Wild rivers fish populations : (Pine, Popple and Pike Rivers). Report 58 1970

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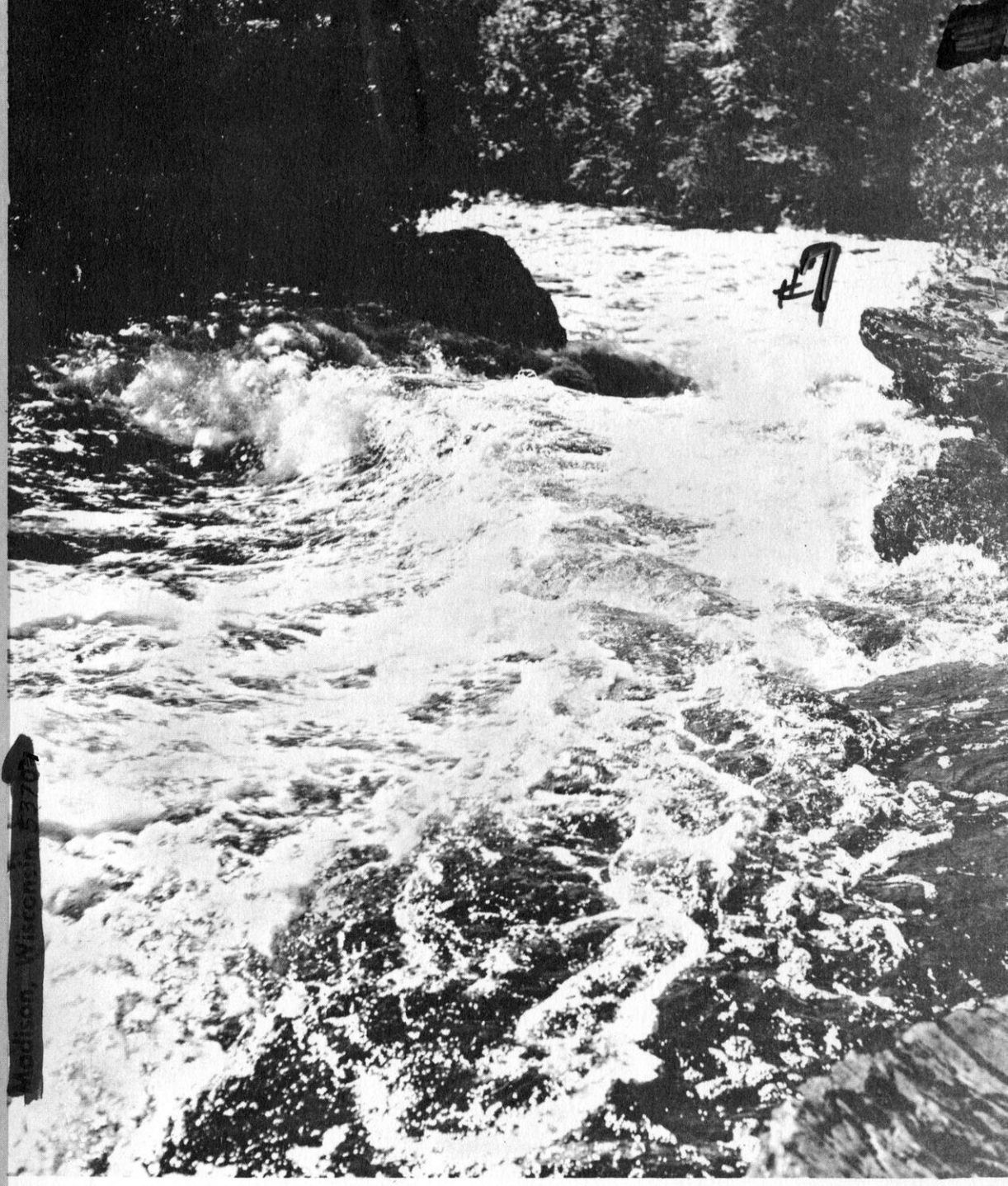
REPORT 58



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WILD RIVERS FISH POPULATIONS

(Pine, Popple and Pike Rivers)

By
John W. Mason and Gerald D. Wegner

ABSTRACT

The fish populations and water quality of the Pine, Popple and Pike Rivers and their tributaries were studied from 1966-68 to document existing conditions in wild rivers and serve as a basis for future protection and use.

The Pine and Popple Rivers are fast-moving rivers, with falls and rapids, although there are also extensive reaches of quiet, slow-moving water. The Pike River is narrower and deeper, and has more bank and instream cover.

Warmwater fish predominated in the lower Pine. Trout were found in all three rivers, but productivity is restricted by low water fertility, high summer temperatures and cold winter temperatures. The north branch of the Pike River is the best stretch of trout water in the wild rivers system. Higher standing crops and better trout reproduction reflect greater productivity.

In future management emphasis should be placed on maintaining the highest quality fishery possible. Stocking of brown trout will be necessary to facilitate the buildup of this species in the wild rivers. Browns are more likely to grow to larger size and provide a more sustained fishery than the other trout species. Trout should be stocked in areas of river having high gradient, and in stretches where wild populations are the lowest.

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ACKNOWLEDGMENT

To name all the individuals who assisted us in the work covered in this report would be an impossibility, so we must extend our thanks to you as a group. We appreciate the valuable help from people in the Bureau of Research, in other Bureaus of the Department of Natural Resources, in the U. S. Geological Survey, and from members of the Wisconsin Academy of Sciences, Arts and Letters.

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The authors are Water Resources Research Biologist and Technician, respectively, in the Bureau of Research in Madison.

Edited by Ruth L. Hine

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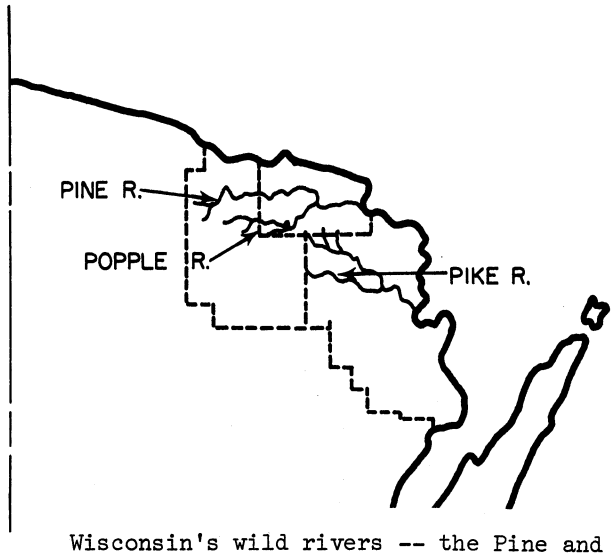
INTRODUCTION

A wild rivers system was established in Wisconsin in 1965 by the Legislature (Chapter 363, Laws of 1965). Specifically designated as Wisconsin's first wild rivers were the Pine, Popple and Pike Rivers located in the northeast area of the state. These rivers were selected because the legislature recognized their unique value and believed they merited special consideration in order to assure their preservation, protection and enhancement.

In 1965 there was only limited information available on the ecology and recreational importance of these rivers. Additional information was needed to document existing conditions in wild rivers and to serve as a basis for their future protection and sound recreational use. Therefore, coordinated projects to study various aspects of the Pine, Popple and Pike Rivers, including the hydrology, fish populations, plant communities and aquatic insect populations, were initiated in 1966. These studies were conducted by state and federal agencies, universities, and the Wisconsin Academy of Sciences, Arts and Letters.

Publications dealing with each phase of the wild rivers investigations are being prepared by the groups involved. This report is focused on the studies of water resources and fish populations of the Pine, Popple and Pike Rivers made by the Bureau of Research of the Department of Natural Resources.



Wisconsin's wild rivers -- the Pine and Popple in Florence and Forest Counties, the Pike in Marinette County.

METHODS

Electrofishing gear of various types was used in sampling fish populations in the wild rivers. It seemed to be reasonably effective, and in most cases provided a fairly accurate inventory of the fish population present. However, the limitations of electrofishing gear in waters such as the wild rivers are well recognized. Width, depth, velocity and low conductivity were problems in some reaches of stream shocked, and may have affected the assessment of fish populations at some stations. Fortunately, stream levels were extremely low during the summer and fall of 1966 when the greatest share of the electrofishing was carried out in the Pine and Popple Rivers.

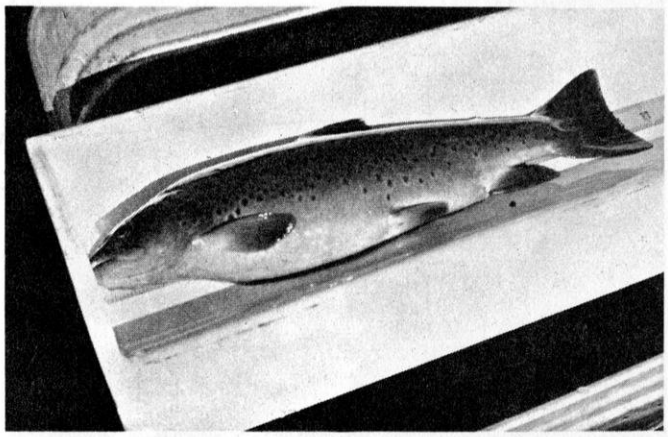
A 230-volt DC generator with 3 electrodes floated on a boat was employed most extensively. In some reaches where the rivers were too wide to be effectively shocked with one unit, two were used side by side.

Some tributary streams (many of which are characterized by heavy bank cover and downed logs in-stream which make floating a boat difficult) were sampled with a hand-carried "long line" unit. This shocker consisted of a small 115-volt DC generator and 2 electrodes on 100 yards of line.

Fish collections in the Pine River Flowage were made with a 230-volt AC boom shocker. The shoreline of the lake was electrofished at night to facilitate the capture of game fish. Attempts also were made to collect game fish in the Pine River above the flowage with the boom shocker unit, but none were caught.

Game fish captured by electrofishing were identified, measured, weighed and returned to the stream. Stocked trout were identified by fin clips given them before

Electrofishing in the wild rivers using two crews abreast.



A nice wild rivers brown trout. The fish of the future?

stocking. At some stations an estimate of the trout population was made by the mark and recapture method: the trout were collected, marked, redistributed and the stream section shocked a second time. At each electrofishing station a species list of minnows and forage fish present in the stream was made (or the fish were preserved in formalin for later identification), and notes on stream widths, depths, velocity, temperature, physical characteristics and in some cases conductivity were recorded. Scientific names of fish cited in text are shown in Appendix A.

The creel census run on the Pine-Popple on the opening weekend of the 1967 trout season involved a field crew of 10 men. Each man had a well-defined section of stream to patrol. He interviewed as many fishermen as possible, checked trout caught, and counted cars at regular intervals.

Ryan recording thermometers were employed to monitor water temperature at various locations in the wild rivers. Installations of these canister-type instruments were relatively simple: they were placed on the stream bottom in an area of good flow and chained to a tree on the bank. The Model D-45 thermographs used have a temperature span of 30-90° or 0-120°F and record continuously over a 45-day period. Accuracy is guaranteed by the manufacturer to be within 2% on time and temperature.

Water quality determinations made both in the field and in DNR laboratories followed established procedures. Dissolved oxygen, temperature, pH, alkalinity and conductivity measurements were made in the field, and water was collected and taken directly to the laboratory for analysis of the other parameters.

PINE RIVER

General Description

The Pine River rises in Butternut and Howell Lakes and the swamps of Forest County and flows eastward to its confluence with the Menominee River (Fig. 1). Starting as small streams in the headwaters of the north and south branches, the Pine builds to a river approaching 200 feet in width at its mouth. The main branch averages between 30-60 feet wide throughout much of its course. The Pine flows a distance of 65 or 76 miles, depending on which branch, north or south, is included. It drains an area of over 400 square miles on its way through Forest and Florence Counties in the northeast corner of the state, most of which is forest or swamp land.

For the most part the Pine is a fast-moving river, with falls and rapids and a wilderness setting that give it the recreational and esthetic qualities of a wild river. It has been "tamed" by only one permanent man-made structure--the hydroelectric dam 12 miles upstream from the confluence with the Menominee that creates the 130-acre Pine River flowage.

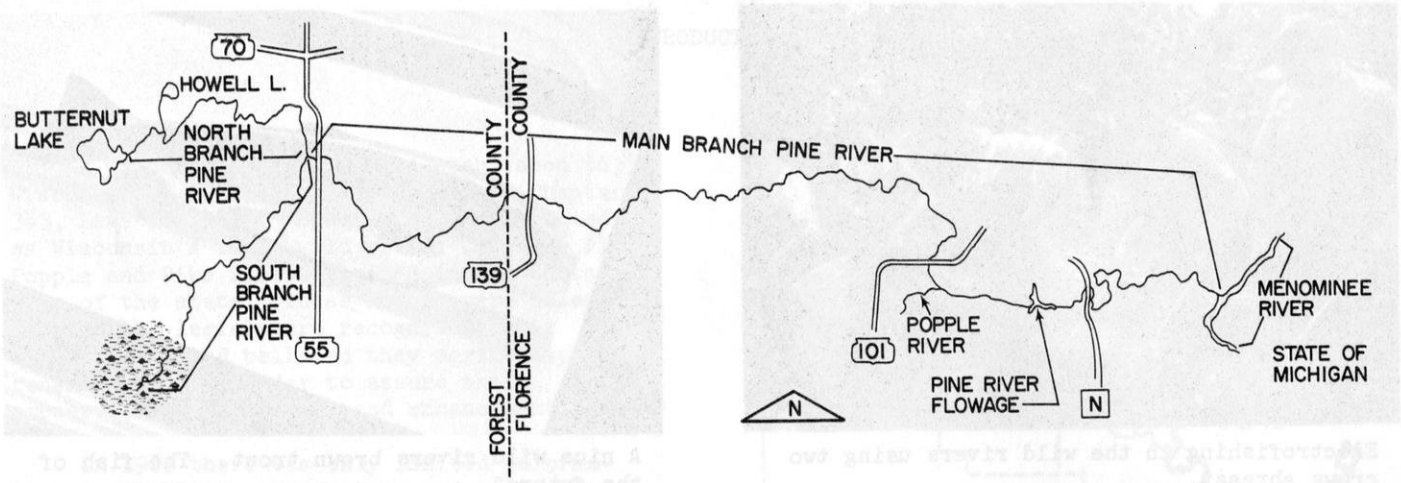
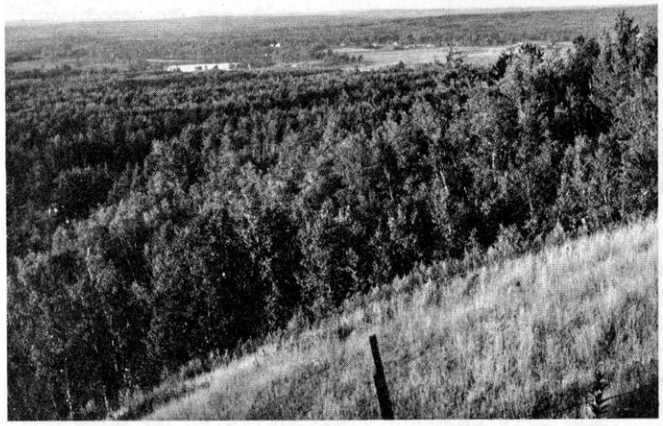


FIGURE 1. Pine River System

The main branch would best be described as a swift and shallow stream (from 1 to 4 feet deep) even though it has some deep holes and sluggish stretches. In general, the stretches of river flowing through swamp lands are lower gradient and deeper than those flowing through forest lands. Gradient in the north and south branches in most sections is not so steep as in the main branch, and the flow has been further slowed in some places by beaver ponding.

The volume of the Pine, and hence the width, depth and velocity, varies markedly with the season and weather conditions. Stream flow at the Pine River power plant has varied from a low of 87 to a high of 4,380 cubic feet per second (average, 420 cfs). Flows below the Pine River dam and flowage are regulated at the generating plant by the Wisconsin-Michigan Power Company. Normally flow in the lower river is high during the day and low at night, but the situation is also dependent upon flow above the dam.



The Pine River country from the top of a Florence County hill: wilderness and water.

The river bed, nearly everywhere except in extremely sluggish stretches, is composed of hard material--the gravel, sand, rubble and boulders common in many streams of the northern highland region. In some places the river flows over exposed granite bedrock of Pre-Cambrian origin. Soft, mucky bottom is found only behind dams, in the headwaters areas, and in other isolated spots. Gravel beds of suitable composition for fish reproduction are numerous and widespread.

Instream cover for fish in the Pine is provided in some places by boulders, downed logs and aquatic vegetation, but other stretches are nearly barren. Overhanging cover from the bank, particularly tag alders in certain areas, provides some additional cover for fish.

Fish and Fishing

Fish populations were sampled in all reaches of the stream at 29 representative locations where access to the river could be gained. More than 17 miles of the Pine was electrofished in all, not including the shoreline of the Pine River Flowage (Table 27, App. B).

Warmwater game fish predominated in the lower Pine River and in the flowage, while cold water species predominated above La Salle Falls, which is located about a mile above the flowage (Table 1). La Salle Falls may in fact be a barrier to some warmwater species, since no smallmouth bass or walleyes were found in the Pine above the falls. Northern pike were collected in the upstream reaches of the river, but they were more numerous in the flowage and below the dam.

Trout were found to be widely distributed in the Pine, but nowhere were large numbers collected. Most of the trout captured (69%) were stocked brook, brown and rainbow trout,

Water levels in the Pine River below the hydroelectric plant are subject to extreme fluctuation. At low flow much of the bottom is exposed (left).

Opening day fishermen on the Pine River enjoy a wilderness surrounding and the "elbow room" it affords them (right).

many of them recently stocked fingerlings. Although wild brook and unmarked brown trout turned up at 17 of the 28 stations shocked, a total of only 66 and 61 of these fish, respectively, were caught.

The length of the unmarked brown trout ranged from 3.0 to 18.3 inches, which probably represents 3 or more year classes and indicates that at least some natural reproduction occurs each year (Fig. 2). Wild brook trout ranged in length from 2.8 to 12.5 inches with several year classes represented but most of them were small, less than 8 inches in length.

Density of warmwater fish populations was low even below the Pine River dam. Smallmouth bass, mostly yearlings, made up the largest segment of the population. Although smallmouth up to 17.7 inches in length were collected, most were 3 to 5 inches long (Fig. 3). No large walleyes or northern pike were caught in the lower river, but a few very large northerns, up to 45+ inches turned up in the Pine River Flowage.

