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A WATERSHED SURVEY AND EDUCATIONAL PROGRAM TO ENHANCE
ENVIRONMENTAL QUALITY IN THE UPPER LITTLE TENNESSEE RIVER VALLEY
YEAR 4
EXECUTIVE SUMMARY

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YEAR 4
EXECUTIVE SUMMARY**

Report to: Western North Carolina Alliance
Water Management, TVA

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Date: December 1992

MASTER

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INTRODUCTION

Work carried out during 1992 under TVA grant No. TV-74216A, administered by the Western North Carolina Alliance, may be broken down into four categories: Index of Biotic Integrity (IBI), Macroinvertebrate Biomonitoring, Visual Reconnaissance, and Survey of Brook Trout. In 1992, we began to shift emphasis from merely studying the watershed to activities aimed at protecting, restoring, or improving water and habitat quality. The "target" area for this work in the upper Little Tennessee River watershed was the 10.0 square mile Rabbit Creek watershed (Holly Springs Community), and work conducted in Holly Springs is here reported separately from watershed-wide monitoring activities.

Additional topics treated in this report include the relation of this project to other activities in the upper Little Tennessee watershed, significant changes in the watershed which occurred independently of this project, a list of other reports prepared to be made available through the project and a list of meetings. Work carried out under this grant in the Spring Creek and Laurel River watersheds (Madison County, North Carolina) will be reported on separately by Mark Hopey.

RABBIT CREEK WATERSHED (HOLLY SPRINGS COMMUNITY)

Introduction

As part of the previous year's work, tributary watersheds of the upper Little Tennessee were prioritized for possible improvement/restoration. The Rabbit Creek watershed was selected as the first upper Little Tennessee River tributary where improvement would be attempted, in collaboration with the Holly Springs Community Club. The first step was to repeat, on a smaller scale, the process carried out in the entire upper Little Tennessee River watershed. In order to more clearly define the problems being experienced in the Rabbit Creek watershed, and their sources, a series of IBI and macroinvertebrate biomonitoring sites were selected and sampled. In addition, visual reconnaissance was conducted for the entirety of Rabbit Creek, its major tributary Cat Creek, and several other tributaries to evaluate riparian land uses, identify areas with unstable banks or point sources of pollution, and locate major waterfalls or changes in stream gradient.

IBI

Five IBI samples were carried out in the Rabbit Creek watershed. One site in the lower reach of Rabbit Creek was used in the 1990 study and was subsequently designated a fixed station for continuing monitoring. One site on lower Cat Creek and three sites on Rabbit Creek above the confluence of Cat Creek were chosen to "bracket" major tributaries.

The fixed station site showed a major improvement in IBI score from 31 (poor) in 1990 to 42 (fair) in 1992. Even so, Rabbit Creek continues to rate second to poorest of the upper Little Tennessee's

tributaries. The monitoring data and visual evidence both suggest that the major contributing factor is erosion control measures taken by some of the upstream landowners.

Rabbit Creek scored significantly better at all three sites upstream of the mouth of Cat Creek (45, 47, and 45), while Cat Creek scored lower (40). All sites appeared to suffer about equally from sedimentation, but deformities (tumors and opaque eyes) observed on fish in Cat Creek suggest that toxic pollutants are present. The most likely source of toxic chemicals is use of pesticides and herbicides for turf maintenance at the Holly Springs Golf Course, which drains to Cat Creek not far above the monitoring site.

Macroinvertebrate Biomonitoring

Macroinvertebrate samples were taken at the five IBI monitoring sites in the Rabbit Creek watershed, plus seven other points where stream flows were too small to permit IBI monitoring of fish samples. Conclusions must await taxonomic identification of the collections by TVA's contractor.

Visual Reconnaissance

The entirety of Rabbit Creek from the point where it crosses U.S. 23/441 (0.5 mile above its mouth at Lake Emory at the entrance to the Holly Springs Community), to its source at the junction of Corbin and Berry Creeks (2.8 miles), was visually surveyed. Cat Creek was visually surveyed from its mouth at Rabbit Creek to its source at the junction of its north and south branches. The following factors were noted and plotted on property maps:

- land use
- extent of shade on banks
- eroded "raw" banks
- damaging obstructions
- possible point sources
- tributaries
- major drops

Less intensive visual surveys were made of the tributaries of Rabbit and Cat Creeks. Visual evidence of sedimentation was obvious everywhere, and it is equally apparent that the principal cause of sedimentation (and probably of organic enrichment, evident from the IBI data and from algal growth) is livestock in unfenced pastures.

