

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FORESTRY, WILDLIFE AND RECREATION

BUREAU OF FISH AND WILDLIFE MANAGEMENT
Fish Management Section Report Number 73

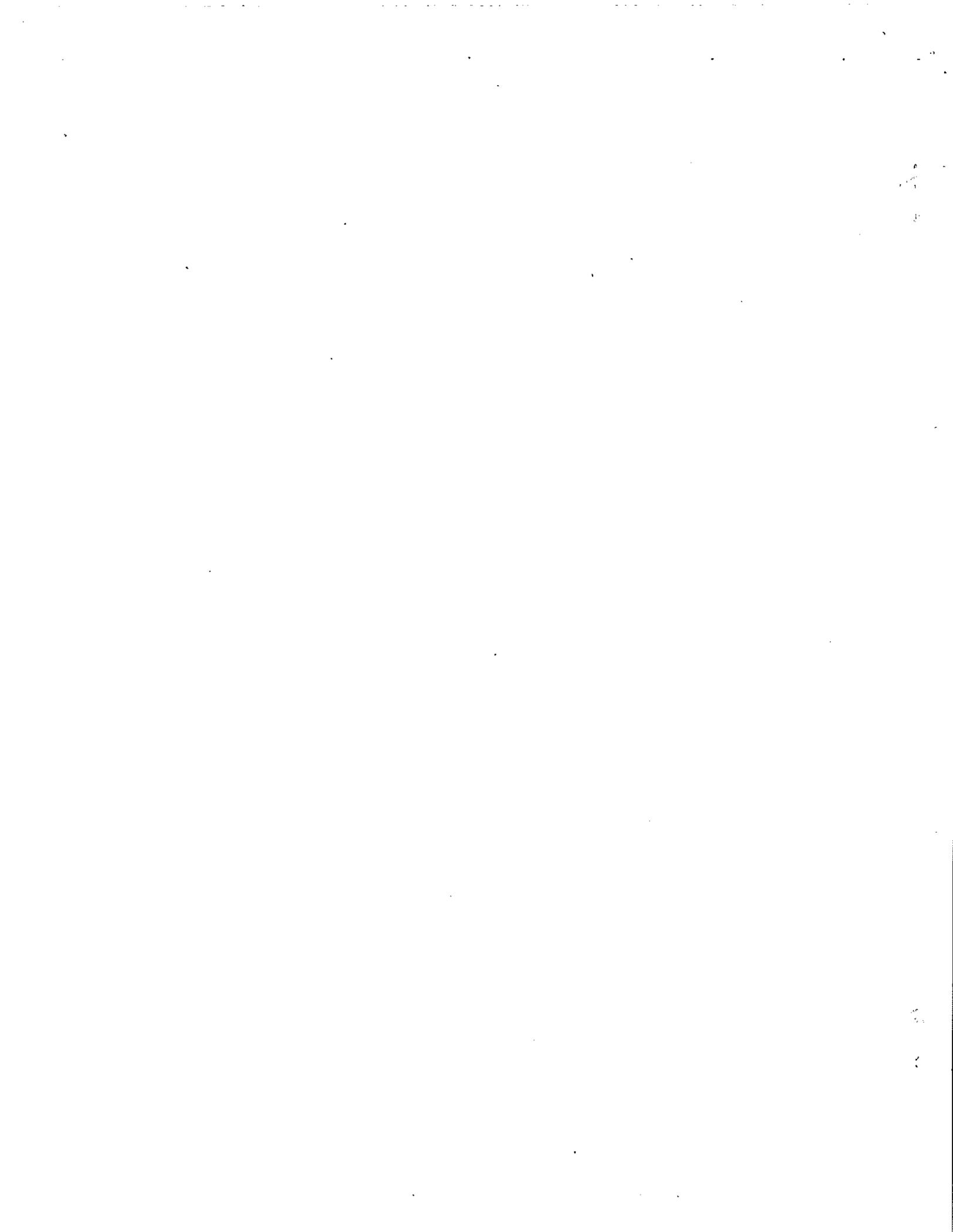
October, 1974

Walleye Fishery in Pike and Round Lakes Price County

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INTRODUCTION

An investigation of the walleye population, Stizostedion vitreum vitreum (Mitchill) in Pike and Round Lakes, Price County, in northwest Wisconsin was conducted during 1972.

The investigation was undertaken to gain information as to the effects of sucker removal on a walleye population and the status of a walleye population under recently liberalized fishing regulations, (removal of size limit in 1971). The evaluation included a random creel census during the summer of 1971 to measure sport fishing effort and harvest, fish population sampling in 1972 to obtain information on age composition, growth, recruitment, reproduction and total mortality of the walleye population and a white sucker and redhorse removal project in the spring of 1972.

This report is of a short range nature and is not intended to answer the many problems which arise in the management of walleye populations. However, when reports such as this are supplemented by long term research studies, a more positive management approach may be gained.

