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Inst.for Fish. Res.
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Extra

February 23, 1954

REPORT NO. 1410

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

By Merle G. Galbraith, Jr.

Abstract

A biological and physical survey was made of streams in the Pine River watershed during the summer of 1952. The purposes of investigation were to determine the need for watershed improvement and to provide data on which fishery management recommendations could be based. Fish collecting was done mainly with an alternating current electric shocking machine. Physical characteristics of the stream were noted at the collecting stations, and a temperature survey was made.

The Pine River and its tributaries drain approximately 131,000 acres of land. This terrain consists of two main land types. East of Fibre it is flat and the soil is mostly clay. West of Fibre the terrain is slightly rolling and sandy, and about half this area is wooded with jack pine and aspen.

High turbidity, mostly due to clay deposits in the stream bed, is typical of the Pine River east of Range 4 West and the lower stretches of the majority of its tributaries. The drainage system, except for Sullivan Creek, the upper reaches of Biscuit Creek, North Fork of Silver Creek, and Trout Brook, is characterized by light brown water. Sand is the chief stream bottom soil; other soils present are clay, silt and gravel.

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*Field work, analysis of data, and preparation of the report were undertaken with Federal Aid to Fish Restoration funds under Dingell-Johnson Project Number F-2-R-1 and F-2-R-2.

A partial temperature survey was made on two consecutive afternoons during a period of warm weather in 1952, and additional readings were taken in 1953 to complete this survey. Forty-three temperature stations were set up on 22 of the 25 major streams that were studied. The readings indicated that high air temperatures elevate water temperatures above the critical level for trout in a considerable portion of the stream system, particularly that part of it which drains the farming areas.

Twenty-five species of fish were represented at the 58 stations established on the drainage system. These species included brook trout, rainbow trout, northern pike, yellow perch, largemouth bass, brown bullhead, mottled sculpin, American brook and sea lampreys, brook stickleback, mudminnow, blacknose, longnose, and pearl dace, and creek chub. Of the 333 trout collected, brook trout constituted 89 per cent of the total.

Twelve of the 25 streams examined contained trout. Of these 12, brook trout were found in the upper part of the Pine River and in Trout Brook, Home, Rock Spring, Clear, North Fork of Silver, Bear, Biscuit, Lumpson, Sweigers, and Sullivan creeks. Except for Bear Creek, native brook trout were taken in all these waters but young-of-the-year from only six streams -- Pine River, Trout Brook, Home, Biscuit, Sweigers, and Sullivan creeks. About 5 per cent of all trout taken were hatchery brook trout. Rainbow trout were collected in the Pine, North Branch of the Pine and Clear, Biscuit, Bear and Sullivan creeks.

Exclusive of hatchery trout stocked in 1952, average total lengths of brook trout indicated fastest growth in the upper portion of the Pine River and in Rock Spring, Clear, Biscuit, and Lumpson creeks. Except for fish in Age-group III, the average growth rate of brook trout in the Pine River watershed appeared about equal to rates of fish from other Michigan streams that have been intensively studied.

Except possibly for Clear, Rock Spring, Chubb, and Home creeks, the North

Fork of Silver Creek, a small portion of the main stream of the Pine River and several small tributaries, streams east of the Range 3-4 West boundary line in the Pine River drainage are not considered worthy of improvement. In contrast, most streams west of the boundary defined above should be considered for a watershed improvement program.

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REPORT NO. 1410

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

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A BIOLOGICAL AND PHYSICAL SURVEY OF THE PINE RIVER DRAINAGE SYSTEM, MACKINAC AND CHIPPEWA COUNTIES, MICHIGAN[1]

By Merle G. Galbraith, Jr.

A biological and physical survey was made on the Pine River and its tributaries during the summer of 1952. The purpose of this survey was to determine the need for a watershed improvement program and to provide information from which to make a management plan. It was felt that the survey report would serve as a guide for carrying out improvements, if a program of this kind appeared practicable, and would also provide the basic information needed to evaluate the after-effects of such improvement. A party consisting of Thomas Stauffer, Junior Fisheries Biologist, leader, and Harold McReynolds and Charles Lanigan, temporarily employed as fishery technicians, examined 58 stations over the entire watershed between June 25 and August 23.

Fish were collected for study at the 58 stations. The majority of fish collections were taken with a 110-volt, 4.2 ampere, gasoline-operated A.C. shocker; scap nets were used to recover the fish. Other collecting gear used was: an experimental gill net 125 feet long composed of five 25-foot sections having square-mesh sizes of 3/4, 1, 1 1/4, 1 1/2and 2 inches; one standard gill net with 2 1/4-inch square mesh; and two 10-foot common sense seines - both with 1/8-inch square mesh. Use of nets and seines was limited, however, because they contributed very little in collecting fish.

The general procedure in shocking was to work all the stream at each collecting station unless otherwise noted. Where the water was deep, it was

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[1] Field work, analysis of data, and preparations of the report were undertaken with Federal Aid to Fish Restoration funds under Dingell-Johnson Project Number F-2-R-1 and F-2-R-2.

sometimes impossible to work the full width of the stream, and in such cases only one or both sides were shocked. Shocking efficiency, designated as percent efficiency in Table 1, was estimated by the crew on the apparent stunning effect of the electrical field, and the degree of difficulty encountered in shocking and capturing stunned fish at each collection station.

Examination points were generally located 2 or 3 miles apart, except where accessibility was a limiting factor. The areas examined are given in Table 1 and are represented by the portion of the stream immediately upstream from 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 stream width was determined by making 10 width measurements spaced 20 feet apart in a 200-foot typical section of the stream. Measurements of water depth were made in the middle of the stream and at locations on either side of the midpoint, from the midpoint to the bank. Depth measurements were taken in the same section as width measurements. Depths were measured to the nearest inch using a yardstick. Surface velocity was determined by averaging the time it took 3 sticks to traverse 100 feet of stream. In Table 5, "sluggish" current is defined as having a flow of less than $\frac{1}{2}$ foot-per-second, and "rapid" as having a velocity greater than this rate. At various fish collecting stations, photographs were taken of typical sections of the stream with one of the crew members holding a board on which a number inscribed in chalk identified the station.

Air and water temperatures were taken with a pocket thermometer at each fish collection station. A separate temperature survey (Table 7) was made during warm weather in order to determine more accurately when 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). The pools of a 200-foot stretch of stream at each station were classified accord-

ing to Embody's tables (1927) with regard to their size, type, and frequency. Although the amount of cover afforded fish is considered when classifying pools according to "type," trout cover and vegetation are classified separately 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 and vegetation have been recorded in Table 6 as good, fair or poor. Under the heading of vegetation, good means abundant, fair indicates a moderate amount, and poor means that plants were sparse or absent.

To facilitate the interpretation of biological and physical data, the major tributaries are treated as units separate from the main Pine River. Beginning with the main stream, the principal tributaries and the tributaries of the principal 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 (figs. 2 & 3) also designate the location of all stations where biological and physical surveys were 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 were taken from the largest of the young-of-the-year trout collected. All the larger trout were scale-sampled except when collections were large. In this case, scales were taken only from a representative sample. Lengths of all trout, whether the fish were scale-sampled or not, were recorded on a game-fish list; small trout of doubtful age that had not been scale-sampled were preserved.

After determining the age of the trout scale-sampled in the field, preserved specimens were aged. Whenever possible, lengths taken in the field were used in recording growth data from preserved fish since preservation causes 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 known-aged fish of similar lengths.

Acknowledgements

I would like to acknowledge the aid of Dr's. Gerald P. Cooper and Frank F. Hooper, and Clarence Taube of the Institute for Fisheries Research in helping me prepare this report. Also appreciated is valuable assistance from Thomas M. Stauffer, survey crew leader, Leland R. Anderson, District 4 Fisheries Supervisor, and A. H. Eichmeier, Meteorologist in Charge, United States Department of Commerce Weather Bureau.

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 (hours)	Average width and depth
Pine River						
Mth	T42N R3W S10	8-22-23-52	Light brown, muddy	250	23.00	3-12' deep
55	44-2-30	8-18-52	Normal, light brown, muddy, 1%	200 along each bank	1.25	42.5' x 28"
54	44-2-19	8-15-52	Normal, light brown, muddy, 1%, visibility poor	200	1.58	41' x 33"
53	44-3-12	8-14-52	Normal, light brown, muddy, 1%, visibility poor	200 along each bank	1.25	19-39" deep
51	44-3-1,12	8-13-52	Normal, light brown, muddy, <1%, visibility poor, fish caught drifted into scap net only by chance; this also holds true for Stations 53-55	225 one side of river only	0.58 0.33**	30.5' x 26"
40	45-3-31	7-13-52	High, light brown, murky, 10%	425	1.33	21.5' x 20"
49	44-4-35	8-8-52	High, light brown, very murky, 5%	320	1.25	21.5' x 17"
48	44-4-3,4	8-8-52	High, light brown, murky, 25%	250	1.25	25' x 17"
42	44-4-5,8	8-4-52	High, light brown, murky, 10%	300	2.33	23.5' x 21"
41	44-5-12	8-1-52	High, dark brown, clear, 10%	240	1.25	19' x 14"
22	44-5-2	7-14-52	High, light brown, murky, 5%	480	1.17	17' x 16"
18	45-5-33	7-10-52	High, dark brown, clear, 10-20%	480	1.00	14.5' x 10"
17	45-5-28	7-10-52	High, very dark brown, clear, <10%	450	1.00	9.5' x 12"
Garden Hill Creek						
2	43-3-23	6-25-52	High, light brown, clear, 60%	183	0.42	7' x 6"
Home Creek						
4	43-3-23	6-27-52	High, light brown, clear, 70%	183	0.33	7.5' x 6"
Simmons Creek						
10	43-2-25	7-3-52	High, light brown, muddy, 20%	340	0.83	10' x 7"
Crooked Creek						
28	43-2-26	7-22-52	High, dark brown, slightly murky; dries up during dry summers	400	0.75	5.5' x 5"

