03**
39	5.58	47.6	43.8	7.86	45.7	224	44.2	**44.57**
42	4.92	41.5	42.8	7.84	44.5	225	43.3	**43.53**
45	4.62	38.5	42.2	7.82	43.7	226	42.6	**42.83**
48	3.44	28.4	41.5	7.79	43.2	227	42	**42.23**
51	3	24.7	41.2	7.77	42.8	228	41.8	**41.93**
54	2.76	22.6	40.9	7.75	42.4	228	41.5	**41.60**
57	2.36	19.3	40.8	7.72	42.1	229	41.3	**41.40**
60	1.77	14.4	40.7	7.7	41.9	229	41.2	**41.27**
63	1.45	11.8	40.6	7.68	41.8	230	40.9	**41.10**
66	1.21	9.8	40.5	7.66	41.6	230	40.9	**41.00**
69	0.82	6.6	40.4	7.65	41.5	231	40.8	**40.90**
72	0.12	1	40.5	7.57	41.5	233	40.8	**40.93**
75	0.08	0.7	40.5	7.28	41.5	328	40.9	**40.97**







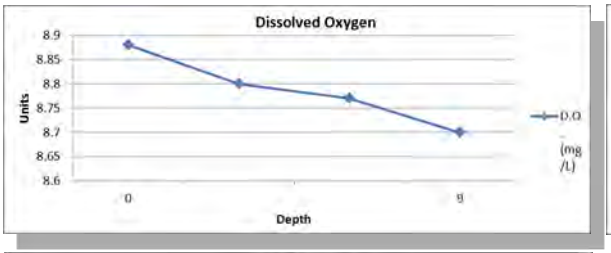


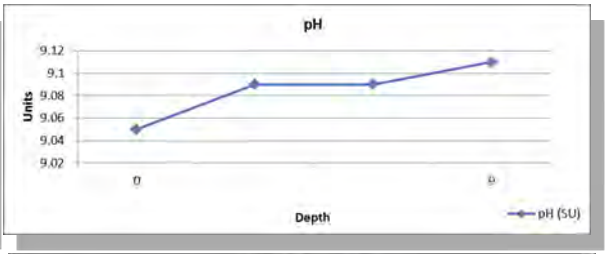
Lake of Dreams (WBIC 679900)

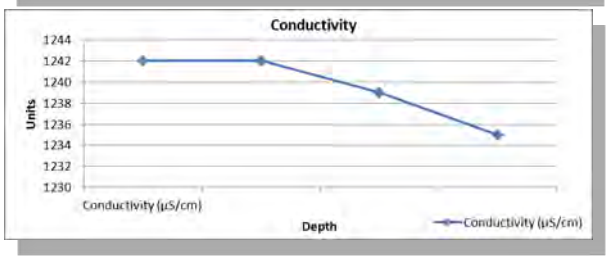
Lake of Dreams is a small (65 acre) lake located in the township of Tippler. Lake of Dreams is a shallow seepage lake with a maximum depth of 15 feet (WDNR 2015G).

2015 AIS staff found no indications of invasives species in Lake of Dreams. The DNR lists Purple Loosestrife as the only known invasive for this lake.

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
10:10	8 ft	Surface	1	3	2	3		
Chemistry Observation Period					**Lat/Long**			
Depth (feet)	**D.O. (mg/L)**	**Saturation (%)**	**Temp (˚F)**	**pH (SU)**	**Temp (˚F)**	**Conductivity (µS/cm)**	**Temp (˚F)**	**Avg. Temp (˚F)**
0	8.88	112.2	75.2	9.05	76.2	1242	75.5	**75.63**
3	8.8	111.6	75.6	9.09	76.2	1242	75.8	**75.87**
6	8.77	111.4	75.6	9.09	75.7	1239	75.8	**75.70**
9	8.7	110.2	75.4	9.11	75.3	1235	75	**75.23**







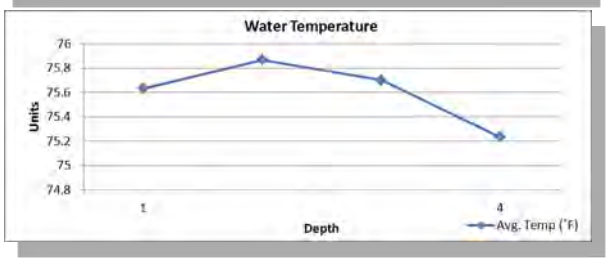


Image from Google Earth

Long Lake (WBIC 677400)

This 337 acre (WDNR 2015H) lake is located on the western boarder of the county. The Florence-Forest county line bisects the lake north-south thought the long axis of the lake. This drainage lake has a maximum depth of 21 feet, but the southern portion of the lake is 10 feet deep or less. This shallow section of the lake develops heavy native plant growth through the summer, making boat passage nearly impossible. Florence County AIS staff were unable to do a full survey of the lake due to this issue. Where Long Lake outflows to Fay Lake there is a flow control structure. Banded (*Viviparus* georgianus) and Chinese (*Cipangopaludina chinensis)* mystery snails as well as purple loosestrife (*Lythrum salicaria*) are confirmed invasives in this lake (WDNR 2015G).

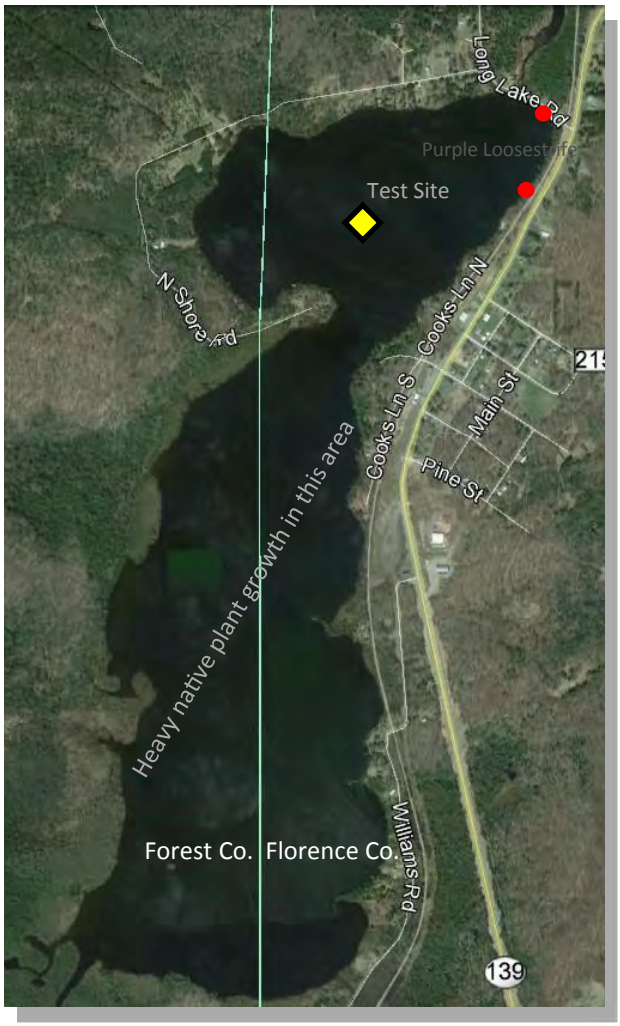


Image from Google Earth

The 2015 lake monitoring was conducted by AIS Technicians Crago and Brunette on July 30. The 2016 monitoring was conducted by Conservation Technician Goodwin and AIS Technician Crago on August 11. The 2016 field work found a few purple loosestrife stems on the north shore of the lake. These were marked with GPS locations. Biological control beetles have been used on the purple loosestrife growth on this lake in the past. The few stems found in 2016 are not sufficient enough to require the new use of beetles. The GPS coordinates will be passed along to WRISC to harvest the plants for their beetle rearing in 2017. The LCD will also work with the Lake Association of Long Lake to remove the plants that WRISC does not need.

In the 2015 season the Florence County Land Conservation Department began working with the Lake Association of Long Lake and DNR Fisheries Biologist Greg Matzke to replace the inefficient aeration system on the lake. Due to the large area of shallow water and abundant summer plant growth, Long Lake has a history of winter fish kills. Wisconsin DNR Fisheries Biologist Greg Matzke recommended an aeration system be run from January 1 to ice out every year. Florence County LCD and AIS staff aided the Lake Association in their efforts to secure funding for a new aeration system through a Lumberjack R.C. & D. grant. By late summer 2016 a new aerator system had been purchased and installed. CT Goodwin inspected the site on January 5, 2017 after multiple sub-zero nights and found the aerator keeping an area ice free.

Long Lake 2015 Data

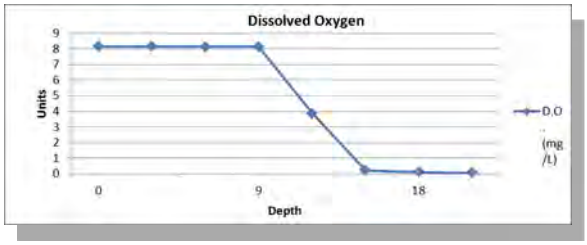
Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
12:45	7 feet	Surface	1	3	2	3		
Chemistry Observation Period					Lat/Long	N45° 50.820' W88° 40.338'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.17	104.8	76.7	8.79	76.3	3.89	76.1	**76.37**
3	8.16	104.1	76.2	8.82	76.2	3.9	76	**76.13**
6	8.15	103.7	76	8.83	76.1	3.9	75.9	**76.00**
9	8.14	103.4	75.8	8.83	76	3.89	75.8	**75.87**
12	3.86	43	63.7	7.58	65.9	3.8	64.7	**64.77**
15	0.22	2.2	56.2	7.37	57.5	3.72	57.5	**57.07**
18	0.1	1	52.1	7.12	52.1	4.62	51.4	**51.87**
21	0.07	0.7	50.8	7.06	50.8	4.81	50.9	**50.83**

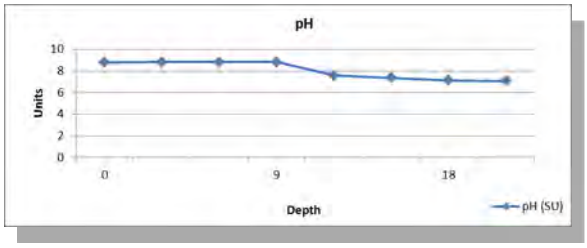
New Long Lake aerator during installation

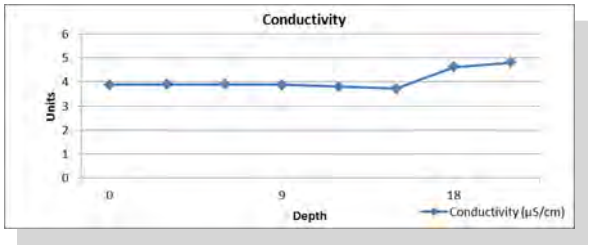
Photo: Mary Sullivan

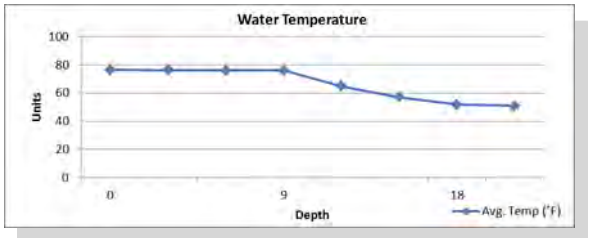
Aerator in operation, Long Lake 2016

Photo: Mary Sullivan



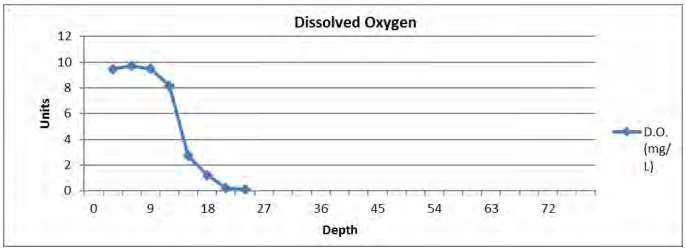


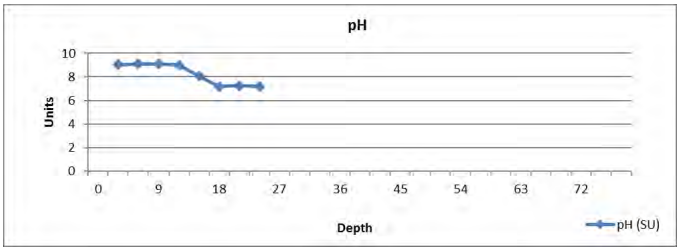


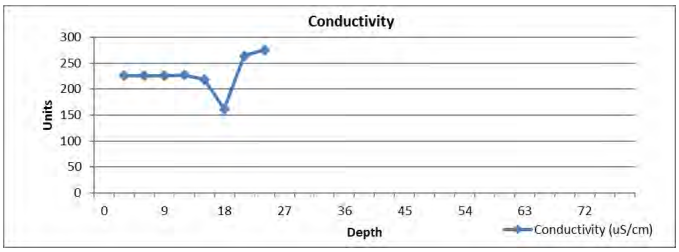


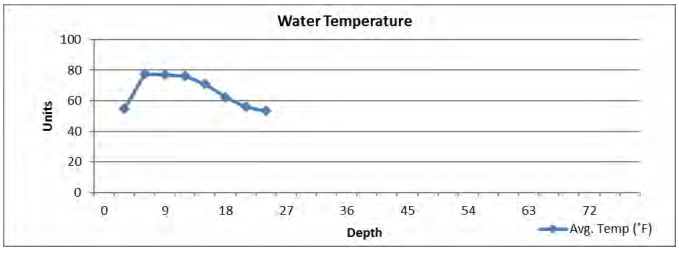
Long Lake 2016 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
12:15	5	23.5	2	2	2	3		2
Chemistry Observation Period			11:55-12:15		Lat/Long	N45° 50.820' W88° 40.338'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.48	123.8	79.2	9.03	7.3	226	77.6	**54.70**
3	9.69	125	77.9	9.09	77.3	226	76.9	**77.37**
6	9.5	121.7	77.3	9.09	76.9	226	76.6	**76.93**
9	8.17	63.6	76.3	9.02	76.5	227	75.8	**76.20**
12	2.7	32.5	71.1	8.08	70.7	219	71.1	**70.97**
15	1.23	13.7	64.5	7.2	61.1	162	61.2	**62.27**
18	0.2	2.1	57.6	7.24	55.3	264	54.9	**55.93**
21	0.12	1.1	54.4	7.19	53	276	52.4	**53.27**









Warning sign, Long Lake boat landing

Photo: Scott W. Goodwin

Long Lake open ice, January 2017

Photo: Scott W. Goodwin

Loon Lake (WBIC 672700)

While the 47 acre Loon Lake was not included on the grant proposal it was added to the list of lakes to cover in 2016 when samples of adult zebra mussels (*Dreissena polymorpha*) were brought into the Land Conservation Office by the granddaughter of a lake property owner. This young lady had just recently finished a report on zebra mussels for her elementary school class, and was confident that the mussels she found on uprooted vegetation along the shore near her family's dock were the invasive.

Within 24 hours CT Goodwin inspected the property and found multiple zebra mussels on uprooted aquatic vegetation gathered along the shoreline. An additional specimen was found on a rock under the dock at the property. Samples were collected, photographed, and turned over to DNR personnel. No zebra mussels were found to be on the dock itself at that time. However, 2015 end-of-season reports from additional Loon Lake property owners came into the Land Conservation Office about finding zebra mussels on docks and boats being removed for winter storage. 2015 was the first time owners have complained about the infestation.

Image from Google Earth

Inset: Zebra mussel on rock found during initial investigation

Loon Lake's public boat access is very poor. Without ready boat access county AIS staff were not able to conduct any data collection from Loon Lake in the 2015 season.

On July 27, 2016 CT Goodwin and AIST Crago conducted monitoring of Loon Lake. Access to the lake was made after securing permission from Loon Lake land-owner, Dwaine Drewa, to access the lake from his property. Mr. Drewa also allowed LCD staff to place substrate test plates on his dock. Zebra mussels were found on many hard surfaces throughout the lake. Additionally, two small stands of European marsh thistle (*Cirsium palistre*) were found in the west shore of the lake. There were less than ten plants in each of these area.

Substrate sample plates were places in Loon Lake on June 29, 2016. The plates were checked and one set pulled on August 10, 2016. Inspection of the plates was conducted at the LCD office using a VanGuard™ model 1132ZF stereo microscope. A total of 18,786 zebra mussels ranging in size from 0.25mm to 16mm were counted on the set of plates. An additional estimated 1,500 zebra mussels were dislodged but captured by the bag used to transport the sample plates.

State of Wisconsin
Department of Natural Resources
Wisconsin Lakes Partnership

Zebra/Quagga Mussel (Quantitative) Report
Requires use of sampler plates
Form 3200-127 (R 02/10)

The purpose of this form is to track the abundance of adult zebra or quagga mussels in lakes where larvae or adults have previously been detected during AIS surveillance monitoring.

A report should be completed for each sampler deployed.

Notice: Information on this voluntary form is collected under ss. 33.02 and 281.11, Wis. Stats. Personally identifiable information collected on this form will be incorporated into the DNR Surface Water Integrated Monitoring System (SWIMS) Database. It is not intended to be used for any other purposes, but may be made available to requesters under Wisconsin's Open Records laws, ss. 19.32 - 19.39, Wis. Stats.

