6. Treatment Optimizer

Overview

The Treatment Optimizer module builds on databases generated by successfully completing all the preceding modules (Database, FVS, Processor), enabling analysis and exploration of one or more optimization scenarios. A complete scenario contains assumptions about the land base to be considered, processing sites to which merchantable wood and residues can be delivered, per hour costs for wood transportation and, by reference to a processor scenario, simulation cycle specific per acre costs, and wood production and revenues associated with each modeled treatment. It also contains decision rules, crafted by the analyst while engaging in treatment optimizer, that determine which treatments are effective for each stand at each time, and when more than one are effective, which is preferred. Economic considerations can be integrated here, for example to filter out stand-prescription combinations deemed too costly, and to include cost in the consideration of what a preferred treatment looks like.

Module Components

The button that activates the Treatment Optimizer module can be found in the module-selector on the left-side of the FIA BioSum Manager desktop (it is labeled "Treatment Optimizer"). Selecting it opens a 3-button panel that accesses three tasks: (1) **Define Calculated Variables**, (2) **Load GIS Data**, (3) **Optimization Scenario**, and (4) **Export to SQLITE**. Unless Calculated Variables are used, the current version of Treatment Optimizer supports analysis for treatment effects, production, costs and revenues associated with cycle 1 only.

Define Calculated Variables

There are two categories of calculated variables (weighted FVS and weighted economic). Weighted FVS variables are derived from values in the PRE/POST tables that are generated by the FVS module. These tables are located in the /fvs/data/<variant> folder.

Weighted FVS variables can be used in an optimization scenario when defining the elements of an effective treatment, as the optimization variable, or as the first tie-breaker variable. Weighted economic variables can be used in an optimization scenario as the optimization variable or as the first tie-breaker variable. In addition, weighted economic variables derived from net revenue or onsite treatment costs can be used to filter packages in the optimization settings.

1. Click the <**Define Calculated Variables**> button to review the list of calculated variables. This screen lists all of the calculated variables available for use along with their descriptions and category/type.
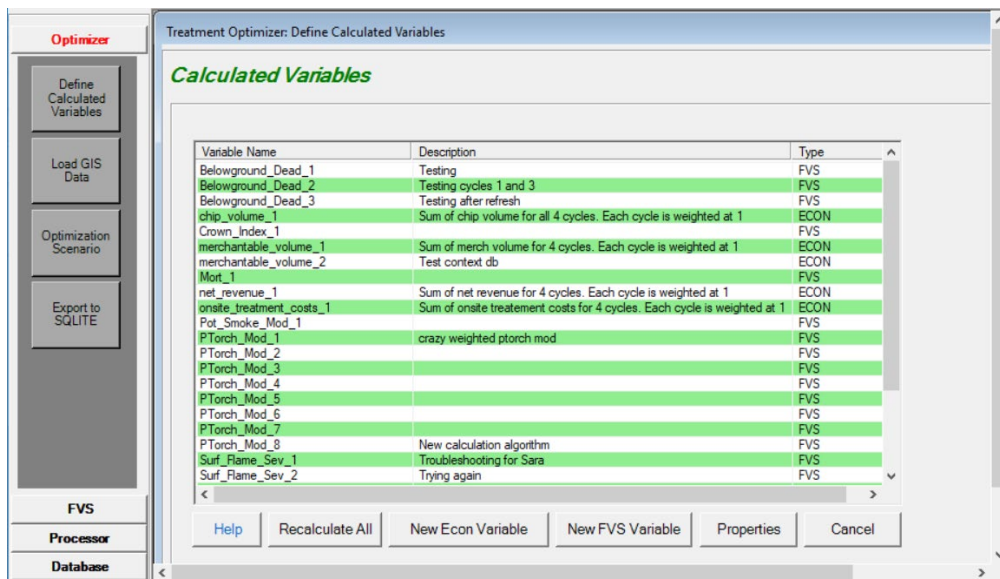

Figure 6.1: List of calculated variables

2. From this window, you have the option of (1) viewing the **Help** for this screen (2) **Recalculating All** existing FVS weighted variables (3) configuring a **New Econ Variable**, (4) configuring a **New FVS Variable**, (5) viewing the **Properties** of a variable, or (6) selecting **Cancel** to close the window.

Recalculate All

1. FVS-based calculated variables are calculated at the time they are created resulting in faster processing times for Treatment Optimizer scenarios. If the underlying FVS output tables change because FVS is re-run, the contents of the weighted variable tables will be

invalid. The most common reason for re-running FVS after working in Treatment Optimizer is to modify the list of prescriptions.

2. Click the **<Recalculate All>** button to commence the recalculation process. Because this process cannot be reversed, you must confirm that you do wish to recalculate. A copy of the existing prepost_fvs_weighted.accdb is saved under the name prepost_fvs_weighted_backup.accdb before the recalculation starts in case of a problem.

3. This process may take several minutes to run depending on the size of the FVS tables and the number of weighted variables.

Configuring a New FVS Variable

1. Click the **<New FVS Variable>** button to configure a new weighted FVS variable.
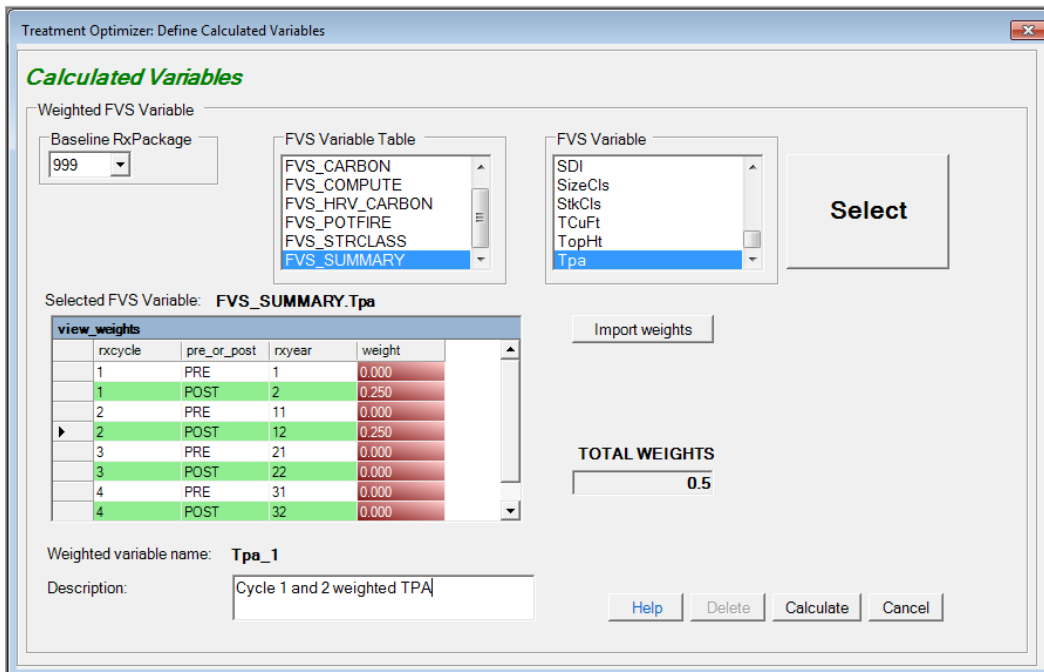

Figure 6.2: New weighted FVS variable properties screen

2. The fields on the weighted FVS variable properties screen are:

    a. **Baseline RxPackage**: Without weighted variables, the effectiveness of optimization scenarios is based on the concept of comparing pre and post values for stand attributes for cycle 1; that is, comparing the values before and immediately (1 year) after treatment. With weighted variables, because you will be comparing summary values across multiple cycles/treatments, the first step is to choose a baseline RxPackage. Treatment

Optimizer will compare the metrics for each RxPackage to the results from the Baseline package. A common scenario is to compare active treatment packages with a grow-only package to isolate the effects of the treatments. Biosum grow-only packages are customarily assigned the RxPackage number 999, but this is configurable.

b. **FVS Variable Table**: This is a list of all the FVS Pre/Post tables that are available to be used as the basis for an FVS weighted variable. If you do not see a table or field that you expect, check the specifications of database output tables in your FVS KCP files. These tables are generated from FVS database output by the BioSum FVS module. Click on a table name to select it, and it will display in highlight.

c. **FVS Variable**: When you select an FVS Variable Table, this box will populate with a list of fields from that table. After you have selected your desired variable, click the **<Select>** button.

d. **Selected FVS Variable:** This read-only field will populate with the table and name of the FVS variable you select from the dropdown lists. This field must be populated before clicking the **<Calculate>** button and before any weights can be imported.

e. **view_weights:** This table lists the rxcycle, and rxyear associated with each analysis point. The rxyear should be used only as a point of reference as it could vary across variants in the project. Each weight is linked to a cycle, Pre or Post. For example: cycle 1 Pre and cycle 1 Post. Enter the appropriate values in the editable (red) column for each analysis point. Below are two possible weighted variable configurations:

Table 6.1: Sample weights for an FVS variable summed after each treatment

Cycle	Weight
1 (Pre)	0
1 (Post)	1
2 (Pre)	0
2 (Post)	1
3 (Pre)	0
3 (Post)	1
4 (Pre)	0
4 (Post)	1

Table 6.2: Sample weights for an FVS variable averaged over 8 cycle time points

Cycle	Weight
1 (Pre)	0.125
1 (Post)	0.125
2 (Pre)	0.125
2 (Post)	0.125
3 (Pre)	0.125
3 (Post)	0.125
4 (Pre)	0.125
4 (Post)	0.125

    f. **TOTAL WEIGHTS**: This read-only field will automatically add the weight values together as you enter weights into the view_weights grid. This is a running total.

    g. **Weighted Variable Name:** This read-only field contains the name of the weighted variable that displays on the Treatment Optimizer scenario screens. FIA Biosum generates the Weighted Variable Name by appending a suffix to the selected FVS variable name. For example: the first weighted variable associated with Surf_Flame_Sev is Surf_Flame_Sev_1, the second Surf_Flame_Sev_2 and so on.

    h. **Description:** This is an optional, but strongly recommended, free form text field where you can type a description of the weighted FVS variable. This description appears on the main Calculated Variables screen and some Treatment Optimizer scenario configuration screens.

3. There are four enabled buttons on the new weighted FVS variable screen. They are:

    a. **<Import weights>**: See the section below on Exporting and Importing variable weights for guidance on using this button

    b. **<Help>**: As on other FIA Biosum screens, clicking on this button opens a new window that displays help text and instructions associated with this screen.

    c. **<Calculate>**: The **<Calculate>** button saves the settings for the calculated variable to the project database. This button also calculates the weighted values for each stand + rxPackage + rxCycle and saves them to the PRE_<FVS_TABLE_NAME>_WEIGHTED and POST_<FVS_TABLE_NAME>_WEIGHTED tables where

FVS_TABLE_NAME is the name of the source FVS output table. For example, if the source variable is from the FVS_POTFIRE table, the name of the PRE_<FVS_TABLE_NAME>_WEIGHTED table will be PRE_FVS_POTFIRE_WEIGHTED. These tables may be found in the /optimizer/db/ prepost_fvs_weighted.accdb.

Because the values are calculated when the FVS weighted variable is created, they can be shared across multiple optimization scenarios and will not be re-calculated when a scenario is run, shortening processing time.

    d. **<Cancel>**: Closes the FVS variable properties screen without creating the weighted variables or saving any parameters specified and returns to the main Calculated Variables screen. This action will <u>not</u> save changes and cannot be undone.