Twenty-two forage fish species were collected in the Pine River (Table 2). Since observations of forage fish were incidental to the game fish population survey, no attempt was made to establish relative numbers. On the basis of distribution, the white sucker, mottled sculpin, hornyhead chub, common shiner, johnny darter, and blacknose and longnose dace in that order, were most common.

A creel census was conducted on the Pine River on the opening weekend of the 1967 trout season (May 13-14), in order to get an indication of fishing pressure, species caught, and origin of the fishermen.

Fishing success was generally poor. Weather conditions were unfavorable, and fishing pressure was relatively light on most reaches of stream. At peak pressure on opening morning, 35 cars were counted on the Florence County section of the Pine.

The 166 anglers checked caught only 56 trout in 519 hours of fishing (Table 3). One hundred twenty-nine fishermen (78%) did not catch a fish, and none caught a limit. Only 20 fishermen were residents of the wild rivers counties, while a surprising number had traveled long distances to fish. Most had driven at least 50 miles and many more than 100 miles.

Water Quality

Measurements of the water quality in the Pine River were made in 1967-68 primarily to obtain information on factors which might be affecting fish populations in the river. Water samples were collected at various locations at different times of the year for chemical analysis, and stream temperatures were continuously recorded at the same sites.

The waters of the Pine River are infertile but relatively free of man's influences. Since the watershed is still sparsely populated and largely forested, water quality probably has changed little over the years. Some alteration to the environment may have occurred during early logging days when the virgin timber was removed or burned, but second growth forest now covers much of the area. Most of the

TABLE 1

Number of Game Fish Sampled by Electrofishing in the Pine River*

Stream Section	Brown trout** Unmarked	Brown trout Stocked	Brook trout Wild	Brook trout Stocked	Rainbow trout Stocked	Northern Pike	Walleyes	Smallmouth Bass	Largemouth Bass	Muskellunge
Lower Pine River (Below impoundment) Stations 1-3	2					11	23	164		
Pine River Flowage Station 3A						21	25		1	5
Main Branch Pine River Stations 4-18	57	142	28		32	5			1	
North Branch Pine River Stations 19-24		7	27	94		1			1	
South Branch Pine River Stations 25-28	2	13	11			1				
	61	162	66	94	32	39	48	164	3	5

* One run, conducted during the period from September 1966 through October 1967.
** Unmarked brown trout over 2 years old may be either wild or stocked trout.

TABLE 2

Forage Fish Species Found in the Main, North and South Branches of the Pine River

	Sampling Stations																											
	Main Branch			Flowage	Main Branch															North Branch						South Branch				No. of Sites
Name	1	2	3	3a	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	Found
White Sucker	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	29
Johnny Darter	X	X	X		X	X	X		X	X	X	X				X	X	X	X				X			X	X	X		18
Mottled Sculpin	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	26
Hornyhead Chub		X	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	24
Northern Creek Chub			X		X	X	X	X					X	X										X	X		X			10
Longnose Dace		X	X		X	X	X		X	X	X		X	X	X	X	X	X			X	X								16
Blacknose Dace					X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X				X	X		X	19
Northern Redbelly Dace					X	X					X													X	X					5
Pearl Dace										X																			X	2
Yellow Bullhead		X					X																							2
Black Bullhead					X																									1
Yellow Perch	X	X	X	X	X		X	X	X					X							X		X		X					12
Bluegill	X	X		X			X		X	X																				6
Tadpole Madtom			X		X					X																				3
Mudminnow						X			X														X			X		X	X	6
Common Shiner	X	X	X		X	X	X	X		X	X	X	X	X	X	X			X		X		X	X	X	X	X	X	X	23
Rock Bass	X	X	X	X																										4
Log Perch	X	X	X																											3
Burbot	X	X																												2
Bluntnose Minnow		X																					X						X	3
Brook Stickleback																				X	X		X	X						4
Brassy Minnow																													X	1

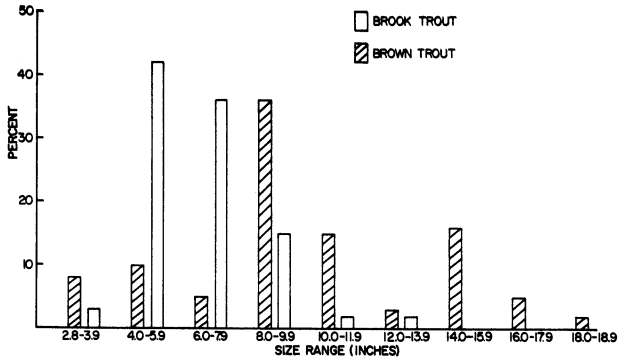


FIGURE 2. Length Frequency Distribution of Unmarked Brown and Wild Brook Trout Captured by Electrofishing in the Pine River, Including North and South Branches. (Unmarked brown trout over 2 years old may be either stocked or wild).

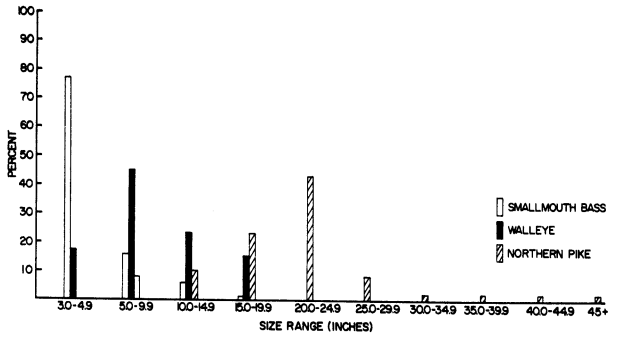


FIGURE 3. Size Distribution of Three Most Numerous Species of Warm Water Fish Caught by Electrofishing in the Pine River, Including Flowage, North and South Branches. (Not shown: Muskellunge--5 caught only in the Flowage, 6 - 23 inches in length; smallmouth bass--3

land in the watershed is either publicly owned or controlled by private companies that follow sound forest management practices.

Both man-made dams and beaver dams have changed the environment and possibly the water quality in certain stretches of the river, but probably not in the main branch to any great extent. Also, the Pine, like all other waterways in Wisconsin, has apparently received some pesticide contamination; DDT and dieldrin residues were detected in trout taken from the river. Levels were among the lowest found anywhere in the state, however, and it appears that only minute quantities of the pesticide have reached the Pine.

The Pine does not receive industrial or municipal wastes. Low nitrogen, phosphorus, chloride and coliform bacteria levels were found at every sampling site and at all times of the year, indicating pollutants are not present in the river (Table 4 and other sources). Similarly, the insect fauna found was of the type normally associated with clean water and good dissolved oxygen conditions. The Pine apparently is not affected significantly by nutrient runoff from the watershed; there was no evidence of high nitrogen and phosphorus levels during peak runoff periods such as is common in streams in agricultural areas. More organic material was present in the river in the summer than later in the year, as might be expected.

Water quality did not differ significantly at any of the sampling sites, except in the south branch where total alkalinity and pH were slightly lower than elsewhere. However, variations in chemical composition were noted at all locations at different times of the year and at different flow stages. Lowest alkalinity, pH, conductivity, and calcium and magnesium concentrations were found during spring and early summer when flows were high, while the highest were in fall and winter at low flow. During periods of high flow, when the Pine is swelled by runoff and swamp drainage, its waters are characteristically coffee-colored and very low in mineral content. At base flow, the Pine is relatively clear and contains its highest mineral concentrations, but it still remains a comparatively infertile stream.

Dissolved oxygen levels were found to be adequate for fish and aquatic life in all reaches of the Pine. The lowest level detected was in the south branch (4.7 ppm) on July 16, 1968, when flow and water temperature were quite high; drainage from bogs and swamp lands where the dissolved oxygen probably was low plus the low stream gradient at the sampling sites may have been the contributing factors. Highest levels were found in the Pine in fall and winter.

A 24-hour dissolved oxygen survey, made in September, 1967 (jointly by DNR and USGS) when the river was near base flow, showed that DO concentrations at that time varied considerably at different points in the river system (Fig. 4). However, no critically low DO's were observed anywhere, and only slight diurnal fluctuations were noted at the different sampling sites.

Water temperatures in the Pine followed generally the same daily and seasonal trends at all recording locations in the north, south and main branches. A record of 1968 daily maximum-minimum temperatures at a representative site in the main branch (Hwy. 101) is given in Table 5. The Pine typically was frozen over or at the freezing point in every reach from early

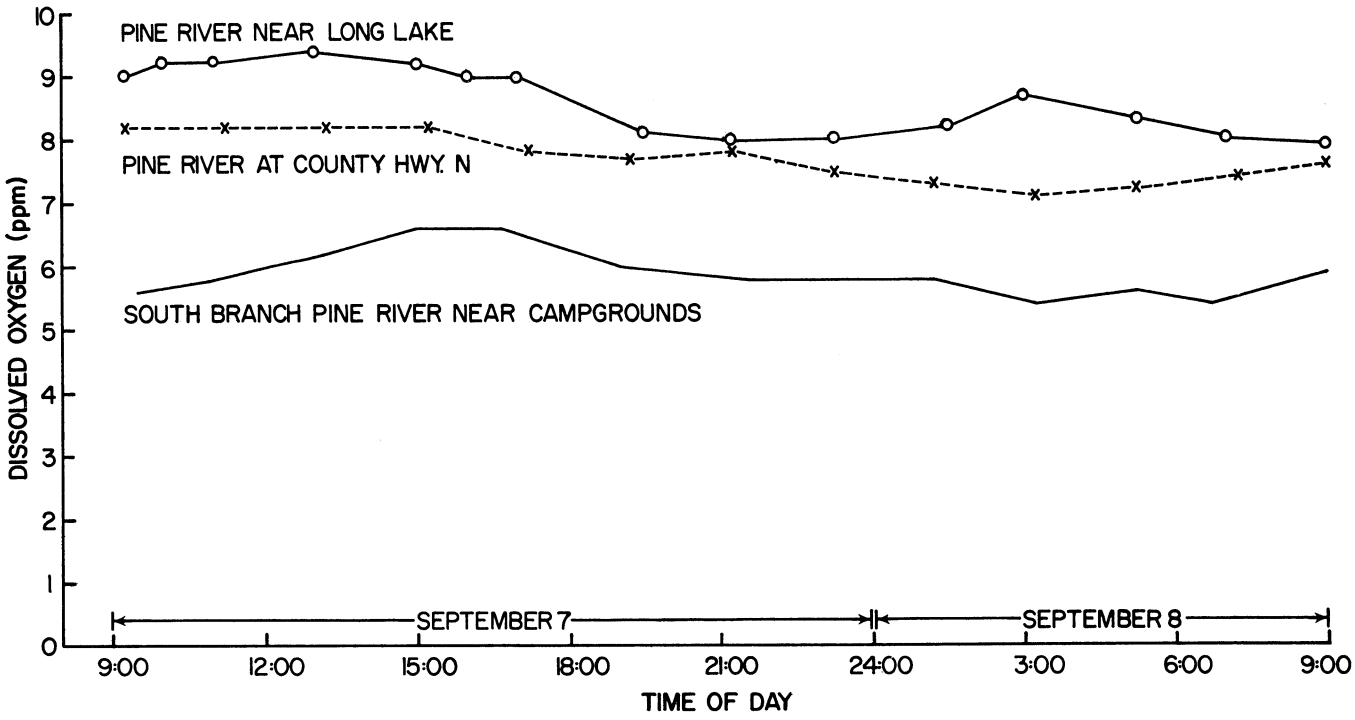


FIGURE 4. Dissolved Oxygen Levels at 3 Different Sampling Sites in Pine River Over a 24-Hour Period, September 7-8, 1967.

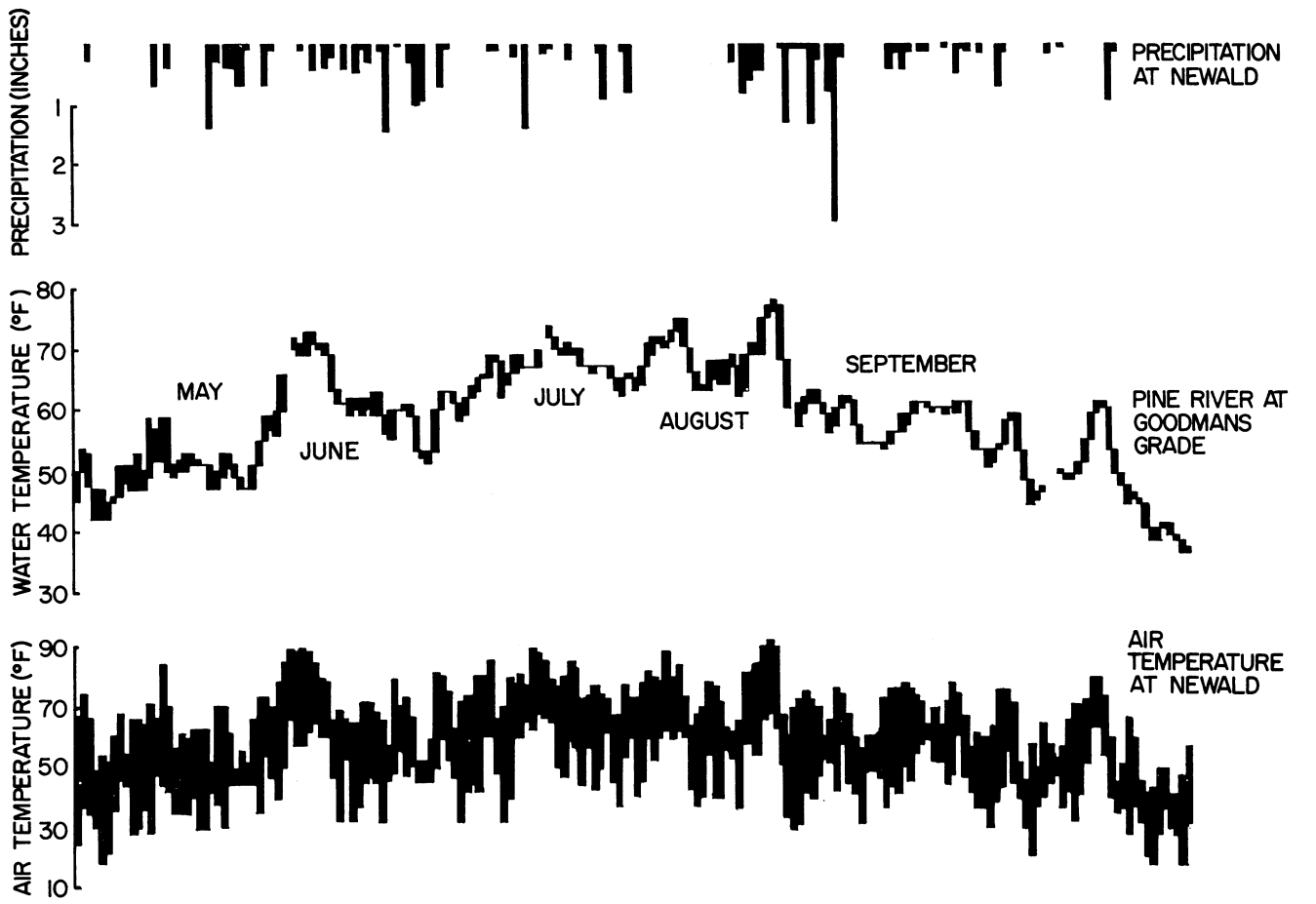


FIGURE 5. Relationship of Water Temperature in the Pine River to Air Temperature and Precipitation, May-October, 1968.

or mid-November until the spring breakup in late March or April. Water temperatures warmed slowly in early spring but rapidly in late spring and summer to reach their highest levels in July and August.

Weather conditions were the most important factor influencing water temperatures at all recording sites. Spring, summer and fall temperatures in the Pine were closely related to air temperature and precipitation patterns (Fig. 5). Generally, hot and dry weather pushed stream temperatures up (and reduced volume of flow) while cool air temperatures and heavy rainfall depressed water temperatures (increased flow).

