

Belle Isle Lakes

Wayne County, T02S/R12E/Sec 12
Detroit River Watershed, Last Surveyed May 2014

Jeffrey Braunscheidel, Senior Fisheries Biologist, MDNR

Environment

The State of Michigan took over management of the City-owned Belle Isle Park in February of 2014 through a lease agreement with the City of Detroit (MDNR website). Michigan's Parks and Recreation Division of the Department of Natural Resources is the lead agency in managing the island as the State's 102nd state park.

Belle Isle is a 982-acre island park in the City of Detroit near the upper end of the Detroit River in Wayne County (Figure 1). Surrounded by water, with approximately 7 miles of shoreline, it is a picturesque spot with a unique ecology. It has a high water table, due to its low elevation. A large portion of the island (about 110 acres) is covered by water (three lakes, a lagoon, a fountain pool, and an interconnecting canal system) and there are 230 acres of forested wetlands. The water table of the island is separate from the Detroit River and is usually a few feet higher than the river except during unusually high river water levels. Its rare wet-mesic forest contains species such as Shumard oak and pumpkin ash that mimic the Detroit ecosystem of hundreds of years ago. Forests like this were found throughout southeastern Michigan after the glacial period. Several species such as the Shumard oak and pumpkin ash, once common in this part of the state, are now quite rare. Red oak, pin oak, swamp white oak, silver maple, and several species of willow and dogwood trees are also common on Belle Isle.

Construction of the various canals, lakes, and lagoons took place between 1893 and 1910. There are currently 5 major water bodies on the island (Figure 2). Listed from largest to smallest they are: Blue Heron Lagoon (41 acres), Lake Muskoday (25 acres), Lake Okonoka (18 acres), Lake Tacoma (11 acres), and the Scott Fountain Basin (about 6-8 acres). In addition, there are about 2 miles (approximately 5 acres) of canals originally linking most of the lakes. The Blue Heron Lagoon was disconnected from this internal canal system in 2013 when it was reconnected to the Detroit River.

MDNR Fisheries Division conducted bathymetric surveys of the 4 lakes in 2014 and produced maps of the lake depths (Figure 3). These maps show that a large portion of the lakes are less than 3 feet deep, although small areas in the Blue Heron Lagoon, Lake Muskoday, and Lake Okonoka were dredged to about 8-9 feet deep to enhance the fish habitat. Blue Heron Lagoon was also reconnected to the Detroit River in 2013 through creation of a broad opening on the east end of the lagoon. Re-contouring of the Blue Heron Lagoon bottom in the eastern end also created some additional deeper areas.

Public access to Lakes Muskoday, Okonoka, and Tacoma is currently available via extensive grassy shorelines with several nearby parking areas. Shore access on Blue Heron Lagoon is limited due to the dense brush lining most of its shoreline. There are some open areas near the bridge at the eastern end of the lagoon where anglers can access the shore, but these are a fair walk from the closest parking area. Several developed shorefishing sites are located along the perimeter of the island to provide

anglers access to the Detroit River. Most of these are currently in disrepair or have conditions which are unsafe or hamper use by anglers. These include the old ferry dockage by Shelter #9, the South Pier, a shoreline boardwalk northeast of the Detroit Yacht Club ("Oxbow" shore fishing site), and the North Pier. Many anglers also utilize undeveloped shoreline around the island that involves climbing over large rocks, broken concrete, and other rough terrain.

History

The City of Detroit purchased the island in 1879 for the sum of \$200,000. In 1881, the newly appointed Park Commission of the City of Detroit hired Frederick Law Olmsted to develop a plan for the island (Belle Isle Conservancy web site). The challenge for Olmsted with Belle Isle was to create a design that allowed for public gathering and recreation while maintaining the natural state of the island. Olmsted produced a design which placed a ferry dock at one end of the island and concentrated all the public facilities there - a refectory, boathouses, a lighthouse, playing fields, a racing oval and exhibition grounds. The rest of the island he left in as natural a state as possible.

Unfortunately, his design was deemed too elaborate and, due to disagreements with the City Council and Park Board, it was never carried out. Olmsted resigned in 1885. The only elements of Olmsted's plan implemented were the pedestrian oriented Central Avenue; a canal system; thinning the forest and clearing underbrush to develop the open and wooded areas; and the combination pavilion/ferry landing.

For many years, access to Belle Isle was by ferry only. The Pavilion Ferry Dock was built in 1883 and the ferries continued to run from the lower end of the island until 1957. The first bridge to the island was a wooden structure erected in 1889. It served as a foot and wagon bridge until it burned in 1915. A temporary structure was put into place and used until a concrete bridge was completed in 1923. Known today as the "Belle Isle Bridge", it was formally named the MacArthur Bridge in 1942 after General Douglas MacArthur, the World War II hero.

Other than some fish sampling in the Blue Heron Lagoon and Lake Okonoka in 2011 by a consulting firm preceding the project to reconnect the lagoon to the Detroit River, no significant fish sampling had been conducted on the island. Fisheries Division conducted the first comprehensive fisheries survey of the four main waterbodies on the island in May of 2014.

Current Status

A fish community survey was conducted in the three lakes and the lagoon from May 12-16, 2014, by MDNR Fisheries Division. Each lake was sampled using 4 nets set for 2 nights each and lifted each day. Lakes Muskoday and Okonoka were each sampled using 1 large-mesh fyke net, 1 inland trap net, and 2 small-mesh fyke nets. Blue Heron Lagoon had 2 large-mesh and 2 small-mesh fyke nets. Due to its shallow condition, Lake Tacoma was sampled using 4 small-mesh fyke nets. All fish were identified to species and measured to the nearest inch. Ageing structures were collected from a subsample of the game fish species and all fish were released, except for a few fish that were retained for contaminant analysis.

In addition to the fish sampling, electronic water temperature loggers were placed at the outlet of Lake Muskoday from mid-April through mid-September 2014 (site 1, Figure 2), and at three locations in the canal system from July through mid-September (sites 2-4, Figure 2). They recorded water temperature every hour through this five month period.

All survey gear combined caught a total of 27 fish species and 934 individuals with a total weight of almost 190 pounds (Table 1). Panfish species such as black crappie and white crappie, bluegill, pumpkinseed, yellow perch, rock bass, and green sunfish comprised 81% of the total catch by number. Small, minnow-like, forage fish species made up another 12% of the total catch. Suckers and bullhead species accounted for almost 4% of the total catch. No endangered, threatened, or special concern fish species were found. Summaries for the individual water bodies occur below.

