WISCONSIN DEPARTMENT OF NATURAL RESOURCES

# Fishery Survey Summary
# Musser Flowage
# 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 Musser Flowage. The estimate of adult walleye population density derived from the early spring netting and electrofishing surveys helped us evaluate the biennial walleye stocking strategy that we initiated in 2014. We continued netting muskellunge in mid-spring to estimate their adult abundance and to gauge the effectiveness of stocking large fingerlings in odd-numbered years since 2001. An electrofishing survey in late spring characterized the status of largemouth bass and bluegill, and fall electrofishing measured natural walleye recruitment. The DNR's Treaty Fishery Assessment Team estimated angling pressure, catch and harvest in a creel survey from May 4 through October 31, 2024. 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

Musser Flowage is a shallow, 563-acre impoundment on the mainstem of the Elk River, located about seven miles east of Phillips, Wisconsin. Three additional tributaries contribute to an estimated annual discharge of 79 cubic feet per second from the 12-foot-high concrete dam. Maximum depth is 15 feet, and a fourth of the surface area is less than 3 feet deep. Late-summer Secchi disk depths, averaging 3.3 feet from the last 10 years, indicate low water clarity. Citizen monitoring data collected almost annually since 1992 consistently reveal eutrophic conditions with high levels of dissolved nutrients that can give rise to severe algae blooms, oxygen-depleted bottom water and dense aquatic vegetation in summer. Musser Flowage belongs in the class of riverine lakes that have a complex fish community.

Lake map symbols show a lakebed comprised entirely of sand and muck—substrates conducive to vegetative growth. Eurasian water milfoil, an invasive plant that went undetected in six surveys from 2010 to 2017, was found most frequently among 27 native and two exotic aquatic plant species documented in an August 2024 survey. The occurrence of invasive curly-leaf pondweed has decreased significantly since its highest abundance recorded in 2013. Similar to previous survey findings, coontail was the most frequently found native plant species in 2024. Rooted aquatic plants grow to a maximum depth of eight feet, but low water clarity limits light penetration, so most of the aquatic vegetation grows between three and six feet deep.

In 1996, 1998, and 2002 rock blankets (low-profile layers of 2- to 12-inch diameter field stone) were added at one mid-lake and nine shoreline locations (total = 46,125 square feet) in an

attempt to create walleye spawning habitat. Though we have captured spawning adults on these artificial reefs, no positive effect on walleye reproduction could be attributed to the rock blankets after several years of evaluation.

Price County maintains a shore fishing pier near the dam, and the Towns of Worcester and Emery provide three public boat landings at the ends of Woodland Lane and Peninsula Drive on the north shore and off Musser Drive on the south shore. The main boat landing on Woodland Drive has a concrete ramp, a boarding pier and ample parking. The other two access sites are shallow and suitable for launching canoes and kayaks but not boats from trailers. Town ordinances regulate boat speed in "no wake" areas marked by buoys and prohibit jet-skiing, waterskiing, knee-boarding, tubing, etc. from 9 a.m. to 6 p.m.

## SURVEY EFFORT

Our early spring netting survey was unusual in 2024. On March 14, shortly after the ice thawed several weeks earlier than normal, we set six fyke nets at known and likely walleye spawning locations. We fished the nets in 48-hour sets and checked them twice when water temperature ranged from 38 to 42° F. With overnight air temperatures dropping to single digits, we removed all nets on March 18 before the lake's entire surface refroze. We reset the nets when the ice thawed again on April 7, 2024. In both periods combined, we captured, marked and released spawning walleye in 78 net-nights of fyke netting effort from March 14 to April 15, 2024. We also measured or counted all gamefish species encountered in that netting effort. On April 15, 2024, we targeted mature walleye again by nighttime electrofishing along the entire shoreline. Two DNR crews sampled 12.10 shoreline miles in 4.72 hours of electrofishing effort when the water temperature was 56-59° F. The proportion of marked walleye in our electrofishing survey allowed us to estimate adult walleye density.

