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RESEARCH REPORT 49

PRODUCTION OF NORTHERN PIKE IN A MANAGED MARSH LAKE RIPLEY, WISCONSIN

By
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Department
of
Natural
Resources

Madison, Wis.

1970

ABSTRACT

During the years 1964-66, Perrys Marsh at Lake Ripley, Jefferson County, was the site of a study to assess the production of northern pike in the marsh.

The number of northern pike produced in Perrys Marsh was too small to significantly improve the northern pike fishery of Lake Ripley. It was concluded that Perrys Marsh was poorly suited as a managed production area for northern pike, probably due at least in part to low zooplankton food levels in the marsh.

A C K N O W L E D G M E N T S

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Edited by Carol A. Knott

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INTRODUCTION

Wetlands and Northern Pike

Northern pike (Esox lucius) spawn in wetlands or lake and stream floodings (McNamara, 1936; Clark, 1950; Fabricius and Gustafson, 1958; Franklin and Smith, 1963). Here the eggs hatch and the fry develop into fingerlings which remain for a few days to several weeks before emigrating back into the main body of water (Hunt and Carbine, 1951; Franklin and Smith, 1963). It is commonly believed that northern pike population levels are directly dependent upon the availability and quality of wetlands bordering lakes and streams. Concern over the loss of wetlands to drainage and landfills has led the Conservation Departments of Minnesota (Jarvenpa, 1967), Michigan (DiAngelo and Williams, 1962), and Wisconsin to purchase, improve, and manage wetlands for northern pike.

Managed Wetlands for Northern Pike

Managed wetlands for northern pike can be developed on upland, marsh, or swamp land through dike and low head dam construction. Managed wetlands are flooded in late winter or early spring by trapping surface water runoff or by pumping water from nearby lakes or streams. Northern pike brood fish or hatchery fry are then stocked. When the fingerlings produced are approximately 2 inches long (the length when predation upon other fish and cannibalism begins), the wetland is drained and the fingerlings are removed for stocking. Most fishery workers believe managed wetlands for northern pike should be readily drainable and should exclude other fish species.

The managed wetland is considered an improvement over natural spawning and rearing conditions for northern pike. Regulated water levels, abundant zooplankton levels which commonly occur in managed wetlands flooded in the spring, and the absence of competing fish are believed to reduce losses of the young due to exposure, food shortage and predation which normally occur in nature. In spite of these advantages the wetlands that can be purchased and managed for northern pike are only a fraction of the wetlands that once bordered many lakes and streams. Successful attempts to replace these losses of natural wetlands with marshes effectively managed for northern pike will depend upon intensive research.

In order to prepare guidelines for future development of marshes we must first determine situations where managed wetlands produce high yields of northern pike, those where management does not succeed, and the effectiveness of that production in augmenting

northern pike populations in associated lakes. This will require many trial and error management attempts in a variety of situations. This study represents a beginning of research in Wisconsin directed to those questions.

The Perrys Marsh Project

In the spring of 1964 the Oakland Conservation Club of Cambridge and the Wisconsin Conservation Department (now Department of Natural Resources) undertook cooperative sponsorship of a northern pike spawning and rearing marsh at Lake Ripley, Jefferson County. The Oakland Conservation Club offered labor and materials for the project. The Department agreed to stock the marsh with northern pike and furnish technical assistance. The marsh was owned by Mr. O. E. Perry, a club member, who presented the club with a 10-year lease to the land.

The Department felt this undertaking would offer an opportunity for study and evaluation of a managed marsh for northern pike. Fish manager Wilbur Byam handled much of the public relations work associated with the project. Fisheries research personnel of the Delafield station furnished technical assistance and evaluated the project. The main objective of the research was to assess the production of northern pike in the marsh. A more comprehensive study could not be undertaken due to the demands of other projects then in progress.

The Department directed the management of Perrys Marsh during the springs of 1964, 1965 and 1966. Limited fieldwork was conducted at the marsh, production figures were kept of the northern pike produced, and electrofishing surveys were conducted at Lake Ripley each year to search for northern pike young.

DESCRIPTION OF THE STUDY AREAS

Perrys Marsh

Perrys Marsh is a quarter mile from Lake Ripley and drains into it by a small stream. In early spring the stream has a flow as great as 3 cubic feet per second, but is dry in many summers. The downstream end of Perrys Marsh is diked by a county road. Two culverts 4 feet in diameter carry the stream flow from the marsh under the road.

