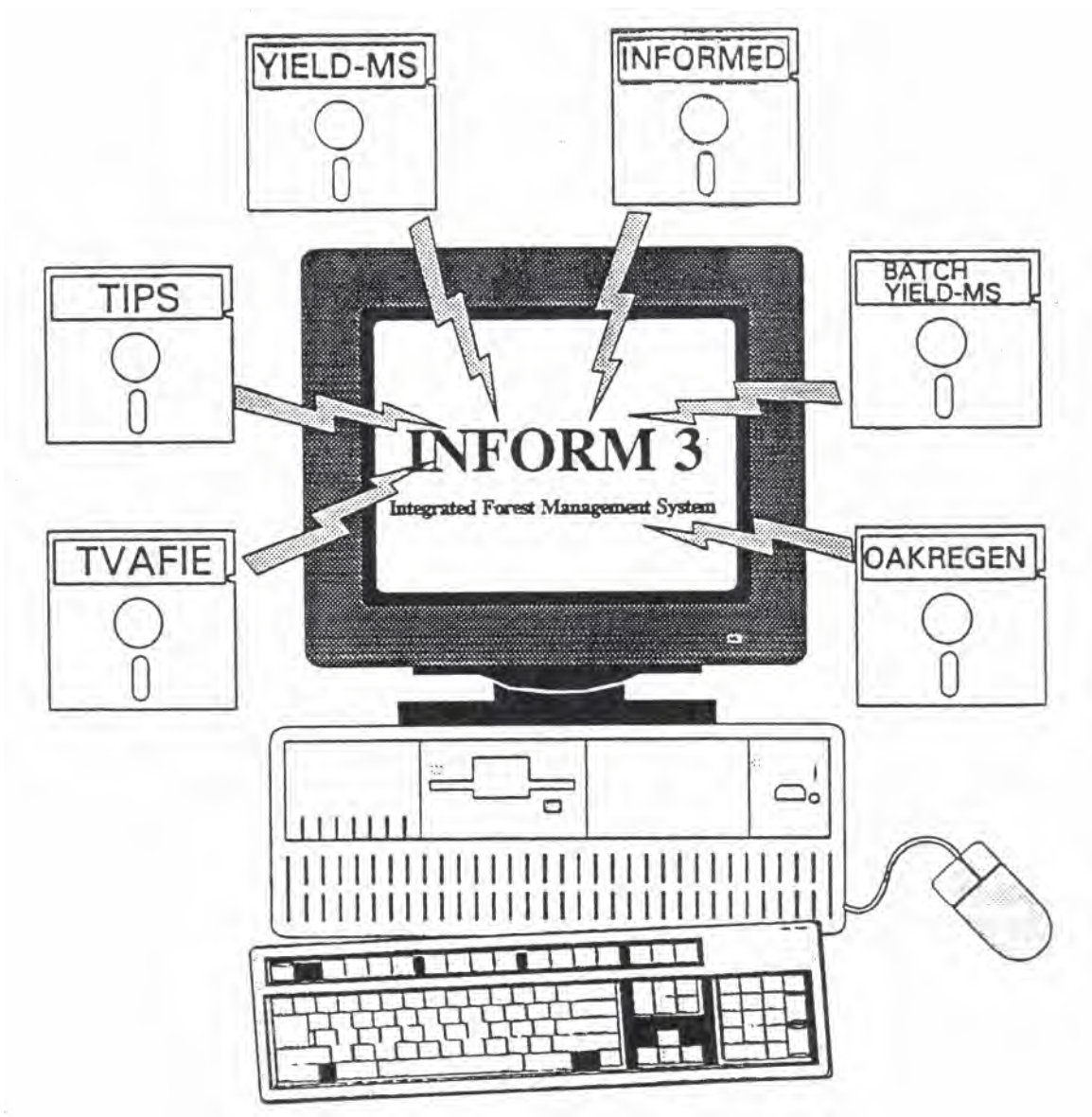# INFORM

INTEGRATED FOREST MANAGEMENT SYSTEM

Version 3

LEARNING AND USING INFORM

Forest Resources Systems Institute

April 22, 1997

Mr. Brian Fiacco
Westvaco Corporation
P.O. Box 1950
Summerville, SC 29484

Dear Brian:

Enclosed is a copy of the INFORM 3 program. Please feel free to work with INFORM's
files to see how your Newton tally program can be designed to output data in this format.
I think that built-in compatibility with the major inventory programs is an important
feature to any data collection program.

I am very excited about the prospecta of FORS working with Westvaco to bring this
product to market. I am sure that it can meet many needs that are not addressed by
current data collectors and software, and that it can redefine the standards by which such
systems are measured. Both are worthy goals for FORS to address. In addition, it seems
that this could also provide another product that help provide a diverse and stable
financial base for FORS.

Tim plans to visit Summerville next month, so he can discuss this some more at that time.
I can probably come down in mid-June to work with you some more. In the meantime,
please let me know what we can do on this end to support this project.

I appreciate your considering FORS as a potential partner in this project. I look forward
to working with you and your staff to make it a reality.

Sincerely,

Stephen K. Nodine
President

cc: Tim Rowell

READ ME FIRST

INFORM 3
Hard Disk Quick Installation Instructions

INFORM3 is provided to you in a format that simplifies the installation procedure. Files are compressed using the PKZIP software. The compression file contains 75 files which will be copied to your hard disk by the installation program. You will need a minimum of 2.8 Mb free hard disk space to install INFORM3. **You cannot operate INFORM3 without following this installation procedure.** Refer to the INFORM 3 manual page 12 for notes on the installation procedure. Great effort has been made to make INFORM 3 as user friendly as possible, however, you should still read the manual before calling the FORS software support line.

The installation program will create a directory on your hard disk named INFORM 3 and will copy the contents of the enclosed disks to that directory. You will operate the INFORM 3 program from there. (Refer to your DOS manual if you are unfamiliar with DOS directories.)

If you have older versions of INFORM **do not instan INFORM 3 in the same subdirectory** with the old version. The new version cannot run properly if files of the old and new version are mixed.

Step-by-step installation instructions
The following example demonstrates installation of INFORM 3 on the C: drive in a subdirectory called INFORM 3. You may install INFORM 3 on another drive and subdirectory by substituting the C in the following instructions with the appropriate drive.

1) **Make** a backup copy of the INFORM 3 disks and store the originals in a rafe place. Use the backup copy to install the program.

2) **Start** from the A: or B: drive of your computer. Your DOS prompt should be A:\> or B:\>

3) **Insert** INFORM3 disk 1 in the A: or B: drive, depending on the disk size that you ordered. To install on drive C: type:

INSTALL C: [←Enter]

Press enter. If you are installing on some other drive (D, E, etc.) replace the C in the aboye command with the correct drive letter. You will be prompted for all further information required for installation by the program.

4) **If you are using 5.25" disks**, remove disk 1 from the drive and repeat step 3 for disks 2, 3 and 4.

You may now run INFORM3 by typing:

AUTO [←Enter]

NOTES:
1. If the screen appears unreadable when running the TIPS program, the ANSISYS driver has not been installed. Refer to the attached document "INSTALLING ANSI.SYS" and page 12 of the INFORM 3 User Manual (INFORM section).
2. If the program is not installed on drive C or if it is not installed in a subdirectory named INFORM, it will be necessary to change the path before INFORM-ED will read the master species file list. See page 5 in the INFORM-ED section of the manual.

INFORM 3 BOASTS MANY NEW FEATURES

Todd E. Hepp
Systems Analyst

INFORM
Integrated Forest Management System
Version 3
User's Manual

YIELD-MS   INFORMED
TIPS   BATCH FIELD-MS
INFORM 3
TVAFIE   OAKREGEN

Tennessee Valley Authority
Norris, TN 37828
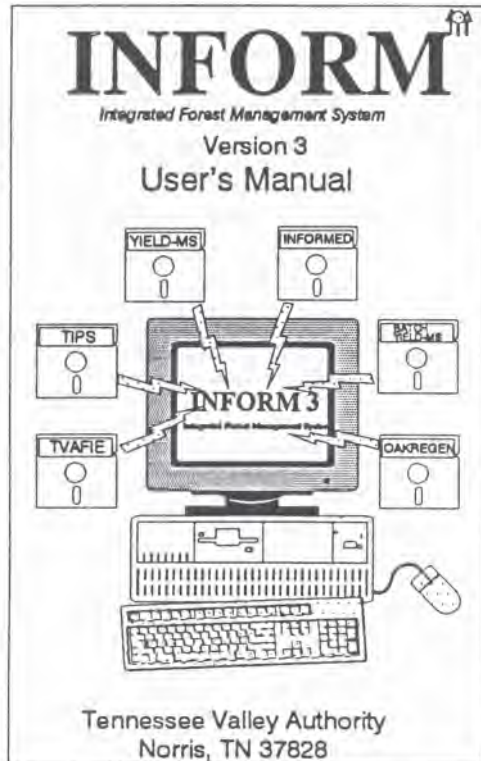
The INFORM (Integrated Forest Management System) PC-based software package was released as version 2 in December, 1990. Some two years and several hundred new users laten, we announce the availability of version 3 beginning December 21, 1992. INFORM performs a vital role in managing forest resources on TVA's reservoir properties by providing the hará numbers needed for stand treatment prescriptions, compliance with environmental regulations, preparation of timber sales, and more. For users outside of TVA, INFORM use has revolutionized on-the-ground forestry on millions of acres throughout the Tennessee valley region and beyond. Version 3 is the most ambitious revision of INFORM since its inception in 1987. All programs have been overhauled and some have been completely rewritten for increased power and better usen friendliness. To follow are highlights of the new features:

-A file compaction process has been used so that INFORM can be installed by inserting a single high density, floppy disk and typing INSTALL.

-The front end for all programs has been upgraded for increased friendliness and uniformity. A mouse can be used to navigate onto any disk volume and sub-directory to retrieve files.

-Metric units are supported for all programs in addition to English units. Area may be expressed in hectares, sawtimber and pulpwood volume in cubic meters, weight in metric tons green or dry, Cree heights in meters, basal anea in square meters, dbh in centimeters, and mast weight in kilograms.

-Log rules may be installed separately for each species.

-Snags, dens, and other dead trees can be tallied for wildlife habitat or old growth assessment purposes and processed without affecting volume statistics or growth projections.

TVAFIE
(TVA Forest Inventory Editor)

- Enter/edit field cruise data into files
- Individual tree tally by plot
- Frequency (dot) tally by stand
- Prism, fixed area plots, or 100%
- Record species, dbh, height
- Optionally, record grade, % sound, cut/leave, sawtimber/pulpwood status
- English or metric units
- Configurable to electronic data recorder (EDR) running DOS
- Optionally, double sample dbh on height (saves time in plantations)
- Sort, cut, copy, and paste plots
- Print cruise data report
- Use shortcut keystrokes to speed data entry (e.g., press Enter for automatic repetition of previous tree observation)
- Number and/or name plots (permits assignment of plots to stands after a cruise is complete; allows maintenance of CFI plot system)
- Enter increment core growth data
- Highly user friendly menus and tested reliability

TIPS
TVA Inventory Processing System

- Process cruise data files into stand/stock table reports
- Flexible report format: per compartment, per stand, per plot
- Delineate volume tables by species, species group, grade, cut/leave, sawtimber/pulpwood, volume unit
- Volume units: mbf (Doyle, Scribner, International), cunits (100 cuft), cords, tons green, tons dry, cubic meters, metric tons, basal area, # stems
- Report topwood and crownwood in selectable volume unit
- Tally snags, cavity trees, etc. and report separately
- Batch process unlimited number of stands per compartment
- Reports standard error, confidence intervals, and sample sizes for stands and compartments
- Direct reports to printer or ASCII file
- Report styles: classic, simple, and by-log-height
- Direct reports to blank delimited flat file importable to dBASE package
- Highly user friendly interface
- Creates file that logs entire run

YIELD-MS
(Timber Yield Planning Tool For Mixed Stands)

- Project stand growth
- Select: TWIGS (Central States, Northeast, Georgia), OAKSIM, G-HAT, or SILVAH dbh growth and mortality eqs.
- Use increment core growth data
- Simulate harvests; Auto-Tree-Marker macro accepts rule-of-thumb marking criteria and edits cut/leave status
- Enter stumpage prices, inflation rates by species group and product
- Appraise stand value
- Report timber sale volumes
- Enter management expenses and revenues by federal income tax type
- Calculate before and after tax net present worth, internal rate of return, composite rate of return, annual equivalent value, benefit cost ratio, soil expectation value
- Report projected cashflows
- Export results to graphics files
- Estimates stand size class as sawtimber, poletimber, seed/sap
- Store all data entered during session in a scenario file for later recall
- User friendly interface

INFORM 3
(INtegrated FORest Management system)

INFORM-ED
(INFORM Master Species File Editor)

- Edit files which store equations, etc. drawn upon by all INFORM programs
- Customize INFORM to local convention
- Create up to 100 species codes
- For each species, edit volume equation coefficients, form class, log rule, volume to weight ratios, boardfoot calculation method, cubic feet to cord factors, grade change probabilities, growth and mortality equations
- Create product codes for chip-n-saw, poles, veneer, snags, etc.
- Define species groups; assign species, stumpage prices, and inflation rates to groups; saved in file; importable to TIPS and YIELD-MS programs
- Report master species file contents
- Quick and easy to use

BATCH-YIELD-MS

- Build a forest level stand records database system
- Process an unlimited number of stands per run
- Select growth model, other options
- Automatically inputs each stand's cruise data file, calculates volumes, grows stand to common year, posts results to ASCII flat files; then the ASCII files in turn, are directly importable to commercial database software such as dBASE IV (tm)
- An assortment of database (dbf), screen generating (scr), and printed report (frm) generating files that work with dBASE IV are supplied to startup
- User manual describes the database development process
- dBASE IV or other package must be supplied by the user
- Operate BATCH-YIELD-MS once per year to update a forest for change attributed to growth and mortality
- Use BATCH-YIELD-MS to project forest into future to determine an allowable cut

UTILITIES

- INFORM system menu facilitates execution of individual programs
- LISTER program prints INFORM reports previously stored as ASCII files
- TXTDIF utility converts graphics files created by YIELD-MS into DIF types; DIF file is readable by Lotus 123, etc.
- EDRFRONT permits point-n-enter selection of stand to edit on EDR's
- TVAFRONT navigates disk directories, marks stand cruise files for inclusion in compartments, selects files to edit
- INSTALL utility permits user to insert distribution floppy and enter INSTALL
- Printer Check module configures printer to condensed mode and stores codes
- 402TIPS utility converts inventory cruise data files from Inventory Processor version 4 to TIPS format

-The TVAFIE (TVA Forest Inventory Editor) is used to enter/edit forest inventory "cruise" data into computer files. It now is configurable for execution on DOS compatible, electronic data recorders (EDR) with screen sizes as small as 6 rows by 20 columns.
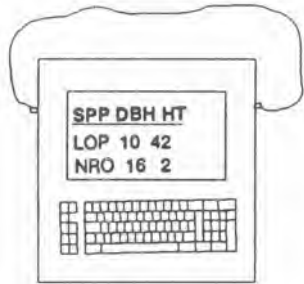
Use of an EDR in the field eliminates keypunching of data in the office. Also, numerous efficiency boosting features have been built into TVAFIE to speed the process of typing in data. Double sampling of tree diameter on height, plot naming and sorting, and the ability to cut and paste plot data from one stand file to another are some of the other new features included in TVAFIE.

-The TIPS (TVA Inventory Processing System) has been completely rewritten. TIPS processes inventory data files created by TVAFIE into stand/stock table reports and files. Compartment, stand, and new plot level reports are controlled by separate menu screens. Plot level reports make TIPS suitable for maintenance of continuous forest inventory (CFI) schemes. There no longer is an upper limit on the number of stands per compartment. Volume units may be specified for topwood, crownwood, and for statistical reports. Reports now come in three styles. Joining the familiar "classic" reports are new, condensed, "simple" reports which resemble a database flat-file, and also highly detailed, "by-log-heights" reports. Other features have been added to facilitate the processing of large numbers of stands in a single run.

-YIELD-MS (Timber Yield Planning Tool for Mixed Stands) has been overhauled for much better user friendliness. YIELD-MS accepts stand/stock table files produced by TIPS and performs growth projections, harvest simulations, financial analyses, and timber sale reporting. A new feature is stand size class determination as either seed/sap, poletimber, or sawtimber according to USFS rules for pine and hardwood. Users now may perform growth projections for up to 99 years at a clip, page through the results when complete, and print a report. The TIMSALE module has been reworked; sawtimber and pulpwood are reported in separate tables and embedded, unoccupied species groups no longer clutter reports. Also, TIMSALE reports may be directed to printers setup for landscape mode on regular or legal size paper. Trees tallied as dead are reported but do not impact growth projections or volume and basal area calculations.

-INFORM-ED (INFORM Edit) was completely rewritten for improved clarity and power. It is used to configure INFORM programs to a specific region by editing species codes, stumpage prices, volume estimating equations, growth rates, and assignment of species to groups. The full screen editor in master species file mode allows any data field for any species to be altered. A

message is flashed which provides a description for each field as it is encountered. A new "global" command can change the contents for a field to the same value for every species in the file. Printed reports can be generated at the individual species level or for all species combined. The TIMSALE Setup mode has a new look. Naming species groups, assigning groups to species, and entering stumpage price data for groups is very straight forward. The program has numerous help screens and a much clearer user manual.

-BATCH-YIELD-MS inputs multiple stand/stock table files and growth adjusts stand statistics to a common year. Results are posted in ASCII files which subsequently are imported into a forest level, stand records database system. In the new version, the wildcard feature for selecting data files was dropped in favor of more simplistic, compartment level processing like TIPS uses. The new BATCH-YIELD-MS can accommodate graded or ungraded tally data and if it encounters missing input data files, it may automatically access TIPS, create the needed files, then resume processing. As data files are encountered, they may be kept or automatically deleted to conserve disk space. Added is the ability to generate output files which contain the essence of the TIPS reports. dBASE IVtm database file skeletons, screen forms, and report generating files are provided to speed migration of BATCH-YIELD-MS generated output files into a stand records database. The user manual describes the entire database building process.

INFORM 3 is configurable to most timber types and market arrangements in the U.S. and southern Canada. It operates on IBM PC compatible XT/AT/386/486 machines operating DOS 3.3 or greater. An optional 80x87 math co-processor boosts performance significantly. INFORM 3 applications are expanded through integration with a word processor for editing reports, a dBASE package for building forest level databases, and a graphics package for producing charts.

Effective March, 1992, YIELDplus (Timber Yield Forecasting and Planning Tool) version **3.0** was released. YIELDplus 3.0 and INFORM 3 are available for a fee through FORS, 122 Helton Ct., Florence, AL 35630. Phone: (205) 767-0250; FAX: (205) 767-3768.

\inform3\infman\article.txt

Installing ANSI.SYS

The ANSI.SYS driver must be installed on your computer in order for INFORM to run correctly. If this file is not properly installed, you will get "computer code" appearing on the screen. Follow the steps below to install ANSI.SYS if you have a problem when running INFORM.

1) From the DOS prompt, navigate to the root directory.

2) Once in the root directory, edit the CONFIG.SYS file. Type:

EDIT CONFIG.SYS

The CONFIG.SYS file should contain a number of lines.

       Example CONFIG.SYS file:

       Files = 30
       Buffers = 15
       DEVICE=C:\DOS\HIMEM.SYS

       Your CONFIG.SYS file will vary from this example.

Move to the end of the file using the down arrow key until the cursor is below the last line. Simply type the new line in the CONFIG.SYS file:

DEVICE=C:\DOS\ANSI.SYS

Exit and save the file:

Press

F
X

When prompted

Loaded file is not saved. Save it now?
Respond

Y

3) When back to the C:\ prompt, reboot the computer. If the INFORM program still does not run properly, call FORS for assisance.

Forest Level Databases

Are You Ready?

Todd E. Hepp

Abstract: *We examine the rationale for developing computerized, forest level databases. The basic ingrediente are described and the Geographic Information System (GIS) option is examined. INFORM 3 (Integrated Forest Management System) is used to demonstrate how the job of building and maintaining a database can be cut down ro size. The Tennessee Valley Authority (TVA) StandFinder system used for TVA reservo ir property management is offered as an example.*

WhyDevelop A Forest Level Database

The chances are good that you already have a forest level database, of sorts, if you are a land manager who has ongoing responsibility for a forest property of several hundred acres or more. Perhaps it's timber cruise records that you keep in a Ming cabinet or nothing more than your collective memory of the property's features. As personal computer hardware prices continue to fall and the sophistication of users in the forestry cornmunity rise, interest is growing in the computerization of forest property record keeping. This is not a novel concept, as large forestland owning entities such as paper companies have been using computers to process inventories into databases for up to 30 years or so. Now the personal computer (PC) revolution is allowing the manager of the State forest, the wildlife refuge, and the medium-sized, non-industrial privately owned forest to benefit from computerized record keeping, too.

For the purposes of this discussion, a forest level database is based on the premise that forests are structured as a collection of stands. A stand is simply an area on the ground that is sufficiently uniform in species composition, age, and condition to be distinguishable from growth in other areas. Stands and the attribute information attached to them (e.g., timber volume estimates, age, site index, aspect, etc.) are intuitively attractive building blocks or records for a forest level system. This implies that stand lines have been delineated on a map using some combination of aerial photo interpretation and/or on-the-ground inventory. A variation on this theme are continuous forest inventory systems (CFI) where a grid of permanent sample plots have been laid out and forest stand lines are not necessarily delineated. In this case, the data unique to each plot form the building blocks of the overall database.

Some of the benefits of computerizing forest records are improved organizational continuity, the ability to perforen queries (i.e., searches) and generate summary reports, automation of growth projections, integration of digitized maps (i.e., GIS), and improved data security. Personnel changes upset the flow of record keeping. The structure imponed by computerization provides a stable mechanism which encourages standardization of procedures. When the number of stands in a forest is large, manual sorting of records which meet specific criteria becomes tedious or impossible. Database packages allow rapid retrieval of information by defining tales and then letting the computer find the records automatically. For example, one might query the database to identify the stands which are good candidates for thinning on the basis of age, vigor, and stocking level. Database packages also excel at linking files together so that, for example, volume data stored in one file may be dovetailed with base stand information stored in another. Once in electronic format, stand and stock table data may be updated for growth and mortality between re-inventories by tapping a growth and yield simulator which is specially designed to automatically update the

database files. Last, since computerization reduces valuable information to files on a disk drive, security may be expedited by duplicating the files onto a cassette tape or a box of floppies for off-site storage. As long as back-up procedures are employed, an organization can easily recover from any office catastrophe by buying a new computer and restoring the data from tape or floppies.

There are disadvantages to building computerized systems. Training in software operation is a rite of passage for all users. The learning curve is particularly acute when the GIS option is exercised. In fact, spending the time needed to learn how to use systems probably is the greatest barrier to their use. Database use also may require the installation of additional hardware/software such as local ares networks (LANS) in the case where several individuals desire to share data. The GIS option requires a hefty PC plus a digitizing tablet, plotter and potentially expensive software. The structure and discipline imponed by a computer sometimes can stymie flexibility; employees who have invested a full career to the management of a particular property may have more knowledge locked in their heads than can ever be conveyed through a computer. However, one may wonder what happens to the organization when these employees get sick or retire.

Ingredients Of A Forest Level Database

Although it sounds trite, a database contains only the information which you care to enter. Later we will discuss how INFORM can automate the building and maintenance of the stand and stock table component. First, you must select a database package. There is a variety of such packages in the marketplace. Some of the bigger sellers are dBASE IV® and Paradox®, Foxpro®, Clipper®, PC-File, Access®, and more. Expect to pay about $400. The dBASE (.dbf) file format is the defacto standard for building data files; however, most commercial packages other than dBASE also honor the .dbf format. Most systems also can impon blank delimited text files (i.e., data in columnar form with one or more blanks separating the columns). Later we will examine how INFORM generated blank delimited text files can be imponed directly finto a database package.

Once you have a database package installed, you may design the file or files which will comprise the overall database. There are entire books written on the subject of database design. Generally, one should aim to avoid file structures which result in redundant information. Most database packages allow the linkage of one file to another through a key field. This feature eliminates the need to create single large, unwieldy files which are slow to load or edit. Figure 1 illustrates how information in two files STAND.DBF and VOLUME.DBF can link up through the key field, Stand_ID. Note that each record or line in the files contains various fields unique to a stand and there is a one-to-one relationship between the records. Database packages also allow many-to-one and one-to-many relationships between the records in files. Anticipating these situations and structuring files accordingly is a commonly used technique to avoid redundancy of data in files.

STAND.DBF					VOLUME.DBF			
Stand_ID	Acres	Established	Type		Stand_ID	Grade-1 Mbf*	Grade-2 Mbf	Grade-3 Mbf	Cords
NORTH01	92.03	1965	LOBLOLLY_PLAN.		NORTH01	1.6	2.3	4.1	12.2
SOUTH01	55.00	1942	UPLAND_HDWD		SOUTH01	2.6	3.2	5.4	11.2
NORTH02	86.42	1955	SHORTLEAF_OAK		NORTH02	0.0	5.6	8.3	0.0
SOUTH02	51.11	1957	NAT._LOBLOLLY		SOUTH02	4.4	0.0	3.1	6.4

*MBF: 1,000 board feet per acre

Figure 1 - STAND.DBF and VOLUME.DBF Linkage Using Stand_ID as a Key Field

The mechanics of initially defining a data file (sometimes referred to as a file skeleton) varíes from one package to the next but generally is highly user friendly. Figure 2 illustrates the initial creation of the file STAND.DBF using dBASE IV. Each field is defined by a narre, type (character or numeric), width (maximum number of characters), and the number of characters to the right of the decimal point (optional if the field is a real number).

Figure 2 - dBASE IV STAND.DBF File Creation

Once the desired database files are created, there are several ways of entering data into them. Earlier we alluded to the technique of importing data from previously created, blank delimited text files such as those produced by INFORM. The other and perhaps most common approach is to simply type it in. Most commercial database packages feature a highly user friendly environment for editing and appending data. Figure 3 illustrates use of dBASE IV to append data directly into a file. Note that each field forms a separate column. Greater utility is achieved by transforming a database file into a form. Forms allow annotations and calculated fields which are derived from the actual fields. Figure 4 depicts the STAND.DBF file shown in Figure 3 as a form.

Figure 3 - Appending Data Directly Into STAND.DBF From The Keyboard

```
 Records    Organize   Go To    Exit
       ┌───────FORM FOR STAND.DBF───────────────────┐
       │                                            │
 STAND_ID      NORTH01                              │
 ACRES         92.03                                │
 ESTABLISHED IN 1965                                │
 FOREST TYPE    LOBLOLLY_PLAN.                      │
       │                                            │
       └────────────────────────────────────────────┘




 Edit    │ C:\dbase\STAND      │ Rec 1/4 │ File │      │ Num
```

Figure 4 - Screen Form for Displaying a Single Record in STAND.DBF

Another feature of database packages is the ability to design templates for printed reports. Once created, report templates may be saved and used repeatedly. Like forms, reports can include annotations such as titles, calculated fields (e.g., sum), and group bands (e.g., sub-totals). Figure 5 illustrates a page from a report designed for STAND.DBF.

Page No. 1
03/26/93

STAND_ID	ACRES	ESTABLISHED	FOREST TYPE	ONE	TWO	THREE	TOTAL
				\-\-\-MBF/ACRE BY GRADE\-\-\-			
NORTH01	92.03	1965	LOBLOLLY_PLAN.	1.6	2.3	4.1	8.0
SOUTH01	55.00	1942	UPLAND_HDWD	2.6	3.2	5.4	11.2
NORTH02	86.42	1955	SHORTLEAF_OAK	0.0	5.6	8.3	13.9
SOUTH02	51.11	1955	NAT._LOBLOLLY	4.4	0.0	3.1	7.5
Total-->	284.56						

Figure 5 - Page From Report for STAND.DBF

A forest level database system is constantly changing as new data is added and files, queries, forms, and report templates are defined. A bottleneck may develop if multiple users desire to access the files at the same time. If this problem grows great enough, you may wish to consider installing a LAN. Most database packages can accommodate such configurations. However, networks definitely add a new layer of complexity and expense. Personnel costs increase because networks require trouble shooting and maintenance. A less elegant approach to sharing files between PC's is "sneakerware." That is, files are passed down the line using tape or floppy disks. This approach requires greater discipline among users, particularly when data is added to files using two or more PC's. A single PC should be designated as the repository for the master files.

__The GIS Option__

Geographic Information Systems have received a good deal of attention in forestry circles over the past 15 years. Now, PC's have sufficient power (i.e., fast processors, large capacity hard disks, high resolution monitors) to operate these systems effectively. Before you take the plunge, however, there are a number of considerations. First, you should understand what a GIS is and how much GIS capability you really need. This may save you considerable time and money, because some users underestimate the enormous investment required to use this technology profitably; the tendency is to purchase excess capability and to overlook increased personnel costs. Second, you should carefully examine how data will be entered into the system (i.e., who, what, where, when). Third, you should consider the specific maps and other analysis products that you expect to get out of the system. Last, you should summarize the benefits and costs to determine if GIS representa good value for your organization.

GIS Defined

Although it is an oversimplification, we will regard GIS's as optional add-ons to the tabular type databases discussed thus far. Visualize a GIS application to forestry as a conventional forest level database with the added ability to attach electronically traced boundary lines for stands, roads, streams, topography, etc. GIS packages use data structures for storing graphics which elevate them aboye computer-assisted drawing (CAD) packages. For example, if you trace in the boundary lines for two adjacent stands (i.e., polygons), a GIS will recognize that a common boundary line is shared by both polygons through a process called topology. GIS's contain an assortment of commands for rudimentary operations, such as calculation of acreage for a polygon. Another strong suit of GIS's is the ability to layer data (e.g., stands, soils, slope, roads, etc.) and overlay this information to determine the intersections or unions of polygons (Figure 6). In fact, this is the main analytic feature that separates GIS's from simple thematic mapping packages.
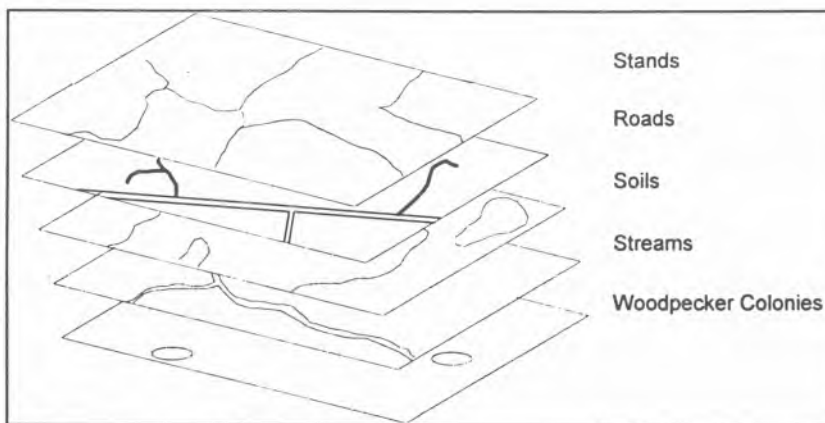

Figure 6 - Possible Data Layers in a Forest Level GIS

In the context of a forest level database, a stand polygon contains an identifier (e.g., Stand_ID) which can link-up with the tabular database. Thus, one may perform queries using the tabular database and express the results in the form of a map. Figure 7 is a map showing the stands which are candidates for thinning. The stands were identified by performing a query in the tabular database using stand age, vigor, and stocking level as criteria. In the absence of a GIS, our results would be limited to a printed report which usted the Stand_ID's for the candidate stands. GIS's also may operate in reverse to access data. You may use a mouse to point to a stand which is displayed on your monitor and a pop-up table may display tabular information about that stand; the GIS automatically reaches into the tabular data files to extract information.
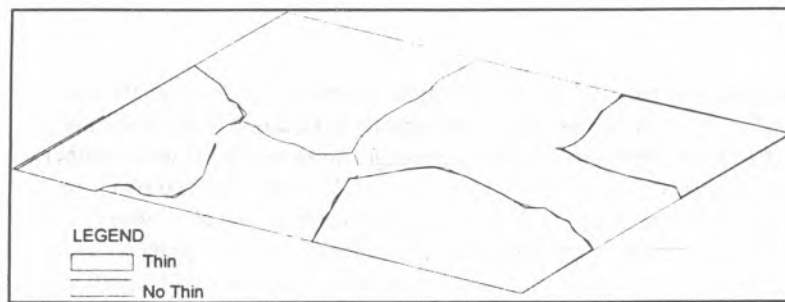
Figure 7 - Sample Map From a Query of Tabular Data Depicting Stands to Thin

GIS's also may perform a number of other tasks such as linear network analysis which is useful for planning logging and trucking operations. Perhaps the greatest benefit of GIS's is the ability to visually summarize the results of any analysis in the form of a computer plotted map. Maps are powerful depictions of features on the ground. However, as we will discuss later, a rack storing USGS 1:24,000 scale topographic maps (Le., quad sheets) and access to a photocopy machine used in conjunction with your conventional forest level database system may meet many of your geographic information needs at a fraction of the cost of a GIS.

Entering Data
By now you may be wondering how you can afford not to begin using GIS technology to enhance your forest level database. Unlike tabular data such as stand age or boardfoot volume, graphic data is very tedious to enter finto a computer. First, assuming you have purchased and installed a GIS software package, you must add a digitizing tablet to your PC. One which is large enough to accommodate an entire quad sheet will cost several thousand dollars. Next, you must digitize the desired data such as stand boundaries (polygons), roads (lines), and sample plot locations (points). This is a very time consuming process which requires considerable training and practice. Several steps are required to clean the data and build topology. In fact, the process of digitizing features from maps is where the greatest personnel cost is incurred for organizations adopting a GIS. Digitizing skills are acquired through months of practice.

Output Products
Some reports generated by a GIS are tabular in nature such as a list of calculated acreages for each stand. Any line printer will suffice for these types of applications. The end product produced from a GIS analysis usually is some sort of map. Most systems provide a variety of "drivers" for various brands of printers and plotters. At the extreme of simplicity, a laserjet printer could produce 300 dots per inch monochrome plots on 8.5" wide paper. For field work, such output may seem inadequate to foresters accustomed to full-size, color quad sheets. Unless expensive raster-based scanning capability is employed or digital line graph (DLG) files are purchased, maps plotted as output from a GIS will not contain the contour lines, streams, power lines, public land survey boundaries, and other annotations taken for granted on quad sheets. Moreover, a plotting device costing tens of thousands of dollars is required to produce maps with the color and clarity standard for quad sheets. Sophisticated plotting devices not only are expensive but depreciate in value rapidly and require skilled operators.

Benefits And Costs
The benefits of a GIS accrue primarily to the senior managers of an organization. It would seem that the required critical mass in staff, hardware, and software associated with the technology would exclude most small organizations from benefiting. As much as conventional databases add continuity, security, and other benefits for a company's tabular record keeping, a GIS does the same for map-based information. The primary difference between the two is the scale of the required investment and the complexity involved. Increased personnel costs for data collection, digitizing, system maintenance, macro development, and other operations, may be underestimated by firms adopting GIS's. The ability to overlay polygons to define new

ones frequently is cited as the highest use of a GIS. However, potential forestry users must ask themselves how often this process is really necessary and how much it is worth, The prospect of needing this capability increases as the number of polygon layers grows. For example, the latest trend is ecosystem management, which encompasses the interfacing of timber management with wildlife habitat zones, aesthetic sensitivity zones, and more. The ability to automate the identification of overlapping zones would be useful. From a public relations standpoint, GIS use may add an aura of credibility when defending controversial natural resource issues; it may give you a competitive edge.

The learning curve for effective use of GIS packages is very large because they are complex and support perhaps thousands of separate commands; casual use is not practical. As previously mentioned, small organizations may achieve the best balance by limiting forest record keeping to a tabular database together with a rack of conventional maps where stand lines and other spatial data are hand-drawn. Adaptations of CAD packages such as FORS/MAP may suffice for other users. For simple forest stand mapping tasks, the $2.75 quad sheet and a pencil are tough to beat; the bulk of the cost to produce a quad sheet is borne by the government, they are printed conventionally, not plotted, they are chock-full with detail, and the ability to use a pencil requires no software or training.

GIS software runs the gamut from one to several thousand dollars per copy. Vendors include ESRI Arc/Info®, Intergraph, GENASYS®, ERDAS®, TYDAC SPANS®, GeoVision®, Electronic Data Systems, Atlas GIS, MapInfo®, and more. Most offer versions which operate on a variety of platforms including PC's. Several are compatible with the dBASE (.dbf) file format or use dBASE IV as the tabular data manager. Acquiring a particular system should be viewed as subscribing to a long-term relationship between your organization and the vendor.

Using INFORM To Build And Maintain A Forest Level Database

The heart of any forest level database is estimates of volume for individual stands or plots. Although this information may be entered by hand, this task becomes time-consuming when the number of stands is large or the desired level of detall is high. A stand and stock table for a single stand may span over 100 fields if volume information is recorded at the individual species, diameter breast high (dbh) class, and product level. Replicate this level of detail across thousands of stands and it becomes obvious that data entry by hand is a formidable task. Moreover, this information becomes increasingly obsolete as the stand continues to grow and trees fall victim to mortality. In the absence of updates for growth and mortality, the volume data entered into the database remains constant until the stand is re-inventoried. For example, if your forest were inventoried on a 20-year cycle, on average, your volume estimates would be 10 years out of date.

INFORM has features which can overcome these problems. Specifically, the BATCH-YIELD-MS program will automatically process the cruise data for an unlimited number of stands, growth-adjust the volume estimates to a common year, and post the results to a variety of blank delimited text files. These files, in turn, may be imported into a database package (Figure 8). Re-operating BATCH-YIELD-MS once per year allows users to replace the volume data files with estimates which are updated for growth and mortality using one of six user-selected, published growth and yield models. They are NE-TWIGS, CS-TWIGS, GA-TWIGS, G-HAT, SILVAH, and OAKSIM. The INFORM distribution disks also contain the .dbf file skeletons, forms, and report templates for dBASE IV users. Short of the database software, the INFORM package supplies you with the necessary files to create a forest level database complete with screen forms and an assortment of generic report templates.

Figure 8 - Using dBASE IV to Import a Blank Delimited Text File Created by BATCH-YIELD-MS

Presently, BATCH-YIELD-MS creates up to three fries suitable for imp-rtation into a database. The first one (.V01) expresses volume and related information emphasizing product breakdowns, grade, and cut/leave status (Figure 9). The data for each stand is stored as a separate record. Note, sample trees need not necessarily have grade or cutlleave status data collected during field inventories to use this frie type.

Page No.   1   V01 Per Acre Report
Stand_ID> EXAMPLE
Year Measured 1990   Acres 50.0   Year Reported 1993

VARIABLE	CUT	LEAVE	TOTAL	$--VALUE	%-ERROR
SAWTIMBER					
USFS Size Class	N/A	SAWTIMB	SAWTIMB		
BA (sqft/sqm)	0.0	71.5	71.5		95.3
Grade 1 (MBF)	0.00	2.02	2.02	$ 120.90	46.8
Grade 2 (MBF)	0.00	2.62	2.62	$ 172.10	82.3
Grade 3 (MBF)	0.00	1.29	1.29	$ 23.00	77.4
Grade 4 (MBF)	0.00	0.00	0.00	$ 0.00	
Grade 5 (MBF)	0.00	2.09	2.09	$ 0.00	88.9
Total (MBF)	0.00	8.02	8.02	$ 316.00	
# Stems	0	62	62		91.3
Avg Dbh (in/cm)	0.0	14.5			
Growth/yr (MBF)	0.000	0.155	0.155	$ 18.35	
Hard Mast (lbs/kg)	0.0	122.3	122.3		
PULPWOOD					
BA (sqft/sqm)	0.0	57.6	57.6		78.5
Volume (CORD)	0.0	7.6	7.6	$ 48.10	93.2
# Stems	0	302	302		86.6
Avg Dbh (in/cm)	0.0	5.9			
Growth/yr (CORD)	0.000	0.921	0.921	$ 5.53	
Hard Mast (lbs/kg)	0.0	0.0	0.0		

Figure 9 - Sample .V01 Report Using dBASE IV and INFORM Supplied Report Template

The second (.V02) fle type created by BATCH-YIELD-MS breaks down basal area per acre by species and grade (Figure 10).

```
Page No.   1                        V02 Per Acre Report


 Stand_ID> EXAMPLE       50.0 ACRE          Year Measured 1990    Year Reported 1993

 ------------------------------------------------------------------------------------
           ------------------SAWTIMBER------------------        -----SAWTIMBER------
 SPPCODE  GRADE-1  GRADE-2  GRADE-3  GRADE-4  GRADE-5  PULPWOOD   TOTAL   CUT   LEAVE
 ------------------------------------------------------------------------------------
                                            BA/ACRE
 BLO        0.0      0.0      0.8      0.0      0.0      5.7       6.5     0.0    0.8
 WHO        0.8     10.3      0.0      0.0      0.0      3.6      14.7     0.0   11.1
 SWG        0.0      0.0      0.0      0.0      0.0      4.6       4.6     0.0    0.0
 YEP       14.5      0.0      1.0      0.0      0.0      8.0      23.5     0.0   15.5
 HIC        0.0      0.0      0.0      0.0      0.0      4.8       4.8     0.0    0.0
 SHP        0.0      0.0      0.0      0.0      0.0     13.6      13.6     0.0    0.0
 DOG        0.0      0.0      0.0      0.0      0.0      2.8       2.8     0.0    0.0
 REM        0.0      0.0      0.0      0.0      0.0      3.8       3.8     0.0    0.0
 PER        0.0      0.0      0.0      0.0      0.0      2.0       2.0     0.0    0.0
 ASH        0.0      0.0      1.0      0.0      0.0      6.6       7.6     0.0    1.1
 LOP        0.0      0.7      7.3      0.0      0.0      2.0      10.0     0.0    8.0
 CHO        0.0      8.0      0.0      0.0      0.0      0.0       8.0     0.0    8.0
 SCO        0.9     10.0      0.0      0.0      0.0      0.0      10.9     0.0   10.9
 BEE        0.0      0.0      0.0      0.0     16.1      0.0      16.1     0.0   16.1
           -------  -------  -------  -------  -------  ------
 TOTAL     16.2     29.0     10.1      0.0     16.1     57.5     128.9     0.0   71.5

 Note:  All data based on BATCH-YIELD-MS projection since inventory.
```

Figure 10 - Sample .V02 Report Using dBASE IV and INFORM Supplied Report Template

The third (.V03) file type is the largest and most versatile. It includes the complete stand table (i.e., frequency of trees by species, dbh, and product) as well as the local volume table (i.e., average volume per tree by species, dbh, and product) for each stand processed. Potentially, this file can be used to create any desired stock table (i.e., volume per acre, hectare, or stand) by matching the cells of the two tables and multiplying the values. Database packages can perforen this task through a feature known as calculated fields. INFORM provides report templates for seven generic tables. Figure 11 excerpts the boardfoot report for a single stand. Of course, once users are familiar with a database package, they may modify the reports or devise completely new ones specific to the task.

V03 Per Acre Report

Stand ID> EXAMPLE   Stand Size >   50.0   Year Reported 1993   Year Measured 1990

Per ACRE
Sawtimber volumes reported in MBF

Species Topwd	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	Total	CORD
BLO	0.000	0.074	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.077	0.060
WHO	0.000	0.002	0.918	0.196	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.126	1.029
SWG	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
YEP	0.000	0.095	0.006	1.446	0.351	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.923	1.292
HIC	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001
SHP	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001
DOG	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
REM	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ASH	0.000	0.101	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.107	0.083
LOP	0.000	0.983	0.103	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.089	0.404
CHO	0.000	0.586	0.116	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.708	0.847
SCO	0.000	0.000	0.662	0.219	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.897	1.029
BEE	0.000	0.000	0.000	0.000	1.802	0.281	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.093	1.494
Total	0.000	1.842	1.814	1.871	2.179	0.306	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.022	6.241

Figure 11 - Sample .V03 Report Using dBASE IV and INFORM Supplied Report Template

TVA StandFinder

TVA owns and manages approximately 140,000 acres of forested reservoir properties along the shores of the Tennessee River and its tributaries. These properties have been inventoried on a ten-year cycle. Over 6,000 stands averaging about 20 acres each have been delineated on the ground. The boundaries for each stand are penciled in on a quad sheet through a combination of aerial photo work followed by fine tuning in the field. Also, a light prism cruise is conducted and a subjective prescription recommending actions for each stand is written. The prism cruise data are entered into an electronic data recorder when available. These data are periodically delivered to the office for processing through INFORM. The .V01, 2, and 3 files, described previously, are generated and appended into dBASE files. Additionally, a number of other dBASE files have been devised to cover a broad range of interests (Figure 12). They include files which track harvesting and other treatment history, threatened and endangered species areas, memo fields which document the prescription write-up, and more. The system, dubbed StandFinder, is constantly evolving as information needs change or as field procedures are modified. Stand lines and treatment lines (e.g., harvest areas) have been digitized and are currently in the process of being linked through a GIS to the dBASE IV files. The original quad sheets which have stand boundary lines drawn on them are photocopied for use by
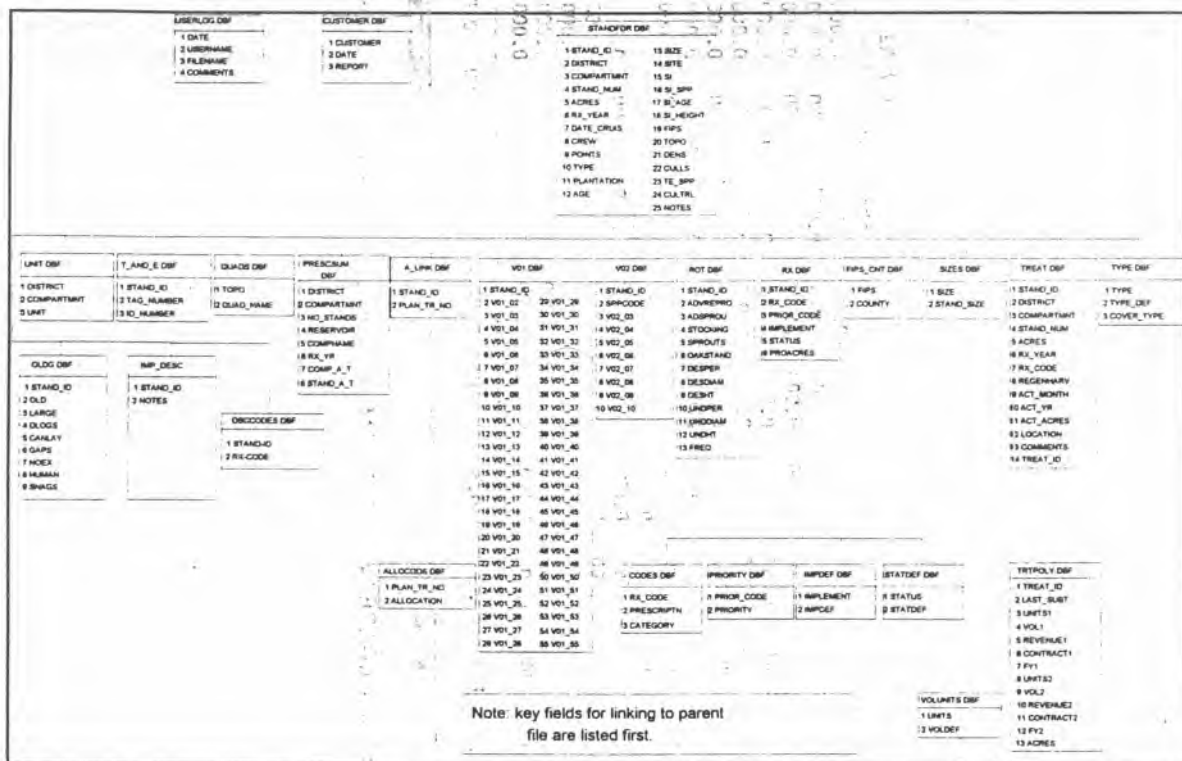
Figure 12 - TVA StandFinder Database File Hierarchy

Every forest management organization has unique information requirements, personnel, and land conditions. There is no universal database configuration that will exactly meet the needs of a particular organization. TVA StandFinder is merely presented as an example. Readers contemplating development of a similar system may wish to follow thé same basic approach and/or take advantage of the .V01, 2, and 3 files and use them as foundation pieces. To date, we have not completed our implementation of GIS. Our

tabular database, however, has been used successfully to perform a number of queries and to produce standard reports used for management planning. Certainly our organization's continuity has been improved because computerization has forced some standardization of procedures. Also, the security of the data has been boosted through the relative case of making backup copies for off-site storage. The automation of growth projections allows us to make a better estimate of total volume and the allowable cut for sustained yield management.

Conclusions

Computerizing forest level records is a deliberate step to automate information storage and retrieval, requiring a plan of action and the cooperation of all players. Like any investment, the benefits should be weighed against the costs. Benefits accrue the most to higher level managers and include improved organizational continuity, rapid query capability, automation of growth projections, integration with other software packages, and improved security. GIS's are expensive add-ons that promise to help larger organizations the most. Although some costs are incurred for hardware and software, the greatest cost generally is "warmware" (i.e., trained personnel). Users content to limit computerized forest record keeping to the tabular level now can participate with less investment than ever before. Today's low-cost, high-powered PC's, user-friendly database packages, and INFORM 3 can be used to get a basic forest level database system up and running in a single day (i.e., provided the stand inventory data is collected and entered). Probably the most compelling long-range reason to develop a forest level database is to brace for the inevitable reporting and documenting burden that may arise from increasing environmental and other regulations.

November, 1992

A USER MANUAL FOR

INFORM

Integrated Forest Management System

Version 3

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ACKNOWLEDGEMENT

DISCLAIMER

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INTRODUCTION

INFORM is a menu shell for an integrated system of forest management software programs. INFORM programs can be used for storing cruise data, creating stand/stock tables, assessing stand value, performing growth projections, simulating harvests, analyzing investments, facilitating graphics production, loading stand records databases, and analyzing advance regeneration data. All region and species specific characteristics of the system are isolated in a single master species file which can be updated as necessary. The modularity designed into INFORM provides consider-able flexibility for expanding use of the system to many regions.

