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

Rural Technology Initiative

Design, Develop, and Deliver science-based solutions for forest management.

www.ruraltech.org

- **Economics**
- **Habitat**
- **Carbon**
- **Fuels Reductions**
- **Bioenergy**
- **Publications**
- **Videos**
- **Computer Technologies**

Washington State Small Forest Landowners

Whatcom

Pend Oreille

San Juan

Skagit

Ferry

Okanogan

Clallam

Island

Stevens

Snohomish

Jefferson

Chelan

Kitsap

Douglas

Spokane

Mason

King

Lincoln

Grays Harbor

Kittitas

Grant

Pierce

Adams

Whitman

Thurston

zoom in

Lewis

Franklin

Garfield

Pacific

Yakima

Benton

Walla Walla

Columbia

Asotin

Wahkiakum

Cowlitz

Skamania

Klickitat

Clark

- **≥ 1 Acre Properties**
  - **5.7 million acres**
  - **215,000 owners**

	Highways
	Washington Small Forest Land Owner
	NLCD Forest Cover

© January, 2009

0   15   30   60
Miles

Spatially Explicit

Grays Harbor

Thurston

zoom in

Pacific

Lewis

Highways

Roads

Type S, F, and Np Streams

Rivers

Washington Small Forest Land Owner

NLCD Forest Cover

©January, 2018

Spatially Explicit

Oakville

——	Highways
——	Roads
——	Type S, F, and Np Streams
——	Rivers
▉	Washington Small Forest Land Owner
▉	NLCD Forest Cover

Spatially Explicit

Oakville

Highways
Roads
Type S, F, and Np Streams
Rivers
Washington Small Forest Land Owner
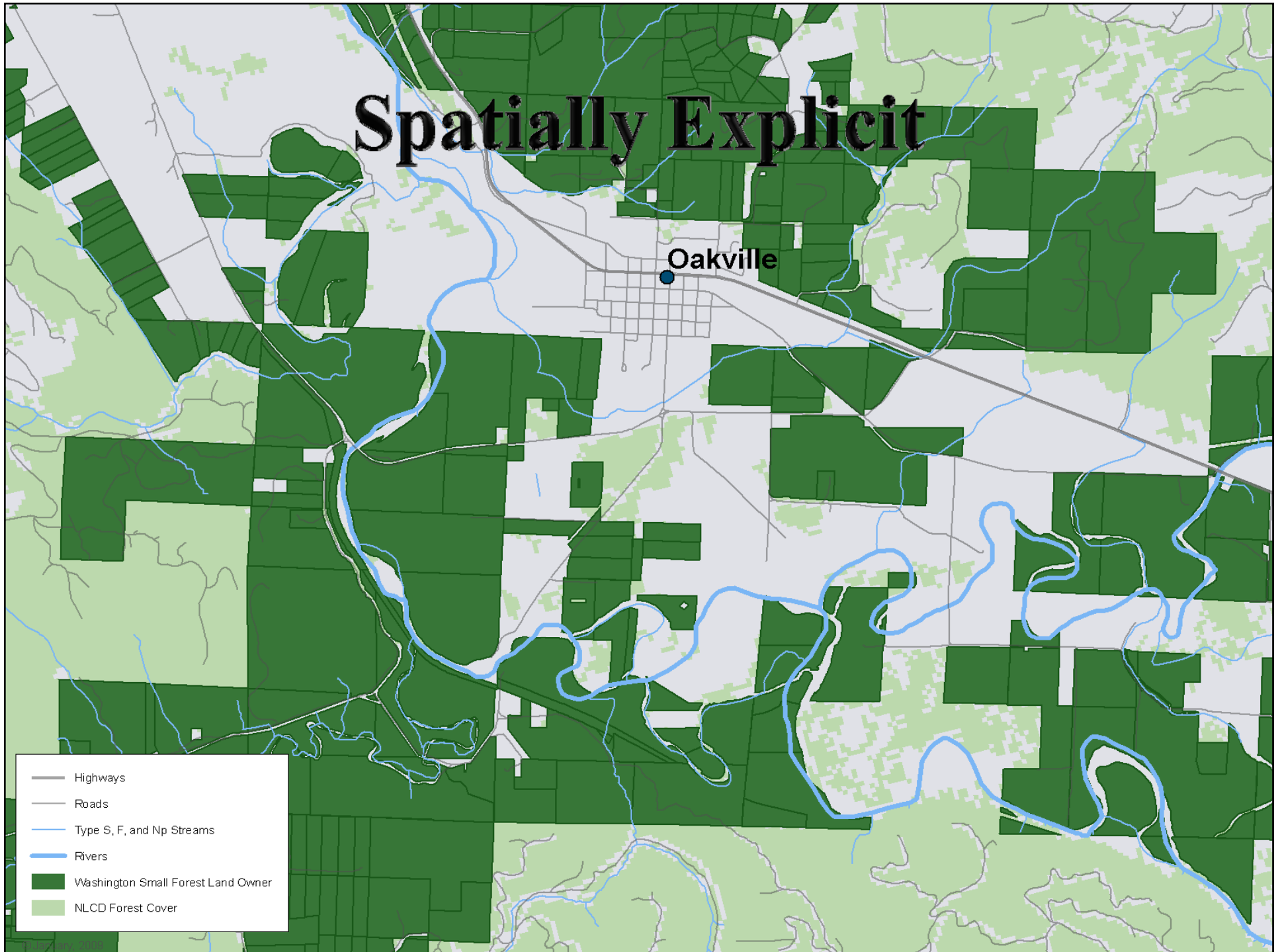
Introduction to the Landscape Management System Version 3.1

- What is the Landscape Management System?
- LMS Portfolios
- LMS Outputs:
    - Stand Visualization
    - LMS Tables

USDA Forest Service
State & Private Forestry
Cooperative Forestry

University of Washington
College of Forest Resources

WASHINGTON STATE
UNIVERSITY

9

Introduction to LMS 3.1

University of Washington
College of Forest Resources

WASHINGTON STATE UNIVERSITY

http://lms.cfr.washington.edu/
http://www.ruraltech.org

http://ext.wsu.edu/

USDA Forest Service
State & Private Forestry
Cooperative Forestry

http://www.fs.fed.us/spf/

Introduction

Welcome to the Landscape Management System (LMS) Version 3.1

The objective of this tutorial is to provide an introduction to the newest version of the Landscape Management System. LMS 3.1 introduces a new approach to the integration of the forestry applications into a simulation and analytical platform.

USDA Forest Service
State & Private Forestry
Cooperative Forestry

University of Washington
College of Forest Resources

WASHINGTON STATE
UNIVERSITY

What is the Landscape Management System?

The Landscape Management System is an evolving set of software tools designed to aid in landscape level management of forest resources. LMS is being developed as part of the Landscape Management Project, a cooperative effort between the Silviculture Laboratory, College of Forest Resources, University of Washington; Yale School of Forestry and Environmental Studies; and the USDA Forest Service, State and Private Forestry.

Description of the Landscape Management System

- The Landscape Management System integrates forest inventory information, geographic information, computerized growth models, visualization software, and analytical software to facilitate landscape, ecosystem, and watershed management. LMS simulates changes in individual stands and landscapes up to 100,000 acres.

  - **Modular** – LMS can incorporate many forms of inventory information, geographic information, growth models, and decision support software. Components of the system can be easily improved or even replaced to provide improved and expanded capabilities.
  - **Flexible** – LMS operates on representative tree lists allowing for the incorporation of new management objectives and measures by relating the objectives to the information in the tree list.
  - **Easy to Use** – LMS is a Microsoft Windows ® application that operates using menus, dialogs, mouse, and keyboard.
  - **Provides Simulations** – LMS provides stand level simulations using growth and yield models to assess different management scenarios. Landscapes are the aggregate of individual stand simulations.
  - **Presents Visualizations** – LMS, in concert with the Stand Visualization System (SVS) and EnVision, provides stand and landscape level visualizations, which can be used to evaluate different management objectives.
  - **Facilitates Additional Analysis** – LMS supports additional analytical capabilities by providing tabular outputs (individual inventory information or summarized results) in Microsoft Excel ® or Microsoft Access ®.

USDA Forest Service
State & Private Forestry
Cooperative Forestry

University of Washington
College of Forest Resources
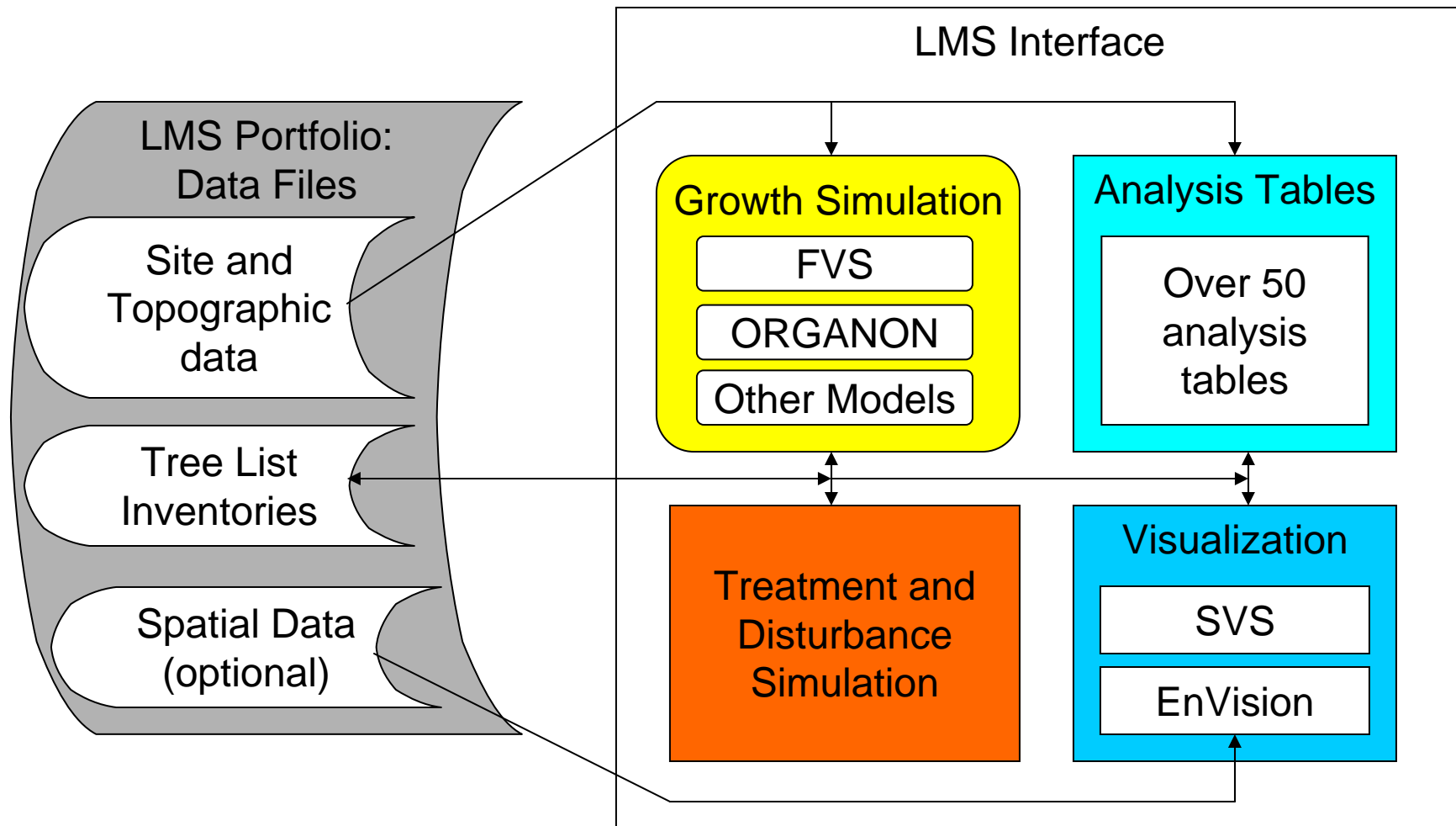
WASHINGTON STATE
UNIVERSITY
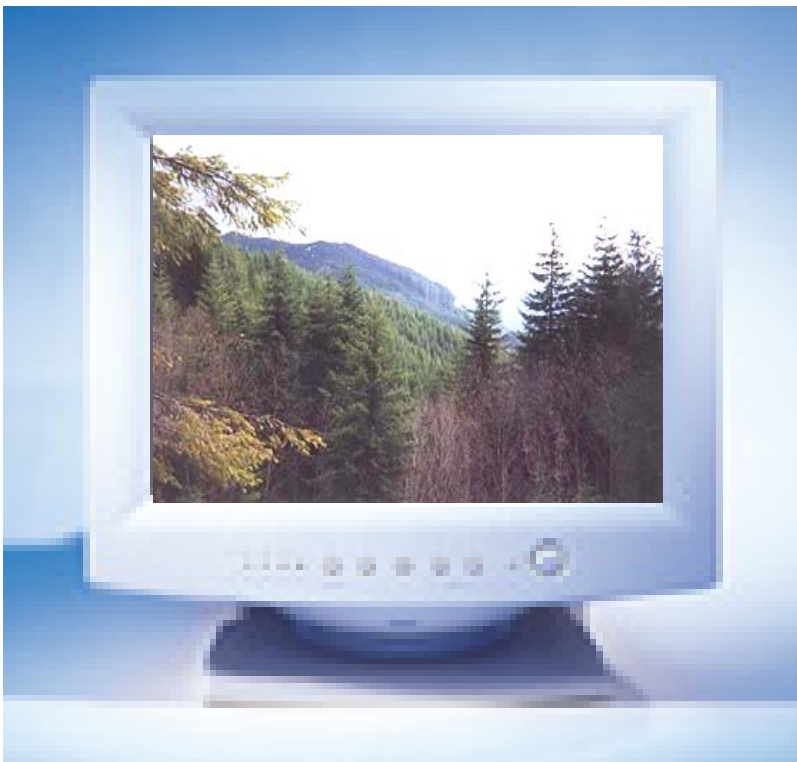
13

System Requirements for LMS

- The Landscape Management System runs on most recent Microsoft Windows computers. Specific requirements are:
  - Pentium PC running Windows 2000 or later. Pentium III (or higher) 800Mhz (or higher) is recommended.
  - SVGA video required, 32MB or more preferred.
    - 2D hardware acceleration useful for stand visualization.
    - 3D OpenGL hardware acceleration useful for landscape visualization
 - 128MB RAM.
  - 80MB hard disk space required.

USDA Forest Service
State & Private Forestry
Cooperative Forestry

University of Washington
College of Forest Resources

WASHINGTON STATE
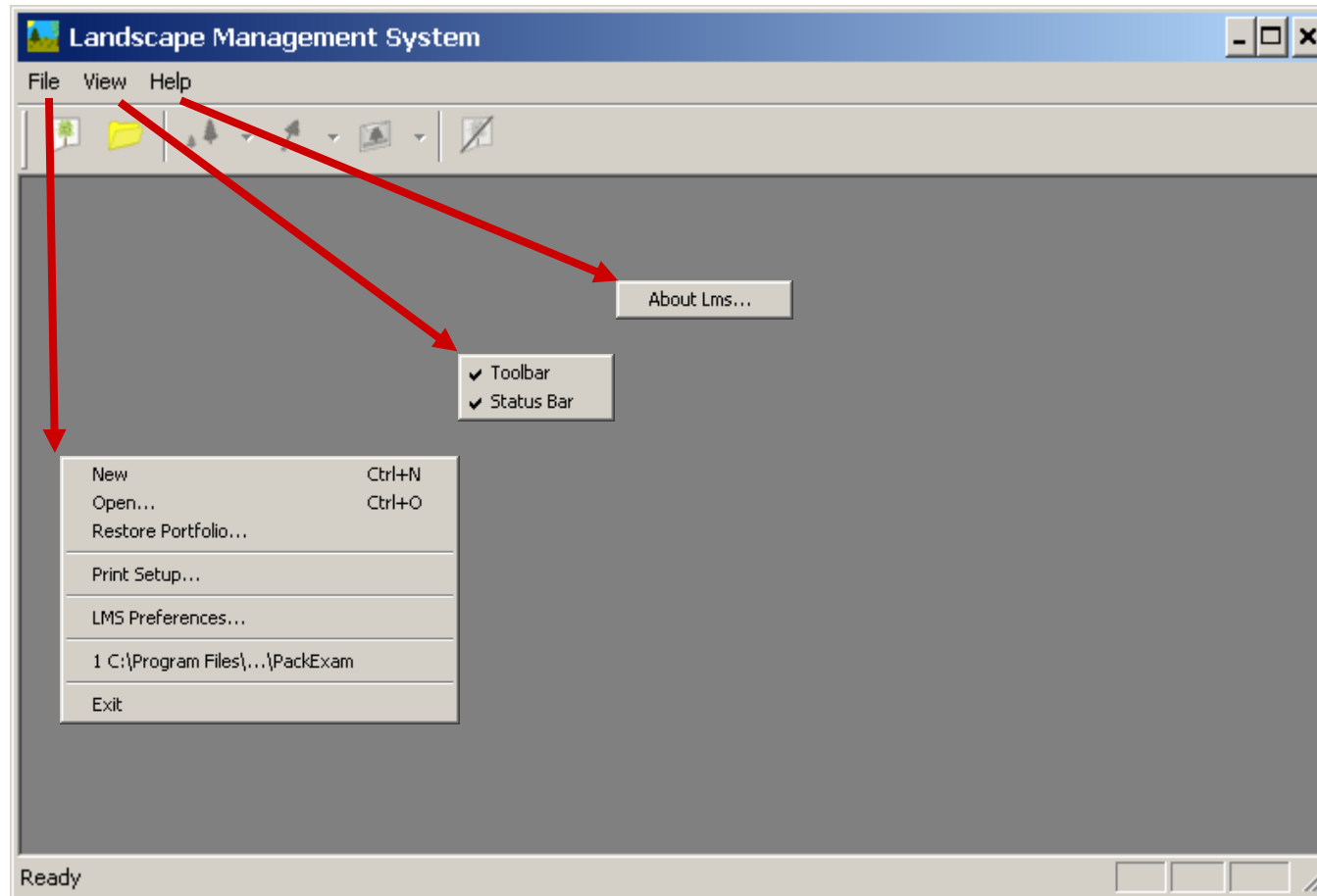UNIVERSITY

LMS Components

LMS Interface

LMS Portfolio: Data Files

Site and Topographic data

Tree List Inventories

Spatial Data (optional)

Growth Simulation
- FVS
- ORGANON
- Other Models

Analysis Tables
- Over 50 analysis tables

Treatment and Disturbance Simulation

Visualization
- SVS
- EnVision

LMS uses Inventory and Spatial information

LMS uses the aggregate of multiple stands to represent a landscape. The landscape may be a contiguous area or may be scattered stands that represent a larger area.

