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A BIOLOGICAL AND PHYSICAL SURVEY OF THE CARP RIVER DRAINAGE SYSTEM, MACKINAC AND CHIPPEWA COUNTIES, MICHIGAN*

By

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During the summers of 1951 and 1952 a biological and physical survey was made of the Carp River drainage system, located in Chippewa and Mackinac counties. The purposes of this survey were to obtain data from which to evaluate conditions for trout, to ascertain the necessity for a watershed improvement program, and to provide basic information for evaluating its effects in future years should such a program be initiated. Biological and physical investigations were completed at 27 stations during the summer of 1951 by a three-man crew.** During the summer of 1952, another crew*** rechecked 25 of the formerly investigated stations as to their physical characteristics and examined nine additional stations for both biological and physical data, thus bringing the total number of fish collecting stations to 36.

The majority of fish collections were taken with a 110-volt, 4.2-ampere portable A. C. shocker; scap nets were used to recover stunned fish. Also used for collecting were hook and line and an experimental gill net 125 feet

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long composed of five 25-foot sections, one each of the following square-mesh sizes: 3/4-, 1-, 1 1/4-, 1-1/2-, and 2-inch. The general procedure in shocking was to work all the stream at each collecting station; but where the water was deep, it was sometimes impossible to work the full width of the stream.

Examination points were generally located 2 or 3 miles apart, except where accessibility was a limiting factor. It was the general procedure that the area covered, outlined in Table 1, was the section immediately upstream from bridges or other points at which collection symbols are shown on maps in this report. Lengths of stream shocked and stream widths were measured with a 100-foot steel measuring tape. Average width was determined in a 200-foot typical section of the stream from 10 width measurements spaced 20 feet apart. Three measurements of water depth, one in the middle of the stream and one each on either side of the midpoint, half the distance to the stream bank, were taken in conjunction with width measurements. Depths were measured to the nearest inch using a yardstick. Surface velocity was determined by measuring off 100 feet of stream and averaging the time it took 3 sticks to traverse the distance. With reference to Table 5, "sluggish" current is defined as having a flow of less than one-half foot per second, and "rapid" as having a velocity greater than this rate. Photographs were taken both in 1951 and 1952 of typical sections of the stream with one of the crew members holding a board on which a number was recorded to identify the station.

Air and water temperatures were taken with a pocket thermometer at each fish collection station, and a separate temperature survey (Table 7) at 20 stations was made during warm weather to determine whether stream temperatures reached lethal limits for trout.

Water color was expressed as colorless, light brown, or brown, and water clarity recorded as clear, murky (slightly turbid), or muddy (turbid). Pools

were classified according to Embody's table (1927) with regard to their size, type and frequency over a 200-foot stretch of stream at each station. Although the amount of cover afforded fish is considered when classifying pools according to type, trout cover and vegetation are given separate headings in Table 6 because "type" refers only to pools and not to the entire length of stream composing the station. With a view toward simplification and ease of comparison, pools have been recorded as good, fair, or poor. With respect to this type of classification, under the heading of "vegetation," good means abundant; fair, medium amounts; and poor, sparse to none.

To facilitate the interpretation of biological and physical data, the major tributaries are handled as units separate from the main Carp River. Beginning with the main Carp, principal tributaries and their tributaries are listed in order progressing upstream. Stations on the streams are listed similarly, progressing from mouth to headwaters, but are not necessarily in numerical sequence. Maps showing the distribution of trout designate all stations where a biological and physical survey was made.

All game fish collected were anesthetized with urethane and then measured, weighed and scale-sampled. Forage fish were preserved immediately for later identification. Scale samples of trout were taken from fast-growing young-of-the-year (judged on the basis of length-frequency distribution) and all larger fish, except when individual collections contained many trout. In event of the latter occurrence, scales were taken only from a representative sample. Lengths of all trout, whether scale-sampled or not, were recorded on a separate game-fish list, and all small trout of doubtful age not scale-sampled were preserved.

During the 1951 collection, trout scales were removed from an area above the lateral line and below the adipose fin, whereas scales from trout collected in 1952 were removed from below the lateral line, just anterior to the anus.

This change in procedure in 1952 conformed to Institute for Fisheries Research Method's Memo No. 4. Trout scales were later impressed on plastic strips and aged with the use of a scale-projection machine. After determining the age of the trout scale-sampled in the field, preserved specimens were aged from scales mounted in water. Whenever possible, lengths taken in the field were used in recording growth data from preserved fish since preservation caused some shrinkage. Fish for which lengths were recorded but which were not scale-sampled or preserved were assumed to have been of the same age as aged fish of similar lengths.

Acknowledgments

I would like to acknowledge the suggestions made by Dr. Frank F. Hooper and Clarence M. Taube, of the Institute for Fisheries Research, in preparation of this report. Also appreciated is the assistance from Thomas M. Stauffer; Martin Miller, Superintendent, Thompson State Fish Hatchery; and A. H. Eichmeier, State Climatologist, United States Department of Commerce Weather Bureau Station, East Lansing, Michigan.

Table 1.--Record of stations and collecting conditions

Streams and station number	Location	Date	Water level, color, turbidity, etc., and shocker efficiency	Length of stream covered (feet)	Amount of time spent shocking (minutes)	Average width and depth
Carp River						
(lower half)*						
M3	T42N R3W S20	8-21,22-52	- high, light brown, murky	125	22 hrs. (exp. gill net)	3-4' deep
20	T42N R3W S20	7-3-51	- high, light brown, clear-10% (not all of width shocked)	1700	80 min.	61' x 13"
21	T42N R3W S18	7-3-51	- high, light brown, murky-25%	1230	60	44' x 18"
6	T42N R4W S12	6-25-51	- high, light brown, murky-10% (deeper water not shocked)	660	50	52' x 2'
17	T42N R4W S4	7-2-51	- high, light brown, murky-50%	1350	75	44' x 2'
26	T42N R4W S5	7-12-51	- high, light brown, murky-25% (entire width not shocked)	850	25	44' x 2'
4	T42N R5W S2	6-22-51	- high, light brown, clear-25%	1200	65	26' x 18"
Carp River						
(upper half)*						
18	T43N R5W S32	7-2-51	- high, light brown, clear-75%	1500	75	41' x 10"
11	T43N R5W S30	6-27-51	- high, light brown, clear-50%	1275	40	44' x 18"
13	T43N R6W S13	6-28-51	- high, light brown, clear-80%	1100	60	26' x 7"
22	T43N R6W S2	7-9-51	- very high, light brown, clear-50%	1040	60	28' x 1'
27	T44N R6W S35	8-11-52	- high, light brown, clear-20%	260	80	28' x 27"
M2	T44N R6W S35	8-13-52	- high, light brown, clear	125	24 hrs. (exp. gill net)	3-7' deep
Red Creek						
7	T42N R4W S24	6-25-51	- high, light brown, clear-80%	200	20	9' x 6"
Flat Creek						
24	T42N R3W S18	7-10-51	- high, dark brown, slightly turbid-10%	500	30	13' x 2'
8	T42N R4W S16	6-26-51	- high, dark brown, murky-75%	300	30	5' x 5"
Platz Lake Outlet	T42N R3W S17	6-25-51	- high, colorless, clear-80%	325	30	9' x 9"
No Name, trib. to Carp River						
30	T42N R4W S4	8-12-52	- high, light brown, clear-60%	200	80	8.5' x 9"
North Fork Carp R.						
25	T42N R4W S5	7-12-51	- very high, light brown, clear	500	50	33' x 16"
1	T43N R4W S19	6-21-51	- normal, colorless, clear-50%	375	55	16' x 12"
East Lake Creek, a trib. to North Fork						
23	T43N R4W S9	7-10-51	- high, colorless, clear-35%	675	45	30' x 4"
Taylor Creek						
2	T43N R5W S23	6-21-51	- normal, light brown, clear-25%	600	45	17' x 3'
Bissel Creek						
3	T43N R5W S34	6-22-51	- normal, colorless, clear-80%	390	70	10' x 1'
M1	T43N R5W S34	6-23-51	- normal, colorless, clear (hook and line)	1800	90 (hook & line)	
Scoles Creek						
9	T43N R6W S36	6-27-51	- high, colorless, clear-60%	360	60	10' x 1'
28	T43N R6W S35	8-11-52	- high, light brown, clear-15%	200	45	10' x 11"
South Branch of Carp						
10	T43N R6W S25	6-27-51	- high, colorless, clear-65%	550	70	17' x 18"
29	T43N R6W S26	8-12-52	- high, light brown, clear-25%	160	75	17.5' x 20"
16	T43N R6W S22	6-29-51	- high, colorless, clear-70%	275	50	13' x 1'
19	T43N R6W S8	7-2-51	- high, light brown, clear	400	35	30' x 1.5'
Tributaries to the So. Br. of Carp						
15	T43N R6W S22	6-29-51	- high, colorless, clear-70%	200	25	6' x 3"
14	T43N R6W S23	6-29-51	- high, colorless, clear-70%	280	50	6.7' x 4"
Ozark Creek						
12	T43N R6W S12	6-28-51	- high, light brown, clear-50%	300	45	13' x 1'
Mud Creek, a trib. to Ozark Creek						
31	T43N R5W S8	8-15-52	- normal, light brown, clear	180	30	6.5 x 7"
Schwaizinger Creek						
32	T44N R6W S28	8-21-52	- high, dark brown, clear-20%	200	65	10.5 x 10"
Kneebone Creek						
33	T44N R6W S23	8-21-52	- normal, dark brown, slightly murky, deep-1%	200	25	12.5' x 20"

*The "lower half" is defined as that part of the Carp River below its intersection with township line 43N and 42N; the "upper half" is above this intersection.

