

**Preliminary Investigation of Northern Pike Production
in Waters of the Shiawassee NWR,
Saginaw County, Michigan During 2000**

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Introduction

The northern pike (*Esox lucius*) is a depleted interjurisdictional native species once plentiful in the Saginaw River, a tributary to Lake Huron. Their numbers have declined due to diking of marsh spawning and nursery habitat. The required spawning and nursery habitats exist on the U.S. Fish & Wildlife Service (Service) Shiawassee National Wildlife Refuge (NWR) located in Saginaw, Michigan; however, fish access may be limited by current refuge management practices. At the request of refuge staff, Alpena Fishery Resources Office (FRO) provided assistance on the refuge by working with refuge staff and partners to examine northern pike use of refuge marshes in 2000.

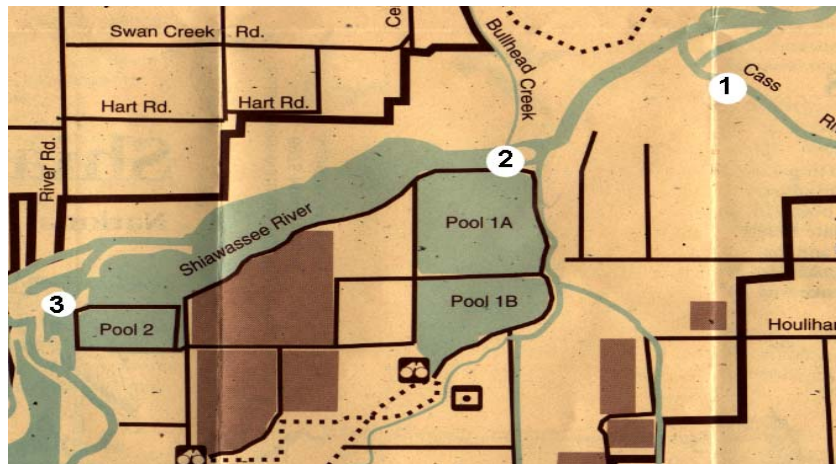


Figure 1. Location of sampling sites on the Shiawassee NWR. Site 1(North Marsh) is a breached marsh located on the Cass River, site 2 (Pool 1A) is a managed marsh located on the Saginaw River, and site 3 (Pool 4) is a natural marsh located on the Flint River.

Northern pike congregate in littoral areas at ice breakup prior to spawning and spawn in mid-March to June in water less than 1.8 m and at water temperatures of 2°C to 18°C (Goodyear et al 1982). Larval pike hatch 10-18 days following spawning and attach to vegetation for 5-10 days. They remain in 0.3 - 0.8 m of water over soft bottoms and in abundant vegetation following detachment.

The objective of the study was to determine if northern pike were using 3 different marsh habitat types on the Shiawassee NWR for spawning and nursery areas (Figure 1). Adult spawning and

juvenile young-of-the-year northern pike were sampled in open, breached and managed marshes on the refuge to determine the abundance of spawning activity, characteristics of the spawning population, and the amount of recruitment. This study will be used to evaluate management practices that may increase marsh accessibility for northern pike on the Shiawassee NWR and may be applicable to other refuge complexes. This project addressed the Saginaw Bay watershed focus area and information was gathered on all species captured, including some species that were identified as Region 3 Resource Conservation Priorities.

The study will provide information on pike use of refuge wetlands that may be used as a management tool to provide immediate and long-term benefits to the integrity and sustainability of the Saginaw River and Bay ecosystem. Study results will be provided to the refuge manager and biologists for their evaluation and potential adaptive management of Shiawassee NWR closed pools to benefit northern pike. In addition to the Shiawassee NWR, the findings of this project will be applicable to the Saginaw River/Bay ecosystem and potentially for fishery management on all NWRs.

Materials and Methods

Three marsh habitat types on the Shiawassee NWR were sampled for the presence of adult spawning northern pike and northern pike fry (Figure 2). North Marsh (site 1), located on the Cass River, was representative of a breached marsh, or a formerly diked area that is periodically breached during high water events or is no longer functioning as a dike due to a break in the dike. North marsh is 113 acres in size and is separated from the Cass River by a dike that is breached at the eastern end. Pool 1A (site 2), located on the Shiawassee River, represented a managed marsh; a marsh where the water level is manipulated with a water control structure (pump and drain pipe). Pool 1A is 315 acres in size and is separated from the Shiawassee River by a dike. Water is regulated in the pool by 2 screw gates. A natural marsh along the Flint River near Pool 4 at the junction of the Flint and the Shiawassee Rivers (site 3) was representative of an open marsh system. Emergent aquatic vegetation was present in all marsh habitats.



Figure 2. (Left photo) View inside the breached marsh (North Marsh). Note the breach to the Cass River is located to the right of the tree in the left side of the photo. (Center photo) View of the natural marsh (Pool 4) from the Flint River. The natural marsh is located in the center of the photo and runs to the upper left. The Flint River is located in the foreground. (Right photo) View inside the closed marsh (Pool 1A). The screw to control water flow in and out of the marsh is located near the gravel in the foreground.

