

BEAVER KILL WATERSHED TROUT STUDY

Year 2002 Progress Report

Background

In the spring of 2000, the New York State Department of Environmental Conservation (DEC), along with fisheries scientists from Cornell University and Trout Unlimited (TU), began a comprehensive study to determine the status and potential for enhancement of the trout resources in the Beaver Kill and Willowemoc Creek. When complete, findings from this study will help form the scientific basis for developing a long-term fisheries management program for the watershed.

The Beaver Kill and Willowemoc are renown in angling history for their trout fishing opportunities and traditions. However, during the 1990's, decreasing levels of fishing use combined with angler perceptions of inadequate management attention and declining catch rates raised concerns about the status and future of the Beaver Kill. Beginning in 1994, TU conducted studies on the economic impact of angling in the region and on the physical condition of the streams relative to trout habitat needs. In addition, DEC has surveyed angler use and trout populations in various segments of the watershed on a periodic basis since the 1930s. The present study builds on these past efforts and is the first project in New York State to examine an entire watershed on a comprehensive basis, providing concurrent data on both the fishery and the environmental factors believed to influence trout abundance and distribution.

The study area encompasses all the stream resources within the 300 square mile Beaver Kill watershed (Figure 1). This includes the full length of the Beaver Kill and its major tributary, Willowemoc Creek, as well as the Little Beaver Kill, Mongaup Creek, and 164 tributary systems that flow into these streams. The current DEC fisheries management program for the watershed includes special trout harvest regulations of "no-kill" on 4.9 miles of the lower Beaver Kill

and 3.2 miles of the Willowemoc, and a 9-inch minimum length limit on 19.5 miles of the system. Wild trout populations in the mainstem reaches are supplemented each year with the stocking of approximately 40,000 brown trout. No brook trout or rainbow trout are stocked in the watershed by DEC. Formal public fishing access is provided via 33 miles of stream bank Public Fishing Rights easements, 20 fishermen parking areas, and substantial areas of State Forest Preserve and campsite lands.

The primary components of the study include: (1) counting and interviewing anglers to estimate the amount of fishing activity occurring, how many trout and of what size are being caught, and the proportion of the catch that is comprised of wild trout; (2) sampling fish populations throughout the watershed by electrofishing to determine species distributions and population characteristics; (3) measuring and mapping environmental factors such as summer water temperatures, water chemistry, flow rates, and trout habitat features; and (4) examining the occurrence, abundance, and dynamics of wild trout populations. This report summarizes information collected during the first three years of the study, with emphasis on new data collected during 2002.

