Natural Resource Inventory Data Visualization and Reporting

Lifeline AI 2000 User Guide: VSO Report Reviewer
Version 1.0 For Microsoft® Access 2000

harmeny

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User's Guide Overview

This manual provides users of Lifeline AI 2000 software applications, loaded with their data, the ability to navigate the various screens to produce the results they want to see. To get started, follow the installation and set-up instructions. Step-by-step instructions on how to view and print the standard reports, or export the underlying datasets are provided. Next, the instructions you need to create your own scenarios, and then view the data graphically, or in spreadsheet form for export, will let you explore relationships in the data to answer your questions as they arise in your day-to-day business.

User Guides with instructions specific to your application(s) follows in appendices since every Lifeline application is unique. Reports and outputs are described in detail for your customized application starting on page 13.

Introduction

Why Lifeline AI?

Lifeline AI (Adaptive Inventory) is for woodlands managers and forest planners who need to implement certification programs for sustainable forest management (SFM). The Lifeline AI system is a forest, land, productivity and silviculture inventory management system that lets you integrate and summarize information across your various forest inventory programs to produce the information needed for SFM. Unlike activity based forest reporting systems and forest simulation models, our systems focus on your current inventory allowing you to:

- Consolidate the inventory
- Explore your land base
- Develop indicators
- Define management scenarios
- Visualize actual results

Lifeline AI helps forestry companies make better decisions by making their data more accessible and easy to use. Applications are initially custom-loaded by the Lifeline developers with your natural resource inventory data into a unique database design. You can have large datasets such as Growth and Yield, Vegetation Inventory, etc., loaded into a Lifeline Application modified to suit your needs. Each application puts large natural resource datasets at your

fingertips to quickly produce standard reports and custom datasets for exporting to other software. You get the freedom to explore your data using scenarios you create, and visualize relationships within the data never before possible.

What is Lifeline AI?

Lifeline AI applications are built as single-user, personal computer programs in Microsoft® Access 2000. You provide the Lifeline developers with your inventory data; customized loading puts your data into our unique normalized, relational database design. You direct the standard and specialized reports you need, and we build them into your software. Lifeline AI gives you the flexibility to explore your data and output data in several formats for exporting to other programs.

The software program was designed for ease-of-use by non-Access 2000 users; simply point and click to proceed through the program features.

- Get fast canned reports in View Standard Reports
- See your results in both standard and customized graphs
- Export your data into other programs for more analyses
- Understand loaded data from the dictionary available from any window
- Get help contact information in "About Lifeline 2000"

Each application can be maintained within your company by an in-house software Administrator trained by the Lifeline developers. An Administrator can append new data as your monitoring continues, update and create new standard reports, and modify the data dictionary and definitions with protocol updates. For more information on application administration, please contact your Lifeline developer.

Installation

Please ensure that your computer meets the following minimum requirements before running the Lifeline applications:

- Access 2000 and Windows operating system
- 500 MHz, Pentium-class processor
- 300 MB free disk space on your hard drive after loading program
- 128 MB of random access memory (RAM)
- colour printer that prints in letter and legal size is required; tabloid size may be required for some customizations

To install and run an application on your computer:

- database applications are received as zipped files on CD
- use an appropriate program such as WinZip or PKZip to unzip
- create a folder "Lifeline" on same directory on your hard drive
- install into the folder; the application should run problem-free
- ensure date settings for your computer are the format yyyy/MM/dd (go to Settings - Control Panel – Regional Settings – Date to change format)
- run "Compact and Repair Database" from the Tools – Database Utilities menu in Access 2000 at the end of each session to prevent files from growing too large

Please contact Mishtu Banerjee (mishtu_banerjee@telus.net) or Andrea Eastham (aeastham@indforserv.bc.ca) if you have any questions, comments, suggestions, or problems.

View Standard Reports

Generate standard reports from pre-defined sets of queries. The standard report feature was designed to provide fast results from very large datasets where each report includes a number of queries and would take a long time to run. You can generate these reports by selecting from a list of variables from within each report type. You can select all the values of a variable, or pick and choose any number of values to be included in your report. You can select more than one variable with any number of values. Datasets similar to the reports can be viewed in spreadsheet format and exported to other programs for further analyses.