The INFORM component programs (Screen 1) are TVAFIE (TVA Forest Inventory Editor), TIPS (TVA Inventory Processing System), YIELD-MS (Timber Yield Planning Tool for Mixed Stands), INFORMED (INFORM Master Species File Editor), BATCH-YIELD-MS, LISTER (INFORM Reports Printing Utility), SCAN (File Display Utility) OAKREGEN, and TXTDIF (Text to DIF Conversion)
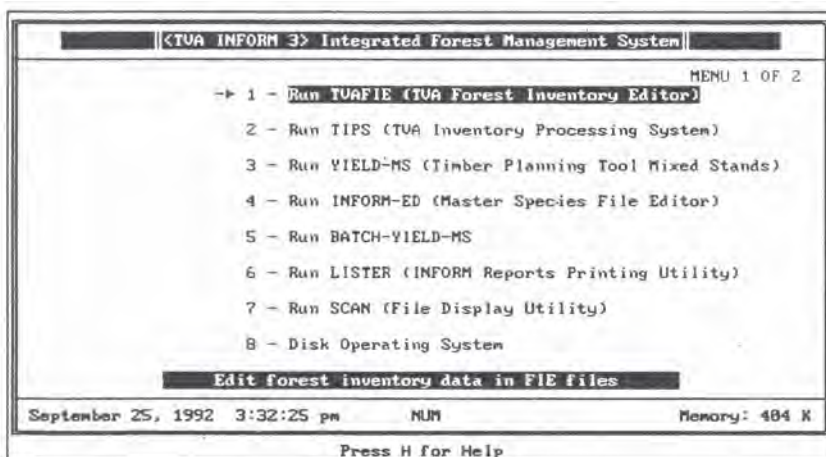

Screen la -INFORM Integrated Forest Management System Menu 1 of 2
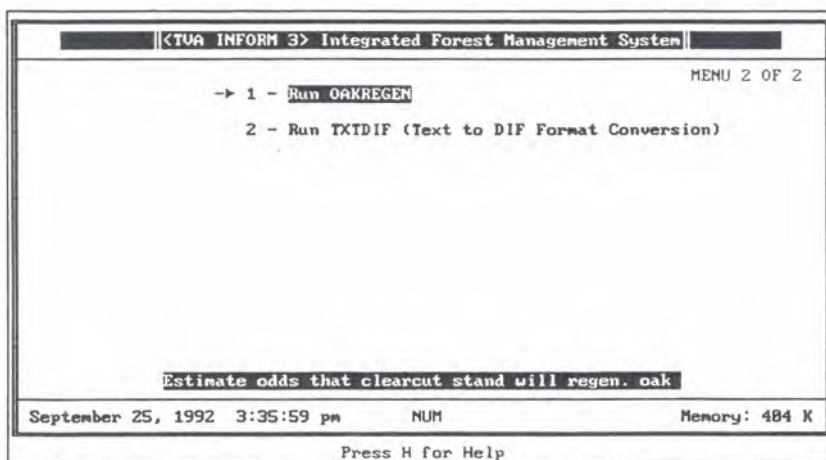
Screen lb -INFORM Integrated Forest Management System Menu 2 of 2

INFORM programs are linked (Figure 1) by various files ending in standard extensions appended automatically. For example, TVAFIE passes cruise data to TIPS via files ending in the extension .FIE. TIPS processing is guided by files ending in extension .UTR which contain the compartment name in record # 1 followed by names of stands comprising the compartment to be processed. TIPS converts cruise data into stand and stock table output which can be passed to YIELD-MS in the form of files ending in extension .SST. YIELD-MS can pass growth, yield and financial analysis results to commercial spreadsheet packages such as Lotus 123 (TM) via files ending in extensions .GR1, .GR2, and .GR3 (an intermediate format conversion to DIF may be required for this step). Once the analysis results have been passed to Lotus 123 an assortment of summary graphs can be produced. Each program can also produce standard printed reports, so the graphing step is an optional luxury that some may feel is unnecessary. BATCH-YIELD-MS is used to load stand records databases via .V01, .V02, and .V03 files. OAKREGEN processes .REG and .SST file pairs to determine if a stand can be successfully converted to an oak type following clearcutting.
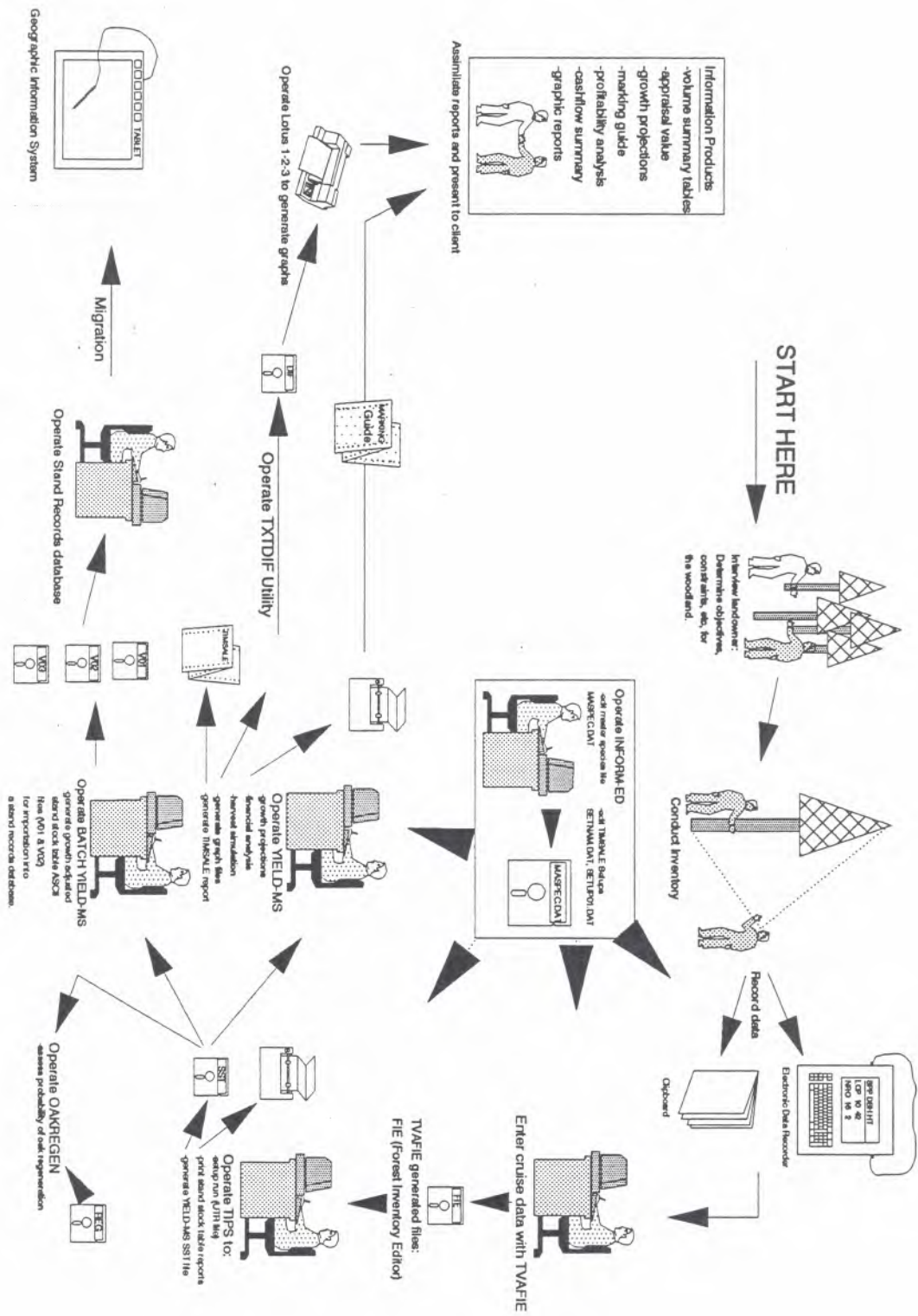
Figure 1 – Systems Concept Diagram

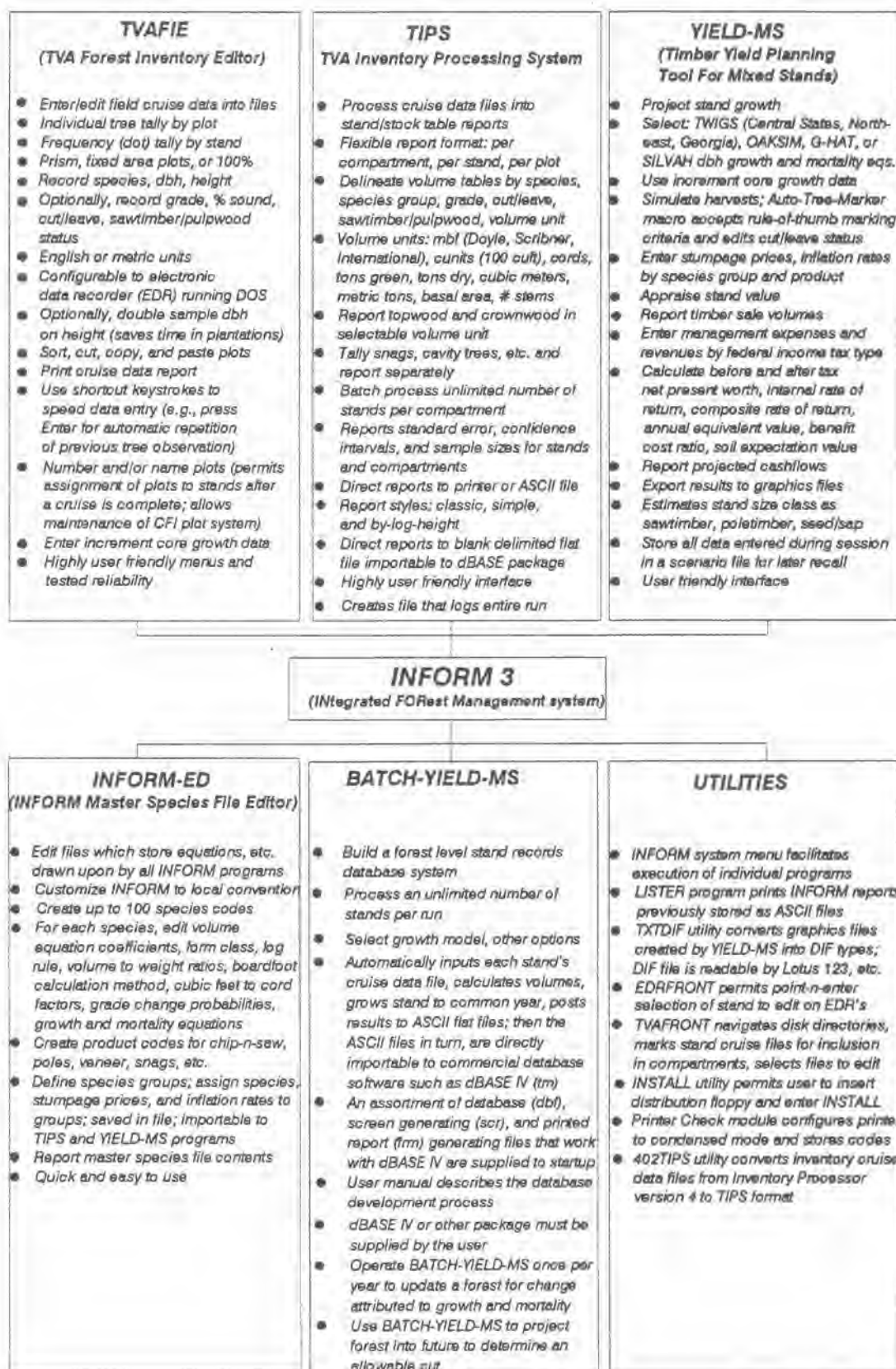Figure 2 outlines the various file types used by INFORM.

EXTENSION	PURPOSE	CREATED/EDITED BY	USED BY
FIE	raw inventory data for a stand	TVAFIE	TIPS
UTR	list of stand (FIE) filenames in compartment	RUNTIPS or text editor	TIPS
SST	stand/stock table for a stand	TIPS, YIELD-MS	YIELD-MS, BATCH-YIELD-MS OAKREGEN
LST	capture TIPS printout report for a compartment	TIPS	TIPLIST, Word Proc.
GR1	graphics/spreadsheet data by year for a stand	YIELD-MS	TXTDIF, Lotus 1-2-3
GR2	graphics/spreadsheet data by species for a stand	YIELD-MS	TXTDIF, Lotus 1-2-3
GR3	graphics/spreadsheet data by dbh for a stand	YIELD-MS	TXTDIF, Lotus 1-2-3
V01	growth adjusted volume data by stand for as many stands included in a run	BATCH-YIELD-MS	dBASE or GIS
V02	growth adjusted basal area by species by stand for as many stands included in a run	BATCH-YIELD-MS	dBASE or GIS
V03	growth adjusted volume by species by dbh by stand for as many stands included in a run	BATCH-YIELD-MS	dBASE or GIS
DAT	extension used for many INFORM permanent data files such as MASPEC.DAT, DFALTC.DAT, SETNAM.DAT, SAVER.DAT, etc.	shipped with system	all INFORM programs
REG	seedling regeneration field data by stand	text editor	OAKREGEN
ROT	regeneration analysis output by stand for as many stands included in a run	OAKREGEN	Word Proc. or dBASE
OPT	runtime options	text editor	BATCH-YIELD-MS OAKREGEN
TXT	capture YIELD-MS printouts	YIELD-MS	Word Proc.
CNF	configuration file such as TVAFIE.CNF for defining screen colors, etc.	shipped with system	various INFORM programs
LOG	capture runtime error and warning messages	BATCH-YIELD-MS, OAKREGEN	text editor
DBF	dBASE IV skeleton for database file	shipped with system	stand records database
SCR	dBASE IV screen form	shipped with system	stand records database
FRM	dBASE IV report generator	shipped with system	stand records database

Figure 2 — INFORM File Types

You have the option to use as few or as many INFORM programs as you deem necessary to meet your specific information needs. Many users may never proceed past processing inventory data with the TVAFIE and TIPS programs. Others may use YIELD-MS for growth, yield, and financial analysis, but not TIMSale. However, the programs have a hierarchy which requires operation of prerequisite programs. For example, you cannot operate YIELD-MS until you enter cruise data into TVAFIE and process it through TIPS.

Figure 3 – INFORM Summary of Operations

TVAFIE
(TVA Forest Inventory Editor)

- Enter/edit field cruise data into files
- Individual tree tally by plot
- Frequency (dot) tally by stand
- Prism, fixed area plots, or 100%
- Record species, dbh, height
- Optionally, record grade, % sound, cut/leave, sawtimber/pulpwood status
- English or metric units
- Configurable to electronic data recorder (EDR) running DOS
- Optionally, double sample dbh on height (saves time in plantations)
- Sort, cut, copy, and paste plots
- Print cruise data report
- Use shortcut keystrokes to speed data entry (e.g., press Enter for automatic repetition of previous tree observation)
- Number and/or name plots (permits assignment of plots to stands after a cruise is complete; allows maintenance of CFI plot system)
- Enter increment core growth data
- Highly user friendly menus and tested reliability

TIPS
TVA Inventory Processing System

- Process cruise data files into stand/stock table reports
- Flexible report format: per compartment, per stand, per plot
- Delineate volume tables by species, species group, grade, cut/leave, sawtimber/pulpwood, volume unit
- Volume units: mbf (Doyle, Scribner, International), cunits (100 cuft), cords, tons green, tons dry, cubic meters, metric tons, basal area, # stems
- Report topwood and crownwood in selectable volume unit
- Tally snags, cavity trees, etc. and report separately
- Batch process unlimited number of stands per compartment
- Reports standard error, confidence intervals, and sample sizes for stands and compartments
- Direct reports to printer or ASCII file
- Report styles: classic, simple, and by-log-height
- Direct reports to blank delimited flat file importable to dBASE package
- Highly user friendly interface
- Creates file that logs entire run

YIELD-MS
(Timber Yield Planning Tool For Mixed Stands)

- Project stand growth
- Select: TWIGS (Central States, Northeast, Georgia), OAKSIM, G-HAT, or SILVAH dbh growth and mortality eqs.
- Use increment core growth data
- Simulate harvests; Auto-Tree-Marker macro accepts rule-of-thumb marking criteria and edits cut/leave status
- Enter stumpage prices, inflation rates by species group and product
- Appraise stand value
- Report timber sale volumes
- Enter management expenses and revenues by federal income tax type
- Calculate before and after tax net present worth, internal rate of return, composite rate of return, annual equivalent value, benefit cost ratio, soil expectation value
- Report projected cashflows
- Export results to graphics files
- Estimates stand size class as sawtimber, poletimber, seed/sap
- Store all data entered during session in a scenario file for later recall
- User friendly interface

INFORM 3
(INtegrated FORest Management system)

INFORM-ED
(INFORM Master Species File Editor)

- Edit files which store equations, etc. drawn upon by all INFORM programs
- Customize INFORM to local convention
- Create up to 100 species codes
- For each species, edit volume equation coefficients, form class, log rule, volume to weight ratios, boardfoot calculation method, cubic feet to cord factors, grade change probabilities, growth and mortality equations
- Create product codes for chip-n-saw, poles, veneer, snags, etc.
- Define species groups; assign species, stumpage prices, and inflation rates to groups; saved in file; importable to TIPS and YIELD-MS programs
- Report master species file contents
- Quick and easy to use

BATCH-YIELD-MS

- Build a forest level stand records database system
- Process an unlimited number of stands per run
- Select growth model, other options
- Automatically inputs each stand's cruise data file, calculates volumes, grows stand to common year, posts results to ASCII flat files; then the ASCII files in turn, are directly importable to commercial database software such as dBASE IV (tm)
- An assortment of database (dbf), screen generating (scr), and printed report (frm) generating files that work with dBASE IV are supplied at startup
- User manual describes the database development process
- dBASE IV or other package must be supplied by the user
- Operate BATCH-YIELD-MS once per year to update a forest for change attributed to growth and mortality
- Use BATCH-YIELD-MS to project forest into future to determine an allowable cut

UTILITIES

- INFORM system menu facilitates execution of individual programs
- LISTER program prints INFORM reports previously stored as ASCII files
- TXTDIF utility converts graphics files created by YIELD-MS into DIF types; DIF file is readable by Lotus 123, etc.
- EDRFRONT permits point-n-enter selection of stand to edit on EDR's
- TVAFRONT navigates disk directories, marks stand cruise files for inclusion in compartments, selects files to edit
- INSTALL utility permits user to insert distribution floppy and enter INSTALL
- Printer Check module configures printer to condensed mode and stores codes
- 402TIPS utility converts inventory cruise data files from Inventory Processor version 4 to TIPS format

5

Changes In Version 2 Over Version 1

A number of improvements have been added to INFORM in version 2.

-Terminology has been changed for Tracts and Units. Tracts are now referred to as "Stands". Units are now referred to as "Compartments".

-The INFORM master menu (i.e., Automenu) has been expanded to include 2 new programs, BATCH-YIELD-MS and OAKREGEN. The former MASPECED program has been expanded in scope and renamed INFORMED.

-TVAFIE has been overhauled for greater clarity and increased flexibility. Tree grades may be entered for pulpwood sized trees. Cut/leave status may be specified for individual tree observations. Moreover, cut/leave, percent soundness, and grade fields can be switched on/off and default values can be designated for each. A directory of existing .FIE files can be generated from TVAFIE.

-TIPS has been modified to accommodate the new TVAFIE version 2 .FIE file format while retaining compatibility with version 1 .FIE files. Formerly, TIPS could process a maximum of 30 stands per compartment. Now TIPS can process up to 500 stands per compartment. The R-square for regression summaries of increment core data is reported. Options have been increased for better flexibility when specifying report formats including separate tables for cut and leave trees, and compartment level statistics for testing stratified random sampling schemes.

-YIELD-MS has been improved with several new features. The GA-TWIGS and NE-TWIGS growth and yield equation systems have been added for increased geographic scope. TIMSALE setups can be imported to define species groups and stumpage prices. Hard mast crop weight (i.e., acorns) estimates are now provided. The Quick-Summary command in the Harvest Simulation module has been expanded to give cut and leave totals by species group and for the stand; a printout can be generated. Algorithms in the Auto-Tree-Marker have been reprogrammed for greater precision. New Auto-Tree-Marker macros have been added for changing cut/leave status by mast characteristics and for maintaining all-sized stands using the basal area, maximum diameter, Q-factor (BDQ) method. Ingrowth from pulpwood to sawtimber during growth projections can key on tree grade for pulpwood trees. A TIMSALE module was added for generating concise volume reports to solicit bids for timber.

-INFORMED is an overhaul of the former MASPECED. Features for editing the master species file MASPEC.DAT have been improved. TIMSALE setups can be created and/or edited. Each TIMSALE setup represents a particular grouping of species into various homogeneous stumpage market groups. The species groups form the basis for TIMSALE reports generated by YIELD-MS. INFORMED also can be used to assign stumpage prices to species groups. In turn, YIELD-MS and BATCH-YIELD-MS use this data to perform volume to value conversions.

-BATCH-YIELD-MS is a special version of YIELD-MS which repetitively processes multiple stands to load stand records databases. It inputs processed inventory data (i.e., .SST files) and outputs growth adjusted (to a common year) estimates of volume and value in ASCII files ending with the extensions .V01, V02, and .V03. Each record in these files represents information for a single stand. The files may be imported to a stand records data base program, migrated to a GIS, or used for other post processing. BATCH-YIELD-MS could be operated annually to keep volume information in a stand records database theoretically current.

-OAKREGEN is a program for applying the system described in Sander, Johnson, and Rogers, 1984, "Evaluating Oak Advance Reproduction In The Missouri Ozarks", USDA-FS, NC-251. OAKREGEN batch processes .SST and .REG (i.e., REGeneration) file pairs for each stand to assess whether clearcutting the stand will result in a new oak stand. OAKREGEN optionally will process and report basic statistics on non-oak regeneration data.

Changes In Version 3 Over Version 2

This is the most ambitious revision of INFORM since its inception. All programs have been overhauled and some have been completely rewritten for increased power and greater user friendliness.

-An installation procedure has been combined with a file compaction process so that INFORM can be installed simply by inserting the distribution floppy disk(s) and typing INSTALL.

-The INFORM System Menu Shell has been altered for improved clarity.

-A new Lister utility allows you to print any INFORM reports which have been stored as a disk (.TXT) file.

-An up-to-date SCAN utility (shareware) also may be accessed directly from the menu. This utility is useful for examining report and data files. SCAN also will chain to a text editor (if one named EDIT exists on your hard disk). Note: DOS 5.0 includes such a text editor.

-The front end for all programs has been upgraded for increased friendliness and uniformity. You may navigate on to any disk volume and subdirectory to retrieve files for execution. An unlimited number of data files may reside in any subdirectory.

-Metric units are supported for all programs in addition to English units. Area may be expressed in hectares, sawtimber and pulpwood volume in cubic meters, weight in metric tons green or dry, tree heights in meters, basal area in square meters, dbh in centimeters, and mast weight in kilograms.

-Log rules may be installed separately for each species.

-Snags, dens, and other dead trees can be tallied for wildlife or old growth assessment and processed without affecting volume statistics or growth projections.

TVAFIE
-TVAFIE is configurable for electronic data recorder (EDR) applications (i.e., screen dimensions are specified on the command line). TVAFIE menus and data screens contract or expand to conform to the specified screen dimensions. The default is 25 lines by 80 columns, however, the valid range is 6 to 50 lines by 20 to 80 columns. This design should minimize training costs since the desktop computer data entry program and the EDR program are merely different configurations of the same program.

-Pulpwood tree heights may be tallied by entering a "P" and saw‐timber heights by entering a "S"; this tells TIPS to use the average height for the species. Entering a "+" for height results in .5 logs being displayed. Pressing return for a blank species code, or for a dbh displays the most recently entered value for the respective field; this makes data entry for plantations much easier. The Enter key now must be pressed to advance to the next field; this makes it easier to type in data without viewing the display as frequently.

-Plots or points may be labeled with a number and name. An incre-menter (like a trip odometer) has been added so that plots may be consecutively numbered even if you change stands; this feature is helpful for EDR use when cruising in a line which intersects 2 or more stands. The plot name field could be used to store plot comments or geographical positioning system (GPS) derived coordi-nates. A Sort command will rearrange plots in alphabetic or numeric order. Plots may be cut, copied, and pasted to existing or new .FIE files. The cut, copy, and paste feature is useful when decisions on plot affiliation by stand are postponed until after the data is collected and entered or when stand boundary lines are changed. This feature also would facilitate INFORM applications for maintenance of a continuous forest inventory (CFI) system.

-Frequency tallies support all shortcut keys offered under Grade tallies. A Save/resume and Save/exit command facilitates rapid changing of stands for EDR applications. Dbh optionally may be recorded in centimeters and height in meters. Data screens are arranged in a columnar fashion to accommodate EDR's with limited columns per line capacity.

-An optional Pulpwood/Sawtimber field has been added for each tree observation. Past versions inferred a tree to be Sawtimber if height were recorded as 5.99 (logs) or less. An entry of 6 or greater inferred merchantable height of pulpwood in feet. This convention continues to be supported, however it now is possible to explicitly specify whether particular tree observations are "P"ulpwood or "S"awtimber. This increases flexibility for exam-

ple, to enter a height for pulpwood trees ranging from 0 to 6 feet. It also is the only reasonable approach for tallying trees using meters for height.

TIPS
-TIPS has been completely re-written. The entire menu structure has been changed. Compartment, Stand, and new Plot level reports are controlled by separate menu screens. Generation of .SST files for later use by YIELD-MS also is controlled by a separate menu. A new Compartment-wide SST may be generated instead of the usual one .SST file per stand.

-There is no limit on the number of stands per compartment. Log rules may be set separately for each species; you can override this feature easily. Volume units may be specified for topwood crownwood, and for statistical reports. Volumes may be reported by species or optionally, by species groups.

-Reports now come in three styles. First, the familiar reports which report volumes by species and dbh class via two tables are now dubbed "classic" reports. Second, a new "simple" report style is a compact, no frills, rendition of the same basic information offered in classic reports, but without the blank lines and wrap-around approach; it closely resembles a database flat-file. In fact, when a Simple style report is ported to a file, you are prompted to select either a printed or database format; the latter is a 2-way table, blank-delimited, flatfile suitable for importation by a spreadsheet or database package. Third, a "by-log-heights" report emphasizes .a highly detailed breakdown of sawtimber volume by species group, dbh, and half log increments. Pulpwood and topwood volumes also appear in "by-log-heights" reports.

-The display of dead trees (i.e., snags, dens) can be switched on or off as may the display of stand level comments entered through TVAFIE. A "duplicate" report selections command makes it easy to instruct TIPS to use the same report format for all stands encountered during a run. This feature is appreciated when hundreds of stands are to be processed as a single compartment.

-TIPS also produces a log file which is useful for monitoring large jobs.

YIELD-MS
-YIELD-MS has been overhauled for better user friendliness. All menus and fields may be edited using cursor, insert, delete, backspace, spacebar, escape, and tab keys.

-A new feature is stand size class calculation as Seed/sap, Poletimber, or Sawtimber according to USFS rules for pine and hardwood.

-The growth projection module was completely re-done. You now may specify a growth projection of up to 99 years at a clip,

page through the results when it's complete, and print a report.

-TIMSALE has been refined so that embedded, unoccupied species groups do not clutter reports. Also, TIMSALE reports may be directed to printers setup for landscape mode on regular or legal size paper. This feature is useful when a large number of species groups are used and the report is to use a single sheet of paper. TIMSALE now reports either sawtimber or pulpwood trees in separate tables. Within each table it is possible to use a mix of volume units. For example, a species group called Pine-pulpwood could use tons while a group called Chip-n-saw used cords. Topwood volumes optionally may be displayed in sawtimber reports. Crownwood volumes may be displayed in sawtimber and pulpwood reports.

-Financial analysis has been upgraded to the level offered in YIELDplus. Dead trees are reported but do not impact growth projections or volume and basal area calculations.

-Metric or English units for volume, weight, and area may be selected from the main menu.

INFORM-ED
-INFORM-ED was completely re-written. This new version is quite user friendly. It features a MASPEC-ED module and a TIMSALE-ED Setup module. Each time the program is run, a MASPEC.BAK file is created as a backup.

-In MASPEC-ED mode, a full screen editor allows you to edit any data field for any species. A message is flashed which provides additional information on a field as it is edited. A Global command allows you to change the contents for a field to the same value for every species in the file (e.g., make the boardfoot calculation method the same for every species).

-New fields include log rule, dead tree, and TVA pulpwood equation dbh adjustment. A printed report can generated at the individual species level or for all species combined. The later case results in a report which is somewhat less detailed but lists what most people want to see.

-The TIMSALE-ED Setup mode has a new look. Naming species groups, assigning groups to species, and entering stumpage price data for groups is very straight forward. The user manual is much clearer and numerous help screens guide you through the program.

BATCH-YIELD-MS
-BATCH-YIELD-MS has been re-written. The wildcard feature was dropped in favor of a .UTR file approach (identical to TIPS) for specifying Compartments to be processed. The new BATCH-YIELD-MS can use .SST files derived from graded or ungraded data.

-If BATCH-YIELD-MS encounters a missing .SST file, it can automatically access TIPS, create the needed .SST file, then resume processing. This is accomplished through a batch file named

DUALMODE.BAT. It's automatically invoked when a switch is set in OPTION.OPT, provided BATCH-YIELD- MS is executed from the INFORM System Menu. As .SST files are read, they may be kept or deleted (to conserve disk space).

-The .V01 and .V02 files have new fields added for greater usefulness. A new .V03 file contains the essence of the TIPS reports rolled into a single file.

-dBASE IV file skeletons, screen forms, and report generating files are included to speed migration of BATCH- YIELD-MS generated files into a stand records database using dBASE IV. The user manual has been upgraded to explain the steps required to perform this task. Those who use commercial database packages other than dBASE IV should have adequate documentation for loading a stand records database too.

Hardware/Software Requirements

To operate INFORM you need an IBM PC/XT/AT/386/486 with at least 640 KB RAM (500 KB total program area net of DOS and RAM resident programs) operating under DOS version 3.3 or greater. A hard disk is required. **An 80x87 math co-processor chip is highly recommended but not required.** Any printer capable of condensed mode (132 columns per line) is suitable. A text editing program such as EDIT or a word processor is needed for editing reports and certain program files.

The following hardware and software are optional:

-A DOS compatible electronic data recorder may be used to create inventory data files in the field.

-A printer capable of up to 256 columns per line (e.g., wide carriage dot matrix or laserjet set in landscape mode using a legal sized paper tray) can be used for certain INFORM reports.

-A word processor (e.g., WordStar, Word Perfect), a spreadsheet graphics package (e.g., Lotus 123, Freelance), and a database system (e.g., dBASE IV) may be used in conjunction with INFORM to edit reports, generate graphics, reformat output, and build stand records databases.

Installation

INFORM is distributed in compressed form (i.e., ZIP) on one high density 3.5" or 5.25" floppy disk or on multiple low density 5.25" disks.

Simply insert the distribution floppy in A: (or B:) and from A:> (or B:>) type INSTALL. The procedure will guide you through INFORM installation on your hard disk. Repeat this procedure for the remaining disks if you received the system on multiple low density floppies.

INFORM 3.1 will be distributed as file INFORM31.EXE, INFORM32.EXE, etc.; consult the README.TXT file.

IMPORTANT: The ANSI.SYS device driver must be installed on your system for proper screen behavior. Otherwise, when running INFORM programs you will notice strange codes scrolling in a column on the left portion of the screen. Your CONFIG.SYS file must contain the statement DEVICE=ANSI . SYS , or DEVICE=\DOS\ANSI.SYS, etc. depending on the location of the ANSI.SYS file. You should use the ANSI.SYS file shipped with your copy of DOS. A sample CONFIG.SYS file is provided with INFORM.

Initial Operation

Type **AUTO** or **INFORM** from the sub-directory to which you copied all INFORM files in order to execute the INFORM master menu. From this menu (Screen 1) you may operate YIELDMS, TVAFIE, TIPS, INFORMED, TXTDIF, LISTER, SCAN, BATCH-YIELD-MS, OAKREGEN, or exit to DOS. Pressing the "S" key switches between monochrome and color modes for configurations having both a color and monochrome monitor. Pressing other alpha keys lists a submenu of commands while pressing the "C" key lists a Copy Notice.

AutoMenu

The menu illustrated in Screen 1 was prepared from the AUTOMENU package by Marshall W. Magee, Magee Enterprises, 6577 Peachtree Industrial Blvd., Norcross, GA 30092-3796. Magee Enterprises has granted permission for distribution of the AUTOMENU application for the INFORM system. AUTOMENU has a copy notice which requests that users send the developer $50.00.

SCAN

The SCAN.COM file is not sold as a part of INFORM. It is useful for looking at files and as a front-end for running EDIT (i.e., if you have an editor called EDIT already installed). A word processor or other editing program can be substituted for SCAN. SCAN is distributed in its entirety on a separate floppy labeled LIST75H. The documentation on this disk provides complete information on the operation, customization, and registration for this freeware program. The author is:

> Vernon D. Buerg
> 139 White Oak Circle
> Petaluma, CA 94952

Windows Tips

INFORM 3 operates in DOS. No special provisions have been **built** into INFORM programs for MicroSoft Windows. However, INFORM can be operated from Windows. With Windows it is possible to multi-task. For example, while a lengthy TIPS or BATCH-YIELD-MS run is ongoing, you may wish to minimize this task and use another program (Screen 2). If Windows is active, after starting a run for an INFORM program you may multi-task by typing Alt-Enter.
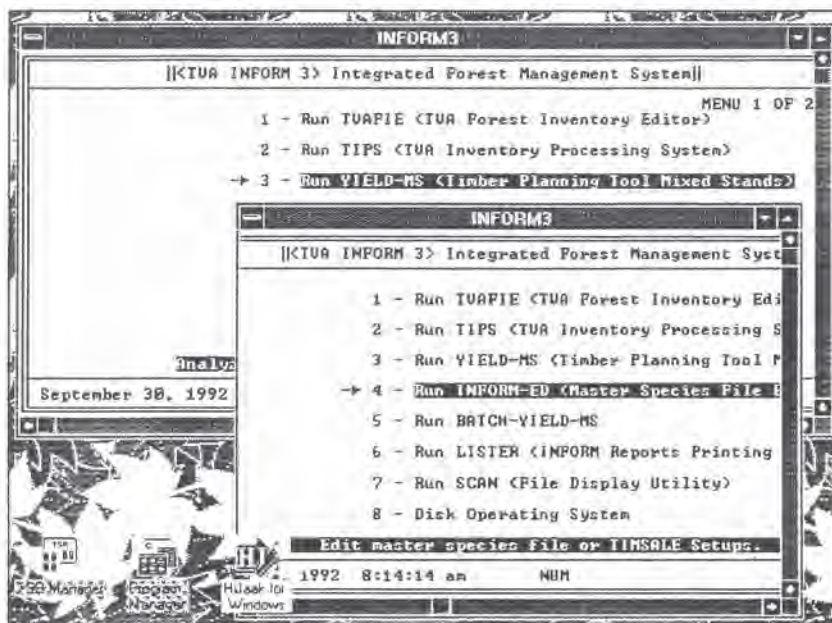
Screen 2 - Sample Application of INFORM in Windows 3.1

Laptops

Many laptops couple monochrome displays with color graphics cards. INFORM programs (other than TVAFIE) automatically sense whether the display card is monochrome or color and use monitor display codes stored either in DFALTC.DAT (for color) or DFALTM.DAT (for monochrome). To force a laptop equipped with a color card and a monochrome display to use the monochrome codes within INFORM, copy file DFALTM.DAT to DFALTC.DAT. For example:

C:\INFORM>COPY DFALTM.DAT DFALTC.DAT

To follow is a brief description of each INFORM component program:

TVAFIE 3.0 (TVA Forest Inventory Editor)

Developer: Randy Holtzclaw

Description: TVAFIE is the cruise data entry/editor program used for transferring inventory field data from field sheets, voice tally audio tapes, or portable data recorder into machine readable form (i.e., .FIE files) prior to executing the Inventory Processor. Included are commands making it convenient to rearrange, modify, or delete data which collectively may describe large forest properties consisting of an unlimited number of stands. You may enter cruise data in English or Metric units, configure the program for EDR applications, and cut, copy, and paste plot data from one stand file to another. TVAFIE may be configured from the command line to screen dimensions ranging from 20 to 80 columns per page and 6 to 50 lines per page. TVAFIE accepts data from frequency tally (i.e., dot tally) or from a grade (i.e., by plot) tally. Dbh may be double sampled on height and numerous shortcut keystroke sequences have been added to speed data entry. You can cruise using a prism, fixed area plots, or 100% tally. Consult the TVAFIE User Manual for complete information.

TIPS 3.0 (TVA Inventory Processing System)

Developer: Todd Hepp and Jim Williamson

Description: TIPS primary function is to input .FIE files and calculate and report stand/stock tables of board feet, cunits, cords, cubic meters, green weight, dry weight, number of stems, or basal area. TIPS also generates .SST files for use by YIELDMS. When increment core growth data is present in .FIE files, TIPS will perform a regression equation summary of growth by dbh and post the results in the .SST file. TIPS provides a sampling error report when grade tallies are used. The TIPS report generating module permits flexibility in selecting print-out table formats and styles and disk file output. Reports may be generated at the compartment, stand, and plot level. Consult the TIPS User Manual for complete information.

YIELD-MS 3.0 (Timber Yield Planning Tool for Mixed Stands)

Developer: Todd Hepp

Description: YIELD-MS is an interactive model for making detailed management prescriptions on forest stands. It can be used to

perform growth projections using the stand table projection method, before and after tax financial profitability analysis, and stand marking simulations. Region specific equations and tables for estimating dbh growth, survival, and grade change probabilities are easily edited. Optionally, increment core growth data processed by TIPS can be tapped as a basis for growth projections. Initial stand conditions are established by inputting .SST files generated by TIPS. A stand and stock table level of detail is used throughout the program. This permits estimates of pulpwood and sawtimber volumes (optionally by grade) to be delineated according to a maximum of 30 individual species, by 20 dbh classes, and by cut/leave status. Data for stumpage prices, management expenses, and other factors may be entered in order to determine stand value. A tree marking subsystem can be used to preview effects of different marking schemes. Graphics which summarize analyses results can be generated in conjunction with spreadsheet packages. The investment potential of various projected management strategies can also be analyzed. Version 3.0 features diameter growth and mortality equations from TWIGS (Central States, Northeast, and Georgia variants), SILVAN, OAKSIM, and GHAT. The TIMSALE option will generate concise single page volume summary reports suitable for soliciting bids when selling timber. Stumpage price data optionally can be imported from TIMSALE setups prepared using INFORM-ED. Consult the YIELD-MS User Guide for complete information.

INFORMED 2.0 (Master Species File Editor)

Developer: Todd Hepp and Jim Williamson

Description: INFORMED is a file utility program for editing the master species file and editing TIMSALE setups. The master species file (MASPEC.DAT) contains all species specific research results needed by INFORM. Each record of the file contains about 1,000 characters of information for an individual tree species. This includes volume equation coefficients, conversion factors, growth and yield equations, and grade change probabilities. This modularity allows portability to various regions pending availability of proper research results, and customization for local conditions and practices. INFORMED also is used to define TIMSALE setups. TIMSALE setups describe a particular way to arrange individual tree species into homogeneous stumpage market groups. After naming a species group, you may assign species and enter stumpage prices and inflation rates. The TIMSALE Setup may be imported by YIELD-MS, BATCH-YIELD-MS, and TIPS. Consult the INFORMED user manual for further information.

BATCH-YIELD-MS 2.0

Developer: Todd Hepp

Description: BATCH-YIELD-MS is a program designed to process and combine multiple .SST files into volume summary files (i.e., .V01, .V02, and .V03). These ASCII files in turn may be imported into stand record database programs. Processing is conducted at the compartment level similarly to TIPS. The compartment could contain all of the stands for a complete forest, hence a single run may generate a very large database. An Options file contains your selections of equation types, ingrowth assumptions (i.e., rules for promoting pulpwood trees into the sawtimber category during a growth projection), stumpage prices, and other program parameters. A log file stores error, warning, and other messages which accumulate over a run. You must designate the year to project volumes. The program simulates growth of the stand from the year of inventory to a designated common year. Entering a zero defeats the growth projection aspect of the program. All volumes are expressed on a per acre or hectare basis. However, the stand acreage is posted to each record in the output files to facilitate expansion of volumes to a stand basis. BATCH-YIELD-MS generates volume estimates consistent with the interactive version of YIELD-MS and can be operated at the beginning of each year in order to load/update the volume data stored in stand records database systems. Sample database file skeletons, screen generators, and report writers are supplied with INFORM.

OAKREGEN 1.0

Developer: Todd E. Hepp

Description: OAKREGEN is a program designed to use .SST and .REG file pairs to compute an index for the expected success in regenerating the site to oak following a clearcut harvest. OAKREGEN uses the stand stock table in .SST files to determine stump sprout capability combined with advance seedling reproduction inventory data stored in .REG files. This information is processed using the procedure described in Sander, Johnson, and Rogers 1984, "Evaluating Oak Advance Reproduction In The Missouri Ozarks", USDA-FS, NCFES, NC-251. OAKREGEN also summarizes data collected for DESirable and UNDesirable seedlings. In this case the percent of plots with an observation, the mean diameter, and the mean height are reported. Due to little user interest, this program was not facelifted for INFORM 3.

LISTER 1.0 (INFORM Reports Printing Utility)

Developer: Todd E. Hepp

LISTER simply accepts the file name of INFORM reports that have been stored as a file and prints them out recognizing form feeds (i.e., "1" in column 1 of the report file) and the currently installed printer codes for condensed mode. INFORM programs automatically append the extension .TXT on all reports directed to files.

TXTDIF 1.0 (Text to DIF File Conversion)

Developer: Leonard Sisson

Description: This utility is the link between YIELD-MS and commercial graphics programs. Its sole purpose is to convert the format of .GR1, .GR2, and .GR3 files into DIF (Data Interchange Format) format. Spreadsheet programs such as Lotus 123 have a Translate Utility for direct input of DIF files.
The syntax is:

Text to DIF File Conversion - Version 1.0

INPUT FILE: inputfile.ext
OUTPUT FILE: outputfile.ext

Note: for Lotus 123, use .DIF for output file extension.

After converting the YIELD-MS generated .GR1, .GR2 or .GR3 files to DIF format, the Translate utility of the spreadsheet-graphing package may be used to convert to the appropriate format to make graphs. Lotus 123 is not the only commercial graphics software available. Many packages have provisions for accepting data from ASCII or DIF files.

APPENDIX

(A)   Directory of files in INFORM system

342TIPS	EXE		TRANS	DAT	***
402TIPS	EXE		TVAFIE	CNF	
ADIF	DAT		TVAFIE	CNT	***
ANSI	SYS	*	TVAFIE	EXE	
AUTO	BAT		TVAFRONT	EXE	
AUTOEXEC	BAT		TXTDIF	EXE	
AUTOMENU	COM		USERID		
AUTOMENU	MDF		VO1	DBF	
AUTOTEMP	BAT		VO1	FRM	
BATCHYMS	EXE		VO1	SCR	
CAPSLOCK	COM		V02	DBF	
CHKLIST	CPS		V02	FRM	
CONFIG	CNF		V02	SCR	
CONFIG	SYS		V03	DBF	
DFALTC	DAT		VO3BAALL	FRM	
DFALTM	DAT		VO3MAST	FRM	
DUALMODE	BAT		VO3STALL	FRM	
EDRFRONT	EXE		VO3STPUL	FRM	
EXAMPLE	FIE		VO3STSAW	FRM	
EXAMPLE	REG		VO3VOPUL	FRM	
EXAMPLE	SST		VO3VOSAW	FRM	
EXAMPLE	UTR		YIELDMS	EXE	
GATC	DAT				
GATCR	DAT				
GATD	DAT				
GATDBH	DAT				
GATM	DAT		*	denotes user supplied file	
GATMORT	DAT				
HELP	HLP				
HELPBAT	HLP		**	shipped separately as complete system	
HELPINFD	HLP				
HELPOAK	HLP				
HELPTIPS	HLP		***	created by INFORM at runtime	
INFORM	BAT				
INFORMED	EXE				
INSTALL	BAT				
LISTER	EXE				
MASPEC	DAT				
MASPEC	SML	***			
MORTF	DAT				
OAKREGEN	EXE				
OPTION	OPT				
README	TXT				
RUNA	BAT				
RUNB	BAT				
SCAN	COM	**			
SETNAM	DAT				
SETUPO1	DAT				
SETUP02	DAT				
TALLY	DRW				
TIPS	EXE				

(B)   Where To Find Information About....

November, 1992

A USER MANUAL FOR

TVAFIE

TVA Forest **I**nventory **E**ditor Program

Version 3

Program By

D. Randal Holtzclaw
Systems Analyst

User Manual By

Todd E. Hepp
Systems Analyst/Biometrician

Tennessee Valley Authority
Land Resources
Forest Resources Development
Norris, Tennessee 37828

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SCREENS

FIGURES

INTRODUCTION

TVAFIE (**TVA F**orest **I**nventory **E**ditor) is part of the INFORM soft-
ware package developed by the Tennessee Valley Authority. The
TVAFIE program allows you to enter new forest inventory data or
edit previously input data for processing later by the TIPS
program. TVAFIE edits a single stand at a time and stores the
data associated with stands in files ending with the extension
".FIE" (TVAFIE automatically appends the .FIE extension onto
stand file names). A detailed discussion of TIPS is provided in
the TIPS Technical Reference Manual. The purpose of this document
is to provide you with the fundamentals of TVAFIE program opera-
tion.

Release 3.0 offers numerous enhancements over previous versions.
See page 7 in the INFORM User Manual for a summary of changes.
The most notable improvements are configurability for electronic
data recorder (EDR) applications, naming, sorting, cutting, and
pasting of plots, double sampling of dbh on height, and metric or
English units mode. TVAFIE can read .FIE files created under
versions 1.0 and 2.0. When version 1.0 or 2.0 .FIE files are
edited, they are automatically converted and saved as version 3.0
files. Inventory files created prior to version 1.0 require
conversion using either the 402TIPS and/or the 342TIPS program.

GETTING STARTED

Overview

Before proceeding with instructions on running TVAFIE, you should be familiar with a few facts on field data collection procedures. Scanning the TIPS User Manual and the TIPS Technical Reference Manual first should help you appreciate the structure of .FIE files.

You should be familiar with the definition of a <u>compartment.</u> Here, a compartment is a collection (perhaps even an arbitrary one) of <u>stands</u> (or a single stand). Depending on the tally scheme employed, stands may be segmented into <u>plots.</u> Plots in turn are comprised of <u>tree observations.</u> Tree observations consist of a three character species code, dbh, height, and optionally pulpwood/sawtimber designation, percent soundness, grade, and cut/leave designation. At the stand level, the program will prompt you for the data necessary to identify the stand along with the individual tree tally data collected on each stand. Early versions of TVAFIE (version 1.0 or IPEDIT) referred to compartments as units and stands as tracts.

Two tally methods are available, but only one may be used per stand. However, tally methods may vary from stand to stand within a compartment. Users may tally by individual trees organized into plots (also known as a "grade" tally) or by frequency (i.e., a "dot tally"). Regardless, of the tally method, the following data are always collected: the species (recorded as a three-character code, the dbh (expressed to the nearest whole inch), and height (measured in feet to a merchantable height for pulpwood, or to the nearest tenth log for sawtimber). In metric mode, dbh is measured in centimeters (cm) and height in meters (m) of pulpwood or number of five m logs. The minimum height for pulpwood is six feet, and the maximum sawtimber height is five and nine tenths logs. With version 3.0, pulpwood heights less than six feet (including zero) optionally may be entered if the pulpwood/sawtimber field is activated and a "P" is entered. Metric mode requires that sawtimber or pulpwood be explicitly designated for each tree observation using the pulpwood/sawtimber field.

Three sample methods are supported. They are Point (prism), Plot, and 100%. The same sample method must be used throughout a stand, however a mix of sample methods may be used from stand to stand within a compartment. If the Point sample method is used, TVAFIE prompts for a basal area factor (BAF). If the Plot sample method is used, TVAFIE prompts for a plot size in acres or hectares down to the nearest ten thousandth. If the 100% sample method is used, the entire stand serves as a single plot.

Figure 1 illustrates the grade tally field sheet recording of a single one tenth acre plot for a stand named EXAMPLE. A blank copy of this field sheet is provided with INFORM documentation, in Appendix (E), and as file TALLY.DRW. DRW files are a graphics

format supported by Lotus Freelance (tm). Users of the frequency tally method can devise their own sheet or use graph paper (Figure 2).

Figure 1 - Sample Grade Tally Method Field Sheet

Figure 2 - Sample Frequency Tally Method Field Sheet

If a grade tally method is used, soundness (Snd) may be recorded
as an optional input. Valid soundness data are entered as a
blank (100% sound) or the single digits zero through nine (0%
through 90% sound). TIPS interprets soundness by calculating the
volume of the tree based on species, dbh, and height, and then
multiplying this value by the specified soundness percent. For
example, if the merchantable portion of a tree was judged to have
20% of its volume defective, the soundness would be 80%. You
would record an "8" on the field sheet under Snd and TIPS would
deduct 20% off the volume.

Likewise, a tree grade (Grd) is also optional with valid values
ranging from 1 to 5. Criteria for tree grade assignment are
arbitrary. A common scheme for hardwoods is to use USDA-FS tree
grading rules for grades 1-3, ties and structural for grade 4,
and culls for grade 5. For pine, a similar scheme may be em-
ployed. The grading option allows pulpwood trees to be graded
too. This becomes useful when performing a growth projection in
YIELD-MS as it will use this information for ingrowth purposes
 (i.e., pulpwood trees promoted into sawtimber will be designated
the specified grade). If the grading option is accessed and
grade fields are left blank for pulpwood trees, YIELD-MS will
promote pulpwood trees into the designated default sawtimber
grade when performing growth projections. TVAFIE does not permit
grading of upper logs.

Another optional field for each tree observation under the grade
tally method is cut/leave (C/L). You may enter a "C" for cut, an
"L" for leave, or leave blank to use the specified default.
Subsequent processing by TIPS optionally provides separate output
tables for cut and leave trees when using this option. The
cut/leave feature is useful for simultaneous cruising and marking
of a stand or for segregating growing stock into desirable or
undesirable categories. Cut and leave designation can be edited
in YIELD-MS with the Harvest Simulation module. However, edits
made in YIELD-MS apply to YIELD-MS output only. For a frequency
tally, percent soundness, tree grades, and cut/leave status
cannot be input; entering the number of trees by species, dbh
class, and height are the only options.

The pulpwood/sawtimber field (S/P) is a new option which allows
you to explicitly designate whether a tree observation is sawtim-
ber or pulpwood. If TIPS encounters an "S" or a "P" in this
field, then the "S" for sawtimber or "P" for pulpwood designation
takes precedence over a designation inferred from height. For
example, if dbh=4, height=4, and pulpwood/sawtimber=P, then this
tells TIPS that the observation is a 4" pulpwood tree that is 4
feet to a merchantable top. On the other hand, if dbh=4,
height=4, and the pulpwood/sawtimber field is deactivated, then
TVAFIE would have interpreted the height of 4 as number of logs
and returned a "diameter too low for sawtimber height" error
message since 4" trees cannot contain sawlogs.

<u>Double sample dbh</u> on <u>height</u>
Another feature new with version 3.0 is the ability to double
sample dbh on height. This is done by entering a "P" or an "S"
in the height field instead of a number. If TIPS encounters an
"S" or a "P" in the height field, then an estimate of height
based on other valid height observations within the stand is used
to calculate volume. This option should only be used when one is
confident that an adequate number of valid height observations
have or will be collected for the stand.

An appropriate application would be volume estimation for pulp-
wood trees in a young pine plantation. After tallying a suffi-
cient number of various sized pulpwood trees for dbh and height,
a suitable height-diameter relationship is established. Field
time may be saved by tallying subsequent pulpwood trees by dbh
only and entering a "P" in the height field. Another application
for this feature would be situations where height data were lost.
<u>Note that standard error estimates appearing</u> in <u>the TIPS statis-
tical reports</u> do <u>not account for sampling error introduced by
using this feature.</u>

TVAFIE reads a list of three-character species codes from the
file, MASPEC.DAT. These codes may be changed by using the INFORM-
ED program. Codes supplied in Appendix B are defaults. A detailed
description of MASPEC.DAT is given in the TIPS Technical Refer-
ence Manual and the INFORM-ED manual. To conserve on disk space
for EDR applications, TVAFIE produces a slimmed down version of
MASPEC.DAT named MASPEC.SML.