Each of the years Perrys Marsh was used for northern pike production, water levels were maintained by a sandbag dam installed in late winter. The dam required about 100 sand bags and was installed at the point where water leaving the marsh enters the outlet culverts. The marsh level was held at 18 inches below the top of the culverts, flooding about 10 acres of the marsh. Water

depths in the flooded area ranged from less than 2 inches to 6 feet with an average depth of about $1\frac{1}{2}$ feet.

Cattails (Typha spp.) dominate most of the flooded area while sedge hummocks (Carex stricta) occur along the edge. Yellow water lily (Nuphar advena) occurs in the deeper portions of the stream channel passing through the marsh. The bottom is predominantly peat and muck. Water in the marsh is clear but tea colored. A water sample taken in the marsh on April 21, 1966 revealed a pH of 8.2 and a methyl orange alkalinity of 257 ppm.



Flooding of Perrys Marsh in April, 1964.

Lake Ripley

Lake Ripley is a fertile, hard water lake typical of southeastern Wisconsin. It has a surface area of 428 acres and a maximum depth of 50 feet (Fig. 1). The 5-foot contour is relatively close to shore except at the shallow inlet bay and the south and west shores of the lake. Lake sediments are sand with gravel along the west shore and muck and marl in the inlet bay. The shore is highly developed with homes and cottages on all high land. About 50 percent of the shoreline on the southeast inlet bay is low, marshy and not conducive for home or cottage development; however, such development has occurred and is threatening portions of the remaining marsh.

Lake Ripley is used extensively for fishing and has provided good fishing in the past. Panfish, predominantly bluegills, provide

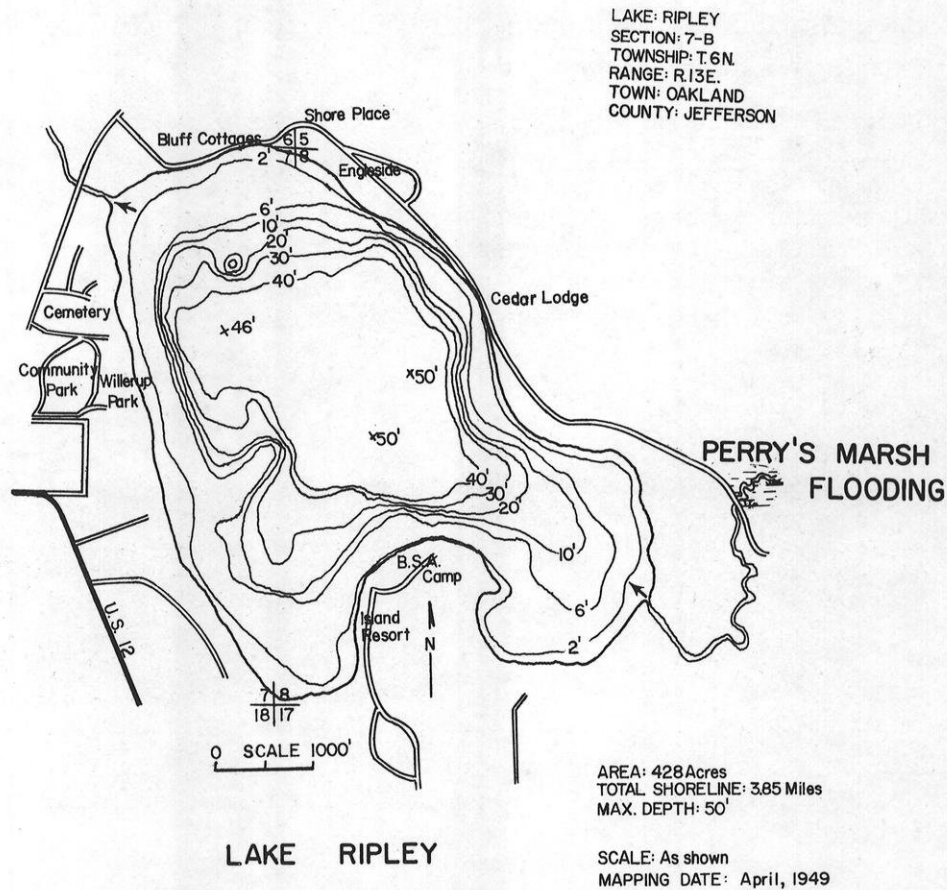


FIGURE 1. Contour map of Lake Ripley showing Perrys Marsh.

most of the fishery. Northern pike and largemouth bass are also important. The angling record for largemouth bass in Wisconsin is an 11 lb 3 oz fish caught from Lake Ripley in 1940. Walleyes have been stocked but have not reproduced well; some large walleyes remain.

