Carney Lake

Dickinson County, T 40 N/ R 29 W/ 6
Sturgeon River watershed, last surveyed 2009

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Environment

Carney Lake is a 117 acre lake located about 7 miles northeast of Iron Mountain (Figure 1). A small outlet flows from Carney Lake into Benton Lake, although fish are not thought to move between the two bodies of water. Mapping efforts from 1961 measured a maximum depth of 35 feet and described the lake's substrate as comprised primarily of sand and organic material with some gravel and rock along the shoreline. The lakeshore is moderately developed compared to other waters in the Northern Lake Michigan Management Unit (NLMMU), and most of the surrounding watershed is forested. Limnological sampling on July 29, 1999 indicated presence of a thermocline, a thin hypolimnion layer, and low dissolved oxygen at the bottom of the lake. This lake has relatively high measures of total alkalinity and pH when compared to area waters.

Carney Lake receives a fair amount of fishing pressure owing to its proximity to the City of Iron Mountain. There is also a State Forest Campground located on Carney Lake, with 16 sites for tents to large trailers, and boat and fishing access.

Aquatic vegetation survey information from the Department of Environmental Quality indicated relatively low plant diversity with seven species, primarily chara and naiad. A survey by the Dickinson County Conservation District in June 2003 documented 11 species of aquatic plants with Eurasian watermilfoil, elodea, and large leaf pondweed being most common. In 2004, 22.7 acres of Eurasian watermilfoil were chemically treated using 2-4,D and funding for the treatment was paid by the riparian association. Additional 2-4,D treatments aimed at reducing Eurasian watermilfoil have occurred since that time.

History

Stocking History

Carney Lake has been managed primarily for walleyes since the late 1930s, as exemplified by the lake's stocking history (Table 1). The first recorded walleye stocking event took place in 1939, followed by stocking of spring fingerlings in 1953 and 1957. The next recorded spring fingerling walleye stocking event occurred in 1980, and walleyes were stocked on a regular basis since that time. The average spring fingerling stocking rate between 1939 and 2006 was 36 per acre. Adult walleyes were transferred from Groveland Mine Pond into Carney Lake in 1986. The stocking prescription approved for 2003-2008 called for stocking spring fingerling walleyes at a rate of 30 per acre every other year.

Fisheries Management

In order to guide management decisions, the fish community in Carney Lake (Table 2) has been surveyed numerous times, beginning with a general survey in 1951. Survey efforts aimed to quantify

the fish community, gauge the level of walleye stocking success and natural recruitment, and evaluate the adult walleye and northern pike population.

This lake was not surveyed or actively managed until the 1950s due to its inaccessibility. There were no roads going near Carney Lake and the surrounding terrain is very rugged. A local sportsmen's group suggested that Carney Lake had good potential for walleyes, thus bringing attention to the lake. The first survey of Carney Lake was a limnology and general fisheries survey in August 1951. Adequate dissolved oxygen (above 6 ppm) was found down to 15 feet deep, although it declined to less than 3 ppm below 20 feet. The lake was thermally stratified with a thermocline beginning at 15 feet deep. Total alkalinity was above average at 126 ppm. Fisheries staff noted some spawning habitat for walleye and smallmouth bass, along with some potential for northern pike spawning. Initial observations also documented that yellow perch and pumpkinseed sunfish were abundant, with a presence of golden shiners.

In an effort to create a walleye fishery, fry were stocked in 1939. Because follow up surveys indicated no survival of these stocked fish, walleyes were not stocked again until 1953. Due to the inaccessible nature of the site, walleyes were carried in partway by a bulldozer and then carried the rest of the distance by the sportsmen's group and Department of Conservation personnel. Walleye survival was documented through a follow up gill net survey in 1956. Walleye management continued through the 1950s with annual stocking. Follow up angler checks and netting indicating that walleye stocking had produced a walleye fishery.