Viewing the Properties of an existing weighted FVS Variable

1. Select the variable you want to review in the main Calculated Variables screen and click the <**Properties**> button. FVS variables can be identified by the 'FVS' value in the **Type** column.
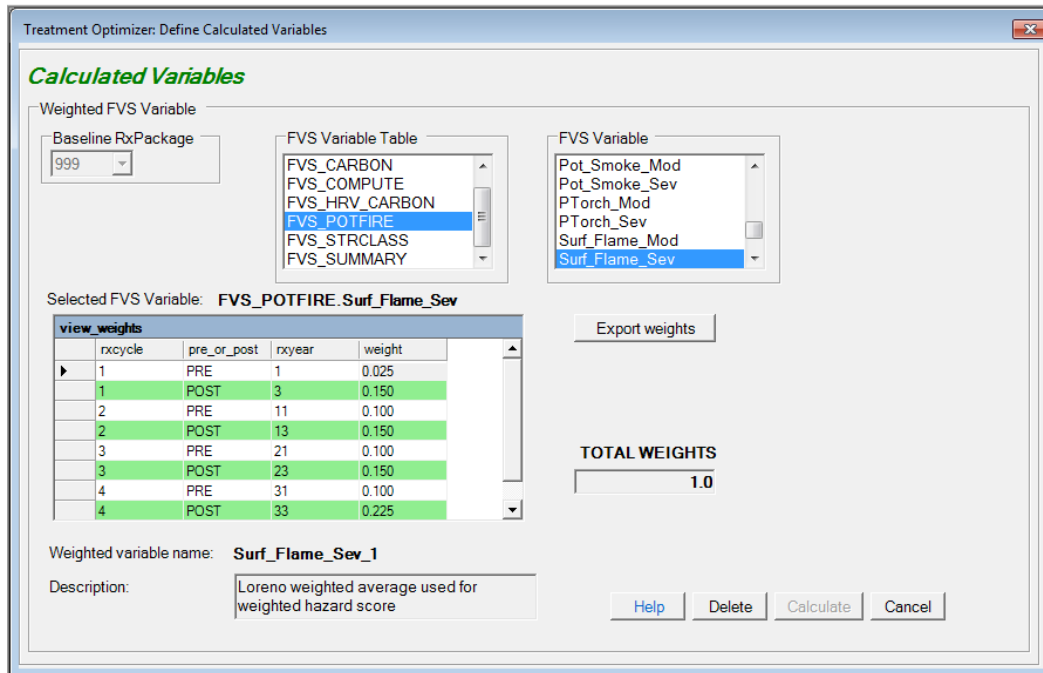

Figure 6.3: Existing weighted FVS variable properties screen

2. The screen for viewing the properties for an existing FVS variable is almost identical to the screen for creating a new weighted FVS variable. See the section immediately above for detailed descriptions of each field.

   The weighted FVS variable properties screen is read-only. As weighted FVS variables can be shared across scenarios, it could lead to data corruption if a weighted FVS variable were re-configured and recalculated if it had been previously used in an optimization scenario.

3. There are four enabled buttons on the view weighted FVS variable properties screen. They are:
   a. <**Export weights**>: See the section below on Exporting and Importing variable weights for guidance on using this button
   b. <**Help**>: As on other FIA Biosum screens, clicking on this button opens a new window that displays help text and instructions associated with this screen.
   c. <**Delete**>: The <**Delete**> button deletes the weighted FVS variable configurations from the project databases and the weighted value columns from the

PRE_<FVS_TABLE_NAME>_WEIGHTED and
POST_<FVS_TABLE_NAME>_WEIGHTED tables

Weighted FVS variables can only be deleted if they are not associated with any optimization scenarios. FIA Biosum will prevent you from deleting an FVS variable if it is in use by an optimization scenario.

d. **<Cancel>**: Closes the FVS variable properties screen without saving the contents and returns to the main Calculated Variables screen.

Configuring a New Economic Variable

This function is similar to viewing the properties of an existing economic variable except that the screen is enabled to allow for variable customization. Economic variables are calculated when a scenario is run and their values are written to the post_economic_weighted table in the optimizer\db\scenario1\scenario_results.mdb.

Viewing the Properties of an Existing Economic Variable

1. Select the variable you want to review in the Calculated Variables tables and click the <**Properties**> button. FVS variables can be identified by the 'ECON' value in the **Type** column.
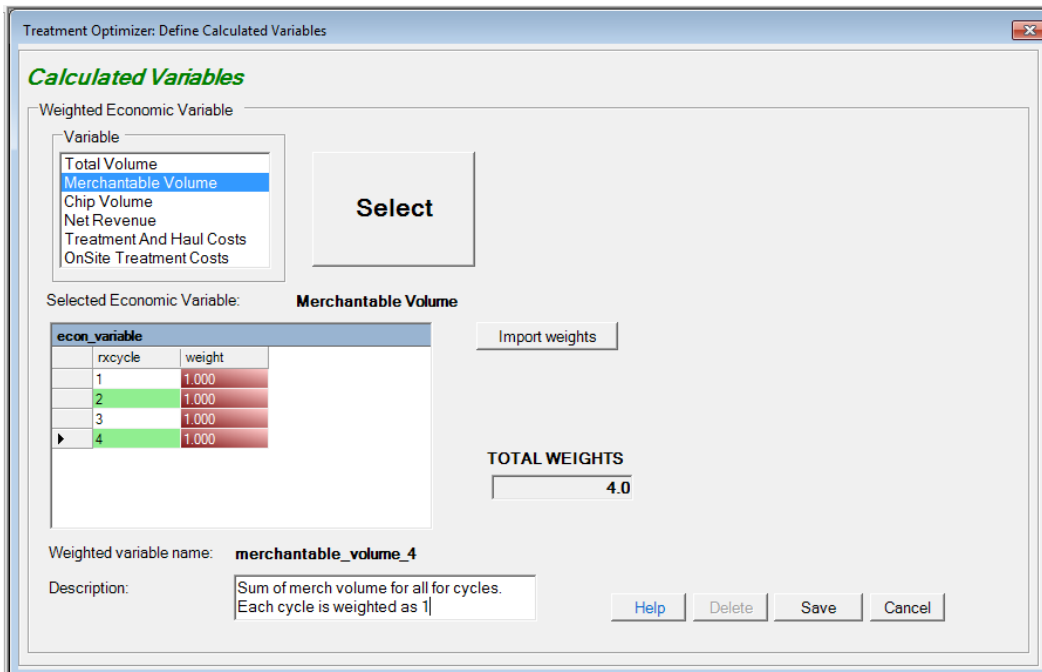

Figure 6.4: Weighted Economic variable properties window

2. The fields on the weighted Economic variable properties screen are:

a. **Variable**: The list of weighted economic variables that can be computed and tracked in BioSum:

Table 6.3: Six economic variables available in FIA Biosum

Variable	Description
Chip Volume	Chip volume generated from the stand/rxPackage
Merchantable Volume	Merchantable volume generated from the stand/rxPackage
Total Volume	Sum of chip and merchantable volume
Net Revenue	Revenue generated from the stand/package less the treatment and haul costs
Treatment and Haul Cost	Sum of harvest costs and haul costs
Onsite Treatment Cost	Costs of implementing the harvest and any surface fuel treatments

b. **Selected economic variable**: This read-only field shows the selected economic variable

c. **econ_variable**: This table displays the weight applied to each rxCycle. Below are two possible weighted variable configurations:

Table 6.4: Sample weights for an economic variable summed over 4 cycles

Cycle	Weight
1	1
2	1
3	1
4	1

Table 6.5: Sample weights for an economic variable averaged over 4 cycles

Cycle	Weight
1	0.25
2	0.25
3	0.25
4	0.25

d. **TOTAL WEIGHTS**: Sum of weights for all 4 cycles

e. **Weighted variable name**: This read-only field contains the name of the weighted variable that is displayed on the Treatment Optimizer scenario screens and as the column name in the post_economic_weighted table. FIA Biosum generates the weighted variable name by appending a suffix to the selected economic variable.

For example: the first weighted variable associated with Merchantable Volume is merchantable_volume_1, the second merchantable_volume_2 and so on.

   f. **Description**: This is an optional, but highly recommended, free form text field that may contain a description of the weighed economic variable. This description appears on the initial weighted variables screen and some Treatment Optimizer scenario configuration screens.

4. There are four enabled buttons on the weighted economic variable properties screen. They are:

   a. **<Export weights>**: See the section below on Exporting and Importing variable weights for guidance on using this button

   b. **<Help>**: As on other FIA Biosum screens, clicking on this button opens a new window that displays help text and instructions associated with this screen.

   c. **<Delete>**: The **<Delete>** button deletes the weighted economic variable configurations from the project databases. Weighted economic variables can only be deleted if they are not associated with any existing Treatment Optimizer scenarios. FIA Biosum will prevent you from deleting an economic variable if it is in use by an optimization scenario. You are also prevented from deleting built-in weighted economic variables (described below).

   d. **<Cancel>**: Closes the economic variables property screen and returns to the main Calculated Variables screen.

Built-in Weighted Economic Variables

FIA Biosum provides a set of default weighted economic variables for your use. These weighted variables assign a weight of 1 to each cycle resulting in the sum of the selected economic variable over all 4 cycles. For example, **net_revenue_1** is the sum of net revenue for all 4 cycles. These built-in variables cannot be deleted. Thus the first custom net_revenue variable that can be created will be labeled net_revenue_2.

Exporting and Importing Variable Weights

Variable weights can be exported from existing weighted variables or imported into new variables. Exported weights are stored in a comma-separated text file to a computer file location specified by the analyst. A project's \optimizer\db folder is one logical location for storing these text files.

To export weights that have already been defined for or associated with an existing weighted variable, view the Calculate Variables dialog for that weighted variable. Then click the **<Export weights>** button and specify a location for the text file. The process should complete in a few seconds. To import weights into a new weighted variable, click the **<Export weights>** button and specify the location of the text file. This process should also complete in a few seconds and the imported weights will appear on the **view_weights** grid. Weighted FVS variables have eight weights and weighted economic variables have four weights, so their weight text files are not interchangeable.

To create a new weight text file without exporting weights, follow the specifications below for weighted FVS and economic variables and save the file with a **.txt** extension. The first value is always the RxCycle number. If BioSum can't read the import file, it will show a message and abort the import process.

Weighted FVS variable example

```
1,PRE,0.025
1,POST,0.15
2,PRE,0.1
2,POST,0.15
3,PRE,0.1
3,POST,0.15
4,PRE,0.1
4,POST,0.225
```

Weighted Economic variable example

```
1,0.33
2,0.33
3,0.33
4,0.01
```

Load GIS Data

Treatment Optimizer calculates haul costs as an element of an optimization scenario. The processing_site and travel_time tables in the \gis\db\gis_travel_times.accdb must be populated prior to calculating haul costs. If the project plots are in one of eight western states (CA, CO, ID, MT, OR, UT, WA, and WY), BioSum provides a master database and automated loading process that may be used to populate these tables.

Before loading the gis_travel_times.accdb, the gis_travel_times_master.accdb needs to be in your AppData directory. The path to this folder varies by computer. The easiest way to locate the correct folder is to click the <**Load GIS Data**> button. If BioSum can't find gis_travel_times_master.accdb, the error message provides the path that it needs to be copied to:
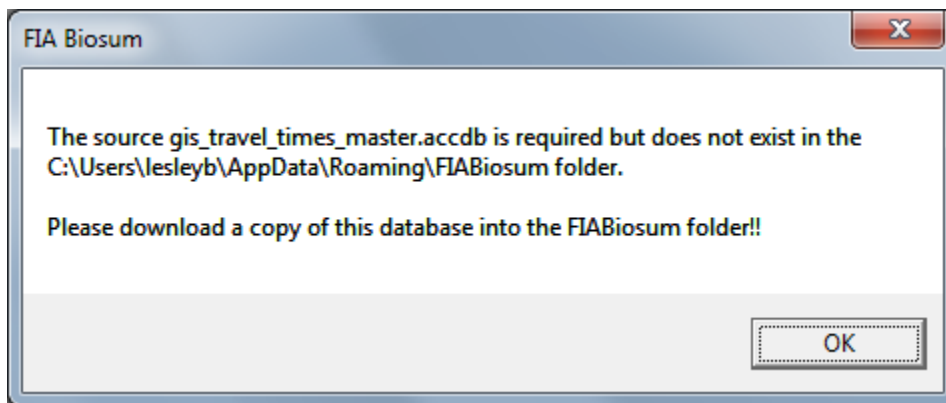
gis_travel_times_master.accdb may be in your C:\FIA\setup folder as it is distributed as part of the BioSum full installation package. If you can't find the database there or want to make sure you have the most current copy, the database can also be downloaded from http://biosum.info. Note that the database is large (approximately 500,000 kb).

