Michigan Department of Natural Resources
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RABBIT RIVER (UPPER)

Allegan County (T4N, R11W. Sections 25, 31, 32, 35, 36)
(T3N, R11W. Sections 1, 2, 3, 4, 9, 10; T3N, R12W, Sections 1, 2, 10, 11)
Surveyed July 29 - August 3, 1993

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Environment

The upper portion of the Rabbit River is a second-order stream rated as second-quality, coldwater. Located in northeastern Allegan County, the designated trout stream portion of the Rabbit River ends at U.S. 131. The Rabbit River flows through the city of Hopkins. Originating in springs in the farmland of Leighton Township, and as outlets in a couple of very small lakes, the stream flows in a westerly direction until it empties into the lower Kalamazoo River. Most areas of the Rabbit River below U.S. 131 have not been surveyed sufficiently; a rotenone survey of those waters is planned for the future.

The watershed of the upper Rabbit River is primarily farmland and some woodlots. Soils in the drainage include poorly drained Granby and Glendora loamy sands, and very poorly drained Adrian and Houghton mucks.

The upper Rabbit River is approximately 9.8 miles in length. The average width is 14 feet, with depths averaging about 1.5 feet. Water velocities range from fast to slow. On average, substrates are composed of sand (60%), silt (20%), gravel (10%), rock (5%), and clay (5%). Only three of seven stations above U.S. 131 contained enough gravel areas (greater than 3%, Raleigh et al. 1986) to support favorable salmonid spawning conditions.

Depending on the section surveyed, overall habitat varies from poor to excellent. Undercut banks and brush are common to most sections, while the occasional log and pool is also found. Watercress is common only to the extreme headwater areas. Commonly found on the stream bottom are sand ripples (dunes), which are indicative of an excessive, moving bedload. Chemical characteristics that have been studied include pH (7.4-8.6), dissolved oxygen (greater than 5.0 ppm in August), and DDT concentrations (not detectable in sampling from 1964).

After a fish kill in July of 1989, the Surface Water Quality Division (SWQD) conducted three surveys of the river between August 1989 and July 1990, with specific sampling conducted both above and below 135th Avenue. The area above 135th Avenue was the site of the chemical contamination which caused the fish kill. Alkalinities at that time ranged from 188 to 234 ppm. Many other chemical characteristics were also analyzed. The results are available in a report issued by the Michigan Department of Natural Resources, SWQD (1990).

The macroinvertebrate communities were qualitatively sampled at four locations in the upper Rabbit River by SWQD. Up to 9 families of the order Insecta, including mayflies and caddisflies, were documented. Many of the species can be classified as intolerant, meaning they succumb easily to polluted waters.

There is no state-owned land along the banks of the upper Rabbit River. However, access is good at most road crossings, and landowner permission is easily obtained by anglers.

Fishery Resources

The upper Rabbit River has been actively managed for trout since at least 1939. Brown trout yearlings have been planted annually. Stocking rates today are about 248 fish per acre. Steelhead stockings in the lower Rabbit River started in the mid-1970s and continue today, averaging 8,000 spring yearlings. Even though a small dam exists in Hamilton, steelhead are able to migrate up into the designated trout stream area and spawn in available habitat. Some natural reproduction of steelhead has been noted in past surveys.

The upper Rabbit River has historically been popular with trout anglers, primarily upstream of Wayland. Historical records also indicate that northern pike and both largemouth and smallmouth bass were popular gamefish, especially in the lower reaches. Other than the addition of trout to the fish community, there is no evidence of change in the community composition of today compared to 50 years ago.

The headwater area above 135th Avenue was designated as a county drain (Hooker-Harvey) in 1926. This designation has caused many fishery management problems for the upper Rabbit River. Dredging activities and the opening of several large springs by dredging substantially increased sediment loads in the river. Sediment basins were installed as a mitigation measure. In 1983, an attempt was made to extend the county drain designation from 135th Avenue downstream to 6th Street. This attempt was overwhelmingly opposed by the public and defeated through court action.

