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The Effect of Sample Size on Rapid Bioassessment Scores and Management Efficiency

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THE EFFECT OF SAMPLE SIZE ON RAPID BIOASSESSMENT SCORES AND MANAGEMENT EFFICIENCY

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The Effect of Sample Size on Rapid Bioassessment Scores and Management Efficiency.

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ABSTRACT

The rapid bioassessment method for stream biomonitoring generally uses a fixed count of 200 macroinvertebrates as the standard subsample size. This number has been argued to be too small to provide accurate estimates on the richness of macroinvertebrate communities and is believed to give misleading information pertaining to stream health. In this study, I used data collected from multiple habitats from 29 streams located in several subecoregions of Georgia to examine how the rapid bioassessment scores perform across subsample sizes of 100, 200, and 300 organisms. Subsample sizes of 100 and 200 organisms were found to underestimate richness, functional feeding group, habit, HBI and NCBI for macroinvertebrate communities. As a result, the overall bioassessment scores were significantly altered. Stream health was estimated better when subsample sizes of 300 organisms were used. However, subsample sizes did not affect the ability of reference sites to differentiate from impaired sites. A longitudinal trend was observed which indicated that 300 organisms were required by streams in north Georgia. Three-hundred organisms were not always required by streams in middle and south Georgia. Stream gradient was an important factor in subsample size determination – fast flowing streams required larger subsample sizes while slow moving streams did fairly well with smaller subsamples. Using different subsample sizes for different subecoregions have been recommended in this study.

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DEDICATION

This thesis is dedicated to my father, Chankhe Rai, a remarkable man.

INTRODUCTION

Background of Rapid Bioassessment and Subsample Sizes

After being amended in 1977, the Clean Water Act (CWA) gave the United States Environmental Protection Agency (EPA) authority to implement water pollution control programs to regulate discharges of pollutants into the waters of the United States (U.S. Environmental Protection Agency 1997). By doing so, the CWA allows the EPA to continually set requirements for water quality standards for all contaminants in surface waters. As such, Section number 101h(a) of CWA has defined its objective as to restore and maintain the chemical, physical, and biological integrity of the nation's waters.

Prior to 1990, chemical criteria were widely used to assess the water quality while biological criteria (biocriteria) were largely ignored. Biocriteria are numeric values or narratives that describe biological preferences for physical and/or chemical conditions based upon designated reference sites. Since 1990 the EPA has encouraged states to develop narrative and biological criteria as regulatory tools in water quality management. Consequently, interest in biological monitoring has rapidly increased, and many states are using biological communities for bioassessment purposes.

In 1989, the rapid bioassessment protocols (RBPs) (Plafkin *et al.* 1989) were developed as a result of specific recommendations made by the EPA in a major study of surface water monitoring. The RBPs are a set of scientific methods designed to provide a simple, cost-effective, screening tool to assess the biological health of streams and rivers for water quality management purposes A decade later the RBPs were updated to reflect the advancement in bioassessment methods and the most cost-effective and scientifically valid approaches (Barbour *et al.* 1999).

The benthic macroinvertebrate assemblage is one of the study foci for rapid bioassessment- the other two being periphyton and fish. Benthic macroinvertebrates are good indicators of localized conditions because many have limited migration patterns or a sessile mode of life, and they integrate the effects of short and long-term environmental variations. A macroinvertebrate assemblage is made up of species that constitute a broad range of trophic levels and pollution tolerances, thus providing strong information for interpreting cumulative effects. They are abundant in most streams and relatively easy to collect and handle. The rapid bioassessment applies shortcut techniques in its biomonitoring procedures and these have been achieved, along with other things, by limiting the number of benthic invertebrates selected for processing. The original benthic macroinvertebrate protocols generally required the collection of 100 organisms (Hilsenhoff 1987, for example). The Georgia Department of Natural Resources had previously recommended this sub-sample size but, very recently has started using 200 organisms instead (Shannon Winsness, GADNR; personal communication).

The organisms are identified, and the pollution tolerance values assigned by best professional judgements of the most abundant taxonomic groups are scored in a scale ranging from 1 to 10. Higher score indicates poor stream quality from which the macroinvertebrate were collected and vice versa. Alternately, the RBPs require an initial characterization, including benthic macroinvertebrate scores, of the reference conditions from similar water bodies that have acceptable water quality (Barbour *et al.* 1999). Reference conditions are quantifiable numbers that represent the qualities of habitat, physicochemical parameters and the biological assemblage found in a pristine or otherwise in a least anthropogenically impaired body of water in the area. The benthic metric (*i.e.*, enumerated value representing some aspects of macroinvertebrate assemblage structure that change in predictable ways with increased human influence) scores obtained from the test sample are then compared to those of reference conditions (Barbour *et al.* 1996). A score similar or close to that of reference conditions indicates good quality of water and vice versa. The current RBPs call for 200 individuals of macroinvertebrates in order to estimate the health of the water body. About 65% of state regulatory agencies subsample 200 or fewer individuals (Carter and Resh 2001).

The size of subsample (number of organisms sorted, identified and catalogued) is an essential problem as it is impossible to completely census a taxonomic assemblage or an entire community. Instead, estimates that describe some portion of the community assemblage are relied upon. The recommended fixed count of 200 individuals is assumed to adequately represent the benthic community of the stream from which it was sampled (Barbour *et al.* 1999). However, obtaining an adequate, representative sample of ecological communities to make compositional comparisons is difficult (Cao *et al.* 2002). Normally, direct measurements of how well a sample represents its community cannot be made because the taxonomic composition and relative abundance in a community are unknown. The species-area relationship generally shows that a larger area (*i.e.*, larger subsample) will harbor greater diversity (MacArthur and Wilson 1967). Contrary to the RBPs recommendation, it is still not clear how well a subsample size of 200 organisms captures the taxonomic composition and relative abundance at the sampling site or of the communities being surveyed. It has been argued that the RBPs give a biased measurement of taxa richness because of the density factor (Courtemanch 1996). The community density factor points out that the number of taxa encountered in a sample increases as a function of the number of individuals in the sample and the area sampled. Sovell and Vondracek (1999) demonstrated that increasing the subsample sizes will change the richness metrics. Similarly, Vinson and Hawkins (1996) suggested using greater than 300 organisms in order to obtain more accurate inferences for richness. Studies by Cao *et al.* (1998, 2002) demonstrate that the estimation of relative differences in taxonomic richness among sites or communities can be strongly dependent upon the sample sizes and that small samples tend to underestimate the differences. Growns *et al.* (1997) also support the argument that small subsample sizes express estimates of the richness of abundant taxa while they often fail to account for taxa that are rare or less abundant. A taxon is determined to be rare if its relative abundance in a community is small (*e.g.*, less than one individual per square meter). However, rare taxa may be very important components of community integrity because of their tolerance to potential stressors, specialized niche and functional redundancy.

Several studies have reported comparisons of the size of subsample and how it relates to biological metrics, but few of these studies have been performed on streams inside the United States. Except for Sovell and Vondracek (1999), these studies were done either on lakes (Somers *et al.* 1998) or on streams in Australia (Growns *et al.* 1995, Growns *et al.* 1997, Metzelling and Miller 2001). Sovell and Vondracek (1999) used single habitat samples (riffles) for their study. However, Ostermiller and Hawkins (2004) have recently investigated stream samples from Oregon and Washingtion for errors associated with sample sizes for River Invertebrate Prediction and Classification System (RIVPACS) and recommended 350 or more individuals. Evaluation of the RBP metric scores using multihabitat samples has not been performed.

Objectives

The primary purpose of this research was to examine the variability of selected metric values as a function of subsample size. The hypothesis was that the analysis of different subsamples taking 100, 200 and 300 organisms would produce different metric values. The null hypothesis was that the subsample sizes would not make any difference in the metric values. Ultimately, the question to be answered was, "Is a sample of 200 organisms, as recommended by the RBP sufficient to create a useful predictive index of impairment?" The subsample sizes were taken as the independent variable and the mean macroinvertebrate index as their dependent variables.

MATERIALS AND METHODS

Site Selection

Twenty-nine stream sites were chosen for the study (Table 1). These were all third order or smaller streams. All study sites were part of a larger set of stream sites that were previously selected using land-use data and Geographical Information System during the characterization of reference stream conditions for Georgia (Gore *et al.* 2004). Sites were selected on a longitudinal transect across the ecoregions of Georgia in order to capture the variability of stream gradients (Figure 1). The sites were able to cover five ecoregions and seventeen subecoregions of the state. The ecoregions and their subecoregions of Georgia are described in detail by Omernik (1987) and Griffith (2000).

Of the total sites, sixteen were classified as high gradient and the remaining thirteen as low gradient streams. Any stream that had at least one riffle running from bank to bank was classified as high a gradient site. Such a riffle was absent in a low-gradient stream. Unique identity codes, total number of organisms picked, health conditions as predetermined by landuse data, and stream flow velocity are also provided for each site in Table 1. The distribution of these sites across the ecoregions and subecoregions of Georgia are depicted in Figure 1.

Field Sampling

Sites were sampled during two index periods. The first index period ran from August of 2001 to February of 2002. The second index period was from August of 2002 to February of 2003. Field sampling was performed according to the multihabitat sampling procedure described on the Benthic Macroinvertebrate Field Sampling Methods provided

Table 1. List of selected sites for study.

S.N.	Stream Name	Site ID	Total Individuals	Condition	Gradient
1	Smith Wick Creek	45a-35	545	Impaired	High
2	Noonday Creek	45a-50	330	Impaired	High
3	Mountain Creek	45a-90	508	Impaired	High
4	Tributary to North Oconee Creek	45b-44	301	Impaired	Low
5	Chickasaw Creek	45c-3	299	Impaired	Low
6	Swinney Branch Creek	45d-11	304	Impaired	High
7	Three Mile Creek	45h-1	326	Impaired	High
8	Day Creek	65d-20	315	Impaired	Low
9	Roaring Branch Creek	65d-39	507	Impaired	High
10	Trib. to West Fork Deep Creek	65h-17	337	Impaired	Low
11	Horsehead Creek	65k-102	346	Impaired	Low
12	Stitchihatchee Creek	65L-184	550	Impaired	Low
13	Clyatt Mill Creek	65o-23	332	Reference	Low
14	Olive Creek	65o-3	391	Impaired	Low
15	Hightower Creek	66d-43	315	Impaired	High
16	Coleman Creek	66d-44-2	359	Reference	High
17	Town Creek	66d-58	474	Reference	High
18	Nimble Will Creek	66g-23	362	Reference	High
19	Yellow Creek	66g-71	327	Impaired	High
20	Hothouse Creek	66j-19	426	Reference	High
21	Moccasin Creek	66j-23	512	Reference	High
22	Hemptown Creek	66j-25	320	Impaired	High
23	Wolf Creek	66j-26	439	Impaired	High
24	South Fork Rapier Mill Creek	66j-28	368	Reference	High
25	West Fork Little River	68c7	317	Impaired	Low
26	Reedy Creek	75e 54	451	Impaired	Low
27	Canochee Creek	75f-50	349	Impaired	Low
28	Cathead Creek	75f-95	314	Reference	Low
29	Pond Fork Creek	75h-70	428	Impaired	Low

in the Quality Assurance Project Plan (QAPP) prepared by Columbus State University (2000). A one-hundred meter reach that was representative of the characteristics of the stream was selected for macroinvertebrate collection. A D-frame net (U.S. Standard No. 30,600 μ mesh openings) was used to take a total of 20 jabs and/or kicks from all major

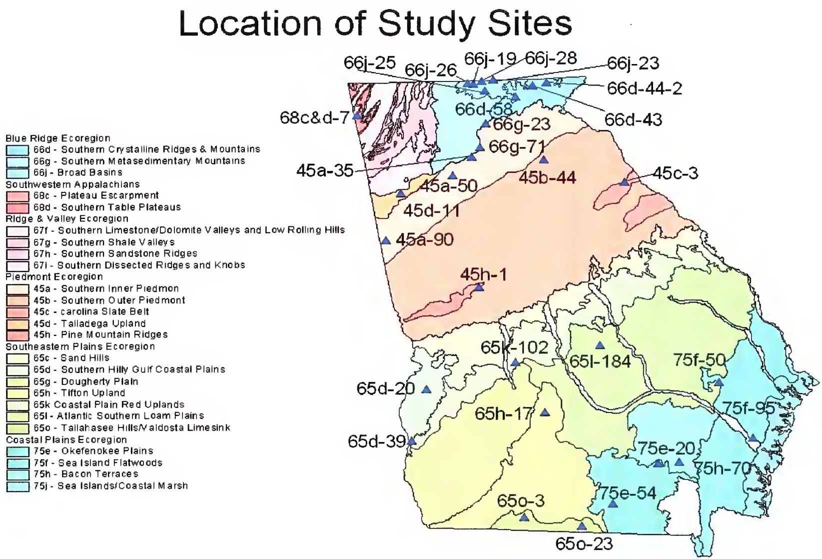

Figure 1. Distribution of study sites across the state of Georgia.

habitat types in the reach. A jab is a forceful thrusting of the net into the habitat and a kick is a stationary sampling accomplished by positioning the net and disturbing the substrate to catch the organisms in the net. Major habitat types for a high gradient stream included fast riffle, slow riffle, snags, undercut banks/rootwads, leaf packs, sand, and macrophytes. For a slow gradient stream the major habitat types comprised woody debris/snags, undercut banks/rootwads, leaf packs, sand, and macrophytes. In order to minimize disturbance and accidental loss of the organisms from their habitats, sampling was initiated at the lower end of the reach, and then proceeded upstream to the upper end of the reach.

The collected materials from jabs and kicks were combined in a sieve bucket of 600 μ mesh openings to obtain a single homogenous sample. The collected material was washed with stream water to remove fine sands. Large debris was also removed after rinsing and inspection for clinging organisms. Samples were then transferred to polypropylene bottles and preserved with 90% ethanol. The bottles were appropriately labeled and transported to the laboratory.

Sample Processing and Subsampling

In the laboratory, each sample was transferred from the polypropylene bottles into the sieve bucket and thoroughly rinsed with tap water. The sample was then spread evenly across a standardized gridded pan (Caton 1991). The pan contains 30 clearly marked squares, and therefore, divides the sample into 30 equal portions. Squares to be sorted from the pan were randomly chosen with the help of random numbers generated by a computer. All macroinvertebrates encountered in each square were sorted and collected in a glass vial. Succeeding squares were sorted, where necessary, until 100 (±10) organisms were obtained. This comprised the first subsample for the study. Sorting was continued to obtain another 100 (±10) organisms and collected in a separate vial. The combination of these organisms with the first subsample made up the second subsample (200 organisms). Similarly, another 100 (±10) organisms were sorted and the combination of this to the second subsample made up the third subsample (300 organisms). If an organism looked like it could not be identified to an acceptable taxonomic level (*e.g.*, badly damaged or missing characteristic body parts), it was placed in the collection vial but not counted. All collection vials were filled with 90% ethanol to preserve the specimens and capped with corks. Terrestrial invertebrates and small vertebrates (fish, tadpoles, salamanders) encountered occasionally were not counted.

Identification

Only the larval or the nymphal stages were identified for all invertebrate groups, except for the beetles, hemipterans, crustaceans, annelids and molluscs, whose adult stages were also identified. No pupae or emergent forms were identified for any group. Identification was done under a dissecting microscope and to the lowest practical level (*i.e.*, to or nearest to the species level depending on available taxonomic keys and conditions of the macroinvertebrate specimens). Appendix A lists all the taxonomic keys that were used in this study. Larval Chironomidae were mounted on slides in CMCP-10© high viscosity mounting medium and identified under a compound microscope.

An acceptable taxonomic level of identification was assigned to all major groups of invertebrates (James A. Gore, University of South Florida, personal communication, 2002). Acceptable taxonomic levels were threshold levels above which an organism was not counted. Therefore, organisms that could not be identified to their acceptable taxonomic level (as a result of poor preservation or missing characteristic body parts) were eliminated from the final list. Often the acceptable levels required for most groups were at the family level. Exceptions were midges that required at least the subfamily level. "Worms" were identified as Oligochaeta, Polychaeta, or Nematoda.

The numbers and the identities of individuals in each taxonomic group were recorded. Except for one site, all study sites had higher number of organisms than the target count (Table 1), because many individuals that were initially excluded from counting (*i.e.*, damaged individuals) were successfully identified to their acceptable taxonomic levels. A complete list of all taxa encountered in each site is provided in Appendix D.

Metric Selection

The metrics analyzed for each subecoregion in this study (see Appendix B) had been predetermined as part of the overall Georgia ecoregions project (Gore *et al.* 2004). Gore *et al.* (2004) used a multimetric (a total of 59 metrics grouped into 5 categories, see Appendix C) approach to assimilate biological data with various functional abilities into a single index to gauge the health of a stream. They finally selected indices comprised of five to seven individual metrics (with at least one metric chosen, wherever possible, from each of the categories) that best distinguished the reference and impaired streams for that particular subecoregion.

Data Analysis

Bootstrap Resampling

Since the metric scores (as a combination of non-linear metrics) could not be demonstrated to be normally distributed, the bootstrap resampling method was chosen to approximate the distribution of possible values associated with each subsample (Efron and Tibshirani 1994; James A. Gore; personal communication, University of South Florida, 2004).

For each site, I selected a sample of 100 organisms randomly, then put each organism back into the population after it was recorded. Twenty-five such samplings were performed in order to ensure a stable and representative distribution of metric values. Next, the process was repeated to select 200 organisms twenty-five times. The same was done to select 300 organisms. Altogether, a single site had 75 total bootstrap samples, 25 each for 100, 200 and 300 organisms. For the fiteen sites that contained <350 organisms (see Table 1), bootstrap samples of 275 organisms were taken in place of 300. For convenience, 275-organism samples are treated and referred to as 300-organisms samples hereafter.

Standardization of Metric Indices

After generating the 75 replicates at each specified subsample size (100, 200, 300), raw metric values were calculated using the Ecological Data Application System Version 3.3.2k (EDAS)© program (Tetra Tech, Inc. 2001). The raw values from each replicate were standardized into unitless scores that ranged from 0 (the worst) to 100 (optimal). The method of standardization varied depending on whether the metric increased or decreased in response to stress (Gore *et al.* 2004). For metrics that decreased with stress (*e.g.*, Ephemeroptera, Plecoptera, and Trichoptera taxa):

STANDARDIZED SCORE = 100 x c/d

Here "c" equals raw metric value and "d" equals the 95th percentile value of the reference stream distribution for that subecoregion.

For metrics that increased with stress (*e.g.*, Hilsenhoff's Biotic Index):

STANDARDIZED SCORE = 100 x {(e-c)/(e-f)}

Here "c" equals raw metric value, "e" eqauls the highest observed value among all streams in that subecoregion, and "f" equals the 5th percentile value of the reference stream distribution for that subecoregion.

Since standardized scores could not, in theory, exceed 100 or fall below 0, all scores greater than 100 or less than 0 were treated as 100 or 0 respectively. The standardization allowed each metric equal importance in the index (*i.e.*, equal weight). Standardized metrics from each category (richness, composition, tolerance/intolerance, functional feeding group, and habit) were then combined into a single inclusive index.

INDEX SCORE = (g+h+i+j+…)/n

Each letter within the parenthesis is equal to a standardized metric score, and "n" equals the total number of metrics included in that subecoregion. All final indices obtained this way scored on a 0 to 100 point scale.

Final indices thus obtained from 25 replicates of each subsample (*i.e.* 100, 200 and 300 organisms) were plotted in box and whisker graphs to evaluate how the indices were distributed in a scale scoring from 0 to 100. Variability for box and whiskers was set at the 25th (lower) and the 75th (upper) percentiles in order to keep the analysis consistent with the method used during metric development by Olson (2002) and Hughes (2004).

Statistical Tests of Significance

The multiple-range test (Steel and Torrie 1960) was used to compare the mean macroinvertebrate index across the range of subsample sizes. This test allowed for simultaneous comparisons of more than two means. In order to test for significance, the least significant range (LSR) and the mean index difference (MID) values were calculated. The test was considered significant when MID value equaled or exceeded the LSR value. All significant tests were performed at 95% confidence level.

Cost-Benefit Analysis

Eventually, the time (cost) associated with each subsample and consideration of the variability in metric values among the subsamples would decide the optimum size for a subsample. A total of 10 sites, 5 low and 5 high gradient streams, were selected for cost-benefit analysis. Times for rinsing samples, sorting, mounting, and identifying the organisms were recorded. Not one subsample had the exact target number (100, 200 or 300); therefore, total time for a complete subsample was calculated by multiplying the average time taken for one organism (sorting, mounting and identifying) to its corresponding subsample size (100, 200 or 300).

RESULTS

The following results are presented according to the subecoregion and the ecoregion. A table that shows the raw and standard metric scores is provided for each site. Substantial changes in scores are depicted by red numerals. The scores were averaged from 25 replicates for each subsample size. Scores from the whole subsample (all organisms that were sorted prior to bootstrap resampling) are also presented. In addition to this, box and whiskers graph for each site is provided. The graph represents the distribution of 25 indices for each subsample size (that is, taken from 25 replicates for each subsample size) against a scale of 0 to 100 points.

Ecoregion 45 – Piedmont

Subecoregion 45a – Southern Inner Piedmont

45a-35

Richness score as Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa increased with increasing subsample size, while the remaining metric indices did not change (Table 2).

Table 2. Metric index scores before and after standardization for site 45a-35.

Metric	Raw Score				Standard Score		
	100*	200*	300*	Whole	100*	200*	300*
EPT Taxa	14.12	20.04	25.08	31.00	82.82	100.00	100.00
% Chironomidae Taxa	53.52	52.20	53.15	53.21	38.53	40.30	39.03
% Cricotopus & Chironomus / TC	14.35	15.26	15.20	15.17	60.54	58.02	58.20
NCBI	6.58	6.57	6.60	6.74	41.38	41.90	40.84
% Scraper Taxa	19.24	18.56	19.01	18.53	48.22	46.52	47.65
% Clinger Taxa	36.24	35.60	35.77	36.00	56.63	55.63	55.90
Mean	**24.01**	**24.71**	**25.80**	**26.78**	**54.69**	**57.06**	**56.94**

*Averaged from 25 replicates.

Index variability declined with increasing subsample size. Inter-quartile variability of all three subsamples overlapped (Figure 2).

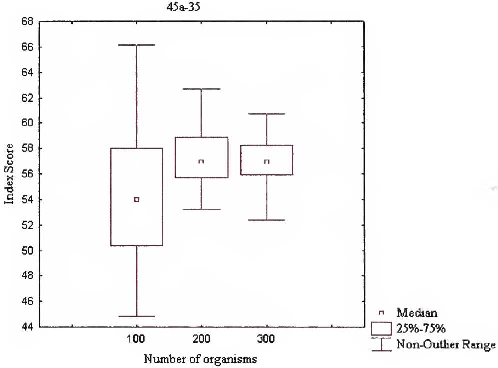

Figure 2. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 45a-35.

<u>**45a-50**</u>

Richness index (EPT taxa) increased with increasing subsample size (Table 3). The remaining metric indices did not display a consistent trend.

Index variability declined with increasing subsample size (Table 3). Inter-quartile variability of all three subsamples overlapped.

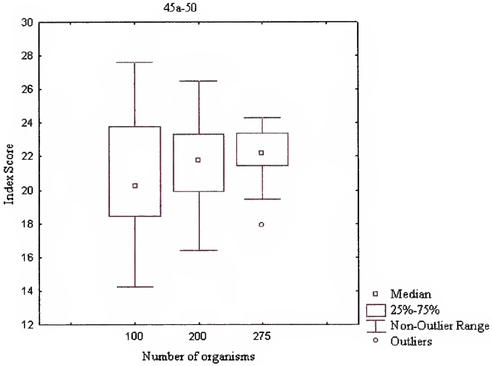

Figure 3. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 45a-50.

Table 3. Metric index scores before and after standardization for site 45a-50.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
EPT Taxa	4.04	5.56	5.80	6.00	23.76	32.71	34.12
% Chironomidae Taxa	73.84	74.78	74.98	74.55	11.29	10.03	9.76
% Cricotopus & Chironomus / TC	24.40	24.17	24.29	24.40	32.88	33.51	33.21
NCBI	7.44	7.36	7.37	7.36	13.14	13.82	13.50
% Scraper Taxa	3.12	3.34	3.23	3.33	7.82	8.37	8.09
% Clinger Taxa	23.36	21.81	21.63	22.73	36.50	32.75	33.80
Mean	**22.70**	**22.84**	**22.88**	**23.06**	**20.90**	**21.87**	**22.08**

45a-90

Richness (EPT taxa) increased with increasing subsample size while the remaining metric indices did not display notable changes (Table 4).

Index variability was greater in 200-organism subsample (Figure 4). Interquartile variability overlapped between subsamples of 200- and 300-organisms while scores from subsamples of 100 individuals were substantially lower (no overlap).

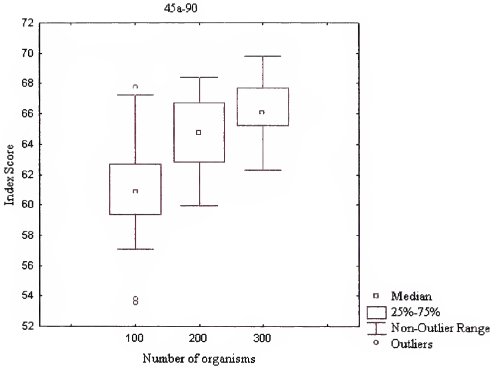

Figure 4. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 45a-90.

Table 4. Metric index scores after and before standardization for site 45a-90.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
EPT Taxa	9.08	12.88	14.04	16.00	53.41	75.76	82.59
% Chironomidae Taxa	41.28	39.76	39.73	40.16	54.94	56.98	57.01
% Cricotopus & Chironomus / TC	1.61	1.82	1.66	1.47	95.57	95.01	95.44
NCBI	6.12	5.97	5.96	5.97	61.52	63.45	63.69
% Scraper Taxa	5.76	5.52	5.89	5.71	14.44	13.83	14.77
% Clinger Taxa	54.80	53.98	54.00	54.53	85.63	84.34	84.38
Mean	**19.78**	**19.99**	**20.21**	**20.64**	**60.92**	**64.90**	**66.31**

Subecoregion 45b – Southern Outer Piedmont

45b-44

Increases in richness (Coleoptera taxa), habit (swimmer taxa) and functional feeding group (FFG) (scraper taxa) indices were found when larger subsamples were used while remaining metric indices measures did not show substantive trends (Table 5).

Table 5. Metric index scores before and after standardization for site 45b-44.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Coleoptera Taxa	0.36	0.92	0.88	1.00	4.09	10.45	10.00
% Oligochaeta Taxa	1.36	1.76	1.59	1.66	94.82	93.30	93.96
% Chironomidae Taxa	56.12	55.32	55.72	55.81	43.99	45.34	44.66
% Intolerant Taxa	17.48	18.35	17.98	15.61	79.76	83.78	82.25
Scraper Taxa	2.20	2.56	2.88	3.0	25.00	29.09	32.73
Swimmer Taxa	1.88	2.52	2.88	3.0	49.47	66.32	75.79
Mean	**13.23**	**13.57**	**13.66**	**13.35**	**49.52**	**54.71**	**56.57**

Index variability declined dramatically for 300-organism subsamples (Figure 5). Interquartile variability overlapped between 200- and 300-organism subsamples while indices created from 100-organism subsamples were substantially lower.

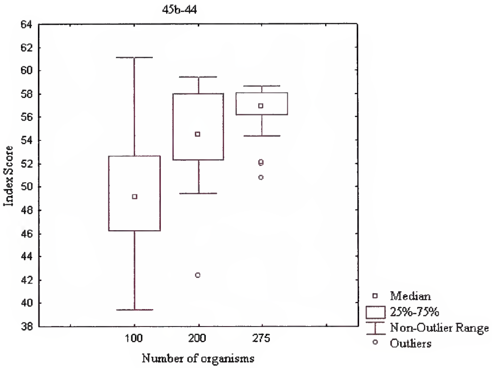

Figure 5. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 45b-44.

Subecoregion 45c – Carolina Slate Belt

45c-3

Richness (of Tanytarsini taxa) and habit (swimmer taxa) indices increased when subsample size was increased while remaining indices did not display substantive changes (Table 6).

Index variability declined dramatically for 300-organism subsample (Figure 6). Interquartile variability overlapped between 200- and 300-organism subsamples. There was a slight overlap between interquartiles of 100- and 200-organism subsamples.

Table 6. Metric index scores before and after standardization for site 45c-3.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Tanytarsini Taxa	3.52	4.76	5.72	6.00	52.54	71.04	85.37
% Odonata	4.76	4.50	4.41	4.35	42.25	45.72	46.96
% Tanypodinae / TC	24.57	23.94	23.97	16.54	12.53	9.57	8.97
Dominant Individuals	10.88	21.64	29.40	32.00	1.27	1.15	1.07
% Intolerant	2.36	1.98	2.07	1.67	7.04	5.91	6.16
% Shredder	5.24	5.42	5.38	5.02	18.25	18.87	17.98
Swimmer Taxa	2.24	3.40	4.00	4.00	56.00	85.00	100.00
Mean	**7.65**	**9.38**	**10.71**	**9.94**	**27.13**	**33.89**	**38.07**

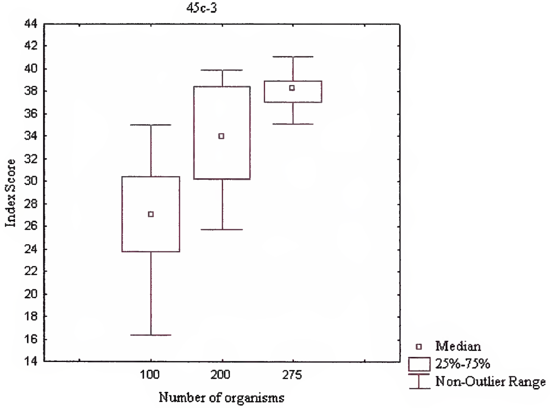

Figure 6. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 45c-3.

Subecoregion 45d – Talladega Upland

45d-11

Richness (as Coleoptera taxa) and FFG (as shredder taxa) indices increased with increasing subsample sizes while remaining indices remained largely unaffected when the number of organisms in the subsample was increased (Table 7).