In our third netting deployment of 2024, we set six fyke nets on April 17 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 eight locations through April 25 when water temperature ranged from 43 to 52° 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 of all muskies 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 Musser Flowage's musky population.

With water temperature between 67 and 68° F, our May 20, 2024 electrofishing survey coincided with the early spawning and nest-building activities of largemouth bass and bluegill. We collected gamefish species along 4.0 shoreline miles in 1.93 hours and subsampling all fish species for one mile in 0.52 hours.

Our September 17, 2024 electrofishing survey targeted young walleye, but we collected all gamefish along 5.80 shoreline miles in 2.55 hours when water temperature was 75° F. The optimal water temperature range for sampling juvenile walleyes is 55-65° F.

A creel clerk counted and interviewed anglers on a randomized schedule through the open-water period of the 2024-2025 fishing season to estimate fishing pressure, catch and harvest.

# Results and Discussion

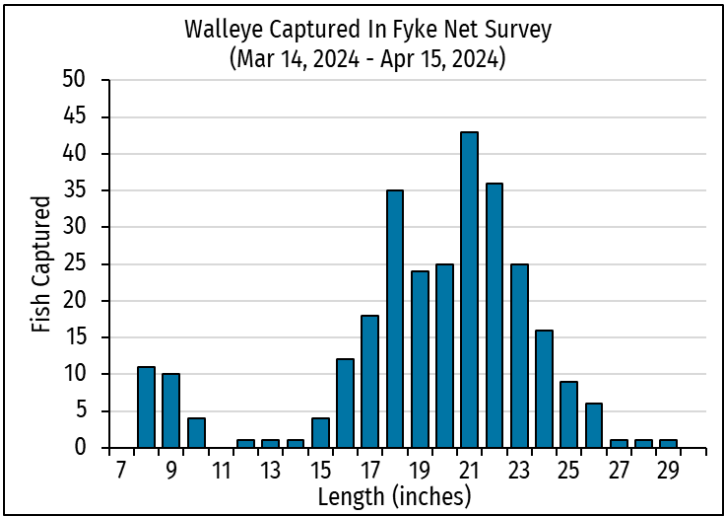
## FISH COMMUNITY

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 13 fish species, compared to 18 species collected by those methods in 2016 and 2017 and 16 species found in 2010 and 2011. We found troutperch, creek chubs, shorthead redhorse, common shiners and brown bullheads in those earlier surveys but not in 2024. After stocking a total of 50,321 large fingerling walleyes since 2014, largemouth bass and muskellunge are still the co-dominant predators in the fish community. Sadly, the combined predatory pressure from Musser Flowage's self-sustaining largemouth bass and northern pike and its walleye and muskellunge still cannot control panfish abundance to improve panfish size.

## FISHING PRESSURE

Based on projections from the creel clerk's counts, anglers spent 9,689 daylight hours or 17.2 hours per acre fishing on Musser Flowage in the spring, summer and fall of 2024, regardless of the species targeted. By comparison, fishing pressure ranged from 1.73 to 164 hours per acre in 687 open-water creel surveys completed in Wisconsin's Ceded Territory between 1990 and 2023. Musser Flowage's projected fishing pressure in 2024 ranked near the 34$^{th}$ percentile value of that dataset. Note that directed fishing effort is an estimate of the hours anglers spent fishing for individual species.

## WALLEYE




Early spring fyke netting in 2024 captured 371 walleyes at a rate of 4.8 fish per net-night. That catch rate ranked between the 75$^{th}$ and 90$^{th}$ percentile values among lakes in the complex-riverine category. Excluding the fish that we recaptured, the 284 unique walleyes in the fyke net sample ranged from 8.0 to 29.4 inches and averaged 19.9 inches long. Early spring electrofishing captured 95 walleyes, including 19 that we marked and released in our netting survey. Electrofishing catch rates were 4.5 walleyes ≥ 10 inches per mile or 11.7 per hour. The 76 walleyes not handled before ranged from 7.5 to 25.8 inches and averaged 14.0 inches. From these netting and electrofishing samples, we estimated that Musser Flowage's walleye population had 697 adults (95% confidence interval = 450-943; coefficient of variation = 0.18) or 1.2 adults per acre. The ratio of males to females in our early spring samples was 0.5. Walleye density in Musser Flowage was below the average value of 1.8 adults per acre in populations maintained primarily by stocking in Wisconsin's Ceded Territory.