In April of 1971, an extensive stream electroshocking survey found low trout numbers and high numbers of competing species. A chemical reclamation project in May of 1971 removed fish from 4th Street to U.S. 131. Brown trout were restocked, along with smallmouth bass below Hopkins. No planned chemical treatments have occurred since 1971.

A fish kill on July 16, 1989 seriously impaired the trout population from 135th to 5th street. A crop-dusting helicopter sprayed the insecticide Endosulfan on celery fields from 135th to 137th avenues. Apparently, the landowner also dredged the river without the proper DNR permits just prior to spraying, probably destroying beds of watercress. The river in this area typically is full of watercress, which serves to hold back runoff. Without the watercress, the Endosulfan freely entered and flowed unimpeded down the watercourse. Sampling by SWQD within 1 month of the fish kill found Endosulfan concentrations in the sediments as high as 120 PPB. Contaminant samples of trout also revealed high concentrations of Endosulfan in the fish.

An extensive fishery survey was conducted within 3 weeks of the fish kill to assess the damage. Based on previous surveys (notably the 1983 population estimates) it was felt that the effects of the fish kill on trout went as far as 5th Street. Brown trout up to 23 inches long were found dead in this stretch. Other species were not affected so far downstream; they were found in similar numbers as before.

Few other trout waters in District 12 (or perhaps Region III) had rivaled the trout production of some sections of the Rabbit River. The area between 135th Avenue and 4th Street had become quite popular for catching 20-inch plus brown trout and a 7-1/4 pounder was caught there in June 1985. Because of the fish kill, we estimated it would take 2 to 4 years for the trout population to be restored naturally. Therefore, a complex restocking regime was developed for quickly rebuilding the lost population to its 1983 structure (the only pre-kill data available). Stocking rates were developed assuming 50% mortality rates per year, per year class.

The most recent fish survey was conducted in 1993 (Table 1). Eight stations between 12th Street and 135th Avenue were sampled with either 250-V stream shocker (lower seven stations) or

backpack shocker (upper station). The 1993 fish community was quite varied (Table 1). A total of 8 species of fish were collected in the designated trout stream portion of the Rabbit River, an increase of two species compared to the 1989 post-kill survey. Species collected in 1993, but not in 1989, include rainbow trout, blackside darter, blacknose dace, and hybrid sunfish. Bluntnose minnows and hornyhead chubs were collected in 1989, but not in 1993.

In the 1993 survey, as in past surveys, brown trout were the most abundant species collected, followed by white sucker, central mudminnow, and Johnny darter (Table 1). These four species accounted for 71.5% of the total catch by number. Rock bass, common shiner, grass pickerel, bluegill, blacknose dace, and green sunfish were all represented by less than five individuals each. There does not appear to be an excessive amount of competition in this section of the river for brown trout.

Age and growth analysis (Table 2) showed that brown and rainbow trout were both growing well above the state average rates (1.4" and 1.6" respectively). Brown trout representing four year classes were collected (age 0-III), but all rainbows belonged to one year class (Age I). It appears that rainbow trout were unsuccessful in 1992 with reproduction efforts, as no young-of-year were collected.

The age structure of the brown trout population was very favorable (Table 3). Recruitment of young trout was very good, although survival from age I to II and from age II to III appeared to be poor. I believe this was mostly due to our sampling efficiency (61% on average, but poor for large fish). The sections of the creek with the most trout (4th Street to 135th Avenue) were practically impenetrable due to excessive foliage and brush.

Compared with the 1983 survey (the last good survey before the fish kill, Table 4) many more species are present today than then. This may be due in part, however, to the better equipment available for collecting fish. Population estimates in 1983 revealed that brown trout were by far the most abundant species found. Mark and recapture estimates of brown trout populations in 1983 between 135th Avenue and 4th Street ranged from 43 to 170 pounds per acre (rivaling Blue Ribbon trout streams in Region II). The trout population in the effected area of chemical contamination was, for all practical purposes in 1989, wiped out. The majority of the trout production in this area was natural. Table 5 presents a comparison of 1983 and 1993 trout population estimates.