Primary Data Collector

Name	Phone Number	Email
Scott Goodwin	715-528-3484	sgoodwin@co.florence.wi.us

Monitoring Location

Waterbody Name	Township Name	County	Station Name
Loon Lake	Florence	Florence	N/A

Latitude (If not at an existing SWIMS monitoring station)	Longitude (If not at an existing SWIMS monitoring station)
N45° 53.256'	W88° 18.517'

Date and Time of Monitoring

Start Date	Start Time	End Date	End Time
06/29/2016	11:00 AM	08/10/2016	10:30 AM

Start Date = Date sampler deployed or since you last removed mussels from the plate. End Date = Date you pulled up the sampler.

Vertical Measurements

Water Depth at Monitoring Location — Feet/ Meters (circle one)	Depth to Top of Zebra Mussel Sampler — Feet/ Meters (circle one)
3.5 feet	1 foot

Measurements from where the invasive was found

Water Temperature — Degrees F / Degrees C (circle one)	Dissolved Oxygen (mg/l)
75.87 at surface taken 7/29/2016 during lake monitoring	8.12 at surface taken 7/29/3016 during lake monitoring

Estimated percent cover where sampler plates were located

Substrate cobble, %	Substrate muck, %	Substrate boulders, %	Substrate sand, %	Bottom covered with plants, %
	10%		90%	50%

Information about Mussels Found

Number of Zebra Mussels on Top Side of Plates	Number of Zebra Mussels on Bottom Side of Plates	
9,922	8,389	
Total Number of Zebra Mussels on Sampler	Size of Largest Zebra Mussel (mm)	Size of Smallest Zebra Mussel (mm)
18,311	16 mm	.25 mm

Note: if more than 20 zebra mussels are found, measure 20 mussels chosen randomly from the sample. If less than 20 mussels are found, measure all mussels. Report results in the table on page 2 of this form.

Additional Comments

An additional 475 were counted on the PVC spacers for 18,786 total. Approx. 1,500 ZM were collected in the bag used to transport test

If you find Zebra Mussels

All initial discoveries should be placed in rubbing alcohol until verification by an expert is obtained. Please collect a sample and bring a copy of this form, along with the sample and a map showing where you found the suspect mussels to your regional Citizen Lake Monitoring Coordinator at the DNR.

If you don't Find Zebra Mussels

If you submit your data online, that is all you need to do. Otherwise, please mail a copy to your regional DNR Citizen Lake Monitoring coordinator. http://dnr.wi.gov/lakes/contacts

Zebra Mussel (Quantitative) Report
Requires use of sampler plates
Form 3200-127 (R 02/08)
Page 2 of 2

Length of Zebra Mussels from Sample

If more than 20 zebra mussels are found, measure 20 mussels chosen randomly from the sample. If less than 20 mussels are

Number	Length (mm)
1	4
2	1
3	1.5
4	2.5
5	1.5
6	3
7	2.5
8	0.5
9	1.25
10	1.5
11	1
12	1
13	1.5
14	0.5
15	4
16	2
17	1.5
18	1.25
19	9
20	1.25

Scans of one NDR form 3200-127 (R02/10) completed for Loon Lake

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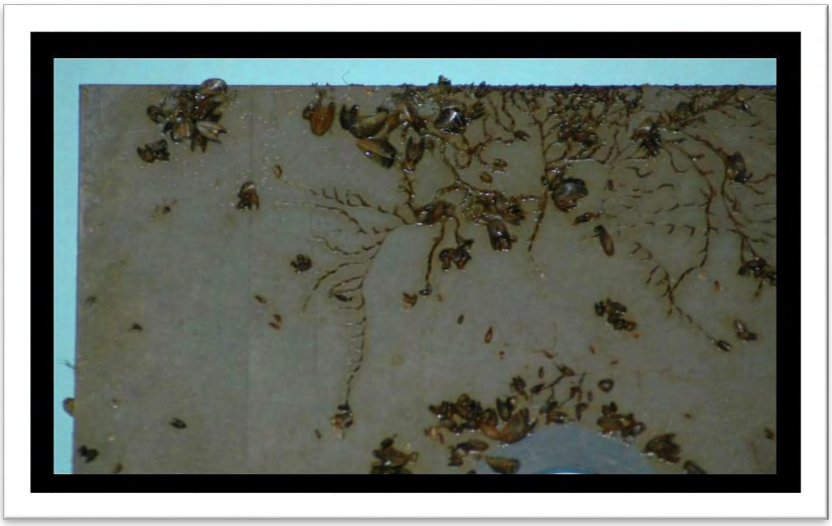
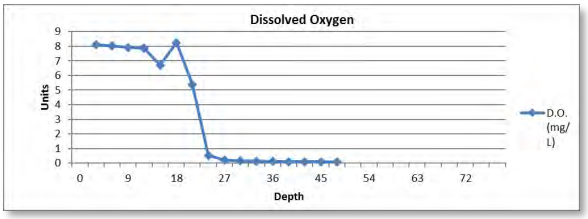
Segment of substrate test plate from Loon Lake, 2016

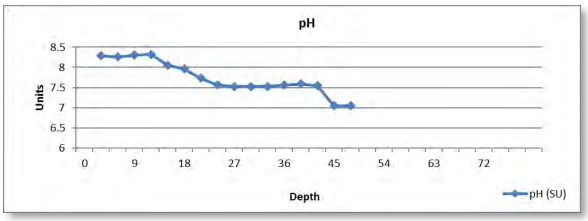
Photo: Scott W. Goodwin

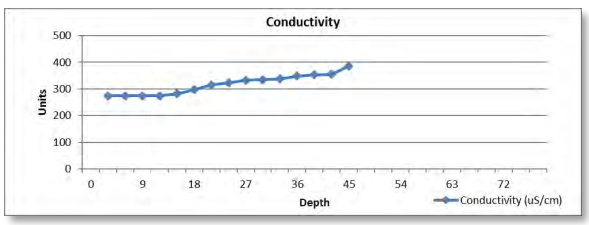


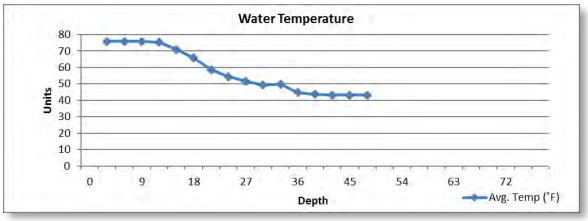
Loon Lake 2016 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
9:35 AM	12.5	45.2	2	3	1	3		3
Chemistry Observation Period			9:45-10:35 AM		Lat/Long	N45° 53.141' W88° 18.786'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.12	103	75.4	8.29	75.9	274	76.3	**75.87**
3	8.02	102	75.6	8.26	75.9	274	76.2	**75.90**
6	7.93	99.2	75.6	8.3	75.9	274	76.2	**75.90**
9	7.87	98.6	74.2	8.32	75.8	274	76.1	**75.37**
12	6.71	82.7	65	8.05	73.8	282	73.8	**70.87**
15	8.24	91.9	65.1	7.96	67	297	65.3	**65.80**
18	5.37	55.6	58.7	7.73	59.3	315	57.9	**58.63**
21	0.53	5.1	53.7	7.56	55.2	323	54.1	**54.33**
24	0.22	2.1	51.5	7.53	52.4	332	50.9	**51.60**
27	0.15	1.4	48.9	7.53	49.3	335	49.6	**49.27**
30	0.13	1.2	46.1	7.53	47	338	56.4	**49.83**
33	0.11	0.9	44.7	7.56	45.4	348	44	**44.70**
36	0.1	0.8	43.5	7.59	44.5	353	43.3	**43.77**
39	0.1	0.8	42.7	7.55	43.7	355	43	**43.13**
42	0.09	0.7	42.7	7.05	43.9	386	43	**43.20**
45	0.08	0.7	42.6	7.05	43.9			**43.25**









Montgomery Lake (WBIC 703300)

This small (23 acre) drainage lake has a maximum depth of 27 feet (WDNR, 2015I). Purple loosestrife (*Lythrum salicaria*) has been previously reported at the lake. No additional invasive species were observed during the 2015 survey.

Image from Google

The 2016 monitoring was conducted on August 5, by AIS staff Weber-Starting and Crago. Purple loosestrife (*Lythrum salicaria*) was documented on the southeast shore. Subsequent work by WRISC removed the plants for use in rearing bio-logical control beetles.

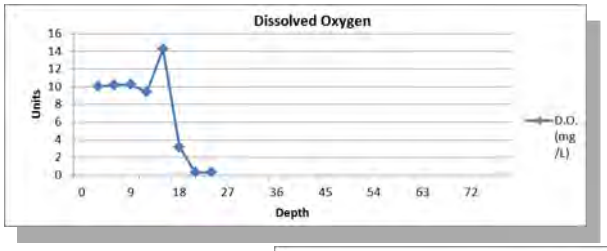
Montgomery Lake will be inspected for new growth of purple loosestrife in the 2017 season. If new stems are found a management plan will be developed in consultation with the DNR and WRISC.

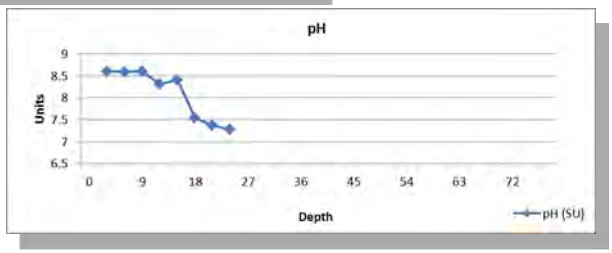
Purple Loosestrife on Montgomery Lake

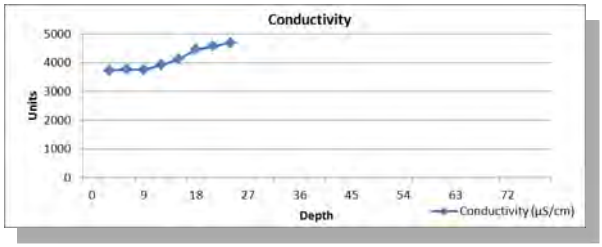
Photos by: Carolyn Weber-Starling

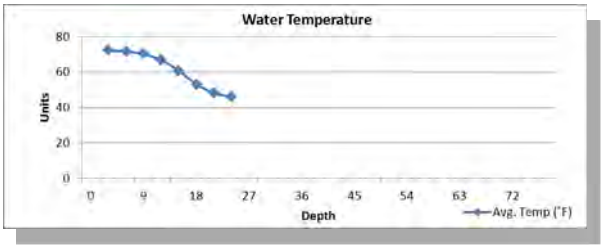
Montgomery Lake 2015 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
11:45	9.3	Surface	1	3	2	3		
Chemistry Observation Period					Lat/Long	N45.91350° W88.16250°		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	10.02	122.8	73.6	8.6	70.1	3730	72.9	**72.20**
3	10.21	123.2	72.1	8.59	71.1	3760	71.8	**71.67**
6	10.25	121.3	70.4	8.6	70.1	3750	70.7	**70.40**
9	9.42	107.5	67.1	8.31	66.8	3920	67.2	**67.03**
12	14.26	151.9	61.1	8.41	60.3	4120	61.1	**60.83**
15	3.2	30.4	51.7	7.54	52.9	4460	54.4	**53.00**
18	0.33	2.9	47.6	7.37	48.1	4570	49.1	**48.27**
21	0.33	2.9	45.7	7.27	45.7	4690	46.5	**45.97**



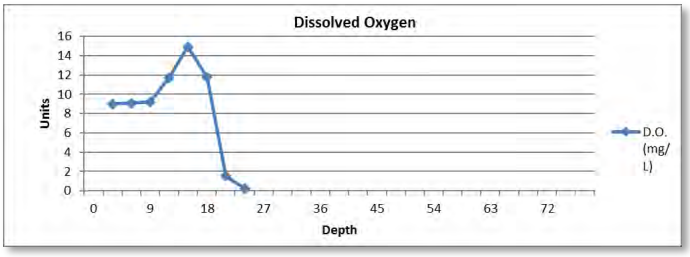


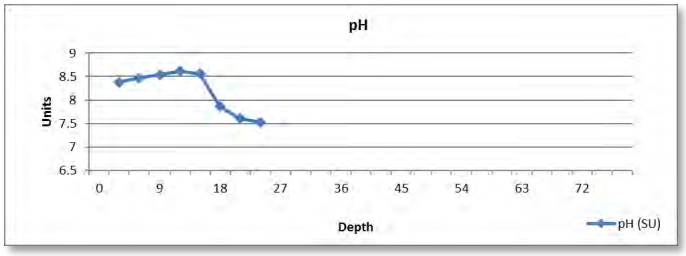


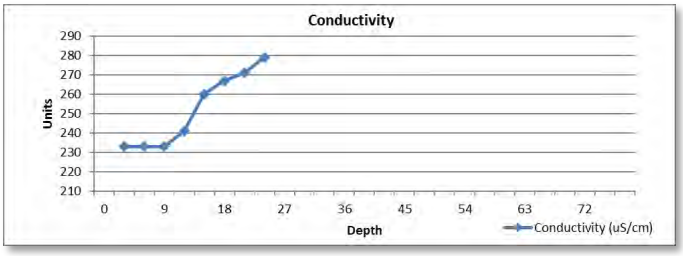


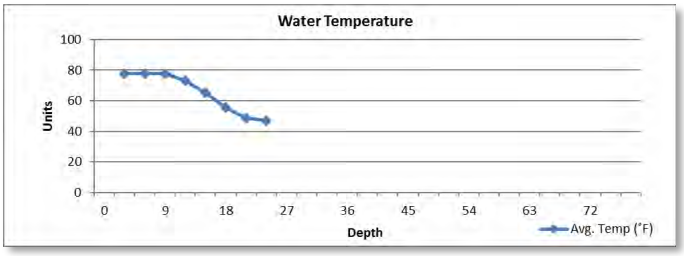
Montgomery Lake 2016 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
1:00 PM	9.5	24	1	3	2	2		3
Chemistry Observation Period					Lat/Long	N45.91350° W88.16250°		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9	115.4	77.6	8.38	77.5	233	78.1	**77.73**
3	9.08	116.4	77.7	8.47	77.6	233	78	**77.77**
6	9.21	118.1	77.7	8.54	77.6	233	77.9	**77.73**
9	11.71	142.9	73	8.62	72.6	241	73.3	**72.97**
12	14.93	167	65.2	8.56	65.5	260	65.1	**65.27**
15	11.74	118.4	56.4	7.86	54.7	267	55.6	**55.57**
18	1.51	14	49.6	7.61	50.1	271	46.4	**48.70**
21	0.25	2.2	46.5	7.53	47.8	279	46.4	**46.90**









Patten Lake (WBIC 653700)

Patten Lake, a 254 acre drainage lake is located in central Florence County (WDNR 2015J). It has a maximum depth of 52. Before 2015 the only documented invasive in this lake were Rusty Crayfish (*Orconectes rusticus*). The 2015 monitoring was conducted by Florence County's AIS Coordinator and a volunteer from the Florence County Lakes and Rivers Association (FCLARA). The conductivity probe would only read in mS/cm, rather than the usual µS/cm. The accuracy of this reading is questionable. There were no new AIS identified in the lake in 2015.

The 2016 monitoring was conducted on June 30 by CT Goodwin and Karen Roberts, a volunteer. A full shoreline survey was conducted. No new invasive species were found at this time. In August the LCD received a phone call regarding an algae bloom in the lake. CT Goodwin responded to the call and found mats of filamentous algae had broken loose from the bottom and collected on the west side of the lake. Goodwin provided the property owner with information on hand removal allowed under Wisconsin Administrative Code NR90.

