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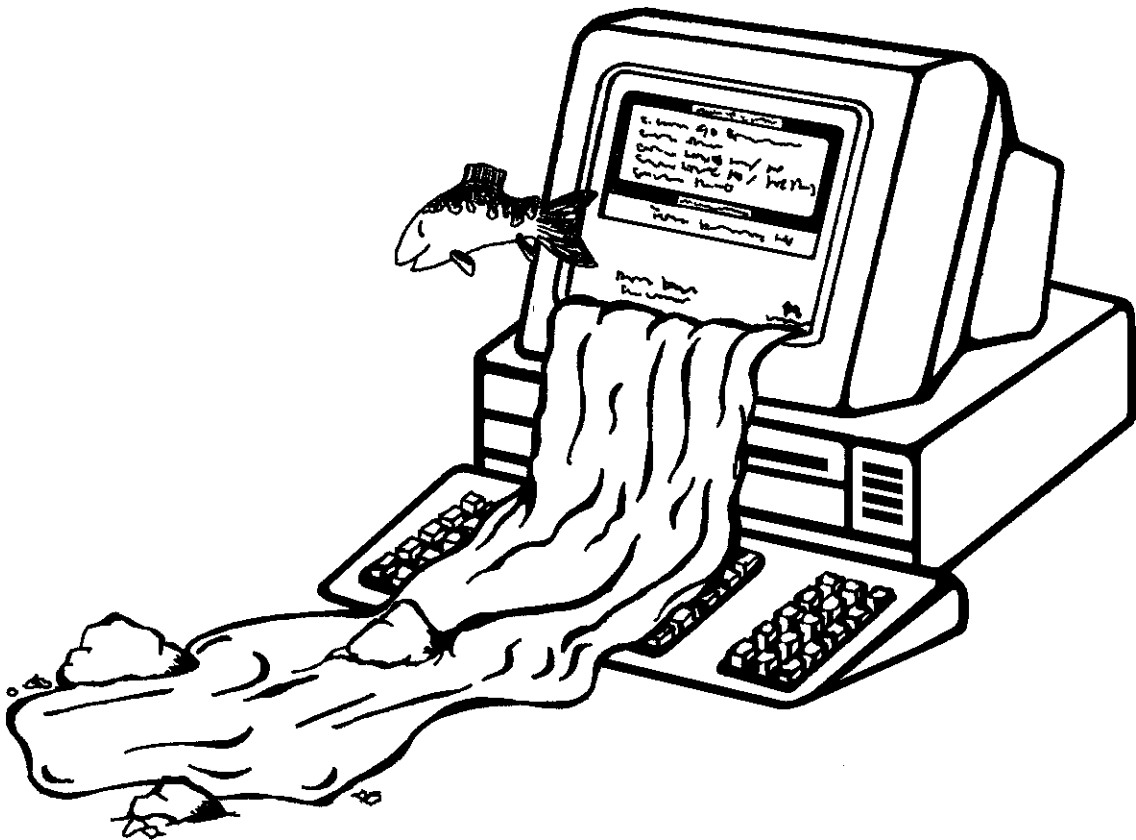


# User's Guide To FBASE: Relational Database Software for Managing R1/R4 (Northern/ Intermountain Regions) Fish Habitat Inventory Data

Sherry P. Wollrab

Published exclusively on the World Wide Web

*Note: The software mentioned in this publication is used exclusively by the Forest Service, but the information is being made available to our customers in case there is an interest outside our agency.*



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## Abstract

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FBASE is a microcomputer relational database package that handles data collected using the R1/R4 Fish and Fish Habitat Standard Inventory Procedures (Overton and others 1997). FBASE contains standard data entry screens, data validations for quality control, data maintenance features, and summary report options. This program also prepares data for importation into an ARC/INFO Geographic Information System. Users have easy access to their habitat inventory data in both a raw and summarized format. FBASE is a stand-alone program and has minimal requirements for RAM and hard drive space, making it feasible for running on most systems. The data tables are in a format that makes them easily transportable to other software programs if users wish to further analyze their data or produce custom reports.

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Keywords: Fish habitat variables, computer program, data entry, summary reports, data tables, data management, standard procedures

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## Introduction

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FBASE is a microcomputer-based relational database software program used to enter, report, and maintain data collected under the *R1/R4 (Northern Region / Intermountain Regions) Fish and Fish Habitat Standard Inventory Procedures Handbook* (Overton and others 1996). This protocol helps Forest Service fish biologists collect fish and fish habitat attributes consistently and efficiently.

Development of the R1/R4 Fish and Fish Habitat Inventory (hereafter referred to as the R1/R4 Inventory) increased the need to have a consistent method of capturing and summarizing these data. The FBASE package provides a means for sharing data and expertise across National Forest Districts, Forests, and Regions and among agencies that use these inventory procedures.

Fish biologists are faced with management decisions from the local project scale (habitat unit and survey reach) to the watershed and sub-basin scale. FBASE enhances the ability to scrutinize the data at these multiple scales. Also, since the data are stored in DBF files and are contained in one database, you can easily access the data or transfer them to other systems for further analysis.

## General Features

FBASE is a relational database, meaning that data are stored in related, or linked, tables. This keeps the tables smaller and simplifies data entry and manipulation by decreasing the input of redundant data, giving FBASE a clear advantage over a simple spreadsheet. See "Section III. ORGANIZATION OF FBASE," "Table Links" for more information on how the tables are linked.

FBASE's main features are its data entry forms, quality control measures, and summary reports. These are described below:

### Data Entry

Perhaps the most evident advantage of using a standardized database such as FBASE is the ease of data entry. Data can be brought in from the field and entered into FBASE without the need to build spreadsheets or database forms. Data can also be entered electronically in the field, such as with a field computer or data logger, and then downloaded to the office computer for analyses. Often the field personnel are accessible for data entry, which ensures that the data will not sit idle in a drawer. Data entry screens mirror the field forms to increase data entry efficiency. FBASE also offers flexibility for entering sub-sampled data or monitoring data to satisfy varying needs for data collection while maintaining quality control standards.

### Data Quality Control

One of the biggest concerns of data managers and biologists is to maintain a high level of data integrity as the data move into an electronic format. FBASE makes it easier to achieve this through data validations that restrict the possible values that can be entered; hence, FBASE can catch many of the most common errors. There are also required fields for which data must be entered so that vital information, such as habitat unit length, cannot be inadvertently omitted. Many variables also list valid choices in tables so that you can choose from the table, thereby avoiding spelling mistakes. FBASE's report system has the option to print out raw data reports, which you can check against the field forms to catch data entry mistakes. Finally, FBASE maintains automatic links between data tables, which decreases the amount of data entry required and reduces the chance of database corruption.

### Reports

FBASE offers many built-in summary reports that give you a quick way to get the most commonly needed summary data. Summary reports can be run at many different sort levels, allowing you to look at the data in various ways depending on the objectives of the analysis and the preferred landscape scale (see "Section V. REPORTS," "Selecting Sort Options for Reports"). If desired, you can design custom reports by using the data with other database programs.

### How to Use this Manual

This manual tells you how to use the FBASE software and presents its functions and capabilities. This is a companion document to the R1/R4 Inventory procedures manual (INT-GTR-346); (see "Software and Procedures Handbook Availability") and does not explain how to collect the inventory data, nor does it provide detail on how data should be written on the data sheets. That information can be found in the R1/R4 Inventory manual (Overton and others 1997).

This manual is organized so that you can refer to the table of contents and quickly go to the desired area. Where there is overlap among sections, the other pertinent section(s) are cross-referenced. If you have a specific problem or question, appendix A provides answers to the most common FBASE questions and problems.

### History of FBASE

FBASE development began in 1990 as an adjunct to the R1/R4 Inventory procedures. Although the inventory protocol and FBASE were originally designed to

meet legal requirements for the inventory of Forests in central Idaho with anadromous fish, their application and use have been broadened to fit the needs of Forest Service Regions 1 (Northern Region) and 4 (Intermountain Region). They are also being adapted by Forest Service, Bureau of Land Management, and State personnel in other areas.

FBASE was initially developed using dBASE IV (Nelson and others, unpublished paper). In 1994, FBASE was re-written in CA Clipper. The purpose of this task was to fix recurring problems, update the program to reflect changes in the inventory procedures, and make the system more efficient and “user-friendly.” Although the program was changed substantially, some elements were retained, such as the data input and report formats and several of the look-up tables. The name “FBASE” was also kept. Some of the changes were substantial enough that conversion programs were written to facilitate the migration of data from the old FBASE to the new. Previous versions of the original FBASE were named 2.xx, such as 2.95 (3.00 would have been the final version of the original FBASE had it been completed). The new FBASE has versions with the format YY.MMa, for example 98.03a, where the *a* represents the first version of that year and month (the second version would be represented by a *b*, and so on). Since version 98.03b is the latest version of the new FBASE, references to the new FBASE will use that version number. Below are some of the major differences between version 2.xx and 98.03b:

### *File Organization*

The data for each stream survey in version 2.xx were housed in multiple tables. Thus, any given survey had separate tables for the header, physical, fish, large woody debris, riparian, and Wolman Pebble Count raw data, and physical and large woody debris calibrated data (which were generated for main channel, side channel, and combined data). Summary files were also created whenever summaries were run. The result of this model was that any given stream survey could potentially be associated with 88 files (Nelson and others, unpublished paper). Although having each survey identified with its own set of tables had some advantages, biologists simply could not manage them and the vast number of files necessitated a complex file naming scheme that was difficult to remember. For version 98.03b, we simplified the data model by reducing the *total* number of core data tables to five, one for each raw data type (header, physical, fish, large woody debris, and riparian) for *all* surveys. For example, all raw physical data for all surveys are contained in one table called HABITAT. Calibration and regression files are not generated because corrections are no

longer required in the R1/R4 Inventory procedures. Summary reports are generally not written to files unless requested by the user.

### *Data Structures*

Changes in the procedures and expansion to Forests outside central Idaho necessitated the need for changes and additions to the data structures. For example, fields were added for redband and brown trout and for the revised substrate classes.

### *Data Validation and Editing*

Data validation was rarely utilized in version 2.xx, and editing was done in the dBASE “browse” mode, which allowed users to inadvertently change values and disrupt table links. Efficiency was also relinquished because editing during data entry was often not possible. In version 98.03b, data validation is employed and data entry and editing are both accomplished in the input screens, reducing data entry errors and increasing efficiency.

### *Table Links*

The table links have been strengthened in version 98.03b. Although the tables were related in version 2.xx, one could easily change a key field during editing and upset the linkages since the change did not cascade throughout the updated table or into other related tables. In version 98.03b, the user is informed if a change is about to be made to a key field. If that change is implemented, the related tables are automatically updated.

### *Record Maintenance*

FBASE version 98.03b utilizes indexes to place records in the proper order as they are added to a table. In version 2.xx, added records were inserted at the bottom of the table, making data proofing inefficient and leading to record duplication. In addition, if a user wished to add a record to a previously entered reach, it had to be added in the dBASE browse mode which was awkward and increased the chance for errors. Version 2.xx also allowed duplicate records to be entered, which is prohibited in version 98.03b.

### *Summary Reports*

Version 98.03b offers an expanded repertoire of summary report and sorting options. Reports are generated “on-the-fly” and are therefore produced more quickly than in version 2.xx. The new version also provides more printer choices.

## Stand-Alone Features

Although FBASE version 2.xx did not require additional software to run, some important tasks could not be accomplished within FBASE and several problems could only be overcome using dBASE. Users also had to run queries in dBASE to update large numbers of records (for example, changing the survey reach number). Version 98.03b incorporates features that enhance its ability to be used without other software, such as re-indexing and sorting and automatic updates when key fields are changed.

## System Efficiency

Rewriting FBASE cut the lines of program code by about half. The RAM requirements are reduced from 8 megabytes to 640 kilobytes, and the hard drive requirement for running the program from 12 to 6 megabytes.

## Getting Started

### System Requirements

FBASE requires the hardware and software listed in [table 1](#). FBASE was originally developed in dBASE and modified with CA Clipper, but it is a stand-alone package, which means that it does not require Clipper, dBASE, or other software to run (except MS-DOS). However, I strongly recommend installing PKZIP (MS-DOS version 1.0 or above). PKZIP is needed to use some of FBASE's utilities, such as exporting data and making backups to floppies (see "Section VII. UTILITIES" and "VIII. SYSTEM"). For more flexibility in manipulating the data stored in FBASE (such as query building and advanced statistics) and producing custom reports, other appropriate software programs must be used.

FBASE is an MS-DOS-based program, not a Windows program. FBASE can, however, be run from an icon in Windows and can be used in a "window" (in

other words, other programs can be run while FBASE is open). Also, a mouse cannot be used.

Although only 8 megabytes of hard drive space and 640 kilobytes of RAM are required to run FBASE, increases in either or both of these will increase efficiency. Also, more hard drive space will be needed as data are entered into FBASE.

One person at each site using FBASE should be assigned the role of Database Administrator (DBA). The DBA should be in charge of maintaining the system, which includes making system backups, manipulating look-up tables, assigning passwords and security levels, moving data (importing and exporting), designating printers, and so forth. This function is important for maintaining consistency and avoiding errors.

### Notational Conventions

This manual uses different typefaces to make distinctions between keystrokes, commands, FBASE menu items, and so forth. These conventions are used to make the manual more readable and understandable and are as follows:

1. Keystrokes used on your keyboard are represented in angle brackets (for example, <Enter>).
2. MS-DOS commands, directories, and statements in system files are represented by all caps and bold (for example, **TYPE FISH.PRN**).
3. Table, file, and field names are described by all caps and no bold (for example, HABITAT.DBF, SURV\_REACH).
4. Messages and variables displayed in FBASE screens are as they appear in FBASE, plus they are bolded (such as, **This is a required field!**).
5. FBASE menu items are also displayed as they are in FBASE and are bolded. A series of menu choices have a "/" to separate the choices (for example, **Utilities/RE-INDEX DATABASE FILES**).
6. User-supplied information and examples, and values displayed by FBASE are italicized (such as *LODGEPOLE CR*).

**Table 1**—FBASE system requirements.

Component	Requirement
Microprocessor	80286 or higher
RAM	640KB or more
Hard disk	At least 8MB of hard disk space (15MB or more is recommended); FBASE can also run from a Bernoulli
Floppy disk drive	1.44MB 3.5-inch or 1.2MB 5.25-inch floppy drive
Video monitor	Monochrome will work but CGA or higher recommended
MS-DOS	Version 3.1 or above
PKZIP Software	DOS version 1.0 or above. Required to import/export data and use FBASE backup system
Microsoft Windows	Not required but FBASE will run in a window



## Installing FBASE

Instructions are provided for installing FBASE on a stand-alone PC and on a network. Each step also provides directions on using FBASE in MS-DOS and in Windows95.

Installing FBASE on a stand-alone PC:

1. MS-DOS: Create an FBASE subdirectory under the desired directory (for example, **C:\**) by going to **C:\** and typing **MD FBASE** (make directory). Then type **CD FBASE** (change directory) from **C:\**.

Windows95: Open Windows Explorer and single-click the left mouse button on the desired directory (for example, **C:\**). Left-click on **File**, then **New**, then **Folder** from the menu. Type the name of the folder (for example, **FBASE**).

2. Insert the floppy disk with the FBASE program into the appropriate floppy disk drive. **FBFILES.EXE**, the file on the disk, is simply a collection of FBASE files that have been condensed onto a floppy using **PKZIP** and then made into an executable file that is self-extracting. **Table 2** lists the files necessary to use FBASE.

MS-DOS: To extract the files, from the **C:\FBASE** directory type **A:FBFILES** (or **B:FBFILES** if the floppy drive is the B drive). The FBASE files on the disk should expand.

Windows95: Left-click the floppy drive in Windows Explorer while the diskette is in the drive. Click and drag the **FBFILES.EXE** file from the floppy directory to the newly created FBASE directory. Double-click the **FBFILES.EXE** file to expand the FBASE files.

3. MS-DOS: When the files have finished expanding, type **FB**. This will activate the **FB.BAT** file that calls the FBASE program and assigns the "Machine ID" (for example, **WS\_01**). The Machine ID is important when using FBASE on a network. By using this BAT file, you can avoid having to change your PC configuration to accommodate the Machine ID. If you are running FBASE on a network, you may want to change the Machine ID (see below for more information).

Windows95: There are several ways to get into FBASE from Windows95. The first way is to activate MS-DOS from Windows and then follow the directions above under "MS-DOS." The second method is to double-click the **FB.BAT** file from Windows Explorer, which will start MS-DOS and run the BAT file. The third method, and probably the most efficient, is to create an icon so that you can start FBASE from your desktop.

To create an FBASE icon, right-click the **FB.BAT** file in your FBASE directory from Windows Explorer and select **Create Shortcut**. A **Shortcut to FB** is added to your directory. To change the name of the shortcut, left-click the shortcut and type the desired name (for example, **FBASE**). If you wish to change the icon,

right-click and choose **Properties**. Click the **Program** button at the top and select **Change Icon** at the bottom right. Select the desired icon and click **OK**, then **OK** again. Click and drag the shortcut to your desktop. Now double-click the icon to start FBASE.

If you type **FBASE** instead of **FB** to start the program, you will get the following message:

**MACHINE ID NOT FOUND Cancel or Add to AUTOEXEC.BAT**

If you wish, you can add a **SET MACHINE** statement in your **AUTOEXEC.BAT** file instead of running the **FB** batch file described above. After this is done, you will type **FBASE** to get into the program, rather than **FB**. See "Using FBASE in a network" below for more information.

4. To properly run FBASE, the **FILES=** statement in the **CONFIG.SYS** file in your root directory must be at least 99 (in other words, **FILES=99**). When you initially start FBASE from MS-DOS or Windows, the **FILES=** statement is checked. If the number of files is below 99, you will get the following message:

**The FILES in C:\CONFIG.SYS needs to be increased. Press 'Y' to Update..N**

If you enter **Y**, the files will automatically be increased to 99. If you enter **N**, the **CONFIG.SYS** file will not be changed and, although you can still start FBASE, you will get an error if you try to enter data. If you prefer, you can also edit the **CONFIG.SYS** file manually.

5. Next, you will get the following message:

**Enter FBASE's Directory DATA Path: C:\FBASE**

If the data tables and executable file are in the same directory, press <Enter> for the default. If the data tables are in a different directory, change the "data path" to the directory where these tables reside.

If you move FBASE to another computer that has a different directory for the data tables (for example, **D:\FBASE**), you will get a message that says:

**Unable to change to Directory \FBASE - Reset FBCONFIG.DAT File**

If you get this message, delete the **FBCONFIG.DAT** file from the FBASE directory and start FBASE. Then you can enter the directory so that it reflects the new data path.

6. You will now see a screen that says **ENTER PASSWORD**. To get into the system, type **TEMP** as the password. Then refer to "Section VIII. SYSTEM," "Adding Your Password" for instructions on how to add your own password for future FBASE sessions.



**Table 2**—FBASE system files.

File Name	Contents of File
ACTLOG.DBF	Log of FBASE use
COMPANY.DBF	Information about the company/Forest using FBASE
DISTRCTS.DBF	Information on National Forest Districts
DISTRCT1.NTX	Index for DISTRCTS.DBF
DISTRCT2.NTX	Index for DISTRCTS.DBF
FB.BAT	FBASE batch file
FBASE.EXE	FBASE executable program
FBHEADER.DBF	Header (reach level) data
FBHEADER.DBT	Header comments
FISH.DBF	Fish (snorkel) data
FISH.DBT	Fish comments
FISH1.NTX	Index for FISH.DBF
FORESTS.DBF	Information on National Forests
FORESTS1.NTX	Index for FORESTS.DBF
FORESTS2.NTX	Index for FORESTS.DBF
FORESTS3.NTX	Index for FORESTS.DBF
HABITAT.DBF	Habitat data
HABITAT.DBT	Habitat comments
HABITAT1.NTX	Index for HABITAT.DBF
HEADER1.NTX	Index for FBHEADER.DBF
HEADER2.NTX	Index for FBHEADER.DBF
HELP.DBF	On-line help information
HELP.DBT	Help comments
LWD.DBF	Large woody debris data
LWD.DBT	Large woody debris comments
LWD1.NTX	Index for LWD.DBF
MACHINE.DBF	Machine IDs and drive location
MENU.DAT	FBASE screen formats
NETLOCK.LOG	System file for network protection
NETLOG.LOG	System file for network protection
PRINTERS.DBF	Available printers and printer codes
REGIONS.DBF	Information on National Forest Regions
REGIONS1.NTX	Index for REGIONS.DBF
REGIONS2.NTX	Index for REGIONS.DBF
RIPARIAN.DBF	Riparian data
RIPARIAN.DBT	Riparian comments
RIPARIA1.NTX	Index for RIPARIAN.DBF
STREAMS.DBF	Stream data
STREAMS1.NTX	Index for STREAMS.DBF
STREAMS2.NTX	Index for STREAMS.DBF
TABLE1.DBF	Pop-up table contents
TABLE1.NTX	Index for TABLE1.DBF
USERFILE.DBF	FBASE user information
USER1.NTX	Index for USERFILE.DBF
USER2.NTX	Index for USERFILE.DBF

## Using FBASE in a Network

Instructions for installing FBASE to use in a network environment are similar to those for the stand-alone PC, with the exception of having to assign a machine ID. The machine ID is necessary so that FBASE can identify which computer is being used at a given time. On stand-alone PCs, the default machine ID is *ws\_01*, which is identified when the batch file (FB.BAT) is activated. To run FBASE on a network,

you must change the machine ID to a number or name that distinguishes your computer. You can use any number or name that succeeds *ws\_* (for example, *ws\_fish*). You can accomplish this by either editing the BAT file, identifying the machine ID when logging into FBASE, or adding a **SET MACHINE** statement to your AUTOEXEC.BAT file. These options are explained in detail below:

1. To edit the FB.BAT file in DOS, type **EDIT FB.BAT** from the FBASE directory. Or, in Windows95,

right-click the FB.BAT file in Windows Explorer and select **Edit**.

The batch file contains a line that says **call fbase ws\_01**. Simply edit the *ws\_01* to your machine ID (make sure it starts with *ws\_*) and select File and Save, then Exit from the main menu. To start FBASE, enter **FB** as you would on a stand-alone machine. The new machine ID will now be in use.

2. Instead of changing the batch file as explained above, you can identify the machine ID upon logging into FBASE. To do this, from the FBASE directory in DOS type **FBASE** followed by the machine ID (for example, **FBASE WS\_FISH**). This ID will override the one used in the batch file. However, make sure you run the executable, which is FBASE, rather than the batch file, which is FB; if FB is used, the ID in the batch file will override the one entered on-the-fly. If you use this method, you will have to enter the ID every time you start FBASE.

3. The third option is to add a **SET MACHINE** statement to your AUTOEXEC.BAT file that automatically uses the machine ID specified in the statement. To do this, type *FBASE*. A message appears that states **MACHINE ID NOT FOUND** and options to **Cancel** or **Add to AUTOEXEC.BAT**. Select **Add to AUTOEXEC.BAT** and enter a machine ID in the space provided. Then edit the AUTOEXEC.BAT file in DOS (type **EDIT C:\AUTOEXEC.BAT**) or Windows95 (right-click on the file from Windows Explorer and select **Edit**). You will see that a **SET MACHINE =** statement has been added. Move this statement so that it is below the **PATH** statement or where there are other **SET** commands. Then save the file and restart your computer to activate the changes. Type *FBASE* to start the program.

## Organization of FBASE \_\_\_\_\_

### Fields and Variables

The field (also called a column or attribute) is the database term that represents a group of related characters containing one set of information and is specified in the database structure; for example, SURV\_REACH, HAB\_LENGTH, and so forth (see appendix B for the data dictionary). A variable refers to the type or category of data collected (such as survey reach number, habitat unit length, and so forth). Oftentimes, these terms can be used interchangeably.

### Records

A record (also known as a row) is a database term that refers to a set of information. Just as a field is made up of a group of related characters, a record is made up of a group of related fields. For instance, in

the HABITAT.DBF table, each habitat unit in a survey reach of a stream has data for each field, constituting a record. You can add, delete, or edit records in a table.

### FBASE Files and Tables

Table 2 lists the files that exist in FBASE and the general contents of the files. All of these files are needed to properly run FBASE. The data files (or tables) are in DBF format, which is the same extension that dBASE and CA Clipper use. The memo (comments) files have the extension of DBT and the index files have the extension NTX (CA Clipper extensions). These files are all automatically maintained by FBASE as you add new or different information.

In this manual, files that contain the data are referred to as "tables." Just as a record is a group of related fields (see above), a table is a group of related records. The tables that contain the inventory data include FBHEADER.DBF, HABITAT.DBF, LWD.DBF, FISH.DBF, and RIPARIAN.DBF. Each of these tables contain all the specified data for all the survey reaches entered. For example, all the header data for all the reaches entered are contained in FBHEADER.DBF. In this way, file maintenance is minimal and you can locate data for specific reaches quickly and easily.

There is also a number of other tables that are used as references to the data being entered, such as STREAMS.DBF, FORESTS.DBF, DISTRCTS.DBF, and so forth. These tables, called look-up tables, already contain data but can be manipulated by the user (or DBA) when necessary. For the sake of readability, the extensions for these tables (DBF) are not included when referring to them in this manual. Also, the table names addressed in this manual are the actual names of the files in the database, but the table names in the FBASE menus may deviate slightly because the former are restricted by DOS file naming conventions. For example, DISTRCTS is the name of the file containing the District data, but the menu refers to the table as the DISTRICT table; hence, the table is addressed as the DISTRCTS table except when referring to the menu.

### Table Links

FBASE data tables are linked together with key fields that give every record in every table a unique identifier. These linkages are vital in maintaining database integrity. An example of a key in the FBHEADER table is STREAM\_ID + STUDY + SURV\_REACH. In other words, every record in this table has a unique combination of the stream ID, study, and survey reach number, and this key is shared with other tables (HABITAT, FISH, LWD,

and RIPARIAN) to maintain a relationship. FBASE maintains these links by restricting changes made to the key. You cannot, for instance, change a stream ID in the HABITAT table. The only place the stream ID can be changed is in the FBHEADER table, and if it is changed there it is automatically changed in all other related tables. This ensures that the data remain attached to the proper header and that the linkages remain intact. These relationships also improve efficiency during data entry because data for key fields do not have to be entered more than once.

## FBASE Screens

FBASE is a “menu-driven” system, meaning that all the tasks you perform in FBASE are accessed through a menu. The main menu is displayed when you log into FBASE (fig. 1). The name of the menu (**MAIN MENU** in this example) is shown at the top of the screen, along with the version number (for example, **Ver. 98.03b**). The center top of the screen displays **FISH HABITAT INVENTORY** and then the name of the Forest, company, or organization using FBASE (**ROCKYMOUNTAIN RESEARCH STATION** for example) (see “Section VIII. SYSTEM,” “Editing the Company Record” for instructions on changing this information). The top right of the screen displays the current date. As you access different sub-menus under the main menu, the heading at the top left of the screen changes to represent the current menu. For example, if you access the **Reports** menu, it reads **FBREPORT**. The center title

also changes to signify the current module, for instance, **FBASE REPORTING SYSTEM**.

At the bottom of the screen in many of the menus and sub-menus, the theme of the menu is described. For example, at the Reports menu, the bottom of the screen reads **Select FBASE reports for printing!**. At the very bottom of the screens, the first name of the user is displayed as well as function keys available to do certain tasks. The main menu, for instance, lists **F1 Help**, **CTRL-F1 Current Users**, **F9 New Clerk**, and **ESC Quit** (fig. 1). **F1** brings up the on-line help system for the menu item, **CTRL-F1** displays the users that are on the system at any point in time, **F9** brings up the password screen so that someone else can log on, and **ESC** lets you leave FBASE and go to the DOS prompt or the Windows screen. You should reference these keys while in every screen since they indicate what options you have for tasks and what keys to press to accomplish the task. The MS-DOS version in use is also displayed at the bottom of the main menu screen.

## Data Entry

The basic purpose of data entry is to electronically store your R1/R4 Inventory data so that further analyses of the data can be performed using the advantages of computer and software technology. However, FBASE does more than create a simple spreadsheet or database in that the data that are entered through a process that aids in data flow and quality control.

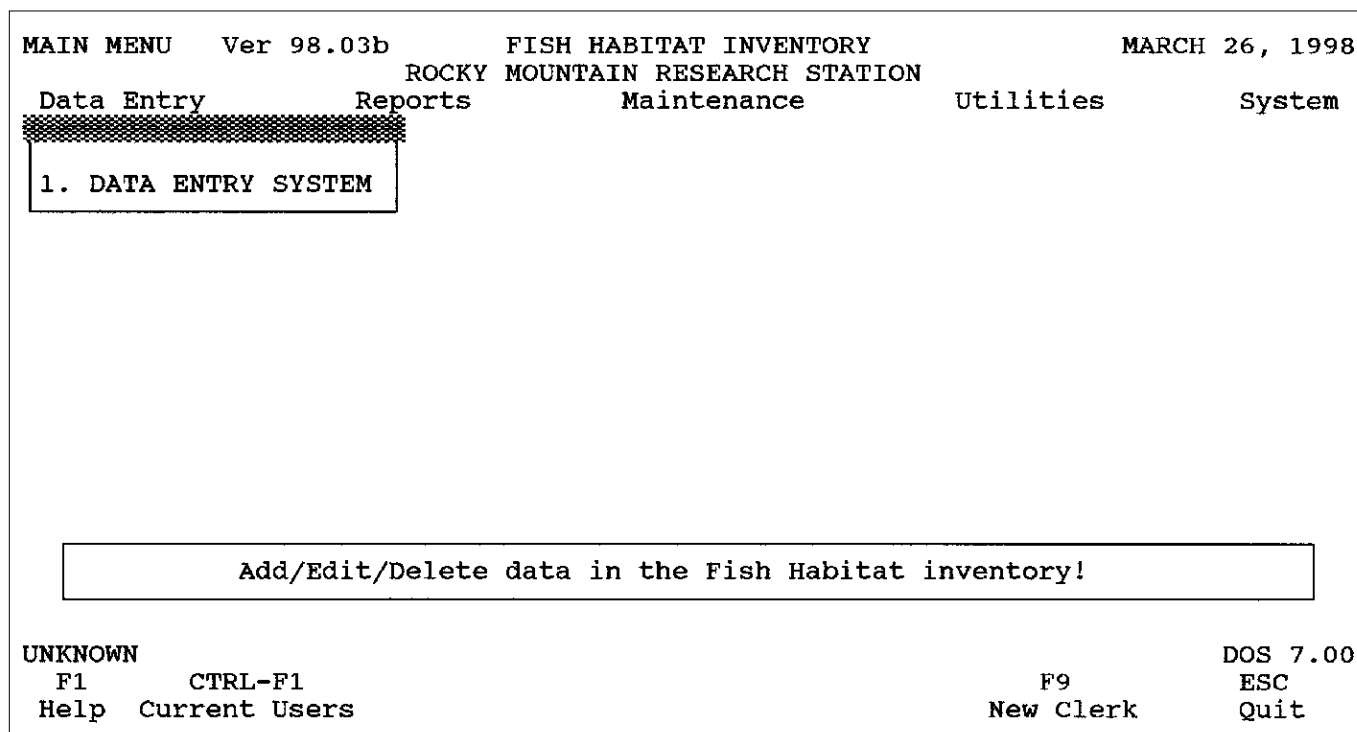


Figure 1—FBASE main menu.

Before entering data, you may want to configure your system for FBASE (see “Section VIII. SYSTEM,” “Configuring Your System”).

## Data Entry Menu

The main menu appears after you enter your password (fig. 1). **Data Entry** is the first item in the main menu. Arrow-key over to **Data Entry** (if not already there) so that it is highlighted. **1. DATA ENTRY SYSTEM** is the only choice under **Data Entry**. The description of the menu item is displayed toward the bottom of the screen and reads **Add/Edit/Delete data in the Fish Habitat inventory!** At the bottom of the screen are the available function keys. These include: **F1 Help** to retrieve on-line data entry help, **CTRL-F1 Current Users** to display the name of the user(s) currently using the system, **F9 New Clerk** to bring up the password screen when switching users, and **ESC Quit** to escape out of FBASE. Your first name should be displayed at the bottom left of the screen (see “Section VIII. SYSTEM,” “Adding Your Password”). If someone else takes over the data entry, use <F9> to switch to that person. This should be done because FBASE maintains a table called ACTLOG.DBF that keeps track of who is using FBASE (and when) in case this information is needed. Press <Enter> to start entering your data. If you now decide against entering data, hit <Esc> to get back to the main menu.

## Data Entry Order

The linkages between FBASE tables require that data be entered in a specific order (fig. 2). First, the header data are entered into the FBHEADER table. The FBHEADER table maintains a link to the HABITAT table. Therefore, the habitat data are entered next. The HABITAT table is linked to the LWD, FISH, and RIPARIAN tables. The data to be contained in these tables must be entered AFTER the header and habitat data; otherwise, the proper links are not established. FBASE safeguards against this through its menu system that controls the order in which you enter data.

## Adding Data Records

As described above in “Data Entry Order,” the header data for a given reach must be entered before any other reach data can be entered. To add an FBHEADER record, press <Enter> while on **1. DATA ENTRY SYSTEM** in the menu. The screen displays **HEADER DATA** and a box where header information can be seen once FBHEADER records are entered (fig. 3). If no FBHEADER records have been entered, this box is empty. Press <F3> to enter an FBHEADER record.

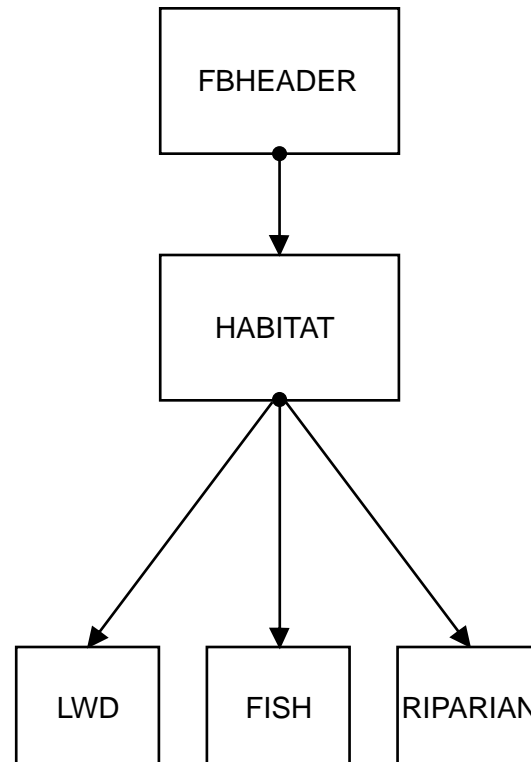


Figure 2—Order of data entry for data tables.

To add a HABITAT record, locate the header of the reach for which you want to enter the habitat data by using the arrow keys (or typing in the stream name and then using the down arrow key) to highlight the appropriate reach. When the desired record is highlighted, press <Enter> to add the HABITAT data.

Before adding an LWD, FISH, or RIPARIAN record, first refer to the appropriate field form from the R1/R4 Inventory. Refer to “FORM 4” for LWD data, “FORM 6” for FISH data, and “FORM 2” for RIPARIAN data. Locate the habitat unit number associated with the first data observation recorded on the form. Then go to that HABITAT record under **HABITAT DATA** and press <Enter> (fig. 4). Select **1. Fish**, **2. Riparian**, or **3. LWD** from the list of choices by pressing the associated number (fig. 5).

## Data Entry Screens

Most tables, with the exception of the RIPARIAN table, have multiple data entry screens for each record (appendix C). At the top of the HABITAT screen, you will see key (unique) information from the FBHEADER record to which the HABITAT record is linked, including the study, stream name and ID, and survey reach number (which also shows the reach type) (appendix C-2). Similarly, you will see the key information for the HABITAT record when you add an LWD, FISH, or RIPARIAN record, including the stream name and ID,

HEADER DATA

STREAM NAME	STREAM	STUDY	REACH	TYPE	FOREST	FOR
*** Top-of-File ***						
OZ CR	ID13579	I98	6	C	TARGHEE NF	15
SOMEWHERE CR	ID12345	I97	1	C	TARGHEE NF	15
SOMEWHERE CR	ID12345	I97	2	B	TARGHEE NF	15
SOMEWHERE CR	ID12345	I98	3	B	TARGHEE NF	15
Back Space		↑ ↓	Pg Up Pg Dn		ENTER	
Total Records: 4		Current: 4				

F1 Help            F3 Add            F4 Edit            F5 Delete            ENTER Habitat            ESC Exit

Figure 3—HEADER DATA screen showing FBHEADER records.

HABITAT DATA

STREAM	STUDY	REACH	TYPE	HAB UNIT	CHAN	SIDE	TYPE
*** Top-of-File ***							
ID12345	I97	1	C	1	M	0	SPW
ID12345	I97	1	C	2	M	0	LGR
ID12345	I97	1	C	3	M	0	DMV
ID12345	I97	1	C	3	A	1	DBW
Back Space		↑ ↓	Pg Up Pg Dn		ENTER		
Total Records: 10		Current: 1					

F1 Help            F3 Add            F4 Edit            F5 Delete            ENTER Select sub-groups            ESC Exit

Figure 4—HABITAT DATA screen showing HABITAT records.

study, survey reach number, habitat unit number, channel code, side unit number, and habitat type (appendix C-3, C-4 and C-5). This information helps you to keep track of the reach or habitat unit for which you are entering data.

A fresh LWD data entry screen is displayed for every LWD single or aggregate entered in the corresponding HABITAT record for a given habitat unit. The number of singles and aggregates, shown below the habitat unit information at the top of the screen, are brought over automatically from the associated HABITAT record when the large woody debris counts are entered. Therefore, if the habitat unit has more than one single or aggregate, after you enter the first record, the large woody debris data entry screen is displayed again so that you can enter the data for subsequent singles or aggregates in that unit. Also, in the upper left corner, you will see the current record number and the total number of LWD records for the unit. For example, in appendix C-3, the first page shows *1 of 2*, meaning that this is the first record out of a total of two records. For the first record, you enter the dimensions of the first single and the number of pieces for the first aggregate; for the second record, you enter the data for the second single and the second aggregate (and the second record will read *2 of 2*) (appendix C-3). This helps you keep track of where you are in relation to the large woody debris data being entered.

## Duplicate Records

In order to protect the file linkages and prevent data entry and analysis errors, FBASE does not permit you to enter duplicate FBHEADER or HABITAT records. If you attempt to enter a duplicate habitat unit, for instance, this message is displayed:

### HABITAT Unit Already Exists!

You must correct the number before you can continue. You also cannot enter the same stream ID for different streams or duplicate EPA reach numbers for the same stream in the STREAMS table.

## Maneuvering Among Variables

After typing in a value for a given variable, press <Enter> or arrow-key down to go to the next variable. Use the arrow keys or <Enter> key if moving among variables on a given screen, or use <Page Up> and <Page Down> if moving to a variable on a different screen. For required variables (see appendix D for a list of these variables), you cannot press <Enter> or arrow key down to the other variables until you enter the mandatory data.

## Data Entry Look-Up Tables

While you are entering data, you will often have the choice between typing the value or selecting the value

HABITAT	Ver 98.03b	FISH HABITAT INVENTORY PHYSICAL HABITAT DETAIL	MARCH 26, 1998
---------	------------	---	----------------

HABITAT DATA						
STREAM	STUDY	REACH	TYPE	HAB UNIT	CHAN	SIDE TYPE
Make Selection						
*** Top-of-File		1.	Fish			
ID12345	I97	2.	Riparian		M	0 SPW
ID12345	I97	3.	LWD		M	0 LGR
ID12345	I97				M	0 DMV
ID12345	I97	3	TOP		A	1 DBW
Back Space		↑ ↓	Pg Up	Pg Dn	ENTER	
Total Records: 10			Current: 1			

F1 Help	ESC Quit
------------	-------------

Figure 5—Selecting the fish, riparian, or large woody debris data entry screens from a HABITAT record.

from an associated look-up table. Whenever there is a variable with a range of choices (for example, **Habitat Type**, **Geology**, and so forth), there is an accompanying look-up table that can be accessed by pressing <F9>. When the table appears, you can either arrow-key down to your selection or you can start typing in the value and the table will track it as you type. Then press <Enter> on the table selection to transfer the value to the field for which you are entering the data. **Figure 6** shows the table that is displayed when you press <F9> for **Habitat Type**. As *SPW* was typed, the table scrolled down to that option. Adjacent to each choice is a short description, for example *SPW-Scour-Plunge-LWD Pool*. Selecting values from the table decreases typing errors and incorrect values. If you enter a code that is not in the look-up table, you will receive a message indicating that the code is invalid. For example, if *granite* is typed in for **Geology**, the following message appears after you press <Enter>:

**Data > FBHEADER P\_GEOL GRANITE <not found in table!**

This is because *granite* is not a valid entry for **Geology** and is therefore not in the corresponding look-up table (TABLE1 POPUP table). If you press <Enter>, FBASE will leave the value entered and go to the next variable, so if you get a message like the one above, make sure you re-type the value or make the selection from the table. Appendix D shows which variables can be

selected from a table (also see individual variable descriptions).

For those variables that do not have an associated look-up table, such as a numeric variable that can have almost limitless values, pressing <F9> will result in a description of the type of data you should enter. For example, pressing <F9> for **Survey Date** will result in the following message:

**Enter date of beginning of reach survey (20)**

Depending on the variable, you may also get specific instructions on how to enter the variable. For example, if you press <F9> for **Observer** this message is shown:

**Enter Observer's name (e.g. S.SMITH) (26)**

The number in parentheses in the above examples represents the number of the field in the data structure.

### Data Validation

Some variables have data validation criteria, or constraints. If you enter a value that does not meet the criteria, FBASE displays a message. For example, if you are entering data in meters, and you enter *5000* for **Elevation**, a message is displayed that reads, **Please enter a value <=4500**. You cannot go to the next variable until the elevation is equal to or below *4500*. Data validation helps to prevent common errors, like entering elevation in feet rather than meters. However,

HABITAT	Ver 98.03b	FISH HABITAT INVENTORY	MARCH 26, 1998
		PHYSICAL HABITAT DETAIL	
Study: I97		Stream: ID12345	SOMEWHERE CR
		Reach:	1-C
Habitat Unit #:	1	Habitat Type:	
Channel Code:	M	Habitat Group:	
Side Channel Unit #:	0	[SPW]	Habitat Type
Unit Length:	-9	SPW - Scour-Plunge-LWD Pool	
Unit Avg. Width:	-9.0	SRN - Step Run	
Unit Avg. Depth:	-9.00	STP - Step Pool Complex	
Pocket Pools:	-9	SUA - Scour-Underscour-Artificial Pool	
Avg. Max Depth:	-9.00	SUB - Scour-Underscour-Boulder Pool	
		SUC - Scour-Underscour-Culvert Pool	
		SUO - Scour-Underscour-Other Pool	
		SUR - Scour-Underscour-Bedrock Pool	
		SUT - Scour-Underscour-Tributary Pool	
		Total Records: 49	MORE ↑ ↓
			Screen - 1
F1			ESC
Help			Exit

**Figure 6**—Look-up table for Habitat Type.



since incorrectly entering elevation in feet could still pass validation (if it is under 4500 feet), you must still be aware of these common errors in order to avoid mistakes. See appendix D for the variable validations (or see individual variable descriptions).

## Required Variables

Data for certain variables must be entered in order to make the data useful for analyses—for example **Habitat Length**. If you try to bypass these required variables FBASE will display a message similar to the following:

**This is a required field! Press F9 for table or field description**

Or, if the variable also has a validation rule (as in the case of **Habitat Length**), the message will appear as:

**Please enter a value >=1**

You will not be able to go to the next variable until a value is entered. See appendix D for variables that are required (or see individual variable descriptions).

## Entering Missing Data

Missing data on the field forms are usually indicated by a slash or hyphen (“---”). If the missing value is numeric (such as average depth), enter the default value of -9.9, which represents missing data. If the variable is a character field (such as riparian community code), leave the entry space blank. It is especially important that 0s are not entered for missing variables, since 0 is a value and will be calculated as such in the summary reports.

## Data Entry Variables

The header, habitat, large woody debris, fish, and riparian variables are listed below with instructions on how to enter the data. The name of each variable appears the same as on the data entry screens and is bolded. Refer to the appropriate field forms from the R1/R4 Inventory procedures when you enter the data. You will need “FORM 1 - Header Data” for the header information; “FORM 2 - Habitat Inventory Form” and “FORM 3 - Substrate Composition” to enter the habitat data; “FORM 4 - Large Woody Debris” for the large woody debris data; “FORM 6 - Fish Data” to enter the fish variables; and “FORM 2 - Habitat Inventory Form” for the riparian data. The first four variables on the fish field form (“Habitat Unit #,” “Habitat Type,” “Habitat Length,” and “Dist. Betw. Units”) are references used in data collection and are not entered into FBASE. Appendix C shows examples of completed FBHEADER (C-1), HABITAT (C-2), LWD (C-3), FISH (C-4), and RIPARIAN (C-5) records; these are for

illustration purposes only and do not contain real data.

