WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Fishery Survey Summary
Spirit Lake and North Spirit Lake
Price County, Wisconsin, 2024

Introduction

The Wisconsin Department of Natural Resources' (DNR) Fisheries Management Team from Park Falls completed netting and electrofishing surveys in 2024 to assess the abundance, size structure and reproductive success of important sportfish populations in Spirit and North Spirit lakes. The estimate of adult walleye population density derived from the early spring surveys also helped us evaluate the survival and growth of walleye raised in local ponds and stocked annually under a Cooperative Fish Rearing Agreement between the DNR and the Rib Lake Area Fish & Game Association. We continued netting muskellunge in mid-spring to estimate their adult abundance and to gauge the effectiveness of stocking large fingerlings for 30 to 40 years. An electrofishing survey in late spring characterized the status of largemouth bass and bluegill, and fall electrofishing measured natural walleye recruitment. Quality, preferred and memorable sizes referenced in this summary are based on standard proportions of world record lengths developed for each species by the American Fisheries Society. "Keeper size" is the team's description for black crappie and yellow perch 9 inches or longer and bluegill at least 7 inches long, based on observed angler behavior.

HABITAT AND PUBLIC ACCESS CHARACTERISTICS

North Spirit Lake and Spirit Lake, collectively known as the Spirit Lakes, are connected drainage lakes, located in Price and Taylor counties about seven miles northeast of Rib Lake, WI. Near the headwaters of the Spirit River watershed, an unnamed stream drains from Hultman and Stone lakes and joins the narrow channel between North Spirit Lake and Spirit Lake. A fixed-crest dam on the outlet of Spirit Lake raises the impoundment level about three feet above the natural condition and releases an average flow of 8.2 cubic feet per second to the Spirit River. With no gates or sluiceways, the dam offers no capability to manipulate water levels. North Spirit Lake, also known as Big Spirit Lake, has a surface area of 213 acres, a maximum depth of 22 feet and an average depth of 12 feet. The substrate is 90% gravel and 10% muck. Spirit Lake, sometimes called Little Spirit Lake, has a surface area of 126 acres, a maximum depth of nine feet and an average depth of six feet. Lakebed materials are 65% gravel, 20% muck and 15% sand. The high phosphorus and chlorophyll-a concentrations and shallow Secchi depths that citizen volunteers have diligently recorded since 1984 allow us to confidently characterize both lakes as eutrophic. Both lakes experience dense algae blooms in late summer that sometimes persist through September. Spirit Lake, having more shallow area where light can penetrate to fine substrate, produces submergent vegetation in higher stand density than North Spirit Lake, which has steeper shorelines and less aquatic vegetation. Spirit Lake and North Spirit Lake are members of the "complex-cool-dark" class of lakes that have a complex fish community with two or more predator fish species, a cool thermal regime and low water clarity. In the last 10 years, mid-summer Secchi depth averaged 2.8 feet in Spirit Lake and 4.7 feet in North Spirit Lake.

Every year in late winter, the Spirit Lakes Improvement Association operates an aerator on each lake to reduce the chance of severe winterkill, which can happen when decomposing plant material depletes dissolved oxygen in the ice-covered season. In February 2010, the channel connecting the two lakes was dredged to improve navigation. The DNR owns and maintains a public boat landing with a dock and parking lot on the south shore of Spirit Lake adjacent to State Highway 102.

SURVEY EFFORT

Our early spring netting survey was unusual in 2024. Shortly after the ice thawed several weeks earlier than normal, we set four fyke nets at known and likely walleye spawning locations in North Spirit Lake on March 14 and in Spirit Lake on March 15. We fished the nets in 24- or 48-hour sets and checked them three times in North Spirit Lake and twice in Spirit Lake when water temperature ranged from 39 to 41°F. With overnight air temperatures dropping to single digits, we removed all nets on March 19 before the lake's entire surface refroze. We reset the nets at the same locations when the ice thawed again on April 7, 2024. In both periods and both lakes combined, we captured, marked and released spawning walleye in 68 net-nights of fyke netting effort from March 14 to April 10, 2024. We also measured or counted all gamefish species encountered in that netting effort.

On April 11, 2024, two DNR crews targeted mature walleye again by nighttime electrofishing along the entire shoreline of both lakes. The proportion of marked walleye in our electrofishing survey allowed us to estimate adult walleye density.

Table 1. Fyke netting effort applied on the Spirit Lakes in 2024.

FYKE NETTING EFFORT	MARCH 14,15-APRIL 10, 2024		APRIL 18-26, 2024	
	Net-nights	Water °F	Net-nights	Water °F
North Spirit Lake	36	39-44	24	47-50
Spirit Lake	32	38-45	24	42-54
Total	68	38-45	48	42-54

In our third netting deployment of 2024, we set four fyke nets in each lake on April 18 to capture, tag and release spawning muskellunge in the first of two consecutive spring netting surveys needed to estimate their adult population density by the mark-recapture method. We fished the nets overnight for two nights and tended them on alternate days in 48 net-nights of fyke netting effort at ten locations through April 26 when water temperature ranged from 42 to 54°F. We scanned all muskies captured and injected a Passive Integrated Transponder (PIT) tag into the dorsal musculature of all that were not already tagged. We recorded the length and gender and the unique identification number of all tags applied or detected by date and net location. The ratio of tagged and untagged muskies captured by fyke netting in the spring of 2025 will allow us to estimate the number of adults in the Spirit Lakes' musky population.

