

Wisconsin Conservation Department
Madison, Wisconsin 53701

Fish Management Division
Management Report No. 10

THE EFFECTS OF LOW DOSAGE
APPLICATION OF FINROL (ACTIVE
INGREDIENT - ANTIMYCIN A) ON THE
YELLOW PERCH (PERCA FLAVESCENS)

by
Gilbert C. Radonski
Richard W. Wendt

December 20, 1966

THE EFFECTS OF LOW DOSAGE APPLICATION OF FINTROL (ACTIVE
INGREDIENT - ANTIMYCIN A) ON THE YELLOW PERCH (PERCA FLAVESCENS)

INTRODUCTION

Overabundant panfish populations and how to cope with them has been a major problem of the fish manager. This problem is magnified in the infertile waters of northern Wisconsin. Corrective measures applied to this problem have been physical removal, chemical removal and predator stocking. Chemical removal has provided the most dependable results. Chemical treatment has been approached on the total, partial and spot treatment basis. Partial treatment appears to have potential to relieve the problem of abundant panfish economically without destroying desirable game fish populations. This technique has been employed in east central Wisconsin using the toxicant toxaphene (Primising and Hacker, 1964). Prior field experiences have indicated that toxaphene's effect cannot be predicted when used in soft water situations such as occur in northeastern Wisconsin. Other toxicants would have to be used to accomplish the partial fish kills. Antimycin, an antibiotic with a high toxicity to fish, was selected for experiments to accomplish partial fish kills.

PROCEDURES AND DESCRIPTION OF THE TOXICANT

McGrath Lake, Oneida County, was selected as a study lake to test the toxicant Fintrol 5 (active ingredient - antimycin) to determine if it had merit for use in accomplishing partial fish kills. Antimycin was discovered by scientists at the University of Wisconsin and is presently handled by the Wisconsin Alumni Research Foundation for development and research. The Wisconsin Alumni Research Foundation has licensed Ayerst Laboratories, New York, a Division of the American Home Products Corporation, to produce and market antimycin. The product, under the trade name "Fintrol", has been approved by the Pesticide Regulations Division of the U. S. Department of Agriculture for use in freshwater fishery management. Fintrol, a dry formulation, is marketed as antimycin coated on silica sand (active ingredient 1%, inert 99%).

There are three reasons why McGrath Lake was selected for this study:

1. It is a typical infertile, soft water lake with an overabundant population of bluegills and yellow perch.
2. The lake is composed of three bays (Fig. 1) and it was felt that different rates of application could be tested in the separate bays.
3. This entire shoreline is in public ownership, thus minimizing any public relations problems which might arise.

MCGRATH LAKE RESULTS

Description of the Lake

McGrath Lake is a seepage lake of low fertility (2.0 ppm total alkalinity), consisting of 48.7 acres with a maximum depth of 24 feet. The secchi disc reading of 18.0 feet indicates the high transparency of the water. The fish species present were bluegills (Lepomis macrochirus), pumpkinseed (Lepomis

gibbosus), yellow perch (Perca flavescens), brown bullheads (Ictalurus nebulosus), white suckers (Catostomus commersonii), mud minnows (Umbra limi), largemouth bass (Micropterus salmoides), and rock bass (Ambloplites rupestris). Fishing 8 trap nets for 48 hours indicated that 84% of the catch were bluegills, 14% were yellow perch and the remaining species - 1% (Table 1).

Results

The first dose of antimycin was applied to Section 2 (Fig. 1) at the rate of 1.0 parts per billion (ppb). Application was made in the early afternoon of August 8, 1966. By 5:30 p.m., a few yellow perch and young-of-the-year bluegills began to show distress. No observations were made between 5:30 p.m. and 7:30 a.m. the following day. During that time period, a brisk northwest wind arose and there was a mixing of antimycin throughout all sections of the lake. At the time of application, the lake was a homothermous 67° F. How thorough the mixing was could not be determined since an analytical technique for detecting low concentrations of antimycin is not available. The following morning a cruise of the lake showed fish dead and in distress along the entire shoreline. The fish affected were yellow perch, bluegills, young-of-the-year largemouth bass and mud minnows. An estimated 90% of the dead fish were yellow perch, although they were only approximately 14% of the total fish population. No adult bass, suckers or bullheads were observed dead or in distress. The dead bluegills were predominantly young-of-the-year.