## Header (FBHEADER) Variables

**Stream ID**—Type in the stream ID from the header form and press <Enter>. The STREAMS table appears with a list of all streams in Idaho and Montana that occur in IRIS (Idaho Rivers and Streams Information System) and MRIS (Montana Rivers and Streams Information System) (see Overton and others 1997 for more information on IRIS and MRIS). If the stream ID that you typed exists in the table, the table is now pointing to a STREAMS record with that ID (fig. 7). Check to make sure that the stream name is correct. For Idaho streams, there may be multiple records with the same stream name and ID but with different EPA reach boundaries. Therefore, you must next find the record with the EPA reach boundaries that encompass the survey reach (these should be on the header form; if not, consult a map). **LOW BOUNDARY** represents the lower EPA reach boundary. If there is only one record with the correct stream name and ID, then there is only one EPA reach and *MOUTH* is displayed under **LOW BOUNDARY**. For example, figure 7 shows a single record for *LODGEPOLE CR* with the stream ID of *ID2097*. If there is more than one record with the same stream name and stream ID, then there is more than one EPA reach, with the first EPA reach lower boundary being *MOUTH* and the next one the name of a tributary. The last record of a given group with matching stream names and IDs will have the name of a tributary as the EPA reach lower boundary and *HEADWATERS* as the upper boundary (not visible on this screen). Note that the information seen here is only a part of the data available for the STREAMS record. To view the entire record, including data such as the EPA reach number, refer to “Section VI. MAINTENANCE,” “Editing a Record in a Look-up Table” (also see fig. 19).

Once you identify the correct record, highlight it with the arrow keys and press <Enter>. Note that while Idaho streams each have a unique stream ID, Montana streams have a unique stream ID for EVERY EPA reach within a given stream. Therefore, for Montana streams, you just have to look for the correct stream name and ID without regard to the EPA reach.

If the stream ID does not exist in the STREAMS table, you must add a STREAMS record by pressing <F3> while in the STREAMS table. You now have a blank record in which to enter pertinent stream data (fig. 8). The *ID* displayed for **Stream ID** and **State** is a default; type over them if they do not apply. Also, you do not need to add a **Stream Number**.

STREAM and RIVERS

STREAM	ST	STREAM ID	TRIBUTARY OF	LOW BOUNDARY
LODGE CR	MT	FG0050000	MILK R	UNNAMED
LODGE CR	MT	FG0060000	MILK R	CREEDMAN COUL
LODGE GRASS CR	MT	IP0100000	LITTLE BIGHORN	MOUTH
LODGEPOLE CR	ID	ID2097	CHAMBERLAIN CR	MOUTH
LODGEPOLE CR	ID	ID30117	SALMON R, S FK	MOUTH
LODGEPOLE CR	MT	EE0350000	MUSSELSHELL R	MOUTH
LODGEPOLE CR	MT	EE0370000	MUSSELSHELL R	LODGEPOLE CR,
Back Space	↑ ↓		Pg Up Pg Dn	ENTER
Total Records: 13,467		Current: 6,778		

F1  
Help

F3  
Add

F4  
Edit

F5  
Delete

ENTER  
Select

ESC  
Exit

Figure 7—Selecting a record from the STREAMS look-up table.

STREAMS and RIVERS TABLE

STREAM	Stream ID: ID	BOUNDARY
*** Top-of- ABBOT CR	Stream Name:	
ACKLEY LAKE	Acronym:	
ACORN CR	Basin Name:	
ADAIR CR	Tributary of:	INTERIOR
Back Space	Low Boundary:	
Total Recor	High Boundary:	
	State: ID	
	Stream Number: 0	ENTER
	EPA Reach:	

Pg Dn  
to Save

ESC  
Cancel

Figure 8—Blank record for adding stream data.

If you enter a new stream name for which there is already a stream ID in the STREAMS table, you will get the following error message:

**Mismatch STREAM ID/STREAM NAME on STREAMS file!**

The record you added is not saved because the stream ID must be unique for each stream.

Similarly, you cannot enter a STREAMS record if a record already exists with the same stream ID and EPA reach number. If you do, this message appears when you try to save the record:

**Duplicate STREAM ID/EPA REACH on STREAMS file!**

You can also add STREAMS records through **Maintenance** in the main menu (refer to “Section VI. MAINTENANCE,” “Adding a Record to a Look-up Table,” for more information). Refer to appendix B and the R1/R4 Inventory procedures for more information on what data to enter in the record.

After you have entered the above information, press <Enter> or <Page Down> to save the record in the STREAMS table. When the record is saved, the following message appears:

**Stream ID has been changed...is this O.K.?**

If you enter Y, the STREAMS table will now contain the added record. Press <Enter> to select the stream from the STREAMS table. The data from the added record are now in the FBHEADER record. If you select the wrong STREAMS record, re-enter the stream ID in the FBHEADER record and then select the correct record from the STREAMS table.

**Stream**—The stream name is added to the FBHEADER record automatically when you select a record from the STREAMS table (see “Stream ID” above).

**Trib of**—The tributary into which the stream flows is also automatically added to the FBHEADER record when you choose a record from the STREAMS table (see “Stream ID” above).

**Study**—The stream study is a character (for instance, I for Inventory, M for Monitoring, and so forth), followed by the last two numbers in the year (such as 98). An inventory stream surveyed in 1998 would therefore have a study of I98. This is a required entry

**Survey Reach No.**—Enter the number of the survey reach for which you are entering data. This is a required field and you must enter a number before you can continue.

**Type**—Enter the reach type (A, B, or C) or select it from the look-up table. This is a required field.

**Survey Reach Lower Boundary, Survey Reach Upper Boundary**—The survey reach boundaries are required fields since they are locators for the survey reach. If the description of either boundary on the header form is too long to fit in the space provided (48 characters), you must shorten it so that it fits. Do this by gleaning the most important information from the description that will best serve to locate the reach in the field. If the boundary is a named tributary, the tributary name is sufficient. If the reach starts at the mouth, *MOUTH* is sufficient as the lower boundary. If the upper boundary of the reach is the headwaters, you must further describe this location if not done so on the header form.

**Code: (Forest), Forest**—When you type in the appropriate Forest code and press <Enter> a look-up table is shown with the codes and the corresponding Forest names. If the table is not pointing to the desired Forest code/Forest name, arrow-key up or down to find the correct record. The table is in ascending order by State, Forest code, and Region. When you locate the correct record, press <Enter>. The Forest name will then be added to the FBHEADER record along with the code.

If you entered the incorrect code and/or chose the wrong record from the FORESTS table, simply enter a different Forest code and the FORESTS table is displayed again, allowing you to choose a different record from the table.

If data were not collected on a National Forest (for example, on Bureau of Land Management land), you can add a record to the Forest look-up table that will reflect the appropriate code and name (see “Section VI, MAINTENANCE,” “Adding a Record to a Look-up Tables”). For instance, the State BLM office code could substitute for a “Region Code,” and the “Forest Name” and “Forest Code” could be the Resource Area name and code.

**Code: (District), District**—Type the District code and press <Enter>. A look-up table is displayed with the District codes and the corresponding District names for the previously identified Forest. Select the record by pressing <Enter>. The District code and name are added to the FBHEADER record from the table.

If you entered an incorrect code and/or chose the wrong record from the DISTRCTS table, simply enter a different District code and the DISTRCTS table is shown again, allowing you to choose a different record from the table.

**Code: (Administering Forest), Adm For**—Type the code for the Administering Forest. Press <Enter> to bring up the FORESTS table and select the record with the appropriate Forest code/Forest name

combination. This is the same table as that used for the Forest code and name. See “Code: (Forest), Forest:” above for further directions.

**Code: (Administering District), Adm Dist**—Type the code for the Administering District. Press <Enter> to bring up the DISTRCTS table and select the record with the appropriate District code/District name combination. This is the same table that is used for the District code and name. See “Code: (District), District:” above for further directions.

#### **Any Non-USFS Inclusions? (Y/N)**

Enter a *Y* (Yes) or *N* (No) in this space. The default is *N* so if *N* is correct, simply press <Enter> here.

**Owner**—If you answered *Y* to **Any Non-USFS Inclusions?** above, enter the owner or manager of the inclusion here (for example, *BLM*).

**Ecoregion Bailey**—Enter the Bailey ecoregion code or make a selection from the look-up table.

**Ecoregion Omernik**—Enter the Omernik ecoregion code or make a selection from the look-up table.

**Geology**—Enter the geology of the reach or make a selection from the look-up table.

**Sub-Geology**—Enter the sub-geology of the reach or make a selection from the look-up table.

**EPA Reach No**—The EPA reach number is added to the FBHEADER record automatically when a STREAMS record is selected from the STREAMS table (see “Stream ID” above). If the EPA reach number is incorrect, see “Stream ID.”

**EPA Reach Lower Boundary; EPA Reach Upper Boundary**—The EPA reach lower and upper boundaries are added to the FBHEADER record automatically when a STREAMS record is selected from the STREAMS table (see “Stream ID” above). If the EPA reach lower and/or upper boundary are incorrect, see “Stream ID” above.

**Legal Location**—Enter the township, range, and section number in the space provided. If any of the numbers is a single digit, put a *0* first followed by the number (such as *S02*).

**Base Quad**—Enter the name of the base quad that covers the start of the reach.

**Survey Lat; Survey Long**—Enter the starting latitude and longitude for the reach if available. Otherwise, leave the space blank.

**Survey Date**—Enter the starting date of the reach survey in *MM/DD/YY* format. The numbers for the year (*YY*) will automatically be changed to the full year (for example, if you enter *98* it is changed to *1998*).

**Observer; Recorder**—Enter the name of the observer and recorder in the spaces provided. Use the format *X.XXXX*, where *X* is the first initial followed by a period, and *XXXX* is the last name (for example, *S.SMITH*).

**Diver 1; Diver 2**—Enter the names of the snorkelers in the spaces provided, in the format *X.XXXX*, where *X* is the first initial followed by a period, and *XXXX* is the last name (for example, *S.SMITH*). Leave this blank if there are no snorkeling data. If there was only one snorkeler, enter the name as “Diver 1.”

**Meas. Units**—Enter an *M* (metric) or *E* (English) for the measurement units used in the inventory or select your choice from the look-up table. This is a required entry.

**Elevation**—Enter the starting elevation of the reach, making sure it corresponds to the correct measurement unit (for instance, if metric is the measurement unit, make sure elevation is in meters, not feet).

If the metric system is used, you must enter a value less than or equal to *4500*; if the English system is used, the elevation must be less than or equal to *14000*.

**Map Gradient**—Enter the map gradient for the reach. This is a required entry, and the value you enter must be less than or equal to *40.0*.

**Obs. Gradient**—Enter the average observed (field) gradient for the reach. The value you enter must be less than or equal to *40.0*.

**Channel Type**—Enter the Rosgen channel type for the reach (such as *C1*) or make the selection from the look-up table. Leave this blank if the Rosgen channel type was not collected in the field (do not put the reach type in here and do not guess what the channel type is based on the reach type).

**Cover Group**—Enter the dominant cover group for the reach (*MEADOW*, *WOODED*, or *UNKNOWN*) or make the selection from the look-up table. You must enter one of the choices listed.

**Discharge**—Enter the discharge for the reach. The value you enter must be less than or equal to *850*.

**Confinement**—Enter the overall confinement for the reach (*U* for unconfined, *M* for moderately confined, or *C* for confined) or make a selection from the look-up table. This is a required variable and cannot be left blank.

**Weather**—Enter the dominant weather pattern for the reach inventory. It is easier to choose this from the look-up table since the choices are abbreviated and specific.

**Wilderness: (Y/N)**—Enter a *Y* (yes) or *N* (no). The default is *N*, so if *N* is correct press <Enter>.

**Header Var 1**—This is an optional variable that does not appear on the header field form. The purpose of this variable is to allow data collection for a reach-level variable of interest that is not part of the standard inventory procedures. FBASE then provides a space to enter the data so that they are part of the database. An example might be valley form. If collected, the data for the variable will most likely be located on the back of the header form and should be labeled. This is a character field rather than numeric. If datum is present, enter it for this variable here, and put the variable description in the comments (for instance, *Header Var 1 is valley form*). Leave this field blank if the datum is not collected.

### *Habitat (HABITAT) Variables*

**Habitat Unit #**—FBASE assumes that the first habitat unit is 1, the next one you enter is 2, and so on. If the number displayed is correct, just press <Enter>. If not, such as when there are side channels or adjacent units and the main channel unit stays the same, or when you are entering sub-sampled data that are nonconsecutive, type the correct number. The habitat unit number always corresponds to the main channel unit number, regardless of whether or not there are associated side channel or adjacent units. You must enter a unit number.

**Channel Code**—Press <Enter> if the unit is a main channel unit (default is *M*), or enter an *S* (side channel) or *A* (adjacent unit) (or select from the look-up table). The channel code cannot be blank.

**Side Channel Unit #**—Press <Enter> if the side channel unit is 0 (in other words, the unit is a main channel unit), or enter the appropriate number if the unit is a side channel or adjacent unit. This variable cannot be blank.

**Habitat Type**—Enter the habitat type for the habitat unit or select the type from the look-up table.

**Habitat Group**—If you entered a habitat type, the correct habitat group will be added automatically. If the habitat type was not collected but the habitat group was, enter the habitat group or select it from the look-up table. Also, if you change the habitat type, the habitat group will be adjusted automatically.

If you change the habitat group so that it does not match the habitat type (for example, the habitat type is an *SLM* and you change the group to *TUR* from *SLA*), FBASE will change it back to the correct group when the record is saved.

**Velocity Class**—If you entered a habitat type or habitat group, the velocity class (*FAST* or *SLOW*) will be added automatically. If you did not enter the type or group, enter the appropriate velocity class or select it

from the look-up table. At a minimum, there must be a velocity class.

If you change the velocity class so that it does not match the habitat type and/or group, you will get a message saying the following:

#### **FAST Habitat Type did NOT match!**

This indicates that you improperly changed the class from *SLOW* to *FAST*. FBASE will correct the velocity class when the record is saved.

**Unit Length**—Enter the length of the habitat unit. You must enter this variable, and the number you enter must be greater than or equal to 1.0.

**Unit Avg. Width**—Enter the width of the unit.

**Unit Avg. Depth**—Enter the average depth of the unit. If the value is in meters, it must be less than or equal to 3.00; if in feet, it must be less than or equal to 10.00.

**Pocket Pools**—If the unit is a fast-water unit, enter the number of pocket pools (even if the number is 0). If the unit is a slow-water unit, you will not be able to enter this variable (or if the habitat type, group, and/or class are changed to represent a slow-water unit, this variable will automatically be changed to the default value of -99).

**Avg. Max Depth**—Enter the average maximum depth of the pocket pools. If “Pocket Pools:” (above) was 0 or empty (-99), this variable will automatically be skipped.

If the average max depth of pocket pools is in meters, the value entered must be less than or equal to 3.00; if in feet, it must be less than or equal to 10.00.

**Max Depth**—Enter the maximum depth of the unit if it is a slow-water unit. If it is a fast-water unit, this variable will automatically be skipped. The maximum depth must be greater than the unit average depth. Otherwise, you will get a message and will not be able to go to the next variable.

If the max depth is in meters, the value entered must be less than or equal to 5.00; if in feet, it must be less than or equal to 15.00.

**Crest Depth**—If the unit is a slow-water unit, enter the crest depth. As with the max depth, this variable will be skipped if the unit is a fast-water unit. The crest depth must be less than the max depth.

If the crest depth is in meters, the value entered must be less than or equal to 3.00; if in feet, it must be less than or equal to 10.00.

**Step Pools**—If the habitat type is an *STP* (step pool complex), enter the number of step pools here. If the unit is anything but an *STP*, this variable is skipped.

**STP Avg. Max Depth**—Enter the average maximum depth of the step pools in the *STP*. If the habitat

type is not an *STP*, or “Step Pools” is 0 (see above), this variable is skipped.

If the average maximum depth of the *STP* is in meters, the value entered must be less than or equal to 3.00; if in feet, it must be less than or equal to 10.00.

**Surface Fines**—Enter the percent surface fines (note that this is a separate variable from substrate fines). If not collected, enter the -99 value. The value entered must be less than or equal to 100.

**Substrate Data?**—If there are substrate data, enter *Y*. If not, press <Enter> for the default value (*N*).

If you enter *Y*, the following message is displayed:

**Press Y to enter Percents or N for Counts**

Type *Y* if the substrate data are in percents, or *N* if they are counts.

**Count (Fines:, Sm Gravel:, Gravel:, Sm Cobble:, Cobble:, Sm Boulder:, Boulder:, Bedrock:)**—Enter the counts for each of the substrate classes listed above (see “FORM 3 - Substrate Composition” from the R1/R4 Inventory procedures).

If counts are entered, percents are automatically calculated (see “Percent” below). Be sure to enter a 0 if the count for a substrate class is 0.

**Percent (Fines:, Sm Gravel:, Gravel:, Sm Cobble:, Cobble:, Sm Boulder:, Boulder:, Bedrock:)**—Enter the percent of each substrate class for the unit but don’t enter percents if counts were collected (see “FORM 3 - Substrate Composition” from the R1/R4 Inventory procedures).

Be sure to enter a 0 if the percent of a substrate class is 0. The values entered must be less than or equal to 100.

**Left Bank Length:, Right Bank Length**—Enter the length of the left and right banks. If these variables were not collected, enter the default (-9.9); DO NOT enter the unit length as a substitute for the bank lengths.

After you enter data for the left and right bank lengths, this message appears:

**If the bank stability data are in percents, type Y; if they are in lengths, type N.**

**Length Stable Left Bank:, Length Stable Right Bank**—If you typed *N* above, you can now enter the length of the stable left and right banks. You can only enter bank stability data for the bank(s) that have a corresponding length since the amount of stable banks is determined from the bank lengths. Therefore, if only one bank length is entered, you can enter the stability for that bank only. If neither bank lengths are entered, you cannot enter the length of the stable banks. Also, the length of stable bank must be less than or equal to

the respective bank lengths. Enter the default (-9.9) if any data for length stable banks are missing.

When the lengths of stable left and right bank are entered, the percent is automatically calculated. If you change the length value, a new percent is calculated.

**Length Undercut Left Bank:, Length Undercut Right Bank**—Enter the length of undercut on the left and right banks. The restrictions for entering undercut bank lengths are the same as for bank stability (see “Length Stable Left Bank:, Length Stable Right Bank” above for more information). Enter the default (-9.9) if the length of undercut banks was not collected.

**Percent Stable Left Bank:, Percent Stable Right Bank**—If you typed *Y* to enter percents, you can now enter the percent of stable banks. As with the other bank data, if bank lengths were not entered, you cannot enter the percent stable banks (or if only one bank length was entered, you can only enter the percent stable bank for that bank). The value entered must also be less than or equal to 100. Enter the default (-99) if any data for percent stable banks are missing.

Percent stable left and right banks are generated automatically if the lengths of stable banks are entered.

**Percent Undercut Left Bank:, Percent Undercut Right Bank**—Enter the percent of undercut on the left and right banks. The restrictions for entering percent undercut bank are the same as for bank stability (see “Percent Stable Left Bank:, Percent Stable Right Bank” above for more information). The value entered must also be less than or equal to 100. Enter the default (-99) if the percent of undercut banks was not collected.

Percent undercut of the left and right banks is generated automatically if the length of the undercut on the banks are entered.

**Left Wetted Channel Shape:, Right Wetted Channel Shape**—Enter the left and right wetted channel shapes or select them from the look-up table.

**Water Temp.**—Enter the water temperature for the unit. If the measurement unit being used is metric, be sure to enter the temperature in Celsius (or Fahrenheit if using the English system). You must enter a value less than 38.0 if the temperature is in Celsius, or equal to or less than 100.0 if in Fahrenheit.

**Air Temp.**—Enter the air temperature for the unit. If the measurement unit being used is metric, be sure to enter the temperature in Celsius (or Fahrenheit if using the English system). You must enter a value less than 50.0 if the temperature is in Celsius, or equal to or less than 110.0 if in Fahrenheit.

**Time Measured**—Enter the time that the water and air temperatures were taken. There is no need to enter this unless the water or air temperatures were collected. This should be entered in military format (for example, 13:05).

**LWD Singles, Aggregates, Root Wads**—Enter the number of large woody debris singles, aggregates, and root wads for the unit, even if the number is 0. Only enter the default (-99) if the variable was not collected for the unit.

**Unit Lat., Unit Long**—Enter the starting latitude and longitude for the unit if collected (otherwise, leave blank). Enter these in the format *38 07 30*, where *30* is degrees, *07* is minutes, and *30* is seconds.

**Physical Var 1, Physical Var 2**—“Var 1” is a character field and “Var 2” is a numeric field. If present, enter the data for this variable here, and put the variable description in the header comments so that you do not have to enter this comment for every habitat unit (for instance, *Physical Var 1 is pool quality rating*). Leave this field blank if not collected. See “Header Var 1” under “Header (FBHEADER) Variables” above for more information.

### *Large Woody Debris (LWD) Variables*

**Singles Number**—The number of large woody debris singles is automatically carried over from the count in the HABITAT record (see “LWD Singles” under “Habitat (HABITAT) Variables” above). Therefore, you cannot enter or change this value here. If this value is incorrect (if the count was entered or recorded wrong on the habitat form), see “Editing Records” below.

**Length**—Enter the length of the single piece of large woody debris. If there is more than one single, the next length is entered in the second LWD record for the unit, and so on.

**Diameter**—Enter the diameter of the single piece of large woody debris. If there is more than one single, the next diameter is entered in the second LWD record for the unit, and so on.

**% Submerged**—Enter the percent of the single piece of large woody debris that is submerged. If there is more than one single, the next percent submerged is entered in the second LWD record for the unit, and so on.

**Aggregate**—Like “Singles Number” above, the number of aggregates is carried over automatically from the HABITAT record large woody debris count. Therefore, it cannot be entered or changed here. If this value is incorrect, see “Editing Records” below.

**Num Pieces**—Enter the number of pieces in the aggregate. If there is more than one aggregate, the number of pieces for the second aggregate is entered in the second LWD record for the habitat unit, and so on.

**LWD Var1**—This is a numeric field. If present, enter the data for this variable here, and put the variable description in the header comments (for instance, *LWD Var1 is count of small woody debris pieces*). Leave this field blank if not collected. See “Header Var 1” under “Header (FBHEADER) Variables” above for more information.

### *Fish (FISH) Variables*

**Dive Date**—Enter the dive date in the *MM/DD/YY* format. FBASE will automatically change the year to the format *YYYY* (such as *1998*).

**Water Temp.**—Enter the water temperature for the unit (labeled “Dive Water Temp” on the field form). Enter the temperature in Celsius if your measurement units are in metric, or Fahrenheit if they are in English. You must enter a value less than *38.0* in Celsius or equal to or less than *100.0* in Fahrenheit. If this value is not on the data sheet, enter the default value (-9.9). Do not substitute the water temperature in the habitat data for that used here.

**Air Temp.**—Enter the air temperature for the unit (labeled “Dive Air Temp” on the field form). Enter the temperature in Celsius if your measurement units are in metric, or Fahrenheit if they are in English. You must enter a value less than *50.0* if in Celsius or equal to or less than *110.0* in Fahrenheit. If this value is not on the data sheet, enter the default value (-9.9). Do not substitute the air temperature in the habitat data for that used here.

**Time**—Enter the time that the water and air temperatures were taken (labeled “Dive Time” on the field form). There is no need to enter this unless the water or air temperatures were collected. This should be entered in military format (for example, 14:45). If this variable was not collected, leave it blank. Do not substitute the time in the habitat data for that used here.

**# of Divers**—Enter the number of divers that snorkeled the unit (*1* or *2*). To determine if the number of divers is one or two, look at the field form next to “COUNTS” where there are columns for “D1” and “D2.” If both columns have data, enter 2. If one column is blank, enter 1.

**Length**—Enter the length of the unit (called “DIVE LENGTH” on the field form). This is a required variable and cannot be skipped. Do not enter the length of



the habitat unit from the habitat field form as a substitute for this variable.

**Average Width**—Enter the average width for the unit (called “DIVE AVG. WIDTH” on the field form). This is a required variable and cannot be skipped. Do not enter the width of the habitat unit from the habitat field form as a substitute for this variable.

**Average Depth**—Enter the average depth for the unit (called “DIVE AVG. DEPTH” on the field form). This is a required variable and cannot be skipped. DO NOT enter the average depth of the habitat unit from the habitat field form as a substitute for this variable. Enter a value less than or equal to 3.00 if in meters, or 10.00 if in feet.

**Maximum Depth**—Enter the maximum depth (called “Dive Max Depth” on the field form) if the unit is a slow-water unit. If it is a fast-water unit and you enter a maximum depth, it will automatically be changed back to -9.99. The maximum depth must be greater than the average depth. Otherwise, you will get an error message and will not be able to go to the next variable. Enter a value less than or equal to 5.00 if in meters, or 15.00 if in feet.

**Percent Undercut Bank;, Percent Overhead Cover;, Percent Submerged Cover;, Percent Large Substrate**—Enter the percent undercut bank, overhead cover, submerged cover, and large substrate for the unit. If no data exist for any of these variables, enter the default (-99). The values entered must be less than or equal to 100.

**Chinook - (Age 0+;, Age 1+;, Adult:), Steelhead - (Age 1+;, Age 2+;, Age 3+:), Rainbow - (>250 mm:), Cutthroat - (<100 mm:;, 100-200 mm:;, 200-300 mm:;, >300 mm:), Bull Trout - (<100 mm:;, 100-200 mm:;, 200-300 mm:;, 300-400 mm:;, 400-500 mm:;, >500 mm:), Brook Trout - (<100 mm:;, 100-200 mm:;, 200-300 mm:;, >300 mm:), Brown Trout - (<100 mm:;, 100-200 mm:;, 200-300 mm:;, 300-400 mm:;, >400 mm:)**—Enter the fish counts for each species and age class. If there was more than one diver, add the numbers for the two columns (“D1” and “D2”) for each age class on the field form and enter that total number for each variable. Enter the default of 0 if no fish in the specific age class were observed.

**Trout young of the year? (Y/N)**—Enter Y or N (default) as to whether there were trout young of the year in the unit (a “+” next to “YOY < 70” on the field form indicates that young of the year were seen).

**Fish Var 1**—This is a numeric field. If present, enter the data for this variable here, and put the variable description in the header comments (for instance, *Fish Var 1 is count of tailed frogs for the unit*). Leave this field blank if not collected. See “Header

Var 1” under “Header (FBHEADER) Variables” above for more information.

## Riparian (RIPARIAN) Variables

**Left Riparian Type 1;, Right Riparian Type 1;, Left Riparian Type 2;, Right Riparian Type 2**—Enter the dominant (“Type 1”) and sub-dominant (“Type 2”) riparian community type codes for the left and right banks (labeled “RCT1 (L),” “RCT1 (R),” “RCT2 (L)” and “RCT2 (R)” on the field form). Enter the codes manually or select them from the look-up table (press <F9>).

**Riparian VAR1**—This is a character field. If present, enter the data for this variable here, and put the variable description in the header comments (for instance, *Riparian Var1 is dominant riparian species*). Leave this field blank if not collected. See “Header Var 1” under “Header (FBHEADER) Variables” above for more information.

## Entering Comments

Comments may be entered in a given record in any of the five data tables by pressing <F2> while anywhere in the record. When you press <F2> you will notice a box in which you enter the appropriate comments for the reach (while in the FBHEADER table) or habitat unit (while in the HABITAT, LWD, FISH or RIPARIAN table). **Figure 9** shows an example of comments entered for a habitat unit in the HABITAT table. You are not limited in the number of words you may enter in this space. At the top of the comment box are some word-processing options, such as <Ctrl-Y> to delete a line, that you may find useful (fig. 9). When you have finished entering the comments, press <F2> again to get back to the data entry screen. The comments will be saved when you save the record. If you are editing comments in a record after it has been saved, see “Editing Records” below.

## Saving Records

When you have finished entering data for a given record, you can save the record by pressing <Enter> on the last variable or pressing <Page Down> from the last screen. If you are at the end of the record it is easiest to hit <Enter>, but if you are at the beginning or middle of the record, it is easier to use the <Page Down>. If you escape (<Esc>) while in the record, the following message will appear:

**Are you sure you want to exit without saving record?(Y/N)**

If you press Y, any data added or changed in that record are not saved. If you press N, the prompt will go

```

F2 =SAVE EDITING      ↑ = UP ONE LINE      ^PGUP =BEG.OF MEMO
ESC =ABORT EDITING   ↓ = DOWN ONE LINE   ^PGDN =END OF MEMO
^Y =DELE CURRENT LINE  → = RIGHT ONE CHAR  HOME =BEG. OF CURR. LINE
^T =DELE WORD RIGHT   = LEFT ONE CHAR    END =END OF CURR. LINE

```

FBASE PHYSICAL HABITAT Record

1 LWD single artificially placed in stream channel. The single forming the pool appears to have fallen in naturally. Old beaver activity present.

F1 Help F2 Save

ESC Cancel

Figure 9—Adding comments for a habitat unit.

ADD\_LWD\_PKG Ver 98.03b

FISH HABITAT INVENTORY  
LARGE WOODY DEBRIS DATA

MARCH 26, 1998

Stream: SOMEWHERE CR ID12345

Study: I97 Reach No. 1-C

Habitat Unit: 1 Channel Code: M Side Unit: 0 Habitat Type: SPW

2 of 2 Sin

Survey Reach:	1	1
Habitat Unit:	3	
Channel Code:	M	-9
Side Unit:	0	0.0

F2 Add Comments

Pg Dn to Save

F9 Table

ESC Cancel

Figure 10—Pop-up box to jump to next record for data entry.

back to the data entry screen and you can then press <Page Down> through the screens to save the record.

If you press <Esc> while entering large woody debris data in the LWD table, you will get the following message:

**Not finished!, are you sure you want to abort?  
(Y/N)**

Entering *Y* at this time will result in not saving the record. However, only the current record is not saved when you press <Esc>; records already entered for single piece dimensions and number of aggregate pieces are not affected. Entering *N* will bring up the data entry screen again.

## Adding More Records

After you save a given FBHEADER or HABITAT record, you can add the next record by pressing <F3>.

After you save an LWD, FISH, or RIPARIAN record, a dialog box will appear prompting you to enter the number of the next habitat unit that contains the data you are entering (fig. 10). This saves time in that you do not have to go back to the HABITAT record list to find the next record that has large woody debris, fish, or riparian data. The dialog box asks for the following information: **Survey Reach, Habitat Unit, Channel Code, and Side Unit**. Enter this information for the next habitat unit containing the data (refer to the R1/R4 Inventory field forms). **Figure 10** shows an example of the information entered into this box.

If you enter the above information but no habitat data exist for the unit given, you will get this message:

**HABITAT data could not be found. Please enter HABITAT data before re-try!**

If the habitat data do not exist for the unit, you cannot enter the large woody debris, fish, or riparian data for that unit.

If the dialog box is displayed and you do not want to enter more data (or you are finished for that reach), press <Esc> to go to the previous screen to enter the fish, riparian, or large woody debris data. From here, you can either enter data for any of the three choices, or press <Esc> a second time to go to the **HEADER DATA** screen.

## Editing Records

While you are entering data in a record, you can edit the data by simply going to the variable you wish to edit (using the arrow keys or <Page Up> and <Page Down>), making the edit, and pressing <Enter> or the down arrow key. If you are entering a variable for which FBASE performs a calculation (such as length of stable bank or substrate counts), changing the value

of the variable will prompt FBASE to change the result of the calculation as well.

To edit an FBHEADER record after it has been saved, press <F4> while it is highlighted on the **HEADER DATA** screen (fig. 3). Go to the desired record for editing by using the arrow keys or typing the stream name so that the pointer follows what you are typing down to the correct stream. Then arrow-key to the appropriate reach. To edit a HABITAT record, press <Enter> on the appropriate FBHEADER record and then <F4> on the desired HABITAT record on the **HABITAT DATA** screen (fig. 4).

To edit an LWD, FISH, or RIPARIAN record after it has been saved, select the FBHEADER record that contains the survey reach of interest, and then select the habitat unit that has the related data that you would like to edit. Choose **1. Fish, 2. Riparian, or 3. LWD** (fig. 5) by pressing the associated number. The fish or riparian data can now be edited.

If you are editing an LWD record, you will see a list of records with large woody debris information for that unit (fig. 11). Go to the LWD record you want to edit (if there is more than one) and press <F4>. Now you can edit the dimensions and percent submerged for the single, or the number of pieces for the aggregate. If you need to edit the number of singles or aggregates, and the LWD data have not already been entered, make the edit to the large woody debris counts in the HABITAT record. If the LWD have already been entered, make the edit in the LWD table by adding a record (<F3>) or deleting an existing record (<F5>). This change will automatically be reflected in the corresponding HABITAT record. For instance, if you enter dimensions for an additional large woody debris single, the single count will be adjusted in the HABITAT record.

If you make a change to the large woody debris counts in the HABITAT record, you will get a message similar to the following:

**SINGLES of 2 has been changed to 1...if LWD file is being used with counts, they will be put out of balance!**

This message serves as a warning that you have entered large woody debris data in the LWD table for two singles, and then changed the counts in the HABITAT table from two singles to one, so the records no longer match each other and the link is disrupted. That is why the data should be edited in the LWD table. This message will not appear if data have not yet been entered in the LWD table for that reach.

To save changes made in any of the data table records, press <Page Down> through the entire record. If you press <Esc> instead of <Page Down>, you will get the following message:

**Are you sure you want to exit without saving record?(Y/N)**

If you press *Y*, any data added or changed in that record are not saved. If you press *N*, the prompt will go back to the data entry screen and you can then press <Page Down> through the screens to save the record.

To edit comments (or to add comments to a previously entered record), press <F2> while in the record and edit or add the comments. Press <F2> again to go to the data entry screen, then press <Page Down> to save the record.

**Editing Key Fields**

Certain key fields exist in each FBHEADER and HABITAT record that, if changed, are also changed in the other records to which they are linked (remember, the FBHEADER table sets the stage for links to the HABITAT table, which is linked to the LWD, RIPARIAN, and FISH tables). In order to make sure that the links are maintained, any changes made in these key fields are automatically changed in the associated records in the HABITAT, LWD, RIPARIAN, and FISH tables.

The key fields, followed by their variable names in parentheses, found in the FBHEADER table include: STREAM\_ID (**Stream ID**), STUDY (**Study**), SURV\_REACH (**Survey Reach No.**), and REACH\_TYPE (**Type**).

Once a change to a key variable is made in the header (for example, changing the study from *I97* to *I98*) and the FBHEADER record is saved with the changes, a message flashes across the screen, stating:

**Stream change being updated in ancillary file habitat**

(A similar message is stated for the other ancillary files as well). These changes only have to be made in the FBHEADER table, saving time and preserving data integrity.

The key fields, followed by their variable names in parentheses, contained in the HABITAT table include: HAB\_UNIT (**Habitat Unit #**), CHAN\_CODE (**Channel Code**), SIDE\_UNIT (**Side Channel Unit #**), HAB\_TYPE (**Habitat Type**), HAB\_GRP (**Habitat Group**), and HAB\_CLS (**Velocity Class**).

The key variables listed above cannot be changed in the LWD, RIPARIAN, and FISH tables. The change must be made in the HABITAT table, whereupon the other tables are automatically updated, thus maintaining the links. When a change to a key habitat variable is made (such as changing the habitat type from an *SLM* to an *SLO*), and you attempt to save the record, a message is displayed on the screen, asking the following:

**Linkage key has been altered, update ALL linked data NOW (Y/N)?**

```

LWD                Ver 98.03b                FISH HABITAT INVENTORY                MARCH 26, 1998
                LARGE WOODY DEBRIS

Stream: SOMEWHERE CR                ID12345
Study: I97                Reach No.    1-C
Habitat Unit:    1 Channel Code: M Side Unit:    0 Habitat Type: SPW

                LARGE WOODY DEBRIS
SINGLE LENGTH DIA. AGG PIECES WADS
FOR ▶ *** Top-of-File ***
      2    4.2    0.14    1    2    1
      2    3.1    0.11    1    -9    1
*** End-of-File ***
Back Space    ↑ ↓    Pg Up    Pg Dn    ENTER
Total Records: 2    Current: 1

F1    F3    F4 or ENTER    F5    ESC
Help  Add  Edit    Delete  Exit
  
```

Figure 11—LARGE WOODY DEBRIS screen showing LWD records.

If you enter an *N*, the data entry screen for the HABITAT record reappears. The change you made is still there, but you must answer *Y* to the above question in order to save the record and update the change in the other tables. Even if there are no data in the other tables, you will still get this message and must answer *Y* to institute the change in the HABITAT record.

It is important not to make changes to the data for these key variables in other database software, such as dBASE. If this is done, the links cannot be maintained and the result is a corrupt database. You should also make a backup of your data before you make profound changes to the data (see "Section VIII. SYSTEM," "Backing Up Your Data").

## Editing Data in Software Other than FBASE

Editing raw data in software other than FBASE is not recommended for several reasons. First, changes to raw data should be made in the same place the data were entered; otherwise changes may be made in one place and not changed where the original data are kept. Second, links are maintained in FBASE that are not maintained if key data are changed in other software. For instance, if the stream ID is changed in the FBHEADER table, but not changed in the ancillary files, the links that have been established in FBASE will be corrupted. Third, not all other software has the same file structure as FBASE, increasing the chance for data corruption. For instance, if changes are made to comments in dBASE rather than FBASE, you will find that the data have been corrupted when you try to access them in FBASE. This will not be the case with all other software, but it is often hard to anticipate the results of manipulating data in other software. Finally, editing data in other software will increase the chance of data errors because the data validity checks that are present in FBASE do not occur elsewhere (unless programmed). There are really no good reasons to edit FBASE data elsewhere, especially since it is easy and efficient to do in FBASE. There are many good reasons to use the data in other programs, however, if more analyses (such as spatial analysis) are desired.

## Data Record Indexing

FBASE uses indexes to display the data in an organized manner. For example, the HABITAT table is indexed on the fields STREAM\_ID + STUDY + SURV\_REACH + HAB\_UNIT + SIDE\_UNIT + CHAN\_CODE (appendix B). Therefore, when you enter a habitat unit, it is displayed in its proper place, even if it is entered out of order. For example, if habitat unit

10 is entered after habitat unit 12, the record is displayed after habitat unit 9 and before 11. Similarly, side channel and adjacent units are displayed after the corresponding main channel unit, even if the side channel or adjacent units are entered first. This makes it easier for you to keep track of what data have been entered and to quickly find individual records. It also improves performance because it enables FBASE to have direct access to a record or records in a table. Index files (with the extension NTX) and the fields by which they are indexed are shown in appendix B.

## Deleting Records

You must be very cautious when deleting FBHEADER records because this will result in the deletion of all the linked HABITAT, LWD, RIPARIAN, and FISH records as well. In other words, all the data in those tables associated with the stream ID, study, and survey reach in the FBHEADER record are deleted. To delete an FBHEADER record, go to the **HEADER DATA** screen where the FBHEADER records are listed (to access this from the main menu, press <Enter> while on **Data Entry** and **1. DATA ENTRY SYSTEM**). Arrow-key down (or type the name of the stream, then arrow-key down) to the record you want to delete and press <F5>. A message will appear, asking:

**Delete this HEADER Record from file? (Y/N)**

If you enter *N*, the record is not deleted; if you enter *Y*, you will then get another warning that states:

**This will DELETE linked Habitat records also, Ok? (Y/N)**

If you enter *N*, the FBHEADER record is not deleted; if you enter *Y*, the FBHEADER record is deleted along with all of the linked HABITAT, LWD, FISH, and RIPARIAN records. If only one FBHEADER record exists and you delete it, the record will not appear to be deleted until you escape from that screen and then press <Enter> again.

As with deleting FBHEADER records, you should be cautious when deleting HABITAT records. If you delete a HABITAT record, the linked records in the LWD, RIPARIAN, and FISH tables are also deleted. In other words, any records in the other tables that contain data for the stream ID, study, survey reach, habitat unit, side channel unit, and channel code that match those of the habitat record being deleted, are also deleted. Therefore, only delete a HABITAT record if you also want to delete the associated records in the other tables.

To delete a HABITAT record, go to the FBHEADER record for the desired reach and press <Enter> while that header is highlighted. Next, you will see the HABITAT records under **HABITAT DATA** (fig. 4). Go

to the HABITAT record you want to delete by using the down arrow key or <Page Down> until the record is highlighted. Press <F5> to delete the HABITAT record and the associated LWD, RIPARIAN, and FISH records. A message will appear, asking:

**Is it OK to DELETE this record? (Y/N)**

If you enter *N*, the record is not deleted and the list of HABITAT records is still displayed. If you enter *Y*, another warning message appears, stating:

**This will DELETE linked Fish, Riparian and LWD also, Ok? (Y/N)**

Again, if you enter *N*, the record is not deleted. If you enter *Y*, the HABITAT record, along with the LWD, RIPARIAN, and FISH records linked to that HABITAT record, are deleted.

To delete an LWD record, first go to the **LARGE WOODY DEBRIS** screen that displays the LWD records that have been entered (from the main menu, choose **1. DATA ENTRY SYSTEM** from **Data Entry**, press <Enter> on the appropriate FBHEADER record, press <Enter> on the HABITAT record that contains the large woody debris data of interest, and choose **3. LWD**). If there are duplicate LWD records, delete one of them by pressing <F5>. However, you must be careful not to delete a record that has both single and aggregate data of which only one data set is a duplicate. For instance, if the dimensions for a single were entered twice and there are data for two aggregates, deleting a record would result in deleting the data for both the duplicate single and the valid aggregate. If this situation occurs, simply edit the record by pressing <F4> and changing the duplicate numbers to the null value (-99 or -9.9), while leaving the valid data as is.

If you delete an LWD record, the count in the HABITAT table is adjusted. For example, if you delete a record that has data for a single, the single is automatically subtracted from the single count in the HABITAT record. However, if you just edit a record so that it has null values, the count is not adjusted. In this case, go to the habitat count and subtract from the count manually.

To delete a FISH or RIPARIAN record, go to the **Fish Count Data or Riparian Data** screen that contains the data you wish to delete (from the main menu, choose **1. DATA ENTRY SYSTEM** from **Data Entry**, press <Enter> on the appropriate FBHEADER record, press <Enter> on the HABITAT record that contains the data of interest, and select **1. Fish** or **2. Riparian**). When you are in the record, press <F5> to delete it. The following message appears:

**Is it OK to DELETE this record? (Y/N)**

If you enter *N*, the record will not be deleted and the cursor goes to the top of the record. If you enter *Y*, the

record is deleted and you can then choose to enter fish, riparian, or large woody debris data or press <Esc> to go back to the listing of the HABITAT records.

You should make a backup of the data before deleting multiple records (see "Section VIII. SYSTEM," "Backing Up Your Data"). If you deleted a record that you did not want to delete, see "Section VIII. SYSTEM," "Restoring Data from an FBASE Backup."

## Reports

---

The advantages of having standard summary reports as part of FBASE are: the calculations are built into the program, saving time and mathematical errors; they are simple to produce because they are run directly from FBASE, with no need for any other software; they are standardized, making comparisons easier; they can be generated using various sorting levels, providing different perspectives on the data; and they provide an efficient means of disseminating information.

FBASE has four types of reports: the INFO reports, the SUMMARY reports, the COMMENTS reports, and the INVENTORY STATUS report. The INFO reports are simply printouts of the data that were entered for the variables. They are most commonly used for "proofing" the data that were entered by comparing the data on the printouts to the data on the field forms. In this way, data entry mistakes can be caught and then edited in FBASE. Examples of these reports are in appendices E-1 and E-2.

The SUMMARY reports provide calculated variables that are used as an aid in the analysis and interpretation of the inventory data. These summary variables are some of the most commonly needed and used by biologists for data analysis. Each report provides a set of summary variables relevant to the type of data collected. For instance, the PHYSICAL SUMMARY report contains variables related to the habitat data, such as mean wetted width, mean width to depth ratio, percent bank stability, and so forth; the LWD SUMMARY report provides the number of large woody debris per 100 meters (or feet), mean lengths and diameters of singles, and so forth; the FISH SUMMARY report contains densities of fish species in specific size and age classes, as well as habitat data for the snorkel units, such as percent overhead cover; and the RIPARIAN SUMMARY report has information such as the percent stream length and occurrence of each riparian community type. To accommodate the many uses of these data, FBASE also offers many ways to group, or sort, the data. See the section "Selecting Sort Options for Reports" for more information on how to summarize the data in meaningful groups. Examples of these reports are in appendices E-3 through E-6.