Other factors that seemed to influence water temperatures to some extent were dams and vegetative cover over the stream. Summer temperatures were slightly higher in the north branch at Windsor Dam than at the other recording sites (Table 6). At Windsor Dam, where the river is ponded by an old logging dam, daily maximum temperatures reached 70°F or more on nearly half the summer days in 1967-68. Coolest summer temperatures (less than 70°F most of the time) were recorded in the south branch where shading by vegetation may help keep some stream sections from warming to the maximums reached at other recording

TABLE 3

Creel Census Statistics on the Pine River, Opening Weekend, May 13-14, 1967

No. interviews	166	
No. fisherman with:		
0 trout	129	(78%)
1-9 trout	37	(22%)
10 trout (limit)	0	
No. hours fished	519	
No. trout caught		
Brown (wild & stocked)	10	
Brook (wild & stocked)	35	
Rainbow (stocked)	11	
Total	56	
Trout caught/hour fishing	0.1	
No. fishermen travelling		
Less than 50 miles	20	
50-100 miles	71	
100-150 miles	41	
150+ miles	15	
Nonresidents	11	
Unknown	8	
No. cars counted (Florence Co.		
Saturday a.m.	35	
Saturday p.m.	17	
Sunday a.m.	16	

TABLE 4

Water Quality Data From the Main, North and South Branches of the Pine River

Sampling Site	Sampling Date	Temperature in °F	pH	Total Alkalinity	Conductivity (25°C)	Dissolved Oxygen (ppm)	Dissolved Phosphate (ppm)	Total Phosphate (ppm)	Ammonia Nitrogen (ppm)	Kjeldahl Nitrogen (ppm)	Nitrate Nitrogen (ppm)	Nitrite Nitrogen (ppm)	Chloride (ppm)	Calcium (ppm)	Magnesium (ppm)	Sodium (ppm)	Potassium (ppm)	Sulfate (ppm)
State Hwy. 101 - Main Branch	27 April 1967	44	7.4	43	106	--	.001	.060	--	--	.141	--	1.32	8.4	5.6	2.72	1.64	--
	4 June 1968	69	7.4	48	112	8.1	.024	.151	.183	.631	.211	.005	1.44	7.0	5.2	1.25	.50	8.7
	16 July 1968	76	7.6	53	120	6.6	.020	.190	.000	.723	.313	.002	2.24	8.0	6.8	2.10	.75	2.5
	8 Oct. 1968	50	7.8	75	--	9.6	.000	.160	.000	.326	.090	.005	1.38	9.8	11.2	1.75	.66	5.0
County Trunk Hwy. N - Main Branch below Dam	27 April 1967	45	7.3	37	96	--	.003	.056	--	--	.176	--	1.13	7.4	6.4	1.48	.84	--
	28 Nov. 1967	32	7.6	98	248	12.0	.000	.003	--	.390	.140	--	1.96	10.0	10.7	1.12	.44	4.5
	4 June 1968	63	7.4	45	113	8.9	.015	.188	.040	.712	.181	.005	1.39	6.5	7.4	1.15	.80	9.3
	16 July 1968	73	7.6	57	138	7.3	.020	.210	.000	.732	.277	.000	1.99	8.4	7.6	2.30	1.25	2.5
	7 Oct. 1968	52	7.8	78	203	10.2	.010	.140	.000	.346	.120	.005	1.63	9.2	10.0	1.60	.74	--
Goodmans Grade - Main Branch	27 April 1967	42	7.4	41	105	--	.001	.003	--	--	.133	--	1.32	7.9	5.8	2.32	1.30	--
	5 June 1968	66	7.4	49	112	7.7	.009	.188	.038	.519	.211	.005	.95	7.0	7.4	0.95	0.55	8.3
	16 July 1968	76	7.6	50	111	7.0	.010	.330	.000	.722	.265	.000	1.74	7.6	5.4	2.50	0.80	0.3
	8 Oct. 1968	50	7.8	75	--	9.7	.000	.100	.000	.285	.120	.005	1.38	10.2	10.6	1.85	.50	5.0
State Hwy. 139 - Main Branch	27 April 1967	45	7.2	31	92	--	.020	.197	--	--	.211	--	1.13	6.0	4.2	2.24	0.96	--
	28 Nov. 1967	32	7.2	70	--	12.5	.003	.050	--	.290	.160	--	1.27	6.8	8.3	1.22	0.26	4.2
Chipmunk Rapids Main Branch	27 April 1967	45	7.4	38	99	--	.018	.120	--	--	.125	--	1.27	7.2	5.2	2.00	1.08	--
Below Confluence with Popple River Main Branch	27 April 1967	44	7.4	44	108	--	.040	.080	--	--	.141	--	1.37	8.4	6.5	2.44	1.76	--
Above Confluence with Menominee R. Main Branch	27 April 1967	42	7.3	43	101	--	.050	.116	--	--	.141	--	1.22	8.1	5.7	2.44	1.04	--
At Windsor Dam North Branch	27 April 1967	44	7.4	38	91	--	.001	.003	--	--	.067	--	.44	6.3	4.6	1.52	.74	--
	28 Nov. 1967	32	7.0	56	120	9.5	.001	.017	--	.250	.020	--	1.27	9.4	11.1	1.14	.50	4.2
	5 June 1968	69	7.0	43	106	6.9	.017	.151	.012	.468	.271	.005	.65	6.5	5.7	1.10	.50	4.3
	16 July 1968	75	7.0	43	92	5.7	.010	.230	.000	.448	.084	.001	1.49	4.8	4.1	2.00	.60	0.7
	8 Oct. 1968	51	7.2	45	--	8.7	.000	.210	.000	.265	.060	.005	.50	4.8	5.9	1.95	.40	4.7
At USGS Gaging Station - South Branch	27 April 1967	44	6.6	18	63	--	.001	.066	--	--	.186	--	1.13	3.3	3.4	2.44	1.56	--
	28 Nov. 1967	32	7.0	60	156	10.0	.030	.033	--	.490	.210	--	2.49	6.0	7.3	1.14	.30	1.5
	5 June 1968	65	6.6	25	78	5.9	.000	.179	.151	.671	.271	.005	.95	3.5	3.8	1.35	.80	7.0
	16 July 1968	71	6.9	31	65	4.7	.020	.160	.051	.692	.367	.003	1.24	4.0	3.9	1.80	.35	0.1
	8 Oct. 1968	50	7.2	45	--	9.0	.010	.180	.000	.346	.181	.008	1.13	4.6	7.4	1.35	.10	5.3

TABLE 5

Maximum-Minimum Temperatures in the Pine River at State Highway 101 for 1968 (in °F)

Month		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Avg.
Jan.	Max.	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	-	32	32	32	32	32	32
	Min.	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	-	32	32	32	32	32	32
Feb.	Max.	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	-	-	32
	Min.	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	-	-	32
Mar.	Max.	32	32	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Min.	32	32	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
April	Max.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37	43	44	47	49	-	-
	Min.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33	36	42	42	43	-	-
May	Max.	52	57	51	45	49	45	45	52	49	53	54	51	59	54	63	60	53	52	53	54	55	53	51	51	54	54	51	49	48	52	57	52
	Min.	43	49	45	39	39	41	42	45	44	44	47	47	46	51	51	49	48	49	49	50	49	49	47	45	49	51	49	48	47	47	52	47
June	Max.	61	60	62	-	71	73	72	73	73	71	71	69	63	61	62	62	64	64	64	65	61	57	61	61	62	61	57	52	53	62	-	64
	Min.	56	59	56	-	66	69	69	69	70	69	69	63	59	61	58	58	58	60	58	58	57	55	55	60	60	57	52	51	51	53	-	60
July	Max.	62	63	62	59	63	65	66	66	71	71	68	70	70	70	67	69	72	73	72	72	71	73	71	69	70	69	70	69	66	67	67	68
	Min.	62	62	59	57	59	61	62	66	65	67	61	62	69	66	66	67	69	72	69	69	70	69	67	67	67	67	68	65	62	63	67	65
Aug.	Max.	67	69	73	74	75	71	73	77	78	73	66	66	65	71	70	67	71	71	68	72	73	73	73	78	81	77	68	64	65	66	66	71
	Min.	63	64	68	69	71	69	70	70	73	65	62	60	61	63	62	61	64	67	60	63	68	68	69	73	76	68	58	55	58	59	60	65
Sept.	Max.	63	59	61	64	64	62	57	53	54	54	54	57	57	58	60	62	62	61	60	60	60	60	61	62	62	56	52	52	51	53	-	58
	Min.	60	58	57	61	61	57	53	53	53	53	53	54	56	56	58	60	61	60	59	60	59	59	59	61	56	51	51	50	50	51	-	56
Oct.	Max.	56	60	59	54	47	45	45	48	49	49	48	48	50	55	59	61	61	59	53	49	47	46	46	43	39	37	39	39	38	36	33	48
	Min.	51	56	54	47	43	41	45	45	49	47	46	47	48	50	55	59	59	53	49	47	43	45	43	39	35	36	37	38	36	33	33	45
Nov.	Max.	37	39	40	37	37	37	37	35	33	32	32	32	32	32	32	32	32	32	32	32	-	-	-	-	-	-	-	-	-	-	-	34
	Min.	33	37	37	37	36	37	35	33	32	32	32	32	32	32	32	32	32	32	32	32	-	-	-	-	-	-	-	-	-	-	-	33
Dec.	Max.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Min.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

sites. Below the power company dam, at County Highway N, daily maximum temperatures were somewhat lower than above the dam, probably due to flow regulation in that reach of the river.

The highest temperature recorded in the Pine River was 81°F at the State Highway 101 site on the main branch and at Windsor Dam on the north branch.

When all factors are considered, the Pine River can be classified as a clean and unpolluted stream, suitable for game fish and fishing and all other forms of recreation associated with a wilderness river.

TABLE 6

Range of Daily Maximum Summer Temperatures at Various Sites on the Pine River, 1967-68*

Temperature Range °F	Percent of Days				
	At Hwy. N	At Hwy. 101	Goodmans Grade	North Branch at Windsor Dam	South Branch at USGS Gage
Over 80	0	1	0	1	0
70 - 79	21	34	32	43	11
60 - 69	75	58	61	53	65
50 - 59	4	7	7	3	24
40 - 49	0	0	0	0	1

* Summer months were considered to be June, July and August

POPPLE RIVER

General Description

The main tributary of the Pine River is the Popple, which originates in the swamp lands of Forest County and joins the Pine 5 miles above the Wisconsin-Michigan Power Company dam (17 miles upstream from the mouth of the Pine). Flowing approximately 45 miles from source to mouth, the Popple drains about 230 square miles of Forest, Marinette and Florence Counties (Fig. 6). It traverses essentially the same type of terrain as the Pine, and possesses most of the same physical characteristics and distinctive features.

Most fastwater stretches of the Popple are found in the lower reaches, the segment from the confluence of the main and south branches to the mouth. There, gradient is steep with falls and rapids common and deep pools present (Table 28, App. B). Even in this reach, however, there are some stretches of wide, sluggish and sometimes deep water. The upper reaches of the Popple flow through extensive swamp lands, where the stream is for the most part low gradient and slow moving. A soft muck bottom and sluggish flow is characteristic of the lower section of the south branch, but the upper section generally has a higher velocity, more pools and a harder bottom.

The volume of flow in the Popple is subject to extreme fluctuation. At the USGS gaging station 11½ miles upstream from the mouth, flows of less than 30 cfs occur periodically during dry weather and a low of 15 cfs was recorded in July, 1964. Runoff of snow melt or precipitation will oftentimes send the Popple beyond 500 cfs at the same location. The maximum discharge rating of 1,100 cfs was made on May 10, 1965. During dry spells such as occurred during the summer and fall of 1966, the upper reaches of the Popple scarcely flow. Wet weather or runoff on the other hand, can change the Popple into a raging torrent.

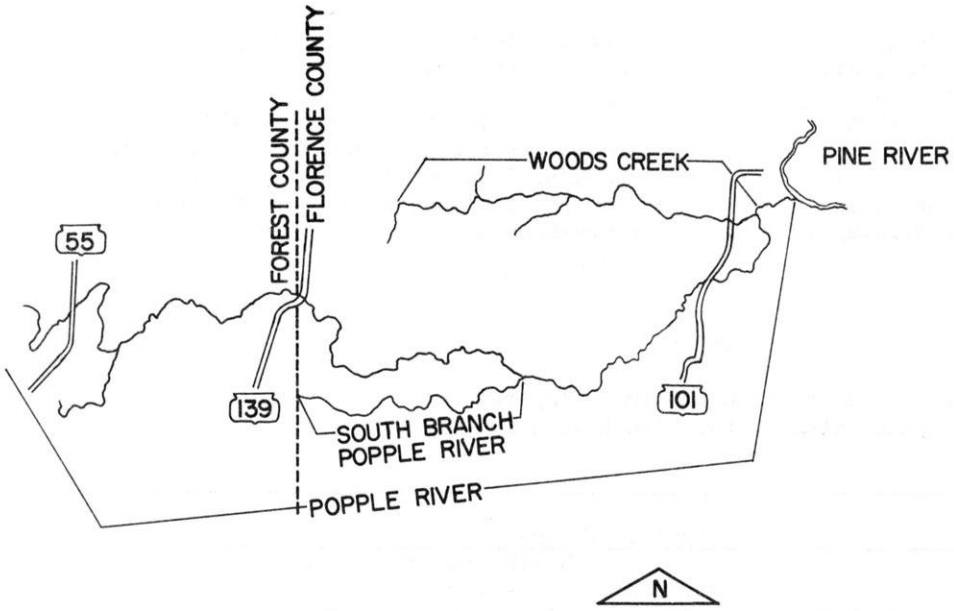
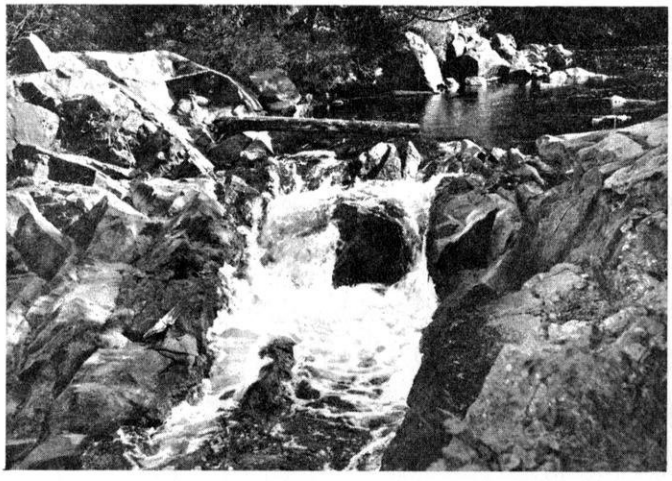
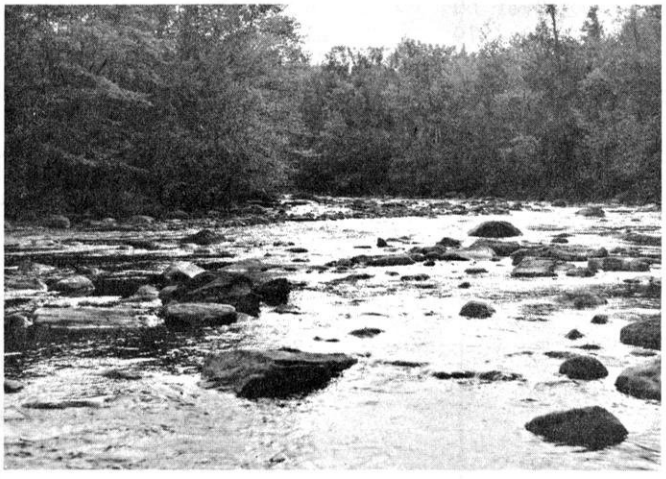


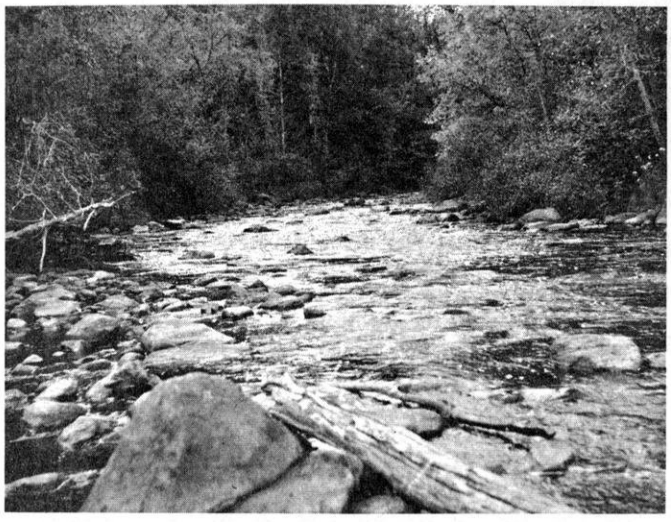
FIGURE 6. Popple River System

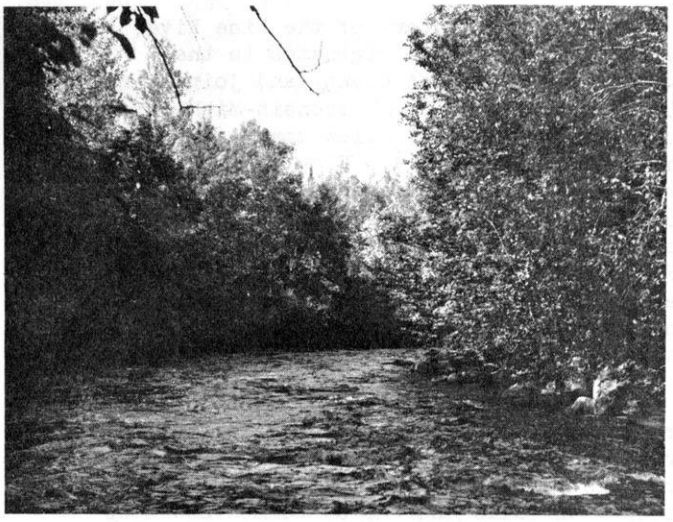


Where wild rivers cut through granite bedrock, waterfalls result.



Boulders are a predominant feature of the river bed in many stretches.





Weather conditions greatly affect stream flows in the wild rivers. Left, the lower Popple River as it appeared during the very dry summer of 1966. Right, the same stretch in the summer of 1967, when precipitation was more nearly normal.

Fish and Fishing

Approximately 6½ miles of the Popple River (including the south branch) was electrofished in August and September, 1966 (Table 28, App. B). A one-run survey of the fish population was made at 17 different stations in the main and south branches of the Popple, and a 2-run population estimate at one station (No. 32).

Trout were the only game fish found in the Popple River (Table 7). No warmwater species were captured, although they could possibly have been present in some habitat niches. Unmarked* brown trout predominated in the samples from the lower reaches of the main branch in 1966, while in the upstream reaches summer-stocked brown trout fingerlings were most numerous. Some wild brook trout were collected at most sampling sites in the main branch, but were found in greater numbers in the headwaters of the south branch.

More wild brown trout were collected in the lower stretch of the Popple River than in any other reach of the Pine-Popple system, but even there the population was low. In this stretch, stations 29-33, one shocker run produced 122 unmarked brown trout ranging from 3.6 to 16.7 inches in length. At least 3 and probably 4 year classes were represented in the catch, but the majority of the trout caught were yearlings (6.7-9.9). Relatively few fingerlings were captured, undoubtedly due in part to shocker inefficiency in collection. The population estimate made at Station 32 indicated the gear was not effective on small fish in that stretch.

The estimated standing crop of yearling and older brown trout at Station 32 was about 7 lbs./acre in September, 1966 (Table 8). Since the fingerling populations could not be estimated, the total standing crop was known to exceed 7 lbs. per acre, but in all probability it was less than 10. On the basis of the first-run electrofishing efficiency of 50% or greater on yearling and older trout established at Station 32, the population estimate was projected to Station 31. The standing crop in this stream section of approximately 5 surface acres was estimated to be 5.7 lbs./acre, excluding the fingerling crop. Since stations 31-32 are considered to be representative of the lower Popple River, the population density was probably about the same elsewhere in that reach.

Age grouping of brown trout was done arbitrarily based on length frequency distribution and the growth rate of fingerlings and yearlings in the lower Popple appears to be slightly over 4 inches per year.

No large brook trout were collected anywhere in the Popple River (or the south branch) by electrofishing; all were less than 10 inches in length (Fig. 7). But some larger brook trout are known to be present in the Popple at certain times of the year, since a few were caught by anglers on the opening weekend in 1967, several over 13 inches long. Indications are that movement of brook trout in the Popple system (and the Pine as well) is large scale, with more brooks inhabiting the main stream in spring and early summer than in the fall. The opening weekend creel census in 1967 gave evidence that migration occurs in that more brook trout were caught by hook and line May 13-14 than were captured by electrofishing in the fall of 1966 (Table 9). Also, the presence of large numbers of brook trout in tributary streams in late summer and fall seems to indicate a spawning or temperature-induced movement to the tributaries.