On August 10, 1966, Section 4 (Fig. 1) was treated with 2.0 ppb antimycin. Observations the following day indicated a good kill of all species other than adult largemouth bass and bluegills. Fish in live cages (yellow perch, pumpkinseed and bluegills) all succumbed within 24 hours.

Within the 48-hour period (August 8 to 10, 1966), 41.4 pounds of Fintrol 5 (188 grams of active antimycin) were applied to Section 2, and 21.1 pounds of Fintrol (96 grams of active antimycin) were applied to Section 4, for a total of 62.5 pounds (284 grams of active antimycin) of Fintrol. Assuming the wind mixed the lake thoroughly so there was a complete distribution of antimycin, there would have been 0.5 ppb antimycin in McGrath Lake. It was quite evident at this point that the toxicant was selective to the yellow perch at the 0.5 ppb level and toxic to most species present at the 2.0 ppb level.

The next step was application of 2.0 ppb antimycin to the entire lake. It was assumed this dose would kill all fish in the lake other than bullheads. Twenty-four hours prior to the 2.0 ppb application, trap nets were set to determine the extent of the yellow perch mortality. On August 16, 1966, the nets were lifted and the catch (Table 1) indicated that the entire yellow perch population had been eradicated.

Application of 2.0 ppb of antimycin was accomplished on August 16, 1966. Twelve hours after application the lake was observed. Dead bluegill adults, young-of-the-year and adult largemouth bass, mud minnows, white suckers, rock bass and pumpkinseeds were observed. Mortality was spread over a 72-hour period. No freshly killed yellow perch were observed, lending proof that the entire yellow perch population was killed by the 0.5 ppb treatment of antimycin.

Bluegills, largemouth bass and yellow perch from a lake of comparable water chemistry were used as test fish to follow degradation of the antimycin. Live cages were placed at various points within the lake. Some of the cages were floating; others were resting on the lake bottom. Since the lake was

Table 1.

Catch prior to application of 0.5 ppb FINTROL^{1/} - McGrath Lake

<u>Species</u>	<u>Catch Per Unit of Effort^{2/}</u>
Bluegill	429
Yellow Perch	77
Rock Bass	1.2
Largemouth Bass	0.8
Pumpkinseed	0.2
Common Sucker	0.2

Catch six days after application of 0.5 ppb FINTROL^{3/} - McGrath Lake

Bluegill	2,290
Yellow Perch	0
Rock Bass	4
Largemouth Bass	1
Pumpkinseed	10
Common Sucker	0

^{1/}Based on 8 trap nets fished 48 hours

^{2/}One trap net fished for 24 hours

^{3/}Based on 5 trap nets fished 24 hours

homothermous, no mid-depth cages were employed. The test fish were put in the cages 24 hours after application of the 2.0 ppb of antimycin. The fish suffered mortalities until the 10th day after treatment (September 26, 1966) after which there was 100% survival. The events that occurred on McGrath Lake indicate that antimycin was selective to the yellow perch at the 0.5 ppb concentration. This merited further investigation.

HARRIET LAKE RESULTS

Description of the Lake

Harriet Lake, Forest County, (Fig. 2) a lake with a past history of excellent largemouth bass fishing but suffering from an overabundance of yellow perch, was the second lake selected for antimycin application. The goal for this lake was to eradicate the yellow perch with a 0.5 ppb application of antimycin without altering companion fish species.

Harriet Lake is a seepage lake of low fertility (2.5 ppm total alkalinity) consisting of 22.5 acres with a maximum depth of 15 feet. A secchi disc reading of 10.0 feet indicates the good transparency of the water. The fish species present were largemouth bass (Micropterus salmoides), smallmouth bass (Micropterus dolomieu), yellow perch (Perca flavescens), black bullheads (Ictalurus melas), bluegills (Lepomis macrochirus), and bluntnose minnows (Pimephales notatus).

