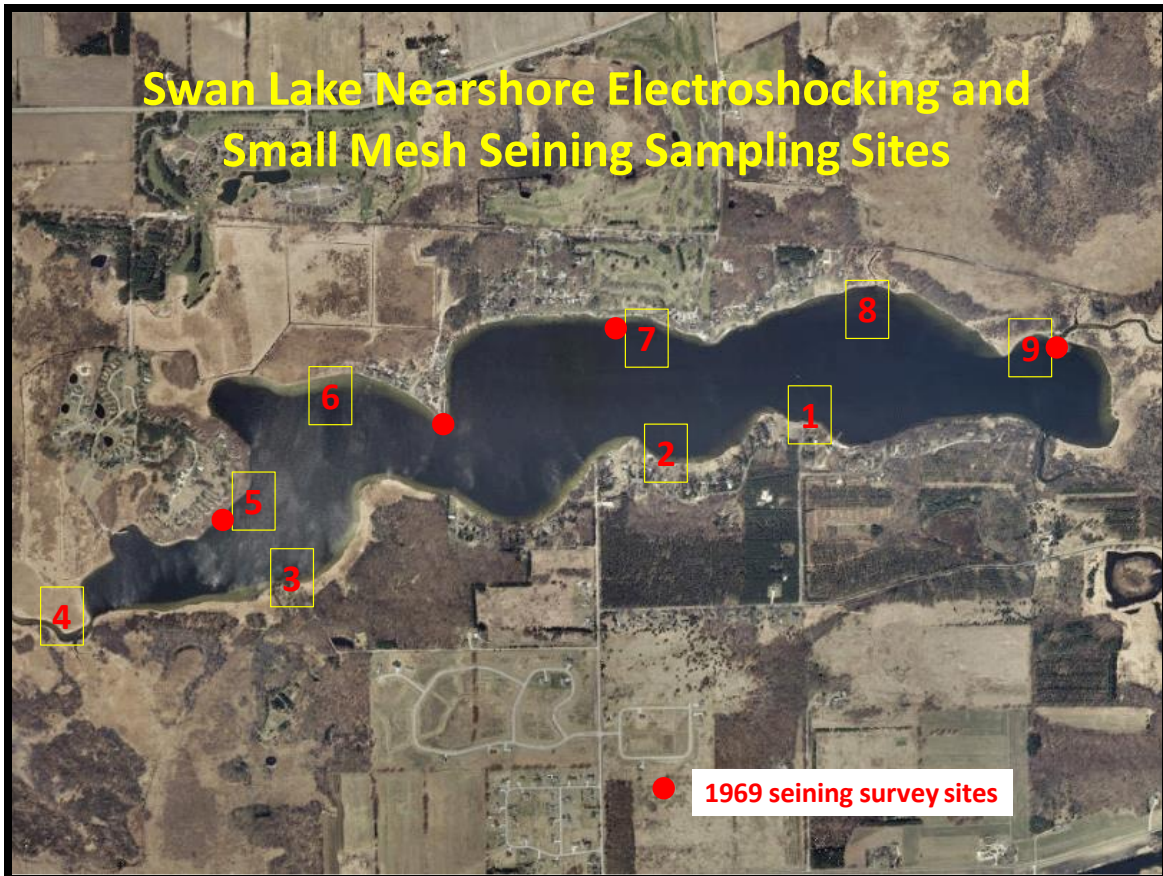


# Fishes of Swan Lake



Columbia County Land and Water Conservation Department

Prepared by

David W. Marshall, Underwater Habitat Investigations LLC

Tim R. Larson, Fisheries Biologist

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## Summary

Limnologists typically focus on traditional trophic status indicators (i.e., TSI secchi water clarity, TSI phosphorus and TSI chlorophyll), macrophyte surveys, plankton analysis, and sportfish inventories when assessing the environmental conditions in lakes. Important ecosystem indicators such as nearshore and nongame fish diversity are often overlooked. Some nearshore fish species are very sensitive to environmental degradation, and have been described as “canaries in the coal mine.” These fish provide important food chain linkages and population declines can reveal ecosystem stresses that traditional lake monitoring will overlook. Nongame fish species are rarely surveyed since they offer no perceived economic benefit compared to more familiar gamefish populations. Nearshore fish surveys are also useful since immature stages of more popular sportfish are also collected and yield information on recruitment.