DESCRIPTION OF STUDY AREA

The study lakes, Pike and Round, constitute half of the four lake, Pike Lake Chain-of-Lakes in northeastern Price County, (see Fig. 1). The other two lakes in the chain, Rice and Turner, flow into Pike Lake via Rice Creek from the northeast. Pike Lake empties into Round Lake through a narrow channel and Round Lake forms the headwaters of the South Fork of the Flambeau River.

Pike Lake is a 738.6 acre drainage lake with four inlets and one outlet. Maximum depth is 17 feet with 6% under 3 feet. Littoral bottom types are 75% sand, 10% muck, 10% detritus and 5% gravel. Aquatic vegetation is limited to scattered patches of Eleocharis sp., Potamogeton sp. and Nymphaea sp. The water is dark brown stained and slightly acid and infertile with a methyl purple alkalinity of 30 and pH of 6.4. Several major walleye, muskellunge and sucker spawning areas have been determined and are located on the accompanying map. Shoreline development is moderate with seven resorts and 30 to 40 cabins present.

Round Lake has an area of 761.2 acres and a maximum depth of 24 feet; 6.1% is under 3 feet and 42.9% is over 20 feet in depth. The water level for Round Lake and the entire Pike Lake Chain is controlled by the outlet structure where the South Fork of the Flambeau River begins. The littoral bottom is predominantly sand and gravel with small bays on the south end of the lake having a muck bottom. Aquatic vegetation consists of large areas of Eleocharis sp. along the shallow northern shore and isolated patches of Potamogeton sp., Nymphaea sp. and Ceratophyllum sp. in the muck-bottomed bays. The dark brown water is soft and slightly acid with a pH of 6.4 and methyl purple alkalinity of 21 um. The U. S. Forest Service controls nearly 2/3 of the land surrounding