Blue Heron Lagoon

Located on the extreme eastern end of the island, this is the largest of the water bodies on Belle Isle and is also the only one directly connected to the Detroit River. The western 2/3 is less than 5 feet deep with much of it less than 3 feet (Figure 3). About a third of the lagoon reaches 5 feet with some small areas on the eastern end as deep as 8-9 feet. A major habitat restoration project was conducted here in 2012. The eastern end of the lagoon was opened up to the Detroit River, some deeper areas were created during the bottom recontouring, and habitat such as gravel and large woody material was added.

A total of 364 fish were collected (Table 1). Bluegill was the most abundant species and accounted for 37% of the total catch (133 fish) with an average length of 4.3 inches. Just under a third of the catch exceeded the minimum size acceptable to anglers of 6 inches. Bluegill growth was good, with a mean growth index 0.3 inches above the state average (Table 2). Other sport fish species comprising large portions of the survey catch included yellow perch (53 fish), pumpkinseed (42 fish), and rock bass (37 fish). A little more than 60% of these exceeded the minimum sizes acceptable to anglers. Growth for both pumpkinseed and yellow perch was well above state average (Table 2). Other sport fish species caught in smaller numbers included black crappie (17 fish), largemouth bass (6), bullhead (18), white crappie (2), and a single northern pike. Of these 5 species, only the black crappie and bullhead had individuals large enough to be acceptable to anglers.

Small, minnow-like fish species made up a significant portion (13%) of the survey catch. These minnow-like species included 26 emerald shiner, 11 bluntnose minnow, 7 spotfin shiner, 2 blackchin shiner, and a single mimic shiner (Table 1). Other species caught in small numbers included 4 bowfin, 2 carp, and a single white sucker and round goby. This is the only lake where a goby was caught during the survey.

Lake Muskoday

This lake is entirely less than 4 feet deep, except for a small area along the northern shore that has been dredged to 8-9 feet deep (Figure 3). Water temperature data from the monitor placed in the lake outlet through the summer of 2014 (Figure 1, monitor 1) showed the lake's surface water temperature ranged from about 70 to 80 F through the months of July and August (Figure 4). These surface water temperatures are not atypical for lakes in the area, but most natural lakes do have a fair amount of deeper areas with cooler water to serve as temperature refugia.

A total of 365 fish were collected (Table 1). White crappie, black crappie, and bluegill were the most abundant of the 13 species caught. White and black crappie combined accounted for 58% of the total catch by number. Only 18% (30 fish) exceeded the minimum size acceptable to anglers (7 inches) and most of these were 7-8 inch white crappie. Black crappie growth was poor with a mean growth index more than 2 inches below the state average (Table 3). All ages from 1 through 7 were collected in the survey.

Bluegill was 25% of the total catch by number with an average length of 4.7 inches. No bluegill exceeded the minimum size acceptable to anglers (6 inches). Growth for this species was also poor with a mean growth index 0.7 inches below the state average (Table 3). All age classes from age 1 through 5 were present in good numbers.

The bluegill population was evaluated using Schneider's Index (Schneider 1990). This index provides a relative measure of the quality of a bluegill fishery in a lake based on a scale of 1-7, with 7 being the best. This scale is developed from both the size structure and growth characteristics of the population in a lake. The bluegill in Lake Muskoday received an index of 1.2 which equates to a "very poor" rating.

Pumpkinseed was the only other species collected in significant numbers. The 30 fish caught accounted for just over 8% of the total catch with only one of these exceeding the minimum size acceptable to anglers (6 inches). While not enough individuals were collected to obtain statistically significant growth information, lengths of the fish that were aged tended to be well below the state average length-at-age (Table 3).

Other sport fish species caught in small numbers included rock bass (7 fish), yellow perch (4), black and brown bullhead (5), and hybrid sunfish (3). Miscellaneous species collected were white sucker (5), white perch (3), shorthead redhorse (2), and 1 longnose gar. In addition, a water snake was observed on the shore of Lake Muskoday in the summer of 2015 carrying a large goby.

Lake Okonoka

Most of this lake is 3 feet or less in depth with several small islands scattered throughout (Figure 3). There is a small area with depths from 5 to 9 feet along the southern shore near the east end of the lake. It is separated from the Blue Heron Lagoon by a weir, but is openly connected to the Belle Isle canal system.

Ten species of fish were collected for a total of 124 fish (Table 1). Bluegill and white crappie dominated the catch comprising 41% and 32%, respectively, of the total catch by number. The 51 bluegill averaged 4.8 inches with only 2 fish exceeding the minimum length acceptable to anglers (6 inches). Bluegill growth was poor with a mean growth index 0.7 inches below the state average (Table 3). The Schneider Index for this lake was 2.2 for a rating of "poor". This increase in rating compared to Lake Muskoday is due to the capture of a single bluegill over 8 inches. White crappie averaged only 5.9 inches with 4 fish exceeding the minimum crappie length acceptable to anglers (7 inches).

The only other sport fish species collected were 6 black crappie, 2 pumpkinseed, and 2 yellow perch. Forage fish species caught included bluntnose minnow (9 fish), emerald shiner (3), and golden shiner (2). Other species found were longnose gar (8), and brown bullhead (1).

Lake Tacoma

This entire lake is 3 feet deep or less (Figure 3) with several islands. Dense aquatic vegetation fills much of the lake during the summer months due to the organic bottom substrates and overall shallowness.

A total of 81 fish comprised of 13 species were collected (Table 1). Emerald shiner was the most abundant fish species found (45 fish or 56% of the total catch by number). Other minnow-like forage species caught included 4 bluntnose minnow, 3 spottail shiner, and 1 golden shiner. Bluegill was the only other species found in significant numbers. The 16 bluegill caught averaged 4.8 inches with none exceeding 6 inches. Growth was poor (Table 3). Several additional species were found in small numbers (Table 1).

Canals

While no fish sampling was conducted in the canals, temperature monitors were placed in three locations from July through mid-September (Figure 2). Water temperatures in the canal section below Lake Muskoday ranged from 66 to 82 through July and August, but were mostly between 70 and 78 similar to the lake temperatures (Figure 5, monitor 2). Daily fluctuations were much more significant in the canal compared to the lake. Water temperatures in the canal below the confluence ranged from 68 to 82, but mostly stayed between 70 and 80 with strong daily fluctuations (Figure 6, monitor 3). Below Lake Tacoma the water temperature ranged from 70 to 84 with most readings between 72 and 82 (Figure 7, monitor 4). The pattern of temperature fluctuation was similar among all three locations and Lake Muskoday, but daily fluctuations were greater in the canals. Water temperatures tended to be a degree or two higher in the downstream section of the canals compared to Lake Muskoday and the upper canal.

