FINAL REPORT
BENTHIC MACROINVERTEBRATE SURVEY
WOLF CREEK RESERVOIR PROJECT

FALL 1998

FOR
US ARMY CORPS OF ENGINEERS
NASHVILLE DISTRICT

PREPARED BY

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SUMMARY

On September 16 and 17, 1998, personnel from the Nashville District Corps of Engineers, Water Management Section (Hydrology and Hydraulic Branch, Engineering-Planning Division) collected water quality and benthic macroinvertebrate samples from six locations (Beaver Creek Mile 21.3, 3WOL10040; Little South Fork Mile 5.2, 3WOL10035; Rockcastle River Mile 24.4, 3WOL10036; Buck Creek Mile 12.4, 3WOL10037; Bark Camp Creek Mile 2.0, 3WOL10023; and Big South Fork Cumberland River Mile 45.0, 3WOL10029) in the Wolf Creek Project drainage.

Benthic macroinvertebrate community structure at each location and comparison of the sites were assessed using: taxa richness, Shannon's Index of Diversity, evenness, percent contribution of dominant taxa, EPT taxa, scraper and filtering collectors ratio, EPT to Chironomidae abundance ratio, Hilsenhoff's Biotic Index, Jaccard's Coefficient and percent similarity. Cluster analyses were accomplished using 1-Jaccard's Coefficient and percent dissimilarity. The clusters were interpreted graphically to relate similar communities. The number of organisms and taxa per Hess were also evaluated statistically using analyses of variance and means separation tests.

A minimum of 117 species of benthic macroinvertebrates was taken from all sites within the Wolf Creek Project drainage. The highest number of species were found in Beaver Creek Mile 21.3 with 59, followed by 56 species from Rockcastle River Mile 24.4, 54 from Bark Camp Creek Mile 2.0, 51 from Little South Fork River Mile 5.2, 47 from Buck Creek Mile 12.4 and the least from the Big South Fork River Mile 45.0 with 44. The greatest densities were found in Beaver Creek Mile 21.3 with an estimate of 28,765/m^2, while Bark Camp Creek Mile 2.0 had the least with ~1,295/m^2.

All sites had fairly species rich and diverse benthic macroinvertebrate populations residing under "Fair" (Beaver Creek Mile 21.3) to "Good" (Rockcastle River Mile 24.2 and Buck Creek Mile 12.4) and "Very Good" (Little South Fork Mile 5.2, Bark Camp Creek Mile 2.0 and Big South Fork River Mile 45.0) water quality conditions. A statistical comparison of the six locations using number of individuals/m^2 found Bear Creek Mile 21.3 and Buck Creek Mile 12.4 equivalent with both significantly greater than the other four sites. A similar comparison using mean number of species found no significant differences between the sites

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INTRODUCTION

On September 16 and 17, 1998, personnel from the Nashville District, Corps of Engineers Water Management Section (Hydrology and Hydraulics Branch, Engineering-Planning Division) collected water quality and benthic macroinvertebrate samples from six locations in the Wolf Creek Reservoir drainage. The Water Management Section maintains a baseline, water quality data collection and monitoring program. A wide range of physical, chemical and biological data is collected, analyzed and reported from various locations representing tailwaters, impounded sites and reservoir inflows for the ten Nashville District reservoirs in the Cumberland River Basin. During 1998, biological data collections included extensive quantitative sampling for benthic macroinvertebrates at all ten Cumberland River Basin projects.

SAMPLING LOCATIONS

Sampling locations in the Wolf Creek Reservoir drainage are shown in Figure 1. The following is a brief description of the six-benthic macroinvertebrate sampling sites.

3WOL10040 – Beaver Creek Mile 21.3, Latitude $36^0$49’05”, Longitude $84^0$52’47”, Inflow location,

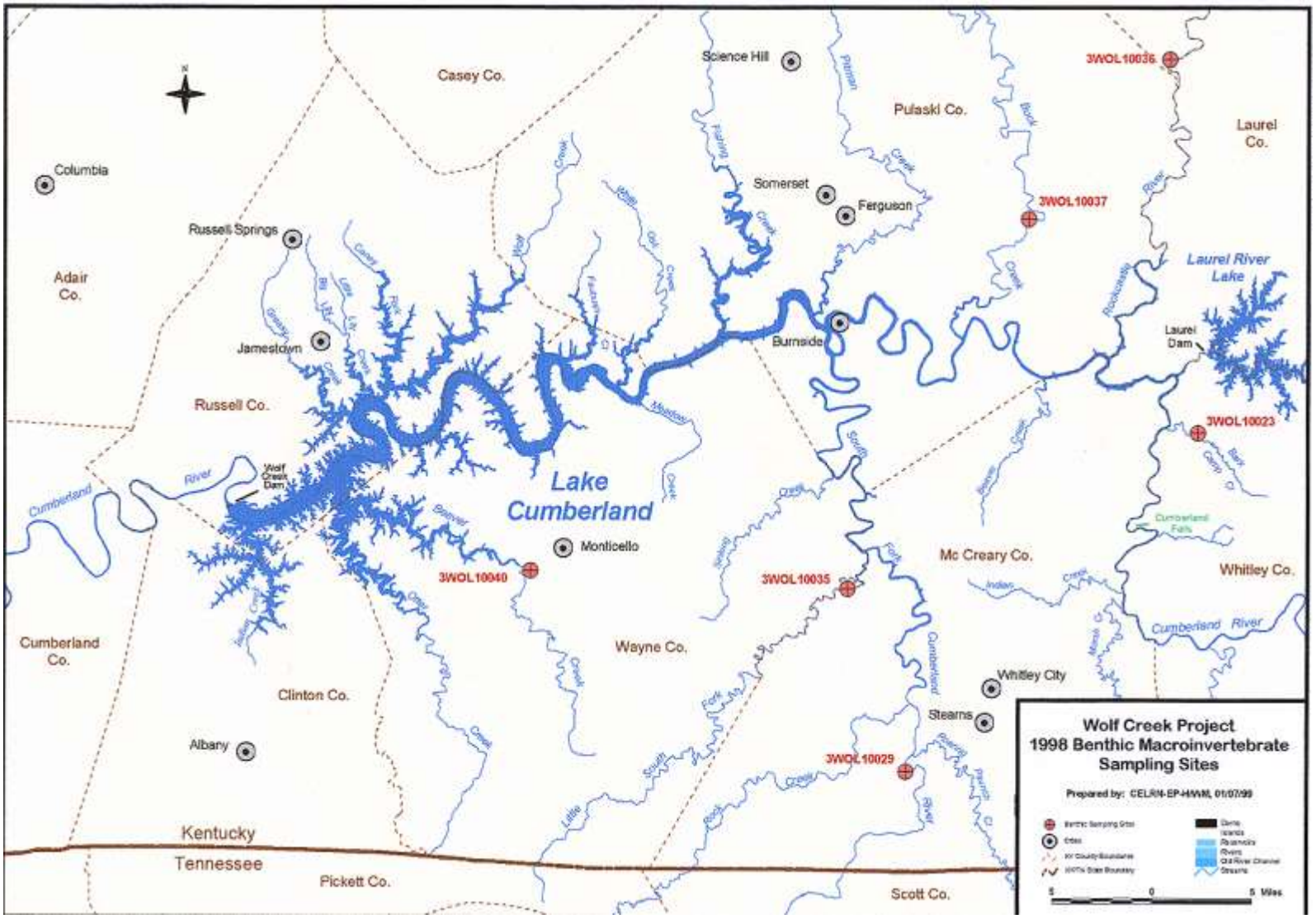
3WOL10035 – Little South Fork Mile 5.2, Latitude $36^0$48’00”, Longitude $84^0$35’48”, Inflow location

3WOL10036 – Rockcastle River Mile 24.4, Latitude $37^0$10’16”, Longitude $84^0$17’45”, Inflow location

3WOL10037 – Buck Creek Mile 12.4, Latitude $37^0$03’38”, Longitude $84^0$25’34”, Inflow location

3WOL10023 – Bark Camp Creek Mile 2.0, Latitude $36^0$54’38”, Longitude $84^0$16’44”, Inflow location.

3WOL10029 – Big South Fork Cumberland River, Mile 45.0, Longitude $36^0$40”03”, Longitude $84^0$32’50”, Inflow location.


Casey Co.
Science Hill
3WOL10036
Pulaski Co.
Laurel Co.
Columbia
Somerset
Ferguson
3WOL10037
Russell Springs
Adair Co.
Laurel River Lake
Jamestown
Burnside
Laurel Dam
Russell Co.
3WOL10023
Lake Cumberland
Wolf Creek Dam
Monticello
3WOL10040
3WOL10035
Mc Creary Co.
Whitley Co.
Cumberland Co.
Wayne Co.
Whitley City
Clinton Co.
Stearns
Albany
3WOL10029
Kentucky
Tennessee
Pickett Co.
Scott Co.
Wolf Creek Project
1998 Benthic Macroinvertebrate Sampling Sites
Prepared by: CELRN-EP-H/WM, 01/07/99
5 0 5 Miles

BACKGROUND

As found in other similar studies, the alteration of the physical or chemical norms of an aquatic environment has the potential to influence nearly all organisms residing in that environment (Goodnight 1973). A community represented by numerous species with no particular numerical domination evident in the population is usually indicative of an unstressed environment (Weber 1973, Klemm etal. 1990). Conversely, a benthic community composed of a few species with large numbers of individuals typifies a stressed community from which intolerant species have been reduced or eliminated by a pollutant or substrate change. The populations of tolerant species expand due to reduced competition or increased resources, or both. The often dramatic benthic community shifts, which can occur in stressed ecosystems, are due to the varying sensitivities of the different macroinvertebrate species. Mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) or EPT species, which spend most of their lives in an aquatic environment, are generally less tolerant of most types of pollution, whereas many flies (Diptera) and worms (Oligochaeta) are more tolerant of environmental stress conditions (Brinkhurst 1962, Beck 1977, Mason 1971, and Merritt and Cummins 1996). Stream reaches may be divided into several ecological categories depending upon whether or not they are subject to stressful agents and, if they are, to what extent or type. They can also be divided into these categories on the basis of the benthic fauna that is supported in that reach.

Attention is usually focused on the macroinvertebrate species because they are more indicative of the relative health of a stream. In addition, macroinvertebrates are found in all habitats, less mobile than other groups of aquatic organisms, easily collected, and most have relatively long periods of development in the aquatic environment. Thus, macroinvertebrate species can be used to indicate deleterious events that have occurred in an aquatic system during any stage of their development.

Clean water streams with variable habitat features often have a high diversity of species with each species represented by a few individuals. Streams receiving organic pollution generally show a decrease in diversity and an increase in density (Gaufin and Tarzwell 1956),

while streams receiving toxic products frequently show a decrease in both diversity and density (Cairns et al., 1971).

Increased sedimentation in streams is a problem most often the result of poor agriculture practices and construction activity in the vicinity streams (Waters, 1995). The effects of increased sedimentation vary, but the primary effect is habitat loss caused by the filling of cracks and crevices with sand and silt and general decrease in habitat diversity.

MATERIALS AND METHODS

At each station, four replicate quantitative samples were taken with a 500 micron mesh Hess sampler (0.09 m^2) from the riffle/run habitat of the stream. Organisms within each area encompassed by the Hess were collected by physically detaching them from the substrate (usually by hand picking or gently sweeping substrate materials with a brush) or by agitating the substrate and allowing the current to carry dislodged organisms into the net. No sorting of organisms and debris was attempted in the field. Organisms and debris were carefully transferred into a storage jar and the entire contents preserved with formalin. Labels bearing unique numbers were applied to the exterior of the jars. These numbers and associated information were then recorded on a chain of custody form. All samples were returned to the Nashville District's Water Management Support Center for storage before delivery to Pennington and Associates, Inc. Storage times ranged from a maximum of four months to a minimum of one month. No deterioration of sample quality was observed during this holding time.

In the laboratory, all benthic samples were washed in a 120 micron mesh screen. After washing, the macroinvertebrates were removed from the detritus under 5x magnification and preserved in 85% ethanol. The organisms were identified to the lowest practical taxonomic level using available keys (Pennington and Associates, Inc. 1994) and counted. Identifications were made with a stereomicroscope (7X to 60X). Slide mounts were made of the chironomids, simuliids, oligochaetes and small crustaceans, and identifications were made with a compound microscope. The chironomids, simuliids, and oligochaetes were cleared for 24 hours in cold 10% KOH. Temporary mounts were made in glycerine and the animals returned to 80% ethanol after identification. When permanent mounts were desired, the organisms were transferred to 95% ethanol for 30 minutes and mounted in euperol.

SUBSTRATE DETERMINATION

A classification of substrate based on the size scale proposed by Wentworth (Compton 1962) was used to make field observations of the substrate present at each station. This classification of detrital sediments is by grain diameter and is as follows:

Diameters	Approximate Inch Equivalents	Name of Loose Aggregate
>256 mm	>10 inch	Boulder
64 to 256 mm	2.5 to 10 inch	Cobble
2 to 64 mm	0.08 to 2.5 inch	Gravel
1/16 to 2 mm	0.002 to 0.08 inch	Sand
1/256 to 1/16 mm	0.00015 to 0.002 inch	Silt
<1/256 mm	<0.00015 inch	Clay

Substrate types encountered at the six sites vary somewhat. In general substrate types at the sites are dominated by cobble and gravel on bedrock with relatively minor amounts of finer grained materials (sand, silt and clay).

COMMUNITY STRUCTURE MEASURES

Brower and Zar (1984) provide a detailed discussion of a variety of techniques for measuring community structure. The use of diversity indices is based upon the observation that normally undisturbed environments support communities with large numbers of species having no individuals present in overwhelming abundance. If the species of a disturbed community are ranked by numerical abundance, there may be relatively few species with large numbers of individuals. Mean diversity is affected by both "richness" of species (or abundance of different species) and by the distribution of individuals among the species. High species diversity indicates a highly complex community.

Species diversity was estimated using Shannon's Index of Diversity (H):

$$H = - p_i \log p_i$$

where p_i is the proportion of the total number of individuals occurring in species i ($p_i=n_i/N$), N is the total number of individuals in all species.

Diversity indices take into account both the species richness and the evenness of the individuals' distribution among the species. Separate measures of these two components of diversity are often desirable. Species richness can be expressed simply as the number of species in the community. Evenness may be expressed by considering how close a set of observed species abundance are to those from an aggregation of species having maximum possible diversity for a given N and s (Brower and Zar 1984).

Evenness is calculated as follows:

$$\text{Pielou } J' = H/H_{max}$$

where H is calculated diversity and H_{max} is maximum possible diversity.

Community similarity between sites is measured by Jaccards Coefficient, Community Loss Index, and Percent Similarity.

$$\text{Jaccards Coefficient} = \frac{C}{S_1 + S_2 - C}$$

$$\text{Community Loss Index} = \frac{S_1 - C}{S_2}$$

where S = Species in each community (S_1 is reference Community in Community loss Index)

C = Species common to both communities

The Community Loss Index is an index of dissimilarity with values increasing as the degree of dissimilarity from the reference station (S_1) increases (Plafkin et al. 1989). Values

range from 0 to infinity. Community Loss was not calculated because no station was designated as a reference site.