Fishing was better on the Popple River on opening weekend, 1967, than on the Pine, although more than half the fishermen still were unsuccessful. Nearly half the trout taken were spring-stocked rainbows. A fair number of wild brook trout were caught, but few brown trout of either wild or hatchery origin showed up in the creel. Most of the fishermen interviewed on the Popple, as on the Pine, had traveled long distances to fish.

White suckers and mottled sculpin were found to be the most widely distributed forage fish in the Popple system; they were each collected at all but one sampling site in the main and south branches (Table 10). Common shiners, longnose and blacknose dace, and the chubs also inhabited most stretches of stream. A wider variety of species was found at Stations 38 and 39, where the river was wide and sluggish, than elsewhere. Several species caught at those stations were not found at any other location. In all, 17 different species of forage fish were collected from the Popple.

Water Quality

The Popple River is a typical brown-stained, soft water northeast Wisconsin stream, with water quality characteristics in most

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* Unclipped browns less than 11 inches long were known to be wild, naturally produced trout, since fish stocked in 1965-66 were marked. Brown trout larger than 11 inches could be of either wild or hatchery origin, but on the basis of the wild-to-stocked ratio of the smaller trout, most of the larger trout are also believed to be wild.

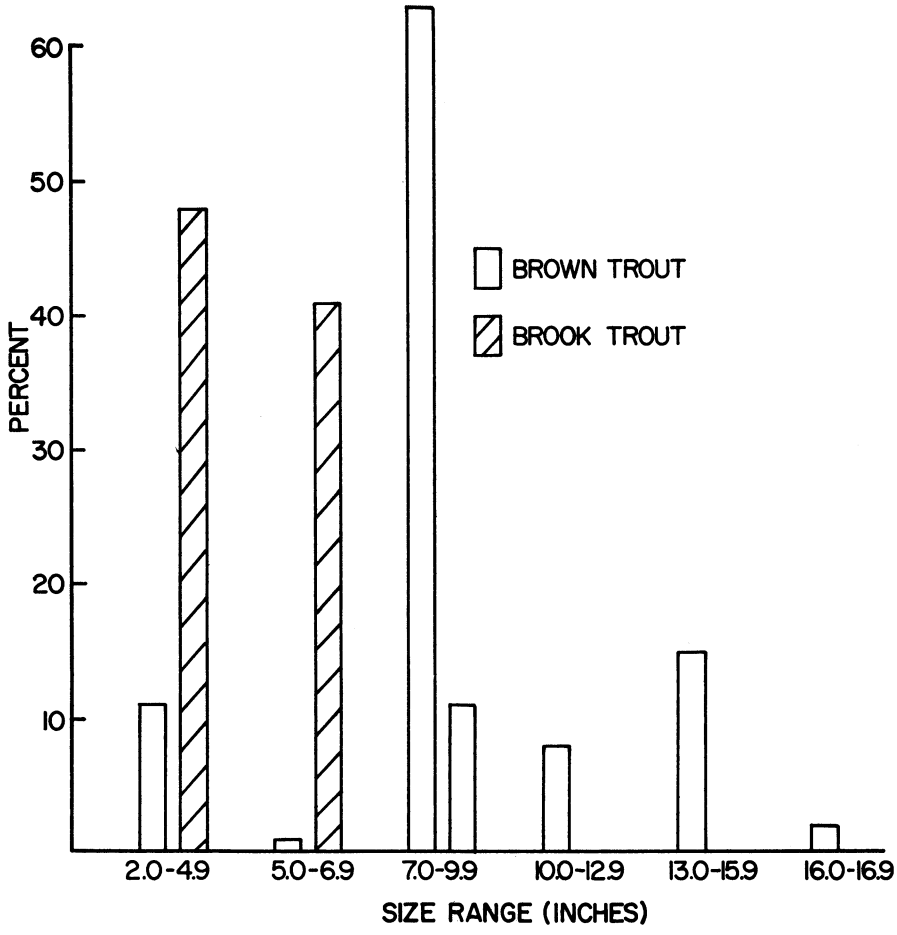


FIGURE 7. Size Distribution of Unmarked Brown and Wild Brook Trout Captured by Electrofishing in the Popple River Including South Branch. (Unmarked brown trout over 2 years old may be either wild or stocked).

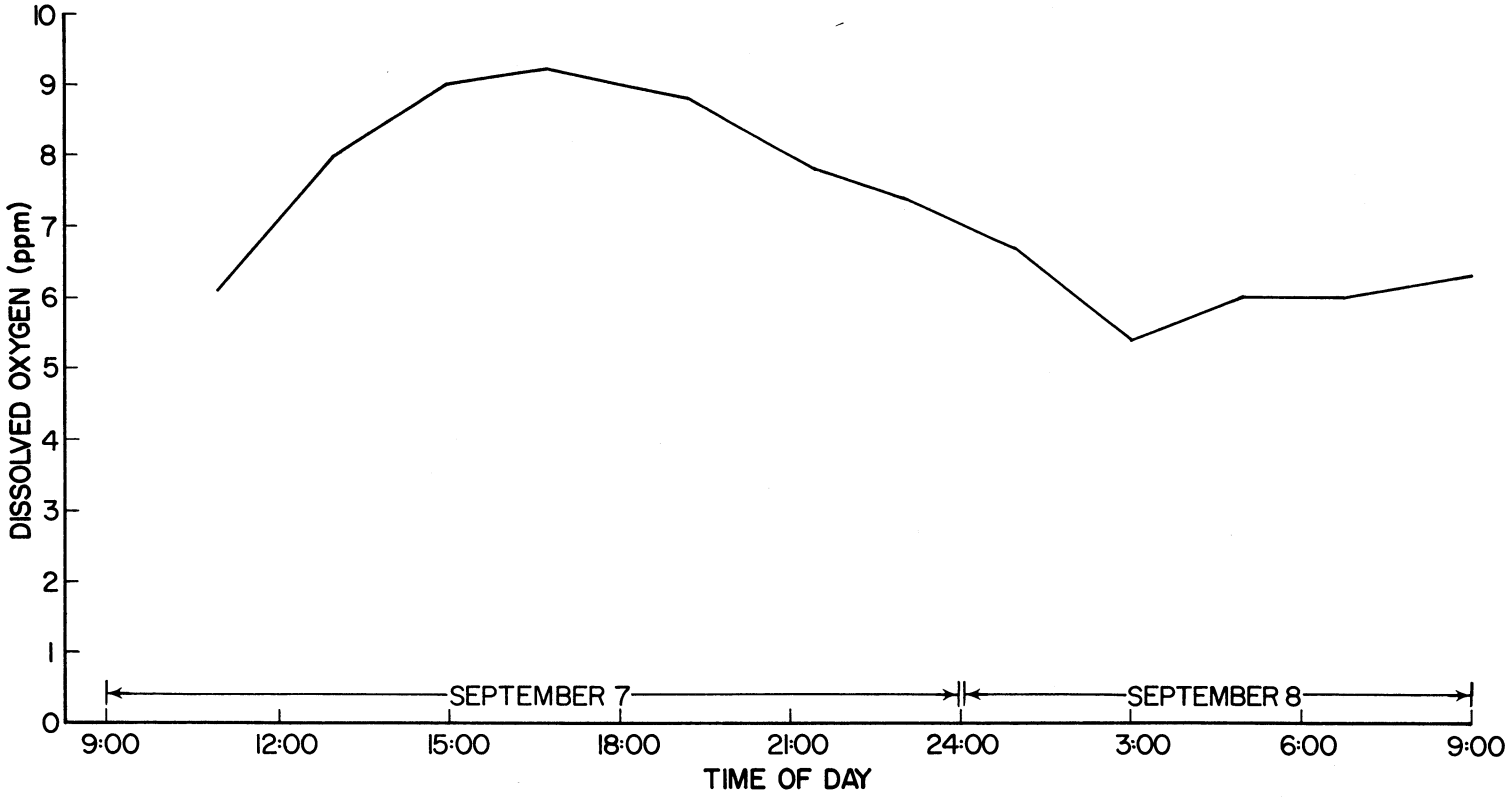


FIGURE 8. Dissolved Oxygen Concentrations in the Popple River Near Fence Over a 24-Hour Period, September 7-8, 1967.

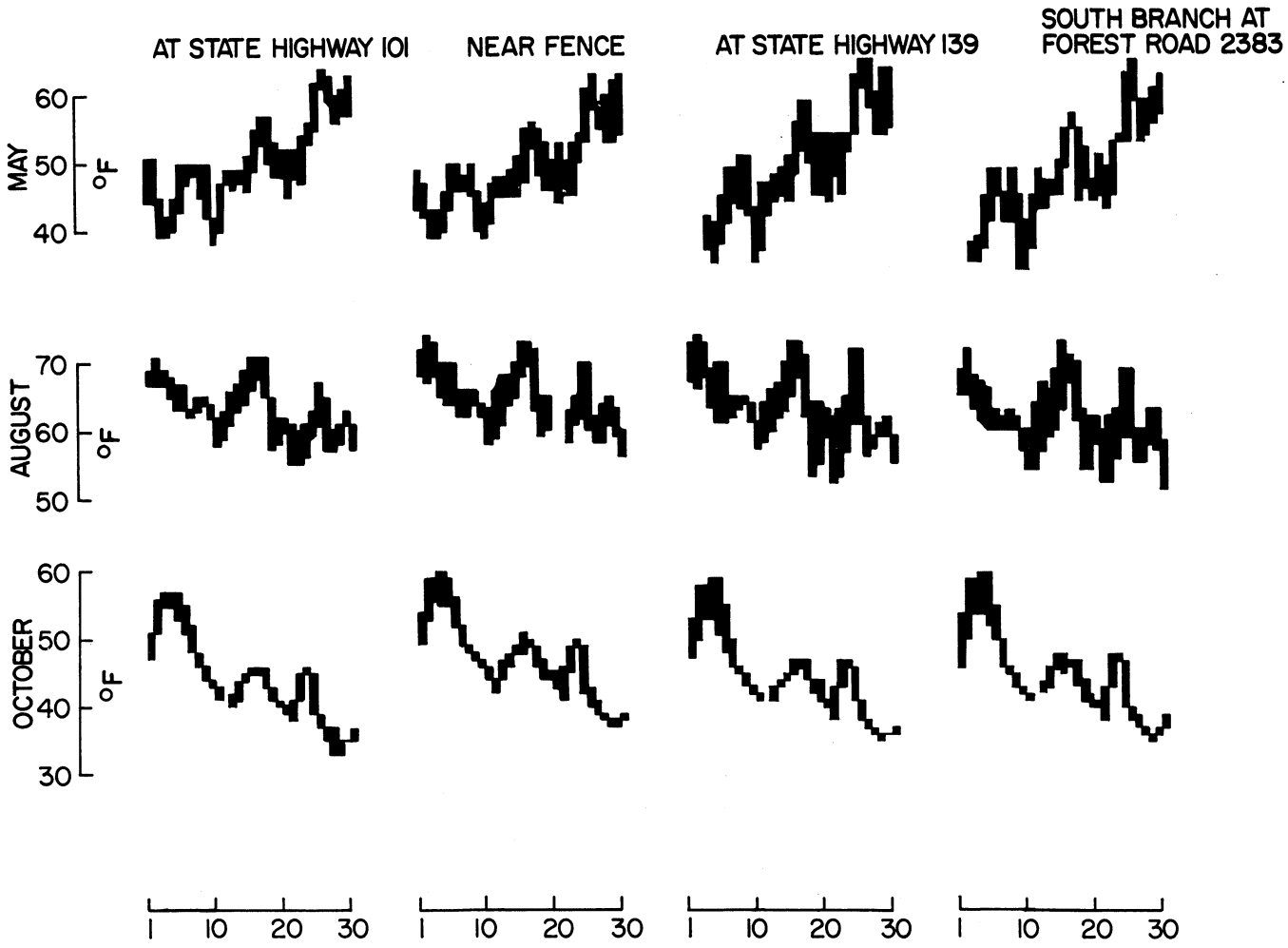


FIGURE 9. Temperature Ranges at Four Different Locations in the Popple River During Representative Spring, Summer and Fall Months, 1967. (*USGS records).

respects similar to the Pine. Water quality varies with the season and the flow stage, but the Popple remains basically infertile (low in nutrient and mineral content) and relatively unaffected by man (Table 11).

The stretch of the Popple from the headwaters to the confluence with the south branch had the lowest alkalinity, pH and mineral content of any reach of the Pine-Popple system. At the State Highway 139 and Forest Road 2,159 sampling sites, alkalinities as low as 13 and 18 parts per million, respectively, were found in April, 1967. The alkalinity of the south branch, on the other hand, seemed to be slightly higher than that of the lower Popple (Hwy. 101).

Dissolved oxygen levels were always found to be higher in the lower Popple than in the upper reaches and the south branch. Lowest levels at all sampling stations occurred in midsummer, 1968, when the July samples showed DO concentrations of 4.2 ppm (49% saturation) in the south branch, 5.5 ppm (64% saturation) at Hwy. 139, and 6.9 ppm (82% saturation) at Hwy. 101. A more pronounced diurnal DO sag than occurred in the Pine River was noted in the Popple River during the survey on September 7-8, 1967 (Fig. 8).

Temperature regimes showed only slight variation at the different recording sites in the Popple (Fig. 9). Daily ranges were somewhat greater at the upstream recording sites (Hwy. 139 and the south branch) than they were farther downstream. Response to weather conditions was pronounced at all locations.

Recorded temperatures were quite similar to those of the Pine River. Summer maximums, however, never reached 80°F during the period of record at any of the Popple River thermograph sites (Table 12). Maximum temperatures did not exceed 70°F on most summer days; maximums in the 60's were recorded on 62-74% of the June, July and August days in 1967-68.

TABLE 7

Trout Captured by Electrofishing in the Popple River
(One Run, August - September 1966)

Stream Section	Brown Trout		Brook Trout	Rainbow Trout
	Unmarked*	Stocked	Wild	Stocked
Lower Popple (Below confluence with South Branch)	122	6	11	1
Upper Popple (Above confluence with South Branch)	1	149	19	
South Branch			95	

* Unmarked brown trout over 2 years old may be either stocked or wild

TABLE 8

Estimated Brown Trout Population and Standing Crop in the Lower Reaches of the Popple River, Fall 1966

Station	Est. Surface Area (Acres)	Date	Age Group	Length Range (inches)	Avg. Length (inches)	Avg. Weight (g)	Mean Coefficient of Condition	Est. Pop.	Est. Total Weight (lbs.)	Est. Standing Crop (lbs./acre)
32	2.4	20 Sept. 1966	0	3.6-4.9	4.1(9)*	12(9)	--	--	--	--
			I	7.2-9.8	8.8(30)	114(28)	1.63(28)	40	10.0	4.2
			II or more	12.4-15.5	13.8(7)	462(7)	1.72(7)	7	7.1	3.0
31**	5.0	16 Sept. 1966	0	3.8-4.7	4.3(6)	12(6)	--	--	--	--
			I	7.5-10.0	8.4(35)	100(34)	1.64(34)	78	17.2	3.4
			II or more	11.8-15.5	--	--	1.65(7)	12	11.6	2.3

* () = No. fish weighed or measured.
** Population estimate projections based on electrofishing efficiency at Station 32.

TABLE 9

Creel Census Statistics on the Popple River
(Main Branch) on Opening Weekend, 1967

No. interviews	145
No. fishermen with:	
0 trout	78 (54%)
1-9 trout	66 (46%)
10 trout (limit)	1
No. hours fished	570
No. trout caught	
Brown (wild & stocked)	24
Brook (wild)	93
Rainbow (stocked)	108
Total	225
Trout caught/hour fishing	0.40
No. fishermen travelling:	
Less than 50 miles	10
50-100 miles	36
100-150 miles	45
150+ miles	17
Nonresidents	7
Unknown	30

TABLE 10

Forage Fish Species Found in the Popple River (including the South Branch), 1966

Name	Sampling Station: Main Branch 29	30	31	32	33	34	35	36	37	38	39	40	41	South Branch 42	43	44	45	46	No. of Sites Found
White Sucker	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	17
Mottled Sculpin	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	17
Johnny Darter	X	X	X	X				X		X	X	X		X		X			10
Common Shiner	X	X	X	X		X	X	X	X	X	X	X	X	X		X			14
Longnose Dace	X	X	X	X	X	X	X	X	X		X	X	X	X		X			14
Blacknose Dace	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X			15
Northern Redbelly Dace		X						X	X	X	X	X	X	X		X			9
Hornyhead Chub	X	X	X	X	X	X	X	X	X	X	X	X	X	X					14
Northern Creek Chub		X	X	X	X	X		X	X		X	X		X		X			11
Black Bullhead						X				X	X								3
Bluntnose Minnow							X			X	X					X			4
Brook Stickleback							X			X	X	X		X		X			6
Pearl Dace										X	X			X		X			4
Brassy Minnow										X	X								2
Finescale Dace											X								1
Iowa Darter											X								1
Mudminnow										X						X			2

TABLE 11

Water Quality Data, Popple River, 1967-68

Sampling Site	Sampling Date	Temperature °F	pH	Total Alkalinity	Conductivity (25° C)	Dissolved Oxygen (ppm)	Dissolved Phosphate (ppm)	Total Phosphate (ppm)	Ammonia Nitrogen (ppm)	Kjeldahl Nitrogen (ppm)	Nitrate Nitrogen (ppm)	Nitrite Nitrogen (ppm)	Chloride (ppm)	Calcium (ppm)	Magnesium (ppm)	Sodium (ppm)	Potassium (ppm)	Sulfate (ppm)
State Hwy. 101	27 April 1967	45	7.4	28	78	--	.005	.040	--	--	.156	--	1.72	5.7	4.5	2.20	1.24	--
	28 Nov. 1967	32	7.2	88	--	13.1	.000	.100	--	.330	.000	--	1.20	6.4	5.4	1.14	.56	3.0
	4 June 1968	68	7.2	37	97	7.5	.019	.113	.183	.651	.241	.005	1.34	6.0	4.3	1.10	.50	9.0
	16 July 1968	76	7.4	52	111	6.9	.000	.260	.010	.672	.247	.003	1.99	6.8	5.6	2.30	.90	1.2
	8 Oct. 1968	50	7.8	69	--	9.9	.000	.230	.000	.346	.166	.005	1.38	8.8	10.2	1.80	.60	4.7
State Hwy. 139	27 April 1967	43	6.6	13	58	--	.008	.090	--	--	.258	--	1.52	3.6	3.5	2.08	.76	--
	28 Nov. 1967	32	7.0	48	106	10.8	.003	.200	--	.240	.010	--	1.32	6.2	6.6	1.10	.30	3.9
	5 June 1968	66	6.6	22	68	5.7	.028	.132	.224	.733	.301	.006	1.64	3.0	3.4	1.20	.35	12.6
	16 July 1968	73	6.9	26	64	5.5	.000	.260	.022	.407	.373	.006	2.24	4.0	3.8	2.30	1.00	0.7
	8 Oct. 1968	51	7.2	40	--	8.8	.020	.360	.000	.448	.271	.010	2.51	5.4	7.0	1.85	1.36	7.3
Forest Road 2159	27 April 1967	45	6.8	18	61	--	.001	.005	--	--	.166	--	1.32	3.9	3.3	2.56	1.28	--
Forest Road 2383 South Branch	27 April 1967	45	7.2	48	122	--	.001	.005	--	--	.081	--	.78	8.9	6.4	2.20	1.28	--
	28 Nov. 1967	32	7.2	92	212	10.3	.000	.087	--	.190	.060	--	1.96	11.8	11.2	1.28	.74	7.5
	4 June 1968	68	7.2	49	108	7.2	.004	.169	.142	.549	.181	.004	1.39	6.5	7.0	1.15	.70	7.0
	16 July 1968	76	7.0	48	111	4.2	.000	.280	.012	.692	.247	.002	1.49	7.2	6.3	1.90	.60	0.3
	8 Oct. 1968	50	7.4	73	--	7.8	.090	.260	.000	.265	.090	.005	1.00	8.0	9.2	1.40	.32	4.7