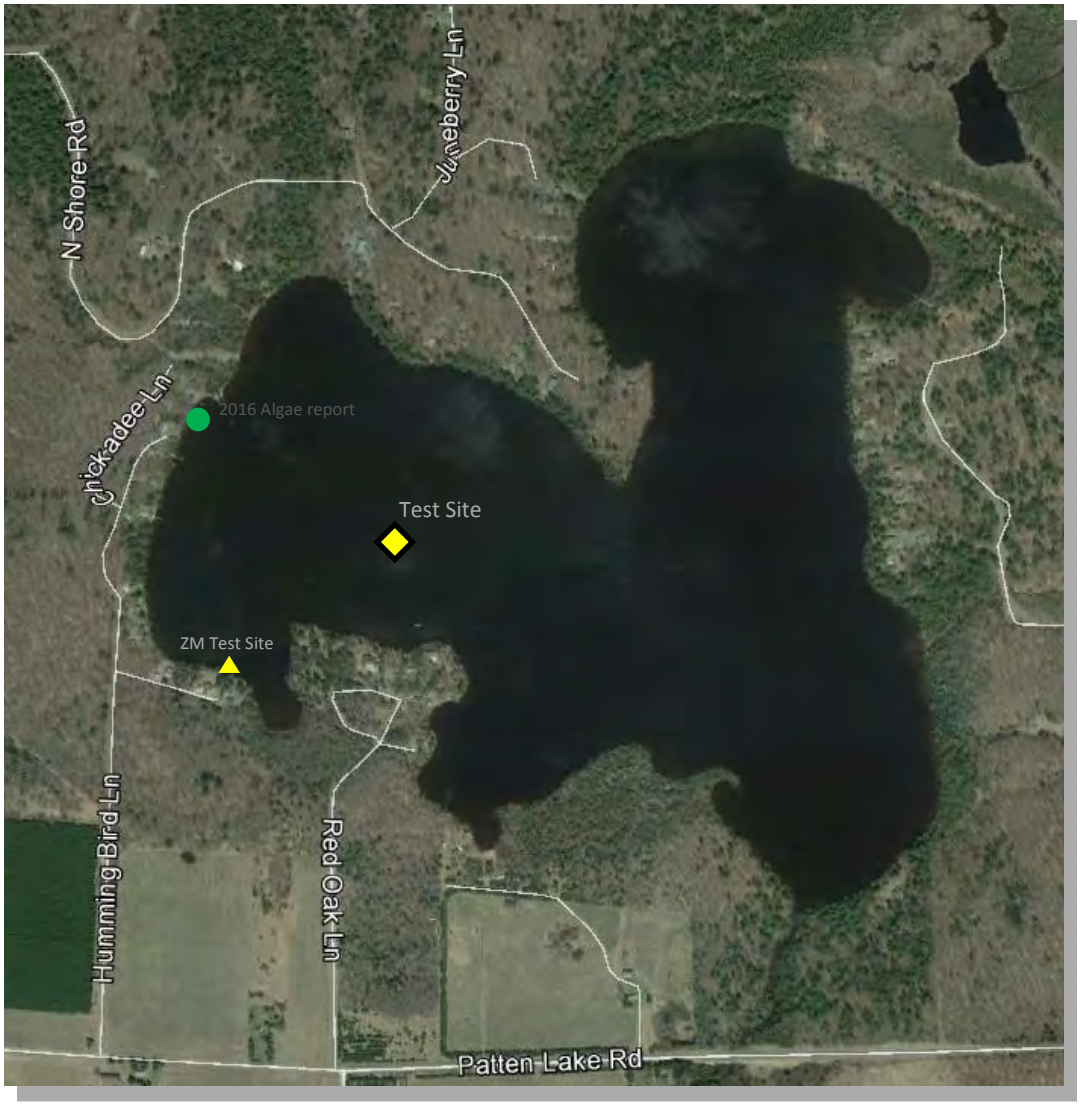


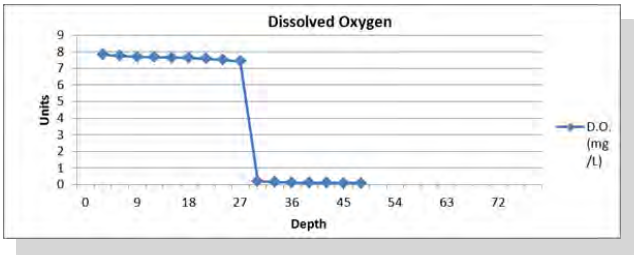
Image from Google Earth

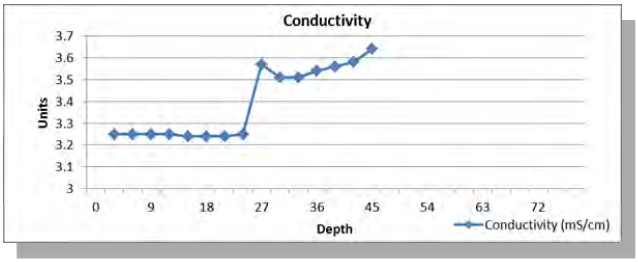
Florence County AIS staff placed two zebra mussel monitoring substrate test plates in this lake at the start of the 2016 season. One set of test plates was left for the season, while the other was checked monthly. Neither set of plates showed zebra mussel growth.

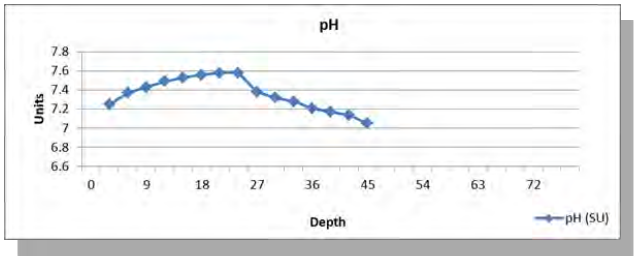
At the one month check AIS staff found two rusty crayfish in between segments of the test plates. Both escaped into the lake before they could be captured. No rusty crayfish were present at subsequent checks. These were the only AIS observed in the lake in 2016.

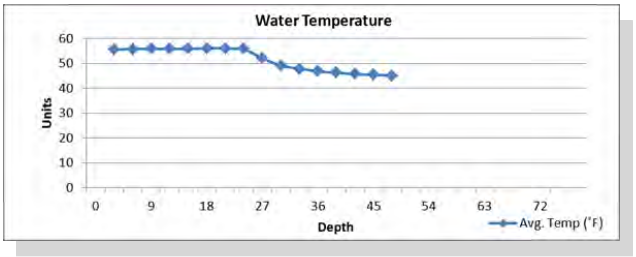
Patten Lake 2015 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
10:15 AM	13		2	3	1	3		3
Chemistry Observation Period					Lat/Long	N45 51.253 W88 25.436		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (mS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	7.84	79.4	55.4	7.25	55.9	3.25	55.5	**55.60**
3	7.75	78.7	55.6	7.37	55.9	3.25	55.8	**55.77**
6	7.7	78.4	55.8	7.43	55.9	3.25	55.8	**55.83**
9	7.68	78.2	55.8	7.49	56	3.25	55.8	**55.87**
12	7.65	77.8	55.8	7.53	56	3.24	55.9	**55.90**
15	7.63	77.7	55.9	7.56	56	3.24	55.9	**55.93**
18	7.59	77.3	55.9	7.58	56	3.24	56	**55.97**
21	7.51	76.5	55.9	7.58	55.8	3.25	55.8	**55.83**
24	7.43	75.6	55.8	7.38	50.1	3.57	50.3	**52.07**
27	0.21	2	50.1	7.32	48.3	3.51	48.6	**49.00**
30	0.14	1.3	48.5	7.28	47.3	3.51	47.4	**47.73**
33	0.12	1.1	47.1	7.21	46.5	3.54	46.8	**46.80**
36	0.11	1	46.3	7.17	46	3.56	46.3	**46.20**
39	0.11	0.9	45.6	7.14	45.6	3.58	46	**45.73**
42	0.09	0.8	45.3	7.05	45.4	3.64	45.6	**45.43**
45	0.09	0.8	45					**45.00**



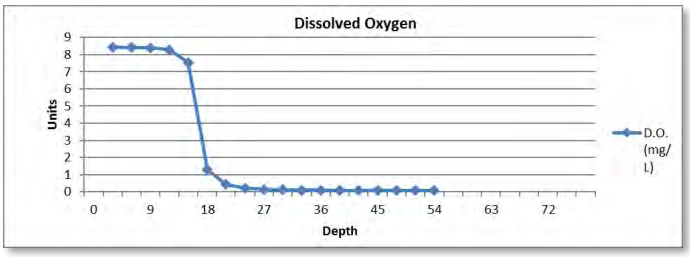


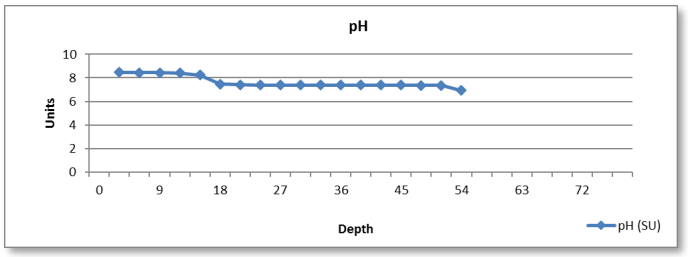


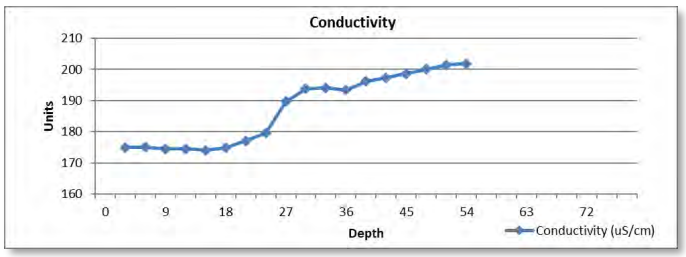


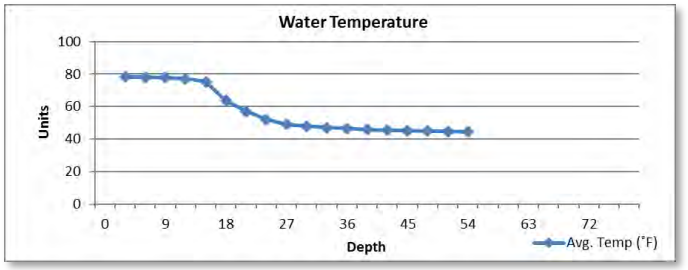
Patten Lake 2016 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
3:05 PM	8	52.4	2	3	1	2		1
Chemistry Observation Period			2:15-3:05 PM		Lat/Long	N45° 51.253' W88° 25.436'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.43	108.3	77.9	8.47	78.4	174.9	78.4	**78.23**
3	8.42	107.9	77.7	8.44	78.2	175	78.2	**78.03**
6	8.39	107.2	77.5	8.45	77.9	174.5	77.9	**77.77**
9	8.27	105	77	8.41	77.2	174.5	77	**77.07**
12	7.54	93.9	75.1	8.23	75.2	174.1	75.5	**75.27**
15	1.29	14.4	65.5	7.46	63	174.8	62.6	**63.70**
18	0.42	4.3	58.1	7.43	57.7	177.1	55.6	**57.13**
21	0.22	2.1	52.5	7.38	53.1	179.5	50.5	**52.03**
24	0.13	1.2	49.6	7.38	49.7	189.7	48.2	**49.17**
27	0.11	1	48.2	7.4	48.4	193.8	47	**47.87**
30	0.1	0.9	47	7.4	47.9	194.1	46.4	**47.10**
33	0.09	0.8	46.6	7.4	47	193.3	45.8	**46.47**
36	0.08	0.7	45.7	7.39	46.4	196.1	45.3	**45.80**
39	0.08	0.7	45.2	7.38	46	197.3	45	**45.40**
42	0.09	0.7	44.9	7.38	45.7	198.6	44.9	**45.17**
45	0.08	0.7	44.7	7.37	45.4	200	44.6	**44.90**
48	0.08	0.7	44.4	7.37	45.3	201.4	44.5	**44.73**
51	0.07	0.5	44.2	6.93	45.2	201.9	44.3	**44.57**





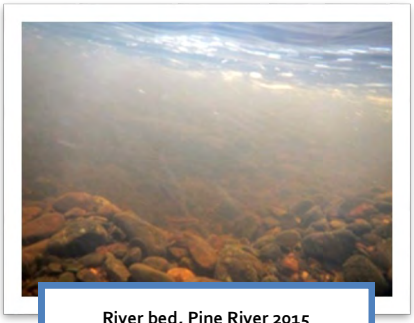




Pine River

On August 8, 2015 Conservation Technician Goodwin and a volunteer, Dr. John Roberts, paddled a 3.3 mile stretch of the Pine River between Rochon's Landing to Highway 101. This route went past the multiple inflows from Sea Lion Lake. Substrate in the slow moving waters at the inflow areas were inspected for zebra mussels and other invasives with the thought that as these invasives are established in Keyes and Loon Lakes the species might have moved to Sea Lion and new areas of the Pine River via the outflow.

The 2015 inspection found no zebra mussels in this stretch of the Pine River. The only invasive identified was rusty crayfish (*Orconectes rusticus*) that have been documented previously in the Pine River.



River bed, Pine River 2015

Photo: Scott W. Goodwin

Image from Google Earth

CT Goodwin takes a GPS reading on the Pine River, 2015

Photo: John Roberts

Porcupine Lake (WBIC 590800)

Image from Google Earth

Porcupine Lake is a 36 acre seepage lake (WDNR 2016F) located in western Florence County. It is fully within the border of Chequamegon-Nicolet National Forest, though much of the shoreline is privately owned. This lake was one lake scheduled for monitoring in 2015, that was missed due to delays from equipment problems.

On July 25, 2016 AISC Weber-Starling and AIST Crago assessed the lake. Access was gained through a property owner and FCLARA volunteer, Mick Mlinar. Mr. Mlinar also provided the paddle -craft used by county staff to conduct the monitoring on this lake. Purple loosestrife (*Lythrum salicaria*) is the only verified AIS at Porcupine Lake. The AIS staff did not document any stems during their assessment. Eurasian water-milfoil (*Myriophyllum* spicatum) has been reported but not verified by the DNR. Weber-Starling and Crago looked for this invasive, but could not find any.

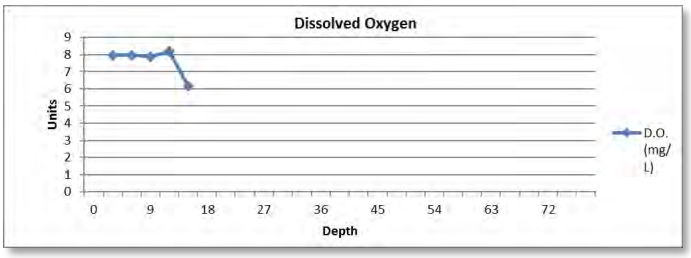
Porcupine lake had the lowest Conductivity reading of any lake tested. This was low enough the field crew wondered if the new probe had broken as the probe did in 2015. Subsequent testing and checking of the calibration confirmed the probe was in working order. Therefore it was not surprising to find Porcupine Lake also had a total hardness of 25ppm, making one of the softest lakes tested (see pg. 78).

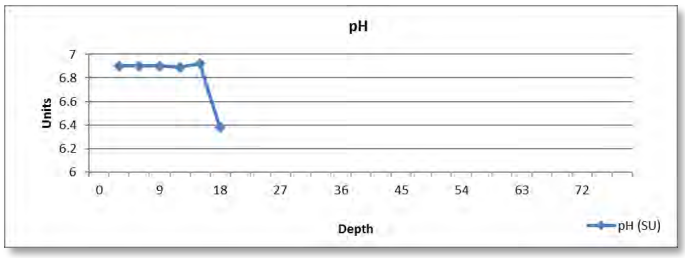
Porcupine Lake 2016 Data

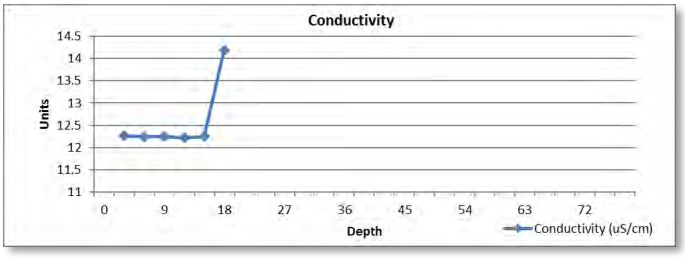
Treefall in Porcupine Lake, 2016

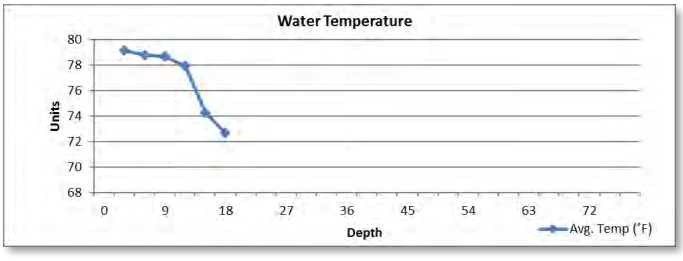
Photo: Carolyn Weber-Starling

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
10:00AM	15	15.6	1	3	1	2		1
Chemistry Observation Period				10:10 AM	Lat/Long	N45° 56.099' W88° 35.616'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	7.97	104.7	79.4	6.9	79	12.26	79	**79.13**
3	7.97	104.2	79	6.9	78.7	12.24	78.7	**78.80**
6	7.89	103	78.8	6.9	78.6	12.25	78.6	**78.67**
9	8.18	106	78	6.89	77.8	12.22	78	**77.93**
12	6.16	76	73.3	6.92	75.1	12.25	74.4	**74.27**
15				6.38	72.7	14.19	72.6	**72.65**







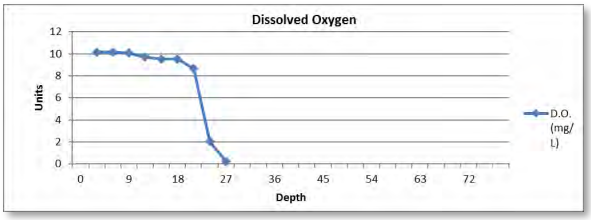


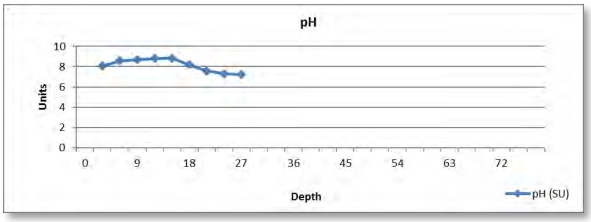
Sand Lake (WBIC 591700)

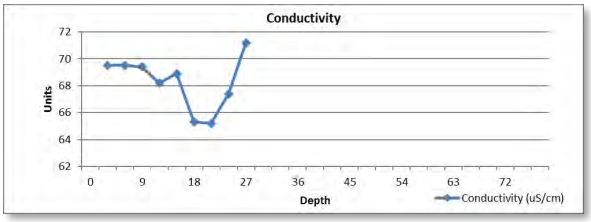
Monitoring on the 23 acre (WDNR 2017A) Sand Lake was conducted by AISC Weber-Starling and AIST Crago on August 17, 2016. This lake was slated to be monitored in 2015, but was not completed. Located with the Spread Eagle Barrens State Natural Area it is a popular lake with visitors to the protected area. There is an unimproved boat landing allowing for small craft access. This lake does not have any known invasive species, and none were found during the 2016 monitoring.

