Fundamental Training and Applications of the Landscape Management System

For NRCS and Conservation District Forestry Personnel

February 10th, 2009 – Pack Forest, Eatonville, WA
February 12th, 2009 – Spokane, WA

Growing and Treating Stands

- Growing Stands
- Evaluating Stand Growth with Tables and Visualizations
- Treating Stands

Growing and Treating Stands

This section presents information on how to accomplish management simulations using LMS. Frequently foresters must prepare different management alternatives for individual stands and then present the outcomes over time. The growth and treatment capabilities of LMS can assist in this endeavor by providing tools that foresters can use to make better management comparisons and subsequent management decisions.

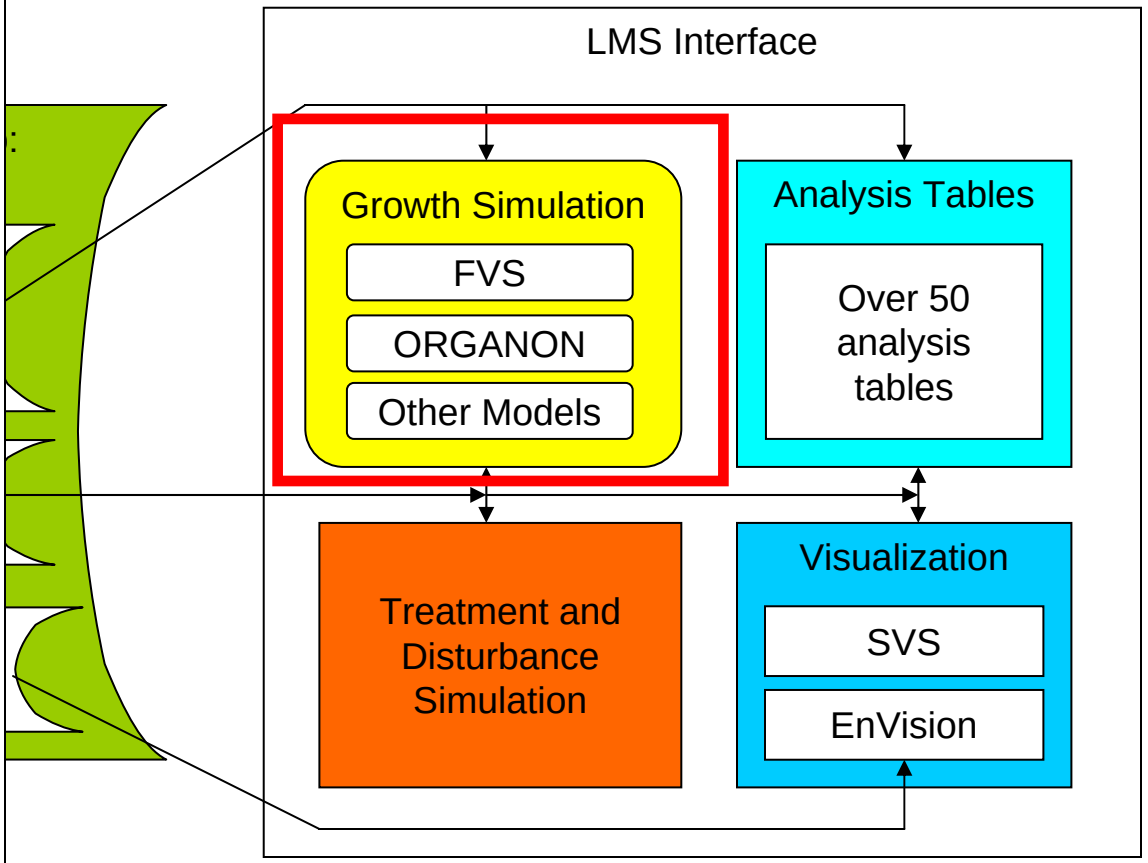
Roadmap

- Simulate forest growth using the growth models in LMS
- Simulate silvicultural treatments in a specific year
  - Remove all trees between 2” and 15” DBH
  - Thin to 75 TPA from below
- Simulate post-treatment growth
- Compare changes in stands caused by treatment in a composite graph in Excel

Growth Modeling with LMS

Growth modeling in LMS is done in the Growth Simulation module. LMS uses a variant of the USFS Forest Vegetation Simulator (FVS), covering nearly all areas of the US with trees, and the ORGANON model from Oregon State University for areas west of the Cascades in Washington and Oregon. Also, since LMS has a modular design, other models can be used as well if an interface is developed (more on this later).

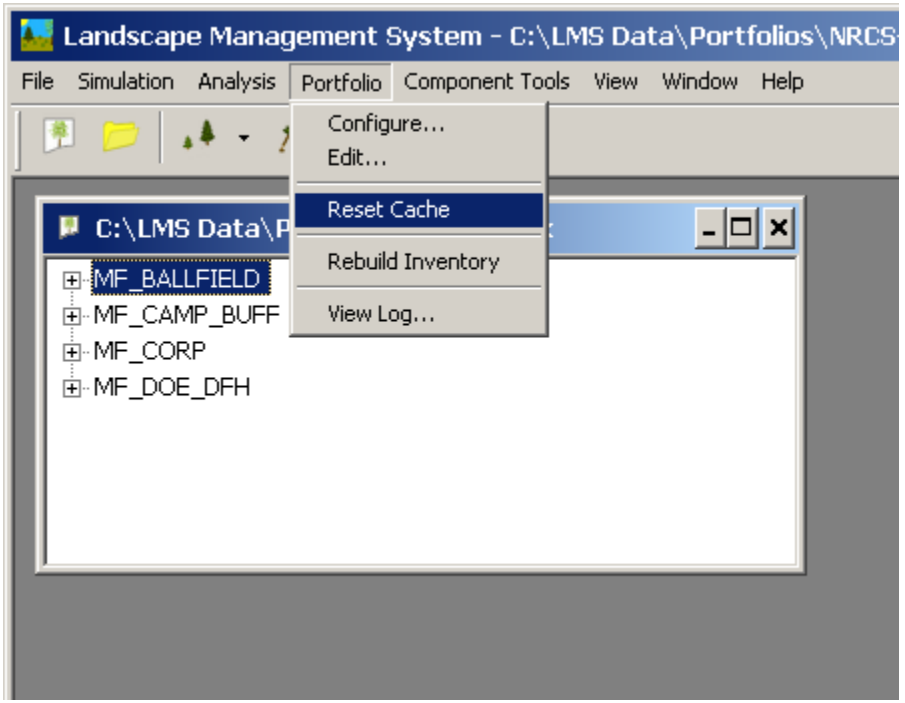
For this exercise we will be using the PN or IE variants of the FVS growth model.



Resetting (“Flushing”) the Cache

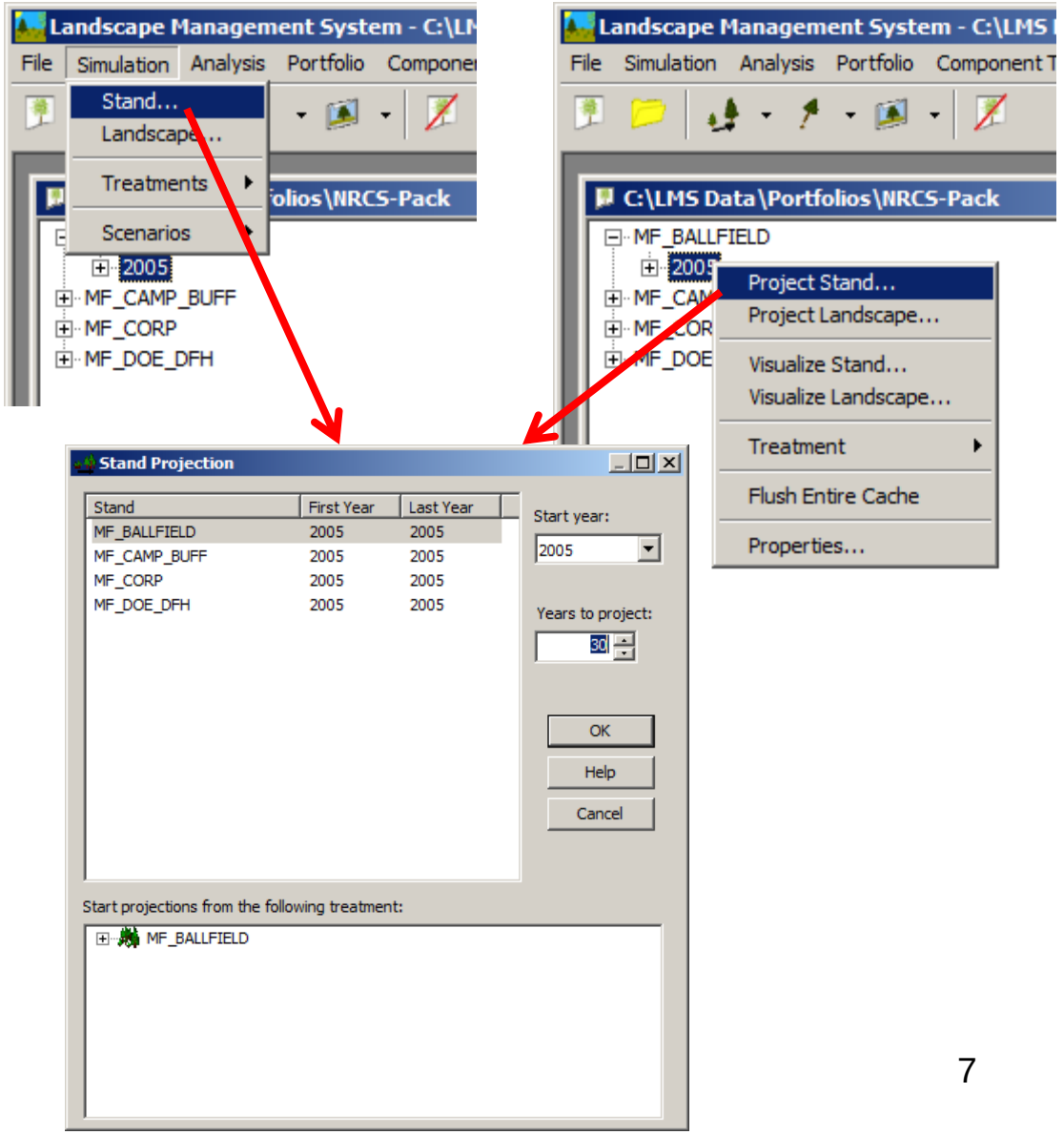
LMS does all treatments and growth on a set of temporary files that are stored in the LMS Cache directory. Working with a copy of the inventory and attributes files gives the ability to return to the initial stand conditions of the portfolio. Before moving on to growing stands the Cache will need to be flushed to get rid of any treatments that were performed previously. Reset the cache using the “Portfolio/Reset Cache” menu command or the Reset button on the toolbar.

Note: Any files that have been saved in the portfolios cache directory will also be deleted. If files are to be saved they must be saved in a different location.

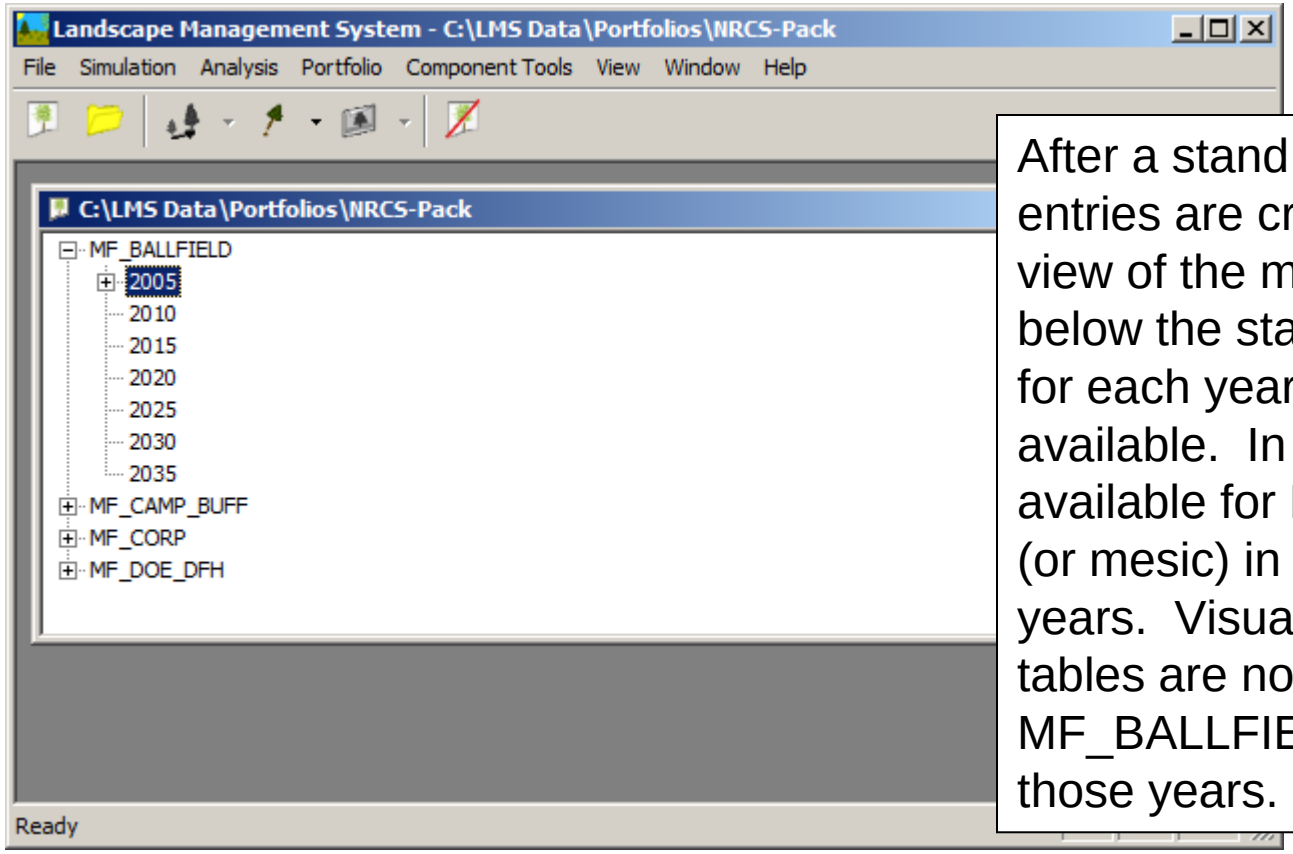


Growing Stands

Growing stands is done from the Stand Projection dialogue which is accessed by selecting “Stand…” from the LMS Simulation drop-down. The Stand Projection dialogue contains a list of stands in the left pane and drop-down lists of years for Start Year and a box for number for Years to Project. For this exercise MF_BALLFIELD (or mesic) will be grown for 30 years. Select the stand name from the list and change “Years to project” to 30. Click OK and the growth will begin.

