Northern Pike Fishing Regulations

Michigan Department of Natural Resources - Fisheries Division

Proposal for Northern Pike Regulations in Michigan

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Biology

Northern pike (*Esox lucius*) are highly influenced by the physical and biological characteristics of lakes and by angler harvest. While the length of the growing season, prey availability, and other factors affect the average length of northern pike at a given age, growth is most affected by population density and lake morphology. Thus, northern pike populations with high density tend to have below-average growth, while those with low density tend to have above-average growth. Based on this density-dependence, northern pike populations in Michigan can be loosely classified into three categories: 1. high-density populations with below-average growth, 2. average-density populations with average growth, and 3. low-density populations with above-average growth. While all northern pike populations do not fit perfectly into one of these categories, some generalizations about the population types can be made. High-density populations with below-average growth tend to occur in relatively shallow waterbodies with abundant aquatic vegetation, and they tend to have poor size structure, higher natural mortality, and consistent recruitment. The higher natural mortality is related to fish size. Small northern pike are vulnerable not only to more predators, but also to cannibalism by adult northern pike. In some shallow waterbodies temperatures can exceed the optimum level for northern pike growth, which also limits size structure. Low-density populations with above-average growth tend to occur in relatively large, deep waterbodies or in waterbodies where spawning habitat has been eliminated or greatly reduced. Some of these low-density populations have access to thermal refuge in the summer months and they often have abundant, optimal forage species such as suckers and/or whitefish species. They tend to have good size structure, lower natural mortality, and low, or inconsistent recruitment. Average-density populations with average growth tend to have intermediate levels of waterbody depth and aquatic vegetation, and thus the size structure and mortality rates tend to lie somewhere between those of the other two population types. Northern pike size structure does not only occur as a function of density and habitat as it can also be affected by angler harvest. In fact, maintaining an appropriate balance of large northern pike, with increasing fishing pressure, has been a problem for managing Michigan northern pike populations. Grimm (1981) and LeCren (1987) suggest that the numbers of small pike are regulated by numbers of large pike through cannibalism. Since the abundance of large pike can influence the density of small pike, fishing regulations designed to improve size structure by restricting angler harvest can potentially have positive indirect effects, in addition to direct effects, on the size structure of northern pike populations.

Fishery Status, Trends, and Issues

Fishing regulations for northern pike have evolved over time, ranging from a “policy of extermination” in the late 1880’s to the current rather restrictive statewide minimum size limit (MSL) of 24 inches. This trend reflects management efforts to decrease fishing mortality, increase production of larger northern pike, and increase top-down predatory control of prey fish. A variety of evaluations have been conducted on northern pike in Michigan which have shaped the current regulations. Several studies have shown that although yield (pounds harvested) is maximized at lower MSLs, size structure and spawning potential are consequently reduced. Latta (1971) reported that an increase in the MSL from 20 to 22 inches would result in a decrease in yield with a further gain in number of spawners. Latta further found that a decrease in the MSL to 16 inches would result in the highest short-term yield, but would reduce the spawning stock below the status necessary to maintain the population. Schneider and Lockwood (1979) evaluated MSLs of zero, 20, and 24 inches against the 14-inch MSL and found that number caught decreased with higher MSLs; however, populations with above-average growth operated differently than those with below-average growth. In 1993 the MSL was increased to 24 inches in an effort to improve size structure and to maintain a certain amount of predatory control. The 24-inch MSL has generally worked to increase the percentage of fish larger than 24 inches in populations with fast growth, but in most other lakes it only increased the number of fish from 20 to 23 inches. In 2002, the daily possession limit for northern pike was further reduced to two from five in response to concerns about the sustainability of some populations, especially where angling pressure had increased dramatically. Currently, northern pike regulations are loosely based on the three population types: no-MSL for high-density populations with below-average growth; 24-inch MSL for average-density populations with average growth; and 30-inch MSL for some low-density populations with above-average growth.

