FFI User Guide

Updated for FFI v1.05.14 and FFI-Lite v1.05.14

Jan 2023

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Welcome to FFI and FFI-Lite

The FFI ecological monitoring utilities are an integration of FEAT and FIREMON, two respected, science-based programs used for fire effects monitoring on public lands. Funded by the Interagency Fuels Management Committee and developed jointly by the National Park Service and Forest Service, FFI is designed as a comprehensive, database-driven framework that organizes sampling protocols, stores field data, and provides analysis tools for vegetation sampling and monitoring programs. FFI is designed for people with vegetation sampling experience who need a way to organize their sampling data so that it can be readily accessed.

The goal of FFI is to act as a robust monitoring tool that can be used across public agencies, as well as private entities, to consistently describe ecological systems. It incorporates components necessary to conduct a successful monitoring program, including an integral database, analysis and reporting tools, a modular spatial component, and a protocol manager that enables users to develop their own sampling methods when needed.

FFI-Lite is a version of FFI that is easier to install and manage than FFI. Unless otherwise specified, any description of FFI in this user guide also pertains to FFI-Lite.

Key concepts

FFI was designed and developed with several key concepts in mind, and it is these concepts that distinguish FFI from other contemporary monitoring tools. Understanding these concepts will help you to make the best use of FFI's capabilities.

FFI is based on the monitoring protocols and methods used in FEAT and FIREMON and adds several new protocols. (For descriptions of each, see About the FFI protocols in the **Additional Information** section. Collected monitoring data is maintained independently of the methods and protocols.

- Your methods and data will be permanent and portable. FFI is designed to support your monitoring and data management routines while ensuring that your methods and data remain separate from the tool itself. The tool is database-driven, rather than method-driven. This means that your assembled methods and collected data will always be available to you, whether or not you use them within the framework of FFI.
- Monitoring data is auditable data. FFI can help to ensure that organizations can collect, validate, track, and store auditable environmental monitoring data over the long term, and that the data will continue to be accessible.
- FFI is hierarchical. The tool is based on a hierarchy of geography, time, and method. This hierarchy is imposed and preserved by the database structure. The geographic hierarchy is represented by the administrative unit (whole study area), project unit (sample population), macro plot, and sample. The temporal component is represented by scheduled sample events.

Text conventions in the User Guide

The table below shows the text conventions used in this manual.

CONVENTION	DESCRIPTION	EXAMPLE
Bold	Something to be selected or clicked; name of module, tab, menu or file.	The **Database Select** window opens. Click the **New Program** icon.
Italic	Name of field, dialog box, or window; options to be selected; directory path.	Click **Next** on the *Confirm Installation* screen
`courier font`	Text to be entered using the keyboard	Enter `string of text` using the keyboard.
NOTE	Note	Notes provide additional information pertinent to a topic.
CAUTION	Caution	Cautions provide warnings.
Blue underlined italics	Internal links; Web links	See *Using FFI* for more information.

FFI-Lite

The user experience of the FFI and FFI-Lite applications were designed to be as similar as possible. Unless otherwise specified, any description of FFI in this user guide also pertains to FFI-Lite. The major difference is computers with FFI-Lite cannot be part of an FFI network configuration (i.e., not used as a client or database master computer)

If you need any of these capabilities then FFI and SQL Server Express must be used.

Additionally, if you want to create custom protocols they will need to be created in Protocol Manager, which is only available with the full version of FFI. A custom protocol can be imported into FFI-Lite after being created in Protocol Manager.

FFI-Lite Software Components

FFI-Lite databases are created in Microsoft SQL CE, which is native in the Windows operating system and does not require a separate installation of off-the-shelf software. The only installed software for FFI-Lite is the FFI-Lite application itself. Maximum database size for SQL CE is 4 GB.

FFI-Lite Use Cases

FFI-lite is designed to be an easy-to-install alternative to FFI. It will be most useful for:

- Field data collection
- Smaller monitoring programs that do not need to access FFI databases from multiple workstations.

Using FFI-Lite: Things to not do on the field computer

These things should not be done on the field computer or field database. Do them on the master computer, in the master database instead:

1) Do not use the **New** menu to create Administrative Units, Projects Unit, Macro Plots or Sample Events with the same name as those in the master database. I.e., all Administrative Units, Projects Unit, Macro Plots and Sample Events should be imported to the field computer, not created on the field computer.
2) Do not change local species codes in Species Management
3) Do not identify unknown species using the Identify Unknown utility in Species Management
4) Do not replace a species code using the Replace Species in Method Data utility in Species Management
5) Do not add or edit Monitoring Statuses using the Monitoring Status Builder utility
6) Do not assign Monitoring Statuses to Sample Events
7) Do not change the names of Project Units or Macro Plots.

NOTE: If you use FFI-Lite to store your master database then items 1 through 6 can be done using FFI-Lite, but only in the master database.

FFI-Lite Installation Process

NOTE: ***Forest Service users must install FFI-Lite through the Forest Service Software Center****.*

You will need a .zip extraction utility such as WinZip to unzip the FFI Installation package.

You must have Windows administrator privileges or ability to "Run Elevated" to install FFI-Lite on your computer. A standard Windows user can use FFI after a Windows administrator has installed it.

1. Get Administrator Privileges on the computer you are installing FFI on.

2. Open Windows Explorer or My Computer, create a temporary directory on your C: drive where you will store the installation files (e.g., c:\FFITemp).

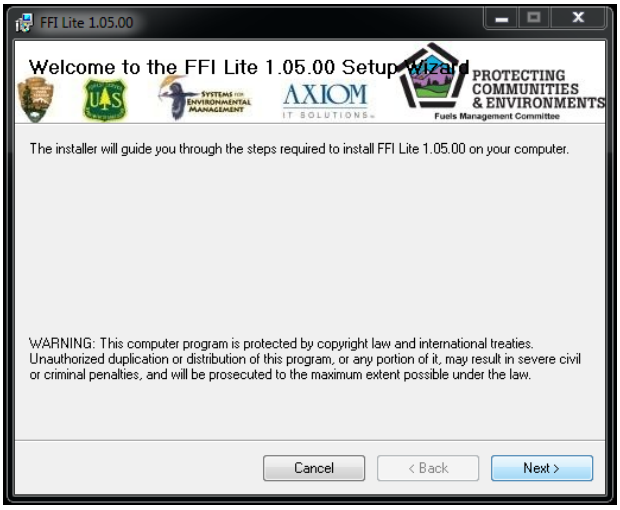
3. Open a browser, go to the FFI-FRAMES website and download ***FFI-Lite Install Package*** from the FFI Software and Manuals page, *Software Instructions and Training Data* tab. Save the file in the temporary directory you created above.

4. Close your browser.

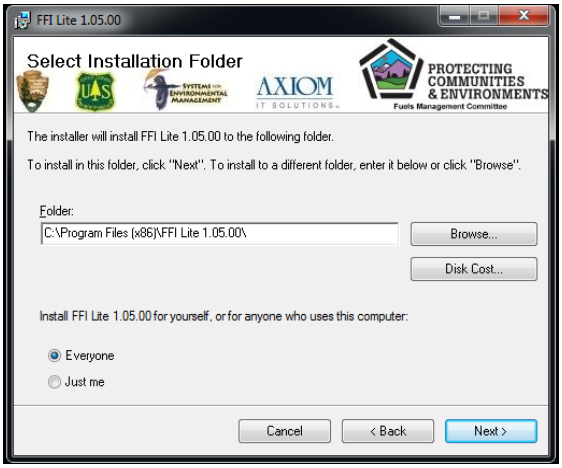
5. In Windows Explorer or My Computer, navigate to the temporary directory and unzip the installation file into the same temporary folder.

6. In Windows Explorer or My Computer, double-click the FFI installation file you unzipped in #3: **Setup.exe**.

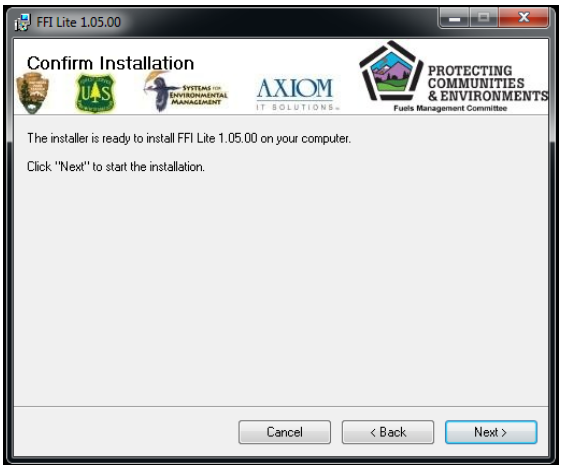
7. The FFI-Lite Setup Wizard page will open. Click ***Next***.



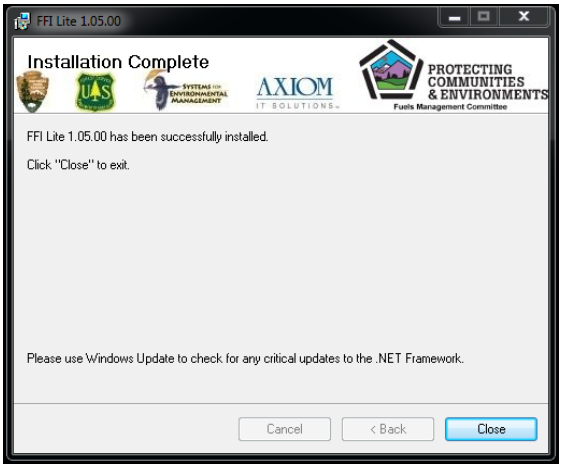
8. Accept the default installation folder and click ***Next***.



9. Click ***Next*** on the Confirm Installation screen.



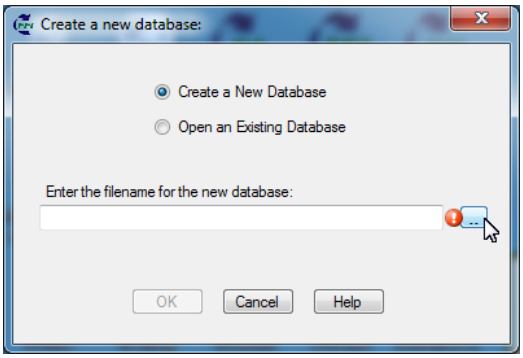
10. Click ***Close*** when the installation is complete. The FFI-Lite 1.05.13.44 icon will be placed on your desktop.



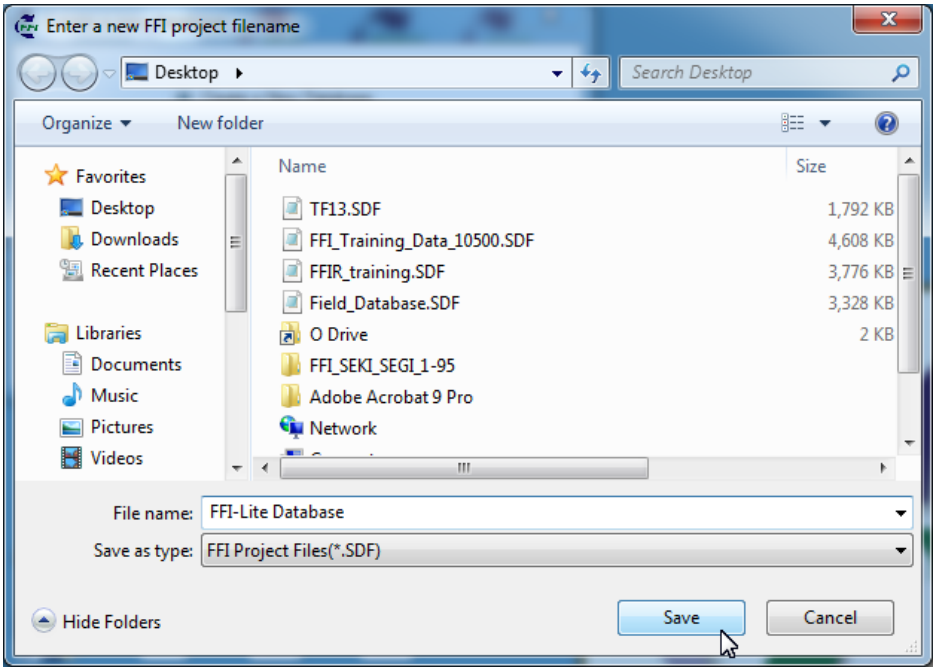
Creating an FFI-Lite Database

1. Double-click the **FFI-Lite** icon to open the application.

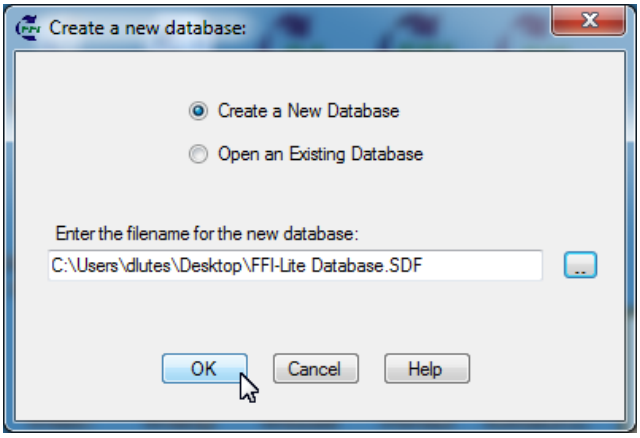
2. Select the *Create a New Database* radio button and click the gray button next to the red circle.



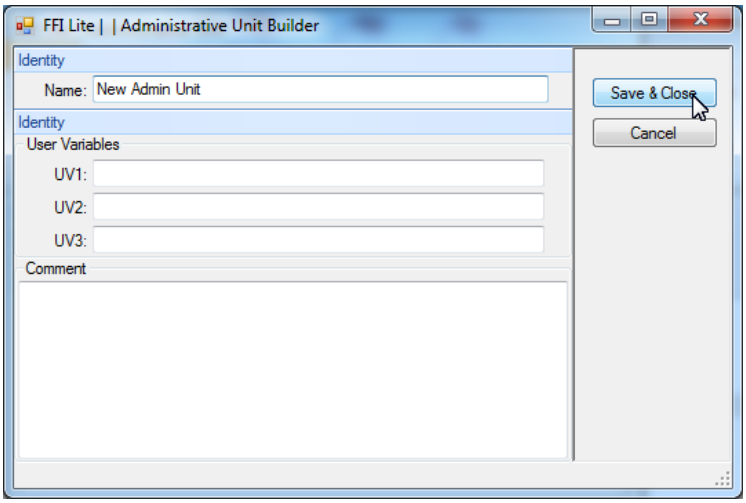
3. Name the database and click **Save**.



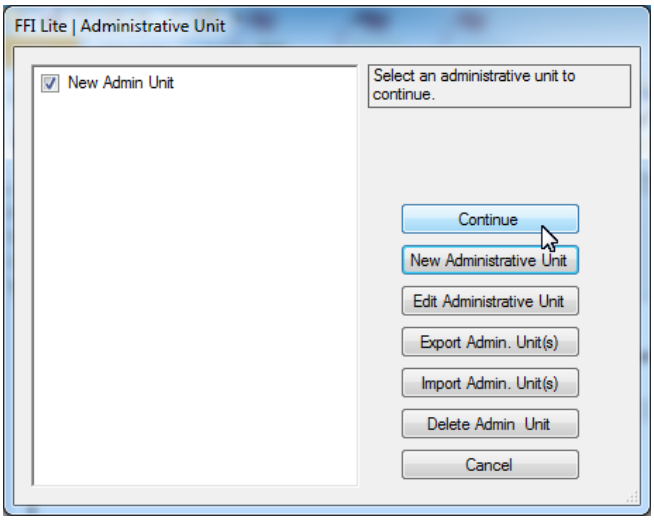
4. Click **OK**.



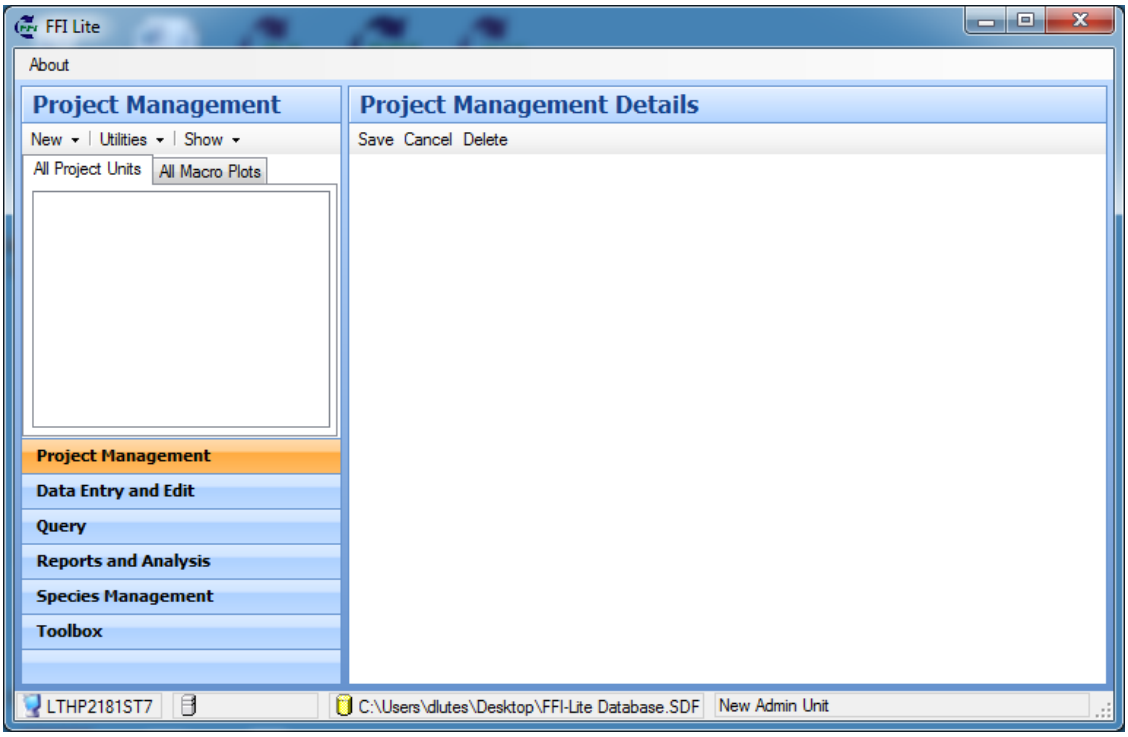
5. Click *New Administrative Unit,* enter a name and click **Save & Close**.



6. Check the box for the new administrative unit and click **Continue**.



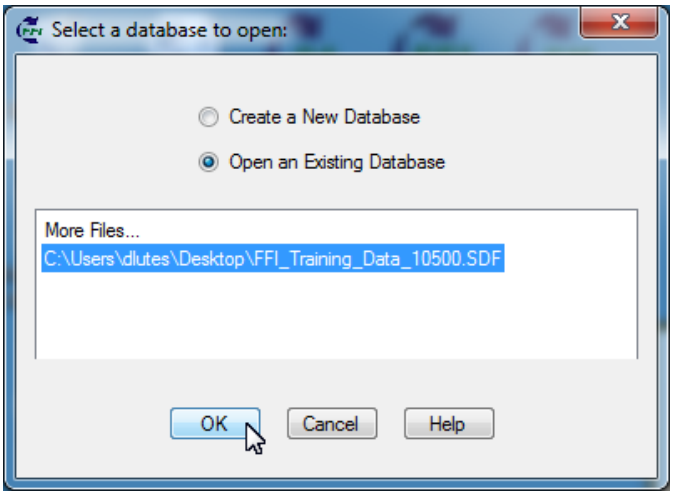
7. The new FFI-Lite database will open and you can set up you database following in Using FFI: Basic Steps for the Beginner.



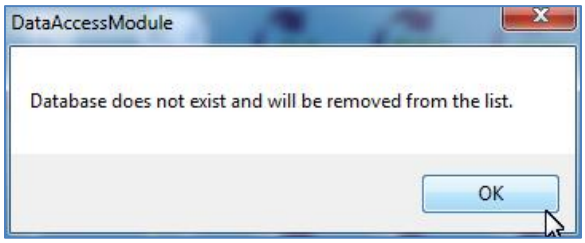
Opening an Existing FFI-Lite Database

1. Double-click the **FFI-Lite** icon to open the application.

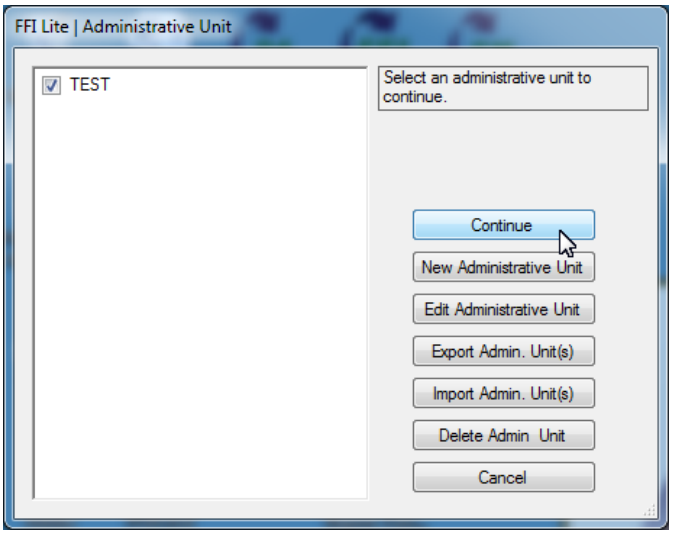
2. Click the *Open an Existing Database* radio button, highlight the database in the window below by clicking on it once and click **Open**. If your database is not listed (which will happen after installing a new version of FFI-Lite), click **More Files…**, navigate to your database (it will have a .sdf file extension) and click **Open**.



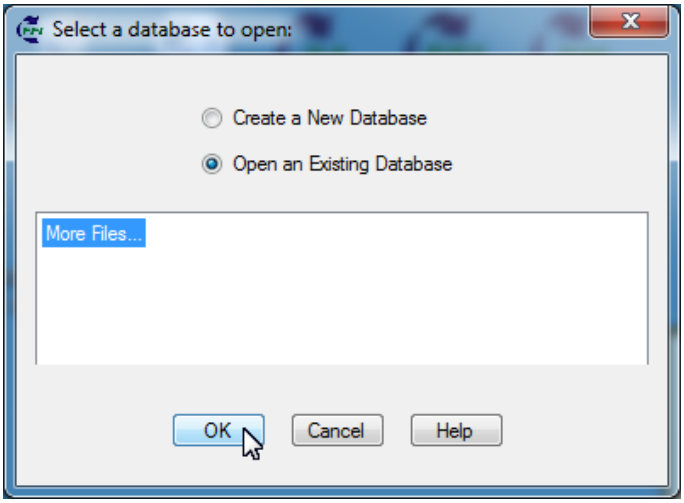
3. If the database can't be found in the specified location a warning will be displayed. Click **OK**. Select a new database to open.



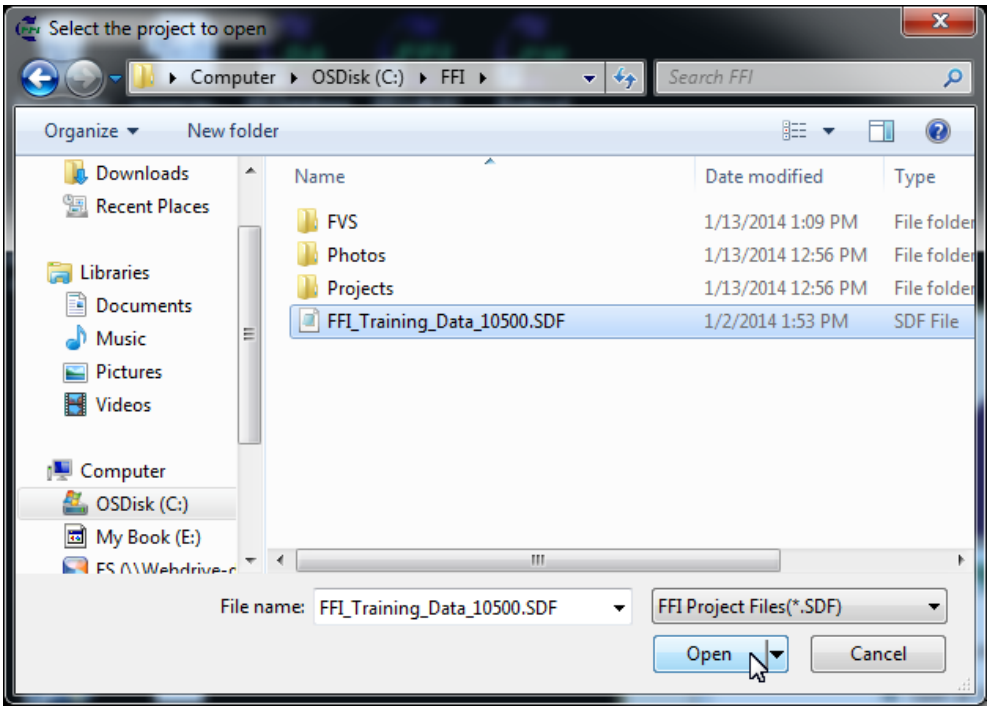
4. The database will open to the Administrative Unit selection screen. Select the *Administrative Unit* you want to work in and click **Continue** to open your data.



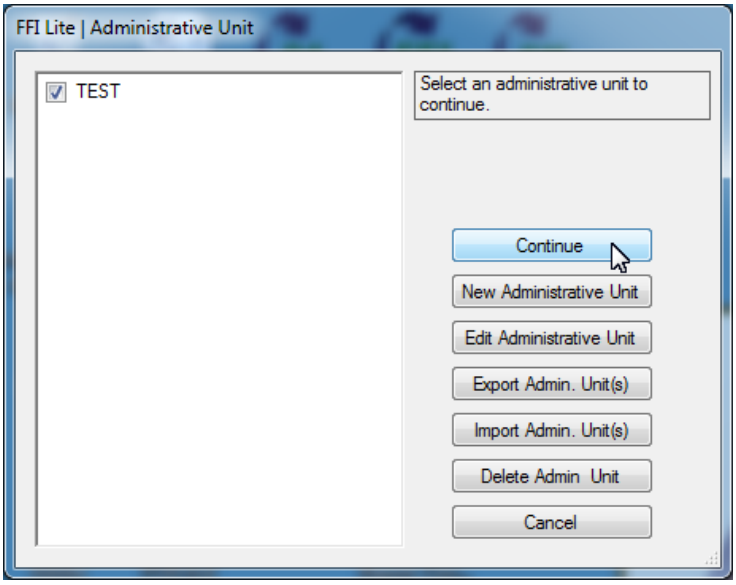
5. To search for the database in a different location highlight **More Files…** by clicking on it once and click **OK**.



6. Navigate to the location of the database, click the database name once to select it and click **Open**.



7. The database will open to the Administrative Unit selection screen. Select the *Administrative Unit* you want to work in and click **Continue** to open your data.



Backing up a FFI-Lite database

You should always have at least two copies of your FFI-Lite database: 1) the "master" database which is the working database you open in FFI-Lite and 2) a "backup" database that includes your most recent edits. Your backup database should be saved on a different computer than your work computer – preferably a computer in a remote location such as a network server. Every time you modify your FFI-Lite database, such as when entering or editing data, you should create and save a backup copy of your database.

1. Open Windows Explorer or My Computer and navigate to the folder where your FFI-Lite master database is saved

2. Right-click on the database filename (it will have an .sdf extension).

3. Select **Copy.**

4. Right click in the same folder and select **Paste.** This will create a backup database with the name *databasename – Copy. sdf* (e.g., *MyDatabase – Copy. sdf*).

5. Next, rename the backup. Right-click on the backup database filename and select **Rename.**

6. Modify the database name to include the date (e.g., *MyDatabase – Copy – Oct012021*) and hit the *Enter* key.

7. Right-click on the backup database filename and select **Cut.**

8. In Windows Explorer or My Computer navigate to the location where you save your backup databases.

9. Right-click and select **Paste.**

FFI

FFI Software Components

FFI incorporates a combination of off-the-shelf and custom software products.

Off-the-shelf software

- **Microsoft SQL Server** – This is the database software that FFI uses. This software was selected because it has been approved by the land management agencies and because the "*Express*" version is free.

Custom software

Custom software consists of three major components. After the FFI software is installed there will be an icon for each component on the computer desktop:

- **FFI Database Administration** – FFI uses Microsoft SQL Server databases for storing field data and FFI protocols. The Database Administration component is the connection between FFI and SQL Server and used for managing your FFI and Protocol Manger Databases. Examples of database management activities include creating, restoring, backing up, patching and deleting databases.

- **FFI Data Tools** – Labeled "FFI" on the computer desktop icon this component is where users spend most of their time entering and editing field data, managing species lists and querying data and running reports.

- **FFI Protocol Manager** - This component is for creating and managing protocols. The FFI installer includes a number of pre-made, "standard" field sampling protocols so most users do not use protocol manager.

Data Hierarchy

The basic goal of FFI is to provide structured storage of monitoring data collected multiple times at the same sampling location, over time. Understanding the data hierarchy in FFI will help you visualize how your data is stored:

- **Database**: FFI databases stored in SQL are the highest level in the hierarchy. Databases are managed in FFI Database Administration.
- **Administrative Unit**: This major division in a database is usually created so data within are from distinctly different geographic and/or vegetative types. In FFI, each Administrative Units has its own local species list. There is no limit to the number of Administrative Units in a database. Administrative Units and all lower levels of the data hierarchy are managed the FFI Data Tools.
- **Project Unit**: Generally used to aggregate data that were collected to assess very similar treatment objectives and collected with very similar field sampling methods. Reports and

analysis can only be accomplished for the Macroplots assign in one Project Unit. There is no limit to the number of Project Units in an Administrative unit.

- **Macroplot**: Physical location where field sampling takes place. A Macroplot is typically defined as a two-dimensional area (e.g., fixed area plot for sampling trees or area where multiple sample points are established), one-dimensional transect or set of transects (sampling planes for down woody material) or combination of one- and two-dimensional sampling sites. Ideally, the same field sampling procedures are repeated at every sample event. There is no limit to the number of Macroplots in a Project Unit. A Macroplot (and associated Sample Event(s)) can be assigned to more than one Project Unit
- **Sample Event**: The date of a field sampling visit to the Macroplot. There is no limit to the number of Sample Events at a Macroplot. Often it takes days or weeks to sample all the Macroplots that will end up all being analyzed together. FFI uses Monitoring Status to order group and order Sample Events for analysis, regardless of the Sample Event date, for analysis.
- **Monitoring Status**: A label defined and assigned by the user that describes the reason and/or temporal order of Sample Event. For example, three Sample Events might occur for the Macroplots in a Project Unit: Pretreatment, Immediate posttreatment and one-year posttreatment. Only one Monitoring Status per Sample Event per Project Unit is allowed.

Nomenclature

FFI uses specific terminology, some of which is adapted from FEAT and FIREMON, its predecessors. Please familiarize yourself with the terms used in FFI.

FIREMON Term	FEAT Term	FFI Term	Description
Registration ID	Land unit	Administrative unit	The study area, or the entire geographic area covered by a sampling effort.
Project ID	Monitoring unit	Project unit	A subset of the administrative unit; a sample population. A project unit, or project, consists of macro plots, sample events, and status.
	Sample site	Candidate site	A geographic point within a project that has been identified as a potential macro plot.
Plot location	Macro plot	Macro plot	A regularly shaped plot within the project unit that contains the target population to be monitored. A macro plot has a specific azimuth around which method data are collected.
Sample event	Monitoring event	Sample event	The date on which sampling or treatment is scheduled.
Sample events	Status	Monitoring Status	A context for a monitoring event in relation to treatments or disturbances.
		Protocol	A collection of related methods.
Method	Protocol	Method	A set of specifications, procedures, and requirements for collecting data during a sampling event, and an associated set of attributes.

FIREMON TERM	FEAT TERM	FFI TERM	DESCRIPTION
Field	Attribute	Sample attribute	Sample attributes describe the conditions associated with a particular sampling event, such as date and time, plot and sample size, weather, names of sampling team members. These attributes are generally collected once per sampling event.
		Method attribute	Method attributes describe the data being collected and analyzed, such as species, count, tree dbh, tree height, percent cover and status. These attributes are generally collected more than once per sampling event.

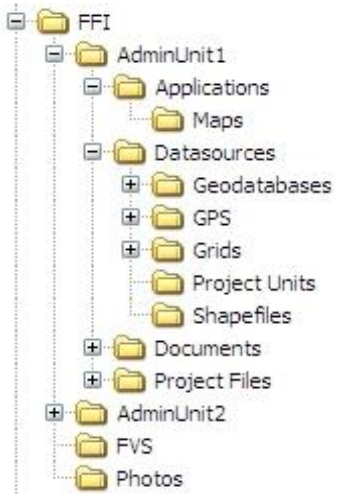
Suggested file structure

A suggested organization for your FFI directories is shown below. This folder structure should be created under C:.

In general, FFI will allow you to file documents wherever you wish. However, there are some instances in which FFI will place, or search for, files in specific locations:

- Photos should be stored in *C:\FFI\Photos*.
- Files exported by the Project Files function in Reports and Analysis may be placed in *C:\FFI\AdminUnit\Project Files*.
- Forest Vegetation Simulator (FVS) export files may be placed in *C:\FFI\FVS*.

NOTE: You may not need all of the folders shown.



Using FFI - Basic steps for the beginner

If you are a new user just getting started FFI can be pretty overwhelming and, while this User Guide is comprehensive, it is not organized in an easy 1-2-3 cookbook format for new users. Here are the basic steps you'll need to use FFI. Each step is linked to the applicable section of the User Guide.

- [1]Install the FFI and SQL Server software. Installation instructions
- [1]In FFI Database Administration, create an empty FFI database. Managing Databases
- In FFI (Data tools), import protocols. Protocols and Methods
- In FFI (Data tools), add project units, macroplots and sample events. Project Management
- In FFI (Data Tools), assign protocols to sample events. Working with Sample Events
- In FFI (Data Tools), create a local species list. Species Management
- In FFI (Data Tools), enter monitoring data. Data Entry and Edit
- In FFI (Data Tools), assign monitoring statuses to sample events. Monitoring Statuses
- In FFI (Data Tools), create data reports. Reports and Analysis
- [1]In FFI Database Administration, backup your database. Managing Databases

[1]These steps are required or available in FFI-Lite

Getting additional help

If you need help beyond the information provided in this User Guide, visit the FFI FRAMES website. This FRAMES page provides:

- A link to the FFI Google Discussion Group.
- Help/How-to documents
- Links to FFI documentation and training information.
- General information about the FFI ecological monitoring utilities.
- Contact information for email and phone support.
- Links to other FRAMES pages.

Links

On-line FFI information at FFI FRAMES website

http://www.frames.gov/ffi

On-line user community at Google Groups (membership required)

http://groups.google.com/group/FFIemu

In addition to the FFI User Guide you are currently viewing there is also a Protocol Manager user guide available on the *FFI Software and Manuals* page on the FFI Frames website.

References

Brown, James K. 1974. Handbook for inventorying downed woody material. Gen. Tech. Rep. INT-16. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 24 p. Available online at:
http://www.fs.fed.us/rm/pubs_int/int_gtr016.pdf (verified Sept. 1, 2021)

Lutes, Duncan C.; Keane, Robert E.; Caratti, John F.; Key, Carl H.; Benson, Nathan C.; Sutherland, Steve; Gangi, Larry J. 2006. FIREMON: The Fire Effects Monitoring and Inventory System. Gen. Tech. Rep. RMRS-GTR-164-CD. Fort Collins, CO. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 1 CD. Available online at:
http://www.treesearch.fs.fed.us/pubs/24042 (verified Sept. 1, 2021)

USDI National Park Service. 2003. Fire Monitoring Handbook. Boise (ID): Fire Management Program Center, National Interagency Fire Center. 274p. Available online at:
http://www.nps.gov/orgs/1965/upload/fire-effects-monitoring-handbook.pdf (verified Sept. 1, 2021)

USDA, NRCS. 2020. The PLANTS Database (https://plants.usda.gov, 17 March 2020). National Plant Data Team, Greensboro, NC 27401-4901 USA.USDA, NRCS, 2007. The PLANTS Database, 21 August 2007. National Plant Data Center, Baton Rouge, LA 70874-4490 USA. (FFI master plant list extracted July 21, 2014).

FFI Installation

Installation requirements

FFI is based on Microsoft® SQL Server 2016 SP2. FFI users have two SQL Server choices: 1) SQL Server 2016 SP2 is a free program that can be used with databases up to 10 GB in size; 2) the full version of SQL Server 2016. The full version does not have a maximum database size limitation but must be purchased.

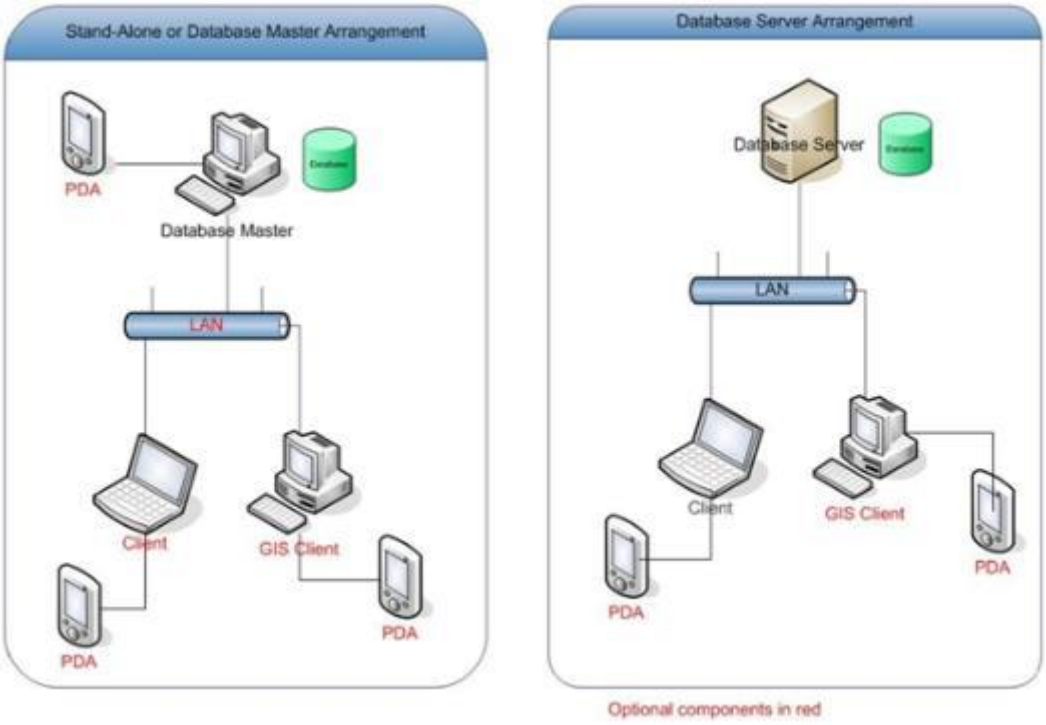
Hardware and software requirements

General requirements:

- Minimum screen resolution of 1024 X 768
- Windows 7, Windows 8 and Windows 10
- Microsoft SQL Server Express 2012, 2014, 2016 SP2 or 2017

Computer configurations

As depicted below, FFI can be installed as a stand-alone system, or as a networked system.



Stand-alone, field or database master computer:

- The stand-alone computer has no other computers attached to it that share its internal databases. The FFI and FFI-Lite import/export utilities are used to move data between databases.

Client computer:

- Connected to the local area network (LAN) and uses data stored on the database master or database server. This can be a field computer. This configuration is not available when using FFI-Lite.

Database server:

- A dedicated computer running a database engine that can be accessed either directly from a server or client computer with password protection, or via an intranet connection. This configuration is not available when using FFI-Lite. This configuration requires that the FFI administrator has physical access to the server. See the Database Administration section for more information.

FFI Installation Process

NOTE: You will need a .zip extraction utility such as WinZip to unzip the FFI Installation package and Training dataset.

You must have Windows administrator privileges or ability to "Run Elevated" to install FFI on your computer. A standard Windows user can use FFI after a Windows administrator has installed it.

FFI is not certified in the Forest Service – you must use FFI-Lite installed from the Forest Service Software Center.

Create a temporary directory on your C: drive, such as *C:\FFITemp*, where you will store the installation files.

To complete the FFI installation you will need to download the install files from the FFI FRAMES website.

Download the following files from the FFI Software and Manuals page, *Software Instructions and Training Data* tab, on the FFI FRAMES website and save them in the temporary directory you created above:

1. **FFI Install Package**

2. If you want to use our test dataset to practice with then download the **FFI Training Database**

There are four key steps involved in installing FFI and creating a database.

NOTE: The full installation process typically requires about an hour to complete.

1. Part 1 - Installing FFI
2. Part 2 - Installing SQL Server Express
3. Part 3 - Creating a database using FFI Database Administration
4. Part 4 - Opening FFI, logging on, and selecting database

Part 1 – Installing FFI

To install *FFI* follow these steps:

1. If you already have a FFI database, create a backup of your data in FFI Database Administration. See Backing up a Database.

2. Uninstall any earlier versions of FFI using the *Windows Add/Remove Programs* function. (Do not uninstall any *Microsoft SQL Server* components.)

3. In *File Explorer*, navigate to the temporary directory where you stored the *FFI* files you downloaded from FRAMES.

4. Double-click on the .zip file for the FFI install package and unzip the files into the same temporary directory you downloaded the .zip file from FRAMES. The file name will be similar to *FFI_1050xxx_Installer.zip*.

5. Double-click the FFI installation file: **Setup.exe**.

6. The *FFI Setup Wizard* page will open.

7. Click *Next*. Select the installation folder and click **Next**.

8. Click **Next** on the *Confirm Installation* screen.

9. When FFI finishes installing click **Next**.

10. Click **Close** when the installation is complete.

Three FFI icons will now be on your desktop: 1) *FFI Protocol Manager*, 2) *FFI Database Administration*, 3) *FFI*.

Part 2 – Installing SQL Server Express 2016 SP2

CAUTION: Follow these SQL installation directions carefully. There are a number of options you must change during installation of SQL. Review each step before proceeding and use the **Back** *button if you think you missed something. Also, remember the password you select in Step 22 or you will not be able to use FFI.*

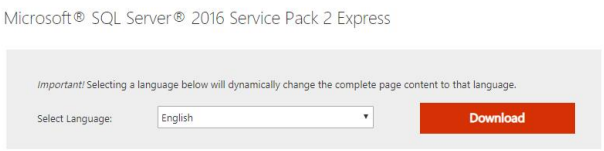
NOTE: You do not need to uninstall older version of SQL Server Express before installing a new one.

NOTE: If you have existing FFI databases be sure make backups of each one before installing SQL Server 2016 SP2.

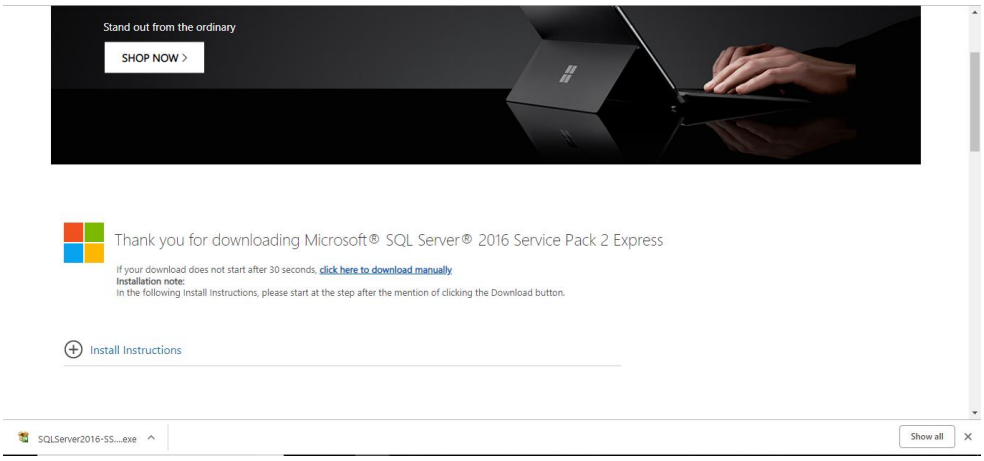
1) Restart your computer before beginning the SQL install process.

2) Go to this link and click the Download button.

https://www.microsoft.com/en-us/download/details.aspx?id=56840

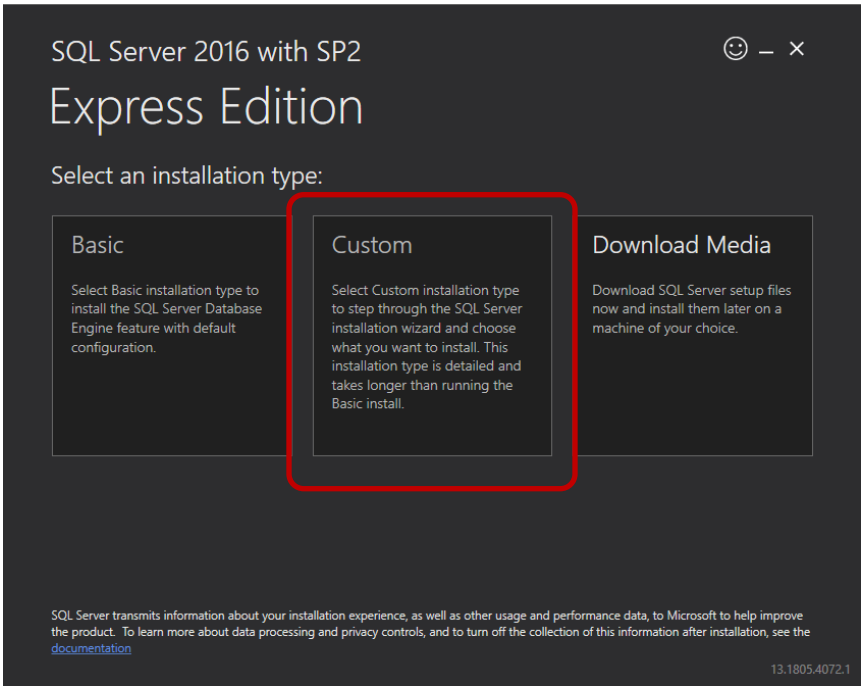


3) A file named *SQLServer2016-SSEI-Expr.exe* (5.8MB) will be put in the Downloads folder.

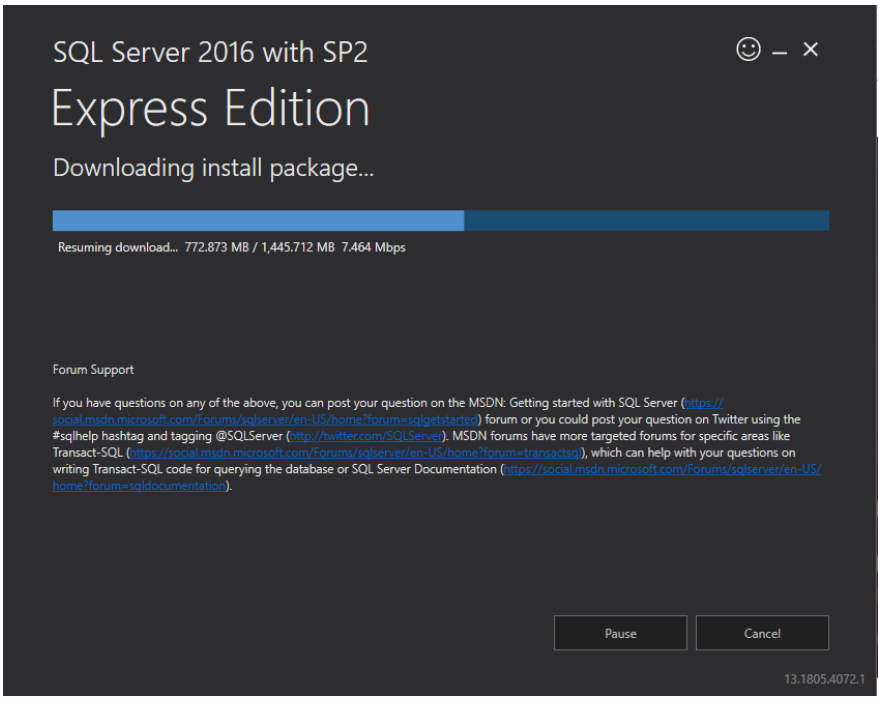


4) Navigate to the setup file in File Explorer or My Computer and double-click the file name.

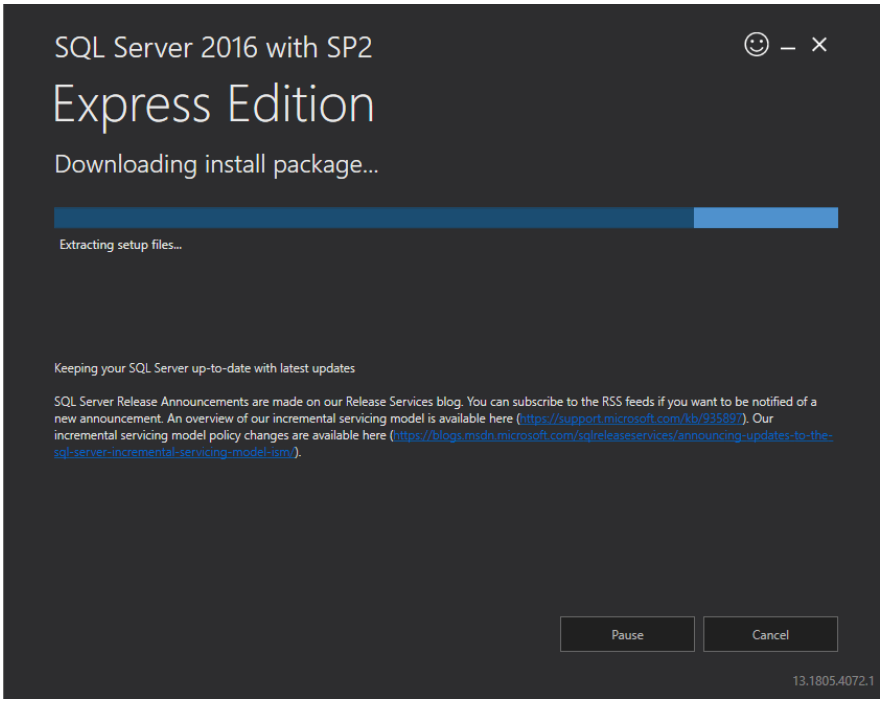
5) Select the Custom option for SQL installation



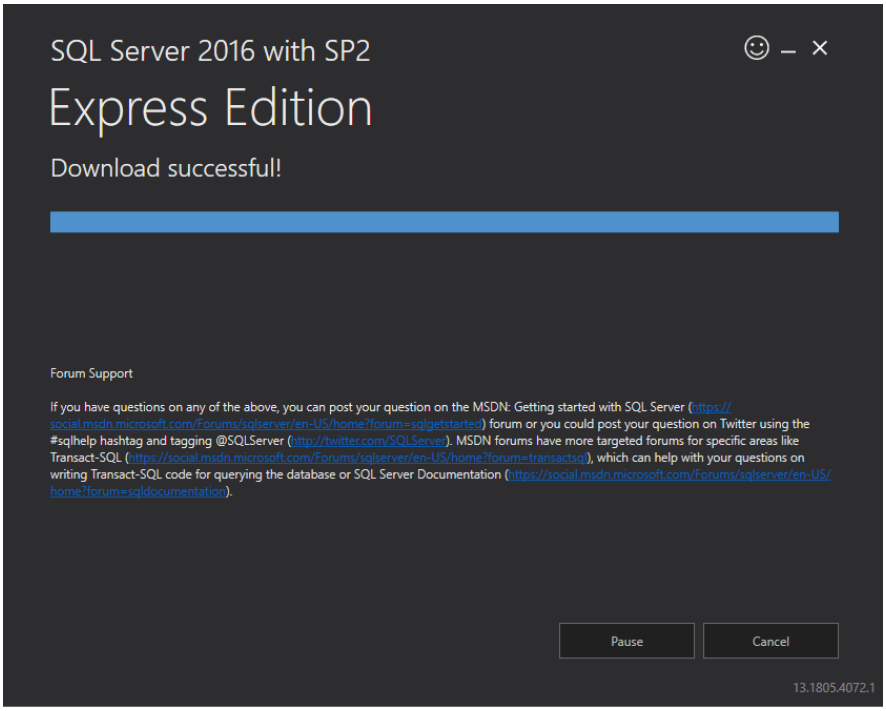
6) The package will be downloaded. The file is quite large so it may take a while to download.



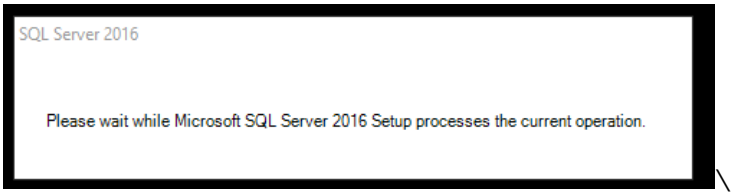
7) When the download is finished the files will be extracted.



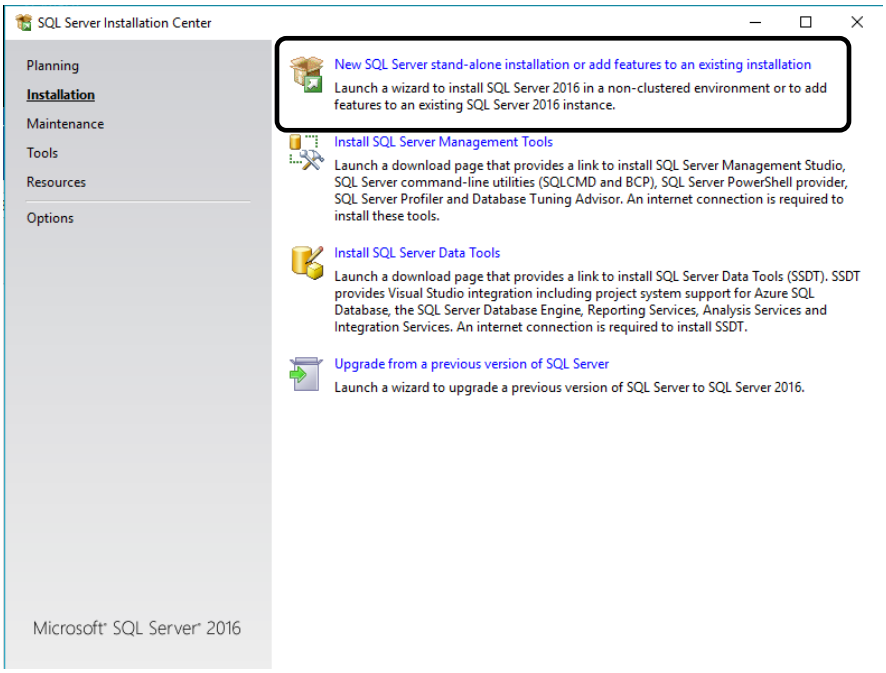
8) The screen will show the download was successful.



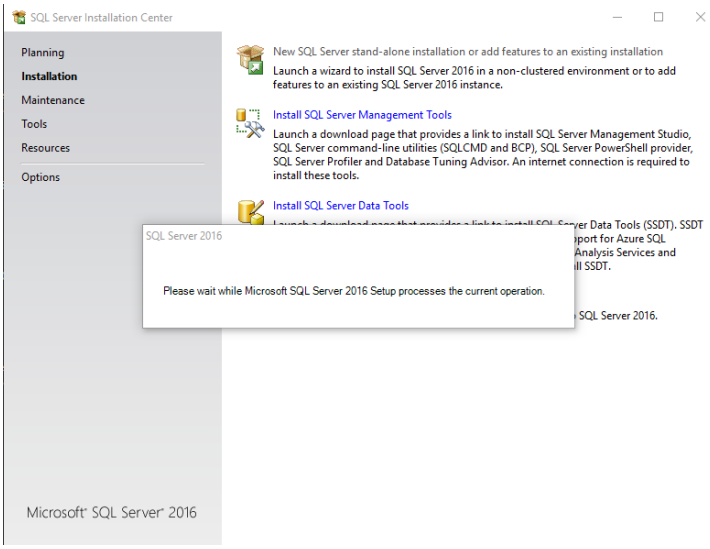
9) Wait for the installer to automatically start.



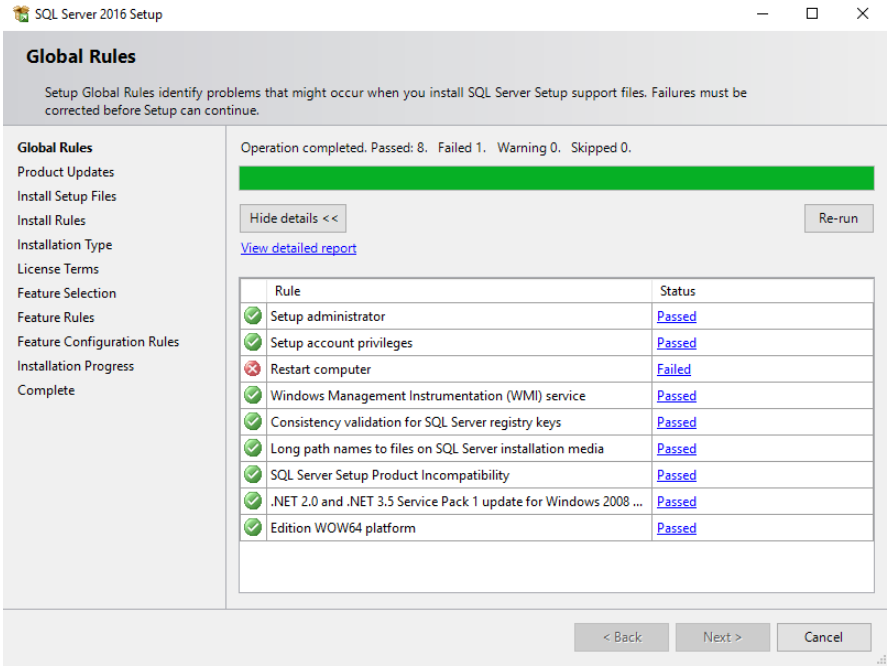
10) When the SQL Server Installation Center screen opens click the top link: New SQL Server stand-alone installation or add features to an existing installation.



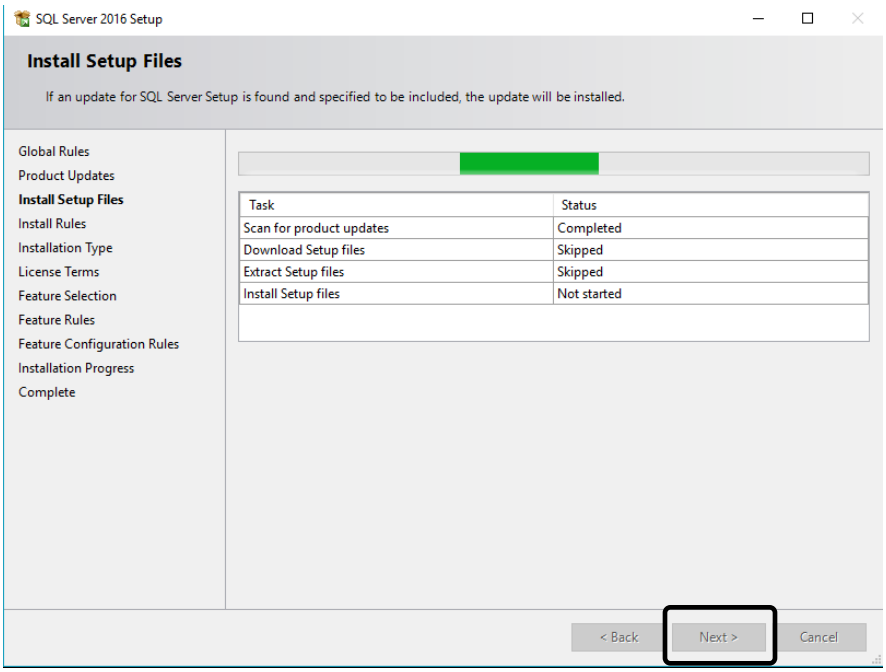
11) The SQL setup process will start.



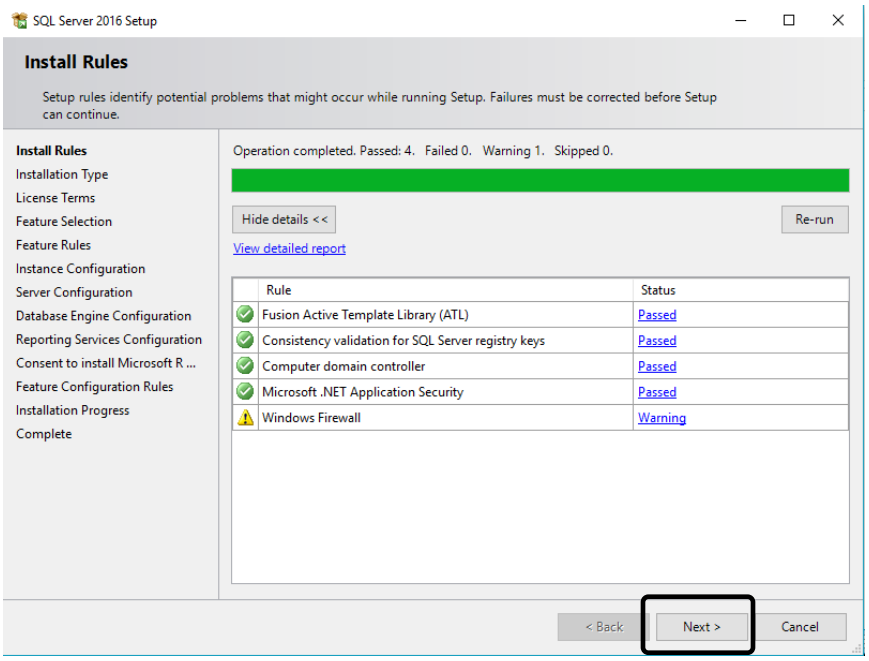
12) The Global Rules screen may not be displayed if there are no errors. Any errors labeled *Fail* will need to be resolved before SQL Server can be installed. Click **Cancel** to end the installation.



13) A progress bar will be displayed as the setup files are installed. Click **Next** after the files are installed.

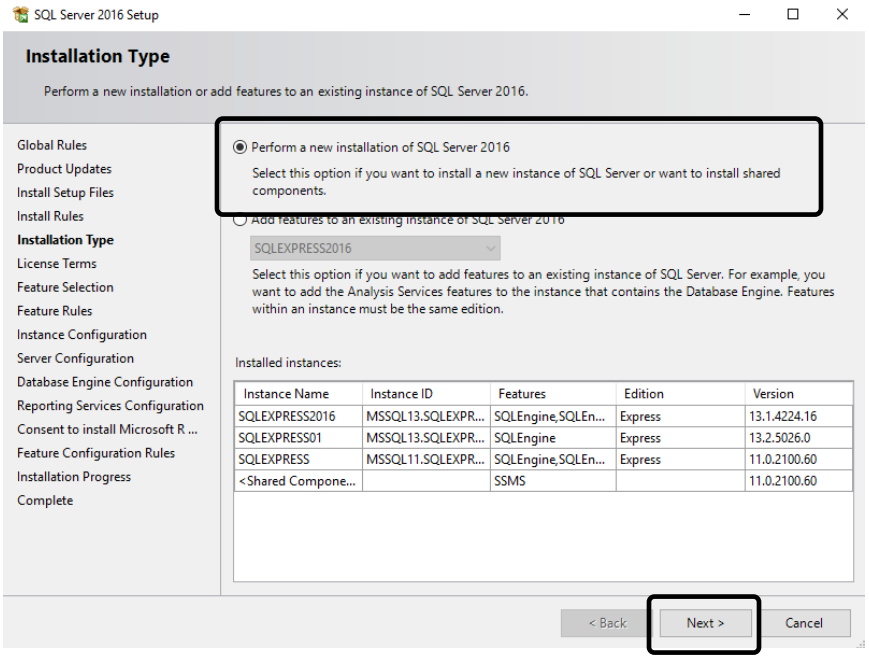


14) The Install Rules screen will be displayed. Any items that *Fail* will need to be resolved before SQL Server can be installed. Click **Next** to continue or **Cancel** to end the installation.

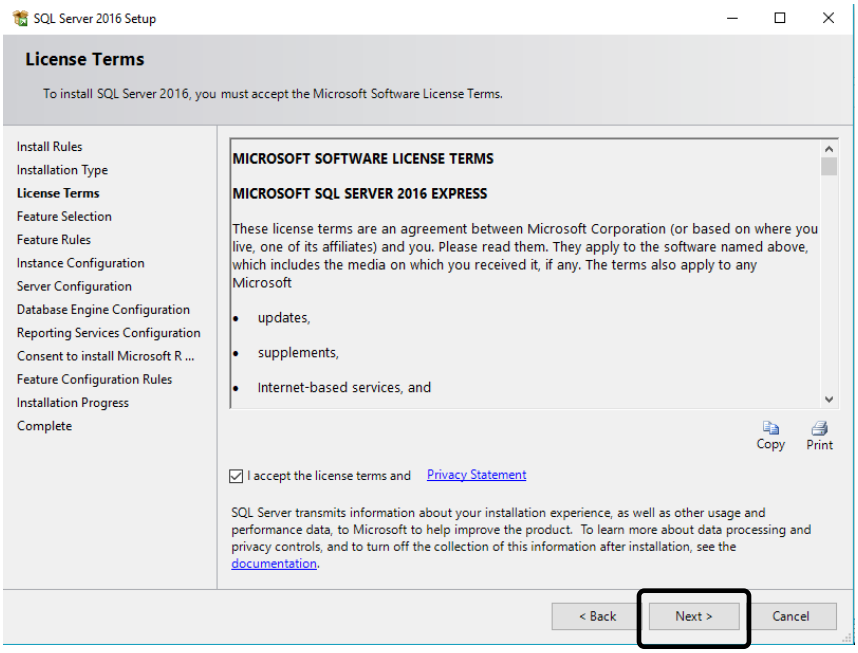


15) On the Installation Type screen, select the *Perform a new installation of SQL 2016* radio button. Click **Next**.

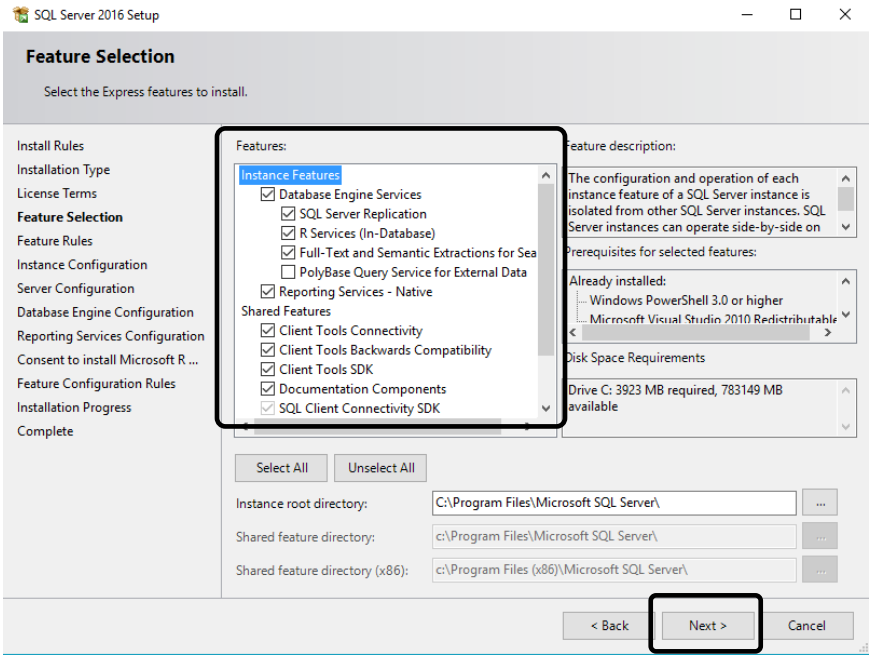
NOTE: This screen shot shows a number of existing SQL instances in the lower window that have already been installed on the computer. If you have not installed SQL Server before you will not see any SQL instances in the lower window.



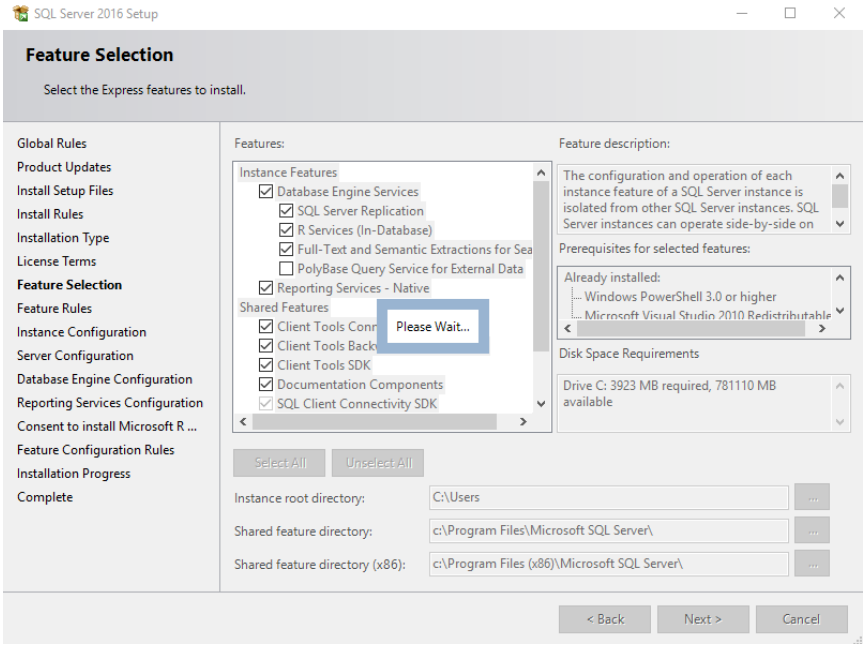
16) Check the box to accept the license terms. Click **Next**.



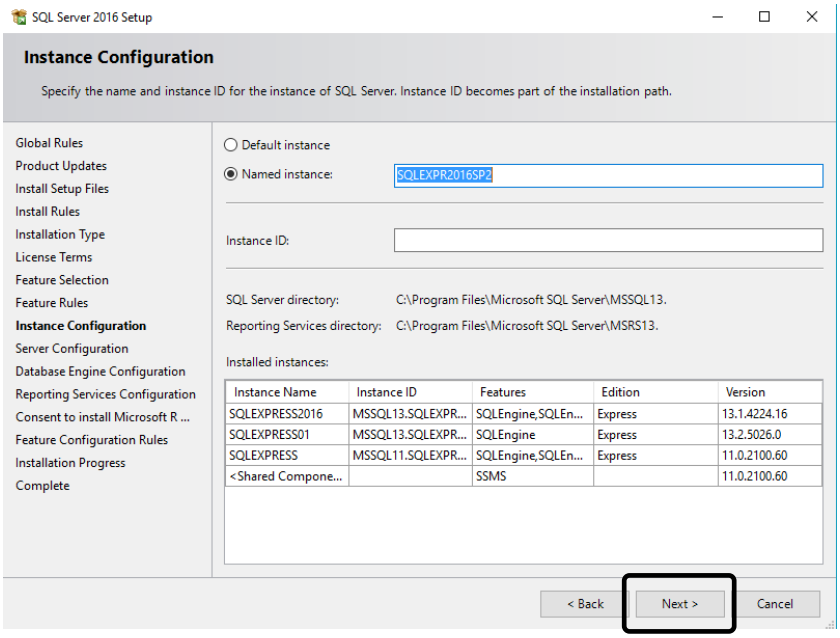
17) On the Feature Selection screen make sure the boxes for the selections shown below are checked. No other changes are required. Click **Next**.



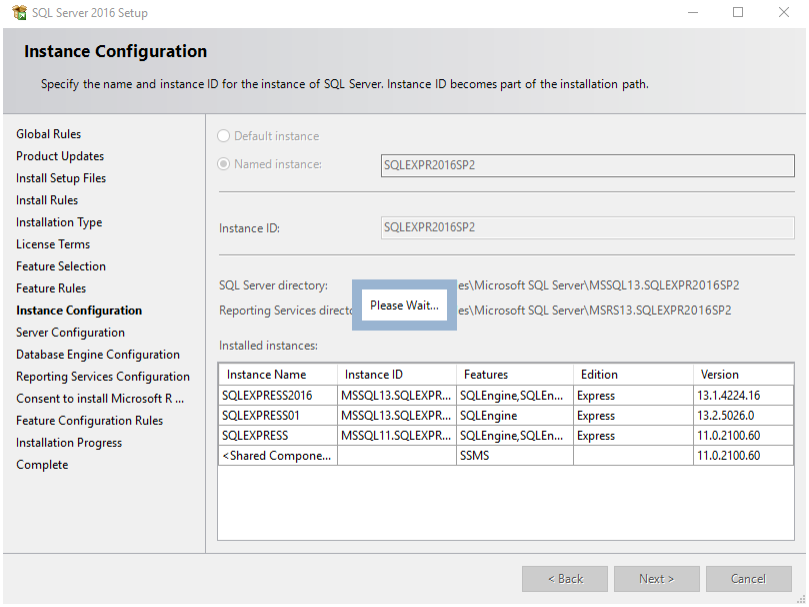
18) Wait while the selections are installed.



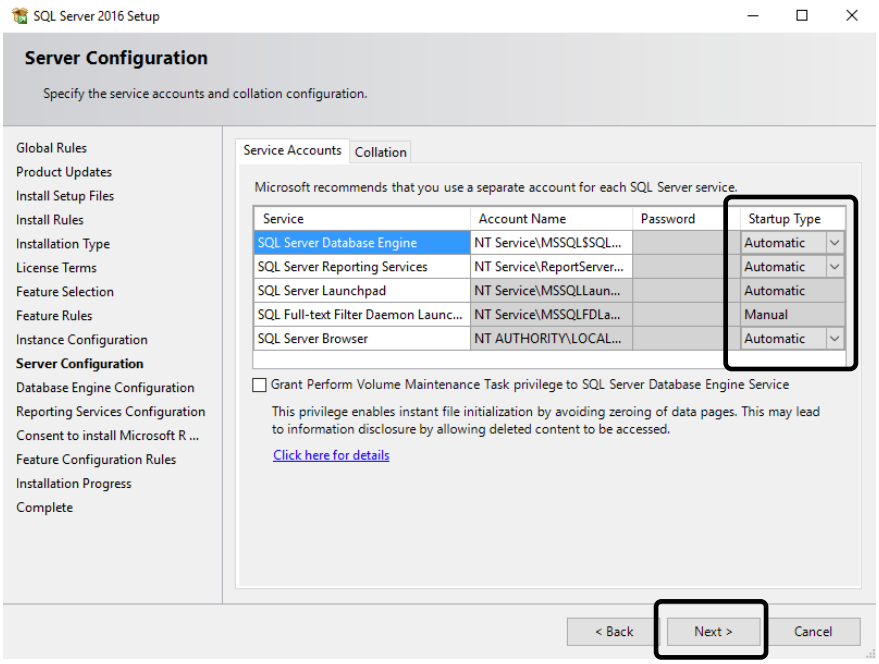
19) On the Instance Configuration screen review the list of installed SQL instances in the window at the bottom. If no instances are listed select the radio button for *Default instance*. If other SQL instances are listed then select the radio button for *Named instance* and type in a unique name. In the screen shot the new SQL instance name is: *SQLEXPR2016SP2*. Click **Next**.



20) Wait while the new SQL instance is created.



21) On the Server Configuration screen make sure the Startup Types match what is shown in the screen shot. If needed, they can be changed by selecting the appropriate option from the dropdown. Click **Next**.



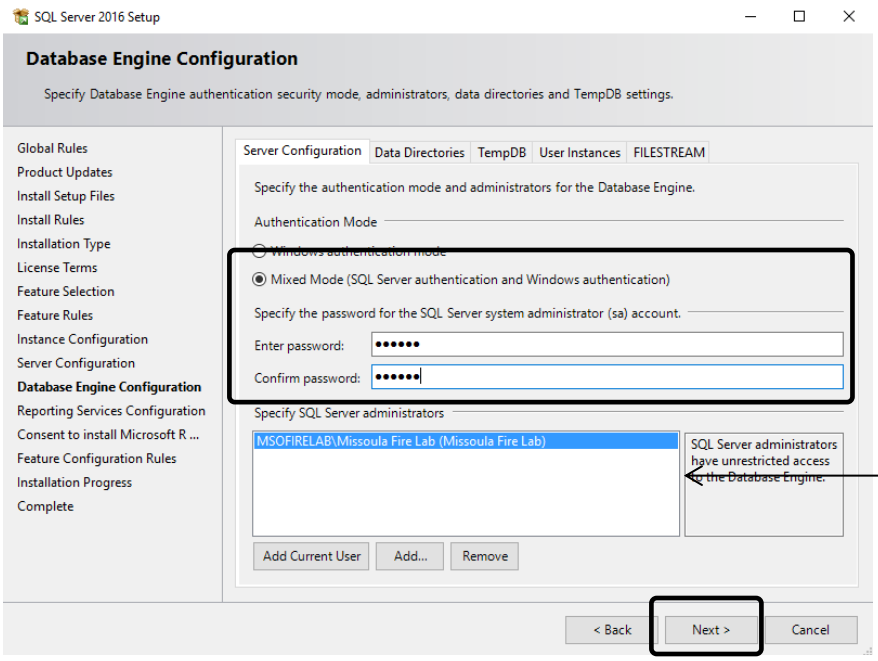
22) On the Database Engine Configuration screen select the radio button for *Mixed Mode* and enter a password. Click **Next** when you have finished entering the information.

NOTE: Select a password that you can remember because you can't access your FFI database(s) without it. If you are IT staff installing FFI for a user, make sure you let the user know what password you selected for them.

When password complexity policy is enforced, new passwords must meet the following guidelines:

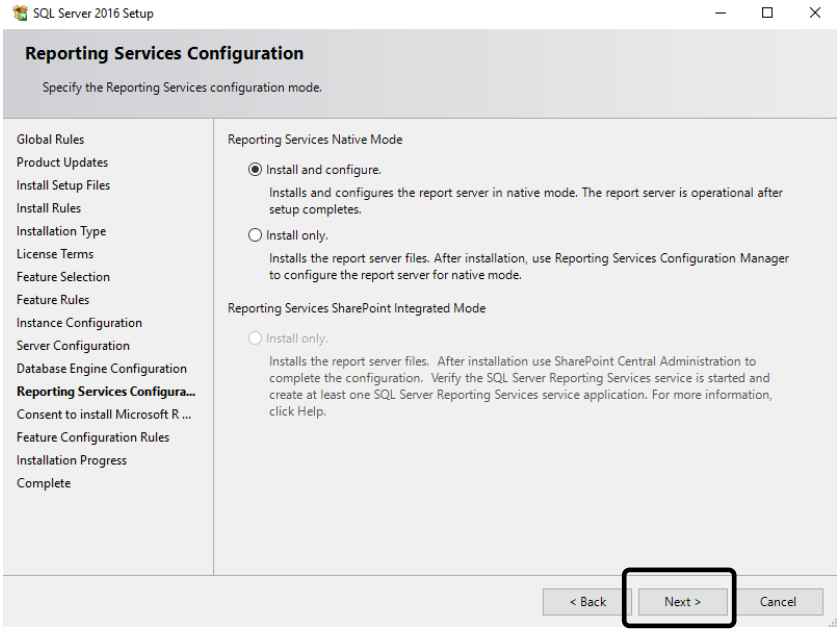
- *The password does not contain the account name of the user.*
- *The password is at least eight characters long.*
- *The password contains characters from three of the following four categories:*
- *Latin uppercase letters (A through Z)*
- *Latin lowercase letters (a through z)*
- *Base 10 digits (0 through 9)*
- *Non-alphanumeric characters such as: exclamation point (!), dollar sign ($), number sign (#), or percent (%).*

(More info: http://technet.microsoft.com/en-us/library/ms161959.aspx)

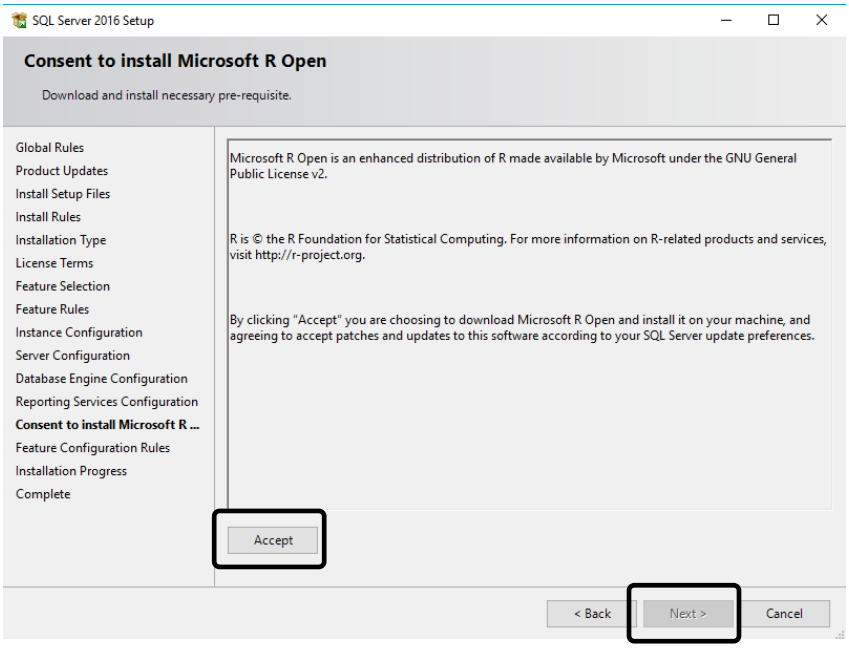


You can allow other users to access this instance of SQL:
1) Click Add…
2) Type the user's computer login name in the box
3) Click Check Names
4) Click OK

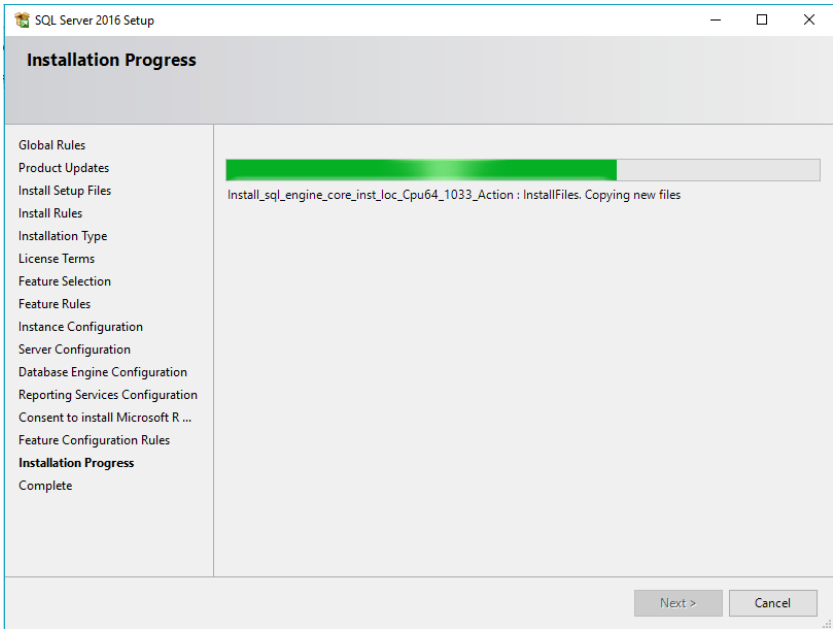
23) No change needed on the Reporting Services Configuration screen. Click **Next**.