The REACH SUMMARY and REACH SUMMARY 2 reports contain reach summary variables, such as percent pools, mean width to maximum depth ratio, number of LWD per mile, and so forth. The main purpose of these reports is to have reach-level data that can be incorporated into a Geographical Information System (GIS). They can also be used apart from a GIS to assist in reach condition analyses. An example of the REACH SUMMARY report can be found in appendix E-7 and the REACH SUMMARY 2 report in appendix E-8.

The COMMENTS reports are simply an output of the comments (text) that were entered for the FBHEADER, HABITAT, LWD, FISH, and RIPARIAN tables. The comments provide additional information not captured in the quantitative data and can be very useful to biologists who are usually not able to observe entire reaches as do the inventory crews. There are two COMMENTS reports, one for the header comments (HEADER COMMENTS report) and one for the habitat, large woody debris, fish, and riparian comments (OTHER COMMENTS report). An example of an OTHER COMMENTS report can be found in appendix E-9.

The INVENTORY STATUS report contains a listing of the streams, reaches, studies, and survey lengths of the streams in your database based on the State(s), Forest(s), or District(s) you select. It is used as a tracking system for your R1/R4 Inventory data and an example can be found in appendix E-10.

A cautionary note: the FBASE reports are intended to provide cursory numerics and do not indicate statistical validity. Further analyses should be done when using the data for comparisons to other streams or reaches.

## Report Menu

The reporting options are found under **Reports/ 1.FBASE SYSTEM REPORTS** on the main menu. Press <Enter> or <1> to access the options. There are 14 options (letters A-N) for reports (fig. 12). Options A-E are the **INFO** reports. These include **A. HEADER INFO, B. PHYSICAL INFO, C. LWD INFO, D. RIPARIAN INFO, and E. FISH INFO**. Reports F-J and M are the **SUMMARY** reports, including **F. PHYSICAL SUMMARY, G. LWD SUMMARY, H. FISH SUMMARY, I. RIPARIAN SUMMARY, J. REACH SUMMARY, and M. REACH SUMMARY 2**. Options K-L are the **COMMENTS** reports, consisting of **K. HEADER COMMENTS and L. OTHER COMMENTS**. The last report is **N. INVENTORY STATUS** report.

## Selecting Reports

To select a report, press <Enter> on the report of interest or type the letter of the report (A-N). For all but the INVENTORY STATUS report, a list of the streams in the STREAMS table will appear. Type in the name of the stream for which you want the report.

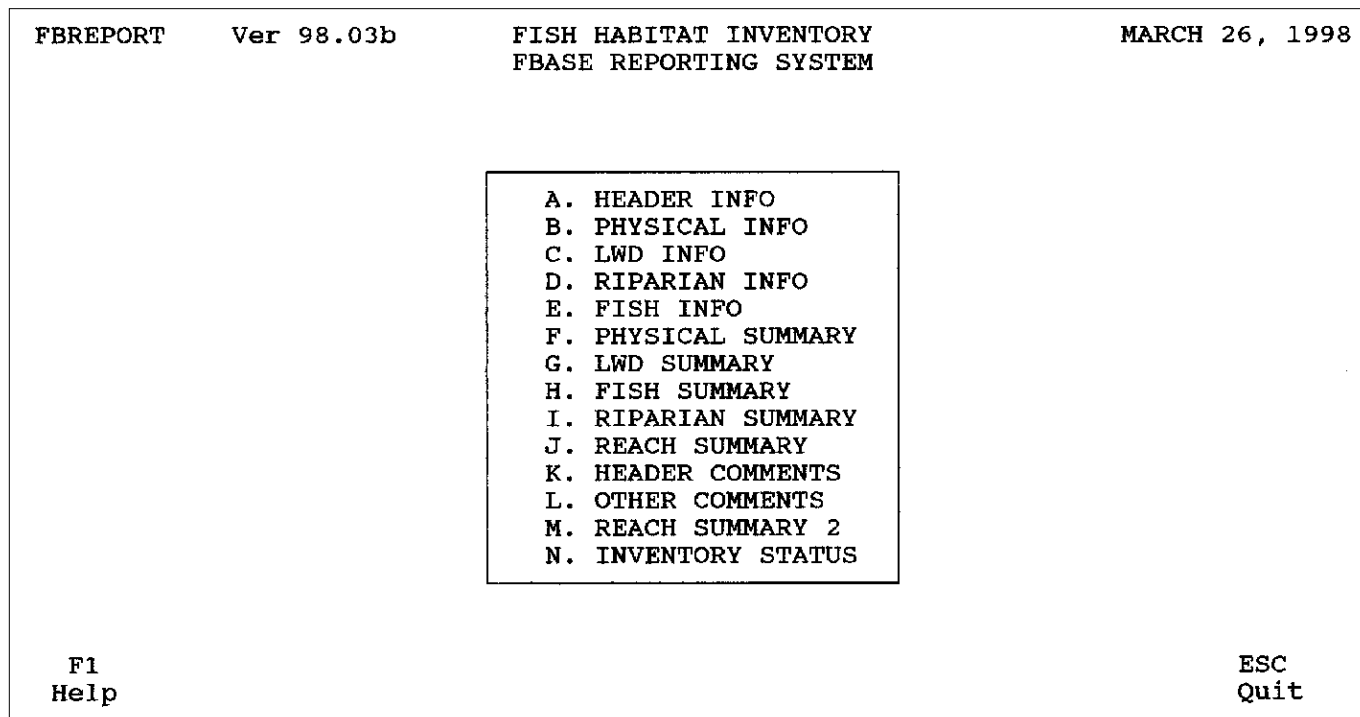


Figure 12—FBASE report menu.



When the correct stream (with the correct stream ID) is highlighted, press <Enter>. If it is an Idaho stream or a stream that you added to the table, it does not matter which EPA reach is highlighted. However, for Montana streams, make sure you are on the EPA reach within which your data are contained (since every EPA reach has its own stream ID).

If there is more than one study (such as *I97* and *I98*), a box is displayed so that you can select the study for which you want to run the report (fig.13). Highlight the appropriate study using the arrow keys and press <Enter>.

### Summarizing Groups of Habitat Units

If you select a PHYSICAL, LWD FISH, or RIPARIAN SUMMARY report, a dialog box appears after you enter the stream name that asks the following:

#### Summarize all units for all reaches? (Y/N)

If you enter *Y*, all of the habitat units will be summarized together. If you enter *N*, you can then select specific habitat units that you want to summarize together. This enables you, in effect, to summarize at the sub-reach level. For instance, if the habitat is managed differently within the reach (for example there is a pasture fence with different livestock management on either side), you may want to summarize the data for the habitat units that fall within each of the different management scenarios. This option can

also be used if there are data for more than one reach but you only want a summary for one of the reaches.

If you enter *N*, a dialog box is displayed listing the reach number on the left side and the habitat unit on the right (fig. 14). To select individual habitat units, press the <Space Bar> to check the unit (fig. 14). Use the arrow keys to move up and down the list. Do not press <Enter> until all the desired units have been selected. If you want to summarize one reach, hit <Space Bar> for every unit in that reach and then press <Enter>.

### Summarizing Data for More Than One Stream

After addressing whether you want to summarize all units for all reaches (see above), a dialog box is displayed that asks the following:

#### Any More Streams? (Y/N)

This option allows you to summarize more than one stream together for such purposes as grouping like reaches or streams together to generate variables that represent “reference” conditions.

If you enter *Y*, select the next stream from the STREAMS table to summarize with the first. There is no limit to the number of streams you can combine, as long as there are data for that stream (you will receive an error if no data exist for the selected stream). If there are data for more than one study, a list is

FBREPORT	Ver 98.03b	FISH HABITAT INVENTORY FBASE REPORTING SYSTEM	MARCH 26, 1998																						
PHYSICAL SUMMARY																									
<table border="1"> <tr> <td colspan="2">A. HEADER INFO</td> </tr> <tr> <td colspan="2">B. PHYSICAL INFO</td> </tr> <tr> <td colspan="2" style="text-align: center;">Select STUDY</td> </tr> <tr> <td>I97</td> <td></td> </tr> <tr> <td>I98</td> <td></td> </tr> <tr> <td>2</td> <td style="text-align: center;">TOP</td> </tr> <tr> <td colspan="2">J. REACH SUMMARY</td> </tr> <tr> <td colspan="2">K. HEADER COMMENTS</td> </tr> <tr> <td colspan="2">L. OTHER COMMENTS</td> </tr> <tr> <td colspan="2">M. REACH SUMMARY 2</td> </tr> <tr> <td colspan="2">N. INVENTORY STATUS</td> </tr> </table>				A. HEADER INFO		B. PHYSICAL INFO		Select STUDY		I97		I98		2	TOP	J. REACH SUMMARY		K. HEADER COMMENTS		L. OTHER COMMENTS		M. REACH SUMMARY 2		N. INVENTORY STATUS	
A. HEADER INFO																									
B. PHYSICAL INFO																									
Select STUDY																									
I97																									
I98																									
2	TOP																								
J. REACH SUMMARY																									
K. HEADER COMMENTS																									
L. OTHER COMMENTS																									
M. REACH SUMMARY 2																									
N. INVENTORY STATUS																									
F1 Help			ESC Quit																						

Figure 13—Selecting a study for a report.

displayed and you must select the desired study (fig. 13). If you want to summarize data for more than one study, just enter *Y* again to summarize more streams and choose the next desired study from the list; repeat the process until all have been selected.

After each stream selection, you are asked if you want to summarize all units for all reaches. In this way, you can summarize multiple streams and “hand-pick” the habitat units that you want summarized for each stream or reach. If you enter *Y*, the box is displayed that asks if you want to summarize more streams. This process will continue until you enter *N* to summarizing more streams, whereupon FBASE will build the data set for the report.

### Selecting Sort Options for Reports

After you have selected the desired stream(s) and habitat units for the summary report, you must select from several sort options. These sort options allow you to summarize the data in various groupings, depending on the data available and the type of analysis that will be performed on the data.

Figure 15 shows the available sort options for the PHYSICAL, FISH, and LWD reports. The RIPARIAN report has slightly different options that are discussed below. The first, or primary, level of sorting for all of the above reports includes the following options: **1. OVERALL, 2. SURVEY REACH, 3. REACH TYPE, 4. CHANNEL TYPE, 5. HABITAT CLASS, and 6.**

**HABITAT GROUP** (fig. 15). The **OVERALL** sort level, for example, allows you to summarize all the data for a given stream (or EPA reach if in Montana) together; the **SURVEY REACH** level groups the data by survey reach; the **REACH TYPE** level summarizes the data by reach type (*A, B, or C*); and so on. Appendices E-3, E-4, and E-5 show examples of data summarized by the **REACH TYPE (PHYSICAL SUMMARY), OVERALL (LWD SUMMARY), and SURVEY REACH (FISH SUMMARY)** primary sort levels. If you are creating a multi-stream report, you cannot use **SURVEY REACH** as the primary grouping (otherwise, all reach ones, reach twos, and so on would be summarized together). You also cannot use this sort level if you are combining studies together since they are treated as if they are different streams. Therefore, you either must use another primary sort level (such as **OVERALL**) or summarize the studies in separate reports.

The second sort level choices include **1. HABITAT TYPE, 2. HABITAT GROUP, and 3. HABITAT CLASS** for all but the **RIPARIAN** summary report (fig. 15). The data are therefore grouped by the first sort level, then grouped additionally by the second level. For instance, if you choose **SURVEY REACH** as the first sort level, and **HABITAT TYPE** as the second, the data in the report are separated initially by each survey reach. Then, within each reach they are grouped by the specific habitat type (in other words, the data for

FBREPORT	Ver 98.03b	FISH HABITAT INVENTORY FBASE REPORTING SYSTEM	MARCH 26, 1998																																	
PHYSICAL SUMMARY																																				
<table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: center;">Select REACH &amp; HabUnit</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">✓</td><td style="text-align: center;">1</td><td style="text-align: center;">1</td></tr> <tr><td style="text-align: center;">✓</td><td style="text-align: center;">1</td><td style="text-align: center;">2</td></tr> <tr><td style="text-align: center;">✓</td><td style="text-align: center;">1</td><td style="text-align: center;">3</td></tr> <tr><td style="text-align: center;">✓</td><td style="text-align: center;">1</td><td style="text-align: center;">4</td></tr> <tr><td style="text-align: center;">✓</td><td style="text-align: center;">1</td><td style="text-align: center;">5</td></tr> <tr><td></td><td style="text-align: center;">1</td><td style="text-align: center;">6</td></tr> <tr><td></td><td style="text-align: center;">1</td><td style="text-align: center;">7</td></tr> <tr><td></td><td style="text-align: center;">1</td><td style="text-align: center;">8</td></tr> <tr> <td style="text-align: center;">8</td> <td colspan="2" style="text-align: center;">MORE ↑ ↓</td> </tr> <tr> <td colspan="3" style="text-align: center;">N. INVENTORY STATUS</td> </tr> </tbody> </table>				Select REACH & HabUnit			✓	1	1	✓	1	2	✓	1	3	✓	1	4	✓	1	5		1	6		1	7		1	8	8	MORE ↑ ↓		N. INVENTORY STATUS		
Select REACH & HabUnit																																				
✓	1	1																																		
✓	1	2																																		
✓	1	3																																		
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✓	1	5																																		
	1	6																																		
	1	7																																		
	1	8																																		
8	MORE ↑ ↓																																			
N. INVENTORY STATUS																																				
F1 Help			ESC Quit																																	

Figure 14—Selecting habitat units for a summary report.

all *SLMs* are grouped, as are the data for all *LGRs*, and so forth). You should choose **HABITAT CLASS** (SLOW and FAST) as the second sorting level if you collected data at the habitat (velocity) class level, or if you want to look at the data from a Apools vs. riffles@ viewpoint. If you choose **HABITAT CLASS** as the first sorting level, then you can only select **HABITAT TYPE** or **HABITAT GROUP** as the second. Similarly, if **HABITAT GROUP** is the first level, then **HABITAT TYPE** is the only option for the second sort level. Appendices E-3, E-4, and E-5 have examples of reports summarized by **REACH TYPE/HABITAT GROUP** (PHYSICAL SUMMARY), **OVERALL/HABITAT TYPE** (LWD SUMMARY), and **SURVEY REACH/HABITAT CLASS** (FISH SUMMARY).

The third sorting level group includes **1. MAIN CHANNEL** and **2. SIDE CHANNEL** (fig. 15). If you select **MAIN CHANNEL** as the third sort level, all the main channel units are summarized together; if you choose **SIDE CHANNEL**, all the side channel units are grouped. Appendices E-3 through E-5 show examples of summary reports sorted by **MAIN CHANNEL** as the third sorting level.

The **RIPARIAN** report does not contain the second sorting level (**HABITAT TYPE**, **CLASS**, and **GROUP**) because it is unlikely that these groupings are related to the riparian community types. Therefore, when you run a **RIPARIAN** summary report, you will choose from the options in the first and third sorting levels only (you would also choose only **MAIN CHANNEL** for

the third level since riparian community types are not collected for side channel units). See Appendix E-6 for an example of a **RIPARIAN** report sorted by **SURVEY REACH**.

## Print Options

After selecting the stream and study for an **INFO**, **REACH SUMMARY**, or **COMMENTS** report, or the sort options for a **PHYSICAL**, **LWD**, **FISH**, or **RIPARIAN SUMMARY** report, a box will appear that gives the following options:

### 1. Print to PRINTER

### 2. Print to FILE

If you want a hardcopy of your report, choose **1. Print to PRINTER**. However, before you can print out a report, you must assign a printer so that **FBASE** knows where and in what format to print the report. See “Section VIII. SYSTEM,” “Assigning a Work Station Printer,” for information on how to assign a printer.

If only one printer was assigned, the report will now print out on that printer. If more than one printer was assigned, a box is shown labeled **Printer Selection**, and you must highlight the desired printer and press <Enter>. The report will then be printed. If the printer failed to print the report, or the report is not in the correct format, see “Section VIII. SYSTEM,” “Assigning a Work Station Printer.”

```

FBREPORT      Ver 98.03b      FISH HABITAT INVENTORY      MARCH 26, 1998
                        FBASE REPORTING SYSTEM

                        ID12345 - SOMEWHERE CR

                        A. HEADER INFO
                        B. PHYSICAL INFO
                        C. LWD INFO
                        D. RIPARIAN INFO
                        E. FISH INFO
                        F. PHYSICAL SUMMARY
                        G. LWD S
                        H. FISH
                        I. RIPAR
                        J. REACH
                        K. HEADE
                        L. OTHER
                        M. REACH
                        N. INVEN

                        1. OVERALL
                        2. SURVEY REACH
                        3. REACH TYPE
                        4. CHANNEL TYPE
                        5. HABITAT CLAS
                        6. HABITAT GROU

                        1. HABITAT TYPE
                        2. HABITAT GROUP
                        3. HABITAT CLASS

                        1. MAIN CHANNEL
                        2. SIDE CHANNEL

F1
Help

ESC
Quit
  
```

Figure 15—Sort options for **PHYSICAL**, **FISH**, and **LWD** reports.

The reports for the PHYSICAL and FISH SUMMARY consist of multiple pages, or sub-reports, which are divided by categories of data. The PHYSICAL SUMMARY report has sub-reports for habitat dimensions, channel parameters, bank stability and undercut, and substrate conditions, while the FISH SUMMARY report contains sub-reports by species and habitat parameters. You have the option to print any or all of these sub-reports. Enter *Y* or *N* as you are questioned as to which sub-reports you want to print. This allows you to reduce the amount of printing if you only want the summary data for specific sub-reports (for example, if the stream does not contain chinook or steelhead, you would not need a printout of that sub-report).

If you simply want to print a report to a text file so that you can look at it on your computer screen, or you want to incorporate the report into a word-processing document for use in another report (for example, a Biological Assessment), select **2. Print to FILE**. A dialog box is displayed that says:

**Enter report FILE NAME:**

Type any name up to eight characters long, preferably one with intuitive meaning, in the space provided. FBASE automatically assigns the extension PRN to the file name, so do not assign an extension.

If you are printing a PHYSICAL or FISH summary, you must now enter *Y* or *N* as to which sub-reports you want to print to the file (see above).

To look at the text file, you must first exit FBASE by pressing <Esc> until you are back at the DOS prompt. While in the FBASE directory, enter **TYPE (FILENAME).PRN | MORE**. Use the **EDIT** DOS command instead of **TYPE** if you wish to cut and paste to another document or view the file lengthwise (the text in the reports is wrapped if **TYPE** is used). For example, if the file was named *LODGESUM*, enter **TYPE LODGESUM.PRN | MORE**. The report for *LODGESUM* should now show on the screen. If it does not, then you probably did not supply the correct file name or extension.

The REACH SUMMARY 2 report has an additional option displayed as **3. Print to DELIMITED File**. If you choose this option, the report is sent to an ASCII text (TXT) file delimited by commas, called REACHSM2.TXT. Having the report in this format makes it easier to transfer the data to Oracle or other UNIX programs.

## Selecting Criteria for the INVENTORY STATUS Report

After you choose the print option for the INVENTORY STATUS report, you must select the State(s), Forest(s), and District(s) for which you want the

listing of inventoried streams. The first selection box shown is for States. If you have streams in your database that span multiple states, you can choose all the States by pressing <Enter> or select individual States by pressing the <Space Bar> on your selection. The Forest selection box is displayed next, and then the District selection box. Make your selections as you did for the States. If you want a report on all your streams regardless of State, Forest, or District, press <Enter> as each selection box is displayed. Your selection criteria are shown at the bottom of the report (appendix E-10).

## Report Formats

Whether you decide to print a report out on a printer or to a file, the format is the same. Referring to the reports in appendix E, you will notice that there is a heading, then a row containing the variable names, then the data below that. At the top left-hand side of the report is the name of the program that calls the report (such as *FB\_PPRNT*). Next to that on the right is the FBASE version number that is being used (such as *v98.03b*). The descriptive name of the report is on the top-middle of every page (for instance, *R1/R4 FISH HABITAT INVENTORY SYSTEM; Physical Habitat Raw Data Listing*). For SUMMARY reports, the sorting criteria are shown under the main heading (for example, *R1/R4 FISH HABITAT INVENTORY SYSTEM; Summary of Main Channel Physical Habitat Dimensions; Listing by Survey Reach and by Habitat Type*).

The *Stream ID*, *EPA Reach*, and *Stream Name* are listed at the top left side of each page. The *Forest* and *District* names are listed at the top middle of each page. On the top right side of every page is the *Run date* (date that the report was printed), *Page*, and *Study*. For summary reports, if more than one stream was summarized together and/or specific habitat units were selected, the stream names, along with their corresponding stream IDs and the units selected, are listed on the left side of the report, and the *EPA Reach* is located next to the District name in parentheses. The *Forest* and *District* names, as well as *Study* are listed separately for each stream.

In the INFO reports, the data for each unit are displayed in rows and the data for each variable are displayed in columns under each variable heading. See appendix E-1 for an example of a HEADER INFO report and E-2 for an example of a PHYSICAL INFO report.

The summary variables in the SUMMARY reports are listed across the page. The (*m*) after certain variables stands for meters (or (*ft*) if in feet), and the (*n*) represents the sample size. Below these, the data are grouped according to the first sort level chosen. For

example, if the data are grouped by survey reach, each survey reach (1, 2, 3, and so forth) is listed one at a time with its corresponding data (appendix E-5). If the data are grouped by survey reach, the reach type for each reach as well as the lower and upper boundaries of the survey reach are also listed (appendix E-5). If the data are grouped by overall stream, there are no grouping headers.

For PHYSICAL, LWD, FISH, and RIPARIAN SUMMARY reports, the second sorting level is represented by the first variable listed on the left side of the report in the variable heading. For example, if habitat type was chosen as the second sort level, *Habitat Type* is displayed (appendix E-4).

The data reside below the variable and grouping headings. The habitat types, groups, or classes are listed first (depending on which you select as the secondary sort level). Next is the total number of units falling within each of the habitat types, groups, or classes, followed by the data for the summary variables. The sample size (n) is found in parentheses next to most of the variables so that you know how many data points went into the calculated value. Blank (not collected or non-applicable) data are represented by a dash (–).

Subtotals and (sub)means are shown for all reports except those sorted by overall stream. They represent the combined total or mean for all the habitat type, group, or class data within the first grouping (such as survey reach). The totals and means for all the data, regardless of sorting level, are shown at the end of all the summary reports.

The RIPARIAN summary report format is similar to the others addressed above with one notable difference: the data are grouped according to the riparian community type rather than the habitat type, group, or class. Therefore, the first variable listed in the variable heading is *Riparian Community Type*. Below that is the primary grouping selected previously (for instance, *Survey Reach*, *Reach Type*, and so forth). The riparian community type codes and descriptions that fall within each of the groupings are displayed below the grouping names.

Examples of the PHYSICAL, LWD, FISH, and RIPARIAN SUMMARY reports are found in appendices E-3 through E-6. The variable calculations are in appendix F.

The REACH SUMMARY reports contain no sort level options. The summary data are grouped by survey reach and are displayed below the survey reach number, reach type, and survey reach boundaries. There are no sub-totals or totals for this report. See appendix E-7 for an example of the REACH SUMMARY report and E-8 for an example of a REACH SUMMARY 2 reports, and appendix F for the variable calculations.

The HEADER COMMENTS report is divided by survey reaches, and shows the survey reach number, the corresponding reach type, and the lower and upper reach boundaries. Below each reach heading are all the header comments entered in the FBHEADER table for that reach. The OTHER COMMENTS report lists the key information for each habitat unit (*Survey Reach*, *Reach Type*, *Unit No*, *Chan Code*, *Side Unit*, and *Hab. Type*) and then displays the comments for each unit by data type (*Habitat*, *Fish*, *Riparian*, and *LWD*). See appendix E-9 for an example of an OTHER COMMENTS report.

The INVENTORY STATUS report lists the Regions, States, Forests, and Districts within the selection criteria, and the survey information associated with them. This information includes the streams, stream IDs, survey reach numbers, studies, and survey lengths (in meters). The end of the report displays the criteria selected and the grand total of the survey lengths. An example of this report can be found in appendix E-10.

## The GISFILE and REACHSM2 Tables Generated from the REACH SUMMARY Reports

When you generate the REACH SUMMARY report, the data are written to a DBF file called GISFILE.DBF. Similarly, if you send the REACH SUMMARY 2 report to a delimited text file, a file called REACHSM2.DBF is created. These tables contain the data for the variables (or fields) by survey reach and are continually updated every time you run the reports. If a summary is generated more than one time for a given stream survey, the table is updated with the most current data, therefore avoiding duplicate records. The main purpose of these tables is to provide reach attributes that can be spatially located in an ARC/INFO geographic information system (GIS) environment.

GISFILE.DBF and REACHSM2.DBF can be accessed through dBASE, Paradox, Microsoft Access, and other similarly structured database programs. The data structures for these tables are shown in appendix B. The GISFILE.DBF file contains the fields *\_FROM*, *\_MID*, and *\_TO*. The *\_FROM* field contains the starting point of the reach, *\_MID* contains the mid-point, and *\_TO* contains the ending point in terms of distance (in meters or feet, whichever is used for habitat unit lengths). The purpose of these fields is to provide reach addresses needed to generate route systems in ARC/INFO.

## Maintenance

---

There are several look-up tables used in FBASE for data entry support and validation, and general information. For example, when you enter a stream, the

STREAMS table is referenced; when you enter a Forest, the FORESTS table is referenced; and so on. The TABLE1 table is used when there are several defined options for a variable, such as **Habitat Type**. When you press <F9> to view the options for the variable, you are actually seeing the choices that are defined in this look-up table. These tables require occasional updating as they contain somewhat dynamic information. For example, you may need to add a stream to the STREAMS table or modify Forest information (such as when two Forests are combined and the name changes) in the FORESTS table.

Look-up tables should be modified cautiously because doing so may undermine the standardization. For example, adding more options for habitat types, geologies, and so forth to the TABLE1 POPUP HELP SYSTEM is inadvisable because this would deviate from the standards established in the R1/R4 Inventory procedures. Adding streams to the STREAMS table is often necessary but should be done with accuracy and thoroughness. It is important, however, to maintain the look-up tables so that information in the database is kept current and useable. This task should be accomplished by a Database Administrator (DBA).

## Maintenance Menu

To update or edit the look-up tables, go to Maintenance in the main menu. Five options are listed,

including **1. STREAM TABLE MAINTENANCE**, **2. REGION TABLE MAINTENANCE**, **3. FOREST TABLE MAINTENANCE**, **4. DISTRICT TABLE MAINTENANCE**, and **5. TABLE1 POPUP HELP SYSTEM** (fig. 16). Press <Enter> on the table or the corresponding number to access the table.

## Adding a Record to a Look-Up Table

To add a record to a look-up table, press <F3> while the table is highlighted. You are given a blank record in which to enter the requested data. Refer to appendix B and the R1/R4 Inventory procedures for more information on what data are entered. When you have completed the entry, press <Page Down> to save the record.

The only reason to add a record to the TABLE1 look-up table is if you want to increase the options for a given variable when entering data for that variable, for example, riparian community types (see cautionary statement above). To add a record to this look-up table, access it as described above, then go to the category (or data table name) where the pop-up will appear by typing in the category name (such as *FBHEADER*, *HABITAT*, and so forth) or paging down to the appropriate category (fig. 17). Notice that in the row beside the CATEGORY field are the FIELD and POPUP fields (fig. 17). Use <Page Down> or the arrow keys to get to the appropriate field name; names are in alphabetical order (see appendix B for a list of field names and corresponding variable descriptions for

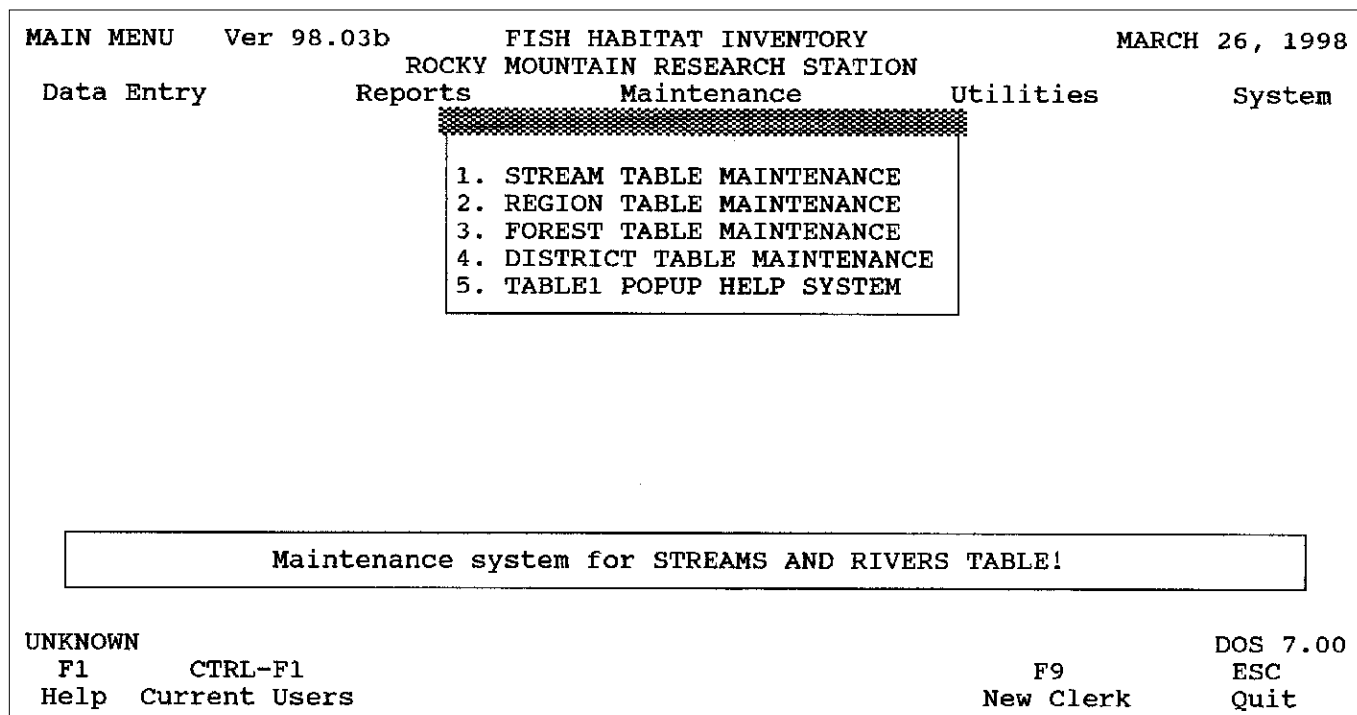


Figure 16—Maintenance menu.

TABLE1 POP-UP

CATEGORY	FIELD	POP UP
HABITAT	H2O_TEMP	Enter the water temperature of the unit
HABITAT	HAB_CLS	FAST
HABITAT	HAB_CLS	SLOW
HABITAT	HAB_DEPTH	Enter the average depth of the unit
HABITAT	HAB_GRP	DBW - Dammed-Backwater
HABITAT	HAB_GRP	DMC - Dammed-Mid Channel
HABITAT	HAB_GRP	NTU - Non-turbulent
Back Space		↑ ↓ Pg Up Pg Dn ENTER
Total Records: 1,429		Current: 251

F1  
Help

F3  
Add

F4  
Edit

F5  
Delete

F8  
Block by Field

ESC  
Exit

Figure 17—TABLE1 POPUP HELP SYSTEM look-up table.

TABLE1 POP-UP

CAT	TABLE1 TABLE	
RIP	o.	
RIP	Category: RIPARIAN	
RIP	Field: RIP_CD1_L	
RIP	Pop Up Line: BB4	- Brdlf.decid;Forb
RIP	Box Title: Riparian Comm. Type	
RIP	ea	
RIPARIAN	RIP_CD1_L	BEOC/EQIS - Betula occidentalis/Equisetum
Back Space		↑ ↓ Pg Up Pg Dn ENTER
Total Records: 1,429		Current: 448

Pg Dn  
to Save

ESC  
Cancel

Figure 18—Entering a record in the TABLE1 POPUP HELP SYSTEM look-up table.



each category). Once the record is highlighted, press <F3> to add a new record with the same category and field name. Then press <Enter> or arrow-key down to **Pop Up Line** and add the desired information (fig. 18).

For example, to add another riparian community type to the list of choices (remember, the list of choices is displayed when you press <F9> while entering data in the RIPARIAN table), type in *RIPARIAN* to scroll down to the correct category, then <Page Down> until the RIP\_CD1\_L field is highlighted. Since there are several codes already in the look-up table, RIP\_CD1\_L is listed several times; it does not matter which of these records is highlighted. Press <F3> to add a new choice. At **Pop Up Line**, enter the code for a new riparian community type (fig. 18). If you want to add a description of the type that will be displayed when pressing <F9> during data entry, make sure you first leave enough spaces to fill the field width before you start the description. For instance, if the new code was XXXX, you would space over nine more spaces before starting the description since the field width for RIP\_CD1\_L is 13 (fig. 18). The contents in **Box Title** (fig. 18) appear at the top of the table when it is called up during data entry. For instance, the box title at the top of the table displaying the riparian community types is *Riparian Comm. Type*. You can leave this blank since only the first record for a given field needs to contain a box title. If you add a riparian community type, remember that there are four fields that must

contain the same types (RIP\_CD1\_L, RIP\_CD2\_L, RIP\_CD1\_R, and RIP\_CD2\_R), so you must add a record for each of these fields in TABLE1.

### Editing a Record in a Look-Up Table

You should edit a record rather than add one if the record is present but the information must be modified. For example, if you added a stream to the STREAMS table but entered the wrong EPA reach number, you should edit the EPA reach number in that record rather than adding another STREAMS record (fig. 19). This reduces clutter in the table and ensures that established links are not upset.

To edit a record in a look-up table, press <Enter> on the table, then <F4>. Edit the appropriate data, then press <Page Down> or <Enter> through the record to save it. After you make a change in the table, you must re-select the record that was changed if applicable to any data you already entered. For example, if you change an EPA reach number in a STREAMS record (do not do this unless you added the record) and there are FBHEADER records that contain data for that stream and reach, you must go to the affected FBHEADER record(s) and change the stream ID (for instance, change the first character) so that the STREAMS table is called up again. Then you can reselect the now edited stream record so that your data record is current.

MAIN MENU Ver 98.03b		FISH HABITAT INVENTORY		MARCH 26, 1998	
		STREAM TABLE MAINTENANCE			
STREAMS and RIVERS TABLE					
LODGE POL		Stream ID: ID2097		BOUNDARY	
<b>STREAM</b>		Stream Name: LODGEPOLE CR		ED	
LODGE CR		Acronym:		MAN COUL	
LODGE CR		Basin Name: MID MAIN_SALMON			
LODGE GRASS		Tributary of: CHAMBERLAIN CR			
LODGEPOLE C		Low Boundary: MOUTH			
LODGEPOLE C		High Boundary: HEADWATERS			
LODGEPOLE C		State: ID		POLE CR,	
LODGEPOLE C		Stream Number: 2097		ENTER	
Back Space		EPA Reach: 1706020704700.00			
Total Recor					
Pg Dn to Save			ESC Cancel		

Figure 19—Editing a STREAMS record in the STREAMS look-up table.

## Deleting a Record in a Look-Up Table

To delete a record from a look-up table, press <F5> while in the table and the record you wish to delete is highlighted. The following message appears:

### Is it OK to DELETE this record? (Y/N)

If you enter Y, the record will be deleted from the table; if N, then the cursor will go back to the top of the record. Before you delete a record from a look-up table, be careful that the record is not referenced anywhere in your data (for instance, do not delete a Forest from the FORESTS table if that Forest appears in an FBHEADER record). If you attempt to delete a stream from the STREAMS table for which you have entered data, you will get the following error message:

### Error BASE/1066 Argument error: conditional

If you get this message, press any key and then re-access FBASE. You will notice that the STREAMS record was not deleted. If you want to delete the STREAMS record, you must first delete the data that are linked to that record and then delete the STREAMS record.

There are very few instances when you should delete a record from a look-up table. Usually, the record should be edited rather than deleted. One example of when deleting a record is appropriate is if two Forests have combined and hence only one record is needed for

the new name rather than two. In this case, edit one of the records so that it has the combined name and delete the other. However, first edit any FBHEADER records that reference that Forest, then make the deletion. Also note that updates to the look-up tables are typically provided with new FBASE versions, so most of these changes are unnecessary for you to undertake.

You should make a backup of the data before deleting multiple records (see "Section VIII. SYSTEM," "Backing Up Your Data"). If you deleted a record in a table that you did not want to delete, see "Section VIII. SYSTEM," "Restoring Data from FBASE Backup."

## Utilities

FBASE utilities provide a means for transferring data sets (import and export utilities), calculating habitat unit addresses for GIS use (dynamic segmentation routine), and performing database "house-cleaning" (file re-indexing and sorting utility). These utilities were built into FBASE to make these tasks more efficient and straight-forward than if you were to perform them outside the system.

## Utilities Menu

From the main menu, under **Utilities**, you will find four options, including **1. EXPORT STREAM PACKAGE**, **2. IMPORT STREAM PACKAGE**, **3.**

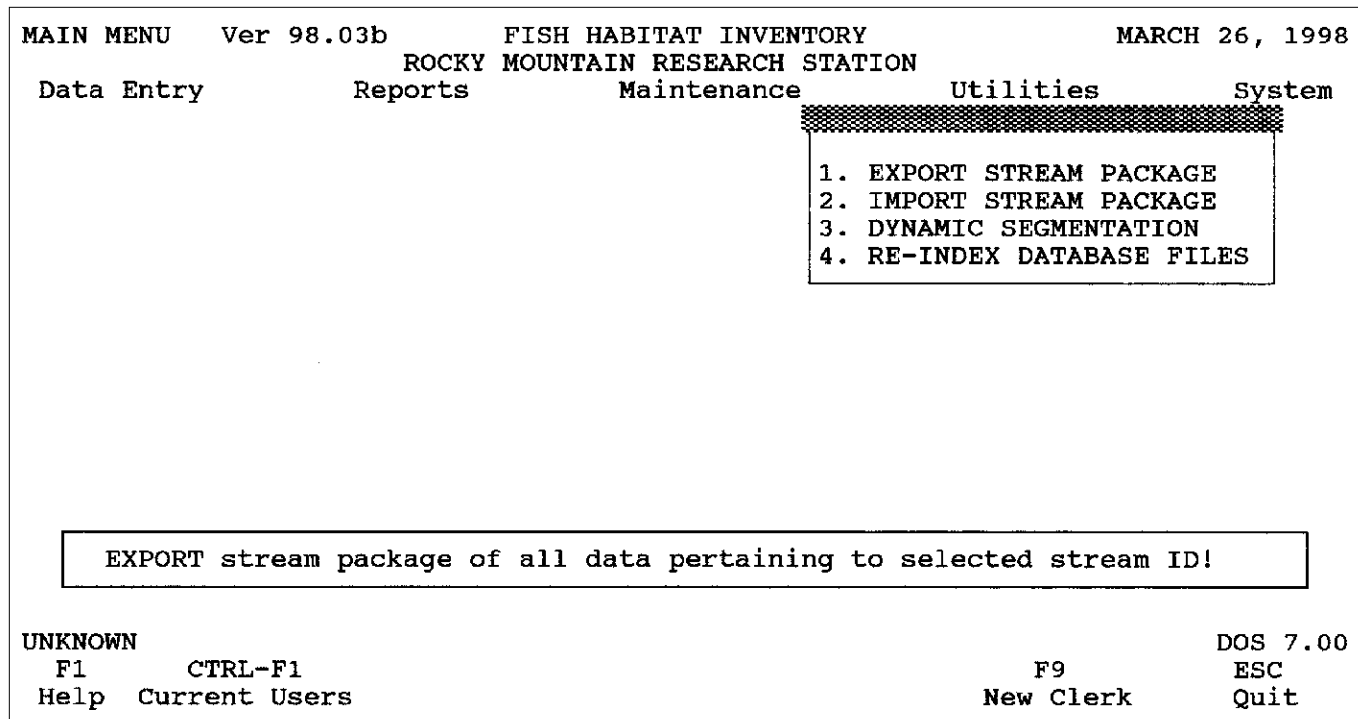


Figure 20—Utilities menu.

**DYNAMIC SEGMENTATION**, and **4. RE-INDEX DATABASE FILES** (fig. 20). To access any of these items, type the corresponding number or arrow-key down to the item and press <Enter>.

## The EXPORT STREAM PACKAGE Utility

Sometimes it is desirable to extract only parts of the data instead of entire files, as when you wish to transfer some stream data to another computer or share specific data with other biologists. If you were to transfer entire data files (FBHEADER, HABITAT, LWD, and so forth) to another computer that has FBASE data, these files would overwrite the existing data files that reside on that system. Therefore, this utility should be used whenever (1) You want to transfer only a portion of the data (specific streams or survey reaches) to another system; (2) There are existing data on the system to which you are transferring the data and you do not want to overwrite these data; or (3) You want to archive individual groups of stream data as a data backup mechanism or because the files are getting too big for the space or memory available on your computer. It is important to note the difference between exporting a stream package and making a backup of your data. Exporting is used to create export files containing specific parts of the data, while backing up your data through FBASE creates a file containing ALL of your data (see “Section VIII. SYSTEM,” “Backing Up Your Data,” for more information on this topic).

### Exporting a Stream Package

PKZIP, a file-compression software package, is required in order to use the EXPORT utility. This is because FBASE creates a ZIP file that contains the specified stream data in a compressed format so that they use up less disk space. The directory containing PKZIP (such as PKZIP, PKWARE) must also be in the path statement of your AUTOEXEC.BAT file so that FBASE can find it when creating the export file (if you are using Windows 95 or above, this is recommended but not required). To confirm whether the PKZIP directory is in your path, type **PATH** from the DOS prompt. If it is not listed, go into the AUTOEXEC.BAT file and add it (see your MS-DOS or PKZIP manual for specific instructions). PKZIP should be installed in its own directory rather than under another directory such as FBASE. Refer to your MS-DOS or PKZIP manual for instructions on performing these tasks. The EXPORT utility will work with PKZIP version 1.0 for DOS or above; it has not been tested with other versions of PKZIP for DOS, or PKZIP for Windows.

The following steps are performed for exporting stream data:

1. Before exporting stream data, re-index your database, especially if data have been edited and not re-indexed. See “The RE-INDEX DATABASE FILES Utility” below (this section) for instructions.

2. Press <Enter> or <1> for **EXPORT STREAM PACKAGE** under **Utilities** in the main menu (fig. 20). The STREAMS table is displayed.

3. Type in the name of the stream for which you have data to export, and select the record with the correct stream ID.

4. The **STREAM SELECTION FOR EXPORT** screen now shows the selected stream ID at the top. It prompts you for the following information:

#### Enter unique transfer file name:

Enter an export file name up to six characters (do not enter an extension). It is helpful if you enter a name that resembles the stream name. For example, enter *LODGE* as a file name for *Lodgepole Creek* data.

**Enter stream STUDY**—Provide the study (such as *I98*) of the data you are exporting. If there is more than one study for the stream and you want the export file to contain all of the studies, leave this entry blank; or, if the stream has only one study, you can also leave it blank.

**Enter Drive ID**—Enter the drive letter (the default is *C*) where you would like the export file to be created. For instance, if you want the export file to be written to a floppy, type *A* (or the appropriate floppy drive letter).

If data for the stream and/or study are not found, the following message is displayed:

#### No STREAM records found for EXPORT!

In this case, re-select the stream and study and try again.

5. The data is now prepared for exporting and several files are created. These files start with a character that represents the data category (*S* for stream, *H* for header, *P* for physical, *F* for fish, *R* for riparian, and *L* for large woody debris), followed by an underscore and the first six characters of the stream ID (for example, *H\_ID2097.DBF*). They have extensions of both DBF and DBT (memo file).

The next screen shows the PKZIP command that is used to create the export file (fig. 21). If the file name you specified was *LODGE* for example, the PKZIP command says to create a file called *TXLODGE* by zipping the files that have been prepared (for example, *?\_ID2097.DB?*). The question marks are wildcards that are used to capture any files that begin with a character (such as *S*, *H*, and so on as explained above) and end with extensions starting with *DB* followed by a character (in this case, *DBF* or *DBT*).

**Make changes necessary to complete the pending event!**

```
PKZIP -&wv -rP -ex A:TXLODGE ?_ID2097.DB?
```

**Figure 21**—PKZIP command to create export file.

If the destination drive is a floppy drive, you will also see the switches `-&wv`, `-rP`, and `-ex` in the command (fig. 21). The `-&wv` says to span multiple disks, wipe the disk (so make sure the disk is free of needed data) and verify when spanning. The `-rP` means that PKZIP will recurse subdirectories and preserve the path structure (in other words, all the levels of subdirectories and files are preserved). The `-ex` indicates maximum compression.

Below the PKZIP command is the ZIP2EXE (file name) command that only appears if you are exporting to a hard drive. This command tells PKZIP to make a self-extracting file from the ZIP file (for example *TXLODGE.EXE*). This is useful because the recipient of the export file does not need PKZIP software to import the data. The EXE file cannot be created on a floppy disk however.