Periodic inventories of these biological indicators are useful in assessing individual population status, community diversity, and overall ecosystem stability. The survey conducted 2015 represents the first comprehensive nearshore inventory of nongame fish species and associated immature sportfish in Swan Lake. The map on the cover page identifies nine nearshore seine and towed electroshocking sites while the four red circles represent a less intensive seining survey that was completed in 1969. Three of the survey sites were sampled in both 2015 and 1969 and are useful for temporal comparisons. Wisconsin DNR had also conducted numerous fish population surveys on Swan Lake, but these surveys focused on sportfish using either boomshockers or fyke nets that were designed to sample larger bodied fish. Results of these surveys revealed several large bodied fish species that were not collected as part of the 2015 nearshore surveys.

Twenty-one species of fish were collected in 2015 using both small mesh seine and towed DC electroshocking gear at the nine sites, including six species that had not been previously reported. WDNR had also reported twenty-one fish species but these are based on 14 separate boomshocking and fyke netting surveys conducted from 1957 through 2013. Twelve species were identified in 1969 as part of a UW Stevens Point seining survey of nearshore species at four sites. The State Special Concern banded killifish was collected at two of four sites in 1969

but none were found at the nine sites sampled with greater effort in 2015. This species has been declining across its range, including losses in many Wisconsin lakes and streams. Future nearshore fish surveys are warranted to better assess the status of the banded killifish in Swan Lake and to assess potential trends in nearshore fish populations. Collectively, surveys conducted since 1957 revealed 34 fish species in Swan Lake.

### **Methods**

The 2015 survey was specifically designed to sample nearshore nongame fishes and juvenile gamefish. It was not designed as a tool for evaluating the growth rates and size distributions of gamefish populations that require boomshocking and fyke netting gear. Instead, a towed DC electro-shocker barge and a 20' small mesh seine were used as part of the 2015 nearshore survey to sample nine sites (cover map). Latitude and longitude locations were recorded at the start and end of each electroshocking sites. Electroshocking distances at each site were approximately 100 yards long that was determined with the trip odometer function of a handheld Garmin GPSmap 76. Seine hauls, perpendicular to shore, were completed at the start point of each electroshocking site (except Site 5 that was too deep for seining). Small mesh (1/8 inch) seining was designed to sample fish populations in slightly deeper water (up to waist deep) than the shoreline electroshocking zone. The combination of gear types was chosen to more effectively sample the different niches, behaviors and habitat preferences of diverse fish populations. Nearshore electrofishing is more effective at sampling of fish species from habitats such as boulders, woody debris and artificial structures.

General habitat features were noted for each site. The primary habitat features were summarized as rock, submersed aquatic plants, emergent aquatic plants and woody debris. Dissolved oxygen and temperature were measured at each site using a YSI ODO meter. Specific conductance was measured with an Extech ExStik II. The WDNR Fish Mapping Application (2015) was used to access the historic Swan Lake fish database for comparisons with the 2015 nearshore survey.

## Results

Tables 1 and 2 display the species collected in 2015 and are separated for towed electroshocking and small mesh seining. Twenty species were collected with the towed DC electroshocker and eleven species using the small mesh seine. The brook silverside was the only species collected using the seine and not the electroshocker. Several areas of the lake lacked habitat beyond the nearshore zone, best characterized as shallow marl flats lacking aquatic plants. At Site 7 for instance, the first seine haul took place in an area lacking aquatic plants and no fish were found. A second haul a short distance away targeted a native aquatic plant bed and numerous fish were caught.