A new road and public access site to Carney Lake were constructed by the Department of Conservation in 1960. This effort allowed mapping of the lake in the winter of 1961. During a fisheries survey completed in July 1961, 41 walleyes between 13.0 and 25.2 inches and averaging 15.9 inches were captured. Other fish captured in this survey included yellow perch, pumpkinseed sunfish, black crappies and numerous white suckers. Subsequent monitoring in late winter indicated adequate levels of dissolved oxygen available under the ice.

In June 1966 a fish kill comprised of several hundred suckers and a few sunfish and black crappies occurred. The event was investigated by fisheries personnel but the cause of this mortality was not determined. No other incident of fish mortality has been reported since then.

A fisheries survey in May 1967 indicated that walleye abundance had dropped and that species diversity was limited. Managers noted that stocked walleye fingerling had historically produced a good walleye fishery. Black crappies were abundant with 444 fish captured ranging from 6.2 to 13.7 inches and averaging 9.5 inches. Fishery managers tried to promote black crappies for angling and expressed concern that chemical treatment may be necessary if black crappies became overabundant and slow growing. White suckers were also numerous in the survey.

A brief survey in June 1974 found remnant walleye and yellow perch populations. Bluegills and pumpkinseed sunfish were also present. Black crappies did not become stunted as feared in the earlier survey summary.

Based on the limited success of initial walleye stocking efforts, walleye fingerling stocking resumed in 1980 and continued biennially on even years. An electrofishing survey in September 1981 found

limited walleye survival from the 1980 stocking event and an average growth rate of -0.6 inches compared to state average.

After four walleye stocking events over an 8 year period, a targeted adult walleye survey was conducted in April 1988. Fifty-three walleyes were captured ranging from 6 to 24 inches, with a mean size of 13.8 inches. This population was primarily composed of five year classes. This walleye year-class picture was somewhat clouded due to a one-time adult walleye transfer of 730 fish from the Groveland Mine walleye ponds. Walleye forage species included abundant levels of golden shiners, common shiners, and creek chubs. Despite the seemingly favorable forage conditions, walleyes were found to be growing -1.3 inches compared to state average. Adult white suckers were observed to be abundant in the survey, and sucker thinning was recommended. White suckers were removed by the District 2 Walleye Club in 1988 (1,100 total pounds or 9.4 pounds/acre) and in 1989 (3,200 total pounds or 27 pounds/acre). These fish were distributed to interested persons.

Dissolved oxygen levels were checked in the winter of 1992 during the planning stages of a crib reef project that was proposed to be carried out with the District 2 Walleye Club. Because dissolved oxygen was greater than 5.0 ppm down to 15 feet deep, a crib reef placed at that depth could be utilized by walleyes and other species year round. In the winter of 1993, the District 2 Walleye Club constructed a reef of 28 oak log cribs (8 feet x 8 feet x 5 feet) on a point bar in the southeast portion of the lake. The reef was placed in 8 to 15 feet of water. A subsequent SCUBA survey the following summer indicated utilization of the reef by walleyes, smallmouth bass, black crappies, and yellow perch.

The 1994 walleye spring fingerling stocking event was assessed with an electrofishing survey in the same year. This survey indicated the 1994 walleye year-class was very strong with 269 fingerlings per mile. Forage was abundant and included bluntnose minnows and golden shiners. Juvenile white suckers were more abundant than in the past. The sucker thinning effort resulted in higher numbers of small fish and thereby bolstered the forage base available to predators. Northern pike and walleye growth rates were faster than previously documented.

A walleye recruitment survey was conducted in September 2002. A modest year class of young-of-year walleyes was sampled and indicated survival of naturally reproduced or stocked fish. As in the past, yearling numbers of walleyes generated by natural reproduction were negligible. Forage availability continued to be strong with bluntnose minnows, golden shiners, and juvenile yellow perch making up most of the forage base. Walleyes continued to grow slightly faster than state average rates.