A 1963 netting survey by the Forest Service, U. S. Department of Agriculture and Nicolet National Forest indicated that the lake had an overabundance of yellow perch, and their management recommendation was chemical treatment to remove all fish species from the lake and restock with game fish.

Results

Antimycin was applied to Harriet Lake on September 30, 1966, at the rate of 0.5 ppb. At that time, the lake was a homothermous 54° F. Twenty-four hours after application, there was no mortality observed. Forty-eight hours after application, two yellow perch (4.0" and 6.0") were found dead, and large schools of yellow perch were observed swimming about lethargically. Seventy-two hours after application, the entire shoreline was dotted with dead yellow perch, and schools of listless yellow perch were swimming about. Ninety-six hours after application, large numbers of dead yellow perch were found along the shoreline but no live yellow perch were observed. The mortality only occurred to the yellow perch population; no other fish were affected.

The reaction of the yellow perch to the antimycin was the same in both Harriet and McGrath Lakes. As the fish assimilated a lethal dose of the toxicant, they became lethargic and began moving along the shoreline in schools. There was also a physical change--it appeared that the protective body mucous was being sloughed off and the fish took on a very shaggy, gray appearance. No attempt to net Harriet Lake was made after the mortality ceased. The lake was observed ten days after application (assuming detoxification after ten days). At that time, no freshly dead fish were found and no dead fish other than yellow perch were observed.

To eradicate a single species of fish in a mixed species situation without modification of the companion species is a big step forward in the area of selective toxicants as a management technique. However, before the real value technique is established, it must be tested in a number of situations and similar results attained. With the latter thought in mind, it was decided to attempt to remove the yellow perch population from another lake.

PERCH LAKE RESULTS

Description of the Lake

The third lake selected is appropriately named "Perch Lake".

Perch Lake, Oneida County, (Fig. 3) is a seepage lake of low fertility (5.0 ppm total alkalinity) consisting of 23.4 acres with a maximum depth of 24 feet. A secchi disc reading of 14.0 feet indicates the high transparency of the water.

The fish species present were largemouth bass (Micropterus salmoides), yellow perch (Perca flavescens), bluegills (Lepomis macrochirus), bluntnose minnows (Pimephales notatus), golden shiners (Notemigonus crysoleucas) and rock bass (Ambloplites rupestris). An electro-fishing survey indicated that the yellow perch was the most abundant fish species present.

Results

Antimycin was applied to Perch Lake on October 21, 1966, at the rate of 0.5 ppb. At the time of application, the lake was a homothermous 48° F. Twenty-four hours after application, no dead or listless fish were observed. Forty-eight hours after application, 10 dead yellow perch and several bluntnose minnows were observed dead. Large schools of yellow perch were noted swimming lethargically along the shoreline. Seventy-two hours after application, there was not much of a change--a few more yellow perch were found dead. The schools of listless yellow perch were still swimming about the shoreline. Ninety-six hours later, the mortality of yellow perch increased. The shoreline became dotted with dead yellow perch, and schools of listless yellow perch were diminishing in size. One hundred and twenty hours after application, the shore was ringed with dead yellow perch. No bluntnose minnows appeared after the first 48 hours.

To determine how thoroughly we had affected the yellow perch population, the lake was treated with 1.0 ppm rotenone 7 days after the antimycin application. Within 48 hours the mortality was complete. Bluegills, rock bass, bluntnose minnows, golden shiners and largemouth bass were killed. No yellow perch showed up after the rotenone was applied. It was evident that the antimycin eradicated the entire yellow perch population.

METHOD OF APPLICATION

The objective in selecting a method of application of a chemical to a lake is to spread it as evenly as possible. This is done to eliminate "hot spots" and to have the desired results accomplished as uniformly as possible over the entire treated area.

The method of application of Fintrol for McGrath Lake involved the use of elaborate equipment. Two power-driven cyclone seeders, stern mounted on a boat, were used. The Fintrol was mixed with plain silica sand at a 1:1 ratio of Fintrol to sand. This was done to insure a more uniform dispersal of a small amount of active ingredient over a relatively large area.