Fish Fauna of the Drainage System

Thirty-one species of fish were collected throughout the Carp River drainage. Besides brook, brown and rainbow trout, game fish included in the collections were northern pike, yellow perch, smallmouth bass, rock bass and pumpkinseed. The warm-water species presumably migrated from lakes in the vicinity of capture, namely, Frenchman, Carp, East, and Lake Huron. American brook, northern brook and sea lampreys were also found in this system, the first-named species being the most widely distributed. Forage fish that occurred most frequently were: western blacknose dace, white sucker, northern mottled sculpin, brook stickleback, mudminnow, and pearl dace.

Of the three species of trout, the rainbow trout was the least numerous and brook trout the most common. Of 36 stations which represent sample areas on 16 streams including the main Carp, brook trout (totalling 76) were collected at 12 stations on 8 streams (see distribution map). Brown trout (42) were collected at six stations, located in the upper section of the Carp, South Branch of the Carp, and Red Creek. Rainbow trout (11) were collected at six stations, representing sample areas on the lower and upper Carp, North Fork, South Branch, and an unnamed tributary on which Station 30 is located.

Since many portions of the drainage system were not investigated, and also because shocking efficiency was quite variable, it is to be expected that the distribution maps give only a general picture of trout distribution. For example, an experimental gill net and the A. C. shocker failed to take any trout at stations M2 and 27; however, two brook trout and a rainbow were caught by fishermen in the immediate vicinity of these stations.

Fish names used in this report are in accordance with the Check List of the Fishes of Michigan (unpublished), revised to March 4, 1955, by Reeve M. Bailey, Curator of Fishes, Museum of Zoology, University of Michigan.

Identification of the majority of fish were verified by W. R. Taylor, formerly in the employ of the Institute for Fisheries Research and doctoral student in ichthyology at the University of Michigan.

List of Fishes in the Carp River Drainage System*/

Game Fish	Scientific Name
Brook trout	Salvelinus fontinalis
Brown trout	Salmo trutta
Rainbow trout	Salmo gairdneri
Northern pike	Esox lucius
Yellow perch	Perca flavescens
Smallmouth bass	Micropterus dolomieui
Northern rock bass	Ambloplites r. rupestris
Pumpkinseed	Lepomis gibbosus
Coarse Fish	
White sucker	Catostomus commersoni
Lampreys	
Northern brook lamprey	Ichthyomyzon fossor
American brook lamprey	Lampetra lamottei
Sea lamprey	Petromyzon marinus
Forage Fish	
Creek chub	Semotilus atromaculatus
Western blacknose dace	Rhinichthys a. meleagris
Longnose dace	Rhinichthys cataractae
Northern pearl dace	Semotilus m. nachtriebi
Finescale dace	Chrosomus neogaeus
Northern redbelly dace	Chrosomus eos
Northern common shiner	Notropis cornutus frontalis
Blacknose shiner	Notropis heterolepis
Spottail shiner	Notropis hudsonius
Bluntnose minnow	Pimephales notatus
Fathead minnow	Pimephales promelas
Brassy minnow	Hybognathus hankinsoni
Central mudminnow	Umbra limi
Central Johnny darter	Etheostoma n. nigrum
Iowa darter	Etheostoma exile
Northern logperch	Percina caprodes semifasciata
Northern mottled sculpin	Cottus b. bairdi
Brook stickleback	Eucalia inconstans
Trout-perch	Percopsis omiscomaycus

*/Names follow Bailey, 1955 (unpublished check list of the fishes of Michigan).

Table 2.--Number of fish taken with shocker at each station, computed to catch per hour, Carp River Drainage, Mackinac and Chippewa counties, June and July, 1951, and August, 1952

Stream drainage unit	Station Number	Time spent shocking (hours)	SPECIES												
			Brook trout	Brown trout	Rainbow trout	Northern pike	Yellow perch	White sucker	Northern brook lamprey	American brook lamprey	Sea lamprey	Blacknose dace	Mudminnow	Mottled sculpin
Carp River (lower half)	M3	22.00*	...	...	1	...	...	...	...	...	...	...	...	...
	20	1.33	...	...	1**	...	...	1	...	...	...	6	2	4
	21	1.00	...	...	...	...	...	4	...	3	...	8	1	10
	6	0.83	...	...	...	...	...	1	...	7	6	4	...	4
	17	1.25	...	...	...	...	...	1	1	10	9	4	4	5
	26	0.42	...	...	2	...	...	...	...	...	12	7	14	38
	4	1.08	...	...	...	...	...	5	7	6	2	4	1	3
Carp River (upper half)	18	1.25	...	10	...	...	...	...	...	5	10	3	...	5
	11	0.67	3	9	...	...	1	6	...	...	3	3	...	6
	13	1.00	1	1	...	...	...	1	...	6	...	3	...	8
	22	1.00	1	...	...	...	12	7	...	...	2	18	...	13
	27	1.33	...	...	...	1	3	3	...	...	...	...	26	2
	M2	24.00*	...	...	...	1	...	1	...	...	...	...	...	...
Red Creek	7	0.33	...	3	...	...	...	3	...	...	...	6	6	...
Flat Creek	24	0.50	...	...	...	...	...	2	...	...	...	2	4	2
	8	0.50	...	...	...	...	...	...	...	...	...	...	98	...
Platz Lake Outlet	5	0.50	...	...	...	...	...	14	...	8	...	8	4	6
No Name Tributary	30	1.33	1	...	1	...	...	...	...	2	...	7	11	3
North Fork Carp River	25	0.83	...	...	2	...	...	1	...	...	...	4	...	7
	1	0.92	4	...	3	...	...	...	...	...	1	8	...	8
East Lake Creek	23	0.75	...	...	...	3	...	5	...	...	...	...	37	...
Taylor Creek	2	0.75	3	...	...	...	...	...	...	3	1	3	4	...
Bissel Creek	3	1.17	17	...	...	...	...	3	...	4	...	4	3	4
	M1	1.50	4**	...	...	...	...	...	...	...	...	...	...	...
Scoles Creek	9	1.00	4	...	...	...	...	3	...	4	...	7	...	4
	28	0.75	...	...	...	...	...	1	...	...	...	12	1	...
South Branch of Carp	10	1.17	32	12	1	...	...	...	...	3	...	...	...	25
	29	1.25	1	10	...	...	...	2	...	34	1	14	6	26
	16	0.83	...	...	...	...	...	...	...	...	...	5	...	8
	19	0.58	...	...	...	...	...	19	...	...	...	2	2	...
Trib. to South Branch	15	0.42	...	...	...	...	...	7	...	...	...	...	12	...
	14	0.83	1	...	...	...	...	1	...	1	...	5	2	7
Ozark Creek	12	0.75	...	...	...	...	...	4	...	8	...	13	...	5
Mud Creek, a tributary	31	0.50	...	...	...	...	...	...	...	...	...	54	2	...
Schwaizinger Creek	32	1.08	...	...	...	...	...	...	...	...	...	1	...	10
Kneebone Creek	33	0.42	...	...	...	...	...	2	...	...	...	...	...	...

*Experimental gill net. Number of fish shown for this collection do not represent fish catch per hour but total fish caught.
**Catch per hour by hook and line.

