

**NEW RIVER GORGE NATIONAL RIVER
LONG-TERM ECOLOGICAL MONITORING SYSTEM
USER MANUAL
DATABASE MANAGEMENT SYSTEM**

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

July 1994

In partial fulfillment of Cooperative Agreement CA4000-8-8008 between Virginia Polytechnic Institute and State University and USDI, National Park Service, New River Gorge National River, Oak Hill, West Virginia 25901

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INTRODUCTION

The purpose of this manual is to explain how to use a database management system that was developed as part of the Long-Term Ecological Monitoring System (LTEMs) for New River Gorge National River. This database management system was designed to store and retrieve the basic data generated from the LTEMs sampling and to calculate a variety of measures that can be used to interpret the ecological meaning of the data. The design of the database management system conforms very closely to the field and laboratory protocols of the LTEMs for analyzing the environmental characteristics, macroinvertebrates, and fish of New River Gorge National River. Data entry screens were designed so that users can work directly from the various field and laboratory worksheets that were developed for the LTEMs.

All programs were developed using dBASE IV version 1.1 and then compiled for execution. Minimum hardware requirements are an IBM compatible machine with a 40-MHz processor, 80-MB hard disk, and 4MB RAM. A printer is also necessary for producing copies of data and summary reports.

Using the Manual

Screens that appear on the computer monitor are presented in this manual with an outline of double lines. Computer screens are numbered sequentially in this manual so they can be referenced in the text, but these screen numbers are not part of the LTEMs program. Names of screens or portions of screens are printed in italics (e.g., *Main Menu* or *Taxon Code* column). Commands that are to be typed by the user

are set off from other text by < > and are in bold type (e.g., <quit>). When instructions are given to press specific keys, that information is set off from other text by [] and is in bold type (e.g., [RETURN]).

Getting Started in the Program

To enter the LTEMs program, the program files and database files must be in one subdirectory and that subdirectory must be on the same default directory as dBASE. At the default directory type <Items>. When the screen comes up describing the dBASE license agreement, press [RETURN]. This will start the LTEMs program, and bring up the *Main Menu* (Screen 1).

```

New River Gorge National River
Long-Term Ecological
Monitoring System
Main Menu

1 - Fish Database
2 - Macroinvertebrate Database
3 - Environmental
   Characteristics Database
4 - Return to DOS
Select ■
(Screen 1)

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The first three options provide access to the three different databases: Option 1, fish; Option 2, macroinvertebrates, Option 3, environmental characteristics. Option 4 is used to leave the LTEMs program and return to DOS.

FISH DATABASE

Choosing Option 1 on the *Main Menu* (Screen 1) provides access to the fish

database and brings up the *Fish Submenu* (Screen 2) with five options.

<p style="text-align: center;">New River Gorge National River Long-Term Ecological Monitoring System Fish Submenu</p>	
1 -	Data Entry
2 -	Data Correction
3 -	Create/View/Print Reports
4 -	Dictionary Maintenance
5 -	Return to Main Menu
<p>Select ■</p>	
<p>(Screen 2)</p>	

Option 1 is used for entering data that have not been previously entered. Option 2 is used for correcting or deleting data that have been previously entered. Option 3

allows the user to create, view, or print various summary reports. Option 4 enables the user to add, delete, or correct taxonomic names and ecological information in the fish dictionary. Option 5 is used to return to the *Main Menu* (Screen 1).

Data Entry

To enter data select Option 1 from the *Fish Submenu* (Screen 2), which brings up *Fish Data Entry* (Screen 3). This screen was designed to be used in conjunction with the Fish Worksheet (see field and laboratory user manual).

All five entry blanks in the heading must be completed before entering fish species and their lengths and weights. To move among the entry blanks in the heading, use either **[RIGHT, LEFT ARROWS]** or **[TAB]**. If the user decides not to enter any data, use the **[TAB]** key to

<p style="text-align: center;">New River Gorge National River Long-Term Ecological Monitoring System Fish Data Entry</p>						
Site: Bluestone		Date: 08/20/92		Entered By: tas		
	Replicate: 1		Effort: 10			
Code	Species	Length	Weight	Trophic Group	Tolerance	Origin
GOD120	Smallmouth bass	12	134.6	PIS	F	I
GOD120	Smallmouth bass	34	56.0	PIS	F	I
GOD120	Smallmouth bass	12	5.0	PIS	F	I
GOD120	Smallmouth bass	12	89.0	PIS	F	I
<p>(Screen 3)</p>						

move the cursor to the first line of the Code column and type <quit>. This will return the user to the *Fish Submenu* (Screen 2).

The *Site* entry blank is completed by toggling through the possible choices with the [SPACE] bar and pressing [RETURN] when the appropriate choice is located. The possible choices for the *Site* entry blank are Bluestone, Sandstone, Prince, Thurmond, and Fayette.

Enter the date the sample was collected in the *Date* entry blank as mm/dd/yy (e.g., 08/03/92 for August 3, 1992).

Type the initials or last name of the person entering the data in the *Entered By* entry blank.

The fourth entry blank should contain the sample *Replicate Number*. In most circumstances there will be 13 replicate fish samples.

The last entry blank is for *Effort*, which is the time spent (minutes) collecting fish during that replicate.

At this point, it is advisable to check all header information and correct any mistakes before beginning to enter fish data. After the first species is entered it is not possible to return to the header while in Data Entry mode. Move among header entry blanks by pressing [RIGHT, LEFT ARROWS]. Corrections to the header can be made later by means of the Data Correction mode, which is explained in another section below, but that process is somewhat time consuming.

After reviewing all header information, press [RETURN], and the cursor will move

to the *Code* column for entering the species of all fish in the sample and their lengths and weights. In the fish database a record consists of an individual fish for a given site, date, and replicate. The first record is entered by typing the appropriate code for the species in the *Code* column and pressing [RETURN]. The *Species* name, *Trophic Group*, *Tolerance*, and *Origin* will automatically be retrieved from the fish dictionary, and the cursor will move to the *Length* column. Enter the length of that fish (in mm) and press [RETURN]. The cursor will move to the *Weight* column. Enter the weight of the same fish (in g) and press [RETURN]. The cursor will move to the next row of the *Code* column, where the previous code is carried forward to facilitate entry of data for a number of fish belonging to the same species. To accept the previous code press [RETURN]. If the next fish belongs to another species, type in the appropriate new code. The steps described in this paragraph should be repeated for all fish found in the replicate. After a species code, length, or weight has been entered, it is not possible to make changes while in Data Entry mode. Later corrections can be made by means of the Data Correction mode, which is explained in another section below.

After the last record has been entered for a given replicate and if there are more replicates to be entered for the same site, type <change> in the next line of the *Code* column. Data from the current replicate will be saved and cleared, and the screen will be prepared for entering the header and data from the next replicate. If the last record has been entered for a given replicate and there are no more replicates to be entered, type <quit> in the next line of the *Code* column. Data from the last

replicate will be saved and the user will be returned to the *Fish Submenu* (Screen 2).

Data Correction

If it is necessary to make corrections to information that is already in the database, the user should select Option 2 from the *Fish Submenu* (Screen 2). This will generate *Fish Data Correction* (Screen 4).

To correct species codes, lengths, or weights, enter the site, date, replicate number, and the code of the species that

The user can move through the records of this species that do not need to be changed by typing <c> at the cursor. When there are more records for a species than will fit on one screen, the program prompts the user to continue to another screen by pressing any key. When a record that needs to be changed is located, type <e> and the cursor will move to the next line of the *Code* column. If the code needs to be changed, type in the correct code, press [RETURN], and the cursor will move to the *Length* column. Enter the length, press [RETURN], and the cursor will move to

New River Gorge National River Long-Term Ecological Monitoring System Fish Data Entry							
Site: Bluestone		Date: 08/20/92			Replicate: 1		
Code	Species	Length	Weight	Trophic Group	Tolerance	Origin	
E	GOD120	Smallmouth bass	50	1.0	PIS	F	I
	GOD120	Smallmouth bass	50	1.2	PIS	F	I
C	GOD120	Smallmouth bass	47	1.0	PIS	F	I
D	GOD120	Smallmouth bass	12	34.0	PIS	F	I
	GOD120	Smallmouth bass	23	78.0	PIS	F	I

(Screen 4)

needs to be changed. This information is entered in the same way as explained for fish data entry. All records that match the specified information (all individual fish of a given species, site, date, and replicate) will be retrieved, and the first record will appear on the screen with the cursor to the left of the species code.

the *Weight* column. Enter the weight, press [RETURN], and the next record for this species will be displayed with the cursor to the left of the species code. The lengths and weights must be entered, regardless of whether they need to be changed or not. If only the length or weight needs to be changed for a record, it

is not necessary to enter the species code again. Simply press [RETURN], the same code will be repeated, and the cursor will move to the *Length* column. The corrected record is automatically written over the old record and saved in the database.

To delete an entire record, type <d> when the cursor is in the space to the left of the species code. The record is automatically deleted in the database, and the next record for this species will be displayed with the cursor to the left of the species code.

If an error was made in a header during data entry, all records with that header information must be individually deleted in Data Correction mode and reentered in Data Entry mode.

When there are no more records for the specified species code, the cursor will move to the *Site* entry blank in the header. Press the [TAB] key until the cursor moves to the *Code* column. If there are other records to be edited, type <change> in the *Code* column and proceed as described above. The Data Correction mode can be exited by typing <quit> in the *Code* column, which returns the user to the *Fish Submenu* (Screen 2).

Reports

The LTEMs database management system is capable of producing a variety of reports that summarize the fish data from replicates and calculate measures for interpreting the ecological meaning of the data. Selecting Option 3 from the *Fish Submenu* (Screen 2) generates the *Information Request for Fish Reports*

(Screen 5), with two entry blanks to specify the replicate samples to be summarized.

New River Gorge National River
Long-Term Ecological
Monitoring System
Information Request for Fish Reports

Site: Bluestone
Date: 08/02/90

Reports have already been created
for
this site and date.
Do you want to recalculate them?

(Screen 5)

The cursor will appear in the *Site* entry blank. The *Site* entry blank is completed by toggling through the possible choices with the [SPACE] bar and pressing [RETURN] when the appropriate choice is located. The possible choices for the *Site* entry blank are Bluestone, Sandstone, Prince, Thurmond, Fayette, and quit. Choosing quit returns the user to the *Fish Submenu* (Screen 2). Choosing a site moves the cursor to the *Date* entry blank, which is completed as explained for the Data Entry mode. Note that the possible choices for the *Date* entry blank are not contained within the program (i.e., not chosen by toggling); therefore, the user must enter the exact sampling date (mm/dd/yy) for the data of interest. Sampling dates for all data currently

contained in the database (through 1990) are listed in Appendix 1. This appendix should be updated annually as new data are entered in the database.

After the *Date* entry blank is completed, the program will question the user about recalculating the reports for these replicate samples if they have been previously created (Screen 5). This question is asked because the program saves most reports after they are created the first time to increase operating speed when those reports are requested again. If the reports for these replicate samples have not been created, this question will not appear and the program will proceed with creating them. If the user is confident that no data have been corrected since the reports for these replicate samples were created, answer the question with no (type <n>). If the user knows data have been corrected since the reports for these replicate samples were created, or is unsure, answer the question with yes (type <y>).

After the *Date* entry blank is completed, the program will question the user about recalculating the reports for these replicate samples if they have been previously calculated (Screen 5). This is because the program saves most reports after they are calculated the first time to increase operating speed when those reports are requested again. If the reports for these replicate samples have not been calculated before, this question will not appear and the program will proceed with calculating them. If the user is confident that no data have been corrected since the reports for these replicate samples were previously calculated, answer the question with no (type <n>). If the user knows data have been corrected since the reports for these

replicate samples were previously calculated, or is unsure, answer the question with yes (type <y>).

Completing the *Information Request for Fish Reports* (Screen 5) generates the *Fish Reports Submenu* (Screen 6) with eight options.

New River Gorge National River
Long-Term Ecological
Monitoring System
Fish Reports Submenu

- 1 - Community Structure at Species Level - Numbers
- 2 - Community Structure at Species Level - Biomass
- 3 - Community Structure at Higher Taxonomic Levels - Numbers
- 4 - Community by Functional Feeding Group, Tolerance, and Origin - Numbers
- 5 - Abundance of Individual Species for All Years
- 6 - Community Measures for All Years
- 7 - Choose New Site/Date
- 8 - Return to Fish Submenu

Select ■

(Screen 6)

Option 1 summarizes community structure at the lowest taxonomic level, usually species, according to numbers (see Appendix 4 for an example of this report). Option 2 summarizes community structure

at the lowest taxonomic level, usually species, according to biomass (see Appendix 5 for an example of this report). Option 3 summarizes community structure at higher taxonomic levels, order and family, according to numbers (see Appendix 6 for an example of this report). Option 4 allows the user to analyze the community according to functional feeding group, tolerance, and origin, according to numbers (see Appendix 7 for an example of this report). Option 5 summarizes the abundance of any individual taxon in each year that data are included in the database (see Appendix 8 for an example of this report). Option 6 allows the user to examine 12 community measures in each year that data are included in the database (see Appendix 9 for an example of this report). Option 7 is used to produce reports from another site, date, habitat, or method and returns the user to *Information Request for Fish Reports* (Screen 5). Option 8 is used to leave the Reports mode and return to the *Fish Submenu* (Screen 2).

Enter the number of the desired option in the *Select* space at the bottom of the *Fish Reports Submenu* (Screen 6). For Options 1, 2, 3, 4, and 6 the reports will be immediately produced on the screen. For Option 5, the *Request for Fish Species* (Screen 7) will appear, and the user must enter the code for the taxon of interest and press [RETURN].

New River Gorge National River
Long-Term Ecological
Monitoring System
Request for Fish Species

Code: GOD120

(Screen 7)

All reports can be viewed on the screen or printed. Use [PAGE DOWN] to view successive screens of longer reports. At the end of each report there is a question to print the report or not. Type <y> for yes or <n> for no. If the answer is yes, another line will appear asking the number of copies. Enter the desired number of copies and press [RETURN]. The user will be returned to the *Fish Reports Submenu* (Screen 6).

Dictionary Maintenance

Selection of Option 4 from the *Fish Submenu* (Screen 2) generates *Fish Dictionary Maintenance* (Screen 8). This option should be used cautiously because any changes require professional expertise in taxonomy and ecology of fish. Dictionary maintenance will be needed only rarely. The only option that has been provided is for adding new taxa (when a taxon that has not been found previously in the New River is collected). Options have not been provided for deleting or editing records in the fish dictionary. Deleting or editing records in the fish dictionary will require a programmer, who will be able to accomplish the necessary tasks with the aid of the Programmer Guide. Deleting or editing records in the fish dictionary will require updating all existing fish databases, which are stored individually for each year.

To add a new taxon, first enter the new code in the *Taxon* entry blank. The taxon code must be unique and must fit into the numerical hierarchy (e.g., all Cyprinidae must start with G020). The current version of the fish dictionary appears in Appendix 2. The program will automatically check to see if the code is already in the system. If an existing code has been selected, the

New River Gorge National River
Long-Term Ecological Monitoring System
Fish Dictionary Maintenance

Taxon	Desc	Name	Trophgrp	Tlrnt	Orgn
G0602	Cyprinus				

program will retrieve all information for that taxon and the cursor will appear to the left of *Taxon* column. In that case, the user should type <c> in the space to the left of the *Taxon* column. The program will leave the existing taxon code and associated information as is, and the cursor will move to the next line in *Taxon* entry blank. The user should modify the taxon code as necessary to make it unique. When a unique taxon code is entered, the program will ask if the user wants to add this taxon to the dictionary. The user has the opportunity to review the new code and make sure it is correct (e.g., is it in the appropriate taxonomic hierarchy?). If correct, type <y>, and the new code will be stored in the dictionary.

The cursor will return to the *Taxon* entry blank, where the new code must be reentered. Press [RETURN] and the cursor will move to the *Desc* entry blank, where the scientific name is entered. Press [RETURN] and the cursor will move to the *Name* entry blank, where the common name is entered. Common and scientific names should be chosen from the 1991 edition of *Common and Scientific Names of Fishes*, published by the American Fisheries Society (Robins et al. 1991).

Press [RETURN] and the cursor will move to the *Trophgrp* entry blank, where the user should enter the trophic group that the new taxon belongs to. Trophic group is entered as an abbreviation; the choices are:

PIS - piscivores, HER - herbivores, OMN - omnivores, VER - invertivores, and INS - insectivores. Press [RETURN] and the cursor will move to the *Tlrnt* entry blank where the user should enter the pollution tolerance of the new taxon. Tolerance is entered as an abbreviation; the choices are: T - tolerant, I - intolerant, and F - facultative or intermediate tolerance. Press [RETURN] and the cursor will move to the *Orgn* entry blank where the user should enter the origin of the new taxon. Origin is entered as an abbreviation; the choices are: E - endemic, N - native, I - introduced, NI - regarded as native, but possibly introduced, IP - probably or possibly introduced, or H - hybrid. Decisions about trophic group, tolerance, and origin must be based on information published in the primary literature on fish ecology or the professional experience of someone who has conducted research on fish ecology. It is likely that a specialist at a university or museum will need to be consulted for this information.

Press [RETURN] after entering origin, and the cursor will move to a new line in the *Taxon* entry blank. If there are no more new taxa to enter, type <quit> and the user will be returned to the *Fish Submenu* (Screen 2).

File Management

The fish database requires annual file maintenance because the program is set up to handle each year's data as a separate data file. The programming had to be done this way because each individual fish is a separate record, and the resulting data file for one year is very large. **The procedures explained below must be followed very carefully because there is a danger of overwriting previous files, which would result in the loss of a year's data.**

After entering a year of fish data and checking for correctness, the database file must be removed from the program and stored with a new name. The basic steps to accomplish this are to rename the current database file containing this year's data, then create an empty file for next year's data with the previous name by copying the structure of the renamed file to the name of the previous file.

This annual file management is performed in dBASE but outside of the LTEMS program. The user must enter dBASE according to the configuration of the particular computer being used. The LTEMS program is exited from the *Main Menu* (Screen 1), but the user must then enter dBASE.