Percent Similarity, for a two-community comparison, is calculated as follows: The number of individuals in each species is calculated as a fractional portion of the total community. The value for species i in community 1 is compared to the value for species i in community 2. The lower of the two is tabulated. This procedure is followed for each species. The tabulated list (of the lower of each pair of values) is summed. The sum is defined as the Percent Similarity of the two communities.

The software package Number Cruncher Statistical Systems version 5.03 was used to evaluate community similarity (Hintze 1992). Cluster analysis sorts sampling units into groups based on the overall resemblance to each other (Lundwig and Reynolds 1988). By using 1-Jaccards Coefficient and Percent Dissimilarity, sampling units are sorted to permit grouping. The cluster analysis combines the distances between sampling units into a matrix table, and two strategies of clustering are used to calculate a distance for N-1 cycles (N=number of sampling units). The cluster analysis is interpreted graphically on a dendrogram to relate the similar communities (Hintze 1992, Ludwig and Reynolds 1988).

The percent contribution of the numerically dominant taxon to the total number of organisms in the community is a rough measure of community balance at the lowest possible taxonomic level (Plafkin et al. 1989). A community, which is dominated by a few species, may be under environmental stress.

The total number of species within the pollution sensitive groups Ephemeroptera, Plecoptera, and Trichoptera is generally considered a measure of water quality and is listed as the EPT Index (Plafkin et al. 1989). The EPT Index generally increases with increasing water quality.

According to Plafkin et al. (1989) the scraper and filtering collector ratio (Sc/FC) reflects the riffle/run community food base and may provide insights into the nature of potential disturbance factors. The ratio of scraper abundance to the combined totals of scrapers and filtering collectors (scrapers / scrapers and filtering collectors) is an adjustment of the scrapers / filtering collectors from a ratio to a measure of percent contribution (Barbour et al. 1992).

The ratio of shredder functional feeding group and total number of individuals (Sh/Total) in the CPOM sample, allows evaluation of potential impairment as indicated by the shredder community. Shredders are considered sensitive to riparian zone impacts and are believed to be good indicators of toxic effects when toxicants are absorbed by or associated with the course particulate organic matter (CPOM) (Plafkin et al 1989). This metric was not included in this study because no CPOM samples were obtained at each station.

The EPT and Chironomidae abundance ratio (EPT/Chironomidae) is the relative abundance of the pollution sensitive groups Ephemeroptera, Plecoptera, and Trichoptera to the more tolerant Chironomidae as a measure of community balance (Plafkin et al. 1989). It is believed that good biotic condition is reflected in benthic communities with an even distribution of species among all four major groups and with substantial representation of Ephemeroptera, Plecoptera, and Trichoptera. Populations with a disproportional number of Chironomidae relative to the sensitive groups is most likely an indication of environmental stress (Plafkin et al. 1989).

A scoring approach developed by Plafkin et al. (1989) to estimate community health utilizes many of the community measures previously discussed. This rapid bioassessment is presented in flow chart format in Figure 2.

Metric	Biological Condition Scoring Criteria			
	6	4	2	0
1. Taxa Richness[a]	>80%	60-80%	40-60%	<40%
2. Hilsenhoff Biotic Index (modified)[b]	>85%	70-85%	50-70%	<50%
3. Ratio of Scrapers/Filt. Collectors[a,c]	>50%	35-50%	20-35%	<20%
4. Ratio of EPT and Chironomid Abundance[a]	>75%	50-75%	25-50%	<25%
5. % Contribution of Dominant Taxon[d]	<20%	20-30%	30-40%	>40%
6. EPT Index[a]	>90%	80-90%	70-80%	<70%
7. Community Loss Index[e]	<0.5	0.5-1.5	1.5-4.0	>4.0
8. Ratio of Shredders/Total[a,c]	>50%	35-50%	20-35%	<20%

[a] Score is a ratio of study site to reference site X 100.
[b] Score is a ratio of reference site to study site X 100.
[c] Determination of Functional Feeding Group is independent of taxonomic grouping.
[d] Scoring criteria evaluate actual percent contribution, not percent comparability to the reference station.
[e] Range of values obtained. A comparison to the reference station is incorporated in these indices.

BIOASSESSMENT		
% Comp. to Ref. Score[a]	Biological Condition Category	Attributes
>83%	Nonimpaired	Comparable to the best situation to be expected within an ecoregion. Balanced trophic structure. Optimum community structure (composition and dominance) for stream size and habitat quality.
54-79%	Slightly impaired	Community structure less than expected. Composition (species richness) lower than expected due to loss of some intolerant forms. Percent contribution of tolerant forms increases.
21-50%	Moderately impaired	Fewer species due to loss of most intolerant forms. Reduction in EPT index.
<17%	Severely impaired	Few species present. If high densities of organisms, then dominated by one or two taxa.

[a] Percentage values obtained that are intermediate to the above ranges will require subjective judgement as to the correct placement. Use of the habitat assessment and physiochemical data may be necessary to aid in the decision process.

Figure 2. Biological Condition Scoring Criteria (Plaqfkin et al. 1989)

BIOTIC INDEX

Both the evenness and diversity indices are based on information of community structure and do not reflect any knowledge of the physiological attributes or ecological affinities of the organisms comprising the community (Howmiller and Scott 1977). Howmiller and Scott (1977) suggest the use of a trophic index for assessing ecological stress using Oligochaete species. After a two-year study of 53 Wisconsin streams, Hilsenhoff (1982) proposed using a biotic index of arthropod populations as a rapid method for evaluating water quality. Hilsenhoff (1987) expanded and improved his biotic index and this index, which is a measure of organic and nutrient pollution, was used in this study.

To calculate the biotic index, species are assigned pollution tolerance values of 0 to 10. A value of 0 is assigned to species found only in unaltered streams of very high water quality, and a value of 10 is assigned to species known to occur in severely polluted or disturbed streams. Intermediate values are assigned to species that occur in streams with intermediate degrees of pollution or disturbance. Where species cannot be identified, genera are assigned values instead. The biotic index is calculated from the formula:

$$BI = \sum \frac{n_i a_i}{N}$$

where n_i is the number of individuals of each species, a_i is the tolerance value assigned to that species and N is the total number of individuals in the sample (Hilsenhoff 1982). The index is an average of tolerance values, and measures saprobity (pertaining to tolerance of organic enrichment) and to some extent trophism.

According to Hilsenhoff (1987) the calculated Biotic Index values reflect the following:

Biotic Index	Water Quality	Degree of Organic Pollution
0.00 - 3.50	Excellent	No apparent organic pollution
3.51 - 4.50	Very Good	Possibly slight organic pollution
4.51 - 5.50	Good	Some organic pollution
5.51 - 6.50	Fair	Fairly significant organic pollution
6.51 - 7.50	Fairly Poor	Significant organic pollution
7.51 - 8.50	Poor	Very significant organic pollution
8.51 - 10.00	Very Poor	Severe organic pollution

Biotic Index values are calculated using tolerance values provided in North Carolina Department of Environment, Health and Natural Resources, Division of Environmental Management Water Quality Section, Standard Operating Procedures Biological Monitoring, Environmental Sciences Branch Ecosystems Analysis Unit, Biological Assessment Group, January, 1997 (North Carolina, Department of Environment, Health and Natural Resources 1997).

Since North Carolina provides water quality classifications for Biotic Index values based on three geographic regions (mountains, piedmont and coastal) it is probably more appropriate to use scoring criteria for the piedmont region. North Carolina's scoring criteria for water quality assessment for the piedmont region are as follows:

NC Biotic Index (Piedmont)	Water Quality
< 5.19	Excellent
5.19 - 5.78	Good
5.79 - 6.48	Good - Fair
6.49 - 7.48	Fair
> 7.48	Poor

STATISTICAL EVALUATION

Sampling efficiency of the field techniques was calculated via a statistical analysis of the quantitative samples. The mean number of organisms per sample, the standard deviation, the standard error, and the sampling precision of the mean were calculated for the benthic samples from each station (Elliot 1977). The sampling precision is the primary parameter evaluated and represents the percentage of the actual mean of the population within which the sample mean lies and indicates how accurately the macroinvertebrate community was sampled. According to Elliot (1977), a sampling precision of 20% (80% confidence) or less is usually acceptable in biological studies. The sampling precision (D) is the ratio of the standard error to the arithmetic mean:

$$D = (S.E./Mean)\ 100$$

Since four quantitative samples were taken in each area, some of the population estimates may not be sampled with 80% or greater confidence. As stated by Elliot (1977), the simplest solution to this problem is to take many samples (over 50 samples), but this is not usually an acceptable allocation of resources.

An analysis of variance (F test) was used to compare the stations using the number of organisms and species per sample. According to Sokal and Rohlf (1981), analysis of variance is a technique in statistics where the total variation in a set of data is partitioned into components associated with possible sources of variability. The relative importance of the different sources

is then assessed by F-tests between each component of variation and the "error" variation. If the calculated F-value is greater than the tabular F-value at the 0.05 level of significance, then a difference between data sets is greater than the variation within a data set. Following the approach of Chew (1977), mean separation tests are applied to separate and rank the mean values of each data set developed from benthic enumeration.

RESULTS AND DISCUSSION

A list of all aquatic benthic macroinvertebrate species, assigned tolerance values, functional feeding groups and numbers of individuals of each species collected from each stream location are presented in Table 1. Complete listings of all data by sample, station and month are found in the Appendix. A summary of benthic community measures is presented in Table 2. A statistical analysis of sampling efficiency and a comparison of the stations using mean number of organisms per Hess sampler is presented in Table 3. A similar comparison using mean number of species per Hess sampler is found in Table 4. A comparison of the stations using Percent Dissimilarity is in Figure 3 while similar comparisons using 1-Jaccard's Coefficient is clustered in Figure 4.

A minimum of 117 species of aquatic benthic macroinvertebrates was taken from the six stations within the Wolf Creek watershed (Table 1). The benthic macroinvertebrate populations from the six sites represented three phyla and 48 families. The highest number of species (59) was found at Beaver Creek Mile 21.3,followed by 56 species taken from Rockcastle River Mile 24.4, 54 from Bark Camp Creek Mile 2.0, 51 from Little South Fork River Mile 5.2, 47 from Buck Creek Mile 12.4 and the least (44) from the site in Big South Fork River Mile 45.0 (Table 1). The greatest densities (no./m^2) were found in Beaver Creek Mile 21.3 with an estimated 28,765/m^2 followed by ~26,852/m^2 at Buck Creek Mile 12.4. The lowest number per m^2 was found at Bark Camp Creek Mile 2.0 with ~1,295/m^2.

Beaver Creek Mile 21.3 (3WOL10040) produced the most species from the four Hess samples with 59. This site also had the highest density estimates of any of the six sites with 28,765/m2 (Table 1). Species of chironomids including *Rheotanytarsus sp*. (24.5%) and *Tanytarsus spp*. (17.7%) were the most abundant followed by the mayfly *Baetis intercalaris* (13.0%). The high numbers of individuals belonging to a few species contributed to the low diversity values (2.66) at this site. There were 18 EPT species at this location as with the Big South Fork River site, which was less than the number of EPT species found at the other four locations. The Biotic Index value (5.87) was high because of the high number of fairly tolerant individuals. The Biotic Index value is considered indicative of "Fair " water quality with fairly significant organic pollution.

Little South Fork River Mile 5.2 (3WOL10035) had a minimum of 51 species, including 19 EPT species, in all the Hess samples taken. This site had the third highest density estimates (6,138/m^2) of the six locations. No species was dominant in the fauna, but the snail *Elimia sp*. (15.0%), the caddisfly *Chimarra sp.* (13.9%), the midge *Rheotanytarsus sp*. (10.7%) and the mayflies *Stenonema sp*. (11.0%) and *Isonychia sp*. (10.7%) were all abundant (Table 1). The Biotic Index value (4.17) is considered representative of "Very Good" water quality with possibly slight organic pollution.

Rockcastle River Mile 24.4 (3WOL10036) had the second highest number of total species (56) and EPT species (23). Density (~2,616/m^2) was second lowest of the six sites. Two species were dominant in the fauna at this site, the mayfly *Stenonema spp*. (26.2%) and the net-spinning caddisfly *Cheumatopsyche spp*. (17.4%). The Biotic Index value (5.0) calculated for the fauna of Rockcastle River Mile 24.4 is representative of a fauna existing under "Good" water quality conditions with some organic pollution.

Buck Creek Mile 12.4 (3WOL10037) had a minimum of 47 benthic macroinvertebrate species and 20 EPT species. Population densities were high at this site with an estimated 26,852/m^2 (Table 1). This site had an abundance of *Cheumatopsyche spp*. (20.0%), *Isonychia sp*. (14.4%) and *Rheotanytarsus sp*. (13.9%). The net-spinning caddisfly *Hydropsyche sp*. (9.1%) and the mayflies *Caenis spp.* (9.0%) and *Stenonema spp*. (7.0%) were also common at this location. The Biotic Index value (5.03) calculated for this site is considered indicative of "Good" water quality with some organic pollution.

Bark Camp Creek Mile 2.0 (3WOL10023) had 54 species total and 25 EPT species (Table). The population densities were lowest at this location with an estimate of 1,295 individuals/m^2. The mayfly *Stenonema spp.* (29.8%) was the most abundant followed by the caddisfly *Psychomyia flavida* (7.9%) and the water penny *Psephenus herricki* (4.9%). The value of diversity for this location was high (3.14). The Biotic Index value 3.68 is indicative of a fauna existing under "Very Good" water quality with possibly slight organic pollution.

The Big South Fork River Mile 45.0 (3WOL10029) site had the fewest total species (44) and EPT species (18) (Table 1). Density estimates of the various populations were approximately 3,289/m^2. The caddisfly *Chimarra sp*. (20.4%), the clam *Corbicula fluminea* (15.7%), the mayfly *Stenonema sp*. (14.2%) and the midge *Rheotanytarsus sp*. (11.8%) were the

most common species at this site. The Biotic Index value (4.39) for this location is indicative of "Very good" water quality conditions with possibly slight organic pollution.

Statistical comparisons of the six sites in the Wolf Creek drainage using mean number of individuals/Hess sample (Table 3) found Beaver Creek Mile 21.3 and Buck Creek Mile 12.4 equivalent with both significantly greater than the other four locations. A comparison of the sites using mean number of species/Hess sample (Table 4) found no significant differences between the six sites at the 0.05 confidence level.

A comparison of the six sites using percent dissimilarity (species shared including a density component) is presented in Figure 3. Big South Fork River Mile 45.0 and Little South Fork River Mile 5.2 are the most similar and cluster first. Rockcastle River Mile 24.4 and Bark Camp Creek Mile 2.0 formed secondary clusters. Buck Creek Mile 12.4 and Beaver Creek Mile 21.3 formed a separate distinct cluster.

A similar comparison using only species shared (Jaccards Coefficient) is presented in Figure 4. In terms of species shared, Buck Creek Mile 12.4 and Rockcastle River Mile 24.4 clustered first followed by Little South Fork Mile 5.2, Big South Fork Mile 45.0, Beaver Creek Mile 21.3 and last, Bark Camp Creek Mile 2.0.

