FISHERIES REPORT
REPORT NO. 03-04
WARMWATER STREAM FISHERIES REPORT
REGION IV
2002

Prepared by

Bart D. Carter
Carl E. Williams
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TENNESSEE WILDLIFE RESOURCES AGENCY

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Cover: The stream survey crew and Royal Blue WMA personnel prepare for a long day of ATV riding and fish sampling on Royal Blue WMA. The ATV proved to be an indispensable mode of transportation for accessing some of the more remote streams on the WMA.

Acknowledgements

We would like to thank the staff of Royal Blue WMA for their support both in personnel and logistics. Without their aid many of the streams on the WMA would not have been surveyed.

Fred Jordan of Royal Blue WMA overlooks the falls on Meadow Creek

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INTRODUCTION

The fish fauna of Tennessee is the most diverse in the United States, with approximately 307 species of native fish and about 30 to 33 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. 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, Nolichucky, 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 2000) as a primary goal.

This is the sixteenth annual report on stream fishery data collection in TWRA's Region IV. The main purpose of this project is to collect baseline information on game and non-game 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 management of fisheries resources in the region.

Efforts to survey the region’s streams have 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 river and stream accounts. These accounts include an introduction describing the general characteristics of the survey site, a study area and methods section summarizing site location and sampling procedures, a results section outlining the findings of the survey(s), and a discussion section, which allows us to summarize our field observations and make management recommendations.

METHODS

The streams to be sampled and the methods required are outlined in TWRA field request No. 02-4. A total of 39 streams were sampled and are included in this report. Stream surveys were conducted from May to October 2002. Seventy-three (IBI and CPUE) fish samples and ten benthic samples were collected.

SAMPLE SITE SELECTION

Index of Biotic Integrity (IBI) 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 positioned survey sites far enough upstream to decrease the probability of collecting transient species. Large river sampling sites (Clinch River, Powell River, and Pigeon River) were selected based on the length of the river and available access points. Typically we selected sample areas in these rivers that represented the best available habitat for any given reach being surveyed. Sampling locations were delineated in the field on 7.5 minute topographical maps and then digitally re-created using a commercially available software package.

WATERSHED ANALYSIS

Watershed size and/or stream order has historically been used to create relationships for determining maximum expected species richness for IBI analysis. 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 (kilometer^2) to develop our relationships as this variable has been shown to be a more reliable metric for predicting maximum species richness. Watershed areas **(the area upstream of the survey site)** were determined from USGS 1:24,000 scale maps.

FISH COLLECTIONS

Fish data were collected by employing an Index of Biological Integrity (Karr et al. 1986). Fish were collected with standard electrofishing (backpack) and seining techniques. A 5 x 1.3 meter seine was used to make hauls in shallow pool and run areas. Riffle and deeper run habitats were sampled with a seine in conjunction with a backpack electrofishing unit (100-600 VAC). An area approximately the length of the seine^2 (i.e., 5 meter x 5 meter) 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 (meter^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 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 three rivers during 2002. Timed boat electrofishing runs were made in pool and shallower habitat where navigable. Efforts were made to sample the highest quality habitat in each sample site and include representation of all habitat types typical to the reaches surveyed. Total electrofishing time was calculated and was used to determine our catch-effort estimates (fish/hour).

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) for identification. Most of the preserved fish collected in the 2002 samples will be 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, statewide collection of otolith samples was initiated in 1995 by regional stream crews. No otoltihs were collected from black bass or rock bass in 2002 as collections were made from these rivers in 1999.

BENTHIC COLLECTIONS

Qualitative benthic samples were collected from each IBI fish sample site and seven of our small stream CPUE sites. 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. (1998). Benthic results are presented in tabular form with each stream account.

WATER QUALITY MEASUREMENTS

Basic water quality data were taken at most sites in conjunction with the fishery and benthic samples. The samples included temperature, pH, and conductivity. Data were taken from midstream and mid-depth at each site, using 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 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 TWRA (Bivens et al. 1994), 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 kilometer^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 if 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.

Catch-per-unit-effort analysis was performed on the three large rivers sampled during 2002. Total time spent electrofishing at each site was used to calculate the CPUE estimates for each species collected. Length categorization analysis (Gabelhouse 1984) was used to calculate Proportional Stock Density (PSD) and Relative Stock Density (RSD) for black bass and rock bass populations sampled during 2002.

Benthic data collected for the 2002 surveys were subjected to a biotic index that rates stream condition based on the overall taxa tolerance values and the number of Ephemeroptera, Plecoptera, and Trichoptera (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	Biotic 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	5.84-6.43	18-21
2.6	6.44-6.48	16-17
2.4	6.49-6.53	14-15
2	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.

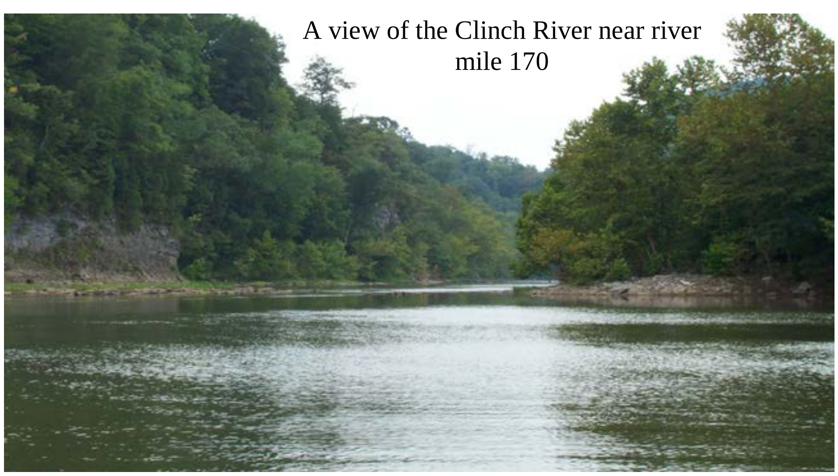
Clinch River

Introduction

The Clinch River represents an important recreational resource for the state both in consumptive and non-consumptive uses. It provides critical habitat for threatened and endangered species and species of special concern. The river supports a diverse fish community and has been documented to host some 43 species of mussels (Ahlstedt 1986). Additionally, it supports one of east Tennessee's better warmwater sport fisheries. The Clinch River has been the focus of numerous surveys and investigations conducted by both state and federal agencies with the major purpose of assessing and monitoring the fish and benthic communities. The Agency has made limited surveys of the river that focused primarily on collecting basic fish, benthic, and water quality data (Bivens 1988, Carter et al. 2000). Our survey of the Clinch River focused on re-evaluating the sport fish population originally sampled in 1999. Our 2002 assessment was derived from nine sample sites located between river mile 202 and river mile 152. After our initial evaluation in 1999, the Clinch River was put into a 3-year rotational schedule with eight other rivers in the region. Sport fish sampling sites were reduced to those that would best characterize these populations.

Study Area and Methods

The Clinch River originates in Virginia and flows in a southwesterly direction before emptying into Norris Reservoir near river mile 152. The river has a drainage area of approximately 3,838 kilometers^2 (upstream of the reservoir). In Tennessee, all of the Clinch River flows through the Ridge and Valley province of east Tennessee coursing by the town of Sneedville before emptying into Norris Reservoir just northwest of Thorn Hill. Public access along the river is primarily limited to bridge crossings and small "pull-outs" along roads paralleling the river. There are several primitive launching areas for canoes or small boats and three developed launching areas managed by the Tennessee Wildlife Resources Agency (Kyles Ford, Sneedeville, Hwy 25E Bridge).



A view of the Clinch River near river mile 170

Between August 6 and August 14, 2002, we conducted nine fish surveys between the Virginia state line and Norris Reservoir (Figure 1). In our survey sites, the riparian habitat consisted primarily of wooded shorelines with interspersed agricultural fields. Submerged woody debri was fairly common in most of our sample areas as were large mats of riverweed (*Podostemum ceratophyllum)*. The river substrate was predominately boulder/cobble in riffle areas and bedrock with interspersed boulders/cobble in the pool habitat. Measured mean channel widths ranged from 41.6 meters to 71.5 meters, while site lengths fell between 190 meters and 890 meters (Table 1). Water temperatures ranged from 27 C to 30.5 C and conductivity varied from 345 to 380 μs/cm (Table 1).

Figure 1. Site locations for samples conducted in the Clinch River during 2002.

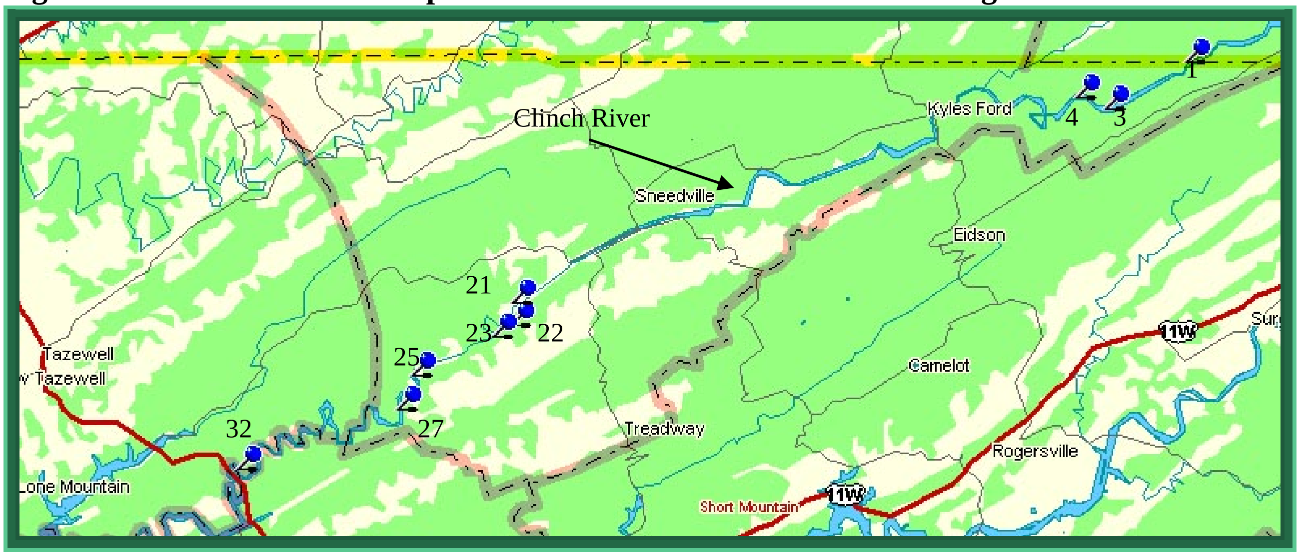


Table 1. Physiochemical and site location data for samples conducted in the Clinch River during 2002.

Site Code	Site	Quad	River Mile	Latitude	Longitude	Mean Width (m)	Length (m)	Temp. C	Cond.	Secchi (m)
420024001	1	Looney Gap	202	363537	825322	44.6	376	28	378	2
420024003	3	Looney Gap	199	363453	825716	41.6	381	30.5	380	2
420024004	4	Looney Gap	197.8	363436	825629	50.6	190	28	378	2
420024021	21	Swan Island	172.5	362838	831721	53	718	27	360	1.3
420024022	22	Swan Island	170.7	362831	831811	71.5	480	29.5	355	1.3
420024023	23	Swan Island	169.6	362754	831803	50	217	27.5	345	1.5
420024025	25	Swan Island	166.6	362645	832057	63	890	27.5	345	1.5
420024027	27	Swan Island	164.5	362545	832128	68.5	520	27.5	345	1.5
420024032	32	Howard Quarter	152.2	362405	832709	71.5	413	27.5	345	1.5

Fish were collected by boat electrofishing in accordance with the standard large river sampling protocols (TWRA 1998). Fixed-boom electrodes were used to transfer 4-5 amps DC at all sites. This current setting was determined effective in narcotizing all target species (black bass and rock bass). Additionally, efforts were made to identify non-target species subsequently encountered and compile a list for each survey site. All sites were sampled during daylight hours and had survey durations ranging from 900 to 1408 seconds. Catch-per-unit-effort (CPUE) values were calculated for each target species at each site. Length categorization indices were calculated for target species following Gabelhouse (1984).

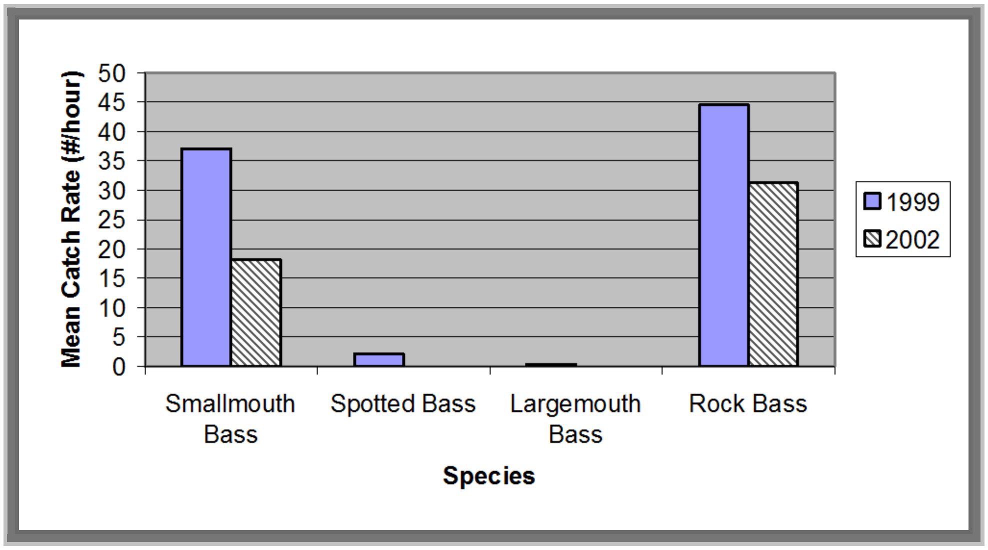
Results

CPUE estimates for smallmouth bass averaged 18.2/hour (SD 10.9), while the mean rock bass estimate was 31.3/hour (SD 16.5) (Table 2). Surprisingly, there were no spotted bass or largemouth bass collected at any of the nine survey sites. Four of the nine sites sampled in 1999 either had spotted bass or largemouth bass present (Carter et al. 2000). Comparatively, there was an overall decline in the mean catch rate of black bass species (51% for smallmouth bass) from our survey in 1999 (Figure 2). Likewise, the mean catch rate for rock bass decreased 29.6% from our sample taken in 1999. The most notable declines were observed at site 3 and at site 32.

Table 2. Catch per unit effort and length categorization indices of target species collected at nine sites on the Clinch River during 2002.

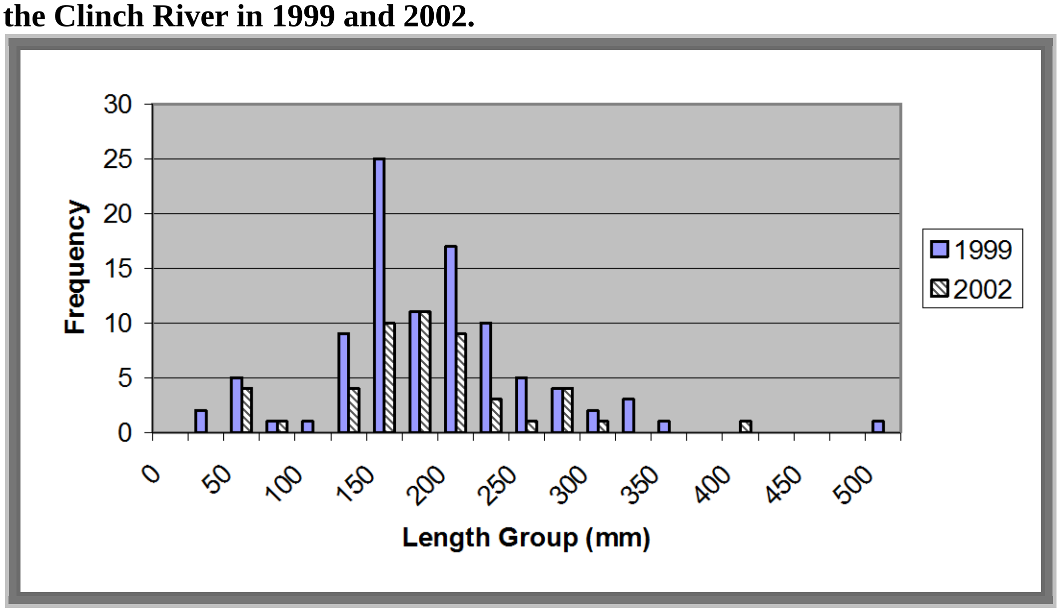
Site Code	Smallmouth Bass CPUE	Spotted Bass CPUE	Largemouth Bass CPUE	Rock Bass CPUE
420024001	12	-	-	52
420024003	28	-	-	36
420024004	11.9	-	-	23.9
420024021	11.6	-	-	23.7
420024022	10.8	-	-	43.2
420024023	15.1	-	-	56.7
420024025	43.4	-	-	23
420024027	11.7	-	-	11.7
420024032	19.5	-	-	11.7
MEAN	18.2	-	-	31.3
STD. DEV.	10.9	-	-	16.5
	Length-Categorization Analysis	**Length-Categorization Analysis**	**Length-Categorization Analysis**	**Length-Categorization Analysis**
	PSD = 17.2	PSD = 0	PSD = 0	PSD = 20.5
	RSD-PREFERRED = 3.4	RSD-PREFERRED = 0	RSD-PREFERRED = 0	RSD-PREFERRED = 0
	RSD-MEMORABLE = 0	RSD-MEMORABLE = 0	RSD-MEMORABLE = 0	RSD-MEMORABLE = 0
	RSD- TROPHY = 0	RSD- TROPHY = 0	RSD- TROPHY = 0	RSD- TROPHY = 0

Figure 2. Trends in mean catch rate of black bass and rock bass collected between 1999 and 2002 from the Clinch River.



The size distribution of smallmouth bass between 1999 and 2002 changed somewhat among our nine sampling stations (Figure 3). Generally, there were fewer bass below 150 mm and fewer above the 300 mm size class in 2002 sample. For the most part, bass in the 175 mm to 325 mm size range were less abundant in 2002, indicating poor recruitment from previous year classes (1998-00). Lower recruitment into the smaller size classes during 2002 indicated a relatively poor year class. This could be attributed to the drought conditions experienced over the last three years and the potential for the density of spawning size fish to be somewhat lower.

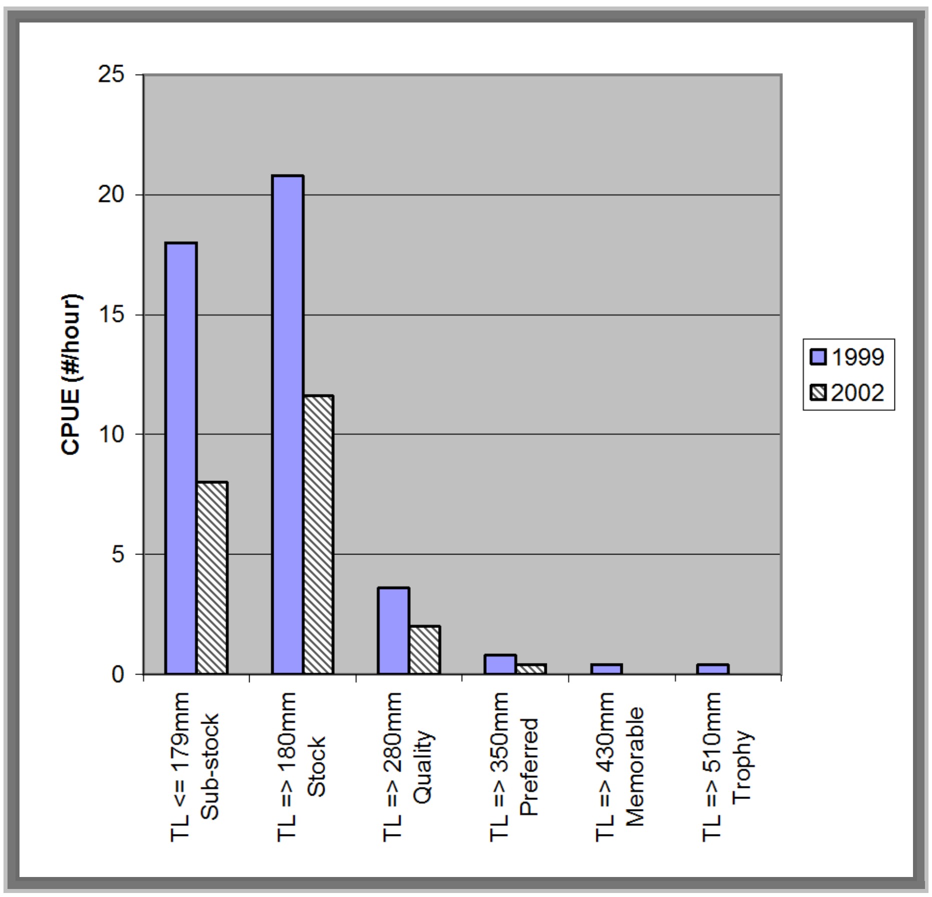
Figure 3. Length frequency distributions for smallmouth bass collected from the Clinch River in 1999 and 2002.



The number of bass over 14 inches remained relatively stable over the two sampling periods. Two bass over 14 inches were collected in 1999 compared to one bass in the 2002 sample. Only one bass in the 20 inch class has been observed to date. It was collected in our 1999 sample near the state line.

Length categorization analysis indicated the relative stock density (RSD) of preferred smallmouth bass (TL $\geq$ 350 mm) was 3.4 (Table 2). RSD for memorable (TL $\geq$ 430 mm) and trophy (TL $\geq$ 510 mm) size bass were 0 and 0, respectively. The PSD of smallmouth bass (ratio of quality size bass to stock size bass) was 17.2. In comparison, the value for 1999 was slightly higher for bass in the preferred category (3.8). Values for memorable and trophy were also slightly higher at 1.9. Catch per unit effort estimates by RSD category in 1999 and 2002 indicated a substantial decline in the catch of sub-stock smallmouth bass (Figure 4). The values for stock and quality size bass in 2002 were also substantially lower when compared to 1999, while the catch rate of smallmouth bass in the preferred category was only slightly lower.

Figure 4. Relative stock density (RSD) catch per unit effort for smallmouth bass collected from the Clinch River in 1999 and 2002.

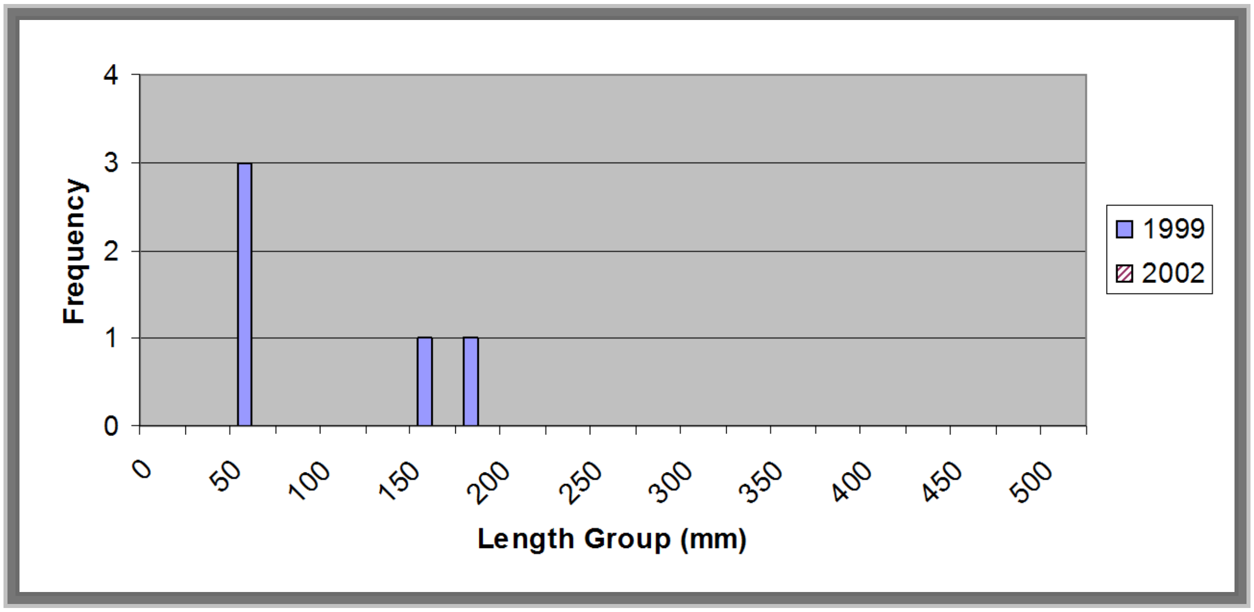


Age and growth characteristics for the smallmouth bass population in the Clinch River were characterized in 1999 (Carter et al. 2000). For the most part, the Clinch River has had growth rates similar to other large river populations with the same age structure.

We did not collect otoliths from smallmouth bass in 2002, assuming that the values generated from the 1999 survey typify the general growth characteristics of this population. In general it takes a smallmouth bass in the Clinch River about 4.7 years to reach 305 mm (12 inches), and about 7.8 years to attain a length of 406 mm (16 inches).

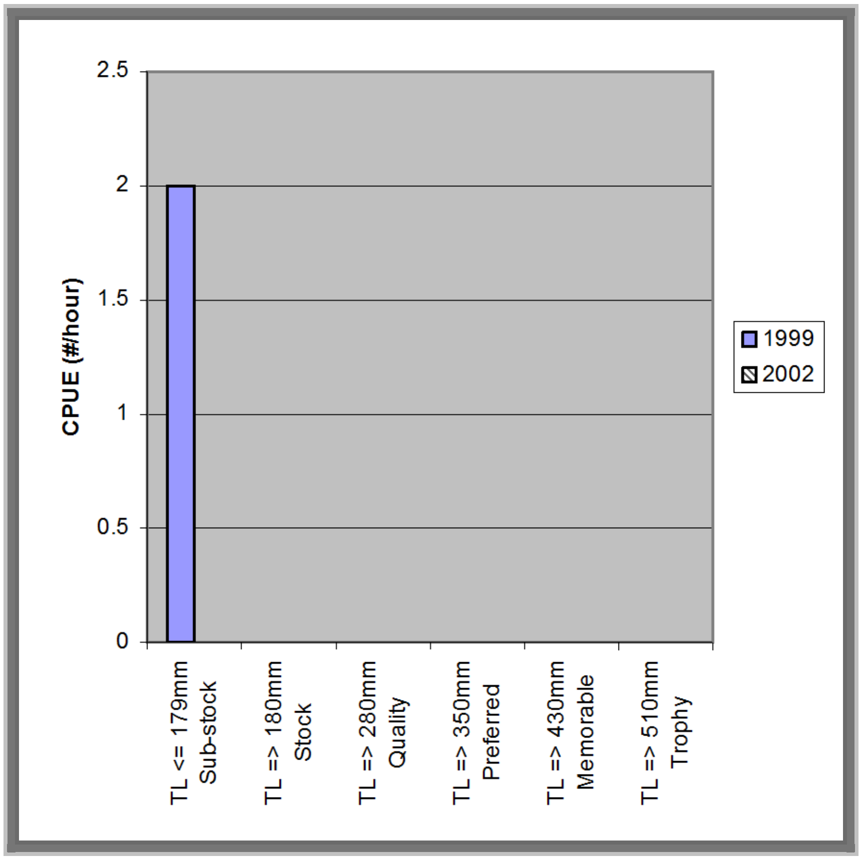
There were no spotted bass collected from the Clinch River in 2002. All of the spotted bass collected at the same nine sample sites surveyed in 1999 were within the 50 mm and 200 mm size groups (Figure 5). Based on the length frequency distribution between 1999 and 2002, there appears to have been very little or no spotted bass reproduction in 2002.

Figure 5. Length frequency distributions for spotted bass collected from the Clinch River in 1999 and 2002.



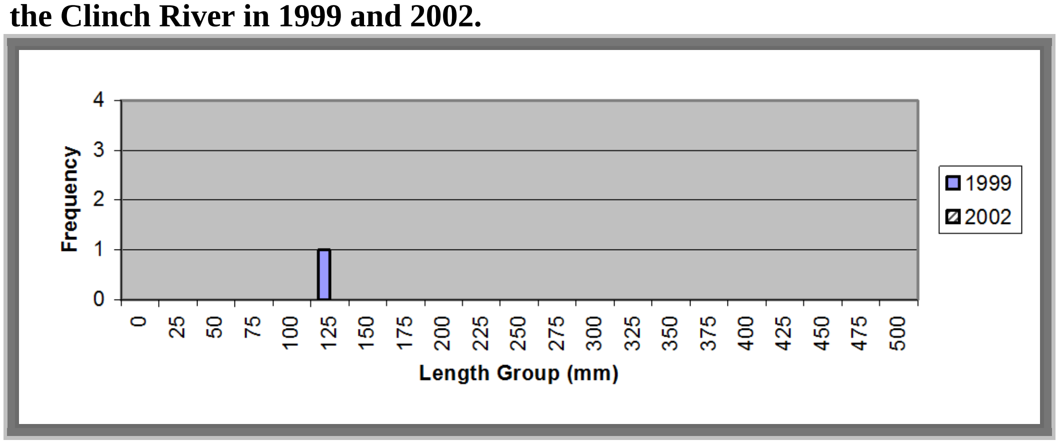
Length categorization analysis indicated the RSD for preferred spotted bass among the nine sampling stations (TL $\geq$ 350 mm) was 0 in 1999 and 2002. RSD for memorable (TL $\geq$ 430 mm) and trophy (TL $\geq$ 510 mm) size bass was 0. The PSD for spotted bass was 20 in the overall 1999 sample, but fell to 0 when recalculated from the nine survey sites common to the 2002 sample. Catch per unit effort estimates by RSD category revealed no spotted bass in the RSD-S and above categories in 1999 (5 in sub-stock category) and no bass in any RSD category in 2002 (Figure 6). Apparently, drought conditions have not been favorable for spotted bass reproduction or recruitment in the Clinch over the last three years as has been the case with many streams in the region.

Figure 6. Relative stock density (RSD) catch per unit effort by category for spotted bass collected from the Clinch River in 1999 and 2002.



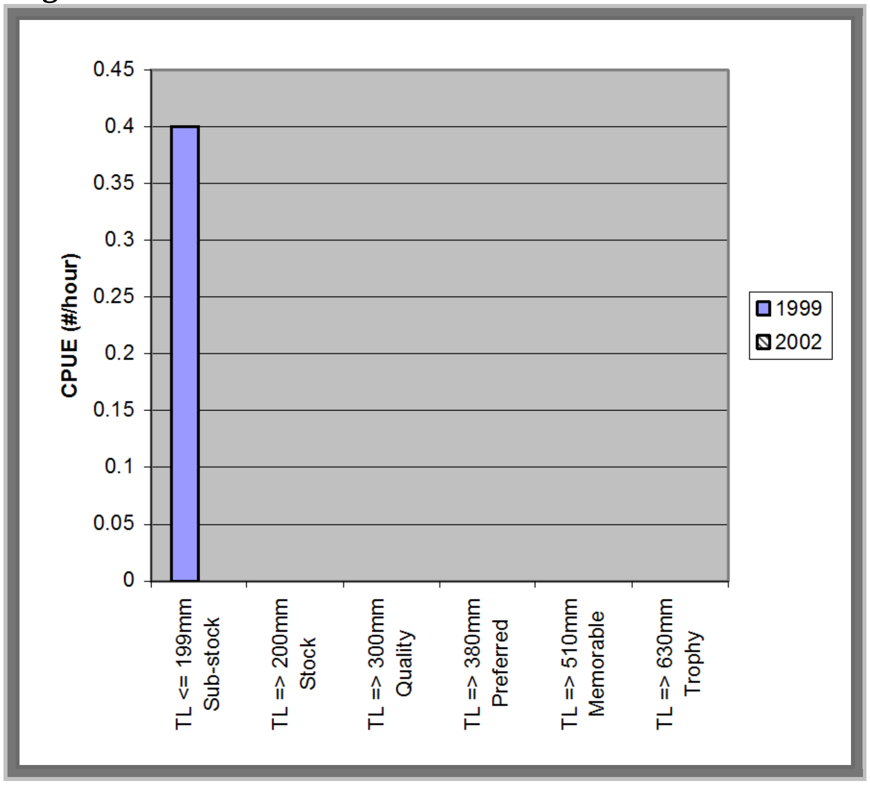
Very few largemouth bass have been collected in the Clinch River between 1999 and 2002 at our nine monitoring stations (Figure 7). None were collected during 2002, which is typical for many riverine fisheries in the region. Occurrence of largemouth bass in the Clinch River is sporadic and should not be considered a contributor to the overall sport fishery.

Figure 7. Length frequency distributions for largemouth bass collected from the Clinch River in 1999 and 2002.



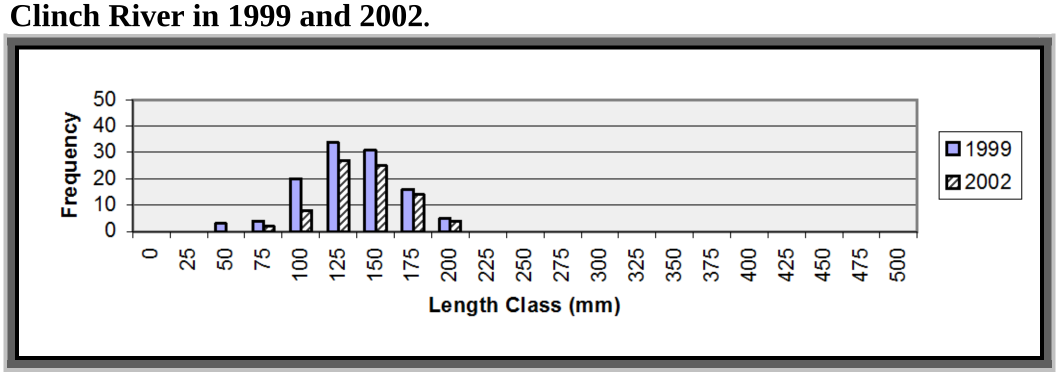
Length categorization data for largemouth bass revealed that there were no fish available to anglers in the quality and above categories during 2002 (Figure 8). This supports the length frequency data above and decisively indicates that the Clinch River does not provide much of an opportunity for largemouth bass angling.

Figure 8. Relative stock density (RSD) catch per unit effort for largemouth bass collected from the Clinch River in 1999 and 2002.



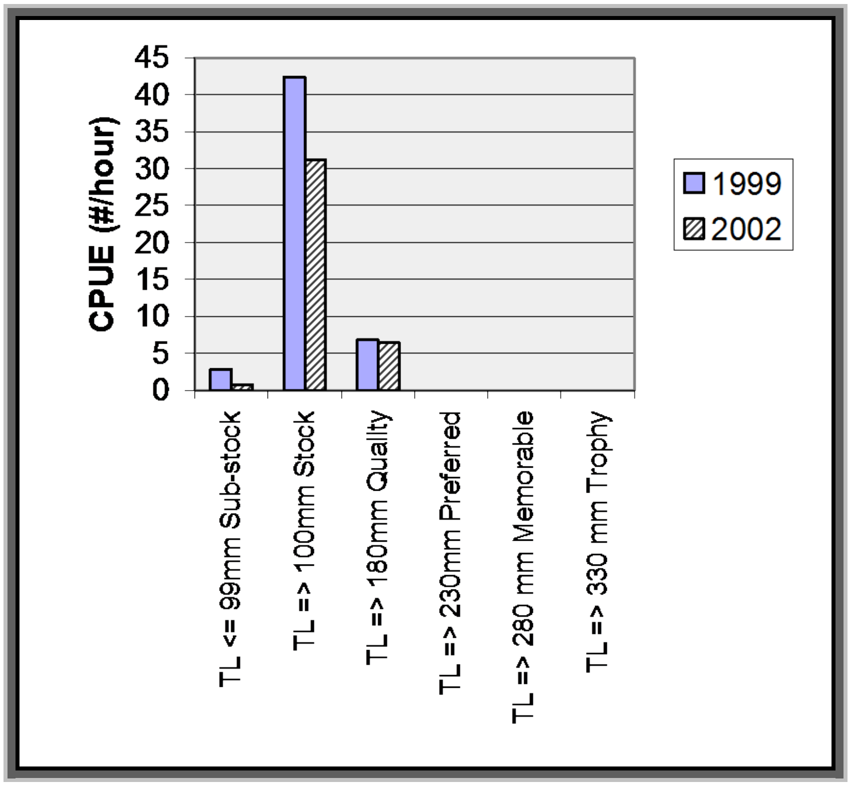
Individuals in the 100 to 200 mm range represented the majority of rock bass in our samples in 1999 and 2002 (Figure 9). There was a slight decrease in the number collected in this size range between the two samples. Length categorization

Figure 9. Length frequency distributions for rock bass collected from the Clinch River in 1999 and 2002.



analysis indicated the RSD for preferred rock bass (TL ≥ 230 mm) was 0. RSD for both memorable (TL ≥ 280 mm) and trophy (TL ≥ 330 mm) size rock bass was 0. The PSD of rock bass was 20.5. Catch per unit effort estimates by RSD category indicated the majority of our catch was stock size fish with few quality size rock bass represented in the sample (Figure 10). The sub-stock catch of rock bass was low, but probably does not indicate poor recruitment due to the fact that sampling efficiency is usually lower with this size group. Overall, the catch rate of rock bass in each RSD category declined in 2002 when compared to the 1999 values.

Figure 10. Relative stock density (RSD) catch per unit effort for rock bass collected from the Clinch River in 1999 and 2002.



Because of our confidence in determining age and growth characteristics (based on previous samples) we did not collect any otolith samples from rock bass in 2002. Therefore, no mortality or potential population growth statistics could be calculated. Age and growth and mortality of rock bass in the Clinch River are assumed to be similar to those reported from our 1999 assessment (Carter et al. 2000).

Although not as intensive as our 1999 survey, we managed to collect 32 species (55 in 1999) from our survey sites that were recorded for TADS purposes. A list of these species can be found in Table 3.

Table 3. Distribution of fish species collected from the Clinch River during 2002 (🐟 = presence).

Clinch River Mile	202	199	198	172	171	170	167	164	152
Site Code	4200240001	4200240003	4200240004	4200240221	4200240222	4200240223	4200240225	4200240227	4200240032
Species									
Catostomidae									
Black Redhorse	🐟	🐟		🐟	🐟	🐟	🐟	🐟	🐟
Golden Redhorse		🐟			🐟				
Northern Hogsucker	🐟	🐟	🐟	🐟	🐟		🐟	🐟	🐟
River Redhorse	🐟					🐟	🐟		
Smallmouth Redhorse	🐟	🐟	🐟	🐟	🐟		🐟	🐟	🐟
Silver Redhorse									🐟
Centrarchidae									
Bluegill				🐟	🐟	🐟			🐟
Longear Sunfish	🐟	🐟	🐟	🐟	🐟	🐟	🐟		🐟
Redbreast Sunfish		🐟	🐟				🐟		
Rock Bass	🐟	🐟	🐟	🐟	🐟	🐟	🐟	🐟	🐟
Smallmouth Bass	🐟	🐟	🐟	🐟	🐟	🐟	🐟	🐟	🐟
Clupeidae									
Gizzard Shad				🐟		🐟			🐟
Cyprinidae									
Bigeye Chub		🐟		🐟					
River Chub	🐟	🐟		🐟			🐟		
Rosyface Shiner			🐟						
Spotfin Shiner				🐟	🐟	🐟			
Stargazing Minnow							🐟		
Largescale Stoneroller		🐟		🐟			🐟		
Streamline Chub	🐟	🐟					🐟		
Striped Shiner		🐟			🐟				
Telescope Shiner							🐟	🐟	
Whitetail Shiner				🐟					
Ictaluridae									
Channel Catfish	🐟		🐟	🐟	🐟	🐟			

Table 3. Continued.

Clinch River Mile	202	199	198	172	171	170	167	164	152
Site Code	420024001	420024003	420024004	420024021	420024022	420024023	420024025	420024027	420024032
Species									
Flathead Catfish	🐟		🐟	🐟	🐟		🐟		🐟
Lepisosteidae									
Longnose Gar	🐟						🐟	🐟	
Percidae									
Bluebreast Darter	🐟								
Gilt Darter	🐟								
Greenside Darter					🐟		🐟		
Logperch				🐟	🐟			🐟	
Redline Darter	🐟								
Sauger									🐟
Tangerine Darter	🐟	🐟	🐟		🐟	🐟	🐟	🐟	🐟
Sciaenidae									
Drum								🐟	

Discussion

The Clinch River provides anglers with the opportunity to catch all species of black bass along with rock bass. Because of the low numbers of spotted and largemouth bass the Clinch River, it should not be considered to contain a sport fishery for these species.

The popularity of this riverine fishery has grown over the last few years and now hosts a good percentage of anglers from Kentucky. Currently we have no angler use/harvest data on the river to aid in evaluating the effects that angler use may or may not have on the sport fishery. It is imperative that we obtain this data in order to answer fisheries management questions, public inquiries, and aid in the development of regulations.

The occurrence of musky in the river warrants continued investigations. The consistent stockings made by the VAGF upstream of the state line could lead to the development of a fishery in the Tennessee portion of the Clinch River. According to

Tom Hampton (VAGF) their stockings have been quite successful and have resulted in the establishment of a sport fishery.

Recent Index of Biotic Integrity surveys by TVA have indicated that the Clinch River is in “good” condition based on data from two long-term monitoring stations. Efforts from a 2001 survey resulted in an IBI score of 50 at river mile 172.4 and a score of 52 at river mile 159.8.

Surveys on the Clinch River will be conducted on a three-year rotation in order to assess any changes in the fishery. Our return trip in 2005 will in all likelihood focus on the sample sites surveyed in 2002, providing no new or more efficient sampling scheme is developed.

Management Recommendations

1. Initiate an angler use and harvest survey.
2. Develop a fishery management plan for the river.
3. Investigate the development of a more efficient sampling strategy.

Titus Creek

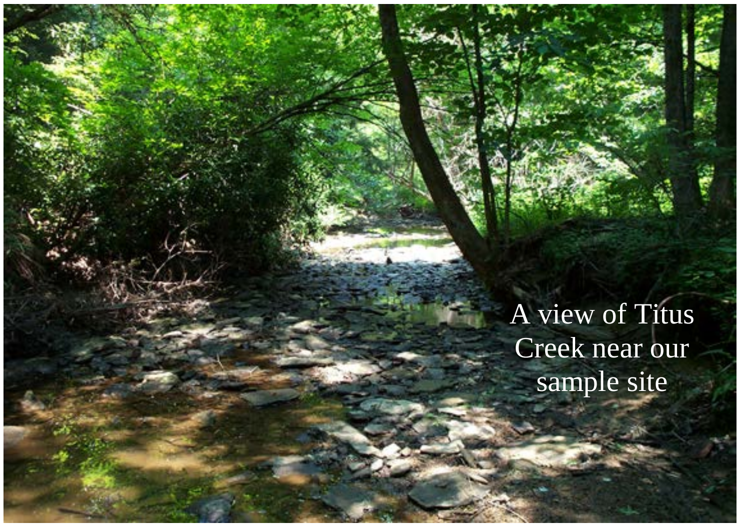
Introduction

Titus Creek is located on Royal Blue WMA and was sampled to characterize the fish community and to investigate the possible occurrence of *Phoxinus* sp. occurring in the stream. We conducted an IBI survey of Titus Creek in 1996 just downstream of the Royal Blue WMA work base. The 1996 sample was conducted at the request of the area manager to assess the relative health of the stream, document fish and invertebrate species occurring in this portion of the stream (Bivens et al. 1997). No prior TWRA surveys (other than 1996) of the stream had been conducted.

Study Area and Methods

Our survey site (Figure 11) was located at the first stream crossing along the old access road that parallels the stream. The stream at this location is low gradient and

Figure 11. Site location for the sample conducted in Titus Creek during 2002.


A view of Titus Creek near our sample site

is dominated by bedrock substrate. Most of the quiet pools had substantial deposits of sediment. Woody cover was sparse in our survey reach and did not contribute significantly to the overall stream cover. Our 1996 habitat assessment of Titus Creek resulted in a classification of sub-optimal due primarily to the degradation caused by extensive coal mining in the watershed and the accompanying road network. Basic water quality measurements for this stream revealed a temperature of 18 C, a conductivity of 78 µs/cm, and a pH of 6.5. Fish were collected with one backpack shocker and a dip net. Survey duration was 857 seconds.

Results

We collected a total of 317 fish representing eight species (Table 4). All of the species collected were common, small stream species and occurred in expected abundances in relation to the available habitat. The most abundant species were blacknose dace and creek chub accounting for 68% of the total number of fish collected. Overall, we encountered five fewer species in our 2002 survey than we did in the 1996 survey. The 2002 sample site was distanced far enough upstream that the stream size and available habitat had decreased considerably. The only game species collected at the 2002 survey site was green sunfish, which were fairly abundant. This stream was rated "fair" in our 1996 IBI assessment and based on our observations in 2002, very little improvement had occurred in the stream during this time period.

Table 4. Species occurrence and associated catch rates (#/hour) for Titus Creek 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420023401	Blacknose Dace	184	86	361.2
420023401	Creek Chub	188	130	546.1
420023401	Fantail Darter	411	8	33.6
420023401	Green Sunfish	347	16	67.2
420023401	Rainbow Darter	401	9	37.8
420023401	Largescale Stoneroller	45	13	54.6
420023401	Striped Shiner	89	27	113.4
420023401	White Sucker	195	28	117.6
		Total	**317**	

Discussion

Titus Creek is typical of many streams in this region of Campbell County. The early exploration and extraction of coal deposits in the region have been detrimental to many streams in the area. Many suffer from depressed pH, but more commonly have limitations contributed by increased sediment load and lack of instream cover.

Management Recommendations

1. Our initial assessment indicated that the protection of the riparian zones and reclamation of strip mines would be most beneficial to this stream. We still consider this to be the most appropriate action for this stream.