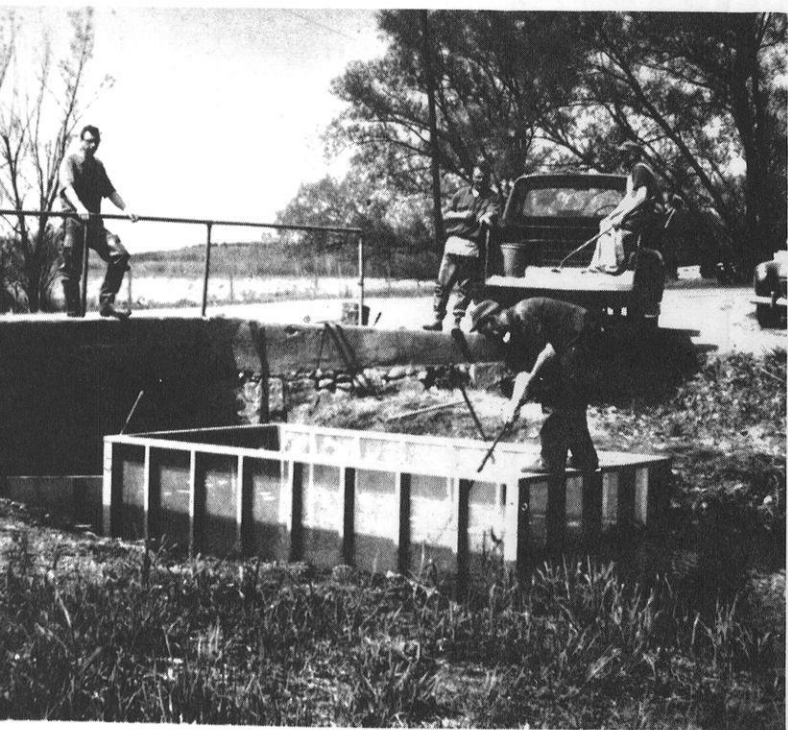
MATERIALS AND METHODS

Dam Construction and Maintenance

Each year during the spring thaw Oakland Conservation Club members installed the sandbag dam. Burlap bags filled with coarse sand were placed in a semi-circle to form the dam at the outlet of Perrys Marsh. Flow was regulated by removing or adding sandbags. The dam required daily inspection for leaks which periodically developed. In early April, 1966 the dam washed out following a heavy rain, requiring the construction of a new sandbag dam.



Using a cheesecloth-covered dip net to search for northern pike fingerlings in a slough at Pleasant Lake (top, left) and making survival counts of northern pike fry in the Delafield ponds (top, right). Similar methods were used at Perrys Marsh.



Oakland Conservation Club members installing the fish trap below Perrys Marsh.

Stocking Northern Pike Adults and Fry

Perrys Marsh was stocked with northern pike adults ready to spawn in 1964 and 1966. The brood fish were taken in fyke nets from Lake Nagawicka, Waukesha County, transported to the marsh by fish truck, and released just above the dam. Northern pike fry, hatched at the Delafield and Wild Rose hatcheries, were scatter planted in 1965. At the time of the fry stocking, a sample of fry was held in muslin enclosures in the marsh. Survival counts were made of the fry in the enclosures until the feeding stage was reached.

Sampling Eggs, Fry, Fingerlings, and Zooplankton

Research personnel made periodic checks in the marsh in 1964 and 1965 to search for northern pike eggs, fry and fingerlings and to collect zooplankton. Similar checks could not be made in 1966. Collection methods used were the same as those of concurrent studies at Pleasant Lake (Kleinert and Mraz, 1966). Bottom vegetation along the margins of the marsh was searched for eggs and fry by hand sorting plant material dipped from the bottom. Fingerlings under 2 inches long were collected in a cheesecloth-covered dip net. Larger fingerlings were caught using a 4-by-6-foot minnow seine. Zooplankton samples were taken just above the marsh dam by pulling a number 2 nylon cone net a measured distance through the water. All samples were preserved in formalin.