Other problems observed, all of much lesser significance, include snags causing bank erosion, agricultural runoff, organic pollution from barns and feedlot areas, removal of shading vegetation, the effects of channelization five or more years ago, drainage of riparian wetlands, and minor accumulations of trash.

Recommendations

It was recommended to the Holly Springs Community Club that, while small restorative chores such as removing obstacles or replanting shade trees could be carried out by the club, priority should be given

to the problems of toxic chemicals apparently originating at the golf course, and sedimentation and organic enrichment related to livestock raising.

In the case of chemicals from the golf course, the first step should be testing to verify the presence and source of agrochemical residues, followed by an effort to work with golf course management to rectify problems. In the case of livestock-caused sedimentation and organic enrichment, the major recommendation is to urge livestock raisers to avail themselves, through the Macon County Soil Conservation District, of an existing cost sharing program to fence livestock out of streams. This suggestion has met with resistance on the part of some of the landowners who need to be involved.

WATERSHED-WIDE IBI

Eight of the 24 IBI sites monitored in 1990 have been selected for annual monitoring as fixed stations within the upper Little Tennessee River watershed (analogous to TVA's biomonitoring program for the entire Tennessee Valley). Three of these sites are on the Little Tennessee River itself: Needmore at River Mile 95.5 (TVA's fixed station on the Little Tennessee), a site just upstream of Franklin and Lake Emory (River Mile 119.0), and one in Georgia just upstream of the Georgia/North Carolina state line (River Mile 136.9). Fixed stations on the lower reaches of Little Tennessee tributaries include the Cullasaja River and Cartoogechaye Creek, the two largest tributaries. Others are Middle Creek, selected so as to be able to track the success of a major Soil Conservation District erosion control program in the cabbage growing area on Scaly Mountain (in the upper reaches), Iotla Creek (by far the worst tributary in the 1990 study), and the lowermost site on Rabbit Creek (to monitor our success in Holly Springs). Table 1 shows IBI scores from these sites in 1992 and preceding years.

Table 1

Site	1990	IBI Score and Bioclass Rating	
		1991	1992
Needmore	54 (excellent)	58 (excellent)	56 (excellent)
Above Franklin			48 (good)
State Line	42 (fair)		42 (fair)
Cullasaja River	46 (fair)	42 (fair)	46 (fair)
Cartoogechaye Creek	46 (fair)		47 (good)
Middle Creek	42 (fair)		53 (good)
Iotla Creek	22 (very poor)		26 (poor)
Rabbit Creek	31 (poor)		42 (fair)

Three of the eight sites sampled (the Needmore and State Line stations on the Little Tennessee and the Cullasaja River site) show little change over the 1990-1992 period, thus merit no further discussion here. The "Above Franklin" station on the Little Tennessee was sampled for the first time in 1992. Its score represents the positive influence of Cartoogechaye Creek, which enters 0.5 miles upstream of the site, on the generally poorer quality of the river upstream of Franklin (as shown by the State Line site).

A one point change in the IBI Score for Cartoogechaye Creek resulted in raising its bioclass rating from fair to good. The change may be significant since the two year interval coincides with the apparent partial recovery of lower Cartoogechaye Creek from a severe sedimentation episode associated with construction of a shopping center.

Improvements in Rabbit and Middle Creeks appear to be related to success in reducing erosion and sedimentation through the efforts of the Macon County Soil Conservation District. Improvement of Little Creek's IBI score reflects an increase in total fish population at the site and the return of one intolerant species (rosyside dace, *Clinostomus funduloides*) absent in 1990. This coincides with the apparent disappearance of a surface oil film frequently observed at the site prior to 1992.

