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User's Guide to SILVAH

Stand Analysis, Prescription, and Management Simulator Program for Hardwood Stands of the Alleghenies

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Abstract

This user's guide describes a computer program--SILVAH--that recommends a silvicultural prescription for a forest stand, based on a summary and analysis of field inventory data. The program also includes a simulator that can be used to project stand growth and development, estimating yields from either prescribed or user-defined treatments.

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Pesticide Precautionary Statement

This publication reports research involving pesticides. It does not contain recommendations for their use, nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended.

Caution: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife--if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.

INTRODUCTION

This paper describes a computer program that recommends a silvicultural prescription for a forest stand, based on a summary and analysis of field inventory data. As such, it is an "expert" system The program also includes a simulator that can be used to project stand growth and development, estimating yields from either prescribed or user-defined treatments. The program's acronym--SILVAH--stands for Silviculture of Allegheny Hardwoods.

SILVAH incorporates the current knowledge about silvicultural treatments in cherry-maple, beech-birch-maple, and oak-hickory forests in the Alleghenies, and packages all the decisionmaking criteria that have been developed through research into a form that is easily used by practicing foresters.

The SILVAH computer program was first developed in 1985 and was thoroughly tested on lands of the Hammermill Paper Co. (now International Paper Co.). Revisions based on their experience resulted in version 2 of the program -- the first version made available for public distribution. Periodic revisions and improvements have been made since then. The current version (4.50) is described in this report. Approximate dates of the various major revisions are as follows:

for IBM PC version 2.0 - 1986
for IBM PC version 3.0 - 1987
for IBM PC version 4.0 - 1988
for IBM PC version 4.5 - 1991
for Data General version 4.0 - 1990

The paper is divided as follows: Chapter 1 describes the purpose and function of the program in general terms, Chapters 2 through 8 provide detailed instructions on use of the program, Chapter 9 and Appendix A and B provide information on program organization, data formats, and the basis of processing algorithms.

Proper use of the SILVAH program requires some knowledge of silvicultural principles in Allegheny forests. A summary of the silvicultural information on which SILVAH is based is presented in USDA Forest Service General Technical Report NE-96 (Revised), "Prescribing Silvicultural Treatments in Hardwood Stands of the Alleghenies", by David A. Marquis, Richard L. Ernst, and Susan L. Stout, 1992. Four-day training courses based on that report are also given several times each year by the Northeastern Forest Experiment Station in cooperation with the extension service of The Pennsylvania State University. A one-day course on the use of the SILVAH computer programs is also given periodically. There is a nominal fee for both courses. Further information may be obtained from the authors at the Northeastern Forest Experiment Station, P.O. Box 928, Warren, PA 16365: Telephone: 814/563-7587.

CHAPTER 1--COMPUTER-ASSISTED STAND ANALYSIS AND PRESCRIPTION

Our knowledge of the factors affecting regeneration, growth and yield, and proper management of forest stands has improved dramatically, especially during the past 20 years. In spite of this vast amount of scientific information, the practice of silviculture is still much more of an art than a science. Subjectivity and intuitive judgment are required to determine the most appropriate silvicultural treatment and to apply that treatment in individual stands. For example, we know that successful regeneration after clearcutting in many eastern hardwoods is highly dependent upon advance seedlings. But how many advance seedlings are needed? How does the number vary with size of seedling, with site, with deer-browsing pressure? How can one evaluate seedling numbers without tedious and costly surveys? What levels of advance reproduction will permit clearcutting, and what levels require other methods to establish adequate regeneration?

The thrust of silvicultural research by the Northeastern Forest Experiment Station at Warren, Pennsylvania, has been not only to identify important factors and discover how they function in regulating regeneration or stand growth, but also to develop objective guidelines on how much is enough or too much in particular circumstances. These guidelines have been integrated into a complete stand analysis and prescription procedure that provides a systematic way of measuring and evaluating critical stand conditions and using that data to arrive at a recommended treatment.

This "system" involves a stand inventory of basic overstory, understory, and site factors that are then summarized and analyzed to evaluate the stand's potential for growth and regeneration. The necessary calculations are simple and can be done readily by hand. Then, decision tables are used to determine the proper prescription based on critical levels of the various site, overstory, and understory variables in combination with landowner objectives.

Since all steps of this process are based on stand and site parameters that have been measured during a sample inventory, the entire process can be handled by computer. SILVAH was written for this purpose.

After field data are entered into the computer, SILVAH performs a data summary, outputting all of the tabular data that one normally expects from a stand inventory. In addition to the tabular data, SILVAH prints an analysis of the stand, rationale for stand treatment, and a specific recommendation or prescription in an easily understood, narrative form. Details on application of the recommended treatment are also provided. If that treatment is a partial cutting of any kind, SILVAH provides specific marking instructions on which sizes, qualities, and species of trees to cut; the volumes involved, and information on the desired residual stand.

So, once an inventory is made, SILVAH does the entire job of analysis, prescription, and marking instruction preparation. It even assists with report writing, providing text files that can be incorporated directly into such reports as the Environmental Analysis Report in the National Forest System, or the Landowner Management Plan prepared by most service foresters and consultants. In fact, we have found the narrative to be especially valuable in dealing with nonindustrial private landowners, who are more likely to accept the service forester's recommendations when they are backed by documentation that they can read and understand. Thus, SILVAH greatly reduces the amount of time required for all aspects of silvicultural decisionmaking and ensures consistency across all areas and among all individuals.

Obviously, no system of this sort can substitute for professional judgment, nor is it intended to do so. The prescriptions are based on average or usual situations. Circumstances not evaluated may often dictate that the recommendations be modified, or landowner objectives may deviate from those assumed, or the guides just may not work in every situation. So the system provides a starting point or standard that must

be verified by professional judgment. Nevertheless, it greatly reduces the work involved and generally improves the quality of decisions made by professional silviculturists.

Several additional features of SILVAH greatly expand its capabilities beyond those already described. SILVAH also optionally outputs to a computer file, key information from the original stand plus data on any cut and residual stands that may result. These output data from individual stands can be combined into a forestwide inventory data base that provides a powerful tool for forest management planning.

If a cruise is completed in each stand before treatment, a complete inventory can be built up even on large properties over a 10- or 15-year period. With such a complete data base, extremely accurate information is available. Managers can query the data base to find out virtually anything they need to know about the property. For all properties, selected forest districts, or individual properties, managers can quickly determine how much volume they have in any or all stand classes, how many areas are ready for harvest, how many are in need of herbicide treatment, and so forth. Unlike many similar sorts of inventory systems, the data base output from SILVAH permits users to identify each of these stands on the ground. For example, one not only can determine that there are X acres needing herbicide treatment, but also can get a listing of the stand, property, and district where every one of those acres is located.

SILVAH also makes it easy to test treatments other than the recommended one. Users can choose one of the many standard cuttings built into SILVAH, or they can modify these standard cuttings to fit particular needs. Each of these standard cutting methods provides a specific formula for control of residual stand density, structure, species composition, and quality. As a result, it is very easy to specify common types of cuts with just a few instructions. The ability to specify individual species, diameters, and quality classes of trees to cut is also provided. After each treatment used, printouts showing the effect of that treatment on cut volumes and residual stand parameters may be obtained. Thus, it is easy to test the immediate effect of alternative treatments.

Still another feature of SILVAH is a stand growth simulator. Individual stand projections can be made and the expected yield can be estimated under virtually any treatment one desires. The projections can be made using SILVAH prescriptions at the end of each projection interval. When this is done, the end result is a recommended schedule of silvicultural treatments for that stand from the present to the end of the rotation. A typical output for such a run might include the recommendations that the stand be thinned now, thinned again in 15 years, then clearcut 35 years from now. Or, the user may specify any sort of treatment or schedule of cutting desired. Either way, detailed estimates of the yields (in volume and value) from each cut and for the entire period are included.

However, we do not visualize most stands being analyzed by time-consuming trial and error simulation. Simulators should not be used extensively by practicing foresters for routine stand prescription. It would be too time-consuming and costly to do this for any large number of stands, and subject to many erroneous conclusions by individuals unfamiliar with the simulator's function and limitations. The recommendations that are incorporated into SILVAH are themselves the result of many simulation runs to determine treatments that maximize particular products under particular conditions. Thus, expert system programs such as SILVAH, which make definite recommendations based upon usual responses of similar stands, are likely to be the most useful approach to daily silvicultural decisionmaking.

However, we do see another major use for simulators in connection with the data base generated by SILVAH. As that data base is built, it is possible to project each stand, and to accumulate these projections and prescriptions in the data base, thereby incorporating the expected inventory at any time in the future. Such projections could drastically reduce the amount of field work needed by permitting computer updating of the data base and by eliminating the need for field work during future inventories in stands that will not require treatment. Furthermore, the data base can be queried to quickly estimate how much volume there

will be or how many stands (or acres) will be ready for final harvest in the years 2000, 2010, and on into the future.

The stand analysis and prescription system on which SILVAH is based was originally developed for Allegheny hardwoods--a variation of the northern hardwood type in which black cherry is a major component. As a result of some recent research advances in evaluation of stand density that can be applied in eastern hardwoods of almost any species composition, by adopting more general data collection procedures, and by incorporating research information on oaks, we have broadened the application of the procedure to beech-birch-maple, cherry-maple, oak-hickory and transition forest types. Many of the critical factors affecting prescriptions are the result of localized conditions, so the stand analysis system and program SILVAH should not be applied without modifications outside of the Allegheny Plateau and Allegheny Mountain provinces of Pennsylvania, New York, Ohio, West Virginia, Maryland, and New Jersey. Nevertheless, the basic procedures could easily be adapted to other forest regions by incorporating decision criteria and critical levels appropriate to the type and geographic area.

CHAPTER 2--SILVAH OVERVIEW

GETTING STARTED

To install and run SILVAH:

1. **Read this entire chapter (Chapter 2)** which is an overview of the SILVAH system and briefly describes the major features. Seasoned computer users probably will find this chapter sufficient instruction to begin using SILVAH, since most of the menus are self-explanatory, and there is on-line help available in the editor where most questions arise. New computer users will find step-by-step instructions for the SILVAH programs in Chapters 4 through 7.

2. **Browse the Table of Contents, Index, and reference material** in the two Appendices so you can quickly find answers to any questions that arise as you use these programs.

3. **Install SILVAH on your computer.** See Chapter 3 for step-by-step instructions.

4. **Run SILVAH using the sample data file and sample script file** included on the distribution diskette(s); then compare your printouts with those in Appendix B. This will help you become familiar with the program, and will also assure you that SILVAH is working properly on your machine. Before you do this, follow the step-by-step suggestions at the end of this chapter (Running the SILVAH Program) to familiarize yourself with the programs.

5. **See Chapter 8 if you have problems.** Some common problems, and their solutions, are covered there. If all else fails, call or send us one of the "Software Problems" forms in Chapter 8.

The computer program described in this publication is available on request with the understanding that the U.S. Department of Agriculture cannot assure its accuracy, completeness, reliability, or suitability for any other purpose than that reported. The recipient may not assert any proprietary rights thereto nor represent it to anyone as other than a Government-produced computer program.

We welcome suggestions on how to improve SILVAH. If you need help or have comments, please write to:

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SILVAH PROGRAMS

There are two major programs in the SILVAH system: SILVAH and SILVED. And there is a utility program called TREECALC.

Editor

SILVED is the editor. It allows you to enter data, save it to a file, edit an existing file, create and edit a defaults file (a file that customizes SILVAH to your specific needs), print data files for checking, and print the defaults file. Most of the time you spend interacting with SILVAH will actually be with SILVED.

Main Program

SILVAH is the main program. It reads the data you have stored in data files, summarizes that data, creates printouts, writes prescriptions, creates data base output files, simulates stand growth, and lets you test alternative treatments. Although it is a tremendously powerful program, it is quite simple to run. If you wish, you can run a whole series of stands with just a few keystrokes. Or you can interact with the program, controlling every step of the way.

Operating Modes

There are three basic operating modes: Interactive, Script, and Batch. Within each mode, you have a choice of printout device (printer or disk file), and treatment of dead trees (include or not include in volumes, basal area, and density). These choices are made from the main menu (Option 3--Change runtime options). Once you have made these choices, SILVAH will continue to use them without bothering to ask each time. But you can change them any time you desire. The defaults file also allows you to change these choices, so that SILVAH will start with your usual choices as the default values.

In **Interactive mode**, SILVAH will ask you which data file(s) to use, and then read it. Then it will come back and ask which printouts you want for the original stand, then print them. Then it will ask if you want it to write a prescription, and if so, will do it. SILVAH proceeds this way through alternative treatments, printouts on the residual, data base files, simulation, simulation printouts, and so on. Thus, you participate actively at every step of the operation, and you can alter your processing depending upon the outcome of earlier steps. To view the intermediate results while that stand is being processed, you must send printouts to the printer, not to a file.

In **Script mode**, SILVAH allows you to answer all the same questions that you would encounter in interactive mode, but it stores your answers in a file called the script file. Then, when you run the program in script mode, you simply tell SILVAH the name of your script file and wait for it to process your data. Thus, script mode avoids the need to specify outputs and options every time you run SILVAH. Many users find this convenient since they process their data in standard ways, getting the same kinds of printouts and using the same options on all or most stands. You can create several script files if you have several "standard" ways of running. Try script mode, it is the most common way that SILVAH is run.

In **Batch mode**, the automation is carried even further. Not only do you tell SILVAH to use a script file to control data processing, but you can create another file (the batch file) that contains the names of your data files and your script files. If you have been collecting data in the field for 2 weeks and your secretary has been entering the data as you worked, you can create a batch file at 5:30 on Friday afternoon specifying all those file names and start SILVAH running, then come in Monday morning to view the result.

Adding Stands Together.

In any of the three modes, you can add several stands together in a single run. If you tallied 15 stands on a property, or in a compartment, you would want to run each separately since the silvicultural prescriptions only make sense on a stand basis. But you might also want to know the total volumes or values on the entire tract. SILVAH will let you combine all those stands into one printout, giving you the average (or total) of the tract. This feature is useful for many purposes, but just remember that the averages are just that, and the prescriptions may be nonsense.

Individual Tree Calculator

TREECALC is a utility program that provides a way to calculate the volume and value of individual trees. It is an electronic volume table. TREECALC uses the same volume, density, grade distribution, value equations, and defaults files as the SILVAH program, so it gives you a convenient way to check on answers produced by the main program. TREECALC can also be educational; by examining the volumes and values of a few trees with this utility, you will have a much better understanding of the procedures that SILVAH uses in its inventory processing. TREECALC is also useful any time you want to calculate and sum values on a small number of individual trees.

HARDWARE REQUIREMENTS

SILVAH will run on any IBM or IBM-compatible microcomputer.[1] You need 640K memory and at least one floppy disk drive. A printer is required if you want printouts, but you can send output to a disk file and view the printouts on the screen if a printer is unavailable.

For operating software, you need MS-DOS or PC-DOS, version 2.0 or later. We have not tested earlier versions of DOS.

Although a hard disk is not required, it is highly desirable. SILVAH can be installed from either a DD or HD disk, but can only be run from a HD floppy or a hard drive.

The original IBM PC and compatibles using 8086 or 8088 processors running at 4.77 megahertz perform reasonably well with SILVAH especially if equipped with a hard disk, though some screen displays may appear to be slow. SILVAH runs extremely well on 80286 or larger machines, especially those with speeds of 10 to 12 megahertz or more. A math coprocessor also speeds up computations, but is not critical. IBM PC compatible computers with a 80286 or 80386SX processor running at 12 to 20 megahertz, with a 30-40 megabyte hard disk, math coprocessor, and 1012K memory are readily available today for under $1,500.

The following table illustrates loading and processing times for several common computer configurations. In each instance, the program was loaded from the system device, data files from a diskette. The data file was for a prism cruise using 10 plots and approximately 14 trees per plot. Heights were recorded on sawtimber trees, and checkmark regeneration data were included. We used our standard script files (printouts were sent to a file, not a printer). Growth was simulated for 40 years.

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[1]The use of trade, firm, or corporation names in this publication is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by the U.S. Department of Agriculture or the Forest Service of any product or service to the exclusion of others that may be suitable.

Table 1.--Hardware comparisons

Computer configuration	Load SILVAH	Run SILVAH	Run SILVAH simulation
	Seconds		
IBM PC with 8088 processor and math coprocessor running at 4.77 mhz. Hard-drive card system. (Norton Computing Index = 1.0, Norton Performance Index = 1.2).	20	125	560
CompuAdd with 80286 processor and math coprocessor running at 12 mhz. Hard disk system. (Norton Computing Index = 9.1; Norton Performance Index = 6.7).	7	33	86
Dell 386LT with 30386SX processor and math coprocessor running at 20 mhz. Hard disk system. (Norton Computing Index = 11.1; Norton Performance Index = 9.2).	3	16	45

MANAGING YOUR FILES

You will use and create many different kinds of files if you use SILVAH extensively. Some of these are program, operational, or data files that you want to protect. Others are temporary files that may be deleted after they have served their purpose. SILVAH will expect to find the nontemporary files in certain places, and may not run if they are missing. The following is a summary of the files used, their names or extensions, and the recommended disk drive or directory in which they can be located.

Current Working Directory

The current working directory is the directory (hard-disk system) or disk drive (floppy-disk system) from which you run your SILVAH programs. The current working directory will usually be disk drive A if you are running from a floppy disk system, or the SILVAH subdirectory of disk drive C if you are running from a hard disk. All of the program files (files with an extension of .EXE) must be here. Your defaults file (such as SILVAH.DEF) and a file containing the text for all prescriptions (PRSCRPTS.DEF) should also be here so SILVAH can find them when you load the program. SILVAH will write some temporary files in your current directory too. These have the extension .TMP, and there may be up to four. They hold temporary values during processing to keep SILVAH from requiring more computer memory. You need not be concerned about these files; SILVAH will handle or create them as needed.

Default Data Directory

The default data directory is the directory in which SILVAH will read or write data if you do not specify a directory explicitly. Use either floppy disk drive A or B for your default data drive (depending on where you send your printouts--see Table 2). This means that SILVED will write your data files there when you create them, and SILVAH will look for them there when you process the data--unless you specify the data drive explicitly at run time. It is important to protect both your data and your program files by not mixing them on the same drive or directory. If you run from a hard disk with a lot of space, you could also set up a special data subdirectory there rather than using drive A. If that is more convenient for you, just change the default data directory in the defaults file using SILVED.

The following files will be written to and looked for on the default data directory: (1) SILVAH data files, with the name <base>.SIL; (2) data base output files containing summary information, with the name <base>.Dyy; data base output files containing condensed SILVAH input data (for example, a file containing stand data projected into the future--data that you may want to reenter into SILVAH for further processing), with the name <base>.Syy.

In the names and extensions here, <base> means the base file name (i.e., the file specification minus the extension and path) of your original data file. When SILVAH outputs a file while processing that data file, it uses the same base name, but attaches a different extension. In this way, you can easily recognize the output files from several different input files The yy in the two data base output files indicates the year the stand was tallied (or the year of projection for simulated stands). Thus, if you enter a file called STAND1.SIL which was tallied in 1988, the data base output file would be STAND1.D88. If you project that stand for 20 years and write both types of data base files at the end of the projection, those files would be named STAND1.D08 and STAND1.S08.

Default Listing Directory

This directory is important only if you send your printer output to a file rather than directly to the printer. We suggest you use floppy drive B as your default listing directory, because these are files that you will usually want to delete after they have been printed.

Two types of files go to this directory. The SILVAH printouts go here under the name <base>.PRN; and listings of raw data or of the defaults settings go here under the name <base>.LST.

Default Script and Batch Directory

This directory will hold the files that control processing when you run SILVAH. There are two kinds of files. Script files contain instructions that determine which printouts you want, whether you want SILVAH to write a prescription, calculate other cuts, output a data base file, and project stand growth. You can create several script files, all of which have the extension .SCR. The batch file stores data on a series of SILVAH runs, permitting you to process a large number of stands as a batch while you do something else. Only one batch file can be in existence at a time. It is called BFILE.SBA. We recommend that you use the current working directory as the default for your script and batch files.

HD Floppy

If you run from a hard disk, ignore this section.

If you run from a floppy disk system, create a boot disk containing all the system boot files shown in Table 2. Use this diskette to start your computer, even when you are running programs other than SILVAH. Then, if you decide to run any of the SILVAH programs, you will be able to do so without rebooting.

Managing your files can be quite simple if you run from a hard disk or high density (HD) floppy disk system with printer. If you run from a HD floppy disk system, all program and control files will usually fit on a single diskette, so you can load and run SILVAH with this disk in drive A, and use drive B for data. No swapping of diskettes is required.

However, if you want to send printouts to a file rather than to a printer, you have to do some swapping. Once SILVAH is loaded, you do not need the program diskette, so you can remove it from drive A and use that drive to hold another diskette (blank, formatted) to capture the printout files.

Table 2.--Recommended file locations, depending upon the type of computer equipment being used

File type	Hard disk	HD Floppy	
		With printer	Without printer
System boot files:			
2 hidden DOS files			
COMMAND.COM			
ANSI.SYS	C:	A: (1)*	A: (1)
CONFIG.SYS			
Program files:			
SILVAH.EXE			
SILVED.EXE	C:\SILVAH	A: (2)	A: (2)
TREECALC.EXE			
PRSCRPTS.DEF			
<defaults>.DEF			
<temporary>.TMP			
Control files:			
<script>.SCR	C:\SILVAH	A: (2)	A: (2)
BFILE.SBA			
Print files:			
<base>.PRN	C:\SCRATCH	------	B: (1)
<base>.LST			
Data files:			
<base>.SIL	A: (1) or	B: (1)	A: (3)
<base>.Dyy	C:\DATA		
<base>.Syy			

*The numbers in parentheses represent the diskette number for each drive. For example, in either floppy disk system without a printer, you need three different types of diskettes that will be used in drive A. One type contains the system boot files, the second contains both program and control files, and the third contains data files.

KEYSTROKES AND HELP

SILVAH uses many keystrokes that are standard in other popular computer programs. If you remember these keystrokes, you will be able to make SILVAH work efficiently, and get yourself out of occasional difficulty.

[Enter] -- nothing you type into SILVAH is acted upon until you hit a terminator, such as the enter key. So, if you make mistakes in typing, you have a chance to correct them. The enter key serves as the primary terminator to your instructions. (In SILVED, other keys can also function as terminators.)

You will use the enter key a lot in SILVAH and SILVED, and once you get on to the way we have set up the menus and screen queries, you will find you can move through the programs very quickly. When a menu is presented, or a question asked, we almost always take a guess at what your answer will be. We even guess at some types of data. That guess is displayed in inverse video at the cursor (right where you would type your answer). If we have guessed right, all you need do is hit the enter key. Of course, you will sometimes want to enter a different answer, and that is no problem--just type your answer (it will overwrite our guess) and hit enter. But you will find many times where you can whiz through the menus just hitting the enter key.

[Esc] -- the escape key will usually let you do just that--escape to the previous step, or return to the menu.

When editing in SILVED, and the cursor is **not** on the first character of a data field, the escape key will restore the previous value of that data field. This is useful if you start to type a new value into a field, and then realize that the old value was correct. Note that the escape key will act as a terminator (will accept the value in the field just like the enter key) if you hit Esc when you are on the **first** character of a data field.

[F1] -- function key F1 is the help key. It is used in SILVAH primarily to remind you how to back up, but in SILVED and TREECALC it is available anywhere you need it. When entering data, if you are about to enter the code for cruise type, or cannot figure out what SILVAH wants when it asks for management goals, tap the F1 key and a one-line help message will appear at the bottom of the screen explaining just what you wanted to know about that item. Well, okay, there is a limit to how much help you can squeeze onto one line, but it is usually enough to get you going or tell you where to look for more information.

The following keys are functional only in SILVED.

[Arrow] -- the right, left, up, and down arrow keys move the cursor around on the screen. So, during data entry or editing, you can move quickly to the specific line or item that you want. If the cursor is within a data field, the arrow keys will move you right or left. If the cursor is at the beginning of a data field, the arrow keys function as a terminator much like the enter key.

[+] -- the gray plus (+) key functions as a terminator much like the down arrow, except that it will move the cursor from the existing data field to the first data field of the next line. This is convenient when entering overstory data, especially if you have not recorded all fields of data. For example, if you have recorded only species, d.b.h., and quality on each tree, and you use the enter key as a terminator after entering quality, the cursor will jump to the next field on that line (height). You would have to hit the enter key repeatedly to step through the remaining fields to get to the next tree, even though you have

no data to enter in those fields. By using the + key as terminator after entering quality, the cursor jumps directly to the species code of the next tree

On original PC keyboards, you lose the down arrow key as a terminator when the Num Lock is On. The + key serves as a substitute for the down arrow in this situation, so you can still enter data conveniently while using the numeric keypad.

[PgDn], [PgUp] -- the page down key
moves you to the next screen; page up moves you back to the previous screen. When entering data, for example, page down will move you from the identification data screen to the regeneration data screen; or from regen to overstory; or from plot 1 overstory to plot 2 overstory, and so on.

[Home] -- the home key takes you back to the
menu. It is quicker than hitting page up or page down repeatedly.

[Ins] -- the insert key is used to change
modes in SILVED from insert mode (adding new data) to edit mode (changing existing data). A line at the top right of the screen reminds you which mode you are in. You must be in edit mode to leave a screen, so if the machine beeps at you and will not let you move on, try hitting the Ins key. It works wonders in these circumstances.

[Del] -- the delete key can be used
when editing overstory data to delete an entire line of overstory data (one tree), or an entire plot of overstory data.

RUNNING THE SILVAH PROGRAMS

After SILVAH is installed on your computer, you can run any of the programs by (1) starting (or rebooting) your computer, (2) moving to the disk or directory containing the SILVAH programs, and (3) typing the program name (SILVED, SILVAH, TREECALC) followed by [Enter]. For more detailed instructions, see Chapters 4 through 7.

Proceed as follows in your first attempts to learn and use SILVAH:

A Run the editor program SILVED, and familiarize yourself with the screens and options available. Try the following:

1. Load the sample data file included on your distribution diskette (TSAMPLE.SIL) using option 1 on the main menu, and option 2 on the edit menu.

2. Examine the sample data file by selecting options 1, 2, and 3 in sequence from the edit menu (or select option 1 and then move to the other kinds of data with the [Pg Dn] key). Do not edit any of the values in this sample file, so you can run it unmodified and compare it to printouts in this manual. Go back to the edit menu with the [Home] key, and return to the main menu with option 8.

3. Select option 7 on the edit menu, which brings up a utility menu. From here you can print a listing of your raw data file (this printout makes it easy to check for typing errors in data entry). Note also that there is an option here to convert old SILVAH version 2 or 3 files to the new format of version 4. You will need to convert any old files before you run them on this new version. Return to the edit menu

4. Examine the defaults values using option 2 at the main menu, followed by options 1, 2, and 3 in sequence from the defaults menu (or select option 2 and then move to the others using the [Pg Dn] key).

5. Edit the data drive, list drive, and script drive options only in the general defaults section to reflect the way you want your machine configured. See the section on managing your files in this chapter for suggestions. Do not edit any other default values now, so you can run the sample data file with the existing defaults to compare against printouts in this manual. Return to the defaults menu with the [Home] key when editing is complete.

6. Save the defaults file with the editing you just did, using option 5 on the defaults menu. For now, just accept the defaults file name (SILVAH.DEF).

7. Get a printout of the defaults using option 6 on the defaults menu. Be sure your printer is connected and on-line before you do this. You can use this printout later to note any changes you would like to make in the defaults before you use real stand data.

8. Now, return to the main menu with option 7, and exit SILVED with option 3 from the main menu.

B. Run the SILVAH program, and familiarize yourself with the screens and options available. Try the following:

1. Create a script file using option 1. Name it "TEST", or any name you choose. SILVAH will guess at your answer to each question, and you can accept that guess, or change the response as you desire.

2. Examine the run time options using option 3. Change some of these options to see the effect on the asterisks in that menu, and on the message in option 4 in the run SILVAH menu. Before you go to the next step, make sure that the options are set for run from script, live trees only, with printouts to a printer (if you have one connected).

3. Now run SILVAH using option 4. Use the script file provided on our distribution diskette (TSAMPLE.SCR), answer "1" to the question about number of stands to be added together, and use the data file provided on the distribution diskette (TSAMPLE.SIL). Watch the screen messages as processing progresses; they keep you informed on what the program is doing.

4. Compare the printouts you get with those in Appendix B. They should be identical. If they are not, something is wrong. See the section on problems, or give us a call.

5. Exit SILVAH using option 6.

C. Run the TREECALC program and familiarize yourself with the screens and options available. Try the following:

1. Move to the species cell, and enter a species code. Then hit [F2] to see the calculations.

2. Move to the d.b.h. cell, and change the d.b.h.. Calculate again with [F2]. While on d.b.h., change it three or four times and calculate new values to see how quickly you can make a series of such calculations.

3. Try changing some of the other parameters, and observe the effect. Note especially the proportions of different sawlog grades for trees of various species and diameters. Also note the effect of entering a specific grade.

4. Use the [F4] key to see the accumulated values of the calculations you have just done.

5. Exit with [F5].

D. Now that you are familiar with each of the SILVAH component programs, complete the setup as follows:

1. Go back into SILVED and edit the defaults file to customize the programs to your needs. Check especially the stumpage prices, the commercial sale breakpoints, and the minimum diameters for volume calculations. Choose the sawtimber log rule that you want to use. And edit the "how SILVAH interacts" and printout option defaults to fit your needs. Then save this defaults file. If you will use only one defaults file, keep the SILVAH.DEF name. But if you create several defaults files, give them each unique names.

2. Enter some real data using SILVED, and then run it off using SILVAH. Compare the answers to your previous method of calculation, and verify that the results are okay. If not, change the defaults values to adjust, if you can. If something still seems wrong, and you cannot figure it out, give us a call.

3. Have fun!

CHAPTER 3--INSTALLING SILVAH ON YOUR COMPUTER

SILVAH DISTRIBUTION DISKETTE(S)

SILVAH is distributed on three different types of diskettes and the number of diskettes will vary, depending on the type.

5.25" double-sided, high-density (DS/HD) diskette holding 1,200k. This is the standard diskette for the IBM PC AT and compatibles. One diskette is included in the distribution kit.

3.5" double-sided, double-density (DS/DD) diskette holding 720k. This is the standard diskette for the IBM Personal System 25, 30 and compatibles. Two diskettes are included in the distribution kit.

3.5" double-sided, high-density (DS/HD) diskette holding 1440k. This is the standard diskette for the larger IBM PS/2 series and most current compatibles. One diskette is included in the distribution kit.

DISKETTE CONTENTS

The distribution diskette(s) contain three SILVAH programs, one text file, one installation batch file, a file needed to enable screen input and output, one sample data file, and one sample script file. These files are stored in compressed format (.ZIP), with the decompression utility supplied as PKUNZIP.EXE.

These files are:

INSTALL.BAT--a utility to help you get all the right files in all the right places. It will lead you through the process of installing SILVAH on your machine, and perform the necessary copy operations. You will only need this file during installation.

SILVAH.EXE--the main program, used to process stand data, write prescriptions, prepare printouts, and so on.