Table 3.--Size range (total lengths in inches) for each species, summarized by stream drainage unit, Carp River Drainage, Mackinac and Chippewa counties, June and July, 1951, and August, 1952

Stream drainage unit	SPECIES													
	Brook trout		Brown trout		Rainbow trout		Northern pike	White sucker	American brook lamprey	Sea lamprey
Carp River (lower half)	...		...		...	(11.0)	...	2.3	3.6	1.8
	...		...		20.2		...	7.7	6.5	15.6
Carp River (upper half)	6.3	(7.1)	7.0	(9.9)	...		7.3	3.4	2.9	1.7
	8.9		12.2		...		20.1	16.5	6.7	13.4
Red Creek	...		7.0		...		...	5.8	...	...
Flat Creek	...		...		...		...	1.0	...	...
Platz Lake Outlet	...		...		...		...	3.1	5.7	...
	...		...		...		...	10.6	6.5	...
No Name Tributary	6.8		...		2.1		...	...	5.9	...
	...		...		...		...	...	6.2	...
North Fork Carp River	2.6	(4.4)	...		1.1	(4.1)	...	4.4	...	15.9
	6.9		...		7.6		...	...	...	...
East Lake Cr.	...		...		...		3.2	1.5	...	...
	...		...		...		3.6	2.9	...	...
Taylor Creek	6.7		...		...		...	...	5.0	17.0
	9.3		...		...		...	...	6.8	...
Bissel Creek	4.2	(6.8)	...		...		...	2.7	3.4	...
	10.1		...		...		...	6.9	6.5	...
Scoles Creek	6.0	(6.3)	...		...		...	2.8	2.4	...
	8.6		...		...		...	4.4	7.1	...
South Branch of Carp	2.0	(8.4)	4.9		9.3		...	1.2	2.2	2.7
	8.7		11.7		...		...	7.4	6.4	...

(Continued)

(Table 3, Continued)

Table 3.--Size range (total lengths in inches) for each species, summarized by stream drainage unit, Carp River Drainage, Mackinac and Chippewa counties, June and July, 1951, and August, 1952

Stream drainage unit	SPECIES						
	Brook trout	Brown trout	Rainbow trout	Northern pike	White sucker	American brook lamprey	Sea lamprey
Tributaries to South Branch	...	...	...	...	...	...	...
North Branch	6.1	...	...	...	2.5	6.1	...
South Branch	...	...	...	...	3.9	...	...
	...	...	...	...	4.6	...	...
Ozark Creek	...	...	...	...	2.8	4.9	...
	...	...	...	...	6.5	6.4	...
Mud Creek	...	...	...	...	...	...	...
Schwaizinger Creek	...	...	...	...	...	...	...
Kneebone Creek	...	...	...	...	2.8	...	...

Age and Growth Analysis

Due to the selectivity of the A. C. shocker with respect to the size of fish stunned (the chance of taking large fish is greater than for small fish), it is questionable whether young-of-the-year trout are limited only to those sections of stream indicated on the distribution map. In view of this consideration and also the number of trout in the collections thought to have been native fish natural reproduction of brook trout probably occurs in some portions of the upper Carp, North Fork of the Carp, Scoles Creek, South Branch of the Carp, Bissel Creek, and Taylor Creek. Reproduction of brown trout, even though no young-of-the-year were caught, may occur in the upper half of the Carp, South Branch of the Carp, and Red Creek. Rainbow trout probably spawn in all sizeable streams containing suitable gravel beds.

Both young-of-the-year and yearling brook trout (one annulus) show fairly good frowth as compared with the growth of this species in other localities. However, the growth of two-year-old brook trout (two annuli) appears to be retarded in comparison. No three-year-old brook trout were collected in the Carp River drainage. Studies completed to date suggest that growth of brook trout in Upper Peninsula streams is slower than that in Lower Peninsula streams. However, one must keep in mind that average lengths for the Carp and Pine drainages (in the table that follows) are conservative figures, which will be explained a little later on.

In contrast to brook trout, the number of two-year-old brown trout collected was greater than numbers of younger year-classes. Brown trout of age-group II comprised 81 percent of the total as compared to 21 percent for brook trout of the same age group. It is suspected, however, that a sizeable number of hatchery brown trout were represented in the total sample collected.

The total number of rainbow trout captured during this survey was too meager a sample from which to draw any valid comparisons. Of the total number

of trout (129) taken from the Carp River, 59 percent were brook trout, 33 percent brown trout and 8 percent rainbow trout.

The small size of the samples prevented comparisons of growth between streams of the Carp River system, and because of this limitation the collection from the watershed as a whole was used in computing the average lengths given in the table below. Average empirical lengths are compared with average calculated growth attained at the end of a growing season for trout in other localities. Since most of the brook trout collected in the Pine River and Carp River drainages were taken during June and July, the figures for these systems represent conservative averages.

Growth of Brook Trout in Various Michigan Streams

Stream	Age-group		
	I	II	III
Carp River System	2.3*/	5.8*/	8.4*/
Hunt Creek	2.7	6.0	9.6
North Branch of the Au Sable	2.6	5.8	9.5
Pigeon River	2.7	6.1	9.7
Sucker Creek	2.2	5.4	9.3
Pine River System	2.4*/	5.2*/	8.0*/

*/Average empirical length of fish whose season of growth was not complete and, therefore, actually had one less annulus than is indicated for this column.

Table 4.--Average total lengths in inches of trout in various age groups, summarized by stream drainage unit, Carp River Drainage, Mackinac and Chippewa counties, June and July, 1951, and August, 1952

Species and stream drainage unit	Age-group					Number of fish in each age-group (and size range)			
	0	I	II	III		0	I	II	III
BROOK TROUT									
Carp River (upper half)	...	7.6	12.6	...		... ...	6.3-9.4 (5)	12.6 (1)	... ...
No Name Tributary to Carp	...	6.8	...	...		... ...	6.8 (1)	... ...	... ...
North Fork Carp River	2.4	6.4	...	...		2.4-2.5 (2)	5.9-6.9 (2)	... ...	... ...
Taylor Creek	...	...	8.0	...		... ...	... ...	6.7-9.3 (2)	... ...
Bissel Creek	...	5.9	8.4	...		... ...	4.2-7.2 (17)	7.3-10.1 (8)	... ...
Scoles Creek	...	5.6	8.3	...		... ...	5.1-6.0 (3)	8.0-8.6 (2)	... ...
South Branch of Carp	2.3	5.3	7.6	...		2.0-3.1 (8)	3.6-8.2 (21)	6.9-8.7 (3)	... ...
North Tributary to South Branch	...	6.0	...	...		... ...	6.0 (1)	... ...	... ...
Average	2.3	5.8	8.4	...	Total fish	10	50	16	...
Weighted Average	2.4	6.2	9.0	...					
BROWN TROUT									
Carp River (upper half)	...	7.0	9.9	12.1		... ...	7.0 (1)	8.3-12.2 (17)	12.1 (1)
Red Creek	...	...	7.0	...		... ...	... ...	7.0 (1)	... ...
South Branch of Carp	...	5.5	9.5	...		... ...	4.9-6.0 (6)	8.3-11.7 (16)	... ...
Average	...	5.7	9.3	12.1	Total fish	0	7	34	1
Weighted Average	...	6.2	8.8	...					
RAINBOW TROUT									
Carp River (lower half)	...	5.1	7.8	20.2		... ...	5.1 (1)	7.8 (1)	20.2 (1)
Carp River (upper half)	...	...	11.0	...		...	...	11.0 (1)	...
No Name Tributary	2.1	...	...	...		2.1 (1)	...	...	...
North Fork Carp River	1.2	4.2	7.0	...		1.1-1.2 (2)	4.2 (1)	6.5-7.6 (2)	... ...
South Branch Carp River	...	...	9.3	...		...	...	9.3 (1)	...
Average	1.4	4.6	8.4	20.2	Total fish	3	2	5	1
Weighted Average	1.6	4.6	8.8	...					

Stocking Effects

Brook trout stocked in the Carp River during June of 1951 averaged 7.9 inches, total length, and were of age-group I. Since these fish were graded prior to stocking, it is unlikely that many trout under 7.0 inches were planted. Only four fish, or eight percent of the total number of fish in age-group I, were over 7.0 inches of which one was captured in 1952. It is highly probable that at least three of these fish were hatchery trout because of the conspicuous difference between their size and that of other fish captured in the same locality. It was extremely difficult to distinguish between hatchery trout and native trout in age-group II because of the small sample. Brook trout planted in 1950 averaged 7.3 inches and would fall under age-group II in 1951. Assuming that the brook trout of the 1950 planting were over 7.3 inches during the time of collection in 1951, by process of elimination at least four of the fish collected in their third year of life in Taylor and Bissel creeks and the South Branch of the Carp were native fish. The largest brook trout, 12.6 inches, captured in the upper half of the Carp (M2) in August, 1952, may have been one of a lot of two hundred 8.9-inch brook trout planted at Station 22 in May of 1952 (see Table 5). Of the total number of brook trout collected in 1951, it appears that at least 83 percent were native and all but approximately 4 percent in age-group I were native.