When the gis_travel_times_master.accdb is in place, click the <**Load GIS Data**> button to start the load process. If BioSum detects existing data in the processing_site or travel_time tables, it will ask for confirmation that the data should be reloaded:
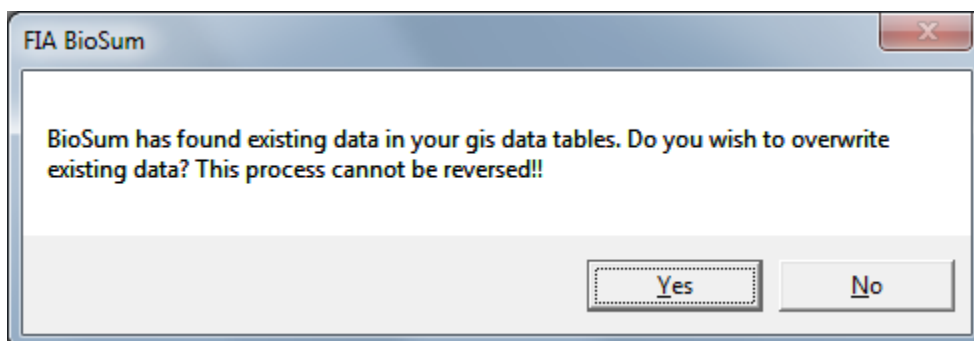
If you allow existing data to be overwritten, BioSum provides the option of backing up the existing data before proceeding.

The automated load process may take a few minutes depending on the number of plots in the project. BioSum starts by selecting records from the master travel_time table associated with all plots in the project. Then BioSum creates processing_site records for every processing_site listed in the project travel_time table. The processing_site table contains some fields that aren't displayed in the BioSum interface and may serve as a resource, if supplementary information about processing_sites is helpful.

A progress indicator will appear in the middle of the BioSum window for the duration of the process. Detailed process steps will appear in the lower right-hand corner of the BioSum Window. When the load has successfully completed, BioSum will show this message: "If you updated existing GIS data, verify the selected sites in Treatment Optimizer. GIS data successfully loaded!"

Optimization Scenario

When you click the <**Optimization Scenario**> button, the Open Scenario screen will appear:
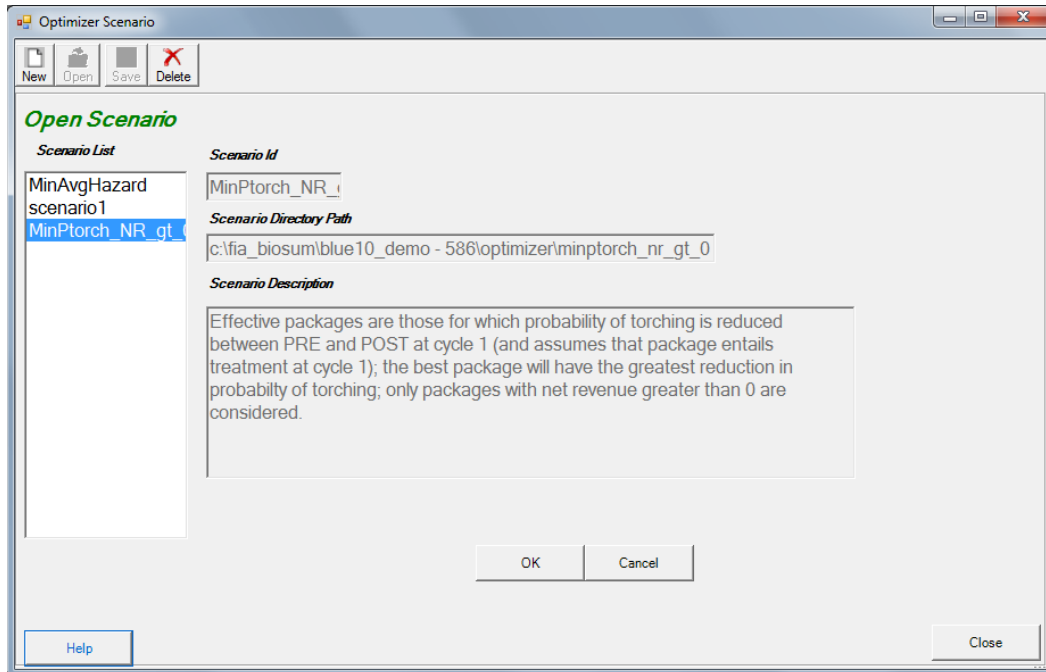
Figure 6.5: Open Scenario window

The Open Scenario form has the following fields:

1. **Scenario List**: This is the list of all the optimization scenarios available in the project. When a scenario in this list is selected (highlighted), the other fields on the screen will update to reflect information about the selected scenario.
2. **Scenario Id**: The optimization scenario id currently selected from the list
3. **Scenario Directory Path**: The computer file system path to the scenario currently selected from the list
4. **Scenario Description**: An optional free form description of the scenario currently selected from the list

There are two buttons enabled on the toolbar in the upper left corner of this window. They are:

1. **<New>**: Use this button to create a new optimization scenario. The **New Scenario** window that will open has places for you to enter the **Scenario Id** and **Description**. The scenario id is required and the description is optional, but strongly recommended. Although the suggested scenario id will start with scenario…, it is recommended to choose a more descriptive scenario id so that it will be useful when trying to identify and select a particular scenario in the future.

2. **<Delete>**: Use this button to delete the selected scenario. All configuration settings and databases associated with the selected scenario will be deleted. **Caution**: this action <u>cannot</u> be undone.

There are two buttons at the base of this window. They are:

1. **<OK>**: This button opens the selected optimization scenario and displays the settings it contains, ready for viewing or editing.
2. **<Cancel>**: Closes the Open Scenario window

Treatment Optimizer Scenario properties

After clicking the <**OK**> button to open an optimization scenario, you can review and update the scenario properties using a combination of buttons and tabs that are available on this form.
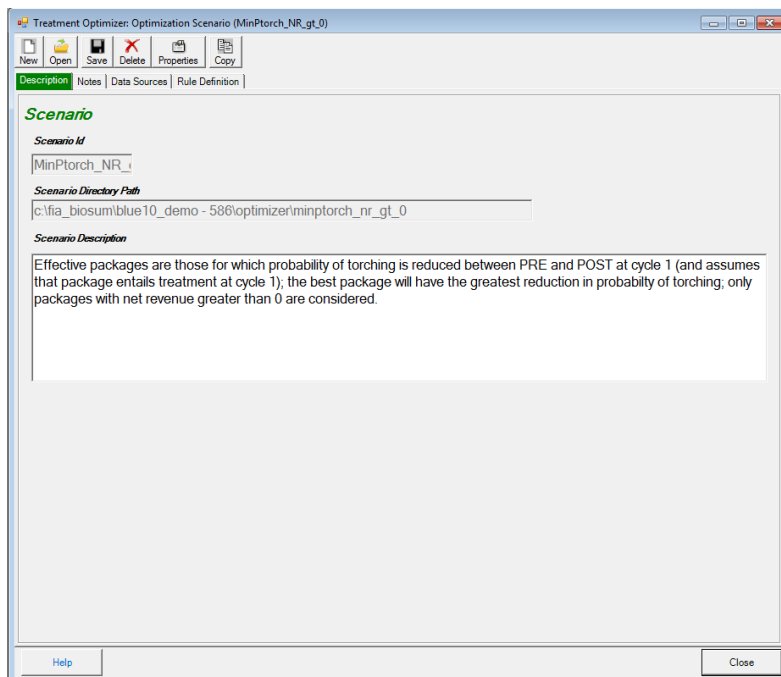
Figure 6.6: First page (Description tab) of optimization scenario properties

The toolbar in the upper left corner of this form has 6 enabled buttons:

1. **<New>**: Opens the new scenario screen to create a new optimization scenario, but see note for <**Open**> button below, as to advisability. It is almost always better to close open scenarios before initializing a new one.
2. **<Open>**: Allows you to select and open an additional scenario. Having multiple optimization scenarios open at the same time can be confusing and is not advised except when there is a desire to inspect and compare two different scenarios, screen by screen.

3. **<Save>**: Saves the configuration settings for the optimization scenario that is open. This button saves all of the settings for the entire scenario regardless of which tab is currently active.
4. **<Delete>**: Deletes the scenario that is open in this window and returns to the Open Scenario screen. All configuration settings and databases associated with the deleted scenario will be removed. **Caution:** this action <u>cannot</u> be undone
5. **<Properties>**: Displays the configuration settings for the current scenario in plain text format, allowing for the review of all configuration settings on a single page. This button is also useful for documenting a scenario, as you can copy and paste the settings into an external text document that can be saved and used as a log or audit trail.
6. **<Copy>**: Copies the settings from a selected scenario to the current scenario. **Caution**: copying a scenario overwrites any existing scenario settings and this action <u>cannot</u> be undone.

The Scenario Description can be updated on this form, if desired. Clicking the **<Close>** button closes the optimization scenario properties window. FIA Biosum will prompt you to save unsaved changes, if any, when this button is clicked.

There are three other tabs on this screen, in addition to **Description: Notes, Data Sources** and **Rule Definitions**.

1. **Notes**: This space accommodates detailed notes about a scenario. Use this tab if the Description field is not large enough to accommodate your descriptive text, or if there is a need to otherwise supplement the information contained in the description.
2. **Data Sources**: This tab displays pointers (file paths, file names, table names, status, records counts, etc.) to all types of source data used in the optimization scenario. Any of these data sources can be copied to another table or database and the pointer updated to point to the copy instead of the original data source. These copies can then be updated or customized to allow further customization of scenarios. For example, an alternate version of travel times could be generated, reflecting the construction of a new road, and could allow the analysis to account for faster travel times from stands to processing facilities.
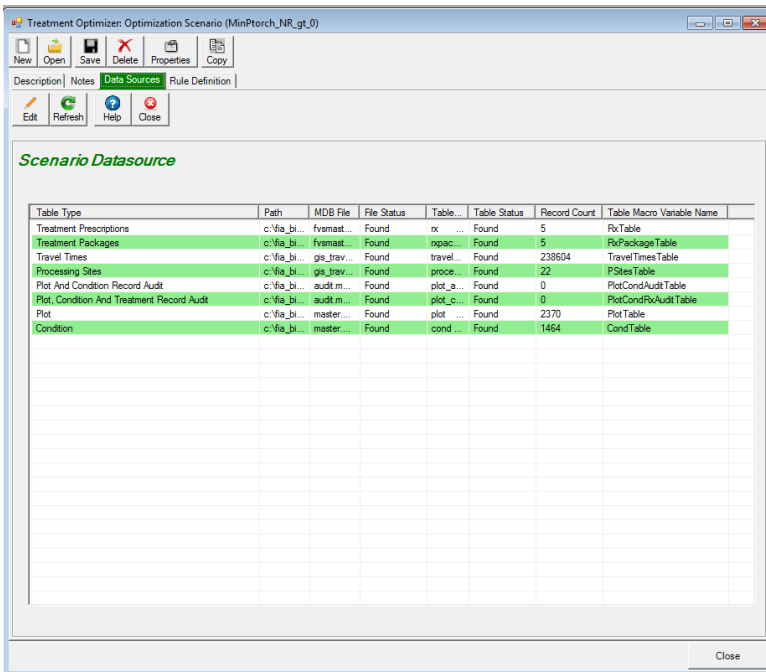
Figure 6.7: The Data Sources tab lists all of the optimization scenario data sources