Our late spring electrofishing surveys coincided with the early spawning and nest-building activities of largemouth bass and bluegill. On the night of May 22, 2024, we collected gamefish species along Spirit Lake's entire shoreline and subsampled all fish species for one mile in 0.50 hours. In North Spirit Lake, we dip-netted gamefish in two stations, each two

miles long, in 1.93 hours on June 3, 2024. That night, we subsampled all species in two half-mile segments in 0.45 hours.

Table 2. Electrofishing survey effort applied on the Spirit Lakes in 2024.

ELECTROFISHING EFFORT	APRIL 11, 2024			MAY 22 & JUNE 3, 2024			SEPTEMBER 16, 2024		
	Miles	Hours	Water °F	Miles	Hours	Water °F	Miles	Hours	Water °F
North Spirit Lake	6.15	3.07	45-46	4.00	1.93	66-70	5.78	2.37	72-74
Spirit Lake	2.91	1.43	47	2.72	1.30	63	2.54	1.00	71-73
Total	9.06	4.50	45-47	6.72	3.23	63-70	8.32	3.37	71-74

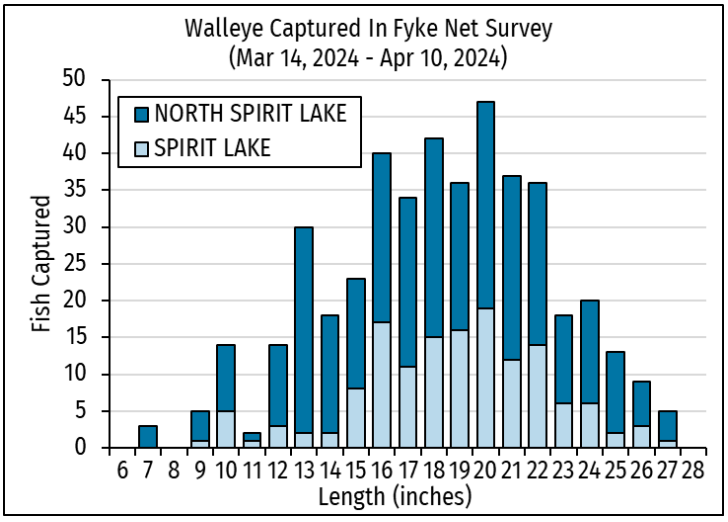
Our fall electrofishing survey targeted young walleye, but two electrofishing crews collected all gamefish along the entire shoreline of both lakes when water temperature was 6-9°F above the optimal water temperature range for sampling juvenile walleyes. In North Spirit Lake, a severe algae bloom hampered our ability to see and capture fish deeper than one foot. Spirit Lake had the water clarity that we would typically expect there.

Results and Discussion

FISH COMMUNITY

Though these surveys were not designed to characterize the entire fish community, our combined netting and electrofishing efforts in the spring and fall of 2024 captured 12 fish species, compared to 13 species collected by those methods in 2015 and 2016. Yellow perch, normally an important forage species, were nearly absent in samples that targeted all fish species. We captured only one perch, 9 inches long by electrofishing in Spirit Lake.

WALLEYE



Early spring fyke netting in 2024 captured 483 walleyes at rates that ranked between the 50th and 75th percentile values among lakes in the complex-cool-dark category (*Table 3*). These mid-range standings point to moderate population abundance. By comparison, fyke nets captured 2.9 and 5.8 walleyes per net-night in Spirit Lake and North Spirit Lake in the spring of 2016. These differences suggest that relative abundance has increased 57-66% since our last surveys. The spring netting catch rate in North Spirit Lake was nearly twice that in Spirit Lake in 2016 and 2024. Early spring electrofishing captured 130 walleyes in North Spirit Lake, including 16 that we marked and released in our netting survey. Electrofishing catch rates were 19.7 walleyes ≥ 10 inches per mile or 39.4 per hour. The 114 walleyes not handled before ranged from 6.0 to 25.0 inches and averaged 15.1 inches long. From these netting and electrofishing samples, we estimated that North Spirit Lake's walleye population had 1,743 adults (95% confidence interval = 860-2,626; coefficient of variation = 0.26) or 8.2 adults per acre. The early spring electrofishing sample in Spirit Lake

had four marked walleyes and nine unmarked walleyes. Spirit Lake's estimated walleye density was 259 adults (95% confidence interval = 112-406; coefficient of variation = 0.29) or 2.1 adults per acre. With wide confidence intervals and high coefficients of variation, these estimates are not statistically robust. Nonetheless, for comparison, walleye density averaged 1.8 adults per acre in populations maintained primarily by stocking in Wisconsin's Ceded Territory.

Table 3. Measures of walleye abundance and size distribution in the Spirit Lakes from fyke net samples in the spring of 2024 with comparison to lake class standards.