LMS uses several types of information to represent the stands:

Stand Attributes
Tree Inventory Information
Digital Elevation Information
Spatial Characteristics

USDA Forest Service
State & Private Forestry
Cooperative Forestry

University of Washington
College of Forest Resources

WASHINGTON STATE
UNIVERSITY

16

Stand Attribute Information

Stands, also referred to as polygons in GIS, are management units created from historical or anticipated use patterns.
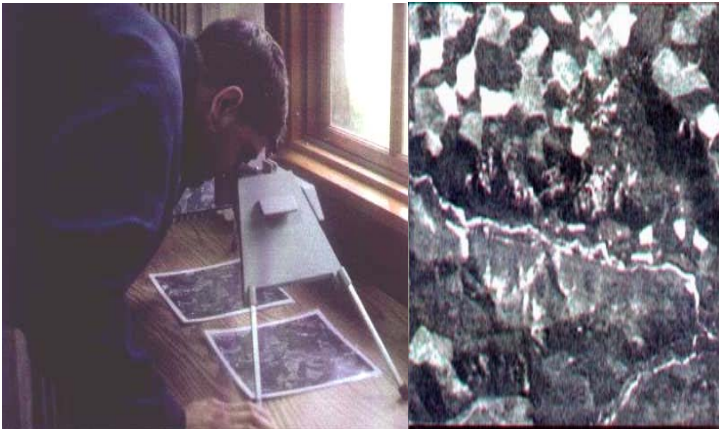
Stand attribute information can be taken from a combination of field data, aerial and ortho photographs, and Geographical Information System (GIS) outputs. Stand data can be assembled in a table (Excel or Access) that is easily imported into LMS. Information needed includes stand name, site index, age, slope, aspect, elevation, and acres. The location column indicates the nearest national forest and is used by the Forest Vegetation Simulator (FVS) growth model, a 0 is entered here as a default value. Habitat Code and Latitude may be entered as 0 in most cases, resulting in a default value picked by the growth model.

Stand Name	Location	Site Index	Habitat Code	Age	Slope	Aspect	Elevation	Latitude	Acres	…
Stand1	602	120	0	9	28.1	249.1	1509	0	15.2	…
Stand2	602	115	0	45	15.6	180	1300	0	22.6	…
…	…	…	…	…	…	…	…	…	…	…

USDA Forest Service State & Private Forestry Cooperative Forestry

University of Washington College of Forest Resources

WASHINGTON STATE UNIVERSITY

17

Tree Inventory Information

Inventory information originates with a field sample or cruise of the trees for each stand within the landscape area. A minimum of 20 tree records per stand is necessary for the growth model to operate correctly. These tree records, when combined with the appropriate expansion factor (sampling multiplier) and entered into a table (Excel or Access), become the tree inventory data.

Tree data is used to create an inventory file containing the initial year of the portfolio, the stand name, the tree record number, species, DBH, height, crown ratio, expansion factor, volume per tree, and maximum crown width. Height, volume per tree, and maximum crown width will be calculated by the growth model if unavailable from field sampling information.

NOTE: Species codes are NRCS Plants species codes, which provide a unique species identifier.

Year	Stand	Species	Diameter	Height	Crown Ratio	TPA	…
2000	Stand1	PSME	18.1	126.0	0.54	2.5	…
2000	Stand1	PSME	16.7	125.0	0.53	2.5	…
2000	Stand1	PSME	19.8	131.7	0.58	2.5	…
2000	Stand1	ALRU2	9.9	61.0	0.25	2.5	…
…	…	…	…	…	…	…	…

Elevation and Spatial Information
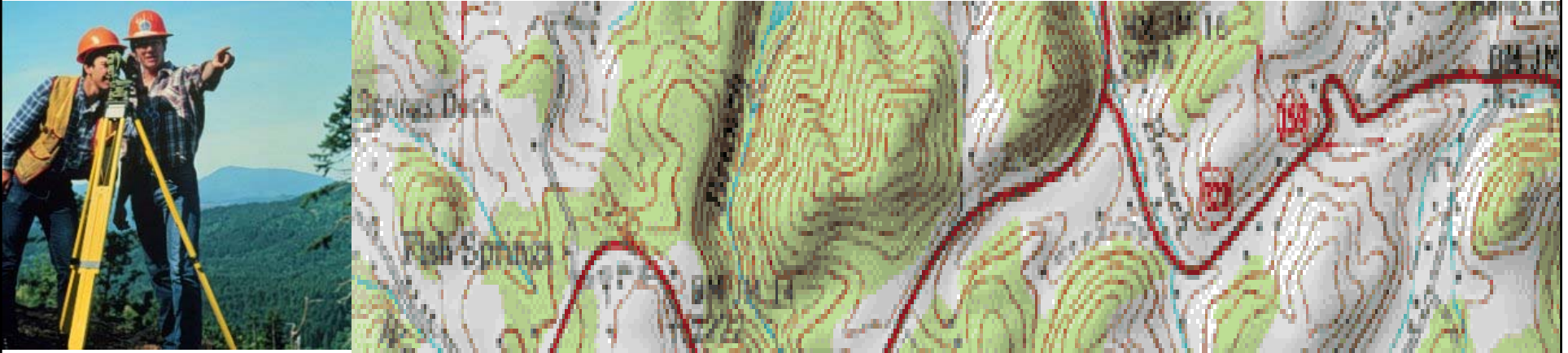
Digital elevation information is an electronically available topographic map. Digital elevation maps can be downloaded from the United States Geological Service (USGS) web site. In the GIS programs, Arc View and Arc Info, map layers such as roads, streams, and stand boundaries are created to make up the **Spatial characteristics** of the landscape. When the spatial characteristics and the digital elevation information are aligned in GIS to the same coordinate system and selected for the area of the landscape, this data is ready to be used with LMS.

It should be noted that GIS data is only necessary for the landscape visualization capability of LMS. All other capabilities including stand visualization are available with only inventory and stand data. More discussion of these files is included in the **Creating a New Portfolio** section at the end of this tutorial.
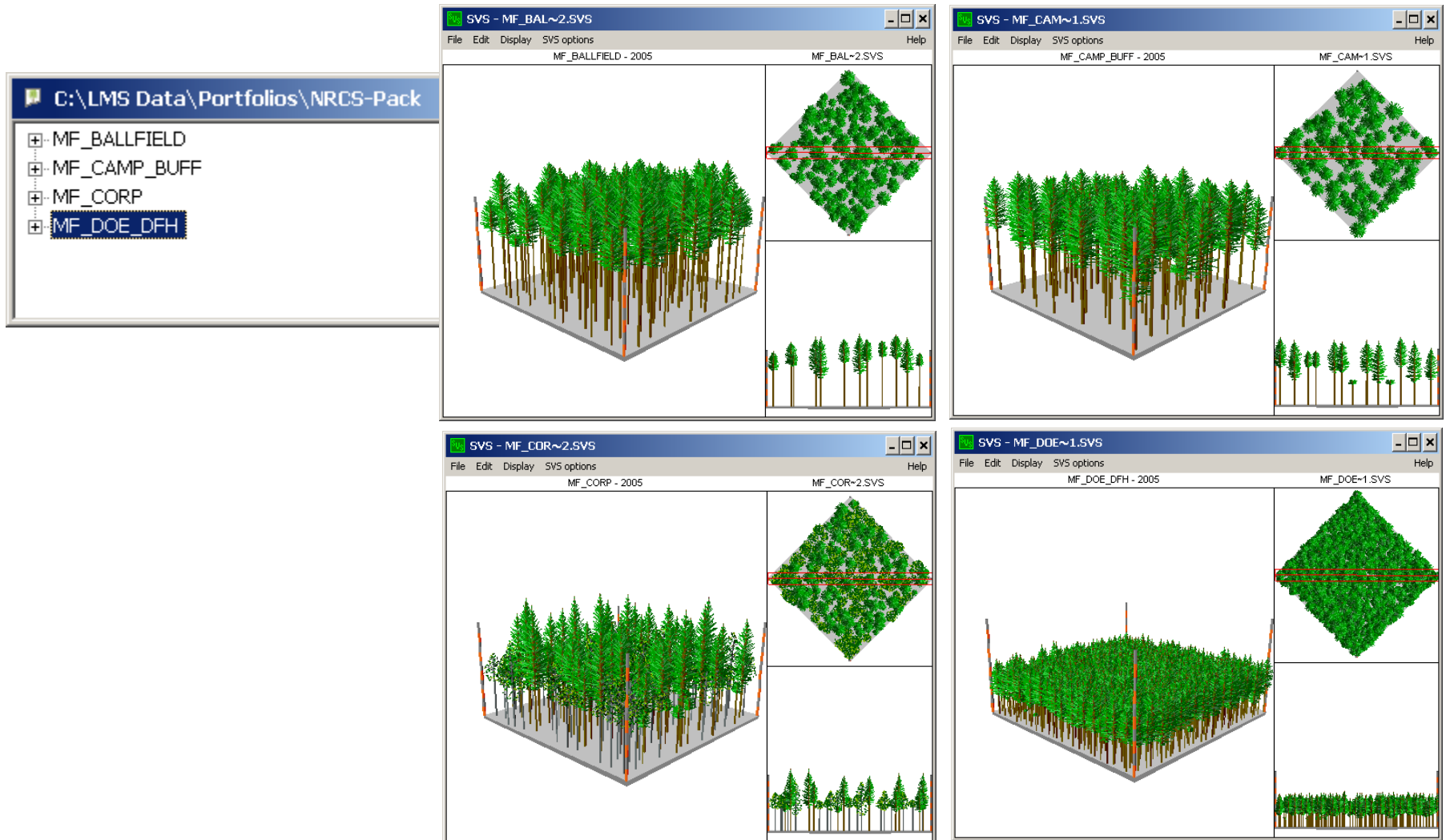
USDA Forest Service
State & Private Forestry
Cooperative Forestry

University of Washington
College of Forest Resources

WASHINGTON STATE
UNIVERSITY
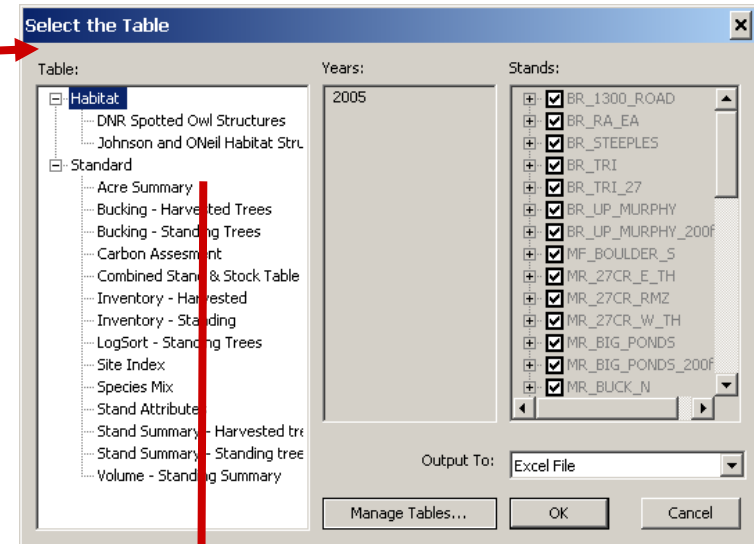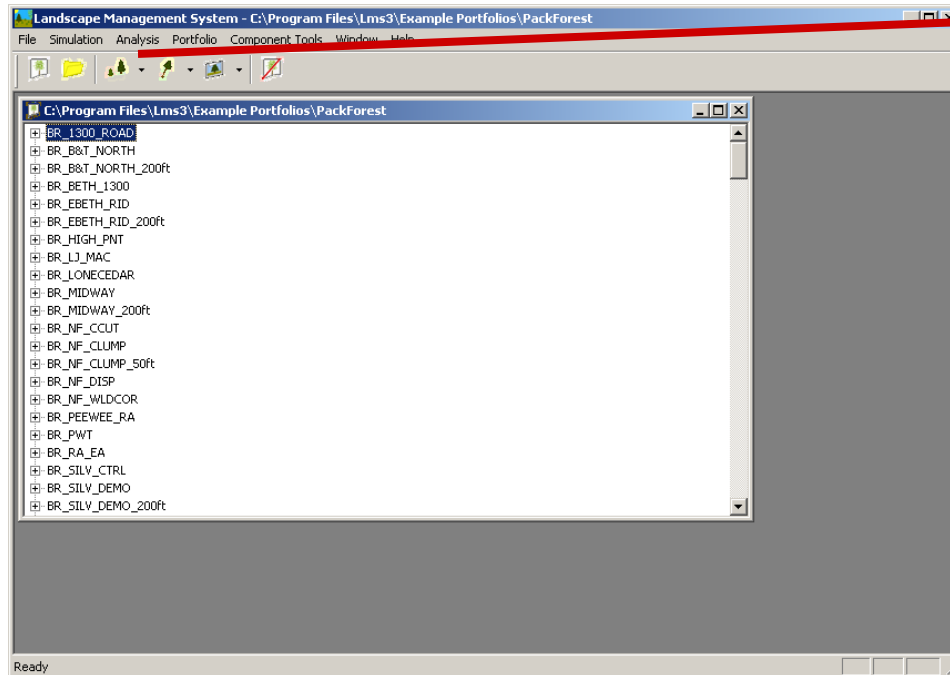
LMS Menus

LMS 3.1 is a typical Windows program that operates using a series of menus and dialogs

LMS Menus – Portfolio Open
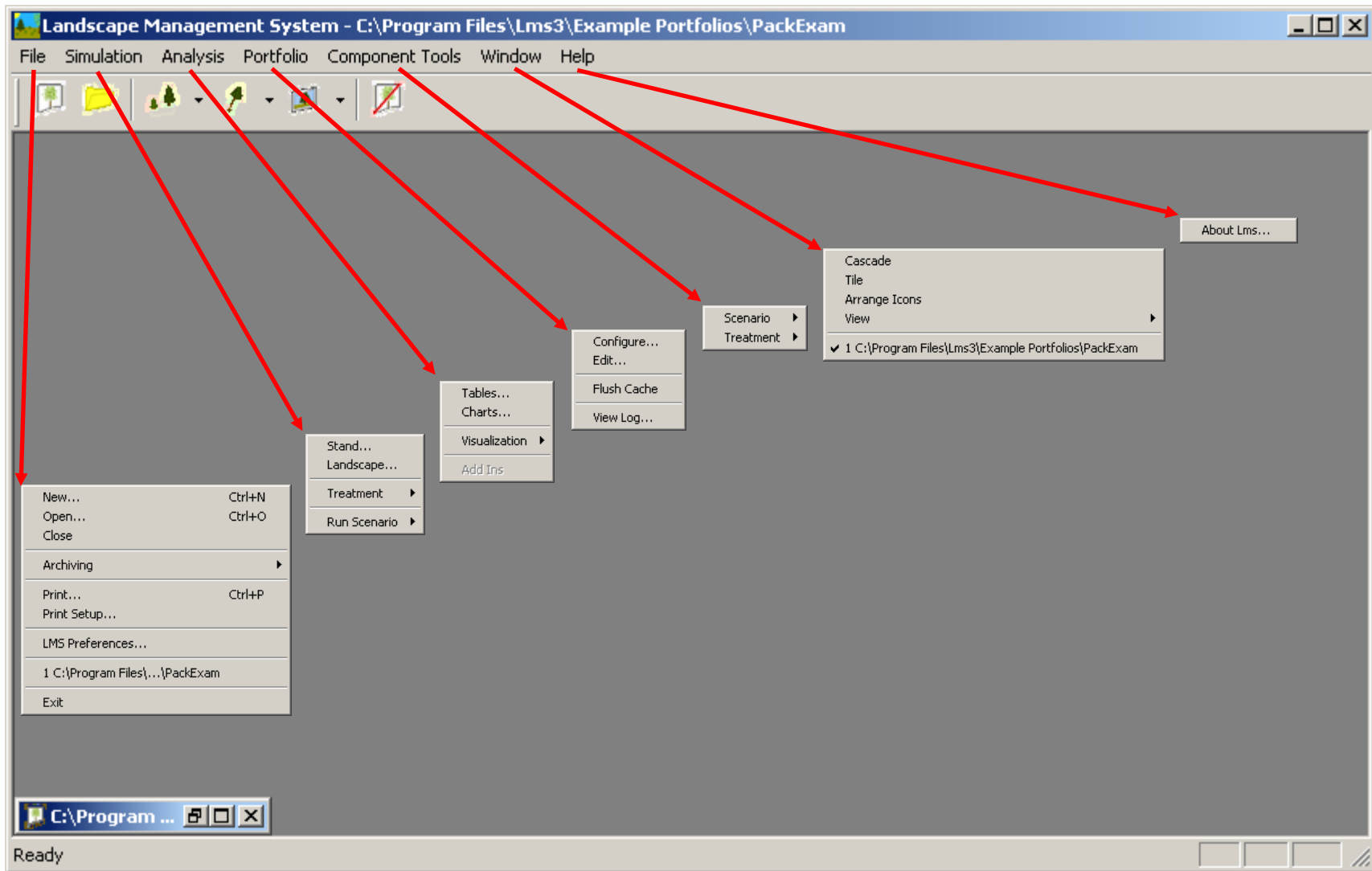
LMS 3.1 is a typical Windows program that operates using a series of menus and dialogs

Starting LMS 3.1

The Landscape Management System should already be installed on your computer.