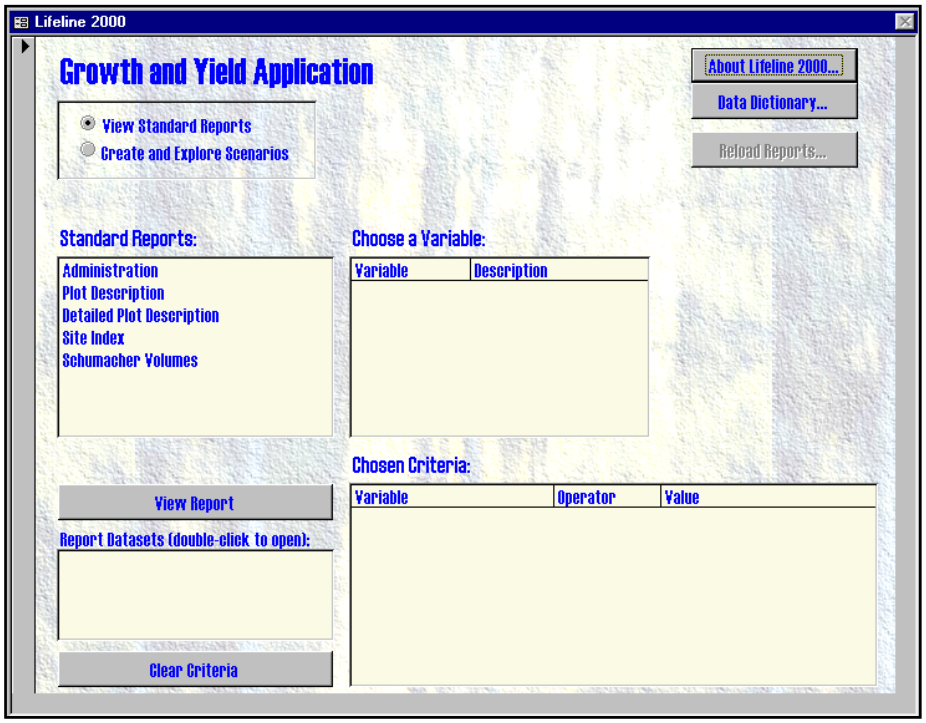


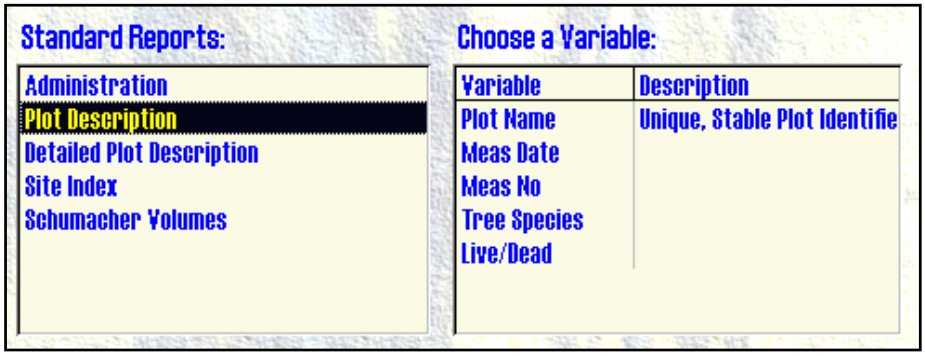
Figure 1: View Standard Reports window after selecting from opening screen. Example is from a Growth and Yield application. Toggle between viewing and create/explore scenarios using buttons in top left-hand box. The Data Dictionary is always available from either window. Reload Reports is not available to users; see your software program administrator.

How to Use View Standard Reports

From the opening screen, choose the report type, and then filter the dataset for the variables and their values you want in your report:

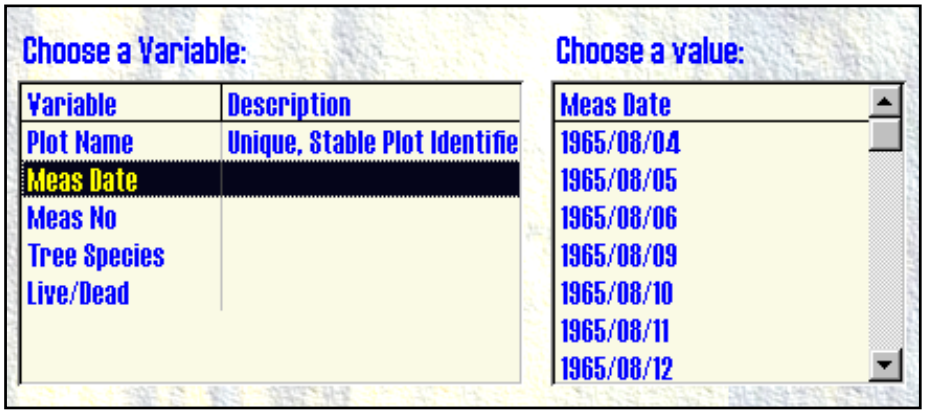
- select View Standard Reports
  - single-click on a selection from Standard Reports list

This returns a list of variables with descriptions for the selected report; only one report can be selected at a time.



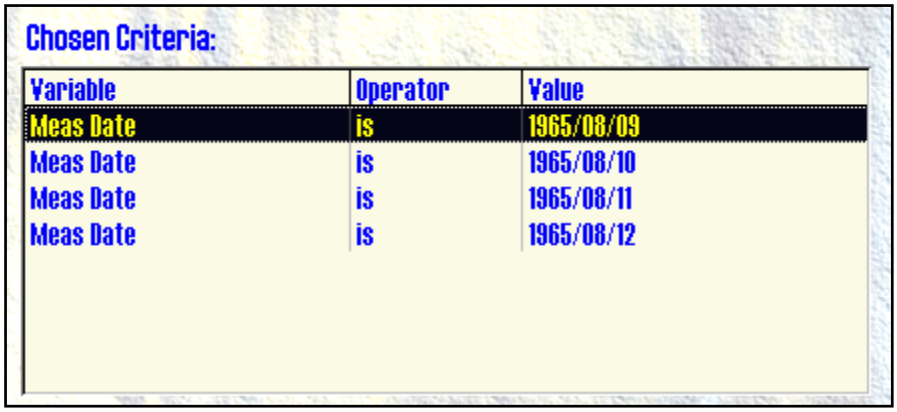
- single-click on a Variable in the list to select

This displays a list of values for the chosen variable.



- double-click on a value or values to select

The selected values are displayed in the Chosen Criteria window. The Variable and the values chosen show your selections. Operator is the relationship between the two; "is" means equal to. Other operators such as "less than", "greater than", etc., could be used.



To delete selected values from the criteria:

- double-click on the value in the Chosen Criteria window to delete from your selection,

or

- highlight and use delete key on keyboard,

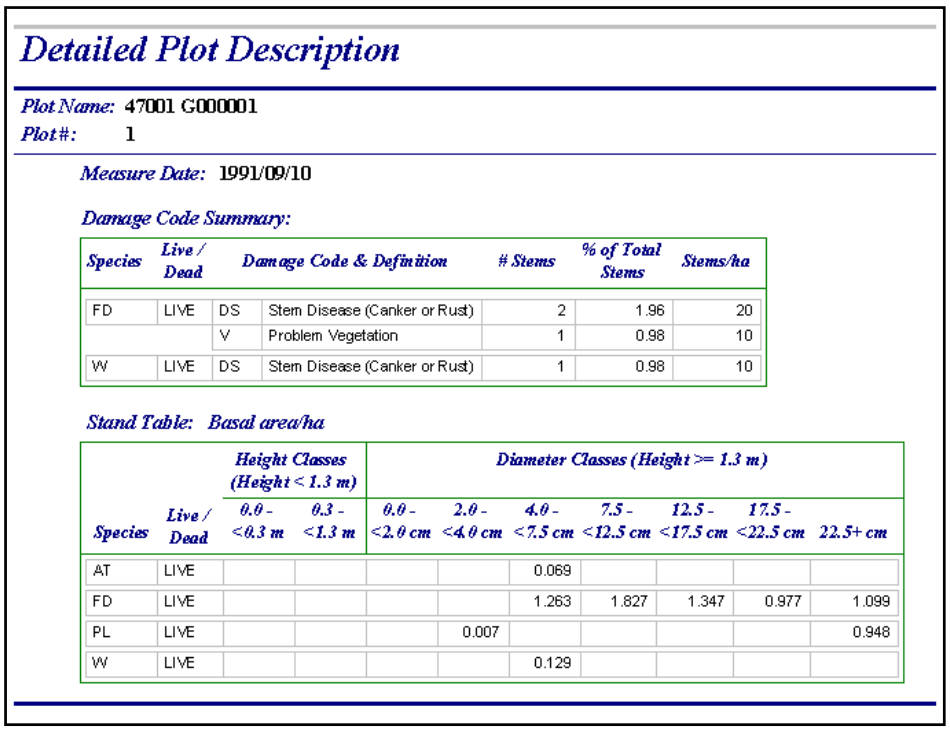
or

- single-click on Clear Criteria to delete all your selections

To view and print the standard report:

- single-click on View Report to view your report

Figure 2 is one example of the Standard Reports that can be produced. Reports are in print preview. You may have to go to Page Setup and change page orientation, margins, and size from Access 2000 File menu the first time you print a report.



Detailed Plot Description

Plot Name: 47001 G000001
Plot #: 1

Measure Date: 1991/09/10

Damage Code Summary:

Species	Live / Dead	Damage Code & Definition		# Stems	% of Total Stems	Stems/ha
FD	LIVE	DS	Stem Disease (Canker or Rust)	2	1.96	20
		V	Problem Vegetation	1	0.98	10
W	LIVE	DS	Stem Disease (Canker or Rust)	1	0.98	10

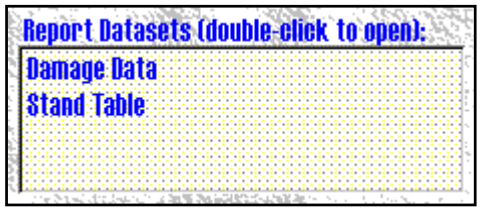
Stand Table: Basal area/ha

		Height Classes (Height < 1.3 m)		Diameter Classes (Height >= 1.3 m)						
Species	Live / Dead	0.0 - <0.3 m	0.3 - <1.3 m	0.0 - <2.0 cm	2.0 - <4.0 cm	4.0 - <7.5 cm	7.5 - <12.5 cm	12.5 - <17.5 cm	17.5 - <22.5 cm	22.5+ cm
AT	LIVE					0.069				
FD	LIVE					1.263	1.827	1.347	0.977	1.099
PL	LIVE				0.007					0.948
W	LIVE					0.129				

Figure 2. Example of a custom designed Standard Report from a Growth and Yield Application.

To export the data as a spreadsheet to another program:

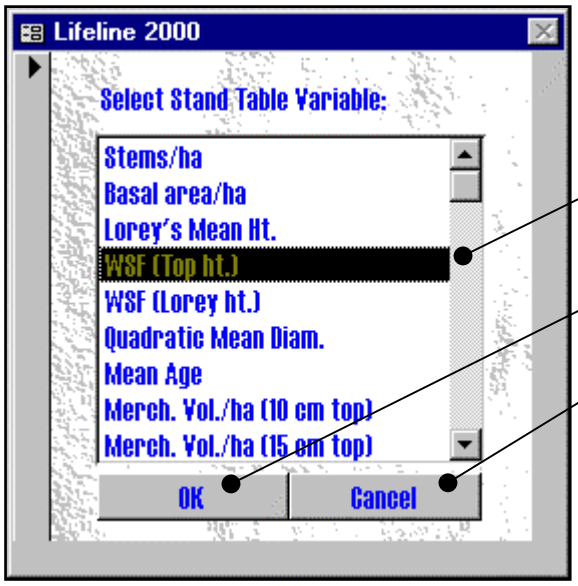
- double-click on the dataset in the Report Datasets window to open



In this example there are two choices. This can vary from one to many.

Continue by using the Access 2000 File Menu to export data to another program such as Microsoft Excel. The spreadsheet format allows you to explore and analyze the data in other software tools. Variable names used in the spreadsheet view are defined in the Data Dictionary available on screen.

Standard Reports can also be customized to change the appearance of a report type to the extent of changing what variables appear in the columns. In those cases, a pop-up box appears after View Report or Report Datasets are selected.



A box appears after selecting "View Report".

Single-click to select.

Click O.K.

Click Cancel to return to previous screen.

If you have completed your session, close the program by clicking the Access 2000 close button or Close from the File menu.

To continue, clear criteria and view a new report, or switch to Create and Explore for analyses. When you toggle from View Standard Reports to Create and Explore, the criteria you had chosen will not be saved.

How to Use the Data Dictionary

The Data Dictionary assists you by:

- Helping you understand each type of measurement in the loaded dataset.
- Allowing updates by your software program Administrator.
- Providing you with a complete description of the measure plus reference documentation.
- Identifying measure types as categorical, integer, numerical or text.
- Providing allowable codes and their definition for categorical types (Figure 3).
- Providing units and valid range of measures for integer and numerical types.
- Displaying descriptions for text types.