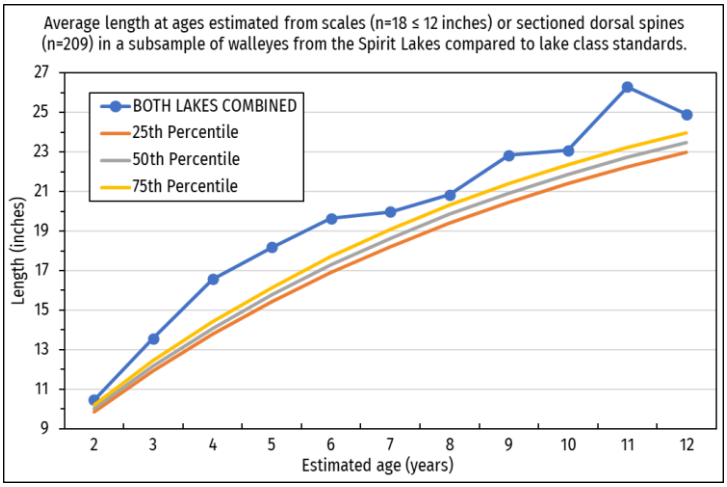
	COMPLEX-COOL-DARK LAKE CLASS						
WALLEYE	**NORTH SPIRIT**	**SPIRIT**	**COMBINED**	**CLASS PERCENTILES**			
				25th	**50th**	**75th**	**95th**
Number captured	329	154	483				
Catch per net-night	9.1	4.8	7.1	1.4	4.3	9.7	29.2
SIZE DISTRIBUTION							
Number measured	302	144	446				
Minimum Length	7.4	9.8	7.4				
Maximum Length	27.6	27.2	27.6	22.4	25.6	27.1	28.5
Average Length	18.5	19.1	18.7	13.0	15.1	17.4	20.1
% Quality Size	78	91	82				
% Legal Size	71	65	69				
% Preferred Size	41	44	42				
% Memorable Size	7.1	4.2	6.2				

Electronic records show that from 1991 to 2004 North Spirit Lake received nearly 165,000 walleye as small fingerlings, averaging about 2.7 inches long. Since 2006, our cooperators grew and stocked a total of 23,748 large walleye fingerlings into North Spirit Lake and 9,885 into Spirit Lake. Under a cooperative fish rearing agreement between the DNR and the Rib Lake Area Fish & Game Association, DNR hatchery staff delivered 1.5- to 2.5-inch fingerlings of the appropriate genetic strain to two ponds near the village of Rib Lake in late June. With cash contributions from neighboring conservation organizations, our cooperators purchased and stocked several shipments of forage to grow the walleyes through summer to 6- to 8-inch fingerlings. Each year in late September or early October, volunteers drained the ponds and stocked about 5,000 to 6,500 walleyes into 15 lakes in Taylor and Price counties. The stocked walleyes help to control panfish abundance and offer "bonus" angling opportunities. The DNR suspended cooperative fish rearing agreements for all species statewide in 2024.

We believe that stocking is the primary source of new recruits to these walleye populations. Though recent measures of natural recruitment are scarce, we found no evidence of in-lake year class production in 16 walleye recruitment surveys completed in North Spirit Lake and three in Spirit Lake between 1992 and 2024. We found no age-0 walleyes in the nine fall electrofishing surveys completed most recently. Fall electrofishing did capture walleye fingerlings at rates ranging from 11 to 76 fingerlings per mile in 1992-1996 and 2001. However, those five assessments took place two to three months after small walleye fingerlings were stocked in North Spirit Lake. Those results may hint at the short-term survival and growth of stocked walleye but not the natural production of walleye year classes. We found promising signs that the walleyes stocked recently as large fingerlings are

surviving and growing to provide angling opportunity that otherwise would not be available in the Spirit Lakes. In addition to the substantial increases in relative abundance noted above, the catch rate of age-1 walleye ranged from 0 to 27 yearlings per mile and averaged 6.4 yearlings per mile in 13 fall electrofishing surveys in the same period. We expect that the put-grow-and-take walleye fishery in the Spirit Lakes will eventually fade away without recurrent stocking at 2- or 3-year intervals to replace the adults that die to angling and natural causes. Under an approved fish stocking permit from the DNR, the Rib Lake Area Fish & Game Association purchased 1,400 large walleye fingerlings from a private hatchery and stocked them into North Spirit Lake in the fall of 2024. Continual stocking will be necessary to maintain this popular walleye fishery.

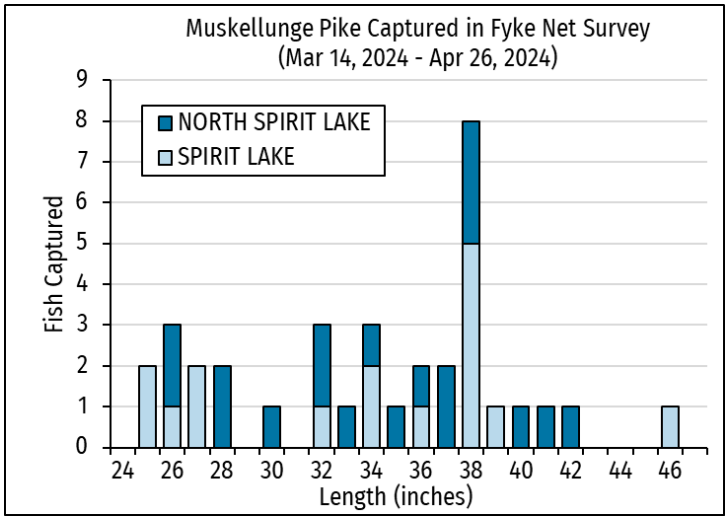
Ring counts on sectioned dorsal spines revealed that most males matured at age 3 and most females matured at age 5, though three males and two females were mature one year sooner (*Appendix 1)*. Based on our age estimates, walleyes grow fast in the Spirit Lakes. In a pooled sample of all sex categories from both lakes combined, their average length exceeded the 75th percentile value of the complex-cool-dark lake class by 0.2 to 3.1 inches at ages 2 through 12 (average=1.4; n=209).