Ring counts on sectioned dorsal spines revealed that, on average, males grew to 17.1 inches in four years (range 16.0-18.1; n=3), 18.0 inches in six years (range 16.7-19.3; n=11) and 20.0 inches in eight years (range 18.5-21.8; n=8). The female walleyes in our aged subsample reached 18.6 inches in 4 years (n=1), 19.4 in five years (n=1), 21.5 inches in six years (range 19.3–24.8; n=23), 22.3 inches in seven years (range 18.3-25.2; n=8) and 24.3 inches in eight years (range 21.1-28.3; n=23). Most (89%) of the females in our aged subsample were 6-8 years old (n=54). A 10.8-inch, age-2 male was the only mature walleye less than four years old. Based on our age estimates, walleye grow fast in Musser Flowage. In a pooled sample of males and females, average length at ages 6-8 exceeded the 75$^{th}$ percentile values by 1.5-1.9 inches (n=76). The mean length of Musser Flowage's walleyes at ages 4 to 8 exceeded the regional averages for northern Wisconsin by 2.9 to 3.2 inches.

This faster-than-average growth rate, combined with low population density, enables the population to produce higher-than-average proportions of large fish. Nearly all (97%) of walleyes ≥ 10 inches captured in fyke nets were quality-size fish at least 15 inches long. Sixty-two percent in that sample were 20 inches or longer, and 7% were at least 25 inches long. The population's favorable size distribution should meet the expectations of anglers who are patient and skilled enough to find and catch walleye in low abundance. A daily bag limit of three walleyes from 15 inches but less than 20 inches may be kept, except one of the three may be over 24 inches. One third of all walleyes in our fyke net sample were legal-size fish 15-19.9 inches long, and 12% were legal-size walleyes over 24 inches.

The low density of the walleye population is reflected in the low amount of time that anglers spent trying to catch them. In 2024, walleyes received only 459 hours of directed angling effort or 3.6% of the total—the least effort aimed toward seven fish species in the open-water creel survey. Projections reveal that anglers caught 255 walleyes and kept 33 legal-size fish whose average length was 17.7 inches.

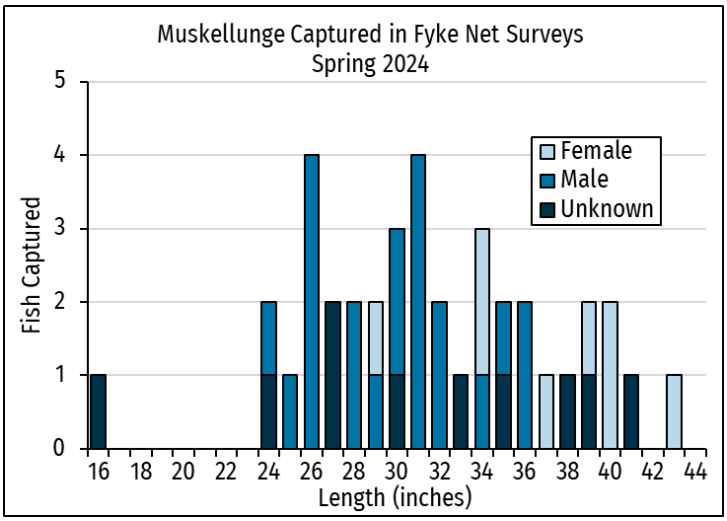
Electronic records dating back to 1991 show that the DNR stocked walleyes into Musser Flowage Lake, beginning in 1992 with small fingerlings from 1.2 to 3.3 inches long, then with 6- to 7-inch fingerlings in even-numbered years beginning in 2014. The most common dosages were 35 or 50 small fingerlings per acre and 20 large fingerlings per acre. The intent of walleye stocking was to shift fish community dominance to a predator capable of controlling panfish abundance. But habitat conditions that strongly favor other species stymied our attempts to increase effective predation on bluegill, black crappie and yellow perch. Stocking is the only source of new recruits to Musser Flowage's walleye population. We captured no age-0 walleyes in 10 fall electrofishing surveys from 2014 to 2024. Nonetheless, the stocked fingerlings are surviving and growing to increase walleye abundance since our most recent surveys. In the spring of 2024, fyke nets captured walleyes ≥ 10 inches at a rate nearly twice as fast as that recorded in the spring of 2017 when estimated walleye population density was 0.2 adults per acre, based on the ratio of fin-clipped to newly captured fish in four successive fyke net lifts.

