

MICHIGAN DEPARTMENT OF NATURAL RESOURCES  
FISHERIES DIVISION

A Fisheries Management Plan  
for

Fremont Lake, Newaygo County

E. J. Trimberger  
District Fisheries Biologist  
Grand Rapids, Michigan

July, 1982

## A FISHERIES MANAGEMENT PLAN FOR FREMONT LAKE, NEWAYGO COUNTY

### INTRODUCTION

Fremont Lake is a large, 790 acre lake located southwest of Fremont, Michigan in Sections 2, 3, 4, 9, 10 and 11 of Township 12 North, Range 14 West. (See map, page 11). It has a drainage area of 14 square miles in the watershed above it.

Fremont Lake has one large inlet known as Darling Creek entering from the north. Darling Creek provides drainage from First, Second, Third and Fourth Lakes. The other major inlet drains Lorden Lake in Section 4 of Township 12 North, Range 14 West. Several smaller spring fed and intermittent tributaries also enter Fremont Lake.

Brooks Creek, the outlet in the southwest corner of Fremont Lake flows south and southwest approximately 20 miles before entering the Muskegon River. Several smaller tributaries enter Brooks Creek along its course. Most of these tributaries contain trout populations.

Fremont Lake is a deep lake, relatively young geologically, usually referred to as an oligotrophic lake. It has a maximum depth of 88' and an average depth of 35'. If unadulterated by man, it would be as pristine as many of the lakes in northern Michigan and Canada.

Fremont was first settled in 1854 by Daniel Joslin. It was originally called Elm Corners and was also known as Weaverville, named after Daniel Weaver, the first postmaster.

In 1862, the name was changed to Fremont Center and in 1875 it became the Village of Fremont named after John C. Fremont, the famous explorer and Civil War General. Fremont became a city in 1911. This area was settled largely by Dutch people who immigrated to America to escape religious persecution. Their backgrounds were largely agricultural. Agriculture remains one of the primary occupations of the area today.

During the course of its settlement, Fremont Lake was the recipient of many forms of pollution which drastically lowered its water quality. In addition to agricultural runoff, Darling Creek carried heavy loads of food processing wastes and untreated and partially treated sewage for many years. These sources of nutrients caused annual fish kills in early summer and early winter and caused severe algae problems which were of public concern.

The algae problem was treated annually with copper sulfate from the early 1950's until recently. Department letter files indicate these efforts were sporadic in their results.

Gerber's Baby Food Company was one of the largest contributors of industrial waste to Fremont Lake. They originally discharged vegetable and fruit washing water and processed wastes laden with starches and sugars directly to Darling Creek. Because of their progressive attitude and community spirit, in 1952 they established their own sewage treatment system which greatly reduced the nutrient load to Fremont Lake.

Other industrial and processed wastes continued to be discharged to Darling Creek until about 1974 when most were diverted to improved treatment systems. Raw and partially treated sewage from the City of Fremont was diverted from Darling Creek to a model sewage lagoon and land treatment system in 1974. Sheridan Township began connecting into this system in 1980 and made final connection in December, 1981. Again, diversion of these waste products to a waste treatment facility greatly reduced the nutrient load of the lake.

### FISH MANAGEMENT HISTORY

The first DNR records of investigation of the fish populations in Fremont Lake date back to 1892. Surveys in 1892, 1926, 1934 and 1935 were very casual in nature and consisted primarily of gathering fishing reports or using a short sein to collect fish along the shoreline. These surveys generally concluded fishing was good and gave no indication carp were present in the lake. However, Mrs. Elma Zue, a lifelong resident of the area, recently recalled for the Muskegon Chronicle that carp were seined from Fremont Lake as early as 1924 by the Fremont Fish and Game Club. She further recalled fishing at that time was excellent, especially for perch. By 1952, continued nutrient enrichment favoring carp caused them to become a problem species in Fremont Lake and DNR files are filled with correspondence from then until the present addressing the situation.