Index variability declined with increasing subsample size (Figure 7). Inter-quartile variability of all three subsamples overlapped.

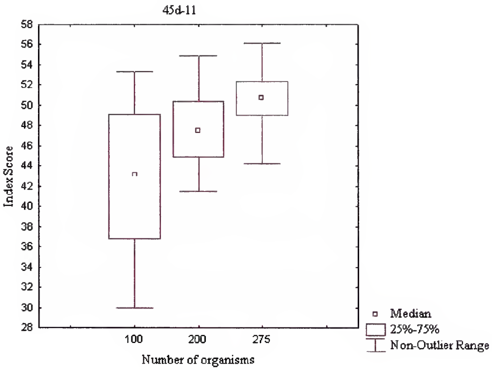

Figure 7. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 45d-11.

Table 7. Metric index scores before and after standardization for site 45d-11.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Coleoptera Taxa	2.08	3.52	4.56	5.00	23.50	39.77	51.53
% Odonata	1.32	1.32	1.29	1.32	81.21	81.62	82.04
% Tanypodinae / TC	11.67	11.39	11.53	7.50	49.46	50.84	50.15
NCBI	5.71	5.70	5.73	5.70	7.92	8.54	7.79
% Tolerant Individuals	17.76	18.10	18.12	18.33	35.19	32.49	32.35
Shredder Taxa	4.84	6.20	6.84	7.00	56.61	72.51	80.00
Mean	**7.23**	**7.71**	**8.01**	**7.48**	**42.32**	**47.63**	**50.64**

Subecoregion 45h – Pine Mountain Ridges

45h-1

Richness (as Plecoptera taxa) increased when larger subsamples were used (Table 8). Remaining metric did not substantially change with larger subsamples.

Index variability declined with increasing subsample size (Figure 8). Inter-quartile variability overlapped among all three subsamples.

Table 8. Metric index scores before and after standardization for site 45h-1.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Plecoptera Taxa	3.84	5.36	6.32	7.00	56.47	78.47	91.65
% Ephemeroptera	4.12	4.34	4.35	4.29	25.26	26.61	26.67
% Plecoptera	9.32	8.84	8.80	8.90	67.02	63.60	63.31
% Intolerant Individuals	31.80	31.14	31.85	31.60	78.83	77.19	78.97
% Scraper	21.68	20.92	21.62	21.17	98.95	100.00	100.00
% Clinger	49.28	50.68	50.37	50.61	82.39	84.73	84.22
Mean	**20.01**	**20.21**	**20.55**	**20.60**	**68.15**	**71.77**	**74.14**

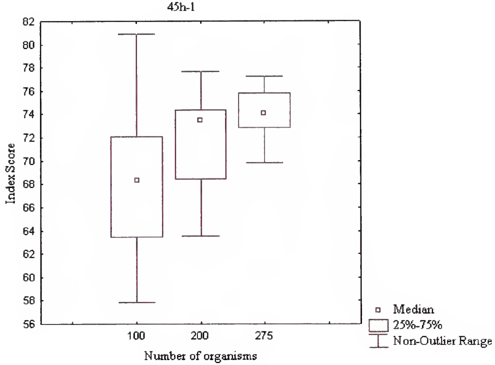

Figure 8. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 45h-1.

Ecoregion 65 – Southeastern Plains

Subecoregion 65d – Southern Hilly Gulf Coastal Plain

65d-20

Richness (as Plecoptera taxa and Trichoptera taxa) index changed with increasing subsample size (Table 9). No substantial changes were found in the remaining metric indices. Oligochaeta taxa were absent from subsamples from this site.

Index variability declined with increasing subsample size (Figure 9). Interquartile variability overlapped between 200- and 300-organism subsamples. Interquartile variability between 100- and 200-organisms overlapped very slightly.

Table 9. Metric index scores before and after standardization for site 65d-20.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Plecoptera Taxa	3.48	4.00	4.00	4.00	64.44	74.07	74.07
Trichoptera Taxa	3.88	5.32	5.84	6.00	60.63	83.13	91.25
% Oligochaeta	0.00	0.00	0.00	0.00	100.00	100.00	100.00
% Hydropsychidae / Trichoptera	88.33	86.47	87.23	86.36	11.97	14.50	13.94
% Predator	16.40	16.52	15.94	17.46	36.85	37.12	35.82
% Filterer	9.52	9.46	9.93	9.84	69.51	69.73	67.98
Mean	**20.27**	**20.30**	**20.49**	**20.61**	**57.23**	**63.09**	**63.84**

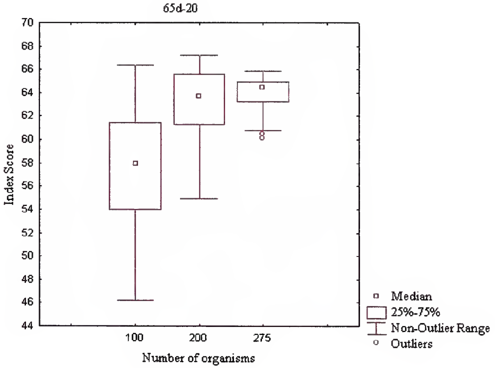

Figure 9. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 65d-20.

65d-39

Richness index (as Plecoptera and Trichoptera taxa) increased with increasing subsample size (Table 10). FFG index values (as percent filterer) decreased when subsample size was increased. The remaining metric indices did not display any trends over the range of subsample sizes.

Index variability declined with increasing subsample size (Figure 10). Interquartile variability overlapped between 100- and 200-organism subsamples while that of 300-organism subsample did not and was substantially higher.

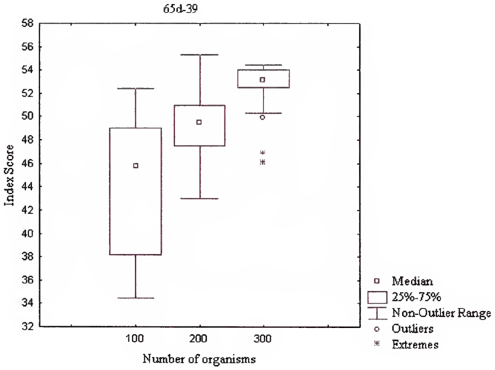

Figure 10. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 65d-39.

Table 10. Metric index scores before and after standardization for site 65d-39.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Plecoptera Taxa	4.40	6.28	7.04	9.00	79.26	97.19	99.41
Trichoptera Taxa	3.96	4.84	6.32	8.00	61.88	74.88	92.63
% Oligochaeta	0.36	0.26	0.19	0.20	97.14	98.12	98.78
% Hydropsychidae / Trichoptera	97.36	95.53	96.45	95.83	2.82	4.79	3.81
% Predator	9.88	9.70	9.13	9.27	22.20	21.80	20.52
% Filterer	32.84	31.14	32.73	32.35	1.77	0.29	0.00
Mean	**24.80**	**24.63**	**25.31**	**25.78**	**44.18**	**49.51**	**52.53**

Subecoregion 65h – Tifton Upland

65h-17

There was an increase in habit index (of burrower taxa) when larger subsamples were used (Table 11). The remaining metric indices did not differ much across the range of subsamples. Ephemeroptera taxa were absent from all subsamples.

Interquartile variability did not consistently increase or decrease across the range of subsamples (Figure 11). Interquartile variability between 200-organism and 300-organism subsamples overlapped with each other while the range interquartile variability for subsamples of 100 organisms was much lower.

Table 11. Metric index scores before and after standardization for site 65h-17.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Ephemeroptera Taxa	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Isopoda	37.28	36.26	36.35	36.50	18.94	21.16	20.96
% Tanytarsini	0.48	0.30	0.28	0.30	1.12	0.70	0.64
% Tolerant Individuals	40.48	42.06	42.05	41.25	57.25	55.14	55.15
% Scraper	1.08	1.08	1.15	1.19	4.16	4.16	4.43
Burrower Taxa	1.64	3.16	3.68	4.00	28.28	54.48	63.45
Mean	**13.49**	**13.81**	**13.92**	**13.87**	**18.29**	**22.61**	**24.11**

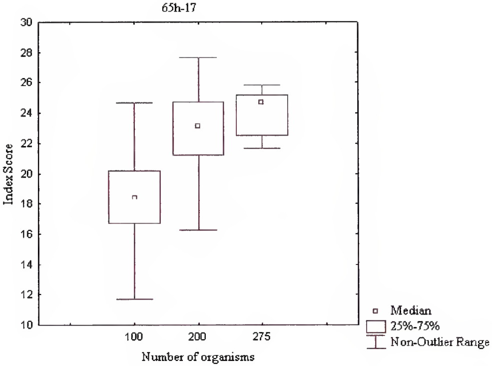

Figure 11. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 65h-17.

<u>**Subecoregion 65k – Coastal Plain Red Uplands**</u>

<u>**65k-102**</u>

The FFG indices (as scraper taxa, and percent shredders) changed slightly when larger subsamples were used (Table 12). The remaining metric indices did not show any clear trends. Gastropoda were absent from all subsamples.

Interquartile variability and median value declined with larger subsample size (Figure 12). Interquartile variability overlapped among all three subsamples.

Table 12. Metric index scores before and after standardization for site 65k-102

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
% Tanypodinae / TC	22.82	22.90	22.86	14.37	35.23	35.02	35.13
% Gastropoda	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Hydropsychidae / Total Trichoptera	68.49	66.74	67.00	66.67	32.02	33.26	33.00
Scraper Taxa	4.48	4.88	5.00	5.00	90.83	98.00	100.00
% Shredder	3.28	2.78	3.04	2.89	38.05	32.25	35.27
% Collector	21.08	21.31	21.45	39.31	22.90	23.23	23.31
Mean	**20.03**	**19.77**	**19.89**	**21.37**	**36.51**	**36.96**	**37.79**

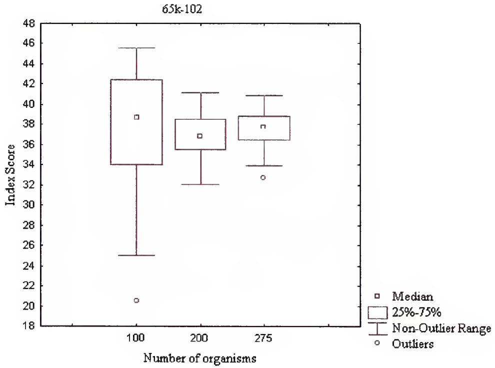

Figure 12. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 65k-102.

Subecoregion 65l – Atlantic Southern Loam Plains (Vidalia Upland)

65l-184

Richness (as Diptera taxa, and Trichoptera taxa), and FFG (as shredder taxa) and habit (as clinger taxa) indices increased when larger subsamples were used (Table 13). Remaining metric indices displayed no clear trends.

Interquartile variability declined slightly at larger subsample sizes (Figure 13). Interquartile variability overlapped among all three subsamples.

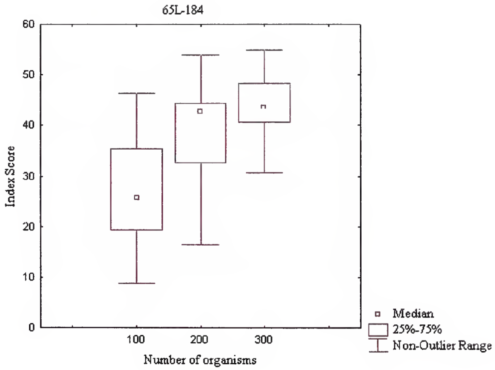

Figure 13. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 65l-184.

Table 13. Metric index scores before and after standardization for site 65L-184.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Diptera Taxa	11.72	16.36	18.20	23.00	34.88	48.69	54.17
Trichoptera Taxa	1.24	2.48	3.16	5.00	25.83	51.67	65.50
% EPT	1.24	1.40	1.32	1.27	14.61	16.49	15.55
% Tolerant Individuals	63.44	63.76	63.19	62.73	18.40	17.75	18.91
Shredder Taxa	3.00	5.16	6.00	8.00	61.83	92.00	97.83
Clinger Taxa	0.44	0.96	1.24	2.00	3.93	8.57	11.07
Mean	**13.51**	**15.02**	**15.52**	**17.00**	**26.58**	**39.20**	**43.84**

Subecoregion 65o – Tallahassee Hills/Valdosta Limesink

65o-23

Richness (as Chironomidae taxa), FFG (as scraper taxa) and habit (as sprawler taxa) indices increased with larger subsamples (Table 14). The index for burrower taxa actually decreased when 200 organisms were used but increased again at 300 organisms, despite taking 25 replicates at each level. Remaining metric indices remained essentially unchanged.

Interquartile variability declined in 300-organism subsample while median value increased dramatically (Figure 14). Interquartile variability overlapped only between 100- and 200- organism subsamples.

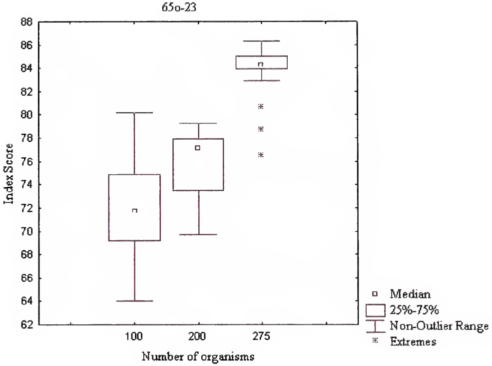

Figure 14. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 65o-23.

Table 14. Metric index scores before and after standardization for site 65o-23.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Chironomidae Taxa	17.64	24.52	27.12	30.00	46.85	65.13	72.03
% Oligochaeta	0.28	0.38	0.26	0.30	99.51	99.33	99.54
NCBI	6.13	5.89	5.94	5.92	79.29	82.03	80.05
Scraper Taxa	2.36	2.72	2.96	3.00	78.67	90.67	98.67
Sprawler Taxa	8.88	9.76	12.24	13.00	94.67	96.89	100.00
Burrower Taxa	5.16	3.08	8.32	9.00	33.62	20.07	54.20
Mean	**6.74**	**7.73**	**9.47**	**10.20**	**72.10**	**75.69**	**84.08**

65o-3

Richness (as Chironomidae taxa), FFG (as scraper taxa) and habit (as sprawler taxa and burrower taxa) indices increased with increasing subsample size (Table 15). The tolerance (NCBI) index did not substantially change. Oligochaeta taxa were absent from all subsamples.

Interquartile variability declined dramatically in the 300-organism subsample (Figure 15). Interquartile variability did not overlap among any subsamples.

Table 15. Metric index scores before and after standardization for site 65o-3.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Chironomidae Taxa	14.12	19.20	23.36	26.00	37.50	51.00	62.05
% Oligochaeta	0.00	0.00	0.00	0.00	100.00	100.00	100.00
NCBI	7.02	7.10	7.08	7.10	41.28	39.87	40.47
Scraper Taxa	2.44	3.08	3.64	4.00	80.00	93.33	100.00
Sprawler Taxa	6.70	9.71	12.36	14.00	74.22	96.89	100.00
Burrower Taxa	1.80	2.40	2.80	3.00	11.73	15.64	18.24
Mean	**5.35**	**6.92**	**8.21**	**9.02**	**57.46**	**66.12**	**70.13**

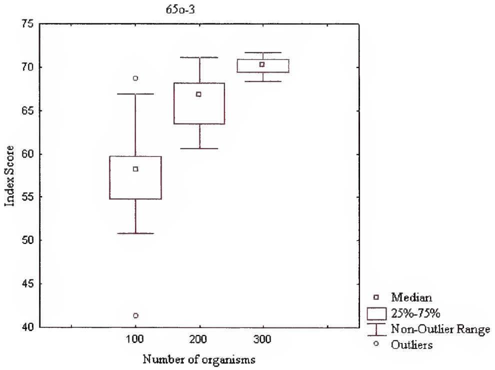

Figure 15. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 65o-3.

Ecoregion 66 – Blue Ridge

Subecoregion 66d – Southern Crystalline Ridges and Mountains

66d-43

Richness (as Diptera taxa) and habit (as clinger taxa) increased in larger subsamples while the remaining metric indices did not display any trends (Table 16).

Interquartile variability declined with subsample size and median value increased (Figure 16). Interquartile variability did not overlap among any subsamples.

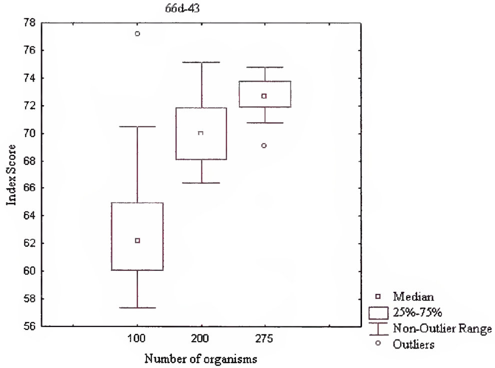

Figure 16. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 66d-43.

Table 16. Metric index scores before and after standardization for site 66d-43.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Diptera Taxa	15.92	23.44	26.52	28.00	53.07	78.13	88.40
% Plecoptera	25.32	24.80	24.76	24.76	82.34	80.65	80.51
% Odonata	0.68	0.60	0.67	0.64	85.09	86.84	85.33
% Dominant Individuals	18.36	18.00	18.02	18.10	27.99	29.49	29.34
% Shredder	27.00	26.30	26.15	26.35	80.48	78.39	75.78
Clinger Taxa	14.44	20.20	22.48	24.00	47.81	66.89	74.44
Mean	**16.95**	**18.89**	**19.77**	**20.31**	**62.80**	**70.07**	**72.30**

66d-44-2

This site showed increases in richness (as Diptera taxa) and habit (as clinger taxa) when larger subsamples were taken (Table 17). No changes were detected among the remaining metric indices.

Interquartile variability declined as subsample size increased (Figure 17). Interquartile variability did not overlap among any of the subsamples.

Table 17. Metric index scores before and after standardization for site 66d-44-2.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Diptera Taxa	12.64	19.08	24.84	28.00	42.13	63.60	82.80
% Plecoptera	24.24	23.88	24.52	24.44	78.54	77.66	79.74
% Odonata	0.44	0.54	0.55	0.64	90.35	88.16	88.01
% Dominant Individuals	13.00	13.00	13.01	13.09	65.28	65.28	65.19
% Shredder	25.92	26.00	26.45	26.46	77.08	77.50	78.85
Clinger Taxa	16.88	22.24	25.28	27.00	55.89	73.64	83.71
Mean	**15.52**	**17.46**	**19.11**	**19.94**	**68.21**	**74.31**	**79.72**

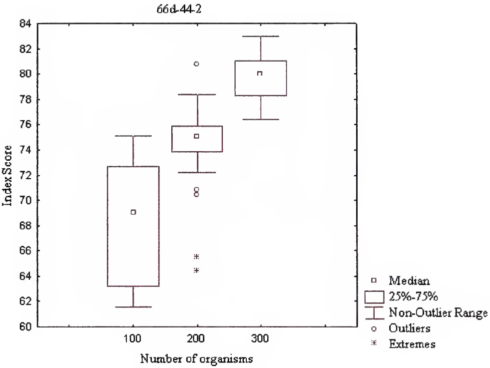

Figure 17. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 66d-44-2.

66d-58

Richness (as Diptera taxa), tolerance (as percent dominant individuals) and habit (as clinger taxa) indices increased with increasing subsample size (Table 18). Remaining metric indices displayed little much. Odonata were absent from all subsamples.

Interquartile variability declined as subsample size was increased while median value increased (Figure 18). Interquartile variability did not overlap among any subsamples.

Table 18. Metric index scores before and after standardization for site 66d-58.

Metric	Raw Score				Standard Score		
	100	200	275	Whole	100	200	275
Diptera Taxa	19.56	25.64	30.16	35.00	65.20	85.47	97.73
% Plecoptera	10.52	10.58	10.44	10.76	34.21	34.41	33.95
% Odonata	0.00	0.00	0.00	0.00	100.00	100.00	100.00
% Dominant Individuals	11.48	10.38	10.24	9.71	76.16	84.04	85.04
% Shredder	14.12	13.52	14.00	14.35	42.09	40.30	41.89
Clinger Taxa	11.72	14.68	17.08	20.00	38.81	48.61	56.56
Mean	**11.23**	**12.47**	**13.65**	**14.97**	**59.41**	**65.47**	**69.20**

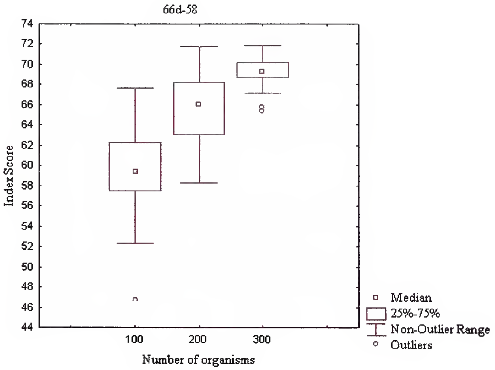

Figure 18. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 66d-58.

Subecoregion 66g – Southern Metasedimentary Mountains

66g-23

Richness (as EPT taxa) and FFG (as scraper taxa) indices increased with increasing subsample size (Table 19). Among the composition measures, percent Tanypodinae/total Chironomidae decreased. Other metric indices did not substantially change.

Interquartile variability declined substantially when 300 organisms were used (Figure 19). Interquartile variability between 200- and 300-organism subsamples overlapped while interquartile range for 100-organism subsamples were considerably lower.

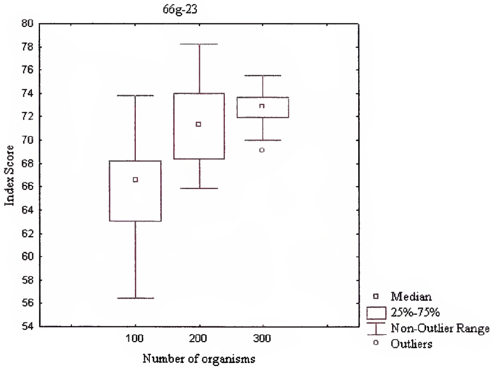

Figure 19. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 66g-23.

Table 19. Metric index scores before and after standardization for site 66g-23.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
EPT Taxa	25.48	35.28	40.56	43.00	69.62	95.54	100.00
% Chironomidae	22.92	22.28	22.71	22.65	67.72	68.90	68.11
% Tanypodinae / TC	13.35	13.84	13.80	7.32	25.93	16.79	15.34
NCBI	3.71	3.66	3.65	3.68	88.56	90.58	90.83
% Dominant Individuals	8.12	7.82	7.63	7.46	92.75	94.85	96.03
Scraper Taxa	5.40	7.08	7.72	8.00	56.25	73.75	80.42
% Clinger	44.96	44.81	44.56	44.48	59.60	59.13	59.07
Mean	**17.71**	**19.25**	**20.09**	**19.51**	**65.78**	**71.36**	**72.83**

66g-71

Indices of richness (as EPT taxa) and FFG (as scraper taxa) increased with increasing subsample size (Table 20). Among the composition measures, percent Tanypodinae/total Chironomidae decreased. Remaining metric indices were largely unaffected by the increase in susbample size.

Interquartile variability declined with increasing subsample size (Figure 20). Interquartile variability between 200- and 300-organism subsamples overlapped slightly while interquartile ranges for 100-organism subsample were lower.

Table 20. Metric index scores before and after standardization for site 66g-71.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
EPT Taxa	17.36	25.52	29.76	33.00	47.43	69.73	81.31
% Chironomidae	30.92	30.64	30.71	30.58	52.89	53.41	53.29
% Tanypodinae / TC	18.50	20.21	20.04	20.00	9.17	0.39	0.00
NCBI	5.53	5.49	5.51	5.50	30.24	31.53	30.72
% Dominant Individuals	16.64	16.00	16.22	16.21	53.40	56.46	55.42
Scraper Taxa	3.68	4.52	4.92	5.00	38.33	47.08	51.25
% Clinger	48.64	49.72	49.73	49.85	64.48	65.92	65.93
Mean	**20.18**	**21.73**	**22.41**	**22.88**	**42.28**	**46.36**	**48.27**

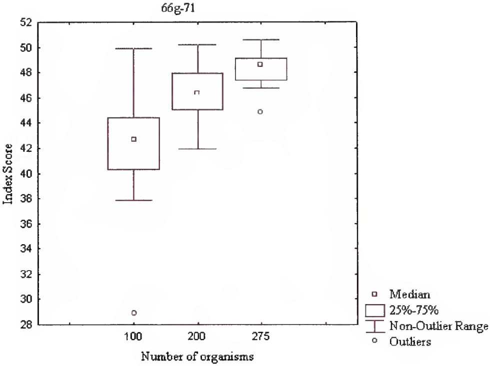

Figure 20. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 66g-71.

Subecoregion 66j – Broad Basins

66j-19

Among richness metrics, only Margalef's Index increased with larger subsamples while Simpson's Index did not (Table 21). FFG (as predator taxa) and habit (as sprawler taxa) indices increased with increasing subsample size. Composition (as percent Tanytarsini) and tolerance (as percent intolerant individuals) indices were largely unaffected by subsample size.

Interquartile variability declined with increasing subsample size while median value increased (Figure 21). Interquartile variability did not overlap among all three subsamples sizes.

Table 21. Metric index scores before and after standardization for site 66j-19.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Simpson's Diversity Index	0.06	0.06	0.05	0.06	56.89	55.80	59.95
Margalef's Index	8.99	11.57	13.25	14.54	66.38	85.42	97.19
% Tanytarsini	1.76	1.94	1.95	1.64	15.30	16.87	16.93
% Intolerant Individuals	18.48	17.24	17.25	17.14	44.80	41.79	41.83
Predator Taxa	5.92	9.72	11.84	14.00	37.95	62.31	75.90
Sprawler Taxa	11.52	16.96	21.24	27.00	53.33	78.44	96.26
Mean	**7.79**	**9.58**	**10.93**	**12.40**	**45.78**	**56.77**	**64.68**

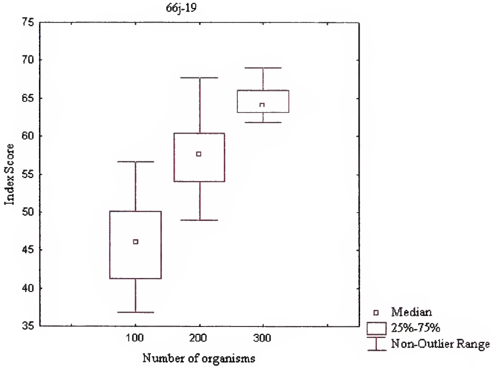

Figure 21. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 66j-19.

66j-23

Richness (by Margalef's Index) increased with larger subsamples. FFG (as predator taxa) and habit (as sprawler taxa) indices increased with increasing subsample size (Table 22). Composition (as percent Tanytarsini) and tolerance (as percent intolerant individuals) indices were largely unaffected by susbample size.

Interquartile variability declined with increasing subsample size while median value increased (Figure 22). Interquartile variability did not overlap among all three subsamples sizes.

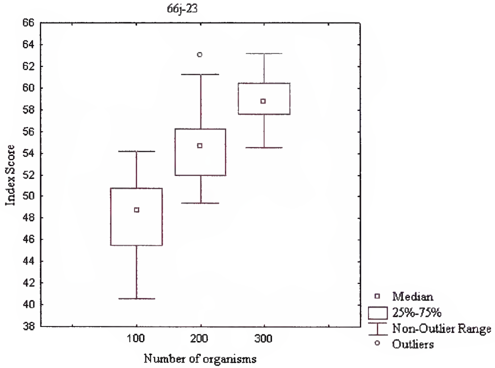

Figure 22. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 66j-23.

Table 22. Metric index scores before and after standardization for site 66j-23.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Simpson's Diversity Index	0.05	0.05	0.05	0.05	63.41	60.92	61.41
Margalef's Index	8.16	9.74	10.55	11.70	60.24	71.93	77.90
% Tanytarsini	1.68	1.46	1.37	1.37	14.61	12.70	11.94
% Intolerant Individuals	35.52	35.80	35.99	33.59	85.94	87.30	87.24
Predator Taxa	5.44	8.08	10.32	14.00	34.87	51.80	66.15
Sprawler Taxa	6.60	9.36	10.68	13.00	30.56	43.33	49.44
Mean	**9.58**	**10.75**	**11.49**	**12.29**	**48.27**	**54.66**	**59.01**

66j-25

Richness (by Margalef's Index) increased with larger subsamples. FFG (as predator taxa) and habit (as sprawler taxa) indices increased with increasing subsample size (Table 23). Composition (as percent Tanytarsini) and tolerance (as percent intolerant individuals) indices were largely unaffected by subsample size.

Interquartile variability declined with increasing subsample size while median value increased (Figure 23). Interquartile variability did not overlap among any of the subsample sizes.

Table 23. Metric index scores before and after standardization for site 66j-25.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Simpson's Diversity Index	0.06	0.06	0.06	0.07	43.31	44.22	45.90
Margalef's Index	6.01	7.16	7.54	7.80	44.39	52.91	55.71
% Tanytarsini	0.44	0.58	0.67	0.63	3.83	5.04	5.82
% Intolerant Individuals	18.16	19.84	20.13	19.57	44.02	48.10	48.80
Predator Taxa	2.36	4.36	5.40	6.00	15.13	27.95	34.62
Sprawler Taxa	6.04	8.12	9.16	10.00	27.96	37.59	42.41
Mean	**5.51**	**6.69**	**7.16**	**7.35**	**29.77**	**35.97**	**38.88**

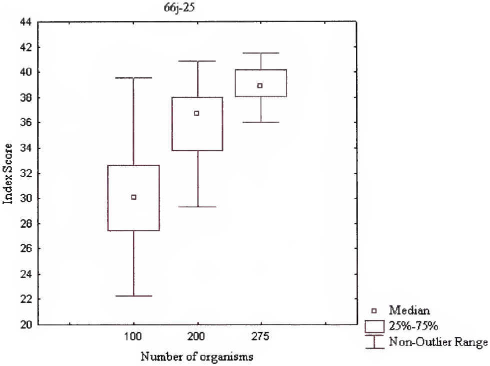

Figure 23. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 66j-25.

66j-26

Richness (by Margalef's Index) increased with larger subsamples. FFG (as predator taxa) and habit (as sprawler taxa) indices increased with increasing subsample size (Table 24). Composition (as percent Tanytarsini) and tolerance (as percent intolerant individuals) indices were largely unaffected by susbample size.