At the dot prompt, type <rename fishbase.dbf to fish(XX).dbf> (fishbase.dbf is the current year's database file;

fish(XX).dbf is the new file name in which XX should be the last two numbers of the current year). For example, after the fish data for 1991 are entered, the user should type <rename fishbase.dbf to fish1991.dbf> and press [RETURN]. Next, type <use fish1991.dbf> and press [RETURN]. Then type <copy structure to fishbase.dbf> and press [RETURN]. At this point the LTEMS program is ready to receive data from the next year. In the example given above, the next year would be 1992.

MACROINVERTEBRATE DATABASE

Choosing Option 2 on the *Main Menu* (Screen 1) provides access to the macroinvertebrate database and brings up the *Macroinvertebrate Submenu* (Screen 9) with five options.

New River Gorge National River Long-Term Ecological Monitoring System Macroinvertebrate Menu	
1 -	Data Entry
2 -	Data Correction
3 -	Create/View/Print Reports
4 -	Dictionary Maintenance
5 -	Return to Main Menu
Select	■
(Screen 9)	

Option 1 is used for entering data that have not been previously entered. Option 2 is used for correcting or deleting data that have been previously entered. Option 3 allows the user to create, view, or print various summary reports. Option 4 enables

the user to add, delete, or correct taxonomic names and ecological information in the macroinvertebrate dictionary. Option 5 is used to return to the *Main Menu* (Screen 1).

Data Entry

To enter data select Option 1 from the *Macroinvertebrate Submenu* (Screen 9), which brings up *Macroinvertebrate Data Entry* (Screen 10). This screen was designed to be used in conjunction with the Macroinvertebrate Worksheet (see field and laboratory user manual).

The *Site* entry blank is completed by toggling through the possible choices with the [SPACE] bar and pressing [RETURN] when the appropriate choice is located. The possible choices for the Site entry blank are Bluestone, Sandstone, Prince, Thurmond, and Fayette.

Enter the date the sample was collected in the *Date* entry blank as mm/dd/yy (e.g., 08/03/92 for August 3, 1992).

New River Gorge National River Long-Term Ecological Monitoring System Macroinvertebrate Data Entry				
Site: Bluestone		Date: 08/22/92		Entered By: tas
Habitat: Cobble/Pebble		Method: PIBS		Replicate: 1
Code	Taxon	Count	Functional Group	HBI Tolerance
5060	Planariidae	35	CG	8
d2	Class Oligochaeta	2	CG	8
f111000	Corbicula fluminea	3	CF	8
(Screen 10)				

All six entry blanks in the heading must be completed before entering taxa and counts. To move among the entry blanks in the heading, use either [RIGHT, LEFT ARROWS] or [TAB]. If the user decides not to enter any data, use the [TAB] key to move the cursor to the first line of the Code column and type <quit>. This will return the user to the *Macroinvertebrate Submenu* (Screen 9).

Type the initials or last name of the person entering the data in the *Entered By* entry blank.

The *Habitat* entry blank is completed by toggling through the possible choices, as was done for the *Site* entry blank. Possible choices for *Habitat* are Justicia, Cobble/Pebble, Rock Outcrop, and Pool.

The *Method* entry blank is completed by toggling through the possible choices, as was done for the *Site* and *Habitat* entry blanks. Possible choices for *Method* are PIBS, ROCS, D-frame, and Surber.

Enter the sample replicate number in the *Replicate* entry blank. The replicate number varies for different methods, as follows: PIBS, 1-3; ROCS, 1-5; D-frame, 1; and Surber, 1-3.

At this point, it is advisable to check all header information and correct any mistakes before beginning to enter taxa and counts. After the first taxon is entered it is not possible to return to the header while in Data Entry mode. Move among header entry blanks by pressing [**RIGHT, LEFT ARROWS**]. Corrections to the header can be made later by means of the Data Correction mode, which is explained in another section below, but that process is somewhat time consuming.

After reviewing all header information, press [**RETURN**], and the cursor will move to the *Code* column for entering the various taxa found in the sample and the number of each taxon. In the macroinvertebrate database, a record consists of an individual taxon for a given site, date, habitat, method, and replicate. The first taxon is entered by typing the appropriate code in the *Code* column and pressing [**RETURN**]. The name of the *Taxon*, *Functional Group*, and *HBI Tolerance* will automatically be retrieved from the macroinvertebrate dictionary, and the cursor will move to the *Count* column. Enter the number of organisms belonging to that taxon in the *Count* column and press [**RETURN**]. The cursor will move to the next row of the *Code* column, and the steps described in

this paragraph should be repeated for all taxa found in the sample. After a taxon code or count has been entered, it is not possible to make changes while in Data Entry mode. Later corrections to taxa and counts can be made by means of the Data Correction mode, which is explained in another section below.

After the last taxon code and count have been entered for a given replicate and there are more replicates to be entered for the same site, habitat, and method, type **<change>** in the next line of the *Code* column. Data from the current replicate will be saved and cleared, and the screen will be prepared for entering data from the next replicate. It will only be necessary to reenter the date and replicate number for the next replicate before proceeding with entering taxa and counts. If the last taxon code and count have been entered for a given replicate and there are no more replicates to be entered, type **<quit>** in the next line of the *Code* column. Data from the last replicate will be saved and the user will be returned to the *Macroinvertebrate Submenu* (Screen 9).

Data Correction

If it is necessary to make corrections to information that is already in the database, the user should select Option 2 from the *Macroinvertebrate Submenu* (Screen 9). This will generate *Macroinvertebrate Data Correction* (Screen 11).

To correct taxa codes or counts, enter the site, date, habitat, method, replicate number, and the code of the taxon that needs to be changed. This information is entered in the same way as explained for macroinvertebrate data entry.

New River Gorge National River
Long-Term Ecological Monitoring System
Macroinvertebrate Data Entry

Site: Bluestone
Method: PIBS

Date: 08/22/90

Habitat: Cobble/Pebble
Replicate: 1

Code	Taxon	Count	Functional Group	HBI Tolerance
D 5060	Planariidae	35.0	CG	8.00

(Screen 11)

The specified record (individual taxon for a given site, date, habitat, method, and replicate) will be retrieved, and the cursor will appear to the left of the code. Three choices are available to the user: making no changes, editing the record, or deleting the record. If the user decides to make no changes to the record, type <c> and the cursor will return to the *Site* entry blank in the header. To edit the record, type <e> and the cursor will move to the next line of the *Code* column. If the code needs to be changed, type in the correct code, press [RETURN], and the cursor will move to the *Count* column. Enter the count and press [RETURN]. The count must be entered on this line of the *Count* column, regardless of whether it needs to be changed or not. If only the count needs to be changed for this record, it is not necessary to enter the taxon code again on this line of the *Code* column. Simply press [RETURN], the same code will be repeated, and the cursor will move to the *Count* column. The corrected record is automatically written over the old record and saved in the database. To delete the

entire record, type <d> when the cursor is in the space to the left of the taxon code. The record is automatically deleted in the database. After editing or deleting a record the cursor will return to the *Site* entry blank in the header.

If additional records need to be corrected, type the appropriate information in the header and *Code* column and proceed as described in the above paragraph.

If an error was made in a header during data entry, all records with that header information must be individually deleted in Data Correction mode and reentered in Data Entry mode.

When all corrections have been made and the user is ready to leave Data Correction mode, the cursor will be in the *Site* entry blank of the header. Press the [TAB] key until the cursor moves to the *Code* column and type <quit>, which returns the user to the *Macroinvertebrate Submenu* (Screen 9).

Reports

The LTEMs database management system is capable of producing a variety of reports that summarize the macroinvertebrate data from replicates and calculate measures for interpreting the ecological meaning of the data. Selecting Option 3 from the *Macroinvertebrate Submenu* (Screen 9) generates the *Information Request for Macroinvertebrate Reports* (Screen 12), with four entry blanks to specify the replicate samples to be summarized.

New River Gorge National River
Long-Term Ecological
Monitoring System
Information Request for
Macroinvertebrate Reports

Site: Bluestone
Date: 08/20/90
Habitat: Cobble/Pebble
Method: PIBS

Reports have already been created
for this site, date, habitat, and
method. Do you want to
recalculate them?

(Screen 12)

The cursor will appear in the Site entry blank. The Site entry blank is completed by toggling through the possible choices with the [SPACE] bar and pressing [RETURN] when the appropriate choice is located. The possible choices for the Site entry blank are Bluestone, Sandstone, Prince, Thurmond, Fayette, and quit. Choosing quit returns the user to the

Macroinvertebrate Submenu (Screen 9). Choosing a site moves the cursor to the *Date* entry blank. The *Date*, *Habitat*, and *Method* entry blanks are completed as explained for the Data Entry mode. Note that the possible choices for the *Date* entry blank are not contained within the program (i.e., not chosen by toggling); therefore, the user must enter the exact sampling date (mm/dd/yy) for the data of interest. Sampling dates for all data currently contained in the database (through 1990) are listed in Appendix 1. This appendix should be updated annually as new data are entered in the database.

After the *Method* entry blank is completed, the program will question the user about recalculating the reports for these replicate samples if they have been previously created (Screen 12). This question is asked because the program saves most reports after they are created the first time to increase operating speed when those reports are requested again. If the reports for these replicate samples have not been created, this question will not appear and the program will proceed with creating them. If the user is confident that no data have been corrected since the reports for these replicate samples were created, answer the question with no (type <n>). If the user knows data have been corrected since the reports for these replicate samples were created, or is unsure, answer the question with yes (type <y>).

Completing the *Information Request for Macroinvertebrate Reports* (Screen 12) generates the *Macroinvertebrate Reports Submenu* (Screen 13) with seven options.

Option 1 summarizes community structure at the lowest taxonomic level,

New River Gorge National River
Long-Term Ecological
Monitoring System
Macroinvertebrate Reports
Submenu

- 1 - Community Structure At
Lowest Taxonomic Level
- 2 - Community Structure At
Higher Taxonomic Levels
- 3 - Community By Functional
Feeding Groups
- 4 - Abundance of Individual
Taxon for All Years
- 5 - Community Measures for
All Years
- 6 - Choose New Site/Date/
Habitat/Method
- 7 - Return to Macroinvertebrate
Submenu

Select ■

(Screen 13)

usually genus (see Appendix 10 for an example of this report). Option 2 summarizes community structure at higher taxonomic levels, usually class, order, or family (see Appendix 11 for an example of this report). Option 3 allows the user to analyze the community according to functional feeding groups (see Appendix 12 for an example of this report). Option 4 summarizes the abundance of any individual taxon in each year that data are included in the database (see Appendix 13 for an example of this report). Option 5 allows the user to examine nine community measures in each year that data are included in the database (see Appendix 14 for an

example of this report). Option 6 is used to produce reports from another site, date, habitat, or method and returns the user to *Information Request for Macroinvertebrate Reports* (Screen 12). Option 7 is used to leave Reports mode and return to the *Macroinvertebrate Submenu* (Screen 9).

Enter the number of the desired option in the Select space at the bottom of the *Macroinvertebrate Reports Submenu* (Screen 13). For Options 1, 2, 3, and 5 the reports will be immediately produced on the screen. For Option 4, the *Request for Macroinvertebrate Taxon* (Screen 14) will appear, and the user must enter the code for the taxon of interest and press [RETURN].

New River Gorge National River
Long-Term Ecological
Monitoring System
Request for Macroinvertebrate
Taxon

Code: 5060

(Screen 14)

All reports can be viewed on the screen or printed. Use [PAGE DOWN] to view successive screens of longer reports. At the end of each report there is a question to print the report or not. Type <y> for yes or <n> for no. If the answer is yes, another line will appear asking the number of copies. Enter the desired number of copies and press [RETURN]. The user will be returned to the *Macroinvertebrate Reports Submenu* (Screen 13).

Dictionary Maintenance

Selection of Option 4 from the *Macroinvertebrate Submenu* (Screen 9) generates *Macroinvertebrate Dictionary Maintenance* (Screen 15). This option should be used cautiously because any changes require professional expertise in taxonomy and ecology of macroinvertebrates. Dictionary maintenance will be needed only rarely, when a taxon that has not been found previously in the New River is collected. Therefore, the only option that has been provided is for adding new taxa.

and associated information as is, and the cursor will move to the next line in the *Taxon* entry blank. The user should modify the taxon code as necessary to make it unique. When a unique taxon code is entered, the program will ask if the user wants to add this taxon to the dictionary. The user has the opportunity to review the new code and make sure it is correct (e.g., is it in the appropriate taxonomic hierarchy?). If correct, type <y>, and the new code will be stored in the dictionary.

New River Gorge National River Long-Term Ecological Monitoring System Macroinvertebrate Dictionary Maintenance			
Taxon	Desc	Tvalue	Funcgrp
E198	Chironomidae	6.0	CG
(Screen 15)			

To add a new taxon, first enter the new code in the *Taxon* entry blank. The taxon code must be unique and must fit into the numerical hierarchy (e.g., all Diptera must start with E19). The current version of the macroinvertebrate dictionary appears in Appendix 3. The program will automatically check to see if the code is already in the system. If an existing code has been selected, the program will retrieve all information for that taxon and the cursor will appear to the left of the *Taxon* column. In that case, the user should type <c> in the space to the left of the *Taxon* column. The program will leave the existing taxon code

The cursor will return to the *Taxon* entry blank, where the new code must be reentered. Press [RETURN] and the cursor will move to the *Desc* entry blank, where the scientific name is entered. Press [RETURN] and the cursor will move to the *Tvalue* entry blank, where the pollution tolerance of the new taxon is entered. Tolerance value is entered as an integer from 0 to 10. The macroinvertebrate tolerance values are a ranking scale, with values at or near 0 meaning most intolerant of pollution, at or near 10 meaning most tolerant of pollution, and around 5 meaning facultative of pollution. After entering an

integer, press [RETURN] and the cursor will move to the *Funcgrp* entry blank, where the abbreviation of the functional group of the new taxon is entered. Functional groups are based on the mechanisms that macroinvertebrates use to obtain food. Choices for functional groups and their abbreviations are: collector-filterers (CF), collector-gatherers (CG), macrophyte piercers (MP), predators (PR), scrapers (SC), and shredders (SH). Press [RETURN] after entering the functional group abbreviation, and the cursor will move to a new line in the *Taxon* entry blank. If there are no more new taxa to enter, type <quit> and the user will be returned to the *Macroinvertebrate Submenu* (Screen 9).

Decisions about tolerance value and functional group must be based on information published in the primary literature on macroinvertebrate ecology or the professional experience of someone who has conducted research on macroinvertebrate ecology. It is likely that a specialist at a university or museum will need to be consulted for this information.

File Management

The macroinvertebrate database does not require annual file maintenance. Unlike the fish database, the program is set up to handle many years of data as a single data file. The difference in the programming is that, for macroinvertebrates, a separate record consists of a sample of the entire community, whereas for fish, each individual fish is a separate record. As a result, it will take much longer for the macroinvertebrate data file to reach an unwieldy size. The macroinvertebrate data file will probably require no attention for at

least 3-4 years and possibly as long as 10 years, depending upon the computer hardware being used. If macroinvertebrate file management does become necessary, a computer programmer should follow the same general approach as described for fish file management. The necessary information can be found in the Programmer Guide.

ENVIRONMENTAL CHARACTERISTICS DATABASE

Choosing Option 3 on the *Main Menu* (Screen 1) provides access to the environmental characteristics database and brings up the *Environmental Characteristics Submenu* (Screen 16) with four options.

New River Gorge National River
Long-Term Ecological
Monitoring System
Environmental Characteristics
Submenu

- 1 - Data Entry
- 2 - Data Correction
- 3 - View/Print Report
- 4 - Return to Main Menu

Select ■

(Screen 16)

Option 1 is used for entering data that have not been previously entered. Option 2 is used for correcting or deleting data that have been previously entered. Option 3 allows the user to view or print the environmental characteristics report. Option 4 is used to return to the *Main Menu* (Screen 1).

To enter data, select Option 1 from the *Environmental Characteristics Submenu* (Screen 16), which brings up *Environmental Characteristics Data Entry* (Screen 17). This screen was designed to be used with the Laboratory Worksheet (see field and laboratory user manual).

New River Gorge National River Long-Term Ecological Monitoring System Environmental Characteristics Data Entry	
Site:	Bluestone
Date:	//
Time:	0- 0
Water Temp.:	0.0C
Dissolved Oxyg.:	0.0 mg/L
Conductivity:	0 umhos
pH:	0.0
Hardness:	0.0 mg/L
Alkalinity:	0.0 mg/L
(Screen 17)	

The *Site*, *Date*, and *Time* entry blanks must be completed before entering any environmental characteristics data. The *Site* entry blank is completed by toggling through the possible choices with the [SPACE] bar and pressing [RETURN] when the appropriate choice is located. The possible choices for the *Site* entry blank are Bluestone, Sandstone, Prince, Thurmond, Fayette, and quit. Choosing quit returns the user to the *Environmental Characteristics Submenu* (Screen 16). Choosing a site brings up several more entry blanks on the screen and moves the cursor to the *Date* entry blank.

Enter the date the sample was collected in the *Date* entry blank as mm/dd/yy (e.g., 08/03/92 for August 3, 1992).

In the *Time* entry blank, enter the starting and ending times for collecting the environmental characteristics samples in the field. These should be entered according to the 24-hour time system, tttt-tttt (e.g., 1300-1430 for 1:00 pm-2:30 pm).