To edit the pointer to the data source, and to make copies of data sources, select a table type and click **<Edit>**. The **Data Source Edit** window will appear. Here you can move, copy, or rename existing Access DB files and tables, and reset links for any table type.
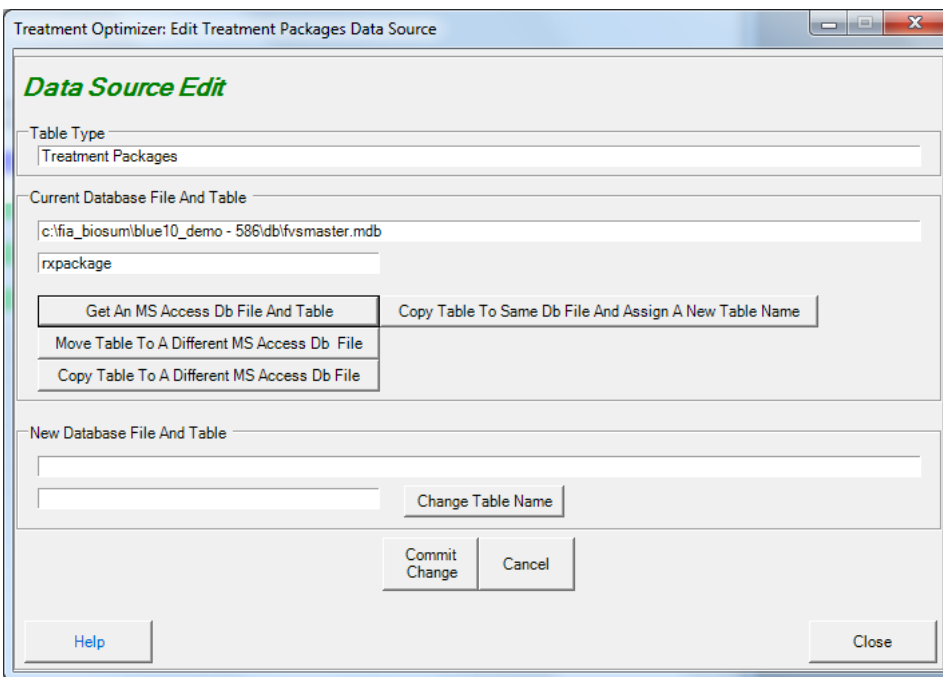

Figure 6.8: The Data Source Edit window

Caution: Making changes to data sources is an advanced capability, not to be undertaken lightly or by FIA Biosum beginners, and has the potential to be confusing or produce unintended consequences.

Rule Definitions

Most of the properties related to a case scenario are configured from the Rule Definitions tab. This tab has 7 child tabs. They are: **Land Ownership Groups**, **Cost and Revenue, Wood Processing Sites, Filter Plot Records, Filter Condition Records, FVS Variables** and **Run**.
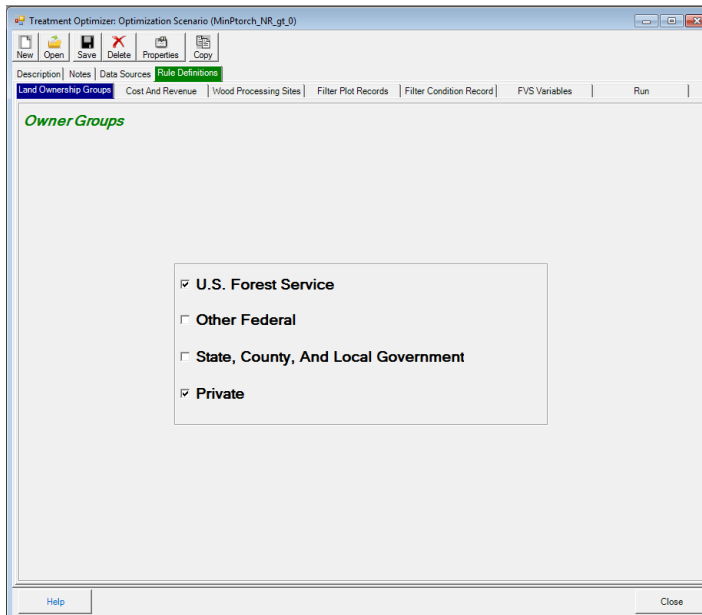
Figure 6.9: The first child tab on the Rule Definitions tab is Land Ownership Groups

1. **Land Ownership Groups**: Allows you to filter your scenario input plots according to landowner group (for example, USFS, private). A checked box tells FIA Biosum to include stands from the corresponding land owner group. One, some, or all owner group boxes can be checked depending on which ownerships are assumed to be managing with the treatments specified in this project.

    It is possible to query final outputs to determine how much of the area treated falls belongs to each owner group, and how much woody biomass, by size class, was generated by each owner group, but these kinds of answers are inextricably linked to the land base considered at the time of the analysis. For example, a bioenergy facility at a given site may only be economically feasible (in terms of longevity of feedstock supply) if all treatable lands are treated. By applying the landownership constraints prior to running the analysis, it is easy to determine scenarios that will make it more obvious when there is not enough supply to warrant a bioenergy facility (e.g., if only Private was checked).

2. **Cost and Revenue**: This tab has 2 child tabs. They are: **Haul Costs** and **Processor Scenario**. The fields on the **Haul Costs** tab relate to costs of hauling woody material (e.g., merchantable wood and woody biomass destined for bioenergy feedstock) from the forest to processing sites. They are:

   a. **Round Trip Truck and Driver Haul Cost per Green Ton Hour:** should be entered in dollars and is used, in combination with the program-calculated round-trip travel times between plots and processing sites, to calculate the costs of hauling woody material (chips or logs) to processing sites via the road network.

   b. **Rail Haul Cost per Green Ton Mile**: should contain the per-mile cost, in dollars, of moving one ton of material one mile along a rail network once it is already on the rail network.

   c. **Truck to Rail Transfer Load Cost (Merch) $/gt**: specifies the costs of inter-modal transition from truck to rail for merchantable wood. If no rail is specified in the scenario, this field can be set to 0.

   d. **Truck to Rail Transfer Load Cost (Chip) $/gt**: specifies the costs of inter-modal transition from truck to rail for chip wood. If no rail is specified in the scenario, this field can be set to 0.
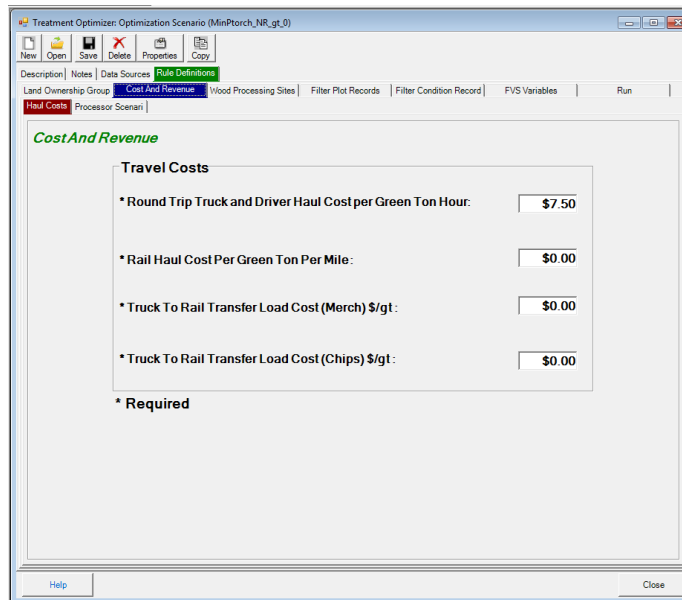

Figure 6.10: Haul Costs child tab on the Costs and Revenue tab

   e. Each optimization scenario MUST be associated with a processor scenario. Use the **Processor Scenario** tab to select the processor scenario that should be used as the source for harvested wood volumes, weights, values, and onsite harvest costs.

3. **Wood Processing Sites**: Displays the names and types of processing sites (psites) that are available for consideration in the scenario. Use the checkbox in the left-hand column to include/exclude a psite from the scenario.

   The **Biomass Processing Type** column on the right-hand side of the table allows you to specify if the psite can process: **Merchantable – Logs Only**, **Chips – Chips Only** or **Both – Logs and Chips**.

   There are 4 buttons below the **Wood Processing Sites** table that may be used to manipulate data on the table. They are:

   a. <**Select All**>: Checks the boxes for all the psites on the current table for inclusion in the current scenario
   b. <**Unselect All**>: Unchecks the boxes for all the psites on the current table to exclude them from the current scenario
   c. <**Use Default Values**>: There is a master psite configuration table called 'processing_site' associated with each FIA Biosum project. This table is located in \gis\db\gis_travel_times.mdb. Use this button if you have made changes to the **Biomass Processing Type** column for the current scenario but wish to revert to the default psite settings from the project master psite table.
   d. <**Update PSite Table With Checked Items**>: Use this button to update the **Biomass Processing Type** field on the project master psite table from the current Wood Processing sites table.

Figure 6.11: The Wood Processing Sites tab displays details of the psites in a scenario

4. **Filter Plot Records**: Allows you to build a SQL filter to include/exclude plots from the optimization analysis. The plot table structure includes the fields *gis_roadless_yn* and *gis_protected_area_yn*. The values in these two fields are obtained during the GIS process. If it is determined that the plot is in a roadless area then the flag *gis_roadless_yn* is set to 'Y'. Likewise, if a plot is in a protected area then the variable *gis_protected_area_yn* is set to 'Y'. When an optimization scenario is calculated, the field *plot_accessible_yn* value is set by evaluating the values in *gis_roadless_yn* and *gis_protected_area_yn* fields. By default an optimization scenario includes an attribute filter to only include plots where *plot_accessible_yn* = 'Y'.
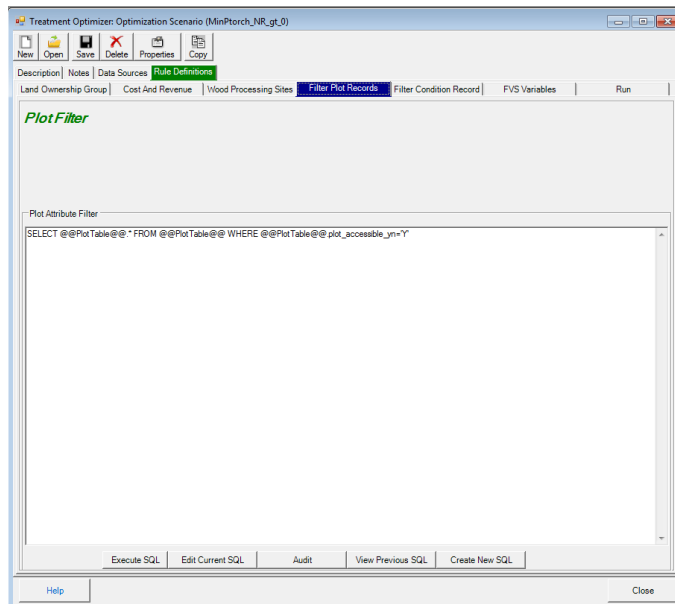

