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BIOLOGICAL MONITORING OF UPPER THREE RUNS CREEK, SAVANNAH RIVER SITE, AIKEN COUNTY, SOUTH CAROLINA

MACROINVERTEBRATE STREAM ASSESSMENTS DURING FIRST SIX MONTHS OF RELEASE OF F/H AREA ETF EFFLUENT DISCHARGE

OCTOBER 1988 - APRIL 1989

REPORT TO: SAVANNAH RIVER SITE,
AIKEN COUNTY, SOUTH CAROLINA

REPORT DATE: JUNE 1989

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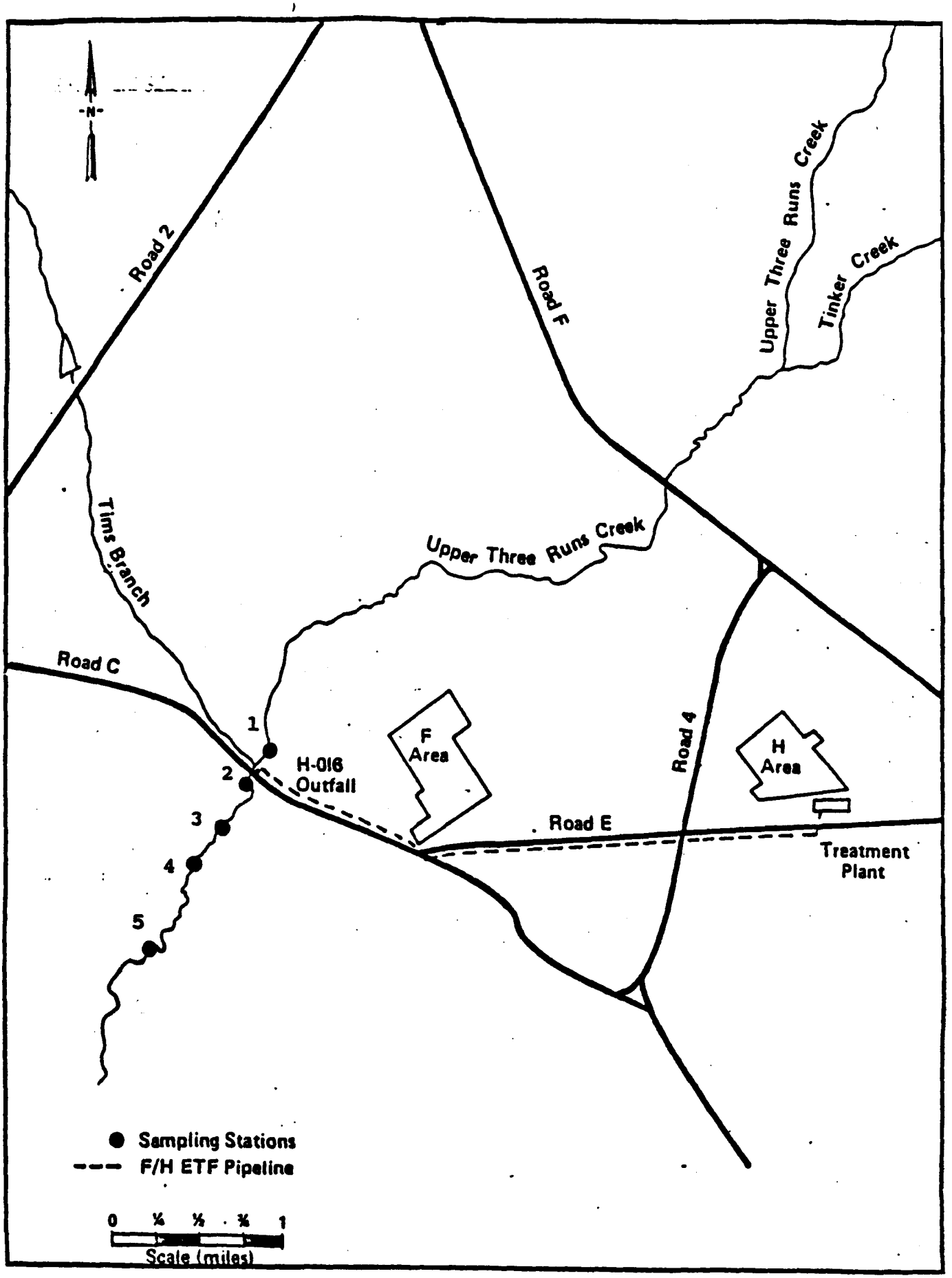
In anticipation of the fall 1988 start up of effluent discharges into Upper Three Runs Creek by the F/H Area Effluent Treatment Facility of the Savannah River Site, Aiken, SC, a two and one half year biological study was initiated in June 1987. Upper Three Runs Creek is an intensively studied fourth order stream known for its high species richness. Designed to assess the potential impact of F/H area effluent on the creek, the study includes qualitative and quantitative macroinvertebrate stream surveys at five sites (see map), chronic toxicity testing of the effluent, water chemistry and bioaccumulation analysis.

This second report presents the results of the last pre-operational qualitative and quantitative (artificial substrate) macroinvertebrate studies (October 1988) and the first post-operational qualitative and quantitative macroinvertebrate stream assessments (January 1989 - quantitative, March 1989 - qualitative, and April 1989 - quantitative). Five sites were sampled, including one site upstream of the Road C bridge (near the Aquatic Ecology Laboratory) and four sites downstream of the Road C bridge. The discharge point, for the H-016 effluent release beginning October 22, 1988, is at Road C.

Figure I A:
Map of Sampling Sites - Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina, July 1987 - April 1989.



II. METHODS

A. Sampling

1. Multiplate Samplers/Quantitative

Five replicate multiplate samplers were set in the stream at each site on a quarterly schedule as follows:

Samplers Set	Samplers Retrieved	# Days Exposure
September 7, 1988	October 5, 1988	28
December 6, 1988	January 4, 1989	29
March 15, 1989	April 11, 1989	27

Each sampler was comprised of 14 circular plates with a diameter of 7.5 cm and thickness of 0.3 cm (area: 0.12 M^2). The plates were made of masonite board and were separated by masonite board spacers. A metal bolt through the plates and spacers held each assembly together.

Samplers were suspended in the water by rope from floats; each sampler being approximately 25 cm below the water surface. Proceeding from left to right when facing up stream replicates A through E were placed at equal spacing across the stream. Similar flow regimes were selected in determining exact site location. It should be noted that a storm event prior to retrieval of samplers on April 11, 1989 caused high water levels and "scouring" of the samplers.

Samplers were retrieved by swiftly lifting each sampler from the water, placing it in a labelled zip-lock type plastic bag and cutting the support rope. Approximately 500 ml of stream water was placed in each bag as well as a site and replicate label. Bags with samplers were placed in a cooler with ice to chill the samples until processing in the laboratory.

2. Qualitative Sampling

Qualitative sampling was conducted on a semi-annual basis, on October 4, 1988 and March 15, 1989. Three samples of 500 cm^3 were collected at each site including a) snag/vascular plant habitat, b) sand habitat and c) mud/detritus/leaf pack habitat . Samples were collected with the use of an aquatic dip net (used for sweeping, bottom sampling, and as a kick net), a U.S. Standard #30 brass sieve, a white collecting pan and hand collecting of various substrates such as moss, bark, and stick/log scrapings. Approximately 15 minutes of sampling effort was expended at each site. Each sample was placed in a 500 ml plastic labelled container, with 80% ethanol for a fixative. A storm event preceeding October 4, 1988 sampling made access to the streambed and snag habitats difficult due to high water levels.

3. Field Chemical Parameters

At each site measurements were taken of dissolved oxygen (ppm), pH, temperature (C) and conductivity (umhos/cm). Dissolved oxygen was measured with a YSI Model 54ARC D.O. meter with a YSI Model A77003 probe. The meter was recalibrated according to the elevation scale/calibration knob and temperature at each site. A Fisher Model 607 pH meter with a probe was used to measure pH. The meter was calibrated, using pH 7 standard buffer solution, at each site.

Temperature readings were made with a Fisher brand mercury thermometer with 1°C gradations. Conductivity was analyzed using a YSI Salinity-Conductivity-Temperature meter (Model 33). All readings were made 2-6" below the water surface and recorded in a bound field record book.

4. Water Chemistry Analysis

Samples for chemical analysis were taken at each site as grab samples just below the water surface. Containers and sample volumes are listed below:

Sampler Container	Volume	Parameters	Preservative
Glass, amber	250 ml	Res Cl	none
Plastic	1/2 gallon	cond, TSS, Hard, Alk, NO2	none
Plastic	250 ml	O-PO4	none
Glass, amber	250 ml	Sediment Hg	W/HNO3
Plastic	500 ml	Metals	W/HNO3
Plastic	500 ml	Dis. Metals	none
Plastic	1/2 gallon	NO3, NH3, T-PO4	W/H_2SO_4
Glass, amber	1 liter	Kerosene, TBP	none

After collection, samples were placed in coolers, chilled with ice and returned to the laboratory.

5. Sediment Analysis

Grab samples of mud/sand were placed in 200 ml glass amber bottles at each site. Samples were collected from sediment in erosional stream zones. Each sample bottle was labelled, chilled with ice and returned to the laboratory.

B. Sample Processing

1. Multiplate Samplers/Quantitative

Each sampler and the contents of the sampler bag were placed in a white collecting pan. Samplers were disassembled and each plate and spacer was scraped/brushed to remove all organisms. Subsequently the contents of each collecting pan were rinsed in a U.S. Standard #30 sieve (to remove sediment) and placed back in the pan. All organisms in the pan were then placed in labelled vials of 80% ethanol preservative, using an illuminated magnifier to facilitate sorting.

2. Qualitative Sampling

Sorting qualitative samples involved processing each sample container in approximately five 100 cm^2 portions until each container was completed. Each portion was placed in a U.S. Standard #30 sieve, rinsed with tap water and transferred to a white collecting pan. Macroinvertebrates were removed from the pan with the aid of an illuminated magnifier and placed in labelled vials of 80% ethanol preservative.

C. Water Chemistry Analysis

Chemical analyses were conducted according to the procedures in "Methods for Chemical Analysis of Water and Wastes" (EPA 600 4/79-020) and are referenced, along with detection limits and preservatives, as follows:

Parameter	EPA Method #	Detection Limit	Preservative
pH	150.1	0.1 Units	On-Site Analysis
Dissolved Oxygen	360.1	0.1 mg/l	On-Site Analysis
Temperature	170.1	1°C	On-Site Analysis
Specific Conductance	120.1	10 umhos/cm	On-Site Analysis
Total Hardness	130.2	1 mg/l	None
Alkalinity	310.1	1 mg/l	None
Total Suspended Solids	160.2	1 mg/l	None
Total Residual Chlorine	330.1	0.1 mg/l	None
Nitrate (As N)	352.1	0.1 mg/l	H_2SO_4 to pH <2.0
Nitrite (As N)	354.1	0.02 mg/l	None
Ammonia (As N)	350.3	0.01 mg/l	H_2SO_4 to pH <2.0
Total Phosphorus (As P)	365.2	0.01 mg/l	H_2SO_4 to pH <2.0
(Ortho Phosphate (As P)	365.2	0.01 mg/l	Filtration
Chromium	218.2	0.005 mg/l	HNO_3 to pH <2.0
Copper	220.2	0.005 mg/l	HNO_3 to pH <2.0
Lead (Furnace)	234.2	0.005 mg/l	HNO_3 to pH <2.0
Manganese	234.2	0.005 mg/l	HNO_3 to pH <2.0
Mercury (water)	245.1	0.005 mg/l	HNO_3 to pH <2.0
Mercury (sediment)	245.3	50 ug/kg	HNO_3 to pH <2.0
Sodium	273.1	0.002 mg/l	HNO_3 to pH <2.0
Uranium	711 B	0.001 mg/l	HNO_3 to pH <2.0
Zinc	289.1	0.005 mg/l	HNO_3 to pH <2.0
* Kerosene	SPE/GC	0.1 mg/l	Qt. Amber Glass with Teflon Lined Lid
* Tributyl Phosphate	SPE/GC	0.05 mg/l	Qt. Amber Glass with Teflon Lined Lid
Tritium	Liquid Scintillation	MCI/L	None

* Solid Phase Extraction GC Analysis Method as Provided by DuPont SRP.

D. Macroinvertebrate Identification

Each vial of sorted organisms was emptied into a glass petri dish (3" diameter) with ethanol and examined under a WILD M3 stereomicroscope at 16x magnification. Organisms were initially separated by order for most taxa and family for true flies (Diptera). After species identification, organisms were returned to the labelled vials for biomass determination, except for voucher specimens. One to three organisms of each species collected in the survey were placed in the Enwright Laboratories reference collection, as voucher specimens. Midges, black flies and annelids were mounted on slides with CMC-10, and examined with a WILD M20 compound microscope (400X Power). A list of references used for identification is given below:

Taxon	References
Annelida	
Polychaeta	Klemm, 1985
Hirudinea	Klemm, 1985
Oligochaeta	Klemm, 1985
Gastropoda	Thompson, 1984 Pennak, 1978
Pelecypoda	Pennak, 1978
Cladocera, Copepoda, Ostracoda	Pennak, 1978 Fitzpatrick, 1983
Isopoda	Williams (EPA), 1972 Fitzpatrick, 1983
Amphipoda	Holsinger (EPA) 1972 Fitzpatrick, 1983
Decapoda	Fitzpatrick, 1983
Hydracarina	Pennak, 1978
Collembola	Merritt & Cummins, 1984
Ephemeroptera	Berner & Pescador, 1988 Brigham et al, 1982 Needham, Traver, Hsu 1935 Lewis, 1974 (EPA670/4-74-6) Morihara & McCafferty, 1979

Taxon	Reference
Odonata	Brigham et al, 1982 Merritt & Cummins, 1984 Needham & Westfall, 1955
Plecoptera	Brigham et al, 1982 Merritt & Cummins, 1984 Stewart & Stark, 1988
Hemiptera	Brigham et al, 1982 Merritt & Cummins, 1984
Megaloptera, Neuroptera	Brigham et al, 1982
Lepidoptera	Brigham et al, 1982
Trichoptera	Brigham et al, 1982 Ross, 1944 Schefter & Wiggins 1986 Wiggins, 1977 Merritt & Cummins, 1984
Coleoptera	Brigham et al, 1982 Merritt & Cummins 1984 Usinger, 1959
Diptera	McAlpine et al, 1981 Johannsen, 1934-37 Brigham et al, 1982 Merritt & Cummins, 1984
Simuliidae	Snoddy & Noblet, 1976
Tipulidae - Tipula	Gelhaus, 1986
Chironomidae	Wiederholm, 1983 Wiederholm, 1986 Hudson et al, In Press.
Brigham et al, 1982	Merritt & Cummins, 1984 Oliver & Roussel, 1983
Ablabesmyia	Roback, 1981
Conchapelopia, Meropelopia	Roback, 1981
Rheopelopia, Thienemannimyia	Roback, 1981
Brillia	Oliver & Roussel, 1986
Cricotopus	Hirvenoja, 1973
Parachaetocladius, Doithri[illegible]	Saether & Sublette 1983

Taxon	Reference
Eukiefferiella, Tvetenia	Bode, 1983
Nanocladius	Saether, 1977
Nilotanypus	Roback, 1985
Pseudorthocladius	Saether & Sublette 1983
Unniella	Caldwell, 1986
Rheocricotopus	Saether, 1985
Orthocladius	Soponis, 1977
Dicrotendipes	Epler, 1987
Tribelos, Phaenopsectra	Grodhaus, 1987

E. Biomass (AFDW)

After macroinvertebrate species identification, organisms were separated by functional group for each site and placed in labelled vials. All five replicates per site were combined. As most midges were placed on microscope slides, they were initially excluded from biomass processing. Each sample for each functional group at each site was dried, weighed and subsequently placed in a weighed crucible at 550°C for ashing (30 minutes in thermolyne furnace). This was followed by 30 minutes in the dessicator for equilibration to room temperature. Subsequently the crucibles were re-weighed, the initial weight subtracted and the ash-free dry weights calculated. An enumerated sample of midges (all subfamilies combined) was separately ashed and weighed to calculate an average "midge weight". This factor was multiplied by the number of midges for each functional group and the biomass corrected accordingly. Weight determinations were made with a Mettler AE200 electronic balance reading to four places (0.0001g).

F. Data Analysis

A number of methods to evaluate the data obtained in qualitative macroinvertebrate assessments have been developed. Several approaches to analyzing the data are used in this report. These approaches concern the richness, density, evenness, pollution tolerance, % composition by major taxonomic group, biomass, functional group analysis, dominant species and community structure.

Community richness is the total number of species collected at a site. Pollution by an effluent discharge generally reduces the number of species (Weber, 1973). A mean density of organisms is calculated per M^2. When depressed, the mean density can reflect the effects of toxic pollutants (Weber, 1973); when elevated, it can suggest nutrient enrichment (Weber, 1973).

Community evenness is based upon the concept that a stream unaffected by pollution will support many species of macroinvertebrates, each represented by a few organisms, whereas a stream impacted by organic pollution will have only a few tolerant species with large numbers of organisms (Weber, 1973). Organisms intolerant to such organic pollution are killed or drift downstream to a more tolerable habitat. With toxic wastes, a similar phenomenon occurs, except that the reduction in the numbers of intolerant species occurs with a decrease in the species population (Weber, 1973). Two indices involving evenness are used; diversity and equitability. Both are computed using the Shannon-Weaver function and the Margalef measure, as described by Weber (1973). Species diversity is an index taking into account the number of species and the distribution of individual organisms within a sampled segment of waterway. In severely polluted water, diversity usually is less than one (Weber, 1973). In unpolluted water, it is higher and may attain three or four. The higher the diversity the less stressful the aquatic environment to the organisms contained therein (Weber, 1973). Equitability is an index that compares the aquatic community under consideration with

an idealized community. Such a community is found in unpolluted habitats where many species are present, few are relatively abundant in individuals, and several are represented within the community by only a few individuals. Equitability has been found to be a more sensitive test of environmental stress than diversity (Weber, 1973). Levels above 0.5 are indicative of good water quality (Weber, 1973). Although these evenness indices are designed primarily for use with quantitative studies, they can also be useful in analyzing qualitative data.

Community pollution tolerance evaluates the macroinvertebrate community based upon the concept that certain taxa of aquatic organisms are considered to be more pollution intolerant than others. Such taxa include most species of mayflies, caddisflies and stoneflies, as well as, certain species of beetles (e.g., some elmids), midges (e.g., Pottastia) and Megaloptera (Hilsenhoff, 1987). Other taxa are more tolerant of pollution, including dragonfly nymphs, true bugs and fly larvae (including many species of midges) (Hilsenhoff, 1987). Two ways of measuring pollution tolerance are provided here; the biotic index and EPT index. A biotic index gives an indication of the average pollution tolerance of organisms present at a stream site. Each species is given a tolerance rating between 0 and 10, with 0 indicating a very intolerant organism and 10 an organism with high tolerance of pollution. The biotic index used here was produced by Hilsenhoff (1987) and designed for northern streams. The EPT index is simply the total number of species at a site which are in the pollution intolerant orders Ephemeroptera (mayflies), Plecoptera (stoneflies) or Trichoptera (caddisflies).

Functional Group Analysis involves classifying each species by feeding strategy, calculating the percentage by total number of organisms and by biomass in each group and comparing those percentages between sites. Species are assigned to a functional group based upon information by Merritt & Cummins (1984).

Functional groups include shredders (herbivores and detritivores), scrapers, predators, piercer-herbivores and collectors (filterers and gatherers). In as much as piercer-herbivores never comprised $\geq$ 1% of the total number or biomass of organisms at any site/date combination, this category is ignored in discussion of functional groups. A shift in the proportions of the functional groups between sites may reflect the presence of a pollution source or changes in the trophic structure of the ecosystem. It must however, be carefully analyzed as a difference in habitat can also produce a shift.

Dominant species in common is a comparison of the five most commonly collected species at the upstream site with that of each downstream site, to determine how many of the same species are found in common.

Results of each method of data analysis are discussed separately, then summarized. As might be expected for this type of data, none of the data sets proved to be normally distributed. A square root transformation of the data (y + 1/2) failed to achieve normality. Therefore all data was analyzed by non-parametric methods for paired data, using a significance level of p=0.05. Comparisons of pre-operational data to post-operational data was accomplished using Wilcoxon's Signed Rank Test (Gilbert, 1987) to compare the corresponding seasons of 1988 and 1989. The winter comparison was February 1988 and January 1989 and the spring comparison was April 1988 and April 1989. Data was also analyzed by combining post-operational data for each site and comparing sites using Friedman's Test (Gilbert, 1987). For the percent composition by major taxonomic group and functional group analysis, each group was separately subjected to Wilcoxon's Signed Rank Test and Friedman's Test. Pre-operational mean values were calculated to include October 1988 data. Results of statistical analyses are provided in Appendix E.

III. Results

A. Species Richness (Figure IIIA, Table IIIAi, IIIAii)

240 species of aquatic macroinvertebrates have been collected during biological monitoring of Upper Three Runs Creek at the five study sites. This total represents eight quantitative (multiplate artificial substrate) sampling periods and four qualitative sampling periods. Quantitative sampling has yielded 167 species, or 70% of the total. 73 species (30%) were collected only by qualitative sampling. Comparison of pre-operational quantitative data with post operational quantitative data showed a minor reduction in the mean number of species collected per sampling period (for all sites) from 42.5 to 41.0. Analysis of the data by Wilcoxon's Signed Rank Test (Appendix E) indicated that the difference in the means was not significant (p=0.05). All downstream sites exhibited species richness values equal to or greater than site 1. As was noted during the first year of pre-operational sampling, species richness reached a maximum in the spring (April) and a minimum in the fall (October). Spring 1988 species richness values were suppressed as compared to spring 1988, due to a storm event preceding collection, with a consequent scouring effect upon the samplers at all sites. Qualitative sampling yielded a total of 106 species during October 1988 (pre-operational) and 146 species during March 1989 (post-operational). October 1988 values were relatively low due to high water levels, reducing access to benthic habitats. Qualitative samples collected in March 1989 indicated excellent species richness at all sites (73-83 species/site).

The average number of species collected per replicate (all sites) were very similar in pre-operational and post-operational collecting periods.

During pre-operational collection periods a mean of 20.5 species per replicate were collected. Post-operational sampling yielded 20.3 species per replicate. Analysis by Wilcoxon's Signed Rank Test (Appendix E) indicated the mean number of species per replicate did not decrease significantly (p=0.05) during the first

two post-operational sampling periods. The mean number of species per replicate ranged from a low of 17.8 at site 4 in January 1989 to a maximum of 24.0 at site 2 in April 1989. Analysis of the data by Friedman's Test indicates that differences in the mean number of species collected per site during post-operational sampling were not significant ($p=0.05$).

Species richness at all sites remained high during post-operational sampling, with no evidence of any impact upon the macroinvertebrate community of the stream by the F/H Area ETF discharge.

TABLE III Ai

Species Richness
Quantitative and Qualitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Total	Mean	Std.Dev.
Sep - Oct 88	29	34	36	32	27	61	31.6	3.6
Dec 88 - Jan 89	39	37	38	37	38	65	37.8	0.8
Mar - Apr 89	38	54	44	40	45	73	44.2	6.2
Total (Post-operational)**	52	66	58	56	58	97	58.0	5.1
Mean	38.5	45.5	41.0	38.5	41.5	69.0	41.0	
Std. Dev. (Post-operational)**	0.7	12.0	4.2	2.1	4.9	5.7	5.4	
Mean	38.8	44.7	43.8	43.2	42.0	74.2	42.5	
Std. Dev. (Pre-Operational)*	9.5	8.4	10.2	9.3	9.0	9.8	8.9	

QUALITATIVE SAMPLING

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Total
October 1988	45	55	41	45	34	106
March 1989	78	81	80	83	73	146
Total	97	107	96	93	88	171

*Includes all sampling periods up to and including October 1988.
**Includes January 1989 and April 1989.

Figure III Ai: Species Richness, Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina. July 1987 - April 1989.

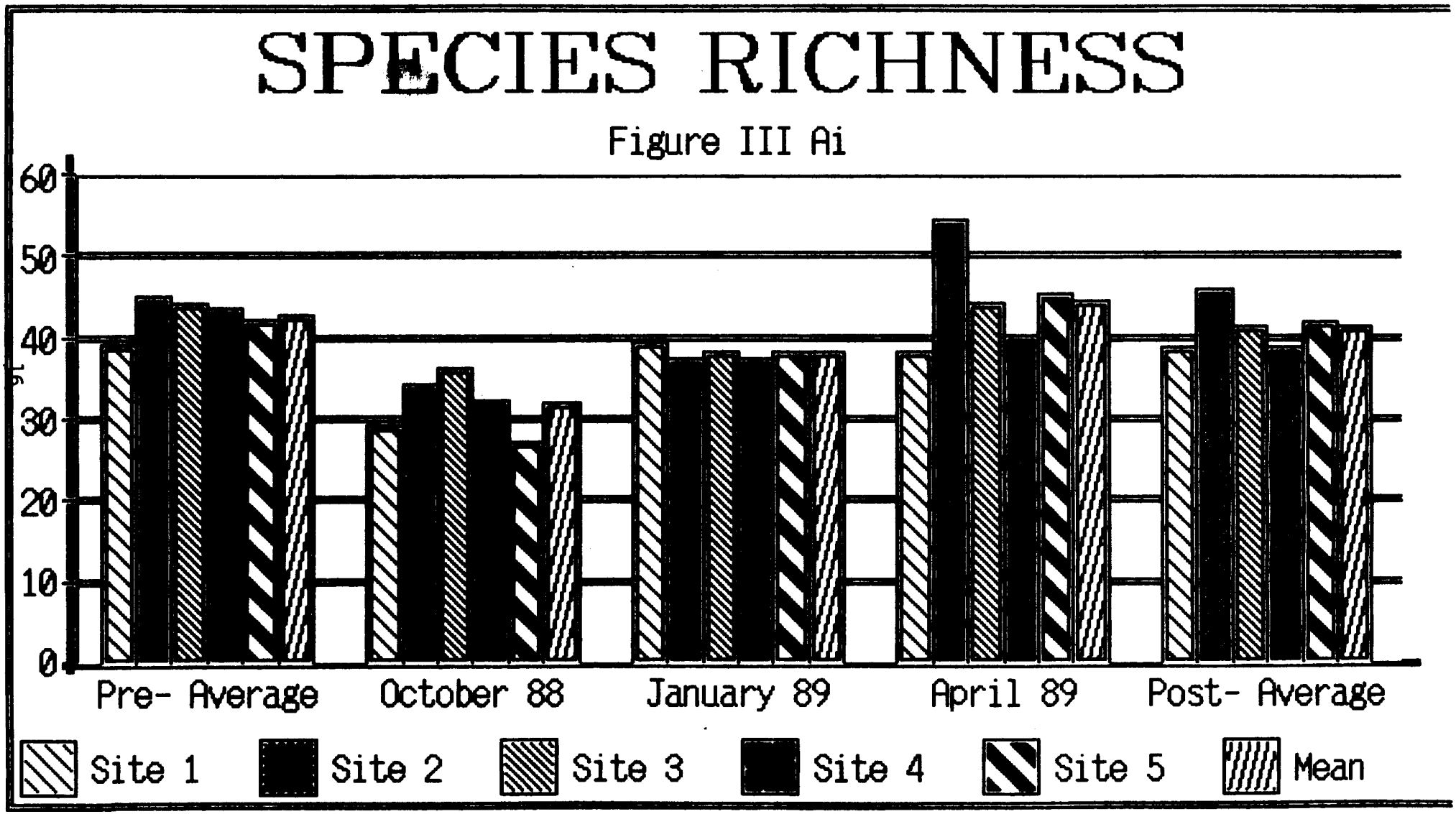


TABLE III Aii

Average # of Species per Replicate
Quantitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)

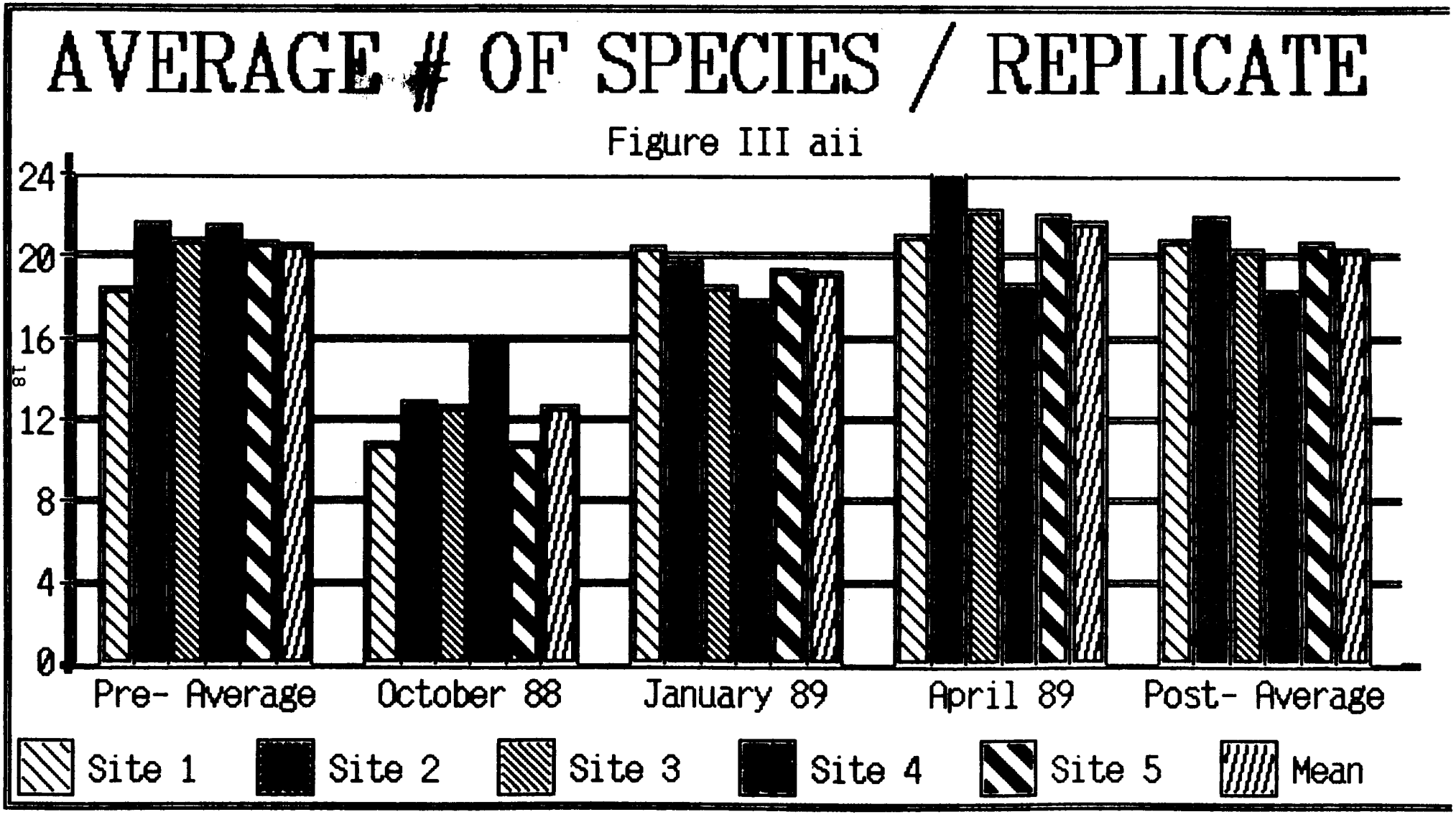
Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Mean	Std.Dev.
Sep - Oct 88	10.8	12.8	12.6	15.8	10.8	12.6	2.0
Dec 88 - Jan 89*	20.4	19.6	18.4	17.8	19.2	19.1	1.0
Mar - Apr 89	21.0	24.0	22.2	18.6	22.0	21.6	2.0
Mean	20.7	21.8	20.3	18.2	20.6	20.3	
Std. Dev. (Post-Operational)***	0.4	3.1	2.7	0.6	2.0	2.0	
Mean	18.3	21.5	20.7	21.4	20.6	20.5	
Std. Dev. (Pre-Operational)**	5.7	6.1	6.5	5.8	6.2	5.7	

Standard Deviation for Mean # of Species / Replicate at Each Site

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5
Sep - Oct 88	5.9	5.8	2.4	3.7	1.3
Dec 88 - Jan 89*	4.6	3.9	9.3	6.4	2.3
Mar - Apr 89	1.7	11.5	3.3	7.7	3.8

* Only 4 replicates were retrieved at Site 4 during Dec 88 - Jan 89.
** Includes all sampling periods up to and including October 1988.
*** Includes January 1989 and April 1989.

Figure III Aii: Average # of Species/Replicate, Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina. July 1987 - April 1989.



B. Total # of Organisms/Mean Density of Organisms per M^2
(Tables III Bi, III Bii; Figure III B)

A total of 3,461 aquatic macroinvertebrates were collected at the five sites over the two post-operational multiplate sampling periods. This represented an average of 1730.5 organisms per sampling period and an average of 346.1 organisms per site. The average number of organisms collected per site reached a maximum of 469 at site 3 during January 1989 sampling and a minimum of 271 at site 4 during the same sampling period. The mean number of organisms/site was slightly higher during pre-operational collection periods (369.2). Analysis by Wilcoxon's Signed Rank Test indicated no significant difference in the mean number of organisms collected pre-operationally and post-operationally ($p=0.05$; Appendix E). Similarly, during post-operational sampling, no significant difference ($p=0.05$) in the mean number of organisms collected per site was found among sites. (Appendix E).

The mean density of organisms per site during post-operational sampling was 553.8 organisms/m2, ranging from 433.6 organisms/m2 at site 4 during January 1989 to 750.4 organisms/m2 at site 3 during January 1989. As the density is directly related to the number of organisms collected, there were also no significant differences in density among sites or between pre and post-operational sampling.

Data on the total number and density of macroinvertebrates collected at Upper Three Runs Creek showed no evidence of any impact upon the community by the F/H area ETF discharge.

TABLE III Bi

Total # of Organisms per Site
Quantitative and Qualitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Total	Mean	Std.Dev.
Sep - Oct 88	152	141	101	197	122	713	142.6	36.1
Dec 88 - Jan 89	343	442	469	271	303	1828	365.6	86.5
Mar - Apr 89	328	335	352	319	299	1633	326.6	19.6
Total (Post-operational)**	671	777	821	590	602	3461		
Mean	335.5	388.5	410.5	295.0	301.0	1730.5	346.1	
Std. Dev. (Post-operational)**	10.6	75.7	82.7	33.9	2.8	137.9	62.5	
Mean	359.2	402.3	355.5	378.8	350.0	1845.8	369.2	
Std. Dev. (Pre-Operational)*	230.9	231.2	180.1	180.6	184.3	793.3	189.0	

QUALITATIVE SAMPLING

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Total
October 1988	147	233	212	210	83	885
March 1989	447	465	435	336	261	1944
Total	594	698	647	546	344	2829

***Includes all sampling periods up to and including October 1989.**
****Includes January 1989 and April 1989.**

Figure III Bi: Total # of Organisms/Site. Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina. July 1987 - April 1989.

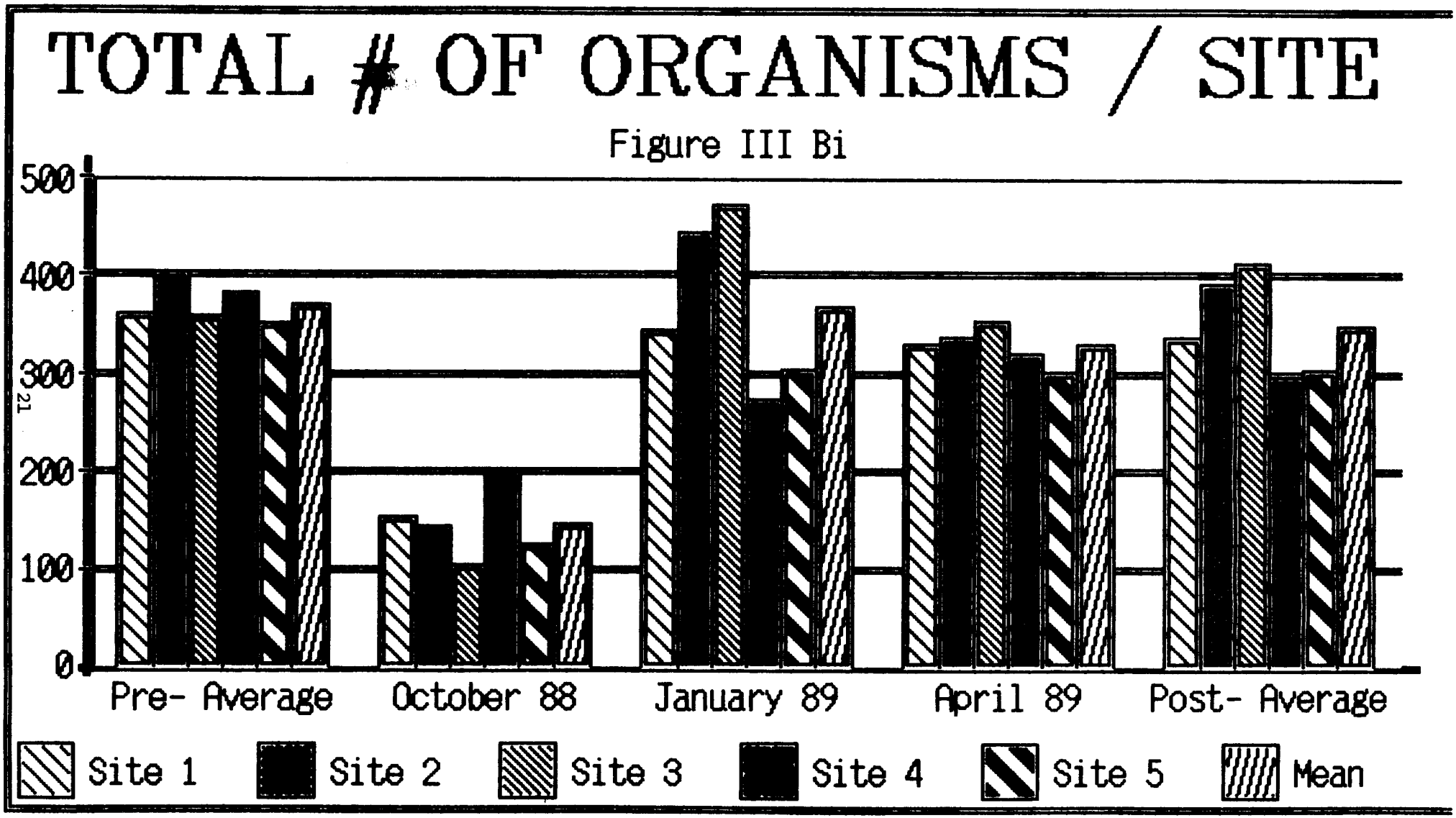


TABLE III Bii

Mean Density of Organisms per M2
Quantitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Mean	Std.Dev.
Sep - Oct 88	243.2	225.6	161.6	315.2	211.2	231.36	55.8
Dec 88 - Jan 89	548.8	707.2	750.4	433.6	484.8	584.96	138.3
Mar - Apr 89	524.8	536.0	563.2	510.4	478.4	522.56	31.4
Total (Post-operational)**	1073.6	1243.2	1313.6	944.0	963.2		
Mean	536.8	621.6	656.8	472.0	481.6	553.8	
Std. Dev. (Post-operational)**	17.0	121.1	132.4	54.3	4.5	100.1	
Mean	574.7	643.7	568.8	606.1	562.7	591.2	
Std. Dev. (Post-Operational)*	369.5	370.0	288.1	288.9	290.9	301.6	

*Includes all sampling periods up to and including October 1988.
**Includes January 1989 and April 1989.

C. % Composition by Major Taxonomic Group

(Table IIICi, IIICii, Figure IIICi)

As was noted in quantitative sampling during the first year of study (pre-operational), the macroinvertebrate community of Upper Three Runs Creek was found to be dominated by midges in January and April 1989. (Table IIICi). 61.5% of the organisms collected were midges. This was a decrease from the proportion of midges in pre-operational sampling (66.5%). Analysis of this difference by Wilcoxon's Signed Rank Test (Appendix E) indicated that the mean percentage of midges collected in April 1989 was significantly lower than the mean percentage collected in April 1988 (74.1%). However, no significant difference was noted between the mean percentage of midges collected in February 1988 and that of the corresponding 1989 winter quarter (January). Analysis of pre-operational versus post-operational data by Wilcoxon's Signed Rank Test also pointed to a reduction in the percentage of mayflies coupled with an increase in the percentage of caddisflies and true-flies (non-Chironomidae) during January 1989, as compared to February 1988. During the spring quarter of 1989, the percentage of beetles increased and the percentage of true flies (non-Chironomidae) decreased as compared to the spring quarter of 1988. Pre and post-operational differences between January 1989 and February 1988 are likely due to seasonal changes over the 7 1/2 week gap between early January (January 4, 1989) and late February (February 26, 1988). The shift toward earlier in the season would be expected to reduce the proportion of mayflies and increase the proportion of non-Chironomid Diptera, as exemplified by the October 1987 and October 1988 results. Differences between April 1988 and April 1989 results appear to be attributed to the high water levels and consequent "scouring effect" present during April 1989 sampling. An examination of the species list for that collection date (Appendix A) shows a larger than normal proportion of organisms which are "clingers", i.e., are adapted to hold on to the substrate under strong flow

conditions. Such organisms include ephemerellid mayflies, hydropsychid caddisflies and elmid beetles. What is critical about the pre-operational versus post-operational percent composition by major taxonomic group data is that there is no shift away from the more intolerant orders of aquatic insects (e.g. Ephemeroptera, Plecoptera and Trichoptera) to more tolerant orders such as Diptera. In fact, the proportion of mayflies, stoneflies and caddisflies increased from 23.6% pre-operationally to 25.7% post-operationally. This indicates the macroinvertebrate community of Upper Three Runs Creek was not adversely affected by the first six months of intermittent discharge of F/H Area ETF discharge.