TABLE 12

Range of Daily Maximum Summer Temperatures at Various Sites on the Popple River, 1967-68

Temperature Range °F	At Hwy. 101	At USGS Gage*	At FR2159**	At Hwy. 139	South Branch Popple River At FR2883
Over 80	0	0	0	0	0
70 - 79	23	26	30	30	32
60 - 69	74	64	68	62	62
50 - 59	3	10	2	8	6

* Ethyl-alcohol actuated recording thermometer
** Only one summer of data available (1967)

TABLE 13

Length-Frequency of Wild Trout Captured by Electrofishing in Woods Creek and Tributaries, 1966-68*

Size Range (inches)	Brook Trout												Brown Trout				
		48								Cody Cr.	Haymarsh Cr.			48			
	47	1966	1967	1968	49	50	51	52	53	54	55	56	47	1966	1967	1968	49 - 56
2.0-2.9	3	21	23	13	-	-	-	1	-	9	6	-	-	-	4	4	No Brown Trout
3.0-3.9	5	44	21	63	4	-	3	3	-	11	3	-	-	-	-	4	Caught
4.0-4.9	1	5	9	5	3	1	1	-	-	2	-	-	-	-	-	-	
5.0-5.9	6	25	43	14	15	10	2	4	-	11	4	-	-	3	-	1	
6.0-6.9	11	40	46	33	21	15	2	-	-	5	1	-	-	4	1	2	
7.0-7.9	11	9	6	13	11	4	2	1	-	2	1	-	-	1	-	3	
8.0-8.9	3	2	2	3	2	1	1	-	-	-	-	-	-	-	1	-	
9.0-9.9	1	2	1	4	2	-	-	-	-	-	-	-	1	-	-	-	
10.0-10.9	3	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	
11.0-11.9	1	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	
12.0-12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
13.0-13.9	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	
TOTALS	45	149	152	149	61	31	11	9	0	40	15	0	1	10	7	14	

* All collections made in 1966 except at Station 48.

TABLE 14

Estimated Trout Population and Standing Crop in Woods Creek, Station 48, in 1966 and 1968*

Date	Species	Age Group	Length Range (inches)	Average Length (inches)	Average Weight (g)	Mean Coefficient of Condition	Est. Pop.	Est. Total Weight (lbs.)	Est. Standing Crop (lbs./acre)
11 Aug. 1966	Brook	0	2.2-4.0	3.1(167)	4.5(167)	--	957	9.5	11.9
		I	4.8-7.7	6.1(108)	38(108)	1.57(108)	193	16.2	20.3
		II or more	8.4-10.3	9.1(7)	136(7)	1.76(7)	15	3.6	4.5
	Brown	I or more	5.2-13.6	--	--	1.56(10)	--	2.1	--
27 Aug. 1968	Brook	0	2.3-4.2	3.3(144)	5.9(41)	--	358	4.8	6.0
		I	5.1-8.1	6.4(88)	44(88)	1.64(88)	113	11.0	13.7
		II or more	8.7-10.5	9.3(8)	144(8)	1.77(8)	8	2.5	3.2
	Brown	0	2.5-3.0	2.8(9)	--	--	--	--	--
		I	5.0-7.8	6.9(14)	53(14)	1.58(14)	24	2.8	--

*Surface area = 0.8 acre

Woods Creek

General Description

Woods Creek is the largest tributary of the Popple River (Fig. 6). It is an appropriately named stream, flowing about 13 miles through forested country in Florence County. The drainage area of Woods Creek is 42.3 square miles, and its volume 9.5 to 20 cfs at base flow. Because of its size and reputation as a brook trout stream, more information was collected on Woods Creek than on any other tributary of the Pine-Popple Rivers.

Fish and Fishing

Ten different stretches of Woods Creek and its feeder streams (Stations 47-56) were shocked in August, 1966 (Table 29, App. B). At Station 48, above State Highway 101, the trout population was estimated in 1966 and 1968; at all other stations, and at Station 48 in 1967, the survey was made only once.

Wild brook trout were collected at all but 2 sampling sites, and some brown trout were also found at the 2 stations farthest downstream (Table 13). Larger numbers of trout were captured in the lower part of the stream than in the upper part. Fingerling and yearling brook trout made up the major share of the trout population at every station. Although fair numbers of 6- to 8-inch fish were found, a few trout larger than 8 inches were caught. Good reproduction was apparent, and the brook trout population seemed to be stable at Station 48 from 1966 through 1968, since nearly the same numbers of trout were collected on the first run each year.

Population estimates at Station 48 in 1966 and 1968 showed brook trout standing crops of 36.7 and 22.9 pounds/acre, respectively (Table 14). The 1968 estimate is thought to be most nearly representative of the biomass there, because high water levels caused poor shocker efficiency and probably a high population estimate in 1966. Standing crops of brown trout could not be estimated in either 1966 or 1968, but were believed to be low both years.

Access was not available to certain upstream sections of Woods Creek that appeared to be good trout habitat. It is therefore possible that some remote

Tributaries in Florence County are typically high-gradient, wooded streams containing brook trout, except where beaver have been active.

stretches of the stream may harbor larger trout and more of them than were collected by electrofishing.

The average growth of brook trout seemed to be 3-3.5 inches per year, based on length-frequency. Age group 0 trout averaged 3+ inches in length and yearlings 6+ inches in August.

Sixty anglers checked on Woods Creek on

TABLE 17

Daily Maximum-Minimum Temperatures on Woods Creek at Hwy. 101 (1967-68)

Month		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Avg.
1967 *																																	
May	Min.	-	43	35	35	36	38	42	44	42	41	33	35	40	41	43	43	46	50	45	45	42	42	46	44	49	52	57	54	51	49	51	44
	Max.	-	51	43	39	44	48	48	48	49	49	41	44	44	45	46	49	53	54	51	52	46	50	50	51	53	60	63	63	57	61	61	50
June	Min.	53	55	57	59	59	59	59	-	57	56	55	56	58	61	63	61	58	57	59	58	61	59	63	57	56	57	59	56	55	57	-	58
	Max.	64	65	67	67	63	61	61	-	60	57	56	58	63	66	65	64	61	63	62	63	64	65	65	63	61	63	63	59	57	61	-	62
July	Min.	61	59	57	55	53	55	57	61	61	63	61	62	58	55	55	57	59	61	60	62	63	-	-	-	63	63	60	59	60	60	61	59
	Max.	63	63	59	57	57	60	63	63	65	65	65	64	62	61	61	60	63	65	67	68	68	-	-	-	68	66	65	66	67	66	65	64
Aug.	Min.	62	63	60	58	58	59	59	59	59	53	53	54	56	58	60	63	63	53	53	54	50	50	51	54	57	55	55	55	57	51	51	56
	Max.	64	66	65	64	63	60	60	61	61	59	57	59	62	62	65	67	67	63	58	59	57	55	57	59	63	61	57	57	60	57	55	61
Sept.	Min.	51	51	51	51	-	55	55	59	54	48	48	51	51	53	57	57	57	58	58	58	56	51	50	48	48	51	47	44	42	43	-	52
	Max.	56	57	55	57	-	61	59	60	59	54	53	54	54	57	57	58	59	59	60	60	59	56	52	51	52	52	50	47	44	47	-	55
Oct.	Min.	43	48	52	51	50	48	45	45	43	41	40	-	39	41	43	43	43	41	39	38	36	35	40	43	39	36	34	33	33	35	35	41
	Max.	48	53	53	54	54	50	47	45	45	43	41	-	41	43	44	45	44	43	41	39	39	40	44	45	43	39	36	34	35	36	37	43
Nov.	Min.	36	36	33	32	32	32	32	32	32	32	34	34	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
	Max.	37	37	36	33	32	32	32	32	32	34	37	37	34	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33
Dec.	Min.	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
	Max.	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
1968																																	
Jan.	Min.	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	-	-	-	-	-	32
	Max.	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	-	-	-	-	-	32
Feb.	Min.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Max.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March	Min.	-	-	-	-	-	-	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	-	32
	Max.	-	-	-	-	-	-	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	35	34	35	37	38	-	33
April	Min.	33	33	33	32	32	32	35	39	36	35	35	42	42	39	35	38	44	42	39	39	39	39	39	39	-	32	34	39	39	39	-	37
	Max.	36	37	37	39	32	36	41	41	41	40	45	51	51	42	40	45	45	44	44	44	44	44	44	44	-	36	41	41	43	45	-	42
May	Min.	39	44	43	39	35	38	40	43	46	42	44	45	41	49	48	49	45	45	44	48	44	44	47	43	45	49	46	45	45	45	48	44
	Max.	49	52	49	43	45	41	43	49	48	50	51	49	57	54	57	57	48	49	50	51	49	50	49	46	49	49	48	46	45	48	51	49
June	Min.	51	54	52	57	62	64	64	64	64	63	59	54	54	54	54	54	55	54	53	53	51	51	54	55	55	51	49	49	51	55	-	55
	Max.	56	56	57	60	68	68	68	67	66	66	63	59	55	56	57	56	57	57	58	55	53	54	55	56	56	55	51	51	55	57	-	58
July	Min.	57	53	55	58	58	61	63	63	57	57	63	62	63	63	63	-	69	68	65	63	65	65	62	62	60	61	61	59	57	57	61	61
	Max.	58	57	58	59	61	63	67	67	64	63	64	63	63	63	65	-	72	69	68	67	67	67	65	64	64	63	62	61	59	61	61	64
Aug.	Min.	58	59	61	62	64	63	64	65	65	58	54	55	56	57	57	57	58	55	55	57	61	61	63	67	67	59	54	51	52	54	55	59
	Max.	61	62	65	66	66	65	67	67	67	65	59	58	59	63	59	58	63	61	57	62	63	63	67	70	70	67	59	56	56	57	57	62
Sept.	Min.	55	55	54	55	57	54	52	52	52	53	51	52	54	54	56	58	59	59	58	58	57	57	58	59	56	52	51	49	50	51	-	55
	Max.	56	55	55	58	57	57	54	52	53	53	53	54	54	56	58	59	59	59	59	58	58	59	59	59	59	56	52	51	51	53	-	58
Oct.	Min.	53	56	52	46	42	42	44	-	49	47	46	46	47	49	53	57	56	51	48	46	43	45	43	40	36	37	39	39	38	35	35	45
	Max.	56	57	57	52	46	44	44	-	49	49	47	47	49	53	57	59	59	56	51	48	46	45	45	43	40	39	39	39	39	38	36	48
Nov.	Min.	36	38	38	37	37	37	35	34	33	32	32	32	32	32	32	32	32	32	32	32	-	-	-	-	-	-	-	-	-	-	-	34
	Max.	38	39	39	38	38	38	37	37	34	33	32	32	32	32	32	32	32	32	32	32	-	-	-	-	-	-	-	-	-	-	-	35
Dec.	Min.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Max.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* No data obtained for January - April, 1967

opening day, 1967 had 93 brook trout and no brown trout (Table 15). Nearly all the fish creeled were 6- to 8-inch 2-year-olds (largest caught was 11 inches). Fishing pressure was generally light in upstream sectors but heavier in the Highway 101 area, where the majority of cars were counted and fishermen interviewed. Harvest of brook trout in the vicinity of Highway 101 may be heavy, if opening day fishing is indicative of season-long pressure.

TABLE 15

Creel Census Statistics on Woods Creek, Opening Weekend of 1967 Trout Season

No. interviews	60
No. fishermen with:	
0 trout	32 (53%)
1-9 trout	26 (43%)
10 trout (limit)	2 (3%)
No. hours fished	174
No. trout caught	
Brook	93
Trout caught/hour fishing	0.53
No. fishermen travelling:	
Less than 50 miles	6
50-100 miles	23
100-150 miles	24
150+ miles	5
Nonresidents	2
No. cars counted:	
Saturday a.m.	28
p.m.	18
Sunday a.m.	15

Water Quality

Woods Creek is a pure water stream, slightly more fertile and usually clearer than the Rivers (Table 16). Water temperatures were cooler during the summer than in the Pine-Popple; maximums in June, July and August hit 70°F on only 2 days in 1967-68 (Table 17). Temperatures at other times of the year paralleled those of the Rivers.

Other Tributaries

Electrofishing in other streams tributary to the Pine and Popple Rivers showed that many contained wild brook trout (Table 30, App. B). A variety of different stream types was sampled, but in general the high-velocity woods streams had the best brook trout numbers. Highest populations of brook trout were found in Lamon-Tangue, Hendricks, Lepages, Riley, Chipmunk and Johnson (Sec. 14, T39N, R18E) Creeks, all in Florence County, and the Little Popple River in Forest County (Table 18).

For the most part brook trout caught were small, mainly fingerlings and yearlings, although the largest brook trout found in Pine-Popple system (15.5 inches) turned up in Rock Creek, a tributary of the Popple. Population estimates at stations in Hendricks, Lepages and Lamon-Tangue Creeks demonstrated that small trout made up the bulk of the populations in those streams (Table 19). Lepages Creek, a small, clear tributary of the lower Pine, had the highest standing crop of trout, estimated to be 54 lbs./acre; nevertheless, only a fraction of the fish were over 7 inches in length. At Station 68 on Lamon-Tangue Creek, just upstream from its confluence with the Popple, the brook trout population appeared to be swelled in late August, 1966 by migrant trout from the Popple.

No warmwater game fish were captured in the tributaries, except for a few in lake outlets. At several stations only forage species were collected, but sampling in some tributaries, for various reasons, may have been inadequate to give a true picture of fish populations.

Twenty-seven species of nongame fish were picked up in tributary streams (Table 20).

TABLE 16

Water Quality Data, Woods Creek, 1967-68

Sampling Site	Sampling Date	Temperature °F	pH	Total Alkalinity	Conductivity (25° C)	Dissolved Oxygen (ppm)	Dissolved Phosphate (ppm)	Total Phosphate (ppm)	Ammonia Nitrogen (ppm)	Kjeldahl Nitrogen (ppm)	Nitrate Nitrogen (ppm)	Nitrite Nitrogen (ppm)	Chloride (ppm)	Calcium (ppm)	Magnesium (ppm)	Sodium (ppm)	Potassium (ppm)	Sulfate (ppm)
State Highway 101	27 April 1967	41	7.6	60	151	--	.008	.170	--	--	.106	--	1.37	12.0	8.2	2.20	1.18	--
	28 Nov. 1967	32	7.4	104	224	12.3	.003	.040	--	.330	.120	--	1.42	12.2	13.7	.98	.46	9.6
	4 June 1968	66	7.6	64	118	8.1	.011	.169	.018	.570	.181	.001	.75	9.5	9.3	1.15	.70	8.7
	16 July 1968	71	7.6	74	164	7.3	.020	.280	.000	.346	.223	.002	1.74	10.8	9.1	2.10	1.00	5.2
	8 Oct. 1968	49	7.8	98	--	10.0	.000	.170	.000	.265	.075	.003	1.26	12.0	15.1	1.70	.66	2.1

TABLE 18

Game Fish Caught by Electrofishing in Streams Tributary to the Pine and Popple Rivers

Tributary	Brook Trout - Wild		Brown Trout-Wild		Largemouth Bass		Northern Pike		Walleye	
	No. Caught 100 Yds. Shocked	Length Range (inches)	No. Caught	Length Range (inches)	No. Caught	Length Range (inches)	No. Caught	Length Range (inches)	No. Caught	Length Range (inches)
Hendricks Creek	18	2.3-8.7								
Little Popple River (Forest Co.)	26	2.4-7.7								
Lepages Creek	44	2.1-9.9								
Deadmans Creek	4	2.5-4.7								
Lamon-Tangue Creek	38	2.2-14.5	18	3.4-9.5						
Lunds Creek	3	5.3-6.2								
Johnson Creek (Sec. 14,T39N R18E)	25	2.4-12.6								
Chipmunk Creek	64	2.5-8.0	5	5.0-9.4						
Riley Creek	15	2.2-8.9								
Morgan Creek	1	6.2								
Wakefield Creek	4	4.4-7.2								
Seven Mile Creek	0									
Johnson Creek (Sec. 21,T40N R15E)	0									
Pine Creek	1	3.7								
Seidel Creek	0				2	3.4-3.5				
Rock Creek	3	2.6-15.1								
Lautermans Creek	1	7.1								
Keipers Creek	2	5.9-6.6								
Simpsons Creek	0									
Emily Lake Outlet	0									
Coldwater Creek	2	3.2-3.4								
Long Lake Outlet	0				1	2.2	1	10.2	1	2.8
Fay Lake Outlet	0				2	2.4-3.8				
Sawyer Creek	4	3.9-7.3								
MacDonald Creek	1	3.5-7.4								
Jones Creek	0									
Stevens Creek	1	3.9								
Halls Creek	2	2.5-8.8			1	3.4				

TABLE 19

Estimated Trout Population and Standing Crops at Various Sampling Sites in Streams Tributary to the Pine and Popple Rivers