Plantings of brown trout that averaged 7.6 inches were made in May, 1951; these fish were of age-group II. Hence none of the trout in age-group I were hatchery trout. Like the brook trout in age-group II, it was impossible to differentiate between hatchery and native brown trout. Brown trout that averaged 9.3 inches and 9.7 inches were planted in 1950 in the upper half of the Carp which might account for the 12.1-inch three-year-old taken at Station 18. No rainbow trout were stocked in this watershed, thus all rainbows captured represented native inhabitants.

Table 5.- Record of recent fish plantings by stream and survey station number and a brief history of previous stocking

Stream and station number	Number, size, and species of fish planted and date of planting 1951	1952	Brief history of previous stockings
Carp River (lower half)			
20	200, 7.6 Brown Trout 5/15/51		Brook trout stocked in 1948 only at Station No. 17.
21	100, 7.6 Brown Trout 5/15/51		Brown trout stocked at all stations in 1949 and 1950 and at most stations in 1948. Also river stocked in 1945 and 1947 with brown trout.
6	300, 7.6 Brown Trout 5/15/51		
17	250, 7.6 Brown Trout 5/15/51		
26	150, 7.6 Brown Trout 5/15/51		
4	100, 7.6 Brown Trout 5/15/51		
Carp River (upper half)			
18	100, 7.9" Brook Trout 6/6/51 150, 7.6" Brown Trout 5/15/51		Stocked with brook trout in 1945, '48, '49 and 1950. 3,000 fingerling brook trout stocked in 1947 and 6,000 in 1948, by USFWS. Brown trout stocked in 1946, '47, '48, '49 and 1950.
11	100, 7.9" Brook Trout 6/6/51		
13	150, 7.9" Brook Trout 6/6/51		
22	50, 7.9" Brook Trout 6/6/51	200, 8.9" Brook Trout 5/12/52	
Carp River, S. Br.			
10	50, 7.9" Brook Trout 6/6/51 100, 7.6" Brown Trout 5/15/51		Brook trout stocked in 1945, '46, '48, and at all stations in 1950. Brown trout stocked in '47, '48, '49 and 1950.
29	50, 7.9" Brook Trout 6/6/51 100, 7.6" Brown Trout 5/15/51	200, 8.9" Brook Trout 5/12/52	
16	50, 7.9" Brook Trout 6/6/51		
19	50, 7.9" Brook Trout 6/6/51		
No Name Trib. to Carp River			
30	20,000 1.5" Brook Trout in Spring Lake, 1 mile above station		None
North Fork Carp			
1			Heavily stocked with Brook Trout in 1948; stocked '49 and 1950.
Bissel Creek			Planted by the USFWS. 4,000 fingerling Brook Trout in '46; 2,000 fingerling Brook Trout in '47; and 3,500 fingerling Brook Trout in 1948.
Taylor Creek			
2			Stocked with 9.1 Brook Trout in '48 and 7.3" Brook Trout in 1950.
Kneebone Creek			
33	200, 7.3-7.9 Brook Trout	50, 8.9" Brook Trout	Stocked with legal size Brook Trout in 1949 and 1950.

Physical Features

The Carp River, located in Moran, St. Ignace and Brevoort townships, Mackinac County, and Trout Lake Township, Chippewa County, lies within the Marquette National Forest and drains an area of approximately 41,000 acres. The surrounding terrain is divided into two main types. East of Station 18 it is flat to slightly rolling, and wooded with tag alders, aspen, and birch. Stream banks of the main Carp are high in the vicinity of the mouth and gradually decrease in height above Station 13. West of Station 18 the Carp flows through an area of sandy soil and jack pine plains. Above Station 19, on the South Branch of the Pine and both its tributaries, the immediate shoreline is swampy. Tag alder is generally the dominant woody plant lining the stream banks throughout the system; logs, undercut banks and overhanging brush are the main cover available for trout.

Streams of the watershed during the time of survey were at a summer high stage. Based on stream depths recorded at this time, it would appear that during normal levels tributary streams of the Carp are generally shallow and small. During the 1951 survey the main Carp River had an average velocity of 1.6 ft./sec. and in 1952 1.8 ft./sec. Taylor and Bissel creeks and a tributary to the South Branch of the Carp (Station 15) were outstandingly sluggish streams.

The predominant bottom soil types are sand and silt. Gravelly stretches occur in Red Creek, North Fork of the Carp, and the lower half of the Carp. In general, there is only little vegetation in streams of this watershed. Cover for trout and pools were classed as fair. Water of the main Carp is typically light brown in color and clear at and above Station 4. Murky water below Station 4 is probably the result of severe bank erosion which occurs along much of the lower Carp River. Except for Kneebone, Schwaizinger, and Flat creeks, all tributaries run clear, and vary in color from light brown to colorless.

During the 1953 temperature survey, run by the author, a stream tributary to the lower Carp was discovered which had not been surveyed (temperature survey Station 48). Reports from personnel of the U. S. Ranger station in Moran indicate that large brook trout are taken and that fishing quality is good in this stream. At the place where temperatures were taken, the stream averaged 5 feet wide and 1 foot deep. Stream flow was rapid, the water was clear, and the bottom consisted of gravel and sand. A beaver dam was located approximately 200 yards upstream from the temperature station.

Table 6.--Physical features

Stream and station number	Average width	Average depth	Current	Pool classification	Cover for trout	Vegetation	Percent - bottom soil types				
							Sand	Gravel	Silt	Clay	Others
Carp River (lower half)											
M3	...	3-4'	Sluggish	...	Good	Poor	100	...	...	...	...
20	61'	13"	Rapid	Fair	Fair	Poor	...	...	...	...	Rubble, 33 Bedrock, 67
21	44'	18"	Rapid	Fair	Fair	Poor	65	...	5	25	Detritus, 5
6	52'	2'	Rapid	Fair	Fair	Poor	5	95	...	...	...
17	44'	2'	Rapid	Good	Poor	Poor	75	...	...	25	...
26	44'	2'	Rapid	Good	Good	Poor	...	30	...	...	Rubble, 70
4	26'	18"	Rapid	Fair	Poor	Poor	100	...	...	...	...
Carp River (upper half)											
18	41'	10"	Rapid	Poor	Poor	Poor	100	...	...	...	...
11	44'	18"	Rapid	Fair	Fair	Poor	100	...	...	...	...
13	26'	7"	Rapid	Fair to poor	Poor	Poor	100	...	...	...	...
22	28'	1'	Rapid	Fair	Fair	Poor	75	20	...	...	Muck, 5
27	28'	27"	Rapid	Fair	Good	Fair	75	...	25	...	...
M2	...	3-7'	Sluggish	...	Good	Fair	...	...	(?)	...	...

Red Creek												
7	9'	6"	Rapid	Fair to good	Good	Fair	50	40	10	...	...	
Flat Creek												
24	13'	2'	Rapid	Poor	Good	Poor	...	...	20	80	...	
8	5'	5"	Sluggish	Poor	Poor	Poor	% (Muck, silt, and detritus)					
Platz Lake Outlet	9'	9"	Rapid	Fair to good	Good	Fair	58	...	30	3	Detritus, 9	
5												
No Name Tributary												
30	8.5'	9"	Rapid	Fair to good	Good	Fair	45	...	50	5	...	
North Fork Carp River												
25	33'	16"	Rapid	Fair	Good	Poor	5	90	5	...	...	20
1	16'	12"	Rapid	Good	Good	Poor	25	75	...	...	...	'
East Lake Creek, a tributary to North Fork												
23	30'	4"	Rapid	Poor	Fair	Poor	50	...	30	...	Detritus, 20	
Taylor Creek												
2	17'	3'	Sluggish	Fair	Fair	Fair	...	...	100	...	...	
Bissel Creek												
3	10'	1'	Sluggish	Fair	Fair	Fair	Trace	...	90	...	Detritus, 10	
M1	...	...	Sluggish	Good	Fair	Fair	...	(Trace	(Muck and detritus)			
Scoles Creek												
9	10'	1'	Rapid	Good	Good	Fair	85	...	5	...	Detritus, 10	
28	10'	11"	Rapid	Good	Good	Poor	100	...	...	...	...	
South Branch of Carp												
10	17'	18"	Rapid	Fair to good	Good	Fair	90	Trace	5	...	Detritus, 5	
29	17.5'	20"	Rapid	Fair	Poor to fair	Fair	95	...	5	...	...	
16	13'	1'	Rapid	Good	Good	Poor	20	Trace	75	...	Detritus, 5	

19	30'	1.5'	Sluggish	Fair	Fair	Poor	...	...	...	...	Pulpy peat
Tributaries to the S. Br. of Carp												
15	6'	3"	Sluggish	Fair	Good	Poor	60	...	40	...	...
14	6.7'	4"	Rapid	Fair	Good	Poor	65	...	30	...	Detritus, 5
Ozark Creek												
12	13'	1'	Rapid	Good	Good	Poor	95	...	5	...	...
Mud Creek, a trib. to Ozark Creek												
31	6.5'	7"	Rapid	Fair	Good	Good	90	...	5	...	Detritus, 5
Schwaizinger Creek												
32	10.5'	11"	Rapid	Good	Good	Poor	90	...	...	...	Detritus, 10
Kneebone Creek												
33	12.5'	20"	Sluggish	Fair	Good	Fair	95	...	5	...	...