Table 1: Swan Lake Fish Collected with DC Towed Electroshocking Barge

Site	1	2	3	4	5	6	7	8	9
Longnose gar		1							
Central mudminnow	1			22		2		5	
Common carp									1
Fathead minnow									1
Bluntnose minnow	4		14				12	2	
Spotfin shiner							1		
White sucker				2					
Black bullhead	2								
Yellow bullhead	7						1		
Tadpole madtom				1					
Brook stickleback				2					
Blackstripe topminnow									3
Brook silverside									
Bluegill	3		2	1		5	2	9	
Green sunfish	57	29	23	1	30	2	10		
Hybrid sunfish	1		1						
Rock bass							1		
Largemouth bass	34	17	9	7		66	15	19	25
Yellow perch				2				1	
Johnny darter	3	1	2		3		4		
Iowa darter	1					4			2
Logperch					7		2		

Table 2: Swan Lake Fish Collected with 20' small mesh seine

Site	1	2	3	4	6	7	8	9
Longnose gar								
Central mudminnow								
Common carp								
Fathead minnow								
Bluntnose minnow						2		
Spotfin shiner						14		
White sucker								
Black bullhead								
Yellow bullhead								
Tadpole madtom								
Brook stickleback	1							
Blackstripe topminnow								
Brook silverside	1					2		
Bluegill	4					2		1
Green sunfish								
Hybrid sunfish								
Rock bass								
Largemouth bass	7	9			1	45	9	45
Yellow perch			4					
Johnny darter	7	9	1					
Iowa darter		8		1			3	
Logperch		33	3					

Juvenile largemouth bass were the most abundant fish collected and were found at every site. Green sunfish was the second most abundant fish in 2015 and was often found along rocky shorelines. We collected the Iowa darter, fathead minnow, bluntnose minnow, Johnny darter, tadpole madtom and Iowa darter in 2015 but none of these species had not been reported in earlier fish surveys based on accepted species listed in the WDNR Fish Mapping Application database for Swan Lake. The Iowa darter is classified as environmentally sensitive and can be vulnerable to environmental changes.

In general, favorable environmental conditions were found around the lake with clear water

and numerous species of desirable native aquatic plants. However, we collected few fish where plants were scarce,. We also observed a stand of nonnative Eurasian watermilfoil near the outlet. Specific conductance levels averaged 443 uS/cm (range 438 – 448). Dissolved oxygen levels averaged 9.5 mg/l (range 7.8 – 13.2).

### **Discussion**

Based on the new species documented as part of this project, Swan Lake supports 34 fish species. Table 3 contains the updated Swan Lake fish species list along with the environmental indicator category; I = Intolerant to environmental degradation, M = Medium tolerance to environmental degradation and T = Tolerant of environmental degradation. Four species in the list are Intolerant, 17 species have Medium tolerance to degradation, 8 species are Tolerant of environmental degradation and others have not been assigned a tolerance category. The banded killifish is the only rare species listed as State Special Concern. It was only collected during the 1969 nearshore seining survey and its current status in Swan Lake is unknown. The banded killifish is one of the “canaries in the coalmine” fish that has declined across its range (Gaumitz 2005, Lyons et al. 2000). The banded killifish has a strong affinity for aquatic plants and its decline often coincides with other environmentally sensitive nearshore species in Wisconsin due to loss of habitat, including aquatic vegetation, and/or water quality degradation (Marshall and Lyons 2008). In Swan Lake, areas devoid of aquatic plants held few fish. While reason or reasons for the areas devoid of aquatic plants are unknown, (Asplund and Cook 1997) documented impacts of motorboats on submerged aquatic plant communities in two marl lakes in southern Wisconsin.

Table 4 compares species found as part of the 1969 UW Stevens Point nearshore seining survey, 14 WDNR surveys from 1957 – 2013 and the 2015 survey. Results demonstrate that a variety of sampling methods are needed to assess fish populations ranging from sportfish to nongame species to invasive nonnative species such as common carp. Our data demonstrate the periodic nearshore fish sampling is needed to better understand the lake ecosystem and potential indicators of environmental change.