Current Status

April 2009 Walleye and Northern Pike Evaluation

An April 2009 walleye and northern pike survey was conducted using fyke nets and collected 11 species totaling 3,844 fish (Table 3). Overall, Carney Lake was found to have a good diversity of species including yellow perch, rock bass, pumpkinseed, minnow species (bluntnose, golden shiner, sand shiner), walleye, and pike. Very few white suckers were captured, which may be a result of previous removal efforts.

Yellow perch was the most abundant fish species in the April sample, making up 65% of the total number. Sizes ranged from 3 to 7 inches, and averaged 4.5 inches.

Northern pike were fairly abundant at 3.6 adults per acre and the size structure was poor, with only 5% considered legal (24 inches). Size classes of pike between 19-23 inches were well represented, with few fish larger than 24 inches; thus, fishing harvest appears to be affecting the population size structure as fish are most likely removed from the population as soon as they reach legal size. Overall growth rates of northern pike from age classes 4 and older are generally very poor as forage resources (i.e., abundant white suckers, larger sized yellow perch) needed to sustain positive growth of pike to medium to large sizes may be limited in Carney Lake (Table 4).

The 2009 survey was the first walleye population estimate conducted on Carney Lake. Walleye abundance at 2.2 adults per acre falls within the expected level for lakes that support a walleye population through a combination of stocking and natural reproduction. Based on stocking records, 70% of the walleyes captured were the result of natural reproduction and 10 of the 15 year classes originated from natural reproduction versus stocking. Walleyes ranging from 13-16 inches are typically abundant in spring surveys; however, the survey effort in Carney Lake did not capture many walleyes from these size classes, thus indicating relatively poor recruitment. Walleyes were growing slightly slower than state average and the Upper Peninsula regional mean growth index (-0.8 and -0.3, respectively). Closer analyses of growth across all age classes of walleyes find that younger (and smaller) walleyes are finding sufficient forage resources to express positive growth above the statewide average mean growth index, whereas older and larger walleyes are experiencing competition for limited forage resources because they are growing slower the statewide average mean growth index (Table 4).

June-September 2009 Status and Trends Survey

The June-September 2009 Status and Trends survey used a standard combination of fyke, gill, and seine nets. Water chemistry, habitat measurements, reptile/amphibian occurrences, and investigation of presence or absence of aquatic nuisance species were also recorded.

On September 24, 2009, the water temperature varied from 69ºF at the surface of the lake to 68ºF near the bottom in approximately 21 feet of water. Dissolved oxygen ranged from 10.92 ppm near the surface to 7.14 ppm near the bottom. Specific conductance measured 228 microsiemens per meter (µS/m) near the surface and 226 µS/m near the lake's bottom. Carney Lake has greater water clarity compared to other lakes within the NLMMU, as evidenced by its Secchi depth of 15 feet. Carney Lake also has a much higher pH (8.8) compared to other Upper Peninsula waters.

Carney Lake was moderately developed with 13 dwellings and 11 docks, and the number of dwellings and docks closely corresponds to the median found within the NLMMU. Surprisingly, none of the shoreline was altered or armored. The amount of submerged wood available as aquatic habitat was very high, serving an important role in fostering a healthy fish community.

Thirteen species were collected, consisting of a total of 2,784 fish (Table 5). Overall, minnows made up 80.4% of the sample numbers while northern pike, walleye, white sucker, and rock bass made up 71.3% of the overall sample weight.

Walleyes were collected representing 13 different age classes. Based on stocking records, 8 of the 13 year classes originated from natural reproduction versus stocking. The growth rate was -1.3 compared

to the statewide mean grown index (Table 6). Similar to the results of the April 2009 survey, smaller walleyes were growing faster than and better able to utilize forage resources compared to larger walleyes.

Northern pike were very abundant with 3.6 adults per acre and a growth rate ranging from -3.4 to -4.7 compared to the statewide average (Table 6).