Comparison of percent composition by major taxonomic group among sites showed some significant differences but no clear trends. The proportion of mayflies was low at site 4 (coupled with a large number of non-Chironomid Diptera), the proportion of stoneflies was elevated at site 3 and the proportion of non-Chironomid Diptera was high at site 4. Habitat differences and flow regimes may account for the differences. No clear impacts attributable to the F/H Area ETF discharge were noted.

Qualitative sampling, as noted in the pre-operational first year study, indicated a smaller percentage of the macroinvertebrate community to be midges (43-48%) than portrayed by artificial substrate sampling. Caddisflies comprised a larger segment of qualitative collections in October 1988 and March 1989 than was observed in quantitative collections. Some differences among sites were seen, however, such differences showed no clear trends indicative of an impact.

Analysis of the percent composition by major taxonomic group indicates a balanced community with no evidence of impacts from the F/H ETF discharge.

TABLE III Ci

Percent Composition by Major Taxonomic Group
Sorted by Date and Site - Quantitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

Sorted by Date

Sampling Date	Oct 88	Jan 89	Apr 89	Post-Operational Mean**	Pre-Operational Mean*
Ephemeroptera	2.2	4.5	7.2	5.7%	8.8%
Plecoptera	12.1	12.5	10.4	11.5%	6.5%
Trichoptera	12.6	7.4	9.7	8.5%	8.5%
Coleoptera	3.8	0.5	9.9	4.9%	5.0%
Diptera (Non-Chironomidae)	5.2	4.3	11.7	7.8%	4.6%
Chironomidae	62.7	70.8	51.0	61.5%	66.3%
Other	1.4	0.0	0.1	0.1%	0.3%

Sorted by Site (Post-Operational)

Site	Site 1	Site 2	Site 3	Site 4	Site 5	Post-Operational Mean**	Pre-Operational Mean*
Ephemeroptera	7.6%	6.9%	5.8%	1.0%	6.8%	5.7%	8.8%
Plecoptera	9.8%	11.8%	17.0%	11.1%	11.6%	11.5%	6.5%
Trichoptera	7.3%	9.9%	10.8%	9.5%	7.5%	8.5%	8.5%
Coleoptera	5.8%	4.7%	5.1%	6.2%	4.3%	4.9%	5.0%
Diptera (Non-Chir.)	5.2%	3.0%	4.8%	18.5%	12.3%	7.8%	4.6%
Chironomidae	64.2%	63.4%	56.3%	53.7%	57.3%	61.5%	66.3%
Other	0.0%	0.3%	0.2%	0.0%	0.2%	0.1%	0.3%

*Includes all sampling periods up to and including October 1988.
**Includes January 1989 and April 1989.

Figure III Ci: Percent Composition by Major Taxonomic Group, Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina. July 1987 - April 1989.

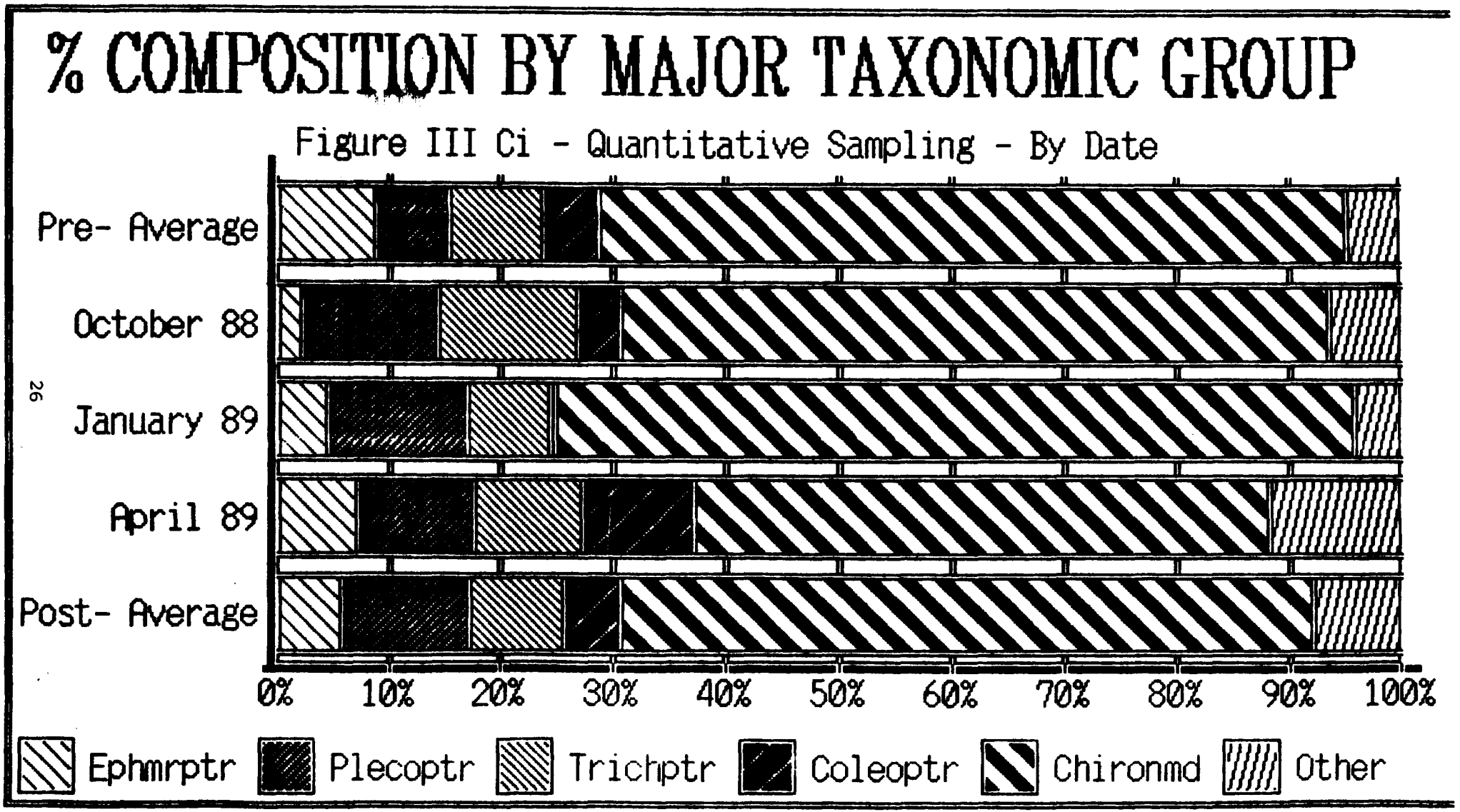


Figure III Ci: Percent Composition by Major Taxonomic Group, Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina. July 1987 - April 1989.

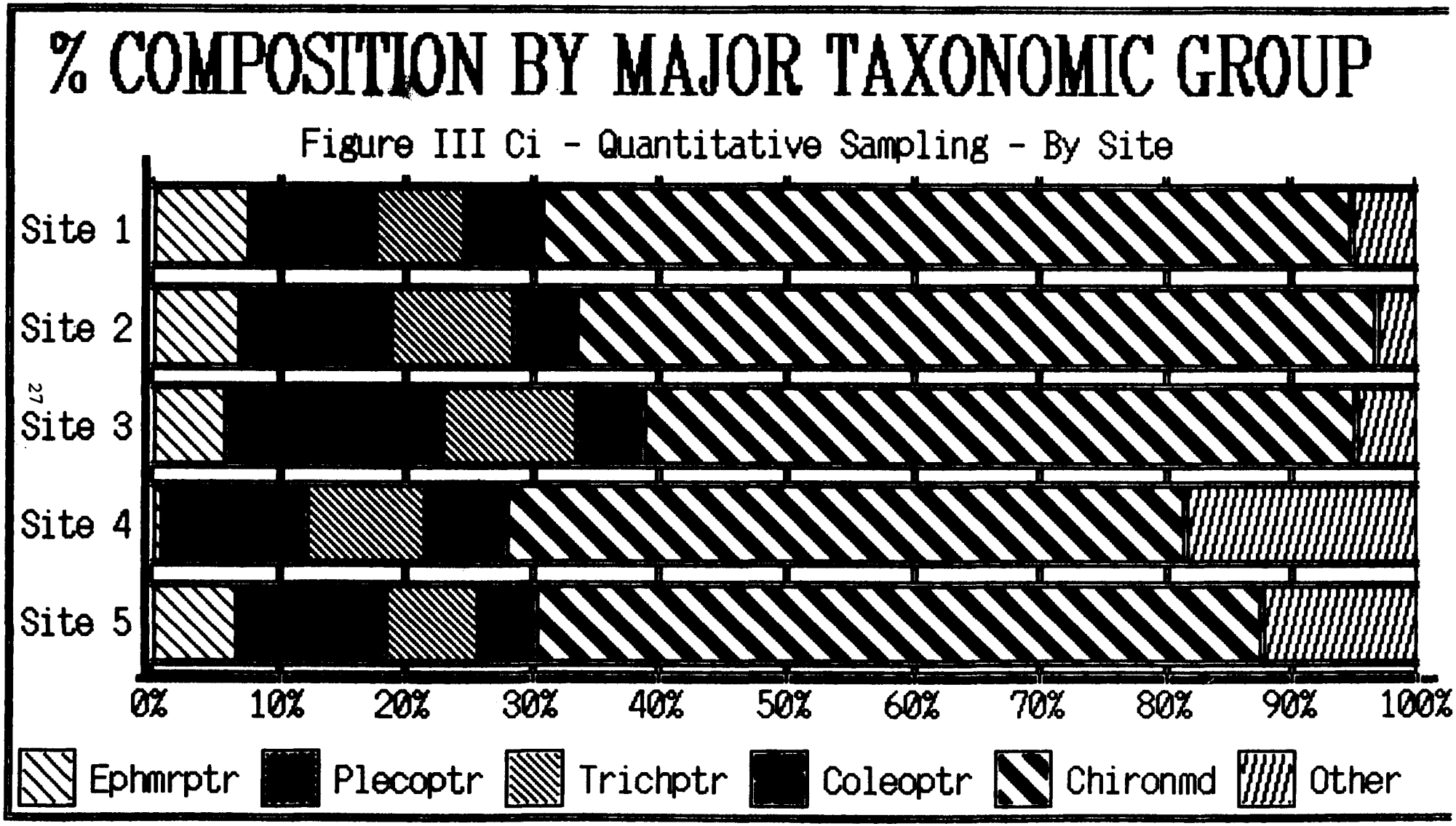


TABLE III Cii

Percent Composition by Major Taxonomic Group
Sorted by Date and Site - Qualitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

October 1988

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Mean
Ephemeroptera	4.8%	2.2%	4.3%	5.2%	3.6%	4.0%
Plecoptera	0.7%	3.9%	7.1%	10.5%	10.8%	6.3%
Trichoptera	27.9%	26.2%	21.2%	24.8%	12.1%	23.6%
Coleoptera	3.4%	4.7%	3.8%	3.3%	2.4%	3.7%
Diptera (Non-Chir.)	15.0%	8.6%	17.0%	8.1%	22.9%	12.9%
Chironomidae	39.5%	50.6%	43.4%	45.2%	25.3%	43.4%
Other *	8.7%	3.8%	3.2%	2.9%	22.9%	6.1%

* Predominantly Gastropoda

March 1989

Site	Site 1	Site 2	Site 3	Site 4	Site 5	Mean
Ephemeroptera	10.7%	9.9%	7.8%	7.7%	10.3%	9.3%
Plecoptera	16.3%	17.2%	16.8%	22.3%	14.9%	17.5%
Trichoptera	6.7%	15.9%	7.8%	14.9%	9.6%	11.0%
Coleoptera	1.2%	3.4%	2.5%	5.7%	3.1%	3.2%
Diptera (Non-Chir.)	5.4%	4.5%	12.9%	8.0%	13.4%	8.4%
Chironomidae	57.5%	44.5%	51.0%	37.2%	46.0%	47.9%
Other	2.2%	4.6%	1.2%	4.2%	2.7%	2.7%

D. Evenness: Diversity and Equitability

(Tables IIIDi, IIIDii, Figures IIIDi, IIIDii)

Diversity values on the post-operational data averaged 4.44, nearly the same as the pre-operational mean, which was 4.46. A very high level is indicative of an even community not dominated by only a few common species. Rather, there is a good distribution of common species, moderately abundant species and uncommon species. Analysis by Wilcoxon's Signed Rank Test (Appendix E) indicates no significant differences in the mean diversity of organisms collected post-operationally as compared to pre-operational data. Pre-operational values ranged from a low of 3.95 at site 1 in October, 1989 to a maximum of 4.93 at site 4 in July, 1987. However, post-operational values ranged from a low of 4.14 at site 3 in January, 1989 to a maximum of 5.01 at site 2 in April, 1989. A Friedman's statistical analysis conducted on the post-operational data showed no significant difference in diversity among sites (Appendix E). Diversity values correlated with species richness on a seasonal basis, reaching a minimum on October, 1987 and a maximum in April, 1988. Even the relatively low October values, however, showed excellent diversity.

Equitability at the five sites averaged 0.79 pre-operationally and 0.77 post-operationally. Analysis by Wilcoxon's Signed Rank Test (Appendix E) is indicative of no significant difference in the mean equitability of the sites during the post-operational sampling periods. A Friedman's test conducted on the data showed no changes in equitability among sites (Appendix E).

TABLE III Di

Shannon-Weaver Diversity Indices
Quantitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Mean	Std.Dev.
Sep - Oct 88	3.95	4.27	4.71	4.27	4.01	4.24	0.3
Dec 88 - Jan 89	4.41	4.29	4.14	4.42	4.31	4.31	0.1
Mar - Apr 89	4.44	5.01	4.50	4.32	4.60	4.57	0.3
Mean	4.43	4.65	4.32	4.37	4.46	4.44	
Std. Dev.	.0	0.5	0.3	0.1	0.2	0.2	
(Post-Operational) **							
Mean	4.33	4.54	4.54	4.49	4.42	4.46	
Std. Dev.	0.3	0.3	0.2	0.3	0.3	0.3	
(Pre-Operational) *							

* Includes all sampling periods up to and including October 1988.
** Includes January 1989 and April 1989.

Figure III Di: Diversity Index, Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek Savannah River Plant, Aiken County, South Carolina, July 1987 - April 1989.

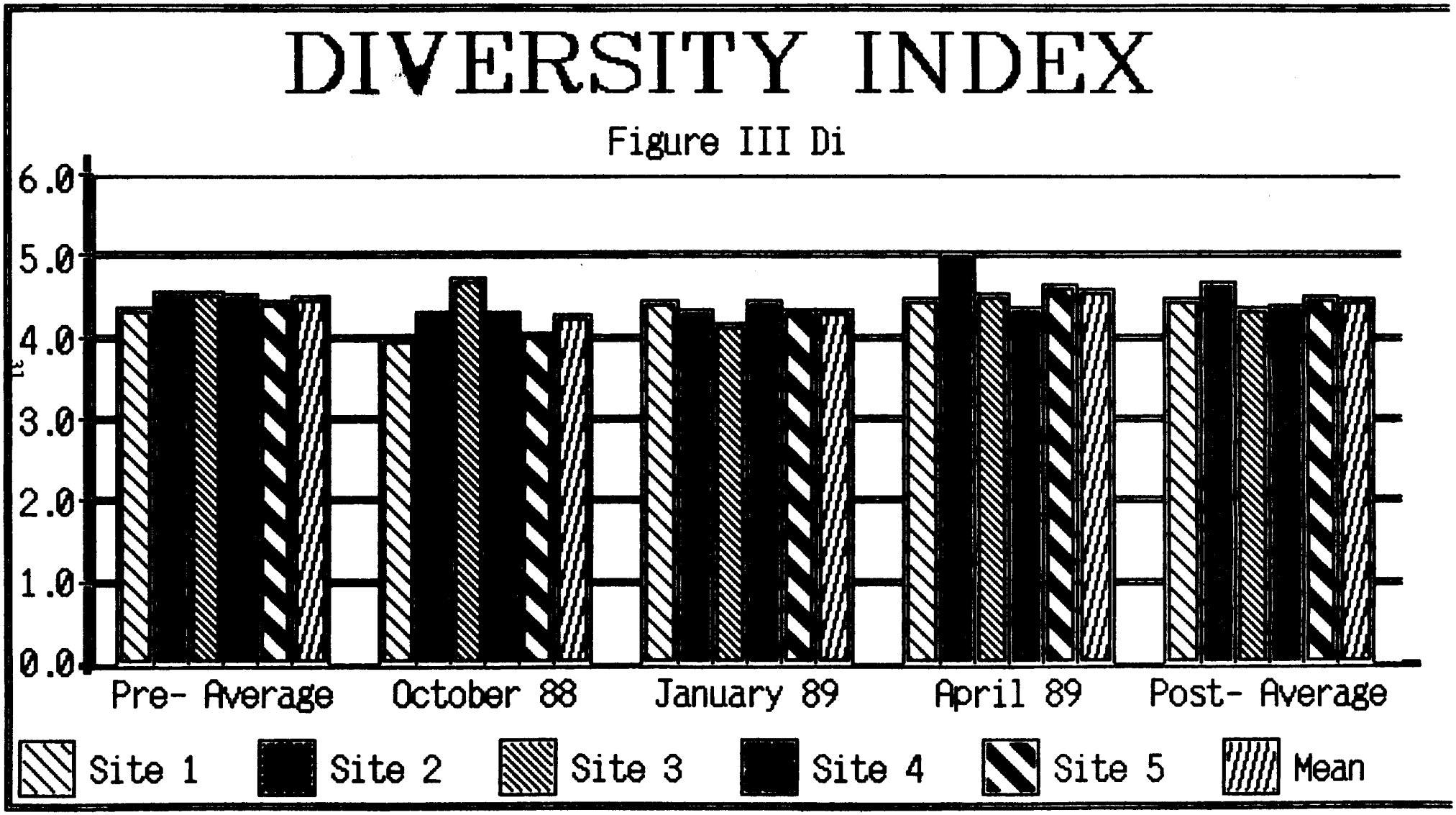


TABLE III Dii

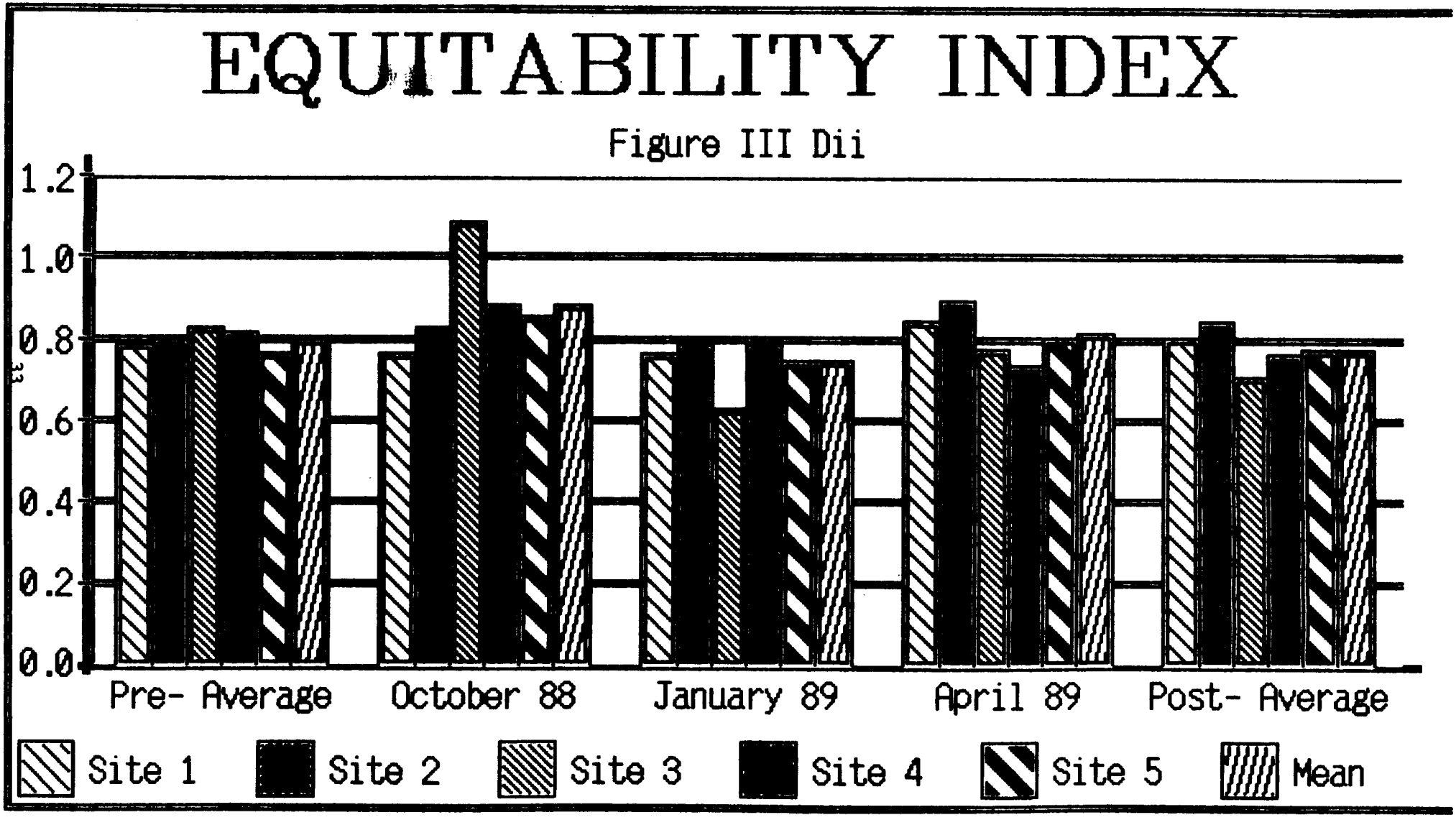
Equitability Indices
Quantitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Mean	Std.Dev.
Sep - Oct 88	0.76	0.82	1.08	0.88	0.85	0.88	0.12
Dec 88 - Jan 89	0.76	0.78	0.62	0.78	0.74	0.74	0.07
Mar - Apr 89	0.84	0.89	0.77	0.73	0.80	0.81	0.06
Mean	0.80	0.84	0.70	0.76	0.77	0.77	
Std. Dev.	0.06	0.08	0.11	0.04	0.04	0.1	
(Post-Operational) **							
Mean	0.78	0.79	0.82	0.81	0.76	0.79	
Std. Dev.	0.10	0.15	0.16	0.16	0.08	0.1	
(Pre-Operational) *							

* Includes all sampling periods up to and including October 1988.
** Includes January 1989 and April 1989.

Figure III Dii: Equitability Index, Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina, July 1987 - April 1989.



E. Total Biomass (Table III Ei)

The average biomass of aquatic macroinvertebrates collected post-operationally on multiplate samplers for all dates and stations combined was 0.4537 g/m^2. The average biomass pre-operationally for all dates and stations combined was 0.4038 g/m2. Pre-operational biomass totals were quite variable, with standard deviations for some totals being larger than the mean values. Variability is largely due to the patchy distribution of large predators (e.g. perlid stoneflies). Average total biomass ranged from a minimum of 0.0347 g/m^2 at site 1 in October 1988 to 1.155 g/m^2 at site 1 in April 1988 (Table III Ei). The differences in average biomass among sites was not significant when analyzed by Friedman's Test (Appendix E). Analysis by Wilcoxon's Signed Rank Test (Appendix E) indicates no significant difference in the mean biomass of organisms collected post-operationally as compared to pre-operational data. Seasonal variation was marked, with total biomass reaching a maximum in April as a large proportion of nymphs and larvae reached the final pre-emergance instars. The total biomass for April, 1989 for all sites was lower than those for April 1988; however this would be the result of the scouring effect caused by a storm event preceding the collection date. Data on the biomass of macroinvertebrates, collected at Upper Three Runs Creek post-operationally showed no impact upon the community by the F/H Area ETF discharge.

TABLE III Ei

Total Biomass (AFDW in g/m2)
Quantitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Mean	Std.Dev.
Sep - Oct 88	0.0347	0.2224	0.7998	0.2694	0.2414	0.3135	0.2871
Dec 88 - Jan 89	0.6976	0.6003	0.5058	0.3118	0.4514	0.5134	0.1467
Mar - Apr 89	0.4162	0.5755	0.3346	0.2507	0.3933	0.3941	0.1199
Mean	0.5569	0.5879	0.4202	0.2813	0.4224	0.4537	
Std. Dev.	0.1990	0.0175	0.1211	0.0432	0.0411	0.1410	
(Post-Operational) **							
Mean	0.3822	0.3990	0.5391	0.2930	0.4057	0.4038	
Std. Dev.	0.4039	0.1881	0.2952	0.1700	0.2464	0.2661	
(Pre-Operational) *							

* Includes all sampling periods up to and including October 1988.
** Includes January 1989 and April 1989.

F. Pollution Tolerance: Biotic Index and EPT Index

(Tables IIIFi, IIIFii, Figures IIIFi IIIFii)

The average biotic index, for all sites and dates combined post-operationally, calculated on the multiplate sampling data was 4.79 (Table IIIFi). This value did not change significantly from pre-operational data (4.96). Wilcoxin's Signed Rank Test analysis indicates no trend of impact upon the macroinvertebrate community caused by post-operational discharges (Appendix E). According to Hilsenhoff (1987) these values represent a good level of water quality (low biotic index values indicate good water quality). Values were lowest in July and highest in October. The multiplate sampling data were most sensitive to midge populations, especially orthoclads and chiromomini midges, which were large in October and small in July. Abundant numbers of Polypedilum, Rheocricotopus and Orthocladius were the major contributing factors resulting in higher biotic indices. In addition to midges, numerous Hydropsychid caddisflies resulted in a higher biotic index when samples were collected qualitatively. A possible reason for the higher proportion of midges may be the smaller biomass of early instars of summer emerging predators. The Friedman's test shows no indication of significant differences among the sites (Appendix E).

The post-operational EPT indices for multiplate sampling at the five sites ranged from a low of 16 to a maximum of 20 (Table IIIFii). No significant differences were noted among sites when subjected to Friedman's test (Appendix E). Wilcoxin's Signed Rank Test analysis indicates no changes in the EPT values when compared to pre-operational data (Appendix E). However, comparison of the EPT values pre and post-operationally for April is indicative only of a moderate impact on the macroinvertebrate community of Upper Three Runs Creek, which is likely caused by the heavy rainfall prior to the sampling date. The highest EPT ratings occurred in the spring, when species richness among the ephemerellid mayflies and perlodid stoneflies was at a peak. EPT values for qualitative sampling were higher, at 26, for March 1989. This value is indicative of good water quality for macroinvertebrate community of Upper Three Runs Creek.

TABLE III Fi

Biotic Indices
Quantitative and Qualitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Mean	Std.Dev.
Sep - Oct 88	5.63	4.66	4.18	5.14	3.80	4.68	0.73
Dec 88 - Jan 89	5.10	5.21	5.12	4.59	5.04	5.01	0.24
Mar - Apr 89	4.69	4.89	4.83	4.38	4.09	4.58	0.34
Mean	4.90	5.05	4.98	4.49	4.57	4.79	
Std. Dev. (Post-Operational)**	0.29	0.23	0.21	0.15	0.67	0.36	
Mean	5.09	5.02	4.86	5.09	4.75	4.96	
Std. Dev. (Pre-Operational)*	0.47	0.50	0.49	0.33	0.55	0.46	

QUALITATIVE SAMPLING

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Mean	Std.Dev.
October 1988	6.13	5.33	4.44	4.92	4.92	5.15	0.63
March 1989	4.71	4.94	4.86	4.84	5.59	4.99	0.35
Mean	5.4	5.1	4.7	4.9	5.3		

* Includes all sampling periods up to and including October 1988.
** Includes January 1989 and April 1989.

Figure III Fi: Biotic Index, Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina, July 1987 - April 1989.

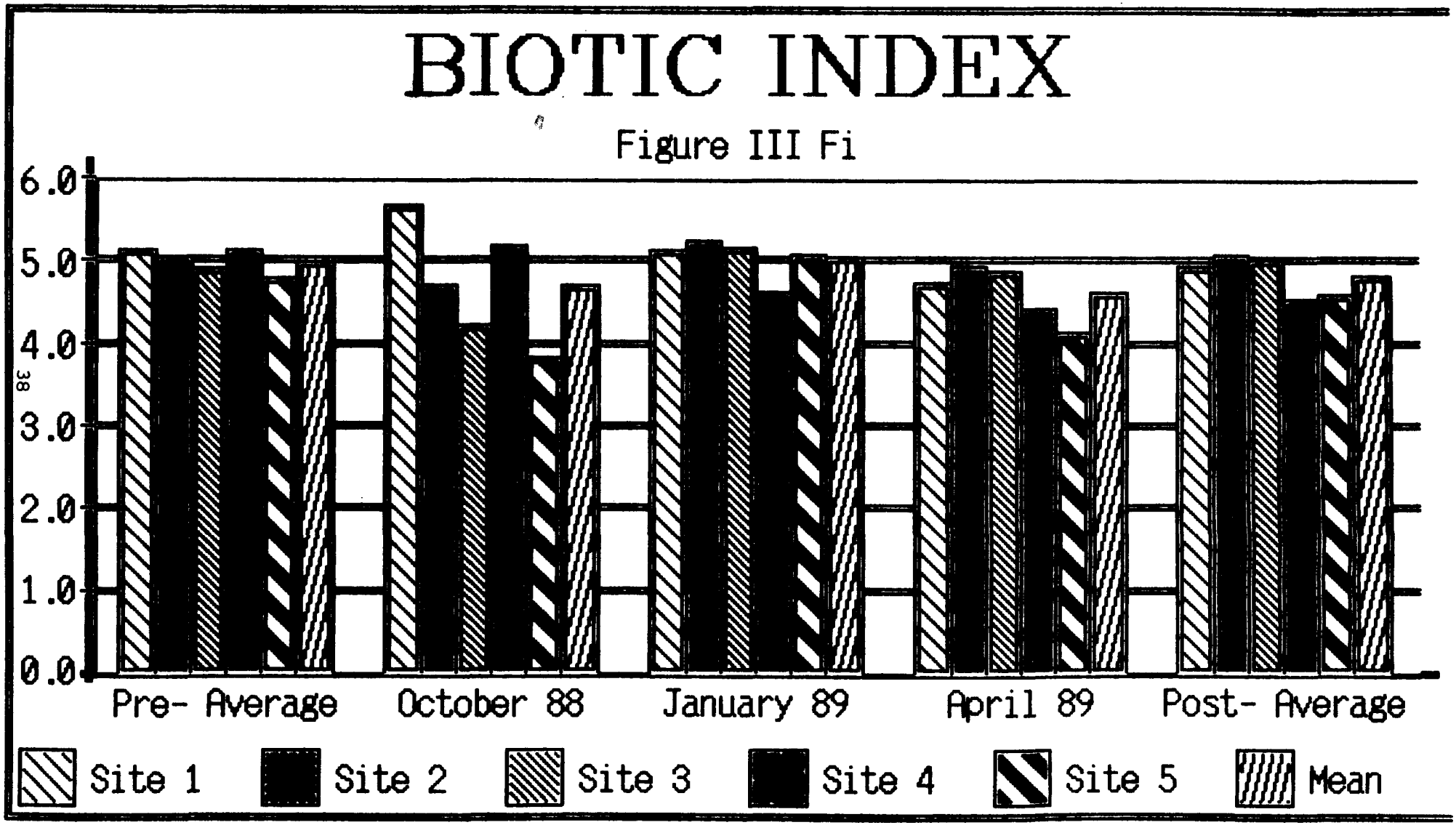


TABLE III Fii

EPT Indices
Quantitative and Qualitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

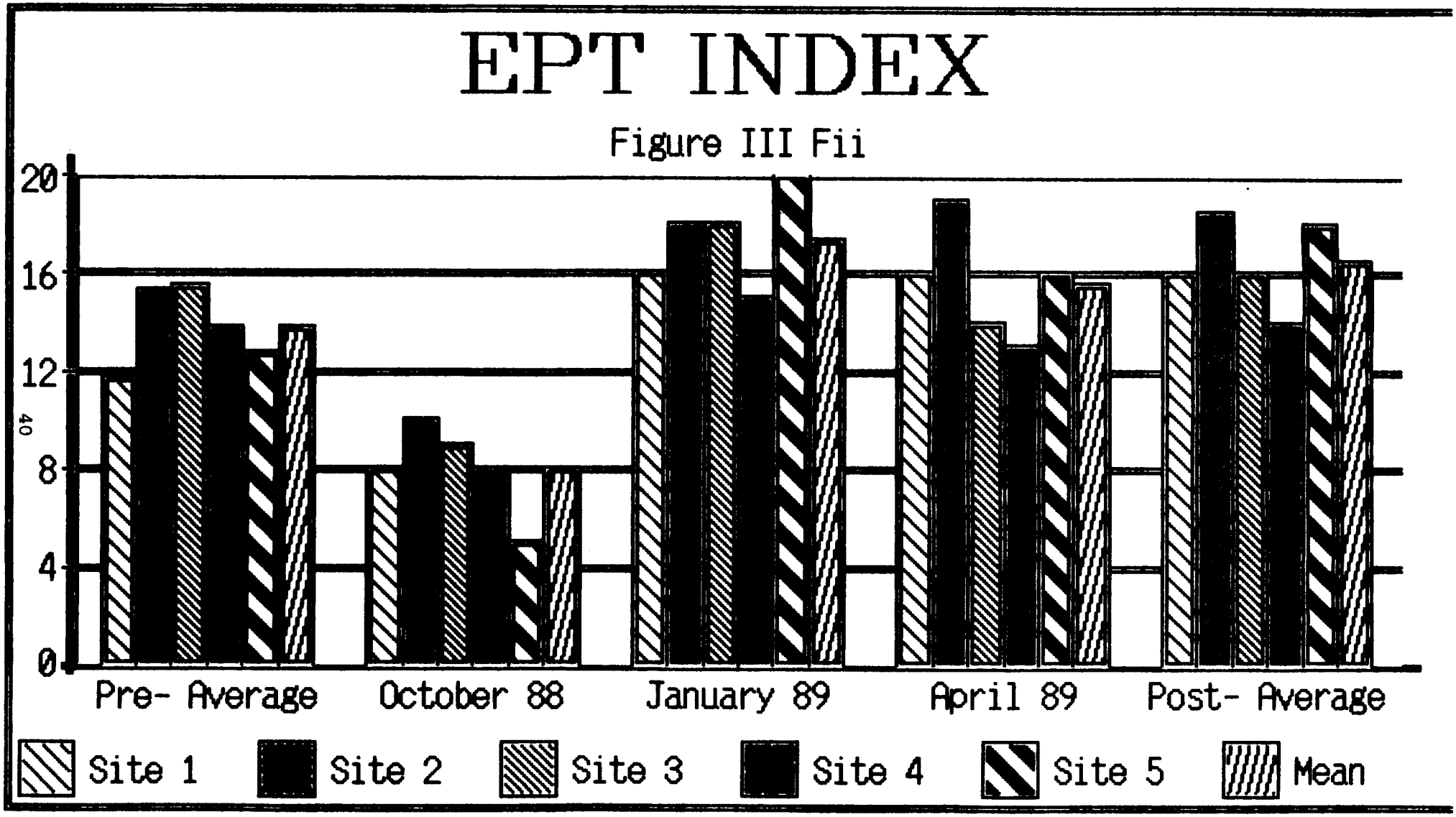
Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Mean	Std.Dev.
Sep - Oct 88	8	10	9	8	5	8.0	1.9
Dec 88 - Jan 89	16	18	18	15	20	17.4	1.9
Mar - Apr 89	16	19	14	13	16	15.6	2.3
Mean	16.0	18.5	16.0	14.0	18.0	16.5	
Std. Dev. (Post-Operational) **	0.0	0.7	2.8	1.4	2.8	2.2	
Mean	11.7	15.3	15.5	13.8	12.7	13.8	
Std. Dev. (Pre-Operational) *	3.5	4.9	5.6	4.9	5.4	4.8	

QUALITATIVE SAMPLING

Sampling Date	Site 1	Site 2	Site 3	Site 4	Site 5	Mean	Std.Dev.
October 1988	10	14	12	11	10	11.4	1.7
March 1989	24	24	26	26	18	23.6	3.3
Mean	17.0	19.0	19.0	18.5	14.0		

* Includes all sampling periods up to and including October 1988.
** Includes January 1989 and April 1989.

Figure Fii: EPT Index, Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina, July 1987 - April 1989.



G. Functional Group Analysis (Tables VIGi, IIIGii, Figures IIIGi IIIGxi, Appendix F)

Functional post-operational group analysis based upon the total number of organisms quantitatively collected per site, portrayed a community dominated by collectors (66%). This was a slight increase from the pre-operational dominance of collectors (64%). Analysis of the data by Wilcoxin's Signed Rank Test suggested that the proportion of collector-gatherers did not fall significantly when comparing seasons pre-operationally and post-operationally. Predators also increased post-operationally, increasing from 17% to 18% (all seasons combined). Analysis by Wilcoxon's Signed Rank Test indicated that the increase was significant between February 1988 and January 1989. Scrapers (grazers) constituted 8% of the community pre-operationally and 6% post-operationally. Seasonal comparisons using Wilcoxon's Signed Rank Test demonstrated a significant differences in the proportion of scrapers between February 1988 and January 1989. Shredders also remained constant in proportion, ranging from 11% pre-operationally to 10% post-operationally. Despite significant post-operational shifts in functional group proportions, no significant shift was seen when comparing upstream site 1 to downstream sites. Analysis by Friedman's Test confirmed the lack of significant differences post-operationally for any functional group among sites.

Post-operational functional group analysis based upon percentage by biomass repeated pre-operational results in finding the community to be dominated by predators (61%). Comparison by Wilcoxon's Signed Rank Test indicated no significant differences between the mean percentage of predators in February 1988 and January 1989 (Appendix E). However, significantly more predator biomass was collected in April 1988 (84%) than in April 1989 (75%). Scrapers were the second largest functional group by biomass (14%), followed by shredders (13%) and collectors (12%). Comparison of pre-operational to post-operational biomass data by Wilcoxon's Signed Rank Test showed a non-significant decrease in the percentage of collectors and significant increase in the percentage of shredders from February 1988 to January 1989. The proportion of collectors (by biomass) did not change significantly between April 1988 and April 1989, however, significantly more scrapers were collected in April 1989. Comparison of biomass data for each functional group among sites by Friedman's Test indicated no significant differences among sites.

Post-operational sampling revealed significant (but not drastic) changes in the functional group proportions as compared to the same season's pre-operational data. However, as no significant shifts in functional groups occurred downstream of the discharge point as compared to the control site, it appears that the F/H Area ETF discharge is not the cause. Minor differences in sampling dates and stream flow conditions are more likely reasons for the observed change over time.

TABLE III Gi

Functional Group Analysis by Site
Quantitative Sampling: Post-operational Data
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

Functional Group	Site 1	Site 2	Site 3	Site 4	Site 5	Post-Operational Overall % of Total **	Pre-Operational Overall % of Total *
Collector-Gatherers							
% by Pop. #	49%	41%	43%	35%	42%	43%	48%
% by Biomass	4%	5%	1%	5%	5%	4%	8%
Collector-Filterers							
% by Pop. #	9%	21%	20%	32%	23%	23%	16%
% by Biomass	4%	11%	7%	9%	10%	8%	8%
Predators							
% by Pop. #	27%	13%	20%	16%	19%	18%	17%
% by Biomass	62%	57%	72%	57%	53%	61%	69%
Scrapers							
% by Pop. #	8%	15%	5%	6%	6%	6%	8%
% by Biomass	14%	14%	14%	15%	14%	14%	9%
Shredder-Herbivores							
% by Pop. #	5%	8%	9%	8%	8%	8%	9%
% by Biomass	9%	6%	1%	6%	8%	6%	3%
Shredder-Detritivores							
% by Pop. #	2%	2%	3%	3%	2%	2%	2%
% by Biomass	6%	6%	6%	7%	10%	7%	3%

* Includes all sampling periods up to and including October 1988.
** Includes January 1989 and April 1989.