Interquartile variability declined with increasing subsample size while median value increased (Figure 24). Interquartile variability did not overlap among all three subsample ranges.

Table 24. Metric index scores before and after standardization for site 66j-26.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Simpson's Diversity Index	0.04	0.04	0.04	0.04	86.43	84.70	84.61
Margalef's Index	8.67	10.34	11.21	12.16	64.02	76.33	82.82
% Tanytarsini	2.04	1.78	1.83	1.37	17.74	15.48	15.89
% Intolerant Individuals	32.64	32.60	33.52	32.12	79.13	79.03	81.26
Predator Taxa	6.08	9.40	11.52	14.00	38.97	60.26	73.85
Sprawler Taxa	12.56	15.36	17.16	19.00	58.15	71.11	79.44
Mean	**10.34**	**11.59**	**12.55**	**13.12**	**57.41**	**64.49**	**69.65**

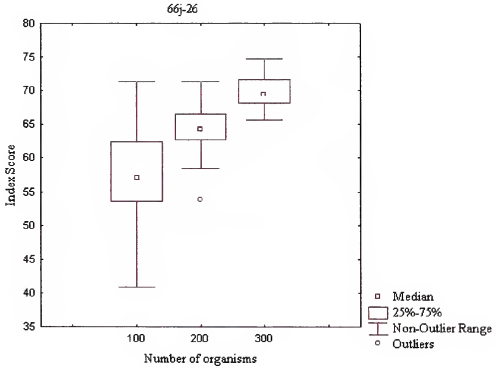

Figure 24. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 66j-26.

66j-28

Richness (by Margalef's Index) increased with larger subsamples (Table 25). FFG (as predator taxa) and habit (as sprawler taxa) indices increased with increasing subsample size. Composition (percent Tanytarsini) and tolerance (as percent intolerant individuals) indices were largely unaffected by susbample size.

Interquartile variability declined dramatically with a subsample size of 300 organisms (Figurre 25). Interquartile variability did not overlap among all three subsample sizes.

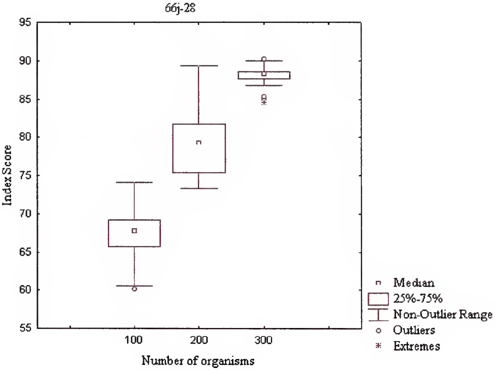

Figure 25. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 66j-28.

Table 25. Metric index scores before and after standardization for site 66j-28.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Simpson's Diversity Index	0.03	0.03	0.03	0.03	92.68	91.72	91.84
Margalef's Index	9.51	11.94	13.64	14.56	70.22	88.19	99.21
% Tanytarsini	5.20	5.50	5.60	5.44	45.22	47.83	48.70
% Intolerant Individuals	36.64	36.68	37.04	36.14	88.15	88.85	89.79
Predator Taxa	6.48	11.24	15.64	18.00	41.54	71.69	97.69
Sprawler Taxa	14.12	18.96	23.36	27.00	65.37	87.70	99.78
Mean	**12.00**	**14.06**	**15.89**	**16.86**	**67.20**	**79.33**	**87.84**

Ecoregion 68 – Southwestern Appalachians

Subecoregion 68c&d – Plateau Escarpment *and* Southern Table Plateaus

68c&d-7

Richness (as Plecoptera taxa) increased slightly with the increase of subsample size (Table 26). The remaining metric indices did not display any trends over the range of subsample sizes. Hydropsychidae were absent from all subsamples.

Interquartile variability declined substantially with increasing subsample size, however, interquartile variability greatly overlapped among all three subsample sizes (Figure 26).

Table 26. Metric index scores before and after standardization for site 68c&d-7.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Plecoptera Taxa	1.64	1.84	2.00	2.00	41.00	46.00	50.00
% Hydropsychidae / Total Trichoptera	0.00	0.00	0.00	0.00	100.00	100.00	100.00
% Tanypodinae / TC	15.12	15.38	15.57	15.53	25.96	23.30	22.24
NCBI	5.16	5.39	5.41	5.40	48.20	49.01	48.46
Scraper Taxa	0.96	1.00	1.00	1.00	14.33	14.93	14.93
% Clinger	11.88	11.20	11.00	11.36	32.81	31.02	30.46
Mean	**5.79**	**5.80**	**5.83**	**5.88**	**43.72**	**44.04**	**44.35**

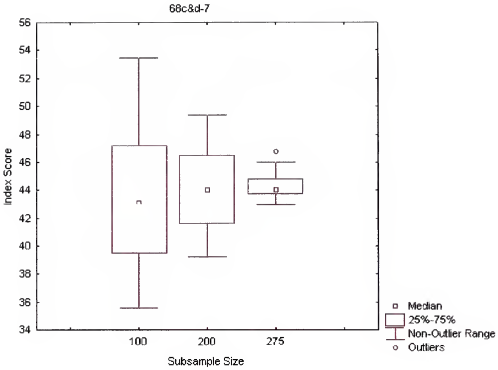

Figure 26. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 68c&d-7.

Ecoregion 75 – Southern Coastal Plain

Subecoregion 75e – Okefenokee Plains

75e-54

Raw score for tolerance (as dominant individuals) index was affected by subsample size, but the standardized index remained the same (Table 27). The rest of the metric indices were unaffected by subsample size. Richness metric was not used for this site.

Interquartile variability declined substantially in larger subsamples while median values remained equal (Figure 27). Interquartile variability greatly overlapped among all three subsamples.

Table 27. Metric index scores before and after standardization for site 75e-54.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
% Oligochaeta	0.64	0.68	0.65	0.67	98.16	98.11	98.21
% Tanypodinae / TC	22.46	22.48	23.15	22.73	48.54	48.49	46.96
% Non-Insect	20.48	19.02	19.68	18.63	78.97	81.19	80.19
Dominant Individuals	13.12	25.00	38.96	57.00	100.00	100.00	100.00
% Collector	37.88	39.12	38.97	39.25	89.71	92.95	93.11
% Filterer	17.48	17.38	16.84	17.30	4.03	3.79	4.42
Mean	**18.68**	**20.61**	**23.04**	**25.93**	**69.90**	**70.76**	**70.48**

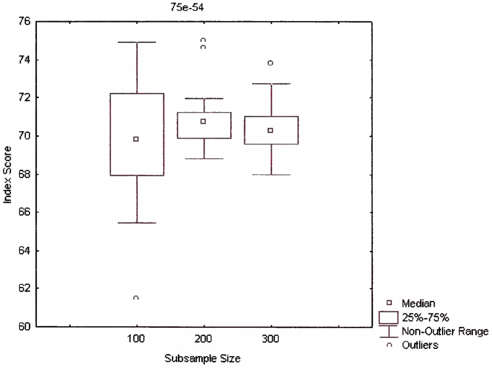

Figure 27. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 75e-54.

Subecoregion 75f – Sea Island Flatwoods

75f-50

Richness (as Chironomidae taxa), composition (as percent Tanypodinae/total Chironomidae) and tolerance (as tolerant taxa) changed with subsample size (Table 28). FFG (as percent filterer) index did not change. Oligochaeta and Odonata were completely absent from all subsamples.

Interquartile variability declined in larger subsamples, as did median index values (Figure 28). Interquartile variability overlapped among all three subsamples.

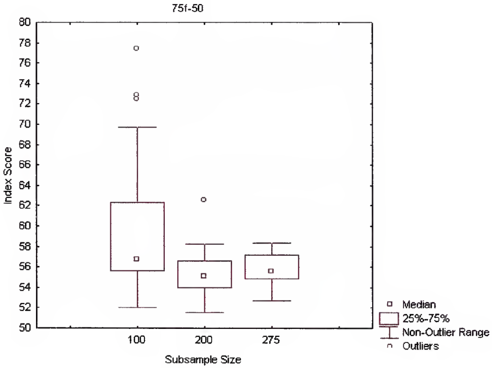

Figure 28. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 75f-50.

Table 28. Metric index scores before and after standardization for site 75f-50.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Chironomidae Taxa	2.40	4.60	5.36	6.00	20.25	38.82	45.23
% Oligochaeta	0.00	0.00	0.00	0.00	100.00	100.00	100.00
% Odonata	0.00	0.00	0.00	0.00	100.00	100.00	100.00
% Tanypodinae / TC	55.72	57.54	52.80	53.85	23.43	7.08	6.45
Tolerant Taxa	10.23	13.12	15.00	15.00	30.73	3.62	0.45
% Filterer	3.96	4.34	4.33	4.30	83.99	82.45	82.48
Mean	**12.05**	**13.27**	**12.92**	**13.19**	**59.73**	**55.33**	**55.77**

75f-95

Richness (as Chironomidae taxa) and tolerance (as tolerant taxa) indices changed with subsample size (Table 29). Oligochaeta, Odonata, Tanypodinae and filterers were absent from all subsamples.

Interquartile variability declined in larger subsamples, as did median index values (Figure 29). Interquartile variability did not overlap among all three subsample sizes.

Table 29. Metric index scores before and after standardization for site 75f-95.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
Chironomidae Taxa	9.12	10.60	10.96	11.00	76.96	89.45	92.49
% Oligochaeta	0.00	0.00	0.00	0.00	100.00	100.00	100.00
% Odonata	0.00	0.00	0.00	0.00	100.00	100.00	100.00
% Tanypodinae / TC	0.00	0.00	0.00	0.00	100.00	100.00	100.00
Tolerant Taxa	6.20	7.48	7.88	8.00	76.63	62.37	57.85
% Filterer	0.00	0.00	0.00	0.00	100.00	100.00	100.00
Mean	**2.55**	**3.01**	**3.14**	**3.17**	**92.27**	**91.97**	**91.72**

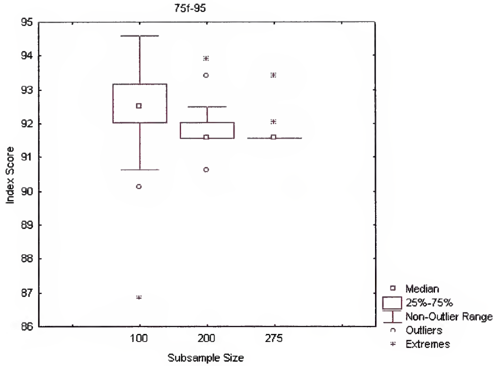

Figure 29. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 75f-95.

Subecoregion 75h – Bacon Terraces

75h-70

FFG (as shredder taxa) and habit (as sprawler taxa) indices increased when larger subsamples were used (Table 30). Oligochaeta remained absent from all subsamples while the remaining metric indices did not change substantially.

Interquartile variability declined very slightly with larger subsamples (Figure 30). Interquartile variability did not overlap among all three subsample sizes.

Table 30. Metric index scores before and after standardization for site 75h-70.

Metric	Raw Score				Standard Score		
	100	200	300	Whole	100	200	300
% Oligochaeta	0.00	0.00	0.00	0.00	100.00	100.00	100.00
% Non-Insect	54.56	54.74	54.37	54.67	40.81	40.61	41.02
HBI	6.64	6.60	6.61	6.60	48.65	50.14	49.69
Shredder Taxa	0.32	0.44	0.72	1.00	7.27	10.00	16.36
Sprawler Taxa	4.00	6.32	8.48	11.0	42.55	67.23	88.77
Mean	**13.10**	**13.62**	**14.04**	**14.65**	**47.86**	**53.60**	**59.17**

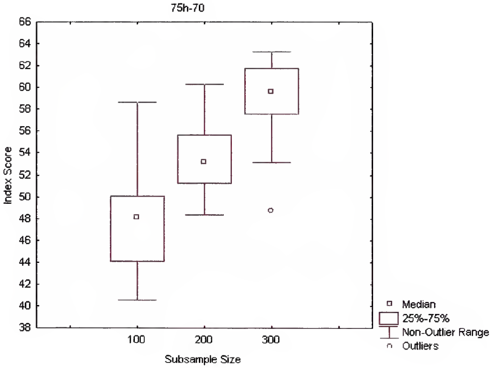

Figure 30. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes in site 75h-70.

The total time for picking, mounting and identifying taxa for 100, 200 and 300 counts of macroinvertebrates in 10 sites are tabulated in Table 31. The average time for the initial 100 organisms was 987 minutes. Mean additional time for 200 organisms was 775 minutes with a cumulative increase of 178.9 %. Mean additional time for 300 organisms was 1413 minutes with a cumulative increase of 250.09 %. Mean additional time between 200 and 300 organisms was 638 minutes with a 139.83 % increase.

Table 31. Time for sorting, mounting and identifying macroinvertebrates for selected stream sites.

Site No	Time for initial 100		Additional time required for successive subsamples					
			100 to 200		100 to 300		200 to 300	
	minutes	%	minutes	cum %	minutes	cum %	minutes	cum %
45a-50	372	100	336	190.32	779	309.41	443	162.57
45a-90	1137	100	1035	191.03	1539	235.36	504	123.20
45c-3	1070	100	918	185.80	1563	246.07	645	132.44
65d-20	1268	100	1068	184.23	1699	233.99	631	127.01
65d-39	1070	100	845	178.97	1711	259.91	866	145.22
65o-23	1272	100	903	170.99	1673	231.53	770	135.40
66d-43	1139	100	928	181.48	1644	244.34	716	134.64
66g-71	509	100	379	174.46	955	287.62	576	164.86
66j-25	964	100	641	166.49	1252	229.88	611	138.07
75f-95	1068	100	697	165.26	1312	222.85	615	134.84
Mean	**987**	**100**	**775**	**178.9**	**1413**	**250.09**	**638**	**139.83**

* Cumulative percentage

DISCUSSIONS

The mean macroinvertebrate indices of the three levels of subsample sizes for each stream site were paired into three different combinations: (1) 100- and 200-organism; (2) 200- and 300 organism; and (3), 100- and 300- organism subsamples. The first combination was used to examine the recommended subsample size of 100 individuals in the original RBP (Plafkin *et al.* 1989), and of Georgia DNR protocols that have been in use until very recently. This protocol was further examined by testing the third combination of paired subsamples. The second combination of paired subsamples tested the adequacy/inadequacy of 200 individuals as prescribed by the current RBP for stream health assessments (Barbour *et al.* 1999). Two hundred individuals have been found to be insufficient by previous studies (Ostermiller and Hawkins 2004).

For every pair of subsamples, the least significant range value (LSR) between their mean macroinvertebrate indices was compared to the mean index difference value (MID). The MID value exceeding the LSR value was considered significantly different (at the 95% confidence level). The multiple-range tests are summarized in Table 32 with the significant MID values depicted in red.

Ecoregion 45 –Piedmont

Subecoregion 45 – Southern Inner Piedmont

45a-35

Subsample size was found to affect richness (*i.e.*, EPT taxa - number of taxa in the Ephemeroptera, Plecoptera and Trichoptera families) while remaining metrics were not. Larger subsamples gave higher estimates for richness (Table 2). A note of interest

Table 32. Multiple-range tests of mean indices across subsamples.

Site No.	Subsamples N1 and N2		Subsamples N2 and N3		Subsamples N1 and N3	
	LSR	MID	LSR	MID	LSR	MID
45a-35	2.03	2.37	2.03	0.12	2.13	2.25
45a-50	1.42	0.89	1.42	0.22	1.50	1.11
45a-90	1.43	3.97	1.43	1.54	1.51	5.51
45b-44	2.25	5.19	2.25	1.85	2.37	7.04
45c-3	2.19	6.77	2.19	4.17	2.31	10.94
45d-11	2.76	5.31	2.76	3.01	2.90	8.32
45h-1	2.43	3.62	2.43	2.36	2.56	5.98
65d-20	2.05	5.86	2.05	0.75	2.16	6.61
65d-39	2.23	5.33	2.23	3.01	2.34	8.34
65h-17	1.41	4.32	1.41	1.50	1.49	5.82
65k-102	2.38	0.18	2.38	0.54	2.50	0.72
65l-184	4.93	12.61	4.93	3.99	5.19	16.60
65o-23	1.87	3.68	1.87	8.18	1.97	11.86
65o-3	2.06	8.66	2.06	4.01	2.17	12.67
66d-43	1.68	7.27	1.68	2.63	1.77	9.90
66d-44-2	2.10	6.10	2.10	5.41	2.21	11.51
66d-58	1.87	6.26	1.87	3.53	1.97	9.79
66g-23	1.8	5.60	1.8	1.47	1.90	7.07
66g-71	1.59	4.08	1.59	1.91	1.67	5.99
66j-19	2.83	10.99	2.83	7.91	2.98	18.90
66j-23	1.82	6.38	1.82	4.37	1.91	10.75
66j-25	1.85	6.20	1.85	2.91	1.95	9.11
66j-26	2.46	7.07	2.46	5.17	2.60	12.24
66j-28	2.04	12.14	2.04	8.90	2.15	21.04
68c&d-7	1.90	0.16	1.90	0.31	2.00	0.47
75e-54	1.29	0.85	1.22	0.27	1.22	0.58
75f-50	2.48	4.40	2.36	0.44	2.36	3.96
75f-95	0.55	0.30	0.55	0.25	0.66	0.55
75h-70	2.13	5.58	2.13	5.73	2.24	11.31

N1 = 100 organisms.
N2 = 200 organisms.
N3 = 300 organisms.

here is the failure of EPT taxa to increase when organism counts were raised from 200 to 300 individuals, regardless of the obvious increase in their raw scores. This is a cosmetic effect from the standardization process. Since the actual EPT taxa standard scores for both subsamples were in the excess of 100 points, and since a 0-100 scale was used for standardization, both subsamples scored equally for EPT taxa.

Metrics whose indices did not change across the range of subsample sizes were composition, functional feeding group (FFG) and habit (clinger, burrower, sprawler and swimmer); all having scored fairly close to the index of the whole sample (Table 2). Furthermore, absence of change in these metrics across the subsamples indicated a proportional rate of increase in successive subsamples. NCBI (a measure of tolerance level of biota to pollutant based on the average tolerance values of individuals within the sample) also scored close to that of the whole sample when different subsamples were used. This suggests a proportionate increase in similar taxa with similar tolerance values in successive subsamples.

The overall mean indices for subsamples with 100-organisms and 200-organisms were significantly different at 95% probability level (Table 32). The change in EPT taxa was entirely responsible for this discrepancy because the rest of the metric indices was the same in all subsamples (Table 2). However, no difference was found between mean indices of 200-organisms and 300-organisms. This was also due to EPT taxa which scored equally, although artificially, in these subsamples.

Because number of individuals in subsample size was closer to the full population size, the variability (inter-quartile range) decreased in larger subsamples (Figure 2). For this site, reliance on information from a 100-organism subsample would lead to erroneous judgment of the stream condition. Using information from 200- or 300-organism subsamples would reduce the chance of making such error. These two subsamples, however, gave similar information on stream condition, as there was no significant difference in their mean indices. Therefore, to save time and unnecessary expense, a subsample with 200 organisms was adequate.

45a-50

Richness was affected by subsample size (Table 3). Larger subsamples gave higher estimates of richness. But composition, FFG, tolerance and habit metrics were not affected by subsample size. A 100-organism subsample gave just as good an estimate as 300-organism subsamples. This suggests that these metrics increased at a proportional rate to increasing subsample size.

The observed increase in the sole richness metric was not sufficient to make a significant difference in the overall mean macroinvertebrate index across the range of subsamples (Table 32). All subsamples provided similar information on this site and therefore, based upon a savings in costs and time, a 100-organism subsample was sufficient.

45a-90

Richness was underestimated in smaller subsamples (Table 4). Larger subsamples gave higher estimates for richness. Subsample size did not affect estimates of composition, FFG, tolerance and habit metrics very much. Subsample of 100 organisms was as good as 200- or 300-organism subsamples in providing estimates for these metrics. In fact, the results from the whole sample (508 organisms) were very similar to those provided by 100 organisms.

Unlike the previous site, increase in only richness score at this site was sufficient to make significant differences in the overall mean index obtained from analyzing 100, 200 and 300 organisms (Table 32). This is a strong suggestion that a 300-organism subsample adds significant information and should be preferred over subsamples with 100 or 200 organisms.

The optimum sample size was not consistent for sites in subecoregion 45a. Because some sites will require a subsample of 300 organisms, all sites in 45a must be subsampled at that level in order to assure an adequate estimate of stream health (Table 33).

Subecoregion 45b- Southern Outer Piedmont

45b-44

Subsample size affected the estimates for richness, FFG, and habit metrics (Table 5). One-hundred organism subsamples gave underestimates for these metrics. Richness was best measured when 200 organisms were used. But for FFG and habit metrics, 300 organisms were required to get better estimates. The seemingly subtle differences in the raw scores of these metrics across subsamples were magnified substantially when equal weights were given to the scores (*i.e.*, standardization).

The overall mean indices of 100- and 200-organism subsamples differed significantly from each other suggesting the latter subsample provides more information (Table 32). But the mean index of 200 organisms did not differ significantly from that of 275 organisms; therefore, the information given by these two subsamples were similar. Hence, a subsample of 200 organisms provided an adequate index of stream condition.

Subecoregion 45c- Carolina Slate Belt

45c-3

Subsample size affected the estimates for richness and habit measures (Table 6). Larger subsamples gave higher estimates for richness and habit. However, estimates for composition, FFG, and tolerance measures were not affected by subsample size, and smaller subsamples produced similar results to larger subsamples.

The overall mean macroinvertebrate index across subsample size differed significantly indicating larger subsamples were more informative than smaller subsamples (Table 32). Therefore, 300-organism subsample was the best indicator of stream health at this site.

Subecoregion 45d- Talladega Upland

45d-11

Subsample size affected estimates for richness and FFG (Table 7) at this site. Larger subsamples gave better estimates for these metrics. However, composition, tolerance, and habit measures were not affected by size of the subsample. All three subsamples produced similar results suggesting a proportional increase of taxa in these metrics when more biota was sampled.

The resulting overall mean indices across subsample range were significantly different (Table 32). Since richness and FFG were grossly underestimated by subsamples containing 100 or 200 organisms, subsamples of 300 organisms were the best indicators of stream condition at this site.

Subecoregion 45h- Pine Mountain Ridges

45h-1

Richness was the only metric underestimated by smaller subsamples (Table 8). Composition, tolerance, FFG, and habit metrics were not affected by subsample size.

Indices from subsamples of 100 and 200 organisms were significantly different in their mean values (Table 32). There was no difference between those of 200- and 300-organism subsamples, hence 200-organism subsamples were adequate.

Although one of the sites was equivocal (requiring only 100 organisms), most sites in the subecoregions required at least subsamples of 300 individuals in order to create the best index of stream health. Therefore, a recommendation of a minimum subsample size of 300 individuals from any stream in Ecoregion 45 would yield the greatest reduction in risk of drawing an erroneous conclusion about the health of these streams. The recommendation is summarized in Table 33.

Ecoregion 65 – Southeastern Plains

Subecoregion 65d- Southern Hilly Gulf Coastal Plain

65d-20

The only metric measrured poorly by smaller subsamples was richness. Composition and FFG were unaffected by subsample size (Table 9).

A subsample of 200 organisms provided more information than 100 organisms because of the significant difference in their mean indices (Table 32). Also, variability declined in 200-organism subsamples. Even though 300-organism subsamples had the smallest variability, they were no better than 200-organism subsamples in providing information (no significant difference in mean index values). Therefore, using 200 organisms is adequate to provide information on stream condition.

65d-39

Subsample size affected the estimates of richness and FFG, but not for that of composition (Table 10).

Significant differences in mean index values across subsample ranges indicated that subsamples with 100 or 200 organisms did not give as much information as subsamples of 300 organisms (Table 32). Variability was also much lower in 300-organism subsamples. Thus, only subsamples with 300 organisms were adequate predictors at this site.

For subecoregion 65d, a minimum sample size of 300 organisms is recommended in order to obtain a more accurate estimate of stream health.

Subecoregion 65h – Tifton Upland

65h-17

Larger subsamples were only necessary for better estimates of habit measure. Richness, composition, tolerance and FFG were unaffected by subsample size (Table 11). Unlike in most sites, subsample size did not affect richness for this site because EPT taxa were completely absent. This suggests the strong value of EPT taxa in the evaluation of stream health.

There were significant differences among the mean indices suggesting additional information was provided with increasing subsample size (Table 32). As in subecoregion

65d, a larger subsample than the RBPs recommendation was required at this site to obtain the best indication of stream health.

Subecoregion 65k – Coastal Plain Red Uplands

65k-102

FFG (*i.e.,* scraper taxa and percent shredder taxa) was the only metric affected by subsample size (Table 12). A closer examination reveals that raw scores for scraper taxa and percent shredder taxa across the three subsample sizes were not very different from that of the complete sample (346 total organisms). Standardization magnified the score differences across the subsample range. Composition metrics, on the other hand, could be measured adequately from only 100 organisms and they produced results similar to those provided from 200- or 300-organism subsamples. Richness measure was not used for this site.

The multiple-range test did not find significant difference in the mean indices among the subsamples; therefore, larger subsamples did not provide more information than smaller ones (Table 32). Even though reduced variability from larger subsamples demonstrate better diagnostic capabilities for stream conditions, it might not be wise to accept this inference since the original sample was relatively small with only 346 organisms (Figure 12). Therefore, a 100-organism subsample was an adequate indicator of stream health at this site.

Subecoregion 65l – Atlantic Southern Loam Plains (Vidalia Upland)

65l-184

Composition and tolerance metrics were not affected by subsample size. These metrics could be estimated well from only 100 organisms because raw scores matched closely to that of the whole sample (550 organisms). Furthermore, standardized scores of these metrics across subsamples were not very different (Table 13). However richness was affected by subsample size and was poorly estimated in smaller subsamples. The same was true for habit and FFG.

Differences in richness, habit and FFG were responsible for the significant difference in the mean indices between 100- and 200-organism subsamples. However, the differences in these metrics between 200 and 300 organisms were not sufficient to be significant (Table 32). Therefore, because subsampling 300 organisms did not add new information to what was already provided from 200-organism subsamples, 200-organism subsamples were adequate for this site to save time and cost.

Subecoregion 65o – Tallahassee Hills/Valdosta Limesink

65o-23

Macroinvertebrate composition and tolerance metrics were not affected by subsample size, while richness, FFG and habit measures were affected by smaller sample sizes (Table 14).

The multiple-range tests showed mean index differences were significant across the range of subsamples (Table 32). Subsamples containing 300 organisms had a very small variability, albeit with a few extreme outliers, when compared to the variability of subsamples of 100-organism or 200-organism (Figure 14). It was clear that subsamples of 100- or 200-organisms did not provide an adequate amount of information about this site; therefore, only 300-organism subsamples were adequate.

65o-3

As in the previous site, composition and tolerance measures in this site were well represented by 100-organism subsamples while richness, FFG and habit measures were not (Table 15).

The multiple-range tests showed mean index differences were significant among the three subsamples (Table 32). Again, subsamples containing 300 organisms had very small variability when compared to subsamples of 100 or 200 organisms (Figure 15). It was clear that subsamples of 100 or 200 organisms omitted an important set of information about this site, and only 300 organism subsamples were appropriate.

Overall, a minimum sample size of 300 organisms is recommended for ecoregion 65 because majority of the sites in the subecoregions required that level for proper assessment of stream condition (Table 33).

Ecoregion 66 – Blue Ridge

Subecoregion 66d – Southern Crystalline Ridges and Mountains

66d-43

Subsamples with 100 individuals adequately characterized macroinvertebrate composition, as well as their tolerance and feeding characteristics for this site (Table 16). However, small samples failed to give proper estimates of richness and habit measures; larger subsamples were better in providing these estimates.

Differences in the mean index values between all three subsamples were significant (Table 32). This suggests additional information on stream condition obtained by subsampling 300 organisms is worth the time and cost. Also, variability in macroinvertebrate index score declined substantially with this subsample size (Figure 16).

66d-44-2

As at the previous site, larger subsamples were required for better estimation of richness and habit measures (Table 17). Subsample size did not affect composition, tolerance and FFG estimates.

Differences in the mean index values between all three subsamples were significant suggesting the costs associated with subsampling 300 organisms are repaid by the additional information gained (Table 32).

66d-58

Smaller subsamples underestimated richness and habit (Table 18). Community composition, tolerance and FFG were not affected by subsample size.

The mean index values between all three subsamples were significantly different (Table 32), while index variability from subsamples of 300 organisms was the smallest (Figure 18). As with many other sites in subecoregion 66d, only a subsample of 300 organisms was adequate to provide the information necessary to assess stream condition.

All sites in this subecoregion required at least a sample of 300 organisms; therefore, samples of 300 organisms are recommended for 66d (Table 33).

Subecoregion 66g – Southern Metasedimentary Mountains

66g-23

Macroinvertebrate composition, tolerance and habit measures were not affected by subsample size and even using 100 organisms apparently provided as much information as 200- or 300-organism subsamples (Table 19). However, richness and FFG were affected by subsample size and required larger subsamples for better estimates.

The differences in richness and FFG were responsible for the significant difference in the overall mean index values between subsamples of 100 and 200 organisms (Table 32). But they were not sufficiently strong to make a significant difference between the mean indices of 200 and 300 organisms. Thus, subsample of 200 organisms was adequate for evaluating this site.

66g-71

Tolerance and habit measures were not affected by subsample size (Table 20). Richness and FFG, on the other hand, increased progressively with larger subsample size. Raw scores from all three subsamples were not different in the ratio of Tanypodinae to Chironomidae but their standardized scores made appreciable differences.

Significant differences in mean index values indicated that 100 and 200 organisms do not provide as much information as a subsample of 300 organisms (Table 32). Therefore, it becomes important to use the largest subsample (*i.e.*, 300 organisms) for this site.

While one site in this subecoregion indicated samples of 200 organisms was adequate for stream health assessment, the other required samples of 300 organisms. At the subecoregion level (for 66d), using samples of 300 organisms is recommended to minimize the risk of erroneous conclusions about stream condition (Table 33).

