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A Study of the Kalamazoo River Between Battle Creek and Kalamazoo to Determine the Extent of Fish Survival Following a Mortality Caused by Cyanide Pollution on September 15, 1947, at Battle Creek

By

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On September 15, 1947, the Battle Creek Plating Company released 4,600 gallons of cyanide solution in the Kalamazoo River through the municipal sewage system of Battle Creek.[1] A heavy fish kill resulted as was evident from thousands of dead carp, suckers, and other fish which were observed floating downstream between Battle Creek and Kalamazoo.

The writer was asked to make an investigation, by the use of an electric shocker, to determine the extent of survival of fish in the various sections of the river between Battle Creek and Kalamazoo. The need for restocking the stream would depend upon the amount of survival of game fish in the river and the amount of migration of fish from the unpolluted tributaries into the river.

Equipment consisted of a 115-volt., 5.2-amp., Kato-light A. C.

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[1] - See minutes of special meeting of Stream Control Commission held at Lansing, September 22, 1947.

generator powered by a Briggs and Stratton gasoline engine. A one-hundred-foot insulated wire cable, equipped with floats, was run from the generator to the two electrodes. The engine and the generator were carried in a boat. The one-hundred-foot wire cable allowed two hundred feet of the river to be shocked without moving the boat. Electrodes were held from eight to fifteen feet apart while in operation in the river.

Shocking of various sections of the river were carried out on September 24 and 25, 1947, and the following results were obtained:

Station No. 1

Date: September 24, 1947.

Location: T. 1 S., R. 8 W., Section 34, Bedford Township. Near western edge of Battle Creek about one mile above point where city sewage empties into river.

This section did not receive any of the cyanide pollution, and no fish mortality was observed or reported here.

Results: A 200-foot stretch of water along the right bank (facing upstream) was shocked. Electrodes were held about eight to fifteen feet apart. During one-half hour of shocking the following fish were found:

No.	Species	Size
1	Notropis cornutus, common shiner	2.5 inches
1	Catostomus commersonnii, common white sucker	8.0 inches

The fact that very few fish were taken at Station No. 1 may be attributed to a combination of several factors. The murkiness of the water due to sewage pollution made it difficult to see fish. Due to the accumulation of sludge beds along both shores, the river appears to be a poor habitat for game fish and small fish. Finally, much of the river here is deep, and the shocker cannot be operated effectively in deep water.

Residents report the presence of many large carp in this section. Common shiners were observed in the mouth of a small creek entering the river at this point.

Station No. 2

Date: September 24, 1947.

Location: T. 1 S., R. 9 W., Section 25, Rose Township. About one-eighth mile below mouth of Seven Mile Creek.

Results: A stretch of about 500 feet along the left bank was shocked. Two sweeps with the shocker were made. The first was from the left bank to ten feet out in the river. The depth ranged from zero to three feet. The second was from fifteen to twenty feet out from the left bank in water ranging from three to four and one-half feet in depth. The bottom in this section was gravel with scattered boulders, and occasional sludge beds in quiet-water areas. Overhanging trees and snags provide excellent cover. The air temperature was 57° F. and the water was 60° F. at 5:00 P. M. During two hours of shocking, the following fish were found:

No.	Species	Size Range (inches)
2	Catostomus commersonnii, common white sucker	7.0 - 14.8
1	Notemigonus crysoleucas auratus, western golden shiner	5.7

These fish may have moved into the river from Seven Mile Creek. About ten dead carp and suckers were observed caught on snags along the bank. No aquatic insects, crayfish, or other invertebrates could be found in this section of the river. Evidently the cyanide pollution had affected these organisms, as well as the fish.

Station No. 3

Date: September 25, 1947.

Location: T. 2 S., R. 9 W., Section 3, Charleston Township. Near southern edge of Augusta at the Augusta Creek entrance.

Results: A stretch of about 1000 feet along the right bank was shocked, holding the electrodes eight to fifteen feet apart; the water depth ranged from zero to four feet. The middle of the river was deep and swift. The water was slightly turbid. The bottom in this section is composed of gravel, scattered boulders, and rubble, with an occasional bed of sludge in quiet waters along the shore. Overhanging trees and bushes, and occasional snags provide good cover. About twenty-five dead carp and suckers were observed caught on snags along shore. During two hours of continuous shocking no living fish, insects, crayfish, or other invertebrates were found. The absence of fish was unexpected, in view of the fact that Augusta Creek enters on the opposite bank at this station and fish could have entered the river from this source after the cyanide pollution had passed downstream.

Station No. 4

Date: September 25, 1947.

Location: T. 2 S., R. 9 W., Section 19, Charleston Township. Bridge at U. S. 12 crossing just east of Galesburg.

