WISCONSIN DEPARTMENT OF NATURAL RESOURCES

2022 Comprehensive Summary Report
Neshkoro Millpond, Marquette County
Waterbody Code 149800

Introduction and Objectives

In 2022, the Wisconsin Department of Natural Resources (DNR) conducted a comprehensive fish survey of Neshkoro Millpond in order to provide insight and direction for the future fisheries management of this lake. Comprehensive fish surveys include both spring fyke netting and electrofishing surveys. Primary sampling objectives of these surveys are to characterize species composition, relative abundance, and size structure. The following report is a brief summary of the activities conducted, general status of fish populations and future management options for Neshkoro Millpond.

SURVEY INFORMATION						
Site Location	**Survey Dates**	**Water Temperature (°F)**	**Target Species**	**Gear**	**Number of Nets**	**Net Nights**
Neshkoro Millpond	03/17/2022 – 03/26/2022	35 –40 °F	Northern pike	Fyke Nets	4	26
Site Location	**Survey Dates**	**Water Temperature (°F)**	**Target Species**	**Gear**	**# of Stations**	**Miles Shocked**
Neshkoro Millpond	05/16/2022	68°F	Bass/Panfish	Boomshocker	3	1.7

Metric Descriptions

- **Catch per unit effort (CPUE) is an index used to measure fish population relative abundance**, which simply refers to the number of fish captured per unit of distance or time. For netting surveys, we typically quantify CPUE by the number and size of fish per net night. For electrofishing, we quantify CPUE as the number caught per mile of water electrofished. CPUE indexes are compared to statewide data by percentiles and within lake trends. For example, if a CPUE is in the 90th percentile, it is higher than 90% of the other CPUEs in the state.
- **Total abundance is a metric that describes population size and is estimated by mark and recapture.** In our study, all captured (insert species) were given a partial caudal fin (i.e., tail fin) clip and released. Each time the nets were checked, all (insert species) were examined for a partial caudal fin clip. The number of previously captured individuals (i.e., fin clipped) was recorded, and proportions of marked individuals to unmarked individuals were used to estimate the total abundance of the (insert species) population.
- **Proportional Stock Density (PSD) is an index used to describe the size structure of fish populations.** It is calculated by dividing the number of quality size fish by the number of stock size fish for a given species. PSD values between 40 - 60 generally describe a balanced fish population.
- **Length frequency distribution (LFD) is a graphical representation of the number or percentage of fish captured by half-inch or one-inch size intervals.** Smaller fish (or younger age classes) may not always be represented in the length frequency due to different habitat usage or sampling gear limitations.
- **Mean age at length is an index used to assess fish growth.** Calcified structures (e.g., otoliths, spines or scales) are collected from a specified length bin of interest (e.g., 7.0-7.5 inches for bluegill). Mean age is compared to statewide data by percentile with growth characterized by the following benchmarks: slow (<33rd percentile); moderate (33rd to 66th percentile); and fast (>66th percentile).
- **Relative weight is an index used to assess the plumpness (i.e., condition) of fish.** It is calculated by comparing the observed weight of a fish to the standard weight (i.e., predicted average weight) of that fish, given its length. A relative weight of 93 means it has average plumpness/weight compared to other fish of the same length. Relative weights above 93 mean it is more plump than average.

DNR Contact

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Lake Information

Acres: 209
Max. Depth: 12
Shoreline Miles: 5+
Public Access: 1 Boat Landing
Lake Class: Simple Riverine

Regulations

Statewide Default all Species
Panfish = 25 total
Bass = 14 inch, 5 bag
Northern Pike = No size limit, 5 bag

Survey Method

- Neshkoro Millpond was sampled according to spring netting 1 (SN1)and spring electrofishing 2 (SE2) protocols as outlined in DNR Fisheries Monitoring Protocols. The primary objective for these sampling periods is to count and measure northern pike, largemouth bass and panfish. Other species of fish may be sampled but are considered by-catch as part of this survey.
- Boom shockers were used to electrofish 1.7 miles of shoreline. Gamefish were collected and measured throughout, and panfish were collected and counted along 1 mile of shoreline.
- Fyke nets were deployed in areas of the lake that contained spawning habitat or were likely travel areas for northern pike. All newly captured northern pike were given a partial fin clip. Some northern pike were weighed and age structures were collected. A subsample of bluegill and black crappie were also taken for age and growth analysis.