Analysis and Discussion

Blue Heron Lagoon has a diverse fish community with a fair number of individuals large enough to be acceptable by anglers. Growth rates were good for the sport fish species evaluated with several species exceeding state average growth. Species with harvestable individuals present, and abundant enough to support angling, included black crappie, bluegill, pumpkinseed, and yellow perch. The open connection to the river will enable seasonal movement into Blue Heron Lagoon by other sport fish species such as largemouth and smallmouth bass, northern pike, white bass, walleye, muskellunge, and others seasonally found in this section of the Detroit River.

The three lakes enclosed within the island's relatively closed system (Muskoday, Okonoka, and Tacoma) have significantly different fish community characteristics compared to the Blue Heron Lagoon that is openly connected to the Detroit River. Sport fish species currently present in significant numbers in these three lakes include bluegill, black and white crappie, and pumpkinseed. These species have very poor size distributions with below average growth characteristics. Only a few larger individuals acceptable to anglers or meeting minimum legal size limits for harvest are available in these waters.

Although there is a somewhat diverse fish community present in Lakes Muskoday and Okonoka, and most of the sport fish species appear to be successfully reproducing, there does not appear to be the

proper habitat or food base available to enable them to reach harvestable sizes and provide a significant fishery. Lake Tacoma had less diversity and very low numbers of fish. Bluegill was the only sport fish species present in significant numbers, but these were all small. Habitat conditions for fish production are even worse in this lake with no deep water and very dense aquatic vegetation.

While there have been angler reports of some bass being caught in Lake Muskoday, this survey did not catch a single bass in any of the three lakes in the closed island system. This lack of largemouth bass or any other significant predator in these lakes is a concern. While a few likely come in during periods of high water levels in the river, they are obviously not surviving or reproducing in the system. This is likely due to the poor habitat conditions both for bass reproduction and growth. The inability of the lakes to support an adequate forage base is another factor that prevents larger predators such as bass from growing, surviving, and reproducing successfully.

There are really no opportunities to manage fish with the current habitat conditions in the lakes. Lack of adequate depth to provide areas with cooler temperatures, lack of large woody material for cover, and poor spawning substrates are all factors in the overall poor habitat quality in the lakes. Potential options to provide better habitat could include dredging to provide an adequate amount of deeper/cooler water, and/or reconnection to the Detroit River to allow seasonal migration of game fish into the lakes, as currently occurs in Blue Heron Lagoon, and also to provide a source of cooler water from the Detroit River.

Water movement within the canals was very slow to nonexistent. Average water temperatures in July (Figures 4-7) were warmer in the lower canals (mid to upper 70s) than in the lake (low-mid 70s). The lack of fresh water flowing through the canals also caused water temperatures in the lower canals to fluctuate each day to a greater degree than in the lake. While lake water temperature changed by 2-4 degrees each day in July (Figure 4), water temperatures in the lower canals (Figure 6 and 7) typically changed 5-8 degrees each day. Repeated temperature fluctuations of this magnitude can be stressful on many species of fish. Naturally flowing streams, and lakes with significant areas of deeper water and a variety of habitats, experience much smaller daily temperature fluctuations or provide habitat variability that enables fish to seek out more desirable conditions. The lack of depth, poor habitat variety in the canals, and the lack of fresh water moving through the canal system to renew dissolved oxygen supplies, all combine to create unfavorable conditions for sustaining a balanced fish community within the canals. Additional sampling to better characterize habitat conditions, dissolved oxygen levels, water depth, and fish use of the canals would provide valuable information for future management of this portion of the aquatic system on Belle Isle.

Management Direction

With the open connection to the Detroit River, Blue Heron Lagoon needs no further fisheries management other than to provide access points for anglers to the shore of the lake towards the eastern end of the lagoon. There is currently a walking path from Lakeside Drive along the southern side of the lagoon (Figure 2) that leads to the bridge over the opening to the river, but no developed access points to the shore are provided other than at the bridge. The bridge path proceeds around the northern side of the lake, but ends before reconnecting to Lakeside Drive and shore access is not provided along this section of path either. It is recommended to develop shore fishing access points (possibly a fishing pier) towards the eastern end of Blue Heron Lagoon and provide signage at the parking area on

Lakeside Drive to identify the fishing opportunity. The brushy, wooded shoreline does provide valuable habitat benefits and shoreline access should be limited to specific locations rather than clearing large areas of the naturally vegetated water-land interface.

Since the fish habitat is so poor in Lake Tacoma, and since there is little chance of developing a significant fishery even with extensive management efforts, this lake should be used for other aquatic-based activities such as kayaking, canoeing, ice skating, bird watching, etc. Wildlife Division might consider evaluating this waterbody for management targeting waterfowl or other aquatic wildlife.

Lakes Muskoday and Okonoka have the best potential for developing some sort of reasonable inland fishery. There is some deeper habitat, but it is still very limited. Dredging to increase this type of habitat and placement of other habitat features such as large woody material and gravel spawning areas would likely be needed to develop something resembling a typical inland lake fishery with bluegill, crappie, sunfish, and largemouth bass as the major species. Allowing natural recruitment of woody material as surrounding trees die and fall into the lakes would be one way to accumulate additional nearshore habitat. Most of these typical inland lake fish species are already present in small numbers and have been shown to naturally reproduce and develop fishable populations if adequate habitat is available.

In the short term, it is recommended that a sport fish species capable of utilizing the existing lake and canal conditions be stocked in Lake Muskoday. Channel catfish can utilize shallow conditions with little flow, higher water temperatures, and the lower oxygen levels present in much of Belle Isle's internal lake and canal system. It is recommended that fingerling channel catfish be stocked in Lake Muskoday annually for three years at a rate of 10/acre (250 fish). This density is a little high for the lake conditions, but they will spread out into the island's canals and even into Lake Okonoka as long as the connections remain open. Although larger fall fingerlings (6-8 inches) would be preferable, only smaller spring fingerlings (3-4 inches) are available. The lack of other predators, such as largemouth bass, should enable even these smaller fish to survive in adequate numbers to establish a catfish population. Occasional stocking of other fish species into Lake Muskoday could temporarily enhance fishing opportunities, but without habitat work, will not build any sort of sustainable fishery. Stocking fish in Lake Okonoka should be avoided at this time due to a project currently in the process of design and implementation to isolate Lake Okonoka from the canal system, create more deep water habitat, and reconnect it directly to Blue Heron Lagoon and the Detroit River.

Other water bodies on Belle Isle that could be evaluated for fishery management include the Scott Fountain Basin and the model boat basin (Figure 2). These waters would need to be surveyed to determine depth and hydrology characteristics. Information on water quality parameters such as temperature and dissolved oxygen levels is also needed.

