

Indiana Northern Pike Strategic Plan 2019-2024



Author

Matthew D. Linn

Editors

Dan P. Carnahan
Jeremy D. Price
Steven B. Donabauer

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Cover photo: Division of Fish and Wildlife Assistant Biologist Brianna Ciara holds a Pike collected from Lake Wawasee (Kosciusko Co.) during a targeted survey in March, 2016.

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MANAGEMENT HISTORY

Northern Pike (*Esox lucius*; hereafter referred to as Pike) are a circumpolar species native to North America and Eurasia. Indiana represents the southernmost extent of their natural range, where they inhabit approximately one-third of Indiana's 452 northern glacial lakes. Pike also exist in many of Indiana's northern rivers including the Iroquois, Kankakee, Tippecanoe, Yellow, Fawn, Pigeon, Elkhart, St. Joseph, Wabash, and Mississinewa rivers. For several years Pike were introduced to southern impoundments, extending their range in Indiana¹.

Pike are voracious predators that grow rapidly. The Indiana state record Pike is 30 pounds, 2 ounces (48¼ inches) caught at Clear Lake (Steuben Co.) in 1992 by Jack Barnes (below). Recent spring surveys from 2012-19 indicate that males rarely exceed 30 inches, while females grow faster and attain larger sizes. Female Pike in Indiana reach memorable-size (34-inches; 10 pounds) by age-6 and trophy-size (44 inches; 20 pounds) by age-12. These growth rates suggest that Indiana Pike nearing 50 inches are approximately 18 years old; Pike in Canada have been aged to 29 years.



Most Pike populations in Indiana are naturally self-sustaining where sufficient habitat exists. Poor water quality and a lack of adequate aquatic vegetation are the primary factors that limit Pike distribution. Year-round access to cool-water habitat ($\leq 73^{\circ}\text{F}$ and ≥ 3 ppm dissolved oxygen) produce abundant Pike of large sizes. Adult Pike migrate to spawn in shallow vegetated bays and marshes in the spring when water temperatures range between $38\text{-}44^{\circ}\text{F}$. In turn, these areas provide the nursery habitat required for yearling Pike to feed and grow. Although the Division of Fish and Wildlife (DFW) experimented with developing Pike spawning marshes to enhance reproduction

¹ Shipman, S. 1979. Observations on the distribution, life history, and stocking strategy for Northern Pike (*Esox Lucius*) in Indiana.

and conducted studies to better document actual Pike spawning locations, these efforts had a short-lived impact on Indiana's Pike management program^{2,3,4}.

From 1962-1995, 460,000 Pike fingerlings and 300,000 fry were stocked into 15 northern glacial lakes and 20 southern reservoirs. Several stocking attempts successfully established or supplemented populations including stockings at Appleman (LaGrange Co.)⁵, Emma (LaGrange Co.)⁶, Manitou (Fulton Co.)⁷, Meteer (LaGrange Co.)⁸, Ontario (LaGrange Co.)⁹, Shipshewana (LaGrange Co.)¹⁰, and Wabee (Kosciusko Co.)¹¹ lakes. However, establishment of naturally reproducing Pike populations from stockings was often ineffective and other stocked predator species were preferred^{12,13,14}. Ultimately, Pike stockings were discontinued at all lakes and reservoirs except J.C. Murphey (Newton Co). In 2005, 192,000 Pike fry and 18,500 fingerlings (2.5 inches) were stocked into J.C. Murphey following a lake renovation. Most recently (2014-15) 20,336 Pike fingerlings (1.7-4.0 inches) were stocked into J.C. Murphey to re-establish Pike following a 2012 mid-summer hypoxic event.

Harvest regulations for Pike (312 IAC 9-7-5) were established with the intent to protect first-time spawners and distribute the catch. Prior to 1961, Pike were regulated by a closed fishing season (May 1-June 15), a 15-inch minimum size limit and no daily bag limit. Since 1961, there has been no closed season on Pike fishing. The daily bag limit for Pike has gone from a 6 Pike per day limit (1961-1968) to a 3 Pike per day limit (1969-current). The minimum size limit has gone from none (1961-1968) to 20 inches (1969-2017). In 2018, the minimum size limit was increased to 24 inches with a daily bag limit of 3 pike per day, of which no more than 1 could be larger than 30 inches. The minimum size limit was increased to 24 inches to protect first-time spawning females, which typically do not mature until age-3 (28 inches). The only exception is Hamilton Lake (Steuben

² Gulish, W. 1967. The Northern Pike Population of Starve Hollow Lake and the Effects of an Artificial Spawning Marsh. . Indiana Department of Natural Resources, Division of Fish and Game. Fisheries Research Section. Indianapolis, IN. 9pp.