Hardware/Software Requirements

The TVAFIE program operates on IBM PC/XT/AT/386/486 or compatible
computer systems under DOS 3.3 or greater. A hard disk is pref-
erable; especially if much data entry will be done. TVAFIE also
can be configured to operate on DOS compatible EDR's which sup-
port at least 6 rows by 20 columns. TVAFIE uses RAM in propor-
tion to the amount of data entered. A full 640 KB of RAM maxi-
mizes program performance. TVAFIE can edit a maximum of approxi-
mately 1,000 plots per stand and upwards to about 500 trees per
plot, depending on your RAM configuration. TVAFIE does not use
extended or expanded memory. The front end of TVAFIE includes
mouse support for pointing to the name of the file which you wish
to edit. Installation of TVAFIE is part of the overall INFORM
installation process.

TVAFRONT

If you are operating from the INFORM system menu (accessed by
typing AUTO or INFORM from DOS), start TVAFIE by moving the
marker to the appropriate menu item and pressing the Enter key
 (Screen 1). The TVAFRONT menu (Screen 2) will be displayed. You
move out of this menu and into TVAFIE either by highlighting
<CREATE.FIE> to create a new .FIE file, or by highlighting an old
filename, then pressing Enter=Go; press "Esc" to back out all
together. Use the Tab key to navigate from one box or command to

the next (or use a mouse) to complete your selections. From this
menu you also may change the volume drive and sub-directory.
Once you exit the TVAFRONT menu by highlighting an .FIE file or
<CREATE.FIE> and pressing Enter=Go, you will enter TVAFIE.
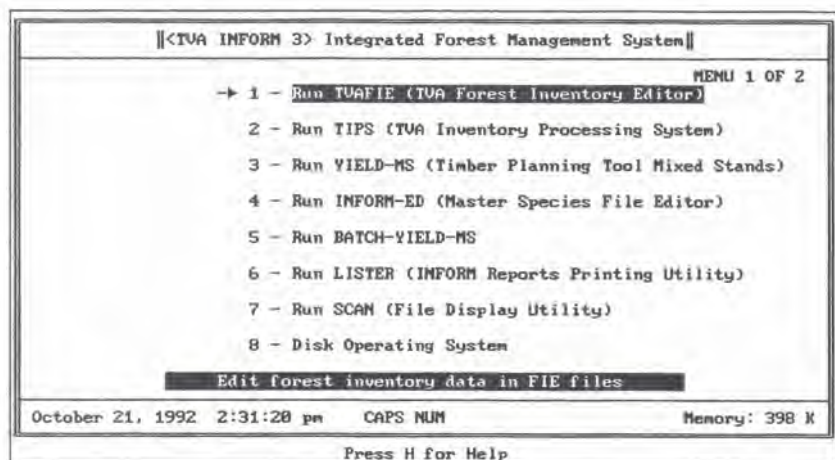
Screen 1 - Accessing TVAFIE From The INFORM Menu
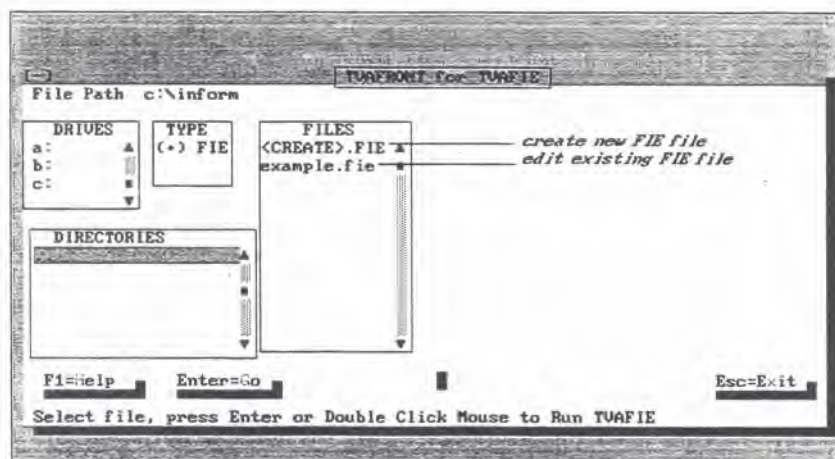
Screen 2 - TVAFRONT Menu For Selecting File To Edit

You may bypass the TVAFRONT menu and execute TVAFIE directly from
DOS by typing **TVAFIE,** provided you are in the proper INFORM
subdirectory (e.g., C:\INFORM >). This approach may be preferable
when the TVAFRONT module is encumbering due to a large number
of .FIE files in a directory or for other reasons.

ENTERING STAND DATA

TVAFIE is easy to use. Particular attention should be paid to the instruction line (displayed as a bright bar) near the bottom of the page. Specific instructions on the current operation (such as entering dbh or height) are displayed on this instruction line. Functions of the "F keys" (located to the left or top of most keyboards) appear at the bottom of the screen below the instruction line. At various points in the program, some of the F keys may be inactive. However, the function of a particular key is consistent throughout the program.

The tab keys or arrow keys, located on the numeric keypad, are used to move the cursor from input field to input field. Within an input field, the cursor is moved backwards with the left arrow key or backspace key. Several additional key sequences are available to speed up data entry. However, these should be used only after the user has some familiarity with the program. These extended function keys are listed in Appendix A.

Departing from previous releases, automatic advancement to the next field does not occur when the last character of a field is input. For example, you must press Enter in order to advance from the species code (Spp) field to the dbh (Di) field.

Within the program, data physically are stored according to "pages." The data specific to the stand (e.g., stand name, acreage, tally method, etc.) comprise page zero. The tally data and growth data make up additional pages. If you have chosen a sampling scheme other than 100%, the word "page" normally is synonymous with "plot" or "point." That is, page 1 is plot 1 and page 10 is point 10. However, this release permits a plot "number" and/or "name." The plot number is arbitrarily set by you while the page number simply represents the physical order of the plot data within an .FIE file. For example, page number 1 (i.e., physically the first plot stored in an .FIE file) may be plot number 100 originating from a multiple stand cruise.

If the tally method is 100%, use the F8 key to add an additional page once a page is filled with data. Also, when a page is created, it is "empty." You can move from page to page by pressing the PgUp (Page Up) and PgDn (Page Down) keys. If a frequency tally was chosen, a new page is required for each tree species tallied.

When all data are entered, use the F10 key to save the data. The program will prompt for a file name in which to store the data. Do not enter an extension when naming a file; the program will automatically append the extension "FIE."

The program may be aborted at any point by entering Ctrl-c. That is, press the Ctrl key and hold it down while pressing the C key. To halt the program, enter a "Y" in response to the prompt. No data is saved if program execution is ended this way.

The examples and sample screens used in this manual, access the
file called EXAMPLE.FIE (shipped with the INFORM system distribu-
tion disks; listing in Appendix C). You may wish to load this
file with TVAFIE and experiment with various program features as
they are discussed in this manual.

First, you are prompted for the type of data (tally or growth)
you want to enter (Screen 3). Pressing the space bar will alter-
nately display either "TALLY" or "GROWTH." Press Return to make
a selection. Retain TALLY to follow the examples used here.


```
C:\INFORM\EXAMPLE.FIE
TVA FOREST INVENTORY EDITOR - V3.0
Press escape to edit another file or exit program




                        Spacebar  toggles TALLY or GROWTH




Edit mode: Tally  Spacebar=Tally/Growth
```
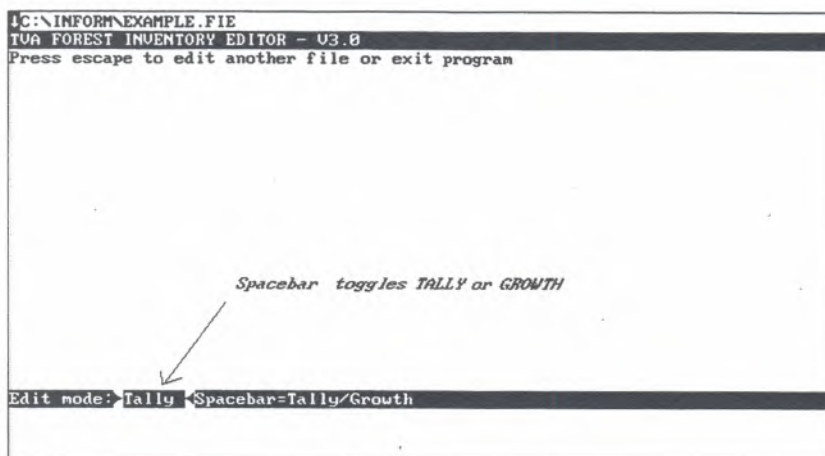
Screen 3 - Select Tally Data Or Growth Data To Edit

Next, the stand information screen will appear (Screen 4).
Pertinent instructions will be displayed at the bottom of the
screen and stand data will appear in the center of the screen.
Enter the data requested. If you are editing existing data, you
may not be able to change some of the information displayed.
This is normal; certain items cannot be changed once data have
been entered. Remember to use the arrow keys to move about.
Also, be aware of and follow the instructions shown at the bottom
of the screen.


```
C:\INFORM\EXAMPLE.FIE
TVA FOREST INVENTORY EDITOR - V3.0
Last edited by TVA FOREST INVENTORY EDITOR V3.0
Name: EXAMPLE
Collected By: J.R. FORESTER
Collected On: 05/01/90
Stand Units: English
Stand Area: 50
Site Index: 80
Stand Age: 40
Sample Method: Plot
Tally Method: GRADE
Sample Size: 1
Plot Size: .1
Show Cut/Leave: Y
Cut/Leave when blank: L
Show Tree Grade: Y
Tree Grade when blank: 3
Show Soundness: Y
Show Pulp/Sawtimber: Y
DATA FOR A TYPICAL STAND IN NORTHERN ALABAMA
Sample Method: Spacebar=Plot/Point/100%
F01 Help      F03     F05       F07        F09 Shift
F02 Find Plot F04     F06       F08 Add Plot F10 Save/Res
```

Screen 4 - Stand Information Screen

To follow is a description of each field in the stand information screen:

Name
If you are entering new data, then name the stand. Do not exceed 20 characters. If you are editing old data, the stand name will appear in this space and you may edit it.

Collected By
Enter the name of the timber cruiser here. This input is optional.

Collected On
Enter the date of the data collection at this prompt. This is another optional input. The system date is the default.

Stand Units
Select English for dbh in inches, height in feet, site index in feet, area in acres. Select Metric for dbh in centimeters, height in meters, site index in meters, and area in hectares.

Stand Area
Enter the stand size to the nearest tenth acre (hectare). Maximum size is 9999.9 acres.

Site Index
If YIELD-MS analysis is anticipated, enter the average site index for the stand. Otherwise, this input is optional. Use a base age of 50. YIELD-MS will allow you to edit site index later.

Stand Age
Enter the average stand age to the nearest year. This input is necessary only if you anticipate performing a growth projection using YIELD-MS. If the stand is mixed aged, enter your best estimate of average age. YIELD-MS will allow you to edit age later.

Sample Method
Display the desired sample method (point, plot, or 100 's) with the spacebar. Press Return to make a selection.

Tally Method
Display the desired tally method (frequency or grade) by pressing the space bar, and make your selection by pressing the Return key. Be sure that the correct method is entered, since your choice cannot be changed once tally data have been entered.

Sample Size
If you used a Frequency tally, then enter the number of plots or points taken. If a Grade tally was done, the program will count plots or points automatically and no input is required.

Plot Size
For a fixed plot cruise, enter the plot size. If a prism cruise was done, then enter the basal area factor (BAF). Be sure to use a decimal, if necessary.

Show Cut/Leave

Use the spacebar to switch Yes or No for activating the display of Cut/Leave fields.

Cut/Leave when blank

Specify a default to use when blanks are entered. If a No is entered for Show Cut/Leave, the Cut/Leave field will not appear in Tally screens.

Show tree grade

Use the spacebar to switch Yes or No for activating the display of Grade fields.

Tree grade when blank

Specify a default to use when blanks are entered. If a No is entered for Show tree grade, the Grade field will not appear in Tally screens.

Show soundness

Use the spacebar to switch Yes or No for activating the display of Soundness fields; the default when blanks are entered is hardwired for 100 % sound. If a No is entered for Display, the Soundness field will not appear in Tally screens.

Show Pulp/Sawtimber

Use the spacebar to switch Yes or No for activating display of the Pulpwood/Sawtimber explicit designation field. Later, when entering tally data, enter a "P" if the tree is pulpwood, an "S" if the tree is sawtimber. A blank is interpreted according to height. This field is mandatory if Stand Units are Metric. Enter a "P" in this field when operating in Metric mode for pulpwood trees less than 6 m in height.

Comments

You may enter a maximum of three lines of comments. This information is optional.

Proceed beyond the stand data entry into tally data entry by pressing the F8 (Add Page) key if you are entering new data, or by pressing the PgDn or F2 key to skip to the desired page if you are editing existing data.

Once the stand data have been entered, you can begin entering the actual cruise data. To do this, press the F8 (Add Page) key. The screen will clear and a new screen will appear (Screen 5). This new screen has a header banner with column heads repeated four times (see Command Line Configuration Codes section to change the number of columns). The tally data will form columns under these heads. Instructions for the function keys appear at the bottom of the screen. If you elected to display Cut/Leave status, each of the column heads will include the "C" abbreviation for Cut/Leave. Likewise, if you elected to display grade, each of the column heads will include the "G" abbreviation for Grade. If you elected to display Soundness, each of the column heads will include the "S" abbreviation for Soundness. And last, if you elected to display Pulpwood/Sawtimber designation, each of the column heads will include a "PS".

```
┌Page 1/1│Plot=
Spp PS Di Hgt S G C┃Spp PS Di Hgt S G C┃Spp PS Di Hgt S G C┃Spp PS Di Hgt S G C
BLO P  4           ┃BLO    10  25       ┃WHO    8  18        ┃SWG    2
SWG    2           ┃SWG    2            ┃SWG    4            ┃SWG    4
SWG    6 12         ┃YEP    8  21        ┃YEP    10 26        ┃HIC    2
HIC    2           ┃HIC    4            ┃HIC    8  14        ┃SHP    8  18
DOG    2           ┃DOG    2            ┃DOG    2            ┃DOG    2
DOG    4           ┃DOG    4            ┃REM    4            ┃REM    3
REM    3           ┃REM    6  15        ┃PER    7  14        ┃ASH    10 21
ASH    6 10         ┃LOP    6  18        ┃SHP    7  21        ┃SHP    13 46
YEP    16 2   1     ┃WHO    14 1.5   2   ┃CHO    13 1     2   ┃SCO    14 1     2
LOP    13 2         ┃BEE    18 2   5     ┃

Species code
F01▶Help         F03▶Insert Obs    F05▶Insert Plot   F07▶Rename Plot   F09▶Shift
F02▶Find Plot    F04▶Delete Obs    F06▶Delete Plot   F08▶Add Plot      F10▶Save/Res
```

Screen 5 - Grade Tally Plot Screen

Grade Tally

For a grade tally, enter the three character species code under the "Spp" column, followed optionally, by "S" or "P" under the Pulpwood/sawtimber column (not used in EXAMPLE.FIE), followed by the dbh (Di), the height (Hgt), then optionally the soundness under the "S" column, the tree grade under the "G" column, and cut or leave status under the "C" column. Remember that pulpwood/sawtimber designation, soundness, grade, and cut/leave status are optional inputs. Continue until the page is filled or until all data are entered. Once all data are entered, use the F10 key to save and end the session.

TVAFIE supports several key sequences for increased data entry efficiency when entering repeating fields. For example, in a plantation situation the same species or diameter may be repeated. Pressing the Enter key on a blank "Spp" or "Di" field will fill the field with the respective species code or dbh entered for the previous tree observation. For example, if you are

entering data for a loblolly pine plantation, you need only enter the loblolly pine species code (i.e., "LOP") once, then press Enter for all succeeding tree observations for the "Spp" field. The "=" key behaves identically, however, it works with the "Snd", "Grd", "P/S", and the "C/L" fields too. The ">" key will repeat an entire tree observation and advance to the next observation. The "<" key will repeat an entire tree observation without advancing to the next observation. Experiment with these features to understand their potential for greater data entry efficiency. Appendix A provides a complete list of commands.

Frequency Tally

If a frequency tally was done, you will be prompted for a three character species code (Screen 6). Valid species codes are given in Appendix B. If you are entering new data, note that the screen will read "Empty..."

Enter dbh under the "Di" column. Next, enter height (in number of logs, or in feet) under the "Hgt" column, followed by the number of observations (trees tallied) under the "Obs" column. The optional pulpwood/sawtimber designation also may be entered. Be sure to enter merchantable heights for pulpwood trees to the nearest foot (meter). Likewise, enter merchantable height for sawtimber trees to the nearest tenth log. For example, enter height for a one and a half log tree as 1.5. Maximum height for sawtimber trees is 5.9 logs; maximum pulpwood height is 250 feet.

Continue to enter data in this manner until the screen is filled or until all data are entered. If more pages are needed for additional data, use the F8 key to add another page. Note that the F2 through F9 keys may be used to enter or edit data by inserting, adding, and deleting pages or observations. Press the F8 key to add additional species. A maximum of 999 tree observations may be entered for a particular dbh-height combination. To accommodate more than 999 trees, a dbh-height combination may be repeated.

```
↓Page 1/1 Species=LOP
   Di  Hgt  Obs      Di  Hgt  Obs      Di  Hgt  Obs      Di  Hgt  Obs
   4        12       6   10   9        6   20   6        8   20   7
   8   30   12       10  30   14       10  40   12       12   1   6




















Observations: 1-9gs/6-250 feet pulpwood
F01►Help            F03►Insert Obs    F05►Insert Page   F07►Rename Page   F09►Shift
F02►Find Spp/Page   F04►Delete Obs    F06►Delete Page   F08►Add Page      F10►Save/Res
```

Screen 6 - Frequency Tally Screen

Function Keys

The Function keys (the Fl through F10 keys) are used to perform various tasks. The purpose of these keys is provided at the bottom of the screen. F1 (Help) displays context sensitive help information. This feature is particularly useful for EDR applications when a user manual isn't handy. A new page (plot) may be added by pressing the F8 key (Screen 7). Use F2 (Find Plot) to find a pre-existing plot by page number, plot number, or plot name. Note that the current page number, plot number, and plot name are displayed on the instruction line at the top of the screen. The tab key allows you to switch among these three identifiers after F2 is pressed (Screen 8). Pressing the F10 (Save/Resume) key allows you to save the data. Regardless of tally method, a variety of function keys are available for speeding changes to the data. They include F3 to insert a tree observation, F4 to delete a tree observation, F5 to insert a page, F6 to delete a page, F7 to rename or renumber a page, and F9 to shift to the second menu (Screen 9).

```
Page 2/2 Plot=   2 OPTIONAL NAME FOR PLOT 2 GOES HERE
Spp PS Di Hgt S G C Spp PS Di Hgt S G C Spp PS Di Hgt S G C Spp PS Di Hgt S G C
```
```
Height: .1-5.9 logs/6-250 feet pulpwood
F01▶Help         F03▶Insert Obs   F05▶Insert Plot  F07▶Rename Plot  F09▶Shift
F02▶Find Plot    F04▶Delete Obs   F06▶Delete Plot  F08▶Add Plot     F10▶Save/Res
```

Screen 7 - Add Plot

```
Page 1/1 Plot=
Spp PS Di Hgt S G C Spp PS Di Hgt S G C Spp PS Di Hgt S G C Spp PS Di Hgt S G C
BLO P  4             BLO   10  25       WHO    8  18       SWG    2
SWG    2             SWG   2            SWG    4           SWG    4
SWG    6  12         YEP   8   21       YEP   10  26       HIC    2
HIC    2             HIC   4            HIC    8  14       SHP    8  18
DOG    2             DOG   2            DOG    2           DOG    2
DOG    4             DOG   4            REM    4           REM    3
REM    3             REM   6   15       PER    7  14       ASH   10  21
ASH    6  18         LOP   6   18       SHP    7  21       SHP   13  46
YEP   16  2  1       WHO  14  1.5   2   CHO   13  1    2   SCO   14  1   2
LOP   13  2          BEE  18   2    5

   (Use Tab key to toggle among)
Page no.    Plot no.         Plot name

Page    1 Plot    1 A PLOT NAME OPTIONALLY GOES HERE
F01▶Help         F03▶Insert Obs   F05▶Insert Plot  F07▶Rename Plot  F09▶Shift
F02▶Find Plot    F04▶Delete Obs   F06▶Delete Plot  F08▶Add Plot     F10▶Save/Res
```

Screen 8 - Find Plot

```
↑Page 1/1 Plot=
Spp PS Di Hgt S G C  Spp PS Di Hgt S G C  Spp PS Di Hgt S G C  Spp PS Di Hgt S G C
BLO P  4             BLO    10  25         WHO     8  18        SWG     2
SWG    2             SWG     2             SWG     4            SWG     4
SWG    6 12          YEP     8  21         YEP    18  26        HIC     2
HIC    2             HIC     4             HIC     8  14        SHP     8  18
DOG    2             DOG     2             DOG     2            DOG     2
DOG    4             DOG     4             REM     4            REM     3
REM    3             REM     6  15         PER     7  14        ASH    10  21
ASH    6 10          LOP     6  18         SHP     7  21        SHP    13  46
YEP   16  2  1       WHO    14 1.5   2     CHO    13   1   2    SCO    14   1   2
LOP   13  2          BEE    18  2    5




Species code
F01▶Help            F03▶Cut/Paste        F05▶Sort Plots      F07▶Print           F09▶UnShift
F02▶                F04▶                 F06▶Increment       F08▶Call DOS        F10▶Save/Exi
```

Screen 9 - Shift To Second Menu

The second menu also includes the F1 key for help. The Shift-F3 (Cut/Paste) command can be used for cut/paste operations. For example, if you want to move one or more pages from one .FIE file to another, then press Shift-F3 if you are in menu 1 or F3 if you are in menu 2. You are prompted for the range of pages to cut, copy, or paste (Screen 10). Copy duplicates pages to another .FIE file but leaves the original pages intact. Cut moves pages to another .FIE file but erases the originals. Paste copies new pages in from another .FIE file. The default filename for these operations is CLIPTALY.FIE. This file is automatically cleared just prior to each cut or copy operation. You may use other .FIE files too. For example, you can copy pages from the presently edited .FIE file to a new .FIE file. However, if you copy directly to an <u>existing</u> .FIE file, the data previously stored in the destination file will be clobbered. You must use CLIPTALY as an intermediate step, then paste the data into the destination file. TVAFIE rejects paste operations when there is a conflict in tally method or sample method.

```
↑C:\INFORM\EXAMPLE.FIE
TVA FOREST INVENTORY EDITOR - V3.0
Copy or Cut pages from the current stand to a new stand
- or -
Paste from another stand into the current stand








           (Use Spacebar to toggle Paste, Cut, or Copy)
              ╲
               ╲
                ↓
Action: Paste  Spacebar=Copy/Cut/Paste
```

Screen 10 - Cut, Copy, and Paste Operations

The Shift-F5 (Sort Plots) command allows you to sort plots

(pages) by plot number or plot name. The tab key controls selection (Screen 11). Recall, that with a grade tally, each plot is physically stored as a separate page. Shift-F5 rearranges the physical order of the pages. This command could be used to segregate plots by name. For example, if you recorded plot names as PINE or HARDWOOD, F5 would clump all of the PINE and HARDWOOD pages. Then the Shift-F3 (Cut/paste) command could be used to move one of the groups to another .FIE file in one operation.

```
↑C:\INFORM\EXAMPLE.FIE
TVA FOREST INVENTORY EDITOR - V3.0
This command will permanently alter
 the order of pages in this stand
Press Escape to cancel . . .




              (Use Spacebar to toggle Number or Name as field to sort on)




Sort by: Number Spacebar=Number/Name

```
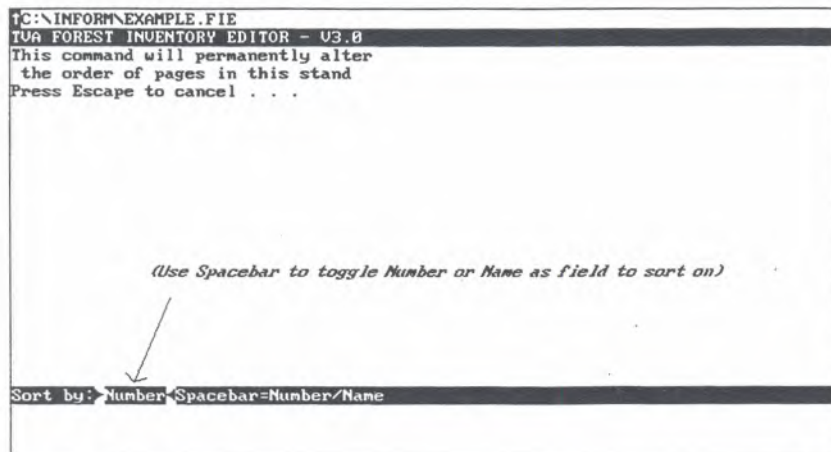
Screen 11 - Sort Plots (Pages) Operations

The Shift-F6 (Increment) command operates like a trip odometer for numbering plots under grade tallies (Screen 12). Each time a new plot is added using the F8 (Add Plot) command, you are prompted to enter a plot number. Although the plot number is arbitrary and optional, TVAFIE loads the plot number field with the value stored by Shift-F6, plus one. This feature is particularly useful for EDR applications where plots are sampled along a line. The value stored by Shift-F6 is not unique to a stand. If you enter some plot data for a stand, save it, and begin adding plot data for another stand, the plot number prompt continues to increment by one with each new plot added, based on where it left off with the former stand. The value is stored in TVAFIE.CNT.

```
↑C:\INFORM\EXAMPLE.FIE
TVA FOREST INVENTORY EDITOR - V3.0
Enter Plot/Point number to begin incrementing
 or zero to use page number








Increment from 0■■■◀

```
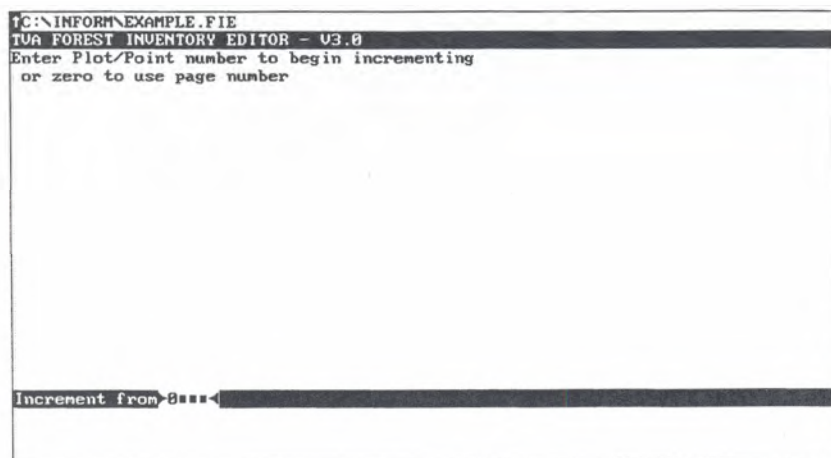
Screen 12 - Increment (Reset Plot Number)

The Shift-F7 (Print) command generates a listing of the entire contents of an .FIE file (Figure 3). This is useful for verifying keypunched data against a field sheet.

```
File Name ... C:\INFORM\EXAMPLE.FIE
Stand Name .. EXAMPLE
Collected ... 05/01/90 by J.R. FORESTER
Units ....... English
Stand size .. 50. Acres
Site index .. 80
Stand age ... 40 Years
Sampled ..... 1 PlotS of .1 Acres
Tallied ..... GRADE
Editor ...... TVA FOREST INVENTORY EDITOR V3.0


Show Cut/Leave ............ Y ... Blank means ... L
Show Tree Grade ........... Y ... Blank means ... 3
Show Soundness ............ Y
Show Pulpwood/Sawtimber ... Y


DATA FOR A TYPICAL STAND IN NORTHERN ALABAMA



Page 1 - Plot= - 38 Observations


Spp PS Di Hgt S G C  Spp PS Di Hgt S G C  Spp PS Di Hgt S G C  Spp PS Di Hgt S G C
-------------------  -------------------  -------------------  -------------------
BLO P  4  .          BLO    10 25.        WHO    8 18.         SWG    2  .
SWG    2  .          SWG    2  .          SWG    4  .          SWG    4  .
SWG    6 12.         YEP    8 21.         YEP   10 26.         HIC    2  .
HIC    2  .          HIC    4  .          HIC    8 14.         SHP    8 18.
DOG    2  .          DOG    2  .          DOG    2  .          DOG    2  .
DOG    4  .          DOG    4  .          REM    4  .          REM    3  .
REM    3  .          REM    6 15.         PER    7 14.         ASH   10 21.
ASH    6 10.         LOP    6 18.         SHP    7 21.         SHP   13 46.
YEP   16 2.   1      WHO   14 1.5   2     CHO   13 1.   2      SCO   14 1.   2
LOP   13 2.          BEE   18 2.   5

-------------------  -------------------  -------------------  -------------------
```

Figure 3 - Shift-F7 Printout of .FIE File Contents

The Shift-F8 (Call DOS) command suspends TVAFIE momentarily to perform a DOS function such as erasing a file, sorting files, etc. This command should not be used for exiting TVAFIE alto-gether; the F10 or Shift-F10 key should be used for this purpose. The Shift-F9 (UnShift) command simply changes menu 2 back to menu 1. The Shift-F10 (Save/Exit) command is a one-shot command for saving the current file and exiting the program. The F10 (Save/Resume) command in menu 1 saves the current file but then resumes editing. The Shift-F10 (Save/Exit) command is preferred for EDR applications when exiting the program to pick a new stand for editing. On the other hand, the F10 (Save/Resume) command is appropriate for periodically securing data into a file as it is entered. Pressing the "End" key twice moves the cursor to the end of the file for resumption of data entry.

ENTERING GROWTH DATA

Growth data may be entered by branching to the GROWTH module instead of the TALLY module upon entering the program. The YIELD-MS program uses growth data to derive radial growth rates. Growth data are not needed by TIPS, but are required if the "Cores Method" of growth projection is desired in YIELD-MS. In the absence of growth data, YIELD-MS can still perform growth projections using equations, file rates, or directly input growth rates.

Growth data consist of the following: the species, the dbh to the nearest tenth inch (cm), and the length of a 10-year core increment expressed to the nearest tenth inch (millimeter). The procedure for entering growth data is similar to the one for entering tally data. Enter the species code under the "Spp" column, the dbh under the "Diam" column, and the 10 year increment core length under the "Len" column (Screen 13). TIPS 3.0 can process up to 1,000 observations per stand. Use the F10 or Shift-F10 key to save your data.

```
Page 1/1
 Spp  Diam   Len     Spp  Diam   Len     Spp  Diam   Len     Spp  Diam   Len
 ASH   9.6   .39     SWG  11.7   .27     SWG  16.8   .82     SHP  15.6   .41
 SHP  20.8   .94     WHO  14.1   .67     WHO  11.5   .49     WHO  10.3   .48
 SCO  11.7   .51     SCO  14.2    .6     BEE  20.8   .81     BEE   4.1   .25
 SCO   5.2   .29











 Core length: .1-9 inches
 F01 Help           F03 Insert Obs    F05 Insert Page   F07            F09 Shift
 F02 Find Page      F04 Delete Obs    F06 Delete Page   F08 Add Page   F10 Save/Res
```

Screen 13 - Growth Data

The default screen dimensions for operating TVAFIE (e.g., from the INFORM System Menu on a desktop PC) are 25 rows by 80 columns. However, TVAFIE may be operated on DOS compatible devices with screens supporting as few as six rows and 20 columns. Most EDR's meet this minimum requirement. New with this version of TVAFIE is the ability to configure screen dimensions from the DOS command line. The next section will describe the various command line options. First, in order to operate TVAFIE on a data recorder, the following files must be copied over:

EDRFRONT.EXE (optional)
TVAFIE.EXE
TVAFIE.CNF
MASPEC.SML

After copying these files from your desktop PC to the EDR, you may wish to edit TVAFIE.CNF so that monochrome (instead of color) screen attributes are used. Consult Appendix (D) for details. If the MASPEC.SML file is not on your PC's INFORM directory, then simply run TVAFIE once (e.g., edit EXAMPLE.FIE and save it) and one will be created. MASPEC.SML simply is a list of valid species codes derived from MASPEC.DAT. Note, if you add or delete species codes using INFORM-ED on your desktop PC, you will have to run TVAFIE at least once and then copy MASPEC.SML over to your EDR if you wish to keep it current. The last step in preparing your EDR to operate TVAFIE is installing ANSI.SYS. Like all INFORM programs, ANSI.SYS must be loaded for proper screen operation. A CONFIG.SYS file must contain the statement DEVICE=ANSI.SYS, or DEVICE=\DOS\ANSI.SYS. etc. A valid ANSI.SYS file (supplied with DOS) must reside in the specified location.

Command Line Configuration Codes

Command line configuration codes are passed to TVAFIE by executing TVAFIE from the DOS prompt followed by commands delimited by slashes "/". For example, by typing C:\INFORM>**TVAFIE /h** from DOS, the various options are listed (Screen 14). Note: in order to experiment with these commands on your desktop PC, operate from a subdirectory which contains only the files EDRFRONT.EXE, TVAFIE.EXE, TVAFIE.CNF, and MASPEC.SML or, disable the front-end program.

```
TVA FOREST INVENTORY EDITOR - V3.0

Abnormal Program Termination


Usage: TVAFIE Filename [Options ...]
Where:
  Filename : path and filename of file to be edited
  Options  :
   - /p       Do not check for attached printer
   - /f       Do not prompt for input file name
   - /d       Set up data recorder defaults
   - /t       Do not prompt for Tally/Grade
   - /in=n    Set index size to "n" plots/points/pages
   - /ps=n    Set plot/point/page size to "n" observations
   - /sw=n    Set screen width to "n" characters
   - /sh=n    Set screen height to "n" rows
   - /sc=n    Set screen width to "n" data columns
   - /h       Show this help information



C:\INFORM>
```

Screen 14 - TVAFIE Command Line Configuration Codes

The **/p** option tells TVAFIE not to check if a printer is attached.
You may wish to try this option if the Shift-F7 (Print) command
fails to print a report. The **/f** option implies that after a
space, the name of an .FIE file is to follow. For example, to
edit EXAMPLE.FIE, type C:\INFORM>**TVAFIE /f EXAMPLE**. TVAFIE would
proceed directly to edit file "EXAMPLE.FIE" without prompting for
a filename. The **/d** option sets the screen width to 40 charac-
ters, the screen height to 8 rows, and the number of data columns
to 2 (Screen 15). This is standard for 8 row by 40 column ma-
chines such as the Husky 16 (tm).

```
↓Page 1/1 Plot=
Spp PS Di Hgt S G C  Spp PS Di Hgt S G C
BLO P   4            BLO   10  25
WHO     8  18        SWG   2
SWG     2            SWG   2
SWG     4            SWG   4
Species code


                    ↑
        Box approximates 8 row x 40 column screen of an EDR
```

Screen 15 - TVAFIE Executed With /d Option

The **/t** option simply causes TVAFIE to bypass the TALLY/GRADE
prompt and proceed directly to edit TALLY data. If you know for
example, that no growth data are to be collected, then this
option saves a keystroke.

The **/in** option controls internal memory management. This command
should only be used if a very large data set (e.g., >500 plots in
one .FIE file) triggered a memory error. Depending on your

computer's RAM situation, you may continue to add plots (pages)
by setting in: to some number larger than the current number of
plots. The default is 500. The maximum is 1,000.

The **/ps** option controls page size (i.e., maximum number of tree
observations per page). On a standard PC with 25 rows and 80
columns, 4 columns of data yields a maximum of 76 tree observa-
tions visible per page (the default is 100). You may increase
/ps: to a maximum of about 500 tree observations per page.
TVAFIE will automatically scroll down when the logical page size
exceeds the physical page size. Remember, even if you are per-
forming a 100% tally, you can always use the F8 key to add more
pages after filling one up.

The **/sw** option specifies the maximum screen width. The default
is 80. Unless the /d option is invoked, /sw should be set to the
number of columns that your EDR supports down to a minimum of 20.

The **/sh** option sets screen height in rows. The default is 25.
Unless the /d option is invoked, /sh should be set to the number
of rows supported by your EDR down to a minimum of 6. At the
other extreme, if you are operating a desktop PC monitor in EGA
or better mode, you can set /sh to 43, and in VGA mode you can
set it to 50. This will allow you to increase /ps (page size).

The **/sc** option sets the number of data columns displayed. The
default is the maximum possible for the screen width. Each
column requires 20 characters; divide the number of columns by 20
and truncate any remainder to determine the optimal /sc setting.
For example, a 25 character wide EDR would allow 25 / 20 = 1 data
column (Screen 16).

Screen 16 - TVAFIE Executed With /sh:8 /sw:40 /sc:1

It is wise to experiment with these options on your EDR to deter-
mine the best mix for optimal performance. For example, on an 8
row by 40 column Husky 16, for timber cruising without growth
data, performance is optimized by executing TVAFIE as follows:

C:\INFORM> TVAFIE /t /sh:8 /sw:40 /sc:2

EDRFRONT

This optional module acts as a front-end to TVAFIE for EDR appli-
cations (Screen 17). It lists all .FIE files in the current
directory and allows you to select one to edit. Selecting
<create> allows you to begin a new file. Normally, you will want
to execute EDRFRONT in order to quickly select an .FIE file and
launch operation of TVAFIE. Command line configuration codes are
automatically passed through to TVAFIE. For example, if you
executed EDRFRONT with the /d option (i.e., C:\INFORM >EDRFRONT
/d), the /d option will be picked up by TVAFIE. To simplify EDR
applications further, it is recommended to execute EDRFRONT from
a batch file. For example, the following batch file would exe-
cute EDRFRONT/TVAFIE by simply typing the character **T** from DOS.

```
 File: T.BAT
linel: EDRFRONT /d
```
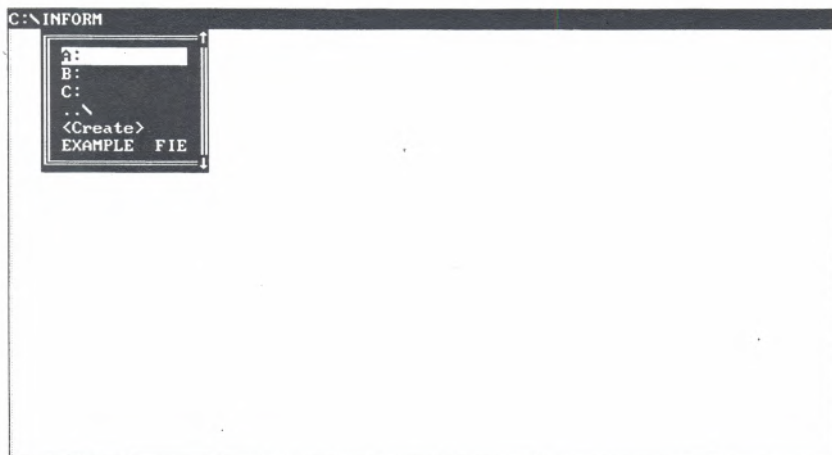

Screen 17 - EDRFRONT

Before heading for the field, you may wish to attach a copy of
Appendix (F) Quick Reference of TVAFIE Commands to the back of
your EDR.

APPENDIX A. Editing function keys for TVAFIE.

Key	Function
Right Arrow	moves cursor to the right
Left Arrow	moves cursor to the left
Backspace	moves cursor destructively to the left
INSert	inserts a blank at the current cursor position
DELete	deletes input at current cursor position
Alt-D	erases from current cursor position to end of field
Tab	jumps cursor to next field
Backtab	jumps cursor to previous field
Enter (blank field)	copy field with value stored for previous observation ("Spp" and "Di" field only)
	copy field with value stored for same field in previous observation
Enter	accepts input and moves cursor to next field
^Enter	jumps cursor to previous field
^Right Arrow	jumps cursor to next observation
^Left Arrow	jumps cursor to previous observation
Down Arrow	jumps cursor to next line
Up Arrow	jumps cursor to previous line
PgDn	go to next screen
PgUp	go to previous screen
^PgUp	go to previous page
^PgDn	go to next page
Home	go to beginning of field
End	go to last character in field
Home Home	go to top of page
End End	go to bottom of page
ESCape	function varies (see on-screen instructions)
F01 - F10	function varies (see on-screen instructions)
>	repeat tree observation, advance to next observation
<	repeat tree observation, no advance to next observation

Note: Keys preceded with the ^ symbol should be pressed simultaneously with the Control (Ctrl) key. Likewise, keys preceded with **ALT** should be pressed simultaneously with the Alt key.

Appendix B. Default species codes.

CODE	SPECIES	CODE	SPECIES
ASH	ASH	SWG	SWEETGUM
ASP	ASPEN	SWO	WHITE OAK
BAS	BASSWOOD	SYC	SYCAMORE
BEE	BEECH	TUP	TUPELO
BIR	BIRCH	VIP	VIRGINIA PINE
BLC	BLACK CHERRY	WAO	WATER OAK
BLG	BLACK GUM	WHO	WHITE OAK
BLL	BLACK LOCUST	WHP	WHITE PINE
BLO	BLACK OAK	WIE	WINGED ELM
BLW	BLACK WALNUT	WIO	WILLOW OAK
BOX	BOXELDER	YEB	YELLOW BIRCH
BUC	BUCKEYE	YEP	YELLOW POPLAR
BUO	BUR OAK	ZBO	BLACKJACK OAK
BUT	BUTTERNUT	ZCH	CHINQUAPIN OAK
CHO	CHESTNUT OAK	ZCO	CHERRYBARK OAK
COT	COTTONWOOD	ZHL	HONEY LOCUST
CUC	CUCUMBER TREE	ZLP	LONGLEAF PINE
CYP	CYPRESS	ZSB	SWEET BIRCH
DOG	DOGWOOD	ZSC	SWAMP CHESTNUT OAK
ELM	ELM	ZSO	SHUMARD OAK
ERC	EASTERN REDCEDAR	MSC	MISCELLANEOUS
HAC	HACKBERRY		
HAM	HARD MAPLE GROUP		
HEM	EASTERN HEMLOCK		
HIC	HICKORY		
HOL	HOLLY		
LOP	LOBLOLLY PINE		
MAG	MAGNOLIA		
MIC	MISC. CONIFERS		
MRO	MISC. RED OAKS		
MUL	MULBERRY		
MWO	MISC. WHITE OAKS		
MYP	MISC. YELLOW PINES		
NRO	NORTHERN RED OAK		
OSO	OSAGE ORANGE		
OVO	OVERCUP OAK		
PEC	PECAN		
PER	PERSIMMON		
PIO	PIN OAK		
POO	POST OAK		
REM	RED MAPLE		
RIB	RIVER BIRCH		
SAS	SASSAFRAS		
SCO	SCARLET OAK		
SHO	SHINGLE OAK		
SHP	SHORTLEAF PINE		
SIM	SILVER MAPLE		
SLP	SLASH PINE		
SRO	SOUTHERN RED OAK		
SWB	SWEETBAY		

Appendix C. EXAMPLE.FIE listing.

```
BEGIN STAND
EXAMPLE                 05/01/90J.R. FORESTER      English        50.Plot
```
```
        1   .1GRADE      80 40TVA FOREST INVENTORY EDITOR  3.O YYYL3Y
DATA FOR A TYPICAL STAND IN NORTHERN ALABAMA
END STAND
BEGIN TALLY
PAGE
BLO 4
BLO1025.
WHO 818.
SWG 2
SWG 2
SWG 2
SWG 4
SWG 4
SWG 612.
YEP 821.
YEP1026.
HIC 2
HIC 2
HIC 4
HIC 814.
SHP 818.
DOG 2
DOG 2
DOG 2
DOG 2
DOG 4
DOG 4
REM 4
REM 3
REM 3
REM 615.
PER 714.
ASH1021.
ASH 610.
LOP 618.
SHP 721.
SHP1346.
YEP16 2. 1
WHO141.5 2
CHO13 1. 2
SCO14 1. 2
LOP13 2.
BEE18 2. 5
END TALLY
BEGIN GROWTH
PAGE
ASH 9.6.39
SWG11.7.27
SWG16.8.82
```

```
SHP15.6.41
SHP20.8.94
WHO14.1.67
WHO11.5.49
WHO10.3.48
SCO11.7.51
SCO14.2 .6
BEE20.8.81
BEE 4.1.25
SCO 5.2.29
END GROWTH
```

Appendix D. Setting Display Terminal Colors

Display terminal foreground and background colors can be config-
ured by editing the file TVAFIE.CNF with a text editor. The
documentation required to make a change is included in the file.
The contents of TVAFIE.CNF which pertain to setting colors are as
follows.

```
*-------------------------------------------------------------------
* To change to MONO ONLY (for Composite screens that are hard to see in color)
* use the codes displayed on the right.  TVAFIE reads the first string
* enclosed in quotes only.  ASCII values may be represented by putting their
* numeric values (up to three digits) after a backslash.  For example, "\027"
* is Escape, "\089" is "Y", etc.  To include a literal backslash, enter two
* backslashes in a row.  For example, "\\" is viewed as "\".
*
* The format for setting screen colors is:
*   (ESC is escape or "\027" and # is a numeric parameter)
*
*   ESC[#;...#m
*
*   Where: # (paramater) is:
*          -------------------------------------------------
*          0  = All attributes off
*          1  = High intensity on
*          4  = Underscore on
*          5  = Blink on
*          7  = Reverse video on
*          8  = Invisible
*          30 = Black foreground     40 = Black background
*          31 = Red        "         41 = Red          "
*          32 = Green      "         42 = Green        "
*          33 = Yellow     "         43 = Yellow       "
*          34 = Blue       "         44 = Blue         "
*          35 = Magenta    "         45 = Magenta      "
*          36 = Cyan       "         46 = Cyan         "
*          37 = White      "         47 = White        "
*          -------------------------------------------------
*
* The "beep on error" may be turned off by putting the value "" for BELL
*-------------------------------------------------------------------
"\027[0;30;46m"    <-- COLOR/MONO  NORMAL    MONO ONLY -->   "\027[0m"
"\027[0;1;37;46m"                  HILITE                    "\027[0;1m"
"\027[0;7m"                        REVERSE                   "\027[0;7m"
"\a"                               BELL                      "\a"
*-------------------------------------------------------------------
```

(E) Grade Tally Sheet

INFORM 3 GRADE TALLY FIELD SHEET

Data Sheet For Tallying By Species, Sawtirnber/Pulpwood, Dbh, Height, Soundness, Grade, and Cut/Leave

Date: __/__/__   Crew: _____   Compartment: _____   Stand: _____   Site Index: _____   Age: _____

Plot #	Species	S/P	Dbh	Ht	Snd	Grd	C/L	Species	S/P	Dbh	Ht	Snd	Grd	C/L	Species	S/P	Dbh	Ht	Snd	Grd	C/L	Species	S/P	Dbh	Ht	Snd	Grd	C/L

(F) Quick Reference of TVAFIE Commands

```
MENU 1 (UnShift)
F1-Help         F2-Find Plot     F3-Insert Obs    F4-Delete Obs
F5-Insert Page  F6-Delete Page   F7-Rename Plot   F8-Add Page
F9-Shift Menu   F10-Save/Resume


MENU 2 (Shift)
F1-Help         F2-             F3-Cut/Paste     F4-
F5-Sort Plots   F6-Increment    F7-Print         F8-Call DOS
F9-UnShift Menu F10-Save/Exit


SHORTCUT KEYSTROKES
Enter       copy Spp or Di on blank field from previous observation
  =         copy field from previous observation
  >         copy entire observation from previous one, advance
  <         copy entire observation from previous one, no advance
Ctrl-C      abort program, no data saved
PgUp        go to previous screen
PgDn        go to next screen
Tab         skip to next field
Home        go to beginning of field
End         go to last character in field
Home Home   go to top of page
End End     go to bottom of page
F1          Help (list species codes from Stand Information Screen 0)


From DOS, type TVAFIE /h to list command line options
```

November, 1992

USER'S MANUAL FOR

TIPS

TVA Inventory Processing System

Version 3.0

By

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TVA is an equal opportunity and affirmative action employer. TVA also ensures that the benefits of programs receiving TVA financial assistance are available to all eligible persons regardless of race, color, national origin, handicap, or age.

DISCLAIMER
TIPS 3.0 has been carefully tested for operational reliability and to the best of our knowledge it contains no errors. However, neither TVA, nor FORS, nor the author claims responsibility for its accuracy.

CONTENTS

SCREENS

FIGURES

INTRODUCTION

TIPS (TVA **I**nventory **P**rocessing **S**ystem) is an integral part of INFORM. TIPS is designed to process cruise data stored in ".FIE" files into stand and stock tables, and/or to provide initial stand and stock data for the YIELD-MS programs. The purpose of this document is to provide basic information on operating the TIPS program. Detailed information on program theory, such as volume calculation methods, etc., may be found in the TIPS Technical Reference Manual (immediately following this user manual). Experienced users may wish to consult the INFORM User Manual (Changes In Version 3 Over Version 2) to learn of enhancements in TIPS version 3.0 versus previous versions.

The TVAFIE program is used to input and edit timber cruise data. This document assumes the user is familiar with the TVAFIE program, and will focus on actual operation of TIPS. Users unfamiliar with the TVAFIE program should review the TVAFIE User's Manual before proceeding.

Overview

Installation of TIPS is included as part of INFORM installation.
Consult the INFORM User Manual if you have not installed INFORM
yet. TIPS requires a full 640 KB of installed random access
memory (RAM). Since TIPS requires considerable RAM to load (443
KB), an excess number of TSR's (terminate-and-stay-resident)
programs such as mouse drivers, disk caches, and others may
prevent TIPS from loading. For example, you may generate a
"program to big to fit in memory" DOS error when attempting to
run TIPS because previously you had loaded a mouse driver. In
this case, the mouse driver must be freed from RAM before TIPS
can be loaded. A math co-processor chip, print spooler, and disk
cache all serve to boost program performance. Consult the INFORM
manual for further information on program installation.