TABLE 1. SUMMARY OF BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.								
SPECIES	T.V.**	F.F.G.***	BEAVER CREEK		LITTLE SO. FORK		ROCKCASTLE	
			MILE 21.3		MILE 5.2		RIVER MILE 24.4	
			3WOL10040		3WOL10035		3WOL10036	
			TOTAL	DENSITY	TOTAL	DENSITY	TOTAL	DENSITY
				No./m^2		No./m^2		No./m^2
MOLLUSCA								
Bivalvia								
Veneroida								
Corbiculidae								
Corbicula fluminea	**6.12**	**FC**			1	2.78	82	227.96
Gastropoda								
Basommatophora								
Ancylidae								
Ferrissia rivularis	**6.55**	**SC**					3	8.34
Lymnaeidae								
Fossaria sp.	***7**	**SC**	1	2.78				
Mesogastropoda								
Pleuroceridae								
Elimia sp.	**2.46**	**SC**	292	811.76	332	922.96	25	69.50
Elimia laqueata	**2.46**	**SC**	22	61.16				
Lithasia sp.								
ANNELIDA								
Oligochaeta								
Haplotaxida								
Lumbricidae			2	5.56				
Naididae	***8**	**CG**	10	27.80				
Nais sp.	**8.88**	**CG**	1	2.78				
Tubificidae w.h.c.	**7.11**	**CG**						
Lumbriculida								
Lumbriculidae	**7.03**	**CG**			6	16.68	4	11.12
Hirudinea	***8**	**P**					1	2.78
ARTHROPODA								
Arachnoida								
Acariformes								
Hygrobatidae								
Atractides sp.	**5.53**		20	55.60				
Crustacea								
Isopoda								
Asellidae								
Caecidotea sp.	**9.11**	**CG**	2	5.56				
Lirceus sp.	**7.85**	**CG**	10	27.80				
Crangonyctidae								
Crangonyx sp.	**7.87**	**CG**			3	8.34		
Decapoda								
Cambaridae							1	2.78
Orconectes sp.	**2.6**	**SH**					1	2.78
Gammaridae								
Gammarus sp.	**9.1**	**SH**	2	5.56				

TABLE 1. SUMMARY OF BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.								
SPECIES	T.V.**	F.F.G.***	BEAVER CREEK		LITTLE SO. FORK		ROCKCASTLE	
			MILE 21.3		MILE 5.2		RIVER MILE 24.4	
			3WOL10040		3WOL10035		3WOL10036	
			TOTAL	DENSITY	TOTAL	DENSITY	TOTAL	DENSITY
				No./m²		No./m²		No./m²
Insecta								
Ephemeroptera								
Baetidae			150	417.00	3	8.34	3	8.34
Acentrella ampla	**3.61**	**CG**			46	127.88	2	5.56
Baetis sp.	***4**	**CG**	66	183.48				
Baetis intercalaris	**4.99**	**CG**	1346	3741.88	3	8.34	37	102.86
Centroptilum sp.	**6.6**	**CG**	10	27.80				
Labiobaetis sp.	***4**	**CG**					1	2.78
Baetiscidae								
Baetisca sp.	**3.4**	**CG**						
Caenidae								
Caenis sp.	**7.41**	**CG**	1	2.78	188	522.64	71	197.38
Ephemeridae								
Hexagenia sp.	**4.9**	**CG**						
Heptageniidae							31	86.18
Epeorus sp.	**1.27**	**SC**						
Heptagenia sp.	**2.57**	**SC**						
Stenacron interpunctatum	**6.87**	**SC**	7	19.46	2	5.56	24	66.72
Stenonema sp.	***4**	**SC**	11	30.58	244	678.32	247	686.66
Stenonema mediopunctatum	**3.77**	**SC**					2	5.56
Isonychiidae								
Isonychia sp.	**3.45**	**FC**	10	27.80	237	658.86	55	152.90
Leptophlebiidae	***2**	**CG**						
Paraleptophlebia sp.	**0.94**	**CG**						
Tricorythidae	***4**	**CG**						
Tricorythodes sp.	**5.06**	**CG**	10	27.80	4	11.12	1	2.78
Odonata								
Coenagrionidae	***9**	**P**			1	2.78		
Argia sp.	**8.17**	**P**	10	27.80	21	58.38	11	30.58
Calopterygidae	***5**	**P**						
Calopteryx sp.	**7.78**	**P**			1	2.78		
Gomphidae	***1**	**P**					2	5.56
Stylogomphus albistylus	**4.72**	**P**						
Plecoptera								
Leuctridae								
Leuctra sp.	**0.67**	**SH**						
Perlidae								
Acroneuria abnormis	**2.06**	**P**			1	2.78		
Neoperla sp.	**1.49**	**P**						
Perlodidae	***2**	**P**						
Hemiptera								
Gerridae		**P**						
Metrobates sp.					1	2.78		
Veliidae								

TABLE 1. SUMMARY OF BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.								
SPECIES	**T.V.****	**F.F.G.*****	**BEAVER CREEK**		**LITTLE SO. FORK**		**ROCKCASTLE**	
			MILE 21.3		**MILE 5.2**		**RIVER MILE 24.4**	
			3WOL10040		**3WOL10035**		**3WOL10036**	
			TOTAL	**DENSITY**	**TOTAL**	**DENSITY**	**TOTAL**	**DENSITY**
				No./m²		**No./m²**		**No./m²**
Rhagovelia obesa								
Megaloptera								
Corydalidae								
Corydalus cornutus	**5.16**	**P**			22	61.16	6	16.68
Nigronia serricornis	**4.95**	**P**	1	2.78	1	2.78	1	2.78
Trichoptera					5	13.90		
Glossosomatidae								
Protoptila sp.	**2.55**	**SC**					19	52.82
Helicopsychidae								
Helicopsyche borealis	**0**	**SC**	30	83.40				
Hydropsychidae	***4**	**FC**	61	169.58	9	25.02	9	25.02
Ceratopsyche sp.	***4**	**FC**	1	2.78	2	5.56		
Ceratopsyche morosa	**2.63**	**FC**	30	83.40			2	5.56
Cheumatopsyche sp.	**6.22**	**FC**	183	508.74	97	269.66	164	455.92
Hydropsyche sp.	***5**	**FC**	23	63.94	64	177.92	4	11.12
Hydropsyche betteni gp.	**7.78**	**FC**	3	8.34				
Macrostemum sp.	**3.52**	**FC**					3	8.34
Macrostemum carolina	**3.52**	**FC**					20	55.60
Parapsyche sp.	**0**	**FC**						
Hydroptilidae			90	250.20				
Hydroptila sp.	**6.22**	**FC**	389	1081.42	4	11.12		
Leptoceridae								
Oecetis sp.	**4.7**	**P**			1	2.78	2	5.56
Limnephilidae								
Neophylax sp.	**2.2**						1	2.78
Philopotamidae					5	13.90		
Chimarra sp.	**2.76**	**FC**			35	97.30		
Chimarra aterrima	**2.76**	**FC**						
Chimarra obscurus	**2.76**	**FC**			307	853.46	3	8.34
Polycentropodidae	***6**	**FC**						
Neureclipsis sp.	**4.19**	**FC**					3	8.34
Polycentropus sp.	**3.53**	**FC**						
Psychomyiidae								
Psychomyia sp.	***2**	**CG**					3	8.34
Psychomyia flavida	**2.91**	**CG**						
Rhyacophilidae	**0**	**P**						
Rhyacophila sp.	***1**	**P**						
Lepidoptera								
Pyralidae								
Petrophila sp.	**2.09**	**SC**	1	2.78	6	16.68	1	2.78
Coleoptera								
Dryopidae	***5**				1	2.78		
Elmidae					15	41.70		
Dubiraphia sp.	**5.93**	**SC**			2	5.56		
Macronychus glabratus	**4.58**	**SH**					2	5.56

TABLE 1. SUMMARY OF BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.								
SPECIES	**T.V.****	**F.F.G.*****	**BEAVER CREEK**		**LITTLE SO. FORK**		**ROCKCASTLE**	
			MILE 21.3		**MILE 5.2**		**RIVER MILE 24.4**	
			3WOL10040		**3WOL10035**		**3WOL10036**	
			TOTAL	**DENSITY**	**TOTAL**	**DENSITY**	**TOTAL**	**DENSITY**
				No./m²		**No./m²**		**No./m²**
Microcylloepus pusillus	**2.11**	**CG**			139	386.42		
Optioservus sp.	**2.36**	**SC**	230	639.40			1	2.78
Optioservus ovalis	**2.36**	**CG**	1	2.78				
Oulimnius latiusculus	**1.78**	**CG**						
Optioservus trivittatus	**2.36**	**SC**					1	2.78
Promoresia sp.	***2**	**SC**						
Promoresia elegans	***2**	**SC**						
Stenelmis sp.	**5.1**	**SC**	1	2.78	12	33.36	1	2.78
Limnichidae								
Lutrochus sp.		**SC**			7	19.46		
Psephenidae								
Ectopria sp.	**4.16**	**SC**	1	2.78				
Psephenus herricki	**2.35**	**SC**	6	16.68	4	11.12	32	88.96
Scirtidae								
Diptera								
Chironomidae			522	1451.16	8	22.24	3	8.34
Ablabesmyia mallochi	**7.19**	**P**	153	425.34	1	2.78	1	2.78
Cardiocladius obscurus	**5.87**	**P**					1	2.78
Chironomus sp.	**9.63**	**CG**	22	61.16				
Conchapelopia sp.	**8.42**	**P**						
Corynoneura sp.	**6.01**	**CG**					1	2.78
Cricotopus sp.	***7**	**CG**	419	1164.82	7	19.46	1	2.78
Cricotopus tremulus	***7**	**CG**	2	5.56	2	5.56		
Cricotopus trifascia	**2.84**	**SH**	32	88.96	6	16.68		
Cryptochironomus fulvus	**6.38**	**P**	163	453.14				
Diamesa sp.	**8.12**	**CG**					1	2.78
Dicrotendipes sp.	**8.1**	**CG**	380	1056.40				
Eukiefferiella devonica gp.	**2.59**	**CG**						
Microtendipes sp.	**5.53**	**CG**	243	675.54				
Nanocladius sp.	**7.07**	**CG**						
Orthocladius sp.	***4**	**CG**	43	119.54				
Parachaetocladius sp.	**0**	**CG**						
Phaenopsectra sp.	**6.5**	**SC**	195	542.10				
Polypedilum convictum	**4.93**	**SH**	338	939.64	65	180.70	8	22.24
Polypedilum fallax	**6.39**	**SH**	16	44.48				
Polypedilum halterale	**7.31**	**SH**	18	50.04				
Polypedilum illinoense	**9**	**SH**					5	13.90
Psectrocladius sp.	**3.59**	**SH**						
Rheotanytarsus sp.	**5.89**	**FC**	2539	7058.42	225	625.50	26	72.28
Stempellina sp.	**0**	**CG**						
Stenochironomus sp.	**6.45**	**SH**			5	13.90		
Tanytarsus sp.	**6.76**	**FC**	1833	5095.74	23	63.94	3	8.34
Thienemanniella xena	**5.86**	**CG**	18	50.04			1	2.78
Thienemannimyia gp.	**8.42**	**P**	213	592.14	2	5.56	2	5.56
Tvetenia bavarica gp.	**3.65**	**CG**	44	122.32			1	2.78

TABLE 1. SUMMARY OF BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.								
SPECIES	**T.V.****	**F.F.G.*****	**BEAVER CREEK**		**LITTLE SO. FORK**		**ROCKCASTLE**	
			MILE 21.3		**MILE 5.2**		**RIVER MILE 24.4**	
			3WOL10040		**3WOL10035**		**3WOL10036**	
			TOTAL	**DENSITY**	**TOTAL**	**DENSITY**	**TOTAL**	**DENSITY**
				No./m²		**No./m²**		**No./m²**
Tvetenia discoloripes gp.	**3.61**	**CG**			6	16.68		
Zavrelia sp.	**5.3**	**CG**	93	258.54	14	38.92		
Empididae								
Hemerodromia sp.	**7.57**	**P**	12	33.36	1	2.78	1	2.78
Simuliidae								
Simulium sp.	**4**	**FC**	11	30.58	11	30.58	3	8.34
Tanyderidae								
Protoplasa fitchii	**4.33**						1	2.78
Tipulidae								
Antocha sp.	**4.25**	**SH**	4	11.12				
Dicranota sp.	**0**	**P**						
Hexatoma sp.	**4.31**	**P**						
TOTAL NO. OF ORGANISMS			**10347**	**28764.66**	**2208**	**6138.24**	**941**	**2615.98**
TOTAL NO. OF TAXA			**59**		**51**		**56**	

TABLE 1. SUMMARY OF BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.								
SPECIES	T.V.**	F.F.G.***	BUCK CREEK		BARK CAMP		BIG SOUTH FORK	
			MILE 12.4		CREEK MILE 2.0		CUMB. RM 45.0	
			3WOL10037		3WOL10023		3WOL10029	
			TOTAL	DENSITY	TOTAL	DENSITY	TOTAL	DENSITY
				No./m²		No./m²		No./m²
MOLLUSCA								
Bivalvia								
Veneroida								
Corbiculidae								
Corbicula fluminea	**6.12**	**FC**	33	91.74			186	517.08
Gastropoda								
Basommatophora								
Ancylidae								
Ferrissia rivularis	**6.55**	**SC**						
Lymnaeidae								
Fossaria sp.	***7**	**SC**						
Mesogastropoda								
Pleuroceridae								
Elimia sp.	**2.46**	**SC**	2	5.56			2	5.56
Elimia laqueata	**2.46**	**SC**						
Lithasia sp.							2	5.56
ANNELIDA								
Oligochaeta								
Haplotaxida								
Lumbricidae			10	27.80			1	2.78
Naididae	***8**	**CG**						
Nais sp.	**8.88**	**CG**						
Tubificidae w.h.c.	**7.11**	**CG**			1	2.78		
Lumbriculida								
Lumbriculidae	**7.03**	**CG**						
Hirudinea	***8**	**P**						
ARTHROPODA								
Arachnoida								
Acariformes								
Hygrobatidae								
Atractides sp.	**5.53**							
Crustacea								
Isopoda								
Asellidae								
Caecidotea sp.	**9.11**	**CG**						
Lirceus sp.	**7.85**	**CG**						
Crangonyctidae								
Crangonyx sp.	**7.87**	**CG**						
Decapoda								
Cambaridae								
Orconectes sp.	**2.6**	**SH**	1	2.78				
Gammaridae								
Gammarus sp.	**9.1**	**SH**						

