Fisheries Report

98-1

WARMWATER STREAM FISHERIES REPORT
REGION IV
1997

Prepared by

Rick D. Bivens
Bart D. Carter
and
Carl E. Williams

Tennessee Wildlife Resources Agency

Development of this report was financed in part by funds from Federal Aid in Fish and Wildlife Restoration (TWRA Project 4321 and 4330) (Public Law 91-503) as documented in Federal Aid Project FW-6.

Cover: Regional TWRA stream crews along with the Tennessee Valley Authority, University of Tennessee, and Tennessee Department of Environment and Conservation cooperate in conducting a fish population survey of Big Creek in Hawkins Co.

WARMWATER STREAM FISHERIES REPORT REGION IV 1997

Prepared by

Rick D. Bivens
Bart D. Carter
and
Carl E. Williams

TENNESSEE WILDLIFE RESOURCES AGENCY
March, 1998

TABLE OF CONTENTS

LIST OF FIGURES

Figure page

INTRODUCTION

The fish fauna of Tennessee is the most diverse in the United States, with approximately 297 species of native fish and about 26 to 29 introduced species (Etnier and Starnes 1993). Region IV has 7,837 km of streams that total approximately 5,711 ha in 21 east Tennessee counties. There are approximately 1,287 km classified as coldwater streams (TWRA 1994). Streams in Region IV, except for a few in Anderson, Campbell, and Claiborne counties (Cumberland River System streams) are in the Ridge and Valley and Blue Ridge physiographic provinces of the upper Tennessee River drainage basin. The main river systems in the region are the Clinch, Powell, Little Tennessee, mainstream Tennessee River, French Broad, and Holston.

Streams and rivers across the state are of considerable value as they provide a variety of recreational opportunities. These include fishing, canoeing, swimming, and other riverine activities that are unmatched by other aquatic environments. Streams and rivers are also utilized as water sources both commercially and domestically. The management and protection of this resource is recognized by Tennessee Wildlife Resources Agency (TWRA) and has been put forth in the Strategic Plan (TWRA 1994) as a primary goal.

This is the eleventh annual report on stream fishery data collection in TWRA's Region IV. The main purpose of this project is to collect baseline information on fish and macroinvertebrate populations in the region. This baseline data is necessary to update and expand our Tennessee Aquatic Database System (TADS) and aid in the protection and management of the resource.

Efforts to survey the region's streams has led to many cooperative efforts with other state and federal agencies. These have included the Tennessee Department of Environment and Conservation (TDEC), Tennessee Valley Authority (TVA), U.S. Forest Service (USFS), Oak Ridge National Laboratory (ORNL), and the National Park Service (NPS).

The information gathered for this project is presented in this report as stream accounts. These accounts include a general summary of the survey work that took place along with the data collected and a management recommendations section for each stream. Sample site location maps and field data are also included.

METHODS

The streams to be sampled and the methods required are outlined in TWRA field request No. 97-4. A total of 19 streams were sampled and are included in this report. Stream surveys were conducted from May to October, 1997. Twenty-three (12 IBI) fish samples and 13 benthic samples were collected.

SAMPLE SITE SELECTION

Sample sites were selected that would give the broadest picture of impacts to the watershed. We typically located our sample site in close proximity to the mouth of a stream to maximize resident species collection. However, we did position survey sites far enough upstream in order to decrease the probability of collecting transient species. Sample lengths ranged from approximately 100 m to 300 m and included all habitat types characteristic to the survey reach. Sampling locations were delineated in the field on 7.5 minute topographical maps and then digitally re-created using a commercially available software package. These maps have been included in each stream account and include the Tennessee Aquatic Database System (TADS) river reach number and quadrangle map coordinates. Map coordinates were obtained with a Motorola Traxar handheld GPS unit.

WATERSHED ANALYSIS

Watershed size and/or stream order has historically been used to create relationships for determining maximum expected species richness in a given stream. This has been accomplished by plotting species richness for a number of sites against watershed areas and/or stream orders (Fausch et al. 1984). We chose to use watershed area (km^2) to develop our relationships as this variable has been shown to be a more reliable variable for predicting maximum species richness. Watershed areas **(the area upstream of the survey site)** were determined by digitizing delineated watershed

boundaries from USGS 1:24,000 scale maps. A GTCO Inc. Digipad in combination with the Earth Retrieval Data Analysis System (ERDAS) software were used to produce watershed area measurements for the 12 IBI samples collected in 1997.

FISH COLLECTIONS

Fish data were collected by employing a slightly modified (Saylor and Alstedt 1990) Index of Biological Integrity (Karr et al. 1986). Fish were collected with standard electrofishing (backpack) and seining techniques. Typically, a 3 or 4.5 x 1.3 meter seine was used to make hauls in shallow pool and run areas in smaller streams (< 6 m mean width). In larger streams, a 6 x 1.3 m seine was used. Riffle and deeper run habitats were sampled with a seine in conjunction with a backpack electrofishing unit (100-600 VAC). An area approximating the length of the seine^2 (i.e., 3 m x 3 m) was electrofished in a downstream direction. A person with a dipnet assisted the person electrofishing in collecting those fish which did not freely drift into the seine. Timed (5-min duration) backpack electrofishing runs were used to sample shoreline habitats. In both cases (seining or shocking) an estimate of area (m^2) covered on each pass was calculated. Fish collections were made in all habitat types within the selected survey reach. Collections were made repeatedly for each habitat type until no new species was collected for three consecutive samples for each habitat type. All fish collected from each sample were enumerated and in the case of game fish, lengths and weights obtained. Anomalies (e.g., parasites, deformities, eroded fins, lesions, or tumors) were noted along with occurrences of hybridization. After processing, the captured fish were either held in captivity or released into the stream where they could not be recaptured.

Catch per unit effort samples (CPUE) were conducted in two rivers and two streams in 1997. Timed boat electrofishing runs were made in pool and shallower habitat where navigable in the two rivers (Pigeon River and North Fork Holston River), while

timed backpack electrofishing runs were used in the two small streams (Laurel Branch and Long Creek). Total electrofishing time was calculated and was used to determine our catch-effort estimates (fish/hour).

One quantitative survey of Big Creek was made in order to gather population data on one of Region IV better smallmouth/rock bass streams. The three-pass removal technique, which is the sampling methodology typically used to gather quantitative data from streams was used in a pre-determined section of stream. Three underlying assumptions of the technique are (1) the population being sampled is closed, (2) sampling effort is constant among passes, and (3) all members of the population have equal catchability which remains constant among passes (Raleigh and Short 1981).

The sample length guidelines for this stream (> 6.5 m mean width) was 200 m, but was adjusted to take advantage of any stream channel features that were capable of obstructing fish movement. Blocknets were set at both ends of the sample area in order to maintain a closed population. Electrofishing units were used a the rate of one for every 3 to 4 m of mean stream width (Habera et al. 1992). The same number of electrofishing units were employed on each pass and their voltage settings remained constant to ensure equal sampling effort.

All game fish captured were anesthetized with MS-222 and processed after each electrofishing pass. All game fish were individually measured to the nearest millimeter total length and weighed to the nearest gram on electronic scales. Nongame fish were enumerated, batch weighed by species, and a length range was obtained. After processing all fish were held in live cages outside the sample area.

Generally, fish were identified in the field and released. Problematic specimens were preserved in 10% formalin and later identified in the lab or taken to Dr. David A. Etnier at the University of Tennessee Knoxville (UTK). Most of the preserved fish collected in the 1997 samples were catalogued into our reference collection or deposited in the University of Tennessee Research Collection of Fishes. Common and scientific names of fishes used in this report are after Robins et al. (1991) and Etnier and Starnes (1993).

AGE and GROWTH

In order to address management questions pertaining to the age and growth characteristics of stream dwelling smallmouth bass, spotted bass, largemouth bass and rock bass populations, collection of otolith samples was initiated in 1995 by each regional stream crew. Otoliths were extracted from smallmouth bass (*Micropterus dolomieu*), spotted bass (*M. punctulatus*), largemouth bass (*M. salmoides*), and rock bass (*Ambloplites rupestris*) for age and growth analysis in those streams considered to support a fishery. Efforts were made to collect a total of 25 to 30 otolith samples representing each size class present, including any Young-of-the-Year (YOY) we captured. Age determinations for the fish collected during 1997 are being made by Frank Fiss (Biologist, Nashville Office).

BENTHIC COLLECTIONS

Qualitative benthic samples were generally collected from each fish sample site. These were taken with aquatic insect nets, by rock turning, and by selected pickings from as many types of habitat as possible within the sample area. Taxa richness and relative abundance are the primary considerations of this type of sampling. Taxa richness reflects the health of the benthic community and biological impairment is reflected in the absence of pollution sensitive taxa such as Ephemeroptera, Plecoptera, and Trichoptera (EPT).

Large particles and debris were picked from the samples and discarded in the field. The remaining sample was preserved in 50% isopropanol and later sorted in the laboratory. Organisms were enumerated and attempts were made to identify specimens to species level when possible. Many were identified to genus, and most were at least identified to family. Dr. David A. Etnier (UTK), examined problematic specimens and either made the determination or confirmed our identifications. Comparisons with identified specimens in our aquatic invertebrate collection were also useful in making determinations. For the most part, nomenclature of aquatic insects used in this report follows Brigham et al. (1982) and Louton (1982). Names of stoneflies (Plecoptera) are after Stewart and Stark (1988) and caddisflies are after Etnier et al. (in press) from which many of the determinations were made. Benthic results are presented in tabular form with each stream account. Crayfish collected from stream surveys conducted during 1997 are reported in Appendix D.

HABITAT QUALITY ASSESSMENT

Stream habitat conditions were evaluated by employing a visually based habitat assessment technique developed by Barbour and Stribling (1995). This technique has been adopted by TDEC and is being implemented as a component of their monitoring protocols. We were primarily interested in assessing human-induced perturbations to the physical structure of streams. The technique permitted us to focus on a select set of habitat parameters that allowed us to make an integrated assessment of the habitat quality in each reach we were surveying. The scoring scheme is based on a 200 point scale and is partitioned into four categories. Categories and scoring ranges for both riffle/run prevalent streams and pool/glide prevalent streams are as follows:

Category	Score Range
Optimal	200-160
Suboptimal	159-110
Marginal	109-60
Poor	59-0

Our habitat assessment procedure involved three individuals **(performed by the same investigators on each stream)** making assessments for each survey reach. The three scores generated form these evaluations were then averaged for an overall score for that reach. The mean score obtained from the evaluations is reported in item 13 of the physicochemical and site location form. Examples of the habitat assessments forms used for seven of the 1997 surveys have been included in Appendix E.

WATER QUALITY MEASUREMENTS

Basic water quality data were taken at most sites in conjunction with the fishery and benthic samples. The samples included dissolved oxygen (DO), temperature, pH, and conductivity. Data were taken from midstream and mid-depth at each site, using a YSI model 58 DO meter and a YSI model 33 S-C-T meter. Scientific Products™ pH indicator strips were used to measure pH. Stream velocities were measured with a Marsh-McBirney Model 201D current meter. The Robins-Crawford "rapid crude" technique (as described by Orth 1983) was used to estimate flows. Water quality parameters were recorded on physicochemical data forms and are included with each stream account.

DATA ANALYSIS

Twelve metrics described by Karr et al. (1986) were used to determine an IBI score for each stream surveyed. These metrics were designed to reflect insights into fish

community health from a variety of perspectives (Karr et al. 1986). Given that IBI metrics were developed for the midwestern United States, many state and federal agencies have modified the original twelve metrics to accommodate regional differences. Such modifications have been developed for Tennessee primarily through the efforts of the TVA and Tennessee Tech University. In developing our scoring criteria for the twelve metrics we reviewed pertinent literature [North American Atlas of Fishes (Lee et al. 1980), The Fishes of Tennessee (Etnier and Starnes 1993), various TWRA Annual Reports and unpublished data] to establish historical and more recent accounts of fishes expected to occur in the drainages we sampled. Scoring criteria for the twelve metrics were modified according to watershed size. Watersheds draining less than 13 km^2 were assigned different scoring criteria than those draining greater areas. This was done to accommodate the inherent problems associated with small stream samples (e.g., lower catch rates and species richness). Young-of-the-Year fish and non-native species were excluded from the IBI calculations. After calculating a final score, an integrity class was assigned to the stream reach based on that score. The classes used follow those described by Karr et al. (1986) and are as follows:

Total IBI score (sum of the 12 metric ratings)	**Integrity Class**	**Attributes**
58-60	Excellent	Comparable to the best situations without human disturbance; all regionally expected species for the habitat and stream size, including the most intolerant forms, are present with a full array of size classes; balanced trophic structure.

48-52	Good	Species richness somewhat below expectation, especially due to the loss of the most intolerant forms; some species are present with less than optimal abundance or size distributions; trophic structure shows some signs of stress.
40-44	Fair	Signs of additional deterioration include loss of intolerant forms, fewer species, highly skewed trophic structure (e.g., increasing frequency of omnivores and green sunfish or other tolerant species); older age classes of top predators may be rare.
28-34	Poor	Dominated by omnivores, tolerant forms, and habitat generalists; few top carnivores; growth rates and condition factors commonly depressed; hybrids and diseased fish often present.
12-22	Very poor	Few fish present, mostly introduced or tolerant forms;

		hybrids common; disease, parasites, fin damage, and other anomalies regular.
	No fish	Repeated sampling finds no fish.

Benthic data collected for the 1997 surveys were also subjected to a similar type of biotic index that rates stream condition based on the overall taxa tolerance values and the number of EPT taxa present. The North Carolina Division of Environmental Management (NCDEM) has developed a bioclassification index and associated criteria for the southeastern United States (Lenat 1993) . This technique rates water quality according to scores derived from taxa tolerance values and EPT taxa richness values. The final derivation of the water quality classification is based on the combination of scores generated from the two indices. The criteria used to generate the biotic index values and EPT values are as follows:

Score	Bitoic Index Values	EPT Values
5 (Excellent)	<5.14	>33
4.6	5.14-5.18	32-33
4.4	5.19-5.23	30-31
4 (Good)	5.24-5.73	26-29
3.6	5.74-5.78	24-25
3.4	5.79-5.83	22-23
3 (Fair-Good)	5.84-6.43	18-21
2.6	6.44-6.48	16-17
2.4	6.49-6.53	14-15
2 (Fair)	6.54-7.43	10-13
1.6	7.44-7.48	8-9
1.4	7.49-7.53	6-7
1 (Poor)	>7.53	0-5

The overall result, is an index of water quality that is designed to give a general state of pollution regardless of the source (Lenat 1993). Taxa tolerance rankings were based on

those given by NCDEM (1995) with minor modifications for taxa which did not have assigned tolerance values. Reported classifications for benthic samples collected by TVA were assigned and based on established TVA criteria and are not comparable to those scores generated by the NCDEM method.

STREAM ACCOUNTS

Bullet Creek

One IBI fishery survey was conducted on Bullet Creek in July 1997:

Location and Length - Tributary to the Hiwassee River. The sample area was located at the confluence of Bullet Creek and Hogback Branch on the property of Roland Fortier. The sample area was approximately 150 m in length and was sampled on 23 July 1997.

Sampling Methodology - This site was sampled with one backpack shocker at 350 VAC and a 4.5 m seine.

Water Quality - (See physicochemical and sample site location form)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and IBI analysis)

Comments - We were primarily interested in evaluating the relative health of this reach of stream. The Agency has made no previous survey of this stream.

We collected a total of 368 fish representing 19 species during our IBI survey of Bullet Creek. Four game species were collected during our efforts. These included rock bass (*Ambloplites rupestris*), redbreast sunfish (*Lepomis auritus*), longear sunfish (*L. megalotis*), and smallmouth bass (*Micropterus dolomieu*). The two most abundant species collected in our survey were central stoneroller (*Campostoma anomalum*) and telescope shiner (*Notropis telescopus*). Together these two species accounted for 26.3% of the total number of fish collected. Darter species collected at this site included redline darter (*Etheostoma rufilineatum*) and snubnose darter (*E. simoterum*).

Our Index of Biotic Integrity analysis indicated this stream was in "good" condition based on an IBI score of 50. Much the this stream's watershed lies within U.S. Forest Service boundaries which has helped protect a substantial portion of the stream and its tributaries. The only metric that had a strong negative influence on the overall score was the high incidence of anomalies on the fish, particularly black grub.

Benthic macroinvertebrates collected in our survey reach included Baetidae, Caenidae, Ephemerillidae, Heptageniidae, Isonychiidae, and Leptophlebiidae mayflies; Capniidae and Perlidae stoneflies; and Brachycentridae, Glossosomatidae, Goeridae, Hydropsychidae, Lepidostomatidae, Limnephilidae, Philopotamidae, Polycentropodidae, Rhyacophilidae, and Uenoidae caddisflies. Coleopterans were the most abundant organisms in our sample comprising 34.6% of the total sample. Trichopterans were second most abundant accounting for 27.4%, while ephemeropterans and plecopterans contributed 16.3% and 3.3%, respectively. A total of 57 taxa was collected in our sample of which 28 were EPT. Based on the EPT taxa richness value and the overall biotic index

of all taxa collected, the relative health of the benthic community was classified as "good to excellent".

Our evaluation of the physical instream habitat and riparian zone in this reach resulted in a mean score of 135. Based on this score and our overall observations of the stream, this reach of Bullet Creek was designated as "sub-optimal".

Management Recommendations:

1. Any action that would address non-point source pollution within the watershed would be beneficial.

2. Consider conducting addtional surveys in order to evaluate the sport fishery.

PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	BULLET CREEK
WATERSHED	HIWASSEE RIVER
SITE	@ HOGBACK BRANCH
COUNTY	MONROE
QUADRANGLE	MECCA QUAD 132 SW
LAT-LONG	351627N-842629W
REACH	06020002-126,0
LENGTH	~ 150 m
AREA (SQ. KM.)	3.47
ELEVATION	1045 FT
DATE	7-23-97
TIME	17:15

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, AND C.E. WILLIAMS

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
7.7 m	0.4 m	1.1 m

2. ESTIMATED % OF STREAM IN POOLS IS 50

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
25	20	10	20	10	15

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
10	15	25	30	10	10

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE
		X

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
20 %	40 %	40 %

7. SHADE OR CANOPY COVER GOOD OVER 60 %

8. FLOW (CFS) 4.3 **COMPARED TO NORMAL**

LOW	NORMAL	HIGH
	X	

9. PRESENT WEATHER

SUNNY AND HOT; T-STORMS OVERNIGHT

10. PAST WEATHER (last 24 hrs)

SAME AS ABOVE; T-STORMS OVERNIGHT

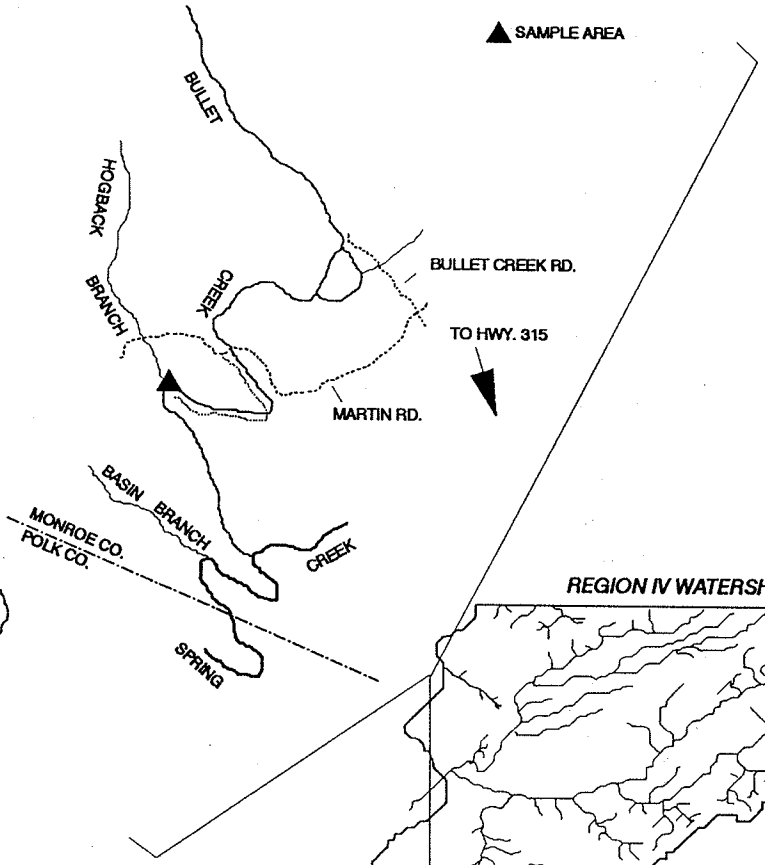
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
6.0	27 C	20	8.0	99.1

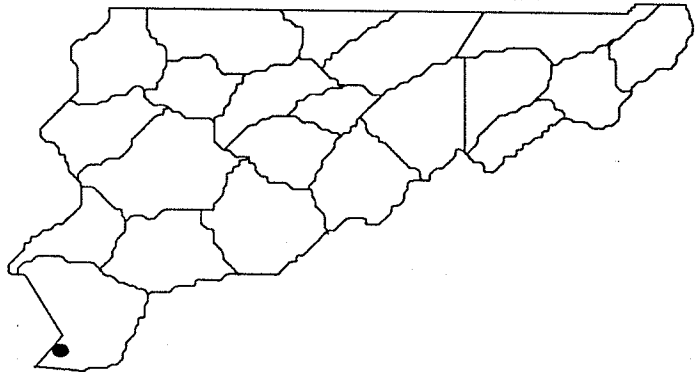
12. COMMENTS

SAMPLE AREA LOCATED ON THE PROPERTY OF ROLAND FORTIER; AT THE CONFLUENCE OF BULLET CREEK AND HOGBACK BRANCH.

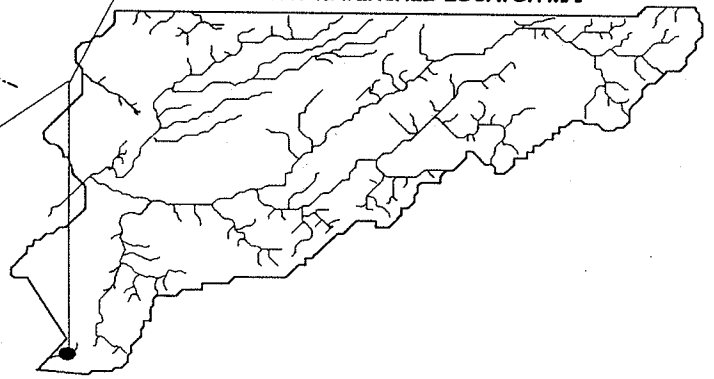
13. $\bar{X}$ HABITAT ASSESSMENT SCORE 135



REGION IV COUNTY LOCATOR MAP



REGION IV WATERSHED LOCATOR MAP



BULLET CREEK FISH DATA

SAMPLING TYPE: SEINING AND SHOCKING

GEAR TYPE: 4.5 m SEINE AND ONE BACKPACK UNIT @ 350 VAC

SPECIES	TADS CODE	NO. COLL.	RANGE(mm)	TOT. WEIGHT(g)	NOTE
Ambloplites rupestris	342	12	71-244	839	
Campostoma anomalum	45	50			
Cottus carolinae	322	23			
Cyprinella galactura	54	12			
Etheostoma rufilineatum	431	32			
Etheostoma simoterum	435	26			
Hypentelium nigricans	207	20			
Lepomis auritus	346	3	82-152	82	
Lepomis megalotis	353	2	104-107	45	
Luxilus chrysocephalus	89	13			
Luxilus coccogenis	90	35			
Micropterus dolomieu	362	6	74-271	397	
Moxostoma duquesnei	224	2			
Nocomis micropogon	110	14			
Notropis telescopus	138	47			
Notropis leuciodus	128	28			
Notropis spectrunculus	135	38			
Rhinicthys atratulus	184	1			
Semotilus atromaculatus	188	4			
	SUM:	368			

INDEX OF BIOTIC INTEGRITY

METRIC DESCRIPTION	SCORING CRITERIA 1	3	5	OBSERVED	SCORE
NUMBER OF NATIVE SP.	<8	8-14	>14	18	5
NUMBER OF DARTER SP.	<2	2-3	>3	2	3
NUMBER OF SUNFISH SP. *less Micropterus*	<2	2	>2	2	3
NUMBER OF SUCKER SP.	0	1	>1	2	5
NUMBER OF INTOLERANT SP.	<2	2	>2	3	5
PERCENT OF INDIVIDUALS AS TOLERANT	>37	37-19	<19	4.6	5
PERCENT OF INDIVIDUALS AS OMNIVORES	>45	45-23	<23	20.9	5
PERCENT OF INDIVIDUALS AS SPECIALISTS	<15	15-29	>29	56	5
PERCENT OF INDIVIDUALS AS PISCIVORES	<2.0	2.0-3.8	>3.8	4.9	5
CATCH RATE	<27.7	27.7-55.2	>55.2	37	3
PERCENT OF INDIVIDUALS AS HYBRIDS	>1	TR-1	0	0	5
PERCENT OF INDIVIDUALS WITH ANOMALIES	>5	5-2	<2	9	1
					50 **GOOD**

IBI RANGE:	0	12-22	28-34	40-44	48-52	58-60
STREAM DESIGNATION:	**NO FISH**	**VERY POOR**	**POOR**	**FAIR**	**GOOD**	**EXCELLENT**

BULLET CREEK
FIELD # 894
EFFORT = 3 PERSON HOURS

TAXA RICHNESS = 57
EPT TAXA RICHNESS = 28
BIOCLASSIFICATION = (4.5) GOOD-EXCELLENT

			NUMBER	PERCENT
COLEOPTERA				34.6
	Dryopidae	*Helichus* adult	4	
	Elmidae	*Dubiraphia* larvae and adults	8	
		Macronychus glabratus adult	1	
		Microcylloepus pusillus adult	1	
		Optioservis adults	6	
		Promoresia adult and larvae	87	
		Stenelmis larvae and adults	6	
	Gyrinidae	*Dineutus* larvae and adults	5	
		Gyrinus adult	1	
	Psepheniidae	*Psephenus herricki*	6	
DIPTERA				7.8
	Athericidae	*Atherix lantha*	7	
	Chironomidae		16	
	Tipulidae	*Hexatoma*	5	
EPHEMEROPTERA				16.3
	Baetidae	*Baetis*	16	
	Caenidae	*Caenis*	1	
	Ephemerellidae	*Ephemerella*	1	
		Eurylophella	3	
	Heptageniidae	*Epeorus rubidus/subpalidus*	6	
		Heptagenia	3	
		Stenonema	16	
	Isonychiidae	*Isonychia*	9	
	Leptophlebiidae	*Habrophlebiodes*	1	
		Paraleptophlebia	3	
HEMIPTERA				0.8
	Gerridae	*Trepobates pictus* females	2	
		Gerris nymph	1	
MEGALOPTERA				2.2
	Corydalidae	*Corydalus cornutus*	2	
		Nigronia serricornis	5	
	Sialidae	*Sialis*	1	
ODONATA				6.4
	Aeshnidae	*Boyeria vinosa*	3	
	Coenagrionidae	*Argia*	2	
	Cordulidae		2	
	Gomphidae	*Gomphus lividus*	6	
		Gomphurus rogersi	4	
		Hagenius brevistylus	2	
		Lanthus vernalis	1	
		Stylogomphus albistylus	1	
	Macromiidae	*Macromia*	2	
PELECYPODA				1.1
	Sphaeriidae	*Sphaerium*	3	
	Unionidae	*Villosa vanuxemensis*	1	
PLECOPTERA				3.3
	Capniidae		5	
	Perlidae	*Acroneuria abnormis*	4	
		Perlesta	1	
	Pteronarcyidae	*Pteronarcys (Allonarcys)*	2	
TRICHOPTERA				27.4
	Brachycentridae	*Micrasema*	1	
	Glossosomatidae	*Glossosoma*	4	
	Goeridae	*Goera* pupa	3	
	Hydropsychidae	*Ceratopsyche sparna*	62	
		Cheumatopsyche	12	
		Hydropsyche betteni/depravata	2	
	Lepidostomatidae	*Lepidostoma*	1	
	Limnephilidae	*Pycnopsyche lepida/scabripennis*	3	
		Pycnopsyche luculenta group	2	
	Philopotamidae	*Chimara*	2	
	Polycentropodidae	*Phylocentropus*	1	
		Polycentropus	1	
	Rhyacophilidae	*Rhyacophila fuscula*	2	
	Uenoidae	*Neophylax*	3	
		TOTAL	**361**	

Canoe Branch

One IBI fishery survey was conducted on Canoe Branch in June 1997:

Location and Length - Tributary to the Powell River. The sample area was located upstream of the road crossing on Poplar Grove Road about 300 m upstream of the Powell River confluence.

Sampling Methodology - This site was sampled with one backpack shocker at 150 VAC and a 3 m seine.

Water Quality - (See physicochemical and sample site location form)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and IBI analysis)

Comments - We were primarily interested in evaluating the relative health of this reach of stream. The Agency has made no previous survey of this stream.

We collected a total of 239 fish representing three species during our IBI survey of Canoe branch. No game species were collected during our survey efforts. The two most abundant species collected in our survey were banded sculpin (*Cottus carolinae*) and blacknose dace (*Rhinicthys atratulus*). Together these two species accounted for 99.6% of the total number of fish collected. No darter species were collected in our IBI survey.

Our Index of Biotic Integrity analysis indicated this stream was in "very poor to poor" condition based on an IBI score of 26. Overall, very few of the metrics scored high with most of the low score being attributable to the low species richness. The lack of species richness in this portion of Canoe Branch can be attributed to two factors. The presence of a culvert near the mouth has eliminated any immigration of fish from the Powell River. We did conduct a qualitative survey downstream of the culvert and found four additional species. These included redline darter (*Etheostoma rufilineatum*), snubnose darter (*E. simoterum*), greenside darter (*E. blennioides*), and striped shiner (*Luxilus chrysocephalus*). Secondly, this stream is heavily influenced by spring flow which typically lowers average annual temperatures (observed temperature on 6 June was 15 C (59 F) and tends to lower overall species diversity. Therefore, the IBI analysis of this stream is misleading and does not accurately reflect the quality of this stream. These findings indicate that this technique should not be used in this stream type where species diversity is being regulated by factors other than environmental degradation.

Benthic macroinvertebrates collected in our survey reach included Baetidae, Ephemerellidae, Ephemeridae, Heptageniidae, Isonychiidae, and Leptophlebiidae mayflies; Capniidae, Peltoperlidae, Perlidae, and Perlodidae stoneflies; and Glossosomatidae, Goeridae, Hydropsychidae, Lepidostomatidae, Limnephilidae,

Philopotamidae, Polycentropodidae, Rhyacophilidae, and Uenoidae caddisflies. Ephemeropterans were the most abundant organisms in our sample comprising 24.6% of the sample. Trichopterans were second most abundant accounting for 23.0% of the total sample. Plecopterans comprised 11.8%, while gastropods contributed 12.0% to the overall sample. A total of 55 taxa was collected in our sample of which 30 were EPT. Based on the EPT taxa richness value and the overall biotic index of all taxa collected, the relative health of the benthic community was classified as "excellent". Given the high overall and EPT taxa richness, this stream warrants extra protection. In most of the lower elevation streams, we rarely see this type of overall species richness and almost never come across EPT richness values this high in the Ridge and Valley Ecoregion. The classification assigned to Canoe Branch was the highest of any calculated for streams surveyed during 1997. Of special interest was the collection of the caddisfly *Goerita betteni* (TWRA Catalog # 19.4) which were obtained from a seep area adjacent to the sample area. The specimens collected from this area were deposited in the invertebrate collection at the University of Tennessee.

Our evaluation of the physical instream habitat and riparian zone in this reach resulted in a mean score of 147. Based on this score and our overall observations of the stream, this reach of Canoe Branch was designated as "sub-optimal".

Management Recommendations:

1. Protection of this watershed should be a high priority as this stream represents a high water quality resource. Any action that would address development within the watershed and non-point source pollution would be beneficial.

PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	CANOE BRANCH
WATERSHED	POWELL RIVER
SITE	POPLAR GROVE RD. X-ING
COUNTY	CLAIBORNE
QUADRANGLE	WHEELER QUAD 153 SE
LAT-LONG	363243N-833122W
REACH	06010206-
LENGTH	~ 200 m
AREA (SQ. KM.)	5.9
ELEVATION	1120 FT
DATE	6-12-97
TIME	1751

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, AND C.E. WILLIAMS

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
4.7 m	0.3 m	0.6 m

2. ESTIMATED % OF STREAM IN POOLS IS 20

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
10	15	15	20	10	30

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
5	15	20	30	10	20

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE
		X

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
20 %	30 %	50 %

7. SHADE OR CANOPY COVER GOOD OVER 40 %

8. FLOW (CFS) 4.4 **COMPARED TO NORMAL**

LOW	NORMAL	HIGH
	X	

9. PRESENT WEATHER

OVERCAST & MILD; SCATTERED SHOWERS; AIR TEMP. 72 F @ 1800

10. PAST WEATHER (last 24 hrs)

SCATTERED T-STORMS; MILD

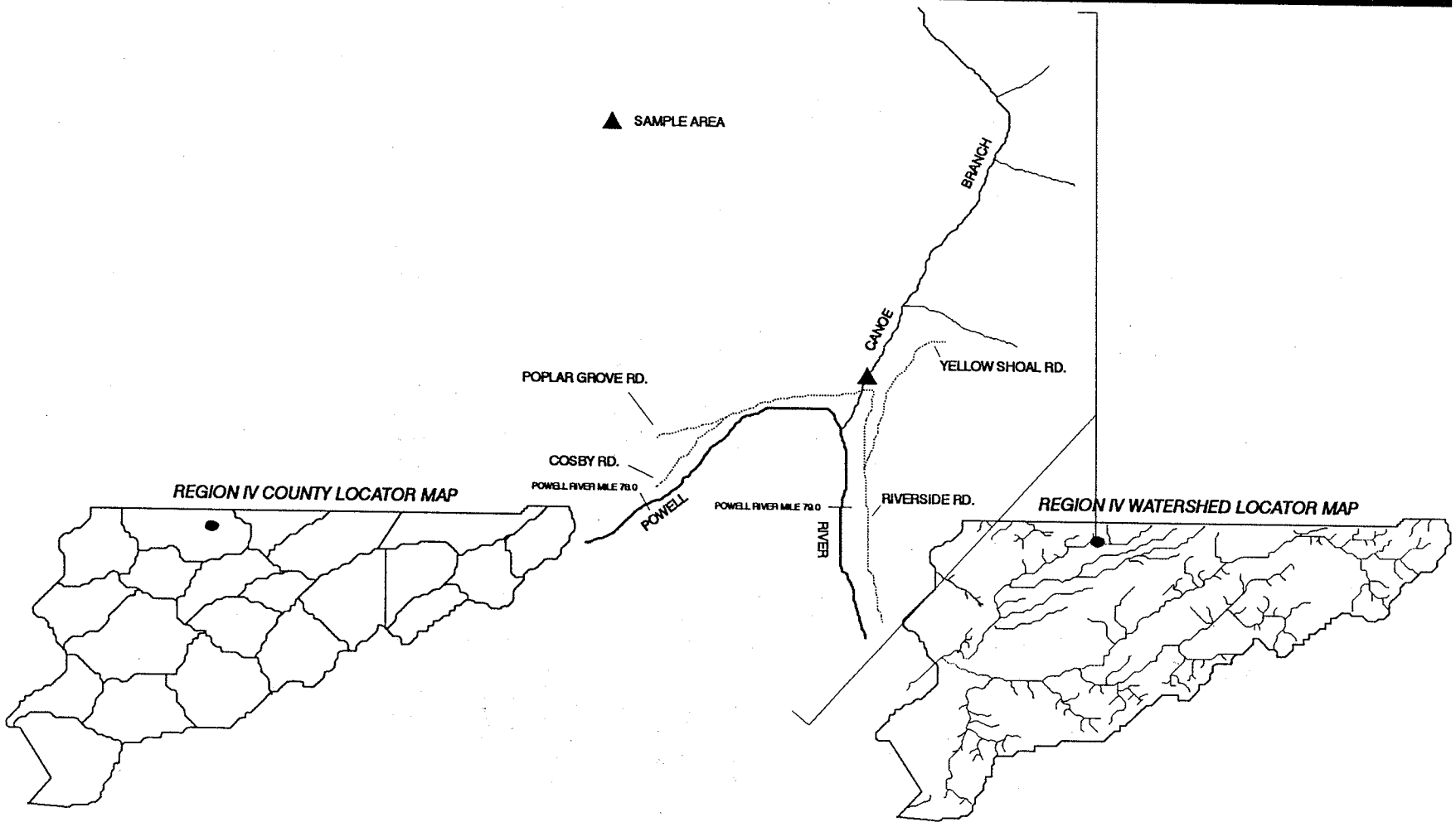
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
7.0	15 C	245	10.3	102.5

12. COMMENTS

SAMPLED AT POPLAR GROVE RD. X-ING ~ 300m UPSTREAM OF POWELL RIVER CONFLUENCE.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE 147



CANOE BRANCH FISH DATA

SAMPLING TYPE: SEINING AND SHOCKING

GEAR TYPE: 3 m SEINE AND ONE BACKPACK UNIT @ 150 VAC

SPECIES	TADS CODE	NO. COLL.	RANGE(mm)	TOT. WEIGHT(g)	NOTE
Campostoma anomalum	45	1			
Cottus carolinae	322	165			
Rhinicthys atratulus	184	73			
	SUM:	239			

INDEX OF BIOTIC INTEGRITY

METRIC DESCRIPTION	SCORING CRITERIA 1	3	5	OBSERVED	SCORE
NUMBER OF NATIVE SP.	<4	4-6	>6	3	1
NUMBER OF RIFFLE SP.	<2	2	>2	1	1
NUMBER OF POOL SP.	<2	2	>2	0	1
% DOMINANCE (COMBINED % OF TWO MOST DOMINANT SP.)	>86	86-74	<74	99.5	1
NUMBER OF HEADWATER INTOLERANT SP.	<2	2	>2	0	1
PERCENT OF INDIVIDUALS AS TOLERANT	>40	40-20	<20	0	5
PERCENT OF INDIVIDUALS AS OMNIVORES	>50	50-25	<25	0.4	5
PERCENT OF INDIVIDUALS AS SPECIALISTS	<9	9-17	>17	0	1
PERCENT OF INDIVIDUALS AS PISCIVORES	0		>0	0	1
CATCH RATE	<40.0	40.0-79.8	>79.8	32.2	1
PERCENT OF INDIVIDUALS AS LITHOPHILIC SPAWNERS	<25	25-50	>50	30.5	3
PERCENT OF INDIVIDUALS WITH ANOMALIES	>5	5-2	<2	0	5
				26	**VERY POOR-POOR**

IBI RANGE:	**0**	**12-22**	**28-34**	**40-44**	**48-52**	**58-60**
STREAM DESIGNATION:	**NO FISH**	**VERY POOR**	**POOR**	**FAIR**	**GOOD**	**EXCELLENT**

CANOE BRANCH
FIELD # 883
EFFORT = 3 PERSON HOURS

TAXA RICHNESS = 55
EPT TAXA RICHNESS = 30
BIOCLASSIFICATION = (4.7) EXCELLENT

			NUMBER	PERCENT
AMPHIPODA			30	5.9
ANNELIDA				0.4
	Oligochaeta		2	
COLEOPTERA				8.7
	Dryopidae	*Helichus* adult	1	
	Dytiscidae	*Hydroporus* adult	1	
	Elmidae	*Optioservus* larva and adults	4	
		Oulimnius latiusculus larva and adult	2	
		Promoresia larva and adults	3	
	Haliplidae	*Peltodytes* adult	1	
	Psephenidae	*Psephenus herricki*	32	
DIPTERA				5.1
	Blephariceridae	*Blepharicera* larvae and pupae	19	
	Chironomidae		3	
	Dixidae	*Dixa*	1	
	Empididae		1	
	Tipulidae	*Dicranota*	1	
		Tipula	1	
EPHEMEROPTERA				24.6
	Baetidae	*Baetis*	44	
	Ephemerellidae	*Drunella cornuta/cornutella*	22	
		Eurylophella	1	
	Ephemeridae	*Ephemera*	4	
	Heptageniidae	*Epeorus rubidus/subpalidus*	17	
		Heptagenia	5	
		Stenacron	12	
		Stenonema	5	
	Isonychiidae	*Isonychia*	14	
	Leptophlebiidae	*Paraleptophlebia*	1	
GASTROPODA				12.0
	Pleuroceridae	form, elongated spiral	41	
	Pleuroceridae	form, stout spiral	20	
HEMIPTERA				2.8
	Corixidae adult		1	
	Gerridae	*Gerris nymph*	6	
	Veliidae	*Rhagovelia obesa* nymphs	7	
ISOPODA				4.7
	Asellidae	*Lirceus*	24	
ODONATA				1.0
	Calopterygidae	*Calopteryx*	1	
	Cordulegastridae	*Cordulegaster* sp	1	
	Gomphidae	*Gomphurus rogersi*	1	
		Gomphus lividus	1	
		Lanthus vernalis	1	
PLECOPTERA				11.8
	Capniidae		11	
	Peltoperlidae	*Peltoperla*	12	
	Perlidae	*Acroneuria abnormis*	5	
	Perlodidae	*Isoperla holochlora*	30	
		Remenus bilobatus	2	
TRICHOPTERA				23.0
	Glossosomatidae	*Glossosoma*	20	
	Goeridae	*Goera* larva and pupa	2	
	Hydropsychidae	*Ceratopsyche sparna*	2	
		Ceratopsyche ventura	15	
		Cheumatopsyche	1	
		Diplectrona modesta	29	
	Lepidostomatidae	*Lepidostoma*	8	
	Limnephilidae	*Pycnopsyche luculenta* group	2	
	Philipotamidae	*Dolophilodes distinctus*	4	
		Wormaldia	1	
	Polycentropodidae	*Polycentropus*	1	
	Rhyacophilidae	*Rhyacophila carolina* group	1	
		Rhyacophila fuscula	7	
		Rhyacophila torva	10	
	Uenoidae	*Neophylax auris/etnieri*	14	
		TOTAL	508	

Town Creek

One IBI fishery survey was conducted on Town Creek in May 1997:

Location and Length - Tributary to the Tennessee River. The sample area was located at Rock Spring Park along Rock Spring Road near stream mile 1.2. The sample area was approximately 150 m in length and was sampled on 13 May 1997.

Sampling Methodology - This site was sampled with one backpack shocker at 125 VAC and a 4.5 m seine.

Water Quality - (See physicochemical and sample site location form)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and IBI analysis)

Comments - We cooperated with TVA in conducting an IBI survey to evaluate the relative health of this stream. The Agency has made no previous survey of this stream.

We collected a total of 370 fish representing 12 species during our survey of Town Creek. Two game species were collected during our efforts. These included bluegill (*Lepomis macrochirus*) and green sunfish (*L. cyanellus*). The two most abundant species collected in our survey were central stoneroller (*Campostoma anomalum*) and banded sculpin (*Cottus carolinae*). Together these two species accounted for 64.9% of the total number of fish collected.

Our Index of Biotic Integrity analysis indicated that this stream was in "poor" condition based on an IBI score of 34. The most negatively influential metrics were the low percentage of intolerant species, the low percentage of trophic specialists and piscivores, and the relatively low catch rate. The stream flows through a highly urbanized area before entering the Tennessee River. This has resulted in the ultimate degradation of this stream.

Benthic macroinvertebrates collected by TVA included 24 taxa with seven EPT families represented in the sample. Based on the sample and utilizing TVA's rating criteria this stream was classified as "fair".

Management Recommendations:

1. Much of this stream's watershed drains an urbanized area which has resulted in its degradation over time. Any action that would address non-point source pollution would be beneficial.

PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	TOWN CREEK
WATERSHED	TENNESSEE RIVER
SITE	@ ROCK SPRING PARK
COUNTY	LOUDON
QUADRANGLE	LENOIR CITY 130 SE
LAT-LONG	354748N-841603W
REACH	06010201-38.0
LENGTH	~ 150 m
AREA (SQ. KM.)	10.4
ELEVATION	795 FT
DATE	5-13-97
TIME	N/A

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, C.E. WILLIAMS AND K. LAKIN et al.

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
N/A	N/A	N/A

2. ESTIMATED % OF STREAM IN POOLS IS N/A

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
N/A %	N/A %	N/A %

7. SHADE OR CANOPY COVER GOOD OVER N/A %

8. FLOW (CFS) N/A **COMPARED TO NORMAL** (LOW / NORMAL / HIGH)

9. PRESENT WEATHER

SUNNY AND MILD

10. PAST WEATHER (last 24 hrs)

SAME

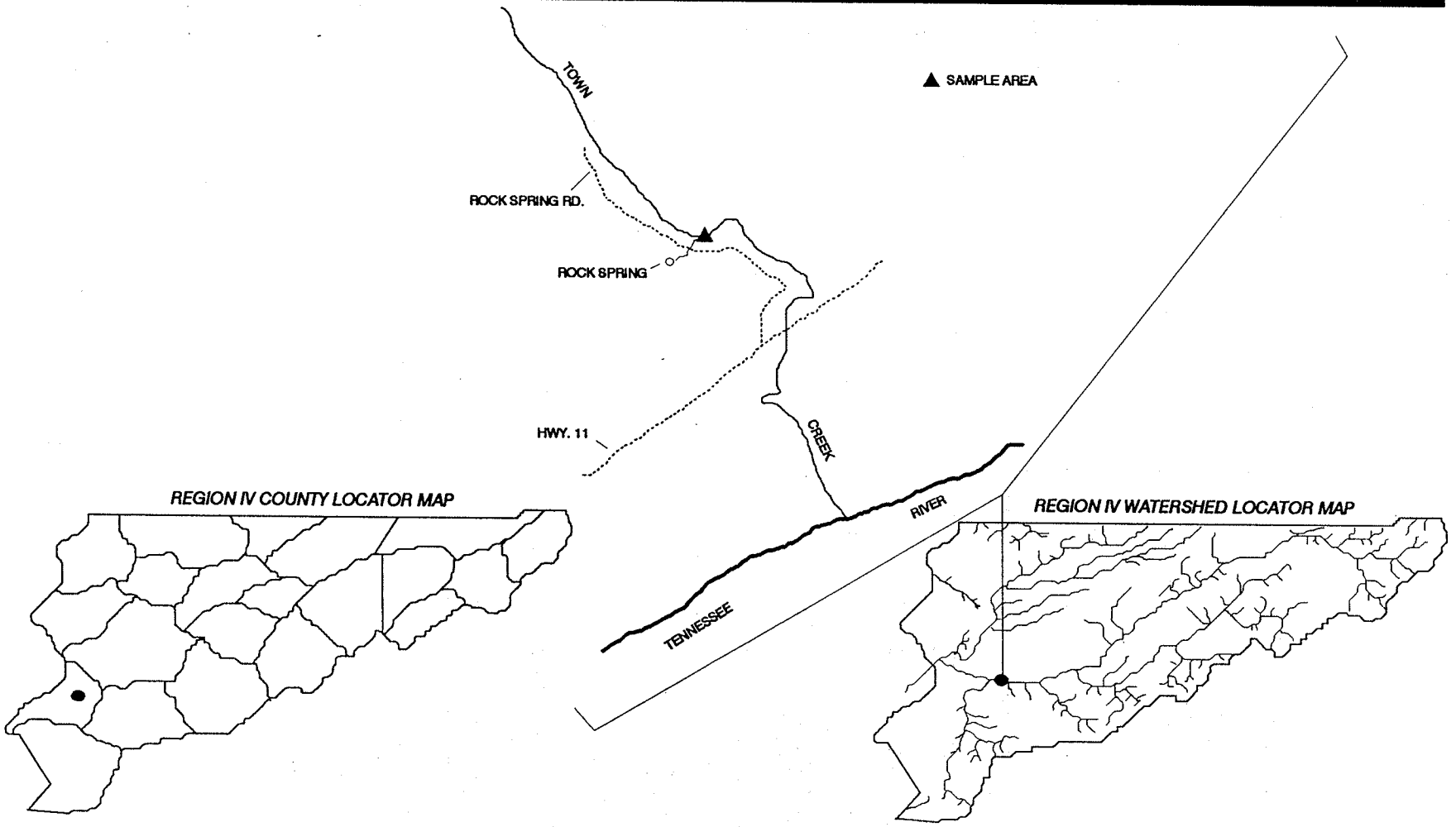
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
N/A	N/A	N/A	N/A	N/A

12. COMMENTS

SAMPLED AT ROCK SPRING PARK IN LENOIR CITY NEAR RIVER MILE 1.2.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE N/A



TOWN CREEK FISH DATA

SAMPLING TYPE: SEINING AND SHOCKING

GEAR TYPE: 4.5 m SEINE AND ONE BACKPACK UNIT @ 125 VAC

SPECIES	TADS CODE	NO. COLL.	RANGE(mm)	TOT. WEIGHT(g)	NOTE
Campostoma anomalum	45	114			
Catostomus commersoni	195	19			
Cottus carolinae	322	126			
Cyprinus carpio	62	1			
Etheostoma simoterum	435	12			
Gambusia sp.		2			
Hypentelium nigricans	207	4			
Lepomis cyanellus	347	5			no length or weight recorded
Lepomis macrochirus	351	13			no length or weight recorded
Luxilus chrysocephalus	89	30			
Rhinicthys atratulus	184	36			
Semotilus atromaculatus	188	8			
		SUM: 370			

INDEX OF BIOTIC INTEGRITY

METRIC DESCRIPTION	SCORING CRITERIA 1	3	5	OBSERVED	SCORE
NUMBER OF NATIVE SP.	<6	6-10	>10	11	5
NUMBER OF RIFFLE SP.	<2	2	>2	2	3
NUMBER OF POOL SP.	<4	4-6	>6	5	3
% DOMINANCE (COMBINED % OF TWO MOST DOMINANT SP.)	>84	84-69	<69	64.9	5
NUMBER OF HEADWATER INTOLERANT SP.	<2	2-3	>3	1	1
PERCENT OF INDIVIDUALS AS TOLERANT	>40	40-20	<20	17	5
PERCENT OF INDIVIDUALS AS OMNIVORES	>50	50-25	<25	44.3	3
PERCENT OF INDIVIDUALS AS SPECIALISTS	<12	12-22	>22	3.2	1
PERCENT OF INDIVIDUALS AS PISCIVORES	<1.5	1.5-2.9	>2.9	0	1
CATCH RATE	<34.4	34.4-68.7	>68.7	23.3	1
PERCENT OF INDIVIDUALS AS LITHOPHILIC SPAWNERS	<25	25-50	>50	27.3	3
PERCENT OF INDIVIDUALS WITH ANOMALIES	>5	5-2	<2	4.9	3
					34 **POOR**

IBI RANGE:	**0**	**12-22**	**28-34**	**40-44**	**48-52**	**58-60**
STREAM DESIGNATION:	**NO FISH**	**VERY POOR**	**POOR**	**FAIR**	**GOOD**	**EXCELLENT**

TVA BENTHIC DATA
TOWN CREEK (@ ROCK SPRINGS)
FIELD # 857

EPT FAMILIES = 7
RATING = (2) FAIR
COMMENTS- TOLERANT TAXA COMMON

		Taxa Count	Abundance +
Crustacea			
	Isopoda	1	
	Decapoda	1	C
Odonata			
	Aeshnidae	1	
	Calopterygidae	1	
	Gomphidae	2	
Ephemeroptera			
	Baetidae	1	A
	Ephemerellidae	2	C
	Ephemeridae	1	R
	Heptageniidae	2	C
	Isonychiidae	1	
Hemiptera			
	Corixidae	1	C
	Gerridae	1	
	Veliidae	1	C
Oligochaeta		1	
Trichoptera			
	Glossosomatidae	1	R
	Psychomyiidae	1	R
Megaloptera			
	Corydalidae	1	
Diptera			
	Chironomidae	1	C
	Culicidae	1	
	Simuliidae	1	C
	Tipulidae	1	
Coleoptera			
	Elmidae	1	
	Hydrochidae	3	A
Gastropoda		2	
Unionoida			
	Unionidae	1	R
Veneroida			
	Corbiculidae	1	

A= ABUNDANT+
C = COMMON+
R = RARE+

Bat Creek

One IBI fishery survey was conducted on Bat Creek in May 1997:

Location and Length - Tributary to the Little Tennessee River. The sample area was located at the bridge crossing on highway 322 near stream mile 9.2. The sample area was approximately 150 m in length and was sampled on 14 May 1997.

Sampling Methodology - This site was sampled with one backpack shocker at 125 VAC and a 4.5 m seine.

Water Quality - (See physicochemical and sample site location form)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and IBI analysis)

Comments - We cooperated with TVA in conducting an IBI survey to evaluate the relative health of this stream. The Agency has made no previous survey of this stream.

We collected a total of 77 fish representing ten species during our survey of Bat Creek. Three game species were collected during our efforts. These included bluegill (*Lepomis macrochirus*), redbreast sunfish (*L. auritus*), and rock bass (*Ambloplites rupestris*). The two most common species collected in our survey were banded sculpin (*Cottus carolinae*) and logperch (*Percina caprodes*). Together these two species accounted for 61.0% of the total number of fish collected.

Our Index of Biotic Integrity analysis indicated that this stream was in "poor" condition based on an IBI score of 30. The most negatively influential metrics were low species richness, the low number of darter, sucker, and intolerant species in the sample, the low percentage of trophic specialists and piscivores, and the relatively low catch rate. At the time of our sample the turbidity of the stream was such that we could not see the bottom of the stream which made sampling difficult. According to local residents, the stream remains turbid through much of the year as a result of increased development activities in the watershed.

Benthic macroinvertebrates collected by TVA included 16 taxa with five EPT families represented in the sample. Based on the sample and utilizing TVA's rating criteria this stream was classified as "poor to fair".

Management Recommendations:

1. It was apparent from our sample that this stream has suffered from non-point source pollution for years. Although the majority of the stream appeared to be physically capable of supporting a diverse fish assemblage, the constant deposition of fine sediments has allowed only more tolerant aquatic organisms to persist. Any action that would address non-point source sedimentation in the watershed would be beneficial.

PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	BAT CREEK
WATERSHED	LITTLE TN RIVER
SITE	@ HWY. 322 X-ING
COUNTY	MONROE
QUADRANGLE	MADISONVILLE 131 SE
LAT-LONG	353702N-841809W
REACH	06010204-4.0
LENGTH	~ 150 m
AREA (SQ. KM.)	72.5
ELEVATION	850 FT
DATE	5-14-97
TIME	N/A

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, C.E. WILLIAMS AND K. LAKIN et al.

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
N/A	N/A	N/A

2. ESTIMATED % OF STREAM IN POOLS IS N/A

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
N/A %	N/A %	N/A %

7. SHADE OR CANOPY COVER GOOD OVER N/A %

8. FLOW (CFS) N/A COMPARED TO NORMAL (LOW / NORMAL / HIGH)

9. PRESENT WEATHER

SUNNY AND MILD

10. PAST WEATHER (last 24 hrs)

SAME

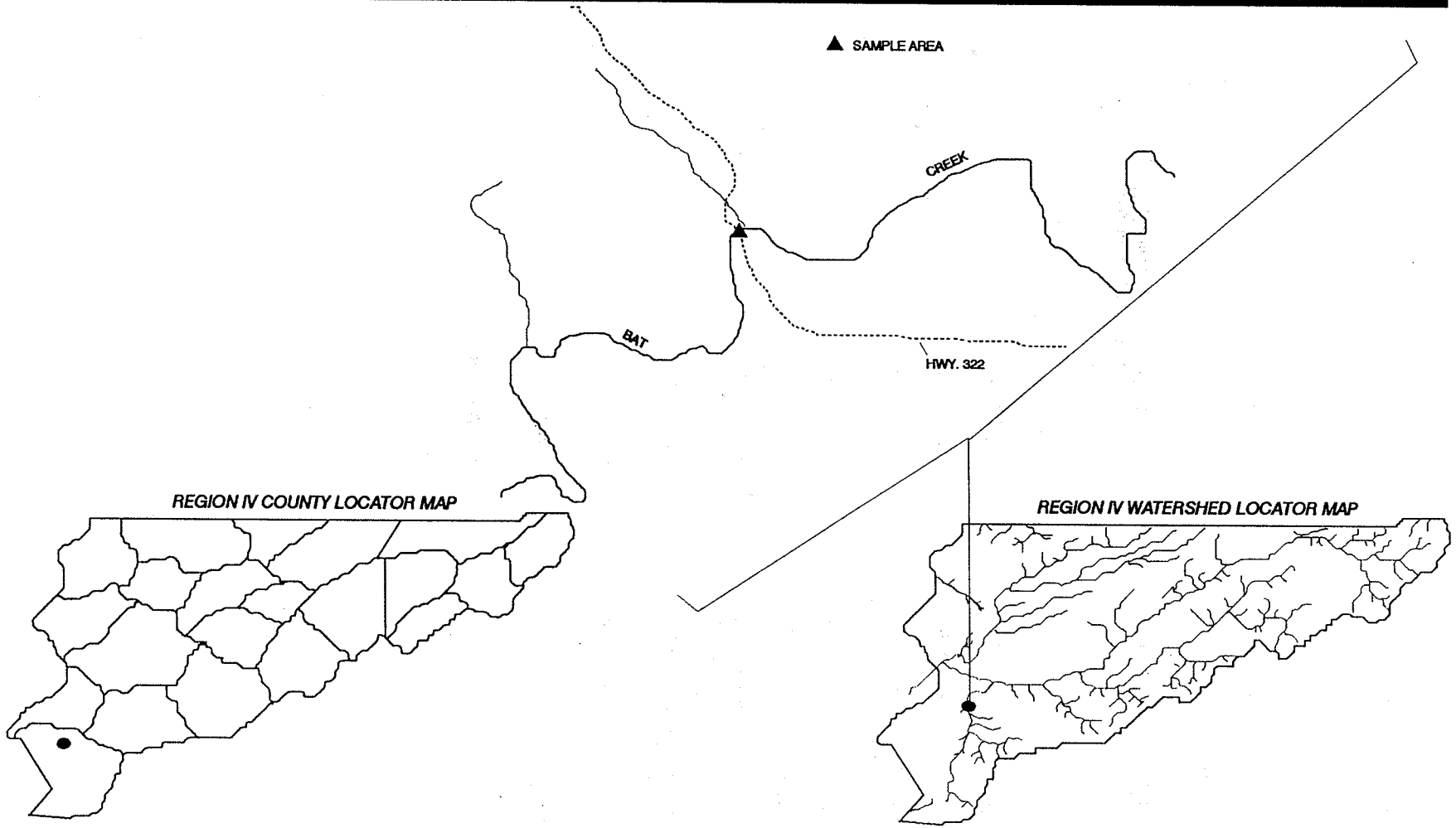
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
N/A	N/A	N/A	N/A	N/A

12. COMMENTS

SAMPLED AT HWY. 322 BRIDGE CROSSING NEAR RIVER MILE 9.2.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE N/A



BAT CREEK FISH DATA

SAMPLING TYPE: SEINING AND SHOCKING

GEAR TYPE: 4.5 m SEINE AND ONE BACKPACK UNIT @ 125 VAC

SPECIES	TADS CODE	NO. COLL.	RANGE(mm)	TOT. WEIGHT(g)	NOTE
Ambloplites rupestris	342	1			no length or weight recorded
Campostoma anomalum	45	5			
Cottus carolinae	322	32			
Cyprinella spiloptera	57	7			
Ehteostoma simoterum	435	4			
Hypentelium nigricans	207	9			
Lepomis auritus	346	2			no length or weight recorded
Lepomis macrochirus	351	1			no length or weight recorded
Percina caprodes	464	15			
Pimephales promelas	177	1			
		SUM: 77			

INDEX OF BIOTIC INTEGRITY

METRIC DESCRIPTION	SCORING CRITERIA 1	3	5	OBSERVED	SCORE
NUMBER OF NATIVE SP.	<11	11-21	>21	8	1
NUMBER OF DARTER SP.	<3	3-4	>4	2	1
NUMBER OF SUNFISH SP. *less Micropterus*	<2	2	>2	2	3
NUMBER OF SUCKER SP.	<2	2	>2	1	1
NUMBER OF INTOLERANT SP.	<2	2-3	>3	0	1
PERCENT OF INDIVIDUALS AS TOLERANT	>32	32-17	<17	9.1	5
PERCENT OF INDIVIDUALS AS OMNIVORES	>38	38-20	<20	7.8	5
PERCENT OF INDIVIDUALS AS SPECIALISTS		LOW CPUE		24.7	1
PERCENT OF INDIVIDUALS AS PISCIVORES		LOW CPUE		1.3	1
CATCH RATE	<20.4	20.4-40.6	>40.6	5.8	1
PERCENT OF INDIVIDUALS AS HYBRIDS	>1	TR-1	0	0	5
PERCENT OF INDIVIDUALS WITH ANOMALIES	>5	5-2	<2	0	5
					30 **POOR**

IBI RANGE:	**0**	**12-22**	**28-34**	**40-44**	**48-52**	**58-60**
STREAM DESIGNATION:	**NO FISH**	**VERY POOR**	**POOR**	**FAIR**	**GOOD**	**EXCELLENT**

TVA BENTHIC DATA
BAT CREEK (@ ST. PAUL)
FIELD # 859

EPT FAMILIES = 5
RATING = (1.5) POOR/FAIR
COMMENTS- TOLERANT TAXA COMMON

		Taxa Count	Abundance +
Oligochaeta		1	
Isopoda		1	
Decopoda		1	C
Plecoptera			
	Perlidae	1	
Odonata			
	Aeshnidae	1	
	Calopterygidae	1	
	Coenagrionidae	1	
Ephemeroptera			
	Baetidae	1	C
	Ephemeridae	1	
	Heptageniidae	2	C
	Isonychiidae	1	
Hemiptera			
	Veliidae	1	
Megaloptera			
	Corydalidae	1	
Coleoptera			
	Elmidae	1	
	Hydrophilidae	3	C
Veneroida			
	Corbiculidae	1	

A= ABUNDANT+
C = COMMON+
R = RARE+

Island Creek

One IBI fishery survey was conducted on Island Creek in May 1997:

Location and Length - Tributary to the Little Tennessee River. The sample area was located at the bridge crossing on Old Slag Road near stream mile 4.4. The sample area was approximately 300 m in length and was sampled on 14 May 1997.

Sampling Methodology - This site was sampled with one backpack shocker at 125 VAC and a 4.5 m seine.

Water Quality - (See physicochemical and sample site location form)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and IBI analysis)

Comments - We cooperated with TVA in conducting an IBI survey to evaluate the relative health of this stream. The Agency has made no previous survey of this stream.

We collected a total of 270 fish representing 13 species during our survey of Island Creek. Four game species were collected during our efforts. These included bluegill (*Lepomis macrochirus*), redbreast sunfish (*L. auritus*), largemouth bass (*Micropterus salmoides*), and yellow perch (*Perca flavescens*). The two most abundant species encountered in our survey were central stoneroller (*Campostoma anomalum*) and logperch (*Percina caprodes*). Together these two species accounted for 51.5% of the total number of fish collected. The high percentage of logperch (35.2%) in our sample can most likely be explained by our close proximity to Tellico Reservoir.

Our Index of Biotic Integrity analysis indicated that this stream was in "fair" condition based on an IBI score of 40. The metrics that had the most negative influence on the overall score were the low number of intolerant species, the low percentage of piscivores, and the low catch rate.

Benthic macroinvertebrates collected by TVA included 32 taxa with 14 EPT families represented in the sample. Based on the sample and utilizing TVA's rating criteria this stream was classified as "good".

Management Recommendations:

1. Although substantially "cleaner" than Bat Creek, this stream is plagued with similar non-point source sedimentation problems. Any action addressing sources of sedimentation within the watershed would be beneficial.

PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	ISLAND CREEK
WATERSHED	LITTLE TN RIVER
SITE	OLD SLAG RD. X-ING
COUNTY	MONROE
QUADRANGLE	MADISONVILLE 131 SE
LAT-LONG	353455N-841606W
REACH	06010204-46.0
LENGTH	~ 300 m
AREA (SQ. KM.)	23.8
ELEVATION	825 FT
DATE	5-13-97
TIME	N/A

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, C.E. WILLIAMS AND K. LAKIN et al.

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
N/A	N/A	N/A

2. ESTIMATED % OF STREAM IN POOLS IS N/A

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
N/A %	N/A %	N/A %

7. SHADE OR CANOPY COVER GOOD OVER N/A %

8. FLOW (CFS) N/A COMPARED TO NORMAL (LOW / NORMAL / HIGH)

9. PRESENT WEATHER

SUNNY AND MILD

10. PAST WEATHER (last 24 hrs)

SAME

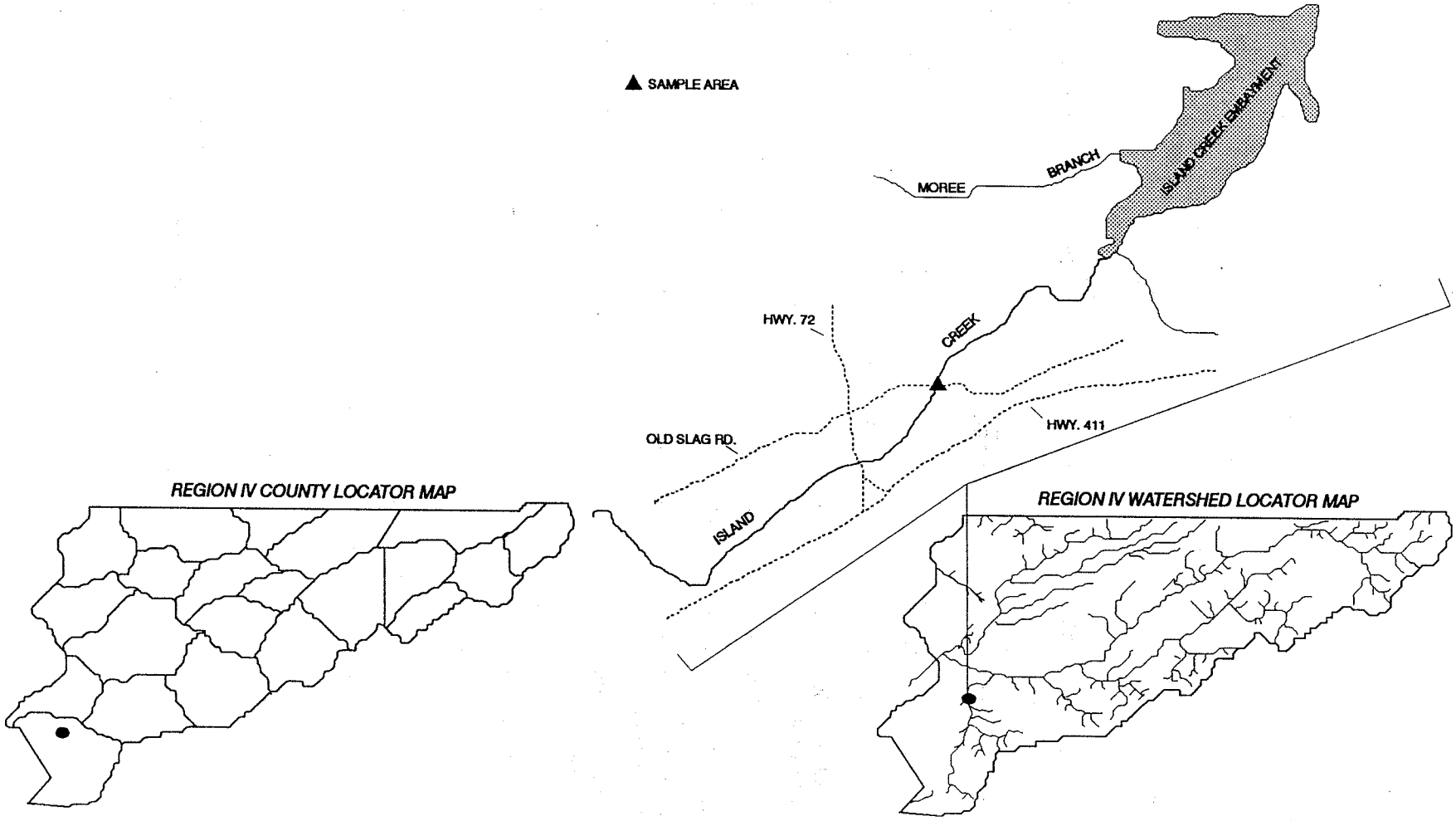
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
N/A	N/A	N/A	N/A	N/A

12. COMMENTS

SAMPLED AT THE BRIDGE CROSSING ON OLD SLAG RD. NEAR STREAM MILE 4.4.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE N/A



ISLAND CREEK FISH DATA

SAMPLING TYPE: SEINING AND SHOCKING

GEAR TYPE: 4.5 m SEINE AND ONE BACKPACK UNIT @ 125 VAC

SPECIES	TADS CODE	NO. COLL.	RANGE(mm)	TOT. WEIGHT(g)	NOTE
Aplodinotus grunniens	496	1			
Campostoma anomalum	45	44			
Cottus carolinae	322	32			
Cyprinella spiloptera	57	35			
Cyprinus carpio	62	5			
Etheostoma simoterum	435	2			
Hypentelium nigricans	207	4			
Lepomis auritus	346	11			no length or weight recorded
Lepomis macrochirus	351	33			no length or weight recorded
Micropterus salmoides	364	1			no length or weight recorded
Moxostoma erythrurum	225	5			
Perca flavescens	458	2			no length or weight recorded
Percina caprodes	464	95			
	SUM:	270			

INDEX OF BIOTIC INTEGRITY

METRIC DESCRIPTION	SCORING CRITERIA 1	3	5	OBSERVED	SCORE
NUMBER OF NATIVE SP.	<8	8-14	>14	10	3
NUMBER OF DARTER SP.	<2	2-3	>3	2	3
NUMBER OF SUNFISH SP. *less Micropterus*	0	1	>1	1	3
NUMBER OF SUCKER SP.	0	1	>1	2	5
NUMBER OF INTOLERANT SP.	<2	2	>2	0	1
PERCENT OF INDIVIDUALS AS TOLERANT	>37	37-19	<19	14.8	5
PERCENT OF INDIVIDUALS AS OMNIVORES	>45	45-23	<23	18.1	5
PERCENT OF INDIVIDUALS AS SPECIALISTS	<15	15-29	>29	35.9	5
PERCENT OF INDIVIDUALS AS PISCIVORES	<2	2-3.9	>3.9	0.4	1
CATCH RATE	<27.5	27.5-54.8	>54.8	18.6	1
PERCENT OF INDIVIDUALS AS HYBRIDS	>1	TR-1	0	0	5
PERCENT OF INDIVIDUALS WITH ANOMALIES	>5	5-2	<2	2.2	3
					40 **FAIR**

IBI RANGE:	**0**	**12-22**	**28-34**	**40-44**	**48-52**	**58-60**
STREAM DESIGNATION:	**NO FISH**	**VERY POOR**	**POOR**	**FAIR**	**GOOD**	**EXCELLENT**

TVA BENTHIC DATA
ISLAND CREEK (@ VONORE)
FIELD # 858

EPT FAMILIES = 14
RATING = (4) GOOD
COMMENTS- TOLERANT TAXA COMMON

		Taxa Count	Abundance [+]
Oligochaeta		1	
Isopoda		1	
Decopoda		1	
Plecoptera			
	Leuctridae	1	
	Nemouridae	1	
	Perlidae	1	
Odonata			
	Aeshnidae	1	
	Calopterygidae	1	
	Cordulegastridae	1	
	Gomphidae	2	
Ephemeroptera			
	Baetidae	3	A
	Caenidae	1	R
	Ephemerellidae	2	C
	Ephemeridae	1	
	Heptageniidae	2	C
	Isonychiidae	1	
	Leptophlebiidae	1	
Hemiptera			
	Corixidae	1	
	Veliidae	1	C
Trichoptera			
	Hydropsychidae	2	A
	Leptoceridae	2	
	Limnephilidae	1	
	Odontoceridae	1	
Megaloptera			
	Corydalidae	1	
	Sialidae	1	
Diptera			
	Chironomidae	1	C
	Simuliidae	1	
	Tipulidae	2	C
Coleoptera			
	Elmidae	1	
	Hydrophilidae	1	C
Unionoida			
	Unionidae	1	
Veneroida			
	Corbiculidae	1	

A= ABUNDANT[+]
C = COMMON[+]
R = RARE[+]

Citico Creek

One qualitative fishery survey was conducted on Citico Creek in October 1997:

Location and Length - Tributary to the Little Tennessee River. The sample area was located in the vicinity of Citico Beach (river mile ~ 1.6) along Citico Rd. just downstream of Smoky Branch. This area of Citico Creek was sampled on 16 October 1997.

Sampling Methodology - This site was sampled with one boat electrofishing unit operating at 3-4 Amps DC.

