Assessing Floating Bog Interceptors (FBIs) in Cherokee Marsh as Potential Fish Habitat Structures

Prepared by

Pete Jopke, Dane County Land and Water Resource Department

And

Dave Marshall, Underwater Habitat Investigations LLC

December 2016

Summary

Floating Bog Interceptors or FBIs are wooden structures designed to weaken erosive wave and ice action, expand emergent marsh vegetation and improve water quality by increasing sedimentation and accretion behind the structures and provide ecosystem services.

 Located in Cherokee Lake , (Map 1.) the University of Wisconsin has been studying the potential impacts of these structures since 2012 under the direction of Professor Chin Wu of the Biological Systems Engineering Department. Initial findings provided by Professor Wu has shown positive results as increases in vegetation and sedimentation have been documented. Anecdotal information on ecosystem services also indicates the FBIs provide added habitat for reptiles, amphibians and avian species. Could the FBIs also provide a critical habitat niche for various fish species?

The Dane County Land and Water Resources Department submitted for and received a Wisconsin DNR small scale lake planning grant to conduct sampling of the FBIs and a control site. For this study, FBIs were sampled during three periods in 2016 to determine if the structures attract or support fish populations, and if so what species. Control sites were also established on the opposite shore from the FBIs. The control site had similar characteristics(bottom substrate, depth, shoreline, aquatic macrophytes, etc.) as that of the study site. Fish populations were sampled in May, July and September using mini fyke nets and in May and July using baited minnow traps. A mini boom shocker survey was completed on August 15th after sunset. The results demonstrated no statistically significant differences between the FBI sites and control sites, suggesting other factors likely had greater influence on distribution of fish populations. Seasonality was one factor after spawning and recruitment of mainly y.o.y bluegills that resulted in much higher numbers of fish collected in both FBI and control sites. Significantly greater numbers of fish were collected in July and September compared with May, prior to Centrarchid spawning. The habitat also changed as the summer progressed. Beds of American lotus greatly expanded along with submersed aquatic plants including coontail, long leaf pondweed and Sago pondweed. Perhaps a more significant finding of the project was the aquatic plant beds that thrived across the lake and likely reflected ongoing common carp removal efforts. Since 2013, over 240,000 pounds of carp have been commercially fished from Cherokee Lake.   The dense aquatic plant beds coupled with significant recruitment of common carp egg eaters, such as bluegills, may represent a positive environmental trend for the marsh.
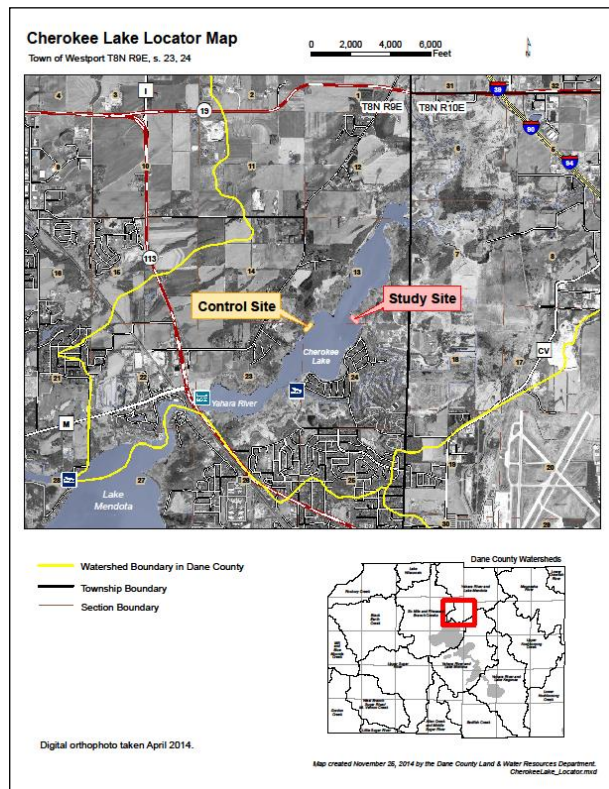
Map 1. Project Locator Map

Introduction

Lake assessment projects typically focus on traditional eutrophication indicators (water clarity, phosphorus, and chlorophyll), aquatic vegetation diversity and abundance, and game fish inventories. Other important ecological indicators, including nearshore fish, are often overlooked in lake evaluations. Nearshore fish populations have been described as "canaries in the coal mine" but are not routinely surveyed since they offer no perceived or direct economic benefit associated with sport fish populations. These sensitive fish populations provide important ecological linkages that may reveal lake-ecosystem stresses even before traditional parameters reveal water quality problems.