Temperature Survey

Routine procedure at fish collection stations included the recording of water and air temperatures. But because of the considerable length of time required to complete a stream survey and the likelihood that cool weather would prevail a goodly share of the time during this period, an independent temperature survey was taken during hot weather. Hence a temperature series was obtained (Table 7) during the afternoons of June 3 and 4, 1952, following a short period with higher than normal summer temperatures. The following summer, on July 22 and 23, 1953, another temperature series was run during and following an abnormally long hot spell. Besides affording a direct comparison of temperatures for the two years, the data obtained from additional stations in 1953 were essential for management recommendations.

In order to determine which streams or portions thereof might reach temperatures critical for trout, the following material was consulted: stream temperature surveys, temperatures taken in conjunction with fish collections (1951 and 1952), and climatological data (U. S. Weather Bureau, 1942 through 1952) recorded at Garnet, Michigan, the nearest temperature recording station. The entire length of East Lake, Mud, and probably Ozark creeks, Red and Flat creeks, and the upper reaches of the South Branch of the Carp, upper Carp, and Scoles Creek evidently attain temperatures unsuitable for trout during hot weather.

Portions of the main Carp below Station 11 may become undesirable for trout in periods of extreme hot weather. It is believed that under average weather conditions the moderating effects of tributaries and springs along the course of the main stream below Station 11 are great enough to maintain stream temperatures within the tolerable limits of trout. Above Station 11, the influx of warm water from Carp and Frenchman lakes exercises a decided influence on the river by warming it for a considerable distance downstream.

Although some trout were taken in this area, it is likely that the major portion of this stretch remains undesirable for trout during the warmer months.

It is apparent from temperatures taken during both summers that the main Carp is cool just below temperature Station 13 to above Station 4. Warm temperatures are then characteristic of the river below Station 4. Because the road was impassable between stations 4 and 17 during the temperature survey in 1953, no attempt was made to obtain temperatures on the North Fork of the Carp immediately above its confluence with the main Carp. Temperatures taken at Station 17 indicate that little or no cooling effect is exerted by this major tributary.

Although air temperatures prior to and during the temperature survey in 1953 were higher in contrast to those taken in 1952, stream temperatures did not rise much above those recorded the previous year, and, therefore, did not greatly influence management recommendations. Cool water temperatures found on July 23, 1953, particularly at stations 45, 46, 47, and 49, may be misleading because they were taken in the late morning after the termination of the hot spell the preceding night. Particularly deceiving may be temperatures taken at stations 46 on Flat Creek and 47 (7) on Red Creek during 1953 as compared to those obtained in 1952. However, these extreme differences in water temperature recorded for each of these stations as compared to those taken on the main Carp (49) and Platz Lake Outlet (45 or 5) in 1952 and 1953 may be attributed to smaller volumes of water in these streams, making the streams more subject to changes in air temperature.

It is thought that provision of shade, reforestation on land bordering the river and its tributaries, and stream improvement devices to increase the flow of sluggish streams will lower temperatures considerably throughout the drainage system.

Table 7.--Temperature survey data on the Carp River Drainage, Mackinac and Chippewa counties, July, 1952 and July, 1953

(*) indicates same location as station immediately above

Stream and station number	Location	Date	Time	Air temperature (°F)	Water temperature (°F)
Carp River (lower half)					
20	T42N R3W S20	7-3-52	3:05PM	71	70
21	T42N R3W S18	7-3-52	2:55PM	77	69
49	T42N R4W S11	7-23-53	12:00PM	63	68
17	T42N R4W S4	7-3-52	3:53PM	72	70
*44	T42N R4W S4	7-22-53**	8:30PM	68	76
4	T42N R5W S2	7-3-52	4:40PM	70	70
*41	T42N R5W S2	7-22-53	4:10PM	79	76
Carp River (upper half)					
18	T43N R5W S32	7-4-52	2:20PM	80	69
*27	T43N R5W S32	7-22-53	5:30PM	78	72
11	T43N R5W S30	7-4-52	2:35PM	71	70
*26	T43N R5W S30	7-22-53	5:45PM	75	72
13	T43N R6W S13	7-4-52	4:05PM	74	71
*24	T43N R6W S13	7-22-53	3:30PM	79	74
22	T43N R6W S2	7-4-52	3:35PM	76	72
*23	T43N R6W S2	7-22-53	3:15PM	79	75

Red Creek					
7	T42N R4W S24	7-3-52	3:35PM	73	74
*47	T42N R4W S24	7-23-53	10:15AM	63	66
Flat Creek					
8	T42N R4W S16	7-3-52	3:45PM	72	80
46	T42N R4W S16	7-23-53	9:30AM	65	70
Platz Lake Outlet					
5	T44N R3W S17	7-3-52	2:40PM	79	68
*45	T44N R3W S17	7-23-53	10:55AM	63	66
North Fork Carp River					
1	T43N R4W S19	7-3-52	4:10PM	74	71
*39	T43N R4W S19	7-22-53	7:05PM	74	74
40	T43N R4W S6			(temperatures not recorded)	
Taylor Creek					
2	T43N R5W S23	7-3-52	4:20PM	75	67
*37	T43N R5W S23	7-22-53	6:55PM	74	71
Bissel Creek					
3	T43N R5W S34	7-3-52	4:45PM	70	66
*38	T43N R5W S34	7-22-53	5:00PM	75	66
Scoles Creek					
9	T43N R6W S36	7-4-52	2:45PM	72	70
28	T43N R6W S35	7-22-53	12:45PM	79	80
South Branch of Carp					
29	T43N R5W S32	7-22-53	5:30PM	77	67
10	T43N R6W S25	7-4-52	2:40PM	74	62
35	T43N R6W S26	7-22-53	12:55PM	81	67

34	T43N R6W S26	7-22-53	12:50PM	81	69
16	T43N R6W S22	7-4-52	3:05PM	76	66
**31	T43N R6W S22	7-22-53	2:40PM	80	64
South Tributary to South Branch					
33	T43N R6W S26	7-22-53	1:30PM	81	66
15	T43N R6W S22	7-4-52	3:15PM	80	73
**30	T43N R6W S22	7-22-53	2:45PM	80	70
North Tributary to South Branch					
50	T43N R6W S26	7-22-53	1:05PM	81	64
14	T43N R6W S23	7-4-52	3:00PM	75	64
**32	T43N R6W S23	7-22-53	2:30PM	80	65
Ozark Creek					
12	T43N R6W S12	7-4-52	4:10PM	71	74
**25	T43N R6W S12	7-22-53	3:40PM	80	77
Mud Creek					
36	T43N R5W S8	7-22-53	3:54PM	79	76
No Name Creek Tributary to Carp (lower half)					
48	T42N R4W S11	7-23-53	11:45AM	63	65
No Name Tributary to Carp (lower half)					
43	T42N R4W S4	7-22-53	8:45PM	67	69

**Temperatures of 1953 taken by M. G. Galbraith, Jr.

Table 8.--Temperatures and notes taken at the time of the biological and physical inventory

