

DEPARTMENT OF NATURAL RESOURCES

Box 450  
Madison, Wisconsin 53701

Bureau of Fish Management  
Management Report No. 42

CARP MIGRATION IN THE LAKE WINNEBAGO AREA

by

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and  
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January 22, 1971

## INTRODUCTION

Carp, Cyprinus carpio Linnaeus, were first introduced in Wisconsin waters at the urging of German immigrants in 1879 (Miller, Brynildson and Threinen, 1959). At this time, few barriers or obstacles proved insurmountable to them in their migration to new habitats. By the year 1900 they were abundant enough to warrant control to prevent them from dominating the environment in many waters containing good warm water fish populations. It was not until 1915, however, that greater emphasis was placed on carp control. Carp control on Lake Puckaway began in 1915 and by 1936, carp control was initiated on Lake Winnebago and connecting waters. Since 1936, control on lakes in the Winnebago area has been based on the assumption that discrete populations existed in each lake. The objective of this study which was initiated in 1967 was to determine if discrete populations did exist or if a homogeneous population existed in the Winnebago area waters.

The movement of a carp population is governed by several factors which include water temperature, natural wariness, spawning activity and migrating tendencies.

It is speculated that the optimum water temperature for carp is 68 F and that their activity decreases as the temperature drops. Seining in the Winnebago area waters is very profitable in the fall when carp populations move into shallow, muddy areas during the day as air and water temperatures increase, and then recede to deeper water during the evening as temperatures decrease.

Except in the spring, carp are usually wary and dash for cover or deep water at the slightest disturbance. At other times, they swim about in a leisurely and almost lazy fashion. A change in the weather can cause them to alter their habitual movements. Even a slight change in the water level affects them. Sigler (1958) noted that carp moved freely into flooded corn fields as long as the water level was rising; however, a drop in the water level as slight as a few inches sent them scurrying back to the protection of the river.

The spawning period is the time for mass migration into lake shallows, stream tributaries, temporary flood plains and marshes. Records of individual carp being captured many miles from their normal habitat indicate that today, as in the 1880's, few barriers block their migration to new waters. Sigler (1958) reported a carp 10.6 inches long and 8.5 ounces in weight that was tagged on March 31, 1954 and released into Bear Creek, Missouri. On August 6, 1956, this fish, 23 inches long and weighing 4 pounds 9 ounces, was caught below Gavins Point Dam, South Dakota. The distance covered during this time, discounting the possibility that the carp had arrived there some time before, was 674 miles.

## WATER AREA

The water areas involved in the study include Lake Winnebago, Big Lake Butte des Morts and Lake Puckaway on the 107-mile-long Fox River; plus Lakes Poygan and Winneconne on the 216-mile-long Wolf River and numerous smaller tributaries of both rivers. The Wolf River joins the Fox River in Big Lake Butte des Morts, 10 river miles above Lake Winnebago and then enters the lake as the Fox River at Oshkosh. The Fox River also flows out of Lake Winnebago at Neenah and Menasha and flows 39 river miles north to Green Bay, Lake Michigan. Runoff water from a 6,000-square-mile watershed enters Lake Winnebago.

### Lake Winnebago

Lake Winnebago has an area of 137,708 acres with a maximum depth of 21 feet and average depth of 15.5 feet. The lake is roughly rectangular in shape: 28 miles long and 10.5 miles wide at its widest point. The bottom of Lake Winnebago is an extensive plain broken only by reefs on the west shore. Except for these reefs and the rock, gravel and sand shorelines and shoals of the lake, the bottom is finely divided, soft mud mixed with peat (Wirth, 1959). Rooted aquatic plants are not abundant in the lake and occur only in rather localized areas.

Lake Winnebago is considered a fertile lake. The water is hard with a methyl-orange alkalinity of 119-124 ppm and has an alkaline pH varying from 7.7 to 8.5 (Priegel, 1969). Dissolved phosphates ( $PO_4-D$ ) are such that heavy algal blooms are common during the summer months.