TIPS uses two types of input data files. Data files with a
".UTR" extension describe the compartment (a collection of
stands) and provide the program with a list of stands comprising
that compartment. Files having a ".FIE" extension contain tree
data for the respective stands (Figure 1). Besides generating
timber volume summary reports, TIPS may be used to produce YIELD-
MS compatible files (Figure 2). YIELD-MS compatible files have
the extension ".SST" (short for stand/stock table). If one of
your objectives is to run YIELD-MS or load a database via BATCH-
YIELD-MS, then the Make-SST's module must be visited.
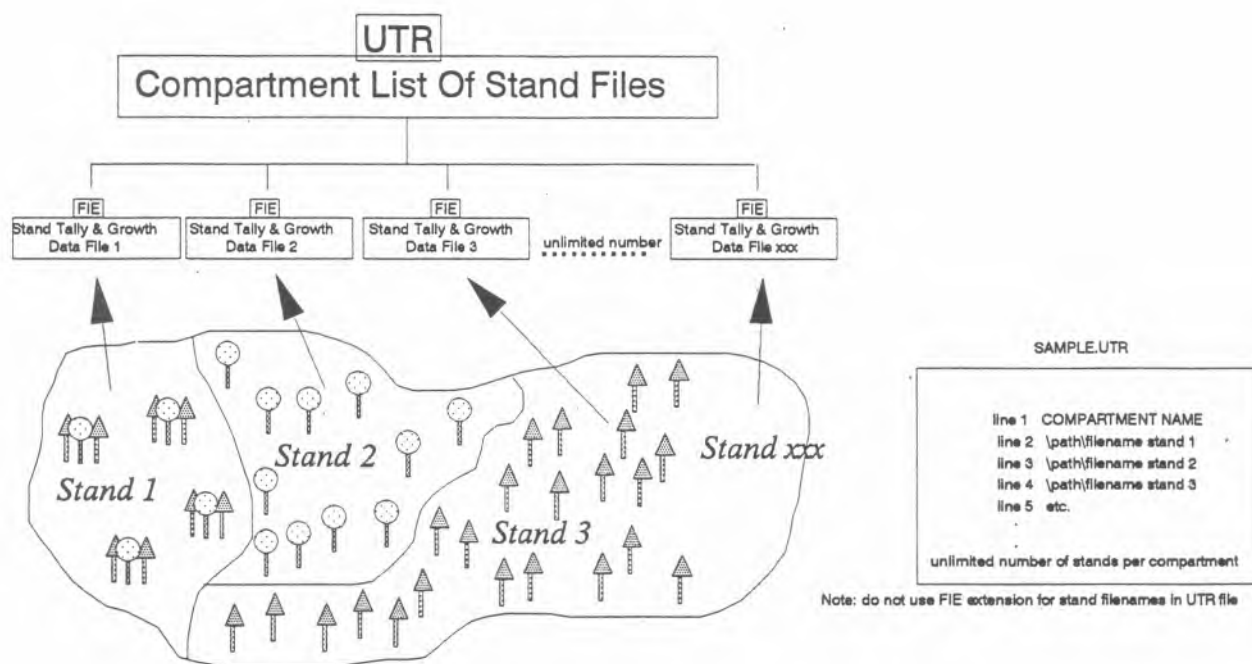
Figure 1 - TIPS Input File And Data Organization

Figure 2 - INFORM Systems Concept Diagram

Geographic Information System

Information Products
- volume summary tables
- appraisal value
- growth projections
- marking guide
- profitability analysis
- cashflow summary
- graphic reports

Operate Lotus 1-2-3 to generate graphs

Assimilate reports and present to client

Migration

Operate Stand Records database

Operate TXTDIF Utility

Inventory Guide

START HERE

Interview landowner. Determine objectives, constraints, etc. for the woodland.

Conduct Inventory

Record data

Operate INFORM-ED
- edit master species file MASPEC.DAT
- edit TIMSALE Setups SETINIM.DAT, SETUP01.DAT
  MASPEC.DAT

Operate YIELD-MS
- growth projections
- financial analysis
- harvest simulation
- generate graph files
- generate TIMSALE report

Operate BATCH YIELD-MS
- generate growth adjusted stand stock table ASCII files (V01 & V02) for importation into a stand records database.

Operate OAKREGEN
- assess probability of oak regeneration

Electronic Data Recorder

Oakboard

Enter cruise data with TVAFIE

TVAFIE generated files: FIE (Forest Inventory Editor)

Operate TIPS to:
- setup run AUTR files
- pool stand stock table reports
- generate YIELD-MS SST file

3

Report Styles

TIPS produces three different report styles. They are:

Classic
These reports are patterned after the style used in previous versions of TIPS (Figure 3). First, a header displays the compartment, stand, or plot name, the acres (hectares), the data collector's name, the product (sawtimber or pulpwood), the grade (all or 1-5), the date of data collection, the volume unit (mbf, cunit, cord, ton green, ton dry, cubic meter, metric ton green, metric ton dry, basal area, or number of stems), and cut/leave (cut, leave, or both)

The header is followed by a table delineated with columns by 2" dbh classes and rows by species or species group which show the calculated volume, basal area, or number of stems. Sawtimber tables expressed in mbf also show the log rule and Girard form class for the species. When sawtimber is selected and the largest observed tree exceeds a dbh of 20", a 2 part table is printed with the 10" through 20" dbh trees in part 1 and the 22" through 40"+ trees in part 2. Pulpwood tables are always one part displaying the 4" through 22"+ dbh trees. Pulpwood tables showing basal area or number of stems begin with the 2" dbh class. Sawtimber tables display topwood and crownwood volume in the last two columns. Pulpwood tables display crownwood volume in the last column. TIPS attempts to fit as many tables as possible per sheet of paper but shifts to a fresh sheet when a new stand is encountered. Zeros are suppressed for clarity.

STAND: EXAMPLE   50.0 ACRES /   20.2 HECTARES   PER: STAND
DATA COLLECTED BY: J.R. FORESTER   PRODUCT: SAWTIMBER   GRADE: ALL
DATE COLLECTED: 05/01/90   VOLUME UNIT: MBF   CUT/LEAVE: BOTH

COMMENTS: DATA FOR A TYPICAL STAND IN NORTHERN ALABAMA

SPECIES	LOG RULE FC	10	12	14	16	18	20	TOTAL	TOPWOOD CORDS	CROWNWOOD CORDS
			- T W O I N C H D I A M E T E R C L A S S E S -							
				- - THOUSANDS OF BOARD FEET - -						
WHITE OAK	INT 78			53.1				53.1	50.0	74.0
YELLOW POPLAR	INT 78				88.5			88.5	56.1	68.8
LOBLOLLY PINE	INT 78		55.0					55.0	17.8	36.6
CHESTNUT OAK	INT 78		33.7					33.7	42.5	48.5
SCARLET OAK	INT 78			39.9				39.9	51.3	127.3
BEECH	INT 78					115.5		115.5	81.3	144.7
T O T A L S			88.7	92.9	88.5	115.5		385.7	299.0	499.9

Figure 3 – Example Classic Report (continued on next page)

4

```
STAND: EXAMPLE                    50.0 ACRES /   20.2 HECTARES                        PER: STAND
DATA COLLECTED BY: J.R. FORESTER          PRODUCT: PULPWOOD                          GRADE: ALL
  DATE COLLECTED: 05/01/90              VOLUME UNIT: CORDS                        CUT/LEAVE: BOTH

      COMMENTS: DATA FOR A TYPICAL STAND IN NORTHERN ALABAMA

=================================================================================================
                      - T W O   I N C H   D I A M E T E R   C L A S S E S -        CROWNWOOD
SPECIES            4     6     8    10    12    14    16    18    20    22+    TOTAL  CORDS
=================================================================================================
                                    - - CORDS - -
BLACK OAK                          37.8                                         37.8   16.0
WHITE OAK               18.8                                                    18.8   15.5
SWEETGUM          8.9                                                            8.9    6.8
YELLOW POPLAR          22.1  39.2                                               61.3   32.3
HICKORY                15.3                                                     15.3   10.4
SHORTLEAF PINE   18.6  20.2        121.9                                       160.7   32.5
RED MAPLE        10.7                                                           10.7   12.9
PERSIMMON        13.2                                                           13.2    8.7
ASH               7.9        31.9                                               39.8   26.9
LOBLOLLY PINE    12.3                                                           12.3    7.9

  T O T A L S    71.7  76.4 108.9 121.9                                        378.9  169.7
=================================================================================================
TIPS (v 3.00)  Date: 10- 8-1992  Time:  8:36: 9      REGISTERED USER> Tennessee Valley Authority
```

Figure 3 - Example Classic Report

Simple
These reports express the same information included in Classic
reports but display the 2" through 40" dbh class in each row,
avoiding two part tables. The header is slightly different from
Classic style reports; the compartment, stand, and plot name are
displayed regardless of whether the report-type is compartment,
stand, or plot. If the report-type were compartment, then the
stand and plot names would be expressed as dashes (i.e., "-").
If the report-type were stand, then the plot name would be ex-
pressed as dashes.

Printing these reports requires a printer capable of 228 charac-
ters per line (cpl) such as a wide carriage dot matrix or Laser-
jet equipped with legal sized (8.5" x 14") paper set in landscape
mode, using a condensed pitch of 16.5 characters per inch (cpi).
Laserjets set in finer pitches may print Simple reports in land-
scape mode on standard 8.5" x 11" paper (Figure 4).

A "database" report, optionally available when a Simple report is
directed to a file, produces a strict two-way table with all
header information embedded in each row (Figure 5). These files
in turn are easily imported into database or spreadsheet packages
for reformatting purposes (e.g., when you want to design your own
custom report style). See Appendix (A) for the file format.

REPORT-TYPE: STAND   COMPARTMENT: EXAMPLE COMPARTMENT   STAND: EXAMPLE   PLOT: --------   PRODUCT: SAWTIMBER   VOLUME-UNIT: MBF   TOPWD-VOLUME-UNIT: CORDS
PER: STAND   GRADE: ALL   CUTLV: BOTH   ACRE : 50.0

SPECIES	LR FC	2 in	4 in	6 in	8 in	10 in	12 in	14 in	16 in	18 in	20 in	22 in	24 in	26 in	28 in	30 in	32 in	34 in	36 in	38 in	40 in	TOTAL	TOPWD
WHITE OAK	INT 78	.0	.0	.0	.0	.0	.0	53.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	53.1	50.0
YELLOW POPLAR	INT 78	.0	.0	.0	.0	.0	.0	.0	88.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	88.5	56.1
LOBLOLLY PINE	INT 78	.0	.0	.0	.0	.0	55.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	55.0	17.8
CHESTNUT OAK	INT 78	.0	.0	.0	.0	.0	33.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	33.7	42.5
SCARLET OAK	INT 78	.0	.0	.0	.0	.0	.0	39.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	39.9	51.3
BEECH	INT 78	.0	.0	.0	.0	.0	.0	.0	.0	115.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	115.5	81.3
T O T A L S		.0	.0	.0	.0	.0	88.7	92.9	88.5	115.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	385.7	299.0

REPORT-TYPE: STAND   COMPARTMENT: EXAMPLE COMPARTMENT   STAND: EXAMPLE   PLOT: --------   PRODUCT: PULPWOOD   VOLUME-UNIT: CORDS   TOPWD-VOLUME-UNIT: CORDS
PER: STAND   GRADE: ALL   CUTLV: BOTH   ACRE : 50.0

SPECIES	LR FC	2 in	4 in	6 in	8 in	10 in	12 in	14 in	16 in	18 in	20 in	22 in	24 in	26 in	28 in	30 in	32 in	34 in	36 in	38 in	40 in	TOTAL	TOPWD
BLACK OAK	INT 78	.0	.0	.0	.0	37.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	37.8	.0
WHITE OAK	INT 78	.0	.0	.0	18.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	18.8	.0
SWEETGUM	INT 78	.0	.0	8.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	8.9	.0
YELLOW POPLAR	INT 78	.0	.0	.0	22.1	39.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	61.3	.0
HICKORY	INT 78	.0	.0	.0	15.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	15.3	.0
SHORTLEAF PINE	INT 78	.0	.0	18.6	20.2	.0	121.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	160.7	.0
RED MAPLE	INT 78	.0	.0	10.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	10.7	.0
PERSIMMON	INT 78	.0	.0	13.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	13.2	.0
ASH	INT 78	.0	.0	7.9	.0	31.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	39.8	.0
LOBLOLLY PINE	INT 78	.0	.0	12.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	12.3	.0
T O T A L S		.0	.0	71.7	76.4	108.9	121.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	378.9	.0

Figure 4 - Example Simple Report

TYPE	COMPARTMENT	STAND	PLOT	PRODUCT	V-UNIT	PER	GRADE	CUTLV	AREAUNIT	AREA	TC-UNIT	SPEC/GRP	SPECIES-OR-GROUP	SPC	LR	FC
STAND	EXAMPLE_COMPARTMENT	EXAMPLE	-------	SAWTIMBER	MBF	STAND	ALL	BOTH	ACRE	50.0	CORDS	SPECIES	WHITE OAK	WHO	INT	78
STAND	EXAMPLE_COMPARTMENT	EXAMPLE	-------	SAWTIMBER	MBF	STAND	ALL	BOTH	ACRE	50.0	CORDS	SPECIES	YELLOW POPLAR	YEP	INT	78
STAND	EXAMPLE_COMPARTMENT	EXAMPLE	-------	SAWTIMBER	MBF	STAND	ALL	BOTH	ACRE	50.0	CORDS	SPECIES	LOBLOLLY PINE	LOP	INT	78
STAND	EXAMPLE_COMPARTMENT	EXAMPLE	-------	SAWTIMBER	MBF	STAND	ALL	BOTH	ACRE	50.0	CORDS	SPECIES	CHESTNUT OAK	CHO	INT	78
STAND	EXAMPLE_COMPARTMENT	EXAMPLE	-------	SAWTIMBER	MBF	STAND	ALL	BOTH	ACRE	50.0	CORDS	SPECIES	SCARLET OAK	SCO	INT	78
STAND	EXAMPLE_COMPARTMENT	EXAMPLE	-------	SAWTIMBER	MBF	STAND	ALL	BOTH	ACRE	50.0	CORDS	SPECIES	BEECH	BEE	INT	78
STAND	EXAMPLE_COMPARTMENT	EXAMPLE	-------	PULPWOOD	CORDS	STAND	ALL	BOTH	ACRE	50.0	CORDS	SPECIES	BLACK OAK	BLO	INT	78

2-in	4-in	6-in	8-in	10-in	12-in	14-in	16-in	18-in	20-in	22-in	24-in	26-in	28-in	30-in	32-in	34-in	36-in	38-in	40-in	TOTAL	TOPWD	CROWNWOOD
.000	.000	.000	.000	.000	.000	53.072	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	53.072	49.968	74.047
.000	.000	.000	.000	.000	.000	.000	88.520	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	88.520	56.053	68.786
.000	.000	.000	.000	.000	54.979	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	54.979	17.847	36.571
.000	.000	.000	.000	.000	33.715	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	33.715	42.493	48.474
.000	.000	.000	.000	.000	.000	39.861	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	39.861	51.336	127.301
.000	.000	.000	.000	.000	.000	.000	.000	115.513	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	115.513	81.255	144.703
.000	.000	.000	.000	37.791	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	37.791	.000	.000

Figure 5 - Example Simple Report (with database option)

By <u>Log Height</u>
These reports provide a highly detailed description of sawtimber volume and number of trees in half log increments by dbh class and by species or species group. The report also provides a condensed description of pulpwood and topwood volume (Figure 6). A separate page is printed for each species or species group. Users who want a one sheet report for the entire stand should use a TIMSale Setup where all species are assigned to a single group. By Log Height reports use 132 cpl (standard). They are useful for timber sale work.

STAND: EXAMPLE   50.0 ACRES /   20.2 HECTARES   PER: STAND
DATA COLLECTED BY: J.R. FORESTER   DATE COLLECTED: 05/01/90   CUT/LEAVE: BOTH
GROUP   : LOW VALUE HDWD   LOG RULE: VARIABLE

Pulpwood Volume						Topwood Volume						10 16'	No.	Sawtimber
Dbh---CORDS		Dbh---CORDS		Dbh---CORDS		Dbh---CORDS		Dbh---CORDS		Dbh---CORDS		in Log	Trees	MBF
2 in		4 in		6 in	27.6	2 in		4 in		6 in		.5		
8 in	37.4	10 in	71.1	12 in		8 in		10 in		12 in	42.5	1.0		
14 in		16 in		18 in		14 in		16 in	56.1	18 in	81.3	1.5		
20 in		22 in		24 in		20 in		22 in		24 in		2.0		
26 in		28 in		30 in		26 in		28 in		30 in		2.5		
32 in		34 in		36 in		32 in		34 in		36 in		3.0		
38 in		40 in		Total>	136.1	38 in		40 in		Total>	179.8	Totals		

----

12 16' in Log	No. Trees	Sawtimber MBF	14 16' in Log	No. Trees	Sawtimber MBF	16 16' in Log	No. Trees	Sawtimber MBF	18 16' in Log	No. Trees	Sawtimber MBF	20 16' in Log	No. Trees	Sawtimber MBF
.5			.5			.5			.5			.5		
1.0	500.0	33.7	1.0			1.0			1.0			1.0		
1.5			1.5			1.5			1.5			1.5		
2.0			2.0			2.0	500.0	88.5	2.0	500.0	115.5	2.0		
2.5			2.5			2.5			2.5			2.5		
3.0			3.0			3.0			3.0			3.0		
3.5			3.5			3.5			3.5			3.5		
4.0			4.0			4.0			4.0			4.0		
4.5			4.5			4.5			4.5			4.5		
5.0			5.0			5.0			5.0			5.0		
5.5			5.5			5.5			5.5			5.5		
Totals	500.0	33.7	Totals			Totals	500.0	88.5	Totals	500.0	115.5	Totals		

----

22 16' in Log	No. Trees	Sawtimber MBF	24 16' in Log	No. Trees	Sawtimber MBF	26 16' in Log	No. Trees	Sawtimber MBF	28 16' in Log	No. Trees	Sawtimber MBF	30 16' in Log	No. Trees	Sawtimber MBF
.5			.5			.5			.5			.5		
1.0			1.0			1.0			1.0			1.0		
1.5			1.5			1.5			1.5			1.5		
2.0			2.0			2.0			2.0			2.0		
2.5			2.5			2.5			2.5			2.5		
3.0			3.0			3.0			3.0			3.0		
3.5			3.5			3.5			3.5			3.5		
4.0			4.0			4.0			4.0			4.0		
4.5			4.5			4.5			4.5			4.5		
5.0			5.0			5.0			5.0			5.0		
5.5			5.5			5.5			5.5			5.5		
Totals			Totals			Totals			Totals			Totals		

----

32 16' in Log	No. Trees	Sawtimber MBF	34 16' in Log	No. Trees	Sawtimber MBF	36 16' in Log	No. Trees	Sawtimber MBF	38 16' in Log	No. Trees	Sawtimber MBF	40 16' in Log	No. Trees	Sawtimber MBF
.5			.5			.5			.5			.5		
etc.			etc.			etc.			etc.			etc.		
5.5			5.5			5.5			5.5			5.5		
Totals			Totals			Totals			Totals			Totals		

TOTAL NUMBER OF SAWTIMBER TREES: 1500.000   TOTAL SAWTIMBER VOLUME: 237.748 MBF

Figure 6 - Example By Log Height Report

RUNTIPS

Once data have been entered and saved as an .FIE file with the
TVAFIE program, you are ready to run TIPS. If you are using the
AUTOMENU program to operate INFORM, move the marker to the proper
menu item and press Enter (Screen 1). To execute TIPS from DOS,
type **TIPS filename.UTR.** TIPS permits the sequential (batch)
processing of an unlimited number of stands per compartment in a
single run. Before processing may begin, you must create or edit
a .UTR (i.e., compartment list of stands) file containing the
name of the compartment in the first record (i.e., header record)
followed by the filenames of all desired stands in the compart-
ment in each additional record (no file extensions). RUNTIPS was
a separate program in INFORM 2 but in INFORM 3, RUNTIPS is simply
a mode of operation under TVAFRONT. It serves as the front-end
of TIPS; its function is to create/edit .UTR files and/or launch
TIPS execution. If you desire to process only one stand, then
your .UTR file will consist of the compartment name on line 1 and
the filename for that stand on line 2. UTR files may be re-used.


```
 ‖<TVA INFORM 3> Integrated Forest Management System‖

                                               MENU 1 OF 2
         1 - Run TVAFIE (TVA Forest Inventory Editor)

     → 2 - Run TIPS (TVA Inventory Processing System)

         3 - Run YIELD-MS (Timber Planning Tool Mixed Stands)

         4 - Run INFORM-ED (Master Species File Editor)

         5 - Run BATCH-YIELD-MS

         6 - Run LISTER (INFORM Reports Printing Utility)

         7 - Run SCAN (File Display Utility)

         8 - Disk Operating System
         Process inventory data into reports or SST files
 October 9, 1992  3:22:55 pm       NUM      CTRL         Memory: 404 K

                   Press H for Help
```
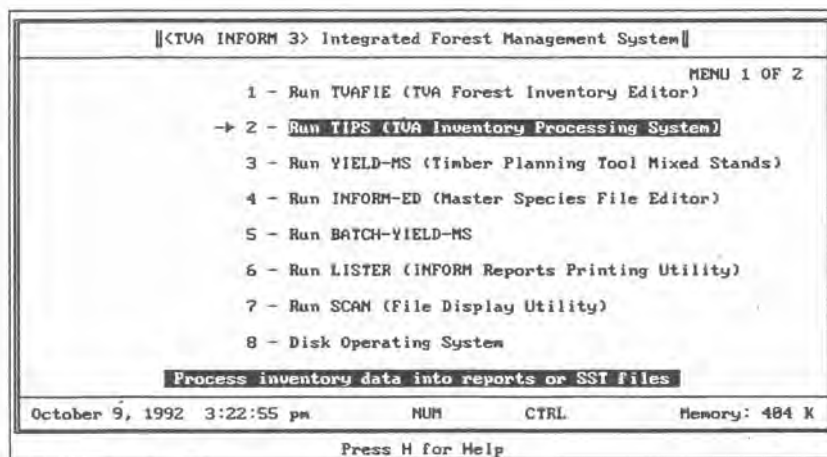
Screen 1 - INFORM Integrated Forest Management System Menu

The RUNTIPS mode of TVAFRONT opens with a menu (Screen 2) which
is used for selecting a .UTR file to execute TIPS, creating a
new .UTR file, editing an old .UTR file, changing disk volume, or
changing directory. Similar to the TVAFRONT menu used by TVAFIE,
a mouse can be used to make selections (use a double-click as
Enter); otherwise, use the Tab and arrow keys to position the
cursor and the Enter key to make a selection. Press Esc if you
desire to abort the program. You can create a new .UTR file by
highlighting <CREATE> . UTR and pressing Enter or edit an
existing .UTR file by highlighting it and pressing **F2=Edit.**
Launch TIPS by simply pointing to the desired .UTR file and
pressing Enter or double-click with a mouse on Enter=Go.
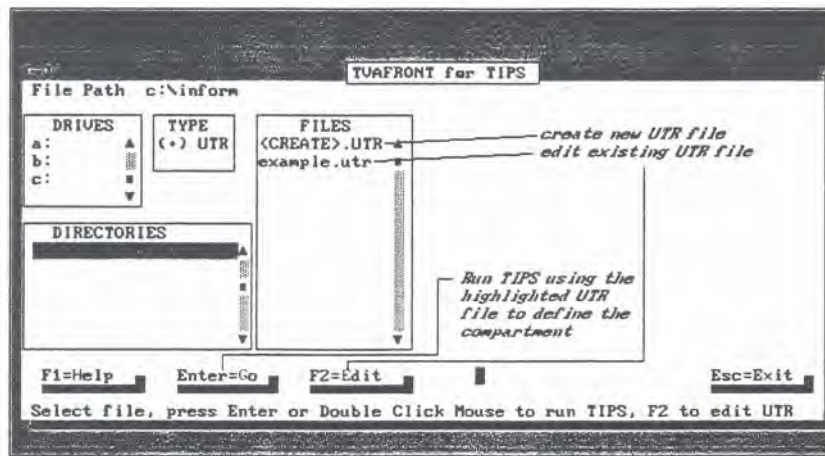
Screen 2 - TVAFRONT (RUNTIPS)

Editing the contents of a .UTR file is easy; typing of .FIE
filenames is not necessary. The screen is divided into several
boxes (Screen 3). Navigate between boxes by using the Tab key or
a mouse. The box entitled **FILES** displays the names of
candidate .FIE filenames to choose from for building the .UTR
file; the box on the far right displays the **UTR** File (i.e.,
compartment name on the first line followed by the names of .FIE
files comprising the compartment on additional lines).
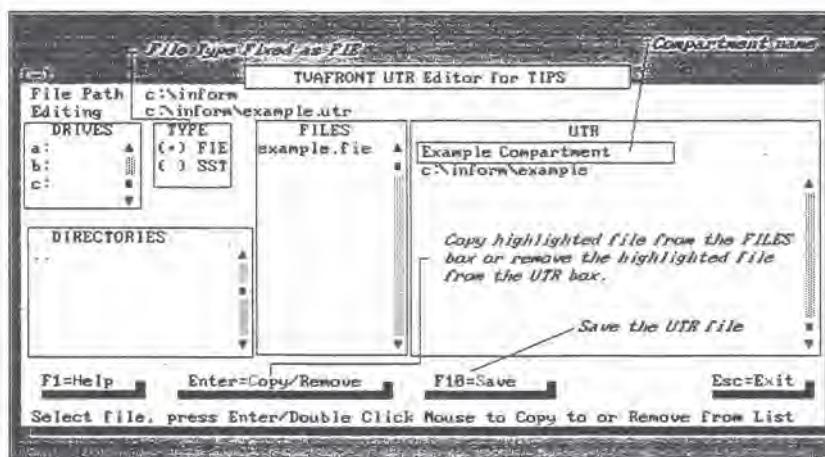
Screen 3 - TVAFRONT (Edit UTR)

If you wish to process only one stand, then the **UTR** box should
show the compartment name on line one and the appropriate stand
filename on line two. You point (single click with a mouse or
use the arrow keys) to highlight .FIE filenames in the **FILES** box
and press Enter (double-click with mouse) in order to add the
filename and path to the **UTR** box. Repeat this process until you
complete building the list of .FIE filenames for the Compartment;
TIPS can handle as many as you like. Remove filenames from the
UTR box by highlighting them and pressing Enter; note, this does
not delete the file, only its name. You may save the contents of
the **UTR** box and specify a .UTR filename when prompted after
pressing the **F10=Save** command; then Esc to exit back.

11

```
| Note for advanced users: TIPS can be executed directly from DOS  |
| by typing TIPS _____.UTR where the preceding blank is occupied |
| by the .UTR  filename.  Of course, this method presumes that the |
| appropriate .UTR  file is previously created.  Some users may    |
| find it more convenient to create or edit .UTR  files using a    |
| text editor and/or file manager rather than with RUNTIPS.        |
```

Once TIPS is executed a banner (Screen 4) is briefly displayed followed by the main menu (Screen 5).
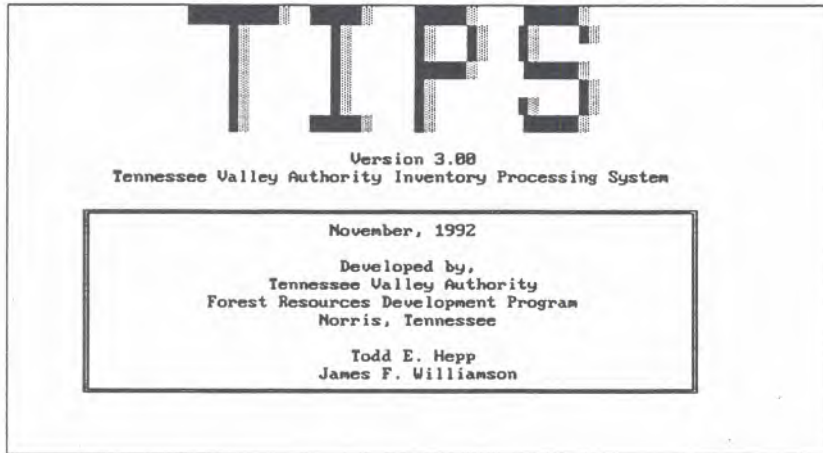
Screen 4 - TIPS Banner
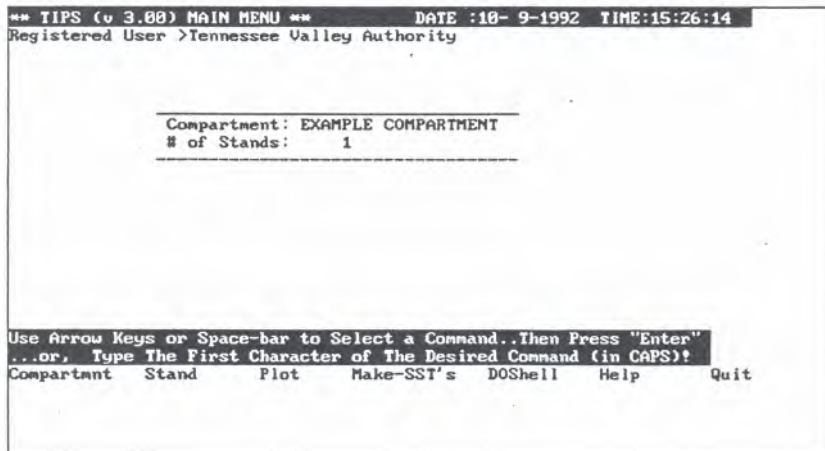
Screen 5 - TIPS Main Menu

The main menu screen displays the TIPS version number, the current date and time, the registered user name, the compartment name and the number of stands in the compartment. From the main menu one can enter the Compartment, Stand, or Plot report generating modules, the Make-SST's module, a DOShell, get Help, or Quit. For example, to generate stand level reports, access Stand. More specifically, the commands are as follows:

Compartment is the module which processes two or more stands consecutively into a grand total summary. Access is denied if there is only one stand in the compartment.

Stand is the module which processes one or more stands, generating unique reports for each stand.

<u>Plot</u> is the module which processes one or more stands and pro-
duces unique reports for each plot within each stand in the
compartment.

<u>Make-SST's</u> is the module which processes FIE's into SST's for
later use by the YIELD-MS programs.

<u>DOShell</u> interrupts TIPS to perform DOS chores such as erasing a
file, checking a disk, printing a file, etc. Do not confuse this
command for the Quit command or you will run out of RAM memory
since DOShell merely suspends TIPS.

<u>Help</u> screens are provided with each menu.

<u>Quit</u> is used to exit the program and ensure that all files are
properly closed and that printer configuration and other selec-
tions are stored for future use.

Quit Module

Quick exit from TIPS is always possible by typing Ctrl-C. Howev-
er, doing so may result in loss of an output file such as a .LOG
or .TXT file. The .UTR and .FIE files are unaffected by a Ctrl-C
exit since they are only read. When exiting TIPS it is recom-
mended that you access the QUIT module (Screen 6). The QUIT
module closes report and other files that may have been opened
and written to during your TIPS session. QUIT also saves the
printer configuration and other codes for your next session.

```
** TIPS (v 3.00) MAIN MENU **            DATE :10- 9-1992  TIME:15:27:23
Registered User >Tennessee Valley Authority


         _____
         Compartment: EXAMPLE COMPARTMENT
         # of Stands:      1
         ----------------------------------------




Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)!
Compartmnt   Stand      Plot      Make-SST's   DOShell    Help      | Quit |
```
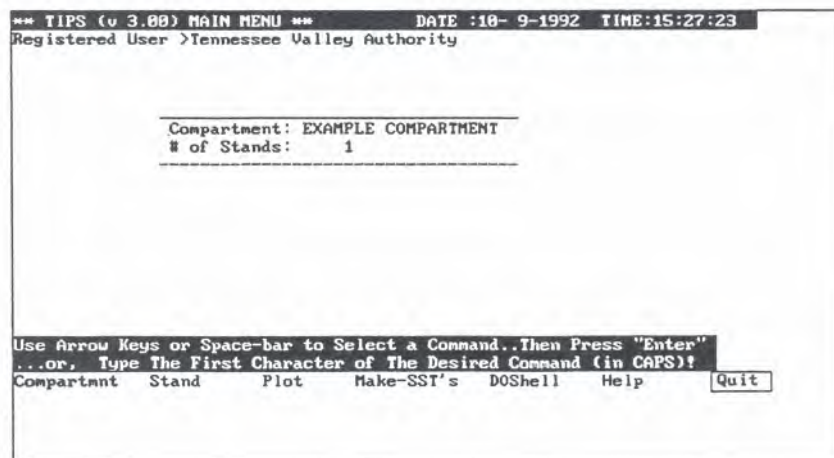
Screen 6 — Quit module

Help Screens

A Help command is available for nearly every menu in the system.
By selecting Help you instruct TIPS to list to the screen stored
information about the currently accessed menu. Some Help
screens contain more than one page of information (Screen 7). In
order to move to subsequent pages, simply select the More-help
command. Control is returned to the prior menu when you press
Return. The help screens are stored in file TIPSHELP.HLP.

Screen 7 - Help

Log Files

Each time TIPS is used to generate reports or SST's a file is
created using the .UTR filename but ending with extension .LOG.
The file logs comments about the success or failure of processing
data for each stand. The easiest way to look at log files is to
exit TIPS and access SCAN from the INFORM System Menu (Screen 8).

Screen 8 - Use SCAN To Display Log File

Besides documenting whether a stand was successfully processed, the log file will display tips for correcting errors in data and the R^2 for regression analysis of growth data. Log files are particularly helpful for evaluating large jobs.

COMPARTMENT REPORT MODULE

The Compartment report module is used to process two or more stands comprising a compartment into reports. Compartment-wide statistical reports (e.g., standard error) also can be produced. This is an application of stratified sampling with each stand representing a stratum. Access to the Compartment Report Module is denied if the compartment has only one stand.

The menu (Screen 9) consists of commands to Return to the main menu, change report Style (see Report Styles under Getting Started), Edit settings displayed on the screen, Go process the data, and get Help. The normal sequence is to select desired report Style, Edit settings appearing on the screen, then Go.

Screen 9 - Compartment Report Module Menu

Editing the screen settings controls the number and type of reports produced. A feature is switched ON if it appears highlighted (i.e., cyan on color monitors, intense on monochrome). A feature is switched OFF if it appears as normal text (i.e., white). The Space-bar key is used to toggle ON and OFF while the cursor, tab, and Enter keys are used to navigate around the screen. Some report Styles restrict the choices. To follow is a description of each feature:

Sawtimber Volume Unit

This controls the volume unit(s) used to display sawtimber stand or stock tables. The choices are MBF (thousands of board feet), CORDS (stacked), CUNITS (100 cubic feet), TONGRN (tons green), TONDRY (tons dry), CMETER (cubic meters), MTNGRN (metric tons green), MTNDRY (metric tons dry), B-AREA (basal area), and #STEMS (number of stems). A separate table is produced for each highlighted unit. Highlighting "ALL" speeds your selection if you desire a table for each of the eight volume units. Metric units (i.e., CMETER, MTNGRN, and MTNDRY) are reported by 5.08 centimeter (cm) dbh classes on a per stand or per hectare (ha) basis. Basal area is reported in square feet (sqft) per acre or square meters (sqm) per ha.

Pulpwood Volume Unit

This controls the volume unit(s) used to display pulpwood stand or stock tables. The choices are identical to sawtimber with the exception of MBF.

Topwood‑crownwood Volume Unit

This is the volume unit used for topwood (i.e., portion of saw-timber tree between sawlog and pulpwood merchantable diameter) and crownwood (i.e., heavy limbs to minimum of 4") volume calcu-lations. These calculations appear as the last columns in Clas-sic and Simple Style reports, or as separate tables in By Log Height Style reports. The choices are CORDS, CUNITS, TONGRN, TONDRY, CMETER, MTNGRN, and MTNDRY.

Table Specifications

Table specifications determine the area units to use, whether to delineate tables by cut/leave and/or by grade, and whether each row in the tables should be by species or optionally by species group. The output can become voluminous if numerous options are highlighted. For example if all eight sawtimber volume units were selected along with all six table specifications, then 8(volume units) x 3(area units) x 2(cut and leave) x 5(grades) = 240 tables would be produced for sawtimber. The table specifica-tions are:

PER-STAND: Display volumes blown up to the area of the stand.
PER-ACRE: Display volumes on a per acre basis.
PER-HECTARE: Display volumes on a per hectare basis.
BY-CUT/LEAVE: Produce separate tables for cut and leave trees.
BY-GRADE: Produce five separate tables for each grade (sawtimber only)
BY SPC GROUP: Produce tables where each row is by species group (species group assignments imported from a TIMSale Setup) rather than by species (the default).

Statistics

If Classic Style reports are selected, TIPS optionally will calculate the compartment-wide mean, standard error, confidence intervals, and other related statistics for sawtimber and pulp-wood trees. Stands are rejected from these calculations if they contain less than two plots, or were tallied using the frequency or 100% method. Each stand is treated as a stratum of a strati-fied sample. The TIPS Technical Reference Manual provides de-tails on statistical calculations. If STATISTICS is highlighted, you may also select the volume unit for pulpwood and sawtimber to appear in the tables. Figure 7 provides a sample statistics report for a compartment named Smith Property where 65 plots were sampled.

```
--------------------------------------------------------------------------------
                        STATISTICAL SUMMARY: Smith Property

================================================================================
VARIABLE           MEAN    STD.-ERROR-MEAN   - - - - - - - CONFIDENCE INTERVALS - - - - - - -
                  /ACRE    Abs.     Pct.        80%              90%              95%
================================================================================
Sawtimber
  Volume(MBF  )     3.7     .14     3.72     3.5 to   3.9    3.5 to   3.9    3.4 to    4.0
  Basal area       36.2    1.59     4.40    34.2 to  38.3   33.6 to  38.9   33.1 to   39.4
  No. Stems        32.5    2.03     6.25    29.9 to  35.1   29.1 to  35.8   28.5 to   36.5

Pulpwood
  Volume(CORDS )    9.7     .49     4.99     9.1 to  10.3    8.9 to  10.5    8.8 to   10.7
  Basal area       86.3    3.40     3.94    81.9 to  90.7   80.7 to  91.9   79.6 to   93.0
  No. Stems       495.3   20.28     4.09   469.2 to 521.4  461.7 to 528.9  455.2 to  535.5
================================================================================

                             Sample size =   65

                Note: Some stands had less than 2 plots or points.
            Statistics were based on a compartment acreage of     350.0 acres.
--------------------------------------------------------------------------------
```

Figure 7 — Example Compartment Statistics Report

Log Rule

Log rule selection applies only if you selected MBF as a sawtim-
ber volume unit. Choose either Scribner, International, Doyle,
or Variable. Selecting Variable tells TIPS to use the log rule
installed by species in MASPEC.DAT. Selection of Scribner,
International, or Doyle applies to every species in the compart-
ment regardless of the logrule installed by species in
MASPEC.DAT.

Dead Trees

Highlight Dead Trees if you want species designated as dead (use
INFORM-ED to install dead species in MASPEC.DAT) to appear in
TIPS reports. When the Dead Trees feature is active, dead trees
are displayed in basal area and stems/acre tables but they have
no merchantable volume or weight.

STAND REPORT MODULE

The Stand report module is used to batch process one or more stands comprising a compartment into separate reports for each stand. Stand-wide statistical reports (e.g., standard error) also can be produced. Reports are produced for each stand in the order received in the .UTR file.

The menu (Screen 10) consists of commands to Return to the main menu, change report Style (see Report Styles under Getting Started), Edit settings displayed on the screen unique to each stand (up to a maximum of 10), Duplicate settings to other stands, Go process the data, and get Help. The normal sequence is to select desired report Style, Edit settings appearing on the screen, Duplicate settings for other stands, then Go. If a compartment has more than 10 stands, then the settings for stand #10 are used for stand's #11 through the end of the compartment.

```
                   STAND REPORT MENU
Stand #    1 of     1 "EXAMPLE                       "  Style: CLASSIC

Sawtimber volume unit:ALL    MBF      CORDS    CUNITS   TONGRN   TONDRY
                             CMETER   MTNGRN   MTNDRY   B-AREA   #STEMS

Pulpwood volume unit: ALL             CORDS    CUNITS   TONGRN   TONDRY
                             CMETER   MTNGRN   MTNDRY   B-AREA   #STEMS

Topwood-Crownwood volume unit:CORDS

Table Specifications:
PER-STAND              PER-ACRE                 PER-HECTARE
BY CUT/LEAVE           BY GRADE                 BY SPC GROUP

STATISTICS-> Pulpwood-unit:CORDS    Sawtimber-unit:MBF

Log Rule:VARIABLE                      Display: COMMENTS    DEAD-TREES
Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)!
  Return      Style      Edit      Duplicate      Go        Help
```

Screen 10 - Stand Report Module Menu

Editing the screen settings controls the number and type of reports produced. A feature is switched ON if it appears high-lighted (i.e., cyan on color monitors, intense on monochrome). A feature is switched OFF if it appears as normal text (i.e., white). The Space-bar key is used to toggle ON and OFF while the cursor, tab, and Enter keys are used to navigate around the screen. Some report Styles restrict the choices. To follow is a description of each feature:

Duplicate

The report settings displayed in the Stand Report Module are unique to a particular stand. For example, in a two stand compartment, you might select sawtimber tables for stand #1 but not for stand #2. Frequently however, you will select settings for a stand (normally the first one) and then desire identical settings for any remaining stands in the compartment. The Duplicate

command copies the settings for the currently displayed stand to all other stands in the compartment (Screen 11).


```
                    STAND REPORT MENU
Stand #   1 of    1 "EXAMPLE                              " Style: CLASSIC

Sawtimber volume unit:ALL   MBF      CORDS    CUNITS   TONGRN   TONDRY
                            CMETER   MTNGRN   MTNDRY   B-AREA   #STEMS

Pulpwood volume unit: ALL            CORDS    CUNITS   TONGRN   TONDRY
                            CMETER   MTNGRN   MTNDRY   B-AREA   #STEMS

Topwood-Crownwood volume unit:CORDS

Table Specifications:
PER-STAND             PER-ACRE              PER-HECTARE
BY CUT/LEAVE          BY GRADE              BY SPC GROUP

STATISTICS-> Pulpwood-unit:CORDS    Sawtimber-unit:MBF

Log Rule:VARIABLE                          Display: COMMENTS    DEAD-TREES
Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or.  Type The First Character of The Desired Command (in CAPS)?
  Return     Style     Edit     Duplicate     Go        Help
Duplicate options for stand #    1 "EXAMPLE                          "
on all stands? > Y
```

Screen 11 - Duplicate Settings

The Duplicate command can be used to suppress output too. For example, if you have a six stand compartment and you desire output only from stand #3, then change the present settings so that no features are highlighted. Then, press Duplicate, then Edit desired features for stand #3, then press Go.

Sawtimber Volume Unit

This controls the volume unit(s) used to display sawtimber stand or stock tables. The choices are MBF (thousands of board feet), CORDS (stacked), CUNITS (100 cubic feet), TONGRN (tons green), TONDRY (tons dry), CMETER (cubic meters), MTNGRN (metric tons green), MTNDRY (metric tons dry), B-AREA (basal area), and #STEMS (number of stems). A separate table is produced for each high-lighted unit. Highlighting "ALL" speeds your selection if you desire a table for each of the eight volume units. Metric units (i.e., CMETER, MTNGRN, and MTNDRY) are reported by 5.08 cm dbh classes on a per stand or per ha basis. Basal area is reported in sqft per acre or sqm per ha.

Pulpwood Volume Unit

This controls the volume unit(s) used to display pulpwood stand or stock tables. The choices are identical to sawtimber with the exception of MBF.

Topwood-crownwood Volume Unit

This is the volume unit used for topwood (i.e., portion of saw-timber tree between sawlog and pulpwood merchantable diameter) and crownwood (i.e., heavy limbs to minimum of 4") volume calcu-lations. These calculations appear as the last columns in Clas-sic and Simple Style reports, or as separate tables in By Log Height Style reports. The choices are CORDS, CUNITS, TONGRN, TONDRY, CMETER, MTNGRN, and MTNDRY.

Table Specifications

Table specifications determine the area units to use, whether to delineate tables by cut/leave and/or by grade, and whether each row in the tables should be by species or optionally by species group. The output can become voluminous if numerous options are highlighted. For example if all eight sawtimber volume units were selected along with all six table specifications, then 8(volume units) x 3(area units) x 2(cut and leave) x 5(grades) = 240 tables would be produced for sawtimber for each stand. The table specifications are:

PER-STAND: Display volumes blown up to the area of the stand.
PER-ACRE: Display volumes on a per acre basis.
PER-HECTARE: Display volumes on a per hectare basis.
BY-CUT/LEAVE: Produce separate tables for cut and leave trees.
BY-GRADE: Produce five separate tables for each grade (sawtimber only)
BY SPC GROUP: Produce tables where each row is by species group (species group assignments imported from a TIMSale Setup) rather than by species (the default).

Statistics

If Classic Style reports are selected, TIPS optionally will calculate the stand-wide mean, standard error, confidence intervals, sample size, and other related statistics for sawtimber and pulpwood trees. Stands are rejected from these calculations if they contain less than two plots, or were tallied using the frequency or 100% method. The TIPS Technical Reference Manual provides details on statistical calculations. If STATISTICS is highlighted, you may also select the volume unit for pulpwood and sawtimber to appear in the tables. Figure 8 provides a sample statistics report for a stand named Mixed Hardwood where 40 plots were sampled.

Log Rule

Log rule selection applies only if you selected MBF as a sawtimber volume unit. Choose either Scribner, International, Doyle, or Variable. Selecting Variable tells TIPS to use the log rule installed by species in MASPEC.DAT. Selection of Scribner, International, or Doyle applies to every species in the stand regardless of the logrule installed by species in MASPEC.DAT.

Comments

".FIE" files may contain up to three lines of comments. These comments, if any, are displayed when "Comments" is highlighted (available only in Classic Style reports). See Figure 3 for an example.

Dead Trees

Highlight Dead Trees if you want species designated as dead (use

INFORM-ED to install dead species in MASPEC.DAT) to appear in TIPS reports. When the Dead Trees feature is active, dead trees are displayed in basal area and stems/acre tables but they have no merchantable volume or weight.

```
--------------------------------------------------------------------------------
                         STATISTICAL SUMMARY: Mixed Hardwood
================================================================================
VARIABLE          MEAN   STD.-ERROR-MEAN      - - - - - - CONFIDENCE INTERVALS - - - - - - - -
                  /ACRE  Abs.    Pct.       80%             90%              95%
================================================================================
Sawtimber
  Volume(MBF  )    5.8    .17    2.91     5.5 to   6.0    5.5 to   6.0    5.4 to   6.1
  Basal area      54.4   1.41    2.59    52.5 to  56.2   52.0 to  56.7   51.5 to  57.2
  No. Stems       46.0   1.27    2.76    44.3 to  47.7   43.9 to  48.1   43.4 to  48.6

Pulpwood
  Volume(CORDS )   7.0    .18    2.55     6.8 to   7.2    6.7 to   7.3    6.6 to   7.4
  Basal area      56.2    .94    1.67    55.0 to  57.5   54.7 to  57.8   54.3 to  58.1
  No. Stems      286.0   4.87    1.70   279.7 to 292.3  277.8 to 294.2  276.2 to 295.8
================================================================================
                          Sample size =   40


                                              Confidence Level
              SAWTIMBER VOLUME (MBF  )      80%      90%      95%
                 Sample Size Required:   ----------------------------
                       at mean+/-  5%       24       38       55
                       at mean+/- 10%        7       11       16
                       at mean+/- 20%        2        2        4


                                              Confidence Level
              PULPWOOD VOLUME  (CORDS )     80%      90%      95%
                 Sample Size Required:   ----------------------------
                       at mean+/-  5%       19       30       42
                       at mean+/- 10%        5        9       13
                       at mean+/- 20%        1        2        3
--------------------------------------------------------------------------------
```

Figure 8 — Example Stand Statistics Report

PLOT REPORT MODULE

The Plot report module is used to batch process one or more stands comprising a compartment into separate reports for each plot. Due to the voluminous nature of this type of analysis, only a Simple Style report is permitted.

The menu (Screen 12) consists of commands to Return to the main menu, Edit settings displayed on the screen unique to the compartment, Go process the data, and get Help. The normal sequence is to Edit settings appearing on the screen, then Go.

```
                     PLOT REPORT MENU
 # of Stands:      1         "EXAMPLE COMPARTMENT "   Report Style: SIMPLE

 Sawtimber volume unit:ALL  MBF     CORDS    CUNITS   TONGRN   TONDRY
                            CMETER  MTNGRN   MTNDRY   B-AREA   #STEMS

 Pulpwood volume unit: ALL          CORDS    CUNITS   TONGRN   TONDRY
                            CMETER  MTNGRN   MTNDRY   B-AREA   #STEMS

 Topwood-Crownwood volume unit:CORDS

 Table Specifications:
                   PER-ACRE                 PER-HECTARE
 BY CUT/LEAVE      BY GRADE



 Log Rule:VARIABLE                                  Display: DEAD-TREES
 Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
 ...or, Type The First Character of The Desired Command (in CAPS)!
  Return      Edit        Go        Help
```

Screen 12 - Plot Report Module Menu

Editing the screen settings controls the number and type of reports produced. A feature is switched ON if it appears highlighted (i.e., cyan on color monitors, intense on monochrome). A feature is switched OFF if it appears as normal text (i.e., white). The Space-bar key is used to toggle ON and OFF while the cursor, tab, and Enter keys are used to navigate around the screen. To follow is a description of each feature:

Sawtimber Volume Unit

This controls the volume unit(s) used to display sawtimber stand or stock tables. The choices are MBF (thousands of board feet), CORDS (stacked), CUNITS (100 cubic feet), TONGRN (tons green), TONDRY (tons dry), CMETER (cubic meters), MTNGRN (metric tons green), MTNDRY (metric tons dry), B-AREA (basal area), and #STEMS (number of stems). A separate table is produced for each highlighted unit. Highlighting "ALL" speeds your selection if you desire a table for each of the eight volume units. Metric units (i.e., CMETER, MTNGRN, and MTNDRY) are reported by 5.08 cm dbh classes on a per stand or per ha basis. Basal area is reported in sqft per acre or sqm per ha.

Pulpwood Volume Unit

This controls the volume unit(s) used to display pulpwood stand or stock tables. The choices are identical to sawtimber with the exception of MBF.

Topwood – crownwood Volume Unit

This is the volume unit used for topwood (i.e., portion of saw-timber tree between sawlog and pulpwood merchantable diameter) and crownwood (i.e., heavy limbs to minimum of 4") volume calcu-lations. These calculations appear as the last columns in Simple Style reports. The choices are CORDS, CUNITS, TONGRN, TONDRY, CMETER, MTNGRN, and MTNDRY.

Table Specifications

The table specifications are:

PER-ACRE: Display volumes on a per acre basis.
PER-HECTARE: Display volumes on a per hectare basis.
BY-CUT/LEAVE: Produce separate tables for cut and leave trees.
BY-GRADE: Produce five separate tables for each grade (sawtimber only)
BY SPC GROUP: Produce tables where each row is by species group (species group assignments imported from a TIMSale Setup) rather than by species (the default).

Log Rule

Log rule selection applies only if you selected MBF as a sawtim-ber volume unit. Choose either Scribner, International, Doyle, or Variable. Selecting Variable tells TIPS to use the log rule installed by species in MASPEC.DAT. Selection of Scribner, International, or Doyle applies to every species in the stand regardless of the logrule installed by species in MASPEC.DAT.

Dead Trees

Highlight Dead Trees if you want species designated as dead (use INFORM-ED to install dead species in MASPEC.DAT) to appear in TIPS reports. When the Dead Trees feature is active, dead trees are displayed in basal area and stems/acre tables but they have no merchantable volume or weight.