MACROINVERTEBRATE BIOMONITORING

In addition to sites in the Rabbit Creek watershed (see above), other sites in the upper Little Tennessee watershed were scheduled for macroinvertebrate sampling in 1992. While full reporting on this work awaits identification of the collections by TVA's contractor, certain comments may be made.

The intent of this program was to annually sample 20 fixed stations comparable to (and including) those to be monitored by means of fish samples (IBI), and to have the collections carried out by all-volunteer crews, without the direct participation of the project director.

During 1992, only 12 samples were completed. Two of these were done as training sessions for volunteers. The Rabbit Creek site also involved the project director, and the Needmore site on the Little Tennessee River is routinely done by a TVA crew. So in fact, only eight stations were successfully sampled by all-volunteer crews. This suggests that the methodology developed is inadequate to the task.

A further problem has been the long "lag time" between sampling and when information on the results can be made available to volunteers and other interested parties. This has caused lack of motivation and necessitated the making of project decisions without anticipated information on macroinvertebrates. For these reasons, the macroinvertebrate monitoring aspect of the program has been temporarily suspended.

BROOK TROUT SURVEYS

Ninety-five sites in 70 tributary watersheds of the Little Tennessee and Cullasaja Rivers were sampled for presence of brook trout (*Salvelinus fontinalis*). This was done for three reasons:

- o To assist in brook trout management by updating and enhancing our knowledge of this rare and highly valued sport fish.
- o To detect possible populations of the putative Southern Appalachian strain or subspecies of *S. fontinalis*.
- o Most important, to provide information to be used in seeking higher water quality classifications for watersheds supporting naturally reproducing populations of this intolerant species.

Brook trout populations were found in 18 watersheds, having a combined area of 37.4 square miles. For each site where brook trout were found, physical habitat parameters were measured and any associated fish species noted. Sites where environmental conditions appeared to be favorable, but no fish of any kind were found, were cataloged as possible brook trout introduction sites. All of these watersheds will eventually be proposed for upgrading to High Quality Waters (HQW) classification. Information from the study is being shared with the North Carolina Wildlife Resources Commission and U.S. Forest Service, and also with researchers looking into brook trout genetics.

Streams in the Georgia portion of the watershed were not sampled in 1992, since more recent data are available for that state and also because there is no provision under Georgia law for connecting brook trout populations to water quality classifications. In North Carolina, we feel we have covered a large majority of all potential brook trout habitat in the watershed. In the past, the chief factor affecting distribution and abundance of brook trout has undoubtedly been habitat loss, particularly due to sedimentation and warming of streams associated with agricultural and development activities. At the present time, however, invasion of brook trout by exotic salmonids, and overfishing, are considered to be the principal limiting factors. The problem of invasion is to a degree exacerbated by mongrelization of native strains with stocked brook trout of northern origin. Acidification was also identified as a factor in two of the streams studied.

CHANGES INDEPENDENT OF THIS PROJECT DURING 1990-1992

Improvement in the Middle Creek, Rabbit Creek, and Cargoogechaye Creek watersheds due to soil conservation measures and/or natural healing of erosion sites has been covered above. Anticipated changes associated with construction of new waste water treatment plants at Highlands and Franklin have yet to occur. In the case of Highlands, this is due to protracted litigation by environmental groups. In Franklin it has to do with voluntary redesign of the plant to more exacting standards (see following section).

The only portion of the watershed which has experienced major changes affecting water quality is that portion in Rabun County, Georgia, where three changes have occurred:

- o Dillard, Georgia has doubled the capacity of their waste water treatment plant from 50,000 to 100,000 gallons/day.

- o Widening of U.S. 23/441 between Rabun Gap and Dillard, Georgia, caused greatly increased sedimentation throughout the parallel stretch of river (5.0 miles).

- o The major industrial discharger in the watershed, the Burlington Industries Carpet Mill at Rabun Gap, Georgia, has been gradually improving their waste treatment process since 1970. During this period, for economic reasons, they gradually reduced and eventually ceased to discharge altogether. Evident differences between the summer of 1990 when the plant was operating full time and summer 1992, after the plant ceased to operate, include lower pH, elimination of odor and discoloration, and reestablishment of aquatic macrophytes in the river downstream of their outfall.