³ Pearson J. 1980. Northern Pike Production at Bufflehead Pond. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 6pp.

⁴ Cwalinski, T. 2001. Northern Pike Spawning Habitat Investigations at Two Natural Lakes in Indiana. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 56pp.

⁵ Koza, L. 1987. Appleman Lake LaGrange County Fish Management Report. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 14pp.

⁶ Koza, L. 1990. Emma Lake LaGrange County Fish Management Report. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 16pp.

⁷ Robertson, B. 1988. Survival and growth of pellet and forage reared Northern Pike at Lake Manitou. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 13pp

⁸ Ledet, N. 1984. Meteer Lake LaGrange County Fish Management Report. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 13pp.

⁹ Koza, L. 1987. Ontario Millpond LaGrange County Spot Check Survey. . Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 7pp.

¹⁰ Ledet, N. 1990. Shipshewana Lake LaGrange County Fish Management Report. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 13pp.

¹¹ Pearson J. 1983. Contribution of stocked Northern Pike to year-class strength and harvest at Wabee Lake. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 17pp.

¹² Stillings, G. 1979. Monroe Reservoir Fish Management Report. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 31pp.

¹³ Flatt, T. 1978. Eagle Creek Reservoir Fish Management Report. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 22pp.

¹⁴ Flatt, T. 1977. Brookville Reservoir Fish Management Report. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 36pp.

Co.) that has no minimum size limit on Pike and a six fish daily bag limit, with no more than 1 one Pike per day over 30 inches.

POPULATION STATUS

Indiana Division of Fish and Wildlife (DFW) biologists have quantified several landscape-level metrics for Pike based on standardized surveys of a random sample of northern Indiana glacial lakes from 2010-18¹⁵. Where Pike have been detected (33%), on average (interquartile range), between 1-5 Pike have been collected that weighed 2.6-6.7 pounds, which represented 0.4-1.0% and 2.9-13.3% of the fish community by number and biomass, respectively. Although Pike up to 38.2 inches have been collected, the average size is 22.9-30.8 inches. Of all the Pike collected (N = 117), 6%, 5%, 53%, 27% and 9% were of < stock (<14 in), stock (14-20 in), quality (20-28 in), preferred (28-34 in) and memorable (34+ in) sizes, respectively.

In 1988, a Summary of Strategic Fisheries Management Activities acknowledged that *Pike fisheries* had not been adequately defined. Because the mere presence (detection) of Pike in a lake does not necessarily equate to a *fishable* population of Pike, biologists mined historical survey data and established several criteria to clearly define an inventory of northern Indiana's *Pike fisheries*: (1) lakes had to be ≥ 90 acres (i.e., $\geq 75^{\text{th}}$ percentile) to have Pike populations of sufficient size deemed resilient to angling pressure; historical survey results had to show (2) catch rates of ≥ 1 Pike/gill net lift and (3) detection of memorable-sized (≥ 34 inches) Pike; and (4) lakes were not managed for other stocked sportfish (e.g., Muskellunge or Walleyes). Twenty-two (22) lakes (9,353 acres) met all the criteria. Another twelve (12) lakes (3,445 acres) met all the criteria except that they are managed for other sportfish. These results enabled biologists to create a 10-year *targeted* sampling plan for *Pike fisheries* during the early spring period (water temperatures 38-44 °F) using large trap nets.

Early spring trap netting (March), contrary to standardized community sampling (June), allows biologists to collect sex-specific data from more and larger Pike within a population without the negative effect of gear-related mortality. Since 2012, Pike have been targeted with spring trap nets on twenty glacial lakes (Table 1). Average (interquartile range) catch rates have ranged from 1.1-3.4 Pike/trap lift. Female Pike (N = 169) represent 26% of the Pike collected, with an average catch rate of 0.3-1.1 females/lift and having measured up to 40.4 inches. None of the females collected have been stock-size (14-21 inches), while 37%, 47% and 17% have been quality (21-28 inches), preferred (28-34 inches) and memorable (34+ inches) sizes, respectively. Memorable-sized female Pike have been observed at 65% of the twenty lakes surveyed since 2012. Average male catch rates have ranged from 0.6-2.1 per trap lift. Only 9 of the 476 (< 2%) males have been ≥ 30 inches (Max = 31.5 inches). Most (81%) of the males have been quality-size (21-28 inches; Table 1).