RELATIVE ABUNDANCE — CATCH PER UNIT EFFORT (CPUE) SPRING NETTING I (SNI)						
Species	**Protocol**	**Total Number Captured**	**CPUE**	**Units**	**Statewide Percentile**	**Lake Class Percentile**
Northern pike	SNI	783	30.1	Net Night	98th	95-99%
Northern pike	SNI (2013)	1231	51.3	Net Night	99th	100%
Largemouth bass	SNI	30	1.2	Net Night	78th	
Largemouth bass	SNI (2013)	74	3.1	Net Night	94th	
Bluegill	SNI	362	13.9	Net Night	66th	
Bluegill	SNI (2013)	137	5.7	Net Night	46th	
Black crappie	SNI	244	9.4	Net Night	72nd	50-75%
Black crappie	SNI (2013)	149	6.2	Net Night	63rd	50-75%

RELATIVE ABUNDANCE — CATCH PER UNIT EFFORT (CPUE) SPRING NETTING I (SNI) CONT.						
Species	Protocol	Total Number Captured	CPUE	Units	Statewide Percentile	Lake Class Percentile
Brown trout	SNI	15	0.6	Net Night	-	-
Brown trout	SNI (2013)	1	0.0	Net Night	-	-
Yellow perch	SNI	24	0.9	Net Night	35th	25-50%
Yellow perch	SNI (2013)	19	0.8	Net Night	34th	25-50%
Pumpkinseed	SNI	2,077	79.9	Net Night	99th	-
Pumpkinseed	SNI (2013)	340	14.2	Net Night	94th	-
Rock bass	SNI	21	0.8	Net Night	40th	-
Rock bass	SNI (2013)	13	0.5	Net Night	30th	-
Lake chubsucker	SNI	174	6.7	Net Night	-	-
Lake chubsucker	SNI (2013)	12	0.5	Net Night	-	-
White sucker	SNI	43	1.7	Net Night	-	-
White sucker	SNI (2013)	16	0.7	Net Night	-	-
Yellow bullheads	SNI	231	8.9	Net Night	-	-
Yellow bullheads	SNI (2013)	10	0.4	Net Night	-	-
Yellow perch	SNI	24	0.9	Net Night	35th	25-50%
Yellow perch	SNI (2013)	19	0.8	Net Night	33rd	25-50%

Northern Pike

Fyke netting is the preferred sampling gear for northern pike when ice goes out. All results presented for northern pike are from spring fyke netting survey.

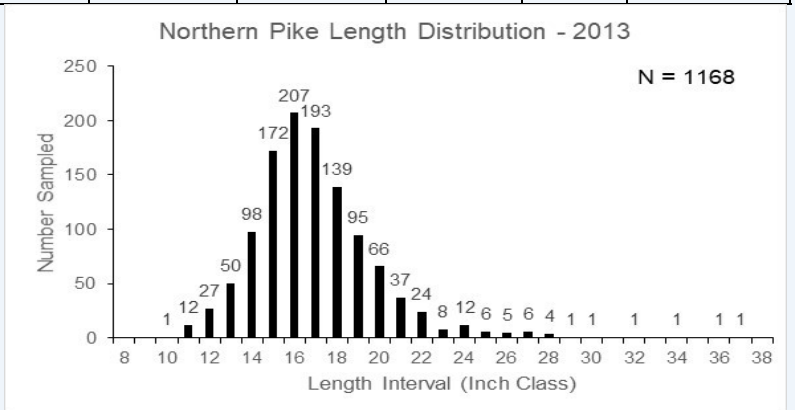
YEAR SIZE STRUCTURE METRICS								
Total Number Measured	Average Length (inches)	Length Range (inches)	Stock and Quality Size (inches)	Stock Number	Quality Number	PSD	Percentile Rank	Size Rating
783	15.8	9.4 –35.6	14.0 and 21.0	77	23	17	14th	Low