SILVED.EXE--the edit program, used to enter or edit stand data, and to edit the program defaults (the values that the program uses for many variables, such as stumpage prices, sawlog rule to use, and so on).

TREECALC.EXE--calculator for tree volumes and values. It uses the same equations as SILVAH, and lets you quickly compute the volume or value of any individual tree. You can use it to verify the numbers SILVAH prints, or estimate many useful values about any tree.

PRSCRPTS.DEF--a formatted, direct-access text file which contains the bulk of the text for SILVAH prescriptions. Each prescription is allotted 15 lines in the file, and each line must be 79 characters long. Although you can easily display or print this file, you should not edit it.

NANSI.SYS--a public domain program that allows your monitor screen to work with SILVAH. You probably do not need it, but it is included just in case. It has been renamed ANSI.SYS to allow easier installation.

TSAMPLE.SIL--a sample SILVAH data file that you can run to make sure SILVAH is working properly on your machine. The printouts should be identical to those in Appendix B.

TSAMPLE.SCR--a script file you can use with TSAMPLE.SIL above to test SILVAH; it will provide the same processing action and printouts as in Appendix B.

INSTALLATION PROCEDURES

When you get your SILVAH distribution diskettes, put a write protect tab on each one immediately. That will guard against accidental erasure. Make backup copies of them and store the originals in a safe place. Then you are ready to start the installation. Table 3 is a suggested organization of disks, based on your operating system (double density, high density or hard disk).

When you start (boot) your computer from a floppy diskette, you use a special system diskette containing two hidden DOS system files, as well as COMMAND.COM. These files are put on the disk automatically when you format the disk with the /S option. SILVAH further requires that this system boot diskette contain the ANSI.SYS driver which in turn requires the line "**DEVICE=ANSI.SYS**" in the CONFIG.SYS file. So two files, CONFIG.SYS and ANSI.SYS, also need to be present when DOS boots. The CONFIG.SYS file is a plain text file; it can be edited with any text editor or word processor capable of writing plain text files. If you already have a CONFIG.SYS file, the file must be edited to add the one line. If you do not have a CONFIG.SYS file, one must be created. The installation program will take care of both the CONFIG.SYS and ANSI.SYS files for you

If you are installing to a 3 1/2" double density drive, format three floppy disks, one containing the DOS boot files. If you are installing to a high-density drive, format two floppy disks, one with the the DOS system boot files.

To format a diskette in drive B and include the DOS system boot files, place the DOS diskette with the FORMAT.EXE on it in drive A and use the DOS command:

> **FORMAT B:/S [Enter]**

To format a diskette in drive B without the DOS system boot files, place the DOS diskette in drive A and use the DOS command:

> **FORMAT B: [Enter]**

If you have a hard disk system, all you need do is create a subdirectory for the SILVAH programs, copy them all to that directory, make sure that ANSI.SYS and CONFIG.SYS files are present in the root directory, and that the CONFIG.SYS file contains the line DEVICE = ANSI.SYS. The installation program will take care of all those tasks for you.

If you feel comfortable with DOS, you could set up SILVAH yourself. Just be sure that the files listed in the table are on each of your disks. However, you may find it convenient to use the installation program. This program checks for the necessary files, and then copies them to the right place.

Table 3.--Suggested disk organization for executing SILVAH

System on:	Files
Double Density 3 1/2" floppy	Disk 1: DOS System ANSI.SYS Disk 2: SILVAH.EXE TREECALC.EXE SILVAH.DEF PRSCRPTS.DEF Disk 3: SILVED.EXE SILVAH.DEF
High Density 5 1/4" or 3 1/2" floppy	Disk 1: DOS SYSTEM ANSI.SYS CONFIG.SYS Disk 2: SILVAH.EXE SILVED.EXE TREECALC.EXE SILVAH.DEF PRSCRPTS DEF
Hard Disk	Root Directory: DOS SYSYEM ANSI.SYS CONFIG.SYS /SILVAH/directory: SILVAH.EXE TREECALC.EXE SILVAH.DEF SILVED.EXE PRSCRPTS DEF

Running the INSTALL batch file

This version of SILVAH has a program that will help you with the installation of all files. It will copy the necessary files to the appropriate destination, and will check for the configuration and driver files. This program will ask several questions, and then based on the response, will do the installation.

You will need your original DOS distribution disks to get one additional file from them. Find the disk with the file ANSI.SYS on it; the installation program will copy it to your system disk if it is not already there.

Place the SILVAH disk with the INSTALL.BAT file on it into floppy drive A. Then start the installation program by typing:

> **A:INSTALL {SOURCE-DRIVE} {Destination-Drive} {Sub-directory}**

where you must supply three parameters, the source drive, the destination drive and the destination sub-directory. For example, to copy files from your floppy drive A to your hard drive C into the SILVAH sub-directory, type:

> **A:INSTALL A: C: \SILVAH**

If you are installing to floppies without a sub-directory, be sure to specify the root as the default by entering a single backslash (\) for the path. For example: >A:INSTALL B:\.

Follow the instructions on the screen to complete the installation. You should now have the necessary files to run SILVAH. To start the program, reboot the computer so that the ANSI driver takes effect, then type in the name of the program. That is, reboot your computer with the system disk you just made if you are running from floppies, or just reboot if you are using a hard disk. See the documentation for details on program operation.

All files you need to execute the SILVAH system are on your disks. However, before you process real data, you will want to create SILVAH.DEF file. See Chapter 5 for instructions on creating and customizing this file.

CHAPTER 4--DATA MANIPULATION

SILVED is a full-screen editor that displays data entry forms on the screen and lets you fill them in. There are three screen forms: one for the identification data, one for the regeneration data, and another for the overstory.

Before you start, be sure that you have started (booted) your computer using the DOS system disk that contains an ANSI.SYS and appropriate CONFIG.SYS file (see Chapter 3). Also be sure that you have a formatted diskette available to hold the data you will create. Then, insert the diskette containing SILVED.EXE into drive A if you are running from a floppy disk system, or move into the SILVAH subdirectory if you are running from a hard disk.

ENTERING NEW STAND

Now, proceed as follows to enter a completely new stand. Start the editor SILVED by typing **SILVED [Enter]**.

The main menu should be presented:

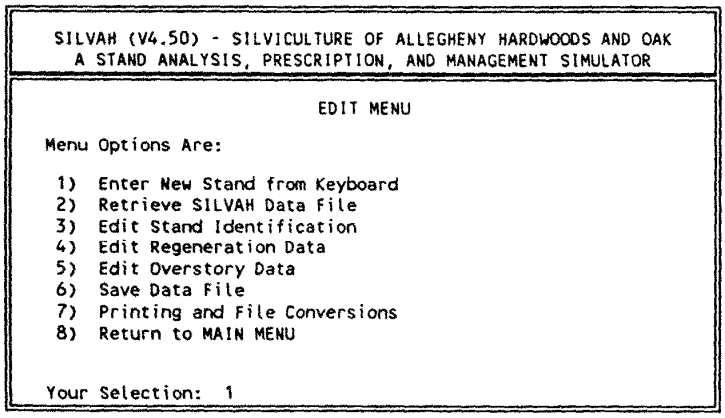
Figure 1.--SILVED Main Menu screen.

```
SILVAH (V4.50) - SILVICULTURE OF ALLEGHENY HARDWOODS AND OAK
  A STAND ANALYSIS, PRESCRIPTION, AND MANAGEMENT SIMULATOR

                                   SILVED MAIN MENU

Menu Options Are:

     1)  Enter or Edit Data File
     2)  Set or Select SILVAH Defaults
     3)  End Session


Your Selection:  1
```

From this, select option 1 to either create a new data file from scratch or to edit an old one. We chose this option since we want to create a new file.

The edit sub-menu will be presented:

Figure 2.--SILVED Edit Menu screen.

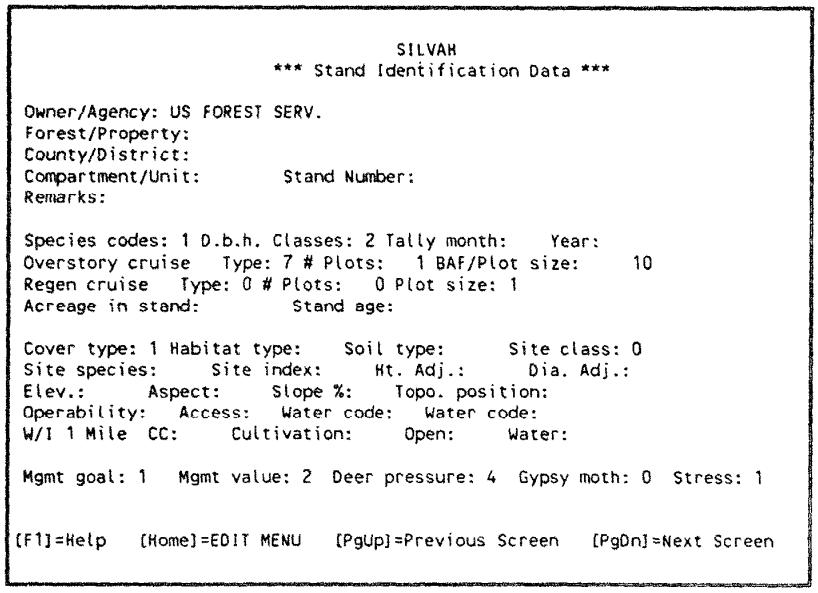


The items included are all of the options for getting data into and out of the SILVAH system. We are entering a completely new stand of data, so proceed by choosing option 1. Do this by typing **1 [Enter]**.

ENTERING IDENTIFICATION DATA

The first form presented is the identification data form:

Figure 3.--SILVED stand identification data entry screen.



You can move through the form using the arrow keys; these keys work as you would expect to move to the next or previous fields and lines. The enter key also moves to the next field. The [PgUp] key returns to the main menu, and the [PgDn] key moves to the regeneration data entry screen. If you are on the first field of the form and try to move to a previous field, it will be the same as hitting the [PgUp] key. Likewise, if you are in the last field and try to move to the next field, you will go to the next page.

The prompts are displayed in normal video, and the responses in bold. The current field being edited is displayed as an inverse video block, with the block size the same as the maximum number of characters allowed for the field.

Notice that some of the fields are already filled in. The ones shown here are the ones supplied from the defaults file. This saves typing these in every time. If these values are not appropriate for you, then they should be changed by editing the defaults file (see Chapter 5).

Many of the values that are requested are coded values. Appendix A defines the legal values and the meanings of those codes. The help key [F1] will provide a short one line message that indicates which values are legal. Complete the entire form with your values. As you type values, you may hear a beep or see an error message displayed at the bottom of the page. This usually means that you are trying to type alpha characters when the field is a numeric one, or you are trying to type too many characters in the field. The field length will always be shown in inverse video.

Changing the species code type has considerable impact on the data in memory. When you enter a different code type, all species code fields are automatically changed. Species codes are entered on the identification data form for site species, and on the plot data forms. Entire files of data can have the species codes converted simply by reading in the old file, changing the species code type, and saving the updated file.

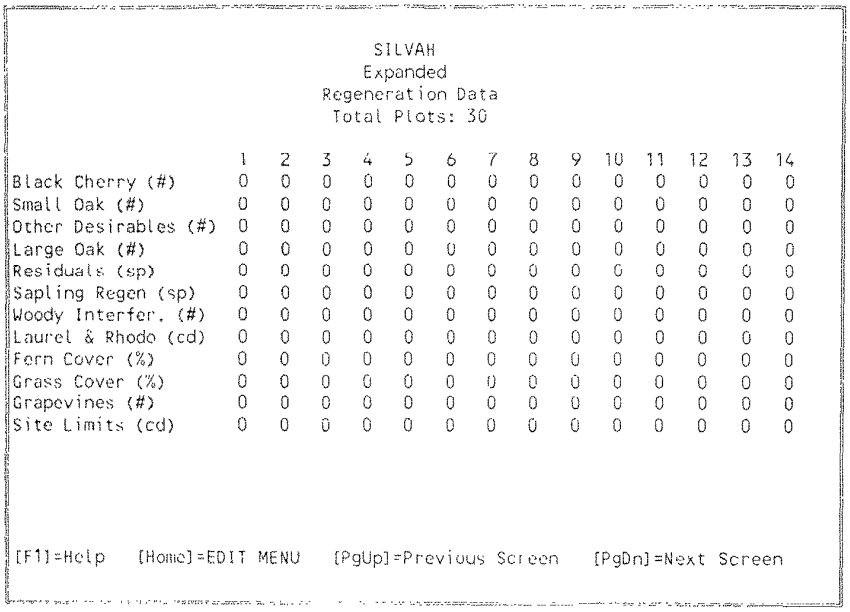
After you enter all of your identification data values, proceed to the next page of values, regeneration data, with either the [PgDn] key or the down arrow, right arrow, or enter key when the cursor is positioned on the last field. When you try to leave the page, an error check is made on all of the values that you have entered. If any illegal codes or values out of range are detected, you will hear a beep, an error message will be displayed at the bottom of the screen, and the cursor will be positioned at the offending field. Correct the problem and continue.

ENTERING REGENERATION DATA

When you move to the next page, you will see one of two different forms, depending upon the type of regen cruise you indicated on the Identification Data form.

Expanded Regeneration Data

Figure 4A.--Expanded Regeneration Data



SILVAH
Expanded
Regeneration Data
Total Plots: 30

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Black Cherry (#)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Oak (#)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Desirables (#)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Oak (#)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Residuals (sp)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sapling Regen (sp)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woody Interfer. (#)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laurel & Rhodo (cd)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fern Cover (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Cover (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grapevines (#)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Site Limits (cd)	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[F1]=Help [Home]=EDIT MENU [PgUp]=Previous Screen [PgDn]=Next Screen

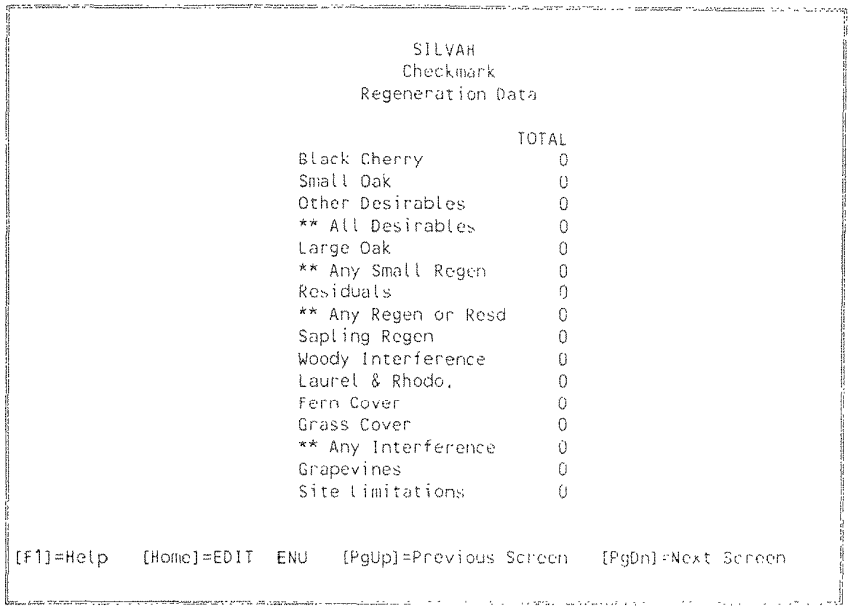
Enter the weighted numbers of seedlings, percent cover, and understory data codes directly from the Regeneration Tally Form. You will be entering data for each plot separately (each column represents a plot).

When the screen becomes full, it will scroll, providing space for additional data.

When you are satisfied with all the regeneration values, hit the [PgDn] key to move to the overstory data entry screen.

Checkmark Regeneration Data

Figure 4B.--Checkmark Regeneration Data



Enter the number of plots stocked with each category of regeneration or interfering plants. The maximum value for any field is the same as the number of regeneration plots taken. The editor will not let you enter any number greater than that.

If you forgot to enter the number of regeneration plots on the identification data form, you'll have to do it before you can enter the regeneration data correctly. Just do a [PgUp], edit the number of plots field, then do a [PgDn] to return to the regeneration data entry screen.

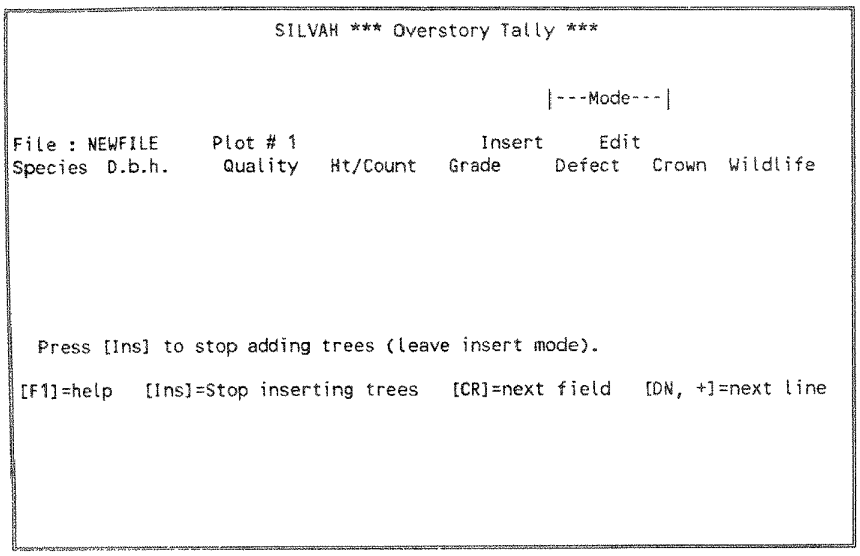
The "any regen" sub-total field must be at least as big as any of the individual regeneration fields. Likewise, the "any w/residuals" must be as big as the "any regen" or "residuals" fields. The "any interference" field must be as big as any of the individual interference fields. This check is done when you try to leave the screen. So if there are errors, you will get an appropriate message and be put back to the field where the error was found.

When you are satisfied with all of the regeneration values, just hit the [PgDn] key to move to the overstory data entry screen.

ENTERING OVERSTORY DATA

The next form that is displayed is the overstory data entry form:

Figure 5.--SILVED overstory data entry screen.



Since there are no data in the file, notice that you are automatically placed in insert mode. This will happen any time you come to this screen and there are no overstory data. The "Insert" mode indicator in the upper right of the screen will be highlighted, letting you know that. The top of the display will also show you which file is being edited and the plot number where you started inserting data. Since this is a new file, the name will show NEWFILE, and you will be in plot 1.

On this form, there are eight columns of data that can be entered for each observation. Only the first three need to be filled in; the remaining five are optional.

When you are in insert mode, the keys to move the cursor around on the screen are more limited than when you are in edit mode. The right arrow and the enter keys move to the next field; the down arrow and the plus key move to the next observation. The left arrow key allows you to edit values on the current line. The up arrow key cannot be used. If you make a mistake entering a field and then move to the next line, you must complete the observation and leave the "insert" mode before you can edit a previous line. In "edit" mode you may move to any line or field and make corrections. The [Ins] key toggles back and forth between "insert" and "edit" mode. However, when you are in "insert" mode and start entering data for an observation, you must complete the first three fields before you toggle back to "edit" mode. So, if you accidently start into an observation that you do not want, just complete the first three fields, toggle back to "edit" mode and delete it. The [F1] key will display a short help message for the field that the cursor is on.

Entering Species Codes

When you begin entering data for a new stand, there will be an inverse video prompt directly under the "species" column. Type in the species code (Table 6, Appendix A) of the first observation (tree) and hit either the enter key or the right arrow key. Type a "0" species code to indicate the end of the plot.

If you type in a species code that does not exist, you will hear a beep, and see an error message stating that the code could not be found; only species codes found in the list may be used. The code you entered will be erased, and the cursor will be placed at the first character of the species code field again.

Remember, if you are done with data entry and trying to leave the data entry screen, you must hit the [Ins] key to go back to "edit" mode.

If you know you typed the species code correctly, then the program probably is expecting a code from a different species code list. Be sure that the identification data field for "Species codes used" is properly set. You will need to hit the [Ins] key to leave insert mode, then back up two pages to the identification data screen to check it. The "Species codes used" field is automatically filled in with a default value. This value can be changed by typing the desired value over the old one. If the default value is not the one you commonly use, then change it in the defaults file as described in Chapter 5.

Entering the Diameter

When the species code field is accepted and the cursor has moved to the "diameter" field, enter the diameter of the observed tree. Remember to enter only whole numbers, and to enter only even numbers if your cruise is by 2-inch size classes. The maximum diameter that may be recorded is 40 inches. If the identification data section says that 2-inch size classes are being used, then you will not be able to enter odd numbers. If the identification data section says that you are using broad size classes, then only the midpoints of the diameter classes are valid. You also will not be able to enter numbers larger than the maximum 40 inches. If any of these error conditions are encountered, the program will beep and display a message about the problem. Type in a legal diameter and hit either the enter key or the right arrow key to move to the next field.

Entering the Quality

The "quality" field is the next one to be filled in. See Table 7 in Appendix A for a list and description of the codes. Type in a legal code and hit the enter or right arrow key to move to the next field.

The species code, diameter, and quality fields must be completed for each observation. SILVED will not let you move down to the next line until these three fields are completed. If you make a mistake while entering one of these fields, you will not be able to switch into edit mode until you enter a valid value into each. Just enter something in each field, then switch to edit mode and either correct the entry or delete the line.

The remaining fields are optional, and may be left blank if desired. If so, hit either the down arrow or the plus key to move to the next observation. If you want to continue entering data for this observation, hit the enter or right arrow key to advance to the next field.

Entering the Height/Count

The "cruise type" entered on the identification data screen determines which value is entered in the next field. This field may contain either the height of the sample tree or a count of trees in this size/species/quality class. See the definitions for overstory cruise type in Appendix A.

If heights are being entered into this column, the heights will be checked to see that the height is realistic for that size tree. If not, a warning message is displayed, but the field is accepted nonetheless, and the cursor moves to the next field. If the value was entered incorrectly, you must move back to the field and make the correction.

Entering Grade, Defect, Crown, Wildlife Codes

The remaining four fields, for grade, defect, crown condition, and wildlife code are completed in a similar way. All four of these fields are optional, and need not be filled in. Just hit the down arrow or the plus key when you have completed as much of the observation as you want. The grade, crown, and wildlife are all coded values. The codes and meanings can be found in Table 7 in Appendix A. Defect is also described there, and is a percentage recorded as tens of percent; that is, 1 for 10 percent, 2 for 20 percent, and so on.

Finishing Up

Repeat this procedure and enter one observation for each line on your tally form. When the screen becomes full, the screen will scroll up, displaying the last two observations at the top of the screen and then prompting for the next observation on line three. This scrolling will not be a smooth line-at-a-time scroll, but will scroll most of the lines off the top of the screen all at once. This saves constantly updating the screen.

Be sure to include a species code of "0" to separate your plots, and include the "0" code after the last plot. You do not need to enter a "-1" species code to end the stand, since the program starts your empty data file with it.

After you enter your last observation, which should be the end of plot "0", hit the [Ins] key to toggle back to the "edit" mode.

You can enter a maximum of 500 plots or 2,000 trees (observations) in any one stand. SILVED will warn you when you reach these limits, and will not allow you to exceed them. This should be more than enough space for any realistic stand, but if you have some unusually large data set that exceeds the space available, you will have to break it into several stands and add them together when you run SILVAH.

This concludes the data entry. If you have made errors entering data, you can edit the data to correct it. See the section on editing in this chapter for more information.

SAVING THE DATA FILE

If there are no errors, then hit the [PgDn] key or the [Home] key to return to the editing menu. Select option 6 and then type in a data file name when asked to save your data permanently to a file.

If the data set is large, then it is a good idea to return to the menu periodically to save the file. This would avoid losing the entire data set in the unlikely event of a power failure.

After your data are saved, you can start entering data for another stand if desired. Selecting the option to enter a new stand (option 1) will clear the memory so that you can start a new stand. If you are through entering data, just return to the main menu and select option 3 to quit.

One additional point; you have a lot of time and money invested in collecting and entering your data. It is always wise to make backup copies of all your important data.

EDITING EXISTING DATA

If you discover some errors in the data that need to be corrected, you will need to edit the file. You will use the same program to edit (SILVED) that you used to enter data originally.

If you have just entered the data set, and have not started a new one or left SILVED, then that file is still in memory and need not be retrieved. You can proceed directly to the section on editing.

However, if you want to edit an old file, or you have left SILVED, you will need to start the editor and retrieve the old file.

The procedures are very similar to those just described for entering data. Start the editor by typing the program name at the DOS prompt: **SILVED [Enter]**

The Main Menu screen, exactly like the one in Figure 1, will be displayed. Select option 1 to edit an existing data file. Then the edit sub-menu (Fig. 2) will be presented.

RETRIEVING A DATA FILE

Retrieve an old file by typing **2 [Enter]**. Then, type in the file name when asked, and hit **[Enter]**. You should see a message on the screen that tells you that your file has been successfully retrieved.

If the file was not found, you will be informed of that also, and you will need to determine why the file was not found. You may have typed the name incorrectly, or the file may not be in the drive/directory where you thought it was. The program always looks for data in the default data directory unless you specifically tell it to look in another drive/directory. The default data directory is specified in the "set defaults" section of this program. If you want to use this feature, you must edit the defaults and save them.

After the file is read, the edit menu will still be displayed. You now have the option of editing either the identification data (option 3), the regeneration data (option 4) or the overstory data (option 5). If you start editing the identification data, you can continue to the regeneration data screen by hitting the [PgDn] key. You can move between screens this way simply by hitting the [PgUp] and [PgDn] keys.

EDITING THE IDENTIFICATION DATA

To edit the identification data, select option 3 by typing **3 [Enter]**, and a screen exactly like the one in Figure 3 should be displayed. The only difference is that it will already contain the old data values.

Move around the screen with the arrow keys and type in the corrected values for any of the fields. When you try to leave the identification data screen, all of the data that you entered are checked for consistency. If any problems are found, you will hear a beep, a message about the problem will be displayed at the bottom of the screen, and the cursor will be positioned at the problem field. You must correct the problem before you can leave the screen.

If you change the species code type on the identification screen, then all of the species codes in the entire file will be converted to the new code type. This is a convenient way to convert species codes throughout a file.

EDITING THE REGENERATION DATA

If instead you wanted to edit the regeneration data, then you would get to it either by paging down through the identification data screen or by selecting the regen edit option from the edit menu by typing **4 [Enter]**. The regeneration screen, like the ones in Figure 4 or Figure 5 , should be displayed. Again the values should be as you typed them in the original file. Move to the one you want to change and type the corrected value. When you have completed this screen, either return to the menu by hitting the [Home] key, or continue to the overstory screen by hitting the [PgDn] key. When you leave this screen, the data are checked to be sure that all of the numbers are consistent. For example, if your regen tally is from a checkmark cruise, the number of plots with any regeneration must be at least as many as the number of plots stocked with black cherry regeneration. If any inconsistencies are found, a message will be displayed and the cursor will be positioned on the problem field. Correct the problem and then leave the screen.

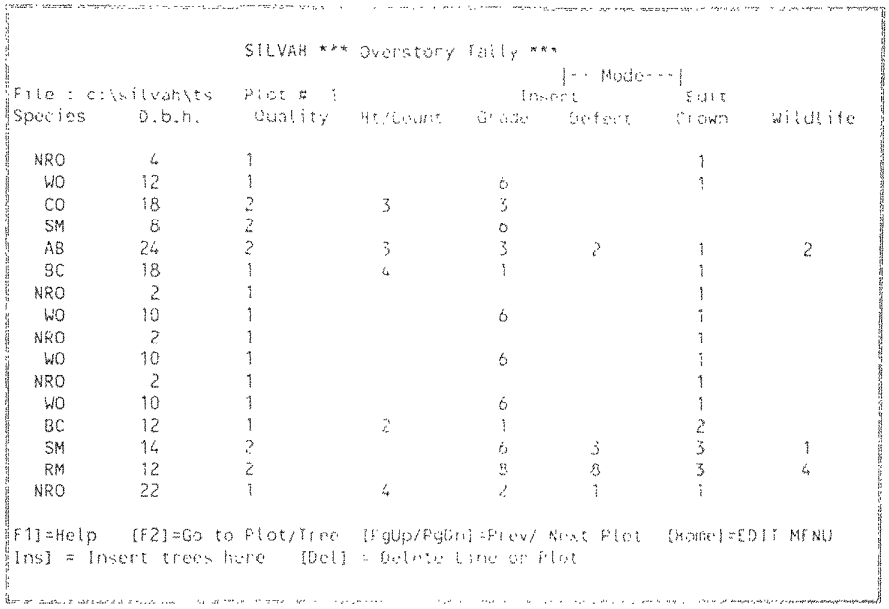
EDITING THE OVERSTORY DATA

The overstory data editing procedures are slightly different than the data entry procedures. On the data entry screen, you could not back up to edit a previous line, you could only go forward. However, when you are editing the overstory data, you can move anywhere on the screen. If there are more observations for the plot than will fit on the screen, you can look at those lines by moving the cursor down while on the last displayed line. To avoid constant screen updating, when you move off the screen, you will scroll several lines at a time.

You can get to the overstory screen either by paging down through the regeneration screen, or by selecting the option from the menu to edit the overstory data by typing **5 [Enter]**.

You should then see the overstory data screen. This screen will display data from the first plot. Generally, the entire plot will fit on one screen, but occasionally you will need to scroll to additional screens to view the remaining trees in the plot. The screen looks almost the same as the overstory data entry screen, but is slightly different:

Figure 6.--SILVED overstory data edit screen



In this example, the data from one plot does not fit on one screen, and the plot trailer of "0" is not visible If the "0" is not shown, there are more lines than can be displayed. The top part of the screen is like the data entry screen shown previously, but the mode indicator shows that you are in "edit" mode Since this is an existing file you are editing, the name of that file is displayed. And since you just started editing overstory data, you are looking at the data in plot 1. When you move from plot to plot, the plot number will change accordingly.

Editing Keys

There are several additional keys that can be used when editing.

The [PgUp], and [PgDn] keys let you move one plot at a time either forward or backward. When you hit the [PgUp] key, you will be positioned at the first tree of the previous plot. The exception to this is when you are already at the first plot; then you will move back to the regeneration data edit screen. When you hit the [PgDn] key, you will be positioned at the first tree of the next plot Again the exception is when you are already at the last plot; then you will move back to the menu screen

Go to a Tree/Plot

The [F2] key allows you to move to a specific tree in a specific plot. When you hit this key, you will be asked for the plot number you wish to go to, then when you answer that question, you will be asked which tree number to go to. The program will supply default values for both the plot number and tree number; if those values are acceptable, just hit the [Enter] key. The program will reposition the cursor to the tree you requested, and will try to place that observation in the center of the screen, so you can see the observations above and below it. If the tree is at the beginning or end of the plot, however, this may not be possible. If the plot or tree number you specify is out of range, there will be a beep and a request for a value that is within range.

The Arrow Keys

The arrow keys move one field or line at a time. When you hit either the left or right arrow, you will move to the previous or next field of the observation, respectively. If you are already at the beginning of the line and hit the left arrow key, you will move to the previous line. Similarly, if you are at the end of the line and you hit the right arrow key, you will move to the next line. The [Enter] key acts the same as the right arrow key, moving to the next field to the right.