A legal lake level was established in 1945, apparently for the purpose of inundating adjacent marshes to allow for increased northern pike spawning. It was thought by increasing the northern pike population the carp population could be reduced by predation of the pike on the carp. A local feud over the lake level developed in the community until the issue was resolved in circuit court in the mid-50's. In June, 1977, the circuit court provided for a winter level one foot lower than the normal level to protect the shoreline from ice damage.

In June, 1957, Biologist Ed Anderson of the then Michigan Conservation Department, did a partial chemical treatment of two bays of Fremont Lake using powdered rotenone. His results were less than desirable as many of the fish avoided the chemical and quickly swam to untreated waters.

From 1954 to the mid-60's, Mr. Edward Borchers of Spring Lake, Michigan, seined carp under permits issued by the then Michigan Conservation Department. This project was conducted in cooperation with the Fremont Fish and Game Club and/or the Fremont Lake Association.

Mr. Borchers removed several tons of carp annually; however, this had little, if any, positive impact on the game fish populations. Further, Mr. Borchers reported this lake was extremely difficult to sein because of its deepness and bottom characteristics.

Mr. Borchers abandoned his carp seining efforts in Fremont Lake in 1962. At that time, he determined his efforts were not commensurate with his rewards as the price of carp was declining while the cost of labor was increasing.

In 1962, Biologist John MacGregor prepared a proposal for a total treatment of the lake. Planning meetings, etc., proceeded until late 1963 when it was determined the water pollution problems would hinder the results. Also, the estimated cost of \$33,607.00 was considered as prohibitive at that time.

With the exception of an occasional trout plant until 1971, virtually no attempts were made to manage the fishery of Fremont Lake between 1962 and 1982. Complaints of poor fishing and a large and expanding carp population from the Fremont Lake Association and fishermen continued. During this period of time, the carp became stunted as a result of the reduced nutrient loading.

Fisheries Biologist Dave MacLean began working with the Fremont Lake Association in 1980. He surveyed the lake in 1981 and found carp comprised 75% of the game fish population by number and 82% by weight. The individual carp weighed an average of 0.6 lbs. each. The largest portion of the game fish population was comprised of black crappies which averaged 7" in size and yellow perch which averaged 6" in size. Other game fish present in the netting survey were northern pike, largemouth bass, bluegills and rock bass, none of which were abundant. Smallmouth bass and walleyes were also known to be present, but were not represented in the 1981 survey indicating their relatively low abundance.

Biologist MacLean prepared a plan to manually remove the carp with impoundment gear and small mesh gill nets. The idea was to capture these fish during their pre-spawning movement when they are most active. The plan called for removing 400,000 pounds of carp within a two week period.

On May 17, 1982, DNR crews for Districts 6 and 9 set approximately 5 miles of 2 1/2" mesh gill net and 15 fyke and trap nets in Fremont Lake. Additional gill and fyke nets were added on May 18th. As of noon on May 20, 1982, only 8,512 pounds of carp had been captured and removed by Fremont area volunteers and DNR crews. It was evident this method of removing carp was not going to achieve the established goal of 400,000 pounds. A decision was made to terminate the project on May 20th and remove all gear.

During the course of this intensive netting effort, only 175 pounds of game fish were removed from the gill nets. This again substantiates the low population of game fish present in Fremont Lake as it represents only 2% of the total fish caught in gill nets. Game fish captured in the fyke and trap nets were returned to the lake alive.

On June 8, 1982, a plan was presented to the Fisheries Division Regional and staff offices to chemically rehabilitate the entire lake and then restock it. This proposal was accepted pending acceptance by the Fremont Lake Association and fishermen in the area.

### FISH MANAGEMENT PROPOSAL

It is proposed to chemically remove all the fish in Fremont Lake using 1 - 1.25 parts per million of NuSyn - Noxfish, a rotenone product, prior to ice-up in late November or December, 1982. The exact amount of chemical to be used will be determined through bioassay tests using Fremont Lake water and carp at 30 - 37 degrees fahrenheit at Michigan State University laboratories.