Rock Spring Creek						
31	43-2-20	7-24-52	High, light brown, clear, 10%	260	1.00	50-50' x 12"
Clear Creek						
3	43-3-14	6-27-52	High, light brown, murky, 15%	375	1.67	13' x 9"
1	43-3-17	6-26-52	High, light brown, clear, 70%	183	0.42	6' x 6"
Silver Creek, North Fork						
29	43-2-18	7-24-52	Very high, colorless, murky, 15%	200	0.7	12' x 11"
Silver Creek, South Fork						
30	43-2-17	7-24-52	Very high, light brown, murky, 10%	400	1.50	40' x 50"
No Name Cr., a trib. to Pine R.						
32	43-3-1	7-24-52	Very high, light brown, muddy, 15% (an intermittent stream.)	200	1.0 0.33***	10' x 13"
Chubb Creek						
56	44-2-31	8-18-52	Normal, light brown, muddy, 30%	200	1.0	15' x 10"
36	44-3-26	7-29-52	High, light brown, muddy, 5%	315	1.25	17' x 16"
35	44-3-33	7-29-52	Very high, light brown, muddy, 10%	300	1.25	14.5' x 16"
Bear Creek						
39	44-3-16-	7-31-52	High, light brown, murky, 10%	500	1.08	15' x 18"
34	44-3-18	7-28-52	Very high, light brown, murky, 10%	300	1.00	15.5' x 16"
8	44-4-24	7-2-52	Normal, light brown, murky, 30%	375	1.25	11' x 14"
5	44-4-28	6-30-52	High, dark brown, clear, 40%	375	0.83	9.4' x 18.3"
Little Bear Creek						
7	44-3-30	7-1-52	High, light brown, murky, 40%	360	0.83	8.5' x 8"
6	44-4-34	7-1-52	High, light brown, clear, 70%	183	0.50	4' x 8"
Biscuit Creek						
38	44-3-9	7-30-52	High, light brown, muddy, swift water & slippery bottom caused low shocking efficiency, 3%	100	1.33 (includes both shocker & seining time in same area)	15.5' x 28"
37	44-3-7	7-30-52	High, light brown, murky	360	1.42	14' x 21"
33	44-4-13	7-28-52	Very high, light brown, murky, <5%	250	1.00	12.5' x 26"
57	44-4-16	8-22-52	Normal, light brown, clear, 60%	500	1.42	17' x 16"
11	44-4-19	7-7-52	Normal, colorless, clear, 50%	410	1.08	16' x 16"
26	44-5-22	7-17-52	Very high, light brown, clear, 40%	150	0.50	7.5' x 15"
Trout Brook						
12	44-3-17	7-7-52	Normal, light brown, murky	400	1.00	10.5' x 10"
9	44-4-13	7-2-52	Normal, light brown, clear, 30%	500	1.33	11.5' x 14"
27	44-4-22	7-21-52	High, colorless, clear, 40%	200	1.17	20' x 6"
No Name, trib. to Pine R.						
44	44-4-1	8-5-52	High, dark brown, slightly murky, 30%	200	1.25	7.5' x 8"
Blind Biscuit Creek						
14	44-4-4	7-9-52	Very high, light brown, muddy, <5%	183	0.83	7' x 20"

Blind Biscuit Creek (contd)						
13	44-4-7,8	7-9-52	Very high, light brown, clear, 100%; probably an intermittent stream	183	0.33	9" x 6.5"
Lumpson Creek						
16	44-5-3	7-10-52	High, light brown, clear, 50%	405****	0.83	8' x 11"
Pine River, N. Br.						
52	44-2-6	8-14-52	Slightly high, light brown, muddy, 5%	200 in rapids & one bank	0.50 0.33***	40' x 21"
50	45-3-19	8-13-52	Very high, light brown, muddy, <5%***	500 - 25% of area shocked	0.83***	15' x 16"
Black Creek						
24	45-3-30	7-16-52	Very high, light brown, murky, 20%	350	1.25	17.5' x 15"
46	45-4-25	8-7-52	Very high, dark brown, murky, 10%	240	1.50	18.5' x 22"
45	45-4-27	8-6-52	Very high, dark brown, slightly murky, 50%	325*****	1.58	12.5' x 11"
15	45-5-24	7-9-52	High, dark brown, clear, <10%	420	0.75	10' x 12"
No Name, trib. to Black Creek						
43	45-4-25	8-5-52	High, dark brown, murky, 60%	200	0.92	5' x 10"
Sweigers Creek						
47	45-4-27	8-7-52	High, light brown, clear, 60%	200	1.00	11.5' x 11"
19	45-4-18	7-11-52	High, dark brown, clear, 20%	320	1.17	10.5' x 8"
Black Creek, S. Br.						
23	45-4-29	7-15-52	High, dark brown, slightly murky, 30%	183	0.67	8.5' x 8"
No Name, trib. to N. Br. Pine						
21	45-4-24	7-14-52	High, dark brown, clear, 10%	320	1.33	11' x 12"
Sullivan Creek						
20	45-4-9	7-11-52	High, colorless, clear, 40%	330	1.00	16' x 16"
25	45-4-4	7-16-52	High, colorless, clear, 30%	183	0.67	5.5' x 5"

*Two gill nets used: (1) experimental gill net, 125', 5—25' sections; and (2) 125', 4½" stretched mesh, gill net
**Time using 10' common sense seine, 1/8" mesh
***10' common sense seine, 1/8" mesh
****Area shocked included divergent small streams created by beaver dam and a short distance in to a beaver pond
*****200' of main stream plus 125' of a branch leading from upstream dam into mainstream

Fish Fauna of the Drainage System

Color, high turbidity, and deep water tended to reduce shocker efficiency considerably. At some stations efficiency was recorded as less than 1 per cent. From the mouth of the main stream north to Station 49, and to Station 53 on the North Branch of the Pine (see maps), collecting at all stations depended largely on chance that stunned fish would drift into scap nets held in back of the electrodes. These samples almost certainly were not as representative as those from other stations. Because shocking efficiency varied from station to station, catch-per-hour figures and species composition should not be used for comparisons without referring to tables on shocking efficiency and physical features. While catch-per-hour was calculated for all species collected in the watershed, only the more common species are listed in Table 2.

Twenty-five species of fish were collected throughout the watershed and included brook and rainbow trout, northern pike, yellow perch, largemouth bass, brown bullhead, and American brook and sea lampreys. Of the shocking done at 58 stations on 25 streams, trout were collected at 22 stations, representing 12 streams. Rainbow trout were present in small numbers in the Pine River (for locations see distribution map), North Pine, and Biscuit, Clear, Bear and Sullivan creeks. Rainbows in this watershed were wild fish, whereas the brook trout population was composed of both native and hatchery fish. Brook trout were taken in portions of 11 streams: Pine River, Trout Brook, North Fork of Silver Creek, and Rock Spring, Bear, Biscuit, Clear, Lumpson, Sweigers, Home and Sullivan creeks. One northern pike and four yellow perch were taken at the mouth of the Pine River. The largemouth bass, all young-of-the-year, were taken in close proximity of one another; one was collected in the Pine River at Station 49 and two in a small tributary to the Pine just two miles east of that point (Station 44). These bass probably migrated from Bobbygay Lake via Blind Biscuit Creek. Two brown bullheads

were collected, one in Chubb Creek and the other in the afore-mentioned tributary to the Pine, at Station 44. Chubb Creek is a warm-water stream and it is likely that water temperatures also run warm in the other stream. American brook lampreys were common throughout the watershed where silty bottoms are prevalent. Sea lampreys, most of which were larvae, were captured in the main Pine, approximately 15 miles upstream from its mouth (Stations 54 and 55), and in Bear, Black and Chubb creeks.

Some of the more important forage species were eastern mottled sculpin, brook stickleback, mudminnow, western blacknose dace, northern pearl dace, northern creek chub, and longnose dace, named in order of numbers taken.

Common names used herein are in accordance with the Check List of the Fishes of Michigan (unpublished), revised to February 15, 1952, by Reeve M. Bailey, Curator of Fishes, Museum of Zoology, University of Michigan. Identifications of the majority of fish were verified by W. R. Taylor of the Institute for Fisheries Research and doctoral student in Ichthyology at the University of Michigan.

TABLE 2

Number of fish taken with shocker at each station, converted to catch per hour. Pine River Watershed, Mackinac and Chippewa counties, June, July, and August, 1952

Stream drainage unit	Station No.	Time spent shocking: (Hours)	SPECIES: Brook trout	Rainbow trout	White sucker	Amer. brook lamprey	Creek chub	Blacknose dace	Longnose dace	Pearl dace	Brassy minnow	Mudminnow	Mottled sculpin	Brook stickleback
Pine River	M1	23.00*			3									
	55	1.25			1	3	2		10				5	5
	54	1.58			1	6	8		3				8	1
	53	1.25			2	10			2				14	1
	51	0.58			14	1	10		9				29	9
		0.33**												
	40	1.33		2		28			8			6	26	
	49	1.25		1		11			1			2	21	
	48	1.25		2	7	12						1	24	2
	42	2.33	1		1	8				1	1		12	3
	41	1.25				3					1		15	2
	22	1.17			1	3				2		1	15	3
	18	1.00	7			3				10	6	1	30	16
	17	1.00	3			3				8	4	8	3	20
Garden Hill Creek	2	0.42										5	5	14
Home Creek	4	0.33	3									3	3	
Simmons Creek	10	0.83					11				10	10	5	
Crooked Creek	28	0.75										1		35

* Two gill nets used: (1) an experimental net and (2) a 4½" stretched-mesh net

** Represents time common sense seine was used. Catch-per-hour computed as 0.58 hour because it was not made clear which fish were seined; the majority of the fish were shocked.

