

Carp (Trout) Lake

Chippewa County, T44N, R6W, many sections
Carp River watershed, May-August 2005

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Environment

Carp Lake, at one time known as Big Trout Lake, is the largest lake in the Carp River watershed. This 560-acre lake is located in the extreme southwest part of Chippewa County and lies one mile west of the village of Trout Lake. Various inlets enter the lake including the outlet from Little Carp Lake (Kneebone Creek) along the northeast shore, and Big Ditch, Betchers and Schweinger creeks along the south shore. The outlet of Carp Lake is a channel which forms the Carp River. There is no control structure on the outlet.

The maximum water depth of Carp Lake is 35 feet. A good portion of the lake is more than 20 feet deep. The lake is thermally stratified in the summer, with colder water and lower dissolved oxygen levels down deep. Bottom substrate consists predominantly of sand in the shallower shoals and pulpy peat (organic matter) in the deeper areas. Three rock reefs covering more than 16,000 square feet exist along the north and northeast shoreline in shallow water. The reefs are made of limestone and were placed in the lake in 1974 in attempts to enhance walleye spawning and nursery habitat. Aquatic vegetation in the lake is limited to emergent bulrush beds, and various species of pondweeds and other submergents. Few limnological surveys have been made on Carp Lake in the past. Based on these and a current profile, productivity is considered to be moderate at Carp Lake with alkalinities slightly over 100 parts per million.

The Carp Lake riparian zone is predominantly a mixture of coniferous and hardwood trees. Cottages and permanent homes are common throughout the length of the shoreline. The land around the lake is mostly privately owned, except for a small parcel of federal land and the Trout Lake Township Park on the north shore. A public boat access is located in the township park and is managed by the Michigan Department of Natural Resources (MDNR), Parks and Recreation Division. It offers a hard-surfaced ramp with sufficient water depth to accomodate most trailerable boats. The site offers parking for approximately 30 trailers.

History

Fisheries management started at Carp Lake in the mid-1930s, when the first fish stocking efforts were initiated. Fry and fingerling walleye were stocked nearly annually between 1934 and 1945. Early fish and aquatic community surveys soon followed in 1936 and 1947. General creel census by law enforcement division personnel was made from 1949-1962.

The 1947 survey indicates Carp Lake had 1 hotel, 12 cottages, and 3 resorts along its shoreline. A thermocline was established in the lake by July. Notes from that year also indicated a good invertebrate hatch in the lake, and good spawning habitat for northern pike and yellow perch. The lack of gravel in the shoals area was believed to limit natural walleye abundance in Carp Lake. Biologists that year used

three gill net lifts to sample the fish population. Fish species collected included white suckers, northern pike, rock bass, walleye, and yellow perch.

Michigan Department of Conservation (MDOC) personnel began stocking both bluegill and largemouth bass fingerlings in Carp Lake by 1948. Fish observations and seining operations at twelve locations occurred at Carp Lake in September 1948 to evaluate bass and bluegill stocking efforts. Species collected included yellow perch, smallmouth bass, rock bass, walleye, white suckers, johnny darters, bluntnose minnows, and common, spottail, and blackchin shiners. Stocking efforts for bluegill and largemouth bass continued through 1951 since these two species were absent from the previous survey.

Seining operations continued on Carp Lake in 1952 at seven locations. Species collected were similar to those found in the 1948 survey, but included pumpkinseed sunfish, blacknose shiners, and mimic shiners. The discontinuation of largemouth bass and bluegill stocking efforts may have been based on the absence of these species in the 1952 survey, following years of stocking. Catch reports from the lake resorts in 1955 indicated good catches of walleye, northern pike, and smallmouth bass. Large bluegill were documented in the angler catch in 1955.

The fish community was surveyed in 1958 by MDOC as part of a "demonstration" to lake residents. Survey effort consisted of three fyke net lifts and one trap net lift. The fish community was again reflective of a northern Michigan lake with panfish and northern pike common. Angling reports at this time, however, were poor for northern pike, and good for rock bass, bluegill, walleye, and smallmouth bass. Thus, bluegill had become established in the harvest yet natural reproduction for this species was lacking. Largemouth bass remained absent from angler catches.