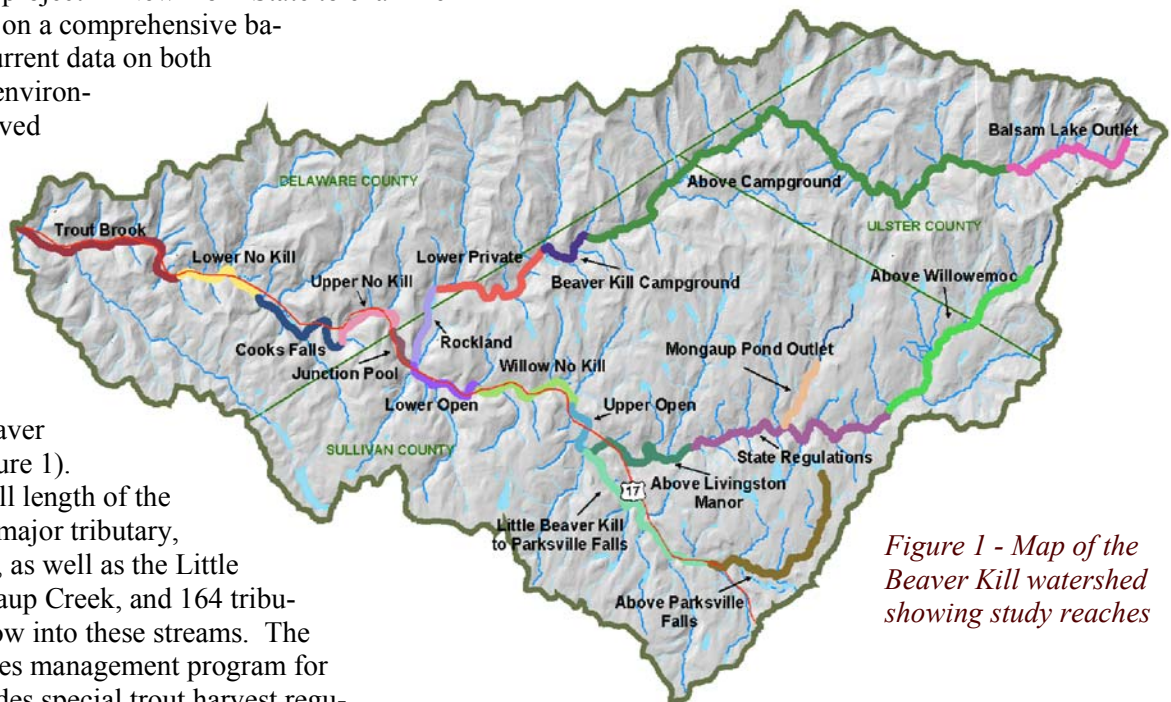


Figure 1 - Map of the Beaver Kill watershed showing study reaches



Angler Effort

Creel survey agents conducted angler counts and interviews on weekends and three weekdays per week throughout the 2002 fishing season, as they had during the previ-

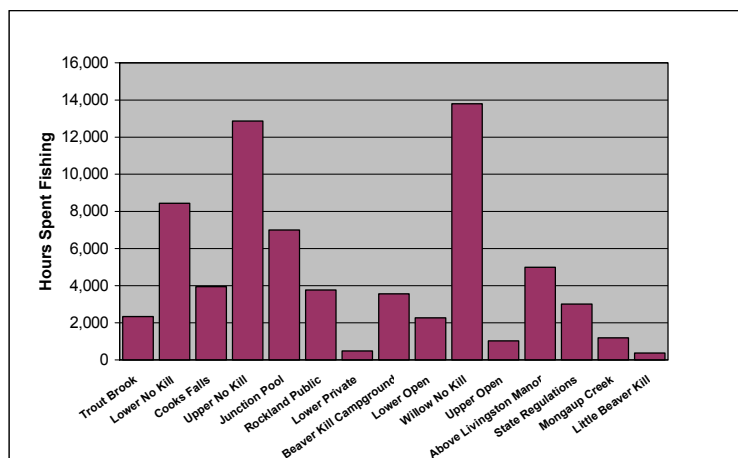


Figure 2 - Angler effort by study reach, averaged over 2000 - 2002

ous two years of the study. An estimated 63,400 hours of angling effort occurred during 2002 on the 15 census reaches, which equates to about 18,300 individual angler trips. Over the course of the study, the heaviest use occurred in the three no-kill areas (Figure 2; see Figure 1 for study reach locations).

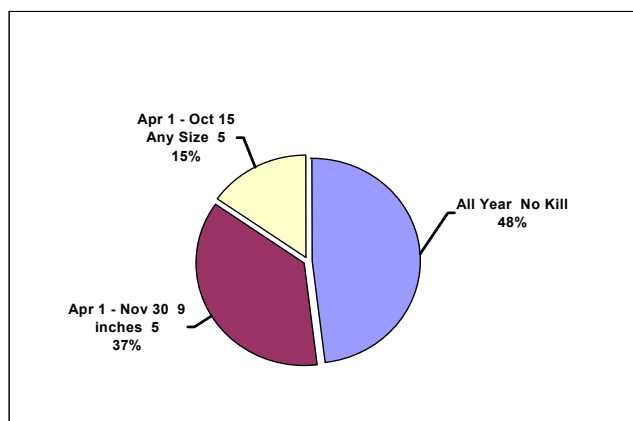


Figure 3 - Angler effort by regulation type for 2002

Angler use in the three no-kill reaches accounted for 48% of the total effort in 2002 (Figure 3). This percentage has ranged from 48 to 54 percent during the course of the study. The Junction Pool study reach was also intensively used as can be seen in Figure 4, which shows fishing pressure on a per-mile basis for each of the study reaches.

Overall angling use in the watershed was similar to the year 2001 estimates, but was only 80% of the year 2000 estimate. The summer of 2002 became quite dry similar to

2001, unlike the very wet year 2000. As illustrated in Figure 5, angling effort was high early in the season for all three years, but declined to low levels in 2001 and 2002 during August and September.