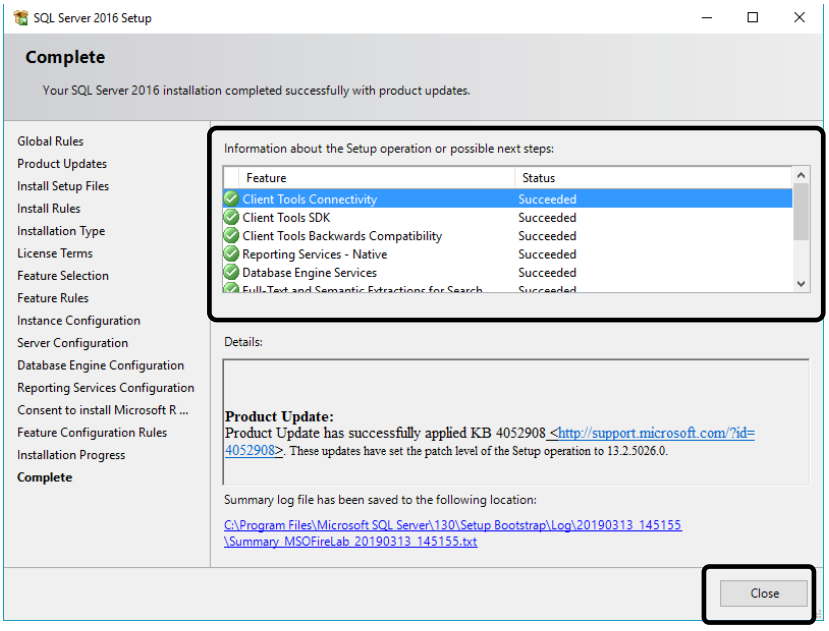
24) Click **Accept** to install Microsoft R Open. Click **Next**.



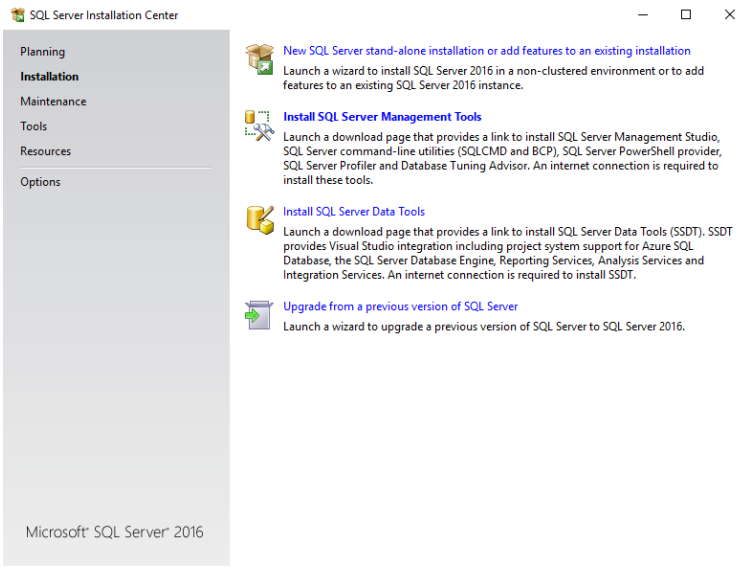
25) A progress bar will be displayed as SQL Server 2016 SP2 Express is installed.



26) When installation is complete scroll through the information about the Setup operation. If issues are noted you may need to fix them before using the SQL instance for FFI. Contact your IT person or search Google for a resolution. Click **Close**.



27) Click the X in the upper right on the Installation Center screen to close out the SQL Server installation.

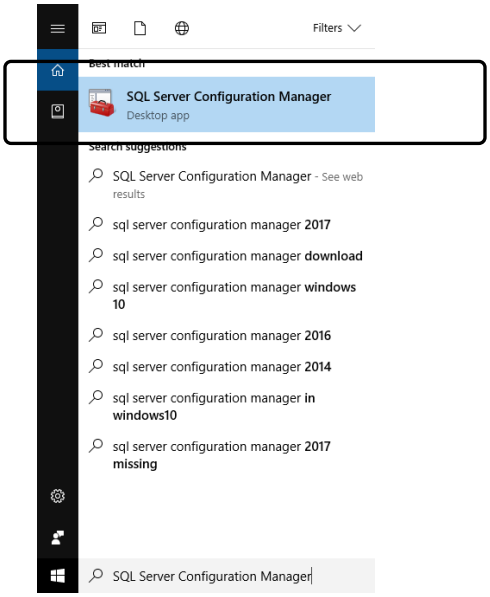


Setting SQL Server to Run as a Local System

When SQL Server Express 2012 or 2016 is initially installed it is set to run under an account. In almost all cases the server instance will eventually stop within a few days and need to be restarted as a Local System. You can wait until later to restart SQL Server or change it now following these instructions.

> *NOTE: The instructions are written for SQL Server Express 2012 but they are similar for other versions.*

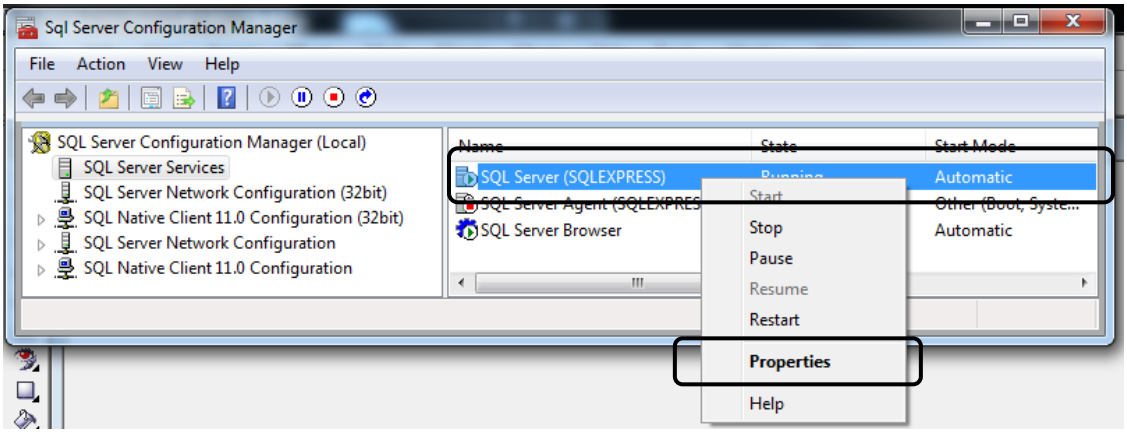
1) Using the Windows search feature at the lower left of your computer screen search for *SQL Server Configuration Manager*.



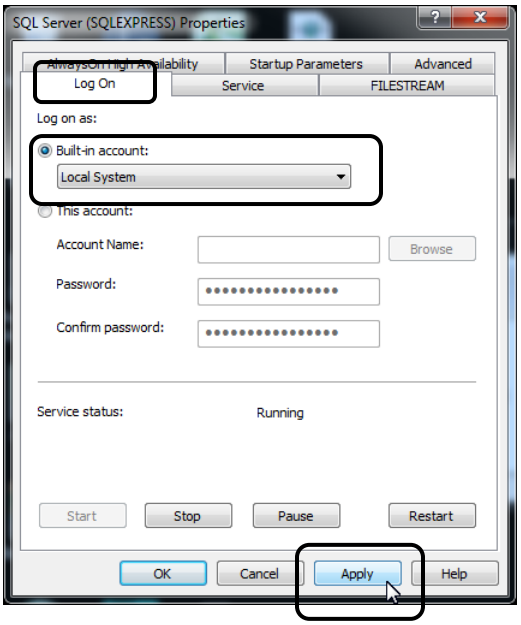
1b) Open SQL Server Configuration Manager following these steps:

- In Windows Explorer or My Computer navigate to *C:\Windows\SysWOW64*
- In that folder look for a file named *SQLServerManagerxx.msc, where xx is based on the SQL Version you are modifying:*
    - *SQL 2012 = SQLServerManager11.msc*
    - *SQL 2014 = SQLServerManager12.msc*
    - *SQL 2016 = SQLServerManager13.msc*
    - *SQL 2017 = SQLServerManager14.msc*
- Right-click on the *.msc* file and select *Run Elevated*, type a justification and click **OK**.

2) SQL Server is the only item in the right pane you need modify. Right-click on the SQL Server entry and select Properties.



3) The window should open to the **Log On** tab (if not, select it). Click the radio button for *Built-In Account* and select **Local System** from the dropdown list. Click **Apply** at the bottom. Wait a few seconds for change to take place.



4) Click the Start button. A scroll bar will appear as the SQL attempts to start the service. The SQL Server service will successfully start. If you receive a warning that the operation timed out then further consultation with your IT person, a Google search or other help is needed. In many cases SQL Server will need to be reinstalled.

5) Close the SQL Server Configuration Manager window.

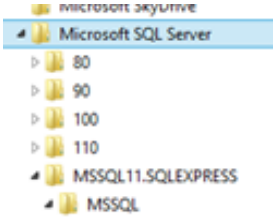
Setting Folder Permissions

If you are an agency employee and you do not typically have Administrator Privileges on your computer follow the directions in this section to set folder permissions for SQL Server.

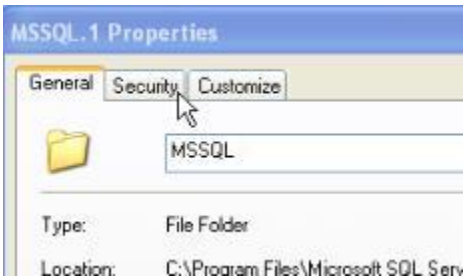
If FFI and SQL are installed on the same computer and you always have Administrator Privileges on the computer then you do not need to set folder permissions. Proceed to: Part 3 – Creating a FFI database.

1. Open Windows Explorer or My Computer and navigate to the *C:\Program Files (x86)\Microsoft SQL Server* folder.

2. In **Windows Explorer** or **My Computer** navigate to *C:\Program Files(x86)\Microsoft SQL Server\MSSQL.1\MSSQL*.



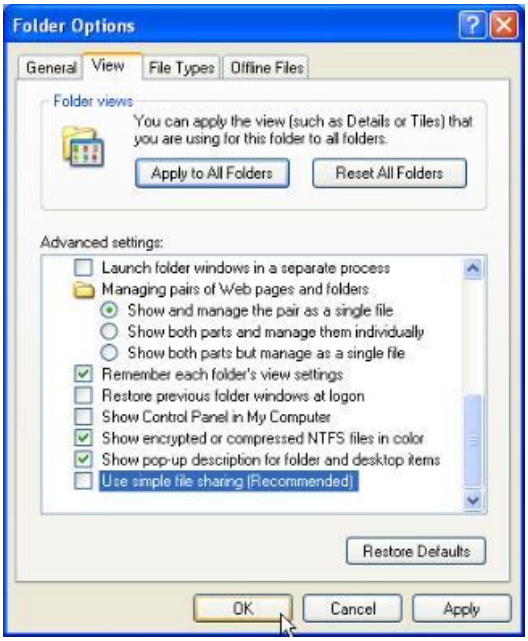
3. Right-click the ***MSSQL*** folder and select ***Properties***. Look for the ***Security*** tab. If you see the ***Security*** tab, select it and proceed to step 4.



a. If you do not see the ***Security*** tab, you will need to turn off *Simple Sharing*. In ***Windows Explorer***, highlight the *Error Logs* folder by clicking on it once and at the top of the ***Windows Explorer*** screen select ***Tools > Folder Options***.

b. In the *Folder Options* dialog, switch to the ***View*** tab.

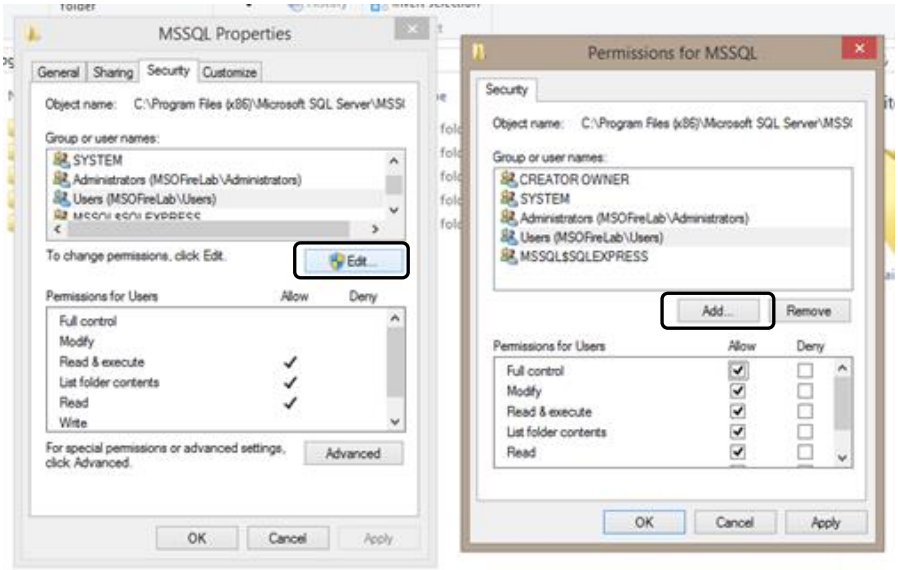
c. Scroll down the list of ***Advanced Settings*** and uncheck **Use simple file sharing**.



d. Click ***OK***.

e. Return to the ***Properties*** dialog for the folder as described above.

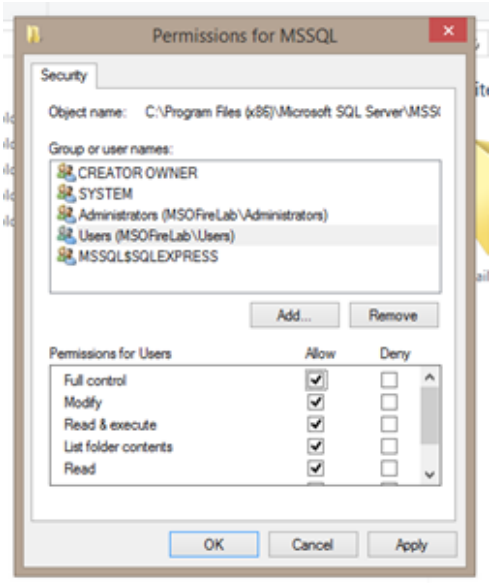
4. Select the ***Security*** tab and if you see your Windows user name in the ***Group or user names*** box skip to step 7, otherwise click ***Edit*** and then in the new window that opens click ***Add.***



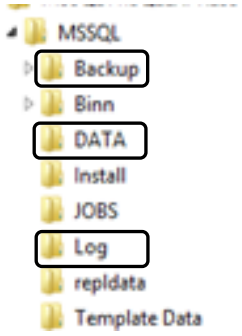
5. In the *Select Users or Groups* dialog, type your Windows user/login name in the window entitled ***Enter the object names to select***. (This is the user name you use when you log in to Windows. E.g., Barney Fife = bfife).

6. Click ***Check Names*** and watch to see if the format of your username changes (indicating that it was found by Windows). Click ***OK***.

7. On the ***Security*** tab, highlight your username in the list of ***Group or user names*** and check to ***Allow***, ***Full Control***. Click **OK**.



8. Next, make sure your user/login has ***Full Control*** access to the *Backup*, *Data* and *Log* folders. The steps used to set permission for these folders are the same as used to set permissions for the MSSQL folder.



9. Finally, check to make sure SQL Server permissions are set for the *Backup*, *Data* and *Log* folders:

a. Right-click the folder name (*Backup*, *Data* and *Log*).

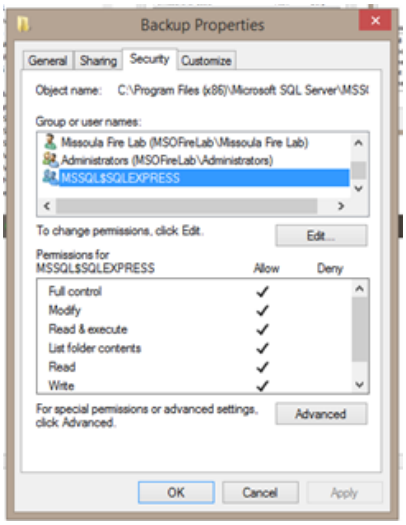
b. Select ***Properties***.

c. Select the ***Security*** tab.

d. Click the ***MSSQL$SQLEXPRESS*** instance user.

e. Click the checkbox to ***Allow***, ***Full Control***.

f. Click ***OK***.



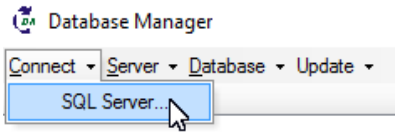
10. SQL Server Express is ready for use.

Part 3 – Creating a FFI database

FFI uses a SQL Server 2016 SP2 database to store protocols and methods. If a database is not already available for your project, you must create one before you can begin to work with FFI. Use **FFI Database Administration** to create a new database.

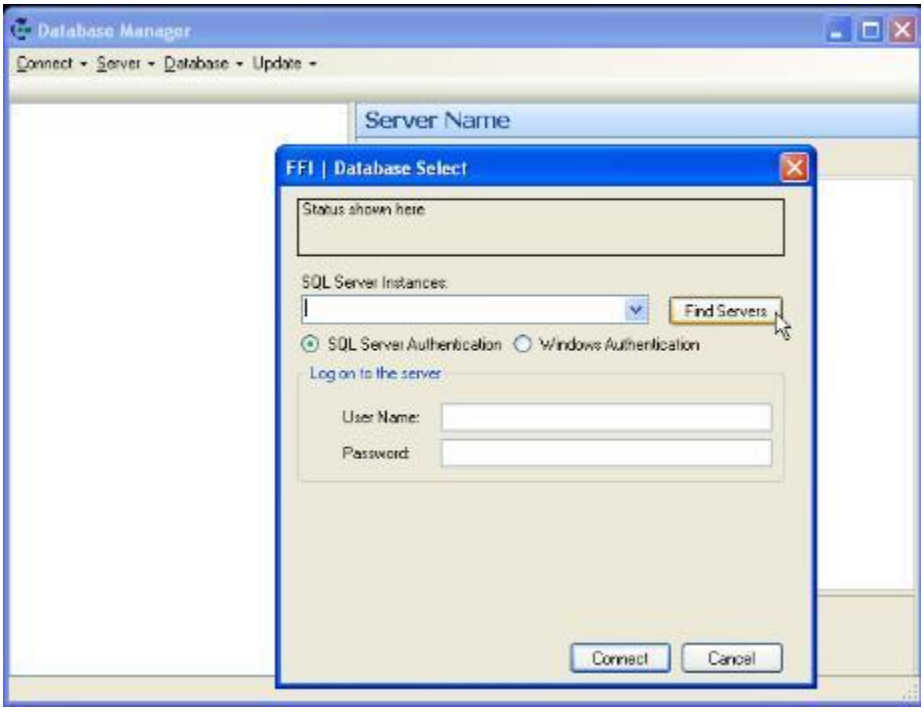
1. Double-click the **FFI Database Administration** icon on your desktop.

2. In the **Connect** menu, select **SQL Server**.

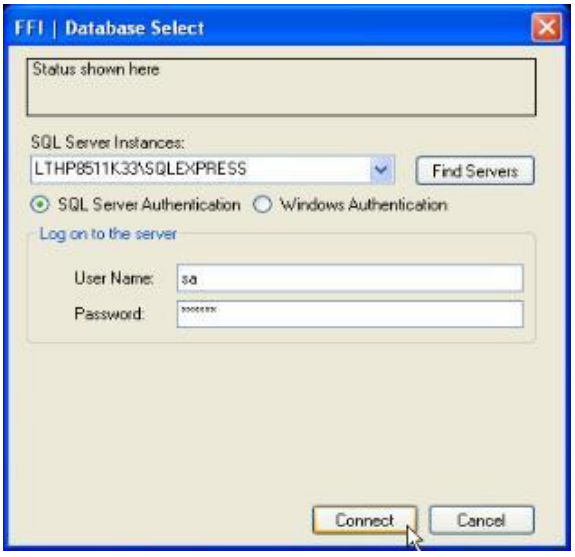


3. If the *SQL Server Instances* field is blank click the **Find Servers** button to refresh the list. It may take a minute to find all of the servers. During that time the hourglass will be displayed. When the hourglass disappears click the down arrow to select the SQL instance you created in Part 2, step 19.

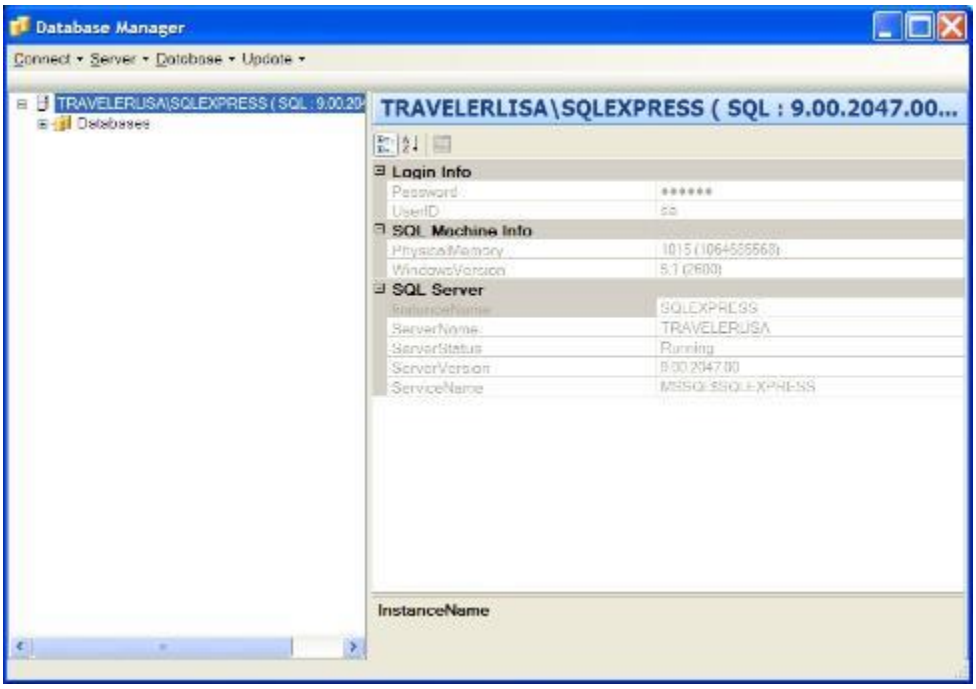
NOTE: If the SQL instance is not found you can manually enter it. The SQL instance name will typically be in the format: computer name\SQLEXPRESS. If you don't know your computer's name click **Start > Control Panel > System**, *click the* **Computer Name** *tab and look for the* Full Computer Name.



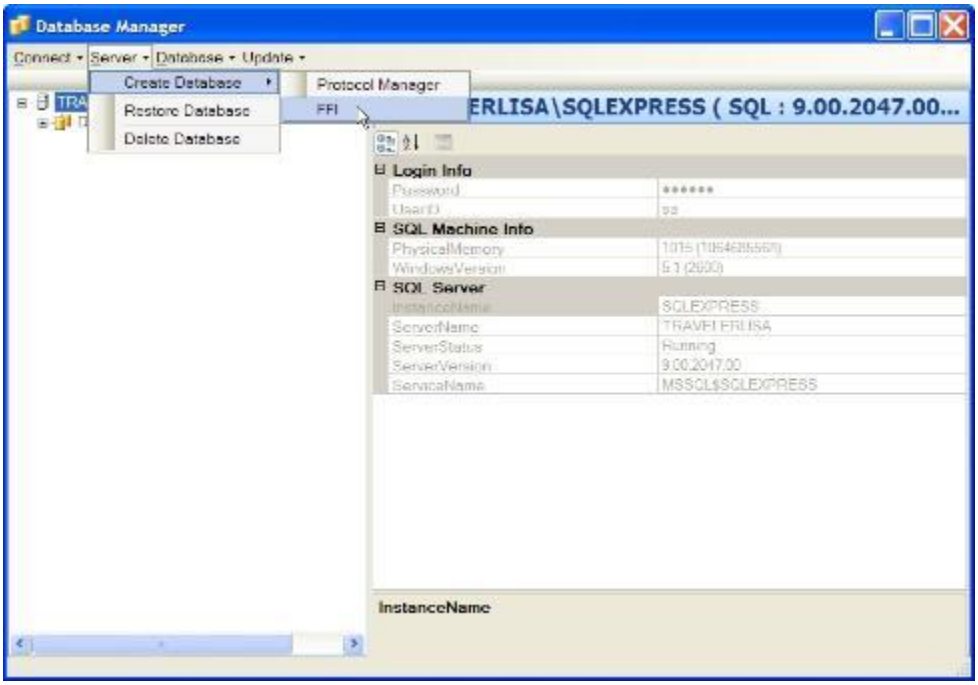
4. Enter `sa` (which stands for System Administrator) as the *User Name* and the SQL password that you created in Part 2, step 22. Click **Connect**.



5. In the tree view in the left pane of the *Database Manager* window, highlight the name of the SQL server instance by clicking on it once.



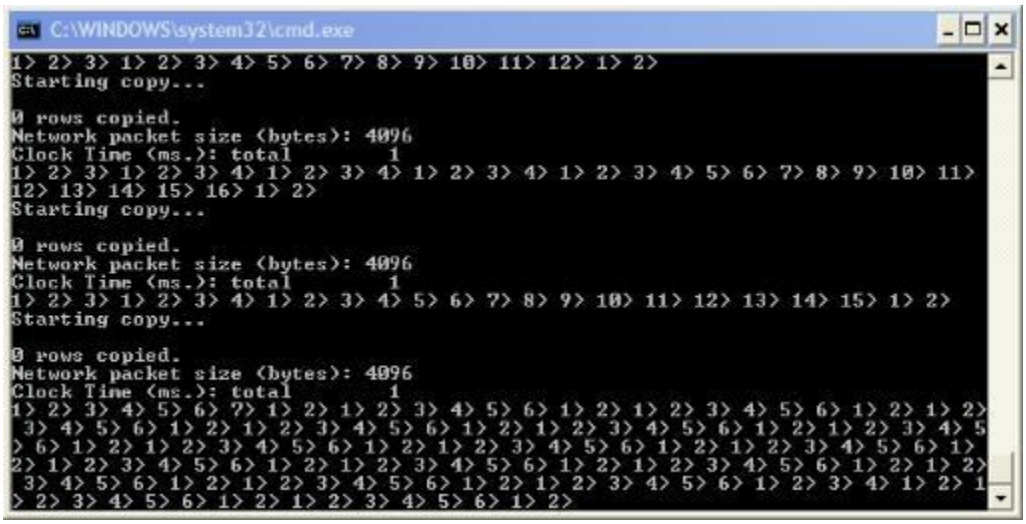
6. In the **Server** menu, select **Create Database**. Select **FFI**.



7. Enter a unique name, such as a park or forest name, for the new database and click **OK**.

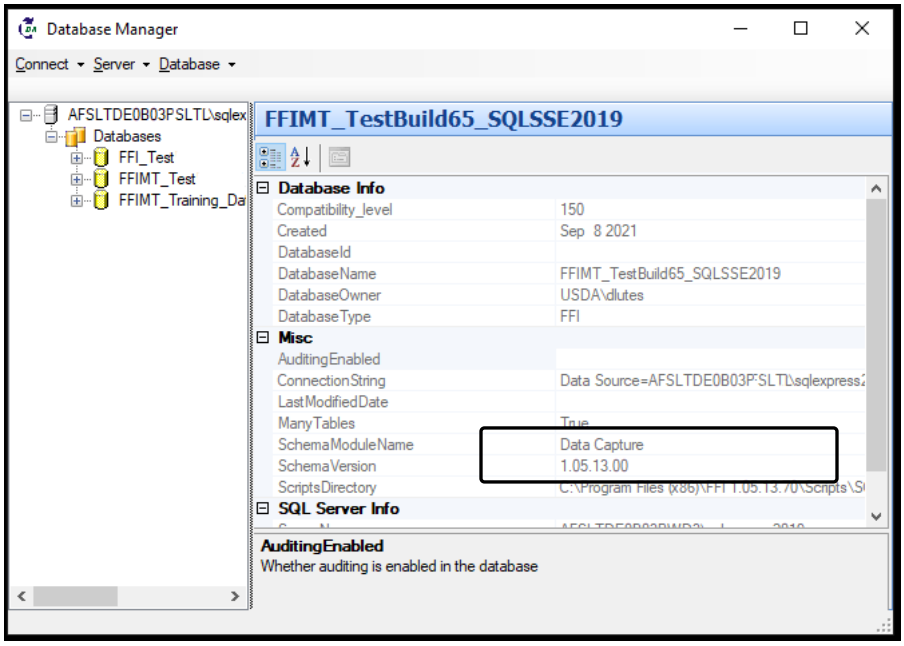
NOTE: You cannot use a database name that already exists in your SQL instance. Database names cannot contain spaces and must begin with an alphabetic character. Database names cannot be changed so choose one you can live with.

8. A *DOS* window and a progress bar open, as shown below. Wait while the database is created, which could take a few minutes, depending on your computer.



9. A dialogue box will notify you when the database has been created.

10. In the tree view of the *Database Manager* window, open the *Databases* folder by clicking on the plus sign to the left of the *Databases* label. The new database will be listed. The schema name, schema version and other information is displayed in the right pane.



11. Close FFI Database Administration.

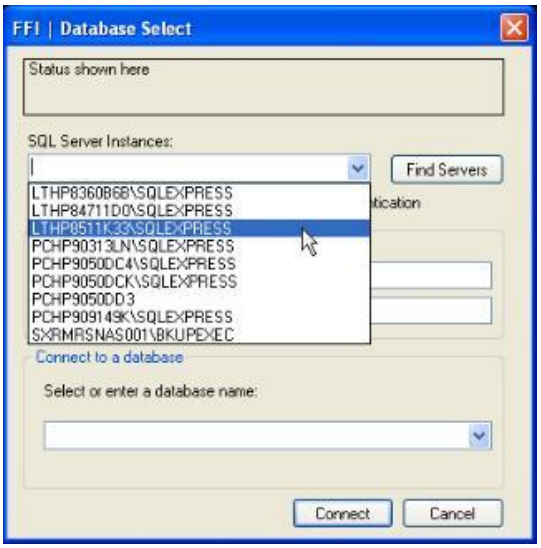
Part 4 – Opening FFI and logging in

1. Double-click the FFI icon on your desktop, or launch FFI from your **Start** menu (***Start > All Programs > FFI 1.05.13 > FFI 1.05.13***). The Database Select window opens.

NOTE: The FFI splash screen may be visible for a few moments while the program loads.

2. If the *SQL Server Instances* field is blank click the ***Find Servers*** button. An hourglass will be displayed for up to a minute as the FFI locates SQL instances. When the hourglass disappears click the down arrow to see the available servers. Select your SQL Server instance from the dropdown.

NOTE: The server name is typically in the format: computer name\SQLEXPRESS. *You may also manually type the server instance name in the field.*



3. Enter the *User Name*, which will be **sa** (System Administrator), enter the SQL password you selected in Part 2 of the SQL Server installation and click the down arrow on the *Select or Enter a Database Name* field. An hourglass will appear while the list is populated, then the list will flash briefly. Click the down arrow again to select the database you created in Part 3 of the SQL Server installation. If the server instance is not available in the SQL Server Instances field type it in manually.

NOTE: If the Select or enter a database name *field is blank you have most likely entered an incorrect SQL password. You must re-enter the* User Name *AND* Password *when you re-attempt to log on to the server.*

4. FFI will open and the new database will be connected.
5. You have successfully installed the FFI components and created a test database.

For further instruction using FFI features and functions, see Basic Steps for the Beginner.

Database Administration

In FFI, administrative functions, including SQL Server and database management, are managed by the **FFI Database Administration** module, which connects directly to the database server.

When you first install FFI, you create an SQL Server, system administration (*sa*) account. This account enables you to access the server and build user databases and administrative units.

When using a server or master computer configuration all the database administration tasks listed in (1) and (2) below will be done on the server or master computer by someone logged on as an FFI administrator. The FFI administrator must have physical access to the server or master computer. If the server is in a remote location a designated SQL Server manager must be assigned as a FFI administrator and willing to do the tasks list in (1) and (2) below.

The **Database Administration** module lets you manage:

1. Databases:
    - Creating a database
    - Restoring a database from backup.
    - Deleting a database
    - Backing up a database
    - Patching a database to function under the current version of **FFI**.
2. Users and roles:
    - Adding and deleting users.
    - Assigning and deleting user roles.

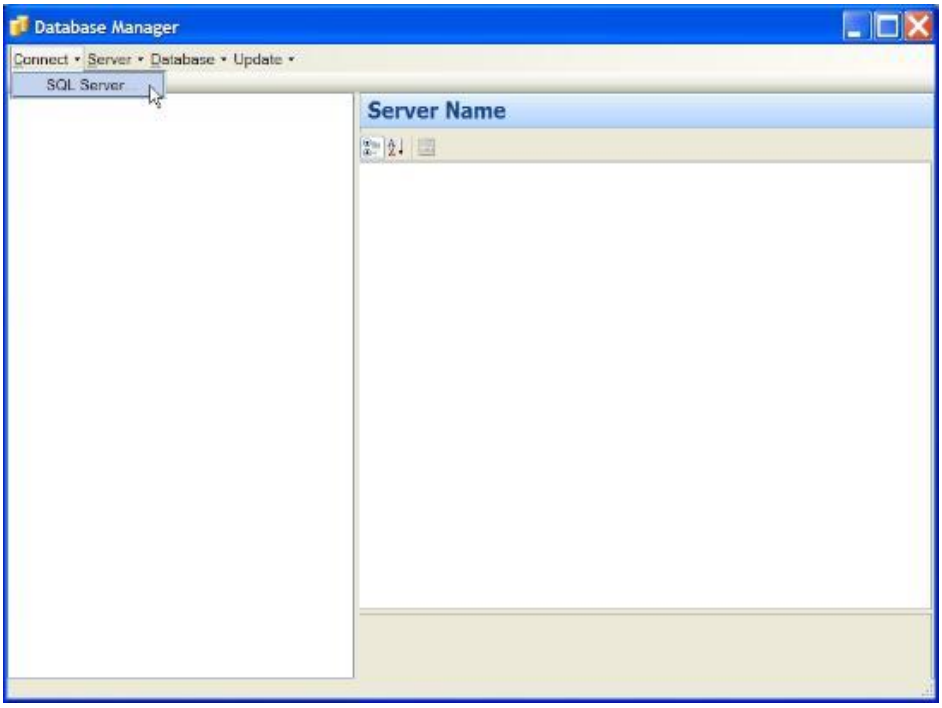
NOTE: For information about user roles, see User roles and permissions.

Logging in to the Database Administration module

To open the **Database Administration** module and work in SQL Server:

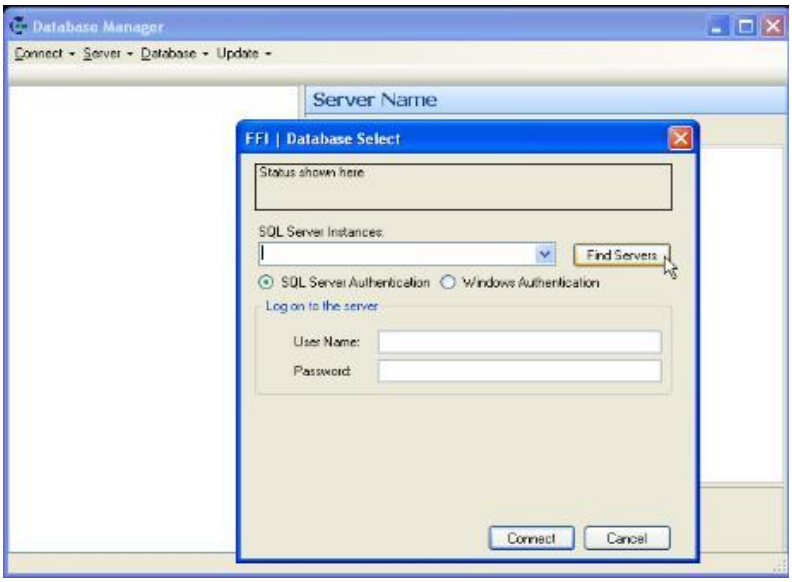
1. Double-click the **FFI Database Administration** icon on your desktop or launch the module from the **Start** menu. The *Database Manager* window opens.

2. In the **Connect** menu, select **SQL Server**.

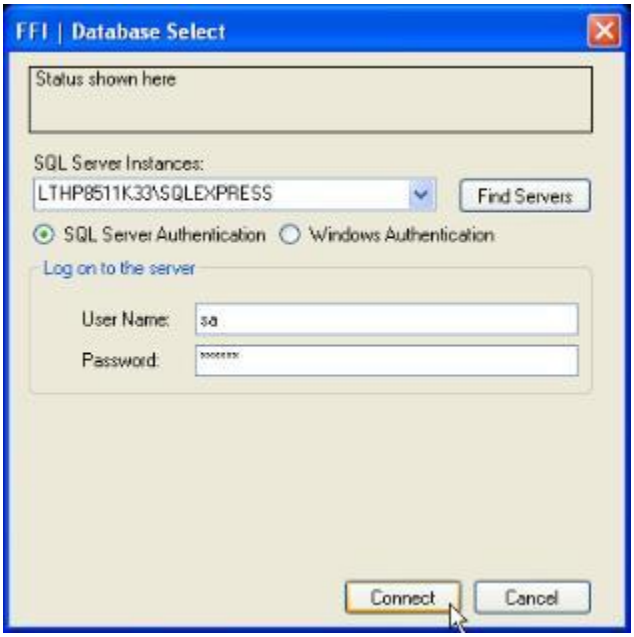


3. If the *SQL Server Instances* field is blank click the **Find Servers** button to refresh the list. It may take a minute to find all of the servers. During that time the hour glass will be displayed. When the hourglass disappears click the down arrow to select your SQL instance.

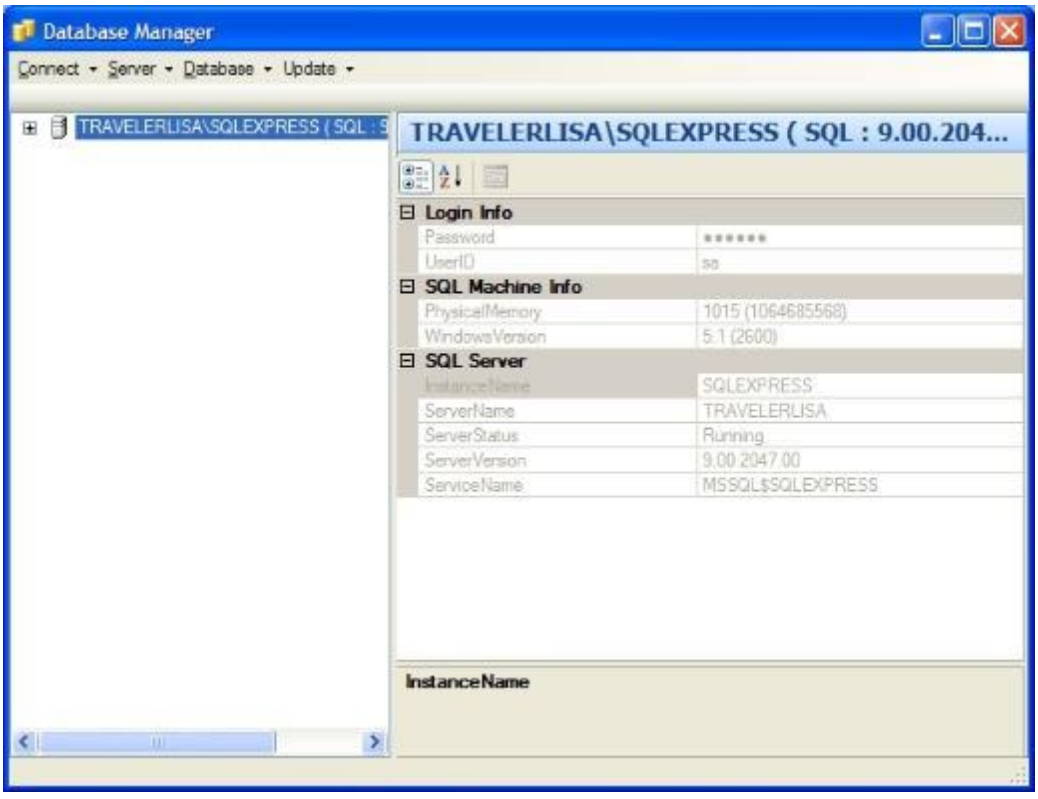
NOTE: You can also manually type in your SQL instance name. It has the form computername\SQLEXPRESS E.g., HPLT934759\SQLEXPRESS. Some Windows users MUST type in their SQL instance name for the first use.



4. Enter *your User Name* and *Password*. Click **Connect**.



5. The *Database Manager* opens.

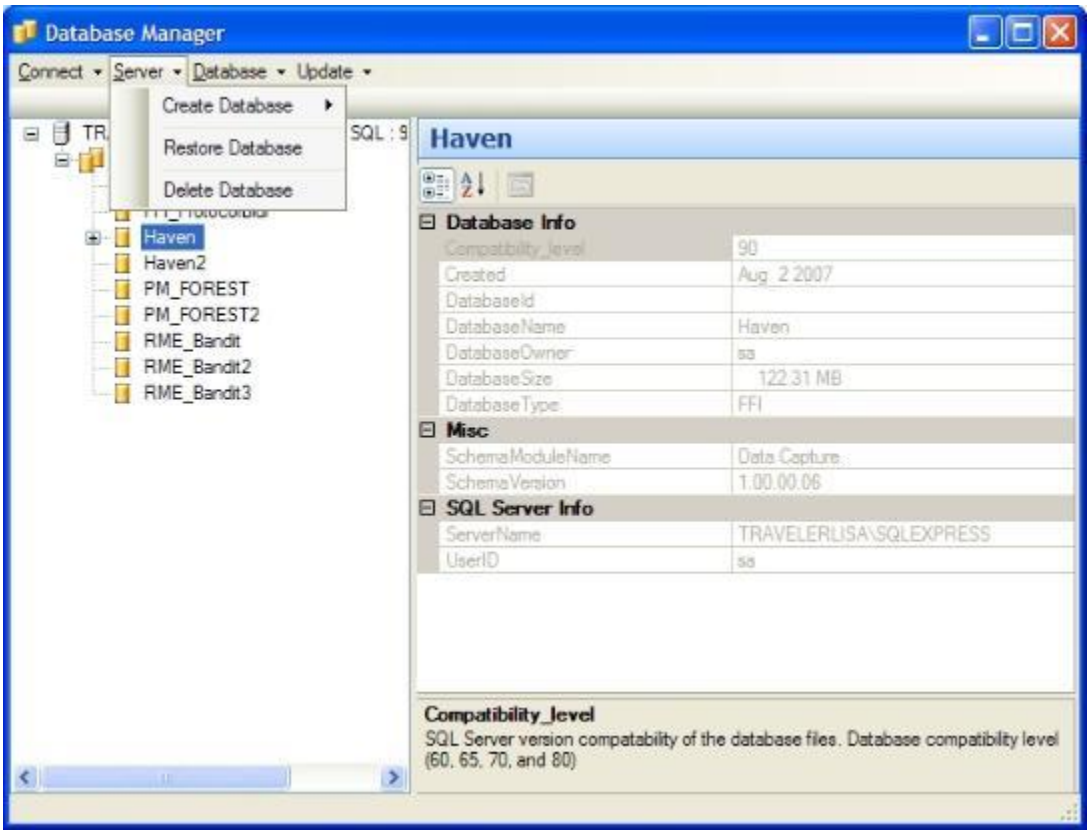


Managing databases

Both the **Server** and **Database** menus in **FFI Database Administration** provide access to database management functions.

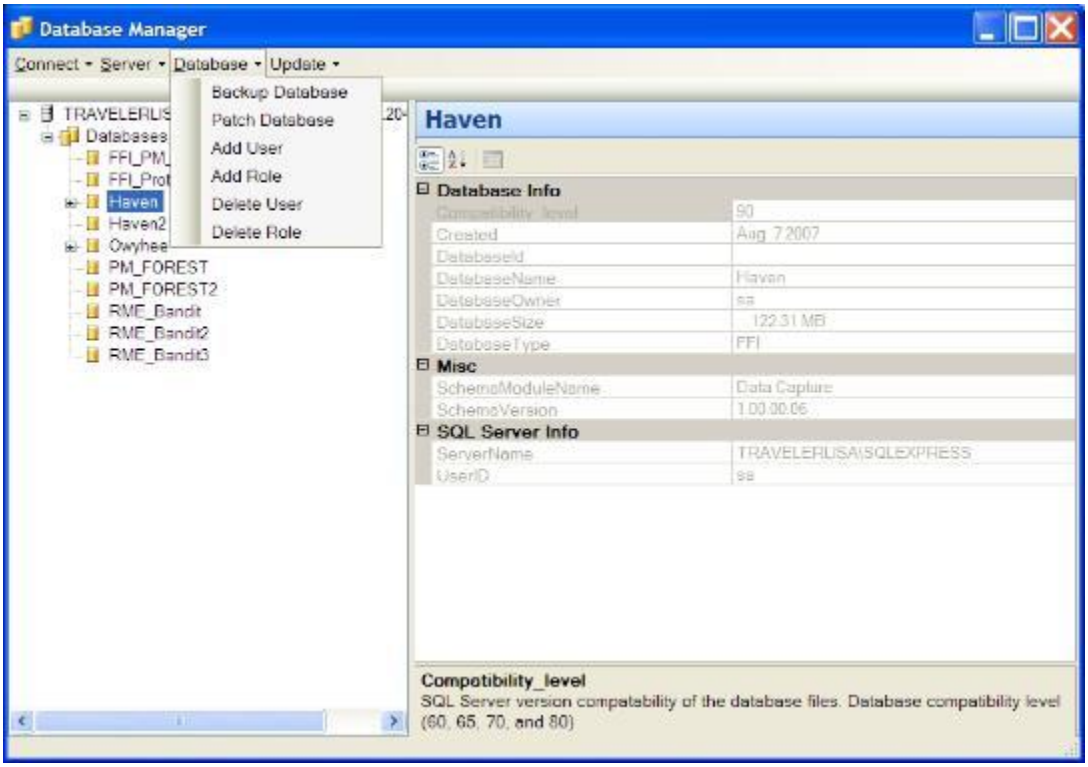
NOTE: If using a server or master computer configuration all these tasks must be done on the server or master computer by someone logged in as an FFI administrator

Server menu



- Creating a Database – create new **FFI** or **Protocol Manager** databases.
- Restoring a Database – restore a deleted or damaged database from a backup database file.
- Deleting Database – delete a database.

Database menu

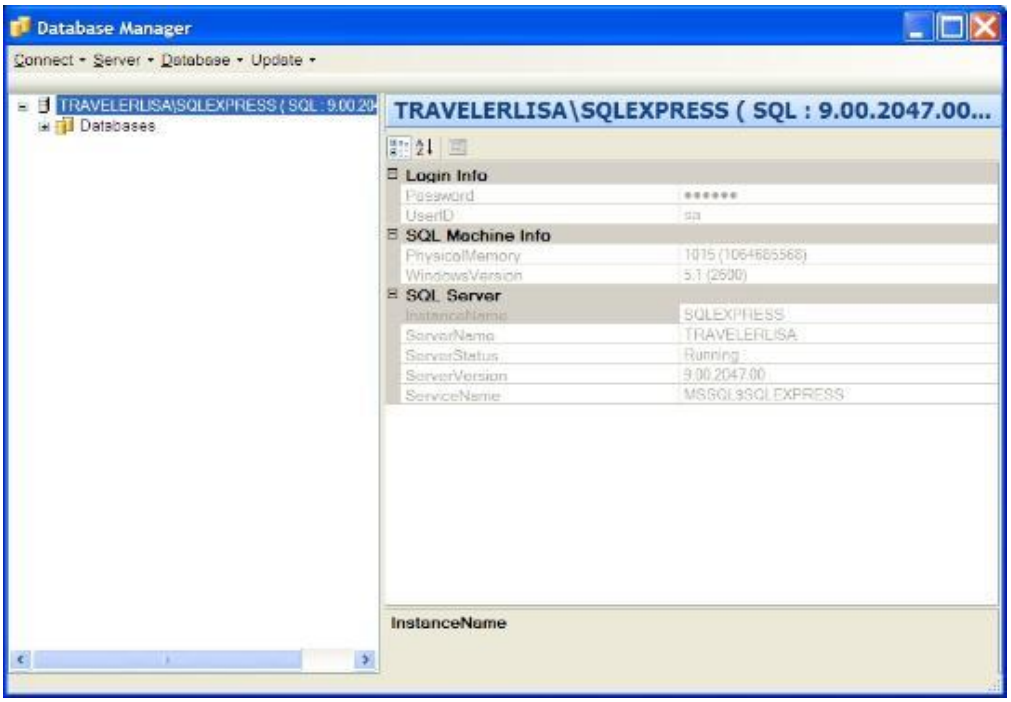


- Backing up Database – create a backup copy of the selected database.
- Patching a Database – update an existing database so that it works correctly with a new version of FFI.

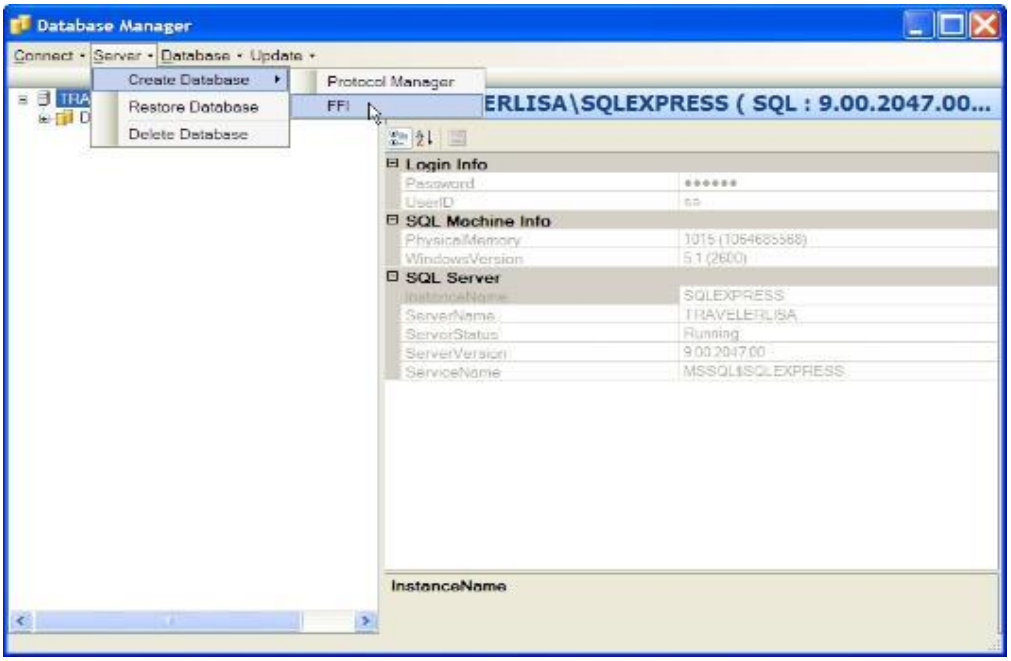
Creating an FFI database

To create a new SQL Server database:

1. In the tree view of the **Database Manager** window, highlight the name of the SQL server instance.



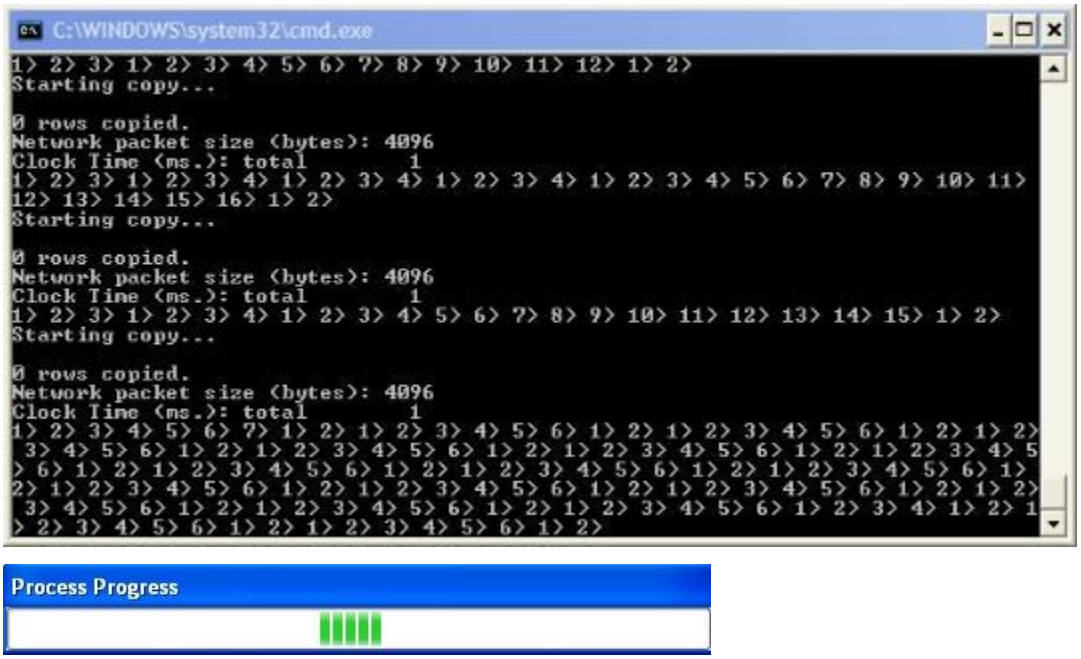
2. In the **Server** menu, select **Create Database**. Select **FFI**.



3. Enter a unique name, such as a park or forest name, for the new database and click **OK**.

NOTE: If a database with the name that you selected already exists, FFI will prompt you to enter a different name or to overwrite the existing database. Database names cannot contain spaces and must begin with an alphabetic character.

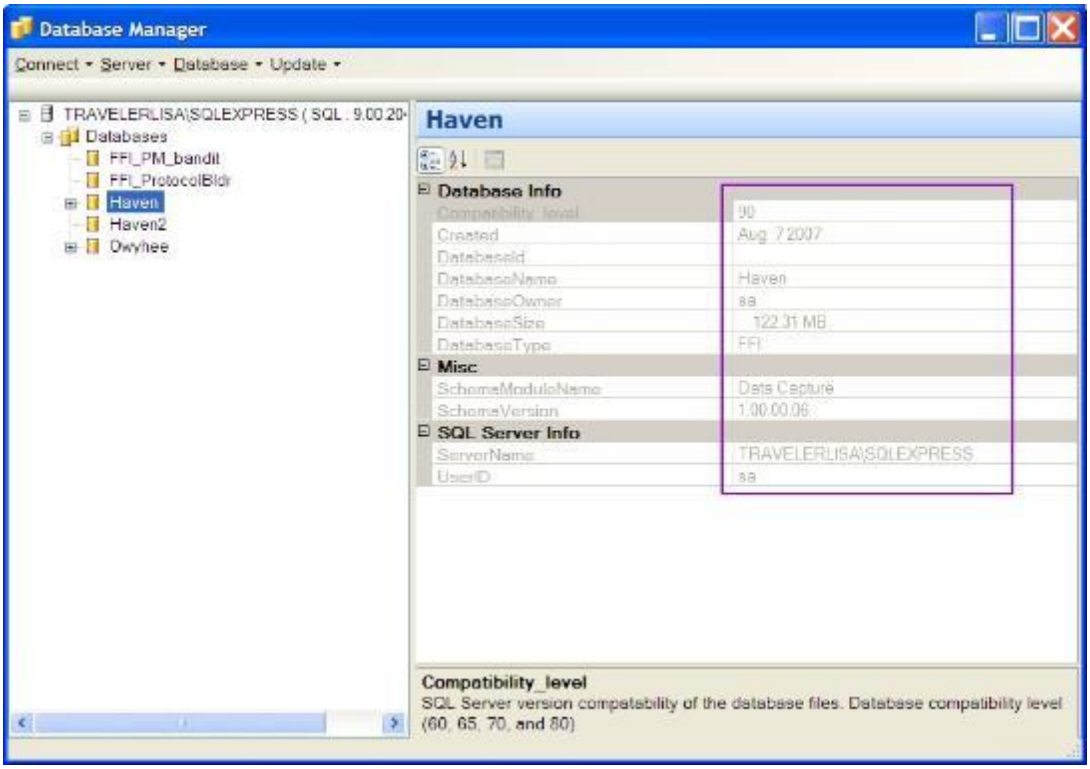
4. A *DOS* window and a progress bar open, as shown below. Wait while the database is created, which could take up to 5 minutes, depending on your computer.



NOTE: Under some circumstances, you might receive an error message reading "Database Creation Failed - The database you have created does not appear to have a valid schema". *This generally occurs when using a slow processor. Simply try creating the database a second time.*

5. In the tree view of the **Database Manager** window, open the *Databases* folder. The new database is listed in the tree view. Note the information about the new database that is shown in the right-hand pane:

- Creation date, name, owner, and size.
- Database type - FFI.
- Schema module name and version.
- SQL server name and user ID.



6. Close the **Database Manager** window.

> *NOTE: In order to store data in your new database it must have the FFI protocols available in the database. To get protocols into a new, empty database you must either: import the protocols, restore a database that has protocols in it or import data from another computer.*

Backing up a database

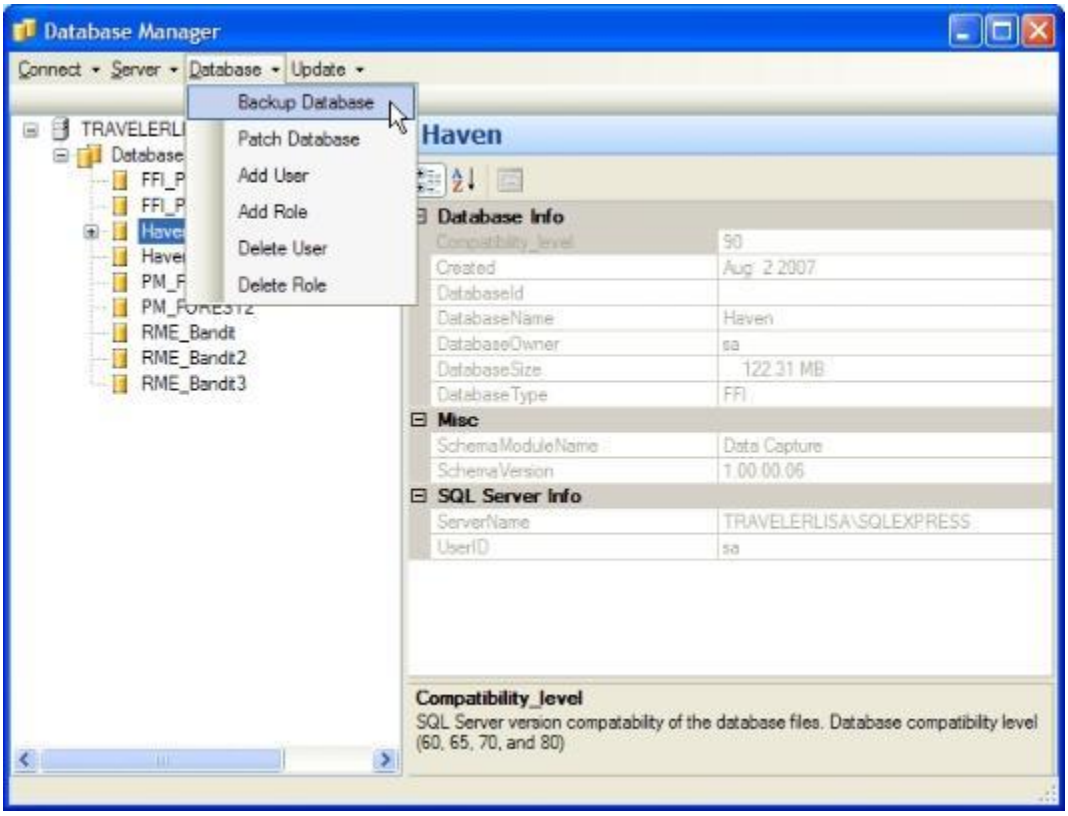
The **Backup Database** command creates a backup copy of the selected database and files it on your computer. Back up your databases often! A deleted database cannot be recovered, but you can restore a database from a backup file.

> *NOTE: Database backup must be done on the computer where SQL Server is installed and must be done by a user logged in with an SQL Administrator role.*

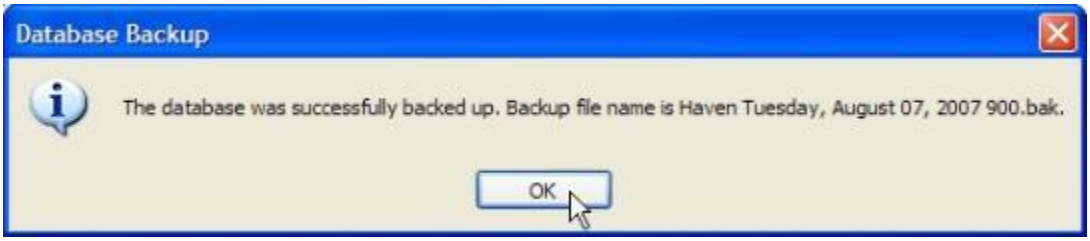
To back up a database:

1. In the **Database Manager** tree view, highlight the name of the database.

2. Click **Backup Database** in the **Database** menu.



3. After a moment or two, a confirmation box opens. Note the name of the backup file and click **OK**.



NOTE: The default location for backup files is C:\Program Files\Microsoft SQL Server\MSSQL.1\MSSQL\Backup. *You should save the backup file in a safe location preferably on a server at an external site.*

NOTE: You may not be able to back up your database due to permissions issue with the SQL Server Backup folder but you can typically save the back up on a flash drive. If that doesn't work open the database in FFI and export each Administrative Unit. In all cases save copies of the files in a safe place.

Patching a database

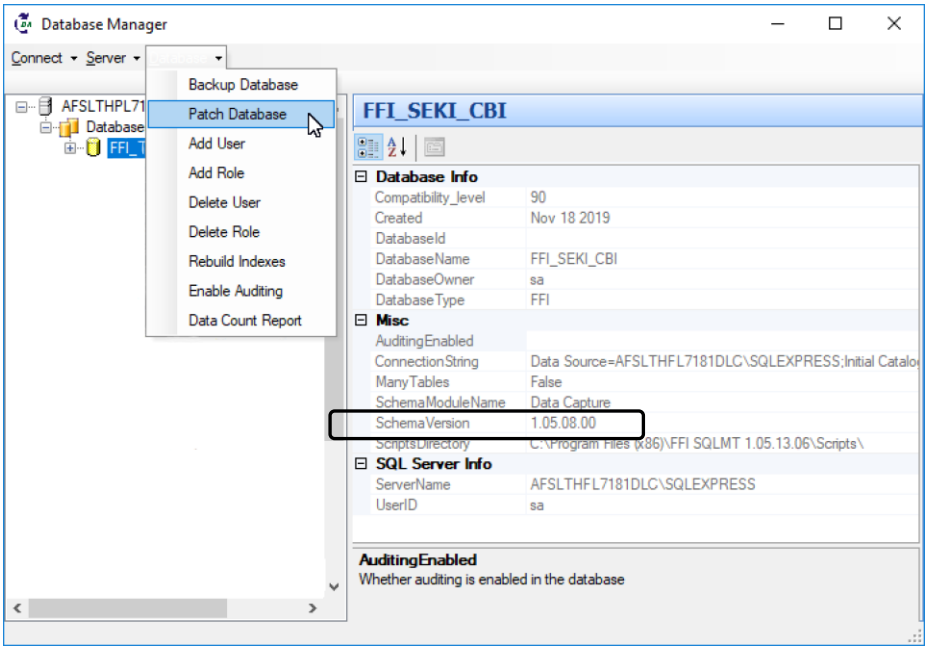
The **Patch Database** command lets you update an existing database so that it works correctly with a new version of FFI.

In this example, the schema version of the database is 1.05.08, but the version of FFI is 1.05.13. Apply the **Patch Database** command to upgrade the database to the current schema version.

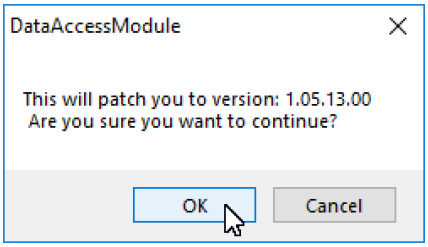
To patch a database:

1. In the tree view of the **Database Manager** window, highlight the name of the database to be patched.

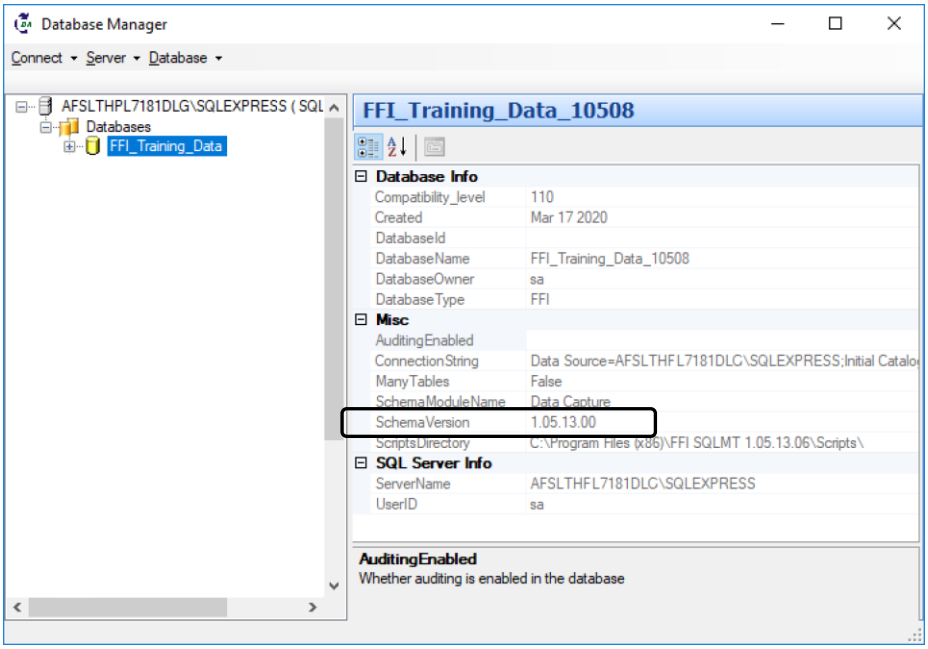
2. In the **Database** menu, select **Patch Database**.



3. Click **OK** in the **Utilities** window to confirm.



4. Depending on the size of the database, a *DOS* window may open as the database is patched. When the patch has finished the schema version will be updated (FFI 1.05.xx.xx database will be patched to the 1.05.13.00 database schema.



5. Back up the patched database using the **Backup Database** command in the **Database** menu.

Restoring a database

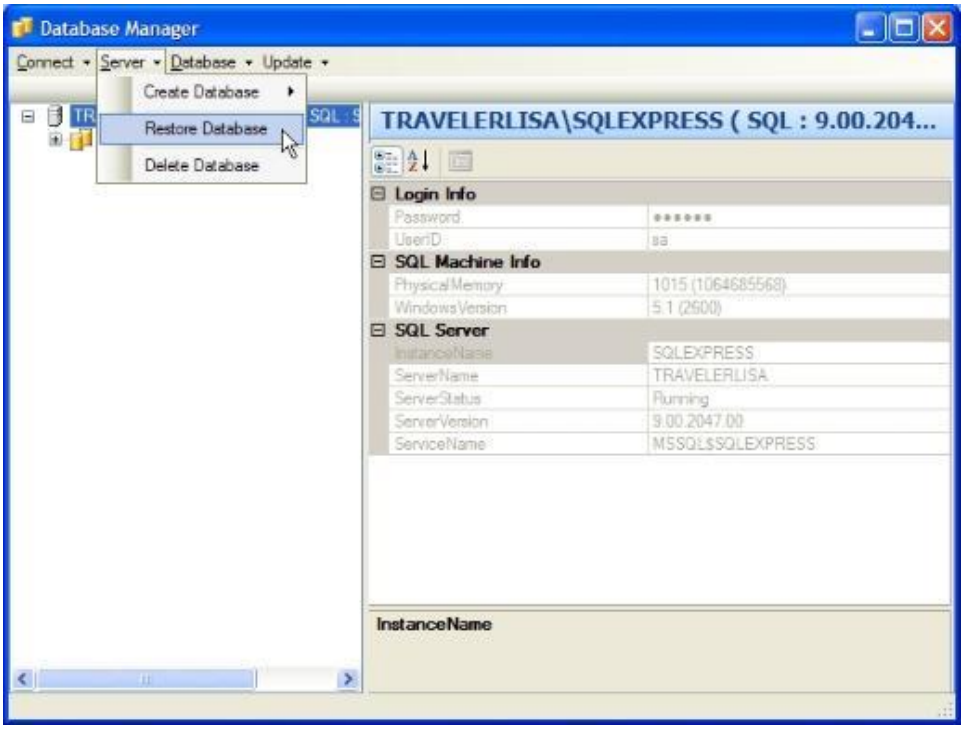
A backed-up database can be restored if it is inadvertently deleted or damaged. You must hold an administrative role to restore a database.

NOTE: Back up your databases often! A deleted database cannot be recovered, but you can restore a database from a backup file. Store your backups in a location separate from your active database(s) such as on a remote server.

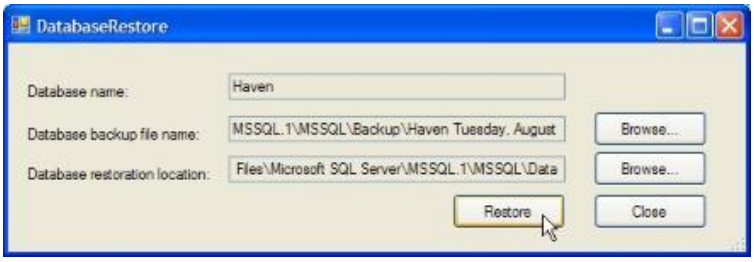
NOTE: You cannot restore a database that already exists in the SQL "Data" folder.

To restore a database:

1. Highlight the name of the SQL server instance in the tree view and select **Restore Database** in the **Server** menu.

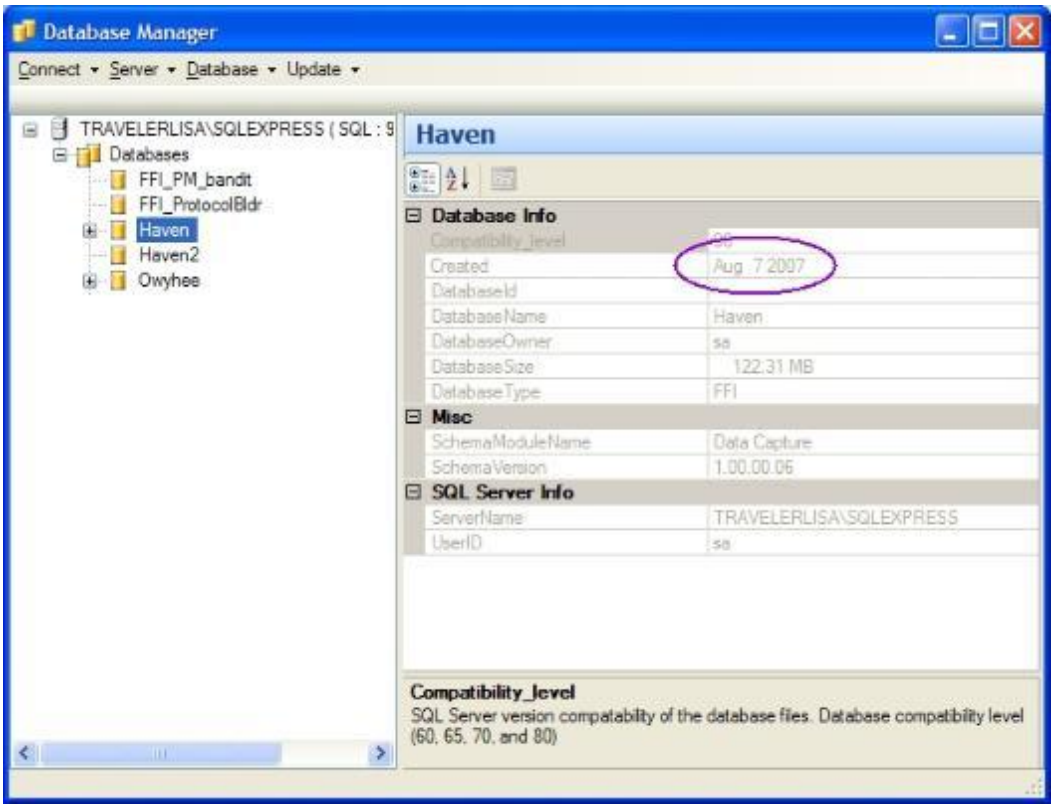


2. The *Database Restore* window opens. Enter the *Database Backup File Name* by clicking the top **Browse** button and navigating to the backup file (it has a .bak extension). Highlight the backup file and click **Open**. Leave the Database Restoration Location as the default. Click **Restore**. Depending on the computer speed and database size it can take several minutes for the database to be restored. During that time it will look as though nothing is happening.



3. Click **OK** to close the message window.

4. The **Haven** database is again listed in the **Database Manager** tree view in the left pane. Its new creation date is the date of the backup file used in the restoration.



NOTE: The Restore Database function can also be used to "import" a database to another computer in a remote location for analysis purposes. Keep in mind that any changes made to the copy on the remote computer cannot be recombined or "synchronized" with the source database.

Deleting a database

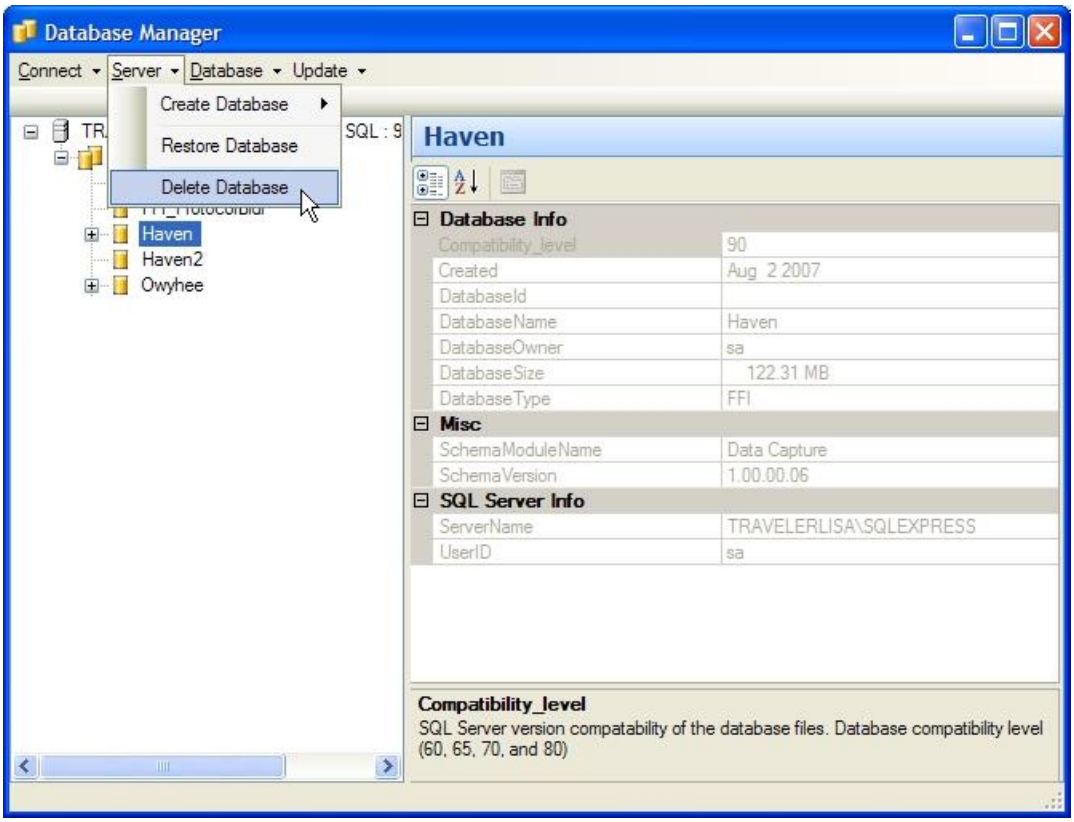
FFI administrators and managers can delete databases that are no longer required.

CAUTION: A deleted database can NEVER be recovered, but you can Restore a database from a backup file.

To delete an FFI database:

1. Highlight the name of the database to be deleted.

2. Click **Delete Database** in the **Server** menu.



3. If you are sure that you wish to delete the database, click **OK** in the confirmation window and the database will be deleted.

Managing users and user roles

CAUTION: Unless you are an experienced SQL Server user we suggest having all users sign in as "sa" using the sa password. This is the password you selected when SQL Server was installed.

If you set up individual SQL users and permissions be advised the FFI user and roles functionality is not working properly when multiple FFI databases are being used. If you have FFI data in more than one SQL database, every user must be given the administrator role to all databases.

This section covers:

- User roles and permissions
- Adding and deleting users
- Assigning and deleting user roles
- Password guidelines

User roles and permissions

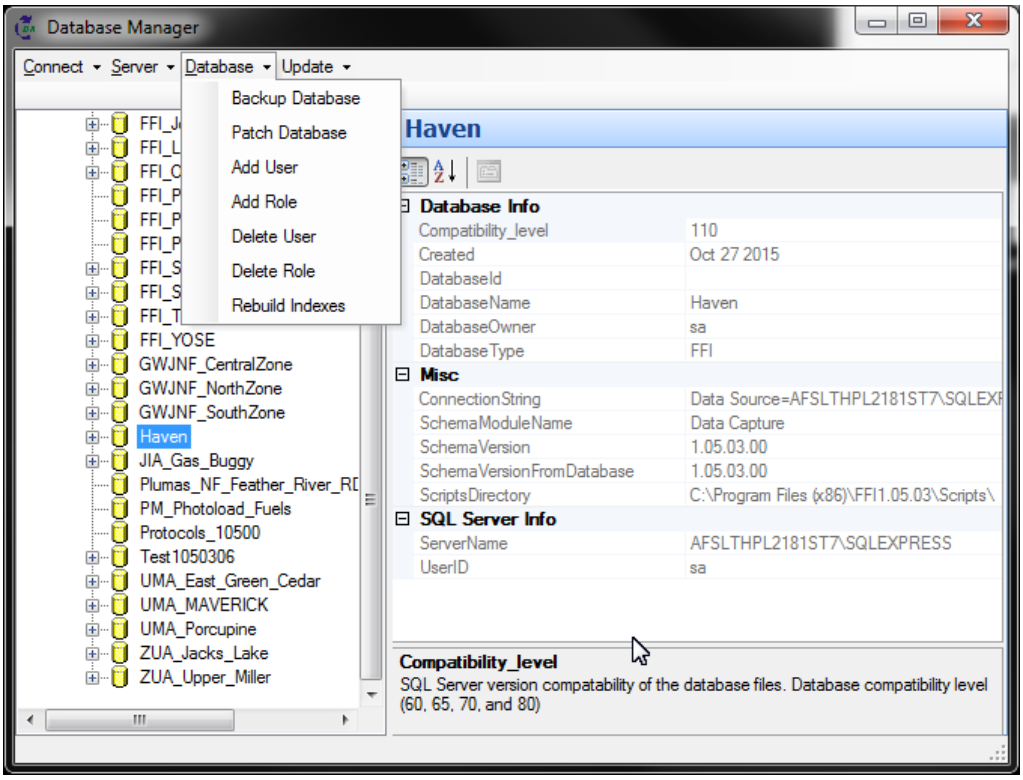
Four user roles are available in FFI. The range of tasks that you can perform is dictated by your role, which is assigned by your FFI administrator or manager. These roles are defined below.