The lack of fresh water moving through the canal system prevents improving the water quality and utilizing any potential fish habitat they contain. Reconnecting the entire system of lakes and canals on the island directly to the Detroit River is not an option as this would result in drastic changes to the water table on the island and thus the wetland ecosystem and unique habitats that are present on Belle Isle. There is a pump system in place at the eastern end of the island to pump water into the canal system from the Detroit River. Operating these pumps on a regular basis (daily or at least several days each week) would provide cooler water and improve overall water quality throughout the canal system

as well as the lakes connected via the canals. It is recommended that regular operation of the pumps be initiated as soon as possible.

There are other options beside managing the internal waterbodies available to provide a quality fishing experience at the Belle Isle Park. Fishing in the Detroit River is excellent with a seasonal variety not possible within the confined inland system on the island. Several shore fishing access sites are already present in the park, but deteriorating conditions or inadequate facilities prevent utilizing them to their full potential. Renovating and upgrading these sites would be much more cost effective and provide more fishing opportunity than major dredging and habitat improvement projects on the inland waters. Specific sites we recommend as priorities in this regards include (Figure 2): a) proper railings and access to the Ferry Dock next to Shelter #9; b) renovation of the South Pier to get anglers closer to the water and within casting distance of the deeper water currently just out of reach; and c) new railing and access route to the Oxbow shore fishing boardwalk. New sites that could be created or enhanced include (Figure 2): d) improved angler access and parking with signage to the east end of the Blue Heron Lagoon where fish are utilizing the deeper water areas recently created when the lake was reconnected to the Detroit River; e) upgrade/renovate the outermost pier at the Detroit Boat Club for angler use; and f) installation of a public boat ramp with trailer parking (possibly in the protected channel adjacent to the Belle Isle Yacht Club at the east end of the island near the Oxbow fishing site).

References

Belle Isle Conservancy website "www.belleisleconservancy.org/learn-more/history-of-the-park" .

Michigan Department of Natural Resources website "www.michigan.gov/dnr". Select Belle Isle under Camping and Recreation.

Schneider, J.C. 1990. Classifying bluegill populations from lake survey data. Michigan Department of Natural Resources, Fisheries Technical Report 90-10, Ann Arbor, MI.

Figure 1. Location map of Belle Isle in Detroit River, Detroit, Michigan.

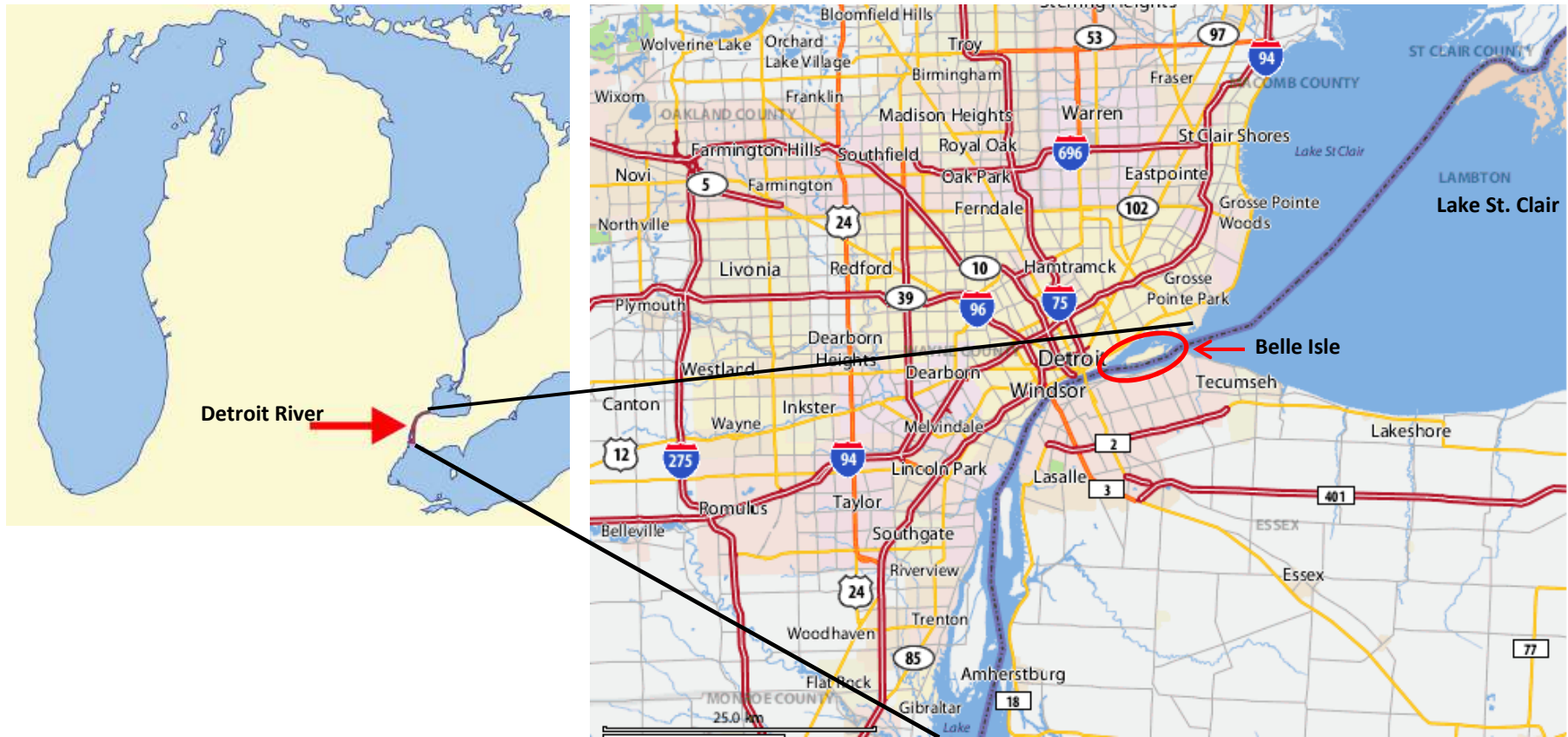


Figure 3. Bathymetric maps of major water bodies on Belle Isle (created using DrDepth software).