¹⁵ Donabauer, S., M. Porto, T. Leverman. 2014. Status and Trends of Indiana Glacial Lake Fish Communities 1986-2014: Spatial and Temporal Variation of Species Specific Detection Probabilities. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 128pp.

Table 1. Targeted Pike survey CPUE at twenty northern Indiana glacial lakes since 2012. Effort for each targeted Pike survey consists of 8 large trap net lifts.

Lake	County	Year	CPUE	N per 8 large trap net lifts					
				<Stock	Stock	Quality	Preferred	Memorable	Trophy
Round	Steuben	2012	2.3	0	0	14	2	2	0
Clear	Steuben	2012	4.1	1	1	22	6	3	0
Hamilton	Steuben	2012	27.3	0	22	176	20	0	0
Snow	Steuben	2013	1.6	0	0	5	6	2	0
Winona	Kosciusko	2014	12.8	0	0	73	21	8	0
Pike	Kosciusko	2014	9.9	1	6	12	11	1	0
Little Chapman	Kosciusko	2015	7.8	0	0	46	14	2	0
Jimmerson	Steuben	2015	0.9	1	2	2	2	0	0
Crooked	Steuben	2016	1.4	0	0	8	1	2	0
Syracuse*	Kosciusko	2016	1.9	0	6	16	7	1	0
Wawasee*	Kosciusko	2016	1.8	0	6	19	3	0	0
Lawrence	Marshall	2017	2.6	0	1	11	7	2	0
Myers	Marshall	2017	1.0	3	0	4	0	1	0
Waldron	Noble	2017	2.5	0	1	10	8	1	0
Dewart	Kosciusko	2018	3.3	0	5	18	3	0	0
James	Steuben	2018	0.0	0	0	0	0	0	0
Loon	Steuben	2018	2.3	1	0	8	7	2	0
South Twin	LaGrange	2019	0.0	0	0	0	0	0	0
Diamond	Noble	2019	1.1	0	0	8	1	0	0
Silver	Steuben	2019	0.8	1	0	2	2	1	0
1 st Quartile			1.1	0	0	5	2	0	0
Median			2.1	0	0	11	5	1	0
3 rd Quartile			3.4	1	3	18	7	2	0

*Effort was increased to 16 large trap net lifts.

ANGLER STATUS

Pike fishing in Indiana stimulates \$7.7 million of annual economic activity in Indiana. Pike ranked 11th among sportfish sought by anglers in the 2016 licensed angler survey. Although the 2016 licensed angler survey indicated that less than 2% of anglers' fish for Pike, local effort can be substantially higher for lakes with fishable populations. For example, 14.5% of the total fishing effort at Hamilton Lake (Steuben Co.) was specifically directed at Pike, while another 12.9% of the total fishing effort was directed at Pike in combination with Largemouth Bass¹⁶.

The 2015-2019 Status and Trends creel survey results from 40 glacial lakes support the findings from the 2016 licensed angler survey, where overall angler preference for Pike was low (1.8%). Preference for Pike among lakes classified as *Pike fisheries* was only slightly higher (2.0%). Among the anglers fishing for Pike, 47%, 40%, 0%, and 13% reported that fishing was “good”, “fair”, “poor”, or “don't know”, respectively. In addition, 40%, 33%, 13%, and 13% said fishing for Pike had “stayed the same”, “declined”, “improved”, or “don't know”, respectively.

The Record Fish and Fish of the Year programs offer additional information on angling success for Pike in Indiana. Since 1963, 5 Pike have been entered as a Record Fish and 69 Pike have been entered as Fish-of-the-Year. Pike were caught from glacial lakes (54%), rivers (27%) and

¹⁶ Koza, L. 2004. A Survey of the Hamilton Lake Fish Population and Fish Harvest: Steuben County. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 17pp.

impoundments (12%). Pike that were entered varied considerably in size: quality (21-28 inches; 4%), preferred (28-34 inches; 7%), memorable (34-44 inches; 73%) and trophy (44+ inches; 16%). The rate at which Pike are entered into the programs has been steadily increasing. From 1963-1999, approximately 1 Pike was entered every 2 years (N = 25), while 2 Pike per year were entered in the 2000's (N = 23) and nearly 3 Pike per year have been entered in the 2010's (through 2018; N = 23).

