

Inventory Wizard:

***A new tool that makes it easy to get started
with the Landscape Management System***

Kevin W. Zobrist, James B. McCarter, and Donald P. Hanley

I. Introduction

“ LMS can help with everyday planning and decision-making for small, family ownerships. ”

Foresters and landowners today are faced with management decisions that are often complex and must consider a variety of both private and public values and objectives. At the same time, new technologies are available that can help inform such decisions and communicate outcomes. Personal computers, for example, are more affordable and accessible than ever, and there is a lot of forestry software available that has powerful analysis capabilities. Tree growth models are particularly useful software programs, as they can predict how forests will change over time and respond to different management treatments. Forest visualization models are also useful. These models can visually convey management outcomes, which is a very effective communication tool. Many such programs are publicly available and can be downloaded for free. Despite this availability, though, they are not widely utilized by forest consultants and family forest landowners. Assembling data for input, learning the required commands, and understanding the outputs of these programs can pose challenges, especially if potential users have limited computer experience.

The Landscape Management System (LMS) was developed by the University of Washington in part to make some of the publicly available forestry software easier to use and more accessible to a wider audience. LMS integrates a number of growth, treatment, spatial, and visualization models into a single, user-friendly package (McCarter et al. 1998, McCarter 2001). LMS seamlessly transfers data between these different models, offering powerful and comprehensive simulation and analysis capabilities. Users do not need to know the different sets of commands for each program, as all functionality can be accessed through graphical menus. A variety of outputs are available in easy-to-use tables and charts.

LMS is powerful enough to provide landscape-level analysis for large corporate and public ownerships. At the same time, LMS can help with everyday planning and decision-making for small, family ownerships. In either case, the quality of the analysis is dependent upon the quality of the input data. Importing forest inventory data into LMS has been one of the challenges to more effective use of the system. Different types of stand-level and tree-level data are necessary, and in many cases LMS requires special alphanumeric codes for certain attributes like species or geographic location. The data must be arranged in columns with specific formats and saved as a series of text files to be imported into LMS. This

detailed process can deter many users. Some potential users, especially those with small ownerships, are not likely to invest the necessary time and resources into data preparation.

The LMS Inventory Wizard was created to make it easier for LMS users to acquire, prepare, and import forest inventory data. The Inventory Wizard guides users through an intuitive series of data entry forms that clarify what information is needed and in what format. Stand and tree attributes can be selected from drop-down menus, and the Inventory Wizard will translate these into the appropriate growth model codes used within LMS. The Inventory Wizard accommodates almost any plot sampling design, and it automatically calculates the per acre expansion factors for each tree. Throughout the data entry process, data are carefully checked to ensure conformance to the standards required by LMS. Once all the inventory data have been entered, the data are automatically organized and loaded into LMS, allowing users to immediately begin using the system.

II. Getting Started with the Inventory Wizard

Figure 1: The Main Menu of the LMS Inventory Wizard.



The LMS Inventory Wizard works on computers running Microsoft Windows 98 or later versions. The Inventory Wizard is not a stand-alone program, but is a database file that requires Microsoft Access 2000 (or later version) to be installed on the computer. However, on computers that do not have an appropriate version of Microsoft Access installed, additional files will be installed to allow full use of the Inventory Wizard. Both LMS and the Inventory Wizard are available for free download from the web (see page 8 for information). The Inventory Wizard module is automatically included with new installations of LMS, or it can be installed separately for current LMS users. Once installed, the Inventory Wizard can be found in the LMS program group on the start menu.

The Inventory Wizard starts in the Main Menu (Figure 1). The Getting Started button will bring up a sub-menu with three options. The first option is the tutorial, which will help familiarize users with the program. The next step is the Growth Model Selection Guide. LMS includes several different growth models, including Oregon State University's ORGANON, with variants covering parts of the Pacific Northwest (Hann 1997), and the USDA Forest Service's Forest Vegetation Simulator (FVS), with variants covering different regions throughout the U.S. (Wykoff et al. 1982, Wykoff 1986). Each growth model has specific data requirements, so the model to be used must be selected before proceeding. The Growth Model Selection Guide helps the user select an appropriate growth model by asking a series of geographic location questions and then recommending an appropriate growth model. For some regions, multiple growth models may be recommended, and in this case the user can pick any of the suggested models.

The final option in the Getting Started Menu is for field inventory forms. For users who have not yet collected field inventory data, these forms will help them collect exactly what is needed so that they can quickly and efficiently enter it into the Inventory Wizard. The field forms cover two data types: (1) plot and tree data and (2) stand data for the growth model selected. Field forms are in Adobe Acrobat PDF format, so users can print as many copies as they need. The forms can even be printed on waterproof paper to create durable plot cards.

