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Source: *Ecology*, Vol. 10, No. 3 (Jul., 1929), pp. 271-274

Published by: Ecological Society of America

Stable URL: <http://www.jstor.org/stable/1929502>

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ECOLOGY

VOL. X

JULY 1929

No. 3

THE EFFECT OF CARP ON A SMALL LAKE: THE CARP AS A DOMINANT¹

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In Washington county, which is in the third tier of southern counties of Wisconsin, there lies a pretty body of water known as Pike lake. This lake is semi-natural: natural in that it was originally a widening of the Neosha river; artificial in that its waters were raised twelve feet by the placing of a dam across the river some sixty years ago. Originally it was a delightful fishing lake, yielding good catches of large-mouth bass (*Micropterus salmoides*), great northern pike (*Esox lucius*), together with a variety of so-called pan fishes, and an occasional wall-eyed pike (*Stizostedion vitreum*). From Pike lake the Neosha river wanders through rich loamy farming country, its course interrupted by occasional little falls and rapids where gravel is encountered. Fifteen miles south and east of Pike lake the Neosha river passes through the town of Neosha, and again some fifteen miles south and east it enters the Rock river. Fifty years ago citizens of Neosha decided to construct a mill to grind the community grain, so a dam was erected across the river at a point where Highway 68 now crosses the stream. The dam raised the waters of the river ten feet, and an entirely artificial lake came into existence. This lake encompassed an area about a mile in length and from a quarter to three quarters of a mile in width, its banks being marked by the original much-worn and very irregular valley of the old Neosha river. Fish were already in the stream; more came down from Pike lake; many were planted. Aquatic vegetation became abundant, and there were fine beds of *Potamogeton*, *Ceratophyllum*, *Vallisneria* and *Nymphaea*, with *Sagittaria* growing in abundance along the shores. Fishing was excellent. I remember, as a boy, driving out to the lake with horse and buggy, to bring home fine catches of large-mouth bass, great northern pike, and delightful pan fish of various species (*Eupomotis gibbosus*, *Lepomis incisor*, *Pomoxis annularis*, *Perca flavescens*, etc). For years it was a first rate fishing lake.

¹ Contribution from the Zoological Laboratory of the University of Illinois, No. 342.

Meanwhile things were happening above in Pike lake. Fishermen, using small carp (*Cyprinus carpio*) for bait, having some left over when the day was done, threw the living minnows overboard. Carp appeared in Pike lake, and reproduced well. Naturally some went over the dam during high water, but there was little evidence of the species in Neosha Mill Pond. Then, eighteen years ago, the Pike lake dam went out, and carp appeared in the Mill Pond. Now, Pike lake is essentially a gravel lake; the Mill Pond a soft, muddy-bottomed lake, much more suited to the requirements of the carp. The species did better in the Neosha pond than it had ever dreamed of in Pike lake. The waters of the pond became muddy, turbid; the vegetation began to disappear. Fishing fell off, slowly at first, and finally died completely. Bass casting gave place to set-line fishing for carp, and the lake was practically forgotten by fishermen.

In 1924 the dam at the outlet of the Mill pond showed signs of going out, so it was decided to replace it completely. In order to facilitate matters, it was decided to drain the lake, thus accomplishing two objects: making the erection of the new dam easier, and at the same time giving the commercial fishermen a chance to make a haul for carp in an effort to clean out the lake so that it might be restocked with game fish. Accordingly, late in September, 1924, a net was placed across the outlet to stop any fish from going down to Rock river, and the water was let out. When the draining was complete there remained great mud flats on each side of what was the original Neosha river channel (Plate VI, A), with all the fish concentrated in this narrow strip. Here was a chance I had long looked for, to see just how many fish there were in a small lake.

As the water receded, two things impressed me. There was no vegetation in the lake—not a single water plant did I see or could I find, save only one small clump of *Sagittaria* growing on a gravel bar at the inlet of the lake. A lake without vegetation. The second item to impress itself was the very peculiar pitted condition of the muddy bottom: everywhere were moon-shaped or semi-round depressions about a quarter of an inch deep (Plate VI, B). These covered the entire exposed bottom, so thickly as to overlap in many places. It was not until we began the seining that I realized that these depressions were the work of carp—the impression of the mouth where the fish had sucked in the soft muck in search of food. This carp “mumbling,” then, satisfactorily accounted for the total absence of aquatic vegetation: the fish had rooted out every plant in the lake. With the vegetation went the haunts of the game fish.

When the first sein came in I had visions of seeing some beautiful fish, but the first draw disillusioned me: there was nothing but carp. The second draw was the same; also the third. In order to bring before you the fish population of the Neosha Mill Pond, I present the following tabulation of every fish that was captured, and we caught in the nets everything except

small minnows and fry. Probably not 5 per cent of the fish weighing half a pound or more escaped us, as the river was divided into sections, and each section was seined completely.

TABLE I. Showing the kind and abundance of fish in the Neosha Mill Pond, September, 1924, (Col. 2), and in Little Silver Lake, Waukesha county, Wisconsin, August, 1921, (Col. 3).

