

FISHERIES DIVISION

TECHNICAL REPORT

Drawdown Related Winterkill of Pontiac Lake, Oakland County, 1981-82

A Lesson in Socio-Biological Relationships

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Michigan Department of
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Introduction

Throughout the fall and winter of 1981-82, events at Pontiac Lake, Oakland County, Michigan, were best described by Murphy's Law, "If anything can go wrong, it will". In what was supposedly an uncomplicated major lake drawdown for dam repair, Mother Nature teamed with well-intentioned, but slow-moving agencies, to produce a significant loss of fish in the lake. An estimated 1.3 million fish (117,000 pounds) died or left the lake through the opened dam.

This report reviews the issue, events, and progress of the fisheries rehabilitation program on Pontiac Lake. Its lesson is positive. What was learned can be used to avoid similar problems in the future.

History

Pontiac Lake is a 585-acre impoundment created in 1926 when Lime Lake, a small lake in the upper Huron River watershed, was dammed. After impoundment, the lake's shoreline quickly became crowded with cottages and permanent homes except for approximately 1 mile of shoreline owned by the Michigan Department of Natural Resources (DNR). Over 70% of the lake is less than 5-feet deep. The bottom was covered with hundreds of old stumps, remains of the pre-impoundment logging operation. Aquatic vegetation and fish prospered in this fertile environment. In recent years, the fishery has been regarded as excellent for largemouth bass, and fair to poor for tiger muskellunge (stocked by the DNR since 1966), northern pike, and panfish.

However, with time the aquatic vegetation problem grew worse and the submerged stumps caused damage to boats, motors, or propellers each summer. Concerned riparians formed the Pontiac Lake Improvement Board in 1977 to deal with the lake's weed and stump problem. In 1979, at the request of the Pontiac Lake Property Owners' Association, a permit was issued by the DNR for the relocation of 200

stumps to reduce the hazard to boats. By relocating the stumps rather than total removal, fish habitat was retained. In 1980 the Inland Lakes Unit of the Land Resource Program Division of the DNR was awarded an Environmental Protection Agency grant to study the lake. That same year a consulting engineering firm, hired by the Lake Improvement Board, recommended a wintertime drawdown of 5 feet for aquatic weed control. They also recommended aeration systems to protect fish during the drawdown and the installation of a supplemental water well to maintain desirable summertime lake levels.

The Problem and Plans

The deteriorating embankments of the dam were a major concern. A second engineering firm was hired by the Oakland County Drain Office to study this problem. Early in 1981, the new engineering firm concluded that the dam was becoming unsafe. They recommended reconstruction of the embankments, a project which would require a 10-foot drawdown of the impoundment.

The Lake Improvement Board and the Drain Office jointly determined that both the dam repair and lake improvement projects could be done simultaneously, thereby saving considerable time and expense. They applied for the required DNR permits to do the projects. The original plan submitted by the Drain Office called for the 10-foot drawdown to be accomplished by November 1, for the dam repairs to be completed by December 25, and for the refilling of Pontiac Lake to occur throughout the winter. The project appeared to be feasible and simple to accomplish. All that was required was: (1) the timely release of 10 feet of water from the lake, (2) repairs to the dam, (3) placement of aerators, and (4) refilling to normal water level.

Action Taken

Since the water level for Pontiac Lake had been set previously by court order, the Drain Office petitioned Oakland County Circuit Court to allow it to lower the level. The chain of events leading to the winterkill situation started when the original hearing, scheduled for September 10, was postponed until October 14. Despite the delay, the Drain Office began releasing water on September 17. The drawdown, according to the engineers, would normally take 30 days at a release rate of 50 cubic feet per second.

By September 20, the lake level had been lowered 9 inches. Over the next 24 hours, a "300-year rainfall" dumped 4.9 inches of rain on Pontiac Lake and its watershed. By October 4, the lake water level was 9 inches above the pre-drawdown level, having risen 18 inches in just 4 days! This rainfall, added to the monthly accumulation in October of 2 inches, equaled 6.9 inches. An aeration system that had been approved and ordered, still had not arrived.