Unnamed Tributary to Titus Creek

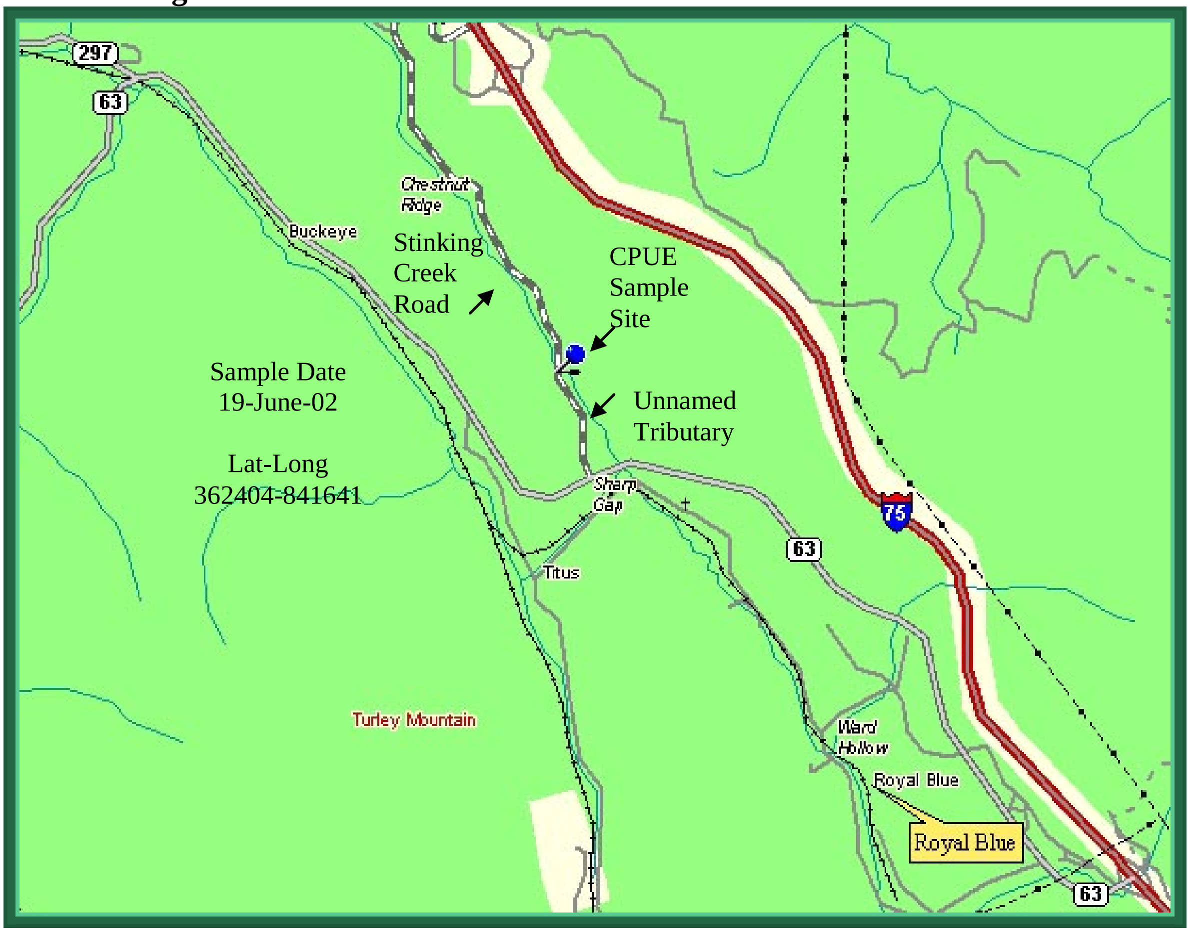
Introduction

This small tributary to Titus Creek was sampled to collect a species list for TADS and to investigate the possible occurrence of *Phoxinus* sp. No prior collections from this stream have been made by TWRA.

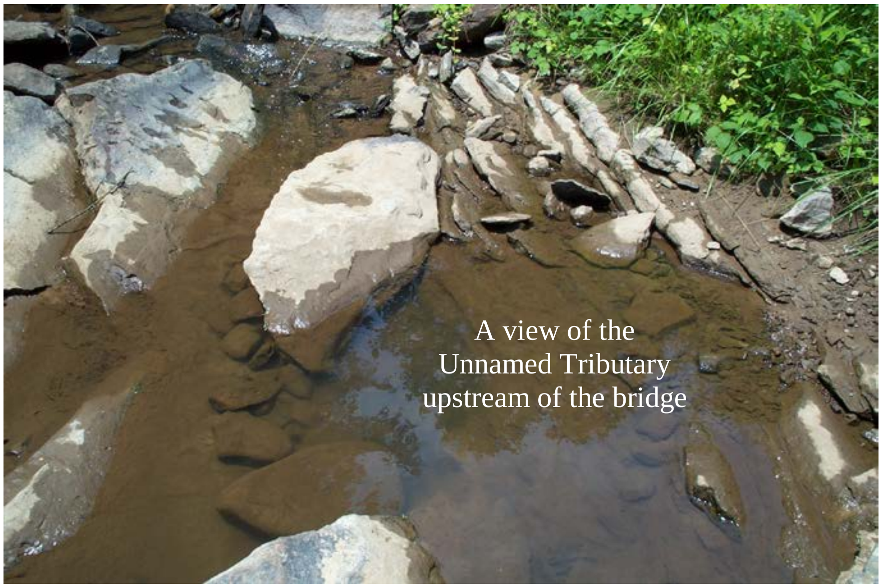
Study Area and Methods

Our survey site was located at the first bridge crossing on Stinking Creek Road (Figure 12). The tributary joins Titus Creek near Sharp Gap just south of Hwy. 63. The stream was moderately graded and had a fair amount of bedrock in the stream channel substrate. Fine sediment was common in the one large pool that we encountered just

Figure 12. Site location for the sample conducted in Unnamed Tributary to Titus Creek during 2002.



downstream of the bridge. The stream channel narrowed considerably above the road crossing and riparian vegetation became dense (primarily rhododendron). We were able to sample about 100 m of stream length before the streamside vegetation began to affect our ability to sample the stream. We used one backpack shocker to collect fish during a timed run (703 seconds). Remaining close to the road for much of its length, the stream appeared to be in better condition above the road crossing when compared to the reach downstream of the bridge. Noticeable impacts from road run off below the bridge were evident as we waded through the stream and disrupted the deposits. Our sampling effort in and around the bridge was hampered by large plumes of sediment that were disturbed as we waded through this area. As seen in the accompanying photo the water immediately became turbid as we entered the stream channel and remained this way until we were a good distance upstream of the bridge. As we expected the fish community reflected the stream condition.


A view of the Unnamed Tributary upstream of the bridge


A view of the Unnamed Tributary downstream of the bridge (note turbidity).

Basic water quality parameters revealed a temperature of 20 C, a conductivity of 215 µs/cm, and a pH of 6.8 at the time of our sample.

Results

We collected a total of 254 fish representing seven species (Table 5). There were no surprises in the fish species collected and no *Phoxinus* sp. were encountered during our survey. The most abundant species were blacknose dace and central stoneroller, which accounted for 61% of the total fish encountered during our survey. The only game species collected was the green sunfish, comprising 2.7% of our total catch.

Table 5. Species occurrence and associated catch rates (#/hour) for Unnamed Tributary to Titus Creek 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420023501	Blacknose Dace	184	95	486.5
420023501	Creek Chub	188	35	179.2
420023501	Fantail Darter	411	33	168.9
420023501	Green Sunfish	347	7	35.8
420023501	Rainbow Darter	401	4	20.4
420023501	Largescale Stoneroller	45	61	312.3
420023501	White Sucker	195	19	97.3
		Total	**254**	

Discussion

Not unlike other streams in the area, this tributary to Titus Creek is suffering primarily from sedimentation and is undoubtedly having an influence on Titus Creek. A fine layer of silt regardless of the habitat type covered most of the substrate in this stream.

Management Recommendations

1. Any action addressing road run off into this stream would be of benefit here as well as Titus Creek.

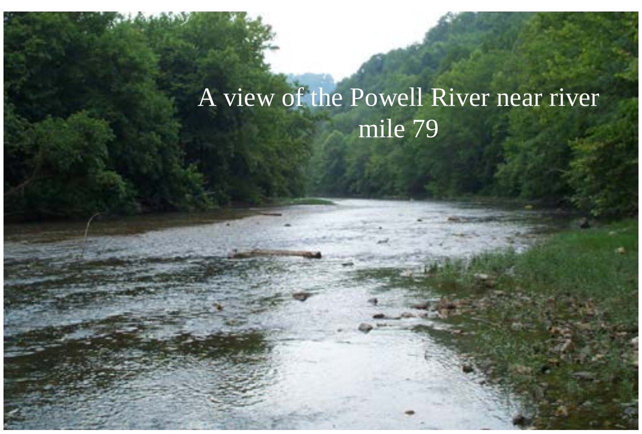
Powell River

Introduction

The remoteness of the Powell River makes it one of the premier warmwater rivers in east Tennessee. It offers the opportunity to take float trips without seeing another individual during the course of a day. The surroundings are appealing which makes a trip to the Powell well worth the drive. It is an important recreational resource for the state both in consumptive and non-consumptive uses. It provides critical habitat for threatened and endangered species and species of special concern. The river supports a diverse fish community and has been documented to host some 37 species of mussels (Ahlstedt 1986). It is one of only two rivers in the region having reaches designated as mussel sanctuaries. Additionally, it supports one of east Tennessee's better warmwater sport fisheries. The Powell River has been the focus of numerous surveys and investigations conducted by other state and federal agencies with the major purpose of assessing and monitoring the fish and benthic communities. The Agency has made limited surveys of the river that focused primarily on collecting basic fish, benthic, and water quality data (Bivens 1988, Carter et al. 2000). Our survey of the Powell River focused on re-evaluating the sport fish population originally sampled in 1999. Our 2002 assessment was derived from ten sample sites located between river mile 115 and river mile 59. After our initial evalution in 1999, the Powell River was put into a 3-year rotational schedule with eight other rivers in the region. Sport fish sampling sites were reduced to those that would best characterize these populations.

Study Area and Methods

The Powell River originates in Virginia and flows in a southwesterly direction before emptying into Norris Reservoir near river mile 54. The river has a drainage area of approximately 1,774 kilometers^2. In Tennessee, all of the Powell River flows through the Ridge and Valley province of east Tennessee coursing by the town of Harrogate before emptying into Norris Reservoir near the community of Authur. Public access along the river is primarily limited to bridge crossings and small "pull-outs" along roads paralleling the river. There are several primitive launching areas for canoes or small boats and one developed launching area managed by the Tennessee Wildlife Resources Agency (Mulberry Creek).



A view of the Powell River near river mile 79

Between June 4 and July 24, 2002, we conducted ten fish surveys between the Virginia state line and Norris Reservoir (Figure 13). In our survey sites, the riparian habitat consisted primarily of wooded shorelines with interspersed agricultural fields. Submerged woody debri and water willow were fairly common in most of our sample areas. The river substrate was predominately boulder/cobble in riffle areas and bedrock with interspersed boulders/cobble in the pool habitat. Measured mean channel widths ranged from 29.5 meters to 52.0 meters, while site lengths fell between 290 meters and 649 meters (Table 6). Water temperatures ranged from 23.5 C to 27.5 C and conductivity varied from 455 to 500 µs/cm (Table 6).

Figure 13. Site locations for samples conducted in the Powell River during 2002.

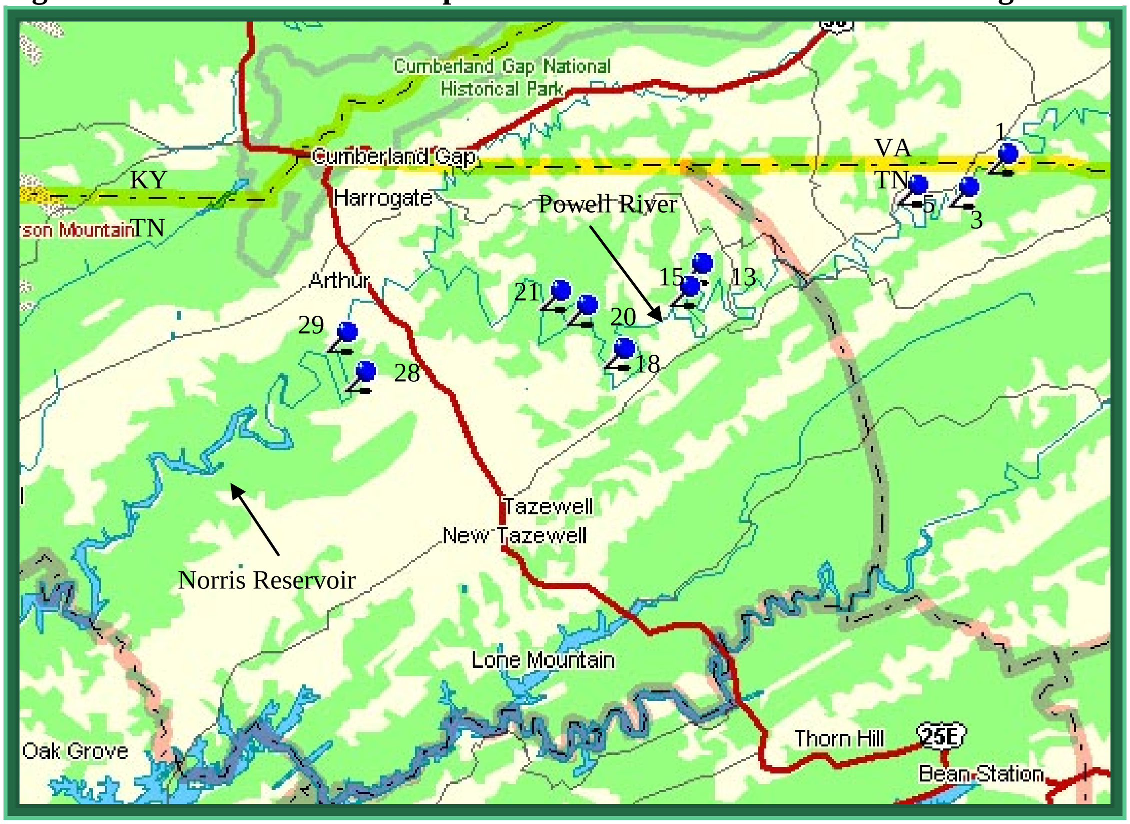


Table 6. Physiochemical and site location data for samples conducted in the Powell River during 2002.

Site Code	Site	Quad	River Mile	Latitude	Longitude	Mean Width (m)	Length (m)	Temp. C	Cond.	Secchi (m)
420023901	1	Back Valley	115	363541	831852	29.5	290	23.5	500	1.7
420023903	3	Back Valley	112.1	363452	832005	30	577	.	.	1.7
420023905	5	Back Valley	107.6	363455	832143	33.5	480	25.5	500	.
420023913	13	Coleman Gap	91	363257	832827	38.5	537	25.5	485	1.2
420023915	15	Coleman Gap	87.1	363223	832849	39	649	.	.	1.2
420023918	18	Wheeler	81	363054	833052	40	383	26	482	1.2
420023920	20	Wheeler	77.3	363153	833202	38	570	25.5	475	1.5
420023921	27	Wheeler	75	363218	833251	38.5	467	25.5	480	1.5
420023928	28	Middlesboro South	61	363019	833855	52	452	27	455	1.2
420023929	29	Middlesboro South	59	363119	833927	41.5	479	27.5	470	1.2

Fish were collected by boat electrofishing in accordance with the standard large river sampling protocols (TWRA 1998). Fixed-boom electrodes were used to transfer 4-5 amps DC at all sites. This current setting was determined effective in narcotizing all target species (black bass and rock bass). Additionally, efforts were made to identify non-target species and compile a list for each survey site. All sites were sampled during daylight hours and had survey durations ranging from 900 to 1186 seconds. Catch-per-unit-effort (CPUE) values were calculated for each target species at each site. Length categorization indices were calculated for target species following Gabelhouse (1984).

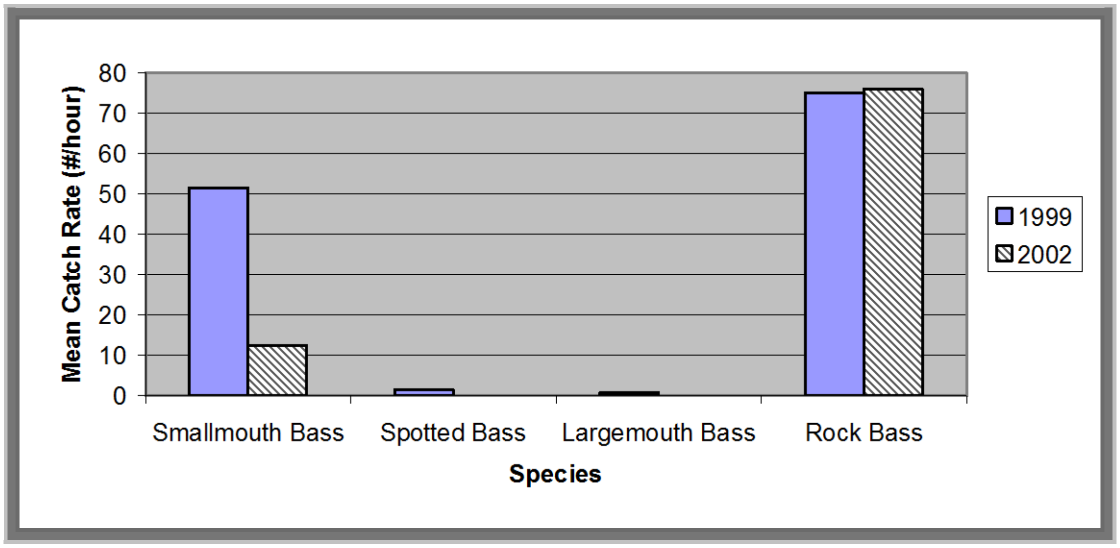
Results

CPUE estimates for smallmouth bass averaged 12.4/hour (SD 8.1), while the mean rock bass estimate was 76/hour (SD 59.7) (Table 7). Surprisingly, there were no spotted bass or largemouth bass collected at any of the nine survey sites. Half of the ten sites sampled in 1999 either had spotted bass or largemouth bass present (Carter et al. 2000). Comparatively, there was a significant decline (76% for smallmouth bass) in the mean catch rate of black bass species from our survey in 1999 (Figure 14). Unlike the Clinch River we observed a slight increase (1.2%) in the mean catch rate of rock bass between the 1999 and 2002 samples.

Table 7. Catch per unit effort and length categorization indices of target species collected at ten sites in the Powell River during 2002.

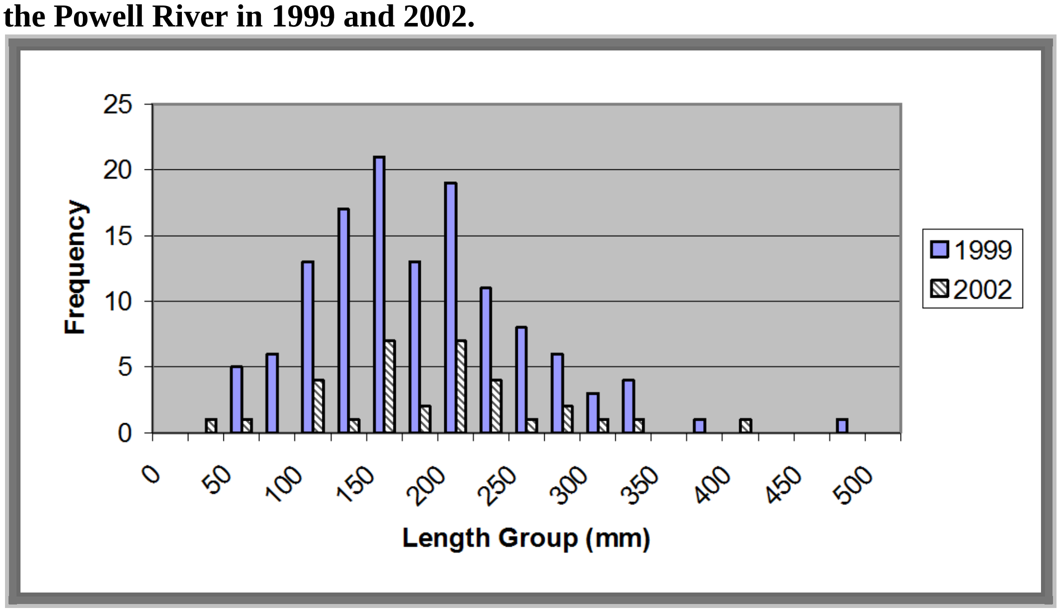
Site Code	Smallmouth Bass CPUE	Spotted Bass CPUE	Largemouth Bass CPUE	Rock Bass CPUE
420023901	10.2	-	-	84.7
420023903	7.6	-	-	26.6
420023905	15.2	-	-	88.0
420023913	27.7	-	-	226.0
420023915	15.6	-	-	19.5
420023918	8.0	-	-	55.5
420023920	15.7	-	-	106.1
420023921	-	-	-	40.0
420023928	3.9	-	-	42.8
420023929	19.7	-	-	71.0
MEAN	12.4	-	-	76.0
STD. DEV.	8.1	-	-	59.7
	Length-Categorization Analysis	**Length-Categorization Analysis**	**Length-Categorization Analysis**	**Length-Categorization Analysis**
	PSD = 22.2	PSD = 0	PSD = 0	PSD = 13.1
	RSD-PREFERRED = 5.5	RSD-PREFERRED = 0	RSD-PREFERRED = 0	RSD-PREFERRED = 0
	RSD-MEMORABLE = 0	RSD-MEMORABLE = 0	RSD-MEMORABLE = 0	RSD-MEMORABLE = 0
	RSD- TROPHY = 0	RSD- TROPHY = 0	RSD- TROPHY = 0	RSD- TROPHY = 0

Figure 14. Trends in mean catch rate of black bass and rock bass collected between 1999 and 2002 from the Powell River.



The size distribution of smallmouth bass between 1999 and 2002 changed somewhat among our ten sampling stations (Figure 15). Generally, there were fewer bass below 150 mm and fewer above the 200 mm size class in 2002 sample. For the most part, bass in the 175 mm to 325 mm size range were less abundant in 2002, indicating poor recruitment from previous year classes (1998-00). Lower recruitment into the smaller size classes during 2002 indicated relatively poor year class. This could be attributed to the drought conditions experienced over the last three years and the potential for the density of spawning size fish to be somewhat lower. Similar trends were observed in the Clinch River during 2002.

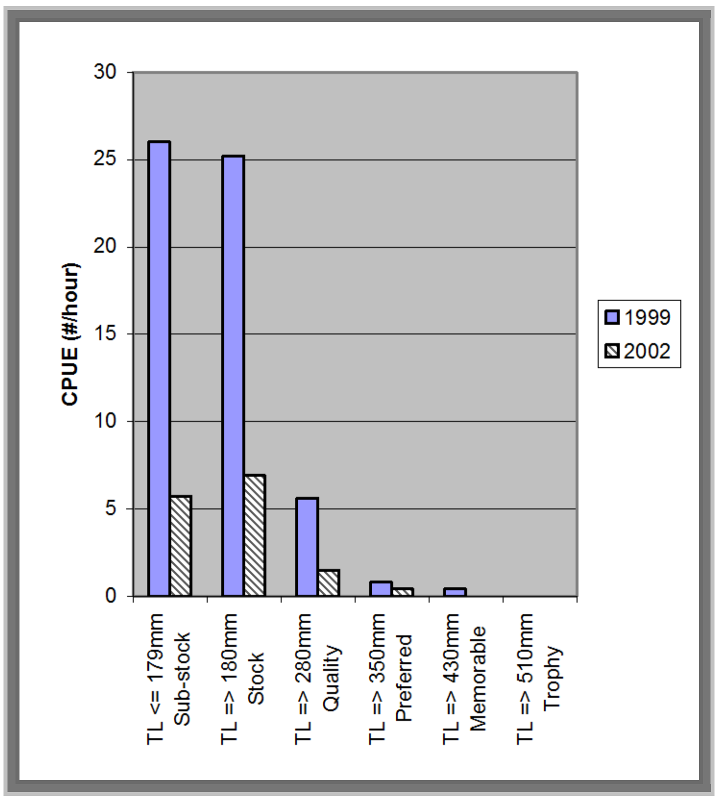
Figure 15. Length frequency distributions for smallmouth bass collected from the Powell River in 1999 and 2002.



The number of bass over 14 inches declined between the two sampling periods. Two bass over 14 inches were collected in 1999 compared to one bass in the 2002 sample. No bass in the 20-inch class have been observed to date in the Powell River although anecdotal reports have indicated bass in this size range.

Length categorization analysis indicated the relative stock density (RSD) of preferred smallmouth bass (TL $\geq$ 350 mm) was 5.5 (Table 7). RSD for memorable (TL $\geq$ 430 mm) and trophy (TL $\geq$ 510 mm) size bass were 0 and 0, respectively. The PSD of smallmouth bass (ratio of quality size bass to stock size bass) was 22.2. In comparison, the value for 1999 was lower for bass in the preferred category (3.2), although there were bass collected in the memorable category (RSD-M = 1.6). No trophy size bass (TL $\geq$ 510 mm) were collected in either year. Catch-per-unit-effort estimates by RSD category in 1999 and 2002 indicated a substantial decline in the catch of all smallmouth bass (Figure 16). The most dramatic declines were in the two smaller categories (sub-stock and stock) where the values declined an average of 75% between the two sampling periods. The decreases in quality and preferred size bass were also high at 73% and 50%, respectively.

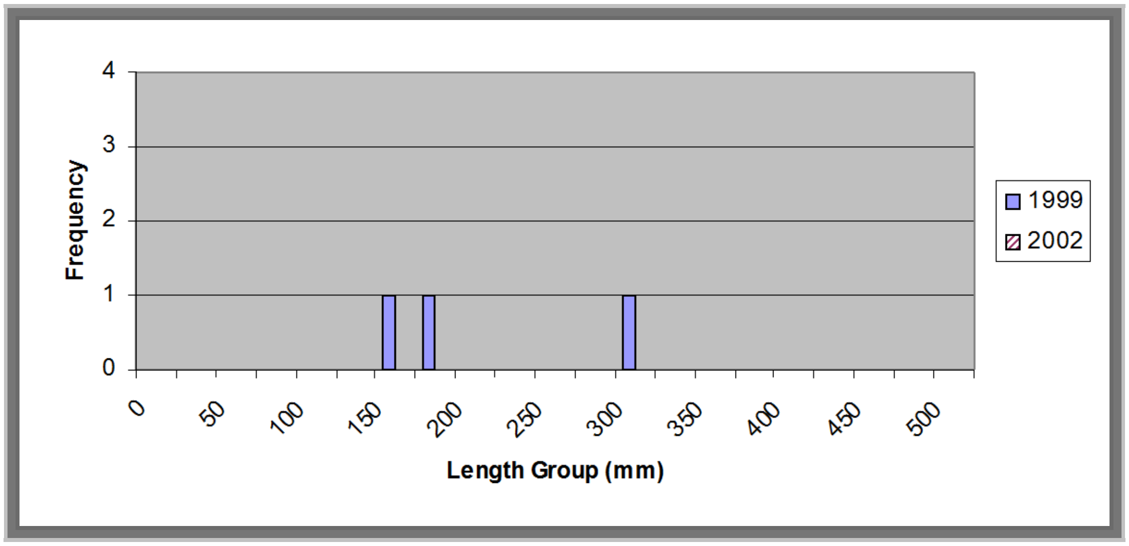
Figure 16. Relative stock density (RSD) catch per unit effort for smallmouth bass collected from the Powell River in 1999 and 2002.



Age and growth characteristics for the smallmouth bass population in the Powell River were characterized in 1999 (Carter et al. 2000). For the most part, the Powell River has had growth rates somewhat slower than other large river populations with the same age structure. We did not collect otoliths from smallmouth bass in 2002, assuming that the values generated from the 1999 survey typify the general growth characteristics of this population. In general, it takes a smallmouth bass in the Powell River about 5.2 years to reach 305 mm (12 inches), and about 9.5 years to attain a length of 406 mm (16 inches).

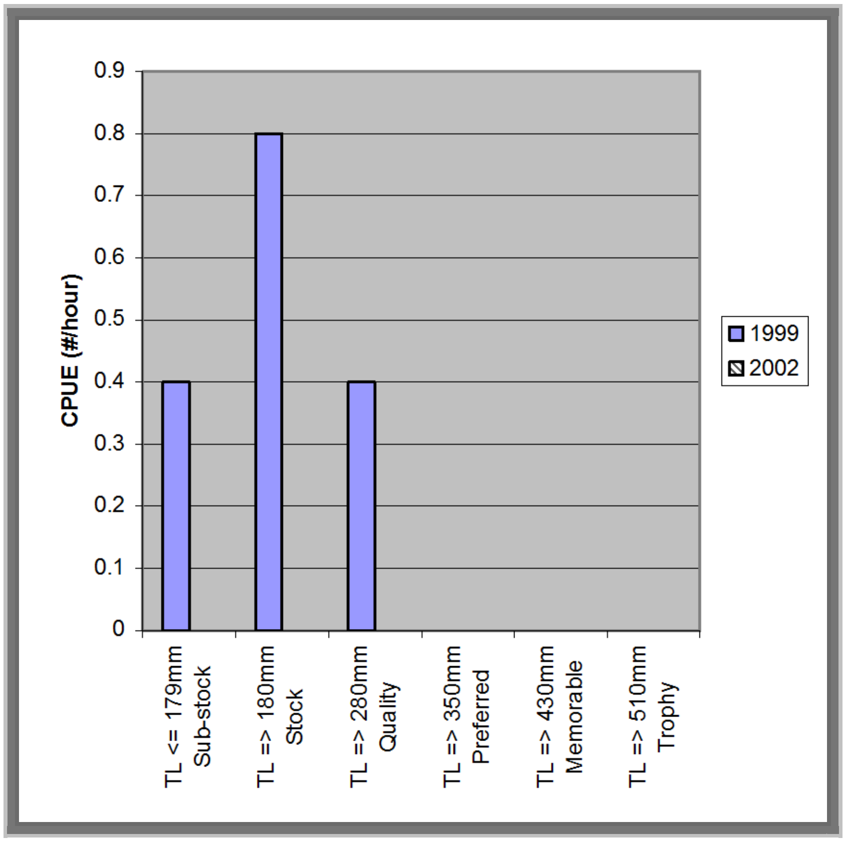
There were no spotted bass collected from the Powell River in 2002. All of the spotted bass collected at the same ten sample sites surveyed in 1999 were within the 150 mm and 300 mm size groups (Figure 17). Based on the length frequency distributions between 1999 and 2002, there appears to have been very little or no spotted bass reproduction or recruitment in 2002.

Figure 17. Length frequency distributions for spotted bass collected from the Powell River in 1999 and 2002.



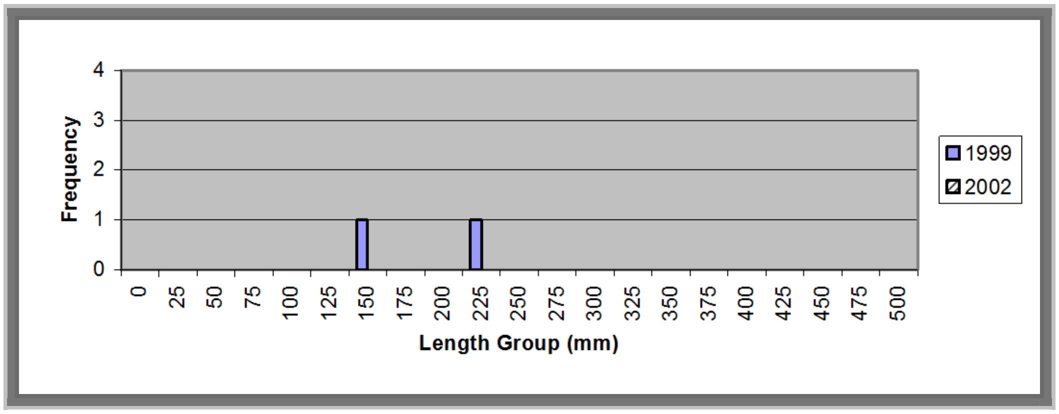
Length categorization analysis indicated the RSD for preferred spotted bass among the ten sampling stations (TL $\geq$ 350 mm) was 0 in 1999 and 2002. RSD for memorable (TL $\geq$ 430 mm) and trophy (TL $\geq$ 510 mm) size bass was 0. The PSD for spotted bass was 36.4 in the overall 1999 sample, but fell to 0 when recalculated from the ten survey sites common to the 2002 sample. Catch per unit effort estimates by RSD category revealed two spotted bass in the RSD-S and above categories in 1999 (1 in sub-stock category) and no bass in any RSD category in 2002 (Figure 18). Apparently, drought conditions have not been favorable for spotted bass reproduction or recruitment in the Powell over the last three years as has been the case with many streams in the region.

Figure 18. Relative stock density (RSD) catch per unit effort by category for spotted bass collected from the Powell River in 1999 and 2002.



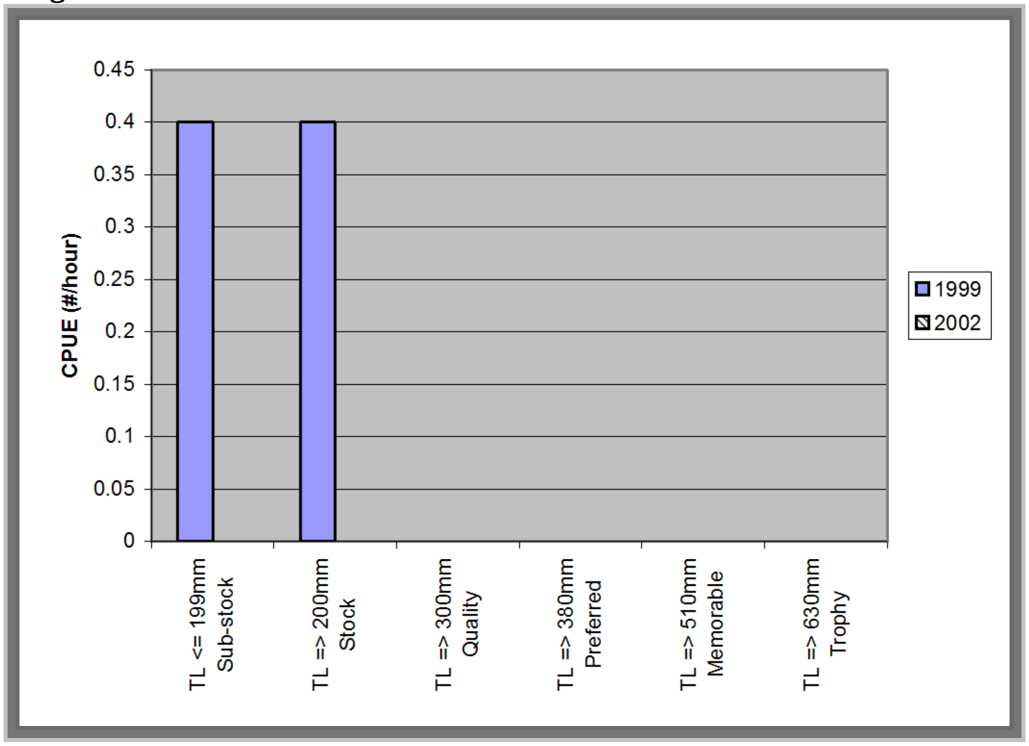
Very few largemouth bass have been collected in the Powell River between 1999 and 2002 at our ten monitoring stations (Figure 19). None were collected during the 2002, which is typical for many riverine fisheries in the region. Occurrence of largemouth bass in the Powell River is sporadic and should not be considered a contributor to the overall sport fishery.

Figure 19. Length frequency distributions for largemouth bass collected from the Powell River in 1999 and 2002.



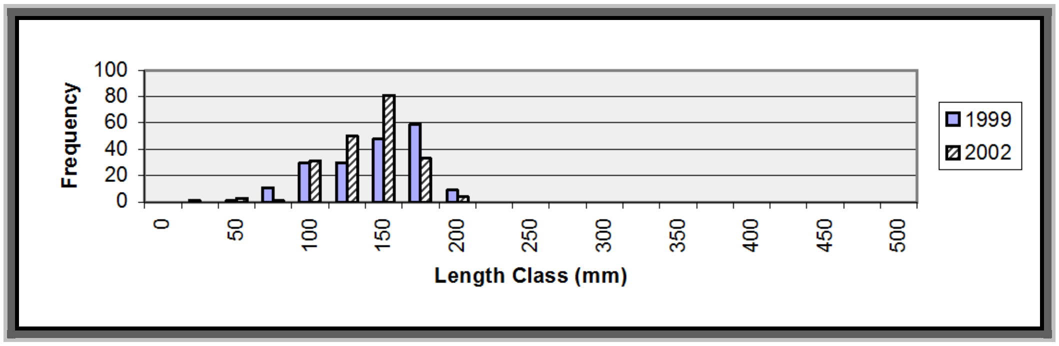
Length categorization data for largemouth bass revealed that there were no fish available to anglers in the quality and above categories during 2002 (Figure 20). This supports the length frequency data above and decisively indicates that the Powell River does not provide much of an opportunity for largemouth bass angling.

Figure 20. Relative stock density (RSD) catch per unit effort for largemouth bass collected from the Powell River in 1999 and 2002.



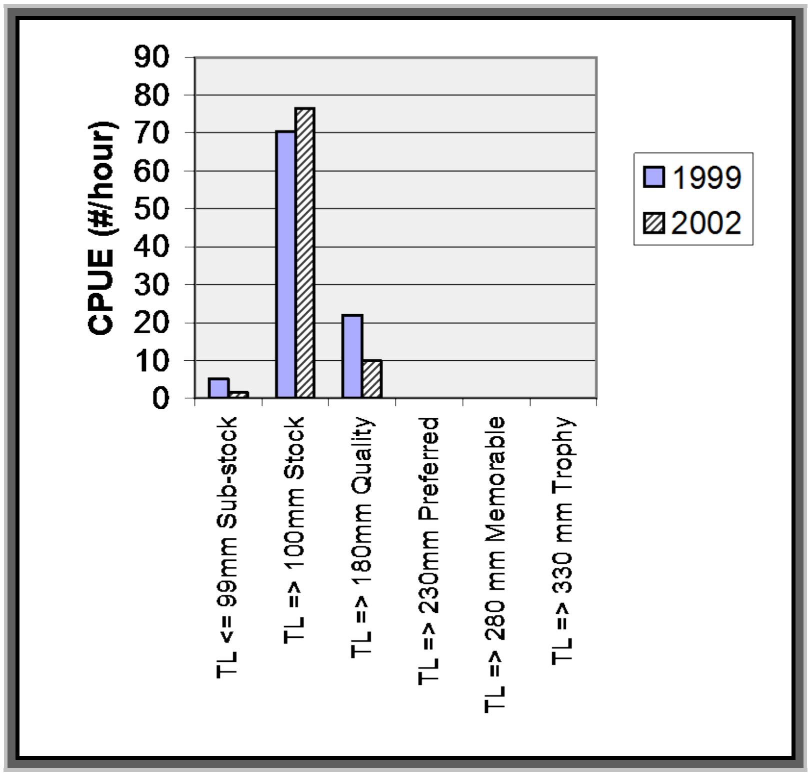
Individuals in the 100 to 200 mm range represented the majority of rock bass in our samples in 1999 and 2002 (Figure 21). Overall, there was a slight increase in the number collected in this size range between the two samples. Length categorization

Figure 21. Length frequency distributions for rock bass collected from the Clinch River in 1999 and 2002.



analysis indicated the RSD for preferred rock bass (TL $\geq$ 230 mm) was 0. RSD for both memorable (TL $\geq$ 280 mm) and trophy (TL $\geq$ 330 mm) size rock bass was 0. The PSD of rock bass was 13.1 (Table 7). Catch per unit effort estimates by RSD category indicated the majority of our catch was stock size fish with fewer quality size rock bass represented in the sample (Figure 22). The sub-stock catch of rock bass was low, but probably does not indicate poor recruitment due to the fact that sampling efficiency is usually lower with this size group. With the exception of the RSD-S category, all other categories declined between the two sampling periods.

Figure 22. Relative stock density (RSD) catch per unit effort for rock bass collected from the Powell River in 1999 and 2002.



Because of our confidence in determining age and growth characteristics (based on previous samples) we did not collect any otolith samples from rock bass in 2002. Therefore, no mortality or potential population growth statistics could be calculated. Age and growth and mortality of rock bass in the Powell River are assumed to be similar to those reported from our 1999 assessment (Carter et al. 2000).

Although not as intensive as our 1999 survey, we managed to collect 41 species (50 in 1999) from our survey sites that were recorded for TADS purposes. A list of these species can be found in Table 8.

Table 8. Distribution of fish species collected from the Powell River during 2002 (🐟 = presence).

Powell River Mile	115	112	108	91	87	81	77	75	61	59
Site Code	420023901	420023903	420023905	420023913	420023915	420023918	420023920	420023921	420023928	420023929
Species										
Catostomidae										
Black Redhorse	🐟	🐟	🐟	🐟	🐟	🐟	🐟	🐟	🐟	🐟
Golden Redhorse		🐟								
Northern Hogsucker	🐟		🐟	🐟	🐟	🐟	🐟	🐟	🐟	
River Redhorse	🐟		🐟	🐟	🐟		🐟			🐟
Smallmouth Redhorse	🐟		🐟	🐟	🐟	🐟	🐟	🐟	🐟	🐟
Silver Redhorse							🐟			
Centrarchidae										
Bluegill		🐟		🐟				🐟	🐟	🐟
Longear Sunfish	🐟		🐟	🐟			🐟	🐟	🐟	
Redbreast Sunfish	🐟	🐟	🐟		🐟					
Rock Bass	🐟	🐟	🐟	🐟	🐟	🐟	🐟	🐟	🐟	🐟
Smallmouth Bass	🐟	🐟	🐟	🐟	🐟	🐟	🐟		🐟	🐟
Clupeidae										
Gizzard Shad			🐟	🐟		🐟	🐟	🐟	🐟	🐟
Cottidae										
Banded Sculpin		🐟			🐟					
Cyprinidae										
Bigeye Chub	🐟									
Mimic Shiner		🐟	🐟			🐟				
Popeye Shiner	🐟									
River Chub	🐟		🐟		🐟		🐟			🐟
Rosyface Shiner					🐟					
Sawfin Shiner	🐟									
Silver Shiner	🐟									
Spotfin Shiner					🐟		🐟	🐟	🐟	🐟
Largescale Stoneroller					🐟	🐟				
Streamline Chub			🐟							🐟

Table 8. Continued.

Powell River Mile	115	112	108	91	87	81	77	75	61	59
Site Code	420023901	420023903	420023905	420023913	420023915	420023918	420023920	420023921	420023928	420023929
Species										
Striped Shiner	🐟						🐟			
Telescope Shiner	🐟		🐟				🐟	🐟	🐟	🐟
Tennessee Shiner	🐟									🐟
Warpaint Shiner	🐟		🐟							
Whitetail Shiner					🐟				🐟	
Ictaluridae										
Channel Catfish					🐟		🐟	🐟		🐟
Flathead Catfish							🐟		🐟	
Yellow Bullhead										🐟
Lepisosteidae										
Longnose Gar	🐟			🐟	🐟					
Moronidae										
White Bass				🐟						
Percidae										
Banded Darter		🐟								
Blueside Darter	🐟					🐟				
Greenside Darter				🐟	🐟	🐟				
Logperch	🐟					🐟			🐟	
Redline Darter					🐟					
Tangerine Darter	🐟	🐟	🐟	🐟	🐟		🐟	🐟		🐟
Petromyzontidae										
Lamprey sp.					🐟	🐟				
Sciaenidae										
Drum							🐟	🐟		

Discussion

The Powell River provides anglers with the opportunity to catch all species of black bass along with rock bass. Because of the low numbers of spotted and largemouth bass in the Powell River, it should not be considered to contain a sport fishery for these species.

The popularity of this riverine fishery is continuing to grow as more anglers shift from reservoir habitats to rivers. This trend will undoubtedly continue as the use on reservoirs increases.   This type of potential for exploitation of riverine fisheries requires angler use/harvest data collection in order to effectively manage the resource. It is imperative that we obtain this data in order to answer fish management questions, public inquiries, and aid in the development of regulations.

Recent Index of Biotic Integrity surveys by TVA have indicated that the Powell River is in “good to excellent” condition based on data from one long-term monitoring stations. Efforts from a 2001 survey resulted in an IBI score of 56 at river mile 65.4.

Overall the Powell River represents one of east Tennessee’s premier warmwater resources. It provides anglers with the opportunity to catch good numbers of smallmouth bass and rock bass and has the potential of producing memorable catches (both in number and size). The surrounding landscape is as eye appealing as the wildlife that lives in and around the river. It provides an excellent escape for recreationists (consumptive and non-consumptive) who are looking for a river that offers relatively undisturbed surroundings and a diverse community of wildlife.

Surveys on the Powell River will be conducted on a three-year rotation in order to assess any changes in the fishery. Our return trip in 2005 will in all likelihood repeat those samples conducted in 2002.

Management Recommendations

1. Initiate an angler use and harvest survey.

2. Develop a fishery management plan for the river.

3. Investigate the development of a more efficient sampling strategy.

Cochran Creek

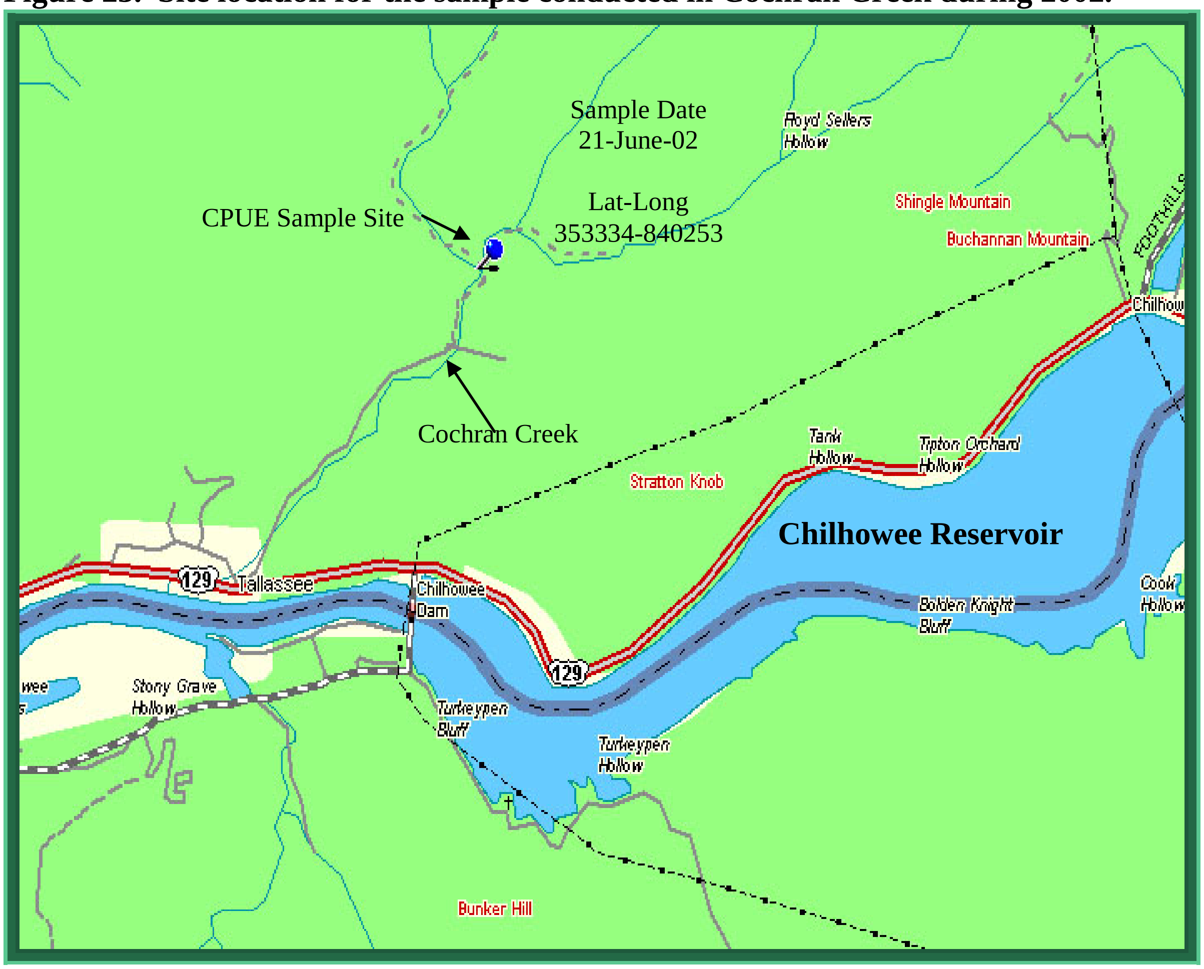
Introduction

Cochran Creek is located on Foothills WMA and was sampled to characterize the fish community and to investigate the possible occurrence of Tennessee dace and rainbow trout in the stream. The 2002 sample was conducted at the request of the WMA manager to assess the relative health of the stream and to document fish species occurring in this portion of the stream. A cursory TWRA survey of the stream in 1995 just upstream from the mouth resulted in the collection of 14 fish species (No field #).