Pumpkinseed sunfish were the most common panfish with 185 fish captured. Pumpkinseeds ranged from 2-7 inches, with only 4.9% being above "acceptable" size of 6 inches. Rock bass comprised 5% of the sample and ranged in size from 1-10 inches. The mean size for rock bass was 5.2 inches, with 39% above "acceptable" size of 6 inches. Green sunfish were only 1.5% of the total catch and ranged from 1-5 inches in length.

Yellow perch made up 2.6% of the total sample, with fish ranging from 2-8 inches. Yellow perch size structure was relatively limited, with the majority being in the 3-6 inch range.

Historical records indicate that bluegill and smallmouth bass were present in Carney Lake, but these species were not collected in the 2009 survey.

Walleye Recruitment Survey, October 9, 2012
A fall walleye index survey was conducted on Carney Lake on October 9, 2012 to evaluate the survival of spring fingerling walleyes stocked in June 2012. The entire shoreline was surveyed with an electrofishing boat and no young-of-year walleyes were captured. Although the 2012 fall walleye index survey did not collect any young-of- year walleyes, this should not be interpreted as lack of survival; instead, it was thought that the survey occurred too late in the year to adequately sample young-of-year walleyes.

Analysis and Discussion

While Carney Lake supports a diverse forage base of small yellow perch and minnows that, in turn, support good growth of small predators, availability of large-bodied forage types is insufficient for adequate growth rates of large predators. When comparing the 2009 spring population estimate and Status and Trends surveys, walleye growth is very fast for young walleyes ages 3-4 and gradually slows to about average by ages 7-8. Growth thereafter for older (and larger) walleyes slows to 2-4 inches under the statewide average growth index. The growth rate for northern pike older than age 3 is also poor. White suckers were manually removed during the late 1980s and currently are low in abundance. Given that adult white suckers are not available to serve as forage for large predators, walleyes and northern pike are depending on yellow perch to meet their forage needs. As a result, large yellow perch were not captured during the 2009 surveys.

Efforts to improve the size structure of the northern pike population are likely limited due to the lack of forage resources especially for larger fish. Northern pike may also be limited by a lack of preferred habitat, as Carney Lake is a fairly shallow waterbody. The northern pike growth rate generally slows in older age classes, and others have documented stunted populations where adult pike summer habitat and suitable size forage are lacking (Diana 1987). Limnological sampling indicates that suitable summer habitat for northern pike may be limited as the hypolimnion layer is very small and essentially

anoxic. White suckers sampled during the survey averaged 19.8 inches, which makes most of the population invulnerable to predation by the current northern pike population

From 1994 to 2006, spring fingerling walleyes were stocked at approximately 29 per acre. In 2009, the spring survey found 2.2 adult walleyes per acre, and this estimate falls within the bounds of what is expected for a population that is supported by stocking. Growth of small walleyes is sufficiently fast to warrant some supplemental stocking of spring fingerlings to maintain an attractive fishery to the angling community that utilizes the campground or travels from the nearby population center of Iron Mountain; however, it is recommended that stocking rates be modest considering the limited forage base available to large walleyes.

Management Direction

Given information available from historic surveys and stakeholder concerns that the walleye population in Carney Lake had declined as a result of insufficient supplemental stocking, Fisheries Division has an approved prescription to continue stocking walleyes at a rate of 30 spring fingerlings per acre on an every other year basis, or 2012, 2014, and 2016. As part of the stocking effort, spring fingerlings are marked with oxytetracycline, or OTC, to help evaluate success of the stocking program and contribution by natural recruitment.

Additional fall walleye index surveys should be scheduled in 2014 and 2016 to measure survival of stocked fish and contribution by natural recruitment. The results of these surveys will help determine if the stocking prescription should be modified.