TABLE 2

Number of fish taken with shocker at each station, converted to catch per hour. Pine River Watershed, Mackinac and Chippewa counties June, July and August, 1952

Stream drainage unit	Station No.	Time spent shocking: (hours)	SPECIES: Brook trout	Rainbow trout	White sucker	Amer. brook lamprey	Creek chub	Blacknose dace	Longnose dace	Pearl dace	Brassy minnow	Mudminnow	Mottled sculpin	Brook stickleback
Rock Spring Cr.	31	1.00	7							5	7	2		8
Clear Creek	3	1.67	1	4	1	1	2	2	2			2	8	2
	1	0.42	31							7		1		38
Silver Cr., N. Fork	29	0.70	9											
South Fork	30	1.50					15	1		2	13	7		112
No Name Cr. trib. to Pine	32	1.00			1		22	9					7	2
		0.33***			6									
Chubb Creek	56	1.00			4		24	22	15			1	118	2
	36	1.25			6		33	31	1	1	2	2	26	11
	35	1.25			14	1	34	11		4	8	14	4	34
Bear Creek	39	1.08			14	2	6	6	3				19	2
	34	1.00			2	1	1					1	5	
	8	1.25		2	5	12		8		3		3	8	4
	5	0.83	1			11		16		18	1	4	1	22
Little Bear Creek	7	0.83			4		5	20		8	1	1	7	6
	6	0.50										2		4

***Represents collection time using common sense seine. Catch-per-hour figures under creek chub and blacknose dace include fish which were seined.

TABLE 2

Number of fish taken with shocker at each station, converted to catch per hour. Pine River Watershed, Mackinac and Chippewa counties June, July and August, 1952

Stream drainage unit	Station No.	Time spent shocking: (hours)	SPECIES											
			Brook trout	Rainbow trout	White sucker	Amer. brook lamprey	Creek chub	Blacknose dace	Longnose dace	Pearl dace	Brassy minnow	Mudminnow	Mottled sculpin	Brook stickleback
Biscuit Creek	38	1.33****			2	1	1	3	4			1	5	2
	37	1.42			4	8		1	5			2	15	2
	33	1.00				4						1	16	2
	57	1.42	11	1	1	20						2		2
	11	1.08	11			19				4		4	70	4
	26	0.50								94	8	8		44
Trout Brook	12	1.00			7			6	3	1		4	6	1
	9	1.33			17	1	2	3		5		2	1	
	27	1.17	151									1	1	
No Name, trib. to Pine River	44	1.25			2		3	1		28	10	54		41
Blind Biscuit Creek	14	0.83				1					1	1		
	13	0.33												
Lumpson Creek	16	0.83	6		1	5				16		12	2	1
Pine River, N. Branch	52	0.55			4	2		5	31				18	
	[illegible]	0.33*****												
	50	0.83****		1					28				4	

**** Collection time includes both shocker and seining operations using common sense seine.
***** Represents collection time using both shocker and common sense seine; catch-per-hour computed using 0.55 hr.

TABLE 2

Number of fish taken with shocker at each station, converted to catch per hour. Pine River Watershed, Mackinac and Chippewa counties June, July and August, 1952

Stream drainage unit	Station No.	Time spent shocking: (hours)	SPECIES											
			Brook trout	Rainbow trout	White sucker	Amer. brook lamprey	Creek chub	Blacknose dace	Longnose dace	Pearl dace	Brassy minnow	Mudminnow	Mottled sculpin	Brook stickleback
Black Creek	24	1.25				11	1	10	1	1		4	24	2
	46	1.50				21		17				2	1	1
	45	1.58			1	3		8		1		3	7	1
	15	0.75										-	-	-
No Name, trib. to Black Creek	43	0.92			3	3	17	18		11		3		38
Sweigers Creek	47	1.00			1	3		31	1	2		3	13	1
	19	1.17	4			3		2					8	
Black Creek, South Branch	23	0.67					1	27		4		1	1	
No Name, trib. to N. Br. Pine	21	1.33					1	6		2		2	2	1
Sullivan Creek	20	1.00	26	4										
	25	0.67	33	3										

TABLE 3

Size range (total lengths in inches) for brook and rainbow trout and several other species, summarized by stream drainage unit. Pine River Watershed, June, July and August 1952 (Average length of trout within parentheses)

Stream Drainage Unit	SPECIES					
	BROOK TROUT	RAINBOW TROUT	WHITE SUCKER	AMER. BROOK LAMPREY	SEA LAMPREY	CREEK CHUB
Pine River	1.8 9.3 (5.0)	1.4 6.9 (4.4)	0.8 16.4	1.2 6.9	3.5 14.0	0.8 3.3
Home Creek	2.1					
Simmons Creek						1.8 5.6
Rock Spring Creek	4.6 7.5 (6.1)					
Clear Creek	4.0 8.2 (5.6)	1.3 8.2 (4.8)	6.0 7.1	6.4		1.8 4.6
Silver Cr., N. Fork	4.3 7.1 (5.4)					
Silver Cr., S. Fork						1.0 3.6
No Name Creek, trib. to Pine R.			1.1 9.2			0.9 2.5
Chubb Creek			1.0 8.6	6.5	6.0 6.4	0.8 7.3
Bear Creek	8.3	5.3 (12.6) 20.0 ✌	1.3 12.9	4.2 7.9	4.0 6.1	1.1 6.3
Little Bear Creek			5.3 7.0			3.4 5.7
Biscuit Creek	2.4 13.5 (5.2)	1.5	0.9 13.9	1.6 6.9		1.0
Trout Brook	1.2 9.4 (2.8)		3.2 12.3	7.0		4.8 7.4

✌ Approximately 20 inches - this fish was captured but escaped before it could be measured.

TABLE 3 (cont.)

Size range (total lengths in inches) for brook and rainbow trout and several other species, summarized by stream drainage unit. Pine River Watershed, June, July and August 1952 (Average length of trout within parantheses)

Stream Drainage Unit	SPECIES					
	BROOK TROUT	RAINBOW TROUT	WHITE SUCKER	AMER. BROOK LAMPREY	SEA LAMPREY	CREEK CHUB
No Name, trib. to Pine River		5.2	3.8 9.2			5.6 7.0
Blind Biscuit Creek				6.8		
Lumpson Creek	4.6 6.9 (5.3)		5.7	5.2 6.6		
Pine River, N. Br.		5.2	3.3 3.6	5.1		
Black Creek			3.3 7.5	2.4 6.1	2.0 2.5	4.6
No Name, Trib. to Black Creek			4.8 5.2	4.5 5.3		2.1 6.0
Sweigers Creek	2.4 5.9 (4.2)		9.4	3.4 5.8		
Black Creek, S. Br.						5.6
No Name, Trib. to N. Br. Pine R.						3.7
Sullivan Creek	1.5 9.7 (4.9)	2.2 5.8 (3.7)				

Growth Analysis and Related Effects of Stocking

Because deep and discolored waters restricted the collecting efficiency, it is not certain whether natural reproduction occurs only in those streams where young-of-the-year trout were collected. Streams which appeared favorable for natural propagation are Biscuit Creek, Trout Brook, Sweigers Creek, Sullivan Creek, and Home Creek. Of these five streams, young-of-the-year brook trout from Biscuit Creek appeared to be the fastest growing, whereas those from Sullivan Creek were the slowest. Slow growth in the latter stream may be due to its exceptionally cold water.

Fingerling brook trout planted in 1951 in the North Fork of Silver Creek, Trout Brook and Lumpson Creek were not marked. No survivors of this planting were collected. All trout (yearlings and two-year-olds) planted in the watershed in 1952 were of legal size, averaging 8.9 inches, total length. Trout planted in May were two years old, whereas those planted in June were one year old. Shocking failed to recover any hatchery trout of Age-group I; however, approximately 44 per cent of the two-year-olds were hatchery trout. The hatchery fish could be separated from native fish on the basis of size.

Average total lengths of trout in various age-groups listed in Table 4 include all trout shocked and aged. Excluding hatchery trout stocked in 1952, the averages of total lengths of brook trout from the various streams (comparisons drawn from collections totalling five or more fish) indicate fastest growth in the headwaters of the Pine River and in Biscuit, Clear, Rock Spring and Lumpson creeks. Further evidence of favorable conditions for fish growth in Clear Creek is provided by the fast growth of rainbow trout of Age-group I.

Few rainbow trout were collected in the watershed; only two fish were of legal size. One specimen captured in Bear Creek was approximately 20 inches long. It is not listed in Table 4 because it escaped before being measured. Growth of rainbows was not evaluated because of the meager sample.

Except for fish of Age-group III (see following table), growth rate of brook trout in the Pine River watershed appears to be about equal to the growth rate of trout in streams of the Lower Peninsula studied by Cooper (1951). This conclusion is based on comparison of the average empirical lengths of trout caught during their growing season in the Pine River watershed with average calculated lengths of trout from other waters which had completed a season's growth.