Study Area and Methods

Our survey site (Figure 23) was located at the third stream crossing along the old access road that parallels the stream. The stream at this location is moderately graded

Figure 23. Site location for the sample conducted in Cochran Creek during 2002.



and is dominated by cobble/boulder substrate. Most of the pools were relatively free of sediment. Woody cover was sparse in our survey reach and did not contribute significantly to the overall stream cover. Habitat variability was lacking and pools in the section we surveyed were infrequent. Most of the habitat above the first small cascade was primarily riffle and run habitat with a few side pools occurring in the sample site. Streamside vegetation was abundant and consisted primarily of rhododendron. This stream could be considered a transitional stream between Ridge and Valley habitat and Blue Ridge habitat. Basic water quality recorded at this site indicated a stream temperature of 18.5 C, a conductivity of 72 µs/cm, and a pH of 6.5. We used one backpack shocker to collect fish during a 1087 second sample.

Results

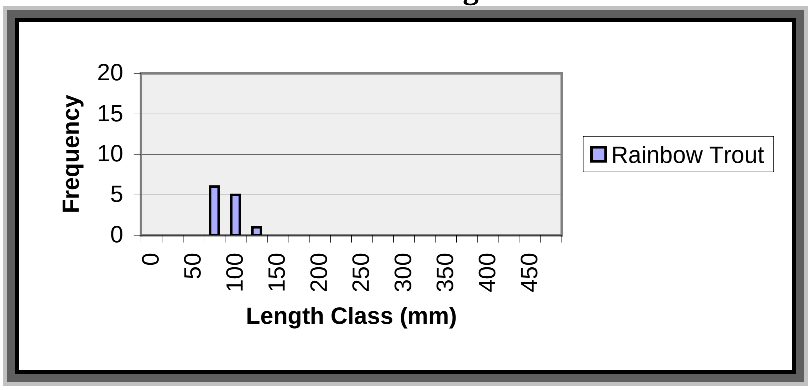
We collected a total of 230 fish representing eight species (Table 9). All of the species with the exception of the Tennessee dace and rainbow trout collected were common, small stream species and occurred in expected abundances in relation to the available habitat. The most abundant species were blacknose dace and creek chub

Table 9. Species occurrence and associated catch rates (#/hour) for Cochran Creek 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420023601	Blacknose Dace	184	134	443.8
420023601	Bluegill	351	1	3.3
420023601	Creek Chub	188	61	202.0
420023601	Greenside Darter	398	1	3.3
420023601	Northern Hogsucker	207	1	3.3
420023601	Rainbow Trout	279	12	39.7
420023601	Snubnose Darter	435	1	3.3
420023601	Tennessee Dace	169	19	62.9
		Total	**230**	

accounting for 85% of the total number of fish collected. The rainbow trout collected ranged in length from 63 to 147 mm and had total weight of 62.5 g. The majority of the trout were small young-of-the-year. Apparently, very few adult trout recruit to the fishery in this stream, probably resulting from the lack of suitable habitat (Figure 24). On a more interesting note, the finding of Tennessee dace in this stream (new locality record) warrants continued monitoring as this species has been deemed in need of management by TWRA. This species appeared to be able to persist in this stream as all size classes were collected in our sample.

Figure 24. Length frequency distribution for rainbow trout collected in Cochran Creek during 2002.



Discussion

Cochran Creek is typical of many streams in the area that drain into upper Tellico and Chilhowee reservoirs. The habitat here most often resembles a combination of features frequently found in both Ridge and Valley and Blue Ridge streams. Thus, the fish communities that dwell in these streams most often have species common to both physiographic provinces. Although this stream does contain a self-sustaining population of rainbow trout, it should not be considered to offer much angling opportunity. The available habitat in the section we surveyed is such that very few trout will recruit to catchable size. Continued monitoring of the Tennessee dace population should occur on a periodic basis since this species is listed by the state.

Management Recommendations

1. Continued protection of the riparian zone should be part of the management strategy for this stream. This will help ensure that the Tennessee dace as well as the rainbow trout continue to persist.

Fortner Branch

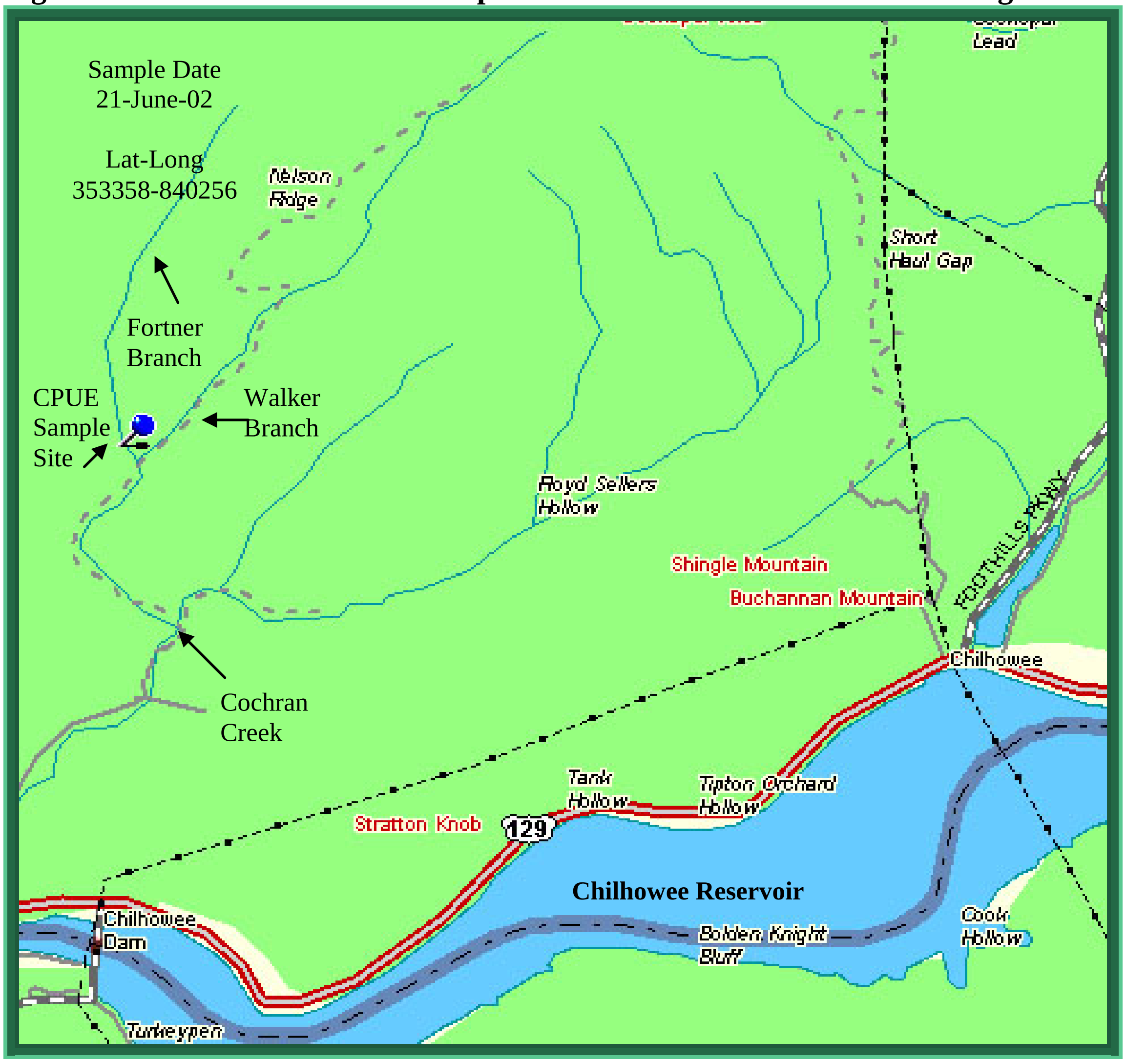
Introduction

This small tributary to Cochran Creek was sampled to collect a species list for TADS and to investigate the possible occurrence of Tennessee dace. The 2002 sample was conducted at the request of the WMA manager to assess the relative health of the stream and to document fish species occurring in this portion of the stream.

Study Area and Methods

Our survey site was located just upstream of the confluence of Fortner Branch and Walker Branch (Figure 25). The stream was moderately graded and had a fair amount of cobble, gravel, and bedrock in the stream channel substrate. Fine sediment and sand was not common in our survey but did occur in the slack water areas.

Figure 25. Site location for the sample conducted in Fortner Branch during 2002.



We were able to sample about 200 m of stream length during our survey. There was a newly disturbed wildlife opening adjacent to the stream but it was sufficiently buffered to prevent sediment form entering the stream. We used one backpack shocker to collect fish during a timed run (492 seconds). Remaining close to the wildlife opening for much of its length, the stream appeared to remain relatively similar in habitat composition within our survey reach. The fish community reflected the size and habitat attributes of this stream. Water quality parameters recorded at the site included a temperature of 21.5 C, a conductivity of 17 µs/cm, and a pH of 6.5.


A view of Fortner Branch within our sample area.

Results

We collected a total of 122 fish representing two species (Table 10). There were no surprises in the fish species collected and no Tennessee dace were encountered during our survey. The most abundant species was creek chub, which accounted for 55% of the total fish encountered during our survey. There were no game species collected from the stream.

Table 10. Species occurrence and associated catch rates (#/hour) for Fortner Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420023701	Blacknose Dace	184	55	402.4
420023701	Creek Chub	188	67	490.2
		Total	**122**	

Discussion

Unlike Cochran Creek, Fortner Branch is limited by its size and habitat availability. There appears to be little potential for Tennessee dace to occur in this stream although not entirely out of the question. Our limited survey of the stream could have overlooked this species if confined to another reach of the stream. The stream represents and important tributary to the overall health of Cochran Creek and should be managed in a way that would prevent degradation downstream.

Management Recommendations

1. Management activities (i.e. wildlife openings) within the watershed should focus on conserving the integrity of this stream.

Little Mountain Branch

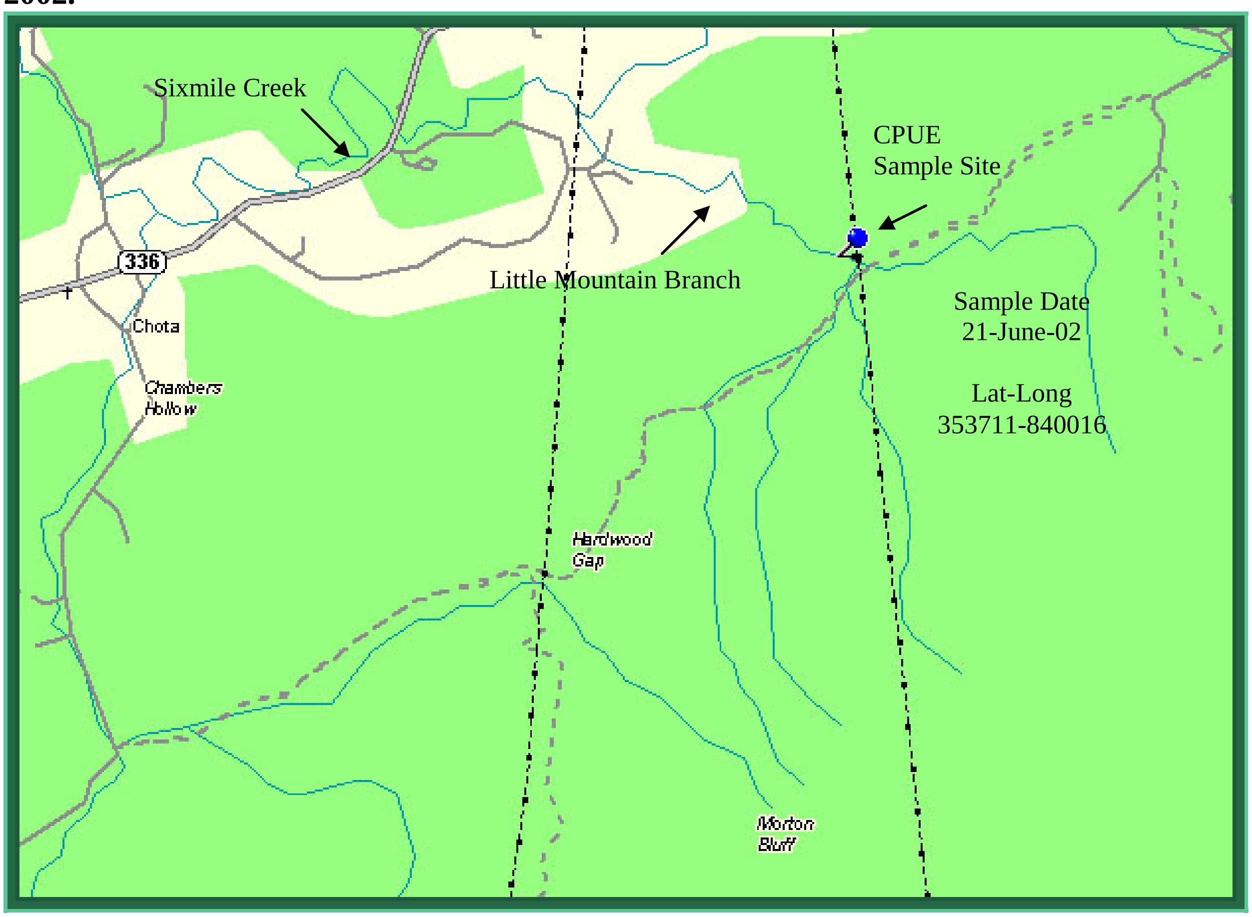
Introduction

Little Mountain Branch a tributary to Sixmile Creek was sampled to collect a species list for TADS and to investigate the possible occurrence of Tennessee dace. The 2002 sample was conducted at the request of the WMA manager to assess the relative health of the stream and to document fish species occurring in this portion of the stream. A cursory TWRA survey of the stream in 1987 just upstream from the mouth resulted in the collection of six fish species (Field # 66).

Study Area and Methods

Our survey site was located at the first road crossing along the Foothills WMA access road (Figure 26). The stream was moderately graded with channel substrate composed primarily of boulder and cobble. Fine sediment and sand was not common in our survey but did occur in the slack water areas. Both stream margins were primarily vegetated with rhododendron and hemlock.

Figure 26. Site location for the sample conducted in Little Mountain Branch during 2002.




A view of Little Mountain Branch

We were able to sample 200 m of stream length during our survey. We used one backpack shocker to collect fish during a timed run (933 seconds). The fish community reflected the size and habitat attributes of this stream. Water quality values recorded at the site indicated a stream temperature of 19 C, conductivity of 180 µs/cm, and a pH of 6.8

Results

We collected a total of 134 fish representing four species (Table 11). There were no surprises in the fish species collected here with the exception of the Tennessee dace. The most abundant species was blacknose dace, which accounted for 81% of the total fish encountered during our survey. The only game fish species encountered was bluegill. The four we collected ranged in length from 72 to 83 mm.


Tennessee Dace collected from Little Mountain Branch

Table 11. Species occurrence and associated catch rates (#/hour) for Little Mountain Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420023801	Blacknose Dace	184	109	420.5
420023801	Bluegill	351	4	15.4
420023801	Creek Chub	188	4	15.4
420023801	Tennessee Dace	169	17	65.6
		Total	**134**	

Discussion

Little Mountain Branch is typical of many streams in the area that drain into upper Tellico and Chilhowee reservoirs. The habitat here most often resembles a combination of features frequently found in both Ridge and Valley and Blue Ridge streams. Thus, the fish communities that dwell in these streams most often have species common to both physiographic provinces. Although no rainbow trout were collected here, this stream was not unlike Cochran Creek in physical attributes. Given a chance, rainbow trout may be able to establish themselves in this stream although it is improbable that a significant fishery would ever develop. Continued monitoring of the Tennessee dace population should occur on a periodic basis since this species is listed by the state and is the first collection of this species from this stream.

Management Recommendations

1. Management activities (i.e. wildlife openings) within the watershed should focus on conserving the integrity of this stream.

Pigeon River

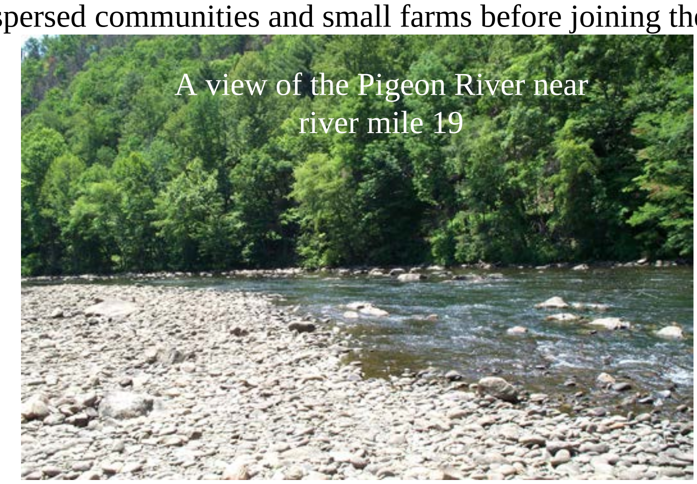
Introduction

The Pigeon River has had a long history of pollution problems, stemming primarily from the 80 plus-year discharge of wastewater from the Champion Paper Mill in Canton, North Carolina. This discharge has undoubtedly had a profound effect on the recreational use of the river and after the discovery of elevated dioxin 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 developed 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). In 2002 all consumption advisories were removed from the river. Since 1988, inter-agency Index of Biotic Integrity samples have been conducted at two localities near river mile 8.2 (Tannery Island) and river mile 16.6 (Denton).

Our 2002 surveys focused on continuing our collection of catch effort data for black bass and rock bass. Catch effort data along with otolith samples from rock bass and black bass were collected from three sites in 1997 (Bivens et al. 1998) and five sites in 1998 (Carter et al. 1999). Since 1999, data has been collected at six sites between river mile 4.0 and 20.5 (Carter et al. 2000, 2001, 2002). During 1998, a 508 mm minimum (20-inch) length limit on smallmouth bass with a one fish possession limit was passed by the Tennessee Wildlife Resources Commission (TWRC). This regulation was implemented on March 1, 1999.

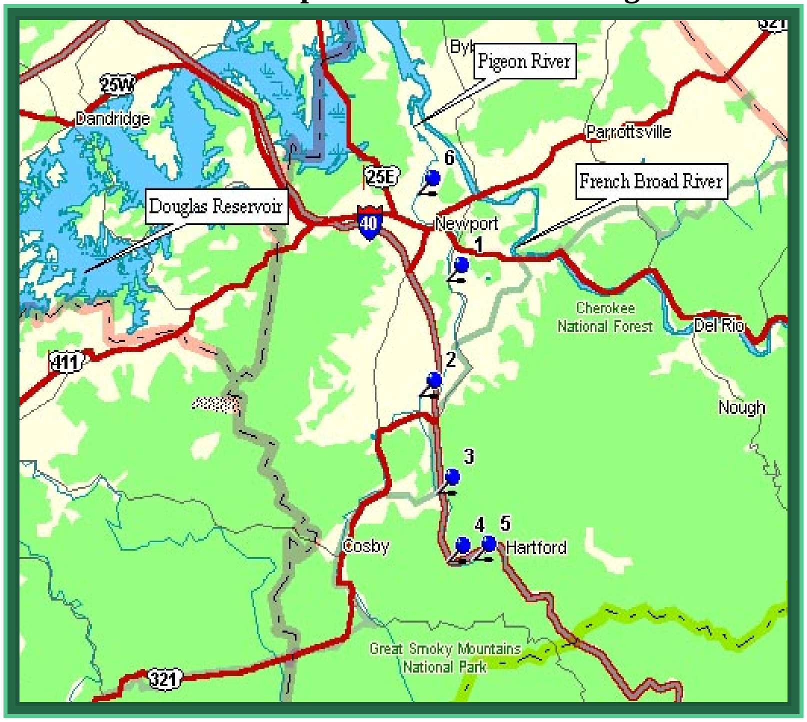
Study Area and Methods

The Pigeon River originates in North Carolina and flows in a northwesterly direction before emptying into the French Broad River near river mile 73.8. The river has a drainage area of approximately 1,784 km^2 at its confluence with the French Broad River. In Tennessee, approximately 35 kilometers of the Pigeon River flows through mountainous terrain with interspersed communities and small farms before joining the French Broad River near Newport. Public access along the river is primarily limited to bridge crossings and small "pull-outs" along roads paralleling the river. There are a few primitive launching areas for canoes or small boats. Between June 17 and October 16, 2002, we conducted 11 fish surveys at six sites between Newport and


A view of the Pigeon River near river mile 19

the community of Hartford (Figure 27). Because this portion of the river is a tailwater, habitat availability fluctuates with water releases. However, in our survey sites during low flow, the habitat consisted primarily of wooded shorelines with interspersed rock outcroppings. Submerged woody debris was fairly common in most of our sample areas. The river substrate was predominately boulder/cobble in riffle areas and bedrock with interspersed boulder/cobble in the pool areas.

Figure 27. Site locations for samples conducted in the Pigeon River during 2002.



Measured channel widths ranged from 35.3 to 64.3 m, while site lengths fell between 80 and 869 m (Table 12). Water temperatures ranged from 20 to 25 C and conductivity varied from 140 to 215 μs/cm (Table 12).

Table 12. Physiochemical and site location data for samples conducted in the Pigeon River during 2002.

Site Code	Site	County	Quad	River Mile	Latitude	Longitude	Mean Width (m)	Length (m)	Temp.	Cond.	Secchi (m)
420023101	1	Cocke	Newport 173NW	8.1	355633N	831043W	53.6	392	-	-	2.0
420023102	2	Cocke	Newport 173NW	13	355322N	831147W	64.3	869	25	170	2.0
420023103	3	Cocke	Hartford 173SW	16.6	355039N	831104W	-	414	-	-	2.0
420023104	4	Cocke	Hartford 173SW	19	354847N	831041W	35.3	80	22	140	2.0
420023105	5	Cocke	Hartford 173SW	20.5	354849N	830945W	47.3	839	20	140	2.0
420023106	6	Cocke	Newport 173NW	4.0	355857N	831156W	54	193	24	215	2.0

Fish were collected by boat electrofishing in accordance with the standard large river sampling protocols (TWRA 1998). Fixed-boom electrodes were used to transfer 4-5 amps DC at all sites. This current setting was determined effective in narcotizing all target species (black bass and rock bass). All fish collected were returned to the river. Additionally, efforts were made to identify non-target species encountered at each survey site. All sites were sampled during daylight hours and had survey durations ranging from 1005 to 5400 seconds. Catch-per-unit-effort (CPUE) values were calculated for each target species at each site. Length categorization indices were calculated for target species following Gabelhouse (1984).

Results

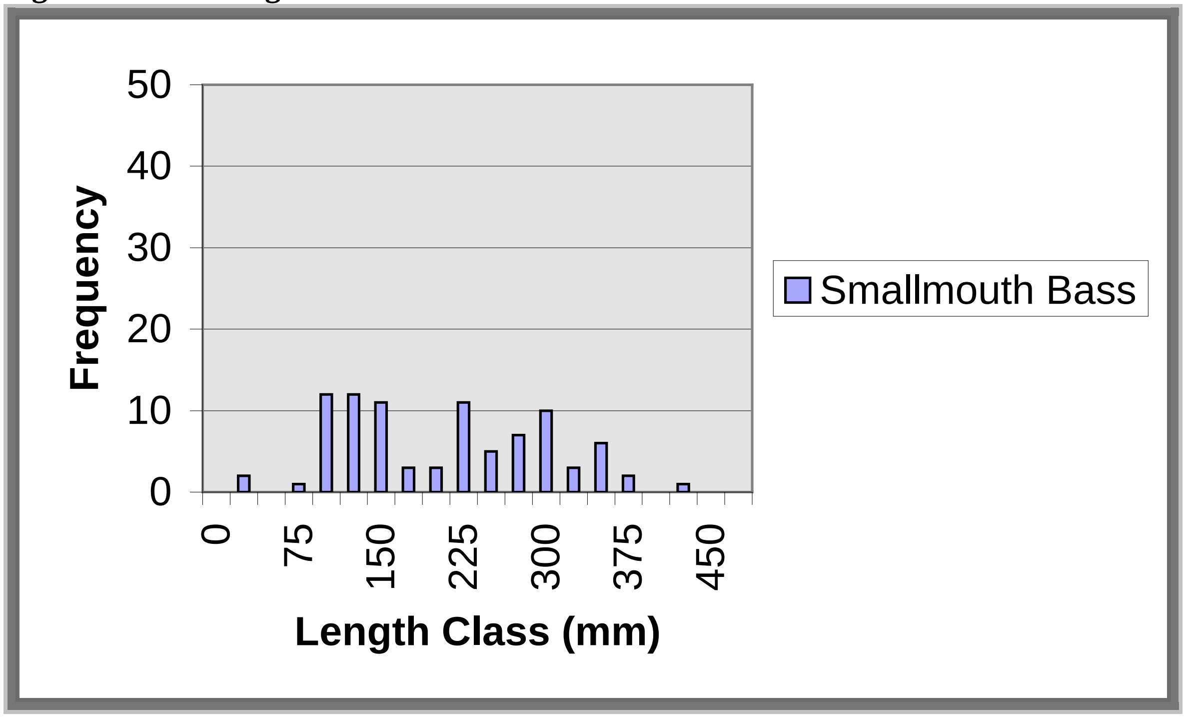
During our surveys, smallmouth bass and rock bass were collected from all sample sites. The collection of spotted bass and largemouth bass was more sporadic. Smallmouth bass was the most abundant black bass species at any of the survey sites. CPUE estimates for this species averaged 17.1/hour (SD 11.8), while the spotted bass and largemouth bass estimates were 0.9/hour (SD 1.2) and 9.5/hour (SD 9.8), respectively (Table 13). There was a general trend of increasing catch rate for smallmouth bass in the intermediate reaches (sites 3-5) of the river (Table 13). Rock bass CPUE was highest between sample sites 2 and 5, averaging 15.7/hour (SD 11.5). The highest catch rate for this species was recorded at site 3 (32.0/hour), which also had the highest value in 2001.

Table 13. Catch per unit effort and length categorization indices of target species collected at six sites on the Pigeon River during 2002.

Site Code	Smallmouth Bass CPUE	Spotted Bass CPUE	Largemouth Bass CPUE	Rock Bass CPUE
420023101	9.0	-	21	6.0
420023102	13.8	2.7	6.4	17.5
420023103	18.0	2.0	-	32.0
420023104	17.9	-	-	10.7
420023105	38.8	1.1	22.2	25.5
420023106	4.9	-	7.4	2.4
MEAN	17.1	0.9	9.5	15.7
STD. DEV.	11.8	1.2	9.8	11.5
	Smallmouth Bass Length-Categorization Analysis	**Spotted Bass Length-Categorization Analysis**	**Largemouth Bass Length-Categorization Analysis**	**Rock Bass Length-Categorization Analysis**
	PSD = 57.1	PSD = 33.3	PSD = 85.3	PSD = 31.9
	RSD-Preferred = 18.4	RSD-Preferred = 0	RSD-Preferred = 20.6	RSD-Preferred = 2.1
	RSD-Memorable = 2.0	RSD-Memorable = 0	RSD-Memorable = 0	RSD-Memorable = 0
	RSD-Trophy = 0	RSD-Trophy = 0	RSD-Trophy = 0	RSD-Trophy = 0

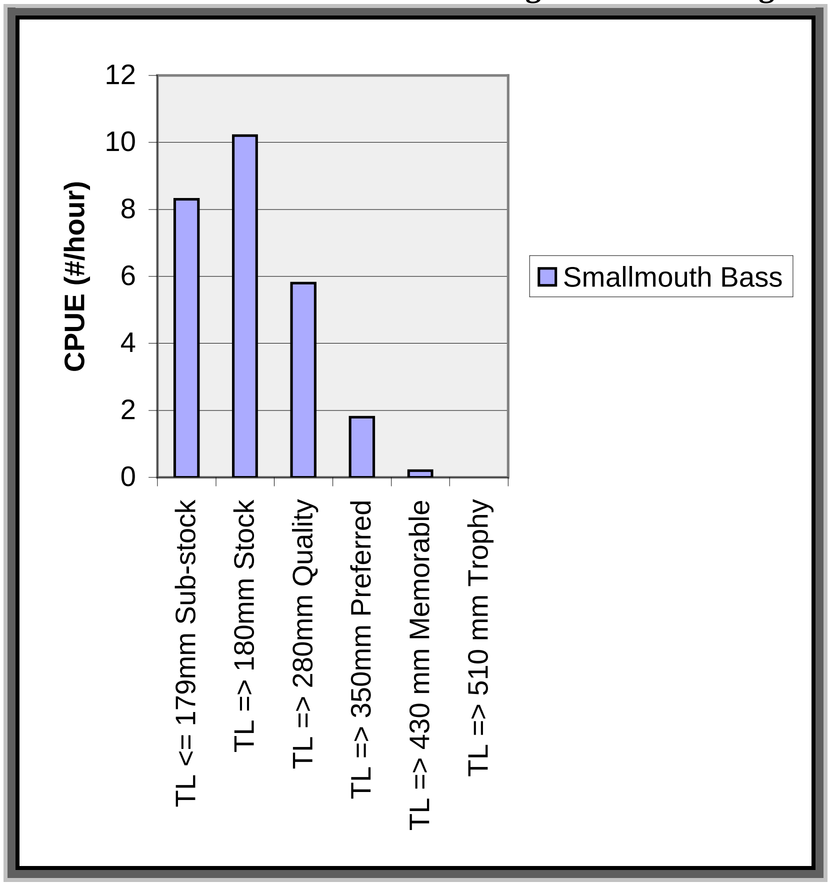
The majority of the smallmouth bass collected from the Pigeon River during 2002 fell within the 100 to 300 mm length range (Figure 28). Our data indicated that bass less than 100 mm were not completely vulnerable to the sampling gear. Length categorization analysis indicated the Relative Stock Density (RSD) for preferred

Figure 28. Length frequency distribution for smallmouth bass collected from the Pigeon River during 2002.



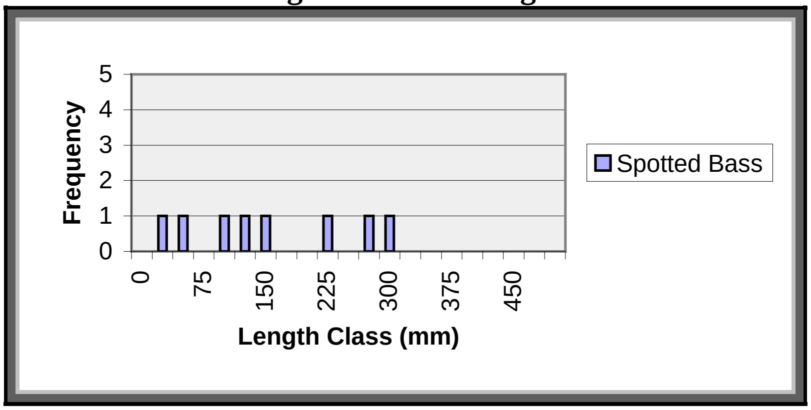
smallmouth bass (TL ≥ 350 mm) was 18.4, which was up 45% (12.7) from the previous year. RSD for memorable (TL ≥ 430 mm) and trophy (TL ≥ 510 mm) size bass were 2.0 and 0, respectively. The PSD of smallmouth bass (ratio of quality size bass to stock size bass) was 57.1. Catch per unit effort estimates by RSD category indicated smallmouth bass had the highest catch rates of any of the black bass species collected for the category RSD-Q and above (Figure 29). Recruitment into the RSD-S and above categories was somewhat lower in 2002, although the catch of RSD-Q bass remained stable. The catch of sub-stock smallmouth was somewhat lower in 2002 declining by about 17% from the previous year. Linear and curvilinear length-weight regression analysis has been calculated for previous years data (Carter et al. 1999) and is assumed to be similar for the 2002 data. No age and growth data was collected from this population in 2002. Age and growth characteristics for smallmouth bass in the Pigeon River are well documented from recent surveys (Carter et al. 1999, 2000).

Figure 29. Relative stock density (RSD) catch per unit effort for smallmouth bass collected from the Pigeon River during 2002.



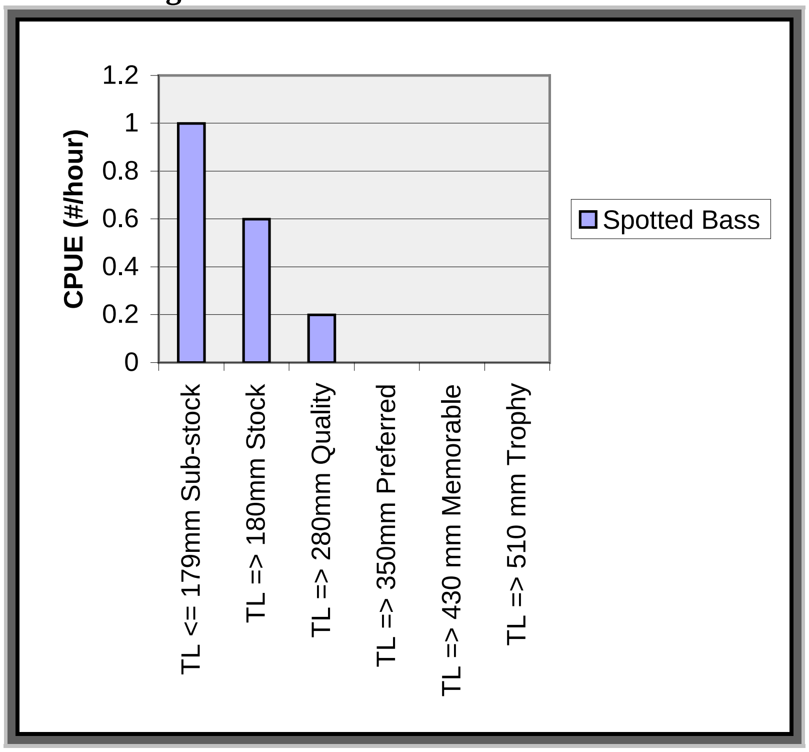
There were very few spotted bass collected from the Pigeon River in 2002. A total of eight (7 in 2001) spotted bass were collected in all of our samples. Because there were so few spotted bass collected in the sample, no one size range dominated the length distribution although the majority of the bass collected were less than 150 mm (Figure 30).

Figure 30. Length frequency distribution for spotted bass collected from the Pigeon River during 2002.



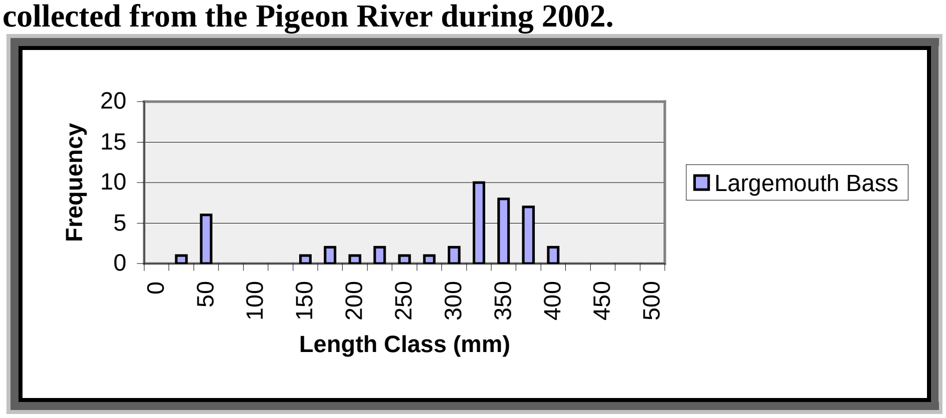
Length categorization analysis indicated the RSD for preferred spotted bass (TL ≥ 350 mm) was 0. RSD for memorable (TL ≥ 430 mm) and trophy (TL ≥ 510 mm) size bass was 0. The PSD of spotted bass was 33.3. Catch per unit effort estimates by RSD category revealed very few spotted bass above the RSD-Q category, indicating a relative lack of larger fish available to anglers (Figure 31). Additionally, the catch rate for sub-stock spotted bass was up slightly from 2001 indicating limited recruitment between 2001-02.

Figure 31. Relative stock density (RSD) catch per unit effort for spotted bass collected from the Pigeon River during 2002.



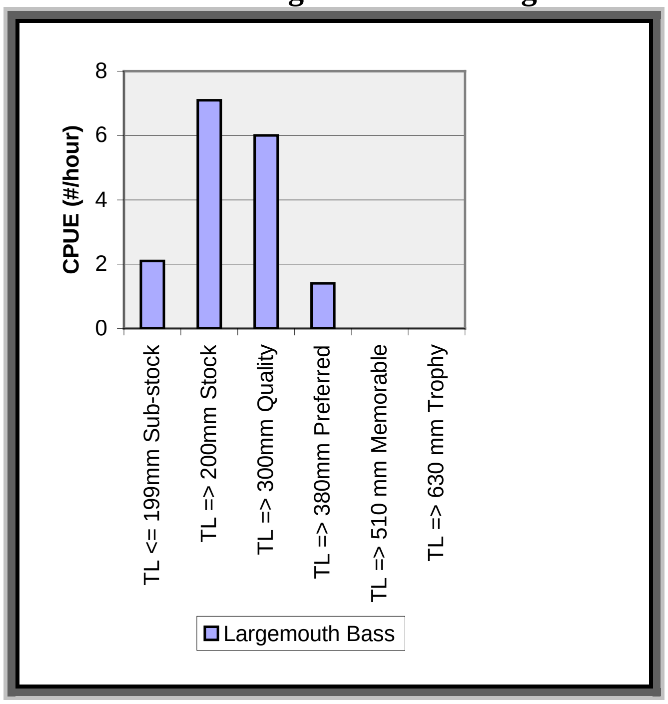
Most of the largemouth bass collected during 2002 fell within the 325 to 375 mm length range (Figure 32). Length categorization analysis indicated the RSD for preferred

Figure 32. Length frequency distribution for largemouth bass collected from the Pigeon River during 2002.



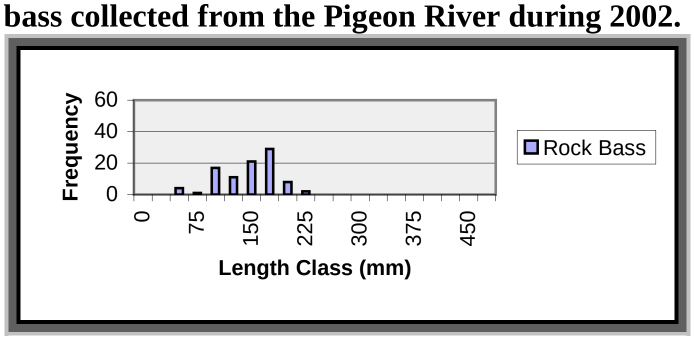
largemouth bass (TL ≥ 380 mm) was 20.6. RSD for memorable (TL ≥ 510 mm) and trophy (TL ≥ 630 mm) size largemouth bass was 0. The PSD of largemouth bass was 85.3. A few largemouth bass above the RSD-Q category were collected in 2002, which was a slight increase over the 2001 trend (Figure 33). Recruitment in 2002 was slightly higher indicating some of the 2001year class recruited to the fishery. There were a few more quality size largemouth bass collected in 2002, however numbers still remain relatively low and do not offer much opportunity for anglers.

Figure 33. Relative stock density (RSD) catch per unit effort by category for largemouth bass collected from the Pigeon River during 2002.



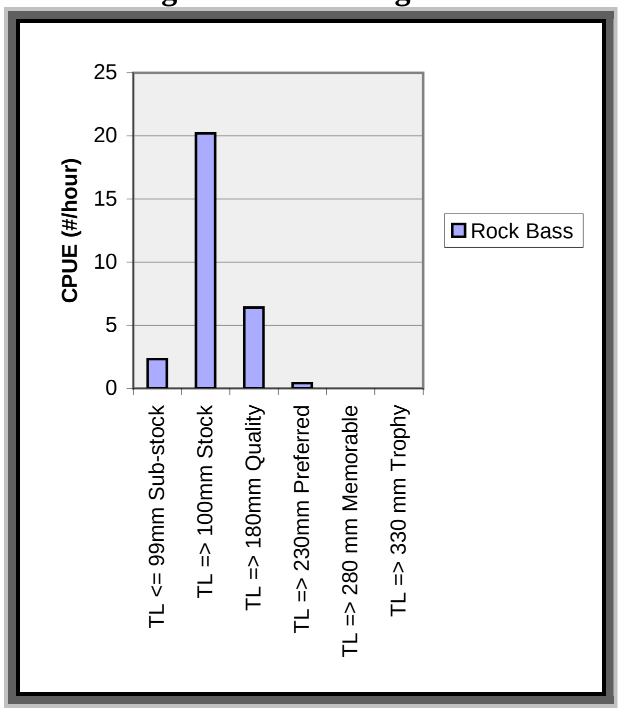
Individuals in the 100 to 175 mm range represented the majority of rock bass in our sample (Figure 34). Length categorization analysis indicated the RSD for preferred rock bass (TL ≥ 230 mm) was 2.1, which was up 90% from 2001 value. RSD for memorable (TL ≥ 280 mm) and trophy (TL ≥ 330 mm) size rock bass was 0.

Figure 34. Length frequency distribution for rock bass collected from the Pigeon River during 2002.



The PSD of rock bass was 31.9. Catch per unit effort estimates by RSD category indicated the majority of our catch was stock size fish (Figure 35) with about 29% of the catch representing quality size and above fish. The sub-stock catch of rock bass was low, but probably does not indicate poor recruitment due to the fact that sampling efficiency is usually lower with this size group.

Figure 35. Relative stock density (RSD) catch per unit effort by category for rock bass collected from the Pigeon River during 2002.



Linear and curvilinear length-weight regression analysis has been calculated for previous years data (Carter et al. 1999), and is assumed to be similar for the 2002 data. No age and growth data was collected from this population in 2002; age and growth characteristics for rock bass in the Pigeon River are well documented from recent surveys (Carter et al. 1999, 2000).

During 2001 we had a sample of black bass and rock bass tested for disease by the U.S. Fish and Wildlife Service as part of the wild fish health survey. We were primarily interested in determining if there was a high incidence of disease among these species due to prolonged exposure to pollutants in the river. We were also interested in screening largemouth bass for largemouth bass virus (LMBV), which has been identified in some Tennessee reservoir populations. Our sample from the Pigeon River in 2001 did not indicate any disease commonly associated with the species tested.

Several other species were collected or observed (46) during our survey of the Pigeon River. None of the fish collected in the 2002 sample were listed by the U.S. Fish and Wildlife Service or the TWRA as threatened or endangered. A list of species occurrence by site can be found in Table 14.

Table 14. Distribution of fish species collected in the Pigeon River during 2002. (🦈 = presence)

Pigeon River Mile	8.1	13.0	16.6	19	20.5	4.0
Site Code	420023101	420023102	420023103	420023104	420023105	420023106
Species						
Catostomidae						
Black Buffalo	🦈				🦈	
Black Redhorse	🦈	🦈	🦈	🦈		🦈
Golden Redhorse	🦈	🦈			🦈	
Northern Hogsucker	🦈	🦈	🦈	🦈	🦈	🦈
River Carpsucker	🦈					
River Redhorse	🦈	🦈		🦈		🦈
Smallmouth Redhorse	🦈	🦈	🦈			🦈
Silver Redhorse			🦈		🦈	
Smallmouth Buffalo	🦈	🦈	🦈	🦈	🦈	🦈
White Sucker					🦈	
Centrarchidae						
Bluegill	🦈	🦈	🦈		🦈	🦈
Black Crappie		🦈				
Green Sunfish	🦈	🦈	🦈			🦈
Largemouth Bass	🦈	🦈			🦈	🦈
Redbreast Sunfish	🦈	🦈	🦈		🦈	
Redear Sunfish			🦈			
Rock Bass	🦈	🦈	🦈	🦈	🦈	🦈
Smallmouth Bass	🦈	🦈	🦈	🦈	🦈	🦈
Spotted Bass		🦈	🦈		🦈	
Clupeidae						
Gizzard Shad	🦈	🦈	🦈	🦈	🦈	🦈
Cottidae						
Banded Sculpin	🦈	🦈	🦈		🦈	

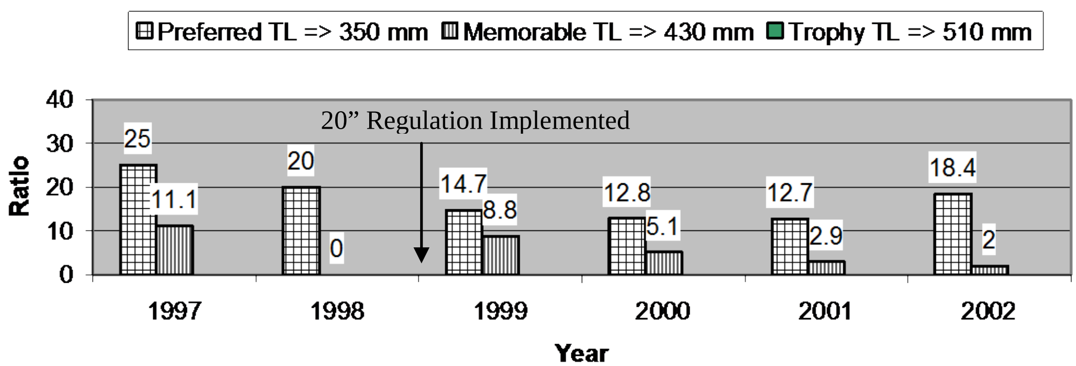
Table 14. Continued.

