2. Database

The Database module is the first step in the BioSum workflow. This section describes how to navigate the BioSum menu, create a new project, open an existing project, add and delete forest inventory data, and manage files in a BioSum project.

Creating a New FIA BioSum Project

1. To create a new project, start the FIA BioSum Manager application and select <File><New Project> (see Figure 2.1).
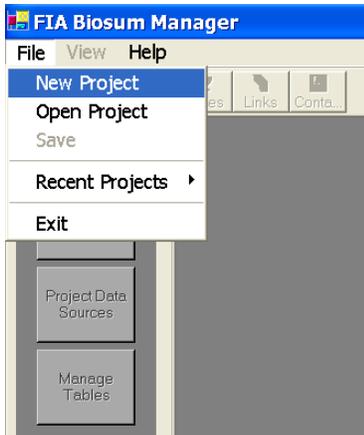

Figure 2.1 – Select New Project from the main menu.

2. Upon selecting <New Project>, the Project form will open (see Figure 2.2). The only required information is the Project ID field. By default, the project directory will be c:\FIA_Biosum\project id. For example, if the project id is 'BlueMountains' the default project directory would be c:\FIA_Biosum\BlueMountains. The default project directory can be changed by selecting the folder icon to the right of the Project Directory text box and navigating to a different directory.
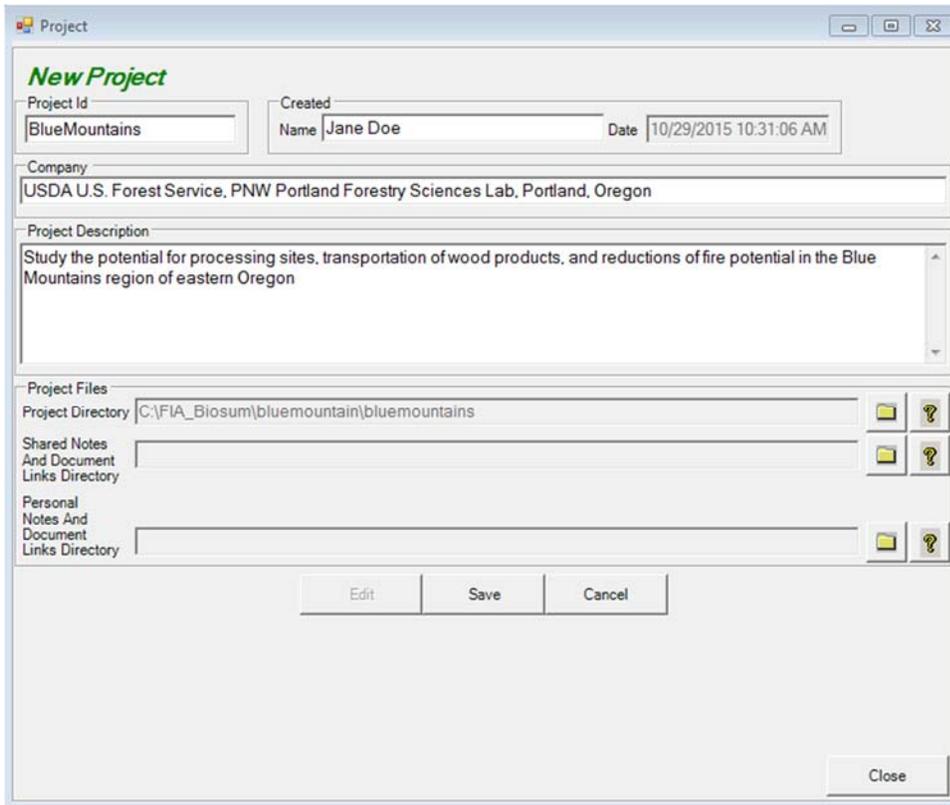
Figure 2.2 – Specify project name, description, and directory.

3. To share project notes and documents with others, click on the folder icon to the right of **the Shared Notes and Document Links Directory**. NOTE: To effectively use the shared document links option, users must have access to the shared directory, and use the same drive letter when mapping to the shared directory. To keep personal project related notes and documents, click on the folder icon to the right of the **Personal Notes and Document Links Directory.**

4. Click the <Save> button to create the new project in the BioSum Manager.

5. The BioSum Manager will create the project directories and copy the necessary project files. Select **<Yes>** if you want the document links depository to keep track of project documents. Select **<Close>** to exit the Project Properties window once the project has been created.

6. When a project is created, the project root directory and subfolders in Figure 2.3 are created.
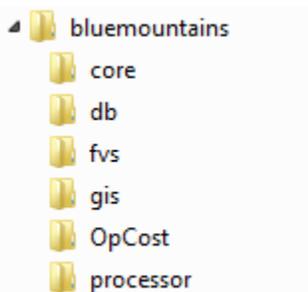

Figure 2.3 –Directory structure of a BioSum project.