Wooden posts installed around planting boxes in fall of 2008 to prevent ice jam damage to the FBIs

Periodic inventories of nearshore fish are needed to determine species diversity, individual population status, and overall ecosystem health. Nearshore fish populations are represented by a diversity of species, including State Endangered, State Threatened, State Special Concern and other environmentally intolerant groups. These surveys, the long term trends, and data on habitat provide important information regarding the status of the fish population and how their required habitat conditions may be changing over time. The insertion of the FBIs may be providing critical habitat for these species and could show they are a valuable asset to not only water quality but certain fish species as well. Besides the problem of the continuing loss of the Cherokee Marsh wetlands, the open-water portion of the Yahara River estuary itself has a severely degraded ecological value.
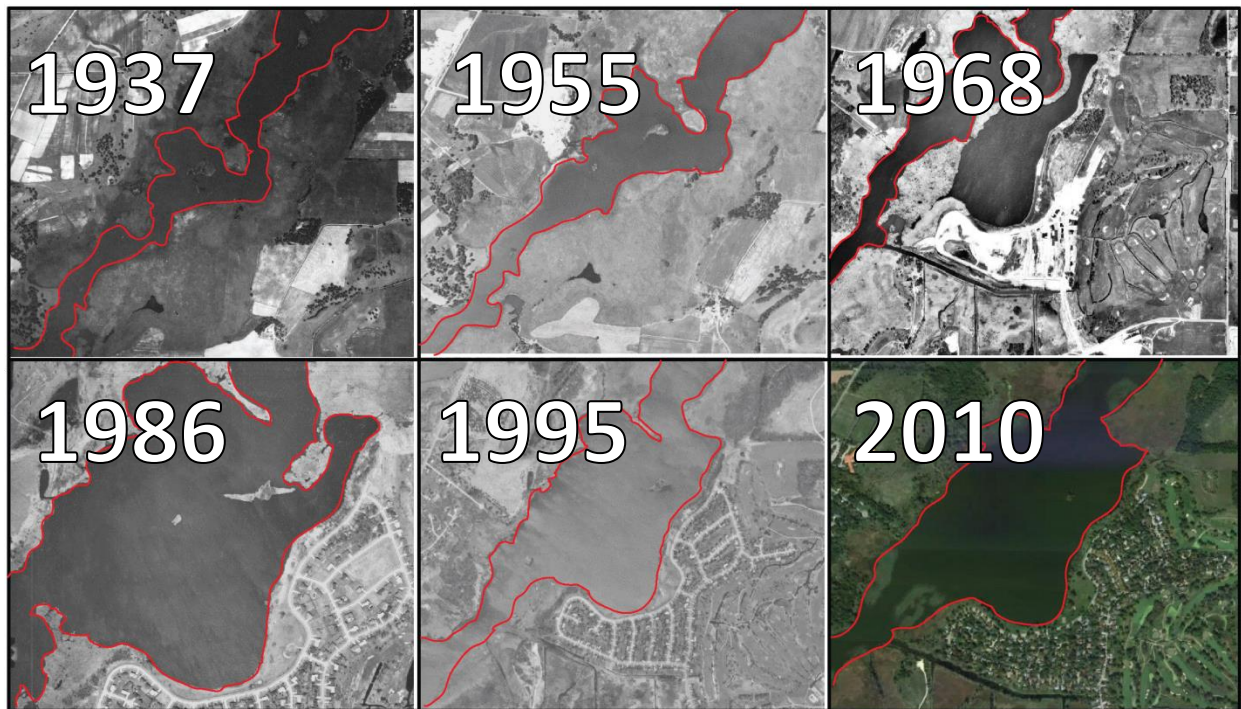
Time series photos showing decrease of Cherokee Marsh 1937-2010. 640 acres or 1 square mile has been lost since 1850's

Large American Louts beds dominate Cherokee Lake. While providing a limited amount of habitat, it serves to shade out other aquatic macrophytes.