Pigeon River Mile	8.1	13.0	16.6	19	20.5	4.0
Site Code	420023101	420023102	420023103	420023104	420023105	420023106
Species						
Cyprinidae						
Bigeye Chub	X		X			
Carp	X	X	X		X	X
Golden Shiner	X					
Longnose Dace	X					
Fatlips Minnow			X			
River Chub	X					
Rosyface Shiner	X		X			
Silver Shiner	X		X	X		X
Spotfin Shiner	X					
Central Stoneroller	X		X	X	X	
Telescope Shiner	X		X	X	X	
Tennessee Shiner			X			
Whitetail Shiner	X		X	X	X	
Ictaluridae						
Channel Catfish	X					X
Percidae						
Banded Darter	X					
Gilt Darter	X		X			
Greenside Darter	X		X			
Logperch	X	X	X		X	X
Redline Darter	X	X	X	X		
Snubnose Darter	X		X	X	X	
Walleye	X	X	X			X
Petromyzontidae						
Chestnut Lamprey	X					
Icthyomyzon sp.					X	X
Salmonidae						
Rainbow Trout				X		
Sciaenidae						
Drum	X		X		X	X

Discussion

The Pigeon River provides anglers with the opportunity to catch all species of black bass as well as rock bass. Perhaps the greatest potential for elevating this river's "trophy" status lies in the smallmouth bass population. Given that a fair percentage of smallmouth bass are reaching the preferred category (average 17% between 1997-2002) and that these fish are growing slightly slower than the statewide average (Carter et al. 1999), there would appear to be potential for trophy management of the smallmouth bass population in this river. With the implementation of the 20-inch length regulation during the 1999-2000 season, shifts in the smallmouth bass population structure may be forthcoming (higher densities of larger bass). We are currently tracking trends in this segment of the smallmouth bass population (Figure 36).

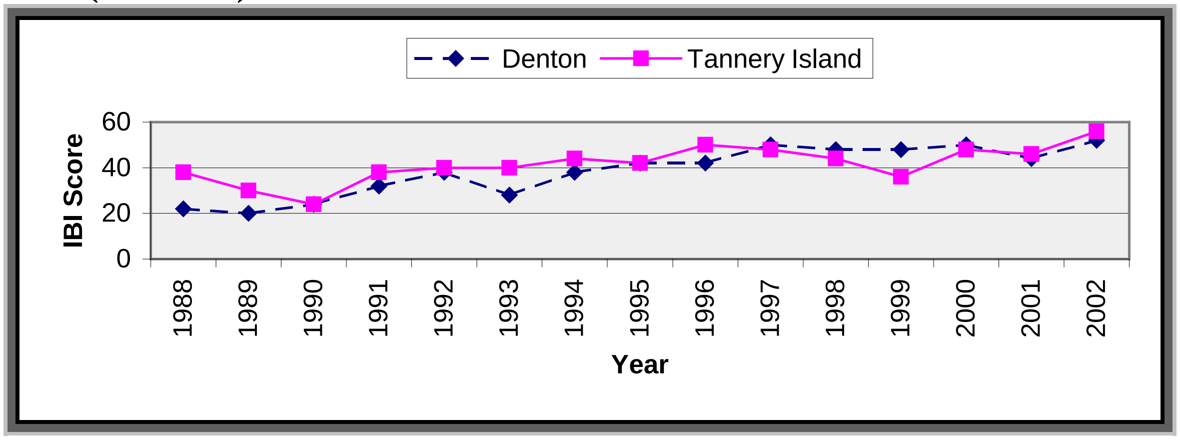
Figure 36. Trends in the ratio of preferred, memorable, and trophy smallmouth bass collected from the Pigeon River 1997-2002.



With the increase in recreational use on the river, it is important that angler use and harvest be profiled. The collection of this type of data will aid in evaluating angler use of the resource and help in evaluating the current size and creel limit restrictions.

Over the last 15 years the IBI scores (TWRA and TVA data) at two stations on the Pigeon River have been steadily increasing (Figure 37). This has primarily been the result of improved wastewater treatment at the Champion Paper Mill in Canton, North Carolina. The improved water quality has undoubtedly had an affect on the amount of recreation that is currently taking place, particularly whitewater rafting. It has also resulted in the return of a few species (e.g. silver shiner, telescope shiner) previously not encountered in the annual surveys. The continuation of improvements to the water quality of the Pigeon River will in all likelihood have dramatic impacts on the use of the river in the future. Surveys on the Pigeon River will be conducted on an annual basis in order to assess any changes in the fishery that may result from the new regulation. Currently, there are ongoing projects to re-introduce selected fish, common mussel, and snail species.

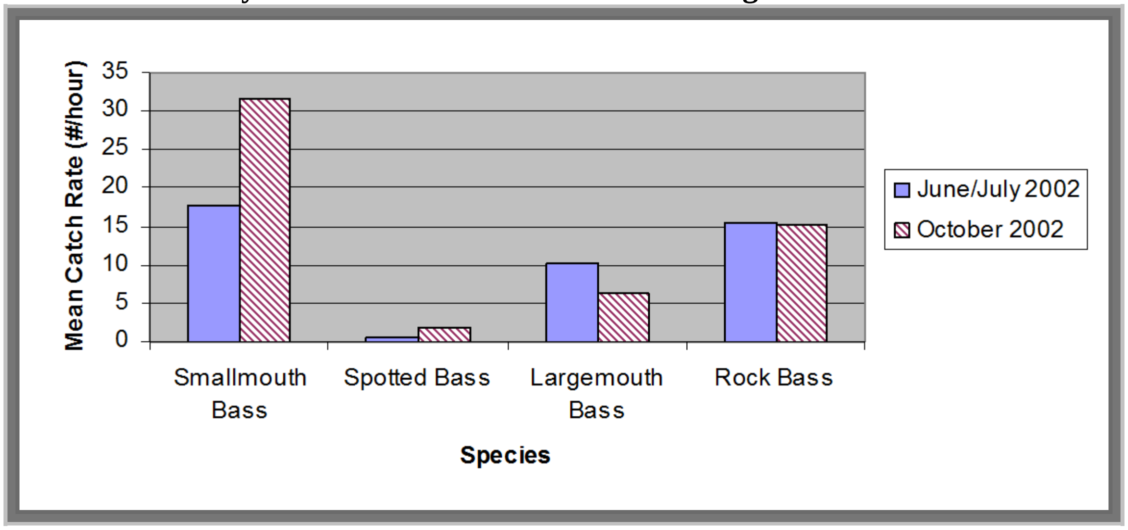
Figure 37. Trends in Index of Biotic Integrity (IBI) at two stations on the Pigeon River (1988-2002).



Over the past few years we have been interested in evaluating black bass and rock bass catch rates at different intervals during the course of a year. During a Pigeon River catfish collection trip in October of 2001 we noticed a substantial increase in the number and size of smallmouth bass collected at one of our annual monitoring stations. As a result of this finding, we decided to investigate this further during 2002 by revisiting five of the six sites surveyed during June/July 2002. With exception of Site 2 all of the monitoring stations were re-sampled during October 2002. We tried to duplicate our surveys methods and durations in order to make a valid comparison between the summer and fall samples.

Based on our two samples there was a substantial increase (78%) in the average catch rate of smallmouth bass although the other species of black bass and rock bass remained relatively constant (Figure 38). This would suggest that a fall sample or possibly a spring sample may be more productive in terms of characterizing bass (particularly smallmouth bass) and rock bass populations in the Pigeon River.

Figure 38. Trends in mean catch rate of black bass and rock bass collected between June/July 2002 and October 2002 from the Pigeon River.



Likewise the size structure of smallmouth bass shifted in favor of larger size classes (Figures 39, 40). This indicated that our summer sample might be somewhat skewed toward smaller bass and may not accurately reflect the true population size structure.

Figure 39. Length frequency distributions for smallmouth bass collected from the Pigeon River between June/July and October 2002.

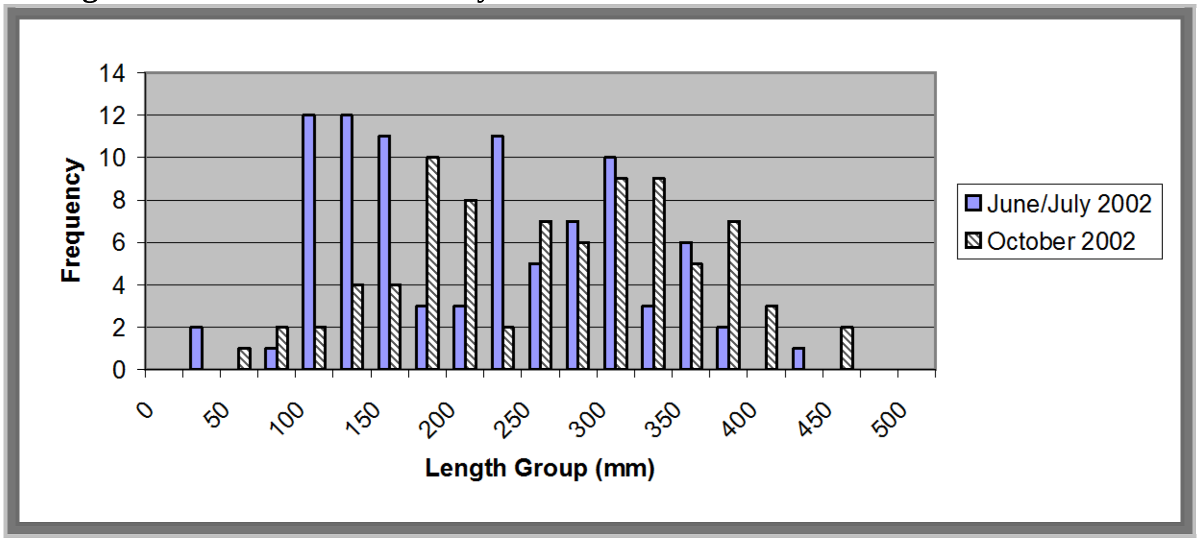


Figure 40. Smallmouth bass collected from the Pigeon River during October 2002.

Management Recommendations

1. Implement an angler-use and harvest survey.

2. Continue monitoring the sport fish population, with detailed analysis focusing on the smallmouth bass fishery and timing of sampling efforts.

3. Continue the cooperative IBI surveys at the two established stations (Denton and Tannery Island).

4. Develop a management plan for the river.

North Fork Holston River

The North Fork Holston River has a reputation of being one of the regions best riverine smallmouth bass fisheries. This is supported by frequent reports of quality size smallmouth bass being caught in the 8.3 kilometer section between the TN/VA line and the confluence with the South Fork Holston River near Kingsport. The Agency has conducted limited surveys (1 site each) of the river in 1989 and 1997 (Bivens and Williams 1990, Bivens et al. 1998) and more extensive surveys of sport fish populations in 1998 and 2001 (Carter et al. 1999, 2002).

Because of the lack of information regarding angler use and harvest in warmwater river fisheries in east Tennessee the TWRA contracted with Tennessee Technological University in 2001 to conduct a creel survey on the North Fork. Between March 1 and October 31, 2001 a roving creel was conducted along the 8.3 km section that flows through Tennessee (Bettoli 2002).

A total of 492 anglers were interviewed during the survey (Bettoli 2002). Overall, 95% of the anglers interviewed were Tennesseans while 5% resided in Virginia (Bettoli 2002). The majority of anglers that were interviewed were local anglers residing in Sullivan County. Fishing pressure over the survey period totaled 13,707 hours representing 7,490 trips (Bettoli 2002). Based on the interviews almost all of the anglers were targeting smallmouth bass and most were practicing catch and release. Anglers who had completed a trip caught on average 1.47 smallmouth bass per trip (Bettoli 2002). The harvest rate for the fish caught was 0.18 bass per trip (Betolli 2002). At the completion of the survey, a total of 8,400 smallmouth bass were reported caught from the North Fork of which 713 were harvested.

The survey of the North Fork represents the second unregulated riverine smallmouth bass fishery to be evaluated in Tennessee. Condo and Bettoli (2000) surveyed the Duck River, which received 25,000 hours of angling pressure over a seven-month period (Condo and Betolli 2000). This approximated to 3.4 hours of angling effort per week per kilometer of river (Condo and Betolli 2000). Comparatively, the North Fork received about 47 hours of effort per week per kilometer.

Although the North Fork did not receive a substantial amount of effort from anglers residing outside of Sullivan County it did receive a significantly higher amount of pressure per river km when compared to the value observed on the Duck River. Based on the findings from the North Fork, Bettoli (2002) suggested that the North Fork would be a good candidate for special regulation given the ability of the river to produce quality size bass and the amount of harvest that was observed during the survey.

Elk Fork Creek

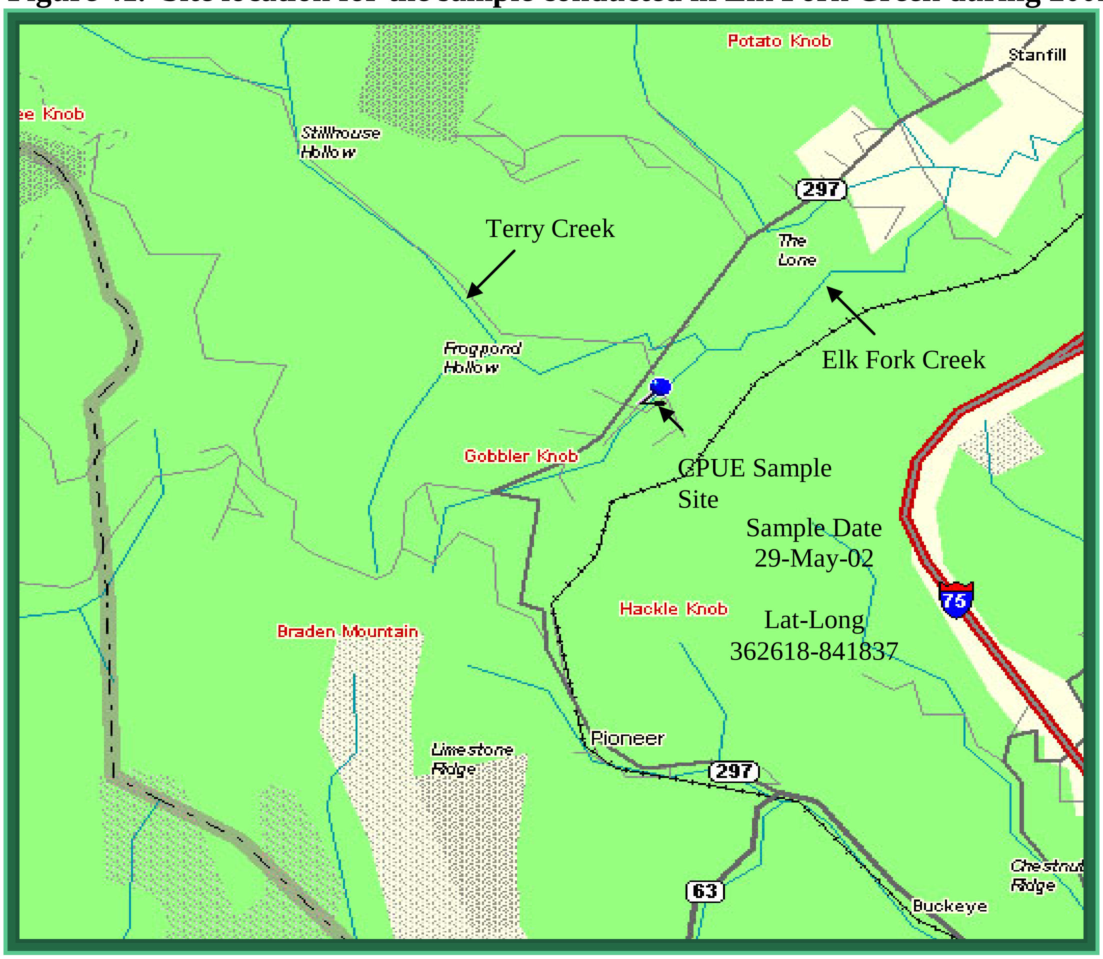
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of *Phoxinus* sp. in the upper reaches. The Agency made two qualitative fish and benthic collections from this stream in 1991, one near Indian Mountain State Park in Jellico and one near stream mile 9.4 (Bivens et al. 1992). In 1994, the agency conducted an Index of Biotic Integrity sample and collected invertebrates just upstream of the confluence of Elk Fork Creek and Little Elk Creek (Bivens et al. 1995).

Study Area and Methods

Our survey site (Figure 41) was located at the stream crossing on N. Paul Lane. The stream at this location was moderately graded and had channel substrate composed

Figure 41. Site location for the sample conducted in Elk Fork Creek during 2002.



primarily of cobble and boulder substrate. Most of the quiet pools had some deposits of sediment. Woody cover was sparse in our survey reach and did not contribute significantly to the overall stream cover. The riparian zone on the left descending bank had all but been removed in favor of residential lawns. The right descending bank was, for the most part, intact and was vegetated with small shrubs and multiflora rose. Our 1994 assessment of Elk Fork Creek led us to believe that the stream was suffering from unregulated waste discharge from residents as many of the fish encountered during this survey had either lesions or black grub. The reach we surveyed in 2002 was a considerable distance upstream of our 1994 survey site and appeared to be less impacted by residential development. Basic water quality measurements for this stream revealed a temperature of 21 C, a conductivity of 210 µs/cm, and a pH of 6.0. It was evident that this portion of the stream was being influenced substantially by spring water. Fish were collected with one backpack shocker and a dip net. Survey duration was 461seconds.

Results

We collected a total of 108 fish representing seven species (Table 15). Most of the species collected were common, small stream species and occurred in expected abundances in relation to the available habitat. The most abundant species was

Table 15. Species occurrence and associated catch rates (#/hour) for Elk Fork Creek 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420021601	Creek Chub	188	49	382.6
420021601	Rainbow Darter	401	19	148.4
420021601	Redbreast Sunfish	346	2	15.6
420021601	Southern Redbelly Dace	167	19	148.4
420021601	Central Stoneroller	45	2	15.6
420021601	Striped Shiner	89	1	7.8
420021601	Stripetail Darter	418	16	124.9
		Total	**108**	

creek chub, which accounted for 45% of the total number of fish collected. The unexpected discovery during this survey was the occurrence of southern redbelly dace, which was quite abundant (17% of the sample) in this portion of the stream. Charlie Saylor (TVA) encountered this species in a spring creek tributary to Elk Fork Creek just upstream of Fall Branch near the community of Oswego during an earlier survey. The occurrence of this species in the Clear Fork drainage is rare in Tennessee and up until our collection had only been observed at the locality sampled by TVA. Southern redbelly dace are more common along the Highland Rim and in the Nashville Basin provinces of middle Tennessee. The only game species collected at the 2002 survey site was redbreast sunfish. The two fish we collected in our sample ranged in length from 109 to 121 mm.


Southern Redbelly Dace collected in Elk Fork Creek

Discussion

The occurrence of the southern redbelly dace in the the Elk Fork Creek drainage warrants further investigation as well as a follow up survey on the status of the population discovered by TVA. Although more common in middle Tennessee, the dace in the Elk Fork Creek drainage may represent isolated and possibly a distinct population.

Management Recommendations

1. Any action that would protect this stream from further degradation would be of benefit to the stream, particularly in the reaches inhabited by the southern redbelly dace. A distribution and status survey of this species within this drainage would be beneficial.

Terry Creek

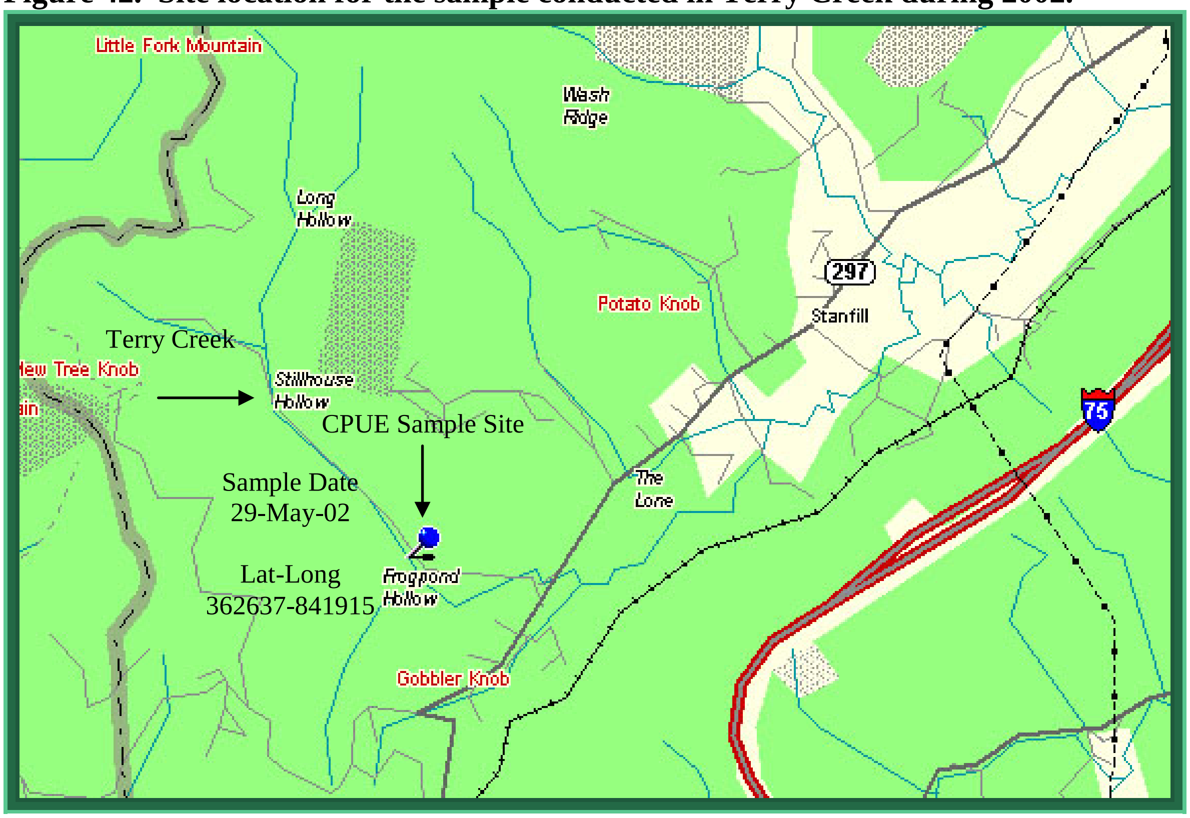
Introduction

Our survey of Terry Creek was conducted in order to assess the condition of the blackside dace population in the stream. TWRA conducted an Index of Biotic Integrity sample in this stream during 1994 at the Hwy. 297 crossing (Bivens et al. 1995).

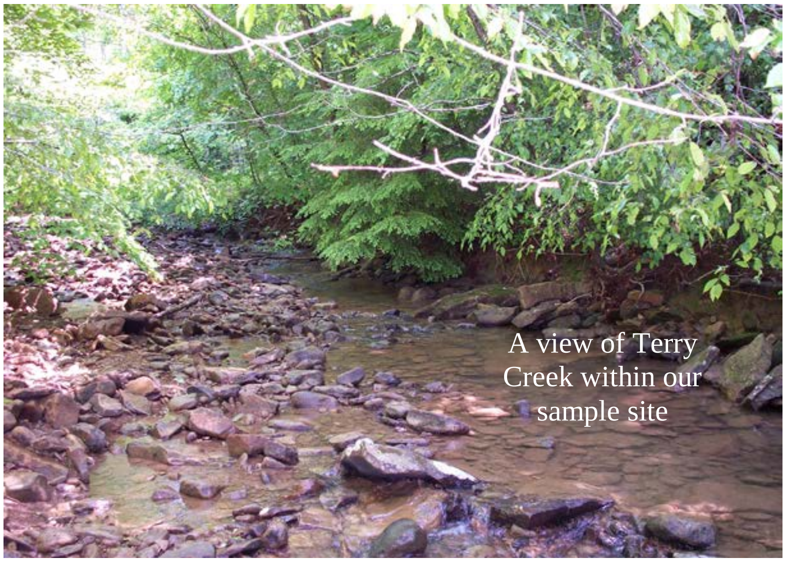
Study Area and Methods

Our 2002 survey was located upstream of the 1994 site in Stillhouse Hollow on the property of Gary Keisler (Figure 42). The stream at this location was moderately graded and had channel substrate composed primarily of cobble and boulder.

Figure 42. Site location for the sample conducted in Terry Creek during 2002.



Most of the quiet pools had some deposits of sediment. Woody cover was sparse in our survey reach and did not contribute significantly to the overall stream cover. The riparian zones on both banks were intact except for one at the upper end of our survey area that had been disturbed by excavating activities. The water level was extremely low and a


A view of Terry Creek within our sample site

majority of the stream substrate was exposed. The stream reach we surveyed was about a 50/50 mix of riffle and pool habitat. Our 1994 assessment of Terry Creek led us to believe that the stream was in good condition based on the fish diversity and aquatic insect community present at the time. However, we did discover a logging operation upstream of our sample site in 1994 that was introducing significant amounts of sediment into the stream. Basic water quality measurements for this stream revealed a temperature of 19 C, a conductivity of 140 µs/cm, and a pH of 5.8. Fish were collected with one backpack shocker and a dip net. Survey duration was 972 seconds.

Results

We collected a total of 200 fish representing nine species (Table 16). Most of the species collected were common, small stream species and occurred in expected abundances in relation to the available habitat. The blackside dace was collected at this location and was relatively abundant contributing 15.5% to the overall number of fish collected The most abundant species was creek chub which accounted for 47% of the total number of fish collected. Three darter species were collected here. These included the arrow darter, rainbow darter, and stripetail darter. Of the three, the rainbow darter was the most abundant accounting for 13% of the total sample.


Blackside Dace collected from Terry Creek

In comparison, our 1994 survey collected 12 species, which included longear sunfish, emerald darter, and northern hogsucker not seen in the 2002 survey. The IBI score derived from our 1994 survey indicated Terry Creek was in “good” condition based on the overall score of 48.

Table 16. Species occurrence and associated catch rates (#/hour) for Terry Creek 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420021401	Arrow Darter	433	2	7.4
420021401	Blackside Dace	166	31	114.8
420021401	Creek Chub	188	94	348.1
420021401	Rainbow Darter	401	26	96.2
420021401	Rosefin Shiner	93	3	11.1
420021401	Central Stoneroller	45	7	25.9
420021401	Striped Shiner	89	11	40.7
420021401	Stripetail Darter	418	13	48.1
420021401	White Sucker	195	12	44.4
		Total	**200**	

Benthic macroinvertebrates collected in our sample comprised 30 families representing 38 identified genera (Table 17). The most abundant group in our collection was the caddisflies comprising 36.2% of the total sample. Overall, a total of 42 taxa were identified from the sample of which 27 were EPT. Based on the EPT taxa richness and overall biotic index of all species collected, the relative health of the benthic community was classified as “good” (4.5). Our benthic collection from a downstream locality in 1994 revealed a substantially lower diversity of insects. Our effort was about half of the effort expended during our 2002 survey. The habitat collected in 1994 was drastically different than the available habitat at our 2002 survey site. There was a lot more riffle area with suitable substrate in our 2002 survey, which probably allowed us to collect higher numbers and increase the diversity of our sample. In 1994, there was more sediment in the stream than we encountered in 2002. This may have had a detrimental effect on the benthic community and was reflected in our survey that year. A total of 20 taxa were collected in our 1994 survey of which eight were EPT. The overall bioclassification at the site was “fair” (2) which was considerably lower than our 2002 score. More intolerant forms were present in our 2002 sample when compared to the 1994 sample. This suggests that the stream has improved since our previous survey or that our survey in 1994 was not thorough enough to accurately depict the benthic community present at that time. In any event, is appears that Terry Creek is capable of supporting a fairly diverse assemblage of aquatic insects as well as the state listed arrow darter and the federally listed blackside dace. The logging activities that were going on in the watershed in 1994 have apparently ceased and the stream appears to have recovered as much as current activities within the watershed will allow.

Table 17. Taxa list and associated biotic statistics for benthic macroinvertebrates collected from Terry Creek.

ORDER	FAMILY	SPECIES	NUMBER	PERCENT
ANNELIDA				0.4
	Oligochaeta		1	
COLEOPTERA				7.5
	Curculionidae	undetermined sp.	1	
	Dryopidae	*Helichus* adults	9	
	Elmidae	*Optioservus* larva	1	
		O. trivittatus adult	1	
	Psephenidae	*Psephenus herricki* 1 adult and 6 larvae	7	
DIPTERA				9.1
	Chironomidae		6	
	Dixidae	*Dixa*	2	
	Tabanidae	*Tabanus*	1	
	Tipulidae	*Hexatoma*	11	
		Tipula	2	
		undetermined sp.	1	
EPHEMEROPTERA				24
	Baetidae	*Baetis*	7	
		Procloeon	4	
	Ephemerellidae	*Drunella*	3	
		Ephemerella	1	
		Eurylophella	17	
	Ephemeridae	*Ephemera*	10	
	Heptageniidae	*Epeorus rubidus/subpallidus*	1	
		Heptagenia	3	
		Stenonema vicarium	5	
	Leptophlebiidae	*Habrophlebiodes*	6	
		Paraleptophlebia	4	
HETEROPTERA				0.4
	Gerridae	*Gerris nymph*	1	
ODONATA				2.4
	Aeshnidae	*Boyeria grafiana*	2	
	Cordulegastridae	*Cordulegaster maculata*	3	
	Gomphidae	*Lanthus/Stylogomphus* early instar	1	
PLECOPTERA				20.1
	Leuctridae	*Leuctra*	6	
	Nemouridae	*Amphinemura delosa/nigritta*	2	
	Perlidae	*Acroneuria carolinensis*	39	
		Eccoptura xanthanes	1	
		undetermined early instars	2	
	Perlodidae	*Isoperla holochlora*	1	
TRICHOPTERA				36.2
	Glossosomatidae	*Glossosoma*	4	
	Hydropsychidae	*Cheumatopsyche*	15	
		Diplectrona modesta	1	
	Hydroptilidae	*Ochrotrichia*	1	
	Lepidostomatidae	*Lepidostoma*	1	
	Limnephilidae	*Pycnopsyche guttifer/scabripennis* group	1	
		P. luculenta group	2	
	Philopotamidae	*Dolophilodes distinctus*	60	
	Polycentropodidae	*Polycentropus*	5	
	Rhyacophilidae	*Rhyacophila carolina*	1	
	Uenoidae	*Neophylax wigginsi*	1	
		TOTAL	**254**	

TAXA RICHNESS = 42
EPT TAXA RICHNESS = 27
BIOCLASSIFICATION = 4.5 (GOOD)

Discussion

Terry Creek is a moderate size tributary to Elk Fork Creek that does not afford much opportunity for recreational angling. There are sunfish species in the lower reaches of the stream but numbers are such that angling probably would not be productive. The population of blackside dace in this stream is of the most significance and should be the primary focus of management activities and stream protection. The distribution of this species upstream of our 2002 survey site is unknown. However, it probable that they persist upstream to the extent that suitable habitat is available.

Management Recommendations

1. Any action that would protect this stream from further degradation would be of benefit to the stream, particularly in the reaches inhabited by the blackside dace.

Hudson Branch

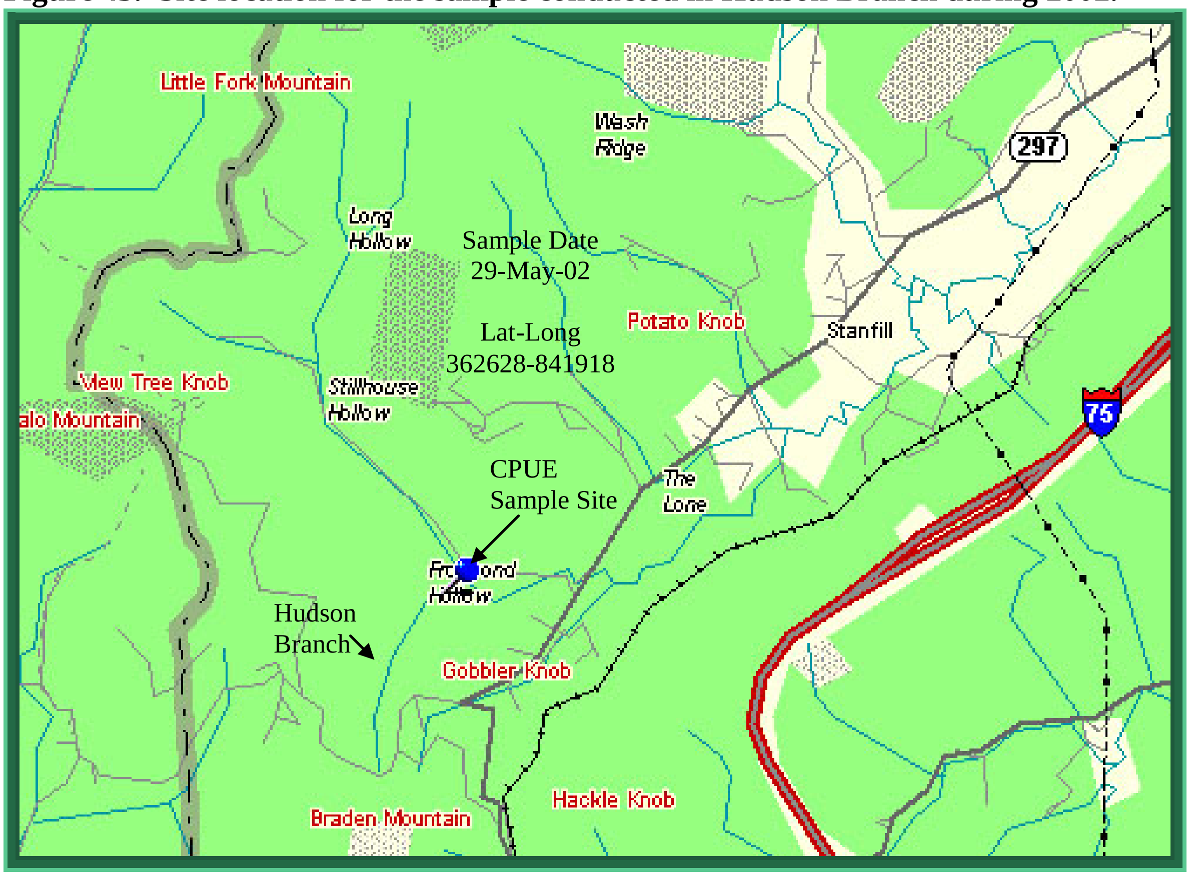
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 43) was located about 200 m upstream of the Terry Creek/Hudson Branch confluence. The stream at this location was relatively low grade and had channel substrate composed primarily of cobble and boulder.

Figure 43. Site location for the sample conducted in Hudson Branch during 2002.



Most of the pools had some deposits of sediment. The instream habitat was composed of about 20% pools and 80% riffles. Woody cover was sparse in our survey reach and did not contribute significantly to the overall stream cover. The riparian zone on both stream

banks had been substantially reduced by a road on the left descending bank and a pasture field on the right descending bank. What vegetation remained was composed of small shrubs and grasses. We surveyed about 100 m of stream length with one backpack shocker and a dipnet during a 480 second effort. Basic water quality measurements for this stream revealed a temperature of 23 C, a conductivity of 90µs/cm, and a pH of 6.0.

Results

We collected a total of 163 fish representing six species (Table 18). Most of the species collected were common, small stream species and occurred in expected abundances in relation to the available habitat. The most abundant species was

Table 18. Species occurrence and associated catch rates (#/hour) for Hudson Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420021501	Arrow Darter	433	4	30
420021501	Blackside Dace	166	24	180
420021501	Creek Chub	188	88	660
420021501	Rainbow Darter	401	24	180
420021501	Central Stoneroller	45	3	22.5
420021501	Stripetail Darter	418	20	150
		Total	**163**	

creek chub, which accounted for 54% of the total number of fish collected. The discovery of blackside dace, which was somewhat expected given the close proximity of Terry Creek contributed 15% to the total sample. The collection of this species however,

does represent a new locality for this species and it appears that these fish remain in the stream permanently. Three darter species were collected from this stream, which was quite unexpected given the size of the stream and the flow conditions during our survey. The state recognized arrow darter along with rainbow darter and stripetail darter were all collected here. The rainbow darter was the most abundant species collected within this group.

Discussion

Hudson Branch is a small tributary to Elk Fork Creek that does not afford any opportunity for recreational angling. The population of blackside dace in this stream is of the most significance and should be the primary focus of management activities and stream protection. The headwaters of this stream are confined within the boundaries of Royal Blue WMA, which offer some protection to the remainder of the stream. The distribution of this species upstream of our 2002 survey site is unknown. However, it is probable that they persist upstream to the extent that suitable habitat is available.

Management Recommendations

1. Any action that would protect this stream from further degradation would be of benefit to the stream, particularly in the reaches inhabited by the blackside dace. A distribution and status survey of this species within this stream would be beneficial.

Hickory Creek

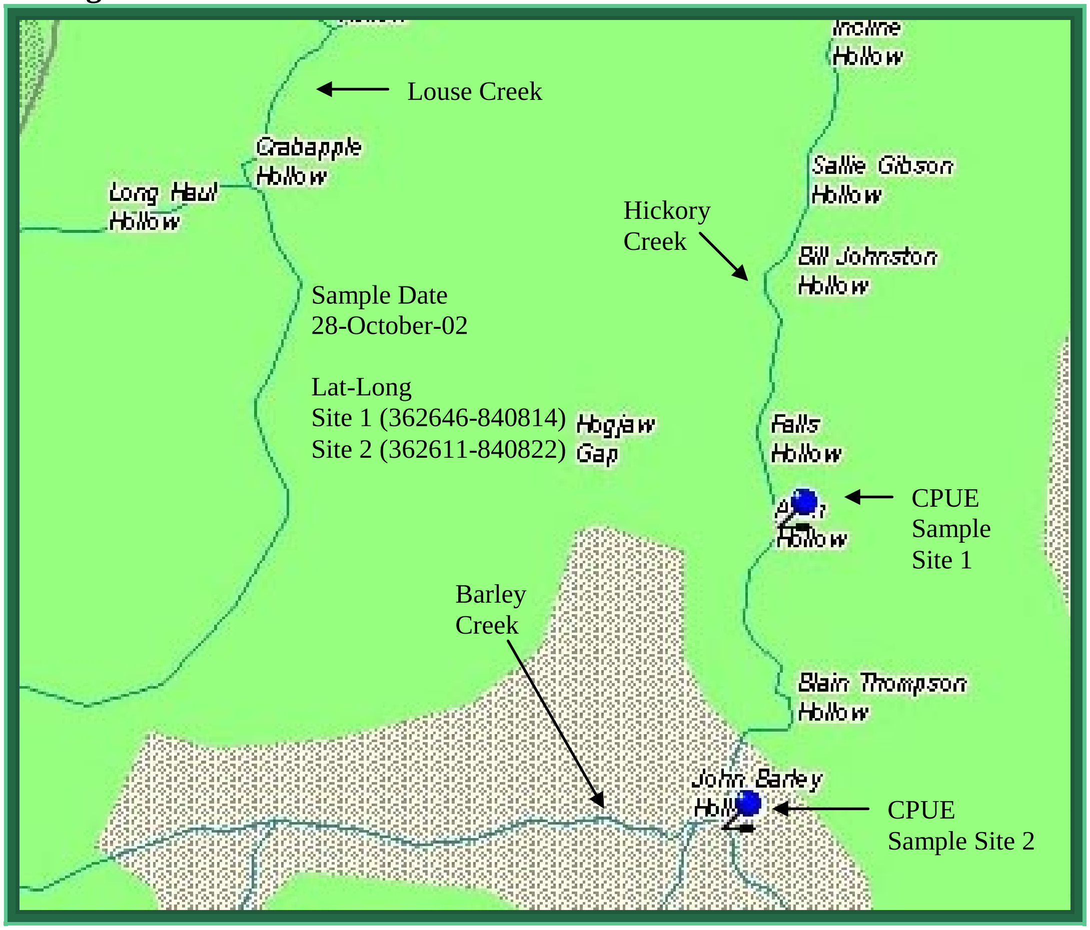
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency did conduct an Index of Biotic Integrity survey in this stream at a downstream locality in 1994 (Bivens et al. 1995).

Study Area and Methods

Our survey sites (Figure 44) were upstream of the Louse Creek/Hickory Creek confluence. Site one was located at the second trail crossing upstream of Louse Creek. The second survey site was located at the first trail crossing upstream of Barley Creek.

Figure 44. Site locations for the samples conducted in Hickory Creek during 2002.



Most of the pools had some deposits of sediment. Woody cover was sparse in our survey reach and did not contribute significantly to the overall stream cover. The stream banks were wooded and the riparian zones were well established within our survey areas. Both of the survey sites had about 40% pool and about 60% riffle habitat. Stream substrate was primarily boulder/cobble with some gravel. In each survey area we sampled about 150 m with one backpack shocker and a dipnet. Sample durations varied from 1200 seconds at site 1 to 900 at site 2. Basic water quality measurements for this stream revealed temperatures of 15 C at both sites, conductivities of 470 and 455 µs/cm at sites 1 and 2, respectively. pH at both sites was 6.5.

Results

We collected a total of 250 fish representing 13 species at Site 1 and 68 fish representing two species at site 2 (Table 19). All of the species collected were common, smaller stream species and occurred in expected abundances in relation to the available habitat. The most abundant species at both sites was creek chub representing 46%

Table 19. Species occurrence and associated catch rates (#/hour) for Hickory Creek 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420025701	Arrow Darter	433	3	9
420025701	Bluegill	351	3	9
420025701	Bluntnose Minnow	176	1	3
420025701	Creek Chub	188	115	345
420025701	Green Sunfish	347	15	45
420025701	Redhorse (juvenile)	220	8	24
420025701	Rainbow Darter	401	10	30
420025701	Redbreast Sunfish	346	6	18
420025701	Spotted Bass	363	2	6
420025701	Central stoneroller	45	76	228
420025701	Stripetail Darter	418	4	12
420025701	White Sucker	195	3	9
420025701	Whitetail Shiner	54	4	12
		Total	**250**	
420025702	Creek Chub	188	65	260
420025702	Green Sunfish	347	3	12
		Total	**68**	

of the catch at Site 1 and 96% of the catch at Site 2. Three darter species were collected at Site 1, including the state listed arrow darter. There were no darters present in our survey at Site 2. No blackside dace were collected although habitat was similar to that of Louse Creek where they are known to occur.

Discussion

Upper Hickory Creek is typical of many headwater streams in the area, offering little opportunity for recreational angling. Although, sunfish species were present, their numbers were at such low levels that angling would probably not be productive. The occurrence of three darter species indicated that this portion of Hickory Creek offered suitable habitat and water quality to sustain these more intolerant fishes. Our 1994 assessment of the stream led us to believe that Hickory Creek was in “good” condition based on the fish and benthic community present at our survey site.

Management Recommendations

1. Any action that would protect this stream from further degradation would be of benefit, given the presence of the arrow darter in this portion of the stream.

Louse Creek

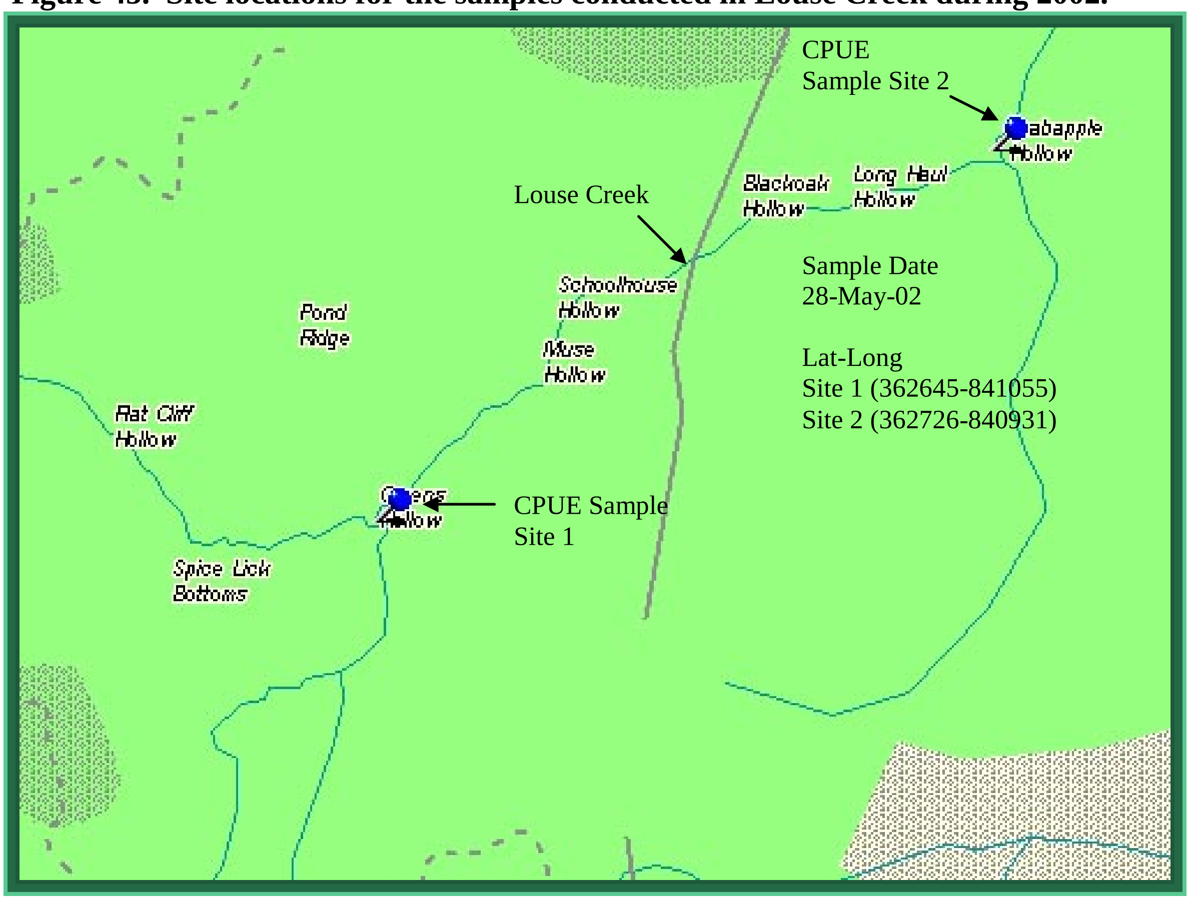
Introduction

This stream was sampled to inventory the fish and benthic species diversity for TADS and to investigate the possible occurrence of blackside dace in the upper portion of this stream. The Agency has made no previous studies or fish collections from this stream. Etnier (1992[a]) did conduct a survey of the fish and benthic community between Jim Branch and Bruce Hollow.