Through the early to mid-1960s, fishing reports were good for walleye and yellow perch in Carp Lake. Pike abundance was considered good, yet most fish were less than 20 inches in length, which was the minimum size limit at that time for pike. Efforts were made by 1963 and 1964 to trap adult pike from the lake and transfer them to spawning ditches connected to the lake at the south end. Fingerling production, however, met with limited success due to the low water levels available to fry and fingerling pike in the marshes. In addition, the marshes used by adult pike often drained south to the Carp River, and away from Carp Lake. Local residents and fisheries officials during this time became interested in controlling water levels in Carp Lake. Both parties felt that a control structure at the river outlet would stabilize lake levels. Managers and lake residents also considered some type of control structure on the pike spawning tributaries near the south end of the lake. Neither structure was established due to financial limitations.

A fish and habitat survey was made at Carp Lake by MDOC personnel in 1967. The lake was found to be thermally stratified by early July. The fish survey was made in the end of summer 1967, with effort consisting of seining and experimental gill net lifts. The fish community was similar to that found in previous surveys. Walleye catch reports were good during this time.

A historical summary of fish management at Carp Lake was made by MDOC in 1971 and followed another fish and habitat survey. Shoreline observations now found the existence of 75 cottages along the lake, as well as 1 hotel and 4 resorts. Alkalinity was found to be 102 ppm, and dissolved oxygen was suitable to fish for most of the water column. Seining, gill netting, and shoreline electrofishing were used to document the July 1971 fish community at Carp Lake. Walleye were present but not common, with

most fish in the 10-12 inch size range. This species had not been stocked in Carp Lake in decades and were believed to be wild fish. Northern pike were common, with most 17-22 inches in length. Bluegill and bass were noted as scarce while other panfish were common. Perch, walleye, and northern pike growth rates were all found to be below the statewide average for each species.

Intensive walleye management began at Carp Lake following the 1971 fish community survey. A walleye spawning reef was built in Carp Lake in 1974. The structure covered 16,280 square feet in three feet of water along the north shore and township park. The structure consisted of an 18-inch thick layer of limestone. It was believed that walleye would use this structure for spawning, and young walleye and other fish species would also use it for nursery habitat. In order to boost walleye numbers, stocking efforts began at the lake in 1974 and continued through 2001 (Table 1). Early stocking efforts were done mostly with fry while small fingerlings have been stocked in more recent years.

Four fisheries surveys were conducted at Carp Lake in the 1970s to evaluate the walleye stocking efforts and reef effectiveness. MDNR Fisheries Division personnel evaluated the walleye population by shoreline electrofishing in August 1975. Sampling effort covered 1,800 feet of shoreline near the reef structure. Thirty-eight walleye ages 1-2 were collected. A similar survey covering 1,500 feet of shoreline was conducted at Carp Lake in June 1976. Thirty-three walleye were collected, ranging in size from 3-8 inches. Most of these fish were young-of-year (age-0) and were believed to be a product of the current year stocking. Other species were collected along the reef in low numbers.

Fisheries managers summarized the effectiveness of the reef in 1977 following three years of walleye fry stocking efforts. It was found that the reef attracted young walleye and other sport fish and was valuable in adding diversity to the habitat (Gruhn 1977). A third survey to evaluate walleye abundance and reef utilization was conducted in June 1977. Nighttime electrofishing was done along 5,000 feet of shoreline and documented good catches of 4-12 inch walleye. No legal (15 inches or greater) walleye were collected.

Biologists surveyed the reef in the spring of 1979 to determine if adult walleye were using it for spawning. Only twelve ripe males were collected. The final survey in the 1970s occurred in September 1979. Nighttime electrofishing was used to evaluate walleye abundance and growth following a decade of stocking. Walleye fishing was considered good at the time, but most fish caught were sub-legals. The survey catch consisted of eighteen walleye, all which were less than 15 inches. Some walleye were from non-stocked years, thus natural reproduction was occurring to some extent.