By November 24, the lake level, which should have been 10-feet lower than normal, had dropped less than 5 inches. The consensus of the Drain Office, Lake Board, and the DNR was to proceed with the project. A decision to delay the project would have required the lake to be drawn down 5 feet and left there over winter since further damage had occurred to the dam as a result of the heavy September rainfall. At this point the aeration system had not yet been placed because some of its parts were unavailable. The Lake Association asked, "If we proceed with the project without aeration, and the fish all die, what will it cost to restock Pontiac Lake?". The DNR answered as follows: (1) stocking a 585-acre lake with young (fingerling) fish, as is routinely scheduled in DNR reclamation projects, would cost approximately \$60,000, and in addition good fishing is not available until the third summer after stocking when the game fish reach catchable size; and (2) recreational

benefits (including profits to the fishing-related businesses on the lake) exceeding \$400,000 per year on Pontiac Lake would be lost. Therefore, a winterkill and 3-year delay in angling activity would deprive the area of \$1,200,000 in recreational value. There were no further discussions about neglecting aeration.

The drawdown continued, but slowly. An attempt to increase the discharge rate caused flooding problems downstream because small culverts at a subdivision road bridge could not pass increased flows. After considerable discussion between the Drain Office and the DNR, the decision was made to remove the culverts and replace them later with larger tubes. Alternate vehicle routes were used by residents affected by the bridge removal. A few minor problems developed, including convincing the contractor to extend his bid (originally scheduled to end on December 21), and closing the lake to use during the winter (since the ice conditions would be unsafe, especially near aeration holes).

On December 30, however, all parties agreed to proceed with the project although the lake was only 5 1/2 feet below normal. The contractor assured all groups that his work would be completed by March 15, and normal water levels could be had by early summer.

Winterkill

Pontiac Lake developed ice cover by December 9, which was extremely early compared with normal winters. The ice cover prevented mixing of wind and water at the surface, effectively eliminating that source of oxygen for aquatic organisms. Typically, during the winter green plants under the ice continue to produce oxygen when sunlight reaches them, but they also consume oxygen at night, on cloudy days, and when ice and snow cover block out the sunlight. In addition, decaying organic matter uses up oxygen. One can compare a lake in winter to a storage battery, in that it is

"fully charged" with oxygen until ice forms, then begins to "run down" over winter, and "recharges" somewhat when sunlight reaches the green plants.

Because the drawdown reduced the lake size, the fish were crowded into one-fifth the normal volume of water. This, compounded by the abnormally early ice and snow cover and the failure to install the aeration system earlier, resulted in critically low oxygen for the fish.

By January 12, water levels had reached the project level of 10 feet below normal. The ice was just thick enough for a DNR fisheries crew to get on the lake and check dissolved oxygen levels at various depths. The oxygen was found to be less than four parts per million (ppm), which was one-half the concentration present in other nearby lakes. By the time an emergency temporary aeration unit was installed and operating on January 19, Pontiac Lake had apparently lost too much of the dissolved oxygen to recover, because oxygen levels continued to fall. Volunteer SCUBA divers from the Oakland Otters Club made visual observations under the ice on two occasions. On January 24, they found some dead and dying fish on the bottom and thousands of distressed fish just below the ice. Oxygen levels were below 2 ppm at all depths. By the end of January, when oxygen levels appeared to have stabilized at 0.2 to 0.4 ppm, Fisheries Division personnel declared the fish population "dead". This was apparently confirmed by a SCUBA dive on February 22, which found only bullheads and bowfin still alive at the aeration hole site. Dead fish completely covered the bottom.

Stump Removal

During the period of fish die-off, the Property Owners' Association took advantage of the low water level to continue the stump removal campaign. A field trip was arranged with Association representatives and DNR personnel

on January 20, to select sites and methods for the removal. A permit was issued on January 22, and on January 30 the stump cutting occurred. Unfortunately, overzealous chain saw operators cut stumps in non-permitted areas, and removed many tree trunks in designated fish habitat areas. This caused considerable controversy as everyone was unhappy about the large amount of fish habitat destroyed. On March 16, when dam repairs were essentially completed, refilling the lake began.

Fish Restocking

Following the loss of the fish population, there was much public discussion. With the news media participating, charges were leveled from all quarters placing blame on one agency or another. Probably no group or agency was blameless in the winterkill of Pontiac Lake. The major problems were poor communications, lack of contingency plans, and lack of coordination.