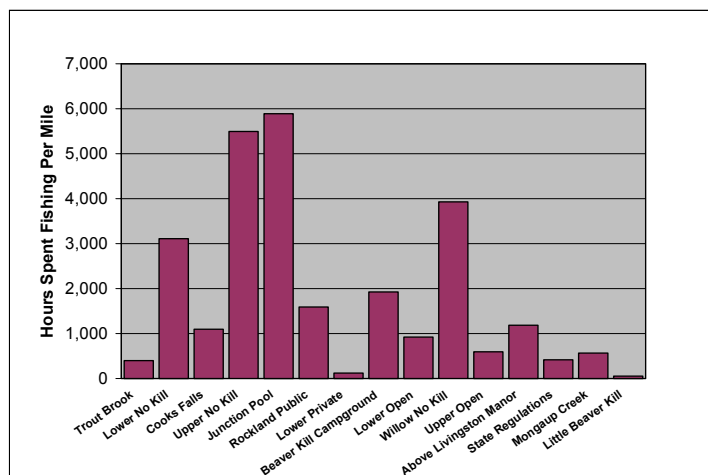


Figure 4 - Hours of fishing per mile, averaged over 2000 - 2002

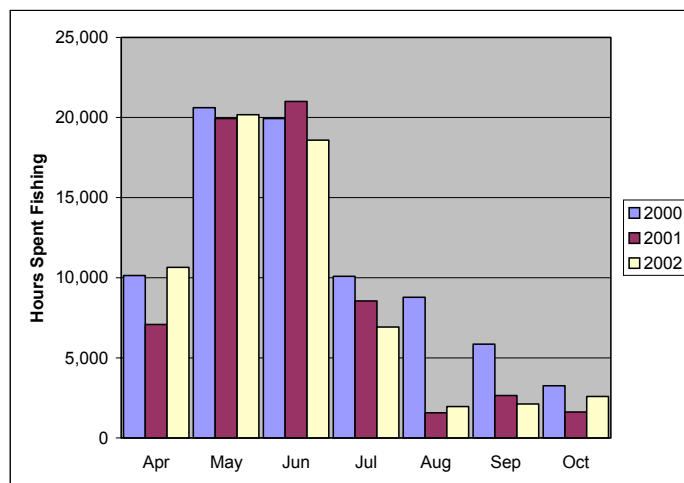


Figure 5 - Angler effort by month for 2000 - 2002

Thermal Refuge Sites

Because trout congregate densely at spring seep locations (thermal refuges) during warm weather periods and because hooking and handling mortality of trout increases markedly in warmer waters, anglers were advised not to engage in catch-and-release fishing at refuge sites for much of the summers of 2001 and 2002. A special effort was made over the last three years to monitor and quantify angler use at known thermal refuge sites.

The most consistent and largest thermal refuge area, with trout numbers approaching 400 fish in 2002, occurs off the mouth of Horton Brook on the lower Beaver Kill. In 2001,

trout began to use this refuge on about July 24, and in 2002 on about July 4. In both years trout used this site until late August. Figure 6 shows how fishing pressure dropped off from over 60 hours per week to about 20 hours per week by mid July. In 2001 no fishing was observed in this thermal refuge from late July through August, and in 2002 only 8 anglers were observed by the creel agent for the same time period.

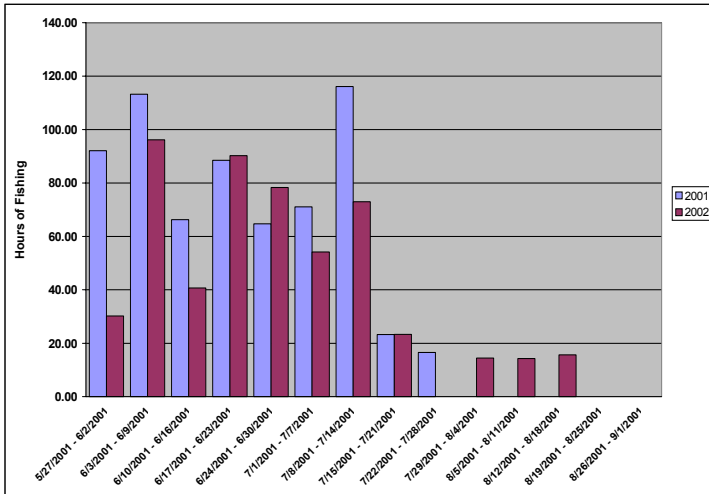


Figure 6 - Angler use at Horton Brook thermal refuge - weekly averages, June through August, 2001 and 2002

Fishing at these sites during summer drought conditions is considered to be “unsportsmen-like” or unethical conduct by knowledgeable and serious trout anglers. It is obvious from the reduced fishing rates that this message was effectively communicated by DEC and the Beaver Kill’s fishing advocates - especially the local TU chapters.