The water quality entry blanks (*Water Temperature*, *Dissolved Oxygen*, *Conductivity*, *pH*, *Hardness*, and *Alkalinity*) should be filled in by typing the values in the designated spaces. This screen has been set up to handle the appropriate number of significant decimal places for each parameter. When each entry blank is filled in the cursor automatically moves to the next entry blank. After the *Alkalinity* entry blank is completed, data entry will continue through 19 parameters, which appear in succession, but only after the preceding parameter is entered. The remaining 19 parameters involve various measures for algae, seston, and macrophytes, which are abbreviated as follows:

PHYTCHLA -- values for individual replicates (2) of phytoplankton biomass as chlorophyll a

PHYTMEAN -- mean of values for individual replicates of phytoplankton biomass as chlorophyll a

PERICHLA -- values for individual replicates (5) of periphyton biomass as chlorophyll a

PERIMEAN -- mean of values for individual replicates of periphyton biomass as chlorophyll a

PERIMEAN -- mean of values for individual replicates of periphyton biomass as chlorophyll a

PERIBIOM -- values for individual replicates (5) of periphyton biomass as ash-free dry weight of organic matter

PERBIMN -- mean of values for individual replicates of periphyton biomass as ash-free dry weight of organic matter

AUTOINDEX -- autotrophic index (ratio of Peribimn/Perimean)

SESTINO -- values for individual replicates (2) of seston biomass as dry weight of inorganic matter

SESTINOMN -- mean of values for individual replicates of seston biomass as dry weight of inorganic matter

SESTTOT -- values for individual replicates (2) of total seston biomass as dry weight of inorganic and organic matter

SESTTOTMN -- mean of values for individual replicates of total seston biomass as dry weight of inorganic and organic matter

SESTORG -- values for individual replicates (2) of seston biomass as dry weight of organic matter

SESTORGMN -- mean of values for individual replicates of seston biomass as dry weight of organic matter

O/I ratio of organic seston and inorganic seston for individual replicates (2) of seston

O/IMEAN -- mean of the O/I ratios for replicates of seston

PODOBIOM -- values for individual replicates (5) of Podostemum biomass as dry weight

PODOMEAN -- mean of values for individual replicates of Podostemum biomass as dry weight

JUSTBIOM -- values for individual replicates (3) of Justicia biomass as dry weight

JUSTMEAN -- mean of values for individual replicates of Justicia biomass as dry weight

The *PHYTCHLA* entry blank is the first to be filled in. After entering the value for the first replicate and pressing [RETURN], the cursor moves to the left of *PHYTCHLA*. The user should type <c>, which moves the cursor to the next *PHYTCHLA* entry blank. Enter the value for the second replicate and press [RETURN]. The program calculates *PHYTMEAN*, and the cursor will move to the first *PERICHLA* entry blank. In the unusual event that there is only one replicate, the user must enter <q> instead of <c> in the entry blank to the left of *PHYTCHLA*. In this case, *PHYTMEAN* is calculated for only one replicate, and the cursor moves to the first *PERICHLA* entry blank.

There should be five replicates for *PERICHLA*. After entering each value, type <c> in the space to the left of *PERICHLA* to continue entering the additional replicates. After the last replicate

is entered, *PERIMEAN* will be calculated and the cursor will advance to the next parameter, which is *PERIBIOM*. In the unusual event that there are less than five replicates for *PERICHLA*, the user must enter <q> instead of <c> in the entry blank to the left of *PERICHLA* after the last replicate. In this case, *PERIMEAN* is calculated for the appropriate number of replicates, and the cursor moves to the entry blank for the next parameter, which is *PERIBIOM*.

There should be five replicates for *PERIBIOM*. After entering each value, type <c> in the space to the left of *PERIBIOM* to continue entering the additional replicates. After the last replicate is entered, *PERIBIMN* and *AUTOINDEX* will be calculated and the cursor will advance to the next parameter, which is *SESTINO*. In the unusual event that there are less than five replicates for *PERIBIOM*, the user must enter <q> instead of <c> in the entry blank to the left of *PERIBIOM* after the last replicate. In this case, *PERIBIMN* is calculated for the appropriate number of replicates then *AUTOINDEX* is calculated, and the cursor moves to the entry blank for the next parameter, which is *SESTINO*.

There should be two replicates for *SESTINO*. After entering the first value, type <c> in the space to the left of *SESTINO* to enter the second replicate. After the second replicate is entered, *SESTINOMN* will be calculated and the cursor will advance to the next parameter, which is *SESTTOT*. In the unusual event that there is only one replicate for *SESTINO*, the user must enter <q> instead of <c> in the entry blank to the left of *SESTINO* after the first replicate. In this

case, *SESTINOMN* is calculated for one replicate, and the cursor moves to the entry blank for the next parameter, which is *SESTTOT*.

There should be two replicates for *SESTTOT*. After entering the first value, type <c> in the space to the left of *SESTTOT* to enter the second replicate. After the second replicate is entered, *SESTTOTMN* will be calculated and the cursor will advance to the next parameter, which is *SESTORG*. In the unusual event that there is only one replicate for *SESTTOT*, the user must enter <q> instead of <c> in the entry blank to the left of *SESTTOT* after the first replicate. In this case, *SESTTOTMN* is calculated for one replicate, and the cursor moves to the entry blank for the next parameter, which is *SESTORG*.

There should be two replicates for *SESTORG*. After entering the first value, type <c> in the space to the left of *SESTORG* to enter the second replicate. After the second replicate is entered, *SESTORGMN* will be calculated and the cursor will advance to the next parameter, which is *O/I*. In the unusual event that there is only one replicate for *SESTORG*, the user must enter <q> instead of <c> in the entry blank to the left of *SESTORG* after the first replicate. In this case, *SESTORGMN* is calculated for one replicate, and the cursor moves to the entry blank for the next parameter, which is *O/I*.

There should be two replicates for *O/I*. After entering the first value, type <c> in the space to the left of *O/I* to enter the second replicate. After the second replicate is entered, *O/IMEAN* will be calculated and the cursor will advance to the next

parameter, which is *PODOBIOM*. In the unusual event that there is only one replicate for *O/I*, the user must enter <q> instead of <c> in the entry blank to the left of *O/I* after the first replicate. In this case, *O/IMEAN* is calculated for one replicate, and the cursor moves to the entry blank for the next parameter, which is *PODOBIOM*.

There will probably be five replicates for *PODOBIOM*, but the program was constructed to handle as many as ten replicates. After entering each value, type <c> in the space to the left of *PODOBIOM* to continue entering the additional replicates. After the fifth replicate is entered, the user must enter <q> instead of <c> in the entry blank to the left of *PODOBIOM*. *PODOMEAN* will be calculated and the cursor will advance to the next parameter, which is *JUSTBIOM*. In the unusual event that there are less than five replicates for *PODOBIOM*, the user must enter <q> instead of <c> in the entry blank to the left of *PODOBIOM* after the last replicate. In this case, *PODOMEAN* is calculated for the appropriate number of replicates, and the cursor moves to the entry blank for the next parameter, which is *JUSTBIOM*.

There will probably be three replicates for *JUSTBIOM*, but the program was constructed to handle as many as ten replicates. After entering each value, type <c> in the space to the left of *JUSTBIOM* to continue entering the additional replicates. After the third replicate is entered, the user must enter <q> instead of <c> in the entry blank to the left of *JUSTBIOM*. *JUSTMEAN* will be calculated, and the user will be asked Would you like to enter more records?. If more records are to be entered, type <y> for yes. The cursor moves to *Environmental Characteristics Data Entry* (Screen

17). If no further records are to be entered, type <n> for no, which moves the cursor to *Environmental Characteristics Submenu* (Screen 16). In the unusual event that there are less than three replicates for *JUSTBIOM*, the user must enter <q> instead of <c> in the entry blank to the left of *JUSTBIOM* after the last replicate. In this case, *JUSTMEAN* is calculated for the appropriate number of replicates, and the user will be asked Would you like to enter more records?. If more records are to be entered, type <y> for yes. The cursor moves to *Environmental Characteristics Data Entry* (Screen 17). If no further records are to be entered, type <n> for no, which moves the cursor to *Environmental Characteristics Submenu* (Screen 16).

Data Correction

If it is necessary to make corrections to information that is already in the database, the user should select Option 2 from the *Environmental Characteristics Submenu* (Screen 16). This will generate *Environmental Characteristics Data Correction* (Screen 18).

To make any corrections, it is first necessary to retrieve the record by entering the appropriate *Site* and *Date*, as explained for environmental characteristics data entry. Although all environmental characteristics are stored as one record for each site and date, the parameters are not all displayed at the beginning of the correction procedure. It is not possible to proceed directly to a specific parameter; the user must proceed in sequence through all parameters.

When the site and date for a desired record are entered, the data for *Time*, and water quality (*Dissolved Oxygen*, *Water*

water quality parameters in the same manner, even if no others need correcting.

After *Water Temperature*, the data correction procedure will continue through 19 parameters, which appear in succession, but only after the preceding parameter has been dispensed with. The remaining 19 parameters involve various measures for algae, seston, and macrophytes, which are abbreviated (see Data Entry, above, for explanation of abbreviations). The cursor will appear to the left of the mean of each parameter as it is retrieved. If a parameter does not need to be corrected the user should type <q> to advance to the next parameter. To correct the parameter, type <e>, and the cursor will move to the first replicate for that parameter. To correct the value for a replicate, type over the incorrect value, and the cursor will move back to the space at the left. Type <c> in the space at the left to correct the next replicate for the same parameter. If a particular replicate does not need to be corrected, but one or more other replicates do need to be corrected, press [RETURN] at the replicate that needs no correction and type <c> in the space at the left to move to the next replicate. When the user reaches the incorrect replicate simply type over the incorrect value. The number of replicates is the same as given in environmental characteristics data entry. The computer will recalculate the correct mean for the parameters if the user corrects any of the replicate values. After *Justmean*, the question *Do you want to edit more records?* appears at the bottom of the screen. Type <y> for yes and the cursor moves back to *Site*, where another record can be retrieved. Type <n> for no and the cursor moves to *Environmental Characteristics Submenu* (Screen 16).

Reports

Selecting Option 3 from the *Environmental Characteristics Submenu* (Screen 16) generates the *Environmental Characteristics Overview* (Screen 19).

New River Gorge National River
Long-Term Ecological
Monitoring System
Environmental Characteristics
Overview

Site: Bluestone

(Screen 19)

The cursor will appear in the *Site* entry blank. The *Site* entry blank is completed by toggling through the possible choices with the [SPACE] bar and pressing [RETURN]. The possible choices for the *Site* entry blank are Bluestone, Sandstone, Prince, Thurmond, Fayette, and quit. Choosing quit returns the user to the *Environmental Characteristics Submenu* (Screen 16). Choosing a site generates *Environmental Characteristics Summary* (Appendix 15), which is a chronological summary report of the environmental parameters for that site. The summary for the site will appear on two screens. The cursor will appear at the message *Press Any Key to Continue* at the bottom of the first screen. When any key is pressed, the remaining information for the summary will appear, and the cursor will be at *Would you like to print this report?* at the bottom of the screen. If the user is only viewing the summary report, type <n> for no, which returns the user to *Environmental Char-*

acteristics Submenu (Screen 16). Type <y> to print a copy of the summary and another line will appear asking the number of copies. Enter the desired number of copies and press [RETURN]. The user will be returned to *Environmental Characteristics Submenu* (Screen 16).

QUALITY CONTROL

After data have been entered into the database management system, they should be verified (within one or two weeks). To verify the accuracy of data entry, the laboratory and field data sheets must be compared to a printed copy of the information in the database file.

To retrieve the desired information in the database file, enter dBASE and get to the dot prompt (a period with the flashing cursor next to it). When the user is at the dot prompt type <use {filename}.dbf> and press [RETURN]. To determine the filename for the desired data, consult the programmer guide where all filenames are listed. To print the information in the entire database filename, which includes all sites and dates, type <list to printer> and press [RETURN]. To print only the information from one site and date, type <set filter to site = "desired site" .and. enter_date = ctod('desired date as mm/dd/yy')> and press [RETURN]. Type <goto top> and press [RETURN]. Then type <list to printer> and press [RETURN].

PROGRAMMER GUIDE

The LTEMs database programs are written entirely in dBASE. All programs are written using a structured programming approach. Each function is in a separate

routine. The programs are too complicated to be executed using dBASE III+ and the initial version of dBASE IV had too many software problems to allow the programs to execute successfully. Therefore only the clipper compiled version is operational. Database files are compatible with dBASE so it is possible to look at the data files from within dBASE. Because of the number of open files, DOS 3.2 or higher is required. The config.sys file must be changed as follows: buffers = 40 and files = 45. The LTEMs system is initiated with a program named SETUP. This module calls different programs for each of the functions on the menu. These programs may then enroll more programs and sub-routines. The nested structure is shown in Figure 1.

There are 13 data files (.dbf), 25 program files (.prg) and 10 index files (.ndx) associated with the LTEMs system. They contain the data used by dBASE IV to create the summary reports. Of the 13 files, one defines the site, three contain fish data, three contain macroinvertebrate data, two contain environmental characteristics data, one contains Students t-values, one contains summary metrics for calculating confidence intervals, and two contain the fish and macroinvertebrate dictionaries.

Tables 1 through 13 define the structure of each database file including field names, types, widths, and descriptions of the data contained in each field. Table 14 defines index keys and index names. When using the LTEMs programs, the user will only be making additions and changes to four files (fishbase.dbf, instbase.dbf, watchem.dbf, foodhab.dbf). All other files are automatically maintained by the programs.

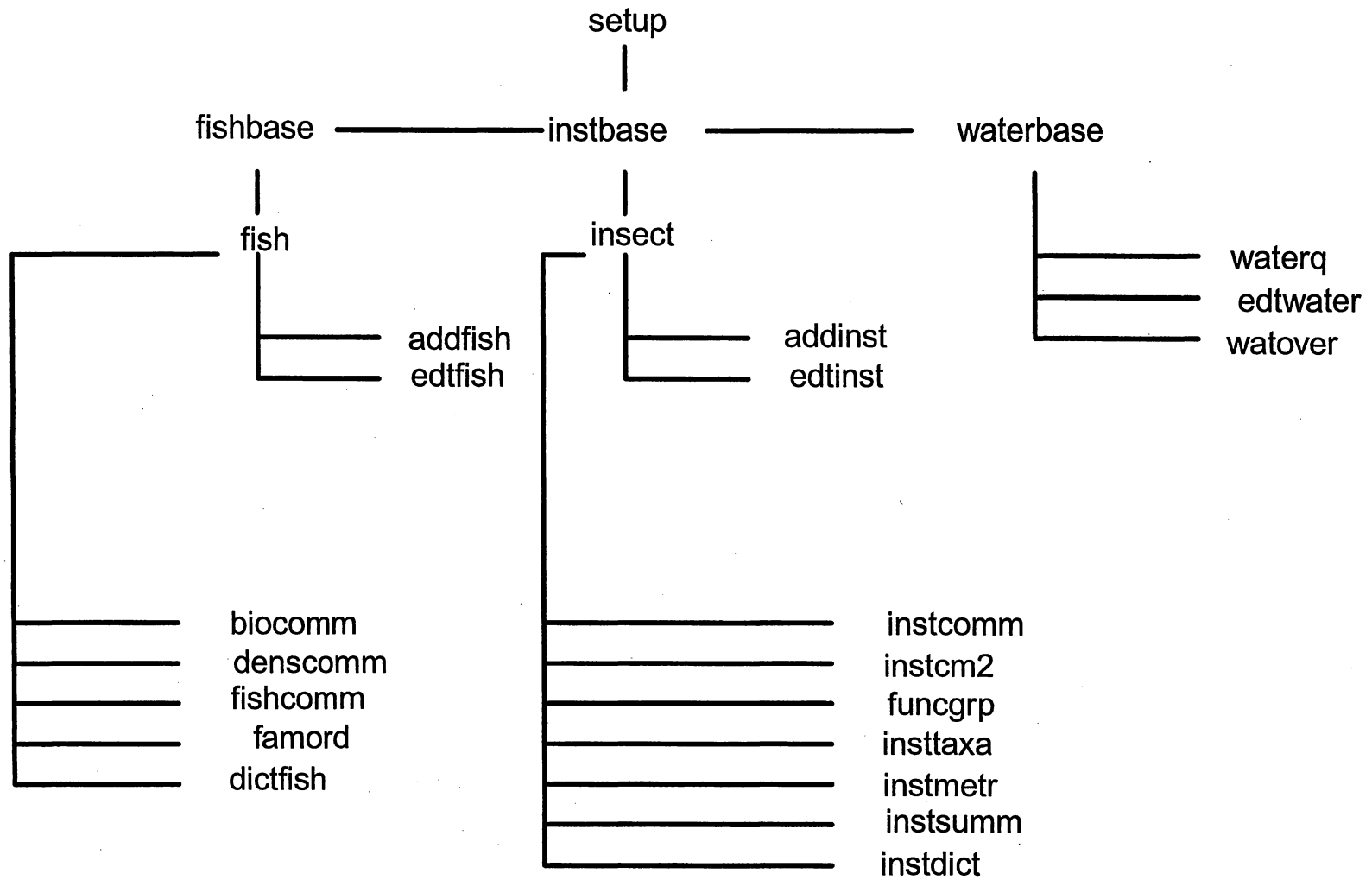


Figure 1. Hierarchical relation among database files in database management systems.

Table 1. Fish record layout in fishbase.dbf.

Field Name	Type	Width	Description
SITE	Character	10	Site
ENTER_DATE	Date	8	Sample date
ENTERED_BY	Character	10	Name
REP	Numeric	2	Replicate
EFFORT	Numeric	2	**
TAXA	Character	6	Taxon code
DESC	Character	28	Taxon description
TROPHGRP	Character	3	Trophic group
TOLERANT	Character	3	Tolerance
ORIGIN	Character	3	Origin
LENGTH	Numeric	3	Species length
WEIGHT	Numeric	6	Species weight

Table 2. Fish summary record layout in fishyr.dbf.

Field Name	Type	Width	Description
YR_SITE	Character	10	Site
YR_DATE	Date	8	Sample date
YR_DESC	Character	28	Common name
YR_TRPHGRP	Character	2	Trophic group
YR_ORIGIN	Character	2	Origin
YR_TOLERNT	Character	2	Tolerance
YR_COUNT	Numeric	4	Total number of individual taxon per replicate
YR_CODE	Character	7	Taxon code
YR_WEIGHT	Numeric	6.2	Total weight of individual taxon per replicate

Table 3. Fish summary record layout in fishmetr.dbf.

Field Name	Type	Width	Description
SITE	Character	10	Site
ENTER_DATE	Date	8	Sample date
DARTERS	Numeric	4	Number of darter species
N_SUNFISH	Numeric	4	Number of sunfish species
TAXA	Character	6	Number of individuals in sample
INTLERANT	Numeric	4.2	Number of intolerant species
TAXA_RICH	Numeric	9.2	Mean number of individuals per replicate
TAXA_CL	Numeric	9.2	95% confidence interval of individual taxon abundance
INTRDUCED	Numeric	4	Number of introduced species
TOLERANT	Numeric	4	Number of tolerant species
DDIVERISTY	Numeric	5.2	Diversity index using density
GREEN_SFSH	Numeric	5.2	Proportion of individuals as green sunfish
SUNFISH_CL	Numeric	4.2	95% confidence interval of sunfish abundance
OMNIVORS	Numeric	4.2	Proportion of individuals as omnivores
OMNIVOR_CL	Numeric	4.2	95% confidence interval of omnivore abundance
INS_CYPRIDS	Numeric	5.2	Proportion of individuals as insectivores/cyprids
INSECTV_CL	Numeric	4.2	95% confidence interval of insectivore abundance
NHYBRIDS	Numeric	4	Proportion of individuals as hybrids
HYBRID_CL	Numeric	4.2	95% confidence interval of hybrid abundance
PISCIVORS	Numeric	5.2	Proportion of individuals as piscivores
PISCIVR_CL	Numeric	5.2	95% confidence interval of piscivore abundance
BIVERSITY	Numeric	5.2	Diversity index using biomass
IN_WBEING	Numeric	5.2	index of well being
REPS	Numeric	2	Total number of replicates
TOTAL_FISH	Numeric	4	Total number of individuals
TOTAL_CL	Numeric	9.2	95% confidence interval of taxa abundance
NATIVE	Numeric	4	Number of native fish species
BIOMASS	Numeric	9.2	Total fish biomass
BIOMASS_CL	Numeric	9.2	95% confidence interval of biomass abundance

Table 4. Fish dictionary record layout in fishdict.dbf.