Adult spawning northern pike assessment

Trapnets (1.2 m with 1.3 cm mesh) and hoop nets (0.9 m with 1.3 cm mesh) were used to collect

spawning northern pike at each of the sampling locations weekly for 1 night at each of the marsh types following ice out in March and April. A trapnet was set in the main river at the entrance to each marsh to capture fish entering the marsh, and a hoopnet was set inside each marsh, at the opening, to trap fish entering.

Young of the year northern pike assessment

One haul with a 33 m seine (6 mm mesh) was used to sample for young of the year northern pike inside each marsh in late March, April, and June. Catches were sorted by species. Total length (cm) and weight (g) were measured on all sport fish species. Scales were taken from northern pike, and the sex and spawning condition was determined, when possible, by release of sex products. Forage and non-sport fish were counted. Unknown fish were preserved in alcohol and later identified to species. The maximum and minimum water depth (m) and surface water temperature (°C) were measured at the time of sampling. The relative abundance of adult spawning northern pike was determined by site based on CPUE (and percent of total catch). Length frequency and length at age was determined for spawning male and female northern pike. The sex ratio of male to females was also determined.

Results

Thirty-one species of fish were captured during the study. Information was collected on a total of 52 northern pike comprised of 46 adult and 6 young of the year (Figure 3). Adult northern pike were collected from February to April and young of the year pike were collected in June. The majority of adults were captured from the open marsh in March. Young of the year were captured from the breached marsh in June.



Figure 3. Northern pike captured during trap netting efforts on the Shiawassee NWR in the spring of 2000.

Adult spawning northern pike assessment

The adult spawning assessment was conducted weekly from 29 February through 4 April 2000. Adult northern pike were captured from each of the three marsh-types sampled (Table 1). The majority of adults (74%) were captured from the entrance to the natural marsh (site 3 -Pool 4).

The forty-six adult northern pike were comprised of 25 males, 8 females, and 13 of unknown sex. Males ranged in length from 31 to 65 cm with a mean length of 56 cm, and females ranged in length

from 59 to 69 cm with a mean length of 68 cm (Figure 4). The overall mean length of adult northern pike was 59 cm. Adults ranged in age from 3 to 8 years and averaged 5 years (Figure 5). Males exhibited a greater range in age than females.

Table 1. Catches of adult northern pike from each of the three marsh types sampled on the Shiawassee NWR in 2000.

	Breached marsh	Closed marsh	Natural marsh	Total number
February	1	0	0	1
March	3	8	29	40
April	0	0	5	5
Total number	4	8	34	46

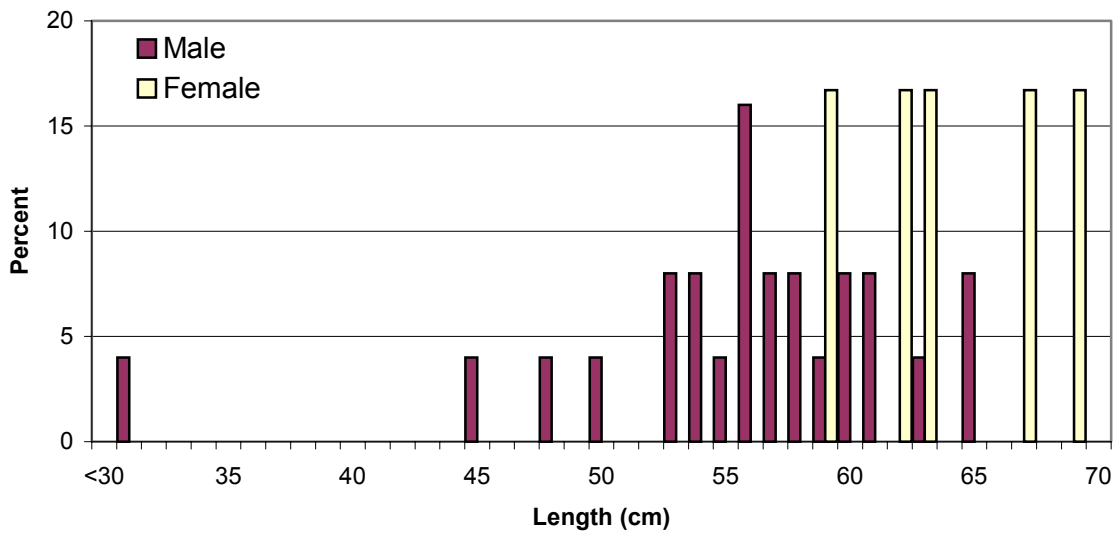


Figure 4. Length frequency of adult northern pike captured from the Shiawassee NWR in 2000. Represented as percent of total northern pike catch.