PROGRAM ANALYSIS

In 2018, the DFW spent \$30,041 to supply 13,045 acres of fishable Pike waters. Angling opportunities for Pike are currently limited to northern Indiana and although the DFW has stocked Pike in southern impoundments (1962-95), anti-pike sentiment and failure to produce fishable populations stalled further efforts to geographically distribute Pike throughout southern Indiana. Less than 2% of anglers fish for Pike in Indiana, but the DFW's revenue generated by the 5,486 Pike anglers equates to \$56,328 annually, yielding a supply:demand ratio of 0.53:1. This ratio closely approximates the 0.5:1 target established by the DFW to sustain native sport fishing opportunities.

Naturally reproducing Pike populations in northern glacial lakes and rivers are meeting the demand for the species in Indiana. Presently, there is no need to increase the supply of Pike in southern Indiana as the DFW is already providing similar angling opportunities by stocking Muskellunge (*Esox masquinongy*) at 5 southern Indiana waterbodies¹⁷. Therefore, the protection and enhancement of endemic northern Indiana Pike populations should be the immediate focus.

The protection and enhancement of Pike populations largely hinges on the availability of habitat, including cool-water habitat ($\leq 73^{\circ}\text{F}$ and ≥ 3.0 ppm dissolved oxygen) and spawning habitat. Anthropogenic habitat modifications (i.e., residential development, vegetation management) are believed to be a contributing factor to the eutrophication (i.e., nutrient loading) of lakes and the resulting reduction in year-round access to cool-water. There are also indications that climatic changes could contribute to reduced cool-water habitat availability in the future¹⁸. Twenty-two cool-water glacial lake catchments were selected as Conservation Opportunity Areas (COA) in the 2015 State Wildlife Action Plan (SWAP)¹⁹. In order to reduce anthropogenic eutrophication and protect cool-water habitat the DFW should focus nutrient reduction conservation efforts in these catchments. This will provide greater protection for these unique aquatic habitats and Pike populations.

Access to preferred spawning habitat in the form of seasonally flooded wetlands and/or permanently submerged aquatic vegetation is critical to stable recruitment among Pike populations. Unfortunately, anthropogenic habitat modification has greatly reduced the availability of these spawning habitats for Pike. An estimated 85-87% of the wetlands that once existed in Indiana have been lost to development, including lentic wetlands that are the preferred

¹⁷ Pearson, J. 2017. Indiana Muskellunge Strategic Plan 2017-2022. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 19pp.

¹⁸ Höök, T., C. Foley, P. Collingsworth, L. Dorworth, B. Fisher., J. Hoverman, E. LaRue, M. Pyron, J. Tank, M Widhalm, and J. Dukes. 2018. Aquatic Ecosystems in a Shifting Indiana Climate. A Report from the Indiana Climate Impacts Assessment. Paper 1.

¹⁹ Indiana Division of Fish and Wildlife. 2015. Indiana State Wildlife Action Plan. Indiana Department of Natural Resources. Indianapolis, IN. 300 pp.

spawning habitat for Pike^{20,21}. The U.S. Fish and Wildlife Service National Wetland Inventory indicates that approximately 134 acres of lentic wetland habitat has been lost among Indiana's *Pike fisheries*. The DFW should support conservation actions that sustain, enhance, or restore wetlands within Conservation Opportunity Areas identified in the 2015 State Wildlife Action Plan.

The DFW should also continue to review statewide harvest regulations to ensure that fishable populations of Pike persist. Early spring surveys indicate that females require 3 years to reach maturity at which time they average 28 inches and most (88%) of the Pike collected that are ≥ 30 inches are females. By protecting large fecund females, equitably distributing the catch among anglers, and protecting Pike so they are able to spawn at least once before being subject to harvest will ensure sustainability of fishable Pike populations. Locally supported regulations to enhance Pike angling should be considered for populations that have low catch rates or poor size structure.