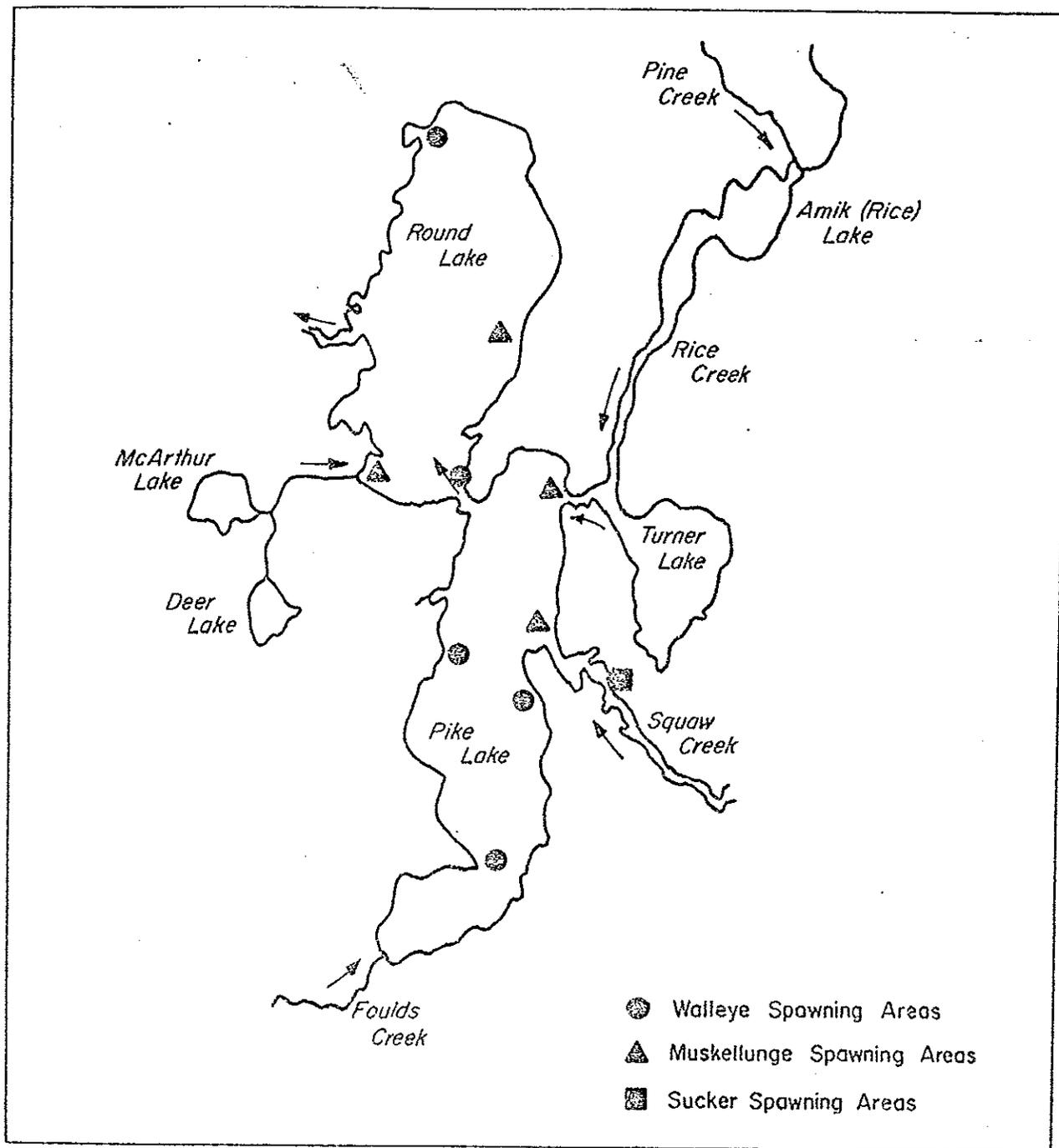


FIGURE 1. PIKE LAKE CHAIN OF LAKES AND ASSOCIATED SPAWNING AREAS

the lake. There are three resorts and 20 to 30 cabins, all on the southern half of the shoreline. Muskellunge and walleye spawning areas are located on the accompanying map.

Public access to Round Lake is gained by a U. S. Forest Service site on the west side of the lake and a DNR site on the southeast side. Both have concrete ramps with parking. The channel between Pike and Round Lakes is navigable as is Rice Creek which connects Pike Lake to Rice and Turner Lakes. The results of this and past surveys indicate that the walleye populations in both lakes are very similar. Water exchange is excellent between the two lakes. For these reasons the walleye populations of the two lakes are considered interchangeable enough to be considered as one population.

METHODS

Equipment

Fish were captured using a 230-volt, 3000 watt A.C. boom shocker, operated at night. No pulsator or transformer units were used on the generators. Due to low conductivity of the water, (46 micromohs/cm) six amperes was the maximum current output attainable. Fyke nets five feet in diameter with 1-inch and 1-1/2-inch stretch mesh were used during the first capture period. The use of fyke nets was discontinued in subsequent capture periods as they were found to be less successful than electrofishing in capturing fish.

Population Estimates and Standing Crop

Ice-out on Pike and Round Lakes was May 7, 1972, approximately two weeks later than usual. Field operations began on Monday, May 8, 1972 and by Wednesday, May 10, walleye spawning activity had peaked, due probably to the unseasonably warm weather immediately following ice-out.

In the spring of 1972 walleyes were captured during spawning (5/8/72 to 5/12/72) concurrently with the sucker removal program. The lakes were electrofished forty hours and ten fyke nets were fished for four days. During the recapture period (6/5/72 to 6/8/72) the lakes were electrofished for 13 hours and 10 minutes.

Fish were captured and marked during the fall (10/9/72 to 10/13/72) using one shocker boat for 14 hours and 20 minutes. During the recapture period (10/23/72 to 10/25/72) three shocker boats were used for a total of 22 hours and 5 minutes.

An additional five hours of electrofishing time was spent checking Rice Lake, Rice Creek and Turner Lake for migration of marked walleyes into other areas of the Pike Lake Chain.

Walleyes were marked by fin removal for future identification. Fish captured in the spring were marked by removal of the top of the caudal fin and in the spring recapture period with removal of the bottom of the caudal fin. Fish in the fall capture period were marked with a right pelvic fin clip and in the fall recapture period with a left pelvic clip. Population estimates were made for the spring and fall of 1972 using Bailey's modification of the Petersen estimate,

$$N = \frac{M(C+1)}{(R+1)} .$$

Weights from 256 walleyes were taken in the fall of 1972 for the purpose of determining average weight and total biomass of walleyes in Pike and Round Lakes. Average weights in the fall were calculated for each age and size group and used to estimate weights in spring as no fish were weighed in that season.

Total Mortality

Total mortality was determined by the difference between the fall and spring population estimates, discounting the fall young-of-the-year walleyes. Exploitation rates were not computed due to insufficient data.

Aging

Walleyes captured in the spring were sexed and then measured. Scales were taken from walleyes in both the spring and fall, pressed on acetate sheets and observed with a projector. All ages were recorded as completed summers of growth.

Creel Census

Walleye harvest data during the investigation was collected by several methods. Creel census forms were distributed to resort owners on Pike and Round Lakes in the spring of 1971 and resort owners were asked to record various harvest data taken from their customers on a random basis. Fish management personnel and local conservation wardens conducted random creel checks throughout that summer on both lakes. Distinction between local and nonlocal anglers was a 25 mile radius from the lakes.

Sucker Removal

The sucker removal phase of the project included forty net days with fyke nets on both Pike and Round Lakes, and forty hours of boom shocking divided between two boom shockers. Stomachs of 96 white suckers and redhorse were removed and placed in separate plastic bags and preserved in 10% Formalin. This was done in an attempt to monitor any possible predation on walleye eggs by suckers.