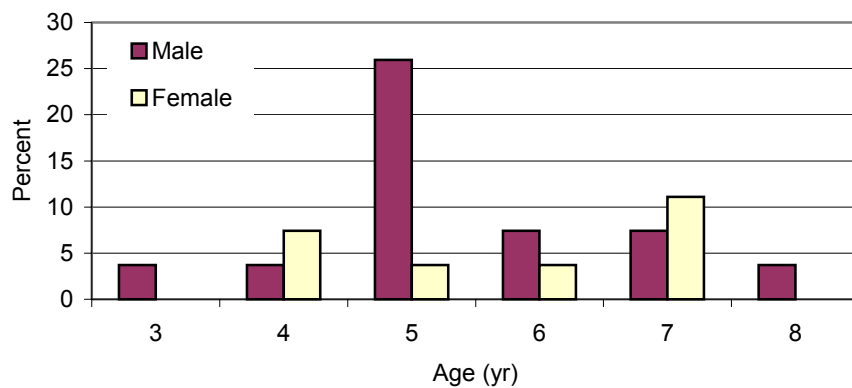


Figure 5. Age composition of northern pike (percent of total northern pike) captured from Shiawassee NWR in 2000.

Young of the year northern pike assessment

Six young of the year northern pike were captured while seining in June at the breached marsh. The young of the year ranged in length from 11 to 13 cm and average 12 cm.

Discussion

All marshes sampled have emergent vegetation and northern pike were captured at each site. Based on our findings, the breached marsh, where young of the year northern pike were documented, was the most successful at providing a production area for northern pike on the Shiawassee NWR. Although this was the area where the fewest adults were captured, the presence of young of the year in the breached marsh confirms its value to this species. The majority of spawning adults were captured at the entrance to the closed and natural marshes, however it was difficult to determine the extent of northern pike use of these wetland types because of low water and the presence of carp.

Year 2000 was the second in a series of low water years on the Great Lakes. The Saginaw River and its tributaries are directly connected to Lake Huron and ebb and flow with lake water levels. Low water levels were encountered in refuge waters of the Shiawassee, Flint, and Cass Rivers, tributaries to the Saginaw River, during 2000 which limited sampling for northern pike in some areas.



Figure 6. Water levels decreased within a 1 week period from 29 February (left) to 7 March (right) and remained low for the rest of the sampling period, keeping us from trap netting outside of the closed marsh site (pictured above) and inside the natural marsh site.

A drop in water levels from 29 February to 7 March drained the natural marsh preventing sampling inside, and lowered the water levels on the Shiawassee River preventing sampling at the entrance to the closed marsh (Figure 6). Although sampling did continue in these areas at the entrance to the natural marsh in the Flint River and inside the closed marsh, the lack of waterway connection in these areas prevented determination of the full extent of northern pike use of these areas. A waterway connection was maintained between the breached marsh and the Cass River, whereby providing continued access to northern pike. This may be the reason why young of the year were found in this area.

A waterway connection was not maintained for the closed marsh, because it was managed to retain water. Closed marshes were opened to allow water in during high water levels in the spring and

then closed to retain water during the summer when water levels drop. There has been speculation in the past that adult spawning northern pike may be entering the closed marshes when the water gates are open in the spring and then become trapped when water gates are closed. The adults have access to spawn and leave the marsh prior to water gate closure. Their offspring, which hatch and remain in shallow vegetated water, may be trapped in the marsh when the gates are closed. Trapped northern pike, adult or young, would be killed over the winter in the shallow marshes or may not find an adequate food supply and starve. However, should northern pike be found to be using closed marshes for spawning and rearing areas, refuge managers could adjust water management practices to allow gates to remain open longer for northern pike passage for spawning and then open the gates later in the season to allow offspring to leave the closed area and enter the river. Water levels need to be sufficient to allow northern pike access to water control structures for passage.

In 2000, water levels were high enough during the first week of sampling to allow the gates of the closed marsh to be opened, permitting water and possibly northern pike into the closed marsh. We documented the presence of adult northern pike in spawning condition in the river at the entrance to the water control gates (which were open at the time). These northern pike were likely entering the marsh to spawn; however no northern pike were captured inside the marsh. Water levels dropped in the following week and the gates to the marsh were closed to retain water. River water levels dropped such that we were not able to sample for northern pike attempting to enter the marsh near the gates. Sampling did continue inside the closed marsh for pike that had gained prior entry, however none were captured. Carp were a problem and filled the net preventing catch of target or any other species (Figure 7).



Figure 7. Nets set inside the closed marsh filled with carp preventing catch of other species.

Continued research is needed during years when water levels are more normal in order to fully determine the extent of northern pike use of wetlands present on the refuge. In normal water years, the natural and closed marshes hold potential as valuable northern pike areas. However, we have documented that breached marshes may provide a valuable resource for northern pike in low water years. A diversity of wetland types may be necessary to provide northern pike habitat under varied water conditions.

Acknowledgements

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