Angler Catch

Catch Rates

Over 4,280 watershed anglers were interviewed as to their fishing success during the 2002 season. Also, 14 people provided detailed diaries of fish caught on each of their Beaver Kill and/or Willowemoc fishing trips.

Interviewed anglers reported catching 4,202 trout in 11,028 hours of fishing during the 2002 season for an overall catch rate of 0.38 trout/hour. As in the previous two years of the survey, a relatively small number (12.8%) of caught trout were kept, however, this number is strongly influenced by the no-kill areas where much of the use was concentrated. Outside the “no-kill” areas, almost 25% of the trout caught were kept in 2002. Over the course of the study, roughly 1/3 of the anglers who caught trout outside of the no-kill areas kept at least one. Using effort estimates derived from angler counts, we estimate a

total catch of 24,160 trout and a total harvest of 3,090 trout.

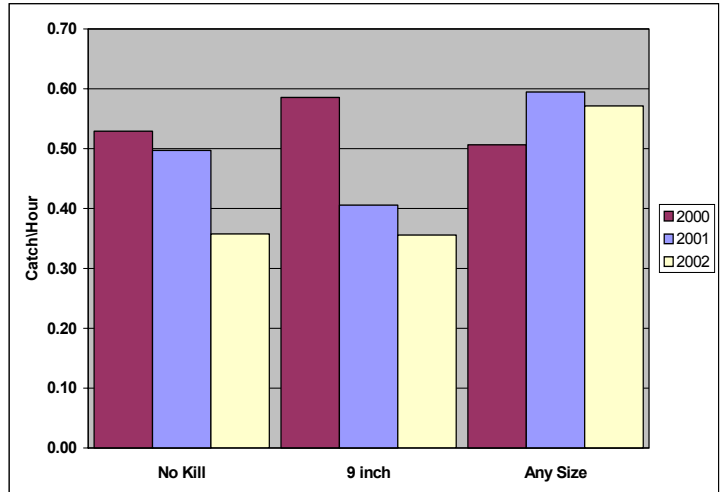


Figure 7 - Angler catch rates by regulation type for 2000 - 2002

Catch rates for the different study reaches varied from about 0.2 to more than one trout/hour with the highest annual rate occurring in Mongaup Creek. Catch rates have been similar across regulation types (Figure 7), but have generally declined during the course of the study. Figure 8 shows the catch rates for each of the three years of the study, by study reach. This decline is likely in response to the warm, dry conditions during 2001 and 2002 and reductions in the number of hold-over fish.

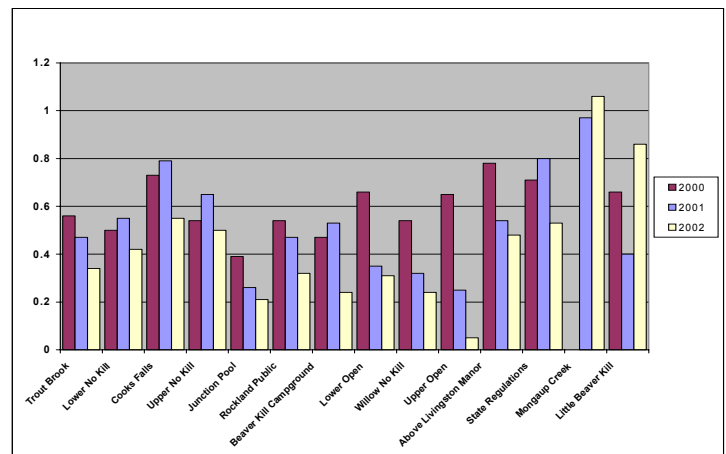


Figure 8 - Angler catch rates by study reach for 2000 - 2002

Catch Composition

Based on angler interviews, brown trout comprised 86.0% of the total catch in 2002, compared to 91.5% in 2001 and 94.5% in 2000. As in 2001, noticeable proportions of rainbow trout were reported caught in the Trout Brook and Lower No-Kill reaches of the lower Beaver Kill (34.0%

and 13.4% , respectively), while brook trout comprised 35.5% and 48.2% of the catch in Mongaup Creek and the upper Willowemoc (State Regulations study reach), respectively.