Opening a Current FIA BioSum Project

1. To open an existing project, select **<File><Open Project>** on the main menu, or select **<Open>** from the toolbar, and navigate to the project root directory and db subfolder. Choose the file 'project.mdb' (see Figure 2.4). Alternatively, **<File><Recent Projects>** can be used to select from a pick list of projects that have been recently opened or saved.
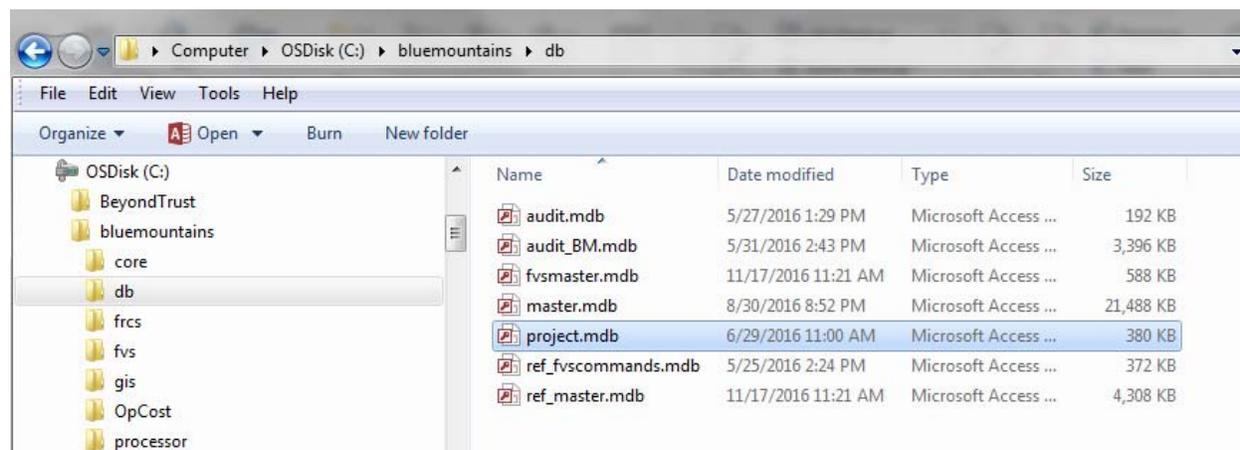

Figure 2.4 – To open a project, navigate to and open the project database in BioSum.

2. Once a project is open, the BioSum Manager provides several tools to help manage a BioSum project. The tools include project properties (**Project** button), which allows edits to the project properties; project notes (**Notes** button), where notes and project details can be stored; the document links depository (**Links** button), which allows project-related documentation to be uploaded, managed, and deleted; and contact information (**Contacts** button), where project-related contacts can be stored. These tools can be accessed from the toolbar located at the top of the BioSum Manager main form. When one of these tools is opened, its window may need to be resized to display content that may otherwise be hidden.

The buttons located on left pane of the FIA BioSum Manager window (see Figure 2.5) provide access to the four principle task groups that comprise the workflow of a BioSum analysis: (1) **Database**, (2) **FVS**, (3) **Processor**, and (4) **Core Analysis**. The currently selected task group will be displayed at the top of the pane with its title in red (indicating it as the active task group). The tasks associated with the task group appear as gray buttons directly beneath the task group name. The **<Database>** group provides access to four tasks:

1. **Plot Data**- Add forest inventory data to, or delete data from, the currently active project.
2. **Wood Processing Sites**– View, edit, or delete wood processing sites. See Travel Time Calculation in chapter 3 of this user guide for details on how this information is used.
3. **Project Data Sources**– View the directory paths and names of the project database files and tables and the number of records they contain.
4. **Manage Tables**– View project MS Access database files: browse contents of database tables, open a database in MS Access, or compact a database file nearing the 2 GB Access database size limit.

Figure 2.5 – Task buttons for the Database task group.

Adding Data

Input Data Sources
The FIA BioSum Manager loads annual inventory data from state-level FIADB MS Access databases available at fia.fs.fed.us as an "append" process that can expand the area covered by an existing project, for example, to add adjacent states.

Overview

This task guides users through the three-step process of adding FIA data to a project: 1) identify the location on the computer of plot, condition, and tree data; 2) select an evaluation set to be analyzed (e.g., which years?); and 3) specify plot filters, if analyzing less than an entire state.

Plot filtering options include inputting all plots in a state FIADB file, filtering by menu selection to 1) include only particular counties and/or particular plots within counties, 2) include only plots with forested or non-forested conditions, or 3) filtering by a text file containing a list of plot identifiers (that correspond to PLOT.CN values in the FIADB database) to include.

Inventory plot data can be loaded in one operation, or incrementally. For example, for a multi-state analysis, the data from each state must be separately "appended" to the project.

When FIA BioSum appends plot, condition, and tree records, it does not import every attribute from FIADB. Rather it adds the particular attributes needed by BioSum, matching the field names of the source table with the field names of the target table. As a result, custom or calculated attribute values can be included within a BioSum project only by adding these as columns in BioSum's plot, condition, or tree tables, typically by running update queries that link the BioSum tables to other tables such as those in the FIADB or other databases.

NOTE: If regeneration is to be accounted for within FVS simulations, seedlings must be added to the TREE table before loading FIADB data into BioSum. To do this, run the *Add-Seedlings* script found in the fvs/scripts folder of your newly created project using the VBA interface within the Access database. This adds the seedlings found in each plot to the tree table so that they can be used when developing regeneration parameters. See Appendix C for details.

Adding FIADB Data

1. To begin, click the **<Database><Plot Data>** buttons on the side menu shown in Figure 2.6.

Figure 2.6- Plot data button.