IBI scores for the State Line site on the Little Tennessee suggest that the same effect of the positive and negative changes reported has been to cancel each other out. This reinforces the conclusion that sedimentation is the most significant problem affecting the Little Tennessee.

RELATION OF THIS PROJECT TO OTHER ACTIVITIES

Rabbit Creek Watershed

Recommendations have been made to the Holly Springs Community Club for restoration/improvement of their streams. Possible participation by the Soil Conservation District has been discussed with the Franklin office of the U.S. Soil Conservation Service.

Brook Trout. Recommendations have been made to the North Carolina Wildlife Resources Commission, U.S. Forest Service, and private landowners with respect to upgrading of water quality classifications. There are needs for further studies (especially of brook trout genetics), for better law enforcement to reduce or eliminate overfishing, and for potential sites for brook trout reintroduction. In 1993 we hope to be providing brook trout samples from selected streams to investigators working on brook trout genetics.

Cullasaja River. The project has continued to produce information on the biology and habitat of the Cullasaja River and to make it available to all parties concerned in the ongoing controversy over the proposed location of Highlands' new waste water treatment plant. Based on our studies, the principal investigator has recommended against the plant being built as planned, with the discharge going into the Cullasaja below Highlands. That design would be virtually certain to cause significant adverse impacts on the downstream ecosystem. The current plant discharges to the Cullasaja River upstream of Sequoyah Dam, which allows the impoundment to provide additional assimilation of wastes remaining in the treated sewage.

Franklin Waste Water Treatment Plant

Information gathered in this study, recommendations by the principal investigator, and support by Western North Carolina Alliance members and project volunteers, resulted in a decision by the town of Franklin to improve the design for their new waste water treatment plant, at significant cost to the town. This is believed to be the first time in history that a North Carolina municipality has voluntarily sought a discharge permit more stringent than that proposed by the State Division of Environmental Management. Changes include longer retention time for landfill leachate, more frequent toxicity monitoring, and backup dechlorination.

Little Tennessee River "Gorge"

Information from this study, plus TVA's studies of invertebrates, especially mussels, in the semi-wilderness reach of the Little Tennessee River in Swain County and northern Macon County has drawn increased attention to the high biological diversity and integrity, and great aesthetic and recreational value of this area. This has in turn been instrumental in persuading The Nature Conservancy and North Carolina Natural Heritage Program to pursue means to protect the Little Tennessee downstream of Franklin. A volunteer task force of Western North Carolina Alliance members has been formed to prepare maps and species lists and otherwise assist The Nature Conservancy, the Natural Heritage Program, and other state, federal, and private agencies to protect the river corridor.

U.S. 441 Widening

The project director has been invited to participate in meetings, along with representatives of state and federal natural resource agencies, and the town of Franklin to make plans for minimizing erosion and sedimentation from the widening of U.S. 23/441 from the Georgia state line to the Franklin area (9.2 miles) begun in September 1992.

Reports

This period coincides with a change in reporting procedure. In place of one large annual report, we will provide an annual series of "mini reports." In addition to this Executive Summary, the following reports have been prepared in 1992:

Report to Holly Springs Community Club: Biomonitoring of Fish Communities, Using the Index of Biotic Integrity (IBI) in the Rabbit Creek-Cat Creek Watershed, Summer 1992.

Report to Macon County Soil Conservation District: Biomonitoring of Fish Communities, Using the Index of Biotic Integrity as an Indicator of the Success of Soil Conservation Measures in the Rabbit Creek and Middle Creek Watersheds, Macon County, North Carolina.

Biomonitoring of the Cullasaja River Watershed - 1991.

Report to Holly Springs Community Club - Visual Reconnaissance of the Rabbit Creek-Cat Creek Watershed, Fall 1992.

Annotated Lists of the Fishes of the Little Tennessee River Watershed Upstream of Fontana Reservoir.

Survey of Brook Trout (*Salvelinus fontinalis*) populations in the Upper Little Tennessee River Watershed, Macon and Swain Counties, North Carolina.

Index of Biotic Integrity (IBI) Monitoring of the Little Tennessee River Watershed Above Fontana Reservoir, 1990-1992.