### Upriver Lakes

The smaller lakes which are upriver from Lake Winnebago include Lake Poygan, Lake Winneconne and Big Lake Butte des Morts and have surface areas of 14,102, 4,507 and 8,857 acres, respectively. The depths of these smaller lakes are similar, with maximum depths in the river channels not exceeding 11 feet. All three lakes have many characteristics common to shallow, eutrophic lakes. Dense islands of Scirpus sp. and Phragmites sp. are found near the shorelines, along with other emergent vegetation, mainly Typha sp. The bottom of these lakes is mostly firm sand overlain with a thick layer of mud. A small amount of rubble occurs in localized areas. The lakes are fertile and heavy algal blooms are common during the summer months.

### Lake Puckaway

Formed in a wide, flat area along the upper Fox River, Lake Puckaway is located 68 river miles from Lake Winnebago. Lake levels are primarily maintained by the Princeton Dam, a low-head structure in the Fox River channel, approximately 5 river miles below Lake Puckaway.

The surface area of Lake Puckaway in 1950 encompassed 5,433 acres, of which 2,550 acres were classified as open water (Kabat, 1954). The lake is approximately 8 miles long, with a maximum width of 1.5 miles. Maximum depth is 5.2 feet, with an average depth of 3 feet. The lake bottom is a mixture of sand, silt and decayed vegetative matter.

Water is partially turbid and algal blooms are quite common. Prior to 1950, aquatic vegetation was abundant and the water was normally clear. Since that time, there has been a calamitous decrease in vegetation, particularly in the more shallow portions of the lake and a general increase in water turbidity.

#### Fox River

The sluggish Fox River drops only 8.5 feet in 95 miles with practically no drop from the Eureka Dam to Lake Winnebago. Oxbows, long meandering loops and widespreads characterize the sluggish path of this river. A great deal of dredging and channel straightening has been done on the Fox River; however, any effects that this might have had in speeding the flow was more than offset by the construction of nine locks and dams along the same stretch. The river today is essentially a series of nine long shallow pools. Since 1940, the river above and below Lake Puckaway has deteriorated drastically. Once abundant emergent and submergent vegetation has disappeared and the water is extremely turbid.

#### Wolf River

The forested headwaters of the Wolf River are slow moving for about 12 miles. After this short stretch, the river descends nearly 700 feet in a 90-mile stretch. The Wolf River from Shawano to Big Lake Butte des Morts drops only 56 feet in these last 114 miles. The lower stretch of the river from Leeman downstream floods over into an extensive flood plain. Vegetation is lacking in the river and water is turbid in this lower stretch.

#### Mecan River

The Mecan River is a long (30.8 miles), fairly large stream that supports an important trout fishery in the upstream portion of the river. Germania Marsh, a 870-acre waterfowl flowage, was constructed in October, 1959 on the lower Mecan River. An electric barrier has been constructed to prevent movement of carp and predator fish from Germania Marsh into the upper Mecan River. The Mecan River has a methyl orange alkalinity of 152-168 ppm and a pH of 7.8-8.0 (Poff and Threinen, 1963).

### METHODS

#### Fish Collection

Carp in Lake Winnebago, Big Lake Butte des Morts, Lake Puckaway and the Fox River above the Princeton Dam were taken with an A. C. shocker unit during daylight hours from July to September in 1967-1968. On the Mecan River, carp were captured in a mechanical trap installed at the outlet of Germania Marsh from May to July, 1967.

The carp that were tagged ranged in total length from 8.0 to 35.0 inches; however, emphasis was placed on tagging smaller carp to provide a sufficient time period to check on migration if it did occur.

### Tagging

The normal procedure for tagging fish was to place them in a holding tank, tag and release them in the same approximate area in which they were captured. A sample was measured to the nearest tenth of an inch in total length.