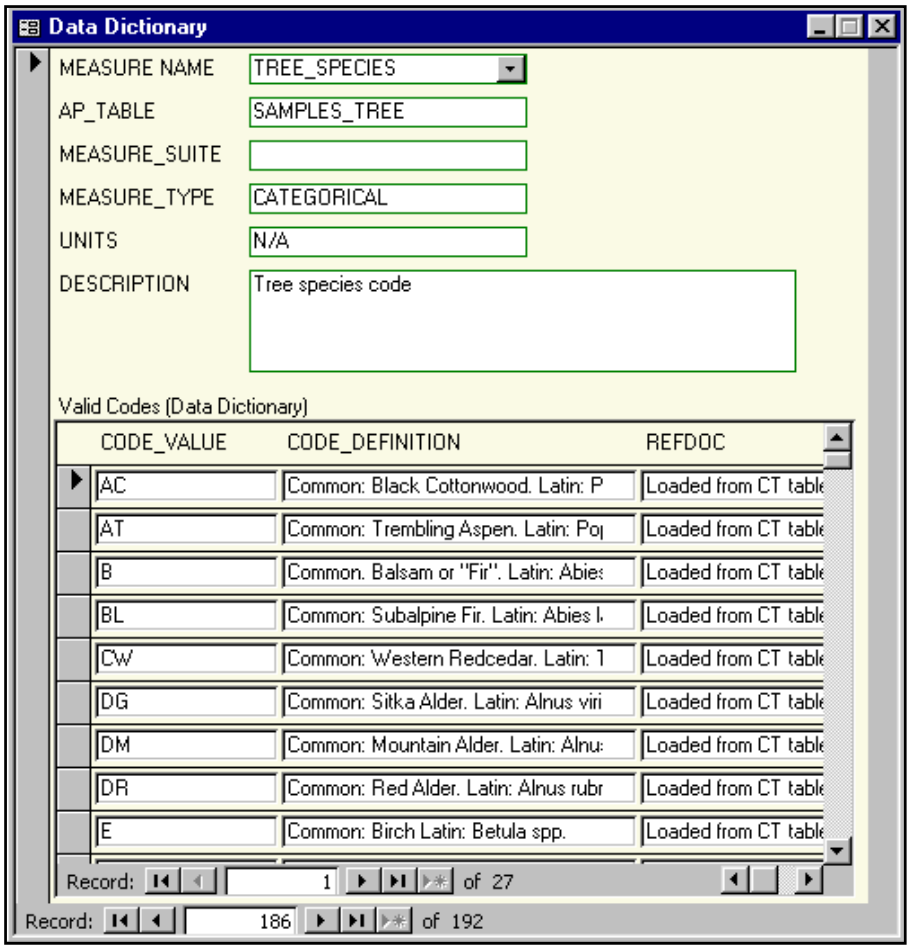


Figure 3: The Data Dictionary provides a description of each measure name in the data set that was loaded. Categorical data displays the measure type and a description followed by a table with the valid codes, code definition, and the reference document they come from where applicable as shown for the Measure TREE_SPECIES.

Steps for using the Data Dictionary:

- single-click Data Dictionary to open

  - pick a measure name from the drop-down list

or

  - type into the measure name box

This automatically takes you to the closest name in the list

Don't know the measure name used? Find it from the description!

- using the mouse, click into the Description box
- from the Access 2000 menu bar, select Edit/Find
- click on Find tab (Caution: do not use Replace tab)
- pick "Any Part of Field" for the Match
- enter text to search by as in Figure 4.
- click Find Next; continue until you find the measure you are looking for

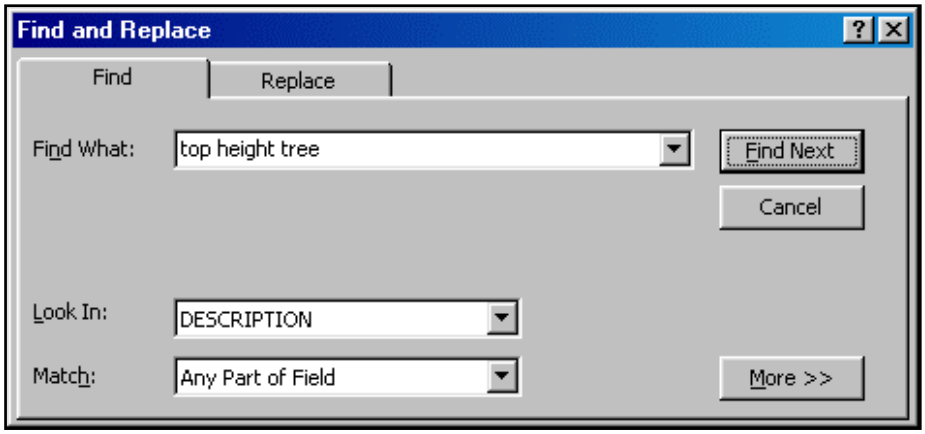
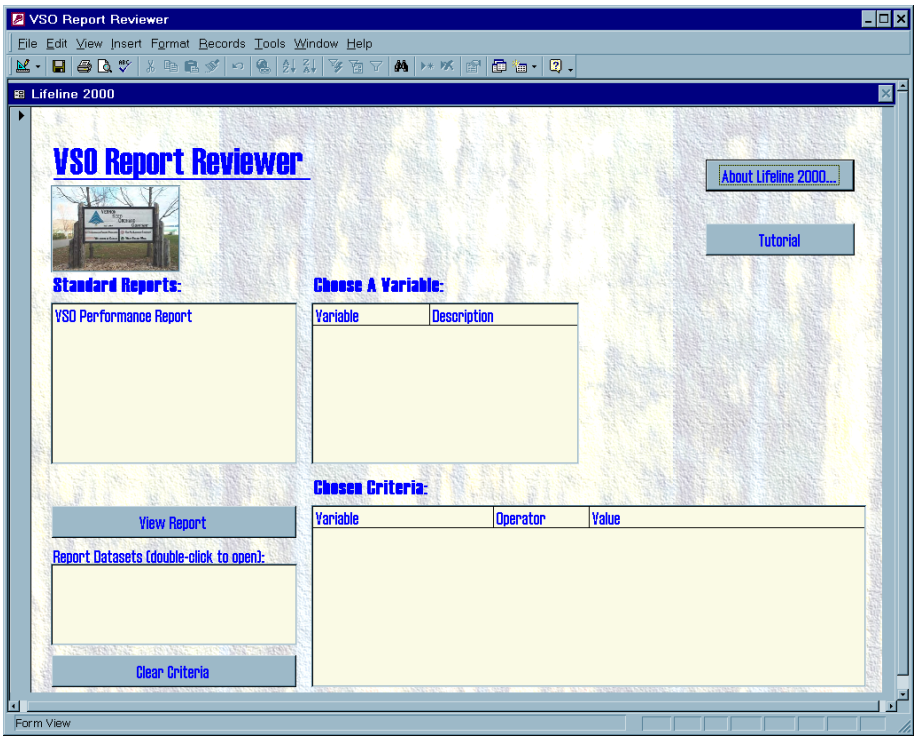


Figure 4: Access 2000 pop-up box for searching the descriptions in the data dictionary that have top height tree anywhere in the Lifeline AI 2000 Description. Use to find a measure name when you don't know what was used in the dataset. Make sure to select for a search to match on "any part of the field".

Appendix 1.
Lifeline 2000

VSO Report Reviewer



User's Guide

June 2004

VSO Report Reviewer

The VSO Report Reviewer is a custom application built in LifeLine 2000. While every custom application has the same basic functionality, as described in the previous sections, there are also differences. This section deals with the specific reports and features unique to the VSO Report Reviewer application.