Table 3: Updated Swan Lake Fish Species List with Environmental Indications

Common Name	Scientific Name	Envir. Tol.
Bowfin	<i>Amia calva</i>	M
Longnose gar	<i>Lepisosteus osseus</i>	M
Gizzard shad	<i>Dorosoma cepedianum</i>	M
Central mudminnow	<i>Umbra limi</i>	T
Northern pike	<i>Esox lucius</i>	M
Muskellunge	<i>Esox masquinongy</i>	I
Common carp	<i>Cyprinus carpio</i>	T
Fathead minnow	<i>Pimephales promelas</i>	T
Bluntnose minnow	<i>Pimephales notatus</i>	T
Spotfin shiner	<i>Cyprinella spiloptera</i>	M
White sucker	<i>Catostoma commersoni</i>	T
Black bullhead	<i>Ameiurus melas</i>	T
Yellow bullhead	<i>Ameiurus natalis</i>	T
Tadpole madtom	<i>Noturus gyrinus</i>	M
Channel catfish	<i>Ictalurus punctatus</i>	M
Brook stickleback	<i>Culaea inconstans</i>	T
Blackstripe topminnow	<i>Fundulus notatus</i>	M
<b>Banded Killifish</b>	<b><i>Fundulus diaphanus</i></b>	<b>SSC</b>
Brook silverside	<i>Labidesthes sicculus</i>	none
Freshwater drum	<i>Aplodinotus grunniens</i>	M
Bluegill	<i>Lepomis macrochirus</i>	M
Green sunfish	<i>Lepomis cyanellus</i>	T
Hybrid sunfish	<i>Lepomis</i>	none
Pumpkinseed	<i>Lepomis gibbosus</i>	M
Rock bass	<i>Ambloplites rupestris</i>	I
Largemouth bass	<i>Micropterus salmoides</i>	M
Smallmouth bass	<i>Micropterus dolomieu</i>	I
Black crappie	<i>Pomoxis nigromaculatus</i>	M
White bass	<i>Morone chrysops</i>	none
Yellow perch	<i>Perca flavescens</i>	M
Johnny darter	<i>Etheostoma nigrum</i>	M
Iowa darter	<i>Etheostoma exile</i>	I
Logperch	<i>Percina caprodes</i>	M
Walleye	<i>Sander vitreus</i>	M

I – Intolerant, M – Medium tolerance, T – Tolerant of degradation

Table 4: Swan Lake Fish Species List Based on Different Sampling Methods and Periods.

Common Name	Scientific Name	2015	1969	WDNR Surveys*
Bowfin	<i>Amia calva</i>			X
Longnose gar	<i>Lepisosteus osseus</i>	X	X	X
Gizzard shad	<i>Dorosoma cepedianum</i>			X
Central mudminnow	<i>Umbra limi</i>	X	X	
Northern pike	<i>Esox lucius</i>			X
Muskellunge	<i>Esox masquinongy</i>			X
Common carp	<i>Cyprinus carpio</i>	X		X
Fathead minnow	<i>Pimephales promelas</i>	X		
Bluntnose minnow	<i>Pimephales notatus</i>	X		
Spotfin shiner	<i>Cyprinella spiloptera</i>	X	X	
White sucker	<i>Catostoma commersoni</i>	X		X
Black bullhead	<i>Ameiurus melas</i>	X	X	
Yellow bullhead	<i>Ameiurus natalis</i>	X	X	
Tadpole madtom	<i>Noturus gyrinus</i>	X		
Channel catfish	<i>Ictalurus punctatus</i>			X
Brook stickleback	<i>Culaea inconstans</i>	X		X
Blackstripe topminnow	<i>Fundulus notatus</i>	X	X	
Banded Killifish	<i>Fundulus diaphanus</i>		X	
Brook silverside	<i>Labidesthes sicculus</i>	X	X	X
Freshwater drum	<i>Aplodinotus grunniens</i>			X
Bluegill	<i>Lepomis macrochirus</i>	X	X	X
Green sunfish	<i>Lepomis cyanellus</i>	X	X	
Hybrid sunfish	<i>Lepomis</i>	X		
Pumpkinseed	<i>Lepomis gibbosus</i>		X	X
Rock bass	<i>Ambloplites rupestris</i>	X		X
Largemouth bass	<i>Micropterus salmoides</i>	X	X	X
Smallmouth bass	<i>Micropterus dolomieu</i>			X
Black crappie	<i>Pomoxis nigromaculatus</i>			X
White bass	<i>Morone chrysops</i>			X