This marginal return on the state's investment in stocking more than 50,000 large fingerlings must be carefully scrutinized, however. Stocking small and large fingerlings regularly over the last 31 years did not establish a self-sustaining population. The

annualized cost to maintain a put-and-grow walleye fishery in Musser Flowage was $5,334, and the total cost of stocking 20 large fingerlings per acre in even-numbered years was $53,340 since 2014. Intensive stocking at the highest experimental rate produced a low density walleye population, which attracted very little angling attention. Walleye density was near the threshold (one adult per acre) considered necessary for a viable walleye fishery. This meager return on a substantial investment warrants that we suspend walleye stocking as a fishery management strategy in Musser Flowage.

## 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 Musser Flowage. We PIT-tagged and released 38 muskellunge captured in fyke nets directed first at walleyes then muskies. 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.




Our fyke netting catch rate of 0.34 muskies per net-night ranked between the 50th and 75th percentiles of the complex-riverine lake class. By comparison, the fyke netting catch rate 0.73 fish per net-night from all spring netting effort in 2017 (90 net-nights) fell between the 75th and 90th percentile values. Excluding five tagged fish recaptured in spring nets, their total length ranged from 16.3 to 43.4 inches and averaged 32.1 inches long. The average length of muskies in the 2024 netting sample placed between the 75th and 90th percentiles among complex-riverine lakes, and maximum length exceeded the 100th percentile value. Two-thirds were quality-size fish 30 inches or longer, 18% were preferred-size muskies at least 38 inches long and 2.6% attained memorable size ≥ 42 inches.

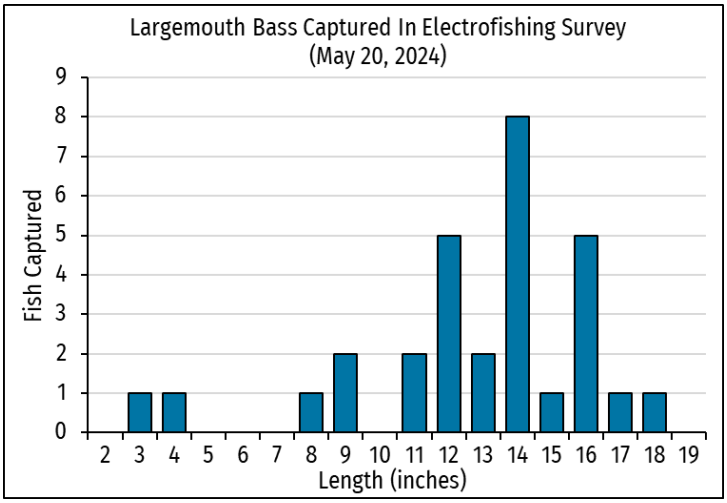
New recruits enter the musky population from stocking and in-lake production to replace the adults that die due to natural causes and angling. The DNR has stocked 4,570 muskies into Musser Flowage in 13 of the 16 odd-numbered years since 1993, initially at a rate of two fingerlings per acre. The stocking rate was reduced to 0.5 fingerlings per acre in 2001, then further reduced to 0.25 fingerlings per acre in 2017. Over the same period, the average length of the stocked fingerlings gradually increased from 8 to 14 inches. We found evidence of natural recruitment from three muskies 8.5-8.9 inches and one 11.2 inches long that we incidentally captured in electrofishing evaluations of walleye recruitment in the fall of 2002, 2018, 2020 and 2021. We completed those four surveys before scheduled stocking occurred or in years when no muskies were stocked into Musser Flowage. Therefore, we can presume these are age-0 fingerlings from natural reproduction in the spring of those years. 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 Musser Flowage's 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 156 muskies that we tagged and released in Musser Flowage since 2015, we recaptured 15 in subsequent surveys. We recaptured 11 tagged muskies after only one to 30 days of applying their tags, so those detections provide no useful information on musky growth. Three tagged muskies recaptured after 516, 564 and 578 days at large gained 0.9, 1.4 and 5.0 inches, respectively. As expected, the largest annual increment came early in the growth history of a young musky that grew from 19 to 24 inches long in about 1.5 years. The longest period between tagging and tag detection was 1,621 days or about 4.4 years over which a 32.1-inch musky gained 6.0 inches, despite the injury to its upper jaw that we noted at recapture. Surprisingly, in our 2024 surveys we recaptured none of the 84 muskies tagged in 2015 through 2017, including 10 fingerlings 10.5 to 13.2 inches long tagged and presumably stocked in the fall of 2015, even though muskies are known to live much longer than 10 years.