Recreational fishing in Michigan influences northern pike populations due to the combination of them being relatively easy to catch and an angler preference for larger pike. Studies have shown that anglers generally select for a medium size range of northern pike (approximately 20 to 30 inches) with smaller northern pike being more often released and larger northern pike being more difficult to catch, though rarely released. Fishing mortality on preferred sizes of northern pike can be high. An intensive survey of seven north-central Minnesota lakes showed that annual exploitation rates were as high as 46% on northern pike longer than 20 inches (Pierce and Tomcko 2003). Pierce and Cook (2000) reported that large (>24 in) northern pike are heavily exploited and that both angling and spearing are responsible. As a result of this size selectivity and high mortality, northern pike size structure has been negatively affected and fewer fish of memorable size are caught today. In response, a variety of size limits designed to improve size structure have been implemented and evaluated around the Midwest. The effect of maximum, minimum, and slot length limits on the sizes and relative abundance of northern pike was evaluated in 22 Minnesota lakes (Pierce 2010). Although the regulations did not achieve management objectives in every lake, the broader-scale, statewide finding was that they improved the size structure of northern pike populations but produced no consistent trends in relative abundance. Maximum length limits produced significant long-term increases in size structure, and high MSLs improved size structure, but the improvements did not carry over to fish above the MSLs. Protected slot length (PSL) limits produced results that were more difficult to interpret, but researchers believed that they generally improved size structure.

Current Predictions

To evaluate the effects of fishing regulations on northern pike populations we used population modeling techniques with inputs such as abundance, growth, mortality, angler selectivity, and recruitment that were derived from current Michigan northern pike populations. In populations with below-average growth a no-MSL regulation resulted in the highest number harvested and highest weight harvested, but also the lowest average weight for a harvested fish and the lowest spawning stock (Table 1). As the simulated MSLs increased, the number and pounds harvested decreased considerably. The 24-34-inch PSL was the only other regulation that was similar to the no-MSL regulation in all categories. While the 24-34-inch PSL only shows modest (18%) gains in the number of northern pike greater than 28 inches relative to the no-MSL regulation, the simulation model does not incorporate any improvements in growth that may result from harvest of small northern pike and subsequent recruitment of northern pike to the protected slot. Thus, improvements in size structure with the PSL regulation are likely underestimated in the model.

Table 1. Size limit predictions for a simulated population with high density and below-average growth

Size Limit	Total number harvested	Total weight harvested (lb)	Average weight of harvested fish (lb)	Number > 28 inches in population	Spawning stock index
No MSL	906	1,533	1.7	11	0.4
20-inch MSL	377	857	2.3	16	0.5
24-inch MSL	94	262	2.8	27	0.6
30-inch MSL	1	4	3.3	36	0.7
24-34-inch PSL	870	1,437	1.7	13	0.4

In populations with average density and growth the total number harvested is again highest with a no-MSL regulation, but the total weight harvested is highest with the 24-inch MSL (Table 2). The average weight of a harvested fish is highest with the 30-inch MSL, but the drawback of that regulation is shown by the lowest number of fish available for harvest. The 24-34-inch PSL shows promise in populations with average growth since both size structure and spawning stock are maximized, while number and weight harvested are still relatively high. The relatively low average weight, however, shows that the majority of the harvested fish would be below the protected slot.

Table 2. Size limit predictions for a simulated population with average density and growth

Size Limit	Total number harvested	Total weight harvested (lb)	Average weight of harvested fish (lb)	Number > 28 inches in population	Spawning stock index
No MSL	357	562	1.6	265	2.2
20-inch MSL	308	554	1.8	300	2.5
24-inch MSL	296	652	2.2	498	3.2
30-inch MSL	115	368	3.2	506	6.5
24-34-inch PSL	333	600	1.8	730	9.0

In populations with low density and above-average growth the number harvested was highest with the no-MSL regulation and the total weight harvested was highest with the 20-inch MSL (Table 3). However, the number of northern pike greater than 28 inches was 61% lower for the no-MSL and 41% lower for the 20-inch MSL, when compared to the current 24-inch MSL. In fact, the gains in total weight harvested were slight compared to the losses in size structure. Poor size structure was one of the biggest complaints when Michigan had a statewide 20-inch MSL. Also, the spawning stock with the 24-inch MSL was more than double than what it would be with a no-MSL regulation. Spawning stock can be an important factor to consider in some low-density populations that suffer from developed shoreline and degraded spawning habitat. The 24-34-inch PSL results in high size structure (double that of the 24-inch MSL), but 24% lower number harvested than the 24-inch MSL, and the lowest total weight harvested.