This faster-than-average growth rate, combined with moderately low population density in Spirit Lake and despite moderately high density in North Spirit Lake, enables the population to produce higher-than-average proportions of large fish. Eighty-two percent of the walleyes ≥ 10 inches captured in fyke nets in both lakes were quality-size fish at least 15 inches or longer. Forty-two percent of walleyes in that sample grew to preferred size 20 inches or longer, and 6% were at memorable-size fish at least 25 inches long. A daily bag limit of three walleyes from 15 inches but less than 20 inches long may be kept, except one of the three may be over 24 inches. Forty percent of walleye in our fyke net sample were legal-size fish 15-19.9 inches long, and 11% were legal-size walleyes over 24 inches.

MUSKELLUNGE

Fyke netting in the spring of 2024 was intended to serve as the "marking" sample in a two-year survey to estimate the number of muskies in the Spirit Lakes. From March 14 to April 26, we tagged and released 34 muskellunge captured in fyke nets directed first at walleyes then muskies in North Spirit and Spirit lakes. If our survey priorities and staffing allow, we will set fyke nets again in mid-spring of 2025 to recapture a sample of the muskies tagged in 2024.



We can estimate population density from the ratio of tagged and untagged fish in the "recapture" sample collected by netting in the spring of 2025, provided that we can recapture at least four tagged muskies in each lake.

The fyke netting catch rates in both lakes ranked between the 25th and 50th percentiles of the complex-cool-dark lake class. By comparison, the fyke netting catch rate of 0.26 fish per net-night from all spring netting effort in 2016 (27 net-nights) matched the 25th percentile of the lake class. With four nets set in each lake for one night in the spring of 2009, we captured 1.3 muskies per net-night in Spirit Lake and 6.5 per net-night in North Spirit Lake. Though our survey effort was low in 2009, those high catch rates suggest that muskies were more abundant 15 years ago.

Table 4. Measures of muskellunge abundance and size distribution in the Spirit Lakes from fyke net samples in the spring of 2024 with comparison to lake class standards.

	COMPLEX-COOL-DARK LAKE CLASS							
MUSKELLUNGE	**NORTH SPIRIT**	**SPIRIT**	**COMBINED**	**CLASS PERCENTILES**				
				25th	**50th**	**75th**	**95th**	**99th**
Number captured	19	21	40					
Number PIT-tagged	18	16	34					
Catch per net-night	0.32	0.38	0.34	0.26	0.52	0.89	2.2	3.2
SIZE DISTRIBUTION								
Number measured	19	16	35					
Minimum Length	26.1	25.1	25.1					
Maximum Length	42.3	46.0	46.0	33.1	36.5	40.7	43.6	45.1
Average Length	34.6	34.1	34.4	18.2	23.6	28.5	36.0	41.1
% Quality Size ≥ 30"	79	69	74					
% Preferred Size ≥ 38"	32	44	37					
% Legal Size ≥ 40"	16	6.3	11					
% Memorable Size ≥ 42"	5.3	6.3	5.7					

Our recent measures of the musky population's size structure were similar in both lakes. The longest musky captured in North Spirit Lake ranked between the 75th and 90th percentile values of maximum length in the complex-cool-dark lake class. The longest from Spirit Lake was positioned between the 99th and 100th percentiles. The average length of muskies in the 2024 netting sample from both lakes placed between the 90th and 95th percentiles. The Spirit Lakes' musky fishery should satisfy avid anglers who recognize the importance of balance between size and numbers. At low to moderate abundance, the population can produce favorable shares of legal- and memorable-size fish. In the Northern Management Zone, anglers may keep a daily bag limit of one musky at least 40 inches long in the open-water period from the Saturday closest to Memorial Day through December 31. However, we suspect that most anglers release the muskies they catch.

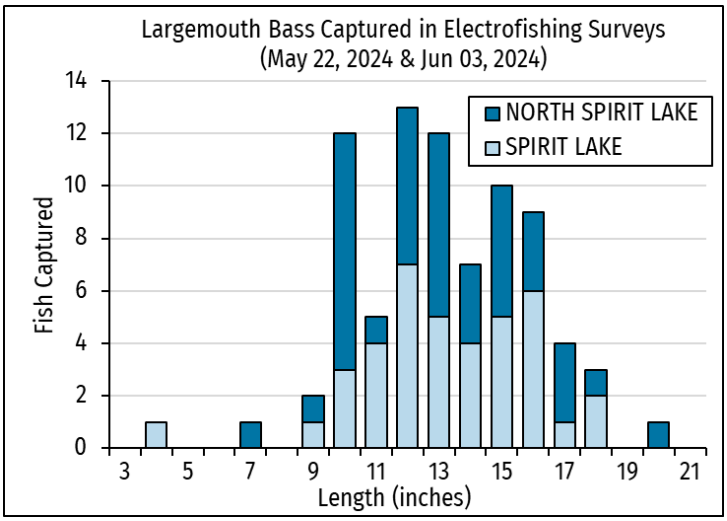
We believe new recruits enter the musky population from stocking and in-lake production to replace the adults that die from natural causes, intentional harvest and hooking injury. Following 12- and 15-year interludes when no muskies were stocked into these waters, 830 large fingerlings from public and private fish hatcheries were released into North Spirit Lake between 2005 and 2023, and 310 were stocked into Spirit Lake since 2014. Currently, the DNR stocks muskies into the Spirit Lakes at a rate of 0.5 large fingerlings per acre in odd-

numbered years. In the last four stocking events, the average length of the DNR's musky fingerlings ranged from 10.9 to 14.4 inches. Assuming that our digital stocking records are accurate, we found evidence of natural recruitment in North Spirit Lake from 10 muskies 10.0-11.9 inches long that we incidentally captured in electrofishing surveys in the spring or fall of 2001, 2004 and 2015. We completed those four surveys in years when no muskies were stocked into the Spirit Lakes or before scheduled stocking occurred in the surveyed year. Our surveys in 2001 took place from 3 to 8 years after any earlier musky stocking in either lake. Therefore, we can presume these young muskies are either age-0 fingerlings from natural reproduction in the spring of surveyed years or age-1 yearlings from the previous spring. Quantitative assessments of natural recruitment are more challenging in musky populations than in walleye populations. Without laboratory analysis to match the genetic makeup of broodstock and their stocked offspring, it's unlikely that we will be able to distinguish the relative contributions from natural reproduction and stocking that sustain the Spirit Lakes' musky population.