The up and down arrow keys move to the previous and next line, respectively. When you change lines, the cursor will be positioned at the first field of the new line, not the field that you are currently in. So, if you need to edit the "quality" field for five consecutive trees, position the cursor at the first field to be changed, then change it. Hit the down arrow key, and then move to the "quality" field again and make the change, and so on. The plus (+) key on the numeric keypad responds the same as the down arrow key, moving to the next line.

Only a limited number of lines of data can be displayed on the screen at one time. When you are at the top of the screen and want to move to the previous line, or are at the bottom of the screen and want to move to the next line, the screen will scroll. When this happens, the line you are moving to will be positioned in the middle of the screen, that is, the screen will scroll a group of lines at a time, and move the line you want to the middle of the screen. The reason for this is that when the screen scrolls, the entire screen must be repainted, and this is a slow process. To keep the screen repainting to a minimum, we have avoided line-at-a-time scrolling.

The Help Key

The [F1] key will display a short help message about the field where the cursor is currently located. These messages serve as a quick reference to the available codes. See Appendix A for a complete description of the codes.

The Delete Key

The [Del] key serves two functions. It will delete the line that the cursor is on, or it will delete an entire plot. You will be prompted to delete a "L"ine, or a "P"lot; answer appropriately. The default is to delete a line, so just hit the **[Enter]** key to accept that default, or type a **P [Enter]** to delete the entire plot. The display will be updated, with the line or plot eliminated, and the cursor will be positioned at the first field of the line or plot following the deleted one. This key also will work to delete a plot delimiter, the "0" trailer record. In such instances, the number of trees in the plot will include the trees before and after the line deleted. You cannot delete the end of stand trailer, the "-1" record.

The Insert Key

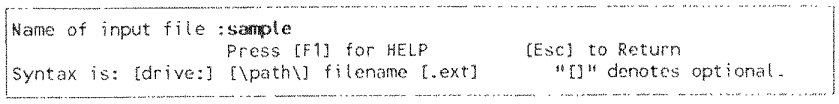
The [Ins] key will toggle between the insert and edit modes. When you toggle into insert mode, the new observations will be inserted immediately before the line that the cursor is on. The screen will be cleared, and up to two lines preceding the insert will be displayed. The cursor will be positioned on the next blank line, at the species code field. At this point, data entry is the same as described in the data entry section. Insert as many observations as needed, then toggle back to the edit mode by hitting the [Ins] key. The cursor will be positioned at the line it was on before inserting any observations.

SAVING THE FILE

When all corrections have been made in your data, you must save the corrected version. Hit the **[Home]** key to return to the edit menu. Then type **6 [Enter]** to save the file.

You will now see the following prompt at the bottom of the screen:

Figure 7.--SILVED prompting for the file name.

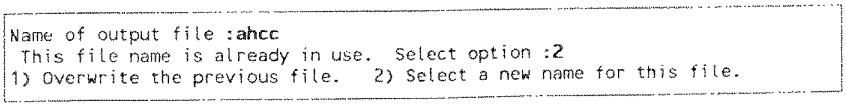


This is a request for the file name. Since you are editing a file, the program remembers the name of the file that you retrieved, and assumes that you want to save the file using the same name. If this is the case, just hit the **[Enter]** key to replace the old file with this updated version. You may also type in a new name (up to 8 characters) to rename this file.

The program will automatically supply the default drive/path if you have not supplied one, and will supply the default extension of ".SIL", for a SILVAH data file. You can override these defaults at any time by explicitly typing either or both the drive/default and extension.

If the file name that you supplied, either by accepting the default, or by typing in a new one, already exists, then the following message will appear:

Figure 8.--SILVED message when file already exists.



This message is a warning that the file name you are trying to use already exists. This is an opportunity to specify a new file name. If you want to overwrite the old file, type **1 [Enter]**, but if you want to use an entirely new name, select option 2 by hitting **[Enter]**. If you do select option 2, you will have a chance to choose another file name.

At any time you may choose to return to the main menu from the edit menu. If the file has not been saved, you will see the following message in the lower portion of the screen:

Figure 9.--SILVED warning message when you try to exit without saving.

```
WARNING !!! There is data in memory that hasn't
been saved yet.  Do you wish to save that data
before you leave the EDIT MENU  (Y/N) ? Y
```

Accept the default Y by hitting the **[Enter]** key, and you will save the file. If you do not want to save the file, for example if you were just browsing through the file, then do not save the file. This is done by hitting **N [Enter]**.

PRINTING AND CONVERSIONS

Data Conversions

SILVAH has been around for some time. As it evolved, additional capabilities have been added. Along with those additions came format changes in the data. SILVED has the capability to convert data from formats of either version 2 or version 3 and convert it to the current version 4 format. The main program does not read the old formats directly, but instead, the editor will read data from an old format file which can then be saved in the new format. This data conversion is listed on the printing and utilities menu. You can get to that point by selecting option 7 from the edit menu of SILVED. That is, start SILVED, then select option 1 to edit data, then select option 7 for printing and utilities. You should see the following choices:

Figure 10.--SILVED Utility Menu Screen.

```
SILVAH (V4.50) - SILVICULTURE OF ALLEGHENY HARDWOODS AND OAK
  A STAND ANALYSIS, PRESCRIPTION, AND MANAGEMENT SIMULATOR

                        UTILITY MENU

     Menu Options Are:

        1)  Convert From Old Format
        2)  Print Data in Memory
        3)  Return to EDIT MENU

     Your Selection:  3
```

Select option 1 to read in an old format data file. The format will be converted automatically. In selecting this option, several things may happen. The program will determine whether it recognizes the format of the old file. If it recognizes the file as already being in V4.0 format, it will tell you. If it recognizes it as a previous version, it will tell you that and read the data using the old format. If it does not recognize the format, it will tell you that and do nothing.

After the file is read, it will ask you if you want to save the file using the new V4 format. If you respond yes, it will write the data using the new format. Be sure to save the file so that it can be edited and used by SILVAH.

Data Listing

The other option listed on this menu is to list your data file to a printer or file. When you select this option, the file that is currently in memory will be formatted and sent to the output device you have selected. The output may be directed to an actual printer, or to a listing file as specified by the output option. If the output is directed to a listing file, then the base name of the file is used along with the ".LST" extension. That is, for the sample file EXAMPLE.SIL, the listing file would have the name EXAMPLE.LST. CAUTION: If you have your default set to print to the printer, then you must have a printer connected and on-line. If you do not have a printer, then the program will stop and you will have to reboot your computer.

CHAPTER 5--SETTING UP DEFAULTS FILE

The defaults file(s) contains information on local stumpage prices, the log rule you want to use, a list of your own species codes (if you do not like ours), your usual cruising procedures, which disk drive you will use for data, where you want your printouts sent, and so on. This feature of SILVAH makes the program very convenient. Every time you load any of the SILVAH programs, you will be asked the name of the defaults file you want to use; then that defaults file will be read.

There are default values for all parameters in the program, so you do not absolutely have to have a defaults file. If you do not have one, SILVAH will warn you each time you load the program that it is using the default values we have coded into the program.

But the default values in the program are ones that we find convenient for our computers and our forest conditions in northwestern Pennsylvania. You can change those values to suit your situation, and the SILVAH programs will use your values every time they are run. So, you should create a defaults file via SILVED.

Some users will find it convenient to create more than one defaults file, especially if you work in several different geographic areas where stumpage prices vary, for example. Thus, you could create a defaults file for each area, and then read the appropriate one when SILVAH loads. The program will ask you for the defaults file name at that time.

STARTING SILVED

Your defaults file can be created by editing and saving the defaults values coded into the SILVED program. If you are running from a floppy disk system, place the disk containing SILVED in drive A, and type: **SILVED [Enter]**. If you are running from a hard disk system, move into the SILVAH subdirectory by typing: **CD \SILVAH [Enter];** then start the program by typing: **SILVED [Enter]**.

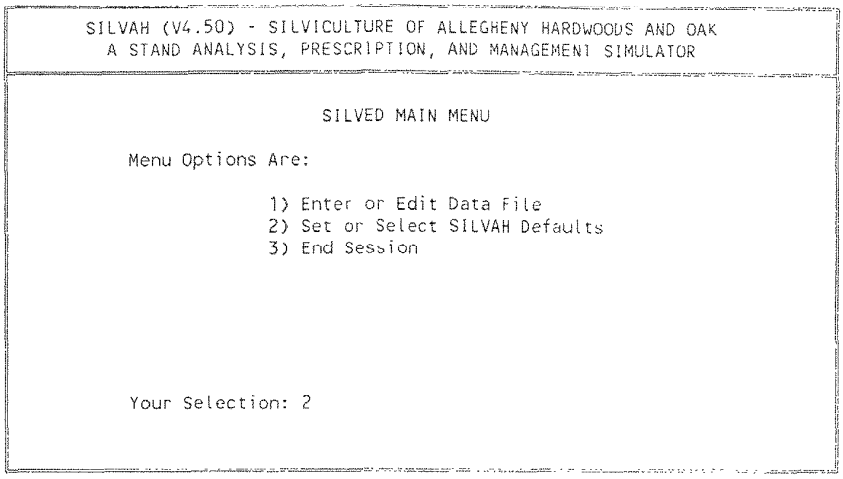
You will then be asked for the name of the defaults file to use.

If you have not created one yet, just hit **[Enter]** to accept the defaults file name SILVAH.DEF. You will get a message that the defaults file could not be found, but that the program is using the defaults values coded into the program.

If you have previously created a defaults file and you are now making changes to it, type in the name of your defaults file when asked, and hit **[Enter]**.

The following menu screen should then appear:

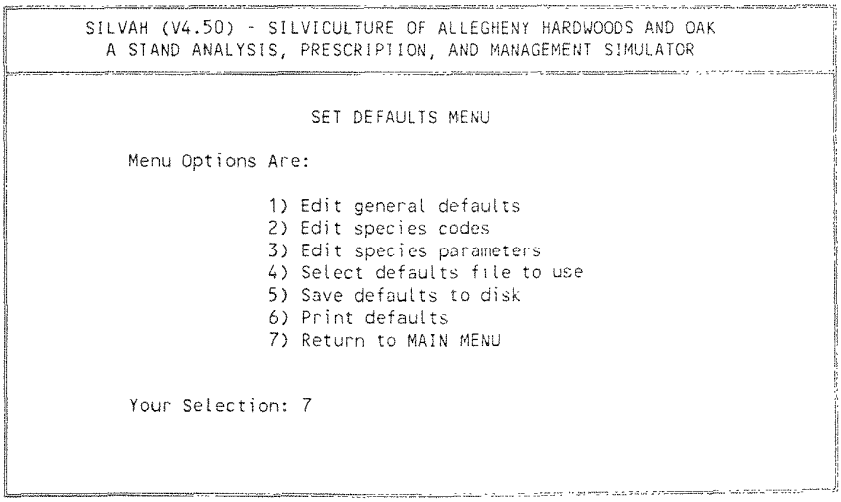
Figure 11.--SILVED main menu.



DEFAULT EDIT OPTION

Edit the defaults by typing **2** **[Enter]**, and the following sub-menu will be displayed:

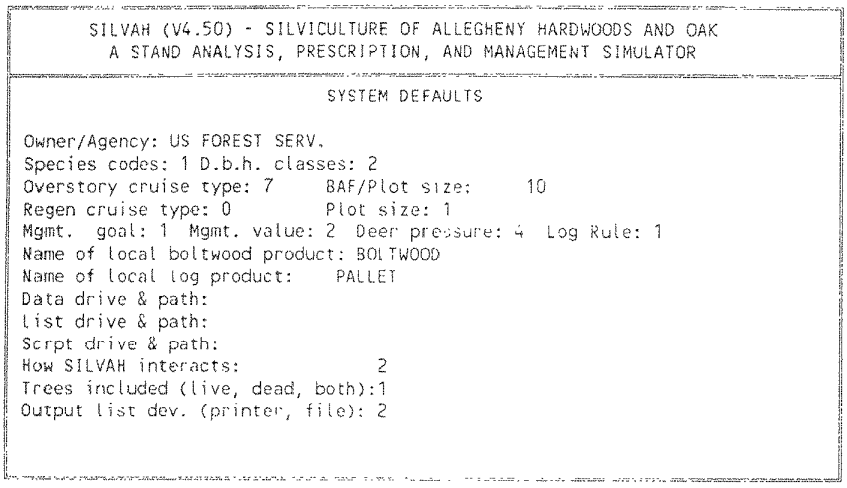
Figure 12.--SILVED defaults menu.



SETTING GENERAL DEFAULTS

The first option in the set defaults menu allows you to set general default values. Select option 1 from the menu by hitting **1 [Enter]**, and the following edit screen will be displayed:

Figure 13.--SILVED system defaults screen, part 1.



The first five lines of data on this screen allow you to supply identification values that generally do not change. This is simply a convenience; it saves the effort of retyping these values for each stand, since they usually remain the same for a particular user. Even though these fields are pre-defined, you can still change them as you enter data.

Codes and definitions for these items are given in Appendix A for all except log rule. The log rule codes are: 1 = International 1/4", 2 = Doyle, 3 = Scribner. The help key (F1) will display these codes for the field on which the cursor is located.

The next two lines allow you to specify the names you want to use (and that will be printed on all output) for one bulk and one log product. For example, if you have a pallet log market or a railroad tie market, you can define that product name here.

The next three lines are the default drives and paths for data, printer listings, and script/batch files. If you store data on diskettes, you will most likely read that data from the same drive each time. If you store data on a hard drive, you will most likely keep it in a special subdirectory. Specifying the default data drive and path here will let you avoid typing that drive/path information each time you specify a file. When you are asked for a file name, you need only type the name, and not the entire path. However, if you have a file on another drive or in another subdirectory, you can type the full drive/path/file name and the program will use that rather than the default.

There are three types of files that are used: data files, printed listings routed to a file, and script/batch files. Each has its own default path. You can specify a separate drive/path for each. Table 2 lists the suggested file organization for each of these files.

The next three lines allow you to set the runtime options that the main program SILVAH uses. That is, it allows you to specify if SILVAH will start in interactive, script or batch mode; whether dead trees, live trees,

or both are included in the data summary; and whether output is routed to the printer or to a disk file. The initial defaults are to use a script file, including only live trees, and routing output to the printer.

After you are finished editing these values, move to the next page by hitting [PgDn], or back to the defaults menu by hitting [Home].

SETTING BREAKING POINT DEFAULTS

This page of defaults defines the volumes required for commercial sales, and the minimum diameters for calculating volumes. You can get to this screen by hitting [PgDn] from the first system default screen.

Figure 14.--SILVED system defaults screen, part 2.

```
SILVAH (V4.50) - SILVICULTURE OF ALLEGHENY HARDWOODS AND OAK
A STAND ANALYSIS, PRESCRIPTION, AND MANAGEMENT SIMULATOR

                              SYSTEM DEFAULTS

                         COMMERCIAL SALE BREAKPOINTS

                                  Board Feet          Cords
Sawtimber sale                      2000.0             .0
Integrated sale                     1500.0            5.0
Cordwood sale                          .0             7.0


                          MINIMUM DIA FOR VOLUMES

                                  Hardwoods          Softwoods
Pulp                                  5.5                5.5
Sawtimber                            10.5                8.5


[F1]=Help    [Home]=Quit to DEFAULTS MENU    [PgUp]=Prev. Screen    [PgDn]=Next Screen
```

The top set of values on this screen specifies how much volume must be available for SILVAH to prescribe a commercial cutting. For example, the defaults shown in the screen above require a minimum of 2,000 board feet to be removed during a sawtimber only sale. If there is insufficient volume available for such a sale, SILVAH will check to see if there is 1,500 board feet and 5 cords to make an integrated sale. If there is not enough volume for an integrated sale, SILVAH will check to see if 7 cords are available for cutting in a pulpwood only sale. If the volume is inadequate to support any of these commercial sale minimums, SILVAH will prescribe no cutting.

The second set of values is the threshold diameters for calculating volumes. For example, hardwood sawtimber volumes will be calculated for trees larger than 10.5 inches (11-inch class if you use 1-inch classes, or 12-inch class if you use 2-inch classes) from the figure above. You can set any threshold diameter you wish for these calculations. Setting the threshold diameter to 41 inches will prevent any calculation of volumes. Thus, you could prevent pulpwood volume from being calculated (if you have no pulpwood market, for example) by setting minimum diameter for pulpwood to 41 inches.

SETTING SPECIES CODE DEFAULTS

SILVAH includes three different sets of species codes. The program itself uses standard USDA Forest Service forest survey codes internally, and you cannot alter these codes. But you may change either the mnemonic or user-defined codes.

The mnemonic codes are the ones printed on all outputs. They use the first letter of the common name to represent individual species (thus, black cherry is BC), and the first letters of the common genus name to represent an entire genus (thus birch is B). You can change these abbreviations to meet your own needs, however.

The user code is a numeric code that you can also customize. While the mnemonic code will allow alpha characters, this code will allow only numeric values.

You can edit the species codes by selecting option 2 and typing: 2 **[Enter]** from the edit defaults menu. You should get the species code edit screen:

Figure 15.--SILVED species codes screen.

SPECIES	MNEMONIC SPECIES CODE	LOCAL SPECIES CODE
1 OTHER SOFTWOODS	OSW	0
4 OTHER HARDWOODS	OHW	88
12 BALSAM FIR	BF	0
68 E. RED CEDAR	ERC	0
70 LARCH	L	0
71 TAMARACK	TAM	0
90 SPRUCE	S	0
91 NORWAY SPRUCE	NS	0
94 WHITE SPRUCE	WS	0
95 BLACK SPRUCE	BS	0
97 RED SPRUCE	RS	0
100 PINE	P	0
105 JACK PINE	JP	0
125 RED PINE	RP	0
126 PITCH PINE	PP	0
129 WHITE PINE	WP	1
132 VIRGINIA PINE	VP	0

[Home]=Defaults menu [PgUp]=Previous Screen [PgDn]=Next screen

There are 100 species included in the program, so there are multiple pages of codes. The figure above shows one of these pages. The species are ordered by the numeric forest survey code. There are three columns: the common name (and forest survey code), the mnemonic, and the local code. The last two columns may be changed as you see fit. You may not change the species that are included, nor can you change the order.

To make changes, simply move to the field you want to change by using the arrow keys, and type the new value. You can see more codes by using the [PgUp] and [PgDn] keys. When all of your changes are made, hit the [Home] key to return to the set defaults menu.

Warning

If you decide to alter the local or mnemonic species codes, and you have already collected data using the default codes (or other versions of your own codes), be careful.

When you run the old data files through SILVAH, you will need to load and use the old defaults file so that species codes are interpreted properly. Therefore, you should save a copy of the old defaults file before you alter the species codes.

A better solution is to convert the species codes in your old data files to the new codes. That way, you will need to maintain only one defaults file for species codes. SILVED will make the conversions automatically for you, but you must do this in the proper sequence to avoid loss of data. Proceed as follows.

1) Make backup copies of all data files to be converted to the new codes, in case something goes wrong.

2) Make certain that you have copies of both your old defaults file (containing the old species codes), and your new defaults file containing new species codes and that both are in your SILVAH directory. Obviously, these two files must have different names.

If you edited the original defaults file and saved the revision under the same name, you'll need to recreate the old defaults file. You can recreate the defaults file included with the program by simply removing all defaults files from the SILVAH directory, starting SILVED, and then saving the built-in defaults.

3) Start SILVED and load the original defaults file containing the old species codes.

4) Retrieve the data file containing the old codes.

5) Go into the ID data, change species code type to 3 (Forest Survey).

6) Load the new defaults file by returning to the Main Menu (HOME, Y), select 2 (set or select SILVAH defaults), 4 (select defaults file to use), type in defaults filename [ENTER].

7) Go back to the identification data screen and change species code to either mnemonic or local to convert species codes to your new type.

8) Save the revised data file.

SETTING THE SPECIES PARAMETER DEFAULTS

There are several parameters associated with each species, including form class, volume correction factors, and stumpage prices for various products. You should edit these values to reflect conditions in your area.

To edit these values, select option 3 of the defaults menu. At the menu prompt, type **3 [Enter]**, and the following screen will be displayed:

Figure 16.--SILVED species parameters screen.

SPECIES	FC	PULP VOL. CORR	SAWT VOL. CORR	SAW $/ MBF	VEN $/ MBF	PULP $/CD	LOCAL USE $/CD.	LOCAL USE $/MBF
170 SOUTHERN PINE	82.	1.00	1.00	12.	0.	2.00	.00	0.
241 N. WHITE CEDAR	82.	1.00	1.00	12.	0.	2.00	.00	0.
261 EASTERN HEMLOCK	82.	1.00	1.00	20.	0.	2.00	.00	0.
310 MAPLE	82.	1.00	1.00	12.	0.	2.00	.00	0.
316 RED MAPLE	82.	1.00	1.00	54.	100.	2.00	.00	0.
317 SILVER MAPLE	82.	1.00	1.00	12.	0.	2.00	.00	0.
318 SUGAR MAPLE	82.	1.00	1.00	55.	150.	2.00	.00	0.
330 BUCKEYE	82.	1.00	1.00	12.	0.	2.00	.00	0.
370 BIRCH	82.	1.00	1.00	36.	0.	2.00	.00	0.
371 YELLOW BIRCH	82.	1.00	1.00	36.	150.	2.00	.00	0.
372 SWEET BIRCH	82.	1.00	1.00	12.	0.	2.00	.00	0.
375 PAPER BIRCH	82.	1.00	1.00	12.	0.	2.00	.00	0.
400 HICKORIES	82.	1.00	1.00	12.	0.	2.00	.00	0.
402 BITTERNUT HICKORY	82.	1.00	1.00	12.	0.	2.00	.00	0.
403 PIGNUT HICKORY	82.	1.00	1.00	12.	0.	2.00	.00	0.
404 PECAN	82.	1.00	1.00	12.	0.	2.00	.00	0.
405 SHELLBARK HICKORY	82.	1.00	1.00	12.	0.	2.00	.00	0.

[Home]=Defaults menu [PgUp/PgDn]=Previous/Next screen

The screen above is an example of one of the parameter editing screens. You can see more species by hitting the [PgDn] and [PgUp] keys.

There are nine columns, of which the last eight may be changed. The first column is the common name and forest survey code. The second column is the form class that will be used in calculating volumes. Girard-Mesavage form class volume tables are used. The next two columns are correction factors that may be used to adjust the volumes, both sawtimber and pulp. If you find that the program consistently gives high or low volumes for a species, then you may change this factor to more reasonably reflect your volumes. The last five columns are the stumpage values for sawtimber, veneer, pulp, local bulk, and local sawlog products.

Move to the field you want to change with the arrow keys and type in the new value that you want to use. When you are finished editing these values, return to the defaults menu by hitting the [Home] key.

SAVING THE DEFAULTS

After you have completed the editing process, be sure to save your changes by selecting option 5. None of the changes you have made will take effect unless you save them. To save the edited defaults, type **5 [Enter]** at the menu prompt, then type in the name you want to use for your defaults file when asked.

Figure 17.--Prompting for the defaults file name.

```
Name of output file:SILVAH.DEF
                                        Press [F1] for HELP          [ESC] to
                                                                     Return
Syntax is:  [drive:] [\path\] filename [.ext]          "[]" denotes optional.
```

The defaults file name that is displayed is SILVAH.DEF. You may use this name, or type another. This file will be stored in the DOS current working directory--along with the SILVAH programs.

All of the SILVAH programs will give you a chance to specify the defaults file you want to use when the program is loaded. You may have several different defaults stored on the disk under different names, and these can be read in by specifying the file name you want to use. To save yourself some typing each time the programs load, name the defaults most frequently used SILVAH.DEF. Then, you can simply accept the default name by hitting [Enter].

When you save the file, the program will first check to see if the file already exists. If it does, then you will have a chance to overwrite it, or to specify a new file name. The following prompt will be displayed in the lower portion of the screen:

Figure 18.--Prompt when file already exists.

```
Name of output file:SILVAH.DEF
  This file name is already in use.   Select option:  2
1) Overwrite the previous file.     2)  Select a new name for this file.
```

If you want to overwrite the existing file, type **1 [Enter]**. If you do not want to overwrite, and do want to use a different name, then just hit the **[Enter]**. You will have a chance to type in a new file name if you specify option 2, the default.

If you have made changes to the default values, and you try to leave the menu screen without saving, you will see the following prompt in the lower portion of the screen:

Figure 19.--Message when trying to leave the menu without saving.

```
In order to make any changes you made to the defaults permanent, you must
save them before you leave the SET DEFAULTS MENU.  Save defaults to disk (Y/N)?  Y
```

If you want to save the file, then just accept the Y response by typing **[Enter]**. If you do not want to save the changes, then type **N [Enter]**. If you tell the program to save the changes, then the procedures detailed above should be followed to save the file.

RETRIEVING AND PRINTING DEFAULTS

The two other options on the menu allow you to retrieve a defaults file for editing, and to print the current defaults. To retrieve a different defaults file for editing, select option 4 by typing **4 [Enter]**. You will then be asked for the file name of the defaults that you want to retrieve. Type in the name and hit the **[Enter]** key.

To print a hardcopy of the defaults, select option 6 from the menu by typing **6 [Enter]**. The listing will be printed to the printer if you have selected the routing option to the printer. The listing will be routed to a file called DEFAULTS.LST if you have selected the routing option to a file.

When you are finished with the editing, and you have saved your changes, you can return to the main menu by selecting option 7 by typing **7 [Enter]**. From the main menu, you can then begin editing data, or quit the program by selecting the appropriate option.

CHAPTER 6--RUNNING SILVAH

Running SILVAH is extremely easy once you have installed the program properly on your computer, and set up the runtime options and script files that you will usually use. If you have not already set up a defaults file, turn to Chapter 5 and follow the instructions there. This chapter will provide instructions on setting the runtime options, creating script files, and other SILVAH processing procedures.

STARTING SILVAH

Start up your computer if it is not already running. If your computer is already running, but you did not start it using a system disk that contains the SILVAH system files (see Chapter 2), you will need to restart (reboot) the computer. Then:

If you run from a floppy disk system, insert your SILVAH program diskette into drive A. From a hard disk system, move into the SILVAH subdirectory. If you installed SILVAH in accordance with the instructions in Chapter 3, change to the SILVAH subdirectory on the hard disk by typing the following at the DOS prompt: **CD\SILVAH [Enter]**.

To load and start the SILVAH main program, type the following at the DOS prompt: **SILVAH [Enter]**

The SILVAH program will load and return with the following question: "Name of defaults file:". Either accept the defaults file name on the screen (SILVAH.DEF) by hitting **[Enter]**, or type in the name of the defaults file you want to use; then hit **[Enter]**.

SILVAH will respond with one of the two following messages:

1. "Retrieving default values from disk ...". This means that you have created a set of customized default values and stored them in a disk file (usually called SILVAH.DEF). These default values tell SILVAH which log rule, form classes, stumpage prices, and so on, to use. SILVAH will read this file each time you load the program.

2. "Your customized defaults file was not found. Therefore, I will use the defaults listed in the documentation. To create and save a customized defaults file, use SILVED main menu option 2. Hit any key to continue." This either means that you have never created a customized defaults file, or that SILVAH cannot find it. When you hit the next key, SILVAH will go ahead and run using the defaults coded into the program.

If you have not created a customized defaults file, you should do so before you run any real data. Follow the instructions in Chapter 5.

If you have created a defaults file and SILVAH cannot find it, check to see that it is on the same disk as the SILVAH program (if you run from floppies and have SILVAH and SILVED on separate diskettes, you need the defaults file on both diskettes). If you run from a hard disk, the defaults file should be in the same subdirectory as the SILVAH program files. If not in the same subdirectory or on the program diskette, you must specify the complete path and file name so SILVAH can find it (SILVAH does not append a default path for the defaults file). Also, check to see that the defaults file has the correct name; usually it is called SILVAH.DEF, unless you told SILVAH to use a different name. Check Chapter 5 for further information.

After the defaults file is loaded, or after you hit any key following the message that SILVAH cannot fin your defaults file, the RUN SILVAH MENU will appear (Figure 20).

Figure 20.--Run SILVAH menu.

```
SILVAH (V4.50) - SILVICULTURE OF ALLEGHENY HARDWOODS AND OAK
  A STAND ANALYSIS, PRESCRIPTION, AND MANAGEMENT SIMULATOR

                    RUN SILVAH MENU

     Menu Options Are:

                  1) Create script file
                  2) Create a batch job
                  3) Change runtime options
                  4) Run from script file,
                     include only live trees,
                     send listings to printer.
                  5) Read alternate defaults file
                  6) Quit

     Your Selection: 4
```

Notice that you have six options at this point, each described briefly in the menu. SILVAH is expecting you to choose one of those options and type a number from 1 to 6 indicating your choice. Notice also that the blinking cursor is positioned in the proper spot to accept your response, and that SILVAH has taken a guess as to what your response will be. SILVAH has guessed that you will choose option 4, and run the program.

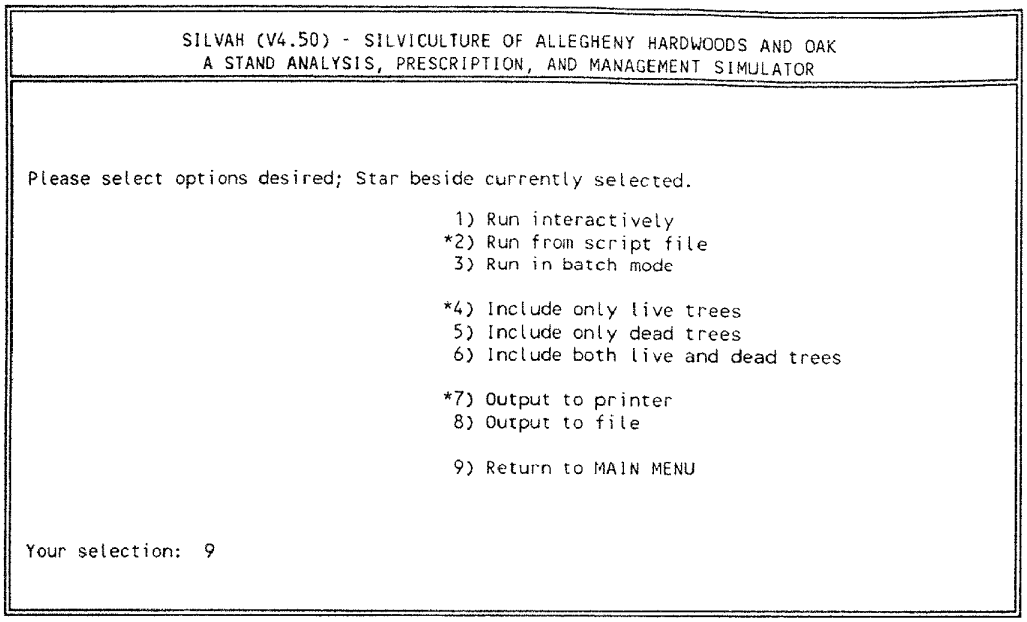
You will find that SILVAH almost always takes a guess at which option you will choose in the various menus. This will save you time once you get used to it, because all you need do is press the enter key if you agree with SILVAH's choice.