Table 3. Size limit predictions for a simulated population with low density and above-average growth.

Size Limit	Total number harvested	Total weight harvested (lb)	Average weight of harvested fish (lb)	Number > 28 inches in population	Spawning stock index
No MSL	5,477	14,278	2.6	986	2.1
20-inch MSL	4,439	15,080	3.4	1,473	3.0
24-inch MSL	3,166	14,160	4.5	2,513	4.8
30-inch MSL	1,259	9,853	7.8	5,137	8.7
24-34-inch PSL	2,398	9,050	3.8	5,640	11.8

Northern pike possession limits were evaluated using simulation models and by examining recent creel survey data. The models showed that an increase in the possession limit to five northern pike would not have any effect on population size. Real-world results for the most part complement the model. Creel surveys conducted from 2001 to 2010 on inland lakes with the 24-inch MSL showed that between 0.4 and 0.5% of anglers having completed their trip harvested two or more northern pike. In lakes where northern pike were detected in the harvest, catches of one northern pike accounted for 77.4% of the total harvest on average, while catches of two northern pike accounted for 17.2% of the total harvest. While it is difficult to determine what proportion of anglers achieving a possession limit of two northern pike would also achieve a higher possession limit, some conclusions can be drawn. In five lakes surveyed in 2001 (the last year of the 5 fish possession limit) only 0.1% of anglers harvested more than 2 northern pike; however, this number could be biased low if anglers were targeting other species. Also, these lakes were all large (>1,000 acres) and only one (Houghton) is known as a good northern pike lake; thus they are not necessarily representative of smaller, more productive northern pike lakes. In the 2001-02 creel survey of Houghton Lake, anglers that possessed their limit of three northern pike accounted for 15.8% of the total harvest, thus there is some evidence that northern pike harvest may increase in some lakes if the possession limit is increased to five fish. Data from an on-site creel survey of the Detroit River, Lake St. Clair, and St. Clair River from March 2002 to February 2005 also provide some insight into the effect of the 2 fish possession limit for northern pike in a combined 5 fish possession limit with bass and walleye. Northern pike were the target species for only 1.8% of the parties and only 2.4% of parties reported harvesting or releasing at least one legal-size northern pike. Furthermore, only 0.7% of the parties that reported harvesting or releasing at least 1 legal-size northern pike reported harvesting their total possession limits, which were largely comprised of walleye. Based on these creel survey results from inland lakes and the St.Clair system, increasing the northern pike

possession limit back to 5 fish per day would likely result in minimal additional harvest of this species, as long as the combined possession limit regulation (5 fish combined for bass, northern pike, and walleye) remained in place.

Management Objectives

The Esocid Committee believes that regulations should vary among waters to optimize fishery values for the various population types. Managers have expressed a need for additional flexibility in managing northern pike populations, and the public has expressed a desire to expand harvest opportunities for northern pike while also protecting populations that have experienced declines in quality due to angler harvest. In a recent public comment period on length-based regulations for northern pike, of the 304 comments received 150 comments (49%) were for no change to the 24-inch MSL, 117 (38%) were for some type of PSL regulation, and 37 (12%) were for no-MSL regulations. Regarding possession limits, 45% of the comments were in favor of a 2-fish possession limit, 12% were for a mixed bag option, and 17% were for a 3-fish possession limit.