PIT tag recoveries shed light on the population's growth rate by comparing the length of individual fish between capture events. This method of growth assessment relies on length measurements at the beginning and the end of a period, rather than subjective interpretation of annular marks on bony structures. Of the 55 muskies that we tagged and released in the Spirit Lakes since 2015, we recaptured six in subsequent survey visits. We recaptured five tagged muskies after only 2 to 22 days of applying their tags, so those detections provide no useful information on musky growth. The longest period between tagging and tag detection was 182 days, but not surprisingly that 34.5-inch fish gained no length over winter. If we can resume netting in the spring of 2025, the PIT-tagged muskies that we recapture can shed light on their annual growth increment and movements.

LARGEMOUTH BASS

Our measures of largemouth bass population abundance and size distribution point to better-than-ordinary angling opportunity in the Spirit Lakes. Compared to lakes in the complex-cool-dark category, the electrofishing catch rate in the spring of 2024 approached the 75th percentile value in North Spirit Lake and exceeded that rank in Spirit Lake. Comparing late-spring electrofishing catch rates in our last three surveys, the relative abundance of largemouth bass in North Spirit Lake was twice that in Spirit Lake in 2009 and 2016, but the higher catches per mile and per hour have shifted to Spirit Lake in 2024. The average length of bass in North Spirit and Spirit lakes fell between the 95th and 99th percentiles of the complex-cool-dark lake class. The longest bass captured in Spirit Lake ranked in the 95th to 99th percentile range, and the longest bass from North Spirit Lake exceeded the lake class's 100th percentile value for maximum length. Anglers may keep a daily bag limit of five largemouth or smallmouth bass in any combination but they must be

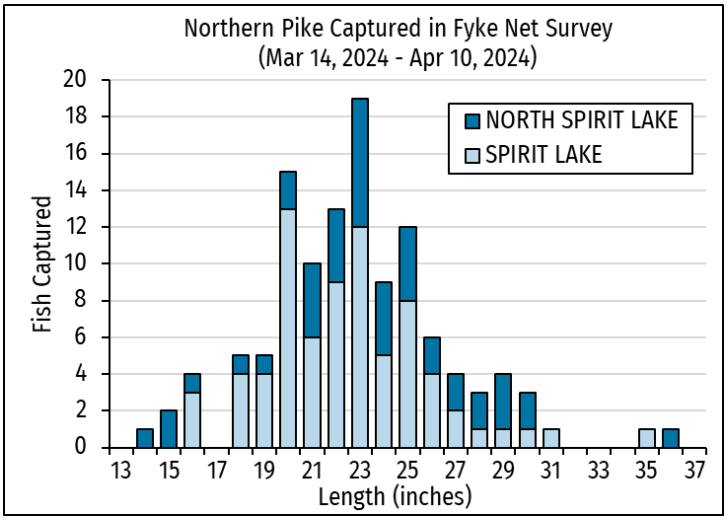


at least 14 inches long. The proportions of legal- and preferred-size fish increased since the spring of 2016 when 30% of largemouth bass captured by electrofishing in both lakes combined were 14 inches and 19% were at least 15 inches long.

Table 5. Measures of largemouth abundance and size distribution in the Spirit Lakes from electrofishing samples in the spring of 2024 with comparison to lake class standards.

	COMPLEX-COOL-DARK LAKE CLASS							
LARGEMOUTH BASS	**NORTH SPIRIT**	**SPIRIT**	**COMBINED**	**CLASS PERCENTILES**				
				25th	**50th**	**75th**	**95th**	**99th**
Number captured	41	39	80					
Catch per mile	10.3	14.3	11.9	1.7	5.4	13.2	37.3	66.3
Catch per hour	21.2	30.0	24.7	3.6	12.1	25.9	65.1	130
SIZE DISTRIBUTION								
Number measured	41	39	80					
Minimum Length	7.6	4.0	4.0					
Maximum Length	20.1	18.3	20.1	12.8	14.9	16.3	17.9	19.8
Average Length	13.4	13.6	13.5	6.6	8.4	10.8	13.2	14.3
% Quality Size	73	79	76					
% Legal Size	40	47	44					
% Preferred Size	33	37	35					
% Memorable Size	2.5	0	1.3					

NORTHERN PIKE



In 2024, early spring fyke nets set for spawning walleye in North Spirit Lake incidentally captured 49 northern pike at a rate of 1.4 pike per net-night. That catch rate ranked between the 25th and 50th percentile values for northern pike in cool, dark lakes with complex fish communities. The fyke netting catch rate of pike in Spirit Lake fell between the 50th and 75th percentiles, indicating that their relative abundance was slightly higher there. Movement and interaction of northern pike between lakes is apparent from several pike that were differentially marked and released in one lake and recaptured a few days later in the other lake. Applying Schnabel's equation[1] to the numbers of pike marked and recaptured in five successive fyke netting visits from March 15 to April 10, 2024, we coarsely estimated that the pike population in the Spirit Lakes combined had 501 adults (95% confidence interval = 296–1,630) or about 1.5 adults per acre.