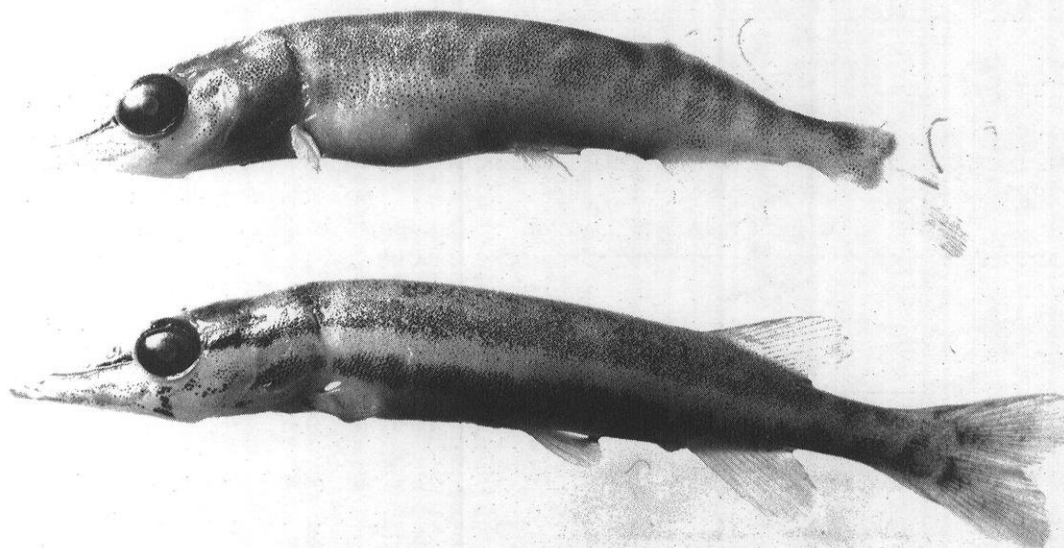
Zooplankters from the cone net samples were identified and then counted in a Sedgwick-Rafter cell under the magnification of a binocular microscope. Densities of zooplankters were estimated by averaging the counts of three 1 cc measures from each water sample. The averaged count derived for the 1 cc samples was then projected to enumerate the number of zooplankters in 1 liter of marsh water. The stomachs of fingerlings collected in the marsh were examined for the amount and kind of food eaten.

Trapping Fish Leaving the Marsh

When northern pike in the marsh reached the feeding stage, a screen fish trap was installed below the sandbag dam to trap fish leaving the marsh. One-eighth-inch mesh screening was used in the trap. This size screening retained fingerlings exceeding 1 inch in length. Smaller screening was tried, but tended to plug up with floating vegetation very quickly and was not practical to use.

When the northern pike fingerlings in the marsh were almost 2 inches long, the marsh was drained over a 24-hour period. During draining the screen fish trap required frequent cleaning. Fingerling northern pike were identified, counted, measured, and released below the trap to allow movement into Lake Ripley. In 1964 all

northern fingerlings were finclipped, but this procedure was abandoned in 1965 and 1966 because 2-inch northern pike fingerlings were difficult to finclip, some fingerlings were injured during finclipping, and the time required was excessive. In addition to northern pike, some grass pickerel (Esox americanus vermiculatus) fingerlings were produced by native pickerel present in the marsh. Grass pickerel fingerlings were identified, counted, measured and preserved in formalin for study. Fingerlings of this species were identified by the pigment-free line extending from the snout to the tail (Kleinert and Mraz, 1966).



Northern pike (above) and grass pickerel (below) fingerlings approximately two inches long. Pigment-free line extending from snout to tail identifies the pickerel.

Fall Shocker Surveys

Lake Ripley was electrofished one night in the fall of 1964 and 1965 and three nights in the fall of 1966 to determine the abundance of northern pike fingerlings. The electrofishing gear consisted of a three-phase 230-volt A.C. generator with three electrodes suspended in the water in triangular fashion. The shocking unit was mounted on a square end work boat powered by a five-horsepower outboard motor. Illuminated by four 150-watt floodlights, the boat was driven at slow speed by the operator seated in the stern, while one or two men dipped fish with long-handled dip nets from the front deck. The surveys circuited the perimeter of the lake covering the shallows to a depth of 8 feet.

BIOLOGICAL DATA

Stocking Northern Pike Spawners

Perrys Marsh was stocked with 15 male and 8 female northern pike containing an estimated 174,264 eggs between April 3 and 15, 1964 (Tables 1 and 2). The marsh was stocked with 32 male and 20 female northern pike containing an estimated 532,934 eggs between March 21 and 29, 1966. All releases were made just above the sandbag dam. Following release the northern pike adults oriented themselves to the current and swam a short distance upstream. Most fish tended to rest on the bottom after proceeding only a few feet from the release point. Marsh water temperatures at the time of the stockings varied from 36 to 44 F. After release, the northern pike adults were seldom seen in the marsh. The large area and dense vegetation in the marsh made observation especially difficult. No spawning activity was observed.