VSO Report Reviewer Application

LifeLine 2000 – VSO Report Reviewer has been linked with data from VSO's field trial protocols. These data have been organized into a common format, so the user may view data from several field trials in a common form.

The Data

The current dataset contains variables from field trials for VSO families from the 1996 and 1999 pick years. Source data is from two key tables of consolidated information:

- VtblfldAllYrsSite – Consolidated site information
- VtblfldAllYrsMeasures – Consolidated information on measured trees

The source data is contained in the database VSOFieldTrials.mdb. This data was used to generate the summary data used in theVSO Report Reviewer.

The Software

The current software you have received from Scientificals Design Inc. contains:

- One standard report: VSO Performance Report.
- This tutorial, which can be launched from inside the application (press "Tutorial" button).

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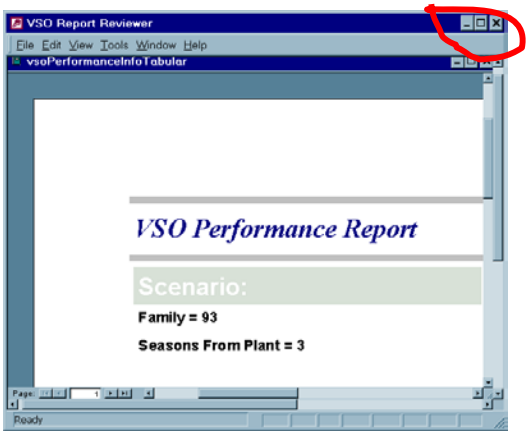
Description of Standard Report Types

VSO Performance Report

The VSO Performance Report is based on a template for evaluating performance of VSO families in terms of their performance, stability, and consistency across sites. We will first describe the VSO Performance Report in terms of using this application. Then we will describe how to interpret the report template through an extended example.

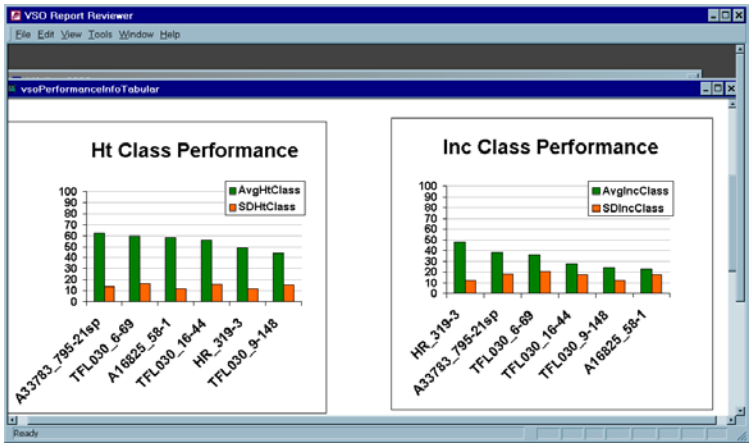
- The VSO Performance Report can be customized by five variables: Orchard, Family, Seasons From Plant, Site Label, Stock Type Label.
- Orchard, currently has a single value "214", but is included to allow for data from other orchards in the future.
- Site Label combines License and CPBLK
- Stock Type Label combines Season of Plant and StockAge
- The report shows the summarized data in several pages.
- Page one lists the scenario you have chosen.



- Click on the maximize page button  to make report fill your screen.
- Use the page navigation buttons 

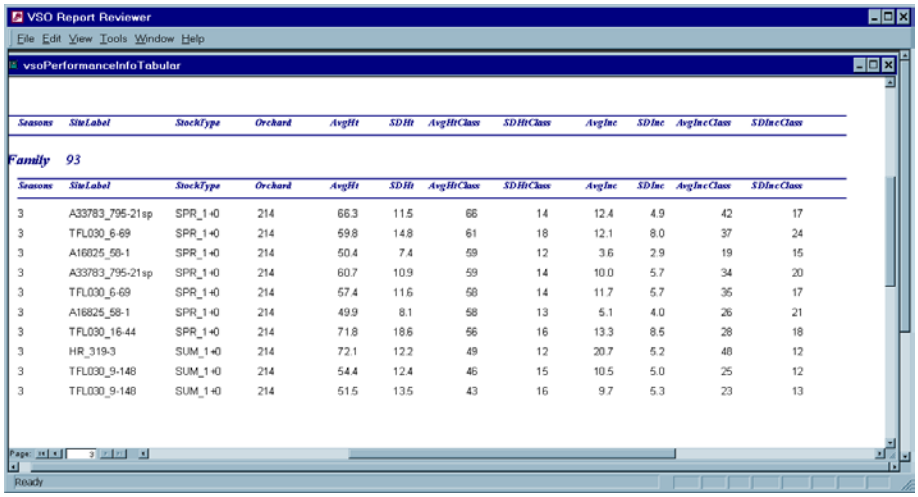
to move through the pages of each report.

- Page two is a graphical representation of this scenario as a bar graph series.



- The left-hand graph summarizes height data (HT Class) while the right-hand graph summarizes Increment data (Inc Class). Interpretation of Ht and Inc classes will be provided below, in context of the data analysis template design.
- In each graph, the Site Labels for the scenario are listed on the X-axis, and class values are listed on the Y-axis.
- Green bars represent class averages while Orange bars represent class standard deviations. The averages and standard deviations are themselves averaged by Site Label. So if you selected several families as part of your scenario, this might approximate a bulking strategy. If you selected several Seasons from Plant as part of your scenario, the resulting graph would be less meaningful.
- The bar graphs are ordered by descending class averages. The site with the highest value for either Ht or Inc class average shows up on the near left-hand side of the X-axis, while the site with the lowest value shows up on the far right-hand side of the X-axis. This approach makes it easier to compare a family's performance across sites.
- In general, if you are interested in the graphical comparisons, the way to proceed in developing a scenario is to first select one or more families you are interested in, then select a season from plant you are interested in, view the results, and then further restrict the scenario based on only those site labels and stock type labels you wish to make comparisons for.

- From page three to the end of the VSO Performance Report, data are summarized for individual families that fell within the scenario you have chosen.