Three fisheries surveys were conducted at Carp Lake by MDNR in the 1980s. Nighttime electrofishing was used in September 1980 to evaluate walleye use of the reef. Four sub-legal walleye were collected, including one young-of-year (YOY; age-0) from a non-stocked year. A similar survey was made in April 1983 along the reef. Effort was limited to one working electrode which captured six walleye ranging in length from 5-17 inches.

A fish community survey was accomplished at Carp Lake in June 1983. Effort consisted of trap nets, fyke nets, gill nets, and seines over a course of five days. Emphasis was still on the walleye community and previous stocking efforts. Walleye survival was deemed acceptable with 11-22 inch fish captured. A larger proportion of adults began showing up in the survey catch. As a result, fisheries managers recommended the continued stocking of this species. The yellow perch population was considered to be

in good condition, with plenty of fish 10 inches and larger available to anglers. Smallmouth bass were rare, while largemouth bass were absent from the catch. Northern pike 10-22 inches were common, with most sub-legal (20 inch minimum size). Other species present included rock bass, pumpkinseed, bullheads, white suckers, and shiners.

A follow-up fish community survey was done ten years later in July 1993. Effort consisted of 8 trap net lifts, 20 fyke net lifts, 1 gill net lift, and 1 seine haul. Catches were somewhat lower in 1993 compared to 1983, but not significantly, and maybe partially explained by weather conditions. Eight walleye were collected, ranging in length from 10-15 inches. Most northern pike were in the 16-23 inch size range and characterized by slow growth. Smallmouth bass were present, but in low numbers. Yellow perch were common, but fewer fish 10 inches and larger were now available to anglers. Pumpkinseed and rock bass were common with most fish 6-8 inches. White suckers were common. Later that year, MDNR further evaluated the walleye population by nighttime electrofishing in September. The sampling effort covered 0.86 miles of shoreline. Good numbers (38) of walleye were collected, including many age-0 fish. Walleye were stocked in Carp Lake in 1993 (Table 1). Despite this, catch-at-age analysis of the walleye catch indicated that some natural reproduction was occurring in Carp Lake. It was during 1993 that the northern pike statewide size limit changed to 24 inches.

Follow-up walleye evaluations were made in 1997 and 1999 at Carp Lake. Effort each time consisted of approximately one hour of nighttime fall electrofishing at various parts of the lake. Seventy walleye were collected in the 1997 evaluation, with many age-0 fish captured in a stocked year (Table 1). Five different age classes (0-4) were noted, with good numbers of age-2 fish present in the lake. This would have been the 1995 year class, which was strictly derived from natural reproduction. Despite good catch numbers, growth of walleye in Carp Lake was 1.5 inches less than growth of this species statewide. Good numbers of walleye were also collected during the fall 1999 species evaluation. Effort produced 60 age-0 fish, and 20 yearlings, both from non-stocked years.

By the turn of the century, natural reproduction of walleye was considered improving in Carp Lake. Walleye stocking efforts were soon discontinued following 2001.

Current Status

A recent fish community survey was conducted at Carp Lake by MDNR Fisheries Division from June 23-27 and on August 31, 2005. Sampling effort consisted of 17 large-mesh fyke net lifts, 9 large-mesh trap net lifts, 7 experimental gill net lifts, and 5 minnow-seine hauls in June. Additional effort occurred in late-August and involved 30 minutes of direct-current nighttime electrofishing. Twelve species of fish were collected during the survey (Table 2). Total catch was 744 fish weighing 673 pounds. Large predator fish including largemouth and smallmouth bass, walleye, and northern pike made up 18% of the total catch by number and 19% by weight. Non-game fish such as bullheads and white suckers made up 29% of the total catch by number and 67% by weight. The panfish community of Carp Lake in 2005 is dominated by rock bass, yellow perch, and pumpkinseed.