Stream and station number	Fish collection station number	Temp. Air	Temp. Water	Time	Date	Notes
Carp River (lower half)	M3	60	60	9:00PM	8-22-52	High banks on one side severely eroded, shade is sparse.
	20	68	64	11:00AM	6-25-52	Bank erosion severe.
	21	68	63	11:30AM	6-24-52	Bank erosion severe, shade - poor.
	6	75	65	4:20PM	6-24-52	Shade - poor.
	17	65	62	2:00PM	6-23-52	Shade - poor, bank erosion severe.
	26	74	69	5:30PM	6-25-52	Shade - poor.
	4	57	56	10:10AM	6-20-52	Shade - poor, bank erosion severe.
Carp River (upper half)	18	60	63	3:50PM	6-19-52	Bottom of shifting sand, some bank erosion, shade - poor.
	11	60	63	2:20PM	6-19-52	Shade - fair.
	13	58	61	3:25PM	6-20-52	Bank erosion severe, poor shade, shifting sand bottom.
	22	68	67	2:20PM	6-20-52	Two beaver dams, bank erosion, shade - poor.
	27	62	68	11:00AM	8-11-52	
	M2	63	65	8:45AM	8-13-52	Sluggish.
Red Creek	7	67	65	10:00AM	6-24-52	Beaver dams above and below shocking station, gravel covered by silt and sand, water current slow.
Flat Creek	24	71	65	2:10PM	6-24-52	Water slow in 1952, 1/2 mile above station are beaver ponds and 2 old beaver dams below which slow current considerably.
	8	70	64	9:20AM	6-24-52	Current slow, shade poor - old beaver ponds above and below station.
Platz Lake Outlet	5	76	69	3:30PM	6-24-52	Shifting sand bottom, shade and cover good; some beaver dams reported.
No Name Tributary	30	63	60	4:45PM	8-12-52	
N. Fork Carp River	25	69	69	6:15PM	6-25-52	Good shade; subject to high degree of flooding.
	1	73	62	12:00PM	6-23-52	Shade - fair.
	10	No temperatures recorded			7-22-53	Beaver dams numerous which warm areas; springs numerous.
East Lake Creek Tributary to North Fork of Carp	23	75	81	2:25PM	6-25-52	Shade - fair - shallow, private dam at source.
Taylor Creek	2	69	56	10:40AM	6-23-52	Sluggish stream; lowland and only brush covered. Beaver dams reported.
Bissel Creek	3	63	54	11:40AM	6-20-52	Poor shade, sluggish; springs in area, many logs across stream. Beaver dam marsh below road culvert and beaver dam upstream; stream above RR bridge fairly fast. Beaver ponds below RR bridge heavily silted.
Scoles Creek	9	54	56	11:00AM	6-19-52	Shade - poor.
	28	67	63	3:25PM	8-11-52	Surrounding area is jack pine plain.
South Branch of Carp	10	61	55	12:45PM	6-19-52	Shifting sand.
	29	66	67	10:00AM	8-12-52	
	16	58	59	2:30PM	6-18-52	
	19	64	65	5:00PM in 1951 survey		Poor shade; large beaver dam impoundment floods marsh and probably warms water considerably. Current very sluggish.
Tributary to South Branch of Carp	15	55	59	9:45AM	6-19-52	Sluggish, shallow stream.
	14	64	57	12:15PM	6-18-52	Partly shaded.
Ozark Creek	12	59	62	4:30PM	6-20-52	Shade poor; beaver dam above station, 100 yards above bridge.
Mud Creek Tributary to Ozark	31	72	70	11:10AM	8-15-52	Drains warm, shallow Mud Lake; old beaver dam at head of stream at outflow of L[illegible].
Schwaizinger Creek	32	65	67	2:30PM	8-21-52	
Kneebone	33	67	56	10:10AM	8-21-52	Pollution from homes, schools and busi[illegible], sewers empty into creek; sluggish flow.

Conclusions and Recommendations

Brook trout were the most prevalent and widely distributed trout in the drainage, followed by brown and rainbow trout. From observations and fish collections, Bissel Creek and the South Branch of the Carp appeared to be the better brook trout waters. Growth data indicate fairly rapid growth of brook trout in Bissel Creek, and growth of brook trout in the drainage system as a whole compares fairly well with growth of brook trout from other localities as reported by E. Cooper (1951); the growth rate is better than the rate reported for the Pine River drainage, Mackinac and Chippewa counties (Galbraith, 1954). Of the total number of trout (129) taken from the Carp River system during the survey, 59 percent were brooks, 33 percent browns and 8 percent rainbows.

Unless fishing pressure is heavy on the main Carp north of Station 18 during June or later, and evidence indicates that this is not the case, it is recommended that brook trout be planted early in April or May, and later season plantings consist only of rainbow trout. This plan is an attempt to harvest a maximum number of trout and to afford better fishing throughout the warmer months. Brook trout plantings should be discontinued in the locality of Station 19 on the South Branch of the Carp during June and later until improvements can be made to lower stream temperatures. Since recent investigations show that recoveries from rainbow trout plantings are much greater than recoveries from brown trout plantings, it appears advisable to discontinue the stocking of brown trout altogether.

In the event of a watershed improvement program, improvement of tributaries--with the view toward lowering water temperature--would probably cool the entire length of the main Carp (except that area immediately below Frenchman and Carp lakes) to within desirable limits for brook trout during summer months. Old beaver dams adversely affecting fish conditions by warming stream

temperatures should be removed. Severe erosion along banks of the main Carp are in immediate need of stabilization because, in addition to raising the turbidity of the water, the eroding sand exerts destructive scouring action, and sand and clay cover potential spawning areas for trout.

Rather than to take streams of the watershed separately and make recommendations necessary for their improvement, a map is included at the end of the report (Map IV) which designates portions of the system in need of improvement. Streams which are unworthy of improvement because of the uncertainty that results would be of any practical benefit to the stream are Mud, Ozark, and East Lake creeks.

On Map II, which designates trout and non-trout waters, rainbow and brown trout waters have been combined because no distinctive features of the streams were noted which would favor one species over the other. The entire Carp River below Station 27 has been designated as rainbow and brown trout water because it is believed that very seldom does it reach lethal temperatures for these species. Probably extension of trout water on Flat and Red creeks as shown on Map V depends entirely on the degree of success of stream improvement in lowering the water temperatures. Data on these two streams are insufficient for drawing up management recommendations. Additional investigation should be carried out on these streams in order to determine the practicability of improving them.

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Map I

Stream temperature survey of the Carp River drainage system. Air temperatures are recorded in blue, and water temperatures in red. Black circles represent stations done in 1952, whereas those in blue were done in 1953.

R. 6 W.

R. 5 W.

R. 4 W.

R. 3 W.

T. 44 N.

T. 43 N.

CHIPPEWA COUNTY
MACKINAC COUNTY

Trout Lake

Ozark

DAYTON LAST

Kenneth

Greene

Moran

BUCKEYE

JACKSON TINDLE

WIGGINS

PLATZ LAKE

ST. MARTINS BAY

TROUT LAKE

FRENCHMAN LAKE

CARP LAKE

TWIN LAKE

JOHNSON LAKE

HUCKLEBERRY LAKE

EAST LAKE

DULUTH

RIVERSIDE CREEK

M-48

SCHWAITINGER CR.

CARP TRAIL

SOUTH CREEK

OZARK TRUCK TRAIL

MUD CREEK

J.T. CAMP TRUCK TRAIL

SOUTH BRANCH CARP RIVER

SOUTH BRANCH TRUCK TRAIL

DELLS MILLS TRAIL

CARP RIVER TRAIL

SCOLES CREEK

JACKSON TRUCK TRAIL

GOODEREAU TRUCK TRAIL

BISSEL CREEK

TAYLOR CREEK

SHORE TO SHORE R.R.

ATLANTIC & PACIFIC R.R.