Again in 2002, all hatchery trout stocked in public waters received an adipose fin clip (Figure 9) prior to being stocked so that wild and hatchery fish could be distinguished in the angler catch and fish sampling surveys. Of 1,530 brown trout creel by interviewed anglers during the course of the study, 90% were fin clipped and known to be of hatchery origin. The angler diary cooperators reported catching 74% hatchery fish, which is roughly the same proportion of hatchery vs wild trout that were observed in the previous two years' diary programs.

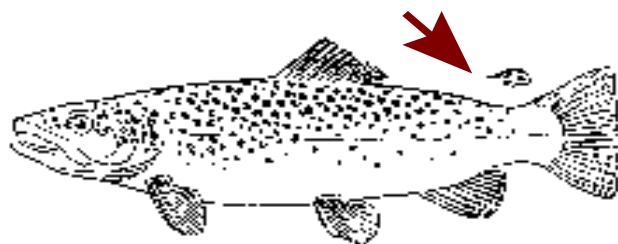


Figure 9 - Stocked brown trout depicting clipped adipose fin

The Anglers

A majority of interviewed anglers fly-fished, either exclusively (75.5%) or in combination with bait and/or lure fishing (6.4%). As in the previous two years, most Beaver Kill use is from visiting or tourist anglers that reside outside the immediate area. Just over 10% of interviewed anglers were from Delaware, Sullivan or Ulster Counties while 42% originated from the New York- New Jersey metropolitan area. Visitors from Canada, England, Yugoslavia, Romania, Japan, South Africa, Holland, Poland, Portugal, and Puerto Rico fished the Beaver Kill system in 2002.

Interviewed anglers were also asked to rate their level of satisfaction with their day of fishing. On a scale of -2 to +2, the average, overall watershed rating was 0.85 from 3,936 interviews. This is down from an overall rating of 1.15 in 2000 and 0.92 in 2001. Levels of satisfaction in 2002 by study reach ranged from 0.46 for the "Junction Pool" section of the Beaver Kill to 1.2 for the "Lower Open" section of the Willowemoc Creek.

Fish Population Surveys

Tributary Streams

A major finding in 2002 was the collection of yearling rainbow trout in Abe Wood Brook and fingerling rainbow trout in Stewart Brook (Figure 10). These were the first collections of rainbow trout in the Willowemoc Creek tributary system. This along with the first collection of rainbow trout in Shin Creek, a tributary that enters the Beaver Kill in Lewbeach, indicates a continuing expansion of rainbow trout throughout the Beaver Kill-Willowemoc drainage.

Rainbow Trout Distribution In Tributaries



Figure 10 - Distribution of rainbow trout in the Beaver Kill-Willowemoc tributaries

Except for a small, isolated population in the upper Beaver Kill, rainbow trout became established in the watershed sometime in the 1980's, probably after 1985. They are now the dominant trout in Trout Brook, Horton Brook, and Spring Brook. Rainbow trout are now found in 10 Beaver Kill tributaries and two Willowemoc Creek tributaries. Long term, it is anticipated that rainbow trout will be found in all suitable tributaries and they could someday become the most abundant wild trout in the Beaver Kill and Willowemoc Creek.

Electrofishing surveys of the 20 tributaries that flow into the Little Beaver Kill were completed in 2002. Trout are present in 12 tributaries of which brook trout were the dominant trout in 10 streams and brown trout in two streams. Overall, brook and brown trout were found in 12 and six tributaries, respectively.

Fifty nine tributaries flow into the Willowemoc Creek of which at least 29 are inhabited by trout. All but three streams have been sampled and these surveys will be completed in 2003. Brook trout were found in 28 tributaries, brown trout in 13 tributaries, and rainbow trout in two

tributaries. Brook trout were the dominant trout in 23 tributaries and brown trout in four tributaries. Brown and brook trout were co-dominant in two streams.