Release and Survival of Fry

In the spring of 1965, fry stockings were made in Perrys Marsh. On April 30, 61,000 fry from the Delafield Hatchery were stocked in muslin enclosures in Perrys Marsh, prior to their release. These fry died on the fourth day of their confinement in the muslin enclosures. Suffocation due to low dissolved oxygen levels in the enclosures was believed responsible for death. A second stocking of 100,000 fry from the Wild Rose Hatchery was scatter planted in the marsh on May 6. Samples from the second stocking held in muslin baskets showed 12 percent survival after 2 days and 3.5 percent survival after 6 days, when the fry became feeding fingerlings averaging 17.0 mm long.

TABLE 1
Timetable of Procedures at Perrys Marsh

Event	Year		
	1964	1965	1966
Sandbag dam installed	March 23	April 6	March 19
Spawners stocked	April 3, 4, 15	---	March 21, 29
Fry stocked	---	May 6	---
Fish trap installed	May 16	May 8	April 23
Marsh drained	May 22-23	June 1-2	May 26



Stocking a northern pike spawner near the semi-circular sandbag dam and culvert tubes which drain Perrys Marsh.

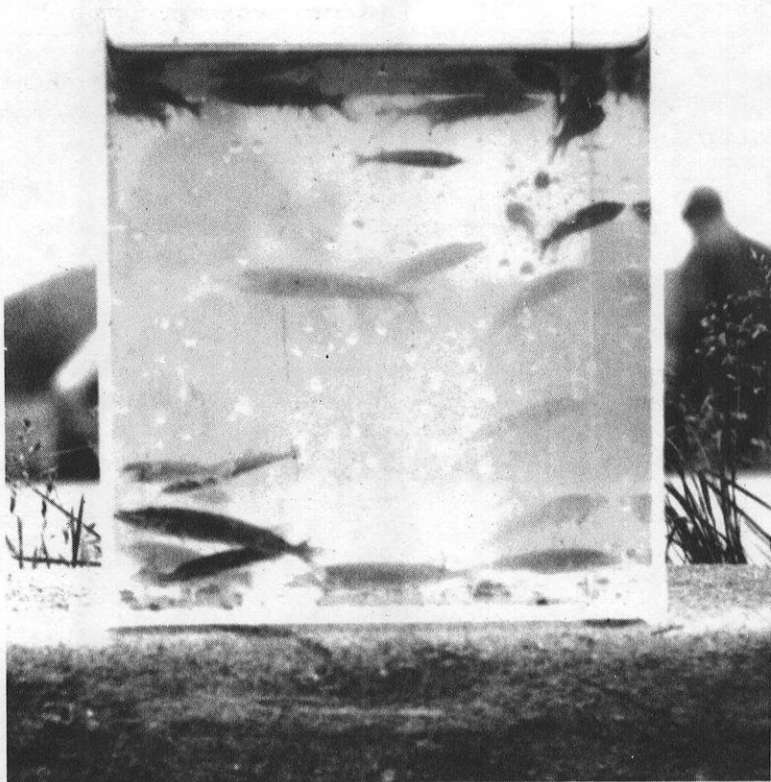
TABLE 2
Northern Pike Stocked and Fingerlings Harvested at Perrys Marsh

Measurement	Year and Species							
	1964		1965		1966			
	N. Pike	Pickerel	N. Pike	Pickerel	N. Pike	Pickerel		
Spawners stocked Males, females	15,	8	--	--	--	32,	20	--
Avg. length (inches) Males, females	--	--	--	--	17.8,	20.7	--	--
Estimated no. of mature eggs*	174,	264	--	--	--	532,	934	--
No. fry stocked	--	--	100,000	--	--	--	--	--
Fingerling yield	703	156	73	60	524	215		
Avg. length (inches) Fingerlings	2.1	1.2	2.2	1.6	1.9	1.6		

*All egg number estimates are based on the northern pike length-egg number relationship described by Franklin and Smith (1963). The 1964 estimate assumes the average length of females was 20.0 inches. The 1966 estimate is the sum total for individual estimates based on actual length measurements of each female.

Sampling Eggs, Fry and Fingerlings

Northern pike eggs were never found in spite of numerous searches of Perrys Marsh in April of 1964 and 1965, but fry were found in April, 1964. Northern pike fingerlings were collected in the marsh on April 29 and May 6, 15 and 18, 1964. A single pickerel fingerling was taken in the May 6 collection. The prior two collections were taken with cheesecloth dip nets in a small section of sedge hummocks in the center of the marsh near the main stream channel. Searches of other locations in the marsh on the same dates failed to yield any fingerlings. The latter two collections were taken by seine just above the dam when the fingerlings were nearly 2 inches long. Numerous searches of Perrys Marsh in 1965 failed to yield fingerlings. No searches were made in the marsh in 1966.



Fingerlings produced at Perrys Marsh: the larger fingerlings are northern pike and the smaller ones are grass pickerel.