Water Quality - (None recorded)

Benthic Collection - (No collection made)

Fish Collected - (See below)

Comments - This stream reach was surveyed in cooperation with Dr. Robert Jenkins (Roanoke College) in an attempt to locate the undescribed "sicklefin redhorse" and to collect otolith samples from rock bass and smallmouth bass. There have been recent Agency surveys of this stream at other localities (Bivens and Williams 1994; Bivens et al. 1997).

Citico Creek was one of the few Little Tennessee River tributary streams located in Tennessee believed to potentially contain the undescribed sicklefin redhorse. Our survey of this stream reach was two-fold, we were interested in documenting any occurrence of the sicklefin redhorse in this stream, and at the same time collect a representative sample of otoliths from smallmouth bass and rock bass for age determination. A small collection of rock bass otoliths was made from this stream in 1996 (Bivens et al. 1997), approximately 38.8 km upstream of this sample site.

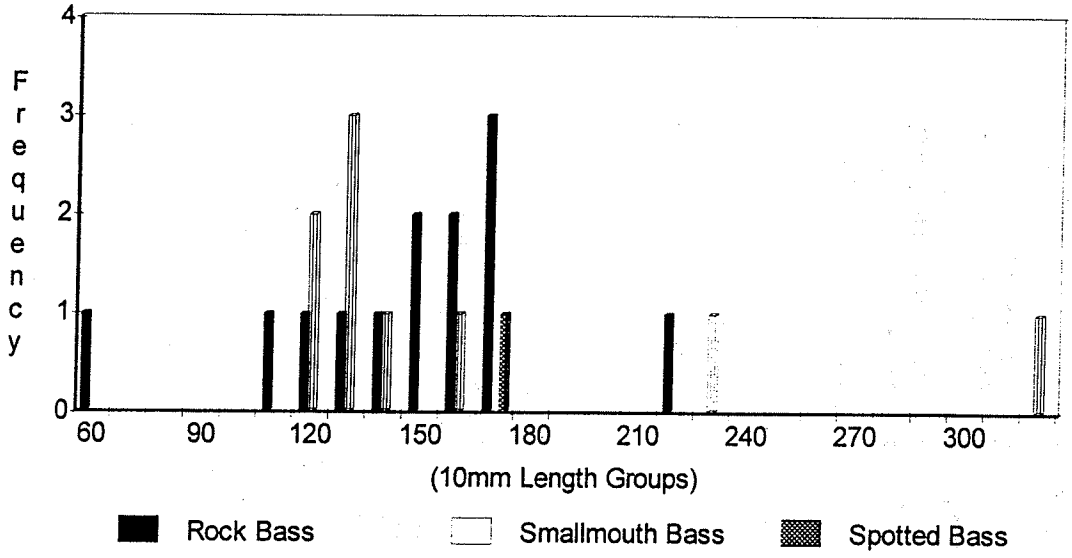
Our survey efforts did not reveal any evidence that the sickle fin redhorse occurred in this reach of Citico Creek. Other species observed during our collection included black redhorse *(Moxostoma duquesnei)*, golden redhorse *(M. euryhrurum)*, and northern hogsucker *(Hypentelium nigricans)*. We were able to collect otoliths from nine smallmouth bass, 13 rock bass and one spotted bass. These samples were sent to the Nashville Office for inclusion in the statewide age and growth evaluation. Figure 1 depicts the size range and frequency of bass collected in our 1997 survey of Citico Creek.

Management Recommendations:

1. Any actions that could address protection of riparian zones and limit non-point source pollution within the watershed would be of benefit to this stream.

2. Consider conducting a quantitative survey of this stream to assess standing crops and densities of game species.

Figure 1. Length Frequency Distributions for Rock Bass, Smallmouth Bass, and Spotted Bass Collected in Citico Creek during 1997



PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	CITICO CREEK
WATERSHED	LITTLE TENN. RIVER
SITE	@ CITICO BEACH
COUNTY	MONROE
QUADRANGLE	TALLASSEE 139 SE
LAT-LONG	353156N-840611W
REACH	06010204-18,0
LENGTH	~ 300 m
AREA (SQ. KM.)	N/A
ELEVATION	820 FT
DATE	10-16-97
TIME	N/A

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, B. JENKINS
C.E. WILLIAMS, AND G. DINKINS

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
N/A	N/A	N/A

2. ESTIMATED % OF STREAM IN POOLS IS N/A

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
N/A %	N/A %	N/A %

7. SHADE OR CANOPY COVER GOOD OVER N/A %

8. FLOW (CFS) N/A **COMPARED TO NORMAL**

LOW	NORMAL	HIGH

9. PRESENT WEATHER

SUNNY AND MILD

10. PAST WEATHER (last 24 hrs)

SAME

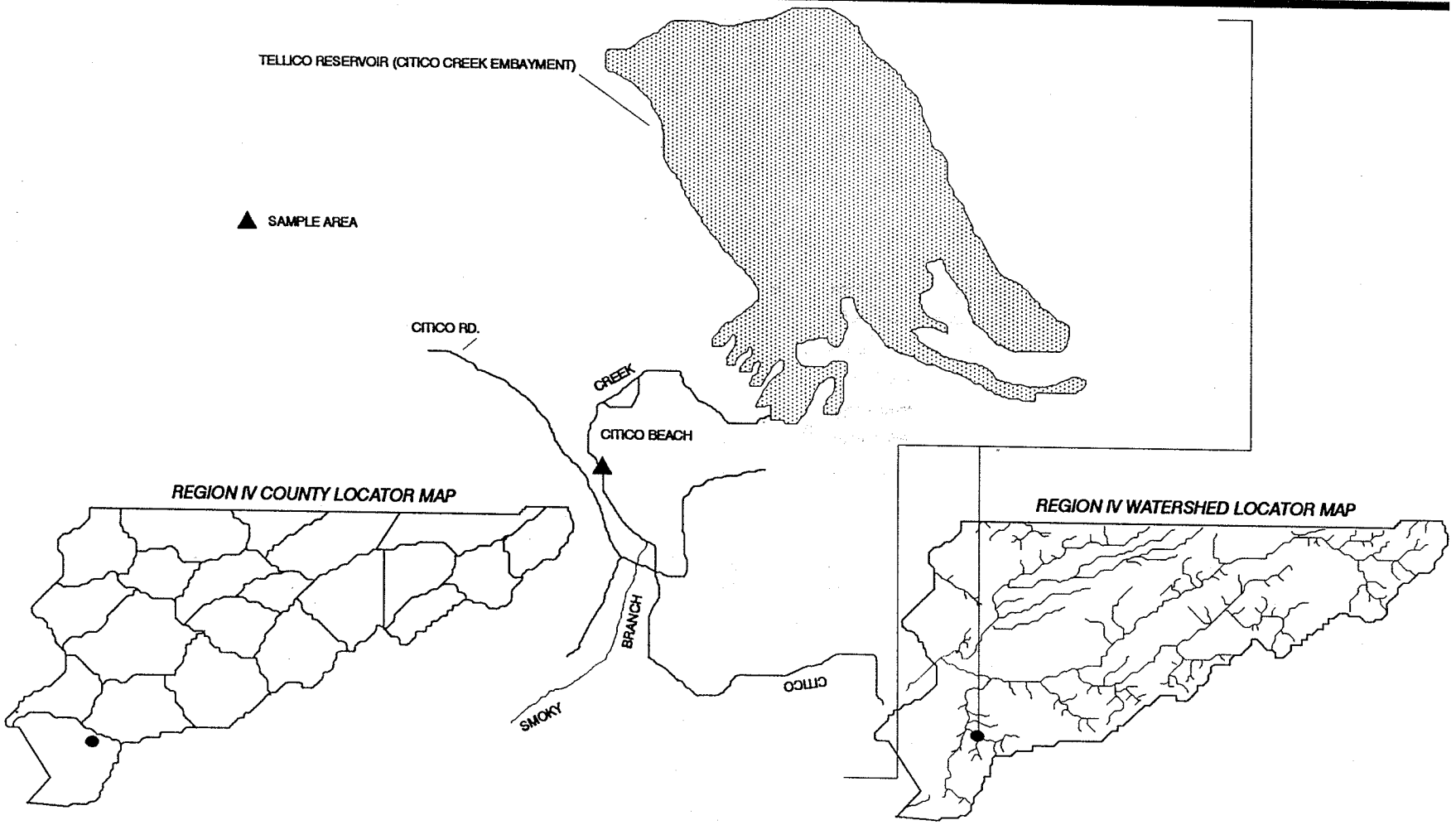
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
N/A	N/A	N/A	N/A	N/A

12. COMMENTS

SAMPLED IN THE VICINITY OF CITICO BEACH.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE N/A



Little Pigeon River

One IBI fishery survey was conducted on Little Pigeon River in August 1997:

Location and Length - Tributary to the French Broad River. The sample area was located near the community of Catlettsburg just downstream of Sanders Island near river mile 2.0. The sample area was approximately 0.7 km in length and was sampled on 7 August 1997.

Sampling Methodology - This site was sampled with one backpack shocker, one boat shocker @ 3-4 amps DC, and a 6 m seine.

Water Quality - (none recorded)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and IBI analysis)

Comments - We cooperated with TVA in conducting an IBI survey to evaluate the relative health of this stream. The Agency did make a collection in the Middle Prong of the Little Pigeon in 1992 (Bivens et al. 1993).

The Little Pigeon River is known for the sport fishery it supports and has a reputation for producing large smallmouth bass. It has been featured on ESPN's "The Fishing Hole" and draws a fair amount of angling pressure each year. Because of the value of the this resource and its close proximity to the heavily developed communities of Sevierville and Pigeon Forge, we were interested in assessing the relative well being of the stream and determining if there were any noticeable trends that might indicate degradation in the fish community.

We collected a total of 1,506 fish representing 48 species during our survey of the Little Pigeon River. Six game species were collected during our efforts. These included bluegill (*Lepomis macrochirus*), redbreast sunfish (*L. auritus*), smallmouth bass (*Micropterus dolomieu*), spotted bass (*M. punctulatus*), largemouth bass (*M. salmoides*), and sauger (*Stizostedion canadense*). The two most abundant species collected in our survey were striped shiner (*Luxilus chrysocephalus*) and redline darter (*Etheostoma rufilineatum*). Together these two species accounted for 32.2% of the total number of fish collected. We were hopeful that we might locate specimens of the snail darter (*Percina tanasi*) which have been found historically in the French Broad River proximal to the mouth of the Little Pigeon River. Seven darter species were collected in the sample, however, no snail darters were found.

Our Index of Biotic Integrity analysis indicated that this stream was in "fair" condition based on an IBI score of 40. The metrics that had the most negative influence on the overall score were the low number of sunfish species in the sample, the high

percentage of tolerant species, the high percentage of omnivores, and the low percentage of piscivores in the sample. Given the high degree of development in the watershed, this portion of the river has remained relatively healthy. Our IBI sampling methodology is not designed to target game species, therefore, the true abundance values of these species has probably been under represented in the sample we conducted.

Benthic macroinvertebrates collected by TVA included 28 taxa with 11 EPT families represented in the sample. Based on the sample and utilizing TVA's rating criteria this stream was classified as "fair".

Management Recommendations:

1. This stream is a valuable recreational resource to the region. The stream supports a good warmwater sport fishery and produces fair numbers of "above average" smallmouth bass. Any action that would address non-point source pollution and protection of riparian zones would be beneficial.

2. Consider conducting additional CPUE electrofishing surveys to begin building a database on the sport fishery.

PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	LITTLE PIGEON RIVER
WATERSHED	FRENCH BROAD RIVER
SITE	@ LPR MILE 2.0
COUNTY	SEVIER
QUADRANGLE	DOUGLAS DAM 156NE
LAT-LONG	355442N-833439W
REACH	06010107-9.0
LENGTH	~ 0.7 km
AREA (SQ. KM.)	927.2
ELEVATION	870 FT
DATE	8-7-97
TIME	N/A

COLLECTOR(S)

R.D. BIVENS, C.E. WILLIAMS AND C.F. SAYLOR et al.

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
N/A	N/A	N/A

2. ESTIMATED % OF STREAM IN POOLS IS N/A

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS ____ AVERAGE ____ SCARCE ____

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
N/A %	N/A %	N/A %

7. SHADE OR CANOPY COVER GOOD OVER N/A %

8. FLOW (CFS) N/A **COMPARED TO NORMAL** LOW ____ NORMAL ____ HIGH ____

9. PRESENT WEATHER

SUNNY AND MILD

10. PAST WEATHER (last 24 hrs)

SAME

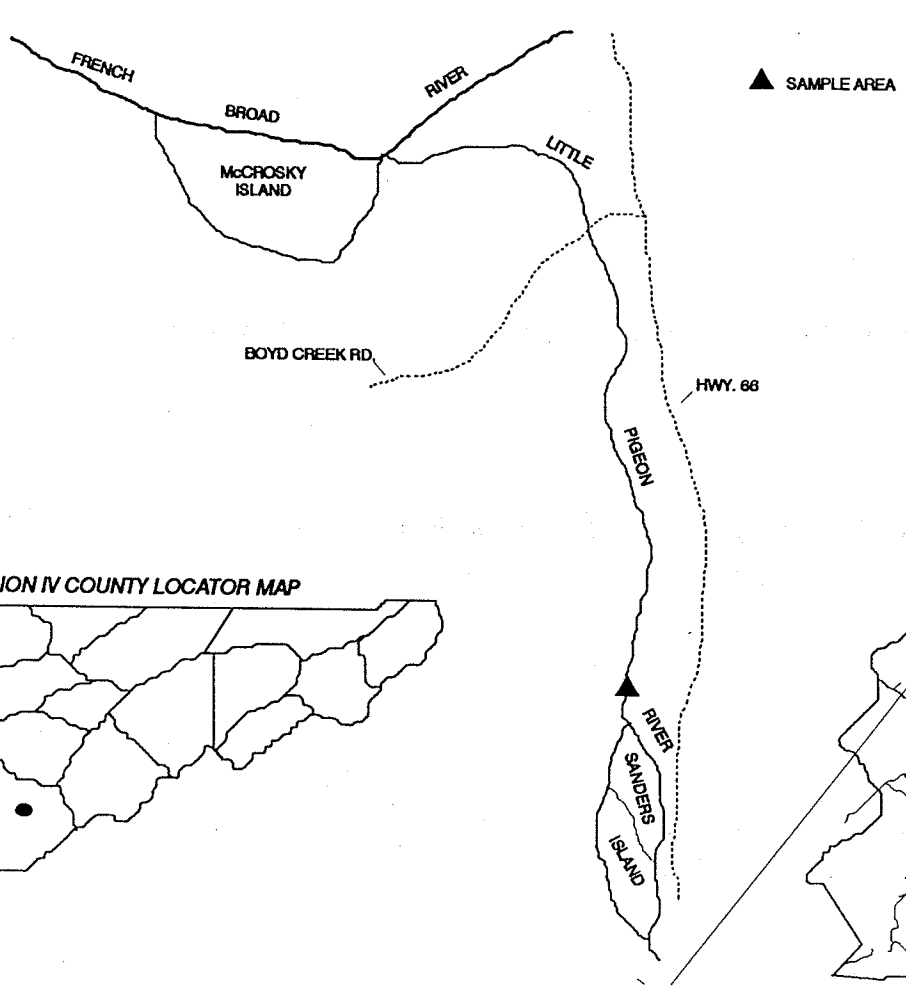
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
N/A	N/A	N/A	N/A	N/A

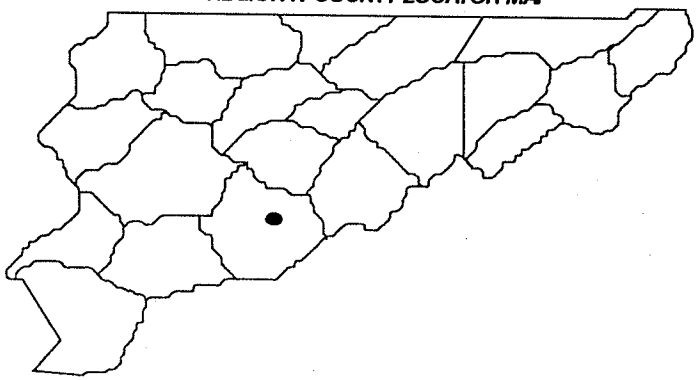
12. COMMENTS

SAMPLED AT LPR MILE 2.0 NEAR THE COMMUNITY OF CATLETTSBURG JUST DOWNSTREAM OF SANDERS ISLAND.

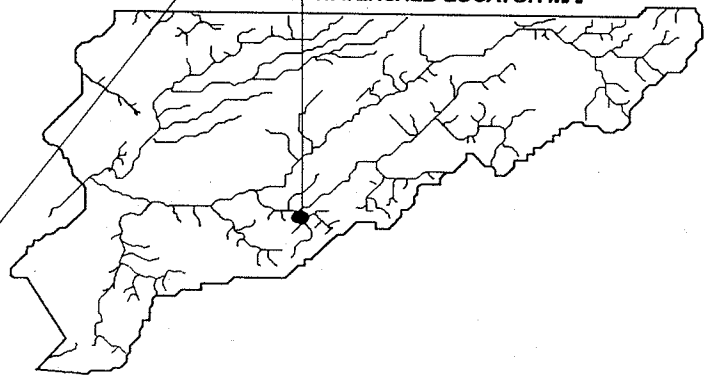
13. $\bar{X}$ HABITAT ASSESSMENT SCORE N/A



REGION IV COUNTY LOCATOR MAP



REGION IV WATERSHED LOCATOR MAP



LITTLE PIGEON RIVER FISH DATA

SAMPLING TYPE: SEINING AND SHOCKING

GEAR TYPE: 6 m SEINE, ONE BACKPACK UNIT, AND ONE BOAT UNIT @ 3-4 AMPS DC

SPECIES	TADS CODE	NO. COLL.	RANGE(mm)	TOT. WEIGHT(g)	NOTE
Ameiurus natalis	233	1			
Aplodinotus grunniens	496	6			
Campostoma anomalum	45	161			
Carpoides cyprinus	192	1			
Cottus carolinae	322	25			
Cyprinella galactura	54	33			
Cyprinella spiloptera	57	56			
Cyprinus carpio	62	29			
Dorosoma cepedianum	41	63			
Etheostoma blennioides	398	14			
Etheostoma jessiae	416	4			
Etheostoma rufilineatum	431	221			
Etheostoma simoterum	435	5			
Etheostoma zonale	449	18			
Fundulus catenatus	301	9			
Fundulus notatus	305	Q			
Hybopsis amblops	79	97			
Hypentelium nigricans	207	166			
Ichthyomyzon bdellium	2	3			
Ictalurus punctatus	240	3			
Ictiobus bubalus	211	2			
Lepisosteus osseus	23	3			
Lepomis auritus	346	57			no length or weight record
Lepomis macrochirus	351	6			no length or weight record
Luxilus chrysocephalus	89	264			
Luxilus coccogenis	90	20			
Micropterus dolomieu	362	7			no length or weight record
Micropterus punctulatus	363	2			no length or weight record
Micropterus salmoides	364	3			no length or weight record
Morone chrysops	326	2			no length or weight record
Moxostoma carinatum	223	18			
Moxostoma duquesnei	224	63			
Moxostoma erythrurum	225	32			
Moxostoma macrolepidotum	226	4			
Nocomis micropogon	110	20			
Notropis leuciodus	128	7			
Notropis photogenis	130	6			
Notropis rubellus	131	17			
Notropis rubricroceus	132	1			
Notropis stramineus	137	4			
Notropis volucellus	140	4			
Percina caprodes	464	25			
Percina evides	467	6			
Phenacobius uranops	159	8			
Pimephales notatus	176	7			
Pylodictus olivaris	262	1			
Rhinichthys cataractae	185	1			
Stizostedian canadense	491	1			no length or weight record
		SUM: 1506			

INDEX OF BIOTIC INTEGRITY

METRIC DESCRIPTION	SCORING CRITERIA 1	3	5	OBSERVED	SCORE
NUMBER OF NATIVE SP.	<19	19-36	>36	46	5
NUMBER OF DARTER SP.	<4	4-6	>6	7	5
NUMBER OF SUNFISH SP. *less Micropterus*	<2	2	>2	1	1
NUMBER OF SUCKER SP.	<3	3-4	>4	7	5
NUMBER OF INTOLERANT SP.	<3	3-4	>4	3	3
PERCENT OF INDIVIDUALS AS TOLERANT	>20	20-11	<11	27.6	1
PERCENT OF INDIVIDUALS AS OMNIVORES	>20	20-11	<11	36.6	1
PERCENT OF INDIVIDUALS AS SPECIALISTS	<25	25-50	>50	31	3
PERCENT OF INDIVIDUALS AS PISCIVORES	<2.0	2.0-4.0	>4.0	1.3	1
CATCH RATE	<10.2	10.2-20.3	>20.3	36.7	5
PERCENT OF INDIVIDUALS AS HYBRIDS	>1	1-Tr	0	0	5
PERCENT OF INDIVIDUALS WITH ANOMALIES	>5	5-2	<2	1	5
					40 **FAIR**

IBI RANGE:	**0**	**12-22**	**28-34**	**40-44**	**48-52**	**58-60**
STREAM DESIGNATION:	**NO FISH**	**VERY POOR**	**POOR**	**FAIR**	**GOOD**	**EXCELLENT**

TVA BENTHIC DATA
LITTLE PIGEON RIVER (CATTLETTSBURG SITE)
FIELD # 904

EPT FAMILIES = 11
RATING = (2) FAIR
COMMENTS- TOLERANT TAXA ABUNDANT

		Taxa Count	Abundance +
Turbellaria			
	Planariidae	1	R
Oligochaeta		1	C
Isopoda		1	C
Decapoda		1	R
Plecoptera			
	Pteronarcyidae	1	R
Odonata			
	Aeshnidae	1	R
	Calopterygidae	1	C
	Coenagrionidae	1	C
	Gomphidae	1	R
Ephemeroptera			
	Baetidae	3	C
	Caenidae	1	R
	Ephemerellidae	1	R
	Heptageniidae	2	C
	Isonychiidae	1	C
	Leptophlebiidae	1	R
Trichoptera			
	Brachycentridae	1	C
	Hydropsychidae	2	A
	Leptoceridae	2	C
	Psychomyiidae	1	R
Megaloptera			
	Corydalidae	1	C
Diptera			
	Chironomidae	3	C
	Simuliidae	1	A
	Tabanidae	1	R
Coleoptera			
	Elmidae	3	C
Arachnoidea			
	Acariformes	1	R
Gastropoda		1	C
Unionoida			
	Unionidae	2	R
Veneroida			
	Corbiculidae		
	Corbicula sp.	1	R

A= ABUNDANT+
C = COMMON+
R = RARE+

West Prong Little Pigeon River

One IBI fishery survey was conducted on West Prong Little Pigeon River in August 1997:

Location and Length - Tributary to the French Broad River. The sample area was located in the town of Pigeon Forge along Highway 441 near river mile 8.5. The sample area was approximately 0.7 km in length and was sampled on 8 August 1997.

Sampling Methodology - This site was sampled with one backpack shocker, one boat shocker @ 3-4 amps DC, and a 6 m seine.

Water Quality - (none recorded)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and IBI analysis)

Comments - We cooperated with TVA in conducting an IBI survey to evaluate the relative health of this stream. The Agency did conduct a survey of this stream in 1984 (Peterson 1984) and responded to two fish kills in Pigeon Forge during 1996.

The West Prong Little Pigeon River originates in the Great Smoky Mountains National Park where it flows through relatively pristine forested terrain before coursing through the cities of Gatlinburg and Pigeon Forge. It eventually joins the Little Pigeon River before emptying into the French Broad River just north of the city of Sevierville. Because of the rapid development of the tourism based cities of Gatlinburg and Pigeon Forge, there have been sporadic historical surveys of this stream in hopes of detecting any degradation to the stream resulting from the rapid commercial growth within the watershed.

We collected a total of 1,092 fish representing 34 species during our survey of West Prong Little Pigeon River. Four game species were collected during our efforts. These included redbreast sunfish (*Lepomis auritus*), smallmouth bass (*Micropterus dolomieu*), spotted bass (*M. punctulatus*), and rock bass (*Ambloplites rupestris*). Otoliths were extracted from all black bass and 14 rock bass (see Fig. 2 for length frequency distributions). The two most common species collected in our survey were central stoneroller (*Campostoma anomalum*) and redline darter (*Etheostoma rufilineatum*). Together these two species accounted for 19.2% of the total number of fish collected. Historical surveys of the same reach of stream by Peterson (1984) and Etnier (1990) accounted for a total of 28 species.

The Agency responded to two fish kills in 1996 that were the result of chlorine spills from Ogle's Waterpark. It was estimated that about a mile of the stream was effected during each event. Much of the fish fauna was eliminated within the affected area which led to enforcement action by the Tennessee Department of Environment and Conservation (TDEC). In complying with the enforcement action by TDEC the owner of Ogle's Waterpark was assessed fines and had to retrofit the facilitie's chlorine treatment

system to accommodate the pellet form of chlorine instead of the liquid (Paul Stodola, TDEC, personnel communication).

Our Index of Biotic Integrity analysis indicated that this stream was in "fair to good" condition based on an IBI score of 46. The metrics that had the most negative influence on the overall score were the low number of sunfish species in the sample and the overall high incidence of anomalies on the fish. Although much of the river has been posted as unfit for body contact due to high levels of fecal coliform, much of the physical stream habitat remains in fair condition. This has allowed fish diversity in this stream to remain relatively high in spite of the rapid growth within the watershed.

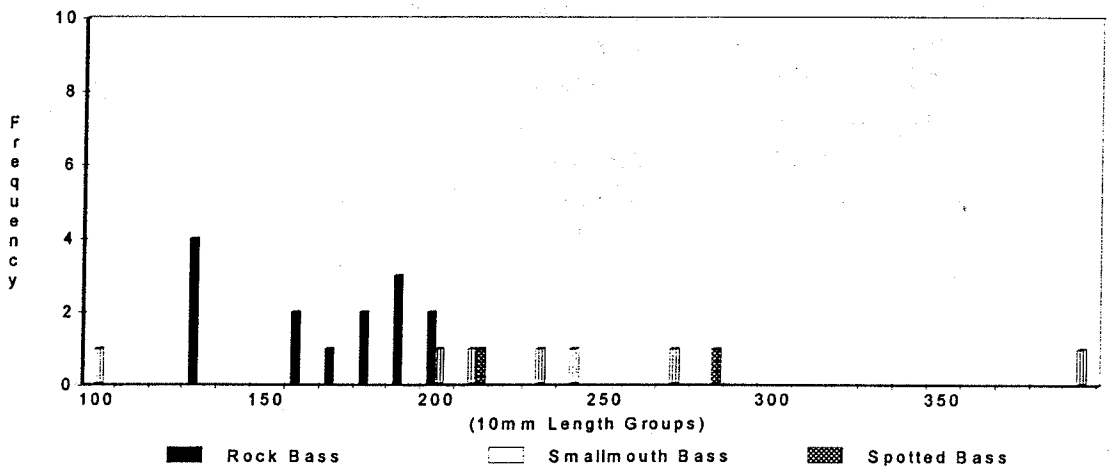
Benthic macroinvertebrates collected by TVA included 24 taxa with eight EPT families represented in the sample. Based on the sample and utilizing TVA's rating criteria this stream was classified as "fair".

Management Recommendations:

1. This stream is a valuable recreational resource for the communities of Gatlinburg and Pigeon Forge. The stream supports a good warmwater sport fishery and produces fair numbers of "above average" smallmouth bass. Any action that would address the bacteria problems would help remove some of the recreational constraints that presently limit the use of the river and would possibly allow for the resumption of trout stocking in this stream.

2. Consider conducting additional CPUE or 3-pass electrofishing surveys to strengthen our existing database on the sport fishery in this stream.

Figure 2. Length Frequency Distributions for Rock Bass, Smallmouth Bass, and Spotted Bass Collected in West Prong Litlle Pigeon River during 1997



PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	W. PRONG LITTLE PIGEON
WATERSHED	FRENCH BROAD RIVER
SITE	@ WPLPR MILE 8.5
COUNTY	SEVIER
QUADRANGLE	PIGEON FORGE 156SE
LAT-LONG	354830N-833450W
REACH	06010107-14.0
LENGTH	~ 0.7 km
AREA (SQ. KM.)	192.1
ELEVATION	950 FT
DATE	8-8-97
TIME	N/A

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER AND M. GRUSSING et al.

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
N/A	N/A	N/A

2. ESTIMATED % OF STREAM IN POOLS IS N/A

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
N/A %	N/A %	N/A %

7. SHADE OR CANOPY COVER GOOD OVER N/A %

8. FLOW (CFS) N/A COMPARED TO NORMAL (LOW / NORMAL / HIGH)

9. PRESENT WEATHER

SUNNY AND MILD

10. PAST WEATHER (last 24 hrs)

SAME

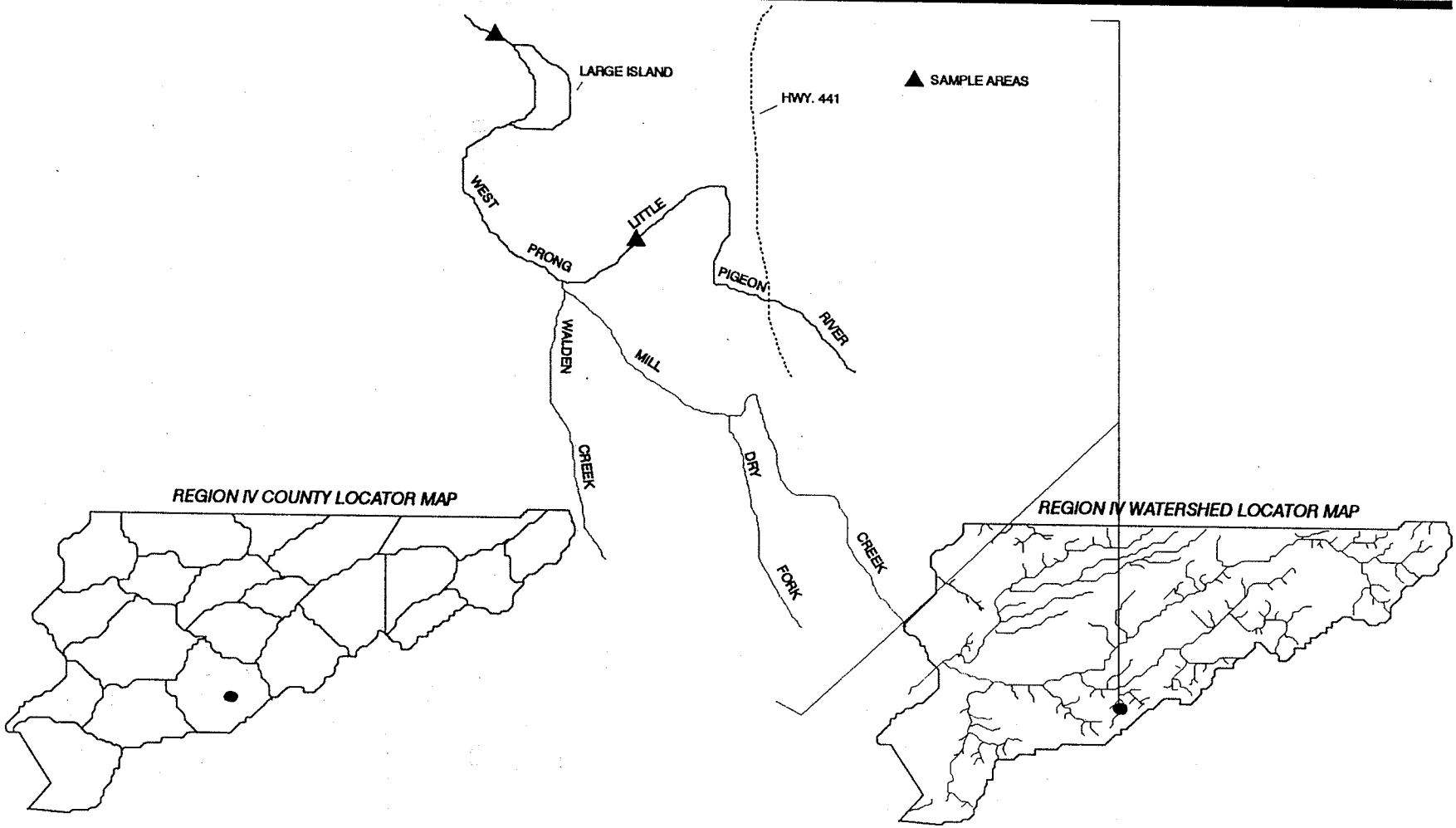
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
N/A	N/A	N/A	N/A	N/A

12. COMMENTS

SAMPLED UPSTREAM AND DONSTREAM OF ISLAND NEAR RIVER MILE 8.5. BOAT SHOCKED UPSTREAM OF ISLAND BACKPACK SHOCKING BELOW ISLAND.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE N/A



WEST PRONG LITTLE PIGEON FISH DATA

SAMPLING TYPE: SEINING AND SHOCKING

GEAR TYPE: 6 m SEINE, ONE BACKPACK UNIT, AND ONE BOAT UNIT @ 3-4 AMPS DC

SPECIES	TADS CODE	NO. COLL.	RANGE(mm)	TOT. WEIGHT(g)	NOTE
Ambloplites rupestris	342	22	134-208	1514	LENGTH/WEIGHT DATA FOR 14
Ameiurus natalis	233	1			
Campostoma anomalum	45	109			
Catostomus commersoni	195	2			
Cottus carolinae	322	45			
Cyprinella galactura	54	73			
Cyprinus carpio	62	4			
Dorosoma cepedianum	41	5			
Erimystax insignis	68	2			
Etheostoma blennioides	398	7			
Etheostoma jessiae	416	4			
Etheostoma kennicotti	418	8			
Etheostoma rufilineatum	431	101			
Etheostoma simoterum	435	30			
Hybopsis amblops	79	89			
Hypentelium nigricans	207	36			
Lampetra appendix	9	8			
Lepomis auritus	346	39			
Luxilus chrysocephalus	89	66			
Luxilus coccogenis	90	73			
Lythrurus lirus	95	6			
Micropterus dolomieu	362	7	108-391	1597	
Micropterus punctulatus	363	2	212-286	441	
Moxostoma duquesnei	224	65			
Moxostoma erythrurum	225	67			
Nocomis micropogon	110	5			
Notropis leuciodus	128	48			
Notropis photogenis	130	61			
Notropis rubellus	131	37			
Notropis stramineus	137	9			
Notropis telescopus	138	44			
Percina caprodes	464	6			
Percina evides	467	10			
Phenacobius uranops	159	1			
	SUM:	1092			

INDEX OF BIOTIC INTEGRITY

METRIC DESCRIPTION	SCORING CRITERIA 1	3	5	OBSERVED	SCORE
NUMBER OF NATIVE SP.	<14	14-26	>26	32	5
NUMBER OF DARTER SP.	<3	3-5	>5	7	5
NUMBER OF SUNFISH SP. *less Micropterus*	2	2	>2	1	1
NUMBER OF SUCKER SP.	<2	2	>2	4	5
NUMBER OF INTOLERANT SP.	<2	2-3	>3	5	5
PERCENT OF INDIVIDUALS AS TOLERANT	>27	27-14	<14	7.1	5
PERCENT OF INDIVIDUALS AS OMNIVORES	>31	31-16	<16	17.8	3
PERCENT OF INDIVIDUALS AS SPECIALISTS	<24	24-47	>47	48.9	5
PERCENT OF INDIVIDUALS AS PISCIVORES	<2.0	2.0-4.0	>4.0	2.8	3
CATCH RATE	<15.7	15.7-31.2	>31.2	21	3
PERCENT OF INDIVIDUALS AS HYBRIDS	>1	1-Tr	0	0	5
PERCENT OF INDIVIDUALS WITH ANOMALIES	>5	5-2	<2	6.3	1
					46 FAIR-GOOD

IBI RANGE:	**0**	**12-22**	**28-34**	**40-44**	**48-52**	**58-60**
STREAM DESIGNATION:	**NO FISH**	**VERY POOR**	**POOR**	**FAIR**	**GOOD**	**EXCELLENT**

TVA BENTHIC DATA
WEST PRONG LITTLE PIGEON RIVER (@ HWY 441)
FIELD # 905

EPT FAMILIES = 8
RATING = (2) FAIR
COMMENTS- TOLERANT TAXA COMMON

		Taxa Count	Abundance +
Turbellaria			
	Planariidae	1	R
Oligochaeta		1	C
Isopoda		1	R
Decapoda		1	C
Plecoptera			
	Leuctridae	1	R
	Perlidae	1	R
Odonata			
	Aeshnidae	1	R
	Calopterygidae	1	R
	Gomphidae	1	R
Ephemeroptera			
	Baetidae	3	C
	Caenidae	1	R
	Heptageniidae	2	C
	Isonychiidae	1	C
Hemiptera			
	Gerridae	1	R
Trichoptera			
	Hydropsychidae	2	C
	Leptoceridae	1	R
Megaloptera			
	Corydalidae	1	C
Diptera			
	Chironomidae	2	C
	Simuliidae	1	R
	Tipulidae	1	R
Coleoptera			
	Elmidae	1	R
Arachnoidea			
	Acariformes	1	A
Gastropoda			
	Ancylidae	1	C
Veneroida			
	Corbiculidae	1	R

A= ABUNDANT+
C = COMMON+
R = RARE+

Flat Creek

One IBI fishery survey and one qualitative survey were conducted on Flat Creek in June 1997:

Location and Length - Tributary to the French Broad River. The IBI sample area was located at the upstream Simms Road crossing at the Voice of Victory Church. The survey reach was approximately 180 m in length and was sampled on 4 June 1997. The qualitative survey site was located approximately 90 m downstream of Forbidden Caverns along Blowing Cave Road. Sample length was approximately 100 m and was sampled on 4 June 1997.