RESULTS

Age and Growth

During the spring survey 1,652 walleyes were sexed. There were 1,461 males and 191 females, which yields a sex ratio of 7.6:1. This falls within the extremes, 0.8:1 - 14:1, reported by Johnson (1971).

Males ranged in total length from 8.0 to 20.9 inches with females ranging from 11.0 to 25.9 inches. Of the ripe males 832 or 56.9% were less than 13.0 inches, the former size limit. Only 28 or 14.6% of the females were less than 13.0 inches (Table 1). Of the 1,461 males, 1,421 (97.2%) were less than 16.0 inches in length.

Spawning male walleyes were fish which completed 3-13 summers of growth (10.5" - 20.4") with 69.5% of the spawners completing 4-7 summers of growth. Males completing five summers of growth formed the largest group with an average length of 13.5 inches. Female spawners were 3-14 summers old (12.0" - 25.5"), with 58.2% of the total females being five and six summer fish. Females six summers old averaged 14.4 inches in total length and accounted for 38.8% of the spawning female walleyes (Table 2).

TABLE 1 LENGTH FREQUENCY OF SPAWNING WALLEYES
TAKEN IN PIKE-ROUND LAKES, SPRING 1972

Total Length (Inches)	Male		Female	
	No. Fish	% Total	No. Fish	% Total
8.0 - 8.9	1	.1		
9.0 - 9.9	2	.6		
10.0 - 10.9	105	7.2		
11.0 - 11.9	281	19.2	10	5.2
12.0 - 12.9	436	29.8	18	9.4
13.0 - 13.9	379	25.9	52	27.3
14.0 - 14.9	154	10.5	65	34.0
15.0 - 15.9	56	3.8	25	13.1
16.0 - 16.9	20	1.4	6	3.1
17.0 - 17.9	11	.8	2	1.0
18.0 - 18.9	3	.1	7	3.7
19.0 - 19.9	5	.3	1	0.5
20.0 - 20.9	1	.1		
21.0 - 21.9			2	1.0
22.0 - 22.9				
23.0 - 23.9				
24.0 - 24.9			1	0.5
25.0 - 25.9			2	1.0
TOTAL	1,461		TOTAL	191

TABLE 2 GROWTH OF SPAWNING WALLEYES TAKEN IN
PIKE-ROUND LAKES IN SPRING, 1972.

Completed Summers of Growth	Male			Female		
	Number of Fish	Average Length	Percent of Total	Number of Fish	Average Length	Percent of Total
3	6	10.5	11.3	1	12.0	2.7
4	9	11.7	16.9	-	-	-
5	10	13.5	18.8	7	13.9	19.4
6	9	14.8	16.9	14	14.4	38.8
7	9	14.9	16.9	2	14.9	5.5
8	4	16.3	7.5	6	16.8	16.6
9	4	17.0	7.5	3	18.7	8.3
10	-	-	-	1	21.8	2.7
11	1	19.2	1.8	-	-	-
12	-	-	-	-	-	-
13	1	20.4	1.8	1	24.7	2.7
14	-	-	-	1	25.5	2.7
TOTAL	53			TOTAL	36	

Growth rates for walleyes in Pike and Round Lakes have decreased from 1959 to 1972 and are exceptionally slow compared to walleyes in several northern Wisconsin lakes (Snow, 1969). Age-length relationships based on 830 fish from summers 1-10 were calculated in the spring of 1959, spring and fall of 1971, and spring and fall of 1972 (Table 3). Fish aged in 1959 would have reached the 13 inch size limit then in effect sometime during their fourth summer of growth. In 1972 the average walleye would be in its fifth summer before obtaining 13.0 inches in length. Generally female walleyes grew at a faster rate than males (Figure 2).