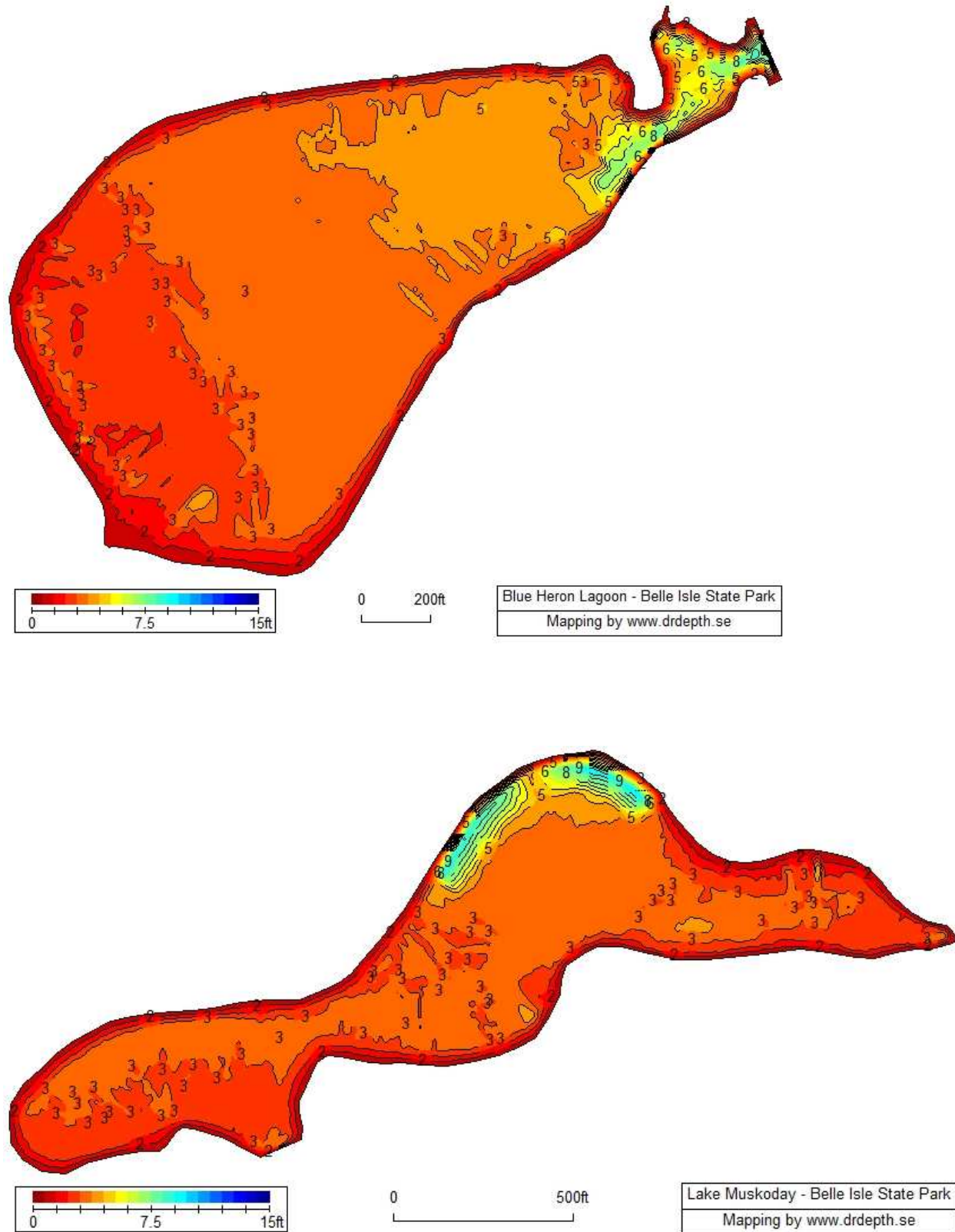


Figure 3 (cont.). Bathymetric maps of major water bodies on Belle Isle (created using DrDepth software).

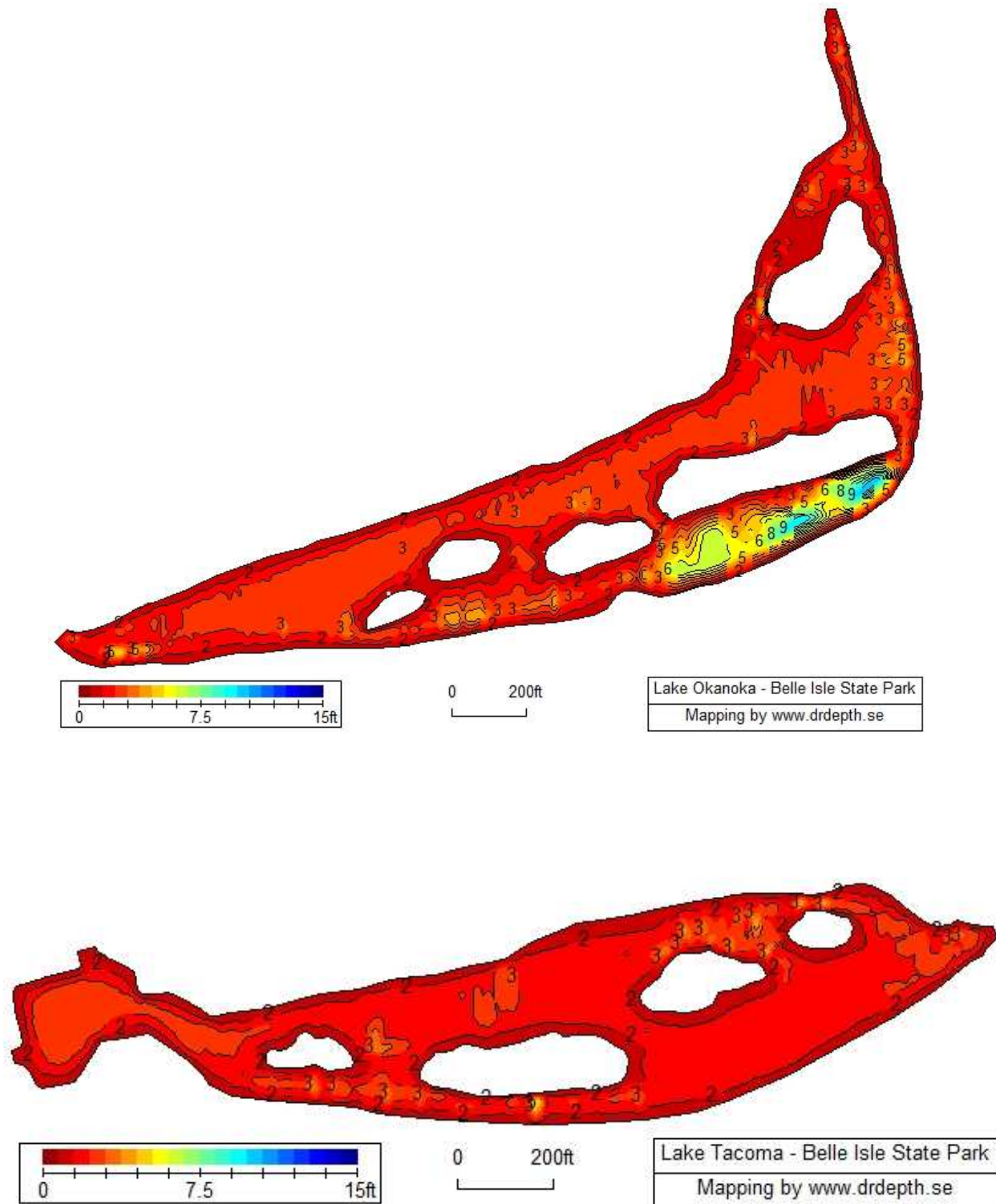


Figure 4. Water temperature graph for Lake Muskoday, Belle Isle (monitor #1). Vertical bars indicate daily temperature range.