2. The **Plot Data** form will open. Click the **<Add Plot Data>** button depicted in Figure 2.7.
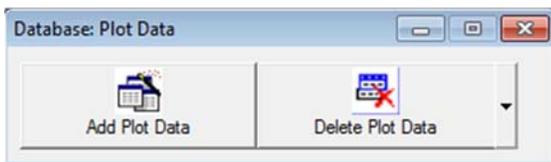

Figure 2.7 – Add or delete plot data.

Please note that windows that open during the BioSum workflow are sometimes hidden behind other windows displayed on the computer's desktop. A good way to find them is to hover the mouse cursor over the BioSum icon in the Windows Start bar—if there are additional BioSum windows open, you will see them as choices for switching to.

3. The first dialog box of the **Plot Data Input** form will appear (see Figure 2.8). Click the folder icon to browse to the location of a state level FIADB Access database, and then select the database to load.

Figure 2.8 – Plot data input.

4. After clicking the desired database and then clicking **\<Open\>**, the 9 table name fields will populate automatically if the FIADB database contains tables with the standard table names for that each type of data (see Figure 2.9).

5. For any table that is not found using the standard name, the table name field will be blank. Click the drop down list to select the desired table from the Access database that contains the data of the specified type (the data matching the dropdown box heading).

6. After ensuring that all table names are correctly specified, click **\<Next\>** to advance to the next step.

Figure 2.9 – Populate form with appropriate tables from the database.

7. A combination of filters can be applied to choose plots, and in some cases, the conditions (full or partial plots) to be included in a BioSum project. These filters are selected via 2 consecutive dialogs. In the second dialog, the population of interest (evaluation set, represented by an EVALID, in FIA parlance) will be specified, such as the 10 panels of field sampled plot data collected for 2005-2014. In the first dialog, there are three levels of plot filtering available that will, in terms of internal program flow, be applied after selecting the desired evaluation set: location, forested status, and condition proportion threshold.

   a. Location: All locations in the state associated with the Access database will be loaded if the "Input all Plots" radio button is selected. If, instead, Filter by Menu Selection is selected, BioSum presents an opportunity to select counties and plots at a later step. The third option is to provide a text file containing a list of PLOT CN (control number) values associated with the plots to be analyzed. If this option is selected, a text file must be browsed for and selected.

      1. **Option 1– Input All Plots. All plots will be added. To add all plots select <Input All Plots>, after first selecting desired options for forested status and condition proportion (see below), then click <Next>.** A list of FIADB EVALID's will appear (see step 8 for guidance). Select the evaluation set of interest and click <**Next**>. Loading of population tables and inventory data may continue for several minutes; thus patience is essential and the temptation to cancel the process, based on a (most likely) incorrect assumption that the load is failing, must be resisted.

      2. **Option 2– Filter Plots by Menu Selection. Plots will be filtered based on selection of counties and plots.**

I. Select <**Filter Plots by Menu Selection**>, and desired options for forested status and condition proportion (see below), then click <**Next>.**

II. A list of FIADB EVALID's will appear (see step 8 for guidance). Select the evaluation set of interest and click <**Next**>. Loading of population tables may continue for several minutes, even on computers with fast processors, so be patient.

III. On the **Filter by State and County** form, select desired counties (counties in only one state can be displayed for any given load operation) (see Figure 2.10). Click <**Append>** to add all plots within the selected counties. Alternatively, select specific plots within the chosen state(s) and counties, by clicking the <**Next>** button to display the **Filter by Plot** form.

IV. On the **Filter by Plot** form, select the desired plots, then click <**Append>**.

3. **Option 3– Filter by File**. Plots will be filtered based on Plot CN (control number) values listed in a text file, one value per line (see Figure 2.11). To designate the text file, select <**Filter by File (Text File Containing Plot_CN numbers)>**, choose the text file, click <**Open>**, select the inventory of interest, and then click <**Next>** to load the population tables and generate the Eval ID selection screen. Select the evaluation set of interest and click <**Next>**. Loading may continue for several minutes, even on computers with fast processors, so be patient.