1. Administrator
   - Performs any activity in FFI and in SQL Server.
2. Manager
   - Manages log-ins, adds and removes user IDs, and changes passwords.
   - Assigns user roles.
   - Creates, alters, and deletes databases; reads error logs.
   - Creates and edits administrative units, project units, and macro plots.
   - Imports new protocols and methods from the Protocol Manager module.
   - Cannot restore databases.
   - Cannot make changes in SQL Server instances.
3. Data entry
   - Creates macro plots and sample events.
   - Enters protocol data.
   - Runs reports and analyses.
   - Cannot access the Database Administration module.
   - Cannot create administrative units or project units.
4. Reader
   - Reads data.

- Runs reports and analyses.
- Exports queries and reports.
- Cannot access the Database Administration module.
- Cannot create administrative units, project units, macro plots, or sample events.

Adding and deleting users

FFI administrators and managers can create and delete user accounts for a database. Use the **Database** menu in the **Database Manager** to add and delete users.



Adding a new user

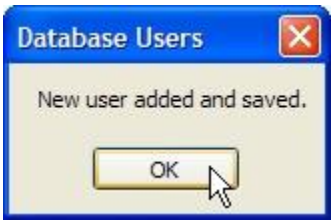
To add a new user:

1. Select the database name in the tree view of the **Database Manager**. In the example, above, a new user is to be added to the *Haven* database.
2. Click **Add User** in the **Database** menu.

3. Enter a name and password for the new user, and click **Save**.

*NOTE: Select a password that you can easily remember, since it cannot be retrieved if it is forgotten. See Password guidelines for help in selecting a password. This is your **sa** user (SQL) password, and you will use it each time you log on to FFI. Be sure to write your **sa** user password down in a safe place. Your **sa** user (SQL) password is different than your Windows password.*

4. Addition of the new user is confirmed. Click **OK** to close the confirmation window.



Deleting a user

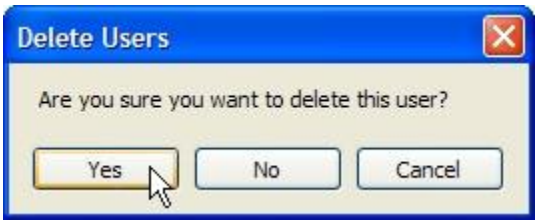
NOTE: No data is lost when a user or user role is deleted.

To delete a user:

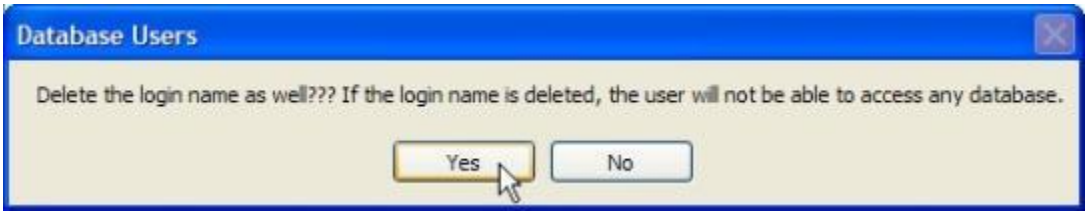
1. Select the database name in the tree view of the **Database Manager**. In the example, above, a user is to be removed from the *Haven* database.
2. Click **Delete User** in the **Database** menu.

3. Enter the name of the user to be deleted and click **Delete**.

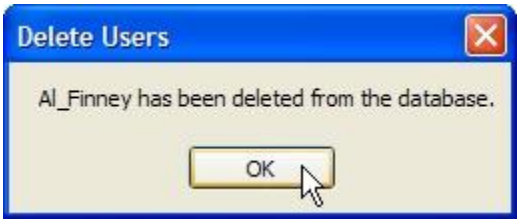
4. Click **Yes** to confirm that you really want to delete the user.



5. Click **Yes** to respond to the warning and delete the users login name.



6. Deletion of the user is confirmed. Click **OK** to close the confirmation window.



Assigning and deleting user roles

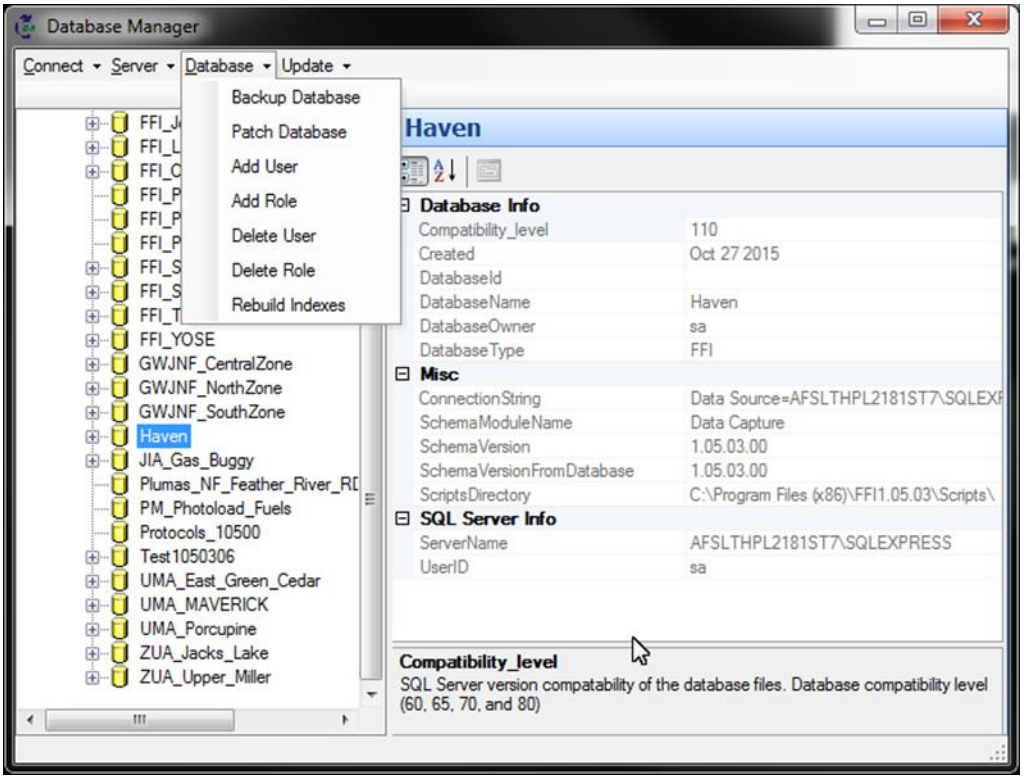
FFI administrators and managers can assign and modify or delete user roles for a database. Managing user roles helps to ensure the integrity of the database by allowing users access to only the tools and functions that they require to do their work. Use the **Database** menu in the **Database Manager** to handle user roles.

Note: The available user roles are Administrator, Manager, Data Entry, and Reader. See User roles and permissions for descriptions.

Assigning a role to a user

To assign a new role to a user:

1. Select the database name in the tree view of the **Database Manager**. In the example, a role is to be assigned to a user of the *Haven* database.
2. Click **Add Role** in the **Database** menu.



3. Enter the name of the user and select the desired role in the *Add Role* dropdown. Click **Save**.

4. Addition of the user new role is confirmed. Click **OK** to close the confirmation window.

Deleting a user role

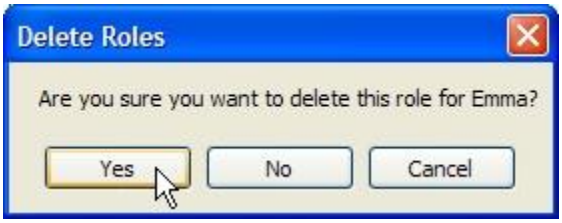
NOTE: No data is lost when a user or user role is deleted.

To delete a user role:

1. Select the database name in the tree view of the **Database Manager**. In the example, a role is to be deleted for a user of the **Haven** database.
2. Click **Delete Role** in the **Database** menu.

3. Enter the name of the appropriate user and select the role to be deleted in the *Role to Delete* field. Click **Delete**.

4. Click **Yes** to confirm that you really want to delete the user role.



5. Deletion of the user role is confirmed. Click **OK** to close the confirmation window.

Password guidelines

To ensure security, new FFI passwords should meet the following guidelines:

- The password does not contain all or part of the username.
- Passwords should be at least eight characters long. Some installations of Windows require passwords at least 12 characters long.
- The password contains characters from three of the following four categories:
  - Uppercase letters A through Z.
  - Lowercase letters A through Z.
  - Numerals 0 through 9.
  - Non-alphanumeric characters such as !, $, #, or %.

Using FFI

This section of the *User Guide* contains detailed procedures for:

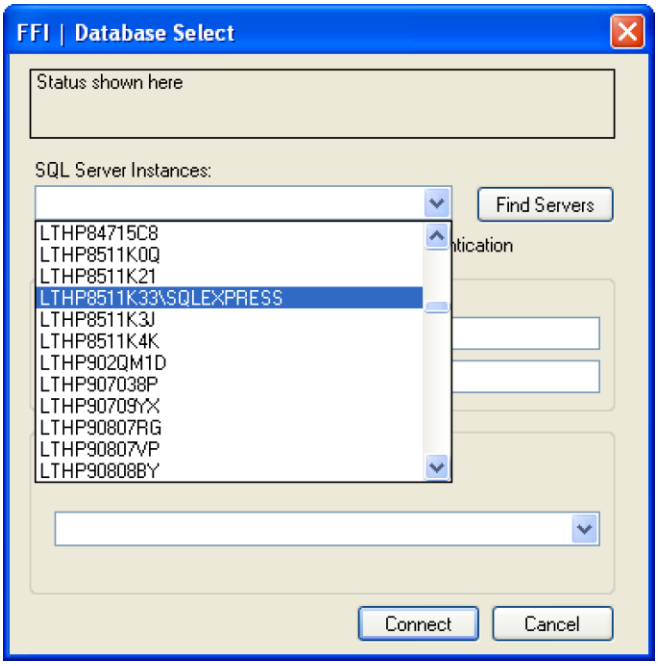
- Starting FFI
- Project management
- Data entry and edit
- Query
- Reports and analysis
- Species management
- Toolbox utilities

Also, see Data entry guidelines for general tips on entering data in FFI.

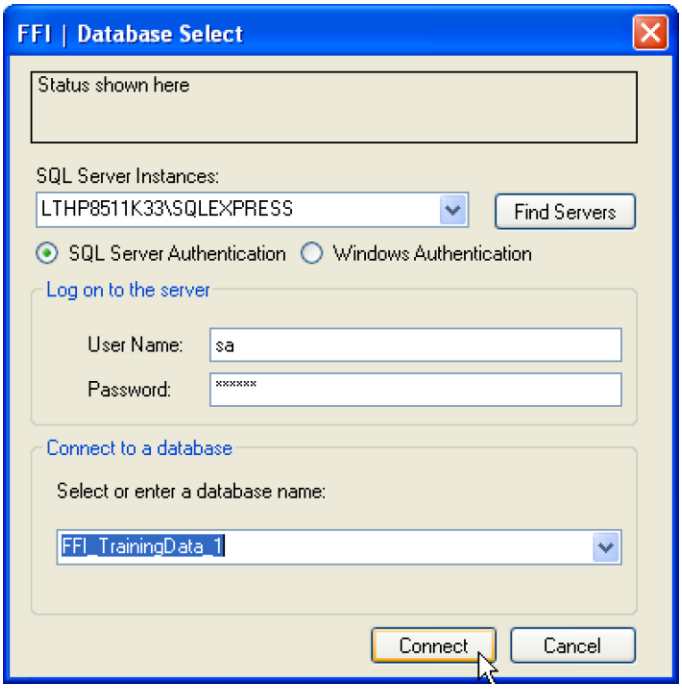
Starting FFI

To start FFI:

1. Double-click the **FFI** icon on your desktop or launch FFI from the *Start* menu.
2. If the SQL Server Instances field is blank click the **Find Servers** button. An hourglass will be displayed for up to a minute as the FFI locates SQL instances. When the hourglass disappears click the down arrow to see the available servers and select your SQL server instance from the dropdown menu.

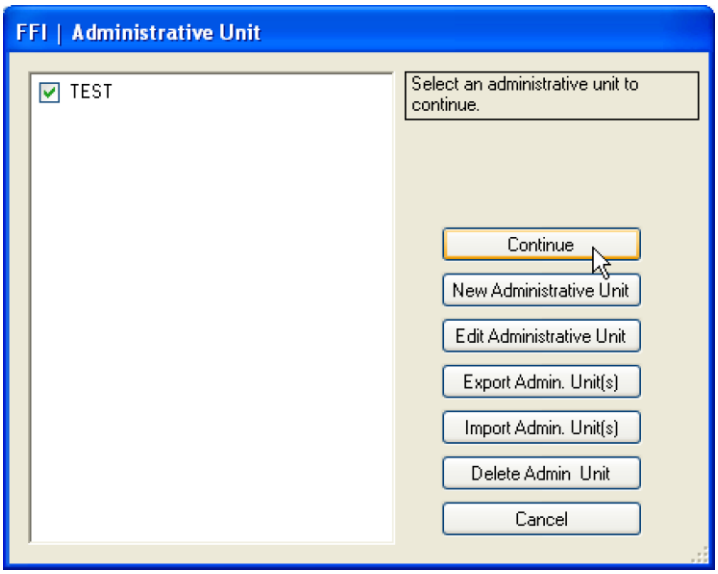


3. Enter the *User Name* and the SQL *Password* and click the down arrow on the *Select or Enter a Database Name* field. An hourglass will appear while the list is populated then the list will flash briefly. Click the down arrow again to select the database you want to connect to.



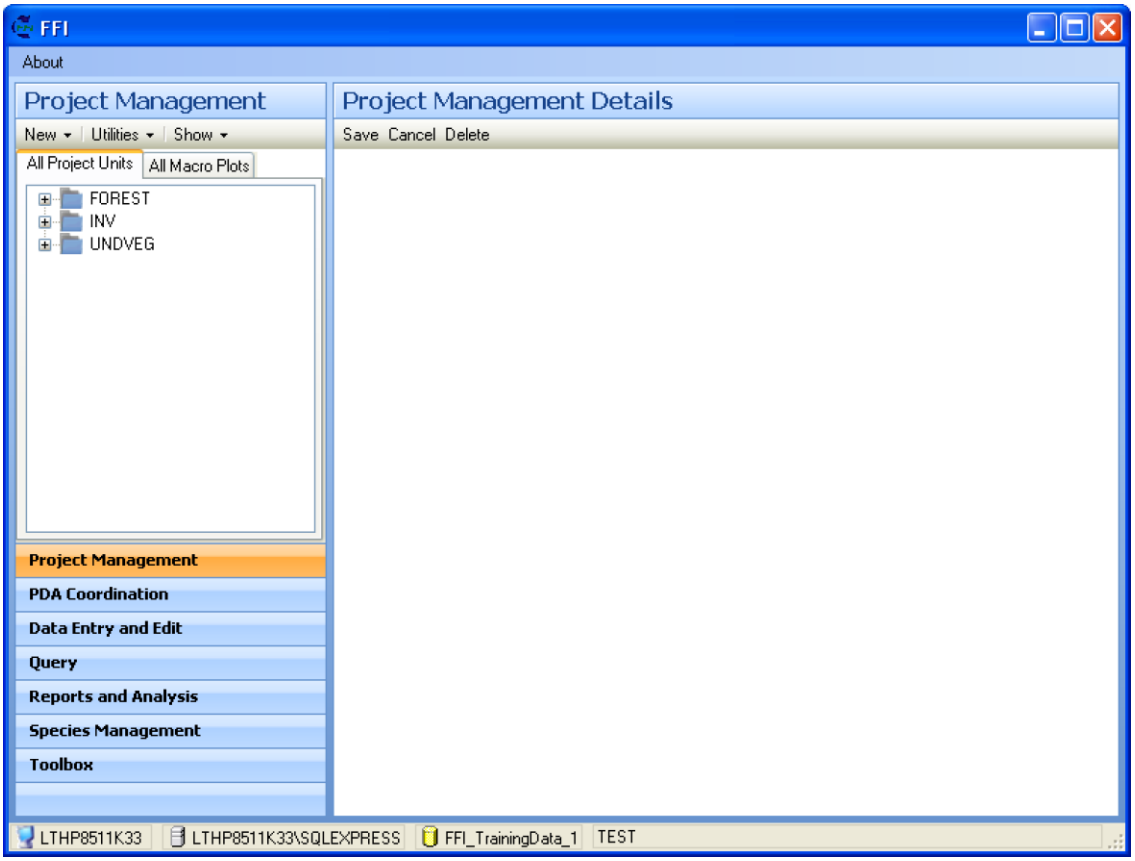
NOTE: If the Select or enter a database name menu is blank you have most likely entered an incorrect SQL password. You must re-enter the User Name AND Password when you re-attempt to log on to the server.

4. Create a *New Administrative Unit* or select the administrative unit you wish to work with and click **Continue.**



*NOTE: You can use this window to edit information about an existing administrative unit. Click the name of the unit and click **Edit Administrative Unit**. Make any necessary changes and click **Save**.*

5. The main FFI window opens. Note that your SQL Server database instance and administrative unit are identified in the footer of the window. Click the FFI module you wish to use and proceed (e.g., *Data Entry and Edit*).



The Attention icon

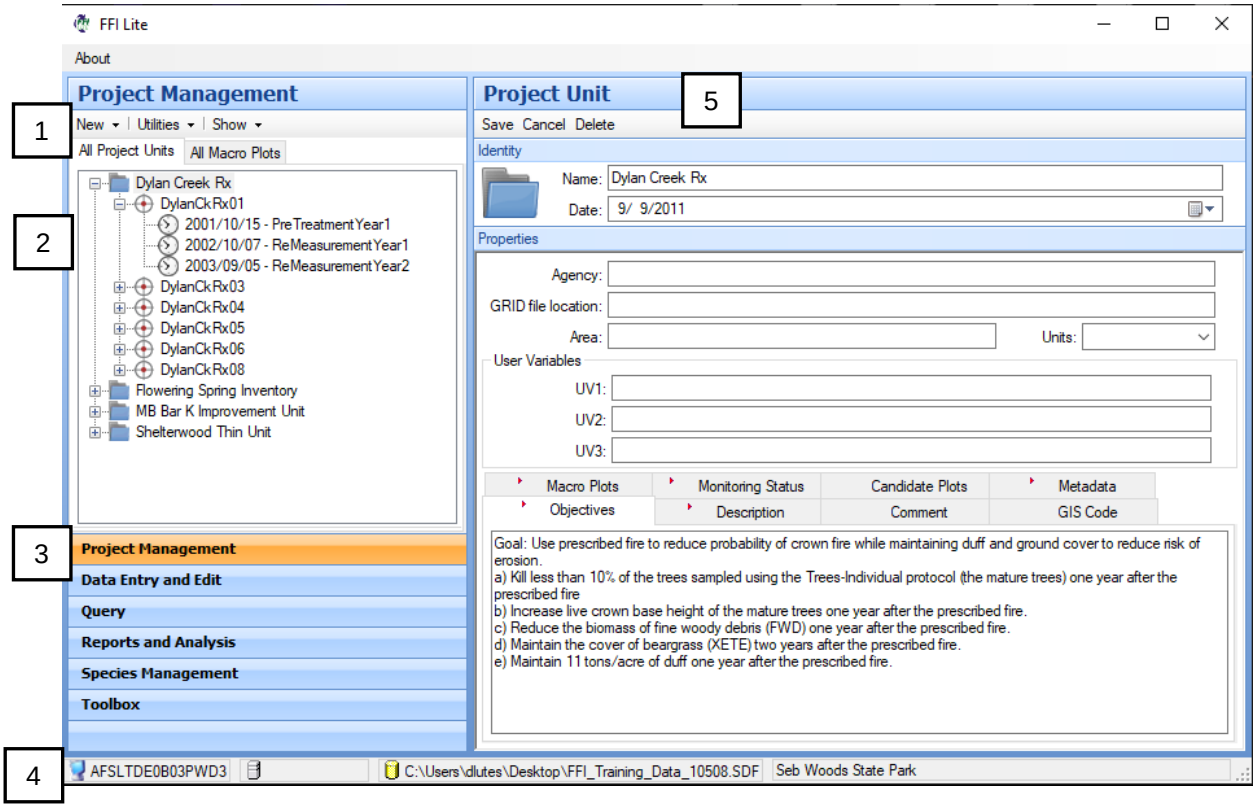
On many forms and input screens, you will see the Attention icon:. This icon indicates required or incorrect input. Mouse over the icon for messages about the required data. Once you resolve the errors and click **Save**, the Attention icon will disappear.

See also:

- FFI user interface
- Protocols and methods
- Project management
- Using FFI

The FFI user interface

The figure below shows the main FFI window. All user activities take place within this window, or within dialog boxes that are opened from this window. Each numbered component is described below.



Menu bar (1)

New menu: Batch Macro Plot Builder, Project Unit, Macro Plot, Sample Event, Change Monitoring Status

Utilities menu: Import Protocols, Import Project Units/Macro Plots, Export Project Units/Macro Plots, Macroplot Report, Sample Event Report, Project Unit Assignment Report, Change Monitoring Statuses, Export Sample Events to CSV

Show menu: The dropdown is divided into two sections: 1) Three checkboxes set the sample event information visible in the tree view to: a) show only the sample event date, b) only the assigned monitoring status or c) both. In the screen shot above, both date and monitoring status are visible for the *DylanCkRx01* sample events. 2) Two checkboxes modify the monitoring statuses that are visible when using right-click functionality to assign monitoring status: a) when *Show Only Unassigned Monitoring Status* only the unassigned monitoring statuses will be shown in the list and b) when the *Show All Monitoring Statuses* box is checked, all the monitoring statuses in the project unit will be shown but monitoring statuses already assigned will be grayed out and unavailable for assignment to the selected sample event. Changes on this menu are automatically saved. See Change Monitoring Status for an example.

Tree view(2)

This pane shows a tree view listing your project units, macro plots, and sample events. You can choose to list the **All Project Units** tab or **All Macro Plots** tab at the top of the tree view. The toolbar of the tree view changes to reflect the function that you select. Depending on which function is active, dropdown menus, toggle bars, or other controls will appear in the tree view toolbar. The Sample Event Report can be used to find plots assigned to a project unit.

Navigation button bar (3)

The navigation button bar lets you switch between the seven FFI functions. The current function is always highlighted.

Footer (4)

The footer remains the same while FFI is open. It identifies the current user, database server, database, and administrative unit.

Work pane (5)

All data entry, viewing, editing, analysis, and querying take place in the work pane or in dialog boxes that are called up from this pane. The work pane and its menus change to reflect the functions that you select.

Protocols and methods

FFI protocols and methods

FFI incorporates the field sampling methods used in FEAT and FIREMON as its standard methods and protocols. In addition, FFI adds several new protocols. The table below lists the standard protocols that are available. For descriptions of each, see About the FFI protocols in the Additional information section.

> *NOTE: FEAT and FIREMON users - see Comparison of sampling protocols in the Additional information section for a crosswalk between the FFI, FEAT, FIREMON, and FMH protocols and methods.*

Each of the standard protocols has its own forms, data summary reports, and data analyses. When you use the **Data Entry and Edit** function to enter monitoring data for a completed sample event, you will use familiar data entry forms that specifically correspond to each protocol that is assigned to the sample event.

STANDARD PROTOCOL	STANDARD PROTOCOL
ARS Cover Points	Biomass – Fuels*
Biomass - Plants	Canopy - Densiometer
CBI*	Cover - Line Intercept
Cover - Points	Cover - Points by Transect
Cover - Species Composition	Cover/Frequency
Density - Belts	Density - Quadrats
Disturbance History	FCCS*
Fire Behavior*	Logs - fixed-area
Photoloads	Pilot Sampling
Plot Description*	Post Burn Severity
Rare Plant Species	Surface Fuels
Surface Fuels - Alaska Duff/Litter	Surface Fuels - Piles
Surface Fuels - Vegetation	Trees
Trees - Individuals	Trees - Saplings (diameter class)
Trees - Seedlings (diameter class)	

* Single-record protocols – only one record per sample event.

Adding additional protocols and methods

To add other protocols and methods to support your monitoring program, install and run the **Protocol Manager** module, which is included in the FFI installation package.

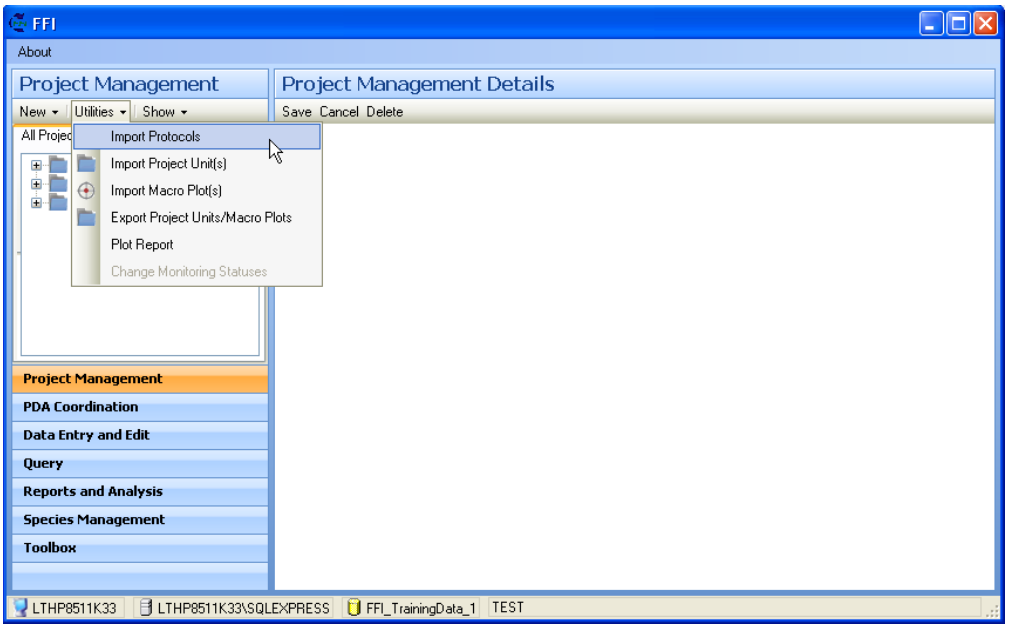
Importing protocols

FFI users with administrator or manager permissions can create new monitoring protocols in **Protocol Manager** and import them into FFI. After protocols are imported, they can be assigned to sample events (see Scheduling a sample event for information on assigning protocols). Importable files have a .pmd extension.

To import protocols:

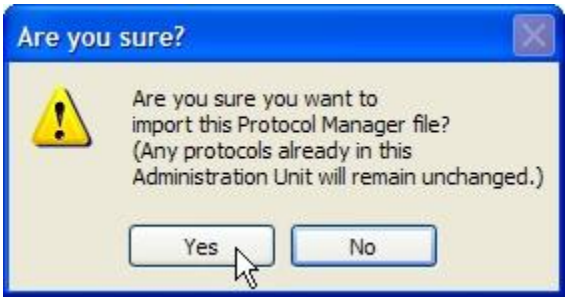
1. Select **Utilities > Import Protocols**.

   *NOTE: If you do not have the correct permissions, the **Utilities** menu will not appear in your FFI window.*

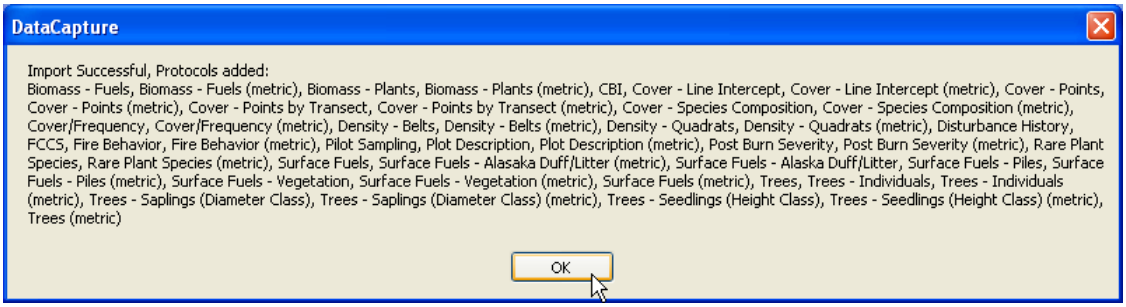


2. Navigate to the protocol file you wish to import and click **Open**. (The .pmd files are included in the installation file you downloaded from FRAMES and will be found in the temporary folder you created during the installation process.)

3. A query window opens. Review the message. To continue, click **Yes**. If you select **No**, your database will not be changed.



4. It may take up to 5 minutes for protocols to import. While they are importing an hourglass may or may not be displayed. A dialog will inform you when the protocols have imported. Click **OK**.



See also:

- Database administration
- Project management
- Using FFI

Project Management

The **Project Management** functions in FFI include:

- Working with Administrative units
- Working with Project Units
- Working with Macro Plots
- Working with Sample Events
- Batch Macro Plot Builder.
- Import/Export Utility
- Legacy Monitoring Status

NOTE: Your assigned role and permissions determine which functions you can perform in FFI. See User roles and permissions for more information or consult your FFI administrator.

Working with Administrative Units

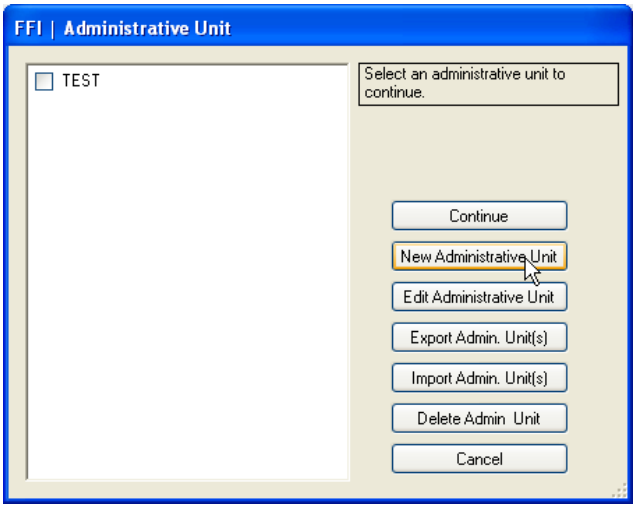
Administrative Units provide a way to intuitively organize your data. For instance, if you manage multiple refuge units, parks, or districts you can store the Project Unit, Macro Plot and Sample Event data for each unit within its own Administrative Unit. Local species lists are managed at the administrative unit. If you manage units with exceptionally different species, then storing the data for each management unit in a separate Administrative Unit may make sense. If species do not vary greatly across management units then using one Administrative Unit for all data will likely be a better choice. A potential cost of using multiple Administrative Units is that data from different administrative units cannot be simply combined for analysis.

Creating a new Administrative Unit

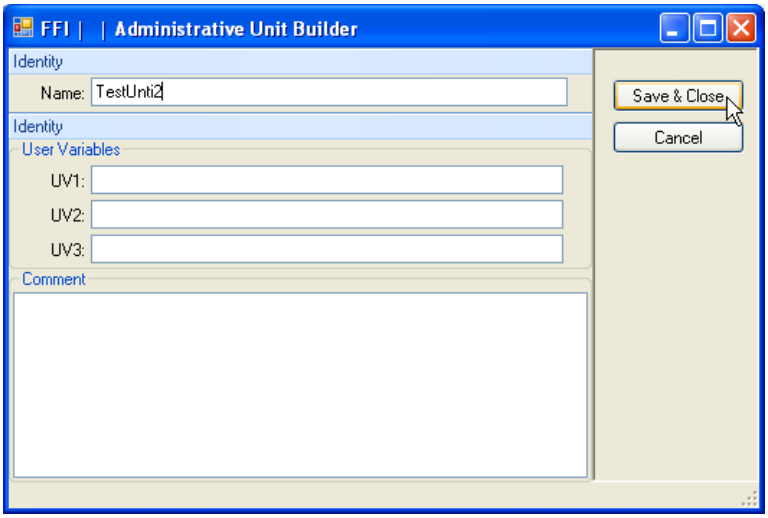
To create a new administrative unit:

1. Open FFI and log on to your database.

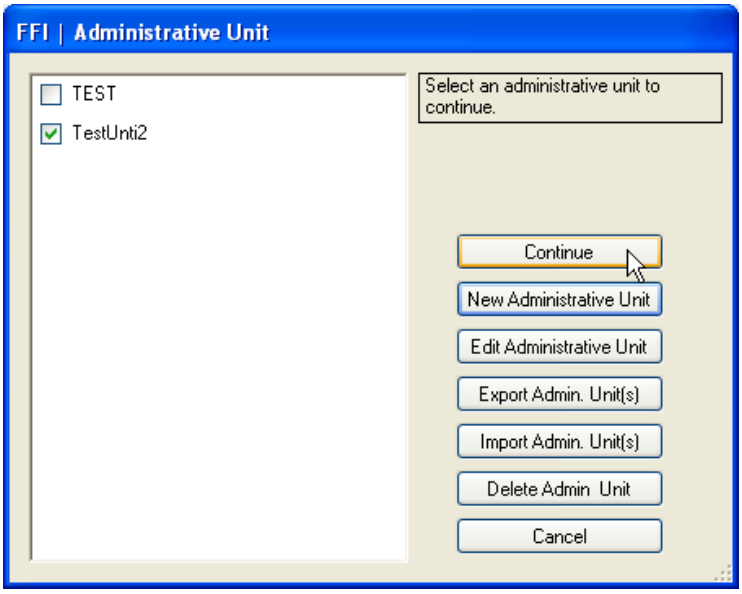
2. The **Administrative Unit** window opens. This window lists any administrative units that currently reside in the database. Click **New Administrative Unit**.



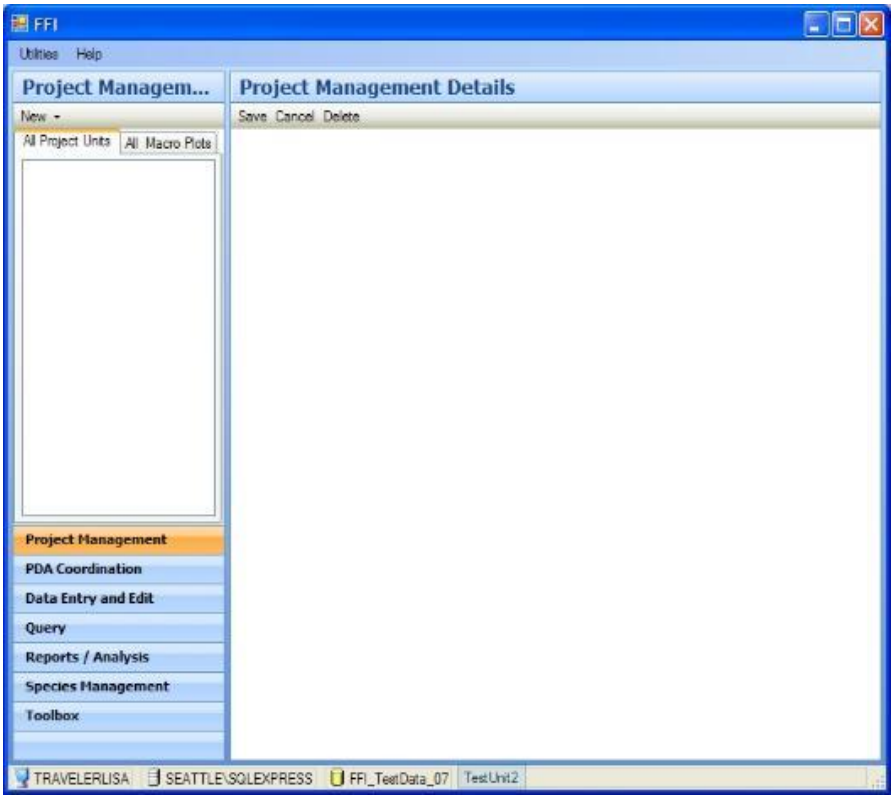
3. The *Administrative Unit Builder* opens. Name the new administrative unit and add any descriptive comments. If you wish, you can use the user variable fields to further describe the administrative unit. Click **Save & Close** when finished.



4. The new administrative unit will be listed in the left pane of the *Administrative Unit* window. Select its radio button and click **Continue**.

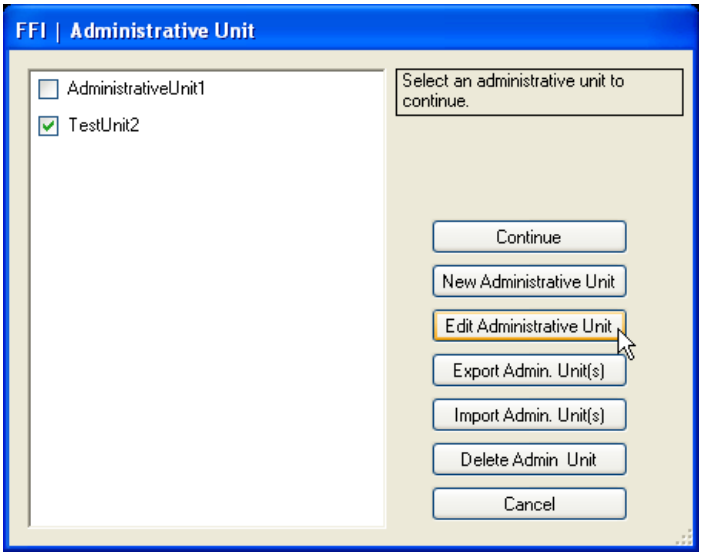


5. The *Project Management* window opens. Note that the name of the new administrative unit appears in the footer of the window.

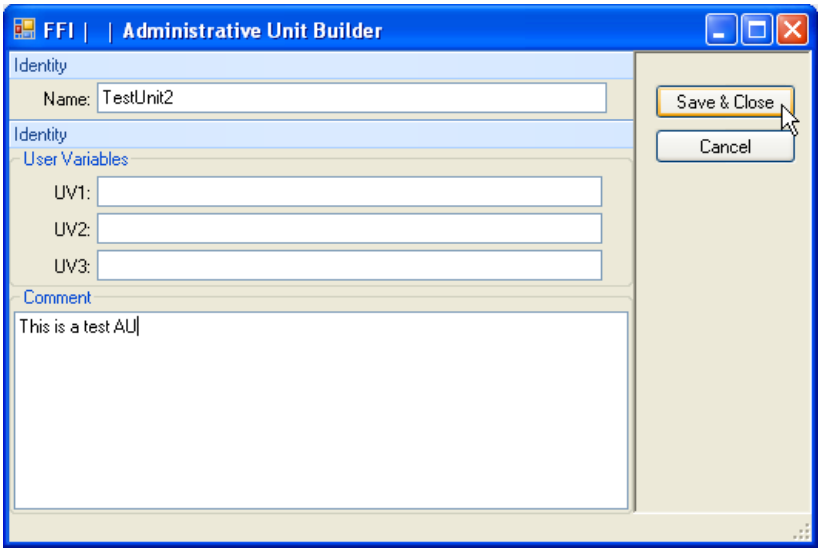


Editing information about an Administrative Unit

You can edit information about an Administrative unit by clicking on the *Edit Administrative Unit* button.



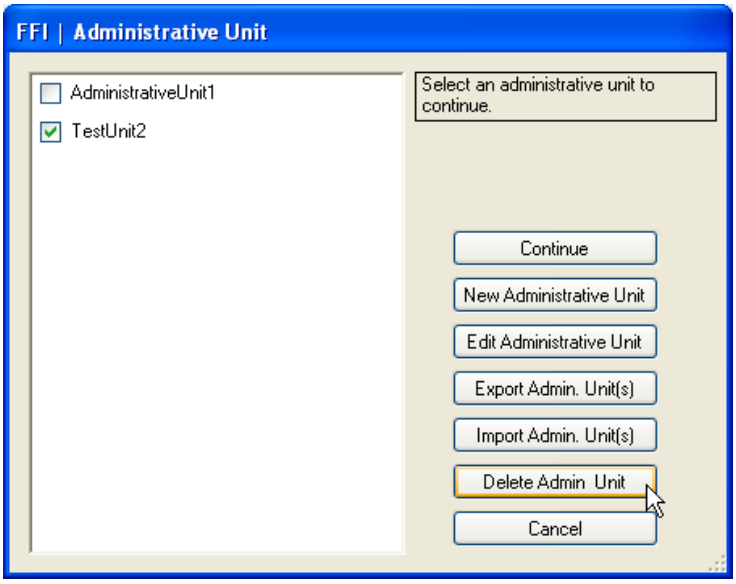
Add or change the data fields and click **Save & Close**.



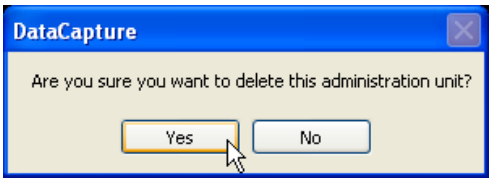
Deleting an Administrative Unit

1. You can delete an entire administrative unit by clicking **Delete Admin. Unit** button.

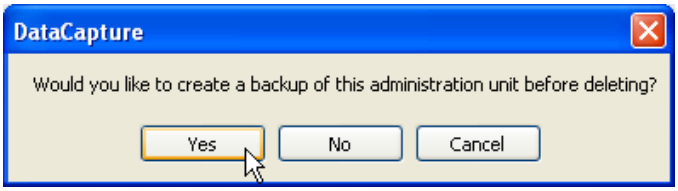
CAUTION: This is a powerful function that should be used carefully.



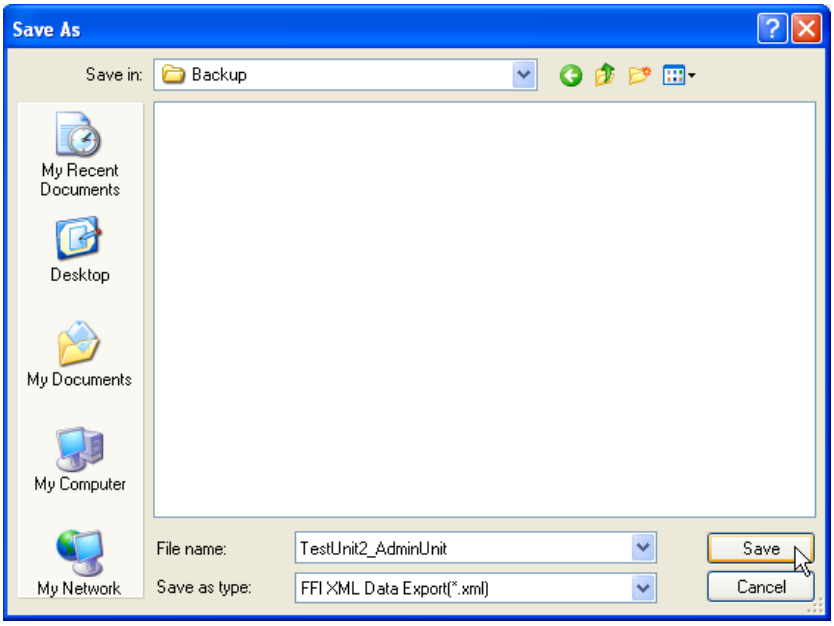
2. Click **Yes** to continue or **No** if you do not want to delete the administrative unit.



3. You will be asked if you would like to export a copy of the administrative unit. Select **Yes**.

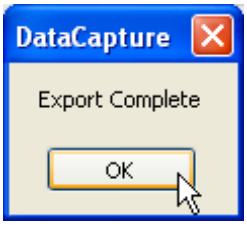


4. Select a location and filename for the export file.



NOTE: The administrative unit backup file is saved as an .xml file. To restore this file use the Import Administrative Unit *function when you log into FFI. You cannot restore an .xml file in* ***FFI Database Administration****.*

5. A progress bar will be displayed as the administrative unit is exported and a dialog will inform you when complete.



See Importing an Administrative Unit for more information.

Working with Project Units

This section covers:

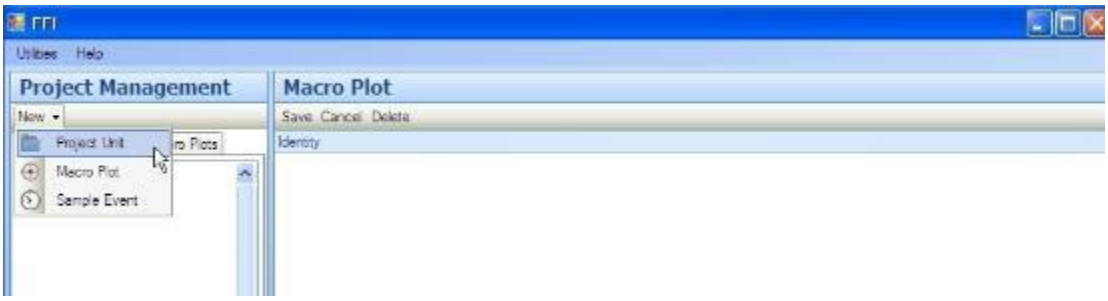
- Creating project units.
- Editing project units.
- Deleting project units.

Creating a new Project Unit

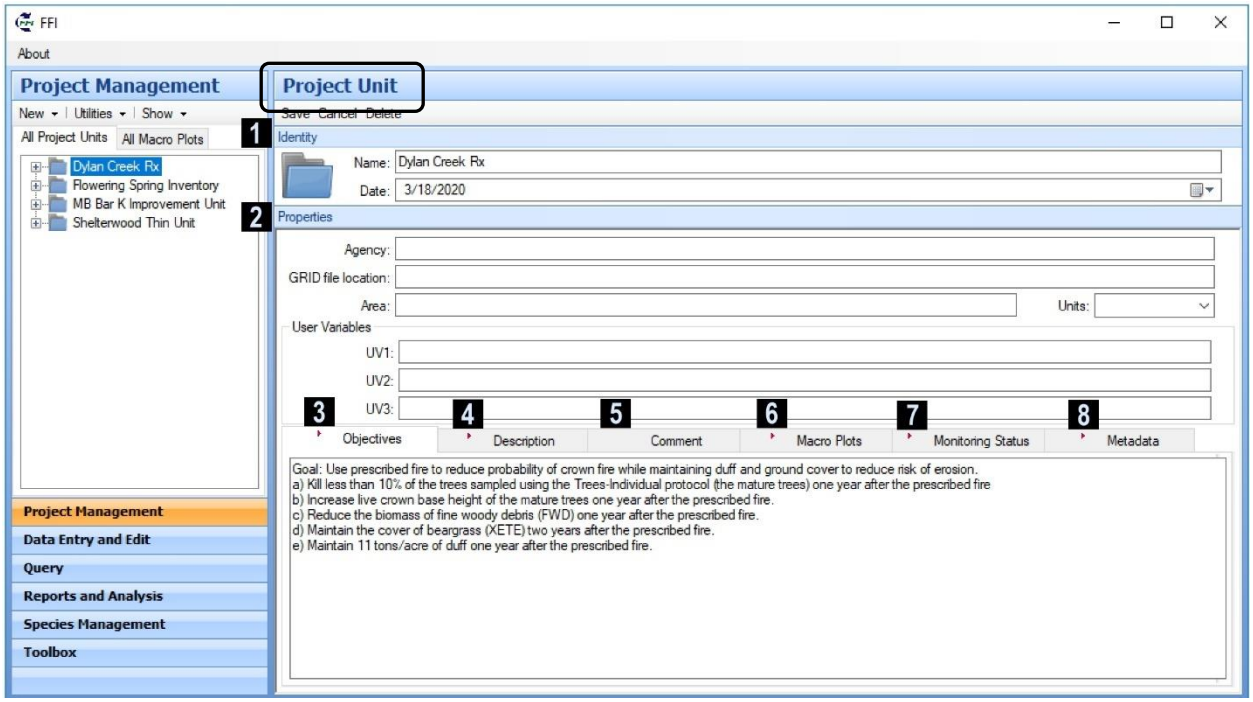
In FFI, a Project Unit is defined as a division of the entire sample population of the administrative unit.

Project Units are usually defined so that they represent an area on the ground. For example, a project unit could consist of "all areas in the Ponderosa vegetation type between 1500 and 2000 meters above sea level, more than 500 meters from the nearest road, and more than 1000 meters from the nearest stream." Project units provide a means to functionally group macro plots for management and analysis. They can be defined so that they overlap spatially, and you can associate macro plots with multiple project units.

To create a new project unit, select **New > Project Unit**. The **Project Unit** window opens.



The **Project Unit** pane contains data entry fields and forms, accessed through a series of tabs, with which you can fully describe the new project unit. The numbered paragraphs in this section correspond to the numbered functions in the window, as identified out below.



1. Add **Identity** information for the new project unit.
    - *Name*. Enter a meaningful name for the unit.
    - *Date*. The default is the date that you create the project unit. Use the dropdown calendar or enter text to select a different date.

2. Add **Properties** information about the new project unit.
    - *Agency*. Enter the agency name.
    - *GRID file location*. This is the file location of the GIS layer, if used. This field will auto-fill if the project unit is spatially defined.
    - *Area*. Enter the number of acres or hectares contained in the project unit.
    - *Units*. Use the dropdown to select *acres* or *hectares*.

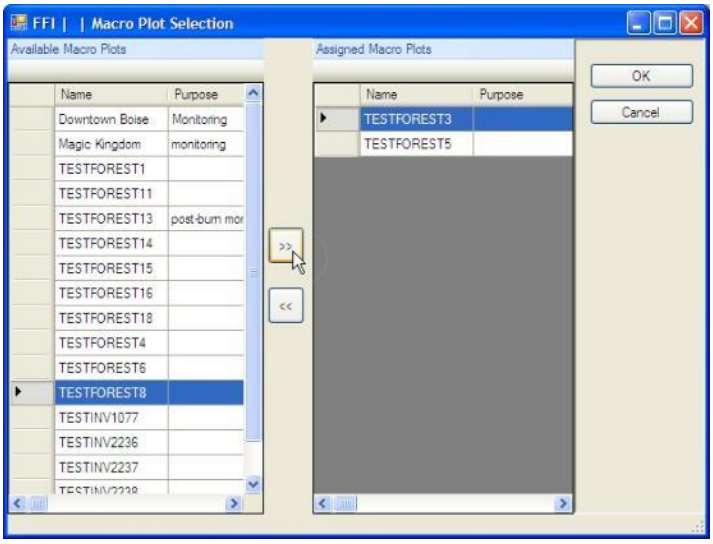
3. Include the **Objectives** for the activities applied in the project.

4. Add a **Description** of the project.

5. Enter any **Comments** regarding the project as a whole

6. **Macro plots** tab. In this tab, click **Assign Macro Plots** to open the **Macro Plot Selection** form, which lets you assign macro plots to a project unit. Select the desired macro plots from the left-hand pane and assign them to the project unit by clicking the **>>** arrow. Click **OK** when finished. The assigned macro plots will be listed in the **Macro plots** window after you save your work. Macro plots may be assigned to more than one project unit. When multiple assignments are made the monitoring statuses assigned to the sample events are maintained in the new project unit.

NOTE: Use the **<<** *and* **>>** *arrows to add or remove macro plots from the* Assigned Macro Plots *pane.*



NOTE: After you complete data entry in a form field, click ***Save*** *at the top of the* ***Project Unit*** *pane.*

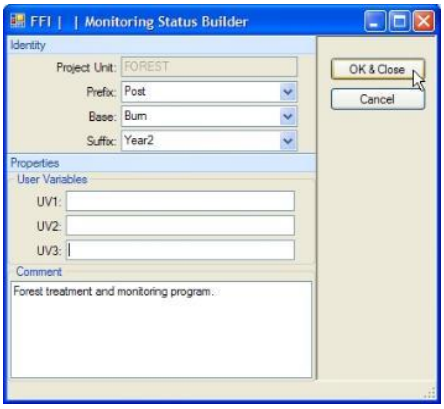
7. **Monitoring status** tab. This tab contains the **Monitoring Status Builder**, which lets you add, edit, delete, and order monitoring status for a project unit. Monitoring status identifies the project unit's status in time in relationship to a treatment or disturbance.

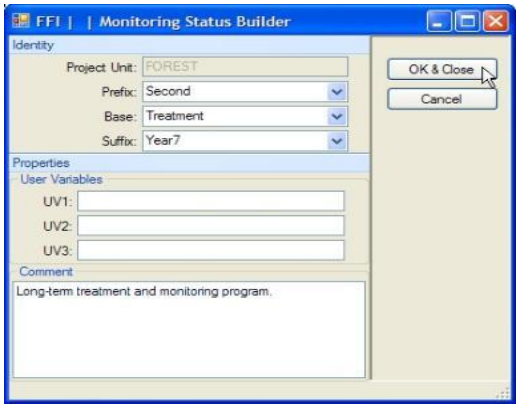
   *NOTE: You can assign monitoring status for a sample event in **Reports and Analysis** or **Utilities > Change Monitoring Statuses** in **Project Management**. For information on using monitoring status in analysis, see Reports and Analysis setup.*

   Click **Add** to open the **Monitoring Status Builder**. After you have assigned monitoring statuses to each project unit, the status list can be edited or deleted, and rearranged in any order. You can either assign the standard criteria listed below or enter your own.

   - **Prefix**: Pre, Post, Re.
   - **Base**: Burn, Disturbance, Measure, Treatment.
   - **Suffix**: Years 1 - 5.

   In the first example, the monitoring status uses the standard criteria and is Post-burn Year 2. In the second example, the status descriptors have been customized to meet a specific program need.

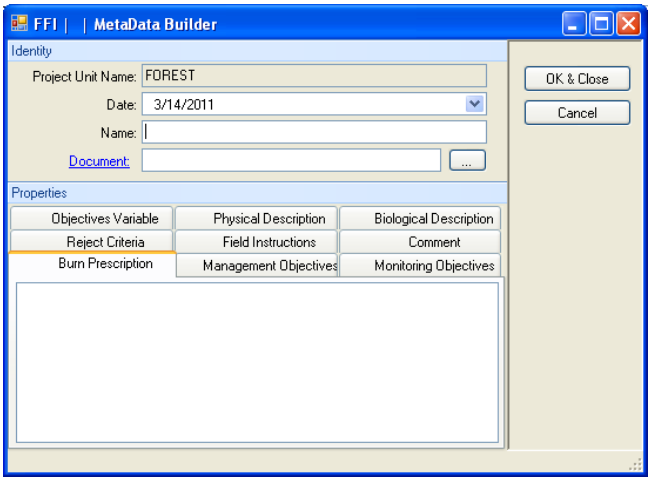




   When you are finished assigning monitoring status, click **OK & Close**.

   NOTE: Also see the Monitoring Statuses section.

6. **Metadata** tab. To add metadata to further describe the project unit, click the **Metadata** tab and select **New.** The *Metadata Builder* window, shown below, opens.



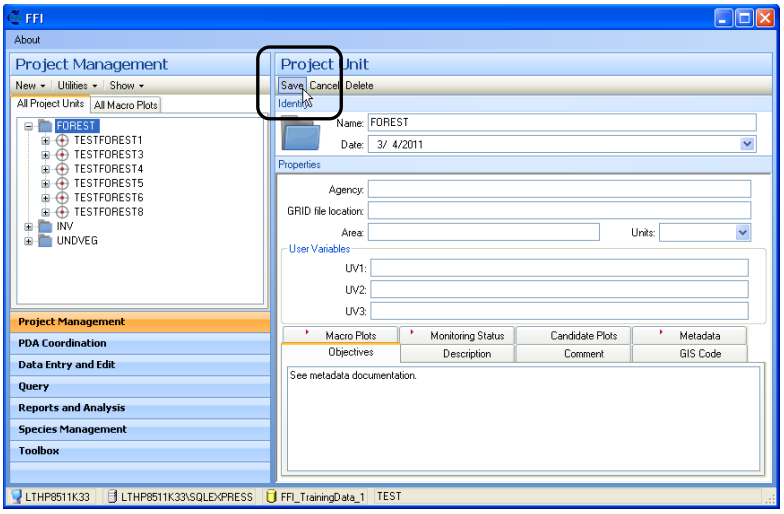
- You can cut and paste text, such as existing documentation about the project unit, into the metadata tab text fields, or enter text directly. Metadata can be added, edited, or updated at any time. Text can be copied and pasted into a word processing package for formatting and printing.
- Metadata records are labeled and sorted by date. Accept the default date or use the calendar to select another date for the record.
- Link to a separate document be adding the path in the *Document* field. This is especially useful if the metadata documentation is already in electronic form and/or contains images (which can't be displayed in the tabbed fields). See the Suggested File Structure section for information about where to store electronic documentation.
- After entering data, click **OK & Close** to save the record. The record will be listed within the **Metadata** tab in the *Project Unit* details window.

Editing a project unit

To edit an existing project unit:

1. In the **Project Management** tree view, highlight the project unit to be edited. The **Project Unit** window opens.

2. Make any necessary changes or updates to the data in the *Project Unit* window and click **Save**.

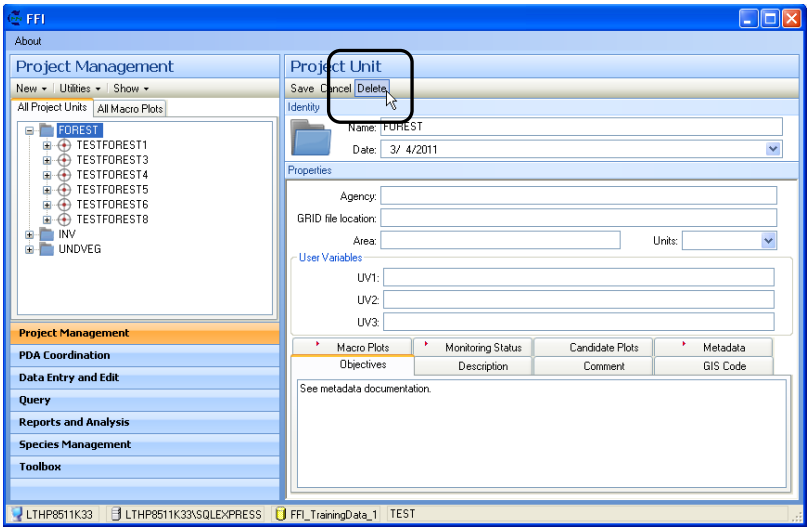


Deleting a project unit

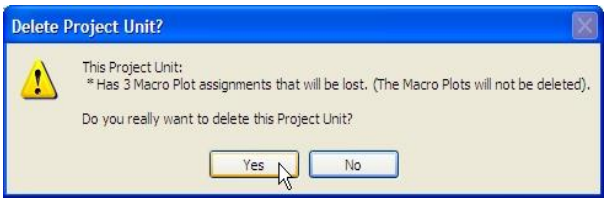
Project units can be deleted from the main *Project Unit* window. You might want to delete a project unit if it was initially set up incorrectly, or after a project has been completed. Deleting a project unit does not affect your macro plots or collected and stored data.

To delete a project unit:

1. In the tree view in the main *Project Management* window, highlight the project unit to be deleted.
2. Click **Delete** at the top of the *Project Unit* window.



3. Click **Yes** in the confirmation box, as shown below.



NOTE: Any assigned macro plots will be retained, although the linkage to the project unit will be lost.

Working with Macro Plots

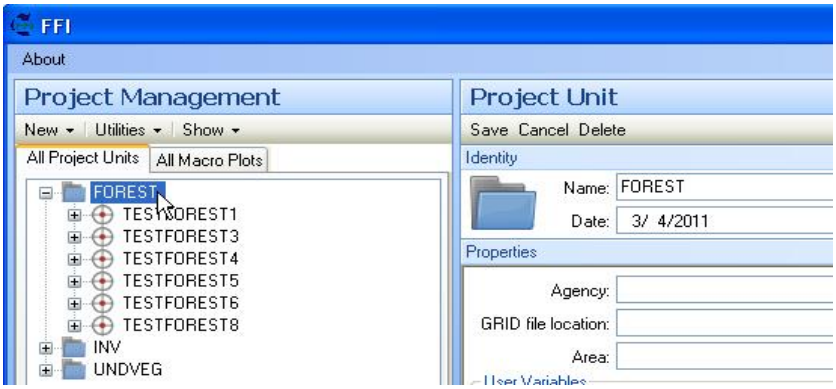
This section covers:

- Creating macro plots individually.
- Creating macro plots in the Batch Macroplot Builder
- Editing macro plots
- Deleting macro plots

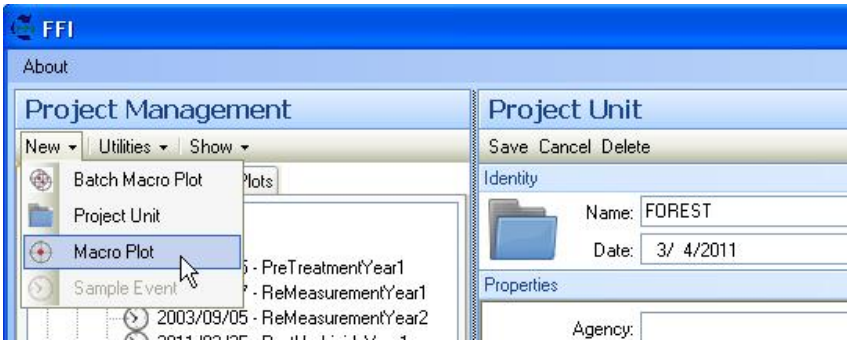
Creating a macro plot individually

NOTE: A macro plot is a geographic sample point within a project unit that has a specific area around which method data are collected.

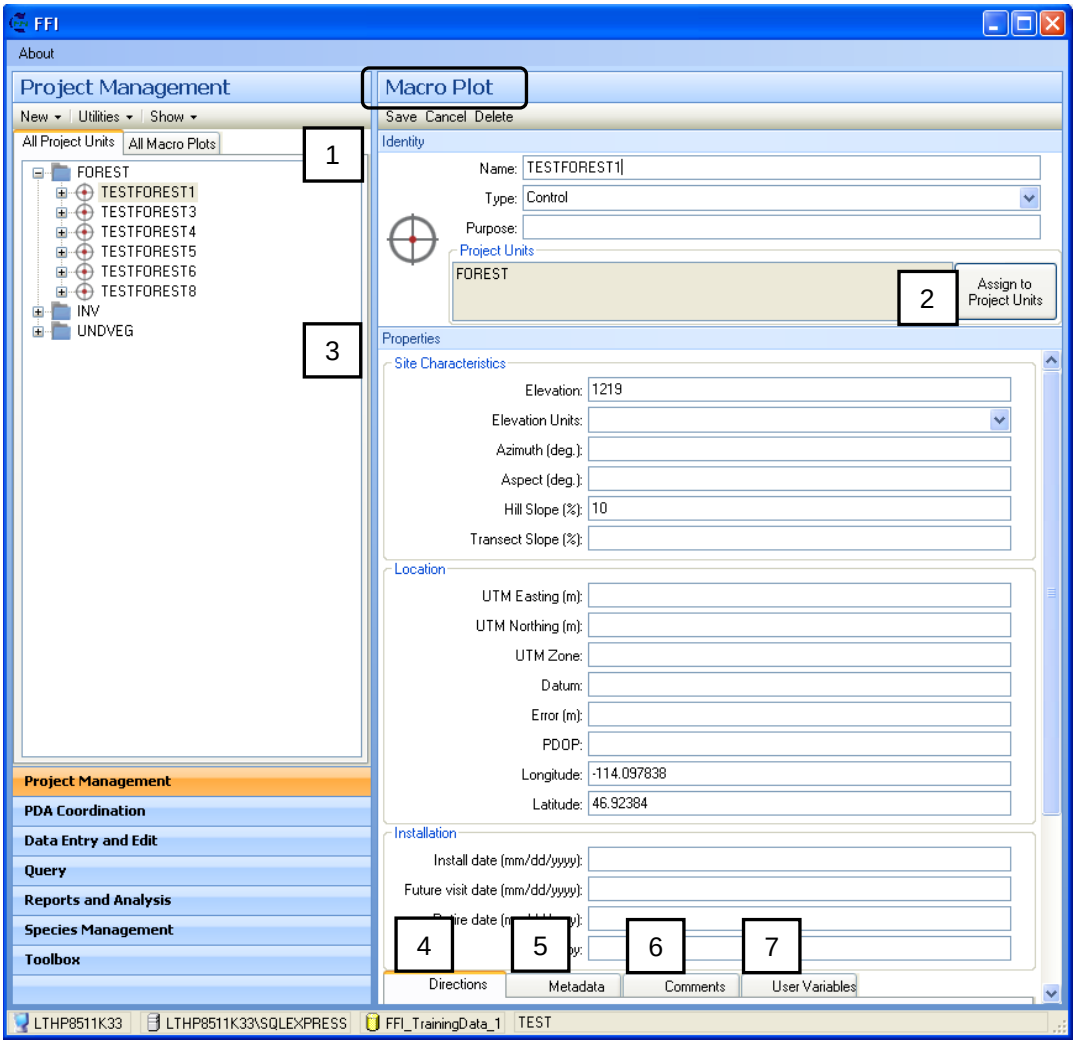
To create a new macro plot in a project unit: in **Project Management** click once on the desired project unit folder to highlight it.



Select **New > Macro Plot**.



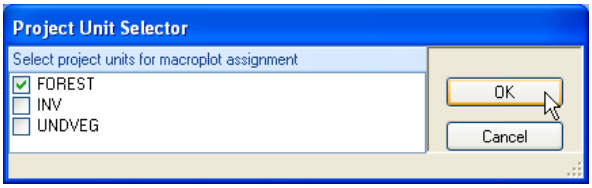
The *Macro Plot* window opens. The numbered sections correspond to the functions in the *Macro Plot* window, described below.



1. Add **Identity** information for the new macro plot.
    - *Name*. Add a meaningful name for the macro plot.

- *Type*. Use the dropdown menu to select the appropriate plot type.
- *Purpose*. Briefly describe the purpose of the plot.

2. To assign the macro plot to a new or different project unit, click the **Assign to project units** button. Available project units will be listed in the **Project Unit Selector**. Check the appropriate checkboxes and click **OK**.



NOTE: A macro plot can be assigned to more than one project unit.

3. Add **Properties** information for the new macro plot, using dropdown menus where provided to assign values.

   - *Site Characteristics*:
     - *Elevation*
     - *Elevation Units*
     - *Azimuth*
     - *Aspect*
     - *Hill slope*
     - *Transect slope*
   - **Location**:
     - *UTM Easting*
     - *UTM Northing*
     - *UTM Zone*
     - *Datum*
     - *Error (m)*
     - *PDOP*
     - *Longitude (decimal degrees)*
     - *Latitude (decimal degrees)*
   - **Installation:**
     - *Install date* - Enter the date when the macro plot was created.
     - *Retire date* - Enter a date when the macro plot will no longer be used.
     - *Located by* - Enter the name of the individual who located the macro plot.

4. In the **Directions** tab, enter direction and location data in the *Start Point* and *Directions* fields.
5. In the **Metadata** tab, enter metadata as appropriate.
6. In the **Comments** tab, add comments as appropriate.
7. In the **User Variables** tab, enter any additional notes or criteria that pertain to the macro plot. You can add up to eight strings of information.

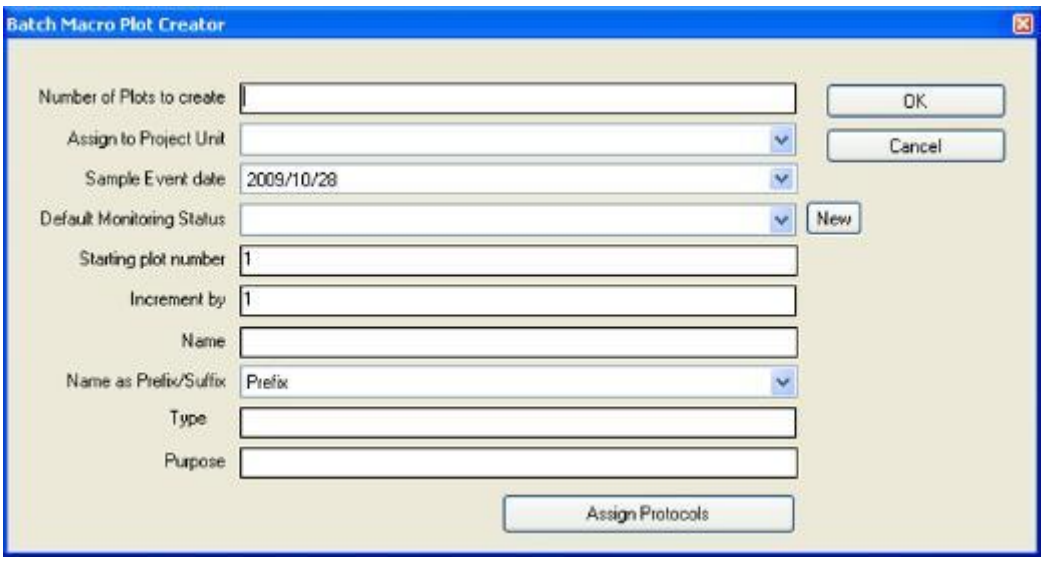
NOTE: The data that you enter as user variables can be used for stratifying, filtering, reporting, or analysis.

8. Click **Save** to save the new macro plot.

Batch Macro Plot Builder

Batch Macro Plot Builder simplifies adding a number of macro plots with one sample event each. If you want to create macro plots individually see the Creating a macro plot individually section.

To open the batch macro plot builder select **Project Management** in the navigation bar and select **New > Batch Macro Plot** from the menu bar above the Tree View. The *Batch Macro Plot Creator* screen will open. Enter information to create the desired number of Macro plots and the associated data. The fields are described below.



Batch Macro Plot Builder field descriptions

Number of Plots to create: (Required; Positive integer). Maximum number of macro plots you can create at one time = 999. Each new macro plot will have one sample event assigned to it.

Assign to Project Unit: (optional; text). Assign new macro plots to a project unit by selecting one from the dropdown list or typing in a new project unit name. If a new project unit name is entered it will be added to the tree view. If no project unit name is entered plots will be added but not assigned to a project and the new plots will only be visible when the **All Macro Plots** tab is selected in the Tree View.

Sample Event Date: (required; date format). By default this is set to the date the macro plots are created in **Batch Macro Plot Builder**. You can accept the default or change it if desired. When entering field data in FFI the sample event date should be changed to the date the data were collected in the field.

Default Monitoring Status: (optional; text). Select from the dropdown or click **New** to add a new default monitoring status. The default monitoring status is provided as a way to track why the sample event was initially created. If a default monitoring status is entered it will be automatically by the assigned monitoring status used in **Reports and Analysis**. Note that, the assigned monitoring status used in **Reports and Analysis** can be different than the default monitoring status assigned the plot in **Project Management**.

Starting Plot Number: (required; integer). By default, this is set to 1. Maximum is 999. Longer numbers can be accommodated by using this field in combination with the *Name* and *Prefix* options below. The plot number will be three digits long with leading zeros. This ensures proper sorting in the macro plot tree view. Negative plot numbers are valid but do not display well in the tree view.

Increment By: (required; integer). Default is 1. Used to increment plot numbers.

Name: (required. text. concatenated with the *Macro Plot Number* to create the complete macro plot identifier. If setting plot numbers greater than 999 then include digits in the name.

Name as Prefix/Suffix: (required; set as Prefix or Suffix). Orders the macro plot name relative to the macro plot number. E.g., If set to Prefix then *Plot001*, if set to Suffix then *001Plot*.

Type: (optional; text). Populates the *Type* field for the macro plot in **Project Management**. Select from the dropdown list or add your own.

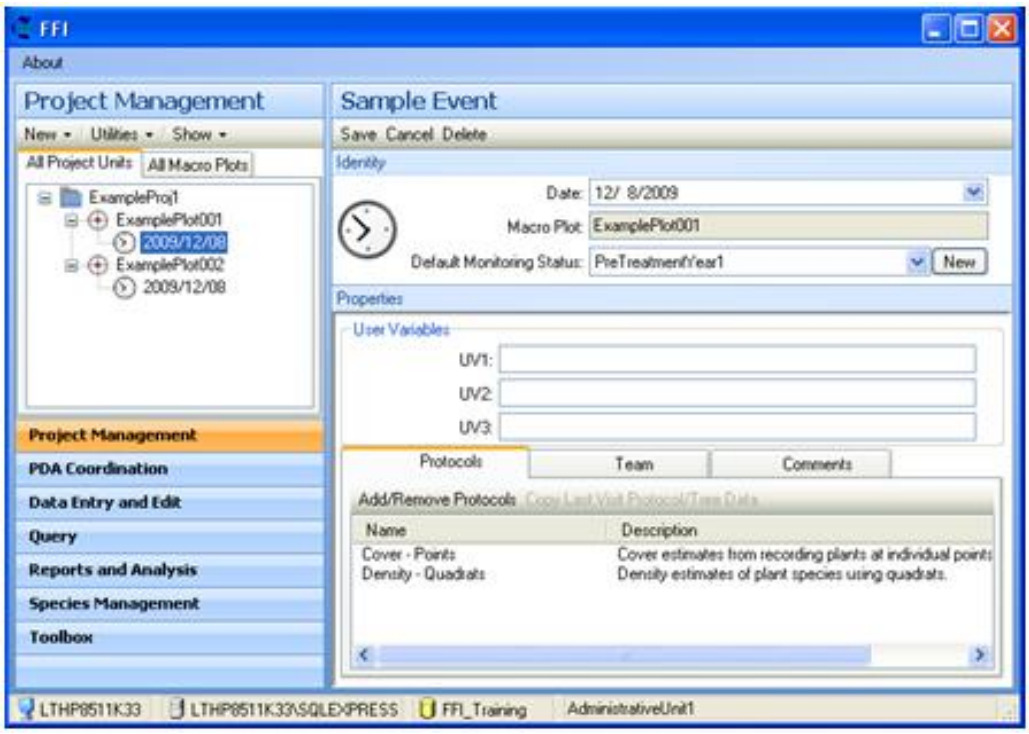
Purpose: (optional; text). Populates the *Purpose* field for the macro plot in **Project Management.**

Assign Protocols: (optional; protocol list). Click to select protocols to all the new macro plot/sample events. If no protocols are selected they can be added in **Project Management**.

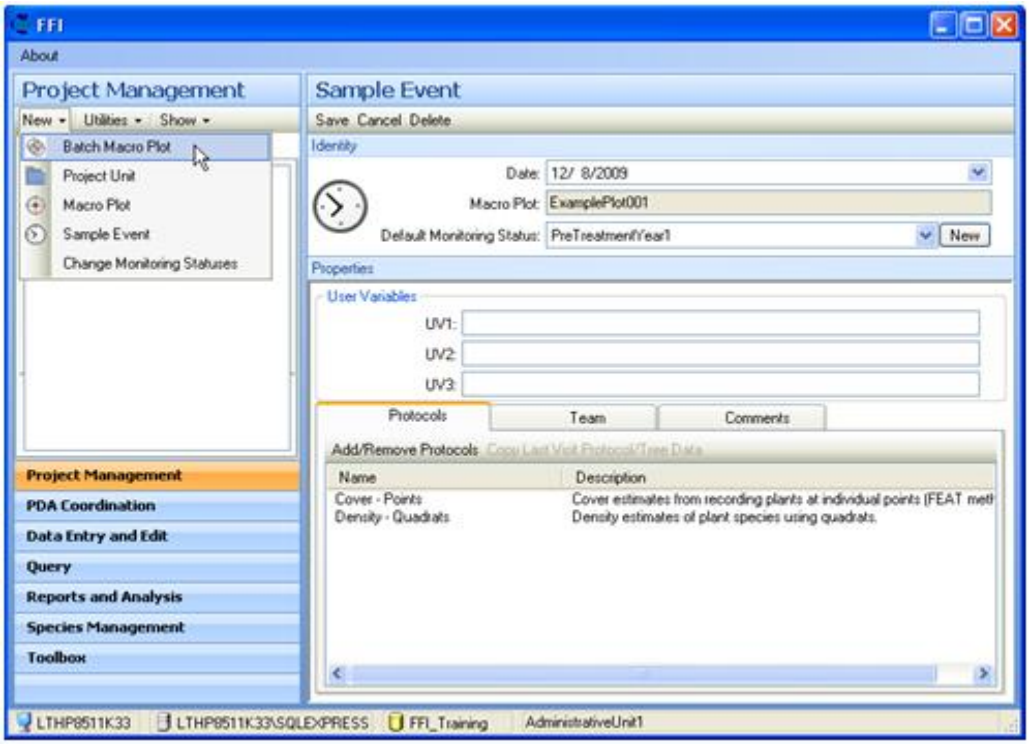
Batch Macro Plot Builder example

In this example four new macro plots will be added to an existing project. Each new macro plot will have one sample event and will have the *Cover - Points* and *Density - Belts* protocols assigned to them.

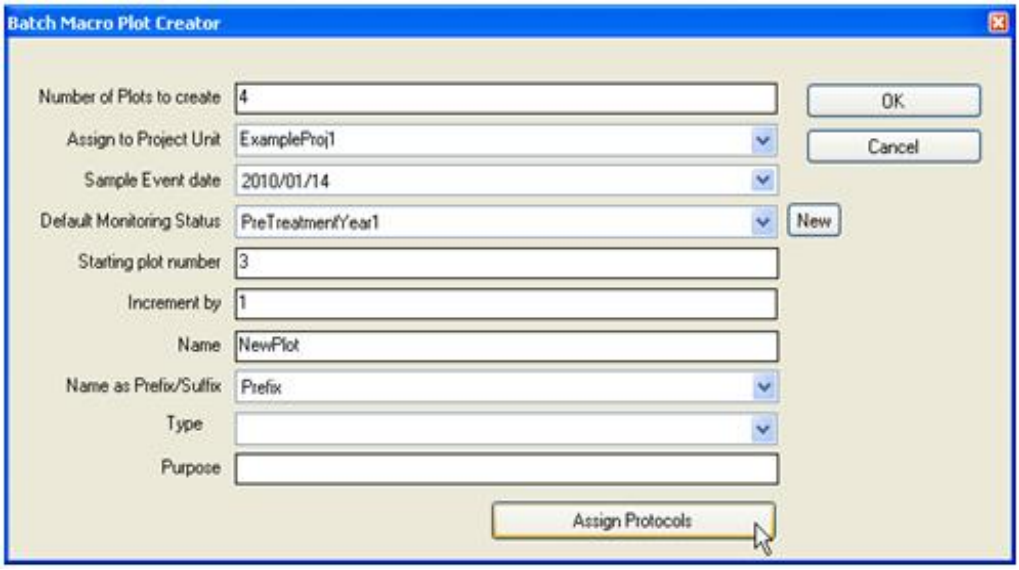
This is what the **Project Management** window looks like before the macro plots are added.



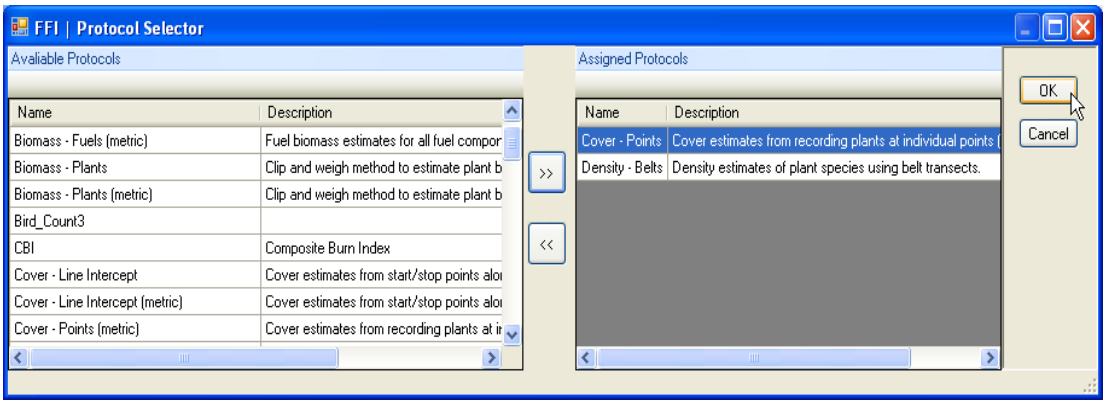
Open the Batch Macro Plot Builder window by selecting **New > Batch Macro Plot** in **Project Management**.



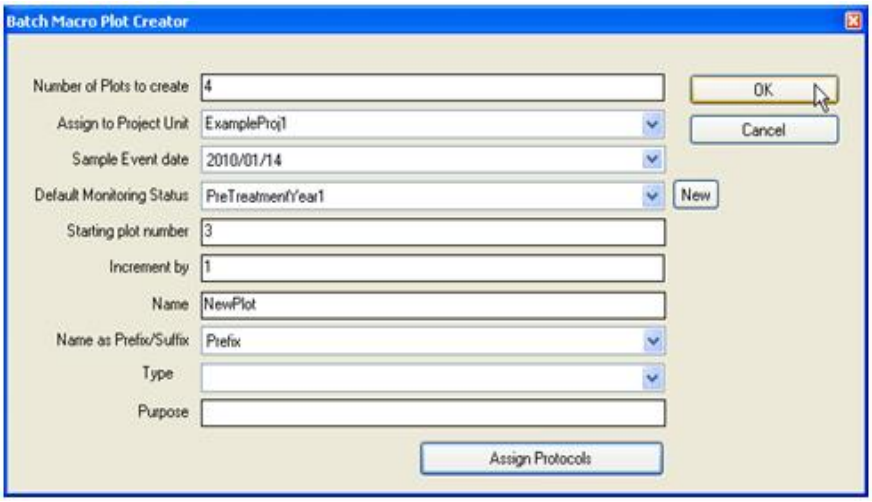
In the *Number of Plots to create* field enter `4`. In the *Assign to Project Unit* field type `ExampleProj1`. Leave the *Sample Event date* as the default. Add a *New Default Monitoring Status* called `PreTreatmentYear1`. Set the *Starting plot number* to `3`. Leave the *Increment by* field set to `1`. In the *Name* field type `NewPlot`. Leave the *Type* and *Purpose* fields blank and click **Assign Protocols**.