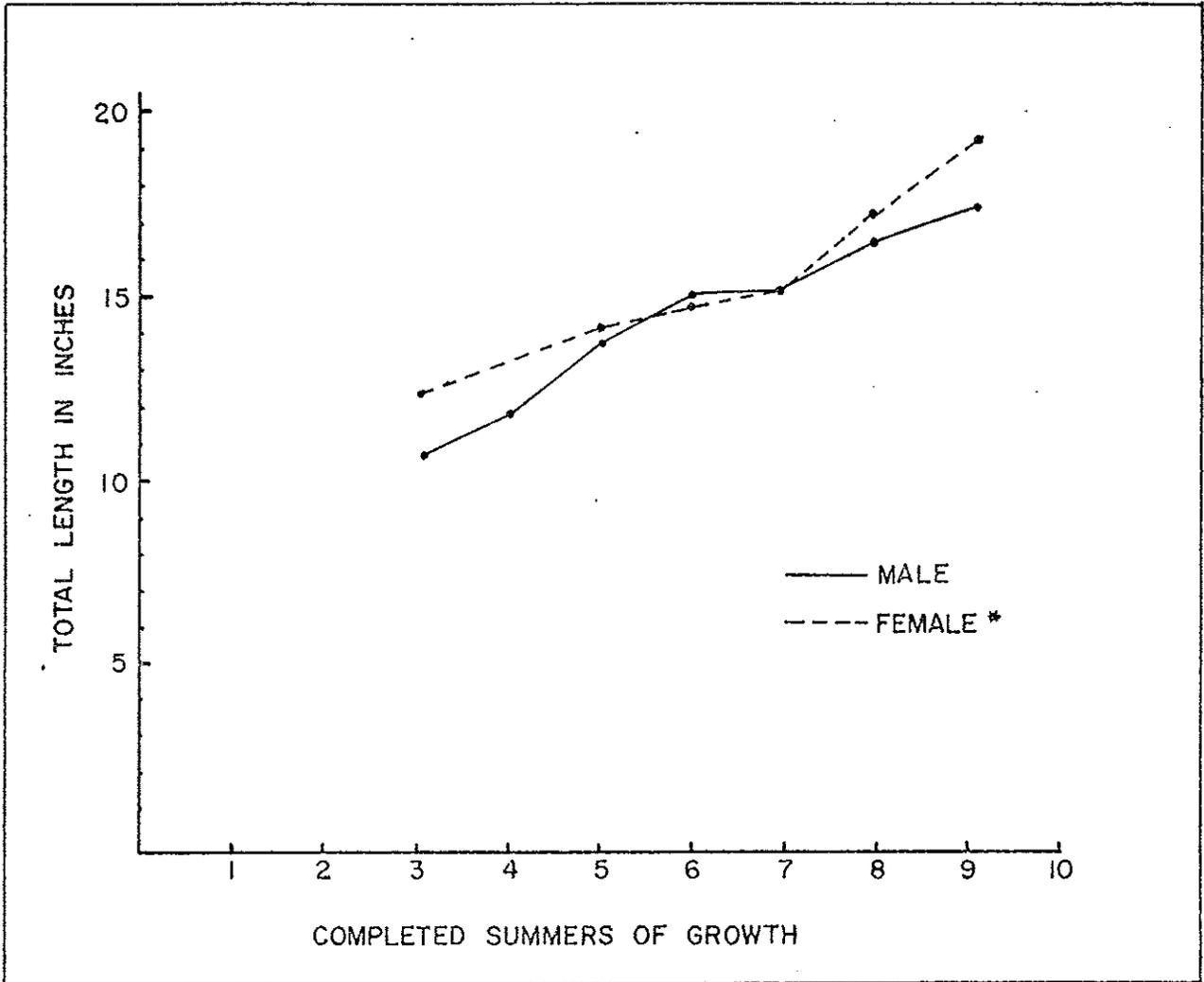
There were 5,053 walleyes marked during the 1972 spring and fall surveys. Of these, 74.6% were less than 13.0 inches in total length and 94.2% were less than 15.0 inches (Table 4). Only twelve fish captured were greater than 20.0 inches in length.

All weights were taken in the fall and sexes could not be separated. Walleyes in Pike and Round Lakes were in their seventh summer of growth (average) before weighing one pound, and had a mean length of 15.0 inches (Table 5). The heaviest fish weighed was two pounds nine ounces (1162 grams), with a total length of 18.0 inches and had completed ten summers of growth.

TABLE 3. AGE-LENGTH RELATIONSHIP OF WALLEYES FROM PIKE-ROUND LAKES

Completed Summers of Growth	Average Length					Number Fish Aged					Total Number of Fish
	1959 Spring	1971* Spring	1971* Fall	1972 Spring	1972 Fall	1959 Spring	1971 Spring	1971 Fall	1972 Spring	1972 Fall	
1	-	-	5.7	6.2	5.5	-	-	27	13	54	94
2	8.7	7.5	8.1	8.3	8.2	7	8	40	13	44	112
3	12.2	11.8	10.6	10.3	10.4	22	119	41	20	61	263
4	15.0	13.3	13.6	11.8	12.1	13	89	10	11	23	146
5	17.8	15.1	15.0	13.6	13.1	4	23	4	18	24	73
6	19.7	17.4	-	14.6	14.1	5	3	-	29	20	57
7	23.2	20.7	-	15.4	15.0	4	3	-	16	20	43
8	-	-	-	16.5	15.7	-	-	-	13	8	21
9	-	-	-	17.0	16.9	-	-	-	8	8	16
10	-	-	-	21.8	17.1	-	-	-	1	4	5