The applications to Harriet and Perch Lakes were less sophisticated. The dry formulation Fintrol was dribbled, undiluted, into the propwash of an out-board motor. This method is very simple, requiring a minimum of equipment.

Of the two methods used, the authors favor the more simple method of dribbling the Fintrol into the propwash.

DISCUSSION

The discovery that yellow perch could be selectively killed in a mixed warmwater fish population was fortuitous.

Lennon (1966), indicates that antimycin has the ability to kill some species without harming others at certain concentrations. It has been shown that 0.5 ppb antimycin is selective to the yellow perch in soft water situations. Walker, et al (1964) indicate that the perch are among the fish most sensitive to antimycin and the sunfish and minnows fall in the intermediate range. This was the case in the three acid, soft water lakes studied (Table 2).

Numerous authors have pointed out the need for a selective toxicant for the yellow perch. Herman, et al (1964) state "Small lakes often have stunted (yellow) perch. Management of these waters is best accomplished by eliminating the (yellow) perch and managing for species with better growth". Lennon (1966) states that emphasis will be put on finding a selective toxicant for 13 species of fish, one of which is the yellow perch.

The application of antimycin as a perchicide may have limitations. Two questions will have to be answered before these limitations are known. They are:

1. Will antimycin at the 0.5 level affect the walleye, a valuable game fish and close relative of the yellow perch?
2. Is the yellow perch as susceptible to antimycin in an alkaline, hard water situation as it was demonstrated to be in acid, soft water?

These limitations may exclude some waters where yellow perch are a problem. But the authors feel antimycin has great potential for management of the yellow perch in soft water situations when applied at prescribed rates.

SUMMARY

Antimycin was used on McGrath Lake to determine if it had merit for accomplishing partial fish kills. Results on McGrath Lake led to investigation of its selective kill capabilities rather than partial kill capabilities. The two lakes selected for further testing of antimycin were Harriet and Perch Lakes, two soft water lakes having overabundant small size yellow perch.

Table 2.

Water Chemistries of McGrath, Harriet and Perch Lakes
at the time of Fintrol application

	Total Alk. (mg/l)	Specific Cond. (Mmhos/cm)	Cl. (mg/l)	SO ₄ (mg/l)	Fe (mg/l)	PO ₄ (d) (mg/l)	PO ₄ (t) (mg/l)	Ca ++ (mg/l)	Mg ++ (mg/l)	Na + (mg/l)	K + (mg/l)	Temp.* (Of)	
McGrath	5.3	2.0	23	0.9	7.7	.09	.07	.21	1.8	1.2	0.5	0.3	67
Harriet	6.1	2.5	13	0.05	1.0	.02	.14	.14	0.93	0.22	0.2	1.1	54
Perch	6.3	5.0	15	0.05	1.0	.11	.24	.24	1.15	0.31	0.4	1.1	48

* All lakes were homothermous at time of application.

Complete eradication, using rotenone, in Perch Lake 7 days after 0.5 ppb antimycin was applied, indicated that the entire yellow perch population was removed without affecting the companion species. The same results were noted in McGrath Lake following total removal.

Although no effort was made to assess the yellow perch mortality in Harriet Lake, it was assumed that it was complete. Results indicate antimycin has great potential for control of yellow perch in soft water situations.

Literature Cited

- Herman, Elmer, Warren Wisby, Lawrence Wiegert & Milton Burdick.
The Yellow Perch, Its Life History, Ecology, and Management.
Wisconsin Conservation Department, Publication 228.
- Lennon, Robert E., 1966. Antimycin--A New Fishery Tool. Wisconsin
Conservation Bulletin, March-April.
- Lennon, Robert E., & Charles R. Walker, 1964. Laboratories and
Methods for Screening Fish-Control Chemicals. Investigations
in Fish Control, Circular 185, Bureau of Sport Fisheries and
Wildlife.
- Primising, Michael, & Vernon Hacker, 1964. Partial Chemical
Treatment of Bugh Lake, Waushara County, During 1962, and Its
Effects on the Fish Population. East Central Area Investigational
Report No. 5 (mimeo.).
- Walker, Charles R., Robert E. Lennon & Bernard L. Berger, 1964.
Preliminary Observations on the Toxicity of Antimycin A to
Fish and other Aquatic Animals. Investigations in Fish Control,
Circular 186, Bureau of Sport Fisheries and Wildlife.