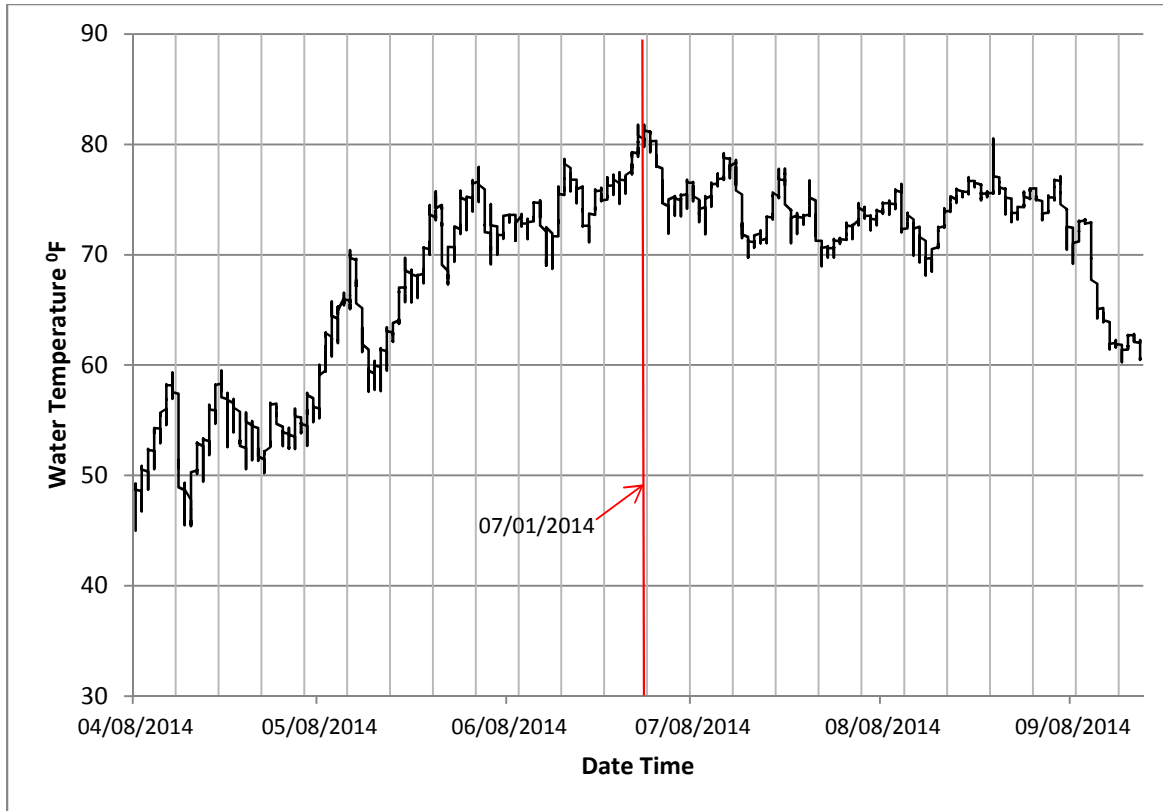


Figure 5. Water temperature graph for Belle Isle canal below Lake Muskoday (monitor #2). Vertical bars indicate daily temperature range.

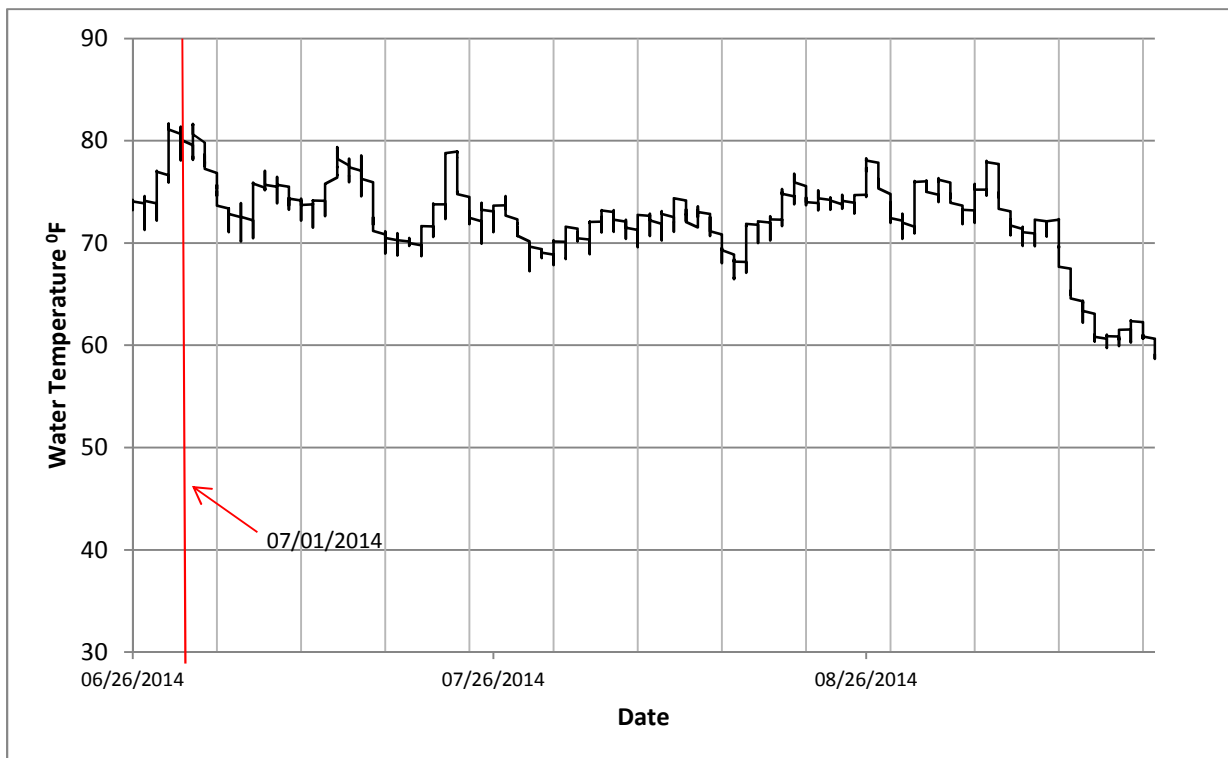


Figure 6. Water temperature graph for Belle Isle canal below confluence (monitor #3). Vertical bars indicate daily temperature range.