Examples of field inventory forms that have been filled out for a five-acre stand of 40-year-old timber in western Washington are shown in Figure 2 and Figure 3. The growth model to be used in this example is the Pacific Northwest Coast (PN) variant of FVS, so the appropriate stand data form has been filled out in Figure 2. Stand data are separated into two categories: required and optional. Required data are the minimum necessary to run LMS. Optional data will further calibrate the growth model for localized results. While not required to run LMS, as much optional data as possible should be entered. In the example, required data include the stand name, stand acreage, the year the inventory is taken, the location (nearest national forest—a list is provided with the form), and stand site index (specified by species, base year, and reference). Optional data include plant association (a list to choose from is provided with the form), stand age, mean aspect, mean slope, elevation, and site indexes for additional species. By discriminating between required and optional data, users can make an informed decision about the level of data-gathering effort to expend based on their available time, expertise, and the desired quality of results.

LMS Inventory Wizard

Stand Data Form for use with the Pacific Northwest Variant of the FVS Growth Model (FVS, PN)

Required Data

| | |
|---|---|
| Stand Name: <u>Example</u> | Inventory Year: <u>2005</u> |
| Stand Acreage: <u>5.0</u> <small>(to the nearest 1/10th acre)</small> | Location: <u>Olympic Nat. For.</u> <small>(your nearest national forest—see attached list)</small> |
| Stand Site Index: <u>120</u> <small>(King's 50-year Douglas-fir index)</small> | |

Optional Data

| | |
|---|---|
| Plant Association/Ecoclass: _____ <small>(see attached list)</small> | Stand Age: <u>40</u> |
| Mean Aspect (degrees): <u>180</u> | Additional Site Index(es): _____ <small>(see attached list for recognized species)</small> |
| Elevation (feet): <u>100</u> | _____ |
| Mean Slope (percent): <u>5</u> | _____ |

Figure 2: Field data form filled in with stand data from the example in the text. Data is specified as required or optional.

III. Using the Inventory Wizard

Once users have their inventory data ready, either from existing data or by filling out the field inventory forms, they are ready to enter the data into the Inventory Wizard. LMS datasets are called “portfolios.” Clicking the Enter/Edit Portfolio Data button on the Inventory Wizard Main Menu will open the select portfolio dialog box (Figure 4). Existing portfolios can be selected here, or a new portfolio can be created by clicking the New button. The new portfolio should be given a name, and the appropriate growth model should be selected. Clicking the Select button will then open the data entry form.

Figure 5 shows a filled-in data entry form using the example data shown in Figure 2 and Figure 3. Stand level data are entered on the left side of the form. Users can browse between multiple stands using the arrow buttons next to the Stand Name field or enter a new stand by clicking the New button. The data entry form has the same divisions as the field inventory form of required and optional data. Geographic location and plant association can be selected from drop-down menus, as well as additional species-specific site indexes. To guide users through each field, a message with more information about the field will appear at the bottom of the screen when that field is clicked.

Plot and tree record data are entered on the right side of the data entry form. Users can browse between multiple plots using the arrow buttons next to the Plot Number field or enter a new plot by clicking the New button. The sampling type can be toggled between fixed and variable. The form will then ask for the appropriate expansion variable, which is the plot size for fixed radius plots or the BAF for variable radius plots. The Advanced Options button will reveal the additional options from the advanced plot form, such as the transect sampling option, nested subplot information, and tree data fields for snags and downed logs. Clicking the Advanced Options button again will hide these options.

Once the plot characteristics are entered, tree records can be added. Species can be selected from a drop-down menu, while count, DBH, height, and live crown ratio can be directly entered into their respective fields. When all stand, plot, and tree data have been entered, clicking the Done button at the bottom of the form will return the user to the Main Menu.

Users can go back to add or modify the data at any time by clicking the Enter/Edit Portfolio Data button on the Main Menu and selecting the appropriate portfolio.

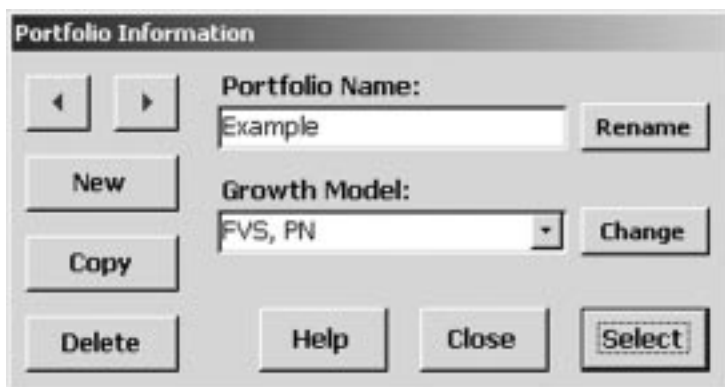


Figure 4: The select portfolio dialog box. A new portfolio has been created called “Example” that uses the FVS, PN growth model. Clicking the Select button will open the data entry form.