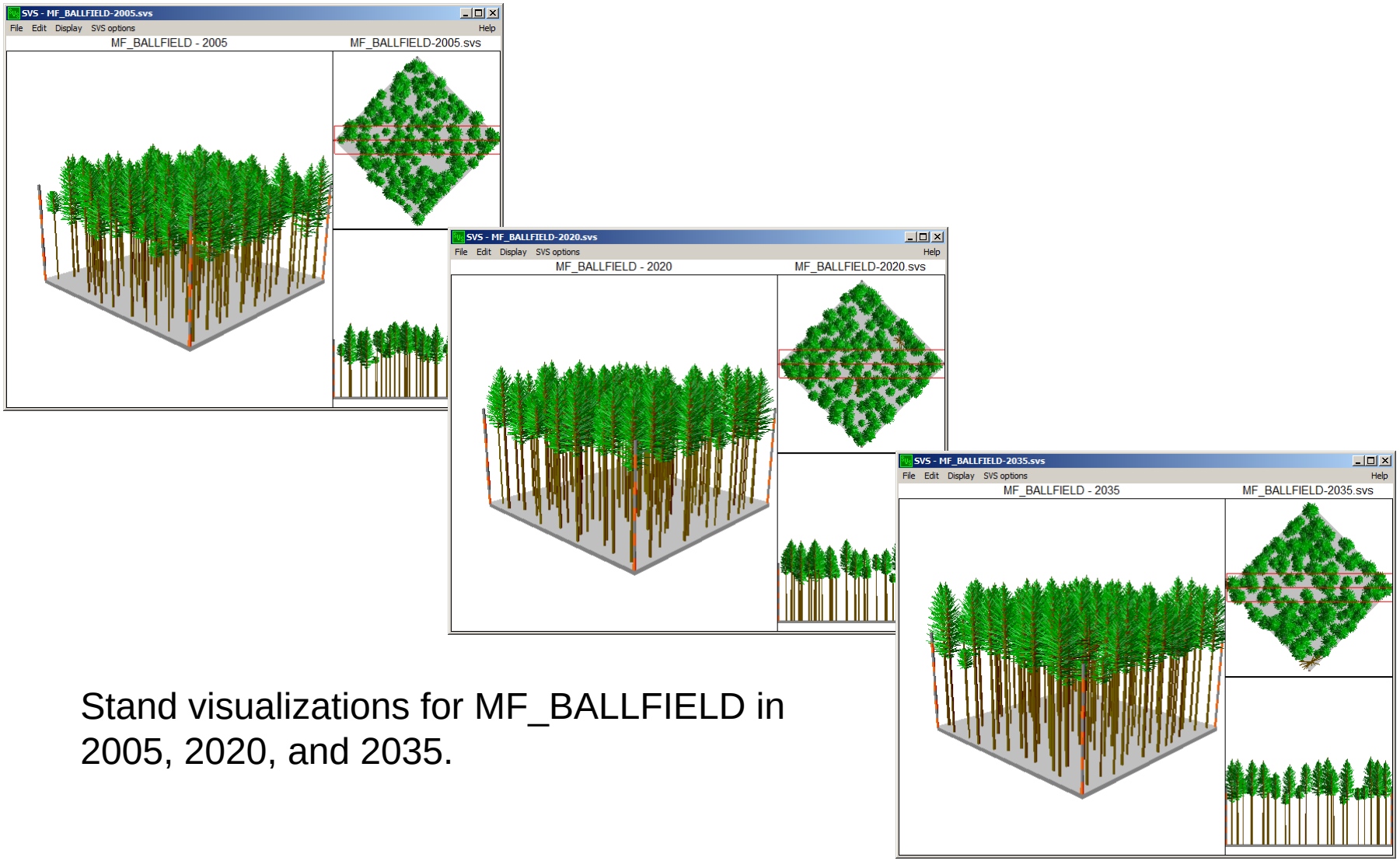


Growing Stands



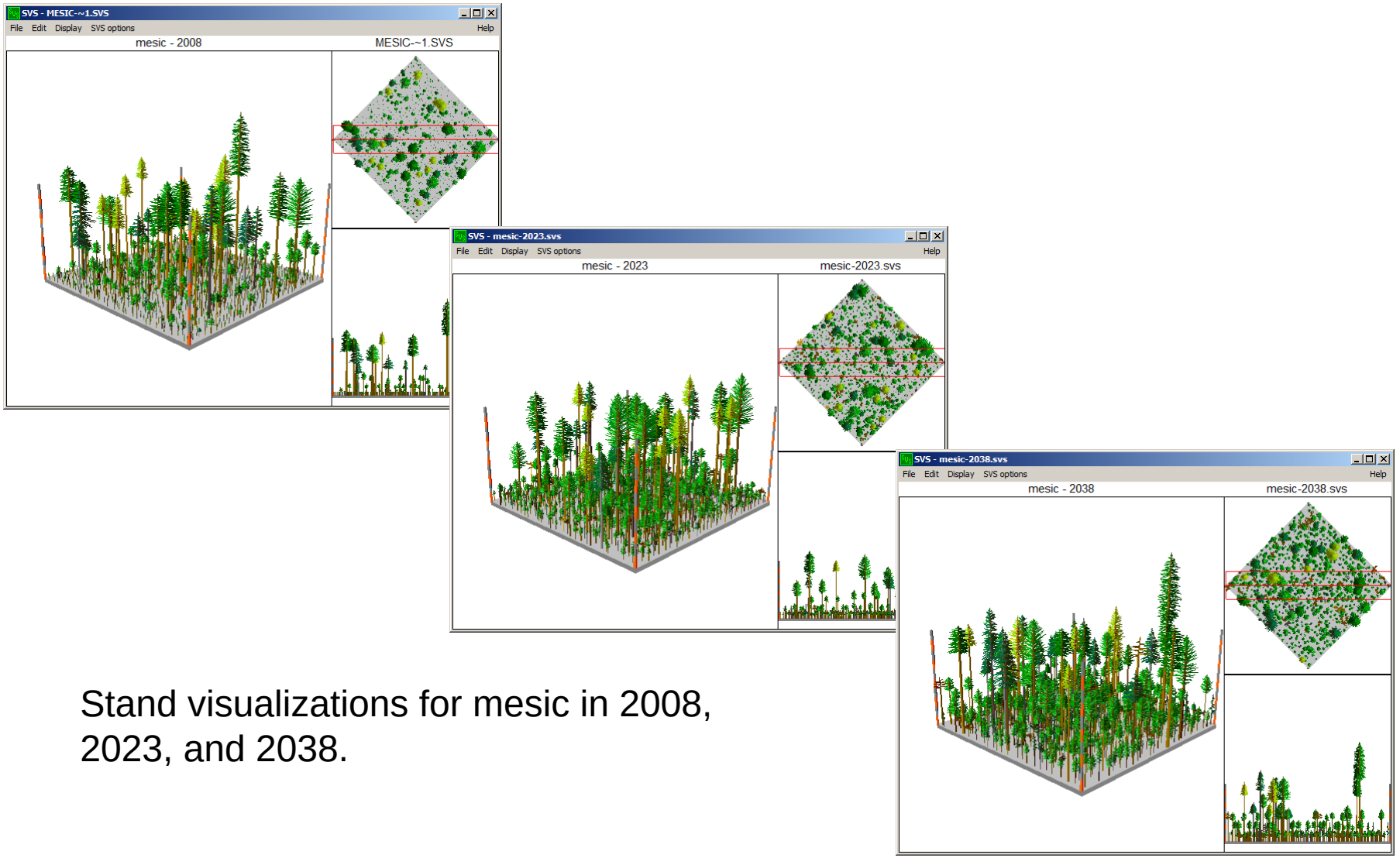
After a stand have been grown, entries are created in the tree view of the main LMS window below the stand that was grown for each year that data area available. In this case data are available for MF_BALLFIELD (or mesic) in seven different years. Visualizations and tables are now available for MF_BALLFIELD (or mesic) for those years.

Looking at Growth using SVS



Stand visualizations for MF_BALLFIELD in 2005, 2020, and 2035.

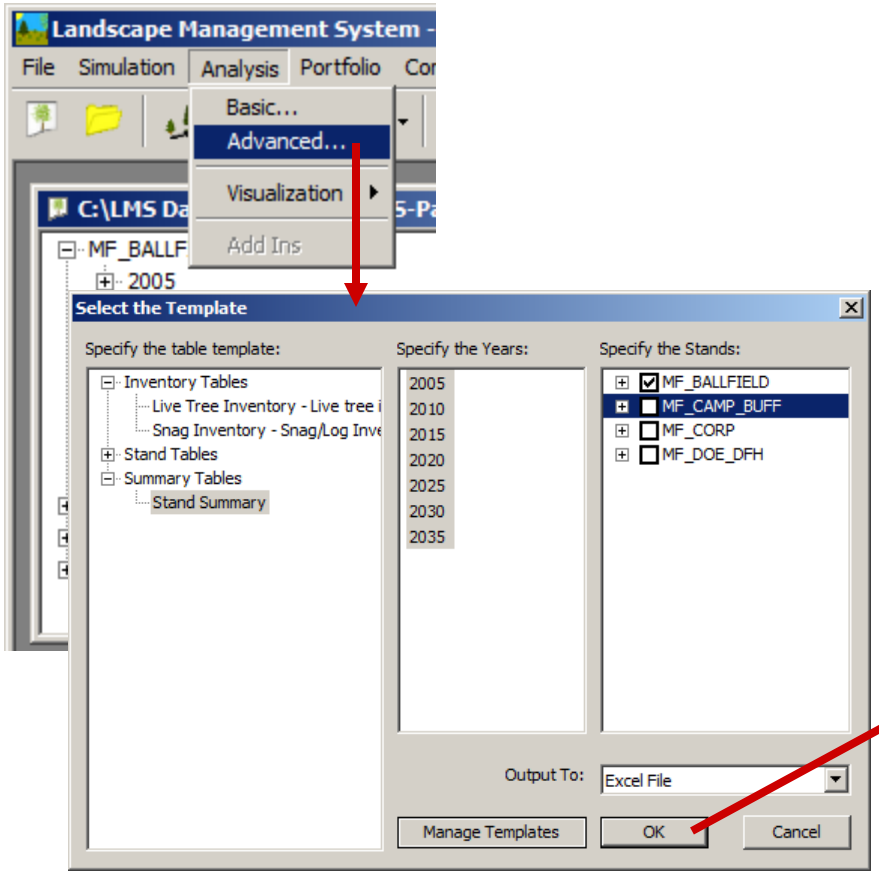
Looking at Growth using SVS

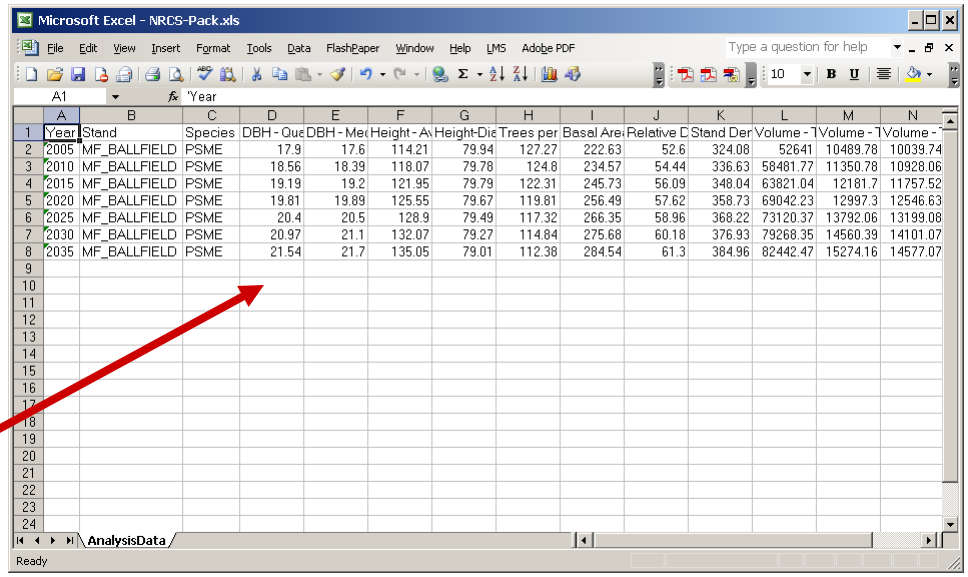


Stand visualizations for mesic in 2008, 2023, and 2038.

Changes in QMD

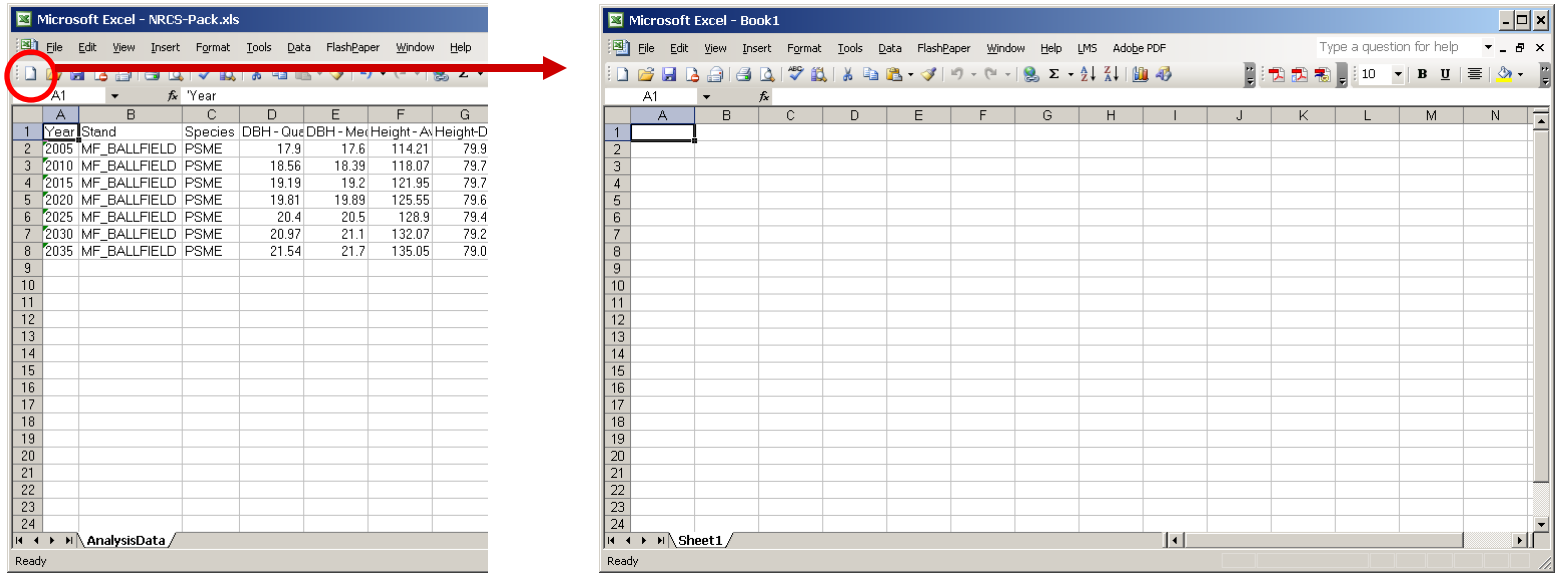
Displaying changes in QMD over the 30-year stand projection will be done using the Stand Summary Total table template and Excel. First, create the Stand Summary table Using Analysis/Advanced… then select the Stand Summary table, leave all years highlighted and then clear the checkbox next to the other stands that we are not currently interested in. The resulting table opens in Excel.



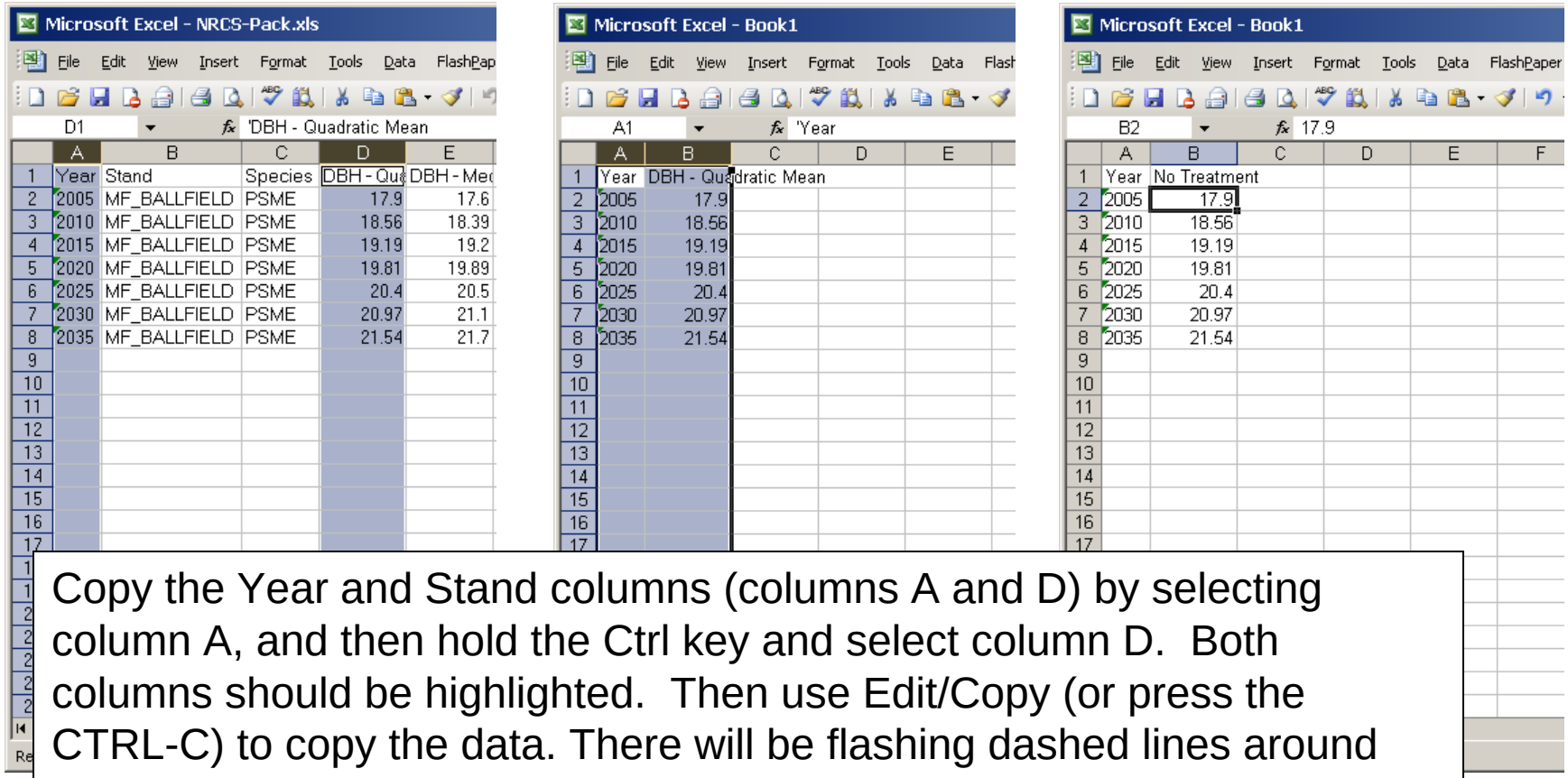


Changes in QMD

To compare changes in QMD between treatments, the QMD and Year columns will need to be copied to a new Excel workbook. Create a new workbook by clicking on “New Workbook” at the left end of the Excel tool bar or by selecting “New…” from the Excel file menu. A blank workbook will be created.