A pre-ice up treatment was decided upon for several reasons, including:

1. NuSyn - Noxfish remains toxic for a longer period of time at low water temperatures, thus minimizing the potential for fish to avoid contact with a lethal concentration. It is estimated the chemical will remain toxic for 2 - 3 months, thus maximizing chances of total eradication of carp.
2. A pre-ice up treatment will minimize the fish cleanup. Most fish will decay during the winter minimizing fish pickup in the spring.
3. Costs are substantially reduced because only about half as much chemical is required when treatment is done just prior to formation of permanent ice cover.

It is estimated it will take three days to dispense the chemical during treatment. Weather conditions may lengthen the time required to make application. Application will be made by DNR crews. Assistance, in handling barrels, loading chemicals into boats, etc., will be sought from the Fremont Lake Association and the community.

Toxicant that is allowed to flow out of Fremont Lake via Brooks Creek will naturally detoxify over this approximate twenty mile distance and will be diluted as it combines with the larger volume of water in the Muskegon River. Brooks Creek will be restocked with brown trout in April of 1983, if water quality studies conclude it is suitable for trout management.

Toxicity tests will be run in Fremont Lake bi-weekly using minnows in live cages at various depths to determine the exact time of detoxification. Dissolved oxygen levels will also be recorded as a means of determining inhabitable water for fish throughout the winter months. As oxygen levels decline in the deep water the fish will be forced up into toxic waters.

Fish restocking will begin in early April following ice-out and spring turnover. The proposed fish stocking program is explained in detail later in this management plan.

### CHEMICAL TOXICITY

Rotenone is a natural extract from the roots of Derris and Lonchocarpus plants from the family Leguminosae. These plants are most commonly found in subtropical and tropical areas of the world.

Rotenone has been used for centuries by the South American Indians to kill fish for eating purposes. In the U.S., it has been used for many years as an insecticide. It has been used as a fish toxicant in Michigan since 1934.

The primary use of rotenone in the U.S. and Michigan continues to be as a garden insecticide where it controls many common pests. It is highly regarded in this role because of its effective control of insects, its low toxicity to nontarget species and its rapid degradation in the natural environment. In fact, it is considered so safe that no restrictions have been placed on minimum residue levels on food products. And, it is one of the few products considered safe to use by organic gardeners.

Toxicity studies completed by independent and Federal laboratories to obtain Environmental Protection Agency registration confirm its low toxicity to mammals and birds. The following LD 50 (Lehtal dosage required to kill 50% of the test animals) test results were presented to the EPA:

LD 50 Mammalian Toxicity

Man	2850 mg/kg (or parts per million)
Dog	3000 mg/kg
Rabbits	1500 mg/kg
Guinea pig	60 mg/kg
White rats	132 mg/kg

LD 50 Bird Toxicity

Pheasants	1000 mg/kg
Mallard ducks	2000 mg/kg
Chickens	1000-3000 mg/kg
Robins	1950 mg/kg
Sparrows	1300 mg/kg
Mourning Doves	4000 mg/kg

These test results mean for example that a 150 pound man would have to consume almost one-half pound of pure rotenone to obtain a lethal dose, or he would have to drink 2.4 gallons of NuSyn - Noxfish directly from the shipping container. Or, an individual would have to drink 2.3 million gallons of treated lake water. It should be kept in mind our proposed application rate of 1 - 1.25 ppm is at least 200 times below the toxicity level for man. It has been shown to be non-toxic to other test animals including livestock at concentrations of 50 ppm - 50 times higher than our proposed concentration.

Rotenone kills fish by constricting the vessels in the gills, which restricts the passage of oxygen into the blood and thus causes suffocation. Rotenone is not taken up by the fish's body and therefore there are no residues left in the flesh.

FISH STOCKING PROGRAM

All traces of rotenone will have disappeared by ice-out in late March or early April, 1983. This will be confirmed by the use of test fish in live cages throughout the winter months. Stocking of game fish can begin as soon as water temperatures reach 45 degrees F.