TABLE III Gii

Functional Group Analysis by Sampling Date
Quantitative Sampling: Post-operational Data
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina
October 1988 - April 1989

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

Functional Group	October 1988	January 1989	April 1989	Post-Operational Overall % of Total **	Pre-Operational Overall % of Total *
Collector-Gatherers					
% by Pop. #	21%	44%	41%	43%	48%
% by Biomass	1%	2%	6%	4%	8%
Collector-Filterers					
% by Pop. #	39%	17%	29%	23%	16%
% by Biomass	7%	7%	10%	8%	8%
Predators					
% by Pop. #	23%	21%	15%	18%	17%
% by Biomass	69%	52%	75%	61%	69%
Scrapers					
% by Pop. #	7%	4%	9%	6%	8%
% by Biomass	15%	19%	7%	14%	9%
Shredder-Herbivores					
% by Pop. #	8%	11%	4%	8%	9%
% by Biomass	2%	10%	<1%	6%	3%
Shredder-Detritivores					
% by Pop. #	2%	2%	2%	2%	2%
% by Biomass	5%	10%	2%	7%	3%

Figure Gi: Functional Group Analysis by site and Biomass, Quantitative Macroinvertebrate Sampling, of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina. July 1987 - April 1989.

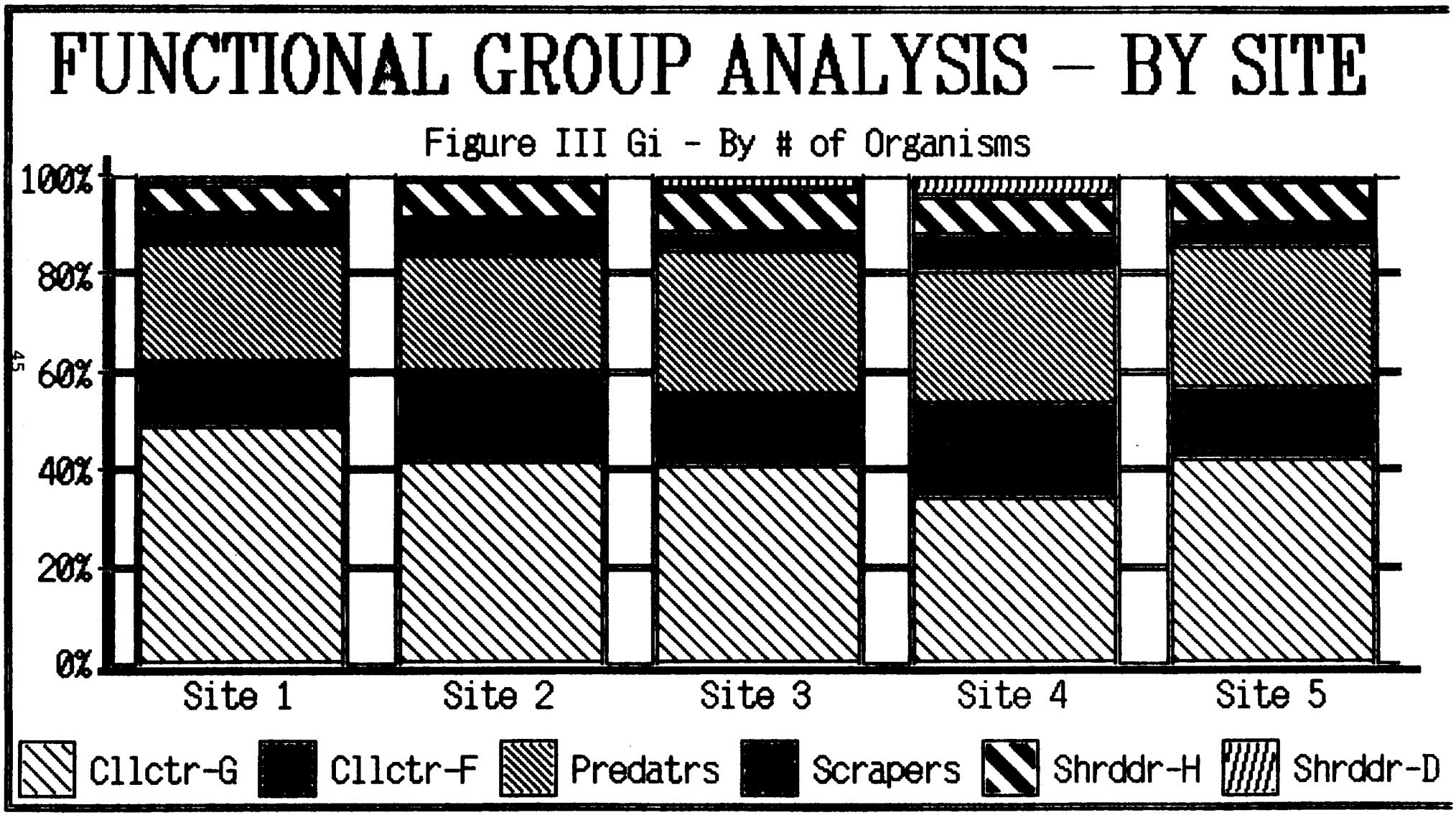


Figure III Gi: Functional Group Analysis by Site and Biomass, Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina. July 1987 - April 1989.

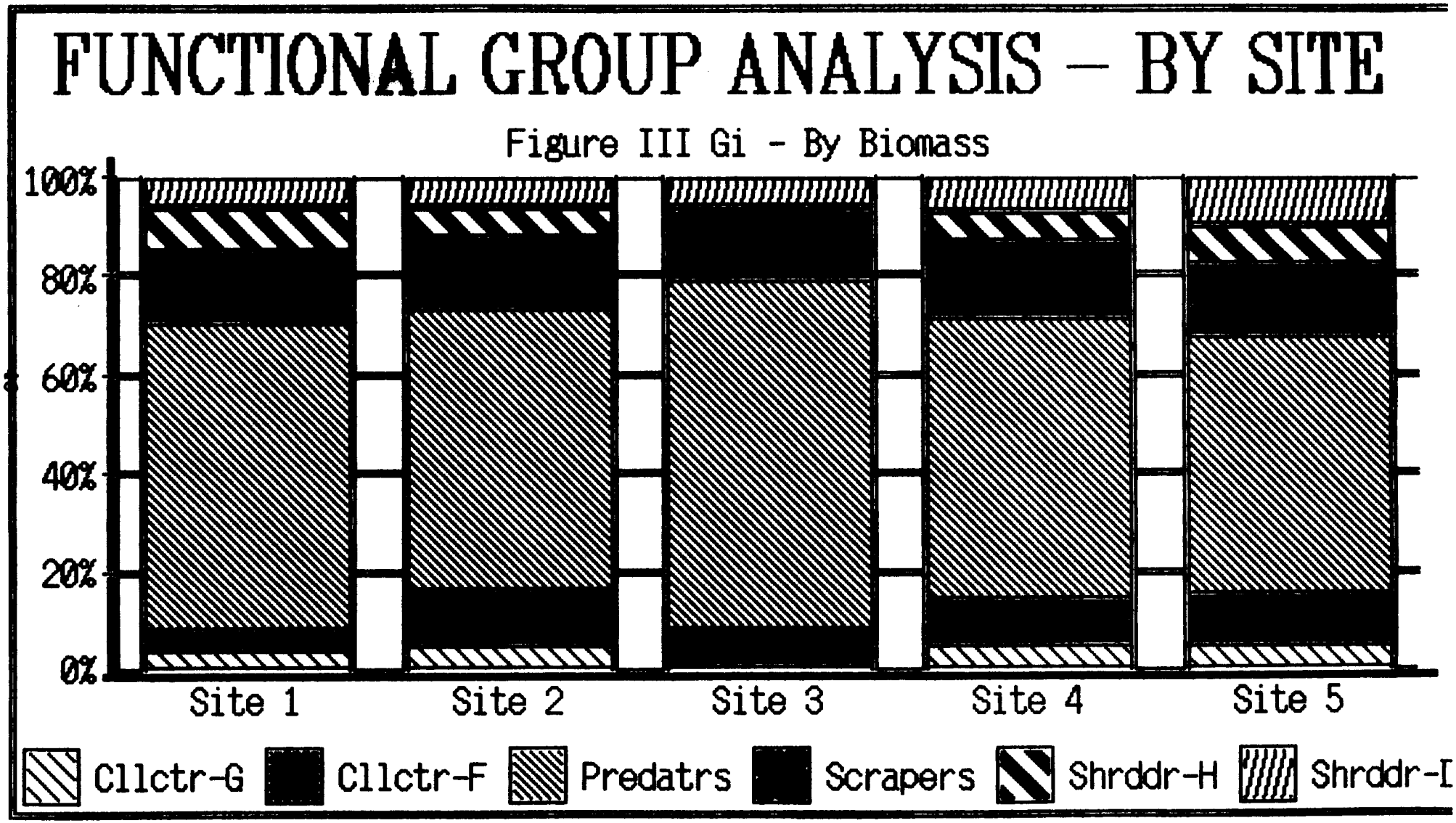


Figure III Gii: Functional Group Analysis by Site and # of Organisms, Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina. July 1987 - April 1989.

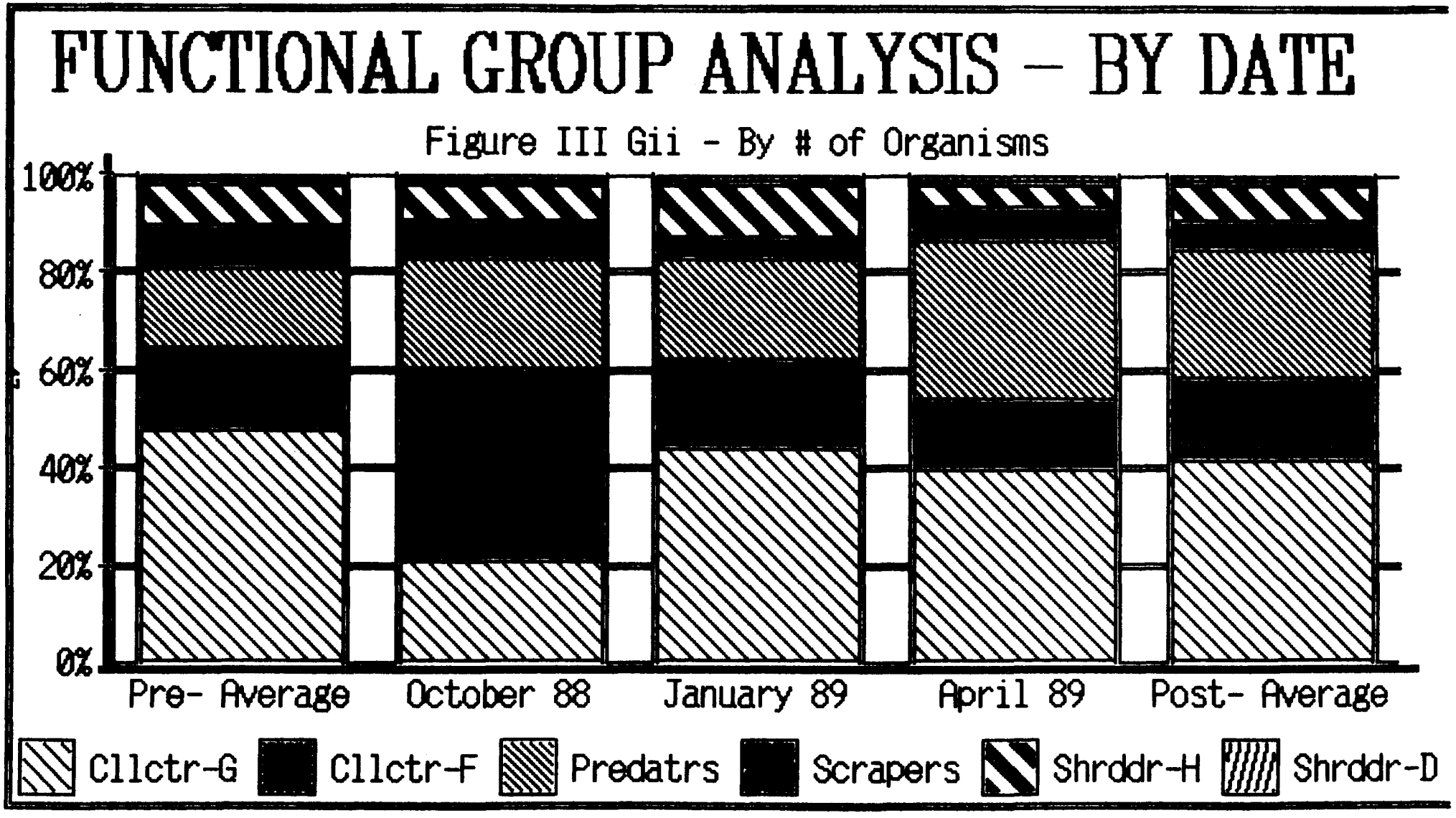
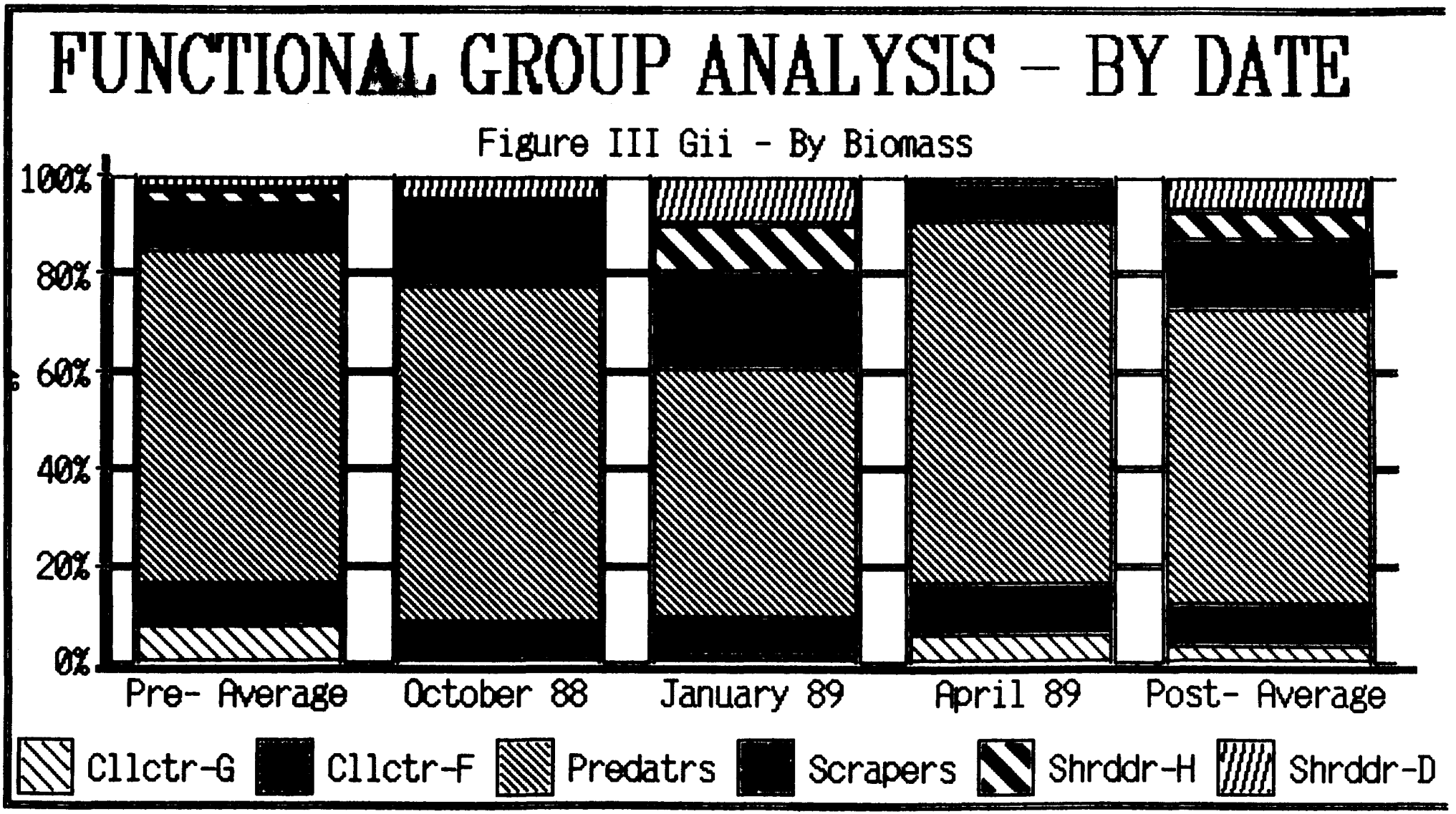


Figure III Gii: Functional Group Analysis by Site and # of Organisms, Quantitative Macroinvertebrate Sampling of Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina. July 1987 - April 1989.



H. Dominant Species and Community Structure

As found pre-operationally, the macroinvertebrate community colonizing the multiplate artificial substrate samplers during post-operational sampling was dominated by rheophilic, snag habitat species, particularly orthoclad midges.

At all sites combined the most commonly collected species was Rheocricotopus robacki and the second most common species was Polypedilum convictum gp. Non-chironomid species among the most commonly collected included black flies (Simulium dixiense/jonesi), caddisflies (Hydropsyche elissoma) and stoneflies (Perlesta placida). The five most commonly collected species at the five sites were as follows:

Site 1	Site 2	Site 3
Orthocladius curtiseta	Polypedilum	R. robacki
Corynoneura sp. 3	R. robacki	P. convictum
Rheocricotopus robacki	R. distinctissimus	R. distinctissimus
Rheotanytarsus distinctissimus	Corynoneura sp. 3	Orthocladius curtiseta
Polypedilum convictum	Perlesta placida	Hydropsyche elissoma

Site 4	Site 5
Simulium jonesi	R. robacki
P. convictum	S. jonesi
R. robacki	P. convictum
O. curtiseta	R. distinctissimus
Simulium jonesi	Tvetenia discoloripes

Although the list varies from site to site, no pronounced shifts in dominants among sites was noted.

Due to the rheophilic/snag bias of artificial substrate sampling, other habitats within the stream are under-represented, particularly sediment-dwelling organisms and neuston (surface) dwelling organisms. Qualitative sampling can give a more balanced overall view of the community in all habitats of the lotic system. A list of species collected post-operationally by qualitative sampling methods, representing non-snag habitats at all sites is presented below:

Sand Community

Agarodes libalis
Beckidia sp.
Bezzia sp. 7
* Cladotanytarsus sp.
Cryptochironomus blarina
C. fulvus gp.
Dolania americana
Haploperla brevis
Paracladopelma undine
Paracladopelma doris
Paralauterborniella nigrohalteralis
* Rheosmittia
Robackia claviger

Neuston/Pelagic Community

Dineutus discolor

Sediment/Leaf Pack Community

* Acerpenna pygmaeus
* Hexagenia limbata
* Paraleptophlebia guttata
Enallagma sp.
Gomphus lividus
Hagenius brevistylus
Lepidostoma sp.
Leuctra sp.
Perlinella drymo
Sialis sp.
Anisocentropus pyraloides
Lepodostoma sp.
* Phylocentropus
Hydroporus pilatei
Sperchopsis tesselatus
Atrichopogon
Bezzia sp. 2,6
Crysops sp.
Culicoides sp.
Erioptera/Ormosia
Hextoma (E.) cinerea
* Palpomyia sp. 1,5
Pilaria
Sphaerium sp.

Ablabesmyia janta
* A. mallochi
Conchapelopia
Clinotanypus pinguis
Heterotrissocladius marcidus
Labrundinia pilosella

* Microtendipes spp.
Pagastiella ostansa
Paramerina sp.
* Polypedilum halterale
* Polypedilum scalaenum
Psectrocladius (Meso.) sp.
Paratendipes nudisquama
Stempellinella sp.
Tanytarsus sp. XVII
* Tribelos jucundus
Caecidotea sp.
Cambarinae
Palaemonetes
Spirosperma sp.
Tubificidae
Gillia altilis
Viviparis subpurpureum

* Dominant Species

Qualitative sampling indicated that the sediment dwelling species are equally abundant to the snag habitat species. Thus, the dominant species noted in qualitative sampling are distinctly different than were found by artificial substrate sampling, which primarily sampled snag habitat species. Sediment/leaf pack habitat may be estimated at approximately 30% of the streambed area, as compared to 60% sand habitat and 10% snag habitat. Each of the three habitat types was sampled equally. A review of the qualitative data by habitat (Appendix B) shows the highest species richness and organism density to be found in the snag habitat and the lowest species richness and organism density in the sand habitat. Field observations indicated that site 1 included less snag and sediment/leaf pack habitat than the other sites and site 5 included a greater proportion of sediment/leaf pack habitat than the other sites. The five most common species collected qualitatively at each site are as follows:

Site 1	Site 2	Site 3
Parametriocnemus lundbecki	H. elissoma	Polypedilum convictu
Conchapelopia sp.	P. convictum	Isoperla sp.
Hydropsyche elissoma	Cladotanytarsus sp. A	H. elissoma
Polydedilum convictum	P. lundbecki	Conchapelopia sp.
Ephemerella dorothea	Isoperla nr. nana	Simulium jonesi

Site 4	Site 5
H. elissoma	Perlesta placida
Rheotanytarsus distinctissimus	Polypedilum halterale
P. convictum	Palpomyia sp. 1
Isoperl nr. nana	Polypedilum scalaenum
Tveteni discoloripes	Viviparis sp.

The patchy nature of habitat distribution makes it more difficult to generalize about community structural changes among sites sampled qualitatively.

Table III Hi

Dominant Species Collected by Multiplate Artificial Substrate Samplers At Five Sites on Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina. January 1989 - April 1989

Ephemeroptera
- Ephemerella dorothea
- Ephemerella invaria/rotunda
- Heptagenia flavescens
- Stenonema modestum/smithae

Plecoptera
- Acroneuria abnormis
- Acroneuria mela
- Isoperla bilineata
- Isoperla nr. nana
- Paragnetina kansensis
- Perlesta placida
- Pteronarcys dorsata
- Taeniopteryx nr. lita

Trichoptera
- Brachycentrus numerosus
- Cheumatopsyche spp
- Hydropsyche elissoma
- Micrasema rusticum

Coleoptera
- Ancyronyx variegatus
- Macronychus glabratus
- Stenelmis markeli
- Stenelmis sinuata

Diptera (non-Chironomidae)
- Atherix lantha
- Simulium jonesi
- Simulium tuberosum

Diptera (Chironomidae)
- Brillia flavifrons
- Conchapelopia sp
- Corynoneura sp. 3
- Nilotanypus fimbriatus
- Orthocladius dentifer
- Orthocladius curtiseta
- Parakiefferiella sp. A, B
- Parametriocnemus lundbecki
- Polypedilum convictum gp
- Rheocricotopus robacki
- Rheotanytarsus distinctissimus
- Rheotanytarsus exiguus
- Symposicocladius lignicola
- Tanytarsus glabrescens gp
- Tanytarsus sp. XVI
- Thienemanniella fusca gp
- Thienemanniella xena gp
- Tvetenia discoloripes
- Tvetenia paucunca/vitracies

I. Water Chemistry (Table III Ii; Appendix F)

Thirty-one parameters were analyzed monthly on water samples collected from five sites on Upper Three Runs Creek. Six parameters were analyzed monthly on water samples from the mouth of Tim's Branch. A summary of that data is presented in Table III Ii. The complete set of data is included in Appendix F. Four parameters were measured as field values: dissolved oxygen, pH, temperature and conductivity. Conductivity was also measured on samples returned to the laboratory.

There was little difference among stations for all parameters except Total Phosphorus and Nitrate Nitrogen. Both of these parameters were slightly elevated in Tim's Branch.

Dissolved Oxygen, pH, Specific Conductance, Temperature and Total Suspended Solids.

The Dissolved Oxygen concentrations (field measurement; Appendix Dii) ranged from 7.3 mg/l to 13.0 mg/l with an overall annual mean of 9.5 mg/l. The annual mean for pH (Field measurement; Appendix Di) was highest at Tim's Branch (6.36) and lowest at site #1. The range for pH was 5.5 to 7.6.

Specific Conductance varied from a high of 29 micromhos/cm to a low of 18 micromhos/cm, with no apparent differences among sites.

The overall mean for Temperature (November - April) was 12.7 °C with a high of 19°C and a low of 7°C. The Temperature followed normal seasonal fluctuations.

Total Suspended Solids ranged from a high of 18 to a low of <4 mg/l. The suspended solids appear to be similar to all sites.

Nitrogen and Phosphorus (Figure Ii)

Through the reporting period the Nitrate Nitrogen was consistently higher at Tim's Branch (mean: 0.9 mg/l). The annual means at the other sites were between 0.083 and 0.15 mg/l. The increase in the mean nitrate nitrogen level at downstream sites (0.12 - 0.15 mg/l) as compared to site 1 (0.083 mg/l), shows that Tim's Branch contributes significantly to nitrate levels in Upper Three Runs Creek. The Ammonia Nitrogen and Nitrite Nitrogen at all sites for all months were below the detection limits for those parameters.

The annual site means for all Upper Three Runs Creek sites for Total Phosphorus were between 0.017 and 0.048 mg/l. Orthophosphate Phosphorus annual site means were below detectable limits at all sites. Total Phosphorus levels in Tim's Branch were much higher (0.65 mg/l). In November 1988, high total phosphorus concentrations in Tim's Branch affected Total Phosphorus readings in Upper Three Runs Creek, resulting in a high level at the first downstream site (2) - 0.2 mg/l, as compared to 0.01 mg/l at station 1.

Sodium, Manganese and Zinc

Sodium concentrations ranged from 1.3 to 2.3 mg/l. The annual site means for Manganese ranged from 0.031 to 0.040 mg/l. Zinc ranged from <0.005 to 0.039 mg/l with annual site mean range from 0.05 to 0.12 mg/l. The dissolved metals were occasionally higher than the total metals indicating the possibility of metal contamination of the sample during filtration. Concentrations of sodium, manganese and zinc were not higher at downstream sites than at site 1.

Chromium, Copper, Lead, Mercury and Uranium

Chromium, Copper, Lead, Mercury and Uranium were right at or below detectable levels at all sites throughout the reporting period, with a single exception. At site 2 in January 1989 a level of 144 ug/l was recorded for sediment mercury. Sediment mercury levels in February - April 1989 were not elevated. Insufficient data is available to conclude that site 2 is characterized by elevated mercury levels post-operationally. Similarly, sites 3-5 do not show any increase in mercury or other measured methods as compared to the control site.

Residual Chlorine

Residual Chlorine was not detected during the reporting period (maximum detection limit = 0.1 mg/l).

Hardness and Alkalinity

Hardness and alkalinity values were quite low at all sites throughout the period, indicating a very soft water with little available buffering capacity. Hardness ranged from 6.0 to 11 mg/l and alkalinity ranged from <1 to 11 mg/l.

Tributyl Phosphate and Kerosene

Neither Tributyl Phosphate nor Kerosene were detected above the method detection limits during this part of the study.

Table III Ii:

Statistical Description of the Water Chemistry Parameters Measured at Five Sites Along Upper Three Runs Creek, Savannah River Site Aiken County, South Carolina. November 1988 - April 1989.

SITE #1

Parameter	Mean [a]	Standard Deviation	Range
Conductivity (umhos)	23	3.082	18 - 26
Chromium	BDL*	0.007	<0.005 - 0.018
Copper	BDL*	0.002	<0.005 - 0.005
Lead	BDL*	0	<0.005 - <0.01
Manganese	0.035	0.019	0.019 - 0.065
Mercury (ug/l)	BDL*	0	<0.2 - <0.5
Sodium	1.5	0.179	1.3 - 1.8
Uranium (ug/l)	1.5	3.674	<0.001 - 9
Zinc	0.0555	0.0975	0.006 - 0.253
Dissolved Chromium	BDL*	0.002	<0.005 - 0.005
Dissolved Copper	BDL*	0.004	<0.005 - 0.010
Dissolved Lead	BDL*	0	<0.005 - <0.01
Dissolved Manganese	0.0224	0.0234	<0.02 - 0.062
Dissolved Mercury	BDL*	0	<0.2 - <0.5
Dissolved Sodium	1.52	0.167	1.32 - 1.8
Dissolved Uranium	2.005	4.899	<0.001 - 12
Dissolved Zinc	0.0698	0.096	<0.04 - 0.24
Nitrate Nitrogen	0.083	0.098	<0.1 - 0.2
Nitrite Nitrogen	BDL*	0	<0.01
Orthophosphate	BDL*	0.005	<0.01 - 0.01
Total Phosphate as Phosphorus	0.0167	0.010	<0.01 - 0.03
Ammonia Nitrogen	BDL*	0.044	<0.1 - 0.11
Hardness	8.1	1.36	6.2 - 10
Alkalinity	6.02	3.58	<1 - 10
Residual Chlorine	BDL*	0	<0.05
Total Suspended Solids	5	7.04	<4 - 18
Kerosene	BDL*	0	<100
Tributyl Phosphate	BDL*	0	<100

a In calculating the Mean and Standard Deviation, results below the detection limit were treated as 0.0.

* BDL = All values were below the detection limits listed in the range.

b The above results are reported in milligrams per liter unless otherwise noted.

Table III Ii:

Statistical Description of the Water Chemistry Parameters Measured at Five Sites Along Upper Three Runs Creek, Savannah River Site Aiken County, South Carolina. November 1988 - April 1989.

SITE #2

Parameter	Mean [a]	Standard Deviation	Range
Conductivity (umhos)	23.67	3.327	18 - 28
Chromium	BDL*	0.0029	<0.005 - 0.007
Copper	BDL*	0.0037	<0.005 - 0.009
Lead	BDL*	0.0024	<0.005 - 0.006
Manganese	0.038	0.0169	0.02 - 0.063
Mercury (ug/l)	BDL*	0	<0.2 - <0.5
Sodium	1.6	0.379	1.3 - 2.3
Uranium (ug/l)	1.502	3.208	<0.001 - 8
Zinc	0.074	0.082	0.226 - 0.014
Dissolved Chromium	BDL*	0	<0.005
Dissolved Copper	BDL*	0.0037	<0.005 - 0.009
Dissolved Lead	BDL*	0	<0.005 - <0.01
Dissolved Manganese	0.024	0.024	<0.02 - 0.069
Dissolved Mercury	BDL*	0	<0.2 - <0.5
Dissolved Sodium	1.67	0.317	1.3 - 2.11
Dissolved Uranium	0.50	1.224	<0.001 - 3
Dissolved Zinc	0.062	0.0814	<0.04 - 0.22
Nitrate Nitrogen	0.15	0.138	<0.1 - 0.4
Nitrite Nitrogen	BDL*	0	<0.01
Orthophosphate	BDL*	0.008	<0.01 - 0.02
Total Phosphate as Phosphorus	0.048	0.0749	<0.01 - 0.20
Ammonia Nitrogen	BDL*	0.004	<0.1 - 0.01
Hardness	9.425	1.461	6.3 - 11
Alkalinity	5.42	2.313	2 - 8.1
Residual Chlorine	BDL*	0	<0.05
Total Suspended Solids	2.33	3.67	<4 - 8
Kerosene	BDL*	0	<100
Tributyl Phosphate	BDL*	0	<100

a In calculating the Mean and Standard Deviation, results below the detection limit were treated as 0.0.

* BDL = All values were below the detection limits listed in the range.

b The above results are reported in milligrams per liter unless otherwise noted.

Table III Ii:

Statistical Description of the Water Chemistry Parameters Measured at Five Sites Along Upper Three Runs Creek, Savannah River Site Aiken County, South Carolina. November 1988 - April 1989.

SITE #3

Parameter	Mean [a]	Standard Deviation	Range
Conductivity (umhos)	24.17	3.656	18 - 29
Chromium	BDL*	0	<0.005
Copper	BDL*	0	<0.005
Lead	BDL*	0	<0.005 - <0.01
Manganese	0.0312	0.022	<0.027 - 0.062
Mercury (ug/l)	BDL*	0	<0.2 - <0.5
Sodium	1.74	0.281	1.54 - 2.3
Uranium (ug/l)	4.337	9.666	<0.001 - 24
Zinc	0.106	0.1487	0.39 - <0.04
Dissolved Chromium	BDL*	0.0049	<0.005 - 0.012
Dissolved Copper	BDL*	0.0041	<0.005 - 0.010
Dissolved Lead	BDL*	0	<0.005 - <0.01
Dissolved Manganese	0.014	0.013	<0.02 - 0.037
Dissolved Mercury	BDL*	0	<0.2 - <0.5
Dissolved Sodium	1.75	0.307	1.5 - 2.3
Dissolved Uranium	1.83	4.49	<0.001 - 11
Dissolved Zinc	0.1085	0.172	<0.04 - 0.45
Nitrate Nitrogen	0.116	0.098	<0.1 - 0.2
Nitrite Nitrogen	BDL*	0	<0.01
Orthophosphate	BDL*	0.005	<0.01 - 0.01
Total Phosphate as Phosphorus	0.018	0.0117	<0.01 - 0.03
Ammonia Nitrogen	BDL*	0.004	<1 - 0.01
Hardness	8.24	1.910	6 - 11
Alkalinity	5.33	2.81	<1 - 8.3
Residual Chlorine	BDL*	0.061	<0.05 - 0.15
Total Suspended Solids	3	3.347	<4 - 5
Kerosene	BDL*	0	<100
Tributyl Phosphate	BDL*	0	<100

a In calculating the Mean and Standard Deviation, results below the detection limit were treated as 0.0.

* BDL = All values were below the detection limits listed in the range.

b The above results are reported in milligrams per liter unless otherwise noted.

Table III Ii:

Statistical Description of the Water Chemistry Parameters Measured at Five Sites Along Upper Three Runs Creek, Savannah River Site Aiken County, South Carolina. November 1988 - April 1989.

SITE #4

Parameter	Mean [a]	Standard Deviation	Range
Conductivity (umhos)	24.33	2.732	20 - 28
Chromium	BDL*	0	<0.005
Copper	BDL*	0.0022	<0.005 - 0.005
Lead	BDL*	0	<0.005 - <0.01
Manganese	0.0397	0.0172	0.025 - 0.070
Mercury (ug/l)	BDL*	0	<0.2 - <0.5
Sodium	1.82	0.290	1.51 - 2.3
Uranium (ug/l)	2.671	6.053	<0.001 - 15
Zinc	0.0548	0.0529	<0.04 - 0.13
Dissolved Chromium	BDL*	0.007	<0.005 - 0.018
Dissolved Copper	BDL*	0.005	<0.005 - 0.012
Dissolved Lead	BDL*	0	<0.005 - <0.01
Dissolved Manganese	0.017	0.0126	<0.02 - 0.038
Dissolved Mercury	BDL*	0	<0.2 - <0.5
Dissolved Sodium	1.768	0.293	1.5 - 2.3
Dissolved Uranium	3	4.472	<0.001 - 10
Dissolved Zinc	0.078	0.087	<0.04 - 0.24
Nitrate Nitrogen	0.117	0.098	<0.1 - 0.2
Nitrite Nitrogen	BDL*	0	<0.01
Orthophosphate	BDL*	0.0055	<0.01 - 0.01
Total Phosphate as Phosphorus	0.018	0.0075	0.01 - 0.03
Ammonia Nitrogen	BDL*	0.0041	<0.1 - 0.01
Hardness	8.92	1.158	7 - 10
Alkalinity	4.87	3.050	<1 - 9.0
Residual Chlorine	BDL*	0	<0.05
Total Suspended Solids	4.12	3.601	<4 - 8
Kerosene	BDL*	0	<100
Tributyl Phosphate	BDL*	0	<100

a In calculating the Mean and Standard Deviation, results below the detection limit were treated as 0.0.

* BDL = All values were below the detection limits listed in the range.

b The above results are reported in milligrams per liter unless otherwise noted.

Table III Ii:

Statistical Description of the Water Chemistry Parameters Measured at Five Sites Along Upper Three Runs Creek, Savannah River Site Aiken County, South Carolina. November 1988 - April 1989.

SITE #5

Parameter	Mean [a]	Standard Deviation	Range
Conductivity (umhos)	24.67	3.326	19 - 29
Chromium	BDL*	0	<0.005
Copper	BDL*	0	<0.005
Lead	BDL*	0	<0.005 - <0.01
Manganese	0.032	2.2799	0.024 - 0.06
Mercury (ug/l)	BDL*	0	<0.2 - <0.5
Sodium	1.82	0.293	1.5 - 2.3
Uranium (ug/l)	3.0035	7.347	<0.001 - 18
Zinc	0.1182	0.129	<0.04 - 0.35
Dissolved Chromium	BDL*	0	<0.005
Dissolved Copper	BDL*	0.0041	<0.005 - 0.010
Dissolved Lead	BDL*	0	<0.005 - <0.01
Dissolved Manganese	0.013	0.0113	<0.02 - 0.032
Dissolved Mercury	BDL*	0	<0.2 - <0.5
Dissolved Sodium	1.857	0.309	1.6 - 2.3
Dissolved Uranium	0.0025	0.0061	<0.001 - 0.015
Dissolved Zinc	0.115	0.161	<0.04 - 0.38
Nitrate Nitrogen	0.117	0.0983	<0.1 - 0.2
Nitrite Nitrogen	BDL*	0	<0.01
Orthophosphate	BDL*	0.0053	<0.01 - 0.01
Total Phosphate as Phosphorus	0.023	0.0082	0.01 - 0.03
Ammonia Nitrogen	BDL*	0.163	<0.01 - 0.4
Hardness	8.41	1.009	7 - 10
Alkalinity	5.55	3.000	1 - 9.4
Residual Chlorine	BDL*	0	<0.05
Total Suspended Solids	4.5	3.987	<4 - 10
Kerosene	BDL*	0	<100
Tributyl Phosphate	BDL*	0	<100

a In calculating the Mean and Standard Deviation, results below the detection limit were treated as 0.0.

* BDL = All values were below the detection limits listed in the range.

b The above results are reported in milligrams per liter unless otherwise noted.

Table III Ii:

Statistical Description of the Water Chemistry Parameters Measured at Five Sites Along Upper Three Runs Creek, Savannah River Site Aiken County, South Carolina. November 1988 - April 1989.

TIM'S BRANCH

Parameter	Mean [a]	Standard Deviation	Range
Chromium	BDL*	0	<0.005
Copper	BDL*	0.00245	<0.005 - 0.006
Mercury (ug/l)	BDL*	0	<0.2 - <0.5
Zinc	0.0533	0.072	<0.005 - 0.19
Nitrate Nitrogen	0.9	0.587	0.4 - 2.0
Total Phosphate as Phosphorus	0.065	0.0122	0.05 - 0.08
Sediments			
Site 1 Mercury (ug/l)	BDL*	11.66	<2.0 - 24
Site 2 Mercury (ug/l)	BDL*	57.60	<2.0 - 144
Site 3 Mercury (ug/l)	BDL*	0	<20 - <50
Site 4 Mercury (ug/l)	BDL*	0	<20 - <50
Site 5 Mercury (ug/l)	BDL*	25.6	<20 - 63

a In calculating the Mean and Standard Deviation, results below the detection limit were treated as 0.0.

* BDL = All values were below the detection limits listed in the range.

b The above results are reported in milligrams per liter unless otherwise noted.

Figure Ii: Nitrate Nitrogen Levels and Total Phosphate Levels for Water Chemistry Sampling at Five Sites on Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina. October 1988 - April 1989.