MAKE SST FILES MODULE

This module is used to produce files ending with extension .SST.
SST's store stand/stock tables in format readable by YIELD-MS
programs (i.e., YIELD-MS, BATCH-YIELD-MS, OAKREGEN). You can use
this module to batch process SST's for each file in the .UTR
file. Optionally, you can direct TIPS to produce SST's that are
delineated by grade, however, they become about five times larger
than ungraded files. You also can create a single compartment-
wide .SST file in lieu of the normal stand-by-stand mode of
operation (the default). You may instruct TIPS to clobber exist-
ing SST's when existing filenames are encountered.

The menu (Screen 13) consists of commands to Return to the main
menu, Edit settings displayed on the screen unique to the com-
partment, Go process the data, and get Help. The normal sequence
is to Edit settings appearing on the screen, then Go.

```
        ┌─────────────────────────────────────────────────────────┐
        │            YIELD-MS SST FILE GENERATION MENU             │
        │ # of Stands:        1          "EXAMPLE COMPARTMENT "    │
        │                                                          │
        │ PER-COMPARTMENT                                          │
        │                                                          │
        │                                                          │
        │                                                          │
        │                                                          │
        │                                                          │
        │                                                          │
        │                                                          │
        │                                                          │
        │                                                          │
        │ Log Rule:VARIABLE      BY GRADE      OVER-WRITE          Display: DEAD-TREES │
        │ Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter" │
        │ ...or,  Type The First Character of The Desired Command (in CAPS)!  │
        │  Return      Edit       Go       Help                    │
        │                                                          │
        └─────────────────────────────────────────────────────────┘
```

Screen 13 - Make-SST's Module Menu

Editing the screen settings controls the type of .SST files pro-
duced. A feature is switched ON if it appears highlighted (i.e.,
cyan on color monitors, intense on monochrome). A feature is
switched OFF if it appears as normal text (i.e., white). The
Space-bar key is used to toggle ON and OFF while the cursor, tab,
and Enter keys are used to navigate around the screen. To follow
is a description of each feature:

Per-Compartment

Highlighting this feature causes all stands in the compartment to
be processed into a single .SST file. The filename is the .UTR
filename plus extension .SST. If "Per-Compartment" is not high-
lighted (the default), then an .SST file is made for every .FIE
file in the .UTR file. You are prompted to specify the path for
creating .SST files in after pressing Go.

Log Rule

Choose either Scribner, International, Doyle, or Variable. Selecting Variable tells TIPS to use the log rule installed by species in MASPEC.DAT. Selection of Scribner, International, or Doyle applies to every species in the stand regardless of the logrule installed by species in MASPEC.DAT.

By Grade

Highlighting this feature causes TIPS to produce .SST files which are delineated by five grade categories. This allows YIELD-MS or BATCH-YIELD-MS to provide growth, harvest, and economic analysis based on grade. A slight loss in precision may result due to significant digit limitations in the files.

Over-Write

Highlighting this feature merely tells TIPS to clobber any existing .SST files of the same name as those being created during a run. If not highlighted, TIPS will skip to the next stand without writing.

Once you type Go, the screen will flash messages of the progress of your run (Screen 14)

```
Stand Filename: EXAMPLE.FIE
Stand #    1 of     1
Stand Name: EXAMPLE
Message: Growth data analysis: Standby!

-STAND HEADER-
DATE:05/01/90  FORESTER:J.R. FORESTER        ENGMET:E  TVAFIE VERSION: 3
ACRES:     50.  # PLOTS:    1  FACTOR:    0.  SI: 80
AGE: 40 CUTLVD:N  SOUNDED:Y  GRADED:Y
DEF CUTLV:L  DEF GRADE:3  EXPLICIT SAWPULP:N
TALLY:2  METHOD:2 BAF:   .0  AVGDBH: 6.7
PLTSIZ:      .10  PRF:      .0000  # SPECIES:14  GROWTH:Y  #OBS:     38
BLO WHO SWG YEP HIC SHP DOG REM PER ASH LOP CHO SCO BEE

DATA FOR A TYPICAL STAND IN NORTHERN ALABAMA
```

Screen 14 - Make-SST's Run In Progress

A common menu is used just prior to the printing of any TIPS reports. It (Screen 15) permits you to proceed to print assuming you have a printer and it is properly connected, configured, and on-line. You also can direct reports to ASCII files by using the File command. The Help screen associated with Screen 15 provides tips for configuring your printer for condensed mode. The printer control code sequences for 9 pin dot matrix and HP Laserjet III printers are given. TIPS recovers from most printer errors including off-line, no-printer-connected, and out-of-paper.

```
                    * PRINTER CHECK *

MAKE CERTAIN THAT PRINTER IS ON-LINE, PROPERLY CONFIGURED, AND
SET TO TOP-OF-FORM BEFORE PROCEEDING TO PRINT.



User Arrow Keys or Space-bar to Select a Command.Then Press "Enter"
...or, Type The First Character of The Desired Command (in CAPS)!

        Print-now Configure   File      Help      Abort
```
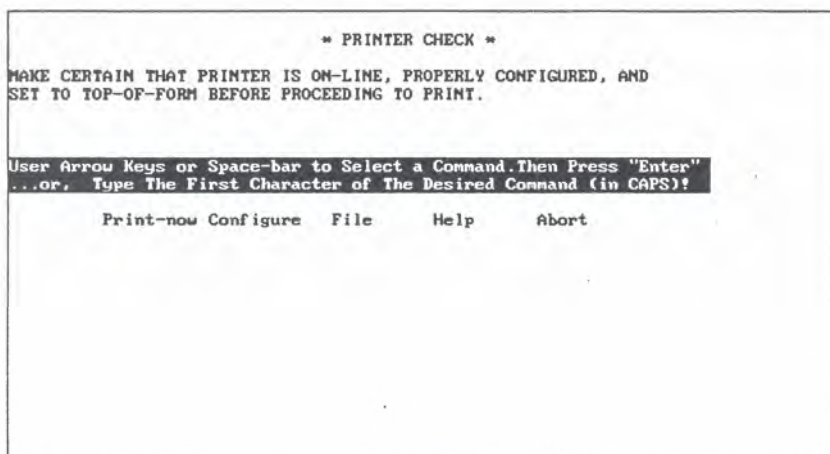
Screen 15 - Printer Operations

TIPS Classic and By Log Height reports require 132 character/line output. The printer must be configured accordingly (i.e., 9" wide paper requires a pitch of 16.5 cpi). If printer options are not controlled by manual switches and/or you wish to configure the printer directly from TIPS, then select the Configure command. Most printers can be configured by a sequence of codes. The Configure command prompts for the number of codes comprising a sequence and then accepts each code individually. Enter the Decimal representation of each code (See table in your printer user manual).

For example, an IBM ProPrinter would be configured by:

```
Number  of  codes = 2
code # 1 = 027    (decimal for ESCape)
code # 2 = 015    (decimal for *)
```

An HP Laserjet III would be configured by:

```
Number of codes = 5
code # 1 = 027
code # 2 = 038
code # 3 = 107
code # 4 = 050
code # 5 = 083
```

Before proceeding be sure the printer is on-line. After success-
fully configuring the printer and exiting TIPS, the printer
will automatically be configured with the same code sequence on
future executions of TIPS. Thus it is unnecessary to recon-
figure the printer unless a different type of printer is substi-
tuted.

Simple reports require 228 cpl, therefore a wide carriage dot
matrix or a Laserjet with legal sized paper must be used if the
pitch is set at 16.5 cpi like for other reports. If available, a
scalable fixed space font (e.g., Hewlett Packard scalable courier
typeface soft-fonts) could be loaded on a Laserjet in advance of
a TIPS run and used to print Simple reports in landscape mode on
standard size paper.

Abort allows you to cancel the print-out before it begins and
return to the prior menu screen.

Direct Report To ASCII File

This option is useful when integration of reports into other
documents is anticipated or if you don't have a printer. Specify
the name of the file without an extension. The extension .TXT is
automatically tacked on. TIPS checks if the file already exists
and gives you the option to replace the existing file (Screen
16)

```
The report can be directed to an ASCII file.  The
filename defaults to the name used for the Scenario unless you
override it. The extension TXT is automatically tacked onto
the name.  If you use an existing filename, the old file
will be replaced.


Enter Path (e.g., C:\YIELD\) --->C:\INFORM\                <---

Enter Name Of The File To Create (No Extension)--->EXAMPLE*<---
```

Screen 16 — Direct Reports To ASCII File

LISTER is accessed from the INFORM System Menu. Use it to print any INFORM produced reports which have been stored on disk. INFORM appends the extension .TXT on all such files and reserves column one for carriage control. LISTER looks for a "1" in column one and ejects a page if it finds one. LISTER will use the currently installed condensed mode configuration codes but it does not allow you to edit them. Use any INFORM application program's Printer Check menu to edit configuration codes. After entering the full filename for an INFORM report to print, press Enter and printing will begin (Screen 17)

```
LISTER will accept INFORM generated reports which have been
stored as disk files (usually with extension "TXT") and print
them.  LISTER automatically uses configuration codes (e.g.,
condensed mode) stored previously by other INFORM programs.
If you are printing a report which exceeds  132 cpl (e.g., 228), then
use either a wide carriage dot matrix printer, or a laserjet
with legal size paper set in Landscape mode.

ENTER COMPLETE NAME OF FILE TO PRINT (e.g., C:\INFORM\REPORT.TXT)

-->C:\INFORM\EXAMPLE.TXT


Enter # of characters per line (e.g., 132) > 132



NORMAL TERMINATION OF LISTER

Press Enter


Stop - Program terminated.
```

Screen 17 - LISTER

(A) Database Option For Simple Reports Format

Files generated under the Database Option for Simple reports conform to the following format. Note, each field is separated by one or more blank spaces and embedded blanks within character fields are converted to "-". This file can be imported into commercial spreadsheet or database packages as a blank delimited ASCII file. Each record consists of 487 bytes.

Field	Name	Type	Width	Decimal	Columns	Definition
1	TYPE	Char	5		1-5	Report type (COMPT, STAND, PLOT)
2	COMPARTMENT	Char	20		7-26	Compartment name
3	STAND	Char	20		28-47	Stand name (20 dashes if TYPE = COMPT)
4	PLOT	Char	56		49-104	Four digit plot number, space, 51 character plot name or 56 dashes
5	PRODUCT	Char	9		106-114	Product (SAWTIMBER, PULPWOOD)
6	V-UNIT	Char	6		116-121	(MBF, CUNIT, CORD, TONGRN, TONDRY, CMETER, MTNGRN, MTNDRY, B-AREA, #STEMS)
7	PER	Char	7		123-129	Per (STAND, ACRE, HECTARE)
8	GRADE	Char	5		131-135	Grade (ONE, TWO, THREE, FOUR, FIVE, ALL)
9	CUTLV	Char	5		137-141	Cut/leave (CUT, LEAVE, BOTH)
10	AREAUNIT	Char	7		143-149	Area unit (ACRE, HECTARE)
11	AREA	Num	8	1	151-158	Area in ACRES or HECTARES
12	TC-UNIT	Char	6		160-165	Topwood/Crownwood (CUNIT, CORD, TONGRN, TONDRY, CMETER, MTNDRY, MTNGRN)
13	SPEC/GRP	Char	7		168-174	Species/Group label (SPECIES, GROUP)
14	SPECIES-OR-GROUP	Char	23		177-199	Species or species group name
15	SPECIES CODE	Char	3		201-203	Three character species code or blank if SPEC/GRP=GROUP
16	LR	Char	3		205-207	Log rule abbreviation (SCR, INT, DOY)
17	FC	Num	2		209-210	Girard form class
18	2-in (5.08-cm)	Num	12	3	212-223	Volume, basal area, or number of stems
19	4-in (10.16-cm)	Num	12	3	224-235	Volume, basal area, or number of stems
20	6-in (15.24-cm)	Num	12	3	236-247	Volume, basal area, or number of stems
21	8-in (20.32-cm)	Num	12	3	248-259	Volume, basal area, or number of stems
22	10-in (25.40-cm)	Num	12	3	260-271	Volume, basal area, or number of stems
23	12-in (30.48-cm)	Num	12	3	272-283	Volume, basal area, or number of stems
24	14-in (35.56-cm)	Num	12	3	284-295	Volume, basal area, or number of stems
25	16-in (40.64-cm)	Num	12	3	296-307	Volume, basal area, or number of stems
26	18-in (45.72-cm)	Num	12	3	308-219	Volume, basal area, or number of stems
27	20-in (50.80-cm)	Num	12	3	320-331	Volume, basal area, or number of stems
28	22-in (55.88-cm)	Num	12	3	332-343	Volume, basal area, or number of stems
29	24-in (60.96-cm)	Num	12	3	344-355	Volume, basal area, or number of stems
30	26-in (66.04-cm)	Num	12	3	356-367	Volume, basal area, or number of stems
31	28-in (71.12-cm)	Num	12	3	368-379	Volume, basal area, or number of stems
32	30-in (76.20-cm)	Num	12	3	380-391	Volume, basal area, or number of stems
33	32-in (81.28-cm)	Num	12	3	392-403	Volume, basal area, or number of stems
34	34-in (86.36-cm)	Num	12	3	404-415	Volume, basal area, or number of stems
35	36-in (91.44-cm)	Num	12	3	416-427	Volume, basal area, or number of stems
36	38-in (96.52-cm)	Num	12	3	428-439	Volume, basal area, or number of stems
37	40-in (101.60-cm)	Num	12	3	440-451	Volume, basal area, or number of stems
38	SUBTOT	Num	12	3	452-463	Sub-total by row for volume, basal area, or number of stems
39	TOPWOOD	Num	12	3	464-475	Volume
40	CROWNWOOD	Num	12	3	476-487	Volume

November, 1992

A TECHNICAL REFERENCE MANUAL FOR

TIPS

TVA Inventory Processing System

Version 3.0

By

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DISCLAIMER
The TIPS software, version 3.0, has been carefully tested for operational reliability and to the best of our knowledge it contains no errors. However, neither TVA, nor FORS, nor the author claims responsibility for its accuracy. In the event undiscovered errors are detected, users are encouraged to report them to FORS or TVA.

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INTRODUCTION

TIPS (TVA Inventory Processing System) is part of the INFORM software package developed by the Tennessee Valley Authority, Norris, Tennessee. TIPS was designed (a) to serve as a stand-alone timber inventory data processing system for converting cruise data into stand, stock, and volume tables, and (b) to provide initial stand and stock data for the YIELD-MS programs. The purpose of this manual is to provide detailed documentation on the theory of operations for TIPS. Operating instructions for the various programs comprising the INFORM system are found in the TIPS User's Manual, the TVAFIE User's Manual, the INFORM-ED User's Manual and the YIELD-MS User's Manual.

TIPS 3.0 replaces TIPS 2.0. Version 3.0 is backward compatible with "FIE" files created for version 1.0.

The TIPS program and the two utility programs, 402TIPS and TIPLIST were written in FORTRAN-77 and compiled with the Micro-soft (R) FORTRAN Optimizing Compiler, version 5.01. Certain special purpose routines within the TIPS program are written in assembler. The Microsoft (R) Overlay Linker was used to link these three programs. Large memory models were used in the devel-opment of all FORTRAN programs.

SYSTEM REQUIREMENTS

Hardware

The TIPS software was designed for use on IBM (tm) and compatible
microcomputers capable of running PC/MS DOS versions 3.3 or
greater. The software has been tested on a variety of IBM com-
patible microcomputers. However, if the software does not seem
to operate correctly on your computer, contact FORS or TVA.

Memory

TIPS requires a full 640 KB of installed random access memory
(RAM). Since TIPS requires considerable RAM to load (443 KB), an
excess number of TSR's (terminate-and-stay-resident) programs
such as mouse drivers, disk caches, and others may prevent TIPS
from loading. For example, you may generate a "program to big to
fit in memory" DOS error when attempting to run TIPS because
previously you had loaded a mouse driver. In this case, the
mouse driver must be freed from RAM before TIPS can be loaded. A
math co-processor chip, print spooler, and disk cache all serve
to boost program performance. Consult the INFORM manual for
further information on program installation.

Optional hardware: math co-processor chip, print spooler, hard
disk cache.

Various hardware enhancements can accelerate program execution
and make the programs easier to use. The availability of a hard
disk, with all necessary data files contained in a sub-directory,
is essential for smooth operations. An associated hard disk
cache will boost performance further.

Although a math co-processor chip (e.g., an 8087, 80287, or
80387) is not required, the presence of this optional chip will
tend to decrease execution time of the TIPS program rather dra-
matically. All software has been linked to take advantage of a
math co-processor chip, in the event one is installed.

If TIPS output is directed to a printer, a print spooler can
decrease total execution time significantly. Since page length
output is produced regularly by the program, a 5-10KB print
buffer will allow the program to print and compute
simultaneously, thus reducing time that the program must wait for
the printer. Various public domain or freeware print spooler
utilities are available, as well as utilities supplied with some
brands of memory expansion boards. A print spooling utility is
not supplied with the TIPS software. Another strategy for in-
creasing performance is to direct reports to a file and then
print them later at a more convenient time using LISTER.

Monitors

TIPS and the other INFORM programs are capable of determining the presence of either a color or monochrome monitor and will operate with either option. The software will operate in monochrome, CGA (color graphics adapter), EGA (enhanced graphics adapter), and VGA (video graphics array) modes.

Device Driver (CONFIG.SYS and ANSI.SYS)

The entire INFORM system, including the TIPS software, relies upon a system screen driver to perform screen functions such as screen clearing and cursor addressing. The file, ANSI.SYS, which is supplied with the user's version of DOS, should be in the root directory (or a specified subdirectory) on the disk volume used for booting the operating system. Also, the file, CONFIG.SYS must also be present in the root directory and contain the fol-lowing records:

        device = ANSI.SYS
        files = 20 <---- (or greater)

Consult the INFORM User Manual (first tab in binder) for further information.

DATA AND DATA STRUCTURE

System data files

Several system level data files are supplied with the TIPS
software. These files are used to define certain parameters,
(e.g., printer control codes and color and monochrome display
attributes), to load species codes and associated information
about each species, and to provide input forms. Each of these
files is described in detail below.

TVAFIE.CNF
Appropriate codes for keyboard characters are found in the file,
TVAFIE.CNF. This file contains 35 records consisting of a three-
digit code, followed by a space, then an explanation of the key's
function. This file is essential for proper functioning of the
TVAFIE data entry program. The integer values associated with
each keyboard function correspond to extended ASCII values, for
those numbers greater than 255. Values less than 256 represent
the actual ASCII value returned to DOS from the keyboard. There
is no utility software to alter this file; users needing to
make changes may do so with a text editor.
DFALTM.DAT and DFALTC.DAT

Two files, DFALTC.DAT and DFALTM.DAT contain special codes for
screen and printer control for color and monochrome monitors,
respectively. These codes are recorded as sets of five three-
digit integer values. The codes for reverse video on, reverse
video off, clear screen, and cursor addressing are located in the
first record of the file. Codes for intense on, intense off, and
compressed print occur in the second record. The columnar posi-
tions and values of the codes are given in the tables below.

Table 1. ASCII code values and file format of DFALTC.DAT file.

Variable	Columns	ASCII Code Values				
Record 1:						
Reverse video on	55-69	027	091	052	049	109
Reverse video off	70-84	027	091	052	052	109
Clear screen	85-99	027	027	091	050	074
Cursor placing	115-129	027	027	091	059	102
Record 2:						
Intense on	1-15	027	091	051	054	109
Intense off	16-30	027	091	051	055	109
Compress print	31-45	027	015	000	000	000

Table 2. ASCII code values and file format of DFALTM.DAT file.

```
=====================================================
    Variable          Columns      ASCII Code Values
_____

Record 1:
   Reverse video on     55-69     027 027 091 055 109
   Reverse video off    70-84     027 027 091 048 109
   Clear screen         85-99     027 027 091 050 074
   Cursor placing     115-129     027 027 091 059 102

Record 2:
   Intense on            1-15     027 027 091 049 109
   Intense off          16-30     027 027 091 048 109
   Compress print       31-45     027 015 000 000 000
_____
```

The DFALTC.DAT and DFALTM.DAT files are used by most INFORM
programs. More detailed screen code information may be found in
the Disk Operating System manual for your system. These files
are updated anytime you use the Configure Printer command.

MASPEC.DAT
The master species file, MASPEC.DAT, contains all the valid tree
species codes and associated data specific to each species. This
file is essential, and TIPS will not execute if this file is
absent. The file may be updated or altered with the utility
program, INFORM-ED. A maximum of 99 species may be loaded into
MASPEC.DAT. The last record in this file must contain the miscel-
laneous species code, MSC. Any species not found in the master
species file list will be assigned to the MSC category, and the
volume coefficients, etc. for this category will be used in the
necessary calculations.

The master species file contains a maximum of 100 records with
928 bytes per record. Columns (byte) 1 through 274 contain data
specific to the TIPS software. Data in columns 275 through 928
are used exclusively by the YIELD-MS program. Additional informa-
tion on the data in this file may be found in the YIELD-MS User's
Manual and the INFORM-ED User's Manual. The data used by TIPS are
summarized in Table 3.

Table 3. Structure and format of TIPS data within the master
species file (MASPEC.DAT).

```
===========================================================
Variable Description                          Columns    Format
-----------------------------------------------------------

Species code                                    1-3        A3
Species name                                    4-27       A24
Fast/slow growing designation                   28         A1
Pulpwood calculation method                     29         I1
TVA pulpwood volume coefficients                30-69      4F10.5
USFS volume coefficients                        70-229     20F8.5
Green weight per cubic foot                     230-237    F8.4
Dry weight per cubic foot                       238-245    F8.4
Cords to cubic foot eqn. coefficients           246-261    2F8.4
Board foot calculation method code              262        I1
Girard form class                               263-264    I2
USFS volume equation DBH limit                  265-266    I2
TVA pulpwood volume equation form               267-268    I2
Log rule code                                   269-270    I2
Dead tree (snag, den, etc.) code                271-272    I2
TVA pulpwood equation dbh adjustment            273-274    I2
-----------------------------------------------------------
```

The INFORM User Manual 3-ring binder pocket should contain a
sample data sheet entitled INFORM 3 GRADE TALLY FIELD SHEET, Data
Sheet For Tallying By Species, Sawtimber/Pulpwood, Dbh, Height,
Soundness, Grade, and Cut/Leave. You may wish to photocopy this
sheet for field use. This sheet also is supplied as file
TALLY.DRW. "DRW" are graphics files created by Lotus Freelance
(tm).

Input Data Files

There are two basic types of input data files. These are the
compartment data file (extension UTR) and the stand data file
(extension FIE). A stand is an aggregation of trees occupying a
specific area and relatively uniform in species composition, age,
and condition. A compartment is defined as an arbitrary collec-
tion of stands. The compartment data file and the stand data file
are described in detail below.

Compartment data file ("UTR")
Data files having the "UTR" extension contain specific compart-
ment level data. The first record in this file contains the
compartment name (twenty characters or less). Subsequent records
consist of the names of files containing stand data (less the
"FIE" extension). Thus, each succeeding record contains a file
name composed of up to 40 characters. Filenames must be left
justified within the first 40 columns of each record. An unlimit-
ed number of stands may be included in a compartment. This file
is read, updated if necessary, and re-written each time the

RUNTIPS program is executed. Therefore, the easiest method of changing a "UTR" file is to run RUNTIPS.

Stand data file ("FIE")
Files with the "FIE" extension contain the cruise data input via the TVAFIE program. File format varies slightly, depending on the tally method used (i.e., grade or frequency). A more detailed discussion of grade and frequency tallies is given in the Methodology section. The "FIE" file consists of three general data segments. They are the stand description data, tally data, and growth data. Each of these data segments is delimited by a pair of "BEGIN..." and "END..." records. The stand description data, consisting of a single record is proceeded by a record containing the words "BEGIN STAND" and is followed by another record containing "END STAND." Likewise, the tree tally data is bracketed by a "BEGIN TALLY" and "END TALLY" pair. Similarly, growth data (i.e., increment core data) is delimited by "BEGIN GROWTH" and "END GROWTH" records. The stand description data segment consists of the data in the table below.

Table 4. Data structure of the stand description data segment of the stand data file.

Variable Description	Columns	Format
Record 1:		
stand name	1 - 20	A20
date	21 - 28	A8
data collector name	29 - 48	A20
English or metric units	49 - 55	A7
stand acreage	59 - 65	F7.0
sample method	66 - 75	A10
number of plots	77 - 79	I3
prism factor or plot size	80 - 84	F5.0
tally method	85 - 94	A10
site index[1]	95 - 97	I3
stand age[1]	98 - 100	I3
version	101 - 134	A35
show cut/leave	136 - 136	A1
show soundness	137 - 137	A1
show grade	138 - 138	A1
cut/leave default	139 - 139	A1
default grade	140 - 140	A1
show explicit sawtimber or pulpwood	141 - 141	A1
Records 2 - 4:		
comment lines 1 - 3[1]	1 - 80	A80

[1]Optional

7

The next data segment in the "FIE" file is the tally data. Data structure and format depend primarily on tally method (grade or frequency), and secondly on sampling method. Differences in data format may be best realized by examining Figs. 1 and 2 below.

```
----------------------------------
(stand description data segment)
END STAND
BEGIN TALLY
PAGE LOP
12 50 3
8 45 2
6 30 4
PAGE SWG
14 40 2
END TALLY
----------------------------------
```

Fig. 1. Tally data segment for a frequency tally.

```
----------------------------------
(stand description data segment)
END STAND
BEGIN TALLY
PAGE    1 EXAMPLE PLOT NAME
BLO 4 6.53LP
BLO1025.
WHO 818.
SWG 2
   .
   .
END TALLY
----------------------------------
```

Fig. 2. Tally data segment for a grade tally.

In a frequency tally, the "PAGE" delimiter corresponds to a species being tallied, while in a grade tally, "PAGE" indicates: (1) a plot (if the sample method is prism or fixed size plot) or (2) a set of 100 observations (if a 100% sample is taken). In a frequency tally, a 3-character species code follows the "PAGE" delimiter, indicating that all records immediately following pertain to that species. Individual records from a frequency tally consist of: (1) a 2-digit dbh, (2) a 3-digit height, (3) 3 digits representing a count of trees observed having the particular height-dbh combination recorded, and optionally, (4) explicit designation as "S"awtimber or "P"ulpwood.

With a grade tally, the "PAGE" delimiter appears on a separate line, followed by a space and optionally a 5 character plot number, a space, and a 51 character plot name. Species observed are recorded on individual records. Following the 3-character

species code is a 2-digit dbh and a 3-digit height. After height are single-digit fields corresponding to soundness, grade, cut/leave status, and explicit sawtimber/pulpwood designation. Soundness, grade, cut/leave status, and sawtimber/pulpwood designation are optional inputs except sawtimber/pulpwood designation is mandatory if Metric units are used. A blank field for soundness always defaults to 100% sound. If the grade or cut/leave options are switched on, a blank field is assigned the specified default value. If sawtimber/pulpwood designation is blank, then a height of 5.99 (16' logs) denotes sawtimber and a height of 6 (feet to a pulpwood merchantable top) denotes pulpwood. A blank height is interpreted as zero pulpwood height unless overridden by an "S" for sawtimber/pulpwood designation.

Format and structure of the growth data segment is consistent regardless of tally method or sample scheme. Growth data consists of 3 fields: a 3-character species code, a 4-digit measurement of d.b.h (accurate to the nearest tenth inch or millimeter), and the length of a 10-year core (accurate to the nearest tenth inch or millimeter). There are no spaces between fields.

Output files

Two types of files may be produced as output from the TIPS program. These are: (1) a YIELD-MS compatible file known as an "SST" file and (2), an IP reports file containing tabular inventory reports.

YIELD-MS (SST) file
The YIELD-MS compatible "SST" file is generated with the Make-SST's command. SST files should be made if the user expects to run YIELD-MS, BATCH-YIELD-MS, or OAKREGEN. Otherwise, producing this file is unnecessary. A detailed description of the "SST" file format and structure is provided in the YIELD-MS User's Manual.

IP report file
Inventory reports from TIPS may be directed to a file rather than the printer by selecting that option when running the program. Caution should be used when directing output to a diskette, as required file size may become large, and available diskette space may be inadequate for lengthy output. Overflow of available disk space is a DOS error that will cause the program to stop. If this happens, the output file will be truncated at the point of overflow. However, the file will be intact up to that point.

IP report files contain standard ASCII characters. Column 1 is reserved for carriage control characters according to FORTRAN standards. Therefore, use of the DOS Print command to list the file will result in improper pagination. The utility program, LISTER, should be used to print IP reports that have been captured in a file. TIPS appends the extension "TXT" on these files.

METHODOLOGY

Regardless of tally method or sampling scheme, procedures for recording dbh (diameter breast height) and merchantable height (to a 4 inch top diameter outside bark for pulpwood using the default equations) and to a sawlog merchantable top remain constant. In the TVAFIE program, the user is instructed to enter a 2-digit integer value for dbh. This value may range from two inches (for pulpwood trees; minimum dbh for a sawtimber tree is 10 inches) to 99 inches (5 to 99 centimeters). Although odd values (e.g., 15 inches) may be entered, all trees will be assigned to the next smaller even dbh class for reporting purposes (e.g., a 5" tree is reported as a 4" tree). However, since volume is a function of dbh, all volumes will be calculated using the dbh value that is input. TIPS processes tally data to the nearest one inch dbh class but reports the results in two inch classes, odd numbered dbh's rounded down. When dbh is recorded in centimeters, TIPS converts the value to the nearest inch for internal processing purposes.

Heights of trees to be tallied as pulpwood are entered to the nearest foot. For sawtimber trees, height is expressed as number of logs. A log is considered to be either 16 or 16.3 feet (5 meters) in length, depending on the sawtimber volume calculation method specified in the master species file. The maximum number of logs in a tree is 5.9. The number of logs may be recorded to the nearest tenth log using a decimal value. For example, the height of a tree containing one and a half logs would be recorded as 1.5. Thus, the product class (i.e., pulpwood or sawtimber) is determined by the manner in which height is entered. That is, heights of less than 6 imply sawtimber; heights of 6 to 250 are associated with pulpwood.

New with version 3 is the optional explicit sawtimber/pulpwood field which overrides the previously described convention. If an "S" or a "P" is encountered in this field then the "S" for sawtimber or "P" for pulpwood designation takes precedence over a designation inferred from height. For example, if dbh=4, height=4, and sawtimber/pulpwood=P, then this tells TIPS that the observation is a 4" pulpwood tree that is 4 feet to a merchantable top. On the other hand, if dbh=4, height=4, and the explicit sawtimber/pulpwood feature is deactivated, then TVAFIE would have interpreted the height of 4 as number of logs and returned an "invalid entry error" since 4" trees cannot contain sawlogs.

Another feature new with version 3 is the ability to double sample dbh on height. Each time TIPS performs volume calculations, species specific and standwide regressions are fit separately for sawtimber and pulpwood observations with valid height observations. The equation form used is:

$$\ln(H) = b_0 + b_1\ln(D)$$

where: H = height
D = dbh

If TIPS encounters an "S" or a "P" in the height field, then the appropriate regression is automatically tapped for an estimate of height and fed to the volume equations. The standwide regression is used as a backup if the species specific regression is deemed inadequate on the basis of r or number of observations. In the event that an inadequate number of valid height observations (e.g. zero) were collected for the stand, a height of zero is substituted. Therefore, this feature should only be used when one is confident that an adequate number of valid height observations have or will be collected for the stand.

An appropriate application would be volume estimation for pulpwood trees in a young pine plantation. After tallying a sufficient number of various sized pulpwood trees for dbh and height, a suitable height-diameter relationship is established. Field time may be saved by tallying subsequent pulpwood trees by dbh only and entering a "P" in the height field. Another application for this feature would be situations where height data were lost. Note that standard error estimates appearing in the statistical reports do not account for sampling error introduced by using this feature.

Tally Methods

Two methods are available for tallying trees. They are an individual tree tally (also known as the grade tally because the user has the option of supplying a soundness and grade designation for each tree) and a frequency (or "dot") tally. Each method has its unique advantages and disadvantages. Once a tally method is chosen for a stand, the user must use that method for the entire stand. However, different stands may have different tally methods. That is, stands within a compartment may have different tally methods, but the tally method within a stand must be consistent. The mixing of some sampling schemes from one stand to the next may preclude a compartment level report. For example, if some stands were tallied using the cut/leave option while others were not, a compartment report may be awkward.

Grade tally
When the grade tally is used, each individual tree is recorded separately. Soundness, cut/leave status, and grade may be recorded, but these inputs are optional. TVAFIE is used to switch these options on and off and to specify a default in the event the option is switched on and a blank is entered. If soundness is not entered, the tree is assumed to be 100% sound. Valid grade designations range from 1 to 5, with 1 being the highest grade. A typical scheme for hardwoods is to use Forest Service tree grade rules for assigning grades 1-3, to assign "ties and structural lumber" quality trees to grade 4, and assign culls to grade 5. This scheme is consistent with the default configuration used by YIELD-MS to perform growth and associated grade change projections. However, criteria for a given grade are arbitrary and are established by the user. Ungraded trees (i.e., grade field is blank) are assigned the default grade in TVAFIE.

The cut/leave option is used to segregate trees into two groups, cut or leave. The cut group is designated by a "C" on the tally form. The leave group is designated by a "L" on the tally form. If the cut/leave option is switched on, a blank in the C/L field is interpreted by TIPS according to the specified default. The cut/leave option is used by cruisers who wish to simultaneously sample and mark a stand for a harvest. "SST" files generated with this option switched on will contain a separate stand table for cut and leave trees. YIELD-MS subsequently can be used to edit cut/leave status in the harvest simulation module. Also, the YIELD-MS Timsale module can report volumes for trees designated as cut, leave, or both.

The term grade tally is a misnomer since grade need not necessarily be recorded; a more accurate title would be "by-plot" tally. However, the term grade tally was initiated many years ago and the name stuck. When using a grade tally, the user enters a three-character species code, a dbh, and merchantable height. The optional fields are explicit sawtimber/pulpwood designation where an "S" or "P" are valid entries, a single digit soundness code (0 = 0 percent sound; 9 = 90 percent sound, and blank = 100 percent sound), a tree grade of 1 to 5, and cut/leave status as "C" or "L". It should be noted that in the Inventory Processor versions 3.4 and 4.0, individual logs within the tree could be graded independently. This is not possible in TIPS and the entire tree must be assigned a single grade.

Frequency tally
The frequency tally is often called the "dot tally" due to the coding system of dot patterns used to accumulate plot totals. This system is faster to use in the field since a cumulative total of like trees is recorded instead of each individual tree. The disadvantage of the frequency tally is that a statistical summary cannot be generated since plot identity is not recorded.

If a frequency tally is chosen, the user will enter a three character species code, a two digit dbh, a merchantable height, and the number of trees observed with each unique height-dbh combination. Explicit sawtimber/pulpwood designation as "S" or "P" may optionally be recorded too. The cut/leave, grade, and percent soundness options are not available with a frequency tally.

Sampling methods

Three sampling methods may be used with TIPS. These methods are: prism (or horizontal point), fixed size plot, and 100 percent sample. As with tally methods, each of these methods has inherent advantages and disadvantages, and users should be informed on each before choosing a method. Those users desiring statistical reports should be especially mindful of sample size and intensity since statistical reliability is a function of these factors. Detailed discussions of each of these methods may be found in any of several forest mensuration or forest measurement texts such as Husch et al. (1972) or Avery (1975).

Prism
The prism cruise is preferred by many foresters because of its
ease of use in the field with the exception of very dense stands.
In this sample method, the field forester selects a point within
a stand and uses it as a sample point center. A sighting is then
taken on trees in the vicinity using a glass prism or angle
gauge. The TIPS software accommodates all commonly used prism
factors.

Plot
When a plot sample method is used, all trees located within a
fixed area plot (such as tenth or quarter acre) are tallied.
Users should be certain to maintain a consistent plot size within
the stand since per acre (and per stand) results are correlated
to sample plot size. The TIPS software will permit changing plot
sizes from stand to stand but not changing plot sizes within a
stand.

100 percent
In a 100 percent sample, all trees within a stand boundary are
measured and recorded. While this method is the most accurate, it
is also the most time consuming and may be impractical on larger
stands. Since the true mean is known, therefore making confidence
interval calculation and required sample size estimation unneces-
sary, a statistical summary is not available for 100 percent
sampling.

Internal Volume Table Structure

Within TIPS, two tables are calculated for each stand. These are
the stand table, containing the number of trees and the volume
table, which contains pulpwood and sawtimber volumes. Both tables
give per acre estimates by species and diameter class. All
requested tabular output is based on one or both of these two
tables. Within TIPS, these two tables are stored as arrays where
a maximum of 30 species may be used. All trees having dbh's
greater than 40 inches will default to the 40 inch class for
reporting purposes. Table 5 summarizes these arrays.

Table 5. Internal Arrays

```
================================================================
Array Name              Function              Subscripts Defined
----------------------------------------------------------------
STABLE(30,20,2,2,11)    STAND TABLE           (30) SPECIES
                                              (20) 2" DBH CLASSES
                                              (2)  CUT OR LEAVE
                                              (2)  SAWTIMBER OR PULP
                                              (11) GRADE 1-5 OR 11
                                                   HALF LOG CLASSES

LOCVOL(30,20,2,26)      LOCAL VOLUME TABLE    (30) SPECIES
                                              (20) 2" DBH CLASSES
                                              (2)  CUT OR LEAVE
                                              (26) CATEGORIES AS
                                                   FOLLOWS:
----------------------------------------------------------------

     1  TOPWOOD CUFT
     2  PULPWOOD CROWNWOOD CUFT
     3  PULPWOOD CUFT
     4  SAWTIMBER CROWNWOOD CUFT
     5  GRADE 1 SAWTIMBER BDFT        -OR-    .5 LOG SAWTIMBER BDFT
     6  GRADE 1 SAWTIMBER CUFT        -OR-    .5 LOG SAWTIMBER CUFT
     7  GRADE 2 SAWTIMBER BDFT        -OR-   1.0 LOG SAWTIMBER BDFT
     8  GRADE 2 SAWTIMBER CUFT        -OR-   1.0 LOG SAWTIMBER CUFT
     9  GRADE 3 SAWTIMBER BDFT        -OR-   1.5 LOG SAWTIMBER BDFT
    10  GRADE 3 SAWTIMBER CUFT        -OR-   1.5 LOG SAWTIMBER CUFT
    11  GRADE 4 SAWTIMBER BDFT        -OR-   2.0 LOG SAWTIMBER BDFT
    12  GRADE 4 SAWTIMBER CUFT        -OR-   2.0 LOG SAWTIMBER CUFT
    13  GRADE 5 SAWTIMBER BDFT        -OR-   2.5 LOG SAWTIMBER BDFT
    14  GRADE 5 SAWTIMBER CUFT        -OR-   2.5 LOG SAWTIMBER CUFT
    15                                -OR-   3.0 LOG SAWTIMBER BDFT
    16                                -OR-   3.0 LOG SAWTIMBER CUFT
    17                                -OR-   3.5 LOG SAWTIMBER BDFT
    18                                -OR-   3.5 LOG SAWTIMBER CUFT
    19                                -OR-   4.0 LOG SAWTIMBER BDFT
    20                                -OR-   4.0 LOG SAWTIMBER CUFT
    21                                -OR-   4.5 LOG SAWTIMBER BDFT
    22                                -OR-   4.5 LOG SAWTIMBER CUFT
    23                                -OR-   5.0 LOG SAWTIMBER BDFT
    24                                -OR-   5.0 LOG SAWTIMBER CUFT
    25                                -OR-   5.5 LOG SAWTIMBER BDFT
    26                                -OR-   5.5 LOG SAWTIMBER CUFT
================================================================
```

Pulpwood Volume Calculation

Various methods are available for calculating volume, depending on whether the tree in question was tallied as a pulpwood tree or as sawtimber. Recall that trees having heights recorded as 6 or more are considered to be pulpwood; trees with heights less than 6 are counted as sawtimber (unless this convention is overridden

by the optional explicit sawtimber/pulpwood designation).

Pulpwood cubic foot volume is calculated according to a species specific option code found in the master species file. If the value of the code equals 1, volume calculation is done in a manner similar to that found in the TVA Inventory Processor, version 4.0. Using this option, cubic foot volume is calculated using 1 of 5 possible equation forms. A set of 4 coefficients for these equations is located in the master species file.

Using this option, any of 5 equations forms may be used to calculate pulpwood volumes. All use dbh and/or merchantable height as independent variables to derive cubic foot volume per tree. This option provides the user the opportunity to specify custom derived coefficients. The equation forms are given in Table 6.

Table 6. TVA pulpwood volume calculation equation forms.

==

Equation code	Equation[1]
1	$V = a + b(D^2)H$
2	$V = a + bD^2) + cH + dD^2H$
3	$V = a + bD^c H^d$
4	$V = D^2 / (a+b/c)$
5	$V = a + b(D^2H)^c$

[1]Where: V = pulpwood cubic foot volume
            D = dbh (diameter at breast height) in inches
            H = merchantable height in feet
      a,b,c,d = species specific coefficients

Likewise, if the value of the equation system code equals 2, a series of U.S. Forest Service equations developed by Clark et al. (1985, 1985a) is used to calculate pulpwood volumes. Two generic equation forms may be used, depending on dbh. A set of twenty coefficients for these equations is located in the master species file. Any of the pulpwood volume calculation coefficients may be modified with the master species file utility program, INFORM-ED.

General forms of the equations are shown below.

$$V1 = a_1(D^2H)^b \qquad \text{(Eq. 1)}$$

$$V2 = a_2(D^2)^b(H)^c \qquad \text{(Eq. 2)}$$

Where: V1 = cubic foot volume of trees < 11.0 in. dbh
D = dbh (diameter at breast height) in inches
H = height (to 4 inch top) in feet
a_1, a_2, b, c = regression coefficients

Crownwood calculation
As used here, crownwood is that portion of the total tree volume, including limbs, excluding the stem to a 4 inch diameter top. Crownwood volume is calculated for both pulpwood and sawtimber trees. With pulpwood trees, crownwood is determined as the difference between total tree volume (as calculated according to Eqns. 1 and 2 above) and pulpwood volume (also calculated by Eqns. 1 and 2). Coefficients are contained within the master species file and may be changed with the INFORM-ED program.

Users should be aware that for purposes of crownwood calculation, total tree volume is calculated according to the method of Clark et al. (1985), while pulpwood volume may be calculated by either Clark's method (Clark et al. 1985) or by the TVA equations. Thus, reliability of crownwood calculation cannot be guaranteed with mixed methodology (i.e., if the TVA equations are used), and results produced from the 2 methods may be inconsistent in some cases.

Sawtimber Volume Calculation

Board foot sawtimber volumes are calculated according to International 1/4 inch, Scribner, or Doyle log rule. Only one log rule may be used per stand. That is, a single log rule must be used consistently to determine sawtimber volumes for all sawtimber trees within a stand. The log rule of choice is specified on a stand by stand basis while running the TIPS program. On trees tallied as sawtimber (i.e., those with heights expressed in number of logs as opposed to feet), cubic foot volumes are calculated for 2 other volume components: topwood and crownwood.

Topwood calculation
Topwood is that portion of the tree's volume contained between the 9 inch diameter top and the 4 inch diameter top. Thus, it is the pulpwood contained in the main stem above merchantable sawlog height. Topwood is found only in connection with sawtimber trees.

In determining topwood volume, the cubic foot volume of the sawlog portion of the stem is calculated according to the method specified in the master species file. Next, the ratio of stem volume (to a 4 inch diameter outside bark (d.o.b.) top) to sawlog

volume is calculated according to Eqn. 3 below (Clark et al. 1985). Using this ratio, cubic foot volume to a 4 inch top is calculated. Topwood is the difference between stem volume to a 4 inch top and the sawlog volume.

$$Y = e^{a(h)^b((1-d/.78D)^2)^2)^c}$$ (Eq. 3)

Where: Y = stem volume to top d.o.b.:total stem volume ratio
d = stem specified top d.o.b. in inches
D = dbh (diameter at breast height) in inches
a,b,c = regression coefficients
e = 2.71828
h = sawlog height in feet

Sawtimber crownwood calculation
Sawtimber crownwood is determined in a manner similar to pulpwood crownwood. That is, sawtimber crownwood is determined as the difference between total tree volume (calculated by Eqns. 1 and 2) and stem volume to a 4 inch diameter top as determined in calculating topwood.

Log rules
In order to increase program execution speed, sawtimber board foot volumes are calculated by sets of equations which approximate the familiar Mesavage and Girard (1956) volume tables. Two sets of equations are available for use within TIPS. Available sets of equations are by Wiant and Castaneda (1977) and Clark et al. (1985). Since the boardfoot calculation method code is located within the master species file, users may specify the set of equations to be used on a species by species basis.

The equations developed by Wiant and Castaneda for calculating board foot volume for form class 78 are as follows:

$$Vi = (1.52968L^2 + 9.58615L - 13.35212) + \\ (1.79620 - 0.27465L^2 - 2.59995L)\ D + \\ (0.04482 - 0.00961L^2 + 0.45997L)\ D^2$$ (Eq. 4)

$$Vs = (17.53508L - 0.59242L^2 - 22.50365) + \\ (3.02988 - 0.02302L^2 - 4.34381L)\ D + \\ (0.51593L - 0.02035L^2 - 0.01969)\ D^2$$ (Eq. 5)

$$Vd = (0.55743L^2 + 41.51275L - 29.37337) + \\ (2.78043 - 0.04561L^2 - 8.77272L)\ D + \\ (0.04177 - 0.01578L^2 + 0.59042L)\ D^2$$ (Eq. 6)

Where: Vi = Board foot volume (International 1/4 inch)
Vs = Board foot volume (Scribner)
Vc = Board foot volume (Doyle)
L = number of 16-foot logs
D = dbh (diameter at breast height) in inches

Similar regression equations have been developed by the U.S.
Forest Service (Clark et al. 1985). These equations are given
below.

$$Vi = -2.788196 + 0.04587D^2 + 0.02560(D^2L) - 0.00291(DL^2) + 0.00015L^2 \qquad \text{(Eq. 7)}$$

$$Vs = -16.40224 + 0.06777D^2 + 0.02376(D^2L) - 0.00265(DL^2) + 0.000097L^2 \qquad \text{(Eq. 8)}$$

$$Vd_1 = 0.00153(D^2)^{1.60122}(L^3)^{0.21566} \qquad \text{(Eq. 9)}$$

$$Vd_2 = 0.00244(D^2)^{1.48489}(L^3)^{0.23199} \qquad \text{(Eq. 10)}$$

Where: Vi = Board foot volume (International 1/4 inch)
   Vs = Board foot volume (Scribner)
   Vd_1 = Board foot volume (Doyle) for trees 9-24
       inches dbh
   Vd_2 = Board foot volume (Doyle) for trees
       greater than 24 inches dbh
   L = number of 16.3-foot logs
   D = dbh (diameter at breast height) in inches

In an analysis of Wiant and Castaneda's equations and their own
equations, Clark et al. (1985) concluded that their International
and Scribner equations (Eqs. 7 and 8) were better predictors than
the corresponding equations (Eqs. 4 and 5), but Wiant and Casta-
neda's Doyle equation (Eq. 6) was a better predictor than Equa-
tions 9 and 10. Although both sets of equations perform well,
users should determine which set best suits their particular
needs.

Log Rule Conversion
Log rules are selected for the compartment, stand, or plot level,
or by individual species when the "Variable" logrule is invoked.
Unlike previous versions of TIPS, version 3 does not introduce
errors by converting board foot estimates from one log rule to
another, for example, when accumulating stands using unlike log
rules in a compartment level report.

Tree grades
In the TVA Inventory Processor program, users were able to record
log grades for each log within a tree. This is not possible with
the TIPS software. If a grade tally is being used, a single grade
(i.e., a tree grade) may be specified optionally. As a rule of
thumb, the tree grade is determined as the grade of the best 12
foot section, within the third worse face, in the butt log.

Form class correction
As used here, form class is defined as "the percentage ratio
between the diameter, inside bark, at the top of the first 16-
foot log and the diameter outside bark at breast height (4 1/2
feet above the ground)..." (Mesavage and Girard 1956:1). The
sets of equations discussed above were developed for trees with a

form class of 78. When calculating board foot volumes of species not having a form class of 78 (as specified in the master species file), the calculated volume at form class 78 is adjusted upward or downward by 3 percent for each unit of difference in form class. This procedure is suggested by Clark et al. (1985:58) and Mesavage and Girard (1956:6).

Soundness correction
Percent soundness is an optional data element used in a grade tally. Observations having no recorded soundness are assumed to be 100 percent sound within the program. However, volumes are adjusted accordingly for those observations having a soundness value entered. Cull trees should be designated as having a soundness of zero. This will result in no volume accumulation from the cull tree, but will account for the tree in the stand table and in basal area calculations.

Dead trees
Species which have been setup in MASPEC.DAT as "dead" (e.g., snags, dens, etc.) can optionally be included in TIPS output through the "Show Dead Trees" switch in the menus. Switching this feature on causes any of these trees to appear in basal area and number of stems tables. However, no volume will be reported for these trees. When the feature is switched off, observations for the species setup as "dead" are skipped over.

TVA dbh adjustment
The value entered for this field in MASPEC.DAT is the tenths of inches used to adjust dbh before feeding it to the TVA volume equations for calculating pulpwood cubic feet. Normally this would be set to zero. However, a quirk in the default coeffi-cients (developed by the USFS) shipped with the system, requires that 4/10" be deducted from dbh before calculating volume. Therefore the value is -4. If a user substitutes different TVA volume coefficients in MASPEC.DAT, then normally the TVA dbh adjustment in MASPEC.DAT should be set to zero.

Volume Unit Conversions

TIPS is capable of generating output tables expressing volume in various units. Sawtimber volume may be expressed in terms of board feet, cords, cunits, and tons (green or dry weight basis). Similarly, pulpwood volume may be expressed as cords, cunits, or on a green or dry weight basis. The procedures for converting to these units are the same for both sawtimber and pulpwood.

Cubic Feet to Cords
Upon request within TIPS, volume output may be expressed as cords. In this case, cubic foot volume as calculated is converted into cords at the time of output using the following equation:

$$cords = V/(a + (bD)) \qquad\qquad (Eq. 17)$$

Where: V = cubic foot volume (pulpwood or sawtimber)
      a,b = species specific coefficients
        D = dbh (diameter at breast height) in inches

The coefficients, a and b, are found in the master species file and may be modified with INFORM-ED. Default values for a and b are 77.1 and 1.43, respectively. An upper limit of 115 cubic feet/cord is imposed regardless of the coefficients used.

Cubic feet to Cunits
Within the TIPS software, a cunit equals 100 cubic feet of wood (unstacked). The term is most often used with pulpwood volume. Whenever tables showing volume in terms of cunits are requested, cubic foot volumes are converted to cunits by dividing the appropriate cubic foot volume table elements by 100 prior to tabular output.

Cubic Feet to Weight
If requested, tables expressing volumes on a green or dry weight basis are produced by multiplying cubic foot volume by a conversion factor. These conversion factors are species specific and may be altered within the master species file with INFORM-ED. Default values were taken from Forbes (1955:14.40). Users desiring to alter these default values in the master species file should enter the average weight of a cubic foot of wood and bark of the species in question. Conversion to a tons basis for reports is done during program execution.