Muskies were the most sought-after sportfish in Musser Flowage, attracting 2,999 hours of targeted fishing effort or 23.5% of the directed effort total. Estimated catch was 199 muskies, but as expected, none were kept. On average, anglers targeting muskies fished 16 hours to catch one in Musser Flowage. In a comparison of specific catch rates across the Ceded Territory, anglers fished 30 hours for each musky they caught and reported in 543 creel surveys since 1990.

## LARGEMOUTH BASS




In our late-spring electrofishing survey, we captured 30 largemouth bass ranging from 3.6 to 18.4 inches and averaging 13.3 inches long. Our catch rates of 7.0 bass ≥ 8 inches per mile or 15 per hour suggest that population abundance has changed little since 2017 when late-spring electrofishing captured 5.4 bass ≥ 8 inches per mile and 13 per hour. Grouping largemouth bass of all sizes, the electrofishing capture rates of 7.5 bass per mile and 15.5 largemouth bass per hour in Musser Flowage in the spring of 2024 both ranked between the 50$^{th}$ and 75$^{th}$ percentile values among lakes that have a complex fish community and riverine habitat conditions. While electrofishing for young

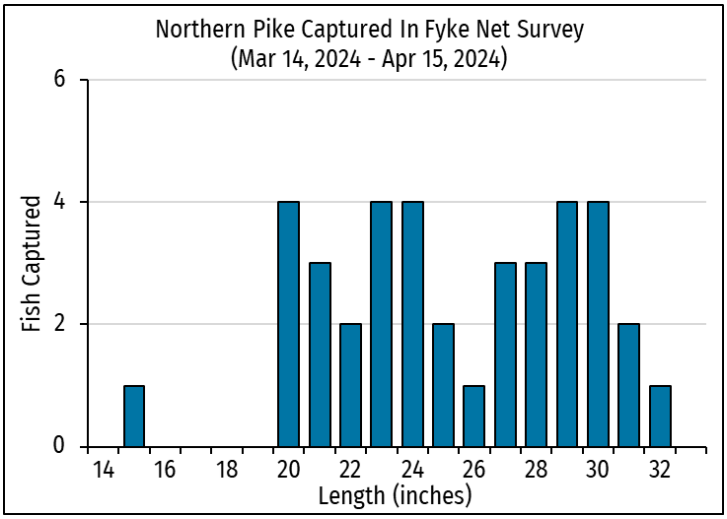
walleye in the fall, we incidentally captured 51 largemouth bass that ranged from 8.0 to 18.5 inches and averaged 13.9 inches long.