The large shallow water body is mostly a bare mud bottom with limited submersed aquatic plants (macrophytes) to support a vibrant fishery, which currently is almost nonexistent. Large aeraila extent of Lotus beds are spread throughout Cherokee Lake.

There has been millions of dollars spent on reducing pollutants (sediment/phosphorus) entering the Yahara Chain of Lakes. Multiple partnerships including local, state, federal and private entities have emerged. Most of the monitoring has focused on water chemistry over the last 10 years. While small in scale, this project was designed to enable resource managers to determine whether FBIs serve additional purposes. By looking at the fish community investigators can also detail an understudied potential benefit that may assist managers in their ongoing efforts to improve the Yahara Chain of Lakes.

Methods

Three sampling gears were used to assess fish. These included mini fyke nets, baited minnow traps and a mini boomshocker. (See Map 2) Mini-fyke nets were deployed during three sampling periods in May, July and September. Nets were set perpendicular to shorelines and spaced equidistant amongst FBIs and at the control site.
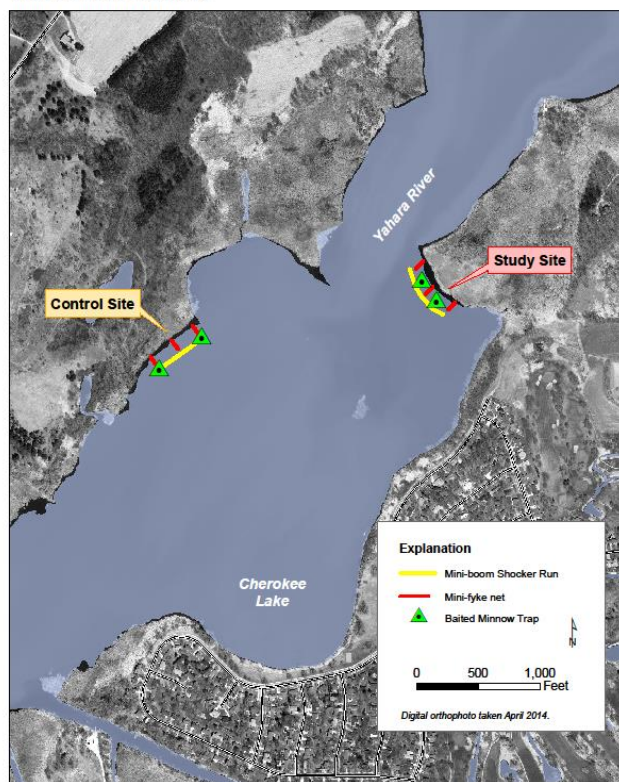
Map 2. Sampling locations and gear types used for fishery assessment

Nets were retrieved and reset for 2-3 24 hour periods. Three fyke nets were set between different FBIs and three control nets were set across the marsh on the west shore. Leads were anchored at the shoreline with 5/8" rebar and the pots secured with an anchor and float.

Baited minnow traps were set within the FBI

Mini Fyke net located in the control site.

structures and near fyke nets at the control sites.

Pete Jopke, Water Resources Planner with Dane Dane County LWRD checking minnow traps.

Traps were baited with dog food and weighted. On the structures themselves, traps were secured to the wooden posts while on the control site, they were tied to the float. Water quality sampling at initial deployment periods included water temperature and dissolved oxygen using a YSI ODO meter. Specific conductance and pH were measured with a YSI Model 63 meter. Water clarity was measured using a standard secchi disc. An additional fish population survey was conducted on August 15th using a mini boomshocker to sample fish populations at night near the FBI and Control shorelines. FBI and Control transects were electroshocked for seven minutes each.

Results

A total of eighteen native fish species was collected during the surveys along with nonnative common carp (Table 1). Eighteen fish species were collected in the fyke nets including common carp. The mini boom shocking run captured sheepshead for a total of 19 species collected as part of the study using all three sampling methods. The most interesting species found during the study included bowfin, tadpole madtom and mottled sculpin. The latter species was unexpected given its affinity to cool clear waters and may have been sustained near some of the springs that are known to occur in the marsh. The single specimen was collected in one of the FBI fyke nets. Eight environmentally tolerant species were collected; two intolerant species, and nine medium tolerant species.