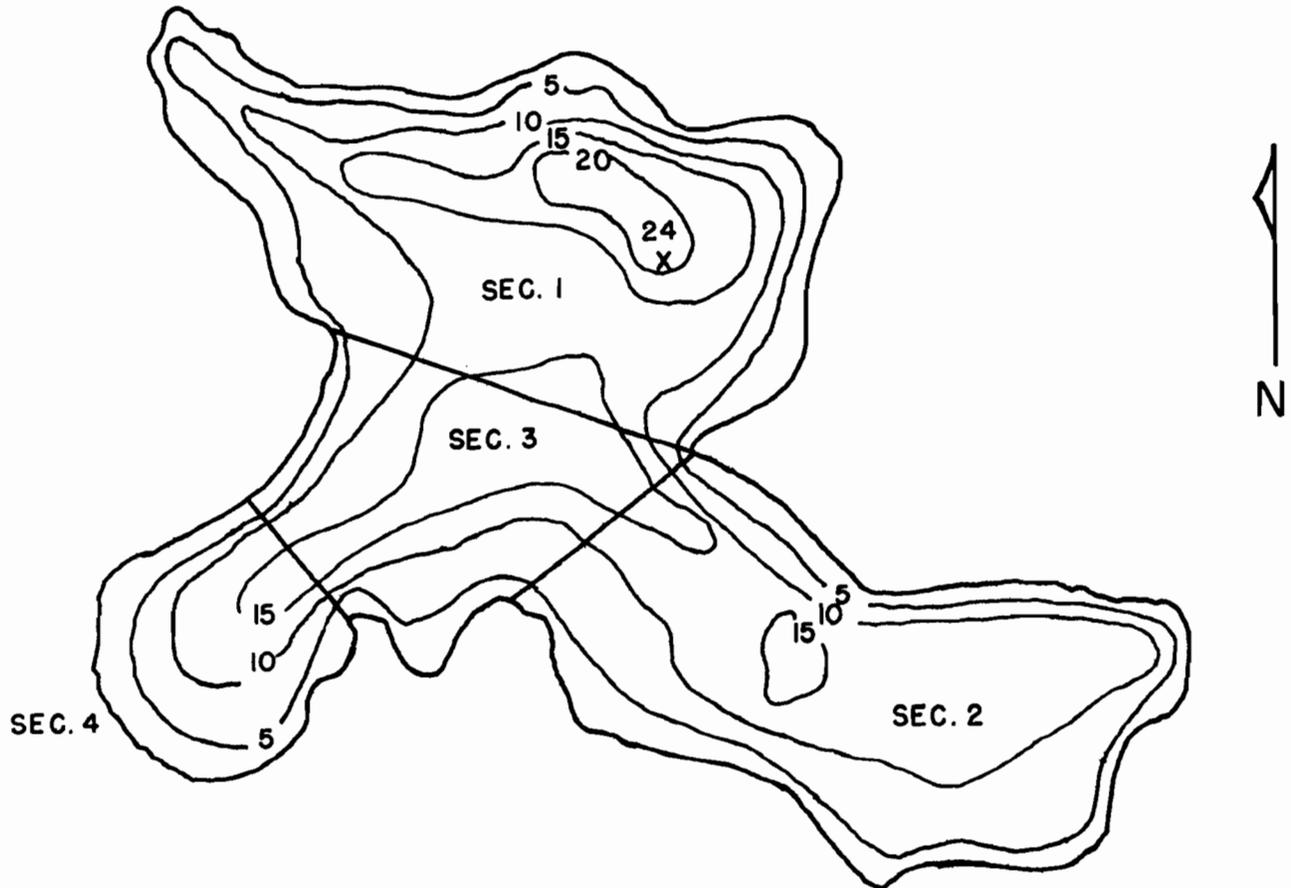
Acknowledgements

The La Crosse Fish Control Laboratory, U. S. Fish and Wildlife
Service, Bureau of Sport Fisheries and Wildlife, Department of the
Interior provided application equipment and personnel for the
McGrath Lake project.