Rock bass were the most commonly collected fish in the survey (Table 2). Most rock bass ranged in length from 6-8 inches, with plenty of larger fish of all ages available to anglers (Table 3). Growth of this species was normal compared to the statewide average (Table 4) (Schneider 2000). No bluegill were collected during the recent survey, indicating that historic stocking efforts for this species failed to produce a self-sustaining population. Pumpkinseed sunfish are still present in Carp Lake and more than

likely fill the niche not occupied by their cousin the bluegill sunfish. Pumpkinseed up to 9 inches in length are available to Carp Lake anglers. Six year classes were collected during the entire seasonal survey ranging from age 1-6. Some quality-size yellow perch (8 inches or larger) are available to anglers (Table 3). Yellow perch growth is average compared to the statewide average for this species (Table 4).

The predator game fish population in 2005 at Carp Lake was dominated by walleye, northern pike, and smallmouth bass. Other species present included largemouth bass and brown trout in low numbers. Walleye comprised 10% of the total catch by number (Table 2). Eleven year classes of this species were collected ranging from 0-10 (Table 4). This correlated with walleye ranging in size from 4-23 inches (Table 3). Twenty percent of the walleye collected in 2005 were legal size (15 inches or larger). Walleye growth (Table 4) is currently slow at Carp Lake, with this species growing nearly one inch slower than typical Michigan walleye populations. This poor growth could be an indicator that natural reproduction is increasing, and competition for forage is limiting growth.

Northern pike continue to be an important predator and game fish in Carp Lake. Pike comprise 6% of the total catch number and 10% of the total weight (Table 2). The pike catch was dominated by smaller fish. Captured fish ranged in length from 10-31 inches (Table 3), with only 4% of those collected of legal size (24 inches or larger). Five age classes (1-5) of pike were collected. Growth of this species (Table 4), as in the past, remains poor and is currently well below the statewide average for this species.

Smallmouth bass still inhabit Carp Lake and make up 2% of the total catch by number and weight (Table 2). Some legal-size smallmouth bass do live in Carp Lake (14 inches and larger) based on the survey catch (Table 3). Only a couple young largemouth bass were collected during the survey indicating that suitable conditions for this species may not exist in Carp Lake.

Other species collected during the survey include white sucker, bullhead species, spottail shiners, johnny darters, and brown trout. The brown trout may be a migrant from the Carp River; this species is probably a seasonal resident like other migrating fish from Lake Huron such as steelhead and salmon. White suckers remain abundant and provide a key forage source for important game fish, as do spottail shiners.

In addition to the 2005 fish survey, limnological parameters were measured in Carp Lake on August 17, 2005. Profiles of temperature, dissolved oxygen, and pH were taken in 31 feet of water (Table 5) using a YSI multi-parameter water-quality sonde. Water temperature ranged from 72°F at the surface to 58°F at the bottom, indicating that the lake stratifies thermally. Dissolved oxygen was suitable to most fish (greater than or equal to 6 ppm) down to 21 feet deep. It was at this depth that the thermocline became established. Carp Lake was nearly anoxic for the lowest 10 feet during the sampling. Secchi disk reading was 11.5 feet, indicating high water clarity for an Eastern Upper Peninsula lake.

Various other parameters such as nitrogen, phosphorus, and alkalinity were also measured in 2005 at Carp Lake (Table 6). Water samples were taken according to standard protocols and sent to the Michigan Department of Environmental Quality (MDEQ) laboratory in Lansing for analysis. The lake has a moderate alkalinity value and a corresponding pH which was slightly basic and varied little throughout the water column (Table 5). Total phosphorus levels in Carp Lake were low but average for a natural lake. These factors indicate low to moderate nutrient status in the lake. High Secchi disk readings, low total phosphorus, moderate alkalinity, and limited thermal stratification all indicate that Carp Lake is mesotrophic.