Fyke nets averaged 3.8 native species and 133.7 individuals at FBI sites (N = 16) compared with 3.1 native species and 108.4 individual fish at control sites (N=14). While the fyke net totals were slightly higher at FBI sites, the results (Figure 1) were not statistically significant based on paired t-tests (P = 0.16 species and P = 0.57). A more significant finding was the general increase in Centrarchids that followed

spawning, recruitment. Numbers of fish increased by large margins when comparing May to July and September (Figure 2). The increase in fish numbers also coincided with significant expansions of floating leaf plants (mostly American lotus) and submersed plants including coontail (*Ceratophyllum demersum*), Sago pondweed (*Potamogeton pectinatus*) and longleaf pondweed (*Potamogeton nodosus*). Both adult and juvenile common carp were caught in the nets by represented less than 11% of the total numbers of fish collected (Figure 3). Many more juvenile bluegills were caught than reported as numbers were truncated at 300 per net. The high numbers of bluegills indicated significant recruitment in the marsh that appeared to support more aquatic plants than in the past.

Over 300+ bluegills from one mini fyke collected in September 2016

5

A male Amia calva, Bowfin captured in May 2016 as noted by the round spot on the tail. Note the elongated dorsal fin.

The baited minnow traps had limited efficacy with the exception of just a few dates and sites, each capturing primarily juvenile bluegills following the spring spawning period. All fish collected in the traps consisted of bluegills, green sunfish or largemouth bass (Figure 4). The mini Boomshocking surveys revealed some differences in fish populations between the FBI and Control shorelines. Centrarchids were more numerous along the FBI shoreline (Figure 5). In general, the baited minnow trap and boomshocking data supplemented the fyke netting data but were overall less revealing than the fyke netting results.

Table 1: Fish Species and Numbers Collected using Mini Fyke Nets, Minnow Traps and Boomshocking

Common Name	Scientific Name	Number (all gear)	*Tolerance
Bowfin	*Amia calva*	2	Medium
Northern pike	*Esox lucius*	1	Medium
Common carp	*Cyprinus carpio*	208	Tolerant
Golden shiner	*Notemigonus crysoleucas*	33	Tolerant
Fathead minnow	*Pimephales promelas*	30	Tolerant
Bluntnose minnow	*Pimephales notatus*	3	Tolerant
Yellow bullhead	*Ameiurus natalis*	13	Tolerant
Black bullhead	*Ameiurus melas*	18	Tolerant
Tadpole madtom	*Notorus gyrinus*	2	Medium
Bluegill	*Lepomis macrochirus*	>3270	Medium
Green sunfish	*Lepomis cyanellus*	124	Tolerant
Black crappie	*Pomoxis nigromaculatus*	227	Medium
Largemouth bass	*Micropterus salmoides*	40	Medium
Smallmouth bass	*Micropterus dolomieu*	12	Intolerant
Yellow perch	*Perca flavescens*	4	Medium
Walleye	*Stizostedion vitreum*	1	Medium
White bass	*Morone chrysops*	7	N.A.
Sheepshead	*Aplodinotus grunniens*	6	Medium
Mottled sculpin	*Cottus bairdi*	1	Intolerant