b. Forested status: The Forested and Non Forested check boxes act as follows. Checking Forested loads any plot with one or more forested conditions. Checking Non Forested loads any plot with one or more non forested conditions. Checking both loads all sampled plots. Most users will want to only load plots containing forested conditions. The opportunity to load completely non-forest plot will likely only be useful for an afforestation analysis. Condition Proportion: Select a value for condition proportion threshold (expressed as a percent) between 1 and 99 using the dropdown list; the default is 25. At the default value, tree data for conditions with condition proportion (fraction of the plot the condition accounts for) of 0.25 or larger (equivalent to the size of one subplot) will be imported into the BioSum Project; for conditions with smaller condition proportions, the condition will be considered nonsampled, and the area accounted for by that condition will re-assigned proportionally to all the other conditions within the same stratum (for example, national forest - forested land) with condition proportion of 0.25 or greater. This helps to protect against modeling conditions containing so few trees that the degree to which the data adequately represents a "stand" for the purpose of exploring management options, is called into question. This threshold can be adjusted, if desired. Increasing the threshold towards 100% will exclude more conditions from contributing to the BioSum analysis while increasing the average count of trees per plot associated with the conditions that remain in the sample; decreasing towards zero will exclude fewer conditions, and increase the inclusion of conditions that may contain very few trees, and may thus generate anomalous results for some conditions.
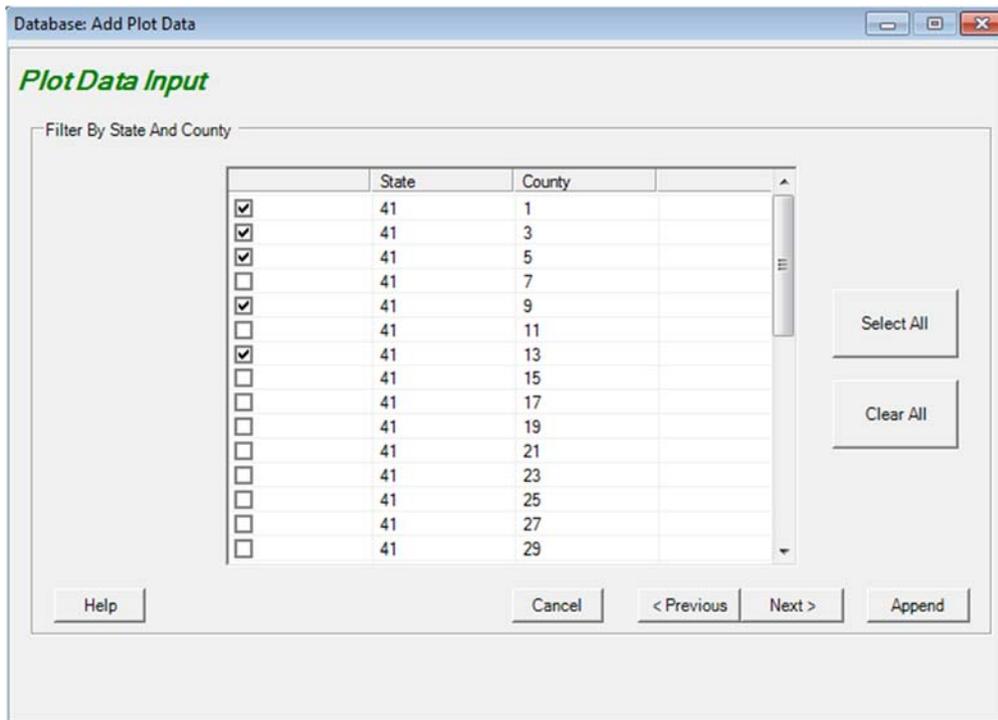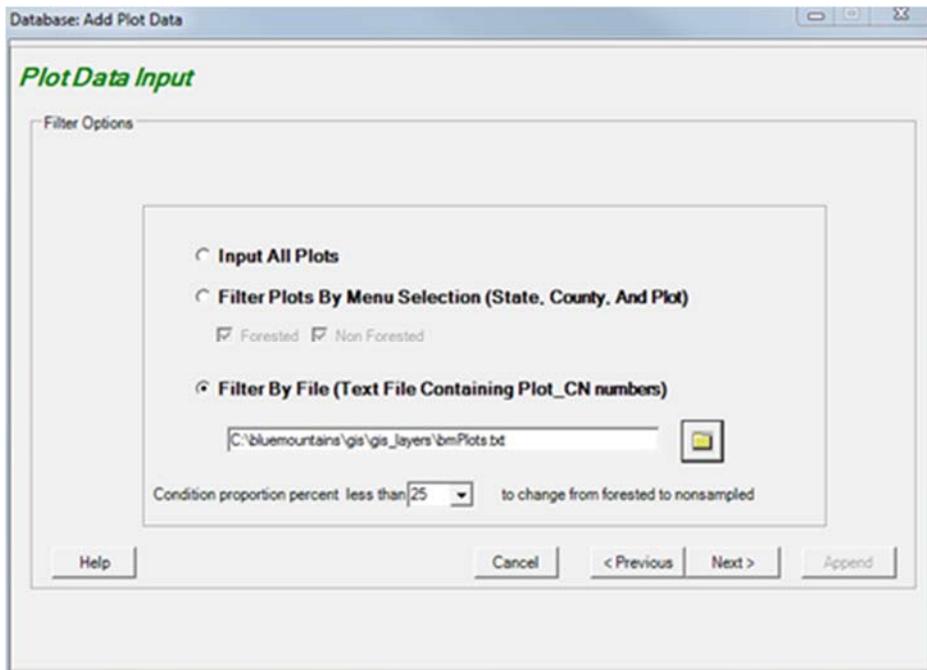
Figure 2.10 – Filter by county.

Figure 2.11 – Filter CN using a text file.

8. BioSum will load the "Eval IDs" (sets of FIA plot identifiers used in the stratification process that ultimately accounts for how many acres of forested landscape each plot and condition represents) from the "POP" tables (e.g., POP_EVAL) in the MS Access input file to allow selection of the state level plot set to be analyzed. Note that additional filtering can be specified to further subset the plots that are loaded into the BioSum project (see above for details). The contents of POP_EVAL tables in FIADB state databases will likely change over time as new Eval ID's are added and existing one retired. For BioSum, look for an Eval Description that references the time period of interest (currently, either the most recent 10 years of available data, or the first ten years of data collected under the annual inventory protocols) and contains the term "Sampled Plots" or "Current Area, Current Volume", for example the yellow highlighted row in Figure 2.12. When in doubt, contact an FIA analyst in your region for advice. As shown below, select the yellow highlighted row (Eval ID = 4) if building a project for the most recent 10 years of data available for Oregon, by selecting it with mouse or cursor keys so that it changes to blue, then click **<Next>**.