Study Area and Methods

Our survey sites (Figure 45) were located in the upper and mid reaches of Louse Creek. Site 1 was located at the trail crossing at the confluence of Jim Branch and Louse Creek. The second survey site was located at the mouth of Crabapple Hollow where an unnamed tributary entered Louse Creek. The stream for the most part was moderately

Figure 45. Site locations for the samples conducted in Louse Creek during 2002.



silted at both locations. This is fairly common for small streams in the upper Cumberland given the long history of logging and coal extraction within the region and current ATV use. Woody cover was sparse in our survey reach and did not contribute significantly to the overall stream cover. At the upstream site (Site 1) beavers had blocked the stream channel and altered much of the habitat within our survey area. At our downstream survey site the stream resumed a more natural state and had no indication of recent alterations to the riparian zone or stream channel. The habitat was more pool dominated at our upper survey size comprising about 80% of the available habitat. At our downstream site the habitat was more of an even mix of pools (40%) and riffles (60%). Stream substrate was primarily boulder/cobble with some gravel. In each survey area we sampled about 200 m with one backpack shocker and a dipnet. Sample durations varied from 1104 seconds at Site 1 to 1140 at Site 2. Basic water quality measurements for this stream revealed temperatures of 19 C at both sites, conductivities of 260 and 142 µs/cm at Sites 1 and 2, respectively. pH at both sites was 6.0.


Louse Creek at Site 1


Louse Creek at Site 2

Results

We collected a total of 58 fish representing four species at Site 1 and 223 fish representing six species at site 2 (Table 20). All of the species collected were common, smaller stream species with the exception of the arrow darter and blackside dace and occurred in expected abundances in relation to the available habitat. Etnier (1992[a]) collected both of these species in the survey conducted that year. All of the blackside dace collected during the 1992 survey were at a downstream


Arrow Darter collected at Site 2

locality near Bruce Hollow. Our collection of this species near Crabapple Hollow represents the most upstream occurrence to date. The most abundant species at both sites was creek chub representing 29% of the catch at Site 1 and 63% of the catch at Site 2. Two darter species were collected at Site 2, including the state listed arrow darter. Overall, our collections compared quite well with the survey conducted in 1992. We collected a total of eight species, as did the 1992 survey (Etnier 1992[a]). All of the species present in 2002 were collected in the 1992 survey with the exception of the largemouth bass (2002 only) and the northern hogsucker (1992 only).

Table 20. Species occurrence and associated catch rates (#/hour) for Louse Creek 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420021201	Blacknose Dace	184	7	22.8
420021201	Bluegill	351	32	104.3
420021201	Creek Chub	188	17	55.4
420021201	Largemouth Bass	364	2	6.5
		Total	**58**	
420021202	Arrow Darter	433	14	44.2
420021202	Blacknose Dace	184	20	63.1
420021202	Blackside Dace	166	1	3.1
420021202	Creek Chub	188	141	445.2
420021202	Stripetail Darter	418	28	88.4
420021202	White Sucker	195	19	60
		Total	**223**	

Benthic macroinvertebrates collected in our sample (Site 2) comprised 30 families representing 42 identified genera (Table 21). The most abundant group in our collection was the mayflies comprising 39.1% of the total sample. Overall, a total of 49 taxa were identified from the sample of which 31 were EPT. Based on the EPT taxa richness and overall biotic index of all species collected, the relative health of the benthic community was classified as “good/excellent” (4.7). Overall, this sample was the most diverse we collected of any of the 2002 benthic samples. It was the only stream to be categorized good/excellent and the only stream to have EPT taxa number in excess of 30. Future surveys should include a benthic sample within this reach, as it appears this is a good indicator of the overall well being of this stream and may provide a better measure than that obtained exclusively from a fish survey.

Table 21. Taxa list and associated biotic statistics for benthic macroinvertebrates collected from Louse Creek.

ORDER	FAMILY	SPECIES	NUMBER	PERCENT
COLEOPTERA				3.5
	Dryopidae	*Helichus* adults	4	
	Dyticidae	*Hydroporus* adults	3	
	Elmidae	*Dubiraphia* adult	1	
		Optioservus trivittatus adult	1	
		Stenelmis adults	2	
DIPTERA				4.1
	Ceratopogonidae	*Palpomyia* complex	1	
	Chironomidae		8	
	Simuliidae		1	
	Tipulidae	*Hexatoma*	1	
		Tipula	2	
EPHEMEROPTERA				39.1
	Baetidae	*Baetis*	24	
		Centroptilum	8	
	Caenidae	*Caenis*	1	
	Ephemerellidae	*Drunella*	26	
		Ephemerella	2	
		Eurylophella	3	
	Ephemeridae	*Ephemera*	16	
	Heptageniidae	*Epeorus rubidus/subpallidus*	1	
		Heptagenia	2	
		Leucrocuta	1	
		Stenacron interpunctatum	9	
		Stenonema early instars	13	
		S. pudicum	2	
		S. vicarium	13	
	Isonychiidae	*Isonychia*	1	
	Leptophlebiidae	*Habrophlebiodes*	2	
HETEROPTERA				0.6
	Gerridae	*Gerris remigis* 1 ♂ and 1 ♀	2	
ISOPODA				2.5
	Asellidae	*Lirceus*	8	
MEGALOPTERA				5.7
	Corydalidae	*Corydalus cornutus*	1	
		Nigronia serricornis	17	
ODONATA				4.1
	Aeshnidae	*Boyeria grafiana*	3	
	Cordulegastridae	*Cordulegaster* early instar	2	
	Gomphidae	*Gomphus (*Genus A*) rogersi*	3	
		Gomphus early instar	1	
		Stylogomphus albistylus	4	
PLECOPTERA				11.4
	Leuctridae	*Leuctra*	4	
	Nemouriidae	*Amphinemura delosa/nigritta*	4	
	Perlidae	*Acroneuria abnormis*	2	
		A. carolinensis	22	
		A. evoluta	1	
	Perlodidae	*Isoperla holochlora*	3	
TRICHOPTERA				29.0
	Hydropsychidae	*Ceratopsyche ventura*	1	
		Cheumatopsyche	24	
		Diplectrona modesta	13	
	Lepidostomatidae	*Lepidostoma*	1	
	Limnephilidae	*Pycnopsyche guttifer/scabripennis* group	1	
		P. luculenta group	1	
	Philopotamidae	*Dolophilodes distinctus*	47	
	Polycentripodidae	*Polycentropus*	2	
	Rhyacophilidae	*Rhyacophila carolina*	1	
		R. fuscula	1	
		TOTAL	**317**	

TAXA RICHNESS = 49
EPT TAXA RICHNESS = 31
BIOCLASSIFICATION = 4.7 (GOOD/EXCELLENT)

Discussion

Upper Louse Creek is typical of many headwater streams in the area, offering little opportunity for recreational angling. The occurrence of two darter species and the blackside dace indicated that the mid reaches of Louse Creek offered suitable habitat and water quality to sustain these more intolerant fishes. Given that much of the watershed is now under the administration of TWRA, the protection and hopefully improvement of this stream will be the focus of future activities within the watershed.

Management Recommendations

1. Any action that would protect this stream from further degradation would be of benefit, given the presence of the arrow darter and blackside dace. Any future management action in this watershed needs to be designed to address these listed species, water quality, and habitat requirements.

Crabapple Hollow Tributary

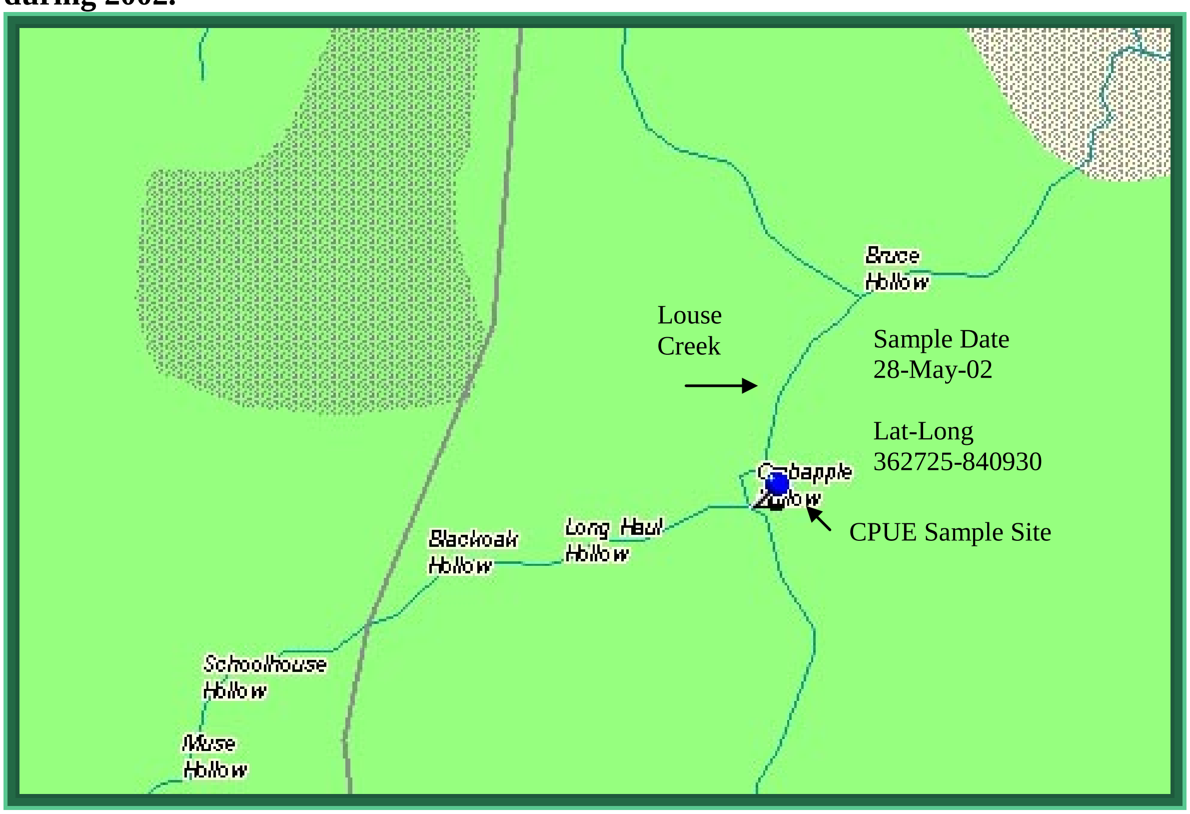
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in the stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

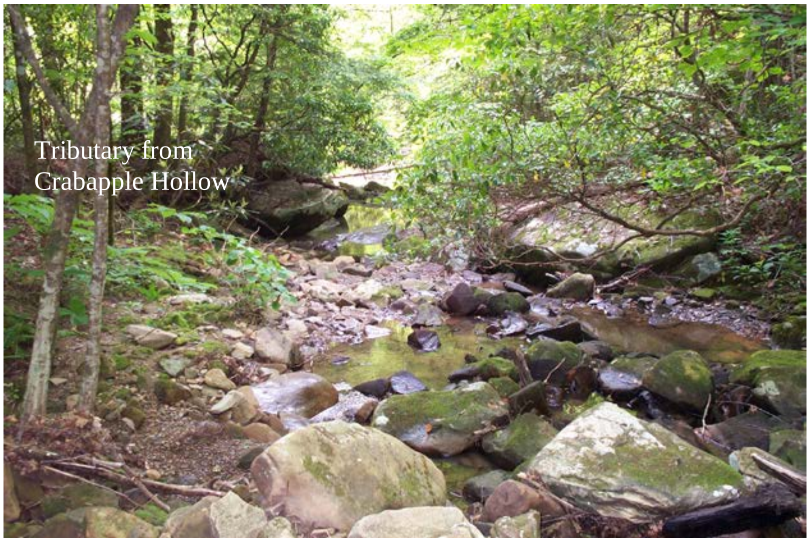
Study Area and Methods

Our survey site (Figure 46) began at the confluence with Louse Creek. The stream at this location was moderately graded and had channel substrate composed primarily of cobble and boulder. Most of the pools were relatively silt free and a noticeable difference

Figure 46. Site location for the sample conducted in Crabapple Hollow tributary during 2002.



in water clarity could be noticed where this stream joined Louse Creek. The instream habitat was composed of about 20% pools and 80% riffles. Woody cover was sparse in our survey reach and did not contribute significantly to the overall stream cover. The



riparian zone on both stream banks was intact and composed primarily of rhododendron. We surveyed about 100 m of stream length with one backpack shocker and a dipnet during a 908 second effort. Basic water quality measurements for this stream revealed a temperature of 17 C, a conductivity of 200 µs/cm, and a pH of 5.5.

Results

We collected a total of 82 fish representing three species (Table 22). Most of the species collected were common, small stream species and occurred in expected abundances in relation to the available habitat. The most abundant species was

Table 22. Species occurrence and associated catch rates (#/hour) for tributary from Crabapple Hollow 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420021301	Arrow Darter	433	3	11.8
420021301	Creek Chub	188	77	305.3
420021301	Stripetail Darter	418	2	7.9
		Total	**82**	

creek chub, which accounted for 94% of the total number of fish collected. The state listed arrow darter was collected from this stream, which is not surprising given our close proximity to Louse Creek. No blackside dace were collected here although the habitat appeared to be suitable. The lower pH combined with the smaller size of the tributary contributed to the overall reduction in species richness of this stream. An old weir dam located a short distance from the mouth still has the potential to restrict fish movement upstream.

Discussion

This small tributary to Louse Creek does not afford any opportunity for recreational angling. The pH of this stream was slightly depressed when compared to other streams in the watershed and may be suffering from some residual mine drainage within this watershed.

Management Recommendations

1. The occurrence of the state listed arrow darter warrants attention for this stream as well as the discovery of the blackside dace in Louse Creek just downstream from this tributary. Any action that would address continued protection of this stream would be of benefit to both species and the water quality in the receiving Louse Creek.

Jim Branch

Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 47) began near the confluence of Jim Branch and Louse Creek. The stream at this location was moderately graded and had channel substrate composed primarily of cobble and boulder. Siltation was prevalent as most of the pools had substantial layers of silt. The instream habitat was composed of about 30% pool

Figure 47. Site location for the sample conducted in Jim Branch during 2002.

habitat and about 70% riffle habitat. Woody cover was sparse in our survey reach and did not contribute significantly to the overall stream cover. The riparian zone on both stream banks was intact and composed primarily of rhododendron. We surveyed about 100 m of stream length with one backpack shocker and a dipnet during a 952 second effort. Basic water quality measurements for this stream revealed a temperature of 16 C, a conductivity of 125 µs/cm, and a pH of 5.8.

Results

We collected a total of 184 fish representing three species (Table 23). All of the species collected were common, small stream species and occurred in expected abundances in relation to the available habitat. The most abundant species was blacknose dace, which accounted for 69% of the total number of fish collected. The five bluegill collected from the stream were small and ranged in length from 65 to 114 mm.

Table 23. Species occurrence and associated catch rates (#/hour) for Jim Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420021101	Blacknose Dace	184	128	484
420021101	Bluegill	351	5	18.9
420021101	Creek Chub	188	51	192.8
		Total	**184**	

Discussion

This small tributary to Louse Creek does not afford any opportunity for recreational angling. The pH of this stream was slightly depressed when compared to other streams in the watershed and may be suffering from some residual mine drainage within this watershed.

Management Recommendations

1. Any action that would help decrease the amount of sediment entering this stream would be of benefit.

Stinking Creek

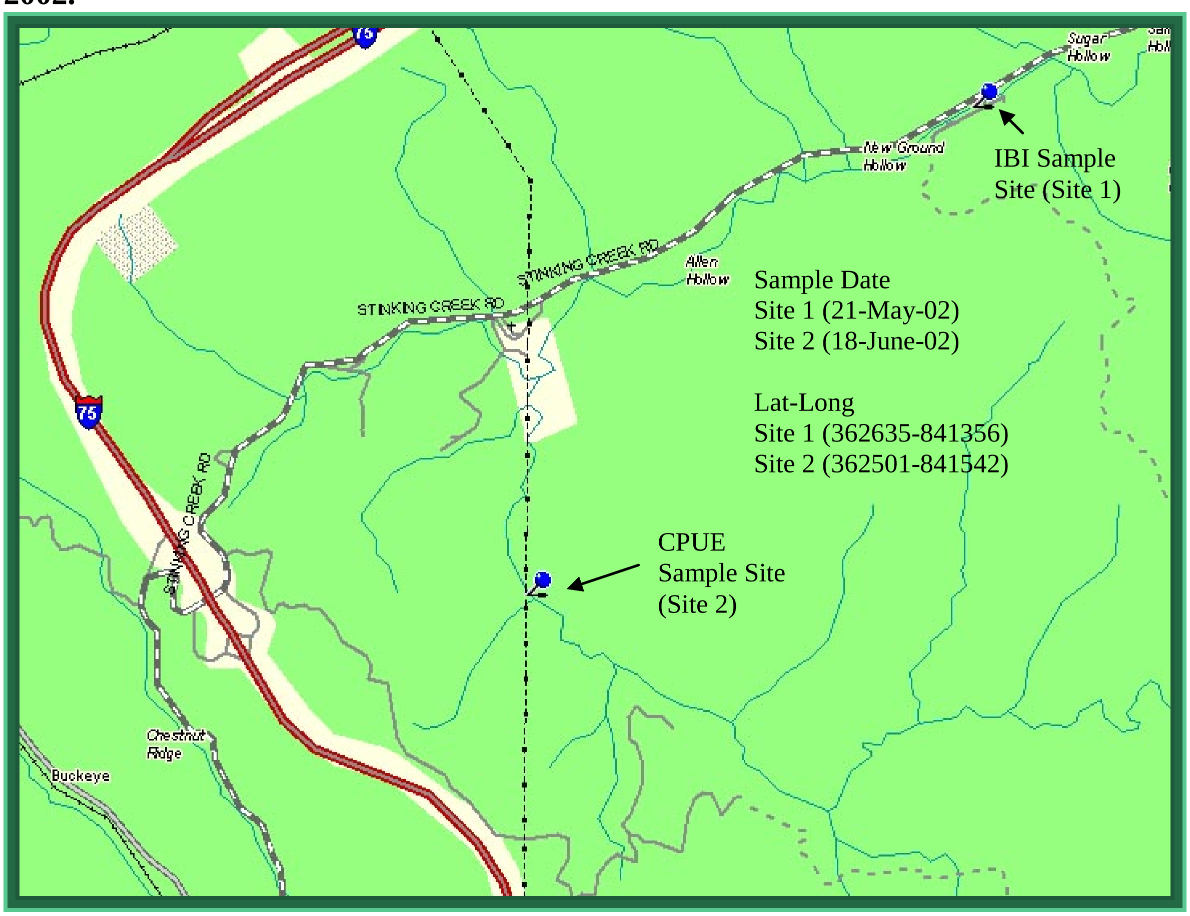
Introduction

Stinking Creek has the reputation for being one of the better quality streams in Campbell County. In 1990 a request by the county wildlife officer led to the evaluation of the stream and its potential for being added to the regional list of stocked trout streams. Bivens and Williams (1991) conducted two samples on this stream in order to assess the fish and benthic community and determine the suitability of the stream as a put and take trout fishery. We returned to the stream in 2002 and repeated a sample at the upstream locality sampled by TWRA in 1990 and at an additional location near Stell Branch.

Study Area and Methods

Our surveys of Stinking Creek (Figure 48) were conducted at the wooden bridge crossing at New Liberty Church (Site 1) and near the mouth of Stell Branch (Site 2).

Figure 48. Sample site locations for the surveys conducted in Stinking Creek during 2002.



Our evaluation of the fish community at Site 1 was accomplished through an Index of Biotic Integrity (IBI) survey. Benthic organisms were collected with kick nets during a timed survey. Analysis of the fish and benthic samples followed procedures developed by Karr et al. (1986) and Lenat (1993). We used a timed run at Site 2 to evaluate the fish community and derive catch rate values for the species collected. At both of our sample locations boulder and cobble were the dominant substrate components although bedrock was prevalent at Site 1. Pools dominated the habitat features at Site 1 contributing about 70% of the available habitat. At Site 2 where the stream gradient had increased, riffles became the prominent habitat feature (60%). Both sites had well-established riparian zones although some disturbance had occurred on the right descending bank at Site 1. This was the result of a new campground development and some disturbance had taken place along the stream margin presumably to create a stream viewing area. Water quality measurements at Site 1 revealed the following information, temperature 11 C, conductivity 60 µs/cm, and a pH of 6.0. At our upstream site temperature was 21 C, conductivity was 138 µs/cm, and pH was 6.5. The obvious temperature difference between the two sites can be explained by the time span between the two samples (spring vs. summer) and the likelihood that substantial groundwater flow is entering the stream between the two sites. The temperature at our Site 1 in August of 1990 was 19.7 C, which lends some support to the hypothesis of groundwater having a cooling effect on this reach of Stinking Creek.


Stinking Creek at Site 1


Stinking Creek at Site 2

Results

We collected a total of 317 fish comprising 15 species at Site 1 and 200 fish representing 14 species at Site 2 (Table 24). There were four game species present at Site 1 and five at Site 2. The two most dominant species collected in our sample at Site 1 were the central stoneroller and whitetail shiner. Together, these two species comprised 46% of the total number of fish in our sample. At Site 2, the central stoneroller and creek chub dominated the fish assemblage collectively contributing 60.5% to the overall sample. Two darter species were collected at Site 1 and one species at Site 2. Both sites had the stripetail darter present. The state listed arrow darter only occurred at Site 1.

Both the northern hog sucker and white sucker were collected at both sites. Black bass, rock bass, bluegill, and redbreast sunfish were present at both sites. The densities of black bass at both sites were such that angling in these areas would probably not be very productive. The species that were at numbers that would offer worthwhile angling were the redbreast sunfish and rock bass. No trout were collected at Site 1 where historical stockings had occurred. It is presumed that none of the stocked rainbow trout naturalized and established a viable population. The last stocking of rainbow trout in this stream was in 1998.

Table 24. Species occurrence and associated catch rates (#/hour) for Stinking Creek 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420025801	Arrow Darter	433	4	.
420025801	Bluegill	351	1	.
420025801	Bluntnose Minnow	176	25	.
420025801	Creek Chub	188	4	.
420025801	Hybrid Sunfish	345	1	.
420025801	Northern Hogsucker	207	4	.
420025801	Redbreast Sunfish	346	32	.
420025801	Rock Bass	342	22	.
420025801	Rosefin Shiner	93	15	.
420025801	Rosyface Shiner	131	43	.
420025801	Smallmouth Bass	362	1	.
420025801	Spotted Bass	363	1	.
420025801	Central Stoneroller	45	53	.
420025801	Stripetail Darter	418	17	.
420025801	White Sucker	195	1	.
420025801	Whitetail Shiner	54	93	.
		Total	**317**	
420025802	Bluegill	351	15	30.3
420025802	Bluntnose Minnow	176	1	2.0
420025802	Creek Chub	188	57	115.2
420025802	Greenside Darter	398	1	2.0
420025802	Largemouth Bass	364	1	2.0
420025802	Northern Hogsucker	207	4	8.1
420025802	Redbreast Sunfish	346	18	36.4
420025802	Rock Bass	342	21	42.4
420025802	Rosefin Shiner	93	1	2.0
420025802	Rosyface Shiner	131	3	6.1
420025802	Smallmouth Bass	362	3	6.1
420025802	Central Stoneroller	45	64	129.4
420025802	Stripetail Darter	418	8	16.2
420025802	White Sucker	195	3	6.1
		Total	**200**	

Overall, the IBI analysis indicated Stinking Creek was in fair condition (IBI score = 42). The most influential metrics on our 2002 score were the low number of sucker, sunfish, and darter species, low percentage of specialists, and the high percentage of anomalies on the fish (Table 25).

Table 25. Stinking Creek Index of Biotic Integrity analysis.

Metric Description	**Scoring Criteria** **1 3 5**	**Observed**	**Score**
Number of Native Species	<10 10-20 >20	14	3
Number of Darter Species	<2 2-4 >4	2	3
Number of Sunfish Species less *Micropterus*	<2 2-3 >3	2	3
Number of Sucker Species	<2 2 >2	2	3
Number of Intolerant Species	<2 2 >2	3	5
Percent of Individuals as Tolerant	>20 20-10 <10	1.7	5
Percent of Individuals as Omnivores	>45 45-22 <22	9.1	5
Percent of Individuals as Specialists	<25 25-50 >50	27.8	3
Percent of Individuals as Piscivores	<1 1-5 >5	8.4	5
Catch Rate	<16 16-32 >32	24.7	3
Percent of Individuals as Hybrids	>1 1-TR 0	0.3	3
Percent of Individuals with Anomalies	>5 5-2 <2	5.3	1
		Total	**42 (Fair)**

Benthic macroinvertebrates collected in our sample comprised 31 families representing 37 identified genera (Table 26). The most abundant group in our collection was the mayflies comprising 42.6% of the total sample. Overall, a total of 48 taxa were identified from the sample of which 26 were EPT. Based on the EPT taxa richness and overall biotic index of all species collected, the relative health of the benthic community was classified as “good” (4.5). At this same site in 1990, a total of 48 taxa were also collected. Mayflies were also the dominant group collected during this sample comprising 24% of the total sample (Bivens and Williams 1991). One species of mussel, the spike (*Elliptio dilatata)*, was collected from Site 1 in 1990. None were observed during the 2002 survey.

Table 26. Taxa list and associated biotic statistics for benthic macroinvertebrates collected from Stinking Creek.

ORDER	FAMILY	SPECIES	NUMBER	PERCENT
ANNELIDA				1.9
	Oligochaeta		8	
COLEOPTERA				1.6
	Dryopidae	*Helichus adult*	1	
	Elmidae	*Optioservus larva*	1	
		Optioservus trivittatus adult	1	
	Hydrophilidae	Unidentified larvae	1	
	Psephenidae	*Psephenus herricki*	3	
DIPTERA				6.8
	Chironomidae		19	
	Dixidae	*Dixella*	1	
	Simuliidae		5	
	Tipulidae	*Antocha*	1	
		Tipula	3	
EPHEMEROPTERA				42.6
	Baetidae	*Baetis*	22	
	Baetidae	Unidentified species	1	
	Ephemeridae	*Ephemera*	1	
	Heptageniidae	*Epeorus rubidus/subpallidus*	15	
		Heptagenia	3	
		Stenacron pallidum	7	
		Stenonema early instars	21	
		S. femoratum	2	
		S. ithaca	9	
		S. vicarium	16	
	Isonychiidae	*Isonychia*	85	
GASTROPODA				2.8
	Pleuroceridae	*Pleurocera* yellow with creamy white aperture	12	
HETEROPTERA				0.2
	Gerridae	*Gerris conformis* ♀	1	
MEGALOPTERA				2.6
	Corydalidae	*Corydalus cornutus*	4	
		Nigronia serricornis	7	
ODONATA				3.7
	Aeshnidae	*Boyeria vinosa*	4	
	Calopterygidae	*Calopteryx*	2	
	Coenagrionidae	*Enallagma*	1	
	Cordulegastridae	*Cordulegaster early instar*	1	
	Corduliidae		2	
	Gomphidae	*Gomphus lividus*	5	
	Macromiidae		1	
PELECYPODA				0.2
	Corbiculidae	*Corbicula fluminea*	1	
PLECOPTERA				6.8
	Perlidae	*Acroneuria sp.*	19	
		Perlesta freckled form	5	
	Perlodidae	*Isoperla holochlora*	5	
TRICHOPTERA				30.7
	Glossosomatidae	*Glossosoma* larvae and pupae	31	
	Helicopsychidae	*Helicopsyche borealis* larvae and pupae	13	
		Ceratopsyche sparna	7	
		Cheumatopsyche	11	
		Diplectrona modesta	8	
		Hydropsyche betteni/depravata	12	
		H. dicantha	2	
	Limnephilidae	*Pycnopsyche lepida* group	1	
		P. luculenta group	3	
	Philopotamidae	*Chimarra*	13	
		Dolophilodes distinctus	19	
	Polycentropodidae	*Nyctiophylax*	1	
	Uenoidae	*Neophylax concinnus*	10	
		TOTAL	**427**	

TAXA RICHNESS = 48
EPT TAXA RICHNESS = 26
BIOCLASSIFICATION = 4.5 (GOOD)

Discussion

The upper reach of Stinking Creek remains relatively unpolluted and as such contains a fairly diverse assemblage of fish and benthic macroinvertebrates. Intolerant forms of both fish and insects were collected at our IBI site, which attest to the relative quality of this portion of the stream. Trout were stocked into Stinking Creek after the 1990 sample, which continued up until 1998. A total of 9,600 catchable rainbow trout were stocked during this time period. Stocking of trout was discontinued in this stream due to landowners restricting access to the stream within the stocking zone. A good portion of Stinking Creek is now under the administration of TWRA, which ensures that best management practices will be followed when activities are conducted within this portion of the watershed.

Management Recommendations

1. Consider resuming the trout stocking program if and when it is determined that public access is adequate to support use.

2. Periodically monitor this stream to determine relative health and sport fish abundance.

Gaylor Hollow Tributary

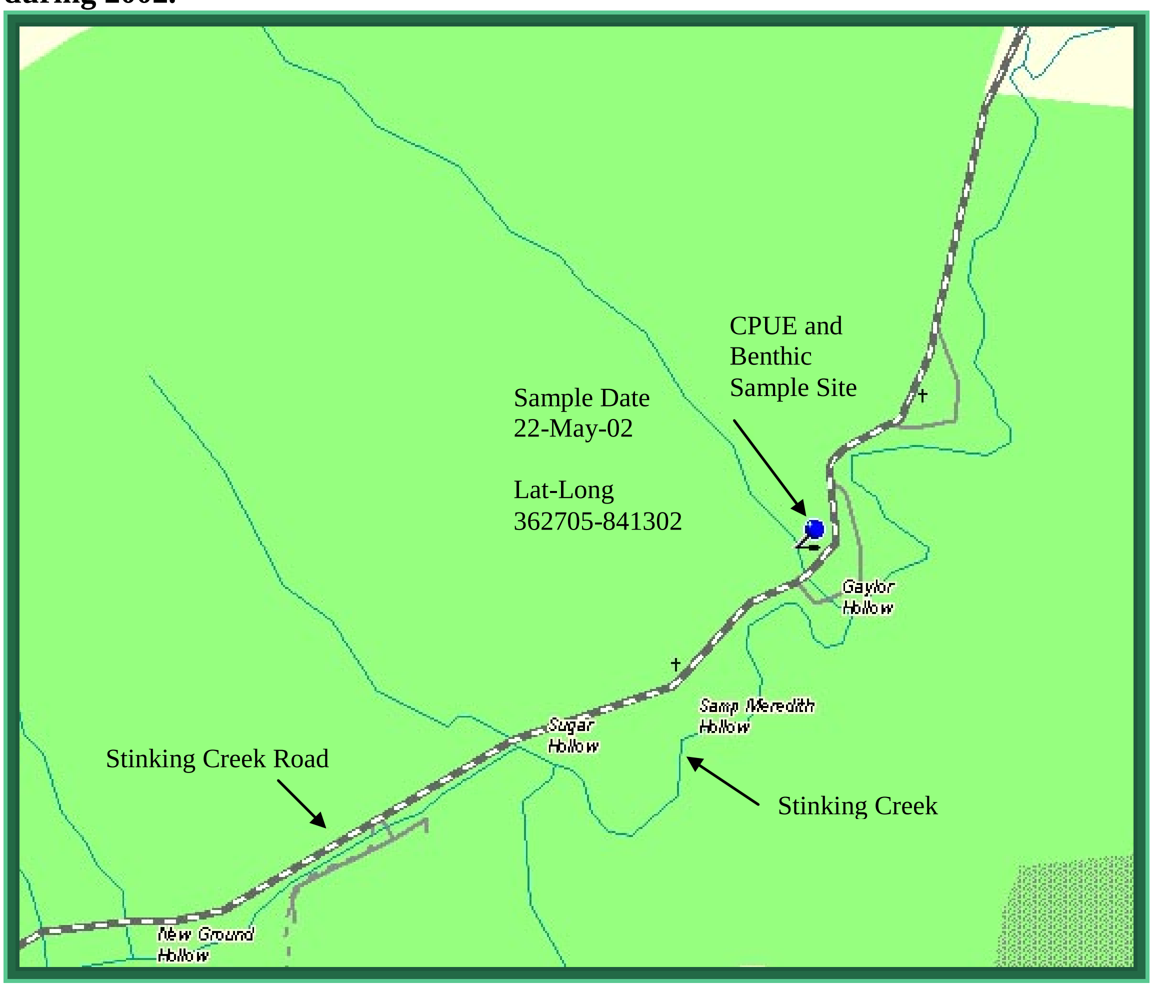
Introduction

This stream was sampled to develop a fish and benthic species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 49) began just upstream of the Stinking Creek Road crossing. The stream at this location was moderately graded and had channel substrate composed primarily of cobble and boulder with formation of small gravel bars.

Figure 49. Site location for the sample conducted in Gaylor Hollow tributary during 2002.



Most of the pools were relatively silt free. The instream habitat was composed of about 50% pools and 50% riffles. Woody cover was quite abundant in our survey reach and contributed significantly to the overall stream cover. The riparian zone on both stream banks was intact and composed primarily of rhododendron. We surveyed about 120 m of stream length with one backpack shocker and a dipnet during a 1200 second effort. Basic water quality measurements for this stream revealed a temperature of 8.5 C, a conductivity of 29 μs/cm, and a pH of 5.8.

Results

We collected a total of 162 fish representing one species (Table 27). The only species collected was the creek chub. Because of its size, no other species were realistically expected other than the blacknose dace. We have found blackside dace in streams of this size. However, their canopy and physical habitat characteristics were quite different than those observed in this tributary.

Table 27. Species occurrence and associated catch rates (#/hour) for tributary from Gaylor Hollow 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420020501	Creek Chub	188	162	486
		Total	**162**	

Benthic macroinvertebrates collected in our sample comprised 26 families representing 34 identified genera (Table 28). The most abundant group in our collection was the mayflies comprising 38.7% of the total sample followed closely by the caddisflies at 38.2%. Overall, a total of 39 taxa were identified from the sample of which 26 were EPT. Based on the EPT taxa richness and overall biotic index of all species collected, the relative health of the benthic community was classified as "good" (4.3). In streams of this size the benthic community evaluation is a more reliable indicator of overall stream quality. Habitat limitations related to stream size naturally restricts the diversity of fishes in these situations and cannot be used as a reliable indicator.

Table 28. Taxa list and associated biotic statistics for benthic macroinvertebrates collected from Gaylor Hollow tributary.

ORDER	FAMILY	SPECIES	NUMBER	PERCENT
COLEOPTERA				1.2
	Dryopidae	*Helichus* adult	2	
	Eubriidae	*Ectopria*	3	
DIPTERA				4.4
	Chironomidae		4	
	Tipulidae	*Dicranota*	5	
		Limnephila	4	
		Tipula	4	
		Unidentified Dipteran larva	1	
EPHEMEROPTERA				38.7
	Ameletidae	*Ameletus lineatus*	3	
	Baetidae	*Baetis*	17	
	Ephemerellidae	*Ephemerella*	62	
		Eurylophella	1	
	Heptageniidae	*Epeorus (probably E. pluralis)*	16	
		E. rubidus/subpallidus	4	
		Leucrocuta	11	
		Stenacron	4	
		Stenonema early instars	16	
		S. meririvulanum	14	
		S. pudicum	3	
	Leptophlebiidae	*Habrophlebia vibrans*	3	
		Habrophlebiodes	3	
HETEROPTERA				0.5
	Gerridae	*Gerris remigis* 1♂ and 1♀	2	
ISOPODA				2
	Asellidae	*Lirceus*	8	
				0.2
MEGALOPTERA	Corydalidae	*Nigronia fasciatus*	1	
ODONATA				1.7
	Cordulegastridae	*Cordulegaster maculata*	2	
	Gomphidae	*Lanthus vernalis*	4	
		Stylogomphus albistylus	1	
PLECOPTERA				13.1
	Leuctridae	*Leuctra*	3	
	Nemouridae	*Amphinemura*	1	
	Peltoperlidae	*Peltoperla*	32	
	Perlidae	*Aconeuria carolinensis*	10	
	Perlodidae	*Isoperla holochlora*	5	
		Remenus bilobatus	2	
TRICHOPTERA				38.2
	Hydropsychidae	*Diplectrona modesta*	99	
	Lepidostomidae	*Lepidostoma*	5	
	Limnephilidae	*Pycnopsyche guttifer/scabripennis* group	3	
		P. luculenta group	7	
	Philopotamidae	*Dolophilodes distinctus*	24	
	Polycentropodidae	*Polycentropus* 9 larvae and 1 pupa	10	
	Psychomiidae	*Lype diversa*	1	
	Rhyacophilidae	*Rhyacophila carolina* larvae and pupa	6	
		TOTAL	**406**	

TAXA RICHNESS = 39
EPT TAXA RICHNESS = 26
BIOCLASSIFICATION = 4.3 (GOOD)

Discussion

This small tributary to Stinking Creek does not afford any opportunity for recreational angling. The pH of this stream was slightly depressed when compared to other streams in the watershed and may be suffering from some residual mine drainage within this watershed. Overall, the stream appeared to be in good condition based on the benthic community present. Several intolerant forms of mayflies, stoneflies and caddis flies were collected here.

Management Recommendations

1. This stream although small is of good quality and could serve as a benthic reference stream for other tributaries to Stinking Creek. Any action that would protect this stream would be of benefit in retaining the quality of the water and habitat.

Pryor Meredith Branch

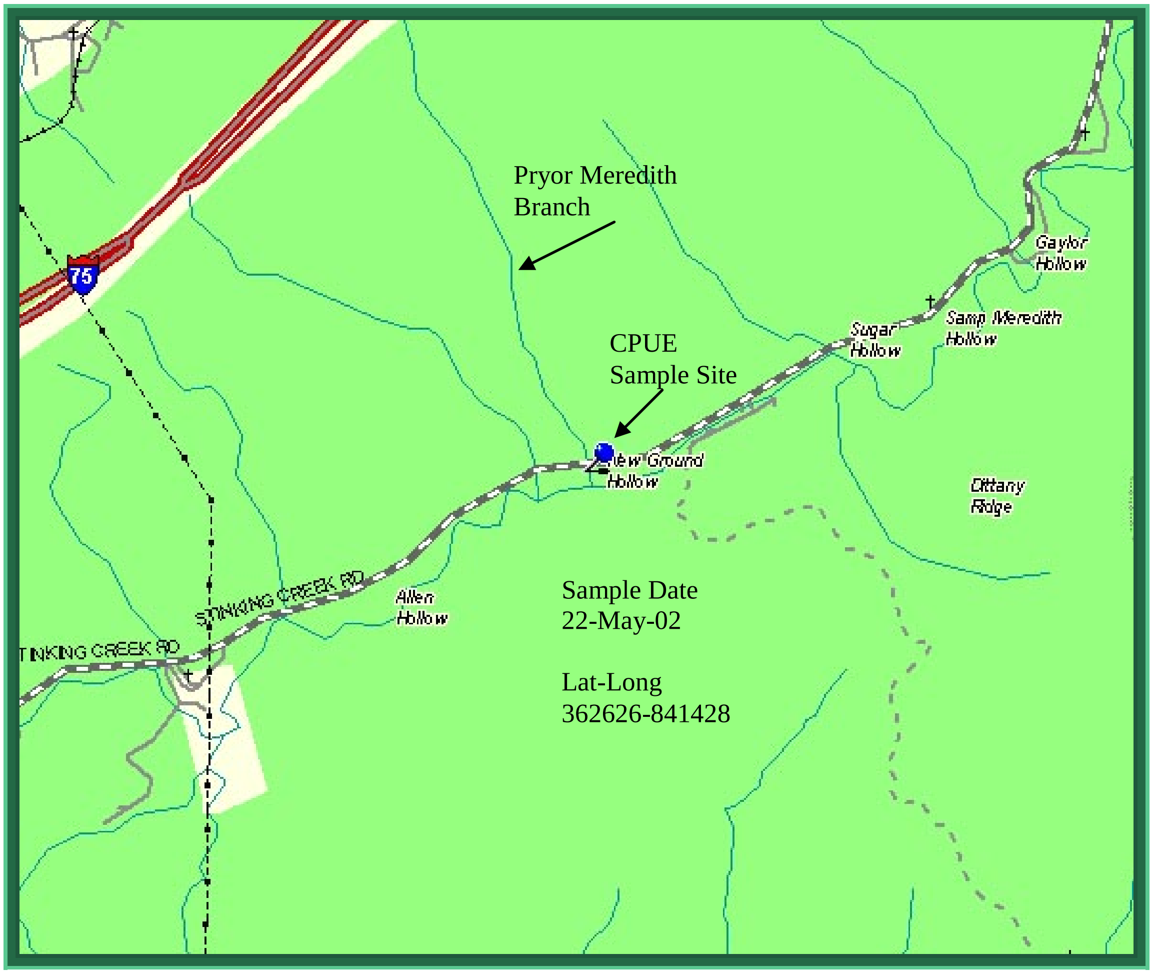
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 50) began at the Stinking Creek Road crossing. The stream at this location was moderately graded and had channel substrate composed primarily of cobble and boulder with some gravel. The substrate was relatively clean

Figure 50. Site location for the sample conducted in Pryor Meredith Branch during 2002.



A view of Pryor Meredith Branch within our survey area

Carl Williams and Rick Bivens electrofish a large pool below Stinking Creek Rd.

and most of the pools had only a slight deposition of silt. There was cattle acces to the stream at the upstream end of our survey area. The instream habitat was composed of about 30% pools and 70% riffles. Woody cover was scarce in our survey reach and did not contributed significantly to the overall stream cover. The riparian zone on both stream banks was intact and composed primarily of shrubs and grasses. We surveyed about 100 m of stream length with one backpack shocker during a 1080 second effort. We surveyed both below and above the bridge on Stinking Creek road. Basic water quality measurements for this stream revealed a temperature of 10 C, a conductivity of 60 µs/cm, and a pH of 5.8.

Results

We collected a total of 87 fish representing four species (Table 29). The most abundant species collected at our site was the creek chub comprising 68% of the total

Table 29. Species occurrence and associated catch rates (#/hour) for Pryor Meredith Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420020601	Arrow Darter	433	6	20
420020601	Creek Chub	188	59	196.6
420020601	Central Stoneroller	45	8	26.6
420020601	Stripetail Darter	418	14	46.6
		Total	**87**	

catch. Stripetail darters were second in abundance followed by central stonerollers and arrow darters. Because of its size, the collection of these four species was all that was expected. We were not expecting to see the arrow, although our close proximity to Stinking Creek was probably the reason they turned up in our sample.

Discussion

This small tributary to Stinking Creek does not afford any opportunity for recreational angling. The occurrence of the arrow darter in this stream is of interest and warrants any protection that may be afforded to this stream. The pH of this stream was slightly depressed but was similar to other streams draining Pine Mountain.

Management Recommendations

1. This stream, although small is of fair quality. Any action that would protect this stream would be of benefit in retaining the quality of the water and habitat and the influence this stream has on Stinking Creek.

Unnamed Tributary

(1st Trib. Upstream of Pryor Meredith Branch)

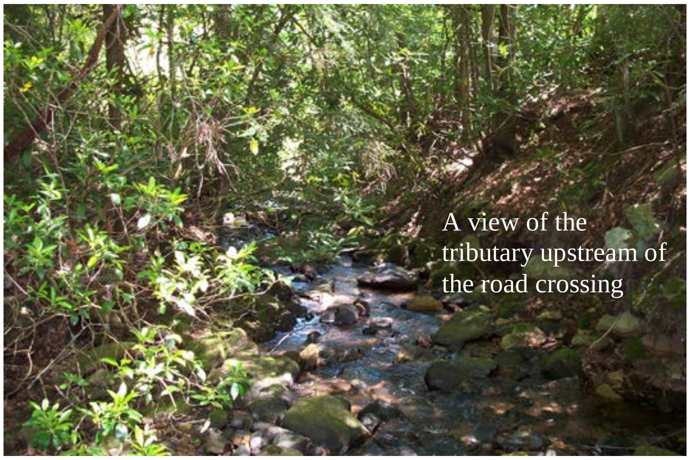
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

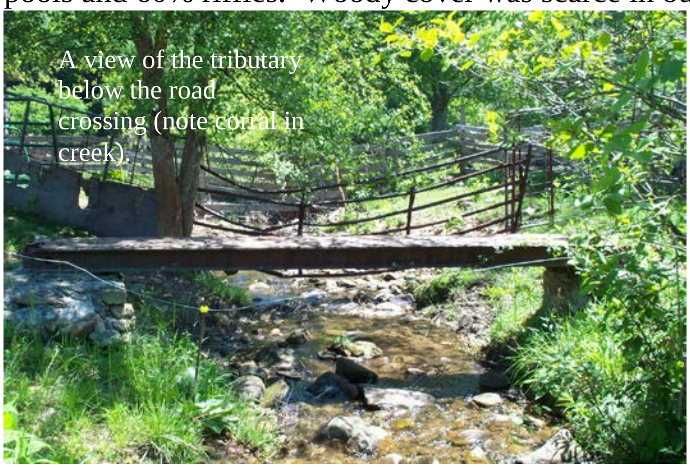
Our survey site (Figure 51) began at the Stinking Creek Road crossing. The stream at this location was moderately graded and had channel substrate composed primarily of cobble and boulder with some gravel. The substrate was relatively clean

Figure 51. Site location for the sample conducted in the unnamed tributary during 2002.



A view of the tributary upstream of the road crossing

and most of the pools had only a slight deposition of silt. There was cattle access to the stream below the road crossing. A corral had been built directly into the stream so that cattle could access the water. Just below this corral the stream canopy opened up and the effects of the increased sunlight and the input of nutrients from the corral were obvious. Large mats of algae were growing below this point and in many areas completely covered the substrate. The instream habitat was composed of about 40% pools and 60% riffles. Woody cover was scarce in our survey reach and did not contributed significantly to the overall stream cover. The riparian zone on both stream banks was intact upstream of the road and was composed primarily of rhododendron. Below the road much of the woody riparian zone had been removed although grasses were well established along most of this reach. We surveyed about 200 m of stream length with one backpack shocker during a 600 second effort. We surveyed both below and above the bridge on Stinking Creek road. Basic water quality measurements for this stream revealed a temperature of 11 C, a conductivity of 60 µs/cm, and a pH of 5.8.



A view of the tributary below the road crossing (note corral in creek).

Results

We collected a total of 45 fish representing three species (Table 30). The most abundant species collected at our site was the creek chub comprising 80% of the total

Table 30. Species occurrence and associated catch rates (#/hour) for unnamed tributary 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420020701	Arrow Darter	433	1	6
420020701	Creek Chub	188	36	216
420020701	Stripetail Darter	418	8	48
		Total	**45**	

catch. Stripetail darters were second in abundance followed by the arrow darter. Because of its size, the collection of these three species was all that was expected. We were not expecting to see the arrow in a stream this small, although our close proximity to Stinking Creek would explain their occurrence here. Most of the fish we collected were captured downstream of the road culvert.