Analysis and Discussion

The overall fish community of Carp Lake has not changed drastically through time, with one exception being an increase in naturally reproduced walleye. The current fish community can generally be characterized as having the following: 1) an average-growing panfish community with low species diversity, 2) a predator community dominated by a slow growing northern pike population and an increasing self-sustainable walleye population, 3) a healthy forage population consisting primarily of white suckers and panfish.

The Carp Lake panfish community includes yellow perch, rock bass, and pumpkinseed. These species have thrived in Carp Lake for many decades and tend to exhibit growth that is average when compared to statewide populations. Experiments in the past with bluegill introductions did not provide a sustainable population.

The lake has a notable history of walleye stocking, even into recent years (Table 1). Stocking efforts were terminated at the early part of the century due to the large increases in naturally reproduced walleye that were observed in previous sampling efforts. Based on age-frequency analysis for the 2005 survey (Table 4), many of the walleye are produced in the wild. Thus, the lake has a naturally sustained walleye population. The temperature and dissolved oxygen profile (Table 5) of Carp Lake indicate suitable summer feeding conditions for this species. Despite this, higher abundances of walleye correlate with growth that is one inch less than the statewide average for this species.

Northern pike continue to thrive in Carp Lake which may be related to good spawning habitat. Anglers report high catch rates of pike, yet low numbers of fish 24 inches and larger. The current survey closely mimics past survey data in that northern pike remain abundant, yet very slow growing.

Overall, the fish community of Carp Lake appears relatively stable. Game fish are abundant and offer diverse angling opportunity. Important panfish such as yellow perch, rock bass, and pumpkinseed are abundant and exhibit normal growth. Walleye natural reproduction in Carp Lake has allowed managers to allocate stocked fish to other waterbodies in the State of Michigan. Northern pike densities are high while growth is poor. Efforts should be made to reduce pike numbers by encouraging harvest through more liberal regulations.

Management Direction

1) Managers should continue to manage self-sustainable walleye populations on Carp Lake. Numbers and year classes are in good shape, and growth is slightly below statewide average. Current supplemental stocking would only reduce growth rates even more. As long as natural reproduction continues, the population will find a balance of its own between numbers and growth rates. Periodic surveys of the lake will help fisheries managers determine walleye abundance and growth.

2) Northern pike have always been abundant and slow growing in Carp Lake. The size limit should be formally removed for this species at this waterbody. This has been a popular management tool at an adjacent lake, and would make regulations more enforceable. Removing the size limit and liberalizing the bag limit (5 fish) will either maintain or slightly increase growth rates by reduced fish competition

while allowing anglers to harvest some fish. Anglers along this lake support this step in increasing larger northern pike, which has been accomplished at neighboring Frenchmans Lake.

3) A follow-up fisheries survey documenting community changes should be accomplished no later than 2020 at Carp Lake. Periodic fall walleye evaluations can be made prior to the full fish community survey.

4) The remaining riparian wetlands adjacent to Carp Lake are critically important to the health of the fish community. These wetlands should be preserved and protected for the purpose of filtering water quality and providing critical fish spawning habitat.

References

Gruhn, B. 1977. Preliminary observations of the artificial walleye spawning reef in Carp Lake, Chippewa County. Michigan Department of Natural Resources Fisheries Division Technical Report. Ann Arbor, Michigan.

Schneider, James C. (ed.) 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

Table 1.-Recent walleye stocking history for Carp Lake, Chippewa County.

Year	Strain	Number	Number/Acre	Avg Length (in)
1974	--	750,000	1,339	Fry
1975	--	750,000	1,339	Fry
1975	--	16,115	29	2.4
1976	--	16,080	29	2.3
1977	--	750,000	1,339	Fry
1977	--	11,054	20	2.5
1981	--	9,275	17	--
1982	--	9,582	17	--
1983	--	1,497	3	--
1984	--	9,582	17	--
1985	Manistique	23,125	41	2.1
1987	--	15,820	28	2.0
1990	Bay De Noc	15,192	27	1.5
1993	Bay De Noc	11,215	20	2.1
1996	Bay De Noc	11,200	20	1.5
1997	Bay De Noc	8,134	15	2.1
2000	Bay De Noc	8,484	15	1.9
2001	Bay De Noc	11,442	20	1.6

Table 2.-Species catch and relative abundance of fishes collected during the Carp Lake fish community survey, June 23-27 and August 31, 2005. Weight is calculated.