Growth of Brook Trout in Various Michigan Streams

Stream	Age-group		
	I	II	III
Pine River Watershed	2.1✓	5.2✓	8.0✓
Hunt Creek	2.7	6.0	9.6
North Branch of the AuSable	2.6	5.8	9.5
Pigeon River	2.7	6.1	9.7
Sucker Creek	2.2	5.4	9.3

✓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 units

Species and stream drainage unit	Age-group 0	I	II	III	No. of fish in each age-group (and size range) 0	I	II	III
Brook Trout								
Pine River	2.3	5.7	8.1	-	4 (1.8-3.1)	7 (4.5-6.8)	2 (7.0-9.3)	-
Home Creek	2.1	-	-	-	1 (2.1)	-	-	-
Rock Spring Creek	-	6.1	-	-	-	7 (4.6-7.5)	-	-
Clear Creek	-	5.5	8.2	-	-	14 (4.0-7.1)	1 (8.2)	-
Silver Creek, N. Fork	-	4.7	6.9	-	-	4 (4.3-5.4)	2 (6.8-7.1)	-
Bear Creek	-	-	8.3	-	-	-	1 (8.3)	-
Biscuit Creek	2.8	5.7	8.0	13.5	13 (2.6-3.2)	6 (5.3-6.4)	7 (7.2-9.4)	1 (13.5)
Trout Brook	2.4	5.0	8.4	-	147 (2.2-3.4)	30 (4.2-6.3)	4 (7.6-8.6)	-
Lumpson Creek	-	5.3	-	-	-	5 (4.6-6.7)	-	-
Sweigers Creek	2.3	5.5	-	-	2 (2.3)	3 (5.3-5.9)	-	-
Sullivan Creek	1.7	4.7	7.9	-	11 (1.5-2.1)	25 (3.4-5.9)	17 (6.7-9.7)	-
Average	2.4	5.2	8.0	13.5	Total 178	101	34	1
Wt. average	2.3	5.4	8.0	13.5				
Rainbow Trout								
Pine River	1.7	5.9	-	-	1 (1.7)	4 (5.2-6.9)	-	-
N. Pine River	-	5.4	-	-	-	1 (5.4)	-	-

TABLE 4 (contd)

Average total lengths in inches of trout in various age-groups, summarized by stream drainage units

Species and stream drainage unit	Age-group 0	I	II	III		No. of fish in each age-group (and size range) 0	I	II	III
Rainbow Trout (cont.)									
Clear Creek	1.3	6.1	-	-		2 (1.3-1.4)	5 (5.5-6.7)	-	-
Biscuit Creek	1.5	-	-	-		1 (1.5)	-	-	-
Bear Creek	-	5.3	-	-		-	1 (5.3)	-	-
Sullivan Creek	2.4	5.0	7.3	-		3 (2.2-2.9)	3 (3.5-5.8)	1 (7.3)	-
Average	1.8	5.7	7.3	-	Total	7	13	1	-
Wt. Average	1.7	5.5	7.3	-					

TABLE 5

Record of plantings of brook trout shortly before or at the time of survey*

Stream and Station No.	Number and size of fish planted and date of planting (plantings up to 1½ miles of collecting station, 1952)			Brief history of previous stocking 1944-1951**
Pine River				
40				Stocked in 1944
49				Stocked in 1949***
48	150, 8.9" 5/14	200, 8.9" 6/4		Stocked from 1944-51
42	150, 8.9" 5/14	200, 8.9" 6/4		Stocked in 1944, 1946-48, 1950-51
41	200, 8.9" 5/14	400, 8.9" 6/4		1944-51, plus fingerlings stocked by USFWS in 1944-1945
22	100, 8.9" 5/14	100, 8.9" 6/4		Same as preceding station
18	100, 8.9" 5/14	100, 8.9" 6/4		1944-46, 1948-51
17				1945, 1947-48
Clear Creek (Elmhirst)				
3				1945
Silver Creek, N. Fork				
29				1951, plus 20,000 (1.5") & 3,000 (3.5") fingerlings
Silver Creek, S. Fork				
30				1944-46, 1948, all were fingerlings, USFWS
Bear Creek				
8				1944, 1946, 1948-49
5				1944-45, 1947-48
Little Bear Creek				
6				1947
Biscuit Creek				
37				1944
33	200, 8.9" 5/14	250, 8.9" 6/4		1944-51
Biscuit Creek (contd)				
57	100, 8.9" 5/14	100, 8.9" 6/4	100, 8.4" 8/13	1944-51
11	200, 8.9" 5/14	200, 8.9" 6/4		1944-51, plus fingerlings by USFWS in 1944
26	100, 8.9" 5/14	50, 8.9" 6/4		1947-1951
Trout Brook				
12	100, 8.9" 5/14			1944-46, 1949-51
9				1944, 1948-49, 1951
27	100, 8.9" 5/14			Stocked in 1951 with 2000 fingerlings (3.5") Legals - 1946-50 plus fingerlings by USFWS in 1944
Lumpson Creek				
16				1951 - 25,000 (1.5") Legals - 1947-49
Pine River, N. Branch				
50				1944
Black Creek				
24	50, 8.9" 5/14	50, 8.9" 6/4		1944-45, 1950-51
46	50, 8.9" 5/14	50, 8.9" 6/4		1945, 1950-51, plus fingerlings stocked by USFWS in 1944
45				1948
15	100, 8.9" 5/14	100, 8.9" 6/4		1949-51, plus fingerlings stocked by USFWS in 1944
Sweigers Creek				
19	100, 8.9" 5/14	125, 8.9" 6/4		1944-51 plus fingerlings stocked by USFWS in 1944
Black Creek, S. Br.				
23				1946
Sullivan Creek				
20	50, 8.9" 5/14			1944-46, 1948-49, 1951 plus fingerlings stocked by USFWS in 1944
25	50, 8.9" 5/14			1945, 1947-49, 1951

* Only brook trout have been planted in this watershed since 1944.

** In addition to this listing, plantings of fingerling brook trout were made during 1946, 1947 and 1948 by the USFWS in the South Branch of the Pine River and in Biscuit, Black, Sweigers and Sullivan creeks and Trout Brook; Black Creek received such planting also in 1945 and Bear Creek in 1946 and 1948.

*** All fish planted were of legal size unless indicated otherwise.

Physical Features of the Pine River System

The Pine River and its 21 principal tributaries drain approximately 131,000 acres of land within Rudyard, Kinross and Trout Lake townships, Chippewa County, and St. Ignace and Marquette townships in Mackinac County. The terrain of the drainage is divided into two main types. Below and east of Fibre it is flat, and soil types consist mainly of clay on which hay is grown; most of the water is highly turbid. West of Fibre the terrain is slightly rolling and the soil sandy. Approximately one-half of the area is wooded. Jack pine and aspen are the dominant trees. Stream cover in this area is provided by tag alders, logs and undercut banks.

With the exceptions of Sullivan Creek and the upper reaches of Biscuit Creek, North Fork of Silver Creek, and Trout Brook, this drainage system is characterized by water which is light brown in color. High turbidity, generally due to clay deposits in the river bed, is typical of the Pine River east of Range 4 West and the lower stretches of the majority of its tributaries (see Table 1). A landslide of approximately an acre of land partially dammed the North Branch of the Pine in the S.E. 1/4 of Section 19, T45N, R3W, on May 13, 1952, and contributed a good deal of clayey turbidity to both the North Branch and the main stream. More recently (April 18, 1953) a landslide of approximately 20 acres of land along the north bank of Biscuit Creek, near Station 38, obstructed approximately 1,000 feet of the stream bed and raised the water level behind the obstruction some 15 or 20 feet. Water of the Biscuit above the dam has backed up for more than a mile.

To date no attempts have been made to restore normal conditions on the Pine. Efforts made to blast a channel through the earthen dam on Biscuit Creek during the summer of 1953 proved worthless. A county road bridge had been inundated by waters backed up by the dam and at this time is still under 2 feet of water.

Trout pools in sections of the stream surveyed rate from fair to good throughout the watershed. The principal cover in the stream is that furnished by the highly stained and turbid water. Logs and undercut banks are of secondary importance.

Stream bottom soil is chiefly of sand. Varying amounts of clay, silt and gravel are also present. The scouring action of sand, turbidity and frequent clay deposits probably largely account for the sparsity of vegetation in streams of the watershed, (see Table 6).