Discussion

This small tributary to Stinking Creek does not afford any opportunity for recreational angling. The occurrence of the arrow darter in this stream is of interest and warrants any protection that may be afforded to this stream. The pH of this stream was slightly depressed but was similar to other streams we sampled draining Pine Mountain.

Management Recommendations

1. This stream, although small is of fair quality. Any action that would protect this stream would be of benefit in retaining the quality of the water and habitat and the influence this stream has on Stinking Creek.

Big Branch

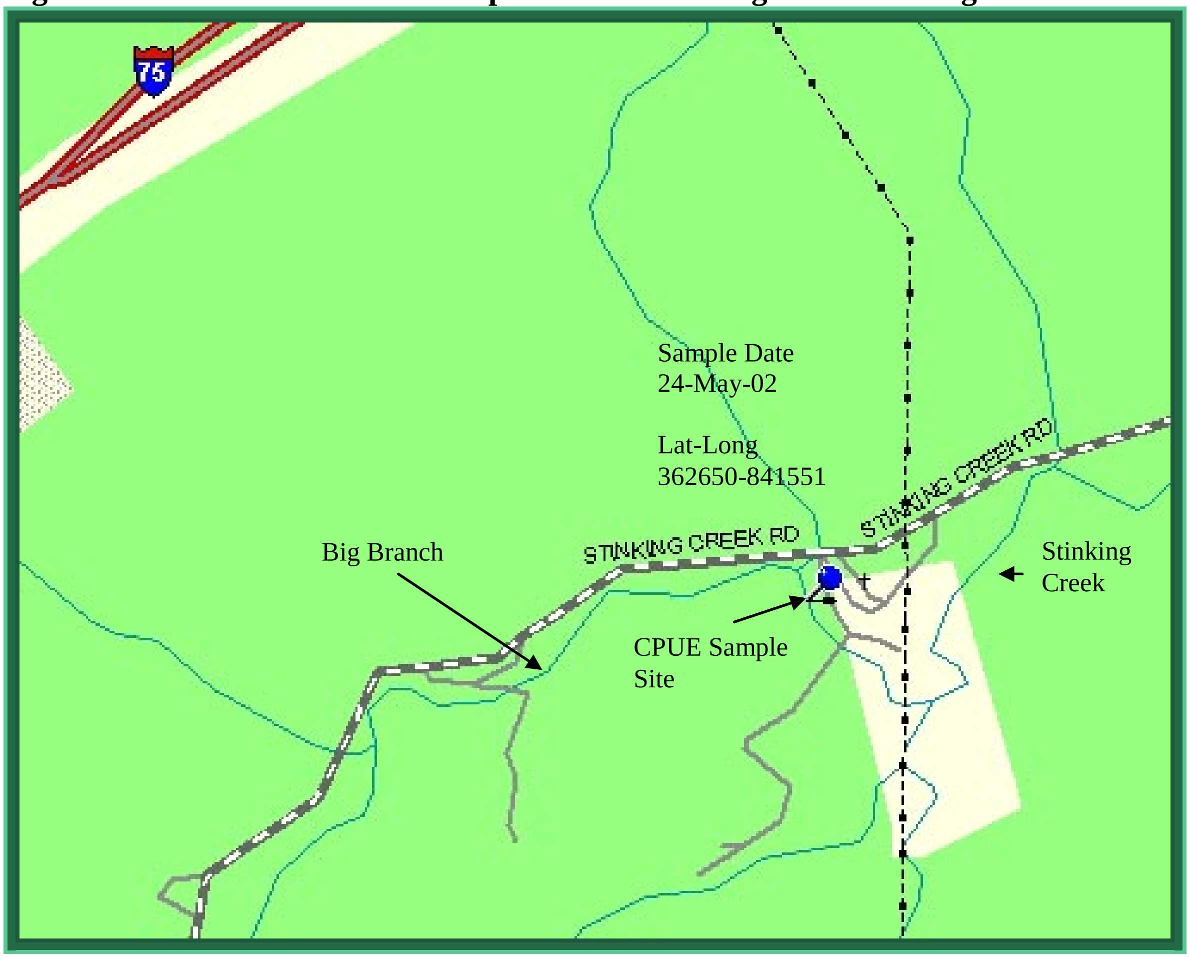
Introduction

This stream was sampled to develop a fish and benthic species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 52) began just upstream of the N. Meredith Lane crossing. The stream at this location was moderately graded and had channel substrate composed primarily of cobble and boulder. There were some gravel bars present in our

Figure 52. Site location for the sample conducted in Big Branch during 2002.



survey reach. Most of the pools were relatively silt free. The instream habitat was composed of about 40% pools and 60% riffles. Woody cover was scarce and did not contribute substantially to the overall stream cover. The riparian zones on both stream banks were intact and composed primarily of trees and shrubs. Much of the riparian zone in the downstream portion of our survey reach had been cleared during residential development. Here most of the canopy was removed leaving the stream exposed to direct sunlight. Algae was quite common in this portion of the stream and covered much of the substrate. We surveyed about 300 m of stream length with one backpack shocker and a dipnet during a 1210 second effort. Basic water quality measurements for this stream revealed a temperature of 13 C, a conductivity of 110 µs/cm, and a pH of 5.8.

Results

We collected a total of 321 fish representing eight species (Table 31). The two

Table 31. Species occurrence and associated catch rates (#/hour) for Big Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420020901	Blacknose Dace	184	50	148.7
420020901	Creek Chub	188	97	288.6
420020901	Lamprey sp.	0	2	5.9
420020901	Redbreast Sunfish	346	14	41.6
420020901	Rock Bass	342	2	5.9
420020901	Central Stoneroller	45	135	401.6
420020901	Stripetail Darter	433	20	59.5
420020901	White Sucker	195	1	2.9
		Total	**321**	

most abundant species collected were central stoneroller and creek chub. Both of the species combined accounted for 72% of the total number of fish collected. Only one darter species, stripetail darter, was collected during our sample. We collected two game species of which the redbreast sunfish was the most abundant. Only two rock bass were collected, ranging in length from 130 to 147 mm. The abundance of central stonerollers present in the sample attests to the openness of the canopy in the lower reach of our survey area and the consequential increase in habitat suitability for this species.

Benthic macroinvertebrates collected in our sample comprised 30 families representing 33 identified genera (Table 32). The most abundant group in our collection was the caddisflies comprising 47.5% of the total sample followed by the mayflies at 26.1%. Overall, a total of 37 taxa were identified from the sample of which 23 were EPT. Based on the EPT taxa richness and overall biotic index of all species collected, the relative health of the benthic community was classified as "good" (4.2).

Table 32. Taxa list and associated biotic statistics for benthic macroinvertebrates collected from Big Branch.

ORDER	FAMILY	SPECIES	NUMBER	PERCENT
COLEOPTERA				1.5
	Dryopidae	*Helichus* adult	1	
	Elmidae	*Optioservus* larva	1	
	Psephenidae	*Psephenus herricki*	2	
DIPTERA				8.0
	Chironomidae		9	
	Dixidae	*Dixa*	1	
	Empididae		1	
	Simuliidae		4	
	Tabanidae	*Tabanus*	2	
	Tipulidae	*Limnephila/Pilaria*	3	
		Tipula	1	
EPHEMEROPTERA				26.1
	Baetidae	*Baetis*	35	
	Ephemerellidae	*Ephemerella*	10	
		Eurylophella	2	
	Ephemeridae	*Ephemera*	5	
	Heptageniidae	*Epeorus rubidus/subpallidus*	8	
		Stenonema	4	
	Isonychiidae	*Isonychia*	1	
	Leptophlebiidae	*Habrophlebiodes*	3	
MEGALOPTERA				0.4
	Corydalidae	*Nigronia fasciatus*	1	
ODONATA				3.4
	Aeshnidae	*Boyeria grafiana*	3	
	Calopterygidae	*Calopteryx*	3	
	Gomphidae	*Lanthus vernalis*	3	
PLECOPTERA				13.0
	Leuctridae	*Leuctra*	1	
	Peltoperlidae	*Peltoperla*	7	
	Perlidae	*Acroneuria abnormis*	6	
	Perlodidae	*Isoperla holochlora*	18	
		Remenus bilobatus	2	
TRICHOPTERA				47.5
	Hydropsychidae	*Ceratopsyche sparna*	3	
		Cheumatopsyche	6	
		Hydropsyche betteni/depravata	1	
	Lepidostomidae	*Lepidostoma*	7	
	Limnephilidae	*Pycnopsyche luculenta* group	3	
	Philopotamidae	*Dolophilodes distinctus* larvae & pupae	81	
	Polycentropodidae	*Polycentropus*	3	
	Rhyacophilidae	*Rhyacophila carolina*	11	
		R. fuscula	6	
	Uenoidae	*Neophylax*	3	
	TOTAL		**261**	

TAXA RICHNESS = 37
EPT TAXA RICHNESS = 23
BIOCLASSIFICATION = 4.2 (GOOD)

Discussion

This tributary to Stinking Creek does not afford much opportunity for recreational angling. The presence of rock bass is also an indicator of the relative quality of the habitat and water. Although low in number they were present and appear to be able to persist under the current conditions. Overall, the stream appeared to be in good condition based on the benthic community present.

Management Recommendations

1. This stream is one of the larger tributaries draining Pine Mountain and as such has a greater single influence on Stinking Creek. Any action that would protect this stream would be of benefit in retaining the quality of this stream and Stinking Creek.

Unnamed Tributary
(1st Trib. to Big Branch)

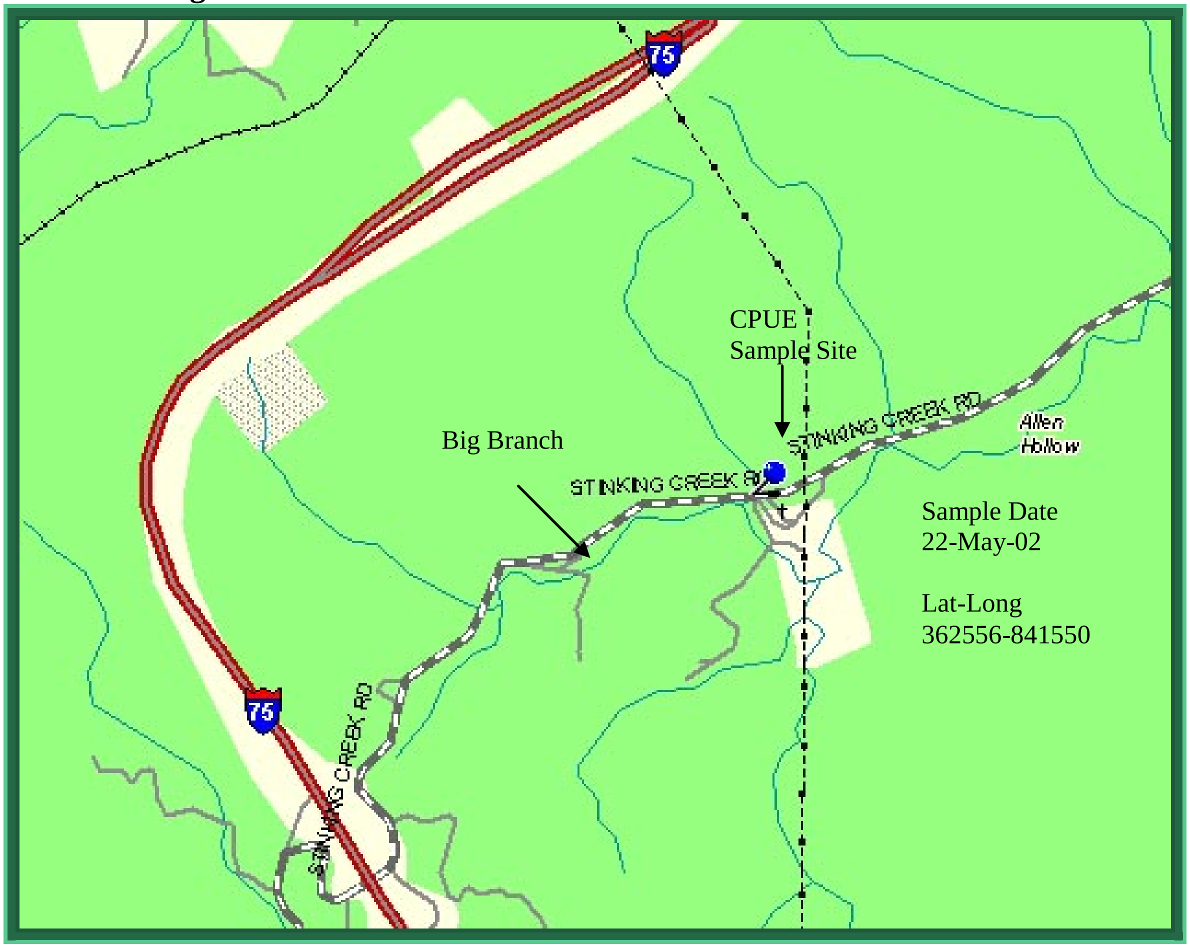
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 53) began at the Stinking Creek Road crossing. The stream at this location had a moderate grade and had channel substrate composed primarily of cobble and boulder with some gravel. The substrate was relatively clean

Figure 53. Site location for the sample conducted in the unnamed tributary to Big Branch during 2002.



with very little silt in the pools. The instream habitat was composed of about 30% pools and 70% riffles. Woody cover was scarce in our survey reach and did not contributed significantly to the overall stream cover. The riparian zone on both stream banks was composed primarily of rhododendron. We surveyed about 150 m of stream length with one backpack shocker during a 351 second effort. We surveyed both below and above the bridge on Stinking Creek road. Basic water quality measurements for this stream revealed a temperature of 10 C, a conductivity of 52 µs/cm, and a pH of 6.2.

Results

We collected a total of seven fish representing two species (Table 33). The most abundant species collected at our site was the creek chub comprising 86% of the total catch. Only one blacknose dace was collected. Given the size of the tributary no other species were realistically expected from this stream. All of the fish collected in the survey, were captured below the road culvert.

Table 33. Species occurrence and associated catch rates (#/hour) for unnamed tributary to Big Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420020801	Blacknose Dace	184	1	10.2
420020801	Creek Chub	188	6	61.5
		Total	**7**	

Discussion

This small tributary to Stinking Creek does not afford any opportunity for recreational angling. The low fish species diversity is typical of this size stream and does not indicate positively or negatively to the quality of the stream. Based on our visual observations and the water quality information it would appear that this stream in good condition. In future samples of this stream, a benthic survey would be more comprehensive in assessing this stream.

Management Recommendations

1. Watershed protection.

Unnamed Tributary

(3rd Trib. flowing west from Pine Mountain)

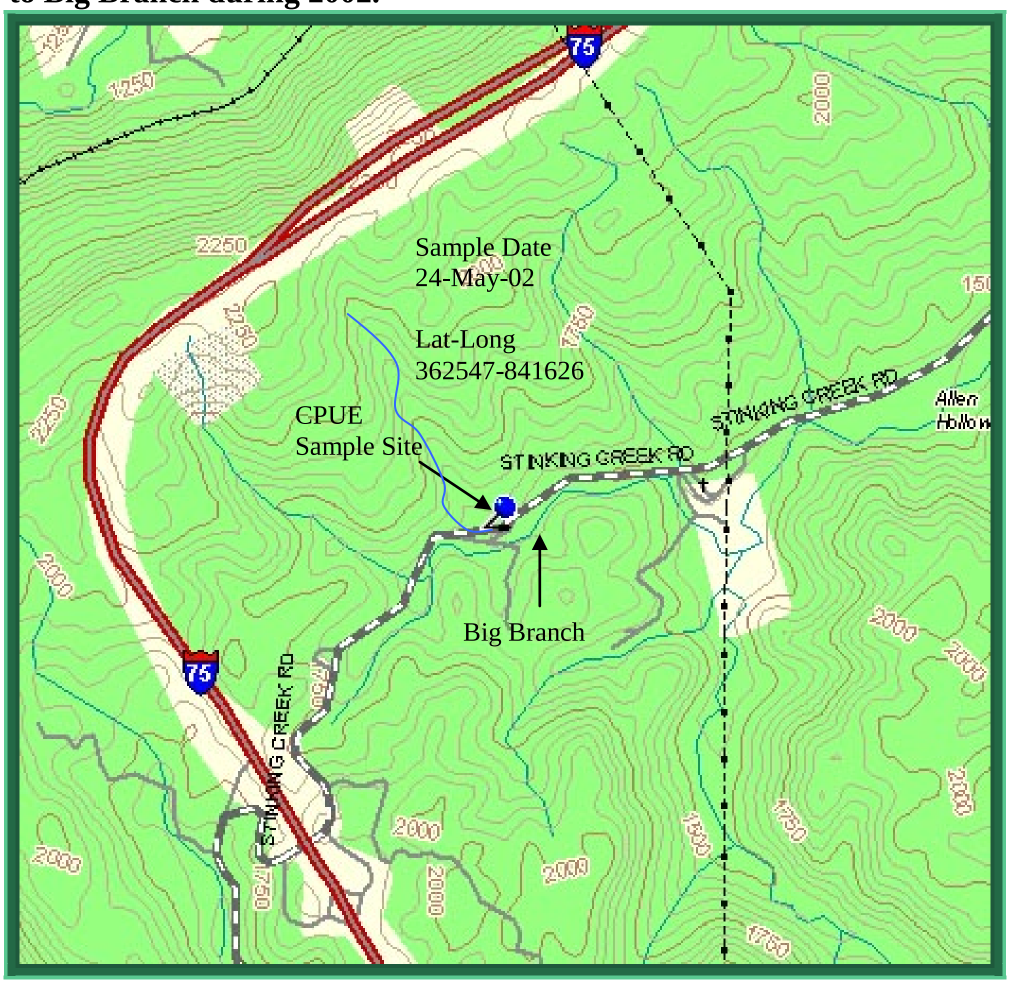
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 54) began at the Stinking Creek Road crossing. The stream at this location was moderately graded and had channel substrate composed primarily of cobble and boulder with some gravel. The substrate was relatively clean

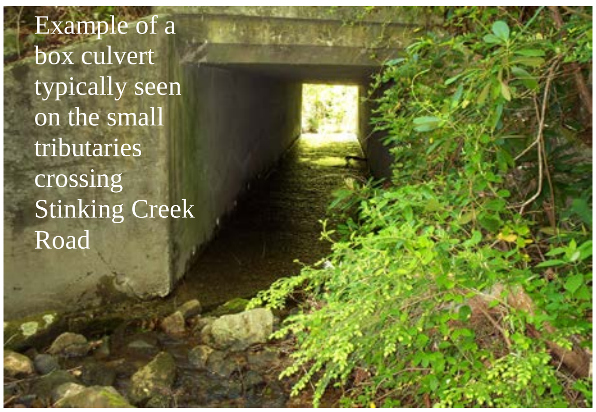
Figure 54. Site location for the sample conducted in the unnamed tributary to Big Branch during 2002.



with very little silt in the pools. The instream habitat was composed of about 30% pools and 70% riffles. Woody cover was scarce in our survey reach and did not contributed significantly to the overall stream cover. The riparian zone on both stream banks was composed primarily of rhododendron. We surveyed about 150 m of stream length with one backpack shocker during a 300 second effort. No water quality data was collected from this stream.

Results

No fish were collected from this stream. Many of the tributaries that cross Stinking Creek road have concrete box culverts that effectively act as fish passage barriers. Typically on the downstream side of these culverts, the stream channel is lowered from initial construction of the culvert and continual erosion. This usually leads to a “hanging culvert” which in most cases is a barrier to fish that typically inhabit these small streams. If an event occurs (i.e flood, pollutant) that eliminates the fish upstream of these culverts, re-colonization from downstream is unlikely without intervention. This may have occurred on this stream at some point in time, as the habitat upstream of the culvert appeared to be suitable for fish.


Example of a box culvert typically seen on the small tributaries crossing Stinking Creek Road

Discussion

It is unclear why this stream did not contain fish. Perhaps it has always been devoid of fish or suffered some past event that eliminated the fish from the stream. In future samples of this stream, a benthic survey would be more comprehensive in assessing the biological condition of this stream.

Management Recommendations

1. Watershed protection.

Johnson Branch

Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 55) began just upstream from the mouth. The stream at this location was low grade and had channel substrate composed primarily of cobble and gravel. Sand was quite prominent in this reach and depositional bars were

Figure 55. Site location for the sample conducted in the Johnson Branch during 2002.

frequent. The instream habitat was composed of about 30% pools and 70% riffles. Woody cover was scarce in our survey reach and did not contributed significantly to the overall stream cover. The riparian zone on both stream banks was composed primarily of woody shrubs and grasses. We surveyed about 100 m of stream length with one backpack shocker during a 163 second effort. Basic water quality measurements for this stream revealed a temperature of 18 C, a conductivity of 30 µs/cm, and a pH of 6.5.

Results

We collected a total of three fish representing one species (Table 34). The only species collected was the creek chub. Because of its size, no other species were realistically expected other than the blacknose dace.

Table 34. Species occurrence and associated catch rates (#/hour) for Johnson Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420023301	Creek Chub	188	3	66.2
		Total	**3**	

Discussion

This small tributary to Stinking Creek does not afford any opportunity for recreational angling. The low fish species diversity is typical of this size stream and does not indicate positively or negatively to the quality of the stream. Based on our visual observations and the water quality information it would appear that this stream was in fair condition given the present and historical activities within the watershed. In future samples of this stream, a benthic survey would be more comprehensive in assessing the condition of this stream.

Management Recommendations

1. Watershed protection.

Meadow Creek

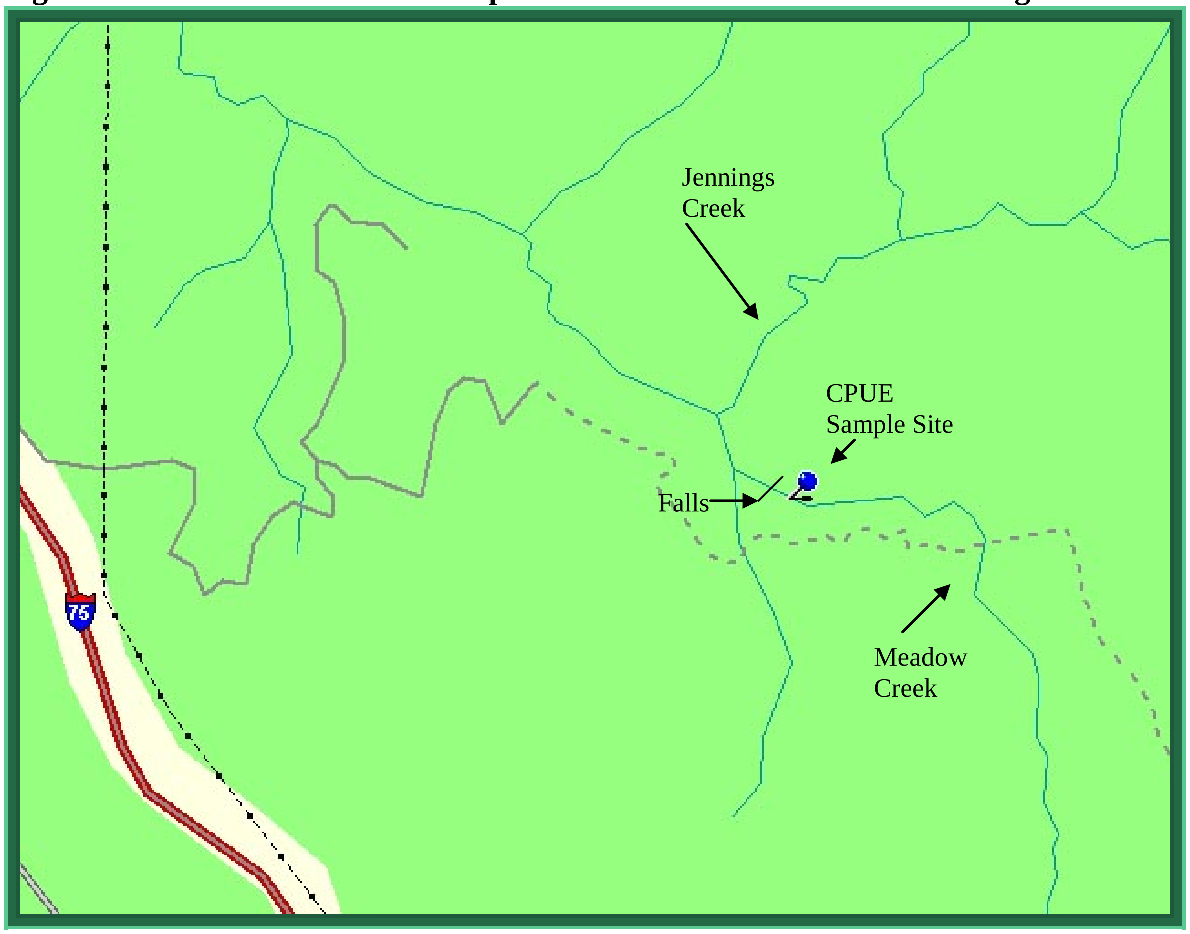
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 56) began at the trail crossing just upstream of Meadow Creek Falls and proceeded upstream. The stream at this location was moderately graded and had channel substrate composed primarily of bedrock and cobble. Silt was relatively

Figure 56. Site location for the sample conducted in Meadow Creek during 2002.



uncommon in the pools comprising no more than 10% of the substrate. The instream habitat was composed of about 30% pools and 70% riffles. Woody cover was scarce in our survey reach and did not contributed significantly to the overall stream cover. The riparian zone on both stream banks was well established and was composed primarily of rhododendron and various other woody shrubs. We surveyed about 200 m of stream length with one backpack shocker during a 304 second effort. Basic water quality measurements for this stream revealed a temperature of 15.5 C, a conductivity of 23 µs/cm, and a pH of 6.5.

Results

We collected a total of one fish representing one species (Table 35). The only species collected was the bluegill. After our survey upstream of the trail crossing we walked downstream to view the falls and observed two additional species (green sunfish and creek chub in a pool just above the falls. The stream flow was extremely low during our sample and many of the fish apparently were regulated to the larger pools, which were not present in our survey reach.

Table 35. Species occurrence and associated catch rates (#/hour) for Meadow Creek 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420023201	Bluegill	351	1	11.8
		Total	**1**	

Discussion

This small tributary to Stinking Creek does not afford much opportunity for recreational angling. The low fish species diversity is typical of this size stream and does not indicate positively or negatively to the quality of the stream. Based on our visual observations and the water quality information it would appear that this stream was in fair condition given the present and historical activities within the watershed. In future samples of this stream, a benthic survey would be more comprehensive in assessing the condition of this stream.

Management Recommendations

1. Watershed protection.

Jennings Creek

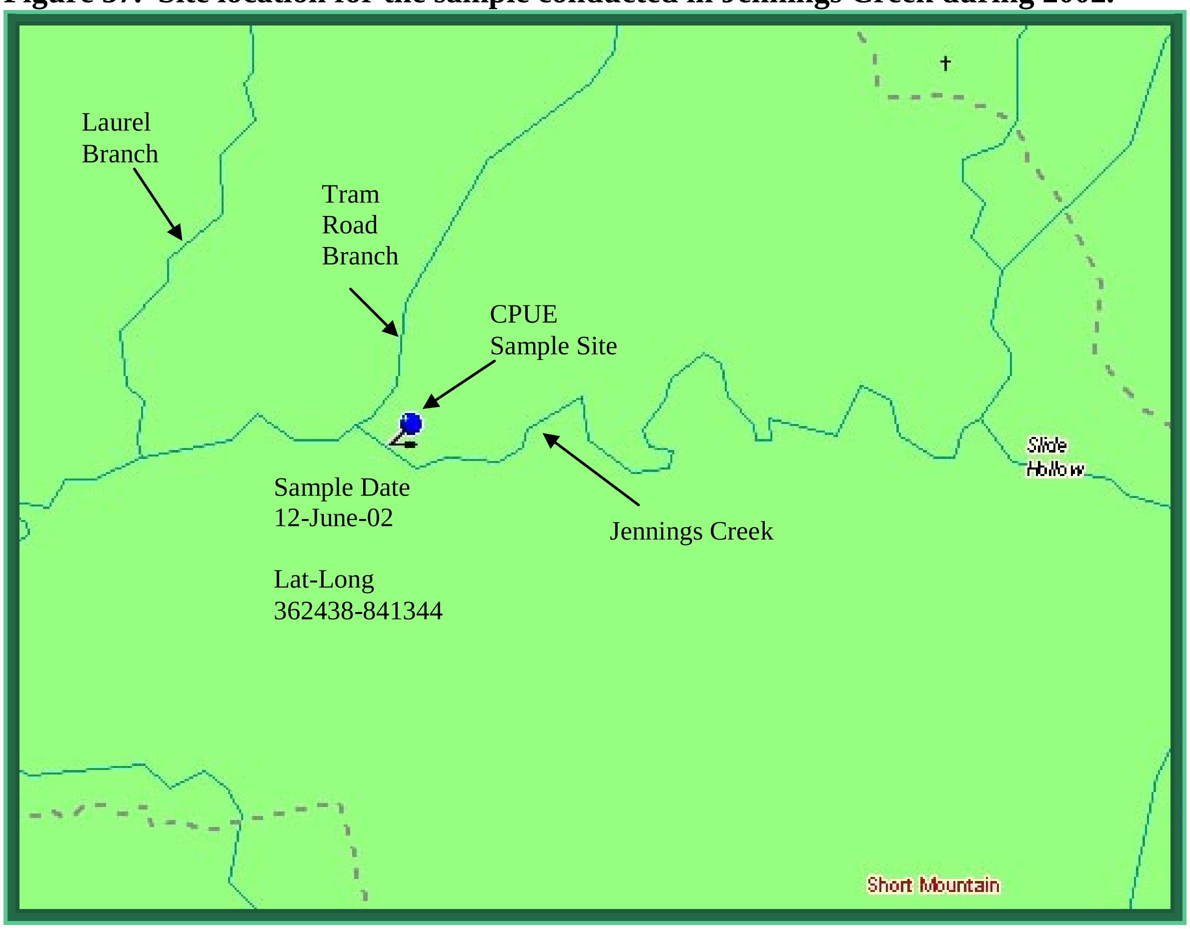
Introduction

This stream was sampled to develop a fish and benthic species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream. Etnier (1989, 1992[b]) made collections from this stream as part of consultation with Gatliff Coal Company.

Study Area and Methods

Our survey site (Figure 57) began just upstream of the confluence of Tram Road Branch and Jennings Creek at the trail crossing. The stream at this location was moderately graded and had channel substrate composed primarily of cobble and boulder. Sand was fairly prevalent in our survey area comprising about 30% of the substrate in the pools and about 10-20% in the riffles. Most of the pools had some silt present, which

Figure 57. Site location for the sample conducted in Jennings Creek during 2002.



was most likely related to the network of ATV trails that meander in and around the stream. The instream habitat was composed of about 40% pools and 60% riffles. Woody cover was scarce and did not contribute substantially to the overall stream cover. The riparian zone on both stream banks was intact and composed primarily of rhododendron and other woody shrubs. We surveyed about 300 m of stream length with one backpack shocker and a dipnet during a 1660 second effort. Basic water quality measurements for this stream revealed a temperature of 21 C, a conductivity of 258 µs/cm, and a pH of 6.5.

Results

We collected a total of 74 fish representing five species (Table 36). The two

Table 36. Species occurrence and associated catch rates (#/hour) for Jennings Creek 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420022801	Arrow Darter	433	4	8.7
420022801	Bluegill	351	1	2.1
420022801	Creek Chub	188	37	80.2
420022801	Rock Bass	342	15	32.5
420022801	Stripetail Darter	418	17	36.8
		Total	**74**	

most abundant species collected were creek chub and stripetail darter. Both of the species combined accounted for 73% of the total number of fish collected. One other darter species, the arrow darter, was also collected at this site. Two game species were collected here of which the rock bass was most abundant. Only one specimen of the bluegill turned up in our sample, which was not surprising given the available habitat. We were well pleased with the abundance of rock bass (20% of the sample), which was related to the quality of the habitat. The rock bass we collected ranged in length from 48 to 157 mm. The arrow darters we collected (4) were also good indicators of the water quality along with the stripetail darters. Etnier (1989, 1992[b]) encountered a maximum of three species during the surveys conducted in those years. These surveys were conducted further upstream, which may explain the absence of the rock bass and bluegill we observed in our survey.

Benthic macroinvertebrates collected in our sample comprised 32 families representing 38 identified genera (Table 37). The most abundant group in our collection was the caddisflies comprising 26.6% of the total sample followed by the mayflies at 26.1%. Overall, a total of 48 taxa were identified from the sample of which 25 were EPT. Based on the EPT taxa richness and overall biotic index of all species collected, the relative health of the benthic community was classified as "good" (4.3).

Table 37. Taxa list and associated biotic statistics for benthic macroinvertebrates collected from Jennings Creek.

ORDER	FAMILY	SPECIES	NUMBER	PERCENT
COLEOPTERA				4.7
	Dryopidae	*Helichus* adults	4	
	Dytiscidae	*Hydroporus* adults	2	
	Elmidae	*Dubiraphia* adults	4	
DIPTERA				6.6
	Ceratopogonidae	*Palpomyia* complex	1	
	Chironomidae		10	
	Simuliidae		1	
	Tabanidae		1	
	Tipulidae	*Hexatoma*	1	
EPHEMEROPTERA				26.1
	Baetidae	*Baetis*	4	
		Procloeon	4	
	Caenidae	*Caenis*	1	
	Ephemerellidae	*Eurylophella*	3	
	Ephemeridae	*Ephemera*	3	
	Heptageniidae	*Stenonema* early instars	16	
		S. femoratum	1	
		S. ithaca	18	
		S. vicarium	1	
	Isonychiidae	*Isonychia*	1	
	Leptophlebiidae	*Habrophlebiodes*	2	
		Paraleptophlebia	1	
HETEROPTERA				0.9
	Gerridae	*Gerris nymph*	1	
	Veliidae	*Rhagovelia obesa* nymph	1	
ISOPODA				3.3
	Asellidae	*Lirceus*	7	
MEGALOPTERA				6.6
	Corydalidae	*Nigronia serricornis*	14	
ODONATA				6.6
	Aeshnidae	*Basiaeshna janata*	1	
		Boyeria grafiana	3	
		B. vinosa	1	
	Calopterygidae	*Calopteryx*	1	
	Cordulegastridae	*Cordulegaster maculata*	1	
	Corduliidae		3	
	Gomphidae	*Gomphus* (Genus A) *rogersi*	1	
		G. lividus	1	
		Lanthus vernalis	1	
		Stylogomphus albistylus	1	
PELECYPODA				0.5
	Sphaeriidae	*Sphaerium*	1	
PLECOPTERA				18.0
	Perlidae	*Acroneuria abnormis*	15	
		A. carolinensis	7	
		A. evoluta	4	
		Eccoptura xanthanes	1	
		Perlesta freckled form	10	
	Perlodidae	*Isoperla holochlora*	1	
TRICHOPTERA				26.6
	Hydropsychidae	*Ceratopsyche ventura*	2	
		Cheumatopsyche	25	
		Hydropsyche betteni/depravata	2	
	Lepidostomatidae	*Lepidostoma*	1	
	Limnephilidae	*Pycnopsyche luculenta* group	9	
	Philopotamidae	*Chimara*	10	
	Polycentropodidae	*Nyctiophylax*	4	
		Polycentropus pupae	3	
	TOTAL		**211**	

TAXA RICHNESS = 48
EPT TAXA RICHNESS = 25
BIOCLASSIFICATION = 4.3 (GOOD)

Discussion

This tributary to Stinking Creek does afford limited recreational angling for rock bass within the area we surveyed. Downstream areas of the creek maybe more suited to angling and provide a higher abundance of fish. The presence of rock bass and the two darter species are also indicators of the relative quality of the habitat and water. Overall, the stream appeared to be in good condition at this location based on the benthic community present and was one of our most diverse collections on Royal Blue WMA.

Management Recommendations

1. This stream is one of the larger tributaries to upper Stinking Creek and as such has a greater single influence on Stinking Creek. Any action that would protect this stream would be of benefit in retaining the quality of this stream and Stinking Creek The occurrence of the arrow darter in this stream warrants continued monitoring.

Laurel Branch

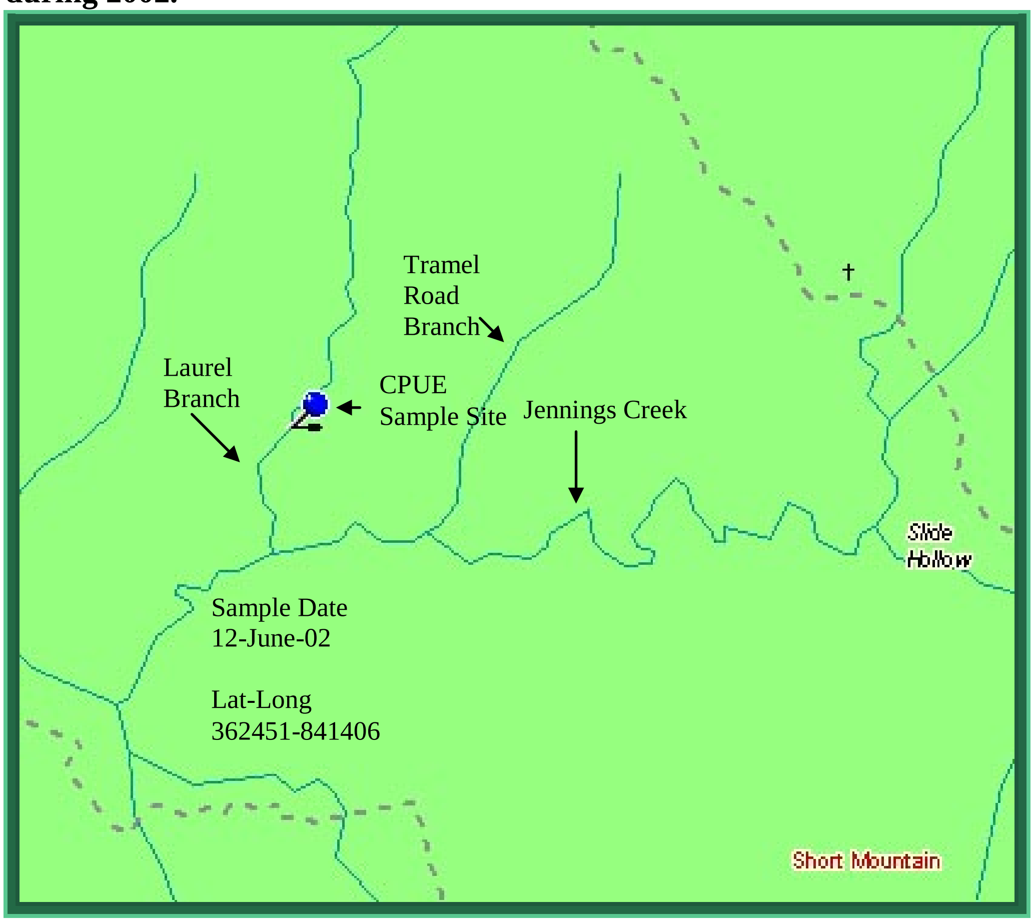
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 58) began at the road crossing and proceeded upstream. The stream at this location was low grade and had channel substrate composed primarily of sand and silt. Beaver ponds built within our sample area had altered almost all of the habitat. As a result of these ponds silt and sediment loads were not moving through

Figure 58. Site location for the sample conducted in Laurel Branch during 2002.




A view of Laurel Branch in our sample area (note water turbidity)

the system and had deposited over almost all of the rocky substrate. Sand comprised about 60% of the substrate while silt accounted for another 40%. Woody cover was scarce in our survey reach and did not contributed significantly to the overall stream cover. The riparian zone on both stream banks had been altered by beaver activity particularly in the upper reaches of our survey area. We surveyed about 100 m of stream length with one backpack shocker during a 212 second effort. Basic water quality measurements for this stream revealed a temperature of 23 C, a conductivity of 35 µs/cm, and a pH of 6.3.

Results

We collected a total of three fish representing two species (Table 38). The only species collected were bluegill and largemouth bass. Because of the beaver activity in this stream it is unlikely that many species other than the ones collected persist in this portion of the stream. With little available substrate and very little cover this reach of the stream more closely resembled a farm pond than a flowing stream. It is expected that conditions may improve upstream of the impoundment although we did not investigate.

Table 38. Species occurrence and associated catch rates (#/hour) for Laurel Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420022701	Bluegill	351	2	33.9
420022701	Largemouth Bass	364	1	16.9
		Total	**3**	

Discussion

This small tributary to Jennings Creek does not afford any opportunity for recreational angling within our survey reach. The low fish species diversity and composition can be attributed to the influence of the beaver ponds and the resultant lack of habitat. On a more positive note, these ponds are functioning as sediment traps and may be having a positive influence on the quality of Jennings Creek. Given the size of the stream and the inherent difficulty in removing beavers it is recommended that future management efforts focus on the quality of the stream above this activity.

Management Recommendations

1. Because this stream is under the influence of a naturally occurring event and there is no evidence of rare species inhabiting this portion of the stream, no management action other than protecting the upstream watershed is recommended.

Johnson Branch

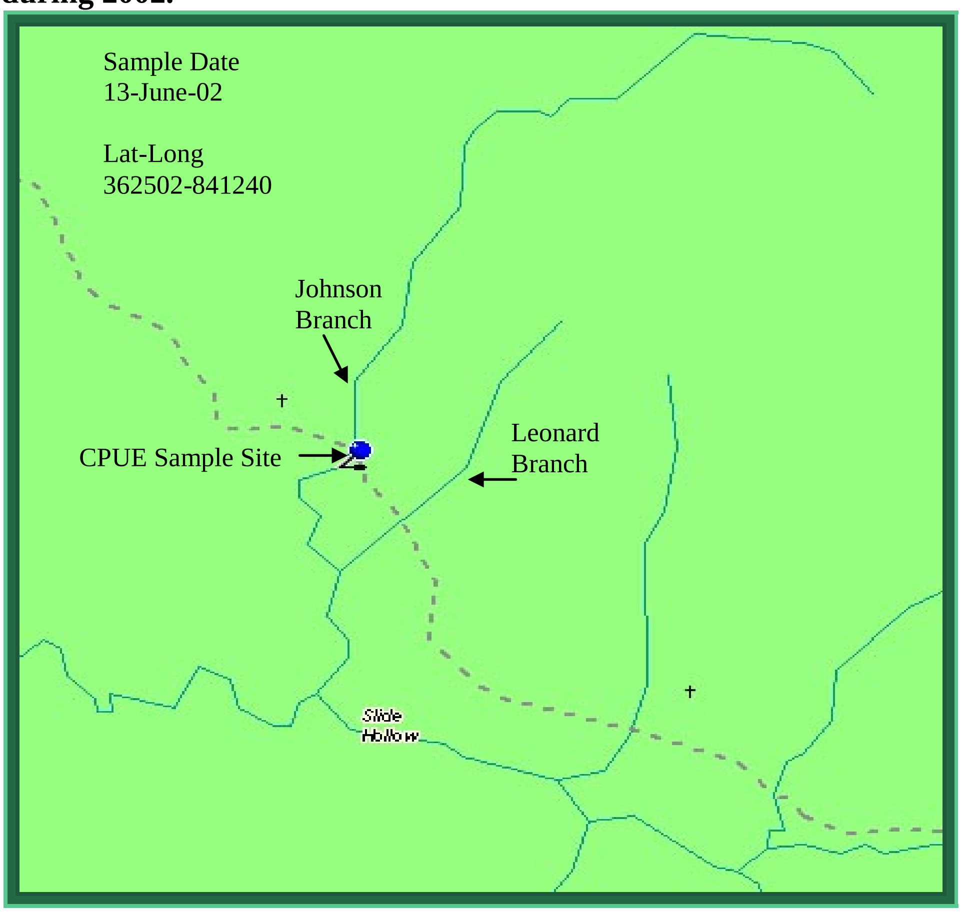
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 59) began at the road crossing and proceeded upstream. The stream at this location was low grade and had channel substrate composed primarily of bedrock and sand. Sand comprised about 70% of the substrate while bedrock

Figure 59. Site location for the sample conducted in Johnson Branch during 2002.



contributed about 30%. Habitat features of this stream included a mix of 60% pool habitat and about 40% riffle habitat. Woody cover was scarce in our survey reach and did not contributed significantly to the overall stream cover. The riparian zone on both stream banks was intact and vegetated primarily with mountain laurel and various other woody shrubs. Because of the low flow conditions most of the stream channel had been de-watered exposing a substantial portion of the stream substrate. We surveyed about 100 m of stream length with one backpack shocker during a 587 second effort. Basic water quality measurements for this stream revealed a temperature of 20 C, a conductivity of 52 µs/cm, and a pH of 6.7.

Results

We collected a total of 96 fish representing two species (Table 39). The only

Table 39. Species occurrence and associated catch rates (#/hour) for Johnson Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420023001	Arrow Darter	433	4	24.5
420023001	Creek Chub	188	92	564.2
		Total	**96**	

species collected were arrow darter and creek chub. Creek chub was the dominant species here accounting for 96% of the total catch. The state listed arrow darter was unexpected in this stream given its size and the lack of habitat. Unlike Laurel Branch, there appeared to be little if any beaver activity in this stream. The only prevalent disturbance we could see during our survey was the impact the road crossing was having on the stream. Because of the slope of the road and its composition a substantial amount of sediment (particularly sand) was being introduced into the stream. This was occurring on both sides of the road and apparently had not been addressed during road construction.

Discussion

This tributary to Jennings Creek is limited by the amount of available habitat upstream, and the influence of the road crossing downstream. The amount of bedrock present in the upstream portion of our survey area negated much diversity as indicated by our species list. The sand input from the road in the downstream reach had covered much of the existing substrate. The presence of the arrow darter indicated the apparent suitability of some of the habitat within our survey reach to more intolerant forms.

Management Recommendations

1. Any action that would address the input of road run off into this stream would be beneficial. The installment of water bars that direct any flow of water away from the stream would help reduce downstream degradation.