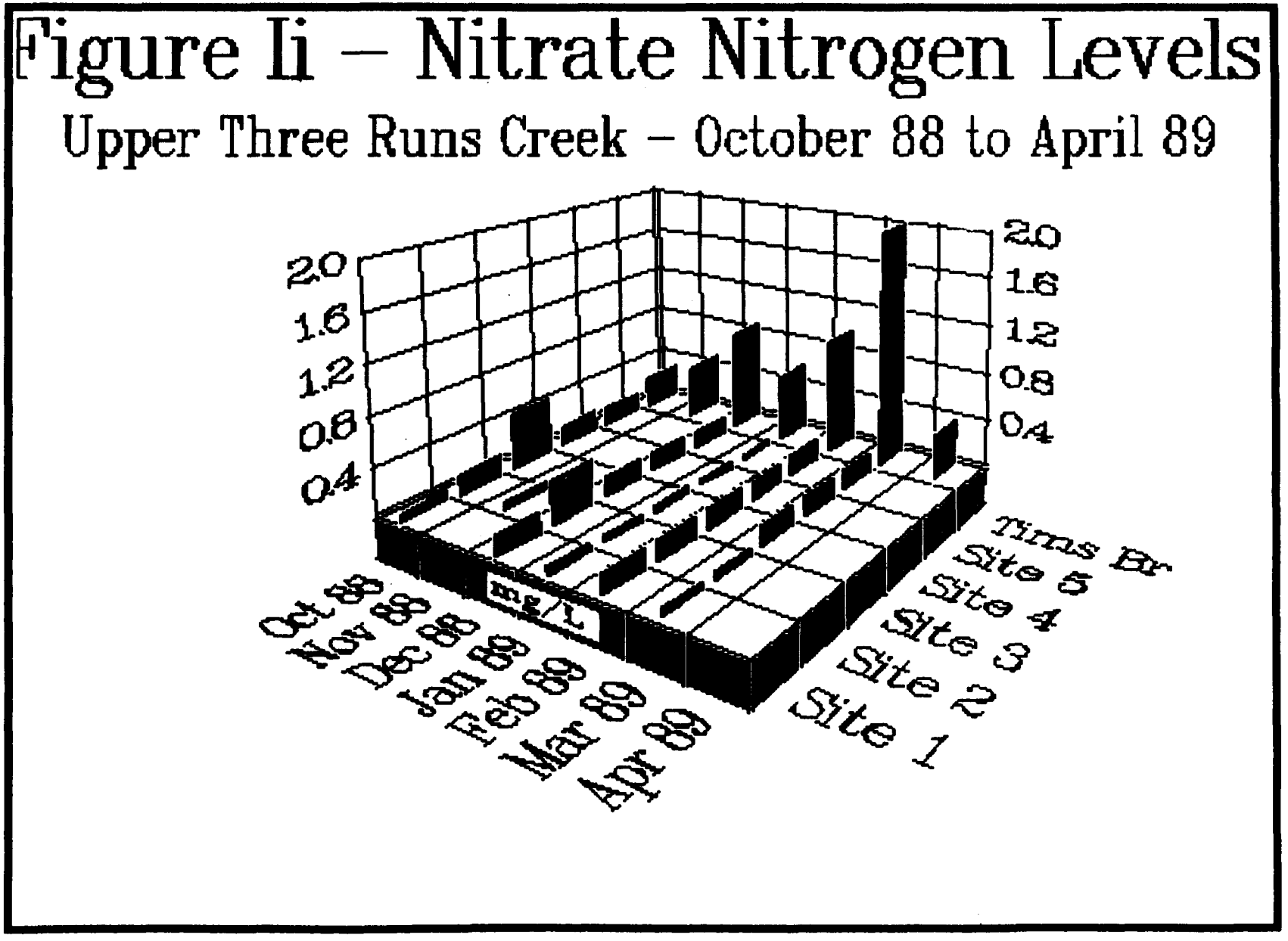
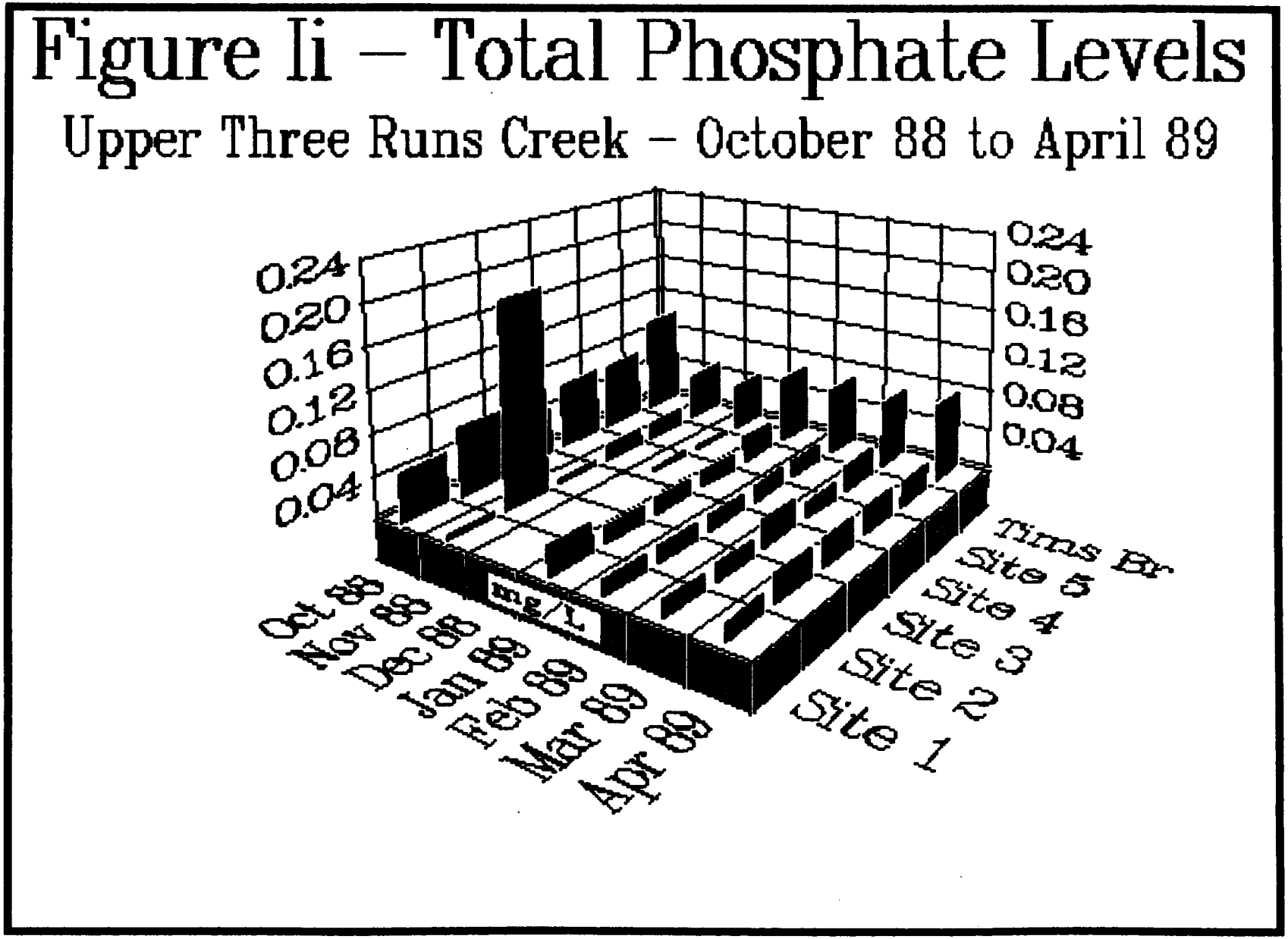


Figure Ii: Nitrate Nitrogen Levels and Total Phosphate Levels for Water Chemistry Sampling at Five Sites on Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina. October 1988 - April 1989.



IV. SUMMARY

The first six months of biological and chemical assessment after the start-up of effluent release by the F/H Area Effluent Treatment Facility of the Savannah River Site indicated the entire stream reach under investigation continues to support a diverse, species rich, well balanced macroinvertebrate community indicative of excellent water quality. A number of minor, but statistically significant shifts in the structure of the community, as compared to pre-operational findings, were noted. These shifts included changes in the trophic (functional group) structure of the community as well as the percent composition by major taxonomic group. Although statistically significant, these changes were small and largely involved changes among pollution intolerant groups rather than a shift toward more tolerant aquatic organisms. The observed changes are not believed to be due to discharges from the F/H ETF. A confirmation that the noted shifts in community structure among aquatic macroinvertebrates were unrelated to effluent releases is that no significant differences among sites (including upstream vs. downstream) were measured for any biological parameter. The individual results for each biological index of stream quality are as follows:

Species Richness:

The mean species richness per site for quantitative sampling from 42.5 pre-operationally to 41.0 post-operationally. The decrease was not significant. No significant differences among sites in the number of species collected quantitatively per site were found. In fact, the number of species at each downstream site was equal to or greater than at the control site. A storm event in April 1989 reduced species richness for that quantitative sampling period as compared to April 1988. The single post-operational qualitative collection yielded 146 species, a very high species richness value indicative of excellent water quality. The number of species collected per replicate was similar pre-operationally and post-operationally. Post-operational sampling also showed no significant differences among sites.

Total # of Organisms/Mean Density:

3,461 aquatic macroinvertebrates were collected during the two post-operational sampling periods. This represented 346.1 organisms per site (553.8/m2) retrieved in quantitative sampling. Statistical analysis by non-parametric procedures indicated that the mean number of organisms per site (and the mean density of organisms) showed no significant differences among sites. Comparison of pre-operational data and post operational data also showed no significant difference. Highest numbers of organisms were collected during January 1989.

% Composition by Major Taxonomic Group:

As is a characteristic of southeastern United States streams, the macroinvertebrate community of Upper Three Runs Creek, as sampled by multiplate artificial substrate samplers, was dominated by midges (61.5%). This proportion of midges was reduced from 66.3% in pre-operational collections, reflecting a substantial decrease in midges during April 1989 as compared to April 1988. The percentage of beetles and non-chironomid diptera increase during April 1989. Further analysis showed a disproportionally large amount of "clinger" habit organisms in April 1989, reflecting the concurrent storm event. Winter samples were taken earlier in the season (January) in 1989 as compared to 1988 (February), resulting in fewer mayflies and more caddisflies and non-chironomid diptera in 1989. Some significant differences in the proportion of major taxonomic groups among sites were noted in post-operational data. Specifically, fewer mayflies and more non-chironomid diptera were collected at site 4 than at other sites, and more stoneflies were found at site 3. However, no clear trends attributable to an

F/H area discharge impact were noted. Qualitative sampling, reaching a broader range of stream habitats, indicated that quantitative sampling may have been biased toward rheophilic midges.

As noted pre-operationally, midges comprised a smaller percentage of organisms collected qualitatively (44-48%) than quantitatively. Larger proportions of caddisflies were collected post-operationally.

Shannon-Weaver Diversity:

At an average level of 4.44, the measured post-operational diversity of the macroinvertebrate community was high, and only insignificantly reduced from the pre-operational mean of 4.46. There was relatively little variation by site, with no site having a community with a mean diversity significantly different than that at other sites. Diversity did vary on a seasonal basis, and was lowest during October 1989 (3.95) and highest in January (5.01). Even the low values, however, were indicative of excellent diversity. The stream community at all sites appears to be well balanced.

Equitability:

Post-operational equitability of the macroinvertebrate community was good at all sites, averaging 0.77. All values equaled or exceeded a value of 0.5 in equitability. No significant differences in the mean equitability among sites were found. However, equitability values for January 1989 at site 3 were quite low (0.62) as compared to other sampling period/site combinations.

Biomass:

The average biomass collected per site per sampling period was 0.4537 g per m2. Among sites, the mean biomass did not vary significantly. Biomass did increase during the winter and spring as many stoneflies, mayflies and caddisflies approached and reached emergence and maturity, and during April 1989 (as compared to April 1988) as a result of scouring by high flow during a storm event.

Biotic Index:

Overall, the biotic index values obtained were suggestive of good water quality, but not low enough to suggest excellent water quality. This is likely a function of the Biotic Index, designed upon data from northern streams less dominated by midges. It seems likely this index underestimates the presence of pollution intolerant species in this system. This is especially true of the orthoclad midges, which are generally given a poor biotic index rating. Analysis of the data indicated no significant differences among site means or between pre-operational and post-operational site means.

EPT Index:

The average number of mayfly, stonefly and caddisfly species collected quantitatively per site in post-operational sampling was 16.5, and ranged from 13 to 20. Site 4 exhibited the lowest EPT average. However, the

mean EPT at site 4 was not significantly less than at other sites. Large numbers of ephemerellid mayflies and perlodid stoneflies resulted in the high EPT values in both post-operational sampling periods. As would be anticipated, EPT values based upon qualitative sampling (23.6) were greater than those for quantitative sampling. This level of the EPT index shows an abundance of taxa in these orders within Upper Three Runs Creek and is suggestive of excellent water quality.

Functional Group Analysis:

As has been noted in previous studies, the macroinvertebrate community of Upper Three Runs Creek was found to be dominated by collectors (66%), based upon numbers of organisms collected quantitatively. Proportions of collector-filterers and predators increased during post-operational collecting. Scrapers and shredders did not shift in their respective proportions. No differences in the post-operational percentages of functional groups among sites was noted. Functional group analysis based upon biomass showed predators to be dominant, comprising 61% of the biomass, with collectors reduced to only 12%. This trend can be attributed to the collectors being primarily midges and the predators being primarily stoneflies of substantial size. All sites demonstrated similar proportions of the various functional groups.

Dominant Species:

Orthoclad midges were the dominant organisms collected by multiplate artificial substrate sampler, particularly the midges Rheocricotopus robacki, Orthocladius curtiseta, Corynoneura, Polypedilum convictum and Rheotanytarsus distinctissimus. These rheophilic species were collected in large numbers. Qualitative sampling showed different species dominant in non-snag habitats. In mud/detritus and leaf pack habitats dominant species included orthoclad and chironomini midges, leptophlebiid mayflies and Phylocentropus caddisflies. Sand habitats were dominated by midges characteristic of such an environment, e.g., Beckidia, Cladotanytarsus and Rheosmittia, as well as numerous other orthoclad midges. Due to the patchy nature of habitat distribution at individual sites, there were some differences in dominant species among sites, but no marked shifts were noted.

Water Quality

Thirty-one parameters were analyzed monthly on water samples collected from the five sites on Upper 3 Runs Creek. Only total phosphorus and nitrate nitrogen were measured at elevated levels downstream. However, this difference may be attributed to nutrient addition from Tims Branch, rather than the F/H ETF effluent. A single elevated sediment mercury measurement (January 1989) at site 2 raised the possibility of low level mercury contamination (144 ug/l). However, this observation was not confirmed in subsequent sampling.

All other measured parameters exhibited similar concentrations upstream and downstream, with no observed impact by the F/H area ETF.

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APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 1 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Heptagenia flavescens	0	0	0	0	1	1
Stenonema modestum/smithae	1	0	0	0	0	1
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	3	1	0	0	1	5
Paragnetina kansensis	0	0	0	0	1	1
Pteronarcys dorsata	1	0	1	0	0	2
HEMIPTERA (true bugs)						
MEGALOPTERA						
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	0	1	0	0	0	1
Hydropsyche elissoma	4	0	0	0	4	8
Neureclipsis sp.	0	0	0	0	2	2
LEPIDOPTERA (moths)						
COLEOPTERA (beetles)						
Stenelmis sp. *	0	1	0	0	0	1
DIPTERA - misc. (true flies)						
Empididae	0	0	0	0	2	2
Simulium dixiense/jonesi	2	0	1	0	0	3
DIPTERA- Chironomidae (midges)						

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 1 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
Corynoneura sp. 3	4	0	1	1	2	8
Cricotopus sp.*	0	0	0	0	1	1
Meropelopia americana	1	0	0	0	0	1
Nanocladius rectinervis	1	0	0	0	0	1
Orthocladius curtiseta	0	1	0	0	0	1
Parakiefferiella sp. A	0	1	1	0	2	4
Paratanytarsus sp.6	1	0	1	0	0	2
Polypedilum convictum	6	0	0	0	7	13
Polypedilum fallax	0	1	0	0	0	1
Polypedilum halterale	1	0	0	0	0	1
Polypedilum scalaenum	1	0	0	0	0	1
Rheocricotopus robacki	7	1	1	0	3	12
Rheotanytarsus distinctissimus	5	5	0	2	2	14
Rheotanytarsus exiguus	15	1	0	0	5	21
Tanytarsus glabrescens gp.	11	6	0	1	11	29
Tanytarsus sp. XIII Rutter	0	1	0	0	0	1
Thienemanniella fusca gp.	5	0	0	1	5	11
Thienemanniella sp.*	2	0	0	1	1	4
Tvetenia discoloripes gp.	1	0	0	0	0	1
CRUSTACEA						

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Heptagenia flavescens	0	0	0	1	0	1
Stenonema modestum/smithae	0	0	0	1	0	1
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	1	3	0	1	2	7
Acroneuria mela	0	1	0	0	0	1
Leuctra sp.	0	0	0	1	0	1
Paragnetina kansensis	6	1	0	1	1	9
Pteronarcys dorsata	1	2	0	0	4	7
HEMIPTERA (true bugs)						
MEGALOPTERA						
Corydalus cornutus	1	1	2	0	0	4
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	0	0	0	1	0	1
Hydropsyche elissoma	4	1	0	3	0	8
Micrasema rusticum	1	0	0	0	0	1
LEPIDOPTERA (moths)						
COLEOPTERA (beetles)						
Macronychus glabratus	1	1	0	0	0	2
Sperchopsis tessellatus	0	1	0	0	0	1
Stenelmis sp. *	0	0	1	1	0	2
DIPTERA - misc. (true flies)						

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
Atherix lantha	0	0	0	0	1	1
Empididae	1	1	0	0	2	4
Hexatoma (Eriocera) cinerea	0	1	0	0	0	1
Simulium dixiense/jonesi	1	1	0	7	0	9
DIPTERA- Chironomidae (midges)						
Ablabesmyia mallochi	0	0	0	0	1	1
Cladotanytarsus sp. A	0	0	0	0	1	1
Corynoneura sp. 3	0	0	0	4	0	4
Orthocladius dentifer	0	0	0	0	1	1
Parakiefferiella sp. A	0	0	0	1	2	3
Parametriocnemus sp. C	0	0	0	1	0	1
Polypedilum convictum	3	1	0	17	5	26
Polypedilum illinoense	2	1	0	0	0	3
Polypedilum scalaenum	0	0	1	0	0	1
Rheocricotopus robacki	0	1	0	12	5	18
Rheotanytarsus distinctissimus	1	2	1	1	0	5
Rheotanytarsus exiguus	0	0	0	1	0	1
Stelechomyia perpulchra	0	2	0	0	0	2
Synorthocladius semivirens	0	0	0	1	0	1
Tanytarsus glabrescens gp.	0	0	0	2	0	2
Thienemanniella fusca gp.	0	1	0	5	4	10
CRUSTACEA						
ANNELIDA (worms)						
MOLLUSCA (snails, clams)						
ACARI						

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Stenonema modestum/smithae	3	0	0	1	3	7
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	1	2	4	2	0	9
Leuctra sp.	0	1	0	0	0	1
Paragnetina kansensis	0	3	0	1	0	4
Pteronarcys dorsata	0	0	3	1	0	4
HEMIPTERA (true bugs)						
MEGALOPTERA						
Corydalus cornutus	1	1	0	0	1	3
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	1	6	2	0	0	9
Cheumatopsyche sp.	0	0	0	0	1	1
Hydropsyche elissoma	0	1	1	0	0	2
Neureclipsis sp.	0	0	0	0	2	2
LEPIDOPTERA (moths)						
Parapoynx obscuralis	0	1	0	0	0	1
COLEOPTERA (beetles)						
Dubiraphia quadrinotata	0	0	1	2	0	3
Macronychus glabratus	0	0	1	0	0	1
Stenelmis sp. *	0	2	2	1	0	5
DIPTERA - misc. (true flies)						

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
Atherix lantha	0	1	0	0	0	1
Empididae	1	0	0	0	0	1
Hexatoma (Eriocera) cinerea	1	0	0	0	0	1
Simulium dixiense/jonesi	0	0	1	1	0	2
DIPTERA- Chironomidae (midges)						
Meropelopia americana	0	0	1	0	1	2
Nilotanypus fimbriatus	0	0	0	0	1	1
Nilothauma babiyi	0	0	0	1	0	1
Pagastiella ostansa	0	0	0	0	1	1
Parakiefferiella sp. A	0	0	0	0	3	3
Parametriocnemus lundbecki	0	2	0	0	0	2
Polypedilum convictum	1	4	2	1	1	9
Polypedilum fallax	0	3	0	0	0	3
Polypedilum sp.*	0	0	1	0	0	1
Potthastia longimanus	0	1	0	0	0	1
Rheocricotopus robacki	1	0	1	0	0	2
Rheotanytarsus distinctissimus	1	0	0	0	1	2
Rheotanytarsus exiguus	0	0	3	1	4	8
Stelechomyia perpulchra	0	0	0	0	1	1
Stenochironomus hilaris	0	1	0	0	0	1
Tanytarsus glabrescens gp.	2	0	0	0	1	3
Tanytarsus sp. XIII Rutter	0	0	1	0	1	2
Thienemanniella fusca gp.	0	0	1	0	0	1

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Pseudocloeon dubium/bimaculatus	0	0	0	0	1	1
Stenonema modestum/smithae	0	1	1	2	0	4
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	6	3	0	2	3	14
Paragnetina kansensis	1	0	0	1	0	2
Pteronarcys dorsata	0	0	0	1	1	2
HEMIPTERA (true bugs)						
MEGALOPTERA						
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	2	0	1	0	0	3
Cheumatopsyche sp.	0	0	1	0	0	1
Hydropsyche elissoma	5	1	9	1	3	19
LEPIDOPTERA (moths)						
Parapoynx obscuralis	0	1	0	0	0	1
COLEOPTERA (beetles)						
Stenelmis sp. *	1	1	0	0	1	3
DIPTERA - misc. (true flies)						
Atherix lantha	0	2	0	0	1	3
Palpomyia sp. 5	0	1	0	0	0	1
Simulium dixiense/jonesi	2	0	0	0	0	2

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
DIPTERA- Chironomidae (midges)						
Brillia flavifrons	0	0	1	0	0	1
Corynoneura nr. taris	0	1	1	0	1	3
Corynoneura sp. 3	0	1	1	1	1	4
Nanocladius rectinervis	0	0	0	0	1	1
Nilotanypus fimbriatus	0	0	0	0	1	1
Orthocladius dentifer	1	0	3	1	1	6
Parakiefferiella sp. A	2	0	0	4	6	12
Parametriocnemus lundbecki	0	0	0	0	1	1
Polypedilum convictum	4	4	0	2	6	16
Potthastia longimanus	2	1	0	0	1	4
Rheocricotopus robacki	1	9	0	1	8	19
Rheocricotopus tuberculatus	0	0	2	0	1	3
Rheotanytarsus distinctissimus	0	2	2	1	19	24
Rheotanytarsus exiguus	4	1	0	0	1	6
Stelechomyia perpulchra	0	0	0	1	0	1
Tanytarsus glabrescens gp.	8	0	0	3	1	12
Thienemanniella fusca gp.	3	3	5	2	7	20
Thienemanniella xena gp.	1	0	0	2	2	5
Tvetenia discoloripes gp.	0	0	2	0	0	2

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 5 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
PLECOPTERA (stoneflies)						
Acroneuria abnormis	0	2	2	1	5	10
Paragnetina kansensis	1	2	0	0	1	4
Pteronarcys dorsata	0	0	0	3	0	3
HEMIPTERA (true bugs)						
MEGALOPTERA						
Sialis prob. vagans	0	0	0	1	0	1
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	0	0	0	15	15	30
Hydropsyche elissoma	0	0	0	2	0	2
LEPIDOPTERA (moths)						
COLEOPTERA (beetles)						
Dubiraphia quadrinotata	0	0	0	0	2	2
Ectopria nervosa	0	0	0	0	1	1
Macronychus glabratus	0	0	0	2	0	2
Stenelmis sp. *	0	0	1	1	2	4
DIPTERA - misc. (true flies)						
Atherix lantha	0	0	0	1	1	2
Empididae	0	1	0	0	2	3
Simulium dixiense/jonesi	0	0	0	1	0	1

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 5 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
DIPTERA- Chironomidae (midges)						
Corynoneura nr. taris	2	0	0	0	0	2
Corynoneura sp. 3	1	0	0	0	0	1
Orthocladius dentifer	0	0	5	1	2	8
Parakiefferiella sp. A	1	0	0	0	0	1
Polypedilum convictum	4	5	1	1	1	12
Polypedilum fallax	2	0	0	0	0	2
Rheocricotopus robacki	2	1	2	1	1	7
Rheocricotopus tuberculatus	1	1	0	0	0	2
Rheotanytarsus distinctissimus	2	0	2	0	0	4
Stelechomyia perpulchra	0	1	0	0	0	1
Tanytarsus glabrescens gp.	3	1	1	0	0	5
Thienemanniella fusca gp.	4	2	2	0	1	9
Thienemanniella xena gp.	0	0	2	0	0	2
Tvetenia discoloripes gp.	0	0	1	0	0	1

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
EPHEMEROPTERA (mayflies)						
Heptagenia flavescens	1	1	0	0	0	2
Pseudocloeon dubium/bimaculatus	0	0	0	1	0	1
Stenonema modestum/smithae	1	1	7	4	0	13
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	5	7	9	14	10	45
Acroneuria mela	0	1	0	0	0	1
Leuctra sp.	0	1	1	0	0	2
Paragnetina kansensis	1	9	4	2	4	20
Pteronarcys dorsata	2	7	4	2	3	18
HEMIPTERA (true bugs)						
MEGALOPTERA						
Corydalus cornutus	0	4	3	0	0	7
Sialis prob. vagans	0	0	0	0	1	1
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	1	1	9	3	30	44
Cheumatopsyche sp.	0	0	1	1	0	2
Hydropsyche elissoma	8	8	2	19	2	39
Micrasema rusticum	0	1	0	0	0	1
Neureclipsis sp.	2	0	2	0	0	4
LEPIDOPTERA (moths)						
Parapoynx obscuralis	0	0	1	1	0	2
COLEOPTERA (beetles)						
Dubiraphia quadrinotata	0	0	3	0	2	5

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Ectopria nervosa	0	0	0	0	1	1
Macronychus glabratus	0	2	1	0	2	5
Sperchopsis tessellatus	0	1	0	0	0	1
Stenelmis sp. *	1	2	5	3	4	15
DIPTERA - misc. (true flies)						
Atherix lantha	0	1	1	3	2	7
Empididae	2	4	1	0	3	10
Hexatoma (Eriocera) cinerea	0	1	1	0	0	2
Palpomyia sp. 5	0	0	0	1	0	1
Simulium dixiense/jonesi	3	9	2	2	1	17
DIPTERA- Chironomidae (midges)						
Ablabesmyia mallochi	0	1	0	0	0	1
Brillia flavifrons	0	0	0	1	0	1
Cladotanytarsus sp. A	0	1	0	0	0	1
Corynoneura nr. taris	0	0	0	3	2	5
Corynoneura sp. 3	8	4	0	4	1	17
Cricotopus sp.*	1	0	0	0	0	1
Meropelopia americana	1	0	2	0	0	3
Nanocladius rectinervis	1	0	0	1	0	2
Nilotanypus fimbriatus	0	0	1	1	0	2
Nilothauma babiyi	0	0	1	0	0	1
Orthocladius curtiseta	1	0	0	0	0	1
Orthocladius dentifer	0	1	0	6	8	15
Pagastiella ostroma	0	0	1	0	0	1
Parakiefferiella sp. A	4	3	3	12	1	23
Parametriocnemus lundbecki	0	0	2	1	0	3
Parametriocnemus sp. C	0	1	0	0	0	1
Polypedilum convictum	13	26	9	16	12	76
Polypedilum fallax	1	0	3	0	2	6
Polypedilum halterale	1	0	0	0	0	1
Polypedilum illinoense	0	3	0	0	0	3
Polypedilum scalaenum	1	1	0	0	0	2
Polypedilum sp.*	0	0	1	0	0	1
Potthastia longimanus	0	0	1	4	0	5
Rheocricotopus robacki	12	18	2	19	7	58
Rheocricotopus tuberculatus	0	0	0	3	2	5
Rheotanytarsus distinctissimus	14	5	2	24	4	49

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Rheotanytarsus exiguus	21	1	8	6	0	36
Stelechomyia perpulchra	0	2	1	1	1	5
Stenochironomus hilaris	0	0	1	0	0	1
Synorthocladius semivirens	0	1	0	0	0	1
Tanytarsus glabrescens gp.	29	2	3	12	5	51
Tanytarsus sp. XIII Rutter	1	0	2	0	0	3
Thienemanniella fusca gp.	11	10	1	20	9	51
Thienemanniella xena gp.	4	0	0	5	2	11
Tvetenia discoloripes gp.	1	0	0	2	1	4

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 1 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Acerpenna pygmaeus	1	0	0	0	0	1
Ephemerella invaria/rotunda	4	1	0	1	1	7
Heptageniidae*	0	1	0	0	0	1
Pseudocloeon punctiventris	1	0	0	0	0	1
Stenonema modestum/smithae	7	0	2	0	2	11
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	1	2	0	0	1	4
Acroneuria mela	0	0	0	1	0	1
Isoperla orata/dicala	1	0	0	0	0	1
Isoperla sp.*	8	0	1	1	0	10
Paragnetina kansensis	0	1	1	0	0	2
Perlesta placida	0	1	0	2	3	6
Pteronarcys dorsata	1	3	4	1	1	10
Taeniopteryx nr.lita	1	0	2	0	0	3
HEMIPTERA (true bugs)						
MEGALOPTERA						
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	3	5	3	1	1	13
Diplectrona modesta	2	0	0	1	0	3
Hydropsyche elissoma	0	0	2	0	0	2
Micrasema rusticum	6	0	0	0	0	6
LEPIDOPTERA (moths)						
COLEOPTERA (beetles)						

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 1 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
Gonielmis dietrichi	0	1	0	0	0	1
Macronychus glabratus	1	0	0	0	0	1
Stenelmis markeli	1	0	0	0	0	1
Stenelmis sp. *	1	0	0	0	0	1
DIPTERA - misc. (true flies)						
Atherix lantha	1	0	0	0	0	1
Ectemnia invenusta	1	0	0	0	0	1
Simulium dixiense/jonesi	1	0	1	0	0	2
Simulium tuberosum	2	0	2	1	0	5
DIPTERA- Chironomidae (midges)						
Brillia flavifrons	1	0	1	0	1	3
Conchapelopia sp.	4	0	0	0	0	4
Corynoneura sp. 3	12	0	10	11	25	58
Cricotopus bicinctus	0	0	1	0	0	1
Orthocladius obumbratus	0	0	0	2	2	4
Orthocladius dentifer	0	3	2	8	1	14
Orthocladius annectens	1	0	0	0	0	1
Parakiefferiella sp. A	1	1	5	2	12	21
Polypedilum convictum	10	2	2	2	8	24
Rheocricotopus robacki	16	2	13	7	5	43
Rheotanytarsus distinctissimus	6	0	2	5	10	23
Rheotanytarsus exiguus	2	1	1	1	2	7
Thienemanniella fusca gp.	0	1	0	1	16	18
Thienemanniella xena gp.	2	0	0	4	4	10
Tvetenia discolipes gp.	2	5	2	3	1	13
Tvetenia paucunca/vitracies	0	1	1	2	0	4

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Baetis intercalaris	0	2	0	0	0	2
Dannella simplex	0	2	0	0	0	2
Ephemerella dorothea	6	0	0	2	0	8
Heptagenia flavescens	1	0	0	0	0	1
Leptophlebia sp.	1	0	0	0	0	1
Stenonema modestum/smithae	7	11	0	3	0	21
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	0	3	1	1	2	7
Acroneuria mela	0	0	1	1	0	2
Isoperla bilineata	0	5	2	2	0	9
Paragnetina kansensis	0	0	0	1	0	1
Perlesta placida	8	12	1	0	0	21
Perlinella ephyre	0	0	0	3	0	3
Pteronarcys dorsata	1	1	0	0	2	4
Taeniopteryx nr.lita	0	1	2	1	0	4
HEMIPTERA (true bugs)						
MEGALOPTERA						
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	1	4	8	3	0	16
Chimarra sp.	0	2	0	0	0	2
Hydropsyche elissoma	9	3	3	3	0	18
Micrasema rusticum	2	0	1	2	0	5
LEPIDOPTERA (moths)						
COLEOPTERA (beetles)						

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
Macronychus glabratus	1	0	0	0	0	1
DIPTERA - misc. (true flies)						
Atherix lantha	0	1	0	0	0	1
Empididae	0	0	0	0	2	2
Simulium dixiense/jonesi	4	0	4	0	0	8
DIPTERA- Chironomidae (midges)						
Brillia flavifrons	2	0	1	0	1	4
Conchapelopia sp.	1	0	0	0	0	1
Corynoneura nr. taris	2	0	2	0	0	4
Corynoneura sp. 3	2	4	22	7	7	42
Orthocladius dentifer	5	3	8	1	5	22
Parakiefferiella sp. A	8	2	4	2	1	17
Parametriocnemus lundbecki	2	0	0	0	0	2
Polypedilum convictum	20	9	19	4	1	53
Rheocricotopus robacki	15	10	15	11	12	63
Rheotanytarsus distinctissimus	23	14	7	3	1	48
Rheotanytarsus exiguus	0	0	2	1	0	3
Thienemanniella fusca gp.	4	1	0	0	1	6
Thienemanniella xena gp.	0	8	8	1	1	18
Tvetenia discoloripes gp.	2	0	0	2	0	4
Tvetenia paucunca/vitracies	0	4	3	8	1	16

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Ephemerella invaria/rotunda	0	1	0	0	0	1
Heptagenia flavescens	0	1	0	0	0	1
Neoephemera youngi	1	0	0	0	0	1
Stenonema modestum/smithae	0	2	0	1	0	3
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	2	0	5	0	0	7
Acroneuria mela	0	0	0	0	1	1
Helopicus subvarians	1	1	0	0	1	3
Isoperla bilineata	0	0	0	0	1	1
Isoperla sp.*	8	5	5	0	8	26
Paragnetina kansensis	1	2	0	0	0	3
Perlesta placida	0	0	1	0	0	1
Perlidae*	0	0	2	0	7	9
Perlinella sp.*	0	0	0	0	1	1
Pteronarcys dorsata	7	2	0	1	2	12
Taeniopteryx nr.lita	1	3	4	0	1	9
HEMIPTERA (true bugs)						
MEGALOPTERA						
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	3	3	0	0	0	6
Cheumatopsyche sp.	0	0	1	0	0	1
Hydropsyche elissoma	9	2	1	0	4	16
Micrasema rusticum	2	1	0	0	0	3
Pycnopsyche sp.	0	0	0	0	2	2
LEPIDOPTERA (moths)						

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
COLEOPTERA (beetles)						
Ectopria nervosa	0	0	0	0	1	1
Stenelmis sp. *	1	0	0	0	0	1
DIPTERA - misc. (true flies)						
Atherix lantha	1	0	1	0	0	2
Simulium dixiense/jonesi	0	0	3	0	0	3
Simulium sp.*	0	2	0	0	0	2
Simulium tuberosum	1	0	1	0	0	2
DIPTERA- Chironomidae (midges)						
Brillia flavifrons	1	0	4	0	10	15
Conchapelopia sp.	0	0	1	0	1	2
Corynoneura sp. 3	18	5	1	0	15	39
Orthocladius dentifer	0	2	11	0	4	17
Parakiefferiella sp. A	8	0	11	0	9	28
Parametriocnemus lundbecki	0	0	0	0	3	3
Polypedilum convictum	12	10	27	0	26	75
Polypedilum sp.*	0	1	0	0	0	1
Rheocricotopus robacki	22	7	16	0	49	94
Rheotanytarsus distinctissimus	14	13	0	0	4	31
Rheotanytarsus exiguus	5	7	0	0	2	14
Thienemanniella fusca gp.	0	1	0	0	1	2
Thienemanniella xena gp.	1	4	1	0	2	8
Tvetenia discoloripes gp.	6	6	2	0	2	16
Tvetenia paucunca/vitracies	1	1	2	0	1	5
Unniella multivirga	0	0	0	0	1	1

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Ephemerella invaria/rotunda	0	3	1	0	0	4
Heptagenia flavescens	0	1	1	0	0	2
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	0	0	0	1	1	2
Acroneuria mela	0	0	1	0	0	1
Allocapnia sp.	0	3	1	0	0	4
Helopicus subvarians	0	0	0	1	0	1
Isoperla bilineata	0	1	0	0	0	1
Paragnetina kansensis	0	0	1	1	0	2
Perlesta placida	0	3	0	0	2	5
Perlidae*	0	8	2	1	0	11
Pteronarcys dorsata	0	5	2	0	0	7
Taeniopteryx nr.lita	0	2	0	0	0	2
HEMIPTERA (true bugs)						
MEGALOPTERA						
TRICHOPTERA (caddisflies)						
Brachycentrus [illegible]rosus	0	6	5	3	5	19
Diplectrona [illegible]	0	0	3	0	1	4
Hydropsyche [illegible]	0	4	1	1	0	6
Micrasema rusticum	0	1	0	0	0	1
LEPIDOPTERA (moths)						
COLEOPTERA (beetles)						
Ancyronyx variegatus	0	1	0	0	0	1

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
Stenelmis sp. *	0	0	0	1	0	1
DIPTERA - misc. (true flies)						
Atherix lantha	0	2	0	0	0	2
Ectemnia invenusta	0	9	0	0	0	9
Simulium sp.*	0	6	0	0	0	6
Simulium tuberosum	0	0	9	0	0	9
DIPTERA- Chironomidae (midges)						
Brillia flavifrons	0	10	0	0	0	10
Conchapelopia sp.	0	1	0	0	1	2
Corynoneura nr. taris	0	0	0	1	0	1
Corynoneura sp. 3	0	5	3	0	3	11
Orthocladius dentifer	0	5	0	0	1	6
Parakiefferiella sp. A	0	0	0	5	2	7
Parametriocnemus lundbecki	0	1	0	0	0	1
Polypedilum convictum	0	33	5	0	5	43
Polypedilum sp.*	0	0	1	0	1	2
Rheocricotopus robacki	0	15	3	11	12	41
Rheocricotopus tuberculatus	0	0	0	0	1	1
Rheotanytarsus distinctissimus	0	9	2	4	5	20
Stempellinella sp.	0	1	0	0	0	1
Thienemanniella fusca gp.	0	0	0	1	0	1
Thienemanniella xena gp.	0	1	0	1	1	3
Tvetenia discoloripes gp.	0	7	3	2	0	12
Tvetenia paucunca/vitracies	0	5	1	0	2	8
Unniella multivirga	0	1	0	0	0	1

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 5 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Caenis sp.	0	0	0	0	1	1
Dannella simplex	1	0	0	0	0	1
Ephemerella dorothea	0	2	1	1	0	4
Eurylophella nr. bicolor	0	0	0	0	1	1
Pseudocloeon dubium/bimaculatus	0	1	2	0	0	3
Pseudocloeon punctiventris	0	0	0	1	0	1
Stenonema modestum/smithae	0	1	1	1	0	3
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	1	3	1	1	1	7
Acroneuria mela	0	0	0	0	1	1
Helopicus subvarians	0	1	1	0	0	2
Isoperla bilineata	0	0	4	3	0	7
Isoperla sp.*	3	0	0	0	0	3
Paragnetina kansensis	0	0	2	0	0	2
Perlesta placida	2	0	0	0	1	3
Perlinella sp.*	0	2	0	0	0	2
Pteronarcys dorsata	3	0	0	0	0	3
Taeniopteryx nr.lita	0	0	0	2	0	2
HEMIPTERA (true bugs)						
MEGALOPTERA						
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	0	0	0	2	0	2
Chimarra sp.	1	0	0	0	0	1
Hydropsyche elissoma	3	1	1	1	1	7
Micrasema rusticum	1	0	0	1	0	2
LEPIDOPTERA (moths)						

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 5 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
COLEOPTERA (beetles)						
DIPTERA - misc. (true flies)						
Atherix lantha	0	0	0	4	0	4
Simulium dixiense/jonesi	3	3	1	3	0	10
Simulium tuberosum	0	3	5	1	0	9
DIPTERA- Chironomidae (midges)						
Brillia flavifrons	7	1	0	0	1	9
Conchapelopia sp.	0	0	0	0	1	1
Corynoneura sp. 3	0	5	8	0	2	15
Orthocladius obumbratus	0	0	2	1	0	3
Orthocladius dentifer	4	0	4	1	4	13
Parakiefferiella sp. A	1	1	6	2	1	11
Parametriocnemus lundbecki	1	0	0	1	3	5
Polypedilum convictum	11	1	5	21	6	44
Potthastia longimanus	1	0	0	0	0	1
Rheocricotopus robacki	10	11	22	12	3	58
Rheotanytarsus distinctissimus	4	2	5	3	1	15
Rheotanytarsus exiguus	0	0	0	1	0	1
Thienemanniella xena gp.	3	3	8	8	2	24
Tvetenia discoloripes gp.	3	1	1	0	0	5
Tvetenia paucunca/vitracies	1	6	8	2	0	17

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
EPHEMEROPTERA (mayflies)						
Acerpenna pygmaeus	1	0	0	0	0	1
Baetis intercalaris	0	2	0	0	0	2
Caenis sp.	0	0	0	0	1	1
Dannella simplex	0	2	0	0	1	3
Ephemerella dorothea	0	8	0	0	4	12
Ephemerella invaria/rotunda	7	0	1	4	0	12
Eurylophella nr. bicolor	0	0	0	0	1	1
Heptagenia flavescens	0	1	1	2	0	4
Heptageniidae*	1	0	0	0	0	1
Leptophlebia sp.	0	1	0	0	0	1
Neoephemera youngi	0	0	1	0	0	1
Pseudocloeon dubium/bimaculatus	0	0	0	0	3	3
Pseudocloeon punctiventris	1	0	0	0	1	2
Stenonema modestum/smithae	11	21	3	0	3	38
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	4	7	7	2	7	27
Acroneuria mela	1	2	1	1	1	6
Allocapnia sp.	0	0	0	4	0	4
Helopicus subvarians	0	0	3	1	2	6
Isoperla bilineata	0	9	1	1	7	18
Isoperla orata/dicala	1	0	0	0	0	1
Isoperla sp.*	10	0	26	0	3	39
Paragnetina kansensis	2	1	3	2	2	10
Perlesta placida	6	21	1	5	3	36
Perlidae*	0	0	9	11	0	20
Perlinella sp.*	0	3	1	0	2	6
Pteronarcys dorsata	10	4	12	7	3	36
Taeniopteryx nr.lita	3	4	9	2	2	20
HEMIPTERA (true bugs)						
MEGALOPTERA						

