Caro Impoundment, Tuscola County

Caro Impoundment is a 200 acre impoundment of the Cass River located one mile south of the Village of Caro in Tuscola County. Caro Dam, originally constructed in 1906 for water supply to Michigan Sugar Company, was reconstructed in 1928 to facilitate power generation for Caro. The hydro-dam has since been retired and now functions to maintain water level primarily for recreational use.

MDEQ, Dam Inventory identifies Caro Dam as a concrete "gravity type" dam approximately 240 feet long with hydraulic head potential of 19 feet. Typical hydraulic head is maintained at 15 feet and current water levels are maintained at a fixed crest with overspill discharge. The impoundment has not been officially mapped but is known to be very shallow with 90% of its depth 5 feet or less. Maximum depth is located at the dam and reaches 12 feet.

The area surrounding Caro Impoundment is described as undulating topography of gently rolling hills. Surface soils are generally characterized as somewhat poorly drained mixes of clay, sand, and loam. Much of the original river floodplains have been inundated from dam effects resulting in an irregular shoreline. Banks on both shores are moderately elevated and lightly developed with approximately 12 residential dwellings. Michigan Sugar Company owns considerable land acreage on both the west and east shores. Wastewater treatment lagoons are present on the east shore.

The Village of Caro operates a 16 acre recreational facility known as "Chippewa Landing" on the southeast shore adjacent to Highway M24. A paved boat launch is available and accommodates motorized watercraft capable of navigating the shallow water contours of the impoundment. A barrier-free fishing platform is also available for shore fishing.

Caro Impoundment is generally categorized as a warmwater, medium size, and shallow reservoir of mesotrophic/eutrophic characteristics. Since the Caro Dam interrupts river flow, the impoundment generally serves as a trap for nutrients and sediments. The impoundment is typically in a turbid state due to upstream sediment loading and constant roiling from wave action and bottom feeding fish species. Limnological parameters indicate water is moderately hard with alkalinity ranging from 170 ppm to 206 ppm and pH values in the range of 7.5-8.4. The impoundment is too shallow for thermal stratification and mean summer temperatures are generally above 70F.

Aquatic vegetation (curlyleaf) and submerged stumps are the principle forms of fish cover and are found in moderate abundance in the impoundment. Fish species likely to thrive in Caro Impoundment are limited to those adaptable to the shallow water environment, high turbidity, and warmwater thermal characteristics.

Historically, fisheries management of Caro Impoundment has concentrated on warm/cool water species. Fisheries assessments in 1969 and 1977 indicated good recreational fisheries for bluegill, black crappie, and northern pike. White suckers, redhorse suckers, and carp populations were also substantial. Aggressive management was forced in 1980 when Michigan Sugar Company drew the impoundment down for dam repairs resulting in significant fish loses. Fisheries rehabilitation included stocking tiger muskellunge, bluegill, and channel catfish (Table 1). Tiger muskellunge stocking was discontinued due to poor survival and in 1985, Caro Impoundment was included in a one-time stocking of walleye fry that included all of the mainstem Cass River. A total of 2.4 million fry were stocked and Caro Impoundment received 200,000 fish. Beginning in 1990, a consistent spring fingerling walleye stocking program was implemented with fish being stocked on a 3 year rotation.

Since 1980, fish community assessments have been conducted in 1982, 1985, 1995, and 2007. Species composition found in 1982 and 1985 indicated the fish community was re-establishing itself similar to

pre-drawdown conditions (Table 2). A gear intensive assessment in 1995 indicated subtle changes occurring in the fish community; 1) white crappies had colonized themselves; 2) black crappie numbers declined; and 3) a significant increase in the channel catfish population. Although Caro Impoundment continued to support high densities of "rough" fish (carp and suckers), it maintained a good angling reputation for crappie and northern pike.

The 1995 assessment also indicated marginal survival of stocked walleye with 13 young of the year fish being collected. In 1998, an electrofishing survey using Serns methodology estimated young of the year walleye density at 8 fish/acre. This density was considered good and sufficient enough to establish a "significant" fishery defined as 3-5 adult walleye/acre. However, both the 1995 and 1998 assessments indicated sparse occurrence of adult walleye (a total of 3 adults collected) despite previous years of stocking.

The 2007 assessment was conducted as part of MDNR, Fisheries Division's Status and Trends Program. The Status and Trends Program seeks to sample selected water bodies, using similar protocol, to document fish community and habitat conditions and trends on a regional and State-wide basis. Fish collection incorporated multiple gear types including trap nets, fyke nets, seine, and night time electroshocking.