Yellow perch	<i>Perca flavescens</i>	x		x
Johnny darter	<i>Etheostoma nigrum</i>	x		
Iowa darter	<i>Etheostoma exile</i>	x		
Logperch	<i>Percina caprodes</i>	x		x
Walleye	<i>Sander vitreus</i>			x
<b>Total Native Species</b>		<b>20</b>	<b>12</b>	<b>20</b>
* 14 boomshocking and fyke netting surveys 1957 - 2013				

### Recommendations

Swan Lake supports a relatively diverse aquatic plant community with numerous beds of floating-leaf and submersed native aquatic plants. Efforts can be made to protect these important habitats and even expand them, in part because of their fish habitat importance. Aquaculture can be a way to increase otherwise declining nongame species such as the State Special Concern banded killifish (Marshall and Dearlove 2013)

### References

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Sampling Site Locations and General Habitat Conditions

	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>	<b>Site 5</b>
Start					
Lat	43.54497	0.54398	0.53984	0.53824	0.54296
Long	89.35529	0.36222	0.37691	0.38779	0.37963
End					
Lat	43.54522	0.54435	0.53971	0.53836	0.54374
Long	89.35644	0.3631	0.37821	0.38688	0.37959
Primary Habitat	rock	sub. plants	emergent	emergent	rock
continued				sub. Plants	
Temp. C	22.3	24	23.5	24.4	24.6
D.O. mg/l	8.4	8.5	7.8	8.8	8.6
Sp. Cond. uS/cm	438	444	446	448	441
	<b>Site 6</b>	<b>Site 7</b>	<b>Site 8</b>	<b>Site 9</b>	
Start					
Lat	0.5464	0.54852	0.54916	0.54763	
Long	0.37713	0.36455	0.35062	0.34476	
End					
Lat	0.54661	0.54847	0.54861	0.54755	
Long	0.37589	0.36325	0.34943	0.34619	
Primary Habitat	emergent	rock	sub. plants	sub. plants	
continued		sub. Plants	wood	emergent	
Temp. C	24.7	24.7	25.6	24.8	
D.O. mg/l	8.3	9.1	12.4	13.2	
Sp. Cond. uS/cm	445	441	438	444	

## Selected Swan Lake Fish Images

Bowfin and Longnose gar, “rough” fish with primitive features. Both of these interesting species are important for maintaining ecological balance in lakes but they carry an image problem from earlier days in the Twentieth Century when they were thought to be a nuisance.



**Bowfin**



**Juvenile Longnose gar**

Bowfin – up to ~43 inches long. Longnose gar – up to ~54 inches long.

Three nongame species representing three different families; Stickleback Family, Silverside Family and Mudminnow Family.



**Brook stickleback**



**Brook silverside**

**Central mudminnow**



Brook stickleback – up to ~2 inches long. Brook silverside – up to ~4 inches long.

Central mudminnow – up to ~4 inches long.

Minnow Family members in Swan Lake.



**Fathead minnow**



**Spotfin shiner**



**Bluntnose minnow**



**Common carp**

Fathead minnow – up to ~2 inches long. Bluntnose minnow – up to ~3 inches long.

Spotfin shiner – up to ~4 inches long. Common carp – up to ~30 inches long.

Three of the four Catfish Family members found in Swan Lake.



**Tadpole madtom**



**Black bullhead**



**Yellow bullhead**

Tadpole madtom – up to ~3 inches long. Black bullhead – up to ~24 inches long.

Yellow bullhead – up to ~8 inches long.

Four of the Sunfish Family members in Swan Lake.



**Green sunfish**



**Bluegill**



**Rock bass**



**Largemouth bass**

Green sunfish – up to ~7 inches long. Bluegill – up to ~12 inches long.

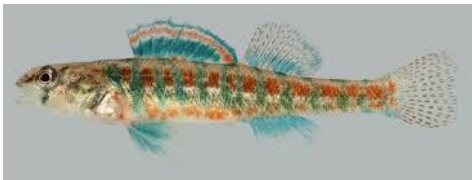
Rock bass – up to ~13 inches long. Largemouth bass – up to ~28 inches long.

Four Perch Family members found in Swan Lake, July 2015.