EvalId	R.	S.	Lo...	Eval_Descr		ReportYear		Notes
2	2...	4...	Ore...	Oregon 2005-2014, Annual P2, includes Region 6 intensified off-grid plots, All plots		2005;2006;2007;2008;2009;2010;2011;2012;2013;2014	...	
4	2...	4...	Ore...	Oregon 2005-2014, Annual P2, includes Region 6 intensified off-grid plots, Sampled plots	...	2005;2006;2007;2008;2009;2010;2011;2012;2013;2014	...	
20110	2...	4...	Ore...	Oregon 2001-2010, Annual P2, includes Region 6 intensified off-grid plots, All plots		2001;2002;2003;2004;2005;2006;2007;2008;2009;2010	...	
40110	2...	4...	Ore...	Oregon 2001-2010, For DWM, Annual P2, includes Region 6 intensified off-grid plots, Sampled plo...		2001;2002;2003;2004;2005;2006;2007;2008;2009;2010	...	
419901	2...	4...	Ore...	Oregon 1999, AREA, PERIODIC, no NFS, no BLM in WO		1999	...	
419902	2...	4...	Ore...	Oregon 1999, VOLUME, PERIODIC, no NFS, no BLM in WO		1999	...	

Figure 2.12 – Select an Eval ID for loading plots to the project.

BioSum will report progress as data loads, and when finished, will display a dialog showing the number of plots, conditions and trees loaded. After clearing that dialog, exit the plot data input window via <**cancel**> or the close box in the upper right window corner ("X").

Deleting Data

FIA BioSum Manager provides the option to delete plots (including records in the plot, condition, and tree tables). A user may delete all or selected plots. To delete Plots, click on the drop down arrow on the right hand side of the **<Delete Plot Data>** button. Then select <**Delete All Plot Records**> or <**Browse And Delete Selected Plot Records**> (see Figure 2.13).

Figure 2.13 – Delete plot data.

Delete All Plot Records

All plot, condition, and tree records will be deleted. Select **<Yes>** in the Delete All Plot Records window to delete records for all plots.

All selected plots and associated condition, tree, and site tree records will be deleted. This might be useful for adapting an existing BioSum project to a new geographic area while preserving all of the prescriptions, packages, species groups, size classes and wood values already entered.

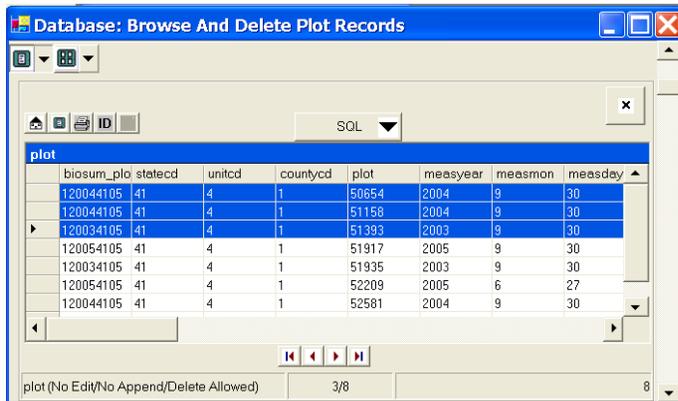## Browse and Delete Selected Plot Records

Figure 2.14 – Browse and delete plot records.

To select multiple plot records, hold down the **<Ctrl>** key and double click in the gray column to the left of the row(s) you wish to delete (see Figure 2.14 for selected rows). Plots can also be selected by right clicking on an entry in a field you wish to sort by, then selecting "filter by entered value" and entering a value. To delete the selected records, hit the <**Delete>** key on your keyboard or right click and select <**Delete**>, then confirm by clicking **<Yes>** (see Figure 2.15). This tool can be used, for instance, to delete plots above a certain elevation (by right clicking in the elevation field, filtering by a chosen value, then deleting selected records) or to delete plots based on other variables.
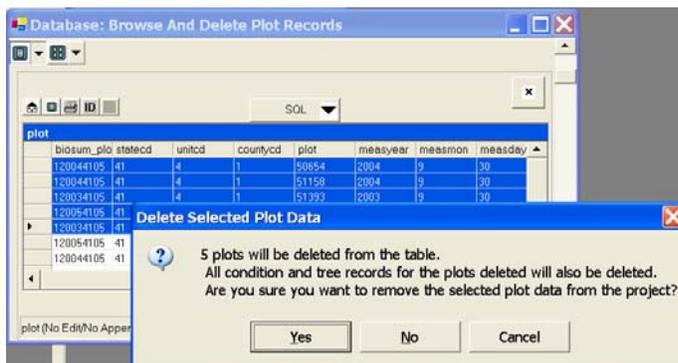
Figure 2.15 – Delete plot data confirmation dialog.

Wood Processing Sites

The Wood Processing Sites task allows entry and editing of wood processing sites-- the locations where harvested wood is delivered for conversion into products or bioenergy. Wood processing sites can be attributed as accepting logs, wood chips, or both and as final delivery terminals or as railheads where wood can be collected and forwarded by rail to a final delivery terminal. Wood processing sites can account for facilities that already exist, or that are under consideration to be built; either way, individual facilities can be toggled on or off during analysis.

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1. Select the **<Wood Processing Sites>** button (see Figure 2.16).