TABLE 1. SUMMARY OF BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.								
SPECIES	T.V.**	F.F.G.***	BUCK CREEK		BARK CAMP		BIG SOUTH FORK	
			MILE 12.4		CREEK MILE 2.0		CUMB. RM 45.0	
			3WOL10037		3WOL10023		3WOL10029	
			TOTAL	DENSITY	TOTAL	DENSITY	TOTAL	DENSITY
				No./m^2		No./m^2		No./m^2
Insecta								
Ephemeroptera								
Baetidae					1	2.78		
Acentrella ampla	**3.61**	**CG**			1	2.78	40	111.20
Baetis sp.	***4**	**CG**	102	283.56	15	41.70	2	5.56
Baetis intercalaris	**4.99**	**CG**	35	97.30	2	5.56	6	16.68
Centroptilum sp.	**6.6**	**CG**	10	27.80				
Labiobaetis sp.	***4**	**CG**						
Baetiscidae								
Baetisca sp.	**3.4**	**CG**			1	2.78		
Caenidae								
Caenis sp.	**7.41**	**CG**	865	2404.70	1	2.78	1	2.78
Ephemeridae								
Hexagenia sp.	**4.9**	**CG**	5	13.90				
Heptageniidae			10	27.80	14	38.92	3	8.34
Epeorus sp.	**1.27**	**SC**			4	11.12		
Heptagenia sp.	**2.57**	**SC**			1	2.78		
Stenacron interpunctatum	**6.87**	**SC**	2	5.56	2	5.56		
Stenonema sp.	***4**	**SC**	675	1876.50	139	386.42	168	467.04
Stenonema mediopunctatum	**3.77**	**SC**						
Isonychiidae								
Isonychia sp.	**3.45**	**FC**	1389	3861.42	9	25.02	96	266.88
Leptophlebiidae	***2**	**CG**			13	36.14		
Paraleptophlebia sp.	**0.94**	**CG**			16	44.48		
Tricorythidae	***4**	**CG**						
Tricorythodes sp.	**5.06**	**CG**	10	27.80			1	2.78
Odonata								
Coenagrionidae	***9**	**P**	5	13.90			1	2.78
Argia sp.	**8.17**	**P**	40	111.20			2	5.56
Calopterygidae	***5**	**P**						
Calopteryx sp.	**7.78**	**P**						
Gomphidae	***1**	**P**			1	2.78		
Stylogomphus albistylus	**4.72**	**P**			2	5.56		
Plecoptera								
Leuctridae								
Leuctra sp.	**0.67**	**SH**			1	2.78		
Perlidae								
Acroneuria abnormis	**2.06**	**P**			3	8.34		
Neoperla sp.	**1.49**	**P**	10	27.80				
Perlodidae	***2**	**P**			11	30.58		
Hemiptera								
Gerridae		**P**						
Metrobates sp.								
Veliidae					2	5.56		

TABLE 1. SUMMARY OF BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.								
SPECIES	T.V.**	F.F.G.***	BUCK CREEK		BARK CAMP		BIG SOUTH FORK	
			MILE 12.4		CREEK MILE 2.0		CUMB. RM 45.0	
			3WOL10037		3WOL10023		3WOL10029	
			TOTAL	DENSITY	TOTAL	DENSITY	TOTAL	DENSITY
				No./m^2		No./m^2		No./m^2
Rhagovelia obesa					3	8.34		
Megaloptera								
Corydalidae								
Corydalus cornutus	**5.16**	**P**	9	25.02			13	36.14
Nigronia serricornis	**4.95**	**P**			6	16.68		
Trichoptera								
Glossosomatidae								
Protoptila sp.	**2.55**	**SC**	5	13.90				
Helicopsychidae								
Helicopsyche borealis	**0**	**SC**						
Hydropsychidae	***4**	**FC**	315	875.70	1	2.78	6	16.68
Ceratopsyche sp.	***4**	**FC**						
Ceratopsyche morosa	**2.63**	**FC**	355	986.90	1	2.78		
Cheumatopsyche sp.	**6.22**	**FC**	1929	5362.62	21	58.38	88	244.64
Hydropsyche sp.	***5**	**FC**	876	2435.28	1	2.78	36	100.08
Hydropsyche betteni gp.	**7.78**	**FC**						
Macrostemum sp.	**3.52**	**FC**	293	814.54				
Macrostemum carolina	**3.52**	**FC**	137	380.86			29	80.62
Parapsyche sp.	**0**	**FC**					1	2.78
Hydroptilidae								
Hydroptila sp.	**6.22**	**FC**						
Leptoceridae								
Oecetis sp.	**4.7**	**P**						
Limnephilidae								
Neophylax sp.	**2.2**							
Philopotamidae							1	2.78
Chimarra sp.	**2.76**	**FC**	10	27.80				
Chimarra aterrima	**2.76**	**FC**			5	13.90	106	294.68
Chimarra obscurus	**2.76**	**FC**	257	714.46			135	375.30
Polycentropodidae	***6**	**FC**						
Neureclipsis sp.	**4.19**	**FC**						
Polycentropus sp.	**3.53**	**FC**			12	33.36	1	2.78
Psychomyiidae								
Psychomyia sp.	***2**	**CG**						
Psychomyia flavida	**2.91**	**CG**			37	102.86		
Rhyacophilidae	**0**	**P**						
Rhyacophila sp.	***1**	**P**			5	13.90	1	2.78
Lepidoptera								
Pyralidae								
Petrophila sp.	**2.09**	**SC**	5	13.90				
Coleoptera								
Dryopidae	***5**							
Elmidae			40	111.20				
Dubiraphia sp.	**5.93**	**SC**						
Macronychus glabratus	**4.58**	**SH**						

TABLE 1. SUMMARY OF BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.								
SPECIES	**T.V.****	**F.F.G.*****	**BUCK CREEK**		**BARK CAMP**		**BIG SOUTH FORK**	
			MILE 12.4		**CREEK MILE 2.0**		**CUMB. RM 45.0**	
			3WOL10037		**3WOL10023**		**3WOL10029**	
			TOTAL	**DENSITY**	**TOTAL**	**DENSITY**	**TOTAL**	**DENSITY**
				No./m²		**No./m²**		**No./m²**
Microcylloepus pusillus	**2.11**	**CG**	25	69.50			61	169.58
Optioservus sp.	**2.36**	**SC**	60	166.80			2	5.56
Optioservus ovalis	**2.36**	**CG**						
Oulimnius latiusculus	**1.78**	**CG**			4	11.12		
Optioservus trivittatus	**2.36**	**SC**	5	13.90				
Promoresia sp.	***2**	**SC**					2	5.56
Promoresia elegans	***2**	**SC**					2	5.56
Stenelmis sp.	**5.1**	**SC**	85	236.30	2	5.56	8	22.24
Limnichidae								
Lutrochus sp.		**SC**						
Psephenidae								
Ectopria sp.	**4.16**	**SC**			1	2.78		
Psephenus herricki	**2.35**	**SC**	65	180.70	23	63.94		
Scirtidae					1	2.78		
Diptera							1	2.78
Chironomidae			40	111.20	9	25.02		
Ablabesmyia mallochi	**7.19**	**P**	10	27.80				
Cardiocladius obscurus	**5.87**	**P**	11	30.58			14	38.92
Chironomus sp.	**9.63**	**CG**						
Conchapelopia sp.	**8.42**	**P**					1	2.78
Corynoneura sp.	**6.01**	**CG**			1	2.78		
Cricotopus sp.	***7**	**CG**			4	11.12		
Cricotopus tremulus	***7**	**CG**	11	30.58				
Cricotopus trifascia	**2.84**	**SH**						
Cryptochironomus fulvus	**6.38**	**P**						
Diamesa sp.	**8.12**	**CG**						
Dicrotendipes sp.	**8.1**	**CG**						
Eukiefferiella devonica gp.	**2.59**	**CG**			4	11.12	2	5.56
Microtendipes sp.	**5.53**	**CG**			7	19.46		
Nanocladius sp.	**7.07**	**CG**	5	13.90	2	5.56		
Orthocladius sp.	***4**	**CG**			4	11.12		
Parachaetocladius sp.	**0**	**CG**			3	8.34		
Phaenopsectra sp.	**6.5**	**SC**						
Polypedilum convictum	**4.93**	**SH**	331	920.18	5	13.90	1	2.78
Polypedilum fallax	**6.39**	**SH**						
Polypedilum halterale	**7.31**	**SH**						
Polypedilum illinoense	**9**	**SH**						
Psectrocladius sp.	**3.59**	**SH**					1	2.78
Rheotanytarsus sp.	**5.89**	**FC**	1343	3733.54	13	36.14	140	389.20
Stempellina sp.	**0**	**CG**			11	30.58		
Stenochironomus sp.	**6.45**	**SH**	5	13.90				
Tanytarsus sp.	**6.76**	**FC**	74	205.72	5	13.90	2	5.56
Thienemanniella xena	**5.86**	**CG**	107	297.46	2	5.56		
Thienemannimyia gp.	**8.42**	**P**	5	13.90	2	5.56		
Tvetenia bavarica gp.	**3.65**	**CG**	32	88.96			1	2.78

TABLE 1. SUMMARY OF BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.								
SPECIES	**T.V.****	**F.F.G.*****	**BUCK CREEK**		**BARK CAMP**		**BIG SOUTH FORK**	
			MILE 12.4		**CREEK MILE 2.0**		**CUMB. RM 45.0**	
			3WOL10037		**3WOL10023**		**3WOL10029**	
			TOTAL	**DENSITY**	**TOTAL**	**DENSITY**	**TOTAL**	**DENSITY**
				No./m²		**No./m²**		**No./m²**
Tvetenia discoloripes gp.	**3.61**	**CG**					3	8.34
Zavrelia sp.	**5.3**	**CG**			5	13.90		
Empididae							1	2.78
Hemerodromia sp.	**7.57**	**P**					1	2.78
Simuliidae								
Simulium sp.	**4**	**FC**					10	27.80
Tanyderidae								
Protoplasa fitchii	**4.33**							
Tipulidae								
Antocha sp.	**4.25**	**SH**	10	27.80	20	55.60	2	5.56
Dicranota sp.	**0**	**P**			1	2.78		
Hexatoma sp.	**4.31**	**P**			5	13.90		
TOTAL NO. OF ORGANISMS			**9659**	**26852.02**	**466**	**1295.48**	**1183**	**3288.74**
TOTAL NO. OF TAXA			**47**		**54**		**44**	

*Hilsenhoff Tolerance Values used when North Carolina Tolerance Values not available.

**North Carolina Tolerance Values range from 0 for organisms very intolerant of organic wastes to 10 for organisms very tolerant of organic wastes.

***F.F.G.- Functional Feeding Group: SH=Shredder, CG=Collector/Gatherer, FC=Filtering Collector, SC=Scraper, P=Predator and PI=Piercer

TABLE 2. SUMMARY OF RBPIII METRICS FOR WOLF CREEK RESERVOIR PROJECT, FALL 1998.						
METRIC	**Beaver Creek**	**Little So. Fork**	**Rockcastle**	**Buck Creek**	**Bark Camp**	**Big So. Fork**
	Mile 21.3	**Mile 5.2**	**River Mile 24.4**	**Mile 12.4**	**Creek Mile 2.0**	**Cumb. RM 45.0**
	3WOL10040	**3WOL10035**	**3WOL10036**	**3WOL10037**	**3WOL10023**	**3WOL10029**
Taxa richness	59	51	56	47	54	44
Biotic Index	5.87	4.17	5.00	5.03	3.68	4.39
Ratio of Scrapers/Filt. Collectors	0.16	0.60	0.94	0.13	2.53	0.22
Ratio of EPT/Chironomidae abundance	0.33	3.45	13.09	3.69	4.12	4.37
Percent Contribution of Dominant Taxon	24.54%	15.04%	26.25%	19.97%	29.83%	15.72%
EPT Index	18	19	23	20	25	18
Shannon Diversity (H')	2.662	2.72	2.679	2.605	3.138	2.604
Pielou Evenness (J')	0.653	0.692	0.666	0.677	0.762	0.688

TABLE 3. STATISTICAL ANALYSES OF SAMPLING EFFICIENCY AND COMPARISON OF THE STATIONS USING MEAN NUMBER OF ORGANISMS, WOLF CREEK RESERVOIR PROJECT, FALL 1998.					
STATION	**NO. OF SAMPLES**	**MEAN NO. OF ORGANISMS**	**STANDARD DEVIATION**	**STANDARD ERROR OF THE MEAN**	**PRECISION OF SAMPLING MEAN**
Beaver Creek Mile 21.3 3WOL10040	4	2586.8	1519.07	759.54	29.4%
Little South Fork Mile 5.2 3WOL10035	4	552.0	572.42	286.21	51.8%
Rockcastle River Mile 24.4 3WOL10036	4	235.3	49.61	24.80	10.5%
Buck Creek Mile 12.4 3WOL10037	4	2414.8	1575.14	787.57	32.6%
Bark Camp Creek Mile 2.0 3WOL10023	4	116.5	44.17	22.09	19.0%
Big South Fork Cumberland River Mile 45.0 3WOL10029	4	295.8	105.92	52.96	17.9%

Calculated F= 6.15

Beaver Creek Mile 21.3	Buck Creek Mile 12.4	Little South Fork Mile 5.2	Big South Fork Cumberland River Mile 45.0	Rockcastle River Mile 24.4	Bark Camp Creek Mile 2.0
2586.8	2414.8	552.0	295.8	235.3	116.5

* Stations underlined are statistically comparable at a 0.05 confidence level.

TABLE 4. STATISTICAL ANALYSES OF SAMPLING EFFICIENCY AND COMPARISON OF THE STATIONS USING MEAN NUMBER OF SPECIES, WOLF CREEK RESERVOIR PROJECT, FALL 1998.					
STATION	**NO. OF SAMPLES**	**MEAN NO. OF SPECIES**	**STANDARD DEVIATION**	**STANDARD ERROR OF THE MEAN**	**PRECISION OF SAMPLING MEAN**
Beaver Creek Mile 21.3 3WOL10040	4	28.8	3.30	1.65	5.7%
Little south Fork Mile 5.2 3WOL10035	4	24.8	5.97	2.98	12.0%
Rockcastle River Mile 24.4 3WOL10036	4	25.5	5.45	2.72	10.7%
Buck Creek Mile 12.4 3WOL10037	4	25.8	4.57	2.29	8.9%
Bark Camp Creek Mile 2.0 3WOL10023	4	27.3	8.5	4.25	15.6%
Big South Fork Cumberland River Mile 45.0 3WOL10029	4	22.8	3.30	1.65	7.2%

Calculated F = 0.57

Beaver Creek Mile 21.3	Bark Camp Creek Mile 2.0	Buck Creek Mile 12.4	Rockcastle River Mile 24.4	Little South Fork Mile 5.2	Big South Fork Cumberland River Mile 45.0
28.1	27.3	25.8	25.5	24.8	22.8

* Stations underlined are statistically comparable at a 0.05 confidence level.