Sampling Methodology - The IBI site was sampled with one backpack shocker at 125 VAC and a 4.5 m seine. The qualitative site was sampled with one backpack unit operating at 200 VAC.

Water Quality - (See physicochemical and sample site location form)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and IBI analysis)

Comments - We were primarily interested in evaluating the relative health of this reach of stream. The Agency has made no previous survey of this stream.

We collected a total of 503 fish representing 15 species during our IBI survey of Flat Creek. Three game species were collected during our efforts. These included redbreast sunfish (*Lepomis auritus*), rainbow trout (*Oncorhynchus mykiss*), and bluegill (*L. macrochirus*). The two most abundant species collected in our survey were central stoneroller (*Campostoma anomalum*) and whitetail shiner (*Cyprinella galactura*). Together these two species accounted for 54.8% of the total number of fish collected. Only one darter species (*Etheostoma simoterum*) was collected at this site. The occurrence of rainbow trout in this stream is the result of the establishment of a small self-sustaining population in the headwater reach of this stream. Much the streams flow originates from a spring upwelling in Forbidden Caverns Cave. This source of cold water coupled with the continual release of trout from a now closed trout farm (English Mountain Trout Farm) resulted in the formation of this small population. Our survey at this site (355420N-832103W) resulted in the capture of 26 rainbow trout with a length range of 25-220 mm, 17 banded sculpin (*Cottus carolinae*), and 14 blacknose dace (*Rhinichthys atratulus*).

Our Index of Biotic Integrity analysis indicated this stream was in "poor" condition based on an IBI score of 30. The metrics that had a strong negative influence on the overall score were the low number of darter and sunfish species, the absence of intolerant species, the low percentage of trophic specialists, the absence of piscivores, and

the high occurrence of anomalies. The stream was transporting a heavy sediment load at the time of our survey. This can be attributed to much of the watershed draining a well developed agricultural region.

Benthic macroinvertebrates collected in our survey reach included Baetidae, Caenidae, Ephemerillidae, Ephemeridae, Heptageniidae, and Isonychiidae mayflies; Perlidae stoneflies; and Glossosomatidae, Helicopsychidae, Hydropsychidae, Leptoceridae, and Uenoidae caddisflies. Of special note was the collection of the caddisfly (*Helicopsyche borealis*). The distribution of this species in east Tennessee is fairly localized and sporadic and is one of more rare species encountered in our annual surveys. Trichopterans were the most abundant organisms in our sample comprising 51.2% of the total sample. Ephemeropterans were second most abundant accounting for 24.5%, while plecopterans only contributed 0.1%. A total of 43 taxa was collected in our sample of which 17 were EPT. Based on the EPT taxa richness value and the overall biotic index of all taxa collected the relative health of the benthic community was classified as "fair to good".

Our evaluation of the physical instream habitat and riparian zone in this reach resulted in a mean score of 125. Based on this score and our overall observations of the stream, this reach of Flat Creek was designated as "sub-optimal".

Management Recommendations:

1. Any action that would address non-point source pollution within the watershed would be beneficial.

PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	FLAT CREEK
WATERSHED	FRENCH BROAD RIVER
SITE	@ UPPER SIMMS RD. X-ING
COUNTY	SEVIER
QUADRANGLE	SHADY GROVE 164 NW
LAT-LONG	355523N-832459W
REACH	06010107-46,0
LENGTH	~ 180 m
AREA (SQ. KM.)	29.8
ELEVATION	1060 FT
DATE	6-4-97
TIME	1310

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, M.T. FAGG
C.E. WILLIAMS, AND DANNY BENNETT

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
5.7 m	0.5 m	1.0 m

2. ESTIMATED % OF STREAM IN POOLS IS 30

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
20	20	10	20	10	20

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
10	15	5	40	20	10

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE
		X

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
30 %	30 %	40 %

7. SHADE OR CANOPY COVER GOOD OVER 50 %

8. FLOW (CFS) 13.6 **COMPARED TO NORMAL**

LOW	NORMAL	HIGH
		X

9. PRESENT WEATHER

PARTLY CLOUDY AND WARM; AIR TEMP. 73 F

10. PAST WEATHER (last 24 hrs)

OVERCAST; SCATTERED SHOWERS

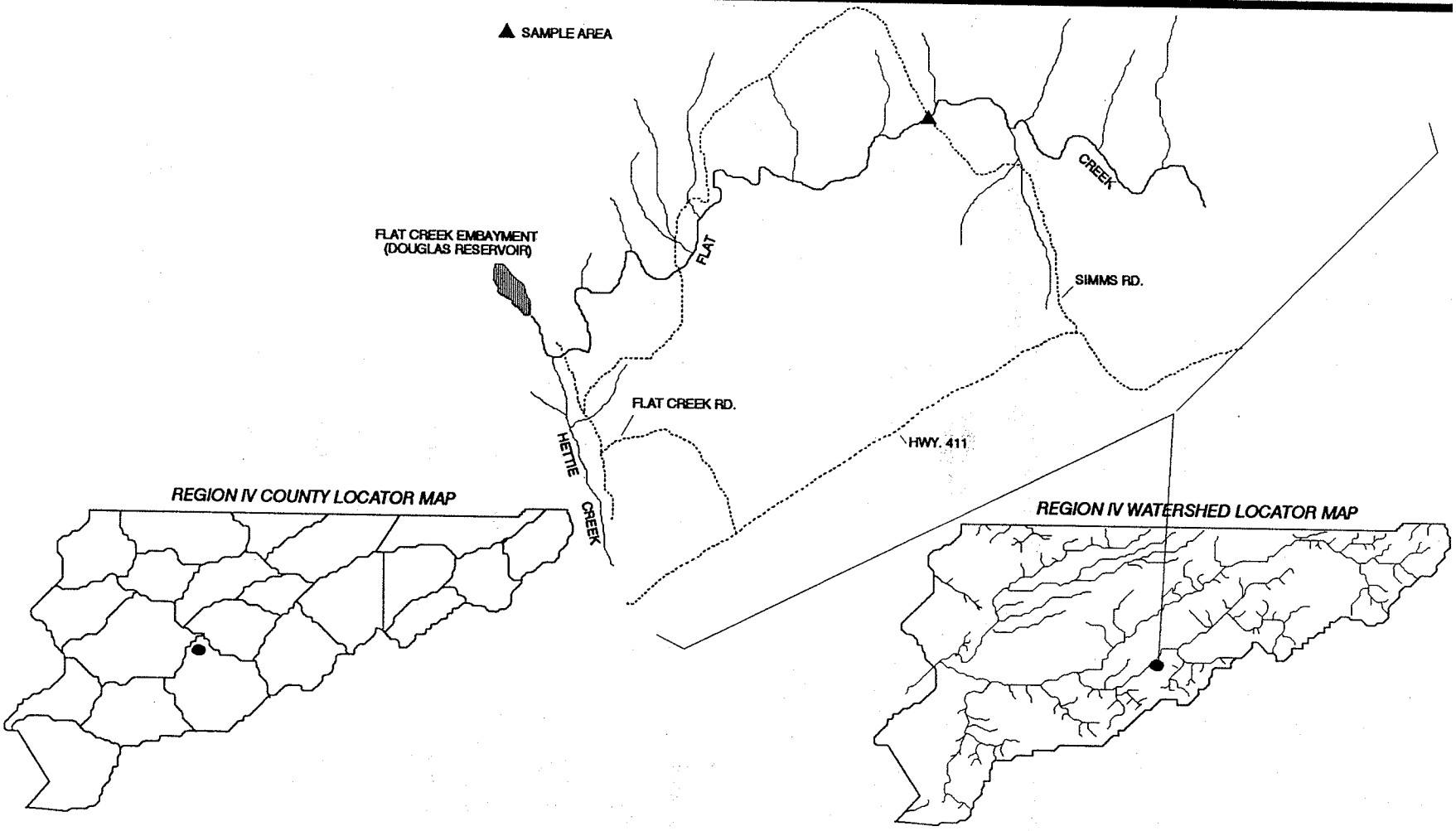
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
7.2	16.8	290	10.2	106

12. COMMENTS

SAMPLE AREA LOCATED @ UPSTREAM SIMMS RD. X-ING @ VOICE OF VICTORY CHURCH.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE 125



FLAT CREEK FISH DATA

SAMPLING TYPE: SEINING AND SHOCKING

GEAR TYPE: 4.5 m SEINE AND ONE BACKPACK UNIT @ 125 VAC

SPECIES	TADS CODE	NO. COLL.	RANGE(mm)	TOT. WEIGHT(g)	NOTE
Campostoma anomalum	45	136			
Catostomus commersoni	195	23			
Cottus carolinae	322	55			
Cyprinella galactura	54	140			
Etheostoma simoterum	435	35			
Hybopsis amblops	79	16			
Hypentelium nigricans	207	8			
Icthyomyzon sp.	1	6			
Lepomis auritus	346	10	61-105	133	
Lepomis macrochirus	351	7	50-108	48	
Moxostoma erythrurum	225	2			
Notropis stramineus	137	1			
Oncorhynchus mykiss	279	1	222	100	
Rhinichthys atratulus	184	62			
Semotilus atromaculatus	188	1			
		SUM: 503			

INDEX OF BIOTIC INTEGRITY

METRIC DESCRIPTION	SCORING CRITERIA 1	3	5	OBSERVED	SCORE
NUMBER OF NATIVE SP.	<9	9-16	>16	13	3
NUMBER OF DARTER SP.	<2	2-3	>3	1	1
NUMBER OF SUNFISH SP. *less Micropterus*	<2	2	>2	1	1
NUMBER OF SUCKER SP.	<2	2	>2	3	5
NUMBER OF INTOLERANT SP.	<2	2	>2	0	1
PERCENT OF INDIVIDUALS AS TOLERANT	>36	36-19	<19	4.8	5
PERCENT OF INDIVIDUALS AS OMNIVORES	>44	44-23	<23	31.6	3
PERCENT OF INDIVIDUALS AS SPECIALISTS	<16	16-31	>31	10.3	1
PERCENT OF INDIVIDUALS AS PISCIVORES	<2.0	2.0-4.0	>4.0	0	1
CATCH RATE	<25.9	25.9-51.6	>51.6	32	3
PERCENT OF INDIVIDUALS AS HYBRIDS	>1	TR-1	0	0	5
PERCENT OF INDIVIDUALS WITH ANOMALIES	>5	5-2	<2	19.9	1
					30 **POOR**

IBI RANGE:	**0**	**12-22**	**28-34**	**40-44**	**48-52**	**58-60**
STREAM DESIGNATION:	**NO FISH**	**VERY POOR**	**POOR**	**FAIR**	**GOOD**	**EXCELLENT**

FLAT CREEK
FIELD # 875
EFFORT = 3 PERSON HOURS

TAXA RICHNESS = 43
EPT TAXA RICHNESS = 17
BIOCLASSIFICATION = (3.8) FAIR-GOOD

			NUMBER	PERCENT
AMPHIPODA			2	0.3
ANNELIDA				0.1
	Oligochaeta		1	
COLEOPTERA				5.9
	Elmidae	*Dubiraphia* larvae and adults	14	
		Macronychus glabratus adults	4	
		Optioservus larva and adult	2	
		Stenelmis larva and adults	11	
	Haliplidae	*Peltodytes* adult	1	
	Hydrophilidae	*Sperchopsis tessellatus* adult	1	
	Psephenidae	*Psephenus herricki*	7	
DIPTERA				5.9
	Chironomidae		33	
	Simuliidae		1	
	Tabanidae	*Tabanus*	4	
	Tipulidae	*Antocha*	2	
EPHEMEROPTERA				24.5
	Baetidae	*Baetis*	6	
	Caenidae	*Caenis*	1	
	Ephemerellidae	*Ephemerella*	51	
	Ephemeridae	*Hexagenia*	2	
	Heptageniidae	*Heptagenia*	4	
		Stenacron	7	
		Stenonema	57	
	Isonychiidae	*Isonychia*	39	
GASTROPODA				0.6
	Physidae		4	
HEMIPTERA				0.9
	Gerridae	*Gerris remigis* males and females	2	
	Veliidae	*Rhagovelia obesa* adults	4	
HYDRACARINA			1	0.1
ISOPODA				4.4
	Asellidae	*Asellus*	20	
		Lirceus	10	
MEGALOPTERA				0.3
	Corydalidae	*Nigronia serricornis*	2	
ODONATA				5.6
	Aeshnidae	*Boyeria vinosa*	1	
	Calopterygidae	*Calopteryx*	15	
	Coenagrionidae	*Argia*	2	
	Gomphidae	*Gomphus lividus*	13	
		Hagenius brevistylus	2	
		Ophiogomphus mainensis	2	
		Stylurus laurae	3	
PLECOPTERA				0.1
	Perlidae	*Perlesta*	1	
TRICHOPTERA				51.2
	Glossosomatidae	*Glossosoma pupa*	1	
	Helicopsychidae	*Helichopsyche borealis* larvae & pupae	42	
	Hydropsychidae	*Ceratopsyche bronta*	45	
		Cheumatopsyche	86	
		Hydropsyche betteni/depravata	134	
		Hydropsyche frisoni	1	
	Leptoceridae	*Triaenodes*	3	
	Uenoidae	*Neophylax auris/etnieri*	37	
		TOTAL	**681**	

Clear Creek

One IBI fishery survey was conducted on Clear Creek in June 1997:

Location and Length - Tributary to the French Broad River. The sample area was located downstream of the bridge crossing on Rainwater Road approximately 0.4 km downstream of Bush's Cannery. The sample area was approximately 200 m in length and was sampled on 3 June 1997.

Sampling Methodology - This site was sampled with one backpack shocker at 125 VAC and a 3 m seine.

Water Quality - (See physicochemical and sample site location form)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and IBI analysis)

Comments - We were primarily interested in evaluating the relative health of this reach of stream. The Agency has made no previous survey of this stream.

We collected a total of 242 fish representing eight species during our IBI survey of Clear Creek. Two game species were collected during our efforts. These included green sunfish (*Lepomis cyanellus*) and bluegill (*L. macrochirus*). The two most abundant species collected in our survey were blacknose dace (*Rhinicthys atratulus*) and banded sculpin (*Cottus carolinae*). Together these two species accounted for 78.1% of the total number of fish collected. The only darter species collected at this site was logperch (*Percina caprodes*).

Our Index of Biotic Integrity analysis indicated this stream was in "poor" condition based on an IBI score of 34. The metrics that had a strong negative influence on the overall score were the absence of darter, sucker, and intolerant species, the low percentage of trophic specialists, the absence of piscivores, and the low catch rate. It was apparent from our observations that the cannery was having a detrimental affect on the stream. There were apparent signs of enrichment as filamentous algae was abundant and the riparian vegetation was much "healthier" than adjacent areas. Additionally, we found three discharge pipes within our survey reach.

Benthic macroinvertebrates collected in our survey reach included Baetidae and Ephemerillidae mayflies; Perlodidae stoneflies; and Glossosomatidae and Hydropsychidae caddisflies. Dipterans were the most abundant organisms in our sample comprising 28.8% of the sample. Ephemeropterans were second most abundant accounting for 22.5% of the total sample. Trichopterans and plecopterans only comprised 2.8% and 2.6%, respectively. Turbellaria (flatworms) were abundant making up 21.2% of the sample. A total of 24 taxa was collected in our sample of which six were EPT.

Based on the EPT taxa richness value and the overall biotic index of all taxa collected, the relative health of the benthic community was classified as "fair". With the observed abundance of tolerant taxa and the lack of EPT taxa it is apparent the cannery is having a negative impact on the stream.

Our evaluation of the physical instream habitat and riparian zone in this reach resulted in a mean score of 119. Based on this score and our overall observations of the stream, this reach of Clear Creek was designated as "sub-optimal" although the score was approaching the marginal category.

Management Recommendations:

1. Any action that would address non-point source pollution within the watershed would be beneficial.

2. It may be beneficial to contact TDEC to see if any recent inspections of there discharges have been made and if any violations were found.

PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	CLEAR CREEK
WATERSHED	FRENCH BROAD RIVER
SITE	@ RAINWATER RD. X-ING
COUNTY	JEFFERSON
QUADRANGLE	CHESTNUT HILL 164 NE
LAT-LONG	355547N-832038W
REACH	06010107-51.0
LENGTH	~ 200 m
AREA (SQ. KM.)	19.4
ELEVATION	1040 FT
DATE	6-3-97
TIME	N/A

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, C.E. WILLIAMS, AND DANNY BENNETT

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
3.6 m	0.2 m	0.6 m

2. ESTIMATED % OF STREAM IN POOLS IS 20

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
30	25	10	20	10	5

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
5	10	10	50	15	10

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE W. CREST ALGAE	SCARCE
	X	

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
10 %	40 %	50 %

7. SHADE OR CANOPY COVER GOOD OVER 60 %

8. FLOW (CFS) 7.6 **COMPARED TO NORMAL**

LOW	NORMAL	HIGH
	X	

9. PRESENT WEATHER

SUNNY AND HOT; AIR TEMP. 80 F @ 1428

10. PAST WEATHER (last 24 hrs)

SAME; T-STORMS OVERNIGHT

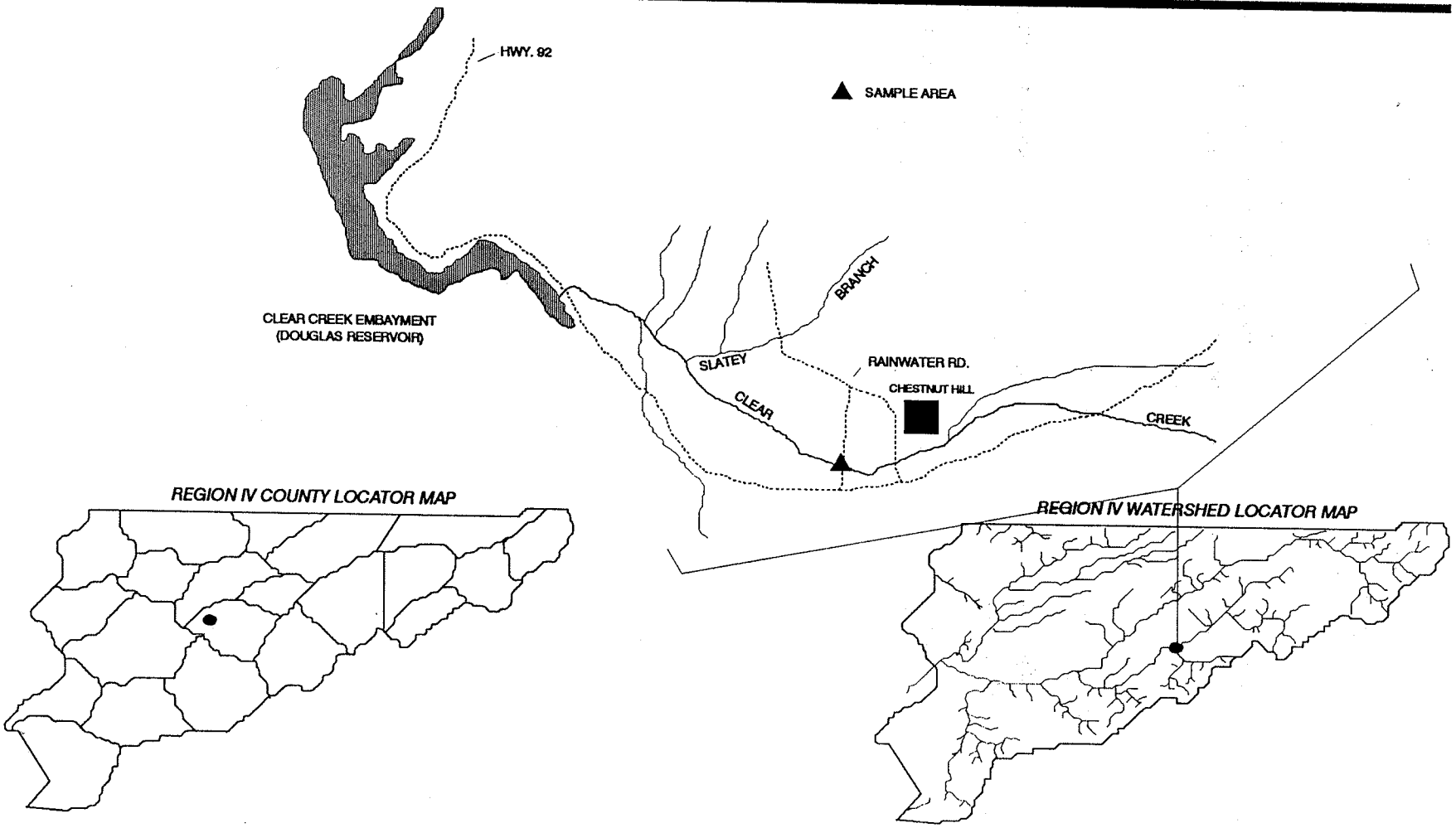
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
N/A	18.8	400	9.9	107

12. COMMENTS

SAMPLE AREA LOCATED AT RAINWATER RD. X-ING ~ 0.25 MI. DOWNSTREAM OF BUSH'S CANNERY. SEVERAL DISCHARGE PIPES BELOW CANNERY (OBSERVED 3).

13. $\bar{X}$ HABITAT ASSESSMENT SCORE 119



CLEAR CREEK FISH DATA

SAMPLING TYPE: SEINING AND SHOCKING

GEAR TYPE: 3 m SEINE AND ONE BACKPACK UNIT @ 125 VAC

SPECIES	TADS CODE	NO. COLL.	RANGE(mm)	TOT. WEIGHT(g)	NOTE
Campostoma anomalum	45	6			
Cottus carolinae	322	71			
Lepomis cyanellus	347	2	91-93	23	
Lepomis macrochirus	351	22	68-107	222	
Percina caprodes	464	10			
Pimephales promelas	177	2			
Rhinicthys atratulus	184	118			
Semotilus atromaculatus	188	11			
		SUM: 242			

INDEX OF BIOTIC INTEGRITY

METRIC DESCRIPTION	SCORING CRITERIA 1	3	5	OBSERVED	SCORE
NUMBER OF NATIVE SP.	<7	7-13	>13	7	3
NUMBER OF DARTER SP.	<2	2-3	>3	1	1
NUMBER OF SUNFISH SP. *less Micropterus*	0	1	>1	2	5
NUMBER OF SUCKER SP.	0	1	>1	0	1
NUMBER OF INTOLERANT SP.	<2	2	>2	0	1
PERCENT OF INDIVIDUALS AS TOLERANT	>38	38-20	<20	5.4	5
PERCENT OF INDIVIDUALS AS OMNIVORES	>47	47-24	<24	3.3	5
PERCENT OF INDIVIDUALS AS SPECIALISTS	<14	14-27	>27	4.1	1
PERCENT OF INDIVIDUALS AS PISCIVORES	<1.9	1.9-3.6	>3.6	0	1
CATCH RATE	<29.1	29.1-58.0	>58.0	26.1	1
PERCENT OF INDIVIDUALS AS HYBRIDS	>1	TR-1	0	0	5
PERCENT OF INDIVIDUALS WITH ANOMALIES	>5	5-2	<2	0.4	5
					34 **POOR**

IBI RANGE:	**0**	**12-22**	**28-34**	**40-44**	**48-52**	**58-60**
STREAM DESIGNATION:	**NO FISH**	**VERY POOR**	**POOR**	**FAIR**	**GOOD**	**EXCELLENT**

CLEAR CREEK
FIELD # 872
EFFORT = 3 PERSON HOURS

TAXA RICHNESS = 24
EPT TAXA RICHNESS = 6
BIOCLASSIFICATION = (2.2) FAIR

			NUMBER	PERCENT
ANNELIDA				2.0
	Oligochaeta		11	
COLEOPTERA				0.9
	Dytiscidae	*Hydroporus* adult	1	
	Elmidae	*Dubiraphia*	1	
		Optioservus larva and adult	2	
		Stenelmis larva	1	
DIPTERA				28.8
	Chironomidae		99	
	Simuliidae		54	
	Tipulidae	*Antocha*	1	
		Tipula	1	
EPHEMEROPTERA				22.5
	Baetidae	*Baetis*	120	
	Ephemerellidae	*Ephemerella*	1	
HEMIPTERA				0.2
	Corixidae		1	
HIRUDINEA			1	0.2
ISOPODA				15.8
	Asellidae	*Asellus*	10	
		Lirceus	75	
ODONATA				2.8
	Aeshnidae	*Aeshna umbrosa*	1	
		Boyeria vinosa	4	
	Calopterygidae	*Calopteryx*	8	
	Coenagrionidae	*Argia*	2	
PELECYPODA				0.2
	Sphaeriidae		1	
PLECOPTERA				2.6
	Perlodidae	*Isoperla holochlora*	14	
TRICHOPTERA				2.8
	Glossosomatidae	*Glossosoma*	2	
	Hydropsychidae	*Ceratopsyche sparna*	1	
		Hydropsyche betteni/depravata	12	
TURBELLARIA			114	21.2
		TOTAL	**538**	

Long Creek

One CPUE fishery survey was conducted on Long Creek in May 1997:

Location and Length - Tributary to the French Broad River. The survey site was located along Long Creek Rd. just upstream of Spencer Branch. The site was sampled on 21 May 1997.

Sampling Methodology - This site was sampled with one backpack electrofishing unit operating at 125 VAC.

Water Quality - (See physiochemical and site location form)

Benthic Collection - (No collection made)

Fish Collected - (See fish data from for species list and CPUE data below)

Comments - This stream was surveyed to develop a fish species list for TADS and to collect otolith samples from any rock bass and/or smallmouth bass collected. The Agency has made no previous collections from this stream.

Long Creek originates in a developed agricultural region of Cocke County. It flows along the base of Meadow Creek Mountain for a good portion of its length before emptying into the French Broad River at river mile 84.2. Because much of stream flows through developed land, the impacts of non-point source sedimentation were evident at our survey site.

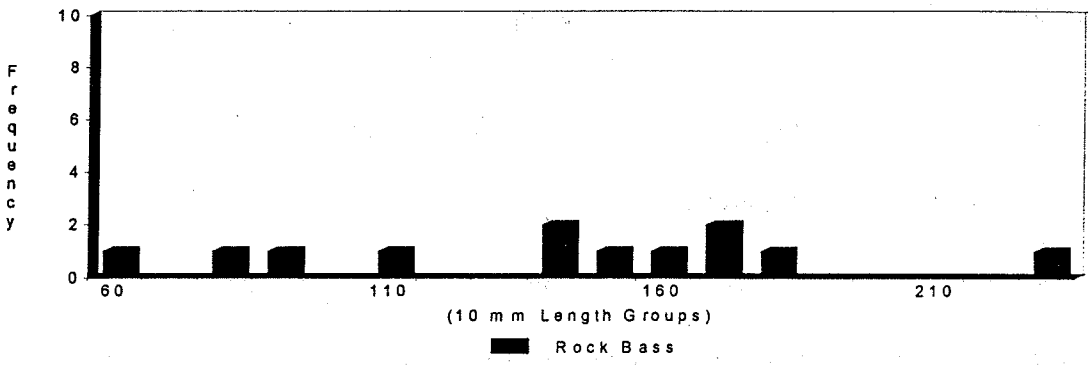
Our CPUE survey of this stream resulted in the collection of 239 fish representing 18 species. All fish encountered during the survey were counted and in the case of rock bass (*Ambloplites rupestris*), individual lengths and weights were obtained (see Fig. 3 for length frequency distribution). Otoliths were extracted from collected rock bass for inclusion in the statewide age and growth evaluation. The two most abundant species collected in our survey were striped shiner (*Luxilus chrysocephalus*) and banded sculpin (*Cottus carolinae*). Together these two species accounted for 27% of all fish collected.

The CPUE estimates for fish collected in our survey were based on a 0.5 hour sample. Fish per hour values ranged from a high of 72 for striped shiner to a low of 2 for spotfin shiner (*Cyprinella spiloptera*) and yellow bullhead (*Ameiurus natalis*). Catch rates for game fish were fairly high with recorded values for rock bass, redbreast sunfish (*Lepomis auritus*), and bluegill (*Lepomis macrochirus*) of 24/hour, 34/hour, and 28/hour, respectively (see accompanying table for individual CPUE data).

Management Recommendations:

1. Any action that would address non-point source sedimentation in the watershed would be beneficial.

Figure 3. Length Frequency Distribution for Rock Bass Collected in Long Creek during 1997



PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	LONG CREEK
WATERSHED	FRENCH BROAD RIVER
SITE	@ FS ACCESS AREA
COUNTY	COCKE
QUADRANGLE	NEDDY MTN. 173 NE
LAT-LONG	355746N-830240W
REACH	06010107-72.0
LENGTH	~ 150 m
AREA (SQ. KM.)	N/A
ELEVATION	1200 FT
DATE	5-21-97
TIME	1630

COLLECTOR(S)

B.D. CARTER AND C.E. WILLIAMS

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
N/A	N/A	N/A

2. ESTIMATED % OF STREAM IN POOLS IS 40

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
20	30	20	30		

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
10	20	30	40		

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SOURCE
		X

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
40 %	40 %	20 %

7. SHADE OR CANOPY COVER GOOD OVER 85 %

8. FLOW (CFS) 7.4 COMPARED TO NORMAL

LOW	NORMAL	HIGH
	X	

9. PRESENT WEATHER

SUNNY AND MILD; AIR TEMP. 68 F @ 1642

10. PAST WEATHER (last 24 hrs)

SAME; COOL OVERNIGHT

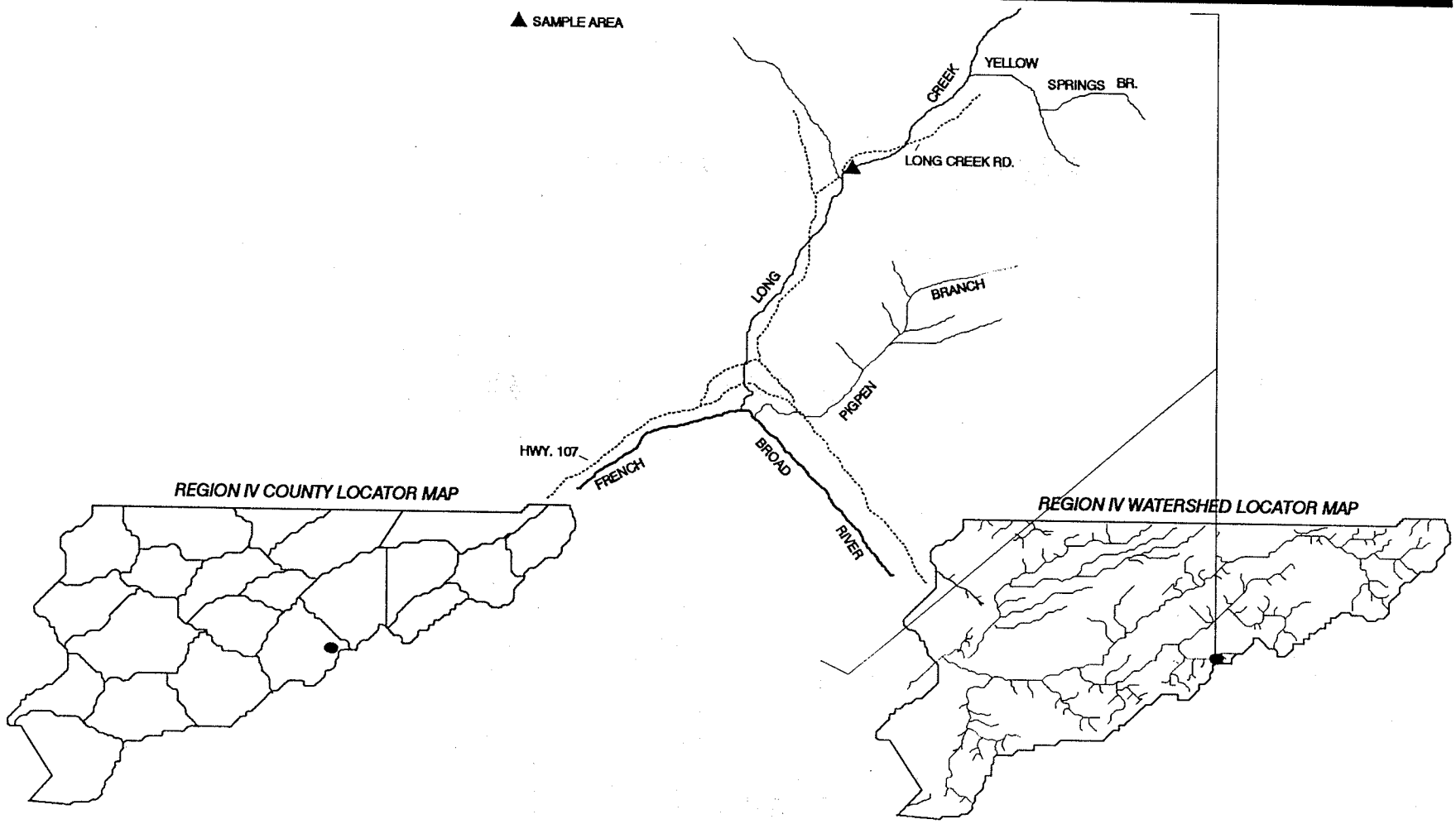
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
6.5	17.0	275	9.6	100

12. COMMENTS

SAMPLE AREA LOCATED ON FOREST SERVICE JUST UPSTREAM FROM SPENCER BRANCH ON LONG CREEK RD.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE N/A



STREAM CPUE FISH DATA FOR LONG CREEK

Stream: Long Creek
Site: @ Spencer Branch
Time of Sample: N/A
Gear: backpack electrofishing
Number of Shockers: 1
Comments: Crew- B.D. Carter and C.E. Williams

Date: 5-21-97
Lat-Long: 355746N-830240W
Total Effort: 1800 seconds
Voltage: 125 VAC
Number of Netters: 1

SPECIES	TADS CODE	RANGE (mm)	10-mm CLASS	TOTAL NUMBER	TOTAL WT (g)	FISH/ HOUR
Ambloplites rupestris	**342**	**69-238**	**All**	**12**	**932**	**24**
			60	1	7	
			80	1	15	
			90	1	18	
			110	1	41	
			140	2	107	
			150	1	87	
			160	1	78	
			170	2	195	
			180	1	113	
			230	1	271	
Lepomis auritus	**346**	**48-203**	**All**	**17**	**732**	**34**
Lepomis macrochirus	**351**	**55-102**	**All**	**14**	**106**	**28**
Ameiurus natalis	**233**		**All**	**1**		**2**
Campostoma anomalum	**45**		**All**	**23**		**46**
Catostomus commersoni	**195**		**All**	**17**		**34**
Cottus carolinae	**322**		**All**	**29**		**58**
Cyprinella galactura	**54**		**All**	**4**		**8**
Cyprinella spiloptera	**57**		**All**	**1**		**2**
Dorosoma cepedianum	**41**		**All**	**9**		**18**
Etheostoma simoterum	**435**		**All**	**24**		**48**
Hybopsis amblops	**79**		**All**	**6**		**12**
Hypentelium nigricans	**207**		**All**	**17**		**34**
Luxilus chrysocephalus	**89**		**All**	**36**		**72**
Luxilus coccogenis	**90**		**All**	**5**		**10**
Moxostoma duquesnei	**224**		**All**	**6**		**12**
Rhinichthys atratulus	**184**		**All**	**3**		**6**
Semotilus atromaculatus	**188**		**All**	**15**		**30**

Laurel Branch

One CPUE fishery survey was conducted on Laurel Branch in May 1997:

Location and Length - Tributary to the French Broad River. The survey site was located at the Hwy. 107 crossing near the community of Del Rio. The survey site extended approximately 75 m downstream of Hwy 107 and about 125 m upstream of the highway. The site was sampled on 21 May 1997.