If not already installed, it can be installed from CD-ROM or by downloading the program from the web site of the Silviculture Laboratory, College of Forest Resources, University of Washington: http://lms.cfr.washington.edu/.
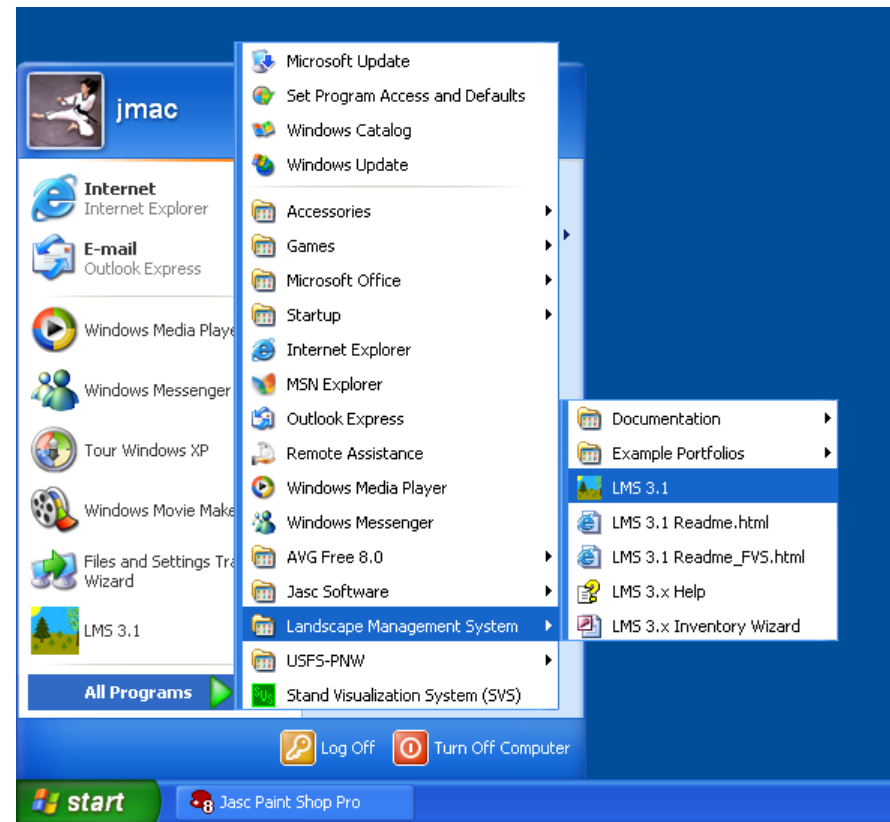
Once LMS has been installed, the program may be opened by clicking Start/All Programs/Landscape Management System/LMS 3.1 (or use the LMS 3.1 Desktop icon).

Landscape Management System Program Group

Use the Landscape Management System Program Group to access the LMS 3.1 program, LMS 3.1 Help File, LMS 3.1 Inventory Wizard, Example portfolios, LMS Tutorials, and additional documentation.
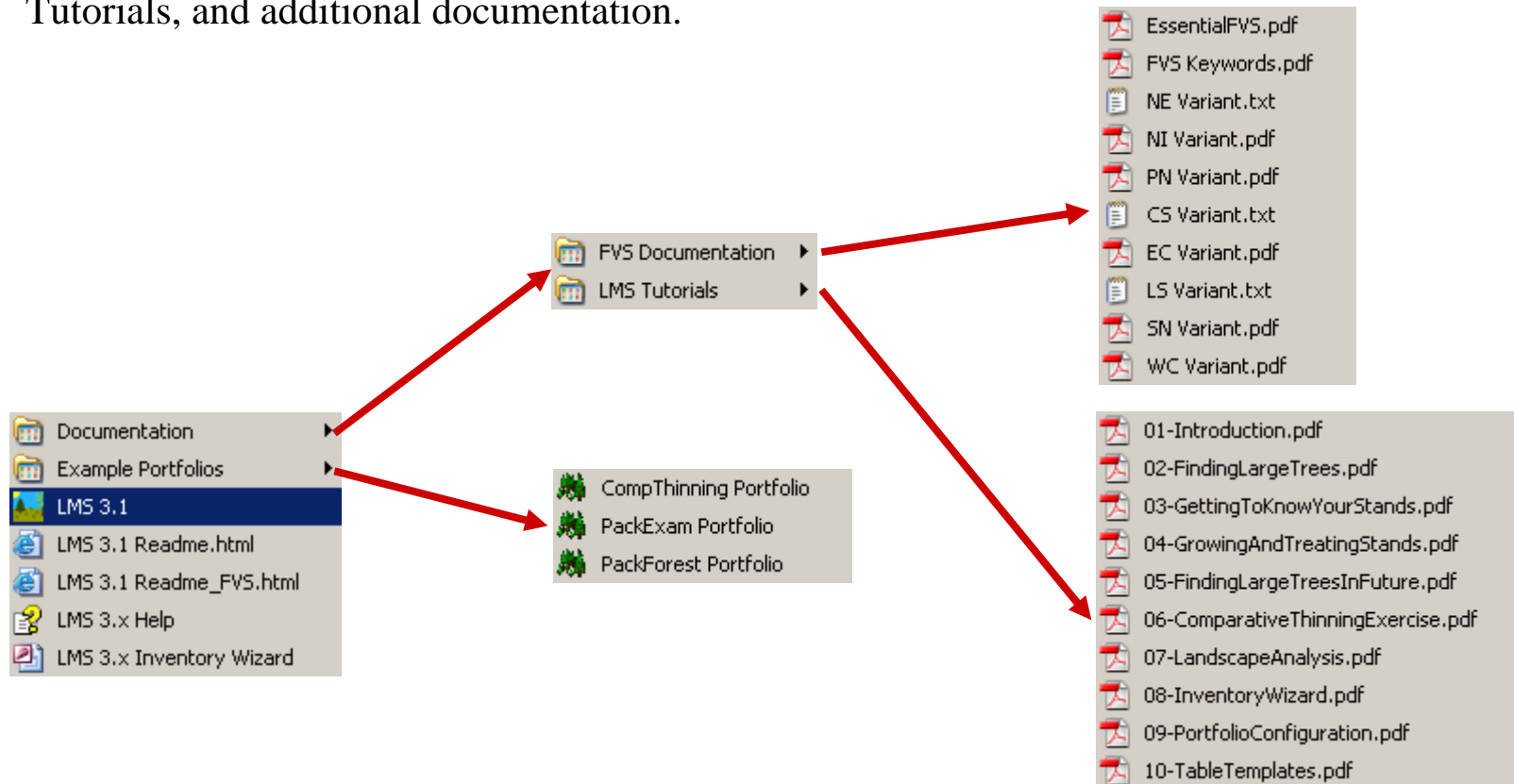
LMS 3.1 Help File

The LMS 3.1 Help File contains a considerable amount of information about the software. It should be considered the first stop for getting information about LMS.
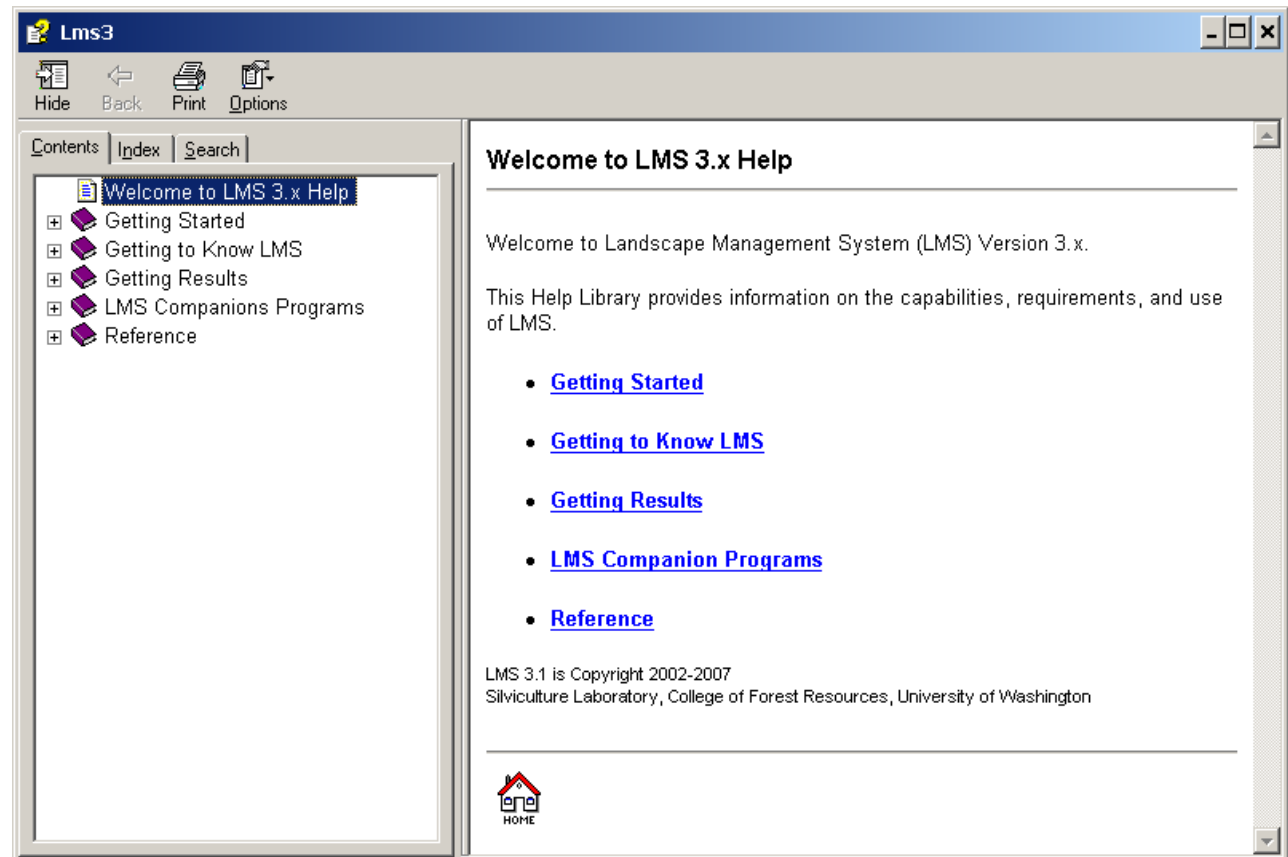
Starting LMS 3.1

The first time LMS 3.1 is started on a computer it needs to copy table templates
and basic analysis tables to your user specific directory. You will be prompted
asking if you would like to update your installed table templates.
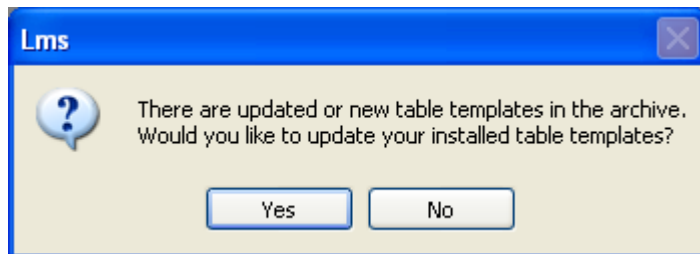
Click Yes. When the Table Update dialog
apperas, click Select All and the click OK.
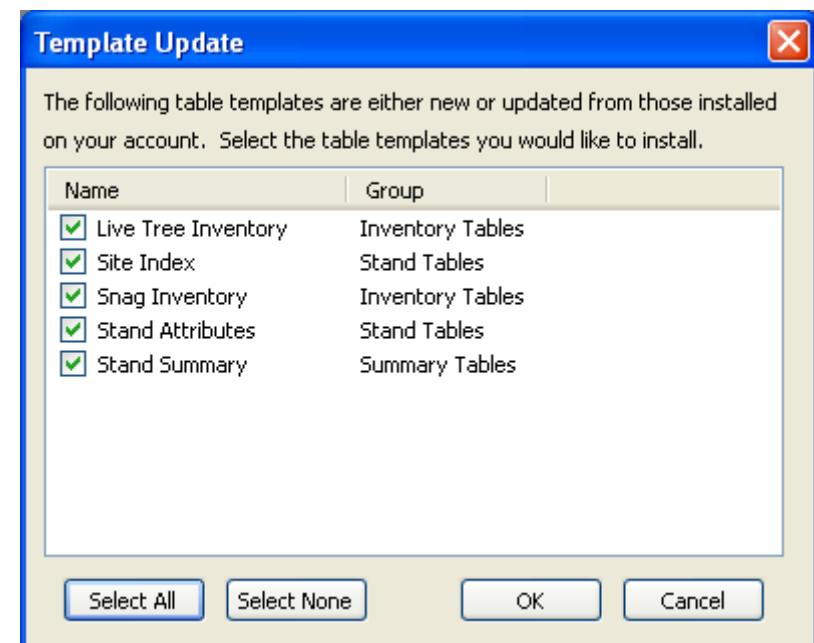
Starting LMS 3.1

The first time LMS 3.1 is started on a computer it needs to copy table templates and basic analysis tables to your user specific directory. You will be prompted asking if you would like to update your installed tables.
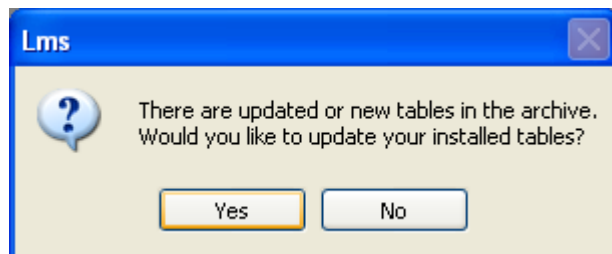
Click Yes. When the Tables Update dialog appears click Select All and the click OK.
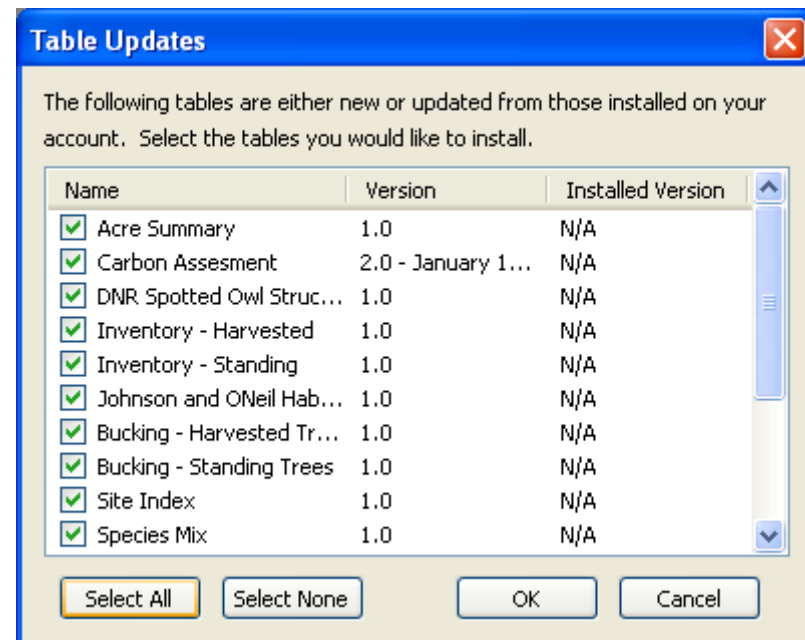
Open Portfolio
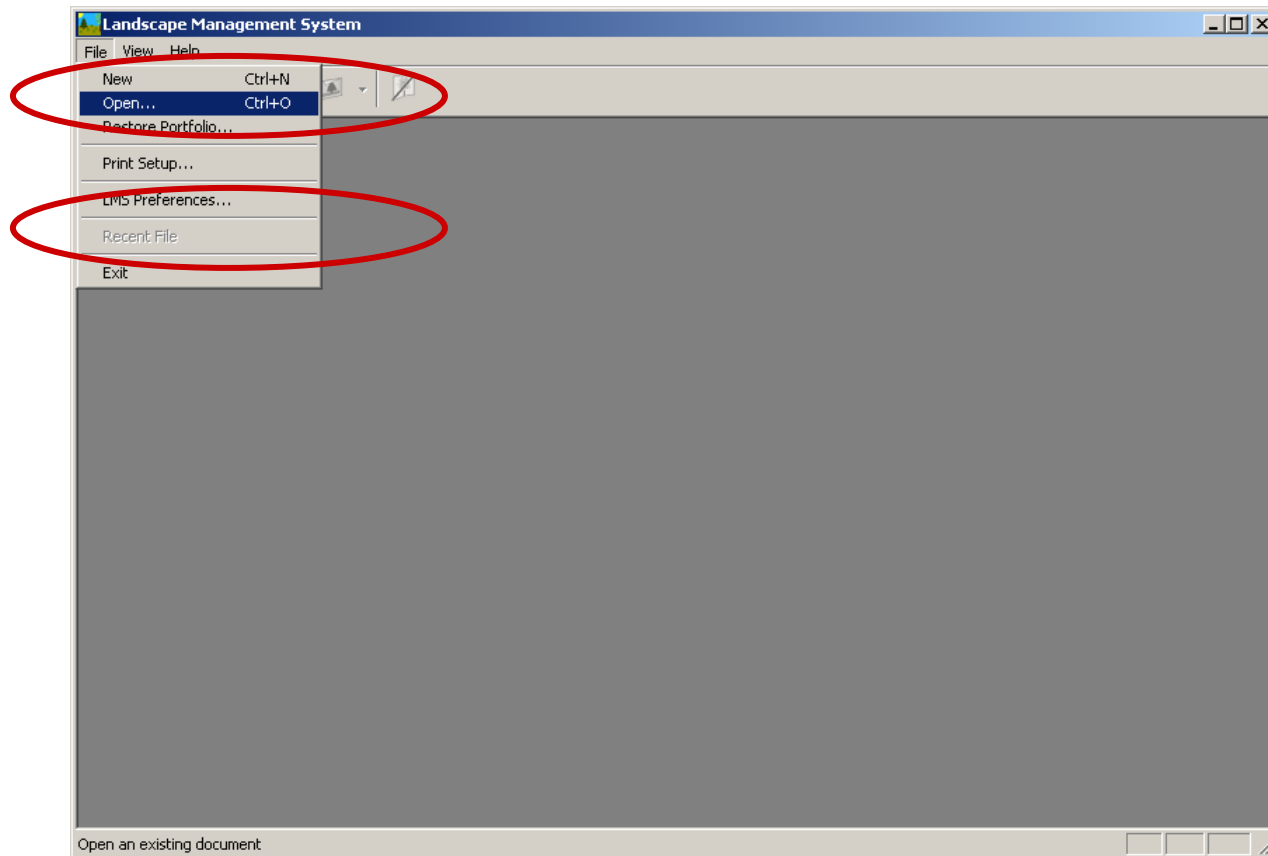
To open a portfolio select the File/Open menu command to access the Open Portfolio Dialog. Alternatively you can select from the recent file list to re-open a portfolio that was used recently.