NORTH BRANCH EAST LAKE CREEK

EAST LAKE CREEK

CARP RIVER

FLAT CREEK

RED CREEK

U.S. 2

PINE RIVER

INSTITUTE FOR FISHERIES RESEARCH

CARP RIVER WATERSHED

MACKINAC AND CHIPPEWA COUNTIES

MAP MODIFIED FROM DEPARTMENT OF CONSERVATION CO. MAP

LEGEND

- PAVED ROAD
- GRAVELED ROAD
- GOOD DIRT ROAD
- POOR DIRT ROAD
- INTERMITTENT STREAM

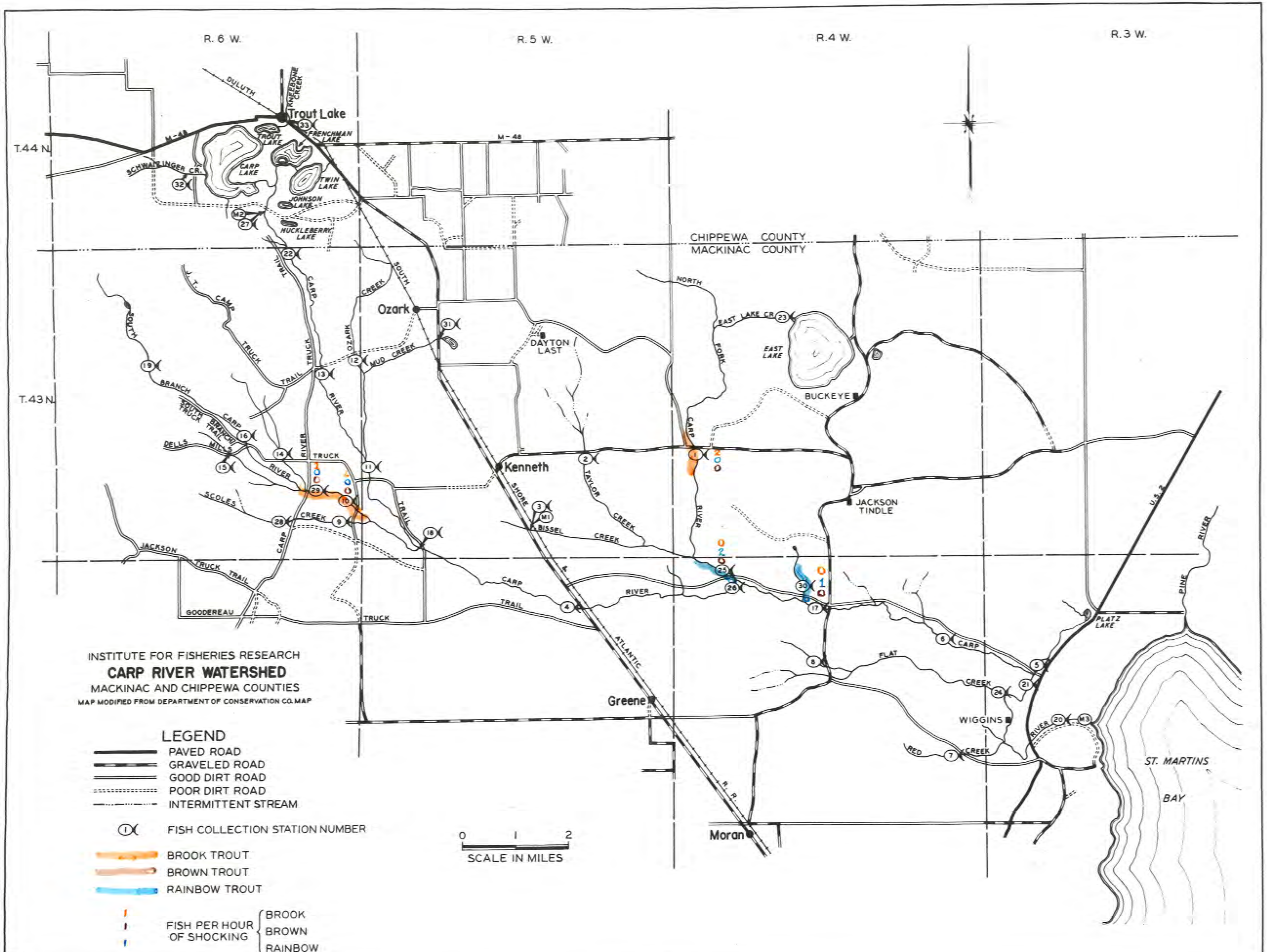
0 1 2

SCALE IN MILES

W.L.C.

Map II

Distribution and catch per hour of young-of-the-year trout.



R. 6 W.
R. 5 W.
R. 4 W.
R. 3 W.
T.44 N.
T.43 N.
Trout Lake
Ozark
Kenneth
Greene
Moran
BUCKEYE
JACKSON
TINDLE
WIGGINS
DAYTON
LAST
CHIPPEWA COUNTY
MACKINAC COUNTY
EAST LAKE
PLATZ LAKE
ST. MARTINS BAY
INSTITUTE FOR FISHERIES RESEARCH
CARP RIVER WATERSHED
MACKINAC AND CHIPPEWA COUNTIES
MAP MODIFIED FROM DEPARTMENT OF CONSERVATION CO. MAP
LEGEND
PAVED ROAD
GRAVELED ROAD
GOOD DIRT ROAD
POOR DIRT ROAD
INTERMITTENT STREAM
FISH COLLECTION STATION NUMBER
BROOK TROUT
BROWN TROUT
RAINBOW TROUT
FISH PER HOUR OF SHOCKING
BROOK
BROWN
RAINBOW
SCALE IN MILES
W.L.G.

Map III

Distribution of Brook, Brown, and Rainbow trout (all ages).

R. 6 W. R. 5 W. R. 4 W. R. 3 W.

T. 44 N.

T. 43 N.

Trout Lake
Ozark
Kenneth
Greene
Moran
DAYTON LAST
BUCKEYE
JACKSON TINDLE
WIGGINS
PLATZ LAKE
ST. MARTINS BAY

CHIPPEWA COUNTY
MACKINAC COUNTY

DULUTH
KNIFE & FORK CREEK
M-48
FRENCHMAN LAKE
TROUT LAKE
CARP LAKE
TWIN LAKE
JOHNSON LAKE
HUCKLEBERRY LAKE
SCHWALTINGER CR.
TRAIL
CARP
SOUTH CREEK
OZARK
MUD CREEK
NORTH EAST LAKE CR.
FORK
EAST LAKE
J.T. CAMP TRUCK TRAIL
SOUTH BRANCH
DELLS MILLS
RIVER
TRUCK
SCOLES CREEK
JACKSON TRUCK TRAIL
GOODEREAU
TAYLOR CREEK
SHORE
BISSEL CREEK
ATLANTIC R. R.
FLAT CREEK
RED CREEK
U.S. 2
PINE RIVER

INSTITUTE FOR FISHERIES RESEARCH
CARP RIVER WATERSHED
MACKINAC AND CHIPPEWA COUNTIES
MAP MODIFIED FROM DEPARTMENT OF CONSERVATION CO. MAP

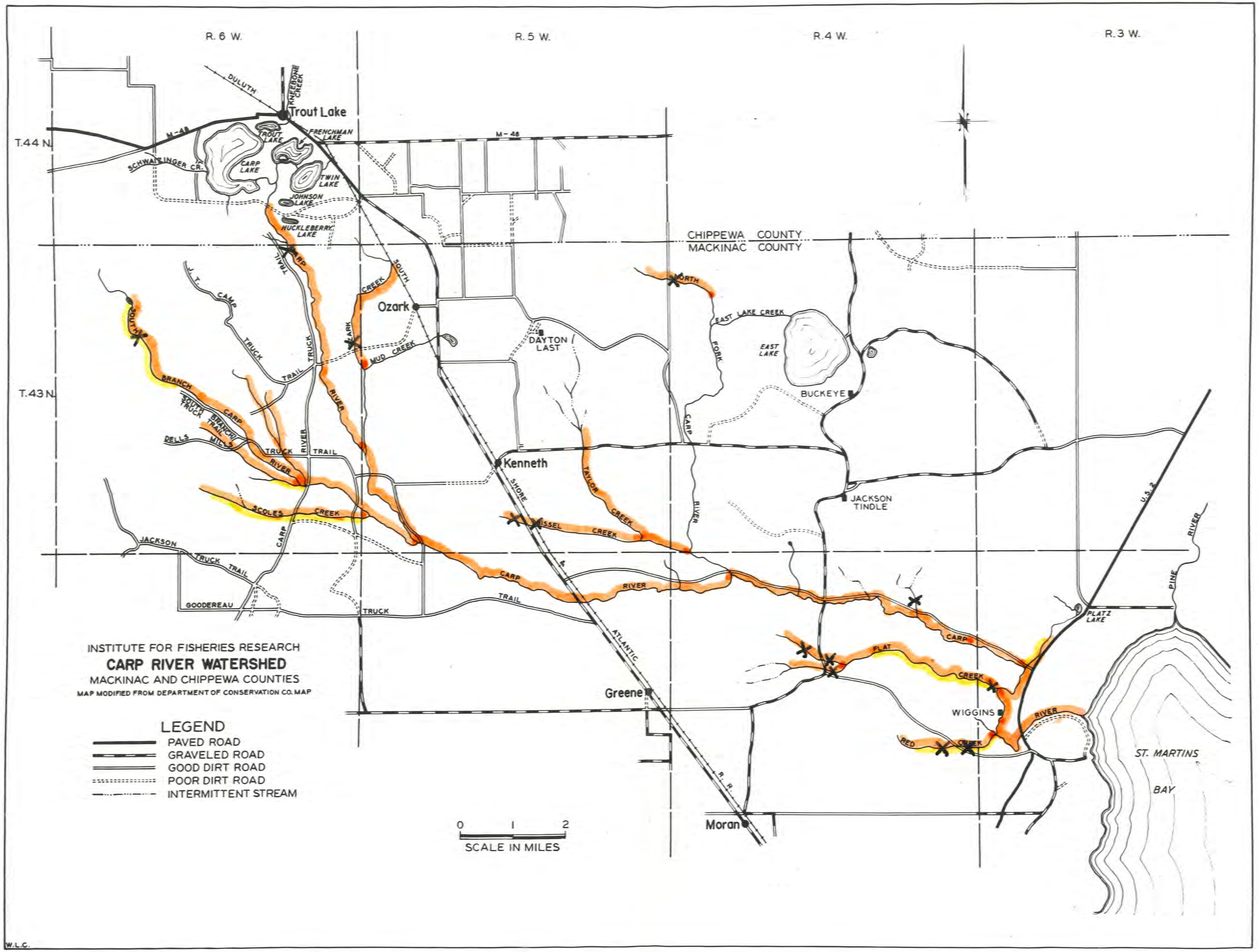
LEGEND
- PAVED ROAD
- GRAVELED ROAD
- GOOD DIRT ROAD
- POOR DIRT ROAD
- INTERMITTENT STREAM
- FISH COLLECTION STATION NUMBER
- BROOK TROUT
- BROWN TROUT
- RAINBOW TROUT
- FISH PER HOUR OF SHOCKING { BROOK, BROWN, RAINBOW

0 1 2
SCALE IN MILES

W.L.G.