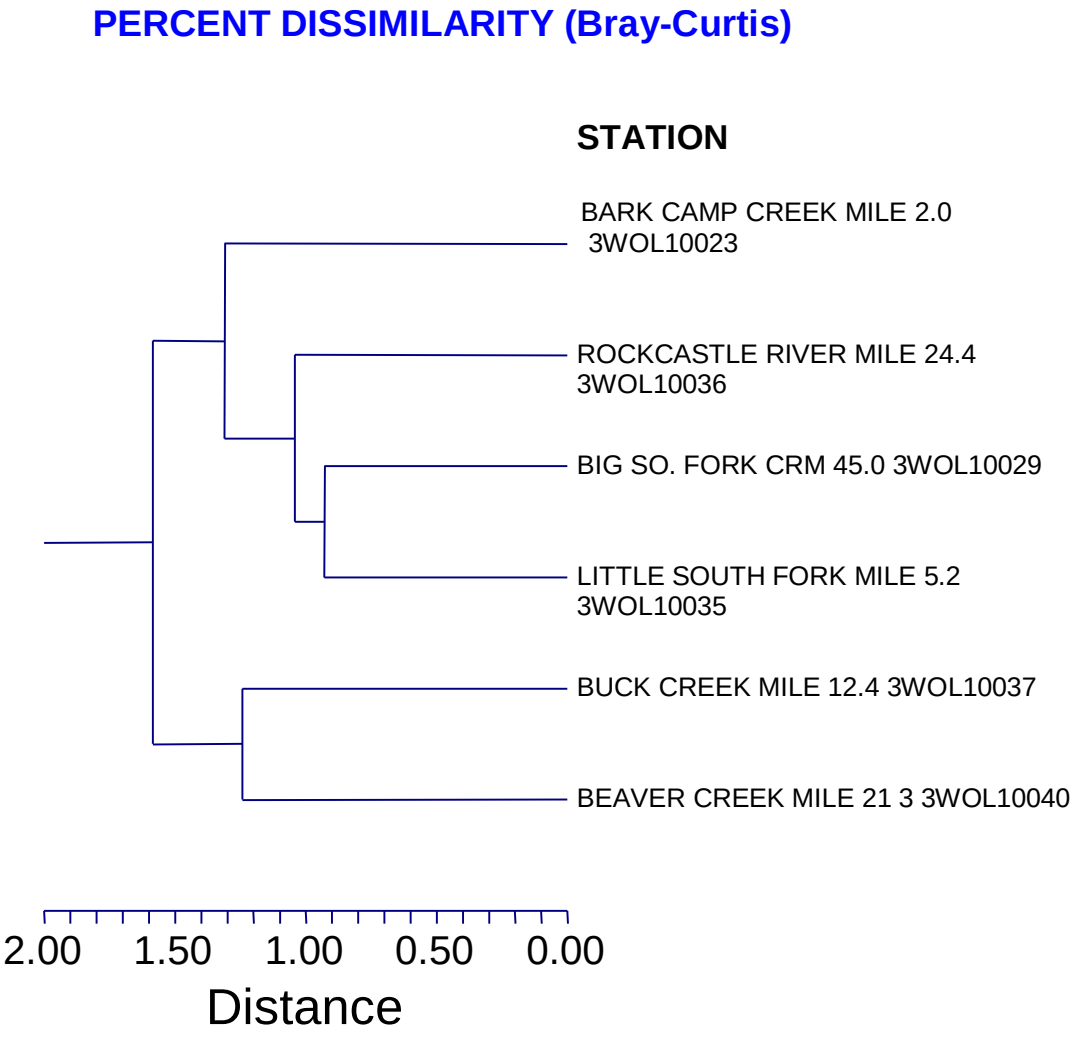


Figure 3. Percent Dissimilarity (Bray-Curtis) Cluster Analysis, Wolf Creek Reservoir Project, September 1998.

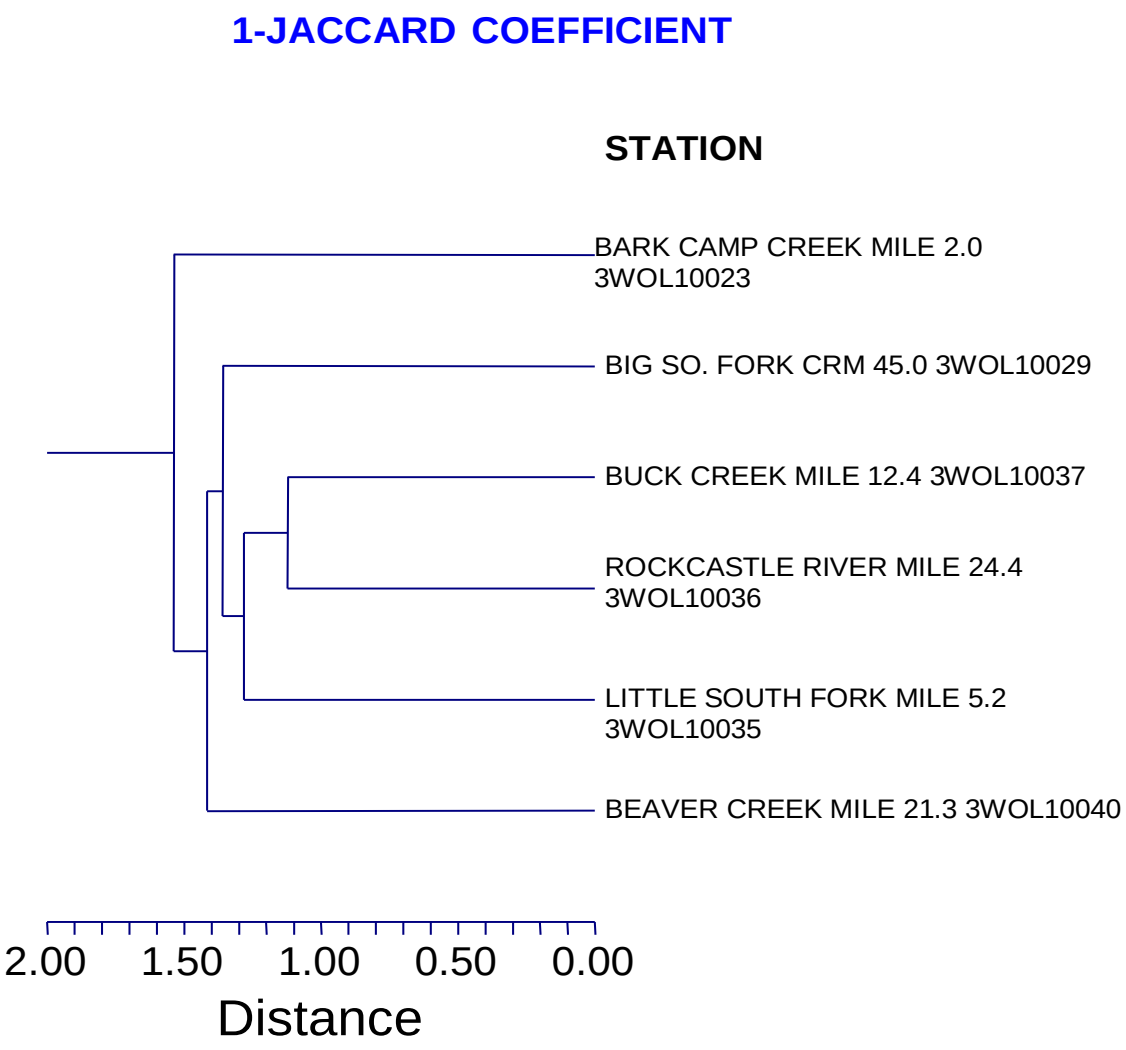


Figure 4. 1-Jaccard's Coefficient Cluster Analysis, Wolf Creek Reservoir Project, September 1998.

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APPENDIX

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BEAVER CREEK MILE 21.3				
			3WOL10040				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
MOLLUSCA							
Bivalvia							
Veneroida							
Corbiculidae							
Corbicula fluminea	**6.12**	**FC**					
Gastropoda							
Basommatophora							
Ancylidae							
Ferrissia rivularis	**6.55**	**SC**					
Lymnaeidae							
Fossaria sp.	***7**	**SC**			1		1
Mesogastropoda							
Pleuroceridae							
Elimia sp.	**2.46**	**SC**	120	122	40	10	292
Elimia laqueata	**2.46**	**SC**	2	1	18	1	22
Lithasia sp.							
ANNELIDA							
Oligochaeta							
Haplotaxida							
Lumbricidae			2				2
Naididae	***8**	**CG**			10		10
Nais sp.	**8.88**	**CG**	1				1
Tubificidae w.h.c.	**7.11**	**CG**					
Lumbriculida							
Lumbriculidae	**7.03**	**CG**					
Hirudinea	***8**	**P**					
ARTHROPODA							
Arachnoida							
Acariformes							
Hygrobatidae							
Atractides sp.	**5.53**		10		10		20
Crustacea							
Isopoda							
Asellidae							
Caecidotea sp.	**9.11**	**CG**				2	2
Lirceus sp.	**7.85**	**CG**		10			10
Crangonyctidae							
Crangonyx sp.	**7.87**	**CG**					
Decapoda							
Cambaridae							
Orconectes sp.	**2.6**	**SH**					
Gammaridae							
Gammarus sp.	**9.1**	**SH**				2	2
Insecta							
Ephemeroptera							

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BEAVER CREEK MILE 21.3				
			3WOL10040				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Baetidae			140			10	150
Acentrella ampla	**3.61**	**CG**					
Baetis sp.	***4**	**CG**				66	66
Baetis intercalaris	**4.99**	**CG**	383	281	682		1346
Centroptilum sp.	**6.6**	**CG**			10		10
Labiobaetis sp.	***4**	**CG**					
Baetiscidae							
Baetisca sp.	**3.4**	**CG**					
Caenidae							
Caenis sp.	**7.41**	**CG**	1				1
Ephemeridae							
Hexagenia sp.	**4.9**	**CG**					
Heptageniidae							
Epeorus sp.	**1.27**	**SC**					
Heptagenia sp.	**2.57**	**SC**					
Stenacron interpunctatum	**6.87**	**SC**				7	7
Stenonema sp.	***4**	**SC**	1	10			11
Stenonema mediopunctatum	**3.77**	**SC**					
Isonychiidae							
Isonychia sp.	**3.45**	**FC**		10			10
Leptophlebiidae	***2**	**CG**					
Paraleptophlebia sp.	**0.94**	**CG**					
Tricorythidae	***4**	**CG**					
Tricorythodes sp.	**5.06**	**CG**			10		10
Odonata							
Coenagrionidae	***9**	**P**					
Argia sp.	**8.17**	**P**		10			10
Calopterygidae	***5**	**P**					
Calopteryx sp.	**7.78**	**P**					
Gomphidae	***1**	**P**					
Stylogomphus albistylus	**4.72**	**P**					
Plecoptera							
Leuctridae							
Leuctra sp.	**0.67**	**SH**					
Perlidae							
Acroneuria abnormis	**2.06**	**P**					
Neoperla sp.	**1.49**	**P**					
Perlodidae	***2**	**P**					
Hemiptera							
Gerridae		**P**					
Metrobates sp.							
Veliidae							
Rhagovelia obesa							
Megaloptera							
Corydalidae							
Corydalus cornutus	**5.16**	**P**					

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BEAVER CREEK MILE 21.3				
			3WOL10040				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Nigronia serricornis	**4.95**	**P**				1	1
Trichoptera							
Glossosomatidae							
Protoptila sp.	**2.55**	**SC**					
Helicopsychidae							
Helicopsyche borealis	**0**	**SC**	10	10	10		30
Hydropsychidae	***4**	**FC**	1	60			61
Ceratopsyche sp.	***4**	**FC**			1		1
Ceratopsyche morosa	**2.63**	**FC**		20	10		30
Cheumatopsyche sp.	**6.22**	**FC**		182	1		183
Hydropsyche sp.	***5**	**FC**		2	21		23
Hydropsyche betteni gp.	**7.78**	**FC**		1	2		3
Macrostemum sp.	**3.52**	**FC**					
Macrostemum carolina	**3.52**	**FC**					
Parapsyche sp.	**0**	**FC**					
Hydroptilidae				60	30		90
Hydroptila sp.	**6.22**	**FC**	270	33	41	45	389
Leptoceridae							
Oecetis sp.	**4.7**	**P**					
Limnephilidae							
Neophylax sp.	**2.2**						
Philopotamidae							
Chimarra sp.	**2.76**	**FC**					
Chimarra aterrima	**2.76**	**FC**					
Chimarra obscurus	**2.76**	**FC**					
Polycentropodidae	***6**	**FC**					
Neureclipsis sp.	**4.19**	**FC**					
Polycentropus sp.	**3.53**	**FC**					
Psychomyiidae							
Psychomyia sp.	***2**	**CG**					
Psychomyia flavida	**2.91**	**CG**					
Rhyacophilidae	**0**	**P**					
Rhyacophila sp.	***1**	**P**					
Lepidoptera							
Pyralidae							
Petrophila sp.	**2.09**	**SC**	1				1
Coleoptera							
Dryopidae	***5**						
Elmidae							
Dubiraphia sp.	**5.93**	**SC**					
Macronychus glabratus	**4.58**	**SH**					
Microcylloepus pusillus	**2.11**	**CG**					
Optioservus sp.	**2.36**	**SC**	230				230
Optioservus ovalis	**2.36**	**CG**		1			1
Oulimnius latiusculus	**1.78**	**CG**					
Optioservus trivittatus	**2.36**	**SC**					
Promoresia sp.	***2**	**SC**					

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BEAVER CREEK MILE 21.3				
			3WOL10040				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Promoresia elegans	***2**	**SC**					
Stenelmis sp.	**5.1**	**SC**		1			1
Limnichidae							
Lutrochus sp.		**SC**					
Psephenidae							
Ectopria sp.	**4.16**	**SC**		1			1
Psephenus herricki	**2.35**	**SC**		1		5	6
Scirtidae							
Diptera							
Chironomidae			110	141	250	21	522
Ablabesmyia mallochi	**7.19**	**P**	48	22	83		153
Cardiocladius obscurus	**5.87**	**P**					
Chironomus sp.	**9.63**	**CG**		22			22
Conchapelopia sp.	**8.42**	**P**					
Corynoneura sp.	**6.01**	**CG**					
Cricotopus sp.	***7**	**CG**	128	261		30	419
Cricotopus tremulus	***7**	**CG**				2	2
Cricotopus trifascia	**2.84**	**SH**	32				32
Cryptochironomus fulvus	**6.38**	**P**	80		83		163
Diamesa sp.	**8.12**	**CG**					
Dicrotendipes sp.	**8.1**	**CG**	96	22	248	14	380
Eukiefferiella devonica gp.	**2.59**	**CG**					
Microtendipes sp.	**5.53**	**CG**	48		193	2	243
Nanocladius sp.	**7.07**	**CG**					
Orthocladius sp.	***4**	**CG**		43			43
Parachaetocladius sp.	**0**	**CG**					
Phaenopsectra sp.	**6.5**	**SC**			193	2	195
Polypedilum convictum	**4.93**	**SH**	80	65	193		338
Polypedilum fallax	**6.39**	**SH**	16				16
Polypedilum halterale	**7.31**	**SH**	16			2	18
Polypedilum illinoense	**9**	**SH**					
Psectrocladius sp.	**3.59**	**SH**					
Rheotanytarsus sp.	**5.89**	**FC**	528	1042	911	58	2539
Stempellina sp.	**0**	**CG**					
Stenochironomus sp.	**6.45**	**SH**					
Tanytarsus sp.	**6.76**	**FC**	432	673	663	65	1833
Thienemanniella xena	**5.86**	**CG**	16			2	18
Thienemannimyia gp.	**8.42**	**P**	32	22	138	21	213
Tvetenia bavarica gp.	**3.65**	**CG**	16		28		44
Tvetenia discoloripes gp.	**3.61**	**CG**					
Zavrelia sp.	**5.3**	**CG**	32		28	33	93
Empididae							
Hemerodromia sp.	**7.57**	**P**		2	10		12
Simuliidae							
Simulium sp.	**4**	**FC**	10			1	11
Tanyderidae							
Protoplasa fitchii	**4.33**						