Broyles Branch

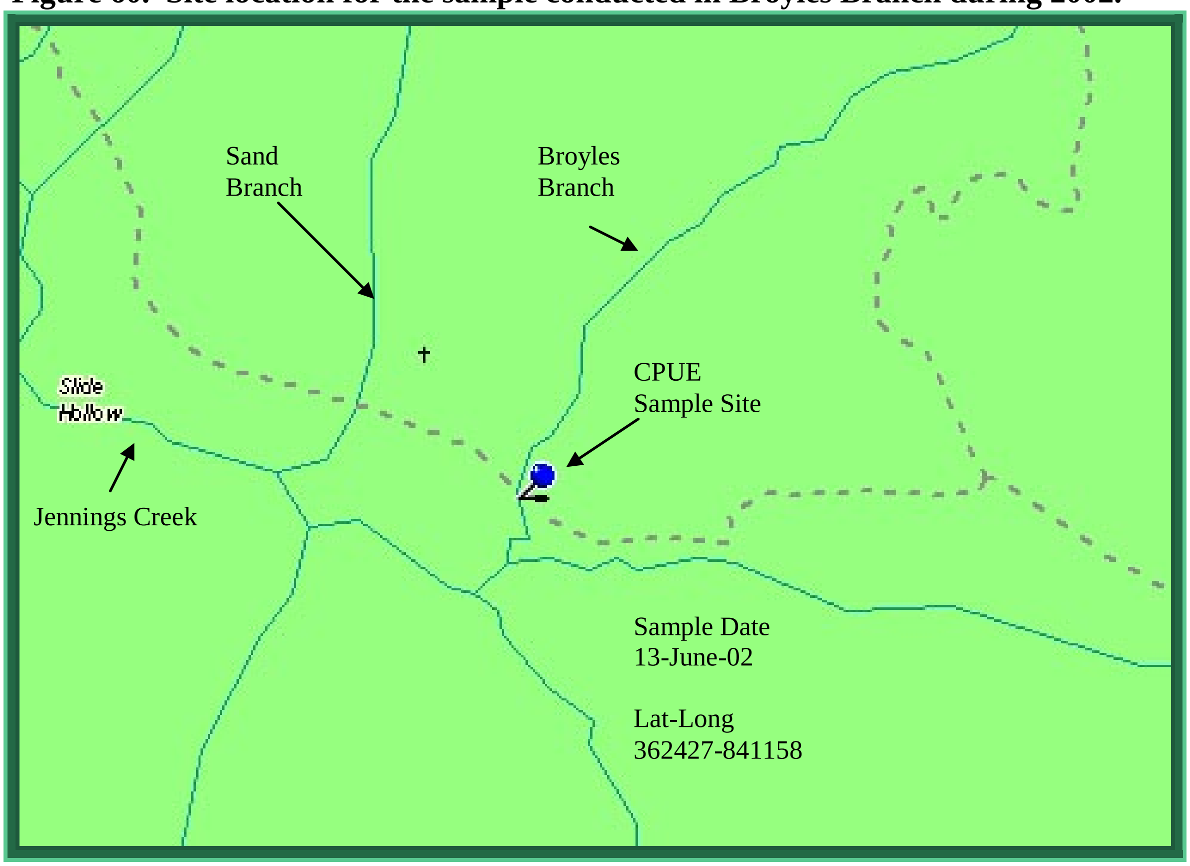
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream. Etnier (1992[b]) made a collection from the lower 200 m of this stream in 1992 as part of consultation with Gatliff Coal Company.

Study Area and Methods

Our survey site (Figure 60) began at the road crossing and proceeded downstream. The stream at this location was low grade and had channel substrate composed primarily of sand and silt. Sand comprised about 65% of the substrate while

Figure 60. Site location for the sample conducted in Broyles Branch during 2002.



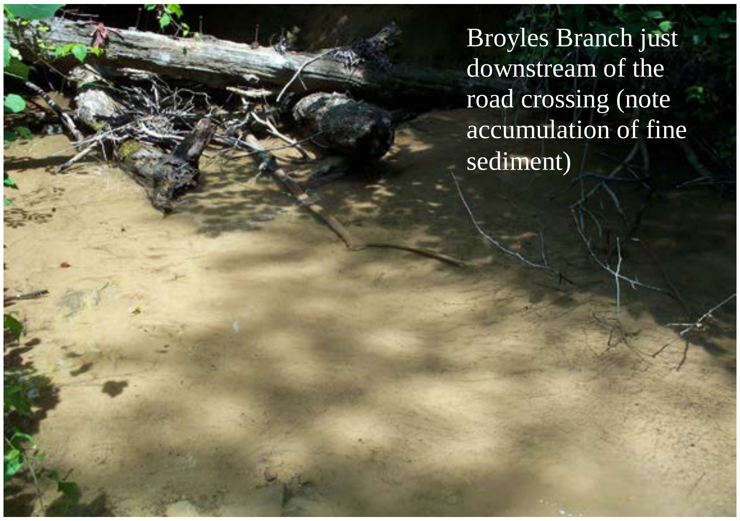
silt contributed about 35%. Most of the larger substrate (i.e. cobble) had long been covered by sand and silt. Habitat features of this stream included an even mix of pools and riffles. Woody cover was scarce in our survey reach and did not contribute significantly to the overall stream cover. The riparian zone on both stream banks was intact and vegetated primarily with small trees/shrubs and herbaceous plants. The stream was severely entrenched in places attesting to the erosive nature of the soils in this watershed. Our survey area encompassed about 200 m of stream length and was sampled with one backpack shocker during a 676 second effort. Basic water quality measurements for this stream revealed a temperature of 20 C, a conductivity of 305 µs/cm, and a pH of 6.5.

Results

We collected a total of 32 fish representing two species (Table 40). The only

Table 40. Species occurrence and associated catch rates (#/hour) for Broyles Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420022901	Creek Chub	188	30	159.7
420022901	Stripetail Darter	418	2	10.6
		Total	**32**	



species collected were stripetail darter and creek chub. Creek chub was the dominant species here accounting for 94% of the total catch. The 1992 survey conducted by Etnier (1992[b]) encountered no additional species. This investigation did note the substantial sediment loads and the relative lack of species diversity resulting from the small stream size.

Discussion

This tributary to Jennings Creek is limited by the amount of available habitat upstream, and the influence of the road crossing downstream. The amount of sediment present in the reach of stream we surveyed precluded any strong establishment of intolerant species.

Management Recommendations

1. Any action that would address the input of road run off into this stream would be beneficial. The installment of water bars that direct any flow of water away from the stream would help reduce downstream degradation.

Straight Fork

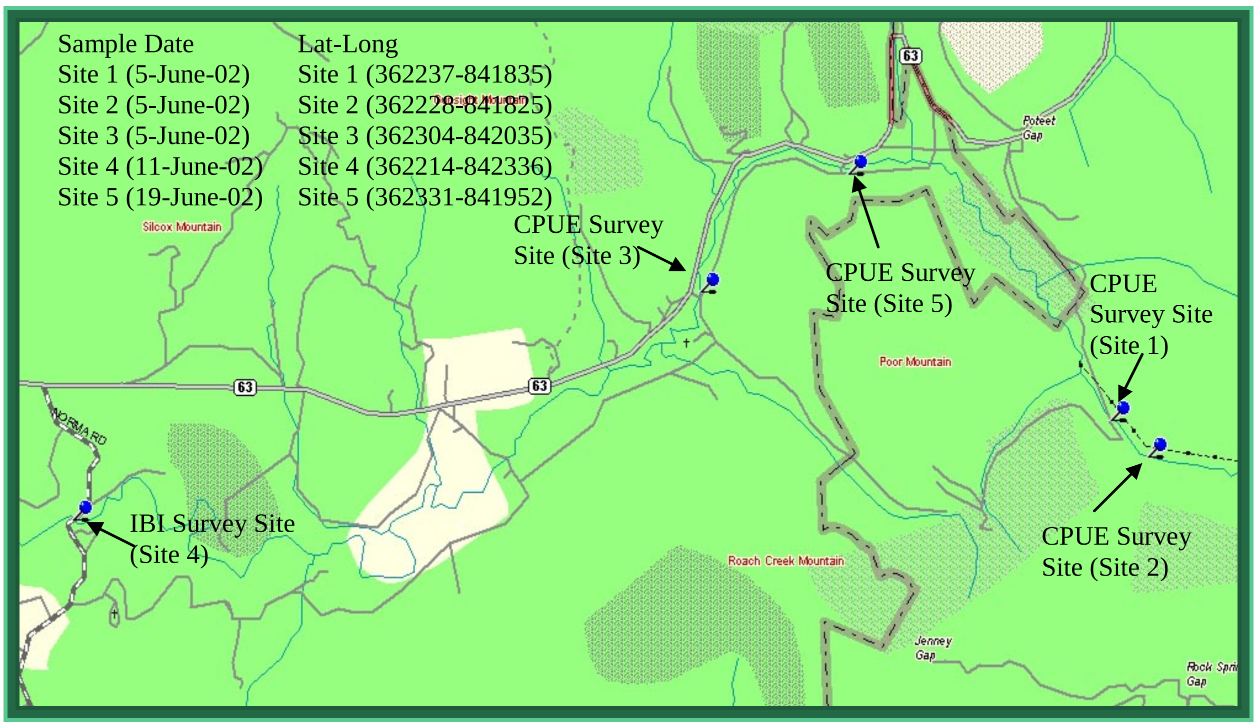
Introduction

Straight Fork is a tributary to the New River originating at the Tennessee Valley Divide and flows in a southwesterly direction before entering Buffalo Creek just southeast of the community of Winona. Much of the headwater area of this stream has been subjected to fossil fuel extraction processes and as a result many of the tributary streams have depressed pH levels. We surveyed this stream at the request of the WMA manager regarding specific concerns about pH problems within the portion of the watershed on Royal Blue WMA. We were primarily interested in developing fish and benthic species lists for TADS and quantitatively (IBI survey) assessing the relative health of the stream.

Study Area and Methods

Our surveys of Straight Fork (Figure 61) were conducted just upstream of the first stream crossing on Royal Blue WMA (Sites 1 and 2), just downstream of Jake Branch (Sites 3 and 5), and at the road crossing on Norma Road (Site 4).

Figure 61. Sample site locations for the surveys conducted in Straight Fork during 2002.



Our evaluation of the fish community at site 4 was accomplished through an Index of Biotic Integrity (IBI) survey. Benthic organisms were collected with kick nets during a timed survey (Sites 1, 2, and 4). Analysis of the fish and benthic samples followed procedures developed by Karr et al. (1986) and Lenat (1993). We used a timed run at Sites 1, 2, 3 and 5 to evaluate the fish community and derive catch rate values for the species collected. At all of our sample locations boulder and cobble were the dominant substrate components although sand and silt were prevalent at Sites 3 and 5. Pools were for the most part the sub-dominant habitat component in all of our survey

areas contributing about 40% to the available habitat. Riffles contributed about 60% to the available habitat. All of the sites had well-established riparian zones although some disturbance had occurred on the left descending bank at Site 5. Water quality measurements at Site 1 revealed the following information, temperature 19.5 C, conductivity 50 µs/cm, and a pH of 4.5. At Site 2 temperature was 20.5 C, conductivity was 45 µs/cm, and pH was 6.5. At Site 3 the measurements were 24.5 C, 395 umhos/cm, and 6.5. At Site 5 temperature was 22.5, conductivity was

490 and pH was 6.8. Water quality at our most downstream site (Site 4) included a temperature of 21 C, conductivity of 450 µs/cm, and a pH of 6.5. A backpack shocker was used at all five sites to collect fish. A 15-foot seine was also used at Site 4 as part of the IBI survey. Our survey durations were fairly equal at the CPUE sites. We conducted 900-second surveys at Sites 1 and 2 and a 600 second survey at Sites 3 and 5.

Results

We did not collect any fish at site 1, which was directly related to the low pH (4.5) of this reach (Table 41). An unnamed tributary just upstream from this site was the source for this acidic water, which was apparently draining from a historical coal mine. At Site 2, just upstream of the unnamed tributary fish were present, although a single species (creek chub) was collected. The stream here was small and had limited flow due to the persistent drought conditions. However, creek chubs were very abundant here and seemed to be able to tolerate these conditions. At Site 3 the fish diversity increased and we managed to collect 21 fish representing five species (Table 41). We did collect two specimens of the federally threatened blackside dace here, which represented the first documented collection of this species in the New River drainage. The most abundant species at this site was the creek chub, which accounted for 67% of the total fish collected. Three game species (bluegill, green sunfish, largemouth bass) were collected here but were at such low numbers that angling would probably not be productive. At Site 4 (our IBI site) we collected seven species and a total of 34 fish. No one species dominated the assemblage, however, central stoneroller and creek chub were the most abundant species collected. One darter species, greenside darter, was also collected. This reach of Straight Fork was receiving substantial amounts of sediment and probably unregulated residential discharge. Our overall habitat evaluation of this site indicated that the physical habitat of the stream was of sub-optimal quality based on a score of 114. Our last survey of Straight Fork (Site 5) was conducted mainly to re-evaluate the blackside dace population and determine if the abundance increased downstream of the original collection locality (Site 3). Two species were collected at this site, which included blackside dace and creek chub. Abundance of blackside dace significantly increased over the collection made at Site 3. We observed a 37 fold increase in the catch rate (#/hour) between Site 3 and Site 5.

Table 41. Species occurrence and associated catch rates (#/hour) for Straight Fork 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420022501	No Fish Collected	498	0	.
420022502	Creek Chub	188	109	436
		Total	**109**	
420022503	Blackside Dace	166	2	8
420022503	Bluegill	351	1	4
420022503	Creek Chub	188	14	56
420022503	Green Sunfish	347	3	12
420022503	Largemouth Bass	364	1	4
		Total	**21**	
420022504	Bluegill	351	2	.
420022504	Creek Chub	188	8	.
420022504	Green Sunfish	347	5	.
420022504	Greenside Darter	398	3	.
420022504	Hybrid Sunfish	345	4	.
420022504	Central Stoneroller	45	8	.
420022504	Striped Shiner	89	4	.
		Total	**34**	
420022505	Blackside Dace	166	50	300
420022505	Creek Chub	188	70	420
		Total	**120**	

Overall, the IBI analysis indicated Straight Fork was in very poor condition (IBI score = 18). All of the metrics received the lowest score possible with exception of the number of sunfish species and percent of omnivores present in the sample (Table 42).

Table 42. Straight Fork Index of Biotic Integrity analysis.

Metric Description	Scoring Criteria 1 3 5	Observed	Score
Number of Native Species	<8 8-16 >16	6	1
Number of Darter Species	<2 2-4 >4	1	1
Number of Sunfish Species less *Micropterus*	<2 2-3 >3	2	3
Number of Sucker Species	<2 2 >2	0	1
Number of Intolerant Species	<2 2 >2	0	1
Percent of Individuals as Tolerant	>20 20-10 <10	56.6	1
Percent of Individuals as Omnivores	>45 45-22 <22	13.3	5
Percent of Individuals as Specialists	<25 25-50 >50	10	1
Percent of Individuals as Piscivores	<1 1-5 >5	0	1
Catch Rate	<16 16-32 >32	3.1	1
Percent of Individuals as Hybrids	>1 1-TR 0	11.7	1
Percent of Individuals with Anomalies	>5 5-2 <2	6.6	1
		Total	**18 (Very Poor)**

Benthic macroinvertebrates collected in our sample at Site 1 comprised 17 families representing 17 identified genera (Table 43). The most abundant group in our collection here was the caddisflies comprising 39.6% of the total sample. Overall, a total of 20 taxa were identified from the sample of which 10 were EPT. Based on the EPT taxa richness and overall biotic index of all species collected, the relative health of the benthic community was classified as “fair/good” (3.5). This was not unexpected because of the depressed pH in this portion of stream. Figure 62 below depicts pH values recorded for the tributary during a 2001 survey by the consulting firm IRTEC.

Figure 62. pH values recorded for an unnamed tributary to Straight Fork during 2001.

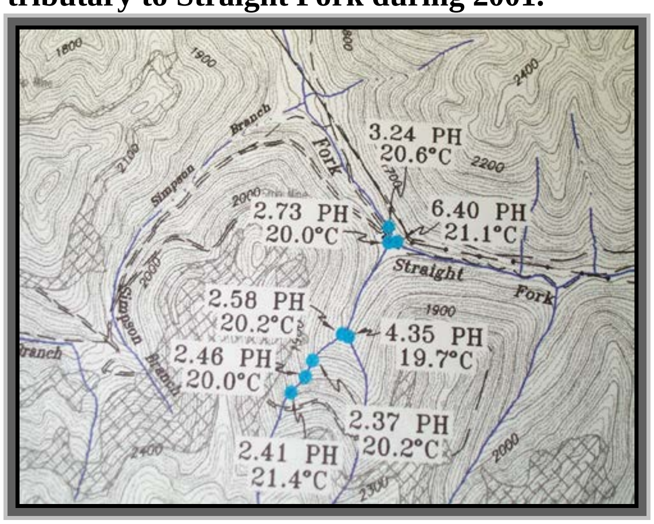


Table 43. Taxa list and associated biotic statistics for benthic macroinvertebrates collected from Straight Fork (Site 1).

ORDER	FAMILY	SPECIES	NUMBER	PERCENT
COLEOPTERA				5.5
	Dytiscidae	*Agabus* adult	1	
		Hydroporus blanchardi 1 larva & 1 adult	2	
	Elmidae	*Optioservus ovalis* adult	1	
	Psephenidae	*Psephenus herricki*	1	
DIPTERA				5.5
	Ceratopogonidae	*Palpomyia* complex	1	
	Chironomidae		3	
	Tipulidae	*Hexatoma*	1	
EPHEMEROPTERA				24.2
	Ephemerellidae	*Eurylophella*	21	
	Ephemeridae	*Ephemera*	1	
HETEROPTERA				1.1
	Gerridae	*Gerris remigis* ♂	1	
MEGALOPTERA				8.8
	Corydalidae	*Nigronia fasciatus*	4	
		Nigronia serricornis	4	
PLECOPTERA				15.4
	Leuctridae	*Leuctra*	2	
	Peltoperlidae	*Peltoperla*	1	
	Perlidae	*Acroneuria abnormis*	6	
		Acroneuria carolinensis	5	
TRICHOPTERA				39.6
	Lepidostomidae	*Lepidostoma*	3	
	Limnephilidae	*Pycnopsyche luculenta* group	8	
	Polycentropodidae	*Polycentropus* larvae and pupae	24	
	Rhyacophilidae	*Rhyacophila carolina*	1	
	TOTAL		**91**	

TAXA RICHNESS = 20
EPT TAXA RICHNESS = 10
BIOCLASSIFICATION = 3.5 (FAIR/GOOD)

At our site (Site 2) upstream of the unnamed tributary the benthic community made a dramatic recovery as expected. Here the pH was 6.5, which allowed a full complement of benthic macroinvertebrates to be collected in our sample. Our sample here comprised 26 families representing 32 identified genera (Table 44). The most abundant group in our collection here was the mayflies comprising 37.3% of the total sample. Caddisflies were the second most dominant group comprising 29.6% of the total sample. Overall, a total of 37 taxa were identified from the sample of which 24 were EPT. Based on the EPT taxa richness and overall biotic index of all species collected, the relative health of the benthic community was classified as “good” (4.2). The increase in the mayfly assemblage (450%) attests to the improvement in water quality as only two taxa were collected below the tributary. This group is usually the most sensitive to changes in pH and thus is a good predictor of stream acidity.

Table 44. Taxa list and associated biotic statistics for benthic macroinvertebrates collected from Straight Fork (Site 2).

ORDER	FAMILY	SPECIES	NUMBER	PERCENT
COLEOPTERA				11.5
	Dryopidae	*Helichus* adult	6	
	Dytiscidae	*Themonectus b. basillaris* adult	1	
	Elmidae	*Optioservus* larva	1	
		Stenelmis adults	3	
	Psephenidae	*Psephenus herricki*	19	
DIPTERA				4.2
	Chironomidae		3	
	Dixidae	*Dixa*	2	
	Tipulidae	*Hexatoma*	6	
EPHEMEROPTERA				37.3
	Baetidae	*Baetis*	11	
	Ephemerellidae	*Drunella*	8	
		Eurylophella	4	
	Ephemeridae	*Ephemera*	7	
	Heptageniidae	*Epeorus (pleuralis* like*)*	2	
		Heptagenia	15	
		Leucrocuta	8	
		Stenacron interpunctatum	12	
		Stenonema (probably *modestum)*	18	
		S. vicarium	2	
	Leptophlebiidae	*Habrophlebiodes*	6	
		Paraleptophlebia	4	
HETEROPTERA				1.2
	Gerridae	*Gerris remigis* 1 ♂ and 1 ♀	2	
	Veliidae	*Rhagovelia obesa* nymph	1	
MEGALOPTERA				1.5
	Corydalidae	*Nigronia serricornis*	4	
ODONATA				0.8
	Cordulegastridae	*Cordulegaster erronea*	1	
		C. maculata	1	
PLECOPTERA				13.8
	Leuctridae	*Leuctra* early instars	9	
	Perlidae	*Acroneuria abnormis* variant form	14	
	Perlidae	*A. carolinensis*	13	
TRICHOPTERA				29.6
	Glossosomatidae	*Glossosoma*	4	
	Hydropsychidae	*Ceratopsyche sparna*	1	
		Cheumatopsyche 4 larvae and 1 pupa	5	
	Lepidostomatidae	*Lepidostoma*	1	
	Limnephilidae	*Pycnopsyche luculenta* group	3	
	Philopotamidae	*Dolophilodes distinctus* larvae and pupae	45	
	Polycentropodidae	*Polycentropus* larvae and pupa	7	
	Uenoidae	*Neophylax aniqua*	1	
		N. wigginsi	10	
	TOTAL		**260**	

TAXA RICHNESS = 37
EPT TAXA RICHNESS = 24
BIOCLASSIFICATION = 4.2 (GOOD)

Benthic macroinvertebrates collected in our sample at Site 4 comprised 20 families representing 21 identified genera (Table 45). The most abundant group in our collection here was the dipterans (true flies) comprising 53.1% of the total sample. Overall, a total of 28 taxa were identified from the sample of which 10 were EPT. Based on the EPT taxa richness and overall biotic index of all species collected, the relative health of the benthic community was classified as "fair/good" (3.0). Overall, the diversity here was higher than at site 1 but the high percentage of tolerant forms (i.e. dipterans) resulted in a lower score. This evaluation complements the IBI score indicating an overall degraded state for this reach of Straight Fork.

Table 45. Taxa list and associated biotic statistics for benthic macroinvertebrates collected from Straight Fork (Site 4).

ORDER	FAMILY	SPECIES	NUMBER	PERCENT
COLEOPTERA				4.6
	Chrysomelidae adult		1	
	Dryopidae	*Helichus* adult	1	
	Elmidae	*Optioservus trivittatus* adults	3	
		Stenelmis adult	1	
DIPTERA				53.1
	Chironomidae		13	
	Empididae		1	
	Simuliidae		47	
	Tipulidae	*Tipula* sp.	2	
		Tipula sp. with unusually long anal gills	6	
EPHEMEROPTERA				3.8
	Baetidae	*Baetis*	2	
		Centroptilum	1	
		Procloeon	2	
HETEROPTERA				3.8
	Gerridae	*Gerris conformis* 1 ♂ and 1 ♀	2	
		G. remigis ♂	1	
	Veliidae	*Rhagovelia obesa* 1 ♂ and 1 ♀	2	
MEGALOPTERA				7.7
	Corydalidae	*Nigronia serricornis*	3	
	Sialidae	*Sialis*	7	
ODONATA				5.4
	Coenagrionidae	*Argia*	2	
	Corduliidae	*Helocordulia* (probably *uhleri)* early instars	2	
		Somatochlora	2	
	Gomphidae	*Gomphus lividus*	1	
PLECOPTERA				0.8
	Leuctridae	*Leuctra*	1	
TRICHOPTERA				20.8
	Hydropsychidae	*Cheumatopsyche*	2	
		Hydropsyche (probably dicantha)	1	
		H. betteni/depravata	18	
	Leptoceridae	*Triaenodes* (possibly *perna)*	1	
	Limnephilidae	*Pycnopsyche guttifer/scabripennis* group	4	
	Polycentropodidae	*Polycentropus*	1	
	TOTAL		**130**	

TAXA RICHNESS = 28
EPT TAXA RICHNESS = 10
BIOCLASSIFICATION = 3.0 (FAIR/GOOD)

Discussion

As a result of the ongoing and historical activities within the watershed Straight Fork has been degraded to a condition that is inhospitable to most intolerant forms of fish and aquatic insects. This was the case for all of our sites, except site 2, which was far enough upstream in the watershed to escape the majority of the pollutants. Many of the tributary streams within the watershed contribute acidified water to the system compounding other water quality issues. The occurrence of blackside dace in this stream is of particular importance, not only for being a new locality record, but also for the existing and potential mining activities proposed within the watershed. The population was particularly strong at Site 5, which would receive water from tributaries draining Braden Mountain. This is of concern given the current proposals of strip mining in this area.

Management Recommendations

1. The protection of Straight Fork and tributaries that would have the potential to affect the blackside dace population in this stream should be a high priority. Any action that addresses acid mine drainage or proposed mining in the watershed would be of benefit to this species. Residential pollution along the stream is also a concern and should be addressed if the stream is to ever fully recover.

Unnamed Tributary

(4th Trib. west of Cross Branch)

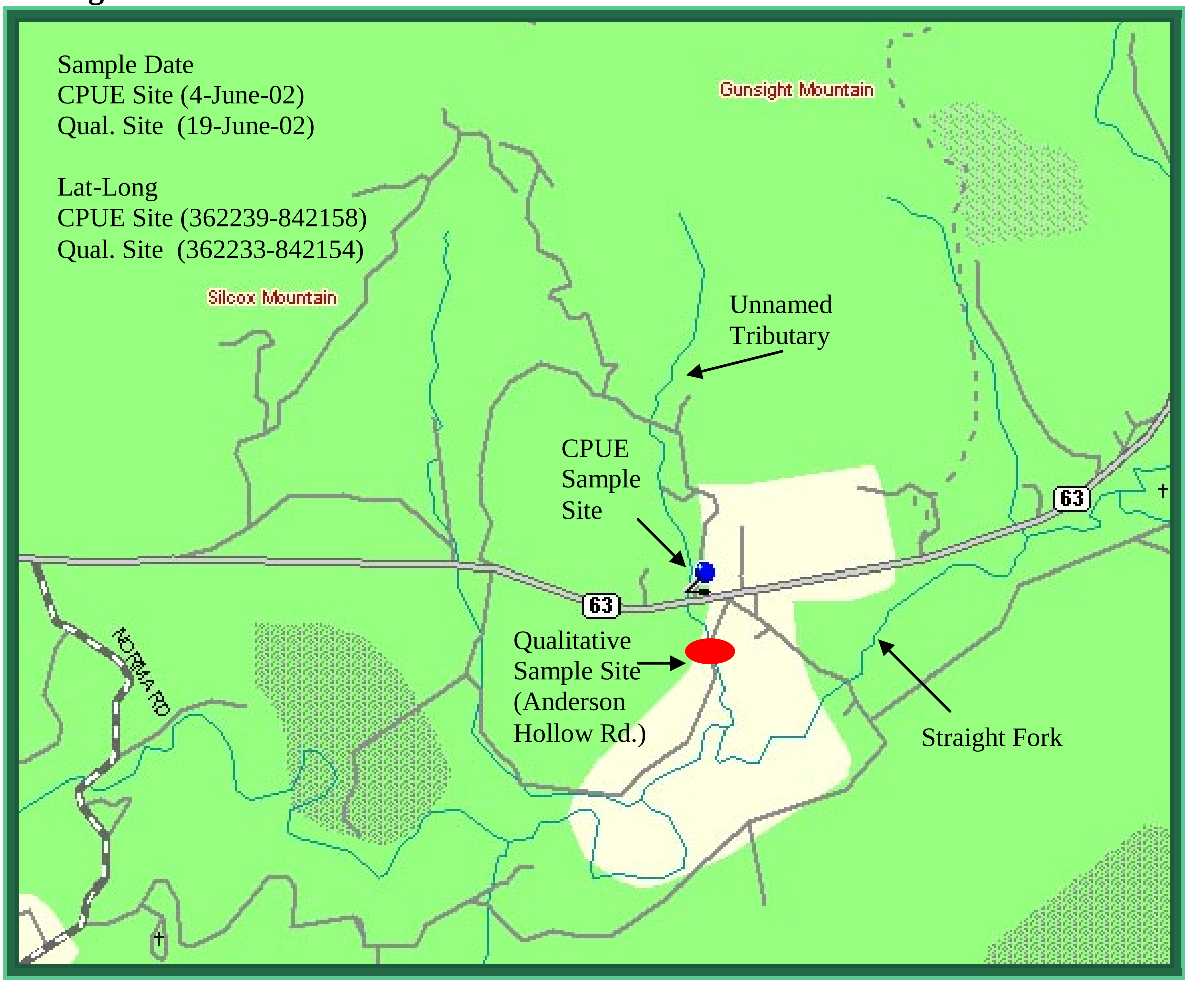
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 63) began at the Hwy. 63 crossing at Silcox Rd. and proceeded upstream. The stream at this location was low grade and had channel substrate composed primarily of bedrock although silt was prevalent in the pools. The instream

Figure 63. Site location for the samples conducted in the unnamed tributary during 2002.




A view of the unnamed tributary within our sample area

habitat was predominantly riffle although there were infrequent shallow pools. Woody cover was scarce in our survey reach and did not contribute significantly to the overall stream cover. The riparian zone on the right descending bank was fairly intact although the left bank had been altered during residential development, pasture establishment and the construction of a road. We surveyed about 200 m of stream length with one backpack shocker during a 1031 second effort. Water quality data from this stream revealed a temperature of 23 C, a conductivity of 125 µs/cm, and a pH of 6.5.

Results

We collected a total of 49 fish representing only two species (Table 46). However, one of these was the federally listed blackside dace. One specimen of this species was collected in a pool created by the box culvert on the downstream side of the highway. Creek chub was the more abundant of the two species accounting for 96% of the total sample. The low diversity in this stream was not unexpected based on the habitat and the flow conditions. A hybrid fish we collected was an apparent cross between creek chub and blackside dace as characteristics of both were prominent. The hybridization between cyprinids is not uncommon as many of them spawn during the same time frame and in within the same habitat. The occurrence of the blackside dace here may represent an introduction from anglers who frequently collect minnows from various streams and hold them in streams until needed. There was a homemade fish holding cage located in the pool below the highway where this fish was collected.


Blackside Dace collected from the tributary


Hybrid (creek chub x blackside dace) collected from the tributary

Table 46. Species occurrence and associated catch rates (#/hour) for the unnamed tributary 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420022401	Blackside Dace	166	1	3.5
420022401	Creek Chub	188	47	164.1
420022401	Hybrid Creek Chub x Blackside Dace		1	3.5
		Total	**49**	

Discussion

The occurrence of blackside dace warrants further investigation into the viability of this population. Although we only collected one specimen during our initial survey and three others during a subsequent qualitative sample we did not fully determine if these fish were reproducing in this stream.

Management Recommendations

1. Further investigation into the viability of this population is warranted. Any action that would alleviate the sediment this stream is receiving would be of benefit.

Cross Branch

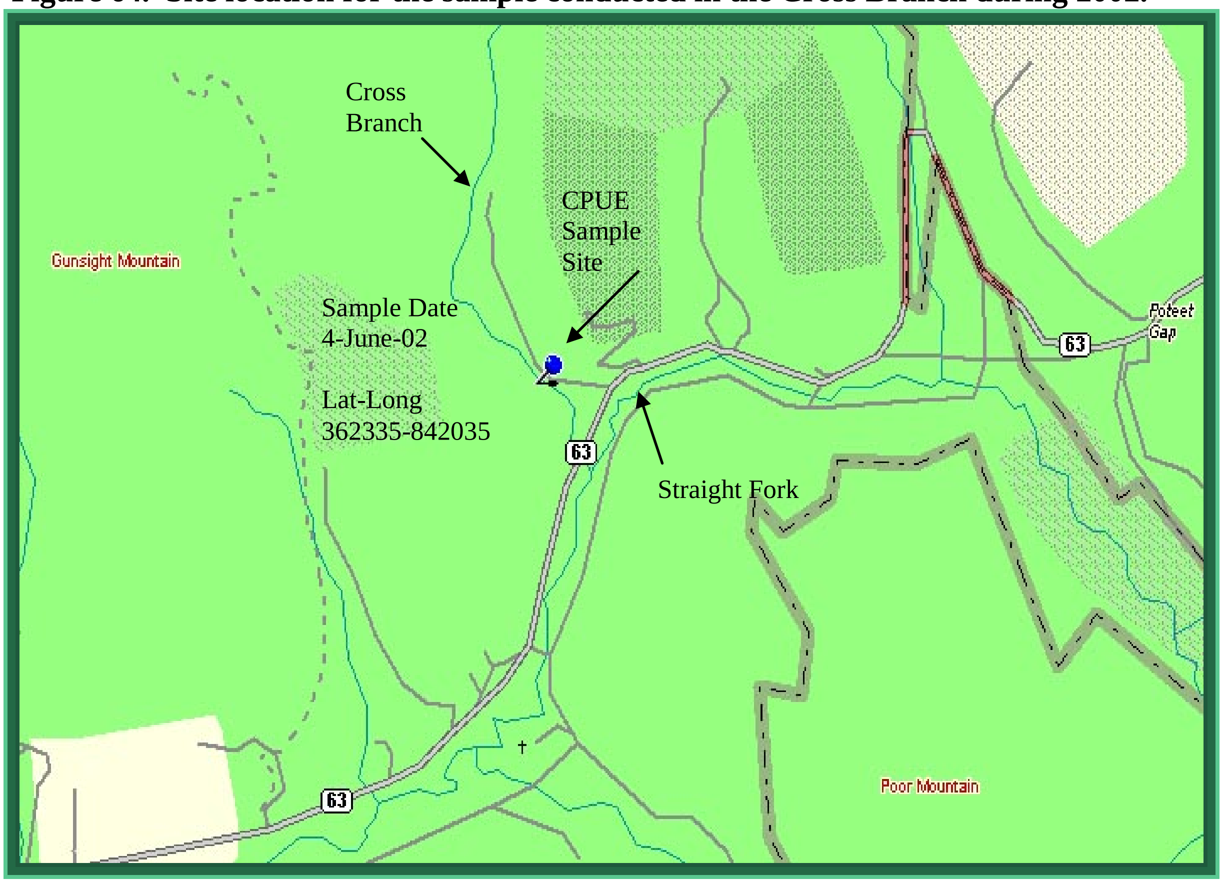
Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 64) began approximately ¼ mile upstream of the Hwy. 63 crossing along Crampton Rd. The stream at this location was low grade and had channel substrate composed primarily of gravel and boulder substrate. The instream habitat was an even mix

Figure 64. Site location for the sample conducted in the Cross Branch during 2002.



of riffle and pool habitat. Woody cover was scarce in our survey reach and did not contribute significantly to the overall stream cover. The riparian zone on the right descending bank was fairly intact although the left bank had been altered during the

construction of the road paralleling the stream. We surveyed about 150 m of stream length with one backpack shocker during an 898 second effort. Water quality data from this stream revealed a temperature of 25 C, a conductivity of 190 µs/cm, and a pH of 6.5.

Results

We collected a total of 136 fish representing three species (Table 47). One of these was the federally listed blackside dace. Fifty-two specimens of this species were collected within our sample area and were second only in abundance to creek chub which made up 61% of our catch. The only other species collected here was one golden shiner. It was apparent, based on the size structure and abundance that the blackside dace was well established here and was reproducing. Like the other tributaries to Straight Fork where this species was found, this population may represent an introduction by anglers who frequently collect and use minnows for bait.

Table 47. Species occurrence and associated catch rates (#/hour) for Cross Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420022301	Blackside Dace	166	52	208.4
420022301	Creek Chub	188	83	332.7
420022301	Golden Shiner	111	1	4.0
		Total	**136**	

Discussion

The occurrence of blackside dace warrants further investigation into the history of this species in this stream.

Management Recommendations

1. Further investigation into the viability of this population is warranted. Watershed protection should be a high priority.

Jake Branch

Introduction

This stream was sampled to develop a fish species diversity list for TADS and to investigate the possible occurrence of blackside dace in this stream. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey site (Figure 65) began at the Jake Branch Road. We sampled both downstream and upstream of the bridge crossing. This was the first tributary to Straight Fork we sampled during 2002. The stream at this location was fairly steep and had channel substrate composed primarily of gravel and cobble substrate. The instream habitat was primarily riffle with about 30% of the stream within our sample area being

Figure 65. Site location for the sample conducted in the Jake Branch during 2002.

Jake Branch upstream of the road crossing

pool habitat. Woody cover was scarce in our survey reach and did not contribute significantly to the overall stream cover. The riparian zone on the right descending bank was fairly intact although the left bank had some alteration due to residential development. We surveyed about 100 m of stream length with one backpack shocker during a 455 second effort. Water quality data from this stream revealed a temperature of 23 C, a conductivity of 435 µs/cm, and a pH of 6.8.

Results

We collected a total of 183 fish representing two species (Table 48). At the beginning of our survey we were taking water quality measurements and happened to talk to one of the adjacent landowners about the stream and any unusual things he had noticed about it in recent years. He immediately informed us that some other brightly colored minnow had displaced all of his "good" minnows he was collecting for bait. He went on to say that this was the first time he had caught them in such high abundance in his minnow trap and was curious as to what species they were. We immediately had an idea of what he was describing and went to his trap to investigate. Upon retrieving the minnow trap we discovered 70 blackside dace mixed in with a few creek chubs. As we continued on with our CPUE sample we were able to collect 51 additional blackside dace, both upstream and downstream of the road crossing. Sixty-two creek chubs were also collected during our survey. It was apparent, based on the size structure and abundance that the blackside dace was well established here and was reproducing. Like the other tributaries to Straight Fork where this species was found, this population may represent an introduction by anglers who frequently collect and use minnows for bait.

Blackside Dace retrieved from the minnow trap in Jake Branch

Table 48. Species occurrence and associated catch rates (#/hour) for Jake Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420022201	Blackside Dace	166	121	403.5 (51 used in CPUE)
420022201	Creek Chub	188	62	490.5
		Total	**183**	

Discussion

The occurrence of blackside dace warrants further investigation into the history of this species in this stream. Based on the conversation with the landowner, this was the first time he had noticed this fish being so abundant in the stream.

Management Recommendations

1. Since it is apparent the blackside dace is established here it is imperative that watershed protection be a high priority. Given the proposed activity on Braden Mountain, particular attention needs to be given to this stream to ensure that this population remains stable.

Montgomery Fork

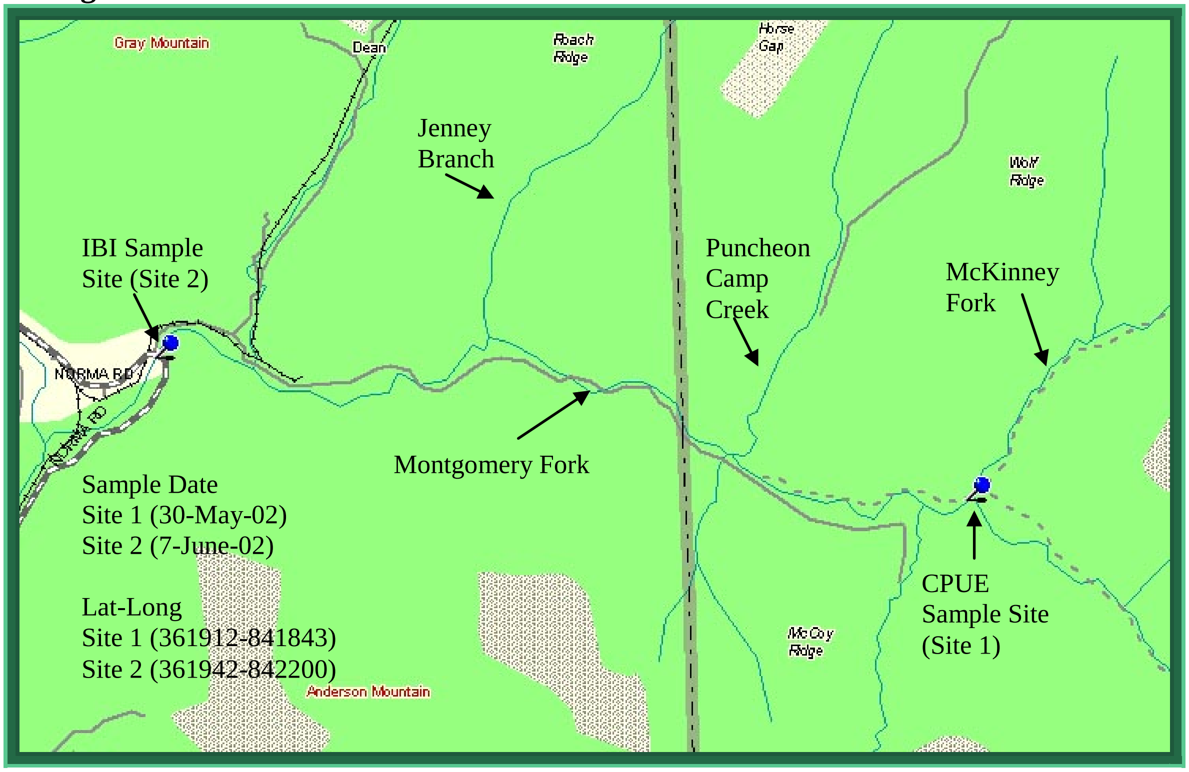
Introduction

Montgomery Fork was sampled to re-evaluate the relative health of the stream and to develop fish and benthic species lists for TADS. In 1991, Montgomery Fork was sampled at the confluence with McKinney Fork to address the lack of aquatic data for this stream and as part of an effort to gather data for streams within the newly formed Royal Blue WMA (Bivens et al. 1992). Our most upstream site (Site 1) was conducted in the same area as the 1991 survey.

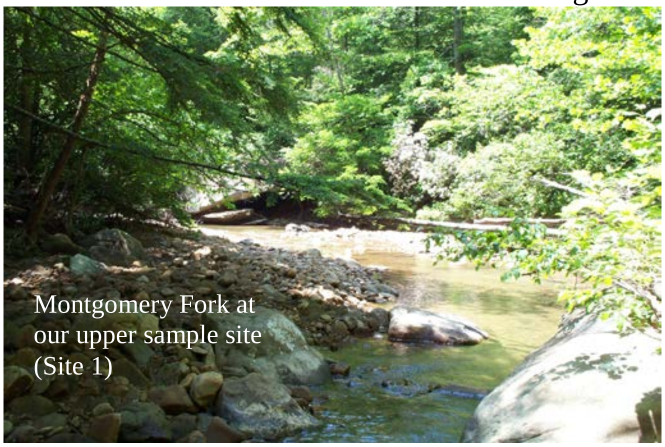
Study Area and Methods

Our surveys of Montgomery Fork (Figure 66) were conducted at the confluence with McKinney Fork (Site 1) and at the bridge crossing on Norma Road (Site 2).

Figure 66. Sample site locations for the surveys conducted in Montgomery Fork during 2002.



Our evaluation of the fish community at Site 2 was accomplished through an Index of Biotic Integrity (IBI) survey. Benthic organisms were collected with kick nets during a timed survey. Analysis of the fish and benthic samples followed procedures developed by Karr et al. (1986) and Lenat (1993). We used a timed run at Site 1 to evaluate the fish community and derive catch rate values for the species collected. At both of our sample locations boulder and cobble were the dominant substrate components although cobble was more prevalent at Site 2. At both of our survey sites the habitat was and even mix of pools and riffles although gradient was somewhat higher at our upstream site. At Site 2 there were extensive shallow glide and riffle areas that were dominated by cobble substrate. Gravel/cobble point bars also occurred quite frequently in this survey reach. Both sites had well-established riparian zones although some disturbance had occurred on both banks at the lower survey site during residential development. The upper survey site resembled a more pristine setting with little disturbance to the terrestrial surroundings other than the access road that parallels the stream. Water quality measurements at Site 1 revealed the following information, temperature 19.5 C, conductivity 230 µs/cm, and a pH of 6.5. At Site 2 temperature was 23 C, conductivity was 260 µs/cm, and pH was 6.7. The obvious temperature difference between the two sites can be explained by the time span between the two samples (spring vs. summer) and the location of the samples in the watershed. A backpack shocker was used at both sites to collect fish. At Site 1 a timed effort of 1,318 seconds was used to derive CPUE values for the species collected. A 15-foot seine was used in conjunction with the backpack shocker at Site 2 to complete the IBI survey.



Montgomery Fork at our upper sample site (Site 1)

Montgomery Fork at our lower sample site (Site 2). Note lack of substrate heterogeneity

Results

We collected a total of 227 fish comprising 12 species at Site 1 and 431 fish representing 20 species at Site 2 (Table 49). There was one game species present at Site 1 and five at site 2. The two most dominant species collected in our sample at site 1 were the central stoneroller and creek chub. Together, these two species comprised 50% of the total number of fish in our sample. In comparison, 11 species of fish were collected from this site in 1991. White sucker was collected in 1991, which was one we did not see in our 2002 survey. We did collect rock bass at this site, which was not collected in 1991. At Site 2, rosyface shiner and striped shiner dominated the fish assemblage, collectively contributing 55% to the overall sample. Five darter species were collected at Site 1 and seven species at Site 2. The state listed ashy darter and emerald darter were collected at both sample sites. The only sucker species at both sites was the northern hogsucker. Rock bass was the only game species collected at site one, whereas bluegill, longear sunfish, rock bass, smallmouth bass, and spotted bass were collected at Site 2. The densities of black bass and rock were such that angling in these areas would probably not be very productive. The species that was at numbers that would offer worthwhile angling was the longear sunfish, which contributed 4.2% to the overall sample at Site 2.

Table 49. Species occurrence and associated catch rates (#/hour) for Montgomery Fork 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420021901	Ashy Darter	405	1	2.7
420021901	Blackside Darter	470	11	30.0
420021901	Creek Chub	188	58	158.4
420021901	Emerald Darter	394	7	19.1
420021901	Greenside Darter	398	5	13.6
420021901	Northern Hogsucker	207	2	5.4
420021901	Rainbow Darter	401	48	131.1
420021901	Rock Bass	342	5	13.6
420021901	Rosefin Shiner	93	2	5.4
420021901	Sand Shiner	137	24	65.5
420021901	Central Stoneroller	45	56	152.9
420021901	Striped Shiner	89	8	21.8
		Total	**227**	
420021902	Ashy Darter	405	3	.
420021902	Blackside Darter	470	2	.
420021902	Bloodfin Darter	434	2	.
420021902	Bluebreast Darter	402	48	.
420021902	Bluegill	351	1	.
420021902	Creek Chub	188	7	.
420021902	Emerald Darter	394	3	.
420021902	Greenside Darter	398	12	.
420021902	Longear Sunfish	353	18	.
420021902	Northern Hogsucker	207	1	.
420021902	Rainbow Darter	401	17	.
420021902	Rock Bass	342	7	.
420021902	Rosefin Shiner	93	19	.
420021902	Rosyface Shiner	131	146	.
420021902	Sand Shiner	137	15	.
420021902	Smallmouth Bass	362	1	.
420021902	Spotted Bass	363	1	.
420021902	Central Stoneroller	45	36	.
420021902	Striped Shiner	89	91	.
420021902	Whitetail Shiner	54	1	.
		Total	**431**	

Overall, the IBI analysis indicated Montgomery Fork was in good condition (IBI score = 48). The most influential metrics on our 2002 score were the low number of sucker, intolerant, and sunfish species and the low percentage of piscivores in the sample (Table 50). Physical habitat evaluation led us to believe that this reach of the stream was sub-optimal based on a mean score of 127.

Table 50. Montgomery Fork Index of Biotic Integrity analysis.