However, if SILVAH guesses wrong, just type the number of your choice (it will replace the default) and hit the enter key.

CHANGE RUNTIME OPTIONS

You will need to understand the runtime options before you attempt to run, or to create script or batch files. So, select option 3 from the RUN SILVAH MENU by typing **3 [Enter]**. This will bring up the RUNTIME OPTIONS MENU (Figure 21).

Figure 21.--Runtime option menu.



Note that there are three groups of options, and that the currently selected option in each group is indicated by an asterisk. You can make only one selection from each of the three groups.

SILVAH has guessed that you will return to the RUN SILVAH MENU without making any changes, and if this is your choice, simply hit the enter key. If you wish to change any of the options, type the option number desired and hit the enter key. The runtime options are:

1. "Run interactively". When you run interactively, SILVAH will ask you a series of questions to determine what you want it to do. SILVAH asks which printouts you want, whether or not you want it to write a prescription, try an alternative cut, output a data base file, project stand growth into the future, and similar options.

   These interactive questions appear during processing, so that you can see the results of the previous processing step before answering questions about the next step. For example, you can look at the residual stand created by a SILVAH prescribed cut before deciding whether to try a different cut. Of course, to look at intermediate output in this way, you must also have chosen to send your output directly to a printer.

2. "Run from script file". Since many users get the same printouts and run with the same options most of the time, it is convenient to record that information in a file and use the file to control processing rather than answering the same questions each time. This file is called the script file. You can create as many script files as you wish. So, if you run in several "standard" ways, create a script file for each (giving each a unique name), and then tell SILVAH which script file to use when you run. If you run SILVAH very often, script files will save you a lot of time.

3. "Run in batch mode". Batch mode provides still another level of convenience for production running of SILVAH. The batch file contains a set of instructions that allows you to run SILVAH many times, processing many stands with no operator attention. You can put the instructions for all stands you want to run in the batch file, start processing, and go home for the night. You must use script files to control the options when running in batch mode.

4. "Include only live trees". If you choose this option, overstory data summaries will include only live trees, even if you tallied standing dead trees in your cruise. (Dead trees are tallied as code 3 in the quality column.)

5. "Include only dead trees". If you choose this option, overstory data summaries will include only dead trees, even if you tallied live trees as well in your cruise. This option is included primarily to permit volume and value estimation for salvage cuts--following mortality from gypsy moth defoliations, for example.

6. "Include both live and dead trees". With this option, live and dead trees are added together in overstory data summaries. Note that dead trees are included in all data summaries--basal area, relative density, volumes, and so on. In effect, they are treated as unacceptable quality live trees.

7. "Output to printer". If you choose this option, the output will go directly to a printer. Printouts will appear as the program runs, so you can view the results of one step before proceeding to the next in interactive mode. There are two disadvantages to using this option: (1) printouts take time if there are many of them; and you must wait for the printouts to be completed before you can give SILVAH further instructions; (2) if SILVAH tries to print and you do not have your printer connected, or do not have it turned on line, SILVAH will wait forever for it to be connected, and you will have to reboot to continue. This does not harm anything, but be aware that SILVAH will not run if you select the printer option without a properly connected printer.

8. "Output to file". With this option selected, SILVAH will create a series of files (called <base>.PRN) each time you run. These files contain your printouts. The <base> in the specification of these files means that SILVAH uses the base name of the data file you are running, and simply changes the extension. So, if your data file was called STAND1.SIL, the printout file corresponding to that data file would be called STAND1.PRN.

   You can run with this option even if you do not have a printer connected to your computer. Or, you can run a series of stands through SILVAH without waiting for all the printouts, then send the files to the printer at a later, more convenient time. These files also can be used with most word processors to incorporate into reports or management plans. If you chose this option, be sure that you have sufficient space on your default print (list) drive to store these files.

You must select one option from each of the three groups of options (see Figure 21). Once you have selected the options you want, hit the enter key (with 9 as your selection) to return to the RUN SILVAH MENU.

When you get back to the RUN SILVAH MENU, notice that the wording of option 4 has changed to reflect the options you have selected. So, you can see what options will be used without actually going to the options menu. Any changes you make in the runtime options will be retained either until you change them, or until you exit from SILVAH.

The values that appear as your runtime options when you load SILVAH are determined by your defaults file. You can change the defaults file so that your runtime options appear as you usually use them. That way, you need not change them each time you start the program.

CREATE A SCRIPT FILE

A script is a predefined list of answers to the questions asked by SILVAH. When you run in script mode, SILVAH reads the answers from the list rather than asking for each answer on the computer screen. To create a script file, choose option 1 from the RUN SILVAH MENU by typing **1 [Enter]**.

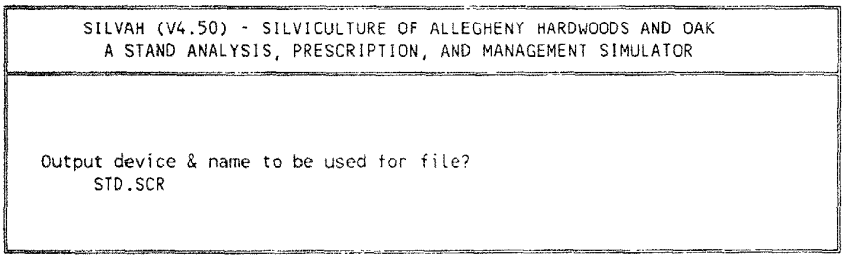
This will bring up a series of menus that enable you to specify which printouts you want, whether SILVAH is to write a prescription, whether you want to specify another cut, which printouts you want on the treatment and residual stand, whether you want to output a data base file, whether you want to project stand growth into the future and if so for how long and with what treatments and printouts, and so on.

For each menu, SILVAH will guess at your answer or answers. Those guesses will produce our "standard" script file, which we call STD.SCR. You can create this standard script file simply by specifying the file name, and then hitting the enter key at each screen. Or, you can pick and choose from the many options provided to get exactly what you want.

The questions asked in creation of a script file are identical to those you would encounter if you run SILVAH interactively. The script file simply lets you record your answers, and reuse them many times. You can create as many script files as you like.

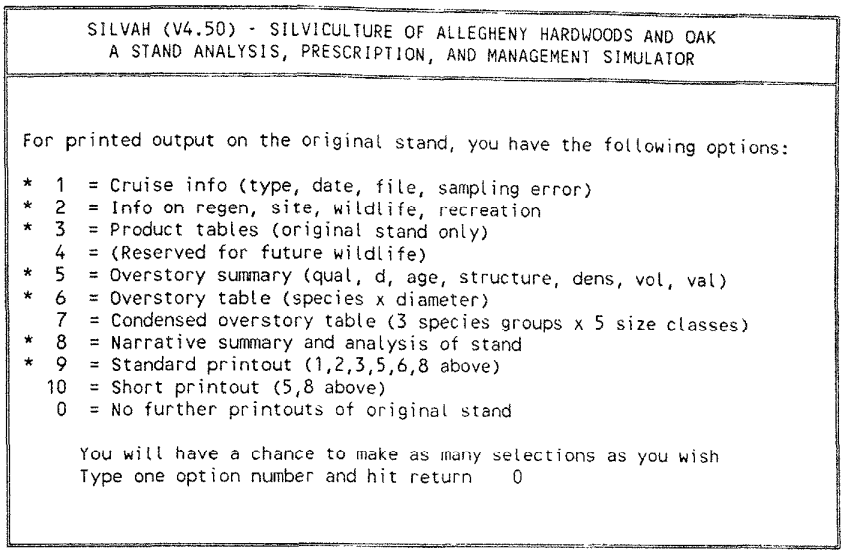
In the figures that follow, each menu is displayed so that you can see the choices offered. Most of these menus are self-explanatory, but a few notes follow each to explain the subtleties.

Figure 22.--Naming the script file.



When you choose to create a script file from the RUN SILVAH MENU, SILVAH will ask you to name the script file. The defaults file name that SILVAH suggests is STD.SCR. You can accept that name by hitting the [Enter]. You may change the file name by typing the new name and then [Enter]. It is usually easiest to let SILVAH use the default drive, path, and extension by specifying only the base name. If you do not specify a device, SILVAH will put it on the default disk drive and subdirectory you have specified for script files in your defaults file. If you do not specify a file name extension, SILVAH will append the extension .SCR.

Figure 23.--Choosing printed outputs.



After you have named your script file, SILVAH will ask a series of questions about the printouts you want on the original stand. You can select as many, or as few, as you wish. When you select some types of printouts, a secondary screen will appear asking you to specify which of several options you want for that particular printout (Figures 24, 25). Again, you may select more than one. When you return from these secondary menus, you will be back at the primary menu. From there you can make additional primary selections, or move on to the next step.

Your selections will be marked with a asterisk, so you can keep track of the ones you have chosen.

When selecting printouts, if you are not sure whether the printout will be useful from the menu description, look at Appendix B for samples.

Figure 24.--Specifying parameters to be used in species X diameter and condensed species group X size group tables.

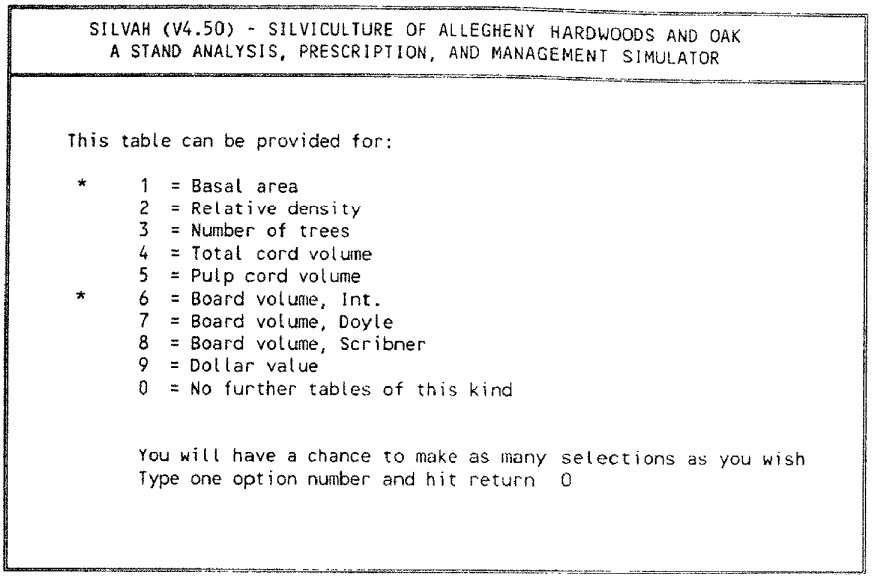
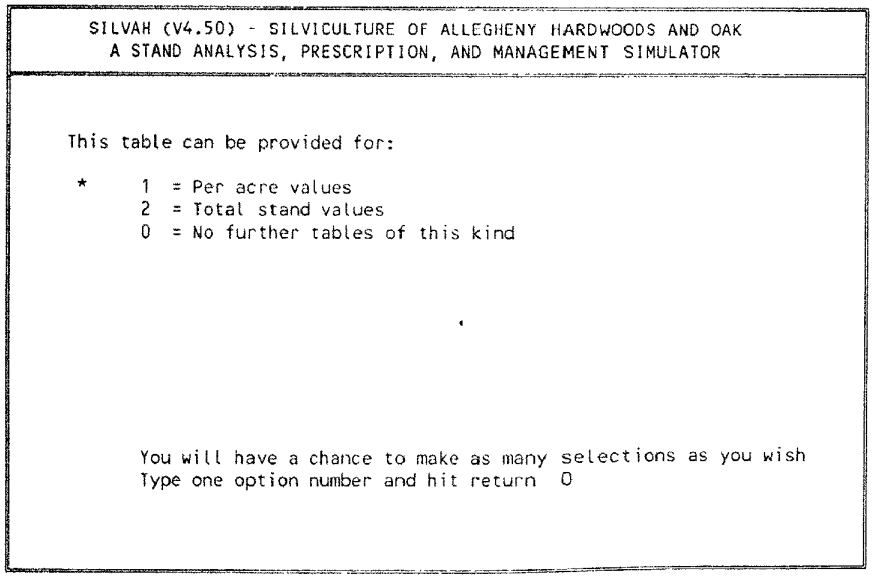


Figure 25.--Selecting the product printout options.



After all the printouts on the original stand have been selected, SILVAH will ask whether you want to write a prescription for this stand, or whether you want to specify your own treatment (Figures 26 and 28). If you do either, SILVAH will then ask which printouts you want for these treatments, and for the residual stands that result (Figure 27).

Figure 26.--Selecting SILVAH prescription.

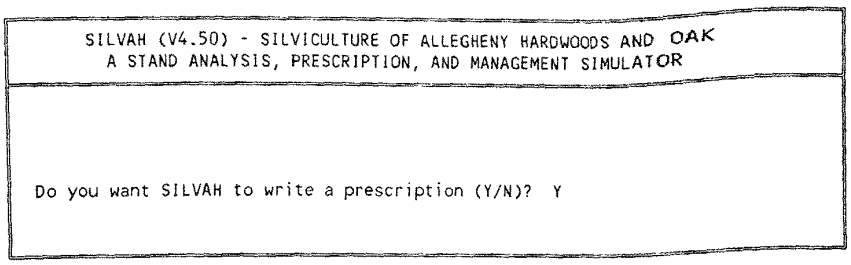


Figure 27.--Specifying prescription or treatment printouts.

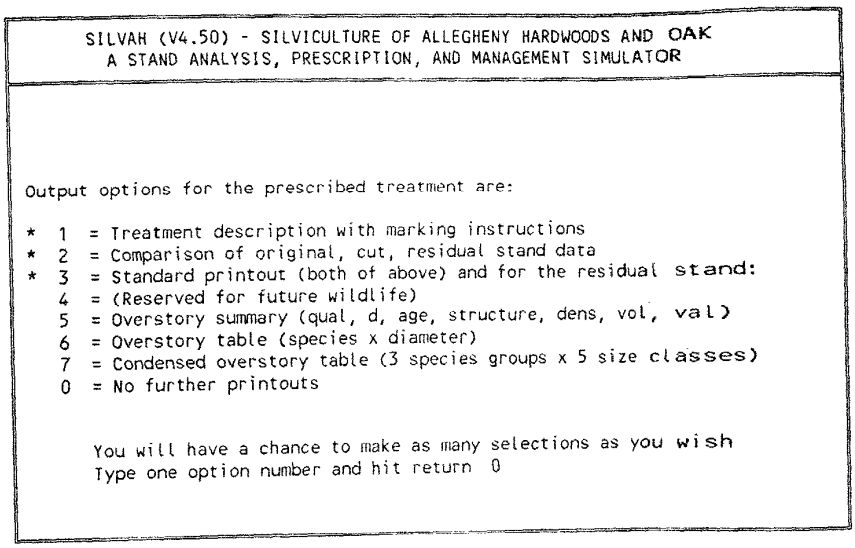
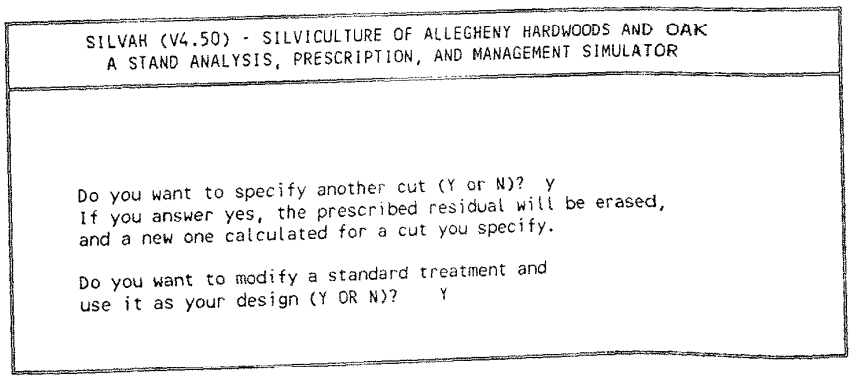


Figure 28.--Selecting another cut.



If you tell SILVAH you want to specify another cut (other than the prescribed one), two or three additional screens will be presented on which you can specify the other cut.

If you modify a standard cut, you will be asked to enter the code for the standard treatment to be used as a basis for the cut (Figure 29). Then you will be asked to specify the minimum residual density and maximum density to be removed (Figure 30). This allows you to regulate residual density, and to set a maximum on the amount removed. The maximum on amount removed will prevent excessively heavy cuts in stands that are at or above full stocking.

If the cut is an even-age cut, you will also be asked to specify the percentage of cut density to come from below the mean stand diameter (Figure 30). This controls the structure of the residual stand. Unless you understand the principle here, it is best to use the 75 percent value that SILVAH prescribes. Using a lower value will result in cutting of more large trees, thus reducing average diameter and delaying maturity.

If the cut is an uneven-age cut, you will be asked to specify the maximum tree size and "q" factor for the cut. Again, this controls the residual stand structure, and you need to understand the silvicultural implications of these parameters to use this option wisely.

You can specify as many other cuts as you wish, and get printouts on each. When you have finished, the residual stand will be that for the last cut you specified. So, if you go on to project stand growth, the projection will be for the residual stand after that last cut.

Figure 29.--Modifying a standard treatment.

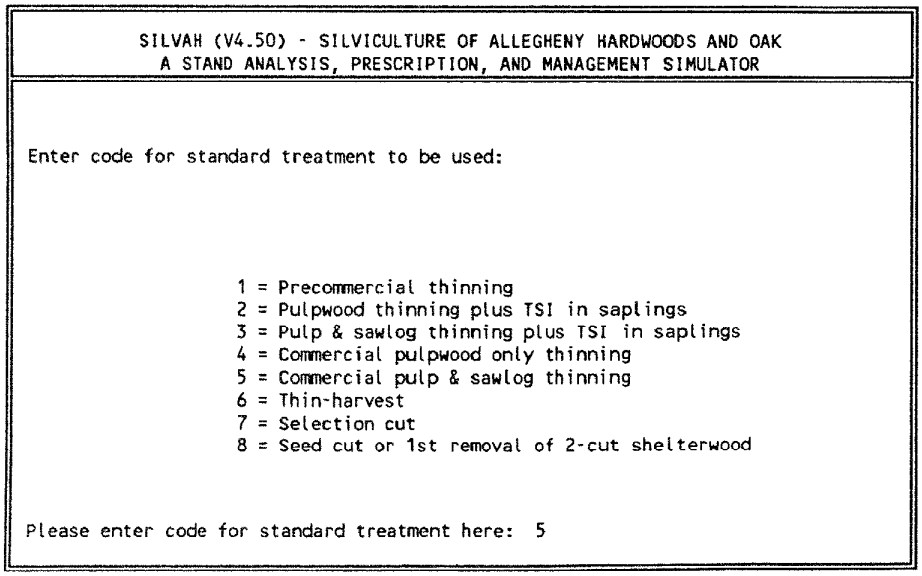


Figure 30.--Specifying treatment parameters to be modified.

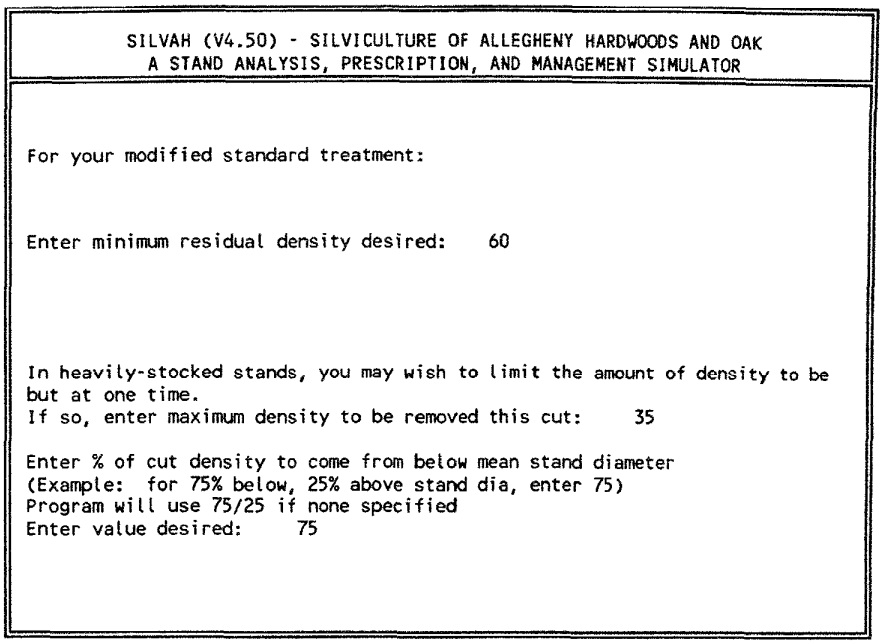
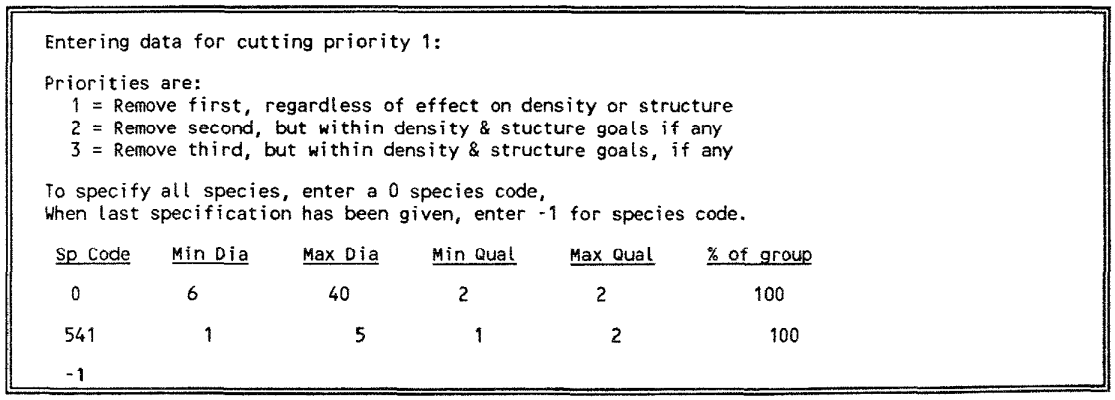


Figure 31.--Specifying which trees to cut in a build your own treatment.



If you choose to build your own treatment (rather than modifying a standard one), you will specify t first two treatment parameters in Figure 30 (those dealing with residual density), and then the screen Figure 31 will be presented three times--once for each of three priorities of cut.

The build your own treatment menu allows you to specify almost any kind of cut you desire. It can a little confusing until you have done it a few times. The two example lines shown in Figure 31 illustrate h the cut is specified.

The first line in the example specifies that 100 percent of the quality 2 (unacceptable) trees, all species, between 6 and 40 inches d.b.h. will be removed.

A priority 1 specification will result in removing all the specified trees, even if that leaves the stand understocked. A priority 2 or 3 specification would result in removing only enough of the specified trees to reach the residual density goal.

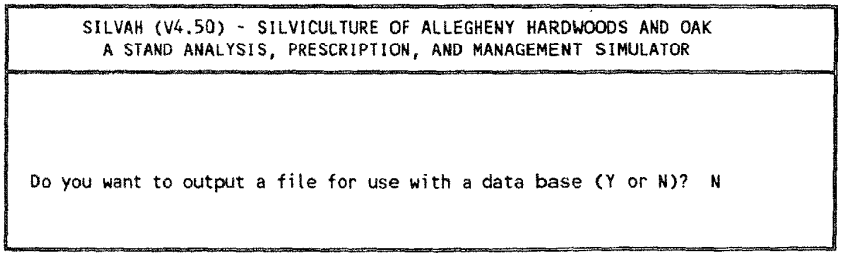
Note that a species code of 0 indicates all species. The second line specifies that 100 percent of the American beech (species code 541) in the sapling sizes (1 to 5 inches) be removed, regardless of quality. In the examples above, all of the specified trees would be removed under priority 1. Under priority 2 or 3, some might be kept if their removal would reduce density below the density goal specified.

Remember that you will get the same screen three times, once to specify each priority of cut. Anything you specify as priority 1 will be removed regardless of the effect it has on stand density or stand structure. Trees specified under priorities 2 and 3 will be removed only within the residual density and structure specification you made.

The only difference between priorities 2 and 3 is that trees specified in each are removed in sequence. All priority 2 trees are removed first, and priority 3 trees are removed only if there is still excess density above the residual goal.

Please note that in specifying species here, you **must** use the forest survey codes. Mnemonic and User-defined codes do not work. Yes, we realize that this is inconvenient, and we will fix it in an upcoming version.

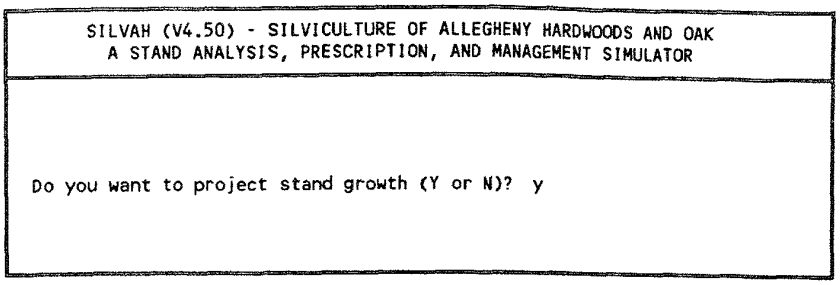
Figure 32.--Requesting that a database record be logged to a file.



The next option is used to specify data base outputs (Figure 32). If you answer yes to this question, SILVAH will write two files to your default data drive. One (called <base>.Dyy) will contain a summary of the stand data for use in building a forest-wide data base. The other (called <base>.Syy) will contain a condensed version of the original input data file. This latter file can be entered into SILVAH in the same manner as any other SILVAH data file. It is useful primarily during stand growth projections, when you may want to project a stand for x number of years and then output a file that you can reenter later for further projections (without having to re-project the original period).

As implied above, you can output these files for the original stand, or for any projected stands that result from stand growth simulation.

Figure 33.--Requesting that the stand be projected.



The screen above (Figure 33) appears if you are running interactively. If you answer yes, SILVAH will calculate expected mortality over the next 5-year period, and subtract it from the existing stand. Then, it will estimate growth on the surviving trees over the next 5 years, add that growth to the surviving trees, and create a new stand table. At this point, you will have all the options you had on the original stand--you can get any or all printouts, write a prescription, apply your own treatment, output data base files, and so on. And, you will then get a chance to project another 5 years. Be aware of the fact that you can generate a huge pile of printouts if you project for a long time period and get printouts at each 5-year period.

So, you can project for as many 5-year periods as you choose simply by answering yes to the projection question. As soon as you answer no, SILVAH processing will cease.

Note that SILVAH always projects on the **residual** stand. If there is no cutting, the residual is the same as the original, so you can project on the original simply by not asking for a prescription and not specifying an alternative cut. On the other hand, if you ask for a cut, the projection will occur on the residual stand after that cut has been removed.

Also note that there may be several residual stands calculated if you try several alternative cuts. The projection will be based on the **last** cut that you tried.

Figure 34.--Simplified projection specifications for the script file.

```
          SILVAH (V4.50) - SILVICULTURE OF ALLEGHENY HARDWOODS AND OAK
            A STAND ANALYSIS, PRESCRIPTION, AND MANAGEMENT SIMULATOR

You will have a chance to specify as many projection periods as you wish.  After
choosing one of the options below, this screen will reappear, so you can combine
projection periods with no printouts and/or no prescriptions, with projection
periods that contain them.  For this projection period, choose one of the
following:

Yrs projected?       Use SILVAH prescription?      Printouts each 5 yrs?

1)  you specify                 yes                          none
2)  you specify                  no                          none
3)  you specify                 yes                prescription, comparison
4)     5                  you specify                      you specify



Your choice?   1
```

If you are creating a script file, and you answer yes to the question about projecting stand growth, the screen above (Figure 34) will appear. Choice 4 lets you specify the projection for each 5-year period, just as you can when running interactively. But options 1, 2, and 3 simplify the projection specifications for most common situations. You can mix and match these choices to create any projection combination you desire.

You can choose to project using the SILVAH recommended prescriptions at each 5-year interval, and either get no printouts (option 1), or two printouts after each 5-year period (option 3). Or, you can choose to project with no treatments and no intermediate printouts (option 2).

No matter which options you choose, in either interactive or script mode, you will always get two summary printouts at the end of a projection run. These are the Stand Development summary, and the Product summary, covering the entire projection period.

Bear in mind that you can output a file to disk for any of the intermediate simulated stands, to use as a new starting point for additional projections. To do this, you must either run interactively, or choose option 4 in the script file for the time period that you want the data base file output.

Also bear in mind that SILVAH will project the **residual** stand after each 5-year period. So, if there is no cutting (the residual and before cut stands are thus equivalent), the projection continues on the before cut stand. But if there is a cutting, the projection continues on the trees left after the last cut that you specified.

CAUTION for Stand Growth Projection Users

The growth and mortality equations in SILVAH have been fairly well tested on 30- to 90-year-old, even-aged cherry-maple stands in northwestern Pennsylvania. Although there are equations for other northern hardwood species and for oaks in the program, the simulator itself has not been well-tested in stands where these other species dominate the species composition. We know that results are erratic in some oak-hickory stands, and in some northern hardwood stands dominated by sugar maple or beech. There is also

no ingrowth function in the program, so projections using uneven-age procedures should not be attempted for more than a 20- to 40-year period.

We are currently refining the simulator equations, and hope to have better equations soon. In the meantime, users are cautioned to treat simulation results for stands other than cherry-maple cautiously.

CREATE A BATCH JOB

If you want to run SILVAH numerous times, getting a series of printouts without having to wait for the program to finish processing each stand before you start the next, you can do so using the batch procedure. Before you start batch processing, you must create a batch file to specify which data files and which script files are to be used for each "run". Using this procedure, you can literally start SILVAH processing and go home for the night.

From the RUN SILVAH MENU, select option 2 by typing **2 [Enter]**. SILVAH will then ask three questions:

1. "Script file name ?" -- type in the name of the script file to be used for this run (if you do not specify an extension, SILVAH will use .SCR);

2. "How many files to be added together in this stand's printout ?" -- enter a number from 1 to 99 (this allows you to treat several stands as if they were one stand, combining data into a single printout. You could get total volume on a property, for example, by using this feature to add all stands together. Beware that prescriptions written for a "stand" that actually contains several different stand conditions may be meaningless);

3. "Path and name for data file ?" -- enter the name of the device on which the data file is stored, the subdirectory (if any) in which it is stored, and the data file name. If you do not type a file extension, SILVAH will use .SIL. Thus, to use a data file called MYFILE.SIL which is on disk drive B, you could type **B:MYFILE.SIL [Enter]**. If you told SILVAH that you would use drive B for data when you created your defaults file, you could simply type **MYFILE [Enter]**. In the latter situation, the program will automatically assume the device, path, and extension.

   If you are adding several files together, SILVAH will ask for the name of each file. Watch carefully, as only the sequence number of the file name message changes, and you may miss it.

After you have answered these three questions for the first "run", SILVAH will ask the same questions repeatedly for as long as you continue to supply answers. Each set of answers constitutes one "run", and will produce one set of printouts.