Open Portfolio Dialog
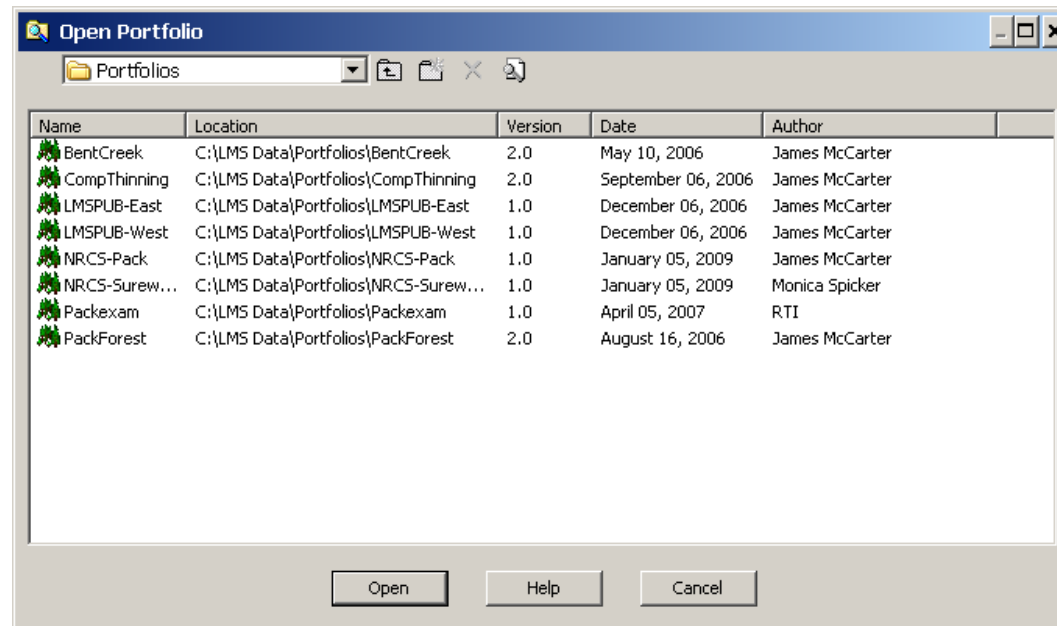
The Open Portfolio Dialog presents a list of valid LMS 3.1 portfolios. Select a portfolio, then click Open (or Double click on the Portfolio Name) to open the portfolio.

NOTE: Example portfolios are now distributed in the C:\Program Folders\Lms3\Example Portfolios directory. You will need to browse to that directory to open the example portfolios. Alternatively you can use the Example Portfolio icons in the Landscape Management System\Example Portfolios program group.

Open Portfolio Dialog
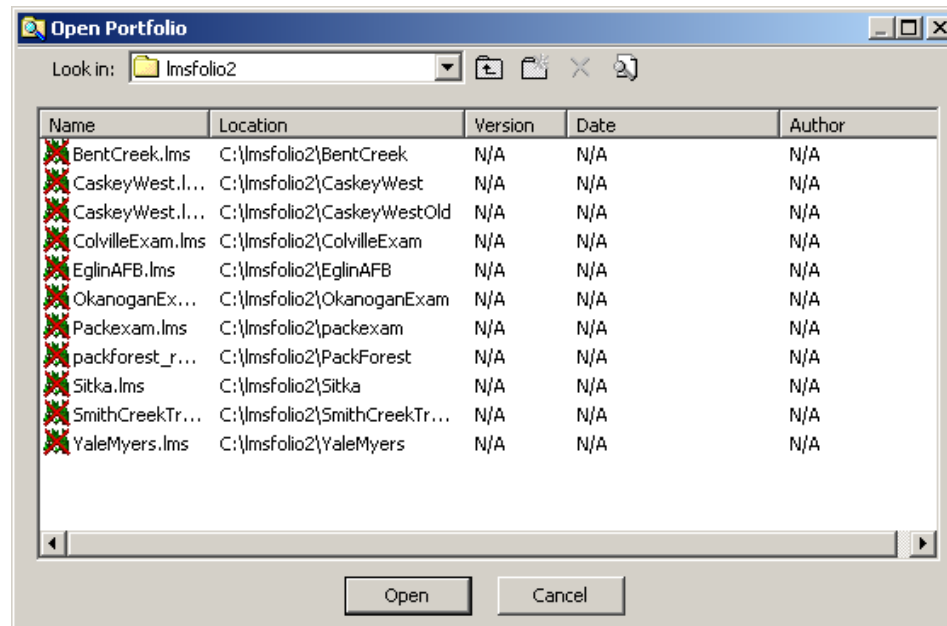
The Open Portfolio Dialog will display the Portfolio Name with a red X over the icon if the portfolio is not a valid LMS 3.1 portfolio. In the example above, LMS 3.1 is indicating that LMS 2.x portfolios are not in the correct format for LMS 3.1.

Pack Forest Portfolio
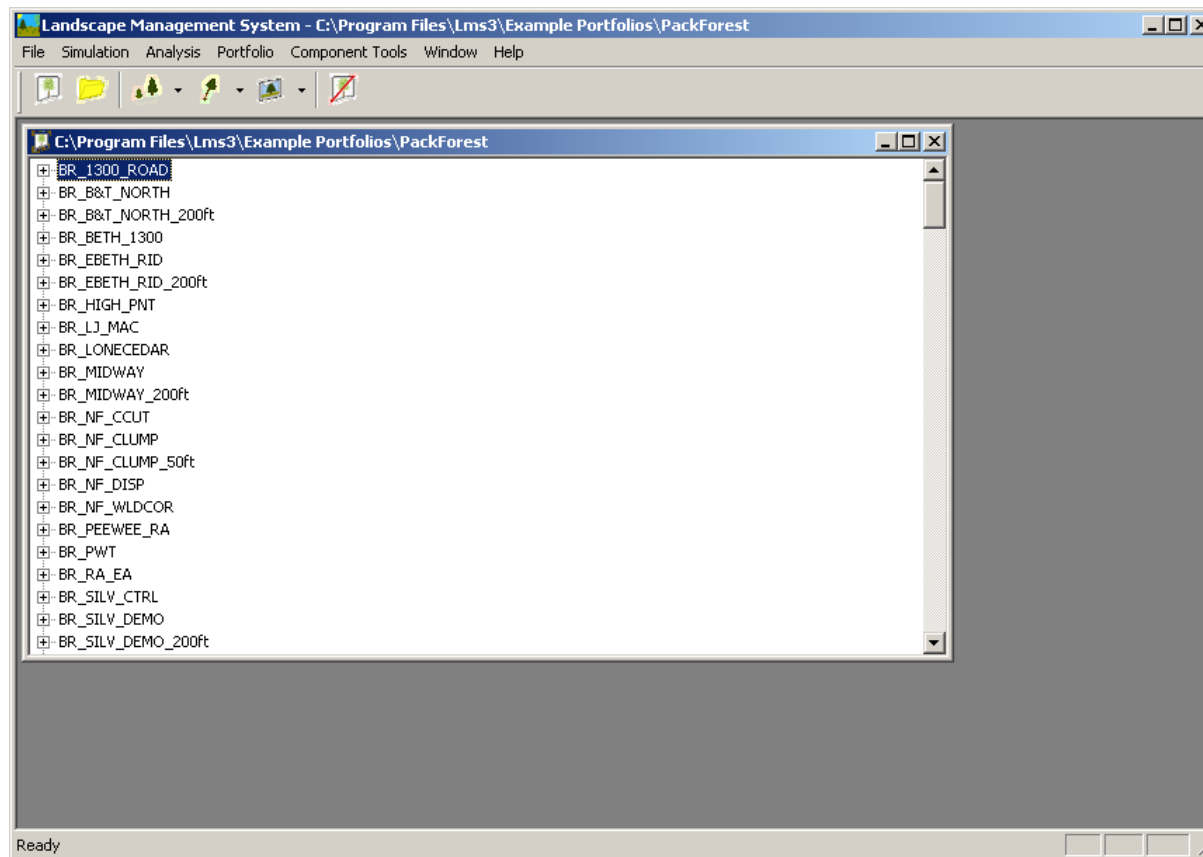
After a few moments, LMS will display the Portfolio Window containing the list of stands in the portfolio. LMS 3.1 is a multiple document application, meaning that multiple portfolios can be open in LMS 3.1 at the same time, each in its own window.

USDA Forest Service
State & Private Forestry
Cooperative Forestry

University of Washington
College of Forest Resources

WASHINGTON STATE
UNIVERSITY

Pack Forest Example Dataset

On January 9, 1926, Charles Lathrop Pack Demonstration Forest came into being with the acceptance of a $9,222 gift from conservationist and East Coast lumberman, Charles Lathrop Pack. This gift was used, pursuant to Mr. Pack's wishes, to acquire the first 334 acres of what would become, by 1996, a 4,300 acre facility.

LMS 3.1 comes with an example dataset for the entire school forest – stand information, tree inventory information, elevation data, and spatial characteristics.
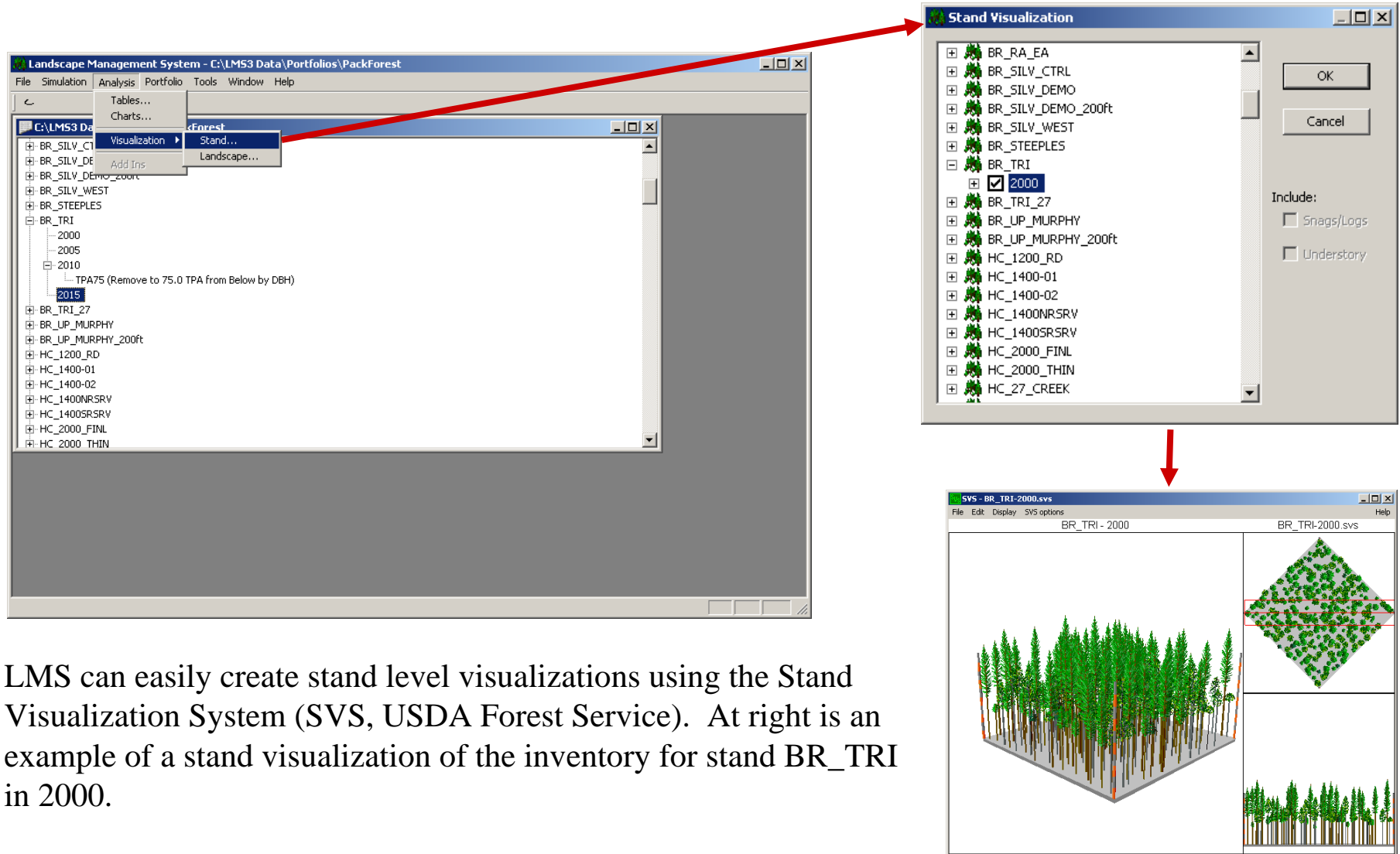
USDA Forest Service
State & Private Forestry
Cooperative Forestry

University of Washington
College of Forest Resources

WASHINGTON STATE
UNIVERSITY
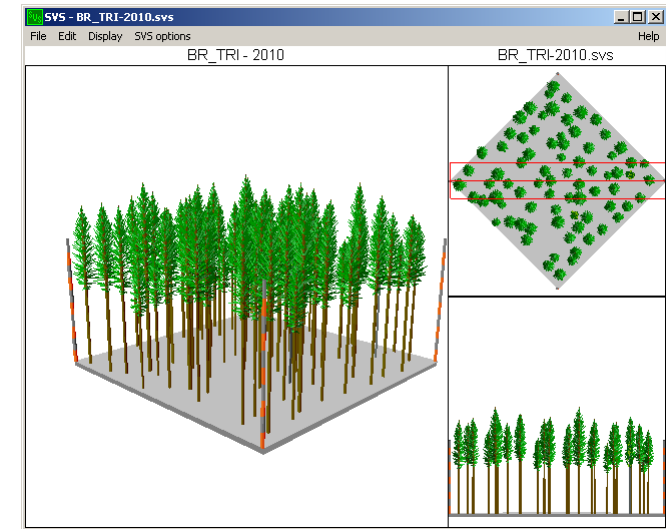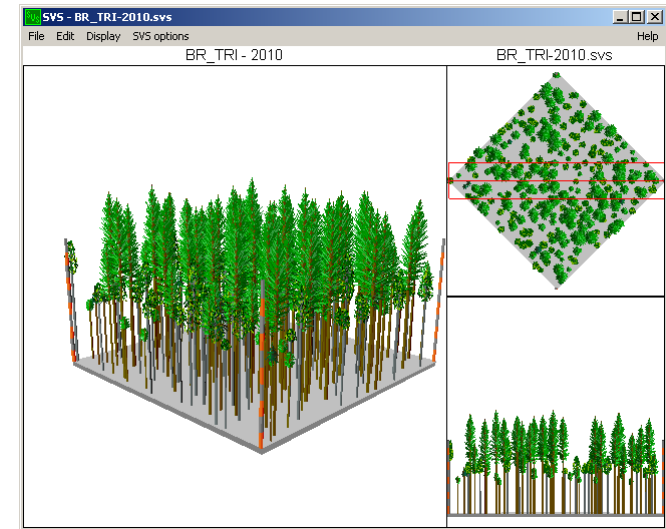
NRCS Example Portfolios

- Two example portfolios were created for this training session:
  - Eastside Washington:
    - Four stands were provided by Monica Spicker, Spokane CC.
  - Westside Washington:
    - Four stands were selected from Pack Forest from around the campus area.