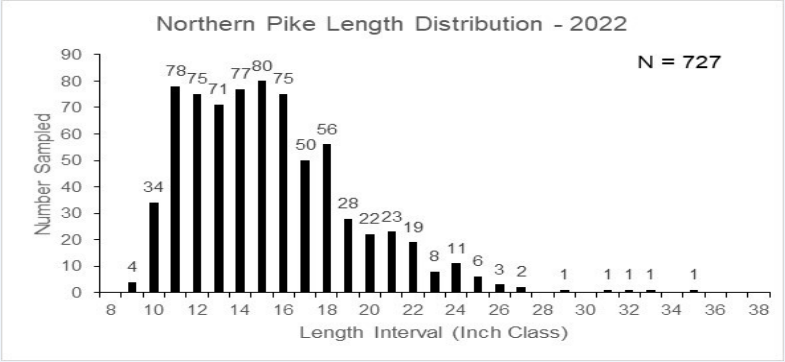
RELATIVE ABUNDANCE (CPUE = NUMBER PER NET NIGHT)					
Total Sampled	2013	2022	Historical Median	2022 Statewide Percentile Rank	2022 Abundance Rating
2014	51.3	30.1	40.7	98th	High

SIZE STRUCTURE (PSD) TRENDS			
PSD by Year		Historical Median	Historical Percentile
2013	2022		
10	17	13.5	10th

ADULT ABUNDANCE (POPULATION ESTIMATE)						
Marked	Cap-tured	Recap-tures	Population Estimate (95% CI)	Number per Acre	Abun-dance Rating	# per Acre 2013
624	675	26	3,552	17	High	52

AVERAGE AGE AT SPECIFIC LENGTH						
Specie	Sex	Count	Length Bin	Average Age	Age Range	Rating
Northern pike	Female	9	18	5.8	5 –7	Low
Northern pike	Male	12	18	5.3	4 –8	Low
Northern pike	All	21	18	5.5	4 –8	Low





Black Crappies

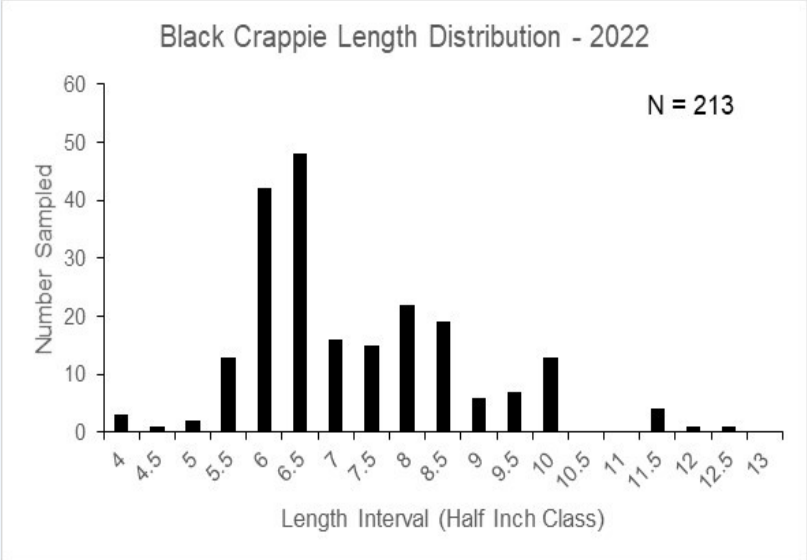
Black crappie were assessed using the early spring netting (SNI) and results presented here are from that survey.

YEAR SIZE STRUCTURE METRICS								
Total Number Measured	Average Length (inches)	Length Range (inches)	Stock and Quality Size (inches)	Stock Number	Quality Number	PSD	Percentile Rank	Size Rating
244	7.4	4.1 –12.8	5.0 and 8.0 inches	209	73	35	28th	Low

RELATIVE ABUNDANCE (CPUE = NUMBER PER NET NIGHT)					
Total Sampled	2013	2022	Historical Median	2022 Statewide Percentile	202 Abundance Rating
393	6.2	9.4	7.8	72nd	Mod –High

SIZE STRUCTURE (PSD) TRENDS			
PSD by Year		Historical Median	Historical Percentile
2013	2022		
10	35	22.5	Low