Stand Table Calculation

At the stand level, the stand table is derived by calculating and accumulating the trees per acre represented by each observation. The contribution of an observation is calculated according to the equations below.

$$T_p = ((BAF/(0.00545415D^2)OBS)/P \qquad\qquad (Eq. 18)$$

$$T_f = (OBS/S)/P \qquad\qquad (Eq. 19)$$

$$T_t = (OBS/A)/P \qquad\qquad (Eq. 20)$$

Where: T_p = tree/ac. contribution (prism sample)
     T_f = tree/ac. contribution (fixed plot sample)
     T_t = tree/ac. contribution (100% sample)
   BAF = basal area factor of prism used
      D = dbh (diameter at breast height) in inches
   OBS = number of trees counted in current observation
      P = number of plots sampled
      S = sample plot size
      A = stand acreage

Basal area calculation

Users may request an output table expressed in terms of basal area by species and diameter class. Basal area calculations are made only if basal area output tables are requested. In this event, the tabular element, expressed in terms of basal area, is calculated by multiplying the appropriate stand table element (expressed in trees per acre) by the factor 0.00545415 times dbh , which is determined implicitly from the array subscript (i.e., table column).

Since trees with diameters greater than 40 inches are included in the 40 inch dbh class, the software is unable to keep a separate accounting of these larger trees. Thus, the user should be aware that the basal area of the 40 inch class, as reported in the output table, may not accurately reflect total basal area due to the presence of larger diameter trees in the 40 inch class.

Statistics

Statistical summaries may be produced on a stand by stand basis if a grade tally was done on that stand. Statistics are not available for stands tallied by frequency or on stands where a 100% sample was taken, regardless of tally method. Pertinent statistics include mean and standard error of the mean expressed on an absolute and percent of the mean basis. Confidence intervals are calculated at the 80%, 90% and 95% confidence levels. These statistics are calculated for the following variables: sawtimber board foot volume, sawtimber cubic foot volume, sawtimber basal area, sawtimber stems per acre, pulpwood cubic foot volume, pulpwood basal area, and pulpwood stems per acre. Derivation of these statistics was done in accordance to the procedures outlined by Freese (1962) and will be discussed in the following sections.

Mean
The mean (or average) per acre is determined by dividing the appropriate grand total volume, basal area, or stems per acre by the number of observations, (i.e., plots or prism points).

Standard error of the mean
The standard error of the mean is an index of the variability of the estimate of the mean and may be expressed as an absolute value or as a percent. To calculate this statistic, the variance (an index of the variability of the data) is found using Eq. 21.

$$s_y^2 = \frac{\sum\limits_{i=1}^{n} y_i^2 - (\sum\limits_{i=1}^{n} y_i)^2/n}{(n-1)} - \qquad \text{(Eq. 21)}$$

Where: s_y^2 = variance

yi = 1 observation
1 = 1,2,...,n
n = number of plots or points

Once variance is calculated, its square root is taken to derive standard deviation. Also, a finite population correction factor must be calculated. If a fixed size plot sampling method was used, this factor is calculated using Eq. 22.

$$FPC = 1 - (nS_f/A) \qquad \text{(Eq. 22)}$$

Where: FPC = finite population correction factor
A = stand acreage
S_f = sample plot size (fixed size plot cruise)
n = number of sample plots

When a prism cruise is used to sample a stand, calculation of the finite population correction factor requires the calculation of a plot radius factor according to the equation below.

$$PRF = \frac{\sqrt{(43560-BAF)/(4BAF)}}{12} \qquad \text{(Eq. 23)}$$

Where: PRF = plot radius factor
BAF = basal area factor of prism used

Once the plot radius factor is calculated, the equivalent of an average plot size is calculated using Eq. 24.

$$P_p = \frac{c(PRF \times D_a)^2}{43560} \qquad \text{(Eq. 24)}$$

Where: P_p = estimated sample plot size (prism cruise)

PRF = plot radius factor
c = 3.1417
D_a = average weighted diameter at breast height in inches

The finite population correction factor to be used in determining the standard error is determined according to Eq. 25 below.

$$FPC = 1 - (nP/A)$$ (Eq. 25)

Where: FPC = finite population correction factor
A = stand acreage
P = sample plot size (or P for prism cruises)
n = number of prism points taken

Once FPC is known, the absolute value of the standard error of the mean is calculated using the following equation.

$$se_a = \sqrt{\frac{s_y^2}{n} \ FPC}$$ (Eq. 26)

Where: se_a = standard error of the mean (absolute)

s_y^2 = variance

n = number of observations (plots or points)

FPC = finite population correction factor

Similarly, the standard error of the mean expressed as a percent of the mean is determined by dividing the standard error of the mean (absolute) by the mean.

Confidence interval calculation
For purposes of calculating confidence intervals, probability levels used are 0.2, 0.1, and 0.5. The degrees of freedom are equal to the number of plots or points minus 1. The tabular "t" values are stored internally in the program. Confidence intervals are calculated by multiplying the standard error of the mean (absolute) by the appropriate tabular "t" value, then adding and subtracting this value from the stated mean.

Sample size estimation
Estimated sample size required at 80%, 90%, and 95% confidence levels and at different margins of error are calculated following the example of Freese (1962:24). If the calculated value of the finite population correction factor (FPC) is greater than 0.95, the initial estimate of required sample size is derived according to Eq. 27.

$$n_i = \frac{t_i{}^2 s_y{}^2}{(a_j M)^2}$$

(Eq. 27)

Where: n_i = estimated sample size at i^{th} confidence level
t_i = Student's t value at i^{th} confidence level, at
120 degrees of freedom
$s_y{}^2$ = absolute standard error of the mean
a_j = level of accuracy at j^{th} margin of error
M = mean
i = confidence level index (1, 2, 3)
j = margin of error index (1, 2, 3)

Similarly, if the value of FPC is less than or equal to 0.95, Eq. 28 is used to calculate the initial sample required. In both equations, the tabular t value is at 120 degrees of freedom.

$$n_i = \frac{1}{\dfrac{(a_j M)^2}{t_i{}^2 s_y{}^2} + \dfrac{1}{N}}$$

(Eq. 28)

Where: n_i = estimated sample size at i^{th} confidence level
a_j = level of accuracy at j^{th} margin of error
t_i = Student's t value at i^{th} confidence level

$s_y{}^2$ = absolute standard error of the mean
M = mean
N = population size (stand acreage/plot size)
i = confidence level index (1, 2, 3)
j = margin of error index (1, 2, 3)

If the estimated required sample size is less than 120, then the process is repeated twice using Eq. 28 in an effort to improve accuracy of the estimate. The degrees of freedom category used with the tabular t values is determined by subtracting 1 from the estimated sample size at each iteration.

Compartment wide statistical summary calculations
TIPS 2.0 calculates the mean, standard error of the mean, and confidence intervals for volume, basal area, and number of stems estimates according to formulae for stratified random sampling. Stands are excluded from statistical calculations if a frequency tally (i.e., dot tally) or 100% tally were used or if only one plot were taken. Each stand within the compartment is treated as a separate stratum. The standard error for each compartment-wide population parameter is calculated using Eq. 29.

$$se_a = \sqrt{\frac{1}{N^2} \sum_{h=1}^{L} \left[\frac{N_h^2 \, S_h^2}{n_h} \, FPC \right]}$$ (Eq. 29)

Where: se_a = standard error of the mean for the compartment

   N = number of acres in compartment

   h = stand number

   L = number of stands in compartment

   N_h = number of acres in stand h

   S_h2 = variance of stand h

   n_h = number of units sampled in stand h

   FPC = finite population correction factor

$$1 - \frac{n_h}{N_h}$$

Stratified random sampling often gives more precise estimates of population parameters than a simple random sample of the same size. This is the case when the variability among trees within the stands is less than the variability among trees regardless of stand affiliation. Confidence intervals are calculated by multi-plying the standard error of the mean, from Eq. 29, by the appro-priate- tabular "t" value, then adding and subtracting this value from the stated mean. The degrees of freedom used for "t" table look-up is calculated as the total number of plots or points taken in the compartment less the number of stands in the com-partment. In the case where the number of stands exceeds the number of plots or points taken, a statistical summary report cannot be generated. A statistical summary report also cannot be generated if any stand was tallied using the frequency (i.e., dot tally) method.

INTERPRETING OUTPUT

Depending on the specific tables requested, possible output may be divided into compartment, stand, and plot level tables. The stand level tables requested for each stand will be printed first, followed by the compartment level tables.

Stand Reports

Stand level reports dealing with conditions specific to each stand are of 3 basic types: sawtimber tables, pulpwood tables, and statistics reports. These reports may be produced according to three styles: classic, simple, and by-log-height. Consult the TIPS User Manual for a full description of each.

Statistics reports
Statistical summaries are produced upon user request if a grade tally was done. Besides the mean, standard error of the mean (expressed on an absolute and percent basis), and confidence intervals (at the 80%, 90%, and 95% confidence levels) are calculated and reported. This information is supplied for each of the following variables: sawtimber volume, sawtimber basal area, sawtimber stems per acre, pulpwood volume, pulpwood basal area, and pulpwood stems per acre.

Standard error of the mean is commonly expressed as "mean plus or minus" a certain amount or percent. Confidence intervals also deal with the mean and show the range of values bounding the mean. As a rule, the range increases as the level of confidence increases. For this reason, the lower end of the confidence interval may be negative. Obviously, there is no negative volume. However, a negative figure represents the actual lower end of the confidence interval.

The figure given as sample size represents the number of plots or points sampled on the current stand. It does not correspond to the number of trees sampled. Similarly, the tables showing estimated sample size required for sawtimber volume and pulpwood volume represent the estimated number of plots that should have been sampled based on the variability of the sample data. Users should routinely check these tables to determine if their sampling effort is adequate, or perhaps, too intense, given the desired confidence level and accuracy. Users should keep in mind that besides actual number of plots or points sampled, these tables are also sensitive to plot size, stocking, and the variability among the trees sampled. As a general rule, a stand of trees having relatively uniform diameters will require fewer points or plots than a similar size stand having trees with a wide range of diameters. Similarly, increasing plot size should tend to decrease the number of plots required because of the increased sampling area. Likewise, stands showing high variability of basal area between plots or points may require more sampling than similar stands with more uniform stocking.

Compartment Report

Sawtimber and pulpwood tables similar to the stand level tables described above are generated at the compartment level. Tabular format and the type of information is very similar in both cases. Volumes, etc. may be reported for a maximum of 30 species. In the event that more than 30 species are encountered on a compartment, those extra species will be reported in the thirtieth (i.e., the last) row of the table and under the name MSC (Miscellaneous). This loss of information may be circumvented by insuring that no more than 30 individual species are recorded within the compartment.

Compartment level statistics reports may be requested. They are similar in format to the stand level statistics reports. However, sample size tables are not generated for the compartment report as in the stand report.

Plot Report

Plot reports are permitted if a grade tally were used. These reports are restricted in style to "simple." They are useful for Continuous Forest Inventory (CFI) systems.

"FIE" files may contain increment core growth data in addition to tally data. Each observation consists of the tree species code, the dbh, and the length of the core from the cambium inward to the tenth annual growth ring (i.e., 10 year radial growth). TIPS attempts to fit a linear regression equation, Eq. 30, using simple least squares procedures. Prior to fitting the equation, the 10 year core length data are transformed into annual dbh growth rates by multiplying the core length by 2 and dividing the result by 10.

$$G = b_0 + b_1 D \qquad\qquad \text{(Eq. 30)}$$

Where:
G = annual dbh growth
b_0 = intercept
b_1 = slope
D = dbh

A separate equation is fit for Fast and Slow growing species groups. The Fast or Slow growing designation is set for each species in the master species file. INFORM-ED can be used to edit the Fast or Slow designation. If an insufficient number of samples is present, the regression may not be successfully fit. In this case, the regression coefficients are returned as zero. If a regression is successfully fit, the R^2 is reported by TIPS in the log file.

The regression coefficients are posted to the "SST" file. YIELD-MS subsequently can tap the coefficients for performing growth projections. From YIELD-MS, the Core method must be designated in the "Edit Parameter Data (Dbh Growth Rates)" module. Consult the YIELD-MS User Manual (pages 13,17,20-25) for further information.

The maximum number of growth observations per stand permitted is 1,000. Any amount over that limit is ignored by TIPS. Users should plan on collecting at least 10 samples each for the Fast and Slow growing species groups in a stand, although TIPS will accept a minimum of 3. As a rule, the more samples taken, the more reliable the equation becomes. Efforts should be made to take samples from a variety of different dbh classes. For example, 100 samples all taken from 10" and 12" dbh trees would yield a poorer equation than 25 samples taken from a broad range of dbh's. Although useful, R^2 should not be used as the sole criteria in judging the quality of the analysis.

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GLOSSARY

ASCII — (a) an acronym for American Standards Code for Information Interchange; (b) a type of data, or data file capable of being read without conversion

ASCII value — one of 256 integer values associated with the various keyboard and graphics characters

Assembler — a low level computer programming language

BAF — an acronym for basal area factor

Basal area factor — a coefficient specific to a prism, used in calculating basal area as a function of trees tallied

Board foot — a measure of sawtimber volume equivalent to a plank 1 inch thick and 1 foot square, or 144 cubic inches

Byte — a single character of data

C Language — a high-level computer programming language

CGA — an acronym for color graphics adapter, a video display mode

Compartment — a group of one or more stands to be processed sequentially by TIPS

Cord — a measure of volume equal to a stack of wood 4 feet' high, 4 feet wide and 8 feet long (i.e., 128 cubic feet including space between pieces)

Crownwood — that wood contained in a tree's crown including limbs and the stem above a 4 inch diameter top

Cunit — 100 cubic feet of wood and bark

dbh — diameter of a tree in inches at breast height (4.5 feet)

Delimiter — a special symbol, character, or word (or pair of such) used to demarcate a set of data or data segment

diameter class — a particular dbh range labeled by its midpoint

Directory — a DOS partition on a hard disk or a diskette

DOS — an acronym for disk operating system

EGA — an acronym for enhanced graphics adapter, a video display mode

Extension — a component of a complete DOS file specifier consisting of 1 to 3 characters proceeded by a period

File – a specific collection of computer data recognized by name

Finite population correction factor – a numerical value used to make sample size estimation more accurate when sampling without replacement

Form class – "the percentage ratio between the diameter, inside bark, at the top of the first 16-foot log and the diameter outside bark at breast height (4 1/2 feet above the ground)" (Mesavage and Girard 1956:1)

FPC – acronym for finite population correction factor

Freeware – software that is available at no charge

Frequency tally – a timber inventory method in which numbers of trees in various dbh-height combinations are recorded collectively .... dot tally

Grade tally – a timber inventory method in which individual trees are recorded and optionally assigned tree grades

Hard disk – a "fixed" disk drive having a non-removable medium, usually with capacities of 10 megabytes or more

Hardware – computer equipment

Increment core – a small plug of wood drilled from a tree to determine growth rate

KB – kilobyte, equivalent to 1024 characters of data

Linking – the process of combining relocatable object files into an executable file

Log rule – an equation or method used to calculate sawtimber volume

Mean – the average of a set of observations

Memory – available internal storage capacity of a computer (RAM)

Monitor – a computer screen, either monochrome or color

Monochrome – a video monitor capable of displaying a single "color," either black and white, green, or amber

Plot – (a) a sampling unit of fixed size; (b) a type of timber cruise using a plot

Plot radius factor – a number, which when multiplied by the dbh of a tallied tree, would give the plot size corresponding to that tree when doing a prism cruise

PRF – acronym for plot radius factor

Prism – (a) an optical device used in timber cruising, having a particular basal area factor; (b) a type of timber cruise using a prism

Pulpwood – a product class for timber, indicated by recording tree height as 6 feet or more

RAM – an acronym for random access memory

Random access memory – the volatile memory installed in a PC which can be written to and read from

Record – a single "line" of data within a file

Root directory – the DOS directory containing all other directories as sub-directories

Sawtimber – a product class for timber, indicated by recording tree height in the range of 0.5 – 5.5 (16' logs). Sawtimber trees will be sawn into lumber.

Stand – an aggregation of trees occupying a specific area and relatively uniform in species composition, age, and condition. The tally and growth data for a stand resides in a "FIE" file.

Software – computer programs (as opposed to hardware)

Spooler – a generic name for software or hardware that allows simultaneous printing and program execution

Stand table – a matrix containing numbers of trees, or trees per acre, by species and by dbh class

Stocking – a measure of the number of trees on a fixed acreage

Topwood – that portion of the tree contained in the main stem between the 9 inch and 4 inch tops

Tract – terminology used for a stand in previous TIPS versions

Tree grade – a relative measure of tree quality concerning its potential to produce quality lumber

Unit – terminology used for a compartment in previous TIPS versions

Variance – a measure of the dispersion of individual sample observations around their mean

Volume table – a matrix containing timber volumes by species and by dbh class

November, 1992

A USER MANUAL FOR

YIELD—MS

Timber Yield Planning Tool for Mixed Stands

Version 3

By

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ACKNOWLEDGMENT

DISCLAIMER
YIELD-MS 3 has been carefully tested for operational reliability and to the best of our knowledge it contains no errors. However, neither TVA, nor FORS, nor the author claim responsibility for its accuracy.

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INTRODUCTION

Historically, TVA has been active in providing information to encourage increased investment levels in forestlands. Recently, TVA has utilized microcomputers as a vehicle to transfer valuable research technologies directly into the hands of forestry professionals and their clients. Development and extensive distribution of software packages such as YIELDplus - Timber Yield Forecasting and Planning Tool (Hepp 1989) and TVA Inventory Processor have significantly improved the quantity and quality of information products prepared by forestry professionals for potential forestland investors.

The majority of forest acreage in the Eastern U.S. is comprised of non-plantation or mixed species stands, of natural origin. In the South, survey statistics (Sheffield and Knight, 1983) and (Boyce and Knight, 1979) indicate that mixed species stands are increasingly supplanting pine monocultures due to a reluctance by landowners to regenerate pine after harvesting. Currently, the oak/hickory, oak/gum, and oak/pine types combined, account for over 65% of the commercial forest acreage in the South (USDA 1977). Over 75% of this vast resource is owned and controlled by numerous non-industrial private forest (NIPF) landowners. Reliable information on potential growth, yield, and economic performance of this resource should serve to facilitate improved management decisions.

Mixed species stands are inherently more complex biologically than pine monocultures. This has increased the difficulty for deriving adequate growth and yield prediction schemes. This factor combined with relatively lower economic value and slow growth rates often associated with mixed types has compromised the amount of growth and yield research conducted relative to pine types. Consequently, we are lacking in adequate growth and yield information suitable for making management decisions in mixed stands. Regardless, the mixed species forest resource is here to stay and in ever increasing abundance. The resource supplies many non-timber benefits such as wildlife habitat, watershed protection, and aesthetics. However, economic incentives to manage mixed types intensively for timber revenue vary tremendously according to the owner's objectives, strength of local markets, site quality, and condition of existing growing stock. In many areas the practice of high grading has degraded species composition and bole quality of existing growing stock. In these areas, complete harvesting with residual control now may be the only alternative for establishing a new vigorous forest.

The economic rationale for growing stumpage of mixed types is difficult to assess. In the case of hardwoods, Kellison (1985) states that greater use is being realized in the manufacture of paper and structural board, and continued use is being made of quality sawtimber for lumber, veneer, and plywood. Lower grade timber is finding ready markets in pallets and railroad crossties. Use of hardwoods for fuelwood is expected to increase, but not significantly so until after the year 2000.

1

Market prices are crucial to NIPF producers. This is because as a group, these producers do not share in profits derived from the value added in manufacturing and processing. With few exceptions, the economic return for managing a full rotation of hardwoods is not competitive with other investment opportunities. The need still exists however, to assess biologic and economic performance of these stands so that the best prescriptions can be made. Even information showing that the economic performance of a particular mixed stand is a non-competitive investment is valuable to the landowner/decision maker. In many analysis situations, sunk costs for existing stands are irrelevant to the present investor who wishes to determine the best course of action for the present.

WHY YIELD-MS?

The complexity arising from the endless variations of owner objectives, constraints, tax effects, site quality, growing stock conditions, market prices, interest rates, and more make it difficult to form management prescriptions based upon objective criteria. Furthermore, rule-of-thumb prescriptions valid for one stand would not likely be valid for another. The decision making environment for mixed stands is exceedingly complex and detailed. A useful computer software tool would complement the decision maker by sorting through the complexities and tedious calculations associated with inventory, growth projection, financial analysis, and the packaging and presentation of information. YIELD-MS is intended to do just that. It is a general purpose tool designed to add structure, continuity, and efficiency to the process of gathering inventory data about a particular stand and forming management prescriptions based on biologic and economic factors.

YIELD-MS integrates stand inventory information with detailed economic factors so that the crucial questions of "if?", "when?", "what?" and "why?" to harvest may be directly evaluated. Among other things, YIELD-MS can be used to generate a detailed marking guide suitable as an aid for marking timber in the field. Deciding which trees to cut/leave in a thinning operation is one of the single most potent management decisions that can be made. It has both short and long term biologic and economic implications. YIELD-MS is a "what-if?" tool useful for previewing effects resulting from a variety of management options.

YIELD-MS can be used to:

-integrate conveniently with an inventory processing system (TIPS) and its associated cruise data editor (TVAFIE).

-estimate stand volume and $ value in detail according to individual species, size, product, grade, and cut/leave status.

-simulate harvests in detail according to criteria that can be duplicated in the field.

-project growth and yield tapping a wealth of published studies.

-estimate hard mast yields for evaluating wildlife implications.

-estimate future cash flows both before and after tax effects are taken into account.

-calculate seven different financial profitability criteria for evaluation of comprehensive investment scenarios.

-print a variety of informational products including a marking guide, cashflow summary, financial profitability, growth, and timber sale bid sheet report.

-facilitate production of bar, line, and pie graph summaries.

-Be applied in the bulk of the eastern U.S. and Canada using English or Metric units.

YIELD-MS is a component part of a comprehensive system of integrated programs (Figure 1). They can be accessed from a single menu (Screen 1) called INFORM (Integrated Forest Management System). TVAFIE (Forest Inventory Editor) is used for input and edit of raw cruise data into files that are readable by TIPS (Inventory Processing System). INFORM-ED is used to edit the Master Species file which contains specific information by species including volume equation coefficients, volume/weight conversion factors, diameter growth and survival estimating equation coefficients, and grade change probability information. The TIPS program features considerable flexibility for specifying output table format and executes much more quickly than previous versions. TIPS may be directed to store stand/stock table output into files (the files end with the extension "SST"). "SST" files are created on a stand-by-stand basis and act as a link to other programs including YIELD-MS. The TXTDIF program is used for linking YIELD-MS created graph files into a format (DIF – Data Interchange Format) recognizable by graphing software such as Lotus 123.

```
||<TVA INFORM 3> Integrated Forest Management System||
                                          MENU 1 OF 2
        1 - Run TVAFIE (TVA Forest Inventory Editor)

        2 - Run TIPS (TVA Inventory Processing System)

    ─→  3 - Run YIELD-MS (Timber Planning Tool Mixed Stands)

        4 - Run INFORM-ED (Master Species File Editor)

        5 - Run BATCH-YIELD-MS

        6 - Run LISTER (INFORM Reports Printing Utility)

        7 - Run SCAN (File Display Utility)

        8 - Disk Operating System
        Analyze growth, harvesting, economics, or TIMSALE
September 25, 1992  3:25:49 pm      NUM          Memory: 404 K
                    Press H for Help
```

Screen 1 – INFORM System Menu Screen

3

Figure 1 — INFORM Systems Concept Diagram
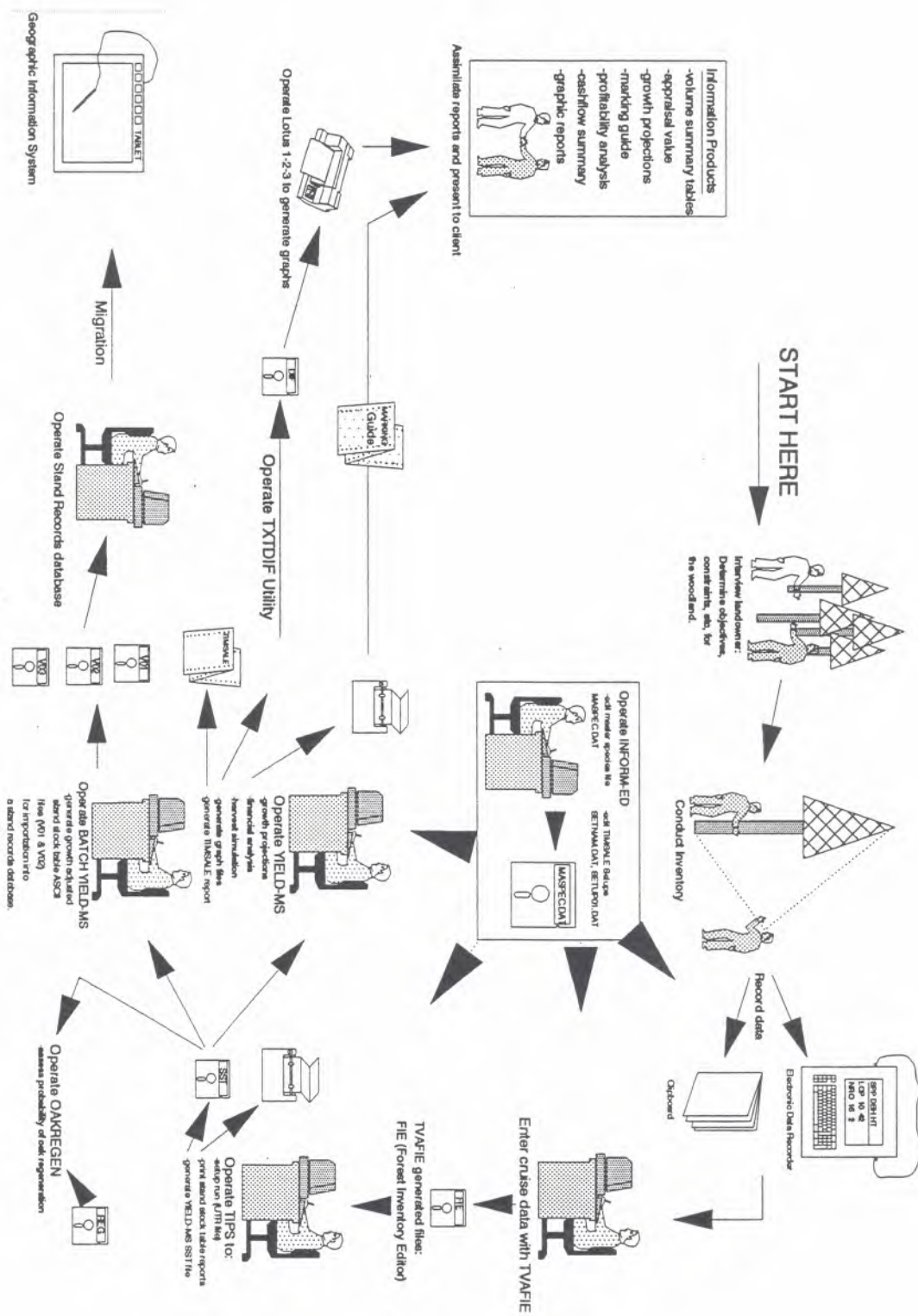
Hardware/Software Requirements

Before attempting to operate YIELD-MS you should read over this manual. YIELD-MS operates under the PC/MS DOS 3.3 or greater operating system on an IBM PC/XT/AT/386/486. You must supply the operating system. The DOS supplied ANSI.SYS file is necessary for proper operation. 640 KB RAM and a hard disk are required. **A 80x87 math co-processor chip is essential for frustration-free YIELD-MS operation.** YIELD-MS will operate in the absence of a math co-processor chip, but growth projections particularly, may take too much time to satisfy most users. Benchmark testing shows a five fold or greater decrease in processing time by using a math co-processor chip. Testing also has shown that an "XT" class machine equipped with a math co-processor chip may outperform an 80386 machine without a math co-processor chip. INFORM will automatically conform to color or monochrome modes depending upon the installed hardware.

Installation

Consult the INFORM User Manual for full instructions on installing INFORM.

If upon execution of any INFORM program you notice strange behavior (i.e., narrow band of assorted characters on the left side of the monitor), then it is likely that ANSI.SYS is not properly installed on your system. Place a DEVICE=ANSI.SYS statement in your CONFIG.SYS file and make certain that ANSI.SYS resides in the root directory of the disk you boot from. Also, include a FILES=20 (or greater) statement in your CONFIG.SYS file.

Initial Operation

Type **AUTO** from the sub-directory to which you copied all INFORM files in order to execute the INFORM master menu. From this menu (Screen 1) you may operate YIELDMS, TVAFIE, TIPS, INFORMED, TXTDIF, TIPLIST, BATCH-YIELD-MS, OAKREGEN, or exit to DOS. Pressing the "S" key switches between monochrome and color modes for configurations having both a color and monochrome monitor. Pressing other alpha keys lists a submenu of commands while pressing the "C" key lists a Copy Notice.

During operation of YIELD-MS, data should be entered at the location of the cursor. <u>Always operate the program with CapsLock on.</u> The Automenu automatically turns on CapsLock for IBM (TM) brand machines. Typically, the maximum permissible field width for numeric entries is indicated by a pair of colons. It is not necessary to re-type already existing data. To re-enter the value appearing between the colons, simply strike Enter. To enter a new value, use the appropriate numeric keys in combination (optionally) with the Insert, Delete, arrow (-->, <--), and Backspace keys so that the field displays the desired value, then press Enter or Tab. YIELDplus data fields now are WYSIWYG (i.e., what you see is what you get); it may take a little getting use to if you used previous versions. The shift-tab key or the up or left arrow generally will allow you to move back to the previous field. Similarly, the right or down arrow keys will allow you to advance from one field to the next (Figure 2).

The number 25, having been entered previously in a 4 character field delimited by colons, is displayed as:

ENTER A NUMBER (XXX) > : 25:

If you desire to retain 25 then simply press Enter

or if you desire to replace 25 with, say 150, then enter space,1,5,0, or, -->,1,5,0, or, Del,Del,De1,1,5,0.

ENTER A NUMBER (XXX) > : 150:   Enter

Figure 2 - Sample of Numeric Data Entry

The other kind of menu used by YIELD-MS is called a space-bar menu (Figure 3). These menus are operated in two different ways. The first method consists of tapping the space-bar or arrow keys until the desired menu item is highlighted. When the desired menu item is highlighted, simply press Enter to activate your selection. The second method to select menu items is to type the first letter of the command (always appearing in a capital letter). This is the way menus in Lotus 123 work.

```
              ┌─────────<──────────<──────────<──────────┐
              │                                           │
              V
   Return  ──→    Help  ──→   Generate  ─→┘
```
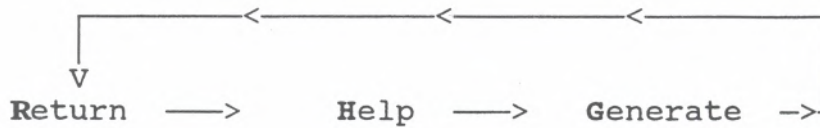
**Press Space-Bar or Arrow To Position Desired Item...Then Press
Enter or, Type First Character of The Desired Command (in CAPS)!**

Figure 3 - Sample of Space-bar Menu

AutoMenu

The menu illustrated in Screen 1 was prepared from the AUTOMENU
package by Marshall W. Magee, Magee Enterprises, 6577 Peachtree
Industrial Blvd., Norcross, GA 30092-3796. Magee Enterprises
has granted permission for distribution of the AUTOMENU applica-
tion for the YIELD-MS system. AUTOMENU has a copy notice which
requests that users send the developer $50.00. The AUTOMENU
application is convenient for operating YIELD-MS but not essen-
tial.

OPERATING YIELD-MS

YIELD-MS is designed around a central, main menu (Figure 4). The order in which commands are selected is at your discretion. None of YIELD-MS's operating functions may be accessed however, with the exception of QUIT, until a stand stock table file (".SST") is loaded. It is recommended to execute YIELD-MS from the INFORM System menu by pointing -> to YIELD-MS (Timber Planning Tool for Mixed Stands) and pressing Enter (Screen 1). This automatically runs TVAFRONT (Run YIELD-MS mode) to select an .SST file (Screen 2). Simply highlight the desired .SST file to load and press Enter to go run YIELD-MS.

Alternatively, YIELD-MS may be executed directly from DOS by typing **YIELDMS filename.SST.** If you execute YIELD-MS from DOS and fail to specify an .SST filename on the command line, then YIELD-MS will nag you with the message: File name missing or blank - Please enter name UNIT 3? At this point you may recover by entering the name of an SST file (including the extension). The easy way to avoid this problem altogether is to execute YIELD-MS from the INFORM System menu, not from DOS.
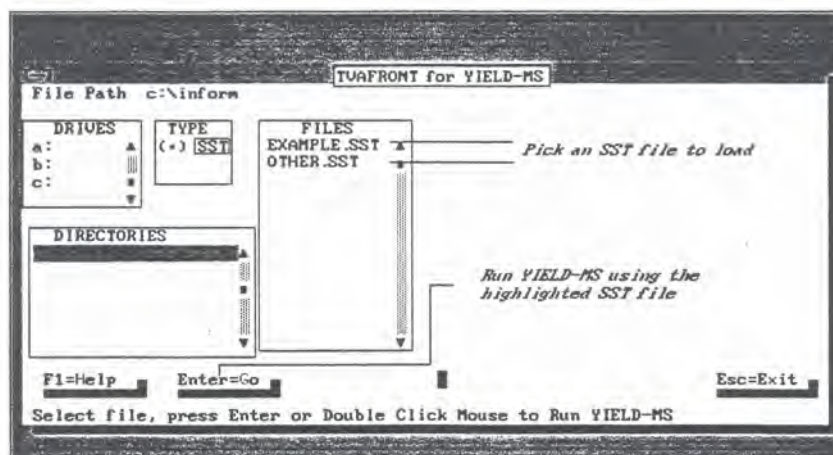
Screen 2 - Run YIELD-MS From TVAFRONT

YIELD-MS is a large program and requires between 2 to 15 seconds to load off disk into RAM. After loading is complete, execution proceeds with display of the banner followed by the Introduction (Screen 3). This screen may be permanently by-passed on future runs by typing Y for yes to the prompt. At this point the YIELD-MS main menu appears (Screen 4). From this screen it is possible to access all operations in the program. It is recommended that the Edit Parameter Data module be visited first.

YIELD-MS is an interactive model for making detailed management
prescriptions on individual, established stands. It can be used to perform
growth projections using the stand table projection method, before and after
tax financial profitability analysis, and stand marking simulations. Region
specific equations and tables for estimating dbh growth, survival, and grade
change probabilities can be edited for each run of the program. Increment core
data may also be used.   Five major equation systems for estimating growth and
survival are installed. Initial stand conditions are determined through a
conventional inventory followed by analysis of the field data by using the TVA
Inventory Processing System. Stand and stock table resolution is used for all
program operations for maximum detail. This permits estimates of pulpwood
and sawtimber volumes (optionally by grade) to be delineated according to a
maximum of 38 individual species, by 20 dbh classes, and by cut/leave status.
Data for stumpage prices, management expenses, and other factors may be entered
in order to determine stand value. A tree marking subsystem can be used to
rapidly preview effects of different marking schemes. The investment potential
of various projected management strategies may also be analyzed. YIELD-MS uses
Lotus style menus. Use the arrow or space-bar keys to highlight the desired
command and press Enter, or type the first character.   Only one stand may be
analyzed at a time. The stand files are prepared by first running the TVA
Inventory Processor program. Before performing a growth projection it is wise
to review all Parameter data including dbh growth rates, survival rates,
ingrowth designation, and species groups and stumpage prices.
Select an Option with the Space-bar and Enter ▮▮▮▮▮▮ Return ▮

Screen 3 — Introduction

```
** YIELD-MS (v 3.00) MAIN MENU      Date= 5- 7-1992 Time= 7:48:47  **

        STAND/STOCK TABLE FILE.              SIMULATED YEAR  1992

    Use Arrow keys or Space-bar to Select a Command..Then Press "Enter"
    ...or,  Type The First Character of The Desired Command (in CAPS)!
                     Load stand/stock table
                     Edit parameter data
                     Project growth
                     Simulate Harvest
                     Financial analysis
                     Graph analysis results
                     Reset reference year
                     Volume and area units
                     TIMSALE (TIMber SALE)
                     DOShell
                     Help
                     Quit

NUMBER OF TREES PER ACRE     BY DBH CLASS FOR Sawtimber AND Pulpwood IN 1992
                                -DBH(in)-
     2   4   6   8  10  12  14  16  18  20  22  24  26  28  30  32  34  36  38  40
  S  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
  P  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
```

Screen 4 — YIELD-MS Main Menu

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LOAD STAND STOCK TABLE FILE (SST)

Enter volume drive letter; Directory of SST filenames displayed

Enter name of SST file to load

EDIT PARAMETER DATA

Dbh growth rates: equations(CS-TWIGS, NE-TWIGS, GA-TWIGS, G-HAT, OAKSIM, SILVAH) Increment core growth data processed by TIPS; ADIF.DAT file rates, direct input

Survival rates: equations (CS-TWIGS, NE-TWIGS, GA-TWIGS, G-HAT, OAKSIM, SILVAH), MORTF.DAT file rates, direct input

Market stumpage prices: by species group, product(sawtimber or pulpwood), units (cunit, cord, tongwt, tondwt, mbf), & inflation rate

Import a TIMSALE Setup

Ingrowth assumptions: by species; specify minimum sawtimber dbh

Report all Parameter Data

GROWTH PROJECTION

Project stand table forward; by number of years & step increment

Restore initial stand conditions

HARVEST SIMULATION

Page display: by products (sawtimber by grade, pulpwood), units (# stems, proportion of cut to leave stems, $-value, volume, basal area, mast lbs), cut or leave, species, and dbh class

Direct Edit: change cut or leave status cell by cell in the stand table

Auto Tree Marker: macro for changing cut or leave status for multiple cells in the stand table by 1. Species, 2. Product, and 3. Priority (dbh, $-value, mast production level, or {basal area, maximum dbh, Q-factor} or BDQ) criteria

Tables Printed: reports stand/stock tables by # stems, proportion of cut to leave, $-value, volume, or basal area

Quick summary: report volumes, $-values, mast for cut & leave by species group; Optionally prints tables

Uncut The Trees: restores all trees in stand table from "cut" to "leave" status

FINANCIAL ANALYSIS

Edit Financial Parameters: planting horizon, discount rates, tax rates

Edit Harvest Expenses As % Of Harvest Value: By harvest #

Edit Financial Transactions: by tax treatment type, first & last year incurred, repetition factor, $ amount per acre, inflation rate %, 25 char. label field

Tax Treatment Types are ordinary deductible expense, PL-96-451 reforestation expense,capital expense in land depletion account, ordinary taxable income, non tax deductible expense, capital gains income, depreciable asset (3,5,7,10,15,20) year life property by ACRS or Straight Line methods

Profitability Analysis: automatically integrates harvest revenue with financial transaction data to calculate net present value (NPV), Internal rate of return (IRR), composite rate of return (CRR), annual equivalent value (AEV), benefit cost ratio (BCR), and soil expectation value (SEV) before and after taxes

Cash Flows Report: year by year expenses and revenues before and after taxes

GRAPH ANALYSIS RESULTS

Generate "snapshot" ASCII files ending in ext. GR1, GR2, & GR3

Run TXTDIF to convert GRx file to DIF file, then migrate to Lotus 123 or equiv.

Use Lotus 123 or equivalent to prepare pie, bar, and line graphs

TIMSALE

Print timber sale volume or value appraisal report

Toggle cut/leave, per acre/stand, inclusion of topwood, inclusion of crownwood

PRINTER CONTROL

Configure pitch, store configuration, test configuration

Re-direct printing of reports to disk file

QUIT

Exit program no data saved

Save all simulation results by appending to SST file, exit program

Figure 4 - YIELD-MS Summary Of Operations

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Load Tract Stand Stock Table ("SST") File

This command prompts you to enter a Path for the disk drive
volume and subdirectory which stores the "SST" file which you
wish to load. Upon entering the Path, a list of all "SST" files
found in the directory is displayed on the screen. This user
manual was prepared using a file named EXAMPLE.SST. This file is
supplied with INFORM. The example is intended to be typical of
conditions in northern Alabama. Load it in order to familiarize
yourself with the system. Most of the sample Screens in this
manual were generated from file EXAMPLE.SST. Simply type in the
name EXAMPLE with no extension (Screen 5) and press Enter.
Recall that if you execute YIELD-MS from the INFORM menu, then an
"SST" file is loaded as normal procedure Therefore, this module
is necessary to use only when you have Quit (saved a file) and
wish to load a new SST file without exiting the program. "SST"
files range in size from 1K to 130K according to the number of
species (maximum 30) and according to whether sawtimber was
graded or not. For this reason, the loading process can take up
to several minutes from a floppy disk (Screen 6). However, for
the typical stand with less than 10 species, the process takes
only a minute or less.

```
Enter Name Of The File........ (No Extension)--->EXAMPLE*<---

        Directory of SST Files in: C:\INFORM\
EXAMPLE
```
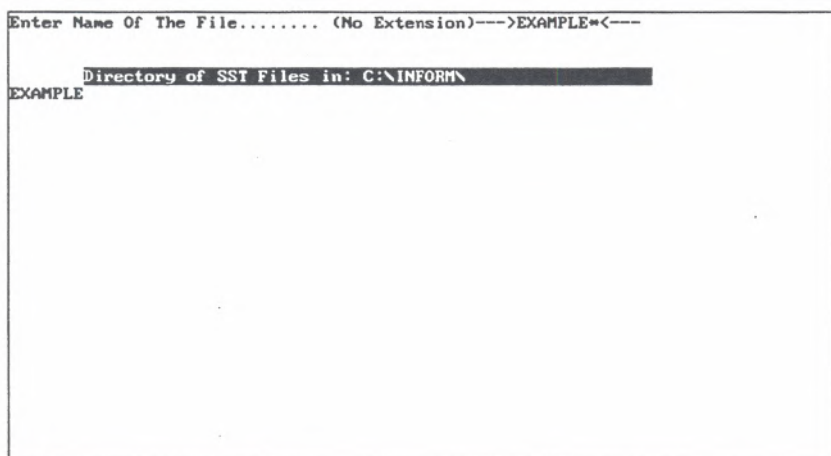
Screen 5 - Load Stand Stock Table

The master species file MASPEC.DAT contains all species specific
equations needed to estimate volumes, growth rates, survival
rates, grade change probabilities, etc. MASPEC.DAT is like a
shelf in a library containing separate books about dozens of
different tree species. YIELD-MS initially must check-out the
books for those species encountered in the particular stand. If
the file cannot be located on-line by the system, then you will
be prompted to enter a diskette containing the file and to speci-
fy the appropriate disk drive letter. MASPEC.DAT is shipped with
INFORM. The INFORM-ED (Master Species File Editor) is used to
alter the MASPEC.DAT file. Nonidentical copies of MASPEC.DAT
being used by various INFORM programs may lead to confusing

results. Therefore it is wise that TVAFIE, TIPS, YIELD-MS, INFORM-ED and other INFORM programs all share a common MASPEC.DAT file.

```
--YIELD-MS STAND/STOCK TABLE FILE MANAGEMENT IN PROGRESS
    .   .   .   .   .   .
    .   .   .   .   .   .
    .   .   .   .   .   .
    .   .   .   .   .   .
    .   .   .   .   .   .
    .   .   .   .   .   .
    .   .   .   .   .   .
    .   .   .   .   .   .
    .   .   .   .   .   .
    .   .   .   .   .   .
    .   .   .   .   .   .
    .   .   .   .   .   .
      .   .   .   .




STAND-BY...LOADING DATA FROM DISK FILE?
```
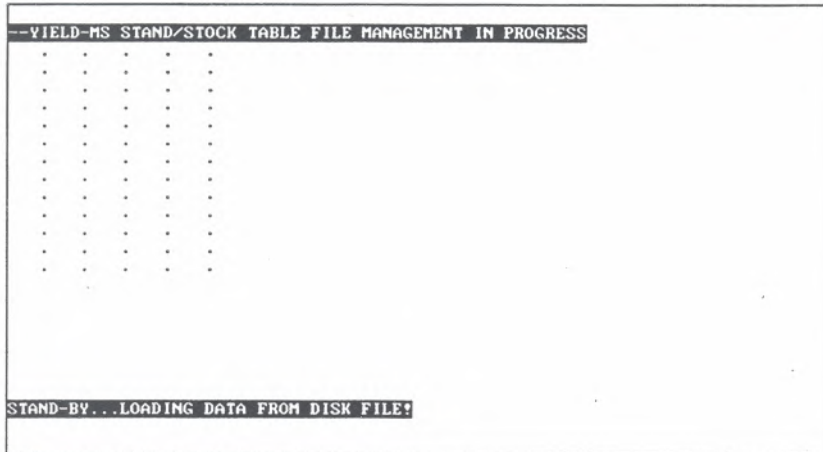
Screen 6 - YIELD-MS Stand/Stock Table File Management in Progress

Edit Parameter Data

Parameter data must be calibrated for the particular stand and market conditions. Parameter data consist of diameter growth rates,' survival rates, stumpage prices, and ingrowth tree species designation (Screen 7). You should review these data before attempting any analyses, especially growth projections. If a growth projection is not anticipated, then it is not necessary to visit the dbh growth rates, survival rates, and ingrowth trees designation submodules. If a growth projection is desired, then these submodules should be visited. The default for dbh growth and survival rates is the TWIGS equation system for the North Central States, Shifley (1987). The default for ingrowth is to designate all tree species for ingrowth. Considerable effort in the design of YIELD-MS was directed at providing the user maximum flexibility to preview and edit these crucial data. It is highly recommended that a report of the Parameter Data be printed and studied for each stand analyzed. Entry to the Parameter Data module is denied if the simulated stand conditions show less than 10 sqft of basal area/acre. This is because current stand stock-ing levels are used as input for equations. In the situation where the combined effects of mortality and harvesting have reduced stand basal area/acre below 10 sqft and you desire to review the rates, the only alternative available is to enter the Growth Projection module and access the BRING BACK THE INITIAL STAND command.

```
                      *** PARAMETER DATA ***




Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)!

                    Return to main menu
                    Dbh growth rates
                    Survival rates
                    Market stumpage price
                    Ingrowth tree species
                    Print report
                    Help
```

Screen 7 - Edit Parameter Data Menu

Dbh Growth Rates

Diameter growth rates are the driving force behind all growth projections (See METHODOLOGY section). The rates are expressed as the dbh growth in inches for one year. Rates may be specified by blending up to four Methods. They are: (E) Equations, (C) increment Cores, (F) File, and (D) Direct input (Screen 8).

SPECIES	C/E/D/F	ADJ%	DBH CLASS(in)									
			2	4	6	8	10	12	14	20	30	40
BLO	E	0	.07	.08	.08	.09	.10	.12	.14	.17	.13	.08
WHO	E	0	.05	.06	.07	.09	.10	.12	.13	.15	.13	.10
SWG	E	0	.07	.08	.11	.13	.16	.19	.21	.25	.20	.15
YEP	E	0	.04	.06	.08	.11	.13	.16	.17	.19	.16	.12
HIC	E	0	.03	.04	.05	.07	.08	.09	.09	.09	.05	.02
SHP	E	0	.06	.06	.07	.06	.09	.10	.10	.08	.01	.00
DOG	E	0	.07	.08	.11	.13	.16	.19	.21	.25	.20	.15
REM	E	0	.07	.17	.24	.28	.29	.30	.30	.29	.25	.18
PER	E	0	.07	.08	.11	.13	.16	.19	.21	.25	.20	.15
ASH	E	0	.04	.08	.12	.14	.15	.14	.14	.12	.09	.06
LOP	E	0	.06	.06	.07	.08	.09	.10	.10	.08	.01	.00
CHO	E	0	.04	.05	.07	.08	.09	.11	.14	.21	.17	.11
SCO	E	0	.06	.07	.08	.10	.11	.13	.16	.19	.11	.01
BEE	E	0	.04	.06	.07	.08	.10	.11	.12	.12	.09	.04

```
BAMAX---> 200        * PERIODIC DBH GROWTH RATE (in/1 YEAR) *      Page 1 of 1
SITE I-> 80  Shifley, S.R. (1987) USFS-NCFES NC-279            *CS-TWIGS*
```

```
1992 Stand Basal Area = 127.2 sqft/ACRE     Note: Growth rates based on the
Equation method may vary during simulation by stocking level, dbh class or age
Return    Page    Author   Modify   Cores   Equation   File    Help
'*' indicates equation is not installed for species so misc. used as substitute
```

Screen 8 - Edit Diameter Growth Rates

Equations:
Equations as a method are generally preferred when available because they typically account for variation in growth attributed to species, stand stocking level, individual tree size, and stocking treatments. Equation coefficients are stored in the Master Species file and several author's studies may be accessed. The AUTHOR command allows you to select the desired study. A constraint is that the rates derived from a single author's study be used throughout the current stand. A "*" denotes situations where the miscellaneous equation was used as a substitute for species that do not have equation coefficients installed in the Master Species file.

The research publications currently installed are Harrison et al (1986a) and Harrison et al (1986b) for southern Appalachian cove hardwoods, Hilt (1983) and Hilt (1985) for mideastern upland oak types, Marquis, et al (1984) for Allegheny hardwoods, Smith and Shifley (1984) for Indiana-Illinois forests, Shifley (1987) for North Central States forests, Hilt and Teck (1989) for Northeast-ern States forests, and Bolton and Meldahl (1986) for Georgia forests. Provisions exist to install the research work from additional studies yet to be identified or completed. This would require inputting the coefficients into the master species file and some reprogramming to accommodate the specific structure of the equations.

As a user, you are strongly encouraged to acquire copies of the research reports cited in order to judge the applicability of equations to specific analyses. It is your responsibility to consider the potential reductions in reliability due to substitution of an equation for a similar species or for a different region, and for effects due to cultural practices. For example, the Harrison equations are derived from thinned plot data and Hilt recommends that his equation be restricted for application in stands at least 30 years old. The Hilt system uses Gingrich's (1967) stocking proportions.

To follow is a brief summary of the models currently installed in YIELD-MS:

Harrison et al

Software implementation: <u>G-HAT</u>

Purpose: Mixed species thinning response model.

Stand types: Appalachian Cove hardwoods (oak, yellow-poplar, maple, cherry) even-aged, 19-60 years.

Maximum recommended projection period: 10 years

Calibration information: Tree species, dbh, stand age, basal area/acre before and after thinning.

Cautions: Model is intended for above average sites, with heavy

thinnings to improve tree quality and spacing. It should not be applied to monocultures or repeatedly thinned stands.

For more information see: Harrison et al (1986a) and Harrison et al (1986b)

Hilt et al

Software implementation: <u>OAKSIM</u>

Purpose: Individual tree growth model for managed stands.

Stand types: Upland oak forests (oak-hickory) in the Mideastern U.S., even-aged, 30 – 120 years.

Maximum recommended projection period: 10 years (The YIELD-MS implementation of OAKSIM does not use the iterative calibration technique which permits projections longer than 10 years). Results from OAKSIM and YIELD-MS (OAKSIM) will not agree.

Calibration data: Tree dbh, mean stand dbh, oak site index, percent stocking, species for estimating survival.

Cautions: Model was developed from stands that were "free-thinned" to improve tree quality and spacing. The model should not be applied to stands younger than 30 years.

For more information see: Hilt (1983), Hilt (1985) and Gingrich (1967)

Marquis et al

Software implementation: <u>SILVAH</u>

Purpose: Multiple species, individual tree growth and survival model.