After all runs have been specified and SILVAH asks for the next script file name, just hit **[Esc]** (or hit the space bar, then the enter key). This will signify that you are done specifying the batch file. If you err, and hit the return here, just enter a zero when SILVAH asks how many files are to be added together. This too will signify that you are done specifying the batch file.

RUN SILVAH

Option 4 on the RUN SILVAH MENU is the one that actually runs the SILVAH program. Notice that the menu wording for this option is in three sections. That wording will change depending upon the runtime options you have selected in your defaults file, or via option 3.

If the defaults we coded into the program are used, the wording is "Run from script, include only live trees, send listings to printer".

The wording is, admittedly, cryptic; it had to be to fit in the menu. But it serves to remind you which options you have selected. When you choose option 4 and hit the enter key, SILVAH will run using the options indicated. To refresh your memory on what this wording means, and the alternative runtime options, see the section entitled "Change Runtime Options" in this Chapter.

Remember, that you must have a script file to run in script mode, and you must have both script and batch files to run in batch mode.

So, to run SILVAH, make sure that you have set the runtime options the way you want them, and that you have created any script or batch file you will use. Once these steps have been completed, you can run SILVAH over and over by simply hitting the Enter key from the RUN SILVAH MENU.

After you type **4 [Enter]** to run SILVAH, you will be asked a few questions, as follows:

Batch Mode

In batch mode you will not be asked any questions at all; SILVAH will read the batch file and do all processing based upon the instructions there.

Script Mode

In script mode you will be asked for:

1. The path and name for the script file. Type that information and hit the return key.

2. The number of files to be added together in this stand's printout. Enter a number from 1 to 99 (this allows you to treat several stands as if they were one stand, combining data into a single printout. You could get total volume on a property, for example, by using this feature to add all stands together. Beware that prescriptions written for a "stand" that actually contains several different stand conditions may be meaningless).

3. The data file(s) path and name. Type that information and hit the enter key.

Interactive Mode

In interactive mode you will be asked for:

1. The number of files to be added together in this stand's printout. Enter a number from 1 to 99 (this allows you to treat several stands as if they were one stand, combining data into a single printout. You could get total volume on a property, for example, by using this feature to add all stands together. Beware that prescriptions written for a "stand" that actually contains several different stand conditions may be meaningless).

2. The data file(s) path and name. Type that information and hit the enter key.

3. Answers to all of the questions about printouts, prescriptions, alternate cuts, data file output, and growth prescriptions that were described under "Creating a Script File" beginning with Figure 22.

Regardless of which mode you are using, SILVAH will go off with this information and run, presenting brief statements on the screen to let you know what it is currently doing. When the run is complete, you will be returned to the RUN SILVAH MENU.

Read Alternate Defaults File

If you wish to change the defaults file that SILVAH uses, choose option 5 from the RUN SILVAH MENU by typing **5 [Enter]**. You will then be asked for the path and file name for the defaults file you wish to use. Type that information, press **[Enter]**, and the new defaults file will be retrieved.

Quit

When you are done running SILVAH, choose option 6 from the RUN SILVAH MENU and hit the enter key. SILVAH will return you to the DOS prompt, from which you can run any other programs you wish--including the SILVAH editor (SILVED) or the SILVAH tree volume and value calculator (TREECALC).

CHAPTER 7--TREECALC, A VOLUME AND VALUE CALCULATOR

How many times have you asked yourself what the volume of an 18-inch black cherry tree was? Or, hat is the basal area or relative density of a tree? TREECALC can help answer these questions. It also ɜn be used to sum all of those values for a number of trees.

Originally, this program was designed just to check the values that SILVAH was printing. But we soon ɜalized that it was much more useful, and would serve as a general purpose electronic volume table and ɔrestry calculator.

The values that are displayed from TREECALC are identical to those that are used in SILVAH. Both ɾograms use the same subroutines, so they give the same results. In addition, this program reads the ame defaults file that is used by both SILVAH and SILVED.

To start the program, type **TREECALC [Enter]** at the DOS prompt. Then, type in the name of the lefaults file you want to use (or accept the default) when asked. A screen similar to the following one Figure 35) will be displayed. The only difference is that this sample screen displays the values calculated or an 18-inch black cherry tree. The initial display will be for a generic hardwood tree and with all values ɪt zero.

Figure 35.--TREECALC volumes and values for a sample tree.

TREECALC -- TREE VOLUME AND VALUE CALCULATOR
From SILVAH, NEFES, Warren Pa.

Sp code type	1	Log rule		1
Species	BC	D.b.h.		18.00
Quality	.00	Height		.00
Grade	.00	Defect		.00
Saw cf	1.00	Pulp cf		1.00
Form class	82.00	Ht adj		1.00
Saw ht	3.16	Pulp ht		5.99

	Logs	Veneer	Const	Bolts	Pulp	Val
Prices	182.00	750.00	3.33	2.00	2.00	.294

% Grade 3+	% Ven	% Grade 1	% Grade 2	% Grade 3
.91	.12	.69	.12	.07

	Pulp (CuFt)	Sawlogs (BF)	Total (CuFt)	Basal area
Gross vol	22.22	217.35	49.94	1.77
Net vol	17.78	197.13	39.96	Relative Den
Value ($)	.44	56.04	56.48	.59

[F1]=Help [F2]=Calculate [F3]=Zero Sums [F4]=Toggle Display Sums [F5]=Quit

You will notice that some of the values on the screen are dim (low contrast), some are bold (high contrast), and that one is highlighted in inverse video. The highlighted value is the current field. Dim values are ones that can be changed. And bold values are the answers that TREECALC computes.

To change any of the dim values, move to it with the arrow keys, type in the new value, and hit either the **[Enter]** key, one of the arrow keys, or one of the function keys. The value will be updated.

The values that can be changed (the ones displayed in low contrast) are described in various other places in this documentation. Specifically, the **Sp Code Type** and the **Ht. Adj.** are described in Chapter 4--entering identification data--and in Appendix A. The **Log Rule**, **Saw CF**, **Pulp CF**, **Form Class**, and **Prices** are described in Chapter 5--setting the default species parameters. The **Species**, **D.b.h.**, **Quality**, **Ht.**, **Grade**, and **Defect** are all described in Chapter 3--entering overstory data--and in Appendix A.

When you change species, all of the values on the screen will be reset to the default values. Make sure all values are set the way you want them before you calculate.

The help key, **[F1]**, will present a one line message that indicates what value needs to be entered in the field that is currently highlighted in inverse video. The messages are concise because of the limited space. If more help is needed, see the appropriate section in the documentation.

When you have entered all of the values on the tree for which you want volumes and values calculated, hit the **[F2]** key to calculate.

You can calculate volumes and values for several different diameters of any species quickly. Just position the cursor at the diameter field, enter the diameter and press **[F2]**. The cursor will remain at the diameter field. Then, just type in another diameter and hit the **[F2]** again. Likewise, you can change any of the other values, such as grades, heights, and so on, and calculate a series of answers very quickly.

The answers, displayed in bold include: **Saw Ht.** and **Pulp Ht.** These are based on local height equations, unless the height was entered. The **Val** field is a price relative, as described in the SETS equation system (see Chapter 9). The percentage breakdowns represent the proportion of trees that are grade 3 or better, and for those trees, the proportion that are grade 1, grade 2, grade 3, and veneer grade. The cubic volumes are calculated from Forest Service Region 9 equations. The board-foot volumes are calculated by the rule specified, using a generalized formulation of the Girrard-Messavage form class tables. The **Basal area** is the standard calculation based on the diameter. And the **Relative den** is the density accounted for by this tree.

You can also accumulate volumes and values for a number of trees. The calculated values at the bottom of the form are accumulated each time the calculate key, **[F2]**, is hit. You can display the total accumulations at any time by hitting the **[F4]** key. This key will toggle back and forth between the accumulated totals and the calculated values for a particular tree. Hitting the **[F3]** key will zero the accumulators so that you can start over again. The following screen (Figure 36) shows the values accumulated for five trees:

Figure 36.--TREECALC values accumulated for five sample trees.

TREECALC -- TREE VOLUME AND VALUE CALCULATOR
From SILVAH, NEFES, Warren Pa.

Sp code type	1	Log rule	1
Species		D.b.h.	18.00
Quality	.00	Height	.00
Grade	.00	Defect	.00
Saw cf	.00	Pulp cf	.00
Form class	.00	Ht adj	.00
Saw ht	.00	Pulp ht	.00

	Logs	Veneer	Const	Bolts	Pulp	Val
Prices	.00	.00	.00	.00	.00	.000

% Grade 3+	% Ven	% Grade 1	% Grade 2	% Grade 3
.00	.00	.00	.00	.00

Summation(N= 5)	Pulp (CuFt)	Sawlogs (BF)	Total (CuFt)	Basal area
Gross vol	132.62	1273.82	287.08	10.21
Net vol	106.10	1118.54	229.67	Relative Den
Value ($)	2.65	217.21	219.86	4.11

[F1]=Help [F2]=Calculate [F3]=Zero Sums [F4]=Toggle Display Sums [F5]=Quit

Notice that this screen displays zeros for the fields that are relevant only to a specific tree. It will display the accumulations for all volumes calculated since it was last zeroed. One additional field is displayed, the number of trees that are included in the sum. That is, the **Summation(N=)** field is displayed.

This calculator makes it easy to calculate the volumes, values, basal areas, and relative densities of any tree, and to sum these values for several trees.

CHAPTER 8--COMMON PROBLEMS

If you have problems with SILVAH, you may find the solution here. In this chapter, we describe some common problems and what to do about them.

If you cannot find the solution to your problem here, look through the table of contents and the index. If that fails, give us a call or write. Our address and phone number are in Chapter 2, and on the start-up screen for each program.

Please note that a problem report form (Figure 37) is included at the end of this chapter. If you write us about a problem, it will help if you fill out that form completely, and send us a copy of the data file, defaults file, and script or batch file you were running at the time the problem occurred.

Problem	Solution
1. Unable to install SILVAH so that any of the programs run.	ANSI.SYS and CONFIG.SYS must be in the root directory of your system disk. ANSI.SYS must be compatible with your version of DOS. Check to see that both files are present, that CONFIG.SYS contains the line "device=ansi.sys". Locate your DOS distribution disks and recopy ANSI.SYS to your system disk. See Chapter 3.
2. Programs were running, but will not load or run now.	Perhaps you started (booted) your computer with a disk that does not contain ANSI.SYS and CONFIG.SYS. Reboot with those files on the system disk. If that does not solve the problem, see problem 1.
3. My monitor has a border of inverse video surrounding the SILVAH screens.	You probably are using a version of ANSI.SYS that does not match your DOS. Locate your DOS distribution disk and replace the ANSI.SYS file on your system disk with the one that came with your DOS.
4. "ERROR: Cannot open file; EXITING" message appears, and program stops.	SILVAH could not find one of the files it needs in the place you told it to look (if you did not specify where, it looks on the DOS default drive). Check the directory for this file; or you may have mispelled the file name--try again; or you may have forgotten to swap diskettes--do so.
5. "Not ready error reading drive X; abort, retry, ignore?" message appears.	You do not have a diskette in a drive that SILVAH is trying to read. If printouts are going to a file, you must have a disk in the default listing drive. Be sure you have the proper diskette in each default drive, and that the drive is locked.

6. Some data fields in my printouts contain *****.	The value to be printed is too large for the space available. This usually means there is an error in the data somewhere. Look especially at the cruise type, BAF, plot size, or number of plots.
7. Data values are unreasonable.	Could be several things. Your acreage value or number of plots or prism factor or plot size may be in error. Or you may have specified the wrong overstory cruise type. Check these values.
8. All my species list as "Other Hardwoods".	You have used the wrong species code type in the identification data block.
9. Program stops with no error messages	Usually occurs when you are trying to print with printer not connected or off-line. Put printer on-line.
10. Volumes do not agree with those I usually use.	You probably use a different log rule, different minimum diameters, and so on. See Chapter 9 for a description of how SILVAH calculates volume. Call us if you want to discuss.
11. Sawlog stumpage prices shown in the Product listing do not agree with those I entered in the defaults file.	They are not supposed to. SILVAH sawlog stumpage prices reflect species, size, and grade in each stand, and will rarely equal the volume times the stumpage price. See Chapter 9 for a description of how SILVAH calculates sawlog value.
12. Program stops and returns to DOS, with an error message similar to: (1452) run-time error F4216: and so on.	An error occurred during processing. Usually the result of a data error, such as incorrect cruise type or coded value out of range. Although unlikely, it could also be an error we made in programming. If you cannot resolve it, write down all information on the screen, make a copy of the data file, and send it to us or call us.
13. When entering data into SILVED, some of it gets lost when I type fast.	The ANSI driver that comes with DOS does not buffer keystrokes very well, and this will happen if data entry is being done by a good typist. Try using NANSI.SYS (which we provided on the distribution diskette and renamed ANSI.SYS). It is better buffered, but could cause other problems, as described in problem 3.
14. SILVAH calculates pulpwood volumes, but I have no pulpwood market	Change the minimum diameter for pulpwood to 41" in the defaults file.
15. SILVAH prescribes partial cutting in stands where the volumes to be cut are too small to be economically feasible	Change the minimum volumes required for various types of cuts in your defaults file.

16. I would like to project stand growth for 40 years with no cuttings. It takes forever to answer all the questions to do that.

Create a script file, and choose option 3 in the projection menu. It does all that automatically. Similar shortcuts are available there if you want to use the SILVAH prescriptions.

17. "Species not found" error appears when I enter a species code into SILVED, even though I know that I have entered a valid code.

The species code type in the stand identification data is probably set for the wrong codes. Edit that field so that it contains the correct code.

18. I started to enter overstory data on a tree and made a typing error. But I cannot switch to edit mode or get off that line to correct it. It keeps beeping at me when I try.

You must enter species code, diameter, and quality for each tree before you can escape that line. Type in any value for each of those parameters, then hit the insert key and go back and edit them.

19. I am trying to enter regen data into SILVED, but when I try to type in the number of plots stocked, it will not accept the value. The error message says the value cannot exceed the total number of plots.

You probably did not enter the correct number of regen plots in the identification data. The total number of plots entered there must be at least as large as the number of plots stocked with any of the regen categories. Hit Pg Up to go back to the identification data screen, and correct the field containing number of regen plots.

Figure 37.--Problem Report Form.

PROBLEM REPORT FORM
SILVAH VERSION 4.50

Please provide as much information as possible about your problem. In addition, sending us a copy of the data file in use when the problem occurred would help us to diagnose and correct the problem.

Program in which problem occurred:		SILVED		SILVAH		TREECALC
Data file in use (send us a floppy with the file, if possible):						
Describe the problem:						
Please copy, as closely as possible, any error messages that appeared on your screen:						

SEND TO: Forestry Sciences Lab, P.O. Box 928, Warren, PA 16365 ATTN: SILVAH

CHAPTER 9--SILVAH DEFINITIONS AND REFERENCES

This chapter contains definitions, code values, output formats, and similar information on values calculated in the SILVAH program. It also cites some of the most important literature from which equations or measurement procedures were taken. There are many other publications from which general information was used, but these are cited in the summary publication on which SILVAH is based--"Prescribing Silvicultural Treatments in Hardwood Stands of the Alleghenies," USDA Forest Service General Technical Report NE-96 (Revised), 1992, by David A. Marquis, Richard L. Ernst, and Susan L. Stout.

COVER TYPES

Cover types in SILVAH are defined as follows:

1. Forest
2. Forest in the process of regenerating (seedling stand)
3. Opening
4. Pasture
5. Cropland
6. Wetland
7. Water
8. Urban
9. Unproductive

FOREST TYPES

Forest types in SILVAH have been defined using the proportion of total stand basal area represented by a particular species or species group. All trees 1.0" d.b.h. and larger are included in this determination.

The types recognized are:

Northern hardwood--stands that have at least 65 percent of the basal area in sugar maple, red maple, American beech, yellow birch, sweet birch, eastern hemlock, American basswood, cucumbertree, black cherry, white ash, or yellow-poplar.

Northern hardwood-hemlock--stands meeting the requirements for the northern hardwood type above that also have at least 50 percent of their basal area in eastern hemlock.

Allegheny hardwood--stands meeting the requirements for the northern hardwood type above that also have at least 25 percent of their basal area in black cherry, white ash, and yellow-poplar, and less than 50 percent of their basal area in eastern hemlock.

Oak-hickory--stands that have at least part of their basal area in any oak or any hickory species.

Transition--stands that have at least 65 percent of their basal area in species of either the northern hardwood or oak-hickory types, but do not qualify for any of the other types alone.

Unknown--any stand that does not qualify for one of the types above.

STAND SIZE CLASSES

Stand size classes used in SILVAH are based upon the average stand diameter; medial diameter (MD) of all trees 1.0" d.b.h. and larger is used in this calculation.

Note that the diameter breaking points for stand size classes do not correspond to the diameter breaking points for individual trees. For example, individual trees grow from the sapling class to the pole class when they exceed 5.5 inches d.b.h., but stands with a medial diameter of more than 4.5 inches are pole stands. This is because the stand diameter usually lags behind the average diameter of the crop trees in the stand.

The classes are:

1. Sapling stands--MD less than 4.5".

2. Small pole stands--MD between 4.5" and 7.5". Such stands will not support commercial cutting.

3. Large pole stands--MD between 7.5" and 10.5". These stands may support a combined commercial thin-TSI (timber stand improvement) if there is a good pulpwood market.

4. Small sawtimber stands--MD between 10.5" and 13.5". In most areas, small sawtimber stands will support commercial thinning.

5. Medium sawtimber stands--MD between 13.5" and 16.5". Medium sawtimber stands will support commercial thinning or thin-harvests.

6. Large sawtimber stands. MD larger than 16.5". Such stands usually have a MD in merchantable-size trees of 18" or more, and are economically mature.

STAND DENSITY CLASSES

The density classes recognized by SILVAH include:

A. Relative density over 95 percent. Such stands are at or near the maximum density possible, and should be the highest priority for partial cutting.

B. Relative density between 80 and 95 percent. Such stands are above the optimum density for best growth and should be thinned if the volumes available will permit a commercial sale. Urgency of cutting is less than that for class A stands.

C. Relative density between 50 and 80 percent. These stands are in the optimum density range for growth of high-quality sawtimber and veneer, and do not need partial cutting.

D. Relative density below 50 percent, but density of acceptable growing stock (AGS) above 35 percent. These stands are understocked, but still contain enough good trees to make further management worthwhile. They simply need time to accumulate additional growing stock.

E. Relative density of AGS below 35 percent. Such stands do not contain enough good trees to warrant further management. They are economically mature, and should be harvested.

Guidelines on evaluation of relative stand density are from:

Gingrich, S. F. 1967. Measuring and evaluating stand density in upland hardwood forests in the Central States. Forest Science. 13:38-53.

Roach, Benjamin A. 1977. A stocking guide for Allegheny hardwoods and its use in controlling intermediate cuttings. Res. Pap. NE-373. Upper Darby, PA: U.S. Department of Agriculture. Forest Service, Northeastern Forest Experiment Station. 30 p.

Stout, Susan L.; Marquis, David A.; Ernst, Richard L. 1987. A relative density measure for mixed-species stands. Journal of Forestry. 85:45-47.

VOLUME AND VALUE CALCULATIONS

Merchantable Heights

SILVAH will accept field measurements of sawlog merchantable height in 8-foot logs, and use that information in calculating volumes. If no heights are entered, SILVAH will calculate heights from equations of sawlog height as a function of species and d.b.h..

Pulpwood heights are always estimated by SILVAH (measurements of pulpwood height are not accepted).

Sawlog height equations were developed from data provided by the Allegheny National Forest and Hammermill Paper Co., and documented in:

Marquis, David A.; Ernst, Richard L.; Stout, Susan L. 1992. Prescribing silvicultural treatments in hardwood stands of the Alleghenies. Gen. Tech. Rep. NE-96 (Revised). Broomall, PA: U.S. Department of Agriculture. Forest Service, Northeastern Forest Experiment Station: 42-43.

The heights determined from the Hammermill data average about 25 percent lower than those from the Allegheny National Forest data. Since the Hammermill data correspond better with the volumes actually utilized for sawlogs, the Hammermill data are used.

Pulpwood height equations were developed from Allegheny National Forest data--no Hammermill data were available. To make the pulpwood heights correspond to the utilization standards of sawlogs, heights calculated by the equations are reduced 25 percent.

Both sawlog and pulpwood height equations return values only if the height is at least half of a full 8-foot bolt (0.5-0.9 bolts is rounded up to one full bolt). However, fractional bolts are retained for trees with more than 1.0 bolts. The sawlog height equation uses species and d.b.h.. For species on which height equations are unavailable, SILVAH uses equations for sugar maple, red maple, and northern red oak. Pulp equations use species, d.b.h., and age. If age is not provided, SILVAH uses 65 years.

Cubic Volumes

Cubic volumes are calcuated using a USDA Forest Service, Region 9, composite volume equation, documented in:

Marquis, David A. 1977. Volume tables for Allegheny hardwoods, 4110-FS-NE-1108-93. Progress Report dated Jan. 21, 1977, on file at the Forestry Sciences Laboratory, Northeastern Forest Experiment Station, Warren, PA.

Although there is a single equation for all species and form classes, correction factors may be used to adjust volumes to individual species. The equation uses d.b.h., pulpwood height in 8-foot bolts, and various transformations and interactions.

Volumes are returned for any tree with at least one half of an 8-foot bolt

Board Volumes

Sawtimber volumes are calculated for the International 1/4", Doyle, and Scribner log rules, as defined in the widely used Mesavage and Girard form-class volume tables. These volumes are approximated using a simplified series of equations developed by Wiant. Reference documents include:

Mesavage, Clement; Girard, James W. 1956. Tables for estimating board foot volume of timber. Washington, DC: U.S. Department of Agriculture Forest Service, 94 p.

Wiant, H. V., Jr.; Castenada, F. 1977. Mesavage and Girard's volume tables formulated. Denver, CO: U.S. Department of the Interior, Resource Inventory Notes, BLM 4:1-4.

Board volume equations use d.b.h., sawlog height in 8-foot logs, and form class. Correction factors also may be applied for each species. Volume is returned for any tree with at least one half of an 8-foot log.

Net Volumes

Gross sawlog volumes are reduced by the following

1. Defect percent (if observed)
2. Percent of sawlog size trees that do not qualify as at least grade 3 or 4 (either observed or estimated by SILVAH).

Gross pulpwood volumes are reduced by the following:

1. Defect percent (if observed).
2. Volume in tree that qualifies for sawlogs
3. 20 percent standard deduction to reflect typical utilization standards.

Grade

SILVAH will accept field measurements of grade, and use that information in calculating value. If no grade observations are entered, SILVAH will estimate grade based upon species and d.b.h.. Grade equations are based on data from both the Allegheny hardwood and the oak-hickory types:

Equations for black cherry, red maple, sugar maple, American beech, yellow birch, and black birch are based on: Ernst, Richard L.; Marquis, David A. 1979. Tree grade distribution in Allegheny hardwoods Res. Note NE-275. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 5p.

Equations for yellow-poplar, red oak, black oak, white oak, and chestnut oak are based on: Myers, John R.; Miller, Gary W.; Wiant, Jr., Harry V.; Barnard, Joseph E 1986 Butt-log grade distributions for five Appalachian hardwood species. Res. Paper NE-590. Broomall, PA: U.S Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 4p.

Species not listed above are calculated using species of similar form, if known. For example, white ash, cucumber, and basswood use the yellow-poplar equations. For species of unknown form, the beech-birch equations are used.

Veneer is estimated at a straight 15 percent of the grade 1 butt logs

In all situations, the proportions calculated above are used for trees entered into SILVAH on which grade was not recorded. When grade is recorded, SILVAH considers 100 percent of the butt log to be the grade recorded, while grade distribution for the upper logs (above the first two 8-foot bolts) is calculated as described.

Value

Values are assigned on the basis of the volume within each product and grade, as determined either by actual measurments or by the SILVAH equations.

Pulpwood, firewood, local bulk product, local sawlog product, and veneer values are calculated simply as the volume in that product times the stumpage value for that product entered by the user.

Factory grade sawlogs are evaluated from extensive sawmill recovery data These data show the average proportion of the various grades of lumber that can be sawn from trees of a given species, d b h , height, and butt-log grade. From these data (equations), a tree quality index is calculated representing the relative value of the lumber that can be sawn from that tree. That relative value is also a function of the stumpage value entered by the user. To get total lumber value in the tree, the value relative is multiplied by the sawlog volume.

Conversion costs are then subtracted from the lumber value These costs reflect the average cost of harvesting and transporting the log. They are a function of diameter (it is more economical to harvest and transport larger diameter logs). All these procedures are documented in:

Debald, Paul S.; Mendel, Joseph. 1976. An individual-tree approach to making stand evaluations. SETS Stand Evaluation Tools 1. Res. Paper NE-336. Upper Darby, PA. U S Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 13p.

Mendel, J.J.; Debald, P.S.; Dale, M.E. 1976. Tree value conversion standards for hardwood sawtimber. SETS: Stand Evaluation Tools 2. Res. Paper NE-337. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 74p.

Debald, Paul S.; Mendel, Joseph J. 1976. Composite volume and value tables for hardwood pulpwood. SETS: Stand Evaluation Tools 3. Res. Paper NE-338. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 43p.

Since the tree quality index and relative value of a tree (under this procedure) are functions of diameter and merchantable height, the value per mbf is not constant. Instead, it varies from one stand to the next. So, stumpage value for factory logs rarely will be equal to the volume times the stumpage value entered by the user. This is an important advantage to the SILVAH program, as the value calculated reflects the size, height, and quality of the trees in the individual stand.

When entering stumpage values for sawlogs, use a woods run average over many sales. This will be approximately the value for a 16" d.b.h. tree.

REGENERATION

Advance Regeneration Guidelines

Guidelines for advance regeneration and interfering understory plants come from numerous sources. Some of the most important are:

Marquis, David A.; Bjorkbom, John C. 1982. Guidelines for evaluating regeneration before and after clearcutting Allegheny hardwoods. Res. Note NE-307. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 4p.

Marquis, David A.; Ernst, Richard L.; Stout, Susan L. 1992. Prescribing silvicultural treatments for hardwood stands of the Alleghenies. Gen. Tech. Rep. NE-96 (Revised). Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 102p.

Marquis, David A. 1987. Assessing the adequacy of regeneration and understanding early development patterns. In Nyland, Ralph D. (Ed). Managing northern hardwoods, Proceedings of a Silvicultural Symposium, 23-25 June 1986, Syracuse, NY.

Marquis, David A. 1982. Effect of advance seedling size and vigor on survival after clearcutting. Res. Pap. NE-498. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 7p.

Sander, Ivan L.; Johnson, Paul S.; Watt, Richard F. 1976. A guide for evaluating adequacy of oak advance reproduction. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 7p.

Oak stump sprouting is modified from the published procedure (Sander et al 1976) as follows:

1. Number of stumps expected to sprout is calculated from overstory data on oak species and d.b.h, without modification.

2. Number of regeneration plots expected to be stocked with oak sprouts at age 20 is also calculated, then reduced by 50 percent in areas with high deer population.

3. Again, in areas with high deer population, an additional requirement is added: no more than 20 percen of the regeneration plots can be considered stocked with oak sprouts; the remaining 50 percent (tc meet minimum requirements of 70 percent stocking) must contain advance regeneration.

Information on soil-site characteristics and limitations for regeneration are from

Auchmoody, L.R. 1983. Northeastern Forest Soils Conference 1983. 1983 July 24-26; Warren, PA. Warren, PA: U.S. Department of Agriculture, Allegheny National Forest. 83p

Seed Source Adequacy

Guidelines on seed source adequacy are adapted from information published in:

Bjorkbom, John C. 1979. Seed production and advance regeneration in Allegheny hardwood forests. Res. Pap. NE-435. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 10p.

Marquis, David A.; Ernst, Richard L.; Stout, Susan I. 1992. Prescribing silvicultural treatments for hardwood stands of the Alleghenies. Gen. Tech. Rep. NE-96 (Revised) Broomall PA. U.S Department of Agriculture, Forest Service, Northeastern Forest Experiment Station 102p

Herbicide Treatments

Information on herbicide efficacy and application techniques is from

Horsley, S.B. 1981. Control of herbaceous weeds in Allegheny hardwood forests with herbicides Weed Science. 29:655-662.

Horsley, Stephen B. In press. Control of understory vegetation in Allegheny hardwood stands with Oust. Northern Journal of Applied Forestry.

Horsley, S. B.; Bjorkbom, J.C. 1983. Herbicide treatment of striped maple and beech in Allegheny hardwood stands. Forest Science. 29:103-112

Fertilization Treatments

Guidelines on aerial fertilization of regeneration are from:

Auchmoody, L.R. 1986. Fertilizing Appalachian hardwoods. In: Guidelines for Managing Immature Appalachian hardwood stands; 1986 May 28-30, Morgantown WV SAF Publ 86-02 Morgantown, WV West Virginia University Books: 208-220.

Nelson, Brad; Auchmoody, L. R. 1987. Fertilization of young clearcuts In Deer, forestry, and agriculture interactions and strategies for management. 1987 June 15-17 Warren PA. [Place of publication unknown] Plateau and Northern Hardwood Chapters, Allegheny Society of American Foresters 108-117

Deer Impact Assessment and Deer Protection

Guidelines on deer impact and protection are from

Marquis, David A. 1987. Silvicultural techniques for circumventing deer damage. In: Deer, forestry, and agriculture: interactions and strategies for management. 1987 June 15-17; Warren, PA. Warren, PA; Plateau and Northern Hardwood Chapters, Allegheny Society of American Foresters. 125-136.

Kochel, Jeff; Brenneman, Ron. 1987. Use and effectiveness of electric fencing in protecting clearcuts from deer browsing. In: Deer, forestry, and agriculture: interactions and strategies for management; 1987 June 15-17; Warren, PA. [Place of publication unknown]; Plateau and Northern Hardwood Chapters. Allegheny Society of American Foresters.

STAND CULTURE GUIDELINES

There are many sources of stand culture guidelines. Those used in SILVAH include the following:

Marquis, David A. 1978. Application of uneven-aged silviculture and management on public and private lands. In: Uneven-aged silviculture and management in the United States. Gen. Tech. Rep. WO-24. Washington, DC: U.S. Department of Agriculture, Forest Service, Timber Management Research: 25-61.

Marquis, David A. 1981. Survival, growth, and quality of residual trees following clearcutting in Allegheny hardwoods. Res. Pap. NE-477. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 90p.

Marquis, David A. 1986. Thinning Allegheny hardwood pole and small sawtimber stands. In: Guideline for managing immature Appalachian hardwood stands: 1986 May 28-30; Morgantown, WV. SAF Publ. 86-02. Morgantown, WV: West Virginia University Books: 68-84.

Marquis, David A., Ernst, Richard L. 1991. The effects of stand structure after thinning on the growth of an Allegheny hardwood stand. Forest Science. 37(4):1182-1200.

Marquis, David A.; Ernst, Richard L.; Stout, Susan L. 1992. Prescribing silvicultural treatments for hardwood stands of the Alleghenies. Gen. Tech. Rep. NE-96 (Revised). Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 102p.