In 1993 we conducted mark and recapture trout estimates at the same sites as in 1983 (Table 5). At 135th Avenue the total pounds per acre of trout was down compared to 1983, but the number of trout per acre was up. There were many more small trout in 1993. At 4th Street, both pounds per acre and number per acre were up in 1993. The percent of the brown trout that were of acceptable size is still lower at both sites than before the kill. This is to be expected as the population in this area was still relatively young and needed a few more years to develop larger trout.

A small setback to rebuilding the trout population occurred on May 15, 1991. Drain maintenance above 138th Street unleashed a torrent of silt that had built up for several years. A substantial number of young-of-year and yearling brown trout were suffocated by the silt. A complete fish kill was averted because maintenance activities were quickly stopped once dead fish were seen.

I believe that trout reproduction is significantly better today than 10 years ago because of the installation of two sediment basins by the Allegan County Drain Commissioner. In 1975 a new drainage ditch was dug above 135th Avenue (T3N, R11W, Sec. 2). While in the process of digging, several very large springs were "uncorked" which delivered continuous and significant amounts of sand to the creek. In response to this, a continuing need for dredging from 135th to 137th Avenue, and a resulting court case of the State of Michigan vs. the Allegan County Drain Commissioner (Case Number 86-7900-CE), the Drain Commissioner agreed in 1988 to install two permanent

sediment basins above 135th Avenue. These were last cleaned out in 1992. These basins undoubtedly are having an effect on the amount of exposed gravel between 4th Street and 135th Avenue, increasing the amounts of natural reproduction.

Management Direction

The Upper Rabbit River should continue to be managed as a second-quality, coldwater stream. The trout fishery has practically been restored to its previous level of production. Chemical reclamation of the river was considered after the 1989 fish kill, but it was felt that the Endosulfan had removed enough trout competitors. The many points of fish species contamination (lake outlets) will always be a problem, so chemical reclamation of the river may be needed in the future.

Habitat restoration is not prudent at this time, but perhaps the best technique for rehabilitating the Rabbit River would be installation of more sediment basins to remove the existing sand bedload. The feasibility of more basins needs to be studied in depth. Much of the sand bedload is coming from the Hooker-Harvey Drain, and we have no control over what happens there. The fact that the headwaters are a designated county drain while downstream areas are not, will continue to create fish management problems for the river.

After the 1993 survey, stocking at sites 03-03-01 (4th Street) and 03-03-10 (135th Avenue) was discontinued due to the significant amount of natural reproduction. We were hoping that recruitment of young-of-year brown trout would extend at least to 5th Street due to migration, but this does not appear to be occurring. Our current management will be to maintain stocking rates at other sites at 248 yearling brown trout per acre (wildrose strain).

Our first goal for the fishery into the next century is to increase the amount of natural recruitment of brown trout. Presently, the uppermost section of the creek from 4th Street to 135th Avenue is the only section where this goal has been met. Increased recruitment could be achieved by the installation of more sediment basins, and also by keeping the existing two basins cleaned out regularly. I suspect that for the next several years at least, the present stocking rate will need to be maintained.

The second goal is to further define the "good" trout water with temperature measurements. In 1995-96, temperature monitoring units were deployed at several locations to evaluate summer temperature regimes.

Two potential obstacles may exist in obtaining these goals. One is the potential for failure to maintain the existing sediment basins; the other is farming activities in the section from 135th to 137th Avenues. Historically, this area is where all trout fishery management problems have occurred.

Another potential obstacle to improving the fishery may be the continued runs of steelhead up into the headwaters. Research in Michigan has suggested that rainbow trout may compete with brown trout (Ziegler 1988). A new study by the Fisheries Research Section is designed to look at this potential problem.