Results: About 100 feet of the river was examined along the left bank. One sweep with the shocker was made holding one electrode near the bank and the other eight to ten feet out in the river. The depth ranged from zero to five feet. The river near this bridge has large beds of sludge and shows signs of containing local domestic sewage, along with tin cans and other junk. The water was deep and turbid. About twelve dead carp and

and suckers were noted on one large snag just above the bridge. During one-half hour of operating the shocker, no living fish, aquatic insects, or crayfish were found. Frogs were abundant in this section.

Station No. 5

Date: September 25, 1947.

Location: T. 2 S., R. 9 W., Section 19, Charleston Township. First bridge downstream from U. S. 12 crossing.

Results: A stretch of about 1000 feet along the left bank was shocked. Two sweeps with the shocker were made. The first extended from the shore to ten feet out and the second from fifteen to twenty-five feet out from the left bank. The river near this bridge has a good bottom composed of gravel, with scattered boulders, rubble, and an occasional bed of silt. Sludge beds are scattered along the shore in quiet waters. One open sewer from a restaurant empties into the river just above this bridge on the left bank. During two and one-half hours of shocking the following fish were found:

No.	Species	Size Range (inches)
1	Cyprinus carpio, carp	10.6
1	Lepomis gibbosus, pumpkinseed	3.5
6	Lepomis cyanellus, green sunfish	3.2 - 4.6
1	Ameiurus natalis, yellow bullhead	4.5

Several live crayfish and a species of Gyrinidae (Whirligig beetle) were observed. No other aquatic insects were found.

Of the fish, the green sunfish and the pumpkinseed were found near the entrance of a small spring which enters the river on the left bank at the bridge. It is possible that these small fish may have survived the pollution by being in this small spring tributary. The other fish were taken out in the river and possibly survived due to a lessening of the toxicity of the cyanide solution.

Station No. 6

Date: September 25, 1947.

Location: T. 2 S., R. 10 W., Section 21, Comstock Township. North side of the reservoir near dam. This reservoir extends upstream approximately through Sections 21 and 22 of Comstock Township.

Results: About 200 feet along the shore was shocked. Two sweeps with the shocker were made, the first with the electrodes at the shore and fifteen feet out, and the second from fifteen to twenty-five feet from the shore. The bottom in this section of the reservoir is composed of gravel, sand, and silt. About two to six inches of silt covers the bottom in the water twenty-five feet from shore. Dead fish, partly decomposed, were still scattered along the shore. Most of them were carp and suckers, but one largemouth bass and several other centrachids (probably pumpkinseeds and bluegills) were noted. During one-half hour of continuous shocking, the following fish were found:

No.	Species	Size Range (inches)
1	Cyprinus carpio, carp	20.5
13	Hyborhynchus notatus, bluntnose minnow	1.2 - 1.8
1	Moxostoma erythrurum, golden redhorse	14.6
6	Lepomis gibbosus, pumpkinseed	3.9 - 4.7
5	Lepomis macrochirus, bluegill	3.4 - 4.3

Evidently the reservoir still has a substantial population of the above species, and presumably there is an adequate breeding stock of game fish present.

Crayfish and aquatic insects were abundant in this section of the reservoir. Apparently the large amount of water in the reservoir diluted the cyanide down to a non-toxic state.

Station No. 7

Date: September 25, 1947.

Location: T. 2 S., R. 10 W., Section 20, Comstock Township. First bridge downstream from the dam.

Results: About 200 feet along the left bank was shocked, from bank to ten to fifteen feet out. The bottom in this section is composed of gravel and sand with scattered silt beds. A large snag under the bridge furnishes good cover for fish. During one-half hour of continuous shocking the following species of fish were found:

No.	Species	Size Range (inches)
12	Hyborhynchus notatus, bluntnose minnow	1.2 - 1.9
1	Hadropterus maculatus, blackside darter	2.8
1	Esox lucius, northern pike	12.9
2	Micropterus dolomieu, smallmouth bass	2.9 - 3.9
4	Ambloplites rupestris, rock bass	2.0 - 6.5
6	Lepomis cyanellus, green sunfish	1.5 - 4.7
1	Lepomis megalotis, longear sunfish	3.5

Apparently the cyanide pollution did not affect the fish below the dam at this station.

Conclusions

Apparently the fish and insect populations were virtually wiped out in the ten miles of the river below Battle Creek. A few fish began to appear at Galesburg and there is probably a substantial population of game fish remaining in the reservoir near Comstock. Carp and suckers apparently made up most of the fish population in the sections of the river where the cyanide pollution was effective. In most sections of the river between Battle Creek and the reservoir, large beds of sludge have been built up

from sewage that has been dumped into the river. However, a few areas do provide good fish habitat. The game and coarse fish species from the various tributaries, and from the reservoir at Comstock, will probably repopulate the sections now devoid of fish.

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