Figure 6.12: Plot attribute filter tab

The **Filter Plot Records** tab has 4 buttons beneath the **Plot Attribute Filter**. They are:

a. **<Execute SQL>**: Click this button to view records selected by the SQL currently in the Plot Attribute filter.
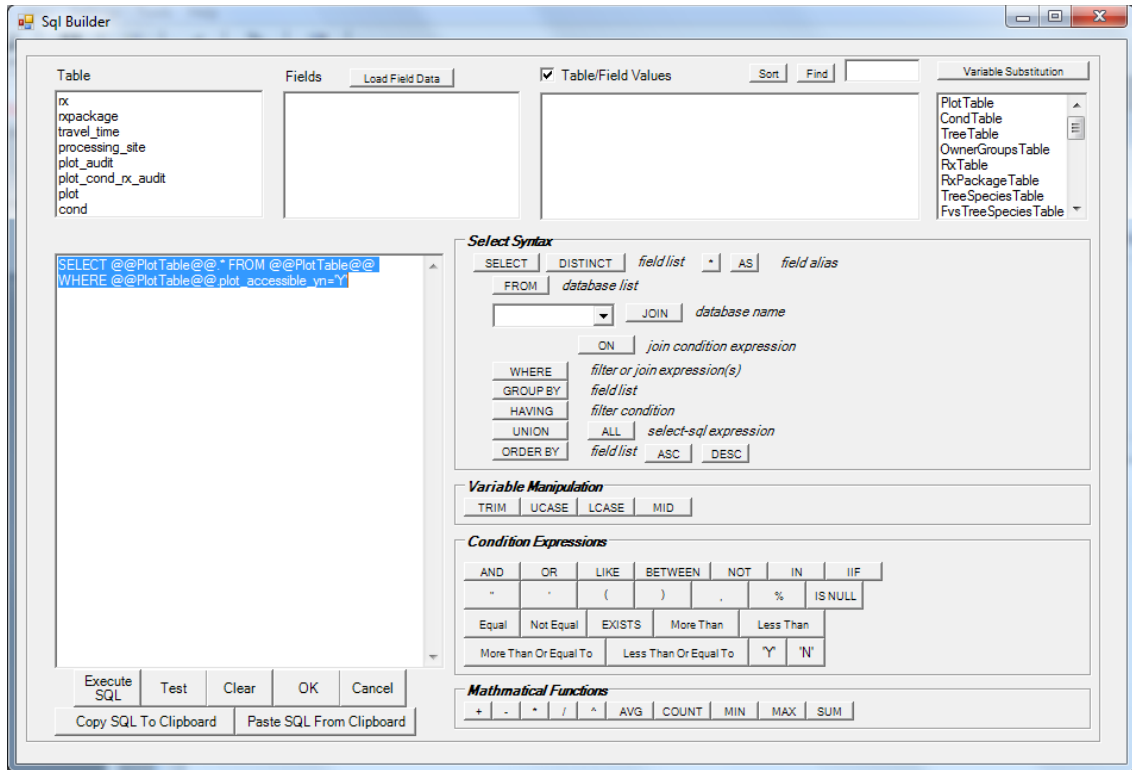b. **<Edit Current SQL>**: Opens the interactive SQL Builder

Figure 6.13: SQL Builder window for the Plot Attribute Filter

    c. **<Audit>**: Tests the plot filter SQL to ensure that it is valid

    d. **<View Previous SQL>**: Lists the previous Plot SQL statements by scenario. The current scenario SQL has a current_yn field value of 'Y.' To select the plot SQL, highlight the row and click the **<Select>** button. To delete the item, highlight the row and click the **<Delete>** button. Deleted records are only marked for deletion and can be recalled by pressing the **<Recall>** button. Using a plot filter from a previous scenario is often a good starting point for novice FIA Biosum users.

    e. **<Create New SQL>**: Begins creation of a new plot SQL statement by asking you to select the tables that should be included in the filter and adding them to the SQL Builder window that subsequently opens.

5. **Filter Condition Records**: Allows you to build a SQL filter to include/exclude conditions (stands) from the optimization analysis. See the section above on filtering plot records for details on building/updating a condition filter. The interfaces are almost identical.

In addition, the Filter Condition Records window provides two fields that specify the **Maximum Yarding Distance Allowed (Feet)**. Conditions exceeding these maximum yarding distances are excluded from optimization scenario processing. There are separate boxes for **Low Slope** and **Steep Slope** conditions. The slope degrees value that

determines whether a slope is steep is configured in the processor scenario associated with the current optimization scenario.

Use the **<Default Values>** to set the **Maximum Yarding Distance Allowed (Feet)** values to the FIA Biosum default. Currently these default values are 2500 feet for both slope categories.

FVS Variables - Overview

The FVS Variables tab is used to select a set of parameters that determines the best RxPackage for each stand. The FVS Variables tab has 3 child tabs. They are **Effective**, **Optimization** and **Tie Breaker**. **Effective** settings support the configuration of up to 4 stand attributes that can be used as a basis for determining whether or not an RxPackage is effective.

Only effective RxPackages are passed through to the **Optimization** analysis step. If no RxPackages are found to be effective for a stand, that stand will be dropped from further analysis. **Optimization** Settings allow the selection of one stand attribute of paramount interest to determine the best RxPackage, if more than one RxPackage is deemed effective. This window optionally allows you to filter on a weighted economic attribute, for example: net revenue > 0 or onsite treatment costs < 200.

If multiple effective RxPackages for a stand have the same optimization attribute value and optionally, pass the weighted economic attribute filter, the **Tie Breaker** attribute will be applied in an effort to obtain a unique best selection for the stand. This attribute can be an FVS stand attribute or a weighted economic attribute. If more than one RxPackage remains after applying the **Tie Breaker**, the tie will be resolved by the **Last Tie-Break Rank**, a number, unique for each RxPackage, that can be assigned by the analyst. If no Rank is assigned, the value defaults to the nominal RxPackage number. The lowest **Last Tie-Break Rank** value resolves any remaining ties and determines the best RxPackage for that stand.

The output of a Treatment Optimizer scenario run is saved to \optimizer\scenario1\db\ scenario_results.mdb. There is also a runlog.txt file in the \optimizer\scenario1\db\ that may be helpful when troubleshooting Treatment Optimizer issues.

FVS Variables – Effective Settings

The Effective tab provides for specification of up to 4 stand attributes, generated in FVS output, to be used individually or in combination to determine whether treatment results in improvement or disimprovement. At least one stand attribute must be defined and used directly, or indirectly (via improvement and/or disimprovement) to effectiveness; however, as long as that requirement is met, there can be attributes specified that are not used in defining improvement, disimprovement, or effectiveness. For example, one might be used as a tie-breaker or in optimization.

Unless the selected FVS variable table name ends in "_WEIGHTED", only the FVS output for cycle 1 will be included in the analysis. Be cautious when combining cycle 1 and weighted variables in the same analysis as they cover different time periods.
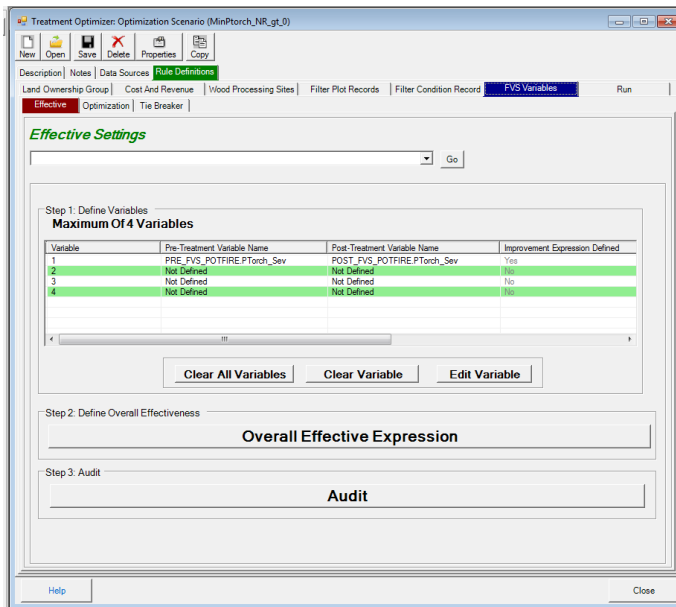

Figure 6.14: The Effective Settings main menu

The collection of Effective Settings variables is summarized on a table on the Effective Settings main menu. The columns are:

1. **Variable**: The identifier of the variable. Each value is unique and ranges between 1 and 4. FIA Biosum supports a maximum of 4 FVS output stand attributes.
2. **Pre-Treatment Variable Name**: The concatenated names (table.field) of the table and field containing the pre-treatment stand attribute. When working with a weighted variable, note that all variable names in the Optimizer workflow that begin with "pre" or "PRE" are, in fact, weighted combinations over all 4 cycles for the silvicultural sequence (package) selected as "base" for that weighted variable (often that is the grow-only sequence, 999).
3. **Post-Treatment Variable Name**: The concatenated names of the table and field of the post-treatment attribute. Table location conventions match those of Column 2. When working with a weighted variable, note that all variable names in the Optimizer workflow that begin with "post" or "POST" are, in fact, weighted combinations over all 4 cycles for the silvicultural sequence (package) being evaluated.
4. **Improvement Expression Defined**: Indicates if an improvement expression is defined for this variable
5. **Disimprovement Expression Defined**: Indicates if an disimprovement expression is defined for this variable

6. **Effective Expression Defined**: Indicates if an effective expression is defined for this variable

Note: At least one effective expression must be defined using at least one of the 4 variables, for their calculated improvement/disimprovement yes/no attributes for an optimization scenario to be valid.

The initial page of the Effective Settings screen has 6 buttons:

1. **<Go>**: Use this button, after making a selection from the dropdown list to its left to gain immediate access to any step in this "wizard"
2. **<Clear All Variables>**: Clears configuration for all variables displayed in the **Step 1: Define Variables** table
3. **<Clear Variable>**: Clears configuration for the variable currently selected via the **Step 1: Define Variables** table
4. **<Edit Variable>**: Opens the first page of the configuration wizard for the variable selected in the **Step 1: Define Variables** table
5. **<Overall Effective Expression>**: Opens the overall effective expression builder which determines if an RxPackage is effective for the stand.
6. **<Audit>**: Runs a series of validation checks to ensure that the Effective Settings can be used by a scenario run.

Defining or editing an effectiveness variable is a 4 step process:

1. Select the source table and field for the stand attribute or variable
2. Define a SQL expression for what constitutes variable post-treatment improvement (shifting the variable to better value)
3. Define a SQL expression for what constitutes variable post-treatment disimprovement (shifting the variable to a worse value)
4. Define a SQL expression for what constitutes variable effective treatment. This SQL expression can utilize the pre- and post- values of the variable, the change in the variable, and the outcomes of the better/worse expressions from steps 2 and 3, if defined.

Selecting an FVS Stand Attribute

To select a new FVS stand attribute (Step 1) choose **Select Variable X…** from the dropdown list at the top of the screen and click the **<Go>** button. To edit an existing FVS stand attribute, select row containing the attribute from the table on the **Effective Settings** main menu and click the <**Edit Variable**> button.
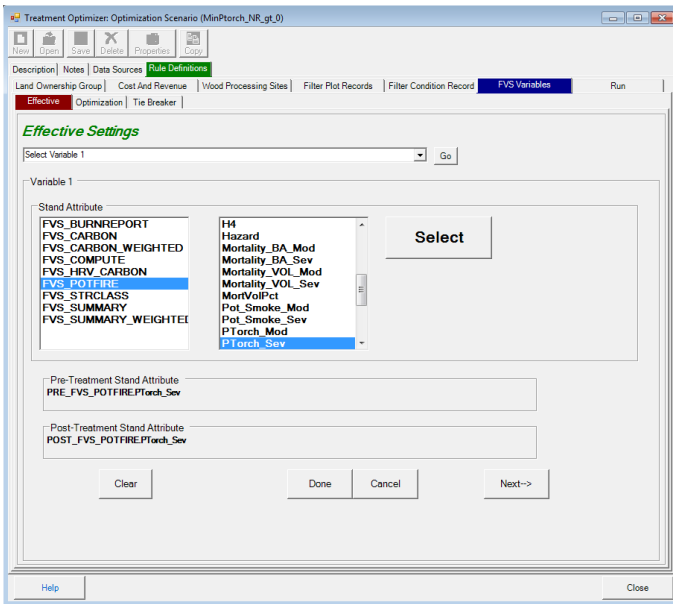
Figure 6.15: Selecting an FVS Stand Attribute

When you select an FVS output table from the first list, the second list will automatically populate with the names of the columns available in the selected table. Choose a stand attribute from the right-hand list and then click the <**Select**> button to select it. The **Pre** and **Post Treatment Stand Attribute** fields will display the name of the selected element. Click the <**Next->**> button to configure the expression for the selected Effectiveness Variable (step 2).