Stream	Station	Surface Area (Acres)	Date	Species	Age Group	Length Range (inches)	Avg. Length (inches)	Avg. Weight (g)	Mean Coefficient of Condition	Est. Pop.	Est. Total Weight (lbs.)	Est. Standing Crop (lbs./acre)
Hendricks Creek	57	0.2	18 Aug. 1966	Brook	0	2.0-4.0	3.2(67)	5.0(67)	--	75	0.8	4.0
					I	4.5-6.9	57(31)	30(31)	1.53(31)	37	2.4	12.0
					II	7.9-8.7	8.4(3)	89(3)	1.51(3)	3	0.6	3.0
Lepages Creek	63	0.1	24 Aug. 1966	Brook	0	2.1-4.3	3.0(43)	4.2(43)	--	171	1.6	16.0
					I	4.6-6.7	5.4(51)	23(50)	1.41(50)	57	3.0	30.0
					II	7.3-8.8	8.0(4)	90(4)	1.73(4)	4	0.8	8.0
Lamon-Tangue Creek	68	0.3	25 Aug. 1966	Brook	0	2.2-3.9	3.1(204)	4.0(204)	--	460	4.1	13.6
					I	4.4-7.6	5.9(67)	30(67)	1.42(67)	76	5.0	16.7
					II or more	9.1-14.5	--	--	1.62(3)	3	1.7	5.7
				Brown	0 or more	2.9-9.5(7)	--	--	--	--	0.5	--

TABLE 20

Forage Fish Species Present in Streams Tributary to the Pine and Popple Rivers, 1966

Stream	Sampling Stations	White Sucker	Mottled Sculpin	Hornyhead Chub	Northern Creek Chub	Common Shiner	Mudminnow	Brook Stickleback	Northern Red-belly Dace	Blacknose Dace	Longnose Dace	Bluntnose Minnow	Pearl Dace	Johnny Darter	Iowa Darter	Finescale Dace	Brassy Minnow	Fathead Minnow	Rock Bass	Yellow Perch	Black Bullhead	Yellow Bullhead	Bluegill	Pumpkinseed	Blacknose Shiner	Blackchin Shiner	Golden Shiner	Tadpole Madtom
Woods Creek, Florence Co.	47-53	X	X	X	X	X	X	X	X	X	X	X		X					X									
Cody Creek, Florence Co.	54-55		X																									
Haymarsh Creek, Florence Co.	56									X	X		X					X										
Hendricks Creek, Florence Co.	57-59	X	X					X			X																	
Little Popple River, Forest Co.	60-62	X	X	X		X		X		X	X		X		X													
Lepages Creek, Florence Co.	63-64		X																									
Deadmans Creek, Florence Co.	65-66		X						X																			
Lamon-Tangue Creek, Florence Co.	67-71	X	X	X	X	X	X	X	X	X			X			X	X	X										
Lunds Creek, Florence Co.	72	X	X				X	X	X				X			X	X											
Johnson Creek, Florence Co. (Sec. 21 T39N R18E)	73		X																									
Chipmunk Creek, Florence Co.	74-75		X				X																					
Riley Creek, Florence Co.	76				X	X		X	X	X			X															
Morgan Creek, Florence Co.	77								X																			
Wakefield Creek, Florence Co.	78	X			X			X	X				X															
Seven Mile Creek, Florence Co.	79							X	X																			
Johnson Creek, Florence Co. (Sec. 21 T40N R15E)	80		X					X	X	X			X															
Pine Creek Florence Co.	81		X		X																							
Seidel Creek Florence Co.	82			X	X																							X
Rock Creek Florence Co.	83	X	X			X	X		X	X			X															
Lautermans Creek, Florence Co.	84	X		X																								
Keipers Creek, Florence Co.	85								X																			
Simpsons Creek, Florence-Forest Cos.	86-87	X	X	X						X	X																	
Emily Lake Outlet, Florence Co.	88	X	X		X	X			X																			
Coldwater Creek, Forest Co.	89				X	X														X			X					
Long Lake Outlet, Florence Co.	90	X		X	X	X								X	X					X			X	X	X	X	X	X
Fay Lake Outlet, Florence Co.	91	X		X	X	X	X				X									X		X						X
Sawyer Creek, Forest Co.	92	X																										
MacDonald Creek, Forest Co.	93																											
Jones Creek Forest Co.	94	X		X		X																						
Stevens Creek, Florence Co.	95	X		X	X				X	X	X																	
Halls Creek Florence Co.	96-97	X	X	X	X	X	X		X	X		X					X				X							

General Description

Although separated from the Pine-Popple drainage basin by only a short distance, the Pike River, especially the North Branch, is by comparison a different type habitat (Fig. 10). Like the Pine and Popple, the Pike flows primarily through forest lands to its confluence with the Menominee River, but the Pike River watershed is more predominantly sand country, and less swamp. Even though this area of Marinette County is still sparsely populated, human activity and development of lands along the Pike is much further advanced than along the Pine-Popple.

Falls and rapids are characteristic of the Pike as they are of the Pine-Popple, but generally the Pike is a narrower and deeper river (Table 31, App. B). The bottom is sand in the lower reaches, except for stretches of rapids. In upstream reaches and tributaries, gravel riffle areas--trout spawning grounds--are common. Bank and in-stream cover is far more prevalent in most stretches of the Pike than in the Pine and Popple Rivers.

Flow in the main branch of the Pike, recorded approximately a mile downstream from the confluence of the north and south branches, has averaged 216 cfs over a 53-year period. Although extreme maximum and minimum flows have been recorded, flow seems to be somewhat more stable in the Pike than in the Pine-Popple system. In addition, the channel characteristics (width and depth) of the Pike probably tend to modify the effects of high and low flows.

Fish and Fishing

The Pike River system was not electrofished as extensively as was the Pine-Popple. The north branch was shocked at 10 locations, but the south branch at only 4 and the main stem not at all. Nonetheless, the limited survey indicated that trout are present throughout the north and south branches and tributaries; they showed up at all but one of 23 stations. No warmwater game fish were collected anywhere in the north or south branches, although they undoubtedly inhabit the main branch above the confluence with the Menominee River.

Brown trout were caught in greater numbers than brook trout at every site in the north branch in 1967 (Table 21), but brook trout outnumbered brown in the samples at Stations 2 and 3 in 1968. In both years, however, the brown trout had more size. While most of the brook trout collected were fingerlings and yearlings less than 7 inches long, most of the brown trout were yearlings or older, many of which exceeded 7 inches and ranged up to 19 inches in length.

Total numbers of trout captured at Stations 2, 4 and 6 by one shocker run was higher in 1968 when 2 units were employed than in 1967 when only one unit was used. Larger samples in 1968 may have resulted from greater shocker efficiency or could have signified changes in the trout population; indications are that more brook trout were present at Stations 2 and 4 in 1968 than in 1967.

The standing crop at Station 10, an upstream reach between U. S. Hwy. 8 and the Railroad Pond dam, was estimated to be about 47 lbs./acre in June, 1967 (Table 22). The population was made up primarily of yearling and 2-year-old brown trout, and yearling brook trout. In August, 1968, the trout population was estimated at Station 2, far downstream on the north branch where a standing crop of approximately 19 lbs./acre was found (not including brown trout fingerlings). Most of the poundage at Station 2, however, was in trout over 8 inches long (brown and brook). By projection, standing crops at Stations 4 and 6 were estimated at roughly 11 and 9 lbs./acre respectively.

In the south branch, brook trout turned up most often (Fig. 11). Few brown trout were captured in the south branch. The rainbows collected undoubtedly were stocked trout.

High numbers of brook and brown trout were found in some of the tributaries electrofished, most less than 7 inches long (Table 23).

White suckers and muddlers (mottled sculpin) were the most widely distributed of the forage fish species. Fifteen different forage species were observed in the north and south branches and their tributaries (Table 24).

Water Quality

Slightly higher basic fertility distinguishes the Pike River from the Pine-Popple; the Pike is usually clearer, and has higher alkalinity, conductivity and mineral content (Table 25). At the 3 sites sampled, the river appeared to be clean and unpolluted, but there are some possible sources of pollution in the drainage basin.

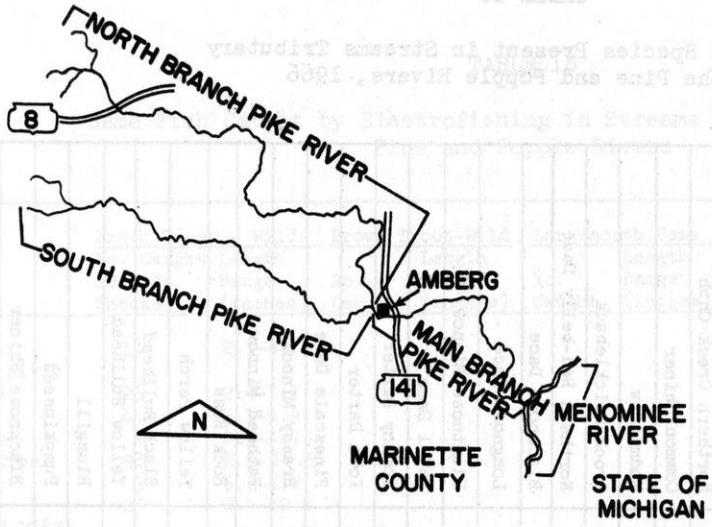
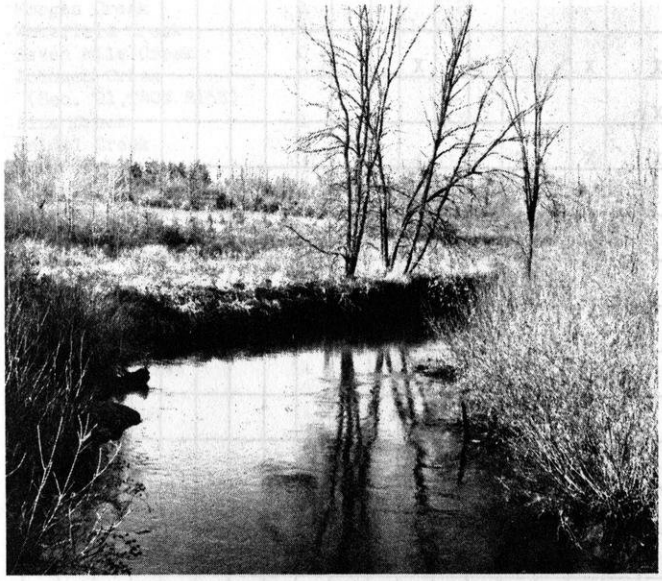


FIGURE 10. Pike River System



Lower reach of the North Branch of the Pike is typically narrower and deeper and has more cover than the Pine and Popple Rivers.

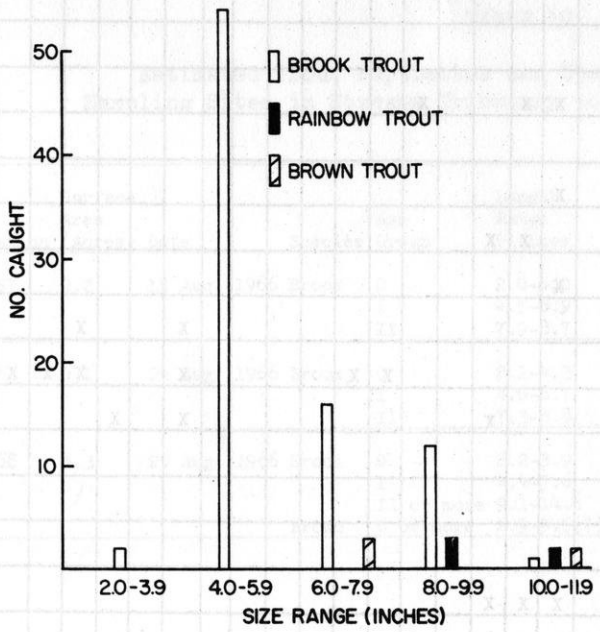


FIGURE 11. Size Distribution of Trout Captured by Electrofishing in the South Branch of Pike River (One Run).

TABLE 21

Wild Trout Captured by Electrofishing in the North Branch of the Pike River, 1967-68*

Size Range	1 1967 Brn	1 1967 Brk	2 1967 Brn	2 1967 Brk	2 1968 Brn	2 1968 Brk	3 1968 Brn	3 1968 Brk	4 1967 Brn	4 1967 Brk	4 1968 Brn	4 1968 Brk	5 1967 Brn	5 1967 Brk	6 1967 Brn	6 1967 Brk	6 1968 Brn	6 1968 Brk	7 1967 Brn	7 1967 Brk	8 1967 Brn	8 1967 Brk	9 1967 Brn	9 1967 Brk	10 1967 Brn	10 1967 Brk
2.0 - 2.9																										
3.0 - 3.9					1	20	1	3	5		11	17					19							2		
4.0 - 4.9	2			1		25		6	10	2	8	7					13				3		26	36	5	16
5.0 - 5.9	1		1			5			1	1	3	2	1		3				4		11		49	32	28	31
6.0 - 6.9		1					1		1	1	2	7							2		3	1	23	7	21	4
7.0 - 7.9											15	1					7	2	1		5		10	2	2	
8.0 - 8.9			1		1		2	2	5		9	2	2		5		13	1			3		22		14	1
9.0 - 9.9	1		5		2	1	1	2	4		2	1	1				8	1			1		6		9	
10.0-10.9	2		4		2		1		2		2		1		1						4		2			
11.0-11.9	2		3		2	1			2		3						1				1				1	
12.0-12.9			2		2										1		3									
13.0-13.9							1										1				2				1	
14.0-14.9			1		4				1		1						1						2			
15.0-15.9					1		1																			
16.0-16.9					1				1								1									
17.0-17.9									1		1															
18.0-18.9																										
19.0-19.9																					1					
20.0-20.9																										
Total	8	1	17	1	16	52	8	13	33	4	57	37	5	0	10	0	67	4	7	0	34	1	140	79	81	52

* One run

Estimated Trout Populations and Standing Crops at Four Different Locations in the North Branch of the Pike River

Station	Surface Area (acres)	Date	Species	Age* Group	Length Range (inches)	Avg. Length (inches)	Avg. Weight (g)	Mean Coefficient of Condition	Est. Pop.	Est. Total Weight (lbs.)	Est. Standing Crop (lbs./acre)
2	1.3	29 Aug. 1968	Brown	0	--	3.9(1)	--	--	--	--	--
				I or more	8.8-16.2	--	--	1.69(19)	21	15.5	11.9
			Brook	0	2.8-5.7	4.2(94)	11(50)	--	250	6.1	4.7
				I or more	8.3-11.2	--	--	2.04(5)	8	3.2	2.5
4**	2.0	28 Aug. 1968	Brown	0	2.7-4.4	3.8(19)	9(19)	--	95	1.9	1.0
				I	5.5-9.0	7.6(29)	72(29)	1.53(29)	40	6.3	3.2
				II or more	9.5-17.8	--	--	1.54(8)	11	7.5	3.8
			Brown-Stocked	I	9.7-11.4	--	--	1.80(2)	3	1.2	0.6
			Brook	0	3.0-4.4	3.7(24)	8(22)	--	120	2.1	1.1
				I or more	5.1-9.2	--	--	1.69(13)	18	2.2	1.1
6**	3.0	30 Aug. 1968	Brown	0	2.5-4.6	3.8(32)	9(20)	-	160	3.2	1.1
				I	7.1-9.5	8.4(28)	89(27)	1.48(27)	38	7.5	2.5
				II or more	11.7-16.0	--	--	1.71(6)	10	9.0	3.0
			Brown-Stocked	I	9.8-12.2	10.9(8)	222(7)	1.72(7)	11	5.3	1.8
			Brook	I or more	7.6-9.6	--	--	1.70(4)	5	1.2	0.4
10	1.3	14 June 1967	Brown	I	4.0-7.2	5.8(93)	36(91)	1.86(86)	316	25.1	19.3
				II	7.5-9.6	8.6(31)	115(30)	1.76(28)	66	16.7	12.8
				III	11.6-14.3	12.8(4)	412(4)	1.86(4)	6	5.4	4.2
			Brook	I	3.8-6.8	5.1(79)	25(78)	1.82(54)	215	11.8	9.1
				II	--	8.1(1)	110(1)	2.07(1)	1	0.2	0.2

* Arbitrarily based on length frequency
** Population estimate projections based on electrofishing efficiency at Station 2

Summer water temperatures were recorded in the Pike only in 1968; however, the data suggest that the north branch remains relatively cool throughout the summer. At the recording station far downstream on the north branch, the maximum temperature never hit 70°F during the summer of 1968 (Table 26). The south branch may be warmer, since maximum temperatures there exceeded 70°F on 18 different days in June, July and August, 1968. Freezing temperatures were recorded at all 3 sites in the north, south and main branches during winter.