Given that trends in negative growth will most likely continue for northern pike, consideration should be given to changing the current fishing regulations (24-inch minimum size limit and possession of 2 fish per day) to either the 5 fish per day possession limit with only 1 > than 24 inches, or the 24-34 inch protected slot limit. The protected slot limit would allow harvest of smaller northern pike and protect faster growing individuals with the objective of improving the overall size structure of the population.

References

Diana, J. S. 1987. Simulation of mechanisms causing stunting northern pike populations. Transactions of the American Fisheries Society. 116: 612-17.

Figure 1. Hydrographic contour map of Carney Lake, Dickinson County, Michigan.

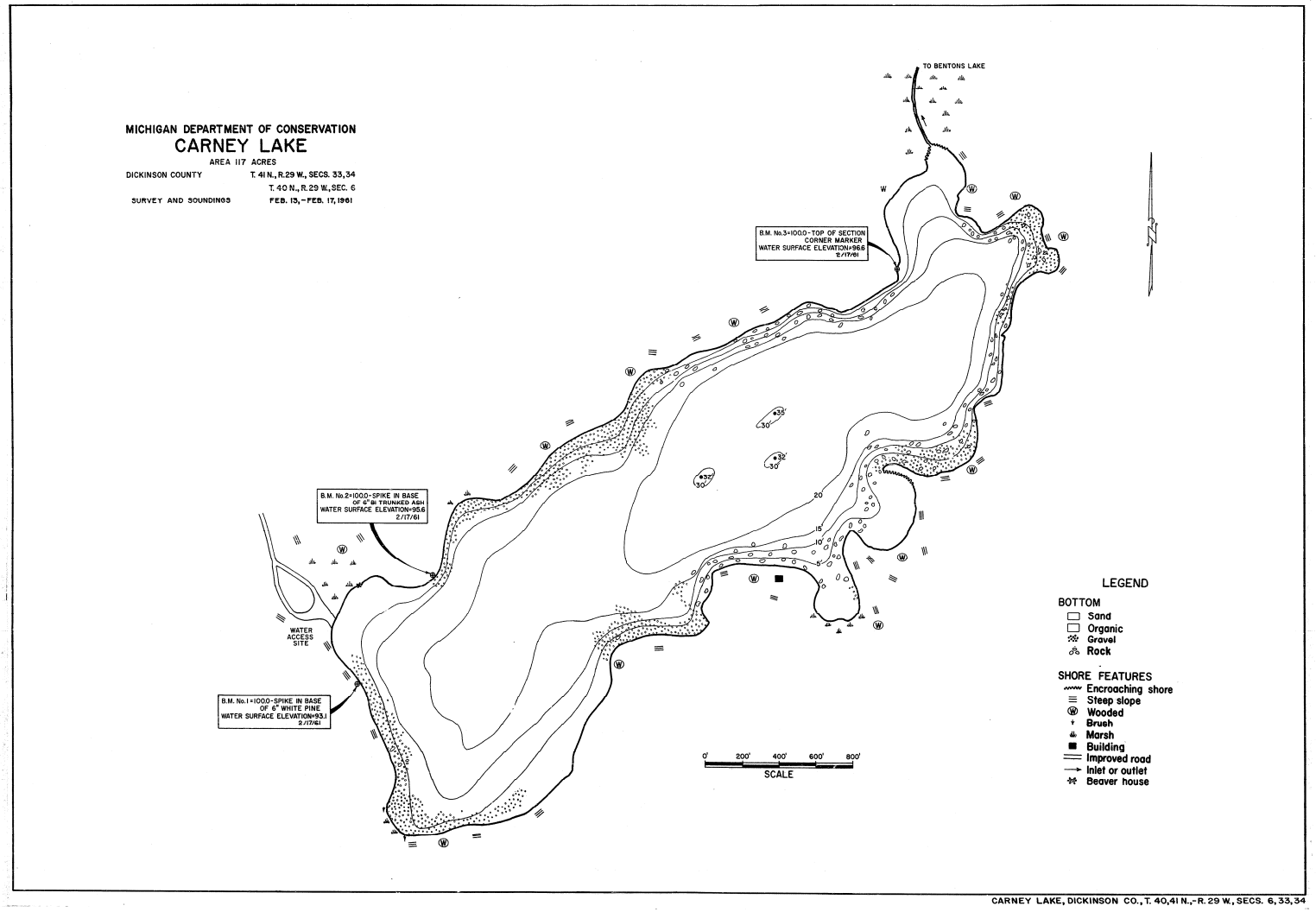

Table 1. Carney Lake fish stocking history 1939-2012.

Species	Year	Number	Number per Acre	Life Stage
Walleye	1939	120,000	1,026	Fry
Walleye	1953	3,000	26	Spring Fingerling
Walleye	1957	2,000	17	Spring Fingerling
Walleye	1980	5,850	50	Spring Fingerling
Walleye	1983	6,805	58	Spring Fingerling
Walleye	1984	7,200	62	Spring Fingerling
Walleye	1986	5,000	43	Spring Fingerling
Walleye	1986	730	6	Adult/Juvenile
Walleye	1988	5,000	43	Spring Fingerling
Walleye	1990	5,220	45	Spring Fingerling
Walleye	1992	3,000	26	Spring Fingerling
Walleye	1994	3,000	26	Spring Fingerling
Walleye	1998	4,431	38	Spring Fingerling
Walleye	2000	3,766	32	Spring Fingerling
Walleye	2002	3,000	26	Spring Fingerling
Walleye	2004	2,850	24	Spring Fingerling
Walleye	2006	3,040	26	Spring Fingerling
Walleye	2012	3,912	33	Spring Fingerling

Table 2. List of fishes (1951 to present) in Carney Lake, Dickinson County, Michigan.