It is proposed to manage Fremont Lake as a 2-story lake. That means in essence managing it for cold water species such as trout as well as for cool and warm water species such as walleyes, bass and panfish. The success of managing for trout will depend largely upon how much dissolved oxygen is available at water depths with temperatures suitable for trout during the warm weather months. Presently, it appears summer trout habitat would be limited to water depths of 15 - 20 feet. It is expected this will change after carp are removed and water clarity improves.

In addition to Fremont Lake, Brooks Creek, if found suitable, will be stocked with about 20,000 brown trout on an annual basis until competition or predation reduces the survival of the plants significantly. These fish should provide a good trout stream fishery, especially through the mid and lower portions of Brooks Creek. Trout may be forced to move into lower portions of the stream from the upstream area as the surface waters at Fremont Lake warm it.

The following stocking rates and total number stocked are subject to change with fish availability from the hatcheries and combinations of like fisheries stocked:

#### RAINBOW TROUT/BROWN TROUT

Rainbow and/or brown trout will be stocked at a rate of 35 per acre for a total stocking of 27,650 fish in Fremont Lake. A request will be made to our hatchery section to obtain the largest size fish available. These fish should reach legal size (10") by mid to late May and provide an immediate fishery for the 1983 fishing season. These will continue to grow and reach a size of 15" by late fall. Surviving fish will continue to grow to a size of 5 - 6 pounds and perhaps larger in future years.

Future plants of yearling rainbows and/or browns will be made in the spring of each year at a planting rate of 20 per acre (15,800 total). These plants will continue until such time as trout survival is poor, angling success is poor, or predatory species on trout such as northern pike become abundant. The total number stocked might be increased if it is shown dissolved oxygen levels at greater depths are favorable for trout survival.

#### LAKE TROUT/SPLAKE

Fremont Lake, being a deep cold oligotrophic type lake has the potential of being one of the few southern Michigan lakes that could provide a lake trout and/or splake fishery. However, with the existing water turbidity caused largely by the carp, oxygen levels at depths having favorable water temperature for these species are marginal at this time. It is expected water clarity will change considerably with the removal of the carp allowing for deeper penetration of oxygen levels to depths of favorable water temperature for these species.

It is proposed to make an experimental plant of 15 lake trout and/or splake per acre (total plant 11,850 fish) in the spring of 1983. If fall surveys indicate significant survival of these species, additional plants will be made in the fall of 1983 and subsequent years, perhaps at increased stocking levels.

Both of these excellent long lived game fish species exhibit good growth to large sizes in Michigan. Many can be expected to be harvested at the 1 - 3 pound size, but many should survive to be harvested at the 8 - 10 pounds or larger size.

#### WALLEYES

Walleye fry (newly hatched fish) will be stocked at a rate of 5,000 - 10,000 per acre for a total stocking of 4.0 to 7.9 million fry. They will be stocked over the course of several weeks beginning in late April, 1983. Checks will be made during the course of the summer of 1983 to determine survival. If survival appears to be low, additional walleye fingerlings will be stocked from outlying rearing ponds as they become available in July, 1983.

Future plants of walleyes will be made from outlying rearing ponds. It is proposed the Fremont Lake Association cooperate with the DNR in locating and operating rearing ponds capable of producing 15,000 - 30,000 fingerlings per year for stocking. Walleye fry or fingerlings should be stocked at the above rates for at least three consecutive years following the initial stocking and in future years as determined necessary by the DNR based upon surveys, natural reproduction, harvest rates, etc. Fingerlings produced from these ponds in excess of the above stocking rates, or in years when it has been determined is not necessary, will be used by the DNR in managing other waters throughout the State.

Fry stocks should attain a length of 8 - 10" by fall of 1983, 12 - 14" by fall of 1984, and become legal (15") in 1985. It is possible because of the fertility of Fremont Lake they may reach legal size in late 1984.