What remained to be done was to reestablish fishing in Pontiac Lake. There was concern for the six businesses on the lake, related to fishing, and the anglers who used the lake. It was estimated by DNR fisheries biologists that 1.3 million fish (117,000 pounds) had been lost. DNR resolved: (1) to reestablish a fishable population as soon as possible, and (2) provide for future angling by including sufficient brood stock to assure immediate natural reproduction. The cost of purchasing enough catchable-sized fish to provide fishing was estimated to be \$144,000. Because of the high cost, Fisheries Division decided to transfer some fish from regularly scheduled survey operations in southern Michigan into the lake. The Drain Office agreed to pay one-half the cost to purchase adult largemouth bass and other fish that might not be available in sufficient numbers from surveys. These fish would be purchased through commercial outlets. Because Fisheries

Division's stocking plan for Pontiac Lake was conceived and published without the input from local citizens and concerned legislators, and because the proposal appeared to substitute catfish for bass, many people were upset. This situation was relieved, however, when a public meeting was held and all interested parties were brought together. This resulted in the negotiation of a stocking plan accepted by all concerned (Table 1).

The search for adult bass and channel catfish began immediately. A Michigan game fish farmer was located who guaranteed delivery of 30,000 pounds of adult catfish from Lake Huron waters. Eleven thousand catfish, from 1 to 15 pounds each, were stocked and available to anglers by June 17. Other catfish came from DNR survey operations at other lakes. The purpose of the catfish plants was twofold: (1) to provide an immediate fishery with good sized game fish as a temporary substitute for largemouth bass, and (2) to provide future control of stunted panfish through predation. Some adult bass from routine surveys were transferred to Pontiac Lake, but many more were needed. A widespread search finally located bass in the states of Indiana and Arkansas. On April 8, over 2,100 4- to 8-inch yearling bass were shipped at no charge to Pontiac Lake from the Indiana Department of Natural Resources.

In July, over 2,100 8- to 15-inch bass were purchased from a private Arkansas hatchery. These fish were stocked on July 15. However, one-third did not survive the trip, and many more died in the lake within a few days after they were planted, apparently due to poor handling in Arkansas. This particular fish mortality created some of the most adverse publicity the whole issue of Pontiac Lake received. Two women, one the owner of a business related to fishing, invited a Detroit television station to get a story on "another DNR disaster" on Pontiac Lake. The resulting TV news program reported that ALL fish in Pontiac Lake were now "contaminated and dying", from those "sick" fish the DNR had

imported from Arkansas. One of the women said, "God help anyone who eats fish out of Pontiac Lake". Despite subsequent TV interviews with DNR Fisheries personnel who had the pathological reports, the earlier newscast caused considerable damage to the Department's image. Because of this, angling and swimming all but ceased on the lake. A nearly hysterical woman called the following morning, asking what she could do to save her son who had eaten some Pontiac Lake fish that night; such was the hysteria created.

Additional fish stocking was continued throughout the summer with over 25 separate plants being made. Over 27,000 large fingerling or adult fish were planted, along with 600,000 northern pike fry, and nearly 1,800 pounds of minnows (Table 1). Local bass fishing clubs chipped in and provided more than 200 adult bass averaging more than 16 inches long caught from local lakes. The direct DNR cost (excluding salaries) of this major stocking effort was approximately \$17,000, which includes one-half the cost of catfish and Arkansas bass, plus transportation costs. The cost of planting fingerlings and adults, excepting pike fry and minnows, was \$0.63 per fish. And if the cost of the catfish (\$15,000) is excluded, the remaining 16,000 fish cost only \$2,000, or \$0.05 each.

Stocking Results

Follow-up surveys of the stocking were extremely encouraging. On July 7, 1982, a 25-foot seine was used at three locations around the lake, sampling in total less than one-half acre, to evaluate spawning success. Over 500 2-inch (young-of-the-year) perch were netted, along with many young bass, crappie, bluegills, and minnows. The adult brood stock had done exactly as expected and the future fishing of Pontiac Lake was assured.

On the night of September 20, a DNR fisheries crew electrofished the lake over one-half of the shoreline. Many

more fish were seen than the 371 netted, measured, and released, including large numbers of young-of-the-year game fish, further proof of game fish reproduction. In the survey, 59 sublegal bass were captured. Undoubtedly, one-third of them would reach legal size of 12 inches by July 1983. Seven northern pike were netted, two of which were legal size (20 inches) and the others a healthy 12 to 13 inches long, good growth for their first year of life. A similar survey on most southeast Michigan lakes would have captured less than half as many pike. The 49 black crappies measured averaged 8.4 inches long, the 43 yellow perch averaged 7.3 inches, and 132 pumpkinseed sunfish averaged 6.1 inches. Netting and electrofishing surveys were conducted in 1983 with results as encouraging as in 1982. Bluegill and pumpkinseed sunfish, crappies, and perch all averaged larger in size than anglers could remember catching for many years. In the future many successful fishing trips to Pontiac Lake are expected.