*Pike Lake Only



* Summer 4 - No Females

FIGURE 2 COMPARATIVE GROWTH RATES FOR MALE AND FEMALE WALLEYES IN PIKE AND ROUND LAKES, SPRING 1972

TABLE 4 LENGTH FREQUENCY OF WALLEYES BY
0.5 INCH GROUPS IN PIKE-ROUND LAKES

Length (Inches)	Spring Marking Period		Fall Marking Period
	Nets	Shocker	Shocker
3.5 - 3.9			1
4.0 - 4.4		4	12
4.5 - 4.9		8	26
5.0 - 5.4		9	71
5.5 - 5.9		21	109
6.0 - 6.4		44	76
6.5 - 6.9		40	29
7.0 - 7.4		27	16
7.5 - 7.9	1	72	36
8.0 - 8.4		200	64
8.5 - 8.9		280	77
9.0 - 9.4	4	324	73
9.5 - 9.9	5	233	64
10.0 - 10.4	16	167	100
10.5 - 10.9	18	151	124
11.0 - 11.4	32	162	128
11.5 - 11.9	27	193	91
12.0 - 12.4	45	232	49
12.5 - 12.9	53	212	42
13.0 - 13.4	67	228	34
13.5 - 13.9	66	201	26
14.0 - 14.4	71	133	25
14.5 - 14.9	43	71	29
15.0 - 15.4	46	49	13
15.5 - 15.9	26	18	14
16.0 - 16.4	12	16	2
16.5 - 16.9	10	11	8
17.0 - 17.4	6	7	3
17.5 - 17.9	4	3	3
18.0 - 18.4	3	5	2
18.5 - 18.9	2	3	2
19.0 - 19.4	4	1	1
19.5 - 19.9	2	3	
20.0 - 20.4			
20.5 - 20.9	1		
21.0 - 21.4	1		
21.5 - 21.9	1	1	
22.0 - 22.4			
22.5 - 22.9			
23.0 - 23.4		1	
23.5 - 23.9		1	
24.0 - 24.4			1
24.5 - 24.9	3		
25.0 - 25.4	1	1	
Total	570	3,132	1,351

TABLE 5 LENGTH AND WEIGHT RELATIONSHIP
FOR AGE GROUPS OF WALLEYES IN
PIKE-ROUND LAKES

Completed Summer of Growth	Sample Size	Length (Inches)		Weight (Grams)	
		Average	Range	Average	Range
1	54	5.5	4.0- 7.3	22	6- 47
2	44	8.2	6.7-10.0	73	33- 12
3	61	10.4	8.4-11.9	161	70- 240
4	23	12.1	10.8-13.6	268	136- 382
5	24	13.1	12.7-13.9	347	290- 432
6	20	14.1	12.7-15.8	431	315- 652
7	20	15.0	13.6-15.9	530	410- 652
8	8	15.7	15.0-16.7	637	566- 765
9	8	16.9	16.3-18.4	757	680- 878
10	4	17.1	16.3-18.0	836	680-1162

Estimated Population Size

Population estimates were made for walleyes in the spring and fall of 1972. Based on the spring surveys the total population of walleyes was estimated at 35,791 (23.8/acre). The fall estimate was 12,038 (7.9/acre) including young of the year, a reduction of 66.4%. The reduction increased to 75.8% when young of the year were discounted (Table 6). A check on emigration revealed no loss of fish.

Population estimates per summer of growth were also calculated (Table 7). The cohorts (age 1-7) decreased in number by an average of 79.2%. Those least affected were the second summer fish which averaged 8.3 inches in total length.

Fingerling production for 1972 was estimated at 3,390 (2.3/acre), considerably less than the 1971 estimate of 9,949 or 6.6/acre (spring 1972 estimate of 1971 production).

TABLE 6 SPRING AND FALL 1972 POPULATION ESTIMATES
BY SIZE GROUPS

Size	Number	Spring		Fall		Loss	% Loss
		95% Conf. Limit	Number	95% Conf. Limit	Number		
≤ 8.9	19,133	(11,750-28,200)	5,837	(4,500-7,400)	13,296	69.5	
9.0-10.9	7,819	(5,500-12,200)	2,527	(2,200-4,000)	5,292	67.7	
11.0-12.9	5,378	(3,000-16,000)	2,657	(1,600-5,200)	2,721	50.6	
13.0-14.9	2,493	(1,700- 5,300)	760	(450-1,750)	1,733	69.5	
≥ 15.0	968	(500- 5,400)	257	(150- 700)	711	73.4	
TOTAL	35,791		12,038		23,753	66.4	
≤ 8.9*	19,133		2,447		16,686	87.2	
TOTAL*	35,791		8,648		27,143	75.8	

*Excluding 1972 young of the year

TABLE 7 SPRING AND FALL 1972 POPULATION ESTIMATES
BY COHORT

Completed Summers of Growth	Population Estimates		Percent Mortality
	Spring	Fall	
0	-	3,390	-
1	9,049	2,638	73.5
2	8,838	3,246	63.5
3	8,475	1,220	85.6
4	3,512	700	77.5
5	2,339	383	83.6
6	1,618	204	87.4
7+	1,010	167	83.5
TOTAL	35,791	12,038	AVERAGE 79.2

Standing Crop and Biomass

From spring to fall, population estimates of walleyes declined from 23.8 fish per acre to 7.9 fish per acre. Walleyes from 3.5 to 12.9 inches in total length varied from 21.5 fish per acre in May to a low of 7.3 per acre in October. Similarly walleyes 13.0 inches and larger declined from 2.3 fish per acre in May to 0.6 fish per acre by October (Table 8).