[1] Ricker, W.E., 1975, *Computation and Interpretation of Biological Statistics of Fish Populations*, Fisheries Research Board of Canada, Bulletin 191.

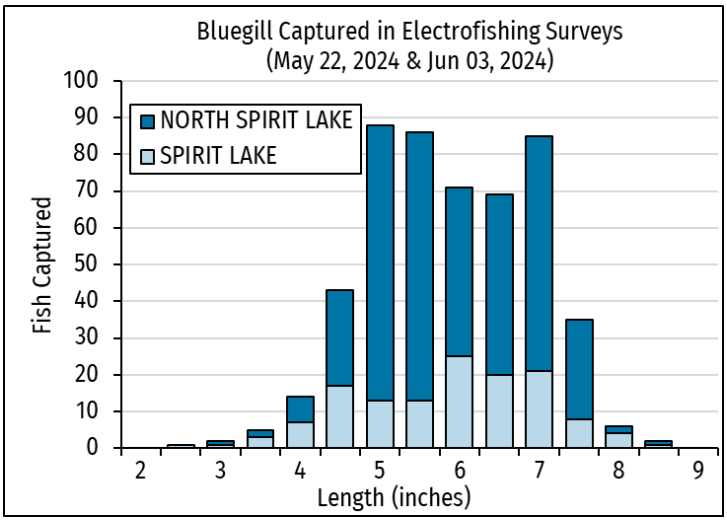
Table 6. Measures of northern pike abundance and size distribution in the Spirit Lakes from fyke net samples in the spring of 2024 with comparison to lake class standards.

NORTHERN PIKE	COMPLEX-COOL-DARK LAKE CLASS							
	NORTH SPIRIT	SPIRIT	COMBINED	CLASS PERCENTILES				
				25th	50th	75th	95th	99th
Number captured	49	83	132					
Catch per net-night	1.4	2.6	1.9	0.9	1.7	3.4	9.2	22.9
SIZE DISTRIBUTION								
Number measured	43	75	118					
Minimum Length	14.2	16.4	14.2					
Maximum Length	36.0	35.9	36.0	23.3	26.9	30.2	34.7	39.4
Average Length	24.0	22.9	23.3	12.7	16.6	19.5	22.0	23.8
% Quality Size	81	68	73					
% Preferred Size	19	6.7	11					
% Memorable Size	2.3	1.3	1.7					

Partly due to the high biological productivity and habitat diversity this system offers, anglers have opportunity to catch large pike in the Spirit Lakes. Their mean and maximum length both ranked between the 95th and 99th percentiles of those lake class values. The percentage of preferred- and memorable-size pike 28 and 34 inches or longer was higher than we typically find in neighboring lakes.

Pike abundance and size structure were similar in 2016 when fyke nets in both lakes captured 1.3 pike ≥ 14 inches per net-night, 64% attained quality size at least 21 inches long, 14% reached preferred size but none grew to memorable size. The plentiful, intermediate-size pike between 20 and 25 inches should satisfy anglers who wish to keep a meal or pickle their catch. Anglers may keep a daily bag limit of five northern pike of any size.

BLUEGILL



Late-spring electrofishing catch rates, exceeding the 95th percentile of the complex-cool-dark class of lakes, point to high bluegill abundance in Spirit and North Spirit lakes. Yet, both lakes are productive enough to grow a quarter of their bluegill population to keeper size at least 7 inches long. Nearly 4% of bluegill in Spirit Lake attained preferred size 8 inches or longer. At about three times the relative abundance of Spirit Lake's bluegill, the population in North Spirit Lake had fewer preferred-size fish. The longest bluegills in our samples from both lakes fell between the 99th and 100th percentile values among lakes in the cool-dark-complex class of lakes. The average bluegill length in the Spirit Lakes ranked between the 95th and 99th percentile values. The relative abundance of bluegill in North Spirit Lake doubled since the spring of 2016 when electrofishing captured 187 bluegill ≥ 3 inches per mile or 374 per hour. In Spirit Lake, the change in electrofishing catch rates suggest that

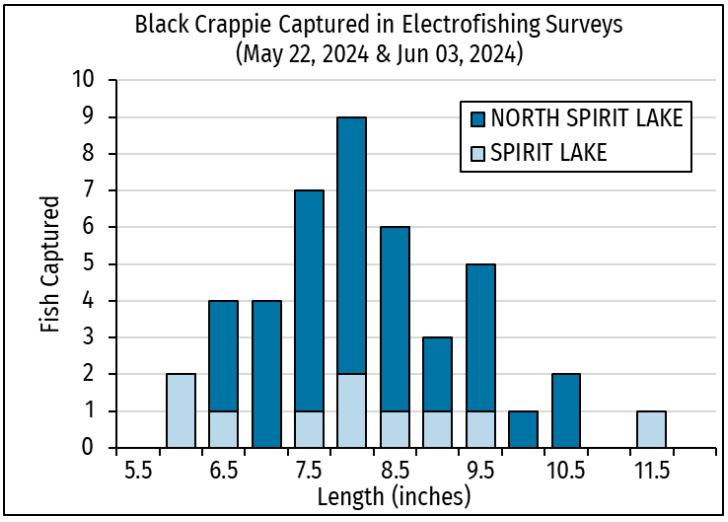
bluegill abundance remained stable or decreased slightly in that period. From 2016 to 2024, the proportion of keeper-size bluegill decreased from 33% in North Spirit Lake and 45% in Spirit Lake. Spirit Lake's bluegill population also had a slightly larger share of preferred-size fish (6%) in 2016.