TABLE 23

Size Distribution of Trout Captured by Electrofishing in Streams Tributary to the Pike River, June, 1967*

Size Range (inches)	Little South Branch Brook Trout	Harvey Creek Brook Trout	K. C. Creek Brook Trout	K. C. Creek Brown Trout	Sidney Creek Brook Trout	Sidney Creek Brown Trout	Chemical Creek Brook Trout	Chemical Creek Brown Trout	Chemical Creek Rainbow Trout
3.0 - 4.9		44	25		32	81	29	18	1
5.0 - 6.9		33	54	2	30	11	98	42	
7.0 - 8.9	1	2	11		1	4	13	1	2
9.0 - 10.9		1			1	3	1		
11.0-12.9				1		1		1	
14.0-14.9				1					

* One run

TABLE 24

Forage Fish Found in the Pike River System, 1967-68

Name	North Branch 1	2	3	4	5	6	7	8	9	10	South Branch 11	12	13	14	Little South Branch 15-16	Harvey Creek 17-18	K. C. Creek 19-20	Sidney Creek 21	Chemical Creek 22-23
White Sucker	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	
Mottled Sculpin	X	X	X	X	X	X	X	X		X	X	X	X			X	X	X	
Common Shiner		X				X	X	X	X	X	X	X	X	X		X			
Northern Creek Chub		X				X		X	X	X	X	X	X	X			X		
Longnose Dace		X		X		X	X		X	X		X	X	X		X			
Blacknose Dace	X	X	X	X	X	X	X	X						X		X			
Northern Redbelly Dace		X						X			X		X						
Hornyhead Chub						X	X				X	X							
Yellow Perch				X															
Johnny Darter		X																	
Brook Stickleback		X				X						X							
Mudminnow						X										X			X
Pearl Dace										X			X	X					
Yellow Bullhead										X									X
Fantail Darter																	X		

TABLE 25

Water Quality Data, North, South and Main Branch of the Pike River, 1967-68

Sampling Site	Sampling Date	Temperature °F	pH	Total Alkalinity	Conductivity (25° C.)	Dissolved Oxygen (ppm)	Dissolved Phosphate (ppm)	Total Phosphate (ppm)	Ammonia Nitrogen (ppm)	Kjeldahl Nitrogen (ppm)	Nitrate Nitrogen (ppm)	Nitrite Nitrogen (ppm)	Chloride (ppm)	Calcium (ppm)	Magnesium (ppm)	Sodium (ppm)	Potassium (ppm)	Sulfate (ppm)
North Branch	27 Nov. 1967	32	7.6	100	283	12.7	.000	.000	--	.250	.080	--	2.30	12.4	12.9	1.20	.86	6.3
Town Road	4 June 1968	64	7.6	76	165	8.3	.011	.141	.183	.489	.151	.003	1.44	12.5	10.5	1.40	1.20	7.3
Sec. 33	17 July 1968	70	7.8	105	195	7.4	.000	.280	.000	.356	.111	.003	1.99	14.0	12.9	1.90	1.30	5.1
T36N R20E	7 Oct. 1968	50	7.8	109	286	10.4	.020	.070	.000	.102	.090	.003	1.38	13.2	14.2	2.05	1.38	1.3
South Branch	27 Nov. 1967	32	7.4	100	260	13.3	.000	.000	--	.250	.000	--	2.01	12.8	12.1	1.12	.78	6.3
Town Road	4 June 1968	64	7.6	64	137	8.8	.000	.169	.163	.631	.181	.004	1.89	14.0	8.8	1.40	1.10	5.3
Sec. 24	17 July 1968	72	7.6	88	184	6.8	.000	.520	--	--	.184	.005	2.24	10.8	10.2	2.50	.85	5.0
T35N R19E	7 Oct. 1968	48	7.8	98	284	10.7	.000	.180	.000	.244	.060	.005	1.88	12.8	11.9	1.90	1.04	3.3
Main Branch	27 Nov. 1967	32	7.6	118	283	14.0	.000	.000	--	.250	.060	--	2.55	12.2	12.0	1.42	.90	5.1
U. S. Highway	4 June 1968	63	7.6	68	128	8.6	.009	.226	.022	.489	.181	.004	1.64	10.0	9.5	1.25	1.00	8.7
141	17 July 1968	71	7.8	97	197	8.0	.000	.490	--	--	.193	.003	2.24	14.4	10.8	2.40	1.20	5.8
	7 Oct. 1968	48	7.8	109	284	11.2	.010	.410	.000	.224	.090	.003	1.88	14.0	12.7	2.15	1.16	1.9

TABLE 26

Range of Daily Maximum Summer Temperatures at Various Sites on the Pike River, 1968

Recording Site	Number of Days Over 80°F	70-79°F	60-69°F	50-59°F	40-49°F	Total
North Branch Pike River at Town Road, Sec. 33 T36N R20E	0	0	47	39	0	86
South Branch Pike River at Town Road, Sec. 13, 24, T35N R19E	0	18	49	22	0	89
Pike at U.S. 141	0	9	33	3	0	45

Warmwater Fish

The lower Pine River, from La Salle Falls to the Menominee River, was the only reach of the wild rivers found to be inhabited primarily by warmwater fish. Even though this stretch of the Pine is not significantly different from the upstream reaches where trout predominate as far as water quality, temperature and physical characteristics are concerned, its proximity to the Menominee River plus the presence of a man-made flowage have given it a warmwater fish population. Warmwater species might be more numerous than they are upstream for an early spring run of northerns and walleyes upriver out of the flowage is known to occur, but the run apparently does not get beyond La Salle Falls, a vertical drop of some 30 feet in the Pine River.

Fish populations were not sampled in the lower Pike, but the situation existing there is in all probability similar to that in the lower Pine. Since the Pike also joins the Menominee, warmwater fish might be expected to inhabit the lower reaches. Dave's Falls near Amberg may constitute the same type of barrier to upstream movement of warmwater species in the lower Pike as does La Salle Falls on the Pine.

Manipulation of water levels in the lower Pine by the Wisconsin-Michigan Power Company no doubt influences fish populations there in some way, but to what extent is uncertain. It is possible that this stretch would hold more game fish if flows were more stable, especially in midsummer. In spring and early summer, when flow normally is high above the dam and the power company maintains high levels below, game fish may reside in larger numbers in the lower Pine.

Trout

Pine-Popple Rivers

With the exception of the lowermost reaches of the Pine and Pike Rivers, trout predominate in all three wild rivers and their tributaries and constitute the most important segment of the fishery.

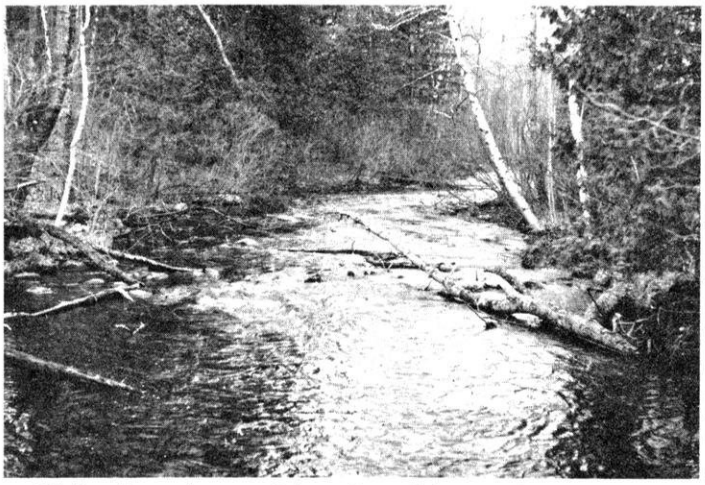
Some of the environmental factors directly affecting trout populations in the wild rivers are food production, temperature, flow, gradient, cover and predation. In the Pine and Popple Rivers these factors interact to create a marginal habitat for trout.

Productivity in the Pine and Popple is restricted by the low fertility of the water. Although food production in the form of aquatic insects and forage fishes is adequate to support the existing trout populations, and growth of trout appears to be satisfactory during the spring, summer and fall months, waters as infertile as the Pine-Popple can produce only limited food supplies. Such streams cannot be expected to support a large biomass of trout, although they may well carry more than were present in 1966.

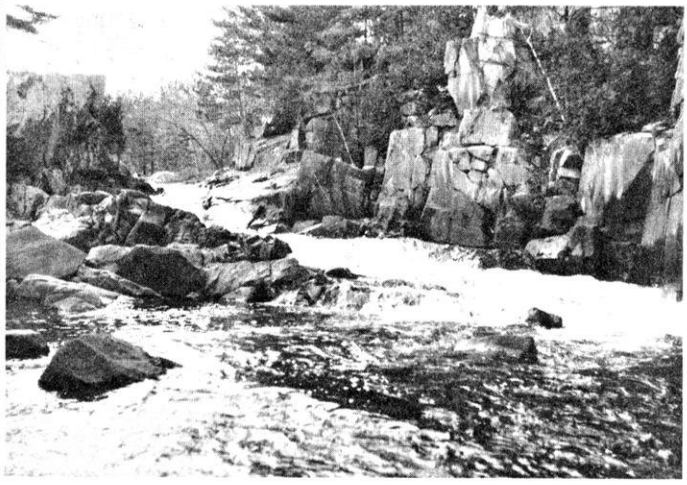
Water temperatures also are something less than ideal for trout in the Pine-Popple. For a period of about five months each year the rivers are almost completely locked by ice cover, resulting in a cold environment which provides for no trout growth and difficult survival. Anchor ice forms extensively in many places in late fall and early witner. Maciolek and Needham (1952) observed that formation of anchor ice under very cold conditions can cause displacement of gravel or stone bottom materials and may cause destruction of trout redds. Reproduction of trout, especially brown trout, could be seriously affected by anchor ice in the Pine and Popple Rivers.

Summer water temperatures parallel air temperatures. Maximums as high as 83°F have been recorded in the main streams, and during heat waves temperatures between 70-80° over extended periods of time are common. Brook trout are known to retreat to the somewhat cooler tributaries during summer heat waves, but brown trout seem to be less transient. Even so, trout mortalities due to warm temperatures have not been observed and apparently summer temperatures seldom if ever become critical. Growth of trout, however, is impaired by high summer temperatures as well as by cold winter temperatures. Brown (1957) found in experimenting with brown trout that optimum temperatures for the growth of brown trout are 45-65°F. Temperatures in the Pine-Popple fall outside this range throughout the winter and, depending on weather conditions, part of the spring, summer, and fall. Cool summers and warm spring and fall weather would seem to benefit trout populations in the Pine-Popple.

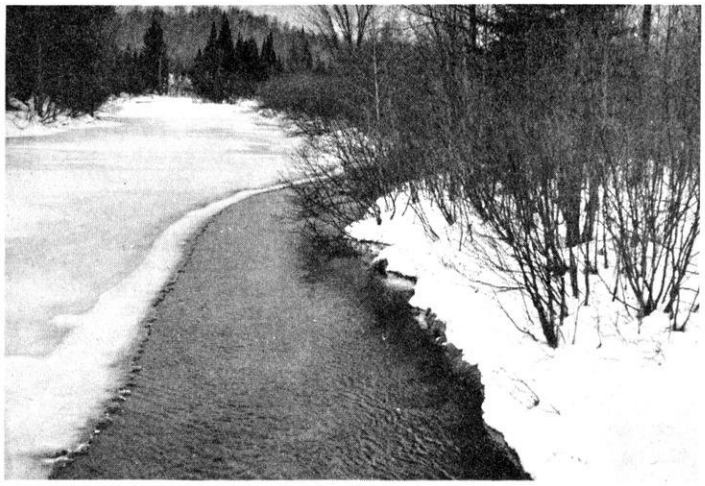
Flows in both the Pine and Popple Rivers always vary seasonally but are also extremely responsive to local weather conditions. Drought and the subsequent low water levels in the rivers can bring about an increase in water temperature and a reduction in living space and cover that adversely affect trout populations. Likewise, high water may be detrimental to food supplies and reproduction. Best conditions for trout no doubt exist when flows are relatively stable.



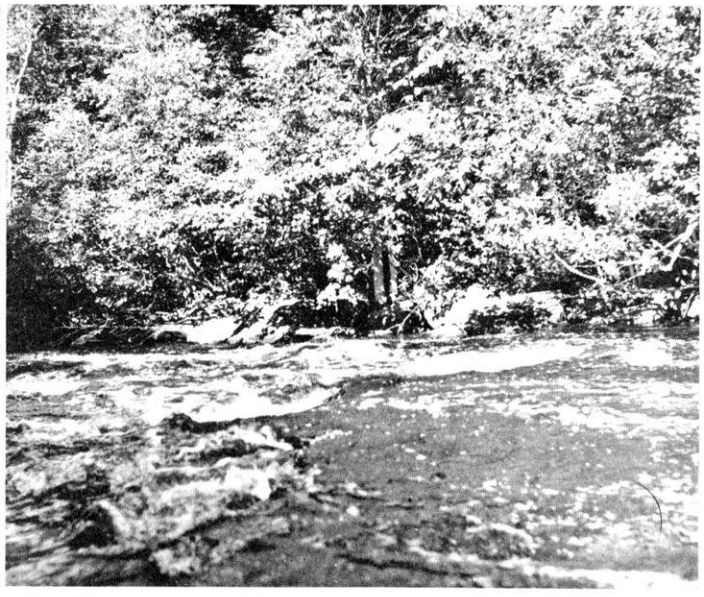
Highest numbers of brook and brown trout -- mostly small and slow growing -- were found in the upstream reaches of the Pike River and its tributaries.



Dave's Falls seems to be the upstream limit to warm water fish populations in the lower Pike. Above the falls, no warm water fish were captured by electrofishing.



Wild rivers are almost completely frozen over in winter (left), except for rapids and isolated areas where tributaries enter the main stream (right).



Some stretches of the Pine and Popple Rivers are wide and sluggish -- unsuitable trout habitat (left). Best trout populations were found in high gradient stretches of the rivers (right).

Trout inhabiting the Pine and Popple Rivers showed a preference for the high gradient, fast water reaches. In these stretches of well-aerated water, such as the stretch of the Popple crossed by State Highway 101, food conditions are undoubtedly best, more cover available, and temperatures slightly better than in sluggish, slow-moving sections.

Pike River

The north branch of the Pike River is from all indications the best stretch of trout water in the wild rivers system.

Although most of the same environmental problems encountered by trout populations in the Pine-Popple also exist in the north branch of the Pike River, they seem to be less significant. Somewhat higher fertility, lower summer temperatures, more stable flows and better cover make this stretch of the Pike a more suitable habitat for trout than the Pine or Popple. The higher standing crops and better trout reproduction found in the north branch reflect the greater productivity of that stream. Little can be said of the south branch of the Pike except that it does not seem to be equal to the north branch, especially in the lower reaches.

TROUT MANAGEMENT

Management activities in the wild rivers for many years have centered basically on the stocking of brook, brown and rainbow trout. Fish of varying sizes and ages have been stocked at different times of the year. Now, highest management priority has been given to efforts to preserve the wild rivers in their present state. Trout stocking, or a lack of it, nevertheless will probably continue to be one of the most important factors contributing to trout population density especially in the Pine and Popple Rivers where natural reproduction is limited.

When the state legislature designated the Pine, Popple, and Pike Rivers as wild rivers in 1965, they called these waters "unique" and worthy of "special management". Management of the trout fishery in the wild rivers system, therefore, should be somewhat different from the management of other trout waters in the state, and should place the greatest emphasis on establishing the highest quality fishery possible. Management would also be geared insofar as possible to bolster trout population numbers, but "quality" should be of primary importance and "quantity" of secondary importance in managing a wild rivers trout fishery. Attempts to establish a "put and take" fishery with freshly stocked trout would seem inconsistent with this goal.

Many of the fishermen interviewed on the opening weekend of the 1967 trout season on the Pine-Popple were there because they sought a desirable "fishing experience". A high percentage of them had driven long distances to fish the Pine-Popple and many were group camping or staying in cabins. They wanted to catch trout, many of them hoping for a "trophy" fish, but enjoyment of the esthetic value of the region was also important to most of them. If they had desired to catch a limit of recently stocked trout, they could have caught them much closer to home.

Opinions may differ on what type of stocking program if any, would most effectively provide high quality trout fishing on the wild rivers. A case could be presented for discontinuing trout stocking entirely on these rivers--there are some fishermen who would like to catch only a wild trout from a wild river. Unfortunately, the 1966 fish population survey of the Pine-Popple Rivers showed that brown trout reproduction was limited there, and that stocking probably is necessary to maintain the brown trout fishery. Furthermore, even though natural reproduction is much better in the Pike River than in the Pine-Popple, stocking there may also be important to the sport fishery.

Studies conducted on other waters in the state, and elsewhere, have all indicated that brown trout are more difficult for anglers to catch than rainbow and brook trout. As a result, brown trout are more likely to grow to a larger size and provide a more sustained fishery than rainbow and brook trout. It appears that the establishment of a brown trout population consisting of a good number of age II or older trout would provide a highly desirable fishery in a wild river system. The stocking program should therefore be designed to facilitate a buildup of the brown trout population. If it is possible to attain this goal (and it may not be, because of environmental conditions), the interested public would be provided with the type of quality fishing they appear to desire from a wild river.

The following general recommendations are made concerning future trout stocking in the wild rivers:

(1) Stock brown trout only; discontinue all brook and rainbow trout stocking. In both branches of the Pike River good reproduction of brook trout is evident, and a substantial number of streams tributary to the Pine, Popple and Pike Rivers have high brook trout populations. The tributaries are a source of supply to the main streams when and where the environment is suitable. Size, not numbers, constitutes the major problem with brook trout in the wild rivers; too few seem to reach a desirable size for a wild rivers fishery.

Rainbow trout do not reproduce in the wild rivers, and apparently do not "carry over" from one year to the next in any significant number. The stocking of rainbows seems to be strictly a put-and-take proposition, which again is not desirable in a wild rivers system.

(2) The brown trout stocked should be yearlings or older and as large as possible. Fingerlings apparently do not survive well; larger fish are believed to have better survival.

(3) Brown trout should be stocked in suitable numbers and at the proper time of year to facilitate carry over and growth to larger size. Trout stocked about June 1 each year, when water conditions are usually best, would probably survive better than those stocked in early spring or fall.

(4) Careful selection of stocking sites is important. The best trout habitat is found where the rivers have a high gradient, and these are the stretches which should be stocked. There are extensive reaches of quiet, slow-moving water on the Pine and Popple Rivers which should be avoided when stocking trout. The lower reaches of the Popple River, from the confluence of the main and south branches to the confluence with the Pine, probably constitute the best brown trout water found in the Pine-Popple system, and should be stocked accordingly. Since good natural reproduction of brown trout takes place in the north branch of the Pike, stocking there should be confined to the stretches where wild populations are lowest.