Total pounds of walleyes decreased from 11,280 (7.4/acre) in May 1972 to 3,878 (2.5/acre) in October, 1972. This reduction amounted to 7,402 pounds (4.9/acre) or 65.6% (Table 9). The greatest percentage reduction was in the group 8.9 inches and less. The group exhibiting the smallest loss percentage-wise was that from 11.0-12.9 inches. This latter group was also the largest in terms of pounds per acre.

TABLE 8 STANDING CROP AND BIOMASS OF WALLEYE, PIKE-ROUND LAKES, 1972

Size (Inches)	Fish Per Acre		Pounds Per Acre	
	Spring	Fall*	Spring	Fall*
3.5-12.9	21.5	7.3	5.4	1.9
≥ 13.0	2.3	0.6	2.0	0.6
All Fish	23.8	7.9	7.4	2.5

*Fall figures include 1972 reproduction

TABLE 9 SPRING AND FALL 1972 WEIGHT PER SIZE GROUP OF WALLEYES IN PIKE-ROUND LAKES

Size	Weight (Lbs.)		Loss	
	Spring	Fall	Pounds	Percent
≤8.9	2,212	605	1,607	72.6
9.0-10.9	2,752	817	1,935	70.3
11.0-12.9	3,175	1,460	1,715	54.0
13.0-14.9	2,292	688	1,604	69.9
15.0+	848	308	541	63.7
TOTAL	11,280	3,878	7,402	65.6

Creel Census

There were 387 anglers interviewed during 1971 on Pike and Round Lakes for a total of 3,150.5 hours fished. Of the anglers interviewed, only 25 were local residents compared to 362 nonlocals.

Local anglers exhibited a much higher success rate for their efforts (2.2 walleyes/angler and .76 walleyes/hour than did nonlocal anglers (2.1 walleyes/angler and .24 walleyes/hour). These anglers harvested a total of 803 walleyes with 527 (65%) below 13 inches.

DISCUSSION

Pike and Round Lakes exhibit a fish species composition similar to many lakes in the Park Falls Area with comparatively large walleye populations. The dominant walleye fishery is slow growing with the majority of fish under 14.0 inches. The panfish population is not extensive and includes black crappie, yellow perch, rockbass, bluegill, pumpkinseed and black bullhead.

Muskellunge have been stocked annually in both lakes from 1959-1964 and from 1969-1972. Walleye, muskellunge and largemouth bass were stocked from 1933 to 1956. The muskellunge population is stable and it is felt that stocking has maintained the population at its present size. Northern pike are more numerous than muskellunge but do not provide the quality angling that muskellunge do in this area. Remnant populations of large and smallmouth bass are present in the lakes.

White suckers and redhorse which are common may be competing with walleyes for food and space in Pike and Round Lakes. Burrows (1969) stated that in infertile lakes with limited food supplies and small numbers of fish species present suckers were competing with walleyes for immature aquatic insects (mainly mayflies). This food source was found to be extremely important especially for a period of six weeks after spawning.

Schneberger (1936-1937) found that suckers apparently do not make a special effort to locate fish eggs but that they were taken incidently with their regular food. Several other studies substantiate this position. This appears to be the situation in Pike and Round Lakes as suckers and redhorse were found randomly along the shoreline in both spring and fall sampling periods.

We believe that the relatively small number of suckers and redhorse actually removed from the lakes, 1321 (2.2 lbs./acre), had little effect in reducing the sucker or redhorse populations. Further surveys revealed no noticeable change in the number of suckers or redhorse observed. It has been suggested that removal of at least 75% of the sucker population is necessary to have a lasting effect on the population. This was not obtained due to the fact that sucker spawning was not localized.

A 13-inch size limit on walleyes was in effect on the Pike Lake chain for many years. A satisfactory fishery of large size walleyes (16.0"+) did not result from this size restriction. Also, a large percentage of acceptable size walleyes were in effect withheld from the fishery.

Prior to the removal of the 13.0 inch size limit on walleyes in Price County in 1971, a comparatively large part of the mature female segment of the walleye population in Pike and Round Lakes was being exploited. Male walleyes were spawning in their third summer with an average length of 10.5 inches and did not become of legal size until after spawning during their fifth year of growth and at an average length of 13.5 inches.

Female walleyes were spawning in their fifth summer with an average length of 13.9 inches and exceeded the legal size limit before they began spawning. This situation obviously did not allow all walleyes to spawn at least once before entering the fishery, an assumption upon which a minimum size limit is based (Bennett 1962). Creel census data reveals that 65% of the fish taken in 1971 were below 13" total length indicating that smaller fish are acceptable to anglers. The removal of the 13-inch size limit will have the effect of spreading out fishing pressure on the entire population and thus reduce pressure on the spawning females. If this is realized there may in effect be more female walleyes available to spawn and the reproductive potential of this species will be increased.