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	13	16	6	19	2	56
Cheumatopsyche sp.	0	0	1	0	0	1
Chimarra sp.	0	2	0	0	1	3
Diplectrona modesta	3	0	0	4	0	7
Hydropsyche elissoma	2	18	16	6	7	49
Micrasema rusticum	6	5	3	1	2	17
Pycnopsyche sp.	0	0	2	0	0	2
LEPIDOPTERA (moths)						
COLEOPTERA (beetles)						
Ancyronyx variegatus	0	0	0	1	0	1
Ectopria nervosa	0	0	1	0	0	1
Gonielmis dietrichi	1	0	0	0	0	1
Macronychus glabratus	1	1	0	0	0	2
Stenelmis markeli	1	0	0	0	0	1
Stenelmis sp. *	1	0	1	1	0	3
DIPTERA - misc. (true flies)						
Atherix lantha	1	1	2	2	4	10
Ectemnia invem[illegible]a	1	0	0	9	0	10
Empididae	0	2	0	0	0	2
Simulium dixiense/jonesi	2	8	3	0	10	23
Simulium sp.*	0	0	2	6	0	8
Simulium tuberosum	5	0	2	9	9	25
DIPTERA- Chironomidae (midges)						
Brillia flavifrons	3	4	15	10	9	41
Conchapelopia sp.	4	1	2	2	1	10
Corynoneura nr. taris	0	4	0	1	0	5
Corynoneura sp. 3	58	42	39	11	15	165
Cricotopus bicinctus	1	0	0	0	0	1
Orthocladius obumbratus	4	0	0	0	3	7

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: January 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Orthocladius annectens	14	0	0	0	0	14
Orthocladius dentifer	1	22	17	6	13	59
Parakiefferiella sp. A	21	17	28	7	11	84
Parametriocnemus lundbecki	0	2	3	1	5	11
Polypedilum convictum	24	53	75	43	44	239
Polypedilum sp.*	0	0	1	2	0	3
Potthastia longimanus	0	0	0	0	1	1
Rheocricotopus robacki	43	63	94	41	58	299
Rheocricotopus tuberculatus	0	0	0	1	0	1
Rheotanytarsus distinctissimus	23	48	31	20	15	137
Rheotanytarsus exiguus	7	3	14	0	1	25
Stempellinella sp.	0	0	0	1	0	1
Thienemanniella fusca gp.	18	6	2	1	0	27
Thienemanniella xena gp.	10	18	8	3	24	63
Tvetenia discoloripes gp.	13	4	16	12	5	50
Tvetenia paucunca/vitracies	4	16	5	8	17	50
Unniella multivirga	0	0	1	1	0	2

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 1 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Dannella simplex	3	1	0	0	0	4
Ephemerella argo	0	0	0	0	1	1
Ephemerella dorothea	1	3	1	0	10	15
Ephemerella invaria/rotunda	2	1	0	0	2	5
Pseudocloeon punctiventris	0	1	0	0	0	1
Stenonema modestum/smithae	1	1	1	0	1	4
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	2	3	1	2	3	11
Haploperla brevis	1	0	0	0	0	1
Isoperla nana	0	1	0	0	7	8
Isoperla sp.*	0	0	0	1	0	1
Paragnetina kansensis	0	0	3	1	0	4
Perlesta placida	2	0	2	0	0	4
HEMIPTERA (true bugs)						
MEGALOPTERA						
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	0	2	0	1	0	3
Cheumatopsyche sp.	2	0	0	0	7	9
Hydropsyche elissoma	2	4	0	2	4	12
Oxyethira	1	0	0	0	0	1
COLEOPTERA (beetles)						
Ancyronyx variegatus	0	0	1	0	0	1
Macronychus glabratus	9	2	2	1	1	15
Stenelmis markeli	4	6	1	3	1	15
Stenelmis sinuata	1	1	0	0	0	2

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 1 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
Stenelmis sp. *	0	1	0	1	0	2
DIPTERA - misc. (true flies)						
Ectemnia invenusta	1	0	0	0	0	1
Simulium dixiense/jonesi	9	11	1	0	1	22
Simulium sp.*	0	0	1	2	0	3
DIPTERA- Chironomidae (midges)						
Conchapelopia sp.	2	0	0	0	0	2
Corynoneura sp. 3	0	1	1	1	1	4
Orthocladius curtiseta	1	12	18	23	18	72
Parakiefferiella sp. A	0	0	0	1	0	1
Parakiefferiella sp. B	2	1	3	3	0	9
Parametriocnemus lundbecki	0	1	4	2	2	9
Polypedilum convictum	2	5	1	3	1	12
Rheocricotopus robacki	7	1	3	4	1	16
Rheotanytarsus distinctissimus	4	6	6	2	6	24
Rheotanytarsus exiguus	1	0	0	0	1	2
Symposiocladius lignicola	0	0	1	1	5	7
Tanytarsus sp. XVI Rutter	0	0	2	0	0	2
Tanytarsus sp.*	0	0	0	0	1	1
Thienemanniella fusca gp.	0	0	1	0	0	1
Thienemanniella xena gp.	0	0	0	0	2	2
Tvetenia discoloripes gp.	0	4	4	5	2	15
Tvetenia paucunca/vitracies	0	3	1	0	0	4

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Dannella simplex	1	0	0	0	0	1
Ephemerella argo	2	0	0	0	0	2
Ephemerella dorothea	2	0	0	2	1	5
Ephemerella invaria/rotunda	2	1	0	0	0	3
Pseudocloeon dubium/bimaculatu	1	0	0	0	0	1
Pseudocloeon punctiventris	1	0	0	0	0	1
Stenonema modestum/smithae	1	0	3	1	1	6
ODONATA (dragonflies)						
Boyeria vinosa	1	0	0	0	0	1
PLECOPTERA (stoneflies)						
Acroneuria abnormis	0	5	1	0	3	9
Acroneuria mela	1	0	0	0	0	1
Isoperla nana	0	1	0	2	1	4
Leuctra sp.	1	1	1	0	0	3
Paragnetina kansensis	1	2	0	1	1	5
Perlesta placida	11	2	2	1	0	16
Pteronarcys dorsata	0	0	0	1	2	3
HEMIPTERA (true bugs)						
MEGALOPTERA						
Corydalus cornutus	0	1	0	0	0	1
TRICHOPTERA (caddisflies)						
Brachycentrus numerosus	0	0	1	0	0	1
Cheumatopsyche sp.	5	0	0	0	7	12
Hydropsyche elissoma	13	1	0	0	4	18
Lepidostoma sp.	1	0	0	0	1	2
Micrasema wataga	3	0	0	0	0	3
LEPIDOPTERA (moths)						

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
COLEOPTERA (beetles)						
Ancyronyx variegatus	0	0	0	0	1	1
Macronychus glabratus	2	2	5	6	0	15
Stenelmis markeli	3	4	3	2	0	12
Stenelmis sinuata	0	0	0	3	0	3
Stenelmis sp. *	3	0	0	0	2	5
DIPTERA - misc. (true flies)						
Atherix lantha	1	0	0	0	0	1
Bezzia sp. 2	0	1	0	0	0	1
Chrysops sp.	0	1	0	0	0	1
Simulium dixiense/jonesi	3	2	0	0	4	9
DIPTERA- Chironomidae (midges)						
Brillia flavifrons	1	1	0	1	1	4
Brillia parva	0	1	0	0	0	1
Conchapelopia sp.	6	2	0	0	1	9
Corynoneura sp. 3	0	1	0	0	0	1
Cricotopus bicinctus	1	0	0	0	1	2
Nanocladius rectinervis	1	0	0	0	0	1
Nilotanypus fimbriatus	2	1	0	0	0	3
Orthocladius c[illegible]iseta	3	2	5	3	1	14
Orthocladius ([illegible]actyloclad.)*	1	0	0	0	0	1
Parakiefferiell[illegible] sp. B	6	4	2	0	0	12
Parametriocnemus lundbecki	7	3	2	1	0	13
Polypedilum convictum	29	2	1	1	3	36
Rheocricotopus robacki	13	6	1	0	2	22
Rheotanytarsus distinctissimus	20	6	0	0	3	29
Rheotanytarsus exiguus	2	1	0	0	0	3
Stelechomyia perpulchra	0	1	0	0	0	1
Stempellinella sp.	1	0	0	0	0	1
Symposiocladius lignicola	1	0	0	0	0	1
Synorthocladius semivirens	0	0	0	0	1	1
Tanytarsus glabrescens gp.	3	1	0	0	0	4
Tanytarsus sp. XI Rutter	0	0	0	0	1	1
Tanytarsus sp. XVI Rutter	3	1	2	1	0	7

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
Thienemanniella fusca gp.	1	1	0	0	0	2
Thienemanniella xena gp.	4	1	0	0	0	5
Tvetenia discoloripes gp.	3	0	0	0	1	4
Tvetenia paucunca/vitracies	9	2	0	0	0	11

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Dannella simplex	0	0	1	0	0	1
Ephemerella argo	0	0	1	1	0	2
Ephemerella dorothea	1	1	12	2	0	16
Ephemerella invaria/rotunda	1	0	5	1	0	7
Stenonema modestum/smithae	0	0	1	1	2	4
ODONATA (dragonflies)						
Boyeria vinosa	0	0	0	0	1	1
PLECOPTERA (stoneflies)						
Acroneuria abnormis	0	1	0	3	2	6
Agnetina capitata	0	1	0	0	0	1
Isoperla nana	1	1	0	1	1	4
Isoperla orata/dicala	0	0	1	0	0	1
Isoperla sp.*	0	0	1	0	0	1
Paragnetina kansensis	3	0	0	0	4	7
Perlesta placida	0	1	5	2	2	10
Pteronarcys dorsata	0	1	2	0	0	3
HEMIPTERA (true bugs)						
MEGALOPTERA						
TRICHOPTERA (caddisflies)						
Cheumatopsyche sp.	0	0	2	0	2	4
Hydropsyche elissoma	9	3	17	3	3	35
LEPIDOPTERA (moths)						
COLEOPTERA (beetles)						
Ancyronyx variegatus	0	0	0	1	0	1

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
Macronychus glabratus	4	6	0	2	1	13
Optioservus sp.	0	1	0	0	1	2
Stenelmis markeli	2	1	0	1	2	6
Stenelmis sinuata	4	1	0	0	1	6
Stenelmis sp. *	1	0	0	0	1	2
DIPTERA - misc. (true flies)						
Simulium dixiense/jonesi	4	2	10	0	0	16
Simulium sp.*	0	2	0	1	0	3
Simulium tuberosum	0	2	0	0	0	2
DIPTERA- Chironomidae (midges)						
Brillia flavifrons	0	0	1	0	0	1
Cladotanytarsus sp. A	0	0	0	0	1	1
Conchapelopia sp.	0	0	0	0	1	1
Corynoneura sp.*	0	0	0	0	1	1
Cricotopus sp.*	0	0	0	1	0	1
Nilotanypus fimbriatus	0	0	0	0	1	1
Orthocladius curtiseta	11	9	8	16	16	60
Parakiefferiella sp. A	0	0	0	1	0	1
Parakiefferiella sp. B	2	1	0	1	2	6
Parakiefferiella sp.4	0	1	0	0	0	1
Parametriocnemus lundbecki	1	0	0	0	3	4
Polypedilum convictum	8	1	2	2	3	16
Rheocricotopus robacki	3	1	1	2	8	15
Rheotanytarsus distinctissimus	14	8	2	1	5	30
Rheotanytarsus exiguus	1	1	0	1	0	3
Symposiocladius lignicola	2	5	0	0	1	8
Tanytarsus glabrescens gp.	0	1	0	0	3	4
Tanytarsus sp. XVI Rutter	0	0	0	0	1	1
Thienemanniella fusca gp.	1	1	0	0	0	2
Thienemanniella xena gp.	1	1	0	0	0	2
Tvetenia discoloripes gp.	13	1	9	5	7	35
Tvetenia paucunca/vitracies	3	0	1	0	0	4

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Ephemerella dorothea	0	0	2	1	0	3
Ephemerella invaria/rotunda	1	0	1	2	0	4
Stenonema modestum/smithae	0	1	2	1	0	4
ODONATA (dragonflies)						
PLECOPTERA (stoneflies)						
Acroneuria abnormis	0	0	1	2	0	3
Acroneuria mela	0	0	0	1	0	1
Agnetina capitata	0	0	2	0	0	2
Isoperla nana	2	1	0	3	0	6
Isoperla sp.*	0	0	1	0	0	1
Paragnetina kansensis	0	1	1	1	0	3
Perlesta placida	0	0	4	3	0	7
Perlidae*	0	0	1	0	0	1
Pteronarcys dorsata	0	1	0	3	0	4
HEMIPTERA (true bugs)						
MEGALOPTERA						
TRICHOPTERA (caddisflies)						
Cheumatopsyche sp.	0	1	1	0	0	2
Hydropsyche [illegible]oma	1	7	11	4	0	23
LEPIDOPTERA (moths)						
COLEOPTERA (beetles)						
Ancyronyx variegatus	0	1	0	0	0	1
Gonielmis dietrichi	0	1	0	0	0	1
Macronychus glabratus	2	2	3	3	1	11

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
Optioservus sp.	0	0	2	0	1	3
Stenelmis markeli	0	2	1	6	0	9
Stenelmis sinuata	0	0	0	6	0	6
Stenelmis sp. *	0	0	0	1	2	3
DIPTERA - misc. (true flies)						
Empididae	0	0	0	2	0	2
Simulium dixiense/jonesi	13	51	8	1	3	76
Simulium tuberosum	1	2	0	0	0	3
DIPTERA- Chironomidae (midges)						
Corynoneura nr. taris	0	0	0	1	0	1
Corynoneura sp. 3	0	0	0	1	0	1
Metriocnemus fuscipes	0	0	0	0	1	1
Orthocladius curtiseta	1	7	7	9	3	27
Parakiefferiella sp. B	0	0	0	5	0	5
Parametriocnemus lundbecki	0	0	0	4	0	4
Polypedilum convictum	0	2	4	10	2	18
Polypedilum sp.*	0	0	0	1	0	1
Rheocricotopus robacki	0	1	6	7	4	18
Rheotanytarsus distinctissimus	0	4	3	10	2	19
Rheotanytarsus exiguus	0	1	0	1	1	3
Symposiocladius lignicola	2	2	0	0	1	5
Tanytarsus glabrescens gp.	0	0	0	1	0	1
Tanytarsus sp. XI Rutter	0	0	0	1	0	1
Tanytarsus sp. [illegible] Rutter	0	0	0	4	0	4
Thienemanniella fusca gp.	0	0	0	1	0	1
Thienemanniella xena gp.	0	0	0	0	1	1
Tvetenia discoloripes gp.	2	12	5	2	1	22
Tvetenia paucunca/vitracies	1	2	2	2	0	7

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 5 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
EPHEMEROPTERA (mayflies)						
Ephemerella argo	0	0	0	1	0	1
Ephemerella dorothea	2	6	1	6	1	16
Ephemerella invaria/rotunda	2	2	1	2	0	7
Pseudocloeon sp.*	0	1	0	0	0	1
Stenonema modestum/smithae	1	0	0	0	1	2
ODONATA (dragonflies)						
Boyeria vinosa	0	0	1	0	0	1
PLECOPTERA (stoneflies)						
Acroneuria abnormis	4	3	6	2	1	16
Isoperla nana	5	0	1	1	1	8
Leuctra sp.	0	1	0	0	0	1
Paragnetina kansensis	1	2	3	0	1	7
Perlesta placida	2	0	1	0	0	3
Pteronarcys dorsata	0	0	1	2	0	3
HEMIPTERA (true bugs)						
MEGALOPTERA						
TRICHOPTERA (caddisflies)						
Brachycentrus nigrosoma	0	0	0	3	0	3
Cheumatopsyche sp.	1	1	0	1	1	4
Hydropsyche elissoma	2	14	4	1	2	23
Micrasema rusticum	0	1	0	0	0	1
Micrasema wataga	0	0	0	1	1	2
LEPIDOPTERA (moths)						
COLEOPTERA (beetles)						

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 5 LOCATION: Aiken Co., SC

	Rep A	Rep B	Rep C	Rep D	Rep E	TOTAL
Macronychus glabratus	0	4	2	1	0	7
Stenelmis markeli	0	5	6	4	0	15
Stenelmis sinuata	0	0	0	1	0	1
Stenelmis sp. *	0	1	0	1	1	3
DIPTERA - misc. (true flies)						
Antocha sp.	0	0	0	1	0	1
Empididae	0	1	0	0	0	1
Simulium dixiense/jonesi	1	20	25	2	0	48
Simulium tuberosum	0	1	0	0	0	1
DIPTERA- Chironomidae (midges)						
Brillia flavifrons	0	0	1	0	0	1
Conchapelopia sp.	1	0	0	0	0	1
Corynoneura nr. taris	0	0	1	0	1	2
Corynoneura sp. 3	0	1	0	0	0	1
Orthocladius curtiseta	8	0	3	9	2	22
Orthocladius dentifer	0	5	0	0	0	5
Parakiefferiella sp. B	0	1	0	1	1	3
Parametriocnemus lundbecki	1	0	0	1	0	2
Polypedilum convictum	4	4	1	2	1	12
Polypedilum scalaenum	0	0	0	2	0	2
Rheocricotopus robacki	3	7	1	6	4	21
Rheotanytarsus distinctissimus	2	4	1	3	1	11
Rheotanytarsus exiguus	2	1	0	1	0	4
Symposiocladius lignicola	0	0	1	0	2	3
Tanytarsus glabrescens gp.	0	0	0	1	1	2
Tanytarsus sp. XI Rutter	0	0	0	0	1	1
Tanytarsus sp. XVI Rutter	0	0	0	3	1	4
Thienemanniella fusca gp.	0	0	0	2	1	3
Thienemanniella xena gp.	0	0	0	1	0	1
Tvetenia discoloripes gp.	3	10	6	1	0	20
Tvetenia paucunca/vitracies	0	1	1	0	0	2

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
EPHEMEROPTERA (mayflies)						
Dannella simplex	4	1	1	0	0	6
Ephemerella argo	1	2	2	0	1	6
Ephemerella dorothea	15	5	16	3	16	55
Ephemerella invaria/rotunda	5	3	7	4	7	26
Pseudocloeon dubium/bimaculatus	0	1	0	0	0	1
Pseudocloeon punctiventris	1	1	0	0	0	2
Pseudocloeon sp.*	0	0	0	0	1	1
Stenonema modestum/smithae	4	6	4	4	2	20
ODONATA (dragonflies)						
Boyeria vinosa	0	1	1	0	1	3
PLECOPTERA (stoneflies)						
Acroneuria abnormis	11	9	6	3	16	45
Acroneuria mela	0	1	0	1	0	2
Agnetina capitata	0	0	1	2	0	3
Haploperla brevis	1	0	0	0	0	1
Isoperla nana	8	4	4	6	8	30
Isoperla orata/dicala	0	0	1	0	0	1
Isoperla sp.*	1	0	1	1	0	3
Leuctra sp.	0	3	0	0	1	4
Paragnetina kansensis	4	5	7	3	7	26
Perlesta placida	4	16	10	7	3	40
Perlidae*	0	0	0	1	0	1
Pteronarcys dorsata	0	3	3	4	3	13
HEMIPTERA (true bugs)						
MEGALOPTERA						
Corydalus cornutus	0	1	0	0	0	1
TRICHOPTERA (caddisflies)						
Brachycentrus nigrosoma	0	0	0	0	3	3

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Brachycentrus numerosus	3	1	0	0	0	4
Cheumatopsyche sp.	9	12	4	2	4	31
Hydropsyche elissoma	12	18	35	23	23	111
Lepidostoma sp.	0	2	0	0	0	2
Micrasema rusticum	0	0	0	0	1	1
Micrasema wataga	0	3	0	0	2	5
Oxyethira	1	0	0	0	0	1
LEPIDOPTERA (moths)						
COLEOPTERA (beetles)						
Ancyronyx variegatus	1	1	1	1	0	4
Gonielmis dietrichi	0	0	0	1	0	1
Macronychus glabratus	15	15	13	11	7	61
Optioservus sp.	0	0	2	3	0	5
Stenelmis markeli	15	12	6	9	15	57
Stenelmis sinuata	2	3	6	6	1	18
Stenelmis sp. *	2	5	2	3	3	15
DIPTERA - misc. (true flies)						
Antocha sp.	0	0	0	0	1	1
Atherix lantha	0	1	0	0	0	1
Bezzia sp. 2	0	1	0	0	0	1
Chrysops sp.	0	1	0	0	0	1
Ectemnia invenusta	1	0	0	0	0	1
Empididae	0	0	0	2	1	3
Simulium dixiense/jonesi	22	9	16	76	48	171
Simulium sp.*	3	0	3	0	0	6
Simulium tuberosum	0	0	2	3	1	6
DIPTERA- Chironomidae (midges)						
Brillia flavifrons	0	4	1	0	1	6
Brillia parva	0	1	0	0	0	1
Cladotanytarsus sp. A	0	0	1	0	0	1
Conchapelopia sp.	2	9	1	0	1	13
Corynoneura nr. taris	0	0	0	1	2	3
Corynoneura sp. 3	4	1	0	1	1	7

APPENDIX A : LIST OF SPECIES FOR QUANTITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: April 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Corynoneura sp.*	0	0	1	0	0	1
Cricotopus bicinctus	0	2	0	0	0	2
Cricotopus sp.*	0	0	1	0	0	1
Metriocnemus fuscipes	0	0	0	1	0	1
Nanocladius rectinervis	0	1	0	0	0	1
Nilotanypus fimbriatus	0	3	1	0	0	4
Orthocladius curtiseta	72	14	60	27	22	195
Orthocladius dentifer	0	0	0	0	5	5
Orthocladius (Eudactyloclad.)*	0	1	0	0	0	1
Parakiefferiella sp. A	1	0	1	0	0	2
Parakiefferiella sp. B	9	12	6	5	3	35
Parakiefferiella sp.4	0	0	1	0	0	1
Parametriocnemus lundbecki	9	13	4	4	2	32
Polypedilum convictum	12	36	16	18	12	94
Polypedilum scalaenum	0	0	0	0	2	2
Polypedilum sp.*	0	0	0	1	0	1
Rheocricotopus robacki	16	22	15	18	21	92
Rheotanytarsus distinctissimus	24	29	30	19	11	113
Rheotanytarsus exiguus	2	3	3	3	4	15
Stelechomyia perpulchra	0	1	0	0	0	1
Stempellinella sp.	0	1	0	0	0	1
Symposiocladius lignicola	7	1	8	5	3	24
Synorthocladius semivirens	0	1	0	0	0	1
Tanytarsus glabrescens gp.	0	4	4	1	2	11
Tanytarsus sp. XI Rutter	0	1	0	1	1	3
Tanytarsus sp. XVI Rutter	2	7	1	4	4	18
Tanytarsus sp.*	1	0	0	0	0	1
Thienemanniella fusca gp.	1	2	2	1	3	9
Thienemanniella xena gp.	2	5	2	1	1	11
Tvetenia discoloripes gp.	15	4	35	22	20	96
Tvetenia paucunca/vitracies	4	11	4	7	2	28

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 1 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
EPHEMEROPTERA (mayflies)				
Acerpenna pygmaeus	1	0	0	1
Caenis sp.	3	0	0	3
Heptageniidae*	1	0	0	1
Hexagenia munda	0	2	0	2
ODONATA (dragonflies)				
Gomphus lividus	0	1	0	1
Gomphus (Gomphus) sp.	0	1	0	1
PLECOPTERA (stoneflies)				
Isoperla sp.*	1	0	0	1
HEMIPTERA (true bugs)				
MEGALOPTERA				
Sialis prob. vagans	0	1	0	1
TRICHOPTERA (caddisflies)				
Cheumatopsyche sp.	5	0	0	5
Chimarra sp.	1	0	0	1
Hydropsyche elissoma	31	0	0	31
Neureclipsis sp.	2	0	0	2
Phylocentropus sp.	0	2	0	2
LEPIDOPTERA (moths)				
Parapoynx obscuralis	4	0	0	4
COLEOPTERA (beetles)				
Anchytarsus bicolor	1	0	0	1
Sperchopsis tessellatus	2	1	0	3
Stenelmis sp. *	1	0	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 1 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
DIPTERA - misc. (true flies)				
Atherix lantha	1	0	0	1
Atrichopogon sp.	0	1	0	1
Bezzia sp. 2	0	0	7	7
Bezzia sp. 6	0	4	0	4
Erioptera /Ormosia sp.	0	1	0	1
Hexatoma (Eriocera) cinerea	0	1	0	1
Palpomyia sp. 1	0	1	0	1
Simulium dixiense/jonesi	6	0	0	6
DIPTERA- Chironomidae (midges)				
Cladotanytarsus sp. A	0	0	7	7
Clinotanypus pinguis	0	0	3	3
Conchapelopia sp.	1	0	0	1
Cryptochironomus blarina	0	0	1	1
Cryptochironomus fulvus gp.	0	0	2	2
Microtendipes nr. rydalensis	1	0	0	1
Paralauterborniella nigrohalte	0	1	4	5
Polypedilum convictum	11	0	0	11
Polypedilum sp.*	1	0	0	1
Rheocricotopus robacki	3	0	0	3
Rheotanytarsus distinctissimus	9	0	0	9
Rheotanytarsus exiguus	2	0	0	2
Tanytarsus glabrescens gp.	3	0	0	3
Tanytarsus sp. XV Rutter	1	0	0	1
Tanytarsus sp. XVI Rutter	1	0	0	1
Tanytarsus sp. XVII Rutter	0	1	0	1
Thienemanniella fusca gp.	3	0	0	3
Thienemanniella xena gp.	1	0	0	1
Tribelos jucundus	0	2	0	2
CRUSTACEA				
ANNELIDA (worms)				
Pristina/Stephensoniana sp.	0	0	1	1
Tubificidae*	0	5	0	5

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
EPHEMEROPTERA (mayflies)				
Acerpenna pygmaeus	1	0	0	1
Centroptilum sp.	0	0	1	1
Neoephemera youngi	1	0	0	1
Pseudocloeon dubium/bimaculatus	1	0	0	1
Tricorythodes sp.	1	0	0	1
ODONATA (dragonflies)				
PLECOPTERA (stoneflies)				
Acroneuria abnormis	2	0	0	2
Leuctra sp.	1	0	0	1
Paragnetina kansensis	1	0	0	1
Pteronarcys dorsata	5	0	0	5
HEMIPTERA (true bugs)				
MEGALOPTERA				
TRICHOPTERA (caddisflies)				
Brachycentrus numerosus	22	0	0	22
Hydropsyche elissoma	30	0	0	30
Micrasema wataga	2	0	0	2
Neureclipsis sp.	0	1	0	1
Polycentropus sp.	0	2	4	6
LEPIDOPTERA (moths)				
Parapoynx obscuralis	1	0	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
COLEOPTERA (beetles)				
Anchytarsus bicolor	1	0	0	1
Dineutus discolor	3	0	1	4
Macronychus glabratus	3	0	0	3
Stenelmis markeli	0	0	1	1
Stenelmis sp. *	0	1	1	2
DIPTERA - misc. (true flies)				
Atherix lantha	5	0	0	5
Bezzia sp. 6	0	2	0	2
Dolichopodidae	0	0	1	1
Hexatoma (Eriocera) cinerea	0	1	0	1
Palpomyia sp. 3	0	1	0	1
Simulium dixiense/jonesi	8	0	0	8
Simulium sp.*	2	0	0	2
DIPTERA- Chironomidae (midges)				
Ablabesmyia mallochi	0	1	0	1
Brillia flavifrons	2	0	0	2
Cladotanytarsus sp. A	0	4	33	37
Clinotanypus pinguis	0	0	3	3
Conchapelopia sp.	1	0	0	1
Corynoneura sp. 3	2	0	0	2
Cryptochironomus blarina	0	1	3	4
Cryptochironomus fulvus gp.	0	0	3	3
Microtendipes nr. rydalensis	1	0	0	1
Paralauterborniella nigrohalte	0	0	3	3
Parametriocnemus lundbecki	4	0	1	5
Polypedilum convictum	23	0	1	24
Polypedilum fallax	1	0	0	1
Polypedilum halterale	2	0	0	2
Polypedilum illinoense	2	0	0	2
Rheocricotopus robacki	3	0	0	3
Rheotanytarsus distinctissimus	10	0	0	10

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Rheotanytarsus exiguus	2	1	0	3
Robackia claviger	0	1	0	1
Symposiocladius lignicola	1	0	0	1
Tanytarsus glabrescens gp.	1	0	0	1
Tanytarsus sp. XI Rutter	1	0	0	1
Tanytarsus sp. XIII Rutter	1	0	0	1
Tanytarsus sp. XIV Cantrell	0	0	2	2
Tvetenia discoloripes gp.	4	0	0	4
CRUSTACEA				
ANNELIDA (worms)				
Pristina/Stephensoniana sp.	0	0	2	2
Tubificidae*	0	1	2	3
MOLLUSCA (snails, clams)				
Gillia altilis	0	0	1	1
Viviparus subpurpureus	0	0	2	2

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
EPHEMEROPTERA (mayflies)				
Acerpenna pygmaeus	0	4	0	4
Pseudocloeon dubium/bimaculatus	3	0	0	3
Stenonema modestum/smithae	1	1	0	2
ODONATA (dragonflies)				
Boyeria vinosa	1	0	0	1
Tetragoneuria semiaquea	1	0	0	1
PLECOPTERA (stoneflies)				
Acroneuria abnormis	1	1	0	2
Leuctra sp.	0	1	0	1
Paragnetina kansensis	0	2	0	2
Perlesta placida	4	0	0	4
Perlidae*	2	0	0	2
Perlinella drymo	0	1	0	1
Pteronarcys dorsata	3	0	0	3
HEMIPTERA (true bugs)				
MEGALOPTERA				
TRICHOPTERA (caddisflies)				
Brachycentrus numerosus	17	5	0	22
Hydropsyche elissoma	17	4	0	21
Micrasema rusticum	2	0	0	2
LEPIDOPTERA (moths)				

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Parapoynx obscuralis	1	0	0	1
COLEOPTERA (beetles)				
Gonielmis dietrichi	1	0	0	1
Optioservus sp.	1	0	0	1
Stenelmis markeli	0	1	0	1
Stenelmis sp. *	3	2	0	5
DIPTERA - misc. (true flies)				
Atherix lantha	2	1	0	3
Culicoides sp.	0	1	0	1
Empididae	2	0	0	2
Simulium dixiense/jonesi	18	10	0	28
Simulium sp.*	2	0	0	2
DIPTERA- Chironomidae (midges)				
Cladotanytarsus sp. A	1	0	0	1
Conchapelopia sp.	3	3	0	6
Microtendipes nr. rydalensis	0	2	0	2
Parametriocnemus lundbecki	2	0	0	2
Polypedilum convictum	40	4	0	44
Polypedilum scalaenum	0	1	0	1
Rheocricotopus robacki	8	2	0	10
Rheotanytarsus distinctissimus	9	3	0	12
Robackia claviger	0	2	0	2
Stelechomyia perpulchra	0	1	0	1
Stenochironomus hilaris	1	0	0	1
Synorthocladius semivirens	1	0	0	1
Tanytarsus glabrescens gp.	1	1	0	2
Tanytarsus sp.*	1	0	0	1
Thienemanniella fusca gp.	1	0	0	1
Thienemanniella xena gp.	3	0	0	3
Tvetenia discoloripes gp.	1	1	0	2

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
CRUSTACEA				
Cambarinae	0	1	0	1
Palaemonetes paludosus	0	2	0	2
ANNELIDA (worms)				
MOLLUSCA (snails, clams)				
Gillia altilis	0	1	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
EPHEMEROPTERA (mayflies)				
Acerpenna pygmaeus	2	0	3	5
Pseudocloeon dubium/bimaculatus	2	0	0	2
Stenonema modestum/smithae	3	1	0	4
ODONATA (dragonflies)				
Enallagma sp.	0	1	0	1
PLECOPTERA (stoneflies)				
Acroneuria abnormis	0	0	1	1
Leuctra sp.	1	0	0	1
Paragnetina kansensis	15	0	0	15
Perlidae*	1	0	0	1
Pteronarcys dorsata	4	0	0	4
HEMIPTERA (true bugs)				
MEGALOPTERA				
TRICHOPTERA (caddisflies)				
Agarodes libalis	0	0	1	1
Brachycentrus numerosus	5	3	0	8
Chimarra sp.	3	0	0	3
Hydropsyche elissoma	40	0	0	40
LEPIDOPTERA (moths)				
Parapoynx obscuralis	1	0	0	1
COLEOPTERA (beetles)				

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Hydroporus pilatei	0	1	0	1
Macronychus glabratus	2	0	0	2
Optioservus sp.	1	0	0	1
Stenelmis sinuata	1	0	0	1
Stenelmis sp. *	2	0	0	2
DIPTERA - misc. (true flies)				
Atherix lantha	5	0	0	5
Bezzia sp. 7	0	0	1	1
Palpomyia sp. 1	0	0	2	2
Sciomyzoidae	0	1	0	1
Simulium dixiense/jonesi	7	0	1	8
DIPTERA- Chironomidae (midges)				
Ablabesmyia mallochi	0	2	0	2
Brillia flavifrons	1	0	0	1
Cladotanytarsus sp. A	0	2	0	2
Conchapelopia sp.	4	1	0	5
Microtendipes nr. rydalensis	1	0	0	1
Nilotanypus fimbriatus	1	0	0	1
Paralauterborniella nigrohalte	0	2	0	2
Polypedilum convictum	22	1	2	25
Polypedilum illinoense	2	0	0	2
Polypedilum scalaenum	0	1	0	1
Rheocricotopus robacki	2	0	0	2
Rheosmittia sp.	0	0	6	6
Rheotanytarsus distinctissimus	30	0	0	30
Rheotanytarsus exiguus	2	0	0	2
Tanytarsus gl[illegible]cens gp.	4	0	0	4
Tanytarsus sp. [illegible] Rutter	1	0	0	1
Tanytarsus sp. XVI Rutter	1	0	0	1
Thienemanniella fusca gp.	1	0	0	1
Thienemanniella xena gp.	2	0	0	2
Tvetenia discoloripes gp.	4	0	0	4

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
CRUSTACEA				
Palaemonetes paludosus	0	2	0	2
ANNELIDA (worms)				
MOLLUSCA (snails, clams)				
Gillia altilis	0	1	0	1
Sphaerium sp.	0	1	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 5 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
EPHEMEROPTERA (mayflies)				
Leptophlebia sp.	2	0	0	2
Neoephemera youngi	1	0	0	1
ODONATA (dragonflies)				
Boyeria vinosa	1	0	0	1
PLECOPTERA (stoneflies)				
Acroneuria abnormis	2	0	0	2
Leuctra sp.	1	0	0	1
Paragnetina kansensis	1	0	0	1
Perlesta placida	1	0	0	1
Pteronarcys dorsata	4	0	0	4
HEMIPTERA (true bugs)				
MEGALOPTERA				
TRICHOPTERA (caddisflies)				
Brachycentrus numerosus	3	0	0	3
Hydropsyche elissoma	2	0	0	2
Phylocentropus sp.	0	4	1	5
LEPIDOPTERA (moths)				
Parapoynx obscuralis	1	0	0	1
COLEOPTERA (beetles)				
Macronychus glabratus	0	1	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 5 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Optioservus sp.	1	0	0	1
DIPTERA - misc. (true flies)				
Atherix lantha	1	0	0	1
Palpomyia sp. 1	0	6	0	6
Palpomyia sp. 4	0	3	2	5
Palpomyia sp. 5	0	1	0	1
Pilaria sp.	0	0	2	2
Simulium dixiense/jonesi	4	0	0	4
DIPTERA- Chironomidae (midges)				
Clinotanypus pinguis	0	1	0	1
Cricotopus vierriensis	0	0	1	1
Cryptochironomus fulvus gp.	0	0	1	1
Nilotanypus fimbriatus	1	0	0	1
Polypedilum convictum	4	0	0	4
Polypedilum halterale	0	2	0	2
Polypedilum illinoense	2	0	1	3
Polypedilum scalaenum	0	0	1	1
Rheotanytarsus distinctissimus	4	0	0	4
Rheotanytarsus exiguus	1	0	0	1
Stenochironomus hilaris	0	0	1	1
Tvetenia discoloripes gp.	1	0	0	1
CRUSTACEA				
ANNELIDA (worms)				
MOLLUSCA (snails, clams)				
Gillia altilis	0	3	1	4
Viviparus subpurpureus	0	12	1	13

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
EPHEMEROPTERA (mayflies)						
Acerpenna pygmaeus	1	1	4	5	0	11
Caenis sp.	3	0	0	0	0	3
Centroptilum sp.	0	1	0	0	0	1
Heptageniidae*	1	0	0	0	0	1
Hexagenia munda	2	0	0	0	0	2
Leptophlebia sp.	0	0	0	0	2	2
Neoephemera youngi	0	1	0	0	1	2
Pseudocloeon dubium/bimaculatus	0	1	3	2	0	6
Stenonema modestum/smithae	0	0	2	4	0	6
Tricorythodes sp.	0	1	0	0	0	1
ODONATA (dragonflies)						
Boyeria vinosa	0	0	1	0	1	2
Enallagma sp.	0	0	0	1	0	1
Gomphus lividus	1	0	0	0	0	1
Gomphus (Gomphus) sp.	1	0	0	0	0	1
Tetragoneuria semiaquea	0	0	1	0	0	1
PLECOPTERA (stoneflies)						
Acroneuria abnormis	0	2	2	1	2	7
Isoperla sp.*	1	0	0	0	0	1
Leuctra sp.	0	1	1	1	1	4
Paragnetina kansensis	0	1	2	15	1	19
Perlesta placida	0	0	4	0	1	5
Perlidae*	0	0	2	1	0	3
Perlinella drymo	0	0	1	0	0	1
Pteronarcys dorsata	0	5	3	4	4	16
HEMIPTERA (true bugs)						
MEGALOPTERA						

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Sialis prob. vagans	1	0	0	0	0	1
TRICHOPTERA (caddisflies)						
Agarodes libalis	0	0	0	1	0	1
Brachycentrus numerosus	0	22	22	8	3	55
Cheumatopsyche sp.	5	0	0	0	0	5
Chimarra sp.	1	0	0	3	0	4
Hydropsyche elissoma	31	30	21	40	2	124
Micrasema rusticum	0	0	2	0	0	2
Micrasema wataga	0	2	0	0	0	2
Neureclipsis sp.	2	1	0	0	0	3
Phylocentropus sp.	2	0	0	0	5	7
Polycentropus sp.	0	6	0	0	0	6
LEPIDOPTERA (moths)						
Parapoynx obscuralis	4	1	1	1	1	8
COLEOPTERA (beetles)						
Anchytarsus bicolor	1	1	0	0	0	2
Dineutus discolor	0	4	0	0	0	4
Gonielmis dietrichi	0	0	1	0	0	1
Hydroporus pilatei	0	0	0	1	0	1
Macronychus glabratus	0	3	0	2	1	6
Optioservus sp.	0	0	1	1	1	3
Sperchopsis tessellatus	3	0	0	0	0	3
Stenelmis markeli	0	1	1	0	0	2
Stenelmis sinuata	0	0	0	1	0	1
Stenelmis sp.	1	2	5	2	0	10
DIPTERA - misc. (true flies)						
Atherix lantha	1	5	3	5	1	15
Atrichopogon sp.	1	0	0	0	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Bezzia sp. 2	7	0	0	0	0	7
Bezzia sp. 6	4	2	0	0	0	6
Bezzia sp. 7	0	0	0	1	0	1
Culicoides sp.	0	0	1	0	0	1
Dolichopodidae	0	1	0	0	0	1
Empididae	1	0	0	0	0	1
Erioptera /Ormosia sp.	0	0	2	0	0	2
Forcipomyia sp.	1	0	0	0	0	1
Hexatoma (Eriocera) cinerea	1	1	0	0	0	2
Palpomyia sp. 1	0	0	0	2	6	8
Palpomyia sp. 3	0	1	0	0	0	1
Palpomyia sp. 4	0	0	0	0	5	5
Palpomyia sp. 5	0	0	0	0	1	1
Pilaria sp.	6	0	0	0	2	8
Sciomyzoidae	0	8	0	1	0	9
Simulium dixiense/jonesi	0	0	28	8	4	40
Simulium slossonae	0	2	0	0	0	2
Simulium sp.*	0	0	2	0	0	2
DIPTERA- Chironomidae (midges)						
Ablabesmyia mallochi	0	1	0	2	0	3
Brillia flavifrons	0	2	0	1	0	3
Cladotanytarsus sp. A	7	37	1	2	0	47
Clinotanypus pinguis	3	3	0	0	1	7
Conchapelopia sp.	1	1	6	5	0	13
Corynoneura sp. 3	0	2	0	0	0	2
Cricotopus vierriensis	0	0	0	0	1	1
Cryptochironomus blarina	1	4	0	0	0	5
Cryptochironomus fulvus gp.	2	3	0	0	1	6
Microtendipes nr. rydalensis	1	1	2	1	0	5
Nilotanypus fi[illegible]latus	0	0	0	1	1	2
Paralauterborni[illegible]la nigrohalte	5	3	0	2	0	10
Parametriocnemus lundbecki	0	5	2	0	0	7
Polypedilum convictum	11	24	44	25	4	108
Polypedilum fallax	0	1	0	0	0	1
Polypedilum halterale	0	2	0	0	2	4