Copy Year and QMD to new Workbook



Copy the Year and Stand columns (columns A and D) by selecting column A, and then hold the Ctrl key and select column D. Both columns should be highlighted. Then use Edit/Copy (or press the CTRL-C) to copy the data. There will be flashing dashed lines around the selected cells. Go to the new workbook and click on the A1 cell, then select Edit/Paster (or use CTRL-V). After copying the numbers change the column heading in B1 to “No Treatment”. Then save the workbook somewhere so that we can access it later.

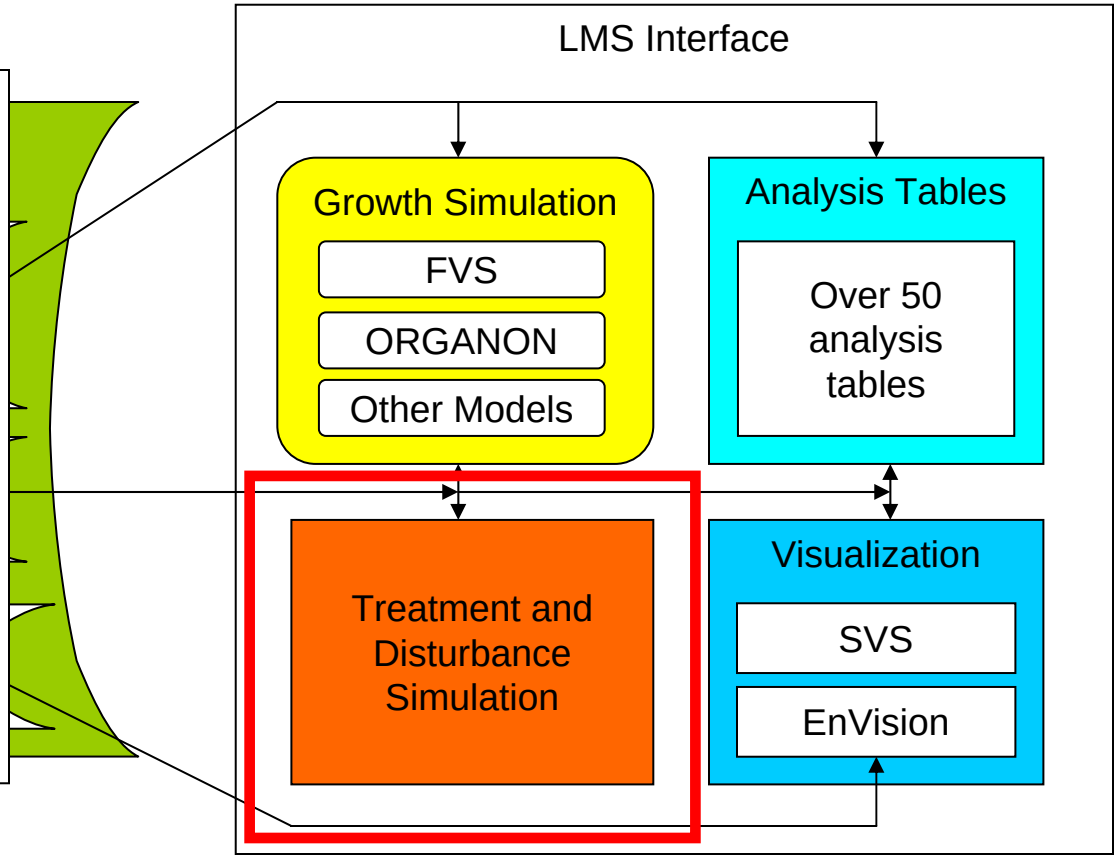
Growth Summary

Treating Stands and Treatment Effects

Learn how to treat stands using LMS and examine treatment effects using LMS

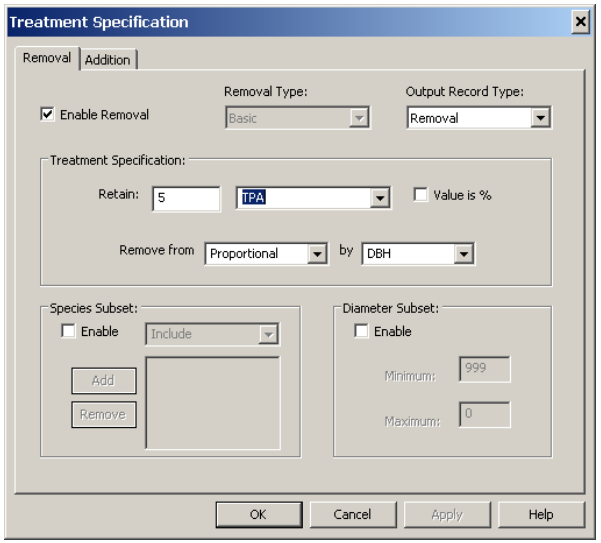
Stand Treatments with LMS

Stand treatments are done with LMS using the Treatment and Disturbance Simulation module of LMS. This module provides the tools needed to simulate silvicultural treatment or natural disturbances, such as windthrow, that remove trees from the stand. Regeneration, either planted or natural, can also be simulated.

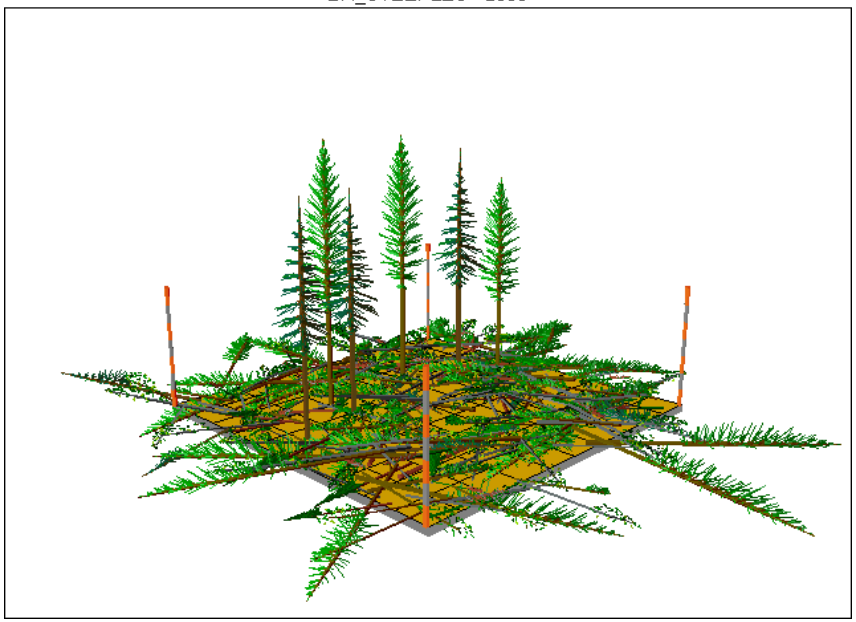


Treating Stands using LMS

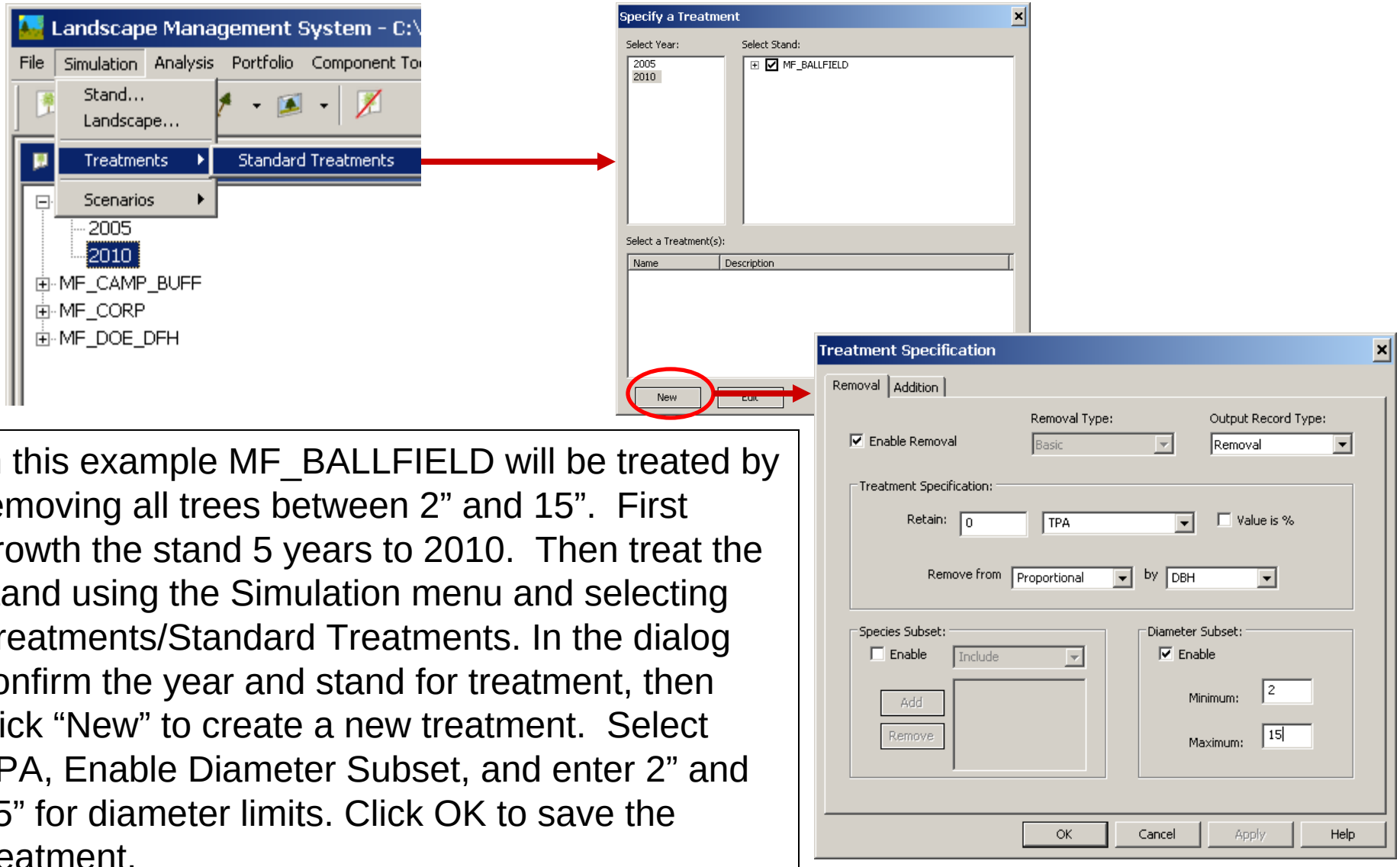
LMS features a treatment program that allows the user to perform silvicultural treatments. Using the Treatment Definition dialog, stands can be thinned to a specified percent of original TPA, actual TPA, basal area, or SDI. Trees can be removed from below (taking the smallest trees first), proportional (taking trees equally from each tree record), or above (taking the largest trees first). Diameter ranges and species to include or exclude can also be defined to target specific species and diameter ranges. Multiple treatments can be performed on a stand in any year giving the ability to simulate complex prescriptions.



BR_STEEPLES - 2000



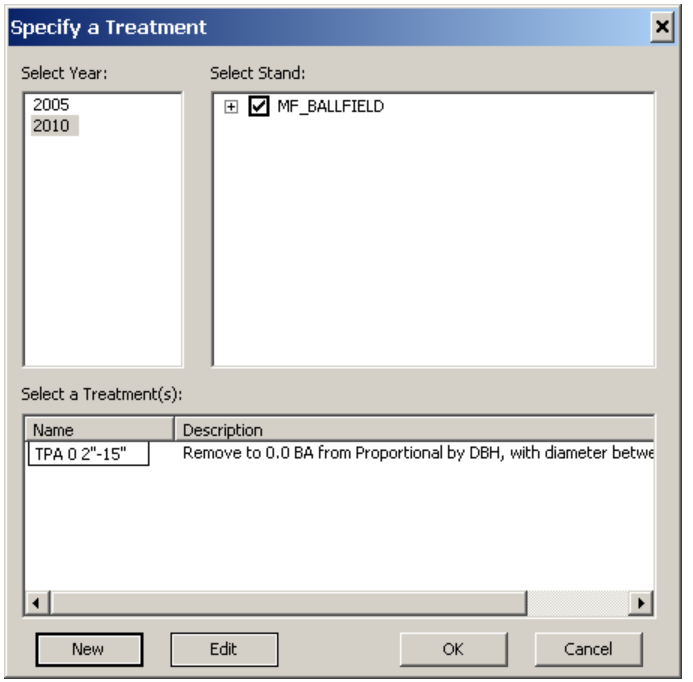
MF_BALLFIELD: Remove trees between 2” and 15”

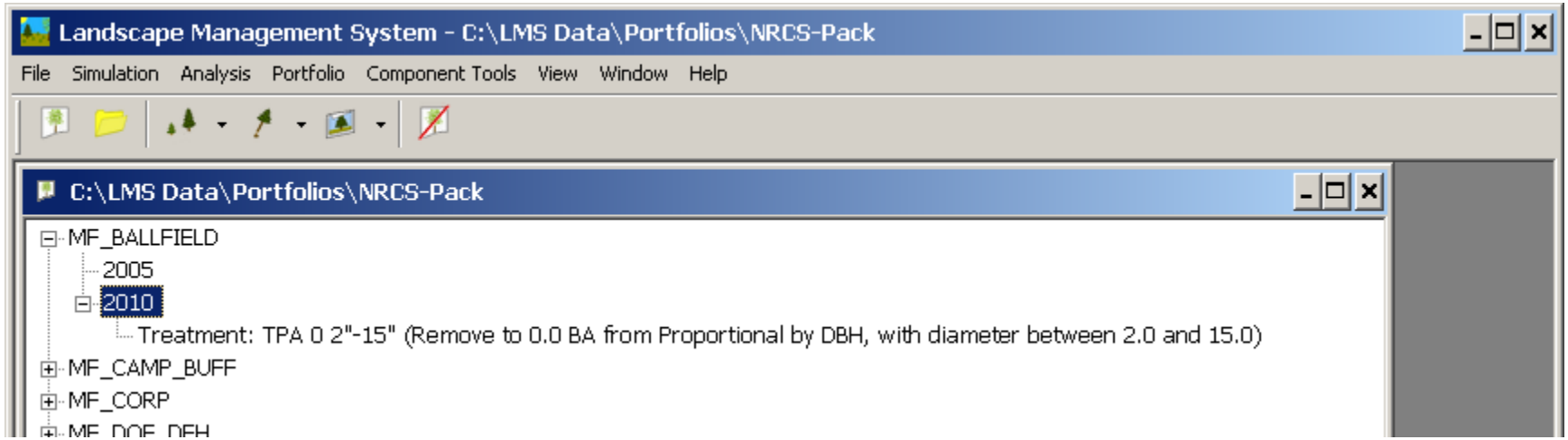


In this example MF_BALLFIELD will be treated by removing all trees between 2” and 15”. First growth the stand 5 years to 2010. Then treat the stand using the Simulation menu and selecting Treatments/Standard Treatments. In the dialog confirm the year and stand for treatment, then click “New” to create a new treatment. Select TPA, Enable Diameter Subset, and enter 2” and 15” for diameter limits. Click OK to save the treatment.