*Adopted from Lyons 2012

Figure 1: Mini Fyke Netting Results

Fyke Netting: Mean Native Species and Numbers at FBI and Control Sites
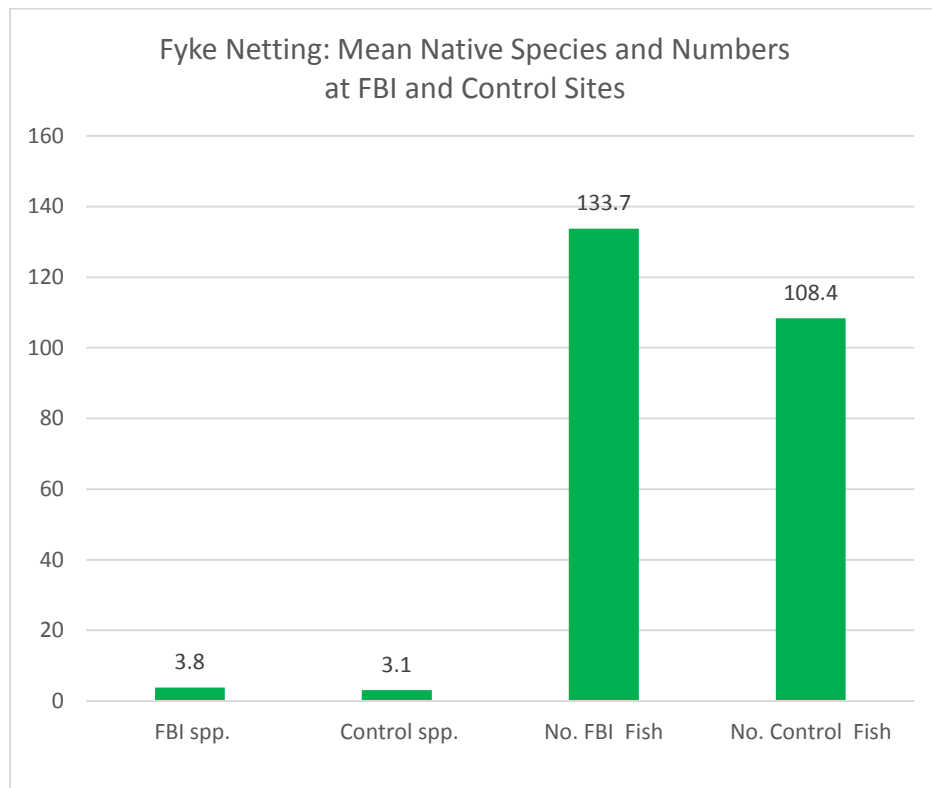
Figure 2: Seasonal Influence on Fyke Netting Efficiency

Seasonal Influence on Fyke Netting
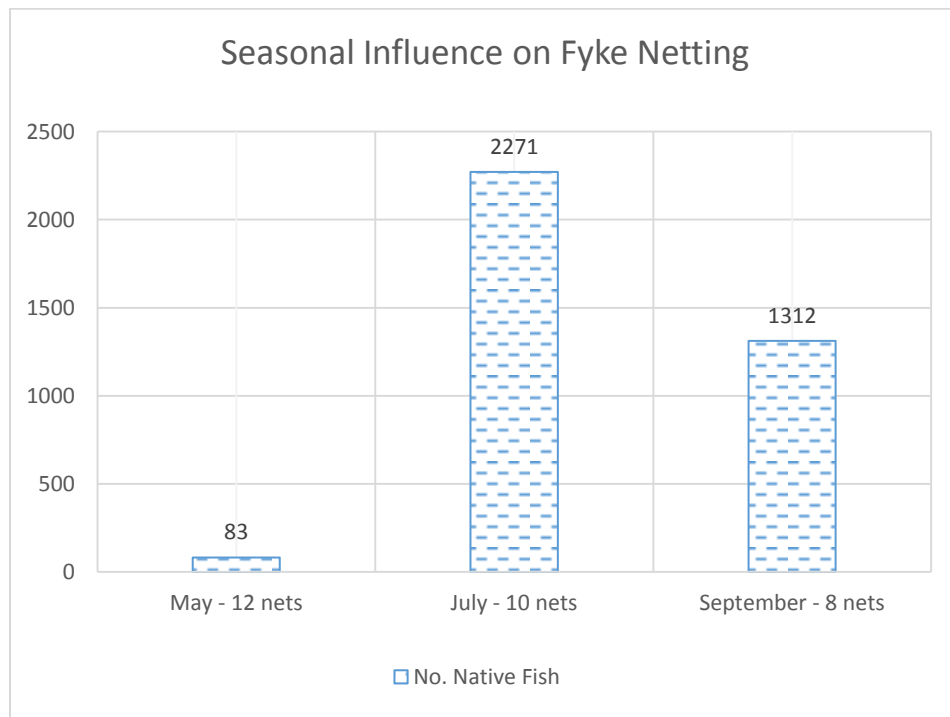
Figure 3: Native Fish Collected Compared with Common Carp