Plastic dart tags (FD-67) No. 20 vinyl tubing, 0.0625 inch in diameter and 2.5 inches long were used to mark 1,500 carp. To distinguish between various tagging sites, three colors were used--orange, red and green. The tags were stamped with a serial number near the distal end of the shaft. The dart tags were inserted into the epaxial musculature immediately below the dorsal fin where the barb pierced through the interspinous bones so when the tag was tugged, the barb contracted the interspinous bones.

Peterson plastic disc tags were used to mark 1,510 carp. Five color combinations were used to identify various tagging sites and years tagged -- all white, all red, all yellow, white and yellow and red and yellow. Peterson disc tags were placed through the hypural plate. The tags were secured with a nickel-coated metal pin.

### Recaptures

Recaptures of tagged carp were reported voluntarily by anglers and commercial fishermen; no rewards were offered. Fishermen were alerted to the presence of tagged carp by the local press, radio and television.

## RESULTS

The number of carp tagged and the number recovered each succeeding year thereafter are shown in Table 1. Of 3,010 carp tagged in 1967 and 1968, 49 or 1.6 percent have been reported recaptured by anglers and commercial fishermen (state and private) through December, 1969. Recoveries during the year in which they were tagged were consistently the highest. Carp tagged in Lake Puckaway during August, 1967 and 1968 were only recaptured in the same year in which they were tagged.

Anglers accounted for only 6 of the returns, while commercial fishermen accounted for 43. Seining for carp by commercial fishermen accounted for 41 of the tagged fish recaptured by commercial fishermen.

TABLE 1

Number and Percentage (in Parentheses) of Tagged Carp Recaptured in Lake Winnebago and Connecting Waters, 1967-1969

Tagging Site	Fish Tagged			Fish Recaptured			Total No. Recaptured
	Date Tagged Month Year	Number Tagged	Year Recaptured	1967	1968	1969	
Lake Winnebago							
Asylum Bay	7,8	1968	500	--	4(0.8)	1(0.2)	5(1.0)
Supple's Marsh	7,8	1968	500	--	5(1.0)	5(1.0)	10(0.2)
Big Lake Butte des Mort	9	1967	510	5(0.9)	15(3.0)	0	20(4.0)
Fox River - at Princeton Dam	7	1967	250	0	0	0	0
Mecan River - at Germania Trap	7	1967	250	1(0.4)	1(0.4)	0	2(0.8)
Lake Puckaway	8	1967	500	6(1.2)	0	0	6(1.2)
	8	1968	500	--	6(1.2)	0	6(1.2)
TOTAL			3,010	12(0.4)	31(1.0)	6(0.2)	49(1.6)

Of the 1,000 carp tagged in Lake Winnebago during 1968, 15 were recaptured: 3 in Lake Winnebago, 10 in Big Lake Butte des Morts, 1 in Lake Winneconne and 1 in the Embarass River (Fig. 1).\* The one recaptured in the Embarass River was tagged at Supple's Marsh near Fond du Lac. This fish traveled approximately 92 river miles to the point of recapture.

Twenty of the 510 carp tagged in Big Lake Butte des Morts during September, 1967 were recaptured: 17 in Big Lake Butte des Morts and 3 in the Fox River between Omro and Big Lake Butte des Morts, a distance of 5 river miles (Fig. 2).\*

All of the carp (1,000) tagged in Lake Puckaway during August, 1967 and 1968 were recaptured in Lake Puckaway (12 fish). Of the 250 carp tagged during July, 1967 at the Germania trap on the Mecan River, only 2 were recaptured: one at the Germania trap the same year it was tagged and one at the mouth of the Grand River at Lake Puckaway (Fig. 2). None of the 250 carp tagged in the Fox River above the Princeton Dam were recovered.

Although there was no evidence that plastic dart tags were lost, there was evidence to indicate a sufficient tag loss for disc tags especially during seining operations.

\* The symbols used in figures 1 and 2 represent different tagging and recovery sites, not different years of tagging or different tags used.