NRCS Eastside – Surewood
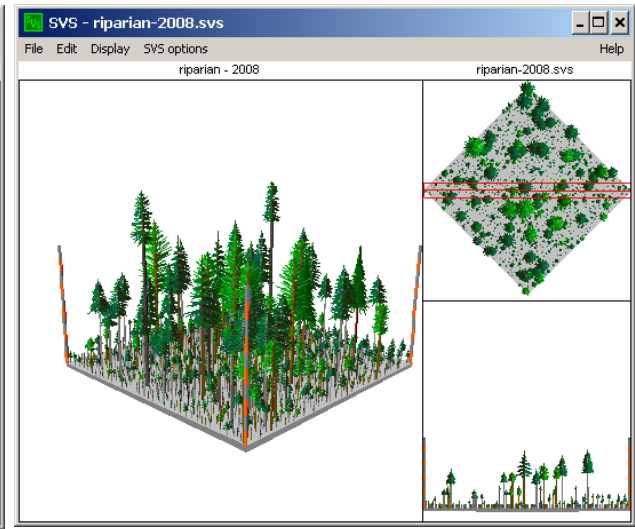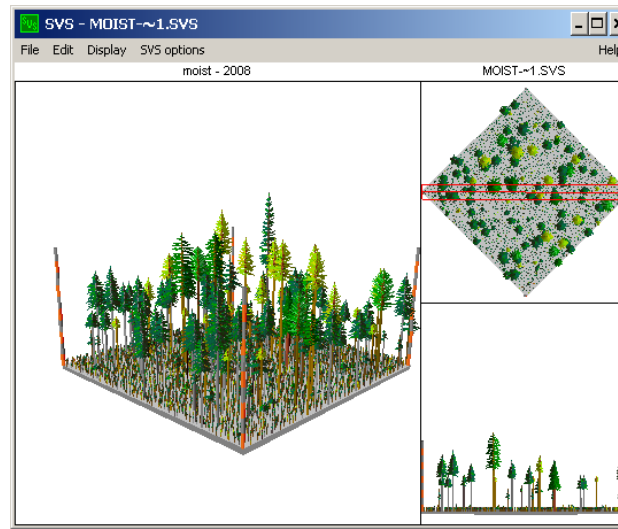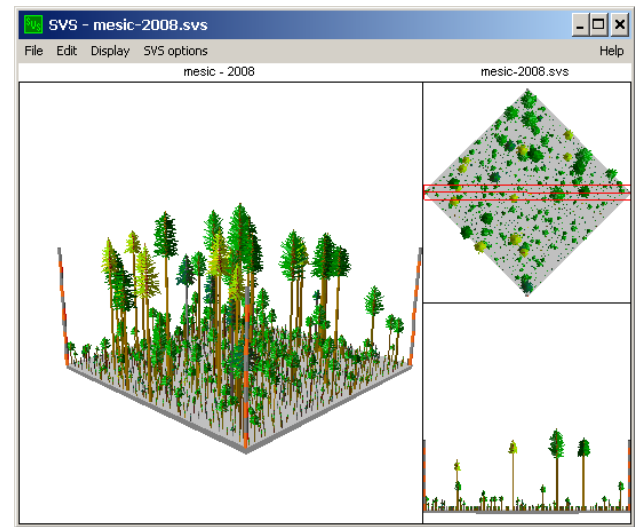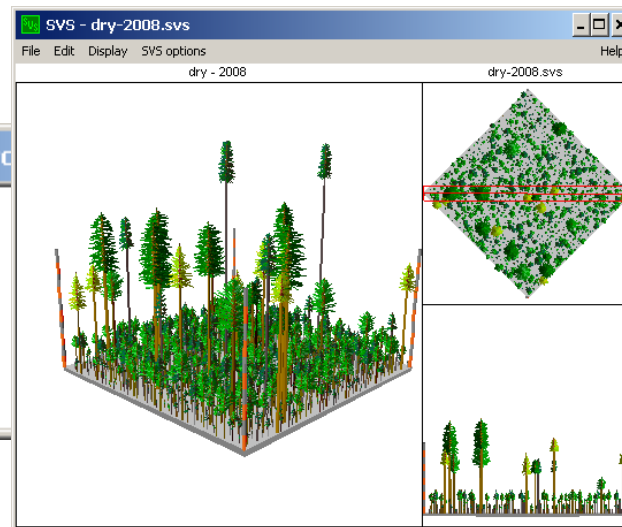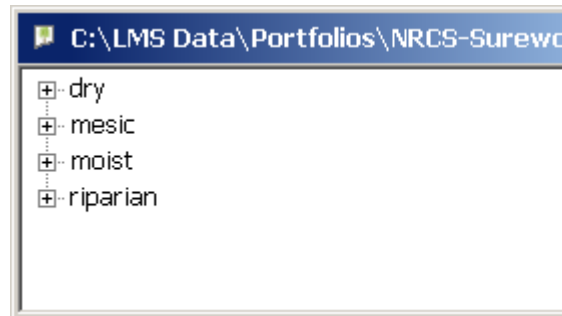
NRCS Westside – NRCS-Pack
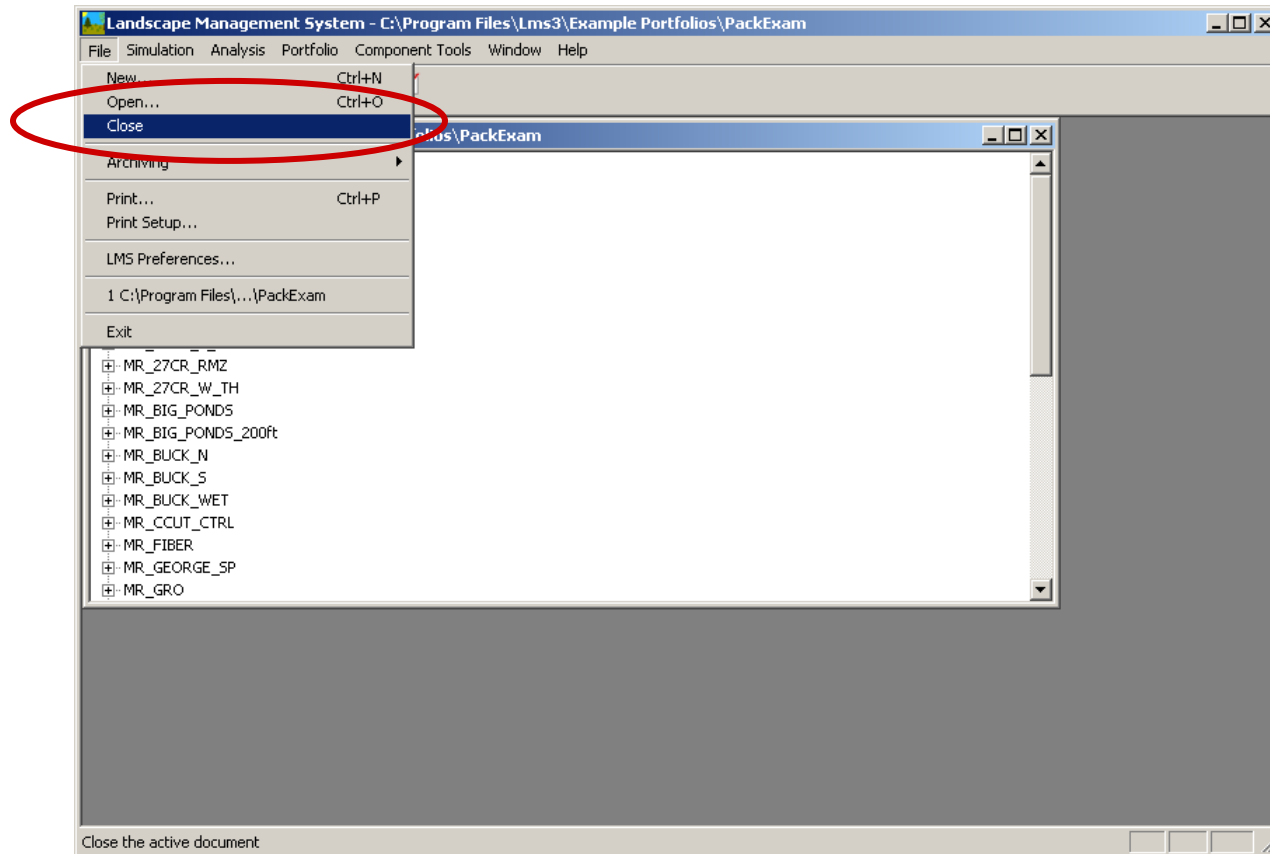
Close Portfolio

Use the File/Close menu command to close the current portfolio.

Exit LMS
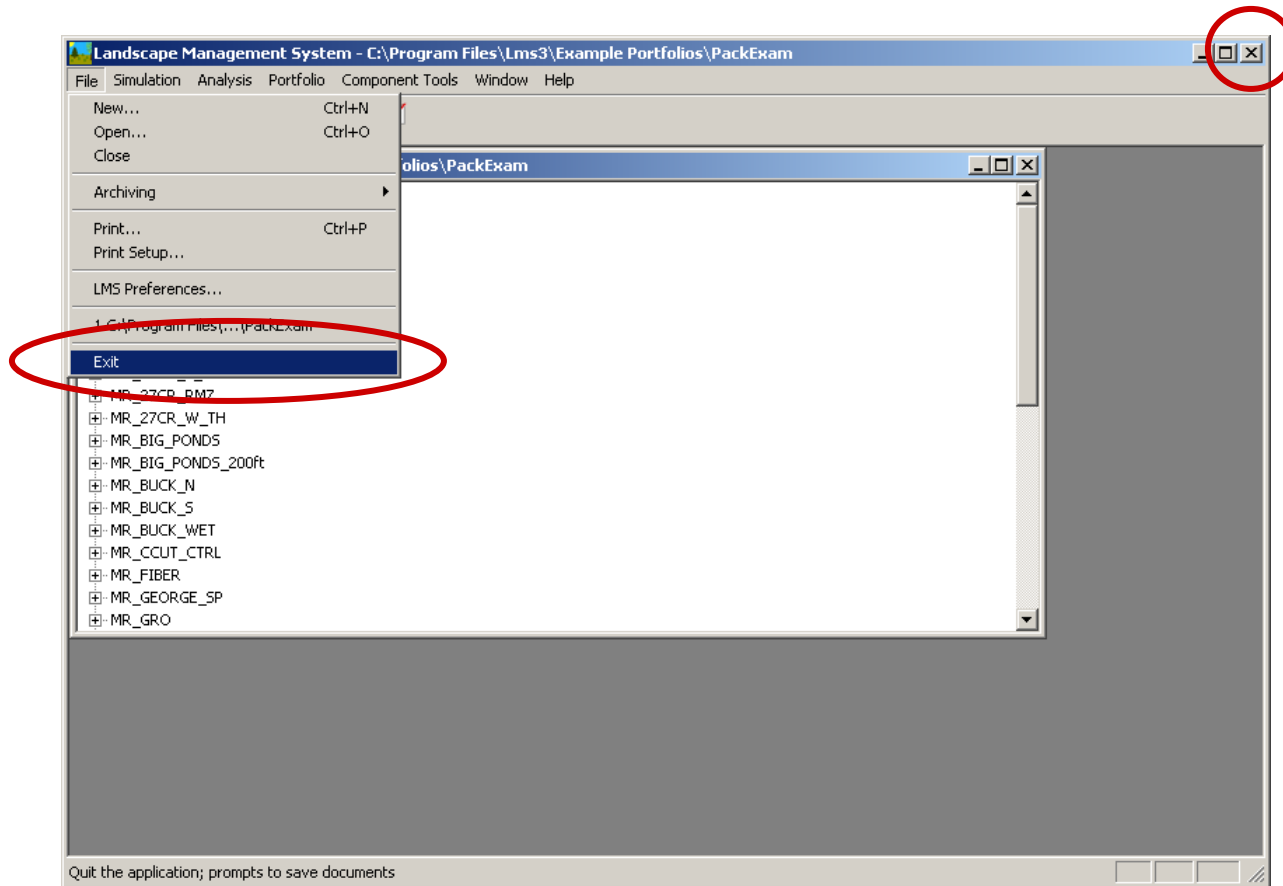
Exit LMS using the File/Exit menu command or by using the X on the upper right of the application window.

Portfolio Windows
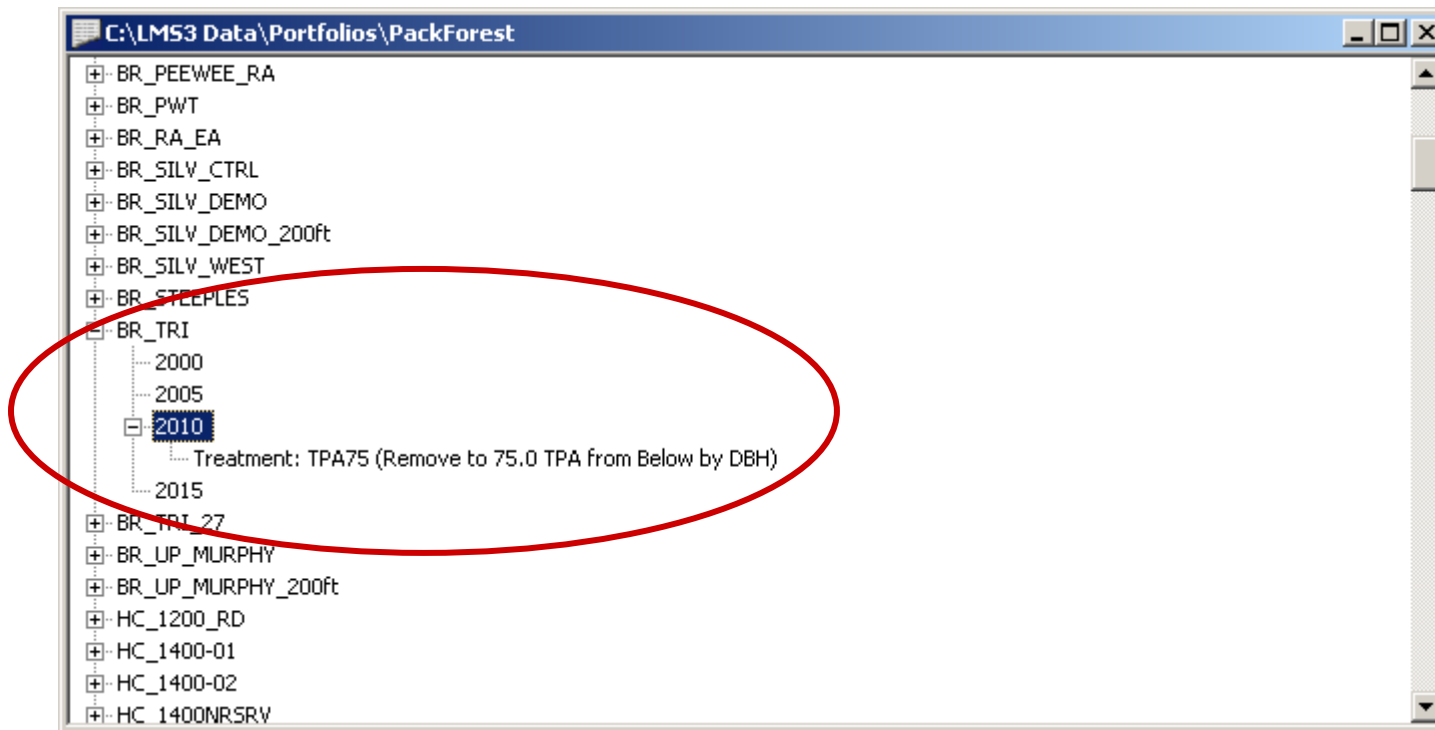
The Portfolio Window contains a list of stand names for the portfolio along with a list of years that inventory information is available for each stand. This tree view will display any treatments that have been applied to the stand. Click the Plus (+) inside the square next to a stand name to open the tree view for that stand.

LMS Tables

- ## Basic Table Interface
  - Pre-define tables implemented in the Python scripting language
    - Requires programming capability to add tables. Tables can be added by users.

- ## Advanced Table Interface
  - User's can create their own tables from LMS variables using GUI.
    - No programming required. Limited to variables known by LMS (additional variables can be added by developing an LMS component).

LMS Basic Tables

Select Analysis/Basic… to open the Select the Table dialog. Select the table, years, and stands, and output to you want and then Click OK to send the requested information to Microsoft Access, Microsoft Excel, or a text editor.

LMS Advanced Tables

Select Analysis/Advanced… to open the Select Template dialog. Select the table template, years, and stands, and output to you want and then Click OK to send the requested information to Microsoft Access, Microsoft Excel, or a text editor.

Stand Visualization

LMS can easily create stand level visualizations using the Stand Visualization System (SVS, USDA Forest Service). At right is an example of a stand visualization of the inventory for stand BR_TRI in 2000.