A total of 733 fish representing 21 fish species were collected with combined efforts (Table 2). Trap and fyke nets accounted for 64% of the total catch while night electroshocking and seine accounted for 30% and 6%, respectively. Gill nets were not used due to the known abundance of channel catfish which tend to damage gear and due to anticipated high fish mortality. Channel catfish, golden redhorse, quillback carpsucker, bluegill, and black crappie were most abundant comprising 72% of the total catch by number. Other species collected included largemouth bass, pumpkinseed sunfish, walleye, white crappie, northern pike, yellow perch, carp, white sucker, golden shiner, green sunfish, greater redhorse, bluntnose minnow, brook stickleback, central mudminnow, johnny darter, and tadpole madtom. The colonization of a significant quillback carpsucker population is new to Caro Impoundment.

A total of 214 channel catfish averaging 21.0 inches comprised 29% of the total catch. Ninety-nine percent of these fish met or exceeded the minimum harvest size of 12 inches. Age-growth analysis indicated channel catfish were growing below State average having a mean growth index of -1.0. Channel catfish longevity appears to peak at age 13 indicating the fish are relatively long lived. A significant channel catfish fishery is indicated by the presence of multiple year classes along with high relative abundance.

Bottom feeding species including golden and greater redhorse, white sucker, carp, and quillback carpsuckers comprised 30% of the total catch. By number and weight, these species represent a significant component of the fish community. It is likely the colonization of quillback carpsuckers and white crappie is associated with fish passage past Caro Dam by some unknown means.

A total of 68 black crappie averaging 8.5 inches comprised 9% of the total catch. A total of 25 white crappie averaging 12.0 inches comprised 3% of the total catch. Black crappie have been historically common to Caro Impoundment and white crappie common since 1995. Black crappie abundance and size structure appears to have declined since 1995. Size structure is acceptable with 47% of the trap net catch exceeding 7 inches in length (Table 3). Fewer white crappie were collected in 2007 but size structure remained similar to 1995 and appears acceptable with all fish exceeding 8 inches in length (Table 3). Age-growth analysis indicates black crappie were growing above State average having a mean growth index of +1.4. State averages are not available for white crappie but growth appears slightly greater than

black crappie and likely indicates acceptable growth. Black crappie longevity appears to peak at age 5 suggesting high adult mortality most likely of natural causes.

Bluegill have historically been, and remain, a relatively small component of the Caro Impoundment fishery. A total of 84 bluegill averaging 5.1 inches comprised 11% of the total catch. Electrofishing gear accounted for 50% of the total catch while trap and fyke nets accounted for 32%, and 18% collected by seine. Most bluegill captured fell in the 4-6 inch size range with only a few reaching 7 inches. Size structure appears acceptable with 40% of the bluegill captured meeting or exceeding the acceptable harvest size of six inches. Age-growth analysis indicates bluegill were growing slightly above State average having a mean growth index of +0.6. Bluegill longevity appears to peak at age 5 suggesting high adult mortality most likely of natural causes.

A total of 31 northern pike averaging 28.7 inches comprised 4% of the total catch. Ninety-four percent of the northern pike captured were collected with trap net gear. Overall size structure appear excellent with 87% of the pike captured exceeding the minimum harvest size of 24 inches. Age-distribution showed the presence of six different year classes with strong representation from the 2003 (age 4) and 2004 (age 3) year classes. Age-growth analysis indicates northern pike were growing extremely well having a mean growth index of +6.7. Although relative abundance appeared similar to the 1995 survey, size structure and growth was improved. Relative abundance, based on catch per effort, suggest a significant northern pike population exists with very good opportunity to catch harvestable fish.

At total of 24 largemouth bass averaging 12.7 inches comprised 3% of the total catch. Eighty-three percent of the total catch were collected at night using electrofishing gear. Overall size structure appeared acceptable with 50% of the largemouth bass meeting or exceeding the minimum harvest size of 14 inches. Age-distribution showed the presence of multiple year classes with recruitment to the harvestable fishery occurring at age 4. Age-growth analysis indicates largemouth bass were growing above State average having a mean growth index of +2.0. Historical records indicate largemouth bass are more prevalent in Caro Impoundment than smallmouth bass. Compared to the 1995 assessment, largemouth bass appear similar in terms of relative abundance, size structure, and growth.