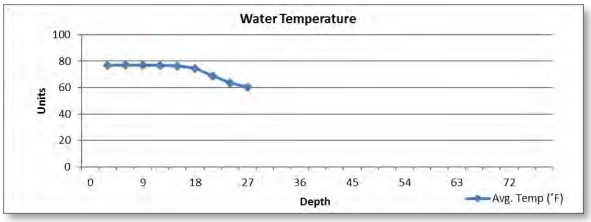
Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
9:45 AM	11.5	25	1	2	1	2		4.5
Chemistry Observation Period					Lat/Long	N45° 51.696' W88° 11.660'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	10.15	127.1	76.3	8.06	77.2	69.5	77.2	**76.90**
3	10.14	127.4	76.6	8.58	77.2	69.5	77.1	**76.97**
6	10.08	126.8	76.8	8.69	77.2	69.4	77	**77.00**
9	9.7	121.9	76.7	8.81	76.9	68.2	76.7	**76.77**
12	9.51	118.9	76.3	8.84	76.4	68.9	76.2	**76.30**
15	9.52	117.6	75	8.19	74.1	65.3	74.6	**74.57**
18	8.66	100.8	69.4	7.58	68.4	65.2	68.9	**68.90**
21	2.04	22.4	63.9	7.29	63.6	67.4	63.7	**63.73**
24	0.24	2.5	59.9	7.22	61.1	71.2	60	**60.33**

Image from Google Earth









Sea Lion Lake (WBIC 672300)

Sea Lion Lake is 114 acres with a maximum depth of 82 feet (WDNR 2015K). This drainage lake takes in water from Keyes, Loon, and Grass Lakes and discharges into the Pine River. As two up-stream lakes have zebra mussel (*Dreissena polymorpha*) infestations it is anticipated Sea Lion will also be colonized in the future. In 2016 the Flornce County Forestry & Parks Department completed a new paved boat ramp and restroom facilities at this landing. This may increase traffic on this lake. It will be assessed for inclusion in future CBCW projects.

The 2015 monitoring was conducted on September 9. CT Goodwin and Cary Anderson, a volunteer with the Florence County Lakes and Rivers Association, conducted a meander survey of the shoreline for three quarters of the lake. Strong winds and a low battery for the trolling motor did not allow for a full survey. Docks, boats, and other hard surfaces were examined for signs of zebra mussels with negative findings. A plankton tow was also conducted by Florence County AIS staff and microscopic examination of the collected sample showed no veligers.

The 2016 survey was conducted by CT Goodwin and AIST Crago on July 17. Unlike 2015, with good weather and a gasoline outboard a full meander survey was conducted, Again, hard surfaces were checked for zebra mussels. None were found.

The 2016 survey did locate two areas of hybrid Eurasian/northern watermilfoil . The locations were documented, but no sample was taken as this invasive has previously been identified in this lake. Native plant density is high and varied in this lake. It should be acknowledged that the survey may have missed some hybrid watermilfoil locations due to this.

Image from Google Earth

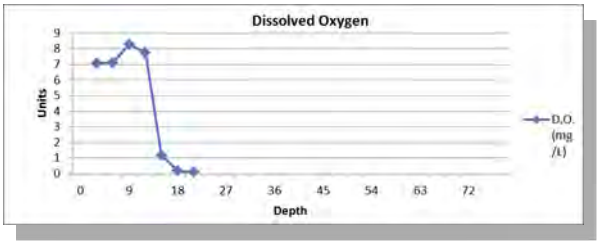
Sea Lion Lake 2015 Data

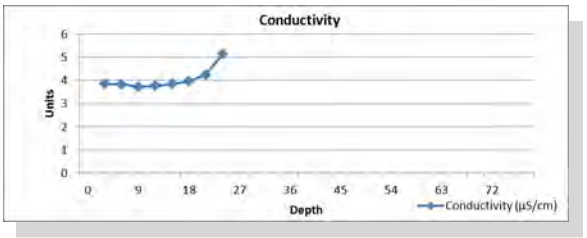
Monitoring this lake for zebra mussels will continue in the future. Some Sea Lion Lake property owners have informed the LCD they are willing to have substrate test plates at their property. The LCD will work to have these in place for the start of the 2017 season.

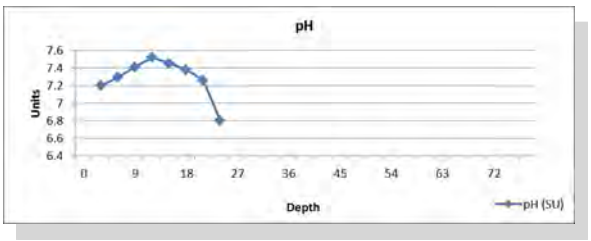
Sea Lion Lake, 2016

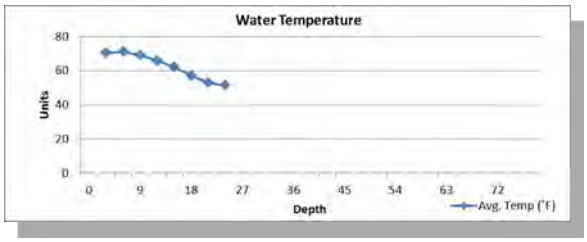
Photo: Scott W. Goodwin

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
9:35	11 ft	23	no	3	1.5	3		3
Chemistry Observation Period			10:00-10:40 AM		Lat/Long	N45° 52.825' W88° 19.579'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	7.08	83	69.3	7.2	71.6	3.84	70.6	**70.50**
3	7.13	84.2	70.8	7.29	71.5	3.83	71	**71.10**
6	8.3	97.8	69.1	7.41	68.9	3.72	69	**69.00**
9	7.75	87.2	65.7	7.52	65.9	3.76	66.1	**65.90**
12	1.19	12.7	61.8	7.45	62.2	3.84	62	**62.00**
15	0.19	1.9	57.1	7.38	57	3.96	57.1	**57.07**
18	0.12	1.2	53.1	7.26	52.8	4.23	52.8	**52.90**
21				6.8	51.6	5.13	51.5	**51.55**



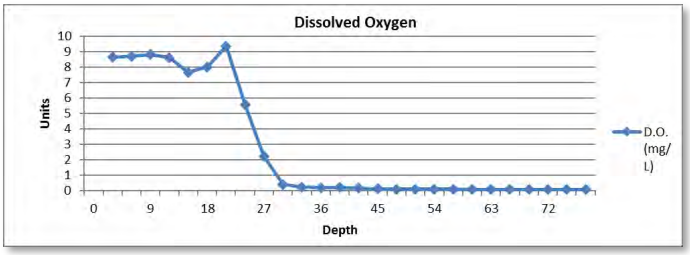


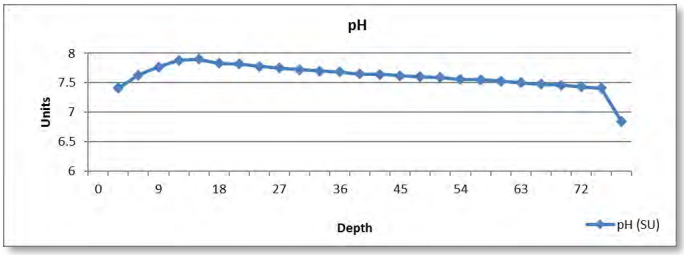


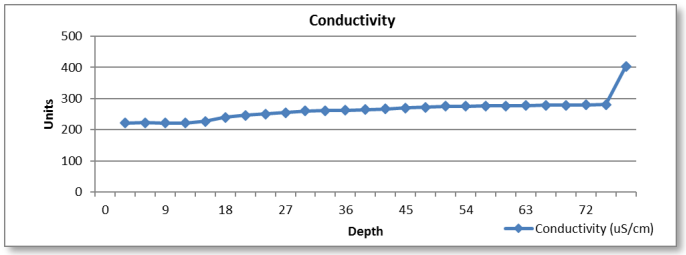


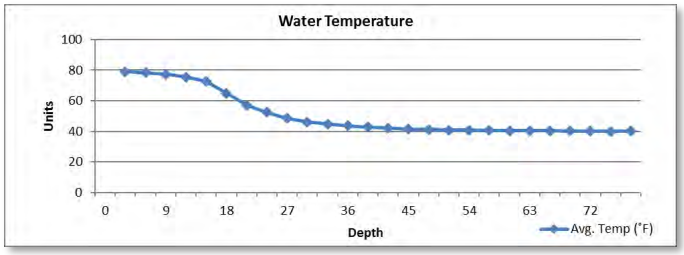
Sea Lion 2016 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
10:40 AM	20	78	2	3	1	2		2
Chemistry Observation Period			10:00-10:40 AM		Lat/Long	N45° 52.513' W88° 19.266'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.65	112.4	79.2	7.41	78.8	221	79	**79.00**
3	8.71	112.3	78.4	7.63	78.4	222	78.5	**78.43**
6	8.82	112.4	77.3	7.77	77.6	221	76.9	**77.27**
9	8.63	107.8	75.4	7.88	75.7	221	75.1	**75.40**
12	7.67	93.2	72.8	7.9	73.7	227	71.7	**72.73**
15	8.03	90.6	66	7.83	66.6	240	62	**64.87**
18	9.36	95.4	57	7.82	58.5	246	55.8	**57.10**
21	5.58	53.2	51.9	7.78	54.2	250	50.9	**52.33**
24	2.23	20	47.5	7.75	50.7	255	47.3	**48.50**
27	0.4	3.5	45.2	7.72	48.2	260	44.5	**45.97**
30	0.24	2	43.9	7.7	46.6	261	43.6	**44.70**
33	0.2	1.7	42.7	7.68	45.2	262	43	**43.63**
36	0.21	1.8	42.2	7.65	44	265	42.1	**42.77**
39	0.17	1.4	41.7	7.64	43.1	267	41.4	**42.07**
42	0.13	1.1	40.9	7.62	42.6	270	40.9	**41.47**
45	0.11	0.9	40.6	7.6	42.2	272	40.7	**41.17**
48	0.1	0.8	40.3	7.59	41.8	275	40.3	**40.80**
51	0.1	0.8	40.2	7.56	41.6	275	40.3	**40.70**
54	0.1	0.8	40.1	7.55	41.5	276	40.2	**40.60**
57	0.09	0.8	39.9	7.53	41.3	276	40.1	**40.43**
60	0.09	0.7	39.8	7.5	41.1	277	40.1	**40.33**
63	0.09	0.7	39.8	7.48	41	278	40	**40.27**
66	0.09	0.7	39.7	7.46	40.9	279	40	**40.20**
69	0.09	0.7	39.7	7.43	40.7	280	40	**40.13**
72	0.08	0.7	39.6	7.41	40.6	281	39.9	**40.03**
75	0.08	0.6	39.6	6.84	41	403	40	**40.20**









Spread Eagle Chain of Lakes

The Spread Eagle Chain of Lakes is located in central Florence County. This chain is a drainage lake system, with the outflow running to the Menominee River at the Twin Falls Flowage (WDNR 2015L). These seven lakes are the most heavily utilized lakes in the county both by residents, and the many visitors using the public landing at North Lake. Spread Eagle Chain hosts fishing tournaments, and a Fourth of July fireworks display that draws many boaters from in and out of the county. All of this boat traffic has resulted in the Spread Eagle Chain becoming home to numerous invasive species.

Invasives known to be in the Spread Eagle Chain of Lakes are banded mystery snail (*Viviparus georgianus)*, Chinese mystery snail (*Cipangopaludina chinensis*), rusty crayfish (*Orconectes rusticus*), zebra mussel (*Dreissena polymorpha*), and Eurasian water-milfoil (*Myriophyllum spicatum)*. In 2015 eDNA results for North Lake showed a positive indication for spiny waterflea. A subsequent plankton tow and examination by the Wild Rivers Invasive Species Coalition (WRISC) staff did not find spiny waterflea specimens.

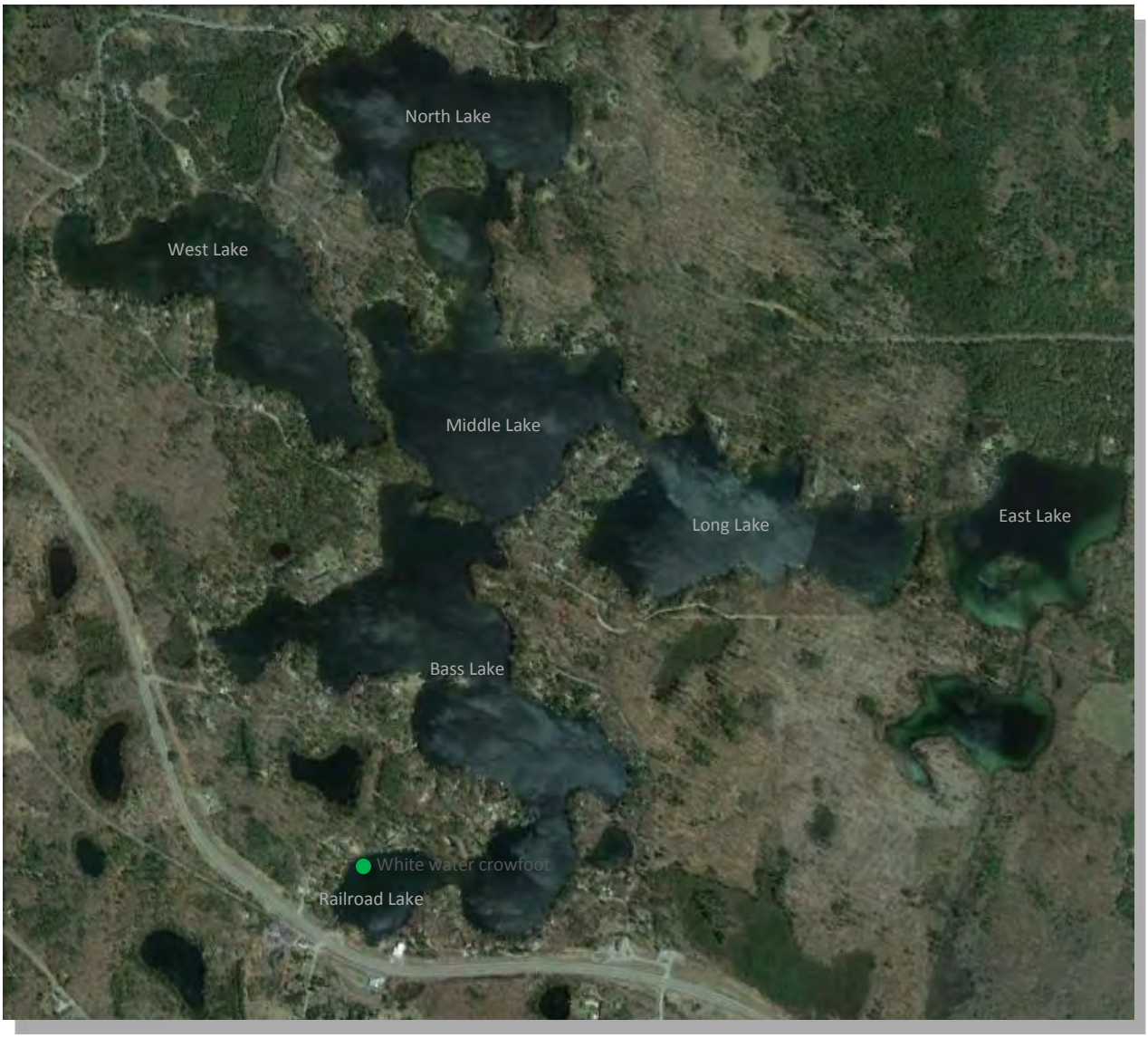


Image from Google Earth

Spread Eagle Chain of Lakes

The Spread Eagle Chain of Lakes Association (SECOLA) has contracted with the environmental consulting firm White Water Associates to conduct hand removal of the Eurasian Water-milfoil (*Myriophyllum spicatum)*. This work is paid for in part by a grant from the DNR. In 2016 it was reported to Florence County AIS staff that the efforts seem to be working, as the populations of Eurasian Water-milfoil were noticeably less in the 2016 season (Weber, personal communication). Monitoring and removal will continue pending new grant funds.

The 2015 monitoring was conducted by Florence County AIS staff Crago and Brunette, with the help of a SECOLA member, Carl Sundberg. The 2016 monitoring was conducted by Florence County AIS staff Weber-Starling, and Crago, with the help of SECOLA member, Gary Weber.