Field Name	Type	Width	Description
SITE	Character	7	Site
DESC	Character	28	Scientific name
NAME	Character	24	Common name
TROPHGRP	Character	3	Trophic group
TOLERANT	Character	2	Tolerance
ORIGIN	Character	3	Origin

Table 5. Insect record layout in instbase.dbf.

Field Name	Type	Width	Description
SITE	Character	10	Site
ENTER_DATE	Date	8	Sample date
ENTERED_BY	Character	10	Name
REP	Numeric	2	Replicate number
DESC	Character	28	Taxon description
HABITAT	Character	13	Habitat
METHOD	Character	10	Method
COUNT	Numeric	6	Total number of individual taxon per replicate
FUNCGRP	Character	3	Functional group
TOLERANCE	Numeric	2	Tolerance value
TAXA	Character	7	Taxon code

Table 6. Insect summary record layout in instyr.dbf.

Field Name	Type	Width	Description
TAXA	Character	7	Taxon code
DESC	Character	28	Taxon description
TVALUE	Numeric	4.2	Tolerance value
FUNCGRP	Character	2	Functional group
COUNT	Numeric	5.2	Total number of individuals per replicate
MEAN	Numeric	4.1	Arithmetic mean
CL95	Numeric	6.3	Confidence. interval
METHOD	Character	10	Method
SITE	Character	13	Site
ENTER_DATE	Date	8	Sample date
HABITAT	Character	13	Habitat

Table 7. Insect summary record layout in summary.dbf.

Field Name	Type	Width	Description
DENSITY	Numeric	5.2	Number of individuals in sample
DENSITY_CL	Numeric	5.2	95% confidence interval of individual taxon abundance
DIVERSITY	Numeric	4.2	Diversity index
DIVERS_CL	Numeric	4.2	95% confidence interval of the diversity index
TAXA_RICH	Numeric	4.2	Taxa richness
TAXA_CL	Numeric	4.2	95% confidence interval of taxa richness
EPT_INDEX	Numeric	4.2	EPT index
EPT_IND_CL	Numeric	4.2	95% confidence interval of the EPT index
HBI	Numeric	4.2	Hilsenhoff biotic index
HBI_CL	Numeric	4.2	95% confidence interval of the Hilsenhoff biotic index
EPT_CHR	Numeric	4.2	Ratio of EPT and Chironomidae abundances
EPT_CHR_CL	Numeric	4.2	95% confidence interval of EPT and Chironomidae abundances
CDOM_TAXA	Numeric	4.2	% Contribution of dominant taxon
CDOM_CL	Numeric	4.2	95% confidence interval for contribution of dominant taxon
SCRAP_FILT	Numeric	4.2	Ratio of scraper to collector filterer
SCRPFILT_CL	Numeric	4.2	95% confidence interval for ratio of scraper to collector filterer
HYDRO_TRCH	Numeric	4.2	Ratio of Hydropsychidae and Trichoptera
HYRODCL	Numeric	4.2	95% confidence interval of the ratio of Hydropsychidae and Trichoptera
SITE	Character	10	Site
ENTER_DATE	Date	8	Sample date
HABITAT	Character	13	Habitat
METHOD	Character	10	Method
REPS	Numeric	2	Replicate

Table 8. Insect dictionary record layout in instdict.dbf.

Field Name	Type	Width	Description
TAXA	Character	7	Taxon code
DESC	Character	28	Scientific name
FUNCGRP	Character	3	Functional Group
TVALUE	Character	2	Tolerance value

Table 9. Student's T-value record layout in tvalue.dbf.

Field Name	Type	Width	Description
DF	Numeric	2	Degrees of freedom
REP	Numeric	2	Replicate #
TVALUE	Numeric	6.3	Tolerance value

Table 10. Summary metrics for individual replicate record layout in summ.dbf.

Field Name	Type	Width	Description
DENSITY	Numeric	6.3	Density
DIVERISTY	Numeric	6.3	Diveristy
TAXA_RICH	Numeric	6.3	Taxa richness
EPT_INDEX	Numeric	6.3	EPT index
HBI	Numeric	6.3	HBI
EPT_CHR	Numeric	6.3	Ratio of EPT and Chironomidae abundance
CDOM_TAXA	Numeric	6.3	Contribution of dominant taxon
SCRAP_FILT	Numeric	6.3	Ratio of scrapers and collector filterer
HYDRO_TRCH	Numeric	6.3	Ratio of Hydropsychidae and Trichoptera

Table 11. Summary for each site record layout in site.dbf.

Field Name	Type	Width	Description
SITE	Character	10	Sample site
ENTER_DATE	Date	8	Sample date
HABITAT	Character	13	Habitat
METHOD	Character	10	Method

Table 12. Environmental characteristics record layout in watchem.dbf.

Field Name	Type	Width	Description
SITE	Character	10	Sample site
ENTERED_BY	Character	10	Name
ENTER_DATE	Date	8	Sample date
TEMP	Numeric	5.1	Temperature
STIME	Numeric	4	Starting time
FTIME	Numeric	4	Finishing time
DISSO2	Numeric	5.1	Dissolved oxygen
COND	Numeric	4	Conductivity
PH	Numeric	5.1	pH
HARDNESS	Numeric	5.1	Hardness
ALKALINITY	Numeric	6.1	Alkalinity

Table 13. Environmental characteristics record layout in foodhab.dbf.

Field Name	Type	Width	Description
SITE	Character	10	Sample site
ENTERED_BY	Character	10	Name
ENTER_DATE	Date	8	Sample date
PHYTCHLA1	Numeric	5.1	Phytoplankton chl a
PHYTCHLA2	Numeric	5.1	"
PHYTMEAN	Numeric	5.1	Phytoplankton chl a mean
PERICHLA1	Numeric	5.1	Periphyton chl a
PERICHLA2	Numeric	5.1	"
PERICHLA3	Numeric	5.1	"
PERICHLA4	Numeric	5.1	"
PERICHLA5	Numeric	5.1	"
PERICHLMEN	Numeric	5.1	Periphyton chl a mean
PERIBIOM1	Numeric	7.1	Periphyton AFDW
PERIBIOM2	Numeric	7.1	"
PERIBIOM3	Numeric	7.1	"
PERIBIOM4	Numeric	7.1	"
PERIBIOM5	Numeric	7.1	"
PERIBIMN	Numeric	7.1	Periphyton AFDW mean
AUTOINDEX	Numeric	5	Autotrophic index
SESTINO1	Numeric	5.2	Seston inorganic
SESTINO2	Numeric	5.2	"
SESTINOMN	Numeric	5.2	Seston inorganic mean
SESTTOTMN	Numeric	5.2	Total seston mean
SESTORGMN	Numeric	5.2	Seston organic mean
SESTTOT1	Numeric	5.2	Seston total
SESTTOT2	Numeric	5.2	Seston total
SESTORG1	Numeric	5.2	Seston organic
SESTORG2	Numeric	5.2	"
O_I1	Numeric	5.2	Seston organic:inorganic
O_I2	Numeric	5.2	"
O_I	Numeric	5.2	Seston organic:inorganic mean
PODOBIOM1	Numeric	7.1	Podostemum biomass
PODOBIOM2	Numeric	7.1	"
PODOBIOM3	Numeric	7.1	"
PODOBIOM4	Numeric	7.1	"
PODOBIOM5	Numeric	7.1	"
PODOBIOM6	Numeric	7.1	"

Table 13, Continued.

Field Name	Type	Width	Description
PODOBIOM7	Numeric	7.1	"
PODOBIOM8	Numeric	7.1	"
PODOBIOM9	Numeric	7.1	"
PODOBIOM10	Numeric	7.1	"
PODOMEAN	Numeric	7.1	Podostemum biomass mean
JUSTBIOM1	Numeric	7.1	Justicia biomass
JUSTBIOM2	Numeric	7.1	"
JUSTBIOM3	Numeric	7.1	"
JUSTBIOM4	Numeric	7.1	"
JUSTBIOM5	Numeric	7.1	"
JUSTBIOM6	Numeric	7.1	"
JUSTBIOM7	Numeric	7.1	"
JUSTBIOM8	Numeric	7.1	"
JUSTBIOM9	Numeric	7.1	"
JUSTBIOM10	Numeric	7.1	"
JUSTMEAN	Numeric	7.1	Justicia biomass mean

Table 14. Index keys and names.

Database	Index Key	Index Name
fishyr	yr_site+dtos(yr_date)+yr_code	fish
fishbase	str(rep,3)+taxa+site+dtos(enter_date)	fish2
	taxa+site+dtos(enter_date)	fish3
fishyr	dtos(yr_date)+yr_code+yr_site	fish4
summary	site+dtos(enter_date)+habitat+method+taxa	insect
instyr	site+dtos(enter_date)+habitat+method+taxa	
instbase	site+dtos(enter_date)+habitat+method+taxa	insect2
	str(rep,3)+taxa+site+dtos(enter_date)+habitat+method	insect3
	dtos(enter_date)+taxa+site+habitat+method	insect4
instbase	taxa	dict
fishbase	taxa	dict
watchem	site+dtos(enter_date)	water
foodhab	site+dtos(enter_date)	water

Appendix 1. Dates of Fish, Macroinvertebrate, and Environmental Characteristic samples and measurements by VPI & SU at sites for New River Gorge National River Long-Term Ecological Monitoring System.

FISH

Site	1988	1989	1990
Bluestone	8/01	8/14	8/02
Sandstone	8/02	8/15	8/03
Prince	8/03	8/09	9/06
Thurmond	8/10	8/07	8/31
Fayette	8/25	8/08	8/06 & 8/16

MACROINVERTEBRATES

Site	1970	1982	1984	1988	1989	1990
Bluestone	8/20	7/26	8/30	8/01	8/15	8/20
Sandstone		7/26	8/30	8/01	8/15	8/12 & 8/21
Prince				8/08	8/09	8/07
Thurmond				8/03	8/10	8/08
Fayette				8/26		8/13

ENVIRONMENTAL CHARACTERISTICS

Site	1982	1983	1984	1986	1987	1988	1989	1990
Bluestone	8/02	8/01	9/04	8/04		8/01	8/14	8/20
Sandstone	7/26		9/04		8/10	8/01	8/14	8/21
Prince						8/08	8/08	8/07
Thurmond						8/08	8/09	8/08
Fayette						8/02	8/08	8/09

Appendix 2. Fish database dictionary including taxon code, fish name, trophic group, origin, and tolerance classifications.

Taxon	Name	Trophic Group	Origin	Tolerance
G	PHYLLUM CHORDATA			
G0	CLASS OSTEICHTHYES			
G00	ORDER ACIPENSERIFORMES			
G01	ORDER LEPISOSTEIFORMES			
G02	ORDER AMIIFORMES			
G03	ORDER OSTEOGLOSSIFORMES			
G04	ORDER ANGUILLIFORMES			
G05	ORDER CLUPEIFORMES			
G050	CLUPEIDAE			
G0500	Alosa			
G05000	Alosa pseudoharengus	INV	I	F
G0501	Dorosoma			
G05010	Dorosoma cepedianum	OMN	I	F
G06	ORDER CYPRINIFORMES			
G060	CYPRINIDAE			
G0600	Campostoma			
G06000	Campostoma anomalum	HER	N	F
G0601	Carassius			
G06010	Carassius auratus	OMN	I	T
G0602	Cyprinus			
G06020	Cyprinus carpio	OMN	I	T
G0603	Cyprinella			
G06031	Cyprinella galactura	INS	IP	F
G06032	Cyprinella spiloptera	INS	N	F
G0604	Luxilus			
G06041	Luxilus albeolus	INS	NI	F
G06042	Luxilus chrysocephalus	INS	NI	F
G0605	Nocomis			
G06050	Nocomis platyrhynchus	INV	E	F
G0606	Notemigonus			
G06060	Notemigonus crysoleucas	OMN	I	T
G0607	Notropis			
G06070	Notropis hudsonius	INS	IP	F
G06071	Notropis photogenis	INS	N	I
G06072	Notropis rubellus	INS	N	I
G06073	Notropis scabriceps	INS	E	F
G06074	Notropis stramineus	INS	N	F
G06075	Notropis telescopus	INS	IP	F
G06076	Notropis volucellus	INS	N	I
G0608	Phoxinus			
G06080	Phoxinus oreas	HER	N	F
G0609	Pimephales			
G06090	Pimephales notatus	OMN	NI	T
G060A	Rhinichthys			
G060A0	Rhinichthys atratulus	OMN	N	T
G060A1	Rhinichthys cataractae	INS	N	I
G060B	Scardinius			
G060B0	Scardinius erythrophthalmus	OMN	I	F
G060C	Semotilus			
G060C0	Semotilus atromaculatus	OMN	N	T
G060H			H	
G061	CATOSTOMIDAE			
G0610	Catostomus			
G06100	Catostomus commersoni	OMN	N	T
G0611	Hypentelium			
G06110	Hypentelium nigricans	INS	N	I

Taxon	Name	Trophic Group	Origin	Tolerance
G07	ORDER SILURIFORMES			
G070	ICTALURIDAE			
G0700	Ameiurus			
G07000	Ameiurus natalis	INS	IP	T
G07001	Ameiurus nebulosus	INS	IP	T
G0701	Ictalurus			
G07010	Ictalurus punctatus	INV	N	F
G0702	Pylodictis			
G07020	Pylodictis olivaris	PIS	N	F
G08	ORDER SALMONIFORMES			
G080	ESOCIDAE			
G0800	Esox			
G08000	Esox masquinongy	PIS	I	F
G09	ORDER PERCOPSIFORMES			
G0A	ORDER ATHERINIFORMES			
G0A0	ATHERINIDAE			
G0A00	Labidesthes			
G0A000	Labidesthes sicculus	INS	I	F
G0B	ORDER GASTEROSTEIFORMES			
G0C	ORDER SCORPAENIFORMES			
G0D	ORDER PERCIFORMES			
G0D0	PERCICHTHYIDAE			
G0D00	Morone			
G0D000	Morone chrysops	PIS	I	F
G0D001	Morone saxatilis	PIS	I	F
G0D00H	M. chrysops x M. saxatilis			
G0D1	CENTRARCHIDAE			
G0D10	Ambloplites			
G0D100	Ambloplites rupestris	PIS	I	F
G0D11	Lepomis			
G0D110	Lepomis auritus	INS	I	F
G0D111	Lepomis cyanellus	INV	N	T
G0D112	Lepomis gibbosus	INS	I	F
G0D113	Lepomis macrochirus	INS	I	F
G0D114	Lepomis megalotis	INS	I	I
G0D11H			H	
G0D12	Micropterus			
G0D120	Micropterus dolomieu	PIS	I	F
G0D121	Micropterus punctulatus	PIS	I	F
G0D122	Micropterus salmoides	PIS	I	F
G0D13	Pomoxis			
G0D130	Pomoxis annularis	INV	I	F
G0D131	Pomoxis nigromaculatus	INV	I	F
G0D2	PERCIDAE			
G0D20	Etheostoma			
G0D200	Etheostoma blennioides	INS	N	F
G0D201	Etheostoma caeruleum	INS	NI	F
G0D202	Etheostoma flabellare	INS	N	F
G0D21	Perca			
G0D210	Perca flavescens	PIS	I	F
G0D22	Percina			
G0D220	Percina caprodes	INS	N	F
G0D221	Percina gymnocephala	INS	E	F
G0D222	Percina oxyrhynchus	INS	N	F
G0D223	Percina roanoka	INS	IP	F
G0D23	Stizostedion			

Taxon	Name	Trophic Group	Origin	Tolerance
G0D230	Stizostedion vitreum	PIS	I	F

Appendix 3. Macroinvertebrate database dictionary including taxon code, macroinvertebrate name, tolerance value, and functional group.