At low to moderate abundance, the size structure of the largemouth bass population improved since our preceding measures. The average length increased 3.3 inches from the sample of 31 bass collected by electrofishing in the late spring of 2017. We noted an identical improvement in the average length of largemouth bass in fall electrofishing samples from 2017 and 2024. The proportions of legal-size bass ≥ 14 inches and preferred-size bass ≥ 15 inches in spring electrofishing samples increased from 22% and 4.3% in 2017 to 57% and 29% in 2024. The average length of bass in the spring of 2024 closely matched the 99$^{th}$ percentile value of the complex-riverine lake class, and the longest bass measured in 2024 ranked between the 95$^{th}$ and 99$^{th}$ percentiles of maximum length values. Musser Flowage lies within the Northern Bass Management Zone where anglers may keep largemouth bass from the first Saturday in May through the first Sunday in March. Smallmouth bass may be kept from the third Saturday in June through the first Sunday in March. A daily bag limit of five largemouth bass or smallmouth bass in any combination may be kept, but they must be at least 14 inches long. Though we captured smallmouth bass in the Elk River upstream and downstream from Musser Flowage, smallmouth bass were never recorded in 37 fish surveys on Musser Flowage since 1970.

In 2024, anglers on Musser Flowage directed nearly as much fishing effort toward largemouth bass as they did toward muskies. Anglers fished 2,859 hours in pursuit of largemouth bass, accounting for 22.4% of the total directed effort. They caught 1,187 largemouth bass and kept 24, releasing 98% of the estimated catch. The two largemouth bass measured by the creel clerk were 14.8 and 16.5 inches long. The clerk did not see the smallmouth bass that anglers said they caught and released in August and September. From those unverified reports, we estimated that anglers incidentally caught 36 smallmouth bass and kept none while they fished for other species. If the fish reported in those interviews were indeed smallmouth bass, and not misidentified, their reported catch would be the first record of the species in Musser Flowage.

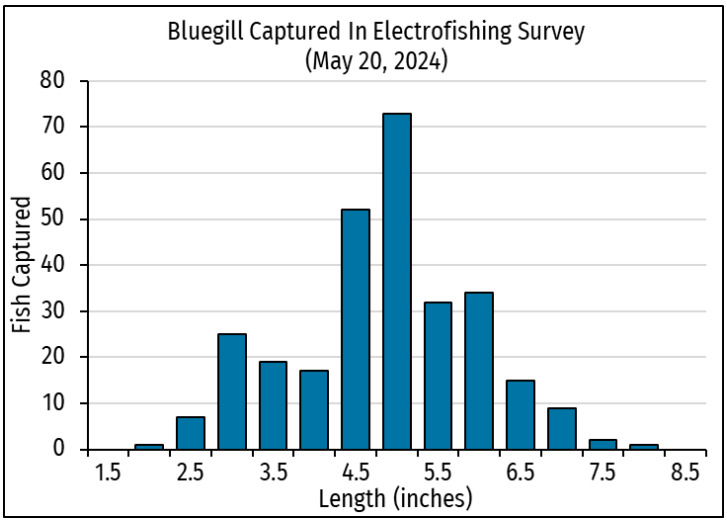
## NORTHERN PIKE

Early spring fyke nets set for spawning walleye incidentally captured 40 northern pike at a rate of 0.5 pike per net-night. That catch rate ranked between the 10$^{th}$ and 25$^{th}$ percentile values for northern pike in riverine lakes with complex fish communities, suggesting low population abundance. The 38 pike captured just once ranged from 15.8 to 32.3 inches and averaged 25.7 inches long. Their mean length nearly matched the 100$^{th}$ percentile value of the complex-riverine lake class, signaling the need to revise the class standards. Eighty-seven percent were quality-size fish ≥ 21 inches long, and 37% attained preferred size ≥



28 inches. Our recent measures of pike abundance and size structure were comparable to those from spring 2017 when 90 nights of fyke netting effort directed first toward walleyes then muskies captured 1.0 pike per net-night, 84% attained quality size, 35% reached preferred size and 6% grew to memorable size at least 34 inches long. We measured no memorable-size pike in 2024. Still, the size distribution of Musser Lake's pike population is somewhat better than we typically find in neighboring lakes. The plentiful, intermediate-size pike between 22 and 28 inches should satisfy anglers who wish to keep a meal. Anglers may keep a daily bag limit of five northern pike of any size. In the open-water period, we estimated that anglers caught 114 pike in 1,194 hours or 9.3% of the total directed fishing effort. They kept 51 northern pike that ranged from 25.0 to 34.9 inches and averaged 28.0 inches long.