Origin: Native = N I= Introduced Status: P= Present observations,
NC=Not Collected (in past decade)
Data from DNR Fisheries Division Records

Common Name	Scientific Name	Origin	Status
Rock bass	*Ambloplites rupestris*	N	P
Black bullhead	*Ameiurus melas*	N	P
White sucker	*Catostomus commersonii*	N	P
Northern pike	*Esox lucius*	N	P
Iowa darter	*Etheostoma exile*	N	P
Green sunfish	*Lepomis cyanellus*	N	P
Pumpkinseed	*Lepomis gibbosus*	N	P
Bluegill	*Lepomis macrochirus*	I	NC
Smallmouth bass	*Micropterus dolomieu*	N	NC
Golden shiner	*Notemigonus crysoleucas*	N	P
Sand shiner	*Notropis stramineus*	N	P
Yellow perch	*Perca flavescens*	N	P
Bluntnose minnow	*Pimephales notatus*	N	P
Black crappie	*Pomoxis nigromaculatus*	I	P
Walleye	*Sander vitreus*	I	P

Table 3. Number, weight and length range of fishes collected with fyke nets from Carney Lake, Dickinson County, Michigan. April 2009.

Common name	Number	Weight (lbs.)	Average length (in.)	Length range (in.)	Percent by number	Percent by weight	Percent legal size
Black bullhead	6	0.25	4.2	2-4	0.16	0.02	0.0
Black crappie	100	23.9	6.4	2-13	2.60	1.83	24.0
Bluntnose minnow	2	0.04	3.5	3	0.05	0.00	NA
Golden shiner	521	7.78	4.6	2-6	13.55	0.60	NA
Green sunfish	33	1.07	3.5	2-5	0.86	0.08	0.0
Northern pike	282	614.05	21.4	13-27	7.30	47.04	5.0
Pumpkinseed	76	4.23	3.9	2-6	1.98	0.32	1.3
Rock bass	84	22.08	6.2	2-10	2.19	1.69	57.1
Walleye	205	472.29	19.0	8-26	5.33	36.18	97.6
White sucker	27	87.55	19.8	8-23	0.70	6.71	100.0
Yellow perch	2,505	72.20	4.5	3-7	65.17	5.53	0.5

Table 4. Weighted mean length (inches) at age, and growth relative to the State average for fish sampled from Carney Lake with fyke nets, April 2009. Number of fish aged is in parentheses. Data from DNR Fisheries Division records.