Applying Treatment

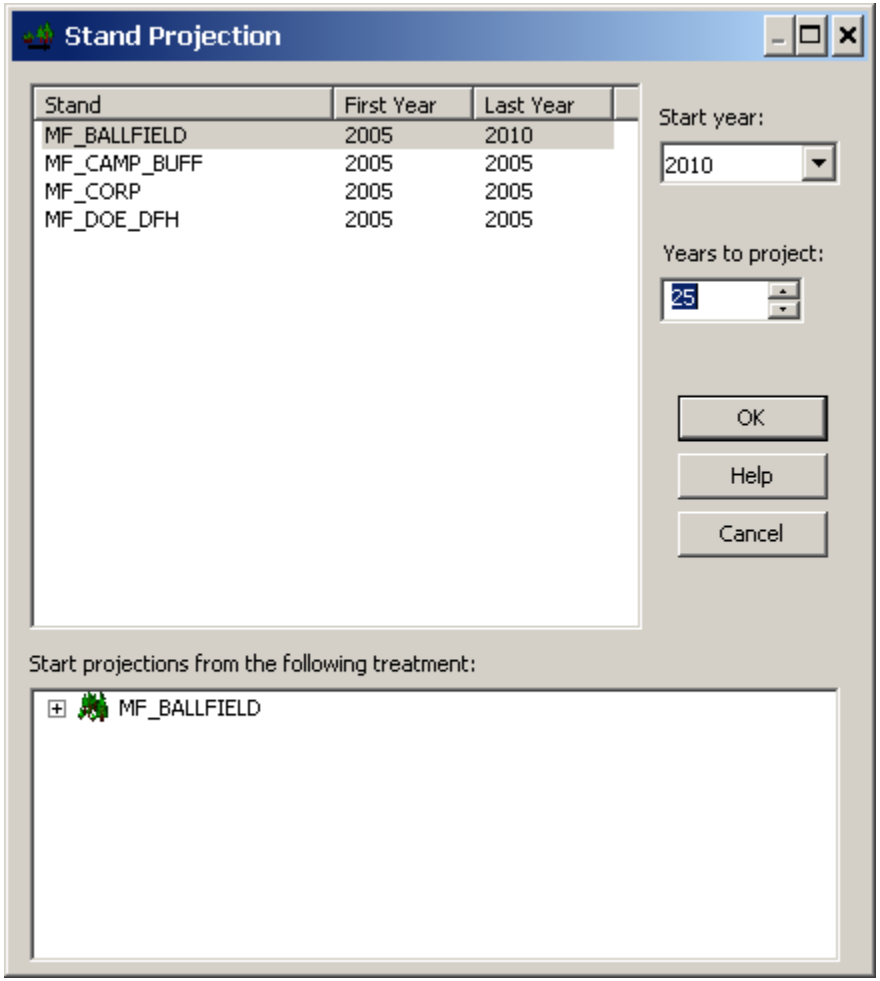
Applying the treatment is done after naming the treatment then selecting the year and stand. Name the treatment by changing New Treatment, under Name, to TPA 0 – 2” to 15”. Confirm that the year 2010 and stand MF_BALLFIELD are selected. Click OK, and the treatment will be applied. The results of the treatment will be shown in the portfolio window.





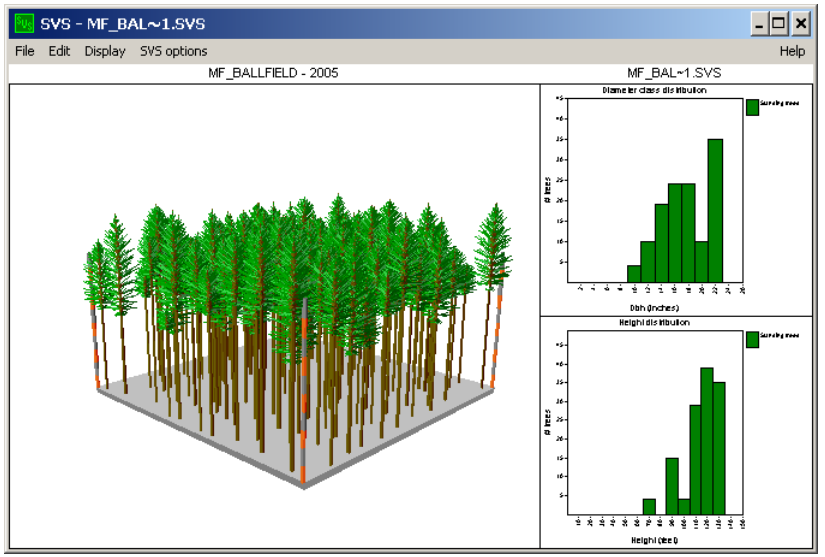
Grow MF_BALLFIELD to 2035

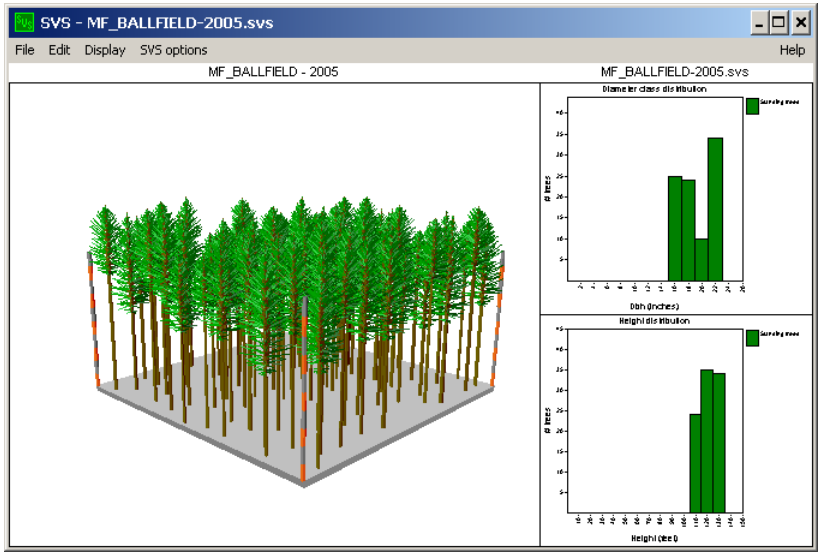
After applying the treatment, grow MF_BALLFIELD for 25 years by selecting MF_BALLFIELD in the Stand Projection dialog. Start year should be 2005 and Years to project should be 25. Click OK to grow the stand.



Getting reacquainted with the stand

- SVS images
  - Make a combined image to see what parts of the distributions were removed.
  - 3-view
  - Graphs with legends
- Tables
  - Stand Summary Total





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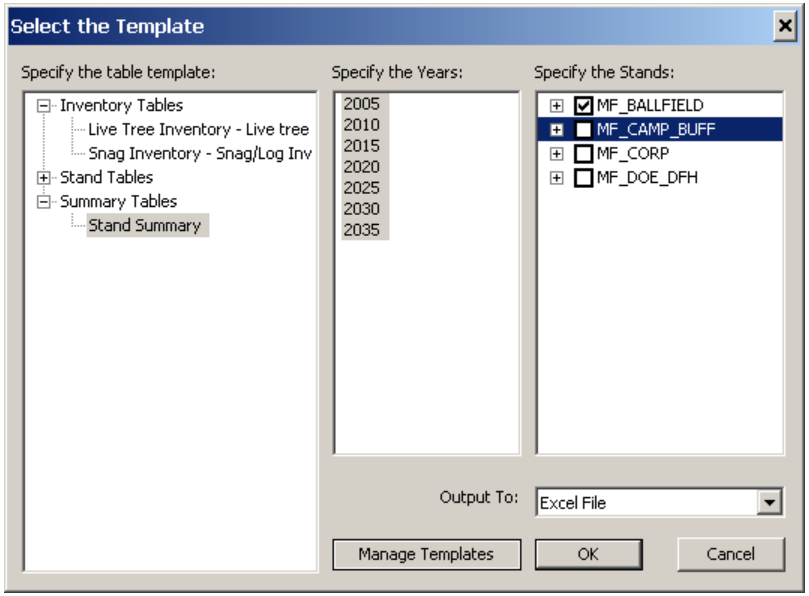
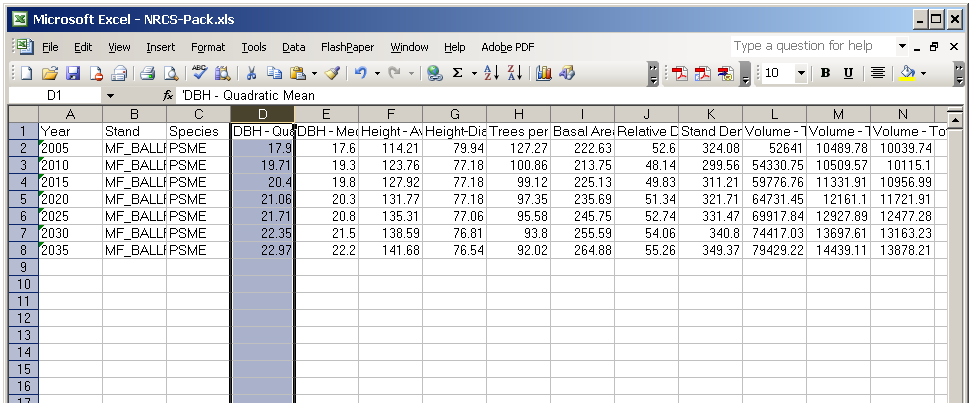
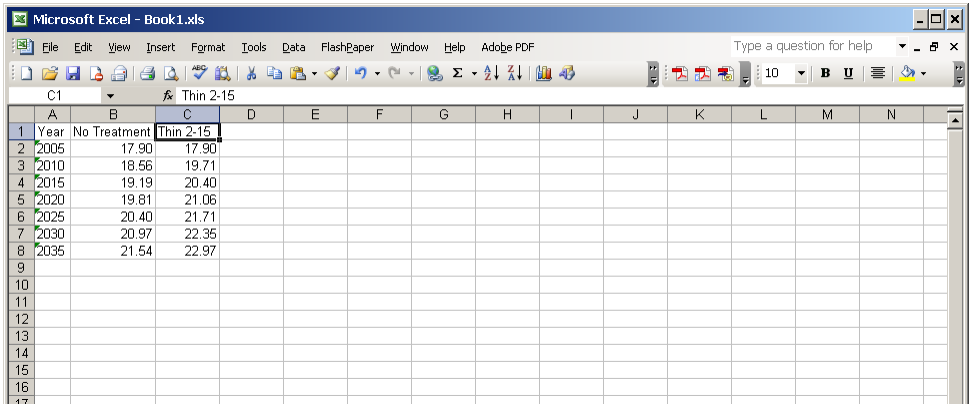


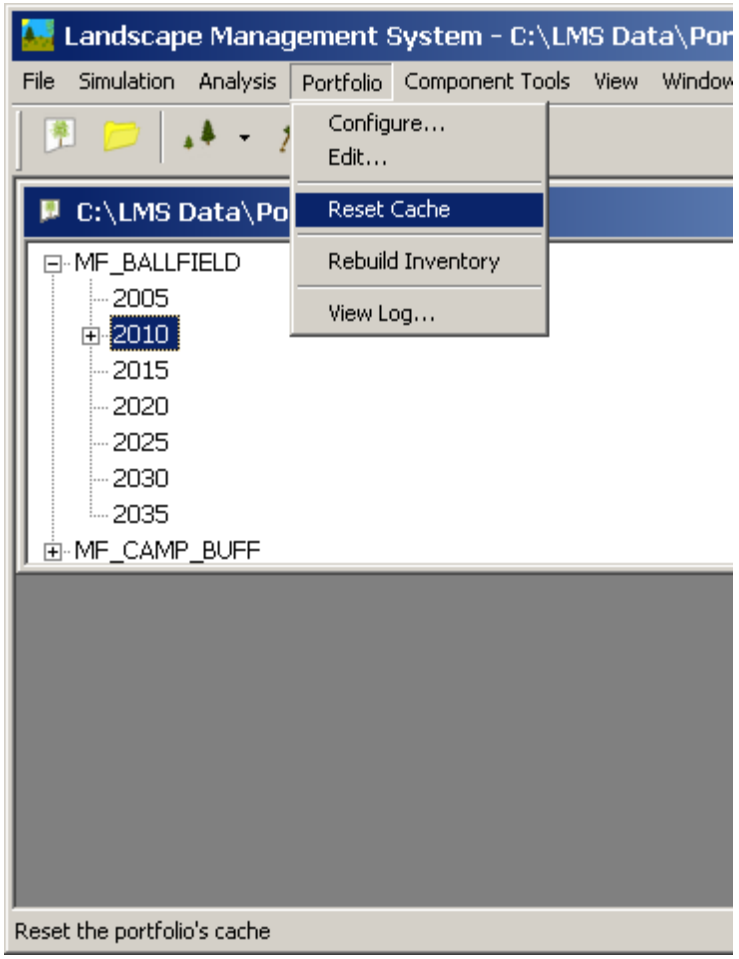




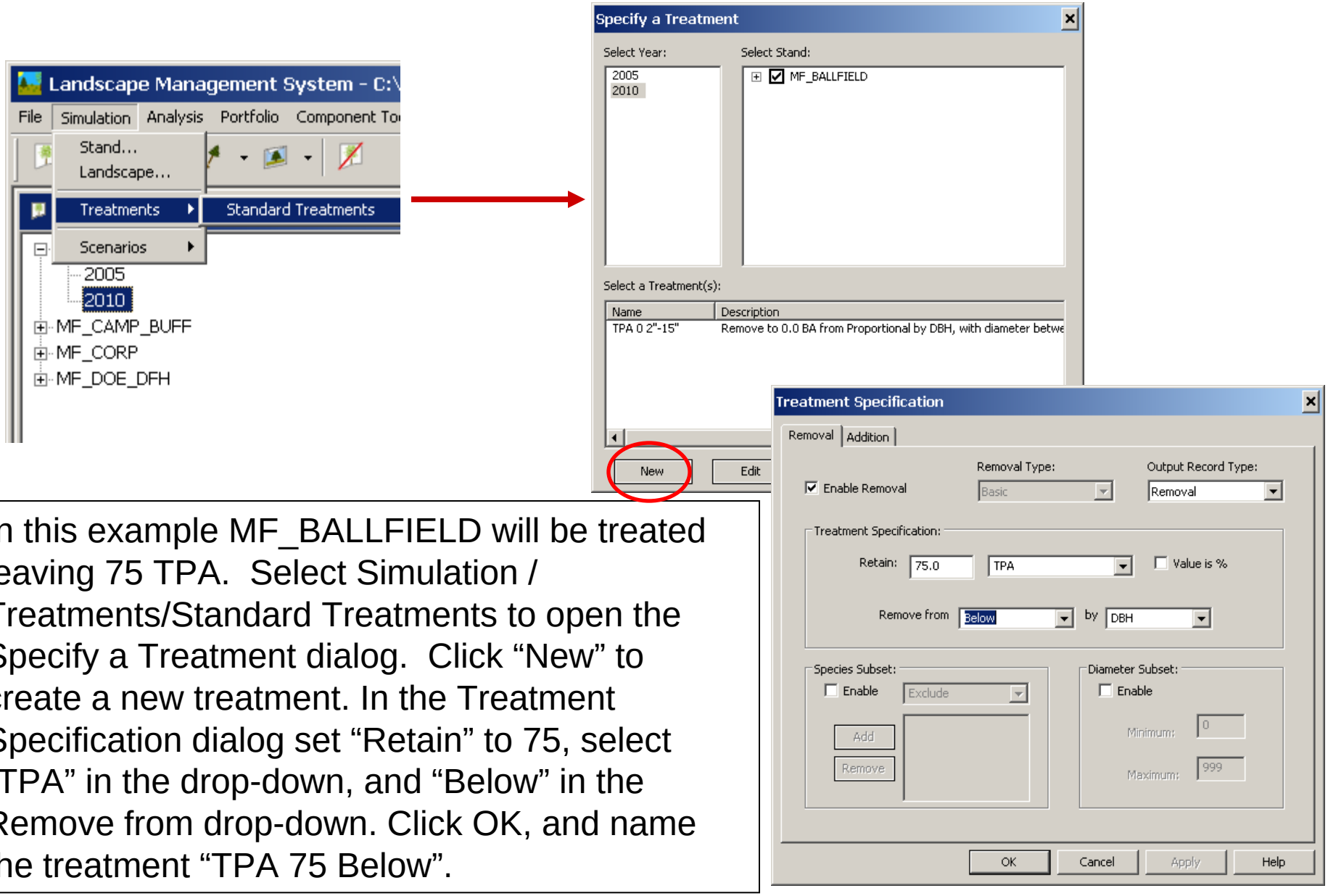
Treatment 2: Leave 75 TPA

To apply the next treatment to MF_BALLFIELD the cache needs to be flushed to eliminate the treatment that was just done. If the cache is not flushed, LMS 3.1 will perform the treatment on the trees left after the first treatment. In this case, all the trees between 2" and 15" will have been removed and the treatment applied in this section will leave 75 TPA of the remaining trees rather than 75 TPA of the original stand. Flushing the cache is done by selecting "Reset Cache" from the LMS Portfolio menu.