Stand types: Allegheny hardwood forests (cherry-maple).

Maximum recommended projection period: 10 years (The YIELD-MS implementation of the equations varies slightly from SILVAH. The equations used are unpublished.

Calibration data: Tree species, dbh relative to stand average, relative stand density.

Cautions: Model was developed from stands in a limited geographic area. Site quality variation is not accounted for. The model may not behave logically for growth after thinning.

For more information see: Marquis et al (1984)

Shifley

Software implementation: <u>CS-TWIGS</u>

Purpose: General, multiple species, individual tree growth and survival model.

Stand types: Central States natural forests.

Maximum recommended projection period: 30 years

Calibration data: Tree species, dbh, basal area/acre distributed by size class, stand site index, crown ratio (optional).

Cautions: None

For more information see: Shifley (1987)

Hilt and Teck

Software implementation: <u>NE-TWIGS</u>

Purpose: Multiple species (28 groups), individual tree growth and survival model.

Stand types: Northeastern States (14) natural forests

Maximum recommended projection period: 30 years

Calibration data: Tree species, dbh, basal area/acre distributed by size class, site index.

Cautions: None

For more information see: Hilt and Teck (1989)

Bolton and Meldahl

Software implementation: <u>GA-TWIGS</u>

Purpose: General individual tree growth and survival model based on cluster analysis procedure.

Stand types: User must specify REGION as Blue Ridge, Lower Coastal Plain, Upper Coastal Plain, Piedmont, or Valley and Ridge. Also, user must specify FOREST TYPE as either White Pine, Hemlock, Loblolly Pine Pln., Shortleaf Pine Pln., Longleaf Pine Pln., Longleaf Pine, Slash Pine, Loblolly Pine, Shortleaf Pine, Virginia Pine, Red Cedar, Pond Pine, Pitch. Pine, Oak Pine, Oak Hickory, Chestnut Oak, Southern Scrub Oak, Oak Gum Cypress, or Elm Ash Cottonwood.

Maximum recommended projection period: 15 years.

Calibration data: Tree species, dbh, basal area/acre distributed by size class, crown ratio (optional), stand site index, age, region, and forest type.

Cautions: Model should generally apply to all Deep South states.

For more information see: Bolton and Meldahl (1986)

Cores:
Increment Cores sampled from the stand can serve as a useful substitute for estimating growth when equations are unavailable. Cores are poor predictors for growth projections exceeding 10 years. They also do not reflect changes in growth by stocking and individual tree relative size. Cores are not species specific under the current design of YIELD-MS except for stratification by species as fast or slow growing. The Core approach to estimating stand growth does have the advantage of being site-specific as growth rates are sampled directly from the trees for which growth is to be estimated. The relative merit of using cores and/or equations as methods for estimating growth must be weighed-out for each situation.

File:
File rates can be called up from a table stored on disk. These rates generally are region specific summaries which suffer from the same reliability deficiencies as increment cores. Unlike increment cores however, file rates do not offer the advantage of being site-specific but they may have relatively better properties for long term growth projections. Appropriate applications of these rates are for regional inventory updates where many acres have been aggregated into an "average acre" for projection purposes. The currently installed rates are from (Smith and Shifley 1984).

Direct:
Direct input of rates is also possible. This command is useful for inputting rates taken from other bulletins. Direct Edit also is useful for editing individual rates by dbh class that were initially determined from Equations, Cores, or File.

A %-Adjustment column is provided for across-the-board percentage reductions or increases in the displayed rates to account for estimated deviations due to site quality, age, stocking, or species.

Survival Rates

The options for specifying survival rates are the same as for diameter growth rates, with the exception of using increment cores (Screen 9). Survival is expressed on an annual basis as the probability to survive. The rates are multiplicative for projection period steps greater than one year. This implies that a tree's survival probability is independent from year to year.

For example:
An annual survival probability rate to survive of 98% yields a five year rate of:

$$(.98)^5 = 90.4\%$$


```
* PROBABILITY TO SURVIVE (1 YEAR PERCENT) *          Page 1
       Shifley, S.R. (1987) USFS-NCFES NC-279          *CS-TWIGS*
SPECIES  E/D/F  ADJ%  -------------------DBH CLASS(in)-------------------
                      2     4     6     8    10    12    14    20    30    40
  BLO     E     0   94.9  97.4  98.3  98.8  99.0  99.1  99.2  99.1  97.0  91.8
  WHO     E     0   96.8  97.9  98.7  99.2  99.4  99.6  99.7  99.9  99.6  98.7
  SWG     E     0   97.2  97.6  97.9  98.1  98.2  98.4  98.5  98.7  98.3  97.8
  YEP     E     0   94.7  95.1  95.9  96.8  97.7  98.5  99.1  99.8  99.7  99.2
  HIC     E     0   96.6  97.9  98.4  98.7  98.8  98.9  99.1  99.8  96.7  91.4
  SHP     E     0   96.2  97.2  98.2  98.9  99.2  99.4  99.5  99.3  96.6  95.8
  DOG     E     0   97.2  97.6  97.9  98.1  98.2  98.4  98.5  98.7  98.3  97.8
  REM     E     0   96.9  97.2  97.7  98.1  98.5  98.8  99.1  99.2  98.8  97.1
  PER     E     0   97.2  97.6  97.9  98.1  98.2  98.4  98.5  98.7  98.3  97.8
  ASH     E     0   95.4  96.4  97.4  98.3  98.8  99.1  99.4  99.5  97.6  95.7
  LOP     E     0   96.2  97.2  98.2  98.9  99.2  99.4  99.5  99.3  96.6  95.8
  CHO     E     0   89.9  94.1  96.3  97.6  98.5  99.0  99.5  99.8  99.1  96.8
  SCO     E     0   86.3  91.9  94.5  96.1  97.1  97.9  98.6  99.2  95.3  84.6
  BEE     E     0   97.1  95.1  94.1  94.0  94.0  94.0  94.0  94.0  94.0  94.0

1992 Stand Basal Area = 127.2 sqft/ACRE    Note: Survival rates based on the
Equation method may vary during simulation by stocking level, dbh class or age
Return    Page    Author   Modify  Equation   File     Help
"*" indicates equation is not installed for species so misc. used as substitute.
```

Screen 9 - Edit Survival Rates

Market Stumpage Prices

Species may be organized into a maximum of 15 separate market groups for the purpose of assigning stumpage prices and inflation rates (Screen 10). If sawtimber is graded, then separate prices may be assigned for each of the five tree grade categories. Pulpwood prices may be assigned for pulpwood trees, topwood from sawtimber trees, and for crownwood (heavy limbs). Volume units may be selected as mbf (thousand board feet), cords (stacked), cunits (unstacked), green or dry tons, cubic meters, and green or dry metric tons. Separate units may be selected for sawtimber and pulpwood trees by individual species groups. When a financial analysis is performed, YIELD-MS automatically accounts for different units of volume when determining $ value. For example, hardwood sawtimber can be marketed in one species group by mbf while pine sawtimber can be marketed in a second group by tons. Volume unit selections in this module operate independently of the Volume Unit Selection command in the YIELD-MS Main Menu (See page 52).

```
        1  "HIGH VALUE HDWD"
SAWTIMBER Stumpage Prices and Inflation Rates by:  MBF      [Graded: Y]

           Ungraded   Grade-1   Grade-2   Grade-3   Grade-4   Grade-5
   PRICE $   95.00     200.00    150.00     80.00     10.00     5.00
INFLATION%     4         5         4          3         3         3

  PULPWOOD Stumpage Prices and Inflation Rates by:  CORD

           Pulpwood   Topwood   Crownwood
   PRICE $    4.00      4.00       .00
INFLATION%     4         4         0

Species
  BLO WHO PER SCO




Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)!
 Return     Next      Previous    Edit     Import     Help
```

Screen 10 - Edit Stumpage Prices

Group Number- Species groups are numbered 1-15. The Next command
advances the screen display to the next higher group; the Previ-
ous command backs up the display by one group.

Group Name- Specify an arbitrary name of up to 15 characters.

Volume Unit- Use the Space-bar key to select either cunits,
cords, tons green, tons dry, mbf, cubic meters, metric tons
green, or metric tons dry.

Stumpage Prices- Enter the $ stumpage value per specified unit of
volume or weight. Sawtimber prices are delineated by the ungrad-
ed category (i.e., value regardless of grade) and/or by grades 1
through 5. The ungraded price is used if the stand data were not
graded (see upper right corner of Screen 10). The Grade 1
through 5 prices are used in lieu of the ungraded price if the
stand data were graded. It is fine to enter prices for both
ungraded and graded sawtimber but YIELD-MS internally uses either
the ungraded price for valuing all sawtimber volume or the grade
1 through 5 prices based on [Graded: Y or N]. Pulpwood prices
should be entered for pulpwood trees, topwood volume from sawtim-
ber trees, and crownwood volume from both sawtimber and pulpwood.

Inflation Rates- Enter the respective annual rate of stumpage
price inflation.

Species- Add species to a group by highlighting them. Delete
species from a group by adding them to another. All species in
the stand must be assigned to a group, even if non-merchantable.

Import- This command imports previously defined TIMSALE Setups of
species groups and related stumpage prices. Simply enter the
number of the desired Setup group (1-10). Any existing species
group and stumpage price assignments will be overridden. Use of
TIMSALE Setups saves you time when the same species groupings and
stumpage price assignments are used repeatedly. See the INFORM-
ED User Manual for more information about TIMSALE Setups.

Ingrowth Tree Species

Ingrowth is specified by the user on an individual species-tally-code basis. During growth projections, pulpwood trees may be promoted into sawtimber trees. Trees which were formerly pulpwood will be moved into the sawtimber category if the particular species is so designated by highlighting the species code. The default is for all tree species to grow from pulpwood into sawtimber. You may specify the minimum dbh class for saw-timber in the range of 10" to 14". In the case where sawtimber is graded, the YIELD-MS growth model promotes pulpwood trees into the sawtimber tree grade category inherited from your tally.


```
                        INGROWTH TREES DESIGNATION

Designate those species for which pulpwood tallied trees
should move into the sawtimber category as the growth
simulator moves them into the minimum class. Use Arrow keys to
line-up a species, the Spacebar to toggle On (highlighted)
or Off (regular), and the Enter key to accept/advance.
                            =SPECIES=
ALL      BLO WHO SWG YEP HIC SHP DOG REM PER ASH LOP CHO SCO BEE


Minimum Sawtimber DBH(in) > 12



Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or, Type The First Character of The Desired Command (in CAPS)!

     Return   Edit
```

Screen 11 - Ingrowth Tree Designation

Print Report of Parameter Data

The Parameter Data Summary Report is a 2-6 page print-out which summarizes all parameter data. It is a useful guide for reviewing assumptions and results (Figure 5).

Growth Projection

YIELD-MS moves the stand/stock table through time via a stand table projection algorithm (Screen 12). As the stand simulation process proceeds through time, the current simu-lated year is displayed. At any point in simulated time it is possible to schedule a harvest of all or a portion of the stand. If a partial harvest is simulated, then the option exists to resume with a growth projection. A maximum of five separate harvests are permitted. The BRING BACK STAND TO INITIAL YEAR command restores original stand condi-tions. The projection algorithm uses the movement ratio by diameter class method (Husch et al, 1972). As the projection proceeds, intermediate results are displayed along with a concise summary of the stand table Sawtimber and Pulpwood (Screen 13). A message (Screen 14) is shown if basal area dips below 10 sqft.

STAND NAME: [EXAMPLE   ]

* PERIODIC DBH GROWTH RATES *

SPECIES	METHOD	ADJ%	2	4	6	8	10	12	14	20	30	40
							[in / 1 YEAR]					
BLACK OAK	EQUATIONS	0	.07	.08	.08	.09	.10	.12	.14	.17	.13	.08
WHITE OAK	EQUATIONS	0	.05	.06	.07	.09	.10	.12	.13	.15	.13	.10
SWEETGUM	EQUATIONS	0	.07	.08	.11	.13	.16	.19	.21	.25	.20	.15
YELLOW POPLAR	EQUATIONS	0	.04	.06	.08	.11	.14	.16	.17	.19	.16	.12
HICKORY	EQUATIONS	0	.03	.04	.05	.07	.08	.09	.09	.09	.05	.02
SHORTLEAF PINE	EQUATIONS	0	.06	.06	.07	.08	.09	.10	.10	.08	.01	.00
DOGWOOD	EQUATIONS	0	.07	.08	.11	.13	.16	.19	.21	.25	.20	.15
RED MAPLE	EQUATIONS	0	.07	.17	.24	.28	.29	.30	.30	.29	.25	.18
PERSIMMON	EQUATIONS	0	.07	.08	.11	.13	.16	.19	.21	.25	.20	.15
ASH	EQUATIONS	0	.04	.08	.12	.14	.15	.14	.14	.12	.09	.06
LOBLOLLY PINE	EQUATIONS	0	.06	.06	.07	.08	.09	.10	.10	.08	.01	.00
CHESTNUT OAK	EQUATIONS	0	.04	.05	.07	.08	.09	.11	.14	.21	.17	.11
SCARLET OAK	EQUATIONS	0	.06	.07	.08	.10	.11	.13	.16	.19	.11	.01
BEECH	EQUATIONS	0	.04	.06	.07	.08	.10	.11	.12	.12	.09	.04

1992 Stand Basal Area = 127.2. Note: That dbh growth rates based on the Equation method vary during simulation by stocking level, dbh class, or age, while Core, Direct or File growth rates are fixed for all stocking levels. Species designated for ingrowth from pulpwood to sawtimber have their name printed in double-strike type.

Source of Equations: Shifley, S.R. (1987) USFS-NCFES NC-279----------------*CS-TWIGS* !!!
"*" indicates that equation is not installed for the species so the miscellaneous type was used as a substitute.

* PROBABILITY OF SURVIVAL PER 1 YEAR *

SPECIES	METHOD	ADJ%	2	4	6	8	10	12	14	20	30	40
							[PERCENT]					
BLACK OAK	EQUATIONS	0	94.9	97.4	98.3	98.8	99.0	99.1	99.2	99.1	97.0	91.8
WHITE OAK	EQUATIONS	0	96.0	97.9	98.7	99.2	99.4	99.6	99.7	99.9	99.6	98.7
SWEETGUM	EQUATIONS	0	97.2	97.6	97.9	98.1	98.2	98.4	98.5	98.7	98.3	97.8
YELLOW POPLAR	EQUATIONS	0	94.7	95.1	95.9	96.8	97.7	98.5	99.1	99.8	99.7	99.2
HICKORY	EQUATIONS	0	96.6	97.9	98.4	98.7	98.8	98.9	99.1	99.0	96.7	91.4
SHORTLEAF PINE	EQUATIONS	0	96.2	97.2	98.2	98.9	99.2	99.4	99.5	99.3	96.6	95.8
DOGWOOD	EQUATIONS	0	97.2	97.6	97.9	98.1	98.2	98.4	98.5	98.7	98.3	97.8
RED MAPLE	EQUATIONS	0	96.9	97.2	97.7	98.1	98.5	98.8	99.1	99.2	98.0	97.1
PERSIMMON	EQUATIONS	0	97.2	97.6	97.9	98.1	98.2	98.4	98.5	98.7	98.3	97.8
ASH	EQUATIONS	0	95.4	96.4	97.4	98.3	98.8	99.1	99.4	99.5	97.6	95.7
LOBLOLLY PINE	EQUATIONS	0	96.2	97.2	98.2	98.9	99.2	99.4	99.5	99.3	96.6	95.8
CHESTNUT OAK	EQUATIONS	0	89.9	94.1	96.3	97.6	98.5	99.0	99.5	99.8	99.1	96.0
SCARLET OAK	EQUATIONS	0	86.3	91.9	94.5	96.1	97.1	97.9	98.6	99.2	95.3	84.6
BEECH	EQUATIONS	0	97.1	95.1	94.1	94.0	94.0	94.0	94.0	94.0	94.0	94.0

Source of Equations: Shifley, S.R. (1987) USFS-NCFES NC-279----------------*CS-TWIGS* !!!
"*" indicates that equation is not installed for the species so the miscellaneous type was used as a substitute.

Figure 5 - Sample Parameter Data Summary Report

```
                                          * STUMPAGE PRICES *
--------------------------------------------------------------------------------------------------

                   1  "HIGH VALUE HDWD"
SAWTIMBER Stumpage Prices and Inflation Rates by:  MBF        [Graded: Y]


             Ungraded   Grade-1    Grade-2    Grade-3    Grade-4    Grade-5
  PRICE $      95.00    200.00     150.00      80.00      10.00      5.00
INFLATION%        4         5          4          3          3          3


  PULPWOOD Stumpage Prices and Inflation Rates by:  CORD


             Pulpwood   Topwood    Crownwood
  PRICE $       4.00      4.00        .00
INFLATION%        4         4          0


Species


  BLACK OAK              WHITE OAK             PERSIMMON             SCARLET OAK
--------------------------------------------------------------------------------------------------

                   2  "LOW VALUE HDWD "
SAWTIMBER Stumpage Prices and Inflation Rates by:  MBF        [Graded: Y]


             Ungraded   Grade-1    Grade-2    Grade-3    Grade-4    Grade-5
  PRICE $      30.00     70.00      50.00      30.00      10.00      5.00
INFLATION%        3         4          3          3          3          3


  PULPWOOD Stumpage Prices and Inflation Rates by:  CORD


             Pulpwood   Topwood    Crownwood
  PRICE $       4.00      4.00        .00
INFLATION%        4         4          0


Species


  SWEETGUM               YELLOW POPLAR         HICKORY               RED MAPLE          ASH
  CHESTNUT OAK           BEECH
--------------------------------------------------------------------------------------------------

                   3  "CONIFERS        "
SAWTIMBER Stumpage Prices and Inflation Rates by:  MBF        [Graded: Y]


             Ungraded   Grade-1    Grade-2    Grade-3    Grade-4    Grade-5
  PRICE $      75.00    125.00      90.00      60.00      20.00     20.00
INFLATION%        4         5          4          3          3          3


  PULPWOOD Stumpage Prices and Inflation Rates by:  CORD


             Pulpwood   Topwood    Crownwood
  PRICE $       9.00      9.00        .00
INFLATION%        3         3          0


Species


  SHORTLEAF PINE         LOBLOLLY PINE
--------------------------------------------------------------------------------------------------
```

Figure 5 — Sample Parameter Data Summary Report (cont.)

```
                        *** STAND STATISTICS PER ACRE    ***    STOCKING % —>
SIM   BA    #  SAWTIMB PULPWD TOPWD CROWNWD  AVG  DBH   MAST    $      SIZE
YEAR  sqft STEMS MBF    CORD   CORD  CORD   GRADE  in    lb   VALUE   CLASS
```

```
NUMBER OF TREES PER ACRE     BY DBH CLASS FOR Sawtimber AND Pulpwood IN 1992
                                   -DBH(in)-
     2    4    6    8   10   12   14   16   18   20   22   24   26   28   30   32   34   36   38   40
S    0    0    0    0    0   20   20   10   10    0    0    0    0    0    0    0    0    0    0    0
P  110   70   60   40   30   10    0    0    0    0    0    0    0    0    0    0    0    0    0    0

          Return    Grow-it   Un-grow   Do-report   Page   Help
```

Screen 12 — Growth Projection Menu

SIM YEAR	BA sqft	# STEMS	SAWTIMB MBF	PULPWD CORD	TOPWD CORD	CROWNWD CORD	AVG GRADE	DBH in	MAST lb	$ VALUE	SIZE CLASS
1992	127.2	380	7.71	8.12	4.68	10.93	2.81	7.83	120.0	583.28	SAWTIMB
1993	128.1	372	7.96	8.11	4.44	10.84	2.75	7.95	121.2	615.28	SAWTIMB
1994	129.1	364	8.20	8.11	4.23	10.79	2.69	8.07	122.3	647.30	SAWTIMB
1995	130.1	356	8.44	8.11	4.04	10.78	2.63	8.19	123.3	679.41	SAWTIMB
1996	131.1	348	8.69	9.10	3.87	10.82	2.58	8.31	124.2	711.67	SAWTIMB
1997	132.1	341	8.95	8.89	3.72	10.91	2.53	8.43	125.0	744.12	SAWTIMB
1998	133.2	333	9.21	8.88	3.59	11.04	2.48	8.56	125.6	776.78	SAWTIMB
1999	134.2	326	9.47	8.86	3.48	11.21	2.43	8.68	126.2	809.67	SAWTIMB
2000	135.3	320	9.75	8.83	3.38	11.43	2.39	8.81	126.6	842.81	SAWTIMB
2001	136.4	313	10.03	8.88	3.29	11.69	2.34	8.94	127.0	876.18	SAWTIMB
2002	137.4	306	10.31	7.97	3.22	12.00	2.30	9.07	127.2	909.78	SAWTIMB

*** STAND STATISTICS PER ACRE *** STOCKING % — N/A

```
NUMBER OF TREES PER ACRE     BY DBH CLASS FOR Sawtimber AND Pulpwood IN 2002
                                   -DBH(in)-
     2    4    6    8   10   12   14   16   18   20   22   24   26   28   30   32   34   36   38   40
S    0    0    0    0    0   23   18   12    9    4    1    0    0    0    0    0    0    0    0    0
P   60   53   45   41   29    6    3    1    0    0    0    0    0    0    0    0    0    0    0    0

          Return    Grow-it   Un-grow   Do-report   Page   Help
```

Screen 13 — Summary of Growth and Yield

```
ERROR: CANNOT PROJECT BECAUSE LESS THAN TEN SQFT OF BA/ACRE IS SURVIVING
```

Screen 14 - Stand Depleted Below 10 SQFT Basal Area/Acre
            Constraint

Grow‗it

This command prompts for two data items, the number of years to
project and the step increment (Screen 15). A maximum number of
99 years may be simulated at a time. It is possible to project
multiple 99 year periods into the future by exiting and re-
entering the Growth Module. However, the longer the projection
period, the less certainty there is of the reliability of the
projection results depending upon the quality of the diameter
growth and survival rates used. In fact, 10 to 20 years is about
the longest growth projection period that is even semi-reliable.

```
              *** STAND STATISTICS PER ACRE    ***    STOCKING % --)
SIM    BA    # SAWTIMB PULPWD TOPWD CROWNWD  AVG  DBH  MAST    $      SIZE
YEAR  sqft STEMS  MBF   CORD   CORD   CORD  GRADE  in   lb   VALUE    CLASS




ENTER # OF YEARS TO PROJECT (XX) >  18      ENTER STEP INCREMENT (XX) > : 1:




_____
NUMBER OF TREES PER ACRE    BY DBH CLASS FOR Sawtimber AND Pulpwood IN 1992
                          -DBH(in)-
   2   4   6   8  10  12  14  16  18  20  22  24  26  28  30  32  34  36  38  40
S  0   0   0   0   0  20  20  10  10   0   0   0   0   0   0   0   0   0   0   0
P110  70  60  40  30  10   0   0   0   0   0   0   0   0   0   0   0   0   0   0

       Return    Grow-it   Un-grow   Do-report   Page   Help
```

Screen 15 - Project Stand Table Into The Future

You may also specify a step interval. The step interval is a measure of resolution for the algorithm. The diameter growth and survival rates are assumed linear between each successive step. Therefore, maximum resolution is achieved by specifying a step interval of one year. The coarsest level of resolution possible would result by entering a step interval equal to the number of years to project. The advantage of entering a coarser resolution is time savings for performing the projection. The disadvantage is reduced accuracy. Graded sawtimber also adds a significant amount of processing time to growth projections. Grade change probabilities are used to promote trees to the next best tree grade category according to species, threshold dbh class, and initial grade (Ernst and Marquis, 1979). Size class is calculated using USFS rules and reported as Seedling/Sapling, Poletimber, or Sawtimber.

Special Case for Growth After Thinning:
In the case where: a) Harrison et a1(1986) equations are used, b) a thinning has just been scheduled, and c) a growth projection for the residual stand is desired, use a step interval equal to the number of years projected. The Harrison equations are sensitive to residual basal area and to basal area just prior to thinning. So if the above conditions exist, use a step interval equal to the number of years projected. This is in order to capture the thinning response effect which is modeled by these particular equations. Harrison et al reported that their equations may give illogical results when applied to stands that are unthinned, thinned from above, or thinned more than once.

Un-grow

This command resets the stand/stock table for the Reference year. The Reference year is the current year or year of inventory. When this command is accessed, it is like "erasing the blackboard" as far as all previously simulated growth and harvesting is concerned. Parameter and financial data are unaffected by this command.

The Page command is used to restore/scroll the display of any growth projection statistics which have accumulated since entering the growth projection module. The Do-report command prints a report of the same statistics.

Harvest Simulation

Harvests are designated by editing the cut/leave status of trees in the stand table. Unless specified otherwise during the field tally phase, all trees default to "leave" status. YIELD-MS contains a powerful, detailed harvest simulator (Screen 16). At the extreme of detail, the Manual-Tree-Mark command permits specification of cut/leave status down to the proportion to cut/leave of an individual cell in the stand/stock table delineated by species, product, grade, and dbh class. Conversely, the Auto-Tree-Marker can simultaneously mark larger numbers of trees according to grouping criteria. At the extreme of coarseness is removal of all trees (clearcut) in a single step. The Harvest Simulator is useful for previewing the economic and biologic consequences for various marking schemes on a "what if?" basis. When a final marking scheme is derived, the stand/stock tables may be printed and used for future reference as a <u>field marking guide.</u> The printed stand/stock tables guide should be suitable as an aid for marking timber in the field.

Note: If a cut/leave scheme was tallied in the field, then you must at least enter and exit the Simulate Harvest module in order for YIELD-MS to recognize a harvest. Postponing this step until after a growth projection is permitted.

```
HARVEST # 1   PRODUCT Pulpwood    Number-of-stems /Acre to Leave=   320.00

                                    -DBH-
SPECIES      2      4      6      8     10     12     14     16     18     20
  BLO             10.00               10.00
  WHO                          10.00
  SWG     30.00  20.00  10.00
  YEP                          10.00  10.00
  HIC     20.00  10.00         10.00
  SHP                   10.00  10.00         10.00
  DOG     40.00  20.00
  REM     20.00  10.00  10.00
  PER                   10.00
  ASH                   10.00         10.00
  LOP              .    10.00
  CHO
  SCO
  BEE

Return                Select-new-units    Product-page        Cut/leave-page
Down-up-page          Left-right-page     Manual-tree-mark    Auto-tree-marker
Tables-printed        Quick-summary       Uncut-the-trees     Help
```

Screen 16 - Harvest Simulation Menu

Page Units,   Product,   Cut/leave, Down-up, Left-right

The stand or stock tables appear as a spreadsheet,   however only one quadrant may be displayed at a   time. That is, the full table contains dbh classes spanning the 2" through 40" class across the screen from left to right, and spanning all species (maximum of 30), up and down. Due to limitations in the number of characters that may be displayed on the monitor, it is necessary to "window" over only a single quadrant at a time. The upper left quadrant contains dbh classes 2" through 20" and species 1 through 15, the upper right quadrant contains dbh

classes 22" through 40" and species 1 through 15, the lower left quadrant contains dbh classes 2" through 20" and species 16 through end, and the lower right quadrant contains dbh classes 22" through 40" and species 16 through end (Figure 6). The Down-up and Left-right commands are used to select a desired window.

-PRODUCT-   -UNITS-   -CUT/LEAVE-   LEFT

Grade-5   Mast

Grade-4   Basal-area

Grade-3   Volume

Grade-2 $-stumpage-value

Grade-1   Proportion-of-stems   Cut

Pulpwood   Number-of-stems   Leave

UP

HARVEST # 1 PRODUCT Pulpwood Number-of-stems /Acre to Leave= 320.00									
				-DBH-					
SPECIES	2	4	6	8	10	12	14	16	18	20
BLO		10.00	10.00		10.00					
WHO				10.00						
SWG	20.00	10.00								
SRO	10.00									
ELM		10.00								
BUC			10.00							
YEP				10.00	10.00					
HIC	10.00			10.00						
SIM	10.00									
CHO		10.00								
SHP			10.00	10.00		10.00				
DOG	40.00	20.00								
REM	10.00	10.00								
SCO	10.00									
PER			10.00							

Return   Select-new-units   Product-page   Cut/leave-page
Down-up-page   Left-right-page   Manual-tree-mark   Auto-tree-marker
Tables-printed   Quick-summary   Uncut-the-trees   Help

v

DOWN

RIGHT

HARVEST # 1 PRODUCT Pulpwood Number-of-stems /Acre to Leave= 320.00									
				-DBH-					
SPECIES	22	24	26	28	30	32	34	36	38	40
ASH										
LOP										
BEE										

Return   Select-new-units   Product-page   Cut/leave-page
Down-up-page   Left-right-page   Manual-tree-mark   Auto-tree-marker
Tables-printed   Quick-summary   Uncut-the-trees   Help

Figure 6 — Harvest Simulation Stand/Stock Table Windowing

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Additionally, it is possible to select Units, Product, and Cut/leave. Units may be selected as either number of stems, proportion of stems, $ stumpage value, volume, or basal area.   Products can be displayed as sawtimber (optionally by grade category) and pulpwood. The Cut/leave command toggles between the table listing trees to cut versus those   to leave.   The Tables-Printed command discussed later allows the full set of tables to printed.

Manual ‗ Tree ‗ Marker

Although it may become tedious, the   stand table (frequency of trees) may   be   adjusted by directly   editing the contents of individual table cells (Screen 17).   In the case where the Leave table is reduced,   the Cut table is increased accordingly and vice-versa.

```
HARVEST # 1   PRODUCT Pulpwood   $-stumpage value/Acre to Leave=   49.21
                                 -DBH-
SPECIES    2      4      6      8     10     12     14     16     18     20
   BLO           .34                 3.82
   WHO                        1.49
   SWG           .58    .70
   YEP                        1.76   3.15
   HIC           .34          1.22
   SHP                 3.36   3.66    ·     21.95
   DOG
   REM           .34    .84
   PER                 1.87
   ASH                  .65          2.54
   LOP                 2.21
   CHO
   SCO
   BEE

ENTER 3 CHAR. SPECIES CODE (XXX) > SHP
```

Screen 17 - Manual Tree Marker

Regardless of the UNIT currently displayed (ie; number of stems, proportion of stems, $ stumpage value, volume, or basal area), YIELD-MS will calculate the proper proportion of stems to cut/leave.

For example suppose:
  UNITS set to $ **Stumpage Value**
  PRODUCT set to **Pulpwood**
  CUT/LEAVE set to **Leave**
  SPECIES is **SHP**
  DBH Class is **8"**

And
  The cell so defined displayed **$3.66**
  (And this cell was comprised of 10 Leave trees)
And
  $2.00 was entered to replace **$3.66**

Then
  [1.0 — (2.00/3.66)] or 54.6% proportionally of the **Leave**
  stems (in this case; 0.546 x 10 stems = 5.46 stems) would
  be shifted to the corresponding **Cut** cell for number of
  stems which causes 4.54 stems to remain in the **Leave** cell.

Auto Tree Marker

The Auto Tree Marker submodule generally is the easiest to use
mechanism for changing cut/leave status for trees in the stand
table. This module contains a series of commands for marking
the stand to cut by grouping trees according to criteria of
SPECIES, PRODUCT and PRIORITY (Screen 18). The intent is
to simulate the marking of the stand for cutting according to
rules-of-thumb that may be duplicated in the field. By experi-
menting with several harvest options you can gain insight on the
most preferred marking scheme. A field marking guide may be
printed to summarize the results. You can make repeated passes
through Tree Marker. In this case the trees marked as "Cut" are
accumulated. Use the UNCUT command to restore all trees to
"Leave" status for the present harvest. Preview a variety of
marking schemes by alternating use of the Tree Marker with the
QUICK SUMMARY and UNCUT commands.

If the objective is to clearcut, then specify ALL Species and ALL
Products, and Size category selection would be irrelevant since
100% of the trees are to be marked as "Cut". In operation, a
clearcut is indicated by entering the Tree Marker Module and
tapping the Enter three times.


```
                            -TREE MARKER-                HARVEST #1
BASAL AREA TO CUT>    .0   LEAVE>137.4

                             -SPECIES-
ALL      BLO WHO SUG YEP HIC SHP DOG REM PER ASH LOP CHO SCO BEE

                             -PRODUCT-
ALL      GRADE-1    GRADE-2   GRADE-3   GRADE-4    GRADE-5   PULPWOOD

                            -PRIORITY-
         Equal proportion by dbh
         Biggest dbh trees
         Smallest dbh trees
         Most $ value trees
         Least $ value trees
         Greatest mast producers
         Poorest mast producers
         Reverse "J" BDQ method
SELECT A "PRIORITY" FOR REMOVAL OF THE TREES
THE SPECIES/PRODUCTS SELECTED ABOVE FOR CUT CONTAIN  42.4  SQFT BASAL AREA/ACRE
ENTER THE PERCENTAGE OF THIS AMOUNT TO ACTUALLY REMOVE ---> 75
```

Screen 18 — Auto Tree Marker

Tree Marker works by identifying trees which meet the selection criteria of SPECIES, PRODUCT and PRIORITY. Trees are designated as "Cut" according to the <u>intersection</u> of the three criteria. The option exists to remove all or a portion of the trees which meet the criteria. For example, in Screen 18 the intent was to remove tree SPECIES which are Low Value Hardwoods and which are in the PRODUCT category of Grades three, four, five, and Pulpwood. The intersection of these two criteria defines a subset of trees comprising 42.4 sqft of basal area/acre. We specify removal of the 75% least valuable trees in this subset. So, under PRIORITY we select Smallest $ Value. Tree Marker then determines the least $ valuable trees within the 42.4 x 75% = 31.8 sqft basal area/acre subset. Tree Marker moves these trees from Leave status into Cut status.

The PRIORITY criteria support the following rules to change cut/leave status:

<u>Equal Proportion By Dbh-</u> changes an equal proportion of trees from each dbh class to cut status to meet the target basal area.

<u>Biggest Dbh Trees-</u> ranks trees by dbh and in descending order changes status to cut until target basal area criterion is met. Prompts for lower dbh limit thus permitting simulation of diameter limit cuts.

<u>Smallest Dbh Trees-</u> ranks trees by dbh and in ascending order changes status to cut until target basal area criterion is met. Prompts for upper dbh limit thus permitting simulation of thinning from below up to a dbh limit.

<u>Most $ Value Trees-</u> ranks trees by $ value and in descending order changes status to cut until target basal area criterion is met.

<u>Least $ Value Trees-</u> ranks trees by $ value and in ascending order changes status to cut until target basal area criterion is met.

<u>Greatest Mast Producers-</u> ranks trees by hard mast production capability and in descending order changes status to cut until target basal area criterion is met.

<u>Poorest Mast Producers-</u> ranks trees by hard mast production capability and in ascending order changes status to cut until target basal area criterion is met.

<u>Reverse "J" BDQ Method-</u> prompts for upper dbh limit and Q factor (default 1.44). Generates a leave stand which best approximates the "all size, reverse J" stand structure of a geometric series (i.e., Law of de Liocourt). This command is useful for generating a marking guide to generate or maintain an "all size" stand structure.

Tables-Printed

The stand/stock tables for both cut and leave trees may be printed according to any or all of the six Unit categories (Screen 19). The Proportion of Stems to cut/leave is particularly useful as a guideline for actually marking a stand. Warning: if sawtimber is graded, and all six Unit categories are selected, then the printout will be at least 36 pages long depending upon the number of species (Figure 7). Therefore if sawtimber are graded, you have the option of merging sawtimber volumes across all grade categories into a single table. This reduces the number of pages in the report by 66%. An exception is that the proportion of stems table cannot be merged across grades.

```
                    PRINT-THE-TABLES           HARVEST #1




Press Space-Bar To Advance To The Desired Menu Item...Then Press <CR>,
You may select more than one item.

          RETURN
          NUMBER OF STEMS
          PROPORTION STEMS
          $ STUMPAGE VALUE
          VOLUME
          BASAL AREA SQFT
          MAST (LBS)
```

Screen 19 - Print The Tables

STAND NAME: [EXAMPLE   ]   CUT/LEAVE NUMBER OF STEMS PER ACRE   FOR SAWTIMBER BY SPECIES AND DIAMETER CLASS
HARVEST # 1, 2002

SPECIES-BY-GROUP	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40+	TOTAL
[CUT]																	
[LOW VALUE HDWD]																	
BEECH					2.88	1.19											4.07
																	4.07
[LEAVE]																	
[HIGH VALUE HDWD]																	
BLACK OAK		2.74	.70	.12	.02												3.59
WHITE OAK		.56	5.07	3.34	1.13	.24	.04										10.37
PERSIMMON		.14	.02														.17
SCARLET OAK			3.98	3.01	1.21	.33	.06										8.59
[LOW VALUE HDWD]																	
SWEETGUM		.17	.03														.20
YELLOW POPLAR		3.46	1.17	3.93	3.69	1.70	.47	.08	.01								14.52
HICKORY		.35	.04														.39
RED MAPLE		1.04	.30	.06													1.41
ASH		3.45	1.19	.24	.03												4.92
CHESTNUT OAK		5.16	2.78	.83	.18	.03											8.99
BEECH						.68	.54	.09									1.32
[CONIFERS]																	
SHORTLEAF PINE		.57	.07														.65
LOBLOLLY PINE		5.79	2.87	.65	.09												9.40
																	64.53

STAND NAME: [EXAMPLE   ]   CUT/LEAVE PROPORTION STEMS PER ACRE   FOR GRADE-2   BY SPECIES AND DIAMETER CLASS
HARVEST # 1, 2002

SPECIES-BY-GROUP	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40+	TOTAL
[CUT]																	
[LEAVE]																	
[HIGH VALUE HDWD]																	
BLACK OAK			100.0	100.0													
WHITE OAK			100.0	100.0	100.0	100.0	100.0										
PERSIMMON			100.0														
SCARLET OAK			100.0	100.0	100.0	100.0	100.0										
[LOW VALUE HDWD]																	
SWEETGUM			100.0														
YELLOW POPLAR			100.0	100.0													
HICKORY			100.0														
RED MAPLE			100.0	100.0													
ASH			100.0	100.0	100.0												
CHESTNUT OAK		100.0	100.0	100.0	100.0	100.0											
[CONIFERS]																	
SHORTLEAF PINE			100.0														
LOBLOLLY PINE			100.0	100.0	100.0												

Figure 7 _ Sample Harvest Summary Simulation Report

SPECIES-BY-GROUP	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40+	TOTAL
						[CUT]											
BEECH					3.33	2.10											5.43
						[LEAVE]											
[HIGH VALUE HDWD]																	
BLACK OAK		15.31	10.89	3.34	.66	.10	.01										30.31
WHITE OAK		3.11	80.49	100.16	49.29	14.94	2.98	.39	.03								251.40
PERSIMMON		.80	.35	.08	.01												1.24
SCARLET OAK			47.53	90.49	52.79	19.90	5.17	.83	.08								216.79
[LOW VALUE HDWD]																	
SWEETGUM		.35	.13	.03													.51
YELLOW POPLAR		7.25	6.40	48.27	65.39	42.18	15.80	3.72	.57	.06							189.64
HICKORY		.73	.21	.03													.98
RED MAPLE		2.18	1.53	.55	.11	.02											4.39
ASH		7.23	6.11	2.17	.40	.05											15.97
CHESTNUT OAK		17.40	15.85	8.52	2.71	.66	.12	.02									45.28
BEECH							1.21	1.29	.28	.04							2.82
[CONIFERS]																	
SHORTLEAF PINE		2.38	.69	.10	·												3.19
LOBLOLLY PINE		38.20	26.97	10.74	2.04	.23	.02										78.19
																	840.71

SPECIES-BY-GROUP	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40+	TOTAL
						- MBF -											
						[CUT]											
BEECH					.666	.420											1.09
						[LEAVE]											
[HIGH VALUE HDWD]																	
BLACK OAK		.191	.080	.022													.30
WHITE OAK		.039	.537	.581	.286	.087	.017										1.55
PERSIMMON																	.01
SCARLET OAK			.317	.525	.306	.115	.030										1.30
[LOW VALUE HDWD]																	
SWEETGUM		.012															.02
YELLOW POPLAR		.242	.133	.695	.935	.603	.226	.053									2.90
HICKORY		.024															.03
RED MAPLE		.073	.034	.011													.12
ASH		.241	.136	.042													.43
CHESTNUT OAK		.348	.317	.144	.046	.011											.87
BEECH							.242	.258	.057								.56
[CONIFERS]																	
SHORTLEAF PINE		.040															.05
LOBLOLLY PINE		.637	.327	.114	.022												1.10

Figure 7 — Sample Harvest Summary Simulation Report (cont.)

Quick Summary

Quick Summary provides a synopsis of stand conditions. Volumes, values, and other stand parameters are tabulated by cut/leave status and species group (Screen 20). Quick Summary is useful for examining the feasibility of a marking scheme. Using Quick Summary in conjunction with Auto Tree Marker and Uncut The Trees is an easy way to rapidly preview the merits of alternative marking schemes.

Next- Advances the screen display to the next occupied species group. After displaying up to 15 groups, the initial screen is repeated.

G-total- Displays volume and value information for all species groups combined.

Print- Generates a printed report summarizing values for all occupied species groups plus the grand total (Figure 8).

```
                           QUICK SUMMARY                   HARVEST #1

SPECIES GROUP  GRAND TOTAL OF ALL SPECIES GROUPS

PRODUCT                 CUT          LEAVE           TOTAL
BASAL AREA(sqft)       31.88        105.64          137.45
NUMBER OF STEMS       132.15        174.30          306.45
AVERAGE DBH (in)        6.64         10.54            9.07
MAST (lb)                .00        127.23          127.23
AVERAGE GRADE           5.00          1.99            2.30
SIZE CLASS            POLETIM       SAWTIMB         SAWTIMB

SAWTIMBER  MBF          1.08          9.23           10.31
PULPWOOD   CORD         2.50          5.47            7.97
TOPWOOD    CORD          .38          2.83            3.22
CROWNWOOD  CORD         3.08          8.92           12.00

SAWTIMBER $VALUE        5.42        840.46          845.88
PULPWOOD $VALUE         9.98         39.53           49.51
TOPWOOD $VALUE          1.54         12.85           14.38
CROWNWOOD $VALUE         .08           .00             .08
TOTAL $VALUE           16.95        892.83          909.78

         Return    Next    G-Total   Print    Help
```

Screen 20 - Quick Summary

SPECIES GROUP: 1 HIGH VALUE HDWD

PRODUCT	CUT	LEAVE	TOTAL
BASAL AREA(sqft)	.00	37.47	37.47
NUMBER OF STEMS	.00	52.29	52.29
AVERAGE DBH (in)	.00	11.46	11.46
MAST (lb)	.00	92.09	92.09
AVERAGE GRADE	.00	1.80	1.80
SAWTIMBER MBF	.00	3.16	3.16
PULPWOOD CORD	.00	1.32	1.32
TOPWOOD CORD	.00	1.14	1.14
CROWNWOOD CORD	.00	3.61	3.61
SAWTIMBER $VALUE	.00	499.74	499.74
PULPWOOD $VALUE	.00	5.27	5.27
TOPWOOD $VALUE	.00	4.56	4.56
CROWNWOOD $VALUE	.00	.00	.00
TOTAL $VALUE	.00	509.57	509.57

SPECIES GROUP: 2 LOW VALUE HDWD

PRODUCT	CUT	LEAVE	TOTAL
BASAL AREA(sqft)	31.80	39.17	70.97
NUMBER OF STEMS	132.14	31.75	163.90
AVERAGE DBH (in)	6.64	15.04	8.91
MAST (lb)	.00	35.14	35.14
AVERAGE GRADE	5.00	1.95	2.50
SAWTIMBER MBF	1.09	4.92	6.01
PULPWOOD CORD	2.50	.00	2.50
TOPWOOD CORD	.38	1.39	1.77
CROWNWOOD CORD	3.08	3.84	6.92
SAWTIMBER $VALUE	5.43	259.60	265.03
PULPWOOD $VALUE	9.98	.00	9.98
TOPWOOD $VALUE	1.54	5.56	7.09
CROWNWOOD $VALUE	.00	.00	.00
TOTAL $VALUE	16.95	265.15	282.10

SPECIES GROUP: 3 CONIFERS

PRODUCT	CUT	LEAVE	TOTAL
BASAL AREA(sqft)	.00	25.41	25.41
NUMBER OF STEMS	.00	44.20	44.20
AVERAGE DBH (in)	.00	10.27	10.27
MAST (lb)	.00	.00	.00
AVERAGE GRADE	.00	2.65	2.65

Figure 8 -Sample Cut/leave By Species Group Summary Report

PRODUCT		CUT	LEAVE	TOTAL
SAWTIMBER	MBF	.00	1.15	1.15
PULPWOOD	CORD	.00	3.81	3.81
TOPWOOD	CORD	.00	.30	.30
CROWNWOOD	CORD	.00	1.34	1.34
SAWTIMBER $VALUE		.00	81.38	81.38
PULPWOOD $VALUE		.00	34.26	34.26
TOPWOOD $VALUE		.00	2.73	2.73
CROWNWOOD $VALUE		.00	.00	.00
TOTAL $VALUE		.00	118.37	118.37

SPECIES GROUP: 4 NON COMMERCIAL

PRODUCT		CUT	LEAVE	TOTAL
BASAL AREA(sqft)		.00	3.61	3.61
NUMBER OF STEMS		.00	46.06	46.06
AVERAGE DBH (in)		.00	3.79	3.79
MAST (lb)		.00	.00	.00
SAWTIMBER	MBF	.00	.00	.00
PULPWOOD	CORD	.00	.35	.35
TOPWOOD	CORD	.00	.00	.00
CROWNWOOD	CORD	.00	.14	.14
SAWTIMBER $VALUE		.00	.00	.00
PULPWOOD $VALUE		.00	.00	.00
TOPWOOD $VALUE		.00	.00	.00
CROWNWOOD $VALUE		.00	.00	.00
TOTAL $VALUE		.00	.00	.00

SPECIES GROUP: GRAND TOTAL OF ALL SPECIES GROUPS

PRODUCT		CUT	LEAVE	TOTAL
BASAL AREA(sqft)		31.80	105.66	137.46
NUMBER OF STEMS		132.14	174.31	306.45
AVERAGE DBH (in)		6.64	10.54	9.07
MAST (lb)		.00	127.23	127.23
AVERAGE GRADE		5.00	1.99	2.30
SIZE CLASS		POLETIM	SAWTIMB	SAWTIMB
SAWTIMBER	MBF	1.09	9.23	10.32
PULPWOOD	CORD	2.50	5.47	7.97
TOPWOOD	CORD	.38	2.83	3.22
CROWNWOOD	CORD	3.08	8.92	12.00
SAWTIMBER $VALUE		5.43	840.71	846.14
PULPWOOD $VALUE		9.98	39.53	49.51
TOPWOOD $VALUE		1.54	12.85	14.38
CROWNWOOD $VALUE		.00	.00	.00
TOTAL $VALUE		16.95	893.09	910.04

Figure 8 -Sample Cut/leave By Species Group Summary Report(cont.)

Uncut The Trees

This command simply moves all trees from Cut status to Leave status for the current harvest. Note, it does not affect harvests scheduled for previous years (Screen 21).

```
HARVEST # 1   PRODUCT Pulpwood    Number-of-stems /ACRE    to Leave= 320.00
                                  -DBH-
SPECIES    2     4     6     8     10    12    14    16    18    20
  BLO          10.00             10.00
  WHO                      10.00
  SWG    30.00 20.00 10.00
  YEP                      10.00 10.00
  HIC    20.00 10.00       10.00
  SHP                10.00 10.00       10.00
  DOG    40.00 20.00
  REM    20.00 10.00 10.00
  PER                10.00
  ASH                10.00       10.00
  LOP                10.00
  CHO
  SCO
  BEE

Return              Select-new-units   Product-page      Cut/leave-page
Down-up-page        Left-right-page    Manual-tree-mark  Auto-tree-marker
Tables-printed      Quick-summary      Uncut-the-trees   Help
```

Screen 21 - Uncut The Trees

Financial Analysis

YIELD-MS provides full capability to perform sophisticated analysis of investments (Screen 22). A cash flow stream may be constructed within the planning horizon time frame. This cash flow stream includes revenues estimated from scheduled harvests and any additional Harvest Expenses or Transactions which have been entered. The After Tax cash flow stream includes all effects due to federal income tax regulations (USDA 1989) including credits, depletion allowances, deductions, depreciation, and tax liabilities. Provisions in the Tax Reform Act of 1986 have been considered in the program design. Calculation of alternative minimum tax is not considered. The Before Tax cash flow stream ignores the effects of the federal income tax system. The cash flows may be printed out with the Report Cash Flows command. The cash flow streams may be used together with the specified discount and inflation rates to calculate Profitability measures. These measures are critical for assessing the desirability of one investment scenario versus another. The profitability analysis results may be printed out as a Financial Summary Report with the Report Profitability command.

You may use "nominal" (include inflation effects) or "real" (net of inflation) dollars for the analysis. Consistency among the various rates is imperative for proper results. For example, don't use a nominal interest rate together with cash flows that are expressed in real dollars.

```
                        *** FINANCIAL ANALYSIS ***


                  PLANNING HORIZON IS FROM 1992  TO  2012

MARGINAL FEDERAL TAX BRACKET=  28.0  %     CAPITAL GAINS TAX RATE  =  28.0  %

DISCOUNT RATE:    BEFORE TAX=  10.0  %      AFTER TAX=   7.2  %



Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)!
                        Return
                        Financial-parameters
                        Market-stumpage-price
                        Sale-of-tmbr-exp-as-%
                        Transactions
                        Profitability-report
                        Cash-flow-report
                        Help
```

Screen 22 - Financial Analysis Menu

Financial Parameters

Financial parameter data consist of planning horizon, tax rates,
and discount rates (Screen 23).


```
                        *** FINANCIAL ANALYSIS ***


                  PLANNING HORIZON IS FROM 1992  TO  2012

MARGINAL FEDERAL TAX BRACKET=  28.0  %     CAPITAL GAINS TAX RATE  =  28.0  %

DISCOUNT RATE:    BEFORE TAX=  10.0  %      AFTER TAX=   7.2  %



Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)!
                        Return
                        Financial-parameters
                        Market-stumpage-price
                        Sale-of-tmbr-exp-as-%
                        Transactions
                        Profitability-report
                        Cash-flow-report
                        Help
```

Screen 23 - Financial Parameter Data

Planning Horizon - enter the beginning and ending year window in
time for all profitability and cash flow calculations. The
beginning year is the reference year for all inflation projec-
tions.

Marginal Federal Tax Bracket- enter the average annual percent-
age rate at which additional income will be taxed. Due to the
progressive structure of income tax tables, the marginal rate is

always greater than the average rate.

Capital Tax Rate- enter the rate at which capital gains income (e.g., timber sale revenue, land sale proceeds) is taxed. Previous versions of YIELD-MS expressed this value as a proportion of the ordinary tax rate.

Discount Rate- enter the average annual percentage rate of interest for the best alternative investment opportunity over the planning horizon period. The before tax rate should be entered. The default for the After Tax Discount Rate is calculated as follows: [(1 - marginal tax bracket) X (discount rate)]. You may override this figure if desired.