You can press <enter> to follow the commands listed or you can change the command to suit individual needs. For example, if you wish to also format a disk, you could add the switch `-&f` to the PKZIP command (see your PKZIP manual for more information on options).

6. When the above commands are issued, the export file is created. Then a directory appears that shows where the export file(s) resides, the size of the file, and when it was modified and accessed. The main purpose of this is to show you if the file was created. If the file was not created for some reason (because, for example, PKZIP is not on your computer), the message **File not found** is shown under the directory.

### *Freeing Up Hard Drive Space*

If you are running out of hard drive space on your computer, or you have so much data that the system is slow-running, you may want to archive some old data to make room for incoming data. As to whether you should archive the data using the EXPORT utility or by making a system backup, I recommend that you at

least do a system backup because you can save files other than just the tables containing the entered data, such as the other look-up tables, indexes, and so forth (see “Section VIII. SYSTEM,” “Backing Up Your Data”). However, you may also want to export each stream data set as well so that you can bring specific data back into the system when needed. If you only have a system backup, you will not be able to append the old data to the new through FBASE since restoring the backup will result in overwriting the existing files.

After the data are backed up or exported, you can delete the data to free up hard drive space if needed (see “Section IV. DATA ENTRY,” “Deleting Records”). However, first make sure that your backup is current and that the export files are free of errors.

## **The IMPORT STREAM PACKAGE Utility**

The purpose of this utility is to append data from the export file to an existing database system (see “The EXPORT STREAM PACKAGE Utility” above). This facilitates data transfer between computers or allows you to un-archive data back into your system. Importing data is different from restoring data from an FBASE backup in that the data are added to existing data, rather than replaced with the data.

### *Importing a Stream Package*

If an EXE export file (for example, *TXLODGE.EXE*) was created, PKZIP software is not required in order to import the file. However, if the export file was created on a floppy disk as a ZIP file, PKZIP is needed for importation. See “The EXPORT STREAM PACKAGE Utility,” “Exporting a Stream Package,” above for more information.

The following steps are performed for importing stream data:

1. Before importing a stream, re-index your data, especially if they have not been re-indexed since the

last edits. See “The RE-INDEX DATABASE FILES Utility” below (this section) for instructions.

2. Press <2> for **IMPORT STREAM PACKAGE** under **Utilities** in FBASE’s main menu (fig. 20).

3. Type the drive ID to indicate where the export file is located. The default is *C*.

4. The **IMPORT STREAM GROUP** screen is displayed with a box that reads **Make Import Selection** and lists the export files available for import. Select the first export file that you want to import and press <Enter>. Note that files being imported from the hard drive have the extension EXE, whereas those on floppies have a ZIP extension.

5. A PKUNZIP command is shown (fig. 22) that tells PKZIP to extract the files contained in the export file. If you are unzipping a file from a floppy disk, you will be prompted to insert the last disk of the backup set. When the file is imported, you will receive a message that the update is complete.

6. If you have more files to import, repeat the above steps. Notice that the previously imported file is no longer listed as an option for importing. After importing the data, the export file is deleted from the FBASE directory.

7. Re-index the database again (see “The RE-INDEX DATABASE FILES Utility” below in this section for instructions).

### Contents of the Imported Data

All of the data for the stream ID and study specified in the export file are imported, including a STREAMS record if not already present in the STREAMS table. When a stream data set is imported, FBASE looks for a matching stream ID, study, and survey reach combination. If found, the data are not imported. If any one of these key variables is different, the data are imported. Therefore, if you are importing two reaches, one of which already exists on the system, only the one that does not exist is imported. If you are importing data that represent an update of data already on the

system, you must first delete the applicable header records from the current system and then import the updated data (see “Section IV. DATA ENTRY,” “Deleting Records”).

### The DYNAMIC SEGMENTATION Utility

This utility prepares your habitat data for dynamic segmentation in a geographic information system (GIS) by calculating addresses for each main channel habitat unit. For each main channel unit of the chosen stream data set, FBASE calculates the habitat unit’s positional length (in meters or feet, depending on what was specified in the header for the measurement unit) based on the length of the unit and its relative distance from the start of the survey reach (Radko 1997). It calculates the point where the unit started from, where it ended, and the mid-point, and puts these values in fields that it creates in the database structure.

When the HABITAT table is brought into the GIS, the addresses are used to “tell” the GIS where each unit is along a linear gradient (survey reach). Once the stream data are spatially located in a GIS, stream habitat conditions can be analyzed relative to other geographic features (for example, vegetation, roads, and so forth), resulting in improved resource understanding, data organization, and information-sharing (Radko 1997).

### Running the DYNAMIC SEGMENTATION Utility

The following are the steps required to run the DYNAMIC SEGMENTATION utility:

1. Go to **Utilities** in the main menu and press <3> or arrow-key down to **3. DYNAMIC SEGMENTATION** and press <Enter>.
2. Choose the stream from the STREAMS table, making sure to select the correct stream ID (the EPA

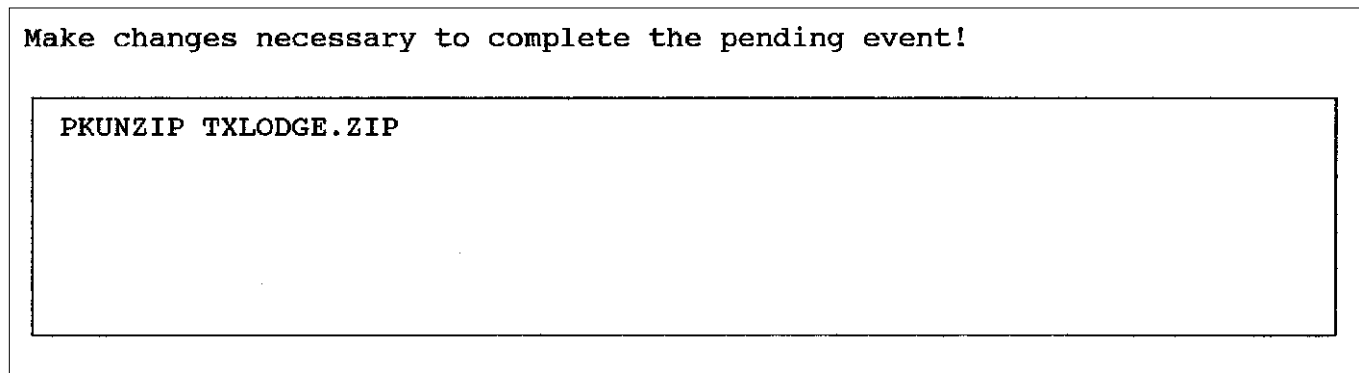


Figure 22—PKUNZIP command to import data.



reach number is unimportant for this task). If you choose a stream that has no data, you will get a message that says that the data for that stream do not exist and you will be returned to the main menu. If this occurs, try selecting a stream again.

3. If there is more than one study for the stream, the study choices are displayed under **Select STUDY**. Use the arrow key to highlight the desired study and press <Enter>.

4. Once you select a stream and study, a screen appears that shows the stream ID and name at the top (such as **ID2097 - LODGEPOLE CR**) and you will get a message similar to the following (but with the stream name you have selected):

**Process records for LODGEPOLE CR DYNAMIC SEGMENTATION Now? (Y/N)**

If you enter *N* (the default), you will be returned to the main menu. If you enter *Y*, FBASE will run the utility and will show how many records it has processed (such as *17 of 32*), until eventually the number of records processed is the same as the total number of records in the data set.

### *The FROM\_, TO\_, and MID\_ Fields and Data*

FBASE creates the fields FROM\_, TO\_, and MID\_ when you run the dynamic segmentation utility, and it puts the unit locational data in these fields. For example, the first habitat unit in the survey reach may go from 0 (FROM\_) to 23.3 (TO\_), with a mid-point of 11.7 (MID\_); the second unit may go from 23.3 (FROM\_) to 40.0 (TO\_) with a mid-point of 31.7 (MID\_); and so on. The first habitat unit of every reach has a FROM\_ of 0. The data in the new fields are located in the HABITAT.DBF table and can be accessed through dBASE, Paradox, Microsoft Access, or other database that can open or import DBF files.

### *Transferring the Data into a GIS*

The HABITAT.DBF table can be transferred to a GIS by using FTP protocol (if transferring from a PC to a UNIX workstation) and using an ARC/INFO command to convert the file from a DBF format to an INFO file format. See *Spatially Linking Basinwide Stream Inventories to Arcs Representing Streams in a Geographic Information System* (Radko 1997) for more information on how to use FBASE data with a GIS.

## **The RE-INDEX DATABASE FILES Utility**

This utility allows you to re-index and sort data in individual tables or all the tables at once. Indexing the tables helps FBASE find the indexed field's value and location by creating an NTX file containing this information. This is especially important for the table links

since FBASE must search for matches so that the data in the tables can be related. You should re-index if you are editing data, moving data (such as when you are exporting or importing data), or prior to making backups of your data. It should also be done on a routine basis, depending on how often you use FBASE and make changes to tables, in order to keep the database "clean."

Sorting the tables results in a physical rearranging within the database tables. It is used less often than re-indexing alone but can make your system run more efficiently if done on an occasional basis.

### *Re-indexing and Sorting Database Files*

Following these steps to re-index and sort data tables:

1. Go to Utilities from the main menu and press <4> or arrow-key down to **4. RE-INDEX DATABASE FILES** and press <Enter>.

2. A screen is displayed that reads the following:

**Re-Index Data Files!** This is followed by the options **With Sorting** or **Standard**.

Select **With Sorting** if you want to re-index and sort the data; select **Standard** if you only want to re-index. Sorting the data takes a substantial amount of additional time and should be used more sparingly.

3. After you make your selection, a screen displays the following:

**Re-Index Data Files!** This is followed by the options **All Database Files** or **Only Select Database Files**.

It is usually desirable to re-index all the files, especially if you are preparing to transport or back up data. However, if you are sorting the data as well and have only made changes to one or a few tables, you may want to re-index all the database files and then go back and sort only the files with which you have been working (this will also re-index those files because sorting cannot be done without re-indexing).

If you choose to re-index or sort all the files, a list of the tables is shown and they will be automatically re-indexed one at a time. As each one is finished, a check mark is displayed next to the table name.

If you choose to re-index and/or sort only selected files, a message will appear for every table, asking whether you want to re-index that table (fig. 23). The default is *Y*, so just press <Enter> if you want to select that file for re-indexing. If you type *N*, you will go to the next table and type *Y* or *N*. If you have finished re-indexing the desired tables and you are not at the end of the list, press <Esc>. However, do not hit <Esc> while a table is being re-indexed. Doing so will gener-





ate an error message and you will have to log back into FBASE and re-index that table again.

The bar at the bottom of the screen marks the progress during re-indexing, and the box above the bar indicates the name of the index file to which the data are being indexed (fig. 24). FBASE first “packs” the data (deletes marked records), then re-indexes, then sorts the tables (if this option was chosen), and then re-indexes again if sorting was done.

### Frequency of Re-indexing and Sorting

As mentioned above, how often you re-index and sort depends on how much you use FBASE and make changes to the tables. A good rule-of-thumb is to re-index all database files at the end of the day when in the data entry and editing mode and to sort about once a week. There are also other relevant occasions at which time you should re-index. These include: prior to exporting or making backups; after adding your password to the USERFILE table; before and after importing data; restoring data from backups; and running the dynamic segmentation routine. Also re-index if you receive suspicious errors that appear related to indexing; for example, if you get a message that values were not found in the look-up table when you are saving a record in the FBHEADER or HABITAT table and the values are visible in the look-up table. In this case, FBASE has lost its ability to locate

and connect to the reference tables. Re-indexing will remedy this problem.

## System

In this section, you will learn how to set up and configure FBASE to be compatible with your workstation and printer, add your password, and back up and restore data. You should ideally set up your system before entering data so that you can log into FBASE with your own password, utilize your workstation’s components most efficiently (for example, a color monitor), and print reports that are formatted correctly.

### System Menu

Under System in the main menu, you will find the following four options: **1. SYSTEM CONFIGURATION (SETUP)**, **2. BACKUP DATA TO FLOPPIES**, and **3. RESTORE DATA FROM FLOPPIES** (fig. 25). To access any of these items, type the corresponding number or arrow-key down to your choice and press <Enter>.

### Configuring Your System

The way in which you configure your system dictates how FBASE utilizes your particular computer for various tasks and recognizes users as having certain

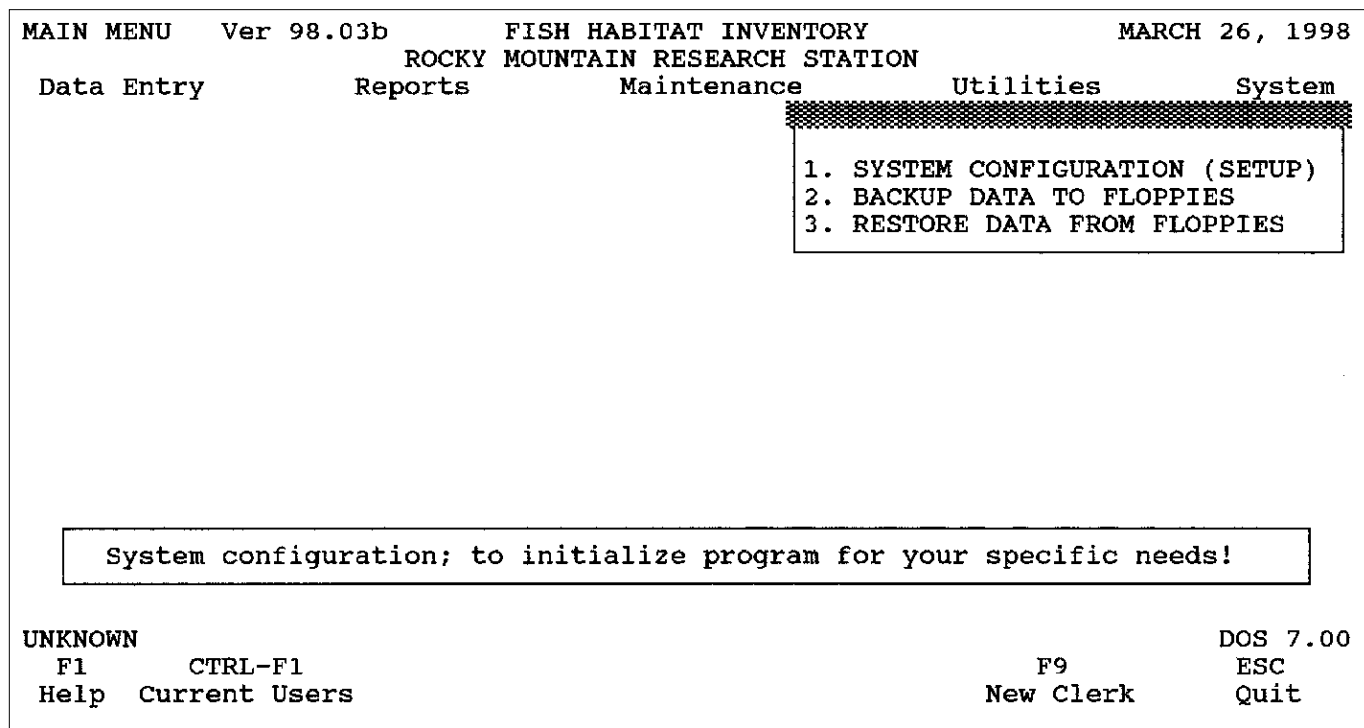


Figure 25—System menu.

privileges. In this way, you will optimize your computer's capabilities in utilizing FBASE and control the level of access for different users on your system.

### *System Configuration (Setup) Menu*

From System in the main menu, press <1> or <Enter> on **1. SYSTEM CONFIGURATION (SETUP)**. There are four options from which to choose, including **1. COMPANY NAME INFORMATION**, **2. WORK STATION SETUP**, **3. EMPLOYEE PASSWORD SECURITY**, and **R. RE-INDEX DATABASE FILES**. Type the corresponding number (or letter) or arrow-key down to your choice and press <Enter>.

### *Company Name Information*

The reason for adding the company name information is so that the heading at the top of the main menu screen will identify the Forest or District name and the original location of the data will be obvious if the database is transferred to another location.

To edit the record in the COMPANY table, enter the following information (type over existing non-applicable data): **Company Name** (Forest or District name), **Address**, **City**, **State**, **Zip + 4**, and **Phone** (including the area code). Press <Enter> from the last entry, or <Page Down> to save the record.

### *Work Station Setup*

The purpose of setting up your work station (or PC) is so that FBASE uses the correct configurations for your computer. These include network and printer options.

**Work Station Setup Menu**—Under **WORK STATION SETUP** there are two options, including **1. WORK STATION SETUP FOR THIS STATION**, and **2. PRINTER ASSIGNMENT FOR THIS STATION**.

**Work Station Setup for Your Station**—To set up your work station, select **1. WORK STATION SETUP FOR THIS STATION** from **2. WORK STATION SETUP** by pressing <Enter> or typing <1>. Provide the following information from the screen prompts (or type over existing information if present): **Enter Work station Location/Phone** (can leave blank), **Color Monitor with this Work station? (Y/N)** (the default is Y), and **Network Printer Capture Options**. If you are not on a network, leave the network printer capture options blank. When finished, press <Enter> on the last entry or <Page Down> to save.

**Assigning a Work Station Printer**—To set up your printer for reports, select **2. PRINTER ASSIGNMENT FOR THIS STATION** from **2.**

**WORK STATION SETUP**. There are two options, **1. CONFIGURE WORK STATION PRINTER(S)**, and **2. MODIFY PRINTERS AND ASSIGNED CODES**.

First select **1. CONFIGURE WORK STATION PRINTER(S)**. The second option is only used if your printer does not have a pre-established configuration. A screen is displayed that reads **1. PRINTER L1, 2. PRINTER L2**, and so forth. Press <Enter> while on **1. PRINTER L1**. A list of printers that FBASE supports is displayed with the heading of **Printers Selection** (fig. 26). Find your printer on the list and press <Enter> to select the printer. If your computer is connected to more than one printer, you can then select the second printer for **PRINTER L2**, and so on. To delete a printer from its assigned position (it will not be deleted from the selection list), highlight the printer position, press <F8> and enter Y when it asks **Delete PRINTER from assigned position? (Y/N)**.

If the exact printer name is not on the list, find one on the list that is of the same type (laser, DeskJet, dot-matrix, and so forth) and that uses the same printer control language. For instance, the HP LaserJet III can be used as a substitute for the Panasonic KX-P4420 Laser Printer. You may have to do some experimenting to find a compatible printer if yours is not listed, so select a report that is short, or select <F6> for **Test Printout** under **2. MODIFY PRINTERS AND ASSIGNED CODES** (see below) while the printer you are testing is highlighted. To print a report using a dot-matrix printer, you must use wide paper (11x8.5-inch) in order to fit the report on the page, unless the printer is able to print landscape.

If your printer is not on the list of configured printers, and you have tried similarly configured printers with no success, you must add your printer to the system from **2. MODIFY PRINTERS AND ASSIGNED CODES** (under **2. WORK STATION SETUP/2. PRINTER ASSIGNMENT FOR THIS STATION**). A screen is displayed with the header **ADD/EDIT/DELETE PRINTERS, EDIT PRINTER CODES**. You need the manual for your printer to be able to add the proper codes. I suggest that you add printer codes, rather than edit existing codes, and that you do not delete any printers from the list since they may be needed in the future.

At the bottom of your screen you will see your options, which include **F1 for Help**, **F4 to Add Printer**, **F5 to Delete Printer**, **F6 to Test Printout**, **ENTER to Edit**, and **Esc to Exit**. Press <F4> to add a printer. Enter the name of the printer (including model) where the screen reads **Add Printer**. Now the printer name will appear on the left and top of the screen and a blank configuration page on the right. The options that appear on the bottom include **F1 for Help**, with the up and down arrow keys, **ENTER to Modify**, **F7 to Edit Printer Name**, and **ESC to Quit**.

```

SETPRINT      Ver 98.03b      FISH HABITAT INVENTORY      MARCH 26, 1998
                ADD/EDIT/DELETE PRINTERS, EDIT PRINTER CODES

```

```

1. PRINTER L1:
2. PRINTER L2:
3. PRINTER L3:
4. PRIN Printers Selection
5. PRIN C.Itho F10 Starwriter
6. PRIN Canon BJ10e
          Canon LBP-8 A1 / A2
          Canon LBP-8 A1 / A2(ISO)
          Citizen 180-D
          Citizen MSP-10 / MSP-15
          TOP

```

Total Printers: 40

```

F1      Move      Press ENTER      F8      ESC
Help    ↑ ↓      to Select    Delete    Exit

```

Figure 26—Selecting a printer from the printer list.

```

USERINFO      Ver 98.03b      FISH HABITAT INVENTORY      MARCH 26, 1998
                USER DATA

```

USER LOOKUP

NAME		E
<pre> *** Top-of-File ▶ TEMP *** End-of-File </pre>	<pre> New Last Name: FISH First Name: FREDDY Initials: FF  Super Last Name: TECH Supr First Name: TINA Security level: 00 New Password: SALMO </pre>	<pre> TEM MANAGER! </pre>
<pre> Back Space      ↑ ↓      Pg Up  Pg Dn      ENTER Total Records: 1 </pre>		

```

F1      ESC
Help    Cancel

```

Figure 27—Entering a password record.

Press <Enter> to add the control codes for **Special Setup**. You are now asked to enter the ASCII values for **Special Setup**. Refer to your printer manual for these values under symbol set PC-8(D/N). As you type in the ASCII values, the corresponding ASCII characters will appear (or vice versa if you press <Tab> and enter the characters). When you are finished, press <Page Down> to save. Press <Enter> again to add the control codes for **Printer Reset**, and continue the process until you have made all the necessary configurations (many of them may not apply to your printer). To test the printer, select <F6> for **Test Printout**. If the printer was correctly configured in FBASE, the printout will print text and characters in the format that the text describes. For instance, the line reading CONDENSED PRINT MODE! will be condensed.

To modify existing codes, press <Enter> on the printer name, arrow-key down to the code that you want to change, and press <Enter>. Edit the ASCII values or characters and press <Page Down> to save. Modifying existing codes is not recommended unless the codes are incorrect for the specified printer (in other words, do not change the printer name and edit the codes instead of adding a printer).

### Password Security

There are two reasons why password security is used in this system. The first is to provide a basic level of security so that only those who are familiar with the purpose and uses of FBASE have access to the data. The second is so that the system can keep track of who is using the system at a given time in case a need for that information arises (this is especially applicable if there are many users). Password security offers some control over who can access the system and at what level they can access the data.

**Getting into FBASE for the First Time**—When you log into FBASE, you are prompted for a password. Initially, use the password TEMP to access FBASE. However, when you first get into FBASE, add your own password so that the system can identify you in future sessions. Then delete the TEMP password (see “Deleting a Password” below).

**Adding Your Password**—To add your password, go to **1. SYSTEM CONFIGURATION (SETUP)** under System, then select **3. EMPLOYEE PASSWORD SECURITY**. A table is displayed with the heading **USERLOOKUP** on the **USERDATA** screen. Press <F6> to add a password record. Enter your **Last Name**, **First Name**, and **Initials**. Next enter your supervisor’s last name (**Super Last Name**) and first name (**Supr First Name**) (fig. 27). The DBA should decide your **Security level**. The choices for security level are *00*, *01*, or *02*. Anything above level *02* is treated the same as *02*. The security level dictates

which parts of the system you can access and if you can manipulate data. Security level *00* is considered the **SYSTEM MANAGER** level, which enables the user to access everything available in the database and to add, delete, and otherwise manipulate data. Level *01* users can do everything *00* users can do except access system tasks (such as work station setup, data backup routines, and so forth). If a level *01* user tries to access **System**, the message **Must have a SYSTEM MANAGER access level** is shown. Level *02* (and above) users are basically view-only users. They cannot add, delete, or edit any of the tables, including the look-up tables under **Maintenance**. They also cannot utilize the re-index or dynamic segmentation utilities (although they can import and export data). Obviously, data entry personnel need to be at level *00* or *01* to be able to add and edit data. Level *01* should be sufficient for most data entry clerks unless they are responsible for backing up data, in which case they should be assigned the *00* level. Users at all levels can run reports and view all data.

Finally, add your **New Password** which must be six characters or less (you can also use numbers)(fig. 27). Make sure that your password is unique, otherwise you will get the following message:

**DUPLICATE use of Password! Please assign a UNIQUE Password.**

If you get this message, enter another password. Save this record by pressing <Enter> after typing in your password.

**Editing Your Password**—To edit your password, press <Enter> while the record is highlighted, make the necessary changes, and press <Enter> on the last entry or <Page Down> to save the changes.

**Deleting a Password**—You can delete a password record (if you are a **SYSTEM MANAGER**) by pressing <F7> on the record to be deleted. You will get this message:

**DELETE this User from the System? (Y/N).**

Enter *Y* to delete the record. For security reasons, it is a good idea to delete the *TEMP* password after you have added your own.

**Printing the Passwords**—You can also print a list of users with passwords by pressing <F4>. A screen displaying **PRINT USER ROSTER** is displayed with options for **ONLY ACTIVE**, **ALL USERS**, or **CANCEL PRINT**. This report prints the user’s name, initials, security level, and supervisor for the active user(s) or all users.

**Using Your Password in Future Sessions**—After you add your password to the system, press <F9> from the main menu for **New Clerk**. Then enter your new password. Notice that the name that appears at the

bottom left of the screen is now your first name rather than **UNKNOWN**. If the user changes during an FBASE session, the new user should press <F9> and enter his/her own password so that FBASE can keep track of who is using FBASE at any given time with a table called ACTLOG.DBF.

If you enter an invalid password, FBASE will give you a BAD PASSWORD message. Wait for the **Enter Password:** dialog box to appear and try again. If you enter an invalid password three times in a row, you are taken back to the DOS prompt.

**Using the ACTLOG TABLE**—FBASE keeps track of who is using FBASE by updating a table called ACTLOG.DBF (see appendix B for the file structure). When you enter your password, this table is updated and includes your name, the machine ID, your user level, and the date and time you logged in. If you want to look at this table because, for instance, changes have been made to the data and you want to know who was using FBASE most recently, you can view the file in another database (or spreadsheet) program, such as dBASE, Paradox, Access, and so forth.

### *Re-indexing Database Files*

This option is also available under **Utilities**. If you wish to access this utility from **System**, go to **1. SYSTEM CONFIGURATION (SETUP)**, then select **R. RE-INDEX DATABASE FILES**. Refer to “Section VII. UTILITIES,” “The RE-INDEX DATABASE FILES Utility” for instructions on re-indexing and sorting your tables.

### **Backing Up Your Data**

It is vitally important that your tables be backed up on a regular basis to avoid losing valuable data and time. Making backups is relatively easy to do and the time expenditure doing so is minor if you consider the time it takes to re-enter or edit data if somehow they are lost. If a table becomes corrupted, it may have serious implications not only for that table, but for the database as a whole. For example, if the FBHEADER table should become corrupt, all the links established with the other tables are also jeopardized. Therefore, the only options to remedy this problem are to restore the tables from a backup, or re-enter all the data, the latter option taking up to three or four weeks or more. FBASE has its own backup utility for your convenience, but backups can also be easily made outside of FBASE (see “Making Backups Outside of FBASE” below).

### *Backing Up Data Versus Using the Export Utility*

As discussed in section “VII. UTILITIES,” “The EXPORT STREAM PACKAGE Utility,” making a

backup of your data should not be confused with exporting data. Exporting extracts the desired data (specific streams) from the data files and creates new files, while backing up data through FBASE involves making copies of entire files. Exporting is used primarily to append data onto FBASE tables that exist on another computer. However, exporting can be used for backing up data if you want to back up individual stream survey sets, but making a full backup is still recommended. Similarly, data backups done through FBASE can serve the purpose of transferring files (including data files) to another computer, but if that computer already contains FBASE data you must be careful not to overwrite existing files.

### *Making Data Backups*

PKZIP software is required in order to back up data using FBASE. See “Section VII. UTILITIES,” “The EXPORT STREAM PACKAGE Utility,” “Exporting a Stream Package,” for more information about this requirement.

The following are the steps required to make a backup of your data through FBASE:

1. Re-index and sort your database tables before making any backups (see “Section VII. UTILITIES,” “The RE-INDEX DATABASE FILES Utility,” for instructions).
2. Go to **System** in the main menu, then type <2> or arrow key down to **2. BACKUP DATA TO FLOPPIES** and press <Enter> (fig. 25).
3. A dialog box appears that reads **Backup Files to Floppy:** and gives the options to backup to the **A: Drive, B: Drive, or Just ARCHIVE to C:** (or the drive on which FBASE resides). Use the right and left arrow keys to make your selection and press <Enter>. Make sure that you have a floppy diskette in the A or B drive if that is where the data will be backed up.
4. Now a screen gives you the choice of backing up the **PROGRAM DATA Set Only** or the **Entire SUB-DIRECTORY**. The “program data set” constitutes all the tables and their attached index and memo files, whereas the “entire sub-directory” encompasses all the files in your FBASE directory, including FBASE.EXE, import and export files, report files, and subdirectories. Press <Enter> on your selection.

If you choose to back up the entire subdirectory, you will get this message:

**NOTE! S\_BKFILE.ZIP can only be restored using the ‘PKUNZIP’ command.**

This simply means that you cannot restore the backup through FBASE since it contains all the files, including the program that runs FBASE. Instead, you must issue a command from the DOS prompt (or Windows)



to extract the data (see “Restoring Data from an FBASE Backup,” “Restoring Data” below for more instruction).

5. The next screen shows a PKZIP command. This command varies slightly depending on whether you are backing up to a floppy or the hard drive and if you back up the data files or the entire subdirectory. If you choose to back up the data files to a floppy, the following command is displayed:

```
PKZIP -&wv -rP -ex A:D_BKFILE *.DB? *.FPT  
*.NTX *.IDX *.CDX
```

This command says to write a file called D\_BKFILE to a floppy in the A drive containing all files that end in the specified extensions (for example, DBF, DBT, FPT, and so on). The **-&wv** says to span multiple disks, wipe the disk (so make sure the disk is free of needed data) and verify when spanning. The **-rP** means that PKZIP will recurse subdirectories and preserve the path structure, and the **-ex** indicates maximum compression. Press <Enter> to execute the command, or modify it if needed (for example, if you want to back up only the DBF and DBT files, you can delete everything after **\*.DB?**).

If you have a virus scanner on your PC that actively scans disks, and the ZIP file spans more than one diskette, you may get a system error or you will not be able to continue the backup on the second diskette. If this occurs, first check the diskette to make sure it is free of viruses, then disable the virus scanner before creating the backup (if you are running Windows95, the virus scanner can be disabled by re-starting Windows in MS-DOS mode).

The command used for backing up the data files to the hard drive is similar, except that the backup file is saved to the hard drive (for example C:\FBASE) instead of the floppy drive and the switches **-&wv** and **-rP** are not included. Also, an additional line is added as follows:

```
ZIP2EXE C:\FBASE\D_BKFILE.ZIP
```

This command converts the ZIP file to an EXE file so that you are able to restore the files without having PKZIP software on the receiving computer. See “Restoring Data from an FBASE Backup,” “Restoring Data” below for more information.

If you chose to back up the entire subdirectory, the screen displays commands similar to the following:

```
PKZIP -ex C:\FBASE\S_BKFILE *.*  
ZIP2EXE C:\FBASE\S_BKFILE.ZIP
```

This indicates that a file called S\_BKFILE will be created (instead of D\_BKFILE) and that all the files (\*.\*) are included in the backup, not just those with specified extensions. As with the D\_BKFILE file, the S\_BKFILE is also converted to an executable so that the

recipient of the backup does not need PKZIP to restore the data.

6. After the PKZIP command is issued, the backup file is created and you can see the files being “added” to the backup file. When it is finished, a directory of the file is shown so that you know that it has been created. If the file was not created, you probably do not have the required PKZIP software or the PKZIP directory is not in the path statement in your AUTOEXEC.BAT file (see “Section VII. UTILITIES,” “The EXPORT STEAM PACKAGE Utility,” “Exporting a Stream package,” for more information about the PKZIP requirement).

### *Frequency of Making Data Backups*

You should make a program data set backup frequently if you are entering and editing data. You may also want to back up the entire subdirectory on occasion, especially if it contains files other than data files (such as reports, import/export files, and so forth) that you wish to keep. It is helpful to establish a routine for making backups so that it is done consistently. For instance, you may want to have five floppies, one for each day of the work-week and labeled as such. Every day during data entry and editing, you could make a backup to the designated floppy.

### *Making Backups Outside of FBASE*

You are not required to create backups through FBASE, and cannot if you do not have PKZIP on your system. There are many other ways to create data backups, such as utilizing a tape or Bernoulli drive. If these options are not available, you can simply copy the desired files through DOS or Windows to floppies and/or the hard drive. However you decide to make backups, make certain it is performed on a regular basis.

### **Restoring Data from an FBASE Backup**

The restore utility provides a means of restoring data into FBASE from a backup file previously created in FBASE (see “Backing Up Your Data” above). Usually this utility is used after a problem with the current database arises, such as table corruption or hard drive failure. However, it can also be used to restore a backup file onto another computer to which you are transferring data if the receiving computer does not already contain FBASE data (see “Restoring Data Versus Using the Import Utility” below).

### *Restoring Data Versus Using the Import Utility*

As addressed under “Backing Up Data Versus Using Export Utility” above, restoring data and importing data have separate purposes and outcomes. Data

should only be restored in FBASE if data do not already exist in the data tables or you wish to overwrite existing data. The import utility is used when data do exist, but the user wants to append additional data to the tables. See also “Backing Up Data Versus Using the Export Utility” above and “Section VII. UTILITIES,” “The IMPORT STREAM PACKAGE Utility.”

### Restoring Data

If the backup file was created on the hard drive, the file ends in EXE, whereas if it was created on a floppy, it has the extension ZIP. To restore ZIP files, you must have PKZIP software (see “Section VII. UTILITIES,” “The EXPORT STEAM PACKAGE Utility,” “Exporting a Stream package,” for more information about the PKZIP requirement).

The steps taken to restore a backup file differ depending on whether the file contains the data set only (D\_BKFILE) or the whole sub-directory (S\_BKFILE). The data in the S\_BKFILE file cannot be restored using the FBASE restore utility because the FBASE.EXE file is in use when you are running FBASE (so it cannot be expanded). Follow these steps to restore the data contained in the S\_BKFILE backup file:

1. If the backup file is S\_BKFILE.EXE, go to the DOS prompt from the FBASE directory and type S\_BKFILE (or, from Windows Explorer, copy the file to your FBASE directory and double-click the file). If the backup file was created on a floppy, it is a ZIP file rather than an EXE file. To restore the S\_BKFILE.ZIP file you must have PKZIP software and you must issue the command from the DOS prompt (or execute it from Windows95). From DOS, type **PKUNZIP S\_BKFILE** while in the FBASE directory. Insert the last diskette in the set (or the only diskette if the file is on one floppy) when asked. Then insert the first diskette in the set.

2. The files in S\_BKFILE will now expand. If there are any files with the same name as those you are trying to restore, you will get a warning that the file already exists. Type *Y* to overwrite the existing file or *N* to avoid overwriting (or *A* to overwrite all the existing files).

3. Go into FBASE and re-index all database files (see “Section VII. UTILITIES,” “The RE-INDEX DATABASE FILES Utility,” for instructions).

If the backup file is called D\_BKFILE.exe (on the hard drive) or D\_BKFILE.ZIP (on one or more floppies), follow these steps:

1. Go to **System** in FBASE’s main menu, then type <3> or arrow key down to 3. **RESTORE DATA FROM FLOPPIES** and press <Enter>(fig. 25).

2. A dialog box appears that reads **RESTORE ‘DATA’ Files from Floppy**: and gives the options to restore data from the **A: Drive**, **B: Drive**, or **Unarchive from C:** (or the drive on which FBASE resides). Use the right and left arrow keys to make your selection and press <Enter>. Make sure that you have a floppy diskette containing D\_BKFILE in the A or B drive if that is where the data reside. Note that to be able to restore your data back into FBASE, the files necessary to run FBASE (table 2) must be in your directory.

3. If you are unarchiving your data (restoring from the hard drive), the following command is displayed:

**PKUNZIP -d C:\FBASE\D\_BKFILE.EXE**

If you are restoring from a floppy the command is similar except for the drive and directory name (for example, *A:D\_BKFILE* instead of *C:\FBASE\D\_BKFILE*). The -d means that the backup file is deleted after the files are “unzipped.” Press <Enter> to execute the command.

4. If the backup file is on a floppy, you are asked to insert the last diskette of the backup set (even if it is only on one floppy). If there is more than one floppy containing the backup file, you then put in the first diskette of the set. If there are any files with the same name as those you are trying to restore, you will get a warning that the file already exists. Type *Y* to overwrite the existing file or *N* to avoid overwriting (or *A* to overwrite all the existing files).

5. After the files expand, a directory is shown of the files that are in your FBASE directory. Make sure that all the desired files are present.

6. Re-index all database files (see “Section VII. UTILITIES,” “The RE-INDEX DATABASE FILES Utility” for instructions).

## Summary

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### Overview of FBASE

FBASE was developed to store, retrieve, and manage data collected using the R1/R4 Fish and Fish Habitat Inventory Procedures (Overton and others 1997). The data entry screens and reports relate directly to these procedures. Therefore, FBASE should not be used to store data for other inventories with different variables and data collection methods. To do this would defeat the purpose of having a standardized database and would result in potentially misleading conclusions about what the data portray.

FBASE allows some flexibility for different sampling levels (number of variables) and frequency (how often the variables are collected). Therefore, FBASE caters to varying amounts of available resources (time, money, and personnel), as well as different needs.



These needs may be based on the sampling objectives, such as basin-level sampling versus monitoring or may be related to the location of the inventory and, hence, which variables are most appropriate to collect. FBASE also offers flexibility for a wide range of users, from those who prefer to use FBASE only for ease of data entry and “canned” reports, to those who use FBASE data as a starting point from which to perform more elaborate analyses outside of FBASE.

There has been a substantial amount of data collected using the R1/R4 Inventory procedures and entered into FBASE. This is providing many opportunities to share data and to conduct broadscale analyses in more efficient and meaningful ways. The cost of having a standard database is also much lower than if users were to develop their databases independently.

## Future Updates and Changes to FBASE

FBASE is not a static program. We are continually receiving comments and suggestions from FBASE users on potential improvements. Also, there are occasional program errors that appear as the program is more heavily used. Therefore, minor updates to the program occur occasionally. Major improvements take more time and are dependent upon funding. As new versions come out, the version name changes to reflect the year, month, and update sequence (if there is more than one update within a month). For example, FBASE version *98.03a* represents the first update (“a”) done in March of 1998. A file with a list of users is kept so that updates are sent as needed.

Work is under way to make FBASE usable on the Forest Service IBM RISC platform. This will facilitate data sharing and make FBASE accessible to those in the Forest Service that do not have PCs but do have access to the IBM system. This system can also communicate with a variety of non-IBM systems.

## References

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## Software and Procedures Handbook INT-GTR-346 Availability

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Send requests for the FBASE software package to the author:

Mailing address: Rocky Mountain Research Station  
316 E Myrtle  
Boise, ID 83702  
Phone: (208) 373-4396

E-mail (outside FS): [swollrab/rmrs\\_boise@fs.fed.us](mailto:swollrab/rmrs_boise@fs.fed.us)

E-mail (within FS): [swollrab/rmrs,boise](mailto:swollrab/rmrs,boise)

Send requests for the Inventory Procedures Handbook (INT-GTR-346) to:

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## Appendix A: Troubleshooting (Commonly Asked Questions)

The following document addresses commonly asked questions and the most frequent problems encountered while using FBASE. If you still have a problem or question after reading the manual and this document, please call technical support at (208) 373-4396. This document is organized and cross-referenced by the sections in the manual. Please refer to the specified section of the manual for more information.

### “Getting Started” Section

*Question:* How do I start the FBASE program?

*Answer:* Once you have copied the FBASE files into a directory, you can start FBASE by typing *FB*, which activates a batch file that assigns the “machine ID” and calls the FBASE program.

*Question:* If I want to run FBASE in a network, what should I do differently to install FBASE?

*Answer:* If you are running FBASE in a network, you must assign a machine ID that identifies your PC. The easiest way to do this is to identify the ID when you log into FBASE (for example, type *FBASE WS\_FISH* if your PC name is *FISH*). Consult your network manager if you wish to use FBASE on a network.

*Question:* When I try to start FBASE by typing *FBASE* I get a message saying **MACHINE ID NOT FOUND**. If I press **Cancel** and try to get back into FBASE I just get the same message. What should I do?

*Answer:* If you are not running FBASE on a network, an easier way to get into FBASE is to type *FB* to activate the batch file (see above answer). You can also select **Add to AUTOEXEC.BAT** if you get the above message and then enter a machine ID. Then go into the *AUTOEXEC.BAT* file and move the **SET MACHINE=** statement below the **PATH** statement, save the file, and re-start your computer. If you see the message **Bad command or file name** flash on the screen at the end of the re-start, then the command is not in the correct place in the *AUTOEXEC.BAT*. Move the statement to another location and try again.

*Question:* When I try to get into FBASE I get an error message that says the following:

**The following ‘NTX’ File(s) are not present as required STREAMS1**

Then it says **Re-index Data Files**. What does this mean?

*Answer:* The above error message means that the index file *STREAMS1.NTX* is missing. To create

the missing index file, re-index the missing table (in this case, *STREAMS.DBF*) by pressing <Enter>, selecting **Standard**, then **Only Select Database Files**. Re-index the appropriate table(s) (see “Section VII. UTILITIES,” “The RE-INDEX DATABASE FILES Utility” for more information).

*Question:* Before I can get into FBASE, it asks for a password. What password do I use?

*Answer:* To get into FBASE for the first time, use the password *TEMP*. After you get into FBASE, add your own password and delete the record with the *TEMP* password (see “Section VIII. SYSTEM,” “Adding Your Password” and “Deleting a Password” for more information).

*Question:* After I enter my password, I get the following error message:

**File ‘STREAMS.DBF’ (not within path) could not be opened!**

Then I get kicked back to MS-DOS. What does this error refer to?

*Answer:* This error is saying that the *STREAMS.DBF* file is not present in your FBASE directory. This file (as well as the other files listed in table 2) is necessary to run FBASE. Check your FBASE directory for any missing files and add them if necessary.

### “Data Entry” Section

*Question:* After I enter data into a record and then save it, I get the following error message: **Error DBFNTX/1006 Create error: T\_VIIUYW.NTX (DOS Error 4)** Then I have to quit out of FBASE. How can I fix this?

*Answer:* This message usually means that the number of files specified in the **FILES=** statement in your *CONFIG.SYS* file is set too low (this statement determines the number of files that can be accessed by MS-DOS at one time). When you first install FBASE you are informed that your **FILES** are set too low and you can increase it to 99 if you answer *Y* to update. If you type *N*, you will have to edit the **FILES=** statement in your *CONFIG.SYS* file from DOS or Windows (from DOS type *EDIT CONFIG.SYS*). Change the number to 99, save the file, then re-start your system (see “Section II. GETTING STARTED,” “Installing FBASE” for more information).

*Question:* I entered the stream ID in the header and then chose a record from the *STREAMS* table. However, after I selected a record, I realized that it has the wrong EPA reach number for my survey reach. I cannot edit the EPA reach number in the header, so how do I change it so that it is correct?

*Answer:* Edit the stream ID variable in the header so that the STREAMS table appears. Then type in the stream name and re-select the correct record (with the correct EPA reach number) from the table.

*Question:* The stream for which I am entering data does not exist in the STREAMS table. When I tried to add a record for it, I got an error message that said **Mismatch STREAM ID/STREAM NAME on STREAMS file!** Why couldn't I add this STREAMS record?

*Answer:* The message you received means that another stream (with a different stream name) has already been assigned the stream ID that you were trying to assign to a new stream record. Since duplicate stream IDs are not allowed for different streams, you received the error message and the record was not added to the STREAMS table.

*Question:* I attempted to add a record to the STREAMS table and got a message saying **Duplicate STREAM ID/EPA REACH on STREAMS file!** Why did I receive this message?

*Answer:* The record you tried to add had the same stream ID and EPA reach number as an existing record, which is not permitted.

*Question:* When I enter a value for a variable, a message appears that says that the value was not found in the table. What table is it referring to and how can I avoid this message?

*Answer:* The table to which the message is referring is displayed when you press <F9> for a variable (these tables are actually segments of the TABLE1 POPUP HELP SYSTEM). If the value you entered was not found in the table, it is probably not a valid value. If this message appears, you should press <F9> and make a selection from the table. If you made a selection from the table and you still get this message, you probably need to re-index your database files (see "Section VII. UTILITIES," "The RE-INDEX DATABASE FILES Utility"). If the value is valid but is not in the table, see "Section VI. MAINTENANCE," "Adding a Record to a Look-up Table" (the DBA should perform this task).