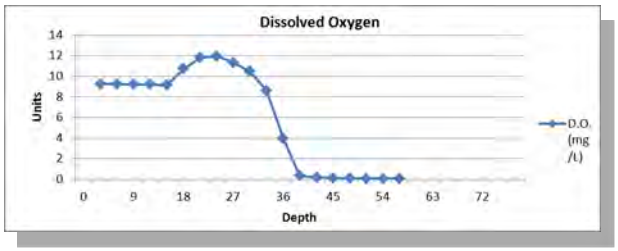
In 2016 the Florence County Land Conservation Department and the officers of the Spread Eagle Chain of Lakes Association had both received complaint calls from Railroad Lake residents about an aquatic plant bloom. This was mistakenly referred to a "milfoil". AIS staff, SECOLA members, and White Water Associates personnel, Angie Stein, assessed the growth and found it to be native White water crowfoot (*Ranunculus aquatilis*).

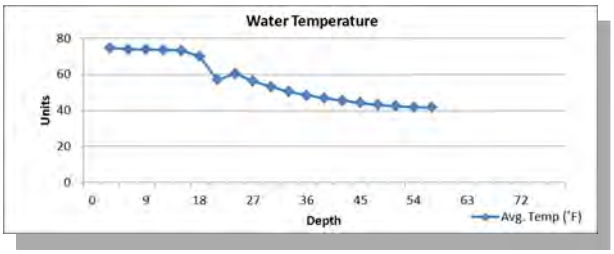
White water crowfoot bloom in Railroad Lake, Spread Eagle Chain, 2016.

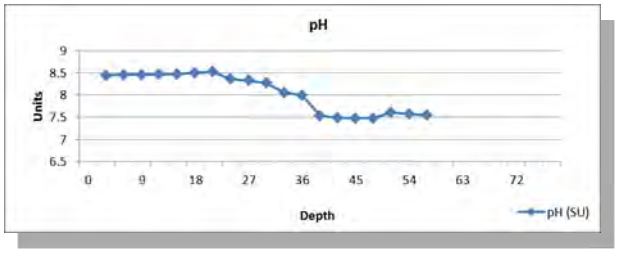
Photos: Carolyn Weber-Starling

Bass Lake (Spread Eagle) 2015 Data (WBIC 702700)

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
1:30	18	56	2	3	1.25	1.9		
Chemistry Observation Period					Lat/Long	N45.88827° W88.13647°		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.24	112.5	73.3	8.44	75.2	4330	75.5	**74.67**
3	9.25	112.5	73.2	8.45	74.4	4300	74.3	**73.97**
6	9.22	112	73.2	8.45	74.1	4310	73.9	**73.73**
9	9.22	111.9	73.1	8.46	73.8	4310	73.7	**73.53**
12	9.15	110.9	72.9	8.47	73.5	4310	73.4	**73.27**
15	10.74	125.8	69.7	8.5	70	4370	69.8	**69.83**
18	11.8	135.2	37.7	8.52	66.7	4430	66.6	**57.00**
21	11.98	128.3	61.8	8.36	59.4	4490	59.8	**60.33**
24	11.34	114.5	56.8	8.33	55.8	4490	56.1	**56.23**
27	10.47	100.3	52.7	8.27	53.2	4540	53.3	**53.07**
30	8.61	79.3	49.6	8.05	50.5	4580	51	**50.37**
33	3.99	35.7	47.6	7.99	48.7	4600	49	**48.43**
36	0.34	3	46.2	7.53	46.7	4710	47.4	**46.77**
39	0.18	1.5	44.9	7.48	45.6	4750	45.6	**45.37**
42	0.13	1.1	43.7	7.47	44.6	4790	44.4	**44.23**
45	0.09	0.8	42.8	7.47	43.3	4810	43.3	**43.13**
48	0.07	0.6	42.1	7.61	42.3	4920	42.4	**42.27**
51	0.06	0.5	41.6	7.57	42	4990	42	**41.87**
54	0.06	0.5	41.3	7.55	41.7	5040	41.6	**41.53**







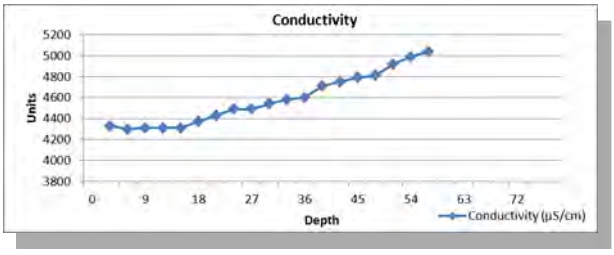
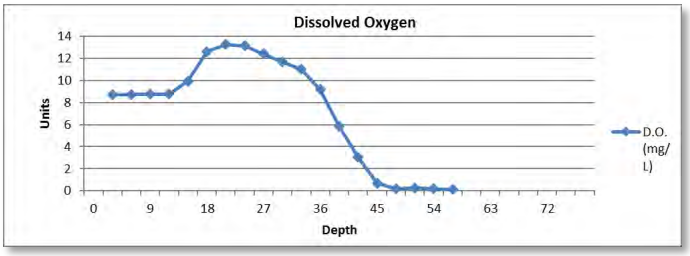
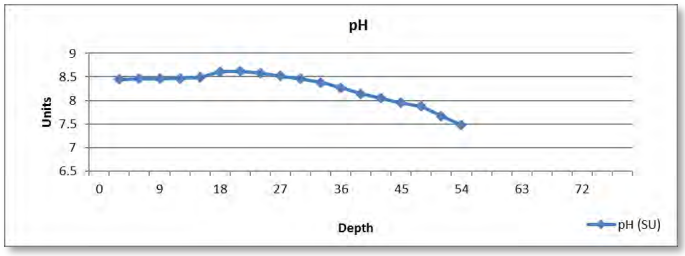


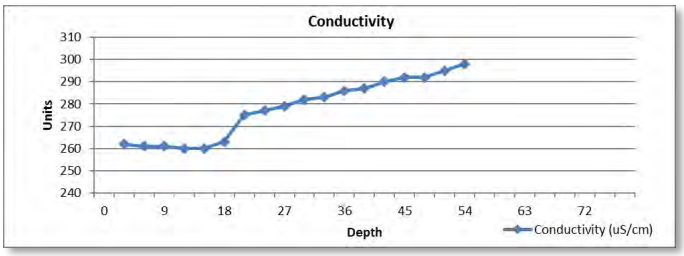
Image from Google Earth

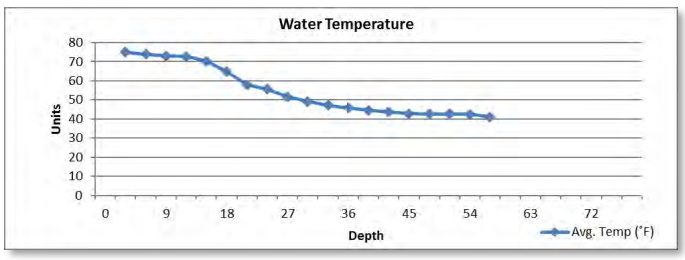
Bass Lake (Spread Eagle) 2016 Data (WBIC 702700)

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
2:00 PM	21	54	2	3	1	2		
Chemistry Observation Period				2:00 PM	Lat/Long	N45° 53.296' W88° 08.188'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.69	107.6	74.6	8.45	74.7	262	75.3	**74.87**
3	8.74	107.1	73.6	8.46	74.1	261	73.8	**73.83**
6	8.77	106.8	72.9	8.46	73.2	261	72.8	**72.97**
9	8.75	106.1	72.6	8.47	72.7	260	72.6	**72.63**
12	9.95	116.1	69	8.49	70.5	260	71	**70.17**
15	12.64	138.7	63.5	8.61	65.6	263	65	**64.70**
18	13.27	137.1	58.7	8.62	61.1	275	54	**57.93**
21	13.14	130.4	55.1	8.58	57.3	277	54.4	**55.60**
24	12.42	118.1	48.9	8.52	54.3	279	51.5	**51.57**
27	11.68	106.9	46.8	8.46	51.5	282	49.3	**49.20**
30	11.03	98.2	44.8	8.38	49.3	283	47.5	**47.20**
33	9.18	79.5	43.4	8.27	47.5	286	46.4	**45.77**
36	5.86	49.8	42.6	8.14	46.3	287	45	**44.63**
39	3.05	32.4	41.9	8.05	45.2	290	43.8	**43.63**
42	0.69	5.7	41.9	7.95	44	292	42.7	**42.87**
45	0.19	1.6	41.3	7.88	43.3	292	43.2	**42.60**
48	0.27	2.2	41.7	7.67	43	295	43.2	**42.63**
51	0.18	1.4	41	7.48	43.1	298	43.2	**42.43**
54	0.13	1.1	41					**41.00**



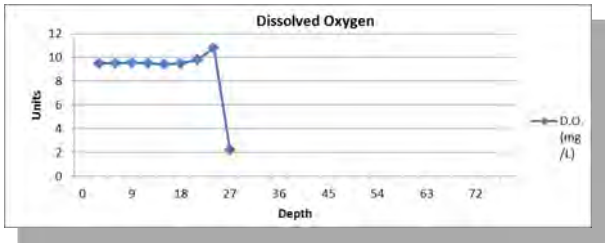


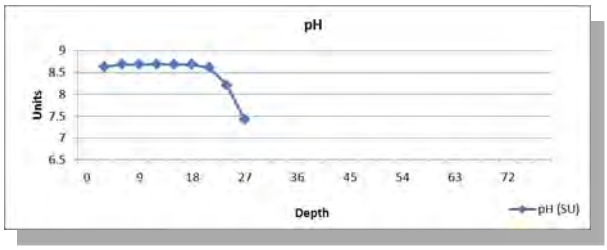


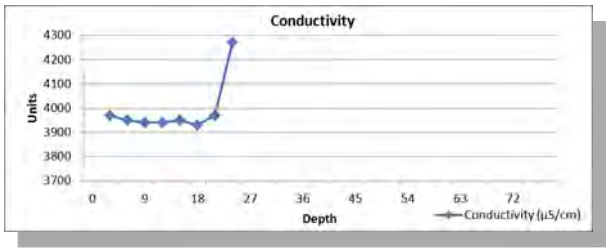


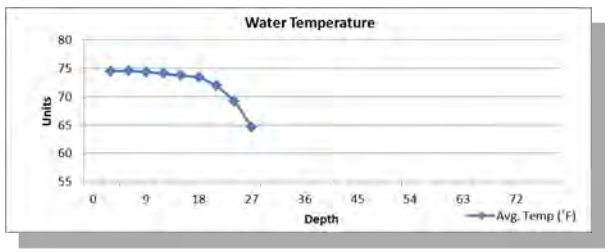
East Lake (Spread Eagle) 2015 Data (WBIC 702400)

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
11:15	20	25	2	3	1.5	2		
Chemistry Observation Period					Lat/Long	N45.89375° W88.11627°		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.5	118	75.3	8.63	73.9	3970	74.1	**74.43**
3	9.5	117.5	74.9	8.68	74.2	3950	74.4	**74.50**
6	9.54	117.7	74.6	8.68	74.1	3940	74.3	**74.33**
9	9.51	116.8	74.2	8.69	73.8	3940	74.1	**74.03**
12	9.42	115.3	73.9	8.68	73.6	3950	73.7	**73.73**
15	9.51	115.8	73.4	8.68	73.4	3930	73.5	**73.43**
18	9.8	117.8	72.1	8.61	71.8	3970	71.9	**71.93**
21	10.79	126.1	69.6	8.21	68.9	4270	69.1	**69.20**
24	2.2	24.4	64.6	7.42	64.6			**64.6**









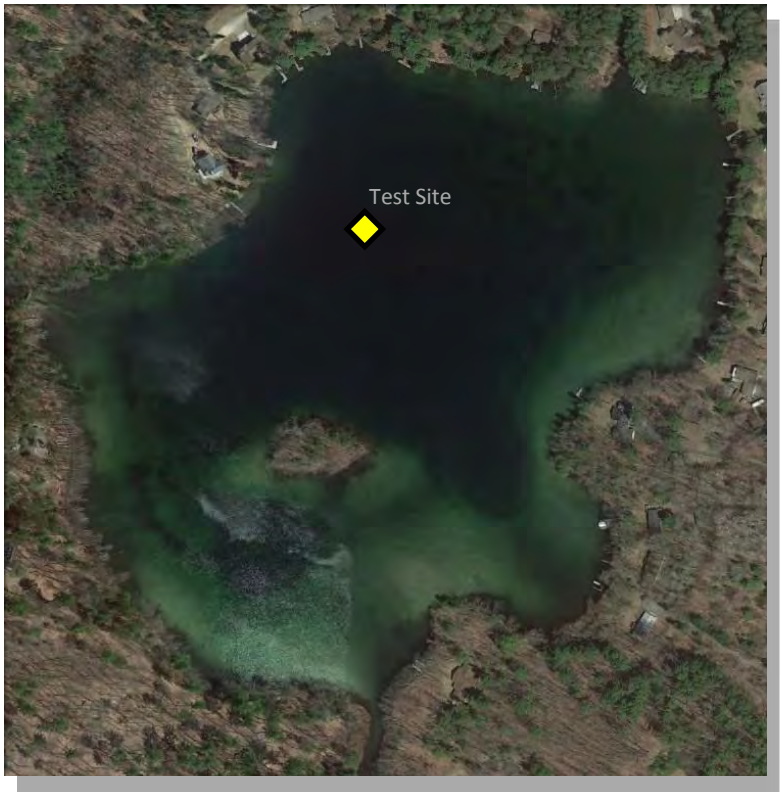
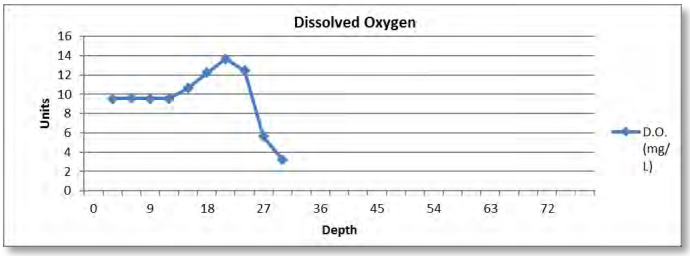
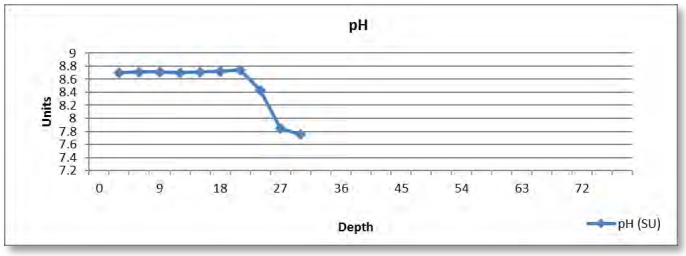


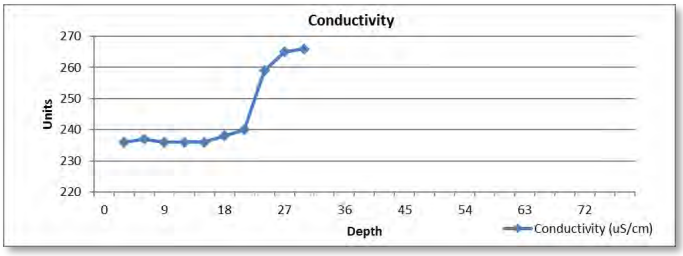
Image from Google Earth

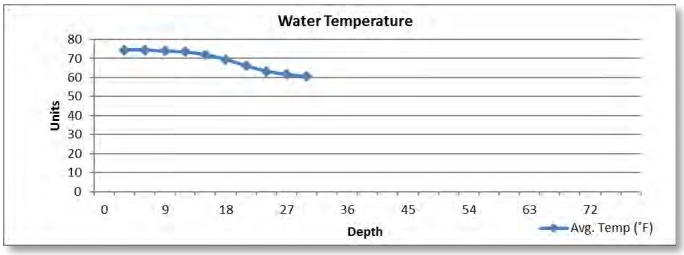
East Lake (Spread Eagle) 2016 Data (WBIC 702400)

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
11:42	14	27	n	3	1	2		
Chemistry Observation Period					Lat/Long	N45° 53.625' W88° 06.976'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.57	117.3	73.7	8.7	74.8	236	74.8	**74.43**
3	9.59	118	74	8.71	74.6	237	74.6	**74.40**
6	9.57	117.3	73.6	8.71	74.1	236	74.1	**73.93**
9	9.55	116.9	73.4	8.7	73.8	236	73.6	**73.60**
12	10.65	128.5	72.1	8.71	72.2	236	71.8	**72.03**
15	12.25	142.6	68.8	8.72	70.2	238	69.3	**69.43**
18	13.67	153.6	65.6	8.74	66.9	240	65.9	**66.13**
21	12.46	136.3	63.3	8.43	62.08	259	64.4	**63.26**
24	5.63	60.1	61.4	7.85	61.2	265	62.2	**61.60**
27	3.2	33.8	60.3	7.75	60.6	266	60.7	**60.53**