	Age/Length															
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Mean growth index[1]
Northern pike	13 (1)	14.6 (1)	20.0 (8)	21.2 (37)	21.3 (11)	22.4 (7)	24.2 (6)									-3.4
Walleye	8.1 (2)	14.1 (2)	15.9 (5)	17.7 (15)	20.1 (1)	21.2 (1)	20.3 (5)	19.7 (12)	20.0 (14)	19.3 (7)	20.3 (3)	19.2 (5)	18.3 (1)	19.6 (1)	18.9 (1)	-0.8

[1]Mean growth index is the average deviation from the state average length at age taken from Schneider et al. 2000.

Table 5. Number, weight and length range of fishes collected with fyke nets, gill nets and seine from Carney Lake, Dickinson County, Michigan, June 2009.

Common name	Number	Weight (lbs.)	Average length (in.)	Length range (in.)	Percent by number	Percent by weight	Percent legal size
Black crappie	28	6.11	6.5	3-12	1.6	3.01	21.4
Bluntnose minnow	1043	4.22	2.1	1-4	58.5	2.08	NA
Golden shiner	169	1.32	2.6	1-6	9.5	0.65	NA
Green sunfish	43	0.57	2.5	1-5	2.4	0.28	0.0
Hybrid sunfish	3	0.53	6.2	5-6	0.2	0.26	66.7
Iowa darter	4	0.01	2.5	2	0.2	0.00	NA
Northern pike	17	52.33	23.3	20-34	0.9	25.78	17.7
Pumpkinseed	185	12.05	4.1	2-7	10.4	5.94	4.9
Rock bass	139	22.17	5.2	1-10	7.8	10.92	38.9
Sand shiner	54	0.27	2.5	2	3.0	0.13	NA
Walleye	19	47.75	19.0	16-23	1.1	23.52	100.0
White sucker	7	22.58	20.1	18-22	0.4	11.12	100.0
Yellow perch	73	3.88	4.7	2-8	2.62	4.1	4.1

Table 6. Weighted mean length (inches) at age, and growth relative to the state average for fish sampled from Carney Lake with fyke nets, gill nets, and seine, June 2009. Number of fish aged is in parentheses. Data from DNR, Fisheries Division records.

	Age/Length															
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Mean growth index[1]
Black crappie		5.60 (12)	7.20 (2)	9.55 (2)	11.85 (2)	11.90 (1)										-0.9
Northern pike			20.66 (2)	21.63 (27)	21.41 (8)	22.62 (6)	23.65 (5)	34.10 (1)	32.00 (1)							-4.7
Pumpkinseed		4.36 (12)	5.21 (9)	5.44 (2)	7.00 (4)	6.90 (1)		6.10 (1)								+0.2
Rock bass		4.52 (9)	5.53 (17)	7.12 (10)	8.00 (7)	8.39 (7)	9.15 (2)			10.00 (1)						+0.4
Walleye			16.40 (3)	17.65 (13)	20.10 (1)	21.20 (1)	20.83 (5)	20.88 (12)	20.90 (13)	18.99 (7)	20.34 (3)	19.22 (5)	18.30 (1)	19.60 (1)	18.90 (1)	-1.3
White sucker					18.60 (1)		18.90 (1)	19.40 (2)		20.30 (1)	21.50 (1)		22.80 (1)			--
Yellow perch		4.96 (20)	6.40 (8)	6.94 (4)	8.00 (1)											-0.6

[1]Mean growth index is the average deviation from the state average length at age taken from Schneider et al. 2000.