Zooplankton Food of Young Northern Pike

There is a great overlapping in the feeding habits of young northern pike of all sizes, but in general feeding proceeds from zooplankton to insects to fish (Hunt and Carbine, 1951; Franklin and Smith, 1963). Northern pike feeding studies show that fingerlings under 1 inch long feed on zooplankton. Between 1 and 2 inches the food includes immature aquatic insects. The third stage of feeding occurs sometime after northern pike exceed 2 inches in length, when the food is primarily fish. Among 35 northern pike fingerling stomachs examined from the marsh collections in 1964, all contained food except seven fish in the 37 to 53 mm length range (Table 3). Food of fingerlings up to 23 mm consisted of copepods and cladocerans. Fingerlings from 37 to 53 mm contained Diptera larvae in addition to copepods and cladocerans.

Daphnia sp. and Cyclops sp. were the two major organisms found in the zooplankton. Zooplankton counts did not exceed 7.4 copepods and 0.4 cladocerans per liter in May 1964 and 3.6 copepods and 1.6 cladocerans per liter in May 1965. These counts compared with counts made in other areas in May indicate a poor zooplankton food supply, especially low in numbers of cladocerans (Table 4). In 1965 attempts were made to increase the numbers of zooplankton in Perrys Marsh by applying 100 lbs. of Torula Yeast on April 20 and 75 lbs. on April 26. Dense cattails restricted the application to open water areas where the current through the marsh carried away much of the yeast applied. In spite of the yeast treatments, zooplankton levels measured by dip net samples were as low in May 1965 as in May 1964.

Trapping Migrating Fish Prior to Drawdown

Franklin and Smith (1963) found that light intensity was one of the most important factors controlling emigration of northern pike fingerlings. They observed that heavy emigration began on cloudy days only if the sun appeared, but began on clear days as soon as the sun rose. Few fingerlings emigrated at night. Franklin and Smith believed northern pike fingerlings must attain a length of 0.8 inches before emigration begins.

We were concerned that northern pike fingerlings might emigrate from Perrys Marsh too small to be trapped or prior to installation of the fish trap. If such emigration took place we would underestimate the production of fingerlings in the marsh. The first year of management we suspected early emigration, but did not witness nor hear reports of early emigration from club members who made frequent visits to the marsh. The fish trap was installed in the stream below Perrys Marsh from one to four weeks prior to draining each year

TABLE 3
Abundance of Food Organisms Determined From Dip Net Samples Compared With Food Organisms
in Northern Pike Fingerlings From Perrys Marsh

Date	Number of Stomachs Examined	Average Length of Fingerlings (mm)	Mean Number of Food Organisms						
			Copepods		Cladocerans		Diptera Larvae		
			Per Stomach	Per Liter	Per Stomach	Per Liter	Per Stomach	Per Liter	
				<u>1964</u>					
April 29	9	12.3	10.9	2.4	0	0	0	0	0
May 6	13	18.8	11.5	5.6	0.1	0	0	0	0.7
May 15	5	36.0	4.0	7.4	4.6	0.4	0.4	0.4	0.9
May 18	8	42.6	0	1.1	0	0.3	0	0	0.1
				<u>1965</u>					
May 4	0	--	--	0.2	--	0	--	--	0
May 12	0	--	--	0.5	--	0.2	--	--	0.1
May 21	0	--	--	3.6	--	1.6	--	--	0.6

TABLE 4
Abundance of Copepods and Cladocerans in Southeastern Wisconsin
Ponds and Wetlands in May*

Area and Year	Mean Number Per Liter of Water		
	Copepods	Cladocerans	Total
Perrys Marsh 1964	4.7	0.2	4.9
Perrys Marsh 1965	1.4	0.6	2.0
Pleasant Lake Slough 1963	14.7	0.2	14.9
Pleasant Lake Slough 1964	3.9	5.0	8.9
Pleasant Lake Slough 1965	5.1	38.3	43.4
Delafield Pond II 1964	1.0	15.2	16.2
Delafield Pond III 1964	0.7	50.3	51.0
Delafield Pond III 1965	0.7	35.2	35.9
Delafield Pond IV 1964	58.1	27.1	85.2
Delafield Pond IV 1965	1.5	4.1	5.6
Delafield Pond V 1964	0.8	37.2	38.0
Delafield Pond V 1965	1.6	31.8	33.4
Average for all areas	7.9	20.4	28.3

*All samples taken by Delafield Station Personnel

to check emigration of fingerlings from the marsh. Less than 50 fingerlings were caught in the fish trap prior to drawdown in any given year indicating few fish were leaving the marsh. Visual observations during bright days failed to reveal more than an occasional fingerling leaving the marsh. This supported our belief that few fingerlings emigrated from the marsh prior to drawdown.