Figure 5: The data entry form filled in with the example data from Figure 2 and Figure 3. Stand data is entered on the left side, while plot data is entered on the right side.

Stand Name: Example

Plot Number: 1.0

Required Data:

Inventory Year: 2005

Stand acreage: 5.0

Location: Olympic National Forest

Stand Site Index: 120
(King's 50-year Douglas-fir index)

Optional Data:

Habitat Type/Plant Association:

Aspect: 180.0 Elevation: 100 Slope: 5.0

Stand Age: 40

Species-Specific Site Index(es):

| Species | Index |
|---------|-------|
| | |

Tree Records

| Species | DBH | Height | Crown |
|---------------------|------|--------|-------|
| DF: Douglas-fir | 17.0 | 107 | 0.40 |
| DF: Douglas-fir | 17.2 | 110 | 0.30 |
| DF: Douglas-fir | 17.9 | 22 | 0.30 |
| DF: Douglas-fir | 12.9 | 91 | 0.25 |
| WH: Western hemlock | 11.3 | 85 | 0.30 |
| DF: Douglas-fir | 19.8 | 115 | 0.40 |
| DF: Douglas-fir | 22.5 | 123 | 0.30 |
| RA: Red alder | 10.6 | 70 | 0.30 |

Current Portfolio: Example

IV. Up and Running in LMS

Figure 6: The Build LMS Portfolio dialog box. Once the example portfolio has been selected, clicking the OK button will create the example portfolio.

Build LMS Portfolio

Portfolio: Example

Portfolio Parameters:

Step Size: 5

Log Sort Table: Pack

Portfolio Author Info:

Name:

Organization:

Build Cancel Help

Once all the inventory data have been entered into the Inventory Wizard, users can quickly create a portfolio and start working in LMS. Clicking the Create LMS Portfolio button on the Inventory Wizard's Main Menu will open the Build LMS Portfolio dialog box (Figure 6). Users can select their portfolio from a drop-down menu. They can then select whether they want the growth model to grow the trees in five- or ten-year increments (called step size). The log sort table to be used can be selected from available options, which will define the log prices used by the economic analysis components of LMS. Author information can also be entered. Clicking OK will create the portfolio and return the user to the Main Menu, where they can exit the Inventory Wizard and begin working with LMS.

LMS includes the USDA Forest Service's Stand Visualization System (McGaughey 1997), which allows users to generate a realistic rendering of what their forest looks like (Figure 7). Various stand summary statistics can be examined, including stand density, basal area, and standing volume. Most importantly, users can simulate management scenarios to better understand the

outcomes of different management choices. Figure 8 shows management outcomes in ten years for the example stand if no action is taken (a), the stand is thinned today (b), or the stand is harvested today and replanted (c).

Figure 7: A stand visualization of the new portfolio created from the example data.

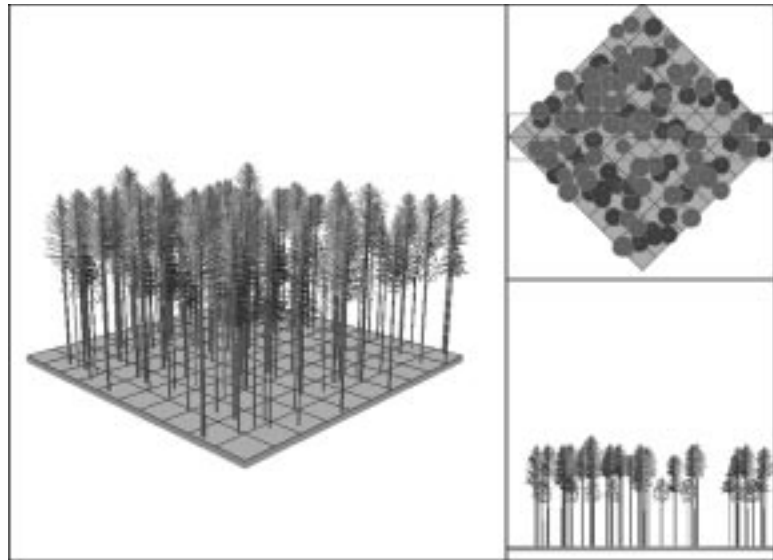
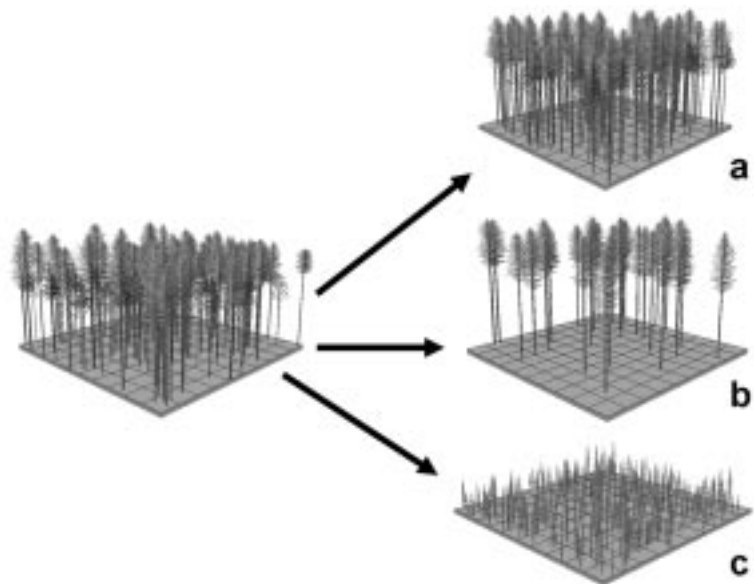