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Polypedilum illinoense	0	2	0	2	3	7
Polypedilum scalaenum	0	0	1	1	1	3
Polypedilum sp.*	1	0	0	0	0	1
Rheocricotopus robacki	3	3	10	2	0	18
Rheosmittia sp.	0	0	0	6	0	6
Rheotanytarsus distinctissimus	9	10	12	30	4	65
Rheotanytarsus exiguus	2	3	0	2	1	8
Robackia claviger	0	1	2	0	0	3
Stelechomyia perpulchra	0	0	1	0	0	1
Stenochironomus hilaris	0	0	1	0	1	2
Symposiocladius lignicola	0	1	0	0	0	1
Synorthocladius semivirens	0	0	1	0	0	1
Tanytarsus glabrescens gp.	3	1	2	4	0	10
Tanytarsus sp. XI Rutter	0	1	0	1	0	2
Tanytarsus sp. XIII Rutter	1	1	0	0	0	2
Tanytarsus sp. XIV Cantrell	0	2	0	0	0	2
Tanytarsus sp. XVI Rutter	1	0	0	1	0	2
Tanytarsus sp. XVII Rutter	1	0	0	0	0	1
Tanytarsus sp.*	0	0	1	0	0	1
Thienemanniella fusca gp.	3	0	1	1	0	5
Thienemanniella xena gp.	1	0	3	2	0	6
Tribelos jucundus	2	0	0	0	0	2
Tvetenia discoloripes gp.	0	4	2	4	1	11
CRUSTACEA						
Cambarinae	0	0	1	0	0	1
Palaemonetes paludosus	0	0	2	2	0	4
ANNELIDA (worms)						
Pristina/Stephensoniana sp.	1	2	0	0	0	3
Tubificidae*	5	3	0	0	0	8
MOLLUSCA (snails, clams)						
Gillia altilis	0	1	1	1	4	7

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: October 1988
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Sphaerium sp.	0	0	0	1	0	1
Viviparus subpurpureus	0	2	0	0	13	15

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 1 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
EPHEMEROPTERA (mayflies)				
Dolania americana	0	0	1	1
Ephemerella argo	3	0	0	3
Ephemerella dorothea	16	0	0	16
Ephemerella inconstans	1	0	0	1
Ephemerella invaria/rotunda	8	0	0	8
Hexagenia munda	0	5	0	5
Paraleptophlebia guttata	0	5	0	5
Pseudocloeon punctiventris	2	0	0	2
Stenonema modestum/smithae	6	1	0	7
ODONATA (dragonflies)				
PLECOPTERA (stoneflies)				
Acroneuria abnormis	3	0	0	3
Haptoperla brevis	1	0	0	1
Helopicus subvarians	1	0	0	1
Isoperla nana	7	0	0	7
Isoperla orata/dicala	1	0	0	1
Isoperla sp.*	27	0	0	27
Paragnetina kansensis	2	0	0	2
Perlesta placida	9	0	0	9
Perlidae*	16	0	0	16
Pteronarcys dorsata	6	0	0	6
HEMIPTERA (true bugs)				
MEGALOPTERA				
Sialis nr. vagans	0	1	0	1
TRICHOPTERA (caddisflies)				

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 1 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Cheumatopsyche sp.	4	0	0	4
Hydropsyche elissoma	16	0	0	16
Micrasema rusticum	0	1	0	1
Micrasema wataga	2	0	0	2
Phylocentropus sp.	0	3	0	3
Polycentropus sp.	0	2	0	2
Triaenodes nr. taenia	0	2	0	2
LEPIDOPTERA (moths)				
COLEOPTERA (beetles)				
Ancyronyx variegatus	1	0	0	1
Dineutus discolor	0	0	1	1
Gonielmis dietrichi	1	0	0	1
Hydroporus pilatei	0	2	0	2
Macronychus glabratus	1	0	0	1
Optioservus sp.	1	0	0	1
Stenelmis sp. *	1	0	0	1
DIPTERA - misc. (true flies)				
Atherix lantha	2	0	0	2
Bezzia sp. 2	0	1	0	1
Empididae	2	0	0	2
Palpomyia sp. 1	0	2	0	2
Palpomyia sp. 4	0	2	0	2
Palpomyia sp. 5	0	4	0	4
Simulium dixie[illegible]/jonesi	9	0	0	9
Simulium sp.*	2	0	0	2
DIPTERA- Chironomidae (midges)				
Ablabesmyia janta	0	2	0	2
Ablabesmyia mallochi	0	3	0	3

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

SITE 1

	SNAG	DETR	SAND	TOTAL
Brillia flavifrons	1	0	0	1
Brillia parva	1	0	0	1
Clinotanypus pinguis	0	1	0	1
Conchapelopia sp.	5	42	1	48
Corynoneura sp.*	8	0	0	8
Cryptochironomus fulvus gp.	0	2	0	2
Gymnometriocnemus sp.	0	1	0	1
Micropsectra sp.	2	2	0	4
Microtendipes nr. rydalensis	3	3	0	6
Nanocladius sp.*	1	0	0	1
Nilotanypus fimbriatus	1	0	0	1
Orthocladius dentifer	2	0	0	2
Pagastiella ostansa	0	2	0	2
Paracladopelma undine	0	2	0	2
Parakiefferiella sp. A	0	2	0	2
Parakiefferiella sp.4	0	1	0	1
Paralauterborniella nigrohalte	0	1	0	1
Paramerina sp.	0	1	0	1
Parametriocnemus lundbecki	41	33	0	74
Polypedilum convictum	21	0	0	21
Rheocricotopus robacki	4	1	0	5
Rheosmittia sp.	0	0	7	7
Rheotanytarsus distinctissimus	7	1	0	8
Rheotanytarsus exiguus	2	0	0	2
Stelechomyia perpulchra	1	0	0	1
Synorthocladius semivirens	1	0	0	1
Tanytarsus glabrescens gp.	1	0	0	1
Tanytarsus sp. XVI Rutter	2	2	0	4
Tanytarsus sp. XVII Rutter	1	0	0	1
Tanytarsus sp.*	1	0	0	1
Thienemanniella fusca gp.	3	0	0	3
Thienemanniella xena gp.	4	0	0	4
Tribelos jucundus	0	14	0	14
Tvetenia discoloripes gp.	11	0	0	11
Tvetenia paucunca/vitracies	9	0	0	9

CRUSTACEA

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 1 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Cambarinae	0	1	0	1
Crangonyx serratus	0	1	0	1
Palaemonetes paludosus	0	1	0	1
ANNELIDA (worms)				
Pristina/Stephensoniana sp.	0	1	0	1
MOLLUSCA (snails, clams)				
Viviparus subpurpureus	0	3	0	3

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
EPHEMEROPTERA (mayflies)				
Acerpenna pygmaeus	0	3	0	3
Baetis intercalaris	0	1	0	1
Baetis sp.*	0	2	0	2
Caenis sp.	1	0	0	1
Ephemerella argo	2	0	0	2
Ephemerella dorothea	17	0	0	17
Ephemerella invaria/rotunda	7	0	0	7
Paraleptophlebia guttata	0	1	0	1
Pseudocloeon punctiventris	1	0	0	1
Stenonema modestum/smithae	8	3	0	11
ODONATA (dragonflies)				
Tetragoneuria semiaquea	1	0	0	1
PLECOPTERA (stoneflies)				
Isoperla nana	27	3	0	30
Isoperla orata/dicala	2	0	0	2
Isoperla sp.*	13	0	0	13
Leuctra sp.	2	0	0	2
Paragnetina kansensis	4	0	0	4
Perlesta placida	11	0	0	11
Perlidae*	5	0	0	5
Pteronarcys dorsata	13	0	0	13
HEMIPTERA (true bugs)				
MEGALOPTERA				
Corydalus cornutus	1	0	0	1
TRICHOPTERA (caddisflies)				

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Brachycentrus numerosus	2	0	0	2
Cheumatopsyche sp.	6	1	0	7
Hydropsyche elissoma	39	1	0	40
Micrasema rusticum	4	0	0	4
Micrasema wataga	4	0	0	4
Neureclipsis sp.	1	0	0	1
Phylocentropus sp.	0	9	0	9
Polycentropus sp.	0	2	0	2
Triaenodes nr. taenia	0	5	0	5
LEPIDOPTERA (moths)				
COLEOPTERA (beetles)				
Ancyronyx variegatus	4	0	0	4
Gonielmis dietrichi	1	0	0	1
Macronychus glabratus	6	0	0	6
Optioservus sp.	5	0	0	5
Stenelmis sp. *	2	0	0	2
DIPTERA - misc. (true flies)				
Atherix lantha	3	0	0	3
Bezzia sp. 2	0	1	0	1
Bezzia sp. 6	0	2	0	2
Bezzia sp. 7	0	0	1	1
Palpomyia sp. 1	0	3	2	5
Palpomyia sp. 4	0	4	0	4
Palpomyia sp. 5	0	3	0	3
Pilaria sp.	0	2	0	2
DIPTERA- Chironomidae (midges)				
Ablabesmyia janta	0	1	0	1
Apsectrotanypus johnsoni	0	1	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 2 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Beckidia sp.	0	0	3	3
Brillia flavifrons	4	0	0	4
Clinotanypus pinguis	0	1	0	1
Conchapelopia sp.	2	11	0	13
Corynoneura sp.*	2	0	0	2
Cryptochironomus fulvus gp.	0	7	0	7
Micropsectra sp.	7	0	0	7
Microtendipes pedellus	0	8	0	8
Nanocladius rectinervis	3	0	0	3
Nilotanypus fimbriatus	2	0	0	2
Orthocladius dentifer	2	0	0	2
Pagastiella ostansa	0	1	1	2
Paracladopelma doris	0	0	3	3
Paracladopelma undine	0	7	1	8
Parakiefferiella sp. A	2	1	0	3
Parakiefferiella sp.4	0	7	0	7
Paralauterborniella nigrohalte	0	4	1	5
Parametriocnemus lundbecki	1	30	0	31
Parametriocnemus sp. C	3	0	0	3
Polypedilum convictum	13	2	0	15
Polypedilum halterale	0	3	3	6
Rheocricotopus robacki	12	0	0	12
Rheosmittia sp.	0	0	1	1
Rheotanytarsus distinctissimus	8	0	0	8
Stempellinella sp.	1	2	0	3
Stenochironomus hilaris	0	1	0	1
Tanytarsus sp. XVII Rutter	0	4	0	4
Thienemanniella fusca gp.	2	0	0	2
Thienemanniella xena gp.	3	0	0	3
Tribelos jucundus	0	5	0	5
Tvetenia discoloripes gp.	17	1	0	18
Tvetenia paucu[illegible]/vitracies	12	0	0	12
Unniella multivirga	1	0	0	1
CRUSTACEA				
Caecidotea sp.	0	1	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

SITE 2

	SNAG	DETR	SAND	TOTAL
Crangonyx serratus	0	3	0	3
Palaemonetes paludosus	0	3	0	3
ANNELIDA (worms)				
Spirosperma sp.	0	1	0	1
MOLLUSCA (snails, clams)				
Gillia altilis	0	3	0	3
Sphaerium sp.	0	1	0	1
Viviparus subpurpureus	0	5	0	5

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
EPHEMEROPTERA (mayflies)				
Dannella simplex	1	0	0	1
Ephemerella argo	1	0	0	1
Ephemerella dorothea	9	0	0	9
Ephemerella invaria/rotunda	6	0	0	6
Hexagenia munda	0	8	0	8
Paraleptophlebia guttata	0	6	0	6
Stenonema modestum/smithae	0	3	0	3
ODONATA (dragonflies)				
Boyeria vinosa	1	0	0	1
PLECOPTERA (stoneflies)				
Acroneuria abnormis	1	0	0	1
Haploperla brevis	0	0	4	4
Helopicus subvarians	2	0	0	2
Isoperla bilineata	1	0	0	1
Isoperla nana	5	1	0	6
Isoperla orata/dicala	1	0	0	1
Isoperla sp.*	41	0	0	41
Leuctra sp.	1	4	0	5
Perlesta placida	10	2	0	12
HEMIPTERA (true bugs)				
MEGALOPTERA				
TRICHOPTERA (caddisflies)				
Cheumatopsyche sp.	1	2	0	3
Chimarra sp.	1	0	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Hydropsyche elissoma	16	0	0	16
Lepidostoma sp.	1	0	0	1
Lype diversa	1	0	0	1
Micrasema rusticum	1	0	0	1
Micrasema wataga	3	0	0	3
Phylocentropus sp.	0	1	0	1
Polycentropus sp.	0	4	0	4
Pycnopsyche sp.	2	0	0	2
Triaenodes nr. taenia	1	0	0	1
LEPIDOPTERA (moths)				
COLEOPTERA (beetles)				
Anchytarsus bicolor	0	1	0	1
Ectopria nervosa	1	0	0	1
Macronychus glabratus	2	0	0	2
Optioservus sp.	1	0	0	1
Stenelmis sp. *	5	0	1	6
DIPTERA - misc. (true flies)				
Antocha sp.	1	0	0	1
Atherix lantha	2	0	0	2
Bezzia sp. 2	1	1	0	2
Empididae	4	0	0	4
Palpomyia sp. 1	0	14	0	14
Palpomyia sp. 3	0	2	0	2
Palpomyia sp. 4	0	4	0	4
Palpomyia sp. 5	3	2	0	5
Simulium dixi[illegible]/jonesi	12	0	0	12
Simulium sp.*	7	1	0	8
Tipula sp.7	1	1	0	2
DIPTERA- Chironomidae (midges)				

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
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STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Ablabesmyia mallochi	0	1	0	1
Clinotanypus pinguis	0	8	0	8
Conchapelopia sp.	3	23	0	26
Corynoneura nr. taris	1	0	0	1
Corynoneura sp. 3	11	0	0	11
Cricotopus bicinctus	1	0	0	1
Cricotopus vierriensis	1	0	0	1
Cryptochironomus fulvus gp.	0	3	0	3
Heterotrissocladius marcidus	0	1	0	1
Lopescladius sp.	1	0	0	1
Nilotanypus fimbriatus	1	0	0	1
Orthocladius curtiseta	13	0	0	13
Paracladopelma undine	0	1	0	1
Paracricotopus sp.	1	0	0	1
Parakiefferiella sp. A	14	0	0	14
Parakiefferiella sp.4	0	6	0	6
Paralauterborniella nigrohalteralis	0	2	0	2
Paramerina sp.	0	1	0	1
Parametriocnemus lundbecki	1	22	0	23
Paratendipes nr. nudisquama	2	0	0	2
Polypedilum convictum	8	4	0	12
Polypedilum halterale	0	1	0	1
Polypedilum scalaenum	1	1	4	6
Polypedilum sp.*	1	0	0	1
Rheocricotopus robacki	15	0	0	15
Rheosmittia sp.	3	0	12	15
Rheotanytarsus distinctissimus	4	2	0	6
Rheotanytarsus exiguus	0	2	0	2
Robackia claviger	0	0	1	1
Stempellinella sp.	0	1	0	1
Stenochironomus hilaris	0	1	0	1
Symposiocladius lignicola	4	0	0	4
Tanytarsus glabrescens gp.	0	1	0	1
Tanytarsus sp. XII Rutter	0	1	0	1
Tanytarsus sp. XVI Rutter	0	1	0	1
Tanytarsus sp.*	2	0	0	2
Thienemanniella fusca gp.	7	0	0	7

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 3 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Tvetenia discoloripes gp.	16	0	0	16
Tvetenia paucunca/vitracies	11	0	0	11
CRUSTACEA				
ANNELIDA (worms)				
MOLLUSCA (snails, clams)				
Gillia altilis	0	4	0	4

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
EPHEMEROPTERA (mayflies)				
Dannella simplex	0	0	1	1
Ephemerella argo	2	0	1	3
Ephemerella dorothea	8	0	0	8
Ephemerella invaria/rotunda	5	0	0	5
Isonychia sp.	1	0	0	1
Neoephemera youngi	1	0	0	1
Paraleptophlebia guttata	0	1	0	1
Pseudocloeon dubium/bimaculatus	1	0	0	1
Stenonema modestum/smithae	4	1	0	5
ODONATA (dragonflies)				
Boyeria vinosa	1	1	0	2
Gomphus lividus	0	1	0	1
Hagenius brevistylus	0	1	0	1
PLECOPTERA (stoneflies)				
Acroneuria abnormis	1	0	0	1
Isoperla bilineata	2	0	0	2
Isoperla nana	23	0	1	24
Isoperla orata/dicala	4	0	1	5
Isoperla sp.*	11	0	0	11
Leuctra sp.	0	1	0	1
Perlesta placida	12	1	1	14
Pteronarcys dorsata	16	0	1	17
HEMIPTERA (true bugs)				
MEGALOPTERA				
TRICHOPTERA (caddisflies)				

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Agarodes libalis	0	0	1	1
Anisocentropus pyraloides	0	1	0	1
Cheumatopsyche sp.	5	0	0	5
Hydropsyche elissoma	32	0	0	32
Lepidostoma sp.	0	1	0	1
Lype diversa	0	0	1	1
Micrasema rusticum	2	0	0	2
Micrasema wataga	2	0	0	2
Phylocentropus sp.	0	2	0	2
Triaenodes nr. taenia	0	3	0	3
LEPIDOPTERA (moths)				
COLEOPTERA (beetles)				
Anchytarsus bicolor	1	0	0	1
Enochrus ochracaeus	1	0	0	1
Macronychus glabratus	4	0	1	5
Optioservus sp.	5	0	0	5
Sperchopsis tessellatus	1	0	0	1
Stenelmis sp. *	5	0	1	6
DIPTERA - misc. (true flies)				
Atherix lantha	1	0	0	1
Bezzia sp. 2	0	1	0	1
Chrysops sp.	0	1	0	1
Empididae	10	0	0	10
Palpomyia sp. 1	0	2	0	2
Palpomyia sp. 4	0	7	0	7
Palpomyia sp. 5	0	3	0	3
Simulium dixiense/jonesi	2	0	0	2
DIPTERA- Chironomidae (midges)				

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Ablabesmyia mallochi	0	2	0	2
Beckidia sp.	0	0	2	2
Brillia flavifrons	0	0	1	1
Cladotanytarsus sp. A	0	1	0	1
Conchapelopia sp.	3	3	0	6
Corynoneura nr. coronata	0	1	0	1
Corynoneura sp. 3	0	1	0	1
Corynoneura sp.*	0	1	0	1
Cryptochironomus fulvus gp.	0	1	0	1
Labrundinia pilosella	0	2	0	2
Lopescladius sp.	1	0	0	1
Microtendipes nr. rydalensis	0	4	1	5
Microtendipes pedellus	0	1	0	1
Orthocladius curtiseta	3	0	0	3
Orthocladius dentifer	1	0	0	1
Pagastiella ostansa	0	2	0	2
Paracladopelma doris	0	0	1	1
Paracladopelma undine	0	3	1	4
Parakiefferiella sp. A	0	3	0	3
Paralauterborniella nigrohalteralis	0	1	0	1
Paramerina sp.	0	2	0	2
Parametriocnemus lundbecki	4	9	0	13
Polypedilum convictum	3	1	1	5
Polypedilum halterale	2	0	8	10
Polypedilum scalaenum	0	5	0	5
Polypedilum sp.*	0	0	1	1
Rheosmittia sp.	0	0	2	2
Rheotanytarsus distinctissimus	3	1	1	5
Rheotanytarsus exiguus	1	0	0	1
Stempellinella sp.	0	2	0	2
Stenochironomus hilaris	1	0	0	1
Symposiocladius lignicola	2	0	1	3
Synorthocladius semivirens	1	0	0	1
Tanytarsus glabrescens gp.	4	0	0	4
Tanytarsus sp.*	0	1	0	1
Thienemanniella fusca gp.	2	0	0	2
Thienemanniella xena gp.	2	0	0	2

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 4 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
Tvetenia discoloripes gp.	16	0	1	17
Tvetenia paucunca/vitracies	8	0	0	8
CRUSTACEA				
Cambarinae	0	3	0	3
Palaemonetes paludosus	0	4	0	4
ANNELIDA (worms)				
MOLLUSCA (snails, clams)				
Gillia altilis	0	0	2	2
Viviparus subpurpureus	0	1	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 5 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
SRPSITE5				
EPHEMEROPTERA (mayflies)				
Baetis frondalis	0	1	0	1
Baetis sp.*	1	0	0	1
Ephemerella dorothea	1	0	1	2
Ephemerella invaria/rotunda	3	0	0	3
Neoephemera youngi	10	0	0	10
Pseudocloeon dubium/bimaculatus	2	0	1	3
Stenonema modestum/smithae	5	2	0	7
ODONATA (dragonflies)				
Gomphus lividus	0	1	0	1
PLECOPTERA (stoneflies)				
Isoperla nana	9	0	1	10
Isoperla orata/dicala	3	0	0	3
Leuctra sp.	1	0	0	1
Perlesta placida	19	0	0	19
Perlidae*	0	3	0	3
Pteronarcys dorsata	3	0	0	3
HEMIPTERA (true bugs)				
MEGALOPTERA				
TRICHOPTERA (caddisflies)				
Anisocentropus pyraloides	0	1	0	1
Cheumatopsyche sp.	10	0	0	10
Hydropsyche elissoma	8	0	0	8
Lype diversa	1	0	0	1
Micrasema wataga	0	1	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
SITE 5 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
SRPSITE5				
Oecetis sp.	0	1	0	1
Pycnopsyche sp.	1	0	0	1
Triaenodes nr. taenia	2	0	0	2
LEPIDOPTERA (moths)				
COLEOPTERA (beetles)				
Ectopria nervosa	1	0	0	1
Gonielmis dietrichi	1	0	0	1
Hydroporus pilatei	0	1	0	1
Macronychus glabratus	1	0	0	1
Optioservus sp.	2	0	0	2
Stenelmis markeli	2	0	0	2
DIPTERA - misc. (true flies)				
Bezzia sp. 2	1	0	0	1
Bezzia sp. 6	1	1	0	2
Hexatoma (Eriocera) cinerea	0	1	0	1
Palpomyia sp. 1	0	9	0	9
Palpomyia sp. 4	0	1	0	1
Palpomyia sp. 5	0	11	1	12
Pilaria sp.	0	3	0	3
Simulium dixiense/jonesi	4	0	0	4
Simulium sp.*	1	0	0	1
Tipula sp.7	1	0	0	1
DIPTERA- Chironomidae (midges)				
Ablabesmyia mallochi	0	1	0	1
Beckidia sp.	0	0	1	1
Cladotanytarsus sp. A	0	1	1	2
Conchapelopia sp.	8	2	0	10
Corynoneura nr. coronata	0	2	0	2
Cryptochironomus fulvus gp.	0	1	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
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SITE 5 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
SRPSITE5				
Lopescladius sp.	0	2	0	2
Microtendipes pedellus	1	4	0	5
Orthocladius curtiseta	2	0	0	2
Pagastiella ostansa	0	1	0	1
Paracladopelma undine	0	2	0	2
Parakiefferiella sp. A	1	2	0	3
Parakiefferiella sp. B	3	1	0	4
Parakiefferiella sp.4	0	2	0	2
Paralauterborniella nigrohalteralis	1	5	0	6
Paramerina sp.	0	2	0	2
Parametriocnemus lundbecki	1	5	0	6
Paratendipes nr. nudisquama	0	1	0	1
Polypedilum convictum	5	0	0	5
Polypedilum halterale	1	5	11	17
Polypedilum scalaenum	0	7	4	11
Psectrocladius (Meso.)	0	1	0	1
Rheocricotopus robacki	1	0	0	1
Rheosmittia sp.	0	1	6	7
Rheotanytarsus distinctissimus	3	2	0	5
Stempellinella sp.	1	4	0	5
Tanytarsus glabrescens gp.	1	1	0	2
Tanytarsus sp. XVI Rutter	1	1	0	2
Tanytarsus sp. XVII Rutter	1	1	0	2
Thienemanniella fusca gp.	2	0	0	2
Thienemanniella xena gp.	1	0	0	1
Tribelos jucundus	0	2	0	2
Tvetenia discoloripes gp.	1	0	0	1
Tvetenia paucunca/vitracies	1	1	0	2
Unniella multivirga	1	0	0	1
CRUSTACEA				
Cambarinae	0	1	0	1
ANNELIDA (worms)				
Spirosperma sp.	0	1	0	1

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
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SITE 5 LOCATION: Aiken Co., SC

	SNAG	DETR	SAND	TOTAL
SRPSITE5				
Tubificidae*	0	0	1	1
MOLLUSCA (snails, clams)				
Sphaerium sp.	0	2	0	2
Viviparus subpurpureus	0	1	0	1
ACARI				

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
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	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
EPHEMEROPTERA (mayflies)						
Acerpenna pygmaeus	0	3	0	0	0	3
Baetis frondalis	0	0	0	0	1	1
Baetis intercalaris	0	1	0	0	0	1
Baetis sp.*	0	2	0	0	1	3
Caenis sp.	0	1	0	0	0	1
Dannella simplex	0	0	1	1	0	2
Dolania americana	1	0	0	0	0	1
Ephemerella argo	3	2	1	3	0	9
Ephemerella dorothea	16	17	9	8	2	52
Ephemerella inconstans	1	0	0	0	0	1
Ephemerella invaria/rotunda	8	7	6	5	3	29
Hexagenia limbata	5	0	8	0	0	13
Isonychia sp.	0	0	0	1	0	1
Neoephemera youngi	5	1	6	1	10	23
Paraleptophlebia guttata	0	0	0	1	0	1
Pseudocloeon dubium/bimaculatus	2	1	0	1	3	7
Stenonema modestum/smithae	7	11	3	5	7	33
ODONATA (dragonflies)						
Boyeria vinosa	0	0	1	2	0	3
Gomphus lividus	0	0	0	1	1	2
Hagenius brevistylus	0	0	0	1	0	1
Tetragoneuria semiaquea	0	1	0	0	0	1
PLECOPTERA (stoneflies)						
Acroneuria abnormis	3	0	1	1	0	5
Haptoperla brevis	1	0	4	0	0	5
Helopicus subvarians	1	0	2	0	0	3
Isoperla bilineata	0	0	1	2	0	3
Isoperla nana	7	30	6	24	10	77
Isoperla orata/dicala	1	2	1	5	3	12
Isoperla sp.*	27	13	41	11	0	92

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
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STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Leuctra sp.	0	2	5	1	1	9
Paragnetina kansensis	2	4	0	0	0	6
Perlesta placida	9	11	12	14	19	65
Perlidae*	16	5	0	0	3	24
Pteronarcys dorsata	6	13	0	17	3	39
HEMIPTERA (true bugs)						
MEGALOPTERA						
Corydalus cornutus	0	1	0	0	0	1
Sialis nr. vagans	1	0	0	0	0	1
TRICHOPTERA (caddisflies)						
Agarodes libalis	0	0	0	1	0	1
Anisocentropus pyraloides	0	0	0	1	1	2
Brachycentrus numerosus	0	2	0	0	0	2
Cheumatopsyche sp.	4	7	3	5	10	29
Chimarra sp.	0	0	1	0	0	1
Hydropsyche elissoma	16	40	16	32	8	112
Lepidostoma sp.	0	0	1	1	0	2
Lype diversa	0	0	1	1	1	3
Micrasema rusticum	1	4	1	2	0	8
Micrasema wataga	2	4	3	2	1	12
Neureclipsis sp.	0	1	0	0	0	1
Oecetis sp.	0	0	0	0	1	1
Phylocentropus sp.	3	9	1	2	0	15
Polycentropus sp.	2	2	4	0	0	8
Pycnopsyche sp.	0	0	2	0	1	3
Triaenodes nr. [illegible]nia	2	5	1	3	2	13
LEPIDOPTERA (moths)						
COLEOPTERA (beetles)						

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
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	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Anchytarsus bicolor	0	0	1	1	0	2
Ancyronyx variegatus	1	4	0	0	0	5
Dineutus discolor	1	0	0	0	0	1
Ectopria nervosa	0	0	1	0	1	2
Enochrus ochracaeus	0	0	0	1	0	1
Gonielmis dietrichi	1	1	0	0	1	3
Hydroporus pilatei	2	0	0	0	1	3
Macronychus glabratus	1	6	2	5	1	15
Optioservus sp.	1	5	1	5	2	14
Sperchopsis tessellatus	0	0	0	1	0	1
Stenelmis markeli	0	0	0	0	2	2
Stenelmis sp. *	1	2	6	6	0	15
DIPTERA - misc. (true flies)						
Antocha sp.	0	0	1	0	0	1
Atherix lantha	2	3	2	1	0	8
Bezzia sp. 2	1	1	2	1	1	6
Bezzia sp. 6	0	2	0	0	2	4
Bezzia sp. 7	0	1	0	0	0	1
Chrysops sp.	0	0	0	1	0	1
Empididae	2	0	4	10	0	16
Hexatoma (Eriocera) cinerea	0	0	0	0	1	1
Palpomyia sp. 1	2	5	14	2	9	32
Palpomyia sp. 3	0	0	2	0	0	2
Palpomyia sp. 4	2	4	4	7	1	18
Palpomyia sp. 5	4	3	5	3	12	27
Pilaria sp.	0	2	0	0	3	5
Simulium dixiense/jonesi	9	0	12	2	4	27
Simulium sp.*	2	0	8	0	1	11
Tipula sp.7	0	0	2	0	1	3
DIPTERA- Chironomidae (midges)						
Ablabesmyia janta	2	1	0	0	0	3
Ablabesmyia mallochi	3	0	1	2	1	7

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Apsectrotanypus johnsoni	0	1	0	0	0	1
Beckidia sp.	0	3	0	2	1	6
Brillia flavifrons	1	4	0	1	0	6
Brillia parva	1	0	0	0	0	1
Cladotanytarsus sp. A	0	0	0	1	2	3
Clinotanypus pinguis	1	1	8	0	0	10
Conchapelopia sp.	48	13	26	6	10	103
Corynoneura nr. coronata	0	0	0	1	2	3
Corynoneura nr. taris	0	0	1	0	0	1
Corynoneura sp. 3	0	0	11	1	0	12
Corynoneura sp.*	8	2	0	1	0	11
Cricotopus bicinctus	0	0	1	0	0	1
Cricotopus vierriensis	0	0	1	0	0	1
Cryptochironomus fulvus gp.	2	7	3	1	1	14
Heterotrissocladius marcidus	1	0	0	0	0	1
Labrundinia pilosella	0	0	1	0	0	1
Limnophyes sp.	0	0	0	2	0	2
Lopescladius sp.	0	0	0	0	2	2
Meropelopia sp.	0	0	1	1	0	2
Microtendipes nr. rydalensis	4	7	0	0	0	11
Microtendipes pedellus	6	0	0	5	5	16
Nanocladius distinctus	0	8	0	1	0	9
Nanocladius sp.*	0	3	0	0	0	3
Nilotanypus fimbriatus	1	0	0	0	0	1
Nilothauma babiyi	1	2	1	0	0	4
Orthocladius curtiseta	0	0	0	0	2	2
Orthocladius dentifer	0	0	13	3	0	16
Orthocladius sp. (Pupa) *	2	2	0	1	0	5
Pagastiella ostansa	0	0	0	0	1	1
Paracladopelma doris	2	2	0	2	0	6
Paracladopelma loganae	0	3	0	1	0	4
Paracladopelma undine	0	0	0	0	2	2
Paracricotopus sp.	2	8	1	4	0	15
Parakiefferiella sp. A	2	3	1	0	3	9
Parakiefferiella sp. B	0	0	14	3	4	21
Parakiefferiella sp.4	1	7	0	0	2	10
Paralauterborniella nigrohalteralis	1	5	6	0	6	18

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Paramerina sp.	1	0	2	1	2	6
Parametriocnemus lundbecki	74	31	1	2	6	114
Parametriocnemus sp. C	0	3	23	13	0	39
Paratendipes nr. nudisquama	0	0	0	0	1	1
Polypedilum aviceps	0	0	2	0	0	2
Polypedilum convictum	21	15	0	0	5	41
Polypedilum fallax	0	0	12	5	0	17
Polypedilum halterale	0	6	0	0	17	23
Polypedilum illinoense	0	0	1	10	0	11
Polypedilum scalaenum	0	0	0	0	11	11
Polypedilum sp.*	0	0	6	5	0	11
Potthastia longimanus	0	0	1	1	0	2
Psectrocladius (Meso.)	0	0	0	0	1	1
Rheocricotopus robacki	5	12	15	0	1	33
Rheosmittia sp.	7	1	15	2	7	32
Rheotanytarsus distinctissimus	8	8	6	5	5	32
Rheotanytarsus exiguus	2	0	2	1	0	5
Robackia claviger	0	0	1	0	0	1
Stelechomyia perpulchra	1	0	0	0	0	1
Stempellinella sp.	0	3	1	2	5	11
Stenochironomus hilaris	0	1	1	1	0	3
Symposiocladius lignicola	0	0	4	3	0	7
Synorthocladius semivirens	1	0	0	1	0	2
Tanytarsus glabrescens gp.	1	0	1	4	2	8
Tanytarsus sp. XII Rutter	0	0	1	0	0	1
Tanytarsus sp. XIV Cantrell	4	0	0	0	0	4
Tanytarsus sp. XVI Rutter	1	4	1	0	2	8
Tanytarsus sp. XVII Rutter	0	0	0	0	2	2
Tanytarsus sp.*	1	0	2	1	0	4
Thienemanniella fusca gp.	3	2	7	2	2	16
Thienemanniella xena gp.	4	3	0	2	1	10
Tribelos jucundus	14	5	0	0	2	21
Tvetenia discoloripes gp.	11	18	16	17	1	63
Tvetenia paucunca/vitracies	9	12	11	8	2	42
Unniella multivirga	0	1	0	0	1	2

CRUSTACEA

APPENDIX B : LIST OF SPECIES FOR QUALITATIVE MACROINVERTEBRATE IN-STREAM ASSESSMENT.

DATE: March 1989
CLIENT: S.R.P.
STREAM: Upper Three Runs Creek
LOCATION: Aiken Co., SC

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	TOTAL
Caecidotea sp.	0	1	0	0	0	1
Cambarinae	1	0	0	3	1	5
Crangonyx serratus	1	3	0	0	0	4
Palaemonetes paludosus	1	3	0	4	0	8
ANNELIDA (worms)						
Pristina/Stephensoniana sp.	1	0	0	0	0	1
Spirosperma sp.	0	1	0	0	1	2
Tubificidae*	0	0	0	0	1	1
MOLLUSCA (snails, clams)						
Gillia altilis	0	3	4	2	0	9
Sphaerium sp.	0	1	0	0	2	3
Viviparus subpurpureus	3	5	0	1	1	10

APPENDIX C

UPPER THREE RUNS CR. - COMPLETE SPECIES LIST

July 1987-April 1989

Species	Biotic Index	Funct. Group	Quantitative Sampling Date								Qualitative			
			Jul 87	Oct 87	Feb 88	Apr 88	Jul 88	Oct 88	Jan 89	Apr 89	Nov 87	Mar 88	Oct 88	Mar 89
EPHEMEROPTERA (mayflies) 28 species														
Acerpenna pygmaeus	4	CG/SC				R			R		R		C	R
Baetis ephippiatus	5	CG/SC	C	R	R	R	R							
Baetis frondalis	5	CG/SC												R
Baetis intercalaris	6	CG/SC		R	R		R		R		R			R
Baetis sp.*	5	CG/SC	R											R
Caenis sp.	7	CG/SC	R	R			R		R		C	R	R	R
Callibaetis sp.	9	CG			R									
Centroptilum sp.	2	CG/SC											R	
Dannella simplex	2	CG			R				R	R		R		R
Dolania americana	2	P										R		R
Ephemerella argo	1	CG/SC			R					R		R		C
Ephemerella dorothea	1	CG/SC			C	C			R	C		C		C
Ephemerella inconstans	1	CG/SC			R									R
Ephemerella invaria/rotunda	1	CG/SC			C	R			R	C		R		C
Ephemerellidae*	1	CG/SC	R		R	R						R		
Eurylophella doris	1	CG										R		
Eurylophella nr. bicolor	1	CG			R	R			R			R		
Eurylophella prudentalis	1	CG									R			
Eurylophella temporalis	5	CG										C		
Heptagenia flavescens	4	CG/SC	C	C	C	C	C	R	R		R	C		
Heptageniidae*	4	CG/SC	R						R				R	
Hexagenia munda	6	CG	R								R	R	R	R
Isonychia sp.	2	CF/P												R
Leptophlebia sp.	4	CG							R		R	R	R	
Neoephemera youngi	5	CG			R	C			R			C	R	R
Paraleptophlebia guttata	1	CG/SD									C	R		C
Pseudocloeon bimaculatus	4	CG/SC	C	R	C	C	C	R	R	R	C	C	R	R
Pseudocloeon punctiventris	5	CG/SC							R	R	R			R
Serratella serratoides	2	CG	R			R	R							
Stenonema modestum/smithae	5	CG/SC	C	C	C	C	C	C	C	C	C	C	R	C
Tricorythodes sp.	4	CG	R										R	

* Specimen not identifiable to genus; R rare - found at 1-3 sites; C common - found at 4-5 sites.

APPENDIX C

UPPER THREE RUNS CR. - COMPLETE SPECIES LIST

July 1987-April 1989

Species		Biotic Index	Funct. Group	Quantitative Sampling Date: Jul 87	Oct 87	Feb 88	Apr 88	Jul 88	Oct 88	Jan 89	Apr 89	Qualitative: Nov 87	Mar 88	Oct 88	Mar 89
ODONATA (dragonflies)	9 species														
Argia sp.		8	P										R		
Boyeria vinosa		2	P	R	R						R		R	R	R
Calopteryx dimidiata		5	P										R		
Calopteryx maculata		5	P			R						R			
Enallagma sp.		8	P											R	
Gomphus (Gomphus) lividus		5	P									R	R	R	R
Gomphus (Gomphus) sp.*		5	P											R	
Hagenius brevistylus		1	P												R
Tetragoneuria semiaquea		5	P									R		R	R
Tetragoneuria sp.		5	P				R						R		
PLECOPTERA (stoneflies)	**19 species**														
Acroneuria abnormis		0	P	R	C	C	C	C	C	C	C	R	C	C	R
Acroneuria mela		0	P	R	R	R		R	R	C	R		R		
Agnetina capitata		2	P								R				
Allocapnia sp.		3	SD							R		R	R		
Alloperla sp.		0	P				R								
Haploperla brevis		1	P								R	R			R
Helopicus subvarians		1	P			R				R		R	R		R
Isoperla bilineata		4	P			C				C			R		R
Isoperla nr. nana		5	P				R				C		R		C
Isoperla orata/dicala		2	P			C	C			R	R		C		C
Isoperla sp.*		2	P				R			C	R			R	C
Leuctra sp.		0	SD				R		R		R	R	R	C	C
Neoperla prob. carlsoni		1	P	R											
Paragnetina fumosa		1	P			R						R	R		
Paragnetina kansensis		1	P	C	C	C	C	C	C	C	C	C	C	C	R
Perlesta placida		5	P	C		R	C	C		C	C	R	C	R	C
Perlidae*		3	P		R	R		R		R	R	R		R	R
Perlinella drymo		1	P					R				R		R	
Perlinella ephyre		1	P							R		R	R		
Pteronarcys dorsata		0	P/SC/SH/SD	C	C	C	R	C	C	C	C	R	C	C	C
Taeniopteryx nr.lita		2	CG/SD				R			C		C	R		
HEMIPTERA (true bugs)	**2 species**														
Hesperocorixa minor		9	P									R	R		
Rhagovelia obesa		9	P									R			

* Specimen not identifiable to genus; R rare - found at 1-3 sites; C common - found at 4-5 sites.

APPENDIX C

UPPER THREE RUNS CR. - COMPLETE SPECIES LIST

July 1987-April 1989

Species	Biotic Index	Funct. Group	Quantitative Sampling Date: Jul 87	Oct 87	Feb 88	Apr 88	Jul 88	Oct 88	Jan 89	Apr 89	Qualitative: Nov 87	Mar 88	Oct 88	Mar 89
MEGALOPTERA	**3 species**													
Corydalus cornutus	6	P	R			R	R	R	R	R		R		R
Nigronia serricornis	0	P		R	R							R		
Sialis prob. vagans	4	P						R			R		R	R
TRICHOPTERA (caddisflies)	**28 species**													
Agarodes libalis	3	CG/SD				R	R					R	R	R
Anisocentropus pyraloides	3	SD				R								R
Brachycentrus nigrosoma	1	CF/SC				C				R				
Brachycentrus numerosus	1	CF/SC	C	C			C	C	C	R	C	R	C	R
Ceraclea resurgens	3	CG/SH/P										R		
Cheumatopsyche spp.	5	CF	C	R	C	C	C	R	R	C	C	C	R	C
Chimarra sp.	4	CF	R	R	R	R	R		R			R	R	R
Cyrnellus fraternus	8	CF	R											
Diplectrona modesta	0	CF			R	R	R		R			R		
Hydropsyche elissoma	6	CF	C	C	C	C	C	C	C	C	C	C	C	C
Hydropsyche sp.*	6	CF		R										
Hydroptila sp.	6	PH	R				R					R		
Lepidostoma sp.	1	SD	R		R	C				R	R	C		R
Limnephilidae *	3	CG/SD			R									
Lype diversa	2	SC	R			R					R			R
Mayatrichia ayama	4	SC	R											
Micrasema rusticum	2	CG/SH						R	C	R	R	R	R	C
Micrasema wataga	2	CG/SH	R		R	R				R	R	R	R	C
Nectopsyche pavida	3	CG/SH									R			
Neureclipsis sp.	7	P/CF/SH					R	R			R	R	R	R
Nyctiophylax sp.	5	SC/SD												
Oecetis sp.	8	P/SH					R					R		R
Oxyethira sp.	3	CG/PH								R				
Phylocentropus sp.	5	CF									C	C	R	C
Polycentropus sp.	6	CF/P/SH	R	R			R				R	C	R	R
Psilotreta sp.	0	CG/SC					R				R			
Pycnopsyche sp.	4	SC/SD							R		R	C		R
Triaenodes nr. injusta	6	SH										R		
Triaenodes nr. taenia	6	SH									C	C		C
Triaenodes sp. 2	6	SH				R	R					R		

* Specimen not identifiable to genus; R rare - found at 1-3 sites; C common - found at 4-5 sites.