Sampling Methodology - This site was sampled with one backpack electrofishing unit operating at 200 VAC.

Water Quality - (See physiochemical and site location form)

Benthic Collection - (No collection made)

Fish Collected - (See fish data form for fish list and CPUE data)

Comments - This stream was surveyed to develop a fish species list for TADS and to collect otolith samples from any rock bass and/or smallmouth bass collected. The Agency has made no previous collections from this stream.

Laurel Branch originates on Meadow Creek Mountain (U.S. Forest Service property) some 7 km upstream of our sample site. It incurs heavy spring influence as it courses towards the French Broad River. This spring influence decreases the overall temperature of the stream, resulting in the establishment of cold water habitat in the upstream reaches.

Our survey of Laurel Branch was conducted in order to obtain CPUE data on the fish species present. A 0.6 hour electrofishing effort was made in which all fish captured were counted, and in the case of rock bass individual lengths and weights obtained (see Fig. 4 for length frequency distribution). Our effort at this site resulted in the collection of 260 fish representing 15 species. These included rock bass (*Ambloplites rupestris*), rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), redbreast sunfish (*Lepomis auritus*), green sunfish (*L. cyanellus*), white sucker (*Catostomus commersoni*), central stoneroller (*Campostoma anomalum*), banded sculpin (*Cottus carolinae*), blacknose dace (*Rhinichthys atratulus*), whitetail shiner (*Cyprinella galactura*), warpaint shiner (*Luxilus coccogenis*), creek chub (*Semotilus atromaculatus*), redline darter (*Etheostoma rufilineatum*), snubnose darter (*E. simoterum*), and black redhorse (*Moxostoma duquesnei*). The trout we collected appeared to be in good condition and had a "wild" appearance. However, because of the narrow size distribution and the lack of any obvious reproduction, it is believed these fish were planted in the stream as fingerlings. Further investigation upstream revealed similar findings of low trout abundance, a narrow size distribution, and no apparent reproduction.

Our CPUE data was based on a 0.6 hour sample with one backpack unit. Fish per hour values ranged from a high of 83.3 for central stoneroller and banded sculpin to a low of 1.7 for brown trout and green sunfish. The catch rate for rock bass was fairly high at 33.3/hour (20 individuals used in estimate), while the catch for rainbow trout was determined to be 15/hour (see accompanying table for individual CPUE data).

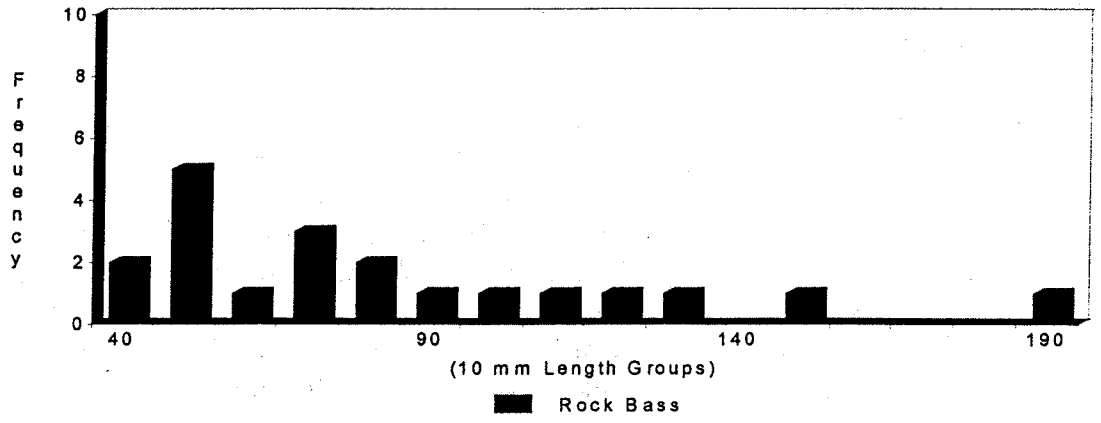
Laurel Branch represent a fairly undisturbed stream as little development has taken place in the watershed. Fine sediment in the substrate was quite low above the highway while levels appeared to increase somewhat below. The increase below the highway can be attributed to adjacent land clearing activities occurring at the time of our sample.

Management Recommendations:

1. Consider monitoring this stream in the future to determine if a self-sustaining trout population has been established.

2. Any action to protect the watershed from negligent development and non-point source pollution would allow this stream to retain its relatively "clean" attributes.

Figure 4. Length Frequency Distribution for Rock Bass Collected in Laurel Branch during 1997



PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	LAUREL BRANCH
WATERSHED	FRENCH BROAD RIVER
SITE	@ HWY. 107 X-ING
COUNTY	COCKE
QUADRANGLE	NEDDY MTN. 173 NE
LAT-LONG	355536N-830020W
REACH	06010107-
LENGTH	~ 150 m
AREA (SQ. KM.)	N/A
ELEVATION	1155 FT
DATE	5-21-97
TIME	1200

COLLECTOR(S)

B.D. CARTER AND C.E. WILLIAMS

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
N/A	N/A	N/A

2. ESTIMATED % OF STREAM IN POOLS IS 30

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
10	20	10	30	30	

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
5	10	10	50	25	

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE
		X

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
20 %	40 %	40 %

7. SHADE OR CANOPY COVER GOOD OVER 70 %

8. FLOW (CFS) 3.5 **COMPARED TO NORMAL**

LOW	NORMAL	HIGH
	X	

9. PRESENT WEATHER

SUNNY AND MILD; AIR TEMP. 70 F @ 1200

10. PAST WEATHER (last 24 hrs)

SAME; COOL OVERNIGHT

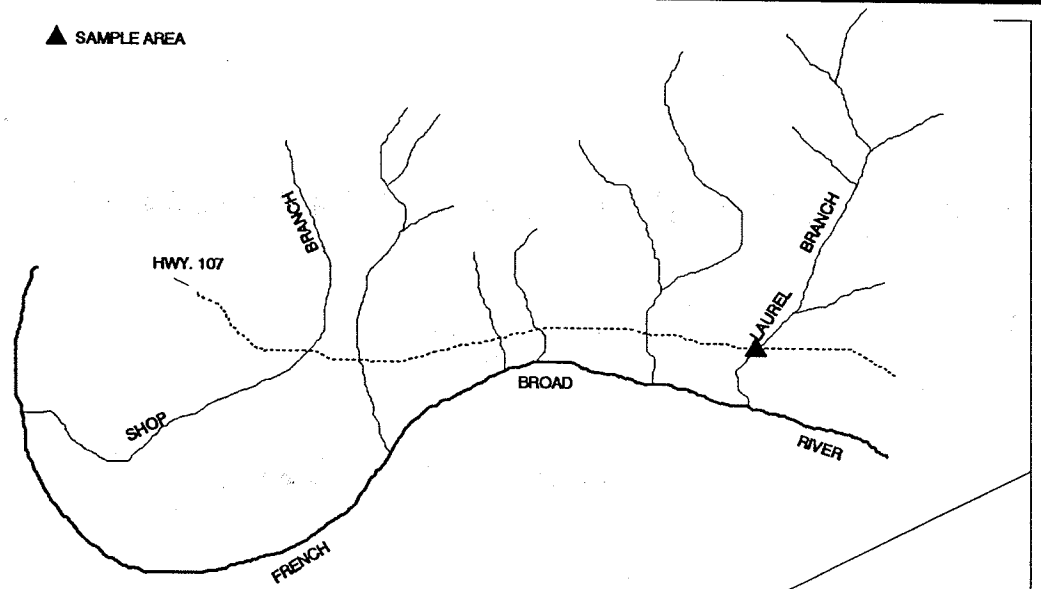
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
6.5	14.9	110	10.1	100.5

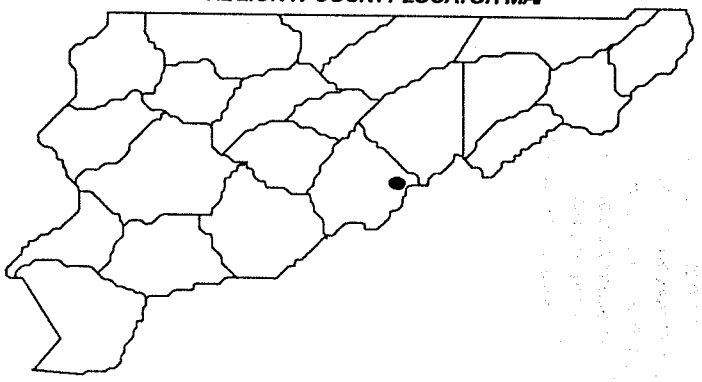
12. COMMENTS

SAMPLE AREA LOCATED @ HWY. 107 X-ING. SAMPLED UPSTREAM AND DOWNSTREAM OF CROSSING.

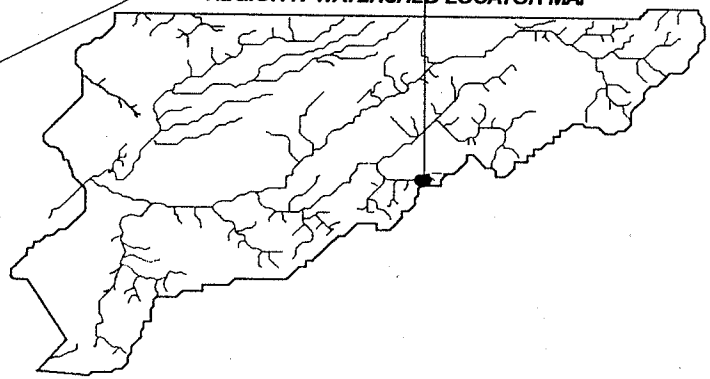
13. $\bar{X}$ HABITAT ASSESSMENT SCORE N/A



REGION IV COUNTY LOCATOR MAP



REGION IV WATERSHED LOCATOR MAP



STREAM CPUE FISH DATA FOR LAUREL BRANCH

Stream: Laurel Branch
Site: @ Hwy. 107 x-ing
Time of Sample: N/A
Gear: backpack electrofishing
Number of Shockers: 1
Comments: Crew- B.D. Carter and C.E. Williams

Date: 5-21-97
Lat-Long: 355536N-830020W
Total Effort: 2040 seconds
Voltage: 200 VAC
Number of Netters: 1

SPECIES	TADS CODE	RANGE (mm)	10-mm CLASS	TOTAL NUMBER	TOTAL WT (g)	FISH/ HOUR
Ambloplites rupestris	**342**	**47-191**	**All**	**20**	**453**	**33.3**
			40	2	4	
			50	5	13	
			60	1	4	
			70	3	27	
			80	2	22	
			90	1	19	
			100	1	19	
			110	1	31	
			120	1	40	
			130	1	44	
			150	1	78	
			190	1	152	
Lepomis auritus	**346**	**57-77**	**All**	**2**	**11**	**3.3**
Lepomis cyanellus	**347**	**82**	**All**	**1**	**10**	**1.7**
Oncorhynchus mykiss	**279**	**142-205**	**All**	**9**	**518**	**15**
Salmo trutta	**284**	**158**	**All**	**1**	**43**	**1.7**
Campostoma anomalum	**45**		**All**	**50**		**83.3**
Catostomus commersoni	**195**		**All**	**3**		**5**
Cottus carolinae	**322**		**All**	**50**		**83.3**
Cyprinella galactura	**54**		**All**	**3**		**5**
Etheostoma rufilineatum	**431**		**All**	**8**		**13.3**
Etheostoma simoterum	**435**		**All**	**30**		**50**
Luxilus coccogenis	**90**		**All**	**2**		**3.3**
Moxostoma duquesnei	**224**		**All**	**9**		**15**
Rhinichthys atratulus	**184**		**All**	**35**		**58.3**
Semotilus atromaculatus	**188**		**All**	**36**		**60**

Richland Creek

One IBI fishery survey was conducted on Richland Creek in May 1997:

Location and Length - Tributary to the Nolichucky River. The sample area was located at the low water ford on Link Mill Road approximately 0.5 km upstream of Davy Crockett Lake. The sample area was approximately 250 m in length and was sampled on 27 May 1997.

Sampling Methodology - This site was sampled with one backpack shocker at 125 VAC and a 4.5 m seine.

Water Quality - (See physicochemical and sample site location form)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and IBI analysis)

Comments - We were primarily interested in evaluating the relative health of this reach of stream. The Agency has made no previous survey of this stream.

We collected a total of 358 fish representing 12 species during our IBI survey of Richland Creek. Three game species were collected during our efforts. These included redbreast sunfish (*Lepomis auritus*), bluegill (*L. macrochirus*), and warmouth (*L. gulosus*). The two most abundant species collected in our survey were central stoneroller (*Campostoma anomalum*) and blacknose dace (*Rhinichthys atratulus*). Together these two species accounted for 71.5% of the total number of fish collected. The only darter species collected was the snubnose darter (*Etheostoma simoterum*).

Our Index of Biotic Integrity analysis indicated this stream was in "poor" condition based on an IBI score of 30. Overall, very few of the metrics scored high with most of the low score being attributable to the low species richness and the high percentage of tolerant fish species in the community. Much of the watershed drains in and around the town of Greeneville which has contributed to the degradation of this stream. Additionally, the stream flows through a well developed agricultural area and in close proximity to a golf course before entering the Nolichucky River.

Benthic macroinvertebrates collected in our survey reach included Baetidae, Heptageniidae, Isonychiidae, and Leptophlebiidae mayflies; Perlidae stoneflies; and Hydropsychidae caddisflies. Dipterans were the most abundant organisms in our sample comprising 46.0% of the sample. Coleopterans were second most abundant accounting for 12.9% of the total sample. Trichopterans comprised 10.0%, while ephemeropterans and plecopterans contributed 9.3% and 0.2%, respectively. A total of 31 taxa was collected in our sample of which nine were EPT. Based on the EPT taxa richness value

and the overall biotic index of all taxa collected, the relative health of the benthic community was classified as "fair".

Our evaluation of the physical instream habitat and riparian zone in this reach resulted in a mean score of 128. Based on this score and our overall observations of the stream, this reach of ~~Clear~~ Richland Creek was designated as "sub-optimal".

Management Recommendations:

1. Any action that would address point and non-point source pollution within the watershed would be beneficial.

PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	RICHLAND CREEK
WATERSHED	NOLICHUCKY RIVER
SITE	@ LINK MILL FORD
COUNTY	GREENE
QUADRANGLE	DAVY CROCKETT LAKE 181 SE
LAT-LONG	360553N-825110W
REACH	06010108-85.0
LENGTH	~ 250 m
AREA (SQ. KM.)	38.6
ELEVATION	1270 FT
DATE	5-27-97
TIME	1530

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, AND C.E. WILLIAMS

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
9.3 m	0.3 m	0.8 m

2. ESTIMATED % OF STREAM IN POOLS IS 30

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
20	10	20		20	30

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
	20	20	10	10	40

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SPARCE
		X

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
15 %	30 %	55 %

7. SHADE OR CANOPY COVER GOOD OVER 70 %

8. FLOW (CFS) 20.4 **COMPARED TO NORMAL**

LOW	NORMAL	HIGH
		X

9. PRESENT WEATHER

CLOUDY AND COOL; AIR TEMP. 70 F @ 1536

10. PAST WEATHER (last 24 hrs)

HOT AND HUMID; T-STORMS OVERNIGHT

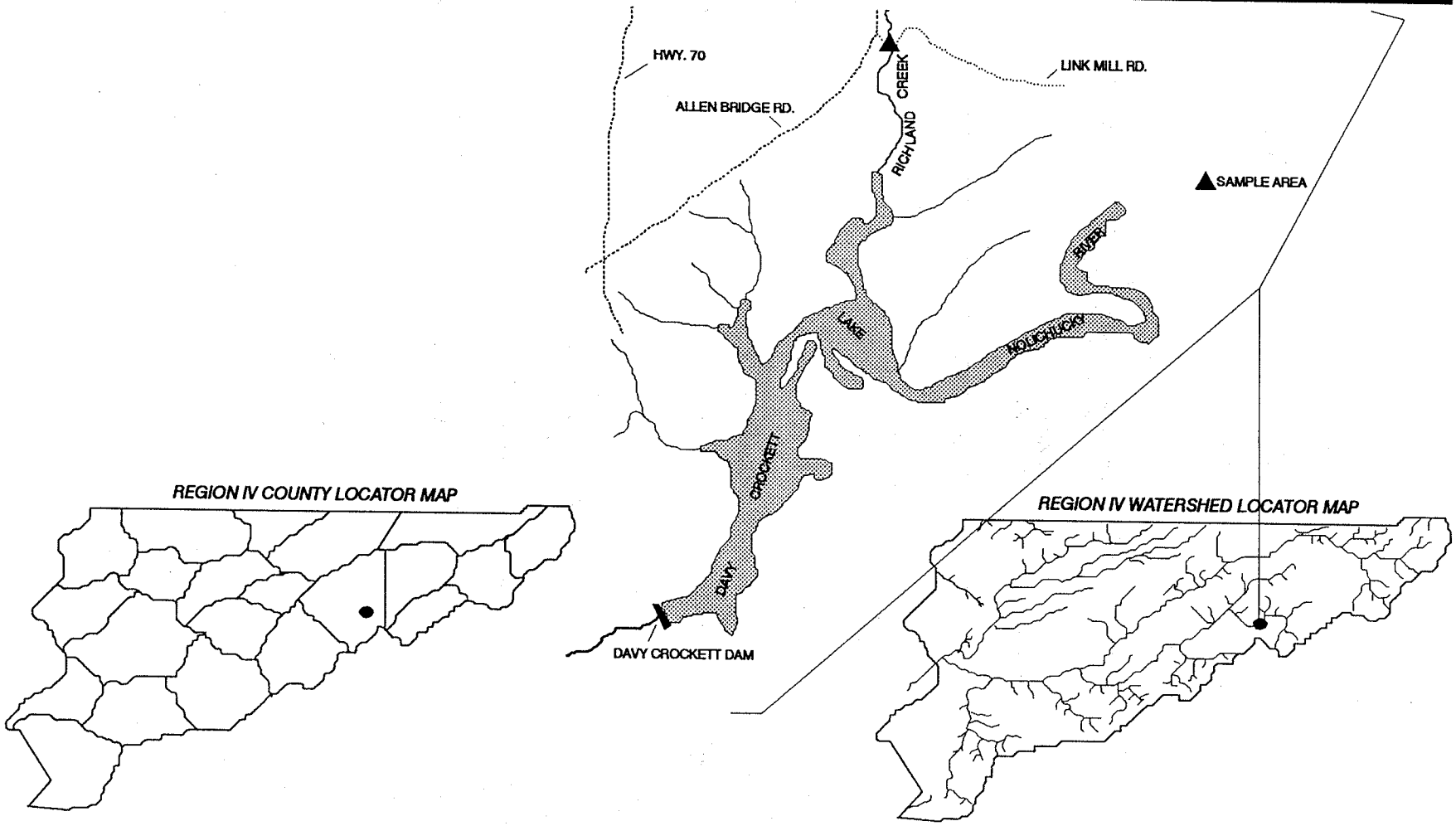
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
6.8	19.0	375	9.5	101.7

12. COMMENTS

SAMPLE AREA LOCATED AT LOW WATER FORD ON LINK MILL ROAD. SAMPLED UPSTREAM AND DOWNSTREAM OF FORD.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE 128



RICHLAND CREEK FISH DATA

SAMPLING TYPE: SEINING AND SHOCKING

GEAR TYPE: 4.5 m SEINE AND ONE BACKPACK UNIT @ 125 VAC

SPECIES	TADS CODE	NO. COLL.	RANGE(mm)	TOT. WEIGHT(g)	NOTE
Campostoma anomalum	45	215			
Catostomus commersoni	195	7			
Cottus carolinae	322	15			
Cyprinella spiloptera	57	2			
Etheostoma simoterum	435	39			
Lepomis auritus	346	1	91	9	
Lepomis gulosus	349	1	68	5	
Lepomis macrochirus	351	27	38-118	210	
Moxostoma duquesnei	224	6			
Moxostoma erythrurum	225	1			
Rhinicthys atratulus	184	41			
Semotilus atromaculatus	188	3			
	SUM:	358			

INDEX OF BIOTIC INTEGRITY

METRIC DESCRIPTION	SCORING CRITERIA 1	3	5	OBSERVED	SCORE
NUMBER OF NATIVE SP.	<9	9-17	>17	11	3
NUMBER OF DARTER SP.	<2	2-3	>3	1	1
NUMBER OF SUNFISH SP. *less Micropterus*	<2	2	>2	2	3
NUMBER OF SUCKER SP.	<2	2	>2	3	5
NUMBER OF INTOLERANT SP.	<2	2	>2	1	1
PERCENT OF INDIVIDUALS AS TOLERANT	>35	35-18	<18	3.4	5
PERCENT OF INDIVIDUALS AS OMNIVORES	>42	42-22	<22	62.2	1
PERCENT OF INDIVIDUALS AS SPECIALISTS	<17	17-33	>33	10.9	1
PERCENT OF INDIVIDUALS AS PISCIVORES	<2.0	2.0-4.0	>4.0	0	1
CATCH RATE	<24.1	24.1-48.1	>48.1	34	3
PERCENT OF INDIVIDUALS AS HYBRIDS	>1	TR-1	0	0	5
PERCENT OF INDIVIDUALS WITH ANOMALIES	>5	5-2	<2	38.9	1
					30 **POOR**

IBI RANGE:	**0**	**12-22**	**28-34**	**40-44**	**48-52**	**58-60**
STREAM DESIGNATION:	**NO FISH**	**VERY POOR**	**POOR**	**FAIR**	**GOOD**	**EXCELLENT**

RICHLAND CREEK
FIELD # 869
EFFORT = 3 PERSON HOURS

TAXA RICHNESS = 31
EPT TAXA RICHNESS = 9
BIOCLASSIFICATION = (2.3) FAIR

			NUMBER	PERCENT
ANNELIDA				1.1
	Oligochaeta		5	
COLEOPTERA				12.9
	Elmidae	*Dubiraphia* adults	3	
		Macronychus glabratus	1	
		Stenelmis larvae and adults	53	
DIPTERA				46.0
	Chironomidae		106	
	Empididae		1	
	Simuliidae		90	
	Tipulidae	*Antocha*	5	
		Tipula	1	
EPHEMEROPTERA				9.3
	Baetidae	*Baetis*	32	
	Heptageniidae	*Stenacron*	6	
		Stenonema	1	
	Isonychiidae	*Isonychia*	1	
	Leptophlebiidae	*Habrophlebiodes*	1	
GASTROPODA				1.6
	Physidae		7	
HEMIPTERA				1.1
	Belostomatidae	*Belostoma*	1	
	Corixidae		3	
	Gerridae	*Gerris remigis*	1	
ISOPODA				5.4
	Asellidae	*Asellus*	24	
MEGALOPTERA				1.4
	Corydalidae	*Corydalus cornutus*	5	
		Nigronia serricornis	1	
ODONATA				10.2
	Aeshnidae	*Boyeria vinosa*	13	
	Calopterygidae	*Calopteryx*	26	
	Coenagrionidae	*Argia*	2	
	Gomphidae	*Gomphus lividus*	3	
		Hagenius brevistylus	1	
PELECYPODA				0.7
	Corbiculidae	*Corbicula fluminea*	3	
PLECOPTERA				0.2
	Perlidae	*Perlesta*	1	
TRICHOPTERA				10.0
	Hydropsychidae	*Cheumatopsyche*	17	
		Hydropsyche betteni/depravata	26	
		Hydropsyche frisoni	1	
		TOTAL	**441**	

Middle Creek

One IBI fishery survey was conducted on Middle Creek in May 1997:

Location and Length - Tributary to the Nolichucky River. The sample area was located just upstream of the mouth near Nolichucky River mile 59.6. The sample area was approximately 150 m in length and was sampled on 28 May 1997.

Sampling Methodology - This site was sampled with one backpack shocker at 150 VAC and a 3 m seine.

Water Quality - (See physicochemical and sample site location form)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and IBI analysis)

Comments - We were primarily interested in evaluating the relative health of this reach of stream. The Agency has made no previous survey of this stream.

We collected a total of 433 fish representing seven species during our IBI survey of Middle Creek. One game species (stocked rainbow trout) was collected during our efforts. The two most abundant species collected in our survey were snubnose darter (*Etheostoma simoterum*) and blacknose dace (*Rhinichthys atratulus*). Together these two species accounted for 72.0% of the total number of fish collected. The snubnose darter was the only darter collected in our survey.

Our Index of Biotic Integrity analysis indicated this stream was in "poor" condition based on an IBI score of 34. Much of the watershed has been subjected to agricultural development which has resulted in increased sediment loads to the stream. We also noted that within the reach we surveyed there was a high incidence of bedrock within the pool and riffle areas. The relatively high occurrence of this unproductive habitat coupled with the small size of the stream and substantial spring influence were key factors in regulating the abundance and diversity of fish in the reach we surveyed. The most negatively influential metrics were the overall lack of species richness, the low number of intolerant species, and the absence of piscivores in the fish community.

Benthic macroinvertebrates collected in our survey reach included Baetidae, Caenidae, Ephemerillidae, Ephemeridae, Heptageniidae, Isonychiidae, and Leptophlebiidae mayflies; Perlidae and Perlodidae stoneflies; and Goeridae, Hydropsychidae, Philopotamidae, and Uenoidae caddisflies. Trichopterans were the most abundant organisms in our sample comprising 33.0% of the total sample. Ephemeropterans were second most abundant accounting for 28.0%, while plecopterans only contributed 0.9% to the overall sample. Dipterans and coleopterans were fairly abundant with each group contributing about 12.0% to the total sample. A total of 41

taxa was collected in our sample of which 20 were EPT. Based on the EPT taxa richness value and the overall biotic index of all taxa, collected the relative health of the benthic community was classified as "good".

Our evaluation of the physical instream habitat and riparian zone in this reach resulted in a mean score of 114. Based on this score and our overall observations of the stream, this reach of Middle Creek was designated as "sub-optimal".

Management Recommendations:

1. Any action that would address non-point source pollution within the watershed would be beneficial.

PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	MIDDLE CREEK
WATERSHED	NOLICHUCKY RIVER
SITE	@ MOUTH
COUNTY	GREENE
QUADRANGLE	CHUCKEY 190 NW
LAT-LONG	360856N-824405W
REACH	06010108-55.0
LENGTH	~ 150 m
AREA (SQ. KM.)	19.2
ELEVATION	1300 FT
DATE	5-28-97
TIME	1500

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, AND C.E. WILLIAMS

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
6.1 m	0.3 m	2.0 m

2. ESTIMATED % OF STREAM IN POOLS IS 20

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
15	15	10	20	15	25

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
5	10	20	30	20	15

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE
		X

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
20 %	20 %	60 %

7. SHADE OR CANOPY COVER GOOD OVER 10 %

8. FLOW (CFS) 17.9 **COMPARED TO NORMAL**

LOW	NORMAL	HIGH
	X	

9. PRESENT WEATHER

CLOUDY AND COOL; AIR TEMP. 66 F @ 1513

10. PAST WEATHER (last 24 hrs)

SAME; T-STORMS OVERNIGHT

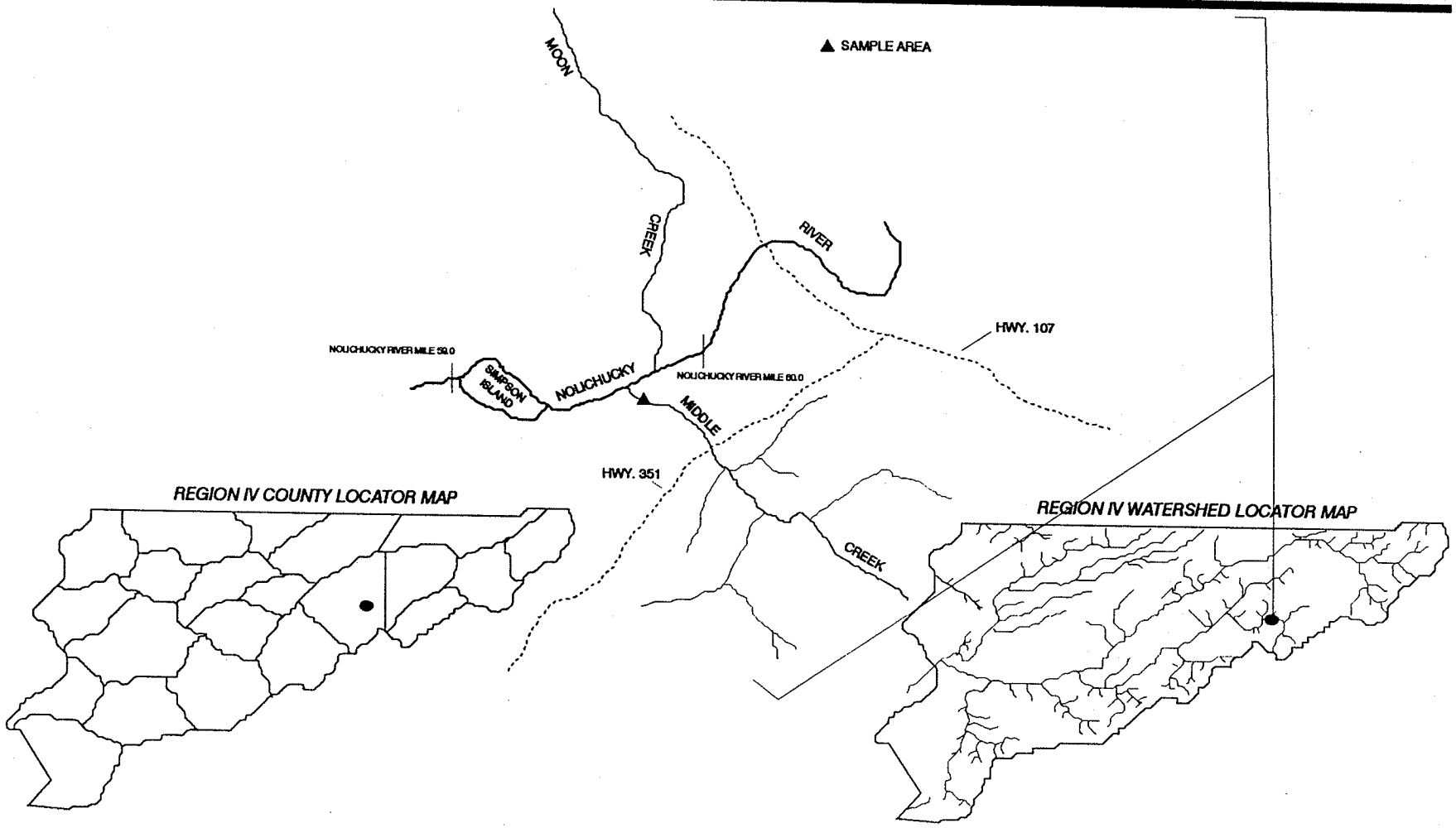
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
6.8	15.4	180	9.5	95.6

12. COMMENTS

SAMPLE AREA LOCATED AT MOUTH JUST ABOVE WATERFALL.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE 114



MIDDLE CREEK FISH DATA

SAMPLING TYPE: SEINING AND SHOCKING

GEAR TYPE: 3 m SEINE AND ONE BACKPACK UNIT @ 150 VAC

SPECIES	TADS CODE	NO. COLL.	RANGE(mm)	TOT. WEIGHT(g)	NOTE
Campostoma anomalum	45	88			
Catostomus commersoni	195	1			
Cottus carolinae	322	11			
Etheostoma simoterum	435	116			
Oncorhynchus mykiss	279	1	302		
Rhinicthys atratulus	184	196			
Semotilus atromaculatus	188	20			
		SUM: 433			

INDEX OF BIOTIC INTEGRITY

METRIC DESCRIPTION	SCORING CRITERIA 1	3	5	OBSERVED	SCORE
NUMBER OF NATIVE SP.	<7	7-13	>13	6	1
NUMBER OF DARTER SP.	<2	2-3	>3	1	1
NUMBER OF SUNFISH SP. *less Micropterus*	0	1	>1	0	1
NUMBER OF SUCKER SP.	0	1	>1	1	3
NUMBER OF INTOLERANT SP.	<2	2	>2	0	1
PERCENT OF INDIVIDUALS AS TOLERANT	>38	38-20	<20	4.8	5
PERCENT OF INDIVIDUALS AS OMNIVORES	>47	47-24	<24	20.6	5
PERCENT OF INDIVIDUALS AS SPECIALISTS	<14	14-27	>27	26.8	3
PERCENT OF INDIVIDUALS AS PISCIVORES	<1.9	1.9-3.6	>3.6	0	1
CATCH RATE	<29.2	29.2-58.2	>58.2	88.4	5
PERCENT OF INDIVIDUALS AS HYBRIDS	>1	TR-1	0	0	5
PERCENT OF INDIVIDUALS WITH ANOMALIES	>5	5-2	<2	2.5	3
					34 **POOR**

IBI RANGE:	0	12-22	28-34	40-44	48-52	58-60
STREAM DESIGNATION:	**NO FISH**	**VERY POOR**	**POOR**	**FAIR**	**GOOD**	**EXCELLENT**

MIDDLE CREEK
FIELD # 870
EFFORT = 3 PERSON HOURS

TAXA RICHNESS = 41
EPT TAXA RICHNESS = 20
BIOCLASSIFICATION = (4.0) GOOD

			NUMBER	PERCENT
ANNELIDA				0.4
	Oligochaeta		2	
COLEOPTERA				12.3
	Elmidae	*Dubiraphia* adults	6	
		Optioservus larvae and adults	16	
		Stenelmis larvae and adults	32	
	Psephenidae	*Psephenus herricki*	15	
DIPTERA				12.0
	Chironomidae		50	
	Dixidae	*Dixa*	7	
	Simuliidae		8	
	Tipulidae	*Hexatoma*	1	
		Tipula	1	
EPHEMEROPTERA				28.0
	Baetidae	*Baetis*	40	
	Caenidae	*Caenis*	1	
	Ephemerellidae	*Ephemerella*	3	
		Eurylophella	1	
		Serratella	30	
	Ephemeridae	*Ephemera*	14	
	Heptageniidae	*Stenacron*	10	
		Stenonema	41	
	Isonychiidae	*Isonychia*	10	
	Leptophlebiidae	*Habrophlebiodes*	7	
GASTROPODA				7.3
	Physidae		1	
	Pleuroceridae		40	
HEMIPTERA				0.4
	Corixidae		1	
	Veliidae	*Rhagovelia obesa*	1	
MEGALOPTERA				0.5
	Corydalidae	*Corydalus cornutus*	1	
		Nigronia serricornis	2	
ODONATA				5.2
	Aeshnidae	*Boyeria vinosa*	5	
	Calopterygidae	*Calopteryx*	18	
	Coenagrionidae	*Argia*	1	
	Gomphidae	*Gomphurus rogersi*	4	
		Stylurus laurae	1	
PLECOPTERA				0.9
	Perlidae	*Paragnetina* (pale brown specimens)	2	
		Perlesta	2	
	Perlodidae	*Isoperla holochlora*	1	
TRICHOPTERA				33.0
	Goeridae	*Goera calcarata*	4	
	Hydropsychidae	*Ceratopsyche bronta*	36	
		Cheumatopsyche	18	
		Hydropsyche betteni/depravata	114	
		Hydropsyche rotosa	1	
	Philopotamidae	*Dolophilodes distinctus*	2	
	Uenoidae	*Neophylax auris/etnieri*	10	
		TOTAL	**560**	

Pigeon River

Five fishery surveys were conducted on the Pigeon River in July 1997:

Location and Length - Tributary to the French Broad River, the sample areas were as follows: Tannery Island @ Pigeon River mile 8.2 along Hwy. 73, Wilton Springs @ Pigeon River mile 13.0, Denton Bridge on Greasy Cove Rd. @ Pigeon River mile 16.6, Bluffton @ Pigeon River mile 19.0, and Hartford @ Pigeon River mile 20.5.

Sampling Methodology - The sites were sampled with one boat electrofishing unit operating at 3-4 Amps DC, one backpack unit operating at 125 VAC and one 4.5 m seine.