Note that the window and method for selecting an FVS Stand Attribute are identical on the Effectiveness, Optimization, and Tie Breaker stand attribute tabs. As a point of reference, table names that include the suffix "_WEIGHTED" are located in the [projectname]/optimizer/db/prepost_fvs_weighted.accdb database; other tables are in the FVS output directory: [projectname]/fvs/db.

Effectiveness Variable Expression Builder

The expression builder is used in steps 2, 3, and 4 of editing an effectiveness variable and also when defining the overall effectiveness expression. It contains the following elements:

1. **<Go>**: Use this button with the dropdown list on the left to gain immediate access to any wizard prompt location
2. **Available Variable(s)**: List the variables that can be used to generate your expression. Use the buttons next to the list to add operators and qualifiers to your expression.
3. **Define expression for what constitutes** …: Contains the expression that will be used during a Treatment Optimizer run. The text can either be built using the buttons above or manipulated directly by typing in the box.
4. **<Test>**: Use this button to test your expression and make sure it is valid

5. **<Default Expression>**: Generates a sample expression in the **Define expression for what constitutes** … box. This should be used as example syntax for composing your own expressions but is not recommended for actual use in most scenarios.
6. **<Previous Expression**>: Lists the previous expression SQL statements by scenario. Current expressions are indicated with a 'Y' in the current_YN field. Using an expression from a previous scenario is often a good starting point for novice FIA Biosum users.
7. **<Clear Expression>**: Clears the **Define expression for what constitutes** … box.
8. **<Done>**: Saves your expression to memory and closes the expression builder. Use the **<Save>** button in the toolbar after clicking **<Done>** to save your configuration changes to your computer. Your changes are also automatically saved before an optimization scenario is run.
9. **<Cancel>**: Closes the expression builder without saving your changes. Note that when you are in edit mode, the settings accessed via the **Optimization** and **Tie Breaker** tabs will be read-only until you use the **<Done>** or **<Cancel>** buttons to exit the expression builder.
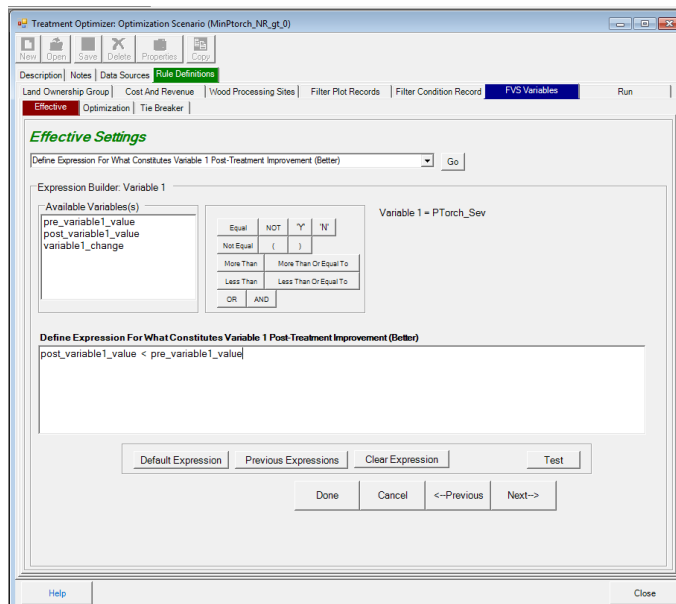

Figure 6.16: Defining variable 1 effective treatment expression using the expression builder

Audit for Effective Variables

The Effective Variables configuration must pass the following tests to be valid:

1. Ensure the user-defined FVS variable tables exist
2. Ensure the user-defined FVS columns exist
3. Ensure overall effectiveness expression exists

4. Ensure no FVS variables are defined more than once
5. Ensure effective expressions all have valid variable references. Example of an invalid variable reference: you delete FVS variable #4 but forget to remove FVS variable #4 from the effective expression.

Effective Variables output

The output from Effective Variables processing is written to the cycle1_effective table in the scenario_results.mdb. The following columns may benefit from a brief description:

1. **nr_dpa**: net revenue for cycle 1
2. If an Economic filter was configured in the **Optimization Settings**, the name of the filter, for example **net_revenue_1**, and the weighted values will be in this table
3. **overall_effective_yn**: indicates if the rxPackage was deemed effective according to the selected criteria. Only stands with a value of 'Y' will be included in downstream analysis

FVS Variables – Optimization Settings

The **Optimization Settings** require you to select a single optimization variable of interest. The variable can be an FVS stand attribute, an economic stand attribute, revenue, or merchantable volume. The FVS stand attribute, revenue, and merchantable volume options apply only to cycle 1. The FVS stand attribute may apply to all 4 cycles if a WEIGHTED stand attribute is selected. The economic stand attribute is always WEIGHTED and applies to 4 cycles. However, depending on the weights supplied (zeros are valid), it could apply to any single cycle or subset of cycles.

The optimization variable configuration includes options for favoring Maximum or Minimum aggregate values and, optionally, excluding stands that do not meet a defined Economic threshold filter.
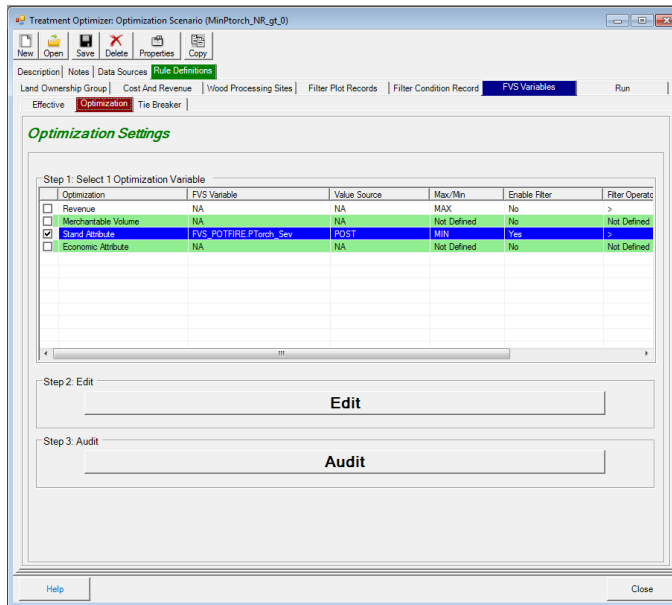
Figure 6.17: Optimization Settings main menu

The Optimization settings are summarized in a table on the Optimization settings main menu. The columns are:

1. The first unlabeled column is a checkbox column. Only one optimization attribute per optimization scenario can be selected.
2. **Optimization**: Lists the optimization attribute type; the options are Revenue, Merchantable Volume, Stand Attribute, and Economic Attribute
3. **FVS Variable**: For stand attributes and economic attributes, the name of the selected variable appears. Stand attributes include the FVS table and field name, concatenated by a period '.'. Economic attributes show the name of the weighted economic variable. 'NA' appears in this column for the cycle 1 not FVS-based Revenue and Merchantable volume variables.
4. **Value Source**: Only populated for stand attributes. The values will be either POST (treatment value) or POST-PRE (treatment change value). 'NA' appears in this column for all other optimization attribute types.
5. **Max/Min**: Should the maximum or minimum value of the attribute be considered optimal?
6. **Enable Filter**: Has an economic filter been configured?
7. **Filter Operator**: The operator for the economic filter
8. **Filter Value**: The threshold value set for the economic filter. If the filter is not enabled, this value will be ignored

The Optimization Settings main menu has 2 buttons:

1. **<Edit>**: Opens the configuration page(s) for the attribute selected in the Optimization Variable table
2. **<Audit>**: Runs a series of checks to ensure that the Optimization attribute and, optionally economic filter, are configured correctly

Editing the Optimization Attribute

If you select a Stand Attribute as an optimization attribute, the first step is to select the table and column for the attribute. The follow-on configuration window allows you to specify additional details. The configuration screens for Economic Attribute, Revenue, and Merchantable Volume are similar to the follow-on configuration window although they may not contain all of the fields as not all fields are relevant to all variable types.
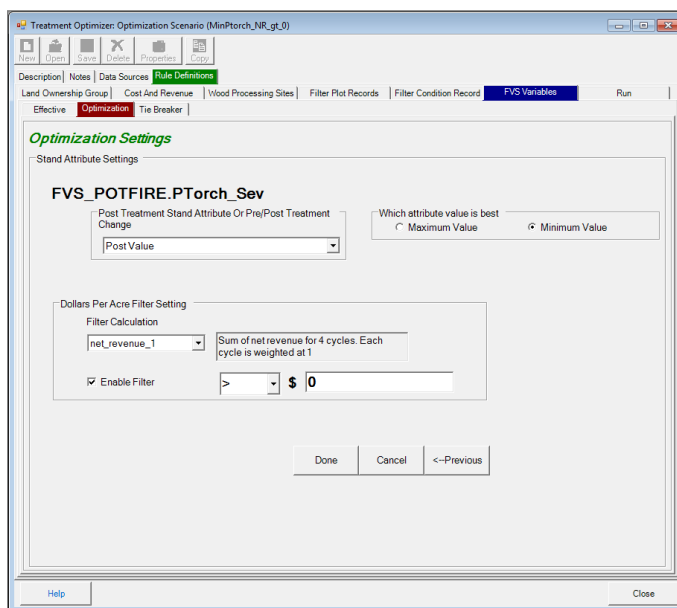

Figure 6.18: Follow-on stand attribute settings configuration window

The name of the selected Optimization variable of interest appears near the top of the configuration window. It will be the FVS variable table and field name, the economic attribute name, Merchantable Volume, or Revenue. The other fields on this screen are:

1. **Post Treatment Stand Attribute Or Pre/Post Treatment Change**: Choose between the post-treatment stand attribute value or the difference between the post and pre-treatment values. The pre-treatment value is subtracted from the post-treatment value.
2. **Which Attribute Value is Best**: Select minimum or maximum value for the stand attribute, economic attribute, revenue, or merchantable volume
3. The following 4 fields work together to configure the optional Economic filter threshold. If a stand and RxPackage combination fails to meet the threshold, it will be excluded from downstream processing.

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a. **Filter Calculation**: This is a select list containing all available net revenue and onsite treatment cost calculations. When you select an item from the list, the calculation description appears next to the select list. Currently net_revenue_1 and onsite_treatment_costs_1 are the only calculations available. These are the sum of net revenue or onsite treatment costs across all 4 cycles. In a future release, you will be able to configure custom calculations using the FIA Biosum calculated variable functionality.

b. **Dollars Per Acre Filter Setting**: Checking this checkbox enables the Economic filter threshold. There is a select list containing a choice of operators (>, <, >=, <=, <>). Select the appropriate operator from this list. The last field is a freeform numeric field that allows you to enter the threshold value. Negative numbers are permitted.

Below are 3 Optimization attribute configuration examples:

- **Optimization**: Stand Attribute
- **FVS Variable**: FVS_POTFIRE_WEIGHTED.Torch Index
- **Pre/Post Treatment Change**
- **Which Attribute Value is Best**: Maximum
- **Economic Filter:** enabled where net_revenue_1 > 100
- **Synopsis:** Find the treatment for each stand where the weighted torch index increased the most after treatment. Only consider stands where the sum of net revenue over 4 cycles is greater than 100.