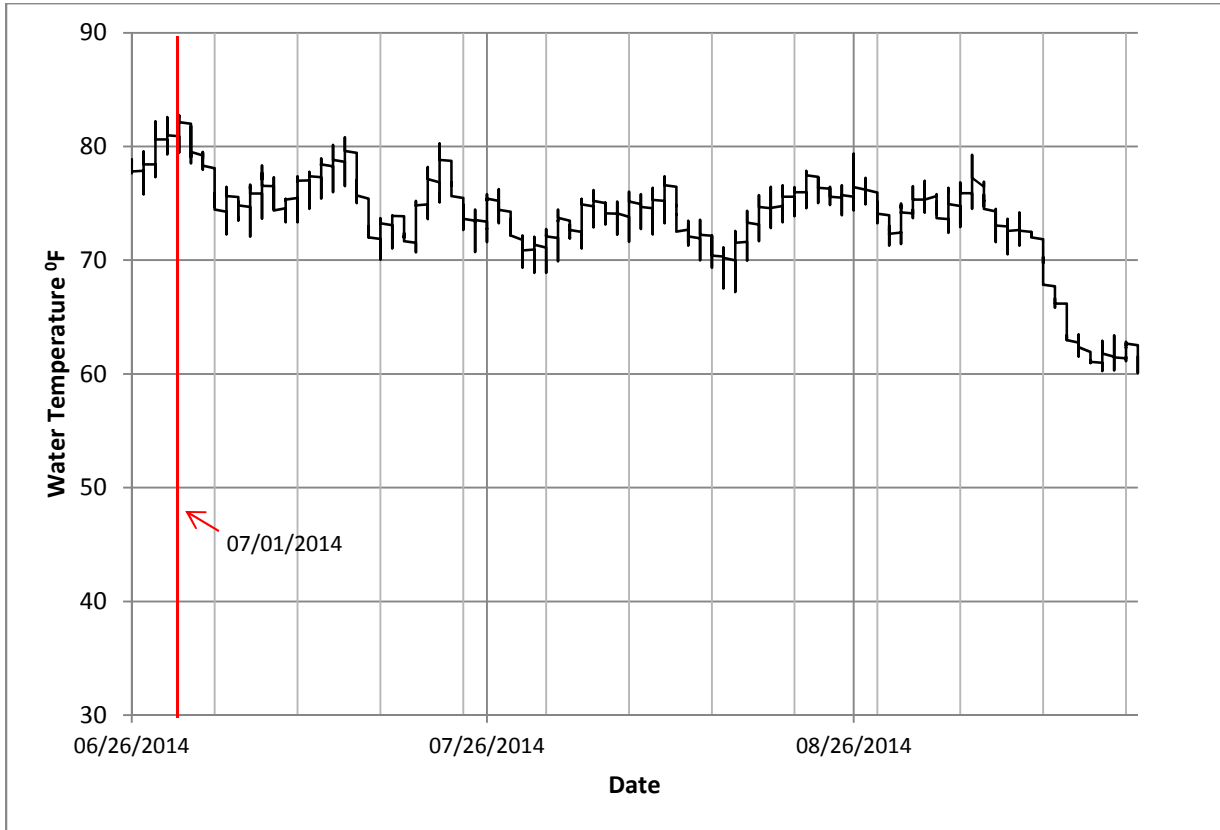


Figure 7. Water temperature graph for Belle Isle canal below Lake Tacoma (monitor #4). Vertical bars indicate daily temperature range.

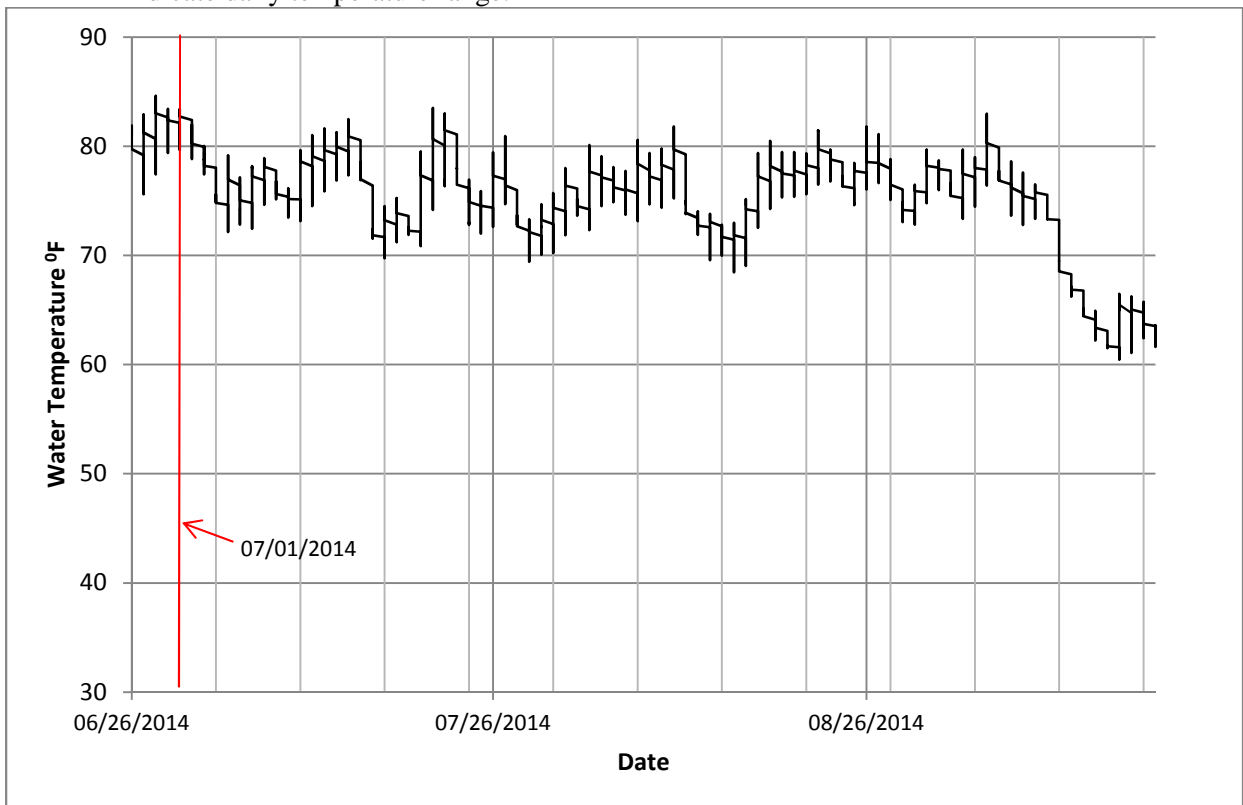


Table 1. Catch summary for all Belle Isle waters surveyed in 2014.