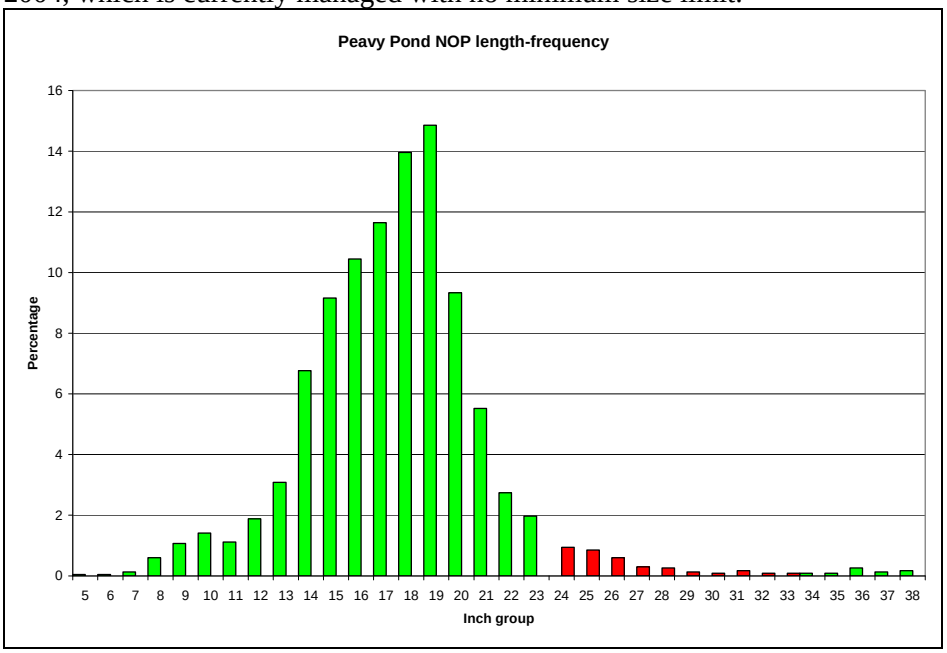
Regulation Proposals

Two proposals have been presented by angler groups for review and consideration. The proposal from Pikemasters is largely based on the assumption of north-south gradients in available spawning habitat, angling pressure, and growth. This proposal includes a 28-inch MSL with a possession limit of one for the southern Lower Peninsula, no MSL (and only one fish over 24 inches) with a possession limit of two for the northern Lower Peninsula, and no MSL (one fish over 20 inches) with a possession limit of three in the Upper Peninsula. While the general loss of pike spawning habitat and growth do follow a north-south gradient, the relationships are not significant enough for them to alone define regulations. For example, while mean lengths at age are generally lower in the Upper Peninsula, latitude only explains a small portion of the variability in growth. Growth is also highly influenced by physical lake characteristics, density, and prey availability. In reality, all three northern pike population types are found throughout Michigan. Also, while the number of anglers and angling pressure may appear to be highest in the southern Lower Peninsula due to its population centers, recent tag return studies from inland lakes suggest that exploitation of coolwater species such as northern pike and walleye are not subject to a north-south gradient. The proposal from the Michigan Darkhouse Anglers Association consists of a single statewide regulation with no MSL (one fish over 32 inches) and a possession limit of three. We recognize the value of this proposal for its simplicity and its potential to increase harvest opportunity. It also offers some protection for larger fish, though the protection is very little given the high length of the “one-over” regulation. While this regulation would probably work in some populations with high density and slow growth by allowing harvest of small northern pike and protection for the largest pike, previous evaluations of no-MSL regulations in populations with average or above-average growth have shown that spawning stock is reduced, overall size structure is reduced, and recruitment can be compromised.