A spring 2012 trap netting survey²² of Hamilton Lake (Steuben Co.) and 2005 creel survey²³ indicated that: (1) overall harvest of Pike is low; (2) small Pike (mostly males) are abundant; (3) large Pike greater than 30 inches are nearly all females that (4) have a high rate of exploitation. To address these issues a no minimum size limit and six fish daily bag limit, with no more than 1 one Pike per day over 30 inches special regulation was placed on Pike at Hamilton Lake. The special regulation was intended to allow anglers to utilize the abundant population of small Pike, enhance the size structure by increasing the number of Pike ≥ 30 inches, and ensure that natural reproduction of Pike was sustained by large (≥ 30 inches) fecund females. The DFW should conduct a targeted spring trap netting survey at Hamilton Lake by 2023 to evaluate the special regulation.

The endemic Pike populations of northern Indiana's glacial lakes and rivers provide unique trophy angling opportunities, however anglers are often unaware of the opportunities that exist. The limited awareness of Pike angling opportunities is at least partially due to the lack of quality and timely fishing information²⁴. Therefore, the DFW should work to improve the marketing of Pike angling opportunities in Indiana via news releases, social media posts, fishing reports, and website content.

²⁰ IDNR. 1996. Indiana Wetlands Conservation Plan. Indiana Department of Natural Resources. Indianapolis, IN. 78pp.

²¹ Dahl, T. 1990. Wetlands Losses in the United States 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 13pp.

²² Donabauer, S. 2015. Population estimate for Northern Pike – Hamilton Lake (Steuben County). Research Note –2012. Indiana Department of Natural Resources. 4 pp.

²³ Koza, L. 2004. A Survey of the Hamilton Lake Fish Population and Fish Harvest: Steuben County. Indiana Department of Natural Resources, Division of Fish and Wildlife. Indianapolis, IN. 17pp.

²⁴ Indiana Division of Fish and Wildlife. 2018. Angler R3 Plan. Indiana Department of Natural Resources. Indianapolis, IN. 17pp.

STRATEGIC PLAN

Population Goal: Deliver fishable Pike populations among glacial lakes.

Objective: Ensure 35 glacial lakes (13,045 acres) provide a median CPUE of 2 Pike per spring trap lift, and confirm that female Pike collected in spring traps represent no less than 25% of the cumulative catch, memorable-sizes (34+ inches) are detected and cumulative PSD's for quality (21-28 in), preferred (28-34 in) and memorable-size (34+ in) Pike are no less than 37%, 47%, and 17%, respectively.

- **Problem:** Lack of scientific data limits the ability to ensure desired catch rates and size structure of Pike populations among Indiana's Pike fisheries.
- **Strategies:**
 1. Monitor glacial lakes that meet the defined population criteria for *Pike fisheries* by conducting early spring (March/April) trap net surveys.
 2. Evaluate the effectiveness of the special regulation at Hamilton Lake by conducting an early spring (March/April) trap net survey within 5 years.

Human Dimensions Goal: Foster greater awareness of Pike angling opportunities and the societal benefits of cool-water habitat.

Objective: Sustain 5,500 Pike anglers.

- **Problem:** Indiana anglers may mistakenly believe that quality *Pike fisheries* only exist at more northern latitudes.
- **Strategies:**
 3. Market angling opportunities for Pike in Indiana via news releases, social media posts, fishing reports, and website content.
 4. Encourage Pike anglers to participate in the Record Fish/Fish-of-the-Year programs.

Objective: Among *Pike fisheries*, sustain angler preference for Pike between 5-10% where 15% and 50% of those targeting Pike consider fishing to be "*improving*" or "*good*", respectively.

- **Problem:** Lack of scientific data limits the ability to ensure optimum angler use and satisfaction among anglers that target Pike.
- **Strategies:**
 5. Compile and summarize creel surveys results among Pike anglers.
 6. Develop and implement a creel survey to quantify angler use of *Pike fisheries* during peak angling periods (open water and ice fishing seasons).
 7. Conduct a targeted survey of Pike anglers using the Point-of-Sale database.
 8. Determine whether contemporary demands on Pike warrant a review of current:
 - Statewide and local (e.g., Hamilton Lake, Steuben Co.) harvest regulations.
 - Stocking sites (e.g., J.C. Murphey, Newton Co.).

Habitat Goal: Protect the cool-water and spawning habitat necessary to sustain existing Pike populations.