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	**T.V.****	**F.F.G.*****	**BEAVER CREEK MILE 21.3**				
			3WOL10040				
			HESS-1	**HESS-2**	**HESS-3**	**HESS-4**	**TOTAL**
Tipulidae							
Antocha sp.	**4.25**	**SH**		1		3	4
Dicranota sp.	**0**	**P**					
Hexatoma sp.	**4.31**	**P**					
TOTAL NO. OF ORGANISMS			**2892**	**3132**	**3918**	**405**	**10347**
TOTAL NO. OF TAXA			**31**	**31**	**29**	**24**	**59**

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	LITTLE SO. FORK MILE 5.2				
			3WOL10035				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
MOLLUSCA							
Bivalvia							
Veneroida							
Corbiculidae							
Corbicula fluminea	**6.12**	**FC**				1	1
Gastropoda							
Basommatophora							
Ancylidae							
Ferrissia rivularis	**6.55**	**SC**					
Lymnaeidae							
Fossaria sp.	***7**	**SC**					
Mesogastropoda							
Pleuroceridae							
Elimia sp.	**2.46**	**SC**	14	37	245	36	332
Elimia laqueata	**2.46**	**SC**					
Lithasia sp.							
ANNELIDA							
Oligochaeta							
Haplotaxida							
Lumbricidae							
Naididae	***8**	**CG**					
Nais sp.	**8.88**	**CG**					
Tubificidae w.h.c.	**7.11**	**CG**					
Lumbriculida							
Lumbriculidae	**7.03**	**CG**		5		1	6
Hirudinea	***8**	**P**					
ARTHROPODA							
Arachnoida							
Acariformes							
Hygrobatidae							
Atractides sp.	**5.53**						
Crustacea							
Isopoda							
Asellidae							
Caecidotea sp.	**9.11**	**CG**					
Lirceus sp.	**7.85**	**CG**					
Crangonyctidae							
Crangonyx sp.	**7.87**	**CG**			3		3
Decapoda							
Cambaridae							
Orconectes sp.	**2.6**	**SH**					
Gammaridae							
Gammarus sp.	**9.1**	**SH**					
Insecta							
Ephemeroptera							
Baetidae						3	3

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	LITTLE SO. FORK MILE 5.2				
			3WOL10035				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Acentrella ampla	**3.61**	**CG**		46			46
Baetis sp.	***4**	**CG**					
Baetis intercalaris	**4.99**	**CG**			2	1	3
Centroptilum sp.	**6.6**	**CG**					
Labiobaetis sp.	***4**	**CG**					
Baetiscidae							
Baetisca sp.	**3.4**	**CG**					
Caenidae							
Caenis sp.	**7.41**	**CG**	46	90	19	33	188
Ephemeridae							
Hexagenia sp.	**4.9**	**CG**					
Heptageniidae							
Epeorus sp.	**1.27**	**SC**					
Heptagenia sp.	**2.57**	**SC**					
Stenacron interpunctatum	**6.87**	**SC**			2		2
Stenonema sp.	***4**	**SC**	48	166	4	26	244
Stenonema mediopunctatum	**3.77**	**SC**					
Isonychiidae							
Isonychia sp.	**3.45**	**FC**	53	169	9	6	237
Leptophlebiidae	***2**	**CG**					
Paraleptophlebia sp.	**0.94**	**CG**					
Tricorythidae	***4**	**CG**					
Tricorythodes sp.	**5.06**	**CG**			2	2	4
Odonata							
Coenagrionidae	***9**	**P**				1	1
Argia sp.	**8.17**	**P**	14		5	2	21
Calopterygidae	***5**	**P**					
Calopteryx sp.	**7.78**	**P**			1		1
Gomphidae	***1**	**P**					
Stylogomphus albistylus	**4.72**	**P**					
Plecoptera							
Leuctridae							
Leuctra sp.	**0.67**	**SH**					
Perlidae							
Acroneuria abnormis	**2.06**	**P**				1	1
Neoperla sp.	**1.49**	**P**					
Perlodidae	***2**	**P**					
Hemiptera							
Gerridae		**P**					
Metrobates sp.				1			1
Veliidae							
Rhagovelia obesa							
Megaloptera							
Corydalidae							
Corydalus cornutus	**5.16**	**P**	1	18	2	1	22
Nigronia serricornis	**4.95**	**P**	1				1

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	LITTLE SO. FORK MILE 5.2				
			3WOL10035				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Trichoptera				5			5
Glossosomatidae							
Protoptila sp.	**2.55**	**SC**					
Helicopsychidae							
Helicopsyche borealis	**0**	**SC**					
Hydropsychidae	***4**	**FC**		5		4	9
Ceratopsyche sp.	***4**	**FC**		1		1	2
Ceratopsyche morosa	**2.63**	**FC**					
Cheumatopsyche sp.	**6.22**	**FC**	12	78	3	4	97
Hydropsyche sp.	***5**	**FC**		56	8		64
Hydropsyche betteni gp.	**7.78**	**FC**					
Macrostemum sp.	**3.52**	**FC**					
Macrostemum carolina	**3.52**	**FC**					
Parapsyche sp.	**0**	**FC**					
Hydroptilidae							
Hydroptila sp.	**6.22**	**FC**			3	1	4
Leptoceridae							
Oecetis sp.	**4.7**	**P**			1		1
Limnephilidae							
Neophylax sp.	**2.2**						
Philopotamidae				5			5
Chimarra sp.	**2.76**	**FC**	32		3		35
Chimarra aterrima	**2.76**	**FC**					
Chimarra obscurus	**2.76**	**FC**		305		2	307
Polycentropodidae	***6**	**FC**					
Neureclipsis sp.	**4.19**	**FC**					
Polycentropus sp.	**3.53**	**FC**					
Psychomyiidae							
Psychomyia sp.	***2**	**CG**					
Psychomyia flavida	**2.91**	**CG**					
Rhyacophilidae	**0**	**P**					
Rhyacophila sp.	***1**	**P**					
Lepidoptera							
Pyralidae							
Petrophila sp.	**2.09**	**SC**		5		1	6
Coleoptera							
Dryopidae	***5**					1	1
Elmidae				15			15
Dubiraphia sp.	**5.93**	**SC**			2		2
Macronychus glabratus	**4.58**	**SH**					
Microcylloepus pusillus	**2.11**	**CG**		100	35	4	139
Optioservus sp.	**2.36**	**SC**					
Optioservus ovalis	**2.36**	**CG**					
Oulimnius latiusculus	**1.78**	**CG**					
Optioservus trivittatus	**2.36**	**SC**					
Promoresia sp.	***2**	**SC**					
Promoresia elegans	***2**	**SC**					

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	LITTLE SO. FORK MILE 5.2				
			3WOL10035				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Stenelmis sp.	**5.1**	**SC**		10	1	1	12
Limnichidae							
Lutrochus sp.		**SC**			7		7
Psephenidae							
Ectopria sp.	**4.16**	**SC**					
Psephenus herricki	**2.35**	**SC**	2		2		4
Scirtidae							
Diptera							
Chironomidae				5	2	1	8
Ablabesmyia mallochi	**7.19**	**P**				1	1
Cardiocladius obscurus	**5.87**	**P**					
Chironomus sp.	**9.63**	**CG**					
Conchapelopia sp.	**8.42**	**P**					
Corynoneura sp.	**6.01**	**CG**					
Cricotopus sp.	***7**	**CG**	3		1	3	7
Cricotopus tremulus	***7**	**CG**	2				2
Cricotopus trifascia	**2.84**	**SH**		5		1	6
Cryptochironomus fulvus	**6.38**	**P**					
Diamesa sp.	**8.12**	**CG**					
Dicrotendipes sp.	**8.1**	**CG**					
Eukiefferiella devonica gp.	**2.59**	**CG**					
Microtendipes sp.	**5.53**	**CG**					
Nanocladius sp.	**7.07**	**CG**					
Orthocladius sp.	***4**	**CG**					
Parachaetocladius sp.	**0**	**CG**					
Phaenopsectra sp.	**6.5**	**SC**					
Polypedilum convictum	**4.93**	**SH**	5	60			65
Polypedilum fallax	**6.39**	**SH**					
Polypedilum halterale	**7.31**	**SH**					
Polypedilum illinoense	**9**	**SH**					
Psectrocladius sp.	**3.59**	**SH**					
Rheotanytarsus sp.	**5.89**	**FC**	57	165	1	2	225
Stempellina sp.	**0**	**CG**					
Stenochironomus sp.	**6.45**	**SH**		5			5
Tanytarsus sp.	**6.76**	**FC**	8	15			23
Thienemanniella xena	**5.86**	**CG**					
Thienemannimyia gp.	**8.42**	**P**			1	1	2
Tvetenia bavarica gp.	**3.65**	**CG**					
Tvetenia discoloripes gp.	**3.61**	**CG**		5	1		6
Zavrelia sp.	**5.3**	**CG**	4	10			14
Empididae							
Hemerodromia sp.	**7.57**	**P**		1			1
Simuliidae							
Simulium sp.	**4**	**FC**		11			11
Tanyderidae							
Protoplasa fitchii	**4.33**						
Tipulidae							

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	LITTLE SO. FORK MILE 5.2				
			3WOL10035				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Antocha sp.	4.25	SH					
Dicranota sp.	0	P					
Hexatoma sp.	4.31	P					
TOTAL NO. OF ORGANISMS			302	1399	365	142	2208
TOTAL NO. OF TAXA			16	29	26	28	51

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	ROCKCASTLE RIVER MILE 24.4				
			3WOL10036				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
MOLLUSCA							
Bivalvia							
Veneroida							
Corbiculidae							
Corbicula fluminea	**6.12**	**FC**	41	21		20	82
Gastropoda							
Basommatophora							
Ancylidae							
Ferrissia rivularis	**6.55**	**SC**		1	1	1	3
Lymnaeidae							
Fossaria sp.	***7**	**SC**					
Mesogastropoda							
Pleuroceridae							
Elimia sp.	**2.46**	**SC**	7	4	2	12	25
Elimia laqueata	**2.46**	**SC**					
Lithasia sp.							
ANNELIDA							
Oligochaeta							
Haplotaxida							
Lumbricidae							
Naididae	***8**	**CG**					
Nais sp.	**8.88**	**CG**					
Tubificidae w.h.c.	**7.11**	**CG**					
Lumbriculida							
Lumbriculidae	**7.03**	**CG**			2	2	4
Hirudinea	***8**	**P**				1	1
ARTHROPODA							
Arachnoida							
Acariformes							
Hygrobatidae							
Atractides sp.	**5.53**						
Crustacea							
Isopoda							
Asellidae							
Caecidotea sp.	**9.11**	**CG**					
Lirceus sp.	**7.85**	**CG**					
Crangonyctidae							
Crangonyx sp.	**7.87**	**CG**					
Decapoda							
Cambaridae						1	1
Orconectes sp.	**2.6**	**SH**	1				1
Gammaridae							
Gammarus sp.	**9.1**	**SH**					
Insecta							
Ephemeroptera							
Baetidae						3	3

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	ROCKCASTLE RIVER MILE 24.4				
			3WOL10036				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Acentrella ampla	**3.61**	**CG**				2	2
Baetis sp.	***4**	**CG**					
Baetis intercalaris	**4.99**	**CG**		16	7	14	37
Centroptilum sp.	**6.6**	**CG**					
Labiobaetis sp.	***4**	**CG**			1		1
Baetiscidae							
Baetisca sp.	**3.4**	**CG**					
Caenidae							
Caenis sp.	**7.41**	**CG**	5	23	13	30	71
Ephemeridae							
Hexagenia sp.	**4.9**	**CG**					
Heptageniidae						31	31
Epeorus sp.	**1.27**	**SC**					
Heptagenia sp.	**2.57**	**SC**					
Stenacron interpunctatum	**6.87**	**SC**		5	6	13	24
Stenonema sp.	***4**	**SC**	57	68	47	75	247
Stenonema mediopunctatum	**3.77**	**SC**	2				2
Isonychiidae							
Isonychia sp.	**3.45**	**FC**	10	25	11	9	55
Leptophlebiidae	***2**	**CG**					
Paraleptophlebia sp.	**0.94**	**CG**					
Tricorythidae	***4**	**CG**					
Tricorythodes sp.	**5.06**	**CG**				1	1
Odonata							
Coenagrionidae	***9**	**P**					
Argia sp.	**8.17**	**P**	1	4	4	2	11
Calopterygidae	***5**	**P**					
Calopteryx sp.	**7.78**	**P**					
Gomphidae	***1**	**P**		2			2
Stylogomphus albistylus	**4.72**	**P**					
Plecoptera							
Leuctridae							
Leuctra sp.	**0.67**	**SH**					
Perlidae							
Acroneuria abnormis	**2.06**	**P**					
Neoperla sp.	**1.49**	**P**					
Perlodidae	***2**	**P**					
Hemiptera							
Gerridae		**P**					
Metrobates sp.							
Veliidae							
Rhagovelia obesa							
Megaloptera							
Corydalidae							
Corydalus cornutus	**5.16**	**P**		3	2	1	6
Nigronia serricornis	**4.95**	**P**				1	1

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	ROCKCASTLE RIVER MILE 24.4				
			3WOL10036				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Trichoptera							
Glossosomatidae							
Protoptila sp.	**2.55**	**SC**		1		18	19
Helicopsychidae							
Helicopsyche borealis	**0**	**SC**					
Hydropsychidae	***4**	**FC**			9		9
Ceratopsyche sp.	***4**	**FC**					
Ceratopsyche morosa	**2.63**	**FC**	1		1		2
Cheumatopsyche sp.	**6.22**	**FC**	40	37	47	40	164
Hydropsyche sp.	***5**	**FC**		2	2		4
Hydropsyche betteni gp.	**7.78**	**FC**					
Macrostemum sp.	**3.52**	**FC**				3	3
Macrostemum carolina	**3.52**	**FC**	6	11	3		20
Parapsyche sp.	**0**	**FC**					
Hydroptilidae							
Hydroptila sp.	**6.22**	**FC**					
Leptoceridae							
Oecetis sp.	**4.7**	**P**			2		2
Limnephilidae							
Neophylax sp.	**2.2**			1			1
Philopotamidae							
Chimarra sp.	**2.76**	**FC**					
Chimarra aterrima	**2.76**	**FC**					
Chimarra obscurus	**2.76**	**FC**			2	1	3
Polycentropodidae	***6**	**FC**					
Neureclipsis sp.	**4.19**	**FC**			3		3
Polycentropus sp.	**3.53**	**FC**					
Psychomyiidae							
Psychomyia sp.	***2**	**CG**		1	2		3
Psychomyia flavida	**2.91**	**CG**					
Rhyacophilidae	**0**	**P**					
Rhyacophila sp.	***1**	**P**					
Lepidoptera							
Pyralidae							
Petrophila sp.	**2.09**	**SC**			1		1
Coleoptera							
Dryopidae	***5**						
Elmidae							
Dubiraphia sp.	**5.93**	**SC**					
Macronychus glabratus	**4.58**	**SH**			2		2
Microcylloepus pusillus	**2.11**	**CG**					
Optioservus sp.	**2.36**	**SC**		1			1
Optioservus ovalis	**2.36**	**CG**					
Oulimnius latiusculus	**1.78**	**CG**					
Optioservus trivittatus	**2.36**	**SC**			1		1
Promoresia sp.	***2**	**SC**					
Promoresia elegans	***2**	**SC**					