Figure 2.16- Wood Processing Sites button

2. To create a new wood processing site, click on **<New>** (see Figure 2.17). Enter the information on the new wood processing site, including the processing site name, the transportation code (road access, railroad access, or both), the material processed by the site (logs, chips, or both), whether the site currently exists, and facility location (latitude and longitude) (see Figure 2.18). Once a new site has been created, be sure to click **<Save>** before exiting the Processing Sites window shown in Figure 2.17.
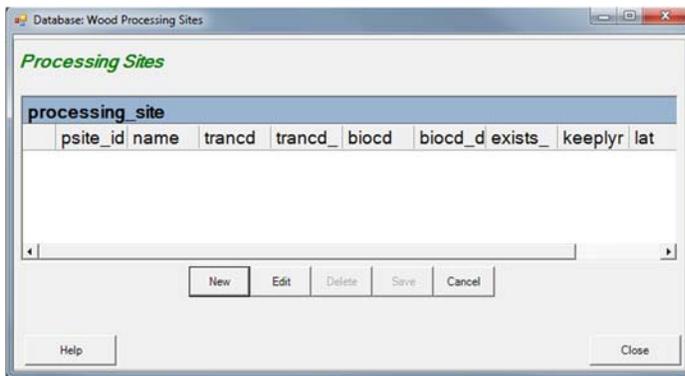
Figure 2.17- Wood Processing Sites dialog
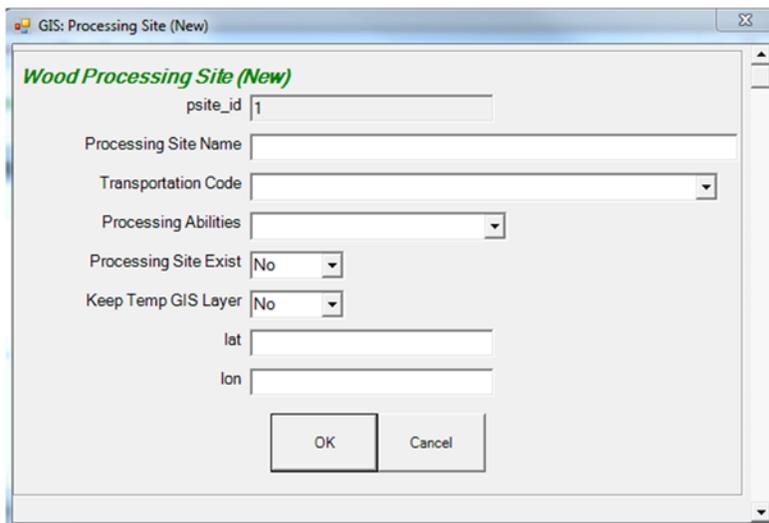
Figure 2.18- Creating a new wood processing site

3. To edit a site, select the <**Edit**> button shown in Figure 2.17 and make changes to each field as needed (see Figure 2.19). Be sure to click <**Save**> before exiting the Processing Sites window to save any edits made.

4. Wood processing sites can also be deleted with this tool by selecting a site then clicking <**Delete**> (also in Figure 2.17), selecting <**Yes**> when the Delete Selected Processing Sites window pops up, then click <**Save**> to save the change.
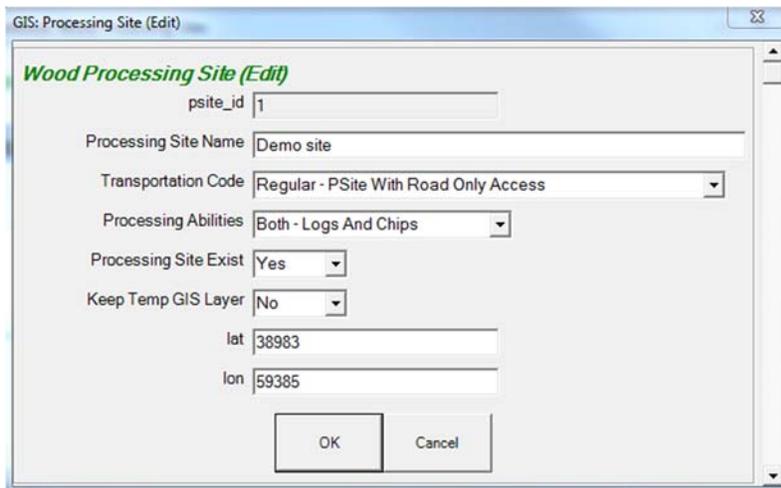
Figure 2.19- Editing a wood processing site

5. Alternatively, site information can be populated or modified by directly manipulating the Access table processing_site within the gis_travel_times.mdb database which typically resides in the gis directory within the BioSum project.

Project Data Sources

1. To view the directory paths and names of the project database files and tables, determine whether or not the file and table names exist, and view table record counts click the **<Project Data Sources>** button from the left-hand menu shown in Figure 2.20. This tool can also be used to change the information source for particular tables in a project (i.e., to point to a different database or table).
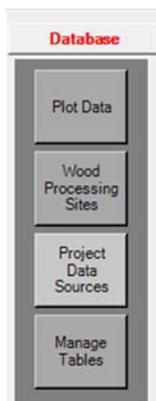
Figure 2.20 – Project data sources.