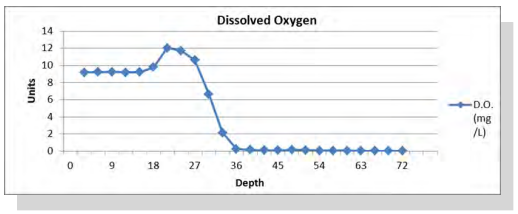


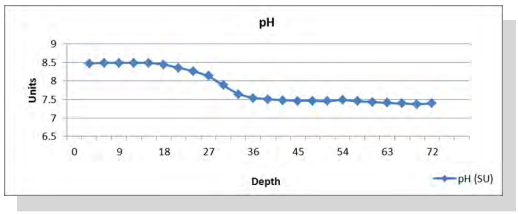


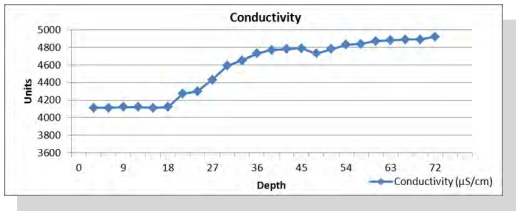


Long Lake (Spread Eagle) 2015 Data (WBIC 702500)

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
11:45	18.5	72	2	3	1.3	1.5		
Chemistry Observation Period					Lat/Long	N45.89387° W88.12777°		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.17		75.1	8.47	74	4110	74.4	**74.50**
3	9.21		74.7	8.48	73.9	4110	74.4	**74.33**
6	9.24		74.2	8.48	73.8	4120	74	**74.00**
9	9.17		74.1	8.48	73.7	4120	74	**73.93**
12	9.2		73.9	8.48	73.7	4110	73.9	**73.83**
15	9.77		71.9	8.44	71.8	4120	71.9	**71.87**
18	12.04		66.1	8.35	66.9	4270	66.4	**66.47**
21	11.7		59.9	8.26	60.1	4300	60.1	**60.03**
24	10.62		54.7	8.13	55.9	4430	55.3	**55.30**
27	6.65		51.4	7.88	51.7	4590	51.5	**51.53**
30	2.15		48.4	7.64	49.7	4650	49.4	**49.17**
33	0.25		46.1	7.53	47.8	4730	46.9	**46.93**
36	0.17		45.3	7.5	46.1	4770	45.4	**45.60**
39	0.11		44.1	7.47	45.4	4780	44.2	**44.57**
42	0.09		43	7.46	44.1	4790	43.2	**43.43**
45	0.16		42.8	7.46	43.6	4730	43.6	**43.33**
48	0.12		42.3	7.45	42.9	4780	42.8	**42.67**
51	0.07		41.9	7.49	43.3	4830	42.3	**42.50**
54	0.06		41.6	7.45	42.8	4840	42.2	**42.20**
57	0.06		41.5	7.43	42.5	4870	41.8	**41.93**
60	0.05		41.3	7.41	42.2	4880	41.6	**41.70**
63	0.04		41.3	7.39	42	4890	41.5	**41.60**
66	0.03		41.2	7.37	41.9	4890	41.4	**41.50**
69	0.03		41.1	7.39	41.8	4920	41.4	**41.43**







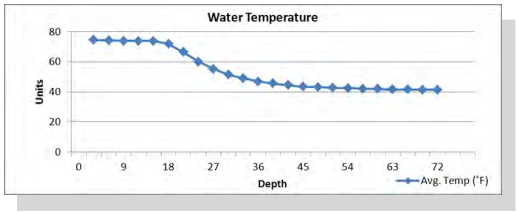
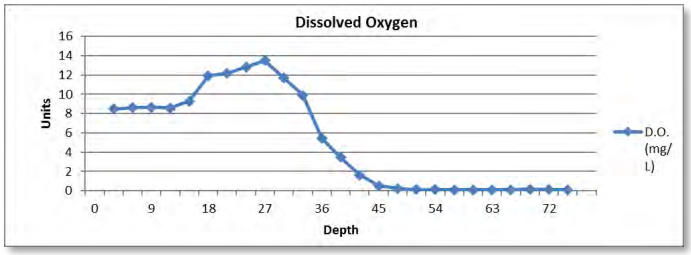
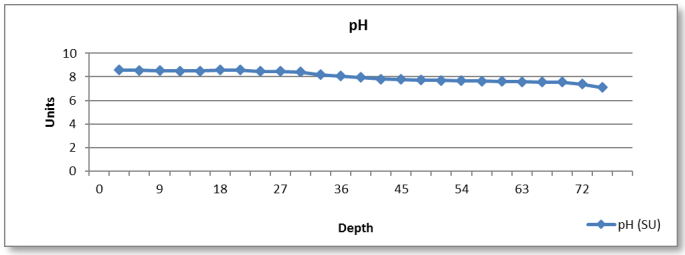


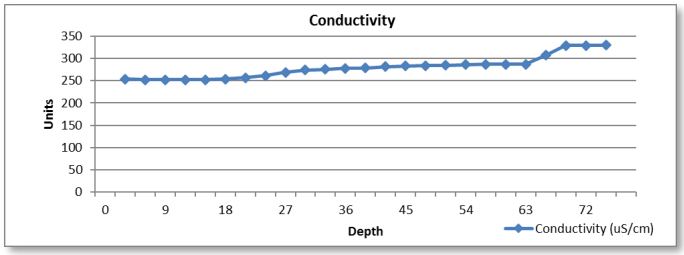
Image from Google Earth

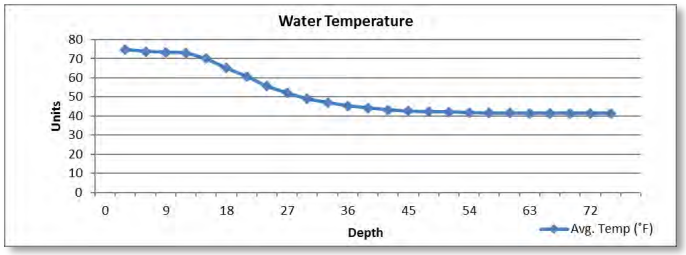
Long Lake (Spread Eagle) 2016 Data (WBIC 702500)

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom	Lake Level	Appearance	Water Color		Perception
			1=yes 2=no	1=high 2=low 3=normal	1=clear 2=murky	1=blue 2=green 3=brown 4=red 5=yellow		1(best) - 5 (worst)
1:10 PM	20	72	n	3	1	2		
Chemistry Observation Period					Lat/Long	N45° 53.632' W88° 07.666'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.48	105.7	75.1	8.58	74.3	254	74.7	**74.70**
3	8.61	106.1	74.1	8.54	73.6	252	73.5	**73.73**
6	8.66	106	73.5	8.52	73.3	252	73.1	**73.30**
9	8.58	104.6	73.2	8.51	73	252	73	**73.07**
12	9.3	109.8	70.1	8.51	70.4	252	69.6	**70.03**
15	11.92	133.4	65.4	8.57	66.2	254	63.7	**65.10**
18	12.16	128.8	60.7	8.57	61.4	257	60	**60.70**
21	12.83	128.3	55.9	8.48	55.8	261	55	**55.57**
24	13.48	128.6	52.3	8.48	52.6	269	51.3	**52.07**
27	11.7	106.2	48.5	8.4	49.7	274	48.5	**48.90**
30	9.9	87.4	46.4	8.19	47.7	276	46.9	**47.00**
33	5.46	46.7	44.1	8.06	46	278	45.6	**45.23**
36	3.48	29.4	43.2	7.95	44.9	279	44.5	**44.20**
39	1.64	13.7	42.4	7.82	43.5	282	43.4	**43.10**
42	0.52	4.3	41.9	7.78	43.1	283	42.8	**42.60**
45	0.25	2.1	41.6	7.74	42.7	284	42.5	**42.27**
48	0.14	1.2	41.3	7.7	42.5	285	42.4	**42.07**
51	0.12	1	41.2	7.68	42.3	286	41.8	**41.77**
54	0.11	0.9	41.1	7.64	42.1	287	41.6	**41.60**
57	0.11	0.9	41.1	7.62	42	287	41.6	**41.57**
60	0.11	0.9	41.1	7.59	41.8	287	41.5	**41.47**
63	0.1	0.8	41	7.57	41.7	307	41.6	**41.43**
66	0.17	1.4	41.2	7.56	41.7	329	41.6	**41.50**
69	0.12	1	41.1	7.39	41.7	329	41.5	**41.43**
72	0.1	0.8	41.1	7.1	41.8	330	41.5	**41.47**



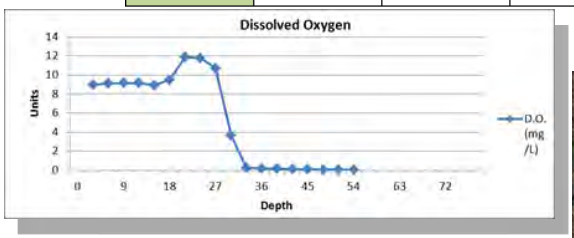


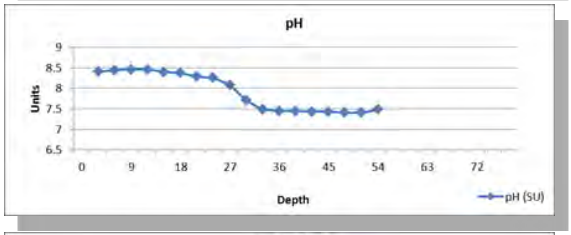


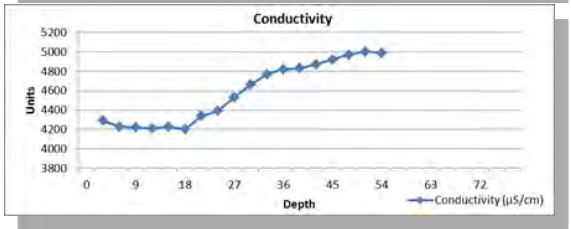


Middle Lake (Spread Eagle) 2015 Data (WBIC 702600)

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow	Perception 1(best) - 5 (worst)
12:45	17.5	53	2	3	1.5	2	
Chemistry Observation Period					Lat/Long	N45.89604° W88.13687°	
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.95	112.1	76.3	8.4	75.8	4290	73.3	**75.13**
3	9.11	112.5	74.9	8.44	74.6	4230	73.5	**74.33**
6	9.15	112.4	74.3	8.45	74.2	4220	73.5	**74.00**
9	9.15	112.1	74.1	8.45	74	4210	73.5	**73.87**
12	8.92	108.5	73.5	8.39	73.1	4230	72.9	**73.17**
15	9.49	112.7	71.2	8.37	72.3	4200	71.8	**71.77**
18	11.87	130.6	64.4	8.28	65.7	4340	65.5	**65.20**
21	11.78	121.9	59.1	8.25	59.9	4390	59.6	**59.53**
24	10.71	104.7	54.5	8.08	54.4	4530	54.8	**54.57**
27	3.68	33.9	49.9	7.7	50.7	4660	51.2	**50.60**
30	0.26	2.3	47.2	7.48	48.4	4770	48.8	**48.13**
33	0.2	1.8	45.8	7.44	46.2	4820	46.5	**46.17**
36	0.16	1.3	44.5	7.44	45	4830	45.4	**44.97**
39	0.13	1.1	43.4	7.43	43.9	4870	43.9	**43.73**
42	0.09	0.8	42.8	7.43	43.1	4920	43.2	**43.03**
45	0.07	0.6	42.2	7.41	42.6	4970	42.7	**42.50**
48	0.06	0.5	42	7.41	42.4	5000	42.4	**42.27**
51	0.05	0.4	41.8	7.48	42.5	4990	42.4	**42.23**







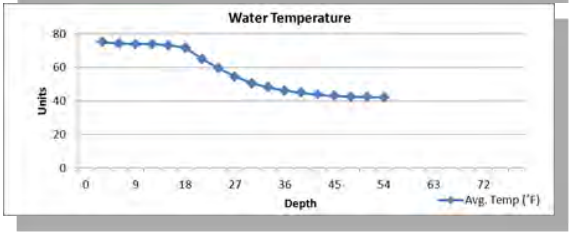
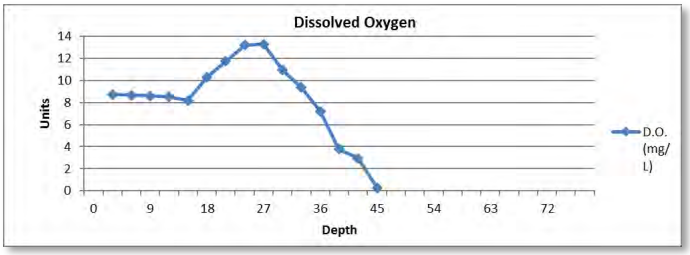
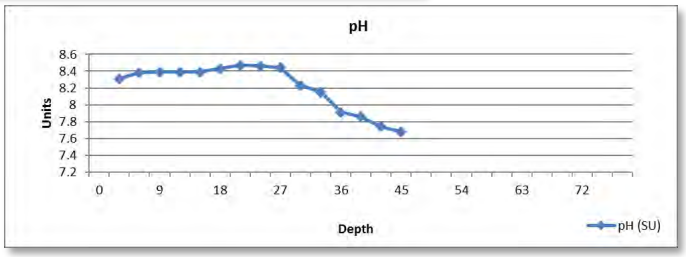


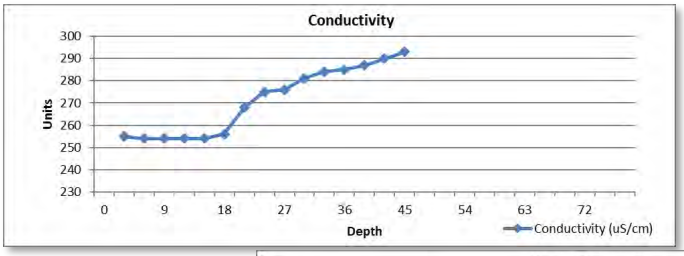
Image from Google Earth

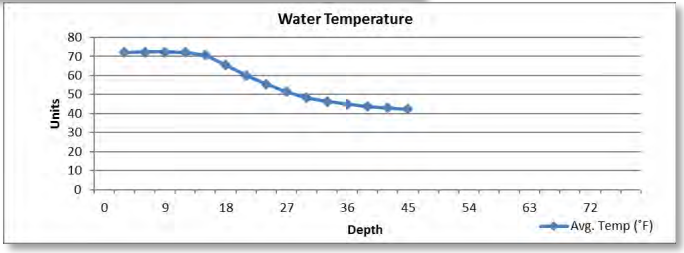
Middle Lake (Spread Eagle) 2016 Data (WBIC 702600)

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
9:50	19	42	2	3	1	1		
Chemistry Observation Period				10:00 AM	Lat/Long	N45° 53.762' W88° 08.212'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.73	104.6	71.5	8.31	72.4	255	72.6	**72.17**
3	8.68	104.2	71.8	8.38	72.6	254	72.7	**72.37**
6	8.6	103.5	71.9	8.39	72.5	254	72.5	**72.30**
9	8.53	102.7	72	8.39	72.3	254	72.3	**72.20**
12	8.18	97.8	71.4	8.39	70.6	254	70.4	**70.80**
15	10.33	116	65.7	8.43	65.8	256	64.7	**65.40**
18	11.75	123.4	60	8.47	60.7	268	59.2	**59.97**
21	13.21	129.9	54.6	8.46	56.4	275	55.2	**55.40**
24	13.29	123.9	50.4	8.44	52.8	276	51	**51.40**
27	10.95	98.6	47.8	8.23	48.8	281	48	**48.20**
30	9.36	81.9	45.8	8.15	47.2	284	46.2	**46.40**
33	7.22	62.2	44.6	7.91	45.3	285	44.8	**44.90**
36	3.78	31.9	43.3	7.86	44.5	287	43.4	**43.73**
39	2.96	24.8	42.7	7.74	43.2	290	43.1	**43.00**
42	0.28	2.3	41.7	7.68	43	293	42.2	**42.30**





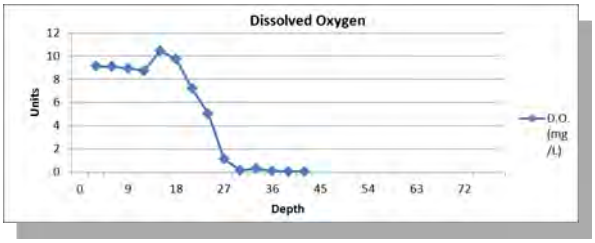


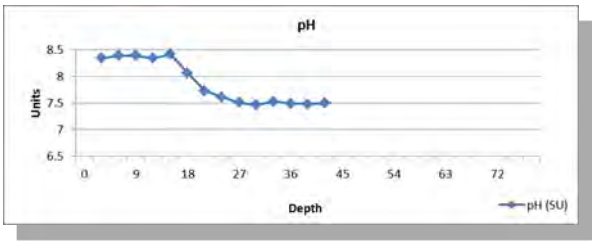


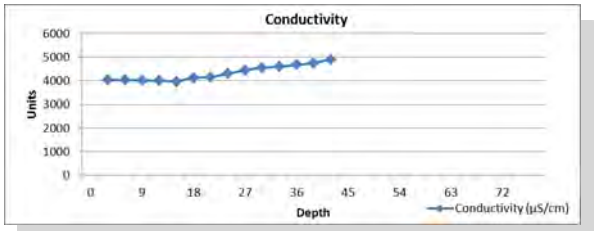
North Lake (Spread Eagle) 2015 Data (WBIC 703000)