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	ROCKCASTLE RIVER MILE 24.4				
			3WOL10036				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Stenelmis sp.	**5.1**	**SC**			1		1
Limnichidae							
Lutrochus sp.		**SC**					
Psephenidae							
Ectopria sp.	**4.16**	**SC**					
Psephenus herricki	**2.35**	**SC**	5	15	7	5	32
Scirtidae							
Diptera							
Chironomidae			3				3
Ablabesmyia mallochi	**7.19**	**P**			1		1
Cardiocladius obscurus	**5.87**	**P**				1	1
Chironomus sp.	**9.63**	**CG**					
Conchapelopia sp.	**8.42**	**P**					
Corynoneura sp.	**6.01**	**CG**		1			1
Cricotopus sp.	***7**	**CG**				1	1
Cricotopus tremulus	***7**	**CG**					
Cricotopus trifascia	**2.84**	**SH**					
Cryptochironomus fulvus	**6.38**	**P**					
Diamesa sp.	**8.12**	**CG**				1	1
Dicrotendipes sp.	**8.1**	**CG**					
Eukiefferiella devonica gp.	**2.59**	**CG**					
Microtendipes sp.	**5.53**	**CG**					
Nanocladius sp.	**7.07**	**CG**					
Orthocladius sp.	***4**	**CG**					
Parachaetocladius sp.	**0**	**CG**					
Phaenopsectra sp.	**6.5**	**SC**					
Polypedilum convictum	**4.93**	**SH**	2	1	5		8
Polypedilum fallax	**6.39**	**SH**					
Polypedilum halterale	**7.31**	**SH**					
Polypedilum illinoense	**9**	**SH**		5			5
Psectrocladius sp.	**3.59**	**SH**					
Rheotanytarsus sp.	**5.89**	**FC**	2	4	17	3	26
Stempellina sp.	**0**	**CG**					
Stenochironomus sp.	**6.45**	**SH**					
Tanytarsus sp.	**6.76**	**FC**	1			2	3
Thienemanniella xena	**5.86**	**CG**		1			1
Thienemannimyia gp.	**8.42**	**P**	1			1	2
Tvetenia bavarica gp.	**3.65**	**CG**	1				1
Tvetenia discoloripes gp.	**3.61**	**CG**					
Zavrelia sp.	**5.3**	**CG**					
Empididae							
Hemerodromia sp.	**7.57**	**P**		1			1
Simuliidae							
Simulium sp.	**4**	**FC**			3		3
Tanyderidae							
Protoplasa fitchii	**4.33**					1	1
Tipulidae							

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	ROCKCASTLE RIVER MILE 24.4				
			3WOL10036				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Antocha sp.	4.25	SH					
Dicranota sp.	0	P					
Hexatoma sp.	4.31	P					
TOTAL NO. OF ORGANISMS			186	254	205	296	941
TOTAL NO. OF TAXA			18	25	29	30	56

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BUCK CREEK MILE 12.4				
			3WOL10037				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
MOLLUSCA							
Bivalvia							
Veneroida							
Corbiculidae							
Corbicula fluminea	**6.12**	**FC**	10	21		2	33
Gastropoda							
Basommatophora							
Ancylidae							
Ferrissia rivularis	**6.55**	**SC**					
Lymnaeidae							
Fossaria sp.	***7**	**SC**					
Mesogastropoda							
Pleuroceridae							
Elimia sp.	**2.46**	**SC**	1			1	2
Elimia laqueata	**2.46**	**SC**					
Lithasia sp.							
ANNELIDA							
Oligochaeta							
Haplotaxida							
Lumbricidae				10			10
Naididae	***8**	**CG**					
Nais sp.	**8.88**	**CG**					
Tubificidae w.h.c.	**7.11**	**CG**					
Lumbriculida							
Lumbriculidae	**7.03**	**CG**					
Hirudinea	***8**	**P**					
ARTHROPODA							
Arachnoida							
Acariformes							
Hygrobatidae							
Atractides sp.	**5.53**						
Crustacea							
Isopoda							
Asellidae							
Caecidotea sp.	**9.11**	**CG**					
Lirceus sp.	**7.85**	**CG**					
Crangonyctidae							
Crangonyx sp.	**7.87**	**CG**					
Decapoda							
Cambaridae							
Orconectes sp.	**2.6**	**SH**	1				1
Gammaridae							
Gammarus sp.	**9.1**	**SH**					
Insecta							
Ephemeroptera							
Baetidae							

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BUCK CREEK MILE 12.4				
			3WOL10037				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Acentrella ampla	**3.61**	**CG**					
Baetis sp.	***4**	**CG**			50	52	102
Baetis intercalaris	**4.99**	**CG**	10	25			35
Centroptilum sp.	**6.6**	**CG**			10		10
Labiobaetis sp.	***4**	**CG**					
Baetiscidae							
Baetisca sp.	**3.4**	**CG**					
Caenidae							
Caenis sp.	**7.41**	**CG**	334	210	191	130	865
Ephemeridae							
Hexagenia sp.	**4.9**	**CG**		5			5
Heptageniidae				10			10
Epeorus sp.	**1.27**	**SC**					
Heptagenia sp.	**2.57**	**SC**					
Stenacron interpunctatum	**6.87**	**SC**	1	1			2
Stenonema sp.	***4**	**SC**	191	151	212	121	675
Stenonema mediopunctatum	**3.77**	**SC**					
Isonychiidae							
Isonychia sp.	**3.45**	**FC**	390	157	644	198	1389
Leptophlebiidae	***2**	**CG**					
Paraleptophlebia sp.	**0.94**	**CG**					
Tricorythidae	***4**	**CG**					
Tricorythodes sp.	**5.06**	**CG**		10			10
Odonata							
Coenagrionidae	***9**	**P**		5			5
Argia sp.	**8.17**	**P**	20	10		10	40
Calopterygidae	***5**	**P**					
Calopteryx sp.	**7.78**	**P**					
Gomphidae	***1**	**P**					
Stylogomphus albistylus	**4.72**	**P**					
Plecoptera							
Leuctridae							
Leuctra sp.	**0.67**	**SH**					
Perlidae							
Acroneuria abnormis	**2.06**	**P**					
Neoperla sp.	**1.49**	**P**		10			10
Perlodidae	***2**	**P**					
Hemiptera							
Gerridae		**P**					
Metrobates sp.							
Veliidae							
Rhagovelia obesa							
Megaloptera							
Corydalidae							
Corydalus cornutus	**5.16**	**P**	1	2	2	4	9
Nigronia serricornis	**4.95**	**P**					

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BUCK CREEK MILE 12.4				
			3WOL10037				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Trichoptera							
Glossosomatidae							
Protoptila sp.	**2.55**	**SC**		5			5
Helicopsychidae							
Helicopsyche borealis	**0**	**SC**					
Hydropsychidae	***4**	**FC**		115	200		315
Ceratopsyche sp.	***4**	**FC**					
Ceratopsyche morosa	**2.63**	**FC**	80	25	230	20	355
Cheumatopsyche sp.	**6.22**	**FC**	435	395	784	315	1929
Hydropsyche sp.	***5**	**FC**		35	731	110	876
Hydropsyche betteni gp.	**7.78**	**FC**					
Macrostemum sp.	**3.52**	**FC**			293		293
Macrostemum carolina	**3.52**	**FC**	45	47		45	137
Parapsyche sp.	**0**	**FC**					
Hydroptilidae							
Hydroptila sp.	**6.22**	**FC**					
Leptoceridae							
Oecetis sp.	**4.7**	**P**					
Limnephilidae							
Neophylax sp.	**2.2**						
Philopotamidae							
Chimarra sp.	**2.76**	**FC**		5		5	10
Chimarra aterrima	**2.76**	**FC**					
Chimarra obscurus	**2.76**	**FC**	37		205	15	257
Polycentropodidae	***6**	**FC**					
Neureclipsis sp.	**4.19**	**FC**					
Polycentropus sp.	**3.53**	**FC**					
Psychomyiidae							
Psychomyia sp.	***2**	**CG**					
Psychomyia flavida	**2.91**	**CG**					
Rhyacophilidae	**0**	**P**					
Rhyacophila sp.	***1**	**P**					
Lepidoptera							
Pyralidae							
Petrophila sp.	**2.09**	**SC**		5			5
Coleoptera							
Dryopidae	***5**						
Elmidae				40			40
Dubiraphia sp.	**5.93**	**SC**					
Macronychus glabratus	**4.58**	**SH**					
Microcylloepus pusillus	**2.11**	**CG**			10	15	25
Optioservus sp.	**2.36**	**SC**			30	30	60
Optioservus ovalis	**2.36**	**CG**					
Oulimnius latiusculus	**1.78**	**CG**					
Optioservus trivittatus	**2.36**	**SC**				5	5
Promoresia sp.	***2**	**SC**					
Promoresia elegans	***2**	**SC**					

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BUCK CREEK MILE 12.4				
			3WOL10037				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Stenelmis sp.	**5.1**	**SC**	40	15	20	10	85
Limnichidae							
Lutrochus sp.		**SC**					
Psephenidae							
Ectopria sp.	**4.16**	**SC**					
Psephenus herricki	**2.35**	**SC**	20	5	20	20	65
Scirtidae							
Diptera							
Chironomidae			20	5	10	5	40
Ablabesmyia mallochi	**7.19**	**P**	10				10
Cardiocladius obscurus	**5.87**	**P**			11		11
Chironomus sp.	**9.63**	**CG**					
Conchapelopia sp.	**8.42**	**P**					
Corynoneura sp.	**6.01**	**CG**					
Cricotopus sp.	***7**	**CG**					
Cricotopus tremulus	***7**	**CG**			11		11
Cricotopus trifascia	**2.84**	**SH**					
Cryptochironomus fulvus	**6.38**	**P**					
Diamesa sp.	**8.12**	**CG**					
Dicrotendipes sp.	**8.1**	**CG**					
Eukiefferiella devonica gp.	**2.59**	**CG**					
Microtendipes sp.	**5.53**	**CG**					
Nanocladius sp.	**7.07**	**CG**		5			5
Orthocladius sp.	***4**	**CG**					
Parachaetocladius sp.	**0**	**CG**					
Phaenopsectra sp.	**6.5**	**SC**					
Polypedilum convictum	**4.93**	**SH**	30	65	146	90	331
Polypedilum fallax	**6.39**	**SH**					
Polypedilum halterale	**7.31**	**SH**					
Polypedilum illinoense	**9**	**SH**					
Psectrocladius sp.	**3.59**	**SH**					
Rheotanytarsus sp.	**5.89**	**FC**	9	290	829	215	1343
Stempellina sp.	**0**	**CG**					
Stenochironomus sp.	**6.45**	**SH**				5	5
Tanytarsus sp.	**6.76**	**FC**		20	34	20	74
Thienemanniella xena	**5.86**	**CG**		5	67	35	107
Thienemannimyia gp.	**8.42**	**P**		5			5
Tvetenia bavarica gp.	**3.65**	**CG**	10		22		32
Tvetenia discoloripes gp.	**3.61**	**CG**					
Zavrelia sp.	**5.3**	**CG**					
Empididae							
Hemerodromia sp.	**7.57**	**P**					
Simuliidae							
Simulium sp.	**4**	**FC**					
Tanyderidae							
Protoplasa fitchii	**4.33**						
Tipulidae							

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	**T.V.****	**F.F.G.*****	**BUCK CREEK MILE 12.4**				
			3WOL10037				
			HESS-1	**HESS-2**	**HESS-3**	**HESS-4**	**TOTAL**
Antocha sp.	**4.25**	**SH**			10		10
Dicranota sp.	**0**	**P**					
Hexatoma sp.	**4.31**	**P**					
TOTAL NO. OF ORGANISMS			**1695**	**1714**	**4772**	**1478**	**9659**
TOTAL NO. OF TAXA			**21**	**32**	**25**	**25**	**47**

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BARK CAMP CREEK MILE 2.0				
			3WOL10023				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
MOLLUSCA							
Bivalvia							
Veneroida							
Corbiculidae							
Corbicula fluminea	**6.12**	**FC**					
Gastropoda							
Basommatophora							
Ancylidae							
Ferrissia rivularis	**6.55**	**SC**					
Lymnaeidae							
Fossaria sp.	***7**	**SC**					
Mesogastropoda							
Pleuroceridae							
Elimia sp.	**2.46**	**SC**					
Elimia laqueata	**2.46**	**SC**					
Lithasia sp.							
ANNELIDA							
Oligochaeta							
Haplotaxida							
Lumbricidae							
Naididae	***8**	**CG**					
Nais sp.	**8.88**	**CG**					
Tubificidae w.h.c.	**7.11**	**CG**	1				1
Lumbriculida							
Lumbriculidae	**7.03**	**CG**					
Hirudinea	***8**	**P**					
ARTHROPODA							
Arachnoida							
Acariformes							
Hygrobatidae							
Atractides sp.	**5.53**						
Crustacea							
Isopoda							
Asellidae							
Caecidotea sp.	**9.11**	**CG**					
Lirceus sp.	**7.85**	**CG**					
Crangonyctidae							
Crangonyx sp.	**7.87**	**CG**					
Decapoda							
Cambaridae							
Orconectes sp.	**2.6**	**SH**					
Gammaridae							
Gammarus sp.	**9.1**	**SH**					
Insecta							
Ephemeroptera							
Baetidae						1	1

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BARK CAMP CREEK MILE 2.0				
			3WOL10023				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Acentrella ampla	**3.61**	**CG**			1		1
Baetis sp.	***4**	**CG**		7	2	6	15
Baetis intercalaris	**4.99**	**CG**	2				2
Centroptilum sp.	**6.6**	**CG**					
Labiobaetis sp.	***4**	**CG**					
Baetiscidae							
Baetisca sp.	**3.4**	**CG**				1	1
Caenidae							
Caenis sp.	**7.41**	**CG**				1	1
Ephemeridae							
Hexagenia sp.	**4.9**	**CG**					
Heptageniidae			6	2		6	14
Epeorus sp.	**1.27**	**SC**	1			3	4
Heptagenia sp.	**2.57**	**SC**		1			1
Stenacron interpunctatum	**6.87**	**SC**	2				2
Stenonema sp.	***4**	**SC**	14	21	44	60	139
Stenonema mediopunctatum	**3.77**	**SC**					
Isonychiidae							
Isonychia sp.	**3.45**	**FC**	2			7	9
Leptophlebiidae	***2**	**CG**	4	7	2		13
Paraleptophlebia sp.	**0.94**	**CG**				16	16
Tricorythidae	***4**	**CG**					
Tricorythodes sp.	**5.06**	**CG**					
Odonata							
Coenagrionidae	***9**	**P**					
Argia sp.	**8.17**	**P**					
Calopterygidae	***5**	**P**					
Calopteryx sp.	**7.78**	**P**					
Gomphidae	***1**	**P**				1	1
Stylogomphus albistylus	**4.72**	**P**	2				2
Plecoptera							
Leuctridae							
Leuctra sp.	**0.67**	**SH**	1				1
Perlidae							
Acroneuria abnormis	**2.06**	**P**				3	3
Neoperla sp.	**1.49**	**P**					
Perlodidae	***2**	**P**	1	4	4	2	11
Hemiptera							
Gerridae		**P**					
Metrobates sp.							
Veliidae			2				2
Rhagovelia obesa			3				3
Megaloptera							
Corydalidae							
Corydalus cornutus	**5.16**	**P**					
Nigronia serricornis	**4.95**	**P**	1	1	2	2	6