Figure 8: Stand visualizations showing what the example stand will look like in ten years if no action is taken (a); the stand is thinned today (b); or the stand is harvested today and replanted (c).



V. Conclusion

New computer technology tools are available that have rigorous analytical capabilities to help landowners achieve diverse objectives. These tools can also improve communication between landowners, foresters, and other stakeholders. Many of these tools are publicly available, but the key to broader use is to create a user environment that makes them more accessible to a wide range of experience levels. LMS integrates a set of publicly available forestry software to allow easy access through a common, graphical interface. However, challenges still remain for users who want

to load their forest data into LMS. The Inventory Wizard addresses this challenge by establishing an intuitive, user-friendly data entry system.

The Inventory Wizard guides users through every step of process, from data collection to computer input. Field inventory forms help with efficient field data collection. Corresponding on-screen forms facilitate easy data entry into the computer. Once data have been entered, an LMS portfolio can be created in one step and users immediately have access to variety of useful programs and analysis tools using their own forest data. The Inventory Wizard process is easy enough for most users, even if they have limited computer experience. The program can get good results with a minimum time investment, especially when working with an assistance forester. These factors help bring the analytical power of LMS to a broader audience, and they are helpful for incorporating LMS into stewardship planning and other programs.

Literature Cited

The LMS program and the Inventory Wizard are available for free download from: <http://lms.cfr.washington.edu/download/>

Current LMS users can download a stand-alone version of the Inventory Wizard from: <http://lms.cfr.washington.edu/lmsinvwizard.html>

Hann, D. W., A. S. Hester, and C. L. Olsen. 1997. ORGANON user's manual: Edition 6.0. Department of Forest Resources, Oregon State University, Corvallis, Oregon. 133 p.

McCarter, J. B. 2001. Landscape management system (LMS): background, methods, and computer tools for integrating forest inventory, GIS, growth and yield, visualization and analysis for sustaining multiple forest objectives. Ph. D. diss., University of Washington. 94 p.

McCarter, J. B., J. S. Wilson, P. J. Baker, J. L. Moffett, and C. D. Oliver. 1998. Landscape management through integration of existing tools and emerging technologies. *Journal of Forestry* 96(6): 17-23.

McGaughey, R. J. 1997. Visualizing forest stand dynamics using the Stand Visualization System. *In: 1997 ACSM/ASPRS Annual Convention and Exposition. American Society for Photogrammetry and Remote Sensing, Seattle, Washington.* p. 248-257.

Wykoff, W. R. 1986. Supplement to the User's Guide for the Stand Prognosis Model—Version 5.0. USDA Forest Service, Intermountain Research Station, Ogden, Utah. 36 p.

Wykoff, W. R., N. L. Crookston, and A. R. Stage. 1982. User's Guide to the Stand Prognosis Model. USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, Utah. 231 p.



Copyright 2004 Washington State University, College of Agricultural, Human, and Natural Resource Sciences

WSU Extension bulletins contain material written and produced for public distribution. You may reprint written material, provided you do not use it to endorse a commercial product. Alternate formats of our educational materials are available upon request for persons with disabilities. Please contact the Information Department, College of Agricultural, Human, and Natural Resource Sciences, Washington State University for more information.

You may order copies of this and other publications from the WSU Bulletin office, 1-800-723-1763, or online <http://pubs.wsu.edu>

Issued by Washington State University Extension and the U.S. Department of Agriculture in furtherance of the Acts of May 8 and June 30, 1914. Extension programs and policies are consistent with federal and state laws and regulations on nondiscrimination regarding race, sex, religion, age, color, creed, national or ethnic origin; physical, mental or sensory disability; marital status, sexual orientation, and status as a Vietnam-era or disabled veteran. Evidence of noncompliance may be reported through your local Extension office. Trade names have been used to simplify information; no endorsement is intended. Revised March 2006. Subject code 400. EB1983