*Question:* When I enter an elevation in the header, I get a message that I must enter a value less than or equal to 4500. What if the elevation is greater than 4500?

*Answer:* If you entered *M* (metric) as your measurement unit (**Meas. Units**), the elevation must be entered in meters. You will not need to enter an elevation greater than 4500 meters.

*Question:* I mistakenly skipped a habitat unit when entering the data, so that now the units are off by one. How can I edit the habitat unit numbering if FBASE will not allow me to enter duplicate unit numbers?

*Answer:* FBASE does not allow you to enter duplicate survey reach or habitat unit numbers because duplicates would confuse the links to the other tables. Therefore, if you need to add a skipped habitat unit, you must do so in such a way as to avoid duplication. This can be accomplished by going to the last record that needs to be changed and increasing the habitat unit number by one, then working backward until you get to the missing habitat unit. You can then add the habitat unit.

*Question:* When I tried to delete a STREAMS record from the STREAMS table, I got the following message: **Error BASE/1066 Argument error: conditional** Why did I get this message and how can I delete the STREAMS record?

*Answer:* This message is displayed if you try to delete a STREAMS record when there are data for that stream in other tables (like the FBHEADER table) and is meant to protect the data from being deleted inadvertently. If for some reason you must delete a STREAMS record (not generally recommended), you must first delete the data entered for that stream.

*Question:* I deleted an FBHEADER record (along with all the linked records in the HABITAT, LWD, FISH, and RIPARIAN tables) by accident. Can I recover these data so I do not have to enter them all over again?

*Answer:* You should restore your latest backup, assuming that the backup contains all the current data (see "Section VIII. SYSTEM," "Restoring Data from FBASE Backup" for more information). As a last resort, if you have not re-indexed the tables since making the deletion, you can go into dBASE (or other database program) and "unmark" those records for deletion since they are not actually deleted until you re-index. Remember to do this for EVERY affected file (HABITAT, LWD, and so forth) (see the program's manual or online help for more information). You cannot "unmark" records in FBASE.

*Question:* How can I delete an FBHEADER record without deleting all the linked records in the HABITAT, LWD, FISH, and RIPARIAN tables?

*Answer:* You cannot delete an FBHEADER record without deleting all the linked records. You should edit the FBHEADER record rather than delete it. If you do delete an FBHEADER record, data for other

FBHEADER records (in other words, survey reaches) are not affected.

*Question:* What is the difference between -9s (the default for most numeric values) and 0s? How do I know which to enter?

*Answer:* There is a very important difference between -9s and 0s. Leave the default of -9 if data DO NOT EXIST for a given variable. Enter a 0 if data do exist for the variable, and the value for the variable is 0. For example, if large woody debris was not counted in a habitat unit, leave the -9s. If it was counted but there was no large woody debris in the unit, enter 0s. Notice that the default value for the fish counts in the FISH table is 0. These should never be changed to -9s unless certain species were disregarded in the counts (for example, there were brook trout but only cutthroat trout were counted).

*Question:* I forgot to add comments while entering the data, so I edited the records needing comments and added them. However, if I look for the comments in the records, they are not there. Why were the comments not saved?

*Answer:* After you enter the comments, you must press <F2> to get back to the main data entry screen. Then you must press <Page Down> to save that record (and thus, the comments). If you just press <F2> and then escape from the record, the comments are not saved.

*Question:* I edited some comments in dBASE and now when I try to access FBASE, I get the following message: **Error DBFNTX/1012 Corruption detected: C:\FBASE\HABITAT.DBF** What happened and how do I fix it?

*Answer:* Although there are many similarities between CA Clipper (in which FBASE was written) and dBASE, the way in which each program treats memo files is different. You cannot change comments in dBASE without corrupting the table(s) in which you make the changes. You will also run into this problem if you change a value in a key field in a table (such as the stream ID in the FBHEADER table) while in dBASE without changing it in all the linked records. There are no advantages, and obvious disadvantages, to editing FBASE data in dBASE (or other database programs), so this practice should be avoided. The only way to recover the corrupt table is to restore the data from a backup (see "Section VIII. SYSTEM," "Restoring Data from FBASE Backup").

*Question:* I entered an FBHEADER record and now I am trying to enter data for the first habitat unit.

However, I cannot get past **Unit Avg. Depth** after I enter a value, either by pressing <Enter> or <Page Down>. What is wrong?

*Answer:* You probably failed to enter a value for **Meas. Units** in the header. Without knowing if the values are in metric or English, FBASE does not know what data validation to employ (the first validation that depends on what the measurement units are is for **Unit Avg. Depth**). Escape from the HABITAT record, edit the FBHEADER record, and add an *M* or *E* for **Meas. Unit**.

*Question:* If there are data for both measured and estimated substrate, how can I enter both?

*Answer:* You can only enter data for measured (counts) OR estimated (percents) values for substrate, not both. Therefore, if both exist, enter the measured data. If a correction factor for the estimated substrate is desired, this must be done outside of FBASE.

*Question:* Why can't I enter the length or percent stable bank without having to enter the left and right bank lengths?

*Answer:* Bank stability is "weighted" by bank length in the summary calculations (see appendix F for summary variable calculations). Therefore, bank lengths must be collected and entered in order to calculate bank stability means.

*Question:* When I change the LWD singles count in the HABITAT table from 2 to 1, I get a message that says the following: **SINGLES of 2 has been changed to 1...if LWD file is being used with counts, they will be put out of balance!** What does this message mean?

*Answer:* Because the LWD counts are linked between the HABITAT and LWD tables, changing the counts in the HABITAT table will affect the data entered in the LWD table. If you reduce the number of LWD singles from 2 to 1 in a HABITAT record, and you have data for the two singles already entered in the corresponding LWD table, the data in the LWD table are put "out of balance" with the HABITAT table (FBASE does not know which record to delete in the LWD table). Although this may sound confusing, just remember that **anytime data have been entered in the LWD table, any editing should also be done in the LWD table**, whether the edit constitutes deleting a record, adding a record, or changing the entered data. If this is done, the LWD counts in the HABITAT table will automatically be adjusted. If data have not been entered in the LWD table, edit the LWD counts in the HABITAT table.

*Question:* I changed a habitat unit number in the HABITAT table, and when I saved the record, I got the following message: **Linkage key has been altered, update ALL linked data NOW (Y/N)?** What does this message mean?

*Answer:* The habitat unit number is a key variable in the HABITAT table (as is channel code, side channel unit number, habitat type, habitat group, and velocity class), so if you change it in the HABITAT table, it must also be changed in the LWD, FISH, and RIPARIAN tables (assuming there are data in these tables). This message just serves as a reminder that, if you answer *Y* to the above question, the value for the habitat unit number will be changed in all the ancillary files. Even if there are no data in the other tables, you should answer *Y* if you want to make the change; otherwise, the habitat unit number is not changed in the HABITAT table.

*Question:* When I try to enter data for an LWD record, I get the following message: **HABITAT data could not be found. Please enter HABITAT data before re-try!** Why can't I enter the LWD data?

*Answer:* The HABITAT data must be entered for a given habitat unit before the LWD, FISH, or RIPARIAN data. This is because the key data you enter in the HABITAT table are linked to those other tables. Therefore, it is easiest just to enter all the HABITAT data for a given survey reach before entering the LWD, FISH, or RIPARIAN data for that reach.

## “Reports” Section

*Question:* When I try to print a report I get the following message: **No ASSIGNED Printer...have SYSTEM Manager correct problem!** How do I assign a printer?

*Answer:* Before you can print a report, you must assign a printer. Do this by going to **System/WORK STATION SETUP/PRINTER ASSIGNMENT FOR THIS STATION/CONFIGURE WORK STATION PRINTER(S)**. Select **1. PRINTER L1** and make a selection from the **Printers Selection** list. If your printer is not on the list, you may have to add your printer's codes under **MODIFY PRINTERS AND ASSIGNED CODES**. See “Section VIII. SYSTEM,” “Assigning a Work Station Printer” for more information.

*Question:* When I chose a stream from the STREAMS table to print a report, I got the following message: **Stream data for ADAIR CR does not exist!** There are data for Adair Creek so why do I get this message?

*Answer:* To run a report, FBASE looks for data that have the same stream ID as the STREAMS record you chose from the STREAMS table. For Montana streams, such as Adair Creek, you must be sure to select the STREAMS record with the EPA reaches that match your data, since every Montana EPA reach has its own stream ID. This is not the case for Idaho streams, which have a stream ID for every stream instead of every EPA reach number (for Idaho streams, select any STREAMS record with the correct stream ID).

*Question:* When I print a report, the report does not fit on the page and there are strange symbols in the place of lines. Why is this and how can I fix it?

*Answer:* You probably did not select the correct printer when you assigned the printer. If the printer is not on the list of choices, you may have to add your printer's codes. See Section “VIII. SYSTEM,” “Assigning a Work Station Printer,” for information on how to assign a printer or add your printer.

*Question:* When I print a report on a dot-matrix printer, the report does not fit on the page. How do I remedy this?

*Answer:* The reports are too wide to print in portrait, but dot-matrix printers do not print landscape. Therefore, you must use wide paper (11x8.5-inch) in order to fit the report on the page. You may have to use a different printer if your dot-matrix printer cannot accommodate wide paper (or print the report to a file and condense it further in a word processing document, and then print it out using that software).

*Question:* When I try to access a report in DOS that was printed to a file, there is nothing there. What is wrong?

*Answer:* First, make sure that you are issuing the DOS command from your FBASE directory, which is where the report file is located. Secondly, make sure that you are typing in the correct file name. Remember that FBASE adds the extension PRN to the end of the report text files. An example of the correct command using the MS-DOS editor is **EDIT RAPHAB.PRN**.

*Question:* There are two studies for the stream data I want to summarize. How do I summarize them together if it only gives me a choice of one or the other?

*Answer:* After you select the stream from the STREAMS table, then select the first study (for instance, *I96*). Then, when you are asked: **Any More Streams? (Y/N)**, enter *Y* and choose the

same stream from the STREAMS table. This time, however, select the other study (for instance, I97). The two studies will now be summarized together in one report. Note, however, that you cannot choose SURVEY REACH as the primary sort level. If a report by survey reach is desired, you must summarize each study separately.

*Question:* There is a livestock enclosure in the middle of one of the survey reaches. How can I summarize this separately from the rest of the survey reach?

*Answer:* You can summarize parts of reaches by entering *N* when asked: **Summarize all units for all reaches? (Y/N)**. Then select (by pressing <Space Bar>) the habitat units that you want to summarize together and press <Enter>. Go through this process again for the other units that you want to summarize separately.

*Question:* The data for bank stability were sub-sampled (they were collected only once out of every four units). Can I still generate a summary report for those data?

*Answer:* You can still generate a summary report if the data are sub-sampled, because FBASE disregards null data in the summary calculations. You must keep in mind, however, that data for bank lengths and other sub-sampled variables do not represent the entire data set but only a part of that data set. The sample size (*n*), which is printed on the reports for relevant variables, should be compared to the total number of units (also printed) so that the data are used appropriately.

*Question:* Can I summarize data for monitored survey reaches (in other words, only data for certain habitat units were collected)?

*Answer:* Yes, see previous *Answer*.

*Question:* If I calculate mean width on the raw data by hand, I come out with a different answer than what the report says. Why is this?

*Answer:* Mean widths, as well as several other variables (for example, habitat depth mean, percent stable bank mean, and so forth), are “weighted” to account for different lengths and sizes. For instance, the widths are weighted by habitat length (in other words, the width of each habitat unit is multiplied by its length and these values are summed, then divided by the sum of the habitat lengths). Therefore, those units with longer habitat lengths are represented greater in the mean width than those with shorter lengths. See appendix F for the summary variable calculations and a list of the weighted variables.

*Question:* When I print a physical summary report, the values for percent bank stability have “\*\*\*\*\*”s. What is wrong?

*Answer:* This indicates that some bank stabilities were entered as lengths, and some percents in the HABITAT table. Bank stability variables must be entered consistently (within a reach, or preferably, the entire survey) as either lengths or percents, but not both because of how FBASE calculates bank stability. To remedy this problem, re-enter the lengths as percents based on the bank lengths. For summary reports that combine streams, it is okay to have one stream with bank stabilities collected by length and the other by percent since FBASE can calculate bank stability based on the percents for both streams. See appendix F for the summary variable calculations.

*Question:* How do I generate GISFILE.DBF and REACHSM2.DBF so that I can incorporate reach data into a GIS?

*Answer:* When you run the REACH SUMMARY report, the GISFILE.DBF file is automatically created. This file is updated every time the report is run. To generate the REACHSM2.DBF file, select **Print to DELIMITED File** when the print options appear. The DBF files are stored in your FBASE directory.

## “Maintenance” Section

*Question:* If the stream for which I am entering data is not in the STREAMS table, where should I add the stream?

*Answer:* The STREAMS record can be added while entering the FBHEADER record for the stream or through **Maintenance**. Either method will activate the STREAMS table and allow you to enter a STREAMS record to the table.

*Question:* When I tried to add a new stream to the STREAMS table I got this message and the stream was not added: **Mismatch STREAM ID/STREAM NAME on STREAMS file!**

*Answer:* This message appears if you enter a new stream name for which there is already a stream ID in the STREAMS table. This is not permitted since every stream must have a unique ID. Assign a unique stream ID and proceed (see the Inventory Procedures manual for directions on how to assign stream IDs).

*Question:* Where do I add riparian community types so that they appear in the table when the data are entered?

*Answer:* The tables that appear while entering data when you press <F9> are actually parts of one table called the TABLE1 POPUP HELP SYSTEM (TABLE1.DBF). Riparian community types, as well as other desired pop-up choices, can be added to this table (see “Section VI. MAINTENANCE,” “Adding a Record to a Look-up Table” for specific information). However, since the pop-up choices reflect the options in the standard Inventory Procedures, it is usually unwise to add your own pop-up selections unless flexibility is permitted (such as with the riparian community types).

## “Utilities” Section

*Question:* I have data on two computers and I want to combine the data so that they are on just one computer. How should I do this?

*Answer:* You should export the data from one computer using **The EXPORT STREAM PACKAGE Utility** and import the data onto the other computer using **The IMPORT STREAM PACKAGE Utility** in FBASE. You must have PKZIP software on your computer to export the data. When you use the import utility, the data are appended (as opposed to restoring the data from a backup that will overwrite existing data). See “Section VII. UTILITIES,” “The EXPORT STREAM PACKAGE Utility” and “The IMPORT STREAM PACKAGE Utility” for specific instructions on how to export and import data.

*Question:* How do I export my data directly to a floppy diskette?

*Answer:* Enter the floppy drive (usually A or B) in the space for “Drive ID.”

*Question:* When I tried to export a stream data set the screen read **Bad command or file name** and then said **File not found**. What happened?

*Answer:* You probably do not have PKZIP installed on your computer, which is required to export data sets from FBASE. Also check your AUTOEXEC.BAT file and make sure that the PKZIP directory is in the PATH (see “Section VII. UTILITIES,” “The EXPORT STREAM PACKAGE Utility” “Exporting a Stream Package” for more information).

*Question:* I exported a stream data set and everything seemed to work fine, but when the directory was shown it said “File not found.” Was the export file created?

*Answer:* If you could see the files being added to the ZIP file, the file was created. However, the default **Drive ID** is **C**. If your hard drive has a different drive letter, you should put that in the place of **C**. The file was still created in your FBASE directory but the directory displayed does not show it because it is looking on the C drive.

*Question:* When I imported some data, I got an error that said the following: **Error DBFNTX/1021 Data width error** Then I can either select **Quit** or **Default**. What is this error and which selection should I make?

*Answer:* This error is usually the result of a numeric field containing alpha data (for example, a space occurs before the number). Often this results from importing data that was in an old format and was converted to a newer FBASE version. If you get this error, select **Default**. The data import will continue.

*Question:* After I run the dynamic segmentation utility, what data are added and where are these data located?

*Answer:* The following fields are added to the HABITAT.DBF file: FROM\_, TO\_, and MID\_. These represent the starting, ending, and mid-point, respectively, of main channel units along the reach. These data can be viewed in any of several database programs, including dBASE, Microsoft Access, Paradox, and so forth.

*Question:* When, and how often, should I re-index and sort my data?

*Answer:* Ideally, you should re-index your database files daily if you are entering and editing data. Additionally, you may need to re-index your files before and after running any of the utilities (like the exporting, importing, or dynamic segmentation utilities), prior to making data backups, and after restoring data from a backup. Also re-index if you start getting error messages during data entry that relate to not finding values in the tables when you know that they are in the tables, or if you type in a value in order to scroll down a table and the pointer does not follow what you are typing (for example, you type a “D” in the STREAMS table and the cursor goes instead to a stream starting with an “F”). I suggest sorting once a week during data entry and editing.

*Question:* I pressed <Esc> while FBASE was re-indexing and sorting my database files. After it finished re-indexing and sorting the table, I was kicked out of FBASE and got the following message: **Unrecoverable**



**error: 660: Incorrect value type** Why did I get this error and what should I do now?

*Answer:* You should not press <Esc> during re-indexing and sorting or you will get the above error. If you do get this error, log back into FBASE and re-index and sort the table from which you pressed <Esc>. If you cannot remember which table that was, re-index and sort all the database files.

*Question:* I deleted some records from a table and then went into dBASE to process a query. I noticed that the records I deleted are still in the database. Why is this and how can I get rid of these records?

*Answer:* Even though you “deleted” the records in FBASE and you can no longer see them in FBASE, they are not actually taken out of the database until you re-index the table from which you deleted the records. You can simply re-index this table in FBASE before running the query in dBASE, or you can remove the records (which will be “marked for deletion”) while in dBASE (see your dBASE manual for details on how to do this).

## “System” Section

*Question:* What do I do if my printer is not on the printer selection list?

*Answer:* If your printer is not on the list of printers supported by FBASE, first try selecting a printer(s) that uses a compatible printer language. Often, you can use a printer that is of the same make and type (for example, an HP laser printer) with slightly different model numbers. You should test printouts by either selecting short reports (to save paper) or choosing **Test Printout** (<F6>) under **2. MODIFY PRINTERS AND ASSIGNED CODES**. If you cannot find any “surrogate” printers, you can add your printer to the list through **2. MODIFY PRINTERS AND ASSIGNED CODES**. The printer codes that you need to add should be in your printer manual (see “Assigning a Work Station Printer”).

*Question:* If I can use *TEMP* as my password to get into FBASE, why do I need to add another password?

*Answer:* As soon as you get into FBASE using the *TEMP* password, you should add your own password and delete the *TEMP* password. The reasons for this are: (1) By adding your own password, FBASE can keep track of who is on the system and when by updating the ACTLOG.DBF file every time you log in with your password; (2) If you keep the *TEMP* password on your system, anybody that looks in this manual would have access to your data and (3) The *TEMP* password provides you with a 00 level (System Manager), but it may be more

appropriate if you are assigned a higher security level (01 or 02) (consult your supervisor or database manager).

*Question:* I have been entering and editing my data. Now I want to make a backup of the data in FBASE but when I tried to do this, I got a message saying the following: **Must have a SYSTEM MANAGER access level** What does this mean and how can I change it so that I can back up my data in FBASE?

*Answer:* This message implies that you were given a security level of 01 when your password was assigned. This security level allows you to access all items in FBASE except those under **System**. If you are responsible for making data backups, consult your supervisor or database manager (or someone else assigned a security level of 00) in order to change this.

*Question:* Why should I do a data backup and how often should I do one?

*Answer:* Whether you do a backup through FBASE or some other means, it is important to do this on a routine basis in case your hard drive crashes or one or more data tables get deleted or corrupted. Ask yourself this: How much data am I willing to re-enter? A day’s worth? A week’s worth? None? Answering this question will tell you how often you should make backups.

*Question:* What is the difference between making a backup of the **PROGRAM DATA Set Only** and the **Entire SUB-DIRECTORY**?

*Answer:* If you select the **PROGRAM DATA Set Only** option, FBASE creates a backup file, called D\_BKFILE, containing all of the DBF, DBT, NTX, FPT, CDX and IDX files that exist in your FBASE directory. If you select **Entire SUB-DIRECTORY**, a file called S\_BKFILE is generated. This file not only contains a backup of the files with extensions specified above, but also any other files existing in your FBASE directory (such as the EXE and PRN files) as well as other subdirectories existing under FBASE.

*Question:* When I tried to do a backup of the “program data set” files in FBASE the screen read **Bad command or file name** and then said **File not found**. Then I got a message saying the following: **The C:\FBASE\D\_BKFILE.EXE File was NOT generated!** Why wasn’t the backup file generated?

*Answer:* The backup file was not generated most likely because you either do not have the required PKZIP software on your computer, or if you do have PKZIP, it is not in the path statement of the

AUTOEXEC.BAT file (see “Section VII. UTILITIES,” “The EXPORT STREAM PACKAGE Utility” “Exporting a Stream Package” for more information on the PKZIP requirement).

*Question:* I tried backing up data through FBASE and when the first diskette was filled, it instructed me to insert the second diskette to continue the backup. However, it just keeps telling me to insert the second diskette as if it does not recognize that there is another one in the drive. What is wrong?

*Answer:* You may have a virus scanner installed on your computer that it is interfering with the backup process. If this is the case, disable the virus scanner and try again.

*Question:* When I attempted to restore my backup file through FBASE I got a message saying that the D\_BKFILE.ZIP file is not present. How can I restore my data?

*Answer:* You probably backed up the entire subdirectory, which creates a backup file called S\_BKFILE, as opposed to the data set which is backed up on D\_BKFILE. You cannot restore S\_BKFILE through FBASE because it contains the program files (such as FBASE.EXE), which cannot be expanded while you are running FBASE. If the backup file is S\_BKFILE.EXE, just type the file name (S\_BKFILE) from your FBASE directory in DOS to expand the files (or, from Windows Explorer, copy the file to the FBASE directory and double-click the file). If the file was created on a

floppy and is called S\_BKFILE.ZIP, you need PKZIP software to expand the files (see “Section VIII. SYSTEM,” “Restoring Data from an FBASE Backup,” “Restoring Data,” for more information).

*Question:* I want to bring a stream data set into another computer. However, I only have a backup file, not an import file. I do not want to copy over the data I already have, I just want to append this data set to existing tables. Is there any way to do this?

*Answer:* If the desired data is still on another computer, create an export file and then import it into your system (see “Section VII. UTILITIES,” “The EXPORT STREAM PACKAGE Utility” and “The IMPORT STREAM PACKAGE Utility”). If these data and/or FBASE no longer exist on another computer (for instance, a backup was made and then the files were deleted), you can create a temporary directory, restore the data from the backup file (see previous question), create an export file with the desired data set, copy the export file into the FBASE directory, and import the data set. If the backup file is called D\_BKFILE, then you will also have to copy the additional required files (see table 2) from your current FBASE directory into the temporary directory (but do not overwrite the data files contained in the backup file). You can also append FBASE files using other database software programs, such as Paradox, if you are an experienced user.

## Appendix B: FBASE Data Dictionary

### FBHEADER.DBF (Header Data Template)

Field Name	Field Description	Type*	Width	Dec.
1 STUDY	Stream inventory type and year	C	3	
2 STREAM	Stream name	C	30	
3 STREAM_ID	Stream code	C	9	
4 FOR_NAME	National Forest name	C	20	
5 FOR_CODE	National Forest code	C	2	
6 DIST_NAME	Ranger District name	C	20	
7 DIST_CODE	Ranger District code	C	2	
8 WILDRNESS	Wilderness status	L	1	
9 ECO_B	Ecoregion code (Bailey)	C	5	
10 ECO_O	Ecoregion code (Omernik)	C	2	
11 P_GEOL	Parent geology	C	11	
12 T_R_S	Legal location	C	14	
13 BASE_QUAD	Primary base map	C	20	
14 USFS_REACH	USFS reach number**	C	16	
15 EPA_REACH	EPA reach number	C	16	
16 LOBOUN	Lower survey reach boundary	C	48	
17 UPBOUN	Upper survey reach boundary	C	48	
18 REF_LAT	Reach start latitude (map)**	C	9	
19 REF_LONG	Reach start longitude (map)**	C	10	
20 DATE_1	Survey start date	D	8	
21 UNITS	Measurement units	C	1	
22 SURV_REACH	Survey reach number	N	5	0
23 REACH_TYPE	Reach type	C	1	
24 SURV_LAT	Reach start latitude (GPS)	C	9	
25 SURV_LONG	Reach start longitude (GPS)	C	10	
26 HABSERVER	Observer name	C	15	
27 HABCORDER	Recorder name	C	15	
28 DIVER1	Snorkeler #1 name	C	20	
29 DIVER2	Snorkeler #2 name	C	20	
30 MAP_SLOPES	tream gradient (map)	N	4	1
31 OBS_SLOPE	Stream gradient (field)	N	4	1
32 FLOW	Reach discharge	N	6	2
33 ELEVATION	Reach start elevation	N	5	0
34 CONFINED	Channel confinement	C	1	
35 WEATHER	Weather conditions	C	10	
36 M_FREQ	Measurement frequency**	N	2	0
37 NON_FS	Non Forest Service land	L	1	
38 OTH_OWN	Other ownership	C	20	
39 ADFOR_NAME	Administering National Forest name	C	20	
40 ADFOR_CODE	Administering National Forest code	C	2	
41 ADDST_NAME	Administering Ranger District name	C	20	
42 ADDST_CODE	Administering Ranger District code	C	2	
43 SUB_GEOL	Geology subclass	C	11	
44 LANDFORM	Landtype association**	C	6	
45 UP_DATE	Date of last header update (prg update)	D	8	
46 CLERK	Data entry clerk initials (prg update)	C	3	
47 COMMENTS	Header comments	M	10	
48 COV_GRP	Cover group	C	10	
49 HVAR1	Optional header variable	C	10	
50 TRIB_OF	Tributary of (stream name)	C	30	
51 EPA_LOBOUN	EPA reach lower boundary	C	30	
52 EPA_UPBOUN	EPA reach upper boundary	C	30	
53 CHAN_TYPE	Rosgen channel type	C	4	

\*Type: C = Character, L = Logical, D = Date, N = Numeric, M = Memo.

\*\*Field not currently used in FBASE.

## HABITAT.DBF (Habitat Data Template)

Field Name	Field Description	Type*	Width	Dec.
1 STUDY	Stream inventory type and year	C	3	
2 STREAM_ID	Stream code	C	9	
3 SURV_REACH	Survey reach number	N	5	0
4 REACH_TYPE	Reach type	C	1	
5 HAB_UNIT	Habitat unit number	N	4	0
6 UNIT_ID	Habitat unit code**	C	13	
7 CHAN_CODE	Main channel, side channel or adjacent unit	C	1	
8 CHAN_TYPE	Channel type**	C	4	
9 SIDE_UNIT	Side channel or adjacent unit number	N	4	0
10 MGMT	Management class**	C	6	
11 OBS_TYPE	Observation class**	C	1	
12 HAB_TYPE	Aquatic habitat type	C	3	
13 HAB_GRP	Aquatic habitat group	C	3	
14 HAB_CLS	Aquatic habitat class	C	4	
15 START_LAT	Unit start latitude	C	9	
16 START_LONG	Unit start longitude	C	10	
17 POCKETS	Number of pocket pools	N	3	0
18 PKT_DEPTH	Average pocket pool depth	N	5	2
19 HAB_LENGTH	Habitat unit length	N	7	1
20 HAB_WIDTH	Habitat unit width	N	4	1
21 HAB_DEPTH	Habitat unit average depth	N	5	2
22 MAX_DEPTH	Habitat unit maximum depth	N	5	2
23 S_DEPTH_L	Shore depth - left bank**	N	5	2
24 S_DEPTH_R	Shore depth - right bank**	N	5	2
25 TAIL_DEPTH	Pool tail crest depth	N	5	2
26 STP_NUM	Step pool number	N	3	0
27 STP_AVG_DP	Step pool average depth	N	5	2
28 PCT_LGSUBS	Percent large substrates**	N	3	0
29 PCT_OVCOV	Percent overhead cover**	N	3	0
30 PCT_SUBCOV	Percent submerged cover**	N	3	0
31 PCT_UCUT	Percent undercut bank**	N	3	0
32 L_WT_SHAPE	Wetted shape - left bank	C	1	
33 R_WT_SHAPE	Wetted shape - right bank	C	1	
34 BFL_WIDTH	Bankfull stream width**	N	6	1
35 MX_BFL_DEP	Maximum bankfull depth**	N	5	2
36 L_BFL_DEP	Bankfull depth - left**	N	5	2
37 R_BFL_DEP	Bankfull depth - right**	N	5	2
38 L_BF_SHAPE	Bankfull shape - left bank**	C	1	
39 R_BF_SHAPE	Bankfull shape - right bank**	C	1	
40 PCT_FINES	Percent fines	N	3	0
41 PCT_PGRAVL	Percent peagravel**	N	3	0
42 PCT_GRAVEL	Percent gravel	N	3	0
43 PCT_RUBBLE	Percent rubble**	N	3	0
44 PCT_COBBLE	Percent cobble	N	3	0
45 PCT_BOLDER	Percent boulder	N	3	0
46 PCT_BEDROK	Percent bedrock	N	3	0
47 PCT_SFINES	Percent surface fines	N	3	0
48 LWD_SINGLE	Number of LWD single pieces	N	3	0
49 LWD_WADS	Number of LWD rootwads	N	3	0
50 LWD_AGREGS	Number of LWD aggregates	N	3	0
51 LEFT_LEN	Left bank length	N	7	1
52 LEN_VGST_L	Length vegetated stable bank-left**	N	7	1
53 LEN_VGUS_L	Length vegetated unstable bank-left**	N	7	1
54 LEN_UVST_L	Length unvegetated stable bank-left**	N	7	1
55 LEN_UVUS_L	Length unvegetated unstable bank-left**	N	7	1
56 RITE_LEN	Right bank length	N	7	1
57 LEN_VGST_R	Length vegetated stable bank-right**	N	7	1

(Con.)

HABITAT.DBF (Con.)

Field Name	Field Description	Type*	Width	Dec.
58 LEN_VGUS_R	Length vegetated unstable bank-right**	N	7	1
59 LEN_UVST_R	Length unvegetated stable bank-right**	N	7	1
60 LEN_UVUS_R	Length unvegetated unstable bank-right**	N	7	1
61 LEN_UCUT_L	Length undercut bank-left	N	7	1
62 LEN_UCUT_R	Length undercut bank-right	N	7	1
63 LEN_GNTL_L	Length gentle bank-left**	N	7	1
64 LEN_GNTL_R	Length gentle bank-right**	N	7	1
65 LEN_STEP_L	Length steep bank-left**	N	7	1
66 LEN_STEP_R	Length steep bank-right**	N	7	1
67 PCT_VGST_L	Percent vegetated stable bank-left**	N	7	1
68 PCT_VGUS_L	Percent vegetated unstable bank-left**	N	7	1
69 PCT_UVST_L	Percent unvegetated stable bank-left**	N	7	1
70 PCT_UVUS_L	Percent unvegetated unstable bank-left**	N	7	1
71 PCT_VGST_R	Percent vegetated stable bank-right**	N	7	1
72 PCT_VGUS_R	Percent vegetated unstable bank-right**	N	7	1
73 PCT_UVST_R	Percent unvegetated stable bank-right**	N	7	1
74 PCT_UVUS_R	Percent unvegetated unstable bank-right**	N	7	1
75 PCT_UCUT_L	Percent undercut-left	N	7	1
76 PCT_UCUT_R	Percent undercut-right	N	7	1
77 PCT_GNTL_L	Percent gentle bank-left**	N	7	1
78 PCT_GNTL_R	Percent gentle bank-right**	N	7	1
79 PCT_STEP_L	Percent steep bank-left**	N	7	1
80 PCT_STEP_R	Percent steep bank-right**	N	7	1
81 H2O_TEMP	Water temperature	N	5	1
82 AIR_TEMP	Air temperature	N	5	1
83 TEMP_TIME	Time temperatures measured	C	5	
84 COV_GRP	Cover group**	C	6	
85 COV_CLASS	Cover class**	C	8	
86 SAND_CNT	Count of sand**	N	3	0
87 PGRAVL_CNT	Count of peagravel**	N	3	0
88 GRAVL_CNT	Count of gravel	N	3	0
89 RUBBLE_CNT	Count of rubble**	N	3	0
90 COBBLE_CNT	Count of cobble	N	3	0
91 BOLDER_CNT	Count of boulder	N	3	0
92 ROCK_CNT	Count of bedrock	N	3	0
93 UP_DATE	Date of last habitat update (prg update)	D	8	
94 CLERK	Data entry clerk initials (prg update)	C	3	
95 PCT_SCOB	Percent small cobble	N	3	0
96 PCT_SBLD	Percent small boulder	N	3	0
97 PCT_BS_L	Percent stable bank-left	N	3	0
98 LEN_BS_L	Length of stable bank-left	N	7	1
99 PCT_BS_R	Percent stable bank-right	N	3	0
100 LEN_BS_R	Length stable bank-right	N	7	1
101 PVAR1	Optional physical variable (character)	C	10	
102 PVAR2	Optional physical variable (numeric)	N	7	1
103 SCOBBL_CNT	Count of small cobble	N	3	0
104 SBOULD_CNT	Count of small boulder	N	3	0
105 FROM_	Start of unit (meters along reach)	N	7	1
106 TO_	End of unit (meters along reach)	N	7	1
107 MID_	Mid-point of unit (meters along reach)	N	7	1
108 LAST_	UNIT Reach number at last unit**	N	5	0
109 FINES_CNT	Count of fines	N	3	0
110 HAB_AREA	Calculated habitat area	N	10	2
111 HAB_VOL	Calculated habitat volume	N	10	2
112 RESID_VOL	Calculated residual pool volume	N	10	2
113 RESID_MXD	Calculated residual max pool depth	N	10	2

(Con.)

## HABITAT.DBF (Con.)

Field Name	Field Description	Type*	Width	Dec.
114 WD_RATIO	Calculated width-to-depth ratio	N	10	2
115 COMMENTS	Habitat comments	M	10	
116 SGRAVL_CNT	Count of small gravel	N	3	0
117 PCT_SGRV	Percent small gravel	N	3	0

\*Type: C = Character, N = Numeric, D = Date, M = Memo.

\*\*Field not currently used in FBASE.

## LWD.DBF (LWD Data Template)

Field Name	Field Description	Type*	Width	Dec.
1 STUDY	Stream inventory type and yea	C	3	
2 STREAM_ID	Stream code	C	9	
3 SURV_REACH	Survey reach number	N	5	0
4 REACH_TYPE	Reach type	C	1	
5 HAB_UNIT	Habitat unit numbe	N	4	0
6 UNIT_ID	Unit identification number**	C	13	
7 CHAN_CODE	Main channel, side channel or adjacent unit	C	1	
8 CHAN_TYPE	Channel type**	C	4	
9 SIDE_UNIT	Side channel or adjacent unit number	N	4	0
10 HAB_TYPE	Aquatic habitat type	C	3	
11 E_LEN_S	Estimated single length	N	5	1
12 E_DIA_S	Estimated single diameter	N	5	2
13 M_LEN_S	Measured single length**	N	5	1
14 M_DIA_S	Measured single diameter*	N	5	2
15 S_PCT_SUBM	Percent submerged single	N	3	0
16 E_PCS_A	Number of pieces in aggregate	N	4	0
17 E_LEN_A	Estimated aggregate length**	N	5	1
18 E_WID_A	Estimated aggregate width**	N	5	2
19 E_DEP_A	Estimated aggregate depth**	N	5	2
20 A_PCT_SUBM	Percent submerged aggregate**	N	3	0
21 E_VOL_A	Estimated aggregate volume**	N	6	2
22 NUM_WADS	Number of root wads**	N	2	0
23 E_LEN_W	Estimated rootwad length**	N	5	1
24 E_DIA_W	Estimated rootwad diameter**	N	5	2
25 M_LEN_W	Measured rootwad length**	N	5	1
26 M_DIA_W	Measured rootwad diameter**	N	5	2
27 W_PCT_SUBM	Percent submerged rootwad**	N	3	0
28 UP_DATE	Date of last LWD update (prg update)	D	8	
29 CLERK	Data entry clerk initials (prg update)	C	3	
30 COMMENTS	LWD comments	M	10	
31 LVAR1	Optional LWD variable	N	7	1
32 DETAIL	LWD detail**	L	1	
33 HAB_GRP	Aquatic habitat group	C	3	
34 HAB_CLS	Aquatic habitat class	C	4	

\*Type: C = Character, N = Numeric, D = Date, M = Memo.

\*\*Field not currently used in FBASE.

## FISH.DBF (Fish Observation Data Template)

Field Name	Field Description	Type*	Width	Dec.
1 STUDY	Stream inventory type and yea	C	3	—
2 STREAM_ID	Stream code	C	9	
3 SURV_REACH	Survey reach number	N	5	0
4 REACH_TYPE	Reach type	C	1	
5 HAB_UNIT	Habitat unit number	N	4	0
6 UNIT_ID	Habitat unit code**	C	13	

(Con.)

**FISH.DBF (Con.)**

Field Name	Field Description	Type*	Width	Dec.
7 CHAN_CODE	Main channel, side channel or adjacent unit	C	1	
8 CHAN_TYPE	Channel type**	C	4	
9 SIDE_UNIT	Side channel or adjacent unit number	N	4	0
10 HAB_TYPE	Aquatic habitat type	C	3	
11 NUM_DIVERS	Number of divers	N	2	0
12 DIVE_DATE	Date of dive	D	8	
13 DIVE_TIME	Time of dive	C	5	
14 DIVE_WTEMP	Water temperature @ dive	N	5	1
15 DIVE_ATEMP	Air temperature @ dive	N	5	1
16 DIV_LENGTH	Length of dive unit	N	7	1
17 DIV_WIDTH	Average width of dive unit	N	4	1
18 DIV_DEPTH	Average depth of dive unit	N	5	2
19 DIV_MAX_DP	Maximum depth of dive unit	N	5	2
20 PCT_UC	Percent undercut bank	N	3	0
21 PCT_OC	Percent overhead cover	N	3	0
22 PCT_SC	Percent submerged cover	N	3	0
23 PCT_LS	Percent large substrates	N	3	0
24 CHIN_0	Age 0 chinook	N	3	0
25 CHIN_1	Age 1 chinook	N	3	0
26 ST_1	Age 1 steelhead	N	3	0
27 ST_2	Age 2 steelhead	N	3	0
28 ST_3	Age 3 steelhead	N	3	0
29 RB	Rainbow >250mm	N	3	0
30 CT_100	Cutthroat <100mm	N	3	0
31 CT_100_200	Cutthroat 100-200mm	N	3	0
32 CT_200_300	Cutthroat 200-300mm	N	3	0
33 CT_300	Cutthroat >300mm	N	3	0
34 BT_100	Bull trout <100mm	N	3	0
35 BT_100_200	Bull trout 100-200mm	N	3	0
36BT_200_300	Bull trout 200-300mm	N	3	0
37 BT_300_400	Bull trout 300-400mm	N	3	0
38 BT_400_500	Bull trout 400-500mm	N	3	0
39 BT_500	Bull trout >500mm	N	3	0
40 YOY	Young of the year presence	L	1	
41 BK_100	Brook trout <100mm	N	3	0
42 BK_100_200	Brook trout 100-200mm	N	3	0
43 BK_200_300	Brook trout 200-300mm	N	3	0
44 BK_300	Brook trout >300mm	N	3	0
45 UP_DATE	Date of last fish update (prg update)	D	8	
46 CLERK	Data entry clerk initials (prg update)	C	3	
47 COMMENTS	Fish comments	M	10	
48 FVAR1	Optional fish variable	N	3	0
49 CHIN_ADT	Adult chinook	N	3	0
50 HAB_GRP	Aquatic habitat group	C	3	
51 HAB_CLS	Aquatic habitat class	C	4	
52 BN_100	Brown trout <100mm	N	3	0
53 BN_100_200	Brown trout 100-200mm	N	3	0
54 BN_200_300	Brown trout 200-300mm	N	3	0
55 BN_300_400	Brown trout 300-400mm	N	3	0
56 BN_400	Brown trout >400mm	N	3	0
57 RD_100	Redband trout <100mm	N	3	0
58 RD_100_200	Redband trout 100-200	N	3	0
59 RD_200	Redband trout >200mm	N	3	0

\*Type: C = Character, L = Logical, D = Date, N = Numeric, M = Memo.

\*\*Field not currently used in FBASE.



## RIPARIAN.DBF (Riparian Data Template)

Field Name	Field Description	Type*	Width	Dec.
1 STUDY	Stream inventory type and year	C	3	
2 STREAM_ID	Stream code	C	9	
3 SURV_REACH	Survey reach number	N	5	0
4 REACH_TYPE	Reach type	C	1	
5 HAB_UNIT	Habitat unit number	N	4	0
6 UNIT_ID	Habitat unit code**	C	13	
7 CHAN_CODE	Main channel, side channel or adjacent unit	C	1	
8 CHAN_TYPE	Channel type**	C	4	
9 SIDE_UNIT	Side channel or adjacent unit number	N	4	0
10 HAB_TYPE	Aquatic habitat type	C	3	
11 SDG_RUSH_L	Sedge/rush, left bank**	N	3	0
12 SDG_RUSH_R	Sedge/rush, right bank**	N	3	0
13 GRSS_FRB_L	Grass/forb, left bank**	N	3	0
14 GRSS_FRB_R	Grass/forb, right bank**	N	3	0
15 RP_SHRB_L	Riparian shrub, left bank**	N	3	0
16 RP_SHRB_R	Riparian shrub, right bank**	N	3	0
17 UP_SHRB_L	Upland shrub, left bank**	N	3	0
18 UP_SHRB_R	Upland shrub, right bank**	N	3	0
19 BARE_L	Bare ground, left bank**	N	3	0
20 BARE_R	Bare ground, right bank**	N	3	0
21 RP_TREE_L	Riparian tree, left bank**	N	3	0
22 RP_TREE_R	Riparian tree, right bank**	N	3	0
23 UP_TREE_L	Upland tree, left bank**	N	3	0
24 UP_TREE_R	Upland tree, right bank**	N	3	0
25 UP_DATE	Date of last riparian update (prg update)	D	8	
26 CLERK	Data entry clerk initials (prg update)	C	3	
27 COMMENTS	Riparian comments	M	10	
28 RVAR1	Optional riparian variable	C	10	
29 RIP_CD1_L	Dominant RCT, left bank	C	13	
30 RIP_CD1_R	Dominant RCT, right bank	C	13	
31 RIP_CD2_L	Sub-dominant RCT, left bank	C	13	
32 RIP_CD2_R	Sub-dominant RCT, right bank	C	13	
33 DC_TRE_L	Deciduous tree, left bank**	N	3	0
34 DC_TRE_R	Deciduous tree, right bank**	N	3	0
35 CN_TRE_L	Coniferous tree, left bank**	N	3	0
36 CN_TRE_R	Coniferous tree, right bank**	N	3	0
37 HAB_GRP	Aquatic habitat group	C	3	
38 HAB_CLS	Aquatic habitat class	C	4	

\*Type: C = Character, N = Numeric, D = Date, M = Memo.

\*\*Field not currently used in FBASE.

## STREAMS.DBF (Stream Data Template)

Field Name	Field Description	Type*	Width	Dec.
1 STREAM_ID	Stream identification code	C	9	
2 STREAM	Stream name	C	3	0
3 ACRONYM	Stream acronym**	C	4	
4 BASIN_NAME	Drainage basin name	C	20	
5 TRIB_OF	Tributary into which the stream flows	C	30	
6 LOBOUN	Lower EPA reach boundary	C	30	
7 UPBOUN	Upper EPA reach boundary	C	30	
8 STATE	State where stream is located	C	2	
9 STREAM_NO	Stream number (from IRIS)**	N	5	0
10 EPA_REACH	EPA reach number	C	16	

\*Type: C = Character, N = Numeric.

\*\*Field not currently used in FBASE.

## REGIONS.DBF (Region Data Template)

Field Name	Field Description	Type*	Width	Dec.
1 STATE	State where Regional office is located	C	2	
2 REG_CODE	Region code	C	2	
3 FS_REGION	Region name	C	30	
4 REG_FBIOL	Regional Fishery Biologist name	C	25	
5 REG_WBIOL	Regional Wildlife Biologist name	C	25	
6 FORESTER	Regional Forester name	C	25	
7 PHONE_SYS	Telephone system (FTS or COMM)	C	3	
8 AREA_CODE	Telephone area code of Regional office	C	3	
9 PHONE_NUM	Telephone number of Regional office	C	8	
10 RO_CITY	Regional office city	C	25	
11 RO_ADD_1	Regional office address (first line)	C	25	
12 RO_ADD_2	Regional office address (second line)	C	25	
13 RO_ZIP	Regional office ZIP code	C	5	

\*Type: C = Character.