<u>Subecoregion 66j – Broad Basins</u>

<u>66j-19</u>

Margalef's Index, one of the two richness measures used for this site, was affected by subsample size. FFG and habit measures were also affected (Table 21). A subsample with 300 organisms typically provided the highest estimate for these metrics. The other richness measure, Simpson's Index remained largely unaffected. Composition and tolerance measures were also unaffected by subsample size so that 100 organism gave similar estimates to 200- or 300-organism subsamples.

Overall, 100- and 200-organism subsamples failed to provide as much information as 300 organism subsamples (lower and significantly different mean index values) (Table 32).

<u>66j-23</u>

Margalef's Index was again affected by subsample size. FFG and habit measures were also affected (Table 22). A subsample with 300 organisms provided the highest estimates for these metrics. Simpson's Index remained largely unaffected by subsample size. Composition and tolerance measures were also unaffected so that 100 organisms gave similar estimates to 200- or 300-organism subsamples.

One-hundred and 200-organism subsamples failed to provide as much information as 300 organisms (again, lower and significantly different mean index values) (Table 32).

66j-25

As at previous sites, subsample size affected Margalef's Index, FFG and habit measures (Table 23). Subsample with 300 organisms provided the highest estimates for these metrics. Simpson's Index remained largely unaffected by subsample size. Composition and tolerance measures were also unaffected so that 100-organism subsamples gave similar estimates to those of 200 or 300 organisms.

Larger subsample (300 organisms) provided more information than 100- or 200-organism subsamples with higher and significantly different mean index values (Table 32).

66j-26

Margalef's Index was affected by subsample size as were FFG and habit measures (Table 24). Subsamples of 300 organisms gave the highest estimates for these metrics while Simpson's Index remained largely unaffected by subsample size. Composition and tolerance measures were also unaffected so that 100 organism gave similar estimates to 200 or 300 organism subsamples.

Larger (300-organism) subsamples provided more information than 100- and 200-organism subsamples with higher and significantly different mean index values (Table 32).

66j-28

Continuing the trend in the 66j subecoregion, one of the richness metrics (*i.e.*, Margalef's Index) was affected by subsample size while the other (*i.e.*, Simpson's Index) was not (Table 25). FFG and habit measures were also affected. Composition and tolerance measures remained unaffected by subsample size so that 100 organism gave similar estimates to 200- or 300- organism subsamples.

Larger (300-organism) subsamples provided more information than 100- and 200-organism subsamples (higher and significantly different mean index values) (Table 32).

Sites in subecoregion 66j strongly indicated that samples of 300 organisms provided the best macroinvertebrate mean index value. Therefore, 300-organism subsample sizes are recommended for stream health assessment for this subecoregion (Table 33). For the entire Ecoregion 66, three-hundred organism subsamples should be used since all of its subecoregions require 300 organisms.

Ecoregion 68 – Southwestern Appalachians

Subecoregion 68c&d – Plateau Escarpment *and* Southern Table Plateaus

68c&d-7

Subsample size did not affect metric indices although slight differences were found in the standardized richness score across the subsample range (Table 26). Subsamples of 100 organisms were just as good as those with 200 or 300 organisms in estimating indices for composition, tolerance, FFG and habit.

Statistically there were no differences in the mean index values among the subsamples (Table 32). Variability in index values was substantially reduced with subsamples of 300 organisms (Figure 26). This large sample was relatively close to the complete sample of 317 organisms, and therefore, was probably not a significant minimization effect. Thus, a subsample of 100 organisms was adequate for estimating stream site condition.

One-hundred organism subsamples are suggested for ecoregion 68 (Table 33). So far, this is the only ecoregion that agreed with the recommendation of 100 individuals according to the original RBP. The subsample size is cautionary as only one site was evaluated for the entire ecoregion.

Ecoregion 75 – Southern Coastal Plain

Subecoregion 75e – Okefenokee Plains

75e-54

None of the macroinvertebrate metrics used at this site was affected by subsample size. A subsample of 100 organisms gave similar estimates to those provided by 200 or 300 organisms (Table 27). It should be noted, however, that similar tolerance estimates observed across subsamples were due to standardization.

Mean overall index difference was not significant among the subsample sizes (Table 32). All subsamples gave similar information on the benthic community; and thereby the condition of this site. Although index variability declined with larger subsamples, the reductions were not appreciable (Figure 27). In sum, processing 200 or 300 organisms added unwanted costs. Processing 100 organisms were adequate to differentiate between reference and impaired conditions.

Subecoregion 75f – Sea Island Flatwoods

75f-50

Subsample size affected biotic richness, composition and tolerance indices (Table 28). Subsamples with 200 organisms gave higher estimates than 100 organisms and their mean index values were significantly different (Table 32). Even though 300 organisms provided higher estimates for these metrics than 200 organisms, the difference in mean overall index was not significant. Therefore, increasing subsample organism count to 300 did not add significant information to that provided by 200-individual counts. Thus, a subsample of 200 organisms was adequate to evaluate stream condition at this site.

75f-95

Richness and tolerance metrics were affected by increasing subsample size (Table 29). Despite this observation, mean overall macroinvertebrate indices across subsample range were not significantly different (Table 32). This was due to the absence of taxa for the remaining metrics, which provided for equal scoring across the subsample ranges. Variability declined with larger subsample size, but the reduction was small relative to the scale considered (Figure 29). Furthermore, the original sample had only 314 organisms. Since 100 organisms gave as much information as 200 or 300 organisms, a subsample of 100 organisms was acceptable for this site.

For subecoregion 75f, a minimum sample size of 200 organisms is suggested even though one of the sites required only 100 individuals (Table 33).

Subecoregion 75h – Bacon Terraces

75h-70

FFG and habit measures were affected by subsample size whereas composition and tolerance measures were not (Table 30). Subsamples of 300 organisms provided the best overall estimate of the benthic community with a higher mean index value that were significantly different from those of other subsamples (Table 32).

For the entire ecoregion 75, three-hundred organism subsample sizes were appropriate because 100 and 200 individuals were not able to adequately characterize the stream conditions in two of the subecoregions (Table 33).

Metric Response to Subsample Size

In all but one (65h-17) of the 26 study sites that used at least some kind of richness measures, subsample size was found to affect the richness. Biotic richness increased when there were more organisms present in the subsample. This finding is consistent with previous works (Duggan *et al.* 2002, Sovell and Vondracek 1999, Cao *et al.* 1998, Growns *et al.* 1997). However, Simpson's diversity index was the exception. It was not found to be as sensitive to sample size as other metrics of richness (Table 21 to 25) because Simpson's Index is weighted towards the abundances of the most common species and responds poorly to the addition of rare species (Magurran 1988; also supported by Veijola *et al.* 1996). A subsample of only 100 organisms was found to be sufficient for estimating Simpson's Index. For other richness metrics, the largest subsample (*i.e.,* 300 organisms in this case) was required. Vinson and Hawkins (1996) also suggested using greater than 300 organisms in order to obtain more accurate inferences for richness.

In most instances, metrics that utilized percentage community composition or relative abundances did not change when larger numbers of individuals were used in the subsample. Such community metrics were percent Chironomidae, the ratio of *Cricotopus* or *Chironomus* to total Chironomidae, percent EPT, percent Ephemeroptera, percent Gastropoda, the ratio of Hydropsychidae to total Trichoptera, percent Isopoda, percent non-insect macroinvertebrates, percent Odonata, percent Oligochaeta, percent Plecoptera, the ratio of Tanypodinae to total Chironomidae, percent Tanytarsini, percent dominant individuals, percent pollution intolerant, percent pollution tolerant, percent clinger, percent collector, percent filterer, percent predator, percent scraper, and percent shredder. Overall, this may be a result of "standardization" of these values on a percentile basis and, subsequent standardization when creating the overall macroinvertebrate metric. Increasing organism counts in the subsample had a proportional increase in the respective taxa. A subsample of 100 organisms was equally informative on these metrics as the other two larger subsamples. Similar conclusions regarding some of these metrics (*e.g.*, percent EPT abundance, percent dominant taxa) have also been made elsewhere (see, for example, Duggan *et al.* 2002).

FFG and habit metrics (excluding those describing community percentage and relative abundance) were not consistent across the range of subsamples. In general, their values increased with increasing subsample size. FFG metrics describe the dominant feeding mechanisms of biota (Rosenberg and Resh 1996). Metrics such as predator, scraper and shredder taxa included in this study are sensitive to taxa richness but measure the functioning of the benthic community rather than just the structure. Even though larger subsamples contain a more diverse assemblage (see above), many taxonomically different individuals exhibit the same feeding pattern and contribute proportionately to the community's dominant trophic character. This may explain why metric scores improved when a greater number of organisms were used in the subsample. As previously discussed, the rest of the metrics in this category (percentages of collector, filterer, predator, scraper, and shredder taxa) did not improve with increasing subsample size.

Habit metrics are descriptions of the movement and positioning mechanisms of benthic organisms (Merritt and Cummins 1996). The habit metrics used in this study (clinger, burrower, sprawler and swimmer taxa) are also sensitive to biotic richness. The higher taxonomic richness in larger subsamples may be responsible for the increase in habit scores, again, because of the possible addition of new taxa displaying same habits. Many macroinvertebrates, although taxonomically different, are known to share similar modes of locomotion or to occupy similar types of substrates (Merritt and Cummins 1996). As discussed earlier, the percentage of clinger taxa was the only habit metric to remain unaffected by subsample size.

In the tolerance/intolerance metric-category, Hilsenhoff's Biotic Index (HBI) was used in only one study site while the North Carolina Biotic Index (NCBI) was used more often. HBI is a measure of the overall organic-pollution tolerances of taxa present in a community (Hilsenhoff 1987). NCBI is a modified form of HBI and also attempts to measure the tolerance level of biota to other impairments (Lenat 1993). Both indices were found to be insensitive to variation in subsample size. Sovell and Vondracek (1999) had made similar conclusions about HBI, but similar comparisons for the NCBI have not been performed anywhere before. Both biotic indices depend heavily upon richness values. Even though new taxa were added in larger subsamples, as demonstrated by the increased richness in this study, consistencies of HBI and NCBI across subsamples indicate a proportional increase in the ratio of pollution sensitive taxa to insensitive taxa for both indices.

Adequate Subsample Size

A summary of the minimum required subsample size of both the subecoregion and the ecoregion scale is provided in Table 33. It is clear that there is no single subsample size that can be relied upon to describe health streams in all subecoregions.

Table 33. Recommended minimum required sample size at the subecoregion and the ecoregion scales.

Subecoregion	Sample Size	Ecoregion	Sample Size
66d	300		
66g	300	66	300
66j	300		
68c&d	100	68	100
45a	300		
45b	200		
45c	300	45	300
45d	300		
45h	200		
65d	300		
65h	300		
65k	100	65	300
65l	200		
65o	300		
75e	100		
75f	200	75	300
75h	300		

Subecoregions in the Blue Ridge (66) required at least 300 individuals. Subecoregion in the Southwestern Appalachians (68) required only 100 individuals. Subecoregions in the Piedmont (45) required either 200 or 300 individuals. Some subecoregions in the Southeastern Plains (65) and the Coastal Plains (75) required only 100 individuals while others required 200 or even 300 individuals. The general trend seen here indicates that using 300 individuals becomes important for sites in extreme north Georgia, while sites located elsewhere do not always require that many.

At the ecoregion level, 300-organism subsamples were the appropriate sizes to minimize the risk of making erroneous conclusion about stream health. Even though ecoregion 68 showed that only 100 individuals were necessary, this recommendation should be treated with some restrictions because only a single subecoregion was studied.

Streams in the Blue Ridge generally had high flow velocity with high concentration dissolved oxygen, low water temperature, and diverse habitat types. High macroinvertebrate diversity (richness) is usually associated with such stream conditions; hence, the need for 300 individual. High gradient streams were also found in some subecoregions of the Piedmont and the Southeastern Plains, but regardless of subecoregion, high gradient streams generally required a minimum of 300 individuals (Table 34). Low gradient streams, on the other hand, did not require that level as much.

Table 34. Percentage of total sites showing recommended subsample sizes.

Site Type	300 Individuals	200 Individuals	100 Individuals	Total
High gradient	75%	19%	6%	100%
Low gradient	38%	31%	31%	100%
Reference condition	75%	12.5%	12.5%	100%
Impaired condition	52%	29%	19%	100%

Another trend is the requirement of at least 300 individuals in minimally impaired (reference) sites (Table 34). This can be explained by the high macroinvertebrate diversity in streams having little or no impairment. But, a surprising 52% of the impaired sites also displayed the need for 300 individuals. However, most of the impaired sites requiring 300 individuals were also high gradient streams, which may have influenced the results.

The RBP method compares the mean index and inter-quartile ranges of reference sites to that of test sites whose health conditions are to be determined. In order to conclude that a test site is impaired, there must be a clear separation between the 25th percentile index value of the reference site and the 75th percentile index value of the test site. An overlap indicates the test site is similar to the reference site and, therefore, in good health. The assumption is that inter-quartile range of the reference site represents the true values of healthy streams for the subecoregions. Since my results showed that inter-quartile range changes across the subsample sizes, an important question arises – does subsample size affect the ability of reference sites to distinguish themselves from impaired sites? Cao *et al.* (1998) had expressed concerns that sample sizes of less than 300 individuals cannot effectively use the macroinvertebrate communities' information and may greatly underestimate the differences between reference and impacted sites. The ineffectiveness of small sample size to characterize macroinvertebrate communities were supported by my results. But my examination of subecoregions 65o and 66g showed that reference sites, regardless of subsample sizes, were still separable from impaired sites (Figures 31 and 32). However, I did not examine the remaining subecoregions due to

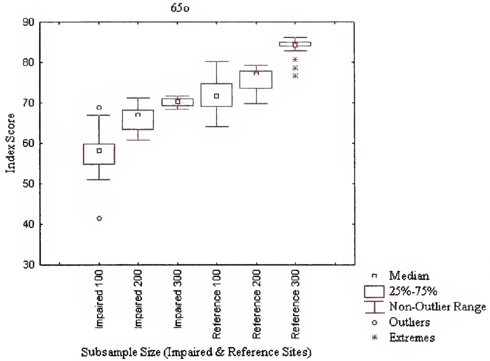

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Figure 31. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes between impaired and reference sites for subecoregion 65o.

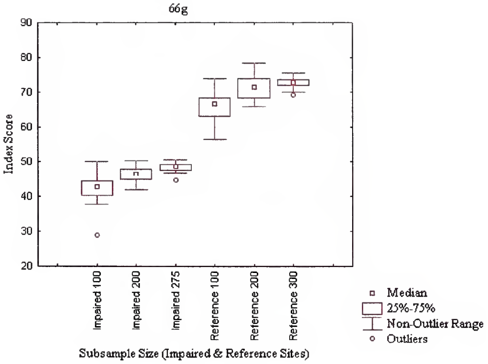

Figure 32. Macroinvertebrate index score distributions (based upon 25 replicate subsamples) at different subsample sizes between impaired and reference sites for subecoregion 66g.

absence of complete data sets (equal sets for both reference and impaired sites); thus subecoregions 65o and 66g may be anomalous.

Cost effectiveness has always been a central issue in utilizing the RBP, particularly with regards to the subsample size, because sorting and taxonomic identification make up the bulk of the entire process. I found identification to be relatively slow for the initial 100 organisms, but progressed rapidly for 200 and 300 organisms because of the recurrence of similar taxa (Table 31). Cumulative time for processing and identifying 200 organisms from 100 organisms was increased by 78.9%. This is a substantial increase in cost, but necessary because 100 organisms were not adequate for 82% of the subecoregions. Cumulative time to identify 300 organisms from 200 organisms was only increased by 39.83%. This increased cost was repaid by the increased ability of metrics to characterize stream health for 59% of the subecoregions, but proved futile for 24% of the subecoregions.

CONCLUSIONS AND RECOMMENDATIONS

The performance of the rapid bioassessment metrics recommended for the ecoregions and subecoregions of Georgia examined in this study was variable in terms of sensitivity to subsample size. Richness metrics were most sensitive and increased with increasing subsample size. At times, the increase was large enough to substantially affect the overall mean macroinvertebrate index value even without the compounding effects of other sensitive metrics. To a lesser extent, some FFG metrics (scraper, predator, and shredder taxa) and habit metrics (burrower, clinger, sprawler, and swimmer taxa) increased in value with increasing subsample sizes. Other metrics did not show any consistent trends.

The study has led me to conclude that the previously recommended subsample sizes of 100 organisms and 200 organisms were not adequate to characterize stream conditions for all subecoregions. Three-hundred organisms subsample sizes were always necessary for subecoregions of northern Georgia while, but were not for those in middle and southern Georgia. Stream gradient was also an important factor because high gradient sites mostly required 300 individuals while most low gradient sites did not. Every subecoregion, with its distinct geographical conditions, influences the streams and the macroinvertebrate community in its own way, and this was reflected in the difficulty of determining one common subsample size to fit all subecoregions (Table 33). Certainly, subsampling 300 organisms would circumvent this problem (as it did at the ecoregion level), but that would mean unnecessarily increasing spending for the evaluation of some subecoregions. Therefore, I recommend using individual subecoregional subsample sizes for specific subecoregions because they provide adequate characterization of stream conditions and a more cost-effective approach. There was some evidence that subsample size does not affect the ability of reference sites to differentiate from impaired sites. This provides further support that any of the three recommended subsample sizes to their respective subecoregion can detect the difference between reference and impaired sites.

I suggest further studies should be done in the future. I recommend the following changes and additions to my study:

1. Equal number of sites should be analyzed for each subecoregion for a robust comparison. I used samples collected for the Georgia Ecoregions Project and, due to sampling problems beyond the control of this study, was unable to acquire equal number of sites for each ecoregion.
2. Subsample sizes with more than 300 individuals should be investigated. Studies using only a few metrics have shown that even 300 organisms may not be enough to characterize stream conditions. I recommend using all metrics, not only richness, because I found habit, FFG and tolerance metrics to be sensitive to subsample size as well.
3. Questions regarding the subsample size effects on reference sites to differentiate from impaired sites should also be explored for all subecoregions. This can be done by analyzing an equal number of impaired and reference sites for each subecoregion. I was able to examine this question for only two subecoregions.
4. Stream gradients seemed to be correlated with subsample size. Further studies could examine affects of stream gradients on subsample size and the ability to differentiate reference and highly impaired sites.

Finally, I would like to emphasize the usefulness of the RBPs in the monitoring, management and restoration of streams. At its best, RBPs provides important biological, physical and chemical quality of a stream in a quick manner. Based on this information, agencies and interested parties will be able to identify and prioritize issues in their decision-making process and, at its worst, the RBPs may provide inaccurate information and consequently mislead management efforts. My conclusions on subsample size requirements will be helpful in minimizing costly mistakes for stream managers amd decision-makers.

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APPENDIX B. List of selected metrics for subecoregions (compiled from Gore *et al.* 2004).

SUBECOREGION	CATEGORY	METRIC	STRESS RESPONSE
Southern Inner Piedmont (45a)	Richness	Ephemeroptera, Plecoptera, Trichoptera (EPT) Taxa	Decrease
	Composition	% Chironomidae	Increase
		% *Cricotopus & Chironomus* / Total Chironomidae (TC)	Increase
	Tolerance / Intolerance	North Carolina Benthic Index (NCBI)	Increase
	Functional Feeding Group	% Scraper	Decrease
	Habit	% Clinger	Decrease
Southern Outer Piedmont (45b)	Richness	Coleoptera Taxa	Decrease
	Composition	% Chironomidae	Increase
		% Oligochaeta	Increase
	Tolerance / Intolerance	% Intolerant Individuals	Decrease
	Functional Feeding Group	Scraper Taxa	Decrease
	Habit	Swimmer Taxa	Decrease
Carolina Slate Belt (45c)	Richness	Tanytarsini Taxa	Decrease
	Composition	% Odonata	Increase
		% Tanypodinae / TC	Increase
	Tolerance / Intolerance	Dominant Individuals	Decrease
		% Intolerant Individuals	Increase
	Functional Feeding Group	% Shredder	Decrease
	Habit	Swimmer Taxa	Decrease
Talladega Upland (45d)	Richness	Coleoptera Taxa	Decrease
	Composition	% Odonata	Increase
		% Tanypodinae / TC	Increase
	Tolerance/Intolerance	NCBI	Increase
		% Tolerant Individuals	Increase
	Functional Feeding Group	Shredder Taxa	Decrease
Pine Mountain Ridges	Richness	Plecoptera Taxa	Decrease
	Composition	% Ephemeroptera	Decrease
		% Plecoptera	Decrease

(45h)	Tolerance / Intolerance	% Intolerant Individuals	Decrease
	Functional Feeding Group	% Scraper	Decrease
	Habit	% Clinger	Decrease
Southern Hilly Gulf Coastal Plain (65d)	Richness	Plecoptera Taxa	Decrease
		Trichoptera Taxa	Decrease
	Composition	% Hydropsychidae / Total Trichoptera	Increase
		% Oligochaeta	Increase
	Functional Feeding Group	% Filterer	Decrease
		% Predator	Increase
Tifton Upland (65h)	Richness	Ephemeroptera Taxa	Decrease
	Composition	% Isopoda	Increase
		% Tanytarsini	Decrease
	Tolerance / Intolerance	% Tolerant Individuals	Increase
	Functional Feeding Group	% Scraper	Decrease
	Habit	Burrower Taxa	Decrease
Coastal Plain Red Uplands (65k)	Composition	% Gastropoda	Increase
		% Hydropsychidae / Total Trichoptera	Decrease
		% Tanypodinae / TC	Increase
	Functional Feeding Group	% Collector	Decrease
		Scraper Taxa	Decrease
		% Shredder	Decrease
Atlantic Southern Loam Plains (65L)	Richness	Diptera Taxa	Decrease
		Trichoptera Taxa	Decrease
	Composition	% EPT	Decrease
	Tolerance / Intolerance	% Tolerant Individuals	Increase
	Functional Feeding Group	Shredder Taxa	Decrease
	Habit	Clinger Taxa	Decrease
Tallahassee Hills/Valdosta Limesink (65o)	Richness	Chironomidae Taxa	Decrease
	Composition	% Oligochaeta	Increase
	Tolerance / Intolerance	NCBI	Increase
	Functional Feeding Group	Scraper Taxa	Decrease
	Habit	Burrower Taxa	Decrease
		Sprawler Taxa	Decrease
Southern	Richness	Diptera Taxa	Decrease

Crystalline Ridges & Mountains (66d)	Composition	% Odonata	Decrease
		% Plecoptera	Increase
	Tolerance / Intolerance	% Dominant Individuals	Increase
	Functional Feeding Group	% Shredder	Decrease
	Habit	Clinger Taxa	Decrease
Southern Metasedimentary Mountains (66g)	Richness	EPT Taxa	Decrease
	Composition	% Chironomidae	Increase
		% Tanypodinae / TC	Increase
	Tolerance / Intolerance	% Dominant Individuals	Increase
		NCBI	Increase
	Functional Feeding Group	Scraper Taxa	Decrease
	Habit	% Clinger	Decrease
Broad Basins (66j)	Richness	Margalef's Index	Increase
		Simpson's Diversity Index	Decrease
	Composition	% Tanytarsini	Decrease
	Tolerance / Intolerance	% Intolerant Individuals	Decrease
	Functional Feeding Group	Predator Taxa	Decrease
	Habit	Sprawler Taxa	Decrease
Plateau Escarpment & Southern Table Plateaus (68c&d)	Richness	Plecoptera Taxa	Decrease
	Composition	% Hydropsychidae / Total Trichoptera	Increase
		% Tanypodinae / TC	Increase
	Tolerance / Intolerance	NCBI	Increase
	Functional Feeding Group	Scraper Taxa	Decrease
	Habit	% Clinger	Decrease
Sea Island Flatwoods (75e)	Composition	% Non-Insect	Increase
		% Oligochaeta	Increase
		% Tanypodinae / TC	Increase
	Tolerance / Intolerance	Dominant Individuals	Increase
	Functional Feeding Group	% Collector	Decrease
		% Filterer	Increase
Sea Island Flatwoods (75f)	Richness	Chironomidae Taxa	Decrease
		% Oligochaeta	Increase
	Composition	% Odonata	Increase
		% Tanypodinae / TC	Increase

	Tolerance / Intolerance	Tolerant Taxa	Increase
	Functional Feeding Group	% Filterer	Increase
Bacon Terraces (75h)	Composition	% Non-Insect	Increase
		% Oligochaeta	Increase
	Tolerance / Intolerance	Hilsenhoff's Biotic Index (HBI)	Increase
	Functional Feeding Group	Shredder Taxa	Decrease
	Habit	Sprawler Taxa	Decrease

APPENDIX C. List of all metrics.

METRIC CATEGORY	METRIC	STRESS RESPONSE
Richness	Chironomidae Taxa	Decrease
	Coleoptera Taxa	Decrease
	Diptera Taxa	Decrease
	Ephemeroptera, Plecoptera, & Trichoptera (EPT) Taxa	Decrease
	Ephemeroptera Taxa	Decrease
	Evenness	Decrease
	Margalef's Index	Decrease
	Plecoptera Taxa	Decrease
	Shannon-Wiener_base_e	Decrease
	Simpson's 'Diversity	Increase
	Tanytarsini Taxa	Decrease
	Total Taxa	Decrease
	Trichoptera Taxa	Decrease
Composition	% Amphipoda	Decrease
	% Chironomidae	Increase
	% Chironominae / Total Chironomidae (TC)	Variable
	% Coleoptera	Decrease
	% *Cricotopus sp. & Chironomus sp.* / TC	Increase
	% Diptera	Increase
	% Ephemeroptera	Decrease
	% EPT	Decrease
	% Gastropoda	Decrease
	% Hydropsychidae / Total EPT	Increase
	% Hydropsychidae / Total Trichoptera	Increase
	% Isopoda	Increase
	%Non-Insecta	Increase
	%Odonata	Increase
	% Oligochaeta	Increase
	% Orthocladiinae / TC	Decrease
	% Plecoptera	Decrease
	% Tanypodinae / TC	Increase
	% Tanytarsini	Decrease
	% Tanytarsini / TC	Decrease
	% Trichoptera	Decrease
Tolerance/Intolerance	Tolerant Taxa	Increase
	% Tolerant Individuals	Increase
	Intolerant Taxa	Decrease

	% Intolerant Individuals	Decrease
	% Dominant Individuals	Increase
	Dominant Individuals	Increase
	Beck's Index	Decrease
	Hilsenhoff's Biotic Index (HBI)	Increase
	North Carolina Biotic Index (NCBI)	Increase
Functional Feeding Group	% Scraper	Decrease
	Scraper Taxa	Decrease
	% Collector	Decrease
	Collector Taxa	Decrease
	% Predator	Decrease
	Predator Taxa	Decrease
	% Shredder	Decrease
	Shredder Taxa	Decrease
	% Filterer	Increase
	Filterer Taxa	Decrease
Habit	Clinger Taxa	Decrease
	% Clinger	Decrease
	Burrower Taxa	Decrease
	Climber Taxa	Decrease
	Sprawler Taxa	Decrease
	Swimmer Taxa	Decrease

APPENDIX D. Number of individual taxa encountered in samples for study sites.