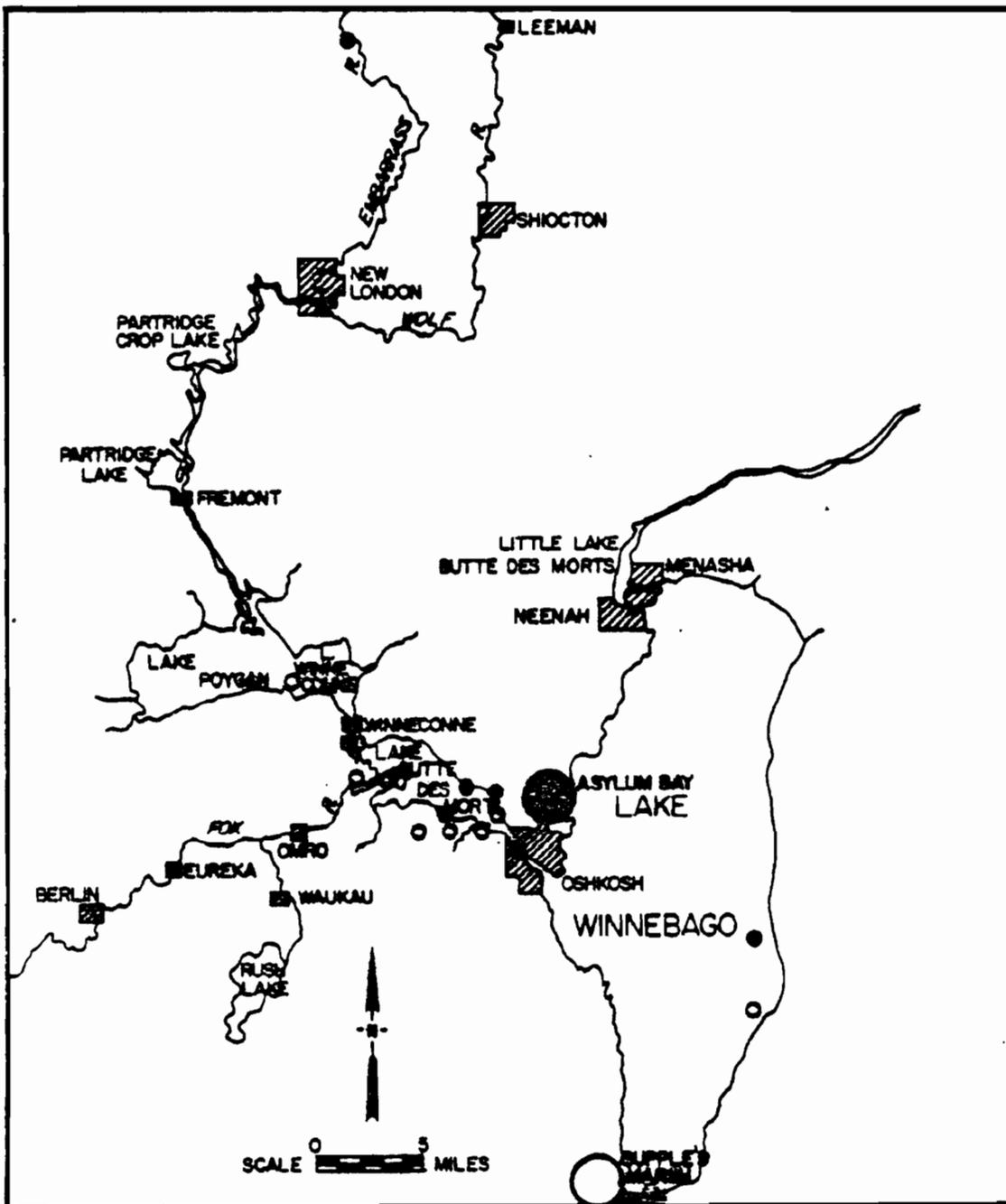


Figure 1. Tagging sites in Lake Winnebago, 1968 (shown by large symbols) and recovery sites of tagged carp, 1967-69 (shown by corresponding small symbols).