- **Optimization**: Merchantable Volume
- **FVS Variable**: N/A
- **Which Attribute Value is Best**: Minimum
- **Economic Filter:** disabled
- **Synopsis:** Find the treatment for each stand that cuts the least amount of merchantable volume for cycle 1. *Note that merchantable volume and revenue optimizations apply to cycle 1 only.*

- **Optimization**: onsite_treatment_costs_1
- **FVS Variable**: N/A
- **Which Attribute Value is Best**: Minimum
- **Economic Filter:** enabled where net_revenue_1 > 0
- **Synopsis:** Find the treatment for each stand that has the lowest onsite treatment costs where net revenue is greater than 0. These are both built-in economic variables and include the sum of all 4 cycles in their calculation.

Audit for Optimization Attribute

The Optimization attribute must pass the following tests to be valid:

1. One optimization attribute of interest must be checked
2. If the optimization is the FVS Post variable then ensure the post column exists
3. If the optimization is the FVS Post-Pre change than ensure both the PRE and POST columns exist
4. The optimization variable has an aggregate definition of MAX or MIN
5. If enabled, ensure the filter operator is valid

Optimization Attribute output

The output from Optimization processing is written to the cycle1_optimization table in the scenario_results.mdb. All stand RxPackage combinations deemed to be effective are included in this table along with their optimization attribute values.

The **affordable_yn** column indicates if a stand RxPackage combination met the economic filter threshold. If an economic filter isn't configured, this field will always be set to 'Y'. If an economic filter is configured, there will be a column with the name of the selected economic attribute, for example: net_revenue_1. This column will be populated with the values of the economic attribute.

If a weighted variable is used anywhere in a scenario configuration, the prefix cycle1_ will be replaced with the prefix all_cycles_.

FVS Variables – Tie Breaker Settings

One and only one RxPackage per stand can be selected as "best" during a Treatment Optimizer scenario run. It is highly probable that multiple RxPackages for a stand may meet the Effectiveness criteria, exceed the economic filter threshold, and have the same Optimization attribute value. For example, if two RxPackages differ only in that one has a diameter cap of, say 21 inches and the other does not, the effectiveness, economics and optimization outcomes are identical for stands containing no trees over 21 inches. In these cases, the **Tie Breaker** settings are used to break any ties.

Tie breaking can be a two-step process. Optionally, you can select a Stand Attribute or Economic Attribute to break any ties. That would not break a tie in the case of the example just described, but might break the tie if, say, two treatments were effective, met the economic filter criterion and happened to achieve the same predicted basal area mortality (if that were the optimization variable). This tie-breaker attribute cannot be the same data element as the Optimization attribute (because the ties that need to be broken arise after application of optimization). In this example Tie Breaker might be set to an economic variable so as to minimize treatment cost or maximize net revenue, or to an Stand attribute such as minimizing a pTorch attribute (probability of torching).

If multiple RxPackages are still tied or a Tie Breaker attribute is not selected, the required Last Tie-Break Rank value will be used to select the "best" RxPackage. On the Tie-Break Rank screen, a unique, integer value is assigned to each RxPackage. The RxPackage with the lowest Tie-Break Rank value will be selected.
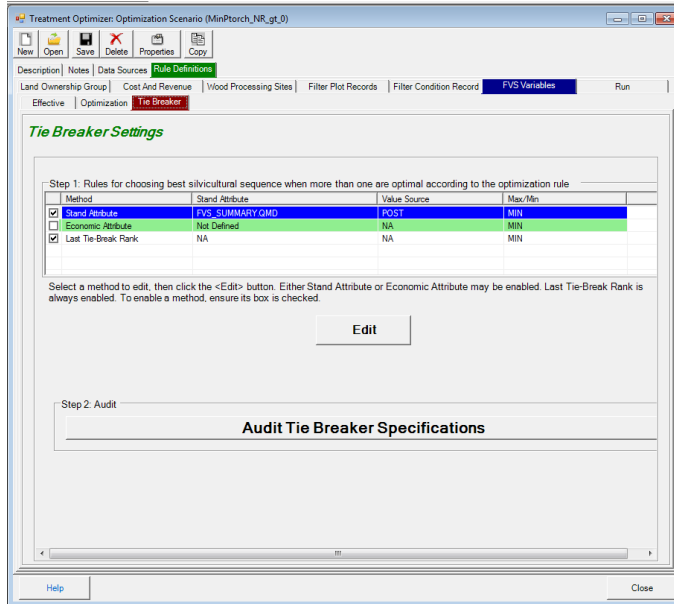

Figure 6.19: Tie Breaker settings main menu

The centerpiece of the Tie Breaker settings main menu screen is a table that lists the potential Tie Breaker attributes of interest: Stand Attribute, Economic Attribute, and Last Tie-Break Rank. The only required attribute is Last Tie-Break Rank (hence it cannot be unchecked). The columns on this table are:

1. The first unlabeled column is a checkbox column. If the checkbox is checked, it means the attribute is selected as a Tie Breaker. In addition to Last Tie-Break Rank, you can select a stand attribute OR and economic attribute but not both.
2. **Method**: Lists the Tie Breaker attribute type; the choices are Stand Attribute, Economic Attribute, and Last Tie-Break Rank.
3. **Stand Attribute**: For stand attributes and economic attributes, the name of the selected variable appears. Stand attributes include the FVS table and field name, concatenated by a period '.'. Economic attributes show the name of the weighted economic variable. The field is not applicable 'NA' for Last Tie-Break Rank.
4. **Value Source**: Only populated for stand attributes. The values will be either POST (treatment value) or POST-PRE (change in treatment value). 'NA' appears in this column for all other Tie Breaker attribute types.
5. **Max/Min**: Should the maximum or minimum value of the attribute be considered best? For Last Tie-Break Rank, this will always be set to MIN.

Editing an Economic or Stand Attribute Tie Breaker

If you wish to use an Economic Attribute as Tie Breaker attribute, the first step is to select the weighted economic attribute. When you select an attribute from the list, a description appears in the **Description** box. After you use the **<Select>** button to finalize your choice, the name of the attribute will appear as the **Currently Active Tie Breaker**. After selecting the attribute, choose either **Minimum** or **Maximum Value** as best. Important Note: The choice is not implemented until you click Select and the name of the attribute appears in the Currently Active Tie Breaker display in this dialog. Running Optimizer with a checked Tie Breaker attribute that does not have a selected attribute identified (i.e., Stand Attribute shows as "Not Defined") will lead to an error relating to "primary key cannot contain a Null value" when executing the last workflow task in Optimizer's Run tab.
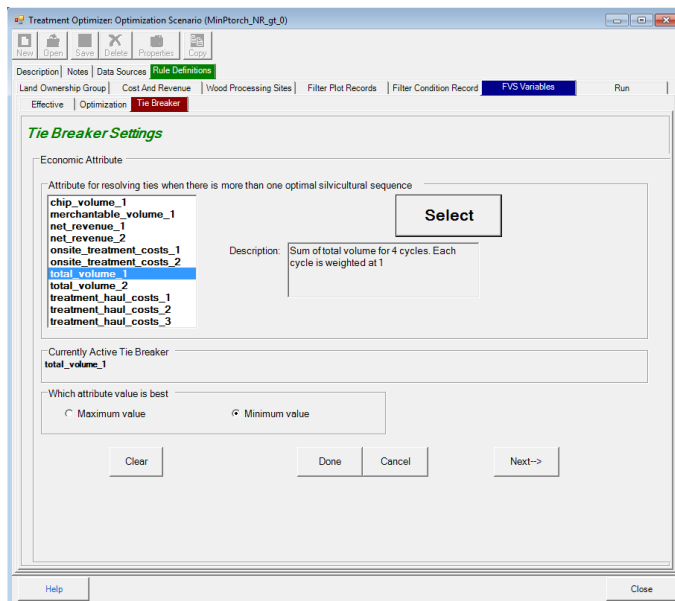

Figure 6.20: Editing an Economic Tie Breaker attribute

The Stand Attribute Tie Breaker screen is similar but also requires you to select **Post Treatment Stand Attribute Or Pre/Post Treatment Change**: Choose between the post-treatment stand attribute value or the difference between the post and pre-treatment values. The pre-treatment value is subtracted from the post-treatment value.

There are four buttons at the base of the Tie Breaker **Stand** or **Economic** attribute screen. They are:

1. <**Clear**>: Clears your selections from the screen
2. **<Done>**: Saves your selections to the computer's memory and returns to the Tie Breaker settings main menu. You must use the **<Save>** button at the top of the Treatment

Optimizer dialog for such changes in the project configuration to persist after FIA Biosum is closed.

3. **<Cancel>**: Discards your changes and returns to the Tie Breaker settings main menu.
4. **<Next->**: Saves your selections and proceeds to the Last Tie-Break Rank window. You must use the **<Save>** button to save your configuration choices to your computer.

The **Last Tie-Break Rank** tab requires assigning a unique rank to each rxPackage in the red-highlighted column. Following FIA Biosum convention, only the red column is editable. The **last_tiebreak_rank** value is the ultimate tiebreaker if more than one rxPackage in a stand has the same **Optimization** and **Tie Breaker** attribute values. The rxPackage with the lowest **last_tiebreak_rank** value will be assigned as best.
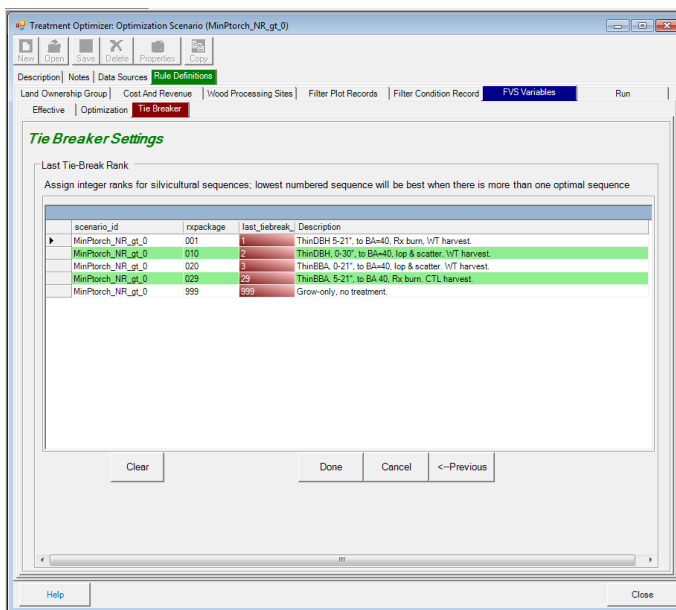

Figure 6.21: The Last Tie-Break Rank window

There are four buttons at the base of the **Last Tie-Break Rank** screen. They are:

1. <**Clear**>: Clears your selections from the screen
2. **<Done>**: Saves your selections to the computer's memory and returns to the Tie Breaker settings main menu. You must use the **<Save>** button to persist your configurations after FIA Biosum is closed.
3. **<Cancel>**: Discards your changes and returns to the Tie Breaker settings main menu.
4. **<-Previous>**: Saves your selections to the computer's memory and returns to either the Stand or Economic attribute window (depending on which was previously selected). You must use the **<Save>** button to save your configuration choices to your computer.

The <**Audit Tie Breaker Specifications**> button runs an audit on the Tie Breaker settings to ensure that the following requirements are met:

1. A last tie-break rank value must be populated for each rxPackage
2. Last tie-break rank values must be unique (one per rxPackage).
3. The stand or economic attribute must be defined if it is checked
4. If enabled, the Tie Breaker attribute cannot be the same as the Optimization attribute

Tie Breaker output

The output from Tie Breaker processing is written to the cycle1_best_rx_summary_before_tiebreaks, cycle1_best_rx_summary, and cycle1_best_rx_summary_air_dest tables in the scenario_results.mdb. The cycle1_best_rx_summary_before_tiebreaks table includes all stand-RxPackage combinations that passed the Optimization attribute and revenue filter threshold tests. It appends the tiebreaker_value (if configured) and last_tiebreak_rank value to each row in the RxPackage table.