It is also predicted that northern pike angling will be as good or better than anyone remembers, based on the large number of fish seen in surveys or caught by anglers already. It will require a few more years for the 4 to 5 pounders to be common again in bass fishing. However, excellent growth of bass in 1983 indicated that there will be plenty of "keepers" soon. Many bass will reach the legal size of 12 inches within 3 years after hatching, rather than the usual state average of 4 years, based on survey results.

Discussion

Apparently the winterkill, while massive for bass and bluegills, was not a total kill after all. There were far too many adult perch caught by anglers fishing through the ice during the winter of 1982-83 to have all been stocked fish. Only 170 adult perch were planted, yet on a good day, hundreds of large 9- to 12-inch perch were caught through

the ice. Pumpkinseed sunfish adults, fat, and sizable, provided a good fishery too, yet none of them were planted after the winterkill. In fact, survey-captured pumpkinseeds outnumbered bluegills by seven to one. Several large tiger muskellunge was caught by anglers as well. None was planted after the winterkill. Also there are now more bullheads, carp, and bowfin than prior to the winterkill, probably due to their tolerance to low dissolved oxygen conditions and high fecundity.

Undoubtedly the Pontiac Lake fish population was severely reduced by the winterkill. Fish stocking was essential to reestablishing good bass, bluegill, and northern pike fishing. Survival of some of the sport fish provided a much appreciated bonus, allowing quicker recovery of the overall fishery. The stocked catfish adults did not generate the angling interest hoped for, and in that light could be considered a failure. However, natural reproduction is occurring and if trends follow those of other state waters, an increased angler interest can be expected in the future. It is believed the catfish will be a predator on small panfish helping keep that population in balance and contributing toward excellent panfish angling. At this point, it can be said that the future of fishing on Pontiac Lake is bright.

Lake Board Action

The Lake Improvement Board, with much encouragement and support from the Lake Association, made two giant strides in 1983. First, they purchased and operated a mechanical weed harvester. In the summer of 1983 (its first season of use) over 1,200 tons of aquatic vegetation were removed from Pontiac Lake. Not only were major portions of the lake opened to boating all summer long, but other areas were cleared to improve angling opportunities. Reduced weed cover provided predators greater chance to catch smaller

fish for food. Secondly, the aeration system was permanently installed and operated through the entire summer of 1983. The unit kept the largest and deepest basin of the lake oxygen rich from top to bottom (from 5.2 ppm to 9.9 ppm at the 25-foot level in 32 feet of water). Its presence should protect the lake from future winterkills. With these problems solved, management of the lake can more adequately be handled.

Department of Natural Resources Action

What if another similar situation develops in the future? The lessons learned from the Pontiac Lake experience will not be forgotten. Considerable analysis and discussion have occurred in the DNR since the fish kill. A formal review culminated in a report to the Director in August 1982. As a result of that review and further efforts in Lansing, the DNR has established a new policy and action procedures for similar situations. Through those guidelines, there is now total Department planning, coordination, and improved communications in major efforts.

Conclusions

The final analysis indicated that the positive results far outweighed the negative impacts. The Pontiac Lake community has a repaired dike and dam, an effective aerator, a good weed harvesting program, and a promising fishery. The Lake Board accomplished a great deal in a short time. Citizens learned that the DNR can respond promptly and positively in restoring a devastated fishery. And perhaps, most importantly, the involved agencies have gained new insight as to how to deal with similar events and each other in the future.

Table 1. Numbers (or pounds) of fish proposed and actually stocked as brood (April-May) or post-spawning (June-August) stock in Pontiac Lake, 1982.¹

Species	Proposed		Actual	
	Brood	Post-spawn	Brood	Post-spawn
Fathead minnows	500 lb	...	1,780 lb	...
Largemouth bass	120 ad	1,000 ad 5,000 fi	57 ad 2,150 fi	2,761 ad
Bluegill	50 ad	500 ad	64 ad	2,095 ad
Black crappie	150 ad	6,000 ad	370 ad	3,419 ad
Yellow perch	150 ad	6,000 ad	170 ad	...
Northern pike	100 ad 600,000 fr	...	152 ad 600,000 fr	...
Channel catfish	5,000 ad to 25,000 ad	...	4,938 ad	10,925 ad

¹Pounds is abbreviated as lb, adults as ad, fingerlings as fi, and fry as fr.