APPENDIX C

UPPER THREE RUNS CR. - COMPLETE SPECIES LIST

July 1987-April 1989

Species	Biotic Index	Funct. Group	Quantitative Sampling Date: Jul 87	Oct 87	Feb 88	Apr 88	Jul 88	Oct 88	Jan 89	Apr 89	Qualitative: Nov 87	Mar 88	Oct 88	Mar 89
LEPIDOPTERA (moths)	**1 species**													
Parapoynx obscuralis	5	SH			R		R	R			R		C	
COLEOPTERA (beetles)	**17 species**													
Anchytarsus bicolor	4	SD	R			R	R					R	R	R
Ancyronyx variegatus	6	CG/SC	R		R	R	R		R	C		R		R
Dineutus ciliatus	8	P										R		
Dineutus discolor	8	P									R	R	R	R
Dubiraphia quadrinotata	8	CG/SC					R	R			R			
Ectopria nervosa	5	SC	R		R		R	R	R		R	R		R
Elmidae *	5	CG/SC	R											
Enochrus cinctus	8	CG		R										
Enochrus ochraceus	8	CG												R
Gonielmis dietrichi	8	CG/SC	R			R	R		R	R			R	R
Gyrinus aenolus	8	P										R		
Hydroporus pilatei	8	P											R	R
Hydroporus sp.*	8	P									R	R		
Macronychus glabratus	4	CG/SC	C	R	R	C	C	R	R	C		C	R	C
Microcylloepus pusillus	3	CG/SC	R								R			
Optioservus sp.	4	CG/SC	R			R	R			R	R	R	R	C
Sperchopsis tessellatus	8	P						R			R	R	R	R
Stenelmis markeli	5	CG/SC	C		R	C	C		R	C			R	R
Stenelmis sinuata	5	CG/SC	C	R	R	R	R			C			R	
Stenelmis sp. *	5	CG/SC	R	R		C	C	C	R	C	C	C	C	C

* Specimen not identifiable to genus; R rare - found at 1-3 sites; C common - found at 4-5 sites.

APPENDIX C

UPPER THREE RUNS CR. - COMPLETE SPECIES LIST

July 1987-April 1989

Species	Biotic Index	Funct. Group	Quantitative Sampling Date: Jul 87	Oct 87	Feb 88	Apr 88	Jul 88	Oct 88	Jan 89	Apr 89	Qualitative: Nov 87	Mar 88	Oct 88	Mar 89
DIPTERA - misc. (true flies) 27 species														
Antocha sp.	3	CG			R					R		R		R
Atherix lantha	2	P	R	R	C	R	R	C	C	R	C	C	C	C
Atrichopogon sp.	8	CG	R				R						R	
Bezzia sp. 2	6	P								R	R	C	R	C
Bezzia sp. 6	6	P										R	R	R
Bezzia sp. 7	6	P					R						R	R
Chrysops sp.	6	CG								R				R
Culicoides sp.	10	P/CG											R	
Dixa sp.	6	CG		R										
Dolichopodidae	4	P											R	
Ectemnia invenusta	1	CF			R				R	R	R	R		
Empididae	6	P	C	R	R		R	C	R	R	R	R	R	R
Erioptera /Ormosia sp.	7	CG									R	R	R	
Forcipomyia sp.	6	P					R					R	R	
Hexatoma (Eriocera) cinerea	2	P						R			R	R	R	R
Palpomyia sp. 1	6	P	R		R						C	R	R	C
Palpomyia sp. 3	6	P									R		R	R
Palpomyia sp. 4	6	P									R	R	R	C
Palpomyia sp. 5	6	P						R			R		R	C
Pilaria sp.	7	P									R	R	R	R
Sciomyzidae	6	P											R	
Simulium jonesi	2	CF	C	C	R	C	C	C	C	C	C	C	R	C
Simulium slossonae	5	CF		R									R	
Simulium sp.*	5	CF	R		R		R		R	R			R	R
Simulium tuberosum	4	CF		R					C	R				
Simulium verecundum	6	CF		R							R			
Tipula sp.1	4	CG/SH/SD									R	R		
Tipula sp.7	4	CG/SH/SD									R	R		R

* Specimen not identifiable to genus; R rare - found at 1-3 sites; C common - found at 4-5 sites.

APPENDIX C

UPPER THREE RUNS CR. - COMPLETE SPECIES LIST

July 1987-April 1989

Species	Biotic Index	Funct. Group	Quantitative Sampling Date: Jul 87	Oct 87	Feb 88	Apr 88	Jul 88	Oct 88	Jan 89	Apr 89	Qualitative: Nov 87	Mar 88	Oct 88	Mar 89
DIPTERA- Chironomidae (midges)	**95 species**													
Tanypodinae	**11 species**													
Ablabesmyia janta	5	CG/P									R	C	R	R
Ablabesmyia mallochi	8	CG/P						R			R	R		C
Apsectrotanypus johnsoni	8	P										R		R
Clinotanypus pinguis	8	P									R		R	R
Conchapelopia sp.	6	P	R	C	C	C	R		C	C	C	C	C	C
Labrundinia pilosella	7	P									C	R		R
Meropelopia sp.	8	P		R	R	R		R				C		
Nilotanypus fimbriatus	6	P	R	C	R	R	R	R		R		C	R	R
Paramerina sp.	8	P												C
Procladius sp.	9	P			R									
Zavrelimyia sp.	8	P									C	R		
Orthocladiini	**40 species**													
Brillia flavifrons	5	CG\SD	C		C	C	R	R	C	R	R	C	R	R
Brillia parva	5	CG\SD	C	R	R					R	R			R
Corynoneura nr. coronata	7	CG	R	C	R	C	R				R	R		R
Corynoneura nr. taris	7	CG	R	C	C	C	C	R	R	R	C	R		R
Corynoneura sp. 3	7	CG		C	C	C	R	C	C	C	R	R	R	R
Corynoneura sp.*	7	CG		R						R	R			
Cricotopus bicinctus	8	CG/SH	R		R	R	R		R	R	R			R
Cricotopus sp. 5 pupa*	6	CG/SH					R			R				
Cricotopus trifasciatus gp.	6	CG/SH				R								
Cricotopus vierriensis	6	CG/SH	C	C	C	C	C	R			R	R	R	R
Gymnometriocnemus sp.	6	CG												R
Heterotrissocladius marcidus	0	CG									R			R
Limnophyes sp.	8	CG		R										
Lopescladius sp.	5	CG										R		R
Metriocnemus fuscipes	6	CG								R				
Nanocladius distinctus	3	CG		R		R	R							
Nanocladius nr. alternantherae	3	CG		R		R						R		
Nanocladius rectinervis	3	CG	C	R		C	R	R		R				R
Nanocladius sp.*	3	CG		R	R							C		R
Orthocladius annectens	6	CG							R					
Orthocladius curtiseta	6	CG				R		R		C				R

* Specimen not identifiable to genus; R rare - found at 1-3 sites; C common - found at 4-5 sites.

APPENDIX C

UPPER THREE RUNS CR. - COMPLETE SPECIES LIST

July 1987-April 1989

Species	Biotic Index	Funct. Group	Quantitative Sampling Date								Qualitative			
			Jul 87	Oct 87	Feb 88	Apr 88	Jul 88	Oct 88	Jan 89	Apr 89	Nov 87	Mar 88	Oct 88	Mar 89
Orthocladius dentifer	6	CG	C	C	C	R	R	R	C	R	C	C		R
Orthocladius obumbratus	6	CG							R					
Orthocladius (Eudactylocladius) sp.	6	CG								R				
Orthocladius sp. (Pupa) *	6	CG	R											
Paracricotopus sp.	6	CG												R
Parakiefferiella sp. A	6	CG		C	C	C	R	C	C	R	R	R		C
Parakiefferiella sp. B	6	CG			R	R				C	R	R		R
Parakiefferiella sp. 4	6	CG								R		R		
Parametriocnemus lundbecki	5	CG	C	C	C	C	C	R	C	C	C	C	R	C
Parametriocnemus sp. C	5	CG				R	R	R			R			R
Parametriocnemus sp. D	5	CG									R	R		
Psectrocladius (Mesopsectro.) sp.	8	CG												R
Pseudorthocladius sp.	0	CG									R			
Rheocricotopus robacki	6	CG/P/SH	C	C	C	C	C	C	C	C	C	C	C	C
Rheocricotopus sp. *	6	CG/P/SH		R	R			R						
Rheocricotopus tuberculatus	6	CG/P/SH	R	R	R				R					
Rheosmittia sp.	6	CG		R	R	R						R	R	C
Symposiocladius lignicola	6	SD	R		C	R				C	R	R	R	R
Synorthocladius semivirens	6	CG\SC	R	R	R	R		R		R	R	R	R	R
Thienemanniella fusca gp.	6	CG	C	C	C	C	C	C	C	C	R	C	R	C
Thienemanniella sp.*	6	CG		R										
Thienemanniella xena gp.	6	CG	R	C	C	C	C	R	C	C	C	C	R	C
Tvetenia discoloripes gp.	5	CG	C	C	C	C	C	R	C	C	C	C	C	C
Tvetenia paucunca/vitracies	5	CG			C	C	R		C	C	R	R		C
Unniella multivirga	5	CG			R				R		C	R		R
Diamesinae 2 species														
Odontomesa fulva	4	CG										R		
Potthastia longimana	2	CG\SC				R		R	R		R	R		

* Specimen not identifiable to genus; R rare - found at 1-3 sites; C common - found at 4-5 sites.

APPENDIX C

UPPER THREE RUNS CR. - COMPLETE SPECIES LIST

July 1987-April 1989

Species	Biotic Index	Funct. Group	Quantitative Sampling Date								Qualitative			
			Jul 87	Oct 87	Feb 88	Apr 88	Jul 88	Oct 88	Jan 89	Apr 89	Nov 87	Mar 88	Oct 88	Mar 89
Chironomini 25 species														
Beckidia sp.	5	CG										R		R
Cryptochironomus blarina	8	P											R	
Cryptochironomus fulvus gp.	8	P					R				R	C	R	C
Demicryptochironomus cuneatus	8	CG									R	R		
Einfeldia sp. A	9	CG			R									
Microtendipes nr. rydalensis	6	CG/CF				R					C		C	R
Microtendipes pedellus	6	CG/CF				R					C	C		R
Nilothauma babiyi	2	CG	R			R	R	R				R		
Pagastiella ostansa	6	CG						R			R	R		C
Paracladopelma doris	7	CG										R		R
Paracladopelma undine	7	CG									R	R		C
Paralauterborniella nigrohalteralis	8	CG									R	R	R	C
Paratendipes nr. nudisquama	8	CG									R			R
Phaenopsectra flavipes	7	CG/SC	C				R				R			
Polypedilum aviceps	6	CG/P/SH		R										
Polypedilum braseniae	6	CG/P/SH										R		
Polypedilum convictum	6	CG/P/SH	C	C	C	C	C	C	C	C	C	C	C	C
Polypedilum fallax	5	CG/P/SH	C	C	R	R	R	R			R	R	R	
Polypedilum halterale	8	CG/P/SH	C		R	R		R			R	R	R	C
Polypedilum illinoense	8	CG/P/SH	C	C	R	R	R	R			R	R	R	
Polypedilum scalaenum	8	CG/P/SH	R			R	R	R		R		R	R	R
Polypedilum sp.*	6	CG/P/SH	R	C	R		R	R	R	R	R	C	R	R
Robackia claviger	6	CG										C	R	R
Stelechomyia perpulchra	5	CG	C	R		R	R	C		R			R	R
Stenochironomus hilaris	5	CG/SD	R	R		R		R			R	R	R	R
Tribelos jucundus	5	CG									C	C	R	R

* Specimen not identifiable to genus; R rare - found at 1-3 sites; C common - found at 4-5 sites.

APPENDIX C

UPPER THREE RUNS CR. - COMPLETE SPECIES LIST

July 1987-April 1989

Species	Biotic Index	Funct. Group	Quantitative Sampling Date								Qualitative			
			Jul 87	Oct 87	Feb 88	Apr 88	Jul 88	Oct 88	Jan 89	Apr 89	Nov 87	Mar 88	Oct 88	Mar 89
Tanytarsini 17 species														
Cladotanytarsus sp. A	7	CG/CF		R				R		R		R	C	R
Cladotanytarsus sp. B	7	CG/CF										R		
Micropsectra sp.	7	CG			R	C					R	R		R
Paratanytarsus sp.	6	CG		R										
Rheotanytarsus distinctissimus	6	CF		C	C	C	C	C	C	C	R	C	C	C
Rheotanytarsus exiguus	6	CF	C	C	C	C	R	C	C	C	C	R	C	R
Stempellinella sp.	4	CG		R		R			R	R	R	R		C
Tanytarsus chinyensis gp. (pupa)*	6	CG/CF					R							
Tanytarsus glabrescens gp.	6	CG/CF	C	C	R	C	C	C		C		R	C	C
Tanytarsus sp. I Cantrell	6	CG/CF									R			
Tanytarsus sp. IX Rutter	6	CG/CF	R	R	R									
Tanytarsus sp. XI Rutter	6	CG/CF		R	R	R				R	R	R	R	
Tanytarsus sp. XII Rutter	6	CG/CF												R
Tanytarsus sp. XIII Rutter	6	CG/CF		R	R	C		R			R	R	R	
Tanytarsus sp. XIV Rutter	6	CG/CF											R	
Tanytarsus sp. XVI Rutter	6	CG/CF		R						C			R	R
Tanytarsus sp. XVII Rutter	6	CG/CF		R		R	R				R	R	R	R
Tanytarsus sp. XVIII Rutter	6	CG/CF										R		
Tanytarsus sp.*	6	CG/CF			R	R	R			R	R	R	R	R

* Specimen not identifiable to genus; R rare - found at 1-3 sites; C common - found at 4-5 sites.

APPENDIX C

UPPER THREE RUNS CR. - COMPLETE SPECIES LIST

July 1987-April 1989

Species	Biotic Index	Funct. Group	Quantitative Sampling Date								Qualitative			
			Jul 87	Oct 87	Feb 88	Apr 88	Jul 88	Oct 88	Jan 89	Apr 89	Nov 87	Mar 88	Oct 88	Mar 89
CRUSTACEA	**4 species**													
Caecidotea sp.	8										R	R		R
Cambarinae	8										R	R	R	R
Crangonyx serratus	8										R	R		R
Palaemonetes paludosus	8										R	R	R	R
ANNELIDA (worms)	**4 species**													
Lumbriculidae	8										R			
Naididae *	5		R									R		
Nais sp.	5		R											
Pristina/Stephensoniana sp.	5			R		R					R	R	R	R
Spirosperma sp.	8										R	R		R
Tubificidae*	8										R	R	R	R
MOLLUSCA (snails, clams)	**3 species**													
Gillia altilis	5										R	R	R	R
Sphaerium sp.	5										R	R	R	R
Viviparus subpurpureus	6										R	R	R	C
ACARI	**1 species**													
Hydracarina	5		R	R					R	R				

Total # of Species: 241

Appendix Di:

Water Quality Parameters (pH and Conductivity) Measured in the Field in Conjunction with Quantitative and Qualitative Sampling of the Macroinvertebrates of Upper Three Runs Creek, Aiken, Co., S.C. October 1988 to April 1989.

	pH (Units)						Conductivity (umhos/cm)					
Date	Site 1	2	3	4	5	T	Site 1	2	3	4	5	T
10/04/88	6.0	7.5	7.2	7.3	7.6	7.5	30	25	25	30	30	50
11/02/88	5.5	5.5	5.6	5.6	5.8	6.6	—	—	—	—	—	70
12/06/88	---	---	---	---	---	---	15	20	20	20	20	50
01/04/89	5.8	5.7	5.8	5.9	5.8	---	15	15	20	25	20	20
02/01/89	6.7	6.6	6.9	6.9	7.0	7.3	20	15	20	15	20	50
03/15/89	6.4	6.5	6.6	6.5	6.5	6.6	20	20	20	20	20	65
04/11/89	5.5	5.6	5.6	5.6	5.7	6.8	15	20	20	20	20	40

T = Tim's Branch

Appendix Dii:

Water Quality Parameters (D.O. + Temperature) Measured in the Field in Conjunction with Quantitative and Qualitative Sampling of the Macroinvertebrates of Upper Three Runs Creek, Aiken Co., S.C. October 1988 to April 1989.

	Dissolved Oxygen (ppm)						Temperature (°C)					
Date	Site 1	2	3	4	5	T	Site 1	2	3	4	5	T
10/04/88	7.8	7.7	7.8	7.3	7.6	9.1	16.0	17.0	17.0	18.0	18.0	13.0
11/02/88	7.7	7.8	7.9	8.3	8.8	7.6	13.0	13.0	13.0	13.0	13.0	12.0
12/06/88	10.9	11.7	11.4	12.1	13.0	12.0	8.5	8.5	8.5	8.2	8.5	7.0
01/04/89	10.0	9.3	9.1	9.8	10.1	10.1	11.0	11.0	10.5	11.0	10.5	10.0
02/01/89	9.5	9.7	10.2	9.5	9.2	11.0	11.6	11.5	11.4	11.4	11.4	12.6
03/15/89	9.3	9.3	9.1	9.0	9.0	10.7	17.0	17.0	16.0	16.0	16.0	19.0
04/11/89	9.7	10.0	9.2	9.5	9.1	12.0	11.0	12.0	12.0	12.0	12.0	12.5

T = Tim's Branch

Appendix E: Results of Statistical Analyses of Biological Indices Data from Quantitative Macroinvertebrate Sampling Using Multiplate Artificial Substrate Samplers at Five Sites Along Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina, June 1987 - April 1989.

Statistical Analysis Comparing Pre and Post-Operational Data

	Normality of Data	Wilcoxon's Signed Rank Test	T
Species Richness	Not Normal	No Significant Diff.	2
# of Species/Replicate	Not Normal	No Significant Diff.	3
# of Organisms/Site	Not Normal	No Significant Diff.	4
EPT Index by Site	Not Normal	Significant Diff.	0
Total Biomass/Site	Not Normal	No Significant Diff.	4
Equitability by Site	Not Normal	No Significant Diff.	6
Diversity Index by Site	Not Normal	No Significant Diff.	6
Biotic Index by Site	Not Normal	No Significant Diff.	3

If a>0.05, No significant differences among means.

Appendix E: Results of Statistical Analyses of Biological Indices Data from Quantitative Macroinvertebrate Sampling Using Multiplate Artificial Substrate Samplers at Five Sites Along Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina, October 1988 - April 1989.

Statistical Analysis for Differences Among Sites (January 89 through April 89)

	Normality of Data	Friedman's Test	Fr
Species Richness	Not Normal	No Significant Diff.	1.8
# of Species/Replicate	Not Normal	No Significant Diff.	1.2
# of Organisms/Site	Not Normal	No Significant Diff.	7.6
EPT Index by Site	Not Normal	No Significant Diff.	8.2
Total Biomass/Site	Not Normal	No Significant Diff.	5.8
Equitability by Site	Not Normal	No Significant Diff.	7.5
Diversity Index by Site	Not Normal	No Significant Diff.	4.7
Biotic Index by Site	Not Normal	No Significant Diff.	1.6

Critical Fr Value: 9.49

If Fr value is greater than critical value, the means are not equal.

Appendix E: Results of Statistical Analyses of Biological Indices Data from Quantitative Macroinvertebrate Sampling Using Multiplate Artificial Substrate Samplers at Five Sites Along Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina, October 1988 - April 1989.

Statistical Analysis for the Pre and Post-operational Data for the Percent Composition by Taxonomic Group.

	Date	Normality of Data	Wilcoxon's Signed Rank Test	T
CHIRONOMIDAE	4/88 vs. 4/89	Not Normal	Significant Diff.	0
	2/88 vs. 1/89	Not Normal	No Significant Diff.	3
COLEOPTERA	4/88 vs. 4/89	Not Normal	Significant Diff.	0
	2/88 vs. 1/89	Not Normal	No Significant Diff.	5
TRICHOPTERA	4/88 vs. 4/89	Not Normal	No Significant Diff.	3
	2/88 vs. 1/89	Not Normal	Significant Diff.	0
PLECOPTERA	4/88 vs. 4/89	Not Normal	No Significant Diff.	7
	2/88 vs. 1/89	Not Normal	No Significant Diff.	3
EPHEMEROPTERA	4/88 vs. 4/89	Not Normal	No Significant Diff.	7
	2/88 vs. 1/89	Not Normal	Significant Diff.	0
DIPTERA	4/88 vs. 4/89	Not Normal	Significant Diff.	0
(non-chironomidae)	2/88 vs. 1/89	Not Normal	Significant Diff.	1

If a>0.05, No significant differences among means.

Appendix E: Results of Statistical Analyses of Biological Indices Data from Quantitative Macroinvertebrate Sampling Using Multiplate Artificial Substrate Samplers at Five Sites Along Upper Three Runs Creek, Savannah River Plant, Aiken County, South Carolina, October 1988 - April 1989.

Statistical Analysis for the Difference Among Sites for the Percent Composition by Taxonomic Group.

	Date	Normality of Data	Friedman's Test	Fr
CHIRONOMIDAE	4/88 vs. 4/89	Not Normal	No Significant Diff.	0.52
	2/88 vs. 1/89	Not Normal	No Significant Diff.	0.00
COLEOPTERA	4/88 vs. 4/89	Not Normal	No Significant Diff.	1.36
	2/88 vs. 1/89	Not Normal	No Significant Diff.	3.60
TRICHOPTERA	4/88 vs. 4/89	Not Normal	No Significant Diff.	4.31
	2/88 vs. 1/89	Not Normal	No Significant Diff.	6.07
PLECOPTERA	4/88 vs. 4/89	Not Normal	No Significant Diff.	4.88
	2/88 vs. 1/89	Not Normal	No Significant Diff.	0.32
EPHEMEROPTERA	4/88 vs. 4/89	Not Normal	No Significant Diff.	1.78
	2/88 vs. 1/89	Not Normal	No Significant Diff.	2.44
DIPTERA	4/88 vs. 4/89	Not Normal	No Significant Diff.	0.40
(non-chironomidae)	2/88 vs. 1/89	Not Normal	No Significant Diff.	2.03

Critical Fr Value: 9.40. If Fr Value is greater than critical value, the means are not equal.

Appendix E: Results of Statistical Analyses of Biological Indices Data from Quantitative Macroinvertebrate Sampling Using Multipl Artificial Substrate Samplers at Five Sites Along Upper Th Runs Creek, Savannah River Plant, Aiken County, South Carolina, October 1988 - April 1989.

Statistical Analysis for the Pre and Post-operational Data (February 19 vs. January 1989).

Functional Group	Normality of Data	Wilcoxon's Signed Rank Test	T
Collector-Gatherers			
by Pop.#	Not Normal	No Significant Diff.	4
by Biomass	Not Normal	Significant Diff.	0
Collector-Filterers			
by Pop. #	Not Normal	Significant Diff.	0
by Biomass	Not Normal	Significant Diff.	0
Predators			
by Pop. #	Not Normal	Significant Diff.	1
by Biomass	Not Normal	No Significant Diff.	4
Scrapers			
by Pop. #	Not Normal	Significant Diff.	0
by Biomass	Not Normal	No Significant Diff.	6
Shredder-Herbivores			
by Pop. #	Not Normal	No Significant Diff.	5
by Biomass	Not Normal	Significant Diff.	0
Shredder-Detritivores			
by Pop. #	Not Normal	Significant Diff.	0
by Biomass	Not Normal	Significant Diff.	0

If a> 0.05, No Significant Differences Among Means.

Appendix E: Results of Statistical Analyses of Biological Indices Data from Quantitative Macroinvertebrate Sampling Using Multipl Artificial Substrate Samplers at Five Sites Along Upper Th Runs Creek, Savannah River Plant, Aiken County, South Carolina, October 1988 - April 1989.

Statistical Analysis for Differences Among Sites for February 1988 and January 1989.

Functional Group	Normality of Data	Friedman's Test	Fr
Collector-Gatherers			
by Pop.#	Not Normal	No Significant Diff.	4.31
by Biomass	Not Normal	No Significant Diff.	1.96
Collector-Filterers			
by Pop. #	Not Normal	No Significant Diff.	6.43
by Biomass	Not Normal	No Significant Diff.	1.63
Predators			
by Pop. #	Not Normal	No Significant Diff.	1.26
by Biomass	Not Normal	No Significant Diff.	4.73
Scrapers			
by Pop. #	Not Normal	No Significant Diff.	0.76
by Biomass	Not Normal	No Significant Diff.	3.84
Shredder-Herbivores			
by Pop. #	Not Normal	No Significant Diff.	3.16
by Biomass	Not Normal	No Significant Diff.	3.68
Shredder-Detritivores			
by Pop. #	Not Normal	No Significant Diff.	5.49
by Biomass	Not Normal	No Significant Diff.	7.96

If a> 0.05, No Significant Differences Among Means.

Appendix E: Results of Statistical Analyses of Biological Indices Data from Quantitative Macroinvertebrate Sampling Using Multipl Artificial Substrate Samplers at Five Sites Along Upper Th Runs Creek, Savannah River Plant, Aiken County, South Carolina, October 1988 - April 1989.

Statistical Analysis for the Pre and Post-operational Data (April 1988 April 1989).

Functional Group	Normality of Data	Wilcoxon's Signed Rank Test	T
Collector-Gatherers			
by Pop.#	Not Normal	Significant Diff.	1
by Biomass	Not Normal	No Significant Diff.	7
Collector-Filterers			
by Pop. #	Not Normal	Significant Diff.	1
by Biomass	Not Normal	No Significant Diff.	5
Predators			
by Pop. #	Not Normal	No Significant Diff.	5
by Biomass	Not Normal	Significant Diff.	0
Scrapers			
by Pop. #	Not Normal	No Significant Diff.	2
by Biomass	Not Normal	Significant Diff.	0
Shredder-Herbivores			
by Pop. #	Not Normal	Significant Diff.	1
by Biomass	Not Normal	No Significant Diff.	0
Shredder-Detritivores			
by Pop. #	Not Normal	Significant Diff.	1
by Biomass	Not Normal	No Significant Diff.	5

If a> 0.05, No Significant Differences Among Means.

Appendix E: Results of Statistical Analyses of Biological Indices Data from Quantitative Macroinvertebrate Sampling Using Multipl Artificial Substrate Samplers at Five Sites Along Upper Th Runs Creek, Savannah River Plant, Aiken County, South Carolina, October 1988 - April 1989.

Statistical Analysis for Differences Among Sites for April 1988 and Apr 1989.

Functional Group	Normality of Data	Friedman's Test	Fr
Collector-Gatherers			
by Pop.#	Not Normal	No Significant Diff.	4.73
by Biomass	Not Normal	No Significant Diff.	4.73
Collector-Filterers			
by Pop. #	Not Normal	No Significant Diff.	4.25
by Biomass	Not Normal	No Significant Diff.	6.43
Predators			
by Pop. #	Not Normal	No Significant Diff.	6.43
by Biomass	Not Normal	No Significant Diff.	5.28
Scrapers			
by Pop. #	Not Normal	No Significant Diff.	1.41
by Biomass	Not Normal	No Significant Diff.	4.14
Shredder-Herbivores			
by Pop. #	Not Normal	No Significant Diff.	2.714
by Biomass	Not Normal	No Significant Diff.	0.00
Shredder-Detritivores			
by Pop. #	Not Normal	No Significant Diff.	4.03
by Biomass	Not Normal	No Significant Diff.	1.07

If a> 0.05, No Significant Differences Among Means are not equal.

Appendix F:

WATER CHEMISTRY PARAMETERS MEASURED AT 5 SITES ALONG UPPER THREE RUNS CREEK, SAVANNAH RIVER PLANT, AIKEN COUNTY, SOUTH CAROLINA. October 1988 - April 1989.

Date Collected: October 4, 1988

LAB NO:	88-A960-01	88-A960-03	88-A960-05	88-A960-09	88-A960-11	88-A960-13	88-A960-07
SAMPLE ID:	Site #1	Site #2	Site #3	Site #4	Site #5	Tim's Branch	Site #3 Duplicate
Parameters:							
Conductivity (umho/cm)	31	32	30	30	30	----	30
Chromium	0.005	0.005	0.005	0.006	0.017	0.015	0.006
Copper	<0.005	<0.005	<0.005	<0.005	0.005	0.006	<0.005
Lead	<0.01	<0.01	<0.01	<0.01	<0.01	----	<0.01
Manganese	0.071	0.074	0.069	0.077	0.079	----	0.072
Mercury (ug/l)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium	1.4	1.4	1.5	1.6	1.7	----	1.5
Uranium (ug/l)	<1	2	<1	1	1	----	<1
Zinc	0.220	0.244	0.207	0.261	0.239	0.245	0.214
Dissolved Chromium	0.005	0.005	<0.005	0.009	0.005	----	0.005
Dissolved Copper	0.005	<0.005	<0.005	0.007	0.007	----	<0.005
Dissolved Lead	<0.01	<0.01	<0.01	<0.01	<0.01	----	<0.01
Dissolved Manganese	0.074	0.056	0.066	0.104	0.067	----	0.085
Dissolved Mercury (ug/l)	<0.5	<0.5	<0.5	<0.5	<0.5	----	<0.5
Dissolved Sodium	1.5	2.1	1.5	1.7	1.7	----	1.6
Dissolved Uranium	<1	1	<1	<1	<1	----	<1
Dissolved Zinc	0.234	0.277	0.265	0.280	0.380	----	0.230
Nitrate Nitrogen	0.1	0.2	0.5	0.2	0.2	0.3	0.8
Nitrite Nitrogen	<0.01	<0.01	<0.01	<0.01	<0.01	----	<0.01
Ortho Phosphate as Phosphorus	0.02	0.03	0.02	0.03	0.06	----	0.02
Total Phosphate as Phosphorus	0.05	0.07	0.05	0.07	0.07	0.10	0.05
Ammonia Nitrogen	<0.1	<0.1	<0.1	<0.1	<0.1	----	<0.1
Hardness	14	14	12	11	12	----	12
Alkalinity	5	4	2	1	4	----	0.5
Residual Chlorine	<0.05	<0.05	<0.05	<0.05	<0.05	----	----
Total Suspended Solids	8	9	9	14	13	----	9
Kerosene (ug/l)	<100	<100	<100	<100	<100	----	<100
Tributyl Phosphate (ug/l)	<50	<50	<50	<50	<50	----	<50

LAB NO:	88-A960-02	88-A960-04	88-A960-06	88-A960-10	88-A960-12	88-A960-08
Sample ID:	Site 1	Site 2	Site 3	Site 4	Site 5	Site #3 Duplicate
Mercury-Sediment (ug/kg)	<50	<50	<50	<50	<50	<50

NOTE: The above results are reported in milligrams per liter unless otherwise noted.

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina. October 1988 - April 1989

DATE COLLECTED: November 2, 1988

LAB NO.:	89-B174-01	89-B174-02	89-B174-03	89-B174-04	89-B174-05
SAMPLE ID:	Site 1	Site 1 Sed. (ug/kg)	Site 2	Site 2 Sed. (ug/kg)	Site 3
Parameters:					
Conductivity (umhos/cm)	26	——	28	——	29
Chromium	0.005	——	0.007	——	<0.005
Copper	0.005	——	0.009	——	<0.005
Lead	<0.01	——	<0.01	——	<0.01
Manganese	0.028	——	0.052	——	0.025
Mercury (ug/l)	<0.5	<50	<0.5	<50	<0.5
Sodium	1.6	——	1.7	——	1.7
Uranium (ug/l)	9	——	8	——	24
Zinc	0.253	——	0.226	——	0.15
Dissolved Chromium	<0.005	——	<0.005	——	0.012
Dissolved Copper	0.010	——	0.009	——	0.010
Dissolved Lead	<0.01	——	<0.01	——	<0.01
Dissolved Manganese	0.013	——	0.020	——	0.018
Dissolved Mercury (ug/l)	<0.5	——	<0.5	——	<0.5
Dissolved Sodium	1.6	——	1.6	——	1.5
Dissolved Uranium	12	——	3	——	11
Dissolved Zinc	0.24	——	0.22	——	0.45
Nitrate Nitrogen	<0.1	——	0.1	——	<0.1
Nitrite Nitrogen	<0.01	——	<0.01	——	<0.01
Orthophosphate	0.01	——	0.02	——	0.01
Total Phosphate as Phosphorus	0.01	——	0.20	——	0.01
Ammonia Nitrogen	<1	——	<1	——	<1
Hardness	10	——	11	——	11
Alkalinity	9	——	6.3	——	6.2
Residual Chloride	<0.05	——	<0.05	——	<0.05
Total Suspended Solids	<4	——	<4	——	<4
Kerosene	<100	——	<100	——	<100
Tributyl Phosphate	<100	——	<100	——	<100

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina. October 1988 - April 1989

DATE COLLECTED: November 2, 1988

LAB NO.:	89-B174-06	89-B174-07	89-B174-08	89-B174-09	89-B174-10
SAMPLE ID:	Site 3 Sed. (ug/kg)	Site 4	Site 4 Sed. (ug/kg)	Site 4 Dup.	Site 4 Dup. Sediment (ug/kg)
Parameters:					
Conductivity (umhos/cm)	----	28	----	29	----
Chromium	----	<0.005	----	<0.005	----
Copper	----	0.005	----	0.005	----
Lead	----	<0.01	----	<0.01	----
Manganese	----	0.025	----	0.024	----
Mercury (ug/l)	<50	<0.5	<50	<0.5	<50
Sodium	----	2.0	----	2.0	----
Uranium (ug/l)	----	15	----	32	----
Zinc	----	0.13	----	0.13	----
Dissolved Chromium	----	0.018	----	<0.005	----
Dissolved Copper	----	0.012	----	0.008	----
Dissolved Lead	----	<0.01	----	<0.01	----
Dissolved Manganese	----	0.019	----	0.018	----
Dissolved Mercury (ug/l)	----	<0.5	----	<0.5	----
Dissolved Sodium	----	1.9	----	2.2	----
Dissolved Uranium	----	10	----	22	----
Dissolved Zinc	----	0.24	----	0.29	----
Nitrate Nitrogen	----	<0.1	----	<0.1	----
Nitrite Nitrogen	----	<0.01	----	<0.01	----
Orthophosphate	----	0.01	----	0.01	----
Total Phosphate as Phosphorus	----	0.02	----	0.01	----
Ammonia Nitrogen	----	<1	----	<1	----
Hardness	----	9	----	9	----
Alkalinity	----	6.3	----	5.0	----
Residual Chloride	----	<0.05	----	<0.05	----
Total Suspended Solids	----	<4	----	<4	----
Kerosene	----	<100	----	<100	----
Tributyl Phosphate	----	<100	----	<100	----

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina. October 1988 - April 1989

DATE COLLECTED: November 2, 1988

LAB NO.:	89-B174-11	89-B174-12	89-B174-13
SAMPLE ID:	Site 5	Site 5 Sed. (ug/kg)	Timms Branch
Parameters:			
Conductivity (umhos/cm)	29	----	----
Chromium	<0.005	----	<0.005
Copper	<0.005	----	0.006
Lead	<0.01	----	----
Manganese	0.024	----	----
Mercury (ug/l)	<0.5	<50	<0.5
Sodium	2.0	----	----
Uranium (ug/l)	18	----	----
Zinc	0.16	----	0.19
Dissolved Chromium	<0.005	----	----
Dissolved Copper	0.010	----	----
Dissolved Lead	<0.01	----	----
Dissolved Manganese	0.015	----	----
Dissolved Mercury (ug/l)	<0.5	----	----
Dissolved Sodium	2.2	----	----
Dissolved Uranium	21	----	----
Dissolved Zinc	0.38	----	----
Nitrate Nitrogen	<0.1	----	0.5
Nitrite Nitrogen	<0.01	----	----
Orthophosphate	0.01	----	----
Total Phosphate as Phosphorus	0.02	----	0.05
Ammonia Nitrogen	0.4	----	----
Hardness	10	----	----
Alkalinity	5.0	----	----
Residual Chloride	<0.05	----	----
Total Suspended Solids	<4	----	----
Kerosene	<100	----	----
Tributyl Phosphate	<100	----	----

The above results are reported in milligrams per liter unless otherwise noted.

Analytical methods are those approved by the U.S. Environmental Protection Agency.

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina. October 1988 - April 1989

DATE COLLECTED: December 6, 1988

LAB NO.:	89-B416-01	89-B416-02	89-B416-03	89-B416-04	89-B416-05
SAMPLE ID:	Site 1	Site 1 Sed. (ug/kg)	Site 2	Site 2 Sed. (ug/kg)	Site 3
Parameters:					
Conductivity (umhos/cm)	23	——	23	——	23
Chromium	0.018	——	<0.005	——	<0.005
Copper	<0.005	——	<0.005	——	<0.005
Lead	<0.01	——	<0.01	——	<0.01
Manganese	0.02	——	0.02	——	0.02
Mercury (ug/l)	<0.5	<20	<0.5	<20	<0.5
Sodium	1.8	——	2.3	——	2.3
Uranium (ug/l)	<1	——	1	——	2
Zinc	0.022	——	0.020	——	0.036
Dissolved Chromium	0.005	——	<0.005	——	<0.005
Dissolved Copper	<0.005	——	<0.005	——	<0.005
Dissolved Lead	<0.01	——	<0.01	——	<0.01
Dissolved Manganese	*	——	0.009	——	0.01
Dissolved Mercury (ug/l)	<0.5	——	<0.5	——	<0.5
Dissolved Sodium	1.8	——	2.0	——	2.3
Dissolved Uranium (ug/l)	<1	——	<1	——	<1
Dissolved Zinc	0.030	——	0.027	——	0.059
Nitrate Nitrogen	0.2	——	0.4	——	0.2
Nitrite Nitrogen	<0.01	——	<0.01	——	<0.01
Orthophosphate	<0.01	——	<0.01	——	0.01
Total Phosphate as Phosphorus	<0.01	——	<0.01	——	<0.01
Ammonia Nitrogen	<1.0	——	<1.0	——	<1.0
Hardness	9	——	10	——	10
Alkalinity	10	——	6.3	——	8.3
Residual Chloride	<0.05	——	<0.05	——	<0.05
Total Suspended Solids	<4	——	<4	——	<4
Kerosene	<100	——	<100	——	<100
Tributyl Phosphate	<100	——	<100	——	<100

* Sample Spilled.

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina. October 1988 - April 1989

DATE COLLECTED: December 6, 1988

LAB NO.:	89-B416-06	89-B416-07	89-B416-08	89-B416-09	89-B416-10
SAMPLE ID:	Site 3 Sed. (ug/kg)	Site 4	Site 4 Sed. (ug/kg)	Site 5	Site 5 Sed. (ug/kg)
Parameters:					
Conductivity (umhos/cm)	----	23	----	24	----
Chromium	----	<0.005	----	<0.005	----
Copper	----	<0.005	----	<0.005	----
Lead	----	<0.01	----	<0.01	----
Manganese	----	0.03	----	0.025	----
Mercury (ug/l)	<20	<0.5	<20	<0.5	<20
Sodium	----	2.3	----	2.3	----
Uranium (ug/l)	----	1	----	<1	----
Zinc	----	0.098	----	0.12	----
Dissolved Chromium	----	<0.005	----	<0.005	----
Dissolved Copper	----	0.007	----	<0.005	----
Dissolved Lead	----	<0.01	----	<0.01	----
Dissolved Manganese	----	0.01	----	0.008	----
Dissolved Mercury (ug/l)	----	<0.5	----	<0.5	----
Dissolved Sodium	----	2.3	----	2.3	----
Dissolved Uranium (ug/l)	----	<1	----	<1	----
Dissolved Zinc	----	0.098	----	0.015	----
Nitrate Nitrogen	----	0.2	----	0.2	----
Nitrite Nitrogen	----	<0.01	----	<0.01	----
Orthophosphate	----	0.01	----	<0.01	----
Total Phosphate as Phosphorus	----	0.01	----	0.01	----
Ammonia Nitrogen	----	<1.0	----	<1	----
Hardness	----	10	----	9	----
Alkalinity	----	9.0	----	9.4	----
Residual Chloride	----	<0.05	----	<0.05	----
Total Suspended Solids	----	<4	----	<4	----
Kerosene	----	<100	----	<100	----
Tributyl Phosphate	----	<100	----	<100	----

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina. October 1988 - April 1989

DATE COLLECTED: December 6, 1988

LAB NO.:	89-B416-11	89-B416-12	89-B416-13
SAMPLE ID:	Site 5 Dup.	Site 5 Dup. Sediment (ug/kg)	Tims Branch
Parameters:			
Conductivity (umhos/cm)	24	----	----
Chromium	<0.005	----	<0.005
Copper	<0.005	----	<0.005
Lead	<0.01	----	----
Manganese	0.025	----	----
Mercury (ug/l)	<0.5	<20	<0.5
Sodium	2.5	----	----
Uranium (ug/l)	<1	----	----
Zinc	0.041	----	0.013
Dissolved Chromium	<0.005	----	----
Dissolved Copper	<0.005	----	----
Dissolved Lead	<0.01	----	----
Dissolved Manganese	0.02	----	----
Dissolved Mercury (ug/l)	<0.5	----	----
Dissolved Sodium	2.3	----	----
Dissolved Uranium (ug/l)	<1	----	----
Dissolved Zinc	0.019	----	----
Nitrate Nitrogen	0.2	----	0.9
Nitrite Nitrogen	<0.01	----	----
Orthophosphate	0.01	----	----
Total Phosphate as Phosphorus	0.01	----	0.05
Ammonia Nitrogen	<1	----	----
Hardness	8	----	----
Alkalinity	10	----	----
Residual Chloride	<0.05	----	----
Total Suspended Solids	<4	----	----
Kerosene	<100	----	----
Tributyl Phosphate	<100	----	----

The above results are reported in milligrams per liter unless otherwise noted.