The cycle1_best_rx_summary table applies the Tie Breaker settings and only includes rows with the 'best' RxPackage for each stand. The cycle1_best_rx_summary_air_dest does the same for air curtain destruction plots.

If a weighted variable is used anywhere in a scenario configuration, the prefix cycle1_ will be replaced with the prefix all_cycles_.

Filter RxPackage

It is often useful to include a broad spectrum of silvicultural sequence options in a BioSum project to address questions and promote learning through experimentation and the answering of "what-if" questions. It is also frequently useful to exclude some sequences from consideration when optimizing. For example, a sequence that includes clearcut treatments might have been modeled to gauge the maximum potential wood flow potential of a landscape, but the analyst would like to exclude it from being selected under a certain policy scenario.

This screen (Figure 6.22) provides for selecting which sequences (packages) to consider as valid options for the optimization. Packages with ticked selection boxes will be considered; those with blank boxes will not.
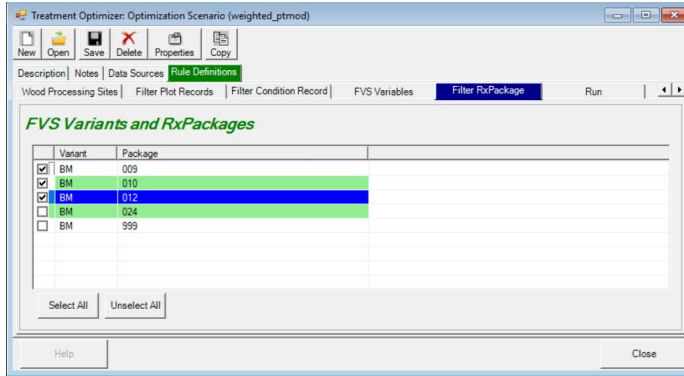
Figure 6.22: The FVS Variants and RxPackages selection grid

For projects with multiple variants, one would typically select the same packages to consider in each of the variants, but because sometimes this assumption might not hold (for example, it might be desirable to run an optimization for less than all the variants in a project), BioSum provides the flexibility for considered packages to differ among variants, so the analyst must make sure to make package choices separately for each variant via these selection boxes.

Run

The Run tab executes the optimization scenario that you have configured and writes out the results to a set of tables in the \optimizer\scenario1\db\scenario_results.mdb. Before commencing the scenario calculations, a series of audits is run to ensure that the optimization configuration is valid. At the base of the run screen are two file size monitors that report the current size of the temporary databases used when calculating an optimization scenario. The maximum size of an MS Access database is 2 gigabytes.
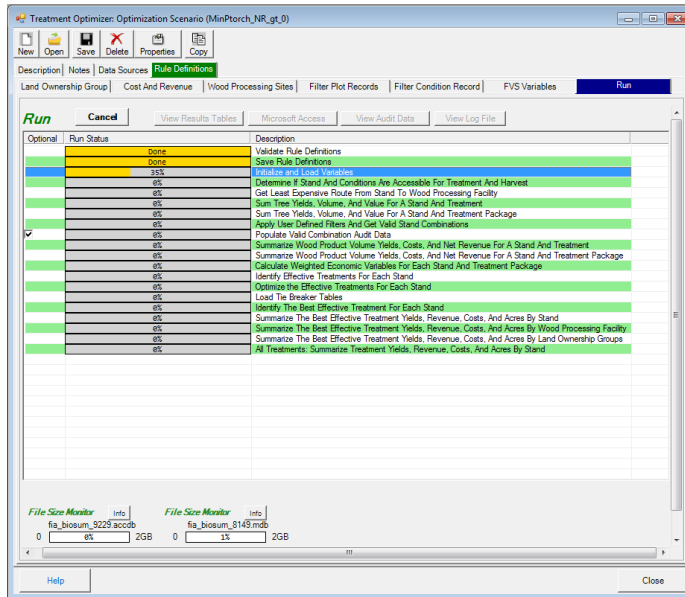

Figure 6.23: The Run scenario window

There are 5 buttons above the table on the **Run** screen. They are:

1. **<Start>**: Clicking this button begins an optimization scenario analysis run. While the scenario is running, the label of this button changes to <**Cancel**>. Click the <**Cancel**> button to interrupt the optimization scenario run for any reason.
2. **<View Results Tables>**: This button is enabled if the scenario_results.mdb exists for the current scenario. Click this button to view the output tables from within FIA Biosum. If all of the tables aren't visible in the viewer, click and drag the lower right-hand corner to enlarge the window.
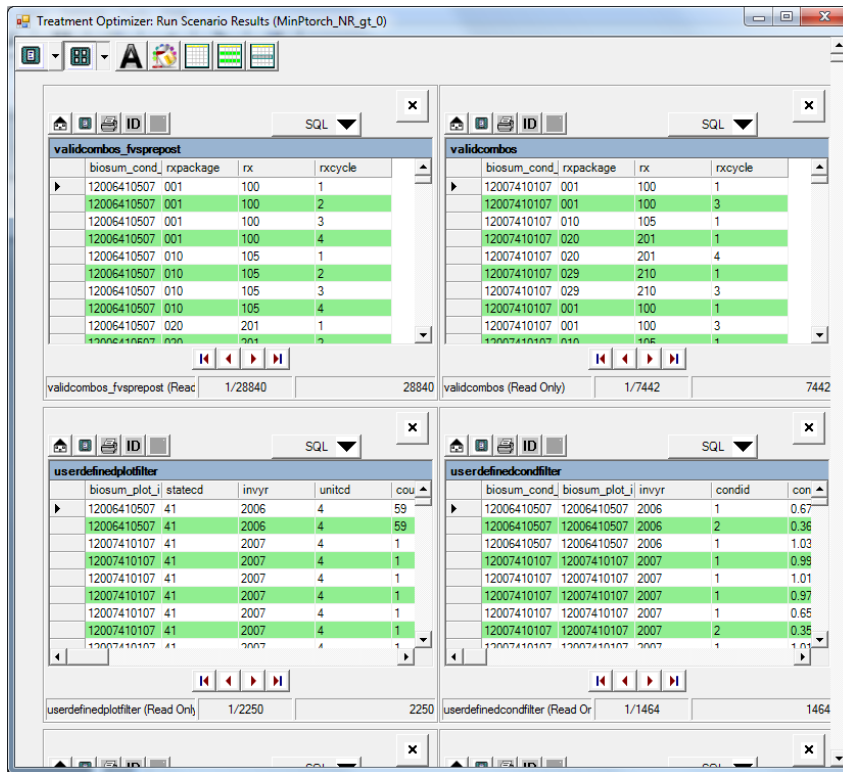
Figure 6.24: The Results Tables viewer

3. <**Microsoft Access**>: Launches Microsoft Access on your computer and opens the scenario_results.mdb, which contains the same tables displayed in the viewer.
4. <**View Audit Data**>: Review the MS Access Treatment Optimizer audit tables from within FIA Biosum
5. <**View Log File**>: Open, in a viewer, the optimization scenario log file (runlog.txt). This log is the place to start troubleshooting software exceptions and anomalies experienced while running an optimization scenario.

Export to SQLite

The OKPyT (Olaf Kuegler Python Based Tabler) Python script offers the ability to "table" BioSum outputs in formatted Excel tables that display means and totals by user-specified groups, accompanied by estimates of the sampling error associated with the means and totals in every table cell. OKPyT relies on databases stored as SQLite, so a utility is provided in Optimizer to export BioSum outputs from the Access database to which they have been written to an SQLite database. Templates for BioSum output tables that we have found to be useful are still being developed at this time, and documentation of how to run the script (which is provided as an executable program) with these BioSum export files will be provided in a future BioSum release.

For now, the export capability may be useful for users who prefer to store and work with data in SQLite rather than MS Access.

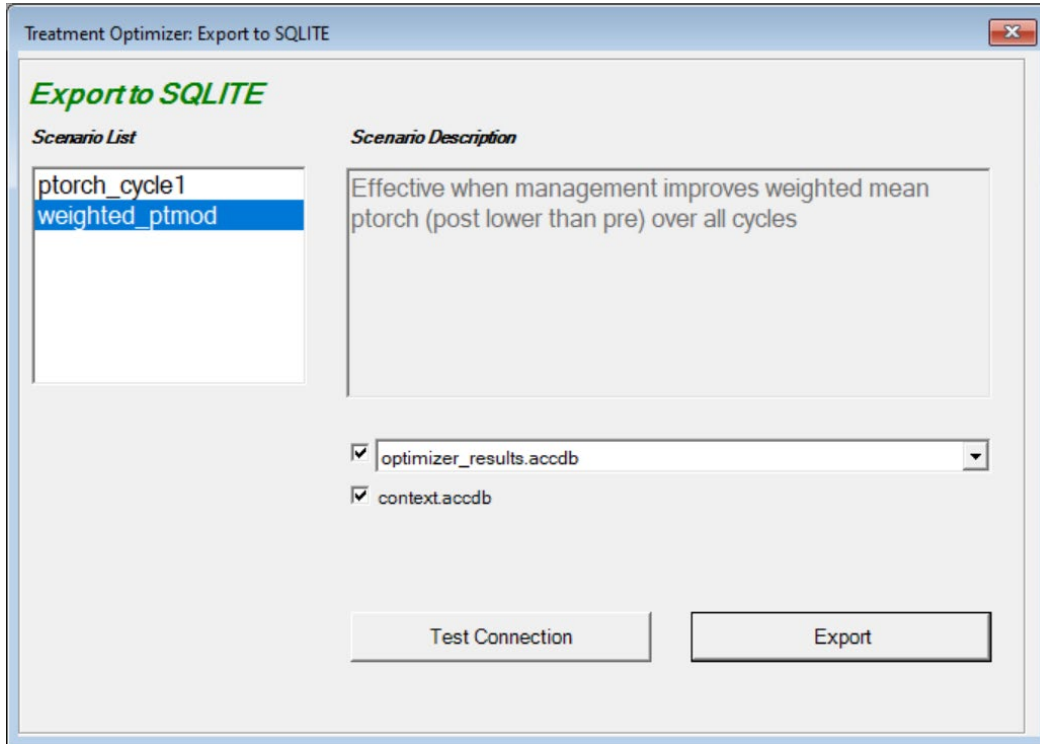When you click the <**Export to SQLite**> button, the Export to SQLite screen will appear:

Figure 6.25: Export to SQLite selection dialog

The Export to SQLite selection dialog has the following fields:

1. **Scenario List**: This is the list of all the optimization scenarios available in the project. When a scenario in this list is selected (highlighted), the Scenario Description updates to reflect the analyst's description of the selected scenario.
2. **Database to Export**: The name of the Access database containing the optimization output to be exported to an SQLite database, optionally including the context database (context.accdb) if its box is checked.

   Typically, optimizer_results.accdb will hold the most recently completed optimization for the scenario, but earlier simulations are stored in the same folder, with a simulation date and time stamp comprising part of the database file name and there may be times when it is desirable to export one of these instead. However, note that it is the responsibility of the analyst to ensure that the context database is current and consistent with the optimizer_results output. For example, it is possible that the context database in the scenario folder contains data from an earlier simulation and that some of the simulation parameters have been changed such that some of the context information has changed

and does not reflect the most recent optimization output for the scenario. For this reason, the best practice is to create a context database during any optimization that you may wish to export to an SQLite database so that context and output are consistent.

Two buttons at the bottom of the dialog provide for testing that an SQLite ODBC driver is installed and functioning (**<Test Connection>**) and initiating the database export (**<Export>**). The export process is quite slow and users should be prepared for it to take 15-25 minutes, depending on whether the context database is also to be exported.