Note: Any files that have been saved in the portfolios cache directory will also be deleted. If files are to be saved, they must be saved in a different location.



MF_BALLFIELD: Leave 75 TPA

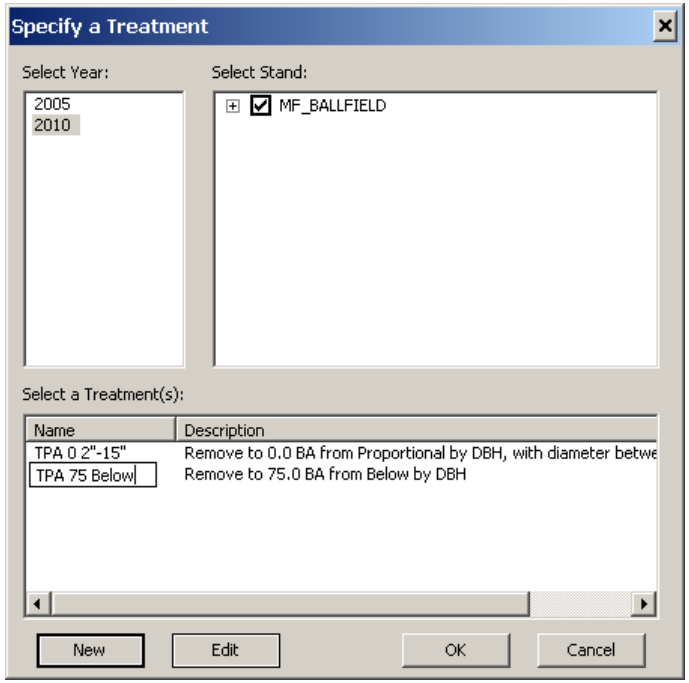


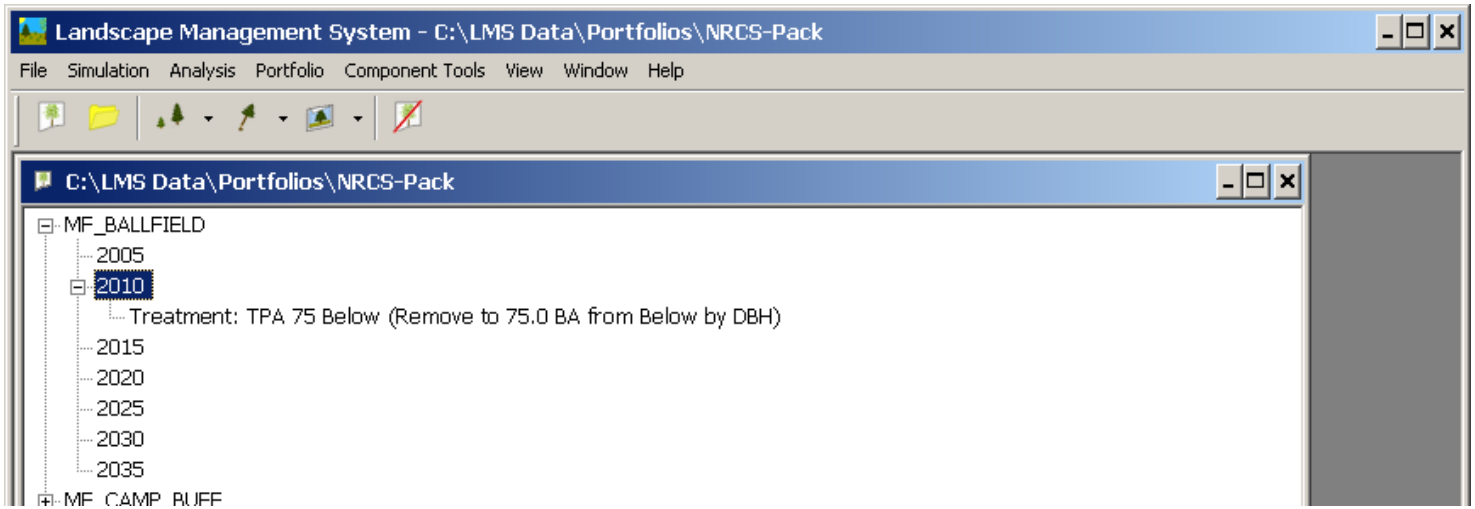
In this example MF_BALLFIELD will be treated leaving 75 TPA. Select Simulation / Treatments/Standard Treatments to open the Specify a Treatment dialog. Click “New” to create a new treatment. In the Treatment Specification dialog set “Retain” to 75, select “TPA” in the drop-down, and “Below” in the Remove from drop-down. Click OK, and name the treatment “TPA 75 Below”.

Applying Treatment

Names the treatment “TPA 75 Below”. Confirm the year, 2010, and stand name and click OK to apply the treatment.

Then grow the stand 25 years to 2031.





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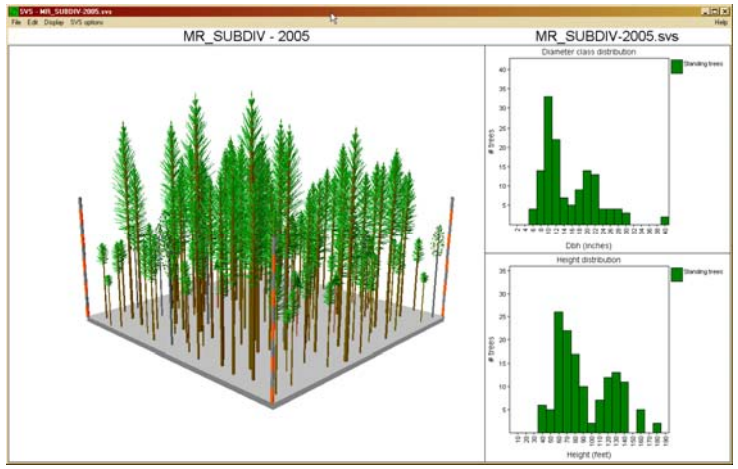

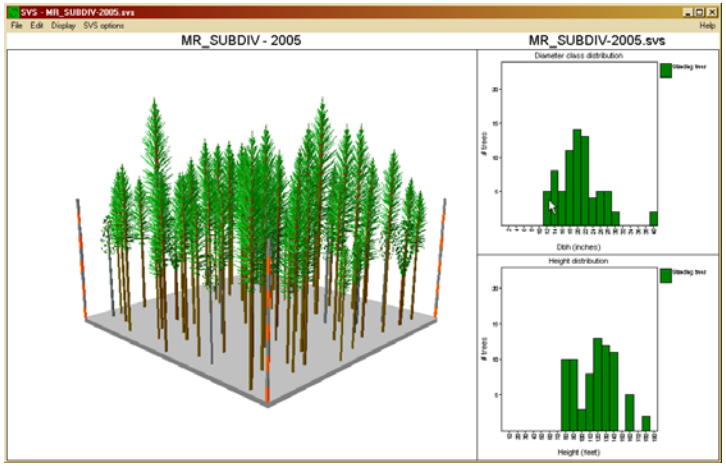

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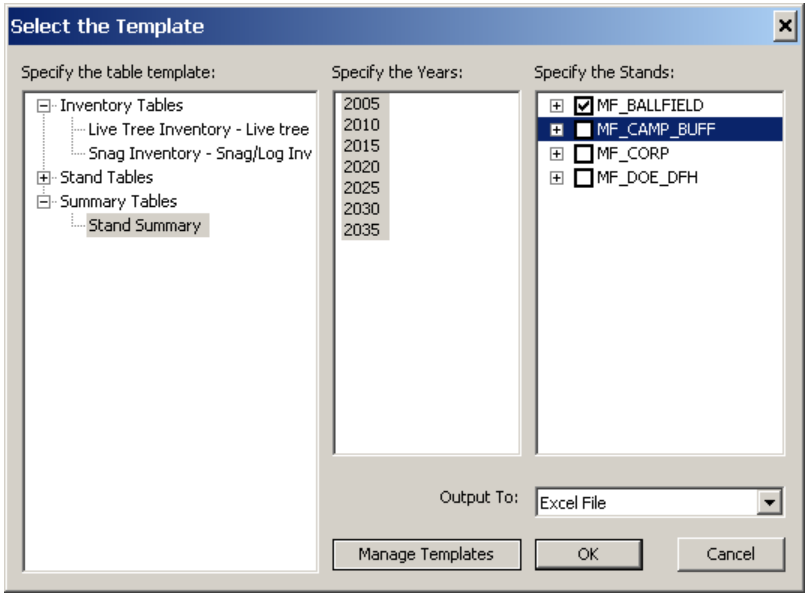
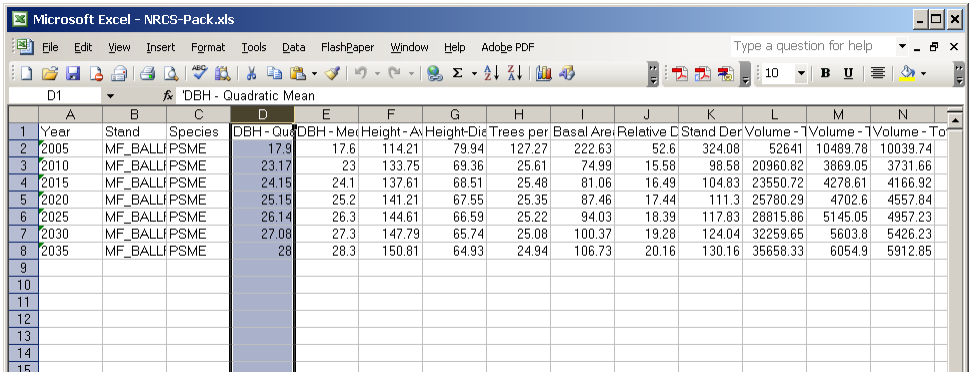
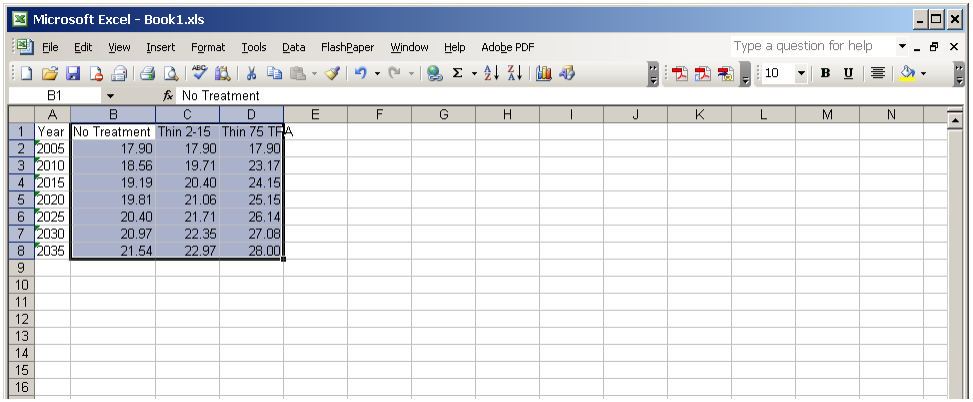


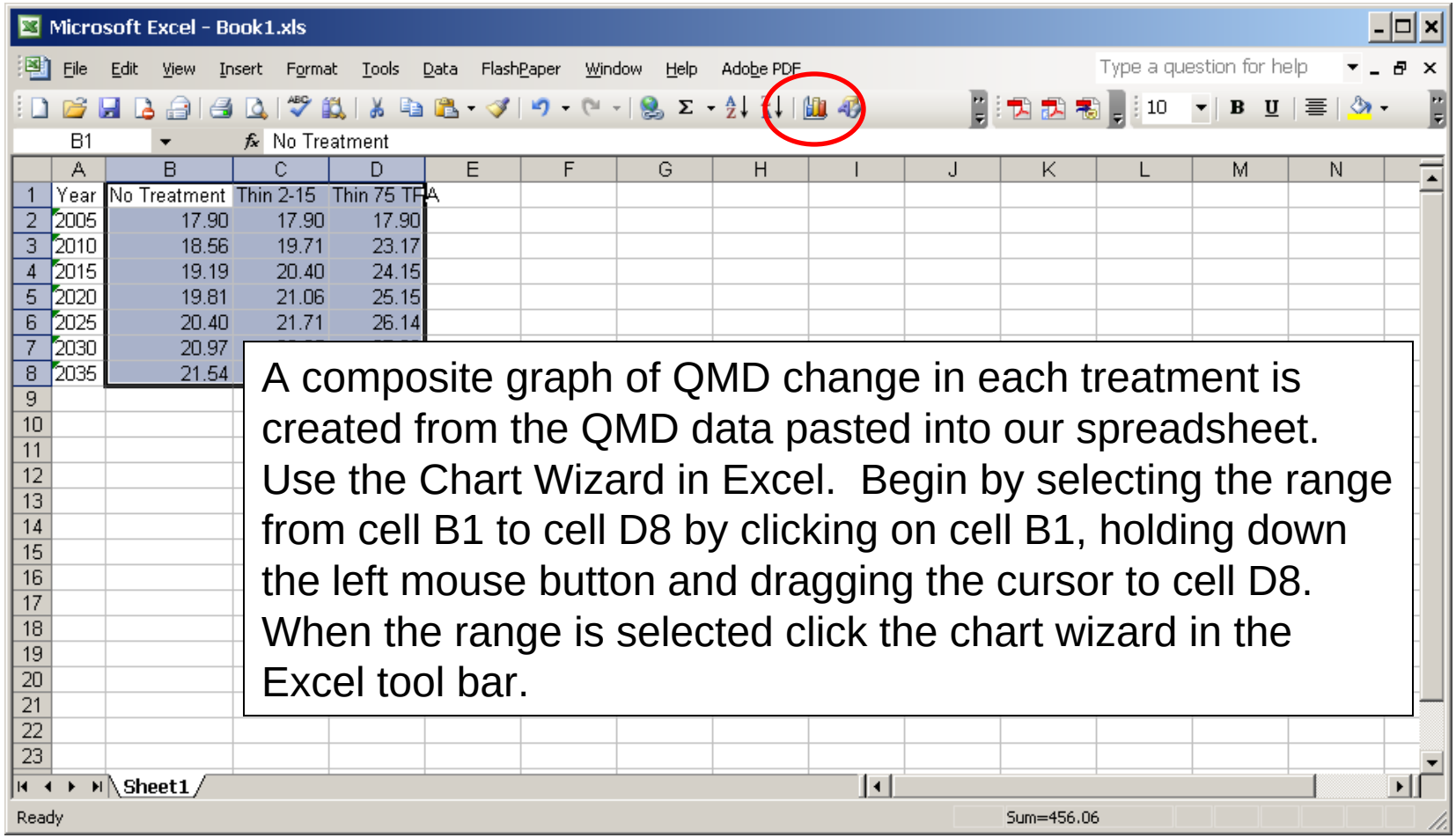


	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Year	Stand	Species	DBH - Qua	DBH - Me	Height - A	Height-Dia	Trees per	Basal Are	Relative D	Stand Den	Volume - T	Volume - T	Volume - To
2	2005	MF_BALLF	PSME	17.9	17.6	114.21	79.94	127.27	222.63	52.6	324.08	52641	10489.78	10039.74
3	2010	MF_BALLF	PSME	23.17	23	133.75	69.36	25.61	74.99	15.58	98.58	20960.82	3869.05	3731.66
4	2015	MF_BALLF	PSME	24.15	24.1	137.61	68.51	25.48	81.06	16.49	104.83	23550.72	4278.61	4166.92
5	2020	MF_BALLF	PSME	25.15	25.2	141.21	67.55	25.35	87.46	17.44	111.3	25780.29	4702.6	4557.84
6	2025	MF_BALLF	PSME	26.14	26.3	144.61	66.59	25.22	94.03	18.39	117.83	28815.86	5145.05	4957.23
7	2030	MF_BALLF	PSME	27.08	27.3	147.79	65.74	25.08	100.37	19.28	124.04	32259.65	5603.8	5426.23
8	2035	MF_BALLF	PSME	28	28.3	150.81	64.93	24.94	106.73	20.16	130.16	35658.33	6054.9	5912.85



	A	B	C	D
1	Year	No Treatment	Thin 2-15	Thin 75 TPA
2	2005	17.90	17.90	17.90
3	2010	18.56	19.71	23.17
4	2015	19.19	20.40	24.15
5	2020	19.81	21.06	25.15
6	2025	20.40	21.71	26.14
7	2030	20.97	22.35	27.08
8	2035	21.54	22.97	28.00

Creating Composite QMD Change Graph



A composite graph of QMD change in each treatment is created from the QMD data pasted into our spreadsheet. Use the Chart Wizard in Excel. Begin by selecting the range from cell B1 to cell D8 by clicking on cell B1, holding down the left mouse button and dragging the cursor to cell D8. When the range is selected click the chart wizard in the Excel tool bar.