Species	Number	Percent by number	Weight (lb.)	Percent by weight	Length range (in.)
Rock bass	234	32	83.1	12	4-11
White sucker	170	23	409.5	61	3-23
Yellow perch	81	11	5.9	1	1-8
Walleye	71	10	47.4	7	4-23
Black bullhead	48	7	42.7	6	8-15
Northern pike	47	6	64.4	10	10-31
Spottail shiner	44	6	0.6	-	2-4
Pumpkinseed	16	2	5.9	1	3-8
Smallmouth bass	16	2	13.4	2	2-18
Johnny darter	14	2	0.0	-	1
Largemouth bass	2	-	0.1	-	3-4
Brown trout	1	-	0.3	-	8
Total	744		673		

Table 3.-Length-frequency distribution of important game fishes collected during the 2005 netting survey at Carp Lake.

Length (in)	Yellow perch	Rock bass	Pumpkinseed	Walleye	Northern pike	Smallmouth bass
1	1					
2	29					2
3	3		1			1
4	13	14	2	2		
5	8	17	1	16		
6	11	56	1	9		
7	7	57	3	3		
8	9	55	8	2		
9		23		1		2
10		10		3	3	4
11		2		3	1	1
12				6	3	2
13				6	2	2
14				6	4	1
15				3	2	
16				3	6	
17				2	5	
18				4	4	1
19					4	
20					4	
21					4	
22				1	3	
23				1		
24						
25					1	
26						
27						
28						
29						
30						
31					1	

Table 4.-Comparison of mean length (inches) at age for various game fishes of Carp Lake from 1959 to 2000. Number in parentheses represents number aged. Growth comparison was across all ages.

[illegible]

Table 5.-Water temperature, dissolved oxygen, and pH profile for Carp Lake, August 17, 2005. Parameters were measured using a YSI multi-parameter water-quality sonde.

Depth (ft)	Temperature (°F)	Dissolved Oxygen (ppm)	pH
Surface	72	8.6	8.7
1	72	8.6	8.7
2	72	8.6	8.7
3	72	8.6	8.8
4	72	8.6	8.8
5	72	8.6	8.7
6	72	8.6	8.8
7	72	8.6	8.8
8	72	8.6	8.8
9	72	8.6	8.8
10	72	8.6	8.8
11	72	8.5	8.8
12	72	8.5	8.8
13	72	8.5	8.8
14	72	8.4	8.8
15	71	8.0	8.7
16	71	7.3	8.5
17	71	7.0	8.5
18	71	6.8	8.5
19	70	7.0	8.5
20	70	5.8	8.3
21	67	3.7	8.0
22	63	0.9	7.9
23	61	0.4	7.8
24	60	0.3	7.8
25	59	0.3	7.7
26	59	0.3	7.7
27	58	0.3	7.7
28	58	0.3	7.7
29	58	0.3	7.7
30	58	0.2	7.6
31	58	0.2	7.7

Table 6.-Additional water chemistry results for Carp Lake, Chippewa County, August 2005.
Parameters were measured according to standard protocols and sent to the MDEQ laboratory in Lansing for analysis.

<u>Parameter</u>	<u>Units</u>	<u>Value</u>
Alkalinity, Total	mg/L	119
Phosphorus, Total	mg/L	0.024
Nitrogen, Total Kjeldahl	mg/L	0.310
Nitrogen, Ammonia	mg/L	0.056
Nitrogen, Nitrate + Nitrite	mg/L	0.0063
Secchi Depth	feet	11.5