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Smithwick Creek 45a-35			Oligochaeta	1
	Basommatophora	Ancylidae	*Ferrissia sp.*	7
	Basommatophora	Physidae	*Physa sp.*	2
	Coleoptera	Dryopidae	*Helichus lithophilus*	1
	Coleoptera	Dytiscidae	*Celina sp.*	1
	Coleoptera	Dytiscidae	*Hygrotus farctus*	1
	Coleoptera	Elmidae	*Ancyronyx variegatus*	3
	Coleoptera	Elmidae	*Dubiraphia sp.*	6
	Coleoptera	Elmidae	*Macronychus glabratus*	5
	Coleoptera	Elmidae	*Optioservus ovalis*	1
	Coleoptera	Elmidae	*Optioservus sp.*	1
	Coleoptera	Elmidae	*Promoresia sp.*	4
	Coleoptera	Elmidae	*Stenelmis sp.*	2
	Coleoptera	Haliplidae	*Peltodytes sexmaculatus*	1
	Coleoptera	Psephenidae	*Psephenus herricki*	1
	Decapoda	Cambaridae	Cambarinae	1
	Decapoda	Cambaridae	*Procambarus sp.*	3
	Diptera	Ceratopogonidae	*Bezzia* complex	2
	Diptera	Chironomidae	*Ablabesmyia mallochi*	5
	Diptera	Chironomidae	*Ablabesmyia sp.*	2
	Diptera	Chironomidae	*Brillia flavifrons*	2
	Diptera	Chironomidae	*Brillia sp.*	5
	Diptera	Chironomidae	*Chironomus sp.*	18
	Diptera	Chironomidae	*Corynoneura sp.*	5
	Diptera	Chironomidae	*Cricotopus bicinctus*	18
	Diptera	Chironomidae	*Cricotopus sp.*	8
	Diptera	Chironomidae	*Cryptochironomus sp.*	6
	Diptera	Chironomidae	*Dicrotendipes sp.*	2
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	1
	Diptera	Chironomidae	*Eukiefferiella sp.*	1
	Diptera	Chironomidae	*Microtendipes pedellus* group	8
	Diptera	Chironomidae	*Microtendipes sp.*	2
	Diptera	Chironomidae	*Nanocladius sp.*	1
	Diptera	Chironomidae	*Odontomesa fulva*	1
	Diptera	Chironomidae	Orthocladiinae	1
	Diptera	Chironomidae	*Orthocladius obumbratus*	2
	Diptera	Chironomidae	*Orthocladius sp.*	4
	Diptera	Chironomidae	*Paracladopelma sp.*	1
	Diptera	Chironomidae	*Parakiefferiella B*	1
	Diptera	Chironomidae	*Parakiefferiella E*	1
	Diptera	Chironomidae	*Parakiefferiella sp.*	1
	Diptera	Chironomidae	*Paralauterborniella nigrohalterale*	3
	Diptera	Chironomidae	*Paramerina sp.*	2
	Diptera	Chironomidae	*Parametriocnemus sp.*	10
	Diptera	Chironomidae	*Paratendipes albimanus*	1
	Diptera	Chironomidae	*Phaenopsectra obediens* group	7
	Diptera	Chironomidae	*Phaenopsectra punctipes* group	1
	Diptera	Chironomidae	*Phaenopsectra sp.*	9
	Diptera	Chironomidae	*Phaenopsectra/Tribelos* complex	24
	Diptera	Chironomidae	*Polypedilum A*	4
	Diptera	Chironomidae	*Polypedilum aviceps*	1
	Diptera	Chironomidae	*Polypedilum halterale* group	1
	Diptera	Chironomidae	*Polypedilum illinoense* group	1
	Diptera	Chironomidae	*Polypedilum scalaenum* group	5

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Smithwick Creek 45a-35	Diptera	Chironomidae	*Polypedilum sp.*	2
	Diptera	Chironomidae	*Polypedilum tritum*	2
	Diptera	Chironomidae	*Potthastia longimana*	3
	Diptera	Chironomidae	*Potthastia sp.*	1
	Diptera	Chironomidae	*Procladius (Holotanypus) sp.*	1
	Diptera	Chironomidae	*Procladius sp.*	1
	Diptera	Chironomidae	*Pseudochironomus sp.*	2
	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	2
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	12
	Diptera	Chironomidae	*Rheotanytarsus sp.*	8
	Diptera	Chironomidae	*Stempellinella leptocelloides*	1
	Diptera	Chironomidae	*Stempellinella/Zavrelia* complex	1
	Diptera	Chironomidae	*Stenochironomus sp.*	1
	Diptera	Chironomidae	*Stictochironomus devinctus*	4
	Diptera	Chironomidae	Tanytarsini	1
	Diptera	Chironomidae	*Tanytarsus A*	3
	Diptera	Chironomidae	*Tanytarsus C*	1
	Diptera	Chironomidae	*Tanytarsus G*	2
	Diptera	Chironomidae	*Tanytarsus J*	1
	Diptera	Chironomidae	*Tanytarsus M*	2
	Diptera	Chironomidae	*Tanytarsus Q*	2
	Diptera	Chironomidae	*Tanytarsus sp.*	9
	Diptera	Chironomidae	*Thienemanniella boltoni*	2
	Diptera	Chironomidae	*Thienemanniella sp.*	2
	Diptera	Chironomidae	*Thienemannimyia* group	22
	Diptera	Chironomidae	*Tribelos fuscicorne*	1
	Diptera	Chironomidae	*Tribelos jucundus*	27
	Diptera	Chironomidae	*Tribelos sp.*	8
	Diptera	Chironomidae	*Zavrelimyia thryptica* complex	1
	Diptera	Empididae	*Hemerodromia sp.*	9
	Diptera	Simuliidae	*Simulium sp.*	3
	Diptera	Tipulidae	*Antocha sp.*	4
	Diptera	Tipulidae	*Pilaria sp.*	4
	Diptera	Tipulidae	*Tipula sp.*	4
	Diptera	Tipulidae	Tipulidae	2
	Ephemeroptera	Baetiscidae	Baetiscidae	1
	Ephemeroptera	Caenidae	*Caenis sp.*	1
	Ephemeroptera	Ephemerellidae	*Ephemerella sp.*	13
	Ephemeroptera	Ephemerellidae	Ephemerellidae	9
	Ephemeroptera	Ephemerellidae	*Serratella deficiens*	3
	Ephemeroptera	Ephemeridae	*Hexagenia limbata*	14
	Ephemeroptera	Ephemeridae	*Hexagenia sp.*	6
	Ephemeroptera	Heptageniidae	Heptageniidae	12
	Ephemeroptera	Heptageniidae	*Stenonema modestum*	20
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	43
	Ephemeroptera	Leptophlebiidae	*Leptophlebia sp.*	2
	Ephemeroptera	Leptophlebiidae	Leptophlebiidae	1
	Ephemeroptera	Siphlonuridae	Siphlonuridae	5
	Odonata	Calopterygidae	*Calopteryx sp.*	1
	Odonata	Coenagrionidae	*Argia sp.*	2
	Odonata	Gomphidae	*Progomphus obscurus*	1
	Odonata	Gomphidae	*Progomphus sp.*	2
	Plecoptera	Capniidae	Capniidae	12
	Plecoptera	Chloroperlidae	Chloroperlidae	4
	Plecoptera	Nemouridae	Nemouridae	2
	Plecoptera	Perlidae	*Eccoptura xanthenes*	1
	Plecoptera	Perlidae	Perlidae	1

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Smithwick Creek 45a-35	Plecoptera	Perlodidae	*Isoperla marlynia*	1
	Plecoptera	Perlodidae	Perlodidae	1
	Plecoptera	Taeniopterygidae	*Oemopteryx* complex	2
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	3
	Trichoptera	Hydropsychidae	*Ceratopsyche sp.*	1
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	11
	Trichoptera	Hydropsychidae	*Hydropsyche betteni/depravata* complex	3
	Trichoptera	Hydropsychidae	Hydropsychidae	3
	Trichoptera	Limnephilidae	*Hydatophylax argus*	1
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	1
	Trichoptera	Philopotamidae	*Chimarra sp.*	1
	Trichoptera	Polycentropodidae	*Polycentropus sp.*	1
	Trichoptera	Psychomyiidae	*Lype diversa*	1
Noonday Creek 45a-50			Oligochaeta	4
	Coleoptera	Elmidae	*Ancyronyx variegatus*	5
	Diptera	Chironomidae	*Ablabesmyia mallochi*	2
	Diptera	Chironomidae	*Ablabesmyia sp.*	1
	Diptera	Chironomidae	*Brillia flavifrons*	3
	Diptera	Chironomidae	*Chironomus sp.*	11
	Diptera	Chironomidae	*Corynoneura B*	1
	Diptera	Chironomidae	*Corynoneura sp.*	28
	Diptera	Chironomidae	*Cricotopus bicinctus*	33
	Diptera	Chironomidae	*Cricotopus sp.*	10
	Diptera	Chironomidae	*Cricotopus sylvestris*	5
	Diptera	Chironomidae	*Cricotopus/Orthocladius* complex	1
	Diptera	Chironomidae	*Dicrotendipes sp.*	1
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	2
	Diptera	Chironomidae	*Eukiefferiella sp.*	2
	Diptera	Chironomidae	*Labrundinia pilosella*	1
	Diptera	Chironomidae	*Micropsectra D*	1
	Diptera	Chironomidae	Orthocladiinae	1
	Diptera	Chironomidae	*Orthocladius dentifer*	1
	Diptera	Chironomidae	*Orthocladius sp.*	14
	Diptera	Chironomidae	*Parakiefferiella B*	2
	Diptera	Chironomidae	*Parametriocnemus sp.*	1
	Diptera	Chironomidae	*Paratrichocladius sp.*	1
	Diptera	Chironomidae	*Phaenopsectra obediens* group	5
	Diptera	Chironomidae	*Phaenopsectra punctipes* group	7
	Diptera	Chironomidae	*Phaenopsectra/Tribelos* complex	3
	Diptera	Chironomidae	*Polypedilum flavum*	3
	Diptera	Chironomidae	*Polypedilum scalaenum* group	1
	Diptera	Chironomidae	*Polypedilum sp.*	2
	Diptera	Chironomidae	*Potthastia longimana*	6
	Diptera	Chironomidae	*Rheocricotopus robacki*	6
	Diptera	Chironomidae	*Rheocricotopus sp.*	6
	Diptera	Chironomidae	*Rheotanytarsus A*	7
	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	5
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	13
	Diptera	Chironomidae	Tanypodinae	1
	Diptera	Chironomidae	*Tanytarsus C*	1
	Diptera	Chironomidae	*Tanytarsus L*	1
	Diptera	Chironomidae	*Tanytarsus sp.*	2
	Diptera	Chironomidae	*Tanytarsus U*	21
	Diptera	Chironomidae	*Thienemanniella sp.*	3
	Diptera	Chironomidae	*Thienemanniella xena*	19
	Diptera	Chironomidae	*Thienemannimyia* group	9
	Diptera	Chironomidae	*Tribelos jucundus*	2

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Noonday Creek 45a-50	Diptera	Chironomidae	*Tribelos sp.*	1
	Diptera	Empididae	*Hemerodromia sp.*	19
	Diptera	Tipulidae	*Tipula sp.*	1
	Ephemeroptera	Baetidae	Baetidae	4
	Ephemeroptera	Heptageniidae	Heptageniidae	1
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	3
	Odonata	Coenagrionidae	*Argia sp.*	1
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	34
	Trichoptera	Hydropsychidae	*Hydropsyche sp.*	3
	Trichoptera	Hydropsychidae	Hydropsychidae	9
Mountain Creek 45a-90			Oligochaeta	8
	Basommatophora	Ancylidae	*Ferrissia sp.*	1
	Basommatophora	Physidae	*Physa sp.*	4
	Basommatophora	Physidae	*Physella sp.*	3
	Basommatophora	Planorbidae	*Gyraulus sp.*	2
	Coleoptera	Curculionidae	*Anchytarsus bicolor*	2
	Coleoptera	Dytiscidae	*Celina sp.*	5
	Coleoptera	Dytiscidae	Dytiscidae	1
	Coleoptera	Dytiscidae	*Hygrotus farctus*	3
	Coleoptera	Elmidae	*Ancyronyx variegatus*	6
	Coleoptera	Elmidae	*Dubiraphia sp.*	11
	Coleoptera	Elmidae	Elmidae	6
	Coleoptera	Elmidae	*Macronychus glabratus*	6
	Coleoptera	Elmidae	*Microcylloepus pusillus*	8
	Coleoptera	Elmidae	*Optioservus sp.*	2
	Coleoptera	Elmidae	*Oulimnius latiusculus*	2
	Coleoptera	Elmidae	*Stenelmis sp.*	3
	Coleoptera	Psephenidae	*Psephenus herricki*	1
	Decapoda	Cambaridae	*Procambarus sp.*	1
	Decapoda	Cambaridae	*Procambarus spiculifer*	1
	Diptera	Ceratopogonidae	*Bezzia* complex	1
	Diptera	Ceratopogonidae	Ceratopogonidae	1
	Diptera	Chironomidae	*Ablabesmyia mallochi*	1
	Diptera	Chironomidae	*Apedilum sp.*	13
	Diptera	Chironomidae	Chironominae	2
	Diptera	Chironomidae	*Chironomus sp.*	2
	Diptera	Chironomidae	*Cricotopus bicinctus*	1
	Diptera	Chironomidae	*Cryptochironomus sp.*	2
	Diptera	Chironomidae	*Diplocladius cultriger*	1
	Diptera	Chironomidae	*Labrundinia pilosella*	2
	Diptera	Chironomidae	*Labrundinia sp.*	1
	Diptera	Chironomidae	*Larsia sp.*	1
	Diptera	Chironomidae	*Microtendipes pedellus* group	33
	Diptera	Chironomidae	*Microtendipes sp.*	93
	Diptera	Chironomidae	*Orthocladius sp.*	2
	Diptera	Chironomidae	*Parachaetocladius abnobaeus*	1
	Diptera	Chironomidae	*Parametriocnemus sp.*	1
	Diptera	Chironomidae	*Phaenopsectra obediens* group	4
	Diptera	Chironomidae	*Phaenopsectra/Tribelos* complex	3
	Diptera	Chironomidae	*Polypedilum aviceps*	2
	Diptera	Chironomidae	*Pseudorthocladius sp.*	7
	Diptera	Chironomidae	*Rheocricotopus sp.*	1
	Diptera	Chironomidae	*Tanytarsus M*	2
	Diptera	Chironomidae	*Tanytarsus sp.*	1
	Diptera	Chironomidae	*Thienemannimyia* group	21
	Diptera	Chironomidae	*Tribelos jucundus*	2
	Diptera	Chironomidae	*Unniella multivirga*	1

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Mountain Creek 45a-90	Diptera	Chironomidae	*Xestochironomus sp.*	1
	Diptera	Chironomidae	*Xylotopus par*	3
	Diptera	Tipulidae	*Leptotarsus sp.*	2
	Diptera	Tipulidae	*Limnophila sp.*	3
	Diptera	Tipulidae	*Tipula sp.*	6
	Diptera	Tipulidae	Tipulidae	1
	Ephemeroptera	Baetidae	Baetidae	4
	Ephemeroptera	Baetiscidae	*Baetisca carolina*	1
	Ephemeroptera	Ephemerellidae	*Attenella attenuata*	1
	Ephemeroptera	Heptageniidae	Heptageniidae	13
	Ephemeroptera	Leptophlebiidae	*Leptophlebia sp.*	8
	Heteroptera	Gerridae	Gerridae	1
	Heteroptera	Veliidae	*Microvelia sp.*	1
	Isopoda	Asellidae	Asellidae	1
	Megaloptera	Corydalidae	*Corydalus cornutus*	1
	Odonata	Calopterygidae	*Calopteryx sp.*	5
	Odonata	Coenagrionidae	Coenagrionidae	1
	Odonata	Gomphidae	Gomphidae	1
	Odonata	Gomphidae	*Gomphus sp.*	1
	Plecoptera	Capniidae	Capniidae	54
	Plecoptera	Perlodidae	Perlodidae	4
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	5
	Trichoptera	Hydropsychidae	*Ceratopsyche sp.*	6
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	52
	Trichoptera	Hydropsychidae	*Hydropsyche sp.*	8
	Trichoptera	Hydropsychidae	Hydropsychidae	39
	Trichoptera	Leptoceridae	Leptoceridae	2
	Trichoptera	Leptoceridae	*Triaenodes sp.*	2
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	1
	Trichoptera	Polycentropodidae	Polycentropodidae	1
	Veneroida	Pisidiidae	*Sphaerium sp.*	1
Tributary to North Oconee River 45b-44			Oligochaeta	5
	Coleoptera	Gyrinidae	*Dineutus sp.*	1
	Decapoda	Cambaridae	Cambarinae	4
	Diptera	Ceratopogonidae	*Bezzia* complex	1
	Diptera	Chironomidae	*Ablabesmyia mallochi*	10
	Diptera	Chironomidae	*Ablabesmyia sp.*	1
	Diptera	Chironomidae	*Brillia flavifrons*	2
	Diptera	Chironomidae	*Brillia sp.*	2
	Diptera	Chironomidae	*Corynoneura sp.*	1
	Diptera	Chironomidae	*Cryptochironomus sp.*	3
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	2
	Diptera	Chironomidae	*Labrundinia sp.*	1
	Diptera	Chironomidae	*Microtendipes pedellus* group	7
	Diptera	Chironomidae	*Natarsia sp.*	1
	Diptera	Chironomidae	*Odontomesa fulva*	1
	Diptera	Chironomidae	*Paracladopelma sp.*	1
	Diptera	Chironomidae	*Paracladopelma undine*	3
	Diptera	Chironomidae	*Parakiefferiella sp.*	2
	Diptera	Chironomidae	*Paramerina sp.*	2
	Diptera	Chironomidae	*Parametriocnemus sp.*	11
	Diptera	Chironomidae	*Paratanytarsus quadratus* complex	1
	Diptera	Chironomidae	*Paratendipes subaequalis*	1
	Diptera	Chironomidae	*Phaenopsectra obediens* group	5
	Diptera	Chironomidae	*Phaenopsectra/Tribelos* complex	3
	Diptera	Chironomidae	*Polypedilum A*	1
	Diptera	Chironomidae	*Polypedilum aviceps*	9

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Tributary to North Oconee River 45b-44	Diptera	Chironomidae	*Polypedilum fallax* group	15
	Diptera	Chironomidae	*Polypedilum scalaenum* group	2
	Diptera	Chironomidae	*Reomyia/Zavrelimyia* complex	6
	Diptera	Chironomidae	*Rheotanytarsus A*	6
	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	1
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	4
	Diptera	Chironomidae	*Rheotanytarsus sp.*	1
	Diptera	Chironomidae	*Stempellinella A*	6
	Diptera	Chironomidae	*Stempellinella sp.*	4
	Diptera	Chironomidae	*Stenochironomus sp.*	1
	Diptera	Chironomidae	Tanypodinae	1
	Diptera	Chironomidae	*Tanytarsus M*	10
	Diptera	Chironomidae	*Tanytarsus sp.*	13
	Diptera	Chironomidae	*Thienemanniella xena*	1
	Diptera	Chironomidae	*Thienemannimyia* group	15
	Diptera	Chironomidae	*Tribelos jucundus*	4
	Diptera	Chironomidae	*Tvetenia vitracies*	1
	Diptera	Chironomidae	*Xestochironomus sp.*	1
	Diptera	Chironomidae	*Zavrelia sp.*	1
	Diptera	Chironomidae	*Zavrelimyia sp.*	5
	Diptera	Dixidae	*Dixa sp.*	1
	Diptera	Empididae	*Hemerodromia sp.*	5
	Diptera	Simuliidae	*Simulium sp.*	2
	Diptera	Tipulidae	*Tipula sp.*	1
	Ephemeroptera	Ephemerellidae	*Ephemerella sp.*	19
	Ephemeroptera	Ephemeridae	*Ephemera sp.*	7
	Ephemeroptera	Ephemeridae	*Hexagenia limbata*	7
	Ephemeroptera	Heptageniidae	Heptageniidae	3
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	10
	Ephemeroptera	Leptophlebiidae	*Leptophlebia sp.*	33
	Ephemeroptera	Siphlonuridae	Siphlonuridae	1
	Megaloptera	Corydalidae	*Nigronia serricornis*	2
	Megaloptera	Sialidae	*Sialis sp.*	1
	Odonata	Calopterygidae	*Calopteryx maculata*	1
	Plecoptera	Capniidae	*Allocapnia sp.*	2
	Plecoptera	Capniidae	Capniidae	3
	Plecoptera	Nemouridae	Nemouridae	1
	Plecoptera	Perlidae	*Eccoptura xanthenes*	1
	Plecoptera	Perlidae	Perlidae	1
	Plecoptera	Perlodidae	*Isoperla sp.*	12
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	6
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	2
	Trichoptera	Psychomyiidae	*Lype diversa sp.*	1
Chickasaw Creek 45c-3	Amphipoda	Talitridae	*Hyalella azteca*	22
	Basommatophora	Ancylidae	*Ferrissia sp.*	1
	Basommatophora	Physidae	*Physa sp.*	4
	Basommatophora	Planorbidae	*Gyraulus sp.*	7
	Calanoida	Temoridae	*Epischura sp.*	6
	Coleoptera	Dytiscidae	Dytiscidae	1
	Coleoptera	Dytiscidae	*Hydroporus (Neoporus) sp.*	2
	Coleoptera	Elmidae	*Ancyronyx variegatus*	1
	Coleoptera	Elmidae	*Dubiraphia bivittata*	4
	Coleoptera	Elmidae	*Dubiraphia sp.*	11
	Coleoptera	Elmidae	*Macronychus glabratus*	1
	Coleoptera	Gyrinidae	*Dineutus discolor*	1
	Decapoda	Cambaridae	Cambarinae	1
	Decapoda	Cambaridae	*Procambarus sp.*	3

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Chickasaw Creek 45c-3	Diptera	Ceratopogonidae	*Bezzia* complex	4
	Diptera	Chironomidae	*Ablabesmyia mallochi*	10
	Diptera	Chironomidae	*Ablabesmyia sp.*	8
	Diptera	Chironomidae	Chironominae	1
	Diptera	Chironomidae	*Chironomus ochreatus*	2
	Diptera	Chironomidae	*Chironomus sp.*	3
	Diptera	Chironomidae	*Corynoneura sp.*	10
	Diptera	Chironomidae	*Labrundinia pilosella*	1
	Diptera	Chironomidae	*Microtendipes pedellus* group	32
	Diptera	Chironomidae	*Nanocladius sp.*	6
	Diptera	Chironomidae	*Parametriocnemus sp.*	8
	Diptera	Chironomidae	*Paratanytarsus dissimilis*	1
	Diptera	Chironomidae	*Phaenopsectra/Tribelos* complex	5
	Diptera	Chironomidae	*Polypedilum halterale* group	1
	Diptera	Chironomidae	*Polypedilum scalaenum* group	2
	Diptera	Chironomidae	*Polypedilum sp.*	1
	Diptera	Chironomidae	*Rheocricotopus sp.*	1
	Diptera	Chironomidae	*Rheotanytarsus sp.*	1
	Diptera	Chironomidae	*Stempellinella A*	4
	Diptera	Chironomidae	*Stenochironomus sp.*	5
	Diptera	Chironomidae	Tanypodinae	1
	Diptera	Chironomidae	*Tanytarsus M*	3
	Diptera	Chironomidae	*Tanytarsus sp.*	10
	Diptera	Chironomidae	*Tanytarsus W*	1
	Diptera	Chironomidae	*Thienemannimyia* group	10
	Diptera	Chironomidae	*Tribelos jucundus*	4
	Diptera	Chironomidae	*Zavrelimyia sp.*	2
	Diptera	Empididae	*Hemerodromia sp.*	2
	Diptera	Tabanidae	Tabanidae	1
	Diptera	Tipulidae	*Hexatoma sp.*	1
	Diptera	Tipulidae	*Tipula sp.*	2
	Ephemeroptera	Caenidae	*Caenis sp.*	24
	Ephemeroptera	Ephemerellidae	*Eurylophella sp.*	1
	Ephemeroptera	Ephemeridae	Ephemeridae	1
	Ephemeroptera	Ephemeridae	*Hexagenia limbata*	1
	Ephemeroptera	Heptageniidae	*Stenacron sp.*	1
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	10
	Ephemeroptera	Leptophlebiidae	*Leptophlebia sp.*	2
	Heteroptera	Notonectidae	*Notonecta irrorata*	2
	Megaloptera	Corydalidae	*Nigronia serricornis*	1
	Odonata	Calopterygidae	*Calopteryx maculata*	1
	Odonata	Calopterygidae	*Calopteryx sp.*	1
	Odonata	Coenagrionidae	*Argia sp.*	8
	Odonata	Corduliidae	*Macromia sp.*	2
	Odonata	Gomphidae	Gomphidae	1
	Plecoptera	Capniidae	Capniidae	1
	Plecoptera	Perlodidae	Perlodidae	1
	Plecoptera	Perlodidae	*Yugus sp.*	1
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	2
	Trichoptera	Leptoceridae	Leptoceridae	2
	Trichoptera	Leptoceridae	*Triaenodes sp.*	4
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	1
	Trichoptera	Polycentropodidae	*Polycentropus sp.*	2
	Trichoptera	Psychomyiidae	*Lype diversa*	17
	Veneroida	Pisidiidae	*Pisidium sp.*	4
Swinney Branch 45d-11			Oligochaeta	1
	Amphipoda	Crangonyctidae	*Crangonyx sp.*	1

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Swinney Branch 45d-11	Basommatophora	Physidae	*Physa sp.*	1
	Coleoptera	Curculionidae	*Anchytarsus bicolor*	2
	Coleoptera	Elmidae	*Dubiraphia bivittata*	2
	Coleoptera	Elmidae	*Dubiraphia sp.*	2
	Coleoptera	Elmidae	*Optioservus sp.*	1
	Coleoptera	Psephenidae	*Ectopria sp.*	1
	Decapoda	Cambaridae	*Cambarus halli*	2
	Decapoda	Cambaridae	*Cambarus sp.*	2
	Diptera	Chironomidae	*Apedilum sp.*	1
	Diptera	Chironomidae	*Corynoneura sp.*	3
	Diptera	Chironomidae	*Diplocladius cultriger*	3
	Diptera	Chironomidae	*Eukiefferiella brevicalcar* group	3
	Diptera	Chironomidae	*Eukiefferiella sp.*	11
	Diptera	Chironomidae	*Hydrobaenus sp.*	1
	Diptera	Chironomidae	*Labrundinia pilosella*	3
	Diptera	Chironomidae	*Labrundinia sp.*	1
	Diptera	Chironomidae	*Microtendipes pedellus* group	16
	Diptera	Chironomidae	*Orthocladius sp.*	1
	Diptera	Chironomidae	*Parakiefferiella sp.*	1
	Diptera	Chironomidae	*Parametriocnemus sp.*	2
	Diptera	Chironomidae	*Phaenopsectra obediens* group	1
	Diptera	Chironomidae	*Polypedilum aviceps*	2
	Diptera	Chironomidae	*Polypedilum flavum*	1
	Diptera	Chironomidae	*Reomyia sp.*	1
	Diptera	Chironomidae	*Rheotanytarsus A*	1
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	20
	Diptera	Chironomidae	*Stenochironomus sp.*	2
	Diptera	Chironomidae	*Tanytarsus sp.*	2
	Diptera	Chironomidae	*Thienemannimyia* group	3
	Diptera	Chironomidae	*Zavrelimyia sp.*	1
	Diptera	Empididae	*Hemerodromia sp.*	1
	Diptera	Simuliidae	*Prosimulium mixtum*	15
	Diptera	Simuliidae	*Prosimulium rhizophorum*	7
	Diptera	Simuliidae	*Simulium sp.*	51
	Diptera	Tipulidae	*Pedicia sp.*	5
	Diptera	Tipulidae	*Pseudolimnophila sp.*	21
	Diptera	Tipulidae	*Tipula sp.*	18
	Diptera	Tipulidae	Tipulidae	1
	Ephemeroptera	Baetidae	*Baetis sp.*	4
	Ephemeroptera	Heptageniidae	Heptageniidae	4
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	15
	Megaloptera	Corydalidae	*Nigronia fasciatus*	1
	Megaloptera	Corydalidae	*Nigronia serricornis*	3
	Odonata	Calopterygidae	*Calopteryx sp.*	2
	Odonata	Coenagrionidae	*Ischnura sp.*	1
	Odonata	Cordulegastridae	*Cordulegaster maculata*	1
	Plecoptera	Capniidae	Capniidae	22
	Plecoptera	Peltoperlidae	*Tallaperla sp.*	3
	Plecoptera	Perlidae	*Acroneuria sp.*	1
	Plecoptera	Perlidae	*Perlesta sp.*	1
	Trichoptera	Calamoceratidae	*Anisocentropus pyraloides*	2
	Trichoptera	Hydropsychidae	*Ceratopsyche sp.*	2
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	23
	Trichoptera	Hydropsychidae	*Hydropsyche sp.*	1
	Trichoptera	Hydropsychidae	Hydropsychidae	2
	Trichoptera	Leptoceridae	Leptoceridae	1
	Trichoptera	Rhyacophilidae	*Rhyacophila sp.*	1

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Three Mile Creek 45h-1			Oligochaeta	1
	Amphipoda	Talitridae	*Hyalella azteca*	2
	Basommatophora	Physidae	*Physa sp.*	1
	Basommatophora	Physidae	*Physella sp.*	1
	Coleoptera	Elmidae	*Dubiraphia bivittata*	2
	Coleoptera	Elmidae	*Dubiraphia sp.*	2
	Coleoptera	Elmidae	*Macronychus glabratus*	7
	Coleoptera	Gyrinidae	*Dineutus ciliatus*	1
	Diptera	Ceratopogonidae	Ceratopogonidae	1
	Diptera	Chironomidae	*Ablabesmyia (Karelia) sp.*	3
	Diptera	Chironomidae	*Ablabesmyia mallochi*	3
	Diptera	Chironomidae	*Ablabesmyia sp.*	2
	Diptera	Chironomidae	*Apedilum sp.*	1
	Diptera	Chironomidae	*Corynoneura sp.*	1
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	1
	Diptera	Chironomidae	*Microtendipes pedellus* group	16
	Diptera	Chironomidae	*Nilothauma sp.*	1
	Diptera	Chironomidae	*Orthocladius C*	1
	Diptera	Chironomidae	*Phaenopsectra obediens* group	1
	Diptera	Chironomidae	*Rheocricotopus sp.*	2
	Diptera	Chironomidae	*Rheotanytarsus A*	1
	Diptera	Chironomidae	*Rheotanytarsus sp.*	1
	Diptera	Chironomidae	*Tanytarsus sp.*	3
	Diptera	Chironomidae	*Thienemanniella xena*	2
	Diptera	Chironomidae	*Thienemannimyia* group	1
	Diptera	Chironomidae	*Tribelos jucundus*	4
	Diptera	Empididae	*Hemerodromia sp.*	1
	Diptera	Tipulidae	*Pseudolimnophila sp.*	10
	Diptera	Tipulidae	*Tipula sp.*	15
	Ephemeroptera	Baetidae	Baetidae	1
	Ephemeroptera	Ephemerellidae	Ephemerellidae	1
	Ephemeroptera	Heptageniidae	Heptageniidae	1
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	11
	Heteroptera	Veliidae	*Rhagovelia sp.*	4
	Megaloptera	Corydalidae	*Corydalus cornutus*	6
	Neotaenioglossa	Pleuroceridae	*Elimia sp.*	55
	Odonata	Coenagrionidae	*Argia sp.*	3
	Odonata	Coenagrionidae	*Enallagma sp.*	1
	Odonata	Corduliidae	*Macromia sp.*	1
	Odonata	Gomphidae	*Dromogomphus sp.*	1
	Odonata	Gomphidae	*Ophiogomphus sp.*	2
	Odonata	Gomphidae	*Progomphus obscurus*	2
	Odonata	Gomphidae	*Progomphus sp.*	2
	Plecoptera	Capniidae	Capniidae	19
	Plecoptera	Perlidae	*Acroneuria abnormis*	4
	Plecoptera	Perlidae	*Acroneuria sp.*	1
	Plecoptera	Perlidae	*Paragnetina immarginata*	1
	Plecoptera	Perlidae	*Perlesta sp.*	1
	Plecoptera	Perlidae	Perlidae	1
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	2
	Trichoptera	Hydropsychidae	*Ceratopsyche sp.*	1
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	89
	Trichoptera	Hydropsychidae	Hydropsychidae	3
	Trichoptera	Leptoceridae	*Setodes sp.*	1
	Trichoptera	Philopotamidae	*Chimarra sp.*	17
	Trichoptera	Polycentropodidae	*Polycentropus sp.*	4
	Veneroida	Corbiculidae	*Corbicula fluminea*	3