More intensive sampling in selected tributaries was conducted to obtain trout population estimates. Trout populations varied widely, ranging from 5 to 156 pounds/acre. Slimy sculpin were typically the most abundant non trout species collected. Population estimates will be repeated in 2003 on selected tributaries to determine the extent of year to year variability.

Mainstem Reaches

Nine mainstem sites, each in a different creel survey reach, were electrofished in 2002. Total trout abundance (all species - hatchery and wild) estimates ranged from 33 to 485 catchable-size trout (age 1 and older - roughly 5 inches or longer) per mile on the Beaver Kill and 143 to 816 trout/mile on the Willowemoc Creek sites (Figure 11).

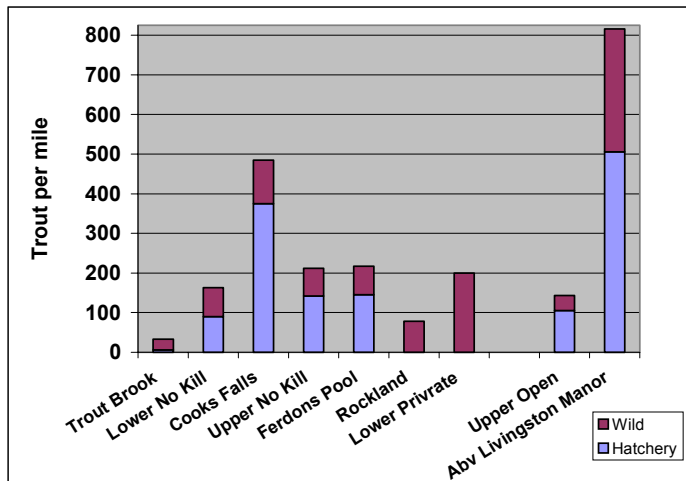


Figure 11 - Estimated trout per mile based on 2002 sampling

Planned collections at three Willowemoc sites, including the No Kill reach, were not made because of sampling difficulties.

A primary focus of the mainstem sampling was to examine the abundance and distribution of wild trout in the fishery. In the Beaver Kill reaches, wild trout density of catchable-size trout ranged from 27 to 200 trout/mile (Figure 11). Wild trout abundance was lowest in the Trout Brook reach and highest in the Lower Private reach by Craigie Clair. The two No Kill reaches had wild trout abundance of 70 and 73 trout/mile. In Willowemoc Creek, wild trout abundance at the two sites sampled was estimated at 38 and 310 trout/mile.

Wild trout abundance in the Beaver Kill and Willowemoc Creek was generally found to be low in comparison with

some other nearby waters. For example, in the West Branch Delaware River, recognized as one of the top trout streams in New York, the wild trout density of catchable-size trout at three locations in 2002 ranged from 972 to 1,950 trout/mile. On the West Branch No Kill reach from 1993 to 2002, wild trout density averaged 1,453 trout/mile.

The Environment

Temperature Monitoring

Water temperatures were again monitored on a hourly basis using thermographs placed at 62 mainstem and tributary sites. A comparison of the maximum water temperatures observed on the Beaver Kill in 2000, 2001 and 2002 (Figure 12) demonstrates the 10° to 15° F difference that occurred between a relatively wet summer with moderate temperatures (2000) and two dry summers with warmer weather (2001 and 2002).

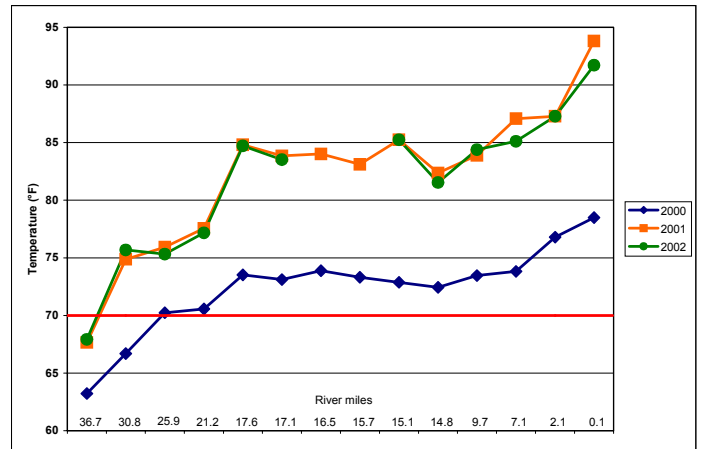


Figure 12 - Maximum recorded water temperatures on the Beaver Kill for 2000 - 2002