To print report:

- From menu bar, select File, then Print.
- "All" will print entire report including plot summaries.
- "Pages" From: 1 To: 2 will print the scenario list and graph.
- Pop-up box appears; click OK.

NOTE:

- Before running another scenario, ensure the report window has been closed. If you change a scenario and click the View Report button without having closed the window first, the window will maximize itself with the previous scenario run.
- Data errors will become apparent in this section. The Growth Report is a good tool for checking your data for errors.
- Use the Report Datasets (How? See page 9) to look at the underlying data for errors. Corrections can be sent to VSO field data steward.

The notes above summarize how to "use" the application. The notes below now turn to developing the concepts and analytical approach needed to interpret scenarios developed in the application, particularly focusing on interpreting the bar graphs.

VSO Performance Report Analysis Template Design

Concepts and Method of Analysis

The goal is to provide a way of viewing the variation of families across sites, such that the Performance, Stability, and Consistency of families can be followed over time. This requires creating a standardized view of the data – so as more sites are added, and more field measurements are made, there is a consistent way of looking at how particular families are doing in the field relative to other families. The template provides a consistent view of the performance of each family in a given year from planting:

> **Performance**: The growth Performance of trees in a family, relative to all other trees on site.
>
> **Stability:** The degree to which Performance is uniform from site to site. Stable families have similar growth Performance across all sites (whether it be high, low or middling performance).
>
> **Consistency**: Related to the variability within a family on a site. A family can be high performing and also highly variable. Greater consistency means greater uniformity within a site. As the Performance within a family at a site becomes more variable, Consistency declines.

The data analysis methods used in the template can be applied to both height and increment data (and any similar growth data such as dbh). The examples here use height and increment data. The template has been implemented as a set of sequential queries that automatically transform the data from a standard input format into the template format. These queries have been packaged in the database application: VSOAnalysisCreator.mdb. Those who are interested in data analysis are invited to study these queries for a deeper understanding of the analysis methods. The essence of the methodology is to "normalize" all trees within a site, so they are on a common reference scale. This allows one to compare the relative performance of a family across sites, in terms of the common reference standard. For any given site, the best performing tree is always scored 100, and the worst performing tree is always scored 1.

The method is as follows: (the method was applied to both Height and Increment data)

1. Assign each tree to a Performance Class, based on its performance relative to other trees on the site. The largest tree on site is in class 100. The smallest tree is in class 1. There are 100 evenly placed classes dividing the range between 1 (smallest tree on site) and 100 (largest tree on site). Each class represents 1% of the range between the smallest and largest tree on site.
2. Take the Average and SD for Performance Class for each family. This estimates how the trees of that family performed relative to trees from other families on the site. This assigns for each family in a site, an Average Performance Class and a Standard

Deviation for that class. The Average Performance Class is a measure that combines performance and relative ranking concepts.

3. Sort the Average Performance Class of a family across sites from highest to lowest.
4. Plot both the Average of Height Class and SD of Height class across sites.

This method leads to the bar graphs you have now seen in the context of the VSO Performance Report.

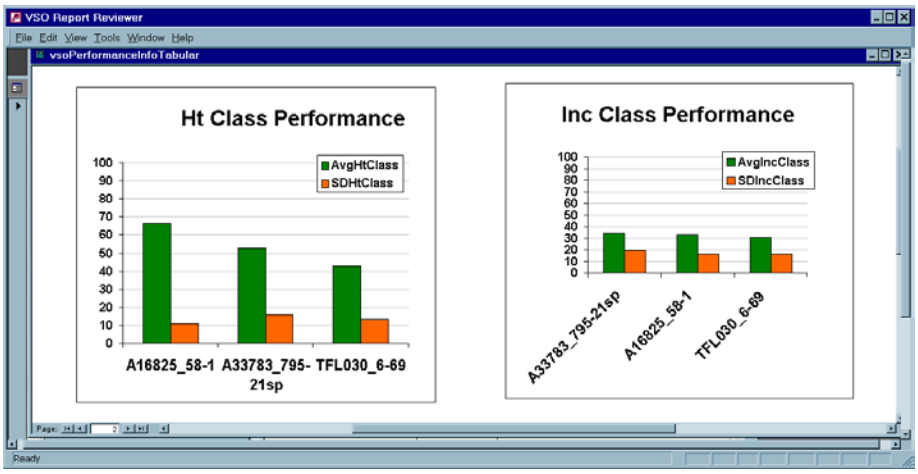
Interpretation of the Analysis Template

Interpretation of the template is illustrated through a series of examples taken from the data to show how graphs based on the template can be interpreted. An extended interpretation is given using family 14 two season after planting; then it is shown how the interpretation method would be applied to two other families – 48 and 55 -- (again two season after planting). Finally, a single family – 139 -- is viewed over several seasons. The families selected for these interpretation examples are also to be found in the report "Effects of Pick Year on Spruce Seedling Height and Annual Increment" that was completed as part of this project (VSOC_Pick_Year_Report.PDF). In that report (figure 1, pg. 4), on average Family 14 is the highest performer, Family 48 performs well, as does Family 55. Family 139 is a poor performer. By going back and forth between the analysis in the VSO Performance Report and the results in the report, "Effects of Pick Year on Spruce Seedling Height and Annual Increment" you should be able to use the results of both reports to cross-validate each other. This follows an old data analysis notion that "strong patterns" will show up across several analytical approaches.

In conduction our interpretation we consider mainly trends across site in the following variables:

AvgHtClass = Average Performance Class for Height for a family.
SDHtClass = Standard Deviation of the Performance Class for Height for a family.
AvgIncClass = Average Performance Class for Increment for a family.
SDIncClass = Standard Deviation of the Performance Class for Increment for a family.