Taxon	Name	Tvalue	Functional Group
2	PHYLUM PROTOZOA	0.00	
3	PHYLUM PORIFERA	0.00	
4	PHYLUM COELENTERATA	0.00	
40	CLASS HYDROZOA	0.00	
400	ORDER HYDROIDA	0.00	
4000	HYDRIDAE	0.00	
400001	Hydra	0.00	
4000018	Hydra americana	0.00	
4001	CLAVIDAE	0.00	
400100	Cordylophora	0.00	
4001000	Cordylophora lacustris	0.00	
5	PHYLUM PLATYHELMINTHES	0.00	
50	CLASS TURBELLARIA	4.00	CG
506	ORDER TRICLADIDA	4.00	
5060	PLANARIIDAE	8.00	CG
506001	Dugesia	8.00	
5060010	Dugesia tigrina	8.00	
5060011	Dugesia polychroa	8.00	
506001X	Dugesia sp. (KRL)	8.00	
50600X	Planariidae (UNID)	8.00	
6	PHYLUM NEMATODA	8.00	CG
6XX	NEMATODA	8.00	CG
6XXXXX	Nematoda (UNID)	8.00	
9	PHYLUM ROTATORIA	8.00	
A	PHYLUM BRYOZOA	8.00	
A0	CLASS ECTOPROCTA	8.00	
A00	ORDER PHYLACTOLAEMATA	8.00	
C	PHYLUM NEMERTINEA	8.00	
C0	CLASS ENOPLA	8.00	
C00	ORDER HOPOLONEMERTINI	8.00	
C00000	Prostoma	8.00	
C000000	Prostoma graecense	8.00	
D	PHYLUM ANNELIDA	8.00	
D1	CLASS POLYCHAETA	8.00	
D2	CLASS OLIGOCHAETA	8.00	CG
D20	ORDER LUMBRICULIDA	8.00	
D200	LUMBRICULIDAE	8.00	
D20000	Lumbriculus	8.00	
D20001	Kincaidiana	8.00	
D200010	Kincaidiana hexatheca	8.00	
D2000X	Lumbriculidae (UNID)	8.00	
D21	ORDER HAPLOTAXIDA	8.00	
D210	HAPLOTAXIDAE	8.00	
D211	ENCHYTRAEIDAE	8.00	
D212	NAIDIDAE	8.00	
D21200	Dero	10.0	
D212000	Dero obtusa	10.0	
D212001	Dero nivea	10.0	
D212002	Dero furcata	10.0	
D21201	Pristina	8.00	
D212010	Pristina osborni	8.00	
D21202	Nais	8.00	
D212020	Nais bretscheri	6.00	
D212021	Nais communis	8.00	
D212022	Nais variabilis	10.0	
D212023	Nais pseudobtusa	10.0	
D21203	Slavina	10.0	

Taxon	Name	Tvalue	Funcgrp
D212030	Slavina appendiculata	10.0	
D21204	Stylaria	8.00	
D212040	Stylaria fossularis	8.00	
D212041	Stylaria lacustris	8.00	
D21205	Arcteonais	8.00	
D212050	Arcteonais lomondi	8.00	
D21206	Chaetogaster	8.00	
D212060	Chaetogaster diaphanus	8.00	
D2120X	Naididae (UNID)	8.00	
D213	TUBIFICIDAE	10.0	CG
D21300	Branchiura	10.0	
D213000	Branchiura sowerbyi	10.0	
D21301	Quistadrilus	10.0	
D213010	Quistadrilus multisetosus	10.0	
D21302	Spirosperma	10.0	
D2130X	Tubificidae (UNID)	10.0	
D214	OPISTHOCYSTIDAE	10.0	
D215	LUMBRICIDAE	10.0	
D2150X	Lumbricidae (UNID)	10.0	
D216	SPARGANOPHILIDAE	10.0	
D22	ORDER BRANCHIOBELLELLIDA	10.0	
D220	BRANCHIOBELLELLIDAE	5.00	
D2200X	Branchiobdellidae (UNID)	5.00	
D23	ORDER AELOSOMATIDA	5.00	
D230	AELOSOMATIDAE	5.00	
D2300X	Aelosomatidae (UNID)	5.00	
D2XXXX	Oligochaeta (UNID)	5.00	
D3	CLASS HIRUDINEA	8.00	PR
D30	ORDER RHYNCHOBDELLIDA	8.00	
D300	GLOSSIPHONIIDAE	8.00	
D30001	Helobdella	10.0	
D301	PISCICOLIDAE	8.00	
D30100	Myzobdella	8.00	
D301000	Myzobdella lugubris	8.00	
D3XXXX	Hirudinea (UNID)	8.00	
E	PHYLUM ARTHROPODA	8.00	
E0	CLASS CRUSTACEA	8.00	
E03	ORDER CLADOCERA	8.00	CF
E030	SIDIDAE	8.00	
E03000	Sida	8.00	
E030000	Sida crystallina	8.00	
E033	DAPHNIDAE	8.00	
E03301	Simocephalus	8.00	
E033011	Simocephalus vetulus	8.00	
E04	ORDER PODOCOPA	8.00	
E04XXX	Podocopa (UNID)	8.00	
E08	ORDER ISOPODA	8.00	
E081	ASELLIDAE	8.00	CG
E08100	Lirceus	8.00	CG
E08101	Asellus	8.00	CG
E081010	Asellus militaris	8.00	
E081XX	Asellidae (UNID)	8.00	
E09	ORDER AMPHIPODA	7.00	
E090	TALITRIDAE	8.00	CG
E09000	Hyaella	8.00	CG
E090000	Hyaella azteca	8.00	CG
E092	GAMMARIDAE	6.00	CG

Taxon	Name	Tvalue	Funcgrp
E09200	Gammarus	6.00	CG
E092004	Gammarus pseudolimnaeus	6.00	CG
E09203	Crangonyx	6.00	CG
E092XX	Gammaridae (UNID)	6.00	
EOA	ORDER DECAPODA	5.00	
EOAO	CAMBARIDAE	5.00	
EOA00	CAMBARELLINAE	5.00	
EOA004	Cambarus	5.00	
EOA0041	Cambarus robustus	5.00	
EOA0042	Cambarus bartonii	5.00	
EOA005	Orconectes	5.00	
EOA0050	Orconectes obscurus	5.00	
EOA0051	Orconectes rusticus	5.00	
EOA00X	Cambaridae (UNID)	5.00	
EOAXXX	Decapoda (UNID)	5.00	
E1	CLASS INSECTA	5.00	
E10	ORDER PLECOPTERA	5.00	
E100	PTERONARCYIDAE	0.00	SH
E10000	Allonarcys	0.00	SH
E100000	Allonarcys biloba	0.00	SH
E100001	Allonarcys comstocki	0.00	SH
E100002	Allonarcys proteus	0.00	SH
E100003	Allonarcys scotti	0.00	SH
E10001	Pteronarcys	0.00	SH
E100010	Pteronarcys dorsata	0.00	SH
E100XX	Pteronarcyidae (UNID)	0.00	SH
E101	PELTOPERLIDAE	2.00	SH
E10100	Peltoperla	2.00	SH
E101000	Peltoperla arcuata	2.00	SH
E101001	Peltoperla tarteri	2.00	SH
E10101	Tallaperla	2.00	SH
E101010	Tallaperla maria	2.00	SH
E102	NEMOURIDAE	2.00	SH
E1020	NEMOURINAE	2.00	
E10201	Prostoia	2.00	SH
E102010	Prostoia completa	2.00	SH
E102011	Prostoia similis	2.00	SH
E102012	Prostoia (similis/completa)	2.00	SH
E1021	AMPHINEMURINAE	2.00	
E10210	Amphinemura	2.00	SH
E102100	Amphinemura wui	2.00	SH
E102101	Amphinemura delosa	2.00	SH
E102102	Amphinemura nigritta	2.00	SH
E102200	Ostrocerca complexa	2.00	SH
E102300	Soyedina carolinensis	2.00	SH
E102XX	Nemouridae (UNID)	2.00	SH
E103	PERLIDAE	1.00	PR
E1030	PERLINAE	1.00	
E10300	Neoperla	1.00	PR
E103000	Neoperla clymene	1.00	PR
E10301	Paragnetina	1.00	PR
E103010	Paragnetina fumosa	1.00	PR
E103011	Paragnetina immarginata	1.00	PR
E103012	Paragnetina media	1.00	PR
E10302	Aagnetina (=Phasganophora)	1.00	PR
E103020	Aagnetina capitata	1.00	PR
E1031	ACRONEURINAE	1.00	

Taxon	Name	Tvalue	Funcgrp
E10310	Perlinella	1.00	PR
E10311	Hansonoperla	1.00	PR
E103110	Hansonoperla appalachia	1.00	PR
E10312	Attaneuria	1.00	PR
E103120	Attaneuria ruralis	1.00	PR
E10313	Acroneuria	1.00	PR
E103130	Acroneuria abnormis	1.00	PR
E103131	Acroneuria filicis	1.00	PR
E103132	Acroneuria lycorias	1.00	PR
E103133	Acroneuria evoluta	1.00	PR
E103134	Acroneuria carolinensis	1.00	PR
E103135	Acroneuria internata	1.00	PR
E103136	Acroneuria perplexa	1.00	PR
E10313X	Acroneuria n.sp.(YBC)	1.00	PR
E10313Y	Acroneuria perplexa group	1.00	PR
E10314	Eccoptura	1.00	PR
E103140	Eccoptura xanthenes	1.00	PR
E10315	Perlesta	1.00	PR
E103150	Perlesta placida group	1.00	PR
E103XX	Perlidae (UNID)	1.00	PR
E104	PERLODIDAE	2.00	PR
E1040	PERLODINAE	2.00	
E10400	Isogenoides	2.00	PR
E104000	Isogenoides hansonii	2.00	PR
E10401	Yugus	2.00	PR
E104010	Yugus bulbosus	2.00	PR
E10402	Cultus	2.00	PR
E104020	Cultus decisis	2.00	PR
E10403	Diploperla	2.00	PR
E104030	Diploperla duplicata	2.00	PR
E104031	Diploperla robusta	2.00	PR
E104032	Diploperla morgani	2.00	PR
E104033	Diploperla kanawholensis	2.00	PR
E10404	Remenus	2.00	PR
E104040	Remenus bilobatus	2.00	PR
E10405	Helopicus	2.00	PR
E104050	Helopicus subvarians	2.00	PR
E10406	Malirekus	2.00	PR
E104060	Malirekus hastatus	2.00	PR
E1040X	Perlodinae (UNID)	2.00	PR
E1041	ISOPERLINAЕ	2.00	
E10410	Clioperla	2.00	PR
E104100	Clioperla clio	2.00	PR
E10411	Isoperla	2.00	PR
E104110	Isoperla burksi	2.00	PR
E104111	Isoperla bilineata	2.00	PR
E104112	Isoperla signata	2.00	PR
E104113	Isoperla lata	2.00	PR
E104114	Isoperla orata	2.00	PR
E104115	Isoperla holochlora	2.00	PR
E104116	Isoperla namata	2.00	PR
E104117	Isoperla transmarina	2.00	PR
E104118	Isoperla similis	2.00	PR
E104XX	Perlodidae (UNID)	2.00	PR
E105	CHLOROPERLIDAE	1.00	PR
E1050	PARAPERLINAЕ	1.00	
E10500	Utaperla	1.00	PR

Taxon	Name	Tvalue	Funcgrp
E1051	CHLOROPERLINAЕ	1.00	
E10510	Alloperla	1.00	PR
E105100	Alloperla usa	1.00	PR
E105101	Alloperla imbecilla	1.00	PR
E105102	Alloperla biserrata	1.00	PR
E105103	Alloperla nanina	1.00	PR
E10511	Haploperla (=Hastaperla)	1.00	PR
E105110	Haploperla brevis	1.00	PR
E10512	Sweltsa	1.00	PR
E105120	Sweltsa onkos	1.00	PR
E105121	Sweltsa lateralis	1.00	PR
E10513	Rasvena	1.00	PR
E105130	Rasvena terna	1.00	PR
E10514	Suwallia	1.00	PR
E105140	Suwallia marginata	1.00	PR
E105XX	Chloroperlidae (UNID)	1.00	PR
E106	TAENIOPTERYGIDAE	2.00	SH
E1060	TAENIOPTERYGINAE	2.00	SH
E10600	Taeniopteryx	2.00	SH
E106000	Taeniopteryx burksi	2.00	SH
E106001	Taeniopteryx maura	2.00	SH
E106002	Taeniopteryx ugola	2.00	SH
E106003	Taeniopteryx parvula	2.00	SH
E106004	Taeniopteryx metequi	2.00	SH
E10600X	Taeniopteryx (burksi/maura)	2.00	SH
E1061	BRACHYPTERINAE	2.00	SC
E10610	Strophopteryx	2.00	SC
E106100	Strophopteryx fasciata	2.00	SC
E106101	Strophopteryx appalachia	2.00	SC
E10611	Taenionema	2.00	SC
E106110	Taenionema atlanticum	2.00	SC
E10612	Bolotoperla	2.00	SC
E106120	Bolotoperla rossi	2.00	SC
E10613	Oemopteryx	2.00	SC
E106130	Oemopteryx contorta	2.00	SC
E106131	Oemopteryx glacialis	2.00	SC
E1061X	Brachypterinae (UNID)	2.00	SC
E106XX	Taeniopterygidae (UNID)	2.00	
E107	LEUCTRIDAE	0.00	SH
E1070	LEUCTRINAE	0.00	
E10700	Leuctra	0.00	SH
E107000	Leuctra ferruginea	0.00	SH
E107001	Leuctra truncata	0.00	SH
E107002	Leuctra sibleyi	0.00	SH
E107003	Leuctra tennis	0.00	SH
E107004	Leuctra carolinensis	0.00	SH
E107005	Leuctra biloba	0.00	SH
E10701	Paraleuctra	0.00	SH
E107010	Paraleuctra sara	0.00	SH
E107011	Paraleuctra distinctus	0.00	SH
E1070X	Leuctridae (UNID)	0.00	SH
E108	CAPNIIDAE	1.00	SH
E10800	Allocapnia	1.00	SH
E108000	Allocapnia spp.	1.00	SH
E10801	Paracapnia	1.00	SH
E108010	Paracapnia angulata	1.00	SH
E1080X	Capniidae (UNID)	1.00	SH

Taxon	Name	Tvalue	Funcgrp
E10XXX	Plecoptera (UNID)	1.00	
E11	ORDER EPHEMEROPTERA	1.00	
E110	EPHEMERIDAE	4.00	CG
E1100	EPHEMERINAE	4.00	
E11000	Ephemera	4.00	CG
E110000	Ephemera varia	4.00	CG
E110001	Ephemera guttulata	4.00	CG
E11001	Hexagenia	4.00	CG
E110010	Hexagenia limbata	4.00	CG
E110011	Hexagenia rigida	4.00	CG
E11001X	Hexagenia spp.	4.00	CG
E1101	PENTAGENIINAE	4.00	
E11010	Pentagenia	4.00	CG
E110100	Pentagenia vittigera	4.00	CG
E110XX	Ephemeridae (UNID)	4.00	CG
E111	NEOEPHEMERIDAE	3.00	CG
E11100	Neoephemera	3.00	CG
E111000	Neoephemera purpurea	3.00	CG
E112	CAENIDAE	4.00	CG
E11200	Caenis	4.00	CG
E112000	Caenis hilaris	4.00	CG
E113	EPHEMERELLIDAE	4.00	CG
E1130	EPHEMERELLINAE	4.00	CG
E11300	Attenella	4.00	CG
E11301	Serratella	4.00	CG
E113010	Serratella deficiens	4.00	CG
E113011	Serratella frisoni	4.00	CG
E113012	Serratella serratoides	4.00	CG
E11302	Dannella	4.00	CG
E113020	Dannella simplex	4.00	CG
E113021	Dannella lita	4.00	CG
E11303	Drunella	4.00	SC
E113030	Drunella cornuta	4.00	SC
E113031	Drunella cornutella	4.00	SC
E113032	Drunella tuberculata	4.00	SC
E113033	Drunella walkeri	4.00	SC
E11304	Ephemerella	4.00	CG
E113040	Ephemerella dorothea	4.00	CG
E113041	Ephemerella needhami	4.00	CG
E113042	Ephemerella rotunda	4.00	CG
E113043	Ephemerella invaria	4.00	CG
E11304X	Ephemerella (BUS)	4.00	CG
E11305	Eurylophella	4.00	CG
E113050	Eurylophella minimella	4.00	CG
E113051	Eurylophella funeralis	4.00	CG
E113052	Eurylophella coxalis	4.00	CG
E1130X	Ephemerellidae (UNID)	4.00	
E114	BAETISCIDAE	3.00	CG
E11400	Baetisca	3.00	CG
E114000	Baetisca lacustris	3.00	CG
E114001	Baetisca berneri	3.00	CG
E115	SIPHONURIDAE	7.00	CG
E1150	SIPHONURINAE	7.00	
E11500	Ameletus	7.00	CG
E115000	Ameletus lineatus	7.00	CG
E115001	Ameletus cryptustimulus	7.00	CG
E116	LEPTOPHLEBIDAE	2.00	CG

Taxon	Name	Tvalue	Funcgrp
E11600	Leptophlebia	2.00	CG
E11601	Paraleptophlebia	2.00	CG
E116010	Paraleptophlebia guttata	2.00	CG
E11602	Choroterpes	2.00	CG
E116020	Choroterpes basalis	2.00	CG
E11603	Habrophlebia	2.00	CG
E116030	Habrophlebia vibrans	2.00	CG
E11604	Habrophlebiodes	2.00	SC
E116040	Habrophlebiodes americana	2.00	SC
E1160X	Leptophlebiidae (UNID)	2.00	
E117	BAETIDAE	4.00	CG
E11701	Baetis	4.00	CG
E117010	Baetis tricaudatus	4.00	CG
E117011	Baetis propinquus	4.00	CG
E117012	Baetis pygmaeus	4.00	CG
E117013	Baetis insignificans	4.00	CG
E117014	Baetis flavistriga	4.00	CG
E117015	Baetis macdunnoughi	4.00	CG
E117016	Baetis intercalaris	4.00	CG
E117017	Baetis amplus	4.00	CG
E117018	Baetis ephippiatus	4.00	CG
E11701X	Baetis (UNID)	4.00	CG
E11701Y	Baetis (BUS)	4.00	CG
E11701Z	Baetis (RDB)	4.00	CG
E11702	Callibaetis	4.00	CG
E11703	Centroptilum	4.00	CG
E11704	Cloeon	4.00	CG
E11705	Heterocloeon	4.00	SC
E117050	Heterocloeon curiosum	4.00	SC
E117051	Heterocloeon petersi	4.00	SC
E11706	Pseudocloeon	4.00	SC
E117060	Pseudocloeon dubium	4.00	SC