Fyke Netting: Native Fish and Common Carp

Native Fish: 1833

Common carp: 208
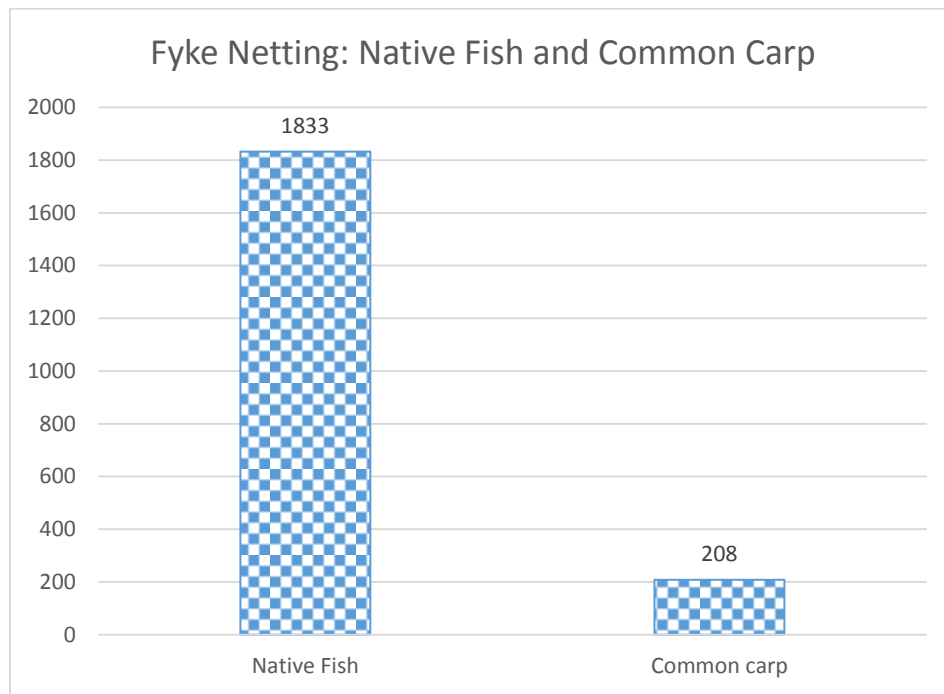
Figure 4: Baited Minnow Trap Results

Baited Minnow Trap Results

Bluegill — FBI (N = 12): 32, Control (N=7): 17

Green sunfish — FBI (N = 12): 1, Control (N=7): 2

Largemouth bass — Control (N=7): 2

Legend: FBI (N = 12), Control (N=7)