Marquis, David A.; Somerville, James; Johnson, Eli. 1980. Northern Hardwoods. In: National Forest Landscape Management, Vol. 2, Ch. 5 (Timber). Agric. Hdbk. 559. Washington, DC: U.S. Department of Agriculture. 118-145.

Roach, Benjamin A.; Gingrich, Samuel F. 1968. Even-aged silviculture for upland central hardwoods. Agric. Hdbk. 355. Washington, DC: U.S. Department of Agriculture: 39p.

GROWTH PROJECTIONS

Growth and Mortality Equations

The growth and mortality equations in SILVAH are from:

Hilt, Donald E. 1985. OAKSIM: An individual-tree growth and yield simulator for managed even-aged upland oak stands. Res. Pap. NE-562. Broomall, PA: U S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 21p.

Marquis, David A. 1982. SIMAH: a stand growth simulator for Allegheny Hardwoods. Unpublished office report on file at the Forestry Sciences Laboratory, Northeastern Forest Experiment Station.

The equations for Allegheny hardwoods estimate growth and mortality using the following individual tree and stand parameters:

1. Relative diameter (d.b.h/stand diameter).
2. Stand density (relative stand density).
3. Species.
4. Site index (oaks only).
5. Age.

TREATMENT CODES

Treatment codes used in SILVAH and output to the data base file are as follows

0) No Treatment Prescribed
100) Precommercial Thinning
210) Combined TSI-Thinning (Integrated)
220) Combined TSI-Thinning (Pulp Only)
310) Commercial Thinning (Integrated)
320) Commercial Thinning (Pulp Only)
400) Combined Thin-Harvest Cutting
700) Group or Single Tree Selection Cut
710) Group or Single Tree Selection Cut
800) Group or Single Tree Selection Cut
900) Do Nothing or Re-Examine Objective
1000) Do Nothing or Re-Examine Objective
1100) Do Nothing or Re-Examine Objective
1200) Do Nothing or Re-Examine Objective
1300) Do Nothing or Re-Examine Objective
501) Clearcut or Final Removal Cut
502) Clearcut or Final Removal Cut
503) Clearcut or Final Removal Cut
504) Shelterwood Seed Cut
505) Shelterwood Seed Cut
506) Shelterwood Seed Cut
507) Shelterwood Seed Cut
508) Shelterwood Seed Cut

509) Shelterwood Seed Cut
510) Shelterwood First Removal Cut
511) Shelterwood First Removal Cut
512) Herbicide and/or Fencing
513) Herbicide and/or Fencing
514) Herbicide and/or Fencing
517) Do Nothing or Re-Examine Objective
520) Shelterwood First Removal Cut
521) Shelterwood First Removal Cut
531) Clearcut or Final Removal Cut and/or Fencing
532) Clearcut or Final Removal Cut and/or Fencing
534) Shelterwood Seed Cut and/or Fencing
535) Shelterwood Seed Cut and/or Fencing
536) Shelterwood Seed Cut and/or Fencing
537) Shelterwood Seed Cut and/or Fencing
538) Shelterwood Seed Cut and/or Fencing
539) Shelterwood Seed Cut and/or Fencing
540) Shelterwood First Removal Cut and/or Fencing
541) Shelterwood First Removal Cut and/or Fencing
551) Shelterwood First Removal Cut and/or Fencing
561) Artificial Regen and/or Fencing
562) Artificial Regen and/or Fencing
563) Artificial Regen and/or Fencing
564) Artificial Regen and/or Fencing
601) Clearcut or Final Removal Cut
602) Clearcut or Final Removal Cut

RECORD TYPE

Record types defined in SILVAH and output to the data base summary file are as follows:

1 Original stand
2 Cut stand
3 Residual stand
4 Simulated stand
5 Cut from a simulated stand
6 Residual of a simulated stand

FILE FORMATS

SILVAH Data File (.SIL or .Syy)

All of the data files read and written by the SILVAH system have the same format. This includes the files created with the editor (.SIL extension), and the intermediate stand files written during stand growth projection (.Syy extension). The data are written in plain ASCII text, and can be edited with any text editor or word processor with text mode. However, you must exercise caution if you do edit these files since they require a strict format. The SILVED editor is the preferred means of editing, since it assures that the format of the file conforms to this standard. By writing these files as text files, they can be moved to other hardware (that is, mini and mainframe computers) to be processed, or they may be reformatted for entry into other programs.

.SIL and .Syy files are sequentially accessed files with a record length of 16 characters. They contain five different kinds of data. These are stand identification data, standard (checkmark) regen data, extendec regeneration data, overstory data, and adjustment factor data. Although .SIL and .Syy files contain data in the same basic format, there are a few significant differences between the files.

.SIL files are created by the SILVED editor and contain raw stand data. .SIL files contain stand identification information, standard regen data, possibly extended regen data, and overstory data. Note that the overstory observations are the same as those input by the user (i.e. individual tree data has not been processed into a stand table format).

.Syy files are created by the database output option and contain processed stand data (i.e. data which has been run through SILVAH and summarized). .Syy files contain stand identification information, standard regen data, overstory data, and adjustment factor data. Note that .Syy files do not contain extended regeneration data or individual tree data, even if the original .SIL file contained these types of data. Instead, .Syy files depict extended regeneration data after it has been processed into a standard (checkmark) tally, and individual tree data after it has been summarized into stand table format. In addition, since adjustment factors cannot be calculated from the stand table data in any .Syy file, adjustment factors for the stand are saved at the end of the file and read back in when the file is processed.

The following table summarizes the data blocks, records, and fields that occur in .SIL and .Syy files. It provides a brief description of each data block, each record within a datablock, and each field within a record. Valid field types are either alphanumeric or numeric.

Table 4. SILVAH data file format

Line	Columns	Type	Description
1	1-4	A	SILVAH version number
	5-9	N	Overstory data flag. If this value is 0, no overstory data is in the file. If this value is 999, overstory data is present in the file.
2	1-5	N	Adjustment factor data flag. If this value is 0, adjustment factors are not present in the file. If this value is 999, adjustment factors are present in the file.
3	1-16	A	Owner/Agency
4	1-16	A	Forest/Property
5	1-16	A	County/District
6	1-6	A	Compartment/Unit
	7-12	A	Stand Number
7	1-16	A	Remarks, first 16 characters
8	1-16	A	Remarks, characters 17 to 32
9	1-16	A	Remarks, characters 33 to 48
10	1-16	A	Remarks, characters, 49 to 64
11	1-4	A	Remarks, characters, 65 to 68
12	1-1	N	Species code type
	2-2	N	classes used
	3-4	N	Month of inventory
	5-8	N	Year of inventory
	9-9	N	Overstory cruise type
	10-12	N	Number of overstory plots
13	1-6	N	Basal area factor or plot size
	7-7	N	Regeneration cruise type
	8-10	N	Number of regeneration plots
	11-11	N	Regeneration plot size
14	1-6	N	Acreage in stand
	7-9	N	Actual stand age
15	1-1	N	Cover type
	2-3	N	Habitat type
	4-7	N	Soil type
	8-9	N	Site class
	10-12	A	Site species
	13-15	N	Site index
16	1-4	N	Height adjustment
	5-8	N	Diameter adjustment
	9-12	N	Elevation
	13-15	N	Aspect
17	1-2	N	Slope
	3-4	N	Topographic position
	5-5	N	Operability
	6-6	N	Access
	7-7	N	Water code
	8-8	N	Water code

Line	Columns	Type	Description
18	1-3	N	Clearcuts within 1 mile
	4-6	N	Cultivation within 1 mile
	7-9	N	Openings within 1 mile
	10-10	N	Water code
19	1-1	N	Management goal
	2-2	N	Management value
	3-3	N	Deer pressure
	4-4	N	Gypsy moth
	5-5	N	Stress

STANDARD REGENERATION DATA BLOCK (REQUIRED)

This data block follows the stand identification block and contains regeneration data in standard checkmark format. The standard regeneration data block is always present in .SIL and .Syy files, even when extended regen data is also present in the file. However, when extended regen data is present in the file, the fields in the following records will have a value of 0.

20	1-4	N	Black cherry regen
	5-8	N	Small oak regen
	9-12	N	Other desirable regen
	13-16	N	All desriables
21	1-4	N	Large oak
	5-8	N	Any small regen
	9-12	N	Residuals
	13-16	N	Any regen or residuals
22	1-4	N	Sapling regen
	5-8	N	Woody interference
	9-12	N	Laurel or rhododendron
	13-16	N	Ferns
23	1-4	N	Grasses
	5-8	N	Any interference
	9-12	N	Grapevines
24			Reserved for future use

EXTENDED REGENERATION DATA BLOCK (OPTIONAL)

This data block follows the standard regeneration block and only occurs in .SIL files and then only when extended regeneration data is input by the user. It consists of a series of repeating records - one record for each non-zero cell in the extended regen section of the field tally sheet. A trailer record with a "-1" in the species code column indicates the end of this data block. The regeneration class codes displayed in the file are derived from the classes displayed on the extended regeneration input screen and are coded in the following manner:

BCR - Black cherry	WDY - Woody interference
SOK - Small oak regen	L&R - Laurel & rhododendron
ODR - Other desirable regen	FRN - Ferns
LOK - Large oak	GRS - Grasses
RSD - Residuals	GRP - Grapevines
SAP - Sapling	LMT - Site limits

25+	1-3	A	Regeneration class code (see above)
	4-7	N	Extended regen plot number
	7-11	N	Regen count, species code, or code for class

Line	Columns	Type	Description
			OVERSTORY DATA BLOCK (OPTIONAL)
This data block follows the standard and/or extended regeneration data block (s). It consists of a series of repeating records - one record for each overstory observation. A zero in the species column indicates the end of an overstory plot, and the value that follows in the diameter column is the plot number. A "-1" in the species column indicates the end of the stand. This trailer record must appear in the file, even if there is no overstory data.			
1+	1-3	N	Species code
	4-5	N	Diameter
	6-6	N	Quality
	7-12	N	Height or count
	13-13	N	Grade
	14-14	N	Percent defect
	15-15	N	Crown condition
	16-16	N	Wildlife code
			ADJUSTMENT FACTORS DATA BLOCK (OPTIONAL)
1	1-9	N	Height adjustment over all qualities
2	1-9	N	Height adjustment for AGS
3	1-9	N	Height adjustment for UGS
4+	1-2	N	Species code index
	3-4	N	Quality class index
	5-6	N	Product class index
	7-15	N	Adjustment factor

Database file (.Dyy)

Data base files are written by SILVAH. They contain stand parameter information for the initial as well as projected (simulated) stands. They are identified by an extension of .Dyy, where yy is the year. This extension will be appended to the base name of the data file. So, for a multiple period projection, there will be one file for each projection period. The files are plain ASCII text files with the format described in Table 5. This text file can be imported into a data base, using whatever software is available.

Table 5. Data base output file format

Line	Columns	Type	Description
1	1-8	A	Base name of file
	9-12	A	Extension of output file
	13-16	A	SILVAH Version number
2	1-16	A	Owner/Agency
3	1-16	A	Forest/Property
4	1-16	A	County/District

Line	Columns	Type	Description
5	1-6	A	Compartment/Unit
	7-12	A	Stand number
6	1-16	A	Remarks
7	1-16	A	Remarks continued
8	1-16	A	Remarks continued
9	1-16	A	Remarks continued
10	1-16	A	Remarks continued
11	1-3	N	Month tallied
	4-8	N	Year tallied
	9-10	N	Overstory cruise type
	11-14	N	Number of overstory plots
12	1-10	N	Prism basal area factor, or fixed plot area
13	1-2	N	Regeneration cruise type
	3-6	N	Number of regeneration plots
	7-8	N	Regeneration plot size
14	1-10	N	Acreage in stand
	11-14	N	Actual stand age
15	1-1	N	Covet type
	2-3	N	Habitat type
	4-7	N	Soil type
	8-9	N	Site class
	10-12	N	Site species
	13-15	N	Site index
16	1-8	N	Height adjustment
	9-16	N	Diameter growth adjustment
17	1-5	N	Elevation
	6-10	N	Aspect
	11-13	N	Slope percent
	14-16	N	Topographic position
18	1-2	N	Operability
	3-4	N	Access
	5-6	N	Water code
	7-8	N	Water code
	9-12	N	Clearcut acres within 1 mile
	13-16	N	Cultivated acres within 1 mile
19	1-4	N	Open acres within 1 mile
	5-6	N	Water code within 1 mile
	7-10	N	Percent of plots with site limitations
20	1-3	N	Management goals
	4-6	N	Management value
	7-9	N	Deer pressure
	10-12	N	Gypsy moth
	13-15	N	Stress in past 5-10 years
21	1-4	N	Percent of plots with black cherry regen
	5-8	N	Percent of plots with small oak regen
	9-12	N	Percent of plots with other desirable regen
	13-16	N	Percent of plots with desirable regen
22	1-4	N	Percent of plots with large oak regen
	5-8	N	Percent of plots with any small regen
	9-12	N	Percent of plots with residuals
	13-16	N	Percent of plots with any regen or residuals
23	1-4	N	Percent of plots with sapling regen
	5-8	N	Percent of plots with woody interference
	9-12	N	Percent of plots with laurel or rhododendron
	13-16	N	Percent of plots with ferns
24	1-4	N	Percent of plots with grasses
	5-8	N	Percent of plots with any interference
	9-12	N	Percent of plots with grapevines
	13-16	N	Seed source index

Line	Columns	Type	Description
25	1-4	N	Regeneration difficulty
	5-8	N	Oak sprout potential (stumps/acre)

Lines 26 through 40 are repeated three times: once for the original, once for the cut, and once for the residual stand. All three groups are output in every data base summary file, even if there is no cut or residual stand. Then, the cut values will be zero, and the residual values will be the same as the original values.

26	1-2	N	Cover type
	3-4	N	Forest type
	5-6	N	Stand size code
	7-8	N	Stand density code
	9-12	N	Treatment code
27	1-6	N	Year tallied (or projected)
	7-8	N	Record type
	9-12	N	Sapling basal area
	13-16	N	Pole basal area
28	1-4	N	Small sawtimber basal area
	5-8	N	Medium sawtimber basal area
	9-12	N	Large sawtimber basal area
	13-16	N	Total basal area
29	1-4	N	Percent black cherry basal area
	5-8	N	Percent white ash basal area
	9-12	N	Percent yellow-poplar basal area
	13-16	N	Percent cucumber basal area
30	1-4	N	Percent basswood basal area
	5-8	N	Percent sugar maple basal area
	9-12	N	Percent red maple basal area
	13-16	N	Percent American beech basal area
31	1-4	N	Percent yellow birch basal area
	5-8	N	Percent sweet birch basal area
	9-12	N	Percent paper birch basal area
	13-16	N	Percent eastern hemlock basal area
32	1-4	N	Percent spruce/fir basal area
	5-8	N	Percent pine basal area
	9-12	N	Percent northern red oak basal area
	13-16	N	Percent white oak basal area
33	1-4	N	Percent chestnut oak basal area
	5-8	N	Percent other oaks basal area
	9-12	N	Percent hickory basal area
	13-16	N	Percent aspen basal area
34	1-4	N	Percent acceptable growing stock (AGS)
	5-8	N	Medial stand diameter
	9-12	N	Medial diameter for merchantable trees
	13-16	N	Quadratic stand diameter
35	1-4	N	Years to maturity
	5-8	N	Effective age
	9-12	N	"q" factor for uneven-age stand structure
	13-16	N	Weibull c factor for even-age stand structure
36	1-6	N	Number trees per acre
	7-11	N	Relative stand density
	12-16	N	AGS relative stand density
37	1-8	N	Gross total cubic-foot volume per acre
	9-16	N	Net total cubic-foot volume per acre
38	1-8	N	Net pulpwood cubic-foot volume per acre
	9-16	N	Gross board-foot volume per acre - user specified log rule
39	1-8	N	Net board-foot volume per acre - user specified log rule
	9-16	N	Dollar value per acre

Line	Columns	Type	Description
40	1-8	N	Mortality
	9-16	N	Unused at present

Lines 41 through 55 are for the cut stand, and contain the same information as lines 26 through 40.

Lines 56 through 70 are for the residual stand, and contain the same information as lines 26 through 40.

APPENDIX A--CODES AND DEFINITIONS FOR SILVAH INPUT DATA

TALLY FORMS

Figure 38 is the SILVAH tally form. It contains space to record stand identification data, regeneration (understory) data, and overstory data in individual tree format. There is space for 4 to 8 prism plots and their associated regeneration plots on each page of the form. Additional pages are used to accommodate additional plots. The form also is used for fixed-area cruises if trees are recorded individually. For most purposes, this is the only form needed. However, a variation that splits the data into two separate forms is also available (Figure 39, 40). Use whichever you find most convenient, or devise your own variation.

Identification Data

The identification data block (Figure 38) contains information needed to identify the stand, information on the cruise procedures used, and basic data on stand and site factors and management goals. Data are obtained from management plans, soil-site maps, aerial photographs, wildlife agency reports, and so on.

Owner/Agency -- List the owner or administering agency. For example: USDA Forest Service; Pennsylvania Bureau of Forestry; International Paper Company; John Doe.

Forest/Property -- List the name or identification of the property. For example: Allegheny National Forest; Elk State Forest; McKean-15; South Woodlot.

County/District -- List county or district in which property is located, if desired, or other information needed to identify it.

Compartment/Unit -- List compartment or other subdivision unit number or name, if there is one.

Stand Number -- List stand number, if there is one.

Remarks -- Add further identification or description of the stand, up to 70 characters.

Cruise Information

Record information on the cruising procedures used during the inventory of this stand, as follows:

Species codes -- Enter code for type of species codes used:

1 - mnemonic codes
2 - user-defined codes
3 - forest survey codes

d.b.h classes -- Enter code for d.b.h. classes used:

1 - 1-inch classes
2 - 2-inch classes
3 - 5 major size classes (saplings, poles, small sawtimber, medium sawtimber, large sawtimber)

Tally Month and Year -- Enter month and year of inventory.

Overstory cruise Type -- Enter code value for overstory cruise type:

1 - Prism cruise, individual trees, height recorded in column 4, plots recorded separately. Either record grades for all trees or record grades for none of the trees. See also code 7.

2 - Prism cruise, individual trees, counts recorded in column 4, plots recorded separately.

3 - Prism cruise, dot tally, all plots tallied together.

4 - Fixed-area cruise, individual trees, height recorded in column 4, plots recorded separately. Either record grades for all trees or record grades for none of the trees. See also code 8.

5 - Fixed-area cruise, individual trees, count recorded in column 4, plots recorded separately.

6 - Fixed-area cruise, dot tally, all plots tallied together (stand table).

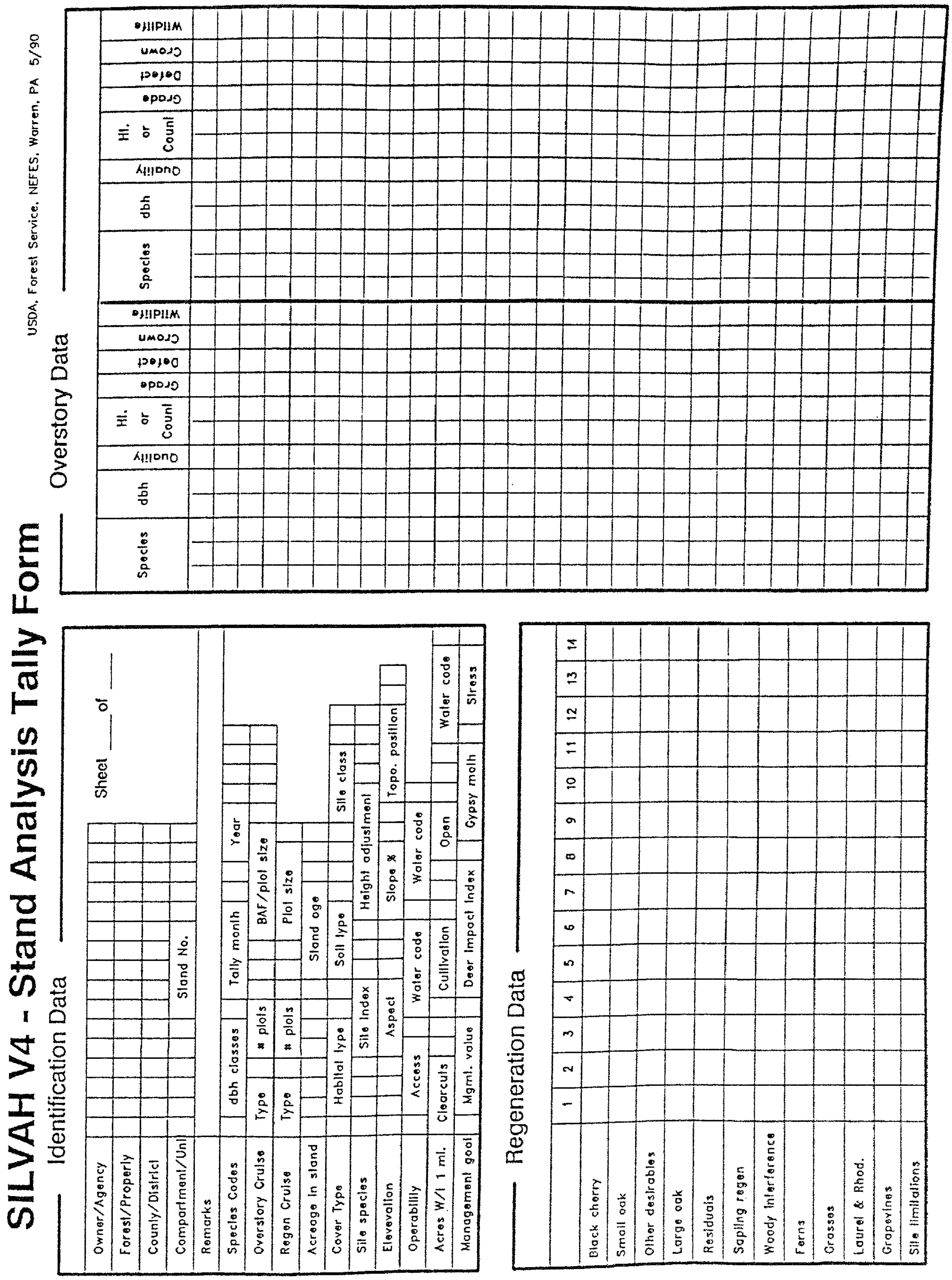
7 - Prism cruise, individual trees, height recorded in column 4, plots recorded separately. Record only major products, that is, cull (grade 8) and sawtimber with only pulp volume (grade 6). Similar to type 1, but used where you want accurate volumes and values without grading all trees.

8 - Fixed-area cruise, individual trees, height recorded in column 4, plots recorded separately. Record only major products, that is, cull and sawtimber with only pulp volume. Similar to type 4, but used where you want accurate volumes and values without grading all trees.

0 - No overstory data

 # plots -- Enter number of overstory plots tallied in this stand.

Figure 38.--SILVAH Stand Analysis Tally Form - V4



SILVAH V4 - Stand Analysis Tally Form

USDA, Forest Service, NEFES, Warren, PA 5/90

Sheet ____ of ____

Identification Data

Owner/Agency

Forest/Property

County/District

Compartment/Unit — Stand No.

Remarks

Species Codes — dbh classes — Tally month — Year

Overstory Cruise — Type — # plots — BAF/plot size

Regen Cruise — Type — # plots — Plot size

Acreage in stand — Stand age

Cover Type — Habitat type — Soil type — Site class

Site species — Site index — Height adjustment

Elevevation — Aspect — Slope % — Topo. position

Operability — Access — Water code — Water code

Acres W/I 1 mi. — Clearcuts — Cultivation — Open — Water code

Management goal — Mgmt. value — Deer Impact Index — Gypsy moth — Stress

Overstory Data

Species	dbh	Quality	Ht. or Count	Grade	Defect	Crown	Wildlife	Species	dbh	Quality	Ht. or Count	Grade	Defect	Crown	Wildlife

Regeneration Data

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Black cherry														
Small oak														
Other desirables														
Large oak														
Residuals														
Sapling regen														
Woody interference														
Ferns														
Grasses														
Laurel & Rhod.														
Grapevines														
Site limitations														

Figure 39.--SILVAH ID & Regen Tally Form

SILVAH - ID & Regen Tally Form

USDA, Forest Service, NEFES, Warren, PA 1/91

Identification Data

Sheet ____ of ____

Owner/Agency							
Forest/Property							
County/District							
Compartment/Unit		Stand No.					
Remarks							
Species Codes	dbh classes	Tally month	Year				
Overstory Cruise	Type	# plots	BAF/plot size	.			
Regen Cruise	Type	# plots	Plot size				
Acreage in stand		Stand age					
Cover Type	Habitat type	Soil type	Site class				
Site species	Site Index	Height adjustment					
Elevation	Aspect	Slope %	Topo. position				
Operability	Access	Water code	Water code				
Acres W/I 1 mi.	Clearcuts	Cultivation	-	Open	Water code		
Management goal	Mgmt. value	Deer impact index	Gypsy moth	Stress			

Notes

Regeneration Data

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	#	%
1 Black cherry																						
2 Small oak																						
3 Other desirables																						
4 All desirables 1+2+3																						
5 Large oak																						
6 Any small regen 1,2,4, or 5																						
7 Residuals																						
8 Any regen or Res. 6 or 7																						
9 Sapling regen																						
10 Woody interference																						
11 Laurel & Rhododendron																						
12 Ferns																						
13 Grasses																						
14 Any intrfr. 10, 11, 12, or 13																						
15 Grapevines																						
16 Site limitations																						

Figure 40.--SILVAH Computer Overstory Tally Form

SILVAH - Computer Overstory Tally Form

USDA, Forest Service, NEFES, Warren, PA 1/91

Overstory Data

Stand ID ______________ Sheet ____ of ____

Species	dbh	Quality	Ht. or Count	Grade	Defect	Crown	Wildlife	Species	dbh	Quality	Ht. or Count	Grade	Defect	Crown	Wildlife	Species	dbh	Quality	Ht. or Count	Grade	Defect	Crown	Wildlife

BAF/plot size -- Enter basal area factor of prism used for prism cruises, or plot size (in acres) for fixed-area cruises. For prism cruises, a 10-factor prism is the default.

Regen cruise Type -- Enter code for type of regeneration cruise:

1 - checkmark understory input. Only the total number of plots stocked with each criterion will be entered.
2 - plot by plot checkmark regeneration. Values are entered for each plot, with any plots stocked (checkmark on paper tally form) entered as 1, plots not stocked entered as 0. Used primarily for electronic field data recorders.
3 - same as 2 above, but actual values entered rather than 1 or 0. Maybe used either with tally sheets or electronic field data recorders when more complete information is desired.
0 - no regeneration data

 # plots -- Enter number of regeneration plots tallied.

Plot size -- Enter code for regeneration plot size.

1 - 6' radius plot (default)
2 - milacre plot

Acreage in Stand -- List total number of acres in the stand.

Stand Age -- List stand age in years. If stand age is unknown, enter 0. If stand is uneven-aged, enter 999.

Stand, Site, and Management Information

Cover type -- List code for cover type, if desired (may be left blank).

1 - forest (default)
2 - forest (seedling stand in process of regeneration)
3 - opening (failed clearcuts, savannahs, other forest lands lacking tree cover)
4 - pasture
5 - cropland
6 - wetland
7 - water
8 - urban
9 - unproductive

Habitat type -- List code for habitat or ecological land type. (reserved for use in future wildlife enhancement--any value entered here will be printed on the output)

Soil type -- Record a code for soil type. (reserved for use in future soils enhancement--any value entered here will be printed on the output)

Site Class -- record a subjective estimate of site quality here, if desired. The coded values are:

0 - none (default)
1 - high site
2 - average site
3 - low site

BAF/plot size -- Enter basal area factor of prism used for prism cruises, or plot size (in acres) for fixe area cruises. For prism cruises, a 10-factor prism is the default.

Regen cruise Type -- Enter code for type of regeneration cruise:

1 - checkmark understory input. Only the total number of plots stocked with each criterion wil be entered.

2 - plot by plot checkmark regeneration. Values are entered for each plot, with any plots stocked (checkmark on paper tally form) entered as 1, plots not stocked entered as 0. Used primarily for electronic field data recorders.

3 - same as 2 above, but actual values entered rather than 1 or 0. Maybe used either with tall sheets or electronic field data recorders when more complete information is desired.

0 - no regeneration data

 # plots -- Enter number of regeneration plots tallied.

Plot size -- Enter code for regeneration plot size.

1 - 6' radius plot (default)

2 - milacre plot

Acreage in Stand -- List total number of acres in the stand.

Stand Age -- List stand age in years. If stand age is unknown, enter 0. If stand is uneven-aged, ente 999.

Stand, Site, and Management Information

Cover type -- List code for cover type, if desired (may be left blank).

1 - forest (default)

2 - forest (seedling stand in process of regeneration)

3 - opening (failed clearcuts, savannahs, other forest lands lacking tree cover)

4 - pasture

5 - cropland

6 - wetland

7 - water

8 - urban

9 - unproductive

Habitat type -- List code for habitat or ecological land type. (reserved for use in future wildlife enhancement--any value entered here will be printed on the output)

Soil type -- Record a code for soil type. (reserved for use in future soils enhancement--any value ente here will be printed on the output)

Site Class -- record a subjective estimate of site quality here, if desired. The coded values are:

0 - none (default)

1 - high site

2 - average site

3 - low site

Site species -- record species code for species used in site index determinaton. Use the same species codes as used for overstory data.

Site Index -- record site index value for this stand, based upon age and height measurements of at least 10 dominant and codominant trees of the site species listed above. Site index is required only if the stand is to be projected (growth simulated) in the computer, and only for oak species.

Ht. Adj. -- If merchantable heights are <u>not</u> recorded, and the merchantable heights calculated by SILVAH do not seem to be representative for this site, the user can insert a value between 0.5 and 1.5 to adjust the merchantable heights and thereby adjust volumes. Additional details on the use of this height adjustment are provided in the documentation on volume calculations.

Dia. Adj. -- (Reserved for future use). If increment cores taken in the stand reveal diameter growth rates significantly different than those calculated by SILVAH, the user will be able to enter a value between 0.5 and 1.5 to alter the growth rates used in stand growth projections.

Elev. -- Record elevation of stand, in feet, above sea level.

Aspect -- Record direction toward which the slope faces as an azimuth (degrees from true north) to the nearest degree (if aspect is due north, use 360°).

Slope % -- Enter slope percent to nearest 1 percent.

Topo. position -- Record topographic position as one of the following codes:

1 - ridge
2 - upper slope
3 - mid-slope
4 - lower slope
5 - bench
6 - upper flat (Plateau)
7 - bottom

Operability -- Record a subjective estimate of operability of the stand for timber harvest and other mechanized activities.

1 - no limitations
2 - slope, rockiness, or poor drainage limit use of mechanical equipment

Access -- Record a subjective estimate of the accessibility of the stand as it may affect timber and wildlife management.

1 - road within or at edge of stand suitable for travel by two-wheel drive vehicles and log trucks
2 - road within or at edge of stand passable only by 4-wheel drive vehicles
3 - no existing roads within or at edge of stand, but there are roads within 1 mile of stand
4 - no roads within 1 mile of stand

Water code -- Record the presence of water courses that may be of value to wildlife within the stand, as follows. There is space to record two codes if more than one type of water course is present. If more than two are found, record the two most important.