The Esocid Committee developed several proposals in order to meet the goals of Fisheries Division and the public. The statewide 24-inch MSL on northern pike is biologically conservative and assures near optimum reproduction in most southern low-density populations. However, improvements in size structure have not been realized in all northern Michigan waters. It is difficult to apply a single-all purpose regulation to pike because of the wide variation in growth rates across the state, the wide variation in exploitation, and the density-dependant nature of this species. We found that the no-MSL regulation has not improved the size structure in populations with high density and below-average growth, but it has allowed high catch rates to occur, as was found in historic regulation evaluations by Latta (1971) and Schneider and Lockwood (1979). The main difference in the proposed regulations is the 24- to 34-inch PSL regulation, which could replace the no-MSL regulation, the 30-inch MSL regulation, or both. This regulation provides a new tool for managers to potentially re-structure northern pike populations by simultaneously allowing harvest of smaller fish and protecting larger fish that are highly vulnerable to harvest. For example, in Peavy Pond (Iron County), a lake currently managed under the no-MSL regulation, 97% of the population is available for harvest with the PSL (Figure 1). In Gratiot Lake (Keweenaw County), a lake currently managed under the 30-inch MSL, 30% of

the population is available for harvest with the PSL compared to 11% being available under the 30-inch MSL.

Figure 1. Length-frequency of northern pike from Peavy Pond, Iron County in 2004, which is currently managed with no minimum size limit.



The committee also discussed the possibility of increasing possession limit for northern pike to 5 in any combination with bass and walleye, but allowing only 2 fish over 24 inches. This would be somewhat of a simplification of regulations since it results in a single possession limit for all lakes. It satisfies the increased harvest that can occur in no-MSL lakes as well as the reduced harvest that should occur in lakes with the 24-inch MSL. Potential options for northern pike regulations are provided in Table 4.

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Table 4. Proposed northern pike regulation scenarios for Michigan. PSL is a protected slot limit with no possession of fish within the protected interval. MSL is a minimum size limit with no possession of fish smaller than the legal size. Statewide regulations would apply to most of the waters in the state where an exception would apply to only some waters listed by each county.

Statewide Regulation on most waters	Allowable Exceptions on some waters	Positive Response	Negative Response
24-inch MSL Possession of 2 fish	No MSL Possession of 5 fish 30-inch MSL Possession of 2 fish	Currently accepted regulations Allows some diversity with management No-MSL allows high harvest In recent public comments on length-based regulations, 49% were in favor of the 24-inch MSL In recent public comments , 45% were in favor of 2-fish possession limit	Diversity of regulation types makes understanding the law more difficult to some anglers Low harvest potential with 30-inch MSL and current limited use No regulation available to restructure populations with poor length distributions Accidental fishing mortality is greater with a higher MSL
No MSL Possession of 5 fish only 1 > 24-inches	24-inch MSL Possession of 2 fish 24 to 34-inch PSL Possession of 2 fish	No MSL provides the highest allowable harvest No MSL provides the least restrictive regulation The protected slot limit can also serve to improve the average catchable size for some lakes	No MSL does not provide an improvement in size structure No MSL is the most risky regulation for populations that are currently growing above average and have a balanced fish population Potential decrease in natural reproduction would result in the need for more stocking and more cost to provide a fishery
24 to 34-inch PSL Possession of 2 fish	24-inch MSL Possession of 2 fish No MSL Possession of 5 fish only 1 > 24-inches	PSL allows harvest of small fish and to keep some large memorable sized fish PSL allows managers to improve an unbalanced population's size structure Single regulation option that provides harvest while still allowing the opportunity to manage the resource	Compliance or initial acceptance of PSL would be problematic to anglers not understanding the possession of legal size fish Loss of some harvest potential for lakes that go from no-MSL to either a PSL regulation or 24-inch MSL
24-inch MSL Possession of 5 fish	24 to 34-inch PSL Possession of 2 fish No MSL Possession of 5 fish only 1 > 24 inches	Most of the lakes in Michigan are well managed under a 24-inch MSL Greatest allowable balance between harvest and average catchable size Possession of 1 or 2 fish over 24-inches good for most lakes to maintain their balanced fishery and provide some lakes with management of size structure Increase in size structure for those lakes added to PSL	Diversity of regulation types makes understanding the law more difficult to some anglers Potential decrease in the number of large fish in lakes that go from a 30-inch MSL to either a No MSL or 24” MSL.