Species	Blue Heron Lagoon				Lake Muskoday				Lake Okonoka				Lake Tacoma				Totals	
	Number	Pounds	% Legal	Size Range	Number	Pounds	% Legal	Size Range	Number	Pounds	% Legal	Size Range	Number	Pounds	% Legal	Size Range	Numbers	% Legal
Black bullhead	11	10.0	100	10-14	4	3.5	100	11-13					1	0.4	100	9	16	100
Black crappie	17	11.1	100	8-12	78	9.1	4	4-8	6	0.7	33	2-8					101	22
Blackchin shiner	2			1-2													2	
Bluegill	133	13.5	32	1-8	94	7.1	0	1-5	51	4.5	4	1-9	16	1.2	0	3-5	294	15
Bluntnose minnow	11	0.1		2-3					9	0.1		2-3	4	0.1		2-3	24	
Bowfin	4	15.4		19-24													4	
Brown bullhead	6	4.3	100	10-12	1	0.7	100	11	1	0.7	100	11					8	100
Common carp	2	13.8		22-26													2	
Emerald shiner	26	0.1		2-3					3	0.0		2-3	45	0.3		1-3	74	
Golden shiner									2	0.1		5-6	1	0.0		4	3	
Green sunfish													1	0.0	0	3	1	0
Hybrid sunfish					3	0.3		4-5									3	
Largemouth bass	6	4.6	0	5-12													6	0
Longnose gar					1	2.0		28	8	11.6		22-28	1	1.2		24	10	
Mimic shiner	1			2													1	
Northern pike	1	1.3	0	18													1	0
Pumpkinseed	42	8.0	64	2-7	30	2.1	3	2-6	2	0.1	0	2-4	2	0.1	0	2-5	76	76
Rock bass	37	12.5	62	1-11	7	2.9	100	7-8					1	0.0	0	2	45	67
Round goby	1			3													1	
Shorthead redhorse					2	3.3		15-16									2	
Spotfin shiner	7	0.1		2-3													7	
Spottail shiner													3	0.0		2-3	3	
White crappie	2	0.2	0	5-6	133	15.4	20	4-11	40	3.5	10	4-10	3	0.2	0	4-5	178	17
White perch					3	1.0		8-9									3	
White sucker	1	0.1		6	5	7.6		15-16					1	0.6		11	7	
Yellow bullhead	1	0.6	100	10													1	
Yellow perch	53	12.3	62	2-11	4	0.7	75	6-8	2	0.6	50	6-10	2	0.0	0	2-3	61	61
Totals	364	107.9			365	55.7			124	22.0			81	4.2			934	

Table 2. Weighted mean length and age composition of selected fish species collected in Blue Heron Lagoon, Belle Isle, May 12-15, 2014.

Species	Age	Number Aged	Length Range (in)	Weighted Mean Length (in)	State Avg. Length (in)	Mean Growth Index*
Black Crappie	III	3	8.4-9.5	8.8	7.5	---
	IV	1	10.5	10.5	8.6	
	V	2	9.5-10.0	9.7	9.4	
	VI	3	10.2-10.9	10.6	10.2	
	VII	4	9.3-10.6	9.8	10.8	
	VIII	2	11.6-12.3	11.8	11.4	
	IX	2	10.9-12.4	12.1	11.9	
Bluegill	I	15	1.4-2.2	1.8	1.8	+0.3
	II	16	3.1-4.4	3.5	3.8	
	III	19	4.4-7.3	5.4	5.0	
	IV	20	4.9-8.0	6.9	5.9	
	V	3	5.1-8.1	7.2	6.7	
	VI	2	7.6-8.5	8.3	7.3	
Pumpkinseed	I	5	2.0-2.5	2.2	1.8	+0.7
	III	10	5.0-7.7	5.8	4.9	
	IV	11	5.4-7.9	6.6	5.6	
	V	2	5.3-7.0	6.5	6.2	
Largemouth Bass	II	1	5.4	5.4	7.1	---
	III	4	11.3-12.3	11.7	9.4	
	IV	1	12.1	12.1	11.6	
Yellow Perch	I	1	2.7	2.7	3.3	+1.3
	II	9	3.3-7.2	5.5	5.2	
	III	25	5.4-8.7	7.1	6.5	
	IV	6	7.5-9.7	9.4	7.5	
	V	7	9.9-11.5	10.7	8.5	
	VII	1	11.3	11.3	10.3	

*Mean growth index is the average deviation from the state average length at age. Only calculated using age groups represented by 5 or more fish.

Table 3. Weighted mean length and age composition of selected fish species collected in Belle Isle Lakes Muskoday, Okonoka, and Tacoma, May 12-16, 2014.

Species	Age	Number Aged	Length Range (in)	Weighted Mean Length (in)	State Avg. Length (in)	Mean Growth Index*
Black Crappie	I	2	2.8-3.1	3.0	4.2	-2.1
	II	2	4.8-5.1	4.8	6.0	
	III	9	5.3-5.9	5.7	7.5	
	IV	7	5.6-6.5	6.2	8.6	
	V	3	6.1-6.5	6.3	9.4	
	VI	4	6.7-8.7	7.4	10.2	
	VII	1	8.1	8.1	10.8	
Bluegill	I	6	1.3-2.4	1.9	1.8	-0.7
	II	16	2.5-4.9	3.1	3.8	
	III	19	3.4-5.8	4.2	5.0	
	IV	31	3.5-6.8	5.1	5.9	
	V	14	4.4-5.8	5.3	6.7	
	VII	3	4.7-5.6	5.2	7.8	
Pumpkinseed	I	2	2.3-2.3	2.3	1.8	---
	II	1	3.4	3.4	3.8	
	III	8	3.9-6.6	4.9	4.9	
	IV	3	3.9-4.2	4.0	5.6	
	VI	3	4.9-5.3	5.2	6.6	
	VII	1	4.9	4.9	7.1	
	White Crappie	II	10	4.5-5.3	4.8	
III		17	5.4-6.4	5.8		
IV		21	6.0-9.1	7.1		
V		8	6.5-11.5	9.2		
VI		1	10.1	10.1		
Yellow Perch		III	1	9.2	9.2	6.5
	IV	3	7.6-10.3	8.9	7.5	
	V	2	6.0-7.1	6.6	8.5	
	VI	1	6.7	6.7	9.4	

*Mean growth index is the average deviation from the state average length at age. Only calculated using age groups represented by 5 or more fish.