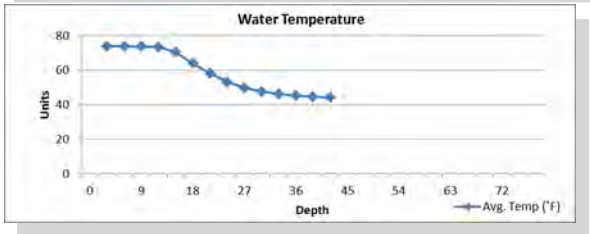
Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
12:45	17.5	53	2	3	1.5	2		
Chemistry Observation Period					Lat/Long	N45.89604° W88.13687°		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.95	112.1	76.3	8.4	75.8	4290	73.3	**75.13**
3	9.11	112.5	74.9	8.44	74.6	4230	73.5	**74.33**
6	9.15	112.4	74.3	8.45	74.2	4220	73.5	**74.00**
9	9.15	112.1	74.1	8.45	74	4210	73.5	**73.87**
12	8.92	108.5	73.5	8.39	73.1	4230	72.9	**73.17**
15	9.49	112.7	71.2	8.37	72.3	4200	71.8	**71.77**
18	11.87	130.6	64.4	8.28	65.7	4340	65.5	**65.20**
21	11.78	121.9	59.1	8.25	59.9	4390	59.6	**59.53**
24	10.71	104.7	54.5	8.08	54.4	4530	54.8	**54.57**
27	3.68	33.9	49.9	7.7	50.7	4660	51.2	**50.60**
30	0.26	2.3	47.2	7.48	48.4	4770	48.8	**48.13**
33	0.2	1.8	45.8	7.44	46.2	4820	46.5	**46.17**
36	0.16	1.3	44.5	7.44	45	4830	45.4	**44.97**
39	0.13	1.1	43.4	7.43	43.9	4870	43.9	**43.73**
42	0.09	0.8	42.8	7.43	43.1	4920	43.2	**43.03**
45	0.07	0.6	42.2	7.41	42.6	4970	42.7	**42.50**
48	0.06	0.5	42	7.41	42.4	5000	42.4	**42.27**
51	0.05	0.4	41.8	7.48	42.5	4990	42.4	**42.23**

Image from Google Earth



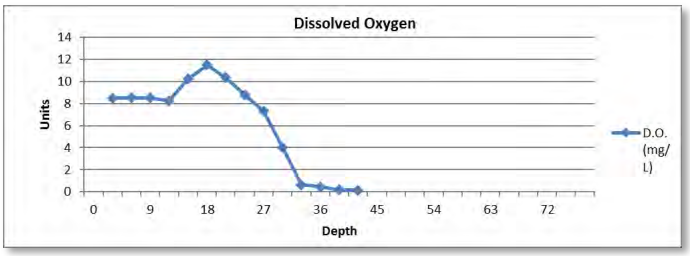


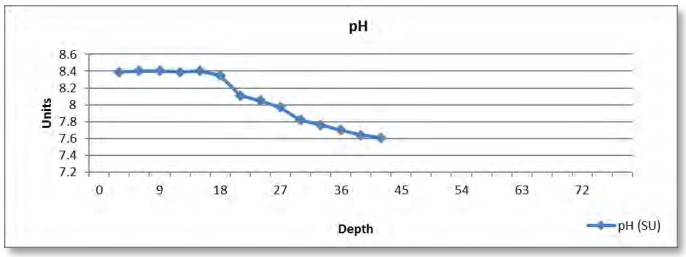


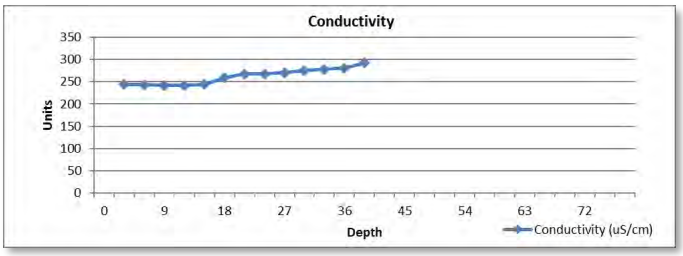


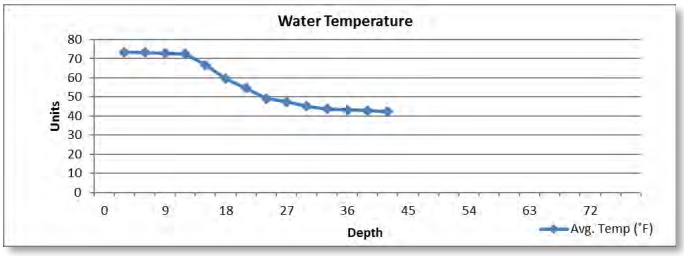
North Lake (Spread Eagle) 2016 Data (WBIC 703000)

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
11:03 AM	13	40	2	3	1	2		
Chemistry Observation Period					Lat/Long	N45° 54.237' W88° 08.370'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.49	104.1	73.7	8.39	72.9	244	73.6	**73.40**
3	8.51	104	73.4	8.4	73	243	73.2	**73.20**
6	8.52	103.5	73	8.4	72.7	242	72.8	**72.83**
9	8.26	100.1	72.7	8.39	72.5	242	72.1	**72.43**
12	10.23	116.8	67.1	8.4	67	244	66	**66.70**
15	11.5	119.7	59.1	8.35	60.3	259	59.1	**59.50**
18	10.36	102.9	55.3	8.11	54.4	267	53.9	**54.53**
21	8.78	81.7	50.3	8.05	50.4	267	46.5	**49.07**
24	7.34	65.7	47.4	7.97	47.8	270	46.9	**47.37**
27	4	34.4	44.6	7.82	45.2	275	45.4	**45.07**
30	0.65	5.5	43.1	7.76	44.1	278	44	**43.73**
33	0.46	3.9	42.6	7.7	43.5	281	43.3	**43.13**
36	0.19	1.6	42.1	7.64	43.1	292	43.1	**42.77**
39	0.14	1.1	41.8	7.61	42.9			**42.35**







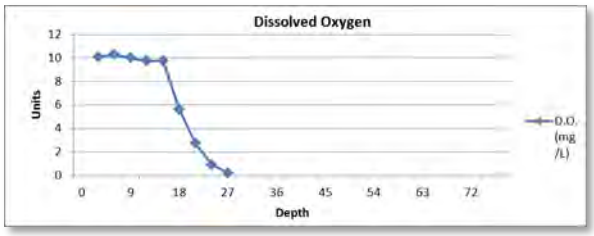


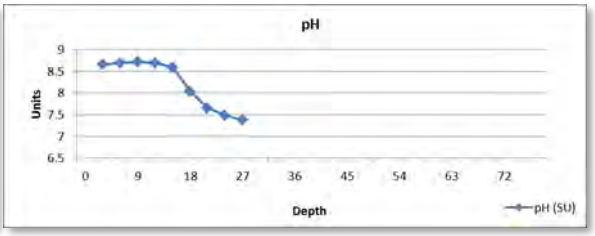
West Lake (Spread Eagle) 2015 Data (WBIC 703500)

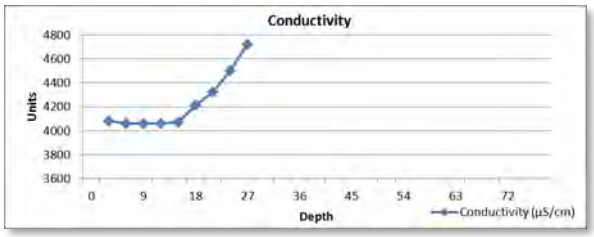
Image from Google Earth

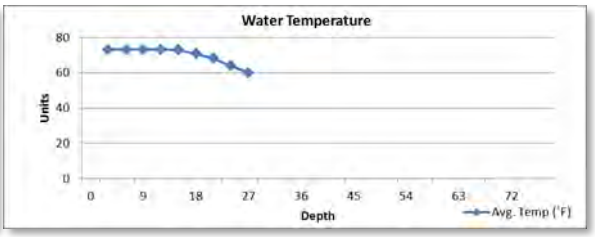
Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow	Perception 1(best) - 5 (worst)
10:00	12.5	25	1	3	1.5	2	
Chemistry Observation Period					Lat/Long	N45.89674° W88.14244°	

Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	10.09	121.8	72.6	8.65	73.4	4080	73.4	**73.13**
3	10.28	124.4	72.9	8.69	73.6	4060	73.2	**73.23**
6	10.02	121.4	73.1	8.71	73.5	4060	73.1	**73.23**
9	9.74	118.2	73.1	8.69	73.4	4060	73.1	**73.20**
12	9.78	118.3	73	8.59	73	4070	72.9	**72.97**
15	5.61	66.1	70.5	8.04	70.7	4210	71	**70.73**
18	2.74	31.4	68.1	7.65	68	4320	68.7	**68.27**
21	0.93	10.2	64	7.49	63.1	4500	64.7	**63.93**
24	0.22	2.3	59.7	7.38	59.8	4720	60.4	**59.97**



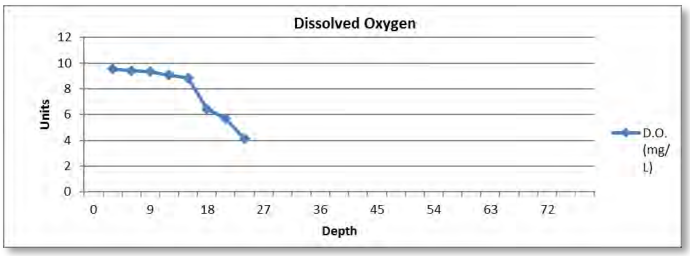


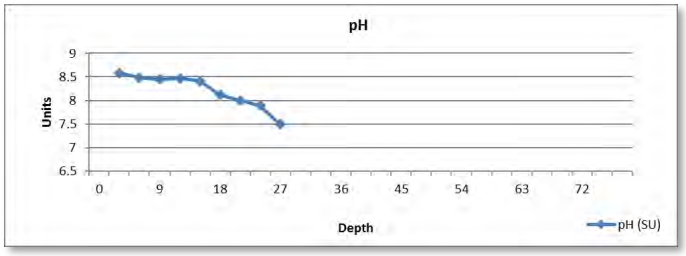


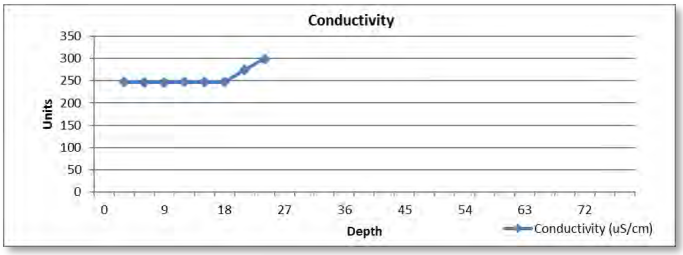


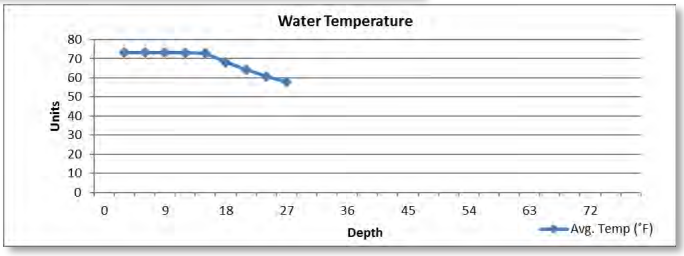
West Lake (Spread Eagle) 2016 Data (WBIC 703500)

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
9:13	14	24	2	1	1	2		
Chemistry Observation Period					Lat/Long	N45° 53.805' W88° 08.546'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	9.54	115.9	72.8	8.58	73.4	247	73.5	**73.23**
3	9.42	114.6	73	8.48	73.3	246	73.3	**73.20**
6	9.33	113.6	73	8.45	73.2	246	73.2	**73.13**
9	9.08	110.5	73	8.47	73.1	247	73.1	**73.07**
12	8.85	107.6	72.9	8.41	72.9	247	73	**72.93**
15	6.43	74.6	68.6	8.12	67.9	247	68	**68.17**
18	5.69	63.3	64.7	8	64.6	274	63.6	**64.30**
21	4.11	43.2	60	7.89	60.5	299	61.7	**60.73**
24				7.49	57.7			**57.70**









West Bass Lake (WBIC 652200)

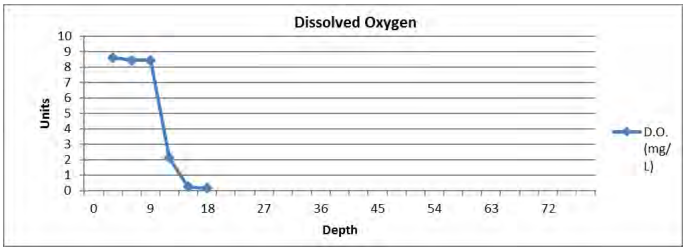
Image from Google Earth

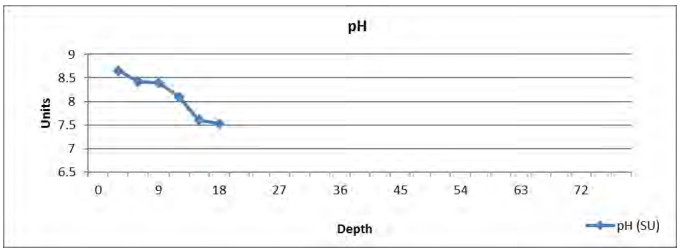
Monitoring of the 55 acre West Bass Lake was conducted by CT Goodwin and AIST Crago on July 15, 2016. A week previously the LCD received a call from a resident concerned with aquatic plant growth in the lake. This call accelerated the planned monitoring of West Bass Lake. Goodwin and Crago found three masses of native southern naiad (*Najas guadalupensis*) on the surface of the lake each approximately three to five square meters. Some plants were still rooted to the ten-foot deep bottom keeping the masses in place. In 2013 Florence County Land Conservation Staff had documented a larger bloom of southern naiad on West Bass Lake (Richard, *et al.* 2013).

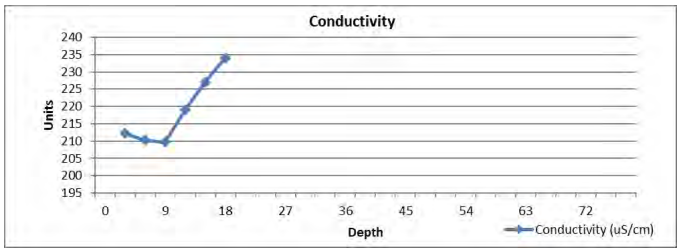
Banded mystery snail (*Viviparus georgianus*) is the only known invasive in West Bass Lake. Goodwin and Crago located a small stand of European marsh thistle (*Cirsium palistre*) along the south shore. As the plants were on private property a sample was not collected.

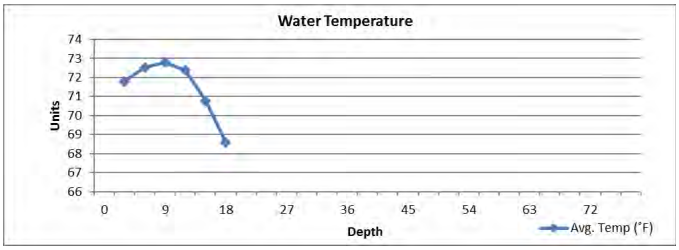
West Bass Lake 2016 Data

Secchi Obs. Time	Secchi Depth	Sampled Lake Depth	Hit Bottom 1=yes 2=no	Lake Level 1=high 2=low 3=normal	Appearance 1=clear 2=murky	Water Color 1=blue 2=green 3=brown 4=red 5=yellow		Perception 1(best) - 5 (worst)
9:10 AM	11	15.4	2	3	2	3		3
Chemistry Observation Period			8:50-9:10		Lat/Long	N45° 46.734' W88° 19.993'		
Depth (feet)	D.O. (mg/L)	Saturation (%)	Temp (˚F)	pH (SU)	Temp (˚F)	Conductivity (µS/cm)	Temp (˚F)	Avg. Temp (˚F)
0	8.64	107.8	71.5	8.65	72.2	212.2	71.7	**71.80**
3	8.46	102.6	72.4	8.42	72.5	210.3	72.7	**72.53**
6	8.45	102.6	72.7	8.4	72.9	209.7	72.8	**72.80**
9	2.12	25.7	72	8.1	72.5	219	72.6	**72.37**
12	0.25	2.9	70.5	7.61	70.7	227	71.1	**70.77**
15	0.17	1.9	68.9	7.53	68.4	234	68.5	**68.60**









Total Phosphorus Test Results

In the 2016 season LCD staff collected near surface samples from the lakes monitored. These samples were sent to the Wisconsin State Laboratory of Hygiene (SLOH) for total Phosphorus testing. The results are tabulated below. Results from the SLOH are noted as approximate due to field collection methods and prolonged storage. Wisconsin statue NR102.06(4)(b) defines the allowable total P based on lake type as follows:

Drainage & Stratified: 30 µg/L
Drainage: 40 µg/L
Seepage & Stratified: 20 µg/L
Seepage: 40 µg/L

As per NR102.06(4)(b) stratified status was defined by calculating the Lathrop/Lillie Value (WDNR 2014) using the equation:

$$\frac{\text{Maximum Depth (feet)}*.3048-0.1}{\text{Log 10 (Lake Area (acres)}*0.40469)}$$

Where a resultant value ≤3.8=mixed lake, >3.8=stratified lake

The SLOH reported results in mg/L, this was converted to µg/L to match NR102.06(4)(b). This testing did not conform to the DNR's WisCALM protocols for Total P testing. A single sample was from each lake, not a minimum of six samples over two years. Any future collection and sampling will conform to the WisCALM standards.