#### LARGEMOUTH/SMALLMOUTH BASS

Adult large and smallmouth bass will be collected from area lakes during the course of routine survey work in 1982. The adults will be held in several ponds through the winter of 1982-83. In the spring of 1983, pairs of these adult bass will be stocked into area rearing ponds where they will reproduce and provide 23,700 3 - 4" fingerlings for stocking in the fall of 1983. The same amount of fingerling bass should be reared for stocking in 1984 and 1985. Natural reproduction will sustain the bass population beyond 1985.

Additional large and smallmouth bass adults held over winter and collected in spring surveys will be stocked in late May, 1983, for the purpose of naturally reproducing in Fremont Lake. This will further enhance re-establishment of bass populations.

A few of the adult bass will be harvested in 1983 and 1984. However, bass fishing will not become an intense fishing until late 1984 or early 1985, when fingerlings stocked should have attained the legal length of 12".

#### BLUEGILLS

Adult bluegills will be collected from area lakes being surveyed and stocked in Fremont Lake in late 1983. This will allow for predatory populations of walleyes and



bass to become established before bluegill recruitment occurs. This will prevent the bluegills from becoming over populated. Because of their high reproductive capacity, bluegills should quickly re-establish themselves and begin producing a good fishery by 1984. Growth of bluegills in Fremont Lake will be excellent, again because of the lake's fertility and abundant aquatic food production.

#### YELLOW PERCH

Four-hundred adult yellow perch will be stocked in late spring of 1983. These fish will be collected from Lake Michigan or Upper Peninsula lakes. Yellow perch spawn early in the spring in our area and have the potential for growing faster than the walleyes and thus out competing them. Thus, the reason for obtaining late spawning adults which will allow the walleyes to become established and utilize the yellow perch as forage. Yellow perch fishing from naturally reproduced fish will enter the fishery in 1984.

#### FATHEAD MINNOWS

Fathead minnows are an excellent forage fish for all game fish. They are capable of spawning several times throughout the summer and do not grow to a size where they are too large for use by game fish. Few exceed 4 inches in length.

It is proposed to stock up to 1 ton of fathead minnows in Fremont Lake in June, 1983. These fish will be collected from rearing ponds throughout the area and should provide forage for the walleyes and bass in 1983 and future years.

#### OTHER SPECIES

It is not recommended other species of game fish be stocked at this time. Species which will be considered for stocking in the future include purebred or tiger muskies, northern pike and crappies. We have elected not to propose stocking these species at this time primarily due to their predatory effect upon the trout and warmwater species.

#### Potential Problems

Several potential problems with this project exist and will be addressed accordingly. First, the possibility exists a total kill of all the carp will not be attained, or carp from adjacent waters will successfully enter Fremont Lake. If substantial numbers of carp were allowed to enter Fremont Lake, it could jeopardize the overall results of the treatment by allowing the re-establishment of carp or other species of fish competitive with or predatory upon the species proposed to be stocked.

The existing carp and game fish populations in Lorden and First, Second, Third and Fourth Lakes are being examined. If these carp populations are found to be high, permission will be sought from riparian landowners to treat these waters as well as Fremont Lake. If treated, these waters will be restocked with trout and/or other desirable game fish species.

Re-introduction of adult carp and/or other undesirable species will be lessened by maintaining the wier if necessary in Darling Creek. While small fish will be able to migrate through the wier, these smaller fish will survive at a lesser rate due to their size and the predatory effect of the fish stocked in Fremont Lake.

The potential also exists some of the carp in Fremont Lake may escape a lethal dosage of rotenone, if they are able to locate an oxygenated groundwater source. These numbers will be minimal and bioassay tests being conducted at MSU will provide us with the correct concentration of chemical to use to insure a maximum kill.

Small numbers of surviving carp will not become a major problem. Their numbers will be low and any reproduction from them will be preyed upon by stocked fish. Also, the habitat change resulting from the treatment will not make the lake conducive to rapid population expansion of this species.