Sometimes, fyke nets can catch the larger bluegills that go undetected in electrofishing surveys. The 153 bluegills that we subsampled and measured in the fyke net survey on North Spirit Lake in the spring of 2024 ranged from 3.7 to 8.3 inches, averaged 6.3 inches and included 33% at least 7 inches long, suggesting that the bluegill population has a slightly better size structure than electrofishing revealed alone. We did not measure a subsample of panfish from the fyke netting surveys in Spirit Lake. The Spirit Lakes have no special harvest restrictions. Anglers may keep a daily bag limit of 25 panfish of any size and species.

Table 7. Measures of bluegill abundance and size distribution in the Spirit Lakes from electrofishing samples in the spring of 2024 with comparison to lake class standards.

BLUEGILL	COMPLEX-COOL-DARK LAKE CLASS						
	NORTH SPIRIT	SPIRIT	COMBINED	CLASS PERCENTILES			
				25th	50th	75th	95th
Number captured	373	134	507				
Catch per mile	373	134	254	42.1	106	188	314
Catch per hour	829	268	534	72	178	308	591
SIZE DISTRIBUTION							
Number measured	373	134	507				
Minimum Length	3.4	2.9	2.9				
Maximum Length	8.5	8.6	8.6	5.9	6.5	7.2	7.8
Average Length	6.1	6.1	6.1	3.0	3.5	4.2	5.5
% Quality Size	51	59	53				
% Keeper Size	25.2	25.6	25.3				
% Preferred Size	0.8	3.8	1.6				

BLACK CRAPPIE



In 2024, we did not assess the abundance and size structure of crappies in a fall fyke netting survey, nor did we count or measure all crappies captured in spring fyke nets, as we typically do. Late-spring electrofishing along 1.00 shoreline mile per lake captured 10 crappies, ranging from 6.1 to 11.9 inches and averaging 8.3 inches long in Spirit Lake. The electrofishing sample from North Spirit Lake had 34 crappies ranging from 6.7 to 10.6 inches and averaging 8.4 inches. However, we are skeptical that late spring electrofishing samples can adequately represent crappie population status. A subsample of 95 crappies measured from 601 captured four fyke net lifts in North Spirit Lake ranged from 6.5 to 10.2 inches and averaged 7.6 inches long. We cannot make meaningful inferences from these

limited samples, so we recommend targeting crappies by fyke netting in both lakes in the spring or fall of 2031 in the next round of scheduled surveys.

YELLOW PERCH

It has been difficult for us to properly characterize the status of yellow perch populations by our traditional survey methods. In the spring of 2024, electrofishing captured 56 perch. The electrofishing catch rates were 34 fish per mile for perch five inches and longer and 112 perch per mile for all sizes. We found none longer than six inches. Perch are the preferred food of walleye, northern pike and largemouth bass. Lucky anglers may find larger perch that evaded our sampling gear.

Management Recommendations

FUTURE EVALUATIONS

- At a 7-year frequency, the next fishery surveys in the Spirit Lakes are scheduled in 2031.

WALLEYE

- Resume the long-standing cooperation between the DNR and the Rib Lake Area Fish & Game Association to raise and stock the large fingerlings that are necessary to maintain the popular walleye fishery in the Spirit Lakes.

MUSKELLUNGE

- Complete the second year fyke netting survey in the spring of 2025 to estimate adult population density.
- In 2031, collect somatic tissue for genetic analysis to identify the relative contributions from stocking and natural reproduction to musky recruitment, so that stocking can be optimized or eliminated.

PANFISH

- Target black crappies by fyke netting in the spring or fall of 2031 to characterize their population abundance and size distribution.
- Extract otoliths from a subsample of crappies to estimate their age and model their growth, then donate the carcasses to the local wildlife rehabilitation center.

SHORELAND MANAGEMENT

- The Spirit Lakes Improvement Association should promote sound shoreland management practices and encourage shoreland owners to consider alternatives to placing riprap for erosion control, especially on low energy sites.
- The Spirit Lakes Improvement Association should investigate the variety of surface water grants that are available to help shoreland owners protect and restore important ecological functions in their riparian zone.

MISCELLANEOUS

- The Spirit Lakes Improvement Association should request and obtain a Fishing Tournament Permit for its annual icefishing contest, if expected participation exceeds

100 anglers. Fishing competitions that have fewer than 100 participants or 20 boats do not require a Fishing Tournament Permit from the DNR, but organizers must register all fishing contests at least 72 hours before the event starts.

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Appendix 1. Average length at ages estimated from scales (n=18 ≤ 12 inches) or sectioned dorsal spines (n=209) in a subsample of walleyes from North Spirit Lake, Spirit Lake and both lakes combined.