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Day Creek 65d-20	Coleoptera	Curculionidae	*Anchytarsus bicolor*	10
	Coleoptera	Elmidae	*Ancyronyx variegatus*	1
	Decapoda	Cambaridae	Cambarinae	1
	Decapoda	Cambaridae	*Procambarus sp.*	11
	Diptera	Ceratopogonidae	*Bezzia* complex	7
	Diptera	Chironomidae	*Ablabesmyia mallochi*	1
	Diptera	Chironomidae	*Clinotanypus sp.*	2
	Diptera	Chironomidae	*Corynoneura sp.*	1
	Diptera	Chironomidae	*Endotribelos hesperium*	1
	Diptera	Chironomidae	*Eukiefferiella sp.*	1
	Diptera	Chironomidae	*Parametriocnemus sp.*	22
	Diptera	Chironomidae	*Paraphaenocladius sp.*	1
	Diptera	Chironomidae	*Paratendipes albimanus*	2
	Diptera	Chironomidae	*Phaenopsectra obediens* group	10
	Diptera	Chironomidae	*Phaenopsectra punctipes* group	1
	Diptera	Chironomidae	*Phaenopsectra/Tribelos* complex	8
	Diptera	Chironomidae	*Polypedilum A*	2
	Diptera	Chironomidae	*Polypedilum fallax* group	6
	Diptera	Chironomidae	*Polypedilum flavum*	3
	Diptera	Chironomidae	*Polypedilum halterale* group	1
	Diptera	Chironomidae	*Polypedilum illinoense* group	4
	Diptera	Chironomidae	*Polypedilum scalaenum* group	7
	Diptera	Chironomidae	*Polypedilum tritum*	18
	Diptera	Chironomidae	*Reomyia sp.*	2
	Diptera	Chironomidae	*Rheotanytarsus sp.*	1
	Diptera	Chironomidae	*Stelechomyia perpulchra*	4
	Diptera	Chironomidae	*Stenochironomus sp.*	43
	Diptera	Chironomidae	Tanypodinae	1
	Diptera	Chironomidae	*Tanytarsus D*	1
	Diptera	Chironomidae	*Tanytarsus M*	1
	Diptera	Chironomidae	*Tanytarsus O*	9
	Diptera	Chironomidae	*Tanytarsus sp.*	9
	Diptera	Chironomidae	*Thienemanniella B*	1
	Diptera	Chironomidae	*Thienemannimyia* group	12
	Diptera	Chironomidae	*Tribelos jucundus*	4
	Diptera	Chironomidae	*Tribelos sp.*	1
	Diptera	Chironomidae	*Xestochironomus sp.*	1
	Diptera	Chironomidae	*Xylotopus par*	8
	Diptera	Phoridae	Phoridae	1
	Diptera	Tipulidae	*Limnophila sp.*	3
	Diptera	Tipulidae	*Tipula sp.*	5
	Ephemeroptera	Ephemeridae	*Hexagenia limbata*	3
	Megaloptera	Corydalidae	*Nigronia serricornis*	4
	Megaloptera	Sialidae	*Sialis sp.*	2
	Odonata	Calopterygidae	*Calopteryx sp.*	4
	Odonata	Coenagrionidae	*Argia sp.*	1
	Odonata	Gomphidae	*Gomphus sp.*	5
	Odonata	Gomphidae	*Progomphus obscurus*	4
	Odonata	Gomphidae	*Progomphus sp.*	2
	Plecoptera	Capniidae	Capniidae	25
	Plecoptera	Chloroperlidae	Chloroperlidae	3
	Plecoptera	Leuctridae	Leuctridae	5
	Plecoptera	Perlidae	*Perlinella sp.*	7
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	4
	Trichoptera	Hydropsychidae	*Hydropsyche sp.*	8
	Trichoptera	Hydropsychidae	Hydropsychidae	4
	Trichoptera	Hydropsychidae	*Potamyia flava*	3

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Day Creek 65d-20	Trichoptera	Leptoceridae	Leptoceridae	1
	Trichoptera	Polycentropodidae	Polycentropodidae	2
Roaring Branch Creek 65d-39			Oligochaeta	1
	Coleoptera	Elmidae	*Stenelmis sp.*	16
	Coleoptera	Psephenidae	*Ectopria sp.*	2
	Diptera	Atherinidae	*Atherix lantha*	8
	Diptera	Ceratopogonidae	*Bezzia* complex	3
	Diptera	Chironomidae	*Ablabesmyia mallochi*	8
	Diptera	Chironomidae	*Ablabesmyia sp.*	1
	Diptera	Chironomidae	*Brillia flavifrons*	3
	Diptera	Chironomidae	Chironominae	1
	Diptera	Chironomidae	*Corynoneura E*	1
	Diptera	Chironomidae	*Corynoneura sp.*	24
	Diptera	Chironomidae	*Cryptochironomus sp.*	2
	Diptera	Chironomidae	*Eukiefferiella claripennis* group	1
	Diptera	Chironomidae	*Krenopelopia hudsoni*	1
	Diptera	Chironomidae	*Labrundinia sp.*	1
	Diptera	Chironomidae	Orthocladiinae	1
	Diptera	Chironomidae	*Paramerina sp.*	2
	Diptera	Chironomidae	*Parametriocnemus sp.*	7
	Diptera	Chironomidae	*Paraphaenocladius sp.*	1
	Diptera	Chironomidae	*Phaenopsectra obediens* group	22
	Diptera	Chironomidae	*Phaenopsectra/Tribelos* complex	14
	Diptera	Chironomidae	*Polypedilum A*	4
	Diptera	Chironomidae	*Polypedilum aviceps*	8
	Diptera	Chironomidae	*Polypedilum flavum*	64
	Diptera	Chironomidae	*Polypedilum tritum*	2
	Diptera	Chironomidae	*Rheocricotopus robacki*	1
	Diptera	Chironomidae	*Rheosmittia sp.*	1
	Diptera	Chironomidae	*Rheotanytarsus A*	6
	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	6
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	14
	Diptera	Chironomidae	*Rheotanytarsus sp.*	1
	Diptera	Chironomidae	*Stempellinella B*	1
	Diptera	Chironomidae	*Stempellinella sp.*	1
	Diptera	Chironomidae	*Stenochironomus sp.*	1
	Diptera	Chironomidae	*Synorthocladius sp.*	3
	Diptera	Chironomidae	*Tanytarsus A*	2
	Diptera	Chironomidae	*Tanytarsus sp.*	6
	Diptera	Chironomidae	*Thienemanniella similis*	1
	Diptera	Chironomidae	*Thienemanniella sp.*	1
	Diptera	Chironomidae	*Thienemanniella xena*	1
	Diptera	Chironomidae	*Thienemannimyia* group	9
	Diptera	Chironomidae	*Tribelos jucundus*	7
	Diptera	Simuliidae	*Prosimulium mixtum*	7
	Diptera	Simuliidae	Simuliidae	1
	Diptera	Simuliidae	*Simulium sp.*	72
	Diptera	Tipulidae	*Limonia sp.*	1
	Diptera	Tipulidae	*Tipula sp.*	6
	Diptera	Tipulidae	Tipulidae	1
	Ephemeroptera	Baetidae	Baetidae	13
	Ephemeroptera	Caenidae	*Caenis sp.*	1
	Ephemeroptera	Heptageniidae	Heptageniidae	7
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	13
	Heteroptera	Corixidae	*Hesperocorixa sp.*	1
	Heteroptera	Veliidae	*Microvelia sp.*	1
	Heteroptera	Veliidae	*Rhagovelia obesa*	1

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Roaring Branch Creek 65d-39	Isopoda	Asellidae	*Caecidotea sp.*	1
	Megaloptera	Corydalidae	*Corydalus cornutus*	3
	Odonata	Coenagrionidae	*Argia sp.*	1
	Odonata	Gomphidae	Gomphidae	2
	Plecoptera	Capniidae	Capniidae	26
	Plecoptera	Leuctridae	Leuctridae	2
	Plecoptera	Peltoperlidae	*Peltoperla sp.*	1
	Plecoptera	Perlidae	*Acroneuria sp.*	9
	Plecoptera	Perlidae	Perlidae	2
	Plecoptera	Perlodidae	*Hydroperla fugitans*	2
	Plecoptera	Perlodidae	Perlodidae	1
	Plecoptera	Perlodidae	*Yugus sp.*	1
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	19
	Trichoptera	Hydropsychidae	*Ceratopsyche alhedra*	1
	Trichoptera	Hydropsychidae	*Ceratopsyche sp.*	1
	Trichoptera	Hydropsychidae	*Ceratopsyche sparna*	12
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	26
	Trichoptera	Hydropsychidae	*Hydropsyche betteni/depravata* complex	1
	Trichoptera	Hydropsychidae	*Hydropsyche sp.*	1
	Trichoptera	Hydropsychidae	Hydropsychidae	4
	Trichoptera	Philopotamidae	*Chimarra sp.*	2
	Veneroida	Corbiculidae	*Corbicula fluminea*	2
	Veneroida	Pisidiidae	*Pisidium sp.*	1
	Veneroida	Pisidiidae	*Sphaerium sp.*	1
Tributary to West Fork Deep Creek 65h-17			Oligochaeta	4
	Amphipoda	Crangonyctidae	*Crangonyx sp.*	43
	Amphipoda	Talitridae	*Hyalella azteca*	36
	Basommatophora	Planorbidae	*Gyraulus sp.*	3
	Coleoptera	Dytiscidae	*Celina sp.*	10
	Coleoptera	Dytiscidae	Dytiscidae	1
	Decapoda	Cambaridae	Cambarinae	4
	Decapoda	Cambaridae	*Faxonella clypeata*	2
	Diptera	Ceratopogonidae	Ceratopogonidae	1
	Diptera	Chironomidae	*Bryophaenocladius sp.*	2
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	24
	Diptera	Chironomidae	*Eukiefferiella sp.*	8
	Diptera	Chironomidae	*Heterotrissocladius cladwell/boltoni* complex	4
	Diptera	Chironomidae	*Hydrobaenus sp.*	1
	Diptera	Chironomidae	*Limnophyes sp.*	3
	Diptera	Chironomidae	*Mesocricotopus loticus*	1
	Diptera	Chironomidae	Orthocladiinae	2
	Diptera	Chironomidae	*Orthocladius oliveri*	3
	Diptera	Chironomidae	*Orthocladius sp.*	5
	Diptera	Chironomidae	*Parametriocnemus sp.*	3
	Diptera	Chironomidae	*Polypedilum sp.*	2
	Diptera	Chironomidae	*Polypedilum tritum*	3
	Diptera	Chironomidae	*Psectrocladius sp.*	1
	Diptera	Chironomidae	*Rheocricotopus sp.*	1
	Diptera	Chironomidae	*Tanytarsus M*	1
	Diptera	Chironomidae	*Tvetenia sp.*	3
	Diptera	Chironomidae	*Zavrelimyia A*	1
	Diptera	Simuliidae	*Prosimulium mixtum*	1
	Diptera	Simuliidae	*Simulium sp.*	6
	Diptera	Tipulidae	*Pilaria sp.*	1
	Diptera	Tipulidae	Tipulidae	2
	Haplotaxida	Lumbricidae	Lumbricidae	6

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Tributary to West Fork Deep Creek 65h-17	Heteroptera	Notonectidae	Notonectidae	1
	Isopoda	Asellidae	Asellidae	16
	Isopoda	Asellidae	*Caecidotea sp.*	82
	Isopoda	Asellidae	*Lirceus sp.*	25
	Plecoptera	Capniidae	Capniidae	15
	Trichoptera	Limnephilidae	*Lenarchus sp.*	1
	Trichoptera	Polycentropodidae	*Polycentropus sp.*	3
	Trichoptera	Rhyacophilidae	*Rhyacophila sp.*	4
	Veneroida	Corbiculidae	*Corbicula fluminea*	2
Horsehead Creek 65k-102			Oligochaeta	1
	Amphipoda	Crangonyctidae	*Crangonyx sp.*	1
	Amphipoda	Talitridae	*Hyalella azteca*	29
	Coleoptera	Dytiscidae	*Hygrotus sp.*	1
	Coleoptera	Dytiscidae	*Thermonectus basillaris basillaris*	1
	Coleoptera	Elmidae	*Ancyronyx variegatus*	1
	Coleoptera	Helodidae	*Cyphon sp.*	30
	Coleoptera	Noteridae	*Mesonoterus sp.*	3
	Decapoda	Cambaridae	*Procambarus sp.*	10
	Decapoda	Cambaridae	*Procambarus spiculifer*	1
	Diptera	Ceratopogonidae	*Bezzia* complex	2
	Diptera	Chironomidae	*Ablabesmyia annulata*	2
	Diptera	Chironomidae	*Ablabesmyia hauberi*	1
	Diptera	Chironomidae	*Ablabesmyia mallochi*	1
	Diptera	Chironomidae	*Ablabesmyia sp.*	5
	Diptera	Chironomidae	*Apedilum sp.*	6
	Diptera	Chironomidae	Chironominae	7
	Diptera	Chironomidae	*Clinotanypus sp.*	3
	Diptera	Chironomidae	*Cryptochironomus sp.*	1
	Diptera	Chironomidae	*Hudsonimyia sp.*	1
	Diptera	Chironomidae	*Labrundinia pilosella*	5
	Diptera	Chironomidae	*Microtendipes sp.*	13
	Diptera	Chironomidae	Orthocladiinae	1
	Diptera	Chironomidae	*Paramerina sp.*	7
	Diptera	Chironomidae	*Paratanytarsus sp.*	1
	Diptera	Chironomidae	*Phaenopsectra obediens* group	14
	Diptera	Chironomidae	*Polypedilum aviceps*	8
	Diptera	Chironomidae	*Polypedilum flavum*	1
	Diptera	Chironomidae	*Polypedilum illinoense* group	19
	Diptera	Chironomidae	*Polypedilum scalaenum* group	3
	Diptera	Chironomidae	*Polypedilum sp.*	8
	Diptera	Chironomidae	*Polypedilum tritum*	2
	Diptera	Chironomidae	*Rheocricotopus robacki*	2
	Diptera	Chironomidae	*Rheocricotopus sp.*	1
	Diptera	Chironomidae	*Rheotanytarsus A*	6
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	5
	Diptera	Chironomidae	*Stempellinella A*	1
	Diptera	Chironomidae	*Stenochironomus sp.*	1
	Diptera	Chironomidae	Tanypodinae	1
	Diptera	Chironomidae	Tanytarsini	5
	Diptera	Chironomidae	*Tanytarsus M*	2
	Diptera	Chironomidae	*Tanytarsus S*	2
	Diptera	Chironomidae	*Tanytarsus sp.*	17
	Diptera	Chironomidae	*Tanytarsus T*	2
	Diptera	Chironomidae	*Thienemannimyia* group	16
	Diptera	Chironomidae	*Tribelos fuscicorne*	7
	Diptera	Chironomidae	*Tribelos jucundus*	5
	Diptera	Chironomidae	*Tribelos sp.*	5

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Horsehead Creek 65k-102	Diptera	Chironomidae	*Trissopelopia ogemawi*	2
	Diptera	Chironomidae	*Xylotopus par*	1
	Diptera	Tipulidae	*Tipula sp.*	1
	Ephemeroptera	Ephemeridae	Ephemeridae	1
	Ephemeroptera	Ephemeridae	*Hexagenia limbata*	3
	Ephemeroptera	Heptageniidae	Heptageniidae	4
	Ephemeroptera	Heptageniidae	*Stenonema modestum*	10
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	14
	Ephemeroptera	Leptophlebiidae	Leptophlebiidae	2
	Heteroptera	Veliidae	*Microvelia sp.*	1
	Megaloptera	Sialidae	*Sialis sp.*	3
	Odonata	Calopterygidae	*Calopteryx maculata*	1
	Odonata	Calopterygidae	*Calopteryx sp.*	4
	Odonata	Coenagrionidae	*Argia sp.*	4
	Odonata	Coenagrionidae	Coenagrionidae	1
	Odonata	Coenagrionidae	*Ischnura sp.*	2
	Odonata	Gomphidae	*Progomphus obscurus*	1
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	16
	Trichoptera	Leptoceridae	*Nectopsyche exquisita*	1
	Trichoptera	Leptoceridae	*Setodes sp.*	1
	Trichoptera	Polycentropodidae	*Polycentropus sp.*	2
	Trichoptera	Psychomyiidae	*Lype diversa*	4
Stitchihatchee Creek 65L-184			Oligochaeta	21
	Amphipoda	Crangonyctidae	*Crangonyx sp.*	65
	Basommatophora	Planorbidae	*Gyraulus sp.*	5
	Coleoptera	Dytiscidae	*Agabus sp.*	1
	Coleoptera	Dytiscidae	*Coptotomus sp.*	3
	Coleoptera	Dytiscidae	Dytiscidae	3
	Coleoptera	Dytiscidae	*Hydroporus (Neoporus) sp.*	15
	Coleoptera	Dytiscidae	*Rhantus sp.*	1
	Coleoptera	Hydrophilidae	*Enochrus sp.*	2
	Coleoptera	Hydrophilidae	*Hydrochus rugosus*	5
	Coleoptera	Hydrophilidae	*Hydrochus sp.*	3
	Coleoptera	Hydrophilidae	*Tropisternus blatchleyi*	8
	Cyclopoida	Cyclopidae	Cyclopidae	9
	Decapoda	Cambaridae	Cambarinae	34
	Decapoda	Cambaridae	*Procambarus sp.*	38
	Diptera	Ceratopogonidae	*Bezzia* complex	8
	Diptera	Ceratopogonidae	*Monohelea sp.*	1
	Diptera	Chironomidae	*Chironomus decorus*	1
	Diptera	Chironomidae	*Chironomus sp.*	4
	Diptera	Chironomidae	*Corynoneura sp.*	1
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	1
	Diptera	Chironomidae	*Hydrobaenus sp.*	24
	Diptera	Chironomidae	*Limnophyes sp.*	7
	Diptera	Chironomidae	*Natarsia A*	1
	Diptera	Chironomidae	*Paratendipes subaequalis*	3
	Diptera	Chironomidae	*Polypedilum tritum*	5
	Diptera	Chironomidae	*Reomyia/Zavrelimyia* complex	20
	Diptera	Chironomidae	*Tanytarsus sp.*	43
	Diptera	Chironomidae	*Tanytarsus V*	1
	Diptera	Chironomidae	*Zavrelimyia sp.*	3
	Diptera	Culicidae	*Aedes sp.*	25
	Diptera	Culicidae	*Culex sp.*	3
	Diptera	Culicidae	Culicidae	75
	Diptera	Ephydridae	Ephydridae	1
	Diptera	Sciomyzidae	Sciomyzidae	1

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Stitchihatchee Creek 65L-184	Diptera	Tipulidae	*Erioptera sp.*	3
	Diptera	Tipulidae	*Limnophila sp.*	5
	Diptera	Tipulidae	Tipulidae	5
	Heteroptera	Belostomatidae	*Belostoma testaceum*	1
	Heteroptera	Corixidae	*Hesperocorixa sp.*	2
	Heteroptera	Gerridae	*Gerris alacris*	1
	Isopoda	Asellidae	Asellidae	16
	Isopoda	Asellidae	*Caecidotea sp.*	56
	Isopoda	Asellidae	*Lirceus sp.*	9
	Odonata	Cordulegastridae	*Cordulegaster sp.*	2
	Trichoptera	Lepidostomatidae	*Lepidostoma sp.*	1
	Trichoptera	Limnephilidae	*Ironoquia sp.*	1
	Trichoptera	Limnephilidae	Limnephilidae	3
	Trichoptera	Phryganeidae	Phryganeidae	1
	Trichoptera	Phryganeidae	*Ptilostomis sp.*	2
	Veneroida	Pisidiidae	*Sphaerium sp.*	1
Olive Creek 65o-3	Amphipoda	Talitridae	*Hyalella azteca*	39
	Basommatophora	Ancylidae	*Ferrissia sp.*	5
	Basommatophora	Planorbidae	*Gyraulus sp.*	1
	Coleoptera	Dytiscidae	Dytiscidae	5
	Coleoptera	Dytiscidae	*Hydroporus (Neoporus) sp.*	11
	Coleoptera	Dytiscidae	*Hygrotus sp.*	13
	Coleoptera	Elmidae	*Dubiraphia sp.*	13
	Coleoptera	Elmidae	Elmidae	1
	Coleoptera	Elmidae	*Macronychus glabratus*	4
	Coleoptera	Elmidae	*Microcylloepus pusillus*	3
	Coleoptera	Haliplidae	*Peltodytes sexmaculatus*	4
	Coleoptera	Hydrophilidae	*Sperchopsis tessellatus*	1
	Decapoda	Cambaridae	*Procambarus sp.*	2
	Decapoda	Cambaridae	*Procambarus spiculifer*	1
	Diptera	Ceratopogonidae	*Bezzia* complex	6
	Diptera	Chironomidae	*Ablabesmyia mallochi*	9
	Diptera	Chironomidae	*Bryophaenocladius sp.*	2
	Diptera	Chironomidae	Chironominae	1
	Diptera	Chironomidae	*Chironomus sp.*	1
	Diptera	Chironomidae	*Corynoneura sp.*	5
	Diptera	Chironomidae	*Cryptochironomus sp.*	1
	Diptera	Chironomidae	*Krenopelopia hudsoni*	1
	Diptera	Chironomidae	*Labrundinia sp.*	1
	Diptera	Chironomidae	*Paracladopelma sp.*	3
	Diptera	Chironomidae	*Parakiefferiella sp.*	5
	Diptera	Chironomidae	*Paralauterborniella nigrohalterale*	1
	Diptera	Chironomidae	*Paraphaenocladius sp.*	1
	Diptera	Chironomidae	*Phaenopsectra/Tribelos* complex	2
	Diptera	Chironomidae	*Polypedilum fallax* group	2
	Diptera	Chironomidae	*Polypedilum flavum*	8
	Diptera	Chironomidae	*Polypedilum halterale* group	2
	Diptera	Chironomidae	*Polypedilum scalaenum* group	60
	Diptera	Chironomidae	*Polypedilum tritum*	12
	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	17
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	2
	Diptera	Chironomidae	*Stenochironomus sp.*	6
	Diptera	Chironomidae	*Tanytarsus C*	2
	Diptera	Chironomidae	*Tanytarsus sp.*	13
	Diptera	Chironomidae	*Thienemanniella sp.*	1
	Diptera	Chironomidae	*Thienemanniella xena*	1
	Diptera	Chironomidae	*Thienemannimyia* group	1

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Olive Creek 65o-3	Diptera	Simuliidae	*Simulium sp.*	3
	Ephemeroptera	Caenidae	*Caenis sp.*	6
	Ephemeroptera	Heptageniidae	Heptageniidae	44
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	2
	Isopoda	Asellidae	*Caecidotea sp.*	28
	Odonata	Calopterygidae	*Calopteryx sp.*	6
	Odonata	Coenagrionidae	*Chromagrion conditum*	5
	Odonata	Libellulidae	*Libellula sp.*	2
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	16
	Trichoptera	Hydropsychidae	Hydropsychidae	3
	Trichoptera	Hydropsychidae	*Potamyia flava*	1
	Veneroida	Corbiculidae	*Corbicula fluminea*	3
	Veneroida	Pisidiidae	Pisidiidae	1
	Veneroida	Pisidiidae	*Sphaerium sp.*	2
Clyatt Mill Creek 65o-23			Oligochaeta	1
	Amphipoda	Talitridae	*Hyalella azteca*	14
	Coleoptera	Dytiscidae	Dytiscidae	5
	Coleoptera	Dytiscidae	*Hygrotus sp.*	3
	Coleoptera	Elmidae	*Ancyronyx variegatus*	5
	Coleoptera	Elmidae	*Dubiraphia sp.*	1
	Coleoptera	Elmidae	Elmidae	1
	Coleoptera	Elmidae	*Stenelmis sp.*	1
	Coleoptera	Helodidae (=Scirtidae)	Helodidae (=Scirtidae)	1
	Decapoda	Cambaridae	*Procambarus sp.*	1
	Diptera	Atherinidae	*Atherix lantha*	2
	Diptera	Ceratopogonidae	*Bezzia* complex	3
	Diptera	Chironomidae	*Ablabesmyia mallochi*	18
	Diptera	Chironomidae	*Ablabesmyia sp.*	5
	Diptera	Chironomidae	Chironominae	1
	Diptera	Chironomidae	*Clinotanypus sp.*	2
	Diptera	Chironomidae	*Corynoneura sp.*	15
	Diptera	Chironomidae	*Cryptochironomus sp.*	1
	Diptera	Chironomidae	*Endotribelos hesperium*	1
	Diptera	Chironomidae	*Labrundinia pilosella*	7
	Diptera	Chironomidae	*Labrundinia sp.*	1
	Diptera	Chironomidae	*Nanocladius sp.*	5
	Diptera	Chironomidae	*Orthocladius sp.*	1
	Diptera	Chironomidae	*Paracladopelma sp.*	1
	Diptera	Chironomidae	*Paramerina sp.*	8
	Diptera	Chironomidae	*Phaenopsectra obediens* group	7
	Diptera	Chironomidae	*Phaenopsectra/Tribelos* complex	1
	Diptera	Chironomidae	*Polypedilum illinoense* group	2
	Diptera	Chironomidae	*Polypedilum scalaenum* group	1
	Diptera	Chironomidae	*Polypedilum sp.*	12
	Diptera	Chironomidae	*Polypedilum trigonum*	4
	Diptera	Chironomidae	*Polypedilum tritum*	1
	Diptera	Chironomidae	*Rheocricotopus robacki*	2
	Diptera	Chironomidae	*Rheotanytarsus sp.*	1
	Diptera	Chironomidae	*Saetheria sp.*	4
	Diptera	Chironomidae	*Saetheria sp. 1*	1
	Diptera	Chironomidae	*Stempellinella A*	2
	Diptera	Chironomidae	Tanypodinae	1
	Diptera	Chironomidae	*Tanytarsus sp.*	7
	Diptera	Chironomidae	*Tribelos jucundus*	64
	Diptera	Chironomidae	*Tribelos sp.*	2
	Diptera	Chironomidae	*Trissopelopia ogemawi*	1

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Clyatt Mill Creek 65o-23	Diptera	Empididae	*Hemerodromia sp.*	2
	Diptera	Simuliidae	*Simulium sp.*	5
	Diptera	Tipulidae	*Hexatoma sp.*	1
	Diptera	Tipulidae	*Pilaria sp.*	5
	Ephemeroptera	Baetidae	Baetidae	9
	Ephemeroptera	Caenidae	*Caenis sp.*	16
	Ephemeroptera	Heptageniidae	Heptageniidae	15
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	22
	Isopoda	Asellidae	*Caecidotea sp.*	1
	Megaloptera	Sisyridae	*Climacia areolaris*	1
	Odonata	Coenagrionidae	*Argia sp.*	2
	Plecoptera	Perlidae	*Acroneuria sp.*	1
	Plecoptera	Perlidae	*Hansonoperla sp.*	5
	Plecoptera	Perlidae	*Perlesta sp.*	12
	Plecoptera	Perlidae	Perlidae	9
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	1
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	4
	Trichoptera	Leptoceridae	*Oecetis sp.*	2
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	2
Hightower Creek 66d-43			Oligochaeta	2
	Basommatophora	Physidae	*Physa sp.*	3
	Coleoptera	Elmidae	*Macronychus glabratus*	5
	Coleoptera	Elmidae	*Optioservus sp.*	19
	Coleoptera	Elmidae	*Oulimnius latiusculus*	4
	Coleoptera	Elmidae	*Promoresia tardella*	3
	Coleoptera	Psephenidae	*Psephenus herricki*	1
	Diptera	Ceratopogonidae	*Bezzia* complex	1
	Diptera	Chironomidae	*Brillia flavifrons*	2
	Diptera	Chironomidae	*Brillia sp.*	2
	Diptera	Chironomidae	*Corynoneura sp.*	5
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	15
	Diptera	Chironomidae	*Eukiefferiella sp.*	1
	Diptera	Chironomidae	*Eukiefferiella tirolensis*	3
	Diptera	Chironomidae	*Microtendipes pedellus group*	1
	Diptera	Chironomidae	*Microtendipes rydalensis group*	1
	Diptera	Chironomidae	*Microtendipes sp.*	1
	Diptera	Chironomidae	*Orthocladius obumbratus*	2
	Diptera	Chironomidae	*Parachaetocladius abnobaeus*	4
	Diptera	Chironomidae	*Parametriocnemus sp.*	1
	Diptera	Chironomidae	*Paraphaenocladius sp.*	1
	Diptera	Chironomidae	*Polypedilum aviceps*	7
	Diptera	Chironomidae	*Polypedilum scalaenum* group	3
	Diptera	Chironomidae	*Rheocricotopus sp.*	3
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	7
	Diptera	Chironomidae	*Rheotanytarsus sp.*	2
	Diptera	Chironomidae	*Stempellinella sp.*	1
	Diptera	Chironomidae	*Stenochironomus sp.*	1
	Diptera	Chironomidae	*Stilocladius clinopecten*	2
	Diptera	Chironomidae	*Thienemanniella sp.*	2
	Diptera	Chironomidae	*Thienemanniella xena*	4
	Diptera	Chironomidae	*Thienemannimyia* group	2
	Diptera	Empididae	*Hemerodromia sp.*	3
	Diptera	Simuliidae	*Simulium sp.*	6
	Diptera	Tipulidae	*Helius sp.*	1
	Ephemeroptera	Ephemerellidae	*Eurylophella sp.*	2
	Ephemeroptera	Heptageniidae	Heptageniidae	6
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	29