E1170X	Baetidae (UNID)	4.00	
E1170Z	Baetis (complex)	4.00	
E119	HEPTAGENIIDAE	4.00	SC
E1190	HEPTAGENIINAE	4.00	
E11900	Stenonema	4.00	SC
E119000	Stenonema femoratum	4.00	SC
E119001	Stenonema ithaca	4.00	SC
E119002	Stenonema mediopunctatum	4.00	SC
E119003	Stenonema pulchellum	4.00	SC
E119004	Stenonema vicarium	4.00	SC
E119005	Stenonema modestum	4.00	SC
E119006	Stenonema terminatum	4.00	SC
E119007	Stenonema mexicanum =integrum	4.00	SC
E119008	Stenonema exiguum	4.00	SC
E119009	Stenonema pudicum	4.00	SC
E11901	Stenacron	4.00	SC
E119010	Stenacron interpunctatum	4.00	SC
E119011	Stenacron carolina	4.00	SC
E11902	Epeorus	4.00	CG
E119020	Epeorus humeralis	4.00	CG
E119021	Epeorus fragilis	4.00	CG
E119022	Epeorus pleuralis	4.00	CG
E119023	Epeorus dispar	4.00	CG
E11903	Cinygmula	4.00	SC
E119030	Cinygmula subaequalis	4.00	SC

Taxon	Name	Tvalue	Funcgrp
E11904	Leucrocuta	4.00	SC
E119040	Leucrocuta thethis	4.00	SC
E11905	Heptagenia	4.00	SC
E119050	Heptagenia flavescens	4.00	SC
E119051	Heptagenia marginalis	4.00	SC
E11906	Nixe	4.00	SC
E11907	Rhithrogena	4.00	CG
E1190X	Heptageniidae (UNID)	4.00	
E11A	POLYMITARCYIDAE	2.00	CG
E11A0	POLYMITARCYINAE	2.00	
E11A00	Ephoron	2.00	CG
E11A000	Ephoron leukon	2.00	CG
E11A001	Ephoron album	2.00	CG
E11B	POTAMANTHIDAE	4.00	CG
E11B00	Potamanthus	4.00	CG
E11C	TRICORYTHIDAE	4.00	CG
E11C0	LEPTOHYPHINAE	4.00	
E11C00	Tricorythodes	4.00	CG
E11D	OLIGONEURIIDAE	2.00	CF
E11D0	ISONYCHIINAE	2.00	
E11D04	Isonychia	2.00	CF
E11D040	Isonychia bicolor group	2.00	CF
E11D041	Isonychia bicolor	2.00	CF
E11XXX	Ephemeroptera (UNID)	2.00	
E12	ORDER ODONATA	2.00	PR
E120	CORDULEGASTRIDAE	3.00	PR
E12000	Cordulegaster	3.00	PR
E120000	Cordulegaster sayi	3.00	PR
E120001	Cordulegaster maculatus	3.00	PR
E121	PETALURIDAE	4.00	PR
E122	GOMPHIDAE	1.00	PR
E12200	Progomphus	1.00	PR
E122000	Progomphus obscurus	1.00	PR
E12201	Ophiogomphus	1.00	PR
E12202	Stylogomphus	1.00	PR
E122020	Stylogomphus albistylus	1.00	PR
E12203	Gomphus	1.00	PR
E12203X	Gomphus sp1 (TFV)	1.00	PR
E12203Y	Gomphus sp2 (TFV)	1.00	PR
E12204	Dromogomphus	1.00	PR
E122040	Dromogomphus spoliatus	1.00	PR
E122041	Dromogomphus spinosus	1.00	PR
E12205	Arigomphus	1.00	PR
E12206	Hylogomphus	1.00	PR
E122060	Hylogomphus viridifrons	1.00	PR
E122061	Hylogomphus abbreviatus	1.00	PR
E12207	Stylurus	1.00	PR
E122070	Stylurus notatus	1.00	PR
E122071	Stylurus spiniceps	1.00	PR
E12208	Hagenius	1.00	PR
E122080	Hagenius brevistylus	1.00	PR
E12209	Lanthus	1.00	PR
E122090	Lanthus parvulus	1.00	PR
E1220X	Gomphidae (UNID)	1.00	PR
E123	MACROMIIDAE	3.00	PR
E12300	Macromia	3.00	PR
E123000	Macromia taeniolata	3.00	PR

Taxon	Name	Tvalue	Funcgrp
E123001	Macromia illinoiensis	3.00	PR
E124	AESCHNIDAE	3.00	PR
E12400	Basiaeschna	3.00	PR
E124000	Basiaeschna janata	3.00	PR
E12401	Boyeria	3.00	PR
E124010	Boyeria grafiana	3.00	PR
E124011	Boyeria vinosa	3.00	PR
E1240X	Aeschnidae (UNID)	3.00	PR
E125	CORDULIIDAE	5.00	PR
E12500	Neurocordulia	5.00	PR
E125000	Neurocordulia molesta	5.00	PR
E125001	Neurocordulia virginiensis	5.00	PR
E12501	Epicordulia	5.00	PR
E125010	Epicordulia princeps	5.00	PR
E12502	Tetragoneuria	5.00	PR
E1250X	Corduliidae (UNID)	5.00	PR
E126	LIBELLULIDAE	9.00	PR
E12600	Libellula	9.00	PR
E12601	Sympetrum	9.00	PR
E12602	Perithemis	9.00	PR
E12603	Celithemis	9.00	PR
E12604	Erythemis	9.00	PR
E126040	Erythemis simplicicollis	9.00	PR
E12605	Pachydiplax	9.00	PR
E126050	Pachydiplax longipennis	9.00	PR
E1260X	Libellulidae (UNID)	9.00	PR
E127	CALOPTERYGIDAE	5.00	PR
E12700	Calopteryx	5.00	PR
E127000	Calopteryx dimidiata	5.00	PR
E12710	Hetaerina	5.00	PR
E127X	Calopterygidae (UNID)	5.00	PR
E128	LESTIDAE	9.00	PR
E129	COENAGRIONIDAE	9.00	PR
E12900	Argia	9.00	PR
E129000	Argia translata	9.00	PR
E129001	Argia moesta	9.00	PR
E129002	Argia tibialis	9.00	PR
E129003	Argia apicalis	9.00	PR
E12901	Nehalonia	9.00	PR
E12902	Ischnura	9.00	PR
E12903	Enallagma	9.00	PR
E129030	Enallagma signatum	9.00	PR
E129031	Enallagma divagans	9.00	PR
E129032	Enallagma exsulans	9.00	PR
E129X	Coenagrionidae (UNID)	9.00	PR
E12A	ANISOPTERA	2.00	PR
E12B	ZYGOPTERA	9.00	PR
E12XXX	Odonata (UNID)	9.00	PR
E13	ORDER HEMIPTERA	9.00	PR
E130	BELOSTOMATIDAE	6.00	PR
E1300	BELOSTOMATINAE	6.00	PR
E13000	Belostoma	6.00	PR
E131	NEPIDAE	6.00	PR
E1310	RANATRINAE	6.00	PR
E13100	Ranatra	6.00	PR
E132	GERRIDAE	8.00	PR
E1320	GERRININAE	8.00	PR

Taxon	Name	Tvalue	Funcgrp
E13200	Gerris	8.00	PR
E1321	TREPOBATINAE	8.00	
E13210	Metrobates	8.00	PR
E13211	Trepobates	8.00	PR
E132110	Trepobates inermis	8.00	PR
E1322	RHAGADOTARSINAE	8.00	
E13220	Rheumatobates	8.00	PR
E132200	Rheumatobates rileyi	8.00	PR
E132XX	Gerridae (UNID)	8.00	PR
E133	MESOVELIIDAE	6.00	PR
E1330	MESOVELIINAE	6.00	
E13300	Mesovelia	6.00	PR
E134	VELIIDAE	6.00	PR
E1340	HYDROESSINAE	6.00	
E13400	Microvelia	6.00	PR
E134000	Microvelia americana	6.00	PR
E1341	RHYAGOVELIINAE	6.00	
E13410	Rhagovelia	6.00	PR
E134100	Rhagovelia obesa	6.00	PR
E134XX	Veliidae (UNID)	6.00	
E134XX	Vellidae (UNID)	6.00	
E139	SALDIDAE	6.00	PR
E1390	SALDINAE	6.00	
E13900	Saldula	6.00	PR
E13A	CORIXIDAE	5.00	MP
E13A0	CORIXINAE	5.00	
E13A00	Palmarcorixa	5.00	MP
E13A01	Sigara	5.00	MP
E13A02	Trichocorixa	5.00	PR
E13A0X	Corixidae (UNID)	5.00	MP
E13B	NOTONECTIDAE	5.00	PR
E13B0	NOTONECTINAE	5.00	
E13BOX	Notonectidae (UNID)	5.00	PR
E13XXX	Hemiptera (UNID)	5.00	
E14	ORDER MEGALOPTERA	5.00	PR
E140	SIALIDAE	4.00	PR
E14000	Sialis	4.00	PR
E140000	Sialis velata	4.00	PR
E141	CORYDALIDAE	5.00	PR
E1410	CORYDALINAE	5.00	
E14100	Corydalus	5.00	PR
E141000	Corydalus cornutus	5.00	PR
E1411	CHAULIODINAE	5.00	
E14110	Chauliodes	5.00	PR
E141100	Chauliodes pectinicornis	5.00	PR
E141101	Chauliodes rastricornis	5.00	PR
E14111	Nigronia	5.00	PR
E141110	Nigronia fasciatus	5.00	PR
E141111	Nigronia serricornis	5.00	PR
E14112	Neohermes	5.00	PR
E141120	Neohermes concolor	5.00	PR
E141XX	Corydalidae (UNID)	5.00	PR
E15	ORDER NEUROPTERA	5.00	PR
E150	SISYRIDAE	3.00	PR
E15000	Sisyra	3.00	PR
E16	ORDER TRICHOPTERA	3.00	
E160	HYDROPTILIDAE	6.00	MP

Taxon	Name	Tvalue	Funcgrp
E1600	LEUCOTRICHINAE	6.00	
E16000	Leucotrichia	6.00	SC
E160000	Leucotrichia pictipes	6.00	SC
E1601	HYDROPTILINAE	6.00	
E16010	Agraylea	6.00	MP
E16011	Dibusa	6.00	SC
E160110	Dibusa angata	6.00	SC
E16012	Hydroptila	6.00	MP
E160120	Hydroptila waubesiana	6.00	MP
E16012X	Hydroptila (BSR)	6.00	MP
E16013	Ochrotrichia	6.00	CG
E16014	Oxyethira	6.00	MP
E16015	Stactobiella	6.00	SH
E16016	Neotrichia	6.00	SC
E1602	ORTHOTRICHINAE	6.00	MP
E16020	Orthotrichia	6.00	MP
E160XX	Hydroptilidae (UNID)	6.00	
E161	HELICOPSYCHIDAE	3.00	SC
E16100	Helicopsyche	3.00	SC
E161000	Helicopsyche borealis	3.00	SC
E162	HYDROPSYCHIDAE	6.00	CF
E1620	MACRONEMATINAE	6.00	
E16200	Macrostemum (=Macronemum)	6.00	CF
E162000	Macrostemum zebratum	6.00	CF
E1621	HYDROPSYCHINAE	6.00	
E16210	Hydropsyche	6.00	CF
E162100	Hydropsyche (H.) orris	6.00	CF
E162101	Hydropsyche (H.) leonardi	6.00	CF
E162102	Hydropsyche (H.) hoffmani	6.00	CF
E162103	Hydropsyche (H.) betteni	6.00	CF
E162104	Hydropsyche (H.) dicantha	6.00	CF
E162105	Hydropsyche (H.) frisoni ??	6.00	CF
E162107	Hydropsyche (H.) hageni	6.00	CF
E162108	Hydropsyche (H.) simulans	6.00	CF
E16210G	Hydropsyche (C.) alhedra	6.00	CF
E16210H	Hydropsyche (C.) bronta	6.00	CF
E16210I	Hydropsyche (C.) cheilonis	6.00	CF
E16210J	Hydropsyche (C.) macleodi	6.00	CF
E16210K	Hydropsyche (C.) morosa	6.00	CF
E16210L	Hydropsyche (C.) slossonae	6.00	CF
E16210M	Hydropsyche (C.) sparna	6.00	CF
E16210N	Hydropsyche (C.) ventura	6.00	CF
E162100	Hydropsyche (C.) walkeri	6.00	CF
E16210V	Hydropsyche (H.) (CNO)	6.00	CF
E16210W	Hydropsyche (H.) (SUT)	6.00	CF
E16210X	Hydropsyche (H.) (BLN)	6.00	CF
E16210Y	Hydropsyche (H.) (BUS)	6.00	CF
E16210Z	Hydropsyche (H.) (YBC)	6.00	CF
E16211	Cheumatopsyche	6.00	CF
E162110	Cheumatopsyche campyla	6.00	CF
E162111	Cheumatopsyche ela	6.00	CF
E162112	Cheumatopsyche helma	6.00	CF
E162113	Cheumatopsyche pettiti	6.00	CF
E162114	Cheumatopsyche analis	6.00	CF
E162115	Cheumatopsyche halima	6.00	CF
E16212	Potamyia	6.00	CF
E162120	Potamyia flava	6.00	CF

Taxon	Name	Tvalue	Funcgrp
E16213	Ceratopsyche	6.00	CF
E162130	Ceratopsyche walkeri	6.00	CF
E162131	Ceratopsyche bronta	6.00	CF
E162132	Ceratopsyche morosa	6.00	CF
E162133	Ceratopsyche slossonae	6.00	CF
E162134	Ceratopsyche alhedra	6.00	CF
E162135	Ceratopsyche macleodi	6.00	CF
E162136	Ceratopsyche sparna	6.00	CF
E162137	Ceratopsyche ventura	6.00	CF
E162138	Ceratopsyche cheilonis	6.00	CF
E1622	DIPLECTRONINAE	6.00	
E16220	Diplectrona	6.00	CF
E162200	Diplectrona modesta	6.00	CF
E162201	Diplectrona metaqui	6.00	CF
E16221	Homoplectra (=Aphropsyche)	6.00	CF
E162210	Homoplectra doringa	6.00	CF
E162300	Parapsyche apicalis	6.00	CF
E16240	Arctopsyche	6.00	CF
E162XX	Hydropsychidae (UNID)	6.00	CF
E162XY	Hydropsychidae (first instar)	6.00	CF
E163	RHYACOPHILIDAE	0.00	PR
E1630	RHYACOPHILINAE	0.00	
E16300	Rhyacophila	0.00	PR
E163000	Rhyacophila fuscula	0.00	PR
E163001	Rhyacophila torva	0.00	PR
E163002	Rhyacophila lobifera	0.00	PR
E163003	Rhyacophila carolina	0.00	PR
E163004	Rhyacophila invaria	0.00	PR
E163005	Rhyacophila vibox	0.00	PR
E163006	Rhyacophila nigrita	0.00	PR
E163007	Rhyacophila glaberrima	0.00	PR
E163008	Rhyacophila minora	0.00	PR
E164	PHILOPOTAMIDAE	3.00	CF
E1640	CHIMARRINAE	3.00	
E16400	Chimarra	3.00	CF
E164000	Chimarra obscura	3.00	CF
E164001	Chimarra socia	3.00	CF
E164002	Chimarra aterrima	3.00	CF
E1641	PHILOPOTAMINAE	3.00	
E16410	Wormaldia	3.00	CF
E164100	Wormaldia moestus	3.00	CF
E16411	Dolophilodes	3.00	CF
E164110	Dolophilodes distinctus	3.00	CF
E164XX	Philopotamidae (UNID)	3.00	CF
E165	PSYCHOMYIIDAE	2.00	CG
E1650	PSYCHOMYIINAE	2.00	
E16500	Psychomyia	2.00	CG
E165000	Psychomyia flavida	2.00	CG
E16501	Lype	2.00	SC
E165010	Lype diversa	2.00	SC
E165XX	Psychomyiidae (UNID)	2.00	
E167	LEPTOCERIDAE	4.00	CG
E1670	MYSTACIDINI	4.00	
E16700	Mystacides	4.00	CG
E167000	Mystacides sepulchralis	4.00	CG
E16701	Trianenodes	4.00	SH
E167010	Trianenodes injusta	4.00	SH

Taxon	Name	Tvalue	Funcgrp
E16702	Leptocerus	4.00	CG
E16703	Setodes	0.00	CG
E167030	Setodes incerta	0.00	CG
E1671	OECETINI	4.00	
E16710	Oecetis	4.00	PR
E167100	Oecetis inconspicua	4.00	PR
E167101	Oecetis cinerascens	4.00	PR
E167102	Oecetis avara	4.00	PR
E1672	ATHRIPSODINI	4.00	
E16720	Ceraclea	4.00	CG
E167200	Ceraclea cancellata	4.00	CG
E167201	Ceraclea transversus	4.00	CG
E167202	Ceraclea tarsipunctata	4.00	CG
E167203	Ceraclea neffi	4.00	CG
E1673	LEPTOCERINI	4.00	
E16730	Nectopsyche	4.00	SH
E167300	Nectopsyche candida	4.00	SH
E167301	Nectopsyche exquisita	4.00	SH
E167XX	Leptoceridae (UNID)	4.00	
E168	PHRYGANEIDAE	4.00	SH
E16800	Ptilostomis	4.00	SH
E16801	Agrypnia	4.00	SH
E16802	Banksiola	4.00	SH
E16803	Fabria	4.00	SH
E16804	Oligostomis	4.00	PR
E16805	Phryganea	4.00	SH
E168XX	Phryganeidae (UNID)	4.00	
E16A	ODONTOCERIDAE	0.00	SC
E16A00	Psilotreta	0.00	SC
E16C	BRACHYCENTRIDAE	1.00	CF
E16C00	Micrasema	1.00	SH
E16C000	Micrasema sprulesis	1.00	SH
E16C001	Micrasema charonis	1.00	SH
E16C01	Brachycentrus	1.00	CF
E16C010	Brachycentrus appalachia	1.00	CF
E16C011	Brachycentrus incanus	1.00	CF
E16C012	Brachycentrus lateralis	1.00	CF
E16C013	Brachycentrus nigrosoma	1.00	CF
E16C014	Brachycentrus numerosus	1.00	CF
E16C015	Brachycentrus solomoni	1.00	CF
E16C016	Brachycentrus spinae	1.00	CF
E16C020	Adicrophleps hitchcocki	1.00	SH
E16E	LEPIDOSTOMATIDAE	1.00	SH
E16E00	Lepidostoma	1.00	SH
E16E000	Lepidostoma lydia	1.00	SH
E16E001	Lepidostoma modestum	1.00	SH
E16F	GLOSSOSOMATIDAE	0.00	SC
E16F0	GLOSSOSOMATINAE	0.00	
E16F00	Glossosoma	0.00	SC
E16F000	Glossosoma nigrior	0.00	SC
E16F1	AGAPETINAE	0.00	
E16F10	Agapetus	0.00	SC