Figure 5: Mini Boomshocking Survey Results

Boomshocking Data

Conclusion

The results of the FBI fish habitat evaluation did not demonstrate a significant increase in fish numbers and species richness compared with the Control shoreline. The structures likely provide some habitat but this is likely minor compared with the floating leaf and submersed aquatic plant communities that no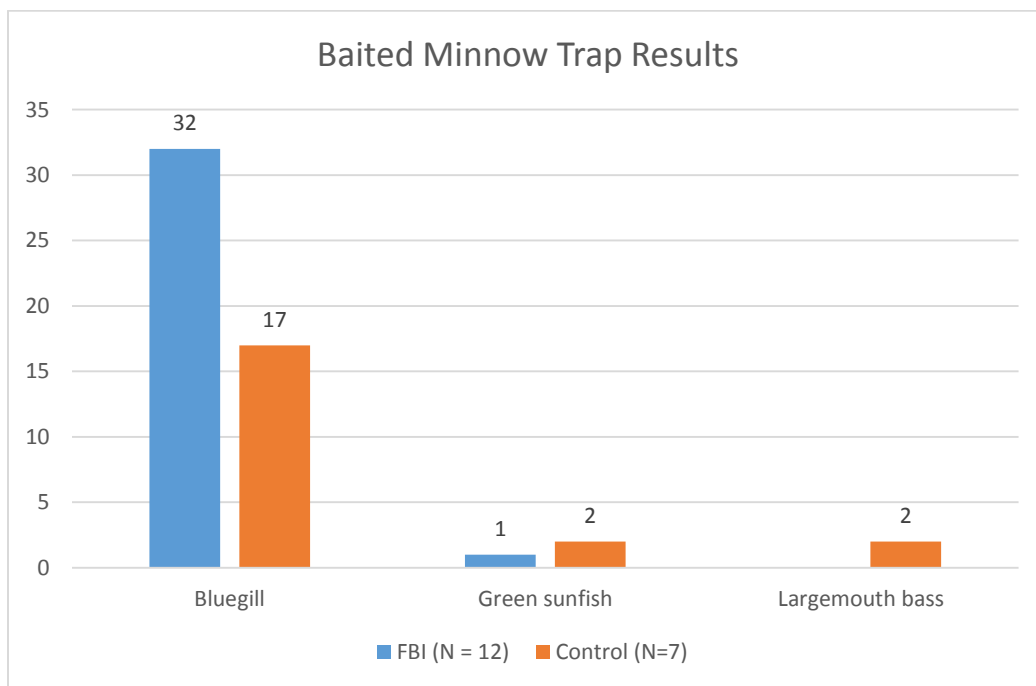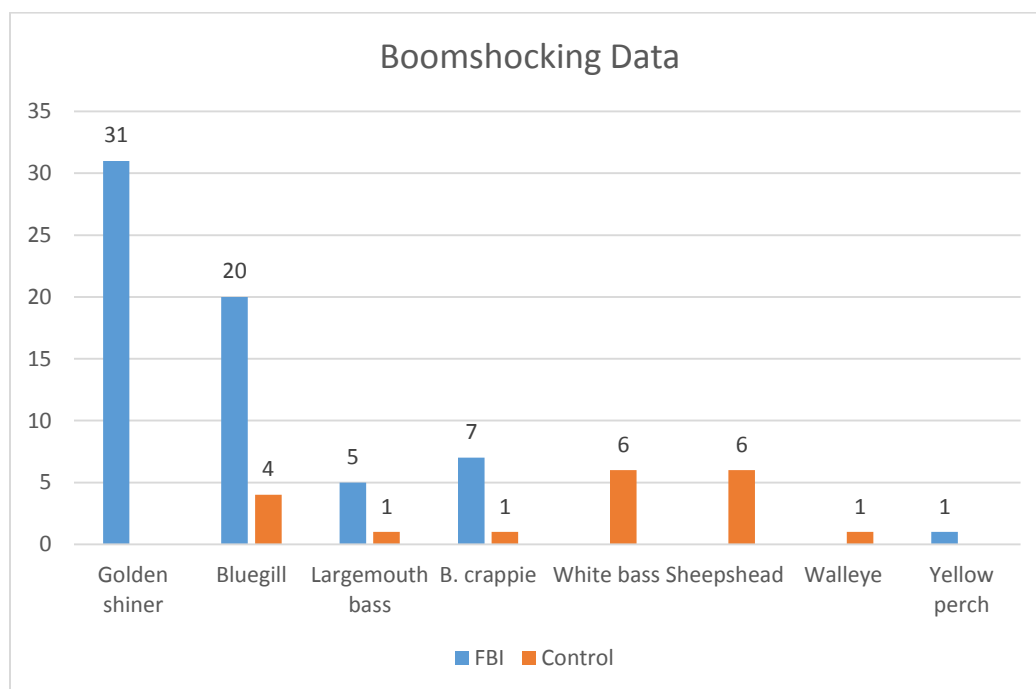w are expanding in the lake. The expansive American lotus beds in the marsh have potential for growing season wave suppression but could suppress submersed aquatic plants the are beneficial. While point intercept macrophytes data is not available for the marsh, our observations suggest an apparent increase in submersed aquatic plant beds in areas where American lotus beds are absent. Increased macrophytes may reflect increased reduced wave suppression and ongoing common carp removal efforts which should still remain a priority for resource managers. The high abundance of juvenile bluegills and other Centrarchids suggestion potential for suppressing common carp recruitment. However, the presence of juvenile common carp in a few of the fyke nets indicates that recruitment is still a factor. Expanding the FBIs and or investigating large scale wave suppression with constructed islands would benefit both the flora and fauna of Cherokee Lake.