2016 Total P Testing Results

Lake Name	Total P in mg/L	Total P in µg/L	Size in Arces	Depth in Feet	Lathrop/Lillie Value	Lake Type	Total P Exceeded	µg/L of Excess Total P
Barrens Lake	0.03	26.40	9.00	23.00	17.8946	Undefined*		
Cosgrove Lake	0.02	23.00	76.00	26.00	10.2803	Seepage	Yes	3.00
Edith Lake	0.05	48.40	42.00	72.00	33.2549	Drainage	Yes	18.40
Fay Lake	0.01	12.10	272.00	10.00	2.9921	Drainage	No	
Fisher Lake	0.03	31.40	50.00	42.00	18.4735	Drainage	Yes	1.40
Frog Lake	0.03	33.40	28.00	21.00	10.7586	Seepage	Yes	13.40
Halsey Lake	0.10	96.80	506.00	10.00	2.6939	Drainage	Yes	66.80
Keyes Lake	0.05	54.70	195.00	74.00	24.2299	Drainage	Yes	24.70
Lake Anna	0.05	49.50	33.00	61.00	30.0927	Seepage	Yes	29.50
Lake Ellwood	0.02	15.60	130.00	25.00	8.7903	Seepage	No	
Lake Emily	0.06	57.20	183.00	43.00	14.2055	Drainage	Yes	27.20
Long Lake	0.03	33.30	337.00	21.00	6.1597	Drainage	Yes	3.30
Loon Lake	0.04	37.50	47.00	55.00	24.6261	Drainage	Yes	7.50
Montgomery Lake	0.08	77.40	23.00	27.00	14.7522	Drainage	Yes	47.40
Patten Lake	0.04	42.20	254.00	52.00	16.1831	Drainage	Yes	12.20
Porcupine Lake	0.03	27.10	36.00	20.00	9.5202	Seepage	Yes	7.10
Sand Lake	0.02	20.80	23.00	28.00	15.3053	Seepage	Yes	0.80
Sea Lion Lake	0.07	68.90	114.00	82.00	29.9055	Drainage	Yes	38.90
Spread Eagle Bass	0.04	35.60	104.00	68.00	25.2690	Drainage	Yes	5.60
Spread Eagle East	0.02	21.60	48.00	27.00	11.9486	Drainage	No	
Spread Eagle Long	0.05	51.70	73.00	75.00	30.1829	Drainage	Yes	21.70
Spread Eagle Middle	0.02	17.50	91.00	75.00	28.7082	Drainage	No	
Spread Eagle North	0.02	17.60	59.00	75.00	31.7591	Drainage	No	
Spread Eagle West	0.02	23.20	71.00	25.00	10.0376	Drainage	No	
West Bass Lake	0.08	77.40	55.00	19.00	8.0806	Drainage	Yes	47.40

*=Barrens Lake is currently undefined in the WDNR database. If future research classifies Barrens Lake as a drainage lake it does not exceed Total P, if a seepage lake it exceeds Total P by 6.40 µg/L.

Water Hardness Testing

In the 2016 season the LCD staff tested total hardness (as $CaCO_3$). This testing was conducted as an initial baseline to establish what lakes might be susceptible to infestation by zebra mussels (*Dreissena polymorpha*), rusty crayfish (*Orconectes rusticus*), or other AIS that require $CaCO_3$. Testing was conducted using Hach® Total Hardness color change test strips (Cat. 27452-50). These test strips produced a color change at 0, 25, 50, 120, 250, & 450 parts per million. While the test strips are not the most accurate method available for $CaCO^3$ testing, this method did allow for quick testing without having to send additional samples to the SLOH.

In their meta-research study, Cohen and Weinstein (2001), concluded a $CaCO_3$ amount of 20mg/L was sufficient to allow viable reproduction of zebra mussels. The field testing of lakes in Florence County indicate that all tested lakes are above this range, with Lake Anna and Porcupine Lake at the low end. Of specific interest for this testing was Sea Lion Lake. As it receives water from Keyes and Loon Lakes it was expected there would be little difference, and yet it was found to be softer, but still well within range for zebra mussels to colonize the lake.

Lake Name	Hardness (ppm)
Barrens Lake	250
Cosgrove Lake	50
Edith Lake	250
Fay Lake	250
Fisher Lake	250
Frog Lake	120
Halsey Lake	250
Keyes Lake	425
Lake Anna	25
Lake Ellwood	250
Lake Emily	250
Long Lake	250
Loon Lake	425
Montgomery Lake	250
Patten Lake	120
Porcupine Lake	25
Sand Lake	120
Sea Lion Lake	250
Spread Eagle North	425
West Bass Lake	125

Zebra mussels on the bottom of Keyes Lake, 2015

Photo: Scott W. Goodwin

Staff and Public Educational Activities

Over the course of this two year grant the Florence County Land Conservation Department was involved with environmental and invasive species educational opportunities for our staff and the public. Our staff partnered with the Wild Rivers Invasive Species Coalition, the Wisconsin Department of Natural Resources, and the private contractor Whitewater Associates on multiple projects.

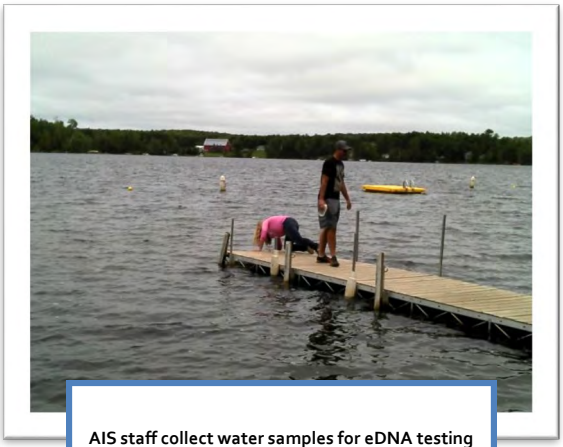
Florence County AIS, CBCW staff and volunteers in training

Photos: Scott W. Goodwin

Florence County AIS staff attended the DNR's "Gear-Up" meeting and training sessions, and Marinette County's Diver Assisted Suction Harvesting workshop. They attended multiple state AIS Coordinators meetings, participated in WRISC's Clean Boats, Clean Waters training, and attended the 2016 Upper Midwest Invasive Species Conference.

AIS Tech Bryce Crago working with DNR Fisheries Biologists

Photo: Greg Matzke



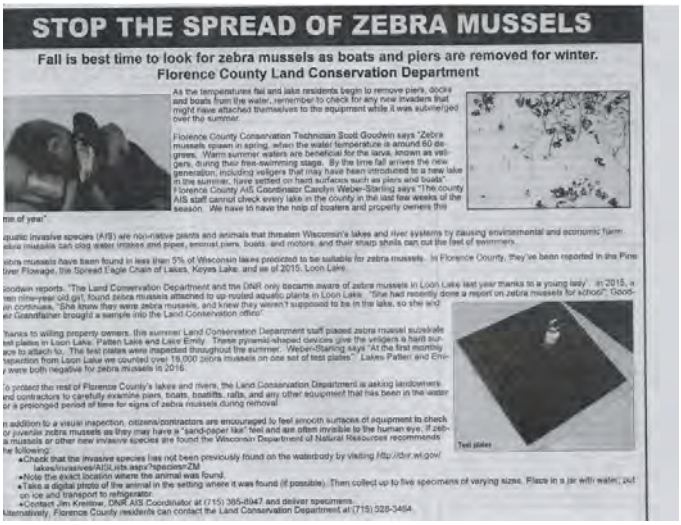
AIS staff collect water samples for eDNA testing on Keyes Lake

In 2015 and 2016 Florence County Staff and volunteers participated in the River Alliance AIS Bridge Snapshot Day. Multiple locations on Woods Creek, and the Pine, and Menomonee Rivers were examined

Two locations from AIS Bridge Snapshot Day

Photo: Scott W. Goodwin

Photo: Carolyn Weber-Starling



STOP THE SPREAD OF ZEBRA MUSSELS

Fall is best time to look for zebra mussels as boats and piers are removed for winter.

Florence County Land Conservation Department

End-of-season zebra mussel inspection newspaper educational notice. From *Florence Mining News* 9/29/2016

Our public education efforts included participating with the help of volunteers and WRISC in the Long Lake, Wisconsin and the Iron Mountain Michigan Fourth of July Parades. Staff and volunteers created floats and distributed Stop Invasive Species materials. Florence County AIS and CBCW staff participated in the 2015 and 2016 Drain Campaigns, and Fourth of July Landing Blitzes.

With thanks to WRISC and the use of their road stencils, Florence County AIS staff painted eight paved boat landings in the county with "Clean, Drain, Dry" and "Stop Invasive Species" messages. We placed AIS educational notices in the local newspaper, including a half-page article for end-of-season zebra mussel inspection of boats and equipment. In the past two years Florence County AIS staff have, through dozens of personal interactions, e-mails, and phone calls, answered hundreds of questions and addressed concerns of county residents and visitors.

Florence County AIS staff painted AIS public awareness messages at boat landings in 2016

Photo: Carolyn Weber-Starling

Truck and boat as AIS awareness float, Long Lake Fourth of July Parade, 2016.

Martha Bartels, Mary, Matt, (AIST) Shelby, & Sydnee Brunette with Benny, the Stop AIS dog, at the Long Lake Fourth of July Parade, 2016.

Florence County and WRISC staff in the 2015 Iron Mountain Fourth of July Parade .

Florence County AIS Coordinator Carolyn Weber-Starling and CBCW Watercraft Inspector Cassie Dumke ready for the 2016 Iron Mountain Fourth of July Parade .

Budget & Finance

A full accounting of all expenses for this project will be provided to the Wisconsin Department of Natural Resources as a part of the grant reimbursement process. This is scheduled to be complete by February 28, 2017. The totals provided in this report are for a general understanding of the program and do not represent the full and final accounting of the AEPP-451-15 project. Parties interested in the final financial information may contact the Florence County Land Conservation Department.

The grant amount was $38,144.90, with a cost share match requirement of $13,198.13

The 2015 reimbursement request and documentation was developed for submission to the WDNR by Margie Yadro and Scott Goodwin. At the end of the 2015 season the project had a remaining cash balance of $20,183.14 and a cost share requirement totaling $7,110.10.

The wages and benefits for the 2016 season were less than initially expected due to staffing changes. Conservation Technician Goodwin stopped being paid from the AEPP-451-15 grant in mid-June, 2016. His subsequent work was treated as cost-share match.

2015	Amount	2016	Amount
Wages & Benefits	$15,818.64	Wages & Benefits	$10,429.67
Equipment	$1,974.22	Equipment	$6,854.47
Travel	$1,128.60	Travel	$1,265.51
Misc. Expenses	$266.40	Misc. Expenses	$925.48

Eurasian/northern water-milfoil hybrid, Barrens Lake, 2015.

Plans for Future Work

The LCD will continue to work on reducing the spread of AIS. We will be looking to the DNR for funding to continue the work started under this project, but will also be looking for additional resources. If funding is not available we will continue to work on AIS issues for the county on a smaller scale than this grant allowed for. We will also be working with WRISC, our partner CISMA, and with the various lake associations in the county to continue the work started under this grant.

In 2017 there will be a new LCD-managed Clean Boats, Clean Waters program in Florence County covering seven landings for at least 1,200 hours of watercraft inspections. This will include the six busiest landings in the county, plus a new landing on the Menominee River that opened in late 2016.

Water Chemistry Testing: The Land Conservation Department has applied for a grant from Lumberjack R.C. & D. to purchase a spectrophotometer. If approved, this device, along with other equipment, will allow the LCD to conduct detailed water chemistry testing. We are not attempting to establish a state-certified laboratory with this testing. As required by the DNR protocols, we will continue to send water samples to the State Lab of Hygiene for Total Phosphorus testing, and any testing that has potential legal ramifications will be sent to the SLOH. However, this "in-house" testing will help with our understanding of the health of Florence County waters. It will allow us to test at a range and volume the department could never afford to process through the State Lab.

WRISC Partnership: The Florence County Land Conservation Department will continue its strong partnership with the Wild Rivers Invasive Species Coalition. Conservation Technician Goodwin will continue to serve on the WRISC Board, and anticipates standing for re-election to this position when his current term is up. In January 2017 WRISC applied for a Great Lakes Restoration Initiative Environmental Protection Agency grant. If this grant is approved for funding this grant could allow WRISC to construct and operate a versatile Diver Assisted Suction Harvesting vessel in the five county area they serve. If this vDASH system is constructed the LCD will work with WRISC and the DNR to utilize the vessel effectively in Florence County.

Barrens Lake: Barrens Lake will be monitored for changes in the non-native milfoil, and the introduction of new invasive species. This lake may make a suitable test lake for WRISC's possible vDASH system. If this project develops the LCD will work closely with the DNR and WRISC moving forward.

Cosgrove Lake: We will continue working with WRISC on non-native Phragmites eradication work on Cosgrove Lake. Inspections will be made of the neighboring ponds to ensure the plant is not spreading. If found, it will be treated pending land-owner permission and permitting from the DNR.

Fay Lake: In 2017 LCD staff will assess Fay Lake for the possible reed canary grass (*Phalaris arundinacea*) that CT Goodwin speculated might be present. This assessment will be scheduled for when the water level is high, and the staff will be prepared to pole the boat through the extensive vegetation that restricted access in 2016.

Lake Ellwood: Monitoring of the EWM in this lake will continue. The Lake Ellwood Association has contracted AIS control work for this lake. It is assumed this work will continue based on funding, and the LCD will be available to assist the Lake Ellwood Association as needed.

Keyes, Loon, Grass & Sea Lion Lakes:

Keyes Lake: Volunteer hand-pulling of the EWM will continue in 2017. However, if this method is found to be of limited use in controlling the plant the Land Conservation Department will contact the Keyes Lake Association to assist the association in applying for a DNR AIS Established Population Control grant to hire a contractor for control work. It is possible that the potential WRISC vDASH vessel, if constructed, could be used on this lake for control before the plant spreads.

Loon Lake: With the discovery of zebra mussels in Loon Lake we will continue to monitor the lake in the 2017 season with substrate test plates. In addition, the LCD will work with WRISC to remove the European marsh thistle (*Cirsium palistre*) found at the south end of Loon Lake.

Image from Google Earth

Grass Lake: The LCD will attempt to access and assess Grass Lake. This lake is part Keyes, Loon, Sea Lion Lakes chain, but it was not included for any work under this grant due to its size and limited access. The lake is small, shallow, and has no public access. Property owner clearance will have to be secured to access the lake. Additionally, If entry can be made, the wetland channels connecting these lakes will also be inspected.

Sea Lion: We will monitor Sea Lion Lake closely in the future for signs the zebra mussels are spreading into the lake via the outflow from Loon Lake. Unfortunately, it is anticipated this will happen at some point. One potential method of stopping this might be to place a semi-permeable barrier at the culvert on the outflow from Loon Lake to Sea Lion Lake. This could be investigated at as a possibility. Numerous questions would need to be answered, foremost being, will the DNR agree to this? What is the flow rate of the culvert? What micron-size mesh will be capable of catching all veligers? How much water would a semi-permeable barrier impound? What is the potential for flooding near-by property? How often would the

barrier need to be cleaned, maintained, and/or replaced? What would the estimated cost be? Would it be effective in the long-term? What is the funding source?

While LCD staff will try to answer these questions, it is possible by the time enough is known to seek a funding source zebra mussels will already be in Sea Lion Lake.

Long Lake: The LCD will work with WRISC and the Lake Association of Long Lake to remove the regrowth of purple loosestrife documented in the 2016 survey. It is possible WRISC may need plants for biologic control rearing. If not, the LCD will assist the Lake Association in removal.

Montgomery Lake: Much of the purple loosestrife that was found on this lake was removed by WRISC staff late in the 2016 season. It is expected there will be more found in 2017. As with Long Lake, the purple loosestrife at this site may prove to be needed by WRISC for beetle rearing. We will work with WRISC to remove any new plants.

Spread Eagle Chain of Lakes: The Land Conservation Department will continue to work with SECOLA on their efforts to combat AIS in the chain. The department will be operating a CBCW boatwash at North Lake for a third season, and as with 2015-16, this location will be staffed full-time, seven days a week. We can do this thanks to the on-going financial support from SECOLA. This support also allows the LCD to staff other landings in the county through the DNR's CBCW program that would not be possible with the match requirements for the DNR's grant.

County Wide: The Land Conservation Department will continue to educate the public and local government officials about the problem of invasive species. Department staff continue to monitor the spread of new invasives as they move closer to the county, and be efforts will be made to prepare for new introductions, and to respond in a timely manner if and when these are found.

Purple Loosestrife on the north shore of Long Lake, 2016.

Photo: Scott W. Goodwin

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Personal Communications

Anderson, Cary (FCLARA) September, 2016
Anderson, Emily (WRISC) December, 2015
Kronlein, M. (MSU) August 24, 2015
Nault, Michelle (WI DNR) August 8, 2016
Weber, Jay (SECOLA) May, 2016