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APPENDIX A

Scientific Names of Fish Cited in the Text

Brook trout	*Salvelinus fontinalis*
Brown trout	*Salmo trutta*
Rainbow trout	*Salmo gairdneri*
Northern pike	*Esox lucius*
Walleye	*Stizostedion vitreum vitreum*
Muskellunge	*Esox masquimongy*
Smallmouth bass	*Micropterus dolomievi*
Largemouth bass	*Micropterus salmoides*
Rock bass	*Ambloplites rupestris*
Bluegill	*Lepomis macrochirus*
Yellow perch	*Perca flavescens*
Pumpkinseed	*Lepomis gibbosus*
White sucker	*Catostomus commersoni*
Yellow bullhead	*Ictalurus natalis*
Black bullhead	*Ictalurus melas*
Johnny darter	*Etheostoma nigrum*
Iowa darter	*Etheostoma exile*
Hornyhead chub	*Hybopsis biguttata*
Northern creek chub	*Semotilus atromaculatus*
Longnose dace	*Rhinichthys cataractae*
Blacknose dace	*Rhinichthys atratulus*
Northern redbelly dace	*Chropomus eos*
Finescale dace	*Chrosomus neogaeus*
Pearl dace	*Semotilus margarita*
Mudminnow	*Umbra limi*
Bluntnose minnow	*Pimephales notatus*
Fathead minnow	*Pimephales promelas*
Brassy minnow	*Hybognathus hankinsoni*
Brook stickleback	*Eucalia inconstans*
Tadpole madtom	*Noturus gyrinus*
Log perch	*Percina caprodes*
Burbot	*Lota lota*
Mottled sculpin	*Cottus bairdi*
Common shiner	*Notropis cornutus*
Golden shiner	*Notemigonus crysoleucas*
Blacknose shiner	*Notropis heterolepis*
Blackchin shiner	*Notropis heterodon*

APPENDIX B

Sampling Station Data

TABLE 27

Sampling Station Data for the Main, North and South Branches of the Pine River

Station Number	Location	Width (Feet)	Depth (Feet)	Bottom Type	General Characteristics
1	Main Branch - Sec. 24 T39N R18E	100-175	1-5	Sand, gravel, rubble, boulders	Water levels fluctuate drastically due to regulation at power company dam. A large fast-flowing river when high, shallow with gravel riffle areas between pools when low.
2	Main Branch - Sec. 22, 23, 26, T39N R18E	100-150	1-5	Sand, gravel, rubble, boulders	
3	Main Branch, Sec. 22, 27, T39N R18E	75-150	1-5	Sand, gravel, rubble, boulders	
3A	Flowage - Sec. 20, 28 29, T39N R18E	130 acres	Max.-35	Sand, gravel silt	Relatively small impoundment with high flow-through, wooded shoreline
4	Main Branch - Sec. 22, 23, T39N R17E	40-100	1-5	Sand, silt, gravel, rubble, boulders	Wide and flat stretch, few deep pools, moderate velocity
5	Main Branch - Sec. 2, 3, 11, T39N R17E	40-80	1-5	Sand, gravel, rubble, boulders	High velocity stretch, relatively shallow over gravel bottom, few deep holes
6	Main Branch - Sec. 31, T40N R17E	40-80	1-4	Sand, gravel, rubble, boulders	Fast-flowing stretch, shallow over sand or gravel, few pools
7	Main Branch - Sec. 3, 4, T39N R16E	30-60	1-5	Sand, gravel, rubble	Relatively shallow over hard bottom, some deep pools
8	Main Branch - Sec. 5, T39N R16E	50-80	1-4	Sand, gravel, rubble, boulders	Fast water over rocky bottom, a few deep holes
9	Main Branch - Sec. 1, T39N R15E	40-75	1-4	Sand, gravel, rubble, boulders	Rapids, a white-water stretch
10	Main Branch - Sec. 2, 11, T39N R15E	30-60	1-4	Sand, gravel, rubble	Moderate velocity stretch, relatively deep over sand bottom
11	Main Branch - Sec. 9, T39N R15E	40-65	1-4	Sand, gravel, rubble	High velocity over gravel, some deep holes
12	Main Branch - Sec. 6, T39N R15E	40-65	1-4	Sand, gravel, rubble	High velocity, shallow over gravel and sand
13	Main Branch - Sec. 12, T39N R14E	30-50	1-4	Sand, silt, gravel, rubble	Wide and flat stretch, moderate velocity, few pools
14	Main Branch - Sec. 11, T39N R14E	20-50	1-5	Sand, gravel, boulders	High velocity stretch, partly rapids, some deep pools
15	Main Branch - Sec. 18, T39N R14E	25-50	1-6	Sand, silt, gravel	Moderate velocity, many long, deep holes
16	Main Branch - Sec. 6, T39N R14E	25-40	1-3	Gravel, rubble, boulders	Rapids
17	Main Branch - Sec. 1, T39N R14E, Sec. 36, T40N R13E	25-40	1-4	Sand, gravel, rubble, boulders	Moderate to high velocity stretch with numerous deep pools
18	Main Branch - Sec. 35, 36, T40N R13E	30-40	1-4	Sand, boulders	Sluggish, relatively deep stretch
19	North Branch - Sec. 26, T40N R13E	15-35	1-5	Sand, silt	Moderate velocity, deep holes, no riffle areas. Meadow stream.
20	North Branch - Sec. 14, T40N R13E	20-30	1-3	Sand, gravel, rubble, boulders	Rapids, few deep pools
21	North Branch - Sec. 22, T40N R13E	15-35	1-3	Sand, gravel, rubble, boulders	Rapids, shallow pools
22	North Branch - Sec. 21, T40N R13E	20-40	1-3	Sand, silt	Quiet, flat water stretch, flowing through marshland.
23	North Branch - Sec. 18, T40N R13E	10-20	1-4	Sand, silt, gravel	Moderate velocity, numerous corner pools and undercut banks, tag alder overhangs
24	North Branch - Sec. 26, T40N R12E	4-8'	½-3	Sand, clay	Shallow, small stream, outlet of Butternut Lake
25	South Branch - Sec. 35, T40N R13E	15-30	1-5	Sand, silt, gravel, boulders	Sluggish and deep in many places, some riffle areas
26	South Branch - Sec. 3, 10, T39N R13E	20-30	1-5	Sand, silt, gravel, boulders	Deep, sluggish section, few riffle areas
27	South Branch - Sec. 20, T39N R13E	15-30	1-4	Sand, silt, gravel	Sluggish and shallow, very little flow
28	South Branch - Sec. 30, T39N R13E	30-60	1-2	Muck, sand	Lake-like, practically no water movement

TABLE 28

Sampling Station Data for the Popple River (including the South Branch)

Station Number	Location	Width (Feet)	Depth (Feet)	Bottom Type	General Characteristics
29	Sec. 26-27, T39N R17E	12-60	1-8	Gravel, sand, boulders	Fast water over gravel and boulders, some rapids, some very deep holes
30	Sec. 33, T39N R17E Sec. 2, T38N R17E	20-60	1-6	Sand, boulders, gravel	High velocity over sand and boulders, some deep pools
31	Sec. 5, T38N R17E	40-80	1-5	Gravel, sand, boulders	Rapids
32	Sec. 5, T38N R17E	30-70	1-4	Gravel, sand, boulders	Fast water stretch, some rapids
33	Sec. 6, T38N R17E	30-70	1-4	Gravel, sand, rubble, boulders	Rapids and fast water stretches
34	Sec. 13, 23, T38N R16E	30-80	1-5	Sand, silt, gravel, boulders	Extensive stretch of sluggish, relatively deep water
35	Sec. 22,23, T38N R16E	30-80	1-5	Sand, gravel, boulders	Wide, flat water stretch, very sluggish
36	Sec. 20, T38N R16E	20-40	1-3	Gravel, rubble, boulders	Rapids
37	Sec. 18, T38N R16E	65-70	1-4	Sand, gravel, boulders	Wide, sluggish stretch
38	Sec. 21, T38N R15E	40-60	1-4	Sand, silt, gravel	Wide and sluggish
39	Sec. 7, T38N R15E	30-35	1-5	Sand, gravel, muck	Sluggish stretch, some deep holes
40	Sec. 1, 2, T38N R14E	25-35	½-2	Gravel, sand, rubble, boulders	Rapids, braided channels
41	Sec. 9, T38N R14E	10-100	½-2	Sand, silt, gravel	Wide, shallow stretch, very little water movement
42-SB	Sec. 19, T38N R16E	25-50	1-4	Sand, gravel, boulders	Wide, moderate velocity stretch over hard bottom
43-SB	Sec. 25, T38N R15E	8-15	1-4	Muck	Sluggish section of stream, flowing through marsh area, very soft bottom
44-SB	Sec. 26, T38N R15E	15-30	1-4	Sand, gravel, muck	Flowing below bridge, wide and sluggish above bridge
45-SB	Sec. 28, T38N R15E	10-22	1-5	Sand, gravel	Moderate velocity, numerous deep pools, brushy banks
46-SB	Sec. 29, T38N	10-20	1-3	Sand, muck	Small stream, wide and shallow in some places

TABLE 29

Sampling Station Data for Woods Creek and Tributaries

Station Number	Location	Width (feet)	Depth (feet)	Bottom Type	General Characteristics
47	Sec. 28, T39N R17E	20-35	1-4	Gravel, sand	High velocity over gravel, braided channels, numerous pools and undercuts
48	Sec. 29, T39N R17E	25-40	1-3	Gravel, sand	High velocity over gravel, braided channels, pools shallow, wooded area
49	Sec. 23, T39N R16E	25-30	1-4	Sand, gravel boulders	Moderate velocity, numerous deep pools, brush banks
50	Sec. 23, T39N R16E	20-25	1-4	Sand, boulders	Moderate velocity, numerous deep pools, tag alder overhang
51	Sec. 20, T39N R16E	15-20	1-3	Sand, boulders	Moderate velocity, braided channels, wooded area
52	Sec. 25, T39N R15E	5-10	1-3	Muck	Small, sluggish stream flowing through marsh area
53	Sec. 27, T39N R15E	4-8	½-2	Sand, muck	Small stream, marshy area
54	Sec. 28, T39N R16E (Cody Creek)	5-8	1-3	Gravel, sand, boulders	Small woods stream, high velocity, boulders and undercuts
55	Sec. 28, T39N R16E (Cody Creek)	6-10	½-1	Sand	Small woods stream, wide and shallow
56	Sec. 27, T39N R16E (Hay Marsh Creek)	5-10	½-2	Sand, rubble boulders	Impounded above road, high velocity woods stream below road

TABLE 30

Sampling Station Data ior Streams Tributary to Pine and Popple Rivers

Station Number	Stream	Location	Width (feet)	Depth (feet)	Bottom Type	General Characteristics
57	Hendricks Creek	Sec. 1 T38N R16E	8-15	1-3½	Sand, boulders	Woods stream, numerous downed logs, coniferous forest
58	Hendricks Creek	Sec. 35 T39N R16E	10-14	1-3	Sand, boulders	Brushy woods stream, alders overhanging, boulders and downed logs
59	Hendricks Creek	Sec. 3 T38N R16E	12-15	½-1	Sand	Wide, flat stretch, relatively open
60	Little Popple River	Sec. 12 T38N R14E	8-15	½-2	Sand, gravel, rubble	Woods stream, very low flow, shallow pools
61	Little Popple River	Sec. 13 T38N R14E	4-11	½-1	Gravel, rubble, boulders	Woods stream, shallow and rocky
62	Little Popple River	Sec. 27 T38N R14E	8-15	½-2	Sand, silt, gravel	Wide and shallow stretch, tag alder overhang
63	Lepages Creek	Sec. 7 T39N R19E	6-12	1-3	Sand	Meadow stream, undercut banks, corner pools
64	Lepages Creek	Sec. 6 T39N R19E	4-9	½-1½	Gravel, sand, boulders	Woods stream, high velocity over gravel and boulders
65	Deadmans Creek	Sec. 1 T39N R18E	4-8	½-1	Sand, gravel, boulders	Small, shallow and brushy stream
66	Deadmans Creek	Sec. 1 T39N R18E	3-5	½-1	Clay	Flat and brushy stream
67	Lamon-Tangue Creek	Sec. 4 T38N R17E	10-25	½-1½	Sand, gravel	High velocity section of stream, numerous shallow pools, wooded banks
68	Lamon-Tangue Creek	Sec. 4 T38N R17E	10-18	1-3	Sand, gravel	High velocity stretch, brushy banks
69	Lamon-Tangue Creek	Sec. 10 T38N R17E	13-21	1-4	Sand, silt	Moderate velocity, numerous pools, brushy banks
70	Lamon-Tangue Creek	Sec. 23 T38N R17E	8-14	1-3	Gravel, sand, muck	Moderate velocity, some pools, partly brushy and partly marsh
71	Lamon-Tangue Creek	Sec. 27-28 T38N R17E	3-7	½-3	Sand, gravel, muck	Small stream, high velocity over boulders, wooded banks
72	Lunds Creek	Sec. 21 T38N R17E	2-5	½-2	Sand, gravel, muck	Small and shallow woods stream
73	Johnson Creek	Sec. 14 T39N R18E	4-8	½-1½	Sand, gravel, clay	Very small stream, numerous shallow pools and undercuts
74	Chipmunk Creek	Sec. 1 T39N R15E	4-8	½-1½	Sand, gravel, rubble	Small, tumbling woods stream
75	Chipmunk Creek	Sec. 1 T39N R15E	4-8	½-1½	Gravel, sand	High gradient woods stream, braided channel, undercuts and downed logs
76	Riley Creek	Sec. 10 T38N R15E	7-15	½-1½	Sand	Shallow, brushy stream, moderate velocity
77	Morgan Creek	Sec. 18 T38N R16E	4-6	½-2	Sand, muck	Small, brushy stream with beaver impoundments
78	Wakefield Creek	Sec. 25 T40N R16E	4-9	½-1	Muck, sand, gravel	Shallow stream with soft bottom
79	Seven Mile Creek	Sec. 27, 33 T40N R17E	4-8	½-1½	Muck, gravel	Marshy, open stream above the road, brushy below the road
80	Johnson Creek	Sec. 21 T40N R15E	4-6	½-1½	Muck, gravel	Sluggish, flat marsh stream
81	Pine Creek	Sec. 24 T39N R18E	3-6	½-1	Sand	Very small and brushy stream
82	Seidel Creek	Sec. 15 T39N R17E	3-6	½-1	Sand, gravel	Small, shallow stream, brushy below the road, marsh above
83	Rock Creek	Sec. 29 T39N R16E	10-15	½-3	Sand, gravel	Woods stream, high gradient below the road
84	Lautermans Creek	Sec. 33 T40N R16E	6-12	½-1	Muck, sand	Small, shallow, marsh stream

TABLE 30 (cont.)

Station Number	Stream	Location	Width (feet)	Depth (feet)	Bottom Type	General Characteristics
85	Keipers Creek	Sec. 33 T40N R16E	1-4	½-1	Sand, gravel	Very small and brushy stream
86	Simpsons Creek	Sec. 36 T38N R15E	4-12	1-3	Sand, silt	Marsh stream, sluggish and relatively deep
87	Simpsons Creek	Sec. 16, 17 T37N R15E	5-8	½-1½	Muck	Small marsh stream, very soft bottom
88	Emily Lake Outlet	Sec. 17 T39N R18E	8-15	½-1½	Sand, gravel	Woods stream, relatively wide and shallow
89	Coldwater Creek	Sec. 25 T39N R14E	4-8	½-3	Sand, gravel	Small, brushy stream
90	Long Lake Outlet	Sec. 17 T39N R15E	12-20	1-3	Sand, gravel, rubble	Moderate velocity stream over hard bottom, wooded
91	Fay Lake Outlet	Sec. 15 T39N R15E	28-41	½-1½	Muck, sand, gravel	Wide, flat, marsh stream
92	Sawyer Creek	Sec. 14 T39N R13E	2-6	½-1½	Sand, silt	Small and brushy stream
93	MacDonald Creek	Sec. 8, 17 T39N R13E	10-20	1-4	Sand, silt	Meadow stream, deep pools and undercut banks
94	Jones Creek	Sec. 18 T39N R14E	10-25	1-3	Sand, muck	Wide, sluggish marsh stream
95	Stevens Creek	Sec. 31 T40N R15E	8-15	½-2	Sand, gravel, rubble	Woods stream, high gradient
96	Halls Creek	Sec. 31, 32 T39N R18E	13-23	½-1½	Sand, gravel, boulders	High gradient woods stream
97	Halls Creek	Sec. 11 T38N R17E	6-15	½-2	Muck	Sluggish marsh stream with soft bottom

TABLE 31

Sampling Station Data for the North and South Branches and Tributaries of the Pike River

Station Number	Stream	Location	Width (feet)	Depth (feet)	Bottom Type	General Characteristics
1	North Branch	Sec. 16 T35N R20E	20-40	1-4	Sand, gravel, boulders	Moderate velocity stretch over sand bottom, some deep holes, wooded terrain
2	North Branch	Sec. 33 T36N R20E	25-50	1-5	Sand, boulders	Moderate velocity over sand bottom, some large and deep holes, some downed logs and alders
3	North Branch	Sec. 29 T36N R20E	20-40	1-5	Sand	Numerous deep pools, downed logs, moderate velocity, lowland woods
4	North Branch	Sec. 27 T36N R19E	25-40	1-5	Sand, gravel, boulders	Moderate velocity over sand and gravel bottom, relatively shallow, a few deep holes
5	North Branch	Sec. 21 T36N R19E	30-60	2-6	Gravel, rubble, boulders	High velocity stretch over rubble and boulders, some very deep holes
6	North Branch	Sec. 10 T36N R19E	30-70	1-5	Sand, gravel	Moderate velocity stretch over sand and gravel bottom, riffles and some deep pools
7	North Branch	Sec. 6 T36N R19E	20-30	1-4	Gravel, rubble boulders	Rapids, some deep pools, wooded terrain
8	North Branch	Sec. 36 T37N R18E	20-40	1-5	Sand, gravel	Meandering stream, moderate velocity, numerous pools, lowland woods and marsh area
9	North Branch	Sec. 33 T37N R18E	20-35	1-3	Sand, gravel, rubble, boulders	Fast-water stretch over rubble and sand bottom, numerous pools, wooded and swamp terrain
10	North Branch	Sec. 33 T37N R18E	25-40	1-3	Sand, gravel, rubble	Rapids, fast water stretches over rocky bottom
11	North Branch	Sec. 16 T35N R20E	25-50	1-3	Sand	Flat and relatively shallow stretch, lowland woods terrain
12	North Branch	Sec. 13, 24, T35N R19E	25-50	1-5	Sand, gravel, rubble, boulders	Some rapids areas, some moderate velocity and deep stretches
13	North Branch	Sec. 27 T36N R18E	20-30	1-3	Sand, silt clay	Meandering, moderate velocity stream, undercut banks, lowland woods and swamp conifers
14	North Branch	Sec. 29 T36N R18E	25-40	1-4	Sand, gravel, rubble boulders	Some rapids, some quiet water, tag alder overhang, wooded area
15	Little South Branch	Sec. 20 T35N R20E	10-15	1-4	Sand	Lowland stream, moderate velocity over sand
16	Little South Branch	Sec. 25 T35N R19E	10-20	2-3	Sand	Moderate velocity stretch, tag alder and willow overhang
17	Harvey Creek	Sec. 26 T36N R17E	14-17	1-2½	Sand, gravel boulders	High velocity woods stream, numerous pools, many logs and boulders
18	Harvey Creek	Sec. 21, 22 T36N R17E	8-20	1-4	Sand	Moderate velocity over sand bottom, some relatively deep pools, wooded terrain
19	K. C. Creek	Sec. 26 T37N R18E	8-15	1-4	Sand	Woods stream with tag alder overhang, moderate velocity over sand bottom
20	K. C. Creek	Sec. 15 T37N R18E	6-12	½-3	Sand, gravel	Woods stream, tag alders overhanging
21	Sidney Creek	Sec. 23, 24 T37N R17E	10-25	½-3	Sand	Tag alders overhanging, downed logs, numerous pools
22	Chemical Creek	Sec. 1 T36N R17E	6-22	½-3	Sand, silt	Lowland woods & marsh terrain, tags alders, few pools, moderate velocity
23	Chemical Creek	Sec. 2 T36N R17E	6-10	½-3	Sand	Moderate velocity stretch with few pools, partially wooded, part marsh

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Please return to:

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