Draining the Marsh

1964: The marsh was drawn down on May 22 and 23, 1964. A total of 703 northern pike fingerlings averaging 2.1 inches and 156 grass pickerel fingerlings averaging 1.2 inches were taken. An estimated 20,000 2-to-3-inch tadpoles were also caught in the trap, the largest number of which were taken during the night of May 22. Other fish, including sunfish, grass pickerel adults, bullheads and lake chub suckers, were also taken in the trap, but together were less than 100 fish. No northern pike adults were taken. All northern pike adults had apparently left the marsh before the trap was installed on May 16.

1965: The marsh was drawn down on May 8. A total of 73 northern pike fingerlings averaging 2.2 inches and 60 grass pickerel fingerlings averaging 1.6 inches were taken. A few sunfish, adult grass pickerel, lake chub suckers, bullheads, several hundred large tadpoles and a number of painted turtles were also taken in the trap. No northern pike adults were taken. They had apparently left the marsh before the trap was installed on May 8.

1966: The marsh was drawn down on May 26. A total of 524 northern pike fingerlings averaging 1.9 inches and 215 grass pickerel fingerlings averaging 1.6 inches were taken. A few sunfish, adult grass pickerel, lake chub suckers, bullheads, six northern pike adults, several hundred large tadpoles and a number of painted turtles were also taken in the trap.

Each year the marsh was drained, the trap was left in place for approximately one week following drawdown to trap fingerlings still present in the stream. During this week, some fingerlings continued to drift into the trap, but never more than 5 percent of the total harvest. Searches were always made in the marsh following draining to look for stranded fingerlings, but none were found. Apparently northern pike adults moved out of the marsh within a few weeks of spawning as few were recaptured in the fish trap.

Shocker Surveys of Lake Ripley

1964: Lake Ripley was electrofished on October 12, 1964, to search for stocked fingerlings originating from the marsh. Eight

adult northern pike from 21.3 to 30.3 inches were caught; however, no native or marked young-of-the-year northern pike from Perrys Marsh were taken.

1965: Lake Ripley was electrofished on October 12, 1965. Two complete circuits of the shoreline were made. Seven northern pike ranging in size from 19.9 to 27.0 inches were caught; no northern likely to be young-of-the-year fish were seen. One of the captured northern pike 21.5 inches long had a left pectoral fin clip. This fish was hatched in the rearing marsh in the spring of 1964.

1966: Lake Ripley was electrofished on the nights of September 15 and 22, and October 17. Two complete circuits of the shoreline were made each night. Three northern pike were caught ranging in size from 24.0 to 31.0 inches. No native or marked young-of-the-year northern pike were taken.

Experience in southeastern Wisconsin lakes has demonstrated that shocker surveys catch few northern pike. We believe the shocker survey is a poor means of determining northern pike abundance. Fyke netting during the spawning run provides best means of determining northern pike abundance. However, the work schedule did not permit spring netting at Lake Ripley.

Observations in 1967

The Fishery Research Section terminated participation in the Perrys Marsh project after the 1966 field work was completed. It was concluded that Perrys Marsh was poorly suited as a managed production area for northern pike. In 1967 the Oakland Club decided to continue managing the marsh as was done in the previous three years, but without stocked fish from the state. Club members reported some northern pike adults moved into Perrys Marsh from Lake Ripley to spawn. Several adult northern pike were caught in the trap returning to Lake Ripley. In May club members reported northern pike fingerlings were appearing in the trap. Fisheries Research personnel from Delafield followed up these reports with a field investigation. Club members had kept count of the fingerlings entering the trap from the marsh. Less than 500 fingerlings were trapped in 1967, most of these were believed to have been grass pickerel. A sample of fingerlings collected during trapping operations was composed of three northern pike between 1.5 and 1.8 inches and 44 grass pickerel between 0.8 and 1.4 inches. About a dozen northern pike were trapped that ranged in size from about 4 to 5 inches; they may have been holdovers in the marsh from the preceding year.

PROJECT PUBLIC RELATIONS

An informal meeting was held between Wisconsin Public Service Commission representatives, Fish Manager Byam, and representatives from the Oakland Conservation Club prior to the start of the project. At this meeting it was verbally decided that no formal permit would be required for the damming of Perrys Marsh in the spring of each year, but water levels should not exceed a level set at 18 inches below the top of the outlet culverts draining the marsh.

