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IMPACT OF BEAVER DAM REMOVAL ON BROOK TROUT POPULATIONS AND THE SPORT FISHERY IN A NORTHEASTERN WISCONSIN STREAM

by Ed L. Avery

Beaver populations in northern Wisconsin burgeoned in the late 1970s and early 1980s, creating unprecedented densities of >1 beaver dam/mile on many area trout streams. Beaver dams constructed on low- to moderate-gradient streams typical of those in this region cause changes in stream habitat that often adversely affect resident trout populations (Patterson 1950, 1951).

In 1982 I initiated a study to test the hypothesis that removal of beaver dams on a brook trout (*Salvelinus fontinalis*) stream and subsequent maintenance of free-flowing conditions would result in: (1) improved living conditions for trout, especially water temperature, (2) an increased trout population, and (3) a higher quality trout fishery. Baseline data collected the year prior to initial dam removal were compared to data from 3 follow-up years. This Findings article examines 2 of the 3 facets of the study hypothesis—the impacts of removing beaver dams on brook trout populations and on the sport fishery. The impact on summer water temperatures was reported in Findings No. 30; the entire study will be analyzed in an upcoming final report.

Study Area

The study area was composed of a section of the North Branch of the Pemebonwon River (PR) and its tributaries, in northeastern Marinette County. The study area included 10 miles of Class II trout water on the PR plus 23 miles on 14 tributaries. The PR averaged 24 ft wide, with a gradient of <15 ft/mile, a discharge of 14 cfs, and light brown, medium-hard, slightly alkaline water. Where free-flowing, tributaries were 4-10 ft wide, with summer flows generally <0.5 cfs. Gradients were generally <50 ft/mile. When my study began, numerous segments of the PR were impounded by beaver dams, and several tributaries were little more than a series of impoundments from headwater to mouth.

The PR contains both wild and stocked brook trout. Brook trout have been planted in the PR annually since 1939. These releases were continued during 1982-86 (Fig. 1). Of an annual stocking of 3,825 legal-sized fish (≥6.0 inches), 29% were released in April prior to the fishing season. The remainder were released in late May, 2-3 weeks into the fishing season. In 1986, mortality following an outbreak of furunculosis (red spot disease) at a trout rearing facility in Niagara, WI, reduced the number stocked in May by 27%.

Methods

Ground reconnaissance of all study area waters was made in early November 1982 to locate beaver dams. DNR blasting crews using "Kenepak" explosive removed all obstructions to stream flow between mid-November 1982 and early May 1983. Of all obstructions, 178 were beaver dams and 41 were log and debris jams, many of which either had been or were currently occupied by beaver. The

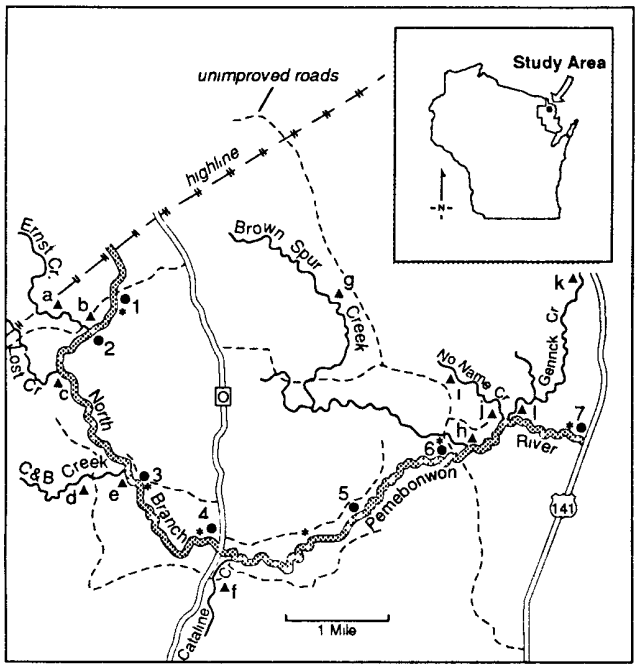

FIGURE 1. Study area on the North Branch Pemebonwon River showing stocking sites on the main stem * and fish sampling stations on the main stem ● and 7 largest tributaries ▲. (Seven other tributaries within the study area are not shown.)

number of obstructions removed from the PR and tributaries approximated 3.5/mile and 8/mile, respectively.

Following the initial 6-month removal period, the study area was reconnoitered at least once per month throughout the remaining 3.5 years of study. New obstructions—all beaver dams—were removed by blasting within 5 days of discovery. This eliminated an additional 327 beaver dams.

Accumulative removal of obstructions from the PR during November 1982-November 1986 was 11/mile. Accumulative removal from tributaries ranged from 1/mile on Lost Creek to 50/mile on Genrick Creek and averaged 19/mile. Removal costs during the 4-year period totaled $33,820 and therefore averaged $62/obstruction.

Changes in the brook trout populations were assessed by comparing population estimates made before (1982) and after (1984, 1986) removal of obstructions. Population estimates were made using the Bailey (1951) modification of the Petersen mark and recapture formula. In some tributaries, lack of recaptures prevented use of the Petersen formula and total captures were used as population estimates. For this Findings, only data for wild brook trout populations in 1982 and 1986 are considered.