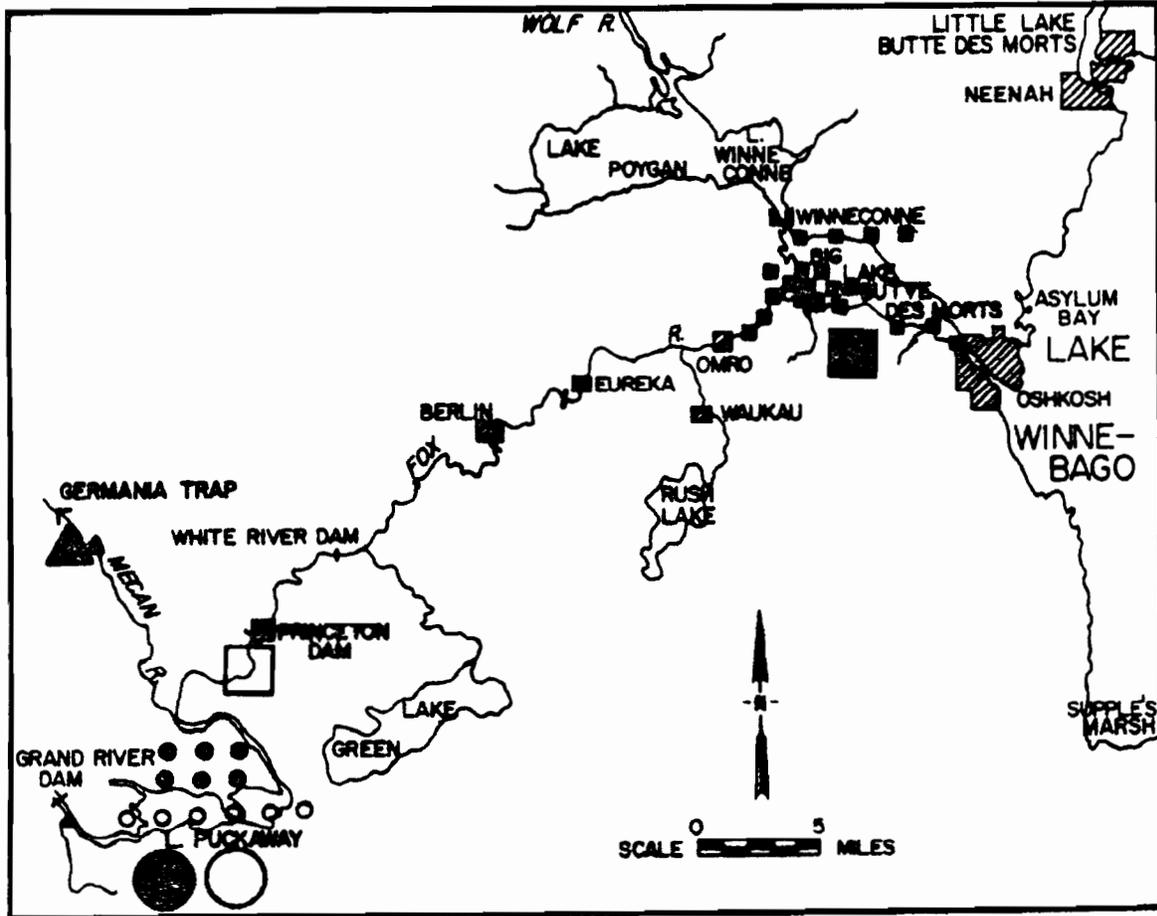


Figure 2. Tagging sites in Lake Puckaway, 1967-68 and Mewan River, Fox River at Princeton Dam and Big Lake Butte des Morts, 1967 (shown by large symbols) and recovery sites of tagged carp, 1967-69 (shown by corresponding small symbols).