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BARK CAMP CREEK MILE 2.0				
			3WOL10023				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Trichoptera							
Glossosomatidae							
Protoptila sp.	**2.55**	**SC**					
Helicopsychidae							
Helicopsyche borealis	**0**	**SC**					
Hydropsychidae	***4**	**FC**		1			1
Ceratopsyche sp.	***4**	**FC**					
Ceratopsyche morosa	**2.63**	**FC**	1				1
Cheumatopsyche sp.	**6.22**	**FC**	1	5	11	4	21
Hydropsyche sp.	***5**	**FC**				1	1
Hydropsyche betteni gp.	**7.78**	**FC**					
Macrostemum sp.	**3.52**	**FC**					
Macrostemum carolina	**3.52**	**FC**					
Parapsyche sp.	**0**	**FC**					
Hydroptilidae							
Hydroptila sp.	**6.22**	**FC**					
Leptoceridae							
Oecetis sp.	**4.7**	**P**					
Limnephilidae							
Neophylax sp.	**2.2**						
Philopotamidae							
Chimarra sp.	**2.76**	**FC**					
Chimarra aterrima	**2.76**	**FC**			1	4	5
Chimarra obscurus	**2.76**	**FC**					
Polycentropodidae	***6**	**FC**					
Neureclipsis sp.	**4.19**	**FC**					
Polycentropus sp.	**3.53**	**FC**	6		4	2	12
Psychomyiidae							
Psychomyia sp.	***2**	**CG**					
Psychomyia flavida	**2.91**	**CG**	3	10	9	15	37
Rhyacophilidae	**0**	**P**					
Rhyacophila sp.	***1**	**P**	1	1		3	5
Lepidoptera							
Pyralidae							
Petrophila sp.	**2.09**	**SC**					
Coleoptera							
Dryopidae	***5**						
Elmidae							
Dubiraphia sp.	**5.93**	**SC**					
Macronychus glabratus	**4.58**	**SH**					
Microcylloepus pusillus	**2.11**	**CG**					
Optioservus sp.	**2.36**	**SC**					
Optioservus ovalis	**2.36**	**CG**					
Oulimnius latiusculus	**1.78**	**CG**				4	4
Optioservus trivittatus	**2.36**	**SC**					
Promoresia sp.	***2**	**SC**					
Promoresia elegans	***2**	**SC**					

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BARK CAMP CREEK MILE 2.0				
			3WOL10023				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Stenelmis sp.	**5.1**	**SC**	2				2
Limnichidae							
Lutrochus sp.		**SC**					
Psephenidae							
Ectopria sp.	**4.16**	**SC**				1	1
Psephenus herricki	**2.35**	**SC**	8	4	5	6	23
Scirtidae				1			1
Diptera							
Chironomidae			4	5			9
Ablabesmyia mallochi	**7.19**	**P**					
Cardiocladius obscurus	**5.87**	**P**					
Chironomus sp.	**9.63**	**CG**					
Conchapelopia sp.	**8.42**	**P**					
Corynoneura sp.	**6.01**	**CG**				1	1
Cricotopus sp.	***7**	**CG**	1	1	1	1	4
Cricotopus tremulus	***7**	**CG**					
Cricotopus trifascia	**2.84**	**SH**					
Cryptochironomus fulvus	**6.38**	**P**					
Diamesa sp.	**8.12**	**CG**					
Dicrotendipes sp.	**8.1**	**CG**					
Eukiefferiella devonica gp.	**2.59**	**CG**	3		1		4
Microtendipes sp.	**5.53**	**CG**	2	2		3	7
Nanocladius sp.	**7.07**	**CG**				2	2
Orthocladius sp.	***4**	**CG**	4				4
Parachaetocladius sp.	**0**	**CG**	1			2	3
Phaenopsectra sp.	**6.5**	**SC**					
Polypedilum convictum	**4.93**	**SH**	2		1	2	5
Polypedilum fallax	**6.39**	**SH**					
Polypedilum halterale	**7.31**	**SH**					
Polypedilum illinoense	**9**	**SH**					
Psectrocladius sp.	**3.59**	**SH**					
Rheotanytarsus sp.	**5.89**	**FC**	1	3	6	3	13
Stempellina sp.	**0**	**CG**	4	1	3	3	11
Stenochironomus sp.	**6.45**	**SH**					
Tanytarsus sp.	**6.76**	**FC**	3	1		1	5
Thienemanniella xena	**5.86**	**CG**			1	1	2
Thienemannimyia gp.	**8.42**	**P**		2			2
Tvetenia bavarica gp.	**3.65**	**CG**					
Tvetenia discoloripes gp.	**3.61**	**CG**					
Zavrelia sp.	**5.3**	**CG**	1			4	5
Empididae							
Hemerodromia sp.	**7.57**	**P**					
Simuliidae							
Simulium sp.	**4**	**FC**					
Tanyderidae							
Protoplasa fitchii	**4.33**						
Tipulidae							

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	**T.V.****	**F.F.G.*****	**BARK CAMP CREEK MILE 2.0**				
			3WOL10023				
			HESS-1	**HESS-2**	**HESS-3**	**HESS-4**	**TOTAL**
Antocha sp.	**4.25**	**SH**		9	5	6	20
Dicranota sp.	**0**	**P**				1	1
Hexatoma sp.	**4.31**	**P**	1		1	3	5
TOTAL NO. OF ORGANISMS			**91**	**89**	**104**	**182**	**466**
TOTAL NO. OF TAXA			**33**	**21**	**19**	**36**	**54**

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BIG SOUTH FORK CUMB. RM 45.0				
			3WOL10029				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
MOLLUSCA							
Bivalvia							
Veneroida							
Corbiculidae							
Corbicula fluminea	**6.12**	**FC**	25	31	77	53	186
Gastropoda							
Basommatophora							
Ancylidae							
Ferrissia rivularis	**6.55**	**SC**					
Lymnaeidae							
Fossaria sp.	***7**	**SC**					
Mesogastropoda							
Pleuroceridae							
Elimia sp.	**2.46**	**SC**		2			2
Elimia laqueata	**2.46**	**SC**					
Lithasia sp.						2	2
ANNELIDA							
Oligochaeta							
Haplotaxida							
Lumbricidae					1		1
Naididae	***8**	**CG**					
Nais sp.	**8.88**	**CG**					
Tubificidae w.h.c.	**7.11**	**CG**					
Lumbriculida							
Lumbriculidae	**7.03**	**CG**					
Hirudinea	***8**	**P**					
ARTHROPODA							
Arachnoida							
Acariformes							
Hygrobatidae							
Atractides sp.	**5.53**						
Crustacea							
Isopoda							
Asellidae							
Caecidotea sp.	**9.11**	**CG**					
Lirceus sp.	**7.85**	**CG**					
Crangonyctidae							
Crangonyx sp.	**7.87**	**CG**					
Decapoda							
Cambaridae							
Orconectes sp.	**2.6**	**SH**					
Gammaridae							
Gammarus sp.	**9.1**	**SH**					
Insecta							
Ephemeroptera							
Baetidae							

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BIG SOUTH FORK CUMB. RM 45.0				
			3WOL10029				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Acentrella ampla	**3.61**	**CG**		20	16	4	40
Baetis sp.	***4**	**CG**			1	1	2
Baetis intercalaris	**4.99**	**CG**	1	5			6
Centroptilum sp.	**6.6**	**CG**					
Labiobaetis sp.	***4**	**CG**					
Baetiscidae							
Baetisca sp.	**3.4**	**CG**					
Caenidae							
Caenis sp.	**7.41**	**CG**				1	1
Ephemeridae							
Hexagenia sp.	**4.9**	**CG**					
Heptageniidae			3				3
Epeorus sp.	**1.27**	**SC**					
Heptagenia sp.	**2.57**	**SC**					
Stenacron interpunctatum	**6.87**	**SC**					
Stenonema sp.	***4**	**SC**	31	38	46	53	168
Stenonema mediopunctatum	**3.77**	**SC**					
Isonychiidae							
Isonychia sp.	**3.45**	**FC**	14	42	19	21	96
Leptophlebiidae	***2**	**CG**					
Paraleptophlebia sp.	**0.94**	**CG**					
Tricorythidae	***4**	**CG**					
Tricorythodes sp.	**5.06**	**CG**		1			1
Odonata							
Coenagrionidae	***9**	**P**			1		1
Argia sp.	**8.17**	**P**				2	2
Calopterygidae	***5**	**P**					
Calopteryx sp.	**7.78**	**P**					
Gomphidae	***1**	**P**					
Stylogomphus albistylus	**4.72**	**P**					
Plecoptera							
Leuctridae							
Leuctra sp.	**0.67**	**SH**					
Perlidae							
Acroneuria abnormis	**2.06**	**P**					
Neoperla sp.	**1.49**	**P**					
Perlodidae	***2**	**P**					
Hemiptera							
Gerridae		**P**					
Metrobates sp.							
Veliidae							
Rhagovelia obesa							
Megaloptera							
Corydalidae							
Corydalus cornutus	**5.16**	**P**	3	3	4	3	13
Nigronia serricornis	**4.95**	**P**					

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BIG SOUTH FORK CUMB. RM 45.0				
			3WOL10029				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Trichoptera							
Glossosomatidae							
Protoptila sp.	**2.55**	**SC**					
Helicopsychidae							
Helicopsyche borealis	**0**	**SC**					
Hydropsychidae	***4**	**FC**	2	4			6
Ceratopsyche sp.	***4**	**FC**					
Ceratopsyche morosa	**2.63**	**FC**					
Cheumatopsyche sp.	**6.22**	**FC**	13	25	33	17	88
Hydropsyche sp.	***5**	**FC**	3	7	24	2	36
Hydropsyche betteni gp.	**7.78**	**FC**					
Macrostemum sp.	**3.52**	**FC**					
Macrostemum carolina	**3.52**	**FC**	7	6	13	3	29
Parapsyche sp.	**0**	**FC**	1				1
Hydroptilidae							
Hydroptila sp.	**6.22**	**FC**					
Leptoceridae							
Oecetis sp.	**4.7**	**P**					
Limnephilidae							
Neophylax sp.	**2.2**						
Philopotamidae						1	1
Chimarra sp.	**2.76**	**FC**					
Chimarra aterrima	**2.76**	**FC**	5	22	25	54	106
Chimarra obscurus	**2.76**	**FC**	14	15	73	33	135
Polycentropodidae	***6**	**FC**					
Neureclipsis sp.	**4.19**	**FC**					
Polycentropus sp.	**3.53**	**FC**				1	1
Psychomyiidae							
Psychomyia sp.	***2**	**CG**					
Psychomyia flavida	**2.91**	**CG**					
Rhyacophilidae	**0**	**P**					
Rhyacophila sp.	***1**	**P**				1	1
Lepidoptera							
Pyralidae							
Petrophila sp.	**2.09**	**SC**					
Coleoptera							
Dryopidae	***5**						
Elmidae							
Dubiraphia sp.	**5.93**	**SC**					
Macronychus glabratus	**4.58**	**SH**					
Microcylloepus pusillus	**2.11**	**CG**	3	18	34	6	61
Optioservus sp.	**2.36**	**SC**			2		2
Optioservus ovalis	**2.36**	**CG**					
Oulimnius latiusculus	**1.78**	**CG**					
Optioservus trivittatus	**2.36**	**SC**					
Promoresia sp.	***2**	**SC**		2			2
Promoresia elegans	***2**	**SC**			2		2

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	T.V.**	F.F.G.***	BIG SOUTH FORK CUMB. RM 45.0				
			3WOL10029				
			HESS-1	HESS-2	HESS-3	HESS-4	TOTAL
Stenelmis sp.	**5.1**	**SC**		2	5	1	8
Limnichidae							
Lutrochus sp.		**SC**					
Psephenidae							
Ectopria sp.	**4.16**	**SC**					
Psephenus herricki	**2.35**	**SC**					
Scirtidae							
Diptera				1			1
Chironomidae							
Ablabesmyia mallochi	**7.19**	**P**					
Cardiocladius obscurus	**5.87**	**P**		3	10	1	14
Chironomus sp.	**9.63**	**CG**					
Conchapelopia sp.	**8.42**	**P**				1	1
Corynoneura sp.	**6.01**	**CG**					
Cricotopus sp.	***7**	**CG**					
Cricotopus tremulus	***7**	**CG**					
Cricotopus trifascia	**2.84**	**SH**					
Cryptochironomus fulvus	**6.38**	**P**					
Diamesa sp.	**8.12**	**CG**					
Dicrotendipes sp.	**8.1**	**CG**					
Eukiefferiella devonica gp.	**2.59**	**CG**	2				2
Microtendipes sp.	**5.53**	**CG**					
Nanocladius sp.	**7.07**	**CG**					
Orthocladius sp.	***4**	**CG**					
Parachaetocladius sp.	**0**	**CG**					
Phaenopsectra sp.	**6.5**	**SC**					
Polypedilum convictum	**4.93**	**SH**				1	1
Polypedilum fallax	**6.39**	**SH**					
Polypedilum halterale	**7.31**	**SH**					
Polypedilum illinoense	**9**	**SH**					
Psectrocladius sp.	**3.59**	**SH**			1		1
Rheotanytarsus sp.	**5.89**	**FC**	32	54	28	26	140
Stempellina sp.	**0**	**CG**					
Stenochironomus sp.	**6.45**	**SH**					
Tanytarsus sp.	**6.76**	**FC**	2				2
Thienemanniella xena	**5.86**	**CG**					
Thienemannimyia gp.	**8.42**	**P**					
Tvetenia bavarica gp.	**3.65**	**CG**	1				1
Tvetenia discoloripes gp.	**3.61**	**CG**		1	1	1	3
Zavrelia sp.	**5.3**	**CG**					
Empididae						1	1
Hemerodromia sp.	**7.57**	**P**				1	1
Simuliidae							
Simulium sp.	**4**	**FC**	1	1	6	2	10
Tanyderidae							
Protoplasa fitchii	**4.33**						
Tipulidae							

TABLE 1A. BENTHIC MACROINVERTEBRATES COLLECTED FROM WOLF CREEK RESERVOIR, SEPTEMBER 1998.							
SPECIES	**T.V.****	**F.F.G.*****	**BIG SOUTH FORK CUMB. RM 45.0**				
			3WOL10029				
			HESS-1	**HESS-2**	**HESS-3**	**HESS-4**	**TOTAL**
Antocha sp.	**4.25**	**SH**		2			2
Dicranota sp.	**0**	**P**					
Hexatoma sp.	**4.31**	**P**					
TOTAL NO. OF ORGANISMS			**163**	**305**	**422**	**293**	**1183**
TOTAL NO. OF TAXA			**19**	**23**	**22**	**27**	**44**

*Hilsenhoff Tolerance Values used when North Carolina Tolerance Values not available.

**North Carolina Tolerance Values range from 0 for organisms very intolerant of organic wastes to 10 for organisms very tolerant of organic wastes.

***F.F.G.- Functional Feeding Group: SH=Shredder, CG=Collector/Gatherer, FC=Filtering Collector, SC=Scraper, P=Predator and PI=Piercer