Highlight the *Cover - Points* protocol in the **Available Protocols** list on the left side of the Protocol Selector window and click the top arrow button in the middle of the screen to move the protocol to the **Assigned Protocols** list on the right. Assign the *Density – Belts* protocol following the same steps. Click **OK**.

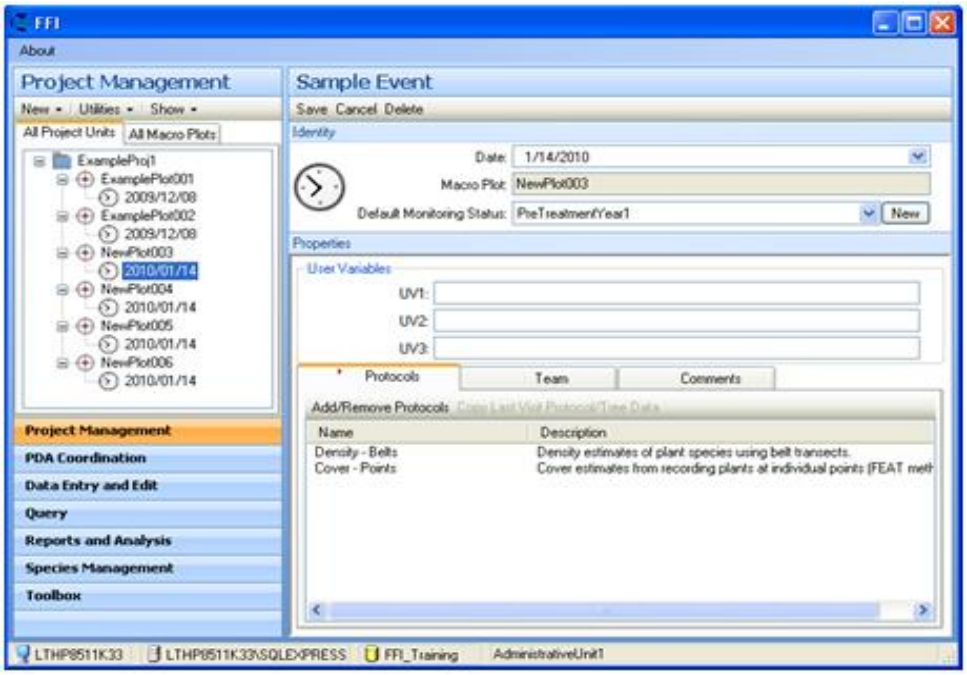


Click **OK** in the *Batch Macro Plot Creator* window.

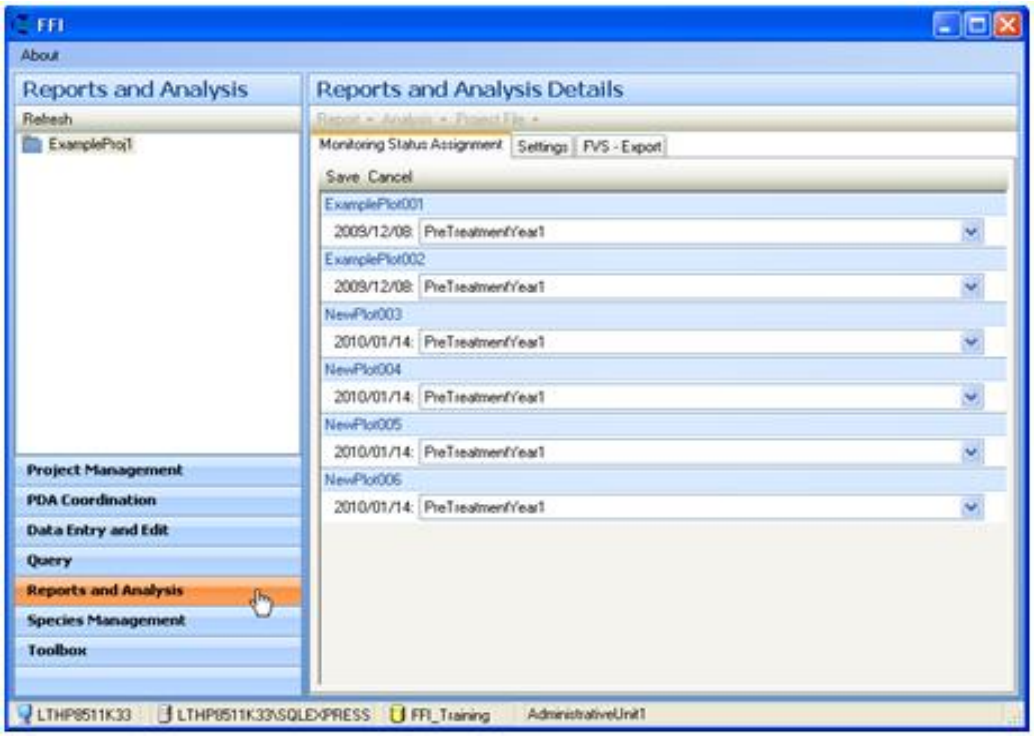


Click **OK** in the dialogue box.

The Project Management screen will refresh with the new macro plots and sample events displayed in the tree view on the left. Highlight a macro plot name and note the *Default Monitoring Status* has been set and protocols assigned.



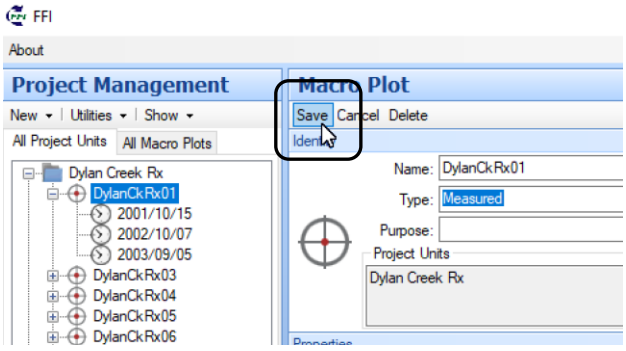
Select **Reports and Analysis** on the navigation bar and note that *Monitoring Statuses* set for the sample events are all set to the default.



Editing a macro plot

To edit an existing macro plot:

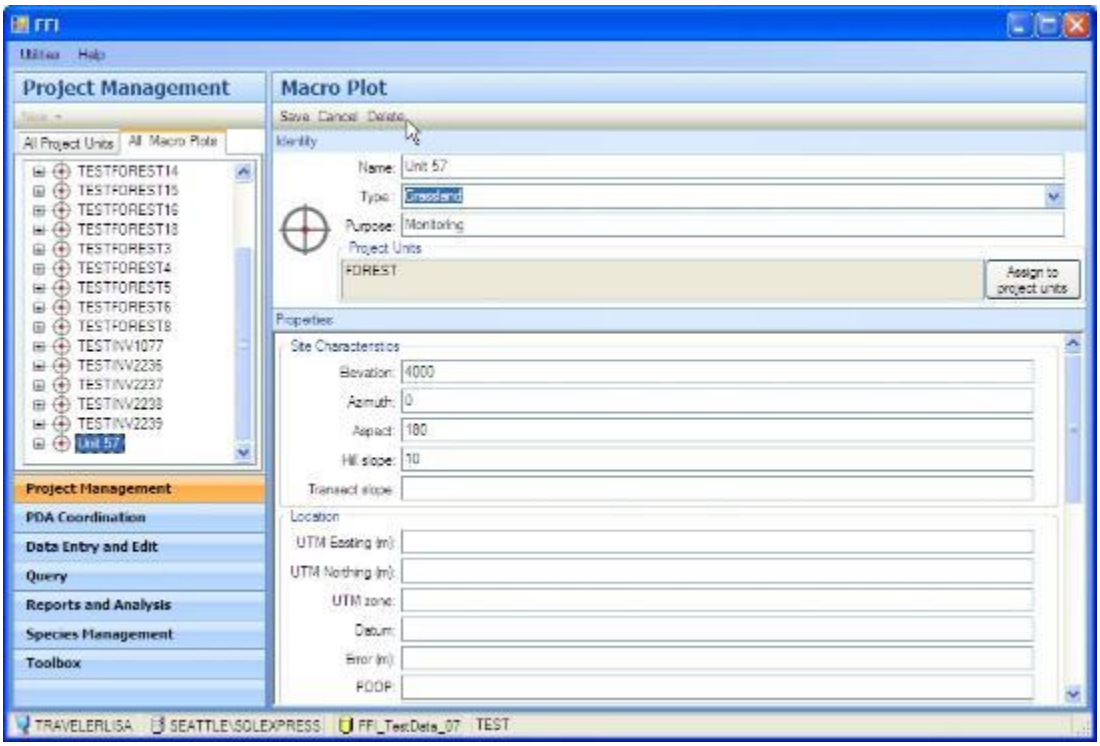
1. In the **Project Management** tree view, double-click the macro plot to be edited.
2. Make any necessary changes to the data in the *Macro Plot* window and click **Save**.



Deleting a macro plot

You can delete a macro plot for which no data has been collected. However, once a macro plot contains data, it cannot be deleted. To delete an empty macro plot:

1. In the tree view in the main **Project Management** window, highlight the macro plot to be deleted.



2. Click **Delete** at the top of the **Macro Plot** window.
3. Click **Yes** in the confirmation box, as shown below.

Working with Sample Events

This section covers:

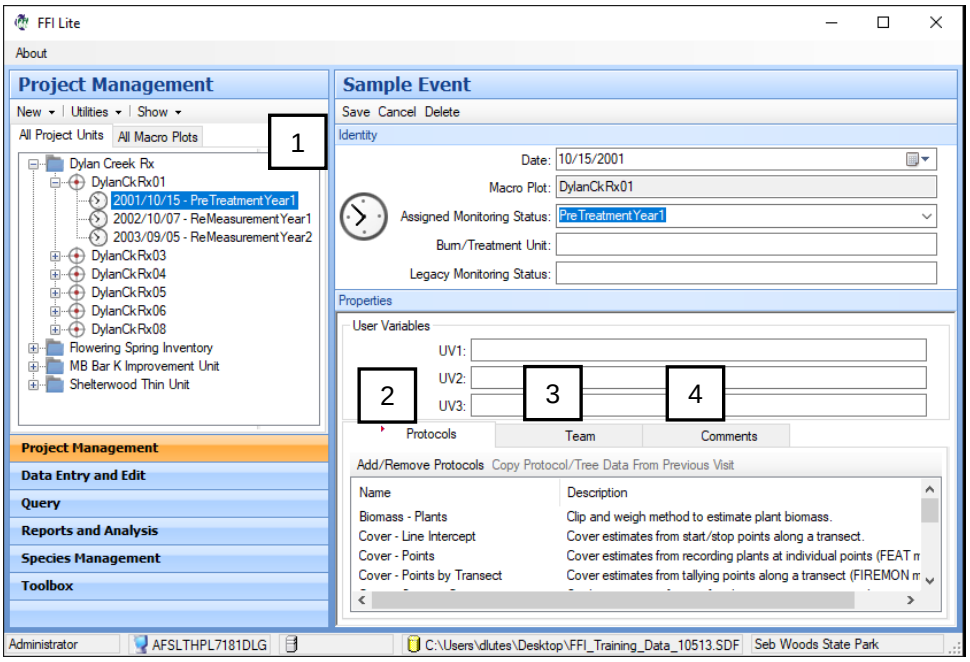
- Scheduling sample events
- Copying protocols and tree data from a previous sample event
- Editing sample events
- Deleting sample events

Scheduling a sample event

In FFI, a sample event is the date of a sample event, treatment, or disturbance. The sample event is a specific point in time at which sampling is to be conducted and identifies which sampling protocols are to be applied. This section explains how to schedule a sample event and assign the protocols to be used.

To schedule a sample event, select the appropriate project unit and macro plot In the **Project Management** window. In the **New** menu at the top of the pane, select **Sample Event**.

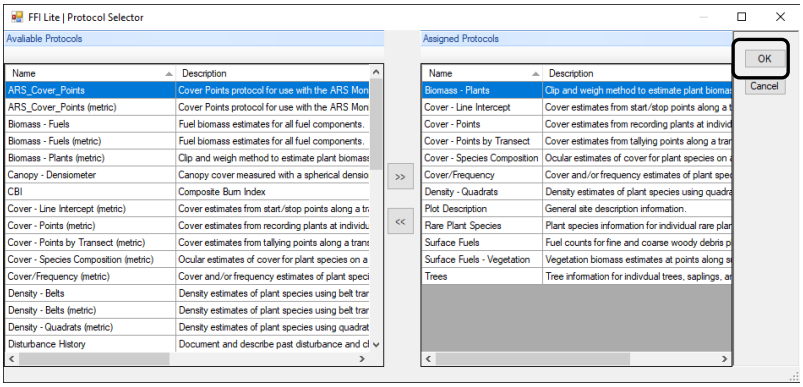
The numbered paragraphs in this section correspond to the functions in the **Sample Event** window, called out below.



1. **Identity**. Assign a *Date* for the event, using the dropdown calendar. The *Macro Plot* field fills in automatically with the macro plot name.

2. Use the **Protocols** tab in the main *Sample Event* window to select the protocols to be used during the sample event:

    - Click **Add/Remove Protocols** to open the *Protocol Selector*. Scroll through or filter the listing to locate the protocols you wish to assign to the sample event.
    - Highlight the desired protocol and either double-click or use the **>>** button.
    - Click **OK** when all applicable protocols have been added to the sample event.



*NOTE: To store photos associated with a sample event, assign the **Plot Description** or **Photos** protocol to the event. See Using photos in FFI for more information.*

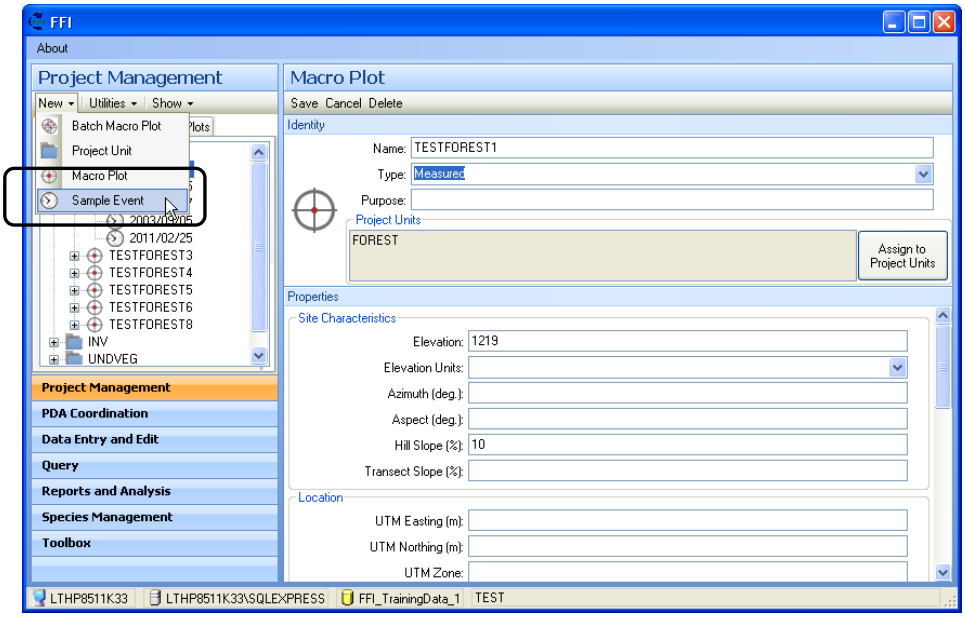
3. In the **Team** tab in the main *Sample Event* window, identify the team scheduled to conduct the sample event.
3. Use the **Comments** tab in the main *Sample Event* window to enter any additional notes or information.

    Click **Save** in the *Sample Event* window toolbar to save the scheduled sample event.

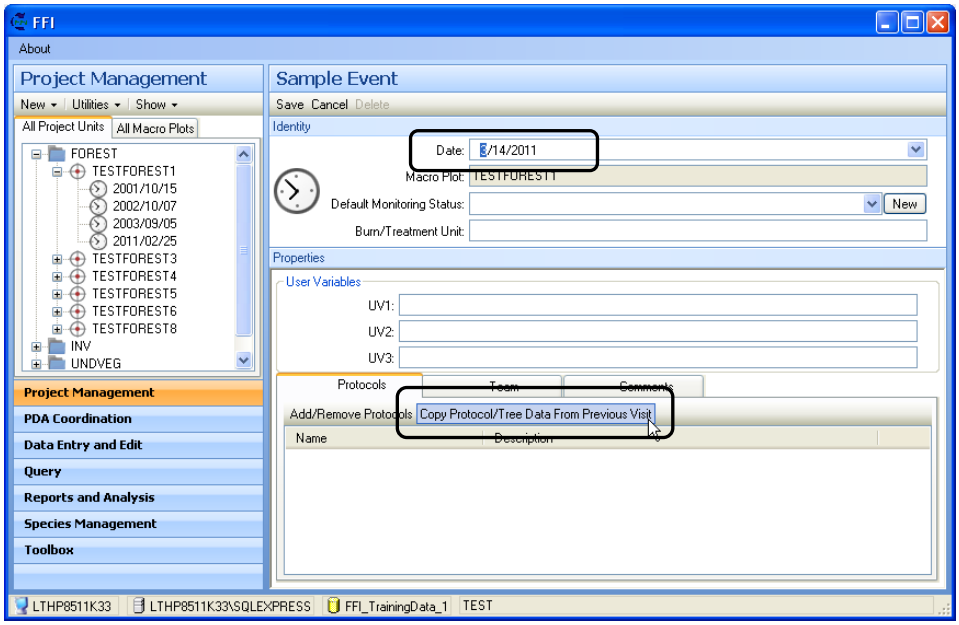
Copying protocols and tree data from a previous Sample Event

When you create a new sample event and select **Copy Protocols and Tree Data from a Previous Visit** the protocols are automatically added in the new sample event and all of the *Trees-Individual* data are also added to the new sample event. This is meant as a time saving measure because the attributes for large trees generally don't change much between sample visits.

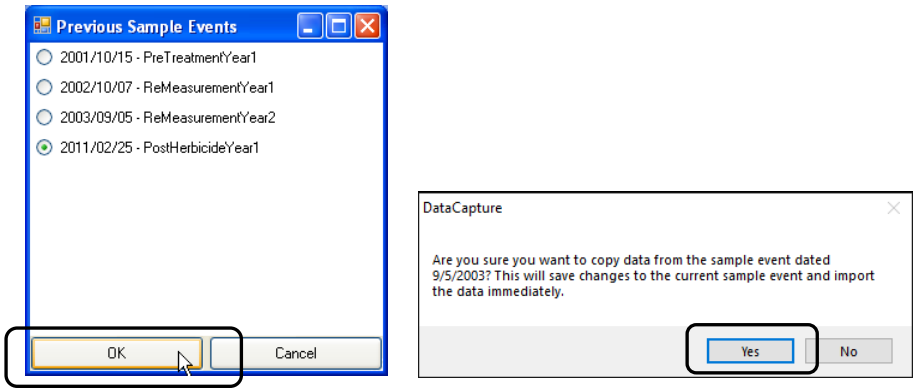
1. In **Project Management** select a macro plot by clicking on it in the tree view on the left. Select **New > Sample Event**.



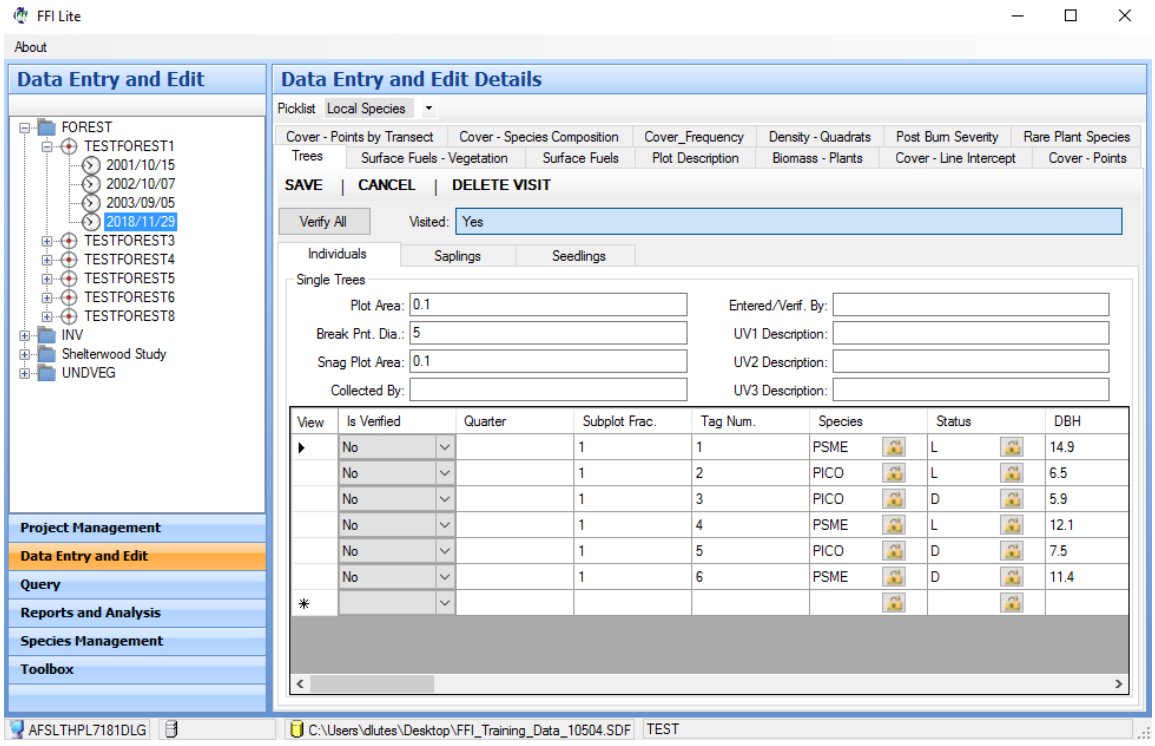
2. Change the sample event **Date** if desired. Select **Copy Protocols/Tree Data From Previous Visit**.



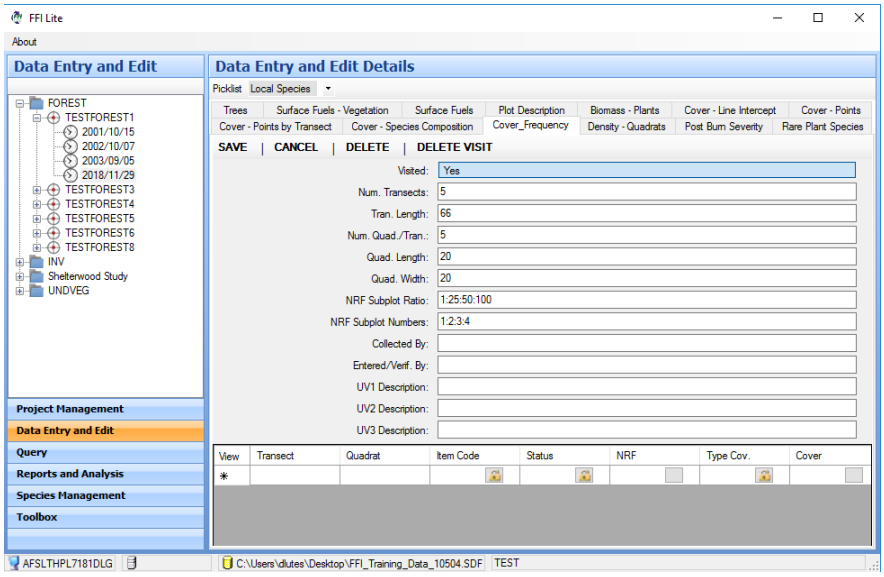
3. Select the visit to copy the data from, click **OK** and click **Yes** to confirm the change. The protocols and data will be added to the new sample event.



4. In **Data Entry and Edit** select the sample event just created. In this example the *Trees* protocol tab has been selected. The sample attributes (plot sizes and breakpoint diameter) and method attributes (tag number, species, status, etc.) for the trees have been copied from the previous visit. Note the *Is Verified* filed is set to *No*. In many cases the tree method attributes will not change from visit to visit. Set the *Is Verified* field to *Yes* as each tree data record is verified in the field.



5. For all other protocols only the sample attributes are copied to the new sample event. In this example the *Cover_Frequency* tab is selected and the *Num. Transects, Tran. Length*, etc. fields have been copied but none of the method attributes have been copied.

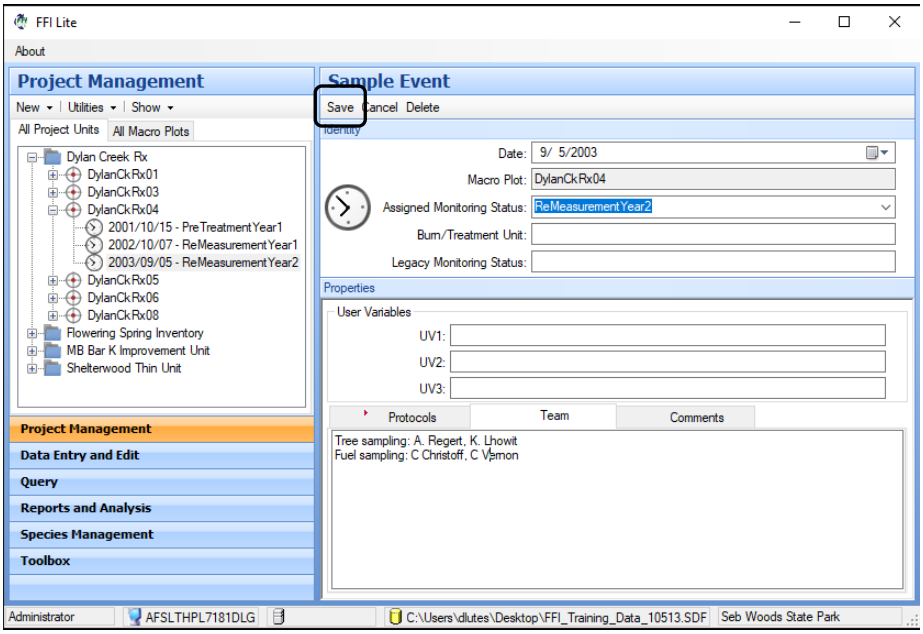


NOTE: When using the Copy from Previous Visit *option the* Visited *field is set to Yes and, thus, the Plot Report will indicate this plot has been visited; however, no method attributes will have been entered.*

Editing a sample event

To edit or update a sample event:

1. In the **Project Management** tree view, select the event to be edited. Make any necessary changes, and click **Save**.

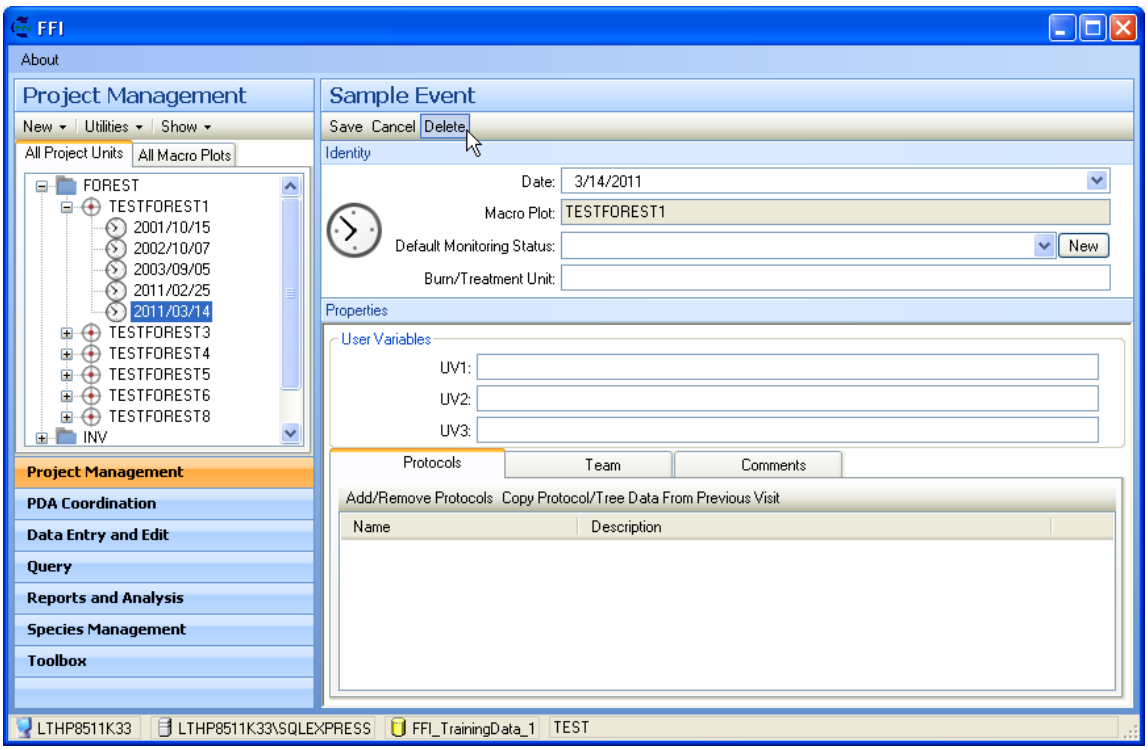


Deleting a sample event

You can delete a sample event for which no data has been collected. Once an event contains data, it cannot be deleted.

To delete an unused or empty sample event:

1. In the tree view in the main **Project Management** window, highlight the sample event to be deleted.



2. Click **Delete** to delete the sample event.
3. Click **Yes** in the confirmation box, as shown below.

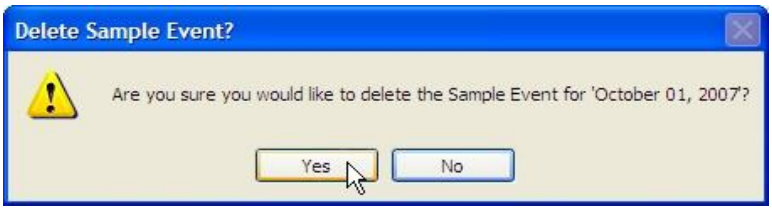


Photo links in FFI

You can't store photos in a FFI database, but you can store links to them using the *Plot Description* or *Photos* protocols.

Naming and filing photos

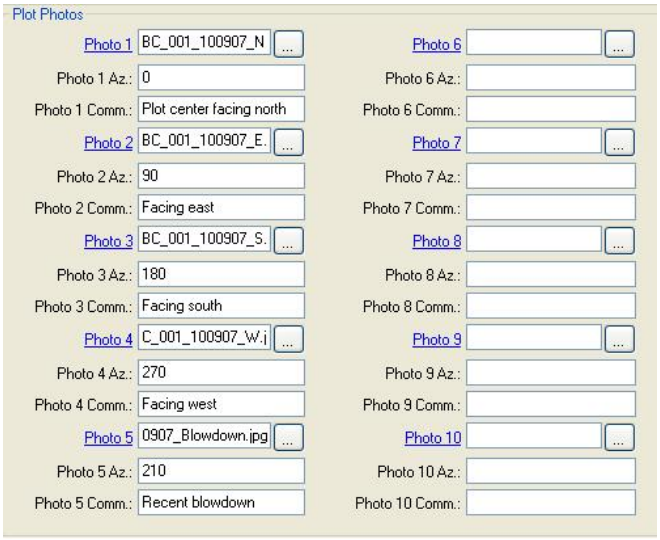
Be descriptive when naming photo files. A photo named *plot1.jpg* is difficult to tie to plot data. Instead, try something like *admin_ proj_plot_D_date* where, *admin* is the administrative unit, *proj* is the project unit, *plot* is the macro plot ID, *D* is the direction the photo was taken, or the sequential photo number and *date* is the date of the photograph. For example, *GLAC_RedBench_RB001_Oct0921_N.jpg* would be a photo taken October 9, 2021of plot 1, facing north, at the Red Bench project in the Glacier National Park administrative unit.

Choose whatever format works best for you but be sure to record the format in your project metadata so photos can be located later. Store plot photos in the C:*FFI**Photos* subdirectory. It is also helpful to include plot information in the photograph itself. One simple way to do this is record project information (project unit, macro plot, date, direction, etc.) on a small whiteboard and then include the whiteboard in your plot photos. Be sure that the whiteboard is legible in the photos but does not take up too much of the photo area. Other considerations:

- Focus the camera on the environment surrounding the plot, not the distance or foreground.
- Make sure that the camera is set for existing light conditions.
- Try to include the plot center in your photographs to reference the photos geographically.

Using the Plot Description protocol for photos

You can capture digital images at every sample visit and store their location and file names in the FFI database. To link photos, assign the *Plot Description* protocol to the sample event. When you go to the *Plot Description* form for the sample event in **Data Entry and Edit**, you can link ten photos using the hyperlink fields in **Plot Photos**, as shown below.



Import/Export utility (XML format)

*NOTE: This discussion pertains to the Import/Export utility available in **Project Management**. The files have an XML format. See* Comma Delimited (CSV) Import and Export *in the **Data Entry and Edit** section of the user guide for information about working with CSV files.*

The FFI Import/Export utility uses .xml files to move data between FFI and FFI-lite databases. When an export file is created it includes all macroplot data, data associated with the protocols, local species list, user species list, pick lists, and fuel constant sets. When creating an export file a copy of the data are stored in the .xml file - data are not removed from the database.

Data import, especially using the *Append* option in FFI, can take a few minutes to hours depending on the amount of data. For example, appending two or three sample events with a few protocols assigned in FFI can take up to 5 minutes. Replacing data takes less time in FFI and, generally, importing in FFI-Lite takes less time than in FFI. Some users have tried to use Microsoft Task Manager to monitor the *DataCapture* process to check if the import is working but be aware the CPU usage for *DataCapture* will drop to zero for extended times and then increase right as the import process ends. The FFI progress bar that is displayed during import will stop if another application on the computer is selected; however, the import process is still working. The progress bar will disappear when the import is complete.

NOTE: It is always wise to create a backup of your master database before and after doing any data import.

- General Rules
- Use Cases for import/export
- Hierarchy of FFI export files
- What data can be appended or replaced using import/export utility?
- Data import options: No change, Append, Replace
- Things to not do in the field database
- How the Import/Export utility handles duplicates
- How the Import/Export utility handles species/item codes
- Where to find Import/Export functions
- Exporting an administrative unit
- Importing an administrative unit
- Exporting a project units and macro plots
- Importing project units and macro plots
- Steps for using the import and export functionality with field computers
- Steps for converting databases between FFI and FFI-Lite

General rules

Once data are exported from the master database for use on a field computer, do not make changes to sample event data (sample and method attributes) in the master database as those changes will be overwritten when the data are imported from the field computer.

Also see this section: Things Not to do in the field database.

Use Cases for import/export

The FFI import/export utility is designed for two functions:

- Facilitate electronic data collection in the field by moving sample and method attributes between a master database and a field database on a field computer.
- Aggregate administrative units, project units, and/or macro plots into a comprehensive database.

Hierarchy of FFI export files

FFI saves all of the data needed to recreate the original FFI data hierarchy, regardless of whether you create an export file of an administrative unit, project unit or macro plot; the original data structure remains intact.

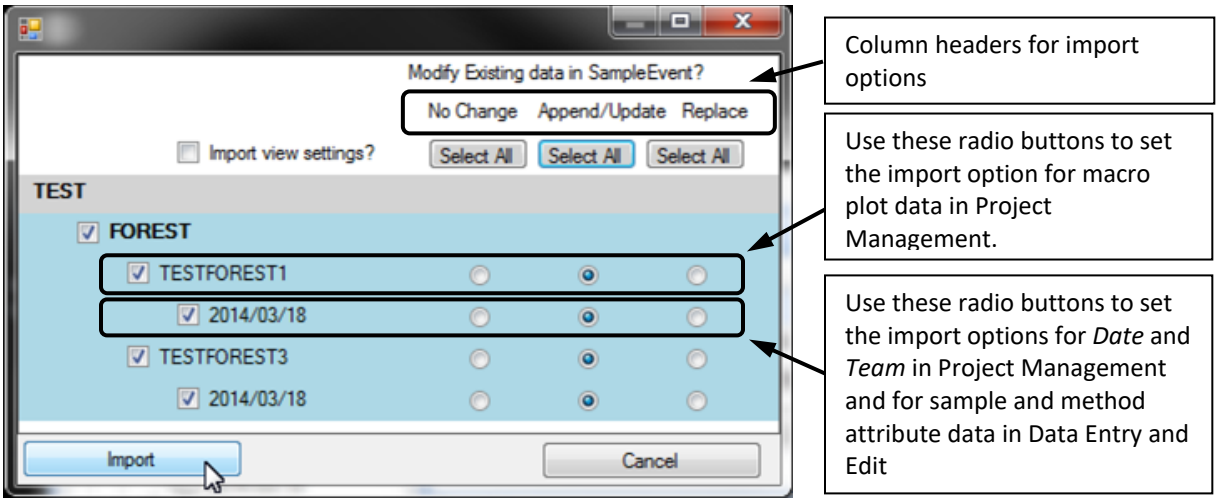
What data can be appended or replaced?

Macro plot data entered in **Project Management** and, sample and method attributes in **Data Entry and Edit** can be appended or replaced.

If macro plot data entered in **Project Management** and/or method attribute records entered in **Data Entry and Edit** are deleted on a field computer, the corresponding record will not be deleted when data is imported when using *Append*; these data records must be deleted on the master computer.

Data import options: *No change*, *Append*, *Replace*

When data are imported, FFI checks the master database to see if data already exist in the macro plot fields and sample event(s) the data are to be imported into. If data exists, you will be prompted to choose an option for the import: *No change*, *Append* or *Replace*.



Macro plot data import rules

- The *No change* option will ignore any data in the import file so the data in the master databases will remain unchanged.
- The *Append/Update* option will look through macro plot data in the import file and compare the same data fields in the master database.
    - If a data field in the import file has data and the same data field is blank in the master database, then the data from the import file is added to the master database.
    - If a data field in the import file has data and the same data field in the master database has data, then the data from the import file is not added to the master database; the master database is not changed. This is true even if the data in the import file is different than data already in the master database. Note this is different behavior than when using the *Replace* option.
    - If a data field in the import file is blank the data in the master database is unchanged.
- The *Replace* option will look through macro plot data in the import file and compare the same data fields in the master database.
    - If a data field in the import file has data and the same data field is blank in the master database, then the data from the import file is added to the master database.
    - If a data field in the import file has data and the same data field in the master database has data, then the data from the import file is added to the master database; the master database is changed. Note this is different behavior than when using the *Append/Update* option.
    - If a data field in the import file is blank the data in the master database is unchanged.

Sample event data import rules

- The *No change* option will ignore any data in the import file so the data in the master databases will remain unchanged.
- The *Append/Update* option will make a fairly complex comparison of the data in the input file and in the master database to bring new data into the sample event. See the table below for more information about how FFI determines what data are imported when using the *Append* option.

  A deleted method attribute record in the field database will not result in the deletion of the corresponding record in the master database when using the *Append* option. Add a note in the Comment field for the record that should be deleted and make the deletion in the master database after importing the data.

Data Entry and Edit		
Sample Attributes	3-Part protocols (Trees and Surface Fuels)	For required sample attributes in the master database, if the existing sample attribute is 0 or the field is null then the import utility brings the value in from the import file, otherwise the attribute value in the import file is skipped. For non-required sample attributes in the master database a sample attribute will be replaced if the corresponding field in the import file is anything other than null.
	All other protocols	The required and non-required sample attributes in the master database will be replaced if the corresponding field in the import file is anything other than null.
Method Attributes	All protocols	In the master database, if the record GUID exists then the data in that record is modified with the import data. If the record GUID does not exist then the new record is imported and added to the method attributes. Method attribute records are not removed from the master database if the attribute GUID does not exist in the import file.

- The *Replace* option overwrites **ALL** existing sample and method attributes for **ALL** protocols - **even for those protocols where *Visited* = *No*** in the import file. If a data field in the import file is null, the corresponding data attribute in the master database will be null after import. At the **Project Management** level only the sample event *Date* and *Team* is replaced.

CAUTION: Use extra care when using the Replace option as there is no way to undo a data Replace change to a database. Never use Replace when importing data collected on multiple computers into the same sample event. ***Data overwritten using the Replace options will need to be re-entered or re-imported***

Things to not do in the field database

These things should not be done on the field computer/field database. Do them in the master database instead:

1. Do not use the **New** menu to create Administrative Units, Projects Unit, Macro Plots or Sample Events. I.e., all Administrative Units, Projects Unit, Macro Plots and Sample Events should be imported to the field computer, not created on the field computer.
2. Do not change local species codes in **Species Management**
3. Do not identify unknown species using the *Identify Unknown* utility in **Species Management**
4. Do not replace a species code using the *Replace Species in Method Data* utility in **Species Management**
5. Do not add or edit Monitoring Statuses
6. Do not assign Monitoring Statuses to Sample Events
7. Do not change the names of Project Units or Macro Plots.

NOTE: If you use FFI-Lite to store your master database then items 1 through 6 can be done using FFI-Lite, but only in the master database.

How the Import/Export utility handles duplicates - GUIDs

FFI uses a Globally Unique Identifier (GUID) to identify almost everything in the database. A GUID is a 26-character random number that should never occur more than once in a database. When you save a value in FFI it is tied to a GUID. If you create a macro plot you can name it whatever you want but FFI will know it by the GUID, which is always unique. So, you can create a macro plot and name it *Plot001* and FFI will assign it a unique GUID and then you can create another macro plot and name it *Plot001* and FFI will give it a different GUID. Thus, it is possible to have two things with the same name – like two macro plots named *Plot001* in one project unit – which is not a problem for FFI but might be a problem for whoever is trying to keep them differentiated while working with the data. If you know ahead of time that data will be combined with the Import/Export Utility, you may want to rename macro plots to avoid duplicates. There is no fast way to rename a number of macro plots in FFI; you have to do it one by one in **Project Management**.

When importing macro plots FFI will check to see if a duplicate macro plot GUID already exists in the administrative unit the data are being imported into. If a duplicate GUID is found - even if the macro plot name is different – you will be prompted to leave existing data unchanged, append existing data with the new data or overwrite the existing data with the new data. See: Data import options: No change, Append, Replace.

How the Import/Export utility handles species symbols/item codes

Species symbols and item codes are the only two import values where FFI first compares symbol/code text instead of the associated GUIDs. When data are imported, the import/export function compares species symbols/item codes (NRCS code, user species code or "unknown" code) associated with the method attributes in the import file and the symbols/codes in the local species list in the master database with one of three results:

1) If a species symbol or item code in the import file but not in the local species list in the master database (case sensitive) then the symbol/code is imported as in the import file.

2) If a species symbol or item code in the import file is the same as a symbol/code in the local species list in the master database (case sensitive) then FFI checks to see if the Local Species GUID field in the import file and the master database are the same. If so, the Master Species GUID is maintained. Any differences in these species property fields: *UV1, UV2, UV3, Description and Comment*; will be modified in the local species list in the master database. Changes in other species properties should be made in the master database, not on the field computer.

3) If a species symbol or item code in the import file is the same as a symbol/code in the local species list in the master database (case sensitive) then FFI checks to see if the Local Species GUID field in the import file and the master database are the same. If they are not the same then the *UV1, UV2, UV3, Description and Comment* fields in the input file are compared to the same fields in the master database and, if they are all the same, the Species GUID for the imported symbol/code is swapped for the existing Local Species GUID in the master database. If the *UV1, UV2, UV3, Description and Comment* fields in the import file and master database are not the same the symbol/code is imported into the master database using the GUID used in the import file and two instances of the same symbol/code will be present in the Local Species List in the master database.

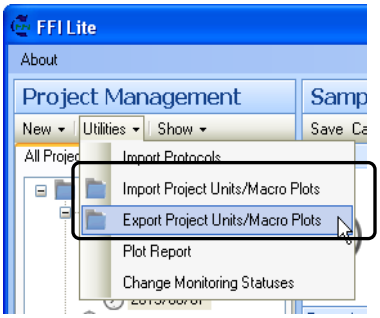
NOTE: The logic described above is different than how FFI handles duplicate species symbols when doing a species list import.

Where to find Import/Export functions

The Import/Export utility is available in two places:

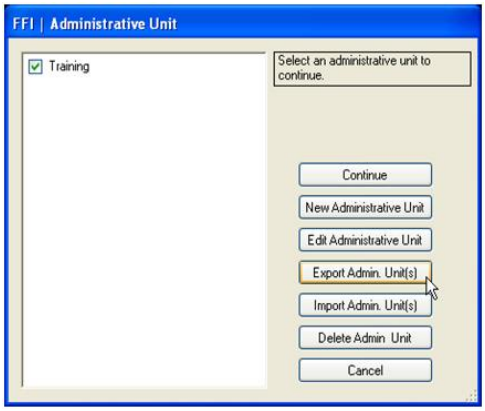
1. On the **Administrative Unit** screen you see when you log in. From here you can export or import all of the data linked to an administrative unit.

2. On the **Utilities** menu in **Project Management** you can import or export data in project units, macro plots and sample events.



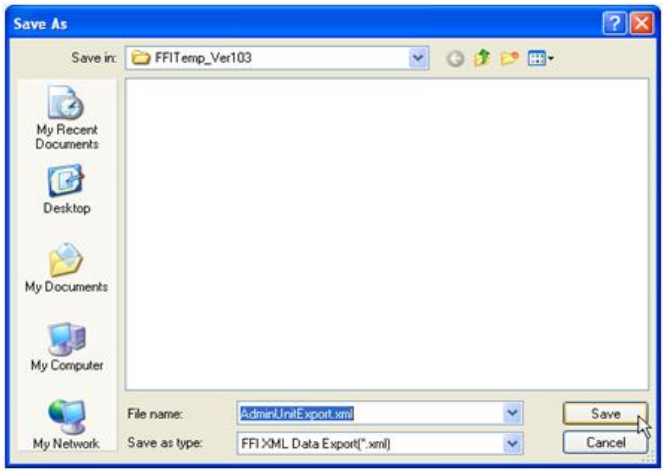
Exporting an Administrative Unit

1. Log in to FFI. Check the box for the administrative unit(s) you want to export and click **Export Admin. Unit(s)**.



NOTE: If multiple administrative units are selected, they will be added to the same export file but they will not be combined into one administrative unit.

2. Name the export file and click **Save**.



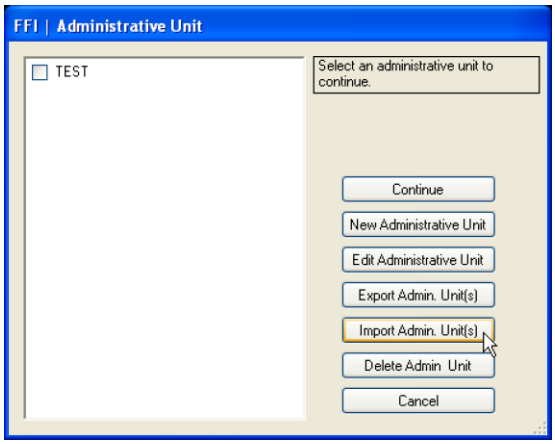
3. A progress bar will be displayed while the file is created.

4. Click **OK** in the dialogue box to complete the export.

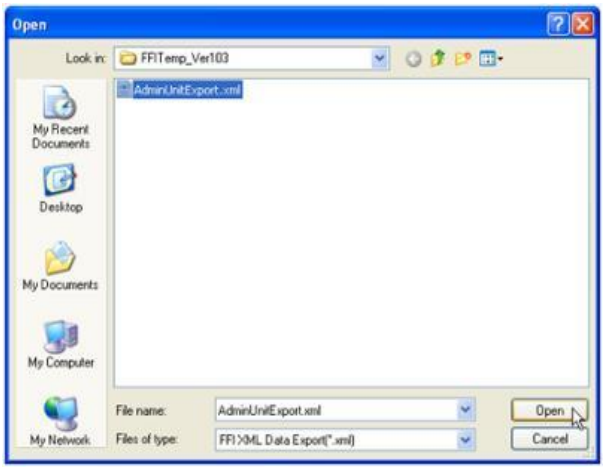
Importing an Administrative Unit

1. Log into FFI. Click the **Import Admin. Unit(s)** button.

   NOTE: You cannot import an administrative unit with the same name as an administrative unit already in the database. You cannot import an administrative unit with the same GUID as an administrative unit already in the database.



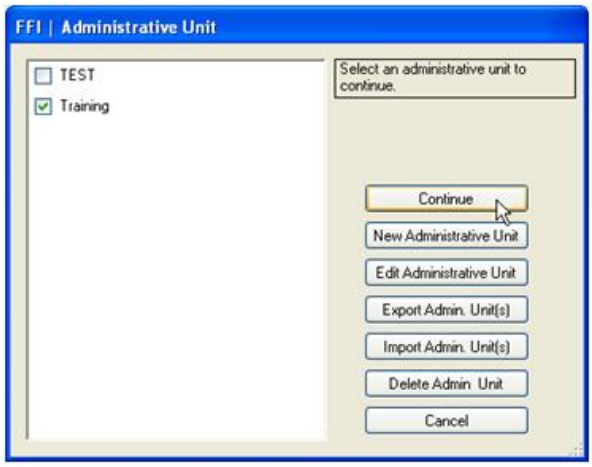
2. Select a data file containing exported administrative units and click **Open**.



3. Select the administrative unit to import and click **Import**.

NOTE: If more than one administrative unit was saved when the export file was created the administrative units will need to be imported individually.

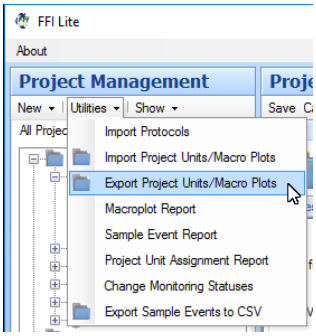
4. A progress bar will be displayed and, when the import is complete, the administrative unit will appear in the administrative unit selection window.



5. Select the administrative unit you want to view and click **Continue**.

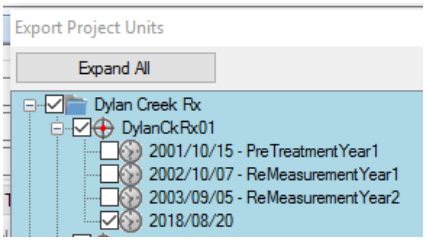
Exporting Project Units and Macro Plots

1. In **Project Management** select ***Utilities > Export Project Units/Macro Plots***

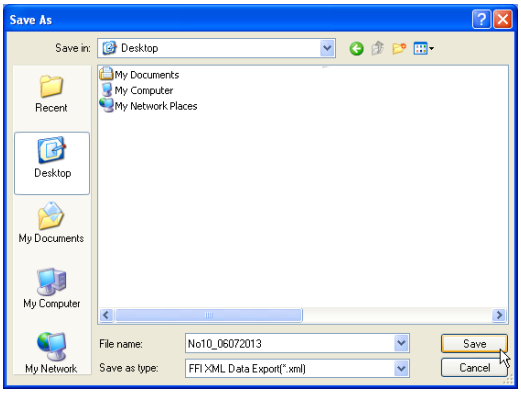


2. Scroll to the desired project unit and check the box(es) of the project unit and/or macro plots you want to export and click **Export.**

NOTE: When you select a check box to export a project unit all of the macro plots and sample events associated with the project are automatically checked. Uncheck macro plots you do not want to be exported. In this example only the last sample event is selected. Even though the project unit name is not selected it will be included in the export file in order to maintain the data hierarchy.



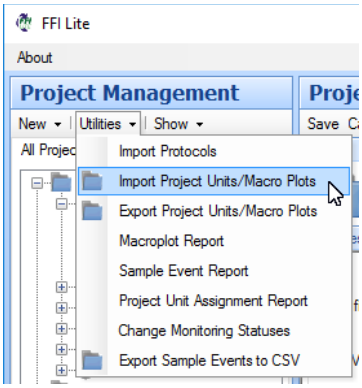
3. Name the file and click **Save**.



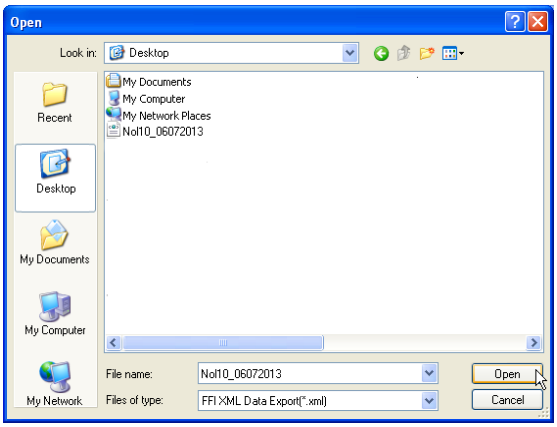
4. A progress bar will be displayed. When the progress bar closes the file has been saved.

Importing Project Units and Macro Plots

1. Select **Utilities > Import Project Unit(s)**

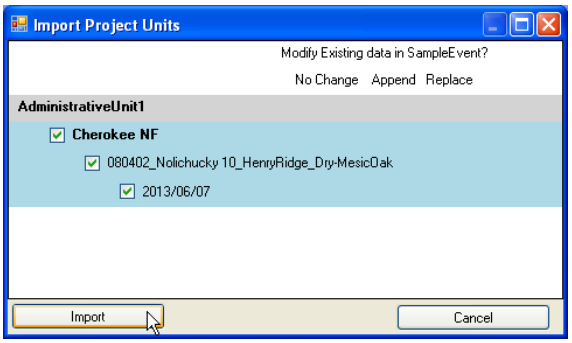


2. Select the file to import and click **Open**.

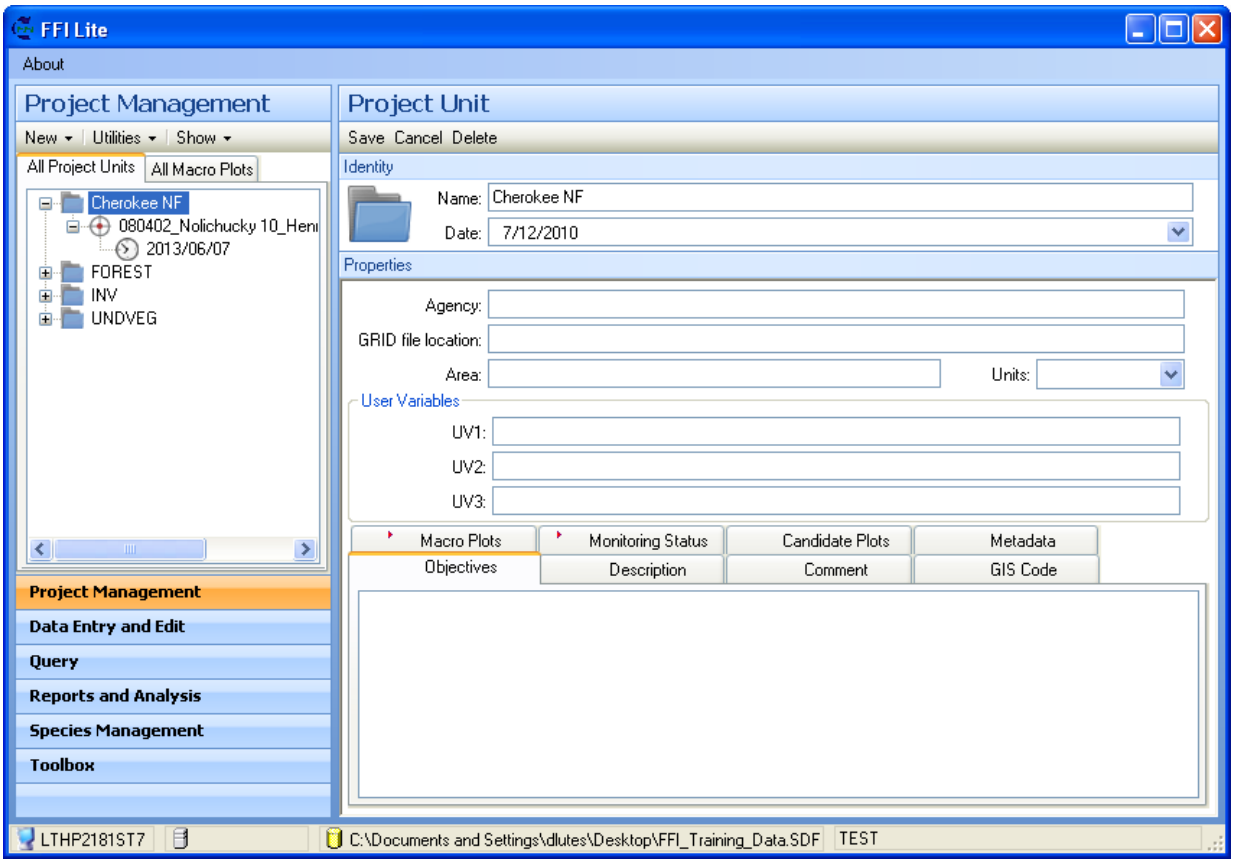


3. Check the box(es) for the projects you want to import and click **Import**.

NOTE: If the sample event being imported already exists in the database radio buttons will be displayed under the No Change, Append and Replace column headers.

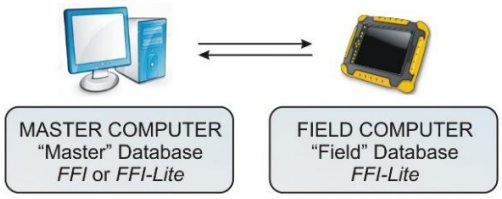


4. The progress bar will display. When the progress bar closes the project(s) will appear in the directory tree.



Suggested steps for using import and export with field computers

One benefit of the import and export functionality is being able to easily move sample event data back and forth between master and field computers. The steps below outline the suggested process.



NOTE: The steps below assume you use FFI for managing your master database but you can use FFI-Lite to manage your master database, if desired. The same procedures apply.

1. Log into your master database in FFI and, for each of macro plot you will (or may) sample during the field visit, create one new sample event and assign the protocols you will use in the field.

2. Export the desired macro plots and sample events from the master database using **Utilities>Export Project Units/Macro Plots**. Save the export file on a flash drive.

NOTE: Once the data have been exported do not make changes to those same macro plots and sample events in the master database until after they have been re-imported from the field computer.

3. On the field computer open *FFI-Lite* and create a new, empty "field" database. Name it something that clearly identifies the project sampled and the date.

4. Open FFI-Lite on the field computer and on the Admin Unit selection screen click the **Import Admin. Unit(s)** button, select the file you exported in step 2 and import the desired administrative unit.

5. Visit field sites and collect data. Remember these rules: Things to not do on a field computer.

6. Back at the office open the database on the field computer in *FFI-Lite* and, using **Utilities>Export Project Units/Macro Plots,** export the macro plots and sample events that have new field data added. Save the export file on a flash drive.

7. On the master computer, open *FFI Database Administration* and create a backup of the master database. Save the backup file in a safe location like Box or OneDrive. If using FFI-Lite, make a copy of your database (SDF file extension), add the current date in the filename and save it in a safe location like Box or OneDrive.

8. On the master computer open *FFI*, log into the master database and select the desired administrative unit. Import the file from the flash drive using **Utilities>Import Project Units/Export Macro Plots** using the **Append** or **Replace** options (Data import options: No change, Append, Replace). Importing into FFI can take a long time if there is a lot of data. Move the file you are importing from the flash drive to the computer desktop to make import faster.

9. Check your data, consider making a backup of your master database. As an extra measure of safety you might also want to save the files exported from the field computer.

Steps for converting databases between FFI and FFI-Lite

FFI data are saved in SQL Server databases and FFI-Lite data are stored in SQLCE databases. SQL Server and SQL CE databases are not interchangeable so data must be converted from one database format to the other when moving data between FFI and FFI-Lite, which FFI does as part of the import/export functionality.

The basic steps are the same if converting databases from FFI to FFI-Lite or FFI-Lite to FFI:

- Export administrative unit(s) out of the current application you are using.
- Create a new database in the application you want to convert the data to: FFI or FFI-Lite.
- Import the administrative unit into the new database.

Large databases (>1GB) may take a long time to convert – an hour or more.

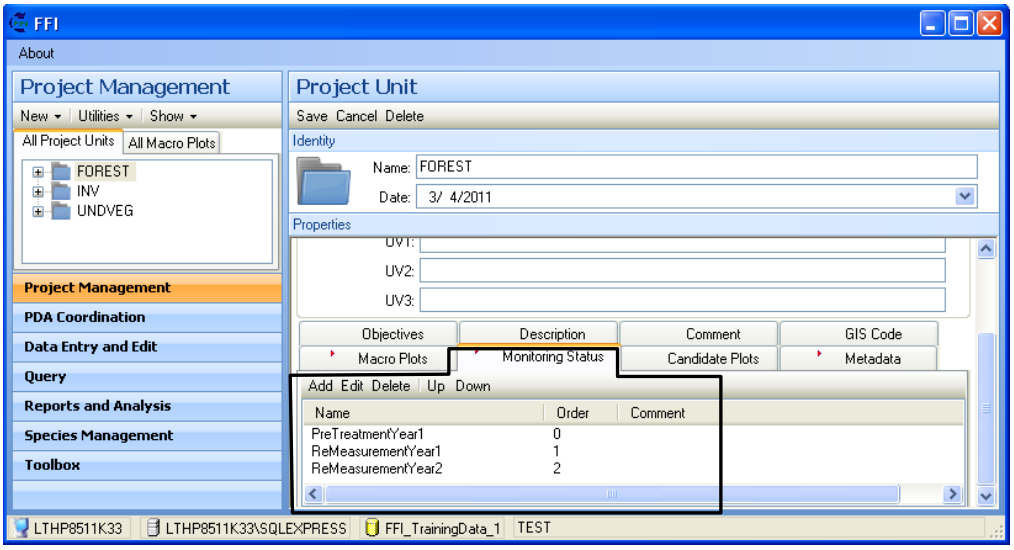
Monitoring Statuses

- Managing Monitoring Statuses
- Adding a Monitoring Status
- Deleting a Monitoring Status
- Assigning Monitoring Statuses
- Default Monitoring Statuses
- Setting and changing Default Monitoring Status

Each time macro plot data are entered in FFI the sample event date is used to link all of the data for that sampling visit. However, the sampling date alone is not a very helpful description when trying to organize sample events relative to the treatments you are monitoring. So FFI uses the Monitoring Status to assist in describing the sample events in ways that will help organize them for reports and analysis. All the monitoring statuses are stored at the project unit level.

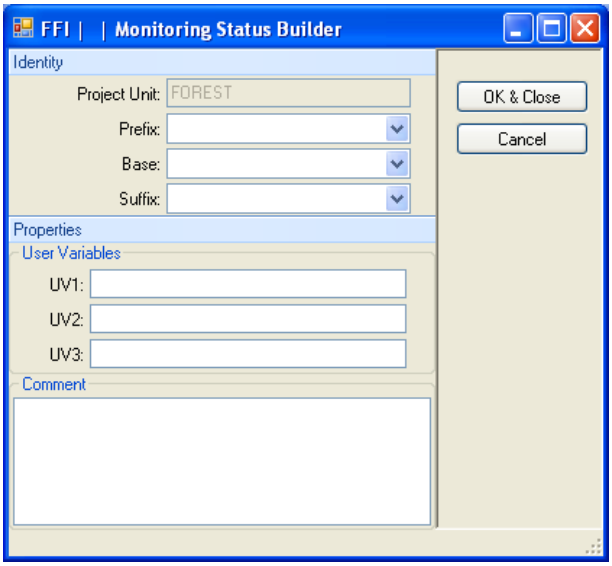
Managing Monitoring Statuses

You can *add, edit*, *delete* and *order* monitoring statuses by clicking on the **Project Management** navigation bar, highlighting a project unit name in the **All Project Units** tree view in the left pane and selecting the **Monitoring Status** tab.



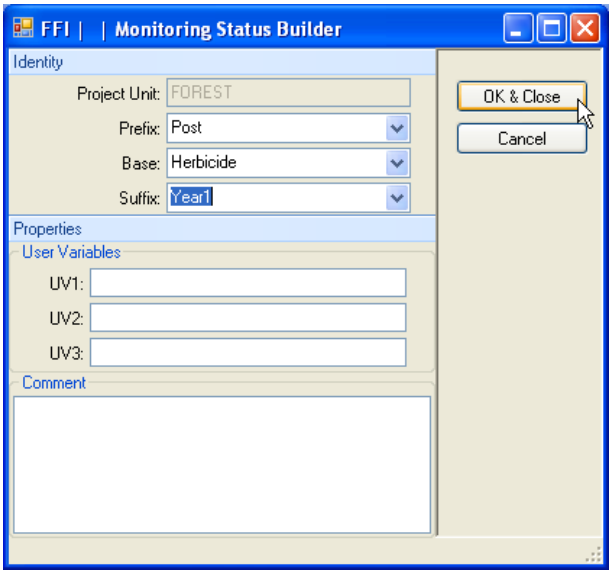
Adding a Monitoring Status

Add a monitoring status when you need a new name for a sampling event. With the **Monitoring Status** tab selected click **Add** and the *Monitoring Status Builder* window will open.

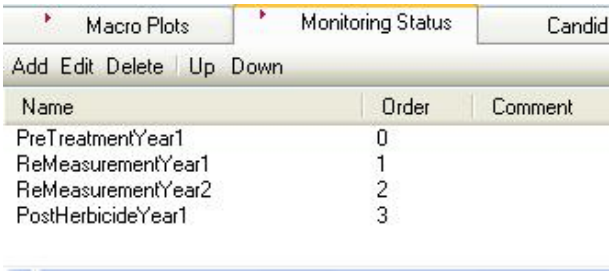


NOTE: Blank Monitoring Status names are not allowed.

Enter a *Prefix, Base* and/or *Suffix* for the monitoring status name. The dropdown boxes for each field list suggested values but you are not required to use them. You should name your monitoring statuses something useful for the project they will be used with. We suggest using all three fields but they aren't required. Your entire monitoring status name can be entered in one field. Click **OK & Close** to save the new monitoring status.

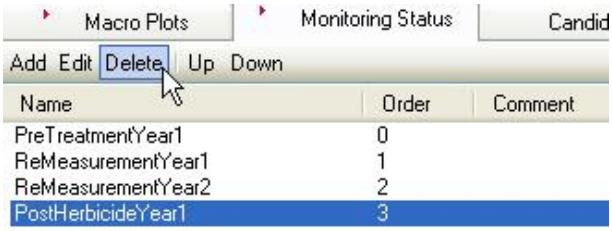


The new monitoring status will be added to the monitoring statuses tab.



Deleting a Monitoring Status

Delete a monitoring status by highlighting the name on the Monitoring Status tab and clicking **Delete**.



NOTE: FFI will not warn you if you try to delete a monitoring status that is assigned to a sample event. If you inadvertently delete an assigned monitoring status you can Add the monitoring status again and assign it to the sample event.

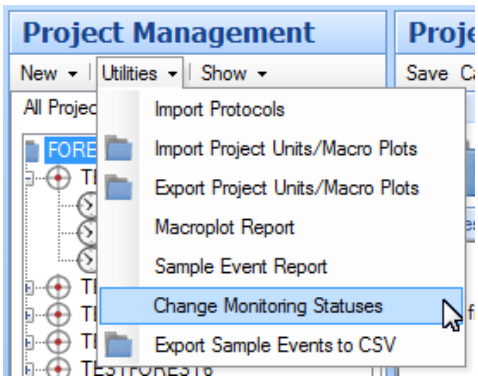
Monitoring Status Order

The order the monitoring status are listed on the **Monitoring Status** tab is the order they will be used in **Reports and Analysis**. To change the monitoring status order highlight the one you want to move and click **Up** or **Down**.

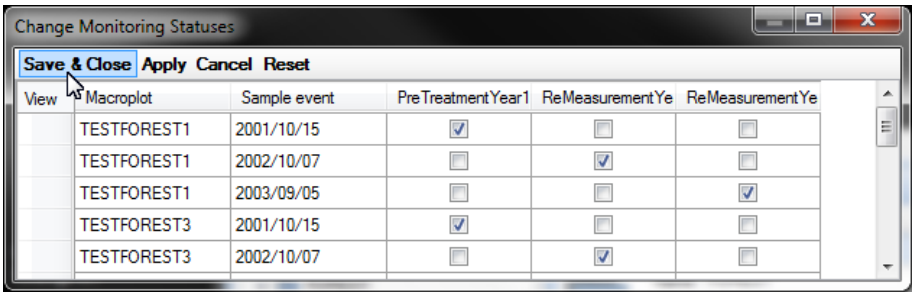
Assigning Monitoring Statuses

You can assign monitoring statuses three ways: 1) using the **Change Monitoring Statuses** utility in **Project Management,** 2) on the **Monitoring Status Assignment** tab in **Reports and Analysis** or 3) in the tree view in **Project Management**,

1. In **Project Management** highlight a project unit or macro plot in the tree view and select **New > Change Monitoring Statuses**.

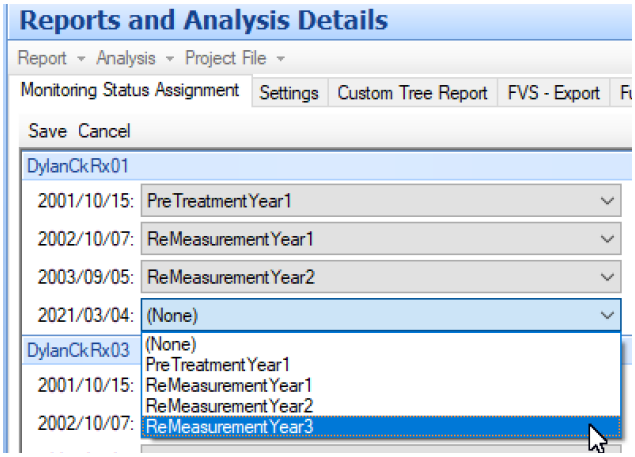


Use the checkboxes to assign monitoring statuses in the *Change Monitoring Statuses* window. When complete click **Save**.



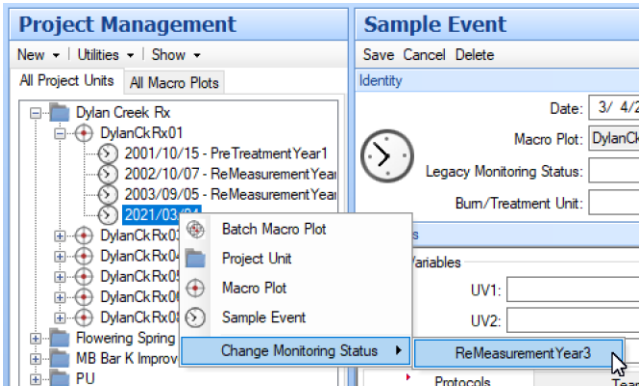
NOTE: Column width can be reset by clicking and dragging the column edge. The position of the columns can be changed by clicking and dragging the column heading name.

2. Click on **Reports and Analysis**, highlight a project unit in the tree view and select a monitoring status from the dropdown list for each sample event. Click **Save**.



NOTE: Any sample event with monitoring status set to None *will be excluded from reports, analysis and queries.*

3. In **Project Management** right-click on a sample event, select **Change Monitoring Status** and then select the desired monitoring status. Click **Save**.



NOTE: The ***Show*** *menu has options to* Show Only Unassigned Monitoring Statuses *or* Show All Monitoring Statuses. *When* Show All Monitoring Statuses *is selected, the monitoring statuses currently assigned to sample events will be grayed out in the list and cannot be assigned to a sample event.*

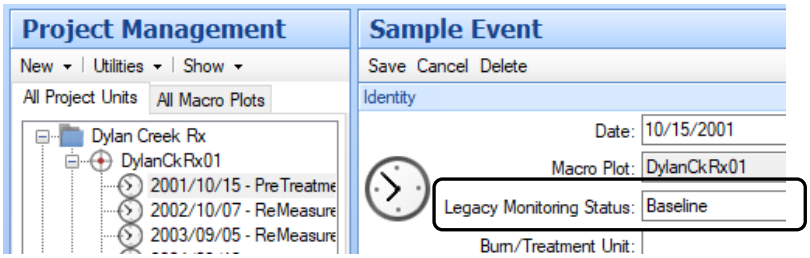
Legacy Monitoring Status (Previously named Default Monitoring Status)

FFI includes an optional field for each sample event called *Legacy Monitoring Status* to help you remember the original reason for establishing the sample event. This field is in addition to the assigned monitoring status that can be displayed in the tree view and required for **Reports and Analysis**. The *Legacy Monitoring Status* field was added because some users switch the assigned monitoring statuses frequently as the plot is used for different reports and/or combined with data in other project units. The *Legacy Monitoring Status* field does not change as the assigned monitoring status so it is a reminder why the sample event data were originally collected.

*NOTE: Legacy Monitoring Status is not used in **Reports and Analysis** or the **Query** tool. Only the assigned monitoring status is used in these modules.*

Setting and changing Legacy Monitoring Status

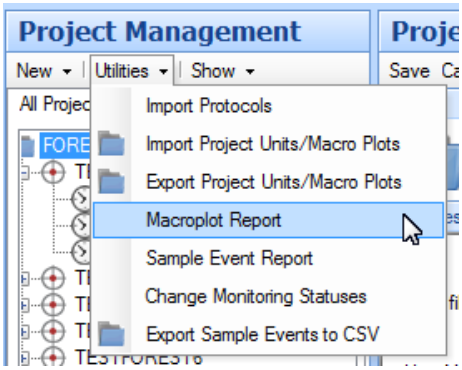
The *Legacy Monitoring Status* can be set by highlighting a sample event in **Project Management** and typing the status name in the field.



Creating a Macroplot Report

The Macroplot Report includes all macro plot data fields in **Project Management**, such as *Elevation, Aspect, Slope, Latitude* and *Longitude*. The report also includes *Sample Event Date*, *Monitoring Status* and *Legacy Monitoring Status* for each sample event. The report is saved as a CSV file that can be opened in a spreadsheet program like Excel.

To create a Macroplot Report select **Utilities > Macroplot Report** in **Project Management** and select a location to save the file.



View the file in Excel.

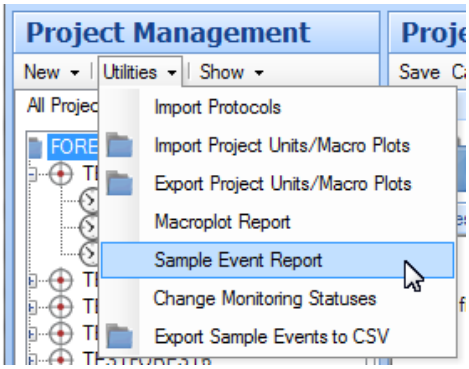
Macroplot	SampleEventDate	MonStatusOrd	MonStatus	DefaultMon	Purpose	LocatedBy	Type	Latitude	Longitude	UTM_X	UTM_
TESTFOREST1							M	46.92384	-114.098		
TESTFOREST1	10/15/2001	0	PreTreatmentYear1								
TESTFOREST1	10/7/2002	1	ReMeasurementYear1								
TESTFOREST1	9/5/2003	2	ReMeasurementYear2								
TESTFOREST3							M	46.92521	-114.097		

Creating a Sample Event Report

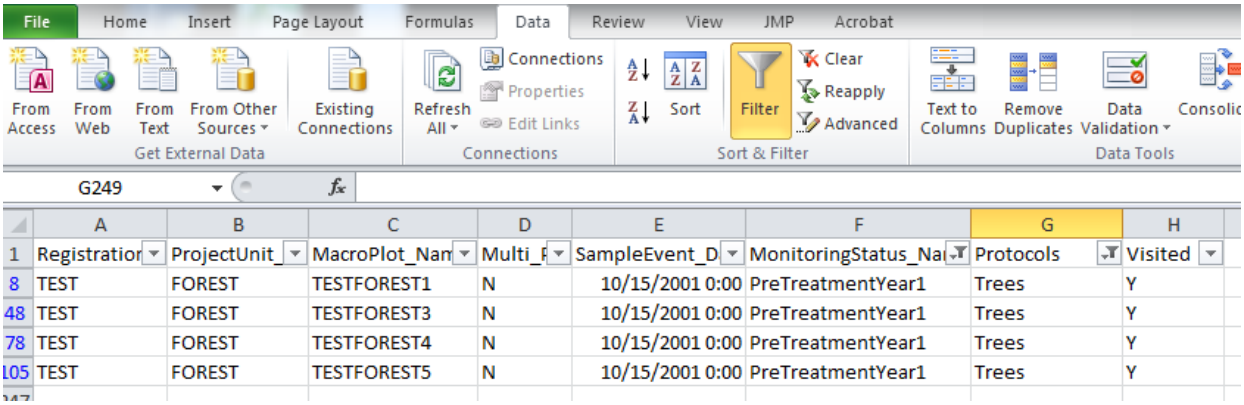
The Sample Event Report lists protocols and monitoring statuses for all sample events in an administrative unit. The report can be used to see what protocols have been assigned to what sample events and whether or not data have been entered for the protocol (if *Visited* is set to *No* then data has not been entered). The report is also helpful for checking assigned monitoring

statuses. The report is saved as a CSV file that can be opened in a spreadsheet program like Excel.

To create a Sample Event Report select **Utilities > Sample Event Report** in **Project Management** and select a location to save the file.



Open the file in the spreadsheet program and use the *Sort* and *Filter* functions to view the plot report. Here the report has been filtered to show only the *PreTreatmentYear1* sample events with the *Tree* protocol assigned to them.



	A	B	C	D	E	F	G	H
1	Registration	ProjectUnit_	MacroPlot_Nam	Multi_P	SampleEvent_D	MonitoringStatus_Na	Protocols	Visited
8	TEST	FOREST	TESTFOREST1	N	10/15/2001 0:00	PreTreatmentYear1	Trees	Y
48	TEST	FOREST	TESTFOREST3	N	10/15/2001 0:00	PreTreatmentYear1	Trees	Y
78	TEST	FOREST	TESTFOREST4	N	10/15/2001 0:00	PreTreatmentYear1	Trees	Y
105	TEST	FOREST	TESTFOREST5	N	10/15/2001 0:00	PreTreatmentYear1	Trees	Y

NOTE: The Visited field will be set to Yes if data has been entered in the protocol even if it is just the sample attribute data that were copied from a previous sample visit.

Project Unit Assignment Report

The Project Unit Assignment Report includes all the macro plots and project units in an administrative unit and a column labeled *Mult_PU* that reports if the macro plot is assigned to one project unit (N) or more than one project unit (Y). The same information can be taken from the Sample Event Report but the Project Unit Assignment Report has fewer records. The report is saved as a CSV file that can be opened in a spreadsheet program like Excel.

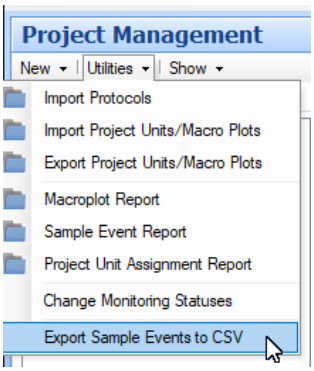
	A	B	C
1	Macroplot	ProjectUnit	Multi_PU
2	DylanCkRx01	Dylan Creek Rx	Y
3	DylanCkRx03	Dylan Creek Rx	N
4	DylanCkRx04	Dylan Creek Rx	N

NOTE: If a macro plot is not assigned to a project unit it will not be included in the Project Unit Assignment Report.

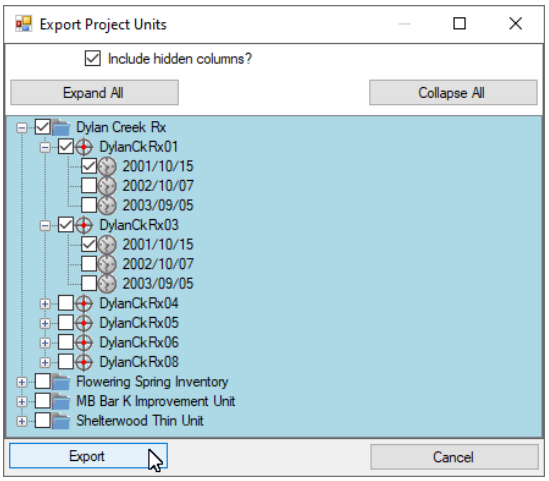
Creating Sample Event CSV files

Protocol information added in **Data Entry and Edit** can be exported to CSV files. The purpose of this function is to create hardcopy field forms of data collected electronically. A CSV file will be created for each protocol for each selected sample event. Filenames will be in the form: *DateExported_MacroplotName_SampleEventDate_ProtocolName.CSV*.

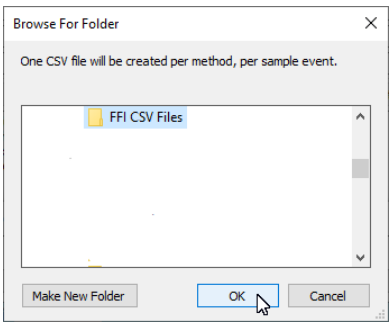
To create CSV files, select **Utilities > Export Sample Events to CSV** in **Project Management.**



Select the sample events you want to export to CSV files. By default, the files will only include the data fields visible in **Data Entry and Edit**. Check the box to **Include Hidden Columns** if you want all the protocol fields saved in the CSV files (hidden fields/columns may include data you want to save in the CSV files). Click **Export.**



Select the destination folder and click OK. A progress bar will display as the files are created.