1	2	3
	Pond with Carp.	Pond with No Carp.
<i>Cyprinus carpio</i> Linn.....	5,891	0
<i>Ictiobus cypinella</i> (Cur. & Val.).....	1	0
<i>Moxostoma breviceps</i> (Cope).....	66	0
<i>Pomoxis annularis</i> Raf.....	17	0
<i>Moxostoma aureolum</i> (LaSueur).....	14	10
<i>Stizostedion vitreum</i> (Mitch.).....	4	20
<i>Esox lucius</i> Linn.....	3	380
<i>Amia calva</i> Linn.....	7	340
<i>Lepomis pallidus</i> (Mitch.).....	2	1,220
<i>Ambloplites rupestris</i> (Raf.).....	1	940
<i>Micropterus salmoides</i> (Lac.).....	0	1,120
<i>Eupomotis gibbosus</i> (Linn.).....	0	610
<i>Pomoxis sparoides</i> (Lac.).....	0	730
<i>Perca flavescens</i> (Mitch.).....	0	680
<i>Lepisosteus osseus</i> (Linn.).....	0	30
Total.....	6,006	6,080

Table I, column 2 shows a total of 5,891 carp against 115 individuals of all other species in the lake. The buffalo and suckers were good specimens, in good condition; the silver bass were remarkable, there being ten fish that weighed between one and a half and two and a half pounds; the northern pike were thin and full of tapeworms, as were the wall-eyes; the dogfish were large and healthy, and the carp were beautiful. The total weight of carp was 37,750 pounds when shipped, and the average weight of 105 unsorted individuals taken at random from the net and weighed on the spot was 6.6 pounds. The largest carp weighed 13.5 pounds.

I regret exceedingly that I have no pre-carp data on the Neosha lake, and it is too early as yet to discuss the effects of the netting on the fish fauna; this will come in due time. However, Neosha is a representative southern Wisconsin lake of one type—the soft bottomed lake which is a member of a chain connected by a river. It may be of interest, therefore, to compare the ichthyological fauna of Neosha with that of Little Silver Lake in Waukesha county, about twenty miles south. This lake is very similar to Neosha in size, bottom type and in its vegetation: it has great beds of *Potamogeton*, *Ceratophyllum* and *Nymphaea*, with local patches of *Sagittaria*. In 1921, while working out the fish fauna of Waukesha county, I made five draws with a 500 foot net of inch and a half mesh in Little Silver. The area seined

was approximately one tenth of the shore-line, so I would estimate—and it is only an estimate—that the figures here presented represent the fish population of the lake. The results of my seining multiplied by ten are offered in Table I, and do not consider the various species of minnows too small to be held in the net used for game fish.

Here, then, we have a clear illustration of the effect carp have had on one particular small lake, at least. They have rooted out all the “weeds,” thereby eliminating the favorite haunts of the game fish, and with the disappearance of the weed beds there must also have been associated changes in the fauna (plankton as well as nekton) of which unfortunately I have no records. The rooting up of the bottom and the constant muddling of the mud has rendered the water almost opaque, as the limit of visibility of a 10 cm. Secchi disc is around thirty inches, indicating a great amount of suspended matter. Bass have been totally eliminated, and there was no indication that bass, northern pike, wall-eye, suckers or any of the pan fish had successfully bred in the lake in the last eight years: scale readings showed only the rock bass to be under eight years of age.

The native species evidently exist as a diversified group, while the introduced carp is capable of changing the entire community composition, bringing about a change as marked as that produced by civilized man on the original vegetation.

SUMMARY

The paper deals with the effect of the carp on an artificial lake, formerly filled with vegetation and containing various native species of game fish in abundance. The carp has become a dominant, the vegetation has completely disappeared, and with it have gone the native game fishes. The water has become very turbid.

The carp is an introduced species, and is here seen to be controlling the habitat. The suggestion is offered that it is at least highly possible that some native species of fishes may be controlling their environment, a point which will bear future investigation.

Artificial ponds offer a most interesting field for study. Valuable results concerning the effect of dams would undoubtedly accrue if studies were begun with the placing of the dams, and were continued until the artificial lake became a stable unit.

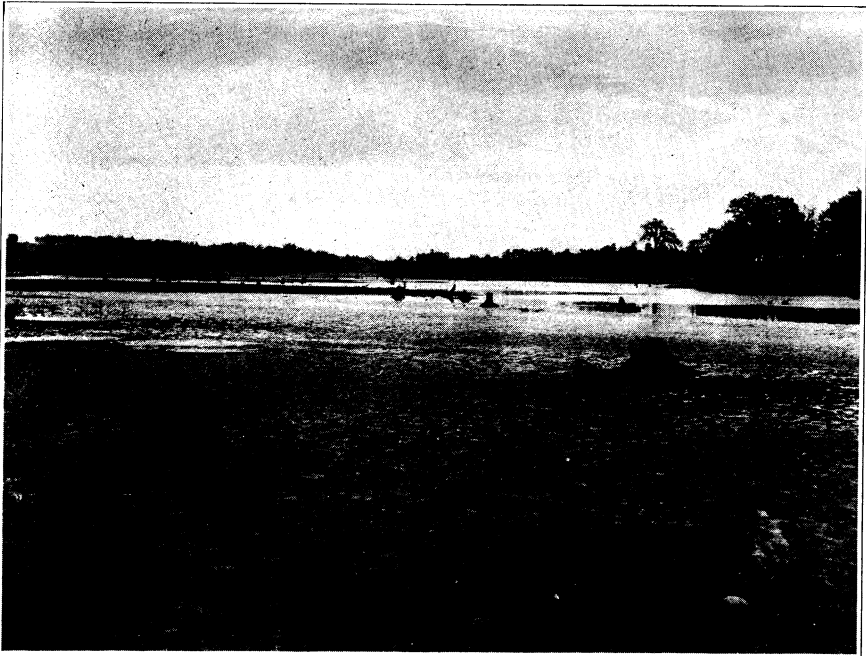


FIG. 1. Neosha Mill Pond, showing stage in draining of the lake.

FIG. 2. Detail study of the mud bottom of the lake after draining, to show the impressions left by carp in their sucking operations.