All of the above, with the exception of the Cullasaja watershed report, are based primarily on field work carried out during 1992. The Cullasaja report was prepared, based primarily on 1991 data, at the request of Save Our Rivers, Inc., one of the principals in litigation over the Highlands Waste Water Treatment Plant, and has been made available to all parties involved in that dispute.

A summary report on the Georgia portion of the Little Tennessee River watershed is projected, as are brief reports to individual landowners at sampling sites. Other reports may be prepared at the request of local groups.

PRESENTATIONS AND MEETINGS

The principal investigator participated in the following meetings related to the project during 1992:

May 6:	Western North Carolina Alliance, Macon County Chapter, Franklin: Plan for 1992 Work.
May 6:	Franklin High School, meet with teachers Peggy Huscussom and Bill Crawford to plan for student participation.
May 14:	Organizational meeting with watershed-wide biomonitoring group to plan work for 1992, WNCA Office, Franklin.
May 19:	Meeting with Macon County Land Use Planner, Mickey Duvall, to discuss the watershed in the context of land use planning - Macon County Courthouse, Franklin.
May 21:	Presentation at conference on sedimentation, Duke Power Company, Lake Norman, NC.
June 1:	Meet with Holly Springs Community Club to plan work in Rabbit Creek watershed.
June 3:	WNCA, Macon County Chapter - Discussion of proposed new Franklin waste water treatment plant (WWTP).

June 18: Meeting with Oak Grove Community Club to discuss possible effects of proposed new Franklin WWTP on downriver area.

June 26-30: Attendance at Society for Conservation Biology Annual Conference, Blacksburg, VA. Discussions with James Darr, University of Washington (IBI), Gary McCracken, University of Tennessee (brook trout genetics); Linda Pierall, NC Natural Heritage Program (conservation strategies for Little Tennessee watershed); others. Informal presentation of project to many individuals. With Mary Kelly and Mark Hopey, helped staff at WNCA booth focusing on this project.

July 2: Meeting with Peg Jones, president, and Billy Clarke, attorney, Save Our Rivers, Inc., to discuss progress of court case re: proposed new Highlands WWTP.

July 14: Testimony at Public Hearing on proposed new Franklin WWTP - Franklin High School.

July 21: Meeting with Franklin Mayor David E. Henson re: proposed new Franklin WWTP.

August 13: Meeting with Angela Baker-James, North Carolina Alliance for Conservation Action, re: possible adoption of methods developed in project.

August 17: Report to Holly Springs Community Club.

September 9: Report to Macon County Chapter, WNCA, re: progress on Franklin WWTP.

October 10: North Carolina Streamwatch Conference, Warren Wilson College, Swannanoa. Participation in panel discussion on public involvement in water quality issues and demonstration of IBI methods in Swannanoa River.

October 19: Coweeta Hydrological Lab (USFS), Otto, NC - Meeting on brook trout distribution with James Buchanan, USFS.

October 22: Meeting on site to discuss erosion control and monitoring practices for widening of U.S. 23/441 between the North Carolina-Georgia line and Franklin, NC. Participation by North Carolina DOT, U.S. Fish and Wildlife Service, NC Wildlife Resources Commission, and town of Franklin.

October 23: Meeting with LeVourne Wiggins and Mike Breedlove of U.S. Soil Conservation Service, Macon County Office, to discuss relation of project to agriculture in Macon County.

November 4: Final report on year's work to Macon County Chapter, WNCA - Franklin.

- November 16: Final report on year's work to Holly Springs Community Club.
- November 23: Meeting to discuss conservation tactics for protecting water quality and biodiversity in the Little Tennessee River below Franklin. Participation by WNCA, Nature Conservancy, U.S. Fish and Wildlife Service, NC Wildlife Resources Commission, and NC Natural Heritage Program.
- November 24: Meeting with Mary Kelly, Mark Hopey, and Ron Lambe at WNCA Office, Asheville, to plan 1993 budget.
- December 30: Meeting with Fred Annand, Merrill Lynch, and Sam Piersall (The Nature Conservancy) and Paul Carlson (WNCA) to discuss approaches to watershed protection/land acquisition in the Little Tennessee Valley below Franklin. Held at The Nature Conservancy State Office, Carrsboro, NC.

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