References

Lyons, J. 2012. Development and validation of two fish-based indices of biotic integrity for assessing perennial cool water streams in Wisconsin, USA. Ecological Indicators 23:402-412.

Fyke Netting Data (Sites 1-3 = FBI, Sites 4-6=Control)

5/24/2016	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Bowfin						
Northern pike						
Common carp					1	
Golden shiner						
Fathead minnow	1	1			1	
Bluntnose minnow						
Yellow bullhead	1	1			3	
Black bullhead						
Tadpole madtom		1				
Bluegill		2			8	
Green sunfish		2				
Black crappie						
Largemouth bass						
Smallmouth bass						
White bass						
Yellow perch						
Walleye						
Mottled sculpin						
Total Numbers	2	7	0	0	12	0
Total Species	2	5	0	0	3	0

Notes: All mini fyke nets were fished a minimum of 2 days. In some instances where specific nets were not fished, investigators may have been limited by high water.

5/25/2016	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Bowfin						1
Northern pike						
Common carp					3	1
Golden shiner			1			
Fathead minnow				3	1	1
Bluntnose minnow						
Yellow bullhead		1	3			2
Black bullhead						
Tadpole madtom				1		
Bluegill	2		14	5	1	1
Green sunfish	3	1	3	5		2
Black crappie						
Largemouth bass						
Smallmouth bass						
White bass						
Yellow perch						
Walleye						
Mottled sculpin			1			
Total Numbers	5	2	22	14	2	7
Total Species	2	2	5	4	2	5

7/26/2016	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Bowfin						
Northern pike			1			
Common carp		21	31	2		4
Golden shiner						
Fathead minnow				10	13	
Bluntnose minnow					2	1
Yellow bullhead			1	1		
Black bullhead	1	4	2	2	2	
Tadpole madtom						
Bluegill	**300**	**300**	**300**	**300**	268	40
Green sunfish	31	17	14	1		
Black crappie	45	18	4	97	4	6
Largemouth bass	12	5				1
Smallmouth bass	1			2	4	
White bass						
Yellow perch	1					
Walleye						
Mottled sculpin						
Total Numbers	391	344	322	413	293	48
Total Species	7	6	6	7	6	4

7/27/2016	Site 1	Site 2	Site 3	Site 4
Bowfin				
Northern pike				
Common carp	68	42	35	
Golden shiner				
Fathead minnow				
Bluntnose minnow				
Yellow bullhead				
Black bullhead		6	1	
Tadpole madtom				
Bluegill	118	39	156	245
Green sunfish	10	14	6	1
Black crappie	7		13	5
Largemouth bass	7		1	
Smallmouth bass	2	1		2
White bass				
Yellow perch	1			
Walleye				1
Mottled sculpin				
Total Numbers	145	60	177	254
Total Species	7	4	5	4

9/21/2016	Site 1	Site 2	Site 4	Site 5
Bowfin			1	
Northern pike				
Common carp				
Golden shiner				
Fathead minnow				
Bluntnose minnow				
Yellow bullhead				
Black bullhead				
Tadpole madtom				
Bluegill	**300**	41		154
Green sunfish	1	1		
Black crappie	2			5
Largemouth bass				2
Smallmouth bass				
White bass				
Yellow perch	1			
Walleye				
Mottled sculpin				
Total Numbers	304	42	1	161
Total Species	4	2	1	3

Water Chemistry Data Summary

	FBI	Control
Temp. C	19.9-25	21.2-26.6
D.O. mg/l	4.9-16.7	12.8-20.1
pH	7.2-7.8	8.1-8.35
Sp. Cond. uS/cm	547-600	518-600
Secchi ft.	0.8-3.5	1.1-2.5

9/22/2016	Site 1	Site 2	Site 4	Site 5
Bowfin				
Northern pike				
Common carp				
Golden shiner	1			
Fathead minnow				
Bluntnose minnow				
Yellow bullhead				
Black bullhead				
Tadpole madtom				
Bluegill	**300**	1	2	**300**
Green sunfish	6			3
Black crappie	6			7
Largemouth bass	2			1
Smallmouth bass				
White bass	1			
Yellow perch				
Walleye				
Mottled sculpin				
Total Numbers	315	1	2	311
Total Species	6	1	1	4