Double-run (i.e., mark and recapture) electrofishing surveys were made at 7 sampling stations on the PR (Fig. 1) in May and October 1982 and 1986. Station lengths were 600-1,007 yd. In addition, the 7 largest tributaries within the study area were identified, and similar electrofishing surveys were made at 12 stations on these tributaries. In 1982 and 1986, these 12 stations were sampled in May-June; 9 stations were sampled in September-October (Table 1). Station lengths were 67-200 yd. All wild brook trout captured—as well as trout stocked in 1982 and 1986—were given site-specific fin clips to permit subsequent separation and identification.

The sport fishery on the PR and tributaries in the study area was studied utilizing a partial creel survey in conjunction with car counts made throughout the 1982, 1984, and 1986 fishing seasons. Car counts were made at 2-hour intervals at all access points. Between car counts, anglers were interviewed to determine their numbers per car, residence, time spent fishing, fishing methods, and fish caught. Fishing pressure was estimated based on counts of cars, time intervals represented by car counts, and anglers per car. Trout harvest was computed by multiplying harvest rate by fishing pressure. Catch and harvest data were based on all brook trout caught (wild plus stocked).

Trout Population Comparisons

Pemebonwon River. Average spring density of wild brook trout in the PR showed a 15% decline from 1982 to 1986, and legal-sized brook trout declined 39% (Table 1). In the fall, average density

declined 22% between 1982 and 1986, and legal-sized brook trout declined 52%.

Tributaries. Trout were found in 4 of 7 tributaries sampled in the spring of 1982 and in 5 of 6 tributaries inventoried in the fall, just prior to removal of obstructions (Table 1). Four years later, brook trout were present in all 7 tributaries sampled in the spring and all 6 tributaries inventoried in the fall.

Not only were brook trout found in more tributaries after removal of obstructions, but their distribution within tributaries also expanded. Between spring 1982 and spring 1986, brook trout distribution expanded from 4 to 11 of the 12 stations sampled (Table 1). Similarly, between fall 1982 and fall 1986, distribution expanded from 5 to 8 of the 9 stations sampled.

TABLE 1. Densities (no./mile) of all wild brook trout and legal-sized brook trout in the PR and all wild brook trout in tributaries during 1982 and 1986. (Initial removal of obstructions to stream flow occurred in 1982-83).

		Spring		Fall	
Stream	Station(s)	1982	1986	1982	1986
PR					
All wild trout	1-7	422	360	1,236	967
Legal-sized trout	1-7	98	60	380	183
Tributaries					
Ernst	a	0	132	-	-
	b	0	26	-	-
Lost	c	150	326	880	1,162
C & B	d	0	18	0	70
	e	176	88	643	1,197
Cataline	f	184	79	368	765
Brown Spur	g	0	35	-	-
	h	411	241	376	411
No Name	i	0	158	0	18
	j	0	0	0	194
Genrick	k	0	9	0	0
	l	0	70	9	132
Avg. tribs.		77	99	253	439

Increases in the abundance of brook trout in tributaries paralleled their expanded distribution following the removal of obstructions. Average density of trout in all tributaries sampled in the spring increased 29% between 1982 and 1986 (Table 1). Average density of trout in the fall increased 74% during the same period.

Successful natural reproduction, based on the presence of age 0 trout, was evident in 2 of 6 tributaries sampled in fall 1982. Natural reproduction was evident in all 6 tributaries sampled in fall 1986.

Sport Fishery Changes

During 1984, the second year following removal of obstructions, fishing pressure and catch rate on the PR were essentially identical to those in 1982 before removal of obstructions (Table 2). Angler harvest of brook trout was up 20%, however, due to a 40% increase in harvest of stocked trout.

In 1986, 4 years after removal of obstructions, fishing pressure and catch rate were down 48% and 23%, respectively, from what they were in 1982. Total harvest was down 54% from 1982. The wild trout component of the season harvest declined 96% from 1982 to 1986, whereas the stocked trout component declined 18%.

No sport fisheries were observed on the tributaries during either 1982 or 1986.

TABLE 2. Characteristics of the brook trout fishery on the PR in 1982, 1984, and 1986.

Year	Fishing Pressure (hr/acre)	Harvest (no./mile) Stocked	Harvest (no./mile) Wild	Catch Rate (no./hr)	Harvest Rate (no./hr)
1982	90	122	104	1.3	0.8
1984	88	171	101	1.4	1.0
1986	47	100	4	1.0	0.8

Summary and Conclusions

Removal of beaver dams and log and debris jams within the study area failed to produce an improvement in either the total number of wild brook trout present or the number of wild, legal-sized brook trout present in the PR 4 years later. Improvements in brook trout populations in 7 tributaries of the PR were recorded, however. Colonization of 3 tributaries by brook trout and increases in the distribution, average abundance, and incidence of natural reproduction of trout in all 7 tributaries were documented by the 4th year following initial removal of obstructions.

Although minor improvements in the sport fishery on the PR were apparent during the second fishing season following the initial removal of obstructions, a drastic decline occurred 2 years later in 1986. Possible causes for this decline include a reduction in the number of trout stocked, a large die-off of recently stocked trout observed in May (apparently due to furunculosis), low numbers of wild brook trout present, and angler dissatisfaction with the poor quality of stocked trout.

Positive changes in the wild brook trout populations in the small, moderate-gradient tributaries of the PR following removal of obstructions demonstrates a negative impact of beaver dams and log jams on such trout streams. Lack of improvement in the PR 4 years after removal of obstructions suggests a longer period of recovery for larger, low-gradient streams, rather than the absence of any detrimental influence of beaver dams.

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