Water Quality - (None recorded)

Benthic Collection - (TVA made collections at the Tannery Island and Denton sites)

Fish Collected - (See fish data form for species list and CPUE data)

Comments - Three of the stream reaches were surveyed to collect otolith samples from rock bass (*Ambloplites rupestris*) and smallmouth bass (*Micropterus dolomieu*) for the statewide age and growth evaluation and to begin developing electrofishing catch-effort data for these species. Two of the sites where otoliths were collected (Tannery Island and Denton) were sampled in cooperation with TVA (see Fagg 1998 for IBI data summary). These sites are long term IBI monitoring stations and were not sampled to obtain CPUE data on game species. Therefore, CPUE estimates for rock bass and black bass at these sites are not reported.

The Pigeon River has had a long history of pollution problems, stemming primarily from the 80+ year discharge of waste water from the Champion Paper Mill in Canton, North Carolina. This discharge has undoubtedly has had a profound effect on the recreational use of the river and after the discovery of elevated dioxon levels in the 1980's raised concerns about public health (TDEC 1996). Although the river has received increased attention in recent years, the recreational use of the river has not reached its full potential. In terms of the fishery, consumption of all fish was prohibited up until 1996 when the ordinance was downgraded, limiting consumption of carp, catfish, and redbreast sunfish (TDEC 1996). Despite the continued posting of consumption advisories, the river does draw a relatively substantial amount of angling pressure. Our 1997 surveys focused collecting otolith samples from rock bass and black bass as well as the initiation of baseline data collection on game species. We chose to sample several localities in a longitudinal sampling scheme that encompassed approximately 20.5 km of river from the city of Newport to the community of Hartford.

Our survey of the Pigeon River at Tannery Island (river mile 8.2) resulted in the collection of 25 smallmouth bass ranging from 81 to 482 mm and four spotted bass (*Micropterus punctulatus*) ranging from 124 to 273 mm (see Fig. 5 for length frequency distributions). Because of the type of sampling done at this site (IBI) CPUE estimates were not calculated.

The survey at the Wilton Springs site (river mile 13.0), accounted for the collection of 27 smallmouth bass (20 used in CPUE estimate), 27 rock bass (21 used in CPUE estimate), eight spotted bass (five used in CPUE estimate), and 13 largemouth bass (*Micropterus salmoides*) (12 used in CPUE estimate) during a 1.4 hour sample. Smallmouth bass ranged in length from 86 to 440 mm, rock bass from 104 to 225 mm, spotted bass 166 to 337 mm, and largemouth bass from 106 to 439 mm (see Fig. 6 for length frequency distributions). Catch-effort evaluations indicated smallmouth occurred at the rate of 14.3/hour, rock bass at the rate of 15/hour, spotted bass at the rate of 3.6/hour, and largemouth bass at 8.6/hour.

Our survey of the Pigeon River at Denton (river mile 16.6) resulted in the collection of 30 smallmouth bass ranging from 72 to 292 mm, 20 rock bass ranging from 70 to 211 mm, and 15 spotted bass ranging from 83 to 335 mm (see Fig. 7 for length frequency distributions. Because of the type of sampling done at this site (IBI) CPUE estimates were not calculated.

The survey at the Bluffton site (river mile 19.0), resulted in the collection of 23 smallmouth bass (19 used in CPUE estimate), and one rock bass during a 0.8 hour sample. Smallmouth bass ranged in length from 78 to 367 mm, while the one rock bass measured 115 mm (see Fig. 8 for length frequency distributions). Catch-effort evaluations indicated smallmouth occurred at the rate of 23.7/hour and rock bass at a rate of 1.3/hour.

Our survey at the Hartford site (river mile 20.5), resulted in the collection of 23 smallmouth bass (22 used in CPUE estimate), four rock bass, seven spotted bass, and three largemouth bass during a 1.0 hour sample. Smallmouth bass ranged in length from 78 to 470 mm, rock bass from 145 mm 203 mm, spotted bass from 254 to 371 mm, and largemouth bass from 235 mm to 450 mm (see Fig. 9 for length frequency distributions). Catch-effort evaluations indicated smallmouth occurred at the rate of 22/hour, rock bass at a rate of 4/hour, spotted bass at a rate of 7/hour, and largemouth bass at a rate of 3/hour.

Management Recommendations:

1. Any actions that could address protection of riparian zones and limit non-point and point source pollution within the watershed would be of benefit to this stream.

2. Conduct additional CPUE and otolith sampling at these sites in 1998.

Figure 5. Length Frequency Distributions for Smallmouth Bass and Spotted Bass Collected in the Pigeon River (Tannery Island) during 1997

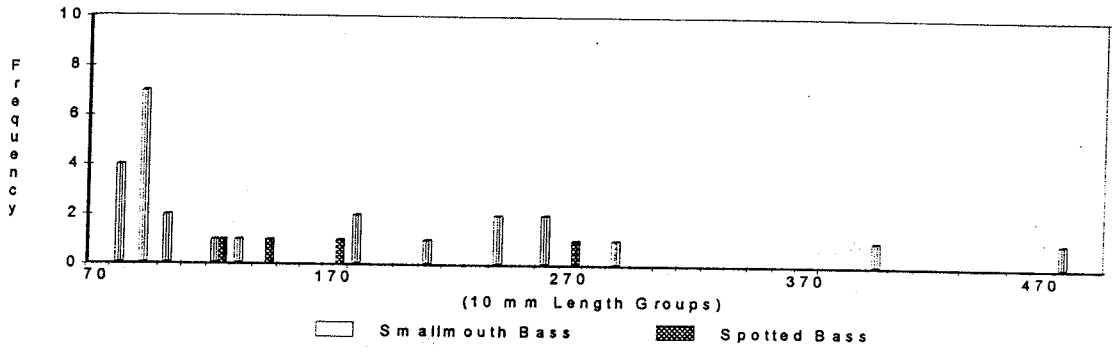


Figure 6. Length Frequency Distributions for Smallmouth Bass, Spotted Bass, Largemouth Bass, and Rock Bass Collected in the Pigeon River (Wilton Springs) during 1997

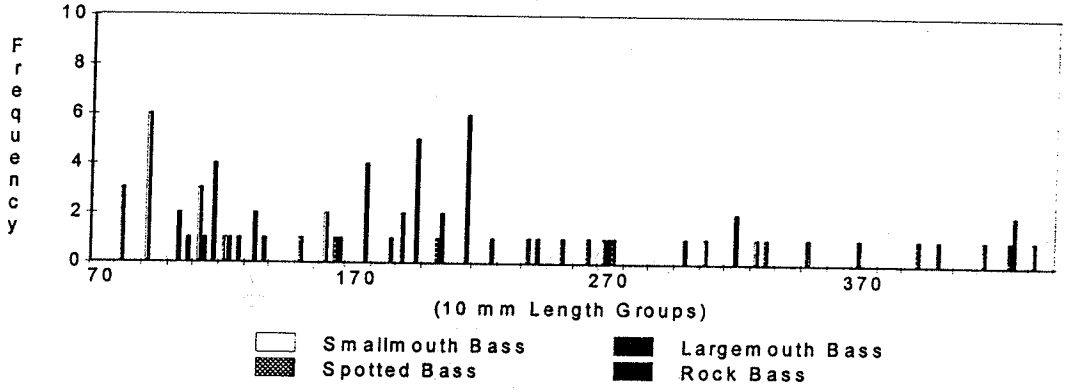


Figure 7. Length Frequency Distributions for Smallmouth Bass, Spotted Bass, and Rock Bass Collected in the Pigeon River (Denton) during 1997

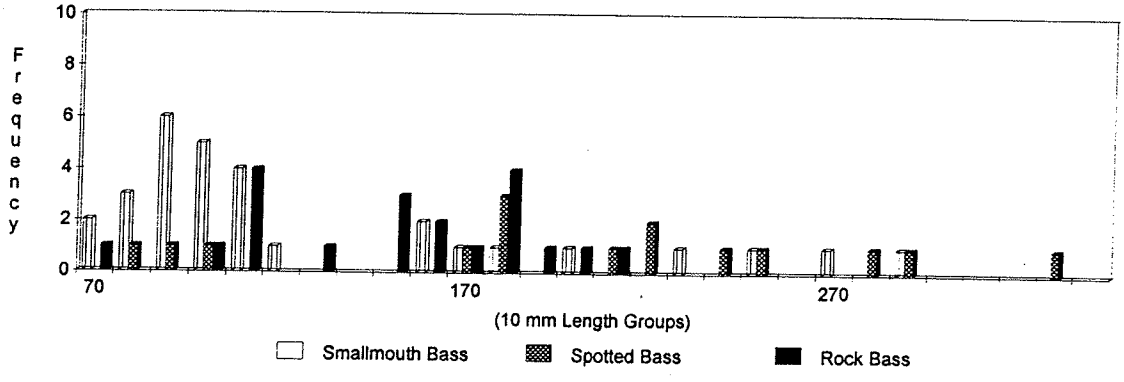


Figure 8. Length Frequency Distributions for Smallmouth Bass, Spotted Bass, and Rock Bass Collected in the Pigeon River (Bluffton) during 1997

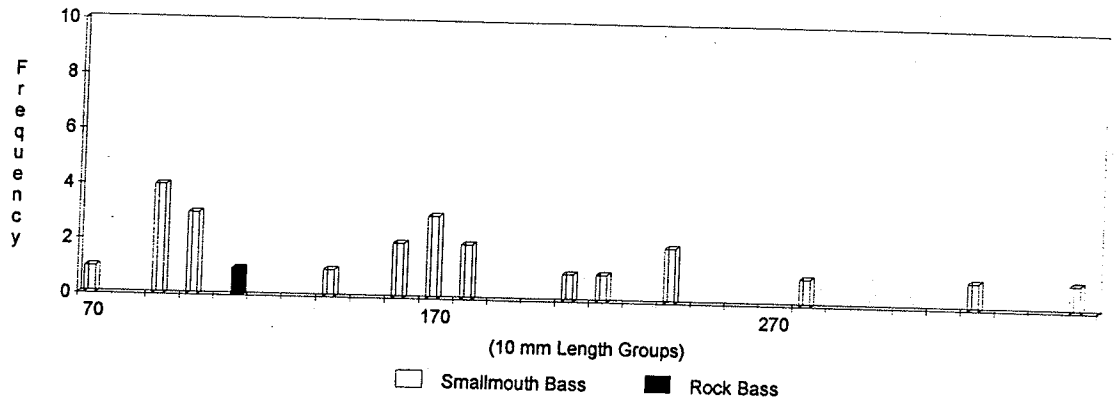
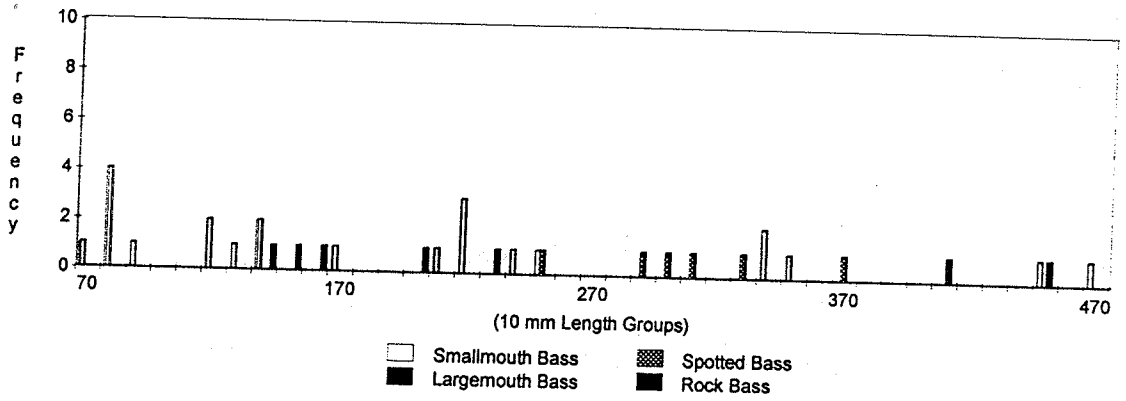


Figure 9. Length Frequency Distributions for Smallmouth Bass, Spotted Bass, Largemouth Bass, and Rock Bass Collected in the Pigeon River (Hartford) during 1997



PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	PIGEON RIVER
WATERSHED	FRENCH BROAD RIVER
SITE	SEE BELOW
COUNTY	COCKE
QUADRANGLE	SEE BELOW
LAT-LONG	SEE BELOW
REACH	06010106-3,0:3,1:9,0
LENGTH	EACH STATION ~ 0.8 KM
AREA (SQ. KM.)	N/A
ELEVATION	SEE BELOW
DATE	7/9,10,16/97
TIME	N/A

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, C.E. WILLIAMS
FRANK FISS, AND TVA

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
N/A	N/A	N/A

2. ESTIMATED % OF STREAM IN POOLS IS N/A

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
N/A %	N/A %	N/A %

7. SHADE OR CANOPY COVER GOOD OVER N/A %

8. FLOW (CFS) N/A **COMPARED TO NORMAL** LOW | NORMAL | HIGH

9. PRESENT WEATHER
SUNNY AND MILD

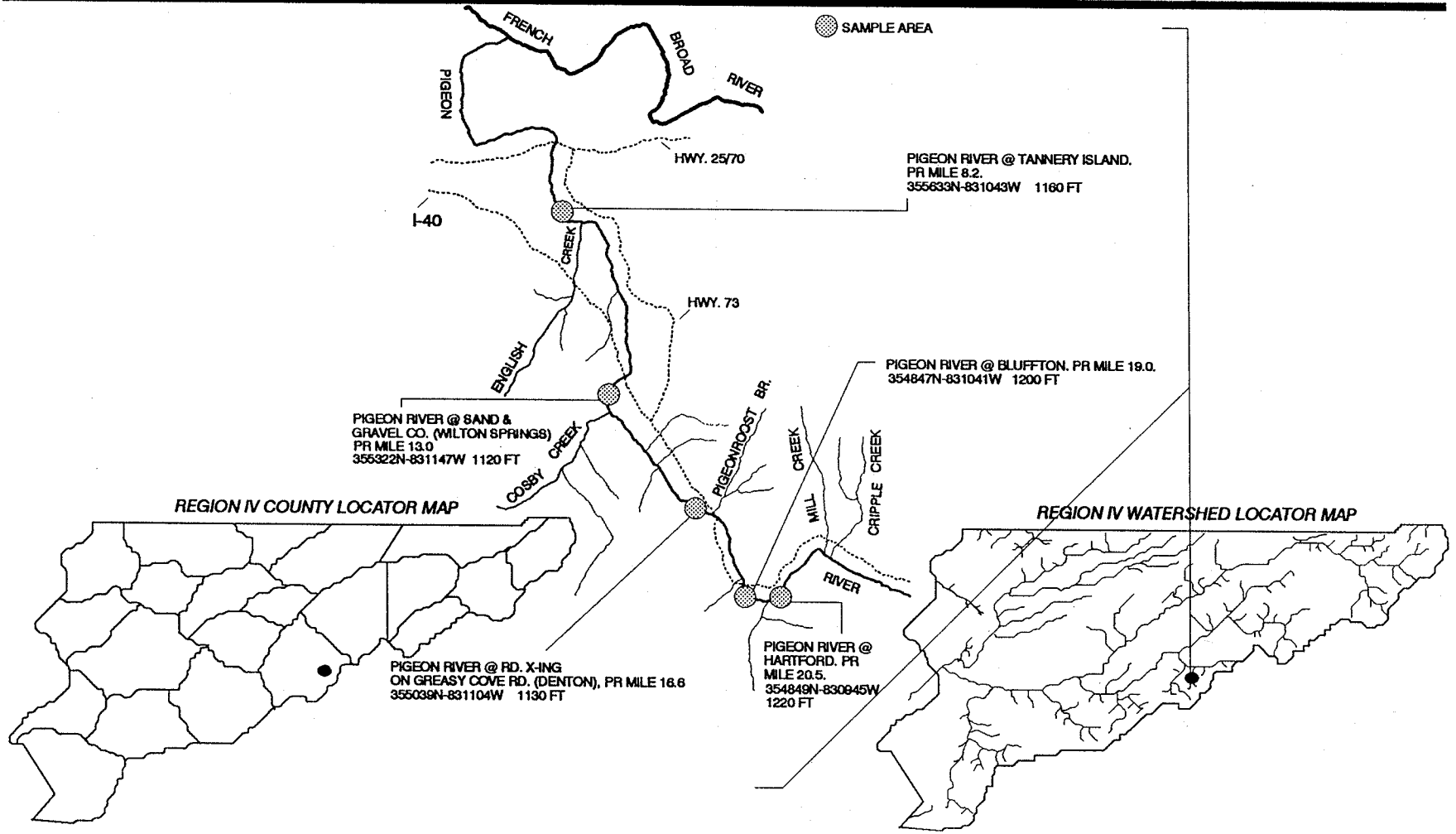
10. PAST WEATHER (last 24 hrs)
SAME

11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
N/A	N/A	N/A	N/A	N/A

12. COMMENTS
LOCATIONS OF SMALLMOUTH BASS/ ROCK BASS COLLECTIONS IN PIGEON RIVER DURING 1997.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE N/A



STREAM FISH DATA FOR PIGEON RIVER
(TANNERY ISLAND SITE)

Stream: Pigeon River
Site: Tannery Island
Time of Sample: N/A
Gear: boat electrofishing
Number of Shockers: 1
Comments: Crew- TVA et al., TDEC et al., and USGS et al.

Date: 7-14-97
Lat-Long: 355633N-831043W
Total Effort: N/A
Amps: 3-4 DC
Number of Netters: 1

SPECIES	TADS CODE	RANGE (mm)	10-mm CLASS	TOTAL NUMBER	TOTAL WT (g)	FISH/ HOUR
Micropterus dolomieu	**362**	**81-482**	**All**	**25**	**3872**	**N/A**
			80	4	38	
			90	7	82	
			100	2	35	
			120	1	25	
			130	1	35	
			180	2	154	
			210	1	128	
			240	2	373	
			260	2	464	
			290	1	333	
			400	1	771	
			480	1	1434	
Micropterus punctulatus	**363**	**124-273**	**All**	**4**	**418**	**N/A**
			120	1	21	
			140	1	38	
			170	1	70	
			270	1	289	

STREAM CPUE FISH DATA FOR PIGEON RIVER (WILTON SPRINGS SITE)

Stream: Pigeon River
Site: Wilton Springs
Time of Sample: N/A
Gear: boat electrofishing
Number of Shockers: 1
Comments: Crew- R.D. Bivens, B.D. Carter, and C.E. Williams

Date: 7-16-97
Lat-Long: 355322N-831147W
Total Effort: 4881 seconds
Amps: 3-4 DC
Number of Netters: 1

SPECIES	TADS CODE	RANGE (mm)	10-mm CLASS	TOTAL NUMBER	TOTAL WT (g)	FISH/ HOUR
Ambloplites rupestris	**342**	**104-225**	**All**	**21**	**2410**	**15**
			100	1	19	
			110	4	124	
			120	1	41	
			130	1	52	
			160	1	172	
			170	2	193	
			180	1	108	
			190	4	583	
			200	1	160	
			210	5	958	
Micropterus dolomieu	**362**	**86-440**	**All**	**20**	**4323**	**14.3**
			80	2	16	
			90	5	48	
			110	3	48	
			120	1	25	
			150	1	38	
			160	2	103	
			190	2	180	
			370	1	625	
			420	1	1020	
			430	1	1140	
			440	1	1080	
Micropterus punctulatus	**363**	**166-337**	**All**	**5**	**1311**	**3.6**
			160	1	58	
			240	1	202	
			260	1	238	
			270	1	292	
			330	1	521	
Micropterus salmoides	**364**	**106-439**	**All**	**12**	**3453**	**8.6**
			100	2	27	
			110	1	17	
			120	1	23	
			130	2	57	
			270	1	257	
			300	1	373	
			320	2	821	
			400	1	969	
			430	1	909	

STREAM FISH DATA FOR PIGEON RIVER
(DENTON SITE)

Stream: Pigeon River
Site: Denton
Time of Sample: N/A
Gear: boat electrofishing
Number of Shockers: 1
Comments: Crew- R.D. Bivens, B.D. Carter, and C.E. Williams
F.C. Fiss, TVA et al., TDEC et al., ORNL et al.

Date: 7-9-97
Lat-Long: 355039N-831104W
Total Effort: N/A
Amps: 3-4 DC
Number of Netters: 1

SPECIES	TADS CODE	RANGE (mm)	10-mm CLASS	TOTAL NUMBER	TOTAL WT (g)	FISH/ HOUR
Ambloplites rupestris	**342**	**70-211**	**All**	**20**	**1786**	**N/A**
			70	1	7	
			100	1	28	
			110	4	127	
			130	1	57	
			150	3	227	
			160	2	196	
			170	1	120	
			180	4	483	
			190	1	148	
			200	1	187	
			210	1	206	
Micropterus dolomieu	**362**	**72-292**	**All**	**30**	**1671**	**N/A**
			70	2	11	
			80	3	21	
			90	6	65	
			100	5	69	
			110	4	71	
			120	1	23	
			160	2	109	
			170	1	73	
			180	1	77	
			200	1	116	
			230	1	190	
			250	1	226	
			270	1	258	
			290	1	362	
Micropterus punctulatus	**363**	**83-335**	**All**	**15**	**2265**	**N/A**
			80	1	7	
			90	1	9	
			100	1	12	
			170	1	68	
			180	3	229	
			210	1	124	
			220	2	291	
			240	1	214	
			250	1	217	
			280	1	301	
			290	1	268	
			330	1	525	

STREAM CPUE FISH DATA FOR PIGEON RIVER (BLUFFTON SITE)

Stream: Pigeon River
Site: Bluffton
Time of Sample: N/A
Gear: boat electrofishing
Number of Shockers: 1
Comments: Crew- R.D. Bivens, B.D. Carter, C.E. Williams, and F.C. Fiss

Date: 7-10-97
Lat-Long: 354847N-831041W
Total Effort: 2858 seconds
Amps: 3-4 DC
Number of Netters: 1

SPECIES	TADS CODE	RANGE (mm)	10-mm CLASS	TOTAL NUMBER	TOTAL WT (g)	FISH/ HOUR
Ambloplites rupestris	**342**	**115**	**All**	**1**	**31**	**1.3**
Micropterus dolomieu	**362**	**78-367**	**All**	**19**	**2165**	**23.7**
			70	1	7	
			90	4	40	
			100	3	35	
			140	1	37	
			160	1	75	
			170	3	213	
			180	2	165	
			240	1	186	
			280	1	292	
			330	1	455	
			360	1	660	

STREAM CPUE FISH DATA FOR PIGEON RIVER (HARTFORD SITE)

Stream: Pigeon River
Site: Hartford
Time of Sample: N/A
Gear: boat electrofishing
Number of Shockers: 1
Comments: Crew- R.D. Bivens, B.D. Carter, C.E. Willaims, and F.C. Fiss

Date: 7-10-97
Lat-Long: 354849N-830945W
Total Effort: 3556 seconds
Amps: 3-4 DC
Number of Netters: 1

SPECIES	TADS CODE	RANGE (mm)	10-mm CLASS	TOTAL NUMBER	TOTAL WT (g)	FISH/ HOUR
Ambloplites rupestris	**342**	**145-203**	**All**	**4**	**376**	**4**
			140	1	54	
			150	1	71	
			160	1	87	
			200	1	164	
Micropterus dolomieu	**362**	**78-470**	**All**	**22**	**4631**	**22**
			70	2	11	
			80	4	25	
			90	1	11	
			120	2	44	
			130	1	36	
			140	2	70	
			170	1	58	
			210	1	116	
			220	3	421	
			240	1	206	
			340	1	537	
			350	1	521	
			450	1	1330	
			470	1	1245	
Micropterus punctulatus	**363**	**254-37**	**All**	**7**	**2623**	**7**
			250	2	409	
			290	1	337	
			300	1	349	
			310	1	413	
			330	1	432	
			370	1	683	
Micropterus salmoides	**364**	**235-450**	**All**	**3**	**2437**	**3**
			230	1	157	
			410	1	865	
			450	1	1415	

Sinking Creek

One IBI fishery survey and three qualitative surveys were conducted on Sinking Creek in May 1997:

Location and Length - Tributary to the Pigeon River. The IBI sample area was located just upstream of Highway 25-70 crossing in Newport. The sample area was approximately 180 m in length and was sampled on 22 May 1997.

Sampling Methodology - This site was sampled with one backpack shocker at 150 VAC and a 4.5 m seine.

Water Quality - (See physicochemical and sample site location form)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and IBI analysis)

Comments - We were primarily interested in evaluating the relative health of this stream reach and continuing our investigations upstream in the watershed to explore the possible existence of a wild trout fishery. The Agency has made no previous survey of this stream.

Sinking Creek originates on English Mountain in Cocke Co. at an elevation slightly above 3,000 feet. It flows through relatively undisturbed steep forested terrain before coursing through a relatively developed residential area upstream of Newport. During its journey down English Mountain it is influenced by spring seeps and one particularly large spring upwelling, Carson Spring. This, along with the wide ranging elevational gradient of the stream made it particularly intriguing to us from the standpoint of habitat/fish community shifts along the stream's length.

We collected a total of 368 fish representing 14 species during our IBI survey of Sinking Creek. Three game species were collected during our efforts. These included bluegill (*Lepomis macrochirus*), rock bass (*Ambloplites rupestris*), and rainbow trout (*Oncorhynchus mykiss*). The two most abundant species collected in our survey were central stoneroller (*Campostoma anomalum*) and banded sculpin (*Cottus carolinae*). Together these two species accounted for 67.9% of the total number of fish collected. We encountered two darter species during our survey. These included snubnose darter (*Etheostoma simoterum*) and logperch (*Percina caprodes*). Additonally, we conducted three qualitative surveys upstream of this site. The most upstream site was located at an elevation of 3,160 feet, upstream of Stokely Chapel. We collected four rainbow trout at this site ranging in length from 110 to 150 mm all appeared to have been stocked. Another survey approximately 0.1 km upstream of Stokely Chapel revealed seven rainbow trout (all stocked) ranging in length from 120 mm to 167 mm. Probably our most interesting finding, was at our third qualitative site located at the Splashaway Road bridge at an elevation 1,450 feet (355711N-831518W). This site was downstream of Carson Spring and flowed through a well developed residential area. Our survey here, revealed a well established wild rainbow trout population with a large majority of the

individuals being Age-0 trout. Several 229 to 254 mm trout were observed and all appeared to be in above average condition. We notified Jim Habera (UT Wild Trout Project) of our findings and plan to conduct a quantitative survey of this stream in 1998. At all of our qualitative sites the habitat appeared to be in fair condition in terms of sedimentation. However, we did notice a progressive decline in quality as we approached the town of Newport.

Our Index of Biotic Integrity analysis indicated this stream was in "poor" condition based on an IBI score of 30. Once the stream enters the town of Newport its quality is degraded quickly as it flow through a highly commercial section of the town. We observed several drain pipes entering the stream within our survey area and made note of the above average sediment loads being transported in this reach of the stream. The most negatively influential metrics were the low percentage of intolerant species, the high percentage of trophic generalists, the low number of trophic specialists and piscivores, and the high percentage of anomalies on the fish.

Benthic macroinvertebrates collected in our survey reach included Baetidae, Ephemerelliade, Heptageniidae, and Leptophlebiidae mayflies; Nemouridae, Perlidae, and Perlodidae stoneflies; and Glossosomatidae, Hydropsychidae, and Uenoidae caddisflies. Ephemeropterns were the most abundant group collected comprising 25.5% of the total sample. Trichopterans and plecopterans were relatively scarce comprising only 11.4% and 8.9% of the total sample. As expected some of the more tolerant forms comprised fairly high percentages, with dipterans representing 19.8% and isopods accounting for 15.4%. A total of 42 taxa was collected in our sample of which 17 were EPT. Based on the EPT taxa richness value and the overall biotic index of all taxa collected the relative health of the benthic community was classified as "fair to good".

Our evaluation of the physical instream habitat and riparian zone in this reach resulted in a mean score of 125. Based on this score and our overall observations of the stream, this reach of Sinking Creek was designated as "sub-optimal".

Management Recommendations:

1. Any action that would address non-point source pollution downstream of Carson Spring may help decrease the degradation of this stream as it flows through the town of Newport.

2. Conduct at least one quantitative survey of the rainbow trout population in the upper reache of the stream. This previously undocumented population could represent a substantial fishery.

3. Monitor the success of rainbow trout stockings upstream of Stokely Chapel. If the efforts to establish a viable rainbow trout population by the private landowners are unsuccessful, consider stocking southern strain brook trout into that portion upstream of the swimming area at Stokely Chapel.

PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	SINKING CREEK
WATERSHED	PIGEON RIVER
SITE	@ HWY. 25-70 X-ING
COUNTY	COCKE
QUADRANGLE	NEWPORT 173 NW
LAT-LONG	355818N-831246W
REACH	06010106-2.0
LENGTH	~ 180 m
AREA (SQ. KM.)	34.9
ELEVATION	1040 FT
DATE	5-22-97
TIME	1500

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, AND C.E. WILLIAMS

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
5.3 m	0.3 m	0.8 m

2. ESTIMATED % OF STREAM IN POOLS IS 50

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
30	20	20	20	10	

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
15	10	50	20	5	

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE
		X

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
15 %	30 %	55 %

7. SHADE OR CANOPY COVER GOOD OVER 80 %

8. FLOW (CFS) 8.4 **COMPARED TO NORMAL**

LOW	NORMAL	HIGH
	X	

9. PRESENT WEATHER

SUNNY AND MILD; AIR TEMP. 71 F

10. PAST WEATHER (last 24 hrs)

SAME; COOL OVERNIGHT

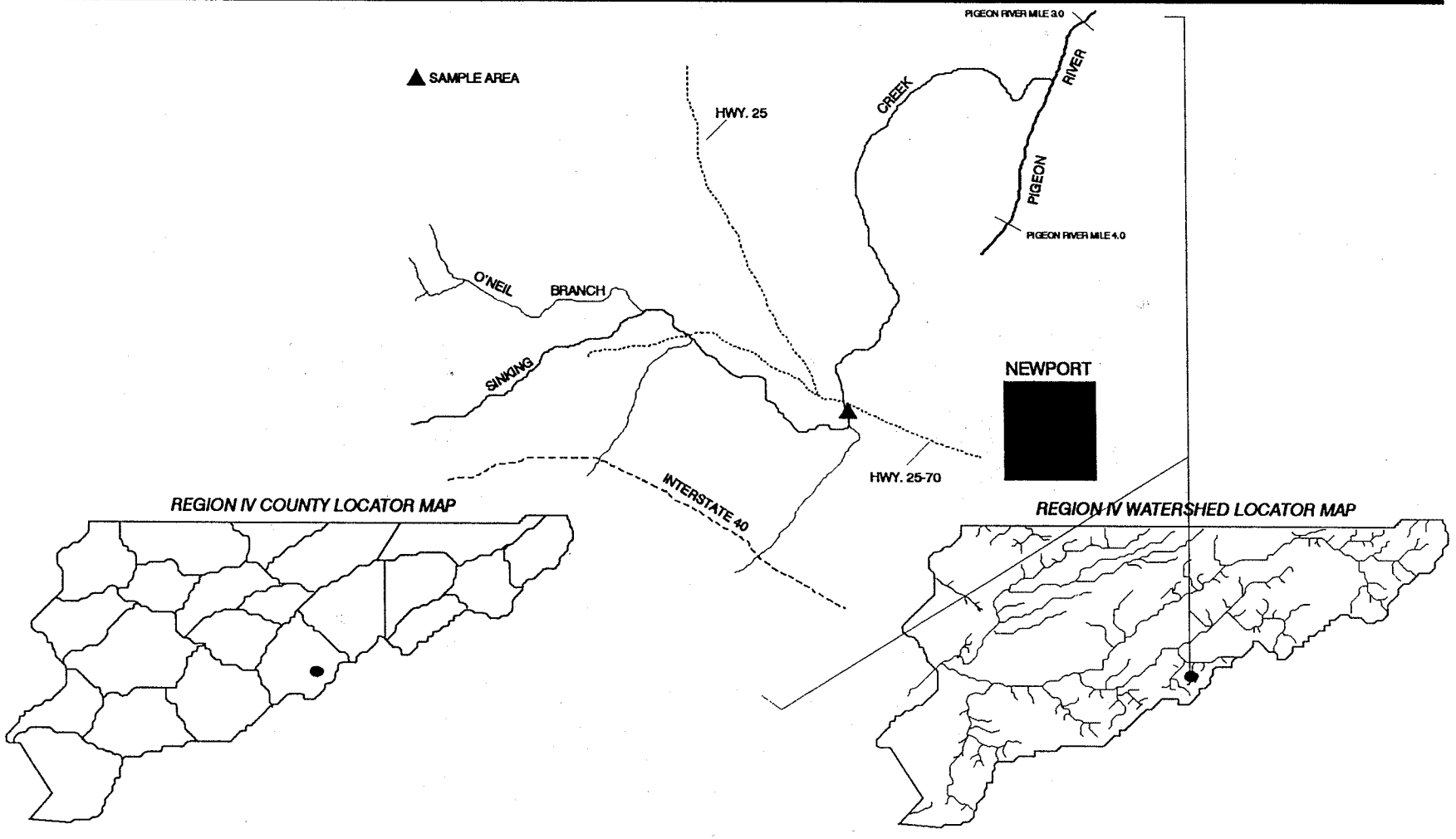
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
6.5	16.4	175	9.4	97.0

12. COMMENTS

SAMPLED JUST UPSTREAM OF HWY. 25-70 X-ING IN NEWPORT. HEAVY SEDIMENTATION. SEVERAL DRAIN PIPES ENTERING CREEK WITHIN SAMPLE AREA.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE 125



SINKING CREEK FISH DATA

SAMPLING TYPE: SEINING AND SHOCKING

GEAR TYPE: 4.5 m SEINE AND ONE BACKPACK UNIT @ 150 VAC

SPECIES	TADS CODE	NO. COLL.	RANGE(mm)	TOT. WEIGHT(g)	NOTE
Ambloplites rupestris	342	1	152	82	
Campostoma anomalum	45	154			
Catostomus commersoni	195	14			
Cottus carolinae	322	96			
Cyprinella galactura	54	1			
Dorosoma cepedianum	41	1			
Etheostoma simoterum	435	14			
Hypentelium nigricans	207	6			
Lepomis macrochirus	352	10	51-171	156	
Luxilus chrysocephalus	89	1			
Oncorhynchus mykiss	279	1	355		
Percina caprodes	464	2			
Rhinichthys atratulus	184	65			
Semotilus atromaculatus	188	2			
	SUM:	368			

INDEX OF BIOTIC INTEGRITY

METRIC DESCRIPTION	SCORING CRITERIA 1	3	5	OBSERVED	SCORE
NUMBER OF NATIVE SP.	<9	9-17	>14	13	3
NUMBER OF DARTER SP.	<2	2-3	>3	2	3
NUMBER OF SUNFISH SP. *less Micropterus*	<2	2	>2	2	3
NUMBER OF SUCKER SP.	<2	2	>2	2	3
NUMBER OF INTOLERANT SP.	<2	2	>2	0	1
PERCENT OF INDIVIDUALS AS TOLERANT	>35	35-18	<18	4.9	5
PERCENT OF INDIVIDUALS AS OMNIVORES	>43	43-22	<22	46.2	1
PERCENT OF INDIVIDUALS AS SPECIALISTS	<17	17-32	>32	4.3	1
PERCENT OF INDIVIDUALS AS PISCIVORES	<2.0	2.0-4.0	>4.0	0.3	1
CATCH RATE	<24.8	24.8-49.4	>49.4	33.2	3
PERCENT OF INDIVIDUALS AS HYBRIDS	>1	TR-1	0	0	5
PERCENT OF INDIVIDUALS WITH ANOMALIES	>5	5-2	<2	36.4	1
					30 **POOR**

IBI RANGE:	**0**	**12-22**	**28-34**	**40-44**	**48-52**	**58-60**
STREAM DESIGNATION:	**NO FISH**	**VERY POOR**	**POOR**	**FAIR**	**GOOD**	**EXCELLENT**

SINKING CREEK
FIELD # 865
EFFORT = 3 PERSON HOURS

TAXA RICHNESS = 42
EPT TAXA RICHNESS = 17
BIOCLASSIFICATION = (3.8) FAIR-GOOD

			NUMBER	PERCENT
AMPHIPODA			4	0.8
ANNELIDA				1.0
	Oligochaeta		5	
COLEOPTERA				3.0
	Dytiscidae	*Hydroporus* adult	1	
	Elmidae	*Optioservus* larvae	2	
		Stenelmis larva and adults	9	
	Eubriidae	*Ectopria*	1	
	Psepheniidae	*Psephenus herricki*	3	
DIPTERA				19.8
	Chironomidae		59	
	Dixidae	*Dixa*	1	
	Empididae		1	
	Simuliidae		35	
	Tipulidae	*Antocha*	8	
EPHEMEROPTERA				25.5
	Baetidae	3 caudal filaments	2	
	Baetidae	2 caudal filaments	17	
	Ephemerellidae	*Ephemerella*	69	
		Eurylophella	29	
	Heptageniidae	*Epeorus rubidus/subpalidus*	10	
		Stenacron	2	
		Stenonema sp.	2	
		Stenonema femoratum	1	
	Leptophlebiidae	*Habrophlebiodes*	2	
GASTROPODA				6.8
	Ancylidae	*Ferrissia*	2	
	Physidae		2	
	Pleuroceridae		32	
HEMIPTERA				0.4
	Gerridae nymph		2	
ISOPODA				15.4
	Asellidae	*Lirceus*	81	
MEGALOPTERA				2.5
	Corydalidae	*Corydalus cornutus*	4	
		Nigronia serricornis	9	
ODONATA				4.4
	Aeshnidae	*Boyeria vinosa*	3	
	Calopterygidae	*Calopteryx*	14	
	Coenagrionidae	*Argia*	1	
	Gomphidae	*Gomphus lividus*	4	
		Stylogomphus albistylus	1	
PELECYPODA				0.2
	Corbiculidae	*Corbicula fluminea*	1	
PLECOPTERA				8.9
	Nemouridae	*Amphinemura delosa*	1	
	Perlidae	*Perlesta*	10	
	Perlodidae	*Isoperla holochlora*	35	
		Isoperla (uniformly brown specimen)	1	
TRICHOPTERA				11.4
	Glossosomatidae	*Glossosoma*	1	
	Hydropsychidae	*Cheumatopsyche*	9	
		Hydropsyche betteni/depravata	17	
	Uenoidae	*Neophylax* (bulbous gill present)	33	
		TOTAL	**526**	

Big Creek

One quantitative fishery survey was conducted on Big Creek in June 1997:

Location and Length - Tributary to the Holston River. The sample area was located at approximately 300 meters upstream of the bridge crossing on W. Bear Hollow Road (stream mile 2.0). The sample area was 200 m in length and was sampled on 25 June 1997.