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Hightower Creek 66d-43	Ephemeroptera	Isonychiidae	*Isonychia sp.*	30
	Megaloptera	Sialidae	*Sialis sp.*	1
	Odonata	Calopterygidae	*Calopteryx maculata*	1
	Odonata	Calopterygidae	*Calopteryx sp.*	1
	Plecoptera	Capniidae	Capniidae	57
	Plecoptera	Leuctridae	Leuctridae	15
	Plecoptera	Perlidae	*Acroneuria abnormis*	1
	Plecoptera	Perlidae	*Acroneuria sp.*	1
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	4
	Trichoptera	Brachycentridae	*Brachycentrus sp.*	1
	Trichoptera	Hydropsychidae	*Ceratopsyche morosa*	4
	Trichoptera	Hydropsychidae	*Ceratopsyche sp.*	1
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	25
	Trichoptera	Hydropsychidae	Hydropsychidae	1
	Trichoptera	Leptoceridae	*Mystacides sepulchralis*	1
	Trichoptera	Leptoceridae	*Triaenodes tardus*	1
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	1
	Trichoptera	Philopotamidae	*Chimarra sp.*	8
	Trichoptera	Philopotamidae	*Wormaldia sp.*	1
	Trichoptera	Rhyacophilidae	*Rhyacophila sp.*	2
Coleman River 66d-44-2			Oligochaeta	1
	Coleoptera	Elmidae	*Optioservus sp.*	11
	Diptera	Atherinidae	*Atherix lantha*	1
	Diptera	Ceratopogonidae	*Bezzia* complex	1
	Diptera	Chironomidae	*Brillia sp.*	3
	Diptera	Chironomidae	*Corynoneura sp.*	7
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	1
	Diptera	Chironomidae	*Eukiefferiella sp.*	6
	Diptera	Chironomidae	*Microtendipes pedellus* group	1
	Diptera	Chironomidae	Orthocladiinae	1
	Diptera	Chironomidae	*Orthocladius lignicola*	1
	Diptera	Chironomidae	*Parakiefferiella coronata*	5
	Diptera	Chironomidae	*Parakiefferiella sp.*	11
	Diptera	Chironomidae	*Parametriocnemus sp.*	1
	Diptera	Chironomidae	*Platysmittia sp.*	1
	Diptera	Chironomidae	*Polypedilum halterale* group	1
	Diptera	Chironomidae	*Polypedilum sp.*	1
	Diptera	Chironomidae	*Polypedilum tritum*	1
	Diptera	Chironomidae	*Pseudorthocladius sp.*	1
	Diptera	Chironomidae	*Stenochironomus sp.*	1
	Diptera	Chironomidae	*Thienemanniella sp.*	1
	Diptera	Chironomidae	*Thienemannimyia* group	2
	Diptera	Dixidae	*Dixa sp.*	1
	Diptera	Simuliidae	*Prosimulium mixtum*	7
	Diptera	Simuliidae	*Prosimulium rhizophorum*	4
	Diptera	Simuliidae	*Simulium sp.*	38
	Diptera	Tipulidae	*Hexatoma sp.*	1
	Diptera	Tipulidae	*Limnophila sp.*	1
	Diptera	Tipulidae	*Pilaria sp.*	1
	Diptera	Tipulidae	Tipulidae	1
	Ephemeroptera	Baetidae	*Baetis sp.*	8
	Ephemeroptera	Baetidae	*Pseudocloeon sp.*	2
	Ephemeroptera	Ephemerellidae	*Attenella attenuata*	1
	Ephemeroptera	Ephemerellidae	Ephemerellidae	1
	Ephemeroptera	Ephemerellidae	*Serratella sp.*	47
	Ephemeroptera	Heptageniidae	*Epeorus dispar*	1
	Ephemeroptera	Heptageniidae	Heptageniidae	10

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Coleman River 66d-44-2	Ephemeroptera	Heptageniidae	*Stenonema sp.*	10
	Ephemeroptera	Leptophlebiidae	Leptophlebiidae	6
	Neotaenioglossa	Pleuroceridae	*Elimia sp.*	5
	Odonata	Cordulegastridae	*Cordulegaster sp.*	1
	Odonata	Gomphidae	*Lanthus sp.*	1
	Plecoptera	Capniidae	Capniidae	10
	Plecoptera	Peltoperlidae	*Peltoperla sp.*	16
	Plecoptera	Peltoperlidae	*Tallaperla sp.*	29
	Plecoptera	Perlidae	*Acroneuria abnormis*	3
	Plecoptera	Perlidae	*Acroneuria sp.*	5
	Plecoptera	Perlidae	Perlidae	1
	Plecoptera	Perlodidae	*Isoperla sp.*	2
	Plecoptera	Perlodidae	Perlodidae	1
	Plecoptera	Pteronarcyidae	*Pteronarcys dorsata*	1
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	19
	Trichoptera	Hydropsychidae	*Ceratopsyche sp.*	1
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	1
	Trichoptera	Hydropsychidae	*Diplectrona modesta*	25
	Trichoptera	Hydropsychidae	*Hydropsyche sp.*	5
	Trichoptera	Hydropsychidae	Hydropsychidae	3
	Trichoptera	Lepidostomatidae	*Lepidostoma sp.*	5
	Trichoptera	Lepidostomatidae	*Theliopsyche sp.*	2
	Trichoptera	Limnephilidae	*Hydatophylax argus*	1
	Trichoptera	Limnephilidae	Limnephilidae	1
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	5
	Trichoptera	Polycentropodidae	Polycentropodidae	2
	Trichoptera	Polycentropodidae	*Polycentropus sp.*	1
	Trichoptera	Rhyacophilidae	*Rhyacophila formosa*	1
	Trichoptera	Rhyacophilidae	*Rhyacophila fuscula*	1
	Trichoptera	Rhyacophilidae	*Rhyacophila sp.*	11
Town Creek 66d-58			Oligochaeta	46
	Coleoptera	Elmidae	*Optioservus sp.*	3
	Coleoptera	Elmidae	*Promoresia elegans*	1
	Coleoptera	Elmidae	*Stenelmis humerosa*	1
	Diptera	Atherinidae	*Atherix lantha*	1
	Diptera	Chironomidae	*Apedilum sp.*	2
	Diptera	Chironomidae	*Brillia flavifrons*	2
	Diptera	Chironomidae	*Brillia sp.*	12
	Diptera	Chironomidae	*Chironomus sp.*	3
	Diptera	Chironomidae	*Corynoneura sp.*	8
	Diptera	Chironomidae	*Diamesa sp.*	2
	Diptera	Chironomidae	Diamesinae	2
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	8
	Diptera	Chironomidae	*Eukiefferiella sp.*	3
	Diptera	Chironomidae	*Microtendipes pedellus* group	9
	Diptera	Chironomidae	*Nanocladius sp.*	6
	Diptera	Chironomidae	Orthocladiinae	3
	Diptera	Chironomidae	*Orthocladius nigritus*	1
	Diptera	Chironomidae	*Orthocladius obumbratus*	8
	Diptera	Chironomidae	*Orthocladius robacki*	1
	Diptera	Chironomidae	*Orthocladius sp.*	8
	Diptera	Chironomidae	*Parakiefferiella sp.*	1
	Diptera	Chironomidae	*Parametriocnemus sp.*	28
	Diptera	Chironomidae	*Paratendipes albimanus*	1
	Diptera	Chironomidae	*Phaenopsectra obediens* group	37
	Diptera	Chironomidae	*Polypedilum A*	3
	Diptera	Chironomidae	*Polypedilum aviceps*	40

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Town Creek 66d-58	Diptera	Chironomidae	*Polypedilum flavum*	12
	Diptera	Chironomidae	*Polypedilum sp.*	1
	Diptera	Chironomidae	*Polypedilum tritum*	1
	Diptera	Chironomidae	Tanypodinae	1
	Diptera	Chironomidae	*Thienemanniella sp.*	2
	Diptera	Chironomidae	*Thienemanniella xena*	8
	Diptera	Chironomidae	*Thienemannimyia* group	12
	Diptera	Chironomidae	*Tvetenia vitracies*	2
	Diptera	Empididae	*Hemerodromia sp.*	1
	Diptera	Tabanidae	*Tabanus sp.*	1
	Diptera	Tipulidae	*Pilaria sp.*	1
	Diptera	Tipulidae	*Tipula sp.*	2
	Ephemeroptera	Ephemerellidae	*Ephemerella sp.*	13
	Ephemeroptera	Heptageniidae	Heptageniidae	2
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	5
	Ephemeroptera	Leptophlebiidae	Leptophlebiidae	1
	Megaloptera	Corydalidae	*Nigronia serricornis*	2
	Plecoptera	Capniidae	*Allocapnia sp.*	31
	Plecoptera	Capniidae	Capniidae	16
	Plecoptera	Peltoperlidae	*Peltoperla sp.*	1
	Plecoptera	Perlodidae	*Isoperla clio*	1
	Plecoptera	Perlodidae	*Isoperla sp.*	1
	Plecoptera	Perlodidae	Perlodidae	1
	Trichoptera	Hydropsychidae	*Ceratopsyche sp.*	10
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	43
	Trichoptera	Hydropsychidae	*Hydropsyche scalaris*	17
	Trichoptera	Hydropsychidae	Hydropsychidae	7
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	3
	Trichoptera	Philopotamidae	*Chimarra sp.*	7
	Trichoptera	Philopotamidae	*Dolophilodes sp.*	4
	Trichoptera	Rhyacophilidae	*Rhyacophila atrata*	1
	Trichoptera	Rhyacophilidae	*Rhyacophila carolina* complex	2
	Trichoptera	Rhyacophilidae	*Rhyacophila fuscula*	2
	Veneroida	Pisidiidae	*Pisidium amnicum*	12
	Veneroida	Pisidiidae	*Sphaerium sp.*	8
Nimblewill Creek 66g-23			Oligochaeta	13
	Coleoptera	Elmidae	Elmidae	1
	Coleoptera	Elmidae	*Macronychus glabratus*	2
	Coleoptera	Elmidae	*Optioservus ovalis*	4
	Coleoptera	Elmidae	*Optioservus sp.*	10
	Coleoptera	Psephenidae	*Ectopria sp.*	2
	Coleoptera	Psephenidae	*Psephenus herricki*	9
	Decapoda	Cambaridae	*Cambarus sp.*	2
	Diptera	Ceratopogonidae	*Bezzia* complex	4
	Diptera	Chironomidae	*Apedilum sp.*	12
	Diptera	Chironomidae	*Brillia flavifrons*	1
	Diptera	Chironomidae	Chironomidae	2
	Diptera	Chironomidae	*Corynoneura sp.*	3
	Diptera	Chironomidae	*Cryptochironomus sp.*	1
	Diptera	Chironomidae	*Djalmabatista pulcher variant* (5 toothed)	1
	Diptera	Chironomidae	*Heterotrissocladius marcidus*	1
	Diptera	Chironomidae	*Hudsonimyia sp.*	1
	Diptera	Chironomidae	*Micropsectra A*	4
	Diptera	Chironomidae	*Micropsectra E*	1
	Diptera	Chironomidae	*Microtendipes pedellus* group	1
	Diptera	Chironomidae	*Microtendipes sp.*	3

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Nimblewill Creek 66g-23	Diptera	Chironomidae	Orthocladiinae	1
	Diptera	Chironomidae	*Paracladopelma sp.*	1
	Diptera	Chironomidae	*Paralauterborniella nigrohalterale*	3
	Diptera	Chironomidae	*Parametriocnemus sp.*	2
	Diptera	Chironomidae	*Paraphaenocladius sp.*	1
	Diptera	Chironomidae	*Phaenopsectra sp.*	1
	Diptera	Chironomidae	*Polypedilum aviceps*	2
	Diptera	Chironomidae	*Polypedilum sp.*	4
	Diptera	Chironomidae	*Pseudorthocladius sp.*	2
	Diptera	Chironomidae	*Reomyia sp.*	1
	Diptera	Chironomidae	*Stempellinella A*	2
	Diptera	Chironomidae	*Stempellinella B*	5
	Diptera	Chironomidae	*Stempellinella sp.*	14
	Diptera	Chironomidae	Tanypodinae	3
	Diptera	Chironomidae	Tanytarsini	1
	Diptera	Chironomidae	*Thienemanniella lobapodema*	1
	Diptera	Chironomidae	*Thienemannimyia* group	5
	Diptera	Chironomidae	*Xylotopus par*	2
	Diptera	Dixidae	*Dixa sp.*	4
	Diptera	Simuliidae	Simuliidae	1
	Diptera	Tabanidae	Tabanidae	1
	Diptera	Tipulidae	*Limnophila sp.*	1
	Diptera	Tipulidae	*Pilaria sp.*	3
	Diptera	Tipulidae	*Tipula sp.*	2
	Diptera	Tipulidae	Tipulidae	2
	Ephemeroptera	Baetidae	Baetidae	2
	Ephemeroptera	Baetiscidae	*Baetisca carolina*	2
	Ephemeroptera	Ephemerellidae	*Attenella attenuata*	2
	Ephemeroptera	Ephemerellidae	*Dannella lita*	1
	Ephemeroptera	Ephemerellidae	*Dannella sp.*	6
	Ephemeroptera	Ephemerellidae	*Ephemerella argo*	4
	Ephemeroptera	Ephemerellidae	*Ephemerella sp.*	9
	Ephemeroptera	Ephemerellidae	Ephemerellidae	2
	Ephemeroptera	Ephemerellidae	*Eurylophella doris* complex	3
	Ephemeroptera	Ephemeridae	*Ephemera sp.*	2
	Ephemeroptera	Heptageniidae	*Epeorus dispar*	5
	Ephemeroptera	Heptageniidae	*Epeorus pleuralis*	7
	Ephemeroptera	Heptageniidae	*Epeorus sp.*	3
	Ephemeroptera	Heptageniidae	Heptageniidae	3
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	27
	Ephemeroptera	Leptophlebiidae	*Habrophlebiodes sp.*	1
	Ephemeroptera	Leptophlebiidae	Leptophlebiidae	7
	Heteroptera	Veliidae	*Microvelia sp.*	3
	Heteroptera	Veliidae	*Rhagovelia obesa*	1
	Odonata	Calopterygidae	*Calopteryx sp.*	1
	Odonata	Calopterygidae	*Hetaerina sp.*	1
	Odonata	Cordulegastridae	*Cordulegaster sp.*	2
	Odonata	Gomphidae	*Dromogomphus spinosus*	2
	Odonata	Gomphidae	Gomphidae	4
	Plecoptera	Capniidae	*Allocapnia sp.*	7
	Plecoptera	Capniidae	Capniidae	9
	Plecoptera	Peltoperlidae	*Tallaperla sp.*	1
	Plecoptera	Perlidae	*Acroneuria abnormis*	7
	Plecoptera	Perlidae	*Acroneuria sp.*	1
	Plecoptera	Perlidae	*Paragnetina immarginata*	1
	Plecoptera	Perlodidae	*Isoperla similis*	1
	Plecoptera	Perlodidae	Perlodidae	2

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Nimblewill Creek 66g-23	Plecoptera	Perlodidae	*Yugus arinus*	1
	Plecoptera	Pteronarcyidae	*Pteronarcys dorsata*	1
	Plecoptera	Taeniopterygidae	*Oemopteryx* complex	3
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	9
	Trichoptera	Hydropsychidae	*Ceratopsyche sp.*	1
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	9
	Trichoptera	Hydropsychidae	*Diplectrona sp.*	1
	Trichoptera	Hydropsychidae	*Hydropsyche sp.*	6
	Trichoptera	Hydropsychidae	Hydropsychidae	1
	Trichoptera	Hydroptilidae	Hydroptilidae	1
	Trichoptera	Limnephilidae	*Hydatophylax argus*	4
	Trichoptera	Limnephilidae	Limnephilidae	2
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	14
	Trichoptera	Philopotamidae	*Dolophilodes sp.*	6
	Trichoptera	Philopotamidae	*Wormaldia sp.*	2
	Trichoptera	Polycentropodidae	*Neureclipsis sp.*	20
	Trichoptera	Psychomyiidae	*Lype diversa*	2
	Trichoptera	Rhyacophilidae	*Rhyacophila sp.*	7
Yellow Creek 66g-71			Oligochaeta	5
	Coleoptera	Curculionidae	*Anchytarsus bicolor*	1
	Coleoptera	Dytiscidae	*Hygrotus farctus*	1
	Coleoptera	Elmidae	*Microcylloepus pusillus*	2
	Coleoptera	Elmidae	*Optioservus sp.*	2
	Coleoptera	Elmidae	*Oulimnius latiusculus*	2
	Decapoda	Cambaridae	*Procambarus sp.*	1
	Diptera	Ceratopogonidae	*Bezzia* complex	1
	Diptera	Ceratopogonidae	*Dasyhelea sp.*	1
	Diptera	Chironomidae	*Ablabesmyia mallochi*	4
	Diptera	Chironomidae	*Apedilum sp.*	4
	Diptera	Chironomidae	*Brillia flavifrons*	1
	Diptera	Chironomidae	*Brillia sp.*	2
	Diptera	Chironomidae	Chironominae	1
	Diptera	Chironomidae	*Corynoneura sp.*	1
	Diptera	Chironomidae	*Dicrotendipes sp.*	2
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	2
	Diptera	Chironomidae	*Eukiefferiella sp.*	3
	Diptera	Chironomidae	*Microtendipes rydalensis* group	1
	Diptera	Chironomidae	*Nanocladius alternantherae*	1
	Diptera	Chironomidae	*Orthocladius obumbratus*	2
	Diptera	Chironomidae	*Parakiefferiella F*	1
	Diptera	Chironomidae	*Parametriocnemus sp.*	4
	Diptera	Chironomidae	*Paratanytarsus dissimilis*	2
	Diptera	Chironomidae	*Paratanytarsus sp.*	3
	Diptera	Chironomidae	*Phaenopsectra obediens* group	1
	Diptera	Chironomidae	*Polypedilum aviceps*	1
	Diptera	Chironomidae	*Polypedilum flavum*	3
	Diptera	Chironomidae	*Potthastia sp.*	1
	Diptera	Chironomidae	*Procladius (Holotanypus) sp.*	1
	Diptera	Chironomidae	*Rheotanytarsus A*	2
	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	13
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	2
	Diptera	Chironomidae	*Rheotanytarsus sp.*	3
	Diptera	Chironomidae	*Stempellinella A*	1
	Diptera	Chironomidae	*Stempellinella sp.*	1
	Diptera	Chironomidae	*Stenochironomus sp.*	2
	Diptera	Chironomidae	Tanytarsini	1
	Diptera	Chironomidae	*Tanytarsus M*	9

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Yellow Creek 66g-71	Diptera	Chironomidae	*Tanytarsus sp.*	3
	Diptera	Chironomidae	*Tanytarsus W*	5
	Diptera	Chironomidae	*Thienemanniella sp.*	1
	Diptera	Chironomidae	*Thienemanniella xena*	1
	Diptera	Chironomidae	*Thienemannimyia* group	12
	Diptera	Chironomidae	*Trissopelopia ogemawi*	2
	Diptera	Chironomidae	*Zavrelimyia thryptica* complex	1
	Diptera	Empididae	Empididae	1
	Diptera	Empididae	*Hemerodromia sp.*	7
	Diptera	Simuliidae	*Prosimulium mixtum*	2
	Diptera	Simuliidae	Simuliidae	8
	Diptera	Simuliidae	*Simulium sp.*	7
	Diptera	Tipulidae	*Antocha sp.*	1
	Diptera	Tipulidae	*Tipula sp.*	1
	Diptera	Tipulidae	Tipulidae	1
	Ephemeroptera	Baetidae	Baetidae	4
	Ephemeroptera	Ephemerellidae	*Attenella attenuata*	1
	Ephemeroptera	Ephemerellidae	*Ephemerella argo*	2
	Ephemeroptera	Ephemerellidae	*Ephemerella sp.*	3
	Ephemeroptera	Ephemerellidae	Ephemerellidae	1
	Ephemeroptera	Ephemerellidae	*Eurylophella bicolor*	1
	Ephemeroptera	Ephemerellidae	*Eurylophella doris* complex	1
	Ephemeroptera	Ephemeridae	*Hexagenia limbata*	1
	Ephemeroptera	Heptageniidae	Heptageniidae	3
	Ephemeroptera	Heptageniidae	*Stenacron pallidum*	1
	Ephemeroptera	Heptageniidae	*Stenonema modestum*	27
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	28
	Ephemeroptera	Heptageniidae	*Stenonema terminatum*	1
	Ephemeroptera	Isonychiidae	*Isonychia sp.*	17
	Megaloptera	Corydalidae	*Corydalus cornutus*	1
	Odonata	Coenagrionidae	*Argia sp.*	1
	Plecoptera	Chloroperlidae	Chloroperlidae	6
	Plecoptera	Nemouridae	Nemouridae	1
	Plecoptera	Perlidae	*Acroneuria sp.*	1
	Plecoptera	Perlidae	*Perlinella sp.*	1
	Plecoptera	Perlodidae	*Isoperla holochlora*	4
	Plecoptera	Perlodidae	*Isoperla sp.*	3
	Plecoptera	Taeniopterygidae	*Oemopteryx* complex	4
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	53
	Trichoptera	Hydropsychidae	*Hydropsyche sp.*	1
	Trichoptera	Hydropsychidae	Hydropsychidae	3
	Trichoptera	Leptoceridae	Leptoceridae	1
	Trichoptera	Leptoceridae	*Oecetis avara*	1
	Trichoptera	Leptoceridae	*Triaenodes tardus*	3
	Trichoptera	Limnephilidae	*Hydatophylax argus*	1
	Trichoptera	Limnephilidae	*Pycnopsyche guttifera*	1
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	2
	Trichoptera	Philopotamidae	*Chimarra sp.*	1
	Trichoptera	Psychomyiidae	*Lype diversa*	2
	Trichoptera	Rhyacophilidae	Rhyacophilidae	1
Hothouse Creek 66j-19	Coleoptera	Elmidae	*Macronychus glabratus*	1
	Coleoptera	Elmidae	*Optioservus sp.*	6
	Coleoptera	Psephenidae	*Psephenus herricki*	1
	Diptera	Atherinidae	*Atherix lantha*	3
	Diptera	Ceratopogonidae	*Bezzia* complex	3
	Diptera	Chironomidae	*Ablabesmyia mallochi*	1
	Diptera	Chironomidae	*Apedilum sp.*	9

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Hothouse Creek 66j-19	Diptera	Chironomidae	*Brillia flavifrons*	3
	Diptera	Chironomidae	*Brillia sp.*	5
	Diptera	Chironomidae	*Corynoneura lobata*	1
	Diptera	Chironomidae	*Corynoneura sp.*	9
	Diptera	Chironomidae	*Cryptochironomus sp.*	1
	Diptera	Chironomidae	*Demicryptochironomus sp.*	1
	Diptera	Chironomidae	*Diamesa B*	1
	Diptera	Chironomidae	*Diamesa C*	1
	Diptera	Chironomidae	*Diamesa sp.*	1
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	11
	Diptera	Chironomidae	*Eukiefferiella devonica* group	1
	Diptera	Chironomidae	*Eukiefferiella sp.*	6
	Diptera	Chironomidae	*Eukiefferiella tirolensis*	2
	Diptera	Chironomidae	*Heterotrissocladius marcidus*	4
	Diptera	Chironomidae	*Meropelopia sp.*	1
	Diptera	Chironomidae	*Microtendipes pedellus* group	4
	Diptera	Chironomidae	*Nanocladius sp.*	3
	Diptera	Chironomidae	Orthocladiinae	3
	Diptera	Chironomidae	*Orthocladius obumbratus*	8
	Diptera	Chironomidae	*Orthocladius oliveri*	1
	Diptera	Chironomidae	*Orthocladius rivulorum*	3
	Diptera	Chironomidae	*Orthocladius sp.*	15
	Diptera	Chironomidae	*Orthocladius vaillanti*	3
	Diptera	Chironomidae	*Parakiefferiella F*	1
	Diptera	Chironomidae	*Parakiefferiella sp.*	4
	Diptera	Chironomidae	*Parametriocnemus sp.*	19
	Diptera	Chironomidae	*Paraphaenocladius sp.*	1
	Diptera	Chironomidae	*Phaenopsectra obediens* group	1
	Diptera	Chironomidae	*Polypedilum aviceps*	2
	Diptera	Chironomidae	*Polypedilum fallax* group	1
	Diptera	Chironomidae	*Polypedilum scalaenum* group	1
	Diptera	Chironomidae	*Polypedilum sp.*	2
	Diptera	Chironomidae	*Polypedilum tritum*	16
	Diptera	Chironomidae	*Pseudorthocladius sp.*	3
	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	2
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	1
	Diptera	Chironomidae	*Rheotanytarsus sp.*	2
	Diptera	Chironomidae	*Stempellinella A*	1
	Diptera	Chironomidae	*Stictochironomus devinctus*	1
	Diptera	Chironomidae	Tanypodinae	3
	Diptera	Chironomidae	*Tanytarsus sp.*	2
	Diptera	Chironomidae	*Telopelopia okoboji*	1
	Diptera	Chironomidae	*Thienemannimyia* group	2
	Diptera	Chironomidae	*Trissopelopia ogemawi*	2
	Diptera	Chironomidae	*Tvetenia bavarica* group	4
	Diptera	Chironomidae	*Tvetenia sp.*	6
	Diptera	Chironomidae	*Xylotopus par*	1
	Diptera	Chironomidae	*Zavrelimyia sp.*	4
	Diptera	Dixidae	*Dixella indiana*	1
	Diptera	Simuliidae	*Prosimulium mixtum*	2
	Diptera	Simuliidae	*Prosimulium rhizophorum*	1
	Diptera	Simuliidae	*Prosimulium sp.*	3
	Diptera	Simuliidae	*Simulium sp.*	24
	Diptera	Stratiomyidae	Stratiomyidae	1
	Diptera	Tipulidae	*Leptotarsus sp.*	1
	Diptera	Tipulidae	*Limonia sp.*	1
	Diptera	Tipulidae	*Tipula sp.*	5

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Hothouse Creek 66j-19	Ephemeroptera	Ephemerellidae	*Ephemerella sp.*	10
	Ephemeroptera	Ephemerellidae	Ephemerellidae	2
	Ephemeroptera	Ephemeridae	*Hexagenia limbata*	1
	Ephemeroptera	Ephemeridae	*Hexagenia sp.*	1
	Ephemeroptera	Heptageniidae	Heptageniidae	18
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	43
	Ephemeroptera	Isonychiidae	*Isonychia sp.*	1
	Ephemeroptera	Neoephemeridae	*Neoephemera purpurea*	2
	Odonata	Calopterygidae	*Calopteryx angustipennis*	1
	Odonata	Calopterygidae	*Calopteryx sp.*	1
	Plecoptera	Capniidae	Capniidae	2
	Plecoptera	Leuctridae	*Leuctra sp.*	1
	Plecoptera	Peltoperlidae	*Peltoperla sp.*	1
	Plecoptera	Perlidae	*Acroneuria abnormis*	1
	Plecoptera	Perlidae	*Acroneuria internata*	2
	Plecoptera	Perlidae	*Acroneuria sp.*	4
	Plecoptera	Perlidae	*Perlesta sp.*	1
	Plecoptera	Perlodidae	*Isoperla sp.*	2
	Plecoptera	Pteronarcyidae	*Pteronarcys dorsata*	1
	Plecoptera	Taeniopterygidae	*Oemopteryx* complex	2
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	74
	Trichoptera	Hydropsychidae	*Hydropsyche sp.*	6
	Trichoptera	Hydropsychidae	Hydropsychidae	8
	Trichoptera	Leptoceridae	*Leptocerus americanus*	1
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	6
Moccasin Creek 66j-23			Oligochaeta	3
	Basommatophora	Ancylidae	*Ferrissia rivularis*	4
	Basommatophora	Ancylidae	*Ferrissia sp.*	7
	Coleoptera	Dryopidae	*Helichus lithophilus*	1
	Coleoptera	Elmidae	*Optioservus sp.*	11
	Coleoptera	Elmidae	*Oulimnius latiusculus*	5
	Coleoptera	Hydrophilidae	*Helophorus linearis*	1
	Coleoptera	Hydrophilidae	*Laccobius sp.*	1
	Coleoptera	Psephenidae	*Psephenus herricki*	7
	Decapoda	Cambaridae	*Cambarus hiwasseensis*	1
	Diptera	Ceratopogonidae	*Bezzia* complex	3
	Diptera	Chironomidae	*Apedilum sp.*	1
	Diptera	Chironomidae	*Brillia flavifrons*	2
	Diptera	Chironomidae	*Brillia sp.*	12
	Diptera	Chironomidae	*Chaetocladius sp.*	1
	Diptera	Chironomidae	Chironomidae	5
	Diptera	Chironomidae	Chironominae	4
	Diptera	Chironomidae	*Corynoneura sp.*	12
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	1
	Diptera	Chironomidae	*Eukiefferiella sp.*	11
	Diptera	Chironomidae	*Microtendipes pedellus* group	36
	Diptera	Chironomidae	*Microtendipes sp.*	13
	Diptera	Chironomidae	Orthocladiinae	3
	Diptera	Chironomidae	*Parakiefferiella sp.*	1
	Diptera	Chironomidae	*Parametriocnemus sp.*	6
	Diptera	Chironomidae	*Paratanytarsus sp.*	1
	Diptera	Chironomidae	*Phaenopsectra sp.*	1
	Diptera	Chironomidae	*Polypedilum aviceps*	1
	Diptera	Chironomidae	*Polypedilum sp.*	2
	Diptera	Chironomidae	*Rheocricotopus sp.*	2
	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	1
	Diptera	Chironomidae	*Rheotanytarsus sp.*	1