1 - spring seep
2 - creek/stream <15' across
3 - creek/stream >15' across
4 - marsh (little or no open water)
5 - swamp (standing live trees)
6 - pond (<1 acre)
7 - lake (>1 acre)
0 - none present

W/I 1 mile -- Record the acreage or presence of the following habitat types within 1 mile of the stand perimeter:

CC - acreage in clearcut areas (stands cut within past 10 years and still in the process of regenerating to trees)
cultivation - acres in cultivated farm crops
open - acres in pastures, failed clearcuts, and similar openings
water - code for type of open water (ponds, lakes, streams >15'wide - see codes above)

Management Goals -- It is assumed that timber production is an important goal of management for any stands being prescribed under the SILVAH system. Visual goals are also considered. Enter one of the following codes to indicate restrictions that visual goals may impose on timber cutting activities.

1 - no restrictions on cutting methods for visual reasons (default).
2 - either even- or uneven-age silvicultural systems may be used, but clearcutting is not acceptable as a final harvest cutting method for visual reasons.
3 - uneven-age silvicultural systems are desired to maintain mature forest canopy at all times, but maximum timber production feasible under this system is desired.
4 - uneven-age silvicultural is desired to maintain a mature forest cover at all times. Timber production is less important than above, and visual goals call for the maintenance of very large trees on the area at all times, and the avoidance of canopy openings.

Selection of goals 1 or 2 above will usually lead to an even-age silvicultural system, and will tend to maximize timber production by maintaining a high proportion of shade intolerant species. Although wildlife goals are not specifically stated, these goals will tend to favor wildlife species that depend on early successional vegetation, and will generally maximize wildlife diversity.

Selection of goals 3 or 4 will lead to an uneven-age silvicultural system, and will tend to produce moderate timber yields by favoring a high proportion of shade tolerant species. These goals will also tend to favor wildlife species that depend on late successional vegetation.

Management Value -- Relative value of this stand for the management goal listed.
This management value is used only in prescriptions that involve gypsy moth damage, where expenses for spraying moth prescriptions are not currently implemented in the SILVAH program.

0 - not observed
1 - high value
2 - medium value
3 - low value

Deer Impact Index -- An estimate of the amount of browsing pressure that deer are likely to exert on regeneration is essential for proper prescription. This deer pressure is an index that may be read from Figure 5 in GTR-NE-96 (Revised), which shows deer impact as a function of deer population and amount of available food in the one square mile area surrounding the stand in question.

Data to use this chart can be obtained in a number of ways. Deer populations are best obtained from a pellet count census in the vicinity of the stand. Such censuses are time consuming, and can only be done in the spring, making it impractical to do on an individual stand basis. However, a few sample censuses done once every 3 or 4 years will provide a useful guide to deer populations within the working area of a forest district or county. If pellet-count data are not available, estimates of the deer population within a deer management zone can usually be obtained from the state game agency.

Estimates of deer food availablity must be made on a subjective basis at present. Evidence of low deer food availablity include: a distinct browse line; substantial numbers of browsed stems; large areas dominated by browse-resistant or less-preferred browse species (beech, striped maple, fern, asters, etc.); extensive areas of unbroken forest with little or no cultivated cropland within one mile of the stand; a preponderance of pole-sized and unthinned sawtimber stands and a limited area in regenerating clearcuts within a mile of the stand; limited diversity of plant species in the understory or in regenerating harvest cuts; limited presence of woodland flowering plants; historical knowledge of deer problems in the area; evidence of poor antler development; low deer weight; average fawn/doe ratios of less than 1:2; and significant winter starvation. If deer food availability is low, but a large amount of harvesting will be scheduled within 1 mile of the stand in question, use the medium deer food availability level in determining deer impact. Combinations of final removal cuts and thinnings that qualify as a large amount of harvesting include the following percentages of the total area: a) 5 percent final removal cuts plus 45 percent thinning; b) 10 percent final removal cuts plus 30 percent thinning; c) 15 percent final removal cuts plus 15 percent thinning; d) 20 percent final removal cuts.

Evidence of high deer food availability is the opposite of that described above: lush understories and vigorous regeneration of a wide variety of species, including preferred browse species; abundant woodland flowers; a preponderance of recent harvest cuts and thinned sawtimber stands within a 1 mile radius (with areas in these two types of harvesting that meet or exceed the area combinations given above); cultivated cropland nearby; and a healthy deer herd with high deer weights, trophy antler development, and a preponderance of twins and triplets during fawning.

Code deer impact index as follows:

1 - very low (as in well-maintained deer exclosure)
2 - low
3 - moderate
4 - high (default)
5 - very high

Stress -- An estimate of the kind and degree of stress that this stand may have experienced during the past 5 to 10 years.

1 - none (default)
2 - thinning, or minor drought-ice-storm damage, or minor insect-disease outbreak that reduced stand density to no less than 50 percent.
3 - thinning, drought-ice-storm damage, or insect-disease outbreaks that reduced stand density below 50 percent.

Understory Data Collection

Understory data are collected at the same time and using the same plot center as for the overstory. Additional plots located between overstory plots will also be needed to obtain an adquate sample. At locations where both overstory and understory data are collected, tally the understory data first to avoid errors in estimation resulting from trampling of vegetation. Understory data are recorded on the ID & Regen Tally Form, regardless which form is used for overstory data collection.

Most of the understory data will be collected on a 6-foot radius plot. This size was selected because it approximates the ground area occupied by a single tree when the tree first reaches merchantable (pulpwood) size. Guides to the numbers of seedlings required per 6-foot plot at various times in the regeneration process have been developed to assure that there is at least one stem per 6-foot plot when the stand first reaches merchantable size--thus assuring full stocking.

Although it may seem necessary at first to make a time-consuming count to determine the number of appropriate-size seedlings on each plot, this is seldom necessary. With a little experience, the numbers can be estimated on most plots without actual counting. Many plots will be either abundantly stocked or extremely sparse, and seedlings that are large enough to count will be readily visible from a standing position. Those that you must kneel down to find are generally too small to count anyway.

Because fern and grass coverage is often spotty, and evidence of site limiting factors is not always obvious, it is best to use a larger plot size for evaluations of these items. A plot size of one-twentieth of an acre (26.4-foot radius) is convenient; or you can use a plot size that encompasses all trees intercepted by the prism. Exact size is not critical for these parameters, and plot boundaries can be estimated by eye.

There are two ways in which understory data can be collected: a condensed, or checkmark, tally and an expanded, or estimated count, tally.

Expanded Regeneration Tally

The expanded regeneration tally, which includes estimates of seedling numbers, (Regeneration Cruise Type Code 2 on the Identification Block) is the recommended understory data collection procedure. With this procedure, data are collected in the form of estimated weighted counts, by species groups. These data can be interpreted at different levels of deer density, so that the entire range of prescriptions described here, including prescriptions for fencing to reduce deer pressure on regeneration, can be evaluated.

The variables to be recorded are described below. The shaded rows on the regeneration tally form (rows 4, 6, 8, 14) are not used during the tally, but are completed as part of the data summary process as described beginning on page 47 of GTR-NE-96.

Small advance regeneration -- Small advance regeneration will be recorded as the weighted number of established seedlings in each of several species groups. These groups include: black cherry, small oak (oak seedlings less than 4.5' tall), other desirable species, and large oak (oak seedlings over 4.5' tall). Other desirable species usually include sugar maple, red maple, white ash, yellow-poplar, cucumbertree, and basswood. In some localities, beech, birch, hickory, hemlock, white pine, and other species may be added to the list of desirable species. Likewise, red maple, chestnut, scarlet, and black oaks may not be considered desirable in some localities. While the list of species that are considered desirable may vary slightly among geographic areas and ownerships, it is important that such a list be developed and applied consistently so that results are comparable from stand to stand.

Advance seedlings of the first three species groups are weighted by height and vigor. Seedlings that are less than 2 inches tall, have fewer than two normal-size leaves, or that still bear cotyledons should not be counted. Larger and more vigorous seedlings between 2 inches and 1 foot tall are counted as one seedling, and seedlings over 1 foot tall are counted as two seedlings. Thus, 10 black cherry seedlings, 2" to 1' tall, plus 5 seedlings over 1' tall would be recorded as 20 seedlings [10 plus (5 x 2)]. Weighting is not used for the large oak category.

Exact counts are not required. When there are relatively few seedlings of a particular species group present on a plot (perhaps 10 or less), a quick count is possible. But with larger numbers, counting is time-consuming and unnecessary. Furthermore, the accuracy required is less when there are large numbers of seedlings. For example, the difference between 10 and 20 seedlings is quite important, but the difference between 100 and 110 seedlings is inconsequential. We suggest that you strive to estimate and record to the following numbers: 5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 200, 200+. To record an estimate of 15, there should be at least 15 seedlings, but fewer than 20 seedlings.

We have found that it requires a day or two of counting seedlings to gain enough experience to estimate weighted numbers accurately. Thereafter, an experienced person can record all understory information in a few minutes on most plots.

Understory conditions are highly variable in many stands. Often, the numbers of advance seedlings will span the range from totally absent to abundant in a single stand that has a reasonably uniform overstory. Because of this, it is far more important to use a large number of understory plots well-distributed over the stand area than it is to achieve great accuracy in the counts on each individual plot. The proportion of stand area with critical levels of understory vegetation is the important factor. So estimates of numbers taken quickly will provide adequate data if the number and distribution of plots are adequate.

Residuals -- If there is a sugar maple, beech, or hemlock tree 3 to 10 inches d.b.h of acceptable quality to retain as a timber residual, record the species code of that tree in the residuals box. Acceptable quality trees for timber residuals have at least moderately good crowns in the intermediate or higher crown class, and clear straight boles free of branches, epicormics, or other defects for at least the first 17 feet. Particular attention should be paid to epicormic branches; trees with more than one or two epicormics on the butt log should not be considered acceptable quality for timber residuals. Less tolerant species 8 to 12 inches d.b.h that meet the standards above may also be recorded here by species code if they are desired as timber residuals.

Do not record trees that might be left for wildlife or other purposes here, unless they qualify for timber residuals as described above. Residuals for these other purposes will be evaluated from the overstory data.

Sapling Regeneration -- If there are at least 2 stems of commercial species 0.5 to 2 inches d.b.h, or at least one stem 2 to 6 inches d.b.h on the 6-foot-radius plot, record the species code of the dominant stem in the sapling regeneration box. Saplings to be counted here are stems of a distinctly different age than those in the overstory -- usually ones that originated after a heavy cutting within the past 25 years or so.

Do not count 0.5- to 2-inch stems of species that would be considered woody interference. Small beech root suckers are a prime example. Trees that qualify as both residuals and as sapling regeneration may be counted in both places.

When there is more than one stem that qualifies as sapling regeneration, record the species code of the one that is most likely to become the dominant tree if the overstory is removed. This will usually be the tree that is currently the largest.

Woody Interference -- Woody interference is recorded as the weighted number of stems of all species of woody interfering plants. These include: beech, striped maple, sourwood, dogwood, sassafras, blackgum, elm, hophornbeam, and blue beech

Weighting is done in a manner similar to that used for small advance regeneration. Count all stems less than 1 foot tall as 1 stem; count all stems over 1 foot tall as 2 stems. Count clumps of beech root suckers that originate from the same node as one stem.

Laurel and Rhododendron -- Record the presence of laurel and rhododendron on the 6-foot-radius plot in one of four categories. 1 = Laurel or Rhododendron present, but less than 1 foot high and covering less than half of the plot area; 2 = present on less than half the plot area, but more than 1 foot tall; 3 = present on more than half of the plot area but less than 1 foot tall; 4 = present on more than half the plot area and more than 1 foot tall.

Fern -- Record an ocular estimate of the percentage of the 1/20-acre plot surface area covered by fern foliage, when viewed from directly above the plot. Count all ferns that grow as individual fronds from the ground level. Ferns that grow in solitary clumps may be ignored, or if abundant, may be recorded at half their actual value. Thus, spinulose wood fern clumps covering 30 percent of the plot surface could be recorded as 15, while hayscented or New York fern fronds, which arise as individual fronds from an underground rhizome, would be recorded at the observed value.

Grass -- Record an ocular estimate of the percentage of the 1/20-acre plot surface covered by foliage of any grass or sedge.

Grapevines -- Record the number of grapevines in the crowns of any tree on the 1/20-acre plot.

Site Limitations -- Record a code value in the Site Limits row for each 1/20-acre plot on which there is any evidence of either poor soil drainage or high stone content in the surface soil. Use a code of 1 for poor drainage, 2 for rocky surface. A blank or 0 indicates that there are no site limitations on that plot.

Soil samples are neither feasible nor necessary for this determination. Site limitations should be evaluated on the basis of surface conditions.

Poorly drained soils are those where a water table persists very close to the soil surface during all or most of the dormant season. Such soils usually have prominent mottling at depths ranging from 1 to 8 inches beneath the surface. But since soil examination is usually not feasible during the stand inventory, drainage must be estimated from landscape position, relief, and indicator plants. Some indicators of poorly drained soils are:

- *Landscape position and relief.* On the Plateau, look for poor soil drainage in concave positions of broad flat plateau tops, in upland bottoms, and at the base of slopes. Low topography is more likely to be poorly drained than high topography. Convex topographic configuration generally indicates well- or moderately well-drained soils. In valley bottoms, soil drainage becomes poorer from the stream channel towards the base of slopes. Concave and low-lying areas in bottoms are especially likely to be poorly drained, as are toes of slopes with many seeps.

- *Standing water* in depressions and wet surface soils during the dormant season, and during periods of normal rainfall in the summer and early fall.

- *Presence of wet-site plants* such as sedges, rushes, sphagnum moss, sensitive fern, interrupted fern, cinnamon fern, skunk cabbage, false hellebore, and marsh marigold.

- *Very deep spongy humus layers at the soil surface.*

Stony areas can be recognized after a little experience. Look for the stone layer beneath the forest floor in road cuts. Large sandstone outcrops will generally be present somewhere up slope as well. The hard and uneven feel of the soil surface when walked upon is a sure indicator of many surface stones.

Checkmark Regeneration Tally

Some users may prefer to make some understory data summary judgments in the woods, thus reducing inventory time. The checkmark regeneration tally procedure (coded as Regen Cruise Type 1 in the Identification Data block) is designed for these users. Because judgments about the adequacy of stocking at each plot are made in the woods for the ambient deer pressure, users who choose this option forego fencing prescriptions. Precriptions including fencing are based on a reevaluation of the expanded regeneration tally data for a Deer Impact Index of 1.

At each understory plot, make a judgment about the adequacy of advance regeneration and the severity of interference problems. This judgment is made using the criteria in Tables 4 (page 45) and 5 (page 46) from GTR-NE-96, for the appropriate level of deer pressure. These are the criteria used for summarizing data collected using the expanded regeneration tally procedure. If the stocking of the plot exceeds the critical value in these tables, make a checkmark.

Small Advance Regeneration -- The expanded regeneration tally procedures explain how to arrive at an estimated weighted count of advance regeneration for each category on the ID & Regen Tally Sheet. Table 4 (p.45) from GTR-NE-96 gives the critical values for each advance regeneration species group (Rows 1 - 5 of the Regeneration Data form) for each level of deer pressure. All desirables include the black cherry, small oak, and other desirables group. If the Deer Impact Index is 4, for example, make a checkmark in the black cherry row for any plot with a weighted count of 25 or more black cherry seedlings. If the Deer Impact Index is 3, make a checkmark in the other desirable row for any plot with a weighted count of 50 other desirable seedlings.

Any small regen -- For each plot that receives a checkmark in row 1, 2, 4, or 5, make a checkmark in the Any small regen row (row 6).

Residuals -- Make a checkmark in the Residuals row (row 7) for each plot that contains at least one acceptable residual tree. The criteria for identifying acceptable residual trees are listed in the procedures for the expanded regeneration tally.

Any regen or Res -- Make a checkmark in this row (row 8) for each plot that contains a checkmark in row 6 or row 7.

Sapling Regeneration -- Make a checkmark in the sapling regeneration row (row 9) for each plot that contains at least 2 stems of commercial species between 0.5 and 2.0 inches d.b.h. or at least one stem 2.0 through 6.0 inches. The criteria for identifying trees to be counted as sapling regeneration are listed in the procedures for the expanded regeneration tally.

Interference -- The determinations for these checkmarks are based on a larger plot, such as one-twentieth of an acre, or the radius of all trees intercepted by your prism. Table 5 (page 46) from GTR-NE-96 gives the critical values for each category of interference (Rows 10 - 13 and 15 of the Regeneration Data form). Make a checkmark in the fern row, for example, if 30% of the surface area of the larger plot is covered by fern foliage. For laurel and rhododendron (row 11) make a checkmark if the plot qualifies for a code 4 or an X if the plot qualifies for a code 2 or 3 (see codes on page 33) from GTR-NE-96. This alternate mark (X) represents "half-stocking" with this form of interference.

Any interference -- Make a checkmark in the Any interference row (row 14) for any plot that has a checkmark in rows 10 - 13. If the only checkmark in these rows is a half-stocking mark for laurel and rhododendron, make a half-stocking mark in the Any interference row.

Site limitations -- Make a checkmark in this row (row 16) for each one-twentieth acre plot on which there is any evidence of either poor soil drainage or high stone content in the soil. See the expanded regeneration tally for a complete discussion of the conditions to be tallied in this row.

Overstory Data

Overstory data collection involves the sampling of overstory trees by species, size, and other characteristics that affect their utility for various timber and wildlife uses. All trees 1.0 inch d.b.h and larger are sampled. For most purposes, we recommend a variable-radius cruise (10-factor prism is recommended), but a fixed-plot cruise can also be accommodated. For either cruise type, trees may be recorded individually, or by groups (as in a dot tally).

Overstory Tally - Individual Trees

On the standard tally form (Figure 38), each tree is recorded on a separate line. The items to be recorded for each tree are as follows.

Species --For ease in computer data entry, species is entered as a code value. Species codes are shown in Table 6. A 3-digit numeric code used throughout the United States by USDA Forest Service forest survey units and a mnemonic code are provided. Users may also define their own codes.

d.b.h -- Diameter breast height may be measured or estimated. If measured, either 1- or 2-inch d.b.h. classes may be used. If estimated, we recommend the use of 2-inch d.b.h. classes. Accurate estimation of diameters requires practice--often inexperienced workers find it necessary to measure diameters for a day or two until their eye becomes calibrated. Thereafter, occasional checks should suffice, except for larger trees, which are hard to estimate and represent substantial value.

Quality -- Three growing-stock quality classes are recognized. Definitions and computer codes are given in Table 7.

Acceptable growing-stock trees are the trees that will be around for the next 15-year period. They are of such species, vigor, and form as to be capable of yielding at least one sawlog. Sapling- and pole-size trees should be classed acceptable if they are expected to contain sawlog material in the future. Do not discriminate because of size; assume that every tree will be allowed to grow to sawtimber size and judge quality on that basis. Sapling-size trees are difficult to judge effectively; if in doubt, consider them acceptable unless they are of extremely poor form.

Unacceptable growing-stock trees (code 2) are trees that either do not have the potential to make a sawlog or that have some damage, disease, or other condition that makes them a poor risk to survive for the next 15 years. All noncommercial species are considered unacceptable growing stock.

Standing dead trees are recorded as code 3. Use of code 3 in combination with the appropriate information on grade will permit estimation of the volume that may be available from dead trees should a salvage cut be prescribed. The estimation of volumes in dead trees can be made by tallying these trees, and selecting the run-time option of SILVAH to consider only the dead trees. Recording of dead trees is optional.

The quality column also can be used to record borderline trees during a prism cruise. If a tree cannot be positively identified as in or out and the user does not want to take the time to measure it accurately, it may be counted as a half-tree by adding 5 to the quality code. Thus an AGS borderline tree would be recorded as a quality 6 (1 + 5).

Height -- If accurate volumes are to be calculated from the inventory data, merchantable heights (in numbers of 8-foot bolts) also should be recorded for each tree that is sawtimber size. These merchantable heights will then be used in volume calculations. If no heights are recorded, volumes will be calculated from local volume tables that incorporate average merchantable heights encountered in stands in northwestern Pennsylvania.

Estimates of merchantable height for sawlog-size trees should be to a point where diameter drops below 10.5 inches inside bark, or the height at which the bole breaks up. For sawlog-size trees that also contain pulpwood, estimate only the sawlog height -- SILVAH will estimate the additional pulpwood height on these trees, and will estimate pulpwood height on pole-size trees from the sawtimber data.

Count -- If the standard tally form is used for a cruise where heights are not being recorded, the height column may be used to record tree count and thus conserve space and reduce time for data entry into the computer. The number of trees with the same species, diameter, quality, and other attributes is entered into this column. In this situation, the columns following the count columns are usually left blank.

Grade -- If accurate timber values and net volumes are to be calculated from the inventory data, tree grade should be recorded. These grades indicate the relative value and merchantability of the trees for timber products. Grades and code values are defined in Table 7. Grades 1 through 3 are standard USDA Forest Service factory sawtimber grades for hardwoods. Grade 4 is a user-defined log grade (such as pallet logs or construction logs), grade 5 is a user-defined bulk product (such as boltwood), grade 6 is for pulp, 7 for fuelwood, 8 for cull, and 9 for veneer.

Defect -- If accurate timber values and net volumes are to be calculated from the inventory data, percent defect should be recorded. Enter a value from 0 to 9 representing the percentage (to the nearest 10%) of the merchantable volume in the tree that is unmerchantable due to decay, sweep, crook, or other defect. Thus, a 1 equals 10%, 9 = 90%, and so on.

Crown -- Three crown condition classes are recognized for use in assessing the probability of survival following gypsy moth defoliation. However, these classes may be used for other purposes. The three classes are good, fair, and poor--based primarily on crown dieback, foliage size and density, and epicormic branching. The classes are defined in Table 7

Wildlife -- If information is desired on wildlife habitat, overstory trees with value as den trees or snags should be recorded. Care should also be taken to mark dead trees with a code 3 or code 4 in the quality column. Both potential and actual den trees and snags are recorded using the codes in Table 7.

End of plot -- On the standard tally form, a zero entered in the species column of the tally form separates one plot from the next. By maintaining each plot separately, it is possible to calculate variances and estimate sampling error.

Tally on Other Forms

This discussion has centered on the values that are recorded on the tally sheet, Figure 38. The information that is collected can be recorded in many different ways, on many different forms. There are no restrictions as long as the necessary information is collected. For example, the data could be collected as a dot tally on a form such as the manual tally form described by Marquis and others, 1992, in General Technical Report NE-96. The SILVAH system will allow this data to be entered easily. Just be sure to indicate the appropriate overstory tally type.

Table 6. Species codes

Species	Forest survey	Mnemonic[1]	User-defined[1]
Other Softwoods	1	OSW	0
Other Hardwoods	4	OHW	88
Balsam Fir	12	BF	0
E. Redcedar	68	ERC	0
Larch	70	L	0
Tamarack	71	TAM	0
Spruce	90	S	0
Norway Spruce	91	NS	0
White Spruce	94	WS	0
Black Spruce	95	BS	0
Red Spruce	97	RS	0
Pine	100	P	0
Jack Pine	105	JP	0
Red Pine	125	RP	0
Pitch Pine	126	PP	0
White Pine	129	WP	1
Virginia Pine	132	VP	0
Southern Pine	170	SP	0
N. White Cedar	241	NWC	0
Eastern Hemlock	261	EH	6
Maple	310	M	0
Red Maple	316	RM	21
Silver Maple	317	SVM	0
Sugar Maple	318	SM	20
Buckeye	330	BUC	0
Birch	370	B	50
Yellow Birch	371	YB	0
Sweet Birch	372	SB	0
Paper Birch	375	PB	0
Hickories	400	H	60
Bitternut Hickory	402	BH	0
Pignut Hickory	403	PH	0
Pecan	404	PCN	0
Shellbark Hickory	405	SLH	0
Shagbark Hickory	407	SGH	0
Mockernut Hickory	409	MH	0
Hackberry	460	HAC	0
Yellowwood	481	YW	0
Persimmon	521	PER	0
American Beech	531	AB	54
Ash	540	A	0
White Ash	541	WA	55
Black Ash	543	BA	0
Green Ash	544	GA	0
Honey Locust	552	HL	0
Butternut	601	BUT	71
Black Walnut	602	BW	0
Sweetgum	611	SG	0
Yellow-Poplar	621	YP	59
Cucumbertree	651	CUC	84
Mountain Magnolia	654	MM	0
Tupelo	690	T	0
Water Tupelo	691	WT	0
Black Gum	693	BG	66
American Sycamore	731	AS	0
Aspen	740	ASP	63
Balsam Poplar	741	BP	0
E. Cottonwood	742	EC	0
Bigtooth Aspen	743	BTA	0
Quaking Aspen	746	QA	0
Black Cherry	762	BC	76

Table 6. Continued

Species	Forest survey	Mnemonic[1]	User-defined[1]
Oak	800	O	0
White Oak	802	WO	40
Swamp White Oak	804	SWO	0
Scarlet Oak	806	SO	32
N. Pin Oak	809	NPO	0
S. Red Oak	812	SRO	0
Cherrybark Oak	813	CBO	0
Overcup Oak	822	OO	0
Burr Oak	823	BRO	0
Blackjack Oak	824	BJO	0
Swamp Chestnut Oak	825	SCO	0
Chinkapin Oak	826	CKO	0
Pin Oak	830	PNO	0
Chestnut Oak	832	CO	48
N. Red Oak	833	NRO	30
Shumard Oak	834	SHO	0
Post Oak	835	PO	0
Black Oak	837	BO	31
Black Locust	901	BL	0
Willow	920	W	0
American Basswood	951	BAS	58
Elm	970	E	61
American Elm	972	AE	0
Slippery Elm	975	SE	0
Rock Elm	977	RE	0
Boxelder Maple	313	BEM	0
Striped Maple	315	STM	99
Devils-walkingstick	353	DWS	89
Serviceberry	355	SVB	91
Blue Beech	391	BB	90
Dogwood	491	DOG	81
Hawthorn	500	HAW	94
Ironwood	701	OST	92
Pin Cherry	761	PC	95
Chokecherry	763	CC	0
Sassafras	931	SAS	96
Mountain Ash	935	MTA	97
Other Non-Commercial	999	ONC	98
Ailanthus	998	AIL	0

1 The codes shown in this column may be replaced by the user.

Table 7. Codes for quality, tree grade, and wildlife.

Growing Stock Quality Classes		Grade Specifications*		Wildlife Tree Codes	
Code	Description	Code	Description	Code	Description
1	Acceptable Growing Stock (AGS)-- These trees are suitable for retention in the stand for at least the next 15-year period. They are trees of commercial species and of such form and quality as to be salable for sawtimber products at some future date. In making this determination, judge each tree on its own merits; assume that every tree will be allowed to grow to sawtimber size even though it is now a small tree in an older stand. Saplings are especially difficult to judge; most knots, bumps, and stoppers will be confined to a small core if the sapling actually grows to larger size, so consider most saplings acceptable. If in doubt about the correct quality class for any tree, consider it acceptable. Many acceptable trees will be removed if a partial cutting is prescribed for the stand, so do not consider the quality determination a cut-leave tally.	1	Factory-lumber log grade 1	1	Potential den tree -- live tree with large dead branch or broken top that represents a potential den cavity, but tree does not now contain a cavity.
		2	Factory-lumber log grade 2	2	Existing den trees -- live trees with natural or artificially created hole for den (do not include shallow food excavations made by pileated woodpeckers.
		3	Factory-lumber log grade 3	3	Snag with potential existing den -- dead or nearly dead trees of same minimum size as 3 above, but containing an existing den cavity.
		4	Locally-defined log product (such as pallet log, local use log, etc.). Construction log grade		
		5	Localy-defined bulk product (such as boltwood)		
		6	Pulpwood (contains a minimum of two contiguous 4-foot bolts with minimum top ID of 4.0" and at least 50% sound)		
		7	Fuelwood (same as pulpwood, but mimimum top ID of 1.0")		
		8	Cull. Tree less than 50% sound, or does not qualify for any of the grades or products listed.		
		9	Veneer log		
2	Unacceptable Growing Stock (UGS) -- These trees do not have the potential to make salable sawtimber products in the future. They may be high risk trees -- trees with disease, damage, or dieback that threatens their survival -- or trees of such poor form that they just have to be removed regardless of the effect that removal will have on stand structure and species composition.	* Factory log grades are defined in: Hanks, Leland F.; Glenn L. Gammon; Robert L. Brisbin; and Everett Rast. 1980. Hardwood log grades and lumber grade yields for factory lumber logs. U.S. Department of Agriculture, Forest Service. Res. Pap. NE-468, 92p. Rast, Everett D.; David L. Sonderman, and Glenn Gammon. 1973. A guide to hardwood log grading. U. S. Department of Agriculture, Forest Service, Gen. Tech. Rep. NE-1, 32p.		
3	Dead -- Standing dead trees.				

APPENDIX B–SAMPLE PRINTOUTS

SILVAH -- SILVICULTURE OF ALLEGHENY HARDWOODS - V4.50
STAND SUMMARY, PRESCRIPTION, AND MANAGEMENT SIMULATOR PROGRAM
DEVELOPED BY THE NORTHEASTERN FOREST EXPERIMENT STATION, WARREN, PA.

OWNER/AGENCY	-- US Forest Serv.	DATE TALLIED:	AUG/1988
FOREST/PROPERTY	-- Allegheny NF	DATE PRINTED:	25/SEP/1991
COUNTY/DISTRICT	-- Ridgway	FILE:	b:tsample.SIL
COMPT - STAND	-- 12 32	DEFAULT:	SILVAH.DEF
ACRES	-- 125.00	TYPE:	TRANSITION HARDWOOD
STAND AGE	-- 68	SIZE:	SMALL SAW
SITE	-- 70 FOR BC	DENSITY:	GT 95 %

OVERSTORY CRUISE INFORMATION

Overstory data is from an individual tree tally prism cruise,
using a 10 factor prism, and with trees tallied by
2 inch dbh classes, and heights in the HT/COUNT column.

Overstory data based on 10. plots;
0. additional plots needed to reach 15 % of the mean;
8. additional plots needed to reach 10 % of the mean.

Mean basal area is 116. plus or minus 16. square feet per acre
at 90 % confidence (13. % of mean).

UNDERSTORY CRUISE INFORMATION

Data on advance regeneration, site limitations, and understory
is from a standard regeneration cruise using 6-ft radius plots.

Understory data is based on 30. plots.

****** WARNING ******
Regeneration data is not based on an adequate number of plots to give
reliable results. At least 1. additional plots needed in this stand.

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FOREST/PROPERTY -- Allegheny NF
COUNTY/DISTRICT -- Ridgway

DATE TALLIED: AUG/1988
DATE PRINTED: 25/SEP/1991
FILE: b:tsample.SIL

COMPT - STAND -- 12 32

DEFAULT: SILVAH.DEF

ACRES -- 125.00
STAND AGE -- 68
SITE -- 70 FOR BC

TYPE: TRANSITION HARDWOOD
SIZE: SMALL SAW
DENSITY: GT 95 %

SPECIES OR CATEGORY	% OF PLOTS STOCKED	AVERAGE VALUE	
DESIRABLE TREE REGENERATION			
BLACK CHERRY	73.		
SMALL OAK	27.		
OTHER DESIRABLES	0.		
** ALL DESIRABLES	77.		
LARGE OAK	3.		
** ANY SMALL REGEN	83.		
RESIDUALS	7.		
** ANY REGEN OR RESIDS	87.		
SAPLING REGEN	0.		
OAK SPROUT POTENTIAL	4.	352.	Stems/ac to sprout
** ANY REGEN OR SPROUT	100.		