Only one 31 inch walleye was collected in this assessment. Adult walleye have been noticeably absent from previous surveys as well. Intensive sampling in 1995 collected 21 juvenile walleye ($\leq$ 15 inches) but no adults. In the 1998 walleye stocking year, fall indexing using Serns methodology estimated a young of year (yoy) population of 8 fish/acre indicating potential development of a significant adult population. This assessment indicates, despite stocking efforts, few walleye are recruiting into the fishery. Yet, anecdotal reports of walleye being harvested by anglers have been reported to MDNR (J. Baker, Fisheries Division, personal communication).

Overall, the fish community of Caro Impoundment appears in an acceptable state given the habitat and water parameters available. Fish species which thrive in Caro Impoundment must be tolerant of accelerated sediment and nutrient loading and warmwater thermal habitat. The high abundance of channel catfish, carp, quillback, and sucker species demonstrate their tolerance of the shallow, warmwater, impoundment ecosystem. However, this assessment also indicated a somewhat under exploited recreational fishery. Channel catfish are over abundant and provide excellent opportunities for catch and harvest. Opportunities for sizeable black crappie, northern pike, and largemouth bass are also available. Bluegill and white crappie occur in lesser abundance but provide additional angling opportunities.

Continued walleye management and stocking is questionable given the poor fishery recruitment found in this survey. Management recommendations are to cautiously extend the fisheries prescription for stocking for another six year period. It is recommended walleye be stocked on an alternate year schedule at a rate of 50-75 spring fingerling/acre (10,000 – 15,000 fish). During stocked years, fall indexing using Serns methodology is highly recommended. In addition, a survey specifically targeting adult walleye should be conducted before renewal of a walleye stocking prescription.

Tech notes:
No gill net set due to channel catfish. Trap nets were more efficient than fyke nets. Numerous redhorse and bluntnose minnows not effectively shocked. Station 3 - good largemouth. LMB were hanging in the arrowhead along shore. Fishing pressure does not appear very heavy.

Sent 10 northern pike to DEQ for contaminant analysis.

Table 1. Fish stocked into Caro Impoundment, Tuscola County (1980 to present).

Year	Species	Number	Rate (#/acre)	Size (inches)
1980	tiger muskellunge	1,200	6	9.0
1981	bluegill	500	3	adult
	channel catfish	67	< 1	16.8
	black crappie	500	3	adult
	tiger muskellunge	700	4	6.6
1982	channel catfish	76	< 1	12.2
	tiger muskellunge	750	4	5.8
1984	northern pike	5,000	25	3.9
	tiger muskellunge	560	3	6.9
1985	walleye	200,000	1000	fry
1990	walleye	10,921	55	4.1
1991	walleye	15,186	76	2.5
1993	walleye	14,890	74	1.3
1995	northern pike	4,000	20	3.0
	walleye	10,038	50	1.9
1998	walleye	15,648	78	1.9
1999	northern pike	1,000	5	4.4
2001	walleye	20,609	103	1.7
2003	walleye	12,349	62	2.0
2006	walleye	12,825	64	1.7

Table 2.-Species composition (percent of total catch) from Caro Impoundment surveys, 1982, 1985, 1995, and 2007.

	Year			
Species	1982	1985	1995	2007
Black bullhead	1	6		
Black crappie	50	49	22	9
Bluegill	2	12	2	11
Brown bullhead	3	2	< 1	
Channel catfish	1	< 1	32	29
Common carp	8	3	12	2
Largemouth bass	1	1	4	3
Northern pike	4	5	3	4
Pumpkinseed	1	< 1	< 1	< 1
Redhorse sucker	22	12		
Golden redhorse			3	15
Greater redhorse			< 1	2
White sucker	8	9	4	1
Yellow bullhead	1		< 1	
Common shiner		1		
Golden shiner		< 1		< 1
Smallmouth bass			< 1	
Walleye			3	< 1
Green sunfish			< 1	1
Rock bass				
White crappie			13	3
Bluntnose minnow				4
Brook stickleback				1
Central mudminnow				< 1
Johnny darter				< 1
Quillback carpsucker			< 1	10
Tadpole madtom				< 1
Yellow perch			< 1	< 1
Total fish collected	384	581	770	733

Table 3.-Caro Impoundment black and white crappie size structure using trap net catch data from 1995 and 2007.

	Black crappie		White crappie	
Sample year	1995	2007	1995	2007
Sample size	108	55	69	16
Average length (inches)	10.2	8.2	11.2	12.3
% ≥ 8 inches	96	47	99	100
% ≥ 9 inches	70	22	97	94
% ≥ 10 inches	56	18	93	88
% ≥ 11 inches	35	11	52	75
% ≥ 12 inches	10	9	25	44