## FORESTS.DBF (Forest Data Template)

Field Name	Field Description	Type*	Width	Dec.
1 REG_CODE	Region code	C	2	
2 STATE	State where Supervisor's office is located	C	2	
3 FOR_NAME	National Forest name	C	20	
4 FOR_CODE	National Forest code	C	3	
5 FOR_FBIOL	Forest Fishery Biologist name	C	25	
6 FOR_WBIOL	Forest Wildlife Biologist name	C	25	
7 FOR_SUPV	Forest Supervisor name	C	25	
8 PHONE_SYS	Telephone system (FTS or COMM)	C	3	
9 AREA_CODE	Telephone area code of Supervisor's office	C	3	
10 PHONE_NUM	Telephone number of Supervisor's office	C	8	
11 SO_CITY	Supervisor's office city	C	25	
12 SO_ADD_1	Supervisor's office address (first line)	C	25	
13 SO_ADD_2	Supervisor's office address (second line)	C	25	
14 SO_ZIP	Supervisor's office ZIP code	C	5	

\*Type: C = Character.

## DISTRCTS.DBF (Ranger District Data Template)

Field Name	Field Description	Type*	Width	Dec.
1 REG_CODE	Region code	C	2	
2 FOR_CODE	National Forest code	C	2	
3 DIST_NAME	Ranger District name	C	20	
4 DIST_CODE	Ranger District code	C	2	
5 DIST_FBIOL	District Fishery Biologist name	C	25	
6 DIST_WBIOL	District Wildlife Biologist name	C	25	
7 DIST_RANGR	District Ranger name	C	25	
8 PHONE_SYS	Telephone system (FTS or COMM)	C	3	
9 AREA_CODE	Telephone area code of District office	C	3	
10 PHONE_NUM	Telephone number of District office	C	8	
11 DO_STATE	District office state	C	2	
12 DO_CITY	District office city	C	25	
13 DO_ADD_1	District office address (first line)	C	25	
14 DO_ADD_2	District office address (second line)	C	25	
15 DO_ZIP	District office ZIP code	C	5	

\*Type: C = Character.

## TABLE1.DBF (Table1 Pop-up Help System Template)

Field Name	Field Description	Type*	Width	Dec.
1 CATEGORY	Data category (e.g., FBHEADER)	C	8	
2 FIELD	Field name	C	10	
3 POPUP	Pop-up description	C	45	
4 TITLE	Box title	C	21	

\*Type: C = Character

## USERFILE.DBF (User Information Template)

Field Name	Field Description	Type*	Width	Dec.
1 MACHINE_ID	Machine (computer) identification number	C	8	
2 USER_LNAME	User's last name	C	20	
3 USER_FNAME	User's first name	C	15	
4 USER_INIT	User's initials	C	3	
5 USER_NO	User number**	C	11	
6 HOME_PHONE	User's home telephone number	C	14	
7 USER_PASS	User's password	C	30	
8 SUPR_LNAME	Supervisor's last name	C	20	
9 SUPR_FNAME	Supervisor's first name	C	20	
10 UP_DATE	Date of last update	D	8	
11 TRNSMT_FLG	Transmit flag (system-assigned)	C	1	

\*Type: C = Character, D = Date.

\*\*Field not currently used in FBASE.

## ACTLOG.DBF (Activity Log Template)

Field Name	Field Description	Type*	Width	Dec.
1 USER_LNAME	User's last name	C	20	
2 USER_FNAME	User's first name	C	15	
3 USER_INIT	User's initials	C	3	
4 MACHINE_ID	Machine (computer) identification number	C	8	
5 USER_LEVEL	User's access level	C	2	
6 ACCES_DATE	Date accessed	D	8	
7 ACCES_TIME	Time accessed	C	5	
8 TIME_OFF	Blank	C	5	
9 DURATION	Blank	C	5	

\*Type: C = Character, D = Date.

## GISFILE.DBF (Reach Summary Report Template)

Field Name	Field Description	Type*	Width	Dec.
1 STREAM_ID	Stream code	C	9	
2 STUDY	Stream inventory type and year	C	3	
3 SURV_REACH	Survey reach number	N	5	0
4 REACH_TYPE	Reach type	C	1	
5 UNITS	Total number of habitat units in survey reach	N	8	0
6 M_GRAD	Stream gradient (map)	N	4	1
7 O_GRAD	Stream gradient (field)	N	4	1
8 LENGTH	Length of survey reach	N	8	1
9 WIDTH	Mean width of survey reach	N	5	1
10 POOLS	Percent pools in survey reach	N	5	1
11 MAXDEP	Mean maximum depth of survey reach	N	5	2
12 WIDDEP	Mean width to depth ratio of survey reach	N	7	1
13 RESVOL	Mean residual pool volume of survey reach	N	8	1
14 LWD	Number of LWD per 100m or ft in reach	N	8	1
15 PCT_BS	Mean percent bank stability for survey reach	N	5	1

(Con.)

## GISFILE.DBF (Con.)

Field Name	Field Description	Type*	Width	Dec.
16 PCT_UCUT	Mean percent undercut bank for survey reach	N	5	1
17 PCT_SFIN	Mean percent surface fines for survey reach	N	5	1
18 DOMRIP	Dominant riparian community type in reach	C	1	3
19 _FROM	Starting point of reach in meters or feet	N	8	1
20 _MID	Mid-point of reach in meters or feet	N	8	1
21 _TO	Ending point of reach in meters or feet	N	8	1

\*Type: C = Character, N = Numeric

## REACHSM2.DBF (Reach Summary Report 2 Template)

Field Name	Field Description	Type*	Width	Dec.
1 LOCAL_ID	Locally-assigned stream code (Flathead NF)	C	7	
2 SURVEY_YR	Stream inventory year (Flathead NF)	C	4	
3 SURVEY_TYP	Survey type (Flathead NF)	C	4	
4 STREAM_ID	Stream code	C	9	
5 EPA_REACH	EPA reach number	C	16	
6 STREAM	Stream name	C	30	
7 STUDY	Stream inventory type and year	C	3	
8 SURV_REACH	Survey reach number	N	5	0
9 FOR_NAME	Forest name	C	20	
10 DIST_NAME	District name	C	20	
11 REACH_TYPE	Reach type	C	1	
12 CHAN_TYPE	Rosgen channel type	C	4	
13 TOTUNITS	Total number of habitat units in survey reach	N	12	
14 GRADMAP	Stream gradient (map)	N	12	1
15 GRADOBS	Stream gradient (field)	N	12	1
16 HABLEN	Length of survey reach	N	12	1
17 WIDTHMN	Mean width of survey reach	N	12	1
18 DEPTHMN	Mean depth of survey reach	N	12	2
19 WIDDPMN	Mean width to depth ratio for survey reach	N	12	1
20 WIDDEPMAX	Mean width to maximum depth ratio	N	12	1
21 LWDNOMN	Number of LWD per mile	N	12	1
22 STBLMN	Mean percent bank stability for survey reach	N	12	1
23 UNDRCTMN	Mean percent undercut bank for survey reach	N	12	1
24 POOL	Percent pools in reach (by length)	N	12	1
25 POOLMILE	Number of pools per mile	N	12	1
26 DPPOOL	Number of deep pools per mile	N	12	1
27 LRGPOOL	Number of large pools per mile	N	12	1
28 RESIDMAX	Mean residual maximum depth for reach	N	12	2
29 RIFFLE	Percent riffles in reach (by length)	N	12	1
30 RUNSGLDS	Percent runs and glides in reach (by length)	N	12	1
31 SRFCEMN	Mean percent surface fines for survey reach	N	12	1
32 SMGRAVMN	Mean percent small gravel for survey reach	N	12	1
33 GRAVMN	Mean percent gravel for survey reach	N	12	1

\*Type: C = Character, N = Numeric.

## FBASE INDEXES

Index File	Indexed By
HEADER1.NTX	STREAM_ID + STUDY + SURV_REACH
HEADER2.NTX	STREAM + STREAM_ID + STUDY + SURV_REACH
HABITAT1.NTX	STREAM_ID + STUDY + SURV_REACH + HAB_UNIT + SIDE_UNIT + CHAN_CODE
FISH1.NTX	STREAM_ID + STUDY + SURV_REACH + HAB_UNIT + SIDE_UNIT + CHAN_CODE
LWD1.NTX	STREAM_ID + STUDY + SURV_REACH + HAB_UNIT + SIDE_UNIT + CHAN_CODE
RIPARIA1.NTX	STREAM_ID + STUDY + SURV_REACH + HAB_UNIT + SIDE_UNIT + CHAN_CODE
STREAMS1.NTX	STREAM + STATE

(Con.)

## FBASE INDEXES (Con.)

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<b>Index File</b>	<b>Indexed By</b>
STREAMS2.NTX	STREAM_ID
REGIONS1.NTX	FS_REGION
REGIONS2.NTX	STATE + REG_CODE
FORESTS1.NTX	FOR_NAME
FORESTS2.NTX	STATE + FOR_CODE + REG_CODE
FORESTS3.NTX	FOR_CODE
DISTRCT1.NTX	DIST_NAME
DISTRCT2.NTX	DO_STATE + DIST_CODE + REG_CODE + FOR_CODE
TABLE1.NTX	CATEGORY + FIELD + POPUP
USER1.NTX	USER_LNAME + USER_FNAME
USER2.NTX	INDEXPASS()

---

## Appendix C: Examples of Completed Records

### Appendix C-1: Completed FBHEADER record

ADD_HEAD	Ver 98.03b	FISH HABITAT INVENTORY	MARCH 26, 1998
INT/R1/R4 STANDARD STREAM INVENTORY SYSTEM			
Stream: SOMEWHERE CR		Stream ID: ID12345	
Trib. of: OVERTHERE R		Study: I97	
		Survey Reach No.:	1 Type: C
Survey Reach Lower Boundary: MOUTH			
Survey Reach Upper Boundary: RAINBOW CR			
Code: 15	Forest: TARGHEE NF	Any Non-USFS Inclusions? (Y/N) Y	
Code: 04	District: PALISADES RD	Owner: BLM	
Code: 15	Adm For: TARGHEE NF		
Code: 04	Adm Dist: PALISADES RD		
Ecoregion Bailey: M333		Geology: PLUTONIC	
Ecoregion Omernik: 15		Sub-Geology: GRANITE	
EPA Reach No: 0123456789101.00			
EPA Reach Lower Boundary: MOUTH			
EPA Reach Upper Boundary: HEADWATERS			
Screen - 1			
F1	F2	Pg Dn	F9
Help	Add Comments	Next	Table
			ESC
			Cancel

ADD_HEAD	Ver 98.03b	FISH HABITAT INVENTORY	MARCH 26, 1998
INT/R1/R4 STANDARD STREAM INVENTORY SYSTEM			
Stream: SOMEWHERE CR		Stream ID: ID12345	
Trib. of: OVERTHERE R		Study: I97	
		Survey Reach No.:	1 Type: C
Legal Location: T30N,R113W,S04 Base Quad: DOROTHY MOUNTAIN			
Survey Lat: Survey Long:			
Survey Date: 07/02/1997			
Observer: D.TOTO		Diver 1: C.LION	
Recorder: T.TINMAN		Diver 2:	
Meas. Units: M			
Elevation: 1458	Channel Type: C2	Confinement: U	
Map Gradient: 1.2	Cover Group: MEADOW	Weather: CLOUDY	
Obs. Gradient: 1.0	Discharge: 0.93	Wilderness: N (Y/N)	
Header Var 1:			
Screen - 2			
F2		Pg Dn	Pg Up
Add Comments		to Save	Prev
			F9
			Table
			ESC
			Cancel

Appendix C-2: Completed HABITAT record

HABITAT	Ver 98.03b	FISH HABITAT INVENTORY PHYSICAL HABITAT DETAIL	MARCH 26, 1998
---------	------------	---	----------------

Study: I97	Stream: ID12345	SOMEWHERE CR	Reach: 1-C
------------	-----------------	--------------	------------

Habitat Unit #: 1	Habitat Type: SPW
Channel Code: M	Habitat Group: SPL
Side Channel Unit #: 0	Velocity Class: SLOW

---

Unit Length: 8.2	Max Depth: 0.79
Unit Avg. Width: 3.6	Crest Depth: 0.18
Unit Avg. Depth: 0.21	Step Pools: -9
Pocket Pools: -9	STP Avg. Max Depth: -9.00
Avg. Max Depth: -9.00	

Screen - 1

F1 Help	F2 Add Comments	Pg Dn Next	F9 Table	ESC Cancel
------------	--------------------	---------------	-------------	---------------

HABITAT	Ver 98.03b	FISH HABITAT INVENTORY PHYSICAL HABITAT DETAIL	MARCH 26, 1998
---------	------------	---	----------------

Study: I97	Stream: ID12345	SOMEWHERE CR	Reach: 1-C
------------	-----------------	--------------	------------

Habitat Unit #: 1	Habitat Type: SPW
Channel Code: M	Habitat Group: SPL
Side Channel Unit #: 0	Velocity Class: SLOW

---

Surface Fines (%) 15	Substrate Data? Y
Count	Percent
Fines: 18	16
Sm Gravel: 12	11
Gravel: 57	51
Sm Cobble: 9	8
Cobble: 12	11
Sm Boulder: 2	2
Boulder: 2	2
Bedrock: 0	0

Left Bank Length: 8.0	
Right Bank Length: 8.8	
	Length    Percent
Stable Left Bank: -9.0	90
Undercut Left Bank: -9.0	10
Stable Right Bank: -9.0	100
Undercut Right Bank: -9.0	20

Screen - 2

F1 Help	F2 Add Comments	Pg Up Prev.	Pg Dn Next	F9 Table	ESC Cancel
------------	--------------------	----------------	---------------	-------------	---------------



Study: I97 Stream: ID12345 SOMEWHERE CR Reach: 1-C

Habitat Unit #: 1 Habitat Type: SPW  
 Channel Code: M Habitat Group: SPL  
 Side Channel Unit #: 0 Velocity Class: SLOW

Left Wetted Channel Shape: I LWD Singles: 2  
 Right Wetted Channel Shape: I Aggregates: 1  
 Root Wads: 1

Water Temp.: 10.2 Unit Lat:  
 Air Temp.: 19.5 Unit Long:  
 Time Measured: 10:05

Physical Var 1:  
 Physical Var 2: -9.0 Screen - 3

F1 Help F2 Add Comments Pg Up Prev. Pg Dn Save F9 Table ESC Cancel

**Appendix C-3: Completed LWD record**

Stream: SOMEWHERE CR ID12345

Study: I97 Reach No. 1-C

Habitat Unit: 1 Channel Code: M Side Unit: 0 Habitat Type: SPW

1 of 2 Singles Number: 2 Aggregate: 1  
 Length: 4.2 Num Pieces: 2  
 Diameter: 0.14  
 % Submerged: 50 LWD Var1: 0.0

F2 Add Comments Pg Dn to Save F9 Table ESC Cancel

Stream: SOMEWHERE CR	ID12345
Study: I97	Reach No. 1-C
Habitat Unit: 1	Channel Code: M Side Unit: 0 Habitat Type: SPW

2 of 2	Singles Number: 2	Aggregate: 1
	Length: 3.1	Num Pieces: -9
	Diameter: 0.11	
	% Submerged: 25	LWD Var1: 0.0

F2  
Add Comments

Pg Dn  
to Save

F9  
Table

ESC  
Cancel

#### Appendix C-4: Completed FISH record

Stream: SOMEWHERE CR	ID12345
Study: I97	Reach No. 1-C
Habitat Unit: 1	Channel Code: M Side Unit: 0 Habitat Type: SPW

Dive Date: 07/16/1997	Average Depth: 0.19
Water Temp.: 11.2	Maximum Depth: 0.76
Air Temp.: 20.5	Percent Undercut Bank: 20
Time: 11:00	Percent Overhead Cover: 5
# of Divers: 1	Percent Submerged Cover: 30
Length: 8.6	Percent Large Substrate: 5
Average Width: 4.0	

Screen - 1

F1  
Help

F2  
Add Comments

Pg Dn  
Next

F9  
Table

ESC  
Cancel

Stream: SOMEWHERE CR

ID12345

Study: I97

Reach No. 1-C

Habitat Unit: 1 Channel Code: M Side Unit: 0 Habitat Type: SPW

Chinook -	Steelhead -	Redband -	Cutthroat -
Age 0+ : 0	Age 1+ : 0	<100 mm: 0	<100 mm: 4
Age 1+ : 0	Age 2+ : 0	100-200 mm: 0	100-200 mm: 2
Adult : 0	Age 3+ : 0	>200 mm: 0	200-300 mm: 0
			>300 mm: 0
	Rainbow -		
	>250 mm: 0		

Screen - 2

F1  
HelpF2  
Add CommentsPg Up  
Prev.Pg Dn  
NextF9  
TableESC  
Cancel

Stream: SOMEWHERE CR

ID12345

Study: I97

Reach No. 1-C

Habitat Unit: 1 Channel Code: M Side Unit: 0 Habitat Type: SPW

Bull Trout -	Brook Trout -	Brown Trout -
<100 mm: 0	<100 mm: 3	<100 mm: 0
100-200 mm: 0	100-200 mm: 1	100-200 mm: 0
200-300 mm: 0	200-300 mm: 0	200-300 mm: 0
300-400 mm: 0	>300 mm: 0	300-400 mm: 0
400-500 mm: 0		>400 mm: 0
>500 mm: 0		

Trout young of the year? (Y/N) Y Fish Var 1: 0 Screen - 3

F1  
HelpF2  
Add CommentsPg Up  
Prev.Pg Dn  
SaveF9  
TableESC  
Cancel

## Appendix C-5: Completed RIPARIAN record

RIPARIAN	Ver 98.03b	FISH HABITAT INVENTORY	MARCH 26, 1998
		Riparian Data	
Stream: SOMEWHERE CR		ID12345	
Study: I97	Reach No.	1-C	
Habitat Unit: 1	Channel Code: M	Side Unit: 0	Habitat Type: SPW
Left Riparian Type 1: SR4		Right Riparian Type 1: SR4	
Left Riparian Type 2: BB2		Right Riparian Type 2:	
Riparian VAR1:			
F1	F2	Pg Dn	F9
Help	Add Comments	Next	Table
			ESC
			Cancel

## Appendix D: Data Entry Quality Control

Variable Name <sup>1</sup>	Table	Required Variable	Validation Criteria <sup>2,3</sup>
<b>Header (FBHEADER) Variables</b>			
Stream	X	X	N/A
Stream ID	X	X	N/A
Trib. of	X	-	N/A
Study	-	X	Letter followed by 2 numbers
Survey Reach No.	-	X	---
Type (Reach)	X	X	N/A
Survey Reach Lower Boundary	-	X	N/A
Survey Reach Upper Boundary	-	X	N/A
Code (Forest)	X	-	N/A
Forest	X	-	N/A
Code (District)	X	-	N/A
District	X	-	N/A
Code (Adm For)	X	-	N/A
Adm For	X	-	N/A
Code (Adm Dist)	X	-	N/A
Adm Dist	X	-	N/A
Any Non-USFS Inclusions? (Y/N)	-	-	Y or N
Owner	-	-	---
Ecoregion Bailey	X	-	N/A
Ecoregion Omernik	X	-	N/A
Geology	X	-	N/A
Sub-Geology	X	-	N/A
EPA Reach No	X	-	N/A
EPA Reach Lower Boundary	X	-	N/A
EPA Reach Upper Boundary	X	-	N/A
Legal Location	-	-	Format TXXX,RXXXX,SXX
Base Quad	-	-	---
Survey Lat	-	-	---
Survey Long	-	-	---
Survey Date	-	-	Date format
Observer	-	-	First initial, followed by period, followed by last name
Recorder	-	-	Same as above
Diver 1	-	-	First initial, followed by period, followed by last name
Diver 2	-	-	Same as above
Meas. Units	X	X	N/A
Elevation	-	-	If Meas. Units = M, <=4500; if Meas. Units = E, <=14000
Map Gradient	-	X	<=40.0
Obs. Gradient	-	-	<=40.0
Channel Type	X	-	N/A
Cover Group	X	X	N/A
Discharge	-	-	<=850
Confinement	X	X	N/A
Weather X - N/A	-	-	-
Wilderness (Y/N)	-	X	Y or N
Header Var 1	-	-	---
<b>Habitat (HABITAT) Variables</b>			
Habitat Unit #	-	X	N/A
Channel Code	X	X	N/A
Side Channel Unit #	-	X	N/A

(Con.)

**Appendix D: (Con.)**

Variable Name <sup>1</sup>	Table	Required Variable	Validation Criteria <sup>2,3</sup>
Habitat Type	X	-	N/A
Habitat Group X - N/A			
Velocity Class	X	X	Matches with Habitat Type; Matches with Habitat Group
Unit Length	-	X	>=1.0
Unit Avg. Width	-	-	---
Unit Avg. Depth	-	-	If Meas. Units = M, <=3.00; if Meas. Units = E, <=10.00
Pocket Pools	-	-	Velocity Class = FAST
Avg. Max Depth	-	-	Velocity Class = FAST; Pocket Pools > 0; if Meas. Units = M, <=3.00; if Meas. Units = E, <=10.00
Max Depth	-	-	Velocity Class = SLOW; > Unit Avg. Depth; > Crest Depth; if Meas. Units = M, <=5.00; if Meas. Units = E, <=15.00
Crest Depth	-	-	Velocity Class = SLOW; < Max Depth; if Meas. Units = M, <=3.00; if Meas. Units = E, <=10.00
Step Pools	-	-	Habitat Type = STP
STP Avg. Max Depth	-	-	Step Pools > 0; if Meas. Units = M, <=3.00; if Meas. Units = E, <=10.00
Surface Fines (%)	-	-	<=100
Substrate Data?	-	X	Y or N
Fines Count	-	-	Substrate Data = Y
Sm Gravel Count	-	-	Substrate Data = Y
Gravel Count	-	-	Substrate Data = Y
Sm Cobble Count	-	-	Substrate Data = Y
Cobble Count	-	-	Substrate Data = Y
Sm Boulder Count	-	-	Substrate Data = Y
Boulder Count	-	-	Substrate Data = Y
Bedrock Count	-	-	Substrate Data = Y
Fines Percent	-	-	Substrate Data = Y; <=100
Sm Gravel Percent	-	-	Substrate Data = Y; <=100
Gravel Percent	-	-	Substrate Data = Y; <=100
Sm Cobble Percent	-	-	Substrate Data = Y; <=100
Cobble Percent	-	-	Substrate Data = Y; <=100
Sm Boulder Percent	-	-	Substrate Data = Y; <=100
Boulder Percent	-	-	Substrate Data = Y; <=100
Bedrock Percent	-	-	Substrate Data = Y; <=100
Left Bank Length	-	-	---
Right Bank Length	-	-	---
Stable Left Bank Length	-	-	Left Bank Length >=0; <= Left Bank Length
Undercut Left Bank Length	-	-	Same as above;
Stable Right Bank Length	-	-	Right Bank Length >=0; <= Right Bank Length
Undercut Right Bank Length	-	-	Same as above
Stable Left Bank Percent	-	-	Left Bank Length >=0; <=100
Undercut Left Bank Percent	-	-	Same as above
Stable Right Bank Percent	-	-	Left Bank Length >=0; <=100
Undercut Right Bank Percent	-	-	Same as above
Left Wetted Channel Shape	X	-	N/A

(Con.)

**Appendix D: (Con.)**

<b>Variable Name<sup>1</sup></b>	<b>Table</b>	<b>Required Variable</b>	<b>Validation Criteria<sup>2,3</sup></b>
Right Wetted Channel Shape	X	-	N/A
Water Temp	-	-	If Meas. Units = M, <38.0; if Meas. Units = E, <=100.0
Air Temp	-	-	If Meas. Units = M, <50.0; if Meas. Units = E, <=110.0
Time Measured	-	-	<=24:00
LWD Singles	-	-	---
Aggregates	-	-	---
Root Wads	-	-	---
Unit Lat	-	-	---
Unit Long	-	-	---
Physical Var 1	-	-	---
Physical Var 2	-	-	---
<b>LWD (LWD) Variables</b>			
Length	-	-	---
Diameter	-	-	---
% Submerged	-	-	---
Num Pieces	-	-	---
LWD Var1	-	-	---
<b>Fish (FISH) Variables</b>			
Dive Date	-	-	Date format
Water Temp	-	-	If Meas. Units = M, <38.0; if Meas. Units = E, <=100.0
Air Temp	-	-	If Meas. Units = M, <50.0; if Meas. Units = E, <=110.0
Time	-	-	<=24:00
# of Divers	-	-	---
Length	-	X	---
Average Width	-	X	---
Average Depth	-	-	If Meas. Units = M, <=3.00; if Meas. Units = E, <=10.00
Maximum Depth	-	-	Velocity Class = SLOW; > Unit Avg. Depth; if Meas. Units = M, <=5.00; if Meas. Units = E, <=15.00
Percent Undercut Bank	-	-	<=100
Percent Overhead Cover	-	-	<=100
Percent Submerged Cover	-	-	<=100
Percent Large Substrate	-	-	<=100
Chinook Age 0+	-	-	---
Chinook Age 1+	-	-	---
Chinook Adult	-	-	---
Steelhead Age 1+	-	-	---
Steelhead Age 2+	-	-	---
Steelhead Age 3+	-	-	---
Rainbow >250mm	-	-	---
Redband <100mm	-	-	---
Redband 100-200mm	-	-	---
Redband >200mm	-	-	---
Cutthroat <100mm	-	-	---
Cutthroat 100-200mm	-	-	---
Cutthroat 200-300mm	-	-	---
Cutthroat >300mm	-	-	---
Bull Trout <100mm	-	-	---
Bull Trout 100-200mm	-	-	---

(Con.)



**Appendix D: (Con.)**

<b>Variable Name<sup>1</sup></b>	<b>Table</b>	<b>Required Variable</b>	<b>Validation Criteria<sup>2,3</sup></b>
Bull Trout 200-300mm	-	-	---
Bull Trout 300-400mm	-	-	---
Bull Trout 400-500mm	-	-	---
Bull Trout >500mm	-	-	---
Brook Trout <100mm	-	-	---
Brook Trout 100-200mm	-	-	---
Brook Trout 200-300mm	-	-	---
Brook Trout >300mm	-	-	---
Brown Trout <100mm	-	-	---
Brown Trout 100-200mm	-	-	---
Brown Trout 200-300mm	-	-	---
Brown Trout 300-400mm	-	-	---
Brown Trout >400mm	-	-	---
Trout Young of the year? (Y/N)	-	X	Y or N
Fish Var 1	-	-	---
<b>Riparian (RIPARIAN) Variables</b>			
Left Riparian Type 1	X	-	N/A
Left Riparian Type 2	X	-	N/A
Right Riparian Type 1	X	-	N/A
Right Riparian Type 2	X	-	N/A

<sup>1</sup>Variable names are displayed as they are in the FBASE data entry screens. See section "VI. DATA ENTRY" for individual variables and how they are entered and appendix B for field names and descriptions.

<sup>2</sup>Where validation criteria is non-applicable (N/A), a table serves as the validation.

<sup>3</sup>Even where there is no validation criteria (displayed as "---"), entries are limited by data type (character versus numeric) and field width.

## Appendix E: Report Examples

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### Appendix E-1: HEADER INFO report

FB\_HPRNT R1/R4 FISH HABITAT INVENTORY SYSTEM Run Date: 03/26/1998  
v98.03b Header file Information Page: 1

Stream & Study: HUNGRY HORSE CR PI2020100 I97

Tributary of: FLATHEAD R, S FK  
Survey Reach No.: 1  
Reach Type: B Habitat Observer: J.JANNOT  
Forest: 10 - FLATHEAD NF Habitat Recorder: B.MITCHELL  
District: 06 - HUNGRY HORSE RD Diver 1:  
Admin. Forest: 10 - FLATHEAD NF Diver 2:  
Admin. District: 06 - HUNGRY HORSE RD Map Gradient: 2.8  
Ecoregion - Bailey: M333 Field Gradient: 2.8  
Ecoregion - Omernik: 15 Flow: 2.94  
Gross Geology: METAMORPHIC Elevation: 1097  
Sub Geology: METASEDIMEN Confinement: M  
Township, Range, Sec: T30N,R18W ,S21 Cover Group: WOODED  
Base Quad Map Name: NYACK SW Weather: CLEAR  
Survey Reach Long: Non FS Inclusions: N  
Survey Reach Lat: Other Owners:  
EPA Reach No.: 1701020920201.00 Wilderness (Y/N): N  
Lower EPA Boundary: HUNGRY HORSE RES  
Upper EPA Boundary: MARGARET CR  
First Date of Survey: 07/21/1997  
Unit (Metric/English: M  
Lower Boundary: BRIDGE @ ROAD #896- H.H. RES.  
Upper Boundary: MOUTH OF MARGRET CREEK  
Channel Type:  
Comments: SLUMPING COMMON AT OUTSIDE BENDS OF STREAM; SOME SECTIONS SEEMED  
TO HAVE LARGER THAN EXPECTED BOULDERS- LARGE BOULDERS (1.5m TO  
2m). OLD LARGE COTTONWOODS > 1m DBH RELATIVELY COMMON AND THE  
GENERAL POTENTIAL FOR LWD RECRUITMENT TO THE STREAM IS GOOD.  
BANK STABILITY WAS GOOD IN MANY AREAS DUE TO ESTABLISHED SHRUBS.  
FISH OBSERVED THROUGHOUT REACH.

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# Appendix E-2: PHYSICAL INFO report

FB\_PPRNT v98.03b Stream ID: P12020100 Run date: 03/26/1998 Page 1  
 EPA Reach: 1701020920201.00 Physical Habitat Raw Data Listing  
 Stream Name: HUNGRY HORSE CR Forest: FLATHAD NF District: HUNGRY HORSE RD Study: I97

Surf	Unit	Chan	Side	Hab	Reach	No.	Type	Code	Unit	Type	Length	Width	Depth	-Pockets-	No.	Depth	Max	Creast	No.	Depth	Surf	Bank	Bank	Bank	Bank	Petab	Pucut	Petab	Pucut	Petab	Pucut	Lchan	Rehan
																							Left	Right	Left	Right	Left	Right	Left	Right	Shape	Shape	
1	1	B	M	0	SLO	17.7	8.0	0.60	-9	-9.00	0.87	0.52	-9	-9.00	4	17.7	17.7	70.0	0.0	50.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	I	R		
1	2	B	M	0	HGR	33.8	5.8	0.30	5	0.45	-9.00	-9.00	-9	-9.00	-9	33.8	33.8	80.0	1.0	50.0	2.0	50.0	1.0	1.0	1.0	1.0	50.0	2.0	2.0	I	I		
1	2	B	S	1	HGR	32.4	4.2	0.20	4	0.35	-9.00	-9.00	-9	-9.00	-9	-9.0	-9.0	-9.0	-9	-9.0	-9	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	U	U		
1	3	B	M	0	LGR	56.2	9.8	0.22	8	0.38	-9.00	-9.00	-9	-9.00	-9	56.2	56.2	95.0	0.0	95.0	0.0	95.0	0.0	0.0	0.0	0.0	95.0	0.0	0.0	I	I		
1	4	B	M	0	HGR	34.8	12.4	0.19	10	0.50	-9.00	-9.00	-9	-9.00	-9	34.8	34.8	100.0	5.0	100.0	20.0	100.0	5.0	5.0	5.0	5.0	100.0	20.0	20.0	I	R		
1	5	B	M	0	SLB	14.7	6.5	0.42	-9	-9.00	0.93	0.30	-9	-9.00	-9	14.7	14.7	100.0	80.0	100.0	0.0	100.0	80.0	80.0	80.0	80.0	100.0	0.0	0.0	I	Z		
1	6	B	M	0	LGR	35.0	6.4	0.30	2	0.50	-9.00	-9.00	-9	-9.00	-9	35.0	35.0	90.0	2.0	100.0	2.0	100.0	2.0	2.0	2.0	2.0	100.0	2.0	2.0	I	I		
1	7	B	M	0	HGR	21.4	8.7	0.30	4	0.55	-9.00	-9.00	-9	-9.00	-9	21.4	21.4	95.0	5.0	95.0	0.0	95.0	5.0	5.0	5.0	5.0	95.0	0.0	0.0	I	I		
1	8	B	M	0	SNW	16.4	12.5	0.17	-9	-9.00	1.00	0.30	-9	-9.00	5	16.4	16.4	100.0	0.0	30.0	0.0	100.0	0.0	0.0	0.0	0.0	30.0	0.0	0.0	I	I		
1	9	B	M	0	LGR	36.0	7.9	0.27	4	0.57	-9.00	-9.00	-9	-9.00	-9	36.0	36.0	95.0	10.0	70.0	0.0	100.0	10.0	10.0	10.0	10.0	70.0	0.0	0.0	I	I		
1	9	B	A	1	SMB	4.4	3.7	0.43	-9	-9.00	0.65	0.40	-9	-9.00	3	-9.0	-9.0	-9.0	-9	-9.0	-9	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	U	U		
1	10	B	M	0	SPB	6.6	7.6	0.37	-9	-9.00	0.70	0.40	-9	-9.00	-9	6.6	6.6	90.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	I	I		
1	11	B	M	0	HGR	16.8	8.3	0.26	8	0.55	-9.00	-9.00	-9	-9.00	-9	16.8	16.8	95.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	I	I		
1	12	B	M	0	SLB	12.3	7.1	0.41	-9	-9.00	0.72	0.50	-9	-9.00	-9	12.3	12.3	100.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	I	I		
1	13	B	M	0	HGR	8.8	8.7	0.40	2	0.57	-9.00	-9.00	-9	-9.00	-9	8.8	8.8	100.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	I	I		
1	14	B	M	0	SMB	6.4	6.9	0.31	-9	-9.00	0.67	0.45	-9	-9.00	-9	6.4	6.4	100.0	0.0	100.0	5.0	100.0	0.0	5.0	5.0	5.0	100.0	5.0	5.0	I	I		
1	15	B	M	0	HGR	19.4	6.3	0.28	3	0.57	-9.00	-9.00	-9	-9.00	-9	19.4	19.4	100.0	0.0	100.0	15.0	100.0	0.0	15.0	15.0	15.0	100.0	15.0	15.0	I	I		
1	15	B	S	1	LGR	11.7	6.8	0.15	2	0.30	-9.00	-9.00	-9	-9.00	8	13.2	13.2	90.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	I	I		
1	15	B	S	2	SLW	13.3	3.8	0.23	-9	-9.00	0.65	0.15	-9	-9.00	-9	13.3	13.3	100.0	25.0	100.0	0.0	100.0	25.0	25.0	25.0	25.0	100.0	0.0	0.0	Z	I		
1	15	B	S	3	LGR	12.5	4.6	0.15	1	0.30	-9.00	-9.00	-9	-9.00	-9	12.5	12.5	100.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	I	I		
1	16	B	M	0	RUN	21.9	7.9	0.50	2	0.67	-9.00	-9.00	-9	-9.00	-9	21.9	21.9	100.0	5.0	80.0	0.0	80.0	5.0	5.0	5.0	80.0	0.0	0.0	I	I			
1	17	B	M	0	HGR	68.8	8.6	0.27	14	0.41	-9.00	-9.00	-9	-9.00	-9	68.8	68.8	90.0	5.0	100.0	50.0	100.0	5.0	5.0	5.0	100.0	50.0	50.0	Z	Z			
1	18	B	M	0	LGR	50.0	9.3	0.32	7	0.47	-9.00	-9.00	-9	-9.00	-9	50.0	50.0	10.0	5.0	100.0	0.0	100.0	5.0	5.0	5.0	100.0	0.0	0.0	Z	I			
1	18	B	A	1	SLW	9.8	3.8	0.45	-9	-9.00	0.55	0.20	-9	-9.00	-9	-9.0	-9.0	-9.0	-9	-9.0	-9	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	U	U		
1	19	B	M	0	HGR	23.8	8.7	0.30	7	0.56	-9.00	-9.00	-9	-9.00	-9	23.8	23.8	100.0	15.0	90.0	5.0	90.0	15.0	15.0	15.0	90.0	5.0	5.0	Z	Z			
1	20	B	M	0	SNW	11.8	9.7	0.43	-9	-9.00	1.15	0.50	-9	-9.00	5	11.8	11.8	100.0	90.0	60.0	0.0	60.0	90.0	90.0	90.0	60.0	0.0	0.0	Z	I			
1	21	B	M	0	HGR	28.4	8.4	0.21	5	0.43	-9.00	-9.00	-9	-9.00	-9	28.4	28.4	100.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	I	I		
1	22	B	M	0	LGR	291.2	7.9	0.25	46	0.45	-9.00	-9.00	-9	-9.00	-9	291.2	291.2	80.0	5.0	99.0	5.0	99.0	5.0	5.0	5.0	99.0	5.0	5.0	Z	Z			
1	23	B	M	0	SMB	14.5	7.1	0.50	-9	-9.00	1.02	0.55	-9	-9.00	-9	14.5	14.5	100.0	0.0	20.0	0.0	20.0	0.0	0.0	0.0	20.0	0.0	0.0	I	I			
1	24	B	M	0	LGR	18.9	7.0	0.16	2	0.45	-9.00	-9.00	-9	-9.00	-9	18.9	18.9	100.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	I	I			
1	25	B	M	0	SMB	10.3	7.1	0.30	-9	-9.00	0.63	0.40	-9	-9.00	3	10.3	10.3	100.0	0.0	100.0	40.0	100.0	0.0	40.0	40.0	100.0	40.0	40.0	I	Z			
1	26	B	M	0	HGR	41.8	6.7	0.24	5	0.62	-9.00	-9.00	-9	-9.00	-9	41.8	41.8	100.0	5.0	100.0	5.0	100.0	5.0	5.0	5.0	100.0	5.0	5.0	Z	Z			
1	26	B	S	1	SNW	6.3	4.7	0.35	-9	-9.00	0.83	0.45	-9	-9.00	-9	-9.0	-9.0	-9.0	-9	-9.0	-9	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	U	U			
1	26	B	S	2	HGR	17.9	4.8	0.30	2	0.45	-9.00	-9.00	-9	-9.00	-9	-9.0	-9.0	-9.0	-9	-9.0	-9	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	U	U		
1	27	B	M	0	SMB	18.4	8.4	0.33	-9	-9.00	0.72	0.44	-9	-9.00	-9	18.4	18.4	90.0	0.0	100.0	50.0	100.0	0.0	50.0	50.0	100.0	50.0	50.0	I	Z			
1	28	B	M	0	LGR	50.0	9.0	0.32	9	0.55	-9.00	-9.00	-9	-9.00	-9	50.0	50.0	100.0	0.0	100.0	10.0	100.0	0.0	10.0	10.0	100.0	10.0	10.0	I	Z			



# Appendix E-3: PHYSICAL SUMMARY report sorted by REACH TYPE/HABITAT GROUP

Fb\_PO1 v98.03b Run date: 03/26/1999  
 R1/R4 FISH HABITAT INVENTORY SYSTEM Page 1  
 Summary of Main Channel Physical Habitat Dimensions  
 Listing by Reach Type and by Habitat Group  
 Stream ID: PK0210000  
 EPA Reach: 1701021102100-00  
 Stream Name: ELK CR Study: I97  
 Forest: FLATHEAD NF District: SWAN LAKE RD

Habitat Group	Total Number of Units	Habitat Length (m)		Mean Width (m)		Habitat Depth (m)		Mean Width/Depth (n)		Habitat Area (m <sup>2</sup> )		Habitat Volume (m <sup>3</sup> )		
		Total(n)	Mean(n)	Percent(n)	Mean(n)	Width (m)	Mean(n)	Max(n)	Depth(n)	Total(n)	Mean(n)	Percent(n)	Total(n)	Mean(n)
<b>Reach Type: B</b>														
DMC	2	24.7(2)	12.4(2)	1.8(2)	12.3(2)	0.49(2)	0.95(2)	24.91(2)	303.6(2)	151.8(2)	2.0(2)	149.6(2)	74.9(2)	2.7(2)
NTU	1	15.0(1)	15.0(1)	1.1(1)	11.0(1)	0.52(1)	-	21.15(1)	165.0(1)	165.0(1)	1.1(1)	85.8(1)	85.8(1)	1.6(1)
SLA	3	54.0(3)	18.0(3)	3.9(3)	11.9(3)	0.48(3)	0.94(3)	25.20(3)	641.5(3)	213.8(3)	4.1(3)	305.5(3)	101.8(3)	5.6(3)
SMD	2	26.0(2)	13.0(2)	1.9(2)	10.3(2)	0.47(2)	0.85(2)	21.79(2)	267.0(2)	133.5(2)	1.7(2)	126.2(2)	63.1(2)	2.3(2)
SPL	7	98.0(7)	14.0(7)	7.1(7)	10.8(7)	0.47(7)	0.87(7)	23.01(7)	1,058.2(7)	151.2(7)	6.8(7)	499.1(7)	71.3(7)	9.2(7)
TUR	15	1,157.3(15)	77.2(15)	84.2(15)	11.3(15)	0.33(15)	-	35.32(15)	13,119.1(15)	874.6(15)	84.3(15)	4,280.1(15)	285.3(15)	78.6(15)
<b>Subtotals</b>	<b>30</b>	<b>1,375.0(30)</b>	<b>45.8(30)</b>	<b>55.5(30)</b>	<b>11.3(30)</b>	<b>0.35(30)</b>	<b>0.89(14)</b>	<b>33.45(30)</b>	<b>15,554.3(30)</b>	<b>518.5(30)</b>	<b>58.5(30)</b>	<b>5,446.4(30)</b>	<b>161.5(30)</b>	<b>59.3(30)</b>
<b>Means</b>														
<b>Reach Type: C</b>														
DMC	3	40.0(3)	13.3(3)	3.6(3)	8.4(3)	0.44(3)	0.80(3)	19.34(3)	336.5(3)	112.2(3)	3.1(3)	148.1(3)	49.4(3)	4.0(3)
NTU	1	26.0(1)	26.0(1)	2.4(1)	10.8(1)	0.37(1)	-	29.19(1)	280.8(1)	280.8(1)	2.5(1)	103.9(1)	103.9(1)	2.8(1)
SLA	10	176.1(10)	17.6(10)	16.0(10)	9.3(10)	0.46(10)	0.91(10)	20.79(10)	1,641.6(10)	164.2(10)	14.9(10)	757.4(10)	75.7(10)	20.3(10)
SMD	2	33.9(2)	17.0(2)	3.1(2)	11.4(2)	0.40(2)	0.74(2)	28.34(2)	386.8(2)	193.4(2)	3.5(2)	155.9(2)	77.9(2)	4.2(2)
SPL	2	53.8(2)	26.9(2)	4.9(2)	10.2(2)	0.39(2)	0.84(2)	26.15(2)	550.1(2)	275.0(2)	5.0(2)	215.1(2)	107.5(2)	5.8(2)
TUR	13	770.5(13)	59.3(13)	70.0(13)	10.1(13)	0.30(13)	-	34.36(13)	7,817.6(13)	601.4(13)	71.0(13)	2,358.3(13)	181.4(13)	63.1(13)
<b>Subtotals</b>	<b>31</b>	<b>1,100.3(31)</b>	<b>35.5(31)</b>	<b>44.5(31)</b>	<b>10.0(31)</b>	<b>0.34(31)</b>	<b>0.86(17)</b>	<b>30.94(31)</b>	<b>11,019.3(31)</b>	<b>355.3(31)</b>	<b>41.5(31)</b>	<b>3,738.8(31)</b>	<b>120.6(31)</b>	<b>40.7(31)</b>
<b>Means</b>														
<b>Totals</b>	<b>61</b>	<b>2,475.3(61)</b>	<b>40.6(61)</b>	<b>100.0(61)</b>	<b>10.7(61)</b>	<b>0.35(61)</b>	<b>0.88(31)</b>	<b>32.33(61)</b>	<b>26,567.6(61)</b>	<b>435.5(61)</b>	<b>100.0(61)</b>	<b>9,185.2(61)</b>	<b>150.6(61)</b>	<b>100.0(61)</b>
<b>Means</b>														

Appendix E-3 (con.)