Stand Visualization Over Time
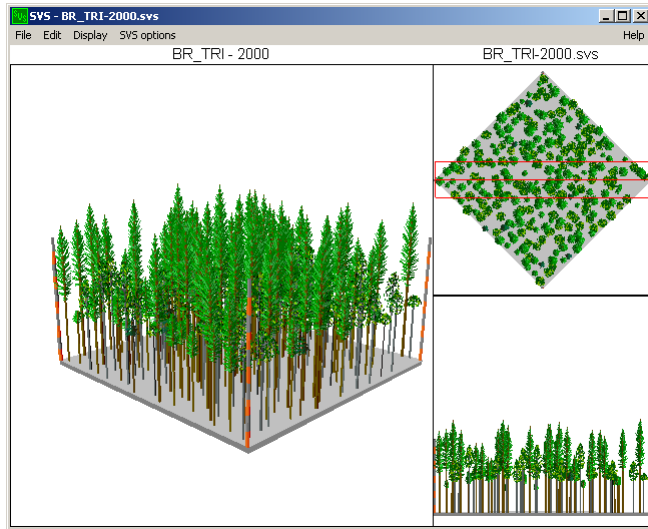
Visualizations can be displayed for different years and showing treatments. Above is the BR_TRI stand in 2000. Above right is the BR_TRI stand growth out to 2010. Below on right is the BR_TRI stand in 2010 after a treatment has removed all but the largest 75 trees per acre.
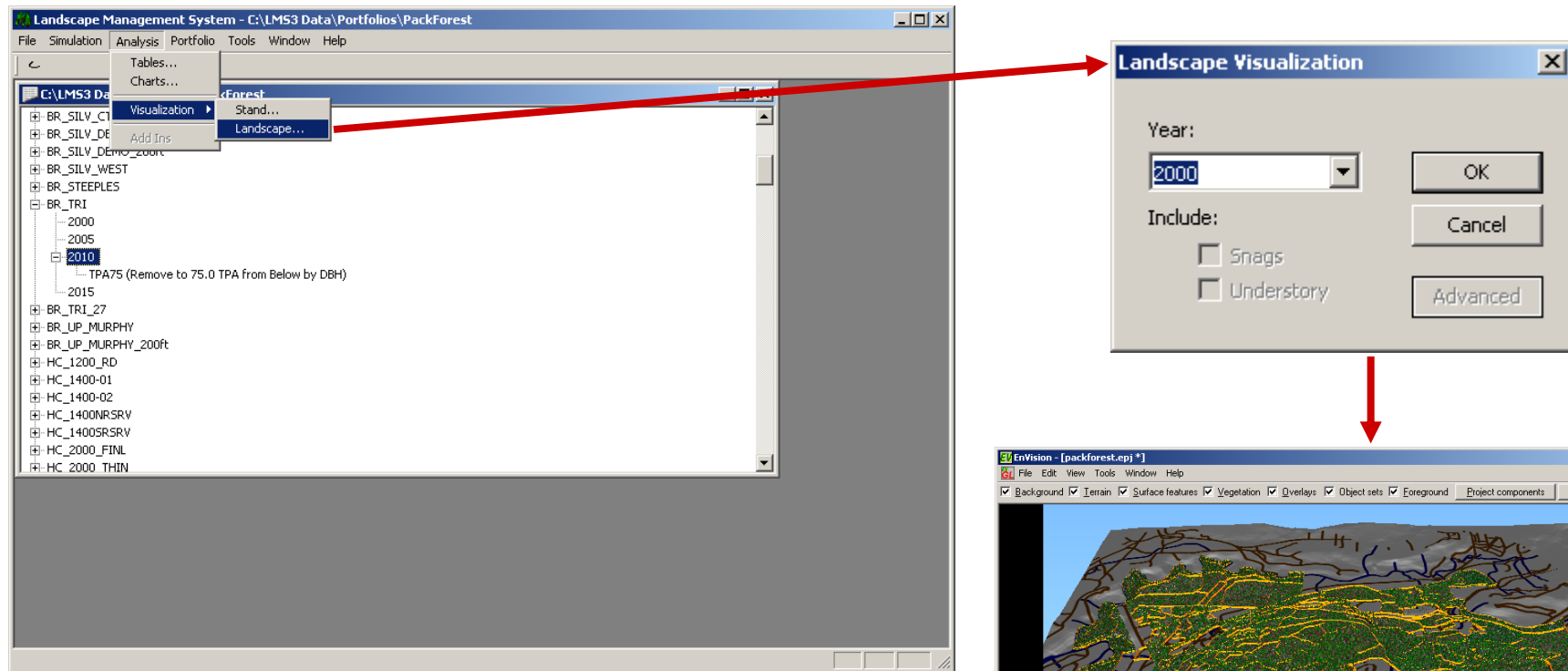
USDA Forest Service
State & Private Forestry
Cooperative Forestry

University of Washington
College of Forest Resources

WASHINGTON STATE
UNIVERSITY

42

Landscape Visualization

LMS can present landscape level visualization using EnVision (USDA Forest Service). At right is an example visualization for the Pack Forest portfolio showing trees, stand boundaries (orange), roads (brown), and streams (blue).
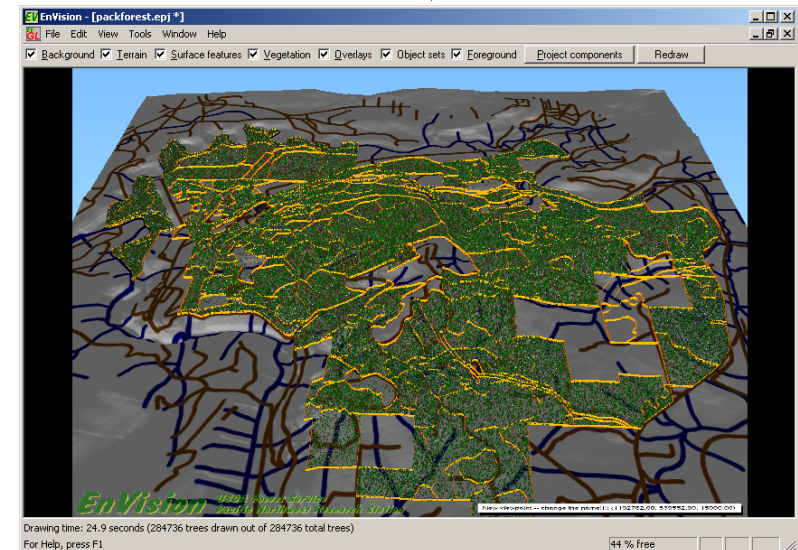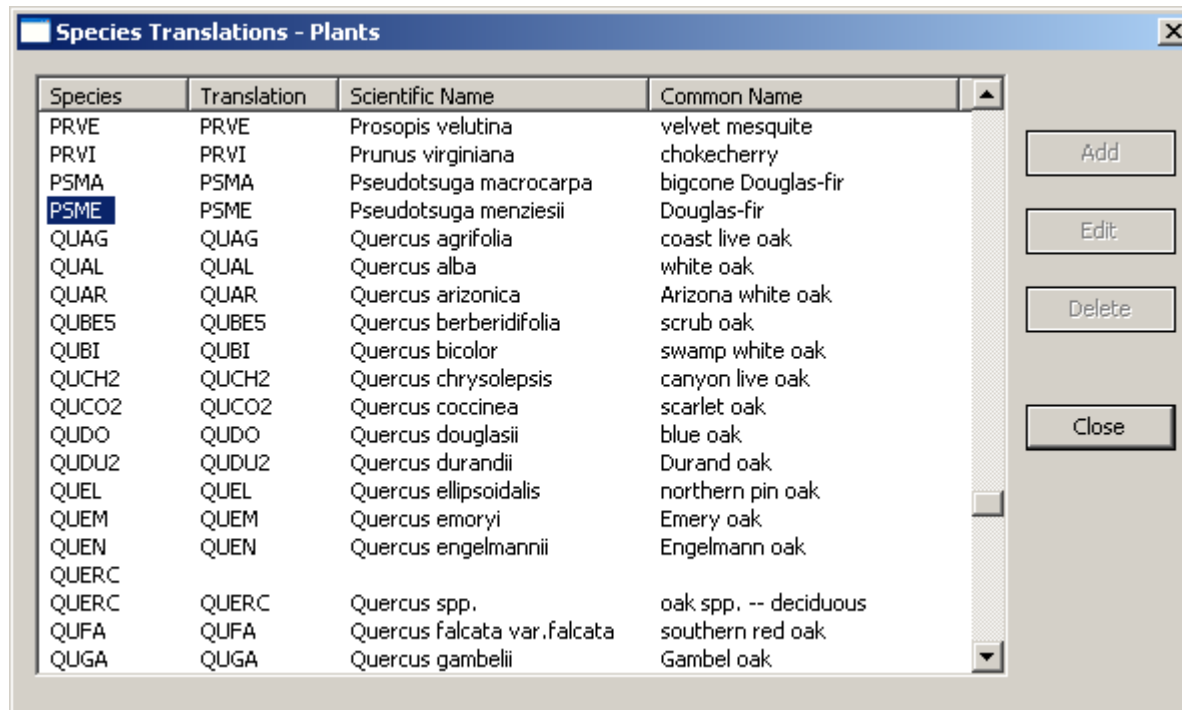
Visualization Compared to Photo

The landscape visualization tool, EnVision, used in LMS can create realistic visualizations. Below is a photograph compared to landscape visualization from LMS. In many cases this visualization can be used for monitoring and may highlight inventory data issues.
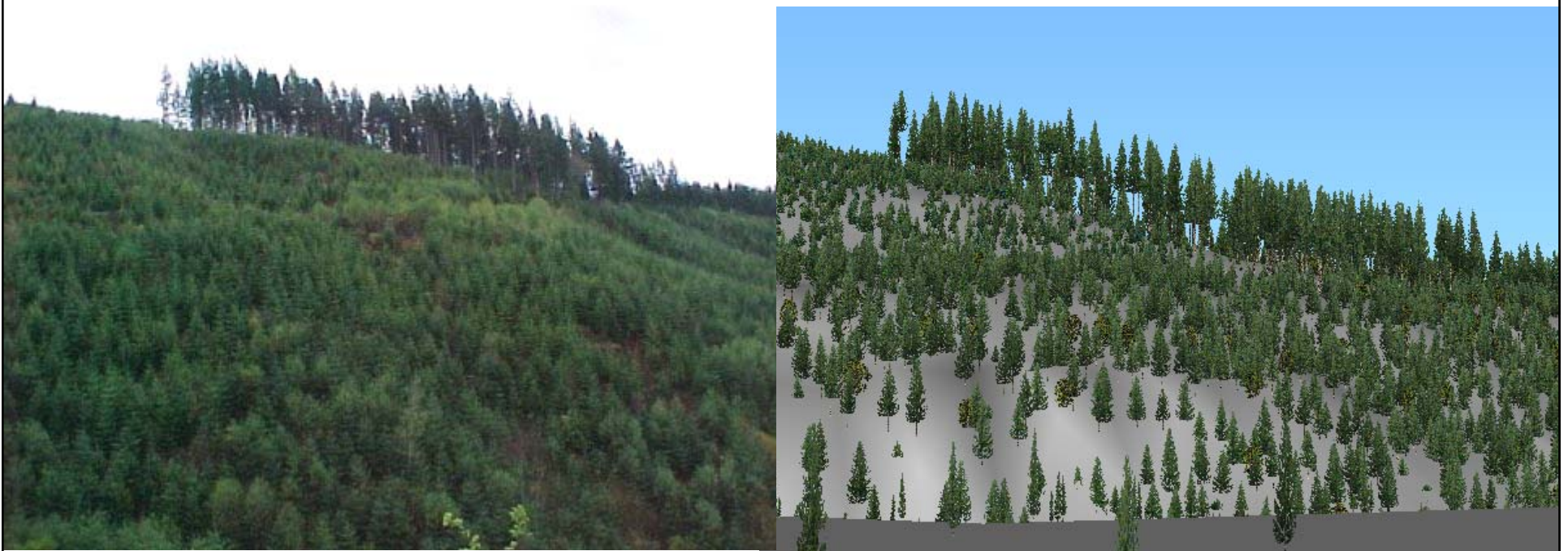
Visualization and photo courtesy of Duane Emmons, Pack Forest

Species Codes in LMS 3.1

LMS 3.1 uses the Natural Resources Conservation Service (NRCS) National Plants[*] database species codes. This provides consistent species codes for the entire country regardless of growth model or analytical tool being used.

The species codes that LMS 3.1 knows can be viewed using the File/LMS Preferences/Edit Known Species.

USDA Forest Service
State & Private Forestry
Cooperative Forestry

University of Washington
College of Forest Resources

WASHINGTON STATE UNIVERSITY

LMS Portfolios

Each LMS portfolio exists in its own subdirectory that contains all the files that comprise the portfolio. The minimum required for a valid portfolio is the portfolio configuration file (.lms) and the portfolio database file (.mdb). All files within an LMS Portfolio are now binary files and cannot be read or modified using a text editor.
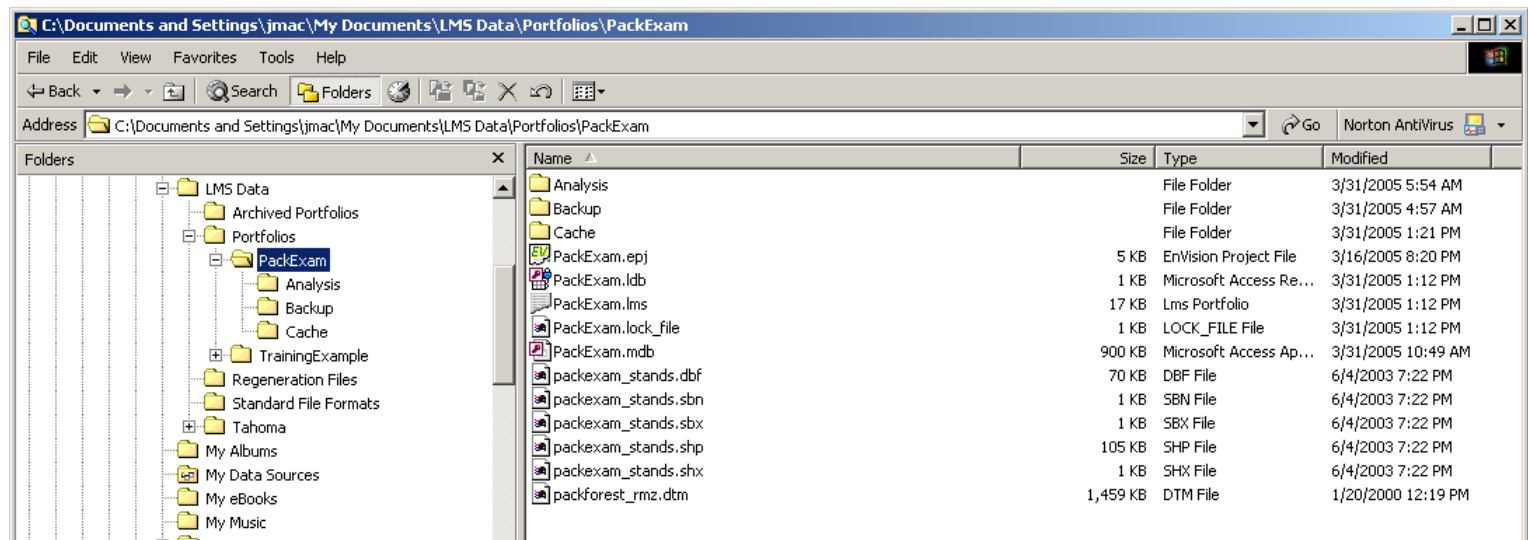
Anatomy of an LMS 3.x Portfolio

- Open LMS 3.x help file (Help/Contents)
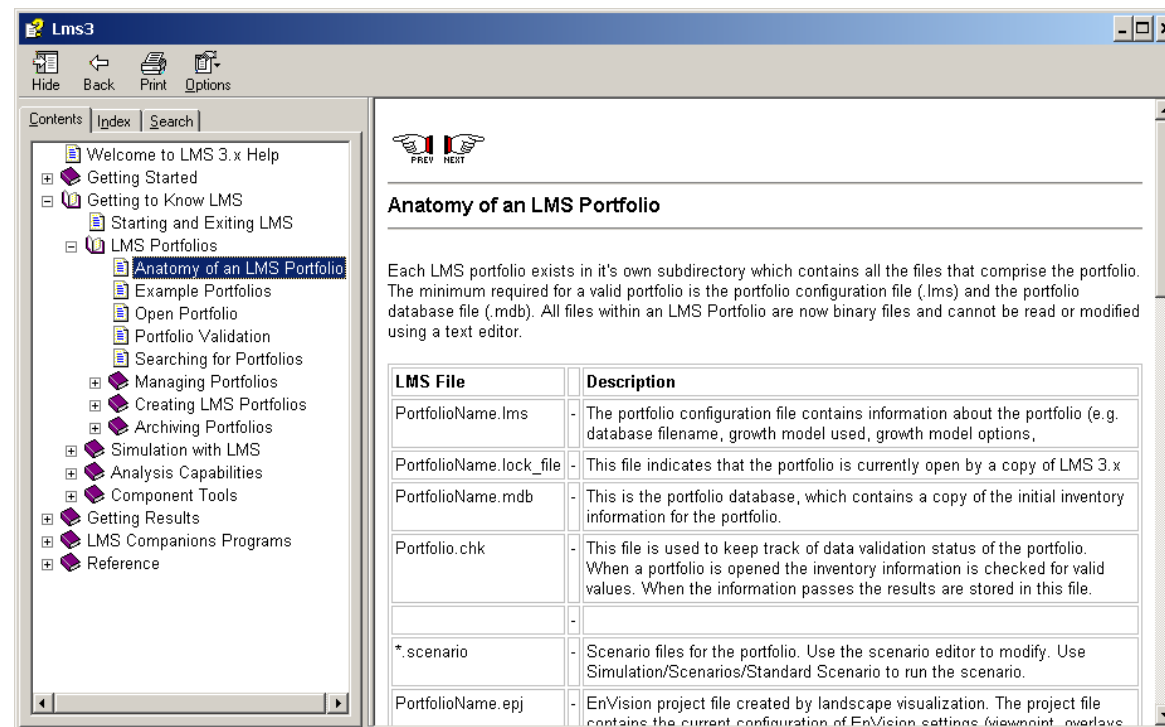
Anatomy of an LMS 3.x Portfolio

The following files are found in the Portfolio directory:

LMS File	Description
PortfolioName.lms	The portfolio configuration file contains information about the portfolio (e.g. database filename, growth model used, growth model options)
PortfolioName.lock_file	This file indicates that the portfolio is currently open by a copy of LMS 3.0.
PortfolioName.mdb	This is the portfolio database, which contains a copy of the initial inventory information for the portfolio.
*.scenario	Scenario files for the portfolio. Use the scenario editor to modify. Use Simulation/Scenarios/Standard Scenario to run the scenario.
PortfolioName.epj	EnVision project file created by landscape visualization. The project file contains the current configuration of EnVision settings (viewpoint, overlays, etc).
*.shp	ESRI shapefiles used by EnVision for stand boundaries and other spatial features. Shapefiles are actually composed of up to 7 pieces (.dbf, .prj, .sbn, .sbx, .shp, .shp.xlm, .shx). A minimum of the .shp, .sbn, and .dbf are required for use by EnVision.
*.dtm	PC Plans Binary DTM files. These files contain the elevation information used by EnVision for landscape visualization. These files are created using converter programs included with EnVision. The original format may be a USGS DEM file, a USGS SDTS file, or an ASCII grid (.asc).
*.vpt	Viewpoint files used by EnVision. These files contain pre-saved viewpoint locations so that the user can return to a specific location in landscape visualization.
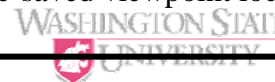
Anatomy of an LMS 3.x Portfolio

In addition to the individual files contained in the portfolio directory, there are several subdirectories that are important to the portfolio:

Directory	Description
Analysis	Temporary output files from visualization and tables are stored here.
Backup	Backup information is stored here when you "edit" the portfolio to add, remove, or rename stands.
Cache	The current and projected inventory (trees, snag and logs, and understory) and projection information.