FACTORS AFFECTING REGENERATION DIFFICULTY

DEER IMPACT	4	High
SEED SUPPLY	1	Abundant seeds

INTERFERING UNDERSTORY

WOODY INTERFERENCE	10.
LAUREL & RHODO	0.
% FERNS	30.
% GRASSES	0.
** ANY INTERFERENCE	33.
GRAPEVINES	0.

SITE LIMITATIONS FOR REGENERATION

SITE LIMITATIONS	7.

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SPECIES OR CATEGORY	% OF PLOTS STOCKED	VALUE	
SITE INFORMATION			
COVER TYPE		1	Forest
HABITAT TYPE		9	Unknown
SOIL TYPE		9	Unknown
SITE CLASS		2	Medium site
SITE SPECIES		BC	
SITE INDEX		70	
REL MERCH HT		1.26	
ELEVATION		2000	
ASPECT		25	
SLOPE %		5	
TOPO POSITION		6	Upper flat
OPERABILITY		1	No limitations
ACCESSABILITY		1	2-wh road at stand
STRESS FACTORS			
DEER IMPACT		4	High
GYPSY MOTH		1	No attack expected
OTHER STRESS		2	Minor

SILVAH -- SILVICULTURE OF ALLEGHENY HARDWOODS - V4.50
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COUNTY/DISTRICT	-- Ridgway	FILE:	b:tsample.SIL
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ACRES	-- 125.00	TYPE:	TRANSITION HARDWOOD
STAND AGE	-- 68	SIZE:	SMALL SAW
SITE	-- 70 FOR BC	DENSITY:	GT 95 %

MANAGEMENT GOALS

No restrictions on mgmt for either visual or wildlife goals.
For this goal, stand value is Medium

WILDLIFE TREES	NO./ACRE
POTENTIAL DEN TREES	12.1
EXISTING DEN TREES	5.1
SNAGS WITH POTENTIAL CAVITIES	.0
SNAGS WITH EXISTING CAVITIES	15.2
OTHER STANDING DEAD TREES (Not Snags)	.0

WATER HABITATS WITHIN THIS STAND INCLUDE:

Spring seep
Stream < 15 ft wide

HABITAT CONDITIONS SURROUNDING THIS STAND

CLEARCUT ACRES W/I 1 MILE	56.00
CULTIVATED ACRES W/I 1 MILE	6.00
OPEN ACRES W/I 1 MILE	30.00
WATER HABITATS INCLUDE:	Lake

SILVAH -- SILVICULTURE OF ALLEGHENY HARDWOODS - V4.50
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ACRES -- 125.00
STAND AGE -- 68
SITE -- 70 FOR BC

DATE TALLIED: AUG/1988
DATE PRINTED: 25/SEP/1991
FILE: b:tsample.SIL

DEFAULT: SILVAH.DEF

TYPE: TRANSITION HARDWOOD
SIZE: SMALL SAW
DENSITY: GT 95 %

ORIGINAL STAND

PRODUCT LISTING (per acre)

SPECIES >	ALL SP	SM	NRO	CO	BC	WO	AB	RM
	NET LOG VOLUME (INT 1/4" LOG RULE) - MBF PER ACRE							
VENEER	.0	.0	.0	.0	.0	.0	.0	.0
GRADE 1	2.8	.0	.4	.0	2.4	.0	.0	.0
GRADE 2	.8	.0	.8	.0	.0	.0	.0	.0
GRADE 3	2.5	.0	.0	1.2	.0	.5	.9	.1
PALLET	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	6.2	.0	1.2	1.2	2.4	.5	.9	.1
	NET BULK VOLUME - CORDS PER ACRE							
BOLTWOOD	.0	.0	.0	.0	.0	.0	.0	.0
PULPWOOD	10.5	2.6	1.2	2.5	1.5	2.1	.5	.1
FIREWOOD	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	10.5	2.6	1.2	2.5	1.5	2.1	.5	.1
	VALUE - DOLLARS PER ACRE							
VENEER	0.	0.	0.	0.	0.	0.	0.	0.
GRADE 1	1272.	0.	150.	0.	1122.	0.	0.	0.
GRADE 2	269.	0.	269.	0.	0.	0.	0.	0.
GRADE 3	123.	0.	0.	15.	0.	86.	20.	1.
PALLET	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL	1664.	0.	419.	15.	1122.	86.	20.	1.
$/MBF	269.	0.	342.	13.	463.	183.	24.	26.
BOLTWOOD	0.	0.	0.	0.	0.	0.	0.	0.
PULPWOOD	21.	5.	2.	5.	3.	4.	1.	0.
FIREWOOD	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL	21.	5.	2.	5.	3.	4.	1.	0.
$/CORD	2.	2.	2.	2.	2.	2.	2.	2.
GR.TOTAL	1685.	5.	422.	20.	1125.	90.	21.	2.

SILVAH -- SILVICULTURE OF ALLEGHENY HARDWOODS - V4.50
STAND SUMMARY, PRESCRIPTION, AND MANAGEMENT SIMULATOR PROGRAM
DEVELOPED BY THE NORTHEASTERN FOREST EXPERIMENT STATION, WARREN, PA.

OWNER/AGENCY	-- US Forest Serv.	DATE TALLIED:	AUG/1988
FOREST/PROPERTY	-- Allegheny NF	DATE PRINTED:	25/SEP/1991
COUNTY/DISTRICT	-- Ridgway	FILE:	b:tsample.SIL
COMPT - STAND	-- 12 32	DEFAULT:	SILVAH.DEF
ACRES	-- 125.00	TYPE:	TRANSITION HARDWOOD
STAND AGE	-- 68	SIZE:	SMALL SAW
SITE	-- 70 FOR BC	DENSITY:	GT 95 %

ORIGINAL STAND

PRODUCT LISTING (total stand)

SPECIES >	ALL SP	SM	NRO	CO	BC	WO	AB	RM
NET LOG VOLUME (INT 1/4" LOG RULE) - MBF / 1								
VENEER	.0	.0	.0	.0	.0	.0	.0	.0
GRADE 1	353.3	.0	50.7	.0	302.6	.0	.0	.0
GRADE 2	102.4	.0	102.4	.0	.0	.0	.0	.0
GRADE 3	317.8	.0	.0	145.0	.0	58.8	107.0	7.0
PALLET	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	773.5	.0	153.1	145.0	302.6	58.8	107.0	7.0
NET BULK VOLUME - CORDS / 10								
BOLTWOOD	.0	.0	.0	.0	.0	.0	.0	.0
PULPWOOD	131.1	32.5	15.4	31.8	18.4	26.1	6.0	.9
FIREWOOD	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	131.1	32.5	15.4	31.8	18.4	26.1	6.0	.9
VALUE - DOLLARS / 1000								
VENEER	.0	.0	.0	.0	.0	.0	.0	.0
GRADE 1	159.0	.0	18.7	.0	140.2	.0	.0	.0
GRADE 2	33.7	.0	33.7	.0	.0	.0	.0	.0
GRADE 3	15.4	.0	.0	1.9	.0	10.8	2.6	.2
PALLET	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	208.0	.0	52.4	1.9	140.2	10.8	2.6	.2
$/MBF	269.	0.	342.	13.	463.	183.	24.	26.
BOLTWOOD	.0	.0	.0	.0	.0	.0	.0	.0
PULPWOOD	2.6	.6	.3	.6	.4	.5	.1	.0
FIREWOOD	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	2.6	.6	.3	.6	.4	.5	.1	.0
$/CORD	2.	2.	2.	2.	2.	2.	2.	2.
GR.TOTAL	210.6	.6	52.7	2.5	140.6	11.3	2.7	.2

SILVAH -- SILVICULTURE OF ALLEGHENY HARDWOODS - V4.50
STAND SUMMARY, PRESCRIPTION, AND MANAGEMENT SIMULATOR PROGRAM
DEVELOPED BY THE NORTHEASTERN FOREST EXPERIMENT STATION, WARREN, PA.

OWNER/AGENCY -- US Forest Serv.
FOREST/PROPERTY -- Allegheny NF
COUNTY/DISTRICT -- Ridgway
COMPT - STAND -- 12 32

DATE TALLIED: AUG/1988
DATE PRINTED: 25/SEP/1991
FILE: b:tsample.SIL
DEFAULT: SILVAH.DEF

ACRES -- 125.00
STAND AGE -- 68
SITE -- 70 FOR BC

TYPE: TRANSITION HARDWOOD
SIZE: SMALL SAW
DENSITY: GT 95 %

ORIGINAL STAND

SPECIES >	ALL SP	SM	NRO	CO	BC	WO	AB	RM
		COMPOSITION -- BA, % OF BA, TREES						
TOT BA	116.0	27.0	21.0	19.0	18.0	13.0	9.0	9.0
SPECIES%	100.	23.	18.	16.	16.	11.	8.	8.
# TREES	793.	385.	319.	37.	13.	19.	5.	15.
		QUALITY -- % IN AGS						
SAPS	100.	100.	100.	0.	0.	0.	0.	0.
POLES	48.	33.	100.	22.	0.	100.	0.	33.
SM SAW	42.	0.	0.	0.	100.	100.	0.	0.
MED SAW	83.	0.	100.	0.	100.	0.	67.	0.
LG SAW	0.	0.	0.	0.	0.	0.	0.	0.
ALL SIZE	60.	48.	100.	11.	100.	100.	22.	11.
		DIAMETERS AND AGES -- INCHES, YEARS						
DIAM	12.1	7.5	11.4	12.3	16.7	11.7	19.3	11.3
DIAM MER	13.9	10.0	18.0	12.3	16.7	11.7	19.3	11.3
QUAD DIA	5.2	3.6	3.5	9.7	16.0	11.3	17.9	10.4
YRS MAT	24.	53.	0.	38.	7.	42.	0.	33.
EFCT AGE	81.	67.	90.	82.	83.	78.	129.	57.
		STRUCTURE						
Q FACTOR	1.44	1.52	1.25	1.37	1.24	1.71	1.27	1.46
WEIB C	.00	.00	.00	.00	.00	.00	.00	.00
		RELATIVE DENSITY -- %						
REL DEN	120.	31.	40.	16.	9.	11.	7.	6.
AGS RDEN	83.	20.	40.	2.	9.	11.	2.	1.
		VOLUMES AND VALUES - INT 1/4" LOG RULE						
GTOT CDS	23.5	1.8	4.1	3.8	8.0	3.6	2.0	.3
NTOT CDS	18.8	1.4	3.3	3.0	6.4	2.9	1.6	.2
PULP CDS	10.5	2.6	1.2	2.5	1.5	2.1	.5	.1
GRS BDFT	7501.	0.	1300.	1322.	2794.	566.	1422.	97.
NET BDFT	6188.	0.	1224.	1160.	2421.	470.	856.	56.
DOLLARS	1685.	5.	422.	20.	1125.	90.	21.	2.

SILVAH -- SILVICULTURE OF ALLEGHENY HARDWOODS - V4.50
STAND SUMMARY, PRESCRIPTION, AND MANAGEMENT SIMULATOR PROGRAM
DEVELOPED BY THE NORTHEASTERN FOREST EXPERIMENT STATION, WARREN,

OWNER/AGENCY	-- US Forest Serv.	DATE TALLIED:	AUG/1988
FOREST/PROPERTY	-- Allegheny NF	DATE PRINTED:	25/SEP/1991
COUNTY/DISTRICT	-- Ridgway	FILE:	b:tsample.SIL
COMPT - STAND	-- 12 32	DEFAULT:	SILVAH.DEF
ACRES	-- 125.00	TYPE:	TRANSITION HARDWOOD
STAND AGE	-- 68	SIZE:	SMALL SAW
SITE	-- 70 FOR BC	DENSITY:	GT 95 %

ORIGINAL STAND

BASAL AREA - SQ. FT. PER ACRE

	B. CHER. W. ASH Y. POP.	R. MAPLE RED OAK OTHERS	SUGAR MAPLE BEECH STR. MAP. OTH. OAK	ALL SPECIES
AGS				
SAPS	.0	9.0	9.0	18.0
POLE	.0	4.0	12.0	16.0
SSAW	9.0	.0	7.0	16.0
MSAW	9.0	9.0	2.0	20.0
LSAW	.0	.0	.0	.0
TOT	18.0	22.0	30.0	70.0
UGS				
SAPS	.0	.0	.0	.0
POLE	.0	2.0	15.0	17.0
SSAW	.0	6.0	16.0	22.0
MSAW	.0	.0	4.0	4.0
LSAW	.0	.0	3.0	3.0
TOT	.0	8.0	38.0	46.0
ALL				
SAPS	.0	9.0	9.0	18.0
POLE	.0	6.0	27.0	33.0
SSAW	9.0	6.0	23.0	38.0
MSAW	9.0	9.0	6.0	24.0
LSAW	.0	.0	3.0	3.0
TOT	18.0	30.0	68.0	116.0

SILVAH -- SILVICULTURE OF ALLEGHENY HARDWOODS - V4.50
STAND SUMMARY, PRESCRIPTION, AND MANAGEMENT SIMULATOR PROGRAM
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OWNER/AGENCY -- US Forest Serv.
FOREST/PROPERTY -- Allegheny NF
COUNTY/DISTRICT -- Ridgway

COMPT - STAND -- 12 32

ACRES -- 125.00
STAND AGE -- 68
SITE -- 70 FOR BC

DATE TALLIED: AUG/1988
DATE PRINTED: 25/SEP/1991
FILE: b:tsample.SIL

DEFAULT: SILVAH.DEF

TYPE: TRANSITION HARDWOOD
SIZE: SMALL SAW
DENSITY: GT 95 %

ORIGINAL STAND

NET VOLUME: DOYLE LOG RULE - BD. FT. PER ACRE

SPECIES > DIA.	ALL SP	SM	NRO	CO	BC	WO	AB	RM
2	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.
12	220.	0.	0.	0.	117.	92.	0.	12.
14	301.	0.	0.	0.	0.	179.	102.	20.
16	1044.	0.	0.	527.	516.	0.	0.	0.
18	928.	0.	0.	274.	655.	0.	0.	0.
20	1235.	0.	616.	0.	385.	0.	234.	0.
22	346.	0.	346.	0.	0.	0.	0.	0.
24	334.	0.	0.	0.	0.	0.	334.	0.
SAPS	0.	0.	0.	0.	0.	0.	0.	0.
POLES	0.	0.	0.	0.	0.	0.	0.	0.
SM SAW	1565.	0.	0.	527.	633.	271.	102.	32.
MED SAW	2509.	0.	962.	274.	1040.	0.	234.	0.
LG SAW	334.	0.	0.	0.	0.	0.	334.	0.
TOTAL	4409.	0.	962.	801.	1673.	271.	671.	32.
SPECIES%	100.	0.	22.	18.	38.	6.	15.	1.

ACCEPTABLE GROWING STOCK ONLY

SAPS	0.	0.	0.	0.	0.	0.	0.	0.
POLES	0.	0.	0.	0.	0.	0.	0.	0.
SM SAW	904.	0.	0.	0.	633.	271.	0.	0.
MED SAW	2153.	0.	962.	0.	1040.	0.	151.	0.
LG SAW	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL	3057.	0.	962.	0.	1673.	271.	151.	0.

SILVAH -- SILVICULTURE OF ALLEGHENY HARDWOODS - V4.50
STAND SUMMARY, PRESCRIPTION, AND MANAGEMENT SIMULATOR PROGRAM
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OWNER/AGENCY	-- US Forest Serv.	DATE TALLIED:	AUG/1988
FOREST/PROPERTY	-- Allegheny NF	DATE PRINTED:	25/SEP/1991
COUNTY/DISTRICT	-- Ridgway	FILE:	b:tsample.SIL
COMPT - STAND	-- 12 32	DEFAULT:	SILVAH.DEF
ACRES	-- 125.00	TYPE:	TRANSITION HARDWOOD
STAND AGE	-- 68	SIZE:	SMALL SAW
SITE	-- 70 FOR BC	DENSITY:	GT 95 %

This transition stand is dominated by Sugar Maple, Red Oak,

Chestnut Oak, Black Cherry, White Oak, and Beech, which together comprise 92 % of the basal area.

This is a small sawtimber stand, with average diameter of 12.1 inches. Total growing stock amounts to 116. sq. ft. of basal area per acre. Gross total volume in all trees, to a 4-inch top, is 19. cords per acre; if divided into pulpwood and sawtimber the net merchantable volume is 10. cords of pulpwood and 6188. board feet of sawtimber (Int 1/4" log rule) per acre. The total stand value is estimated to be about 1685. dollars per acre.

Relative stand density is 120. % of the average maximum stocking expected in undisturbed stands of similar size and species composition. This density is well above the optimum for best individual tree growth. At this relative density, growth rate of the biggest trees is probably moderate, while growth rate of the medium and smaller-sized trees is probably poor and mortality due to crowding high. Partial cutting to provide more growing space for trees of better quality and species is highly desirable at this time.

If this stand is managed under an even-age silvicultural system, the several species groups will mature at markedly different times. The average number of years to maturity is 24. and effective stand age is about 81. years old.

If this stand is managed under an all-age silvicultural system, the distribution of diameters, proportion of sawtimber, and density of shade-tolerant species are adaptable to selection cutting.

Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves and warrant further management.

Sapling trees too small to be merchantable do not represent a significant proportion of stand stocking and need not be included in any partial cuttings.

Advance seedlings are abundant and should provide the basis for successful natural regeneration if the overstory is harvested. The next stand will be dominated by Black Cherry

Undesirable understory plants may interfere with attempts to establish regeneration. These plants include woody interference, ferns, grasses, mountain laurel, or rhododendron.

SILVAH -- SILVICULTURE OF ALLEGHENY HARDWOODS - V4.50
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OWNER/AGENCY	-- US Forest Serv.	DATE TALLIED:	AUG/1988
FOREST/PROPERTY	-- Allegheny NF	DATE PRINTED:	25/SEP/1991
COUNTY/DISTRICT	-- Ridgway	FILE:	b:tsample.SIL
COMPT - STAND	-- 12 32	DEFAULT:	SILVAH.DEF
ACRES	-- 125.00	TYPE:	TRANSITION HARDWOOD
STAND AGE	-- 68	SIZE:	SMALL SAW
SITE	-- 70 FOR BC	DENSITY:	GT 95 %

******RECOMMENDED TREATMENT******

Commercial Thinning (Integrated Sale)

Perform a thinning to provide additional growing space for the better trees and provide some intermediate yield. Stand size and composition are such that the thinning can be performed on a commercial basis and will yield a product mix consisting of both sawlogs and pulpwood.

The volumes to be removed are: 1907. bd ft (Int 1/4" log rule) and 5.4 cords per acre. A pulpwood-only sale will yield: 5.9 cords.

WARNING Sapling basal area is just below the 20 sq. ft. decision point; a non-commercial thinning prescription may also be appropriate.

WARNING Thinning in stands with interfering understory plants may cause them to expand and require treatment at final harvest.

******MARKING INSTRUCTIONS******

Reduce relative stand density to 78. % leaving 64. sq. ft. of basal area per acre. Remove trees in the size and quality classes shown below:

Cut 2. out of 3. trees from the polesize class.

Cut 3. out of 5. trees from the ssawsize class.

Cut 1. out of 5. trees from the msawsize class.

Cut all of the trees from the lsaw size class.

About 89 % of the trees cut will be UGS. This will result in the removal of about 100 % of the UGS this stand and about 100 % of the merchantable-sized UGS.

Within the size and quality constraints above, favor the best trees whenever possible. Try to preserve seed sources of scarce species if they are desired in the regeneration, and strive for uniform spacing among residuals whenever possible.

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STAND SUMMARY, PRESCRIPTION, AND MANAGEMENT SIMULATOR PROGRAM
DEVELOPED BY THE NORTHEASTERN FOREST EXPERIMENT STATION, WARREN, PA

OWNER/AGENCY -- US Forest Serv.
FOREST/PROPERTY -- Allegheny NF
COUNTY/DISTRICT -- Ridgway

COMPT - STAND -- 12 32

ACRES -- 125.00
STAND AGE -- 68
SITE -- 70 FOR BC

DATE TALLIED: AUG/1988
DATE PRINTED: 25/SEP/1991
FILE: b:tsample.SIL

DEFAULT: SILVAH.DEF

TYPE: TRANSITION HARDWOOD
SIZE: SMALL SAW
DENSITY: GT 95 %

	ORIGINAL	CUT	RESIDUAL
BASAL AREA - SQ FT/A			
SAPS	18.0	.0	18.0
POLES	33.0	22.8	10.2
SM SAW	38.0	22.0	16.0
MED SAW	24.0	4.2	19.8
LG SAW	3.0	3.0	.0
TOTAL	116.0	52.0	64.0
NUMBER OF TREES - #/A			
# TREES	793.	94.	699.
DIAMETERS - IN.			
DIAM	12.1		11.8
DIAM MER	13.9		15.5
QUAD DIA	5.2		4.1
RELATIVE DENSITY - %			
REL DEN	120.		78.
AGS RDEN	83.		78.
BD FT INT 1/4", VALUE/A			
GR. BDFT	7501.	2565.	4936.
NET BDFT	6188.	1907.	4281.
DOLLARS	1685.	54.	1631.

	ORIGINAL	CUT	RESIDUA
SPECIES COMPOSITION -			
% BC	16.		28.
% SM	23.		18.
% RM	8.		1.
% AB	8.		3.
% NRO	18.		31.
% WO	11.		17.
% CO	16.		2.
QUALITY -- % IN AGS			
% AGS	60.		100.
AGES - YRS.			
YRS MAT	24.		14.
EFCT AGE	81.		86.
STRUCTURE			
Q FACTOR	1.4		1.3
WEIB C	.0		.0
CORD VOLUME/A			
TOT CDS	23.5	7.4	16.1
NET CDS	18.8	5.9	12.9
PULP CDS	10.5	5.4	5.0

---------- TOTAL STAND ----------

BD FT INT 1/4", VALUE			
GR. MBF	937.6	320.6	617.0
NET MBF	773.5	238.4	535.1
M DOLLAR	210.6	6.8	203.8
CORD VOLUME			
TOT CDS	2937.	920.	2016.
NET CDS	2349.	736.	1613.
PULP CDS	1311.	681.	630.

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OWNER/AGENCY -- US Forest Serv.
FOREST/PROPERTY -- Allegheny NF
COUNTY/DISTRICT -- Ridgway

COMPT - STAND -- 12 32

ACRES -- 125.00
STAND AGE -- 68
SITE -- 70 FOR BC

DATE TALLIED: AUG/1988
DATE PRINTED: 25/SEP/1991
FILE: b:tsample.SIL

DEFAULT: SILVAH.DEF

TYPE: TRANSITION HARDWOOD
SIZE: SMALL SAW
DENSITY: 50 TO 80 %

RESIDUAL STAND

BASAL AREA - SQ. FT. PER ACRE

SPECIES > DIA.	ALL SP	SM	NRO	CO	BC	WO	AB	RM
2	13.0	7.0	6.0	.0	.0	.0	.0	.0
4	5.0	2.0	3.0	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0
8	1.9	.0	.0	1.3	.0	.0	.0	.6
10	8.3	2.6	1.9	.0	.0	3.8	.0	.0
12	6.0	.0	.0	.0	3.0	3.0	.0	.0
14	4.0	.0	.0	.0	.0	4.0	.0	.0
16	6.0	.0	.0	.0	6.0	.0	.0	.0
18	5.9	.0	.0	.0	5.9	.0	.0	.0
20	10.9	.0	5.9	.0	3.0	.0	2.0	.0
22	3.0	.0	3.0	.0	.0	.0	.0	.0
24	.0	.0	.0	.0	.0	.0	.0	.0
SAPS	18.0	9.0	9.0	.0	.0	.0	.0	.0
POLES	10.2	2.6	1.9	1.3	.0	3.8	.0	.6
SM SAW	16.0	.0	.0	.0	9.0	7.0	.0	.0
MED SAW	19.8	.0	8.9	.0	8.9	.0	2.0	.0
LG SAW	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	64.0	11.6	19.8	1.3	17.9	10.8	2.0	.6
SPECIES%	100.	18.	31.	2.	28.	17.	3.	1.

ACCEPTABLE GROWING STOCK ONLY

SAPS	18.0	9.0	9.0	.0	.0	.0	.0	.0
POLES	10.2	2.6	1.9	1.3	.0	3.8	.0	.6
SM SAW	16.0	.0	.0	.0	9.0	7.0	.0	.0
MED SAW	19.8	.0	8.9	.0	8.9	.0	2.0	.0
LG SAW	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	64.0	11.6	19.8	1.3	17.9	10.8	2.0	.6

SILVAH -- SILVICULTURE OF ALLEGHENY HARDWOODS - V4.50
STAND SUMMARY, PRESCRIPTION, AND MANAGEMENT SIMULATOR PROGRAM
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OWNER/AGENCY -- US Forest Serv.
FOREST/PROPERTY -- Allegheny NF
COUNTY/DISTRICT -- Ridgway

DATE TALLIED: AUG/1988
DATE PRINTED: 25/SEP/1991
FILE: b:tsample.SIL

COMPT - STAND -- 12 32

DEFAULT: SILVAH.DEF

ACRES -- 125.00
STAND AGE -- 68
SITE -- 70 FOR BC

TYPE: TRANSITION HARDWOOD
SIZE: SMALL SAW
DENSITY: GT 95 %

******TREATMENT SPECIFIED BY USER******

The volumes to be removed are: 4172. bd ft (Int 1/4" log rule) and 8.2 cords if an integrated sale or 12.8 cords if a pulpwood-only sale.

******MARKING INSTRUCTIONS******

Reduce relative stand density to 60. %, leaving 39. sq. ft. of basal area per acre. Remove trees in the size classes shown below:

Cut all of the trees from the pole size class.

Cut 4. out of 5. trees from the ssaw size class.

Cut 2. out of 3. trees from the msaw size class.

Cut all of the trees from the lsaw size class.

About 60 % of the trees cut will be UGS. This will result in removal of about 100 % of the UGS in this stand, and about 100 % of the merchantable-sized UGS.

SPECIFICATIONS USED FOR THIS CUT ARE BASED ON
A SINGLE TREE AND GROUP SELECTION CU

MINIMUM DENSITY	MAXIMUM REMOVED	STRUCTURE FACTOR	MAXIMUM DIAMETER	Q FACTOR
60	35		24	1.2

SPECIES	DIA TO DIA		QUAL TO QUAL		% CUT	PRIORITY
ALL	6	11	1	1	63	3
ALL	12	17	1	1	47	3
ALL	18	23	1	1	56	3

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OWNER/AGENCY -- US Forest Serv.
FOREST/PROPERTY -- Allegheny NF
COUNTY/DISTRICT -- Ridgway

DATE TALLIED: AUG/1988
DATE PRINTED: 25/SEP/1991
FILE: b:tsample.SIL

COMPT - STAND -- 12 32

DEFAULT: SILVAH.DEF

ACRES -- 125.00
STAND AGE -- 68
SITE -- 70 FOR BC

TYPE: TRANSITION HARDWOOD
SIZE: SMALL SAW
DENSITY: GT 95 %

******TREATMENT SPECIFIED BY USER******

The volumes to be removed are: 3338. bd ft (Int 1/4" log rule) and 4.7 cords if an integrated sale or 7.7 cords if a pulpwood-only sale.

******MARKING INSTRUCTIONS******

Reduce relative stand density to 78. %, leaving 64. sq. ft. of basal area per acre. Remove trees in the size classes shown below:

Cut 2. out of 5. trees from the pole size class.

Cut 1. out of 2. trees from the ssaw size class.

Cut 2. out of 3. trees from the msaw size class.

Cut all of the trees from the lsaw size class.

About 77 % of the trees cut will be UGS. This will result in removal of about 87 % of the UGS in this stand, and about 87 % of the merchantable-sized UGS.

SPECIFICATIONS USED FOR THIS USER-DEFINED CUT:

MINIMUM DENSITY	MAXIMUM REMOVED	STRUCTURE FACTOR	MAXIMUM DIAMETER	Q FACTOR
60	35		0	.0

SPECIES	DIA TO DIA		QUAL TO QUAL		% CUT	PRIORITY
AB	6	40	1	2	100	1
ALL	6	40	2	2	84	2
ALL	20	40	1	2	84	2
ALL	6	40	1	1	100	3

SILVAH -- SILVICULTURE OF ALLEGHENY HARDWOODS - V4.50
STAND SUMMARY, PRESCRIPTION, AND MANAGEMENT SIMULATOR PROGRAM
DEVELOPED BY THE NORTHEASTERN FOREST EXPERIMENT STATION, WARREN, PA.

OWNER/AGENCY -- US Forest Serv.
FOREST/PROPERTY -- Allegheny NF
COUNTY/DISTRICT -- Ridgway

COMPT - STAND -- 12 32

ACRES -- 125.00
STAND AGE -- VARIOUS
SITE -- 70 FOR BC

DATE TALLIED: AUG/1988
DATE PRINTED: 25/SEP/1991
FILE: b:tsample.SIL

DEFAULT: SILVAH.DEF

TYPE:
SIZE:
DENSITY:

SIMULATED STAND DEVELOPMENT

YRS	NO. TREES	BASAL AREA	REL DEN	DIA MER	% CAP	% M&B	% OAK	TOT CDS	PULP CDS	MBF	$	NET GROWTH	MORT
0	793	116	120	13.9	16	31	46	19	10	6.2	1685		
CUT	75	52	42					8	5	3.3	626		
RES	718	64	78	12.9	24	24	49	11	6	2.8	1059		
												2.32	.08
5	701	76	84	14.2	25	22	49	14	6	4.4	1625		
												2.07	.38
10	632	86	87	15.2	25	21	50	17	7	5.7	2217		
												2.12	.40
15	567	97	90	16.2	26	20	50	20	8	7.3	2981		
CUT	54	38	30					7	4	2.1	421		
RES	514	58	60	19.1	38	19	42	13	4	5.3	2560		
												2.15	.08
20	502	69	66	20.1	37	18	44	15	4	6.6	3360		
CUT	502	69	66					15	4	6.6	3360		
RES	0	0	0	.0	0	0	0	0	0	.0	0		

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DEFAULT: SILVAH.DEF

TYPE:
SIZE:
DENSITY:

SIMULATED PRODUCT YIELD

YRS	DATE	TOTAL CORDS	PULP CORDS	MBF SAW	$ TOTAL
INITIAL STAND					
0	1988	11.1	5.8	2.8	1059.
CUTTING YIELDS					
0	1988	7.7	4.7	3.3	626.
15	2003	7.4	4.4	2.1	421.
20	2008	15.5	4.4	6.6	3360.
FINAL STAND					
20	2008	.0	.0	.0	0.
TOTAL YIELD		30.6	13.6	12.0	4407.

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