Objective: Maintain a detection rate for Pike of 33% among standardized June glacial lakes surveys that is indicative of cool-water (minimum 1 foot layer containing $\leq 73^{\circ}\text{F}$ and $\geq 3\text{ppm}$ dissolved oxygen) habitat sustainability during the late-summer period and sufficient spawning habitat.


- **Problem:** The lack of a monitoring program limits the ability of managers to use Pike as an indicator species to assess cool-water habitats at the landscape-level.
- **Strategies:**
 9. Conduct standardized gill net surveys in June among glacial lakes.
 10. Monitor cool-water habitat by conducting late-summer temperature and dissolved oxygen profiles among standardized glacial lake surveys.
- **Problem:** Eutrophication is a threat to cool-water habitat sustainability and the loss of spawning habitat reduces recruitment among Indiana's *Pike fisheries*.
- **Strategies:**
 11. Forge partnerships that will address nutrient loading and protect spawning habitat among the Conservation Opportunities Areas identified for cool-water glacial lake habitats in the 2015 SWAP.
 12. Develop and support policy or legislation that will:
 - Protect shoreline, riparian, and wetland habitats.
 - Encourage vegetation control methods that limit nutrient recycling and protect spawning habitat.
 - Reduce external nutrient loading to cool-water glacial lakes.
 13. Identify spawning habitats utilized by Pike among *Pike fisheries* and work with partners to ensure the long-term protection of these habitats.

Author

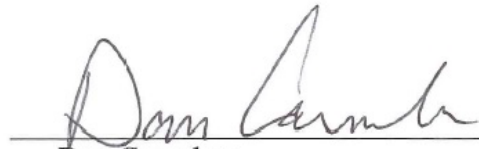
Matthew D. Linn
North Fisheries Research Biologist

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Editors

 12/5/19

Jeremy Price Date
North Region Fisheries Supervisor

 12/5/19

Dan Carnahan Date
South Region Fisheries Supervisor

 12/5/19

Steve Donabauer Date
Indiana Division of Fish & Wildlife

PRIORITIZED STRATEGIES

DFW staff were provided the opportunity to prioritize strategies using a voting system. Each staff member was provided a total of five (5) votes which could be distributed amongst multiple strategies or as few as one (1) strategy. The table below ranks strategies from highest priority to lowest priority based on the cumulative number of votes received by DFW staff. The percentage of votes each strategy received of all available votes provided for reference.

Priority Rank	Strategy #	Strategy	Percent (%)
1	1	Monitor glacial lakes that meet the defined population criteria for Pike fisheries by conducting early spring (March/April) trap net surveys.	20%
2	13	Identify spawning habitats utilized by Pike among Pike fisheries and work with partners to ensure the long-term protection of these habitats.	20%
3	2	Evaluate the effectiveness of the special regulation at Hamilton Lake by conducting an early spring (March/April) trap net survey within 5 years.	17%
4	3	Market angling opportunities for Pike in Indiana via news releases, social media posts, fishing reports, and website content.	14%
5	6	Develop and implement a creel survey to quantify angler use of Pike fisheries during peak angling periods (open water and ice fishing seasons).	9%
6	10	Monitor cool-water habitat by conducting late-summer temperature and dissolved oxygen profiles among standardized glacial lake surveys.	6%
7	11	Forge partnerships that will address nutrient loading and protect spawning habitat among the Conservation Opportunities Areas identified for cool-water glacial lake habitats in the 2015 SWAP.	6%
10	4	Encourage Pike anglers to participate in the Record Fish/Fish-of-the-Year programs.	3%
8	5	Compile and summarize creel surveys results among Pike anglers.	3%
9	7	Conduct a targeted survey of Pike anglers using the Point-of-Sale database.	3%
11	8	Determine whether contemporary demands on Pike warrant a review of current: 1) Statewide and local (e.g., Hamilton Lake, Steuben Co.) harvest regulations 2) Stocking sites (e.g., J.C. Murphey, Newton Co.).	0%
12	9	Conduct standardized gill net surveys in June among glacial lakes.	0%
13	12	Develop and support policy or legislation that will: 1) Protect shoreline, riparian, and wetland habitats 2) Encourage vegetation control methods that limit nutrient recycling and protect spawning habitat 3) Reduce external nutrient loading to cool-water glacial lakes.	0%

PROGRAM ACTIONS (2015-present)

2015

- A Northern Pike targeted survey was completed at Little Chapman Lake (Kosciusko Co.).
- Northern Pike were detected during standardized Status and Trends Fish Community surveys at Big Otter (Steuben Co.), Clear (LaPorte Co.), Eagle (Noble Co.), Gage (Steuben Co.), Old (Whitley Co.), and West Otter (Steuben Co.) lakes.
- Northern Pike fisheries were used to define cool-water lake catchments in the Indiana State Wildlife Action Plan.