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
Pine River											
M1	...	3-12'	Sluggish	...	Good	Poor	Bottom appeared to be hard				
55	42.5'	28"	Rapid	Fair	Good	Poor	25	60	...	15	...
54	41'	33"	Rapid	Fair to good	Good	Poor	25	60	...	15	...
53	...	19-39"	Rapid	...	Good	Poor	Clay, sand and gravel				...
51	30.5'	26"	Rapid	Poor	Good	Poor	50	20	...	30	...
40	21.5'	20"	Rapid	Poor	Good	Poor	45	...	...	25	30% sandy clay
49	21.5'	17"	Rapid	Fair	Good	Poor	100	...	...	...	...
48	25'	17"	Rapid	Fair	Poor-fair	Poor	100	...	...	...	...
42	23.5'	21"	Rapid	Fair	Good	Poor	83	...	...	...	17% silty sand
41	19'	14"	Rapid	Fair-good	Good	Poor	80	...	12	...	8% detritus
22	17'	16"	Rapid	Fair	Fair	Poor	100	...	...	...	...
18	14.5'	10"	Rapid	Poor	Poor-fair	Poor	100	...	...	...	...
17	9.5'	12"	Rapid	Good	Good	Poor	Apparently sand				
Garden Hill Creek											
2	7'	6"	Rapid	Fair	Good	Poor	45	55	...	...	...
Home Creek											
4	7.5'	6"	Rapid	Fair	Good	Poor	15	75	10	...	...
Simmons Creek											
10	10'	7"	Sluggish	Fair	Poor-fair	Poor	...	...	50	50	...
Crooked Creek											
28	5.5'	5"	Sluggish	Good*	Fair	Poor	80	...	20	...	...
Rock Spring Creek											
31	50-60'	12"	Sluggish	Good*	Good	Poor	...	...	100	...	...
Clear Creek											
3	13'	9"	Rapid	Fair	Good	Poor	...	100	...	....	...
1	6'	6"	Rapid	Fair	Good	Poor	Silt and sand 45%, sand & rubble 45%, gravel 5%				
Silver Creek, N. Fork											
29	12'	11"	Rapid	Good	Good	Good	50	...	...	...	50% silty clay
Silver Creek, S. Fork											
30	40'	50"	Sluggish	Good**	Good	Good	...	...	100	...	...
No Name Cr., trib. to Pine River											
32	10'	13"	Rapid	Fair	Good	Fair	50%	...	...	50	...
Chubb Creek											
56	15'	10"	Rapid	Fair	Good	Good	...	70	...	30	...
36	17'	16"	Rapid	Fair	Good	Poor	...	85	...	15	...
35	14.5'	16"	Rapid	Fair	Good	Good	...	50	...	28	22% silty clay
Bear Creek											
39	15'	18"	Rapid	Good	Good	Poor	10% sandy clay, 80% clay, 10% gravel over clay				
34	15.5'	16"	Rapid	Poor-fair	Fair	Poor	30	...	...	70	...
8	11'	14"	Rapid	Fair	Good	Fair	...	...	63	37	trace of gravel
5	9.4'	18.3"	Sluggish	Good**	Fair-good	Fair	25	...	75	...	...
Little Bear Creek											
7	8.5'	8"	Rapid	Fair	Fair	Poor	37% silt over clay, 63% silty sand over clay				
6	4'	8"	Rapid	Good	Good	Poor	12	...	38	...	50% detritus
Biscuit Creek											
38	15.5'	28"	Rapid	Fair	Good	Poor	...	...	...	70	30% sandy clay
37	14'	21"	Rapid	Fair-good	Good	Poor	...	...	...	85	15% sandy clay
33	12.5'	26"	Rapid	Fair-good	Good	Poor	90	...	...	10	...
57	17'	16"	Rapid	Poor	Poor	Poor	70% silty sand, 25% silt, 5% detritus				
11	16'	16"	Sluggish	Fair	Poor-fair	Poor	...	...	87	...	13% silty sand
26	7.5'	15"	Rapid	Fair-good	Fair	Poor	...	...	...	...	100% silt and muck
Trout Brook											
12	10.5'	10"	Rapid	Fair	Fair	Poor	93	...	...	7	...
9	11.5'	14"	Rapid	Fair-good	Good	Good	100% silt and detritus				
27	20'	6"	Rapid	Fair	Good	Fair	75	8	17	...	...
No Name, tributary to Pine River											
44	7.5'	8"	Rapid	Fair	Good	Fair	8	...	90	...	2% detritus
Blind Biscuit Creek											
14	7'	20"	Rapid	Fair-good	Good	Poor	...	...	...	100 (?)	...
13	9"	6.5"	Rapid	Fair	Good	Fair	100	...	...	...	...
Lumpson Creek											
16	8'	11"	Rapid	Fair	Poor	Poor	10% silty sand, 90% silt				
Pine River, North Branch											
52	40'	21"	Rapid	Poor	Good	Poor	20	40	...	20	20% claysand
50	15'	16"	Rapid	Fair	Good	Poor	46	...	...	24	30% sandy clay
Black Creek											
24	17.5'	15"	Rapid	Fair-good	Good	Poor	71	...	...	14	15% detritus
46	18.5'	22"	Rapid	Fair	Good	Fair	...	...	...	14	86% silty sand
45	12.5'	11"	Sluggish	Fair-good	Good	Fair	25	...	15	...	60% silty sand
15	10'	12"	Rapid	Fair	Good	Poor	100	...	...	...	...
No Name, Tributary to Black Creek											
43	5'	10"	Rapid	Good	Good	Poor	29	...	21	7	63% silty sand
Swelgers Creek											
47	11.5'	11"	Rapid	Fair	Good	Fair-good	82	...	8	...	10% detritus
19	10.5'	8"	Rapid	Fair-good	Good	Fair	100	...	...	...	...
Black Creek, South Branch											
23	8.5'	8"	Rapid	Fair-good	Good	Fair	...	...	...	...	100% silt, detritus & logs
No Name, Tributary to North Branch of Pine											
21	11'	12"	Rapid	Good	Good	Poor	4	...	...	95	1% detritus
Sullivan Creek											
20	16'	16"	Rapid	Fair	Poor-fair	Good	25% sand over silt, 75% silt				
25	5.5'	5"	Rapid	Fair	Good	Poor	85	3	12	...	...

* Area shocked was one continuous pool.

** Area shocked all one continuous pool formed by beaver dams.

Temperature Survey

Routine procedures at fish collection stations included the taking of water and air temperatures. Because of the considerable length of time required to complete a stream survey and the likelihood that cool weather would prevail during most of this period, it was decided that an independent temperature survey should be made as rapidly as possible during a period of hot weather. Temperature series were obtained (Table 1) at 43 stations on 22 of the 25 main streams of the watershed during the afternoons of two consecutive days following a five-day period of warm weather in July 1952 and also after a two-week period of abnormally warm weather in July 1953. In addition, readings were repeated at eight stations in July 1953 for comparison with 1952 readings. These latter readings are excluded from the map but are listed in Table 7.

Temperatures recorded during the physical and biological survey and the temperature survey indicate that high air temperatures will elevate water temperatures above the critical level for trout in many tributaries and portions of the main stream. Differences between air temperature and stream temperature taken simultaneously (Table 7), and maximum stream temperatures obtained during the partial survey (Table 8), indicate that the following streams do not remain cool enough for trout during periods of hot weather: Simmons Creek, Home Creek, Crooked Creek, South Fork of Silver Creek, No Name Creek (T43N, R3W, Sec. 1) and No Name Creek (T44N, R4W, Sec. 1), Chubb Creek, Black Creek, Prey's Creek and portions of Trout, Clear, Lumpson, Bear and Little Bear creeks.

Air temperatures taken during the partial survey were only slightly higher than the average maximum temperature taken at the nearest U. S. Weather Station (Dunbar Forestry Experiment Station) for the 11-year period of 1942-1952. Thus water temperatures taken during July 1952 appear to be rather typical and should be expected during an average summer. During the

temperature survey of 1953, following a period of very hot weather, measurements were repeated at 8 stations included in the 1952 survey on Trout Brook and Bear, Little Bear and Biscuit creeks. Comparisons made of water temperatures in these streams for the two years indicated that water temperatures, despite higher air temperatures and a longer and warmer warming period in 1953, did not increase much.

TABLE 7

Temperature survey data on the Pine River Watershed, Mackinac and Chippewa Counties, July 1952 and 1953

Stream and station number	Location	Date	Time	Air temperature (°F)	Water temperature (°F)
Pine River					
T29	T42N R3W S3	7-7-52	3:15PM	72°	78°
T20	44-2-19	7-7-52	2:20 PM	84°	72°
T17	44-3-1	7-7-52	1:10PM	77°	66°
"	"	7-21-53	8:30PM	71°	66°
T50	45-3-31	7-21-53	7:50PM	73°	60°
T39	44-4-5	7-21-53	4:15PM	84°	57°
T40	44-5-2	7-21-53	4:35PM	84°	64°
T42	45-5-33	7-21-53	5:30PM	81°	61°
Garden Hill Creek					
T28	43-3-23	7-7-52	3:05PM	74°	63°
Home Creek					
T27	43-3-23	7-7-52	3:00PM	77°	73°
Simmons Creek					
T30	43-2-25	7-7-52	3:30PM	81°	79°
Crooked Creek					
T31	43-2-26	7-7-52	3:35PM	79°	78°
Rock Spring Creek					
T32	43-2-20	7-7-52	3:45PM	76°	74°
Clear Creek					
T26	43-3-14	7-7-52	2:55PM	82°	74°
South Fork of Silver Creek					
T33	43-2-17 (below beaver dam)	7-7-52	3:50PM	78°	82°
No Name Cr., Tributary to Pine R.					
T24	43-3-1	7-7-52	2:40PM	83°	76°
Chubb Creek					
T22	44-2-31	7-7-52	2:30PM	78°	77°
T13	44-3-28	7-6-52	3:50PM	78°	76°
Bear Creek					
T11	44-3-16	7-6-52	3:35PM	79°	75°
T8	44-3-18	7-6-52	3:05PM	80°	75°
"	"	7-21-53	2:58PM	86°	75°
T5	44-4-24	7-6-52	2:30PM	82°	74°
"	"	7-21-53	2:22PM	86°	74°
T2	44-4-28	7-6-52	2:10PM	77°	74°
Little Bear Creek					
T14	44-3-30	7-6-52	4:15PM	84°	76°
"	"	7-21-53	2:20PM	85°	75°
T3	44-4-34	7-6-52	2:00PM	73°	66°
Biscuit Creek					
T10	44-3-9	7-6-52	3:25PM	78°	69°
T51	44-3-10	7-21-53	8:00PM	71°	72°
T7	44-3-7	7-6-52	2:50PM	80°	66°
"	"	7-21-53	3:25PM	84°	66°
T38	44-4-13	7-21-53	2:45PM	85°	65°
T1	44-4-19	7-6-52	1:50PM	77°	60°
"	"	7-21-53	2:10PM	81°	69°
T34	44-5-22	7-21-53	12:10PM	81°	76°

Stream and station number	Location	Date	Time	Air temperature (°F)	Water temperature (°F)
Trout Brook					
T9	T44N R3W S17	7-6-52	3:15PM	78°	70°
"	"	7-21-53	3:05PM	86°	70°
T37	44-3-17	7-21-53	2:55PM	86°	72°
T6	44-4-13	7-6-52	2:35PM	77°	76°
"	"	7-21-53	3:35PM	84°	77°
T36	44-4-22	7-21-53	1:30PM	82°	60°
No Name Creek					
T35	44-4-19	7-21-53	12:50PM	80°	70°
Lumpson Creek					
T41	44-5-3	7-21-53	5:05PM	84°	82°
North Branch of Pine River					
T18	44-2-6	7-7-52	1:30PM	79°	72°
T48	45-3-19	7-21-53	7:15PM	75°	70°
Black Creek					
T49	45-3-30	7-21-53	7:38PM	73°	70°
T43	45-5-1	7-21-53	5:45Pm	81°	56°
Sweigers Creek					
T44	45-4-18	7-21-53	5:52PM	80°	66°
Sullivans Creek					
T46	45-4-9	7-21-53	6:10PM	78°	57°
T45	45-4-4	7-21-53	6:00PM	79°	48°
Prey's Creek					
T47	45-4-24	7-21-53	6:30PM	78°	74°

TABLE 8

Air and stream temperatures taken in 1952 at the time of fish collection and observed factors which might influence stream temperatures.