Each of these directories are managed by LMS.
Modifying or deleting any files in these directories may break your portfolio and prevent LMS from running.

Anatomy of an LMS 3.1 Portfolio

The default location for LMS 3.1 portfolios is in C:\LMS Data\Portfolios. This value can be modified by making Windows Registry changes to point to a directory of your choosing. See the example registry file (C:\Program Files\Lms3\Lms3-WorkingDir.reg for an example. This registry file includes the settings for two LMS 3.1 registry entries: LMS Data Directory and Portfolio Directory. You can edit this file using a text editor to change the location of the LMS Data Directory by replacing the string. After making changes you can make these changes to the registry by double clicking the .reg file, or importing the registry file using the registry editor. *Note: Making improper entries may cause LMS 3.1 to function incorrectly.*

NRCS-Pack Portfolio

Packexam Portfolio

LMS Outputs

- Users interact with the results of simulation and treatments by using a variety of tools to interpret the results of their simulated management actions. This is done primarily through tabular output and visualization:
    - LMS Tables
    - LMS Visualizations

LMS Tables

- ## Basic Table Interface
  - Pre-define tables implemented in the Python scripting language
    - Requires programming capability to add tables. Tables can be added by users.

- ## Advanced Table Interface
  - User's can create their own tables from LMS variables using GUI.
    - No programming required. Limited to variables known by LMS (additional variables can be added by developing an LMS component).

- ## Over 20 tables are distributed with LMS 3.x

LMS Basic Tables

Select Analysis/Basic… to open the Select the Table dialog. Select the table, years, and stands, and output to you want and then Click OK to send the requested information to Microsoft Access, Microsoft Excel, or a text editor.

LMS 3.x – Example Tables

The Inventory table (left) provides the raw inventory information: Species, DBH, Height, Crown Ratio, TPA, Volumes, and Max Crown Width.

The Summary table provides typical statistics for forest stands: Species, Quadratic Mean Diameter, Ave DBH, TPA, Ave Height, Total Basal Area, SDI, CurtisRD, and Volumes.

USDA Forest Service
State & Private Forestry
Cooperative Forestry

University of Washington
College of Forest Resources
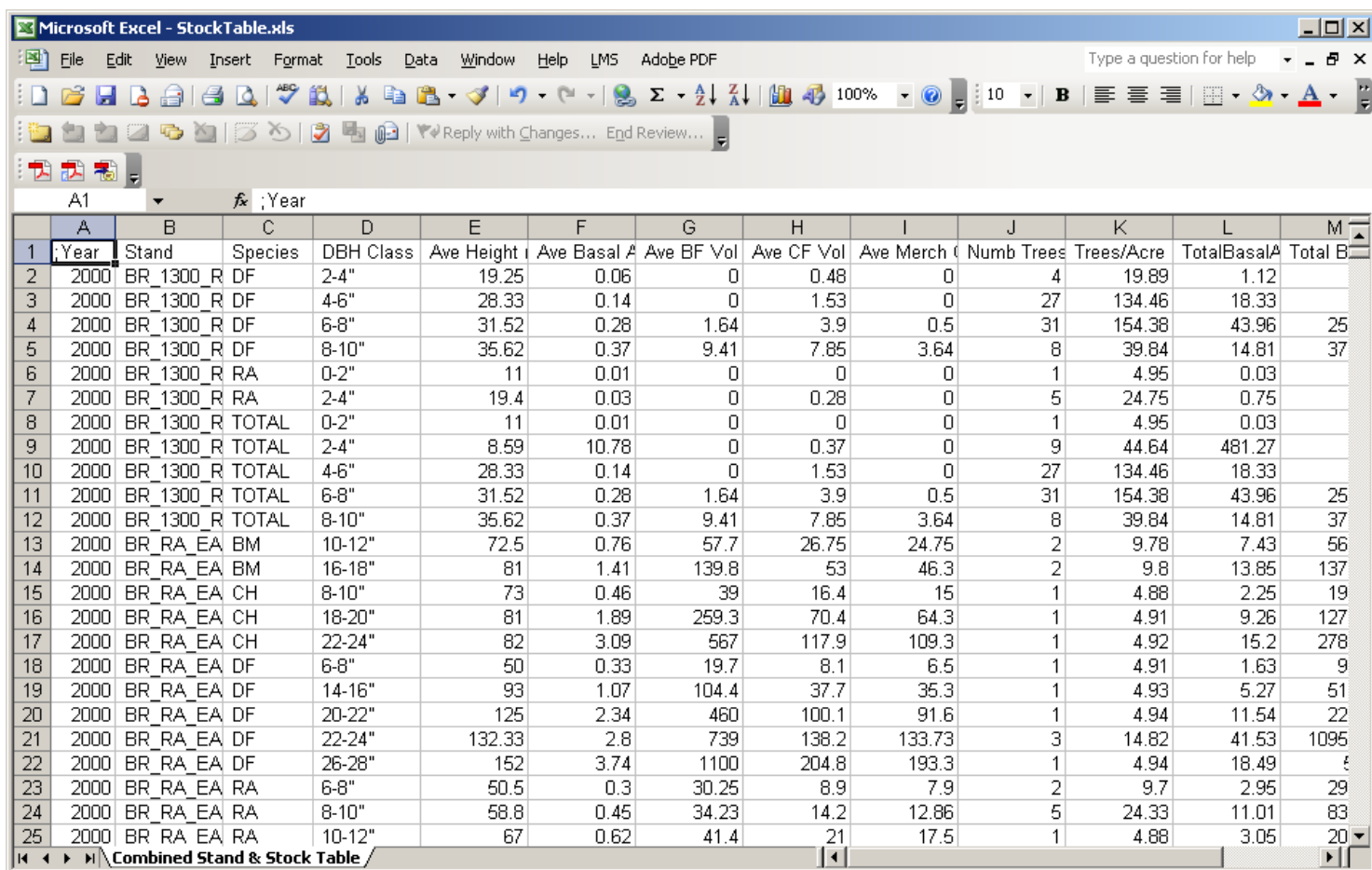
WASHINGTON STATE UNIVERSITY
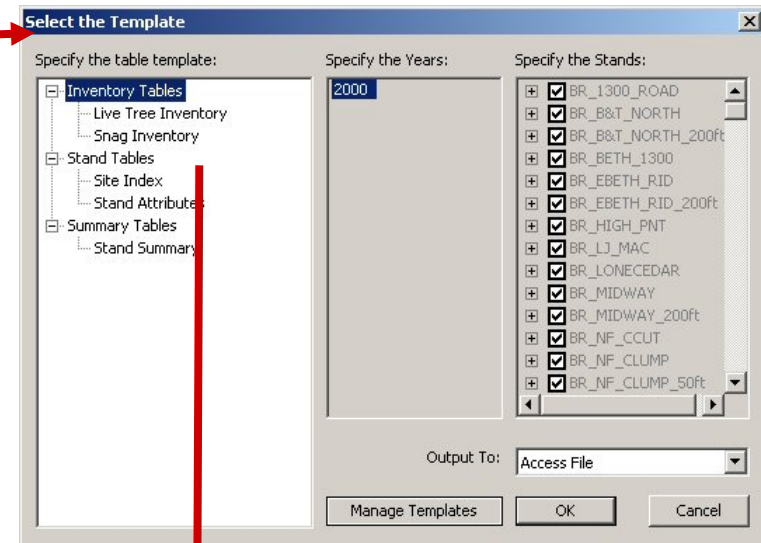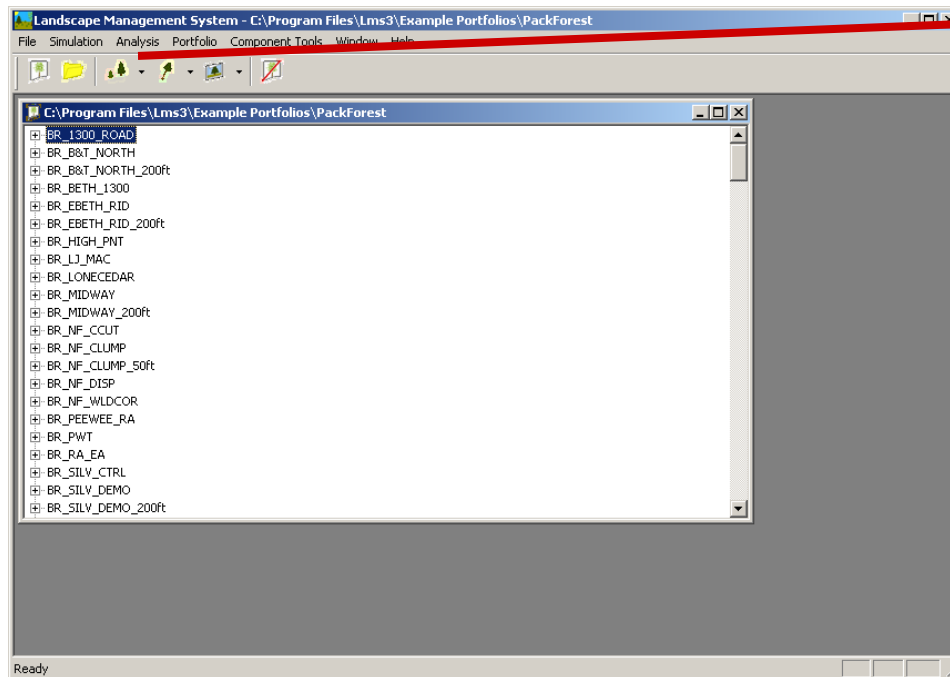
LMS 3.x – Example Table
Combined Stand & Stock Table

The Combined Stand & Stock table displays summary statistics by diameter class and species. It includes Ave Height, Ave Basal Area, Ave Board Foot Volume, Ave Cubic Foot Volume, Trees/Acre, Total Basal Area, Total Board Foot Volume, and Total Cubic Foot Volume by species and diameter class.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	;Year	Stand	Species	DBH Class	Ave Height	Ave Basal A	Ave BF Vol	Ave CF Vol	Ave Merch	Numb Trees	Trees/Acre	TotalBasalA	Total B
2	2000	BR_1300_R	DF	2-4"	19.25	0.06	0	0.48	0	4	19.89	1.12	
3	2000	BR_1300_R	DF	4-6"	28.33	0.14	0	1.53	0	27	134.46	18.33	
4	2000	BR_1300_R	DF	6-8"	31.52	0.28	1.64	3.9	0.5	31	154.38	43.96	25
5	2000	BR_1300_R	DF	8-10"	35.62	0.37	9.41	7.85	3.64	8	39.84	14.81	37
6	2000	BR_1300_R	RA	0-2"	11	0.01	0	0	0	1	4.95	0.03	
7	2000	BR_1300_R	RA	2-4"	19.4	0.03	0	0.28	0	5	24.75	0.75	
8	2000	BR_1300_R	TOTAL	0-2"	11	0.01	0	0	0	1	4.95	0.03	
9	2000	BR_1300_R	TOTAL	2-4"	8.59	10.78	0	0.37	0	9	44.64	481.27	
10	2000	BR_1300_R	TOTAL	4-6"	28.33	0.14	0	1.53	0	27	134.46	18.33	
11	2000	BR_1300_R	TOTAL	6-8"	31.52	0.28	1.64	3.9	0.5	31	154.38	43.96	25
12	2000	BR_1300_R	TOTAL	8-10"	35.62	0.37	9.41	7.85	3.64	8	39.84	14.81	37
13	2000	BR_RA_EA	BM	10-12"	72.5	0.76	57.7	26.75	24.75	2	9.78	7.43	56
14	2000	BR_RA_EA	BM	16-18"	81	1.41	139.8	53	46.3	2	9.8	13.85	137
15	2000	BR_RA_EA	CH	8-10"	73	0.46	39	16.4	15	1	4.88	2.25	19
16	2000	BR_RA_EA	CH	18-20"	81	1.89	259.3	70.4	64.3	1	4.91	9.26	127
17	2000	BR_RA_EA	CH	22-24"	82	3.09	567	117.9	109.3	1	4.92	15.2	278
18	2000	BR_RA_EA	DF	6-8"	50	0.33	19.7	8.1	6.5	1	4.91	1.63	9
19	2000	BR_RA_EA	DF	14-16"	93	1.07	104.4	37.7	35.3	1	4.93	5.27	51
20	2000	BR_RA_EA	DF	20-22"	125	2.34	460	100.1	91.6	1	4.94	11.54	22
21	2000	BR_RA_EA	DF	22-24"	132.33	2.8	739	138.2	133.73	3	14.82	41.53	1095
22	2000	BR_RA_EA	DF	26-28"	152	3.74	1100	204.8	193.3	1	4.94	18.49	5
23	2000	BR_RA_EA	RA	6-8"	50.5	0.3	30.25	8.9	7.9	2	9.7	2.95	29
24	2000	BR_RA_EA	RA	8-10"	58.8	0.45	34.23	14.2	12.86	5	24.33	11.01	83
25	2000	BR_RA_EA	RA	10-12"	67	0.62	41.4	21	17.5	1	4.88	3.05	20

LMS Advanced Tables

Select Analysis/Advanced… to open the Select Template dialog. Select the table template, years, and stands, and output to you want and then Click OK to send the requested information to Microsoft Access, Microsoft Excel, or a text editor.
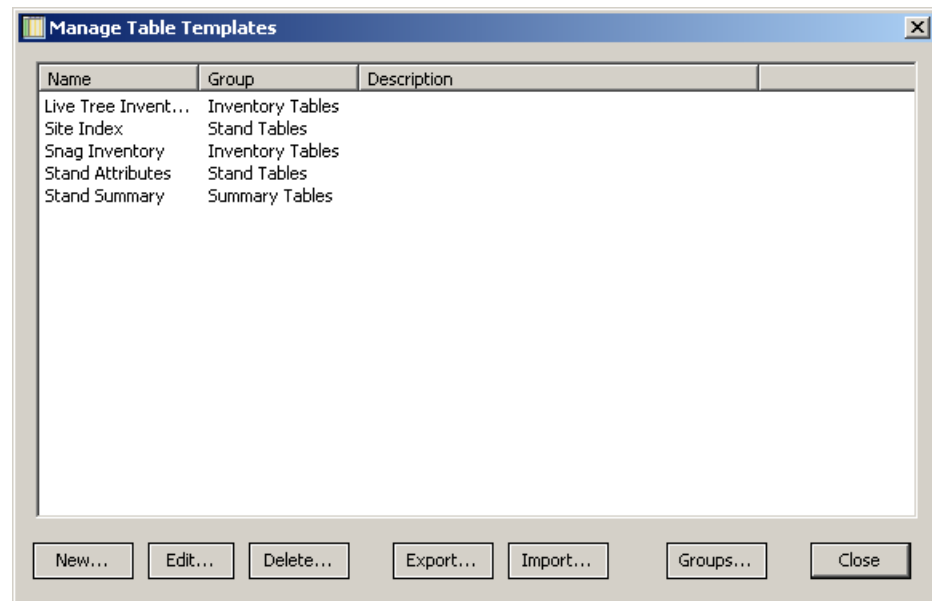
Manage Table Templates

Templates are divided into Template Groups. This dialog shows two Template Groups: Live Tree and Stand Data.

You can Create, Load, Edit, and Delete existing Table Templates.

NOTE: Load and Delete are not implemented yet.

Edit Template Values

Existing Table Templates can also be modified.

You can change the Template Name, Template Group, Template Description, and the order of the variables in the Template.

Future enhancements will allow you to add and remove variables from the template.