AGE	NORTH SPIRIT LAKE												COMPLEX-COOL-DARK PERCENTILES		
	FEMALE			MALE			UNKNOWN			ALL SEXES COMBINED					
	LENGTH (inches)		COUNT	LENGTH (inches)		COUNT	LENGTH (inches)		COUNT	LENGTH (inches)		COUNT			
	AVERAGE	RANGE		AVERAGE	RANGE		AVERAGE	RANGE		AVERAGE	RANGE		25th	50th	75th
2				13.0	-	1	10.0	7.4 - 12.4	15	10.2	7.4 - 13	16	9.9	10.0	10.2
3				13.5	12.1 - 15.6	18	13.9	13.2 - 14.7	3	13.6	12.1 - 15.6	21	11.9	12.2	12.4
4	19.4	18.5 - 20.2	2	15.9	14.4 - 17.3	11	18.9	16.5 - 21.3	2	16.7	14.4 - 21.3	15	13.8	14.1	14.4
5	19.6	17.6 - 22.8	12	16.2	12.8 - 18.2	8	18.1	-	1	18.2	12.8 - 22.8	21	15.4	15.8	16.2
6	20.9	19.0 - 22.7	18	17.9	16.6 - 19.3	9				19.9	16.6 - 22.7	27	16.9	17.3	17.7
7	22.0	21.6 - 22.2	4	17.9	17 - 19.1	6				19.6	17 - 22.2	10	18.2	18.6	19.1
8	23.4	22.8 - 23.8	4	18.2	15.8 - 19.5	4				20.8	15.8 - 23.8	8	19.4	19.8	20.3
9	24.6	24.3 - 25.2	4	19.6	19.1 - 19.9	3				22.5	19.1 - 25.2	7	20.5	20.9	21.4
10	24.1	-	1	18.5	-	1				21.3	18.5 - 24.1	2	21.4	21.9	22.4
11	26.4	25.7 - 27.2	4							26.4	25.7 - 27.2	4	22.2	22.7	23.2
12	26.1	-	1	20.3	-	1				23.2	20.3 - 26.1	2	23.0	23.5	24.0

AGE	SPIRIT LAKE												COMPLEX-COOL-DARK PERCENTILES		
	FEMALE			MALE			UNKNOWN			ALL SEXES COMBINED					
	LENGTH (inches)		COUNT	LENGTH (inches)		COUNT	LENGTH (inches)		COUNT	LENGTH (inches)		COUNT			
	AVERAGE	RANGE		AVERAGE	RANGE		AVERAGE	RANGE		AVERAGE	RANGE		25th	50th	75th
2				12.5	12.2 - 12.7	2	11.0	10.7 - 11.3	2	11.7	10.7 - 12.7	4	9.9	10.0	10.2
3							13.7	-	1	13.7	-	1	11.9	12.2	12.4
4				15.8	15.1 - 16.4	3				15.8	15.1 - 16.4	3	13.8	14.1	14.4
5	19.0	18.3 - 20.2	8	16.9	16.4 - 18.4	5	17.7	17.3 - 18.6	3	18.1	16.4 - 20.2	16	15.4	15.8	16.2
6	20.7	18.6 - 24	11	16.6	15.9 - 17.2	6	19.5	-	1	19.2	15.9 - 24	18	16.9	17.3	17.7
7	21.0	20.2 - 22.2	9	18.7	17.8 - 20.2	4				20.3	17.8 - 22.2	13	18.2	18.6	19.1
8	22.7	21.7 - 24.6	5	18.6	17.1 - 19.2	4				20.9	17.1 - 24.6	9	19.4	19.8	20.3
9	23.5	22.5 - 24.1	4							23.5	22.5 - 24.1	4	20.5	20.9	21.4
10	24.0	23 - 24.8	4							24.0	23 - 24.8	4	21.4	21.9	22.4
11	26.1	25.9 - 26.3	2							26.1	25.9 - 26.3	2	22.2	22.7	23.2
12	26.6	26 - 27.2	2							26.6	26 - 27.2	2	23.0	23.5	24.0

AGE	BOTH LAKES COMBINED												COMPLEX-COOL-DARK PERCENTILES		
	FEMALE			MALE			UNKNOWN			ALL SEXES COMBINED					
	LENGTH (inches)		COUNT	LENGTH (inches)		COUNT	LENGTH (inches)		COUNT	LENGTH (inches)		COUNT			
	AVERAGE	RANGE		AVERAGE	RANGE		AVERAGE	RANGE		AVERAGE	RANGE		25th	50th	75th
2				12.6	12.2 - 13.0	3	10.1	7.4 - 12.4	17	10.5	7.4 - 13	20	9.9	10.0	10.2
3				13.5	12.1 - 15.6	18	13.9	13.2 - 14.7	4	13.6	12.1 - 15.6	22	11.9	12.2	12.4
4	19.4	18.5 - 20.2	2	15.8	14.4 - 17.3	14	18.9	16.5 - 21.3	2	16.6	14.4 - 21.3	18	13.8	14.1	14.4
5	19.4	17.6 - 22.8	20	16.5	12.8 - 18.4	13	17.8	17.3 - 18.6	4	18.2	12.8 - 22.8	37	15.4	15.8	16.2
6	20.8	18.6 - 24	29	17.4	15.9 - 19.3	15	19.5	-	1	19.6	15.9 - 24	45	16.9	17.3	17.7
7	21.3	20.2 - 22.2	13	18.3	17 - 20.2	10				20.0	17 - 22.2	23	18.2	18.6	19.1
8	23.0	21.7 - 24.6	9	18.4	15.8 - 19.5	8				20.8	15.8 - 24.6	17	19.4	19.8	20.3
9	24.0	22.5 - 25.2	8	19.6	19.1 - 19.9	3				22.8	19.1 - 25.2	11	20.5	20.9	21.4
10	24.0	23 - 24.8	5	18.5	-	1				23.1	18.5 - 24.8	6	21.4	21.9	22.4
11	26.3	25.7 - 27.2	6							26.3	25.7 - 27.2	6	22.2	22.7	23.2
12	26.4	26 - 27.2	3	20.3	-	1				24.9	20.3 - 27.2	4	23.0	23.5	24.0