## BLUEGILL




Electrofishing along a mile of Musser Flowage's shoreline in late spring produced a sample of 287 bluegills that ranged from 2.2 to 8.1 inches and averaged 5.1 inches long. The longest bluegill exceeded the 100$^{th}$ percentile value for maximum bluegill length among complex-riverine lakes. Their average length ranked between the 75$^{th}$ and 90$^{th}$ percentiles of that lake class. Our electrofishing catch rate of 287 bluegills per mile fell between the 90$^{th}$ and 95$^{th}$ percentiles. Similarly, our catch rate of 556 bluegills per hour was between the 95$^{th}$ and 99$^{th}$ percentiles. When compared to lakes with similar characteristics, these high catch rates point to high bluegill abundance in Musser Flowage. Their relative abundance has roughly doubled since late spring 2017 when electrofishing captured 135 bluegills per mile and 331 per hour. Though their average length increased one half inch since our last survey, the proportion of keeper-size bluegill ≥ 7 inches in spring electrofishing samples decreased from 8% in 2017 (n=140) to 4% in 2024. Sometimes, fyke nets can catch the larger bluegills that go undetected in electrofishing surveys. The 56 bluegills that we subsampled and measured from our walleye netting effort ranged from 3.4 to 7.5 inches and averaged 5.5 inches long. The netting subsample had twice the share of keeper-size bluegill (9%) than the electrofishing sample had. Musser Flowage has no special harvest restrictions. Anglers may keep a daily bag limit of 25 panfish of any size and species. Creel survey projections show that anglers caught 10,887 bluegills and harvested 2,374 in 2,369 hours, or 18.5% of directed fishing effort. The creel clerk measured 100 harvested bluegills that averaged 6.9 inches, but only one fish in that sample reached preferred size 8 inches or longer.

## 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 1.0 shoreline mile captured 51 crappies,

ranging from 4.8 to 9.5 inches and averaging 6.1 inches long. However, we are skeptical that late spring electrofishing samples can adequately represent crappie population status. A subsample of 137 crappies measured from several fyke net lifts ranged from 4.2 to 11.3 inches and averaged 6.0 inches long. Anglers spent 2,286 hours fishing for crappies from May through October 2024, catching an estimated 4,830 and keeping 751 that ranged from 6.0 to 11.9 inches and averaged 8.9 inches long. Panfish anglers tend to keep the largest fish they catch, but only 15% of the crappies harvested from Musser Flowage were keeper-size fish 9 inches or longer. We cannot make meaningful inferences from our limited samples, so we recommend targeting crappies by fyke netting in the spring and fall of 2030 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 18 perch. The electrofishing catch rates were 12 fish per mile for perch 5 inches and longer and 18 perch per mile for all sizes. We found none longer than 7.5 inches. We got an indirect, unconventional indication of abundant perch 5 to 7 inches long that were gilled in the mesh of fyke nets that we removed three times from Musser Flowage in spring 2024. Perch are the preferred food of walleye, northern pike and largemouth bass. Lucky anglers may find larger perch that evaded our sampling gear, but apparently, only a few did in 2024. In the open-water creel survey, anglers caught 1,466 yellow perch in 616 hours spent fishing for them, but they kept only 186 between 7.0 and 9.9 inches long. Eleven of the 14 harvested perch measured by the creel clerk were less than 9 inches.

## Management Recommendations

### FUTURE EVALUATIONS

- At a 6-year frequency, the next fishery surveys in Musser Flowage are scheduled in 2030.

### WALLEYE

- Discontinue walleye stocking in Musser Flowage.

### MUSKELLUNGE

- Complete the second year fyke netting survey in the spring of 2025 to estimate adult population density.
- In 2030, 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 2030 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 Musser Lake 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 Musser Flowage 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.

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