NOTE: This utility may export many files! Select the destination folder carefully.

Data Entry and Edit

Use the **Data Entry and Edit** function to enter sampling data into the FFI database after a sample event has been completed, or to confirm data quality after uploading data from a PDA. **Data Entry and Edit** is protocol-based.

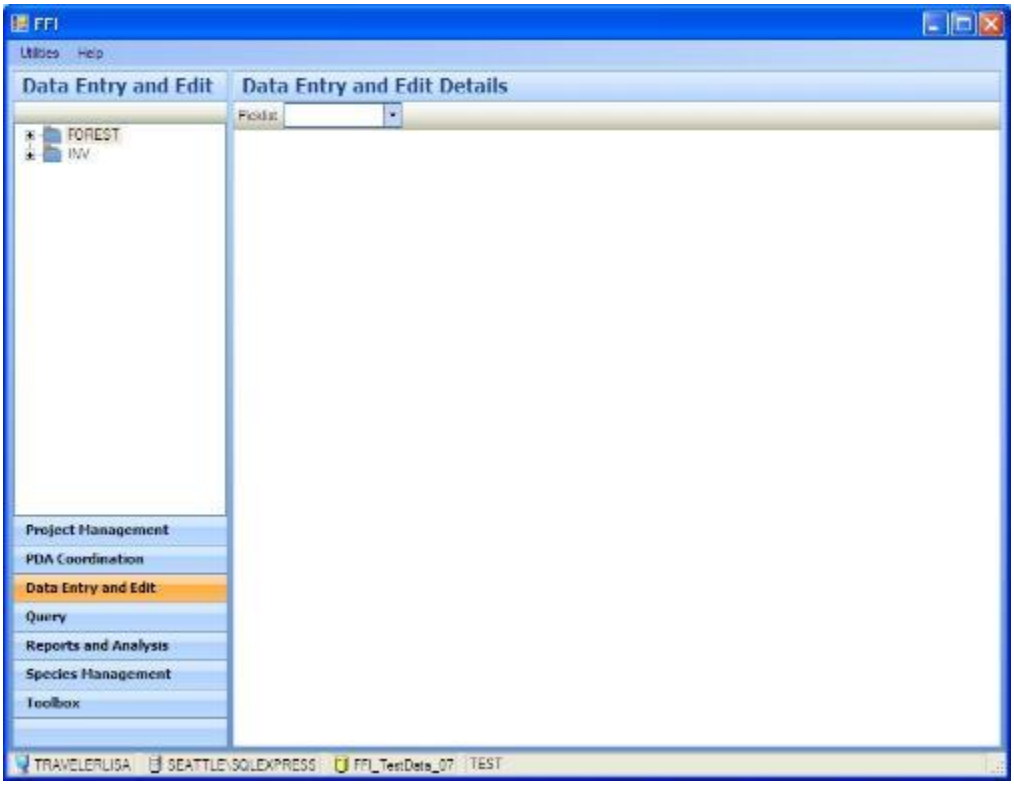
> *NOTE: The **Data Entry and Edit** function assumes that you have worked with and understand the methods and protocols and are familiar with the standard data forms used to collect monitoring data in the field.*

This section of the User Guide contains:

- A brief tutorial on how to use the Data Entry and Edit function, with some very basic guidelines on data entry methods.
- A brief discussion of fuel constants, which are integral to three of the surface fuels protocols.

Data Entry and Edit user interface

The basic **Data Entry and Edit** user interface is shown below.

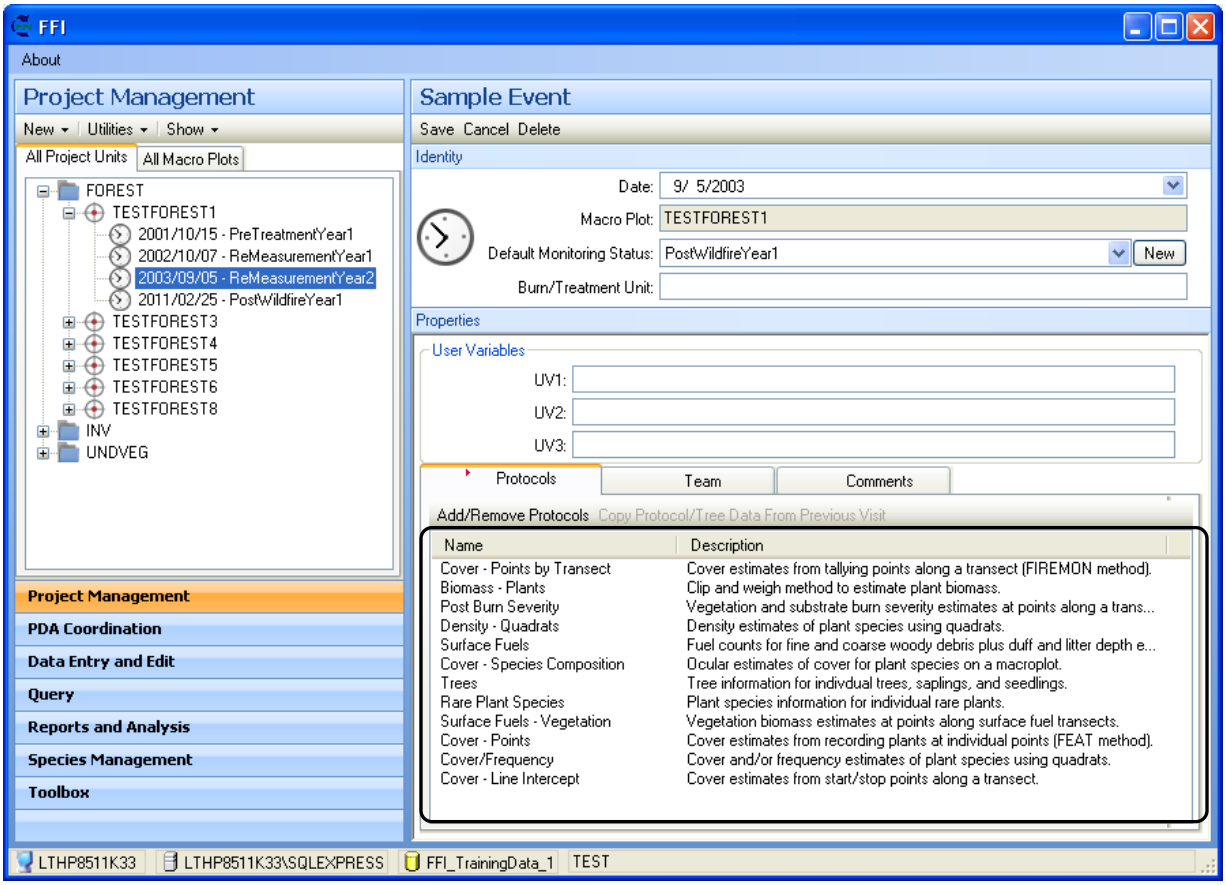


Data Entry and Edit basics

Protocols and sample events

When you select a sample event from the **Data Entry and Edit** tree view, FFI opens the *Data Entry and Edit Details* window. A tab is displayed for each sampling protocol assigned to the sample event.

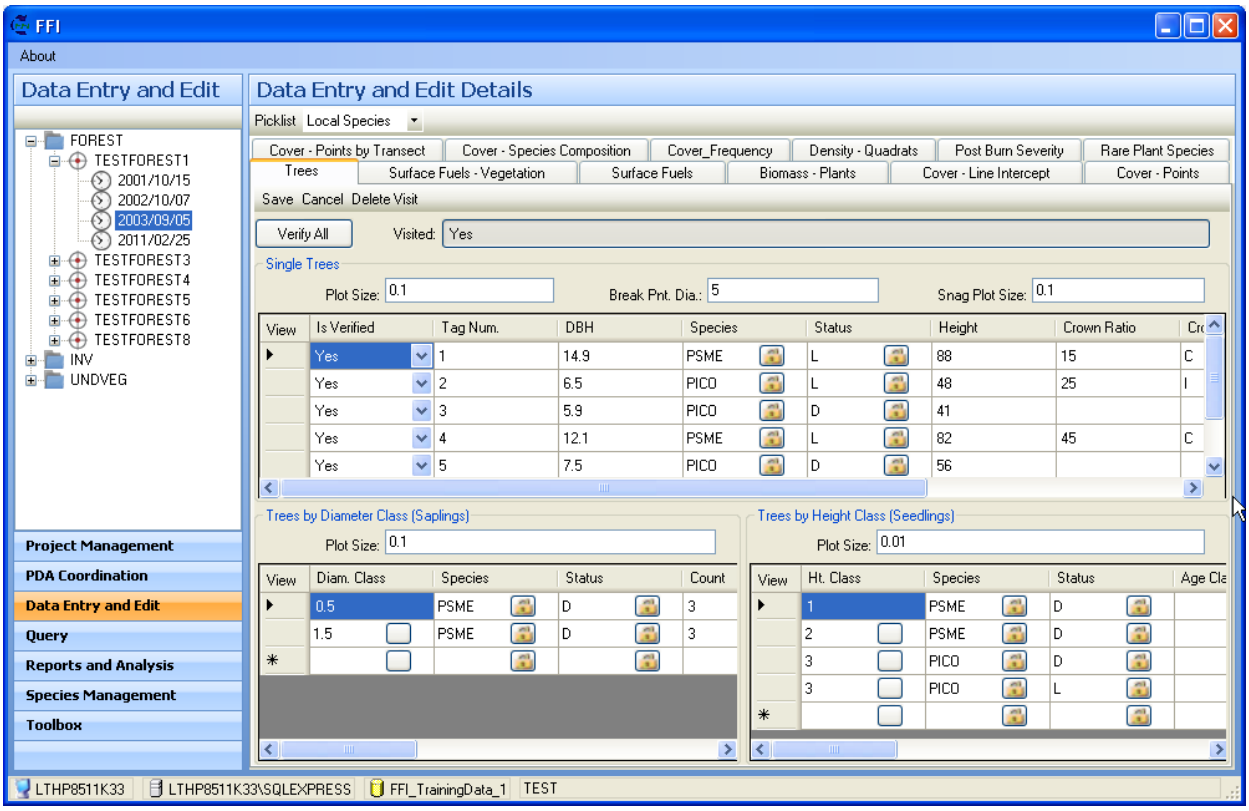
This screenshot of the **Project Management, Sample Event** window identifies the 12 protocols that are assigned to the *Sept. 5, 2003* sample event in macro plot *TESTFOREST1* of the *TEST* project unit.



When in **Data Entry and Edit**, double-clicking on a sample event in the tree view opens the *Data Entry and Edit Details* window. Here the **Sept. 5, 2003** sample event is opened in **Data Entry and Edit**, and tabs for all 12 protocols are displayed.

- Click a tab to open the data entry form you wish to work with.
- Save your data before moving from one protocol tab to another.
- Use the toolbar to save the record, cancel data entry, or delete the entire visit.

*CAUTION: Clicking **Delete Visit** will permanently erase all data on the active tab, including all subtabs of the Trees and Surface Fuels protocols. It will not delete data stored on other protocols attached to the sample event.*

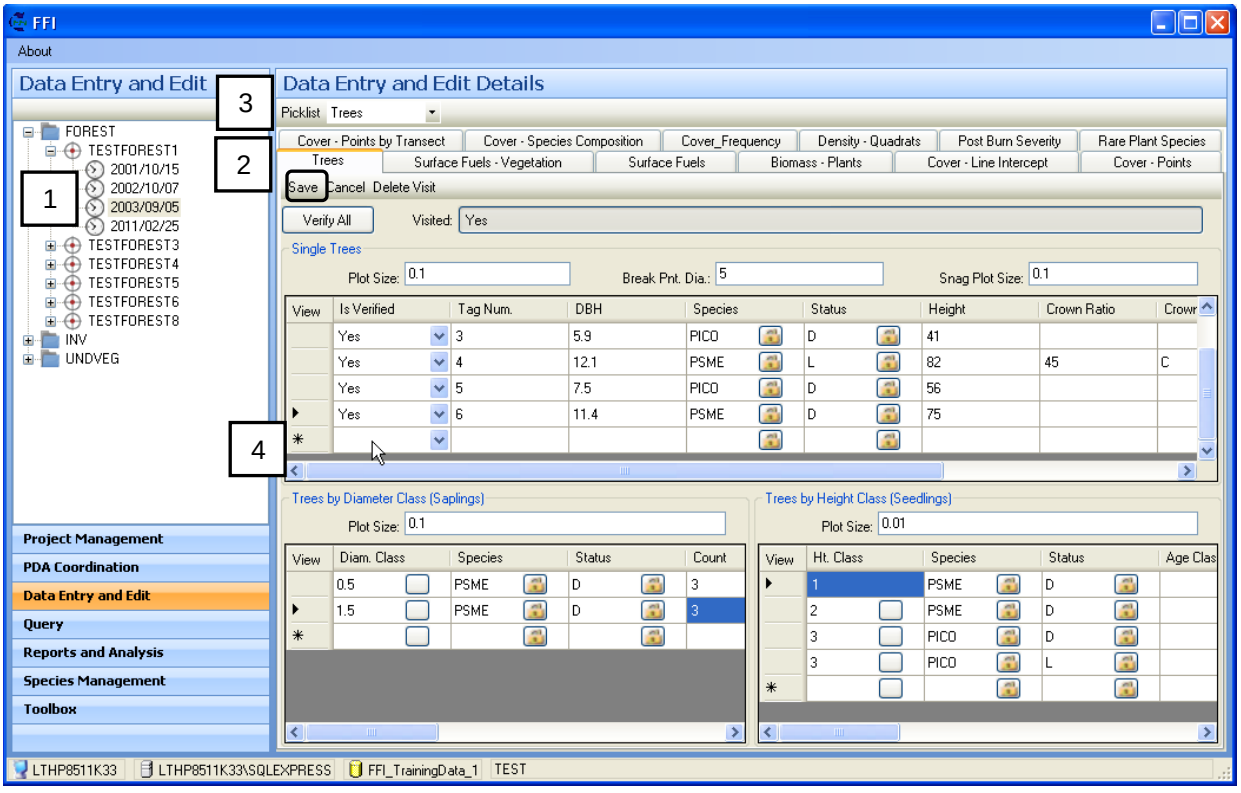


Basic data entry procedures

This page outlines basic data entry procedures. See Data entry guidelines for additional information.

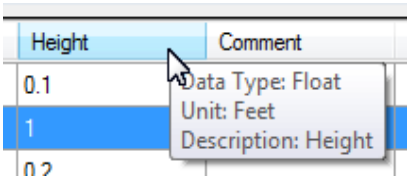
To enter data for a completed sample event:

1. With **Data Entry and Edit** navigation bar selected click a sample event in the tree view to open the *Data Entry and Edit Details* window**.** In this example, The Sept. 5, 2003 sample event for macro plot *TESTFOREST1* is selected.
2. In the *Data Entry and Edit Details* window, select a protocol data collection tab to work with. The *Trees* protocol is selected and the form is now open.
3. If you wish, click the **Picklist** menu and select a picklist. Here, the *Trees* picklist is selected. (Also, see Using picklists in Data Entry and Edit)
4. Begin to enter data by clicking in the first cell. Use the *Tab* key on your keyboard to move between cells. When you have completed entering data for the record hit the *Enter* key on your keyboard to begin a new row. Click **Save** when you are finished entering data on the current form.

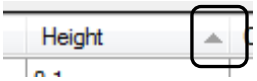


Data entry guidelines

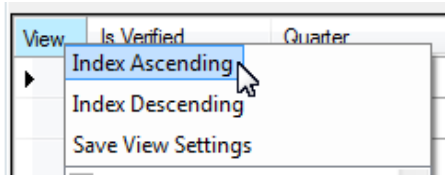
- Hover over the column headings for a description of the data to be entered into the field.



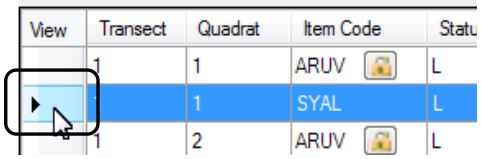
- Use the *Tab* key to move horizontally between fields.
- The *Enter* key moves the cursor to the first (left-most) field in the next row.
- Clicking *Shift + Enter* adds a new row and moves the cursor to the current column in the new row.
- Click a column heading to sort ascending or descending. An arrowhead will appear when sorted.



- Click *View* > *Index Ascending* to order records as they were entered.

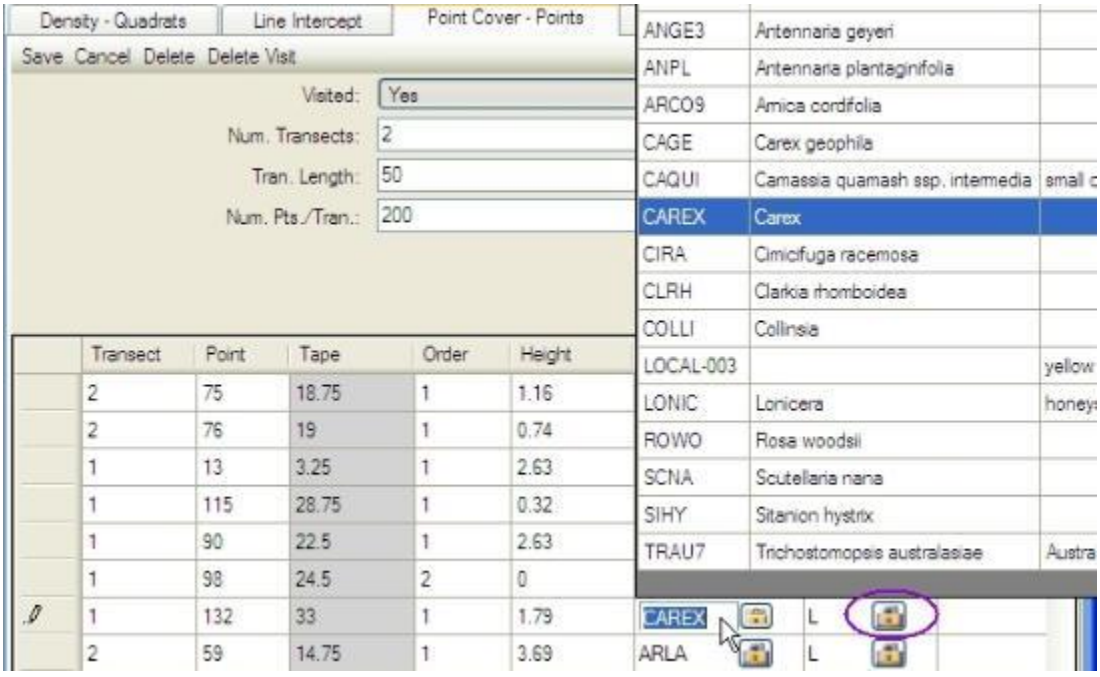


- To cancel data collection for a protocol, click **Cancel**.
- To delete a record row, select the entire row (by clicking in the row selector box at the left of the row) and press *Delete* on your keyboard.



- To delete all entered data for a protocol, click **Delete Visit**. Use carefully as this cannot be "undone".
- Grayed-out columns are calculated fields. When you click **Save** after completing a record row, the calculated values will appear. You cannot enter data into these fields.
- If you conduct a sample event but have no data to report, enter the required sample attribute(s) in the header area of the form (e.g., plot area) and click **Save**. This ensures that the plot visit is included in any calculations that you make, such as density or frequency calculations.
- A record is a row. All fields (columns) within the record must be completed correctly before the record can be saved. For this reason, completing data entry row by row is preferable to a column-by-column approach.

- Data entry forms are columnar. Scroll all the way to the right to ensure that you locate and complete all fields.
- Column widths can be changed and are saved when the database is closed
- Press *Enter* on the keyboard to add a new record.
- Method attribute codes and species data types, such as **Species**, **Class**, and **Status**, are entered into the forms through dropdown lists. The lists contain all permitted values for the attribute or species and are identified in data entry forms by a lock symbol, indicated in the example below. Reach these lists by clicking on the lock icon to open the list, and then selecting the desired value. In this example, clicking the lock icon opens the species list and the species *Carex* is highlighted.



- Method attribute codes and species data types can also be entered into the forms using the auto-complete feature. *Tab* into the field and begin entering text. *Tab* away from the field when you see the desired value.
- Grayed-out columns, like the Tape column above, contain calculated values. When you click **Save** after completing a record row, the calculated values will appear. Do not enter data into these fields.
- *Comment* and *User Variable (UV)* fields are always text fields.
- *UV* fields can be used to contain any data you wish to record but that is not specifically called for in the form. For example, when you are using a data entry form that uses specific ranges, use a *UV* field to enter and retain the actual readings. Or, you might use a *UV* to record whether the right or left side of a transect is being sampled. When performing analyses, you can stratify by UVs. When using the UV fields complete the UV description fields in header to describe the data.
- You must **Save** or **Cancel** changes within a protocol tab before switching to another protocol tab. FFI will prompt you to cancel or save your changes.

- A red Attention icon will notify you of required data or form errors. Hover over the icon to view the message. A form cannot be saved until all errors have been resolved. Once you resolve the errors and click **Save**, the Attention icon will disappear.

View settings

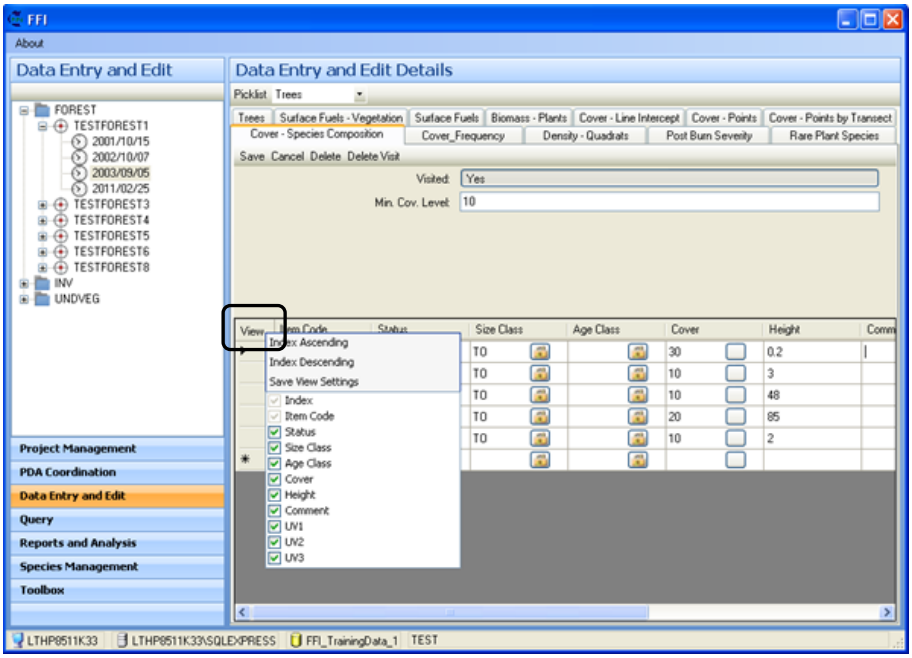
FFI includes the ability to: 1) hide, 2) reorder, resize and 3) freeze columns in the data entry grid.

The view settings are carried with the database. If you change protocol view settings in one sample event the view settings will apply to all sample events in the database.

- How to hide and unhide columns
- How to change column order
- How to freeze columns
- Changing column size
- Importing view settings

How to hide and un-hide columns

Click on the **View** button in the upper left corner of the data grid, uncheck the fields you do not want to see and select **Save View Settings.** Is this example no fields are hidden. Required fields are grayed out. To unhide columns click **View** and check the boxes of the columns you want to see.

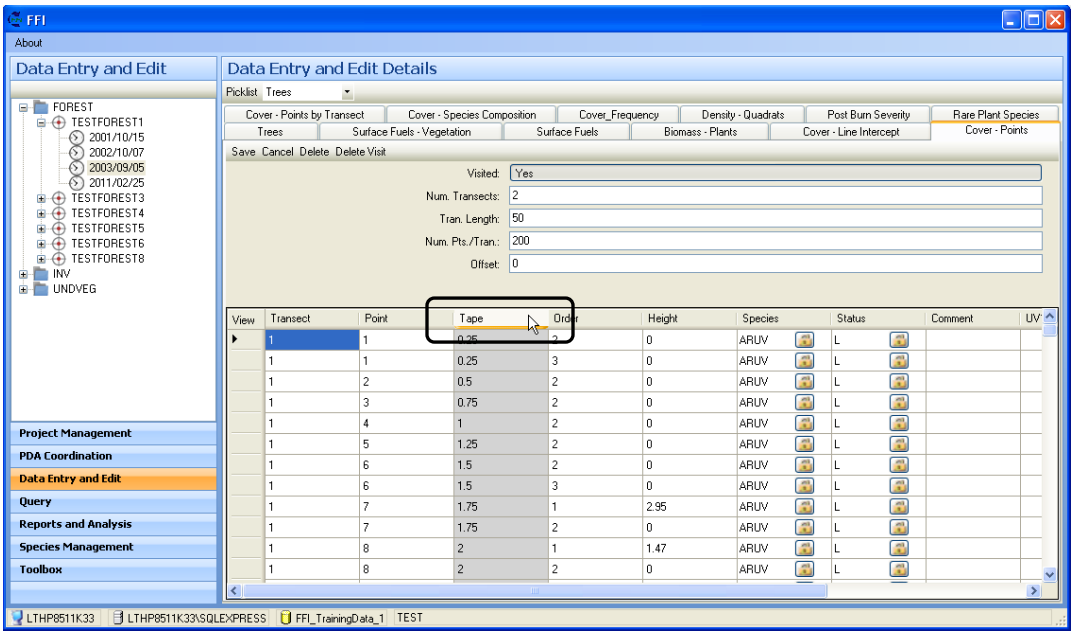


How to change column order

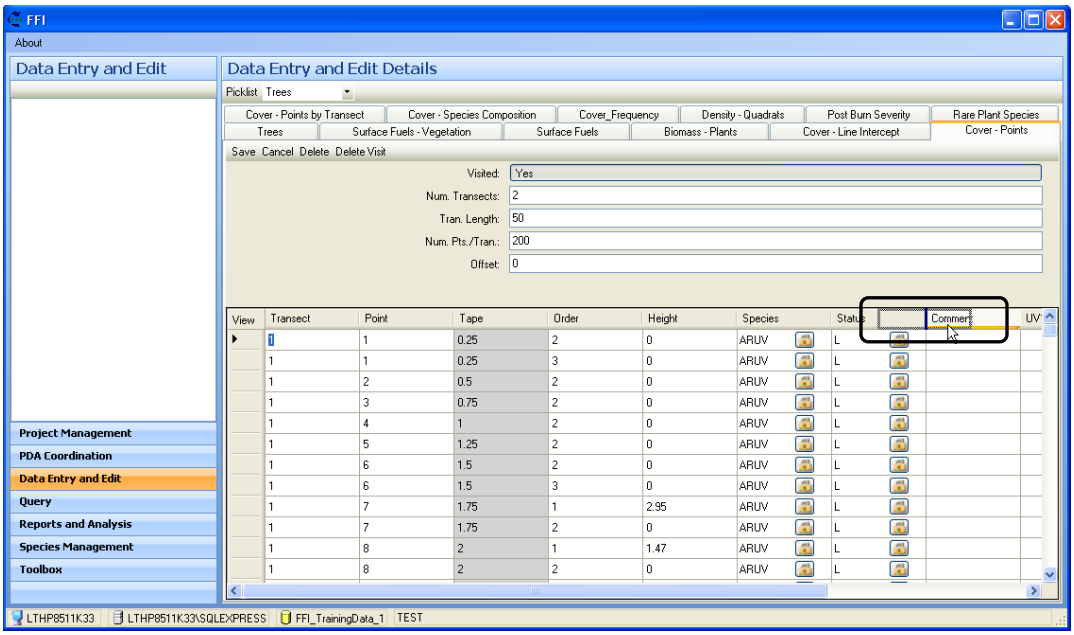
Change the column order by selecting the column header you want to move and dragging it to its new position. Column position is saved with the database.

In this example the *Tape* field is moved to right of the *Status* field so the user doesn't have to tab over it during data entry.

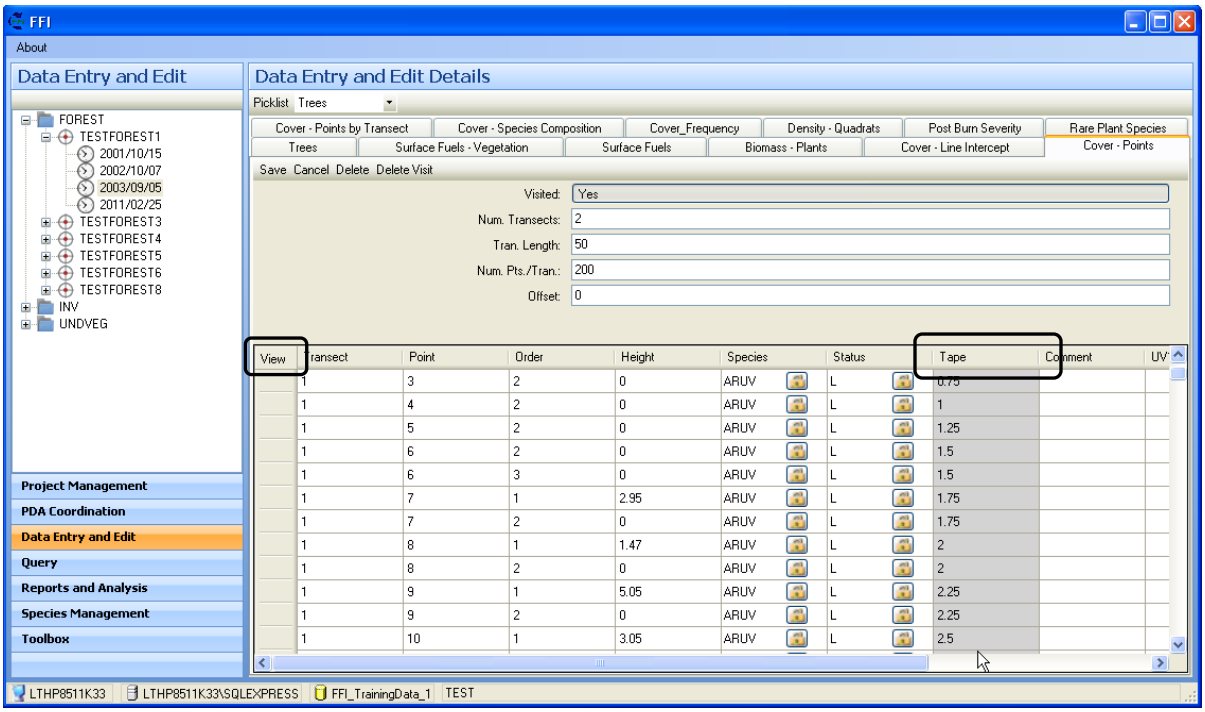
Place the cursor over the column label you want to move, click and hold the left mouse button...



...drag the field to the position you want it...



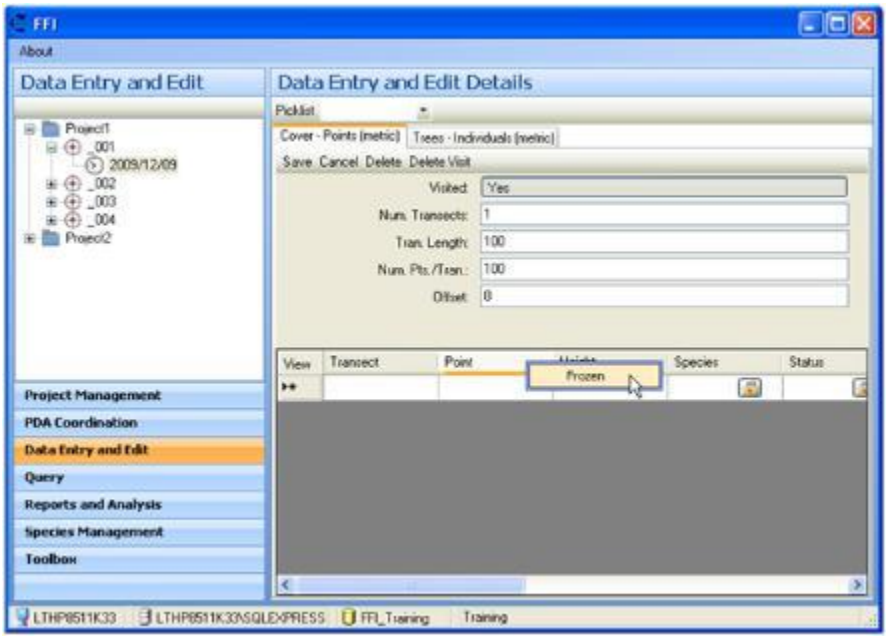
…release the left mouse button. The *Tape* field is now right of the *Status* field. Click the **View** menu in the upper left of the data grid and select **Save View Settings.**



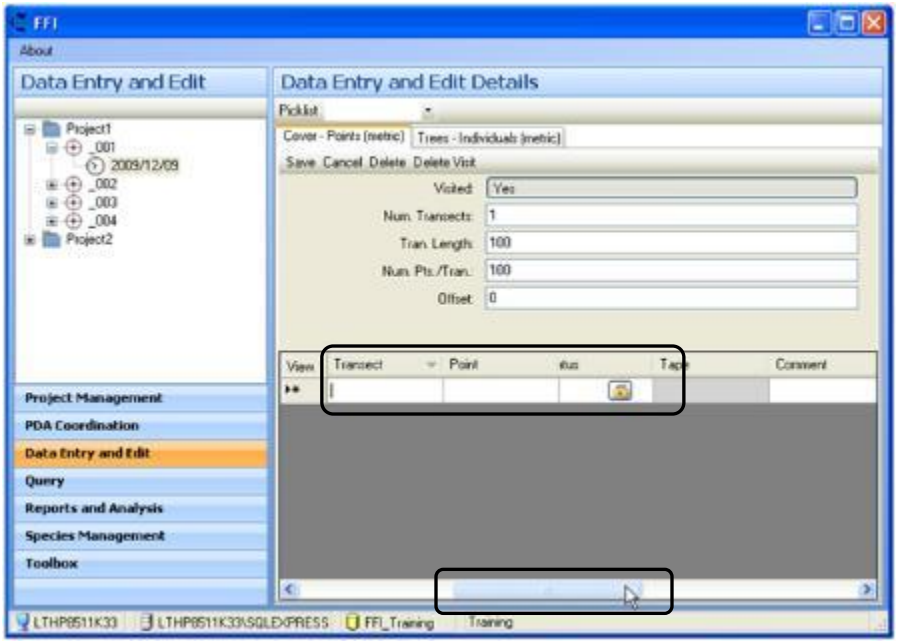
How to freeze columns

Freezing a column makes that column and every column to the left of it stay in place when scrolling right. Here is an example of freezing the *Point* and *Transect* fields.

Place the cursor on the rightmost column label you want to freeze, right-click and select *Frozen*. Click the **View** menu and select **Save View Settings.**



Now when scrolling to the right the *Transect* and *Point* field remain in view.



To un-Freeze column right-click and uncheck the *Frozen* box. Poin

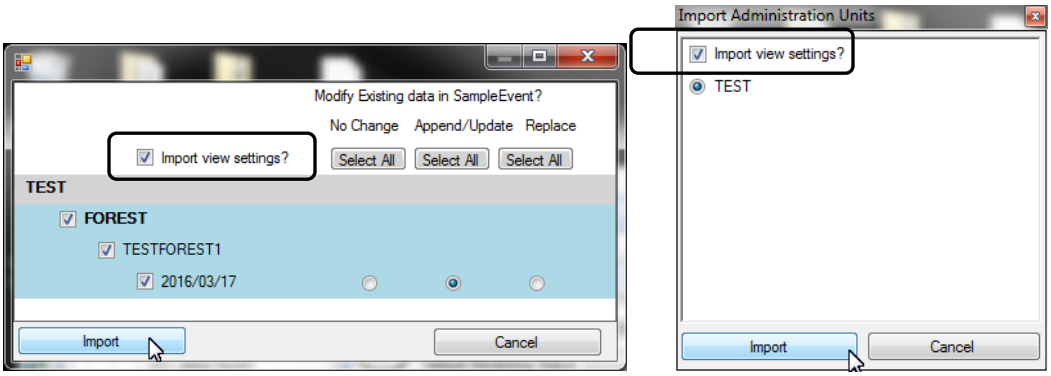
Changing column size

Column width and column header height can be changed by moving border while holding down the left mouse button. The column width changes are saved with the other view settings. Column height changes are not.

View	Tag Num.	Species	Status	DBH	Height	Crown Ratio	Crown Class	Live Crown Base Ht.	Subplot Frac.
▶	1	ABLA	L	14.9	88	60	C	35	1
	2	PICO	L	6.5	48	54	I	22	1
	3	PICO	L	5.9	41	31	S	28	1
	4	PSME	L	12.1	82	62	C	31	1
	5	PICO	L	7.5	56	64	C	20	1
	6	PSME	D		75				1
*									

Importing view settings

Export files created in FFI or FFI-Lite include the view settings for all protocols in the database (even protocols not in the export file). When importing you will have the option to import the view settings that were copied from the source database or maintain the view settings as they exist in the destination database. To import the view settings, check the **Import View Settings** box. If left unchecked the view settings in the destination database will be unchanged.



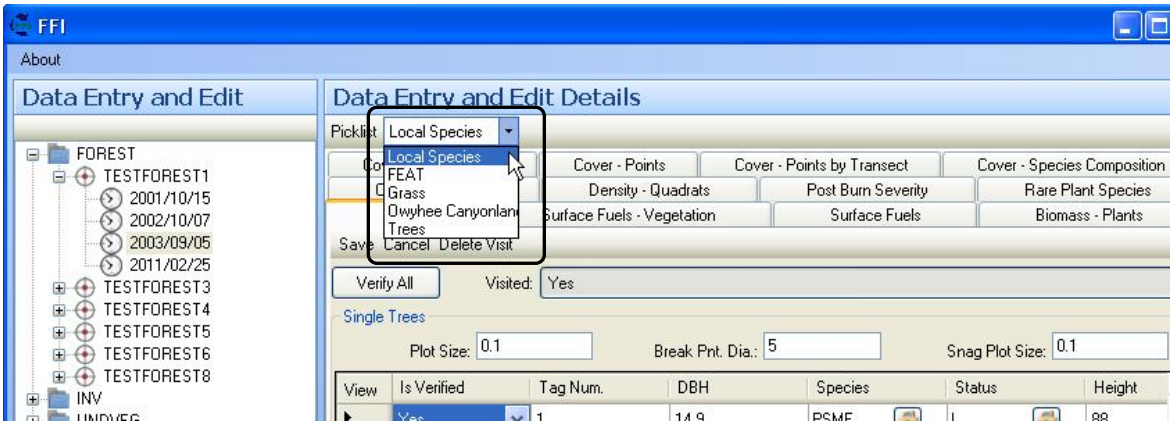
NOTE: View settings will be imported if the Import view settings *box is checked even if* No Change *is selected for all macro plots and sample events.*

Using picklists in Data Entry and Edit

Picklists are a subset of your local species list and are used whenever you want to use a subset of species during data entry or when querying your data. Picklists are saved at the administrative unit level.

When you enter data for a sample event, you can apply the picklist that you used while collecting sample data in the field. This limits the number of species available for selection in the data entry forms to only those that you know to be present in the sampled area, which can save considerable time. You can readily switch between picklists at any time to using the *Picklist* dropdown.

To select a picklist, click the **Picklist** dropdown menu in the toolbar of the *Data Entry and Edit Details* window and select the desired picklist.



Select *Local Species* in the picklist dropdown to see the entire local species list again.

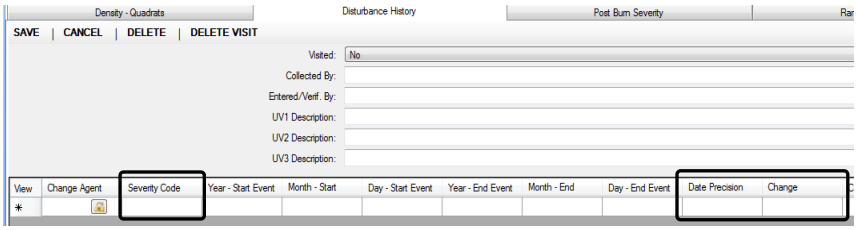
Method-specific data entry tips

This section includes notes and tips that are pertinent to specific methods.

- Disturbance history
- Biomass - Fuels
- Density – Belts/ Density - Quadrats

Disturbance history

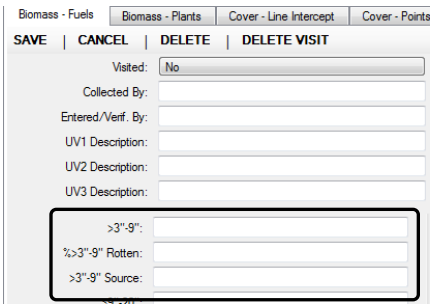
For clarification of certain fields in the *Disturbance History* data entry form, see below.



1. *Severity Code*: This is a user-defined field, since there is no standard set of codes for severity of disturbance. Establish a set of codes to meet your particular situation before going to the field.
2. *Date Precision*: This is a decimal field that allows users to indicate how sure they are of the time of disturbance noted in the previous six data fields (these fields are truncated on the graphic above), in years. For example, you might know the precise date of a prescribed fire but not the dates or insect- or disease-related disturbance. In this field, you could, for example, enter a value of 2 to indicate that your level of certainty as expressed in the previous fields is within about two years.
3. *Change Description*: This is a text field. Use it to describe the change that has occurred, or to provide additional data to describe the change agent.

Biomass - fuels

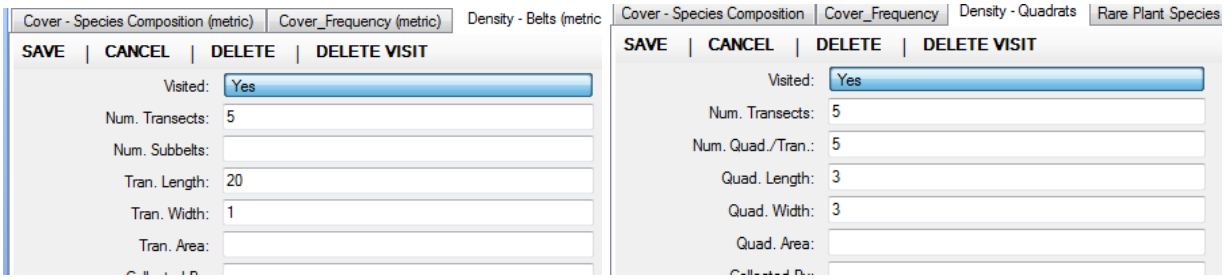
Before going into the field select a photo guide that describes fuels in your area. These guides generally divide fuels into either a >3" class or the smaller classes. In the field, visually divide the fuels into the classes used in the selected photo guide and record these values in the data entry form.



1. Units for the > fields (e.g., >3"–9") are in tons per acre.
2. Units for the *% Rotten* fields (e.g., %>3"-9" Rotten) are the percentage of the class that is rotten vs. sound.
3. Information in the *Source* fields (>3"-9" Source) is a description of the source publication. It is a text field.

Density – Belts/Density - Quadrats

If values are entered in the Transect or Quadrat Length and Transect or Quadrat Width sample attribute fields then density is calculated using the area sum of those two values regardless of the value entered in the Transect or Quadrat Area field. If the Transect or Quadrat Area field is populated and the Width and Length fields are blank then Density is calculated using the Area value.



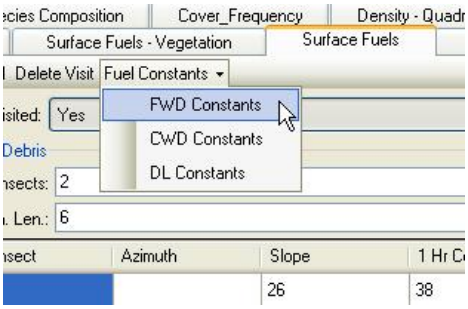
Fuel constants

Fuel constants are used in equations to calculate fuel loads. They are associated with the surface fuel protocols, as shown here:

PROTOCOL	FUEL CONSTANTS
Surface fuels	FWD (fine woody debris), CWD (coarse woody debris), and DL (duff/litter) constants
Surface fuels - Alaska duff/litter	Alaska DL constants
Surface fuels - vegetation	FLVeg (Fuel Load Vegetation) constants
Logs – Fixed-area	CWD constants

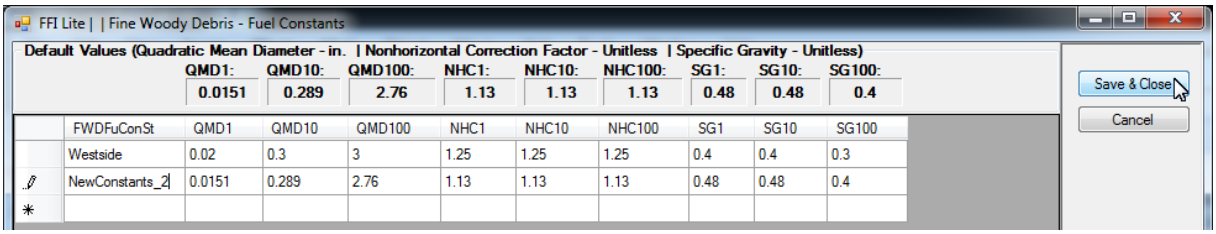
The use of the fuel constants is not required, however; the default values for the *Surface Fuels* and *Surface Fuels - Vegetation* protocols (duff, litter, FWD, CWD and vegetation) are typical for the U.S. Northern Rocky Mountain states and may not be applicable for your area. The fuels constants used in the *Surface Fuels - Alaska duff/litter* protocol are typical for that state. A partial list of references for fuel constants is available on *Fuel Constant Set References* page on the FFI FRAMES website. Fuel Constants Sets are saved with the database and are available in all sample events.

The *Fuel Constants* field is embedded in the protocol data entry sheets. As shown in the example below, the *Fuel Constants* for the **Surface Fuels** protocol includes *FWD Constants*, CWD *Constants*, and *DL Constants*.



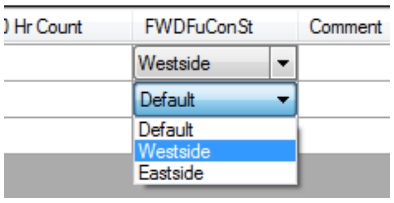
NOTE: Even though Fuel Constant Sets are entered at the sample event level and appear to only be available for one sample event, they are available for every sample event in a database.

In this example below, the *FWD* fuel constant data grid has been selected. Default values are displayed at the top of the Fuel Constant Set window. The first custom Fuel Constant Set named *Westside* has been entered in the grid below the default values and another row has been added with a default Fuel Constant Set name of *NewConstants_2*. The fuel constant values for the new set are initially the same as the default values at the top of the window. The second row is ready to be named by the user and new fuel constants entered. Click **Save & Close** when finished.



NOTE: Fuel Constants are always entered in English units regardless of being added to a metric- or English-units protocol. The required units for each data field are displayed at the top of the Fuel Constants window.

The custom Fuel Constant Sets will be available in the dropdowns in the applicable protocols.



Comma delimited file (CSV) Import and Export

*NOTE: This discussion pertains to the CSV import and export available in **Data Entry and Edit**. The files have a CSV format. See Import/Export Utility (XML format) in the **Project Management** section of the user guide for information about working with XML files.*

FFI provides comma delimited file (CSV) import and export functionality in **Data Entry and Edit** for the most used FFI methods. CSV import can simplify field data collection because FFI-Lite is not required – any device with a spreadsheet application (e.g., Excel or Google Sheets) can be used to collect data. Data are imported one method at a time for each macro plot/sample event.

The CSV file format is unique to each method. Methods that include a species symbol or item code dropdown list will need customization to link symbols and codes to their associated GUIDs (the FFI database only recognizes species symbol and item code GUIDs).

FFI allows data import and export at sample event level for these methods:

Trees – Individuals	Trees – Saplings	Trees – Seedlings
Surface fuels – Fine woody debris	Surface fuels – Coarse woody debris	Surface fuels – Duff & litter
Surface fuels – vegetation	Surface fuels – Alaska duff/ litter	Logs – Fixed-area
Cover – Line intercept	Cover – Points by transect	Cover – Points
Cover – Species composition	Cover/Frequency	Density – Quadrats
Density - Belt	Biomass – Plants	Biomass - Fuels
Rare plant species	Post burn severity	Disturbance history
FCCS	Pilot sampling	CBI – Composite Burn Index

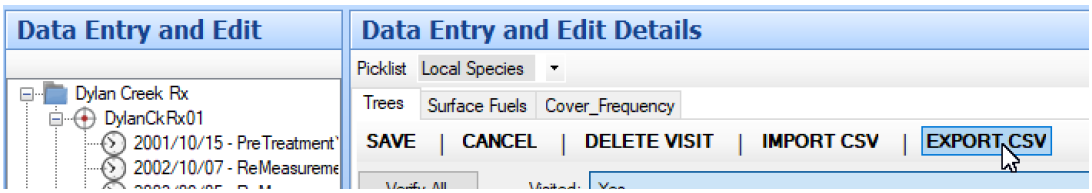
CSV notes

- Each macro plot and method will require a unique CSV file.
- The CSV file does not include any information that associates it to a macro plot, sample event or method.
- Use the filename to associate data with a macro plot, sample event and method.
- Data can only be imported one sample event and method at a time.
- When importing data from a CSV file, FFI searches for valid column headers and imports data into the appropriate fields in the FFI database. The column order of the CSV files is not important, and any extra columns are ignored. Data fields you do not collect data for do not need to be included in your CSV files.
- On import, data will be checked for data type and range, and against the valid options if the field is limit-to-list. Any errors will prevent import of any data in the CSV file.
- FFI databases save species symbols and item codes as GUID values rather than the actual symbols or codes. For any method that includes a Species or Item field, it is necessary to create a spreadsheet template that includes a lookup table to automatically match the species symbol with the species GUID or item code with the Item GUID. Symbol and code GUIDs are unique to each database so templates must be database specific.
- CSV data can only be imported into a method that has no existing method attributes.
- FFI has multiple-method protocols like Tree Data and Surface Fuels. You will not be able to save each method in FFI until the sample attributes (e.g., *Plot Area* and *Snag Plot Area* in Trees - Individuals) for each method are entered in FFI. When copying data from a previous visit, these fields will be automatically copied, otherwise you will need to enter them for each method in FFI before saving.
- When copying data from a previous visit all Trees-Individuals method attributes (e.g. Species, DBH, Height) are copied to the new sample event. The CSV import will append

imported tree records to any existing tree records in the method so you should manually delete the Trees-Individuals method attributes before importing from a CSV file or you will have duplicate records.

Exporting a CSV file

To create a CSV file for a method, select the method in any sample event in FFI **Data Entry and Edit**. Click **Export CSV** file and save the CSV file to a folder of your choice.



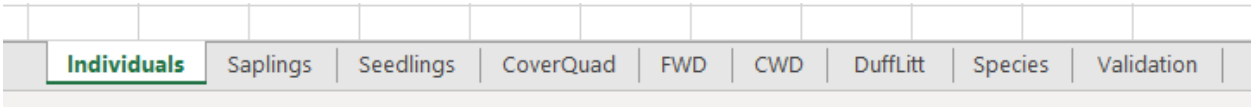
The file will include all the field names used in the method

	A	B	C	D	E	F	G	H	I	J	K	L
1	Index	IsVerified	QTR	SubFrac	TagNo	Spp_GUID	Status	DBH	Ht	CrwnRto	CrwnCl	LiCrBH

Creating a Data Collection Template

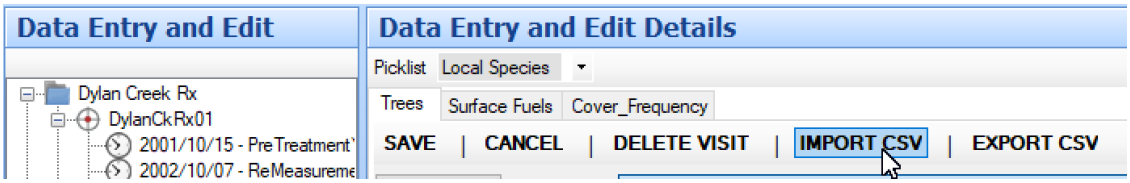
You only need to create one CSV file per method to use as a template for data collection. You can customize the template to include only the fields you will collect, add data validation (e.g., limit the range of data entered or a include a dropdown of valid options), rearrange the column order and so on. If it is a method with a *Species* or *Item* field, you will need to add a lookup table to match the symbol or codes with the associated GUID. If you add data validation or species lookup table then the file will need to be saved in a format that allows those features to be saved with the file. For example, in Excel save the file as an *XLSX* format. A Google Sheet will also save the customization. Your template can include tabs for each method. Data for each method/tab must be exported in CSV format for import back in to FFI. The screen shot shows tabs for all Trees methods, Surface Fuels methods and cover quadrats, along with tabs for the species GUID lookup table and data validation.

NOTE: For more information about creating a CSV template for data collection see FFI CSV Import and Export Template Setup *on the* Other Documents *tab on the FFI FRAMES website.*

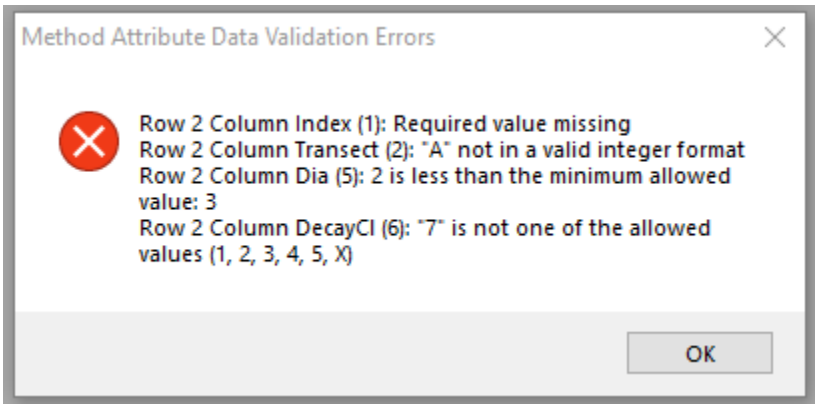


Importing a CSV file

CSV import is not as sophisticated as the XML import/export utility available in **Project Management** so, for each CSV file (method), you will navigate to the specific macroplot/sample event you want to import the data into and click **Import CSV**.



FFI will check for required fields, data type, etc. and report any errors. In this example, several errors are reported for a Surface Fuels – CWD file import. No data are imported when errors are found – the errors must be corrected in the CSV file before the data can be brought into the database.



Click **Save** in FFI after importing the method data.

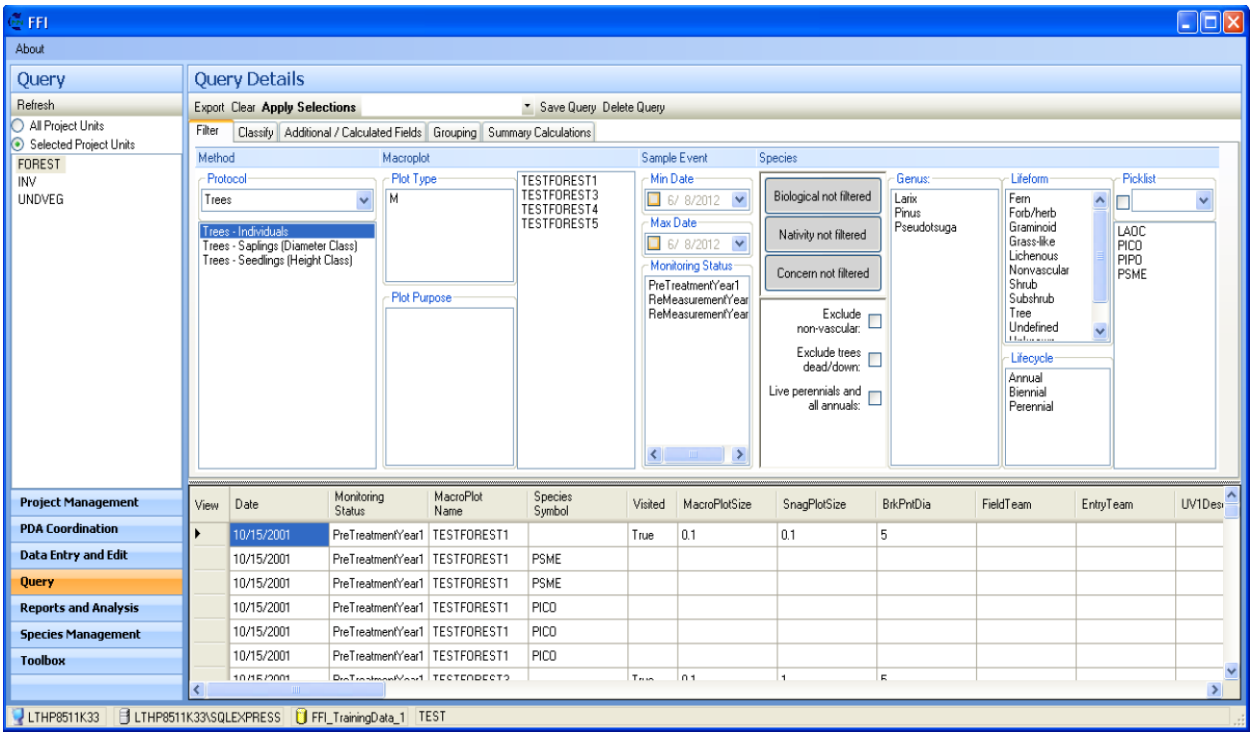
Query

The **Query** screen lets you retrieve and explore your method data within a powerful and flexible user interface. Within the Query screen, you have complete control over the method data that you want to look at, the macro plots that you want to include in calculations, and even the types of calculations that you want to do. Query is used to:

- View data for selected plots that fit designated criteria.
- Group data in unique ways for exploration.
- Explore how individual species change with monitoring status.
- Explore the effect of treatments during each sampling event.
- Classify attributes with user-defined names.
- Calculate measures of density, DBH, or cover.
- Export unique data combinations for further analysis.

This section includes descriptions of the four main functions that are included within the query process. These functions include Filtering, selecting Additional Data, Classifying, and Grouping and Calculating summary data (see FFI screen below). Each function is described is this guide using examples that illustrate specific queries that can be developed. Because this feature is so flexible, however, these examples cannot show the many possibilities for creating data sets that a user has.

NOTE: Be aware that FFI will not prevent you from making inappropriate selections. Not every query that can be created will be useful or meaningful.



NOTE: On each tab, click on Apply Selections *after you have made your query selections*

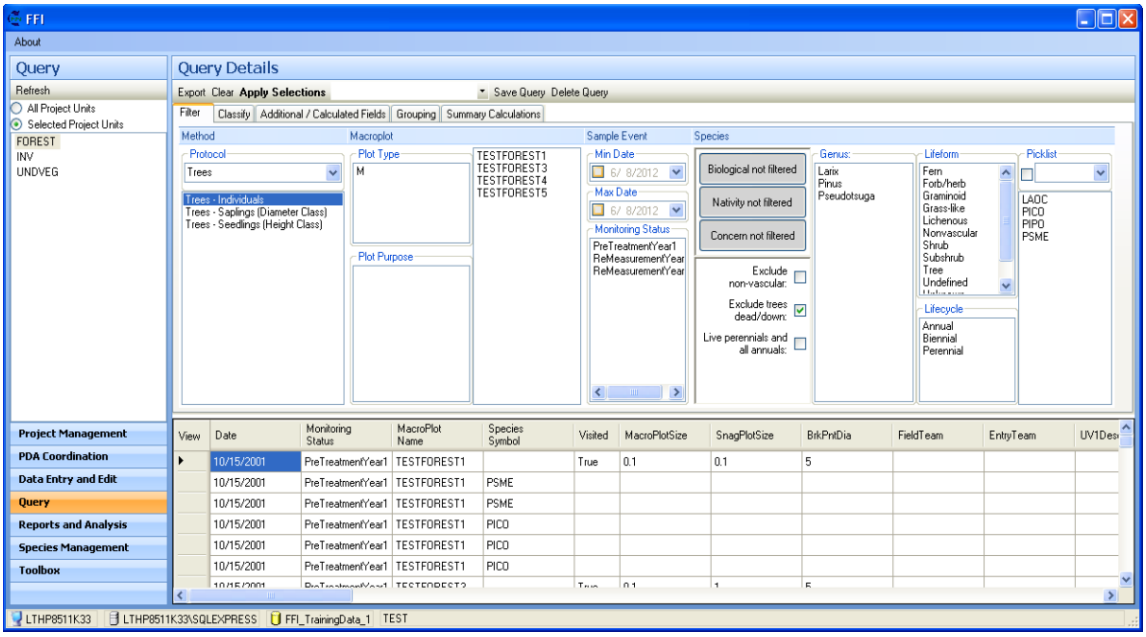
- The Filter tab lets you quickly pick the method that you want to explore data from, the macro plots that you would like to include in a data set, the sample events or monitoring status that are important to you, species or group of species that you want to focus on; and it gives you many options to explore your data sets.
- Classify let you break continuous values like DBH into classes, which can then be grouped in the results.
- Additional/Calculated Fields allow you to include attributes from the event, plot and species table that would otherwise not be included in the results.
- Grouping can be used to summarize data by the values in one or more field and perform calculations.
- Summary Calculations is used to make the final calculations in the query

NOTE: The Query Builder Calculation Guide provides helpful tips for making a number of basic queries. It is available on the Help Documents page on the FFI FRAMES website. Practice exercises can be found in the query exercises available on the FFI Training Materials page on the FFI FRAMES website. The exercises provide example queries for the most common query types: basic filtering; basic classification; and calculations of density, cover and frequency.

Query – Filter tab

The FFI *Filter* tab lets you select records by project unit, method, macro plot, sample event, and species. After you have selected the project, you can proceed through the filtering fields and other *Query* tabs to refine your query output. Filtered records are displayed in the grid at the bottom of the *Query Details* window and can be exported as an Excel file.

NOTE: Filter is based on method, rather than protocol.



NOTE: Basic descriptive data for a macro plot, such as Visited ***status and*** MacroPlotSize***, is*** *shown only in the first record of each macro plot in the lower grid.*

Using the Filter tab

1. Select the project unit in the tree view.
2. Select the protocol in the dropdown listing, and then select the appropriate method (*Tree Data - Individuals* is selected is in the example screen shot,). This limits the query to only those macro plots that include sample events using the selected method.
3. Continue making choices in each field to create the query. In the example, no macro plots are highlighted so all plots will be included in the query and the option to exclude dead/down trees is checked.

   NOTE: If the **Exclude non-vascular** *box is checked the query results will exclude records that are* Not Biological *(identified in the PLANT Characters box in Species Management). Checking the* **Exclude trees dead/down** *box excludes trees with Crown Class codes of* DD, BBD *and* CUS *from a query of the Trees-Individuals method. If the* **Live perennials and all annuals** *box is checked then species with a Status of Dead will be excluded from the query results.*

4. Click **Export** to export the grid as a data file for use in other software packages. The query itself is not exported.
5. Click **Clear** at any time to clear all selections within the query. The Protocol field will remain selected until it is changed by the user so the lower table will also display all data from this protocol until it is changed.

Some filtering guidelines:

- You can filter all project units or one project unit at a time. If you would like to explore data from multiple project units (but not *all* the project units) within one query, you should create a new project unit under Project Management (you could name it *analysis project*, for example), choose the macro plots you would like to combine under the new analysis project, assign monitoring statuses to the sample events and then, in Query Builder, query to filter or group plots within that analysis project as described in the *Query* section. This gets around the 'query within a single project' rule.
- Only one method can be queried at a time.
- If no items in a list are highlighted, then all items are included in the query. To filter a list, click an item once to include it in a query (it will be highlighted). If one item in a list is highlighted all other items will be excluded from the query. To unselect an item click it a second time so it is no longer highlighted.
- To select a range of sample event dates, enter a minimum and maximum date (inclusive). To select a single date, make the two the same. To include all dates, leave both blank (as in the example above) by unselecting the checkboxes.
- You can select a picklist as a filtering criterion.
- Click on any column heading to sort the records by that data element.
- When viewing the records, scroll horizontally across the grid to view all record fields.

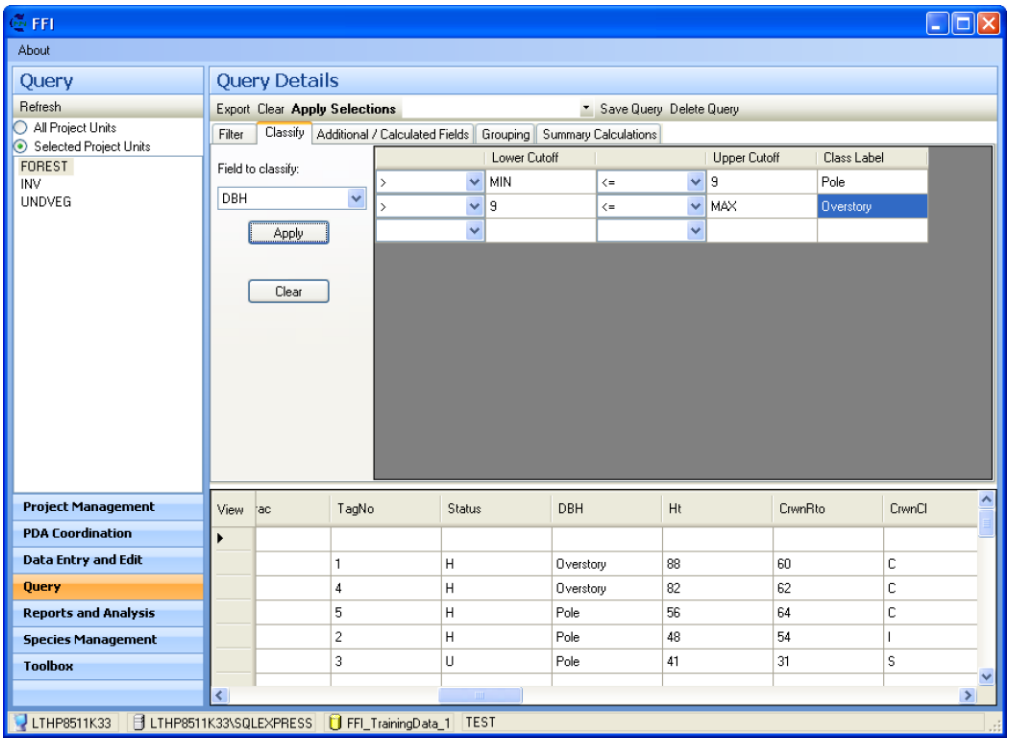
NOTE: If you click the ***Query All Project Units*** *button on the* Filter *page, the query will show all of the macro plots (and all sampling events within each macro plot) for the selected method. All of the method attributes within the method will also be listed in the grid. You will not be*

able to filter on monitoring status in any query because all sampling events are already included in your output when you chose this option.

Query – Classify tab

The *Classify* tab allows you to classify any attribute that is displayed as numeric field in your query, such as tree DBH or plant height. The classes that you create can be used in calculations within FFI or exported to use in other applications.

NOTE: More information can be found in the query exercises available on the FFI Training Materials page on the FFI FRAMES website. The exercises provide example queries for the most common query types: basic filtering; basic classification; and calculations of density, cover and frequency.



NOTE: Basic descriptive data for each macro plot, such as Visited *status and* SnagPlotSize*, is shown in the first record for each macro plot in the data grid. The data gird contains all attribute data for your selected macro plots, status, method and field.*

Using the Classify tab

1. Select a protocol/method that contains the data you want to classify. Protocols and methods are selected on the preceding *Filter* tab. In the example above, the method that contains the DBH data that we want to classify is Tree Data – Individuals.
2. In the dropdown list on this *Classify Tab* screen, select the *Field to classify*. In this case, we chose DBH.
3. On the first available line in the upper table, enter the *Upper Cutoff* value and a *Class Label* name that you want to assign to this class. In this example, there are two classes.

From 0 to 9 (the upper cutoff value) our trees will be classified as Poles. Those trees greater than 9 will be classified as Overstory. Note that there is no upper limit to the overstory class in this example.

4. Click **Apply** and then **Apply Selections** to classify the records, or **Clear** to clear the values. The **Clear** button below the **Apply** button will clear only values in the upper table where the classification is set. When you click **Apply Selections**, the original numeric values for the classified column (i.e., DBH) in the lower table are replaced with your new class names. These new names cannot be cleared or changed by clicking **Clear**. They must be reclassified to change them. The classify procedure only changes the data in Query Builder. The data in the FFI database remains unchanged.

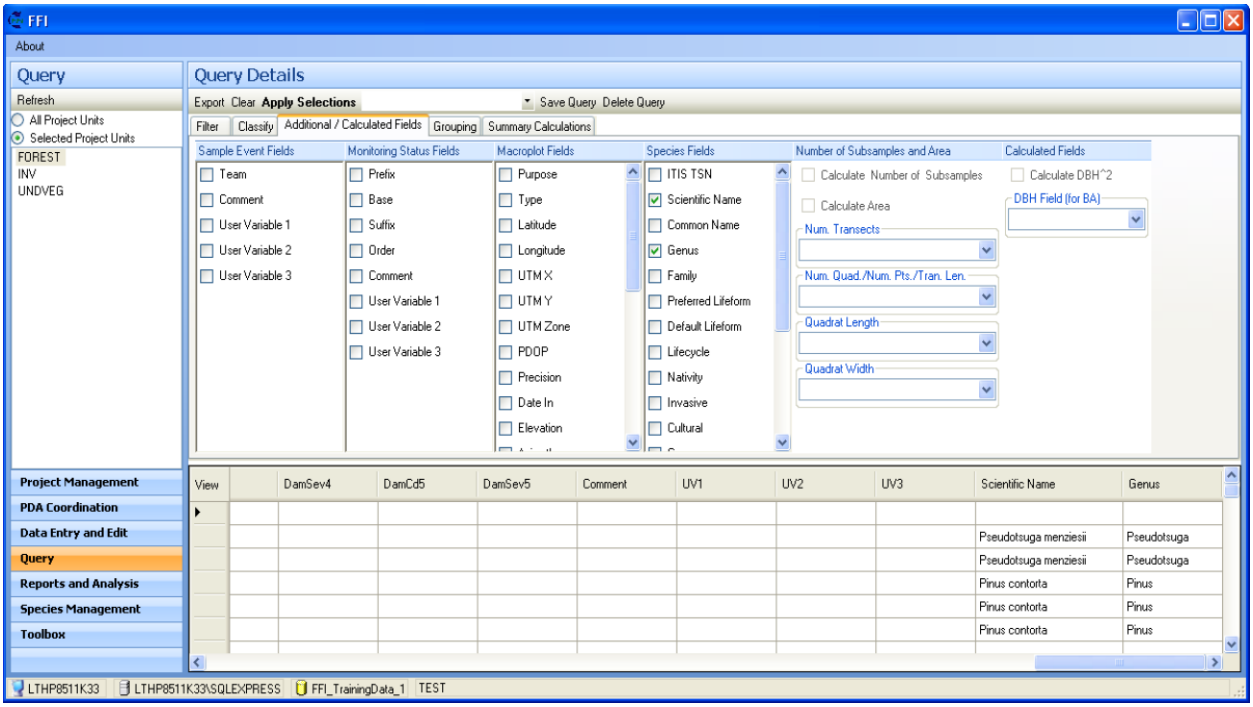
Some guidelines:

- For the first class, provide only a class label, not a lower cutoff value (It defaults at '0').
- For each subsequent class, the lower cutoff you provide will also be the upper cutoff for the previous class. All you need to supply is your upper value for the class and a class label on each line.
- If you make a mistake in your classification process, click clear or use the arrows to maneuver to the cell with the error and begin your classification process again.
- You may classify more than one field when you are within the Classify tab.
- To exclude missing values from the classification, label the lowest class 'missing' and then set the Lower Cutoff of the next class to > 0. (This is the default when you enter the Classify Tab.) If you want to eliminate this option, begin typing your classification on the first line by changing the 'MIN' to '0' and setting the 'Upper cutoff' and 'Class Label' as described above.
- Your new class descriptions will show up automatically in the lower table of the Filter tab and in the Grouping tab when you click Apply.
- Click on any column heading to sort the records by that data element. In the example above, the records are sorted by *Date*.
- When viewing the records, scroll horizontally across the grid to view all record fields.

Query – Additional/Calculated Fields tab

The *Additional/Calculated Fields* tab lets you include additional fields in your query. As indicated below, you can select any of the description fields that are assigned to a macro plot, sample event, monitoring status, or species if the field contains data.

NOTE: More information can be found in the query exercises available on the FFI Training Materials page on the FFI FRAMES website. The exercises provide example queries for the most common query types: basic filtering; basic classification; and calculations of density, cover and frequency.



NOTE: Basic descriptive data for a macro plot, such as Visited *status and* MacroPlotSize, *is shown in the first record for each macro plot.*

Using the Additional/Calculated Fields tab

1. Select additional data fields to expand the query. In this example, the species fields *Scientific Name* and *Genus* are displayed after **Apply Selections** is clicked.
2. Each time you apply a filtering criterion and apply the selection, the record grid updates. Note that columns have been added for *Scientific Name* and *Genus*.
3. Click **Export** to export the grid as a data file for use in other software packages. The query itself is not exported.
4. Click **Clear** at any time to clear the query.

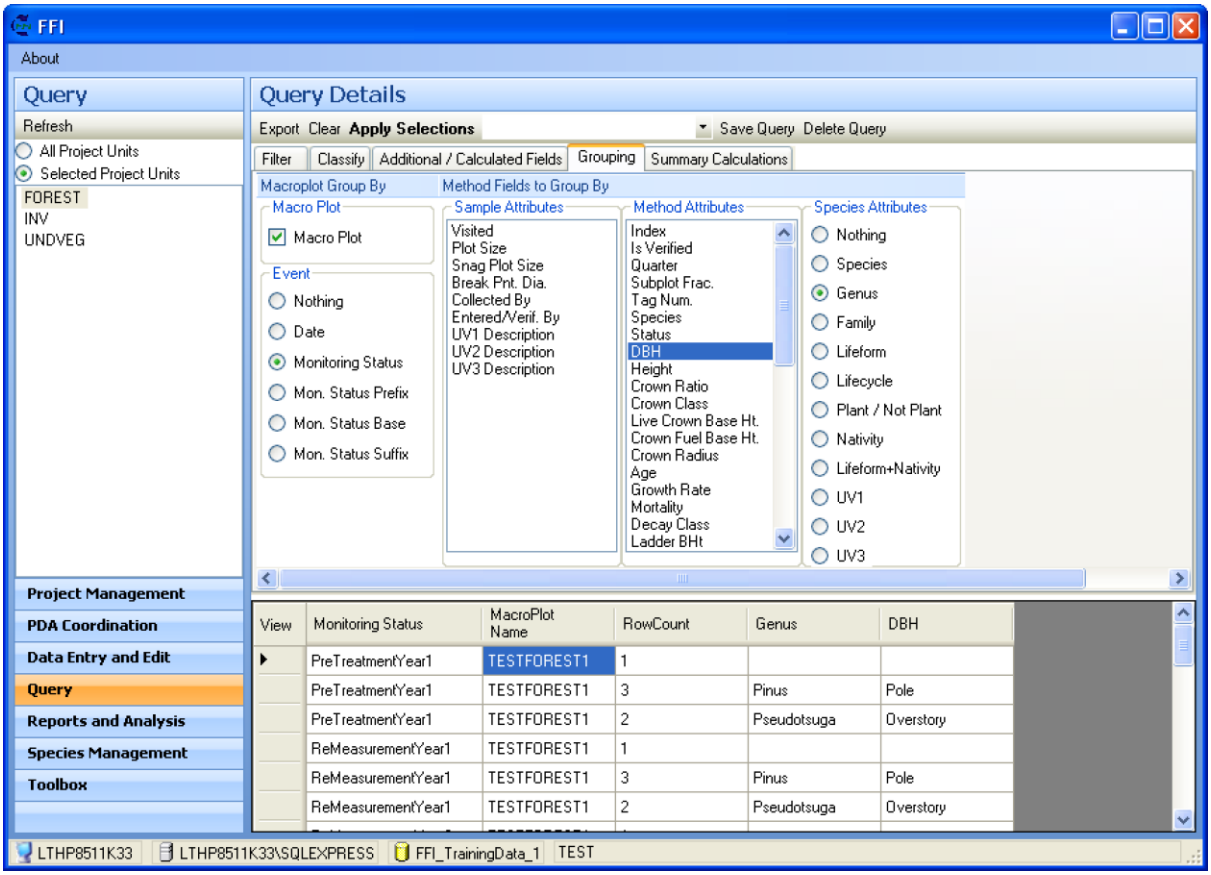
Some guidelines:

- If the selected method does not have species data, the *Species* checkboxes will be grayed out.
- Select only fields that contain values.
- If you choose to query **All Project Units**, monitoring status will not be available. The query will show all macro plots (and all sampling events within each macro plot for the selected method). All of the method attributes within the method will also be listed in the grid. You will not be able to filter on monitoring status in any query because all sampling events are already included in your output when you chose this option.
- Some methods that are sampled in quadrats have length and width attributes, but not area. To calculate area, enter the *Width* and *Length* and click the **Calculate Area** checkbox. Calculated areas will be summed automatically in the *Grouping* tab.
- Click on any column heading to sort the records by that data element. In the example above, the records are sort by date.
- When viewing the records, scroll horizontally across the grid to view all record fields.

Query – Grouping tab

The *Grouping* tab allows you to group data by any method field. You can group by macro plot, sample event date, monitoring status, and various species fields.

NOTE: More information can be found in the query exercises available on the FFI Training Materials page on the FFI FRAMES website. The exercises provide example queries for the most common query types: basic filtering; basic classification; and calculations of density, cover and frequency.



Using the Grouping tab

1. Click on fields you want to group the data by and click **Apply Selections**. In the example, Trees Individual data have been grouped to show the number of rows (tree records) for each genus and size class, for each macro plot and monitoring status.

2. Click **Clear** at any time to clear the query.

Some guidelines:

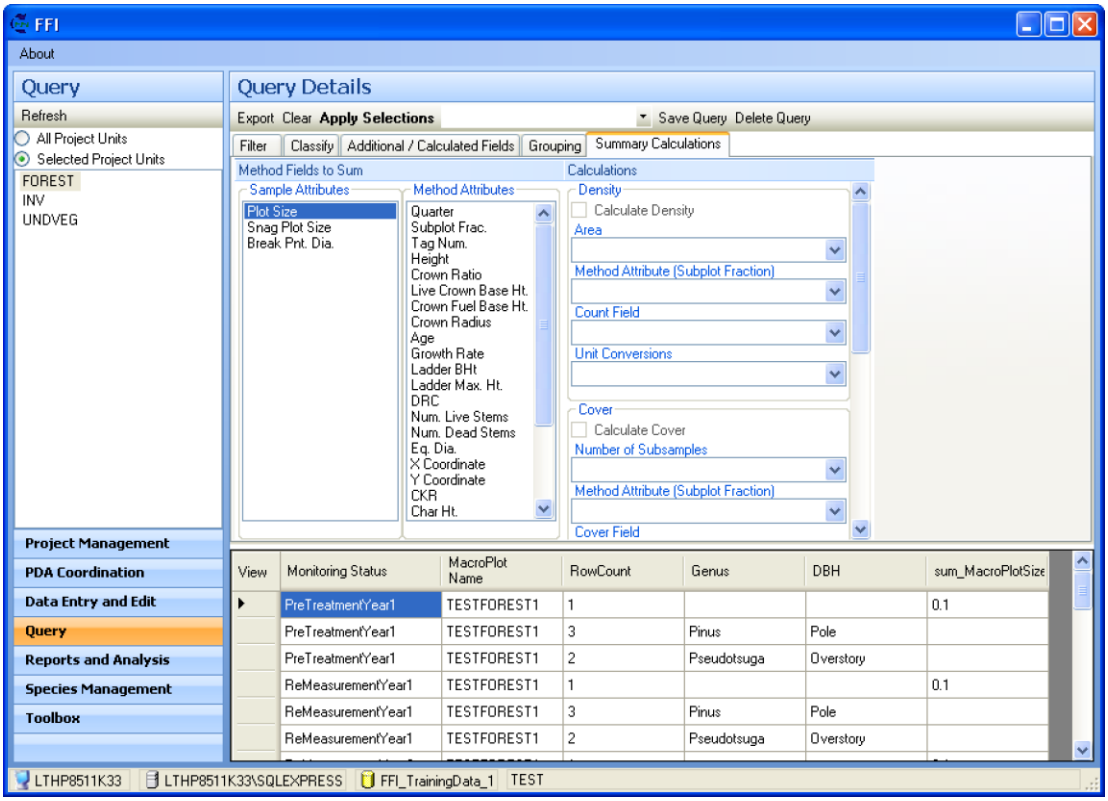
- Do not group by tally fields. For example, in the method *Cover - Points*, don't group by number of transects or points per transect.

Query –Summary Calculations tab

The *Summary Calculations* tab allows you to sum values in any numeric method field for selected records.

NOTE: The Query Builder Calculation Guide provides helpful tips for making a number of basic queries. It is available on the Help Documents page on the FFI FRAMES website. More information can be found in the query exercises available on the FFI Training Materials page on the FFI FRAMES website. The exercises provide example queries for the most common query types: basic filtering; basic classification; and calculations of density, cover and frequency.