Sampling Methodology - This site was sampled with three backpack shockers at 125 VAC and one tow barge at 3 amps DC.

Water Quality - (See physicochemical and sample site location form)

Benthic Collection - (See benthic collection form)

Fish Collected - (See fish data form for species list and population statistics summary)

Comments - Our survey of this stream was primarily concerned with gathering quantitative data on the sport fishery in an area proposed for impoundment by the city of Rogersville. No previous quantitative data has been collected on the sport fishery. The agency and TVA did conduct IBI surveys of the stream in 1995 just downstream of this site.

We collected a total of 1,949 fish representing 21 species during our survey of Big Creek. Five game species were collected during our efforts. These included stocked rainbow trout (*Oncorhynchus mykiss*), rock bass (*Ambloplites rupestris*), bluegill (*Lepomis macrochirus*), redbreast sunfish (*L. auritus*), and smallmouth bass (*Micropterus dolomieu*) (see Fig. 10 for length frequency distributions). Overall central stoneroller (*Campostoma anomalum*) accounted for the highest single species percentage (24.3) of our total catch. The most abundant game species collected in our survey was rock bass, accounting for 4.5% of all fish collected.

Our three pass electrofishing survey of Big Creek revealed standing crop (14.94 kg/ha) and density (287.10/ha) of rock bass to be the highest of the five species collected. Smallmouth bass standing crop and density were somewhat lower at 4.05 kg/ha and 48.39/ha, while redbreast sunfish values (0.18 kg/ha and 9.68/ha) were the lowest of the five game species in the sample. Population estimates of game species indicated there were 89 rock bass, ten bluegill, three redbreast sunfish, 15 smallmouth bass, and three rainbow trout in our 0.3 ha survey area. The catch rate for rock bass was determined to be 21.2/hour, while the CPUE for smallmouth bass was substantially lower at 3.7/hour. Overall, estimates for the two most abundant game species (rock bass and smallmouth bass), indicate a quality fishery when compared to information collected from a similar

size stream (Indian Creek) in 1995 (Bivens et al. 1996). Indian Creek is considered by many to be one of east Tennessee's better wadeable free flowing rock bass/smallmouth bass fisheries.

Our Index of Biotic Integrity analysis of Big Creek in 1995 (Bivens et al. 1996) indicated that this stream was in "fair to good" condition based on an IBI score of 46. The only metric that strongly influenced the overall score was the relatively high percentage of trophic generalists in the sample. There were some indications of organic enrichment as filamentous algae was observed in the stream. Index of Biotic Integrity sampling by TVA in the same vicinity as our sample in 1995 revealed similar findings. Their IBI evaluation resulted in a score of 42 which was slightly lower than our score (TVA 1996).

Benthic macroinvertebrates from our sample included Baetidae, Caenidae Ephemerellidae, Ephemeridae, Heptageniidae, Leptophlebiidae, and Isonychiidae mayflies; Glossosomatidae, Hydropsychidae, Hydroptilidae, Leptoceridae, Odontoceridae, Philopotamidae, Polycentropodidae, and Uenoidae caddisflies. Perlidae was the only stonefly family collected. Trichopterans were the most abundant organisms in our survey, comprising 37.3% of the total sample. Ephemeropterns were second most abundant with 27.0%. Odonates and coleopterans were the next most abundant groups, contributing 8.9% and 7.3%, respectively. A total of 56 taxa was collected from this site of which 27 were EPT taxa. Based on the tolerance values for the taxa collected and the overall EPT taxa richness value, this reach of Big Creek was assigned a bioclassification of " good to excellent". This classification was very similar "good" (56 total taxa, 22 EPT taxa) to the one we calculated in the 1995 survey of this stream. A noteworthy collection of the mayfly *Brachycercus* was made during our benthic survey. Although no designation has been given for this species, its occurrence and distribution appears to be fairly sporadic and localized.

A cursory mussel survey was conducted within the area proposed for impoundment. Collections within the area resulted in the identification of three mussel species. These included rainbow shell *(Villosa iris)*, mountain creekshell (*Villosa vanuxemensis*), and Tennessee pigtoe (*Fusconaia barnesiana*). Rainbow shell and mountain creekshell were the only live mussels found in the survey reach.

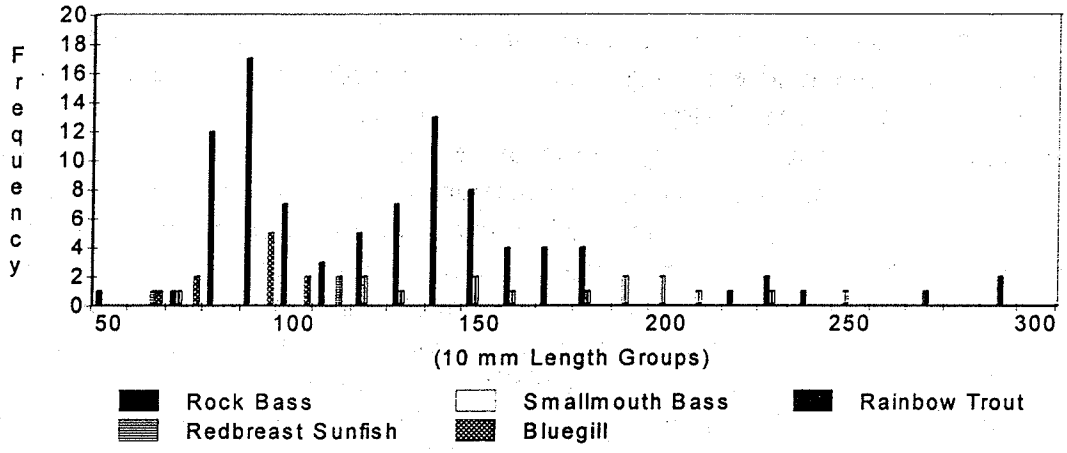
Management Recommendations:

1. The occurrence of blotchside logperch in this stream (Bivens et al. 1996) merits special consideration as little is known about population density and distribution within the stream.

2. The area proposed for impoundment contains a healthy sport fishery and should be considered a valuable resource. Alteration of the lotic habitat would most likely be detrimental to the rock bass and smallmouth bass populations in the area of impoundment.

3. Effects to water quality and habitat below the proposed impoundment merit consideration.

Figure 10. Length Frequency Distributions for Rock Bass, Smallmouth Bass, Rainbow Trout, Redbreast Sunfish, and Bluegill Collected in Big Creek during 1997



PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	BIG CREEK
WATERSHED	HOLSTON RIVER
SITE	~300 m ABOVE RD. X-ING
COUNTY	HAWKINS
QUADRANGLE	BUREM 180 NW
LAT-LONG	362545N-825725W
REACH	06010104-15.0
LENGTH	200 m
AREA (SQ. M.)	3100
ELEVATION	1130 FT
DATE	6-24-97
TIME	1130

COLLECTOR(S)

B.D. CARTER, M.T. FAGG AND C.E. WILLIAMS

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
15.5 m	0.3 m	0.6 m

2. ESTIMATED % OF STREAM IN POOLS IS 30

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
10	20	10	10	20	30

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
5	10	15	20	10	40

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE
	X WATER WILLOW	

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
20 %	40 %	40 %

7. SHADE OR CANOPY COVER GOOD OVER 60 %

8. FLOW (CFS) 28.1 **COMPARED TO NORMAL**

LOW	NORMAL	HIGH
	X	

9. PRESENT WEATHER

SUNNY AND HOT; AIR TEMP. 88 F @ 1257

10. PAST WEATHER (last 24 hrs)

SUNNY; HOT AND HUMID

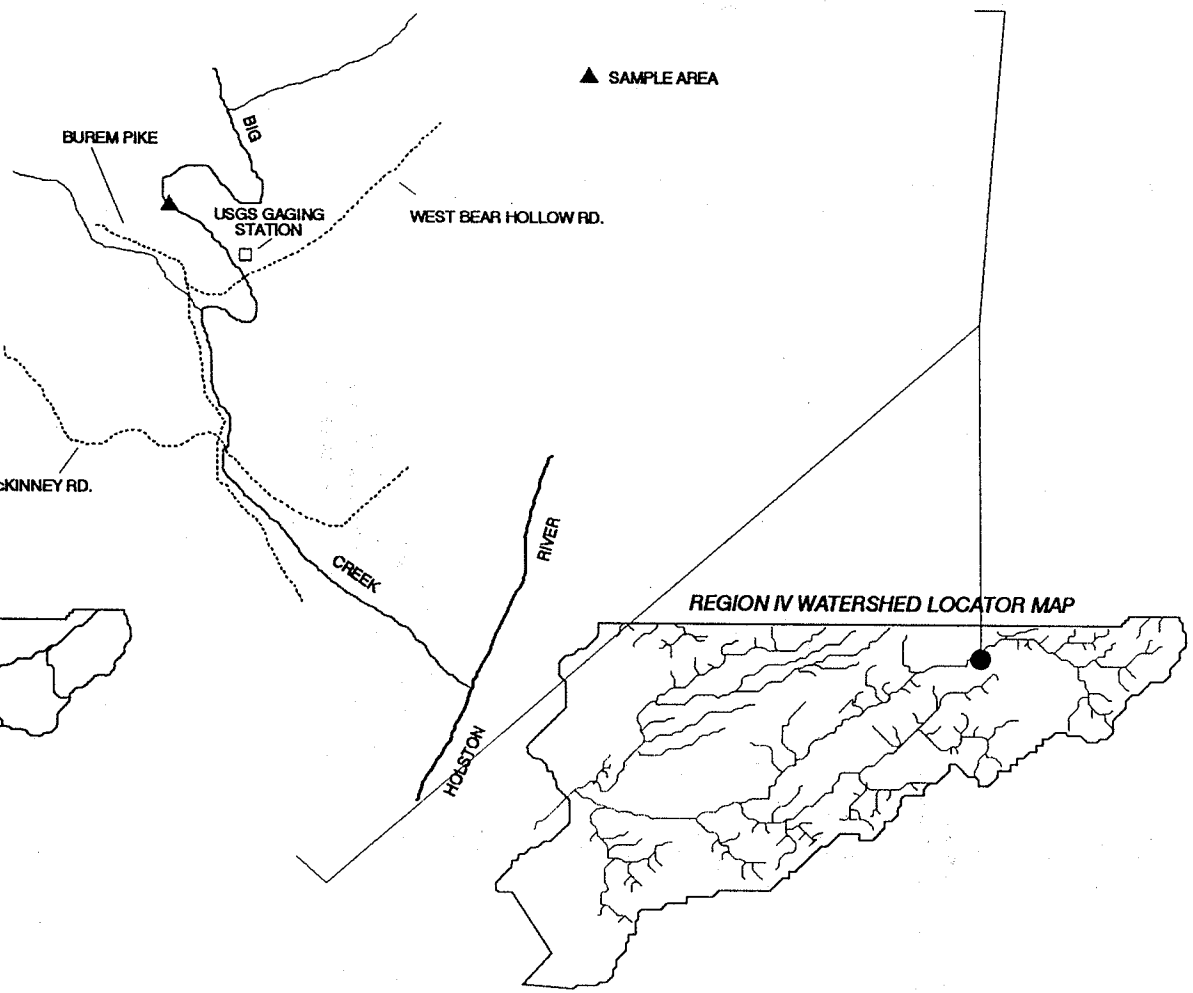
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
7.5	23.5	320	8.9	106

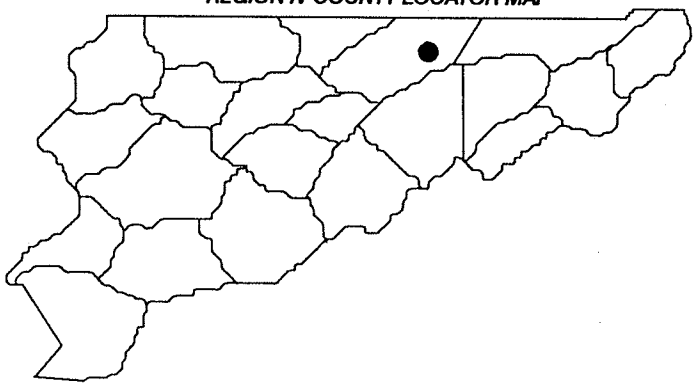
12. COMMENTS

SAMPLE AREA LOCATED ~150 m UPSTREAM OF USGS GAGING STATION.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE N/A



REGION IV COUNTY LOCATOR MAP



REGION IV WATERSHED LOCATOR MAP

BIG CREEK FISH POPULATION SUMMARY STATISTICS

SPECIES	AREA[a]	POPEST[b]	95% CI[c]	BIOMASS[d]	#/HA[e]	KG/HA[f]
Ambloplites rupestris	3100	89	87-93	4625	287.10	14.92
Campostoma anomalum	3100	484	476-492	8717	1561.29	28.12
Cottus carolinae	3100	222	206-238	868	716.13	2.80
Cyprinella galactura	3100	59	38-102	489	190.32	1.58
Etheostoma blennioides	3100	40	32-56	213	129.03	0.69
Etheostoma rufilineatum	3100	326	ND	353	1051.61	1.14
Etheostoma simoterum	3100	66	62-73	135	212.90	0.44
Hybopsis amblops	3100	20	19-24	74	64.52	0.24
Hypentelium nigricans	3100	58	58-59	6235	187.10	20.11
Lepomis auritus	3100	3	3-3	55	9.68	0.18
Lepomis macrochirus	3100	10	10-12	146	32.26	0.47
Luxilus chrysocephalus	3100	47	47-49	375	151.61	1.21
Luxilus coccogenis	3100	211	203-219	1765	680.65	5.69
Lythrurus faciolaris	3100	7	7-8	13	22.58	0.04
Micropterus dolomieu	3100	15	15-15	1255	48.39	4.05
Moxostoma duquesnei	3100	8	8-8	3725	25.81	12.02
Nocomis migropogon	3100	207	203-212	3620	667.74	11.68
Notropis leuciodus	3100	281	254-308	514	906.45	1.66
Notropis telescopus	3100	18	18-19	26	58.06	0.08
Oncorhynchus mykiss	3100	3	3-3	693	9.68	2.24
Semotilus atromaculatus	3100	1	1-1	5	3.23	0.02
TOTAL		**2175**		**33901**	**7016.13**	**109.36**

[a] surface area of sample site (m^2)
[b] population estimate by species
[c] population estimate 95 % confidence intervals
[d] biomass estimate (avg. weight x pop. estimate)
[e] estimated number of individuals per surface hectare of water
[f] estimated total weight in kilograms per surface hectare of water
ND = non-descending removal pattern- no confidence interval generated

BIG CREEK FISH POPULATION SUMMARY STATISTICS

Stream: Big Creek
Site: ~ 300 m upstream of W. Bear Hollow Rd.
Time of Sample: N/A
Gear: backpack and tow barge electrofishing
Number of Shockers: 3 backpacks and one tow barge
Comments: Crew- R.D. Bivens, B.D. Carter, C.E. Williams, M.T. Fagg, F.C. Fiss T. Cleveland, J. Prestwich, J. Pipis, J. Habera, N. Bates, B. Brown et al., and D. Tomlonavich et al.

Date: 6-24-97
Lat-Long: 362545N-825725W
Total Effort: 14,908 seconds
Voltage: 125 VAC and 3 amps DC
Number of Netters: 6

SPECIES	TADS CODE	RANGE (mm)	10-mm CLASS	TOTAL NUMBER	TOTAL WT (g)	FISH/ HOUR
Ambloplites rupestris	**342**	**53-245**	**All**	**87**	**4579**	**21.2**
			50	1	3	
			70	1	8	
			80	12	152	
			90	17	281	
			100	7	155	
			110	3	87	
			120	5	195	
			130	7	322	
			140	13	779	
			150	8	583	
			160	4	347	
			170	4	427	
			180	1	130	
			220	1	245	
			230	2	565	
			240	1	300	
Micropterus dolomieu	**362**	**77-258**	**All**	**15**	**1252**	**3.7**
			70	1	6	
			120	2	44	
			130	1	31	
			150	2	93	
			160	1	71	
			180	1	77	
			190	2	172	
			200	2	226	
			210	1	150	
			230	1	157	
			250	1	225	
Lepomis auritus	**346**	**60-116**	**All**	**3**	**55**	**0.7**
			60	1	3	
			110	2	52	
Lepomis macrochirus	**351**	**60-101**	**All**	**10**	**146**	**2.4**
			60	1	5	
			70	2	18	
			90	5	88	
			100	2	35	
Oncorhynchus mykiss	**279**	**275-296**	**All**	**3**	**693**	**0.7**
			270	1	180	
			290	2	513	
Campostoma anomalum	**45**	**26-177**	**All**	**474**	**8537**	**115.6**
Cottus carolinae	**322**	**30-90**	**All**	**202**	**790**	**49.3**
Cyprinella galactura	**54**	**35-130**	**All**	**38**	**315**	**9.3**
Etheostoma blennioides	**398**	**10-100**	**All**	**32**	**170**	**7.8**
Etheostoma rufilineatum	**431**	**41-77**	**All**	**217**	**235**	**52.9**
Etheostoma simoterum	**435**	**25-71**	**All**	**62**	**127**	**15.1**
Hybopsis amblops	**79**	**62-82**	**All**	**19**	**70**	**4.6**
Hypentelium nigricans	**207**	**83-338**	**All**	**58**	**6235**	**14.1**
Luxilus chrysocephalus	**89**	**54-133**	**All**	**47**	**375**	**11.5**
Luxilus coccogenis	**90**	**49-133**	**All**	**203**	**1698**	**49.5**
Lythrurus faciolaris	**93**	**46-78**	**All**	**7**	**13**	**1.7**
Moxostoma duquesnei	**224**	**322-402**	**All**	**8**	**3725**	**2.0**
Nocomis micropogon	**110**	**50-185**	**All**	**203**	**3550**	**49.5**
Notropis leuciodus	**128**	**45-88**	**All**	**242**	**443**	**59.0**
Notropis telescopus	**138**	**52-73**	**All**	**18**	**26**	**4.4**
Semotilus atromaculatus	**188**	**80**	**All**	**1**	**5**	**0.2**

BIG CREEK BENTHIC DATA
FIELD # 884
EFFORT = 3 PERSON HOURS

TAXA RICHNESS = 56
EPT TAXA RICHNESS = 27
BIOCLASSIFICATION = 4.5 (GOOD TO EXCELLENT)

			NUMBER	PERCENT
COLEOPTERA				7.3
	Dryopidae	*Helichus*	4	
	Elmidae	*Promoresia*	4	
		Stenelmis	3	
	Hydrophilidae	adults	2	
	Psephenidae	*Psephenus herricki* larvae & adult	11	
DIPTERA				3.7
	Athericidae	*Atherix lantha*	1	
	Chironomidae		8	
	Empididae		1	
	Simuliidae		1	
	Tipulidae	*Antocha*	1	
EPHEMEROPTERA				27.0
	Baetidae	*Baetis*	13	
	Caenidae	*Brachycercus*	1	
	Ephemerellidae	*Ephemerella*	1	
		Eurylophella	2	
		Serratella	7	
		Hexagenia	8	
	Heptageniidae	*Heptagenia*	2	
		Stenacron interpunctatum	10	
		Stenonema	22	
	Isonychiidae	*Isonychia*	21	
	Leptophlebiidae	*Choroterpes*	1	
GASTROPODA				5.2
	Physidae	*Physella*	2	
	Pleuroceridae	*Elimia*	3	
		Leptoxis	9	
		Pleurocera	3	
HEMIPTERA				1.2
	Veliidae	*Rhagovelia obesa*	4	
ISOPODA				2.4
	Asellidae	*Lirceus*	8	
MEGALOPTERA				3.1
	Corydalidae	*Corydalus cornutus*	1	
		Nigronia serricornis	7	
	Sialidae	*Sialis*	2	
ODONATA				8.9
	Aeshnidae	*Boyeria vinosa*	6	
	Coenagrionidae	*Argia*	3	
		Enallagma	7	
	Gomphidae	*Dromogomphus spinosus*	2	
		Gomphurus sp.	3	
		Gomphus lividus	3	
		Hagenius brevistylus	4	
	Macromiidae	*Macromia*	1	
PELECYPODA				1.5
	Corbiculidae	*Corbicula fluminea*	1	
	Sphaeriidae	*Sphaerium*	4	
PLECOPTERA				2.4
	Perlidae	*Acroneuria sp. early instar*	2	
		Neoperla	3	
		Perlesta	3	
TRICHOPTERA				37.3
	Glossosomatidae	*Glossosoma*	1	
	Hydropsychidae	*Ceratopsyche cheilonis*	3	
		Cheumatopsyche	12	
		Hydropsyche betteni/depravata	78	
		Hydropsyche frisoni	1	
	Hydroptilidae	*Leuchotrichia*	9	
	Leptoceridae	*Oeceitis*	1	
		Triaenodes	9	
	Odonticeridae	*Psilitreta labida*	1	
	Philopotamidae	*Chimara*	4	
	Polycentropodidae	*Nyctiophylax*	1	
		Polycentropus	1	
	Uenoidae	*Neophylax auris/etnieri*	1	
		TOTAL	327	

North Fork Holston River

One CPUE fishery survey was conducted on the North Fork in September 1997:

Location and Length - Tributary to Holston River the sample area was located in the vicinity of the North Fork-Sensabaugh Branch confluence approximately 2.8 km north of Hwy. 11W (NFHR mile 2.4). This reach of the North Fork was sampled on 25 September 1997.

Sampling Methodology - This site was sampled with one boat electrofishing unit operating at 3-4 Amps DC.

Water Quality - (None recorded)

Benthic Collection - (No collection made)

Fish Collected - (See fish data form for species list and CPUE data)

Comments - This stream reach was surveyed to collect otolith samples from rock bass (*Ambloplites rupestris*) and smallmouth bass (*Micropterus dolomieu*) for the statewide age and growth evaluation and to begin developing electrofishing catch-effort data for these species. The Agency conducted a qualitative survey of this river in 1989 near river mile 4.2 (Bivens and Williams 1990).

The North Fork Holston River has a reputation of being one of the regions best large river smallmouth bass fisheries. This is supported by frequent reports of quality size smallmouth being caught in the 8.3 km section between the TN/VA line and the confluence with the South Fork Holston River near Kingsport. Our interest in surveying the short reach that flows through Tennessee, was to gather data that would characterize the growth and longevity of rock bass and smallmouth bass dwelling in the river and to begin compiling baseline CPUE estimates..

We collected a total of 20 smallmouth bass, 39 rock bass, and one spotted bass (*Micropterus punctulatus*) during a 0.7 hour random sample. This resulted in CPUE values of 29/hour for smallmouth bass, 56/hour for rock bass, and 1.4/hour for spotted bass. All fish collected were sacrificed for ototliths samples. These samples were sent to the Nashville Office for analysis and inclusion in the statewide age and growth study. Although we have no previous data from this river, our initial sample seems to indicate a healthy population with a normal size distribution and a fairly high occurrence (4.3/hour) of smallmouth over 381 mm (15 inches). The rock bass size structure and abundance appeared to be typical of a river this size with individuals ranging up to 239 mm (9.4 inches). Figure 11 depicts the size structure and frequency of bass collected in our sample of the North Fork Holston River.

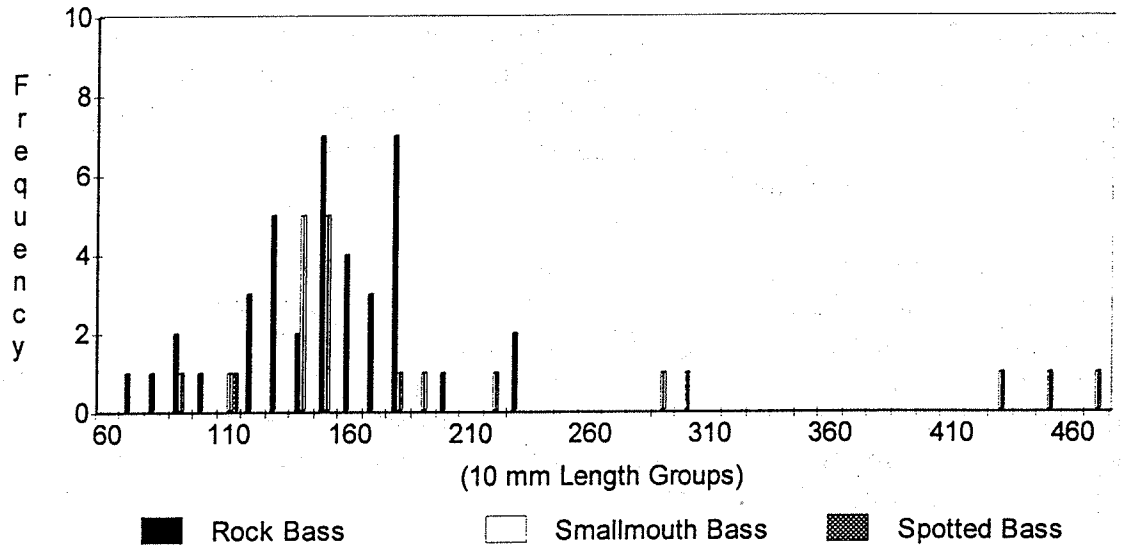
Management Recommendations:

1. Any actions that could address protection of riparian zones and limit non-point source pollution within the watershed would be of benefit to this stream.

2. Conduct additional CPUE and otolith sampling at this site in 1998.

3. Consider including two additional survey reaches in 1998, one near the confluence with South Fork Holston River (~ river mile 1.0) and one near the TN/VA line (~ river mile 4.5).

Figure 11. Length Frequency Distributions for Rock Bass, Smallmouth Bass, and Spotted Bass Collected in North Fork Holston River during 1997



PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	N. FORK HOLSTON RIVER
WATERSHED	HOLSTON RIVER
SITE	@ NFHR MILE 2.4
COUNTY	HAWKINS/SULLIVAN
QUADRANGLE	KINGSPORT 188 SE
LAT-LONG	363440N-823707W
REACH	06010101-1.0
LENGTH	~ 0.7 km
AREA (SQ. KM.)	N/A
ELEVATION	1170 FT
DATE	9-25-97
TIME	N/A

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, AND C.E. WILLIAMS

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
N/A	N/A	N/A

2. ESTIMATED % OF STREAM IN POOLS IS N/A

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
N/A %	N/A %	N/A %

7. SHADE OR CANOPY COVER GOOD OVER N/A %

8. FLOW (CFS) N/A **COMPARED TO NORMAL** (LOW / NORMAL / HIGH)

9. PRESENT WEATHER

SUNNY AND MILD

10. PAST WEATHER (last 24 hrs)

SAME

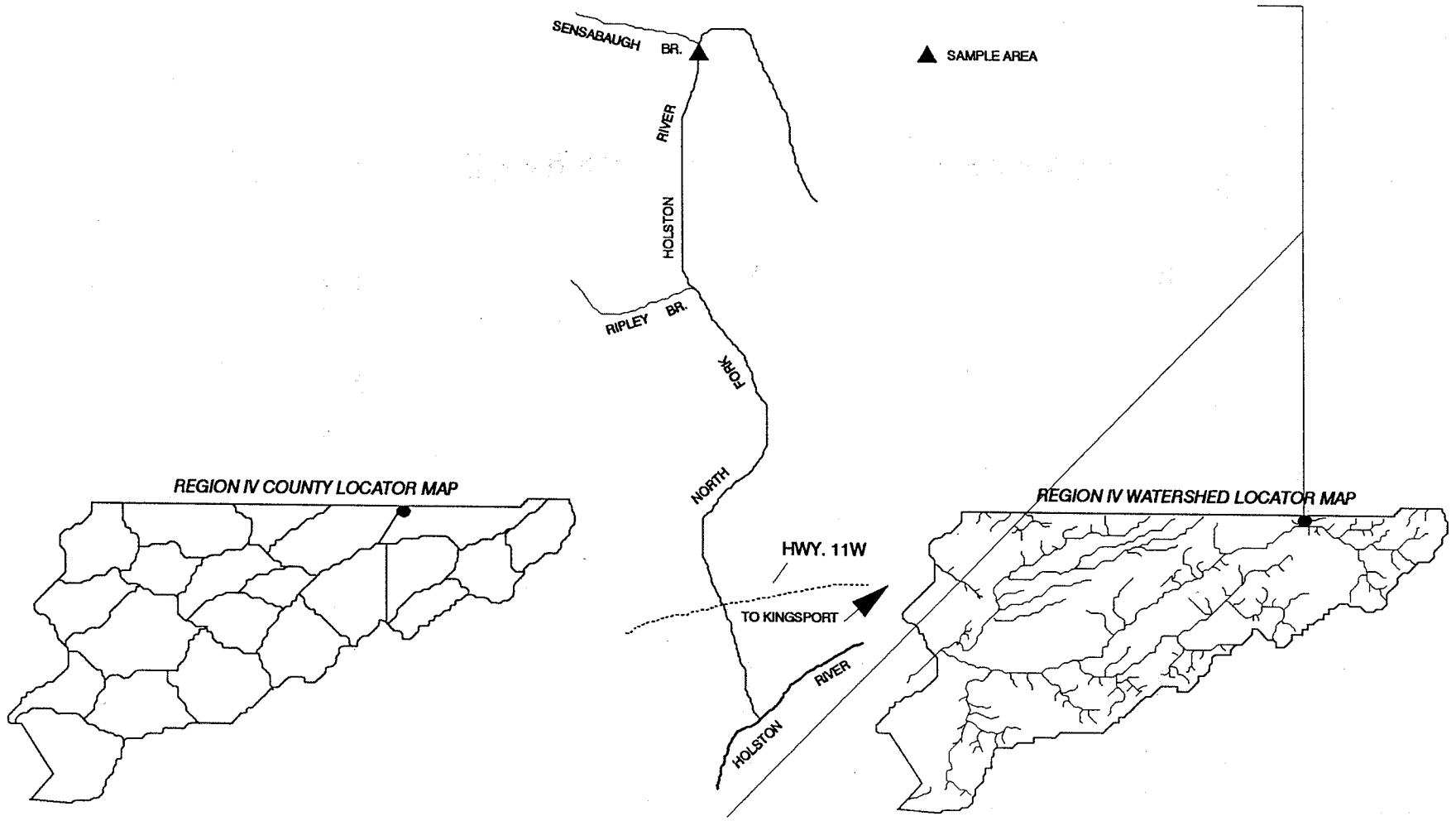
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
N/A	N/A	N/A	N/A	N/A

12. COMMENTS

SAMPLED IN THE VICINITY OF N. FORK HOLSTON SENSABAUGH BRANCH CONFLUENCE ~ 2.8 KM NORTH OF HWY. 11W CROSSING.
NO WATER QUALITY OR PHYSICAL DATA RECORDED.

13. $\bar{X}$ HABITAT ASSESSMENT SCORE N/A



STREAM CPUE FISH DATA FOR NORTH FORK HOLSTON RIVER

Stream: North Fork Holston River
Site: @ river mile 2.4
Time of Sample: N/A
Gear: boat electrofishing
Number of Shockers: 1
Comments: Crew- R.D. Bivens, B.D. Carter, and C.E. Williams

Date: 9-25-97
Lat-Long: 363440N-823707W
Total Effort: 2543 seconds
Amps: 3-4 DC
Number of Netters: 1

SPECIES	TADS CODE	RANGE (mm)	10-mm CLASS	TOTAL NUMBER	TOTAL WT (g)	FISH/ HOUR
Ambloplites rupestris	**342**	**75-239**	**All**	**39**	**3198**	**56**
			70	1	7	
			80	1	10	
			90	2	34	
			100	1	17	
			120	3	112	
			130	5	225	
			140	2	116	
			150	7	472	
			160	4	338	
			170	3	295	
			180	7	860	
			200	1	152	
			230	2	560	
Micropterus dolomieu	**362**	**95-472**	**All**	**20**	**4974**	**29**
			90	1	11	
			110	1	16	
			140	5	176	
			150	5	202	
			180	1	70	
			190	1	76	
			220	1	120	
			290	1	295	
			300	1	308	
			430	1	1120	
			450	1	1175	
			470	1	1405	
Micropterus punctulatus	**363**	**115**	**All**	**1**	**17**	**1.4**

Sensabaugh Branch

One qualitative fishery survey was conducted on Sensabaugh Branch in July 1997:

Location and Length - Tributary to the North Fork Holston River. The survey site was located along Sensabaugh Rd. at the train tunnel approximately 1.9 km upstream of the North Fork and Sensabaugh Branch confluence. The site was sampled on 22 July 1997.

Sampling Methodology - This site was sampled with one backpack electrofishing unit operating at 125 VAC.

Water Quality - (None recorded)

Benthic Collection - (No collection made)

Fish Collected - (See below)

Comments - This stream was surveyed to develop a fish species list for TADS and to collect otolith samples from rock bass (*Ambloplites rupestris*) and/or smallmouth bass (*Micropterus dolomieu*). The Agency has made no previous collections from this stream.

Our survey of Sensabaugh Branch resulted in the collection of 284 fish representing 17 species. These included:

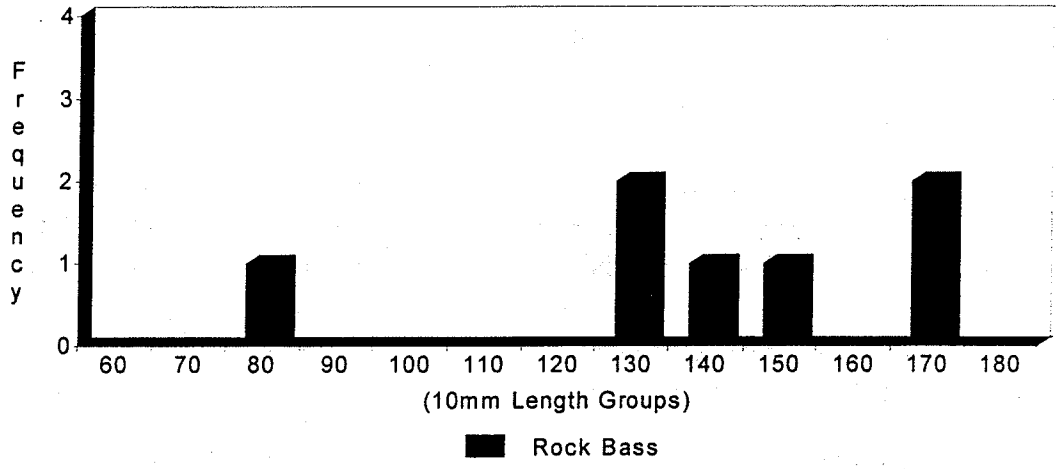
SPECIES	TADS	NUMBER
Banded sculpin (*Cottus carolinae*)	322	52
Bigeye chub (*Hybopsis amblops*)	79	1
Blacknose dace (*Rhinichthys atratulus*)	184	37
Bluegill (*Lepomis macrochirus*)	351	3
Central stoneroller (*Campostoma anomalum*)	45	82
Fantail darter (*Etheostoma flabellare*)	411	12
Golden shiner (*Notemigonus crysoleucas*)	111	2
Green sunfish (*Lepomis cyanellus*)	347	10
Hybrid sunfish (*Lepomis cyanellus x macrochirus*)	345	3
Largemouth bass (*Micropterus salmoides*)	364	1
Northern hogsucker (*Hypentelium nigricans*)	207	7
Redbreast sunfish (*Lepomis auritus*)	346	1
Rock bass (*Ambloplites rupestris*)	342	7
Snubnose darter (*Etheostoma simoterum*)	435	22
Striped shiner (*Luxilus chrysocephalus*)	89	18
Telescope shiner (*Notropis telescopus*)	138	11
Warpaint shiner (*Luxilus coccogenis*)	90	14
White sucker (*Catostomus commersoni*)	195	1

All rock bass captured in the sample were sacrificed for otoliths. Figure 12 below depicts the frequency and size range of rock bass collected.