Habitat Group	Total Number	Number of Pocket Pools		Pkt Pool		Average		Mean Resid.		Residual Volume (m³)		LWD	
		Total(n)	Mean(n)	Mean Depth (m)	Depth (m)	Max Depth (m)	Max Depth (m)	Max Depth (m)	Max Depth (m)	Total(n)	Mean(n)		Total(n)
Reach Type: B													
DMC	2	-	-	-	-	0.38(2)	-	0.57(2)	-	176.0(2)	88.0(2)	5(2)	20.2(2)
NTU	1	3(1)	3.0(1)	20.0(1)	0.54(1)	-	-	-	-	-	-	0(1)	0.0(1)
SIA	3	-	-	-	-	0.41(3)	-	0.53(3)	-	330.8(3)	110.3(3)	11(3)	20.4(3)
SMD	2	-	-	-	-	0.48(2)	-	0.37(2)	-	95.3(2)	47.5(2)	5(2)	19.2(2)
SPL	7	-	-	-	-	0.45(7)	-	0.42(7)	-	462.7(7)	66.1(7)	14(7)	14.3(7)
TUR	15	143(15)	9.5(15)	12.4(15)	0.56(15)	-	-	-	-	-	-	173(15)	14.9(15)
Subtotals	30	146(16)	9.1(16)	12.5(16)	0.56(16)	-	-	0.43(14)	0.46(14)	1,064.8(14)	76.1(14)	208(30)	15.1(30)
Means													
Reach Type: C													
DMC	3	-	-	-	-	0.44(3)	-	0.36(3)	-	119.4(3)	39.8(3)	9(3)	22.5(3)
NTU	1	-	-	-	-	-	-	-	-	-	-	13(1)	50.0(1)
SIA	10	-	-	-	-	0.35(10)	-	0.56(10)	-	986.1(10)	98.6(10)	23(10)	13.1(10)
SMD	2	-	-	-	-	0.36(2)	-	0.38(2)	-	141.9(2)	71.0(2)	5(2)	14.7(2)
SPL	2	-	-	-	-	0.41(2)	-	0.44(2)	-	228.3(2)	114.2(2)	11(2)	20.4(2)
TUR	13	55(13)	4.2(13)	7.1(13)	0.57(13)	-	-	-	-	-	-	84(13)	10.9(13)
Subtotals	31	55(13)	4.2(13)	7.1(13)	0.57(13)	-	-	0.37(17)	0.49(17)	1,475.7(17)	86.8(17)	145(31)	13.2(31)
Means													
Totals	61	201(29)	6.9(29)	10.3(29)	0.56(29)	-	-	0.40(31)	0.48(31)	2,540.5(31)	82.0(31)	353(61)	14.3(61)
Means													

Appendix E-3 (con.)

FB\_PO3 v98.03b R1/R4 FISH HABITAT INVENTORY SYSTEM Run date: 03/26/1998  
 Stream ID: PK0210000 Summary of Main Channel Bank Stability and Undercut Page 1  
 EPA Reach: 1701021102100.00 Listing by Reach Type and by Habitat Group  
 Stream Name: ELK CR Forest: FLATHEAD NF District: SWAN LAKE RD Study: I97

Habitat Group	Total Number of Units	Bank Length (m)		Stable Bank			Unstable Bank			Undercut Bank		
		Left(n)	Right(n)	Left(n)	Right(n)	Mean(n)	Left(n)	Right(n)	Mean(n)	Left(n)	Right(n)	Mean(n)
<b>Reach Type: B</b>												
DMC	2	24.4(2)	19.4(2)	90.08(2)	88.05(2)	89.18(2)	9.92(2)	11.95(2)	10.82(2)	2.46(2)	0.62(2)	1.64(2)
NTU	1	15.0(1)	15.0(1)	90.00(1)	97.00(1)	93.50(1)	10.00(1)	3.00(1)	6.50(1)	3.00(1)	7.00(1)	5.00(1)
SLA	3	56.0(3)	51.0(3)	86.70(3)	90.92(3)	88.71(3)	13.30(3)	9.08(3)	11.29(3)	19.66(3)	1.16(3)	10.84(3)
SMD	2	24.0(2)	26.0(2)	95.25(2)	96.38(2)	95.84(2)	4.75(2)	3.62(2)	4.16(2)	5.50(2)	11.23(2)	8.48(2)
SPL	7	100.0(7)	98.0(7)	96.28(7)	93.29(7)	94.80(7)	3.72(7)	6.71(7)	5.20(7)	10.54(7)	3.73(7)	7.17(7)
TUR	15	1,188.3(15)	1,200.3(15)	92.73(15)	92.41(15)	92.57(15)	7.27(15)	7.59(15)	7.43(15)	10.11(15)	11.53(15)	10.82(15)
<b>Subtotals</b>	<b>30</b>	<b>1,407.7(30)</b>	<b>1,409.7(30)</b>	<b>92.71(30)</b>	<b>92.48(30)</b>	<b>92.59(30)</b>	<b>7.29(30)</b>	<b>7.52(30)</b>	<b>7.41(30)</b>	<b>10.23(30)</b>	<b>10.41(30)</b>	<b>10.32(30)</b>
<b>Means</b>												
<b>Reach Type: C</b>												
DMC	3	39.0(3)	39.0(3)	67.44(3)	66.54(3)	66.99(3)	32.56(3)	33.46(3)	33.01(3)	37.33(3)	23.21(3)	30.27(3)
NTU	1	23.0(1)	30.0(1)	92.00(1)	90.00(1)	90.87(1)	8.00(1)	10.00(1)	9.13(1)	5.00(1)	8.00(1)	6.70(1)
SLA	10	165.6(10)	179.1(10)	79.75(10)	68.12(10)	73.71(10)	20.25(10)	31.88(10)	26.29(10)	25.52(10)	11.43(10)	18.20(10)
SMD	2	22.7(2)	23.7(2)	91.69(2)	91.88(2)	91.78(2)	8.31(2)	8.12(2)	8.22(2)	15.41(2)	11.89(2)	13.61(2)
SPL	2	56.8(2)	55.0(2)	89.02(2)	94.36(2)	91.65(2)	10.98(2)	5.64(2)	8.35(2)	11.76(2)	13.65(2)	12.69(2)
TUR	13	842.5(13)	814.5(13)	88.57(13)	82.55(13)	85.61(13)	11.43(13)	17.45(13)	14.39(13)	17.84(13)	7.28(13)	12.65(13)
<b>Subtotals</b>	<b>31</b>	<b>1,149.6(31)</b>	<b>1,141.3(31)</b>	<b>86.74(31)</b>	<b>80.70(31)</b>	<b>83.73(31)</b>	<b>13.26(31)</b>	<b>19.30(31)</b>	<b>16.27(31)</b>	<b>19.00(31)</b>	<b>8.90(31)</b>	<b>13.97(31)</b>
<b>Means</b>												
<b>Totals</b>	<b>61</b>	<b>2,557.3(61)</b>	<b>2,551.0(61)</b>	<b>90.02(61)</b>	<b>87.21(61)</b>	<b>88.62(61)</b>	<b>9.98(61)</b>	<b>12.79(61)</b>	<b>11.38(61)</b>	<b>14.17(61)</b>	<b>9.73(61)</b>	<b>11.95(61)</b>
<b>Means</b>												



Appendix E-3 (con.)

FB\_POS v99.03b Run date: 03/26/1998  
 RI/RA FISH HABITAT INVENTORY SYSTEM Page 1  
 Summary of Main Channel Substrate Condition  
 Listing by Reach Type and by Habitat Group  
 Stream ID: PK0210000  
 EPA Reach: 1701021102100.00  
 Stream Name: ELK CR Study: I97  
 Forest: FLATHEAD NF District: SWAN LAKE RD

Habitat Group	Total Number of Units	Number of Meas. Units	Number of Est. Units	Mean Percent Substrate Coverage							Mean % Surface Fines		
				Fines	Small Gravel	Gravel	Small Cobble	Cobble	Small Boulder	Boulder		Bedrock	
Reach Type: B													
DMC	2	2	-	10.0	9.5	20.5	16.5	20.5	20.5	13.5	9.5	0.0	-
NTU	1	-	-	-	-	-	-	-	-	-	-	-	-
SLA	3	-	-	-	-	-	-	-	-	-	-	-	10.0
SMD	2	-	-	-	-	-	-	-	-	-	-	-	7.5
SPL	7	-	-	-	-	-	-	-	-	-	-	-	10.4
TUR	15	1	1	13.0	8.5	14.0	22.0	20.5	20.5	12.5	9.0	0.0	10.0
Subtotals	30	3	1	11.5	9.0	17.3	19.3	20.5	20.5	13.0	9.3	0.0	9.9
Means													
Reach Type: C													
DMC	3	-	-	-	-	-	-	-	-	-	-	-	-
NTU	1	-	-	-	-	-	-	-	-	-	-	-	-
SLA	10	3	-	19.0	11.3	27.0	20.3	19.7	19.7	3.0	0.0	0.0	15.1
SMD	2	1	-	12.0	7.0	14.0	21.0	22.0	22.0	20.0	5.0	0.0	8.5
SPL	2	1	-	10.0	2.0	22.0	28.0	35.0	35.0	0.0	3.0	0.0	10.0
TUR	13	1	-	7.0	8.0	15.0	22.0	23.0	23.0	21.0	5.0	0.0	14.1
Subtotals	31	6	-	14.3	8.5	22.0	22.0	23.3	23.3	8.3	2.2	0.0	13.7
Means													
Totals	61	9	1	13.2	8.7	20.1	20.9	22.2	22.2	10.2	5.0	0.0	11.9
Means													

# Appendix E-4: LWD SUMMARY report sorted by OVERALL/HABITAT TYPE

FB\_P04 v98.03b

Stream ID: PI2020100  
 EPA Reach: 1701020920201.00  
 Stream Name: HUNGRY HORSE CR

R1/R4 FISH HABITAT INVENTORY SYSTEM  
 Summary of Main Channel Large Woody Debris  
 Listing Overall and by Habitat Type

Run date: 03/26/1998  
 Page 1

Forest: FLATHEAD NF      District: HUNGRY HORSE RD

Study: I97

Habitat Type	Number of Units	Single Pieces				Aggregates				Root Wads					
		Tot#	Mean#	#/100m	Mean	Length	Vol (m <sup>3</sup> )	\$Sub.Vol	Tot#	Mean#	# Pieces	Tot#	Mean#	#/100m	
HGR	11	25	2.3	7.5	0.26	7.8	12.72	6.44	10	0.9	3.0	37	4	0.4	1.2
LGR	13	59	4.5	6.4	0.29	11.5	93.42	1.10	23	1.8	2.5	81	14	1.1	1.5
RUN	2	3	1.5	6.6	0.47	9.4	7.98	3.40	0	0.0	0.0	-	3	1.5	6.6
SLB	3	1	0.3	2.9	0.20	18.9	0.59	5.00	3	1.0	8.6	12	1	0.3	2.9
SLO	2	0	0.0	0.0	-	-	-	-	1	0.5	3.2	9	0	0.0	0.0
SLW	1	4	4.0	24.1	0.15	5.5	0.41	10.03	2	2.0	12.0	8	0	0.0	0.0
SMB	8	5	0.6	3.8	0.18	9.3	1.46	14.36	4	0.5	3.0	13	2	0.3	1.5
SMW	3	7	2.3	18.6	0.41	6.2	9.04	1.19	5	1.7	13.3	68	0	0.0	0.0
SPB	1	0	0.0	0.0	-	-	-	-	0	0.0	0.0	-	0	0.0	0.0
SPO	1	0	0.0	0.0	-	-	-	-	0	0.0	0.0	-	0	0.0	0.0
SPW	2	0	0.0	0.0	-	-	-	-	3	1.5	11.6	21	0	0.0	0.0
<b>Totals</b>	47	104	2.2	6.5	0.29	10.0	125.62	2.00	51	1.1	3.2	249	24	0.5	1.5
<b>Means</b>															

# Appendix E-5: FISH SUMMARY report sorted by SURVEY REACH/HABITAT CLASS

FB\_PO7R1 v98.03b R1/R4 FISH HABITAT INVENTORY SYSTEM Run date: 03/26/1998  
 Stream ID: ID12739 Summary of Main Channel Fish Counts and Densities Page 1  
 EPA Reach: 1706020104101.00 Listing by Survey Reach and by Habitat Class  
 Stream Name: YANKEE FORK Forest: SALMON-CHALLIS NF District: YANKEE FORK RD Study: I94

Habitat Class	Number of Snorkel Sites	Habitat Area (m <sup>2</sup> )	Habitat Vol (m <sup>3</sup> )	Chinook		Steelhead		Rainbow		Cutthroat		Bull Trout		Brook Trout	
				Total	per 100m <sup>2</sup>	Total	per 100m <sup>2</sup>	Total	per 100m <sup>2</sup>	Total	per 100m <sup>2</sup>	Total	per 100m <sup>2</sup>	Total	per 100m <sup>2</sup>
<b>Survey Reach12</b>															
Reach Type: C															
Survey Reach Lower Boundary: COMPLIANCE WITH JORDAN CR															
Survey Reach Upper Boundary: PUZZLER GULCH (INNERMITTENT CR)															
FAST	6	3,107.8	657.5	19	0.61	2	0.06	0	0.00	0	0.00	1	0.03	0	0.00
SLOW	6	965.5	513.3	21	2.18	2	0.21	0	0.00	0	0.00	0	0.00	0	0.00
<b>Subtotals</b>	<b>12</b>	<b>4,073.2</b>	<b>1,170.8</b>	<b>40</b>	<b>0.98</b>	<b>4</b>	<b>0.10</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>	<b>1</b>	<b>0.02</b>	<b>0</b>	<b>0.00</b>
<b>Densities</b>															
<b>Survey Reach13</b>															
Reach Type: C															
Survey Reach Lower Boundary: COMPLIANCE WITH PUZZLER GULCH															
Survey Reach Upper Boundary: COMPLIANCE WITH ADAIR CR															
FAST	5	2,028.5	486.6	29	1.43	4	0.20	0	0.00	0	0.00	0	0.00	0	0.00
SLOW	3	592.8	187.0	24	4.05	2	0.34	0	0.00	0	0.00	2	0.34	0	0.00
<b>Subtotals</b>	<b>8</b>	<b>2,621.3</b>	<b>673.5</b>	<b>53</b>	<b>2.02</b>	<b>6</b>	<b>0.23</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>	<b>2</b>	<b>0.08</b>	<b>0</b>	<b>0.00</b>
<b>Densities</b>															
<b>Totals</b>	<b>20</b>	<b>6,694.5</b>	<b>1,844.4</b>	<b>93</b>	<b>1.39</b>	<b>10</b>	<b>0.15</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>	<b>3</b>	<b>0.04</b>	<b>0</b>	<b>0.00</b>
<b>Densities</b>															

Appendix E-5 (con.)

FB\_P07A V98-03b R1/R4 FISH HABITAT INVENTORY SYSTEM Run date: 03/26/1998  
 Stream ID: ID12739 Summary of Main Channel Snorkled Habitat Dimensions and Cover Page 1  
 EPA Reach: 1706020104101.00 Listing by Survey Reach and by Habitat Class  
 Stream Name: YANKEE FORK Forest: SALMON-CHELLIS NF District: YANKEE FORK RD Study: I94

Class Sites	No. of Snorkel	Dive Length	Dive Width	Dive Depth	Dive Max Depth	Mean(n)	Habitat Area	Habitat Volume	Total(n)	Percent	Undercut Bank		Overhd Cover		Submrg Cover		Large Substr		
											Mean(n)	Mean(n)	Mean(n)	Mean(n)	Mean(n)	Mean(n)	Mean(n)	Mean(n)	
Survey Reach:12 Survey Reach Lower Boundary: CONFLUENCE WITH JORDAN CR																			
Reach Type: C Survey Reach Upper Boundary: PUZZLER GULCH (INTERMITTENT CR)																			
FAST	6	232.4	13.4(6)	0.21(6)	-	3,107.8(6)	76.3	657.5(6)	56.2	6.0(6)	6.4(6)	3.2(6)	49.7(6)						
SLOW	6	108.2	8.9(6)	0.53(6)	1.16(6)	965.5(6)	23.7	513.3(6)	43.8	0.9(6)	9.8(6)	5.9(6)	12.1(6)						
<b>Totals</b>	<b>12</b>	<b>340.6</b>	<b>12.0(12)</b>	<b>0.29(12)</b>	<b>1.16(6)</b>	<b>4,073.2(12)</b>	<b>60.8(12)</b>	<b>1,170.8(12)</b>	<b>63.5(12)</b>	<b>4.4(12)</b>	<b>7.2(12)</b>	<b>3.9(12)</b>	<b>40.8(12)</b>						
Means																			
Survey Reach:13 Survey Reach Lower Boundary: CONFLUENCE WITH PUZZLER GULCH																			
Reach Type: C Survey Reach Upper Boundary: CONFLUENCE WITH ADAIR CR																			
FAST	5	172.3	11.8(5)	0.24(5)	-	2,028.5(5)	77.4	486.6(5)	72.2	0.0(5)	4.3(5)	1.5(5)	55.1(5)						
SLOW	3	78.9	7.5(3)	0.32(3)	0.67(3)	592.8(3)	22.6	187.0(3)	27.8	25.9(3)	5.0(3)	1.7(3)	17.6(3)						
<b>Totals</b>	<b>8</b>	<b>251.2</b>	<b>10.4(8)</b>	<b>0.26(8)</b>	<b>0.67(3)</b>	<b>2,621.3(8)</b>	<b>39.2(8)</b>	<b>673.5(8)</b>	<b>36.5(8)</b>	<b>8.1(8)</b>	<b>4.5(8)</b>	<b>1.6(8)</b>	<b>46.6(8)</b>						
Means																			
<b>Totals</b>	<b>20</b>	<b>591.8</b>	<b>11.31(20)</b>	<b>0.28(20)</b>	<b>1.00(9)</b>	<b>6,694.5(20)</b>	<b>100.00</b>	<b>1,844.4(20)</b>	<b>100.00</b>	<b>6.0(20)</b>	<b>6.1(20)</b>	<b>3.0(20)</b>	<b>43.1(20)</b>						
Means																			

Appendix E-5 (con.)

FB\_P07B v98.03b R1/R4 FISH HABITAT INVENTORY SYSTEM Run date: 03/26/1998 Page 1  
 Stream ID: ID12739 Summary of Main Channel Fish Counts and Densities-Chinook & Steelhead  
 EPA Reach: 1706020104101.00 Listing by Survey Reach and by Habitat Class  
 Stream Name: YANKEE FORK Forest: SALMON-CHALLIS NF District: YANKEE FORK RD Study: I94

No. of Habitat Class Sites	Chinook Counts				Steelhead Counts											
	Age 0	Age 1	Age 2	Age 3	Age 1	Age 2	Age 3	Total								
Survey Reach:12 Survey Reach Lower Boundary: CONFLUENCE WITH JORDAN CR																
Reach Type: C Survey Reach Upper Boundary: PUZZLER GULCH (INTERMITTENT CR)																
FAST	18	0.58	1	0.03	0	0.00	19	0.61	2	0.06	0	0.00	0	0.00	2	0.06
SLOW	21	2.18	0	0.00	0	0.00	21	2.18	0	0.00	2	0.21	0	0.00	2	0.21
Subtotals	39		1		0		40		2		2		0		4	
Densities		0.96		0.02		0.00		0.98		0.05		0.05		0.00		0.10

Survey Reach:13 Survey Reach Lower Boundary: CONFLUENCE WITH PUZZLER GULCH																
Reach Type: C Survey Reach Upper Boundary: CONFLUENCE WITH ADAIR CR																
FAST	29	1.43	0	0.00	0	0.00	29	1.43	4	0.20	0	0.00	0	0.00	4	0.20
SLOW	23	3.88	1	0.17	0	0.00	24	4.05	1	0.17	1	0.17	0	0.00	2	0.34
Subtotals	52		1		0		53		5		1		0		6	
Densities		1.98		0.04		0.00		2.02		0.19		0.04		0.00		0.23
Totals	91		2		0		93		7		3		0		10	
Densities		1.36		0.03		0.00		1.39		0.10		0.04		0.00		0.15

Appendix E-5 (con.)

FB\_P07C v98.03b  
 Stream ID: ID12739  
 EPA Reach: 1706020104101.00  
 Stream Name: YANKEE FORK  
 RI/R4 FISH HABITAT INVENTORY SYSTEM  
 Summary of Main Channel Fish Counts and Densities-Rainbow & Redband  
 Listing by Survey Reach and by Habitat Class  
 Forest: SALMON-CHALLIS NF District: YANKEE FORK RD  
 Run Date: 03/26/1998 Page 1  
 Study: 194

		Rainbow Counts			Redband Counts		
No. of		#per	#per	#per	#per	#per	
Habitat	Snorkel	100m <sup>2</sup>	100m <sup>2</sup>	100m <sup>2</sup>	100m <sup>2</sup>	100m <sup>2</sup>	100m <sup>2</sup>
Class	Sites	Total	<100mm	100-200mm	>200mm	Total	
Survey Reach:12 Survey Reach Lower Boundary: CONFLUENCE WITH JORDAN CR							
Reach Type: C Survey Reach Upper Boundary: PUZZLER GULCH (INTERMITTENT CR)							
FAST	6	0	0.00	0	0.00	0	0.00
SLOW	6	0	0.00	0	0.00	0	0.00
Subtotals	12	0	0.00	0	0.00	0	0.00
Densities							
Survey Reach:13 Survey Reach Lower Boundary: CONFLUENCE WITH PUZZLER GULCH							
Reach Type: C Survey Reach Upper Boundary: CONFLUENCE WITH ADAIR CR							
FAST	5	0	0.00	0	0.00	0	0.00
SLOW	3	0	0.00	0	0.00	0	0.00
Subtotals	8	0	0.00	0	0.00	0	0.00
Densities							
Totals	20	0	0.00	0	0.00	0	0.00
Densities							

Appendix E-5 (con.)

FB\_P07D V98.03b R1/R4 FISH HABITAT INVENTORY SYSTEM Run date: 03/26/1998  
 Stream ID: ID12739 Summary of Main Channel Fish Counts and Densities-Bull Trout Page 1  
 EPA Reach: 1706020104101.00 Listing by Survey Reach and by Habitat Class  
 Stream Name: YANKEE FORK Forest: SALMON-CHALLIS NF District: YANKEE FORK RD Study: I94

Bull Trout Counts																	
Habitat Class	No. of Snorkel Sites	#per 100m <sup>2</sup>										#per 100m <sup>2</sup> Total					
		<100mm	100-200mm	100m <sup>2</sup> 100m <sup>2</sup>	200-300mm	100m <sup>2</sup> 100m <sup>2</sup>	300-400mm	100m <sup>2</sup> 100m <sup>2</sup>	400-500mm	100m <sup>2</sup> 100m <sup>2</sup>	>500mm		100m <sup>2</sup> 100m <sup>2</sup>				
Survey Reach:12 Survey Reach Lower Boundary: CONFLUENCE WITH JORDAN CR																	
Reach Type: C Survey Reach Upper Boundary: PUZZLER GULCH (INTERMITTENT CR)																	
FAST	6	0	0.00	1	0.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.03
SLOW	6	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Subtotals	12	0	0.00	1	0.02	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.02
Densities																	
Survey Reach:13 Survey Reach Lower Boundary: CONFLUENCE WITH PUZZLER GULCH																	
Reach Type: C Survey Reach Upper Boundary: CONFLUENCE WITH ADAIR CR																	
FAST	5	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
SLOW	3	0	0.00	2	0.34	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.34
Subtotals	8	0	0.00	2	0.08	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.08
Densities																	
Totals	20	0	0.00	3	0.04	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.04
Densities																	



Appendix E-5 (con.)

FB\_P07E V98.03b R1/R4 FISH HABITAT INVENTORY SYSTEM Run date: 03/26/1998  
 Stream ID: ID12739 Summary of Main Channel Fish Counts and Densities--Brook & Brown Trout Page 1  
 EPA Reach: 1706020104101.00 Listing by Survey Reach and by Habitat Class  
 Stream Name: YANKEE FORK Forest: SALMON-CHALLIS NF District: YANKEE FORK RD Study: 194

		Brook Trout Counts					Brown Trout Counts							
Habitat Class	No. of Snorkel Sites	<100mm	100-200mm	200-300mm	>300mm	Total	100m	<100mm	100-200mm	200-300mm	300-400mm	>400mm	Total	Densities
Survey Reach:12 Survey Reach Lower Boundary: CONFLUENCE WITH JORDAN CR														
Reach Type: C Survey Reach Upper Boundary: PUZZLER GULCH (INTERMITTENT CR)														
FAST	6	0	0	0	0	0	0.00	0	0	0	0	0	0	0.00
SLOW	6	0	0	0	0	0	0.00	0	0	0	0	0	0	0.00
Subtotals	12	0	0	0	0	0	0.00	0	0	0	0	0	0	0.00
Survey Reach:13 Survey Reach Lower Boundary: CONFLUENCE WITH PUZZLER GULCH														
Reach Type: C Survey Reach Upper Boundary: CONFLUENCE WITH ADAIR CR														
FAST	5	0	0	0	0	0	0.00	0	0	0	0	0	0	0.00
SLOW	3	0	0	0	0	0	0.00	0	0	0	0	0	0	0.00
Subtotals	8	0	0	0	0	0	0.00	0	0	0	0	0	0	0.00
Totals														
Densities														
20 0 0 0 0 0 0 0.00 0 0 0 0 0 0.00														

Appendix E-5 (con.)

FB\_PC07F V98.03b R1/R4 FISH HABITAT INVENTORY SYSTEM Run date: 03/26/1998  
 Stream ID: ID12739 Summary of Main Channel Fish Counts and Densities-Cutthroat Listing by Survey Reach and by Habitat Class Page 1  
 EPA Reach: 1706020104101.00 Forest: SALMON-CHALLIS NF District: YANKEE FORK RD Study: I94  
 Stream Name: YANKEE FORK

Forest: SALMON-CHALLIS NF District: YANKEE FORK RD Study: I94

Habitat Class	No. of Snorkel Sites	Cutthroat Counts						Total	#per 100m <sup>2</sup>		
		#per 100m <sup>2</sup> <100mm	#per 100m <sup>2</sup> 100-200mm	#per 100m <sup>2</sup> 200-300mm	#per 100m <sup>2</sup> >300mm	#per 100m <sup>2</sup>	#per 100m <sup>2</sup>				
Survey Reach:12 Survey Reach Lower Boundary: CONFLUENCE WITH JORDAN CR											
Reach Type: C Survey Reach Upper Boundary: PUZZLER GULCH (INTERMITTENT CR)											
PAST	6	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
SLOW	6	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Subtotals	12	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Densities											
Survey Reach:13 Survey Reach Lower Boundary: CONFLUENCE WITH PUZZLER GULCH											
Reach Type: C Survey Reach Upper Boundary: CONFLUENCE WITH ADAIR CR											
PAST	5	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
SLOW	3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Subtotals	8	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Densities											
Totals	20	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Densities											

# Appendix E-6: RIPARIAN SUMMARY report sorted by SURVEY REACH

FB\_P06 v99.03b R1/R4 FISH HABITAT INVENTORY SYSTEM Run date: 03/26/1998 Page 1  
 Stream ID: ID7116 Summary of Main Channel Riparian Community Types Listing by Survey Reach  
 EPA Reach: 1706020112400.00 Forest: SAWTOOTH NF District: KETCHUM RD Study: I95  
 Stream Name: EAST PASS CR

Riparian Community Type	Left Bank			Right Bank			Bank Total		
	Occur	%	% Strm Length	Occur	%	% Strm Length	Occur	%	% Strm Length
Survey Reach:4 Survey Reach Lower Boundary: UNNAMED TRIB RB T8N,R18E,S11,SW1/4,NW1/4									
Reach Type: B Survey Reach Upper Boundary: UNNAMED TRIB RB T8N,R18E,S10,SW1/4,SW1/4,SE1/4									
BB2 - Brdlf.decidi;shrb/forb	7	7.8	2.8	1	1.1	0.4	8	8.9	1.6
BB4 - Brdlf.decidi;Forb	0	0.0	0.0	5	5.6	2.4	5	5.6	1.2
CC1 - Up1.Sbalp/Ldg;Up1.midshrb/forb	90	100.0	59.4	67	74.4	41.0	90	100.0	50.2
SD1 - Up1.shrb	0	0.0	0.0	18	20.0	7.1	18	20.0	3.5
SR4 - Willow/Aldr;Wet.forb/gras/edge	65	72.2	37.2	78	86.7	46.2	86	95.6	41.7
XX1 - Unvegetated (plant cover <10%)	2	2.2	0.7	7	7.8	3.0	8	8.9	1.8
Survey Reach:5 Survey Reach Lower Boundary: (UNNAMED TRIB LB)T8N,R18E,S10,SW1/4,SW1/4,SE1/4									
Reach Type: B Survey Reach Upper Boundary: (UNNAMED LAKE TRIB RB)T8N,R18E,S10,SW1/4,SE1/4									
BB2 - Brdlf.decidi;shrb/forb	0	0.0	0.0	1	6.3	37.3	1	6.3	18.6
BB4 - Brdlf.decidi;Forb	4	25.0	8.1	3	18.8	5.4	4	25.0	6.7
CC2 - Rip.Sbalp/Ldg;Wet.midshrb/forb	1	6.3	18.6	0	0.0	0.0	1	6.3	9.3
GR4 - Rip.gras/forb	1	6.3	3.3	0	0.0	0.0	1	6.3	1.7
HD1 - Up1.forb/gras	0	0.0	0.0	6	37.5	14.7	6	37.5	7.4
SR2 - Willow/Aldr;Wet.gras/edge	3	18.8	5.3	5	31.3	17.6	6	37.5	11.5
SR4 - Willow/Aldr;Wet.forb/gras/edge	12	75.0	64.7	8	50.0	21.1	13	81.3	42.9
XX1 - Unvegetated (plant cover <10%)	0	0.0	0.0	2	12.5	3.9	2	12.5	2.0

# Appendix E-7: RESEARCH SUMMARY report

FB\_P08 v98.03b R1/R4 FISH HABITAT INVENTORY SYSTEM Run date: 01/26/1998  
 Stream ID: ID7116 EPA Reach: 1706020112400.00 Summary of Selected Reach Habitat Parameters Page 1  
 Stream Name: EAST PASS CR Forest: SAWTOOTH NF District: KETCHUM RD Study: I95

Total Number of Units	Gradient MAP	Habitat Length(m) OBS	Width(m)		Max Depth(m) Mean	Width/Depth (m) Mean	Resid. Vol.(m³) Mean	LWD No. per 100(m)	Stbl Bank		Undrct Bank		% Srfce Fines		Dem. Ripar. Type	From:	Mid:	To:
			Mean	Pools					Mean	Mean	Mean	Mean	Mean	Mean				
Survey Reach:4																		
Reach Type: B																		
90	4.4	-	1,852.4	3.9	26.1	0.77	18.6	19.5	3.0	85.4	22.6	15.6	0.0	926.2	1,852.4			
Survey Reach:5																		
Reach Type: B																		
16	3.5	3.1	313.0	3.5	27.1	0.87	10.6	16.8	1.9	86.0	34.7	14.7	1,852.4	2,008.9	2,165.4			
Survey Reach:6																		
Reach Type: A																		
20	5.9	-	367.1	4.1	20.5	0.91	13.8	10.9	4.6	96.2	38.0	15.0	2,165.4	2,349.0	2,532.5			
Survey Reach:7																		
Reach Type: B																		
30	3.9	3.2	696.1	3.8	29.6	0.83	13.1	21.7	7.0	98.1	43.4	16.1	2,532.5	2,880.5	3,228.6			
Survey Reach:8																		
Reach Type: A																		
60	5.5	3.2	1,020.6	4.0	30.9	0.81	13.9	15.6	9.6	94.6	56.4	16.8	3,228.6	3,738.9	4,249.2			

# Appendix E-8: RESEARCH SUMMARY 2 report

FB\_P012 v98.03b  
 Stream ID: PF0800000  
 EPA Reach: 1701020608000.00  
 Stream Name: DEAD HORSE CR  
 R1/R4 FISH HABITAT INVENTORY SYSTEM  
 Summary of Selected Reach Habitat Parameters 2  
 Run date: 03/26/1998  
 Page 1  
 Forest: FLATHEAD NF  
 District: GLACIER VIEW RD  
 Study: I97

Total Number of Units	MAP	Gradient	Habitat Length(m)	Width(m) Mean	Depth Mean	Width/Mx Depth Mean	IMD No. per Mile	\$Stbl Bank Mean	\$Undrct Bank Mean	#Pools per mi. Pools per mi.	#Deep Pools per mi. per mi.	#Lrg. Pools per mi. per mi.	Resid. Max Dep. Mean	Riffle Glds Mean	Runs/ Fines Mean	\$Sm. Grav. Mean				
Survey Reach1																				
Reach Type: B																				
Channel Type: B1																				
115	4.0	4.0	1,932.2	4.2	0.15	29.6	7.86	472.5	99.5	32.4	24.3	54.4	0.0	0.9	0.38	73.4	2.3	18.6	5.8	48.8
Survey Reach2																				
Reach Type: B																				
Channel Type:																				
246	3.5	3.5	2,398.8	3.5	0.14	30.5	7.82	379.6	99.9	30.4	35.1	95.2	0.0	4.0	0.38	61.5	3.4	23.8	11.8	54.2
Grand total..... 4,231.0																				

# Appendix E-9: OTHER COMMENTS report

FB\_PO11 v98.03b R1/R4 FISH HABITAT INVENTORY SYSTEM Run date: 03/26/1998  
 Stream ID: ID12739 COMMENTS REPORT Page 1  
 EPA Reach: 1706020104101.00  
 Stream Name: YANKEE FORK Forest: SALMON-CHALLIS NF District: YANKEE FORK RD Study: I94

Survey Reach	Reach Type	Unit No	Chan Code	Side Unit	Hab. Type	Comments
13	C	1	M	0	HGR	Habitat: REACH BEGINS AT PUZZLER GULCH (DRY INT. TRIB) RB-INSIGNIFICANT SC ENTERS LB (TOU) (DRY - 15M UP)

Survey Reach	Reach Type	Unit No	Chan Code	Side Unit	Hab. Type	Comments
13	C	2	M	0	RUN	Fish: 2 YOY, 2 ADULT WHITEFISH

Survey Reach	Reach Type	Unit No	Chan Code	Side Unit	Hab. Type	Comments
13	C	4	M	0	SMB	Habitat: "HOMEMADE" BRIDGE CROSSES UNIT -RUDIMENTARY CABIN RB LARGE TALUS SLOPE/150M FROM LB (ACROSS ROAD) Fish: 2 ADULT WHITEFISH

Survey Reach	Reach Type	Unit No	Chan Code	Side Unit	Hab. Type	Comments
13	C	9	M	0	SLM	Fish: 1 YOY WHITEFISH

Survey Reach	Reach Type	Unit No	Chan Code	Side Unit	Hab. Type	Comments
13	C	16	A	1	DBA	Habitat: ARTIFICIAL DAM AND TRENCH CUT TO DIVERT WATER FOR MINING PURPOSES-SCREEN ACROSS TRENCH

Survey Reach	Reach Type	Unit No	Chan Code	Side Unit	Hab. Type	Comments

Appendix E-9 (con.)

FB\_P011 v98.03b RI/R4 FISH HABITAT INVENTORY SYSTEM Run date: 03/26/1998  
 COMMENTS REPORT Page 2

Stream ID: ID12739  
 EPA Reach: 1706020104101.00  
 Stream Name: YANKEE FORK Forest: SALMON-CHALLIS NF District: YANKEE FORK RD Study: I94

Survey Reach	Reach Type	Unit No	Chan Code	Side Unit	Hab. Type	Comments
13	C	17	M	0	GLD	Fish: SUBSTRATE COVERED WITH ALGAE
13	C	19	M	0	SMT	Fish: 1 ADULT WHITEFISH
13	C	20	M	0	LGR	Fish: 1 ADULT WHITEFISH; 1 SCULPIN SIDE CHANNEL FULL OF CHINOOK 0'S

# Appendix E-10: INVENTORY STATUS report

FB\_P013 v99.03b

R1/R4 FISH HABITAT INVENTORY SYSTEM  
Habitat Inventory Status Report

Run date: 03/26/1998  
Page 1

Region	State	Forest	District	Stream Name	Stream ID	Reaches	Study	Survey Length(m)
01	MT	FLATHEAD NF	GLACIER VIEW RD	BIG CR	MT292	1-7	I93	7000.7
01	MT	FLATHEAD NF	GLACIER VIEW RD	BIG CR	PF0830200	1	I97	2470.5
01	MT	FLATHEAD NF	GLACIER VIEW RD	COAL CR	MT810	2-5	I94	7962.0
01	MT	FLATHEAD NF	GLACIER VIEW RD	DEAD HORSE CR	PF0800000	1-2	I97	4231.0
01	MT	FLATHEAD NF	GLACIER VIEW RD	SHORTY CR	PF0880000	1	I95	4443.6
01	MT	FLATHEAD NF	GLACIER VIEW RD	SHORTY CR, S FK	PF0970000	1	I95	481.1
01	MT	FLATHEAD NF	GLACIER VIEW RD	SHORTY CR, S FK	PF0970000	2-4	I96	2591.9
01	MT	FLATHEAD NF	HUNGRY HORSE RD	EMERY CR	PI1280000	1-4	I96	7077.6
01	MT	FLATHEAD NF	HUNGRY HORSE RD	EMERY CR	PI1280100	5-6	I96	4100.8
01	MT	FLATHEAD NF	HUNGRY HORSE RD	HUNGRY HORSE CR	PI2020100	1	I97	1590.5
01	MT	FLATHEAD NF	HUNGRY HORSE RD	HUNGRY HORSE CR	PI2020200	2	I97	2280.3
01	MT	FLATHEAD NF	HUNGRY HORSE RD	HUNGRY HORSE CR	PI2020300	3	I97	817.6
01	MT	FLATHEAD NF	HUNGRY HORSE RD	HUNGRY HORSE CR	PI2020400	4	I97	2943.4
01	MT	FLATHEAD NF	SPOTTED BEAR RD	ADDITION CR	MT1718	1-3	I93	7891.1
01	MT	FLATHEAD NF	SPOTTED BEAR RD	DRUMMING CR	11006DRM0	1	I96	161.8
01	MT	FLATHEAD NF	SPOTTED BEAR RD	LODGEPOLE CR	PG0540000	1-2	I96	4031.5
01	MT	FLATHEAD NF	SPOTTED BEAR RD	LODGEPOLE CR	PG0540100	3-6	I96	6927.6
01	MT	FLATHEAD NF	SPOTTED BEAR RD	SOUTH CR	11006STH0	1-4	I96	3768.8
01	MT	FLATHEAD NF	SWAN LAKE RD	CONDON CR	PR0880300	1-2	I94	2535.6
01	MT	FLATHEAD NF	SWAN LAKE RD	ELK CR	PK0210000	1-3	I97	2475.3
01	MT	FLATHEAD NF	SWAN LAKE RD	ELK CR	PK0210100	4-6	I97	1704.7
01	MT	FLATHEAD NF	SWAN LAKE RD	HALL CR	PK1090100	1	I96	107.8
01	MT	FLATHEAD NF	SWAN LAKE RD	LION CREEK	MT4218	1-5	I94	6270.4
Total Survey Length								83865.6

The above report selection criteria was as follows:

-States- -Forests- -Districts-

All All  
 MT 01 SWAN LAKE RD  
 MT 04 SPOTTED BEAR RD  
 MT 06 HUNGRY HORSE RD  
 MT 07 GLACIER VIEW RD



## Appendix F: FBASE Summary Variable Calculations

The following are the calculations used in the FBASE summary reports. The field names are used to represent the variables in the calculations; for a description of the field names, see the data dictionary in appendix B. The “n” used in some calculations represents the sample size (or number of times that the variable was collected).

The calculations in this document are by habitat unit. For instance, the Habitat Length Total calculation, which is Sum(HAB\_LENGTH), is calculated by adding together the habitat lengths of the habitat units (within the applicable sort levels).

When FBASE computes the summary variables, it does not include any missing data (represented by -9) in the calculation, nor is the -9 included in the sample size (n). If the value for the variable is 0, the 0 is included in the calculation and the sample size (n).

If widths and depths are sub-sampled, the totals for Habitat Area and Habitat Volume will represent only the SAMPLED area or volume and not the true total. Similarly, if max depths and/or crest depths are missing due to sub-sampling or data collection error, the Residual Volume Total will not be the survey total but just the sampled total. Refer to the sample size (n) in the summary reports to determine whether data were sub-sampled or are missing.

Some summary variables, such as Width Mean, Habitat Depth Mean, and Width/Depth Mean are “weighted” so that variables in units that are longer and/or larger have a greater “weight” in the calculation than units that are shorter and/or smaller. For instance, mean width is weighted by habitat unit length so that the longer units contribute more toward the mean width than the shorter units. This is done by multiplying each width by the length, and then adding these together and dividing by the sum of the lengths of all the units. The following is a list of summary variables that are weighted and the variable by which they are weighted:

Summary variable:	Weighted by:
<b>Physical Habitat Reports:</b>	
Width Mean	Habitat Length
Habitat Depth Mean	Habitat Area
Width/Depth Mean	Habitat Length
Pocket Pool Depth Mean	Number of pocket pools
Percent Stable Bank (Left, Right, Mean) <sup>1</sup>	Bank length
Percent Unstable Bank Mean <sup>1</sup>	Bank length
Percent Undercut Bank (Left, Right, Mean) <sup>1</sup>	Bank length

(Con.)

Summary variable:	Weighted by:
<b>Fish Reports:</b>	
Dive Width Mean	Dive Length
Dive Depth Mean	Dive Area
Percent Undercut Bank Mean	Dive Length
Percent Overhead Cover Mean	Dive Area
Percent Submerged Cover Mean	Dive Area
Percent Large Substrate Mean	Dive Area
<b>Reach Report:</b>	
Width Mean	Habitat Length
Width/Depth Mean	Habitat Length
Percent Stable Bank Mean <sup>1</sup>	Bank length
Percent Undercut Bank Mean <sup>1</sup>	Bank length
<b>Reach Report 2:</b>	
Width Mean	Habitat Length
Habitat Depth Mean	Habitat Area
Width/Depth Mean	Habitat Length
Width/Maximum Depth Mean	Habitat Length
Percent Stable Bank Mean <sup>1</sup>	Bank length
Percent Undercut Bank Mean <sup>1</sup>	Bank length

<sup>1</sup>The summary variables for banks are weighted only if the bank parameters are collected in percents and not when they are collected in meters.

## Physical Habitat Summary Report

This report has several sub-reports, including “Summary of Main Channel Physical Habitat Dimensions,” “Summary of Main Channel Habitat Parameters,” “Summary of Main Channel Bank Stability and Undercut,” and “Summary of Main Channel Substrate Conditions.” These reports can also be generated for the side channels. Each sub-report heading is followed by its program name.

### Summary of Main Channel Physical Habitat Dimensions (FB\_PO1)

1. Habitat Class, Group, or Type: Acronym for HAB\_CLS (*FAST*, *SLOW*), HAB\_GRP (*SLA*, *TUR*, and so forth), or HAB\_TYPE (*SLM*, *LGR*, and so forth) occurring within the primary sorting level (*OVERALL*, *SURVEY REACH*, *REACH TYPE*, *CHANNEL TYPE*, *HABITAT CLASS*, or *HABITAT GROUP*).

2. Total Number of Units: Count of HAB\_UNIT occurring within each HAB\_CLS, HAB\_GRP, or HAB\_TYPE.

3. Habitat Length Total:  
Sum(HAB\_LENGTH)

4. Habitat Length Mean:

$$\frac{\text{Sum}(\text{HAB\_LENGTH})}{n}$$

5. Habitat Length Percent:<sup>1</sup>

$$\frac{\text{Sum}(\text{HAB\_LENGTH})}{\text{Habitat Length Subtotal}} * 100$$

6. Width Mean (weighted by habitat length):

$$\frac{\text{Sum}(\text{HAB\_WIDTH} * \text{HAB\_LENGTH})}{\text{Sum}(\text{HAB\_LENGTH})}$$

7. Habitat Depth Mean (weighted by habitat area):

$$\frac{\text{Sum}(\text{HAB\_DEPTH} * \text{HAB\_LENGTH} * \text{HAB\_WIDTH})}{\text{Sum}(\text{HAB\_LENGTH} * \text{HAB\_WIDTH})}$$

8. Maximum Depth Mean:

$$\frac{\text{Sum}(\text{MAX\_DEPTH})}{n}$$

9. Width/Depth Mean (weighted by habitat length):

$$\frac{\text{Sum}((\text{HAB\_WIDTH}/\text{HAB\_DEPTH}) * \text{HAB\_LENGTH})}{\text{Sum}(\text{HAB\_LENGTH})}$$

10. Habitat Area Total:<sup>2</sup>

$$\text{Sum}(\text{HAB\_AREA})$$

11. Habitat Area Mean:<sup>2</sup>

$$\frac{\text{Sum}(\text{HAB\_AREA})}{n}$$

12. Habitat Area Percent:<sup>2,3</sup>

$$\frac{\text{Sum}(\text{HAB\_AREA})}{\text{Habitat Area Total}} * 100$$

13. Habitat Volume Total:<sup>2</sup>

$$\text{Sum}(\text{HAB\_VOL})$$

14. Habitat Volume Mean:<sup>2</sup>

$$\frac{\text{Sum}(\text{HAB\_VOL})}{n}$$

15. Habitat Volume Percent:<sup>2,4</sup>

$$\frac{\text{Sum}(\text{HAB\_VOL})}{\text{Habitat Volume Subtotal}} * 100$$

<sup>1</sup>Habitat Length Percent represents the percent length of the habitat units in the secondary sort level (*HABITAT TYPE*, *GROUP*, or *CLASS*) relative to all of the habitat types, groups, or classes within the primary sort level (such as *SURVEY REACH*, *REACH TYPE*, and so forth). Habitat Length Percent Subtotals on the summary report represent the percent length of all units within the primary sorting level (for example, *SURVEY REACH*) relative to the length of all units in all reaches. The Habitat Length Percent Totals should always be equal to 100.0 (or close to 100.0 because of rounding), since this calculation reflects the percent of all unit lengths within all reaches.