Chart Wizard – Step 1

Excel's Chart Wizard is a 4-step, interactive tool that guides the user through creating charts. In Step 1 the type of chart is selected. Select "Line" under chart type then click "Next".

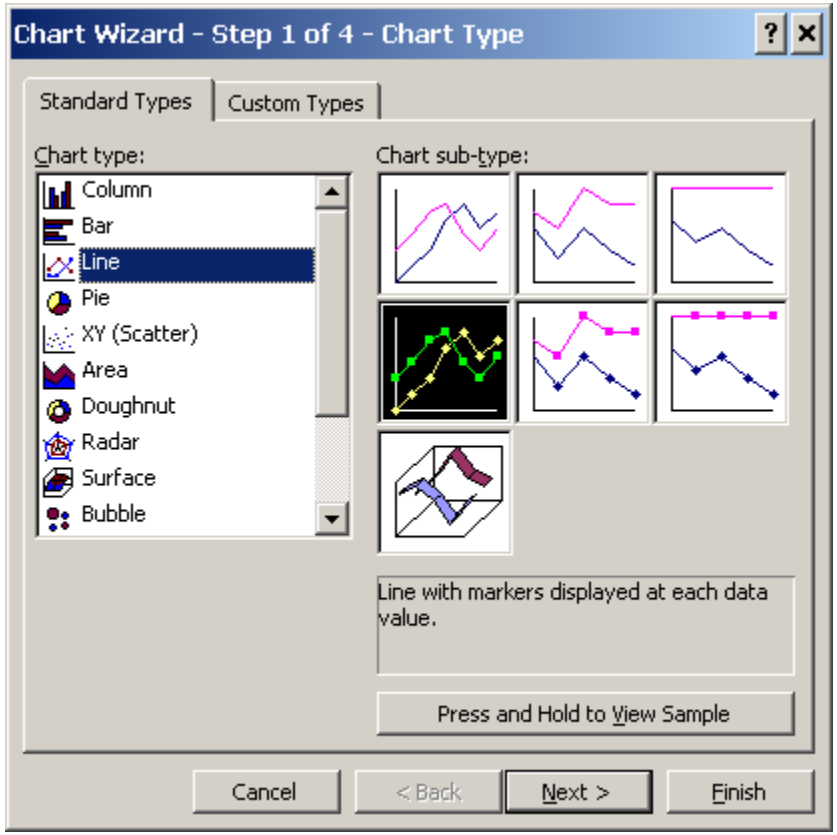
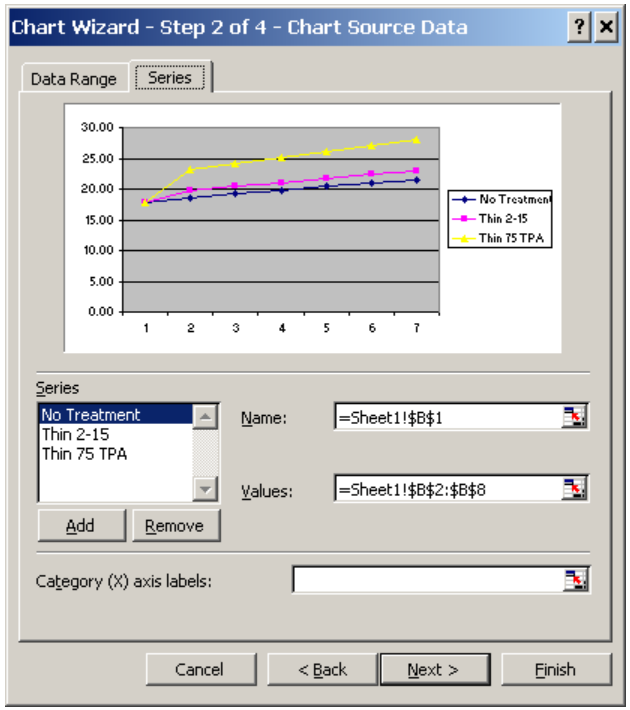


Chart Wizard – Step 2



Step 2 of the Chart Wizard lets the user change the location of the source data for the chart and set the x-axis labels. Clicking the “Series” tab allows the user to change the names of the data series that are being plotted and add values for the x-axis. Click the button to the right of the “Category (X) Axis Labels” box (left) to go back to the summary table and highlight the years in column A (below). After the year range has been selected, click the icon on the dialog to return to the Chart Wizard.

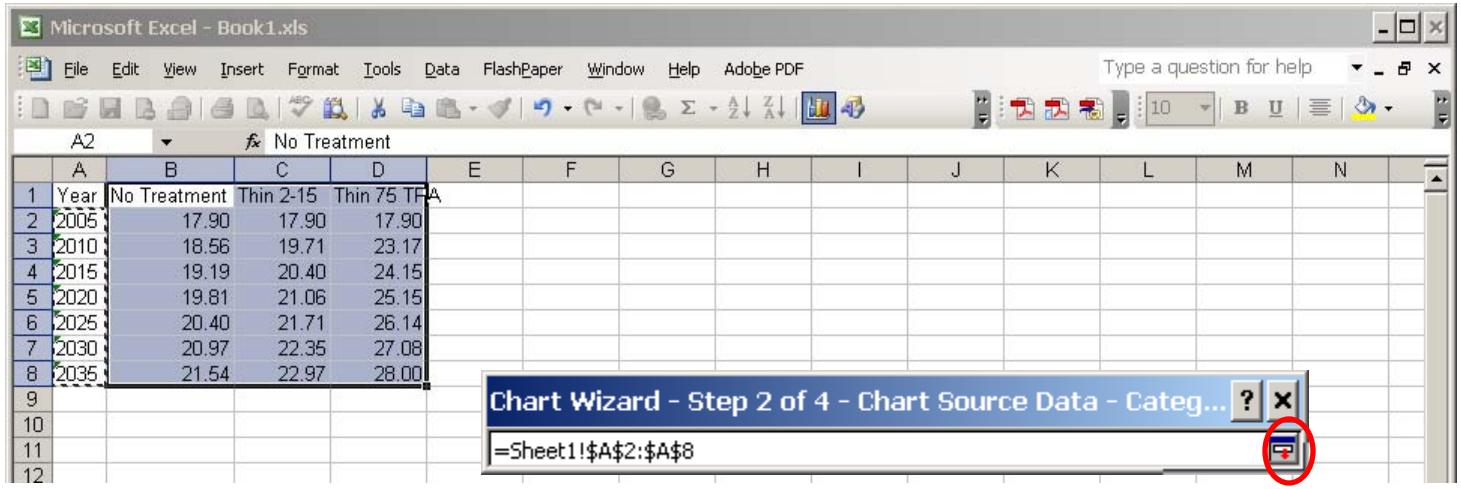
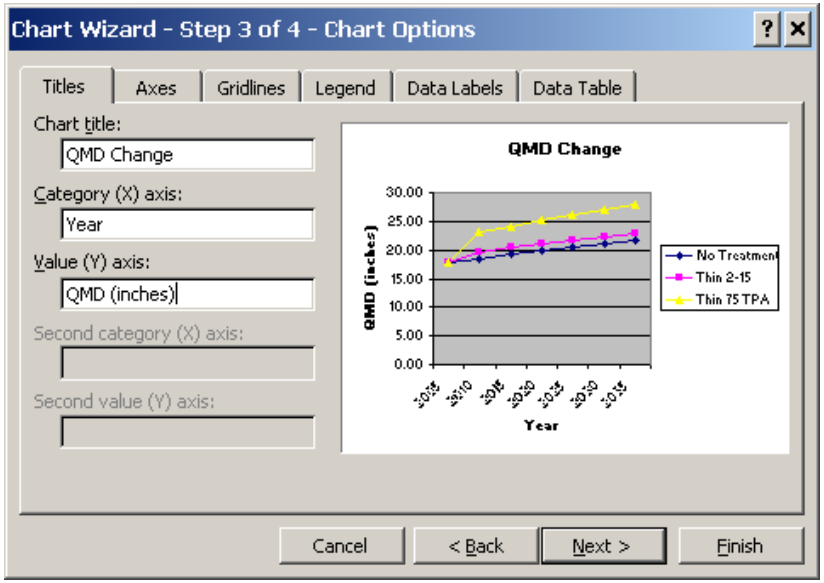


Chart Wizard – Step 3

Step 3 of the Chart Wizard is where chart options, such as title, axis labels, and legends are specified. Under the Titles tab enter “QMD Change” in the Chart Title box, “Year” in the Category (X) axis box, and “QMD (inches)” in the Value (Y) axis box. These values will automatically be added to the chart. Under the Legend tab check the “Top” radio button under “Placement” to place the legend above the chart. Click Next to go to Step 4.



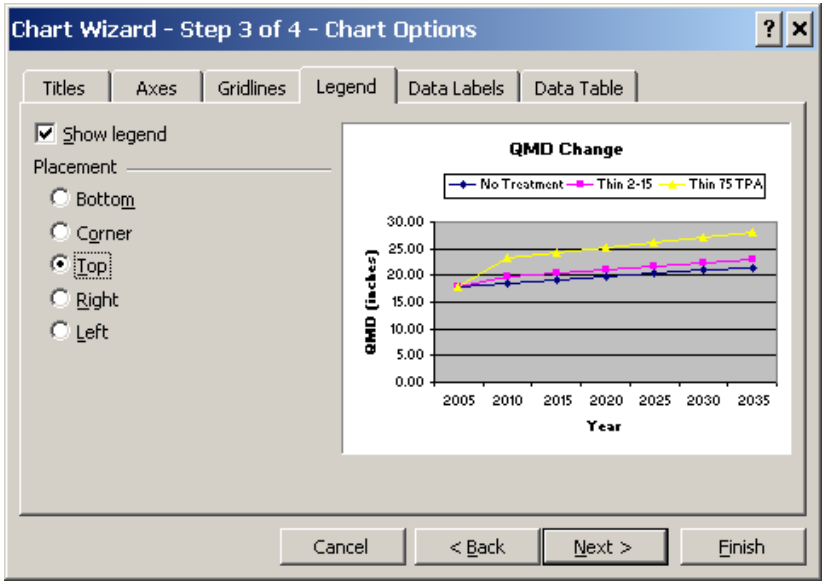
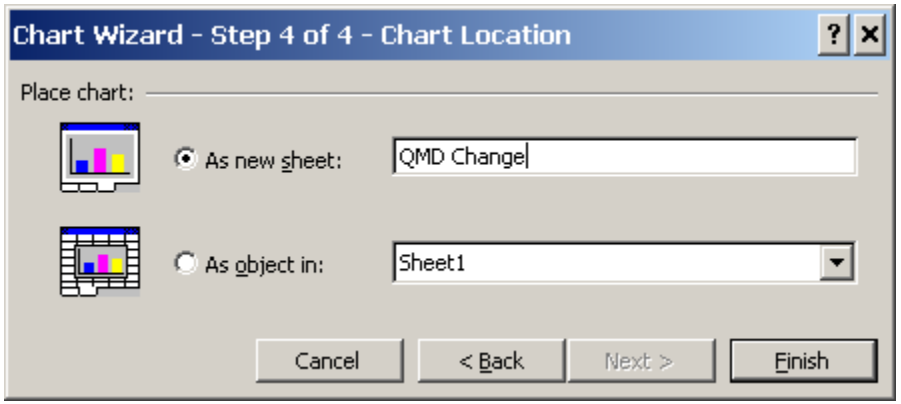
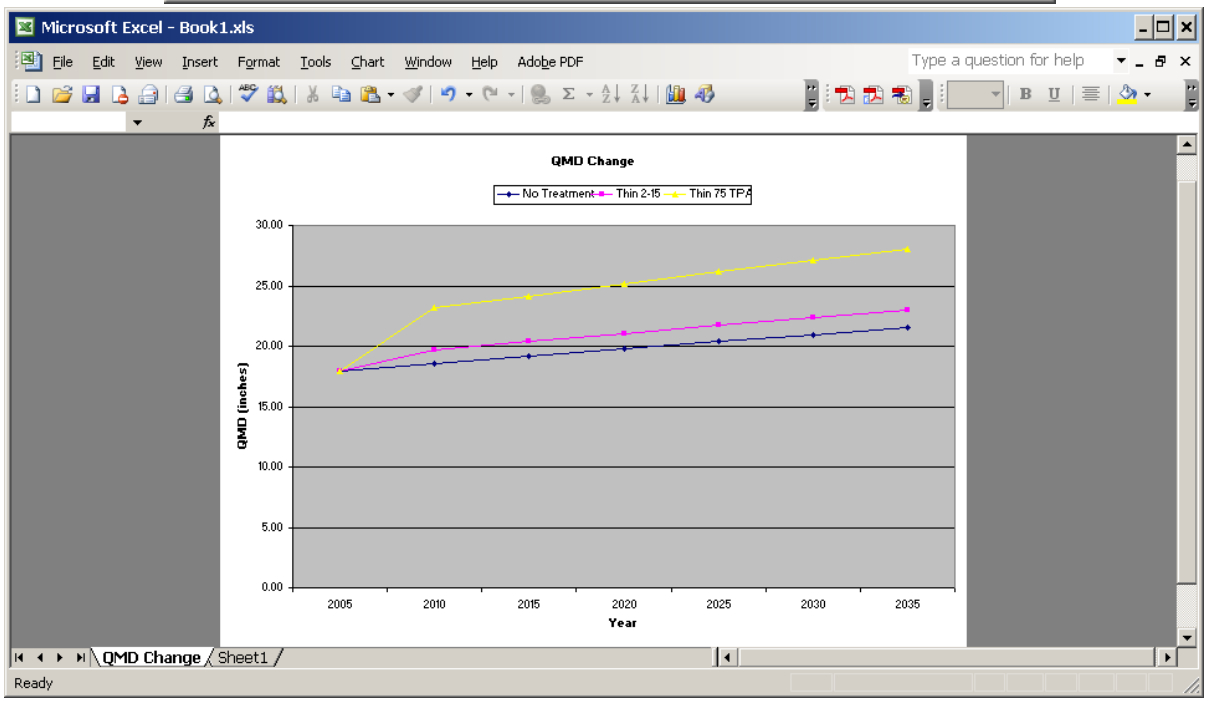
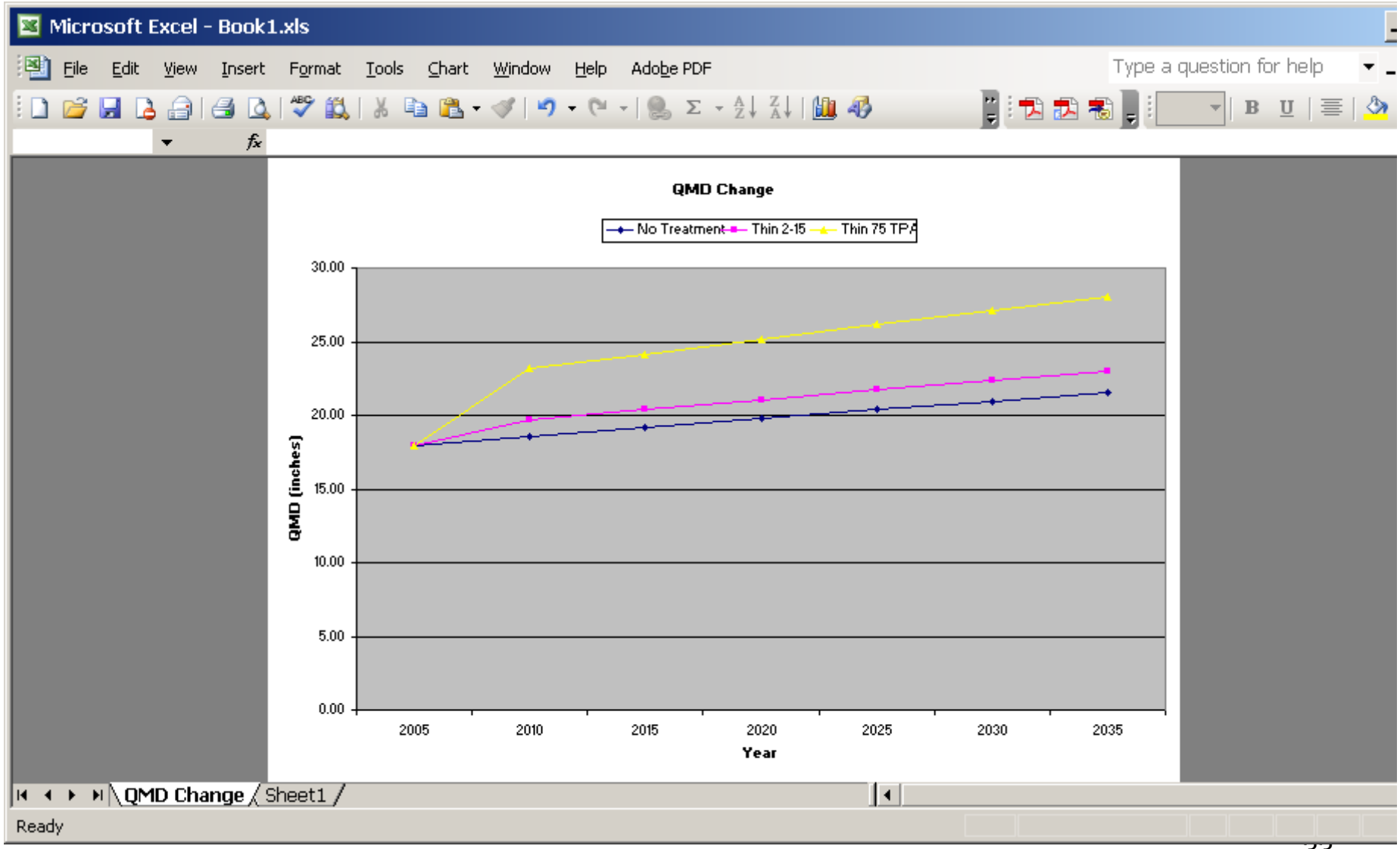