For any set of filtered/grouped data, you can calculate the total area, total transect length, or total count of transect points sampled by summing the appropriate sample attribute. Using the count or sum of the grouped data, along with the area, length, or number of points, you can calculate density, frequency, or percent cover. Filtered and grouped records are displayed in the grid at the bottom of the *Query Details* window and can be exported to a comma delimited file.



NOTE: Basic descriptive data for a macro plot, such as sum_MacroPlotSize, is shown in the first record for each macro plot.

Using the Summary Calculations tab

1. Select fields to sum and click **Apply Selections**. In the first screen shot Plot Size has been selected as the field to sum (shown as *sum_MacroPlotSize* in the data grid).

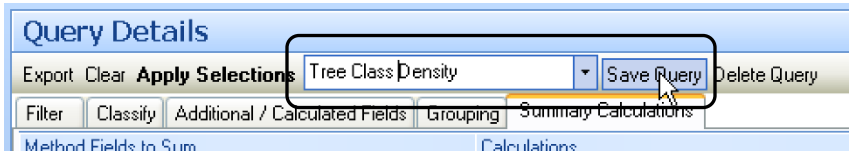
2. Select the Calculation fields. In the second screen shot Density fields were entered: Area=sum_MacroPlotSize, Count Field=RowCount, and Unit Conversion=Acres – Acres (feet). The Density checkbox was selected and, after clicking **Apply Selections**, the Density of pole trees and overstory trees for every macro plot/monitoring status were displayed in the data grid.

Some guidelines:

- Be sure to review the summed area or point counts in your results. Your sample configuration may result in sums that do not reflect reality.

Using saved queries

Once all the query selections have been made you can save the query to repeat the same query again later. Type a query name in the field and click **Save Query**. (Queries are saved in this folder: *C:\ProgramData\FFI\SavedQueries)*.

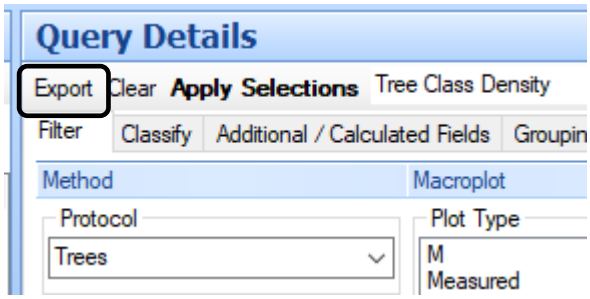


To use a saved query select it from the dropdown list and the query will run immediately. To remove an unused query, select the query in the dropdown and click **Delete Query**.

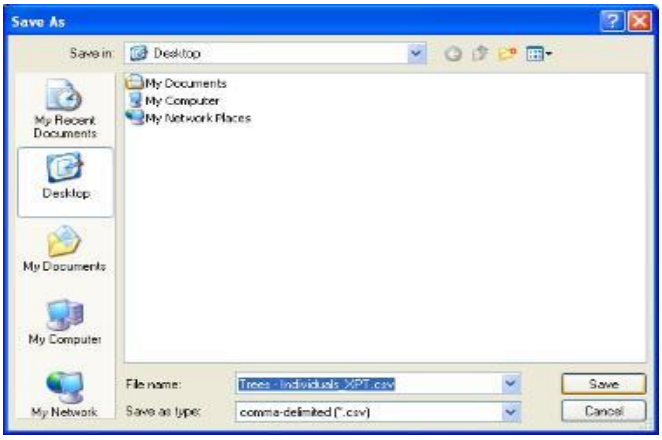
Exporting query results

The results of queries generated by the FFI query builder can be saved and exported as a *.csv file for use in reporting or analysis. To export a query as a *.csv file:

1. Develop a query that contains the fields and data list that you would like to work on in an external application.
2. Click **Export** in the *Query Details* toolbar.



3. Browse to the location where you would like to save the file, enter a name for the export file, and click **Save**.



Reports and analysis

This section of the *User Guide* presents procedures for using FFI's **Reports and Analysis** functions.

NOTE: In FFI, all analysis takes place within a project unit. If you wish to perform an analysis using data representing multiple project units, you can create an analysis project unit and assign the macro plots of interest to the new project unit.

- Creating reports
- Calculations and reporting
- Miscellaneous calculation notes
- About the reports
- Custom Tree Report
- Creating FVS files
- Creating FuelCalc and FOFEM files
- Performing Analyses
- Report and Analysis setup
- Creating a Summary Report
- Creating an Analysis Report or Graph

Creating reports

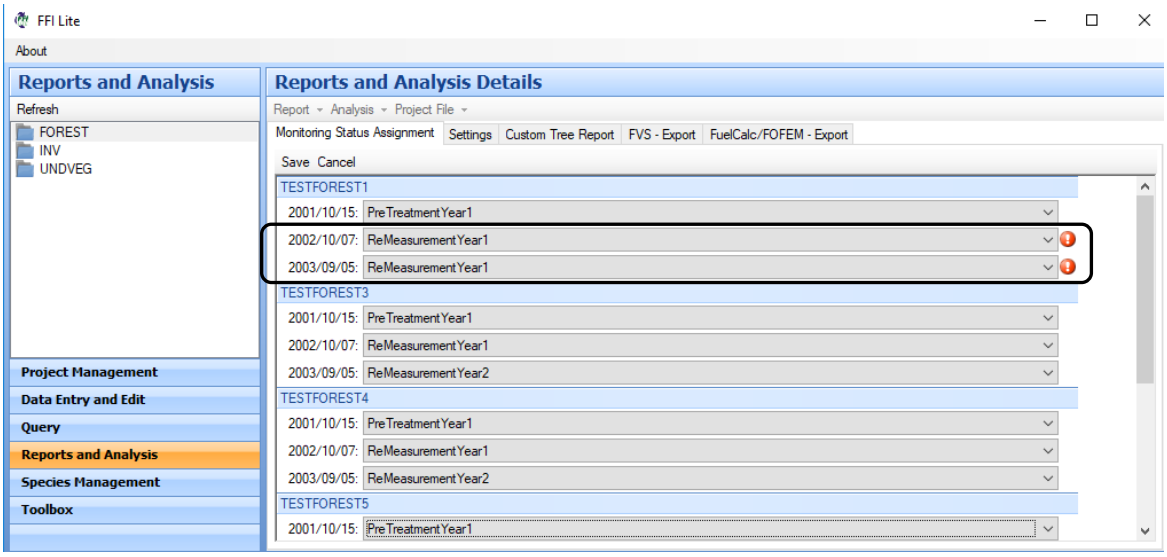
In FFI, you can create data summary reports for a project unit based on the standard FFI protocols or other protocols that you have imported. Reports can be printed, or exported as comma delimited, Excel, Acrobat PDF or Microsoft Word files.

The standard FFI reports are listed below. For descriptions of each report type, see About the reports.

Biomass - Plants	CBI	Cover - Line Intercept	Cover - Points
Cover - Points by Transect	Cover - Species Composition	Cover - Frequency	Density - Belts
Density - Quadrats	Disturbance History	Fire Behavior (CSV only)	Pilot Sampling
Plot Description (CSV only)	Post Burn Severity	Surface Fuels	Surface Fuels - Alaska Duff/Litter
Surface Fuels - Piles	Surface Fuels - Vegetation	Trees	Trees by species
Trees – Fire Effects	Trees – Fire Effects by Species	Trees – Seedlings, Saplings	Trees – Seedlings, Saplings by Species
Trees - Variable Radius	Trees - Variable Radius by Species	Biomass – Fuels (CSV only)	Photoloads
Logs – Fixed-area	Canopy – Densiometer		

To create a report:

1. Select **Reports and Analysis** navigation bar to open the *Reports and Analysis Details* window.
2. Select the desired project unit. The *Monitoring Status Assignment* window opens, listing all associated macro plots and sample events for the selected project unit.
3. Using the dropdown lists, assign the appropriate monitoring status for each sample event to be analyzed. Click **Save** when finished.

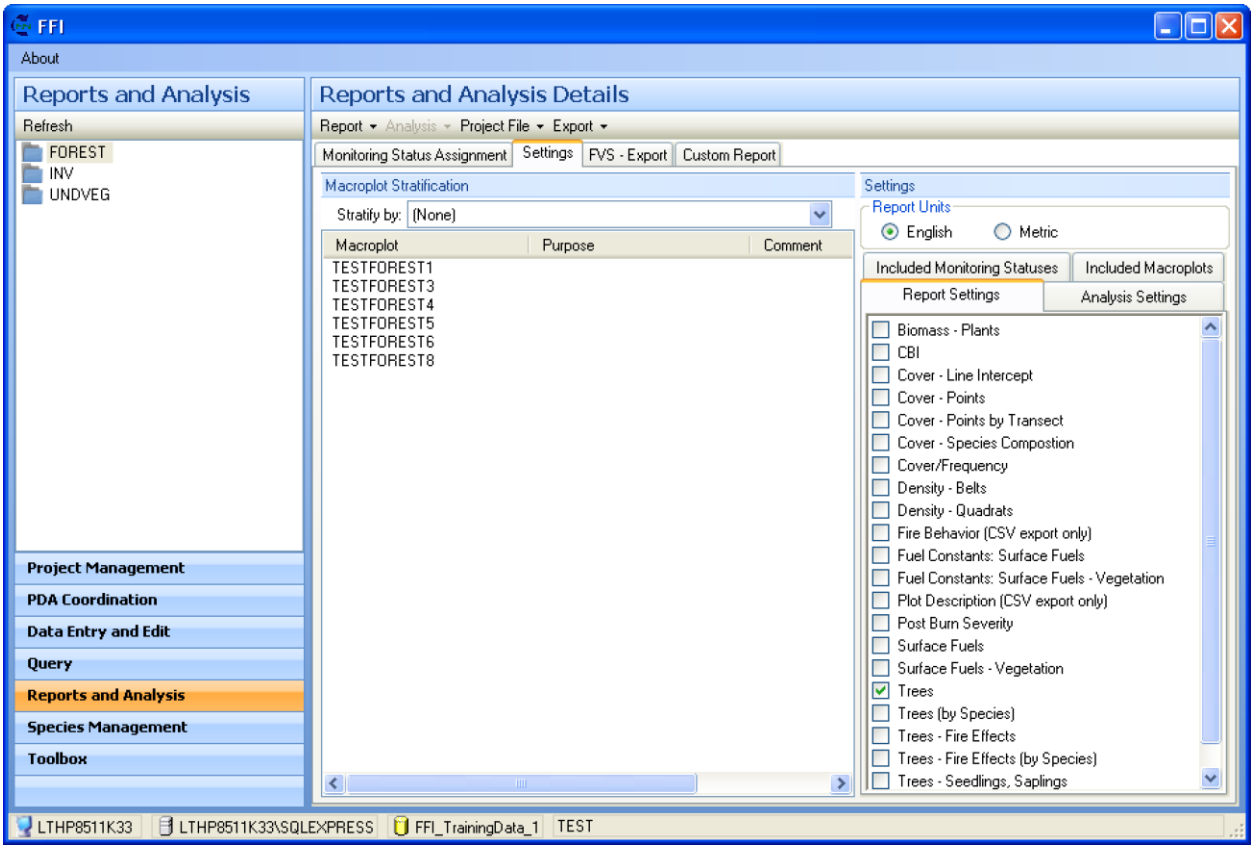


NOTE: A monitoring status can be assigned to one sample event per macro plot. In this example, an error is shown for TESTFOREST1 *because* ReMeasurementYear1 *has been assigned to two sample events.*

4. Using the **Settings** tab, you can select report options.

   - Use the *Stratify by*: dropdown to select stratification criteria, if desired.

   NOTE: The available stratification criteria are the organization codes, or user variables, that you may have assigned to the macro plot during creation or subsequent editing. For more information, see Creating a Macro Plot.

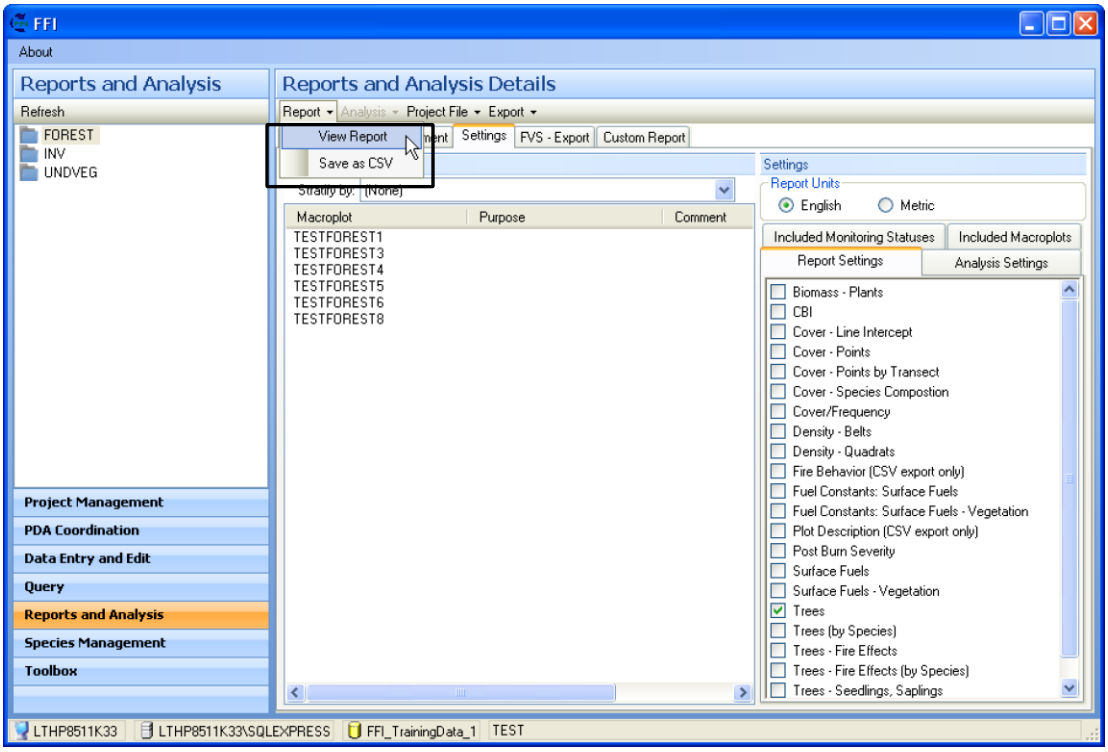


   - Select either English or metric *Report Units*.
   - Select the desired data summary report in the *Report Settings* tab.
   - In the *Included Monitoring Statuses* tab, unselect any monitoring statuses that you do not wish to include in the report.
   - In the *Included Macro Plots* tab, unselect any macro plots that you do not wish to include in the report.

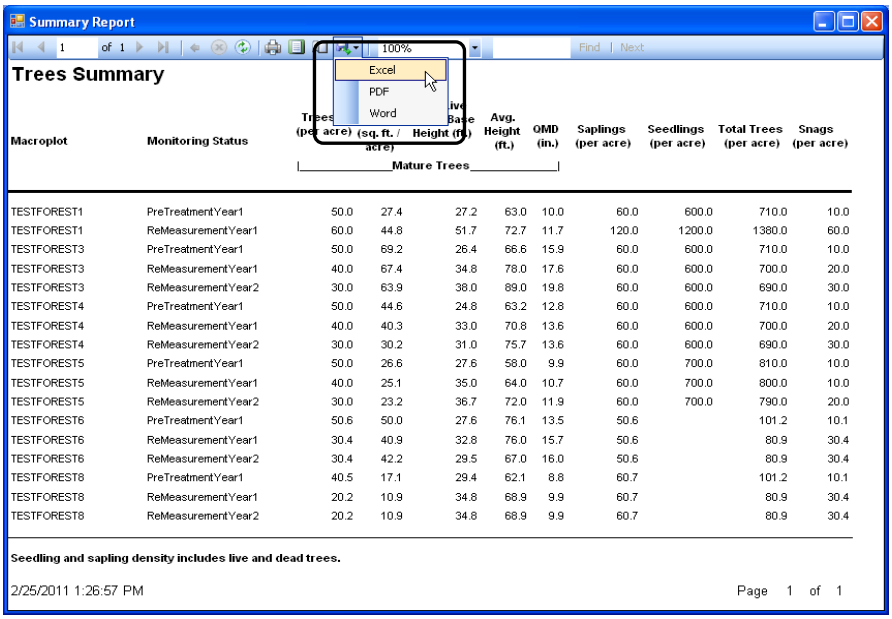
   - *NOTE: For information on the data summary reports available in FFI, see About the reports.*

5. To view the report, click **View Report** in the *Report* dropdown.

NOTE: Reports can also be saved as .csv files. The comma delimited files are easier to work with in a spreadsheet program they do not have multiple row headers or merged cells.



6. A tree data summary report is shown here. Note that the report can be saved as an Excel, PDF or Word file.



Calculations and reporting

Calculation rules are used to determine when plot values are included in report averages and when values are included in the reports themselves. The rules apply to summary reports, CSV reports and analysis reports.

For protocols with one method (e.g., *Surface Fuels – vegetation*):

- If *Visited* = No, then the plot is not included in reports or in the number of plots (*n*) used to calculate averages.
- If *Visited* = Yes and sample attributes needed to make calculations and method attribute records have been entered then the calculated component value is included in the average and the plot is included in *n* used to calculate the average.

FFI has two 3-part protocols: *Trees* and *Surface Fuels.* Each of these protocols includes three, related methods. However, the protocols have only one *Visited* field, which is used to identify whether data collection was attempted for that protocol during a plot visit. When *Visited=No* FFI **Reports and Analysis** assumes the protocol was not sampled and the plot is not included in the plot count used for calculating report averages. Because the 3-part protocols have only one *Visited* field for three methods, FFI uses special rules to determine whether sampling was attempted for each individual method during a plot visit. These rules discriminate: 1) plots with a method that was not sampled (e.g., no seedling data collection was attempted on the plot) and 2) plots that were sampled but no data was collected for a method (e.g., trees were sampled but no seedlings were found).

If *Plot Size* (on any of the methods related to the *Trees* protocol) or *Number of Transects* (on any of the methods related to the *Surface Fuels* protocol) is set to zero, then **Reports and Analysis** assumes data collection for the method was not attempted. If *Plot Size* or *Number of Transects* is greater than zero, then FFI assumes data collection for the method was attempted. Specifically:

If *Visited* = No, then: the plot is not included in report, component values are not included in averages and the plot is not counted in *n* used to calculate averages.

If *Visited* = Yes, then:

- If *Plot Size* (*Trees* protocol) or *Number of Transects* (*Surface Fuels* protocol) for all methods on a 3-part form = 0, then:
  - Un-stratified report: The macro plot is not included in *n* used to calculate the average attribute values displayed in the report. No row for the macro plot is displayed in the report.
  - Stratified Report: The macro plot is not included in *n* used to calculate the average attribute values displayed in the report. (True even if there are data records for any method).
- If *Plot Size* (*Trees* protocol) or *Number of Transects* (*Surface Fuels* protocol) for some methods on a 3-part form = 0, then:
  - Un-stratified report: A row for the macro plot is included in the report but blanks are displayed in the report for attributes corresponding to the method(s) were *Plot Size* or *Number of Transects* is set to zero.
  - Stratified Report: For those methods where *Plot Size* or *Number of Transects* are set to zero the macro plot is not included in *n* used to calculate the average attribute values displayed on the report. (True even if there is method attribute data).
- If *Plot Size* (*Trees* protocol) or *Number of Transects* (*Surface Fuels* protocol) for some methods on a 3-part form are > 0 but no method attributes were sampled, then:
  - Un-stratified report: The calculated attributes are included in the report with zeroes displayed on the un-stratified report if no method attribute data is entered.

- Stratified Report: The macro plot is included in *n* on the stratified report and zeroes are included in the average for methods where *Plot Size* or *Number of Transects* is not zero and no method attributes are entered.

Miscellaneous calculation notes

Trees

For tree records in the Trees-Individual method, if Status=*Dead* and Crown Class=*Dead and Down* (DD) or *Broken Below DBH* (BBD), then the record is not included in the calculation of Snag density in reports or FVS, FOFEM or FuelCalc export files.

Canopy – Densiometer calculations

The Densiometer report displays the *Avg. Hits* of all transects and points per plot and the *Canopy Closure*. The protocol assumes four densiometer readings per point.

When the Canopy field dropdown is set to *Closed* then it is assumed the dots or grid intersections on the densiometer are counted when they overlap with canopy.

Avg. Hits = the average of all Densiometer counts

Canopy Closure = sum of all Densiometer counts / (Num. Dots * number of method attribute rows * 4) * 100.

When the Canopy field dropdown is set to *Open* then it is assumed the dots or grid intersections on the densiometer are counted when they overlap with open sky.

Avg. Hits = Num. Dots - the average of all Densiometer counts

Canopy Closure = 100 – (sum of all Densiometer counts / (Num. Dots * number of method attribute rows * 4) * 100)

The Num. Transects and Num. Pts./Tran. fields are not used in the closure calculations.

About the reports

NOTE: See also About the FFI Protocols

The data summary reports are available through the **Reports and Analysis** menu. Each of the summaries can be customized by selecting specific macro plots and monitoring statuses needed with the *Report Settings* tab. Any of the results from these summary reports can also be copied and pasted into external applications for more comprehensive analysis if desired. Each report type is summarized below.

ARS Cover - Points

The ARS Cover – Points summary report displays average percent cover by species, average height of the top species hit, average canopy heights of the subsequent layers (if any), foliar cover, bare ground cover, basal cover, species foliar cover and average canopy height. This method requires the use of specific user species codes to provide all the report functionality. See

the *ARS Cover Points Protocol Overview* on the *Other Documents* tab on the FFI FRAMES website for more information

Foliar cover: Total hits where top layer is a real plant code/total number of points*100. (Note: A real plant code is any NRCS symbol or user species, except the codes listed in the table 1.)

Bare Ground: Total number of hits where top layer is "NONE" and surface = "S"/total number of points sampled*100.

Basal Cover: Total number of hits where soil surface is a real plant code/total number of points sampled*100. (Note: With the exception of "NONE" and the soil surface codes listed in table 1, all codes will be treated as "real plant codes" when calculation of basal cover is made.)

Species Foliar Cover: Total number of hits where any layer is a real plant code/total number of points sampled*100. Duplicate hits at a point are not included in the cover calculation for a species.

Average Canopy Height: Average height of each layer. Null fields are ignored.

Biomass - Plants

The Biomass report simply returns the average biomass for each macro plot. Dry weights are totaled by analysis group (such as lifeform or individual species) and the totals are divided by the number of transects. The average dry weight is then multiplied by a conversion factor that takes the transect areas and converts the weights by transect area to lbs/acre or kg/m^2.

CBI

The CBI summary report displays an average burn severity rating (Composite Burn Index) for three analysis scales including (1) the total plot, (2) each vegetation strata requested, (3) and the substrate. Severity ratings range from 0 (no burn effect visible) to 3 (highest burn effect). For each analysis, the burn effects are averaged. The greater the average CBI number, the greater the burn severity for the analyzed unit.

Canopy – Densiometer

The Canopy – Densiometer summary report shows the average number of dot hits that intercept the canopy and Canopy Closure. See Canopy – Densiometer calculations for more info.

Cover - Line Intercept

The Cover - Line Intercept summary report displays (1) the average percent cover for each species by macro plot and monitoring event; and (2) the average height values for each plant species sampled using the line intercept method. The percent cover of each species on an individual transect is calculated by totaling the species' intercepts on one transect and dividing by the total transect length. The Average Cover % for the macro plot, however, is calculated by adding the percent cover values (by species) for all transects and dividing by the total number of transects in the macro plot. The Average Height value is obtained by totaling the species heights by status and size class. The totals are then divided by the number entries in each class to obtain an average. Average height is displayed in feet or meters depending on the output units selected.

Cover - Points

The Cover - Points summary report displays the average point hits, average total hits, average cover percent, and average height values for plant species sampled on a macro plot using the point intercept method. Average Point Hits is the average number of hits per transect for an item and does not include multiple hits for an item at an individual point. Average Total Hits is the average number of total hits for an item and includes multiple hits for an item at an individual point. The percent cover for an item on an individual transect is computed by dividing the number of hits for an item by the number of points per transect. The average cover for the macro plot is computed by summing the individual transect-cover values and dividing by the total number of transects. Average height for each species in feet (m) is calculated for the macro plot by averaging the height at each point, if there is more than one height measurement at a point, summing the point averages and dividing by the number of points where the species was recorded. Plant species and ground cover values for point frames are calculated by dividing the number of hits for an item by the total number of points per frame. The frame cover values are used to calculate an average cover value for the plot.

Cover - Points by Transect

The Cover - Points by Transect summary displays the average cover and average height of each species or substrate item by macro plot and monitoring status. Unlike the Cover – Points summary, this summary report uses the only the summary of total hits for each species or substrate item. Percent cover for each transect is calculated by dividing the total number of hits for a species/substrate by the total number of points sampled on the transect. Average cover for the macro plot is computed by summing all percent covers by species or substrate and dividing by the number of transect lines.

Cover - Species Composition

The Cover - Species Composition summary report displays the species cover and height data just as it is entered in the data entry/edit. No calculations are made within this report.

Cover/Frequency

The Cover/Frequency summary displays the average percent cover for a macro plot and the average frequency of each species within nested plots. It also displays an average species height for each species sampled. To calculate the percent cover for each species sampled on a macro plot, the mid-point of the estimate range for the species' cover in each quadrat is summed by transect (this midpoint is actually entered when you use the dropdown box during data entry). The transect sums are divided by the number of quadrats to give an average percent cover for the species on that particular transect. The averages for each transect are summed and then divided by the number of transect lines to give an Average Cover (%) for the macro plot in the summary report. Average height is computed by summing all measured heights (by species and status) and dividing by the number of species' entries on each transect line. These average heights are summed and divided by the number of transect lines to get the Average height for each species in the macro plot.

The Average Frequency for the nested samples in the Cover/Frequency summary is obtained by first determining where each species is located within each quadrat (see the Cover/Frequency description of subplots in FIREMON method descriptions at http://www.frames.gov/firemon). If the species is located only in a small corner of the quadrat, the plant is located in subplot "1." If

it is located in the right half of the quadrat, the plant is located in subplot "4." The average nested-root frequency for subplot 1 is calculated by counting the number of times the species is in subplot "1" in the quadrats and dividing by the total number of quadrats in the macro plot. For the frequency of plants in subplot 2, the numbers of occurrences in subplot 2 and subplot 1 are summed and the total is then divided by the total number of quadrats in the macro plot. The process for calculating the frequency in For subplots 3 and 4 is the same as for subplot 2 (i.e., count all the times a plant occurs in the desired group, add the number of times it occurs in all lower groups, and divide by the total number of quadrats). Results are displayed as a percent.

Density - Belts

The Density-Belt summary report displays a summary by macro plot and monitoring status for each species that is sampled using the density method. The total count of each species in the belt transect is divided by the number of transects to get an average count. The average counts are converted to an average per unit area (per ft2 (m2) or per acre (hectare)) by dividing the average count by the sample area and applying the appropriate conversion factors. The average height in feet (m) is also calculated for each item.

If values are entered in the Transect Length and Transect Width sample attribute fields then density is calculated using the area sum of those two values regardless of the value entered in the Transect Area field. If the Transect Area field is populated and the Transect Width and Transect Length fields are blank, then Density is calculated using the Transect Area value.

Density - Quadrat

The Density - Quadrat summary report displays the average number of items per quadrat rather than per belt. It calculates average items per unit area and average height just as in the Density-Belt report.

If values are entered in the Quadrat Length and Quadrat Width sample attribute fields then density is calculated using the area sum of those two values regardless of the value entered in the Quadrat Area field. If the Quadrat Area field is populated and the Quadrat Width and Quadrat Length fields are blank, then Density is calculated using the Quadrat Area value.

Disturbance History

The Disturbance History summary report displays information on change agents, damage severity, and timing of disturbance for each macro plot if the information is entered during visits to the plot. There are no calculations attached to this report.

Logs - Fixed-area

The summary report calculates total volume using conic-paraboloid formula provided in:

> *Fraver, S. Ringvall, A. Jonsson, B.G. 2007. Refining volume estimates of down woody debris. Can. J. For. Res. 37: 627-633.*

Volume is converted to biomass using the default or user supplied fuel constants.

The report includes loading of 1000-hr, 1000-hr sound and 1000-rotten. The CSV report and FuelCalc/FOFEM export divide logs into five size classes (3"-6", 6"-9", 9"-12", 12"-20", 20+") by decay class. Log data exported to FVS are divided into six classes (3"-6", 6"-12", 12"-20", 20"-35",

35"-50", 50+") in hard and soft condition. Log volume for the log segments is calculated using the conic-paraboloid formula but with large and small end diameter estimated by rate of diameter change per length (inches/foot) based on the entire log. Estimating diameter this way causes small error in volume when sum the volume of segments is compared to the volume of the total log.

Photoloads

The report and CSV include 1-hr, 10-hr, 100-hr, 1000-hr, shrub and herb loading. The load of 1000-hr logs is not exported to FuelCalc/FOFEM or FVS files because the distribution of biomass in classes is unknown.

Pilot Sampling

The Pilot Sampling summary displays the counts species and substrate elements in four quadrats by macro plot and monitoring status. No calculations are made within this report.

Post Burn Severity

The Post Burn Severity summary report gives separate assessments of burn effects for the substrate and vegetation strata. The severity rating for each assessment is an average obtained by adding all values and dividing by the number of points on a transect and by the total number of transects. The percent severity values are determined by counting the number of hits within each substrate category (i.e., how many hits in substrate 1) and dividing each by the total number of points per transect. If more than one transect is taken at a macro plot, all subplot totals are averaged by the total number of points on the multiple transects.

Surface Fuels

The Surface Fuels summary report displays the average fuel loadings in tons per acre (or kg per m^2) for each macro plot. The loadings are calculated from fuel counts and duff/litter estimates on the fuels transects along with average vegetation cover and heights. Down woody loadings are calculated for 1-hr, 10-hr, 100-hr, 1-100-hr, 1000-hr sound, 1000-hr rotten, and 1-1000-hr fuels. Biomass is calculated based on the equations presented in the Handbook for Inventorying Downed Woody Material (Brown, 1974). Non-slash, composite values are used for quadratic mean diameter, non-horizontal correction and specific gravity of fine woody debris. Pieces of coarse woody debris in decay class 1, 2, and 3 are considered sound and assigned a specific gravity of 0.40. Decay class 4 and 5 pieces are considered rotten and assigned a specific gravity of 0.30. Loading of litter and duff is calculated using bulk densities of 2.75 lbs/ft^3 and 5.5 lbs/ft^3, respectively. The fuel constants used to calculate loading can be modified by adding custom Fuel Constant Sets. Duff and litter depth summaries are provided.

Surface Fuels - Alaska Duff/Litter

This report computes the average biomass for litter, moss, duff, and lichen for each macro plot and then converts the values to tons/acre (or hectares/m^2) biomass. Depths for each element are averaged and displayed by macro plot and monitoring status within the report.

Surface Fuels - Vegetation

The Surface Fuels – Vegetation report returns an average percent cover, average height, and average biomass for shrub- and herb- fuels for each macro plot and monitoring status. All results are output by lifeform (herb, shrub) and status (live, dead) within the report. Biomass of live and dead shrubs and biomass of live and dead herbaceous plants are calculated using the equation:

$$B = 21.87 * (H*C*BD)$$

Where, B = biomass (tons/acre), 21.87 is the conversion of lb/ft^2 to tons/acre (43,560/2000), H = height (ft), C = percent cover/100, and BD = bulk density (lb/ft^3).

Default bulk density used for the live and dead, herbaceous and shrub components is 0.11 lbs/ft^3. Custom bulk density values can be entered in Fuel Constant Sets.

When metric report units are specified, biomass is reported in kg/m^2.

Surface Fuels – Piles

There are six dimensions for pile shape two for width, height, and length, however only the *irregular solid* pile shape uses all six fields. Other shapes use the input dimensions below. Other dimensions entered for any specific pile shape will be ignored.

Code	Shape	Width 1	Width 2	Length 1	Length 2	Height 1	Height 2
HS	Half-sphere	X				X	
PA	Paraboloid	X				X	
HC	Half-cylinder	X		X		X	
HF	Half-frustum of cone	X	X	X			
CR	Half-frustum of a cone w/round ends	X	X	X			
HE	Half-ellipsoid	X		X		X	
IS	Irregular solid	X	X	X	X	X	X

In Data Entry and Edit, hovering the mouse cursor over the dimension labels will show which shapes the fields are applicable for. Width 1 is the only required dimension field.

Pile Composition is required but is ignored when the *Machine* pile type is selected.

Trees; Trees by Species

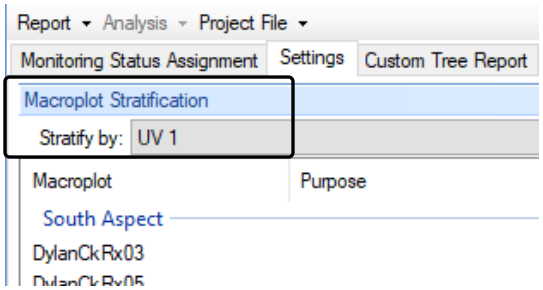
The Trees summary report displays tree densities (i.e. trees per unit area) for mature trees, saplings, seedlings, and snags by macro plot. For mature/overstory trees, it also displays the calculated basal area, average live crown base height, average height, and quadratic mean diameter (QMD) for each macro plot and monitoring unit. The Trees by Species summary report

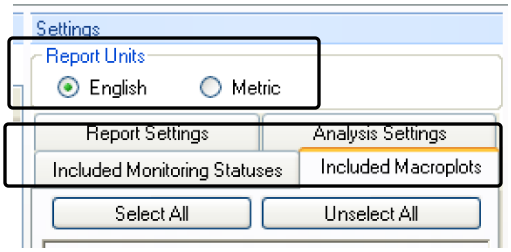
displays the same elements as the Tree Data report except that each element is displayed by species for the macro plot. Within this report are the densities, basal area, average live crown base height, average height, and quadratic mean diameter for each mature tree separated by species. Densities of each species for in the sapling, seedling, and snag classes are also computed. Trees with status other than *Dead* and with *Crown Class* not *Broken Below DBH*, *Dead and Down* or *Cut Stump* are included in the *Individual Trees* portion of the report. Trees recorded as *Dead* and with *Crown Class* not *Dead and Dead* are included in the Snags portion of the report.

Custom Tree Report

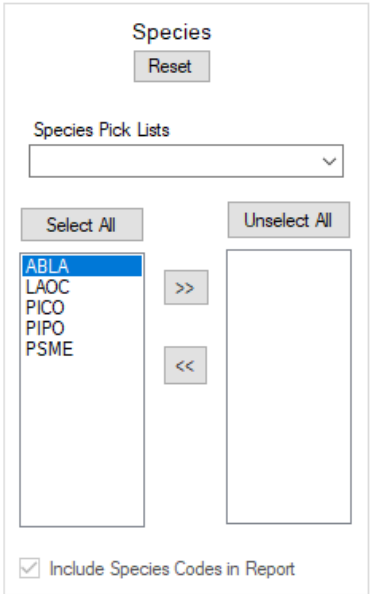
The Custom Tree Report provides the same report data as the standard tree reports but with tree data divided into user defined classes. Data stored in the *Trees – Variable Radius* protocol cannot be included in the Custom Tree Report at this time.

On the **Settings** tab in **Reports and Analysis**, make a selection in the *Stratify by* field, and select the report units, macro plots and monitoring status(es) you want to include in the report.

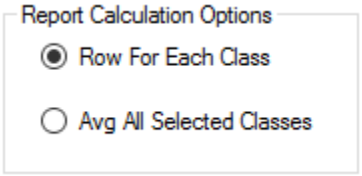




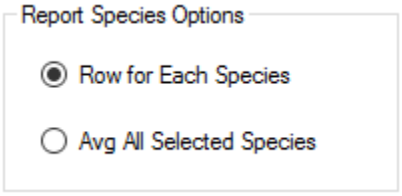
When the **Custom Tree Report** tab is selected FFI will search the database for species symbols to be added to the species selection boxes. In a large database this process may take a few seconds.



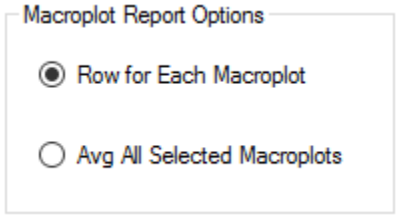
The *Report Calculation Options* provide options for grouping the classes in the report: 1) All the classes for each method together or 2) one row for each class.



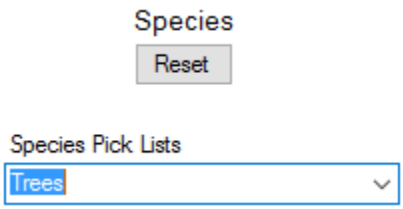
The *Report Species Options* provide a way to; 1) create a report with one row for each selected species or 2) create a report that groups all species together.



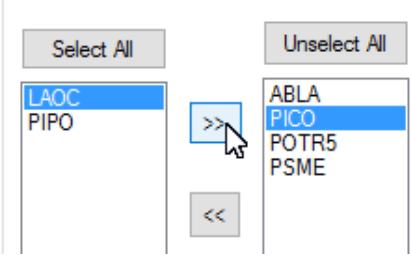
The *Macroplot Report Options* provide a way to; 1) create a report with one row for each selected macro plot or 2) create a report that groups all macro plots.



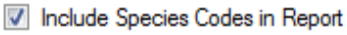
If most or all the species you are interested in creating a report for are in a species *Pick List* you can select the pick list in the *Species Pick List* dropdown. All species symbols in the pick list will be moved to the right side of the species selection window even if they have not been recorded on the plots selected on the **Settings** tab; however, species will not be included in the report if they were not recorded on the included macro plots/sample events.



Select species codes to include in the report by highlighting the symbols in the left window and clicking the arrow in the center to move to the symbols to the right. Move species symbols from the right window to the left to remove them from the report.



When all species codes are included in a report, the report format can look awkward. Unchecking the *Include Species Codes in Report* box will replace the codes with the text *ALL* and make the report more readable.

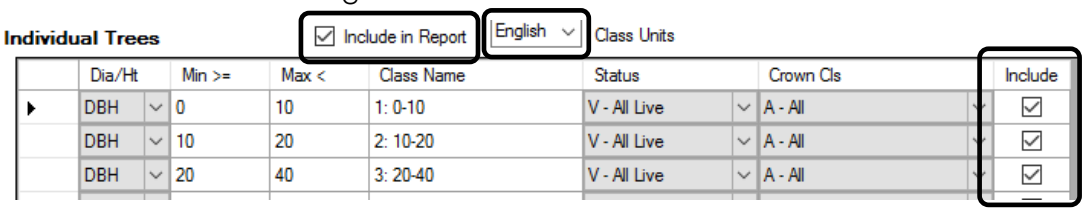


The custom tree report screen provides data grids for classifying the three standard FFI tree methods: *Tree-Individuals, Trees by Diameter Class (saplings) and Trees by Height Class (seedlings)*. A report for each method will be created if the *Include in Report* checkbox above the data grid is checked.

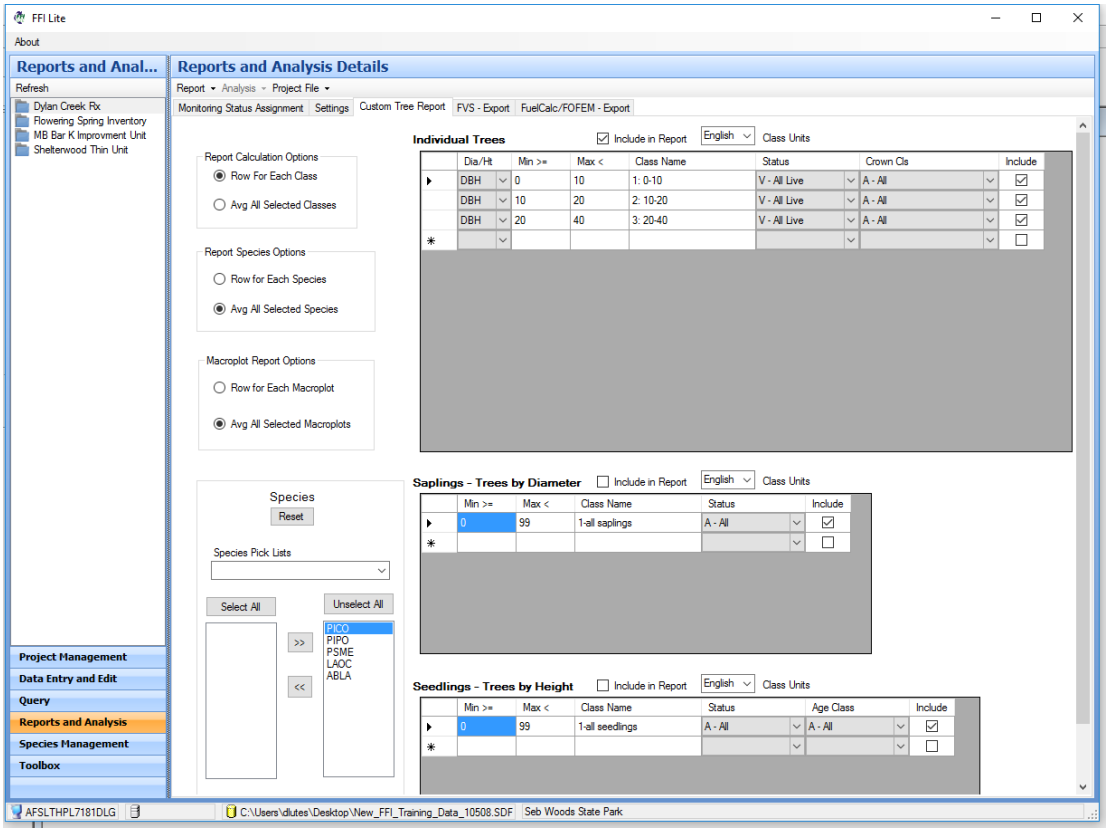
Each row in the data grid also has an *Include* checkbox. Check the *Include* checkbox for all methods and classes that you want included in your reports.

NOTE: Classes are displayed alphabetically in the reports so using a number prefix in the class name will order them intuitively in the report.

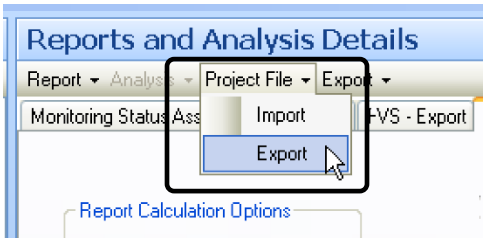
Use the dropdown list above each method grid for setting the *Class Units*. Data will be classified based on the *Class Units* selected, not on the method units. For example, you can set the class units as English, run a custom tree report for a metric method and FFI will convert the classification values from English to metric.

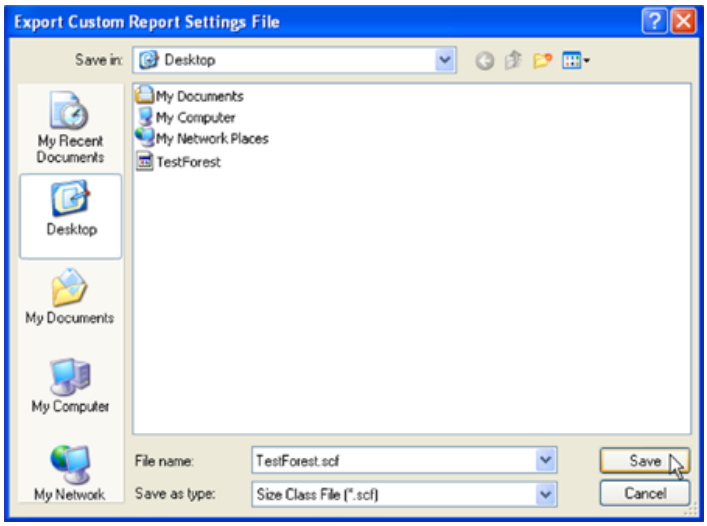


Enter the classification data (*Dia./Ht, Min., Max.*, etc.) for Saplings and Seedlings if you want reports created for those methods. All fields are required.1

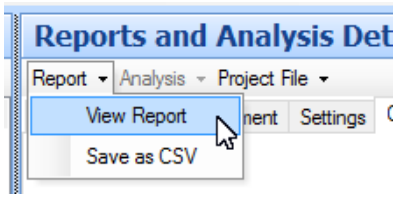


After you have entered the data classes you can save them for future use by selecting **Project > Export**, entering a file name and clicking **Save**. Use the *Import* feature to use the classes again in the future.





Create a report for each method by selecting **Report > View Report**.



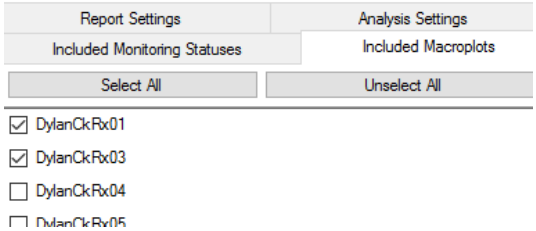
Custom Tree Report - Individual - Each Class - English

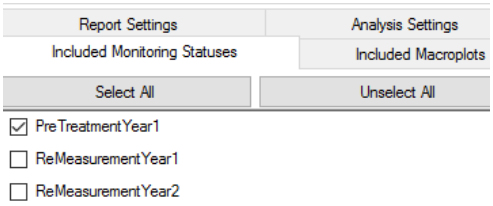
Class Name (strata)	Monitoring Status	Species	Trees (per acre)	Basal Area (sq. ft./ac.)	Avg. Ht. (feet)	Avg. Crown Ratio (%)	Avg. Live Crown Base Height (feet)	Avg. Crown Fuel Base Ht. (feet)	Avg. Bole Char Height (feet)	Avg. Crown Scorch Ht. (feet)	Avg. Crown Scorch (%)
1: 0-10	PreTreatmentYear1	PICO PIPO PSME LAOC ABLA	25.1	8.4	50.0	50.0	23.1				0.0
2: 10-20	PreTreatmentYear1	PICO PIPO PSME LAOC ABLA	21.7	24.2	78.8	60.5	30.5				0.0
3: 20-40	PreTreatmentYear1	PICO PIPO PSME LAOC ABLA	1.7	6.5	109.0	60.0	42.0				0.0

NOTE: One report will be created for each method with the Include in Report *checkbox marked.*

Example

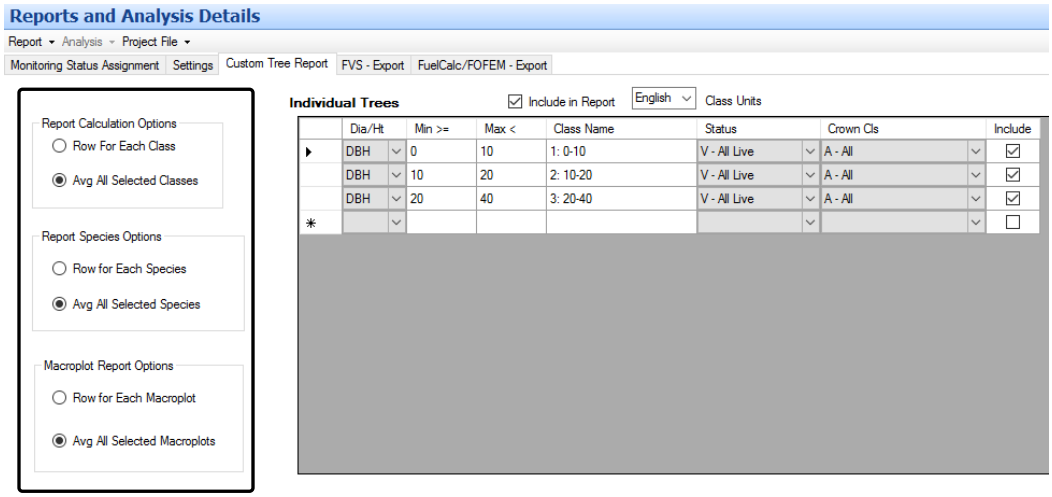
Two macro plots and one monitoring status have been selected on the **Settings** tab. All reports created for this example will use these same settings.



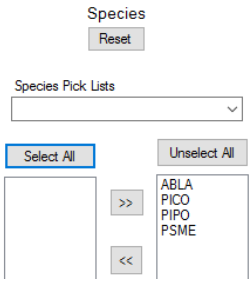


On the **Custom Tree Report** tab, three DBH classes have been defined for the *Trees - Individuals* method. Based on the classes entered by the user the report will include all tree species 0 to 40 inches DBH in one class because the *Avg All Selected Class* radio button has been selected as well as the radio button to average all selected species and macroplots. The only tree records in the *Trees - Individuals* method that will not be included in this report are those greater than 40 inches DBH.

NOTE: Two classification fields available in the Custom Tree Report are not required fields in FFI Data Entry and Edit: 1) Crown Class *in the* Tree – Individuals *method and 2)* Age Class *in the* Trees – Trees by Height Class (Seedlings) *method. If these fields are left blank in Data Entry and Edit the associated records will only be included in a Custom Tree Report if the* A – All *selection is made for that field in the Custom Tree Report.*



All species are included in the report.

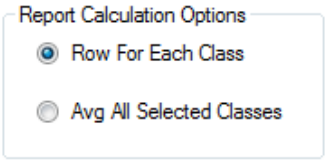


Selecting **Report > View Report** creates the output showing there is an average of 50 trees per acre on the two plots.

Custom Tree Report - Individual - Average All Classes - English

Class Name (strata)	Monitoring Status	Species	Trees (per acre)	Basal Area (sq. ft./ac.)	Avg. Ht. (feet)	Avg. Crown Ratio (%)	Avg. Live Crown Base Height (feet)	Avg. Crown Fuel Base Ht. (feet)	Avg. Bole Char Height (feet)	Avg. Crown Scorch Ht. (feet)	Avg. Crown Scorch (%)
All Classes	PreTreatmentYear1	ABLA PICO PIPO PSME	50.0	48.3	64.8	54.1	26.8				0.0

Next, the *Row For Each Class* radio button is selected and a report is created.

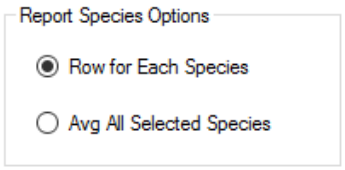


Instead of one row, the report now has a row for each class identified in the *Class Name* column. Looking at the row for 0 – 10-inch trees there is an average of 30 trees per acre in that class and that includes all four species listed in the report.

Custom Tree Report - Individual - Each Class - English

Class Name (strata)	Monitoring Status	Species	Trees (per acre)	Basal Area (sq. ft./ac.)	Avg. Ht. (feet)	Avg. Crown Ratio (%)	Avg. Live Crown Base Height (feet)	Avg. Crown Fuel Base Ht. (feet)	Avg. Bole Char Height (feet)	Avg. Crown Scorch Ht. (feet)	Avg. Crown Scorch (%)
1: 0-10	PreTreatmentYear1	ABLA PICO PIPO PSME	30.0	8.5	45.7	48.2	22.2				0.0
2: 10-20	PreTreatmentYear1	ABLA PICO PIPO PSME	15.0	20.2	88.3	64.0	31.0				0.0
3: 20-40	PreTreatmentYear1	ABLA PICO PIPO PSME	5.0	19.6	109.0	60.0	42.0				0.0

In the next report the only change is the button for *Row for Each Species* has been selected.

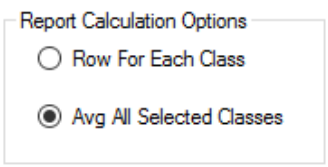


The report now includes a row for every species in every size class.

Custom Tree Report - Individual - Each Class - English

Class Name (strata)	Monitoring Status	Species	Trees (per acre)	Basal Area (sq. ft./ac.)	Avg. Ht. (feet)	Avg. Crown Ratio (%)	Avg. Live Crown Base Height (feet)	Avg. Crown Fuel Base Ht. (feet)	Avg. Bole Char Height (feet)	Avg. Crown Scorch Ht. (feet)	Avg. Crown Scorch (%)
1: 0-10	PreTreatmentYear1	ABLA	0.0	0.0							
1: 0-10	PreTreatmentYear1	PICO	15.0	3.6	48.3	49.7	23.3				
1: 0-10	PreTreatmentYear1	PIPO	5.0	0.9	21.0	35.0	13.0				0.0
1: 0-10	PreTreatmentYear1	PSME	10.0	4.0	54.0	52.5	25.0				0.0
2: 10-20	PreTreatmentYear1	ABLA	5.0	6.1	88.0	60.0	35.0				
2: 10-20	PreTreatmentYear1	PICO	0.0	0.0							
2: 10-20	PreTreatmentYear1	PIPO	5.0	10.2	95.0	70.0	27.0				0.0
2: 10-20	PreTreatmentYear1	PSME	5.0	4.0	82.0	62.0	31.0				
3: 20-40	PreTreatmentYear1	ABLA	0.0	0.0							
3: 20-40	PreTreatmentYear1	PICO	0.0	0.0							
3: 20-40	PreTreatmentYear1	PIPO	5.0	19.6	109.0	60.0	42.0				0.0
3: 20-40	PreTreatmentYear1	PSME	0.0	0.0							

In the last report the radio button for *Ave. All Selected Classes* is selected.



The report shows one row for each species with all classes combined.

Custom Tree Report - Individual - Average All Classes - English

Class Name (strata)	Monitoring Status	Species	Trees (per acre)	Basal Area (sq. ft./ac.)	Avg. Ht. (feet)	Avg. Crown Ratio (%)	Avg. Live Crown Base Height (feet)	Avg. Crown Fuel Base Ht. (feet)	Avg. Bole Char Height (feet)	Avg. Crown Scorch Ht. (feet)	Avg. Crown Scorch (%)
All Classes	PreTreatmentYear1	ABLA	5.0	6.1	88.0	60.0	35.0				
All Classes	PreTreatmentYear1	PICO	15.0	3.6	48.3	49.7	23.3				
All Classes	PreTreatmentYear1	PIPO	20.0	40.0	78.8	55.0	27.3				0.0
All Classes	PreTreatmentYear1	PSME	15.0	7.9	63.3	55.7	27.0				0.0

Creating FVS files

The Forest Vegetation Simulator (FVS) is a powerful, complex tool. The FVS team provides numerous training opportunities each year and we highly recommended taking a class if you are going to use the FVS application. See the FVS website for FVS user manuals, software, training classes and other information.

FFI creates a SQLite database that can be used in FVS and the associated Fire and Fuels Extension (FFE). The FVS-FFE files exported from FFI include data from the protocols in the table below. If data for one or more fuel components are found in more than one protocol then the average loading of that component across all protocol will be exported to the FVS file (excluding null values). If no fuels data is entered in FFI then FVS-FFE will use default values. Only one monitoring status at a time can be exported.

Protocol data exported to FVS

Method[1]	**Data exported**
Surface Fuels[2]	Duff depth and duff, litter, 1-hr, 10-hr 100-hr and 3"+ load in decay classes
Biomass-Fuels	Loading of upper and lower duff[3], litter, 1-hr, 10-hr, 100-hr, 3"-9"[4], 9"-20"[4] and 20"+[4].
Surface Fuels - Vegetation	Live herb and live shrub load.
Photoloads	1-hr, 10-hr, 100-hr, herb and shrub.
Fixed area logs	Loading of 3"+ material, in size and decay classes.
Surface Fuels – Alaska Duff and Litter	Duff, litter, lichen, and live and dead moss load.
Trees - Individuals	Species, status, tree density, diameter, height, crown base height, crown class, crown ratio.
Trees by Diameter Class (saplings)	Species, status, tree density, diameter class, avg. height, avg. crown ratio.
Trees by Height Class (seedlings)	Species, status, tree density, height class, avg. diameter, avg. crown ratio.
Tree-Variable radius	Species, status, tree density, diameter, height, crown base height, crown class, crown ratio.

[1] If a fuel component is present in more than one FFI method then the value exported to FuelCalc is the average component values.

[2] 3"+ fuel load is exported by decay condition in these classes: 3"-6", 6"-12", 12"-35", 35"-50" and >50". Decay class 1, 2 and 3 = hard, decay class 4 and 5 = rotten.

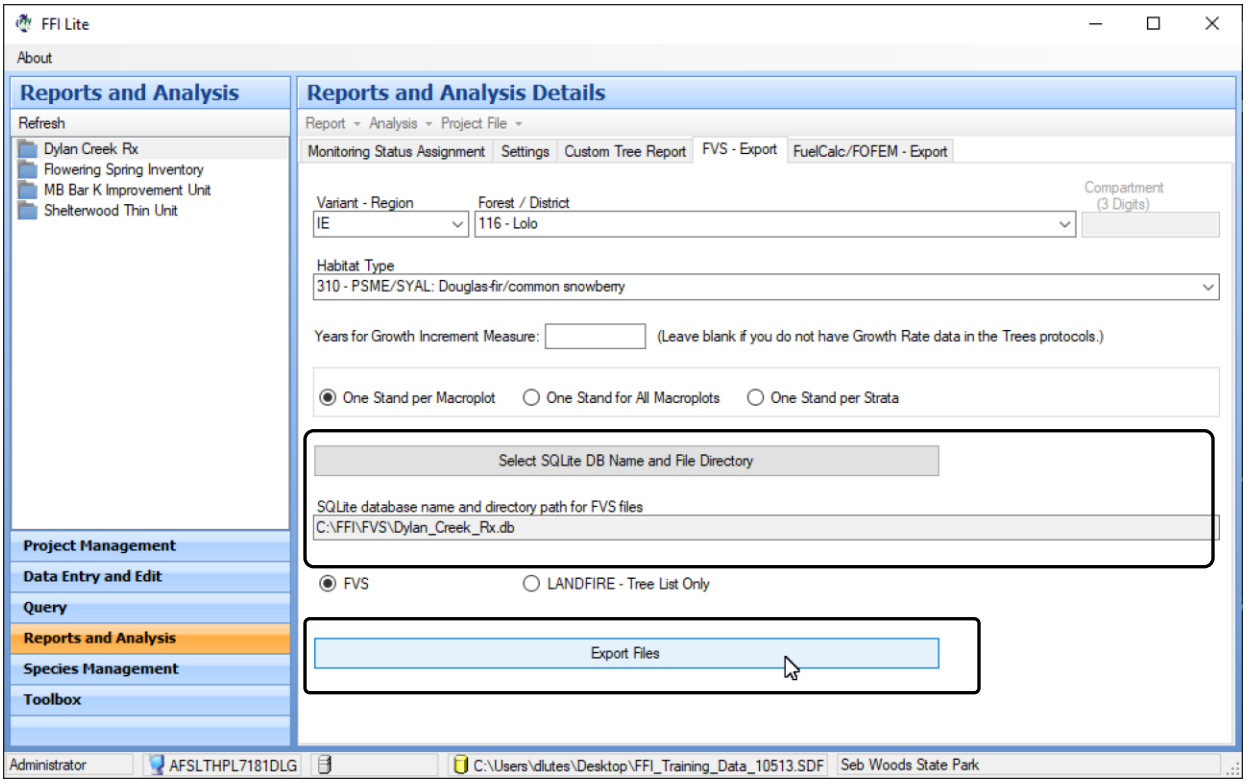
[3] The two components are summed for FVS export.

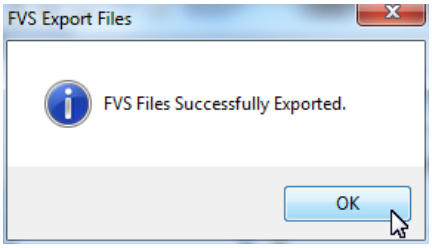
4 Loading in these Biomass-Fuels classes are divided into FVS classes using these proportions:

Biomass-Fuels 3"-9":	FVS 3"-6" = 3"-9" x 0.269	FVS 6"-9" = 3"-9" x 0.731
Biomass Fuels 9"-20":	FVS 6"-12" = 9"-20" x 0.194	FVS 12"-20" = 9"-20" x 0.806
Biomass-Fuels 20+:	FVS 20"-35" = 20"+ x 1.0	
FVS 35"-50" and >50" = null		

To create the FVS database in FFI click on the **FVS-Export** tab and select the *Variant-Region, Forest-District* and *Habitat Type*. If you have collected tree growth rate data in FFI and wish to include it in FVS then set the *Years for Growth Increment Measure* field. The increment value entered will be used to calibrate growth for all sample events included in the FVS database. Choose a grouping option for the data: one FVS stand per FFI macro plot/sample event, one FVS stand for all selected FFI macro plot/sample events or one FVS stand per FFI strata (set in the *Stratify By* filed on the **Reports and Analysis**, **Settings** tab). Click **Select SQLite DB Name and File Directory** and choose a database name and a folder to store it in. The path to the folder cannot have spaces. (E.g., you cannot store in *My Documents*).

When all the selections have been made click **Export Files**. A dialog box will be displayed when the export is complete.





NOTES: The Trees-Individual, Damage and Severity code fields 1 through 3 are included in the FVS database if they are numeric values. Character based damage codes and damage and severity code fields 4 and 5 are ignored.

*Height to Top Kill (HtTopK) is calculated for live trees (i.e., where status = L, H, U, S) and added into the FVS database when the following three fields are entered for a FFI tree record: tree height, damage code (set to 96 or 97) and severity code fields (either the '900' codes or a percent value). HtTopK=TreeHt – (TreeHt * (percent top dead/100))*

Creating FuelCalc and FOFEM files

FOFEM and FuelCalc are applications many mangers use to plan treatments. FFI export data for FOFEM and FuelCalc from the protocols listed in the table below. If data for one or more fuel components are found in more than one protocol then the average loading of that component across all protocol will be exported to the FOFEM and FuelCalc files (excluding null values)

Protocol data exported to FOFEM and FuelCalc

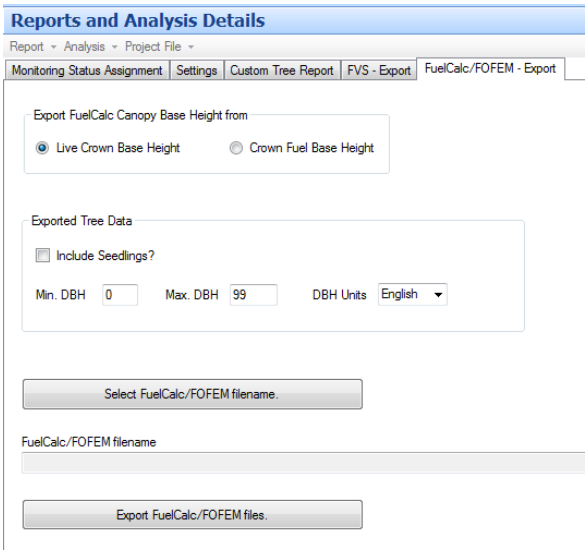
Method[1]	**Data exported**
Surface Fuels[2]	Duff depth and duff, litter, 1-hr, 10-hr, 100-hr and 3"+ load in decay classes
Biomass-Fuels	Loading of upper and lower duff[3], live and dead moss, lichen, litter, 1-hr, 10-hr 100-hr, grass, low shrub and high shrub[3].
Surface Fuels - Vegetation	Live herb and live shrub load.
Photoloads	1-, 10-, 100-hr, herb and shrub.
Logs – Fixed-area	Loading of 3"+ material, in size and decay classes.
Surface Fuels – Alaska Duff and Litter	Duff, litter, lichen, and live and dead moss load.
Trees - Individuals	Species, status, tree density, diameter, height, crown base height, crown class, crown ratio.
Trees by Diameter Class (saplings)	Species, status, tree density, diameter class, avg. height, avg. crown ratio.
Trees by Height Class (seedlings)	Species, status, tree density, height class, avg. diameter, avg. crown ratio.

[1] If a fuel component is present in more than one FFI method then the value exported to FOFEM/FuelCalc is the average component value.
[2] 3"+ fuel load is exported by decay class in these classes: 3"-6", 6"-9", 9"-12", 12"-20" and >20"
[3] The two classes are summed for FOFEM and FuelCalc export.

FFI will create files that can be imported directly into the FuelCalc and FOFEM applications. Select the macro plots and monitoring status you want to export data from on the **Settings** tab in **Reports and Analysis**. The data is exported at the plot level. You can export multiple monitoring

statuses. Plots cannot be grouped/stratified for FuelCalc/FOFEM export. Data can be exported from English or metric protocols but only English unit values are exported.

Select the **FuelCalc/FOFEM – Export** tab. Select the radio button for exporting the *Live Crown Base Height* or *Crown Fuel Base Height* field. Check the *Include Seedlings* box if you want to have seedlings in the export file. Set the DBH range of saplings and individual trees and the class units. Click the *Select FuelCalc/FOFEM filename* button and select a filename that will be used as the prefix for the exported files. Click *Export FuelCalc/FOFEM files.*



The export feature creates files with extensions *.FFI. .TRE* and *.PHO* that have the same prefix. The *.FFI* file includes plot name, monitoring status and component fuel load. The *.TRE* file includes tree information. These files are completely described in FOFEM and FuelCalc user guides. The *.PHO* file includes link to photos and is not used by FOFEM or FuelCalc.

Performing Analyses

In FFI, you can configure various types of statistical analyses. Results can be formatted, printed, or exported as either Excel files or Acrobat PDFs.

The analyses available through the **Analysis** menu are summarized below.

Descriptive statistics

Descriptive statistics display the raw data and any summary data.

- In the *Parametric* option, the descriptive statistics are the mean, standard deviation, and confidence intervals based on the selected alpha value.
- In the Nonparametric option, the descriptive statistics are the median, distribution-free confidence intervals based on the selected alpha value, and the actual confidence levels (the closest possible confidence level to the selected alpha value given the sample size).

Statistical analysis

In the *Statistical Analysis* option, the descriptive statistics are displayed along with tests for significant differences between monitoring statuses.

- The *Parametric* analysis generates a One-Way ANOVA with a Dunnett's T-test.
- The *Nonparametric* option generates a Friedman's test with a nonparametric multiple comparison test.

Report and Analysis setup

FFI offers several options to configure a statistical analysis. Select either a descriptive statistics or statistical analysis.

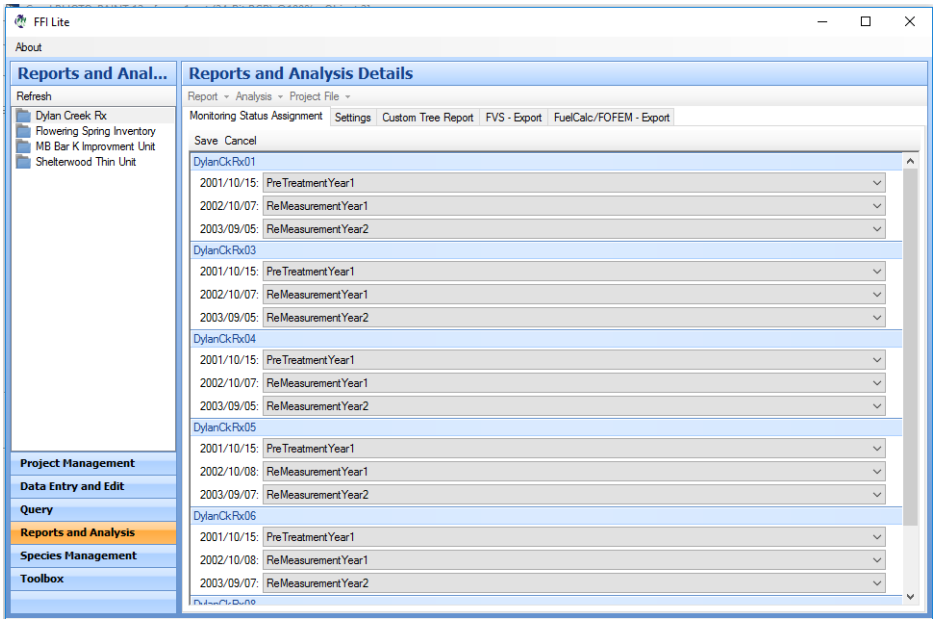
- A *Descriptive Statistics* analysis report will display the raw data and any summary data. If you select the *Parametric* option, the descriptive statistics are the mean, standard deviation, and confidence intervals based on the selected alpha value. If you select the *Nonparametric* option, the descriptive statistics are the median, distribution free confidence intervals based on the selected alpha value, and the actual confidence levels (the closest possible confidence level to the selected alpha value given the sample size). You can select the decimal precision of the analysis report.
- If you select the *Statistical Analysis* option, the descriptive statistics are displayed along with tests for significant differences between monitoring statuses. The parametric analysis generates a One-Way ANOVA with a Dunnett's T-test. The nonparametric option generates a Friedman's test with a nonparametric multiple comparison test. You can select the decimal precision of the analysis report.

NOTE: These analyses are further explained in the section Analysis Output Types.

To prepare for an FFI analysis:

1. Select **Reports and Analysis** from the main FFI menu to open the *Reports and Analysis Details* window.

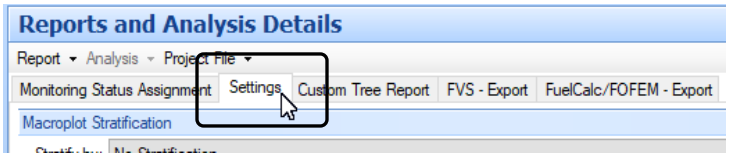
2. Select the desired project unit in the left pane and the *Monitoring Status Assignment* window opens, listing all associated macro plots and sample events for the selected project unit.



3. If the monitoring statuses have not been assigned, then use the dropdown lists next to each sample event date to assign an appropriate monitoring status for each sample event to be analyzed. Click **Save** when finished.

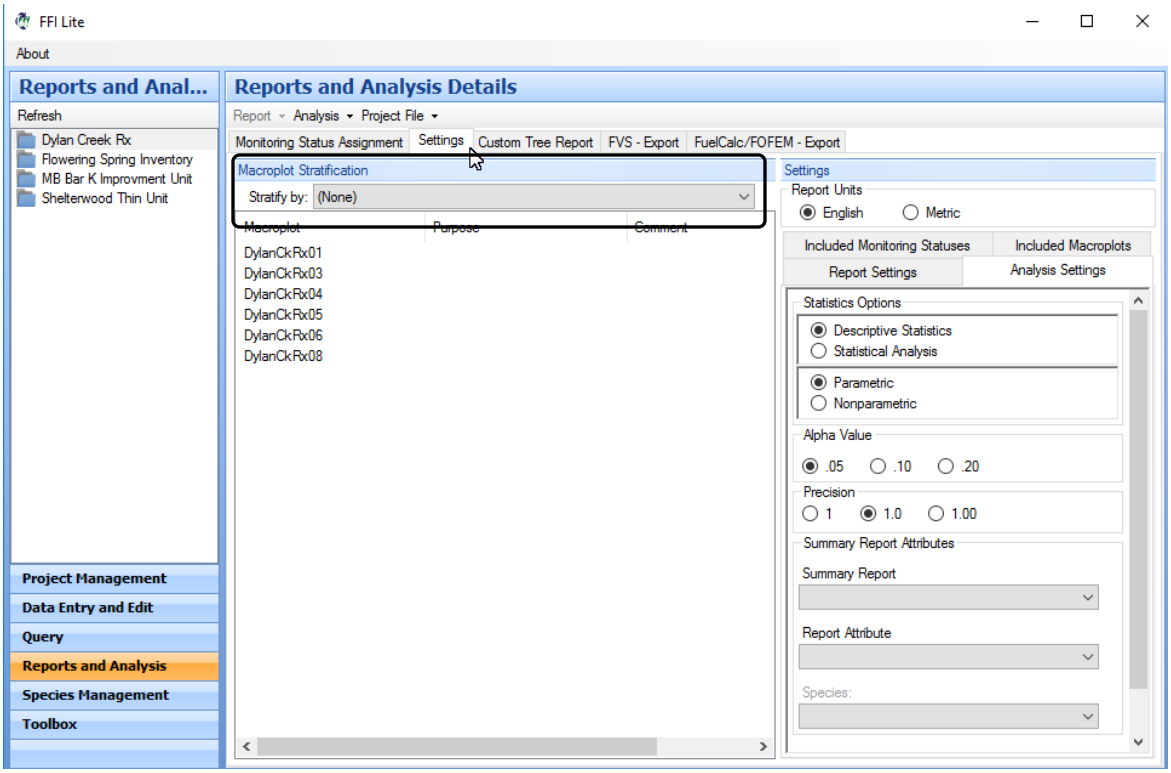
NOTE: See: Managing Monitoring Statuses for more information.

4. Click the **Settings** tab.

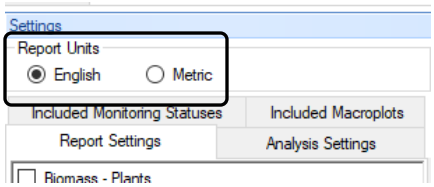


5. Use the *Stratify by:* dropdown in *Macro Plot Stratification* to select a stratification criterion, if desired.

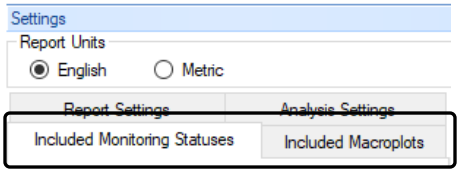
   NOTE: The available stratification criteria are the organization codes, or user variables, that may have been assigned to the macro plot during creation or subsequent editing. For more information, see Creating a macro plot.



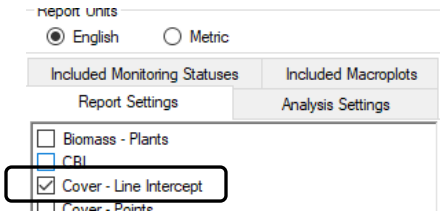
6. Select to report the output in either English or metric *Report Units*.



7. In the *Included Monitoring Statuses* tab, deselect any monitoring statuses that you do not wish to include in the analysis.
8. In the *Included Macro Plots* tab, deselect any macro plots that you do not wish to include in the analysis.

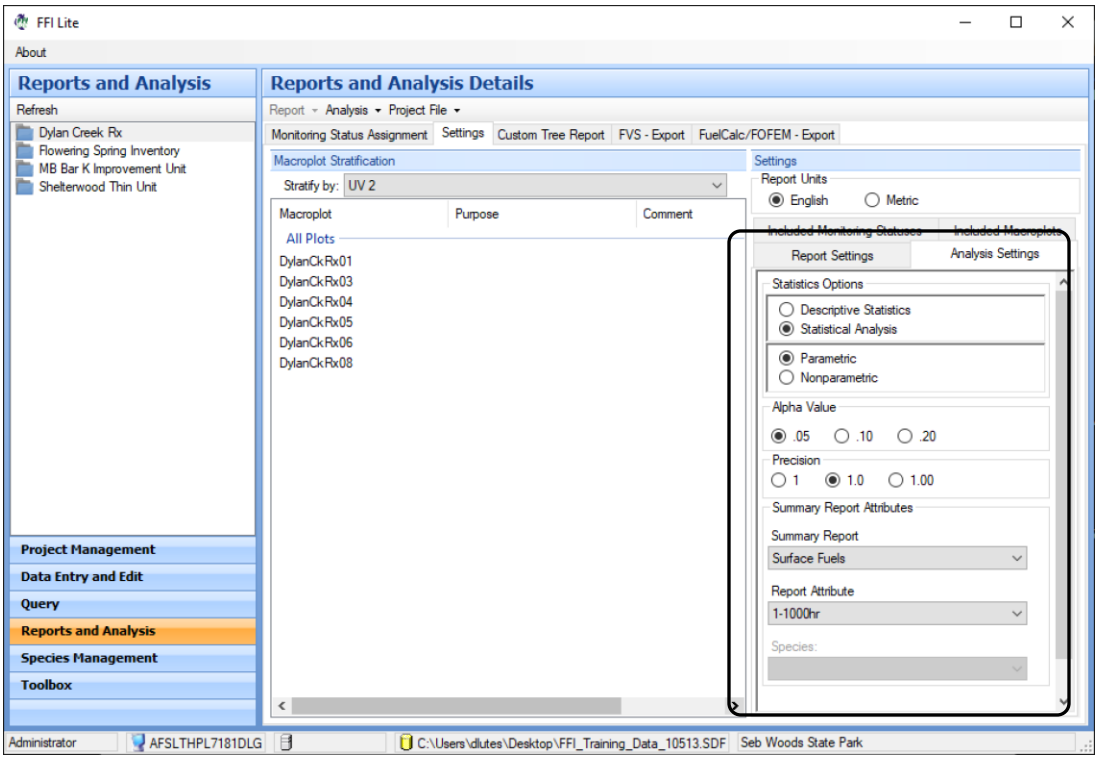


9. To setup summary report, click the *Report Settings* tab and mark the checkboxes for the reports you want to create.



10. To setup an analysis report, click the n the *Analysis Settings* tab, then:

    a. Select the desired *Statistics Options*.
    b. Select the appropriate *Alpha Value*.
    c. Select the appropriate *Precision*.
    d. Select the appropriate *Summary Report* and *Report Attributes*.
    e. If your analysis involves species data, select the appropriate *Species*.

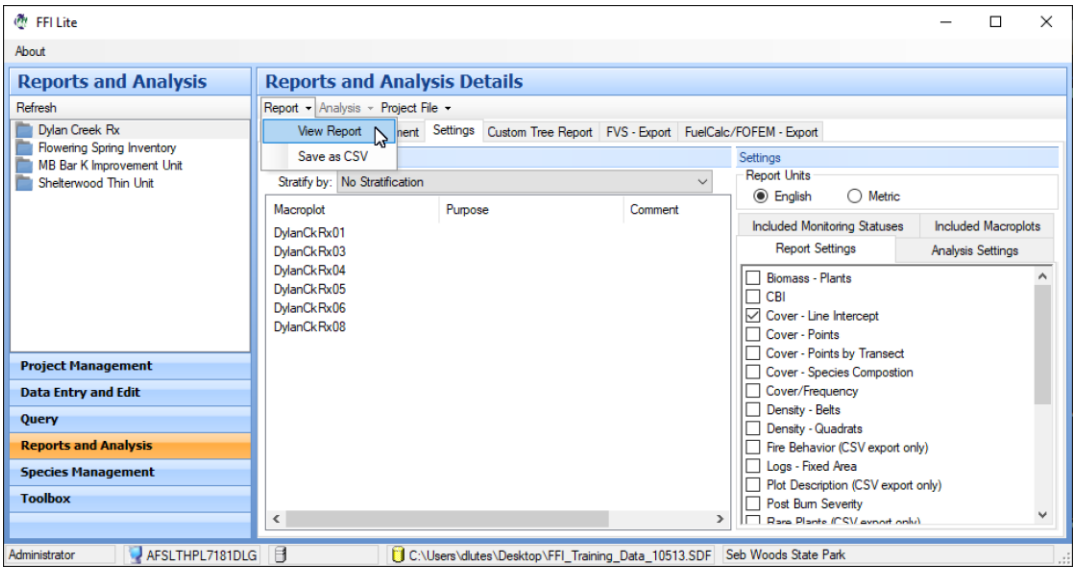


Creating a Summary Report

To create and view a summary report:

1. Select the *Report Setting* tab
2. Select *View Report* from the **Report** menu

NOTE: The CSV report has the same data as the summary report - more data for some protocols – and the comma delimited files are easier to import into other software like statistics packages.