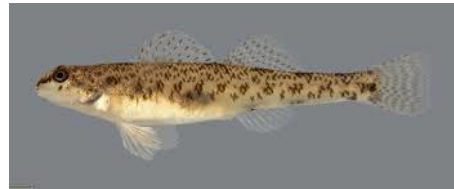


**Logperch**

**Yellow perch**



**Iowa darter**



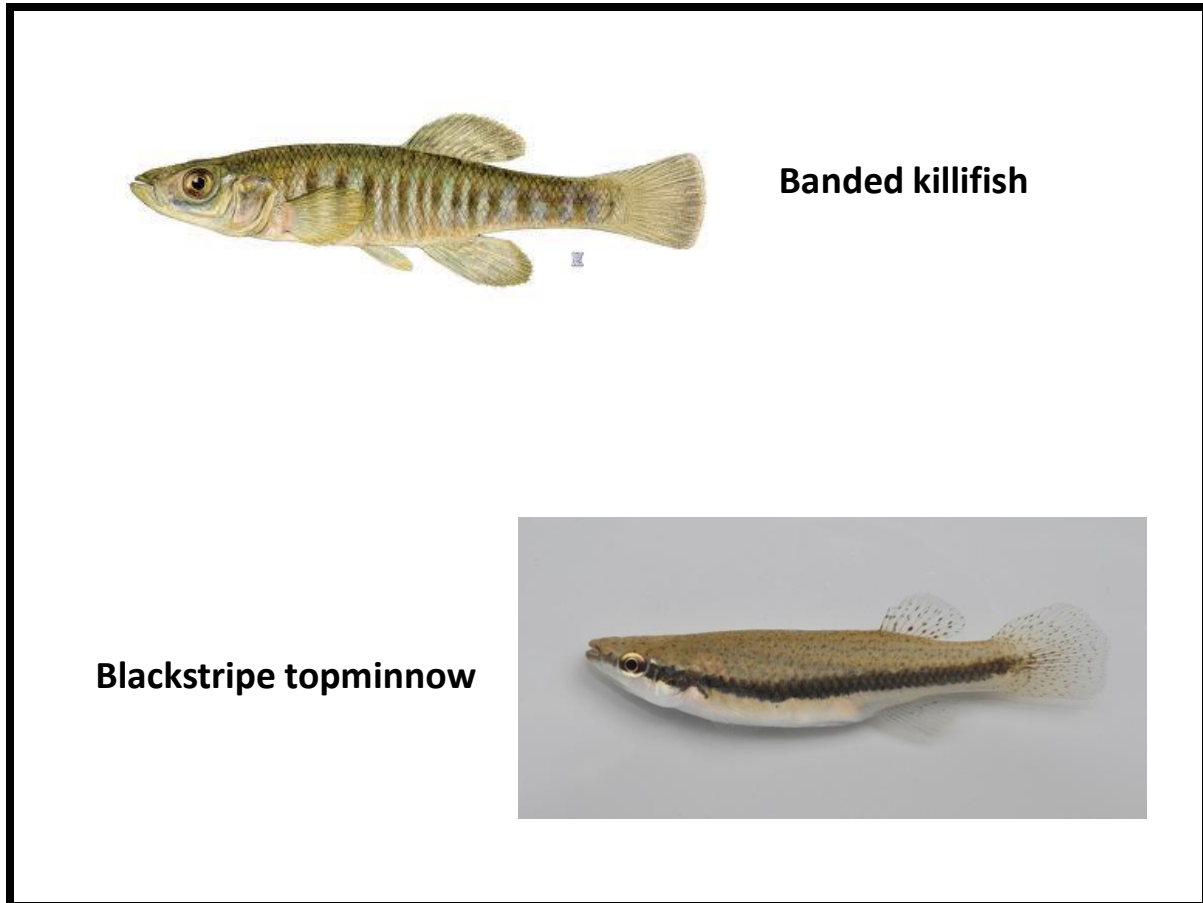
**Johnny darter**

Logperch – up to ~5 inches long. Yellow perch – up to ~14 inches long.

Iowa darter – up to ~2 inches long. Johnny darter – up to ~2 inches long.



Two of the three Topminnow Family members that occur in Wisconsin have been found in Swan Lake.



Banded killifish – up to ~3 inches long. Blackstripe topminnow – up to ~3 inches long.