Management Recommendations:

1. Any action that would limit non-point source pollution within the watershed would be of benefit to this stream.

Figure 12. Length Frequency Distribution for Rock Bass Collected in Sensabaugh Branch during 1997



PHYSIOCHEMICAL AND SAMPLE SITE LOCATION DATA

STREAM	SENSABAUGH BRANCH
WATERSHED	HOLSTON RIVER
SITE	@ TRAIN TUNNEL
COUNTY	HAWKINS
QUADRANGLE	CHURCH HILL 188 SW
LAT-LONG	363443N-823736W
REACH	06010101-
LENGTH	~ 100 m
AREA (SQ. KM.)	N/A
ELEVATION	1260 FT
DATE	7-22-97
TIME	N/A

COLLECTOR(S)

R.D. BIVENS, B.D. CARTER, AND C.E. WILLIAMS

1. CHANNEL CHARACTERISTICS

AVG. WIDTH	AVG. DEPTH	MAX. DEPTH
N/A	N/A	N/A

2. ESTIMATED % OF STREAM IN POOLS IS N/A

3. ESTIMATED POOL SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

4. ESTIMATED RIFFLE SUBSTRATE (%)

SILT	SAND	GRAVEL	RUBBLE	BOULDER	BEDROCK
N/A	N/A	N/A	N/A	N/A	N/A

5. ABUNDANCE OF LITTORAL AQUATIC PLANTS IS

NUMEROUS	AVERAGE	SCARCE

6. INSTREAM COVER ABUNDANCE IS

GOOD IN	AVERAGE IN	POOR IN
N/A %	N/A %	N/A %

7. SHADE OR CANOPY COVER GOOD OVER N/A %

8. FLOW (CFS) N/A — COMPARED TO NORMAL: LOW | NORMAL | HIGH

9. PRESENT WEATHER

SUNNY AND MILD

10. PAST WEATHER (last 24 hrs)

SAME

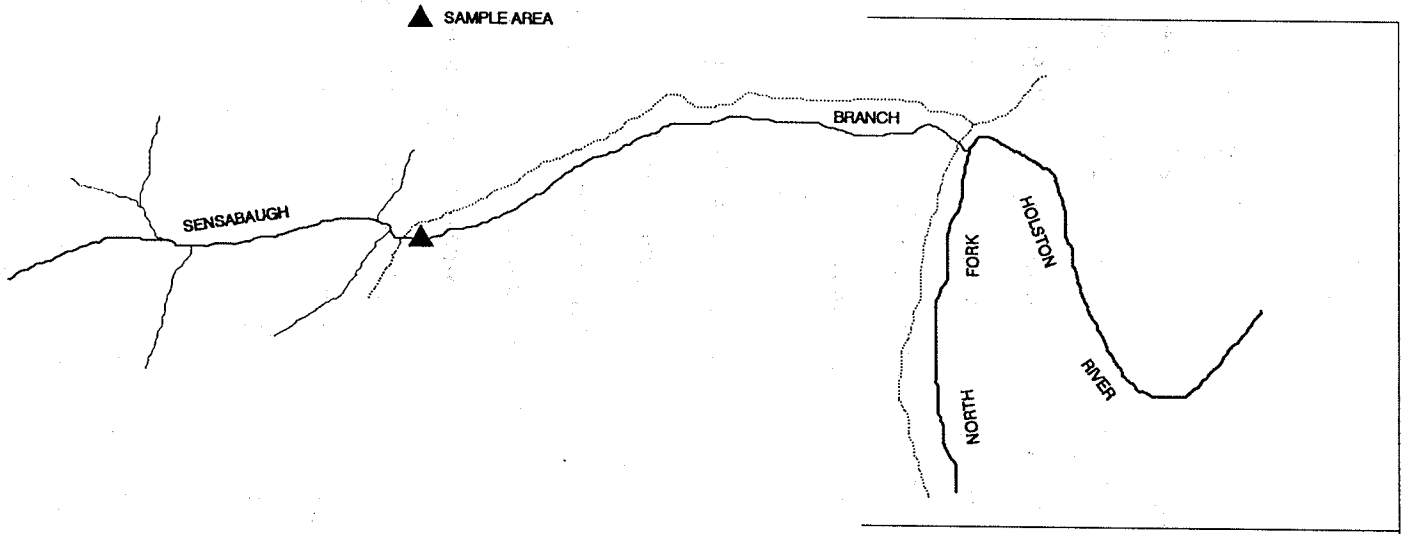
11. WATER QUALITY

pH	TEMP	COND.	D.O.	% SAT.
N/A	N/A	N/A	N/A	N/A

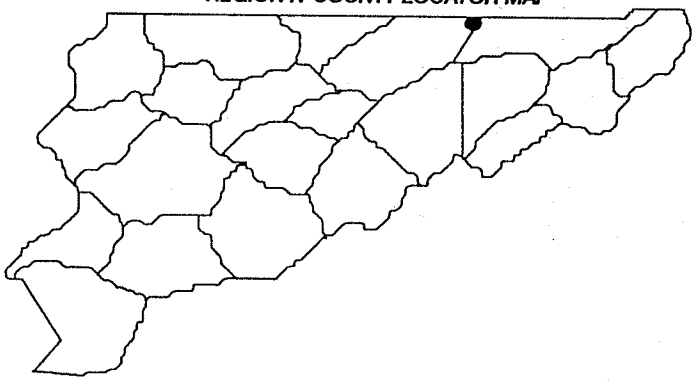
12. COMMENTS

SAMPLED AT TRAIN TUNNEL ON SENSABAUGH RD.

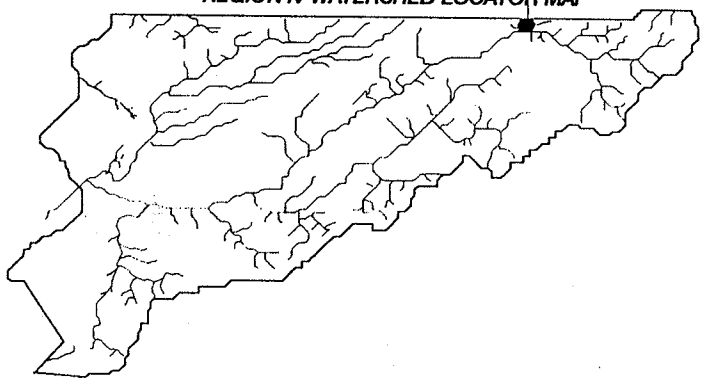
13. $\bar{X}$ HABITAT ASSESSMENT SCORE N/A



REGION IV COUNTY LOCATOR MAP



REGION IV WATERSHED LOCATOR MAP



SUMMARY

Our 1997 stream surveys comprised 23 fish samples (12 IBI) and 13 benthic samples. Index of Biotic Integrity scores for the fish samples ranged from 26 to 50 (very poor/poor to good) with an average score of 35. Ratings for the benthic macroinvertebrate samples ranged from 1.5 to 4.7 (poor/fair to excellent) with an average rating of 3.2. Of the 12 IBI fish surveys conducted 66.6% (8) scored "poor" or below, 16.6% (2) scored "fair", 8.3% (1) score "fair to good", and 8.3% (1) scored "good". Based on the analysis of the benthic macroinvertebrate ratings collected during 1997, 7.6% (1) of the samples was categorized as "poor to fair", 38.5% (5) scored "fair", 15.3% (2) rated "fair to good", 15.3% (2) scored "good", 15.3% (2) ranked "good to excellent", and 7.6% (1) was considered to be "excellent".

In those streams where CPUE data was obtained, values ranged from a low of 1.3/hour to a high of 56/hour for rock bass, while smallmouth bass values exhibited a more narrow range of 3.7/hour to 29/hour. Largemouth bass and spotted bass catch rates were generally lower as expected, with values ranging from 3/hour to 8.6/hour and 1.4/hour to 7/hour, respectively. The one 3-pass depletion survey (Big Creek) conducted in 1997 revealed standing crops of 14.9 kg/ha for rock bass and 4.1 kg/ha for smallmouth bass. Calculated densities for rock bass and smallmouth bass in Big Creek during 1997 were 287.1/ha and 48.4/ha, respectively.

Since 1995 we have been collecting black bass and rock bass otolith samples from various streams within the region for the statewide age and growth evaluation. To date we have collected 1,293 samples consisting of 734 rock bass, 424 smallmouth bass, 97 spotted bass, and 38 largemouth bass. This information will be used to characterize

growth patterns and longevity, allowing the agency to develop and implement sound management guidelines for these target species.

In regards to streams supporting game fish populations that would provide adequate angling opportunities, we concluded that nine of the 19 streams surveyed contained adequate angling opportunities for one or more species of game fish. These included Bullet Creek, Little Pigeon River, West Prong Little Pigeon River, Long Creek, Laurel Branch, Pigeon River, Sinking Creek, Big Creek, and North Fork Holston River More quantitative information should be collected on these streams and their value as sport fisheries promoted.

As is the case in many areas of east Tennessee, streams are suffering primarily from residential/commercial development and agricultural practices. The primary product of these activities that is ultimately regulating the full potential of many streams is sedimentation. This component of habitat degradation had the most consistent negative influence on our instream habitat analysis for the streams we surveyed in 1997.

LITERATURE CITED

Barbour, M.T. and J.B. Stribling. 1995. An improved visual-based technique for assessing stream habitat structure. Draft document. TetraTech Incorporated, Owings Mills, Maryland. 34 pp.

Bivens, R.D., and C.E. Williams. 1990. Region IV stream fishery data collection report: 1989. Tennessee Wildlife Resources Agency.

Bivens, R.D. and C.E. Williams. 1993. Region IV stream fishery data collection report: 1992. Tennessee Wildlife Resources Agency, Nashville.

Bivens, R.D. and C.E. Williams. 1994. Region IV stream fishery data collection report: 1993. Tennessee Wildlife Resources Agency, Nashville.

Bivens, R.D. and C.E. Williams. 1996. Region IV stream fishery data collection report: 1995. Tennessee Wildlife Resources Agency, Nashville

Bivens, R.D., B.D. Carter, and C.E. Williams. 1997. 1996 Region IV trout fishery data collection report: 1996. Tennessee Wildlife REsources Agency, Nashville.

Brigham, A.R., W.U. Brigham, and A. Gnilka, editors. 1982. Aquatic insects and oligochaetes of North and South Carolina. Midwest Enterprises, Mohomet, Illinois.

Etnier, D.A. 1990. An assessment of fish and benthic macroinvertebrate communites above and below the Pigeon Forge Sewage Treatment Plant outfall on 28 October 1990, West Prong Little Pigeon River, Sevier County, Tennessee. University of Tennessee, Knoxville.

Etnier, D.A. and W.C. Starnes. 1993. The fishes of Tennessee. The University of Tennessee Press, Knoxville.

Fagg, M.T. 1998. Tennessee Wildlife Resources Agency aquatic habitat protection project annual report region IV. Fiscal year 1996-97. Nashville, TN.

Fausch, K.D., J.R. Karr, and P.R. Yant. 1984. Regional application of an index of biotic integrity based on stream fish communities. Transactions of the American Fisheries Society 113:39-55.

Habera, J.W., R.J. Strange, and S.E. Moore. 1992. Stream morphology affects trout capture efficiency of an AC backpack electrofisher. Jouranl of the Tennessee Academy of Science 67:55-58.

Karr, J.R., K.D. Fausch, P.L. Angermier, P.R. Yant, and I.J. Schlosser. 1986. Assessing biological integrity in running waters, a method and its rationale. Illinois Natural History Survey. Special Publication 5.

Lee, D.S., C.R. Gilbert, C.H. Hocutt, R.E. Jenkins, D.E. McAllister, and J.R. Stauffer, Jr. 1980. Atlas of North American freshwater fishes. North Carolina State Museum of Natural History. Publication #1980-12 of the North Carolina Biological Survey.

Lenat, D.R. 1993. A biotic index for the southeastern United States: derivation and list of tolerance values, with criteria for assigning water-quality ratings. Journal of the North American Benthological Society 12(3)279-290.

Louton, J.A. 1982. Lotic dragonfly (Anisoptera:Odonata) nymphs of the southeastern United States: identification, distribution, and historical biogeography. Doctoral dissertation. The University of Tennessee, Knoxville.

North Carolina Department of Environmental Management. 1995. Standard operating procedures - biological monitoring. North Carolina Department of Environment, Health, and Natural Resources. 43 pp.

Orth, D.J. 1983. Aquatic measurements Pages 61-84 in L.A. Neilsen and D.L. Johnson, editors. Fisheries Techniques. American Fisheries Society, Bethesda, Maryland.

Peterson, D.C. 1984. An evaluation of the fish community of the West Prong, Pigeon River. Internal Report. Tennessee Wildlife Resources Agency, Talbott, TN.

Raleigh, R.F. and C. Short. 1981. Depletion sampling in stream ecosystems: assumptions and techniques. Progessive Fish Culturist 43:115-120.

Robins, C.R., R.M. Bailey, C.E. Bond, J.R. Brooker, E.A. Lachner, R.N. Lea, and W.B. Scott. 1991. Common and scientific names of the fishes from the United States and Canada (fifth edition). American Fisheries Society Special Publication No. 20. Bethesda, Maryland.

Saylor, C.F. and S.A. Ahlstedt. 1990. Application of index of biotic integrity (IBI) to fixed station water quality monitoring sites. Tennessee Valley Authority, Water Resources-Aquatic Biology Department, Norris.

Stewart, K.W. and B.P. Stark. 1988. Nymphs of North America stonefly genera (Plecoptera). Entomological Society of America. Volume 12.

Tennessee Department of Environment and Conservation. 1996. The status of water quality in Tennessee 1996 305(b) report. Tennessee Department of Environment and Conservation, Division of Water Pollution Control. Nashville, TN.

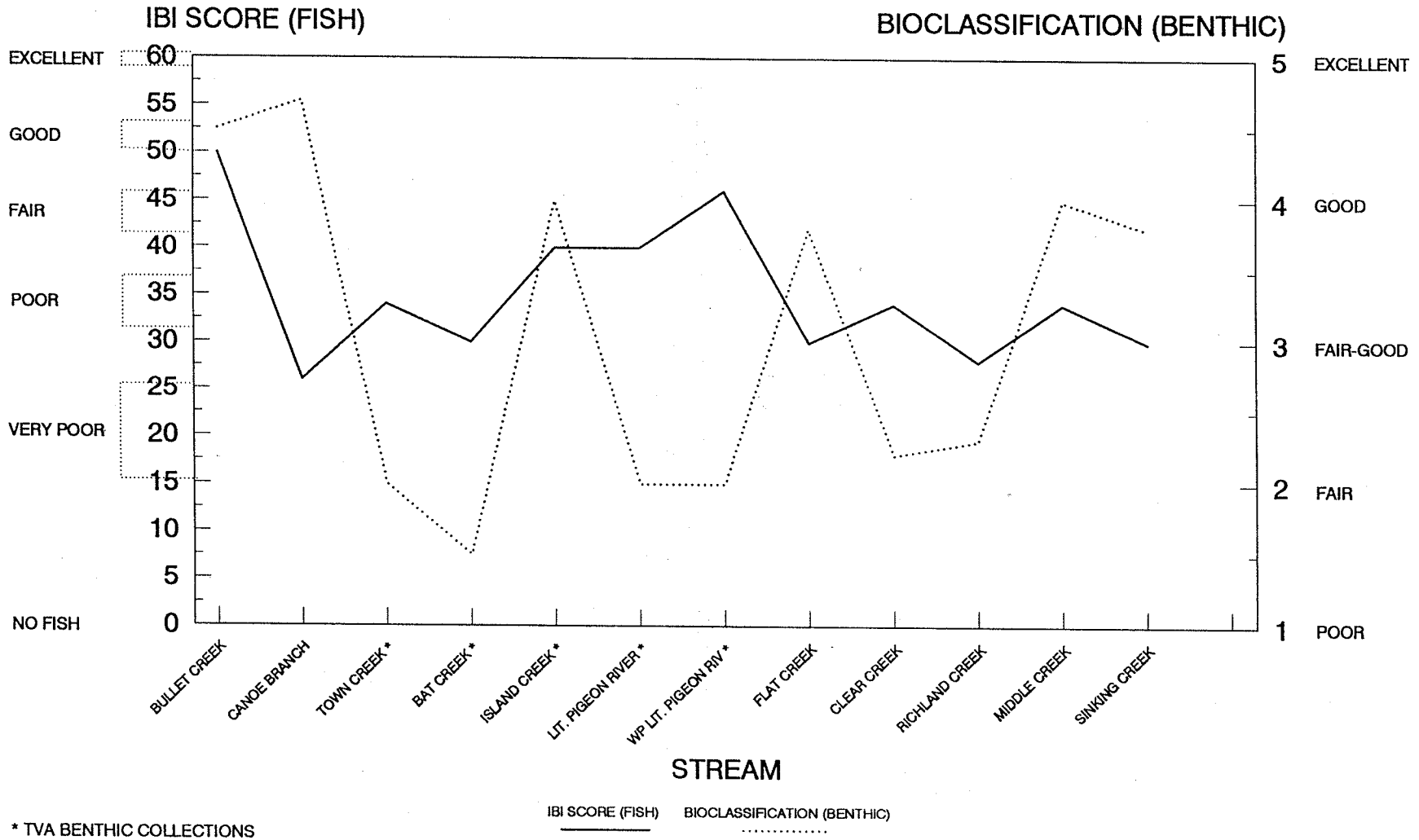
Tennessee Valley Authority. 1996. Holston Watershed: biological condition of streams (1993-1995 stream surveys). TVA Clean Water Initiative, Holston River Action Team, Norris, TN.

Tennessee Wildlife Resources Agency. 1994. A strategic wildlife resources management plan for entering the twenty-first century. Tennessee Wildlife Resources Agency, Nashville.

APPENDIX A

Trends in IBI Fish Scores and Biotic Index Values Calculated for Benthic Macroinvertebrate Samples Collected during 1997

Trends in IBI Fish Scores and Biotic Index Values Calculated for Benthic Macroinvertebrate Samples Collected during 1997



* TVA BENTHIC COLLECTIONS

APPENDIX B

Fish Species Collected during 1997 with Designations for Trophic Guild, Reproductive Guild, Tolerance, and Headwater Habitat

Fish Species with Designations for Tolerance, Trophic Guild, Reproductive Guild, and Headwater Habitat

Family	Species	Tolerance	Trophic Guild	Reproductive Guild	Headwater Habitat
CATOSTOMIDAE	*Carpiodes cyprinus*		OM		
	Catostomus commersoni	TOL	OM	L	P
	Hypentelium nigricans			L	
	Ictiobus bubalus		OM		
	Moxostoma carinatum			L	
	Moxostoma duquesnei	INT		L	P
	Moxostoma erythrurum			L	P
	Moxostoma macrolepidotum			L	
CENTRARCHIDAE	*Ambloplites rupestris*	INT	TC		P
	Lepomis auritus				
	Lepomis cyanellus	TOL			P
	Lepomis macrochirus				
	Lepomis megalotis	HI			P
	Lepomis gulosus				P
	Lepomis sp. (hybrid)				
	Micropterus dolomieu	TC			P
	Micropterus punctulatus	TC			P
	Micropterus salmoides	TC			P
CLUPEIDAE	*Dorosoma cepedianum*	TOL	OM		
COTTIDAE	*Cottus carolinae*				R
CYPRINIDAE	*Campostoma anomalum*	OM			
	Cyprinella galactura				P
	Cyprinella spiloptera	TOL			P
	Cyprinus carpio	TOL	OM		
	Erimystax insignis		OM	L	R
	Hybopsis amblops	HI	SP	L	P
	Luxilus chrysocephalus	TOL	OM	L	P
	Luxilus coccogenis	HI	SP	L	P
	Lythrurus faciolaris		SP	L	P
	Nocomis micropogon		OM		P
	Notemigonus crysoleucus	TOL	OM		
	Notropis leuciodus	HI	SP	L	P
	Notropis photogenis		SP	L	P
	Notropis rubellus		SP	L	
	Notropis rubricroceus	HI	SP	L	P
	Notropis spectrunculus		SP	L	P
	Notropis stramineus		SP	L	P
	Notropis telescopus	INT	SP	L	P
	Notropis volucellus		SP	L	
	Pimephales notatus		OM		P
	Pimephales promelas		OM		
	Phenacobius uranops		SP	L	R
	Rhinichthys atratulus			L	
	Rhinichthys cataractae	HI	SP	L	R
	Semotilus atromaculatus	TOL			P
FUNDULIDAE	*Fundulus catenatus*	HI	SP	L	R
	Fundulus notatus				
ICTALURIDAE	*Ameiurus natalis*	TOL	OM		P
	Ictalurus punctatus		OM		
	Pylodictus olivaris		TC		
LEPISOSTEIDAE	*Lepisosteus osseus*	TOL	TC		
MORONIDAE	*Morone chrysops*		TC	L	
PERCIDAE	*Etheostoma blennioides*		SP	L	R
	Etheostoma flabellare	INT	SP		R
	Etheostoma jessiae	INT	SP	L	P
	Etheostoma kennicotti		SP	L	P
	Etheostoma rufilineatum		SP	L	R
	Etheostoma simoterum		SP	L	R
	Etheostoma zonale		SP	L	R
	Perca flavescens				
	Percina caprodes		SP	L	P
	Percina evides	INT	SP	L	R
	Stizostedion canadense		TC	L	
PETROMYZONTIDAE	*Ichthyomyzon bdellium*				
	Ichthyomyzon sp.				
	Lampetra appendix				
POECILIIDAE	*Gambusia sp.*				
SALMONIDAE	*Oncorhynchus mykiss*				
	Salmo trutta		TC		
SCIAENIDAE	*Aplodinotus grunniens*				

INT = INTOLERANT HI = HEADWATER INTOLERANT ONLY SP = SPECIALIST L = SIMPLE LITHOPHIL R = RIFFLE
TOL = TOLERANT OM = OMNIVORE TC = TOP CARNIVORE P = POOL

APPENDIX C

Distribution of Fishes Collected during 1997 Stream Surveys

Distribution of Fishes Collected during 1997 Stream Surveys

Watershed →	A	B	C	D	D	D	E	E	E	E	E	E	F	F	G	G	H	H	H
	BULLET CREEK	CANOE BRANCH	TOWN CREEK	BAT CREEK	ISLAND CREEK	CITICO CREEK	LITTLE PIGEON RIVER	WP LITT PIGEON RIVER	FLAT CREEK	CLEAR CREEK	LONG CREEK	LAUREL BRANCH	RICHLAND CREEK	MIDDLE CREEK	PIGEON RIVER	SINKING CREEK	BIG CREEK	FORK HOLSTON RIVER	SENSABAUGH BRANCH
FAMILY	SCIENTIFIC NAME	STATUS																	
CATOSTOMIDAE	*Carpiodes cyprinus*							X											
	Catostomus commersoni				X				X	X		X	X	X	X		X			X
	Hypentelium nigricans		X		X	X	X		X	X	X		X				X	X		X
	Ictiobus bubalus							X												
	Moxostoma carinatum							X												
	Moxostoma duquesnei		X					X	X			X	X	X				X		
	Moxostoma erythrurum					X		X	X	X				X						
	Moxostoma macrolepidotum							X												
CENTRARCHIDAE	*Ambloplites rupestris*		X		X		X		X			X	X			X	X	X	X	X
	Lepomis auritus		X			X	X		X	X	X		X	X	X				X	X
	Lepomis cyanellus				X							X		X						X
	Lepomis macrochirus				X	X	X		X		X	X	X		X		X	X		X
	Lepomis megalotis		X																	
	Lepomis gulosus													X						
	Lepomis sp. (hybrid)																			X
	Micropterus dolomieu		X				X	X	X							X		X	X	
	Micropterus punctulatus						X	X	X							X			X	
	Micropterus salmoides					X		X								X				X
CLUPEIDAE	*Dorosoma cepedianum*							X	X			X					X			
COTTIDAE	*Cottus carolinae*		X	X	X		X		X	X	X	X	X	X	X	X		X	X		X
CYPRINIDAE	*Campostoma anomalum*		X	X	X		X		X	X	X	X	X	X	X	X		X	X		X
	Cyprinella galactura		X						X	X	X		X	X				X	X		
	Cyprinella spiloptera						X		X				X		X						
	Cyprinus carpio				X		X		X	X											
	Erimystax insignis									X											
	Hybopsis amblops								X	X	X		X						X		X
	Luxilus chrysocephalus		X		X				X	X			X					X	X		X
	Luxilus coccogenis		X						X	X			X	X					X		X
	Lythrurus faciolaris																		X		
	Lythrurus lirus									X											
	Nocomis micropogon		X						X	X									X		
	Notemigonus crysoleucus																				X
	Notropis leuciodus		X						X	X									X		
	Notropis photogenis								X	X											
	Notropis rubellus								X	X											
	Notropis rubricroceus								X												
	Notropis spectrunculus		X																		
	Notropis stramineus								X	X	X										
	Notropis telescopus		X							X									X		X
	Notropis volucellus								X												
	Pimephales notatus								X												
	Pimephales promelas					X						X									
	Phenacobius uranops								X	X											
	Rhinichthys atratulus		X	X	X						X	X	X	X	X	X	X		X		X
	Rhinichthys cataractae								X												
	Semotilus atromaculatus		X		X						X	X	X	X	X	X	X	X	X		
FUNDULIDAE	*Fundulus catenatus*								X												
	Fundulus notatus								X												
ICTALURIDAE	*Ameiurus natalis*								X	X			X								
	Ictalurus punctatus								X												
	Pylodictus olivaris								X												
LEPISOSTEIDAE	*Lepisosteus osseus*								X												
MORONIDAE	*Morone chrysops*								X												
PERCIDAE	*Etheostoma blennioides*								X	X									X		
	Etheostoma flabellare																				X
	Etheostoma jessiae								X	X											
	Etheostoma kennicotti									X											
	Etheostoma rufilineatum		X						X	X			X						X		
	Etheostoma simoterum		X		X	X	X		X	X	X		X	X	X	X		X	X		X
	Etheostoma zonale								X												
	Perca flavescens						X														
	Percina caprodes					X	X		X	X		X					X				
	Percina evides								X	X											
	Stizostedion canadense								X												
PETROMYZONTIDAE	*Ichthyomyzon bdellium*								X												
	Ichthyomyzon sp.									X											
	Lampetra appendix									X											
POECILIIDAE	*Gambusia sp.*				X																
SALMONIDAE	*Oncorhynchus mykiss*									X			X		X		X	X			
	Salmo trutta												X								
SCIAENIDAE	*Aplodinotus grunniens*						X		X												

FE = FEDERALLY ENDANGERED, FT = FEDERALLY THREATENED, ST = STATE THREATENED, INM = IN NEED OF MANAGEMENT

A = HIWASSEE RIVER WATERSHED
B = POWELL RIVER WATERSHED
C = TENNESSEE RIVER WATERSHED
D = LITTLE TENNESSEE RIVER WATERSHED
E = FRENCH BROAD RIVER WATERSHED
F = NOLICHUCKY RIVER WATERSHED
G = PIGEON RIVER WATERSHED
H = HOLSTON RIVER WATERSHED

APPENDIX D

Distribution of Crayfishes Collected during 1997 Stream Surveys

Distribution of Crayfishes Collected during 1997 Stream Surveys

Watershed →	A	B	C	D	E	E	F	F	G	H	H
	BULLET CREEK	CANOE BRANCH	TOWN CREEK	BAT CREEK	FLAT CREEK	LAUREL BRANCH	RICHLAND CREEK	MIDDLE CREEK	SINKING CREEK	BIG CREEK	SEN SABAUGH BRANCH
FAMILY	SCIENTIFIC NAME	STATUS									
Cambaridae	*Cambarus bartonii*			X			X	X			
	Cambarus dubius		X								
	Cambarus girardianus		X	X						X	X
	Cambarus longirostris							X	X		
	Cambarus thomai			X							
	Orconectes erichsonianus				X	X	X				
	Orconectes forceps				X	X					
	Orconectes rusticus									X	X
	orconected virilis								X		

FE = FEDERALLY ENDANGERED, FT = FEDERALLY THREATENED, ST = STATE THREATENED, INM = IN NEED OF MANAGEMENT

A = HIWASSEE RIVER WATERSHED
B = POWELL RIVER WATERSHED
C = TENNESSEE RIVER WATERSHED
D = LITTLE TENNESSEE RIVER WATERSHED
E = FRENCH BROAD RIVER WATERSHED
F = NOLICHUCKY RIVER WATERSHED
G = PIGEON RIVER WATERSHED
H = HOLSTON RIVER WATERSHED

APPENDIX E

Mean Habitat Assessment Scores for Streams Surveyed during 1997

Mean Habitat Assessment Scores for Streams Surveyed during 1997

	PREVALENT HABITAT TYPE	HABITAT PARAMETER 1	HABITAT PARAMETER 2	HABITAT PARAMETER 3	HABITAT PARAMETER 4	HABITAT PARAMETER 5	HABITAT PARAMETER 6	HABITAT PARAMETER 7	HABITAT PARAMETER 8	HABITAT PARAMETER 9	HABITAT PARAMETER 10	
	RIFFLE/RUN	Instream Cover	Epifaunal Substrate	Embeddedness	Channel Alteration	Sediment Deposition	Freq. of Riffles	Channel Flow Status	Bank Vegetative Cover	Bank Stability	Riparian Vegetative Zone Width	
	GLIDE/POOL	Bottom Substrate	Pool Substrate	Pool Variability	Channel Alteration	Sediment Deposition	Channel Sinuosity	Channel Flow Status	Bank Vegetative Cover	Bank Stability	Riparian Vegetative Zone Width	
STREAM	* DESIGNATION	SCORE	SCORE	SCORE	SCORE	SCORE	SCORE	SCORE	SCORE	SCORE	SCORE	MEAN TOTAL SCORE
BULLET CREEK	RIFFLE/RUN	12	12	12	18	12	14	17	13	14	11	135
CANOE BRANCH	RIFFLE/RUN	11	16	15	19	16	17	19	10	15	9	147
FLAT CREEK	RIFFLE/RUN	15	12	11	15	9	16	15	13	12	7	125
CLEAR CREEK	RIFFLE/RUN	14	16	8	13	8	17	14	9	12	8	119
RICHLAND CREEK	RIFFLE/RUN	8	8	9	15	12	15	17	16	16	12	128
MIDDLE CREEK	RIFFLE/RUN	11	10	11	18	8	12	18	8	15	3	114
SINKING CREEK	RIFFLE/RUN	10	13	7	16	6	13	16	17	14	13	125

* Streams designated as riffle/run or glide/pool were evaluated based on the specific criteria for that habitat type.

APPENDIX F

Visual-Based Habitat Assessment Forms Used to Evaluate Stream Habitat during 1997

HABITAT ASSESSMENT FIELD DATA SHEET *RIFFLE/RUN PREVALENT STREAMS*

STREAM _____ DATE _____

SITE _____ INVESTIGATOR _____

Riffle/Run Prevalent Streams are those in moderate to high gradient landscapes that sustain water velocities of approximately 1 ft/sec or greater. Natural streams have substrates primarily composed of coarse sediment particles (i.e., gravel or larger) or frequent coarse particulate aggregations along stream reaches.

Habitat Parameter	Category			
	Optimal	Suboptimal	Marginal	Poor
1. Instream Cover (Fish)	Greater than 50% mix of snags, submerged logs, undercut banks, or other stable habitat.	30-50% mix of stable habitat; adequate habitat for maintenance of populations.	10-30% mix of stable habitat; habitat availability less than desirable.	Less than 10% mix of stable habitat; lack of habitat is obvious.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Epifaunal Substrate	Well-developed riffle and run; riffle is as wide as stream and length extends two times the width of stream; abundance of cobble.	Riffle is as wide as stream but length is less than two times width; abundance of cobble; boulders and gravel common.	Run area may be lacking; riffle not as wide as stream and its length is less than 2 times the stream width; gravel or large boulders and bedrock prevalent; some cobble present.	Riffles or runs virtually nonexistent; large boulders and bedrock prevalent; cobble lacking.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	New embankments present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, coarse sand on old and new bars; 30-50% of the bottom affected; sediment deposits at obstruction, constriction, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Habitat Parameter	Category			
	Optimal	Suboptimal	Marginal	Poor
6. Frequency of Riffles	Occurrence of riffles relatively frequent; distance between riffles divided by the width of the stream equals 5 to 7; variety of habitat is key. In the highest gradient streams (e.g., headwaters), riffles are continuous, and placement of boulders or other large, natural obstruction is evaluated as providing habitat diversity.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream equals 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is between ratio >25.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Flow Status	Water reaches base of both lower banks and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 2 inches or less in average stubble height.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score ____

Habitat Parameter	Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note -- channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Flow Status	Water reaches base of both lower banks and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of stream-bank vegetation is very high; vegetation has been removed to 2 inches or less in average stubble height.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e. parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score ____

HABITAT ASSESSMENT FIELD DATA SHEET — *GLIDE/POOL PREVALENT STREAMS*

STREAM _____ DATE _____

SITE _____ INVESTIGATOR _____

Glide/Pool Prevalent Streams are those in low to moderate gradient landscapes that have velocities rarely greater than 1 ft/sec, except during storm events. Natural streams have substrates of fine sediment or infrequent aggregations of coarser (gravel or larger) sediment particles along stream reaches.

Habitat Parameter	Category			
	Optimal	Suboptimal	Marginal	Poor
1. Bottom Substrate/ Available Cover	Greater than 50% mix of snags, submerged logs, undercut banks, rubble or other stable habitat and at stage to allow full colonization potential (i.e., logs/ snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not get prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Channel Alteration	Channelization or dredging absent or minimal; stream with normal, sinuous pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yrs) may be present, but recent channelization is not present.	New embankments present on both banks; channelization may be extensive, usually in urban areas or drainage areas of agriculture lands; and >80% of stream reach channelized and disrupted.	Extensive channelization; banks shored with gabion or cement; heavily urbanized areas; instream habitat greatly altered or removed entirely.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Sediment Deposition	Less than 20% of bottom affected; minor accumulation of fine and coarse material at snags and submerged vegetation; little or no enlargement of islands or point bars.	20-50% affected; moderate accumulation; substantial sediment movement only during major storm event; some new increase in bar formation.	50-80% affected; major deposition; pools shallow, heavily silted; embankments may be present on both banks; frequent and substantial sediment movement during storm events.	Channelized; mud, silt, and/or sand in braided or nonbraided channels; pools almost absent due to deposition.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

APPENDIX G

1997 Summary of Strategic Plan Activities

1997 Summary of Strategic Plan Activities

ACTIVITY	COMPLETED	NUMBER
Identified land for purchase and/or lease of stream easements from landowners for habitat protection (I-1)	NO	
Participation in stream restoration projects (I-4)	NO	
Development of a watershed management plan (II-1)	NO	
Stream surveys (II-2)	YES	23
Implemented a creel and/or user survey (II-3)	NO	
Identification of stream fishing access sites for purchase and/or lease (III-1)	NO	
Cooperation with organized groups for stream habitat development and cleanup (III-3)	NO	
Design and implementation of stream habitat enhancement programs (IV-1)	NO	
Evaluation of stream habitat enhancement (IV-2)	NO	
Public education about stream fishing (VI-1)	YES	22
Locations for potential land purchases or leases:	NO	