Chart Wizard – Step 4

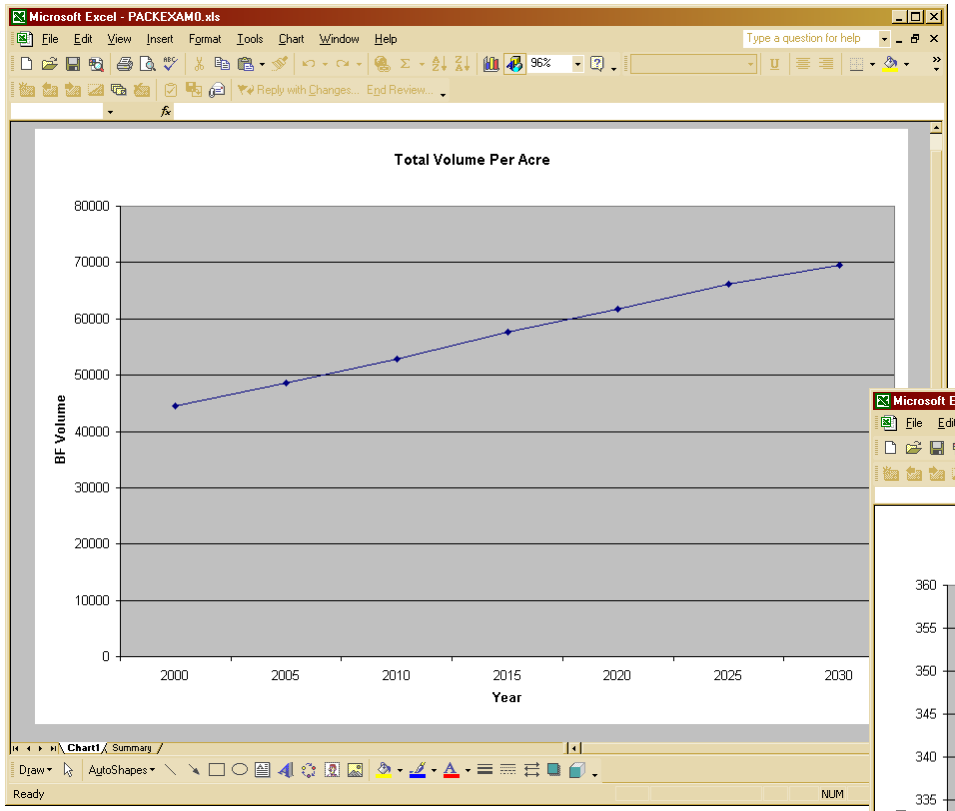
Step 4 of the Chart Wizard lets the user select where the chart will be placed, either in a new worksheet or as an object in an existing worksheet (top). Select “As new sheet” and change the name to “QMD Change”. Click Finish to complete the chart. A new worksheet titled “QMD Change” will be added to the workbook with the QMD Change chart (bottom).



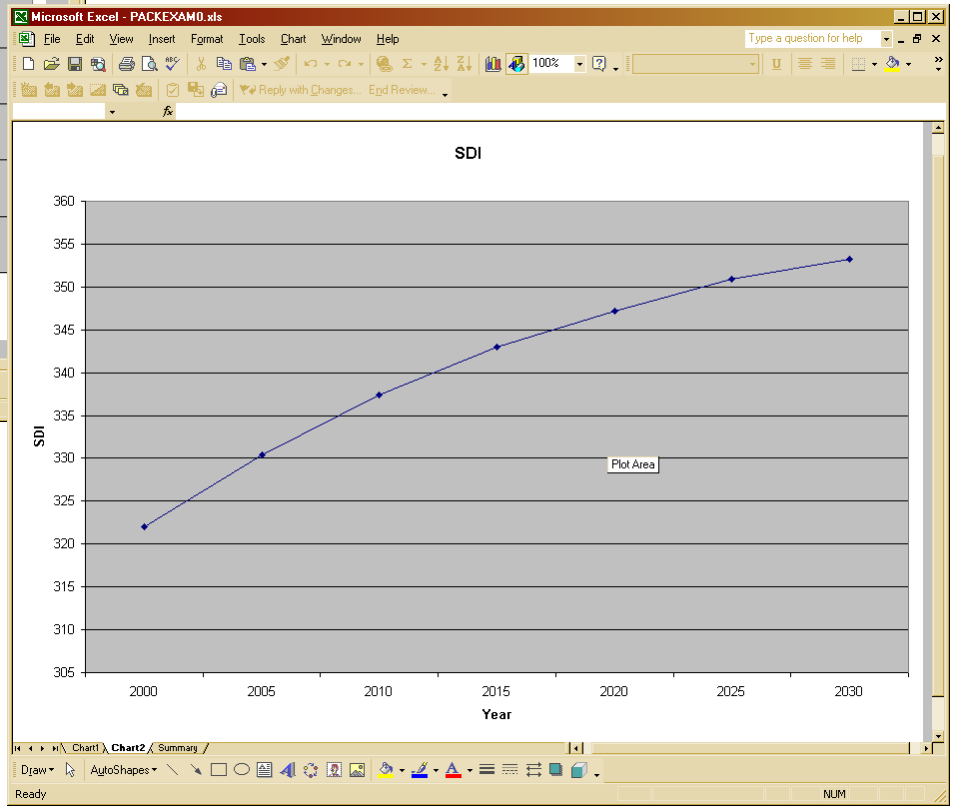



Microsoft Excel - Book1.xls
File Edit View Insert Format Tools Chart Window Help Adobe PDF
Type a question for help
QMD Change
No Treatment
Thin 2-15
Thin 75 TPA
30.00
25.00
20.00
15.00
10.00
5.00
0.00
QMD (inches)
2005
2010
2015
2020
2025
2030
2035
Year
QMD Change
Sheet1
Ready

Other Charts from Summary Table



Other charts can be made from the summary table. For example, Total Volume Per Acre and SDI are created by selecting the TVolPerAcre or SDI column rather than the QMD column.



Exercise

- Using the same stand as the previous exercise, perform treatments in the year 2000 with the objectives of creating older forest habitat and harvest volume.
- Grow for 30 years
- View SVS images to examine stand changes caused by treatment and growth
- Create QMD graph for No Treatment and each of the treatments.

Growth and Treatment Summary

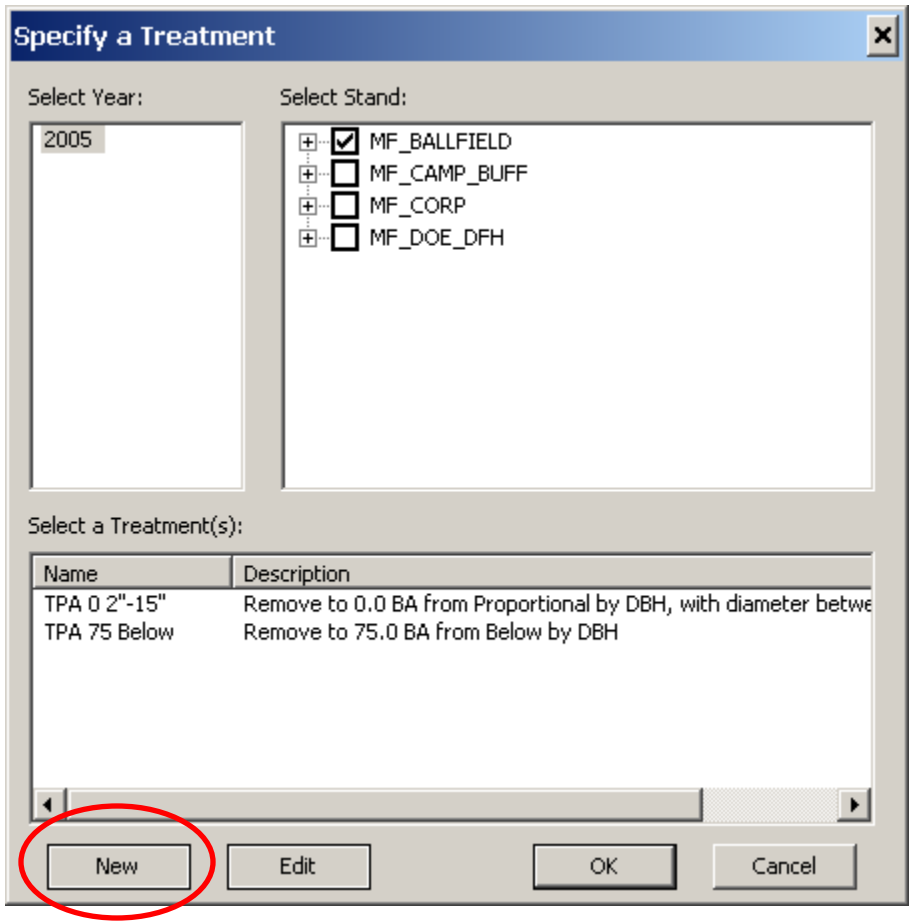
Regenerating Stands and Treatment Effects

Learn how to regenerate stands using LMS and examine the results using LMS

Regenerating Stands

Regenerating stands with LMS is done using the same treatment specification dialog as for a thinning.

Click NEW to create a new treatment…



Regenerating Stands

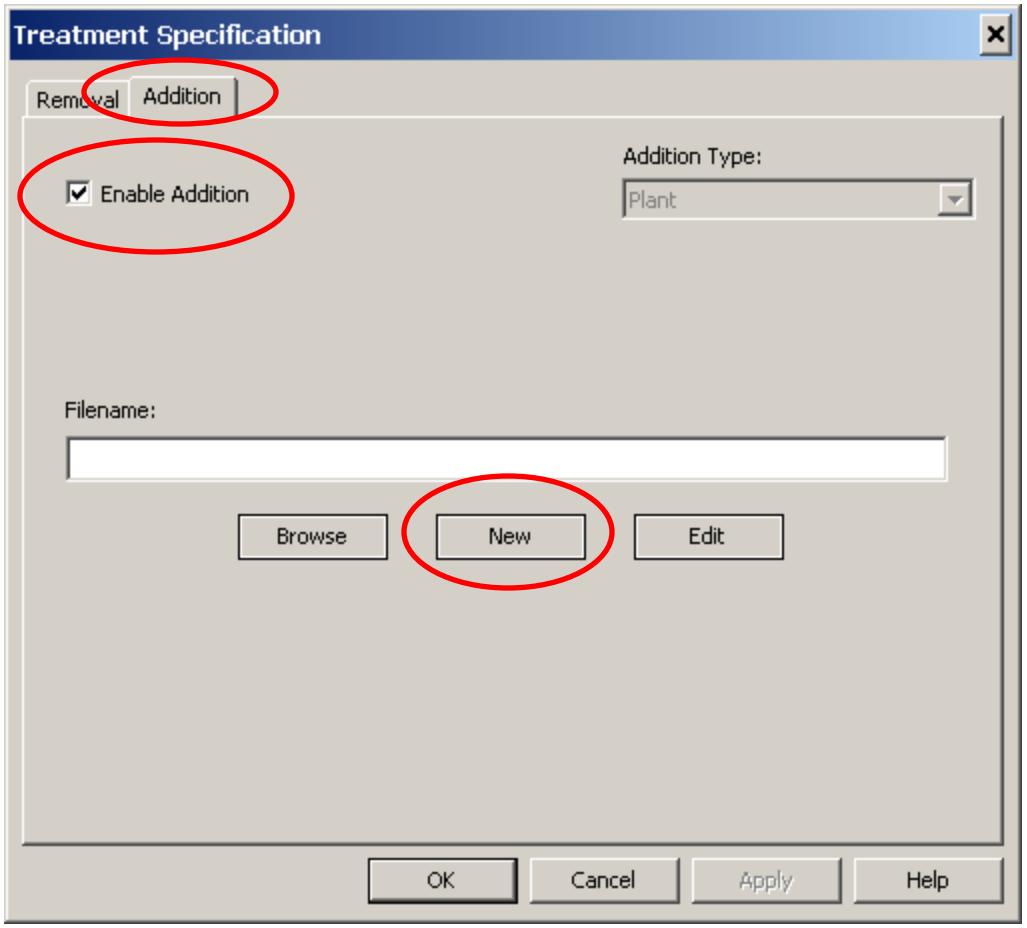
From the Treatment Specification dialog select the Addition tab to specify regeneration information.

Check Enable Addition to indication that you want inventory records added as part of this treatment.

Click the New button to create a new regeneration files.

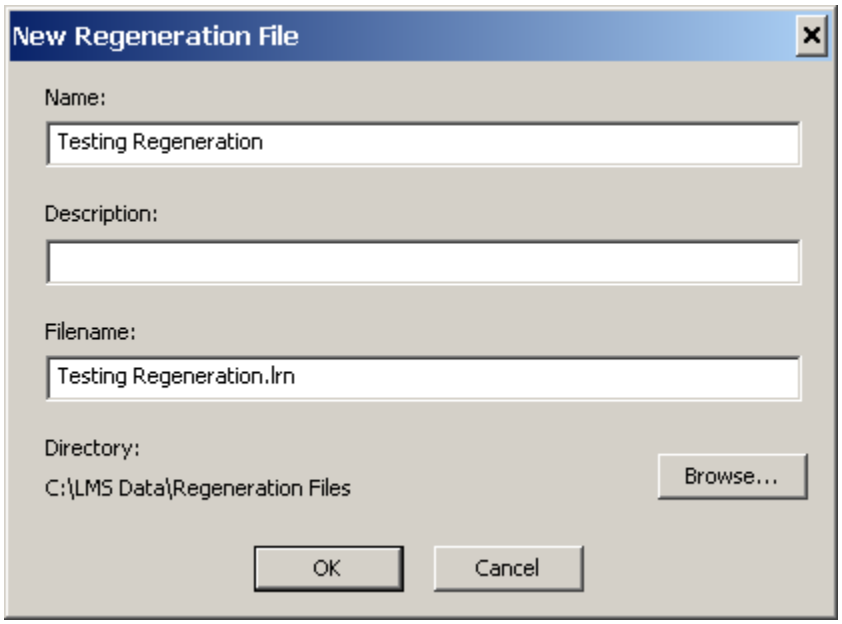
Click Browse to select and existing regeneration file.