E16F2	PROTOPTILINAE	0.00	
E16F20	Protoptila	0.00	SC
E16F21	Culoptila	0.00	SC
E16FXX	Glossosomatidae (UNID)	0.00	
E16G	LIMNAPHILIDAE	4.00	SH

Taxon	Name	Tvalue	Funcgrp
E16G0	NEOPHYLACINAE	4.00	
E16G00	Neophylax	4.00	SC
E16G000	Neophylax concinnus	4.00	SC
E16G001	Neophylax ornatus	4.00	SC
E16G1	LIMNEPHILINAE	4.00	
E16G10	Pycnopsyche	4.00	SH
E16G11	Limnephilus	4.00	SH
E16G12	Platycentropus	4.00	SH
E16G2	DICOSMOECINAE	4.00	
E16G20	Ironoquia	4.00	SH
E16G3	GOERINAE	4.00	
E16G30	Goera	4.00	SC
E16G4	APATANIINAE	4.00	
E16G40	Apatania	4.00	SC
E16G400	Apatania praevolans	4.00	SC
E16GXX	Limnephilidae (UNID)	4.00	SH
E16H	POLYCENTROPODIDAE	6.00	CF
E16H0	POLYCENTROPODINAE	6.00	
E16H00	Cyrnellus	6.00	CF
E16H000	Cyrnellus fraternus	6.00	CF
E16H01	Neureclipsis	6.00	CF
E16H010	Neureclipsis crepuscularis	6.00	CF
E16H02	Nyctiophylax	6.00	PR
E16H020	Nyctiophylax moestus	6.00	PR
E16H03	Polycentropus	6.00	PR
E16H04	Cernotina	6.00	PR
E16HXX	Polycentropodidae (UNID)	1.00	
E16I	MOLANNIDAE	6.00	SC
E16I00	Molanna	6.00	SC
E16J	SERICOSTOMATIDAE	1.00	SH
E16J00	Fattigia	1.00	SH
E16J000	Fattigia pele	1.00	SH
E16XXX	Trichoptera (UNID)	1.00	
E17	ORDER LEPIDOPTERA	1.00	SH
E170	PYRALIDAE	5.00	SH
E1700	NYMPHULINAE	5.00	
E17000	Petrophila (=Parargyractis)	5.00	SC
E17001	Paraponyx	5.00	SH
E170XX	Pyralidae (UNID)	5.00	SH
E171	NOCTUIDAE	5.00	SH
E18	ORDER COLEOPTERA	5.00	
E181	HALIPLIDAE	7.00	MP
E18100	Peltodytes	7.00	MP
E181000	Peltodytes duodecimpunctatus	7.00	MP
E18101	Halipus	7.00	MP
E182	DYTISCIDAE	6.00	PR
E1820	COLYMBETINAE	6.00	
E18200	Laccornis	6.00	PR
E1821	LACCOPHILINAE	6.00	
E18210	Laccophilus	6.00	PR
E1822	HYDROPORINAE	6.00	
E18220	Hydroporus	6.00	PR
E182XX	Dytiscidae (UNID)	6.00	
E183	GYRINIDAE	5.00	PR
E1830	ENHYDRINAE	5.00	
E18300	Dineutus	5.00	PR
E183000	Dineutus discolor	5.00	PR

Taxon	Name	Tvalue	Funcgrp
E1831	GYRININAE	5.00	PR
E18310	Gyrinus	5.00	PR
E184	HYDROPHILIDAE	5.00	PR
E1840	HYDROPHILINAE	5.00	
E18400	Tropisternus	5.00	PR
E184000	Tropisternus lateralis	5.00	PR
E18401	Hydrophilus	5.00	PR
E1841	HELOPHORINAE	5.00	
E18410	Helophorus	5.00	SH
E1842	HYDROBIINAE	5.00	
E18420	Enochrus	5.00	CG
E18421	Laccobius	5.00	MP
E1843	BEROSINAE	5.00	
E18430	Berosus	5.00	MP
E184300	Berosus peregrinus	5.00	MP
E184XX	Hydrophilidae (UNID)	5.00	
E186	HYDRAENIDAE	5.00	PR
E18600	Hydraena	5.00	PR
E187	PSEPHENIDAE	4.00	SC
E18700	Psephenus	4.00	SC
E187000	Psephenus herricki	4.00	SC
E188	DRYOPIDAE	5.00	SC
E18800	Helichus	5.00	SC
E188000	Helichus fastigiatus	5.00	SC
E188001	Helichus lithophilus	5.00	SC
E188002	Helichus basalis	5.00	SC
E189	ELMIDAE	4.00	SC
E1890	ELIMINI	4.00	
E18900	Stenelmis	4.00	SC
E189000	Stenelmis mera	4.00	SC
E189001	Stenelmis concinna	4.00	SC
E189002	Stenelmis crenata	4.00	SC
E189003	Stenelmis musgravei	4.00	SC
E189004	Stenelmis sandersoni	4.00	SC
E189005	Stenelmis sexlineata	4.00	SC
E18901	Macronychus	4.00	SC
E189010	Macronychus glabratus	4.00	SC
E18902	Ancyronyx	4.00	SC
E189020	Ancyronyx variegata	4.00	SC
E18903	Microcylloepus	4.00	SC
E189030	Microcylloepus pusillus	4.00	SC
E18904	Optioservus	4.00	SC
E189040	Optioservus trivittatus	4.00	SC
E189041	Optioservus ovalis	4.00	SC
E189042	Optioservus immunis	4.00	SC
E18905	Dubiraphia	4.00	SC
E189050	Dubiraphia bivittata	4.00	SC
E189051	Dubiraphia vittata	4.00	SC
E189052	Dubiraphia minima	4.00	SC
E18906	Promoresia	4.00	SC
E189060	Promoresia elegans	4.00	SC
E189061	Promoresia tardella	4.00	SC
E18907	Oulimnius	4.00	SC
E189070	Oulimnius latiusculus	4.00	SC
E189XX	Elmidae (UNID)	4.00	
E18A	EUBRIIDAE	4.00	SC
E18A00	Ectopria	4.00	SC

Taxon	Name	Tvalue	Funcgrp
E18B	LIMNICHIDAE	5.00	CG
E18B00	Lutrochus	5.00	CG
E18B000	Lutrochus laticeps	5.00	CG
E18C	PTILODACTYLIDAE	5.00	SH
E18C00	Anchytarsus	5.00	SH
E18C000	Anchytarsus bicolor	5.00	SH
E18D	STAPHYLINIDAE	5.00	PR
E18E	CURCULIONIDAE	5.00	SH
E18XXX	Coleoptera (UNID)	5.00	
E19	ORDER DIPTERA	5.00	
E190	BLEPHARICERIDAE	5.00	SC
E19000	Blepharicera	5.00	SC
E191	TANYDERIDAE	7.00	
E19100	Protoplasa	7.00	
E191000	Protoplasa fitchii	7.00	
E192	TIPULIDAE	3.00	SH
E1920	TIPULINI	3.00	
E19200	Tipula	3.00	SH
E192000	Tipula furca	3.00	SH
E192001	Tipula abdominalis	3.00	SH
E19200X	Tipula sp1 (YBC)	3.00	SH
E1921	LIMONIINI	3.00	
E19210	Antocha	3.00	CG
E19211	Limonia	3.00	SH
E1922	PEDICIINI	3.00	
E19220	Dicranota	3.00	PR
E19221	Pedicia	3.00	PR
E1923	HEXATOMINI	3.00	
E19230	Hexatoma	3.00	PR
E192300	Hexatoma spinosa	3.00	PR
E192301	Hexatoma fultonensis	3.00	PR
E192302	Hexatoma cinerea	3.00	PR
E19230X	Hexatoma (YBC)	3.00	PR
E19231	Limnophila	3.00	PR
E19232	Pseudolimnophila	3.00	PR
E19233	Paradelphomyia	3.00	PR
E19234	Pilaria	3.00	PR
E1924	ERIOPTERINI	3.00	
E19240	Gonomyia	3.00	
E19241	Molophilus	3.00	
E19242	Ormosia	3.00	CG
E192420	Ormosia sp1(RDB)	3.00	CG
E19243	Erioptera	3.00	CG
E192430	Erioptera sp1	3.00	CG
E192431	Erioptera sp2 (YBC)	3.00	CG
E192XX	Limoniinae (UNID)	3.00	
E192XXX	Limoniinae sp1(YBC)	3.00	
E192YY	Tipulidae (UNID)	3.00	
E193	PSYCHODIDAE	10.0	CG
E1930	PSYCHODINI	10.0	
E19300	Psychoda	10.0	CG
E1931	PERICOMINI	10.0	
E19310	Telmatoscopus	10.0	CG
E19311	Pericoma	10.0	CG
E193XX	Psychodidae (UNID)	10.0	
E194	CHAOBORIDAE	7.00	PR
E1940	CHAOBORINI	7.00	

Taxon	Name	Tvalue	Funcgrp
E19400	Chaoborus	7.00	PR
E194000	Chaoborus punctipennis	7.00	PR
E194XX	Chaoboridae (UNID)	7.00	PR
E195	DIXIDAE	7.00	CG
E19500	Dixa	7.00	CG
E196	CULICIDAE	8.00	CF
E1960	ANOPHELINEAE	8.00	
E19600	Anopheles	8.00	CF
E1961	CULICINAE	8.00	
E19610	Aedes	8.00	CG
E19611	Culex	8.00	CF
E19612	Culiseta (=Theobaldia)	8.00	CG
E19613	Mansonia	8.00	CG
E19614	Psorophora	8.00	PR
E19615	Uranotaenia	8.00	CF
E196XX	Culicidae (UNID)	8.00	
E197	SIMULIIDAE	6.00	CF
E1970	PROSIMULIINI	6.00	
E19700	Prosimulium	6.00	CF
E197000	Prosimulium fontanum	6.00	CF
E197001	Prosimulium fuscum	6.00	CF
E197002	Prosimulium magnum complex	6.00	CF
E197003	Prosimulium mixtum	6.00	CF
E197004	Prosimulium mysticum	6.00	CF
E197005	Prosimulium rhizophorum	6.00	CF
E19701	Cnephia	6.00	CF
E19702	Stegopterna	6.00	CF
E197020	Stegopterna mutata complex	6.00	CF
E1972	SIMULIINI	6.00	
E19720	Simulium	6.00	CF
E197200	Simulium decorum	6.00	CF
E197201	Simulium vittatum complex	6.00	CF
E197202	Simulium jenningsi	6.00	CF
E197203	Simulium venustum complex	6.00	CF
E197204	Simulium tuberosum complex	6.00	CF
E197205	Simulium luggeri	6.00	CF
E197206	Simulium aureum complex	6.00	CF
E197207	Simulium gouldingi	6.00	CF
E197208	Simulium impar	6.00	CF
E197209	Simulium pugetense	6.00	CF
E19720A	Simulium pictipes complex	6.00	CF
E19720B	Simulium fibrinflatum	6.00	CF
E19720C	Simulium nyssa	6.00	CF
E19720D	Simulium underhilli	6.00	CF
E19720E	Simulium parnassum	6.00	CF
E19720F	Simulium verecundum complex	6.00	CF
E197XX	Simuliidae (UNID)	6.00	CF
E198	CHIRONOMIDAE	6.00	CG
E1980	TANYPODINI	6.00	
E19800	Tanypus	6.00	PR
E1980X	Tanypodini (UNID)	6.00	PR
E1981	MACROPELOPIINI	6.00	
E19816	Procladius	6.00	PR
E1982	COELOTANYPODINI	6.00	
E19821	Coelotanypus	6.00	PR
E1983	PENTANEURINI	6.00	
E19830	Ablabesmyia	6.00	PR

Taxon	Name	Tvalue	Funcgrp
E198300	Ablabesmyia mallochi	6.00	PR
E198301	Ablabesmyia parajanta	6.00	PR
E19830X	Ablabesmyia (BSR)	6.00	PR
E19832	Conchapelopia	6.00	PR
E19835	Labrundinia	6.00	PR
E198350	Labrundinia pilosella	6.00	PR
E19836	Larsia	6.00	PR
E19838	Nilotanypus	6.00	PR
E198380	Nilotanypus fimbriatus	6.00	PR
E1983A	Pentaneura	6.00	PR
E1983G	Zavreliomyia	6.00	PR
E1983X	Thienemannimyia group	6.00	PR
E1983Z	Pentaneurini (UNID)	6.00	PR
E1984	NATARSIINI	6.00	
E19840	Natarsia	6.00	PR
E1985	BOREOCHLINI	6.00	
E19851	Lasiodiamesa	6.00	CG
E1987	DIAMESINI	6.00	
E19870	Diamesa	6.00	CG
E198700	Diamesa (RDB)	6.00	CG
E19872	Pagastia	6.00	CG
E19873	Potthastia	6.00	CG
E198730	Potthastia longimanus	6.00	CG
E19874	Pseudodiamesa	6.00	CG
E19876	Sympotthastia	6.00	CG
E198A	CORYNONEURINI	6.00	
E198A0	Corynoneura	6.00	CG
E198A00	Corynoneura scutellata	6.00	CG
E198A1	Thienemanniella	6.00	CG
E198AX	Corynoneurini (UNID)	6.00	CG
E198B	ORTHOCLADIINI	6.00	
E198B0	Cardiocladius	6.00	PR
E198B1	Cricotopus	6.00	CG
E198B10	Cricotopus / Orthocladius	6.00	CG
E198B11	Cricotopus bicinctus group	6.00	CG
E198B2	Eukiefferiella	6.00	CG
E198B20	Eukiefferiella spp.	6.00	
E198B21	Eukiefferiella claripennis	6.00	
E198B22	Eukiefferiella pseudomontana	6.00	
E198B23	Eukiefferiella sp3	6.00	
E198B24	Eukiefferiella longicalar	6.00	
E198B3	Tvetenia	6.00	
E198B30	Tvetenia discoloripes group	6.00	
E198B31	Tvetenia bavarica group	6.00	
E198B4	Nanocladius	6.00	CG
E198B5	Psectrocladius	6.00	CG
E198B6	Orthocladius	6.00	CG
E198B60	Orthocladius (Euorth) type 1	6.00	
E198B61	Orthocladius (Euorth)	6.00	
E198B7	Rheocricotopus	6.00	CG
E198B8	Epoicocladius	6.00	
E198B80	Epoicocladius. ephemerae	6.00	
E198B9	Diplocladius	6.00	CG
E198BA	Cordites	6.00	
E198BB	Brillia	6.00	SH
E198BC	Parametricnemus	6.00	CG
E198BC0	Parametricnemus lundbecki	6.00	CG

Taxon	Name	Tvalue	Funcgrp
E198BD	Paraphaenocladus	6.00	CG
E198BE	Xylotopus	6.00	SH
E198BE0	Xylotopus par	6.00	SH
E198BF	Parachaetocladus	6.00	CG
E198BG	Parakiefferiella	6.00	CG
E198BH	Synorthocladus	6.00	CG
E198BI	Heterotrissocladus	6.00	CG
E198BJ	Hydrobaenus	6.00	SC
E198BX	Orthoclaadiini (UNID)	6.00	
E198BZ0	Orthoclaadiini sp1 (BUS)	6.00	
E198BZ1	Orthoclaadiini sp2 (PIV)	6.00	
E198BZ2	Orthoclaadiini sp3 (PCS)	6.00	
E198BZ3	Orthoclaadiini sp4 (BUS)	6.00	
E198BZ5	Orthoclaadiini sp6 (KRL)	6.00	
E198BZ6	Orthoclaadiini sp7 nr. Smittia	6.00	
E198BZ7	Orthoclaadiini sp8 (YBC)	6.00	
E198BZ8	Orthoclaadiini sp9 (YBC33)	6.00	
E198C	PSEUDOCHIRONOMINI	6.00	
E198C0	Pseudochironomus	6.00	CG
E198D	CHIRONOMINI	8.00	CG
E198D0	Chironomus	8.00	CG
E198D1	Cryptochironomus	8.00	PR
E198D2	Cryptotendipes	8.00	
E198D20	Cryptotendipes sp1	8.00	
E198D3	Demicryptochironomus	8.00	CG
E198D5	Endochironomus	8.00	SH
E198D50	Endochironomus nigricans	8.00	SH
E198D6	Glyptotendipes	8.00	SH
E198D60	Glyptotendipes lobiferus	8.00	SH
E198D61	Glyptotendipes (Polytomus)	8.00	SH
E198D7	Goeldichironomus	8.00	CG
E198D70	Goeldichironomus holoprasinus	8.00	CG
E198D9	Harnischia	8.00	CG
E198D90	Harnischia curtilamellata	8.00	CG
E198D9X	Harnischia complex	8.00	CG
E198DA	Kiefferulus	8.00	CG
E198DB	Lauterborniella	8.00	CG
E198DC	Dicrotendipes	8.00	CG
E198DC0	Dicrotendipes neomodestus	8.00	CG
E198DC1	Dicrotendipes nervosus	8.00	CG
E198DC2	Dicrotendipes modestus	8.00	CG
E198DD	Microtendipes	8.00	CF
E198DD0	Microtendipes caelum	8.00	CF
E198DD1	Microtendipes pedellus	8.00	CF
E198DI	Parachironomus	8.00	PR
E198DIO	Parachironomus pectinatellae	8.00	PR
E198DK	Paralauterborniella	8.00	CG
E198DL	Paratendipes	8.00	CG
E198DN	Phaenopsectra	8.00	SC
E198DO	Polypedilum	8.00	SH
E198DO0	Polypedilum fallax group	8.00	SH
E198DQ	Stenochironomus	8.00	CG
E198DR	Stictochironomus	8.00	CG
E198DS	Tribelos	8.00	CG
E198DT	Stelechomyia	8.00	SH
E198DT0	Stelechomyia perpulchra	8.00	SH
E198DU	Xenochironomus	8.00	PR

Taxon	Name	Tvalue	Funcgrp
E198DV	Robackia	8.00	CG
E198DVO	Robackia claviger	8.00	CG
E198DV1	Robackia demeijerei	8.00	CG
E198DW	Cladopelma	8.00	CG
E198DX	Chironomini (UNID)	8.00	
E198DZ0	Chironomini sp1 (BUS)	8.00	
E198E	TANYTARSINI	6.00	CF
E198E0	Cladotanytarsus	6.00	CG
E198E3	Micropsectra	6.00	CG
E198E5	Paratanytarsus	6.00	CG
E198E50	Paratanytarsus dissimilis gr.	6.00	CG
E198E6	Rheotanytarsus	6.00	CF
E198E7	Stempellina	6.00	CG
E198E70	Stempellina sp3 (Oliver)	6.00	CG
E198E8	Stempellinella	6.00	CG
E198E9	Tanytarsus	6.00	CF
E198E90	Tanytarsus coffmani	6.00	CF
E198E91	Tanytarsus glabrescens group	6.00	CF
E198E92	Tanytarsus guerlus group	6.00	CF
E198E9A	Tanytarsus (group A)	6.00	CF
E198EA	Zavrelia group	6.00	CG
E198EX	Tanytarsini (UNID)	6.00	