Stream and station No.	Temp. Air	Water	Time	Date	Factors which might influence stream temperatures
Pine River					
M1	77	63	3:30 P.M.	8/25	
55	68	61	11:30 A.M.	8/18	
54	77	63	3:30	8/25	
53	72	62	3:00	8/14	
51	72	60	5:00	8/13	
40	77	57	3:00	7/13	
49	75	56	3:00	8/8	
48	69	53	11:00 A.M.	8/8	
42	59	50	3:25	8/4	
41	68	54	10:00 A.M.	8/1	
22	70	62	3:55	7/14	
18	70	60	5:15	7/10	
17	74	60	3:00	7/10	
Garden Hill Creek					
2	69	68	4:30	6/25	
Home Creek					
4	66	67	3:55	6/27	
Simmons Creek					
10	74	72	1:15	7/3	Area of pasture land, dams reportedly located below station.
Crooked Creek					
28	76.5	66.5	1:20	7/22	Dam above road culvert & one 200' below (only temporary drainage ditch).
Rock Spring Creek					
31	70	62	5:30	7/24	Recent beaver impoundment near road, area surveyed is impoundment.
Clear Creek					
3	70	69	1:40	6/27	Good cover at both stations.
1	68	64	2:30	6/26	Beaver dam above station may warm water considerably.

Silver Creek, N. Fork					
29	68	45	11:15 A.M.	7/24	Beaver dams reported below station.
Silver Creek, S. Fork					
30	75	73	2:20	7/24	Dams broken through by high water but dams back water up 400' - dams are at and above road.
No Name Creek, Trib. to Pine R.					
32	78	64	2:30	7/24	Dries up during normal summer
Chubb Creek					
56	72	69	2:30	8/18	Farming area, open country.
36	66	68	3:40	7/29	Farming area, open country.
35	66	65	11:30 A.M.	7/29	Farming area, open country.
Bear Creek					
39	78	68	3:15	7/31	Open country.
34	69	72	3:30	7/28	Fairly good bank cover here.
8	82	74	2:30	7/6	Stream widens out between stations 5 & 8 - water colorless and clear.
5	77	62	10:45 A.M.	6/30	Beaver dam slows stream a considerable distance.
Little Bear Creek					
7	84	76	4:15	7/6	Cedar swamp surrounded by flood plain.
6	73	66	2:00	7/6	Floods surrounding cedar swamp when high.
Biscuit Creek					
38	66	60	3:50	7/30	In farming area.
37	58	60	11:30 A.M.	7/30	In farming area.
33	71	65	11:00 A.M.	7/28	
57	64	57	3:30	8/22	Lacks bank cover. Old beaver dam below station.
11	76	57	11:35 A.M.	7/17	Area shocked runs through beaver meadows, many springs in area.
26	74	74	1:20	7/17	A series of old beaver dams , one about 200' long west of Dick Road - shade poor.
Trout Brook					
12	76	70	1:00	7/7	Shade lacking.
9	77	76	2:35	7/6	Meadow area diverts stream into many channels.
27	71	45	4:45	7/21	
No Name Creek, Trib. to Pine R.					
44	65	63	4:20	8/5	Poor shade.
Blind Biscuit Creek					
14	55	62	1:45	7/9	Beaver pond below Bobbygay Lake.
13	63	59	11:30 A.M.	7/9	Stream probably dry most of summer.
Lumpson Creek					
16	74	66	11:05 A.M.	7/10	Beaver dam warms water. Shade poor - marsh below station diverting stream through marshy area.
Pine R., N. Br.					
52	71	62	12:03	8/14	Open farming country.
50	70	56	12:15	8/13	Land slide above this station and resultant damming of river.

Black Creek					
24	71	62	1:30	7/16	
46	68	58	11:15 A.M.	8/7	Many logs in this area and upstream.
45	66	67	2:30	8/6	Old dams here both above and below station divides stream.
15	58	58	4:15	7/9	
No Name Creek, Trib. to Black Creek					
43	65	58	10:50 A.M.	8/5	Old, rather large beaver dams - warms water.
Sweigers Creek					
47	68	61	2:55	8/7	Fairly good shade but beaver dam just above station.
19	72	56	11:30 A.M.	7/11	
Black Creek, S. Br.					
23	66	59	10:00 A.M.	7/15	New beaver dam 200' above logging road; frequent small dams in this stream.
No Name, Trib. to N. Br. Pine					
21	69	63	11:30 A.M.	7/14	Log jams abundant.
Sullivan Creek					
20	69	53	3:00	7/11	Dam reported above this station.
25	70	46	4:15	7/16	

Conclsions and Recommendations

Upon closer examination of the field data, and after discussing the survey results with Thomas Stauffer, survey crew leader, and Leland Anderson, fisheries supervisor in this district, it appears that improvement of the main stream of the Pine River east of the Range 3-4 West boundary line and of the North Branch below Station 50, would be an expensive program and would have doubtful value for improving conditions for fish life. This conclusion contradicts the tentative conclusions drawn in the preliminary report (Institute Report No. 1352) on this portion of the watershed. The high turbidity of the water in this area is not temporary as previously believed but continues throughout the year. The turbidity is not so much due to upland bank erosion as to deposits of fine clay in the river bed which continually wash into the water. With the possible exception of Chubb and Home creeks, Clear Creek, Rock Spring Creek, North Fork of Silver Creek, and small portions of the main stream of the Pine and several smaller tributaries (See Map V), the streams east of Range 3-4 West boundary line are not considered worthy of improvement.

West of Range 3-4 West boundary, the streams of the watershed are affected only slightly, if at all, by clay deposits. Bottom types are mostly of sand, and the flooding and scouring action is generally not so severe as in the lower reaches of the drainage system. Streams, or portions thereof, in this area which are suggested for improvement are indicated on the maps at the end of this report. Under no circumstances should the earthen dams created by landslides across the North Branch of the Pine and Biscuit Creek be left in their present state because they are continually imparting additional clay particles to the river below.

Maps of the Pine River system are presented at the end of this report which show, among other things, the extent of trout water. 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.

None of the streams in the system give evidence of containing enough trout to support much fishing pressure. If the number of rainbow trout collected is an indication of the total population, rainbow fishing can be of little current value to sportsmen except possibly at the time of fall and spring runs. Judging from the small number of young-of-the-year rainbows caught, it is unlikely that very large runs occur. Rainbow trout runs have been reported by local residents in portions of Biscuit, Clear and Chubb creeks, Trout Brook, Main Pine and the North Branch of the Pine. In recent years, however, these runs have reportedly diminished in size until now there apparently are no migrations of appreciable size.

In order to open up more of the streams to trout fishing, stocking of legal-size rainbows in place of brook trout should be attempted in designated rainbow water in Bear, Little Bear and Black creeks, and the Pine River. If rainbow trout were planted, they may compete to some extent with brook trout for more favorable water. However, it is known that rainbows can survive warmer temperatures and should do at least as well as planted brook trout.

Brook trout make fairly good growth in the Pine River and stocking of this species in designated brook-trout water should be continued. Warm water and areas of unproductive sand and clay bottom apparently restrict their distribution to a few areas. More of the watershed probably could support trout if the old beaver dams found on most of the tributaries were removed and trees or shrubs were planted in unshaded portions of the streams. If conditions on Sullivan Creek are such that treatment of an opposite nature could be tried, installation of low-head dams on this cold stream should warm the water and might increase the growth rate of brook trout.

Approved by: A. S. Hazzard

Typed by: Norma St.Arnauld

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Merle G. Galbraith, Jr.