AVERAGE AGE AT SPECIFIC LENGTH					
Specie	Count	Length Bin	Average Age	Age Range	Rating
Black Crappie	12	8.0	3.0	3.0	High



RELATIVE ABUNDANCE — CATCH PER UNIT EFFORT (CPUE) SPRING ELECTROFISHING (SEII)						
Species	Protocol	Total Number Captured	CPUE	Units	Statewide Percentile	Lake Class Percentile
Largemouth bass	SE2	50	29.4	Per Mile	72nd	50 –75%
Largemouth bass	SE2 (2013)	76	54.3	Per MIle	88th	75 –90%
Northern pike	SE2	8	4.7	Per Mile	83rd	-
Northern pike	SE2 (2013)	11	7.9	Per MIle	94th	-
Bluegill	SE2	63	63	Per Mile	41st	25 –50%
Bluegill	SE2 (2013)	53	37.9	Per MIle	30th	25 –50%
Pumpkinseed	SE2	121	121	Per Mile	98th	90 –95%
Pumpkinseed	SE2 (2013)	69	49.3	Per MIle	93rd	99 –100%
Black crappie	SE2	10	10	Per Mile	63rd	-
Black crappie	SE2 (2013)	6	4.3	Per MIle	44th	-
White sucker	SE2	7	7	Per Mile	-	-
White sucker	SE2 (2013)	28	20	Per MIle	-	-
Bullheads (sp)	SE2	25	25	Per Mile	-	-
Bullheads (sp)	SE2 (2013)	3	2.1	Per MIle	-	-

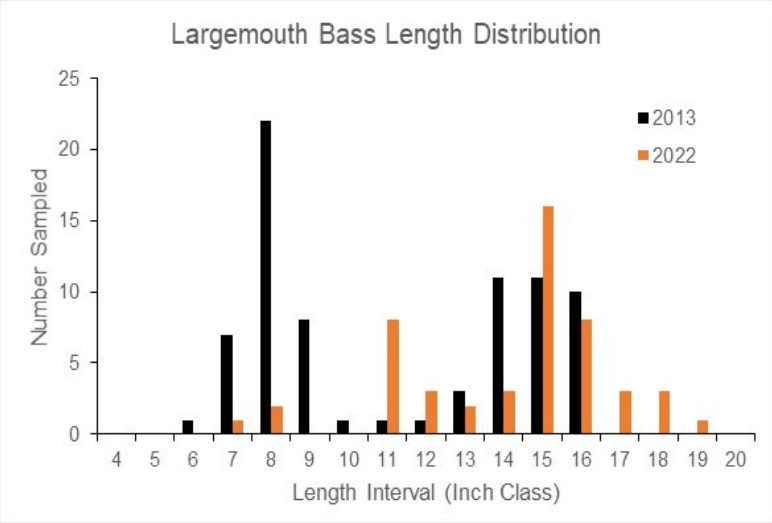
Largemouth Bass

Electrofishing is the preferred sampling gear for Largemouth bass. All results presented are from spring electrofishing II survey (SEII).

YEAR SIZE STRUCTURE METRICS								
Total Number Measured	Average Length (inches)	Length Range (inches)	Stock and Quality Size (inches)	Stock Number	Quality Number	PSD	Percentile Rank	Size Rating
50	14.5	7.8 –19.7	8.0 and 12.0 inches	49	39	80	82nd	High

RELATIVE ABUNDANCE (CPUE = NUMBER PER MILE)					
Total Sampled	2013	2022	Historical Median	2022 Statewide Percentile Rank	2022 Abundance Rating
126	54.3	29.4	41.9	72nd	Moderate

SIZE STRUCTURE (PSD) TRENDS			
PSD by Year		Historical Median	Historical Percentile
2013	2022		
53	80	66.5	60th