#### DISCUSSION AND CONCLUSIONS

During July to September, 1967 and 1968, 3,010 carp were tagged in Lake Winnebago and connecting waters with a recovery of 49 carp (1.6 percent) through December, 1969. During 1967 and 1968, 1,400,000 carp were removed by state and private commercial fishermen. Low returns prohibited attainment of the original objective which was to determine whether or not discrete populations of carp existed in the Lake Winnebago area waters. To meet the objective of this study, considerably more (a minimum of 15,000-20,000) should be tagged before any positive results can be obtained.

Although tag returns were few, they did indicate movement out of Lake Winnebago into the upriver lakes especially Big Lake Butte des Morts and as far as the Embarrass River. There was no indication of carp tagged in upriver areas migrating into Lake Winnebago.

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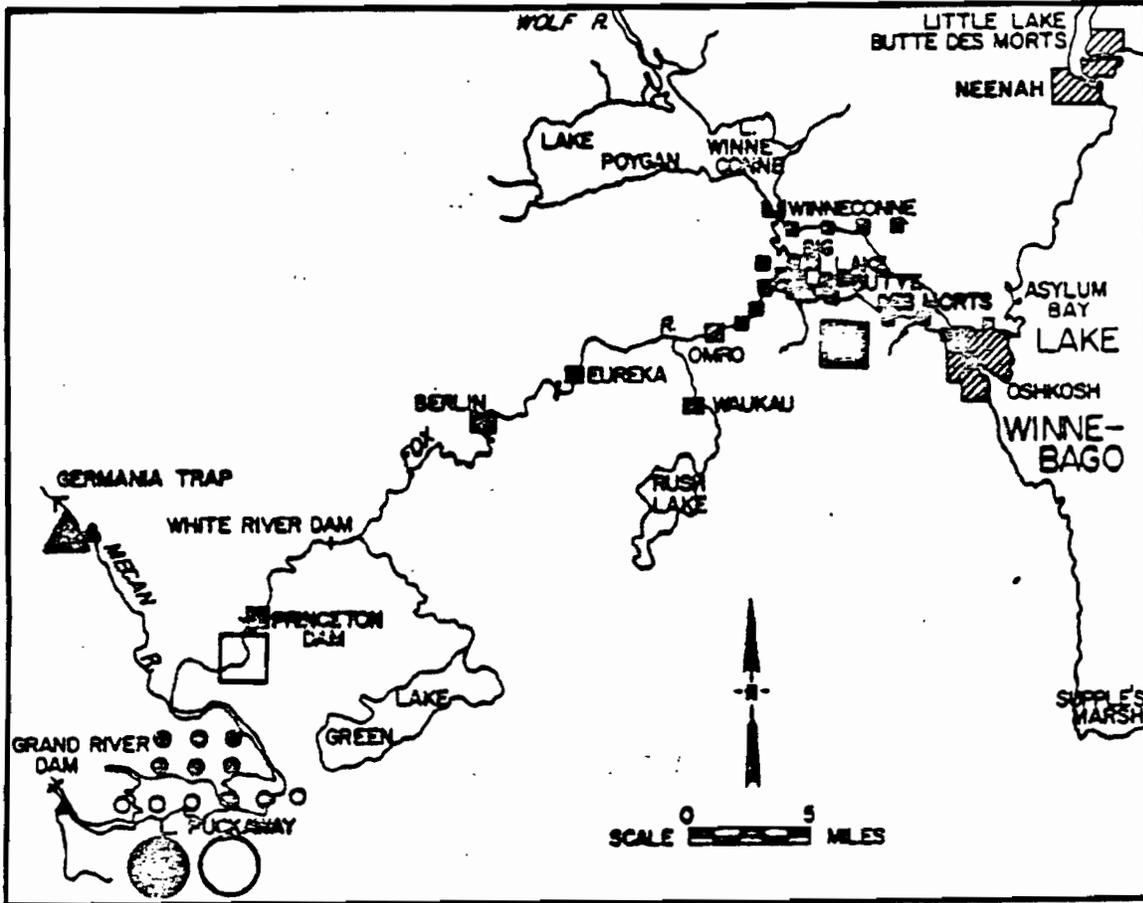


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