Figure 13 displays the highest seven day average temperature taken from sites on the mainstem Beaver Kill in 2000, 2001 and 2002. In 2000 only the lowest few miles of the river experienced temperatures above 70°F - considered stressful for trout. In contrast, both 2001 and 2002 had one week where stream temperatures averaged 75°F or higher from the mouth to river mile 15 (Junction Pool) and 70°F up to river mile 23 which is just upstream of Berry Brook.

Maximum water temperatures in Willowemoc Creek demonstrated the same 10° to 15° F increase from year 2000 levels. In 2000, water temperatures did not exceed 70° F average anywhere on the Willowemoc while in both 2001 and 2002 weekly stream temperatures averaging almost 75°F occurred all the way upstream to the mouth of the Little Beaver Kill.

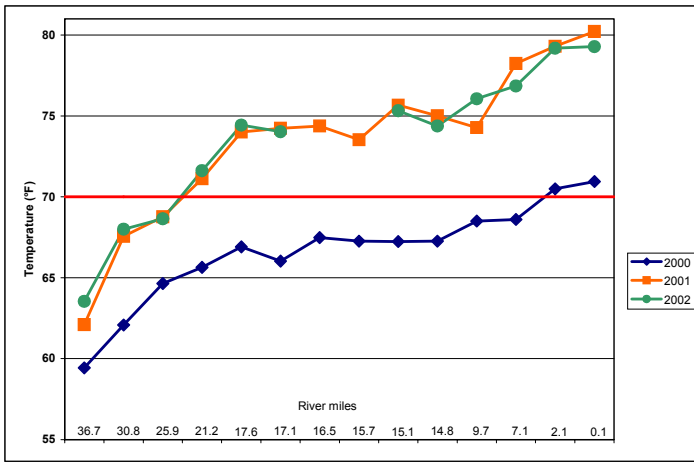


Figure 13 - Highest seven-day average water temperatures on the Beaver Kill for 2000 - 2002

Thermal Refuge Sites

Thermal refuge sites identified during the summer of 2001 were monitored during the summer of 2002 by DEC staff when water temperatures critical to trout survival began to occur. Only two sites (Horton Brook and Cook Brook) seemed to consistently hold large numbers of trout for long periods of time.

Trout utilization of thermal refuges was first observed on July 4, 2002 at the Horton Brook refuge site. Water temperatures that day reached 82°F in the mainstem Beaver Kill just upstream from the mouth of Horton Brook. Trout were last seen using the Horton Brook refuge on August 28 with the mainstem temperature at 68°F.

In 2001, trout utilization of thermal refuges was first observed on July 22 at the Cooks Falls pool after water temperatures had reached 77°F in that area the previous day. Trout were last noted using a refuge during 2001 on August 21 at Horton Brook with the mainstem temperature at 73°F.

Stream Flows

Discharge was measured at 38 sites on the Beaver Kill and its tributaries during two different flow regimes over the course of the summer in 2002. Conditions for conducting flow measurement included summer low stream levels and no recent rains in the watershed. We measured flows at our sample sites when the US Geological Survey (USGS) gauge at Cooks Falls was reading, on average: 96.5 cfs and 44 cfs. At those levels, Willowemoc Creek supplied 57% and 64% of the flow respectively into Junction Pool where it enters the Beaver Kill in Roscoe. The highest volume tributaries on the Beaver Kill/Willowemoc system at low flows are the Little Beaver Kill and Mongaup Creek. Figure 14 shows the average weekly stream flow

for the period beginning at the end of April and continuing to early October and illustrates the difference between the wet summer in 2000 and the dry summers in 2001 and 2002. For reference, the median summer low flow at the USGS Cooks Falls' gauge, based on 87 years of record, is about 100 cfs.