Create Table Templates

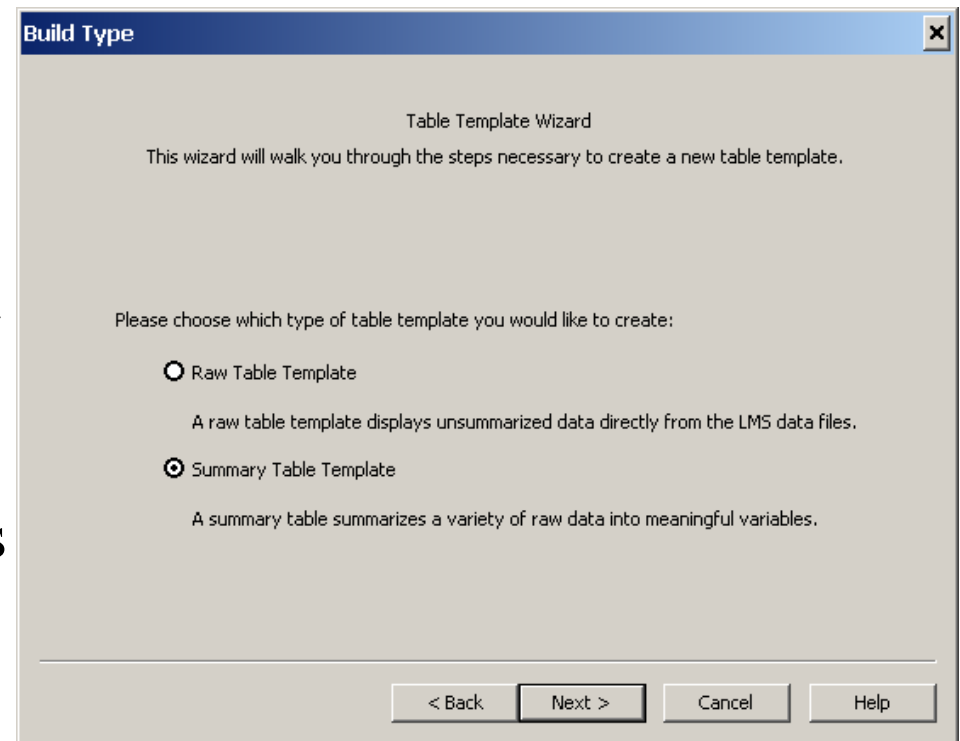To create a new advanced table click the New button.
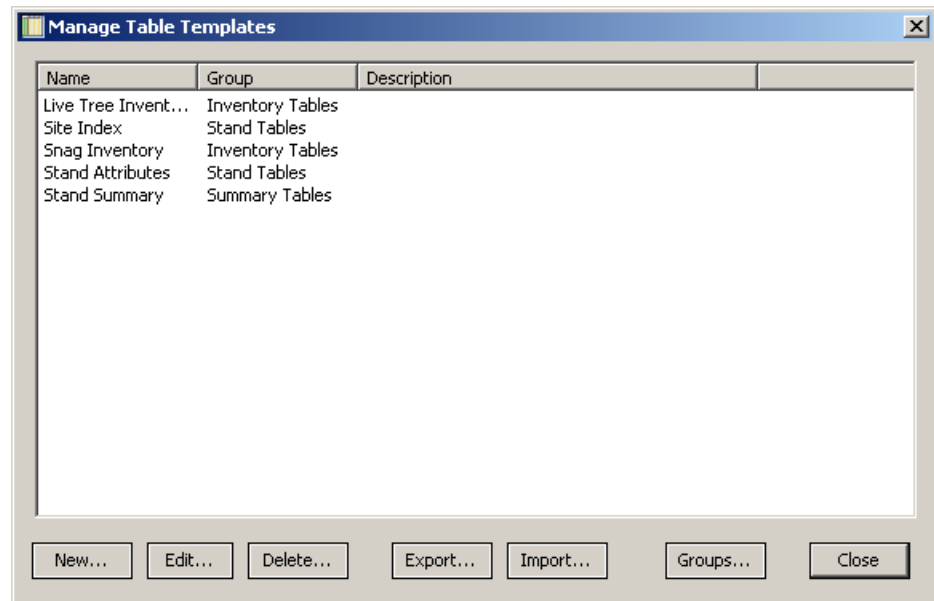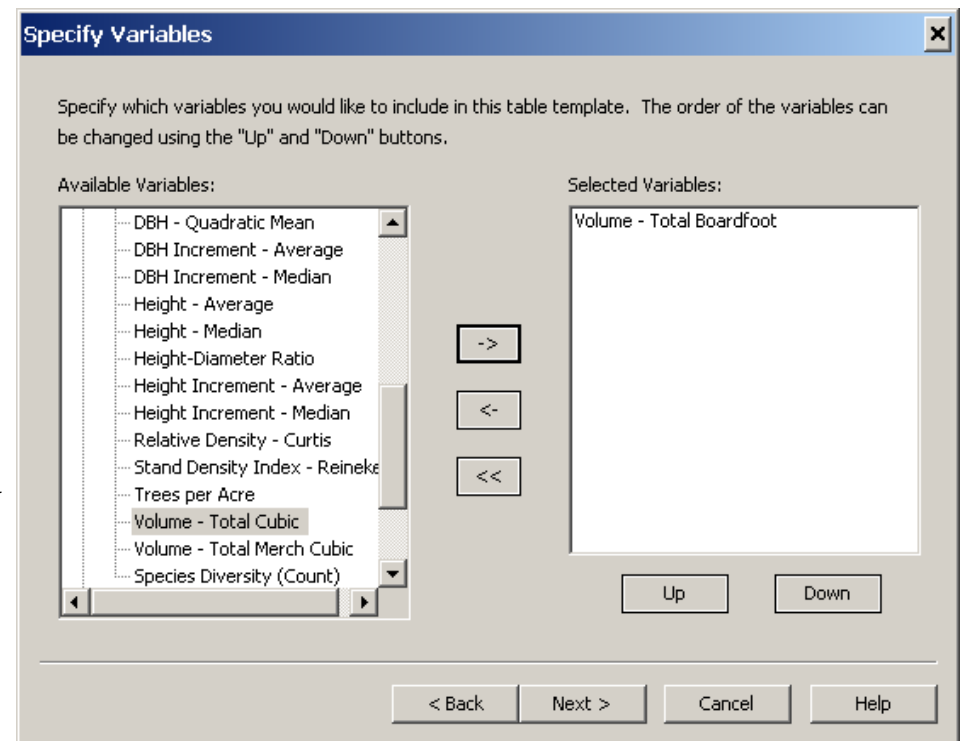
Create Table Template

You can select between "Raw Tables Templates" and "Summary Tables Templates". Raw tables just report the underlying information out of the databases of inventory in the portfolio. Summary tables compute typical forestry statistics on the inventory information.

We are going to create a Summary table.

Build Type

Table Template Wizard

This wizard will walk you through the steps necessary to create a new table template.

Please choose which type of table template you would like to create:

○ Raw Table Template

A raw table template displays unsummarized data directly from the LMS data files.

⊙ Summary Table Template

A summary table summarizes a variety of raw data into meaningful variables.

< Back | Next > | Cancel | Help
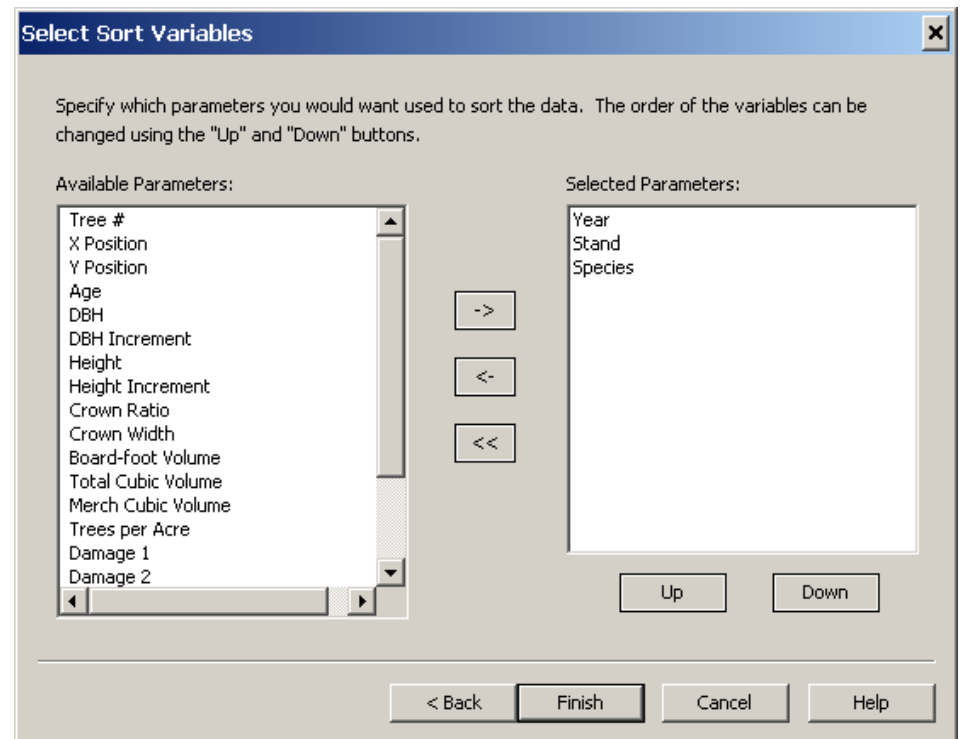
Create Table Template

Select between the kinds of information available (Tree, Snags, Understory, Site Index, or Stand). In this case we want to make a board foot volume summary table by species and stand. Open the Tree section and scroll down to find the Volulme – Total BoardFoot item and move it to selected variables (highlight and click or double-click).

USDA Forest Service
State & Private Forestry
Cooperative Forestry

University of Washington
College of Forest Resources

WASHINGTON STATE
UNIVERSITY

Create Table Template

Sort variables are those that the summary will be computed over. In our case we want the board foot volume for each species in a stand for all years that we have inventory information.

Move Year, Stand, and Species to Selected variables.

Create Table Template

The final dialog show a summary of the Sort and Data variables and prompts for the Template Name and a group to store the template under.

LMS Visualization

- LMS contains tools for Stand and Landscape level visualization:
  - Stand Visualization System (SVS) for stand level (flat acre representation of single stands)
  - EnVision for landscape level (combines spatial and inventory information to produce images of stands on landscape groups surface)

Stand Visualization
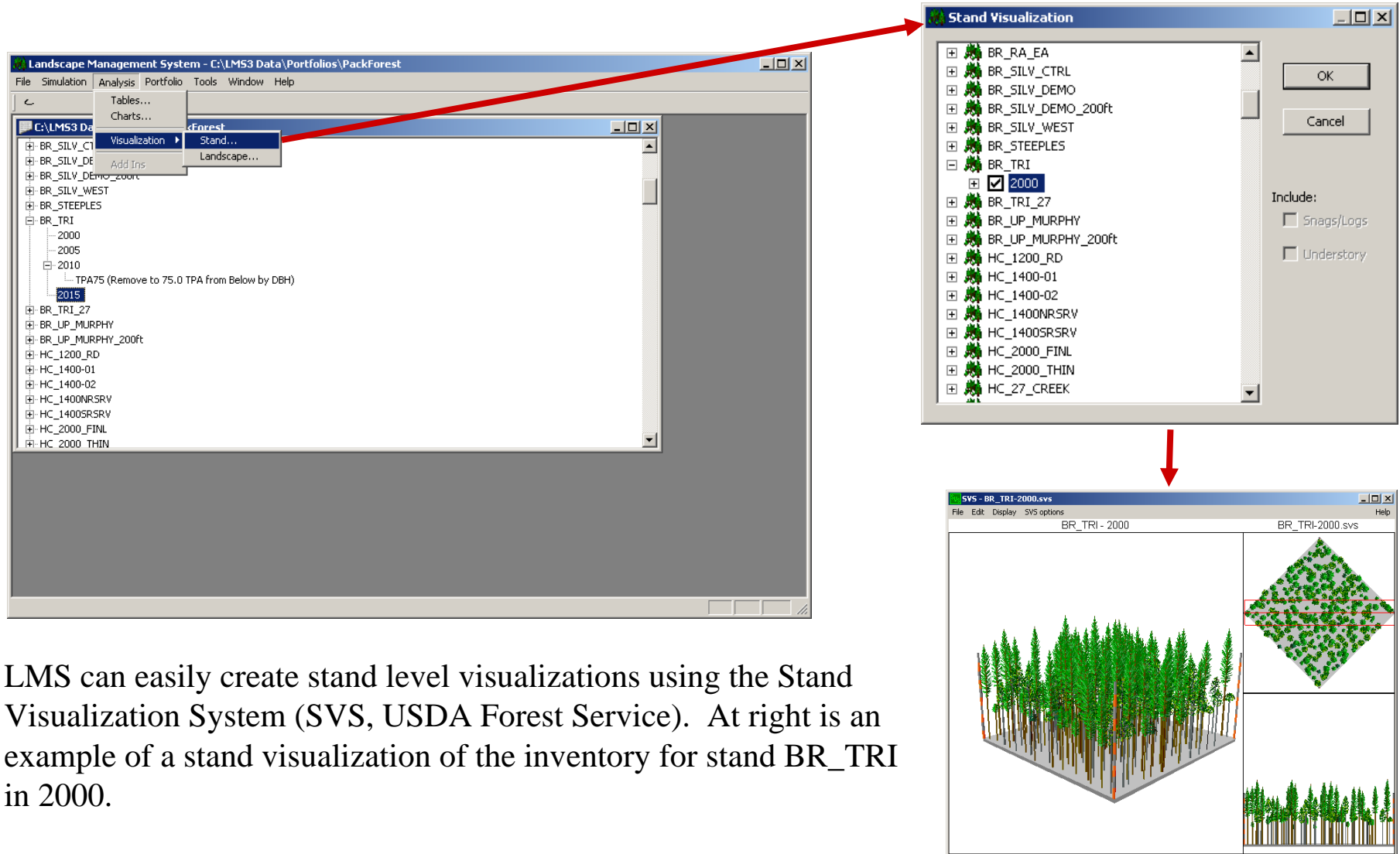
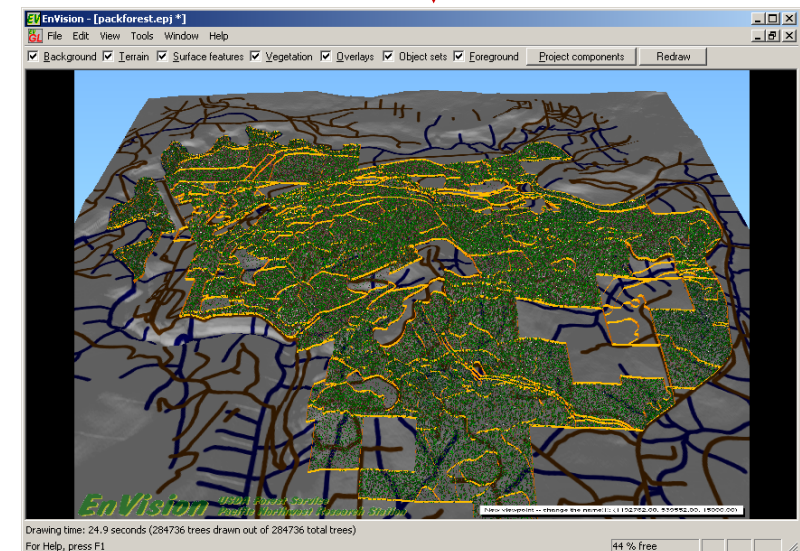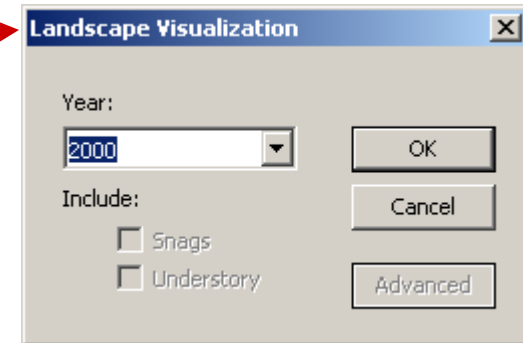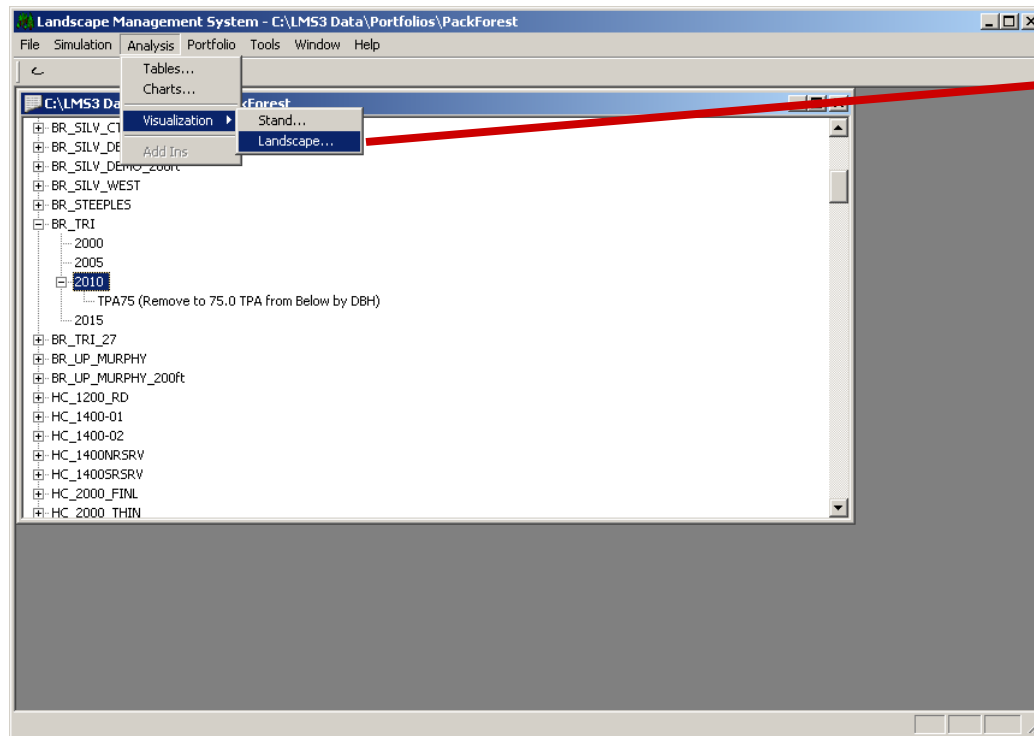LMS can easily create stand level visualizations using the Stand Visualization System (SVS, USDA Forest Service). At right is an example of a stand visualization of the inventory for stand BR_TRI in 2000.

Landscape Visualization

LMS can present landscape level visualization using EnVision (USDA Forest Service). At right is an example visualization for the Pack Forest portfolio showing trees, stand boundaries (orange), roads (brown), and streams (blue).