FAMILY 14, 2 SEASONS AFTER PLANTING INTERPRETATION:



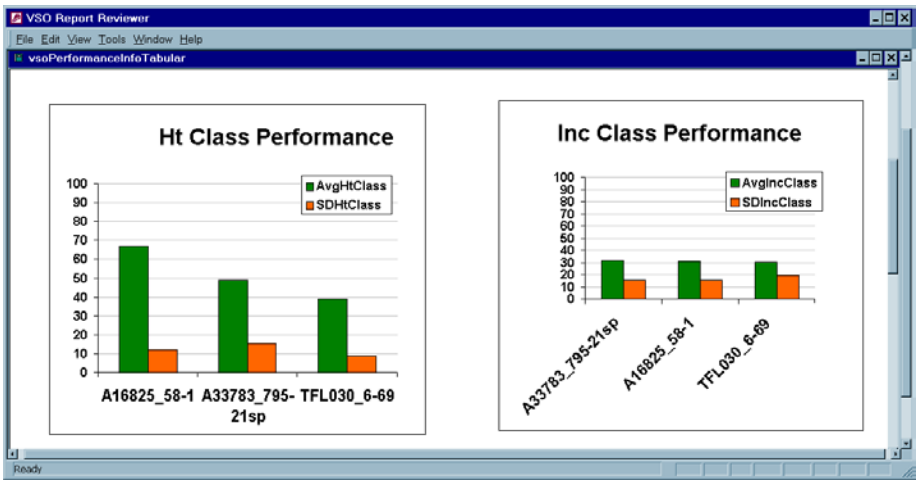
First we look from Left to Right on the graph. In this case, for Ht Class Performance the family performs very well on one site (left hand), slightly above average on one site, and more poorly on third (right hand). The "slope" of the graph from left to right, visually represents "stability of performance" across sites. A family that was very stable would have no slope. For Inc Class Performance, the ordering of sites is not same as for Ht Class – but in this case, there is very little variation in AvgIncClass. For both Ht and Inc Classes, the poorest performance in on site TFL030_6-69.

The SDHtClass gives a measure of the variability within sites – i.e. its "consistency" of performance. Say two families had similar values in terms of AvgHtClass. They would have similar average performance across sites. However, if one family had lower values for SDHtClass, it would have more consistent performance. Say there was a minimum growth target for a site that was below the Average Height. The family with the lower SDHtClass would have more trees that were above this target than the family with higher SDHtClass, even though both families had the same Average Performance across sites.

In this case, no obvious trends appear in SDHtClass or SDIncClass, which range from between 10 and 20.

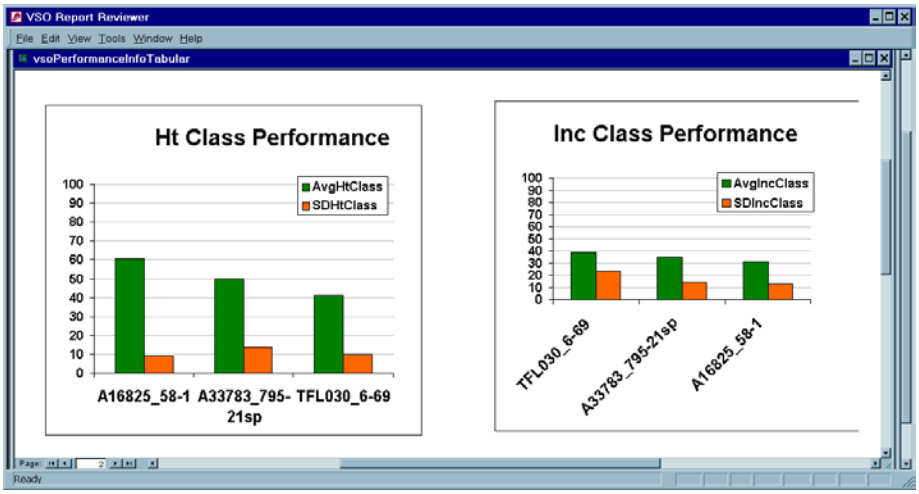
Family 14, in terms of stability, has variable performance across sites – but very good performance on at least one site. In terms of consistency, it is fairly consistent across sites.

FAMILY 48, 2 SEASONS AFTER PLANTING INTERPRETATION



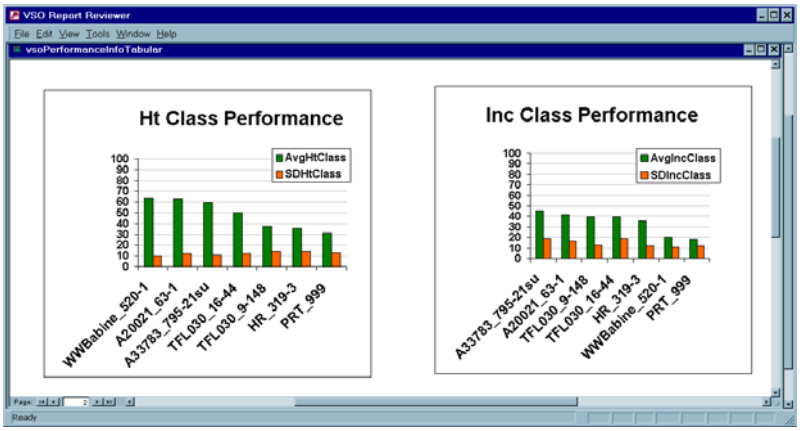
Family 48 performs nearly identically to Family 14, though in each case it's AvgHtClass is slightly lower. Again performance is not stable from site to site. Again site TFL030_6-69 is the poor performer. Again there is a fair degree of consistency across sites as indicated by the SD for both Ht and Inc.

FAMILY 55, 2 SEASONS AFTER PLANTING INTERPRETATION

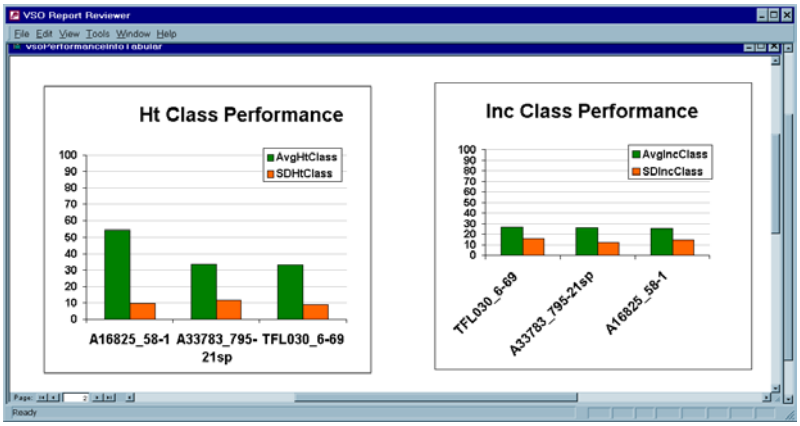


Family 55 performs nearly similar to Family 48, but has a clearly lower AvgHtClass for the "best site" A16825_58-1. Again performance is not stable from site to site, but in this case there is less of a slope. Again site TFL030_6-69 is the poor performer. In this case TFL030_6-69 has the poorest Ht performance but the best Increment performance. .