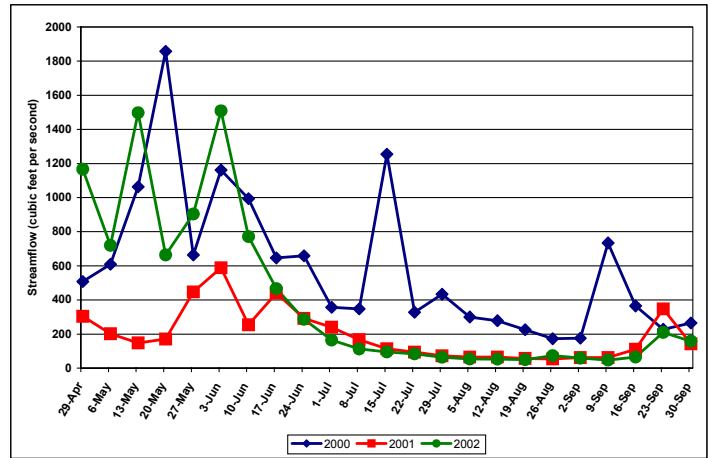


Figure 14 - Average weekly stream flow at USGS Cooks Falls station for 2000 - 2002

Habitat Protection and Improvement

The major highway (Rt 17) that runs through the Beaver Kill watershed corridor is scheduled to be upgraded to interstate standards and re-designated as I-86. Some aspects of this work have potential for significant impacts and opportunities relating to drainage patterns and trout habitat conditions in the study area. The Beaver Kill Study planning work group regularly includes participation by representatives of the New York State Department of Transportation (DOT) at planning meetings to facilitate coordination on highway project developments. Additionally, a number of special meetings were held with DOT engineering and planning staff, both on site and off, to assure upfront consideration of fisheries issues in the Environmental Impact Statement and engineering design phases of the project. Preliminary recommendations on habitat protection considerations and the design of the project were prepared by DEC staff and submitted to DOT.

A potential mitigation site in connection with upgrade of the highway is in vicinity of the old airport downstream of Parkville along the Little Beaver Kill. The stream here has captured a series of large ponds, believed to have been created as "borrow pits" during the original construction of Rt 17. Under certain flow conditions, these ponds contribute substantially to the warming of the Little Beaver Kill. The project would entail moving the stream back to the streambed (now dry) that it previously occupied, and creating a wetland/floodplain where the ponds are now located.

Next Steps

The angler creel census portion of the study has now been completed, but other data will continue to be collected in 2003. This will include a fourth year of electrofishing sampling in mainstem and major tributaries to measure trout abundance and distribution. Water temperatures will continue to be monitored, and additional temperature monitoring stations will be established in and around the airport borrow pits to get a better handle on how these ponds are impacting stream temperatures. Data analysis and surveys to determine variability in tributary trout production will continue through 2005 along with research to identify wild trout origins.

A major new component that will be added to the study in 2003 is a radiotelemetry project involving stocked trout. This project is primarily in response to the relatively low numbers of trout that were captured in the mainstem reaches during the electrofishing surveys. Approximately 120 hatchery-reared trout (80 yearlings and 40 two-year-olds) with surgically implanted radio transmitters will be released along with regularly stocked fish in the upper no-kill area on the Beaver Kill and in the no-kill area on the Willowemoc. These fish will be tracked throughout the spring and summer, and will hopefully provide us with information on the movement patterns and fate of stocked fish. Fish implanted with radio transmitters can be identified by a trailing antenna (Figure 15). If they happen to harvest a radio-tagged fish, anglers are requested to remove the tag and contact the regional fisheries office in Stamford.

A public meeting is planned for May 2003, in which we will share information on the Beaver Kill Watershed Trout study, and begin to solicit public input for the future direction of management actions within the watershed.

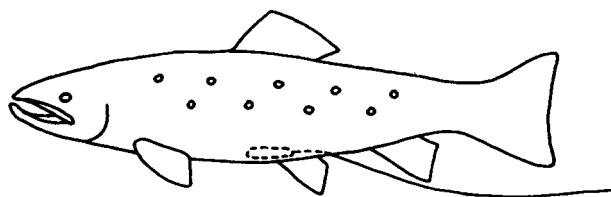


Figure 15 - Radio-tagged trout

More Information

For additional information about the Beaver Kill Study, contact either the DEC Region 3 Office in New Paltz at (845) 256-3066 or the DEC Region 4 office in Stamford at (607) 652-7366. A full-color version of this report can be downloaded from the DEC website at:

www.dec.state.ny.us/website/locator/fwmr.html#fishing

Printed on recycled paper 5/2003



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