Fish Manager Byam and Fisheries Research personnel met with the Oakland Club on several occasions each year to coordinate project activities. We presented a project progress report with colored slides to a winter meeting of the club each year.

The Oakland Conservation Club was divided into 3 factions concerning the Perrys Marsh project. One group consisting of 7 club members and Mr. O. E. Perry, owner of the marsh, firmly supported the project and provided excellent assistance over the entire study period. These men made sacrifices of their spare time and labor in building and maintaining the marsh dam and fish trap, and made frequent observations of the marsh and reported to us and followed our suggestions promptly and completely. It was a pleasure to work with them. A second larger group consisted of many members of the club who supported the project but did not participate. The third group was a minority, chiefly a single member who insisted the project would not succeed.

During the marsh operation, complaints were received from 2 farmers and 1 homeowner, located on the watershed above Perrys Marsh. These property owners complained that the dam interfered with drainage from their properties. Our own checks and checks made by Wisconsin Public Service Commission Engineers failed to substantiate these complaints.

SUMMARY AND CONCLUSIONS

For the 3-year period of marsh operation, the average yearly production of fingerlings amounted to only 87 northern pike and 29 grass pickerel per acre of marsh compared to an average production of 1,930 fingerlings per acre in 10 managed marshes in Michigan in the 3-year period 1959-1961 (DiAngelo and Williams, 1962). Actual counts made by trapping northern pike fingerlings emigrating from 19 controlled spawning areas in Minnesota showed the average production of fingerlings per acre to be 4,834 in 1962 and 1,788 in 1963 (Jarvenpa, 1967). The small number of northern pike produced in Perrys Marsh was too small to significantly improve the northern pike fishery of Lake Ripley. Reasons for the low production of

fingerlings may have been related to low zooplankton food levels in the marsh. Perrys Marsh contained little zooplankton in the spring and was chiefly of the cattail marsh type, which has been found to be poorly suited for northern pike production elsewhere. The site also had the undesirable feature of having a stream draining the marsh, which compounded the difficulty of maintaining the dam during high water and permitted entry and exit of fish.

We believe efforts should be increased to locate and manage new production areas for northern pike in Wisconsin waters where failure of natural production is evident. In spite of poor success in producing northern pike fingerlings in Perrys Marsh, studies in Michigan and Minnesota have demonstrated that large numbers of northern pike can be produced through wetland management. In selecting new sites, it is recommended that habitat types be tried which have proven to be successful in Michigan and Minnesota work. Sites which are completely drainable and where it is possible to exclude other fish are reported to be best.

Further studies of the northern pike production capacity in managed marshes will be necessary including studies of factors controlling production and the effectiveness of that production in augmenting northern pike populations in associated lakes. A monitoring system should be adopted whereby basic information on the numbers of northern pike stocked and produced can be determined for all rearing areas used in the state. Information on the characteristics of the rearing areas, including water chemistry data, zooplankton levels and food contents of fingerling stomachs should be determined. Accurate record keeping over a period of years will eventually enable us to isolate those factors associated with maximum production.

LITERATURE CITED

Clark, C. F.

1950. Observations on the spawning habits of the northern pike, Esox lucius, in Northwestern Ohio. Copeia, 1950, No. 4: 285-288.

DiAngelo, S., and J. E. Williams

1962. Ponds for pike. Mich. Conserv. May-June 1962:2-7.

Fabricius, E., and K. J. Gustafson

1958. Some new observations on the spawning behavior of the pike, Esox lucius L. Fish. Bd. of Sweden, Inst. of Freshwater Res. Drottningholm, 39:23-54.

- Franklin, D. R., and L. L. Smith, Jr.
1963. Early life history of the northern pike, Esox lucius L., with special reference to the factors influencing the numerical strength of year classes. Trans. Amer. Fish. Soc. 92:91-110.
- Hunt, B. P., and W. F. Carbine
1951. Food of young pike, Esox lucius L., and associated fishes in Peterson's Ditches, Houghton Lake, Michigan. Trans. Amer. Fish. Soc. 80:67-83.
- Jarvenpa, O. E.
1967. Multiple purpose marsh management in Minnesota. Paper presented at the 29th Annual Meeting, Midwest Fish and Wildlife Conf., Madison, Wis., Dec. 10-13, 1967. 7p.
- Kleinert, S. J., and D. M. Mraz
1966. Life history of the grass pickerel (Esox americanus vermiculatus) in southeastern Wisconsin. Wis. Conserv. Dept. Tech. Bull. No. 37. 40 p.
- McNamara, F.
1936. Breeding and food habits of the pikes, Esox lucius and Esox vermiculatus. Trans. Amer. Fish. Soc. 66:372-373.