2. Each table has a unique identifier, or '*Table Type*.' The '*Path*' column displays the directory path for the corresponding MDB File. The '*MDB File*' column contains the file name for the Microsoft Access database. '*File Status*' indicates whether or not a file is found, while '*Table Name*' contains the name of the table. The '*Table Status*' column indicates whether the table is found in the MDB file. '*Record Count*' shows the number of records in the table. All columns may be updated by clicking on the **<Refresh>** button. Some of the 37 table types maintained as input data for a BioSum project are shown in Figure 2-21 and Table 2.1. Other BioSum tables, of both inputs and outputs, associated with the Processor and Core Analysis

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task groups, are not contained in the databases referenced here (those located within the db, fvs and gis subdirectories of a BioSum project).

Figure 2.21- Project data source window

Table 2.1 – Summary of table types in project data sources.

Table Type	Description
Plot	Plot records.
Condition (aka stand)	Condition records.
Tree	Tree records.
Fire And Fuel Effects	Pre- and Post-treatment fire and fuel effects data generated by FVS.
Harvest Costs	Harvest cost data generated by OpCost.
Owner Groups	FIADB owner group values and descriptions.
Tree Diameter Groups	User defined groupings of tree species and diameters.
Treatment Prescriptions	User defined treatment labels. Treatments are assigned an A-Z character value.
Tree Species Groups	User defined tree species group number and tree species group label.
Tree Species Groups List	User defined tree species group assignments. Lists the tree species under each group number.
Tree Species	Lists tree species by FIA species code, FVS species code, FVS variant, FVS conversion value, group assignment, oven-dry weight conversion to dry to green weight ratios.
FVS Tree Species	Conversion matrix of FIA tree species to FVS tree species by FVS variant.
Tree Volumes And Values By Species And Diameter Groups	Processor summed output of tree volumes and values by the groupings listed in both the 'Tree Diameter Groups' table and the 'Tree Species Groups' table.
Travel Times	Travel times between plots and processing sites on the road network and between railheads and processing sites on the rail network.

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Processing Site	Wood processing site facilities.
FVS Tree List For Processor	FVS tree cutlist output that has been formatted by the FIA BioSum Manager to be used as input into the Processor.
FIADB FVS Variant	User defined plot and FVS variant assignments for FIADB records. NOTE: Not used for PNW IDB because records already have FVS variant assignments.
Tree Species And Diameter Groups Dollar Values	Dollar value per unit volume for the tree diameter and species group assignments.

3. Data sources can also be edited using this tool, giving the user the ability to manage tables that are used in a BioSum project. To edit a data source, select a table type and click the <Edit> button on the top left of the screen as shown in Figure 2.21. This tool displays where the selected table is currently stored and allows the user to move the selected table to a differed mdb file, copy the selected table to a different mdb file, or make a copy of the table within the same mdb file, assigning a new name to the copy (see Figure 2.22). One useful feature of this tool is that it allows the user to overcome the MS ACCESS 2GB file size limit by allowing a table to be copied to another MDB. Once the desired changes are made, select <Commit Change> then close the window with <Close> or the close control <x>.
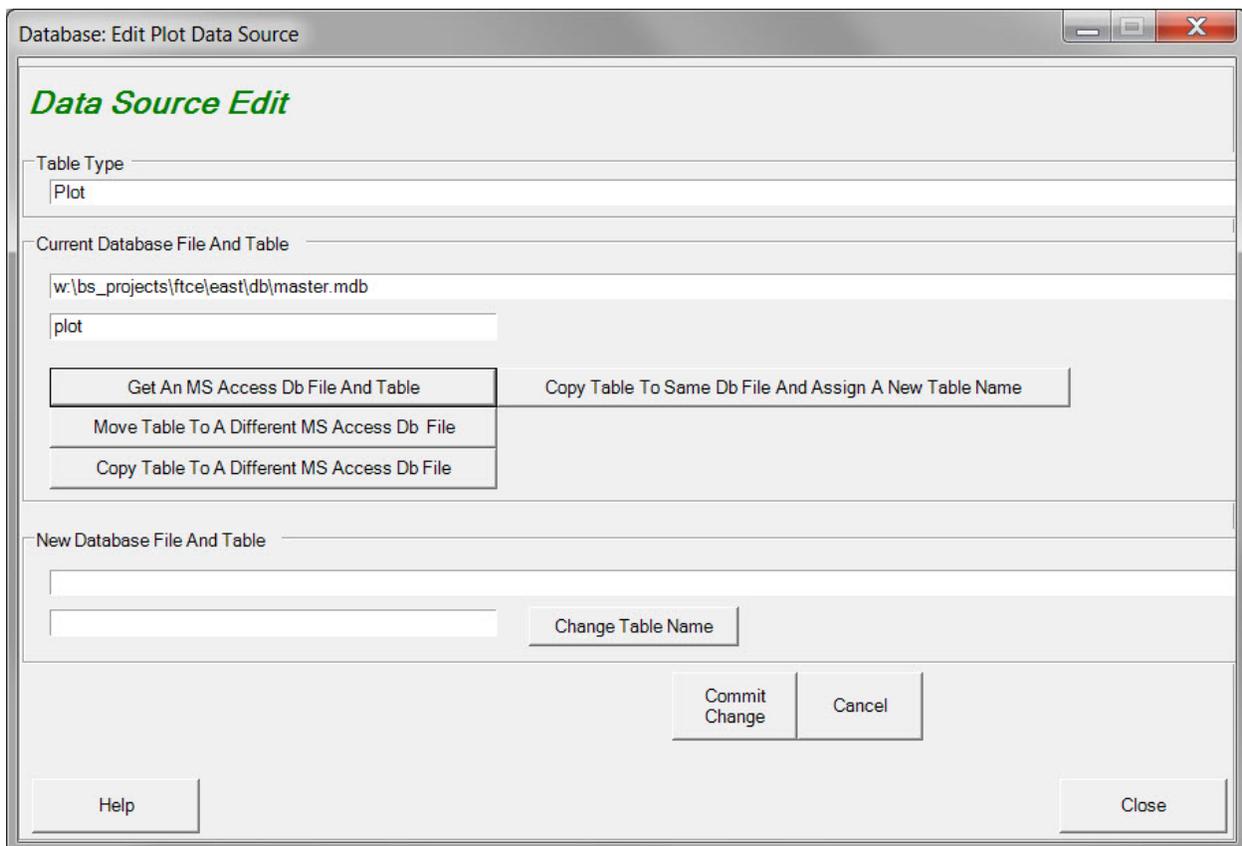