2016

- Northern Pike targeted surveys were completed at Crooked (Steuben Co.), Jimmerson (Steuben Co.), Syracuse (Kosciusko Co.), and Wawasee (Kosciusko Co.) lakes.
- Northern Pike were detected during standardized Status and Trends Fish Community surveys at Cass (LaGrange Co.), Diamond (Noble Co.), Hunter (Elkhart Co.), Pike (Kosciusko Co.), Round (Steuben Co.), Tamarack (West Lakes Chain; Noble Co.) lakes.

2017

- Northern Pike targeted surveys were completed at Lawrence (Marshall Co.), Myers (Marshall Co.), and Waldron (Noble Co.) lakes.
- Northern Pike were detected during standardized Status and Trends Fish Community surveys at Lawrence (Marshall Co.), Lower Long (Noble Co.), Wall (LaGrange Co.), and Winona (Kosciusko Co.) lakes.

2018

- Northern Pike targeted surveys were completed at Dewart (Steuben Co.), Loon (Steuben Co.), and James (Steuben Co.) lakes.
- Northern Pike were detected during standardized Status and Trends Fish Community surveys at Barton (Steuben Co.), Dewart (Kosciusko Co.), Little Chapman (Kosciusko Co.), Messick (LaGrange Co.), Myers (Marshall Co.), Pretty (LaGrange Co.), Rupel (St. Joseph Co.), Tippecanoe (Kosciusko Co.) lakes.
- The statewide minimum size limit for Northern Pike was increased from 20.0 inches to 24.0 inches to provide greater protection to spawning females. The bag limit was also modified to allow only one Pike per day over 30 inches. The only exception to this rule was Hamilton Lake (Steuben Co.) that has no minimum size limit on Pike, with no more than 1 one Pike per day over 30 inches.

2019

- Northern Pike targeted surveys were completed at Diamond (Noble Co.), Silver (Steuben Co.), and South Twin (LaGrange Co.) lakes.

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APPENDIX A

Preference Calculation

The preference was calculated by using the top 3 fish species selected during 2016 Indiana Licensed Angler Survey (LAS).

$$\% \text{ Preference} = \text{species LAS Top 3} / \text{total of all LAS top 3} \% * 100$$

$$\% \text{ Northern Pike preference} = 2.5 / 213.75 * 100 = 1.17\%$$

From 2011 National Survey of Fishing, Hunting, and Wildlife Recreation- Indiana:

Anglers (inland) - 745,290

Days of fishing (inland) - 20,719,290

Total expenditures (all waters) - \$671,840,000

Total expenditures (inland): \$665,138,060 ((427,310,000+244,530,000)-6,701,940)

Trip related (All waters) - \$427,310,000

Equipment and other (All waters) - \$244,530,000

Lake Michigan Expenditures: \$6,701,940

Average total expenditures per angler day- \$32.10 (\$665,138,060/20,719,000 angler days). This figure includes all inland expenditures. (\$ used for our creels)

Economic value:

Total Fishing Trip Expenditures (Inland species)=\$665,138,060

Species trip expenditures=% Species preference*\$665,138,060 (total expenditures)

Northern Pike trip expenditures= 0.0117*665,138,060=\$7,782,115

APPENDIX B

Preference Calculation

See Appendix A.

From 2016 National Survey of Fishing, Hunting, and Wildlife Recreation- Indiana:

Anglers – 477,680

Economic Value:

Northern Pike licenses= Northern Pike preference*angler licenses

Northern Pike licenses=0.0117*477,680=5,589

State-wide License value = \$4.6M Sport Fish Restoration grant+\$1.53M DFW matching funds =
\$6.13M

Individual license value=477,680 licensed anglers/\$6.13M=\$25.67

Indiana Northern Pike license revenue =5,589*\$25.67=\$143,470

Because Division of Law Enforcement receives roughly half of license revenue:

Net Northern Pike license revenue=Indiana Northern Pike license revenue*0.5

Net Northern Pike license revenue=\$143,470*0.5=\$71,735