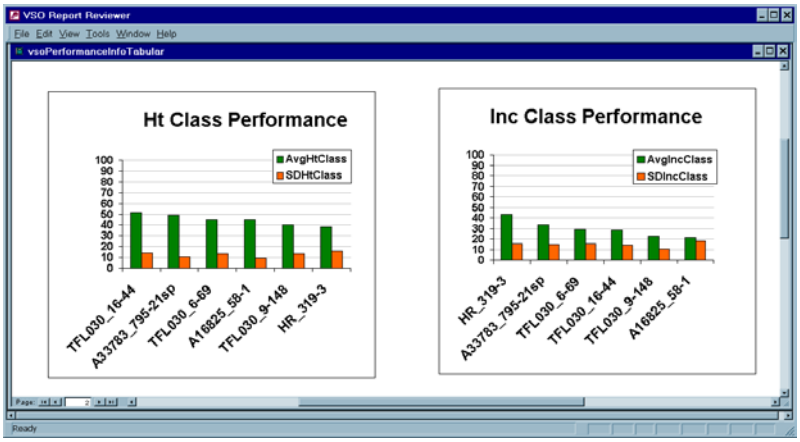
FAMILY 139, 1 SEASON AFTER PLANTING INTERPRETATION:



FAMILY 139, 2 SEASON AFTER PLANTING INTERPRETATION:



FAMILY 139, 3 SEASONS AFTER PLANTING INTERPRETATION:



Our final interpretation example uses Family 139. In the report "Effects of Pick Year on Spruce Seedling Height and Annual Increment" this family was found to have the poorest performance. In making comparisons across Sites AND across years, we run into some complications induced by the field design(s). The same families are not consistently represented in all sites for all years. The sites used in the report "Effects of Pick Year on Spruce Seedling Height and Annual Increment" are not those for which we have data one season after planting; and are only a subset of the sites for which we have data three years after planting. So, we do not end up with a consistent picture in this case of performance across THE SAME sites for 1, 2, and 3, seasons after planting. Given, this caveat, we can note some general trends from the three figures on the previous page:

- Height performance declines over time.
- This family becomes increasingly stably mediocre over time. This is noted in that over time, there is less "slope" from best to worst site.
- Performance within site is quite consistent, with SD often hovering around 10 for Ht Classes with somewhat more variability for Inc Classes.

In summary, family 139 can be relied upon to perform poorly, and be a stable and consistent mediocrity.

Other Uses for the Template and Modification of the Method

This template is being applied in the VSO case, to compare performance of families across sites. However, it is a fairly general template that could be applied to providing a standardized comparison for other kinds of experimental or monitoring data. In particular the same ideas could be applied to:

- Comparing different survey strata, from silviculture surveys
- Comparing performance of Stock Types in various sites (e.g. from an experiment, or NIVMA data)

Additionally, though for the purposes of this template, we have created performance classes scaled between the smallest and largest tree on a site, other methods of scaling could be used such as:

- Using a particular set of Maximum and Minimum threshold values.
- Using statistical measures for setting maximum and minima. For example, classes could be defined in terms of falling within a range of +/- 2 standard deviations from the mean (i.e. 99 % of observations).
- More sophisticated statistical measures, such as percentile classes, which identify the percentile of trees less than a given class assuming a particular data distribution.

In choosing to scale the class based on the smallest and largest tree on site –we focused on a measure that could be easily translated to field experience, without really requiring a lot of additional statistical concepts.

The basic intuition is: Imagine you see the smallest tree on site, and the largest tree on site. You notch on a measuring stick at the height of the smallest tree. You notch on it the height of the largest tree. Then you subdivide the stick into a set of notches where the first notch is 1 and the last notch is 100. You then place this measuring stick beside every other tree, and measure it. What you are doing, is assigning it a position between the smallest and largest tree on site. This description (impractical in the field, of course; but practical in the computer) provides a physical intuition for what is being measured in terms of real trees on site.

Finally – 100 classes were used as they can conveniently be interpreted. Over time, and use of the template, it may be decided that fewer classes are needed to pick up major patterns of difference in performance, stability, and consistency.

The method has been implemented, so it is very easy to modify the number of classes used, and so it is possible to modify what criteria are used to define the maximum and minimum classes

Suggestions for Exploring Data with the VSO Report Reviewer

- Build a catalog of performance for each family across all years for which there are measurements.
- Identify a set of families that are represented on several sites and years, and create scenarios comparing just these families.
- Try out "in electro" the consequences of bulking some families together. This is done by selecting several families that are on the same sites, for a particular year. The process by which data is averaged can serve as a rough estimate of what the bulk performance might be of equal amounts of those families were mixed into a seedlot. Rather than taking the results as "predictive" use them as a learning tool to compare what happens when one mixes "good" and "poor" performers or tries to bulk "similar performers" into a lot.

Updating Field Data

Yearly updating of VSO field data would be done by the VSO field data steward. This would be an individual responsible for the quality and integrity of the field data, and who would be responsible for updating the applications with new field information each year.

Essentially data has to be updated at three points:

- THE DATABASE HOLDING THE FIELD DATA. In the database, "VSOFieldTrials.mdb" which holds the field data. In this database are two tables that must be updated yearly "vtblfldAllYrsSite" and "vtblfldAllYrsMeasures" which holds site and tree measurement information respectively. In this database a form "Pre-Load Process" guides the user in the steps needed to append new data, and incorporates some data checking queries.
- THE DATABASE ANALYZING THE FIELD DATA. In the database, "VSOAnalysisCreator.mdb" either import or link in the tables "vtblfldAllYrsSite" and "vtblfldAllYrsMeasures" and then go to "frmCreateReportDataSet" and click on the button "Create Report Data". This launches a set of automated queries that populates the table "reptblVSOPerformanceInfo"
- THE VSO REPORT REVIEWER. Import or link in the table "reptblVSOPerformanceInfo". The report reviewer will now be operating using your updated field data.

Whether importing, or linking in the tables, always make sure to make a backup copy of (1) the databases and (2) the actual tables, prior to update.