Bluegill

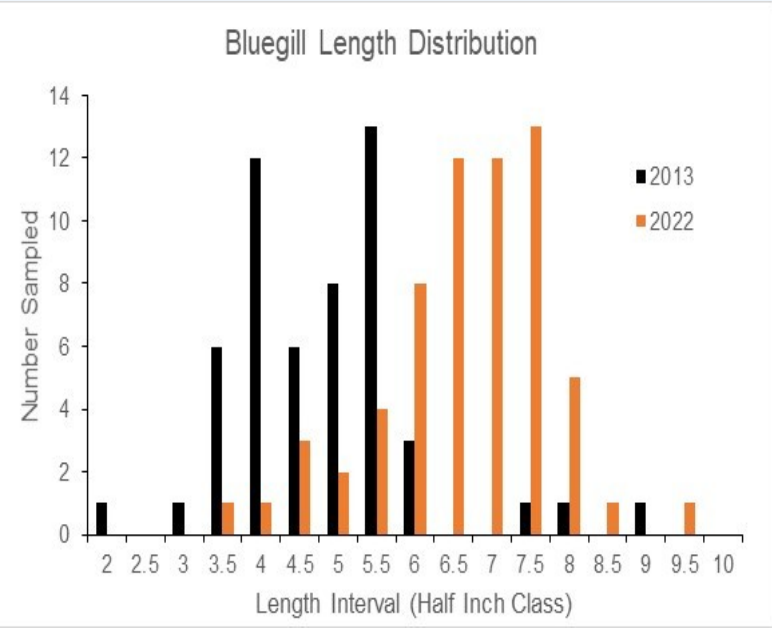
Electrofishing is the preferred sampling gear for bluegill. All results presented are from spring electrofishing II survey (SEII).

YEAR SIZE STRUCTURE METRICS								
Total Number Measured	Average Length (inches)	Length Range (inches)	Stock and Quality Size (inches)	Stock Number	Quality Number	PSD	Percentile Rank	Size Rating
63	6.6	3.6 –9.5	3.0 and 6.0 inches	63	52	83	94th	High

RELATIVE ABUNDANCE (CPUE = NUMBER PER MILE)					
Total Sampled	2013	2022	Historical Median	2022 Statewide Percentile Rank	2022 Abundance Rating
116	37.9	63	50.5	41st	Moderate

SIZE STRUCTURE (PSD) TRENDS			
PSD by Year		Historical Median	Historical Percentile
2013	2022		
12	83	47.5	65th

AVERAGE AGE AT SPECIFIC LENGTH							
Specie	Sex	Count	Length Bin	Average Age	Age Range	Percentile	Rating
Bluegill	Female	10	6	3.1	3 –4	86th	High
Bluegill	Male	8	6	3.3	3 –4	77th	High
Bluegill	All	18	6	3.2	3 –4	83rd	High



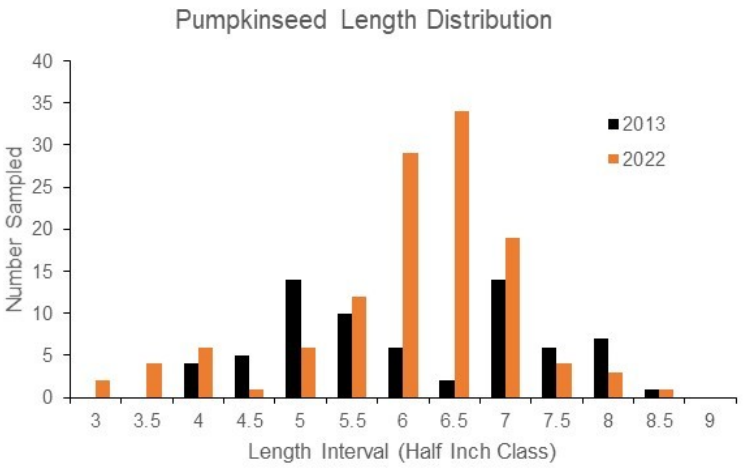
Pumpkinseed

Electrofishing is the preferred sampling gear for Pumpkinseed. All results presented are from spring electrofishing II survey (SEII).

YEAR SIZE STRUCTURE METRICS								
Total Number Measured	Average Length (inches)	Length Range (inches)	Stock and Quality Size (inches)	Stock Number	Quality Number	PSD	Percentile Rank	Size Rating
121	6.1	3.4 –8.7	3.0 and 6.0 inches	121	90	74	89th	High

RELATIVE ABUNDANCE (CPUE = NUMBER PER MILE)					
Total Sampled	2013	2022	Historical Median	2022 Statewide Percentile Rank	2022 Abundance Rating
190	49.3	121	85.2	98th	High

SIZE STRUCTURE (PSD) TRENDS			
PSD by Year		Historical Median	Historical Percentile
2013	2022		
52	74	63	79th



A small boat and fyke nets were used to do the survey on Neshkoro Millpond. Photo by DNR.