3. The report presents protocol summary data for the selected macro plots and monitoring statuses

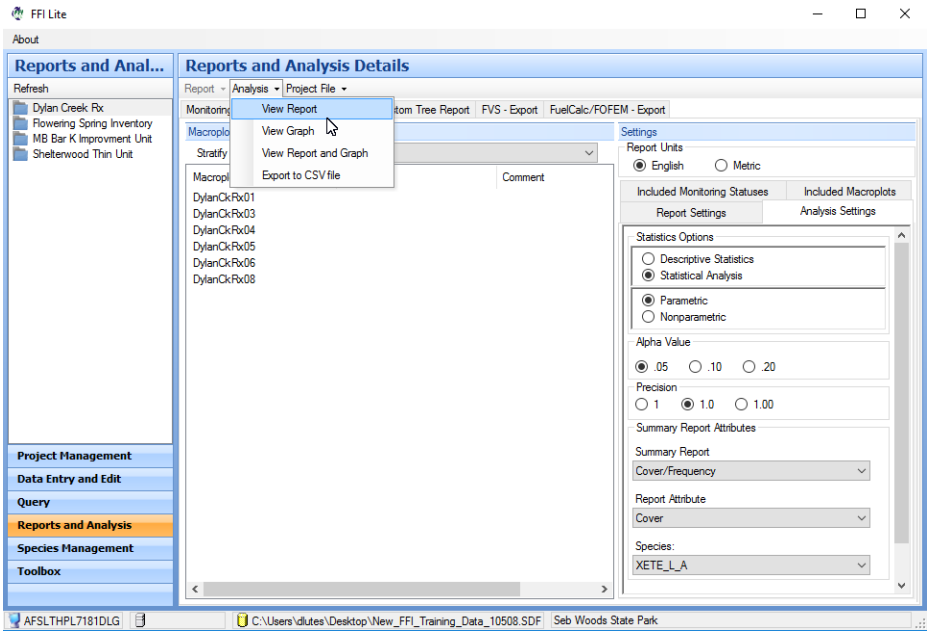
Cover - Line Intercept Summary

Macroplot	Monitoring Status	Item	Status	Size Class	Age Class	Type of Cover	Average Cover%	Average Height(ft.)
DylanCkRx01	PreTreatmentYear1	PHMA5	L	TO			35.5	3.7
DylanCkRx01	PreTreatmentYear1	PRVI	L	TO			23.5	7.5
DylanCkRx03	PreTreatmentYear1	PHMA5	L	TO			18.8	4.2
DylanCkRx03	PreTreatmentYear1	SYAL	L	TO			18.1	3.0
DylanCkRx04	PreTreatmentYear1	PRVI	L	TO			14.7	9.5
DylanCkRx04	PreTreatmentYear1	SYAL	L	TO			4.0	1.8
DylanCkRx05	PreTreatmentYear1	PHMA5	L	TO			15.2	3.0
DylanCkRx05	PreTreatmentYear1	PRVI	L	TO			12.0	7.5
DylanCkRx05	PreTreatmentYear1	SYAL	L	TO			13.4	2.1
DylanCkRx06	PreTreatmentYear1	PHMA5	L	TO			33.4	3.8
DylanCkRx08	PreTreatmentYear1	SYAL	L	TO			9.2	1.6
DylanCkRx08	PreTreatmentYear1	VAGL	L	TO			0.8	8.3

Creating an Analysis Report or Graph

To create and view an analysis report or graph:

1. Select *View Report* or *View Graph* in the **Analysis** menu.



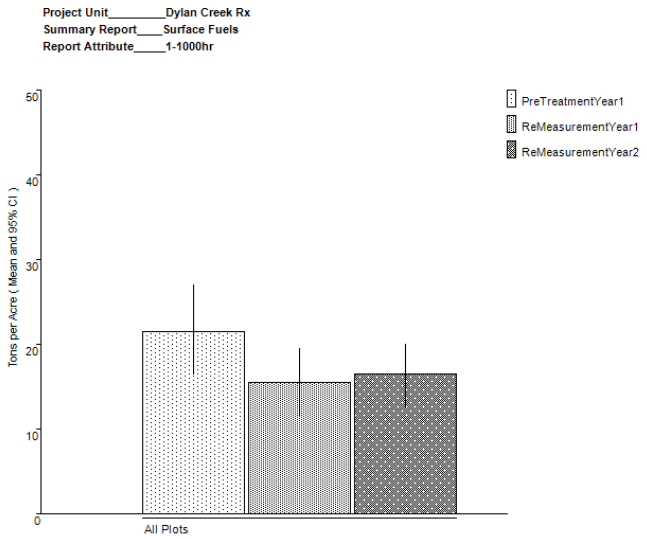
2. The Analysis Report has a row for each macro plot and rows for the data used in the statistical test. There are columns for each monitoring status plus columns for differences (always compared against the first monitoring status in the analysis). Statistical test results are at the bottom of the report.

```
One-Way Analysis of Variance

Project Unit_____________Dylan Creek Rx
Summary Report___________Cover/Frequency
Report Attribute_________Cover
Units____________________Percent
Species__________________XETE_L_A
```

PreTreatmentYear1		ReMeasurementYear1			ReMeasurementYear2		
Plot	Attr	Attr	Diff	%Diff	Attr	Diff	%Diff
DylanCkRx01	10.8	4.4	-6.4	-59.3	7.3	-3.5	-32.2
DylanCkRx03	1.2	0.0	-1.2	-100.0	0.8	-0.4	-33.3
DylanCkRx04	20.8	1.6	-19.2	-92.3	17.2	-3.6	-17.3
DylanCkRx05	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DylanCkRx06	5.2	3.6	-1.6	-30.8	5.6	0.4	7.7
DylanCkRx08	1.6	0.0	-1.6	-100.0	0.0	-1.6	-100.0
Mean	6.6	1.6	-5.0	-75.8	5.2	-1.4	-21.9
SDev	8.0	2.0			6.7		
N	6.0	6.0			6.0		
CI-Lower	-1.8	-0.5			-1.8		
CI-Upper	15.0	3.7			12.1		

```
Dunnett's multiple comparison test

F-Value =  1.06    Prob = 0.3701    Alpha =.05 (Settings Dialog Box)
```

3. The Analysis Graph includes a bar for each monitoring status. When plots are stratified the graph includes a vertical bar, which is the confidence interval around the mean.



NOTE: See [Analysis Output Types] for more analysis examples.

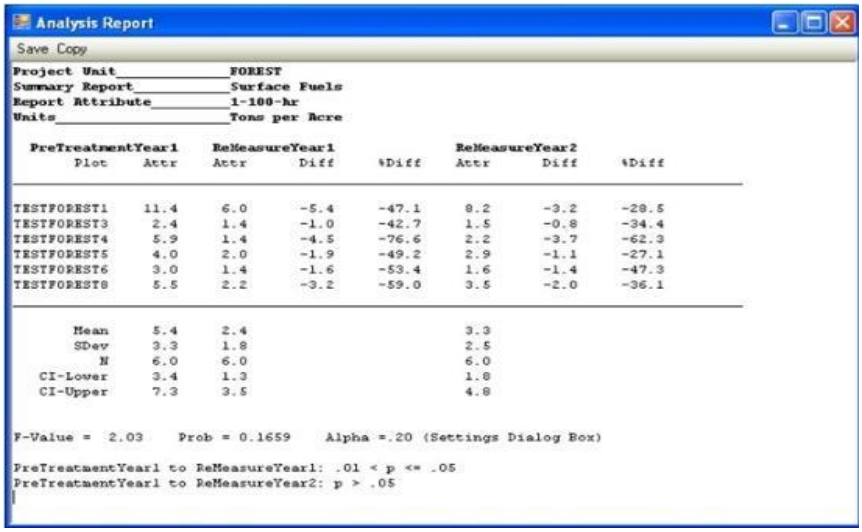
Analysis output types

This section contains examples of the reports and graphs generated in FFI:

- Parametric statistical report
- Nonparametric statistical report
- Parametric bar chart by strata
- Nonparametric bar chart by strata
- Non-stratified bar chart

Note that reports and graphs can be saved or copied. The *Copy* button copies the report or graph to the Windows clipboard for pasting into a document. The *Save* button saves reports to a Rich Text file and graphs to a high-resolution bitmap file.

Parametric statistical reports

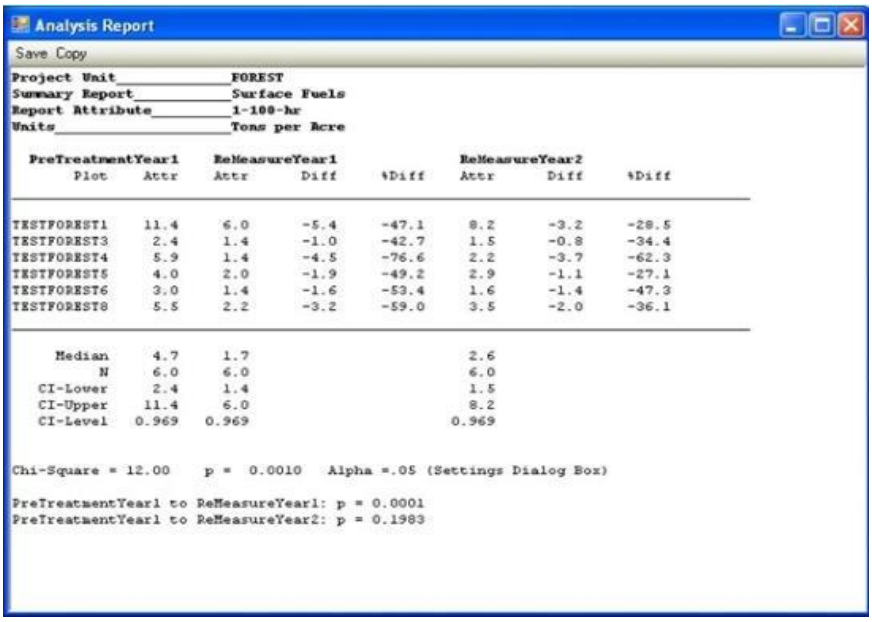


The FFI parametric statistic routine uses a one-way analysis of variance procedure for a single attribute by two or more monitoring statuses. Analysis of variance is used to test the hypothesis that several means are equal. In addition to determining that differences exist among the means, FFI determines which means differ when the ANOVA F-test indicates a significant difference. A Dunnett's pairwise multiple comparison procedure is used to compare a set of treatments against a single control mean. FFI uses the first monitoring status as the control and the subsequent sampling events as the set of treatments.

The FFI analysis report displays the attribute value for each plot and the absolute and percent difference for each value relative to the first monitoring status. The mean values, standard deviation, and differences in mean values are displayed at the bottom of the plot attribute value table. Confidence intervals are also displayed at the bottom of the plot attribute table. The confidence level of the interval is the alpha value selected in the main analysis form. The F-statistic and associated P-value for the ANOVA table are displayed below the plot attribute

table. If the F-statistic is significant FFI reports the significance value for each pairwise comparison at the bottom of the report.

Nonparametric statistical reports

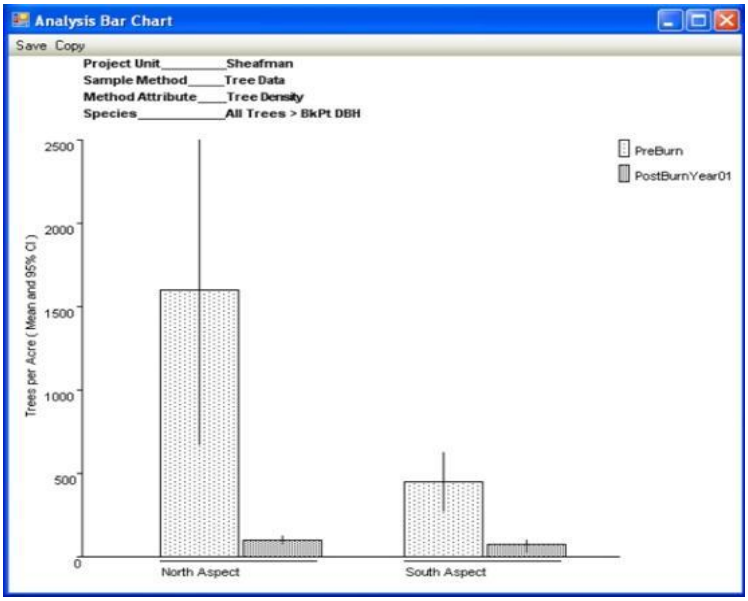


The FFI nonparametric statistic routine uses a Friedman's test for a single attribute by two or more sampling events. Friedman's test is a nonparametric analysis of variance used for randomized block or repeated measures experimental designs. The analysis is performed by using ranks (not the actual data) and is useful with data that do not meet the parametric analysis of variance assumptions. Data is ranked within a block (plot) among treatments (sample events). Friedman's analysis of variance is used to test the hypothesis that several treatments (sample events) are equal. In addition, a nonparametric multiple comparison test based on Friedman rank sums is used to compare a set of treatments against a single control mean. FFI uses the first monitoring status as the control and the subsequent sampling events as the set of treatments.

The FFI analysis report displays the attribute value for each plot and the absolute and percent difference for each value relative to the first monitoring status. The median values and differences in median values are displayed at the bottom of the plot attribute value table. Confidence intervals are also displayed at the bottom of the plot attribute table. The confidence level for the confidence interval is determined by the user in the main analysis form. For example, an alpha value of 0.05 will generate a 95% confidence interval. However, since distribution-free confidence intervals are based on integer numbers of order statistics (positions of ordered data around the median) the actual confidence level is slightly greater than the user-specified level. FFI displays the actual confidence level along with the upper and lower limits. The Friedman chi-square statistic and associated P-value are displayed below the plot attribute table. The pairwise comparisons between monitoring statuses and the first monitoring status are displayed at the bottom of the report.

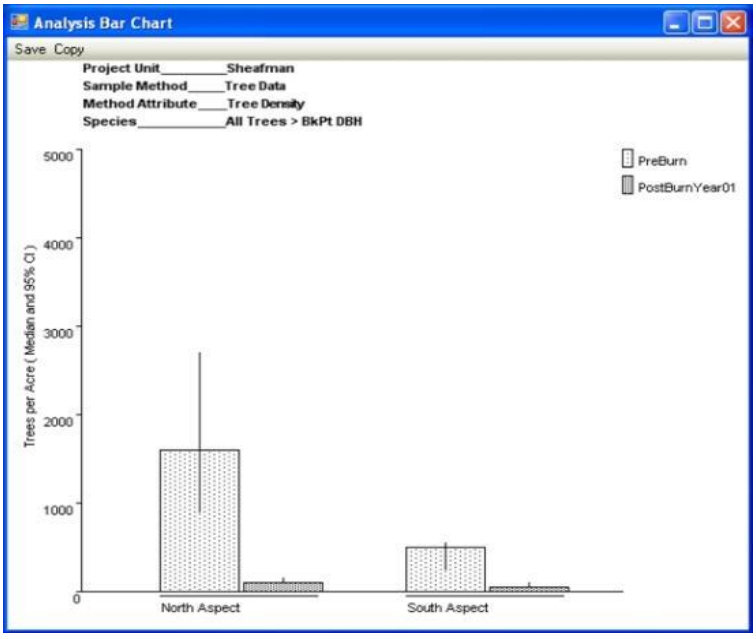
Parametric statistics bar chart by strata

If you choose to stratify macro plots, FFI displays a stratified bar chart. If you select the *Parametric* option under *Statistics Options*, the graph displays the mean value by strata for each monitoring status and the confidence intervals associated with the selected alpha value.



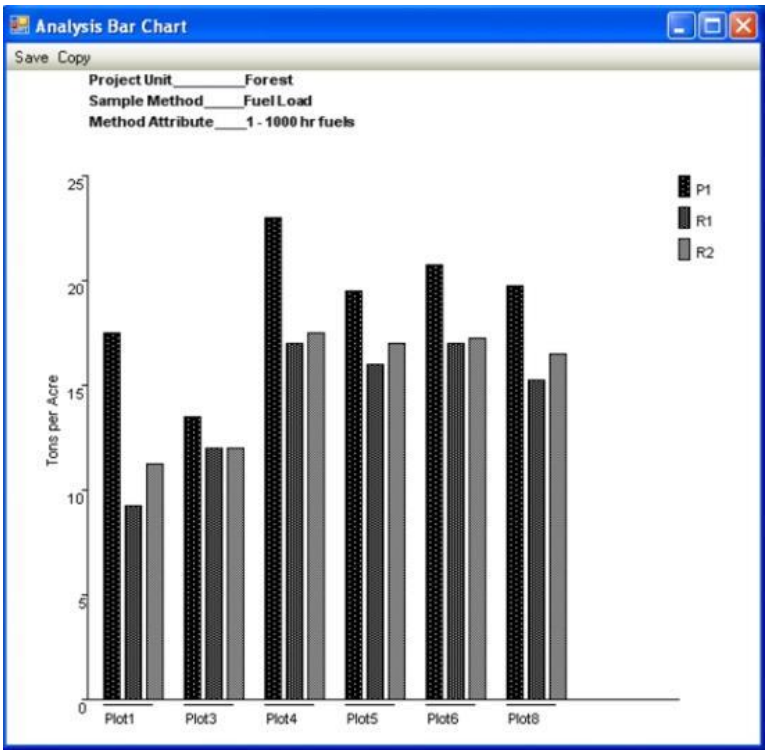
Nonparametric statistics bar chart by strata

If you choose to stratify macro plots, FFI displays a stratified bar chart. If you select the *Nonparametric* option in the main *Analysis* window, the graph displays the median value by strata for each monitoring status and the distribution-free confidence intervals associated with the selected alpha value.



Bar chart using non-stratified data

If you choose to not to stratify macro plots, FFI displays a bar chart of your plot data. The values displayed on the chart are the values for each plot by monitoring status.



Species management

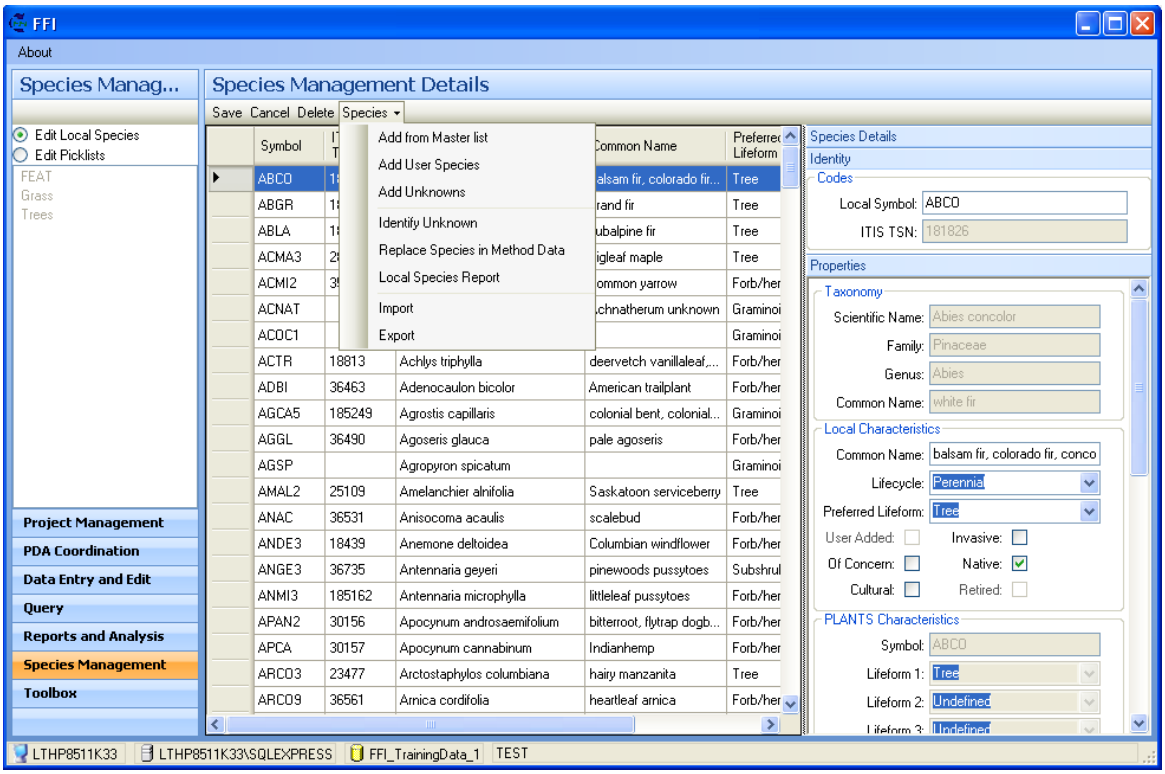
FFI's Species Management component incorporates the Natural Resources Conservation Service (NRCS) PLANTS database, from which you can create a local species list for an administrative unit. The PLANTS database is searchable by symbol, scientific, and common name, and addresses vascular plants, mosses, liverworts, hornworts, and lichens of the U.S. and its territories. For further information, visit https://plants.usda.gov.

In Species Management, you can:

- Add from Master list - create a local species list for an administrative unit by selecting species symbol from the PLANTS database.
- Add User Species - add up to 100 local species not identified in the PLANTS database, which can be used to represent substrates or generic classifications.
- Add Unknowns - add placeholder species for use in the field.
- Identify Unknown - replace an unknown species with a species from the PLANTS database or a known local species.
- Replace Species in Method Data – replace the symbol for either an unknown or a known species after data has been collected for that species in the field without affecting the data. Replacement is made at the protocol level. To make a species symbol replacement for every instance in a database use the Global Species Replacement utility in the **Toolbox.**
- Export - export species lists for use by other administrative units.
- Import - import FFI species lists representing other administrative units, or import converted FEAT or FIREMON species lists.
- Work with Picklists - create and manipulate picklists for field projects.

NOTE: Do not do any species management in a field database/field computer. See FFI-Lite: Things not to do on a field computer.

The basic Species Management interface and menu options are shown below. *Save*, *Cancel*, and *Delete* functions are available from the *Species Management Details* window toolbar.



Internally, FFI tracks each species with a Globally Unique Identifier (GUID). Any species that you add to your local species list, including user-defined species that you enter by hand, will have the same GUID across all of your FFI databases. As you record field data, species observations will be tied to the species list using the GUID. This means that edits in the species list will carry over to all existing data.

Creating a local species list

You can create a new local species list for your administrative unit by:

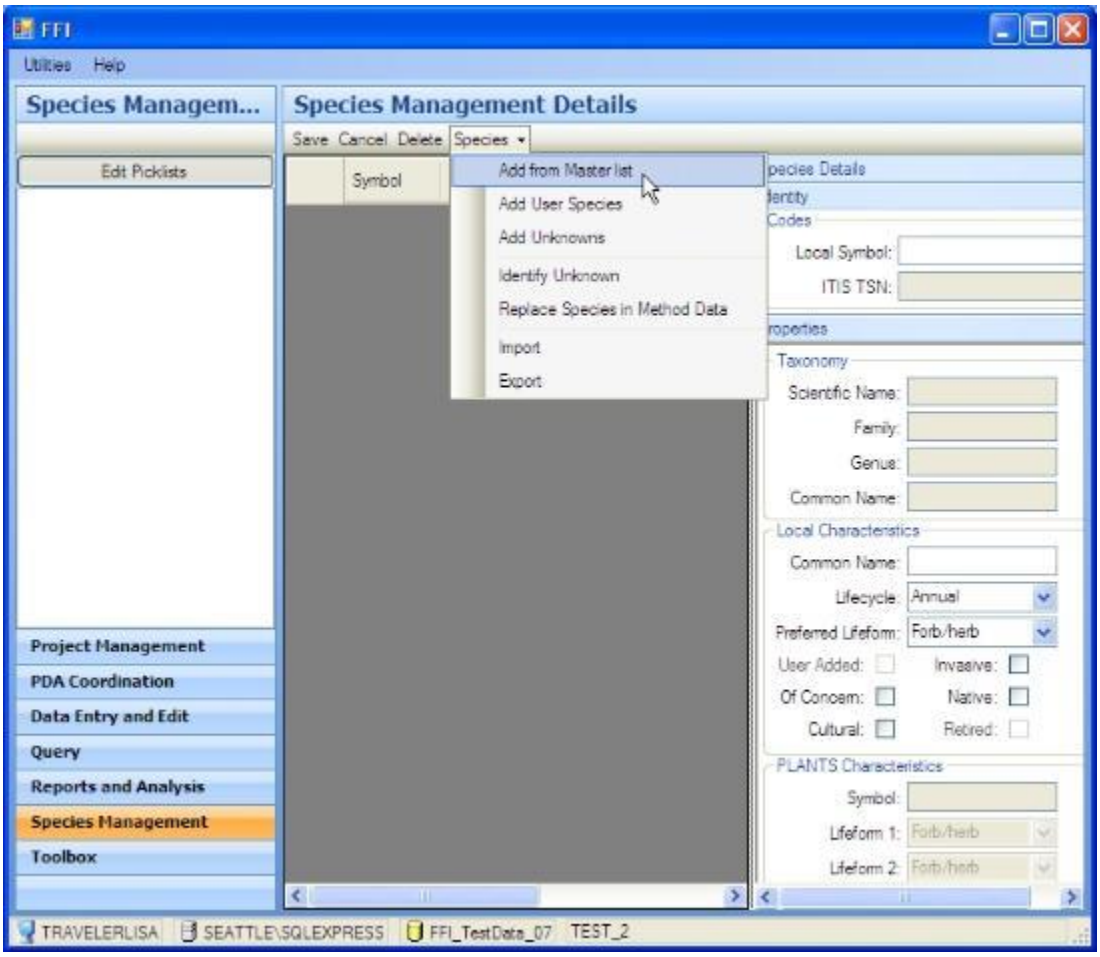
- Adding species from the master list
- Entering user species from scratch

Adding species from the master list

To build a local species list by selecting entries from the NRCS PLANTS database:

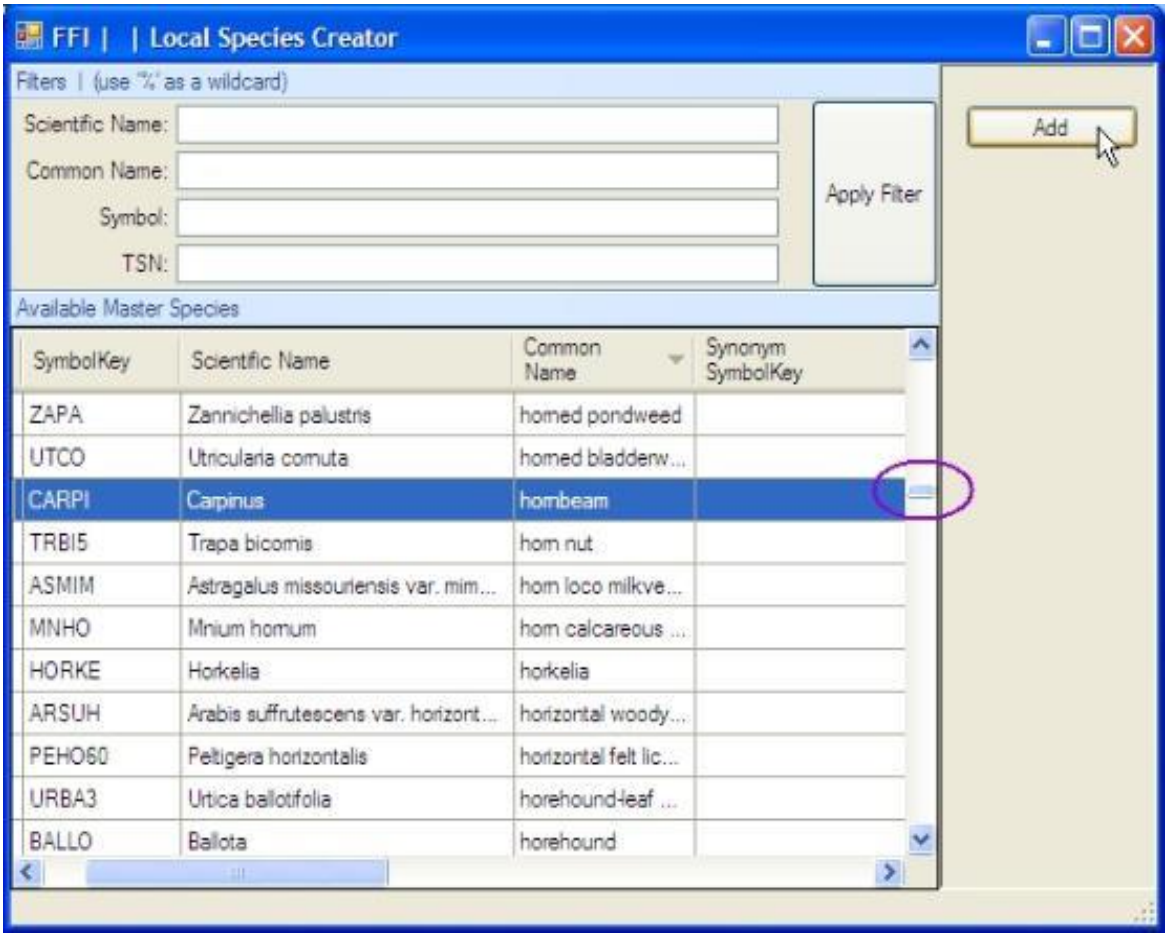
1. Click on the **Species Management** navigation bar and the *Species Management Details* window opens.

2. Select **Add from Master list** in the **Species** menu.



3. The *Local Species Creator* form opens. You can select species either by scrolling through the complete PLANTS list or by filtering the complete list.

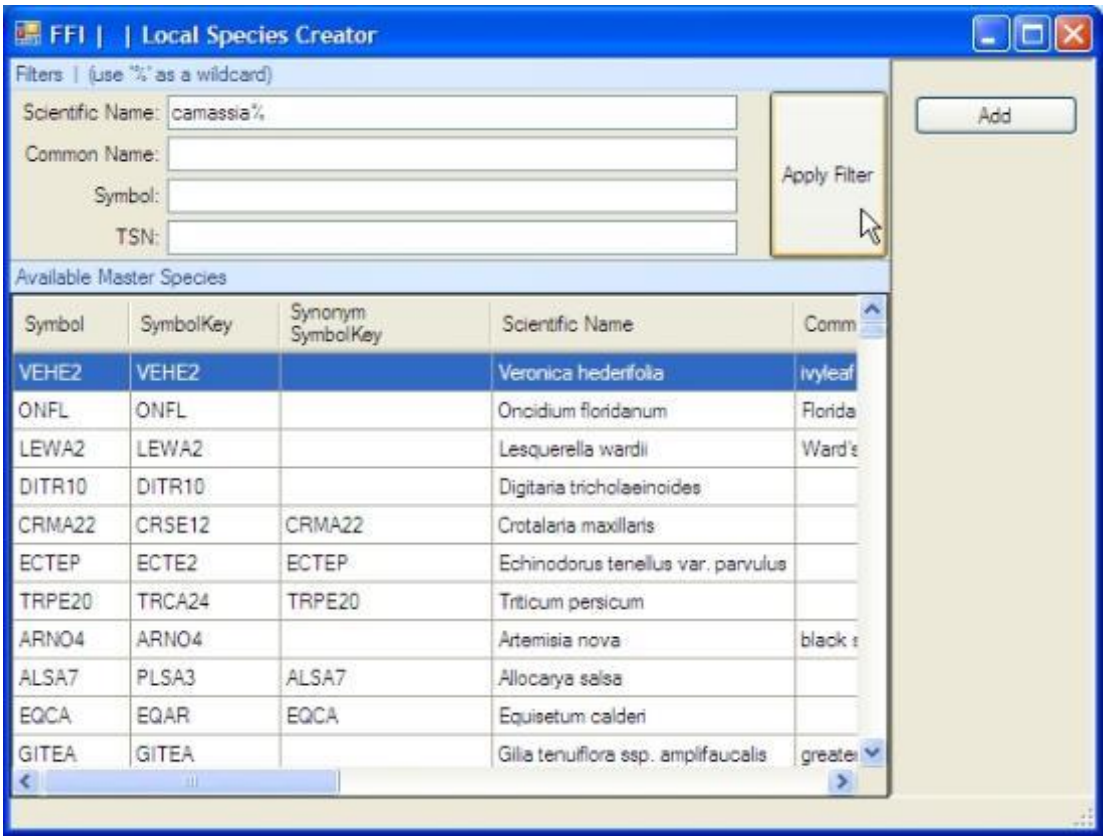
4. To select species by *scrolling*, scroll through the list and select plants of interest. Use the *CTRL* key to select more than one species. When you are done, click **Add** to add the selected species to your species list.



NOTE: Click on any column heading to order that column alphabetically. Drag and drop column headings to change the order in which the columns appear.

5. To add species by *filtering*, enter your filter criteria - scientific or common name, plant symbol, or TSN. In this example, `camassia` is used with the wildcard `%`. When you are ready, click **Apply Filter**.

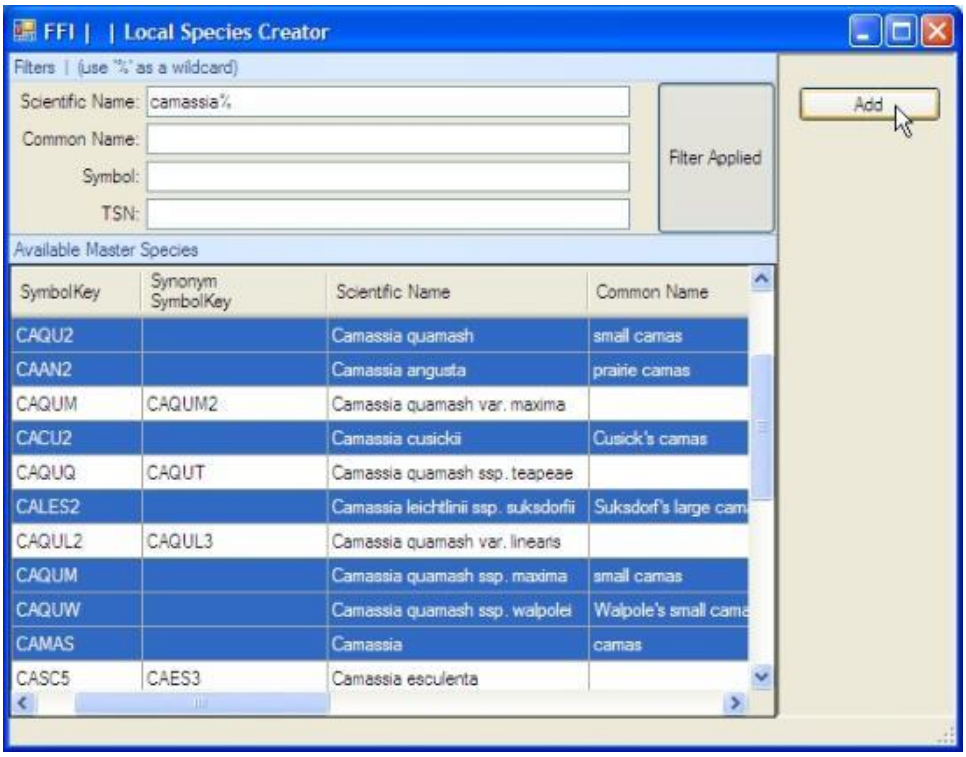
NOTE: The PLANTS database contains a series of codes, prefaced with the number 2, for generic species and substrates. To locate and add a generic or substrate, see



NOTE: The PLANTS database contains approximately 90,000 records. Pick your filter criteria with care, and be prepared to wait a moment or two for the command to be executed.

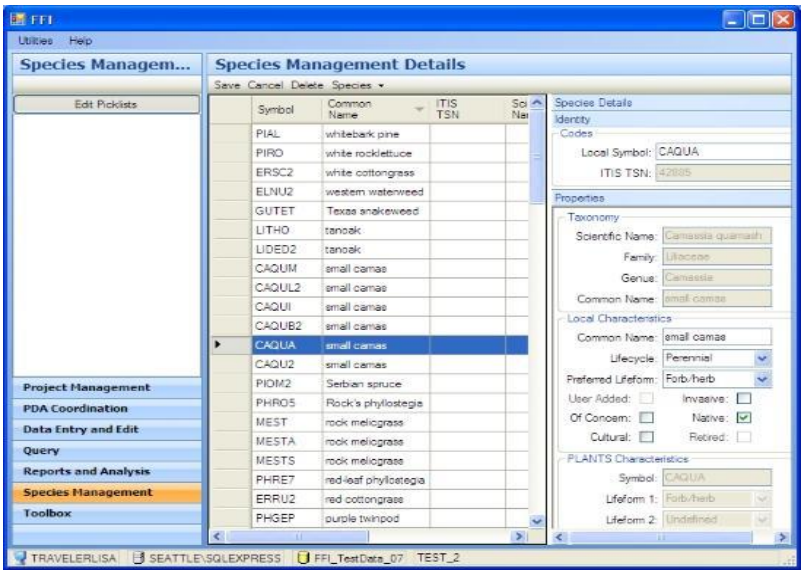
6. The resulting filtered list, shown below, contains all of the `camassia` species in the PLANTS database. Make your selections by scrolling through the filtered list. Use the CTRL key to select more than one entry.

7. Click **Add** to add your selections to the local list.



The resulting local species list appears in the central pane of the **Species Management** window, as shown here. You can:

- Scroll horizontally through the list to view all fields.
- Drag and drop column headings to rearrange the list to suit your needs.
- Click any entry to display *Identity* and *Properties* data for that species.



*NOTE: The Local Characteristics data can be edited. Make any necessary changes to the data to reflect local conditions and click **Save**.*

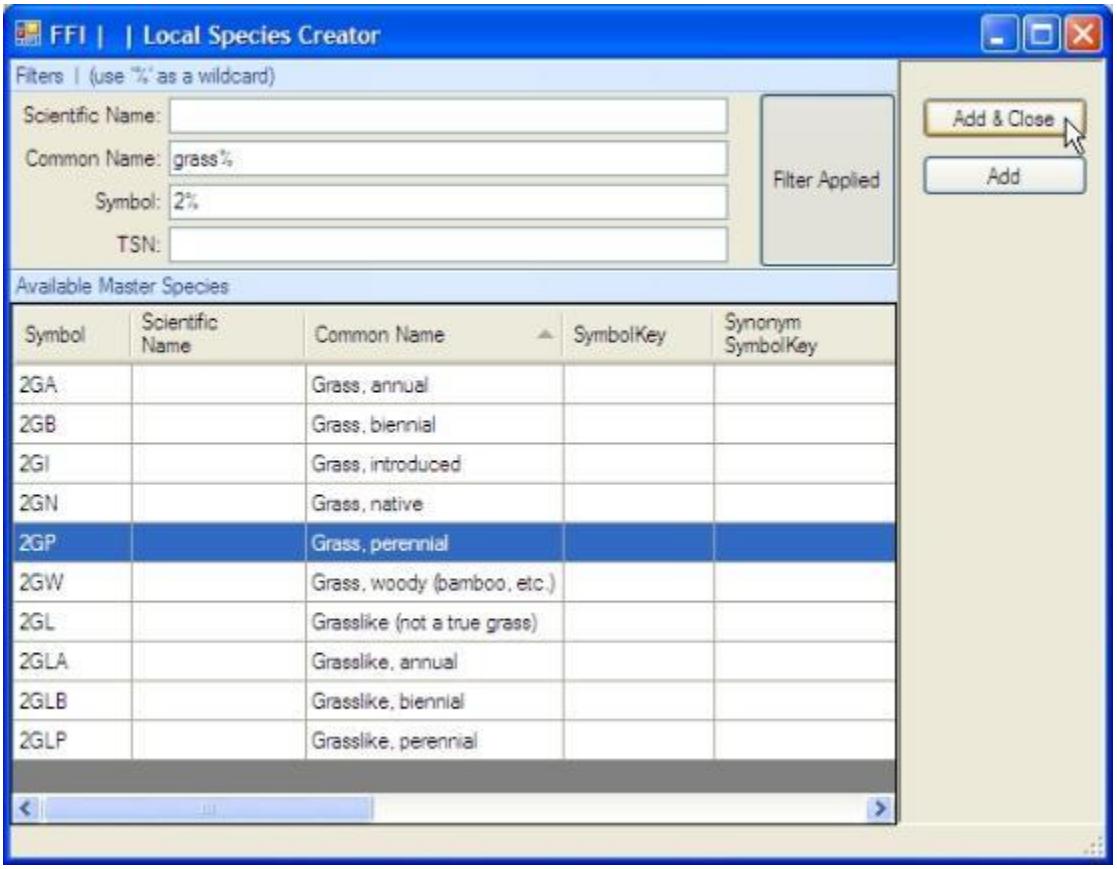
Locating and adding generics and substrates

The PLANTS database contains a set of symbols and descriptive common names for generic substrates and plant categories such as 'deciduous tree' or 'herbaceous vine' that are useful in survey, monitoring, and inventory work. These symbols and categories are widely used by a number of federal agencies.

NOTE: See Adding user species for incorporating your own generic substrates and plants to the species list.

To locate and add a generic species or substrate from the PLANTS database to your species list:

1. Enter `2%` as the **Symbol** search criterion.
2. Enter any other search criteria to focus the search. In this example, `grass%` is being used as a search criteria.
3. Scroll through the resulting list to select the desired symbol.
4. Click **Add & Close** to add the selected symbol to the local species list.



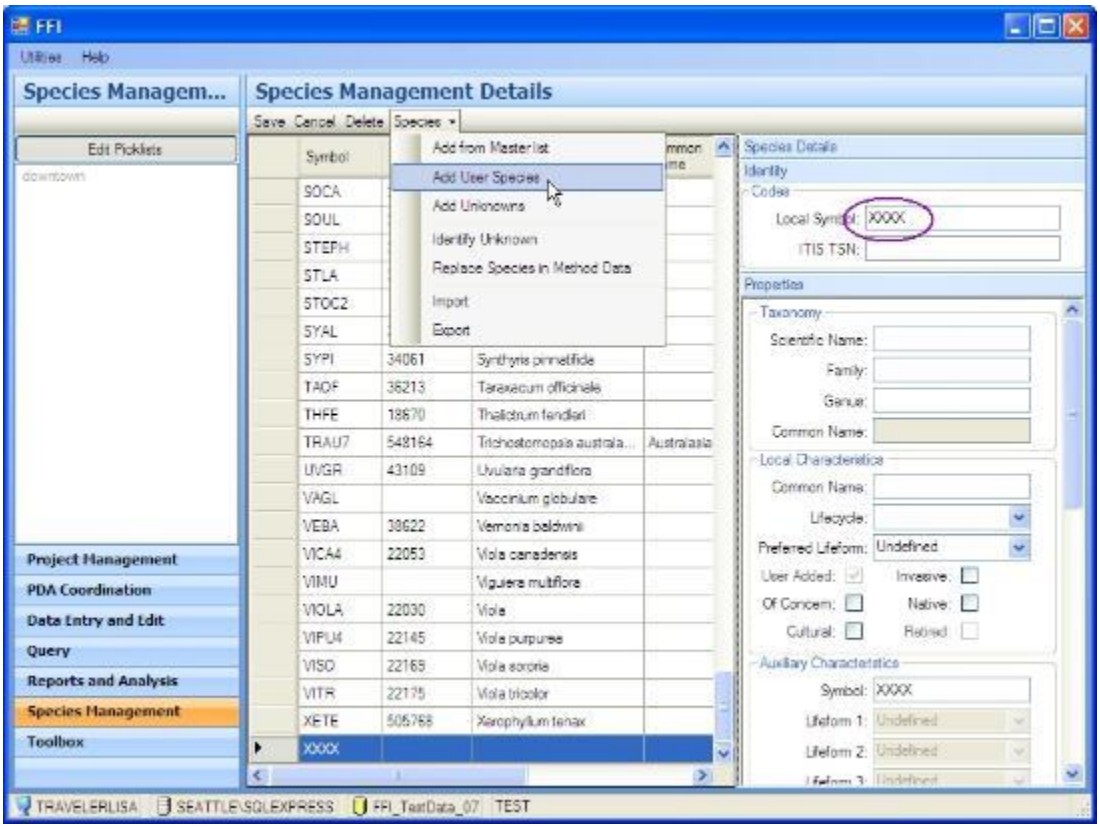
Adding user species

You can easily add species that occur locally but that are not found in the PLANTS master list. Also, you can create species that represent substrates, such as rocky soils, or you can create generic, non-taxonomic identifiers, like "fern".

NOTE: The PLANTS database contains a comprehensive catalog of generic substrates and plants that may be useful to you. See Locating and adding generics and substrates for incorporating PLANTS database generics to the species list.

To add a user species to your local species list:

1. Open the **Species Management** window.
2. Select **Add User Species** in the **Species** menu. A new blank row is added at the end of the local list.

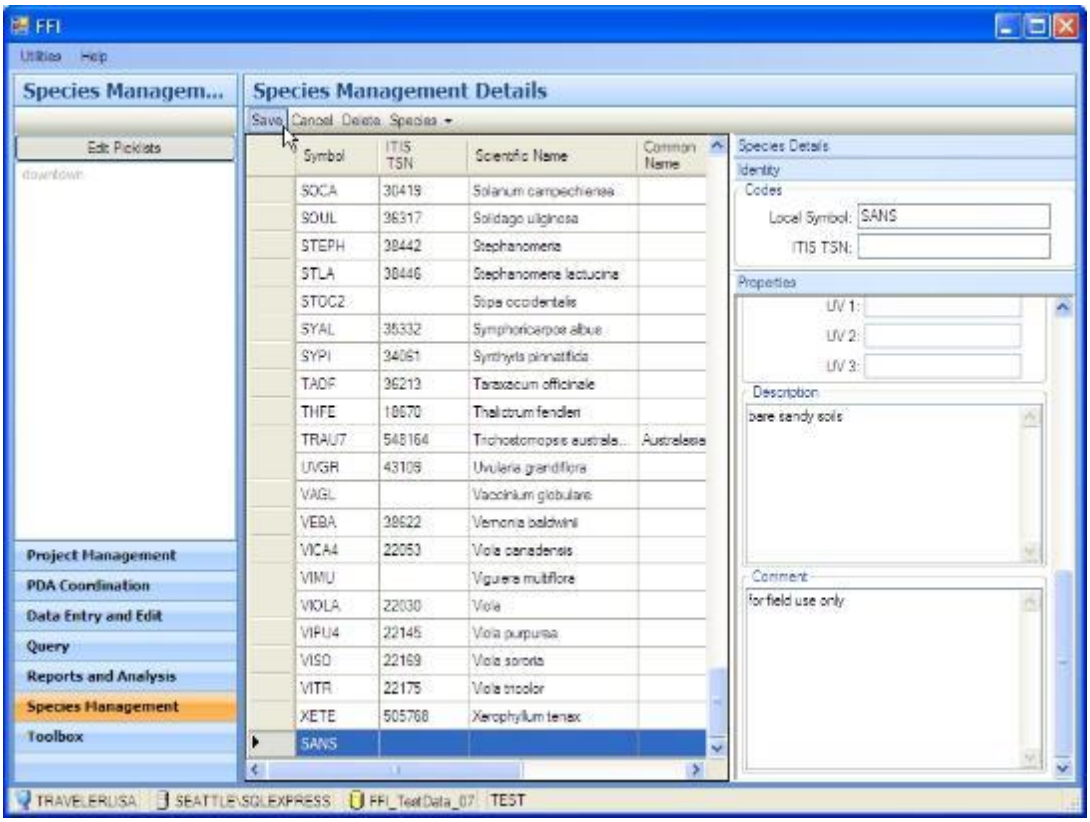


3. In the *Species Details - Identity* box, replace the default XXXX code with a code that is meaningful to you.

NOTE: Check the new code that you want to assign against the codes in the PLANTS database to ensure that, for example, a code you assign does not already represent a known plant in the database.

4. In the right-hand pane of the **Species Management** window, add as much information as possible to describe the species or identifier. (Be sure to scroll all the way down the pane to complete the *Description* and *Comment* text fields.)

In this example, the code SANS, representing bare sandy soils, does not occur in the PLANTS database.



5. Click **Save** in the *Species Management Details* window toolbar. In this example, the new species SANS appears at the bottom of the species list.

NOTE: Click any column heading to order that column alphabetically. Drag and drop column headings to change the order in which the columns appear.

Working with unknowns

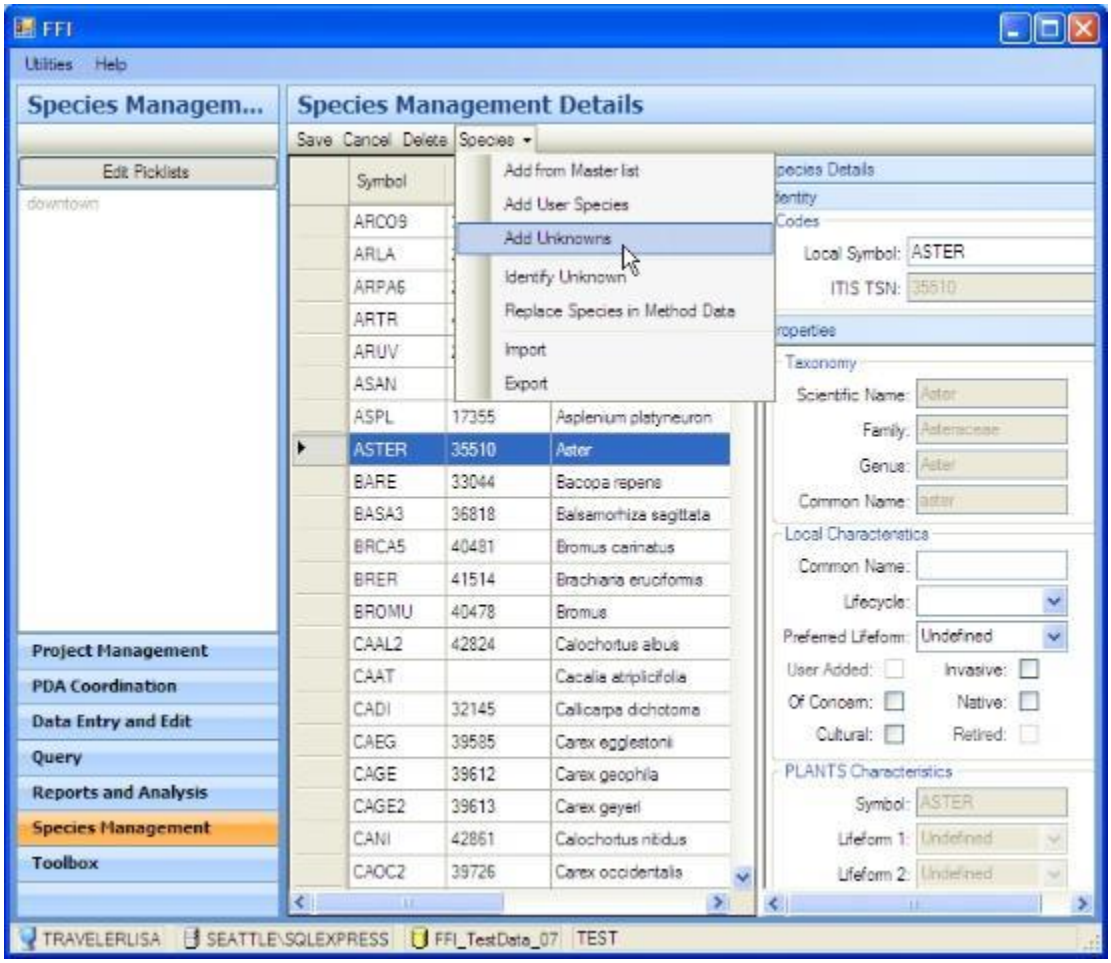
An **unknown** is a placeholder that can be used to represent a species that you did not expect to encounter or cannot identify, and that is therefore not included in your species list. FFI lets you easily create and then replace unknowns.

If using multiple field crews assign a range of unknowns to each crew. Doing so will avoid issues when identifying unknown later on. For example, if you create 10 unknown species codes assign unknowns 1- 5 to one field crew and unknown 6 - 10 to the other field crew.

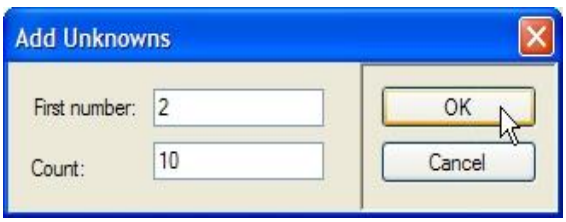
Adding unknowns to the local species list

You can add up to 999 unknown species to your species list to accommodate the needs of your field work. To add unknowns to the local species list:

1. In the **Species Management** window, select **Add Unknowns** in the **Species**

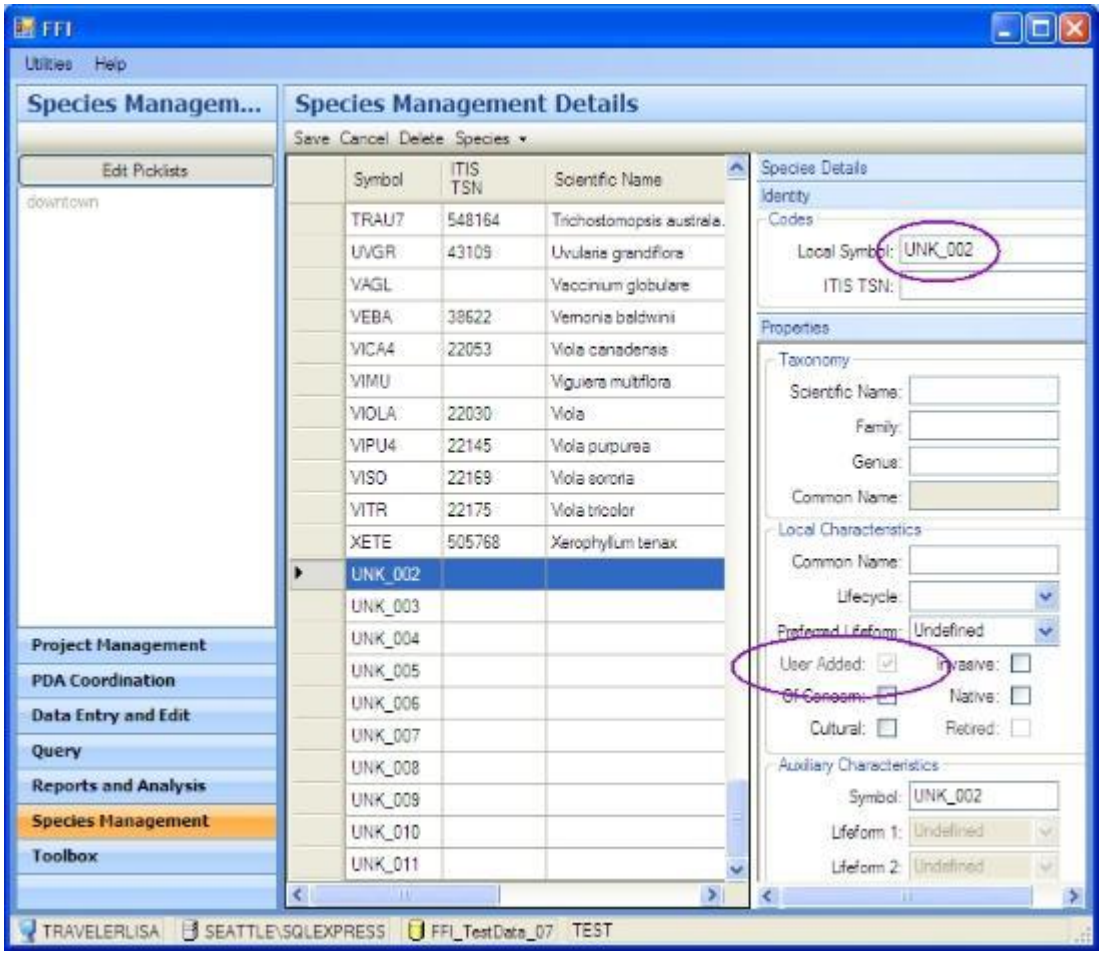


2. The *Add Unknowns* box opens. In the box, stipulate the first number to be used, and stipulate how many unknowns you wish to add to the local list. In this example, *10* unknowns will be added, and the first one will be numbered 2. Click **OK**.



3. Ten unknown species are added to the local species list, as shown below. The first unknown is coded in the default numbering format as *UNK_002*. *UNK_002* is shown as the *Local Symbol* in the *Codes* box in *Species Details* and refers to the local plant code.

*NOTE: The **User Added** box is automatically checked.*



NOTE: You can either accept the default numbering format or use your own identification code for unknowns. Be aware that if you accept the default, the symbol may be identical to that of unknowns added to other administrative unit species lists.

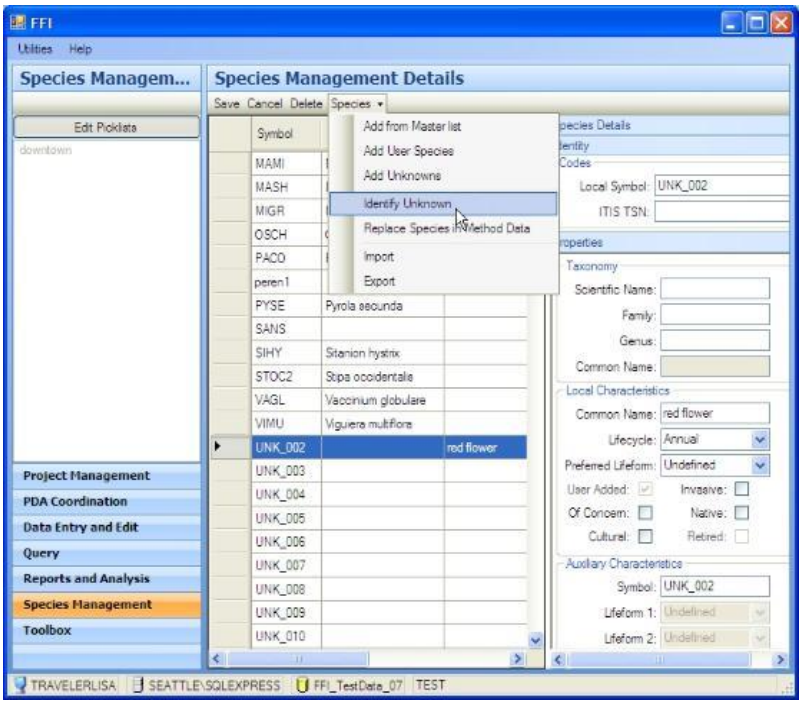
4. Edit the symbol and enter any information you have for the unknown species in the right-hand pane of the *Species Management Details* window. Scroll down through the pane to see all available information fields.
5. When you are done, click **Save** to save your work.

Identifying unknowns

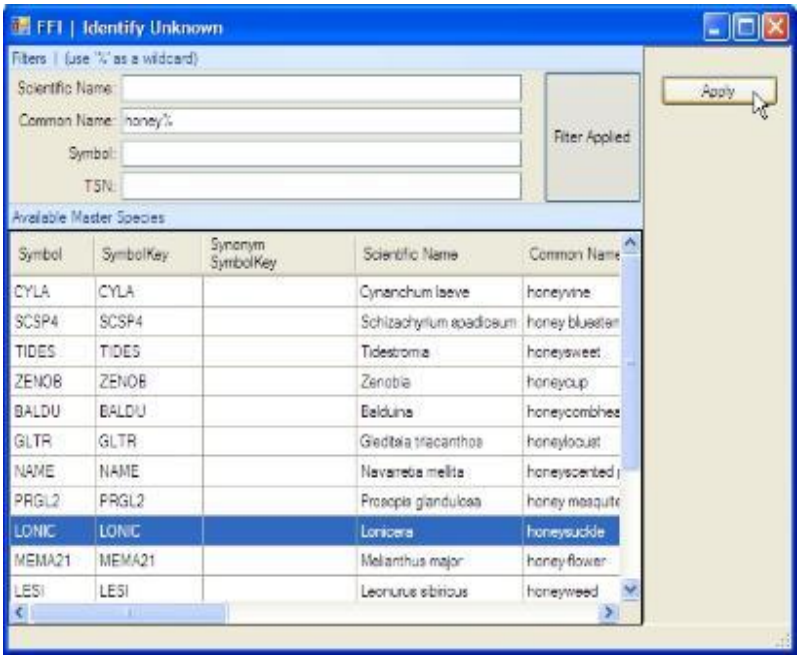
When you are able to identify an unknown species, you can easily replace it with the correct species.

1. In the *Species Management Details* window, highlight the unknown you wish to replace.

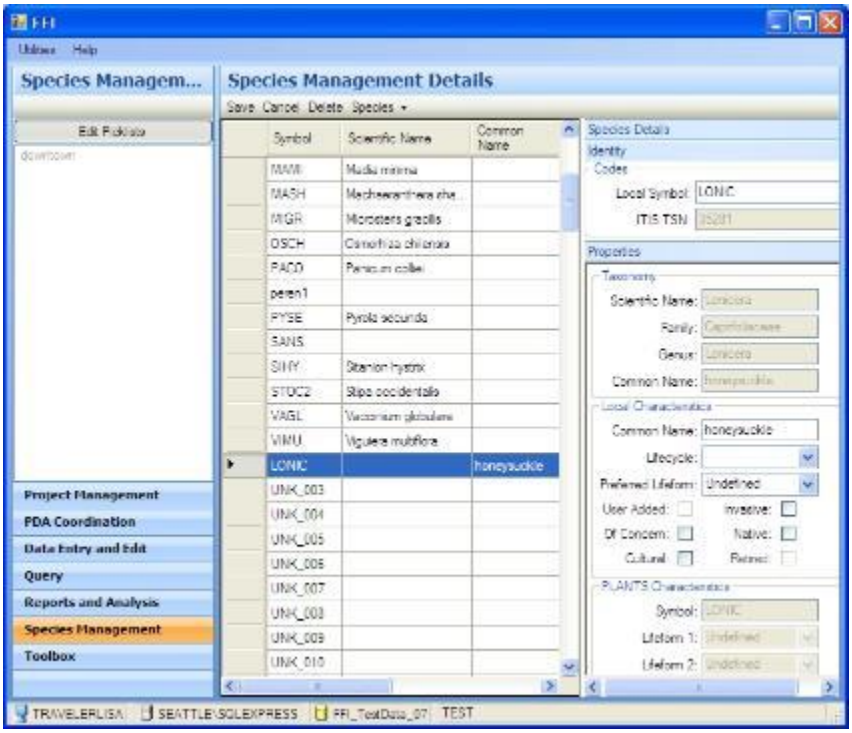
2. Select **Identify Unknown** in the **Species** menu.



3. The *Identify Unknown* window opens. By filtering or scrolling, locate and highlight the correct species. Click **Apply**.



4. The unknown is replaced with the correct species. Note that the *Species Details* in the right-hand pane are updated to reflect the correct species.



Replacing species in method data

If you collect data for a species in the field but later determine that the species was incorrectly identified, you can replace it with the correct species from your local species list.

> *CAUTION: This procedure involves risk to existing data. Try to use the* Identifying Unknowns *function if possible. If you must use the* Replace Species in Method Data *procedure, be sure to carefully limit the scope of the replacement.*

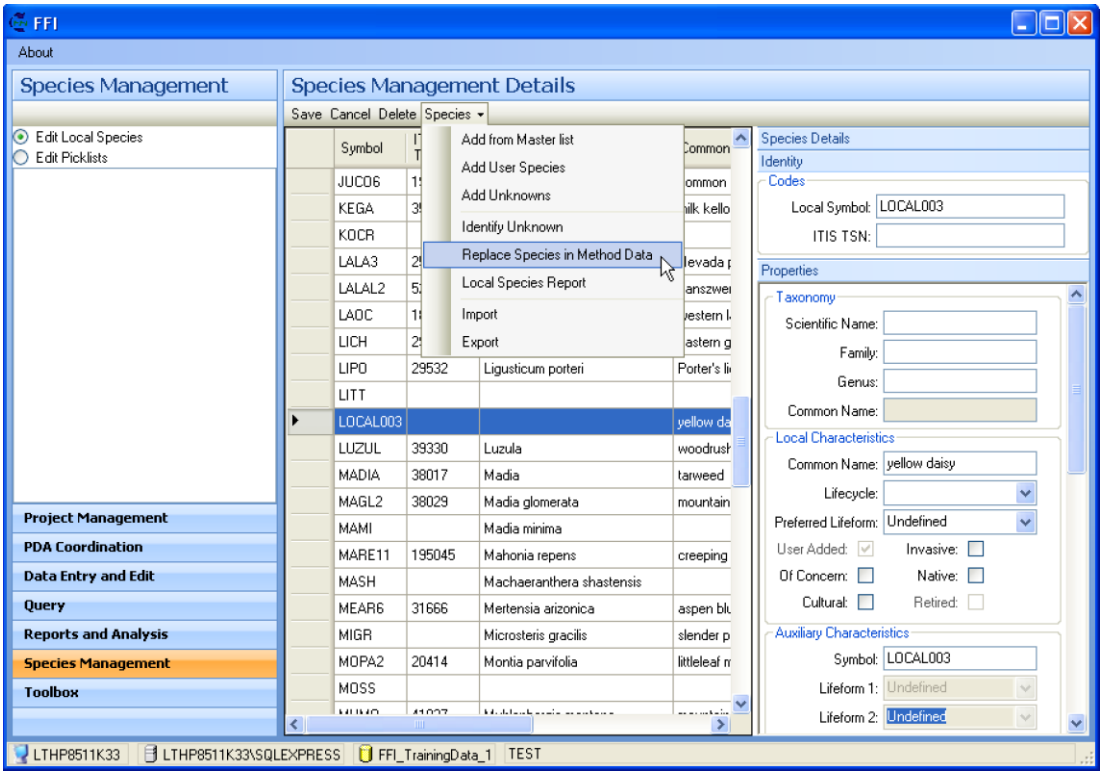
The following procedure will replace the name of the misidentified species only. All data collected during sampling remains intact.

> *NOTE: If you want to change species codes in an entire Administrative unit see* Administrative Unit Species Replacement *in the* Toolbox *section.*

To replace an unknown for which you have collected field data (If the correct species is not already on your local species list, add it before you follow this procedure):

1. Back up your database.
2. In the *Species Management Details* window, select the species to be replaced.

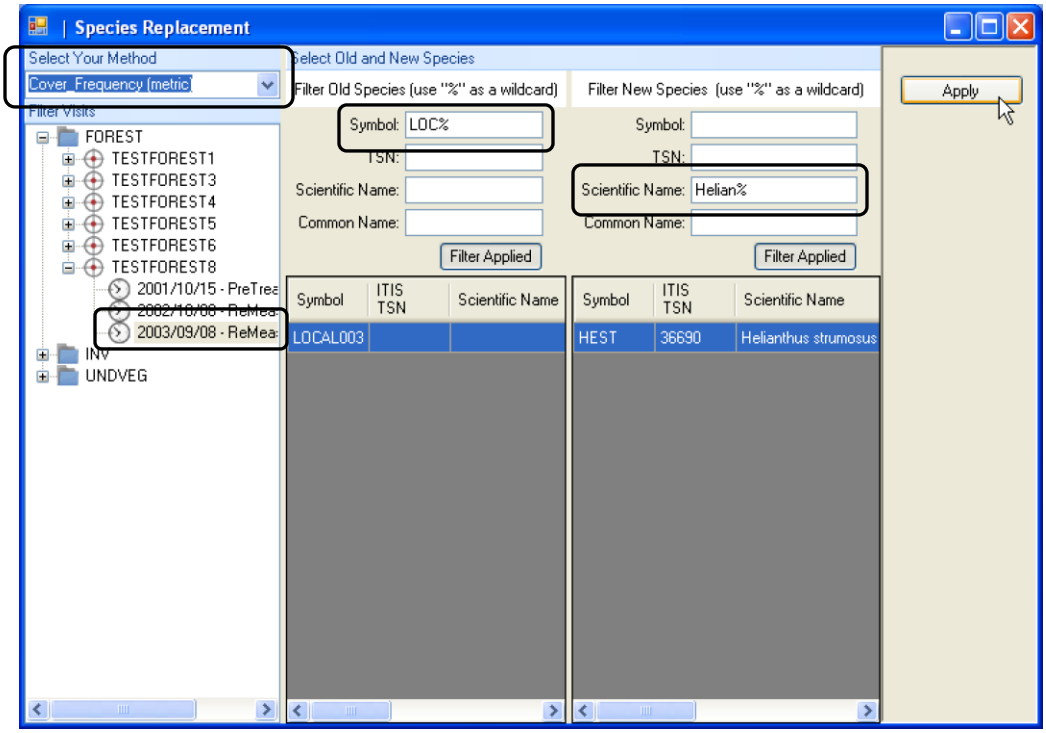
3. Select *Replace Species in Method Data* from the **Species** menu.



4. The *Species Replacement* window opens. Enter the appropriate criteria:
    - In the *Select Your Method* list, select the method for which data needs to be replaced. In this example *Cover Frequency–metric* is selected.
    - In the *Filter Visits* tree view, select the applicable project unit, macro plot, and sample event. In this example the *2003/09/08* sample event for *TESTFOREST8* is selected.

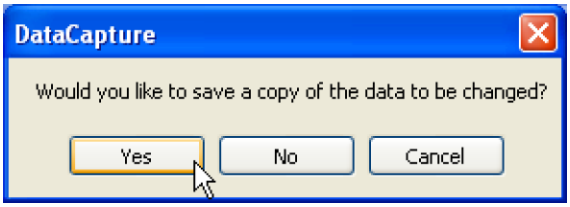
    NOTE: If you select the Project Unit, *all sample events within that project will be changed. If you select the* Macro Plot, *all sample events in that plot will be updated. To update several, but not all, sample events within a macro plot, you will need to update each sample event individually.*

- By scrolling or filtering, select the species to be replaced (the *Old Species*; *LOCAL003* in this example) and the correct species (the *New Species*; in this example, a member of the helianthus family).

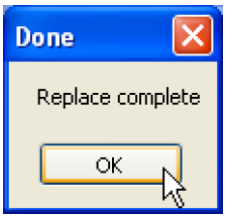


5. Click **Apply**.

6. You will be given the option to save a copy of your data. Select **Yes** or **No** depending on your level of comfort about the proposed change. If you select *Yes* enter a file name, select a location and click **Save**.



7. If the species to be changed was found in the selected sample event(s) and protocol the dialog box will say *Replace complete*. If the species was not found in the selected sample event(s) and protocol the dialog box will report *No species found*. Click **OK** to close the dialog box.



Exporting and importing species lists

FFI species lists and their associated picklists can be exported and imported as *.xml files for use in other administrative units.

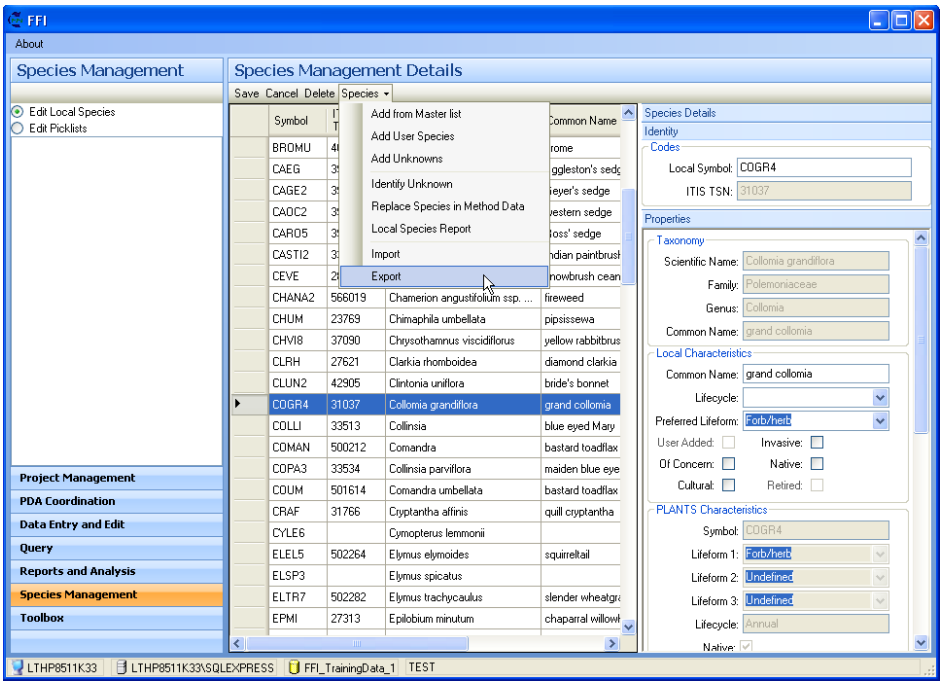
- You can import a species list from another administrative unit to apply to your own administrative unit, even if your own species list already exists.
- If another administrative unit contains similar species to your administrative unit, you can save time and effort by importing that unit's existing local species list instead of creating a new list from scratch. After import, you can edit the list as needed.
- When you export and import a species list, all picklists associated with the administrative unit are also exported and imported. You can edit or delete the imported picklists.
- Picklists are also matched by species symbol, so if your local list already includes a particular species that is included in an imported picklist, the species will appear.
- If you already have a picklist in your administrative unit that has the same name as a picklist in the file that you are importing, your existing list will be retained but you will have two picklists with the same name. You can change the name of picklists in **Species Management,** if desired.

Exporting a species list

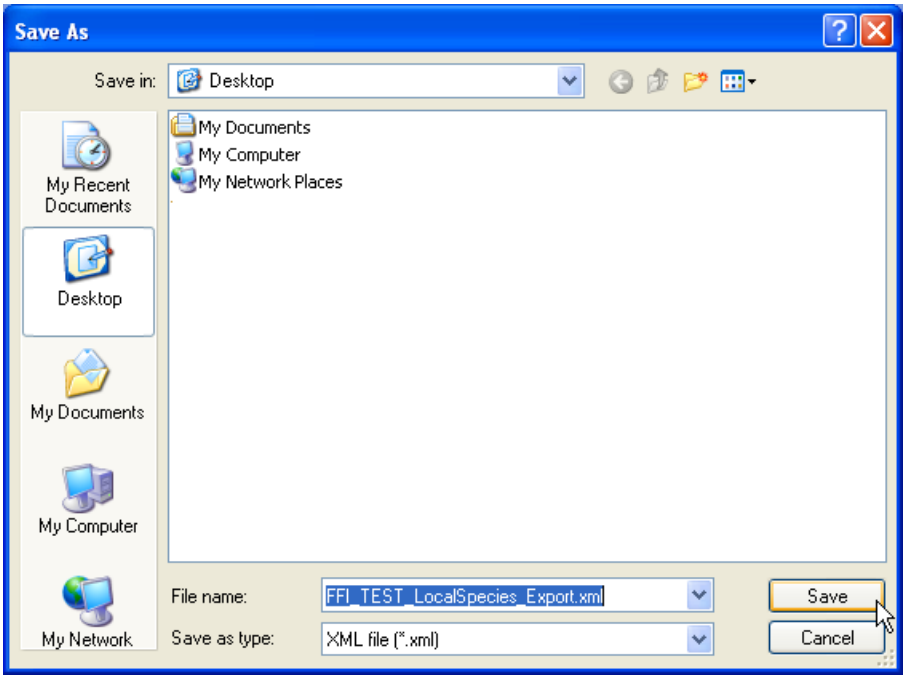
You can export your local species list as an *.xml file for use by another administrative unit. The species list will be exported along with all associated picklists.

To export a species list:

1. In the main **Species Management** window, select *Export* in the **Species** menu.



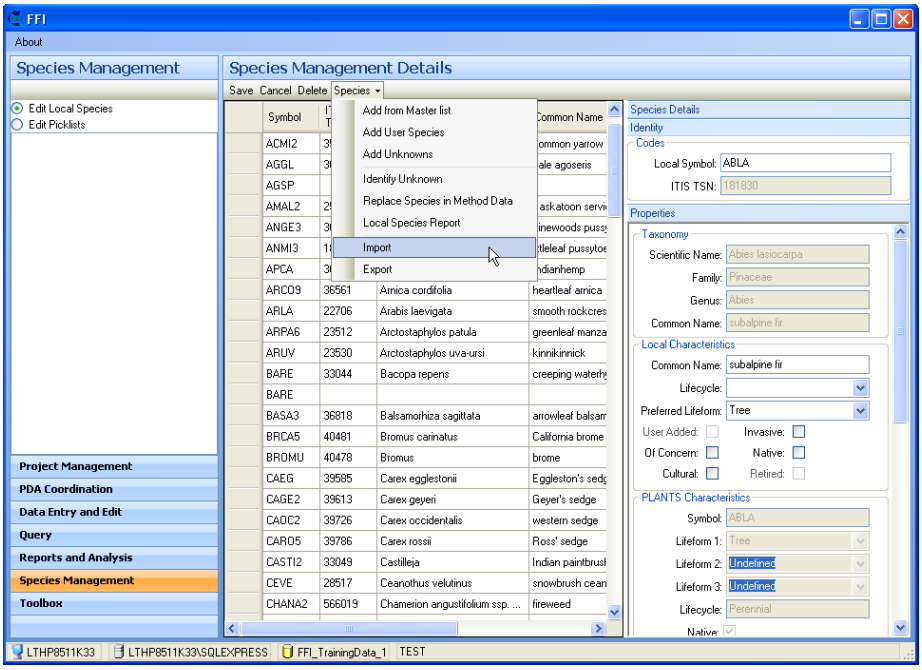
2. In the *Save As* window, assign a name for the export file, or accept the default name. Click **Save**.



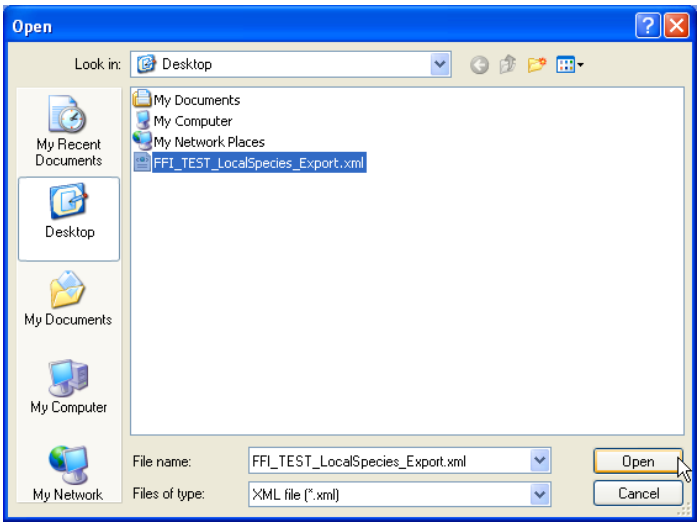
3. In the *Export Species* window, click **OK**.

Importing a species list

1. An administrative unit's species lists and picklists can be imported into another administrative unit. To import a species list with its associated picklists: In the main **Species Management** window, select *Import* in the **Species** menu.



2. In the Open file window, select the *.xml file to be imported and click **Open** to import the file.



3. FFI adds the unique species to the local species list and adds the picklists. "Unique species" are defined as species that have the same PLANTS species code and identical species properties (e.g., local characteristics, user variables, description and comments). The species properties for each species record can be viewed in the right pane in **Species Management**. In this example, 172 species from the PLANTS database and 13 user-added species were added to the local species list. Five picklists were added. Click **OK** in the *Species Import Results* window to confirm this information.

Handling of species symbols/item codes during import

The species import function compares the species symbols/item codes (NRCS symbol, user species code or "unknown" code) in the species list import file and in the local species list in the master database.

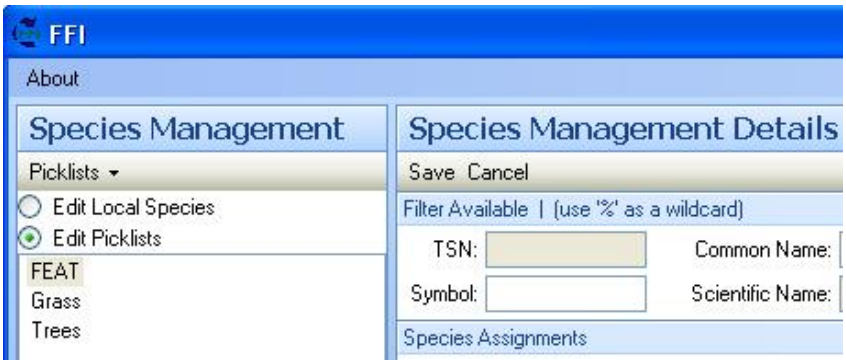
1) If a species/code is in the import file but not in the local species list, then it is imported as in the import file.
2) If a symbol/code in the import file is the same as one already in the local species list (case sensitive) a new record is not added to the local species list in the master database even if the GUID and/or species properties (e.g., for *Lifeform*, *Lifecycle*, *Invasive, UV1, UV2, UV3, Description, Comment*, etc.) are different.

NOTE: The logic described above is different than when importing method attribute data.

Using picklists

A picklist is a subset of the local species list that represents species specifically known to inhabit a project unit or species of a specific lifeform. You can develop picklists for specific sample events that you can print and use in the field. FFI lets you easily create, manipulate, and delete picklists.

To reach the picklist functions, click the *Edit Picklists* radio button in the **Species Management** window. The **Picklists** menu becomes available.



The available picklist functions are:

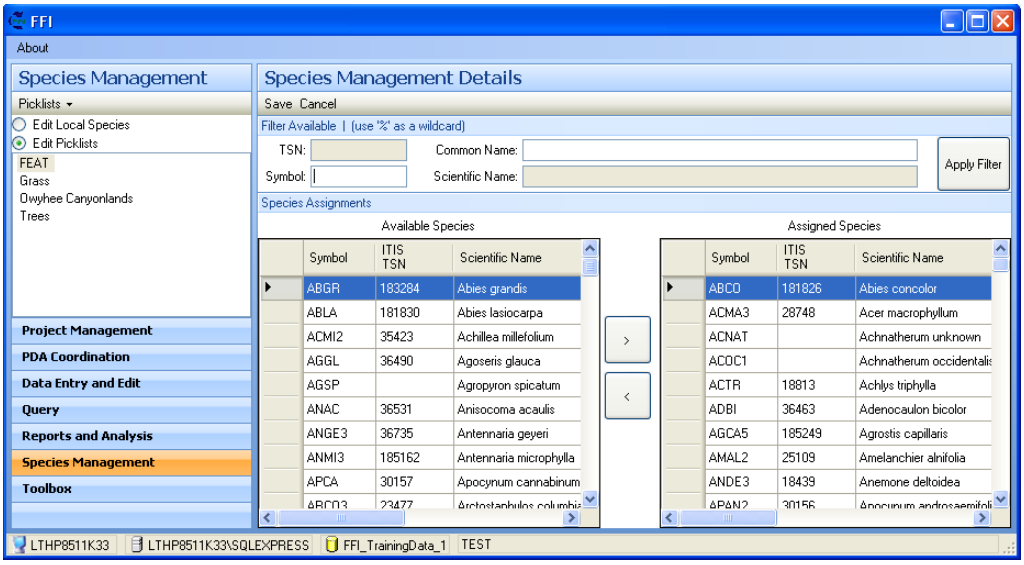
- Creating a new picklist
- Duplicating a picklist
- Editing a picklist
- Deleting a picklist
- Printing picklists or species reports

Creating a new picklist

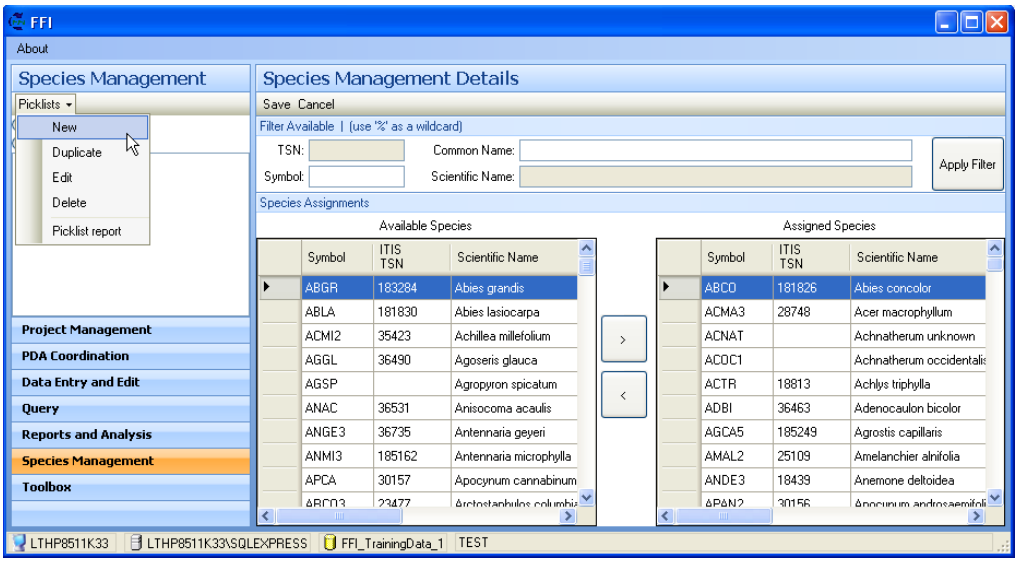
Once you have created your local species list, you can create picklists to more specifically describe the species present in a project unit to support specific sample events.