Indications from this and past surveys in Pike and Round Lakes are that the walleye population fluctuates widely from year to year. This fluctuation is probably more related to the scarcity of food species than to exploitation by anglers (Johnson 1969). Forage fish were exceptionally scarce and were made up of yellow perch, troutperch, common shiner, white sucker and redhorse. Under these conditions cannibalism by walleyes must be substantial. During the fall survey the only forage fish observed were troutperch and a few shiners. With the exception of young of the year walleyes, all other fish of forage size were nearly absent from these lakes.

It has been stated that walleye populations seldom exceed 50 pounds/acre. The study lakes presented a much smaller biomass than this in both the spring and the fall of 1972. Biomass estimates of 7.4 pounds/acre and 2.5 pounds/acre in the spring and fall respectively reflect a considerable reduction in biomass occurring over a period of 4-5 months. While estimates of natural mortality and angling mortality have not been made, observations indicate that fishing pressure and success over the summer of 1972 was light. We therefore assume that natural mortality played a major part in the total mortality picture. Creel census results in 1971 show that 2% of the walleyes harvested were less than nine inches in total length yet in 1972 55.9% of the total population reduction was composed of fish 3.5 to 8.9" in total length.

It should be noted that possible areas of bias may affect the population estimates. Fall walleye sampling appears to provide poor results in obtaining a balanced look at the population. Many fish which are present in the spring during the spawning run may not be sampled during the fall, particularly the larger walleyes. The total walleye population estimates for both spring and fall were arrived at by estimating the size of individual age groups and adding these figures rather than computing one estimate using the totals for C, M and R. This helped to reduce any bias to the more abundant smaller segment of the population.

Results from this survey as well as from other surveys of lakes in the Park Falls Area have provided some insight into the complex problem of walleye

management. It appears that an inverse relationship exists between walleye numbers and abundance of panfish and related forage species. For the last several years a decline in panfish numbers and an increase in walleye numbers has been observed in the Pike Lake Chain. However, this has not resulted in an associated increase in walleye biomass. The same trend has been noted in other waters of this area. Other important factors which undoubtedly affect this relationship include water fertility and the lack of aquatic plants in the Pike Lake Chain.

In order to manage the lakes for maximum sustained yield, production of walleyes must be increased. In this light, two possible management approaches appear evident; either supplementing the existing population with planted walleyes or increasing the forage base through intensive stocking of a desirable food species. Beginning in 1974 and continuing through 1976 yellow perch will be stocked annually at a rate of 50 per acre. This program will be evaluated the following year (1977) during which no stocking will take place. The evaluation will not only indicate results of the perch stocking but also provide data on the success of natural reproduction in muskellunge since stocking of this species was discontinued in 1973.

In the event the perch stocking program is unsuccessful, walleyes will be introduced at a rate of 50 per acre on an alternate year basis for five consecutive years. Also, if this evaluation indicates, the muskellunge stocking program may be reinstated alternating with walleyes. This approach will also be evaluated at the end of the five year period.

Both alternatives will be accompanied by a continued liberalized size regulation on walleyes.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the numerous people who assisted in gathering and analyzing the data presented in this paper; the Conservation Wardens who helped in gathering creel census information and in the survey work, and the people of many bureaus at the Park Falls Area headquarters who worked long hours on the boom shockers. Special thanks go to Howard Snow, Tom Beard and Jim Kempinger of the Bureau of Research for their guidance in setting up the study and gathering and analyzing the data, and for the use of their crews and equipment. Special thanks also to Helen Vuchetich for typing this report.

LITERATURE CITED

- Bennett, George W.
1962. Management of artificial lakes and ponds. Reinhold Publishing Corp., New York. pp. 208-209.
- Burrows, Charles R.
1969. Our walleyes and the sucker game. Minnesota Conservation Volunteer. July-August. pp. 17-20.
- Johnson, Fritz H.
1969. Environmental and species associations of the walleye in Lake Winnibigoshish and connected waters, including observations on food habits and predator-prey relationships. Minn. Dept. of Cons. Minnesota Fisheries Investigations. No. 5. pp. 5-36.
- Johnson, Fritz H.
1971. Numerical abundance, sex ratios, and size composition of the walleye spawning run at Little Outfoot Sioux Lake, Minnesota 1942-1969, with data on fecundity and incidence of Lymphocystis. Minn. Dept. of Natural Resources Investigational Report No. 314. 9 p.
- Schneberger, Edward
1937. Unpublished data.
- Snow, Howard E.
1969. Comparative growth of eight species of fish in thirteen northern Wisconsin lakes. Wisconsin Dept. of Natural Resources Research Report No. 46. 23 p.