DNR hatchery crew out of Wild Rose spawning northern pike from Neshkoro Millpond. Photo by DNR.

Full Summary

Northern Pike

Neshkoro Millpond supports a high density, poor size structure, slow growing northern pike population. Lengths of fish sampled ranged from 9.4 –35.6 inches with an average size of 15.8 inches down from 17.4 inches in 2013. Only 2% of fish sampled in 2013 and 2023 surveys were of legal size. Data from this survey generated a proposal to remove the northern pike size limit and return bag limit to 5 fish. The desired effect is to see a PSD increase from 17% to 20 to 40%, and reduce the population to less than the current 17 per acre. This might spur an increase in growth rates from 18 inches at 5.5 years closer to the desired 22 inches at 5.5 years. A proposal went to spring hearing in 2022 and as of 2023, the 26/2 size/bag limit for northern pike has now been removed in the White River System from the river and from Neshkoro Millpond, Lower White River Flowage, West Branch Millpond, and Wautoma Pond, including all tributaries.

Nice northern pike and panfish caught in spring netting survey.

Largemouth Bass

Largemouth bass numbers were down but still rank in the moderate rating statewide with 29.4 per mile of shoreline. This is slightly on the low side, the 2013 catch rate of 54.3 per mile is more typical of what we would like to see. Fish sampled ranged from 7.8 -19.7 inches with an average size of 14.5 inches. Size structure is good with 80% of the fish larger than 8 inches also larger than 12 inches and 69% also larger than the legal size of 14 inches. Management should focus on maintaining size structure, increased abundance to about 50 per mile and hopefully produce memorable (20 inch) largemouth bass.

Bluegill

In Neshkoro Millpond 63 bluegill per mile is a moderate rate compared to statewide averages, but lower than expected for Marquette County where 100 –150 per mile is more common. However, the catch rate is up from the 37.9 per mile in 2013. Predation from over abundant northern pike and competition from an abundant pumpkinseed population may be contributing the lower than desired population. The size structure is good with 83% larger than 6 inches and a size range of 3.6 –9.5 inches with an average size of 6.6 inches.

Some of the nice panfish we sampled in spring netting.

Pumpkinseed

At 121 pumpkinseeds per mile, Neshkoro Millpond is in the 98th percentile compared to statewide averages. Numbers have increased significantly from the 49.3 per mile in 2013 which was at the 93rd percentile. The size structure falls in the 89th percentile compared to the statewide average with 74% of fish larger than 6 inches. Fish ranged from 3.4 –8.7 inches and averaged 6.1 inches.

Black Crappie

Neither electrofishing or spring fyke netting did a great job of assessing the black crappie population. Black crappies are a notorious boom and bust fishery which means they will have a large population increase one year which could be followed by many years with a lower population. The abundance during this survey of 9.4 per net night ranked in the 72nd percentile compared to statewide populations with a low size structure ranking in the 28th percentile. Only 35% of fish larger than 5 inches were also larger than 8 inches. Fish ranged from 4.1 – 12.8 inches and averaged 7.4 inches and there appears to be a year-class that may produce a harvestable population by 2025 at the current growth rate.

Yellow Perch

Typically the nets are deployed early in the season for targeting northern pike; and removed before yellow perch move into the shallows to spawn. With this net strategy we tend to miss the peak collection time for yellow perch. We sampled 24 yellow perch during spring netting which ranks in the 35th percentile compared to statewide population's. Fish ranged from 6.8 –12.8 inches and averaged 9.9 inches. No yellow perch were sampled during the electrofishing survey. The limited catch from both methods make it difficult to predict future availability.

Lake chubsuckers were common in our survey.

Other Species

Other species sampled during our 2023 survey were brown bullheads, brown trout, bluntnose minnow, common carp, common shiners, fathead minnows, golden shiners, lake chubsuckers, northern hog sucker, shorthead redhorse, rock bass, white suckers and yellow bullheads.

Photos by DNR