<sup>2</sup>The following fields are pre-calculated during data entry and the values are then used in the summary calculations:

$$\text{HAB\_AREA} = \text{HAB\_LENGTH} * \text{HAB\_WIDTH}$$

$$\text{HAB\_VOL} = \text{HAB\_LENGTH} * \text{HAB\_WIDTH} * \text{HAB\_DEPTH}$$

<sup>3</sup>Habitat Area Percent represents the percent area of the habitat units in the secondary sort level (*HABITAT TYPE*, *GROUP*, or *CLASS*) relative to all of the habitat types, groups, or classes within the primary sort level (such as *SURVEY REACH*, *REACH TYPE*, and so forth). Habitat Area Percent Subtotals on the summary report represent the percent area of all units within the primary sorting level (for example, *SURVEY REACH*) relative to the area of all units in all reaches. The Habitat Area Percent Totals should always be equal to 100.0 (or close to 100.0 because of rounding), since this calculation reflects the percent of all unit areas within all reaches.

<sup>4</sup>Habitat Volume Percent represents the percent volume of the habitat units in the secondary sort level (*HABITAT TYPE*, *GROUP*, or *CLASS*) relative to all of the habitat types, groups, or classes within the primary sort level (such as *SURVEY REACH*, *REACH TYPE*, and so forth). Habitat Volume Percent Subtotals on the summary report represent the percent volume of all units within the primary sorting level (for example, *SURVEY REACH*) relative to the volume of all units in all reaches. The Habitat Volume Percent Totals should always be equal to 100.0 (or close to 100.0 because of rounding), since this calculation reflects the percent of all unit volumes within all reaches.

### Summary of Main Channel Habitat Parameters (FB\_PO2)

1. Habitat Class, Group, or Type: Acronym for *HAB\_CLS* (*FAST*, *SLOW*), *HAB\_GRP* (*SLA*, *TUR*, and so forth), or *HAB\_TYPE* (*SLM*, *LGR*, and so forth) occurring within the primary sorting level (*OVERALL*, *SURVEY REACH*, *REACH TYPE*, *CHANNEL TYPE*, *HABITAT CLASS*, or *HABITAT GROUP*).

2. Total Number of Units: Count of *HAB\_UNIT* occurring within each *HAB\_CLS*, *HAB\_GRP*, or *HAB\_TYPE*.

3. Number of Pocket Pools Total:

$$\text{Sum}(\text{POCKETS})$$

4. Number of Pocket Pools Mean:

$$\frac{\text{Sum}(\text{POCKETS})}{n}$$

5. Number of Pocket Pools per 100m:

$$\frac{\text{Sum(POCKETS)}}{\text{Sum(HAB\_LENGTH)}} * 100$$

6. Pocket Pool Depth Mean (weighted by number of pocket pools):

$$\frac{\text{Sum(PKT\_DEPTH * POCKETS)}}{\text{Sum(POCKETS)}}$$

7. Number of STP Pools Total:

$$\text{Sum(STP\_NUM)}$$

8. STP Complex Maximum Depth Mean:

$$\frac{\text{Sum(STP\_AVG\_DP)}}{n}$$

9. Crest Depth Mean:

$$\frac{\text{Sum(TAIL\_DEPTH)}}{n}$$

10. Residual Maximum Depth Mean:<sup>1</sup>

$$\frac{\text{Sum(RESID\_MXD)}}{n}$$

11. Residual Volume Total:<sup>1</sup>

$$\text{Sum(RESID\_VOL)}$$

12. Residual Volume Mean:<sup>1</sup>

$$\frac{\text{Sum(RESID\_VOL)}}{n}$$

13. LWD Total:

$$\text{Sum(LWD\_SINGLE + LWD\_AGREGS + LWD\_WADS)}$$

14. Number LWD per 100m:

$$\frac{\text{Sum(LWD\_SINGLE + LWD\_AGREGS + LWD\_WADS)}}{\text{Sum(HAB\_LENGTH)}} * 100$$

<sup>1</sup>The following fields are pre-calculated during data entry and the values are then used in the summary calculations:

$$\text{RESID\_MXD} = \text{MAX\_DEPTH} - \text{TAIL\_DEPTH}$$

$$\text{RESID\_VOL} = (\text{MAX\_DEPTH} - \text{TAIL\_DEPTH}) * \text{HAB\_AREA}$$

## Summary of Main Channel Bank Stability and Undercut (FB\_PO3)

1. Habitat Class, Group, or Type: Acronym for HAB\_CLS (*FAST, SLOW*), HAB\_GRP (*SLA, TUR*, and so forth), or HAB\_TYPE (*SLM, LGR*, and so forth) occurring within the primary sorting level (*OVER-ALL, SURVEY REACH, REACH TYPE, CHANNEL TYPE, HABITAT CLASS, or HABITAT GROUP*).

2. Total Number of Units: Count of HAB\_UNIT occurring within each HAB\_CLS, HAB\_GRP, or HAB\_TYPE.

3. Bank Length Left:

$$\text{Sum(LEFT\_LEN)}$$

4. Bank Length Right:

$$\text{Sum(RITE\_LEN)}$$

5. Percent Stable Bank Left:

If meters stable bank collected:

$$\frac{\text{Sum(LEN\_BS\_L)}}{\text{Sum(LEFT\_LEN)}} * 100$$

If percent stable bank collected (weighted by left bank length):

$$\frac{\text{Sum(PCT\_BS\_L * LEFT\_LEN)}}{\text{Sum(LEFT\_LEN)}}$$

6. Percent Stable Bank Right:

If meters stable bank collected:

$$\frac{\text{Sum(LEN\_BS\_R)}}{\text{Sum(RITE\_LEN)}} * 100$$

If percent stable bank collected (weighted by right bank length):

$$\frac{\text{Sum(PCT\_BS\_R * RITE\_LEN)}}{\text{Sum(RITE\_LEN)}}$$

7. Percent Stable Bank Mean:

If meters stable bank collected:

$$\frac{\text{Sum(LEN\_BS\_L + LEN\_BS\_R)}}{\text{Sum(LEFT\_LEN + RITE\_LEN)}} * 100$$

If percent stable bank collected (weighted by bank length):

$$\frac{\text{Sum}(\text{PCT\_BS\_L} * \text{LEFT\_LEN}) + \text{Sum}(\text{PCT\_BS\_R} * \text{RITE\_LEN})}{\text{Sum}(\text{LEFT\_LEN} + \text{RITE\_LEN})}$$

8. Percent Unstable Bank Left:

100 - Percent Stable Bank Left

9. Percent Unstable Bank Right:

100 - Percent Stable Bank Right

10. Percent Unstable Bank Mean:

If meters stable bank collected:

$$\frac{\text{Sum}((\text{LEFT\_LEN} - \text{LEN\_BS\_L}) + (\text{RITE\_LEN} - \text{LEN\_BS\_R}))}{\text{Sum}(\text{LEFT\_LEN} + \text{RITE\_LEN})} * 100$$

If percent stable bank collected (weighted by bank length):

$$\frac{\text{Sum}((100 - \text{PCT\_BS\_L}) * \text{LEFT\_LEN}) + \text{Sum}((100 - \text{PCT\_BS\_R}) * \text{RITE\_LEN})}{\text{Sum}(\text{LEFT\_LEN} + \text{RITE\_LEN})}$$

11. Percent Undercut Bank Left:

If meters undercut bank collected:

$$\frac{\text{Sum}(\text{LEN\_UCUT\_L})}{\text{Sum}(\text{LEFT\_LEN})} * 100$$

If percent undercut bank collected (weighted by left bank length):

$$\frac{\text{Sum}(\text{PCT\_UCUT\_L} * \text{LEFT\_LEN})}{\text{Sum}(\text{LEFT\_LEN})}$$

12. Percent Undercut Bank Right:

If meters undercut bank collected:

$$\frac{\text{Sum}(\text{LEN\_UCUT\_R})}{\text{Sum}(\text{RITE\_LEN})} * 100$$

If percent undercut bank collected (weighted by right bank length):

$$\frac{\text{Sum}(\text{PCT\_UCUT\_R} * \text{RITE\_LEN})}{\text{Sum}(\text{RITE\_LEN})}$$

13. Percent Undercut Bank Mean:

If meters undercut bank collected:

$$\frac{\text{Sum}(\text{LEN\_UCUT\_L} + \text{LEN\_UCUT\_R})}{\text{Sum}(\text{LEFT\_LEN} + \text{RITE\_LEN})} * 100$$

If percent undercut bank collected (weighted by bank length):

$$\frac{\text{Sum}(\text{PCT\_UCUT\_L} * \text{LEFT\_LEN}) + \text{Sum}(\text{PCT\_UCUT\_R} * \text{RITE\_LEN})}{\text{Sum}(\text{LEFT\_LEN} + \text{RITE\_LEN})}$$

## Summary of Main Channel Substrate Conditions (FB\_PO5)

1. Habitat Class, Group, or Type: Acronym for HAB\_CLS (*FAST*, *SLOW*), HAB\_GRP (*SLA*, *TUR*, and so forth), or HAB\_TYPE (*SLM*, *LGR*, and so forth) occurring within the primary sorting level (*OVERALL*, *SURVEY REACH*, *REACH TYPE*, *CHANNEL TYPE*, *HABITAT CLASS*, or *HABITAT GROUP*).

2. Total Number of Units: Count of HAB\_UNIT occurring within each HAB\_CLS, HAB\_GRP, or HAB\_TYPE.

3. Number of Measured Units: Count of HAB\_UNIT number in which measured substrate (Wolman) data were collected.

4. Number of Estimated Units: Count of HAB\_UNIT number in which estimated substrate (ocular) data were collected.

5. Percent Fines Mean:

$$\frac{\text{Sum}(\text{PCT\_FINES})}{n}$$

6. Percent Small Gravel Mean:

$$\frac{\text{Sum}(\text{PCT\_SGRV})}{n}$$

7. Percent Gravel Mean:

$$\frac{\text{Sum}(\text{PCT\_GRAVEL})}{n}$$

8. Percent Small Cobble Mean:

$$\frac{\text{Sum}(\text{PCT\_SCOB})}{n}$$

9. Percent Cobble Mean:

$$\frac{\text{Sum}(\text{PCT\_COBBLE})}{n}$$

10. Percent Small Boulder Mean:

$$\frac{\text{Sum}(\text{PCT\_SBLD})}{n}$$

11. Percent Boulder Mean:

$$\frac{\text{Sum(PCT\_BOLDER)}}{n}$$

12. Percent Bedrock Mean:

$$\frac{\text{Sum(PCT\_BEDROK)}}{n}$$

13. Percent Surface Fines Mean:

$$\frac{\text{Sum(PCT\_SFINES)}}{n}$$

## LWD Summary Report \_\_\_\_\_

This report can be generated for the main channel or side channel LWD data.

The report heading is followed by its program name.

### Summary of Main Channel Large Woody Debris Quantity and Volume (FB\_PO4)

1. Habitat Class, Group, or Type: Acronym for HAB\_CLS (*FAST, SLOW*), HAB\_GRP (*SLA, TUR*, and so forth), or HAB\_TYPE (*SLM, LGR*, and so forth) occurring within the primary sorting level (*OVER-ALL, SURVEY REACH, REACH TYPE, CHANNEL TYPE, HABITAT CLASS, or HABITAT GROUP*).

2. Total Number of Units: Count of HAB\_UNIT number within each HAB\_CLS, HAB\_GRP, or HAB\_TYPE.

3. Number of Single Pieces Total:

$$\text{Sum(LWD\_SINGLE)}$$

4. Number of Single Pieces Mean:

$$\frac{\text{Sum(LWD\_SINGLE)}}{n}$$

5. Number of Single Pieces per 100m:

$$\frac{\text{Sum(LWD\_SINGLE)}}{\text{Sum(HAB\_LENGTH)}} * 100$$

6. Single Pieces Diameter Mean:

$$\frac{\text{Sum(E\_DIA\_S)}}{n}$$

7. Single Pieces Length Mean:

$$\frac{\text{Sum(E\_LEN\_S)}}{n}$$

8. Single Pieces Volume Total:

$$\text{Sum}(3.14 * ((E\_DIA\_S/2)^2) * E\_LEN\_S)$$

9. Single Pieces Percent Submerged Volume Total:

$$\frac{\text{Sum}(3.14 * ((E\_DIA\_S/2)^2) * E\_LEN\_S * S\_PCT\_SUBM)}{\text{Sum}(3.14 * ((E\_DIA\_S/2)^2) * E\_LEN\_S)}$$

10. Number of Aggregates Total:

$$\text{Sum(LWD\_AGREGS)}$$

11. Number of Aggregates Mean:

$$\frac{\text{Sum(LWD\_AGREGS)}}{n}$$

12. Number of Aggregates per 100m:

$$\frac{\text{Sum(LWD\_AGREGS)}}{\text{Sum(HAB\_LENGTH)}} * 100$$

13. Total Number Pieces in Aggregate Total:

$$\text{Sum(E\_PCS\_A)}$$

14. Number of Root Wads Total:

$$\text{Sum(LWD\_WADS)}$$

15. Number of Root Wads Mean:

$$\frac{\text{Sum(LWD\_WADS)}}{n}$$

16. Number of Root Wads per 100m:

$$\frac{\text{Sum(LWD\_WADS)}}{\text{Sum(HAB\_LENGTH)}} * 100$$

## FISH Summary Report \_\_\_\_\_

This report has several sub-reports, including “Summary of Main Channel Fish Counts and Densities,” “Summary of Main Channel Snorkeled Habitat Dimensions and Cover,” and “Summary of Main Channel Fish Counts and Densities” by species, including “Chinook and Steelhead,” “Rainbow and Redband,”

“Bull Trout,” “Brook and Brown Trout,” and “Cutthroat.” These reports can also be generated for the side channels. Each sub-report heading is followed by its program name.

### Summary of Main Channel Fish Counts and Densities (FB\_PO7R1)

1. Habitat Class, Group, or Type: Acronym for HAB\_CLS (*FAST, SLOW*), HAB\_GRP (*SLA, TUR*, and so forth), or HAB\_TYPE (*SLM, LGR*, and so forth) occurring within the primary sorting level (*OVERALL, SURVEY REACH, REACH TYPE, CHANNEL TYPE, HABITAT CLASS, or HABITAT GROUP*).

2. Number of Snorkel Sites: Count of HAB\_UNIT occurring within each HAB\_CLS, HAB\_GRP, or HAB\_TYPE that were snorkeled.

3. Habitat Area: Sum  

$$\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})$$

4. Habitat Volume:  

$$\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH} * \text{DIV\_DEPTH})$$

5. Chinook Total:  

$$\text{Sum}(\text{CHIN}_0 + \text{CHIN}_1 + \text{CHIN\_ADT})$$

6. Chinook per 100m<sup>2</sup>:  

$$\frac{\text{Sum}(\text{CHIN}_0 + \text{CHIN}_1 + \text{CHIN\_ADT})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

7. Steelhead Total:  

$$\text{Sum}(\text{ST}_1 + \text{ST}_2 + \text{ST}_3)$$

8. Steelhead per 100m<sup>2</sup>:  

$$\frac{\text{Sum}(\text{ST}_1 + \text{ST}_2 + \text{ST}_3)}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

9. Rainbow Total:  

$$\text{Sum}(\text{RB})$$

10. Rainbow per 100m<sup>2</sup>:  

$$\frac{\text{Sum}(\text{RB})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

11. Cutthroat Total:  

$$\text{Sum}(\text{CT}_{100} + \text{CT}_{100\_200} + \text{CT}_{200\_300} + \text{CT}_{300})$$

12. Cutthroat per 100m<sup>2</sup>:  

$$\frac{\text{Sum}(\text{CT}_{100} + \text{CT}_{100\_200} + \text{CT}_{200\_300} + \text{CT}_{300})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

13. Bull Trout Total:  

$$\text{Sum}(\text{BT}_{100} + \text{BT}_{100\_200} + \text{BT}_{200\_300} + \text{BT}_{300\_400} + \text{BT}_{400\_500} + \text{BT}_{500})$$

14. Bull Trout per 100m<sup>2</sup>:  

$$\frac{\text{Sum}(\text{BT}_{100} + \text{BT}_{100\_200} + \text{BT}_{200\_300} + \text{BT}_{300\_400} + \text{BT}_{400\_500} + \text{BT}_{500})}{(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

15. Brook Trout Total:  

$$\text{Sum}(\text{BK}_{100\text{mm}} + \text{BK}_{100\_200} + \text{BK}_{200\_300\text{mm}} + \text{BK}_{300})$$

16. Brook Trout per 100m<sup>2</sup>:  

$$\frac{\text{Sum}(\text{BK}_{100\text{mm}} + \text{BK}_{100\_200} + \text{BK}_{200\_300\text{mm}} + \text{BK}_{300})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

### Summary of Main Channel Snorkeled Habitat Dimensions and Cover (FB\_PO7A)

1. Habitat Class, Group, or Type: Acronym for HAB\_CLS (*FAST, SLOW*), HAB\_GRP (*SLA, TUR*, and so forth), or HAB\_TYPE (*SLM, LGR*, and so forth) occurring within the primary sorting level (*OVERALL, SURVEY REACH, REACH TYPE, CHANNEL TYPE, HABITAT CLASS, or HABITAT GROUP*).

2. Number of Snorkel Sites: Count of HAB\_UNIT occurring within each HAB\_CLS, HAB\_GRP, or HAB\_TYPE that were snorkeled.

3. Dive Length Total:  

$$\text{Sum}(\text{DIV\_LENGTH})$$

4. Dive Width Mean (weighted by dive length):  

$$\frac{\text{Sum}(\text{DIV\_WIDTH} * \text{DIV\_LENGTH})}{\text{Sum}(\text{DIV\_LENGTH})}$$

5. Dive Depth Mean (weighted by dive area):  

$$\frac{\text{Sum}(\text{DIV\_DEPTH} * \text{DIV\_LENGTH} * \text{DIV\_WIDTH})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})}$$

6. Dive Maximum Depth Mean:  

$$\frac{\text{Sum}(\text{DIV\_MAX\_DP})}{n}$$

7. Habitat Area Total:

$$\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})$$

8. Habitat Area Percent:<sup>1</sup>

$$\frac{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})}{\text{Habitat Area Subtotal}} * 100$$

9. Habitat Volume Total:

$$\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH} * \text{DIV\_DEPTH})$$

10. Habitat Volume Percent:<sup>2</sup>

$$\frac{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH} * \text{DIV\_DEPTH})}{\text{Habitat Volume Subtotal}} * 100$$

11. Percent Undercut Bank Mean (weighted by dive length):

$$\frac{\text{Sum}(\text{PCT\_UC} * \text{DIV\_LENGTH})}{\text{Sum}(\text{DIV\_LENGTH})}$$

12. Percent Overhead Cover Mean (weighted by dive area):

$$\frac{\text{Sum}(\text{PCT\_OC} * \text{DIV\_LENGTH} * \text{DIV\_WIDTH})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})}$$

13. Percent Submerged Cover Mean (weighted by dive area):

$$\frac{\text{Sum}(\text{PCT\_SC} * \text{DIV\_LENGTH} * \text{DIV\_WIDTH})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})}$$

14. Percent Large Substrate Mean (weighted by dive area):

$$\frac{\text{Sum}(\text{PCT\_LS} * \text{DIV\_LENGTH} * \text{DIV\_WIDTH})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})}$$

<sup>1</sup>Habitat Area Percent represents the percent area of the snorkel units in the secondary sort level (*HABITAT TYPE*, *GROUP*, or *CLASS*) relative to all of the habitat types, groups, or classes within the primary sort level (such as *SURVEY REACH*, *REACH TYPE*, and so forth). Habitat Area Percent Totals on the summary report represent the percent area of all units within the primary sorting level (for example, *SURVEY REACH*) relative to the area of all units in all reaches. The Habitat Area Percent Totals should always be equal to 100.00 (or close to 100.00 because of rounding), since this calculation reflects the percent of all unit areas within all reaches.

<sup>2</sup>Habitat Volume Percent represents the percent volume of the snorkel units in the secondary sort level (*HABITAT TYPE*, *GROUP*, or *CLASS*) relative to the other habitat types, groups, or classes within the primary sort level (such as *SURVEY REACH*, *REACH TYPE*, and so forth). Habitat Volume Percent Totals on the summary report represent the percent volume of all units within the primary sorting level (for example, *SURVEY REACH*) relative to the volume of all units in all reaches. The Habitat Volume Percent Totals should always be equal to 100.00 (or close to 100.00 because of rounding), since this calculation reflects the percent of all unit volumes within all reaches..

## Summary of Main Channel Fish Counts and Densities - Chinook and Steelhead (FB\_P07B)

1. Habitat Class, Group, or Type: Acronym for HAB\_CLS (*FAST*, *SLOW*), HAB\_GRP (*SLA*, *TUR*, and so forth), or HAB\_TYPE (*SLM*, *LGR*, and so forth) occurring within the primary sorting level (*OVERALL*, *SURVEY REACH*, *REACH TYPE*, *CHANNEL TYPE*, *HABITAT CLASS*, or *HABITAT GROUP*).

2. Number of Snorkel Sites: Count of HAB\_UNIT occurring within each HAB\_CLS, HAB\_GRP, or HAB\_TYPE that were snorkeled.

3. Chinook Age 0 Count:

$$\text{Sum}(\text{CHIN}_0)$$

4. Chinook Age 0 per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{CHIN}_0)}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

5. Chinook Age 1 Count:

$$\text{Sum}(\text{CHIN}_1)$$

6. Chinook Age 1 per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{CHIN}_1)}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

7. Chinook Adult Count:

$$\text{Sum}(\text{CHIN\_ADT})$$

8. Chinook Adult per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{CHIN\_ADT})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

9. Chinook Total Count:

$$\text{Sum}(\text{CHIN}_0 + \text{CHIN}_1 + \text{CHIN\_ADT})$$

10. Chinook per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{CHIN}_0 + \text{CHIN}_1 + \text{CHIN\_ADT})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

11. Steelhead Age 1 Count:

$$\text{Sum}(\text{ST}_1)$$

12. Steelhead Age 1 per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{ST}_1)}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

13. Steelhead Age 2 Count:

$$\text{Sum}(\text{ST}_2)$$

14. Steelhead Age 2 per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{ST}_2)}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

15. Steelhead Age 3 Count:

$$\text{Sum}(\text{ST}_3)$$

16. Steelhead Age 3 per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{ST}_3)}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

17. Steelhead Total Count:

$$\text{Sum}(\text{ST}_1 + \text{ST}_2 + \text{ST}_3)$$

18. Steelhead per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{ST}_1 + \text{ST}_2 + \text{ST}_3)}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

### Summary of Main Channel Fish Counts and Densities - Rainbow and Redband (FB\_PO7C)

1. Habitat Class, Group, or Type: Acronym for HAB\_CLS (*FAST, SLOW*), HAB\_GRP (*SLA, TUR*, and so forth), or HAB\_TYPE (*SLM, LGR*, and so forth) occurring within the primary sorting level (*OVERALL, SURVEY REACH, REACH TYPE, CHANNEL TYPE, HABITAT CLASS, or HABITAT GROUP*).

2. Number of Snorkel Sites: Count of HAB\_UNIT occurring within each HAB\_CLS, HAB\_GRP, or HAB\_TYPE that were snorkeled.

3. Rainbow Total Count:

$$\text{Sum}(\text{RB})$$

4. Rainbow per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{RB})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

5. Redband < 100mm Count:

$$\text{Sum}(\text{RD}_{100})$$

6. Redband < 100mm per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{RD}_{100})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

7. Redband 100-200mm Count:

$$\text{Sum}(\text{RD}_{100\_200})$$

8. Redband 100-200mm per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{RD}_{100\_200})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

9. Redband > 200mm Count:

$$\text{Sum}(\text{RD}_{200})$$

10. Redband > 200 per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{RD}_{200})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

11. Redband Total Count:

$$\text{Sum}(\text{RD}_{100} + \text{RD}_{100\_200} + \text{RD}_{200})$$

12. Redband per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{RD}_{100} + \text{RD}_{100\_200} + \text{RD}_{200})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

### Summary of Main Channel Fish Counts and Densities - Bull Trout (FB\_PO7D)

1. Habitat Class, Group, or Type: Acronym for HAB\_CLS (*FAST, SLOW*), HAB\_GRP (*SLA, TUR*, and so forth), or HAB\_TYPE (*SLM, LGR*, and so forth) occurring within the primary sorting level (*OVERALL, SURVEY REACH, REACH TYPE, CHANNEL TYPE, HABITAT CLASS, or HABITAT GROUP*).

2. Number of Snorkel Sites: Count of HAB\_UNIT number occurring within each HAB\_CLS, HAB\_GRP, or HAB\_TYPE that were snorkeled.

3. Bull Trout < 100mm Count:

$$\text{Sum}(\text{BT}_{100})$$



4. Bull Trout < 100mm per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{BT}_{100})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

5. Bull Trout 100-200mm Count:

$$\text{Sum}(\text{BT}_{100\_200})$$

6. Bull Trout 100-200mm per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{BT}_{100\_200})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

7. Bull Trout 200-300mm Count:

$$\text{Sum}(\text{BT}_{200\_300})$$

8. Bull Trout 200-300mm per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{BT}_{200\_300})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

9. Bull Trout 300-400mm Count:

$$\text{Sum}(\text{BT}_{300\_400})$$

10. Bull Trout 300-400mm per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{BT}_{300\_400})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

11. Bull Trout 400-500mm Count:

$$\text{Sum}(\text{BT}_{400\_500})$$

12. Bull Trout 400-500mm per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{BT}_{400\_500})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

13. Bull Trout > 500mm Count:

$$\text{Sum}(\text{BT}_{500})$$

14. Bull Trout > 500mm per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{BT}_{500})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

15. Bull Trout Total Count:

$$\text{Sum}(\text{BT}_{100} + \text{BT}_{100\_200} + \text{BT}_{200\_300} + \text{BT}_{300\_400} + \text{BT}_{400\_500} + \text{BT}_{500})$$

16. Bull Trout per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{BT}_{100} + \text{BT}_{100\_200} + \text{BT}_{200\_300} + \text{BT}_{300\_400} + \text{BT}_{400\_500} + \text{BT}_{500})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

### Summary of Main Channel Fish Counts and Densities - Brook and Brown Trout (FB\_PO7E)

1. Habitat Class, Group, or Type: Acronym for HAB\_CLS (*FAST, SLOW*), HAB\_GRP (*SLA, TUR*, and so forth), or HAB\_TYPE (*SLM, LGR*, and so forth) occurring within the primary sorting level (*OVER-ALL, SURVEY REACH, REACH TYPE, CHANNEL TYPE, HABITAT CLASS*, or *HABITAT GROUP*).

2. Number of Snorkel Sites: Count of HAB\_UNIT occurring within each HAB\_CLS, HAB\_GRP, or HAB\_TYPE that were snorkeled.

3. Brook Trout < 100mm Count:

$$\text{Sum}(\text{BK}_{100})$$

4. Brook Trout 100-200mm Count:

$$\text{Sum}(\text{BK}_{100\_200})$$

5. Brook Trout 200-300mm Count:

$$\text{Sum}(\text{BK}_{200\_300})$$

6. Brook Trout > 300mm Count:

$$\text{Sum}(\text{BK}_{300})$$

7. Brook Trout Total Count:

$$\text{Sum}(\text{BK}_{100} + \text{BK}_{100\_200} + \text{BK}_{200\_300} + \text{BK}_{300})$$

8. Brook Trout per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{BK}_{100} + \text{BK}_{100\_200} + \text{BK}_{200\_300} + \text{BK}_{300})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

9. Brown Trout < 100mm Count:

$$\text{Sum}(\text{BN}_{100})$$

10. Brown Trout 100-200mm Count:

$$\text{Sum}(\text{BN}_{100\_200})$$

11. Brown Trout 200-300mm Count:

$$\text{Sum}(\text{BN}_{200\_300})$$

12. Brown Trout 300-400mm Count:)

$$\text{Sum}(\text{BN}_{300\_400})$$

13. Brown Trout > 400 Count:

$$\text{Sum}(\text{BN}_{400})$$

14. Brown Trout Total Count:

$$\text{Sum}(\text{BN}_{100} + \text{BN}_{100\_200} + \text{BN}_{200\_300} + \text{BN}_{300\_400} + \text{BN}_{400})$$

15. Brown Trout per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{BN}_{100} + \text{BN}_{100\_200} + \text{BN}_{200\_300} + \text{BN}_{300\_400} + \text{BN}_{400})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

### Summary of Main Channel Fish Counts and Densities - Cutthroat (FB\_PO7F)

1. Habitat Class, Group, or Type: Acronym for HAB\_CLS (*FAST, SLOW*), HAB\_GRP (*SLA, TUR*, and so forth), or HAB\_TYPE (*SLM, LGR*, and so forth) occurring within the primary sorting level (*OVERALL, SURVEY REACH, REACH TYPE, CHANNEL TYPE, HABITAT CLASS*, or *HABITAT GROUP*).

2. Number of Snorkel Sites: Count of HAB\_UNIT occurring within each HAB\_CLS, HAB\_GRP, or HAB\_TYPE that were snorkeled.

3. Cutthroat < 100mm Count:

$$\text{Sum}(\text{CT}_{100})$$

4. Cutthroat < 100mm per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{CT}_{100})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

5. Cutthroat 100-200mm Count:

$$\text{Sum}(\text{CT}_{100\_200})$$

6. Cutthroat 100-200mm per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{CT}_{100\_200})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

7. Cutthroat 200-300mm Count:

$$\text{Sum}(\text{CT}_{200\_300})$$

8. Cutthroat 200-300mm per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{CT}_{200\_300})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

9. Cutthroat > 300mm Count:

$$\text{Sum}(\text{CT}_{300})$$

10. Cutthroat > 300mm per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{CT}_{300})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

11. Cutthroat Total Count:

$$\text{Sum}(\text{CT}_{100} + \text{CT}_{100\_200} + \text{CT}_{200\_300} + \text{CT}_{300})$$

12. Cutthroat per 100m<sup>2</sup>:

$$\frac{\text{Sum}(\text{CT}_{100} + \text{CT}_{100\_200} + \text{CT}_{200\_300} + \text{CT}_{300})}{\text{Sum}(\text{DIV\_LENGTH} * \text{DIV\_WIDTH})} * 100$$

### RIPARIAN Summary Report \_\_\_\_\_

This summary cannot be generated for side channels, since these data are not collected for side channels. The report heading is followed by its program name.

### Summary of Main Channel Riparian Community Types (FB\_PO6)

1. Riparian Community Type: Common or scientific names of riparian community types (RCT) occurring within the primary sorting level (*OVERALL, SURVEY REACH, REACH TYPE, CHANNEL TYPE, HABITAT CLASS*, or *HABITAT GROUP*).

2. Occurrence Left Bank: Count of number of habitat units containing RCT on left bank (RIP\_CD1\_L or RIP\_CD2\_L)

3. Percent Occurrence Left Bank:

$$\frac{\text{Occurrence Left Bank}}{\text{Count of number of habitat units where RCT\_CD1\_L not blank}} * 100$$

4. Percent Stream Length Left Bank:<sup>1,2</sup>

$$\frac{\text{Sum}(\text{HAB\_LENGTH}) \text{ of RCT (RIP\_CD1\_L or RIP\_CD2\_L)}}{\text{Sum}(\text{HAB\_LENGTH}) \text{ of habitat units where RIP\_CD1\_L not blank}} * 100$$

5. Occurrence Right Bank: Count of number of habitat units containing RCT on right bank (RIP\_CD1\_R or RIP\_CD2\_R)

6. Percent Occurrence Right Bank:

$$\frac{\text{Occurrence Right Bank}}{\text{Count of number of habitat units where RCT\_CD1\_R not blank}} * 100$$

7. Percent Stream Length Right Bank:<sup>1,2</sup>

$$\frac{\text{Sum}(\text{HAB\_LENGTH}) \text{ of RCT (RIP\_CD1\_R or RIP\_CD2\_R)}}{\text{Sum}(\text{HAB\_LENGTH}) \text{ of habitat units where RIP\_CD1\_R not blank}} * 100$$

8. Occurrence Total: Count of number of habitat units containing RCT on either bank (RIP\_CD1\_L, RIP\_CD2\_L, RIP\_CD1\_R, or RIP\_CD2\_R).

9. Percent Occurrence Total:

$$\frac{\text{Occurrence Total}}{\text{Count of number of habitat units where RIP\_CD1\_L and RIP\_CD1\_R not blank}} * 100$$

10. Percent Stream Length Total:<sup>1,2</sup>

$$\frac{\text{Sum(HAB\_LENGTH) of RCT (RIP\_CD1\_L, RIP\_CD2\_L, RIP\_CD1\_R, or RIP\_CD2\_R)}}{2 * (\text{Sum(HAB\_LENGTH)}) \text{ of habitat units where RIP\_CD1\_L and RIP\_CD1\_R not blank}} * 100$$

<sup>1</sup>Where a dominant AND subdominant RCT occur, the corresponding habitat unit length is divided by 2. This assumes that the dominant and sub-dominant RCT each make up 50% of the stream length. Even though the dominant RCT may make up significantly more than 50% of the stream length, this could not be calculated since these data are not collected. Therefore, a conservative estimate was made.

<sup>2</sup>The following is an example of how Percent Stream Length Left Bank, Right Bank, and Total are calculated for each riparian community type in a reach containing three habitat units:

Habitat unit #1:	Habitat unit #2:	Habitat unit #3:
HAB_LENGTH = 7.4	HAB_LENGTH = 8.2	HAB_LENGTH = 11.7
RIP_CD1_L = BB2	RIP_CD1_L = HD1	RIP_CD1_L = BB2
RIP_CD2_L = SR4	RIP_CD1_R = SR4	RIP_CD2_L = HD1
RIP_CD1_R = SR4		RIP_CD1_R = HD1

Percent Stream Length Left Bank of BB2 =  $((7.4/2)+(11.7/2))/27.3 * 100 = 35.0\%$   
 Percent Stream Length Left Bank of SR4 =  $(7.4/27.3) * 100 = 13.5\%$   
 Percent Stream Length Left Bank of HD1 =  $((8.2)+(11.7/2))/27.3 * 100 = 51.5\%$

Percent Stream Length Right Bank of BB2 = 0.0%  
 Percent Stream Length Right Bank of SR4 =  $((7.4)+(8.2)/27.3) * 100 = 57.1\%$   
 Percent Stream Length Right Bank of HD1 =  $((11.7)/27.3) * 100 = 42.9\%$

Percent Stream Length Total of BB2 =  $((7.4/2)+(11.7/2))/54.6 * 100 = 17.5\%$   
 Percent Stream Length Total of SR4 =  $((7.4/2)+(7.4)+(8.2))/54.6 * 100 = 35.3\%$   
 Percent Stream Length Total of HD1 =  $((8.2)+(11.7/2)+(11.7))/54.6 * 100 = 47.2\%$

## REACH Summary Report \_\_\_\_\_

The following calculations are performed at the reach level. The report heading is followed by its program name.

### Summary of Selected Reach Habitat Parameters (FB\_PO8)

1. Total Number of Units: Count of HAB\_UNIT number occurring within reach.

2. Map Gradient:

Map gradient percent (MAP\_SLOPE)

3. Observed Gradient:

Observed gradient percent (OBS\_SLOPE)

4. Habitat Length Total:

Sum(HAB\_LENGTH)

5. Width Mean (weighted by habitat length):

$$\frac{\text{Sum(HAB\_WIDTH * HAB\_LENGTH)}}{\text{Sum(HAB\_LENGTH)}}$$

6. Percent Pools (by length):

$$\frac{\text{Sum(HAB\_LENGTH) where HAB\_CLS = "SLOW"}}{\text{Sum(HAB\_LENGTH) of units in reach}} * 100$$

7. Maximum Depth Mean:

$$\frac{\text{Sum(MAX\_DEPTH)}}{n}$$

8. Width/Depth Mean (weighted by habitat length):

$$\frac{\text{Sum}((\text{HAB\_WIDTH} / \text{HAB\_DEPTH}) * \text{HAB\_LENGTH})}{\text{Sum(HAB\_LENGTH)}}$$

9. Residual Volume Mean:<sup>1</sup>

$$\frac{\text{Sum(RESID\_VOL)}}{n}$$

10. Number LWD per 100m:

$$\frac{\text{Sum(LWD\_SINGLE + LWD\_AGREGS + LWD\_WADS)}}{\text{Sum(HAB\_LENGTH)}} * 100$$

11. Percent Stable Bank Mean:

If meters stable bank collected:

$$\frac{\text{Sum(LEN\_BS\_L + LEN\_BS\_R)}}{\text{Sum(LEFT\_LEN + RITE\_LEN)}} * 100$$

If percent stable bank collected (weighted by bank length):

$$\frac{\text{Sum(PCT\_BS\_L * LEFT\_LEN) + Sum(PCT\_BS\_R * RITE\_LEN)}}{\text{Sum(LEFT\_LEN + RITE\_LEN)}}$$

12. Percent Undercut Bank Mean:

If meters undercut bank collected:

$$\frac{\text{Sum(LEN\_UCUT\_L + LEN\_UCUT\_R)}}{\text{Sum(LEFT\_LEN + RITE\_LEN)}} * 100$$

If percent undercut bank collected (weighted by bank length):

$$\frac{\text{Sum(PCT\_UCUT\_L * LEFT\_LEN) of units + Sum(PCT\_UCUT\_R * RITE\_LEN)}}{\text{Sum(LEFT\_LEN + RITE\_LEN)}}$$

13. Percent Surface Fines Mean:

$$\frac{\text{Sum}(\text{PCT\_SFINES})}{n}$$

14. Dominant Riparian Community Type: Code for riparian community type that occurs most often in reach.

15. From: Sum(HAB\_LENGTH) of all units prior to first unit in reach.

16. Mid:

$$\frac{\text{From (-) To}}{2}$$

17: To: Sum(HAB\_LENGTH) of all units to last unit in reach.

<sup>1</sup>The following field is pre-calculated during data entry and the values are then used in the summary calculations: RESID\_VOL = (MAX\_DEPTH - TAIL\_DEPTH) \* HAB\_AREA

### Summary of Selected Reach Habitat Parameters 2 (FB\_PO12)

1. Total Number of Units: Count of HAB\_UNIT number occurring within reach.

2. Map Gradient:

Map gradient percent (MAP\_SLOPE)

3. Observed Gradient:

Observed gradient percent (OBS\_SLOPE)

4. Habitat Length Total:

$$\text{Sum}(\text{HAB\_LENGTH})$$

5. Width Mean (weighted by habitat length):

$$\frac{\text{Sum}(\text{HAB\_WIDTH} * \text{HAB\_LENGTH})}{\text{Sum}(\text{HAB\_LENGTH})}$$

6. Habitat Depth Mean (weighted by habitat area):

$$\frac{\text{Sum}(\text{HAB\_DEPTH} * \text{HAB\_LENGTH} * \text{HAB\_WIDTH})}{\text{Sum}(\text{HAB\_LENGTH} * \text{HAB\_WIDTH})}$$

7. Width/Depth Mean (weighted by habitat length):

$$\frac{\text{Sum}((\text{HAB\_WIDTH}/\text{HAB\_DEPTH}) * \text{HAB\_LENGTH})}{\text{Sum}(\text{HAB\_LENGTH})}$$

8. Width/Maximum Depth Mean (weighted by habitat length):

$$\frac{\text{Sum}((\text{HAB\_WIDTH}/\text{MAX\_DEPTH}) * \text{HAB\_LENGTH})}{\text{Sum}(\text{HAB\_LENGTH})}$$

9. Number LWD per Mile:<sup>1</sup>

$$\frac{\text{Sum}(\text{LWD\_SINGLE} + \text{LWD\_AGREGS} + \text{LWD\_WADS})}{\text{Sum}(\text{HAB\_LENGTH})} * 1609$$

10. Percent Stable Bank Mean:

If meters stable bank collected:

$$\frac{\text{Sum}(\text{LEN\_BS\_L} + \text{LEN\_BS\_R})}{\text{Sum}(\text{LEFT\_LEN} + \text{RITE\_LEN})} * 100$$

If percent stable bank collected (weighted by bank length):

$$\frac{\text{Sum}(\text{PCT\_BS\_L} * \text{LEFT\_LEN}) + \text{Sum}(\text{PCT\_BS\_R} * \text{RITE\_LEN})}{\text{Sum}(\text{LEFT\_LEN} + \text{RITE\_LEN})}$$

11. Percent Undercut Bank Mean:

If meters undercut bank collected:

$$\frac{\text{Sum}(\text{LEN\_UCUT\_L} + \text{LEN\_UCUT\_R})}{\text{Sum}(\text{LEFT\_LEN} + \text{RITE\_LEN})} * 100$$

If percent undercut bank collected (weighted by bank length):

$$\frac{\text{Sum}(\text{PCT\_UCUT\_L} * \text{LEFT\_LEN}) \text{ of units} + \text{Sum}(\text{PCT\_UCUT\_R} * \text{RITE\_LEN})}{\text{Sum}(\text{LEFT\_LEN} + \text{RITE\_LEN})}$$

12. Percent Pools (by length):

$$\frac{\text{Sum}(\text{HAB\_LENGTH}) \text{ where HAB\_CLS} = \text{"SLOW"}}{\text{Sum}(\text{HAB\_LENGTH}) \text{ of units in reach}} * 100$$

13. Number Pools per Mile:<sup>1</sup>

$$\frac{\text{Count}(\text{HAB\_UNIT}) \text{ where HAB\_CLS} = \text{"SLOW"}}{\text{Sum}(\text{HAB\_LENGTH}) \text{ of units in reach}} * 1609$$

14. Number Deep Pools per Mile:<sup>1</sup>

$$\frac{\text{Count}(\text{HAB\_UNIT}) \text{ where HAB\_CLS} = \text{"SLOW"} \text{ and MAX\_DEPTH} > 1.6}{\text{Sum}(\text{HAB\_LENGTH}) \text{ of units in reach}} * 1609$$

15. Number of Large Pools per Mile:<sup>1</sup>

$$\frac{\text{Count}(\text{HAB\_UNIT}) \text{ where HAB\_CLS} = \text{"SLOW"} \text{ and MAX\_DEPTH} > 0.80 \text{ and HAB\_AREA} > 20}{\text{Sum}(\text{HAB\_LENGTH}) \text{ of units in reach}} * 1609$$

16. Residual Maximum Depth Mean:<sup>2</sup>

$$\frac{\text{Sum}(\text{RESID\_MXD})}{n}$$

17. Percent Riffles (by length):

$$\frac{\text{Sum}(\text{HAB\_LENGTH}) \text{ where HAB\_TYPE} = \text{"LGR"} \text{ or "HGR"}}{\text{Sum}(\text{HAB\_LENGTH}) \text{ of units in reach}} * 100$$

18. Percent Runs/Glides (by length):

$$\frac{\text{Sum}(\text{HAB\_LENGTH}) \text{ where HAB\_GRP} = \text{"NTU"}}{\text{Sum}(\text{HAB\_LENGTH}) \text{ of units in reach}} * 100$$

19. Percent Surface Fines Mean:

$$\frac{\text{Sum}(\text{PCT\_SFINES})}{n}$$

20. Percent Small Gravel Mean:

$$\frac{\text{Sum}(\text{PCT\_SGRV})}{n}$$

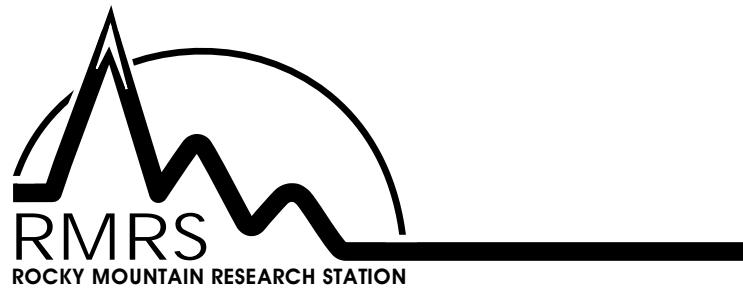
21. Percent Gravel Mean:  $\text{Sum}(\text{PCT\_GRAVEL})$

$$\frac{\text{Sum}(\text{PCT\_GRAVEL})}{n}$$

<sup>1</sup>If variable is collected in feet rather than meters, the number of pools, deep pools, or large pools is multiplied by 5280 rather than 1609 to obtain the number per mile.

<sup>2</sup>The following field is pre-calculated during data entry and the values are then used in the summary calculations:

$$\text{RESID\_MXD} = \text{MAX\_DEPTH} - \text{TAIL\_DEPTH}$$



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