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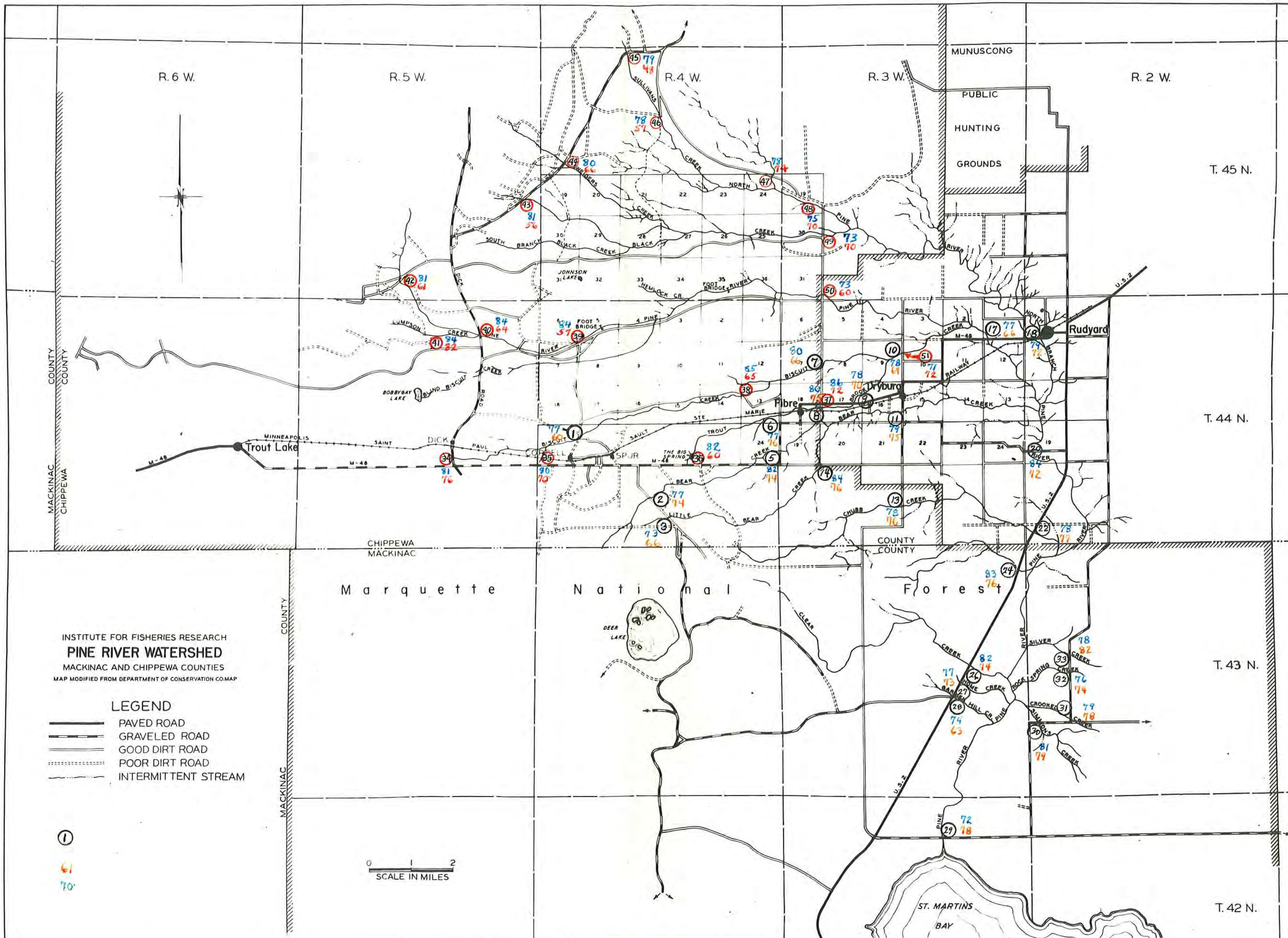
MAP I

Stream temperature survey of the Pine River watershed. Figures in blue ink are air temperatures, those in red, water temperatures. Black circles are stations surveyed in 1952 whereas red circles indicate stations examined in 1953.



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PINE 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
SCALE IN MILES
R. 6 W.
R. 5 W.
R. 4 W.
R. 3 W.
R. 2 W.
T. 45 N.
T. 44 N.
T. 43 N.
T. 42 N.
MUNUSCONG
PUBLIC
HUNTING
GROUNDS
Marquette National Forest
Rudyard
Trout Lake
Dryburg
Fibre
DICK
SPUR
ST. MARTINS BAY
DEER LAKE
BOBBYGAY LAKE
JOHNSON LAKE
CHIPPEWA
MACKINAC
COUNTY
W.L.C.

MAP II

Distribution of brook and rainbow trout water. Red indicates brook trout water and blue designates rainbow trout water; all other is non-trout water.

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PINE RIVER WATERSHED

MACKINAC AND CHIPPEWA COUNTIES

MAP MODIFIED FROM DEPARTMENT OF CONSERVATION CO-MAP

LEGEND

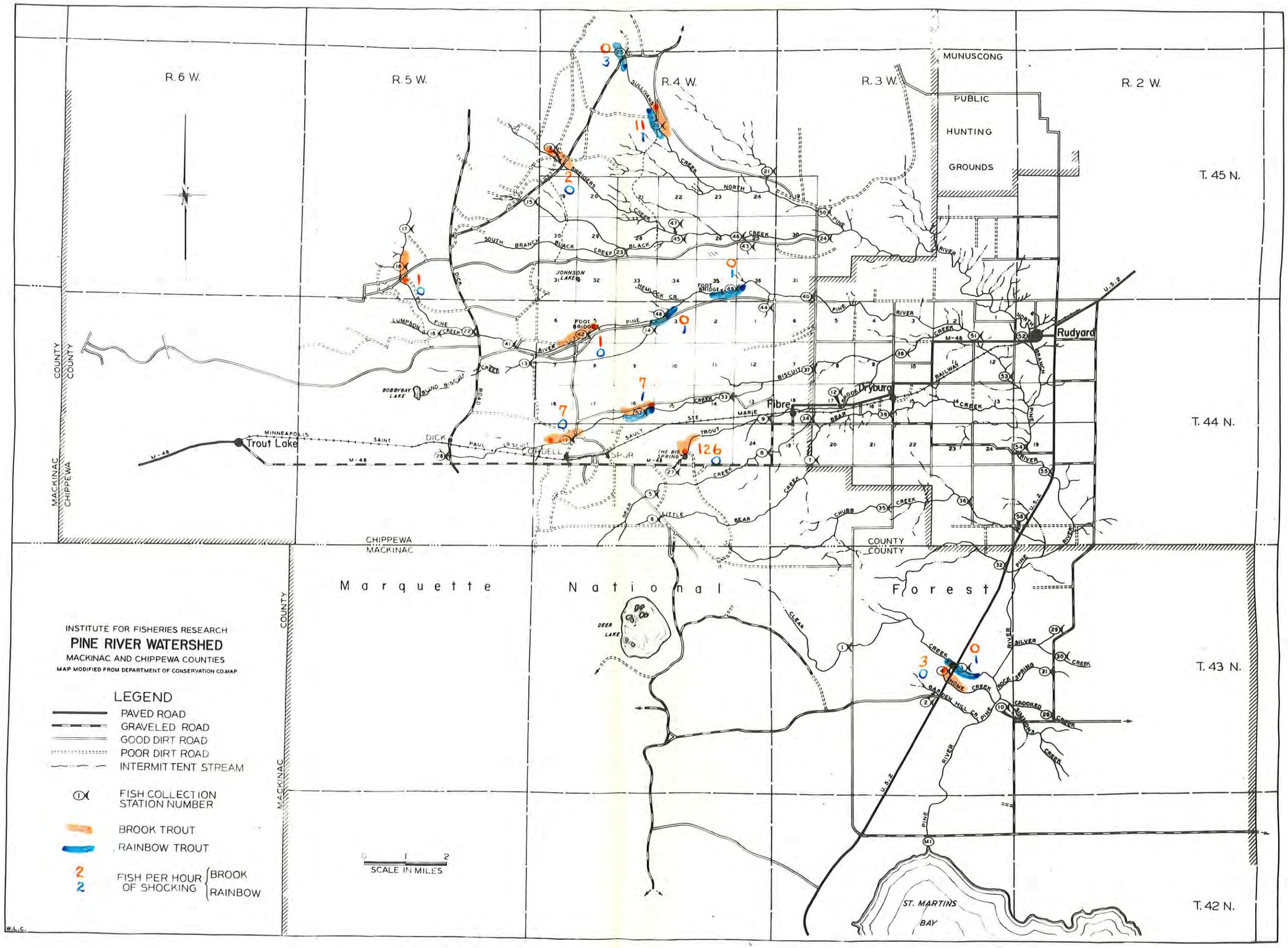
- PAVED ROAD
- GRAVELED ROAD
- GOOD DIRT ROAD
- POOR DIRT ROAD
- INTERMITTENT STREAM

SCALE IN MILES 0 1 2

W.L.C.