Click Edit to modify a currently selected regeneration files.



Regenerating Stands

The New Regeneration File dialog allows you to enter a name and description for the regeneration files. The filename will be automatically created.



Regenerating Stands

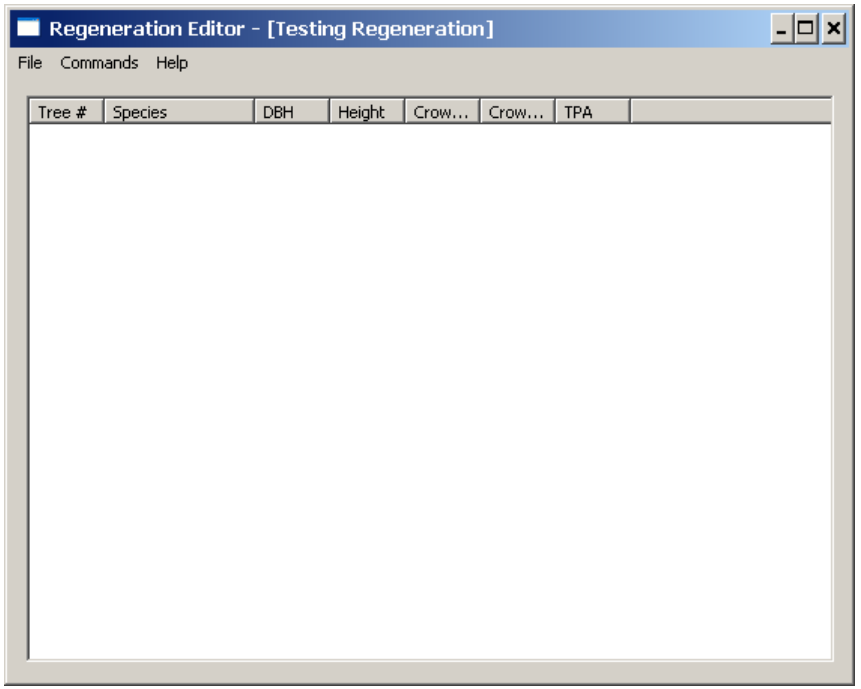
From the Regeneration Editor you can manage individual inventory records in the regeneration file.

Use Commands/Add to add new inventory records to the file.

Use Commands/Modify to edit and existing record.

Use Commands/Expand Records to spread an inventory records to several records.

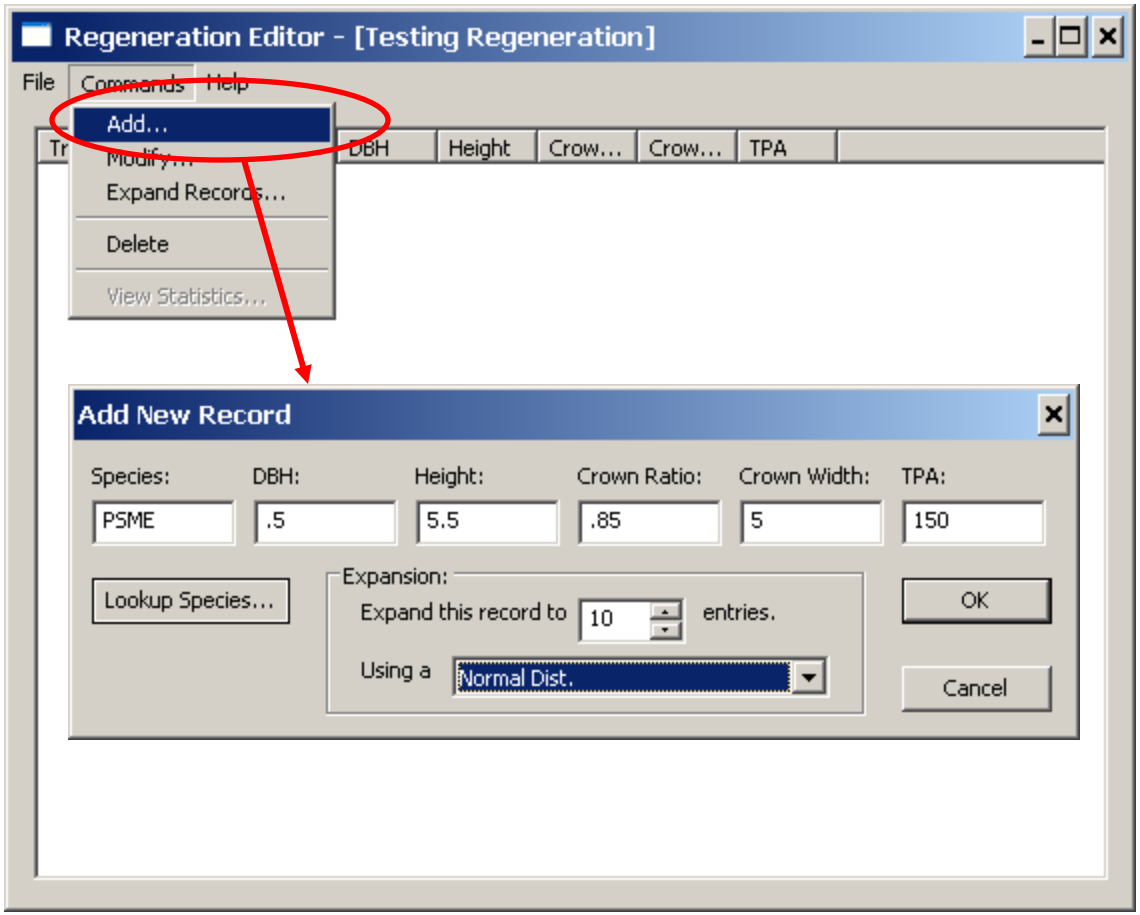
Use Commands/Delete to remove a record.



Regenerating Stands

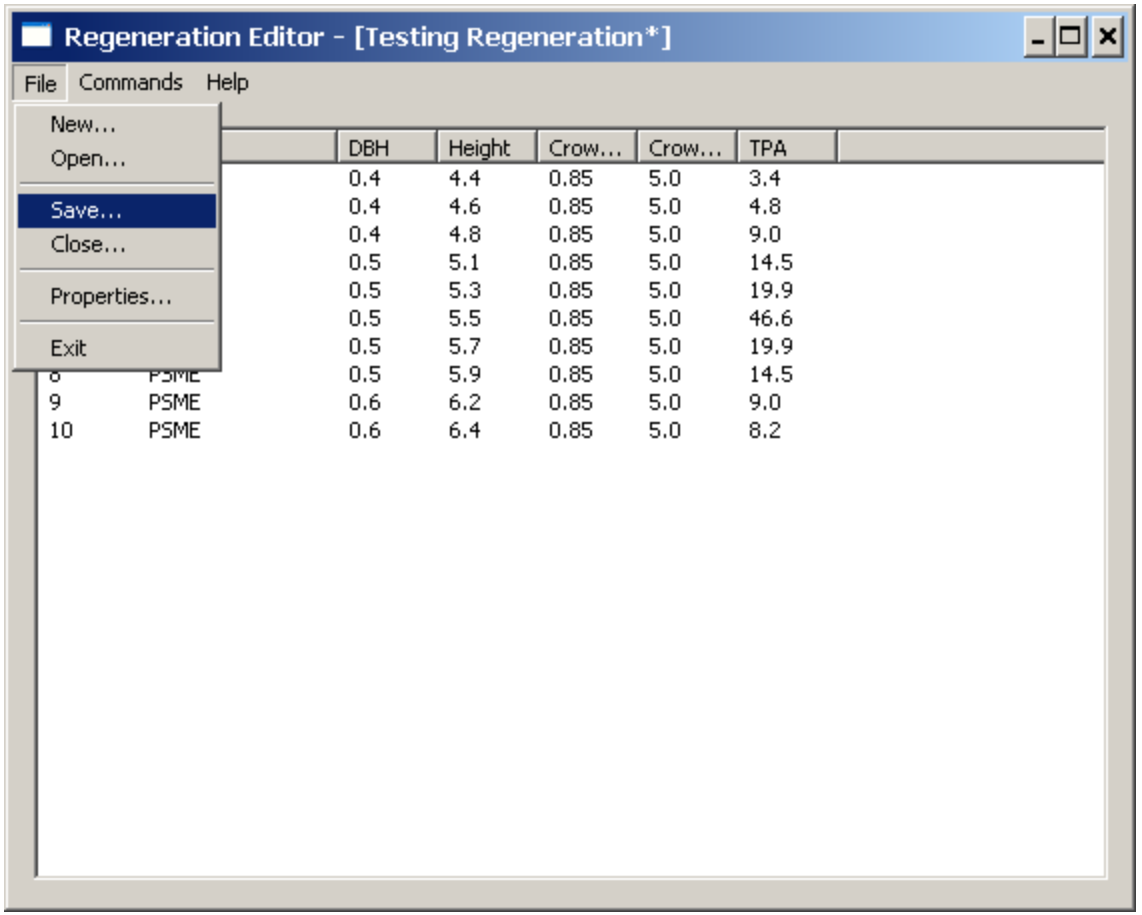
The Add New Record dialog allows you to specify the species, diameter, height, crown ration, crown width, and TPA for the record. You can have any record expanded to the desired number or records.

When expanding records you can use a normal distribution or no distribution.



Regenerating Stands

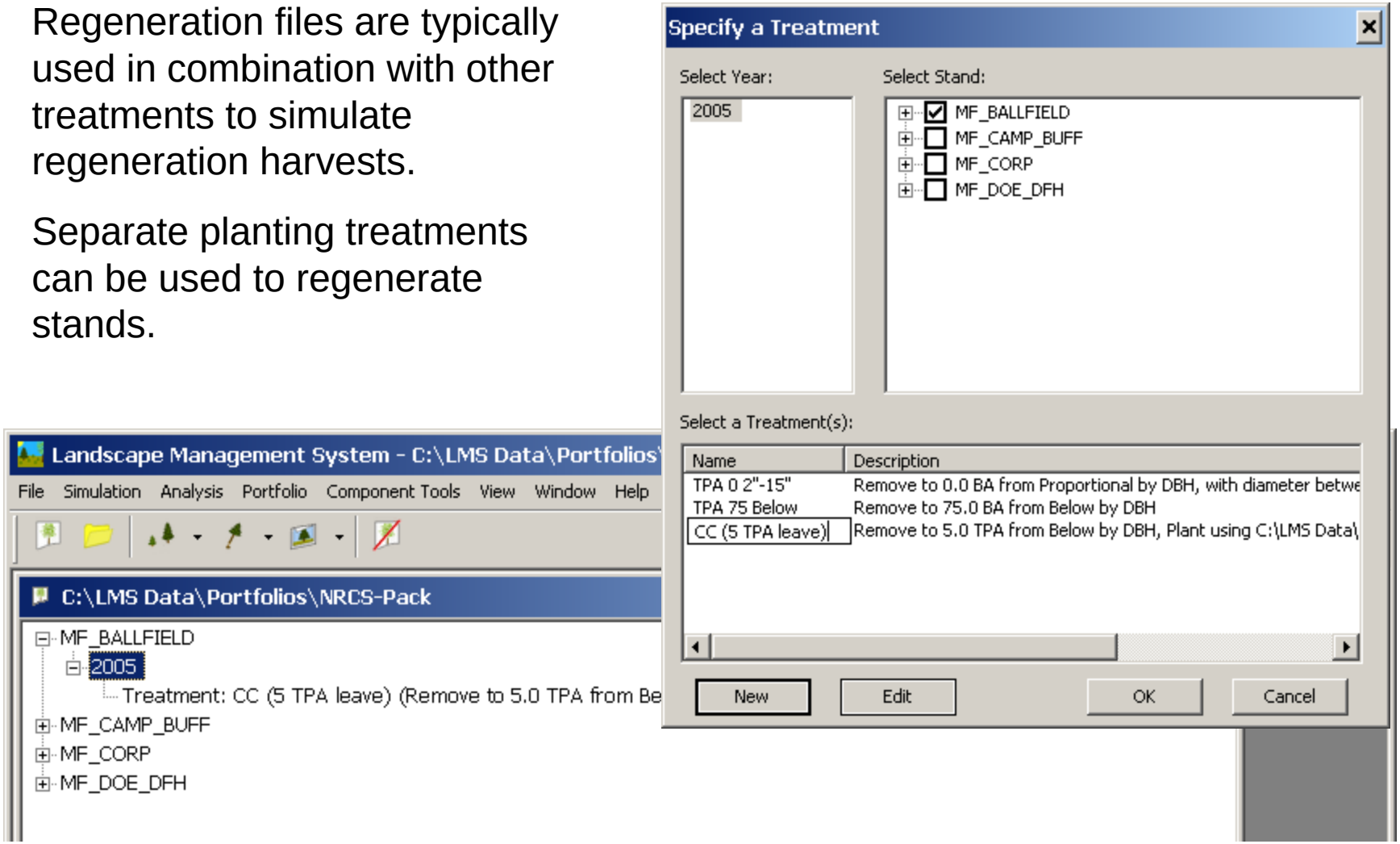
When done editing save the file using the File/Save command.



Regenerating Stands

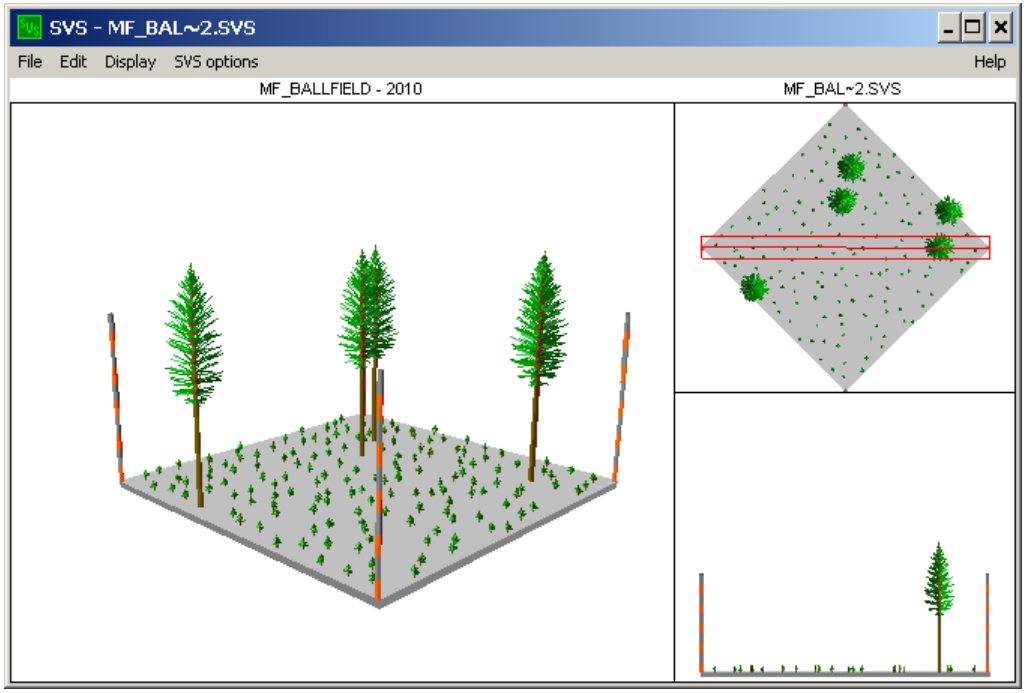
Regeneration files are typically used in combination with other treatments to simulate regeneration harvests.

Separate planting treatments can be used to regenerate stands.



Regenerating Stands

The regeneration records are introduced into the inventory after the stand is grown one cycle. The SVS image to the right shows what the stand might look like five years after a regeneration harvest that left 5 TPA and regenerated with 150 TPA of PSME.



Regenerating Stands Summary