Analytical methods are those approved by the U.S. Environmental Protection Agency.

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina October 1988 - April 1989

DATE COLLECTED: 01/04/89

LAB NO.:	89-B607-01	89-B607-02	89-B607-03	89-B607-04	89-B607-05
SAMPLE ID:	Site 1	Site 1 Sed. (ug/kg)	Site 2	Site 2 Sed. (ug/kg)	Site 3
Parameters:					
Conductivity (umhos/cm)	26	----	25	----	26
Chromium	<0.005	----	<0.005	----	<0.005
Copper	<0.005	----	<0.005	----	<0.005
Lead	<0.01	----	<0.01	----	<0.01
Manganese	0.051	----	0.041	----	0.049
Mercury (ug/l)	<0.5	<50	<0.5	144	<0.5
Sodium	1.5	----	1.6	----	1.7
Uranium (ug/l)	0.003	----	0.003	----	0.004
Zinc	0.017	----	0.027	----	0.39
Dissolved Chromium	<0.005	----	<0.005	----	<0.005
Dissolved Copper	<0.005	----	<0.005	----	<0.005
Dissolved Lead	<0.01	----	<0.01	----	<0.01
Dissolved Manganese	0.02	----	0.03	----	0.0043
Dissolved Mercury (ug/l)	<0.5	----	<0.5	----	<0.05
Dissolved Sodium	1.5	----	1.5	----	1.5
Dissolved Uranium	0.001	----	<0.001	----	<0.001
Dissolved Zinc	0.0070	----	0.013	----	0.0070
Nitrate Nitrogen	0.1	----	0.1	----	0.1
Nitrite Nitrogen	<0.01	----	<0.01	----	<0.01
Orthophosphate	0.01	----	<0.01	----	<0.01
Total Phosphate as Phosphorus	0.03	----	0.02	----	0.02
Ammonia Nitrogen	0.01	----	0.01	----	0.01
Hardness	8	----	10	----	6
Alkalinity	6.5	----	8.1	----	6.5
Residual Chloride	<0.05	----	<0.05	----	<0.05
Total Suspended Solids	18	----	8	----	7
Kerosene	<100	----	<100	----	<100
Tributyl Phosphate	<100	----	<100	----	<100
pH (units)	5.8	----	5.7	----	5.8

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina October 1988 - April 1989

DATE COLLECTED: 01/04/89

LAB NO.:	89-B607-06	89-B607-07	89-B607-08	89-B607-09	89-B607-10
SAMPLE ID:	Site 3 Sed. (ug/kg)	Site 4	Site 4 Sed. (ug/kg)	Site 5	Site 5 Sed.
Parameters:					
Conductivity (umhos/cm)	----	26	----	26	----
Chromium	----	<0.005	----	<0.005	----
Copper	----	<0.005	----	<0.005	----
Lead	----	<0.01	----	<0.01	----
Manganese	----	0.045	----	0.06	----
Mercury (ug/l)	<50	<0.5	<50	<0.5	63
Sodium	----	1.8	----	1.8	----
Uranium (ug/l)	----	0.005	----	<0.001	----
Zinc	----	0.0078	----	0.35	----
Dissolved Chromium	----	<0.005	----	<0.005	----
Dissolved Copper	----	<0.005	----	<0.005	----
Dissolved Lead	----	<0.01	----	<0.01	----
Dissolved Manganese	----	0.02	----	0.0057	----
Dissolved Mercury (ug/l)	----	<0.5	----	<0.5	----
Dissolved Sodium	----	1.7	----	1.7	----
Dissolved Uranium	----	<0.001	----	<0.001	----
Dissolved Zinc	----	0.014	----	0.018	----
Nitrate Nitrogen	----	0.1	----	0.1	----
Nitrite Nitrogen	----	<0.01	----	<0.01	----
Orthophosphate	----	<0.01	----	<0.01	----
Total Phosphate as Phosphorus	----	0.02	----	0.03	----
Ammonia Nitrogen	----	0.01	----	<0.1	----
Hardness	----	10	----	8	----
Alkalinity	----	5.5	----	5.3	----
Residual Chloride	----	<0.05	----	<0.05	----
Total Suspended Solids	----	8	----	10	----
Kerosene	----	<100	----	<100	----
Tributyl Phosphate	----	<100	----	<100	----
pH (units)	----	5.9	----	5.8	----

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina October 1988 - April 1989

DATE COLLECTED: 01/04/89

LAB NO.:	89-B607-11	89-B607-12	89-B607-13
SAMPLE ID:	Site 1 Dup.	Site 1 Dup. Sediment (ug/kg)	Tims Branch
Parameters:			
Conductivity (umhos/cm)	26	----	----
Chromium	<0.005	----	<0.005
Copper	<0.005	----	<0.005
Lead	<0.01	----	----
Manganese	0.066	<50	----
Mercury (ug/l)	<0.5	----	<0.5
Sodium	1.7	----	----
Uranium (ug/l)	0.005	----	----
Zinc	0.52	----	0.061
Dissolved Chromium	<0.005	----	----
Dissolved Copper	<0.005	----	----
Dissolved Lead	<0.01	----	----
Dissolved Manganese	0.0065	----	----
Dissolved Mercury (ug/l)	<0.5	----	----
Dissolved Sodium	1.6	----	----
Dissolved Uranium	<0.001	----	----
Dissolved Zinc	0.010	----	----
Nitrate Nitrogen	0.1	----	0.6
Nitrite Nitrogen	<0.01	----	----
Orthophosphate	<0.01	----	----
Total Phosphate as Phosphorus	0.02	----	0.07
Ammonia Nitrogen	<0.1	----	----
Hardness	8	----	----
Alkalinity	6.1	----	----
Residual Chloride	<0.05	----	----
Total Suspended Solids	15	----	----
Kerosene	<100	----	----
Tributyl Phosphate	<100	----	----
pH (units)	5.8	----	----

The above results are reported in milligrams per liter unless otherwise noted.

Analytical methods are those approved by the U.S. Environmental Protection Agency.

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina October 1988 - April 1989

DATE COLLECTED: 02/01/89

LAB NO.:	89-B783-01	89-B783-02	89-B783-03	89-B783-04	89-B783-05
SAMPLE ID:	Site 1	Site 1 Sed. (ug/kg)	Site 2	Site 2 Sed. (ug/kg)	Site 3
Parameters:					
Conductivity (umhos/cm)	23	——	23	——	24
Chromium	<0.005	——	<0.005	——	<0.005
Copper	<0.005	——	<0.005	——	<0.005
Lead	<0.01	——	<0.01	——	<0.01
Manganese	0.019	——	0.028	——	0.031
Mercury (ug/l)	<0.5	<50	<0.5	<50	<0.5
Sodium	1.4	——	1.4	——	1.6
Uranium	0.001	——	0.010	——	0.019
Zinc	0.035	——	0.05	——	0.043
Dissolved Chromium	<0.005	——	<0.005	——	<0.005
Dissolved Copper	0.006	——	<0.005	——	<0.005
Dissolved Lead	<0.01	——	<0.01	——	<0.01
Dissolved Manganese	0.017	——	0.017	——	0.015
Dissolved Mercury (ug/l)	<0.5	——	<0.5	——	<0.5
Dissolved Sodium	1.5	——	1.5	——	1.5
Dissolved Uranium	0.002	——	0.009	——	0.007
Dissolved Zinc	0.13	——	0.074	——	0.11
Nitrate Nitrogen	0.2	——	0.2	——	0.2
Nitrite Nitrogen	<0.01	——	<0.01	——	<0.01
Orthophosphate	<0.01	——	<0.01	——	<0.01
Total Phosphate as Phosphorus	0.02	——	0.02	——	0.02
Ammonia Nitrogen	0.11	——	<0.01	——	<0.1
Hardness	7	——	8	——	7
Alkalinity	6.3	——	6.6	——	5.7
Residual Chloride	<0.05	——	<0.05	——	<0.05
Total Suspended Solids	7	——	<4	——	<4
Kerosene	<100	——	<100	——	<100
Tributyl Phosphate	<100	——	<100	——	<100

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina October 1988 - April 1989

DATE COLLECTED: 02/01/89

LAB NO.:	89-B783-06	89-B783-07	89-B783-08	89-B783-09	89-B783-10
SAMPLE ID:	Site 3 Sed. (ug/kg)	Site 4	Site 4 Sed. (ug/kg)	Site 5	Site 5 Sed.
Parameters:					
Conductivity (umhos/cm)	----	24	----	24	----
Chromium	----	<0.005	----	<0.005	----
Copper	----	<0.005	----	<0.005	----
Lead	----	<0.01	----	<0.01	----
Manganese	----	0.043	----	0.032	----
Mercury (ug/l)	<50	<0.5	<50	<0.5	<50
Sodium	----	1.6	----	1.7	----
Uranium (ug/l)	----	0.016	----	0.021	----
Zinc	----	0.070	----	0.067	----
Dissolved Chromium	----	<0.005	----	<0.005	----
Dissolved Copper	----	<0.005	----	<0.005	----
Dissolved Lead	----	<0.01	----	<0.01	----
Dissolved Manganese	----	0.015	----	0.018	----
Dissolved Mercury (ug/l)	----	<0.5	----	<0.5	----
Dissolved Sodium	----	1.5	----	1.7	----
Dissolved Uranium	----	0.005	----	0.015	----
Dissolved Zinc	----	0.083	----	0.084	----
Nitrate Nitrogen	----	0.2	----	0.2	----
Nitrite Nitrogen	----	<0.01	----	<0.01	----
Orthophosphate	----	<0.01	----	<0.01	----
Total Phosphate as Phosphorus	----	0.02	----	0.02	----
Ammonia Nitrogen	----	<0.1	----	<0.1	----
Hardness	----	7	----	7	----
Alkalinity	----	3.1	----	8.3	----
Residual Chloride	----	<0.05	----	<0.05	----
Total Suspended Solids	----	8	----	4	----
Kerosene	----	<100	----	<100	----
Tributyl Phosphate	----	<100	----	<100	----

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina October 1988 - April 1989

DATE COLLECTED: 02/01/89

LAB NO.:	89-B783-11	89-B783-12	89-B783-13
SAMPLE ID:	Site 2 Dup.	Site 2 Dup. Sediment (ug/kg)	Tims Branch
Parameters:			
Conductivity (umhos/cm)	22	----	----
Chromium	<0.005	----	<0.005
Copper	<0.005	----	<0.005
Lead	<0.01	----	----
Manganese	0.028	----	----
Mercury (ug/l)	<0.5	<50	<0.5
Sodium	1.5	----	----
Uranium (ug/l)	0.013	----	----
Zinc	0.035	----	0.056
Dissolved Chromium	<0.005	----	----
Dissolved Copper	<0.005	----	----
Dissolved Lead	<0.01	----	----
Dissolved Manganese	0.015	----	----
Dissolved Mercury (ug/l)	<0.5	----	----
Dissolved Sodium	1.3	----	----
Dissolved Uranium	0.012	----	----
Dissolved Zinc	0.25	----	----
Nitrate Nitrogen	0.2	----	1.0
Nitrite Nitrogen	<0.01	----	----
Orthophosphate	<0.01	----	----
Total Phosphate as Phosphorus	<0.01	----	0.07 ----
Ammonia Nitrogen	<0.1	----	----
Hardness	8	----	----
Alkalinity	6.6	----	----
Residual Chloride	<0.05	----	----
Total Suspended Solids	<4	----	----
Kerosene	<100	----	----
Tributyl Phosphate	<100	----	----

The above results are reported in milligrams per liter unless otherwise noted.

Analytical methods are those approved by the U.S. Environmental Protection Agency.

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina October 1988 - April 1989

DATE COLLECTED: 03/14/89

LAB NO.:	89-C049-01	89-C049-02	89-C049-03	89-C049-04	89-C049-05
SAMPLE ID:	Site 1	Site 1 Sed. (ug/kg)	Site 2	Site 2 Sed. (ug/kg)	Site 3
Parameters:					
Conductivity (umhos/cm)	18	——	18	——	18
Chromium	<0.005	——	<0.005	——	<0.005
Copper	<0.005	——	<0.005	——	<0.005
Lead	<0.005	——	<0.005	——	<0.005
Manganese	0.026	——	0.025	——	<0.027
Mercury (ug/l)	<0.2	21	<0.2	<20	<0.2
Sodium	1.4	——	1.3	——	1.6
Uranium	<0.001	——	<0.001	——	<0.001
Zinc	<0.04	——	0.109	——	<0.04
Dissolved Chromium	<0.005	——	<0.005	——	<0.005
Dissolved Copper	<0.005	——	<0.005	——	<0.005
Dissolved Lead	<0.005	——	<0.005	——	<0.005
Dissolved Manganese	<0.02	——	<0.02	——	<0.02
Dissolved Mercury (ug/l)	<0.2	——	<0.2	——	<0.2
Dissolved Sodium	1.4	——	1.3	——	1.6
Dissolved Uranium	<0.001	——	<0.001	——	<0.001
Dissolved Zinc	<0.04	——	<0.04	——	<0.04
Nitrate Nitrogen	0.1	——	0.1	——	0.2
Nitrite Nitrogen	<0.01	——	<0.01	——	<0.01
Orthophosphate	0.01	——	<0.01	——	0.01
Total Phosphate as Phosphorus	0.02	——	0.02	——	0.03
Ammonia Nitrogen	<0.1	——	<0.1	——	<0.1
Hardness	6.21	——	7.25	——	7.25
Alkalinity	4.3	——	3.2	——	5.3
Residual Chloride	<0.05	——	<0.05	——	0.15
Total Suspended Solids	<4	——	<4	——	5
Kerosene	<100	——	<100	——	<100
Tributyl Phosphate	<100	——	<100	——	<100

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina October 1988 - April 1989

DATE COLLECTED: 03/14/89

LAB NO.:	89-C049-06	89-C049-07	89-C049-08	89-C049-09	89-C049-10
SAMPLE ID:	Site 3 Sed.	Site 3 Dup.	Site 3 Sed. Duplicate	Site 4	Site 4 Sed.
Parameters:	(ug/kg)		(ug/kg)		
Conductivity (umhos/cm)	----	18	----	20	----
Chromium	----	<0.005	----	<0.005	----
Copper	----	<0.005	----	<0.005	----
Lead	----	<0.005	----	<0.005	----
Manganese	----	0.024	----	0.025	----
Mercury (ug/l)	<20	<0.2	<20	<0.2	<20
Sodium	----	1.6	----	1.7	----
Uranium (ug/l)	----	<0.001	----	<0.001	----
Zinc	----	<0.04	----	<0.04	----
Dissolved Chromium	----	<0.005	----	<0.005	----
Dissolved Copper	----	<0.005	----	<0.005	----
Dissolved Lead	----	<0.005	----	<0.005	----
Dissolved Manganese	----	<0.02	----	<0.02	----
Dissolved Mercury (ug/l)	----	<0.2	----	<0.2	----
Dissolved Sodium	----	1.5	----	1.6	----
Dissolved Uranium	----	<0.001	----	<0.001	----
Dissolved Zinc	----	<0.04	----	<0.04	----
Nitrate Nitrogen	----	0.2	----	0.2	----
Nitrite Nitrogen	----	<0.01	----	<0.01	----
Orthophosphate	----	0.01	----	0.01	----
Total Phosphate as Phosphorus	----	0.02	----	0.02	----
Ammonia Nitrogen	----	<0.1	----	<0.1	----
Hardness	----	7.25	----	9.32	----
Alkalinity	----	5.3	----	5.3	----
Residual Chloride	----	<0.05	----	<0.05	----
Total Suspended Solids	----	4	----	4	----
Kerosene	----	<100	----	<100	----
Tributyl Phosphate	----	<100	----	<100	----

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina October 1988 - April 1989

DATE COLLECTED: 03/14/89

LAB NO.:	89-C049-11	89-C049-12	89-C049-13
SAMPLE ID:	Site 5	Site 5 Sed. (ug/kg)	Tims Branch
Parameters:			
Conductivity (umhos/cm)	19	----	----
Chromium	<0.005	----	<0.005
Copper	<0.005	----	<0.005
Lead	<0.005	----	----
Manganese	0.029	----	----
Mercury (ug/l)	<0.2	<20	<0.2
Sodium	1.6	----	----
Uranium (ug/l)	<0.01	----	----
Zinc	<0.04	----	<0.04
Dissolved Chromium	<0.005	----	----
Dissolved Copper	<0.005	----	----
Dissolved Lead	<0.005	----	----
Dissolved Manganese	<0.02	----	----
Dissolved Mercury (ug/l)	<0.2	----	----
Dissolved Sodium	1.6	----	----
Dissolved Uranium	<0.001	----	----
Dissolved Zinc	<0.04	----	----
Nitrate Nitrogen	0.2	----	2.0
Nitrite Nitrogen	<0.01	----	----
Orthophosphate	0.01	----	----
Total Phosphate as Phosphorus	0.03	----	0.07
Ammonia Nitrogen	<0.1	----	----
Hardness	8.28	----	----
Alkalinity	4.3	----	----
Residual Chloride	<0.05	----	----
Total Suspended Solids	6	----	----
Kerosene	<100	----	----
Tributyl Phosphate	<100	----	----

The above results are reported in milligrams per liter unless otherwise noted.

Analytical methods are those approved by the U.S. Environmental Protection Agency.

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina October 1988 - April 1989

DATE COLLECTED: 04/11/89

LAB NO.:	89-C214-01	89-C214-02	89-C214-03	89-C214-04	89-C214-05
SAMPLE ID:	Site 1	Site 1 Sed. (ug/kg)	Site 2	Site 2 Sed. (ug/kg)	Site 3
Parameters:					
Conductivity (umhos/cm)	25	----	25	----	25
Chromium	<0.005	----	<0.005	----	<0.005
Copper	<0.005	----	<0.005	----	<0.005
Lead	0.007	----	0.006	----	<0.005
Manganese	0.065	----	0.063	----	0.062
Mercury (ug/l)	<0.2	24	<0.2	27	<0.2
Sodium	1.30	----	1.30	----	1.54
Uranium (ug/l)	<0.001	----	<0.001	----	<0.001
Zinc	0.006	----	0.014	----	0.017
Dissolved Chromium	<0.005	----	<0.005	----	<0.005
Dissolved Copper	<0.005	----	<0.008	----	<0.005
Dissolved Lead	<0.005	----	<0.005	----	<0.005
Dissolved Manganese	0.062	----	0.069	----	0.037
Dissolved Mercury (ug/l)	<0.2	----	<0.2	----	<0.2
Dissolved Sodium	1.32	----	2.11	----	1.70
Dissolved Uranium	<0.001	----	<0.001	----	<0.001
Dissolved Zinc	0.012	----	0.039	----	0.025
Nitrate Nitrogen	<0.1	----	<0.1	----	<0.1
Nitrite Nitrogen	<0.01	----	<0.01	----	<0.01
Orthophosphate	<0.01	----	<0.01	----	<0.01
Total Phosphate as Phosphorus	0.02	----	0.03	----	0.03
Ammonia Nitrogen	<0.1	----	<0.1	----	<0.1
Hardness	8.2	----	10.3	----	8.2
Alkalinity	<1	----	2	----	<1
Residual Chloride	<0.05	----	<0.05	----	<0.05
Total Suspended Solids	5	----	6	----	6
Kerosene	<100	----	<100	----	<100
Tributyl Phosphate	<100	----	<100	----	<100

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina October 1988 - April 1989

DATE COLLECTED: 04/11/89

LAB NO.:	89-C214-06	89-C214-07	89-C214-08	89-C214-09	89-C214-10
SAMPLE ID:	Site 3 Sed. (ug/kg)	Site 4	Site 4 Sed. (ug/kg)	Site 4 Dup.	Site 4 Dup. Sediment
Parameters:					
Conductivity (umhos/cm)	----	25	----	25	----
Chromium	----	<0.005	----	<0.005	----
Copper	----	<0.005	----	<0.005	----
Lead	----	<0.005	----	<0.005	----
Manganese	----	0.070	----	0.062	----
Mercury (ug/l)	<20	<0.2	<20	<0.2	<20
Sodium	----	1.51	----	1.55	----
Uranium (ug/l)	----	<0.001	----	<0.001	----
Zinc	----	0.023	----	0.013	----
Dissolved Chromium	----	<0.005	----	<0.005	----
Dissolved Copper	----	<0.005	----	<0.005	----
Dissolved Lead	----	<0.005	----	<0.005	----
Dissolved Manganese	----	0.038	----	0.033	----
Dissolved Mercury (ug/l)	----	<0.2	----	<0.2	----
Dissolved Sodium	----	1.61	----	1.66	----
Dissolved Uranium	----	<0.001	----	<0.001	----
Dissolved Zinc	----	0.39	----	0.032	----
Nitrate Nitrogen	----	<0.1	----	<0.1	----
Nitrite Nitrogen	----	<0.01	----	<0.01	----
Orthophosphate	----	<0.01	----	<0.01	----
Total Phosphate as Phosphorus	----	0.03	----	0.03	----
Ammonia Nitrogen	----	<0.1	----	<0.1	----
Hardness	----	8.2	----	8.2	----
Alkalinity	----	<1	----	1	----
Residual Chloride	----	<0.05	----	<0.05	----
Total Suspended Solids	----	5	----	<4	----
Kerosene	----	<100	----	<100	----
Tributyl Phosphate	----	<100	----	<100	----

Appendix F: Water Chemistry Parameters Measured at 5 Sites Along Upper Three Runs Creek, Savannah River Site, Aiken County, South Carolina October 1988 - April 1989

DATE COLLECTED: 04/11/89

LAB NO.:	89-C214-11	89-C214-12	89-C214-13
SAMPLE ID:	Site 5	Site 1 Sed. (ug/kg)	Tims Branch
Parameters:			
Conductivity (umhos/cm)	* 26	----	----
Chromium	<0.005	----	<0.005
Copper	<0.005	----	<0.005
Lead	<0.005	----	----
Manganese	* 0.719	----	----
Mercury (ug/l)	<0.2	<20	<0.2
Sodium	1.50	----	----
Uranium (ug/l)	<0.001	----	----
Zinc	0.012	----	<0.005
Dissolved Chromium	<0.005	----	----
Dissolved Copper	<0.005	----	----
Dissolved Lead	<0.005	----	----
Dissolved Manganese	0.032	----	----
Dissolved Mercury (ug/l)	<0.2	----	----
Dissolved Sodium	1.64	----	----
Dissolved Uranium	<0.001	----	----
Dissolved Zinc	0.029	----	----
Nitrate Nitrogen	<0.1	----	0.4
Nitrite Nitrogen	<0.01	----	----
Orthophosphate	<0.01	----	----
Total Phosphate as Phosphorus	0.03	----	0.08
Ammonia Nitrogen	<0.1	----	----
Hardness	8.2	----	----
Alkalinity	1	----	----
Residual Chloride	<0.05	----	----
Total Suspended Solids	7	----	----
Kerosene	<100	----	----
Tributyl Phosphate	<100	----	----

* This Data is Suspect.

The above results are reported in milligrams per liter unless otherwise noted.

Analytical methods are those approved by the U.S. Environmental Protection Agency.

APPENDIX Gi

Functional Group Analysis by Site
September - October 1988 Quantitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

Functional Group	Site 1	Site 2	Site 3	Site 4	Site 5	Overall % of Tot
Collector-Gatherers						
% by Pop. #	21%	25%	22%	19%	14%	21%
% by Biomass	5%	2%	1%	1%	<1%	1%
Collector-Filterers						
% by Pop. #	41%	39%	37%	45%	27%	39%
% by Biomass	3%	1%	3%	4%	31%	7%
Predators						
% by Pop. #	29%	19%	20%	22%	41%	23%
% by Biomass	47%	71%	76%	84%	34%	69%
Scrapers						
% by Pop. #	2%	7%	10%	7%	5%	7%
% by Biomass	15%	15%	16%	4%	27%	15%
Shredder-Herbivores						
% by Pop. #	7%	7%	10%	6%	9%	8%
% by Biomass	28%	3%	1%	1%	3%	2%
Shredder-Detritivores						
% by Pop. #	1%	2%	1%	1%	4%	2%
% by Biomass	3%	9%	4%	7%	4%	5%

APPENDIX Gii

Functional Group Analysis by Site
December 1988 - January 1989 Quantitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

Functional Group	Site 1	Site 2	Site 3	Site 4	Site 5	Overall % of Tot
Collector-Gatherers						
% by Pop. #	54%	44%	41%	34%	47%	44%
% by Biomass	2%	4%	1%	3%	4%	2%
Collector-Filterers						
% by Pop. #	14%	20%	15%	23%	15%	17%
% by Biomass	5%	15%	3%	5%	9%	7%
Predators						
% by Pop. #	16%	20%	25%	21%	22%	21%
% by Biomass	50%	34%	76%	54%	26%	52%
Scrapers						
% by Pop. #	6%	6%	2%	6%	3%	4%
% by Biomass	20%	23%	16%	18%	21%	19%
Shredder-Herbivores						
% by Pop. #	8%	10%	13%	12%	12%	11%
% by Biomass	14%	12%	1%	9%	18%	10%
Shredder-Detritivores						
% by Pop. #	2%	1%	3%	4%	2%	2%
% by Biomass	9%	11%	4%	11%	23%	10%

APPENDIX Giii

Functional Group Analysis by Site
March - April 1989 Quantitative Sampling
Upper Three Runs Creek
Savannah River Site, Aiken County, South Carolina

QUANTITATIVE SAMPLING (5 Replicate Multiplate Artificial Substrate Samplers)
(All Replicates Combined)

Functional Group	Site 1	Site 2	Site 3	Site 4	Site 5	Overall % of Tot
Collector-Gatherers						
% by Pop. #	50%	37%	46%	34%	35%	41%
% by Biomass	9%	6%	<1%	10%	7%	6%
Collector-Filterers						
% by Pop. #	23%	23%	27%	40%	32%	29%
% by Biomass	3%	7%	17%	17%	10%	10%
Predators						
% by Pop. #	12%	22%	13%	12%	17%	15%
% by Biomass	82%	81%	62%	63%	75%	75%
Scrapers						
% by Pop. #	10%	9%	9%	7%	10%	9%
% by Biomass	6%	6%	10%	9%	8%	7%
Shredder-Herbivores						
% by Pop. #	3%	7%	3%	4%	5%	4%
% by Biomass	<1%	<1%	<1%	<1%	<1%	<1%
Shredder-Detritivores						
% by Pop. #	2%	3%	3%	2%	2%	2%
% by Biomass	<1%	<1%	11%	<1%	<1%	2%

c:\dfb\123\smpl-twi.wk1 D.F. Brown 05/15/89

treated water tank inlet - flow proportional composite sample

treated water disch begin date & time		tank	gal per tank level drop	collected date & time		pH	alpha d/m/ml	B/G d/m/ml	O&G mg/l	NH4 mg/l	conductiv umho/cm	Cr mg/l	Cu mg/l	Hg mg/l	Pb mg/l	Zn mg/l	tritium (per SRL) pCi/ml
ETF flowsheet average						6-9	0.12	5.0	2.09	0.901	175	0.00119	0.00026	0.000906	0.000034	0.0299	99,010
EFT flowsheet maximum						6-9	0.59	25.1	7.23	1.555	729	0.0695	0.00602	0.011016	0.000127	0.588	495,049
NPDES monthly average limit						6-9	---	---	< 10.0	< 20.0	---	< 1.71	< 1.46	< 0.045	< 0.29	< 1.48	---
NPDES daily maximum limit						6-9	---	---	< 15.0	MRO	---	< 2.77	< 2.07	< 0.175	< 0.58	< 2.61	---
SRL's toxicity recommendation						---	---	---	---	---	---	< 0.05	< 0.05	< 0.040	< 0.05	< 1.50	---
radionuclide goal						---	< 3	< 10	---	---	---	---	---	---	---	---	---
10/22/88	0215(1)	3	120339	10/21/88	1400	7.59	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
10/23/88	2200	2	recyled to WasteWater Collection														
11/01/88	1010	3	122376	10/31/88	1705	7.65	< 3	< 10	1.2	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
11/03/88	0405	2	121008	11/02/88	0912	8.16	< 3	< 10	2	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
11/04/88	1555	3	117724	11/03/88	0530	8.31	< 1	< 5	2.8	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
11/05/88	1436	2	130585	11/04/88	0800	7.58	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
11/14/88	1053	3	122072	11/11/88	0000	7.42	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
11/15/88	1755	2	121616	11/15/88	0535	7.48	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
11/21/88	1100	3	120248	11/19/88	0130	7.47	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
11/22/88	1610	2	120491	11/21/88	2315	7.37	< 1	< 5	< 1	< 1		< 0.1	< 0.1	0.0047	< 0.2		
11/27/88	1310	3	120734	11/24/88	2001	7.49	< 1	< 5	1.3	< 1		< 0.1	< 0.1	0.005	< 0.2		
11/28/88	1355	2	121008	11/27/88	2224	7.44	< 1	< 5	1.07	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
12/01/88	1450	3	119853	12/01/88	0015	7.09	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
12/03/88	1430	2	116691	12/02/88	1748	7.34	< 1	< 5	1.1	< 1		< 0.1	< 0.1	0.003	< 0.2		
12/05/88	1020	3	115535	12/04/88	1855	7.21	< 1	< 5	1.4	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
12/08/88	1320	2	120567	12/07/88	0445	8.12	< 1	< 5	2.8	< 1		< 0.1	< 0.1	0.005	< 0.2		
12/12/88	1045	3	120096	12/10/88	1705	7.46	< 1	< 5	2.2	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
12/15/88	2300	2	120096	12/15/88	0652	8.59	< 1	< 5	2.5	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
12/16/88	0400	3	recyled to WasteWater Collection														
12/20/88	0906	2	119792	12/18/88	0700	7.4	< 1	< 5	5.3	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
12/24/88	1620	3	118576	12/23/88	1345	7.44	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
12/27/88	1012	2	120020	12/26/88	0100	7.32	< 1	< 5	2	< 1		< 0.1	< 0.1	0.003	< 0.2		
12/29/88	1110	3	120141	12/29/88	0100	7.56	< 1	< 5	1.5	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
12/31/88	1035	2	118591	12/30/88	1430	7.7	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
01/01/89	1230	3	127697	12/31/88	1400	7.82	< 1	< 5	< 1			< 0.1	< 0.1	< 0.002	< 0.2		
01/02/89	1450	2	119974	01/02/89	0310	7.92	< 1	< 5	4.6	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
01/05/89	1625	3	120096	01/04/89	1615	7.36	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
01/07/89	0712	2	120689	01/06/89	1820	7.02	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
01/08/89	1410	3	120552	01/07/89	2100	7.27	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
01/11/89	0410(2)	2	116143	01/10/89	0720	7.7	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
01/15/89	0317	3	116022	01/13/89	4x12	8.12	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
01/17/89	0620	2	120096	01/16/89	1818	7.51	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
01/19/89	0614	3	121251	01/18/89	1300	7.49	< 1	< 5	< 1	< 1		< 0.1	< 0.1	0.002	< 0.2		
01/20/89	0825	2	120400	01/20/89	0230	7.4	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
01/22/89	1430	3	120096	01/22/89	12x8	7.57	< 1	< 5	< 1	< 1		< 0.1	< 0.1	0.003	< 0.2	< 0.1	

treated water tank inlet - flow proportional composite sample

treated water disch begin date & time		tank	gal per tank level drop	collected date & time		pH	alpha d/m/ml	B/G d/m/ml	O&G mg/l	NH4 mg/l	conductiv umho/cm	Cr mg/l	Cu mg/l	Hg mg/l	Pb mg/l	Zn mg/l	tritium (per SRL) pCi/ml
01/24/89	1025	2	120400	01/23/89	2200	7.86	< 1	< 5	7.6	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
01/25/89	1240	3	120096	01/25/89	0300	7.56	< 1	< 5	1.2	< 1		< 0.1	< 0.1	0.002	< 0.2	< 0.1	
01/26/89	1355	2	119184	01/26/89	0900	7.92	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2		
01/30/89	0400	3	120096	01/28/89	0400	8.19	< 1	< 5	3	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
01/31/89	0935(3)	2	120096	01/31/89	0045	8.23	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
02/02/89	0415	3	120096	02/01/89	1600	7.89	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
02/04/89	0015	2	122072	02/03/89	1730	7.59	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
02/06/89	0445	3	120643	02/05/89	[illegible]	7.82	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
02/08/89	0655	2	121160	02/07/89	[illegible]	7.83	< 1	< 5	2	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	12,000
02/09/89	1045	3	117481	02/08/89	[illegible]	8.09	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	9,370
02/11/89	1100	2	120400	02/11/89	0050	7.79	< 1	< 5	1.2	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	13,100
02/12/89	2010	3	120248	02/12/89	1415	7.95	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	23,300
02/14/89	0530	2	120096	02/13/89	1600	7.75	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	22,200
02/15/89	1030	3	120096	02/14/89	2300	8.01	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	21,100
02/17/89	1320	2	120354	02/16/89	2100	7.82	< 1	< 5	2.8	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	27,400
02/19/89	1020(4)	3	120096	02/18/89	2350	7.31	< 1	< 5	< 1	< 1		< 0.1	< 0.1	0.003	< 0.2	< 0.1	
02/21/89	0720	2	117968	02/21/89	12x8	7.33	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
02/23/89	0715	3	120096	02/22/89	1200	7.46	< 1	< 5	< 1	< 1		< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
02/26/89	1235	2	120339	02/26/89	0200	7.56	< 1	< 5	2	< 1	520	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/01/89	0400	3	120096	02/28/89	1225	8.7	< 1	< 5	< 1	< 1	153	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/04/89	1040	2	120096	03/04/89	0300	7.48	< 1	< 5	< 1	< 1	73	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/07/89	0833	3	116295	03/06/89	1640	7.51	< 1	< 5	< 1	< 1	69	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/09/89	0545	2	85131	03/08/89	1145	7.85	< 1	< 5	1.9	< 1	14.62	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/12/89	0040	3	124763	03/11/89	0530	7.45	< 1	< 5	< 1	< 1	85	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/13/89	0530	2	117481	03/12/89	2200	6.92	< 1	< 5	2	< 1	320	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/14/89	1845	3	122467	03/14/89	0800	6.89	< 1	< 5	< 1	< 1	290	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/16/89	1430	2	120096	03/16/89	1030	6.56	< 1	< 5	< 1	< 1	304	< 0.1	< 0.1	0.003	< 0.2	< 0.1	
03/17/89	1210	3	122984	03/17/89	0600	7.12	< 1	< 5	< 1	< 1	1400	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/18/89	0915	2	120096	03/18/89	0400	7.17	< 1	< 5	< 1	1.47	1113	< 0.1	< 0.1	0.004	< 0.2	< 0.1	
03/19/89	1330	3	122224	03/19/89	0530	7.18	< 1	< 5	2	3.18	1600	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/20/89	1105	2	119427	03/20/89	0300	7.14	< 1	< 5	< 1	< 1	700	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/22/89	0752	3	119153	03/21/89	2055	6.83	< 1	< 5	< 1	< 1	310	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/23/89	0805	2	120096	03/22/89	2045	6.76	< 1	< 5	3.7	1.4	880	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/24/89	0835	3	120765	03/23/89	2200	6.73	< 1	< 5	< 1	< 1	500	< 0.1	< 0.1	0.002	< 0.2	< 0.1	
03/25/89	1525	2	120096	03/25/89	0030	6.73	< 1	< 5	< 1	< 1	130	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/26/89	0600	3	121920	03/25/89	2200	6.37	< 1	< 5	< 1	< 1	210	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/27/89	1247	2	120339	03/27/89	0600	7.86	< 1	< 5	< 1	< 1	220	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/28/89	1520	3	121312	03/28/89	1047	7.79	< 1	< 5	< 1	< 1	420	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/29/89	0350	2	120704	03/28/89	2324	7.03	< 1	8	< 1	1.3	1200	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
03/29/89	2305	3	121160	03/29/89	1630	6.87	< 1	< 5	< 1	1.02	900	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	

Appendix H: F/H Area ETF Effluent Discharge Release Dates, October 1988 - April 1989.

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treated water disch begin date & time	tank	gal per tank level drop	treated water tank inlet - flow proportional composite sample: collected date & time	pH	alpha d/m/ml	B/G d/m/ml	O&G mg/l	NH4 mg/l	conductiv umho/cm	Cr. mg/l	Cu mg/l	Hg mg/l	Pb mg/l	Zn mg/l	tritium (per SRL) pCi/ml
03/30/89 1305	2	110519	03/30/89 [redacted]	6.91	< 1	< 5	< 1	< 1	610	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
04/10/89 0600	2	120096	04/10/89 [redacted]	7.83	< 1	< 5	< 1	1.87	370	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
04/11/89 0815	3	120856	04/10/89 2245	6.96	< 1	< 5	< 1	< 1	170	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
04/12/89 0910	2	120400	04/11/89 2230	7.03	< 1	< 5	< 1	< 1	150	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
04/13/89 0910	3	120552	04/13/89 0105	6.62	< 1	< 5	4.3	< 1	170	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
04/14/89 0900	2	120096	04/14/89 0015	6.47	< 1	< 5	< 1	< 1	170	< 0.1	< 0.1	0.002	< 0.2	< 0.1	
04/15/89 0200	3	120400	04/14/89 1905	6.78	< 1	< 5	< 1	< 1	130	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
04/16/89 0715	2	120552	04/16/89 0115	6.7	< 1	< 5	< 1	< 1	141	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
04/18/89 0650	3	120248	04/17/89 0800	6.99	< 1	< 5	< 1	< 1	130	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
04/19/89 2125	2	104894	04/19/89 0945	6.13	< 1	< 5	< 1	< 1	111.5	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
04/20/89 2320	3	118576	04/20/89 1730	7.23	< 1	< 5	< 1	< 1	216	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
04/22/89 2110	2	120096	04/22/89 1515	6.75	< 1	< 5	< 1	< 1	170	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
04/26/89 0600	3	120096	04/25/89 1600	6.91	< 1	< 5	< 1	< 1	180	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
04/28/89 0935	2	120096	04/27/89 2210	6.79	< 1	< 5	< 1	< 1	260	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
05/01/89 0700	3	120096	04/30/89 0950	6.85	< 1	< 5	< 1	< 1	440	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
05/02/89 1835	2	120400	05/02/89 1410	6.86	< 1	< 5	< 1	< 1	460	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
05/03/89 ~2000	3	~85	05/03/89 1500	6.98	< 1	< 5	< 1	< 1	390	< 0.1	< 0.1	< 0.002	< 0.2	< 0.1	
05/05/89 ~1800	2	~85	05/05/89 1015												
05/06/89 ~2300	3	~85	05/06/89 1805												
05/08/89 ~1200	2	~85													
05/09/89 ~0600		~80													
05/10/89 ~0800		~85													

Appendix H: F/H Area ETF Effluent Discharge Release Dates, October 1988 - April 1989.

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				treated water tank inlet - flow proportional composite sample										
treated water disch begin date & time	tank	gal per tank level drop	collected date & time	pH	alpha d/m/ml	B/G d/m/ml	O&G mg/l	NH4 mg/l	conductiv umho/cm	Cr mg/l	Cu mg/l	Hg mg/l	Pb mg/l	Zn mg/l	tritium (per SRL) pCi/ml

notes: (1) the last of the simulant run discharges.
(2) disch down to 6.0%, remainder (to 3%) followed on 01/13/89 @ 8x4.
(3) " " 64.9 " 6 " 02/01/89 @ 0500.
(4) " " 14.0 " 6 " 02/20/89 @ 4x12.
(5)
(6)
(7)
(8)
(9)
(10)