MAP III

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



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PINE RIVER WATERSHED

MACKINAC AND CHIPPEWA COUNTIES

MAP MODIFIED FROM DEPARTMENT OF CONSERVATION CO.MAP

LEGEND

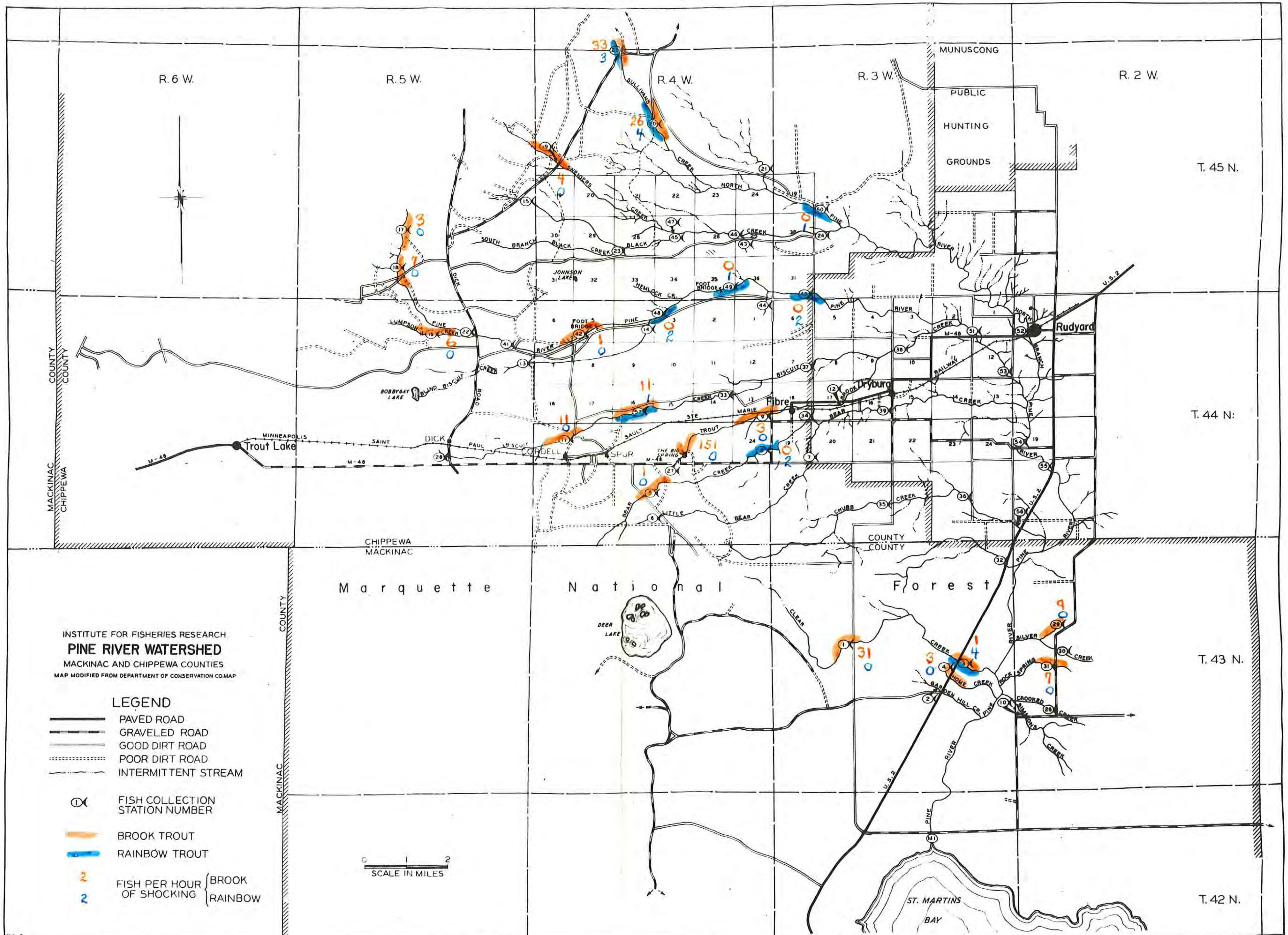
- PAVED ROAD
- GRAVELED ROAD
- GOOD DIRT ROAD
- POOR DIRT ROAD
- INTERMITTENT STREAM
- (1) FISH COLLECTION STATION NUMBER
- BROOK TROUT
- RAINBOW TROUT
- 2 / 2 FISH PER HOUR OF SHOCKING { BROOK / RAINBOW

0 1 2 SCALE IN MILES

W.L.C.

MAP IV

Distribution and catch-per-hour of brook and rainbow trout (all ages).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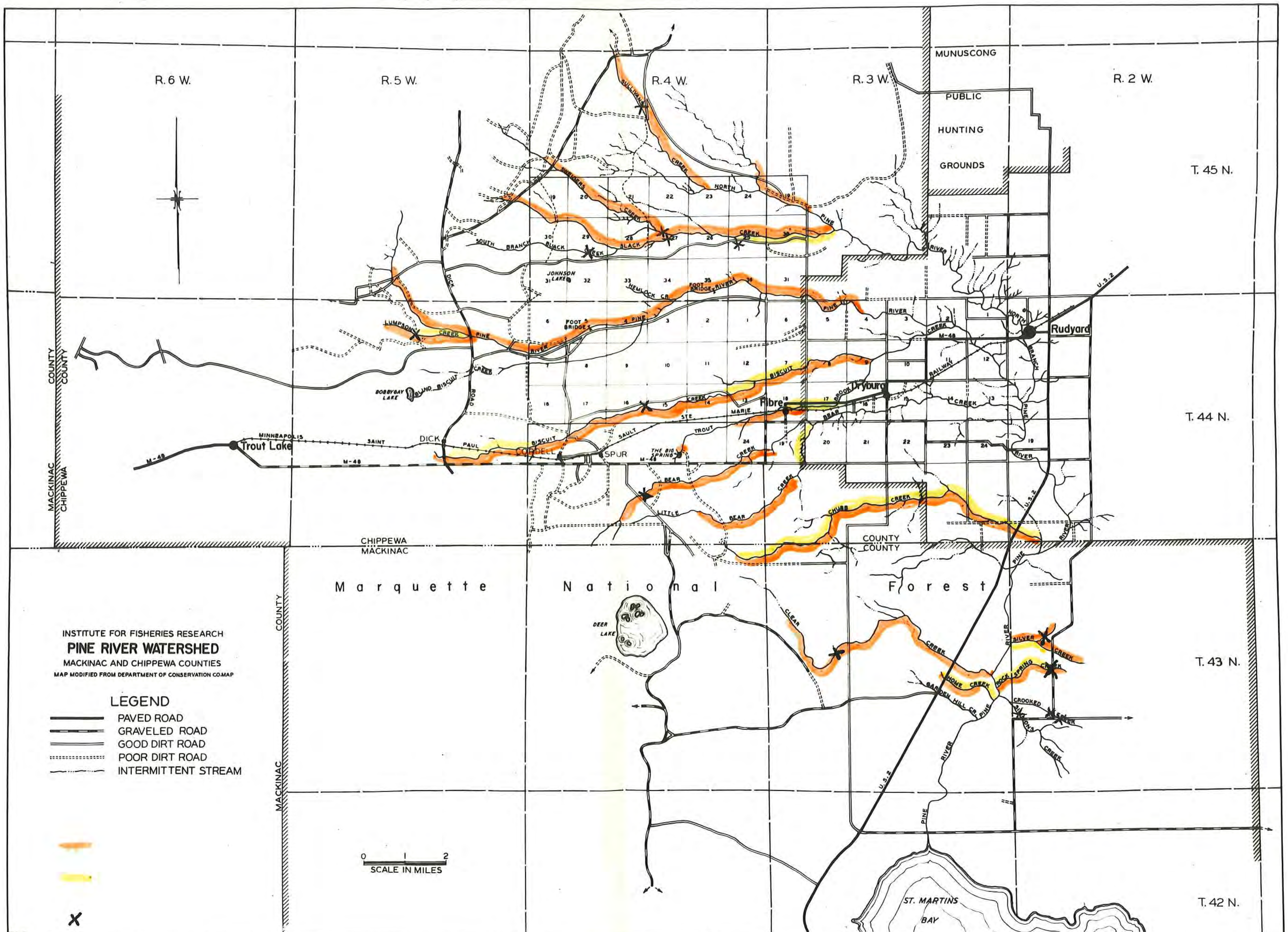
PINE RIVER WATERSHED
MACKINAC AND CHIPPEWA COUNTIES
MAP MODIFIED FROM DEPARTMENT OF CONSERVATION CO.MAP
LEGEND
PAVED ROAD
GRAVELED ROAD
GOOD DIRT ROAD
POOR DIRT ROAD
INTERMITTENT STREAM
FISH COLLECTION STATION NUMBER
BROOK TROUT
RAINBOW TROUT
FISH PER HOUR OF SHOCKING
BROOK
RAINBOW
SCALE IN MILES
R. 6 W.
R. 5 W.
R. 4 W.
R. 3 W.
R. 2 W.
T. 45 N.
T. 44 N.
T. 43 N.
T. 42 N.
MUNUSCONG
PUBLIC
HUNTING
GROUNDS
Rudyard
Dryburg
Fibre
Trout Lake
CORDELL
SPUR
Marquette National Forest
CHIPPEWA
MACKINAC
MACKINAC COUNTY
CHIPPEWA COUNTY
ST. MARTINS BAY
DEER LAKE
BOBBYGAY LAKE
JOHNSON LAKE
W.L.C.

MAP V

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


INSTITUTE FOR FISHERIES RESEARCH
PINE 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
SCALE IN MILES
0 1 2
R. 6 W.
R. 5 W.
R. 4 W.
R. 3 W.
R. 2 W.
T. 45 N.
T. 44 N.
T. 43 N.
T. 42 N.
MUNUSCONG
PUBLIC
HUNTING
GROUNDS
Rudyard
Dryburg
Fibre
Trout Lake
Cordell
Spur
Dick
Marquette National Forest
CHIPPEWA
MACKINAC
COUNTY
COUNTY
MACKINAC
CHIPPEWA
DEER LAKE
BOBBYGAY LAKE
JOHNSON LAKE
ST. MARTINS BAY
MINNEAPOLIS SAINT PAUL SAULT STE MARIE
M-48
U.S. 2
PINE RIVER
NORTH BRANCH
SOUTH BRANCH
BLACK CREEK
SULLIVAN CREEK
HEMLOCK CR.
FOOT BRIDGE
LUMPSON CREEK
BLIND BISCUIT CREEK
BISCUIT CREEK
BROOK
TROUT
THE BIG SPRING
BEAR CREEK
LITTLE BEAR
CHUBB CREEK
CLEAR CREEK
SILVER CREEK
HOME CREEK
SPRING CREEK
BARDEN HILL CR.
CROOKED CREEK
SIMMONS
DICK ROAD
W.L.C.