To create a new picklist:

1. In the **Species Management** window, click the *Edit Picklists* radio button, as shown. The **Picklists** menu will become available.



2. Select *New* in the **Picklists** menu.

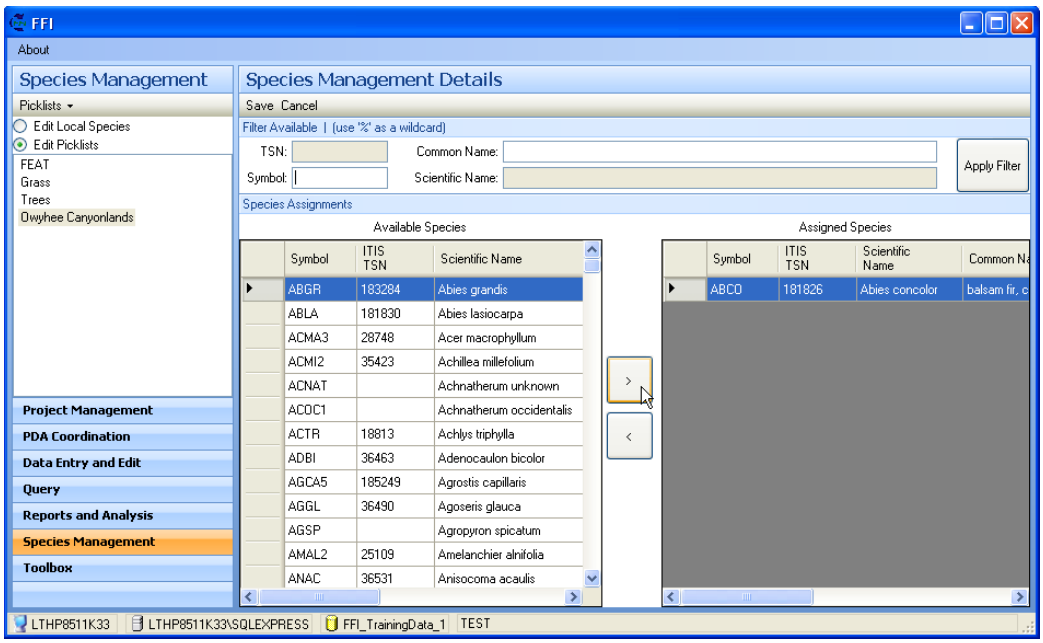


3. The *Picklist properties* form opens. Add a *Name* and *Description* for the new picklist. If you wish, add any user variables to further describe the list or the area to which the list pertains. Click **Save & Close**.

Populating a new picklist

After you have created the new picklist, the *Species Assignments* window opens. To populate the list:

1. Select, by filtering or scrolling through the *Available Species* list, the plants to be added to the new picklist. In this example, the *Available Species* list was filtered with the wildcard `camas%`.
2. Click the right-arrow button to add the species to the *Assigned Species* list or click the left-arrow to remove species.



3. Continue selecting and adding species until the new picklist is complete.
4. Click **Save**.

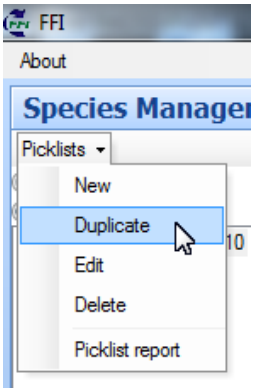
NOTE: The new picklist will be associated only with the administrative unit in which it was created. To use a picklist in another administrative unit, see Importing or exporting lists.

NOTE: Click the Edit Local Species *radio button go back to your local species list.*

Duplicating a picklist

In some cases, it may be more practical to duplicate and modify an existing picklist than create a new one for a sample event. To duplicate a picklist:

1. In the **Species Management** window, click the **Edit Picklists** radio button.
2. Select the picklist to be duplicated.
3. In the **Picklists** menu, select **Duplicate**. Note that the menu obscures the list of available picklists.



4. The *Picklist properties* form opens. Add a new *Name* and *Description* for the duplicate picklist. If you wish, add any user variables to further describe the list or the area to which the list pertains. Click **Save & Close**.

5. In the *Unsaved Changes* box, click **Yes**.
6. In the *Species Assignment* window, modify the list to meet your requirements. Delete assigned species or add additional species using the right or left arrow buttons.
7. Click **Save** when finished.

Editing picklist properties

To edit the name and description for a picklist:

1. In the **Species Management** window, click the **Edit Picklists** radio button.
2. Select the picklist to be edited.

3. In the **Picklists** menu, select **Edit**. The *Picklist Properties* window opens.

4. Make any necessary changes. Click **Save & Close** when finished.

Updating a picklist

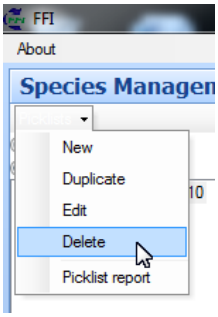
If necessary, you can add or delete species from a picklist. To update a picklist:

1. In the **Species Management** window, click the **Edit Picklists** radio button.
2. Select the picklist to be updated.
3. In the *Species Assignment* window, delete assigned species or add additional species using the right or left arrow buttons.
4. Click **Save** when finished.

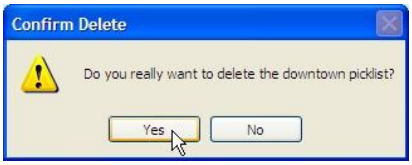
Deleting a picklist

Picklists can be deleted once they are no longer needed. To delete a picklist:

1. In the **Species Management** window, click the **Edit Picklists** radio button.
2. Select the picklist to be deleted.
3. In the **Picklists** menu, select **Delete**. Note that the menu obscures the list of available picklists.



4. In the **Confirm Delete** window, click **Yes**.



Editing a species list

Updating local information

To update local information for a species:

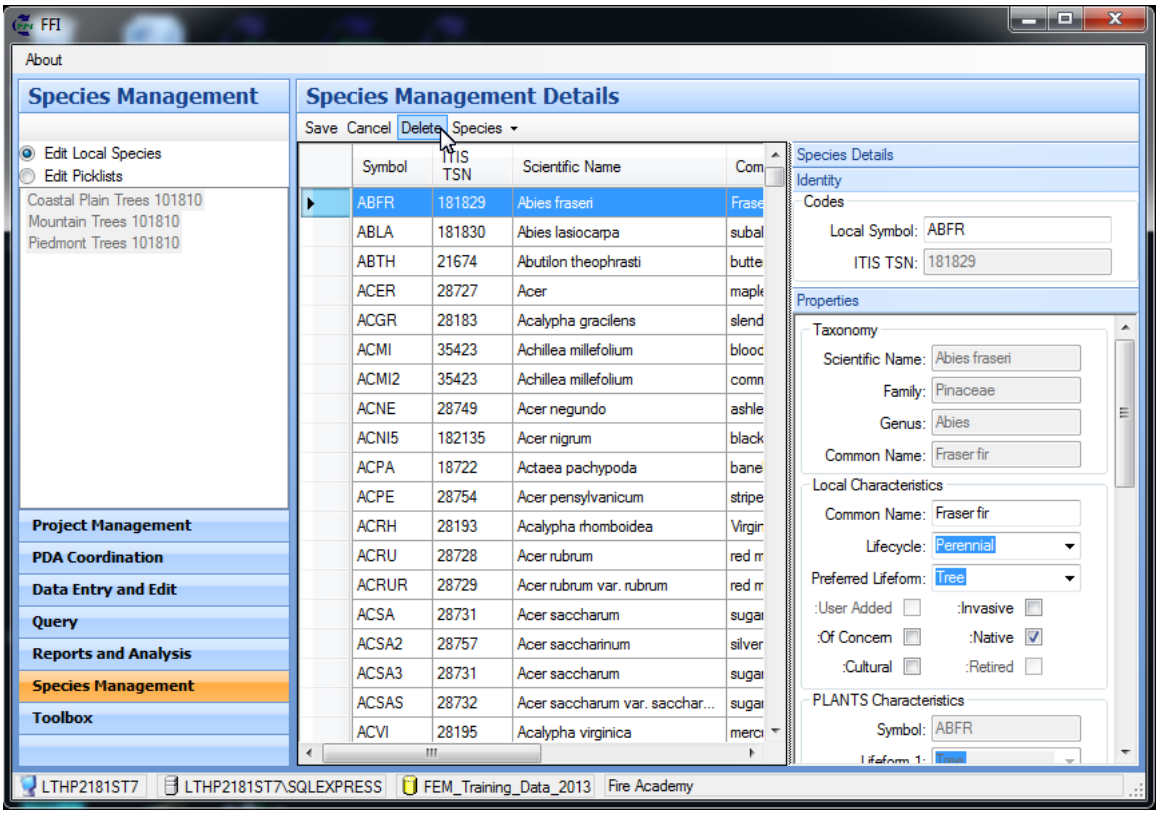
1. In the **Species Management** window, select the species to be edited.
2. Edit the *Local Characteristics* information as appropriate.
3. Click **Save**.

Removing a species from the species list

To remove a species from the species list:

1. In the **Species Management Details** window, select the species to be deleted.

NOTE: Species cannot be deleted from the local species list if they have been used in data entry.



2. Click **Delete** to remove the entry from the list. Confirm the deletion in the pop-up window.
3. Click **Save**.

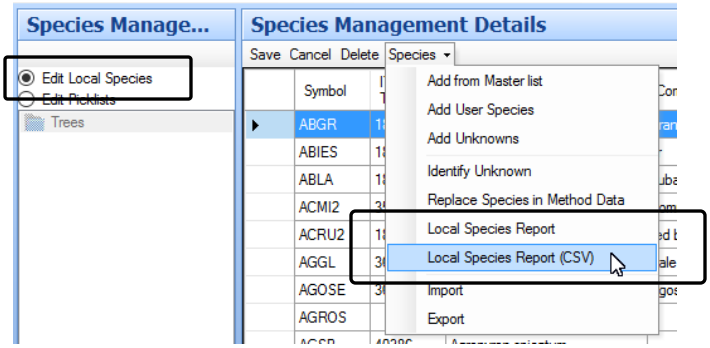
Printing species reports

You can print your complete local species report or print an individual picklist report.

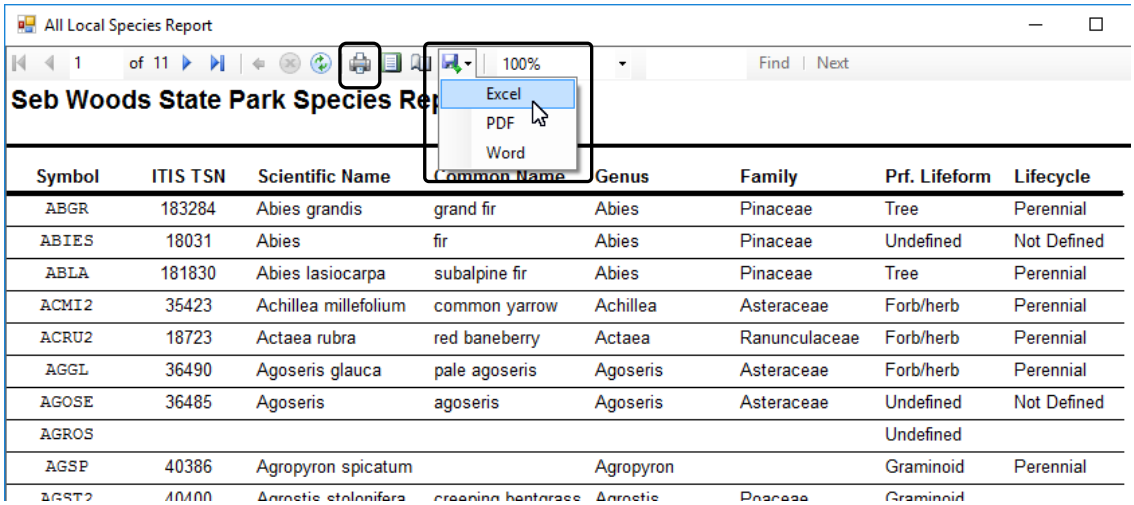
To create a report of the local species list:

1. In the **Species Management** window, click the **Edit Local Species** radio button.

2. Select ***Species > Local Species Report***



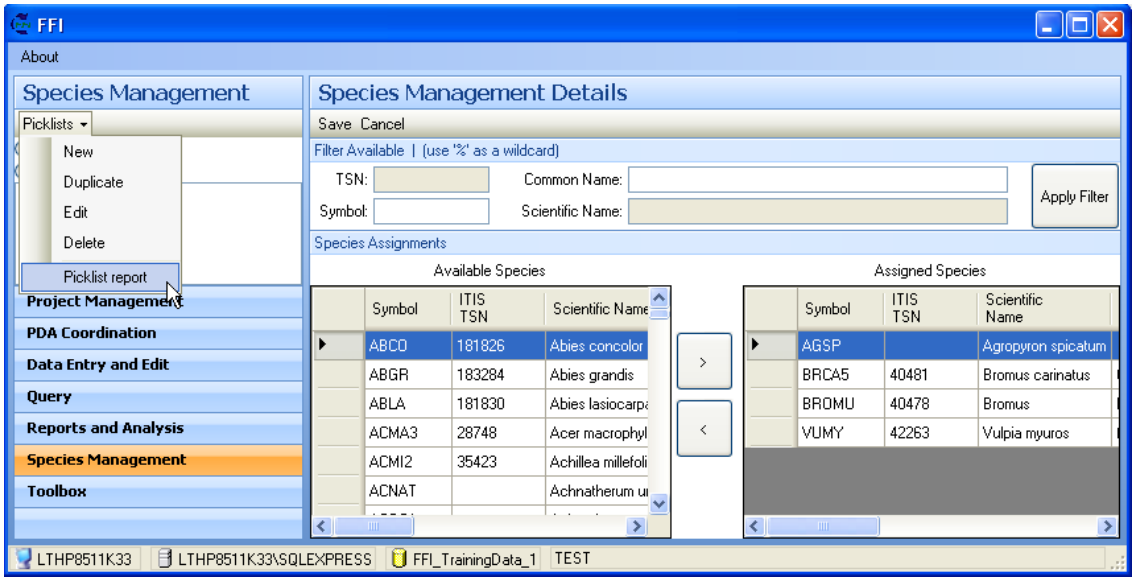
3. After the report is displayed print the report or save as an Excel, PDF or Word file to be printed later. The *CSV* export for the local species list removes report formatting and is easier to manipulate in a spreadsheet program.



Symbol	ITIS TSN	Scientific Name	Common Name	Genus	Family	Prf. Lifeform	Lifecycle
ABGR	183284	Abies grandis	grand fir	Abies	Pinaceae	Tree	Perennial
ABIES	18031	Abies	fir	Abies	Pinaceae	Undefined	Not Defined
ABLA	181830	Abies lasiocarpa	subalpine fir	Abies	Pinaceae	Tree	Perennial
ACMI2	35423	Achillea millefolium	common yarrow	Achillea	Asteraceae	Forb/herb	Perennial
ACRU2	18723	Actaea rubra	red baneberry	Actaea	Ranunculaceae	Forb/herb	Perennial
AGGL	36490	Agoseris glauca	pale agoseris	Agoseris	Asteraceae	Forb/herb	Perennial
AGOSE	36485	Agoseris	agoseris	Agoseris	Asteraceae	Undefined	Not Defined
AGROS						Undefined	
AGSP	40386	Agropyron spicatum		Agropyron		Graminoid	Perennial
AGST2	40400	Agrostis stolonifera	creeping bentgrass	Agrostis	Poaceae	Graminoid	

To create a report of a picklist

1. In the **Species Management** window, click the **Edit Picklist** radio button.
2. Highlight the picklist you wish to create report for and select *Picklists > Picklist report*.



2. 3. After the report is displayed print the report or save as an Excel, PDF or Word file to be printed later.

Seb Woods State Park Trees Picklist Species Report

Symbol	ITIS TSN	Scientific Name	Common Name	Genus	Family	Prf. Lifeform	Lifecycle
ABLA	181830	Abies lasiocarpa	subalpine fir	Abies	Pinaceae	Tree	Perennial
LAOC	183417	Larix occidentalis	western larch	Larix	Pinaceae	Tree	Perennial
PICO	183327	Pinus contorta	lodgepole pine	Pinus	Pinaceae	Tree	Perennial
PIEN	183291	Picea engelmannii	Engelmann spruce	Picea	Pinaceae	Tree	Perennial
PIPO	183365	Pinus ponderosa	ponderosa pine	Pinus	Pinaceae	Tree	Perennial
POTR5	195773	Populus tremuloides	quaking aspen	Populus	Salicaceae	Tree	Perennial
PSME	183424	Pseudotsuga menziesii	Douglas-fir	Pseudotsuga	Pinaceae	Tree	Perennial

Toolbox

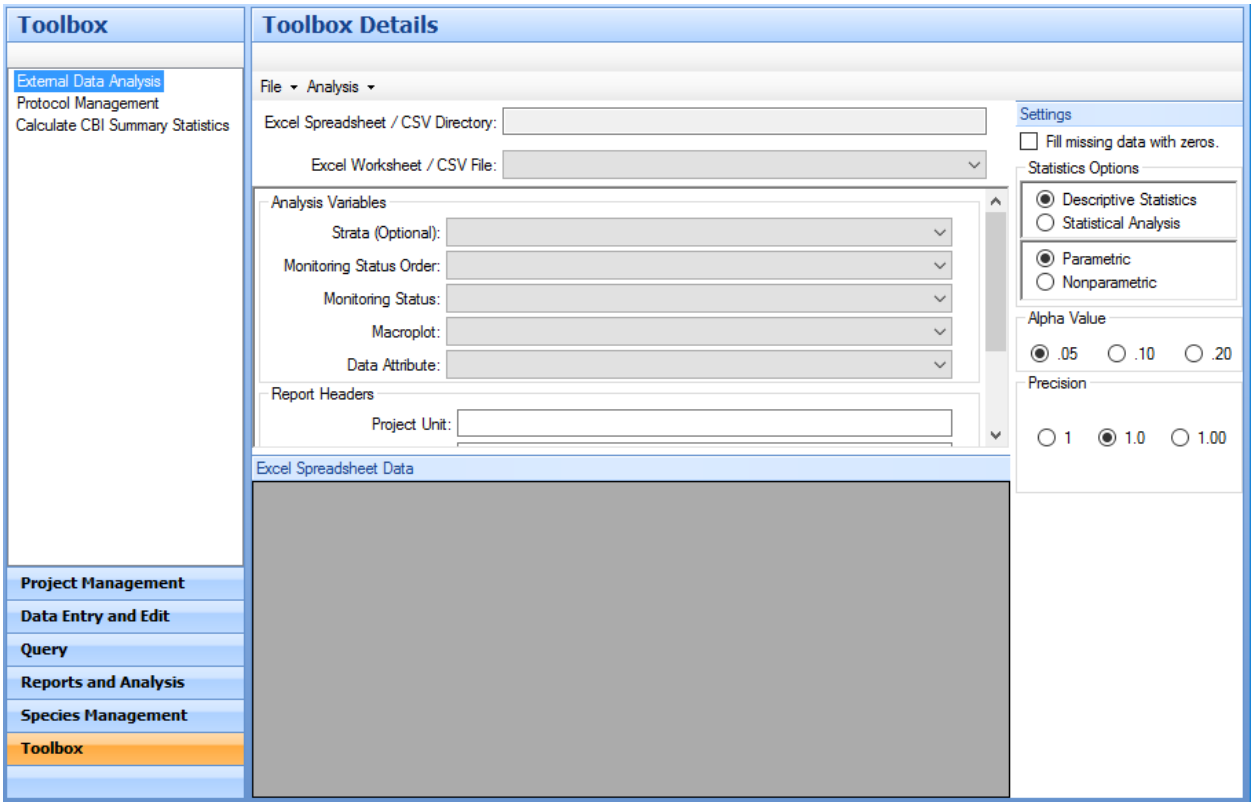
The FFI **Toolbox** includes these functions:

- External Data Analysis provides a link between FFI and other analysis programs by supporting import of external files for analysis.
- Protocol Management lets you retire and unretire protocols that you do not need for your monitoring programs.
- Administrative Unit Species Replacement is used to replace all instances of a local species symbol or user symbol entered in any protocol in an entire database.
- Calculate CBI Summary Statistics simply refreshes the CBI summary fields in all instances of the CBI protocol in a database.

External data analysis

The *External data analysis* function in the **Toolbox** is used to import data contained in Excel spreadsheets for statistical analysis within FFI. The types of analyses that can be run are the same as those that are described in the Data analysis section of the *User Guide*.

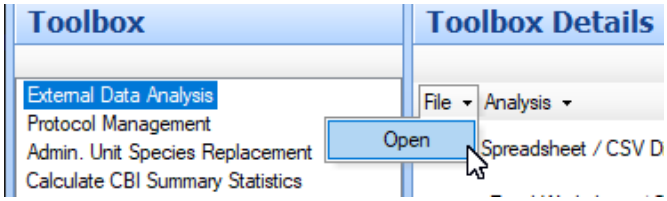
Format requirements for imported spreadsheets are outlined in Spreadsheet Requirements.



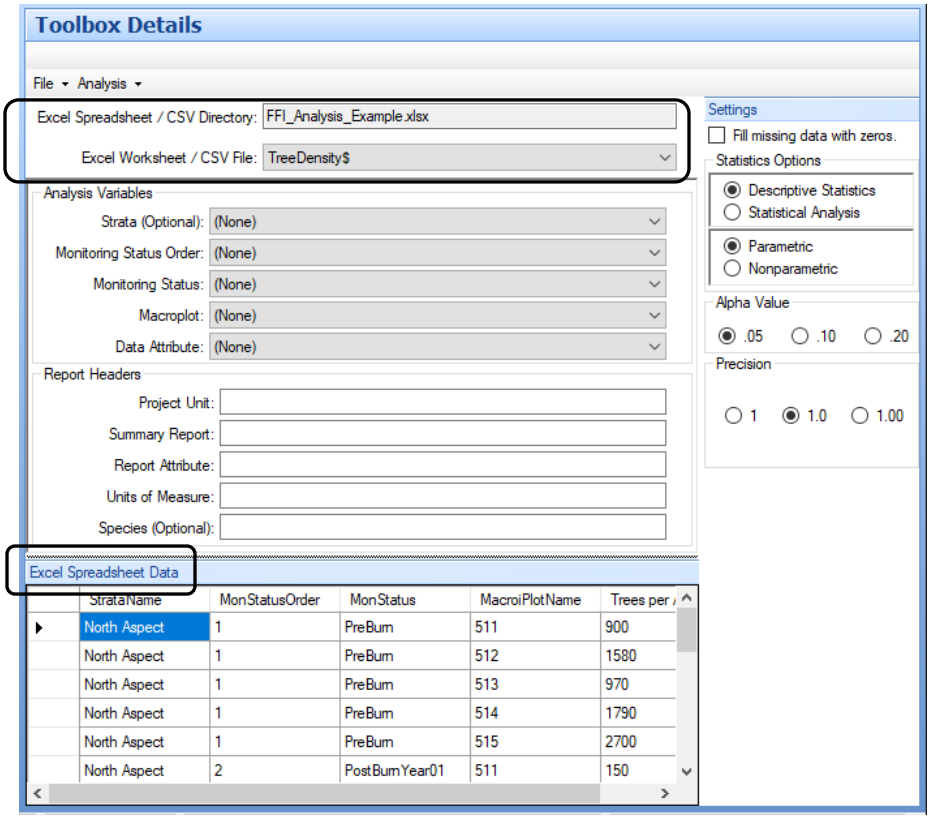
Data import and analysis

To import an Excel spreadsheet and analyze the imported data:

1. In the *Toolbox Details* window, select **File > Open**.



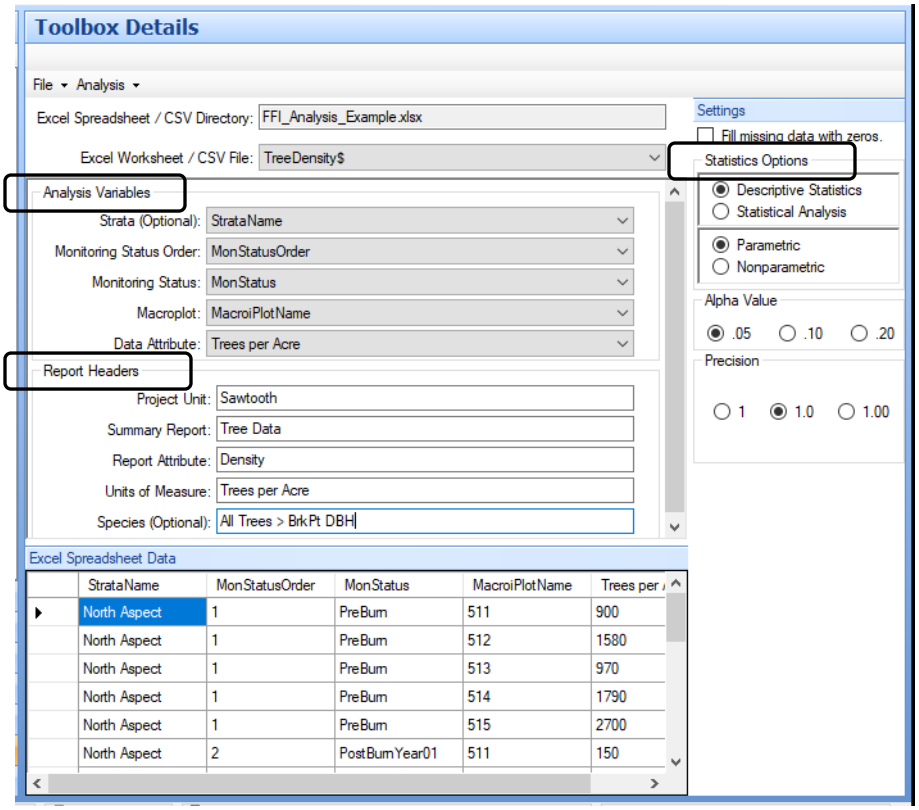
2. Navigate to the desired Excel file and click **Open**. FFI imports the spreadsheet and displays its name in the *File Name* box. After you select the desired *Worksheet*, FFI populates the *Excel Spreadsheet Data* window.



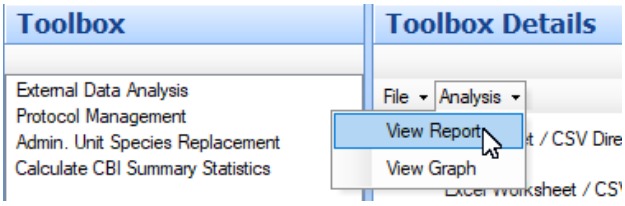
NOTE: Data cannot be edited in this view. To make changes to your data, edit the Excel spreadsheet and then import it again.

3. Using the dropdown lists, populate each field in the *Analysis Variables* window. The *Strata* field is optional, but all other fields are mandatory.
4. Populate the *Report Headers* text boxes. These fields will be used to fill in the header rows in the analysis report and graphs.

5. Select the desired *Statistics Options*. For information about these options, see Performing analyses.



6. To run the analysis and view the resulting report or graph, select *View Report* or *View Graph* in the **Analysis** menu.



To see the report and graph resulting from this analysis, see Analysis output. Reports and graphs can be saved and copied.

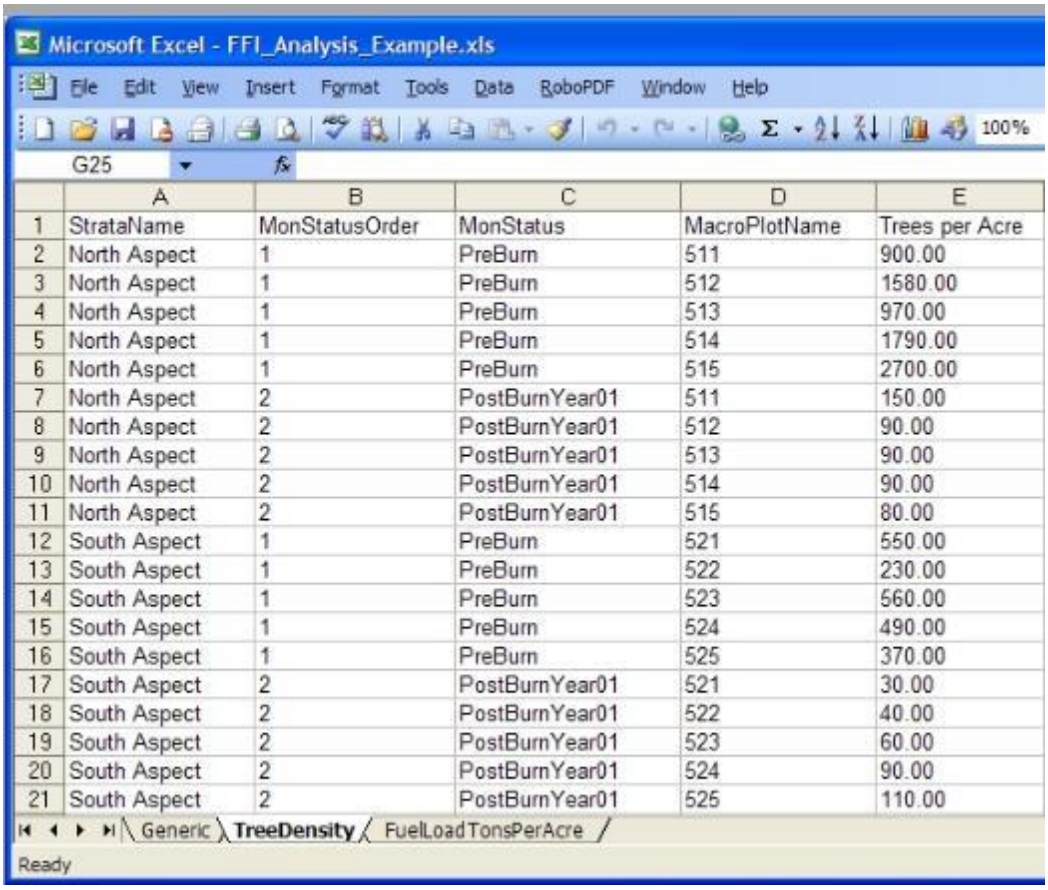
Spreadsheet requirements

The sample spreadsheet below identifies the minimum requirements for an Excel spreadsheet to be imported into the FFI analysis tool. Each row in the spreadsheet must contain:

- Monitoring status order (column B), as an integer.
- Monitoring status label (column C).
- Macro plot name (column D).
- At least one data attribute of numeric data (column E).

As shown, a strata name (column A) can also be included.

Each individual worksheet in the spreadsheet should be named to reflect the name of the protocol for which data is being analyzed. The name of the worksheet in the sample below is *TreeDensity*; the data attribute (column E) is Trees per Acre.



Microsoft Excel - FFI_Analysis_Example.xls

File Edit View Insert Format Tools Data RoboPDF Window Help

100%

G25

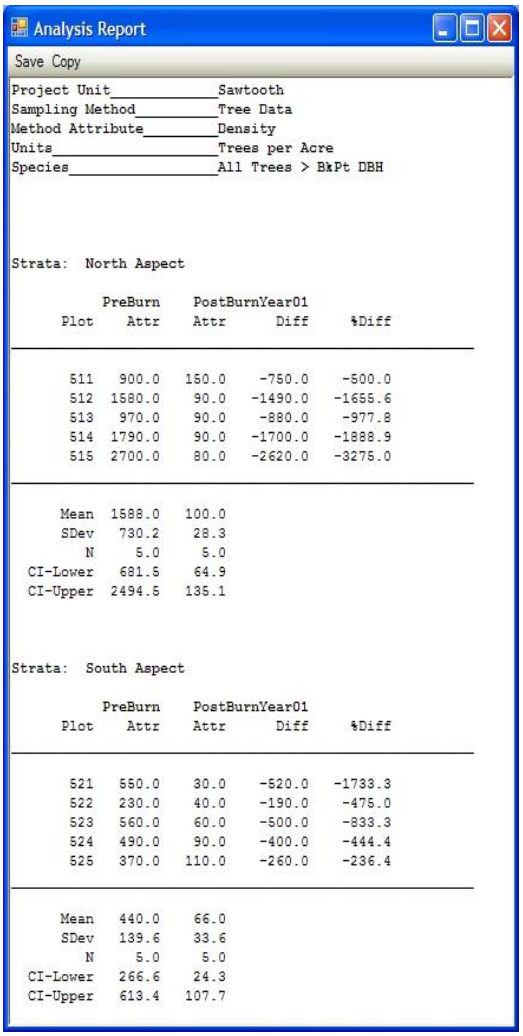
	A	B	C	D	E
1	StrataName	MonStatusOrder	MonStatus	MacroPlotName	Trees per Acre
2	North Aspect	1	PreBurn	511	900.00
3	North Aspect	1	PreBurn	512	1580.00
4	North Aspect	1	PreBurn	513	970.00
5	North Aspect	1	PreBurn	514	1790.00
6	North Aspect	1	PreBurn	515	2700.00
7	North Aspect	2	PostBurnYear01	511	150.00
8	North Aspect	2	PostBurnYear01	512	90.00
9	North Aspect	2	PostBurnYear01	513	90.00
10	North Aspect	2	PostBurnYear01	514	90.00
11	North Aspect	2	PostBurnYear01	515	80.00
12	South Aspect	1	PreBurn	521	550.00
13	South Aspect	1	PreBurn	522	230.00
14	South Aspect	1	PreBurn	523	560.00
15	South Aspect	1	PreBurn	524	490.00
16	South Aspect	1	PreBurn	525	370.00
17	South Aspect	2	PostBurnYear01	521	30.00
18	South Aspect	2	PostBurnYear01	522	40.00
19	South Aspect	2	PostBurnYear01	523	60.00
20	South Aspect	2	PostBurnYear01	524	90.00
21	South Aspect	2	PostBurnYear01	525	110.00

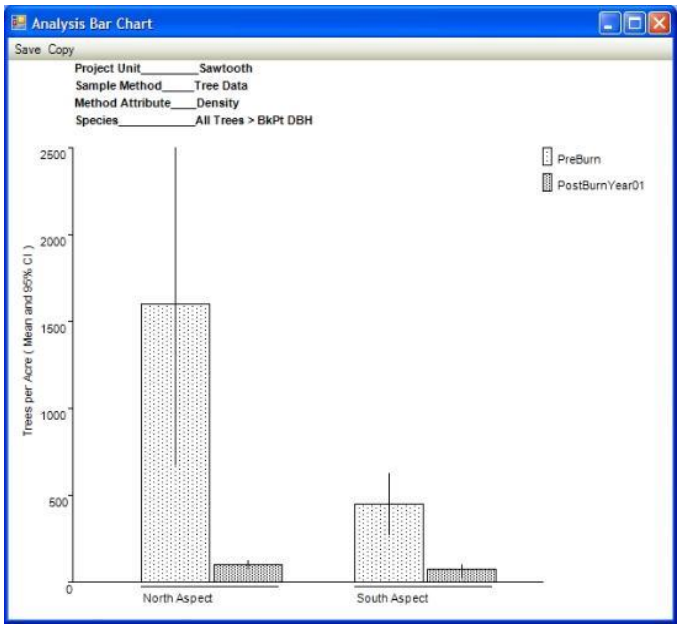
Generic | TreeDensity | FuelLoadTonsPerAcre

Ready

Analysis output

The reports and graphs are the same format as created for Analysis and can be saved and copied directly from the *Analysis Report* toolbar.



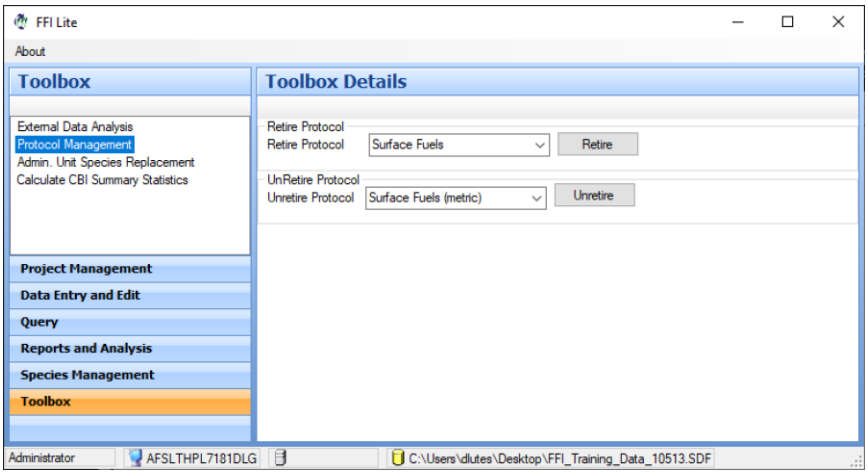


Protocol management

The *Protocol Management* function allows you to retire and unretire protocols that are not needed for your programs.

- *Retire* a protocol for which data exists, but which you do not plan to use again. Retired protocols may not be added to new sample events but on any sample events where the protocols were assigned before being retired the data will be viewable and editable. All data attached to retired protocols will be maintained in the database.

- The protocol can be *Unretired* should it be needed again in the future. All protocols that are retired are automatically listed in the *Unretire Protocol* window.



In this example the *Surface Fuels (metric)* protocol has been retired but can be unretired by clicking the **Unretire** button.

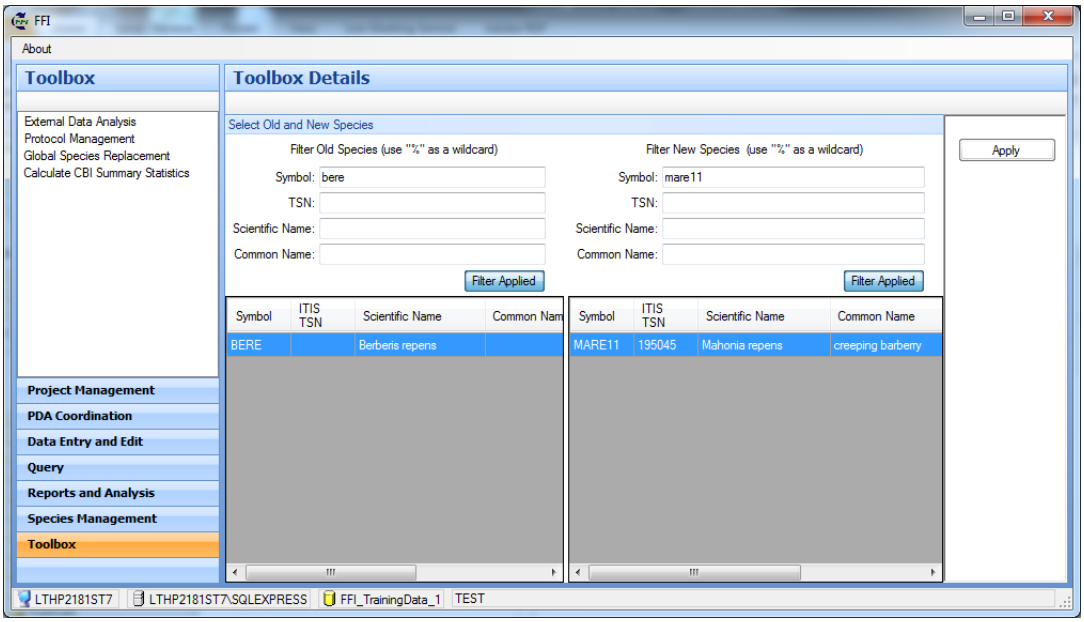
Administrative Unit Species Replacement

Administrative Unit Species Replacement is available only in FFI and is used to change every instance of a species symbol in an administrative unit. The primary function is for updating species symbols when a new version of the master species list is added in FFI. The species replacement utility is more powerful than the *Replace Species in Method Data* utility in **Species Management**. It is also more perilous if it is not used carefully because the changes are wide ranging. You should create a backup database before making any administrative unit species replacement(s).

Replacing a species symbol

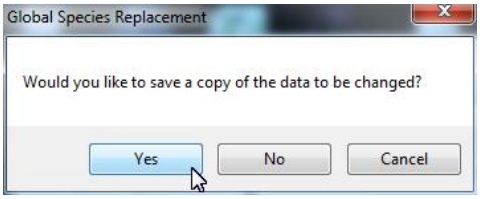
New species symbols that will be replacing old ones need to be added to the local species. See Creating a Local Species List for more information.

The symbol/species in the right pane will replace the symbol/species in the left pane. To replace a species enter in a *Symbol*, *TSN*, *Scientific name* or *Common name* into the appropriate fields and click **Apply Filter**. If more than one record is returned, highlight the desired record and click **Apply**.

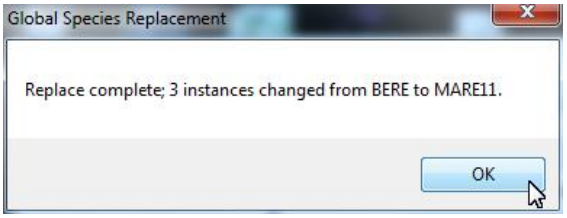


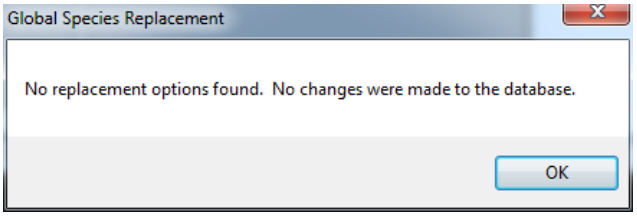
If you are certain you want to continue, click **OK**.

Create a copy of the database if desired.



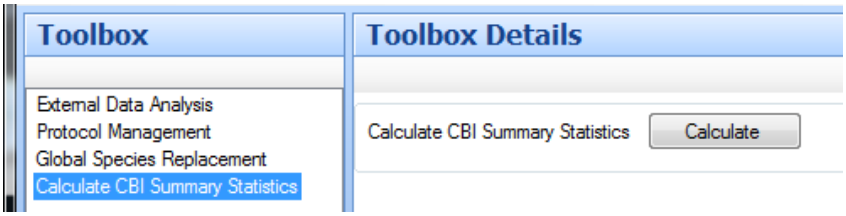
The window will indicate the number of species changes made or will report that no replacements were made. Click **OK** to close the window.





Calculate CBI Summary Statistics

In rare cases the summary statistics for the CBI protocol are not automatically calculated in **Data Entry and Edit**. Click the *Calculate* button to refresh the summary calculation for all instances of the CBI protocol in the database.



Additional information

This section contains supplemental information, tables, and links that may be helpful for FEAT and FIREMON users.

- Information on administrative units, project units, and macro plots
- Comparison of FFI, FEAT, FIREMON, and FMH program elements
- Comparison of FFI, FEAT, FIREMON, and FMH sampling protocols
- Description of FFI protocols

Administrative units, project units, and macro plots

FFI uses a unique set of terms derived from FEAT and FIREMON to describe land areas and monitoring events. The basic units are:

- Administrative unit – An *administrative unit* is an area that is managed as an individual entity, such as a park, forested area, county or city, hunting unit, watershed study area, or other discrete land area. In FFI, an administrative unit corresponds to an SQL Server database. Although multiple administrative units can reside on a computer, there is no communication between them. All analysis takes place within an individual administrative unit. Data is managed and analyzed at the Adminstrative unit level. An administrative unit is comparable to the *landunit* used in FEAT.
- Project unit – a *project unit* (equivalent to the FEAT *monitoring unit*) is a division of the entire sample population of an administrative unit. Project units are usually defined to represent an area on the ground. For example, a project unit could consist of "all areas in the Ponderosa vegetation type between 1500 and 2000 meters above sea level, more than 500 meters from the nearest road, and more than 1000 meters from the nearest stream." However, project units are not required to have any spatial meaning, but can be defined for temporary administrative or analysis purposes. They provide a means to functionally group macro plots for management and analysis. Project units can be defined so that they overlap spatially, and macro plots can be associated with multiple project units. Use FFI Spatial module to spatially define a project unit.
- Macro plot – a macro plot is a distinct place on the face of the earth that can be sampled one or more times. A macro plot established within an administrative unit defines the location of the primary sample. The plot is used to establish and define permanent sampling sites as well as sites that contain multiple subsamples and sample types. Examples of macro plots might include:
    - A forest plot with four quadrants, two veg lines, ten herb frames, and four fuels lines.
    - A CBI plot with an understory circle and an overstory circle.
- Candidate site – A geographic point within a project unit that has been identified as a potential macro plot.
- Sample event -

To understand other differences between terms used in FFI and terminology used in FEAT and FIREMON, see the nomenclature table.

About the FFI protocols

NOTE: See also About the Reports

Each FFI protocol is based on FIREMON and/or FEAT/FMH sampling procedures and created within Protocol Manager. A description of the FIREMON procedures can be found on the FIREMON pages at http://www.frames.gov/firemon. A description of the FEAT and FMH procedures can be found at http://www.nps.gov/fire/wildland-fire/resources/documents/fire-effects-monitoring-handbook.pdf.

Most FFI protocols consist of only one sampling method. Some, like the *Tree Data* protocol, however, combine three distinct sample methods within a single protocol. For quick reference, all FFI protocols are briefly summarized below.

For information about the reports for each protocol see the About the reports.

ARS – Cover Points

This protocol is a modification of the line-point intercept method described in the USDA Agricultural Research Service (ARS), Monitoring Manual, Vol. I (Herrick et al. 2005). The line-point intercept protocol in general is described further in Measuring and Monitoring Plant Population (Elzinga et al. 1998) and FIREMON: Fire effects monitoring and inventory system (Lutes et al. 2006). Sampling is generally accomplished along a series of parallel transects. Plot size, number of transects and number of points per transect are determined by the user based on objectives, vegetation and resources. One suggested plot design for line-point intercept sampling has five parallel 50 meter transects set 10 meters apart. Sample points are at 1-meter intervals along each transect for a total of 250 sample points per plot.

The ARS Cover Points protocol in FFI is less tedious to use than the standard FFI Cover Points protocol but is limited to a maximum of six species hits and one soil surface hit per sample point, compared to an unlimited number of species hits per sample point in the standard Cover Points protocol. Data collection is more intensive with the ARS Cover Points protocol that with the standard FFI Cover Points by Transect protocol, but that protocol does not allow the species sampled at each point to be tracked through time like the ARS Cover Points protocol does.

For more information the *ARS Cover Points Protocol Overview* posted on the *Other Documents* page on the FFI FRAMES website.

Biomass - Fuels

The Biomass-Fuels protocol is used to record actual measured weights of fuel on a macro plot using laboratory analysis. Biomass may also be available from legacy data or from photographic guides that incorporate biomass data as part of their fuel load calculations. Examples of photographic guides developed using biomass data are the Photo Series, Photoload, and Photo Guides published by the U.S. Forest Service. These photographic guides cover many ecosystems and are available for many parts of the U.S. Newer versions published by the USFS. Pacific Northwest Research Station includes biomass data for several different fuel attributes. Attribute biomass estimates from photographic publications are entered into the FFI biomass form in the same way as actual measured weights. Biomass using measured weights is obtained from field plots using a three-step process that includes collecting and separating all fuels from a macro plot, drying the collected samples in an oven, and weighing the dried samples with an

analytical scale. The fuels are usually separated into size classes as they are gathered in the field, then dried and weighed by the same sampled size classes. The resulting weights for each size class are stored in the Fuel Biomass protocol in FFI. If desired, the biomass data may be combined with other plot-level fuels data to provide an extensive description of the fuelbed at the macro plot scale.

Biomass - Plants

The Biomass-Plants protocol is used to record actual measured weights of each type of plant material on a macro plot. Biomass is a very accurate measure of plant cover, but it is also a destructive and time-consuming sampling method. Biomass is obtained by clipping all plant material from each plot and separating it into the groups of interest, such as lifeform, family, species, or any other grouping appropriate to study objectives. The material for each group is separated into bags in the field. It is then taken back to a laboratory, dried in ovens, and the dry material is weighed by sampling group using an analytical scale. The Plant Biomass protocol in FFI is used to enter the weights of each sampled group. If the samples are weighed prior to drying, the pre-drying weight is entered under "Green Wt" in FFI. The weight after drying should be recorded under "Dry Wt."

Canopy – Densiometer

The protocol is used to record densiometer hits of canopy or open sky from one or more points on a plot. Four samples are collected at each point and entered in the Densiometer fields. The protocol assumes either 94 or 24 dot densiometers, however any other integer may be used in the Num. Dots field. Set the Canopy to *Closed* if the number of canopy hits are counted or set it to *Open* if the number of open sky hits are counted. The total proportion of dots per plot that overlap canopy or open sky is used calculate canopy closure.

CBI

CBI is the Composite Burn Index sampling protocol. The CBI protocol is used to quantify, rate, and track the burn effects on the substrate or each vegetation layer after a fire and to correlate those effects with changes observed in the moderate-resolution Landsat Thematic Mapper. Plot sampling is used to calibrate and validate remote sensing results and to relate radiometric change to actual fire effects on the ground. Because the fire effects are correlated with Landsat images, CBI plots can be rather large (>100 ft or 30 m wide). CBI is most effective when all vegetation layers are sampled in the field and then compared with the Landsat Imagery. However, the protocol can also be used as a stand-alone tool without remote sensing data to describe and evaluate localized burn sites for a variety of purposes.

For CBI, burned percentages are visually estimated for the substrate elements and for the different size classes (layers) of vegetation and recorded on the CBI protocol form. The substrate and vegetation layers are evaluated by attribute (litter, duff, richness cover, etc.). Each attribute has an associated burn effect that the observer evaluates (e.g., unchanged, 50% loss, etc). The loss percentages recorded on the form are used to calculate a burn severity rating within FFI for each vegetation layer and for the entire plot. The greater the CBI number, the greater the burn severity on the macro plot. For more information on this protocol and what the ratings mean, see the online FIREMON user manual (Landscape Assessment) on FRAMES.

Cover - Line Intercept

The Line Intercept protocol is used to assess changes in plant species cover over time on a macro plot. It uses a permanently marked base line for sampling the within-stand variation and quantifying statistically valid changes in plant species cover and height over time. The protocol is applicable for most forest and rangeland communities and is one of the fastest ways to estimate percent cover in areas with dense cover or tall trees. It is especially useful when users need to quantify shrub cover greater than 3 feet (1 m) tall because ocular estimation of cover for large shrubs or dense vegetation is difficult using most other methods. The Line Intercept protocol can also be used in conjunction with cover-frequency transects when vegetation over 3 feet (1 m) exists or to calibrate ocular estimates of shrub cover with the Species Composition protocol (see description).

The Line Intercept protocol uses a tape measure stretched between two permanently marked end points either on the ground or at a specified height above the vegetation canopy, depending on the purpose of the sampling. Vegetation cover is determined by calculating how much of the measuring tape is covered with plant material. To use this protocol, the stop and start points for each species' foliage or substrate attributes are recorded along the measuring tape. For example, if a small tree starts at 10.0 ft along the tape and ends at 15.0 ft, it covers an interval of 5 ft. If a single grass species starts at 25 ft and ends at 27.5 ft, it covers an interval of 2.5 ft. The start and stop points are recorded in the cover- line intercept form. The amount of tape that a specimen covers is referred to as the interval or intercept and is also recorded on the line intercept form. The percent cover of each species is the total of all intercepts for the species divided by the line length. In addition to cover intervals, a size class is recorded on the form to indicate how tall the particular plant is. Height estimates should only be made for the part of the plant that is intercepted by the tape, not the whole plant.

Cover - Species Composition (Ocular Macro Plot)

The Species Composition protocol uses a combination of ocular estimates for canopy cover and actual measurements of height to sample each plant species on a macro plot. It is relatively fast and efficient to conduct in the field and is suited for sampling a wide variety of vegetation types. It is especially useful in plant communities with tall shrubs or trees to inventory large areas when there are few examiners available to help with sampling. Like other sampling methods, this protocol is useful for describing a stand or plant community and documenting important changes over time. However, it does not quantify the variability within a stand and cannot be used to detect statistically significant changes over time. The data that are required for this protocol are species name, status, canopy cover, and height. Canopy cover is an ocular estimate of the area of ground covered by the vertical projection of the outermost perimeter of the natural spread of the plant's foliage. Height measurements are made either by using a size class or by measuring each specimen.

Cover - Points

The Point Cover protocol is used to assess changes in plant species cover or ground cover for a macro plot. It is primarily suited for vegetation types less than 3 feet (1 m) in height and particularly useful for recording or tracking changes in ground cover. The protocol uses a narrow diameter pole that is lowered to the ground at systematic intervals (usually every foot or meter) along a measuring tape. Plant species or groundcover that touches the pole are recorded as 'hits' along the measuring tape/transect. The "hits" are the samples in this protocol and they are recorded by tape location, species, and height. The samples are statistically valid

representations of the stand variation and of the amount of change in cover and height over time when they are reassessed on permanently marked transects.

Cover - Points by Transect

Point Cover transect data is collected in the same way as the Cover-Points data and it is used for the same types of sampling (see section above). The only difference is that the points are not recorded individually in Cover – Points by Transect. The "hits" on each species are summarized in the field and each species is entered only once on the form. If there are different size classes for the species, they may be entered multiple times; but, in general, this protocol uses a summary approach to record and analyze the hits.

Cover – ARS Points

Point Cover transect data is collected in the same way as the Cover-Points data and it is used for the same types of sampling (see section above). This protocol is a modification of the line-point intercept method described in the USDA Agricultural Research Service (ARS), Monitoring Manual, Vol. I (Herrick et al. 2005). Up to seven hits per point (including one 'surface' hit) can be recorded in one record. A full description of the protocol and summary report is available on the *Other Documents* page on the FFI website (www.frames.gov/ffi).

Cover/Frequency (FIREMON and Daubenmire cover classes)

The Cover / Frequency protocol is used to assess changes in plant species cover and frequency for a macro plot. This protocol uses quadrats (small sample frames) to sample within-stand variation and to statistically quantify changes in plant species cover, height, and frequency over time. Frame sizes may vary depending on the objectives of the study and the method used. Since it is difficult to estimate cover in quadrats for larger plants, this protocol is primarily suited for grasses, forbs, and shrubs less than 3 feet (1 m) in height.

For this protocol, quadrats are placed systematically along randomly located transects. Canopy cover is assessed within each quadrat by visually estimating the percent of the quadrat that is occupied by the vertical projection of each species (or each substrate element) onto the ground. Species frequency is recorded as the number of times that it occurs within a given number of quadrats. Frequency is typically recorded for plant species that are rooted within the quadrat.

Within the cover frequency protocol, there are two different scales available for visually estimating plant cover. The first is the FIREMON scale, which uses 13 intervals to span cover estimates of 0 to 100%. The second is the Daubenmire scale (from R. Daubenmire, 1959, A canopy coverage method. Northwest Science 33: 43-64), which uses 6 intervals. Do not mix scales. Rather select the one set that meets your study objectives most closely and use it exclusively within a sample event.

Density - Belts

The Density– Belts protocol is used to assess changes in plant species density and height for a macro plot. The protocol is most commonly used to sample shrubs and trees. Belt transects have a length and a width and are usually much larger than the density-quadrat frames. Like the quadrat frames, belt transects need to be randomly located on the landscape to give statistically valid results for cover or frequency over time. Sampling within the belt boundaries is

done by counting the number of individual plants within each species. The total number of individuals for each species is recorded along with a height class. Density is calculated as the number of individuals per unit area. The accuracy of the density estimate depends largely on the size and shape of the belt, and the optimum belt size and shape depends on the plant species distribution (see discussion on shape and boundary problems associated with belts and quadrats in the FIREMON User Guide.

To estimate tree density, we recommend using the Tree sampling protocols in FFI rather than the density-belt approach.

Density - Quadrats

The Density–Quadrats protocol is used to assess changes in species density and plant height for a macro plot. The protocol generally requires a sample frame that is sized appropriately to the lifeform of interest and that is placed randomly on the landscape so that the sampling will be statistically valid. Density - Quadrats is primarily suited for grasses and forbs where individual plants or stems can be distinguished, while longer, wider belt transects are most appropriate for sampling shrubs and trees. The numbers of individuals for each plant species within each quadrat are counted and the count for each quadrat is recorded. Density is calculated as the number of individuals per unit area.

Disturbance History

The Disturbance History protocol provides a means of tracking disturbances on a macro plot. Although the protocol is purely descriptive, it can be extremely useful to relate ecologic effects and disturbance factors during monitoring. The protocol contains 31 causal agents that can be used to describe disturbance on each macro plot. These agents include a range of factors, from the introduction of exotic species to clear-cutting. The duration of each disturbance event can be recorded using start and stop dates if they are known. The effects caused by each agent and the relative amount of damage they cause can be summarized within the protocol by using the "change" field or by using one or more of the three user variables provided.

FCCS

The Fire Characteristic Classification System (FCCS) was developed by the Forest Service Pacific Northwest Research Station as a way to characterize all of the combustible components of a fuelbed. The FCCS fuelbeds are linked to a classification system that uses seven variables. Directions for sampling the variables are provided in the FCCS user guide.

FFI stores data for the seven FCCS variables in a special table. The values for these variables can be entered directly into FCCS software to classify a fuel bed or used to describe an entirely new FCCS fuelbed. To describe a new fuel bed, the user samples the fuelbed (vegetation, down woody material, trees, etc.) using the FFI sampling protocols and records values for the seven variables. The fuelbed description is then linked to the classification variables in FCCS to define a custom FCCS fuelbed. Biomass of some fuelbed strata can be calculated using FFI summary reports (e.g., down woody material, duff, litter, etc.). Other biomass estimates will need to be calculated outside FFI (e.g., allometric equations to calculate shrub biomass from cover and height measurements).

Fire Behavior

The Fire Behavior protocol is used to describe the behavior of a particular fire and the ambient weather conditions that influence the fire's behavior. This protocol is not plot based. Users collect fire behavior data by fire event and time-date, instead of collecting data at one specific macro plot location. If users want to describe fire characteristics at a particular macro plot, they should use the Plot Description protocol and fill in the information on Flame Length, Spread Rate, and Fire Behavior Picture fields at each specific location (see below). The FireID and Fire Date fields in the Plot Description protocol link a macro plot's specific fire behavior information and physical and biological characteristics to the broader fire-event information described within the Fire Behavior protocol. The data that should be collected for the Fire Behavior protocol includes information on location, burning conditions, fire behavior, and fuel moistures. To adequately describe a fire event, all fields within the protocol form should be completed.

Logs – Fixed Area

This protocol is used to complete a survey of dead down woody material >3" diameter (logs) or portions of logs that are within a fixed area. This approach tends to provide estimates with less variability of log volume and biomass than the line transect technique (see Surface Fuels). It is well suited for sites with few logs. This protocol is often used in conjunction with the Photoloads protocol.

Photoloads

The photoload sampling protocol is a fuel sampling technique used to estimate the loading of surface fuels for a number of fire management objectives but primarily for the prediction of fire effects. This technique uses a series of downward- or sideward-looking photographs of synthetic fuelbeds of gradually increasing fuel loadings as reference for visually estimating fuel loadings in the field. A description of the method is published here: www.fs.fed.us/rm/pubs/rmrs_gtr190.pdf

Plot Description

The Plot Description protocol is used to describe general macro plot characteristics that provide an ecological context for data analyses. Within this protocol, many of the plot characteristics that are important to analyzing relationships or fire behavior data are described. This protocol provides the general ecological data that can be used to stratify or aggregate fire monitoring results. The data collected in the plot description characterize the topographical setting, geographic reference point, general plant composition and cover, ground cover, fuels, and soils information for a macro plot. Comment fields also allow for documentation of plot conditions and location using photos and notes. None of the data fields are required in the plot description form, but all should be filled out at least once for each macro plot to give the sampling events ecological context.

Post-Burn Severity

The Post Burn Severity protocol is used to assess changes in vegetation and substrate after a fire and is most useful to determine how much of an area has been lightly burned versus scorched or unburned. Essentially, it is a point-transect method for sampling burn severity. The samples are statistically valid representations of both the stand variation and the effect that the burn has on the vegetation and the substrate.

For the Post Burn Severity protocol, a transect line is laid out for a specified distance. At systematic intervals along the line, the vegetation and substrate are examined. Each point is evaluated for burn severity and assigned a corresponding code value (1= heavily burned, 5 = unburned; 0 = not applicable, -1 = not assessed). The location on the tape and the severity codes for both vegetation and substrate are recorded within this protocol.

Rare Plant Species

The Rare Plant Species protocol is used to assess changes in uncommon, perennial plant species when other monitoring methods are not effective. Individual plants are identified and monitored for statistical changes in plant survivorship, growth, and reproduction over time. This protocol is primarily used for Threatened and Endangered species and uncommon grass, forb, shrub, and tree species of special interest.

In this protocol, individual plants are spatially located using distance measurements along and from a permanent baseline. Each located plant is marked in the field using a permanent tag, which is recorded in the rare plant species form. Data are collected on the plant's status (living or dead), stage (seedling, non-reproductive, or reproductive), size (height and diameter), and reproductive effort (number of flowers and fruits). Extra variables are also available if the observer wants to make observations or comments on each of plant.

Surface Fuels

The Surface Fuels protocol is a planar- and line-transect technique used to assess the downed woody debris, duff, and litter on a macro plot. This protocol consists of three sample methods: 1) fine woody debris, 2) coarse woody debris and 3) duff and litter.

Fine and coarse woody debris are sampled using the planar transect method (Brown, 1974). Fine woody debris pieces are tallied in the standard fire fuel size classes: 1-hour (0-0.25 in. / 0-0.635 cm), 10-hour (0.25-1.00 in./0.635-2.54 cm), and 100-hour (1.00-3.00 in./2.54-7.62 cm). Coarse woody debris greater than 3" (7.62 cm) in diameter at the point of planar intersection require diameter, decay class*, and slope of each transect. Duff and litter are entered as depths measured at specified points along a transect. Fuelbed depth - an estimate of the vertical extent of the combustion zone (including litter, woody debris, herbs and live woody, etc.) – may be entered, but FFI does not estimate fire behavior.

Fuel constants can be entered separately for each fuel type or users can use a default value provided in FFI.

* "Sound" and "rotten" are not included in the coarse woody debris (CWD) decay class dropdown list. When recording the decay class of CWD, we suggest using the five-decay-class classification instead of the two-class system of "sound" and "rotten". The two-class system is useful for fire information, but the five-class system has proven more useful for ecosystem applications and should be used whenever possible. This is especially true if the Fuel Constant Sets (FCS) are used. The FCS lets you modify some fuel attributes that are used to calculate biomass. For example, the specific gravity of CWD in each decay class can be defined in an FCS. In the default FCS, the specific gravity of decay classes 1 through 3 are set to 0.4, and the specific gravity of decay classes 4 and 5 is set to 0.3. If you wish to use the two-class system, you may use decay class 1 for sound and decay class 5 for rotten, then enter S or R in one of the UV fields as appropriate to remind yourself that the two-class system was used. The characteristics used to identify logs in each of the decay classes are discussed in the FIREMON FL sampling methods. The FIREMON discussion is based on the CWD classification presented in:

Maser, C., Anderson, R., Cromack, Jr., K., Williams, J.T., Martin, R.E., 1979. Dead and down woody material. In: Thomas, J.W. (Ed.), Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington. USDA Agricultural Handbook 553. pp. 78–95.

Surface Fuels - Alaska Duff and Litter

The expanded duff and litter protocol is based on the standard duff and litter sampling method found in the Surface Fuels protocol, but it also includes sampling guidelines for collecting the depth of the live moss, dead moss, upper duff, lower duff, and lichen layers. The protocol was developed primarily for Alaska systems, but it can be used in any ecosystem where assessment of any of these components is important. If desired, the user may build a Fuel Constant Set within FFI, which includes the bulk density of each component. FFI will calculate the biomass of each component of the expanded duff and litter table and provide it in summary reports.

Surface Fuels - Piles

The Surface Fuel – Piles protocol is used to assess the biomass of piled fuels. Piles are generally composed of post-treatment harvest material (slash) and tend to be scattered across a treatment area. The Surface Fuels – Piles protocol can include one or more piles. Thes protocol should only be used to calculate the loading of piled material. Other sampling protocols (e.g., Surface Fuels or Photoload) should be used to sample un-piled down woody material.

Piles are assessed by measuring the height, width, length, and pile shape. For machine piled material pile mass is calculated using guidance for packing ratio, species composition and soil content in Hardy 1998. For hand piles, pile mass is calculated using equations in Wright, et al. 2009. The FFI summary reports include biomass for all piles, pile loading by area, pile planform area and proportion of area covered by piles.

Hardy, Colin C, 1998, Guidelines for Estimating Volume, Biomass, and Smoke Production for Piled Slash, USDA Forest Service Pacific Northwest Research Station General Technical Report PNW-GTR-364, Portland OR, 28p.

Wright, Clinton S.; Balog, Cameron S.; Kelly, Jeffrey W. 2009. Estimating volume, biomass, and potential emissions of hand-piled fuels. Gen. Tech. Rep. PNW-GTR-805. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 23 p.

Surface Fuels - Vegetation

The Surface Fuels – Vegetation protocol is used to describe the lifeform types on the macro plot that may contribute to fire severity and fire spread. This protocol does not include measures of downed woody debris, which are sampled using the Surface Fuels protocol (see above). This protocol characterizes only the live and dead shrubs and live and dead herbs.

Surface Fuels – Vegetation uses two 6-ft (2-m) cylindrical sample areas located at specific positions along a transect line to describe shrub and herb fuels. Within the cylinder, canopy coverage of live woody species (trees and shrubs), dead woody species, live non-woody species (herbs), and dead non-woody species are estimated. A height is also estimated for each of the four types of fuels. "Cover" is the vertically projected cover contributed by each category estimated within the cylinder. It includes plant parts from plants rooted in the sampling cylinder and plant parts that project into the sampling cylinder from plants rooted outside.

Cover is estimated by imagining all of the vegetation in each class pressed to the ground and determining what percentage of the cylinder is covered. "Height" is the average height of each group as it appears within the cylinder. Detailed information on implementing this protocol can be found in the FIREMON User guide.

Tree: Trees - Individuals; Trees - Saplings; Trees - Seedlings

The Tree protocols are used to sample individual trees, snags, saplings, poles, and seedlings in a fixed-area plot or to estimate tree density, size, and age class distributions before and after fire so that tree survival and mortality rates can be assessed. These protocols can also be used to sample individual shrubs over 6 ft (2 m) tall. The Trees protocol consists of three distinct methods – single tree, diameter class, and height class. If the user does not wish to record data for all three methods on a macro plot, each method can also be accessed individually by using the (1) Trees – Individuals; (2) Trees – Saplings; or (3) Trees – seedlings protocols.

Each of the tree forms can be used for specific classes of trees, as long as the user defines the diameters or size/height classes of interest. For example, within the single-tree form, all sizes of trees (including saplings or seedlings) that meet user-designated break-point diameters can be recorded by species. The Trees by Diameter Class form can be used to record trees less than diameter class 4 (e.g., saplings) or used to represent some user-defined diameter-based classification as long as it is defined in the metadata, comment or user-variable fields. The Trees by Height Class form can be used to record trees less than 4.5 ft (1.37 m) tall (e.g., seedlings)) or to represent a user-defined height classification.

The three methods within the Tree protocol provide comprehensive descriptions of tree characteristics on a macro plot. The Single-Tree data form allows the user to record measures of diameter, height, age, growth rate, crown length, pathogen evidence, fire damage, and snag information for each tree above a user-specified diameter. The protocol also includes descriptions of how the tree has been affected by burning, where the tree is located on a landscape, and what other types of damage that the tree has sustained. The Diameter- and Height-Class forms allow users to track changes in status, number of individuals, and amount of crown growth only.

Trees – Variable Radius

This protocol is used for "merchantable" overstory trees. Tree measurements are similar to the Trees-Individuals method described above but tree selection is using a siting gauge or prism. The associated report provides the same information as the Trees-Individuals report.

Comparison of program elements

The following table compares FFI program elements with those of its predecessor monitoring programs.

FFI	FIREMON	FEAT	FMH
Administrative Unit	**PD Plot Description** > **Registration Unit**	**Land Unit**	**Park/Unit** [1]
Project management tab > Project Unit (name, agency, objectives, description, monitoring status, candidate plots, metadata)	**PD Plot Description** > **Project ID** (plot ID, organizational information)	**Monitoring Unit** > **Macro plot** **Management Monitoring Unit** > **Assign macro plots** (plot ID, monitoring objectives, metadata, burn prescriptions, creation and retirement dates)	**Park/Unit** [1] **Form FMH-4** **Form FMH-7** (burn and/or treatment status) Also, all information on plot ID, burn status, treatment history required by other FMH forms
Project management tab > Sample Event (name, type, purpose, site characteristics, position/location, PDOP, installation and retire dates. All sampling protocols and timing are assigned here.) Note: all biophysical descriptions are located in separate Plot Description method.	**PD Plot Description** > **Sample Event** (plot ID, georeferenced information, all biophysical characteristics)	**Monitoring Design > Monitoring Event** (biophysical descriptions, locations, etc.) [2]	**Form FMH-4** (choosing sampling protocols and monitoring types) **Form FMH-5** (GIS, location, directions to plot, and metadata) **Form FMH-5a** (history of site visits) [3] **Form FMH-7** (sampling areas)
PDA Coordination tab. Allows data entry from a PDA	Not available	Need separate module (**FEAT Mobile > FEAT for PPC2**) to run FEAT on PDA	Not available
Query tab. Filter, add data. classify, group and calculate, export or print from within FFI	**Simple Query Builder**. Export all queries for printing outside program	**Summary Builder**. Filter, more fields, classify, group and calculate, export - Access query or Excel .xls files	Not available

FFI	FIREMON	FEAT	FMH
Reports and analysis tab > Report 1. Summary reports by sample method or attribute or strata 2. Reports by monitoring status 3. Save, print, or export reports	**Reports** 1. Data summary reports by sample method or attribute 2. Sampling event filter 3. Create, clear, save, print, or export reports	**Print Monitoring Unit** [4] **Metadata** **Print Species List** **Summary Builder (export file, print outside program)**	Not available. Entry of records indexed for checking data input
Reports and analysis tab > Analysis 1. Custom reports for user-defined groups 2. Bar charts available by method and attribute 3. Statistical significance calculated where applicable 4. Computes confidence intervals 5. Multiple comparison procedures 6. FVS-FE data export	**Data analysis** - Separate program, **FMAT**, used for analysis and statistics 1. Custom reports for special group analyses 2. Bar charts available by method and attribute 3. Statistical significance calculated where applicable 4. Computes confidence intervals 5. Multiple comparison procedures	**Data analysis** only for: 1. Fuel Load calculations (under Reports and Analysis > Fuel Load) 2. Density, basal area, cover and frequency calculations (in Summary Builder under Group & Calculate tab)	**Analysis** 1. Single status summary, grouped by plots, species, native/non-native, live/dead, size class 2. Change over time, grouped by same as above 3. Confidence intervals computed 4. Bar/line/area graphs available 5. Sample size calculations **Form FMH-26** (data analysis record) [5]
Species Management tab. Create species list that functions with dropdown menu upon data entry (import lists, create new list, add from master USDA NRCS list, make user list, handle unknowns, global replace feature, print species lists. SQL database-driven.	Add species to fields as needed from lookup table; Access database-driven	**Species Management**. Comparable to FFI although screens are different; Access database-driven	**Form FMH-6** (species code list) 6
Toolbox tab > External data analysis. Import data from Excel for analysis in FFI	Copy and paste Excel data into Access database	Not available	Not available
Toolbox tab > Protocol management. Manage (delete, retire, or reinstate protocols)	Not available	Not available	Not available
Protocol Manager module. Create new method definitions for FFI	Not available	Not available	Not available

FFI	FIREMON	FEAT	FMH
Photo Management. Make separate photo folder and store photos in it, with link from user variable (UV) fields if desired.	Photo storage within individual method forms (PD form or local code fields)	**Data Entry and Review > Photos** (date, time, status, photo list, actual photos displayed within form)	**Form FMH-23** (photographic record sheet)

Notes:

[1] The Park/Unit in FMH can correspond to either an administrative unit OR a project unit in FFI depending on how a study is set up. For example, if managers wanted to do a study of rare plants in several parks for restoration purposes, an administrative unit might be entitled "Western and Central US rare plant study" and each park would be a project under that umbrella. In this case, non-agency rare plant studies could also be included as separate projects. Each project would be analyzed separately in the reports and analysis but all would be accessible within the same FFI user screen. Alternately, if a park/unit was set up as an administrative unit, only data from that park would be accessible within FFI at any one time. Projects would be specific to the individual park. To view data from another park, you would have to close FFI, reopen, and chose another administrative unit (park).

[2] FFI incorporates several FEAT forms, and parts of forms, into the Sample Event, including several fields under Monitoring Design (i.e., macro plot, subsamples, assign protocols, and plot templates.

[3] FFI maintains a record of each site visit by sampling event. When you revisit a site, you start a new sampling event. After data is entered into a sampling event, the list of sampling events under a macro plot becomes the list created in the FMH-5a form. Note: There is no FFI equivalent for form FMH-25, Plot Maintenance Log.

[4] FEAT printouts are located in various places within the program and accessed individually. The list included here may not be complete.

[5] FFI analyses can be saved and printed or exported to another application and printed to fulfill the requirements of FMH-26.

[6] The standard protocols in FFI do not contain a form for recording information on voucher specimens. Voucher information would have to be stored within the metadata or within FFI user variables located in the method that was used to collect the sample. If a protocol is needed for collecting voucher specimens, however, it can be created within Protocol Manager and imported into FFI to fulfill sampling needs.

Comparison of sampling protocols

The following table compares available sampling protocols in FFI with those of its predecessor monitoring programs.

FFI	FIREMON	FEAT	FMH
ARS Cover – Points. Cover and height by point in layers.	Not available	Not available	Not available
Biomass (Fuels). Weights for all live and dead surface fuel types	Not available	Not available	Not available
Biomass (Plants). Green and dry weights for clipped vegetation	Not available	**Biomass**. Herbaceous wet and dry weight	Not available

FFI	FIREMON	FEAT	FMH
Canopy – Densiometer. Cover estimates using spherical densiometer	Not available	Not available	Not available
Composite Burn Index (CBI) 1. Plot information 2. Substrate 3. Herbs - low shrubs <1 m tall 4. Tall shrubs 1 - 5 m tall 5. Intermediate trees 6. Big trees 7. Summary values (plot mean)	**CBI** 1. Plot information 2. Substrate 3. Herbs, low shrubs, tree seedlings 4. Tall shrubs, saplings 5. Intermediate trees 6. Big trees 7. Composite burn index calculation	**CBI** 1. Plot information 2. CBI A Substrates 3. CBI B Herbs 4. CBI C Tall shrubs 5. CBI D Intermediate trees 6. CBI E Big trees 7. CBI Summation	Not available
Cover - Line intercept. Transect, species, status, size and age class, start point, stop point, intercept, height	**LI - Line intercept**	**Line Intercept**. Line intercept, basal and aerial	Not available
Cover - Species composition. Species, status, NRF, type code, cover, height	**SC - Species composition**. Species, status, cover, height	**Ocular cover/observed species**. Species, cover, status	**Form FMH-15** (50 m transect data, species observed but not intercepted)[1] **Form FMH-16** (30 m transect data, species observed but not intercepted)
Cover - Points. Transect, point number, tape location, order, species, status, height	Not available	**Point transect**	**Form FMH-15** (50 m transect data) **Form FMH-16** (30 m transect data Used for shrub and herbaceous covers
C**over - Points by transects**. Transect, species, status, hits	**PO Tran - Points Intercept by Transect** **PO Frame - Points Intercept by Frame/Grid**	Not available	Not available
Cover – Frequency. Cover and nested rooted frequency in quadrats.	**CF - Cover Frequency**	**Cover by Frame**	Not available
Density - Belts. Transect, species, status, size and age class, count, height	**DE - Belt**	**Density**. Herbaceous, shrub, and tree density	**Forms FMH-17** and **17a** (herbaceous density data) Forms FMH-10 and 10A (seedling tree data)

FFI	FIREMON	FEAT	FMH
Density - Quadrats. Quadrat number, species, status, size and age class, count, height	**DE - Quadrat**	**Density**. Herbaceous, shrub, and tree density	**Form FMH-18** (herbaceous density data)
Disturbance History. Change agents, disturbance codes, and timing variables	Not available	**Event Type** and **Disturbance Type** recorded in **Monitoring Event**	Not available
Fuel Characteristic Classification System (FCCS). Ecoregion, vegetation formation, structural stage, cover type, change agent, fire regime, FRCC	Not available	Not available	Not available
Fire Behavior. Fire information, location information, burning conditions, fire behavior, fuel moisture, and user variables for photo links	**FB - Fire Behavior**	Not available	**Forms FMH11, 1a** **Forms FMH-2. 2a** **Form FMH-3** (wind speed for smoke use only) **Form FMH-3a** (fuel load calculations only) [2]
Logs - Fixed-area. Diameters and length of logs.	Not available	Not available	Not available
Metadata. Entered at project unit or in any of the UV fields in each form	**MD - Metadata**	Metadata entered in **Monitoring Unit**	Comments or Notes area on most FMH forms
Pilot Sampling	Not available	**Pilot Sampling**	Not available
Plot Description. Plot dimensions, biophysical description, photo plots, general fire behavior	**PD - Plot Description**. Biophysical description, fuels, photos, plot-level fire behavior	General plot characteristics descriptions associated with **Macro Plot** and **Monitoring Unit**	**Form FMH-4** (biophysical descriptions, monitoring type) **Form FMH-5** (Plot location) **Form FMH-7** (plot photo order only)
Post Burn Severity. Tape distance, burn effects on vegetation and substrate	Not available	**Post Burn Severity**	**Form FMH-21** (forest plot burn severity) **Form FMH-22** (brush and grass plot burn severity)
Rare Plant Species. Species, location along and from baseline, status, stage, size, number of stems and fruiting structures	**RS - Rare Species**	Not available	Not available

FFI	FIREMON	FEAT	FMH
Surface Fuels (3-part form) 1. Fine woody debris 2. Coarse woody debris 3. Duff and litter	**FL - Fuel Load** 1. Fine woody debris (includes duff and litter depth) 2. Coarse woody debris	**Fuels** 1. Fuels 1 - 100 2. Fuels 1000 3. Fuels LD (litter and duff)	**Form FMH-7** (fuel-load transect azimuth and slope only) **Form FMH-19** (forest plot fuels inventory)
Surface Fuels - Alaska DuffLitter. Transect, sample location, offset, litter depth, live and dead moss depth, upper and lower duff depth, lichen depth, fuelbed depth, fuel constant	Not available	Not available	Not available
Surface Fuels - Piles. Pile number, pile count, shape, dimensions, pack ratio, specific gravity	Not available	Not available	Not available
Surface Fuels - Vegetation. Sample location, herb and shrub status, cover, and height	**FL - Fuel Load** 3. Vegetation (live and dead herbs and shrubs)	Not available	Not available
Trees (3-part form) [3, 4] 1. Single trees 2. Trees by diameter class 3. Trees by height class	**TD - Tree Data** 1. Mature trees 2. Saplings 3. Seedlings	**Overstory and Pole Trees**. Contains damage code and severity fields, status, and break-point diameter	**Form FMH-8** (overstory tagged tree data) **Form FMH-9** (pole-size tree data) [5] **Forms FMH-10 and 10a** (seedling tree data) **Form FMH-20** (tree post-burn assessment)
Trees – Variable radius. Overstory trees sampled with a prism or gauge			

Notes:

[1] The Species Composition method could technically be used for Forms FMH-15 and FMH-16 by leaving Cover blank. FFI's summary report will not be accurate if Cover is left blank.

[2] FFI has no equivalent for FMH forms FMH-3 and 3-a, which describe visibility, CO exposure, emissions, particulates, and smoke. Sample protocols for these elements can be created in Protocol Manager and imported into FFI if they are important to sample for a particular study.

[3] The Trees protocol in FFI is a combination of three protocols that incorporate information from several FMH forms. If managers want to sample only one size class, they can use the individual FFI tree protocols, which include Trees-Individuals, Trees-Saplings, or Trees-Seedlings. These forms include only data entry fields for the size class of interest.

[4] FFI does not have protocols for plot-tree mapping (Forms FMH-11, 12, 13, and 14). X-Y coordinates can be entered in the Trees (or Trees-Individual) protocol for mapping in other applications

[5] Only the Trees and Trees-Individual protocols in FFI store the information on tree tags and damage codes that is required in Form FMH-9.

New protocols

These protocols were not in FIREMON, FMH or FEAT and have been added since the initial release of FFI

- ARS Cover Points: Another point cover assessment
- Canopy – Densiometer: For estimating canopy closure
- Logs - Fixed-area: Assessment of down woody material greater than 3 in. diameter on a fixed-area plot
- Photoloads: Quadrat-based fuel sampling using downward looking photos.
- Trees-Variable radius: Point sampling technique using a prism or sighting gauge.