Metric Description	Scoring Criteria 1 3 5	Observed	Score
Number of Native Species	<10 10-20 >20	20	3
Number of Darter Species	<2 2-4 >4	7	5
Number of Sunfish Species less *Micropterus*	<2 2-3 >3	3	3
Number of Sucker Species	<2 2 >2	1	1
Number of Intolerant Species	<2 2 >2	2	3
Percent of Individuals as Tolerant	>20 20-10 <10	1.6	5
Percent of Individuals as Omnivores	>45 45-22 <22	21.1	5
Percent of Individuals as Specialists	<25 25-50 >50	58	5
Percent of Individuals as Piscivores	<1 1-5 >5	2.1	3
Catch Rate	<16 16-32 >32	37.4	5
Percent of Individuals as Hybrids	>1 1-TR 0	0	5
Percent of Individuals with Anomalies	>5 5-2 <2	0.7	5
		Total	**48 Good**

Benthic macroinvertebrates collected in our sample comprised 25 families representing 29 identified genera (Table 51). The most abundant group in our collection was the caddisflies comprising 33.9% of the total sample. Overall, a total of 37 taxa were identified from the sample of which 18 were EPT. Based on the EPT taxa richness and overall biotic index of all species collected, the relative health of the benthic community was classified as “fair/good” (3.5). Our 2002 benthic sample was some distance removed from the sample taken in 1991. Therefore, we could not directly compare these two samples. However, the taxa richness (37) was identical in both surveys and the EPT taxa richness was only slightly different (18 in 2002 vs. 13 in 1991).

Table 51. Taxa list and associated biotic statistics for benthic macroinvertebrates collected from Montgomery Fork.

ORDER	FAMILY	SPECIES	NUMBER	PERCENT
ANNELIDA				0.8
	Oligochaeta		1	
COLEOPTERA				18.2
	Dryopidae	*Helichus* adults	15	
	Elmidae	*Stenelmis* adult	1	
	Gyrinidae	*Dineutus discolor* 1 ♂ and 1 ♀	2	
		D. robertsi ♂	1	
	Psephenidae	*Psephenus herricki* 1 larva & 2 adults	3	
DIPTERA				8.3
	Athericidae	*Atherix lantha*	1	
	Tabanidae	*Tabanus*	1	
	Tipulidae	*Hexatoma*	2	
		Tipula	6	
EPHEMEROPTERA				17.4
	Baetidae	*Baetis*	10	
	Baetiscidae	*Baetisca lacustris*	1	
	Ephemerellidae	*Eurylophella*	4	
	Ephemeridae	*Ephemera*	2	
	Heptageniidae	*Stenonema vicarium*	4	
HETEROPTERA				0.8
	Veliidae	*Rhagovelia obesa* nymph	1	
MEGALOPTERA				5.8
	Corydalidae	*Corydalus cornutus*	4	
		Nigronia serricornis	3	
NEMATOMORPHA	(Horsehair worm)		1	0.8
ODONATA				5
	Calopterygidae	*Calopteryx*	1	
	Cordulegastridae	*Cordulegaster o.obiquua*	2	
	Corduliidae		1	
	Gomphidae	*Gomphus lividus*	1	
		Lanthus vernalis	1	
PLECOPTERA				9.1
	Leuctridae	*Leuctra*	5	
	Peltoperlidae	*Peltoperla*	1	
	Perlidae	*Acroneuria abnormis*	1	
		A. carolinensis	3	
	Perlodidae	Early instars	1	
TRICHOPTERA				33.9
	Hydropsychidae	*Ceratopsyche slossonae*	3	
		C. sparna	23	
		Cheumatopsyche	5	
		Diplectrona modesta	2	
		Hydropsyche dicantha	2	
	Limnephilidae	*Pycnopsyche guttifer/scabripennis* group	2	
		P. luculenta group	3	
	Polycentropodidae	*Polycentropus*	1	
	TOTAL		**121**	

TAXA RICHNESS = 37
EPT TAXA RICHNESS = 18
BIOCLASSIFICATION = 3.5 (FAIR/GOOD)

Discussion

Like other streams within this region, Montgomery Fork has been subjected to decades of coal extraction and logging which have led to the degradation of this stream. However, since the intitial survey was completed in 1991, rock bass have returned to this section of stream. The absence of game species in the 1991 survey was noted and was a point of concern. Since this time it appears that at least rock bass have returned to this portion of the stream, which is a good indication of water quality improvement. The presence of the ashy darter was also encouraging, as this species was not collected in 1991 and represents a new collection record for this New River tributary. The disparity between the fish IBI score and the benthic index score was somewhat puzzling, however, there did appear to be relative lack of substrate heterogeneity at our lower site which could possibly explain the lower benthic diversity observed here.

Ashy Darter collected at our lower Montgomery Fork site (Site 2)

Management Recommendations

1. With the inclusion of most of the watershed within the boundaries of Royal Blue WMA, the quality of this stream should continue to improve. Any action that would address known mine “hotspots” within the watershed would be of benefit.

2. This stream could support a put and take trout fishery although the presence of the state listed darter species would have to be considered before such a program was initiated.

3. Periodically survey this stream to determine any improvement or degradation.

Jenney Creek

Introduction

This stream was sampled to develop a fish species diversity list for TADS. The Agency has made no previous collections from this stream and is not aware of any other collections made by other agencies.

Study Area and Methods

Our survey of Jenney Creek (Figure 67) began upstream of the confluence with Montgomery Fork. We sampled upstream from the access road for approximately 200 meters. This was one of five tributaries to Montgomery Fork sampled during 2002. The stream at this location was moderately graded and had channel substrate composed primarily of bedrock (50%) and silt. The instream habitat was primarily riffle with about 40% of the stream within our sample area being pool habitat. Woody cover was

Figure 67. Site location for the sample conducted in the Jenney Creek during 2002.

scarce in our survey reach and did not contribute significantly to the overall stream cover. Our survey was confined to a 200 m length of stream with one backpack shocker during a 600 second effort. Water quality data from this stream revealed a temperature of 19 C, a conductivity of 358 µs/cm, and a pH of 5.5.

Results

No fish were collected from this stream. Presumably the acidity of the water is the primary contributor to this as habitat appeared suitable. Although we did not walk the entire length of the stream to the confluence, there are no known barriers to fish migration between our survey point and the mouth of the creek. The watershed of Jenney Creek has been subjected to many forms of coal mining and logging, the most prevalent being strip mining. There may still be some deep mine drainage that continues to depress the pH in this stream and probably precludes any fish movement from Montgomery Fork. Our survey was during low flow, so it is suspected that during periods of higher flow the pH may decrease further. A cursory benthic survey of a seep area near Jenney Creek accounted for the following aquatic insects: *Peltoperla, Diplectrona metaqui, Goerita betteni, Wormaldia,* and *Thaumalea*. The pH of this seep was about 7.0.

Discussion

Given no other apparent indications as to the absence of fish we presume that low pH is the limiting factor to fish inhabiting this stream. We did observe a metal culvert at the upstream end of our site that exhibited signs of deterioration commonly associated with acidic water.

Management Recommendations

1. Any action that would help buffer the water coming into this stream or correct sources of acidic runoff (if few) would be of benefit. A survey of the aquatic insect community may prove more beneficial in assessing the current condition of this stream.

Puncheon Camp Creek

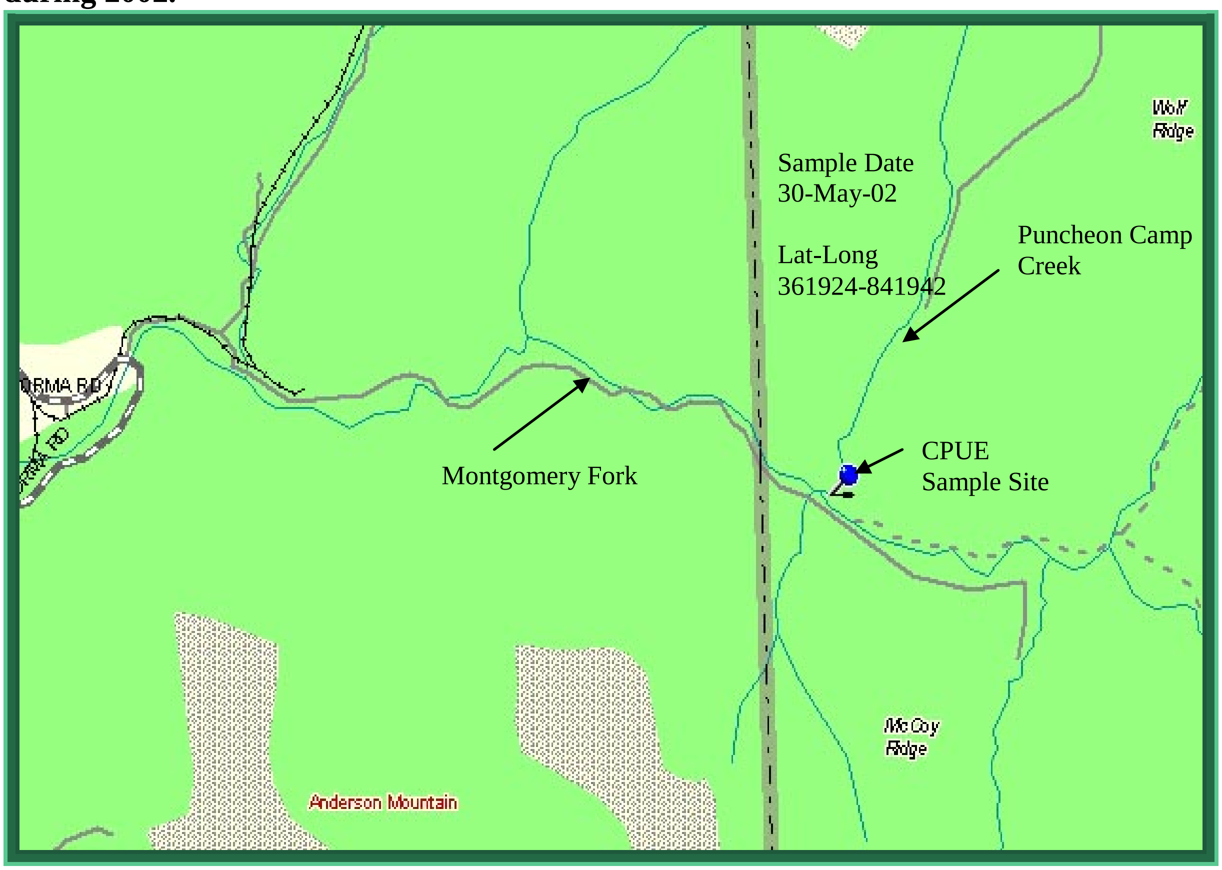
Introduction

This stream was sampled to develop a fish species diversity list for TADS. The Agency made a collection from this stream in 1991 (Bivens et al. 1992). We are not aware of any other collections made by other agencies from this creek.

Study Area and Methods

Our survey of Puncheon Camp Creek (Figure 68) began upstream of the confluence with Montgomery Fork. We sampled upstream from the access road for approximately 200 meters. The stream at this location had a moderate grade and had channel substrate composed primarily of gravel, cobble and silt. The instream habitat was primarily riffle with about 40% of the stream within our sample area being pool habitat. Woody cover was more abundant than in other streams in this area and a few notable cover logs were present in our survey reach. Both riparian zones were intact

Figure 68. Site location for the sample conducted in the Puncheon Camp Creek during 2002.



although there was some indication that both stream margins were somewhat unstable when subjected to high flow conditions. Both banks were vegetated with small shrubs

A view of Puncheon Camp Creek within our survey area. Note bank instability on right descending bank (arrow).

and herbaceous plants. Our survey was confined to a 200 m length of stream with one backpack shocker during an 1167 second effort. Water quality data from this stream revealed a temperature of 17 C, a conductivity of 240 µs/cm, and a pH of 6.0. The pH in this stream was somewhat depressed but was not at the level that would prevent fish from inhabiting this stream.

Results

A total 69 fish representing six species were collected from this stream (Table 52). Two darter species along with one game species (rock bass) were present. The most abundant species collected was the creek chub, which accounted for 71% of the total number of fish collected. The other species collected here occurred in similar abundances. The presence of the two darter species suggest that this stream has adequate habitat and water quality to support these more intolerant forms. The collection made at the same location in 1991 accounted for four species. No rock bass or striped shiners were collected in the 1991 survey.

Table 52. Species occurrence and associated catch rates (#/hour) for Puncheon Camp Creek 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420021701	Blackside Darter	470	3	9.2
420021701	Creek Chub	188	49	151.1
420021701	Rainbow Darter	401	4	12.3
420021701	Rock Bass	342	3	9.2
420021701	Central Stoneroller	45	2	6.1
420021701	Striped Shiner	89	8	24.6
		Total	**69**	

Discussion

This stream is a good quality tributary to Montgomery Fork that should be protected. With the watershed being confined within the boundaries of the Royal Blue WMA this should not be an issue barring any concessions made for future coal exploration or extraction. Future surveys of this stream should include a benthic sample to give a better evaluation of this stream.

Management Recommendations

1. Watershed protection should be a priority. Any action that would address existing problems associated with historical coal mining would be of benefit.

Greens Branch

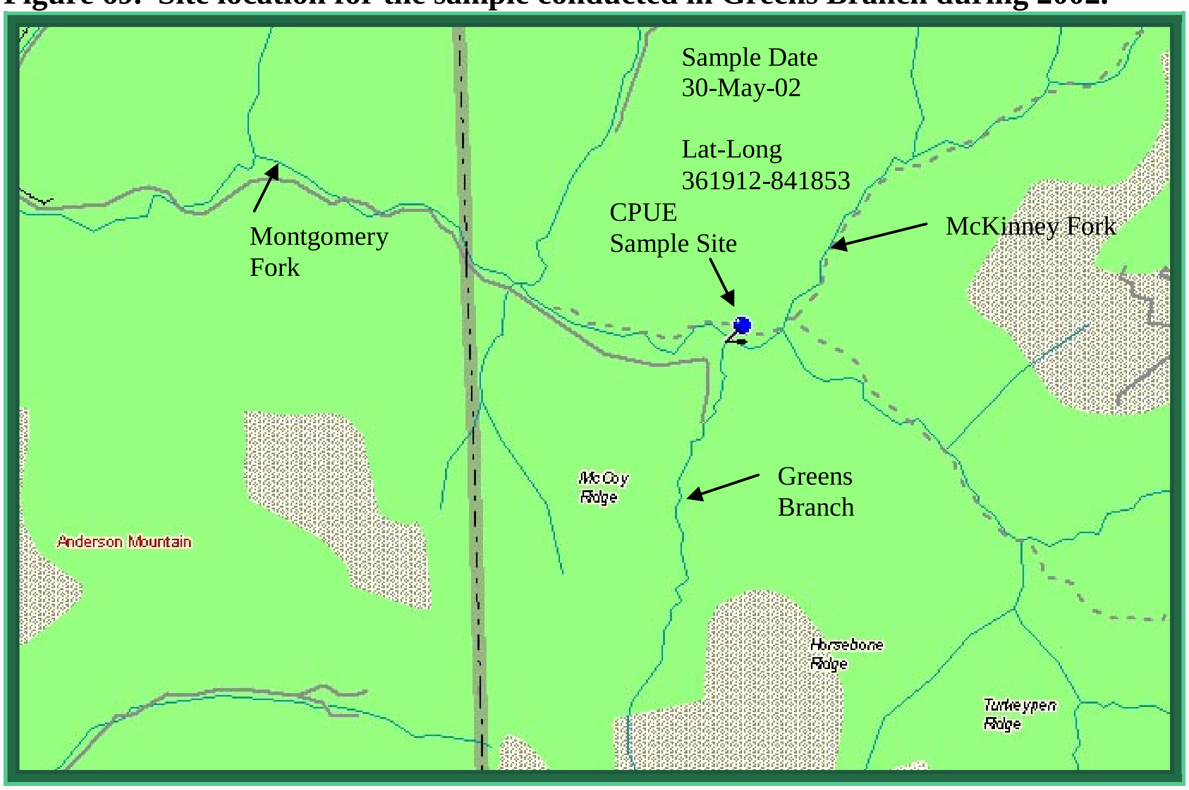
Introduction

This stream was sampled to develop a fish species diversity list for TADS. The Agency has not made any previous surveys of this stream and is not aware of any other collections made by other agencies from this creek.

Study Area and Methods

Our survey of Greens Branch (Figure 69) began upstream of the confluence with Montgomery Fork. We sampled upstream from the mouth of the creek for approximately 100 m. The stream at this location had a higher grade than other tributaries surveyed in the Montgomery Fork watershed. Channel substrate was composed primarily of cobble and gravel. The instream habitat was primarily riffle with about 30% of the stream within our sample area being pool habitat. Woody cover was scarce and did not contribute significantly to the overall stream cover. Both banks were well vegetated

Figure 69. Site location for the sample conducted in Greens Branch during 2002.



and stable with rhododendron as the primary understory component. Our survey was about 100 m in length and was sampled with one backpack shocker during a 666 second effort. Water quality data from this stream revealed a temperature of 18 C, a conductivity of 200 µs/cm, and a pH of 6.0. Water quality in this tributary was similar to the others sampled in the watershed with the exception of Jenney Creek.

Results

A total of 70 fish representing five species were collected from this stream (Table 53). Two darter species (greenside darter and rainbow darter) were collected here. The most abundant species collected was the creek chub, which accounted for 76% of the total number of fish collected. Rainbow darters were second in abundance contributing 14% to the sample. The low numbers of greenside darter, central stoneroller, and striped shiner suggest these species are transients from Montgomery Fork.

Table 53. Species occurrence and associated catch rates (#/hour) for Greens Branch 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420022101	Creek Chub	188	53	286.4
420022101	Greenside Darter	398	1	5.4
420022101	Rainbow Darter	401	10	54.0
420022101	Central Stoneroller	45	3	16.2
420022101	Striped Shiner	89	3	16.2
		Total	**70**	

Discussion

This stream is a good quality tributary to Montgomery Fork that should be protected. With the watershed being confined within the boundaries of the Royal Blue WMA this should not be an issue barring any concessions made for future coal exploration or extraction. Future surveys of this stream should include a benthic sample to give a better evaluation of this stream.

Management Recommendations

1. Watershed protection should be a priority. Any action that would address existing problems associated with historical land use would be of benefit.

McKinney Fork

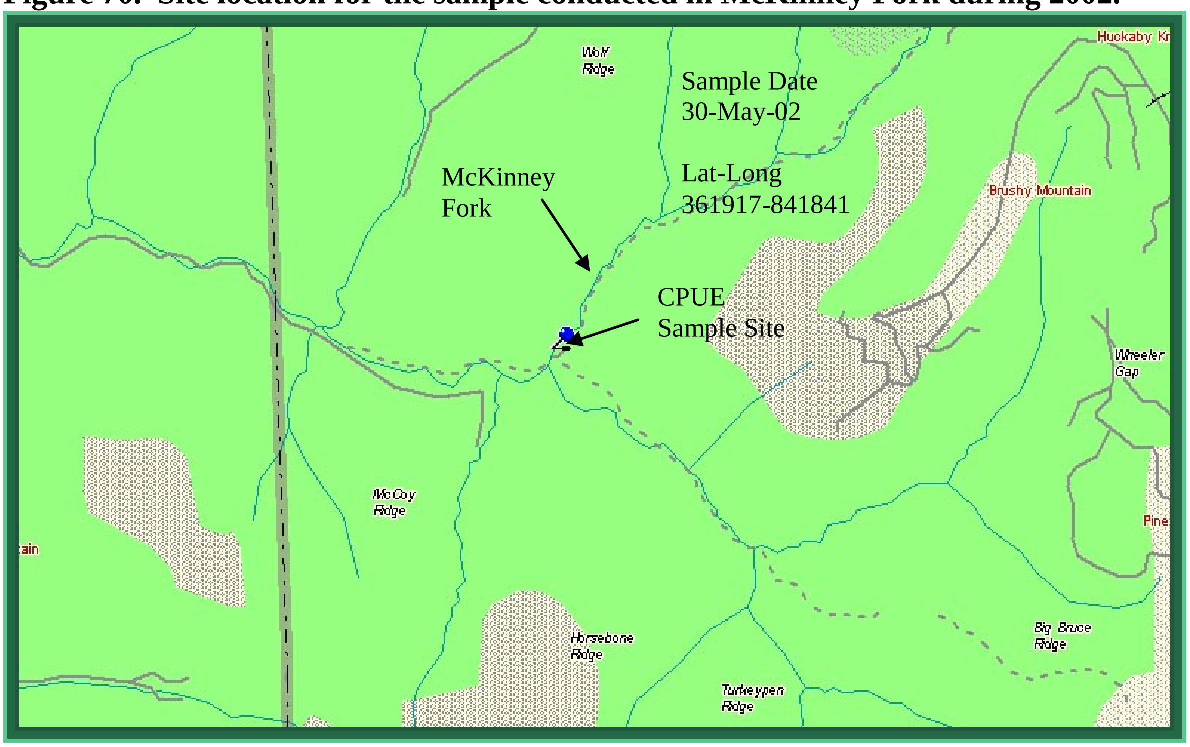
Introduction

This stream was sampled to develop a fish species diversity list for TADS. The Agency conducted a survey of this stream in 1991 (Bivens et al. 1992). We are not aware of any other agency surveys of this stream.

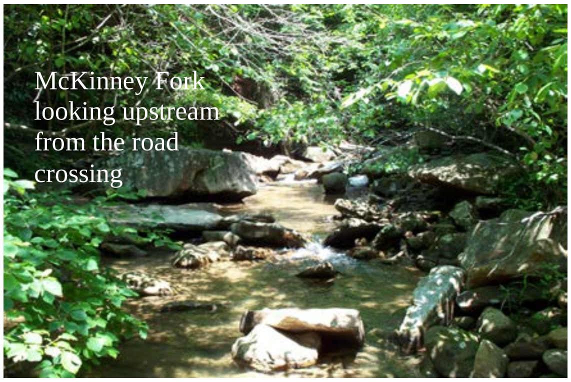
Study Area and Methods

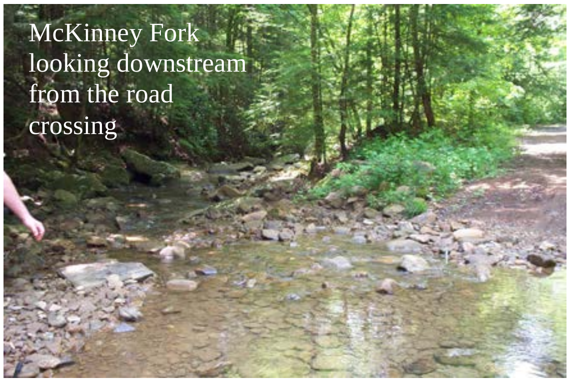
Our survey of McKinney Fork (Figure 70) began upstream of the confluence with Montgomery Fork. We sampled upstream from the road crossing for approximately 150 m. The stream at this location had a steeper channel and had attributes similar to Greens Branch. Channel substrate was composed primarily of sand, gravel, and cobble in the pools and gravel and cobble in the riffles. The instream habitat was primarily riffle with about 40% of the stream within our sample area being pool habitat. Woody cover was scarce and did not contribute significantly to the overall stream cover. Both banks

Figure 70. Site location for the sample conducted in McKinney Fork during 2002.



were well vegetated and stable with rhododendron as the primary understory component. Our survey was about 150 m in length and was sampled with one backpack shocker during a 1002 second effort. Water quality data from this stream revealed a temperature of 21 C, a conductivity of 303 µs/cm, and a pH of 6.0. Water quality in this tributary was similar to the others sampled in the watershed with the exception of Jenney Creek. The conductivity was slightly higher in this stream suggesting some residual influence from coal mining activities in the watershed or a naturally occurring geological change.





Results

A total 63 fish representing three species were collected from this stream (Table 54). No darter species were present in the sample. Like other small streams in this watershed creek chub is almost always the most abundant species. In McKinney Fork they accounted for 92% of the total sample. Central stoneroller and white sucker were the only other species present. The survey conducted in 1991 found the same three species as present in 2002, and an additional sucker species (northern hogsucker). Abundances were similar for species common to both surveys indicating relatively stable conditions in this stream.

Table 54. Species occurrence and associated catch rates (#/hour) for McKinney Fork 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420021801	Creek Chub	188	58	208.3
420021801	Central Stoneroller	45	4	14.3
420021801	White Sucker	195	1	3.6
		Total	**63**	

Discussion

This stream is a good quality tributary to Montgomery Fork that should be protected. With the watershed being confined within the boundaries of the Royal Blue WMA this should be easily accommodated in future management actions within the watershed. Future surveys of this stream should include a benthic sample to give a better evaluation of this stream.

Management Recommendations

1. Watershed protection should be a priority. Any action that would address existing problems associated with historical coal mining would be of benefit.

Wheeler Creek

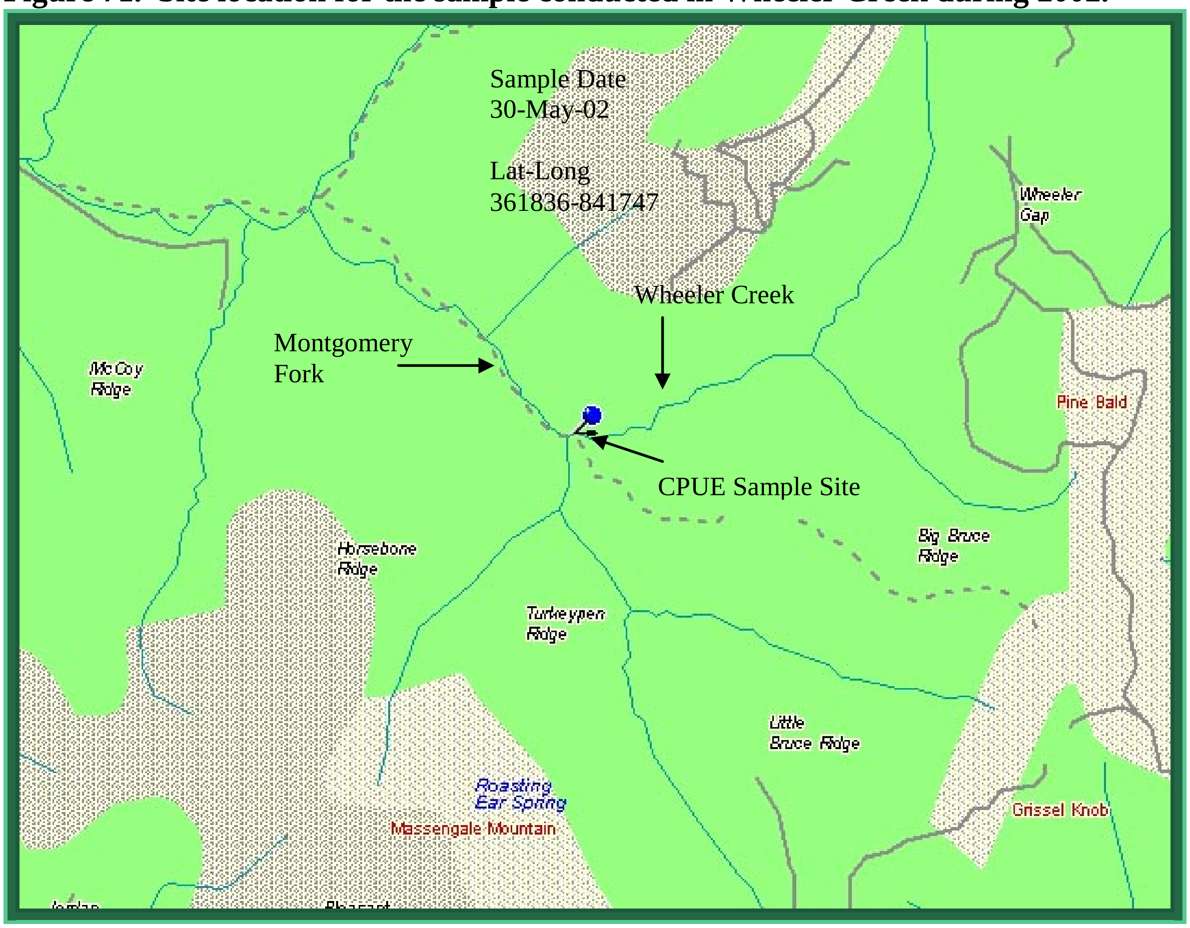
Introduction

This stream was sampled to develop a fish species diversity list for TADS. The agency has made no previous collections from this stream and is not aware of any other biological collections.

Study Area and Methods

Our survey of Wheeler Creek (Figure 71) began upstream of the confluence with Montgomery Fork. We sampled upstream from the road crossing for approximately 150 m. The stream at this location was moderately graded and had channel substrate composed primarily of gravel cobble, and boulder. The instream habitat was primarily riffle with about 40% of the stream within our sample area being pool habitat. Woody cover was scarce and did not contribute significantly to the overall stream cover. Both

Figure 71. Site location for the sample conducted in Wheeler Creek during 2002.



banks were well vegetated and stable with rhododendron as the primary understory component. Our survey was about 150 m in length and was sampled with one backpack shocker during a 571 second effort. Water quality data from this stream revealed a temperature of 18.5 C, a conductivity of 240 µs/cm, and a pH of 6.0.


A view of Wheeler Creek within our survey area

Results

A total 107 fish representing two species were collected from this stream (Table 55). No darter species were present in the sample. Creek Cub was the most abundant species collected accounting for 98% of the total sample. Central stoneroller was the only other species collected.

Table 55. Species occurrence and associated catch rates (#/hour) for Wheeler Creek 2002.

Site Code	Species	Tads Code	Total Number	CPUE (#/hour)
420022001	Creek Chub	188	105	661.9
420022001	Central stoneroller	45	2	12.6
		Total	**107**	

Discussion

This stream is a good quality tributary to Montgomery Fork that should be protected. With the watershed being confined within the boundaries of the Royal Blue WMA this should be easily accommodated in future management actions within the watershed. Future surveys of this stream should include a benthic sample to give a better evaluation of this stream.

Management Recommendations

1. Watershed protection should be a priority. Any action that would address existing problems associated with historical coal mining would be of benefit.

Summary

We surveyed three rivers and 36 streams, collecting 73 fish samples and 10 benthic samples. In the three large rivers sampled during 2002, mean CPUE values for smallmouth bass ranged from a high of 18.2/hour in the Clinch River to a low 12.4/hour in the Powell River. Overall, the most dramatic observation between the 1999 samples conducted on these rivers and the 2002 samples was the decline in the average catch rate of smallmouth bass in the Clinch and Powell rivers. On average we observed a 63.5% decline in the mean catch rate of this species in these rivers (range 51%-76%). Likewise, we observed an annual decline of 46% for smallmouth bass in the Pigeon River. Spotted bass were collected in one (Pigeon River) of the three large rivers sampled during 2002. The average catch rate for this species was (0.9/hour). Largemouth bass were absent in all of the rivers with the exception of the Pigeon where we captured an average of 9.5/hour from our six sample sites. Rock bass values remained fairly constant between the three rivers when compared to previous samples. The majority of the 2002 catch rate values for this species remained relatively constant or actually increased in the case of the Powell River over the previous samples. However, in the Clinch River we observed a 30% decline in the overall abundance within our sample sites.

The smallmouth bass declines we observed in the comparisons made in 2002 are not unlike the previous year (Carter et al. 2002). We had documented declines in the abundance and size structure of this species in most of our riverine populations. A four-year drought cycle in east Tennessee is believed to be the most influential factor in the observed trends. The situations we have observed in east Tennessee are apparently influencing other populations in the Southeast. Similar trends have been observed in Virginia smallmouth populations according Larry Mohn of the Virginia Department of Game and Inland Fisheries. In a recent sport fishing periodical he indicated that they have observed smallmouth bass mortality rates as high as 80% under similar drought conditions (Hart 2002).

Of the three IBI surveys conducted in 2002, Montgomery Fork scored the highest with (50) followed by Stinking Creek (42) and Straight Fork (18). Benthic scores for these three samples all fell between “fair/good and good” categories with scores ranging from 3.0 (Straight Fork) to 4.5 in Stinking Creek. Of particular interest was the collection of the federally threatened blackside dace in Straight Fork and several tributaries to Straight Fork. This represents the first collection of this species within the New River drainage. Additionally, we discovered a healthy population of southern redbelly dace in upper Elk Fork Creek as well as ashy darter in Montgomery Fork.

Most of the streams we surveyed on Royal Blue WMA were suffering some type of impairment resulting from historical coal mining, logging or the road networks associated with both of these activities. We did manage to find state and federally listed fish species on the WMA. These occurrences warrant consideration in the development of management activities in these watersheds. Some of the streams, although small, are of good quality and should be protected in future activities conducted within the WMA.

There were a few streams that would benefit from additional mine reclamation if possible (Jenney Creek and upper Straight Fork).

Over the past nine years the stream survey unit has been conducting Index of Biotic Integrity surveys in various watersheds within the region. These have been done in response to requests made by TWRA personnel, cooperative effort requests, and general interest in determining the state of certain streams. Our compilation of these surveys has given us a reference database for many streams in the region that can be used for comparison purposes should we return for a routine survey or responding to a water quality issue. Table 56 lists our results for various streams surveyed during this time period.

Table 56. Index of Biotic Integrity and Benthic Biotic Index scores for samples conducted between 1994 and 2002.

Water	Watershed	Year Surveyed	County	IBI Score	Benthic BI Score
Capuchin Creek	Cumberland River	1994	Campbell	44 (Fair)	3 (Fair/Good)
Trammel Branch	Cumberland River	1994	Campbell	36 (Poor/Fair)	3 (Fair/Good)
Hatfield Creek	Cumberland River	1994	Campbell	42 (Fair)	3 (Fair/Good)
Baird Creek	Cumberland River	1994	Campbell	38 (Poor/Fair)	3 (Fair/Good)
Clear Fork (Site 1)	Cumberland River	1994	Campbell	52 (Good)	3 (Fair/Good)
Clear Fork (Site 2)	Cumberland River	1994	Claiborne	40 (Fair)	N/A
Clear Fork (Site 3)	Cumberland River	1994	Claiborne	24 (Very Poor/Poor)	1 (Poor)
Elk Fork Creek	Clear Fork	1994	Campbell	40 (Fair)	2 (Fair)
Fall Branch	Clear Fork	1994	Campbell	28 (Poor)	1 (Poor)
Crooked Creek	Clear Fork	1994	Campbell	38 (Poor/Fair)	2 (Fair)
Burnt Pone Creek	Clear Fork	1994	Campbell	38 (Poor/Fair)	2 (Fair)
Whistle Creek	Clear Fork	1994	Campbell	38 (Poor/Fair)	2 (Fair)
Little Elk Creek	Clear Fork	1994	Campbell	40 (Fair)	2 (Fair)
Lick Fork	Clear Fork	1994	Campbell	38 (Poor/Fair)	2 (Fair)
Terry Creek	Clear Fork	1994	Campbell	48 (Good)	2 (Fair)
Crouches Creek	Clear Fork	1994	Campbell	28 (Poor)	1 (Poor)
Hickory Creek (Site 1)	Clear Fork	1994	Campbell	46 (Fair/Good)	3 (Fair/Good)
Hickory Creek (Site 2)	Clear Fork	1994	Campbell	48 (Good)	2 (Fair)
White Oak Creek	Clear Fork	1994	Campbell	30 (Poor)	2 (Fair)
No Business Branch	Clear Fork	1994	Campbell	30 (Poor)	3 (Fair/Good)
Laurel Fork	Clear Fork	1994	Campbell	52 (Good)	3 (Fair/Good)
Lick Creek	Clear Fork	1994	Campbell	44 (Fair)	3 (Fair/Good)
Davis Creek	Clear Fork	1994	Campbell	38 (Poor/Fair)	2 (Fair)
Rock Creek	Clear Fork	1994	Campbell	54 (Good/Excellent)	3 (Fair/Good)
Little Tackett Creek	Clear Fork	1994	Claiborne	28 (Poor)	3 (Fair/Good)
Unnamed tributary to Little Tackett Creek	Clear Fork	1994	Claiborne	0 (No Fish)	3 (Fair/Good)
Rose Creek	Clear Fork	1994	Campbell	36 (Poor/Fair)	2 (Fair)
Rock Creek	Clear Fork	1994	Claiborne	28 (Poor)	2 (Fair)
Tracy Branch	Clear Fork	1994	Claiborne	34 (Poor)	2 (Fair)
Little Yellow Creek (Site 1)	Cumberland River	1994	Claiborne	38 (Poor/Fair)	N/A
Little Yellow Creek (Site 2)	Cumberland River	1994	Claiborne	38 (Poor/Fair)	N/A
Little Yellow Creek (Site 3)	Cumberland River	1994	Claiborne	36 (Poor/Fair)	N/A
Hickory Creek	Clinch River	1995	Knox	46 (Fair/Good)	3 (Fair/Good)
White Creek	Clinch River	1995	Union	34 (Poor) (SC)	4 (Good)
Little Sycamore Creek	Clinch River	1995	Claiborne	40 (Fair)	4.5 (Good/Excel).
Big War Creek	Clinch River	1995	Hancock	50 (Good)	4 (Good)
North Fork Clinch River	Clinch River	1995	Hancock	46 (Fair/Good)	4 (Good)
Old Town Creek (Site 1)	Powell River	1995	Claiborne	40 (Fair)	4 (Good)
Old Town Creek (Site 2)	Powell River	1995	Claiborne	42 (Fair)	4 (Good)
Indian Creek	Powell River	1995	Claiborne	N/A	4 (Good)
Sweetwater Creek	Tennessee River	1995	Loudon	30 (Poor)	3 (Fair/Good)
Burnett Creek	French Broad River	1995	Knox	46 (Fair/Good)	3 (Fair/Good)
Jockey Creek	Nolichucky River	1995	Greene	34 (Poor)	3 (Fair/Good)
South Indian Creek (Sandy Bottoms)	Nolichucky River	1995	Unicoi	38 (Poor/Fair)	4 (Good)
South Indian Creek (Ernestville)	Nolichucky River	1995	Unicoi	44 (Fair)	4 (Good)
Spivey Creek	Nolichucky River	1995	Unicoi	54 (Good/Excellent)	4 (Good)

Table 55. Continued.

Water	Watershed	Year Surveyed	County	IBI Score	Benthic BI Score
Little Flat Creek	Holston River	1995	Knox	42 (Fair)	3 (Fair/Good)
Beech Creek	Holston River	1995	Hawkins	48 (Good)	4 (Good)
Big Creek	Holston River	1995	Hawkins	46 (Fair/Good)	4 (Good)
Alexander Creek	Holston River	1995	Hawkins	34 (Poor)	4 (Good)
Thomas Creek	South Fork Holston River	1995	Sullivan	54 (Good/Excellent)	4 (Good)
Hinds Creek	Clinch River	1996	Anderson	36 (Poor/Fair)	3 (Fair/Good)
Cove Creek	Clinch River	1996	Campbell	28 (Poor)	3 (Fair/Good)
Titus Creek	Clinch River	1996	Campbell	42 (Fair)	3 (Fair/Good)
Cloyd Creek	Tennessee River	1996	Loudon	36 (Poor/Fair)	4 (Good)
Sinking Creek	Little Tennessee River	1996	Loudon	34 (Poor)	4 (Good)
Baker Creek	Little Tennessee River	1996	Loudon	26 (Very Poor/Poor)	3 (Fair/Good)
Little Baker Creek	Little Tennessee River	1996	Blount	38 (Poor/Fair)	4 (Good)
Ninemile Creek	Little Tennessee River	1996	Blount	24 (Very Poor/Poor)	4 (Good)
East Fork Little Pigeon River	French Broad River	1996	Sevier	36 (Poor/Fair)	3 (Fair/Good)
Dunn Creek	French Broad River	1996	Sevier	32 (Poor)	4 (Good)
Wilhite Creek	French Broad River	1996	Sevier	44 (Fair)	4 (Good)
Watauga River (above Watauga Res.)	Holston River	1996	Johnson	42 (Fair)	4 (Good)
Stony Fork	Big South Fork	1996	Campbell	38 (Poor/Fair)	4 (Good)
Bullett Creek	Hiwassee River	1997	Monroe	50 (Good)	4.5 (Good/Excel.)
Canoe Branch	Powell River	1997	Claiborne	26 (V Poor/Poor) (SC)	4.7 (Excellent)
Town Creek	Tennessee River	1997	Loudon	34 (Poor)	2 (Fair)
Bat Creek	Little Tennessee River	1997	Monroe	30 (Poor)	1.5 (Poor/Fair)
Island Creek	Little Tennessee River	1997	Monroe	40 (Fair)	4 (Good)
Little Pigeon River	French Broad River	1997	Sevier	40 (Fair)	2 (Fair)
West Prong Little Pigeon River	French Broad River	1997	Sevier	46 (Fair/Good)	2 (Fair)
Flat Creek	French Broad River	1997	Sevier	30 (Poor)	3.8 (Good)
Clear Creek	French Broad River	1997	Jefferson	34 (Poor)	2.2 (Fair)
Richland Creek	Nolichucky River	1997	Greene	30 (Poor)	2.3 (Fair)
Middle Creek	Nolichucky River	1997	Greene	34 (Poor)	4 (Good)
Sinking Creek	Pigeon River	1997	Cocke	30 (Poor)	3.8 (Good)
Chestuee Creek	Hiwassee River	1998	Monroe	28 (Poor)	2.5 (Fair/Fair -Good)
Fourmile Creek	Powell River	1998	Hancock	36 (Poor/Fair)	4.5 (Good/Excel.)
Martin Creek	Powell River	1998	Hancock	50 (Good)	4 (Good)
Big Creek	Tellico River	1998	Monroe	46 (Fair/Good)	4 (Good)
Oven Creek	Nolichucky River	1998	Cocke	40 (Fair)	2.9 (Fair/Good)
Cherokee Creek	Nolichucky River	1998	Washington	36 (Poor/Fair)	2.8 (Fair/Good)
Bennetts Fork	Cumblerland River	2000	Claiborne	30 (Poor)	3.5 (Fair/Good)
Gulf Fork Big Creek	French Broad River	2001	Cocke	42 (Fair)	4.0 (Good)
Nolichucky River	French Broad River	2001	Unicoi	56 (Good/Excellent)	4.0 (Good)
North Fork Holston River	Holston River	2001	Hawkins	50 (Good)	4.5 (Good)
Stinking Creek	Cumberland River	2002	Campbell	42 (Fair)	4.5 (Good)
Straight Fork	Cumberland River	2002	Campbell	18 (Very Poor)	3.0 (Fair/Good)
Montgomery Fork	Cumberland River	2002	Campbell	48 (Good)	3.5 (Fair/Good)

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APPENDIX A

Common and scientific names of fishes used in this report

Family	Common Name	Scientific Name
Catostomidae	Black buffalo	*Ictiobus niger*
	Black redhorse	*Moxostoma duquesnei*
	Golden redhorse	*Moxostoma erythrurum*
	Northern hogsucker	*Hypentelium nigricans*
	River carpsucker	*Carpiodes carpio*
	River redhorse	*Moxostoma carinatum*
	Smallmouth redhorse	*Moxostoma breviceps*
	Silver redhorse	*Moxostoma anisurum*
	Smallmouth buffalo	*Ictiobus bubalus*
	White sucker	*Catostomus commersoni*
Centrarchidae	Black crappie	*Pomoxis nigromaculatus*
	Bluegill	*Lepomis macrochirus*
	Green sunfish	*Lepomis cyanellus*
	Largemouth bass	*Micropterus salmoides*
	Longear sunfish	*Lepomis megalotis*
	Redbreast sunfish	*Lepomis auritus*
	Redear sunfish	*Lepomis microlophus*
	Rock bass	*Ambloplites rupestris*
	Smallmouth bass	*Micropterus dolomieu*
	Spotted bass	*Micropterus punctulatus*
Clupeidae	Gizzard shad	*Dorosoma cepedianum*
Cottidae	Banded sculpin	*Cottus carolinae*
Cyprinidae	Bigeye chub	*Hybopsis amblops*
	Blacknose dace	*Rhinichthys atratulus*
	Blackside dace	*Phoxinus cumberlandensis*
	Bluntnose minnow	*Pimephales notatus*
	Carp	*Cyprinus carpio*
	Central stoneroller	*Campostoma anomalum*
	Creek chub	*Semotilus atromaulatus*
	Fatlips minnow	*Phenacobius crassilabrum*
	Golden shiner	*Notemigonus chrysoleucas*
	Largescale stoneroller	*Campostoma oligolepis*
	Longnose dace	*Rhinichthys cataractae*
	Mimic shiner	*Notropis volucellus*
	Popeye shiner	*Notropis ariommus*
	River chub	*Nocomis micropogon*
	Rosefin shiner	*Lythrurus faciolaris*
	Rosyface shiner	*Notropis rubellus*
	Sand shiner	*Notropis stramineus*
	Sawfin shiner	*Notropis sp.*
	Silver shiner	*Notropis photogenis*
	Southern redbelly dace	*Phoxinus erythrogaster*

Family	Common Name	Scientific Name
Cyprinidae	Spotfin shiner	*Cyprinella spiloptera*
	Stargazing minnow	*Phenacobius uranops*
	Streamline chub	*Erimystax dissimilis*
	Striped shiner	*Luxilus chrysocephalus*
	Telescope shiner	*Notropis telescopus*
	Tennessee dace	*Phoxinus tennesseensis*
	Tennessee shiner	*Notropis leuciodus*
	Warpaint shiner	*Luxilus coccogenis*
	Whitetail shiner	*Cyprinella galactura*
Ictaluridae	Channel catfish	*Ictalurus punctatus*
	Flathead catfish	*Pylodictus olivaris*
	Yellow bullhead	*Ameiurus natalis*
Lepisosteidae	Longnose gar	*Lepisosteus osseus*
Moronidae	White bass	*Morone chrysops*
Percidae	Arrow darter	*Etheostoma sagitta*
	Ashy darter	*Etheostoma cinereum*
	Banded darter	*Etheostoma zonale*
	Blackside darter	*Percina maculata*
	Bloodfin darter	*Etheostoma sanguifluum*
	Bluebreast darter	*Etheostoma camurum*
	Blueside darter	*Etheostoma jessiae*
	Emerald darter	*Etheostoma baileyi*
	Fantail darter	*Etheostoma flabellare*
	Gilt darter	*Percina evides*
	Greenside darter	*Etheostoma blenniodes*
	Logperch	*Percina caprodes*
	Rainbow darter	*Etheostoma caeruleum*
	Redline darter	*Etheostoma ruflineatum*
	Sauger	*Sander canadense*
	Snubnose darter	*Etheostoma simoterum*
	Stripetail darter	*Etheostoma kennicotti*
	Tangerine darter	*Percina aurantiaca*
	Walleye	*Sander vitreum*
Petromyzontidae	Chestnut lamprey	*Ichthyomyzon castaneus*
	Lamprey sp.	*Ichthyomyzon sp.*
Salmonidae	Rainbow trout	*Oncorhynchus mykiss*
Sciaenidae	Drum	*Aplodinotus grunniens*