Mr. James E. Powers, Wisconsin Alumni Research Foundation,
provided technical assistance on antimycin and application rates for the
McGrath Lake project.

FIGURE 1

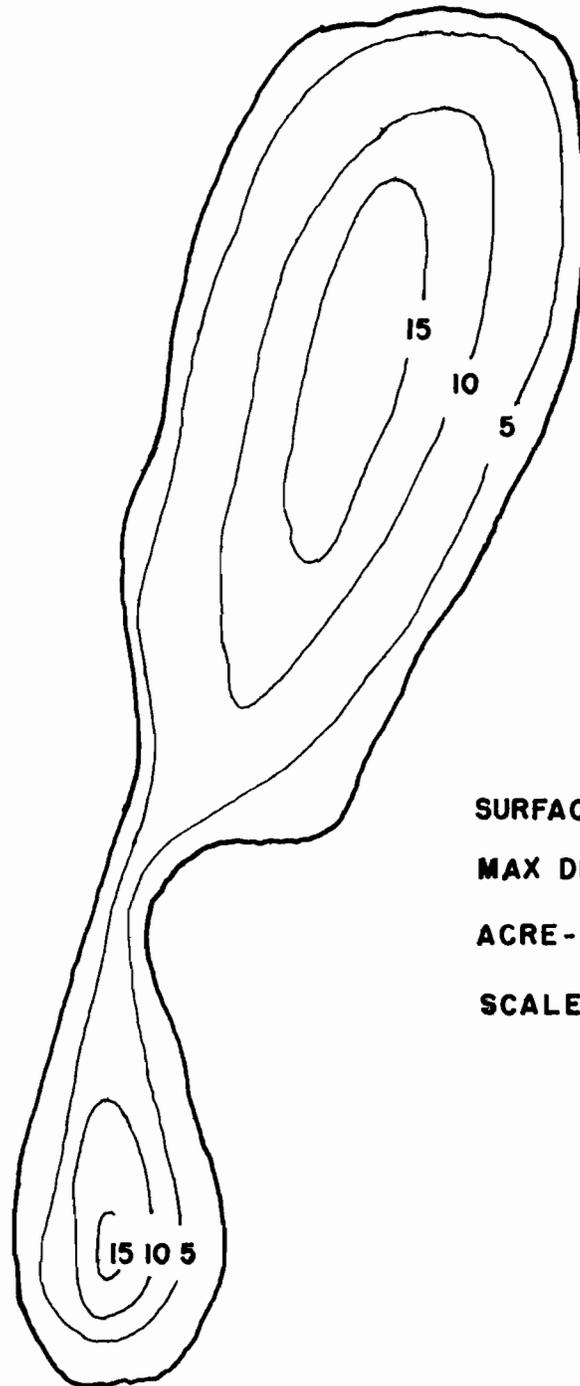
MC GRATH LAKE, ONEIDA CO.



SECTION 1	18.2 ACRES
	182.2 ACRE-FEET
2	17.1 ACRES
	150.9 ACRE- FEET
3	8.0 ACRES
	86.2 ACRE- FEET
4	5.3 ACRES
	38.5 ACRE- FEET

SURFACE ACRES	=	48.7
MAX. DEPTH	=	24 FT.
ACRE- FEET	=	458
SCALE: 1 INCH	=	420 FT.