Reinfestation from downstream will be prevented by maintaining the dam at Grandpa Lakes. Proper dam maintenance will prevent upstream movement of undesirable fish.

Residents are advised that because of the improved water clarity, rooted aquatic plant growth will increase. This may provide a problem in some of the shallower bays of the lake. However, increased aquatic plant growth will provide such advantages as additional spawning habitat and nursery and food areas for various fish.

#### COSTS: BENEFITS

At the present time, it is estimated Fremont Lake will require 9,061 gallons of NuSyn - Noxfish for treatment at 1 ppm. At the present contract price of \$11.20 per gallon, the total estimated chemical cost is \$101,483.20. This cost will increase if bioassay tests determine a concentration of greater than 1 ppm is necessary or if it is necessary to treat adjacent lakes. It is expected manpower, lodging, travel and equipment expenses will be about \$7,000.

These project costs do not include the cost of fish stocking due to the variability in the cost due to sizes and numbers stocked and hatchery source. It is estimated fish stocking will cost about \$10,000 per year. Present plans call for the DNR to bear the cost of this project utilizing Game and Fish Protection Funds derived from fishing and hunting revenues. The DNR recognizes this is a large expenditure for one project; however, we believe the benefits, both aesthetic and economic, are worth this expenditure.

Private contributions to this program will also be accepted and proper recognition given to donors. Contributions will be appreciated in view of the total project cost, the impending economic conditions of Michigan, and the financial impact this project will have on Fremont and the surrounding area.

Sport fishing survey results in Michigan show that 37.8 days of angling per acre are provided annually from a total lake reclamation project. This means Fremont Lake would provide about 29,941 angler days per year. Expanding this figure for a minimum of 5 years shows a total angler use of 149,705 days.

Economic surveys conducted in 1979 by Dr. Daniel Talhelm of Michigan State University show anglers on inland waters spent an average of \$25/day in pursuit of their sport. These monies were spent for fishing tackle, lodging, travel, meals, beverages and related equipment. Seventy-five percent (75%) of these monies were spent within 25 miles of the fishing site. Using Dr. Talhelm's figures, the expected 149,705 days of fishing over the next five years have an anticipated value of \$3,742,625.00. Compared to the estimated total project cost including fish stocking of \$118,000, the cost benefit ratio of this project is projected at 1:36. This is a very favorable cost benefit ratio for a project of this type.

In addition to the economic benefits of this project, there are many aesthetic benefits also. Users of Fremont Lake including boaters, swimmers and fishermen will find the clarity of the water more pleasing than the existing turbid water conditions. The quality of the fish harvested from the lake will also improve as stable fish populations of highly desirable fish are established replacing the predominant carp population that exists now.

#### SUMMARY:

Fremont Lake through the years has been used and abused to the point where today the fish populations are dominated by carp. It is proposed to rid the lake of carp by chemically rehabilitating it in November or December of 1982 with 1 - 1.25 ppm of NuSyn - Noxfish, a rotenone product cleared by the EPA for use as a fish toxicant. NuSyn - Noxfish has a very low toxicity to man, animal and bird life.

Restocking of the lake will begin early in the Spring of 1983. Presently, plans call for stocking about 27,650 rainbow and/or brown trout, 11,850 splake and/or lake trout, 4 to 7.9 million walleye fry, 23,700 large and smallmouth bass fingerlings, adult yellow perch and bluegills as well as fathead minnows. Future plants of these same species will be made as needed to insure a high quality fishery.

The total estimated cost of this project including fish stocking is \$118,500. Aside from any private donations which are made to the project, the cost will be borne by the Department of Natural Resources. Based upon 1979 figures, it is estimated this project will have an economic value of 3.7 million dollars over the 5 years following treatment. Seventy-five percent of these monies will be spent within 25 miles of Fremont Lake.

The high quality fishery established as a result of the proposed treatment will be coupled with improved aesthetics of the lake. Fremont Lake has the potential of being one of west Michigan's best fishing lakes.

Fremont Lake Chemical Reclamation  
Project Area