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Moccasin Creek 66j-23	Diptera	Chironomidae	Tanypodinae	3
	Diptera	Chironomidae	*Tanytarsus W*	4
	Diptera	Chironomidae	*Thienemanniella sp.*	1
	Diptera	Chironomidae	*Thienemanniella xena*	10
	Diptera	Dixidae	*Dixa sp.*	9
	Diptera	Simuliidae	*Simulium sp.*	10
	Diptera	Tipulidae	*Dicranota sp.*	1
	Diptera	Tipulidae	*Limnophila sp.*	1
	Diptera	Tipulidae	*Molophilus sp.*	2
	Diptera	Tipulidae	*Tipula sp.*	6
	Diptera	Tipulidae	Tipulidae	9
	Ephemeroptera	Ephemerellidae	*Ephemerella sp.*	1
	Ephemeroptera	Ephemerellidae	Ephemerellidae	3
	Ephemeroptera	Heptageniidae	Heptageniidae	12
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	38
	Ephemeroptera	Isonychiidae	*Isonychia sp.*	13
	Ephemeroptera	Leptophlebiidae	*Leptophlebia sp.*	2
	Odonata	Gomphidae	*Stylogomphus albistylus*	2
	Plecoptera	Capniidae	*Allocapnia sp.*	4
	Plecoptera	Capniidae	Capniidae	78
	Plecoptera	Chloroperlidae	Chloroperlidae	1
	Plecoptera	Perlidae	*Acroneuria abnormis*	1
	Plecoptera	Perlodidae	*Isoperla marlynia*	9
	Plecoptera	Perlodidae	Perlodidae	1
	Plecoptera	Pteronarcyidae	*Pteronarcys dorsata*	1
	Plecoptera	Taeniopterygidae	*Oemopteryx* complex	1
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	9
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	53
	Trichoptera	Hydropsychidae	Hydropsychidae	2
	Trichoptera	Lepidostomatidae	*Lepidostoma sp.*	2
	Trichoptera	Limnephilidae	*Hydatophylax argus*	2
	Trichoptera	Limnephilidae	Limnephilidae	1
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	5
	Trichoptera	Philopotamidae	*Dolophilodes sp.*	6
	Trichoptera	Philopotamidae	*Wormaldia sp.*	9
	Trichoptera	Polycentropodidae	*Neureclipsis sp.*	2
	Trichoptera	Polycentropodidae	*Polycentropus sp.*	6
	Trichoptera	Rhyacophilidae	*Rhyacophila atrata*	1
	Trichoptera	Rhyacophilidae	*Rhyacophila fuscula*	3
	Trichoptera	Rhyacophilidae	*Rhyacophila glaberrima*	2
	Trichoptera	Rhyacophilidae	*Rhyacophila sp.*	11
	Veneroida	Pisidiidae	*Pisidium sp.*	14
Hemptown Creek 66j-25			Oligochaeta	3
	Basommatophora	Ancylidae	*Ferrissia sp.*	3
	Coleoptera	Elmidae	*Optioservus sp.*	19
	Coleoptera	Psephenidae	*Psephenus herricki*	1
	Decapoda	Cambaridae	*Cambarus hiwasseensis*	1
	Diptera	Chironomidae	*Ablabesmyia mallochi*	2
	Diptera	Chironomidae	*Brillia flavifrons*	1
	Diptera	Chironomidae	*Brillia sp.*	1
	Diptera	Chironomidae	*Corynoneura sp.*	12
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	23
	Diptera	Chironomidae	*Eukiefferiella sp.*	1
	Diptera	Chironomidae	*Microtendipes pedellus* group	36
	Diptera	Chironomidae	*Nanocladius sp.*	1
	Diptera	Chironomidae	Orthocladiinae	4
	Diptera	Chironomidae	*Orthocladius obumbratus*	3

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Hemptown Creek 66j-25	Diptera	Chironomidae	*Parametriocnemus sp.*	6
	Diptera	Chironomidae	*Phaenopsectra obediens* group	3
	Diptera	Chironomidae	*Polypedilum flavum*	1
	Diptera	Chironomidae	*Polypedilum scalaenum* group	2
	Diptera	Chironomidae	*Polypedilum sp.*	1
	Diptera	Chironomidae	*Rheotanytarsus sp.*	2
	Diptera	Chironomidae	*Stictochironomus sp.*	34
	Diptera	Chironomidae	*Stilocladius clinopecten*	1
	Diptera	Chironomidae	*Thienemanniella sp.*	3
	Diptera	Chironomidae	*Thienemanniella xena*	7
	Diptera	Chironomidae	*Thienemannimyia* group	1
	Diptera	Simuliidae	*Simulium sp.*	42
	Diptera	Tipulidae	*Antocha sp.*	2
	Ephemeroptera	Baetidae	Baetidae	3
	Ephemeroptera	Baetidae	*Baetis sp.*	6
	Ephemeroptera	Ephemerellidae	*Ephemerella sp.*	6
	Ephemeroptera	Ephemeridae	Ephemeridae	1
	Ephemeroptera	Heptageniidae	Heptageniidae	7
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	16
	Megaloptera	Corydalidae	*Nigronia serricornis*	1
	Odonata	Gomphidae	Gomphidae	2
	Plecoptera	Chloroperlidae	Chloroperlidae	1
	Plecoptera	Perlidae	*Acroneuria sp.*	3
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	2
	Trichoptera	Hydropsychidae	*Ceratopsyche sp.*	6
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	20
	Trichoptera	Hydropsychidae	*Hydropsyche sp.*	6
	Trichoptera	Hydropsychidae	Hydropsychidae	3
	Trichoptera	Leptoceridae	Leptoceridae	1
	Trichoptera	Philopotamidae	*Chimarra sp.*	19
	Trichoptera	Rhyacophilidae	Rhyacophilidae	1
Wolf Creek 66j-26			Oligochaeta	3
	Coleoptera	Curculionidae	*Anchytarsus bicolor*	6
	Coleoptera	Elmidae	*Ancyronyx variegatus*	1
	Coleoptera	Elmidae	*Macronychus glabratus*	1
	Coleoptera	Elmidae	*Optioservus ovalis*	2
	Coleoptera	Elmidae	*Optioservus sp.*	1
	Coleoptera	Elmidae	*Promoresia elegans*	1
	Coleoptera	Elmidae	*Promoresia tardella*	2
	Coleoptera	Elmidae	*Stenelmis sp.*	2
	Coleoptera	Gyrinidae	*Dineutus robertsi*	1
	Coleoptera	Psephenidae	*Psephenus herricki*	2
	Decapoda	Cambaridae	*Cambarus sp.*	3
	Diptera	Atherinidae	*Atherix lantha*	3
	Diptera	Chironomidae	*Apedilum sp.*	2
	Diptera	Chironomidae	*Brillia flavifrons*	9
	Diptera	Chironomidae	*Brillia sp.*	10
	Diptera	Chironomidae	*Corynoneura B*	1
	Diptera	Chironomidae	*Corynoneura sp.*	13
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	15
	Diptera	Chironomidae	*Eukiefferiella sp.*	7
	Diptera	Chironomidae	*Eukiefferiella tirolensis*	33
	Diptera	Chironomidae	*Heterotrissocladius marcidus*	6
	Diptera	Chironomidae	*Limnophyes sp.*	3
	Diptera	Chironomidae	*Micropsectra D*	2
	Diptera	Chironomidae	*Micropsectra sp.*	1
	Diptera	Chironomidae	*Microtendipes sp.*	1

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Wolf Creek 66j-26	Diptera	Chironomidae	*Nanocladius sp.*	1
	Diptera	Chironomidae	*Orthocladius rivulorum*	2
	Diptera	Chironomidae	*Orthocladius sp.*	1
	Diptera	Chironomidae	*Parachaetocladius abnobaeus*	4
	Diptera	Chironomidae	*Parametriocnemus sp.*	12
	Diptera	Chironomidae	*Paraphaenocladius sp.*	2
	Diptera	Chironomidae	*Phaenopsectra punctipes* group	1
	Diptera	Chironomidae	*Polypedilum aviceps*	1
	Diptera	Chironomidae	*Polypedilum sp.*	1
	Diptera	Chironomidae	*Polypedilum tritum*	1
	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	1
	Diptera	Chironomidae	*Rheotanytarsus sp.*	2
	Diptera	Chironomidae	*Thienemanniella sp.*	1
	Diptera	Chironomidae	*Thienemanniella xena*	6
	Diptera	Chironomidae	*Thienemannimyia* group	3
	Diptera	Chironomidae	*Zavrelia sp.*	2
	Diptera	Chironomidae	*Zavrelimyia sp.*	1
	Diptera	Dixidae	*Dixa sp.*	4
	Diptera	Simuliidae	*Simulium sp.*	12
	Diptera	Tipulidae	*Limnophila sp.*	1
	Diptera	Tipulidae	*Tipula sp.*	8
	Ephemeroptera	Baetidae	*Baetis sp.*	2
	Ephemeroptera	Ephemerellidae	*Ephemerella sp.*	1
	Ephemeroptera	Heptageniidae	Heptageniidae	8
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	24
	Ephemeroptera	Isonychiidae	*Isonychia sp.*	3
	Ephemeroptera	Leptophlebiidae	Leptophlebiidae	12
	Megaloptera	Corydalidae	*Nigronia serricornis*	1
	Odonata	Calopterygidae	*Calopteryx maculata*	1
	Odonata	Calopterygidae	*Calopteryx sp.*	6
	Odonata	Cordulegastridae	*Cordulegaster obliqua fasciata*	1
	Plecoptera	Capniidae	Capniidae	37
	Plecoptera	Chloroperlidae	*Utaperla sp.*	3
	Plecoptera	Leuctridae	*Leuctra sp.*	8
	Plecoptera	Nemouridae	Nemouridae	2
	Plecoptera	Perlidae	*Acroneuria sp.*	1
	Plecoptera	Perlodidae	*Isoperla sp.*	9
	Plecoptera	Pteronarcyidae	*Pteronarcys dorsata*	2
	Plecoptera	Taeniopterygidae	*Oemopteryx* complex	7
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	4
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	41
	Trichoptera	Hydropsychidae	*Hydropsyche sp.*	1
	Trichoptera	Hydropsychidae	Hydropsychidae	7
	Trichoptera	Limnephilidae	Limnephilidae	20
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	25
	Trichoptera	Philopotamidae	*Dolophilodes sp.*	2
	Trichoptera	Rhyacophilidae	*Rhyacophila amicis*	2
	Trichoptera	Rhyacophilidae	*Rhyacophila fuscula*	6
	Trichoptera	Rhyacophilidae	*Rhyacophila sp.*	5
South Fork Rapier Mill Creek 66j-28	Coleoptera	Elmidae	*Dubiraphia sp.*	1
	Coleoptera	Elmidae	*Optioservus sp.*	12
	Coleoptera	Elmidae	*Oulimnius latiusculus*	1
	Coleoptera	Gyrinidae	*Dineutus robertsi*	1
	Coleoptera	Gyrinidae	*Dineutus sp.*	1
	Coleoptera	Gyrinidae	Gyrinidae	1
	Decapoda	Cambaridae	*Cambarus sp.*	1
	Diptera	Atherinidae	*Atherix lantha*	1

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
South Fork Rapier Mill Creek 66j-28	Diptera	Ceratopogonidae	*Bezzia* complex	2
	Diptera	Chironomidae	*Apedilum sp.*	1
	Diptera	Chironomidae	*Brillia flavifrons*	2
	Diptera	Chironomidae	*Brillia sp.*	6
	Diptera	Chironomidae	*Cantopelopia gesta*	1
	Diptera	Chironomidae	*Corynoneura lobata*	1
	Diptera	Chironomidae	*Corynoneura sp.*	5
	Diptera	Chironomidae	*Eukiefferiella brehmi* group	11
	Diptera	Chironomidae	*Eukiefferiella sp.*	6
	Diptera	Chironomidae	*Krenopelopia hudsoni*	1
	Diptera	Chironomidae	*Micropsectra A*	2
	Diptera	Chironomidae	*Micropsectra D*	8
	Diptera	Chironomidae	*Microtendipes pedellus* group	23
	Diptera	Chironomidae	*Nanocladius alternantherae*	1
	Diptera	Chironomidae	*Nanocladius sp.*	2
	Diptera	Chironomidae	*Odontomesa fulva*	1
	Diptera	Chironomidae	Orthocladiinae	2
	Diptera	Chironomidae	*Orthocladius sp.*	1
	Diptera	Chironomidae	*Parachaetocladius abnobaeus*	7
	Diptera	Chironomidae	*Parakiefferiella F*	1
	Diptera	Chironomidae	*Parakiefferiella sp.*	1
	Diptera	Chironomidae	*Parametriocnemus sp.*	14
	Diptera	Chironomidae	*Paratanytarsus quadratus* complex	1
	Diptera	Chironomidae	*Paratanytarsus sp.*	1
	Diptera	Chironomidae	*Phaenopsectra obediens* group	2
	Diptera	Chironomidae	*Polypedilum aviceps*	18
	Diptera	Chironomidae	*Polypedilum flavum*	1
	Diptera	Chironomidae	*Polypedilum sp.*	4
	Diptera	Chironomidae	*Potthastia longimana*	1
	Diptera	Chironomidae	*Rheocricotopus sp.*	1
	Diptera	Chironomidae	*Rheopelopia acra*	1
	Diptera	Chironomidae	*Rheotanytarsus A*	1
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	7
	Diptera	Chironomidae	*Stempellinella sp.*	1
	Diptera	Chironomidae	*Thienemanniella sp.*	2
	Diptera	Chironomidae	*Thienemanniella xena*	4
	Diptera	Chironomidae	*Thienemannimyia* group	3
	Diptera	Chironomidae	*Zalutschia A*	1
	Diptera	Chironomidae	*Zavrelimyia thryptica* complex	2
	Diptera	Simuliidae	*Prosimulium mixtum*	1
	Diptera	Simuliidae	*Prosimulium rhizophorum*	1
	Diptera	Simuliidae	*Prosimulium sp.*	2
	Diptera	Simuliidae	*Simulium sp.*	8
	Diptera	Tabanidae	*Chrysops sp.*	1
	Diptera	Tabanidae	Tabanidae	1
	Diptera	Tipulidae	*Pseudolimnophila sp.*	2
	Diptera	Tipulidae	*Tipula sp.*	2
	Diptera	Tipulidae	Tipulidae	1
	Ephemeroptera	Heptageniidae	Heptageniidae	3
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	31
	Ephemeroptera	Isonychiidae	*Isonychia sp.*	4
	Ephemeroptera	Leptophlebiidae	*Leptophlebia sp.*	19
	Ephemeroptera	Leptophlebiidae	Leptophlebiidae	10
	Neotaenioglossa	Pleuroceridae	*Elimia sp.*	2
	Odonata	Aeshnidae	*Boyeria vinosa*	1
	Odonata	Calopterygidae	*Calopteryx maculata*	1
	Odonata	Calopterygidae	*Calopteryx sp.*	2

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
South Fork Rapier Mill Creek 66j-28	Odonata	Gomphidae	*Gomphus sp.*	1
	Plecoptera	Capniidae	*Allocapnia sp.*	1
	Plecoptera	Capniidae	Capniidae	30
	Plecoptera	Capniidae	*Paracapnia angulata*	6
	Plecoptera	Chloroperlidae	*Utaperla sp.*	10
	Plecoptera	Nemouridae	*Ostrocerca sp.*	1
	Plecoptera	Peltoperlidae	*Tallaperla sp.*	6
	Plecoptera	Perlidae	*Acroneuria sp.*	2
	Plecoptera	Perlodidae	*Isoperla clio*	1
	Plecoptera	Perlodidae	*Isoperla similis*	1
	Plecoptera	Perlodidae	*Isoperla sp.*	4
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	4
	Trichoptera	Brachycentridae	*Brachycentrus sp.*	1
	Trichoptera	Calamoceratidae	*Anisocentropus pyraloides*	1
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	13
	Trichoptera	Lepidostomatidae	*Theliopsyche sp.*	1
	Trichoptera	Limnephilidae	*Hydatophylax argus*	6
	Trichoptera	Limnephilidae	*Pycnopsyche divergens*	2
	Trichoptera	Limnephilidae	*Pycnopsyche lepida* complex	2
	Trichoptera	Limnephilidae	*Pycnopsyche sp.*	11
	Trichoptera	Philopotamidae	*Chimarra sp.*	1
	Veneroida	Pisidiidae	*Pisidium sp.*	2
West Fork Little River 68c&d-7			Oligochaeta	21
	Coleoptera	Dytiscidae	Dytiscidae	1
	Coleoptera	Dytiscidae	*Hygrotus farctus*	4
	Coleoptera	Elmidae	*Dubiraphia sp.*	3
	Coleoptera	Elmidae	Elmidae	1
	Coleoptera	Elmidae	*Stenelmis sp.*	7
	Coleoptera	Gyrinidae	*Gyrinus marginellus*	1
	Coleoptera	Hydrophilidae	*Berosus sp.*	2
	Diptera	Ceratopogonidae	*Alluaudomyia sp.*	2
	Diptera	Ceratopogonidae	*Bezzia* complex	7
	Diptera	Ceratopogonidae	*Dasyhelea sp.*	1
	Diptera	Chironomidae	*Ablabesmyia mallochi*	5
	Diptera	Chironomidae	*Ablabesmyia sp.*	3
	Diptera	Chironomidae	*Apedilum sp.*	1
	Diptera	Chironomidae	*Clinotanypus sp.*	5
	Diptera	Chironomidae	*Dicrotendipes neomodestus*	1
	Diptera	Chironomidae	*Dicrotendipes sp.*	8
	Diptera	Chironomidae	*Djalmabatista pulcher*	1
	Diptera	Chironomidae	*Heterotrissocladius cladwell/boltoni* complex	24
	Diptera	Chironomidae	*Labrundinia sp.*	1
	Diptera	Chironomidae	*Macropelopia decedens*	1
	Diptera	Chironomidae	*Microtendipes pedellus* group	7
	Diptera	Chironomidae	*Orthocladius obumbratus*	3
	Diptera	Chironomidae	*Parakiefferiella sp.*	3
	Diptera	Chironomidae	*Parametriocnemus sp.*	1
	Diptera	Chironomidae	*Paratanytarsus D*	1
	Diptera	Chironomidae	*Paratanytarsus sp.*	4
	Diptera	Chironomidae	*Phaenopsectra obediens* group	21
	Diptera	Chironomidae	*Phaenopsectra/Tribelos* complex	4
	Diptera	Chironomidae	*Polypedilum tritum*	1
	Diptera	Chironomidae	*Potthastia longimana*	1
	Diptera	Chironomidae	*Procladius (Holotanypus) sp.*	1
	Diptera	Chironomidae	*Procladius sp.*	3
	Diptera	Chironomidae	*Psectrocladius elatus*	1

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
West Fork Little River 68c&d-7	Diptera	Chironomidae	*Psectrocladius octomaculatus*	4
	Diptera	Chironomidae	*Psectrocladius psilopterus* group	1
	Diptera	Chironomidae	*Pseudochironomus sp.*	2
	Diptera	Chironomidae	*Stilocladius clinopecten*	1
	Diptera	Chironomidae	Tanypodinae	1
	Diptera	Chironomidae	*Tanytarsus sp.*	15
	Diptera	Chironomidae	*Thienemannimyia* group	4
	Diptera	Chironomidae	*Tribelos jucundus*	4
	Diptera	Chironomidae	*Unniella multivirga*	18
	Diptera	Chironomidae	*Zalutschia briani*	10
	Diptera	Simuliidae	*Prosimulium sp.*	2
	Diptera	Tabanidae	*Chrysops sp.*	1
	Diptera	Tipulidae	*Antocha sp.*	1
	Ephemeroptera	Baetidae	*Baetis sp.*	45
	Ephemeroptera	Ephemerellidae	*Eurylophella doris* complex	1
	Isopoda	Asellidae	*Lirceus sp.*	1
	Megaloptera	Sialidae	*Sialis sp.*	2
	Odonata	Coenagrionidae	*Chromagrion conditum*	18
	Odonata	Corduliidae	*Didymops transversa*	2
	Plecoptera	Capniidae	Capniidae	13
	Plecoptera	Taeniopterygidae	*Taeniopteryx sp.*	2
	Trichoptera	Leptoceridae	*Mystacides sepulchralis*	1
	Trichoptera	Limnephilidae	*Hydatophylax argus*	1
	Trichoptera	Limnephilidae	Limnephilidae	6
	Trichoptera	Limnephilidae	*Platycentropus radiatus*	7
	Trichoptera	Phryganeidae	*Ptilostomis sp.*	2
	Veneroida	Pisidiidae	Pisidiidae	1
Reedy Creek 75 e-54			Oligochaeta	3
	Amphipoda	Talitridae	*Hyalella azteca*	24
	Coleoptera	Dytiscidae	*Hygrotus farctus*	32
	Coleoptera	Elmidae	*Ancyronyx variegatus*	2
	Coleoptera	Elmidae	*Dubiraphia sp.*	4
	Coleoptera	Elmidae	Elmidae	1
	Coleoptera	Elmidae	*Microcylloepus pusillus*	1
	Decapoda	Cambaridae	*Procambarus spiculifer*	3
	Diptera	Ceratopogonidae	*Bezzia* complex	7
	Diptera	Chironomidae	*Ablabesmyia mallochi*	8
	Diptera	Chironomidae	*Alotanypus aris*	1
	Diptera	Chironomidae	*Apsectrotanypus johnsoni*	3
	Diptera	Chironomidae	Chironomidae	1
	Diptera	Chironomidae	Chironominae	3
	Diptera	Chironomidae	*Chironomus sp.*	2
	Diptera	Chironomidae	*Corynoneura sp.*	5
	Diptera	Chironomidae	*Gillotia alboviridus*	1
	Diptera	Chironomidae	*Labrundinia pilosella*	5
	Diptera	Chironomidae	*Labrundinia sp.*	10
	Diptera	Chironomidae	*Micropsectra D*	1
	Diptera	Chironomidae	*Micropsectra sp.*	1
	Diptera	Chironomidae	*Nanocladius alternantherae*	1
	Diptera	Chironomidae	Orthocladiinae	1
	Diptera	Chironomidae	*Orthocladius annectens*	10
	Diptera	Chironomidae	*Phaenopsectra obediens* group	6
	Diptera	Chironomidae	*Phaenopsectra/Tribelos* complex	8
	Diptera	Chironomidae	*Polypedilum illinoense* group	1
	Diptera	Chironomidae	*Polypedilum scalaenum* group	15
	Diptera	Chironomidae	*Polypedilum sp.*	3
	Diptera	Chironomidae	*Polypedilum tritum*	2

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Reedy Creek 75 e-54	Diptera	Chironomidae	*Procladius (Holotanypus) sp.*	1
	Diptera	Chironomidae	*Procladius bellus var. 1*	1
	Diptera	Chironomidae	*Procladius sp.*	2
	Diptera	Chironomidae	*Rheotanytarsus A*	1
	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	35
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	3
	Diptera	Chironomidae	*Stelechomyia perpulchra*	1
	Diptera	Chironomidae	*Stenochironomus sp.*	3
	Diptera	Chironomidae	Tanypodinae	3
	Diptera	Chironomidae	Tanytarsini	2
	Diptera	Chironomidae	*Tanytarsus A*	1
	Diptera	Chironomidae	*Tanytarsus C*	3
	Diptera	Chironomidae	*Tanytarsus D*	7
	Diptera	Chironomidae	*Tanytarsus L*	12
	Diptera	Chironomidae	*Tanytarsus N*	1
	Diptera	Chironomidae	*Tanytarsus S*	1
	Diptera	Chironomidae	*Tanytarsus sp.*	12
	Diptera	Chironomidae	*Telopelopia okoboji*	1
	Diptera	Chironomidae	*Thienemanniella sp.*	2
	Diptera	Chironomidae	*Thienemanniella xena*	2
	Diptera	Chironomidae	*Thienemannimyia* group	10
	Diptera	Chironomidae	*Tribelos jucundus*	5
	Diptera	Chironomidae	*Unniella multivirga*	1
	Diptera	Empididae	*Hemerodromia sp.*	10
	Diptera	Ephydridae	Ephydridae	1
	Diptera	Simuliidae	*Prosimulium sp.*	1
	Diptera	Simuliidae	*Simulium sp.*	9
	Ephemeroptera	Ephemerellidae	Ephemerellidae	2
	Ephemeroptera	Ephemerellidae	*Eurylophella bicolor*	1
	Ephemeroptera	Ephemerellidae	*Eurylophella doris* complex	35
	Ephemeroptera	Heptageniidae	Heptageniidae	7
	Ephemeroptera	Heptageniidae	*Stenonema sp.*	1
	Ephemeroptera	Leptophlebiidae	Leptophlebiidae	2
	Isopoda	Asellidae	*Lirceus sp.*	57
	Megaloptera	Corydalidae	*Nigronia serricornis*	2
	Odonata	Aeshnidae	*Boyeria vinosa*	1
	Odonata	Coenagrionidae	*Argia fumipennis*	2
	Odonata	Coenagrionidae	*Argia sp.*	3
	Odonata	Coenagrionidae	*Chromagrion conditum*	1
	Odonata	Coenagrionidae	Coenagrionidae	3
	Odonata	Coenagrionidae	*Ischnura sp.*	5
	Trichoptera	Hydropsychidae	*Cheumatopsyche sp.*	1
	Trichoptera	Hydropsychidae	Hydropsychidae	2
	Trichoptera	Leptoceridae	*Oecetis sp.*	2
	Trichoptera	Leptoceridae	*Triaenodes sp.*	5
	Trichoptera	Leptoceridae	*Triaenodes tardus*	4
	Trichoptera	Molannidae	*Molanna tryphena*	2
	Trichoptera	Philopotamidae	*Chimarra sp.*	12
	Trichoptera	Polycentropodidae	*Polycentropus sp.*	1
	Trichoptera	Psychomyiidae	*Lype diversa*	2
	Trichoptera	Psychomyiidae	Psychomyiidae	2
Canoochee Creek 75f-50			Oligochaeta	60
	Basommatophora	Ancylidae	*Ferrissia sp.*	1
	Basommatophora	Physidae	*Physella sp.*	42
	Basommatophora	Planorbidae	*Planorbella magnifica*	11
	Basommatophora	Planorbidae	*Planorbella sp.*	41
	Basommatophora	Planorbidae	Planorbidae	10

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Canoochee Creek 75f-50	Basommatophora	Planorbidae	*Planorbula armigera*	11
	Coleoptera	Dytiscidae	*Hydroporus (Neoporus) sp.*	1
	Coleoptera	Dytiscidae	*Hygrotus sp.*	1
	Coleoptera	Elmidae	*Stenelmis sp.*	2
	Diptera	Ceratopogonidae	*Bezzia* complex	33
	Diptera	Ceratopogonidae	Ceratopogonidae	1
	Diptera	Chironomidae	*Ablabesmyia sp.*	1
	Diptera	Chironomidae	*Einfeldia A*	1
	Diptera	Chironomidae	*Polypedilum tritum*	5
	Diptera	Chironomidae	*Procladius (Holotanypus) sp.*	3
	Diptera	Chironomidae	*Procladius sp.*	1
	Diptera	Chironomidae	*Tanypus sp.*	2
	Diptera	Tipulidae	*Pilaria sp.*	1
	Odonata	Coenagrionidae	*Chromagrion sp.*	2
	Odonata	Coenagrionidae	Coenagrionidae	3
	Odonata	Libellulidae	*Pachydiplax longipennis*	1
	Veneroida	Pisidiidae	*Pisidium sp.*	15
	Veneroida	Pisidiidae	*Sphaerium sp.*	100
Cathead Creek 75f-95			Oligochaeta	9
	Amphipoda	Talitridae	*Hyalella azteca*	2
	Coleoptera	Dytiscidae	*Celina sp.*	1
	Diptera	Ceratopogonidae	*Bezzia* complex	3
	Diptera	Chironomidae	*Chironomus ochreatus*	20
	Diptera	Chironomidae	*Chironomus sp.*	13
	Diptera	Chironomidae	*Chironomus staegeri*	1
	Diptera	Chironomidae	*Kiefferulus sp.*	25
	Diptera	Chironomidae	*Phaenopsectra obediens* group	7
	Diptera	Chironomidae	*Polypedilum bergi*	5
	Diptera	Chironomidae	*Polypedilum illinoense* group	3
	Diptera	Chironomidae	*Polypedilum scalaenum* group	2
	Diptera	Chironomidae	*Polypedilum trigonum*	17
	Diptera	Chironomidae	*Polypedilum tritum*	90
	Diptera	Chironomidae	*Tribelos fuscicorne*	4
	Isopoda	Asellidae	*Caecidotea sp.*	112
Pond Fork Creek 75h-70	Amphipoda	Talitridae	*Hyalella azteca*	1
	Coleoptera	Dytiscidae	*Hygrotus farctus*	36
	Coleoptera	Elmidae	*Stenelmis quadrimaculata*	1
	Coleoptera	Helodidae	*Cyphon sp.*	12
	Diptera	Ceratopogonidae	*Bezzia* complex	3
	Diptera	Chironomidae	*Ablabesmyia mallochi*	1
	Diptera	Chironomidae	*Ablabesmyia sp.*	1
	Diptera	Chironomidae	*Chironomus sp.*	3
	Diptera	Chironomidae	*Corynoneura sp.*	1
	Diptera	Chironomidae	*Dicrotendipes sp.*	20
	Diptera	Chironomidae	*Georthocladius (Atelopodella) sp.*	1
	Diptera	Chironomidae	*Glyptotendipes testaceus*	4
	Diptera	Chironomidae	*Goeldichironomus sp.*	1
	Diptera	Chironomidae	*Kiefferulus sp.*	6
	Diptera	Chironomidae	*Labrundinia sp.*	10
	Diptera	Chironomidae	*Orthocladius sp.*	3
	Diptera	Chironomidae	*Parachironomus sp.*	1
	Diptera	Chironomidae	*Paraphaenocladius sp.*	1
	Diptera	Chironomidae	*Paratanytarsus dissimilis*	7
	Diptera	Chironomidae	*Paratanytarsus sp.*	8
	Diptera	Chironomidae	*Phaenopsectra obediens* group	1
	Diptera	Chironomidae	*Phaenopsectra punctipes* group	1
	Diptera	Chironomidae	*Polypedilum halterale* group	2

STREAM	ORDER	FAMILY	FINAL IDENTITY	TOTAL
Pond Fork Creek 75h-70	Diptera	Chironomidae	*Polypedilum sp.*	1
	Diptera	Chironomidae	*Polypedilum tritum*	26
	Diptera	Chironomidae	*Procladius (Holotanypus) sp.*	1
	Diptera	Chironomidae	*Procladius sp.*	6
	Diptera	Chironomidae	*Reomyia sp.*	3
	Diptera	Chironomidae	*Rheotanytarsus pellucidus*	2
	Diptera	Chironomidae	*Rheotanytarsus sp.*	2
	Diptera	Chironomidae	Tanypodinae	3
	Diptera	Chironomidae	*Tanytarsus sp.*	3
	Diptera	Culicidae	*Deinocerites sp.*	1
	Diptera	Simuliidae	*Prosimulium sp.*	1
	Diptera	Tabanidae	*Tabanus sp.*	2
	Ephemeroptera	Baetidae	Baetidae	7
	Heteroptera	Notonectidae	Notonectidae	1
	Isopoda	Asellidae	Asellidae	5
	Isopoda	Asellidae	*Caecidotea sp.*	226
	Isopoda	Asellidae	*Lirceus sp.*	2
	Odonata	Calopterygidae	*Calopteryx angustipennis*	1
	Odonata	Coenagrionidae	Coenagrionidae	1
	Odonata	Coenagrionidae	*Ischnura sp.*	1
	Odonata	Corduliidae	Corduliidae	3
	Odonata	Corduliidae	*Didymops transversa*	1
	Odonata	Corduliidae	*Macromia sp.*	2
	Odonata	Libellulidae	*Erythemis simplicicollis*	1
	Odonata	Libellulidae	*Libellula incesta*	1