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References

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Table 1. - Number, weight, and length (inches) of fish collected from upper Rabbit River with 250 v DC (2 probes) streamshocker and backpack shocker, July 29, to August 3, 1993.

Species	Number	Percent by number	Length range (inches)[1]	Average length	Percent legal size[2]
Brown trout	109	31.7	1-16	6.7	31(8)
White sucker	54	15.7	1-17	6.1	
Central mudminnow	53	15.4	1-4	3.0	
Johnny darter	30	8.7	1-2	2	
Creek chub	23	6.7	1-8	4.7	
Pumpkinseed	16	4.7	1-7	3.4	6(6)
Northern hogsucker	16	4.7	4-11	8.3	
Rainbow trout	8	2.3	6-8	7.5	38(8)
Stonecat		6	1.7	3-6	5.8
Blackside darter	6	1.7	2-3	2.7	
Hybrid sunfish	6	1.7	1-3	3	0(6)
Lamprey ammocete	4	1.2	5-9	7.5	
Bluegill	4	1.2	3-7	5	25(6)
Grass pickerel	3	0.9	3-4	3.8	
Blacknose dace	2	0.6	3-4	4	
Green sunfish	2	0.6	1-3	2.5	0(6)
Common shiner	1	0.3	6	6.5	
Rock bass	1	0.3	4	4.5	0(6)
Total	344	100			

[1]Note some fish were measured to 0.1 inch, others to inch group: e.g., "5" = 5.0 to 5.9 inches, "12" = 12.0 to 12.9 inches; etc.

[2]Percent legal size or acceptable size for angling. Legal size or acceptable size for angling is given in parentheses.

Table 2. - Average weighted total length (inches) at age, and growth relative to the state average,

for fish sampled from the upper Rabbit River with 2-probe streamshocker and backpack shockers, July 29 to August 3, 1993. Number of fish aged is given in parentheses.

Species	Age 0	I	II	III	IV	Mean growth index[1]
Brown trout	4.1	8.1	11.7	14.4	---	+1.4"
	(20)	(41)	(4)	(7)	---	
Rainbow trout	---	7.3	---	---	---	+1.6"
	---	(7)	---	---	---	

[1]Mean growth index is the average deviation from the state average length at age

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Table 3. - Estimated age frequency (percent) of fish caught from the Upper Rabbit Riverwith 2 probe Streamshocker and backpack shocker, July 29, to August 3, 1993.

Species	Age 0	I	II	III	IV	Number caught
Brown trout	48	43	4	5	---	109
Rainbow trout	---	100	---	---	---	8

Table 4.--Species and relative abundance of fishes collected by number at four stations on the upper Rabbit River, 1983.

Species	Number	Percent	Length range (inches)[1]
Brown trout	148	77.9	1-22
White sucker	25	13.2	4-14
Central mudminnow	6	3.2	2-3
Creek chub	3	1.6	3-6
Grass pickerel	3	1.6	3-9
Rainbow trout	2	1.0	4-8
Bluegill	1	0.5	4
Northern hogsucker		0.5	7
Total	188		

[1]Fish were measured to inch group: e.g.,"1" = 1.0 to 1.9 inches; "2" = 2.0 to 2.9 inches; etc.

Table 5. - Comparison of mark and recapture brown trout population estimates (Bailey formula) from pre-kill sampling (August 1983) and post-kill sampling after stocking (August 1993).

		Year	
Site		1983	1993
135th Avenue			
	Pounds/Acre	170	107
	Number/Acre	215	400
	% Acceptable length	63	44
	Length range	3-21	1-15
4th Street			
	Pounds/Acre	45	61
	Number/Acre	408	538
	% Acceptable length	45	17
	Length range	3-19	1-15

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Questions, comments and suggestions are always welcome! Send them to tinchert@michigan.gov