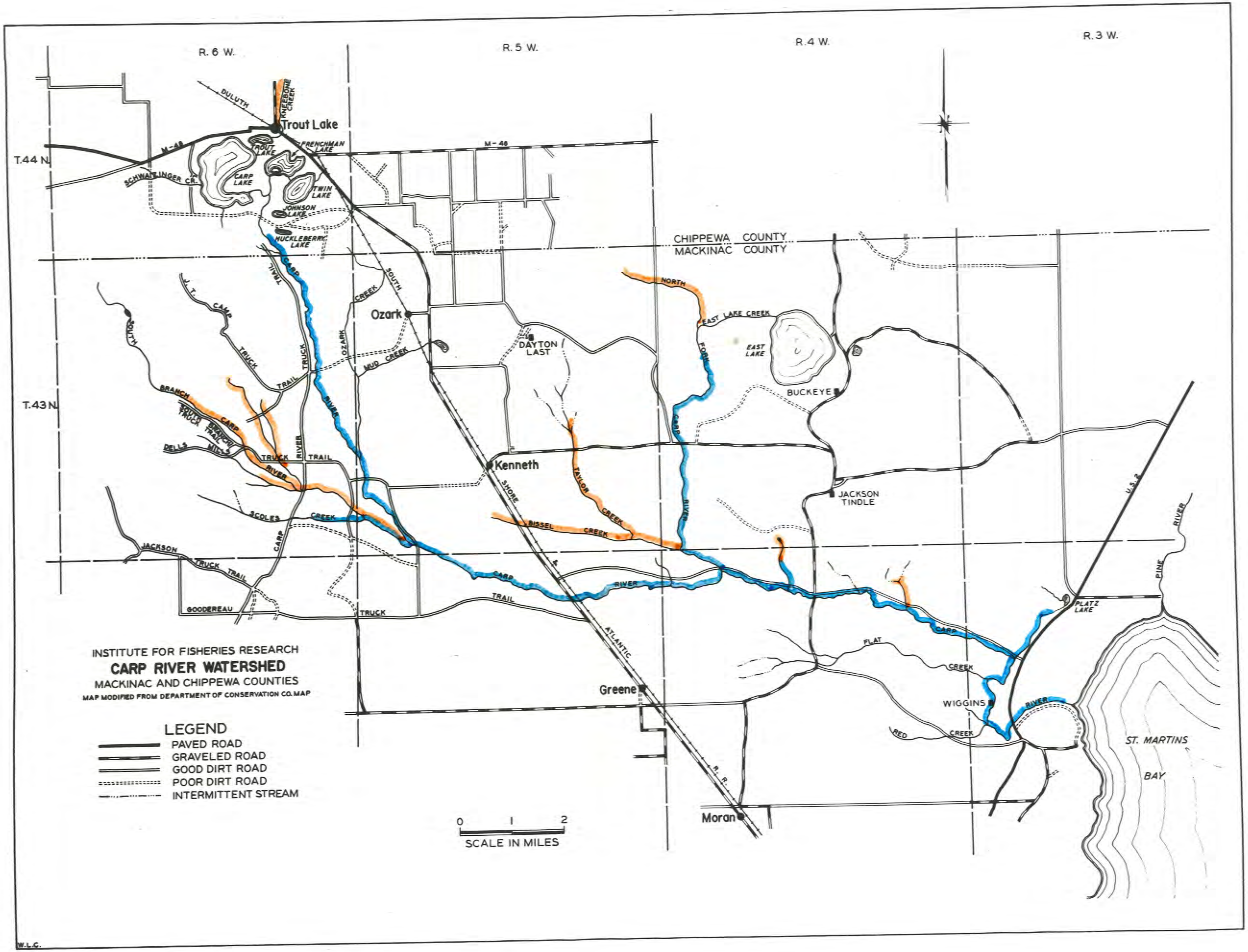
Map IV

Proposed stream improvement and beaver dam locations. Red indicates stream sections needing improvement, yellow indicates possible extension of trout water, and the letter X indicates beaver dams.


R. 6 W.
R. 5 W.
R. 4 W.
R. 3 W.
T. 44 N.
T. 43 N.
Trout Lake
DULUTH
KNEEBONE CREEK
M-48
TROUT LAKE
FRENCHMAN LAKE
CARP LAKE
SCHWATZINGER CR.
TWIN LAKE
JOHNSON LAKE
HUCKLEBERRY LAKE
CHIPPEWA COUNTY
MACKINAC COUNTY
Ozark
DAYTON LAST
EAST LAKE CREEK
EAST LAKE
BUCKEYE
Kenneth
JACKSON TINDLE
SOUTH BRANCH CARP RIVER
SCOLES CREEK
DELLS
MILLS
MUD CREEK
TAYLOR CREEK
RISSEL CREEK
CARP RIVER
FLAT CREEK
RED CREEK
JACKSON TRUCK TRAIL
GOODEREAU
TRUCK TRAIL
SHORE
ATLANTIC
R. R.
U.S. 2
PINE RIVER
PLATZ LAKE
WIGGINS
Greene
Moran
ST. MARTINS BAY
INSTITUTE FOR FISHERIES RESEARCH
CARP RIVER WATERSHED
MACKINAC AND CHIPPEWA COUNTIES
MAP MODIFIED FROM DEPARTMENT OF CONSERVATION CO. MAP
LEGEND
PAVED ROAD
GRAVELED ROAD
GOOD DIRT ROAD
POOR DIRT ROAD
INTERMITTENT STREAM
0 1 2
SCALE IN MILES
W.L.C.

Map V

Distribution of brook and rainbow trout water. Red indicates brook trout water and blue designates rainbow trout water.


R. 6 W.
R. 5 W.
R. 4 W.
R. 3 W.
T. 44 N.
T. 43 N.
DULUTH
KNEEBONE CREEK
Trout Lake
M-48
FRENCHMAN LAKE
TROUT LAKE
CARP LAKE
TWIN LAKE
SCHWATZINGER CR.
JOHNSON LAKE
HUCKLEBERRY LAKE
CHIPPEWA COUNTY
MACKINAC COUNTY
CARP RIVER
TRAIL
SOUTH
CREEK
Ozark
OZARK
MUD CREEK
J. T. CAMP TRUCK TRAIL
SOUTH BRANCH
SOUTH BRANCH CARP RIVER
TRUCK TRAIL
DELLS
MILLS
TRUCK TRAIL
SCOLES CREEK
JACKSON TRUCK TRAIL
GOODEREAU TRUCK TRAIL
NORTH FORK CARP RIVER
EAST LAKE CREEK
EAST LAKE
DAYTON LAST
BUCKEYE
Kenneth
SHORE
TAYLOR CREEK
BISSEL CREEK
JACKSON TINDLE
ATLANTIC
R. R.
Greene
Moran
U.S. 2
PINE RIVER
PLATZ LAKE
FLAT CREEK
WIGGINS
RED CREEK
RIVER
ST. MARTINS BAY
INSTITUTE FOR FISHERIES RESEARCH
CARP RIVER WATERSHED
MACKINAC AND CHIPPEWA COUNTIES
MAP MODIFIED FROM DEPARTMENT OF CONSERVATION CO. MAP
LEGEND
PAVED ROAD
GRAVELED ROAD
GOOD DIRT ROAD
POOR DIRT ROAD
INTERMITTENT STREAM
0 1 2
SCALE IN MILES
W.L.C.