E198F	CHIRONOMINAE/ORTHOCLADIINAE	6.00	CG
E198G	TANYPODINAE	6.00	PR
E198H	CHIRONOMINAE	6.00	CG
E198J	ORTHOCLADIINAE	6.00	CG
E198XX	Chironomidae (UNID)	6.00	
E199	CERATOPOGONIDAE	6.00	PR
E1990	FORCIPOMYIINAE	6.00	
E19900	Atrichopogon	6.00	CG
E199000	Atrichopogon peregrinus	6.00	CG
E199001	Atrichopogon (DCS)	6.00	CG
E199002	Atrichopogon (PCS)	6.00	CG
E199003	Atrichopogon (YBC)	6.00	CG
E19901	Forcipomyia	6.00	SC
E1991	DASYHELEINAE	6.00	
E19910	Dasyhelea	6.00	CG
E1992	CERATOPOGONINAE	6.00	
E19920	Culicoides	6.00	PR
E19921	Palpomyia	6.00	PR
E199210	Palpomyia tibialis group	6.00	PR
E19922	Bezzia	6.00	PR
E19923	Palpomyia / Bezzia	6.00	PR
E19924	Stilobezzia	6.00	PR
E199XX	Ceratopogonidae (UNID)	6.00	
E19A	STRATIOMYIIDAE	10.0	CG
E19A0	OXYCERINI	10.0	
E19A00	Oxycera	10.0	CG
E19A1	ODONTOMYIINI	10.0	
E19A10	Odontomyia	10.0	CG
E19A2	STRATIOMYINI	10.0	
E19A20	Stratiomys	10.0	CG
E19A200	Stratiomys (PIV)	10.0	CG
E19A201	Stratiomys (DCS)	10.0	CG
E19AXX	Stratiomyiidae (UNID)	10.0	CG
E19B	TABANIDAE	6.00	PR
E19B0	CHRYSOPINI	6.00	

Taxon	Name	Tvalue	Funcgrp
E19B00	Chrysops	6.00	CG
E19B1	TABANINI	6.00	
E19B10	Tabanus	6.00	PR
E19B100	Tabanus fairchildi	6.00	PR
E19B10X	Tabanus (YBC/MFF)	6.00	PR
E19BXX	Tabanidae (UNID)	6.00	PR
E19C	ATHERICIDAE	2.00	PR
E19C00	Atherix	2.00	PR
E19C000	Atherix lantha	2.00	PR
E19G	EPHYDRIDAE	6.00	CG
E19G0	EPHYDRINI	6.00	
E19GXX	Ephydridae (UNID)	6.00	
E19I	DOLICHOPODIDAE	4.00	PR
E19I01	Rhaphium	4.00	PR
E19I02	Hydrophorus	4.00	PR
E19IOX	Dolichopoidae (UNID)	4.00	PR
E19J	EMPIDIDAE	6.00	PR
E19J0	HEMERODROMIINAE	6.00	
E19J00	Hemerodromia	6.00	PR
E19J01	Chelifera	6.00	PR
E19J1	CLINOCERINAE	6.00	
E19J10	Clinocera	6.00	PR
E19J2	EMPIDINAE	6.00	
E19J20	Rhamphomyia	6.00	PR
E19J30	Oreogeton	6.00	PR
E19JXX	Empididae (UNID)	6.00	PR
E19K	MUSCIDAE	6.00	PR
E19K0	LIMNOPHORINAE	6.00	
E19K00	Limnophora	6.00	PR
E19K000	Limnophora aequifrons	6.00	PR
E19KXX	Muscidae (UNID)	6.00	PR
E19L	PTYCHOPTERIDAE	7.00	CG
E19XXX	Diptera (UNID)	7.00	
E1A	ORDER COLLEMBOLA	7.00	CG
E1A0	PODURIDAE	7.00	CG
E1A000	Achorutes(=Hypogastrura)	7.00	CG
E1A2	ISOTOMIDAE	7.00	CG
E1A200	Isotomurus	7.00	CG
E1A2000	Isotomurus palustris	7.00	CG
E1A2XX	Isotomidae (UNID)	7.00	CG
E1AXXX	Collembola (UNID)	7.00	
E1B	ORDER HYMENOPTERA	7.00	PR
E1C	ORDER ORTHOPTERA	7.00	SH
E1C0	TRIDACTYLIDAE	7.00	SH
E1C000	Ellipes	7.00	SH
E1C0000	Ellipes minuta	7.00	SH
E1D	ORDER PSOCOPTERA	7.00	
E2	CLASS ARACHNIDA	7.00	
E20	ORDER ACARI (HYDRACARINA)	5.00	PR
E20XXX	Acari (UNID)	5.00	PR
F	PHYLUM MOLLUSCA	5.00	
F0	CLASS GASTROPODA	5.00	SC
F00	ORDER LIMNOPHILA	5.00	CG
F000	PHYSIDAE	8.00	CG
F0000	PHYSINAE	8.00	
F00000	Physa	8.00	CG
F00001	Physella	8.00	CG

Taxon	Name	Tvalue	Funcgrp
F000XX	Physidae (UNID)	8.00	
F001	LYMNAEIDAE	7.00	CG
F0010	LYMNAEINAE	7.00	
F00100	Fossaria	7.00	CG
F00101	Lymnaea	7.00	CG
F002	PLANORBIDAE	7.00	CG
F0020	HELISOMINI	7.00	
F00200	Menetus	7.00	CG
F002000	Menetus dilatatus	7.00	CG
F00201	Helisoma	6.00	CG
F0021	PLANORBINI	6.00	
F00210	Gyraulus	6.00	CG
F002XX	Planorbidae (UNID)	6.00	
F003	ANCYLIDAE	4.00	SC
F0030	FERRISSINAE	4.00	
F00301	Ferrissia	4.00	SC
F003010	Ferrissia rivularis	4.00	SC
F01	ORDER MESOGASTROPODA	4.00	
F010	VALVATIDAE	4.00	
F01000	Valvata	4.00	
F0110X	Lymnaeidae (UNID)	4.00	
F012	VIVIPARIDAE	3.00	CG
F0120	LIOPLACINAE	3.00	
F01200	Campleoma	3.00	CG
F012XX	Viviparidae (UNID)	3.00	
F013	HYDROBIIDAE (=BULIMIDAE)	3.00	
F0130	AMNICOLINAE	3.00	
F01300	Amnicola	3.00	
F014	PLEUROCERIDAE	4.00	SC
F01400	Pleurocera	4.00	SC
F01401	Leptoxis	4.00	SC
F01404	Elimia (=Goniobasia)	4.00	SC
FOXXXX	Gastropoda (UNID)	4.00	
F1	CLASS BIVALVIA (=PELECYPODA)	4.00	CF
F10	ORDER UNIONOIDA	4.00	CF
F101	UNIONIDAE	4.00	CF
F10100	Fusconaia	4.00	CF
F11	ORDER VENEROIDA	4.00	CF
F110	SPHAERIIDAE	8.00	CF
F11000	Sphaerium	8.00	CF
F110000	Sphaerium striatinum	8.00	CF
F11001	Musculium	8.00	CF
F110010	Musculium transversum	8.00	CF
F11002	Eupera	8.00	CF
F11003	Pisidium	8.00	CF
F110XX	Sphaeriidae (UNID)	8.00	
F111	CORBICULIDAE	8.00	CF
F11100	Corbicula	8.00	CF
F111000	Corbicula fluminea	8.00	CF
F1XXXX	Bivalvia (UNID)	8.00	
FXXXXX	Mollusca (UNID)	8.00	

Appendix 4

Fish Summary 1:
 Community Structure at Species Level - Numbers
 Site:Fayette Year:1990 Replicates:13

Common Name	Numbers	Trophic	Tolerance	Origin
	Collected	Group		
Northern hog sucker	1	INS	I	N
Flathead catfish	2	PIS	F	N
Rock bass	11	PIS	F	IP
Redbreast sunfish	3	INS	F	IP
Bluegill	5	INS	F	IP
Longear sunfish	2	INS	I	I
Smallmouth bass	117	PIS	F	IP
Spotted bass	1	PIS	F	NI
Greenside darter	8	INS	F	N
Rainbow darter	3	INS	F	N
Sharpnose darter	2	INS	F	N
			Lower	Upper
Summary			95%	95%
			C.L.	C.L.
Mean number of species		2.62	1.62	3.62
Total number of taxa		11		
Number of native species		6		
Number of introduced species		5		
Diversity Index(numbers)		1.51		
Number of darter species		3		
Number of sunfish species		3		
Number of intolerant species		2		
Number of tolerant species		0		
% green sunfish		0.0%	0.00	0.00
% omnivores		0.0%	0.00	0.00
% insectivorous cyprinids		0.0%	0.00	0.00
% piscivores		84.5%	78.82	90.21
Mean number of fish		11.92	8.15	15.69
% hybrids		0.0%	0.00	0.00
Total number of fish		155		

Appendix 5

Fish Summary 2:
 Community Summary at Species Level - Biomass
 Site:Fayette Year:1990 Replicates:13

Common Name	Biomass(grams)	
Northern hog sucker	3.1	
Flathead catfish	105.9	
Rock bass	431.8	
Redbreast sunfish	4.5	
Bluegill	4.7	
Longear sunfish	111.0	
Smallmouth bass	260.1	
Spotted bass	1.9	
Greenside darter	13.5	
Rainbow darter	2.0	
Sharpnose darter	2.8	
Summary	Lower 95% C.L.	Upper 95% C.L.
Mean fish biomass(g) per run	72.4	26.2 118.6
Total Biomass (g)	941.3	
Diversity Index	2.00	
Index of Well Being	9.45	

Appendix 6

Fish Summary 3:
Community Structure at Higher Taxonomic Levels - Numbers
Site:Fayette Year:1990

Order/Family	% of Total	
	Order	Family
ORDER CYPRINIFORMES	0.6	
CATOSTOMIDAE		0.6
ORDER SILURIFORMES	1.3	
ICTALURIDAE		1.3
ORDER PERCIFORMES	98.1	
CENTRARCHIDAE		89.7
PERCIDAE		8.4

Appendix 7

Fish Summary 4:

Community by Functional Feeding Group, Origin, and Tolerance - Numbers
 Site: Fayette Year: 1990

<u>Functional Group</u>	<u>% of Total</u>	<u>Origin Category</u>	<u>% of Total</u>
Omnivores	0.0	Introduced	1.3
Insectivores	15.5	Native	10.3
Piscivores	84.5	Endemic	0.0
Herbivores	0.0	Probably Introduced	87.7
Invertivores	0.0	Probably Native	0.6

<u>Tolerance Category</u>	<u>% of Total</u>
Tolerant	0.0
Intolerant	1.9
Facultative	98.1

Tolerant Species CollectedIntolerant Species Collected

Northern hog sucker
 Longear sunfish

Introduced and Probably
 Introduced Species Collected

Rock bass
 Redbreast sunfish
 Bluegill
 Longear sunfish
 Smallmouth bass

Appendix 8

Fish Summary 5:
Abundance of Individual Species for All Years
Site:Fayette Species:Smallmouth bass

Year	Total Count	Total Biomass
1988	53	2498.0
1990	117	260.10

Appendix 9

Fish Summary 6:
 Community Measures for All Years
 Site: Fayette

Year	#species	#darters	#sunfish	#intolerant	Total#	#introduced	#tolerant
1988	18	3	4	2	150	8	2
1990	11	3	3	2	155	5	0

Year	% green sunfish	% omnivores	% ins. cyprinids	% piscivores	Diversity
1988	1.33	0.00	4.00	50.67	2.97
1990	0.00	0.00	0.00	84.52	1.51

Appendix 10

Macroinvertebrate Summary 1:
 Community Structure at Lowest Taxonomic Level
 Site:Bluestone Year:1990 Habitat:Cobble/Pebble Method:PIBS Replicates: 3
 * denotes < 0.1%

Taxa	Mean Number/sample	Lower 95% C.L.	Upper 95% C.L.	Functional Group	HBI Tolerance
PLANARIIDAE	1.0	0.0	3.5	CG	8
CLASS OLIGOCHAETA	6.0	0.0	31.8	CG	8
Asellus	0.7	0.0	3.6	CG	8
Crangonyx	31.3	0.0	112.1	CG	6
Serratella	3.3	0.0	15.6	CG	4
Baetis	101.0	0.0	224.6	CG	4
Heterocloeon	83.0	0.0	382.1	SC	4
Pseudocloeon	8.7	0.0	37.5	SC	4
Stenonema	6.7	0.0	14.3	SC	4
Epeorus	0.3	0.0	1.7	CG	4
Heptagenia	0.7	0.0	2.1	SC	4
Tricorythodes	62.7	0.0	273.3	CG	4
Isonychia	32.0	0.0	96.7	CF	2
Corydalus	1.0	0.0	5.3	PR	5
Leucotrichia	1.3	0.0	7.0	SC	6
Hydroptila	0.7	0.0	3.6	MP	6
HYDROPSYCHIDAE	1.0	0.0	5.3	CF	6
Macrostemum (=Macronemum)	0.3	0.0	1.7	CF	6
Hydropsyche	2.7	0.0	12.1	CF	6
Cheumatopsyche	4188.0	1573.7	6802.3	CF	6
LEPTOCERIDAE	1.0	0.0	5.3	CG	4
Oecetis	0.7	0.0	3.6	PR	4
Ceraclea	4.7	0.0	15.0	CG	4
Petrophila (=Parargyractis)	53.7	0.0	133.5	SC	5
Stenelmis	60.0	0.0	177.9	SC	4
ORDER DIPTERA	1.7	0.0	8.9		5
CHIRONOMIDAE	1581.0	1418.5	1743.6	CG	6
Hemerodromia	3.7	0.0	11.7	PR	6
Physa	27.3	0.0	64.5	CG	8
Ferrissia	25.3	0.0	58.4	SC	4
Corbicula	16.0	0.0	60.2	CF	8

Summary	Mean Value/sample	Lower 95% C.L.	Upper 95% C.L.
Density	6307.0	3422.0	9192.0
Diversity Index	1.46	0.00	2.27
Taxa Richness	21.7	13.7	29.7
EPT Index	12.0	9.5	14.5
HBI	5.87	5.62	6.12
EPT/Chironomidae Abund.	2.83	1.41	4.25
% Contrib. Dom. Taxon	66.0	51.6	80.4
Scrap./(Scrap. + Filt.)	0.06	0.00	0.30
Hydropsychidae/Tot. Tricho.	1.00	1.00	1.00

Appendix 11

Macroinvertebrate Summary 2:
 Community Structure at Higher Taxonomic Levels
 Site:Bluestone Year:1990 Habitat:Cobble/Pebble Method:PIBS
 Replicates: 3
 * denotes < 0.1%

Taxa	% of Total Phylum, Class or Order	Family
CLASS TURBELLARIA	*	
ORDER TRICLADIDA	*	
PLANARIIDAE		*
CLASS OLIGOCHAETA	*	
CLASS CRUSTACEA	0.5	
ORDER ISOPODA	*	
ASELLIDAE		*
ORDER AMPHIPODA	0.5	
GAMMARIDAE		0.5
CLASS INSECTA	98.3	
ORDER EPHEMEROPTERA	4.7	
EPHEMERELLIDAE		*
BAETIDAE		3.0
HEPTAGENIIDAE		0.1
TRICORYTHIDAE		1.0
OLIGONEURIIDAE		0.5
ORDER MEGALOPTERA	*	
CORYDALIDAE		*
ORDER TRICHOPTERA	66.6	
HYDROPTILIDAE		*
HYDROPSYCHIDAE		66.5
LEPTOCERIDAE		0.1
ORDER LEPIDOPTERA	0.9	
PYRALIDAE		0.9
ORDER COLEOPTERA	1.0	
ELMIDAE		1.0
ORDER DIPTERA	25.2	
CHIRONOMIDAE		25.1
EMPIDIDAE		*
CLASS GASTROPODA	0.8	
ORDER LIMNOPHILA	0.8	
PHYSIDAE		0.4
ANCYLIDAE		0.4
ORDER VENEROIDA	0.3	
CORBICULIDAE		0.3

Appendix 12

Macroinvertebrate Summary 3:

Community By Functional Feeding Group

Site:Bluestone Year:1990 Habitat:Cobble/Pebble Method:PIBS

Replicates: 3

* denotes < 0.1%

Functional Feeding Groups	% of Total
Shredders	0.0
Collector-gatherers	28.9
Collector-filterers	67.2
Scrapers	3.8
Predators	*
Piercers	0.0
Total % represented	99.96

Appendix 13

Macroinvertebrate Summary 4:
Abundance of Individual Taxon for All Years
Site:Bluestone Habitat:Cobble/Pebble Method: PIBS
Taxon: CLASS OLIGOCHAETA

Year	Mean Number/sample
1982	2.0
1984	0.3
1988	0.6
1989	2.3
1990	6.0

Appendix 14

Macroinvertebrate Summary 5:
Community Measures for All Years

**** denotes < minimum amount

Site:Bluestone Habitat:Cobble/Pebble Method: PIBS

Year	Density	Divers. Index	Taxa Richness	EPT Index	HBI	EPT/ Chiron. Abund.	%Contrib. Dom. Taxon	Scrap./ (Scrap. Tot. +Filt)	Hydro./ Tricho.
1982	4136.3	2.06	9.7	4.7	0.00	2.83	51.3	0.00	0.66
1984	2364.0	2.14	18.0	8.3	6.03	1.67	44.7	0.05	0.98
1988	3170.2	1.57	18.8	8.2	5.96	1.14	50.4	0.03	1.00
1989	881.0	2.35	19.7	10.0	5.67	2.26	44.3	0.14	1.00
1990	6307.0	1.46	21.7	12.0	5.87	2.83	66.0	0.06	1.00

Appendix 15

Environmental Characteristics Summary:

All Measures for All Years

Site: Bluestone

Year	Temperature (°C)	Conductivity (µmhos)	pH	Dissolved Oxygen (mg/L)	Alkalinity (mg/L)	Hardness (mg/L)
1982	27.5	0	7.9	7.9	0.0	0.0
1983	0.0	0	0.0	0.0	0.0	0.0
1984	24.5	0	7.9	7.4	64.2	0.0
1986	27.0	210	7.9	6.6	0.0	0.0
1988	27.0	130	8.0	7.2	54.2	102.6
1989	24.5	120	8.9	8.0	74.0	85.5
1990	25.0	190	7.7	7.1	58.8	102.6

Year	Mean Phytoplankton (µgChla/L)	Mean Periphyton (µgChla/cm ²)	Autotrophic Index	Mean Podostemum (gDW/m ²)	Mean Justicia (gDW/m ²)	Mean Seston (mgAFDW/L)
1982	0.0	0.0	0	0.0	0.0	3.29
1983	0.0	0.0	0	3.2	0.0	0.00
1984	8.8	0.0	0	1.0	627.0	1.88
1986	0.0	0.0	0	0.6	0.0	1.72
1988	8.6	3.5	501	0.3	38.3	2.53
1989	2.8	11.9	128	2.8	19.3	1.74
1990	2.3	1.8	347	1.5	78.9	1.60