Figure 2.22- Editing data sources

Manage Tables

The **Manage Tables** task (see Figure 2.23) lists the project MDB files in a tree directory format, the tables in a MDB file, and the columns in a table. This tree directory can be utilized to locate and inspect all databases and tables in a BioSum project (see Figure 2.24). When a MDB file is selected, it can be compacted by clicking on the **<Compact>** button, or opened in Access by clicking on the **<Open in Access>** button. Opening the MDB file in Microsoft Access allows the user to view the tables in an MDB file, the data within each table, and make edits to the MDB file and associated data (though this is not generally advised). The user may also select a table and columns of their choice, and click on **<Browse>** to view the records. Once columns in a table are selected (boxes next to the column names are checked), the <**Browse**> button allows users to review the data populating those columns in the selected table, without risk of inadvertently introducing unwanted edits.
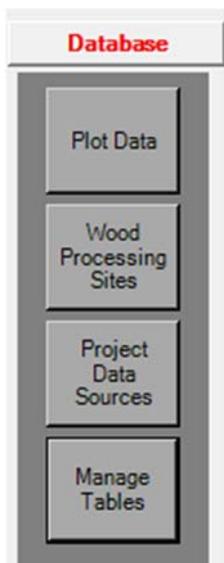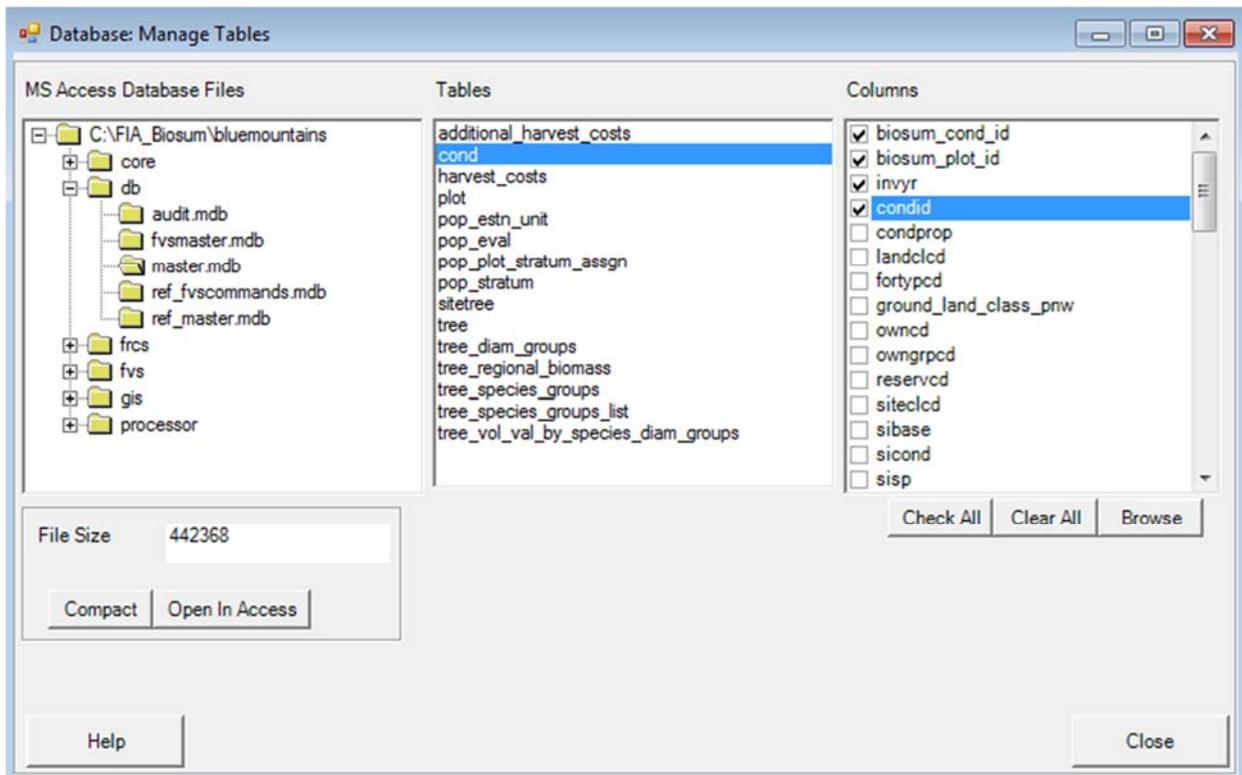

Figure 2.23- Manage Tables.

Figure 2.24– Manage Tables dialog.