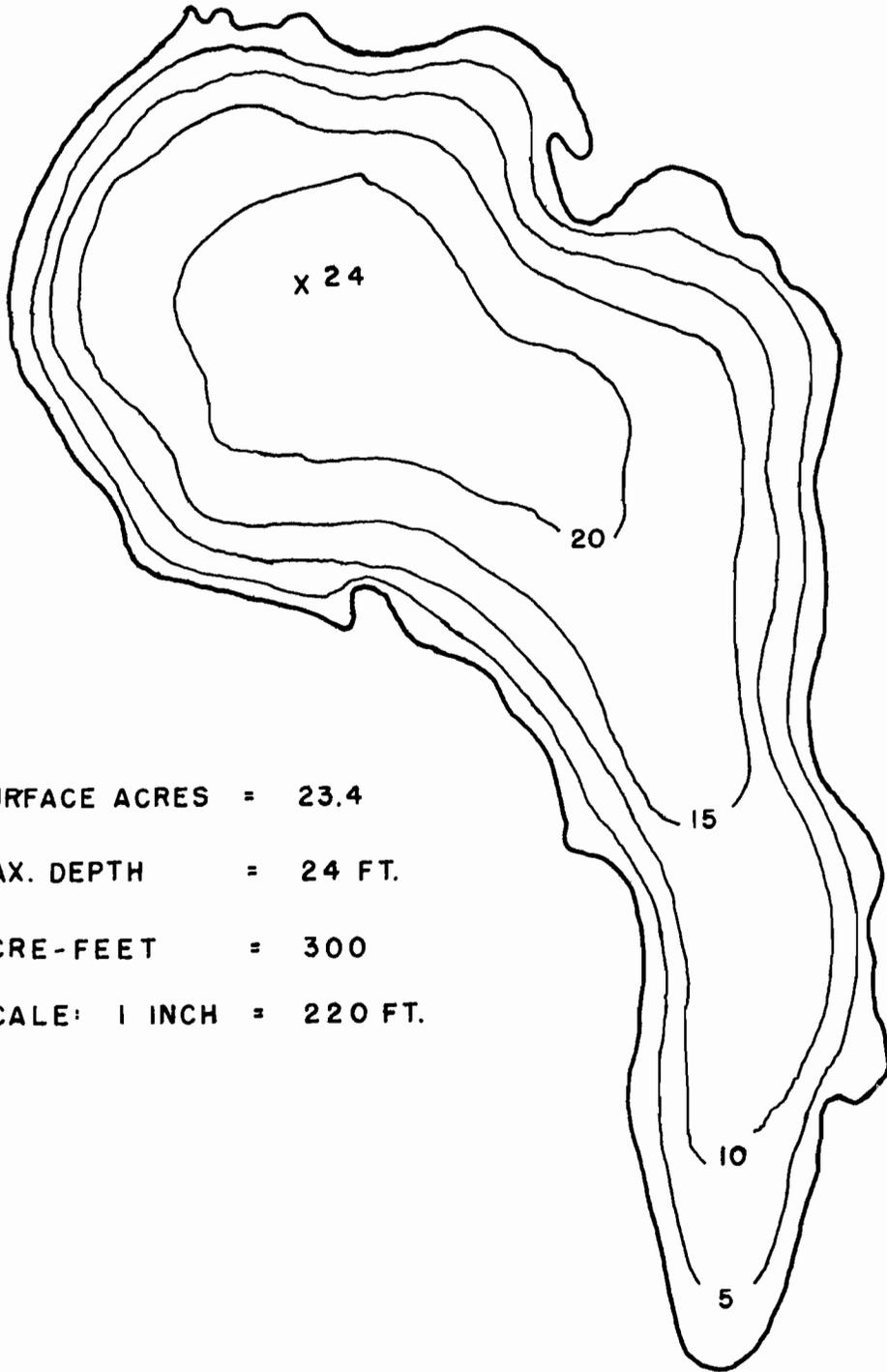
FIGURE 2
HARRIET LAKE, FOREST CO.



SURFACE ACRES = 22.5
MAX DEPTH = 15 FT.
ACRE- FEET = 225
SCALE: 1 INCH = 330 FT.

FIGURE 3

PERCH LAKE, ONEIDA CO.



SURFACE ACRES = 23.4
MAX. DEPTH = 24 FT.
ACRE- FEET = 300
SCALE: 1 INCH = 220 FT.