Sale Of Timber Expenses as a Percentage

Some times it is convenient to express harvest expenses as a percentage of estimated timber revenues as in the case of a consultant's commission or fee. This module simply prompts for the percentage figure by harvest # (Screen 24).

```
       -EXPENSE FOR TIMBER SALES COMPUTED AS % OF HARVEST $VALUE-


 HARVEST #              YEAR          PERCENT

     1                  2000          10: %

     2                  2010          10  %
```

Screen 24 - Sale of Timber Expenses as a Percentage

39

Transactions

Transactions fall into one of eight tax treatment type categories (Screen 25). Transactions are specified to occur according to first year, last year, and the number of years within the time interval before repetition. For example, a repetition = 2 indicates a transaction to be <u>repeated every</u> two years within the time interval including the first and last year. Also specified is the amount in present dollars, the annual inflation rate, and an optional 25-character description field which may be used for further labeling. Transaction amounts are assumed to be in beginning-of-planning-horizon-year dollars with respect to inflation. Note that the ordinary deductible expense (#1) and non deductible expense (#4) categories can be used to accommodate Tax Reform 1986 rules changes concerning the deductibility of certain expenses. An investor must have Active Status (ie; material participation) in order to deduct all expenses in category #1. Passive investors may deduct some of these expenses using category #1 but the balance must be entered as non deductible expenses in category #4. The exact treatment of expenses and losses will vary by complex rules depending upon the circumstances involved. For example, passive losses cannot be used to offset active income or portfolio income. Closely held corporations are treated differently than individuals, etc. To follow is a description of the eight tax treatment categories and the interpretation of each category when YIELD-MS conducts the profitability analysis:

```
GENERAL TRANSACTION DATA - PLANNING HORIZON IS FROM 1992 TO 2012 - PAGE 1 of 1
 #      TYPE         F-YR L-YR REP $AMOUNT PER INF%        DESCRIPTION
 1 Ordinary-dedbl-exp  1992 2012  1     1.75 Acre  3 AD VALOREM TAXES
 2 PL-96-451-rfst-exp  1992 1992  1     8.00 Acre  2 TIMBER STAND IMPROVEMENT
 3 Tmbr-dpln-a-capexp  1992 1992  1   125.00 Acre  0 ADJUSTED TIMBER BASIS
 4 Income-ord-taxable  1992 2012  1     2.00 Acre  3 HUNTING LEASE INCOME
 5 Depreciable-asset   1992 C3 ACRS      4.50 Acre  4 BACKPACK SPRAYER
 6 Ordinary-dedbl-exp  1992 2012  1     1.50 Acre  4 ANNUAL MANAGEMENT FEE
 7 Land-dpln-a-capexp  2002 2002  1    35.00 Acre  3 BUILD PERMANENT ROAD




Return              Erase-transaction  Modify-transaction Ordinary-dedbl-exp
PL-96-451-rfst-exp  Tmbr-dpln-a-capexp Non-deductible-exp Land-dpln-a-capexp
Income-ord-taxable  Capgain-i-landsale Depreciable-asset  Help
Show-the-next-page
```

Screen 25 - Transactions

1. Ordinary Deductible Expenses   (e.g., cultural practices, property tax, management fee, casualty loss, rent, insurance) for Active Status investors are charged fully for the year incurred with tax refunds computed at the marginal tax rate. Note: Passive investor status restricts the deductibility of certain expenses.

2. PL-96-451 Reforestation Expenses which qualify for Packwood Amendment PL-96-451 treatment, (e.g., site prep, planting, regeneration) are charged fully for the year incurred but receive a 10-percent investment tax credit and a 7-year amortization recovery schedule. A maximum of $10,000 annually of reforestation expenses can be claimed in this category. If the amount will exceed 10,000 and it is not possible to divide the activity amount over multiple years, then the amount in excess should be placed in category #3, Capital Expense in Timber Depletion Account. A word of caution is needed here. Entering reforestation expenses as separate transactions for the same year is permitted, however it is the user's responsibility to ensure that the $10,000 limit is not exceeded. Likewise, the effect of inflation should be taken into account if a reforestation expense is scheduled to occur in a year other than the base year.

3. Timber Depletion Account Capital Expenses (e.g., timber basis, capital cost to timber) are charged fully for year incurred and accumulated over the planning horizon in an internal account. Tax refunds computed at the capital gains rate are realized for each simulated harvest by depleting the account according to the proportion of TOTAL BASAL AREA removed in harvest.

4. Non Deductible Expenses (e.g., interest, taxes, management expenses, etc.) may be non deductible under Passive Investor status. Non deductible expenses are charged fully for the year incurred but they receive no tax refund.

5. Land Depletion Account Capital Expenses (e.g., land basis, capital costs to land) are charged fully for the year incurred and accumulated in an account. Tax refunds computed at capital gains rate are realized only upon a Land Sale.

6. Income, Ordinary Taxable (e.g., hunting lease) is taxed as ordinary income.

7. Capital Gains Income from a Land Sale is taxed as capital gains.

8. Depreciable Asset expenses (e.g., equipment) must be labeled as 3, 5, 7, 10, 15, or 20 year property. Also, a depreciation method of either ACR (accelerated cost recovery) or SL (straight line) must be selected along with the cost of the equipment or other property. YIELD-MS handles Depreciable Assets by calculating the depreciation allowance for each year in the schedule and deducting the amount. YIELD-MS uses the new modified ACRS schedules.

Profitability Report

This command triggers a profitability analysis. The results are displayed on the monitor (Screen 26). The option then exists to print a full report. The report is composed of three sections. 1) Financial Parameter Data, 2) Financial Profitability Analysis, and 3) Financial Transactions.

```
                    ** PROFITABILITY PER ACRE    **
                 PLANNING HORIZON IS FROM 1992  TO   2012

MARGINAL FEDERAL TAX BRACKET=  28.0 %     CAPITAL GAINS TAX RATE  =  28.0 %

DISCOUNT RATE:    BEFORE TAX= 10.0 %        AFTER TAX=   7.2 %

                                    (ADJUSTED FOR INFLATION)
                                 BEFORE TAX           AFTER TAX

NET PRESENT WORTH              $   215.96        $   304.18
 INTERNAL RATE OF RETURN           15.0 %            13.4 %
 COMPOSITE RATE OF RETURN          13.6 %             9.8 %
 ANNUAL EQUIVALENT VALUE       $    25.37        $    29.16
 DISCOUNTED BENEFIT/COST RATIO       1.9               1.6
 SOIL EXPECTATION VALUE        $   253.66        $   405.01


Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or, Type The First Character of The Desired Command (in CAPS)!
        Return     Print      Help
```

Screen 26 – Profitability Analysis Summary

The profitability analysis consists of calculations for the following measures on both a <u>before</u> and <u>after</u> tax basis:

Net Present Worth: Revenues discounted to present year less costs discounted to present year. A value greater than zero indicates that at least the discount rate is being earned on the project.

Internal Rate of Return: The interest rate at which discounted revenues equal discounted costs. It assumes that all intermediate revenues (i.e., thinning revenue, tax savings, etc.) are reinvested into the project. The project is considered profitable if the Internal Rate of Return exceeds the discount rate.

Composite Rate of Return: The rate of return assuming that all intermediate revenues are reinvested at the specified discount rate. Some view this as a more realistic measure of performance than IRR since not all investors have the option to reinvest intermediate cash flows back into a similar project as is assumed by the IRR.

Annual Equivalent Value: Net Present Value expressed as an annuity over the planning horizon, computed at the discount rate. This is a useful measure for comparing investments of unequal length. For example AEV might be useful to compare forestry investments (periodic) to agriculture (annual).

Discounted Benefit/Cost Ratio: Revenues discounted to present year divided by costs discounted to present year. The project is profitable if the value is greater than one. This value is commonly used for ranking public projects.

Soil Expectation Value: Present Net Value of perpetual repetitions of the investment described in the planning horizon window. This value is useful for comparing investments of unequal length and for determining bare land value.

The Financial Transactions are computed and reported in chronological order on a per acre basis. Harvest revenues are computed and spliced into the report at the appropriate years (Figure 9). The Figure 9 example shows a regime consisting of 10 years of growth, a thinning in 2002, followed by 10 more years of simulated growth, ending with a clearcut in 2012.

FINANCIAL PARAMETER DATA

PLANNING HORIZON IS FROM 1992 TO 2012

MARGINAL FEDERAL TAX BRACKET= 28.0 %   CAPITAL GAINS TAX RATE = 28.0 %

DISCOUNT RATE: BEFORE TAX= 10.0 %   AFTER TAX= 7.2 %

FINANCIAL PROFITABILITY ANALYSIS PER ACRE
(ADJUSTED FOR INFLATION)

	BEFORE TAX	AFTER TAX
NET PRESENT WORTH	$ 216.03	$ 304.27
INTERNAL RATE OF RETURN	15.0 %	13.4 %
COMPOSITE RATE OF RETURN	13.6 %	9.8 %
ANNUAL EQUIVALENT VALUE	$ 25.38	$ 29.17
DISCOUNTED BENEFIT/COST RATIO	1.9	1.6
SOIL EXPECTATION VALUE	$ 253.75	$ 405.13

FINANCIAL TRANSACTIONS
(UNADJUSTED FOR INFLATION)

TYPE	FIRST YEAR	LAST YEAR	REPEAT EVERY	AMOUNT $	PER	INFLATION %	DESCRIPTION
ORDINARY DEDUCTIBLE EXPENSE	1992	2012	1	-1.75	ACRE	3	AD VALOREM TAXES
REFORESTATION EXPENSE >PL-96-451	1992	1992	1	-8.00	ACRE	2	TIMBER STAND IMPROVEMENT
CAPITAL EXPENSE TIMBER DPLN ACC	1992	1992	1	-125.00	ACRE	0	ADJUSTED TIMBER BASIS
ORDINARY TAXABLE INCOME	1992	2012	1	2.00	ACRE	3	HUNTING LEASE INCOME
DEPRECIABLE CLASS 3 PROP. @ ACRS	1992	1992	1	-4.50	ACRE	4	BACKPACK SPRAYER
ORDINARY DEDUCTIBLE EXPENSE	1992	2012	1	-1.50	ACRE	4	ANNUAL MANAGEMENT FEE
CAPITAL EXPENSE LAND DPLN ACC	2002	2002	1	-35.00	ACRE	3	BUILD PERMANENT ROAD
CAPITAL GAINS HARVEST REVENUES	2002	2002	1	16.95	ACRE	*	FROM SIMULATED REMOVALS
HARVEST EXPENSE	2002	2002	1	-1.69	ACRE	*	COMPUTED AS 10 % OF HARVEST VALUE
CAPITAL GAINS HARVEST REVENUES	2012	2012	1	1259.37	ACRE	*	FROM SIMULATED REMOVALS
HARVEST EXPENSE	2012	2012	1	-125.94	ACRE	*	COMPUTED AS 10 % OF HARVEST VALUE

* -INFLATION RATE IS COMPUTED AS COMPOSITE OF SPECIFIED SAWTIMBER AND PULPWOOD INFLATION RATES ACCORDING TO PRODUCT MIX

--TOTAL NET CASH FLOW = $ 949.94 /ACRE   (INCLUDES ALL CASH TRANSACTIONS BEFORE TAXES WITHIN PLANNING HORIZON)

Figure 9 - Sample Financial Summary Report

Cash Flow Report

This command lists the estimated cash flows for the planning horizon time frame on the monitor (Screen 27). The cash flows do not reflect effects due to inflation as it would be meaningless to compare dollars of varying purchasing power from one period to the next. If the number of years in the planning horizon exceeds the capacity of the monitor then it is possible to Up-page or Dn-page in order to view the full report. A print-out may also be generated (Figure 10)

Screen 27 - Cash Flows Summary

CASHFLOWS BY YEAR REPORT

YEAR	BEFORE-TAX				AFTER-TAX			
	REVENUE	EXPENSE	NET	ACCUMULATED-NET	REVENUE	EXPENSE	NET	ACCUMULATED-NET
				-UNINFLATED DOLLARS PER ACRE -				
1992	2.00	140.75	-138.75	-138.75	4.28	141.31	-137.03	-137.03
1993	2.00	3.25	-1.25	-140.00	3.77	3.81	-.04	-137.07
1994	2.00	3.25	-1.25	-141.25	3.50	3.81	-.31	-137.38
1995	2.00	3.25	-1.25	-142.50	3.21	3.81	-.60	-137.98
etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.
2011	2.00	3.25	-1.25	-182.25	2.91	3.81	-.90	-167.23
2012	1261.37	129.19	1132.18	949.94	1324.44	482.37	842.07	674.84

Figure 10 - Cash Flow Summary Report

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Graph Analysis Results

By selecting the GENERATE command you can instruct YIELD-MS to output the results of simulations to special files (Screen 28). The files may then be translated into a spreadsheet program such as 123 via conversion to the DIF format. Then the data may be processed into a variety of graphs. The steps to follow are:

1. Operate YIELD-MS

2. Use GENERATE command to create files ending in the extensions .GR1, .GR2, .GR3

3. Operate TXTDIF to convert each file to .DIF format (Software Arts, 1980)

4. Operate spreadsheet such as Lotus 123, use the Translate utility (Columnwise) to create .WRK files readable by the spreadsheet.

5. Operate the graphics module of the spreadsheet program to produce the desired graphs

```
Three files are created in the specified path storing
ingredients for creating graphics with a separate package.
The file names default to the SST filename unless you override
it. The extensions GR1, GR2, and GR3 are appended on by
YIELD-MS for the three kinds of data stored. After exiting
YIELD-MS the data may be imported to a spreadsheet program
such as Lotus123 by converting to DIF -Data Interchage Format

Enter Path (e.g., C:\INFORM\)--->C:\INFORM\            <---

Enter Name Of The File To Create (No Extension)--->EXAMPLE <---




Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or, Type The First Character of The Desired Command (in CAPS)!



Return    Help     Generate
```

Screen 28 - Generate GR1, GR2, or GR3 File

Generate A GR1, GR2, or GR3 File

YIELD-MS supplies the name of the Tract file as a default, however you may override it. YIELD-MS will build three files on the same disk volume used for data. The extensions GR1, GR2 and GR3 are appended. Each file contains a single table. They are: GR1-BY YEAR, GR2-BY SPECIES and GR3-BY DBH CLASS. The GR1-BY YEAR table lists basal area, # stems, sawtimber, volume/wt, stand liquidation $ value, and accumulated net cash flow after taxes

without inflation effects. Each record represents a successive year of simulation through the maximum number of years simulated. These data are useful for plotting development over simulated time in the form of a line plotting. The GR2-BY SPECIES file lists volumes and value a species at a time. The volumes and values stored represent the "leave trees" present for the simulated year existing at the time the GENERATE command is accessed. The GR2-BY SPECIES file is useful for creating pie-chart graphs of volume and value by species. The GR3-BY DBH CLASS file expresses the same values as GR2-BY SPECIES except they are stored on a 2" diameter class basis. The GR3-BY DBH CLASS data type is useful for creating bar histograms for the various data attributes over dbh class (See Appendix).

Note, as a YIELD-MS progresses through growth projections and/or harvest simulations, it is possible to access the GENERATE graph file command as many times as desired. The effect is to take a "snapshot" of stand conditions ("leave" trees only) each time the command is executed. Of course, it is necessary to use a different file name for each execution. For example, it may be useful to use a filename which contains the number for the currently simulated year.

TXTDIF Utility Operation

This utility is the link between YIELD-MS and commercial graphics programs (Screen 29). Its sole purpose is to convert the format of GR_ files into DIF (Data Interchange Format) format. Spreadsheet programs such as Lotus 123 have a Translate Utility which can directly input DIF files. Access TXTDIF from the INFORM menu or from DOS.

```
C:\YIELDMS>TXTDIF
INPUT_FILE: EXAMPLE.GR1
OUTPUT_FILE: GRAPH1.DIF

C:\YIELDMS>
```

Screen 29 — TXTDIF Utility

The syntax is:

Text to DIF File Conversion – Version 1.0

INPUT FILE: inputfile.ext
OUTPUT FILE: outputfile.ext

Note: for LOTUS or SYMPHONY, use "DIF" for output file extension.

After converting the YIELD-MS generated GR@ files to DIF format, the Translate utility of the spreadsheet-graphing package can then be used to convert to the appropriate format to make graphs. Lotus 123 is by no means the only commercial graphics software that can be used. Many packages have provisions for accepting data from ASCII files like the .GR@ files created by YIELD-MS.

The graphs in Figure 11 were generated from the EXAMPLE file in conjunction with Lotus 123, Freelance and a HP Laser Jet III printer.
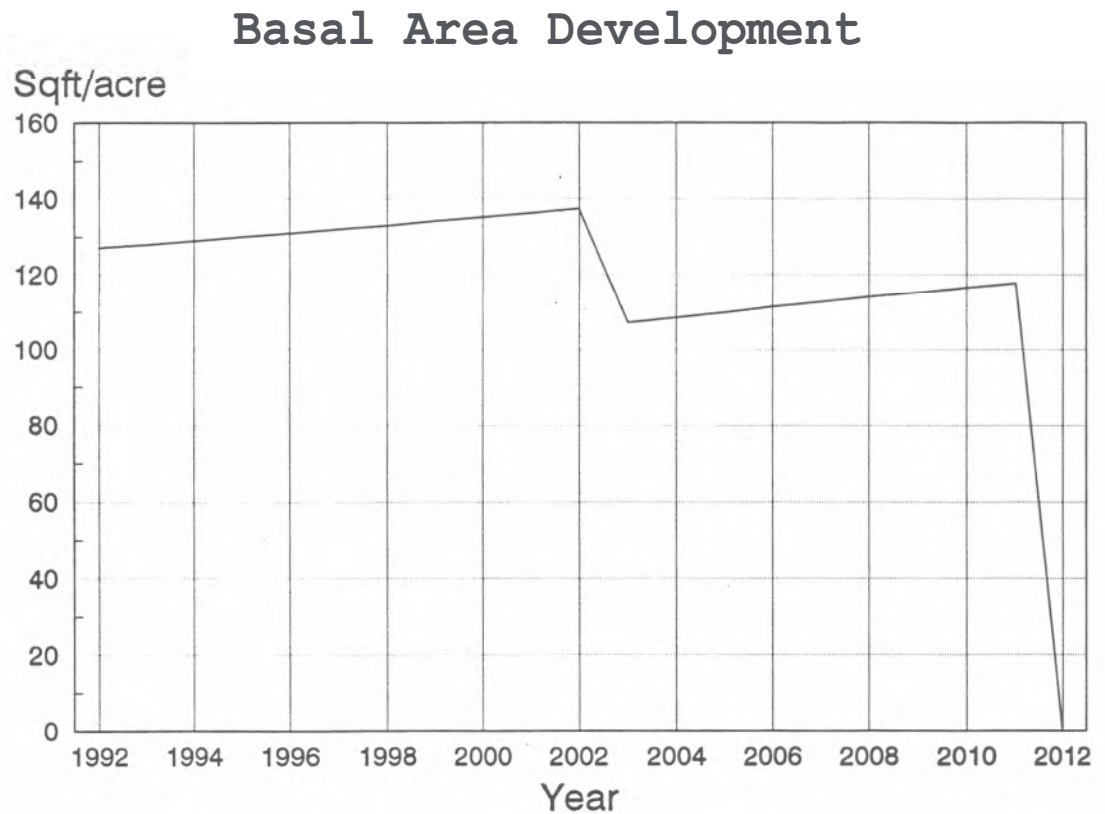
Figure 11 – Assorted Graphs from Lotus 123 and Freelance
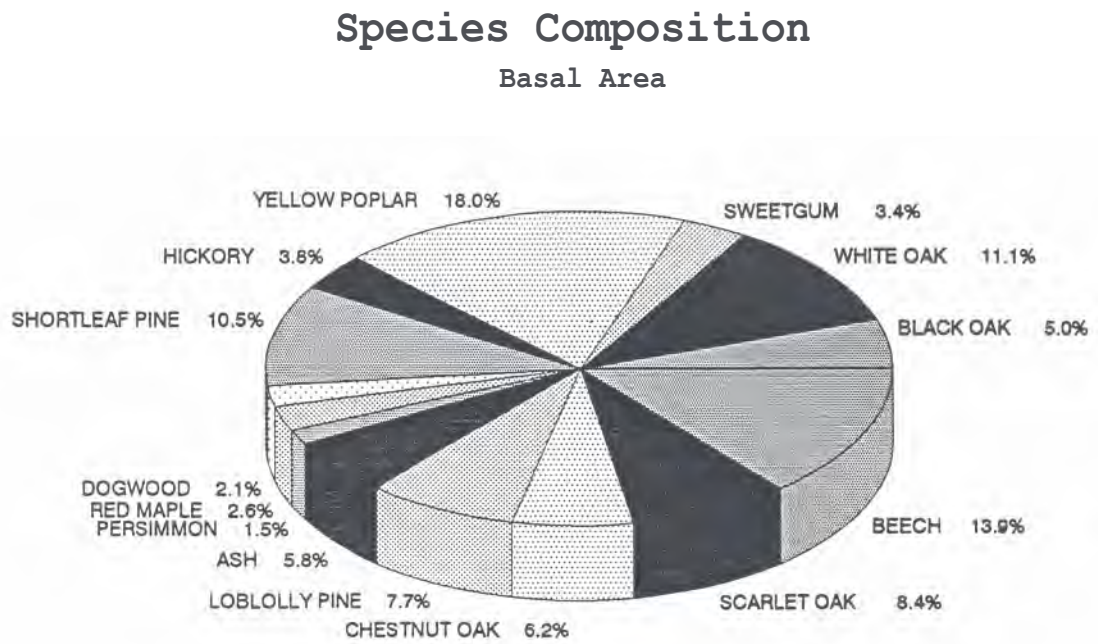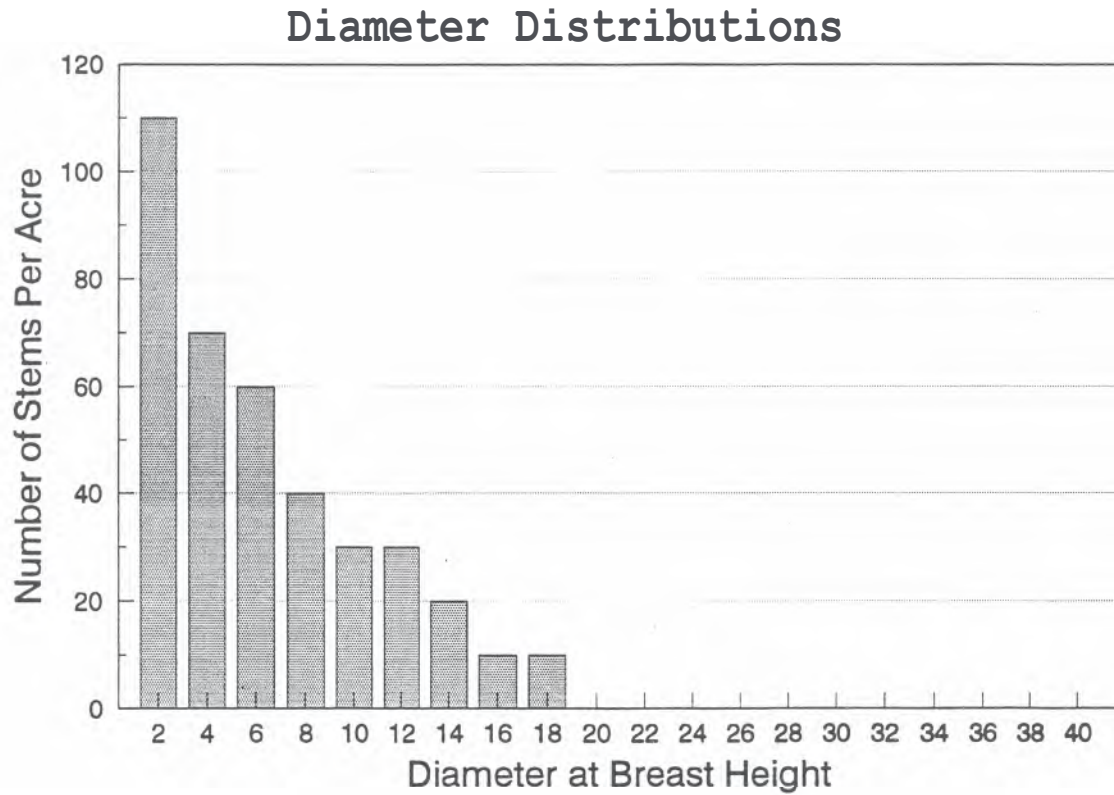
Diameter Distributions

Species Composition
Basal Area

Figure 11 - Assorted Graphs from Lotus 123 and Freelance

Sawtimber Distribution by Tree Grade

MBF per Acre (y-axis, 0 to 2.5)

Diameter at Breast Height (x-axis, 2 to 40)

■ Grade 1 ▦ Grade 2 ▦ Grade 3 ▦ Grade 4 ▦ Grade 5

Accumulated Net Cash Flow

Thousands of Dollars Per Acre (y-axis, (500) to 2,000)

Year (x-axis, 1992 to 2012)
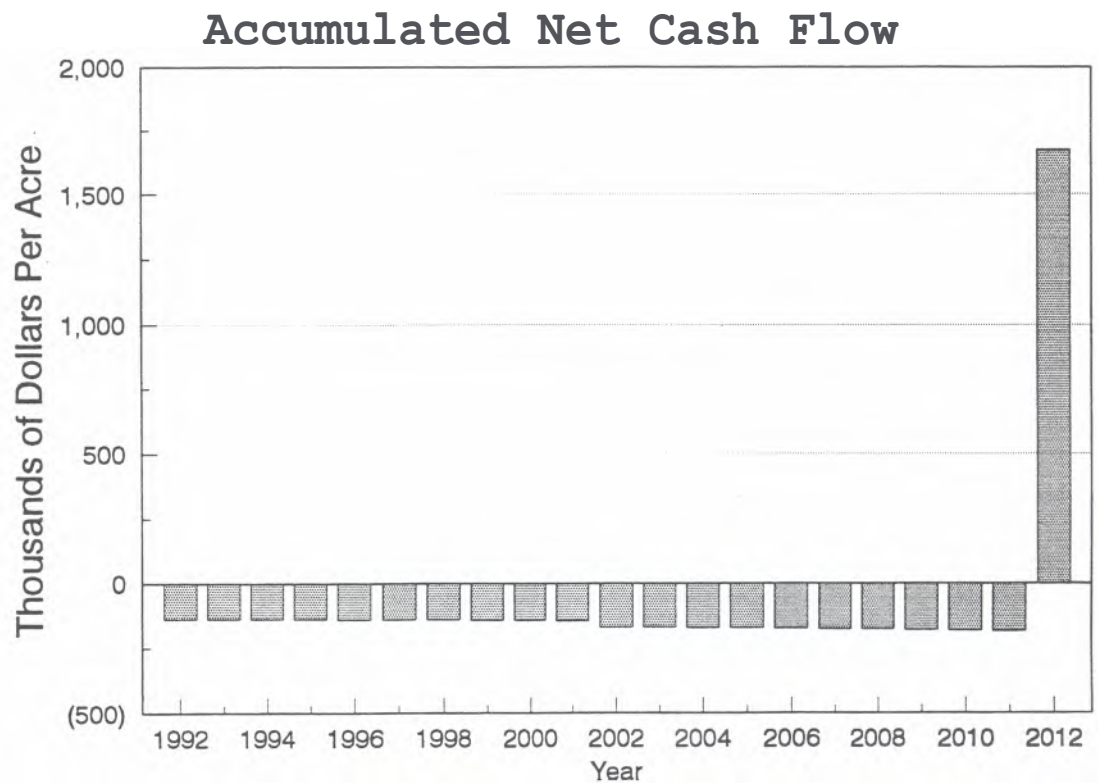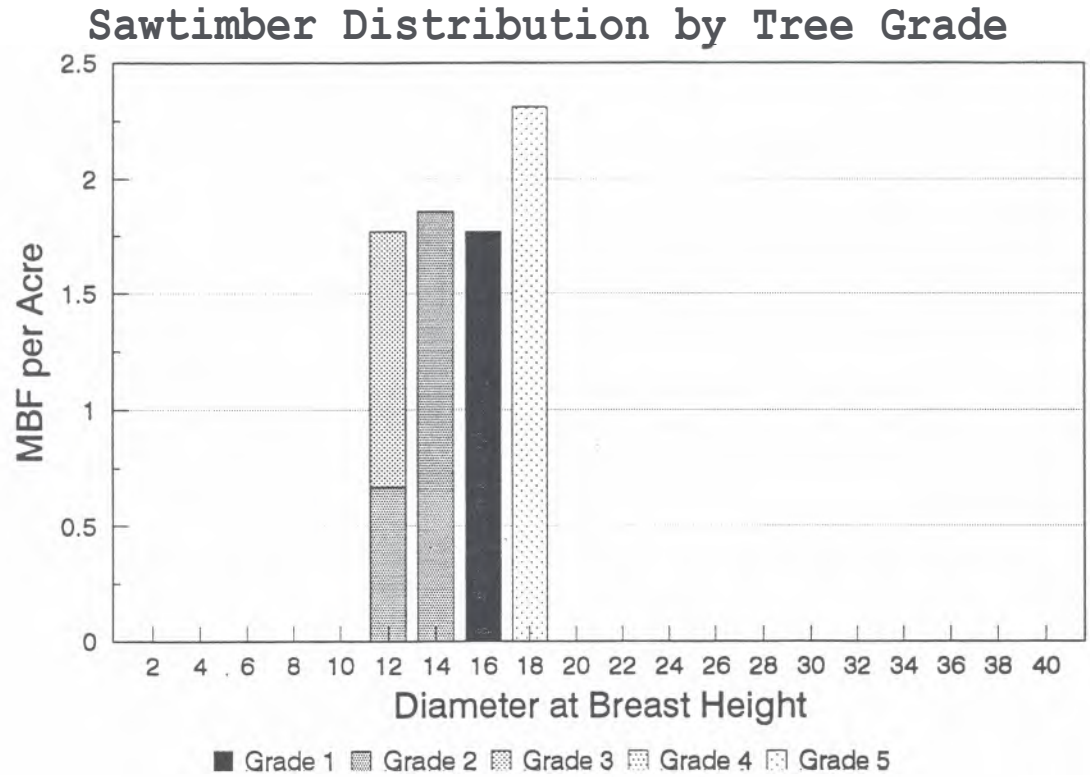
Figure 11 - Assorted Graphs from Lotus 123 and Freelance

Quit Module

Quick exit from YIELD-MS is always possible by typing ctl-C. However, data is not saved. This is fine as long as you have no data that you wish saved. The original "SST" file is unaffected by a ctl-C exit. When exiting YIELD-MS it is recommended that you access the QUIT module (Screen 30). The QUIT module allows you to save your data from the session back to the "SST" file initially loaded at the beginning of the session. This way you can begin a simulation session, terminate it, and resume it at a later time without losing any keystrokes. The original stand table is always preserved. Stand tables altered through a growth or harvest simulation are appended on to the file in addition to the original stand table. If you elect to simply EXIT TO DOS then YIELD-MS related data from the current session is not saved, however the printer configuration, reference year, and other miscellaneous data are saved regardless.

```
                    *** QUIT MODULE ***



Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)?

                Return to main menu
                Save data to file
                Both save data and exit to DOS
                Exit to DOS (no data saved)
```
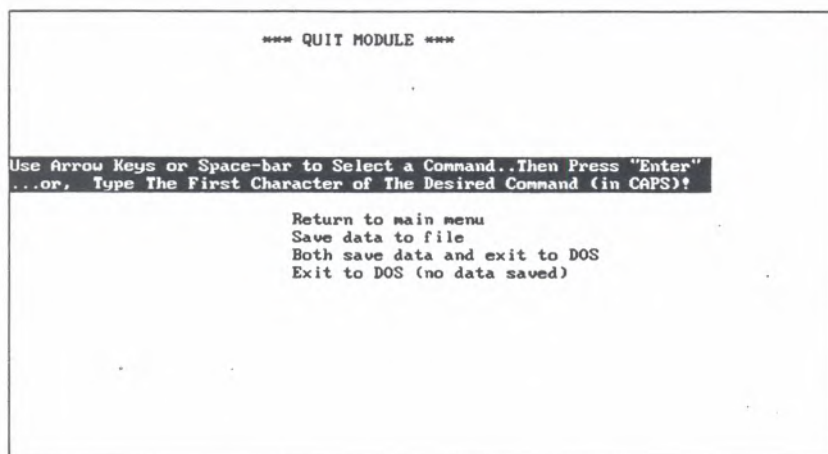
Screen 30 - Quit module

Help Screens

The space-bar menu has a HELP command available for nearly every screen in the system. By selecting HELP you instruct YIELD-MS to list to the screen stored information about the currently accessed menu. Some HELP screens contain more than one page of information. In order to move to subsequent pages, simply select the MORE-HELP command. Control is returned to the prior menu when you press Enter. The help screens are stored in file HELP.HLP.

Printer Operations

A common menu is used just prior to the printing of any YIELD-MS
reports. It (Screen 31) permits you to proceed to print assuming
you have a printer and it is properly connected, configured, and
on-line.

```
                        * PRINTER CHECK *

MAKE CERTAIN THAT PRINTER IS ON-LINE, PROPERLY CONFIGURED, AND
SET TO TOP-OF-FORM BEFORE PROCEEDING TO PRINT.


User Arrow Keys or Space-bar to Select a Command.Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)!


       Print-now Configure   File     Help     Abort


CONFIGURE PRINTER...ENTER # OF CODES IN CONTROL SEQUENCE  (X)>  2
CONFIGURE PRINTER...ENTER DECIMAL CODE #1  (XXX)>   27
CONFIGURE PRINTER...ENTER DECIMAL CODE #2  (XXX)> : 15:
```

Screen 31 - Printer Operations

YIELD-MS summary reports require 132 character/line output. The
printer must be configured accordingly (i.e., 9" wide **paper**
requires a pitch of 16.5 CPI). If printer options are not con-
trolled by manual switches and/or you wish to configure **the**
printer directly from YIELD-MS, then select the Configure com-
mand. Most printers can be configured by a sequence of codes.
The Configure command prompts for the number of codes comprising
a sequence and then accepts each code individually. Enter the
Decimal representation of each code (See table in your printer
user manual).

For example, an IBM ProPrinter would be configured by:

Number of codes = 2
code # 1 = 027   (decimal for ESCape)
code # 2 = 015   (decimal for *)

An HP Laserjet III would be configured by:

Number of codes = 5
code # 1 = 027
code # 2 = 038
code # 3 = 107
code # 4 = 050
code # 5 = 083

Before proceeding be sure the printer is on-line. After success-
fully configuring the printer and exiting YIELD-MS, the printer
will automatically be configured with the same code sequence on
future executions of YIELD-MS. Thus it is unnecessary to recon-
figure the printer unless a different type of printer is substi-
tuted.

Abort allows you to cancel the print-out before it begins and
return to the prior menu screen.

Direct Report To ASCII File

This option is useful when integration of reports into other
documents is anticipated or if you don't have a printer. Specify
the name of the file without an extension. The extension TXT is
automatically tacked on. YIELD-MS checks if the file already
exists and gives you the option to replace the existing file
 (Screen 32).

```
The report can be directed to an ASCII file.  The
filename defaults to the name used for the Scenario unless you
override it. The extension TXT is automatically tacked onto
the name.  If you use an existing filename, the old file
will be replaced.


Enter Path (e.g., C:\YIELD\) --->C:\INFORM3                <---

Enter Name Of The File To Create (No Extension)--->EXAMPLE <---
```

Screen 32 - Direct Reports To ASCII File

Volume and Area Units Selection

This module (Screen 33) allows you to designate the volume units
to be used for sawtimber and pulpwood throughout YIELD-MS. The
choices are CUNIT (unstacked 100 cuft), CORD (stacked 128 cuft),
TONGWT (tons green), TONDWT (tons dry), MBF (1000 board feet),
CMETER (cubic meter), MTNGRN (metric ton green), and MTNDRY
 (metric ton dry). Growth projection, harvest simulation, and
other reports reflect your selection. Area units may be set to
acres or hectares. If hectare is selected, then basal area
automatically is displayed in square meters instead of square
feet, site index is in meters instead of feet, and mast is in
kilograms instead of pounds.

```
SELECT VOLUME UNITS USED IN YIELD-MS REPORTS

SAWTIMBER VOLUME UNIT >  MBF

PULPWOOD VOLUME UNIT  >  CORD

          AREA UNIT >  ACRE


Press Space-Bar To Select Desired Item..Then Press Enter
```

Screen 33 - Volume Units Selection

Dead Trees Support

Consistent with other INFORM programs, YIELD-MS handles tree
species designated as dead in MASPEC.DAT (e.g., snags, dens) by
reporting them in stand tables but not in volume, basal area, or
weight estimates. During a growth projection, tree species
designated as dead remain stationary and do not influence growth
rates for living trees.

TIMSALE Operation

TIMSALE is a module used for generating a concise volume or value
report suitable for soliciting bids for the sale of timber.
TIMSALE reports volumes by species groups as columns and by dbh
classes as rows. The TIMSALE module can be used to preview
reports (Screen 34) on your monitor before printing. Note that
volumes for 3 species groups can be displayed per screen; the
Next_page command displays the next 3 occupied species groups, up
to a maximum of 5 pages comprised of 3 species groups per page.
The Down-up command toggles the display between the 2-20" dbh
classes and the 22-40" dbh classes. Totals displayed on the
monitor correspond only to the volumes visible on the monitor.
For example, the "Sawtim Total Trees" figure of 3000 in Screen 33
would not account for trees in dbh classes 22-40". However, the
Print command generates tables consisting of all species groups
and dbh classes (2-40") in a single report. This report may be
directed to a printer or to a file (Figure 12).

Dbh	HIGH VALUE HDWD		LOW VALUE HDWD		CONIFERS		No. Total Trees	Volume Total MBF	Topwood CORD
	No. Trees	Volume MBF	No. Trees	Volume MBF	No. Trees	Volume MBF			
2 in									
4 in									
6 in									
8 in									
10 in									
12 in			500	33.7	500	55.0	1000	88.7	61.0
14 in	1000	92.9					1000	92.9	181.2
16 in			500	88.5			500	88.5	55.8
18 in			500	115.5			500	115.5	81.1
20 in									
Total	1000	92.9	1500	237.7	500	55.0	3000	385.6	299.0

Topwood

Volume	CORD 101.2	CORD 179.6	CORD 18.2	Logrule = VARIABLE

Return	Next_page	Down-up	Sawtim/pulpwd	Acre/stand	Volume/$value
Leave/cut/all	Topwood	Crownwood	Print	Help	

Screen 34 — TIMSALE

Other TIMSALE commands include:

Sawtim/pulpwd: toggles between display of sawtimber trees or pulpwood trees. The volume units used in the body of the table are unique to each species group as specified in the Edit Parameter Data / Market Stumpage Prices module accessed from the main menu. The unit used for the total volume (value) column on the right side of the report is controlled by the Volume Units Selection module accessed from the main menu. It is possible therefore, to express a mixture of volume units by group within the body of the report. However, the total volume (value) column on the right side of the report will use a single volume unit to reflect the equivalent volume of all the trees.

Acre/stand: toggles between volumes expressed per acre (hectare) to a per stand basis.

Volume/$-value: toggles between volume estimates and dollar value estimates. Stumpage prices used to calculate value can be edited in the Edit Parameter Data / Market Stumpage Prices module accessed from the main menu. Likewise, this module can be used to change the species groups. Species groups and stumpage prices also can be changed using INFORM-ED prior to YIELD-MS operation; the Setup is imported using the Market Stumpage Prices, Import command.

Leave/cut/all: toggles between the reporting of trees tagged Leave, trees tagged Cut, or trees tagged both Leave and Cut.

Topwood: toggles the display of topwood for sawtimber trees.

Crownwood: toggles the display of crownwood for sawtimber or pulpwood trees.

The volume units used for expressing topwood and/or crownwood can be edited using the conventions described above.

Volume per Stand   for All   Sawtimber trees
Stand Name: [EXAMPLE   ]   ACRE > 50.0

| Dbh | HIGH VALUE HDWD | | LOW VALUE HDWD | | CONIFERS | | No. Total Trees | *Volume Total MBF | Topwood CORD |
	No. Trees	Volume MBF	No. Trees	Volume MBF	No. Trees	Volume MBF			
2 in									
4 in									
6 in									
8 in									
10 in									
12 in			500	33.7	500	55.0	1000	88.7	61.0
14 in	1000	92.9					1000	92.9	101.2
16 in			500	88.5			500	88.5	55.8
18 in			500	115.5			500	115.5	81.1
20 in									
22 in									
24 in									
26 in									
28 in									
30 in									
32 in									
34 in									
36 in									
38 in									
40 in									
Total	1000	92.9	1500	237.7	500	55.0	3000	385.6	299.0

* Includes all trees regardless of volume unit displayed in body of table.

Topwood

	CORD		CORD		CORD	
Volume	101.2		179.6		18.2	

Figure 12 _ Sample TIMSALE Report For Sawtimber With Topwood

```
                        -SPECIES GROUP KEY-

"SPECIES GROUP NAME"    "SPECIES NAME"         "LOG RULE"   "FORM CLASS"

HIGH VALUE HDWD
                       BLACK OAK              INTERNAT         78
                       WHITE OAK              INTERNAT         78
                       PERSIMMON             INTERNAT         78
                       SCARLET OAK           INTERNAT         78


LOW VALUE HDWD

                       SWEETGUM              INTERNAT         78
                       YELLOW POPLAR         INTERNAT         78
                       HICKORY               INTERNAT         78
                       RED MAPLE             INTERNAT         78
                       ASH                   INTERNAT         78
                       CHESTNUT OAK          INTERNAT         78
                       BEECH                 INTERNAT         78


CONIFERS

                       SHORTLEAF PINE        INTERNAT         78
                       LOBLOLLY PINE         INTERNAT         78


NON COMMERCIAL

                       DOGWOOD               INTERNAT         78
```

Figure 12 – Sample TIMSALE Report

Print: allows you to produce a TIMSALE Report directly on your
printer or in a file. Unlike other YIELD-MS reports, TIMSALE
also supports landscape mode printing on standard or legal sized
paper. The three modes are:

Portrait- standard 8.5" x 11" [132 characters/line] **default**
Legal- landscape 8.5" x 14"   [256 characters/line]
Landscape- 8.5" x 11"   [192 characters/line]

Portrait mode requires that your printer be set for condensed
mode printing (like other YIELD-MS reports). Portrait mode is
the default. Legal mode is the maximum width possible and
requires 14" paper on a laserjet or a wide carriage dot matrix
printer. Landscape mode is an intermediate sized report which
requires that your laserjet printer be set for landscape printing
using standard 8.5" x 11" paper. YIELD-MS does not set your
printer for landscape modes. You must perform this task on your
printer control panel prior to printing. Landscape mode reports
on legal or standard paper have the advantage of allowing a
greater number of species groups to be printed across in a single
table.

Growth and Yield Simulator

YIELD-MS uses a standard, movement ratio algorithm for projecting the stand table (Husch, et al 1972). The ingredients for a growth and yield projection are the beginning stand table and local volume table (both supplied by TIPS), individual tree species diameter growth rates, survival probability rates, in-growth tree species designation, and optionally the probabilities for change in grade (Ernst and Marquis, 1979) according to the species, the threshold diameter class, and the initial grade (Figure 13). The stand table is stratified by pulpwood and sawtimber trees (optionally by five tree grade categories). Grade is strongly influenced by dbh. YIELD-MS will promote trees into better grade categories during growth projections. As trees are promoted to the next highest dbh class, they are compared with the minimum dbh required to move up in grade for the partic-ular species. If the minimum dbh requirement is met, a propor-tion are promoted while the remainder stay in the same grade. The minimum dbh requirement and proportions by grade and by species, are stored in the Master Species file. They can be modified.

Grading Tally Scheme
When grading is employed, pulpwood trees promoted into sawtimber through growth simulations are put in the default grade category (usually 3) unless tallied otherwise. Greater precision in growth projections can be achieved by tallying a tree grade for pulpwood trees as if they were of minimum sawtimber dbh. The TVAFIE and TIPS software will accommodate graded pulpwood trees and pass the results on to YIELD-MS via the "SST" file. A tally scheme for sawtimber could consist of using USFS hardwood sawtim-ber tree grades 1-3, use grade 4 for ties and structural sawtim-ber, and grade 5 for culls. Pulpwood trees could be assigned a grade 5 if they were cull or a grade 3 if otherwise. This scheme allows you to assess the quality of sub-merchantable growing stock and reflect the result in growth projections. Grade as-signments can only be made through TVAFIE.

YIELD-MS Stand Table Projection Algorithm
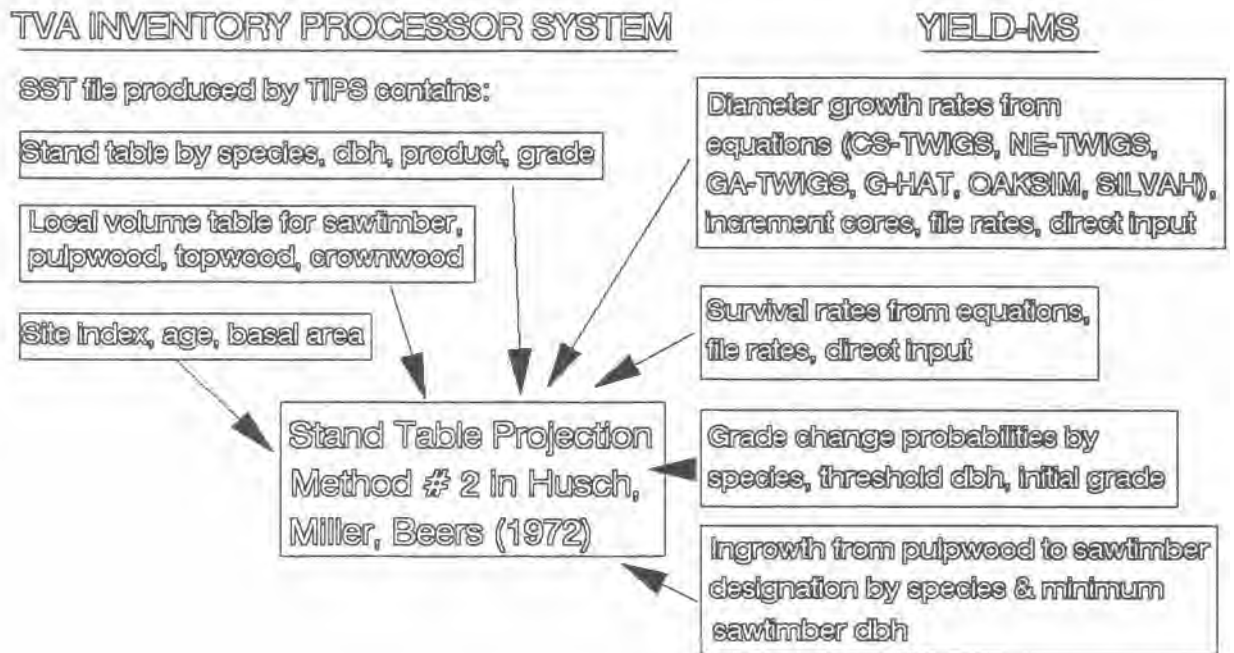
Figure 13 - Growth and Yield Algorithm

The local volume table is produced by TIPS. Cells in the table
storing average volume per tree information for which there are
no observations pose a dilemma for estimating future yields.
This is because trees are likely to be promoted by the algorithm
into larger dbh classes for which there are no volume per tree
observations from the inventory. An estimate of volume is re-
quired as a best substitute.

A technique was devised for estimating volumes for empty cells in
the local volume table which relies on regression summaries to
extrapolate.

The equation form used is:

$$\ln(V) = b0 + b1 \ln(D)$$

Where:

In = natural base e logarithm
V = volume or weight
b0, b1 = regression coefficients
D = dbh

This equation is fit during the "SST" file creation phase by the Inventory Processor to each species and product category in the local volume tables. The equation derived values are then used to fill in the empty cells of the local volume tables. In the case where only a few observations exist for a particular species, or where the slope coefficient (b1) shows decreasing volume (V) with increasing dbh (D), then a species pooled equation is used as a substitute for the species specific equivalent.

This method does not guarantee a smooth behavior for volume-by-dbh in the local volume table, but since cells which do contain observations from the inventory are not replaced with regression estimates, this method results in complete agreement between the inventory and the initial yield estimate prior to growth projections. This method also is attractive because it draws upon local volume information from the stand being analyzed as the ingredient for making extrapolations. This approach implies that the volume over dbh relationship in the stand remains constant through time.

Assumptions for Growth and Yield:

That the stand table projection algorithm projects the stand table reliably. This includes application of the dbh growth rates, survival rates, ingrowth trees designation, and grade change probabilities. Movement ratios are calculated to promote trees to larger dbh classes. Mortality is applied prior to each projection cycle. YIELD-MS is an unconstrained, individual tree, stand table projection model. It does not rely on iterative techniques to adjust growth with a stand level model. Diameter change is attributed to the growth model and number of trees reductions are attributed to the survival model. Therefore, basal area and volume estimates for the stand are influenced by both. It also is assumed that the volume over dbh relationship in the local volume table for the currently inventoried stand remains constant through time. This restricts the length of reliable projections for young, even-aged stands. It is not recommended that YIELD-MS be used for non-typical stand conditions.

Financial Calculations

The length of the planning horizon is defined from the beginning to the ending year specified. Although timber harvests and transactions may be specified to occur outside this time interval, the profitability analysis and total net cash flow calculations operate only within the planning horizon. The first step of analysis is to build cash flow streams separately for revenues

and expenses. The cash flow streams are also stratified for
before and after taxes. (USDA 1989). The before tax tables
ignore tax treatment categories for transactions and timber
harvest revenue. The effects due to inflation however are in-
cluded. The after tax tables also account for inflation but
additionally consider taxes, tax refunds, investment tax credits,
amortization schedules, etc., in accordance with the respective
tax treatment category (See page 40). Timber harvest revenue is
taxed at the capital gains rate.

After building the cash flow tables the profitability analysis
begins. Internal rate of return calculations are determined from
a bisection algorithm that converges on a root of the net present
worth function in the range of -50 percent to +200 percent.
Nonconvergence criteria are (a) a maximum of 100 iterations
through the algorithm and (b) a tolerance level of $.50. The
range for valid discounted benefit/cost ratio is -300 to +300.
Results that are out-of-range or otherwise invalid are reported
as nonapplicable (N/A).

In some cases, due to tax advantages of the Packwood amendment
(Reforestation Tax Incentive — Public Law 96-451), an after tax
analysis may show a higher rate of return or present net worth
than the before tax analysis of the same data. Also it is possi-
ble to produce seemingly contradicting results among the five
profitability measures, especially when comparing on a before and
after tax basis. Proper interpretation requires careful study of
the assumptions for each measure. Particular attention should be
paid to assumptions concerning reinvestment of intermediate
incomes and the effect of discount rates.

Assumptions for Financial Analysis:

It is assumed that all data used to perform financial analysis
are known with certainty. That is, variation between what is
predicted to occur and what actually occurs (ie; risk) is not and
cannot be accounted for by the program. This applies to growth
and yield projections used to estimate future volumes and thus
harvest revenues as well. Economic factors such as stumpage
prices coupled with inflation rates amount to forecasts of future
market conditions.

Amortization schedules, tax laws, etc. . . remain unchanged over
planning horizon.

Timber investment qualifying for reforestation tax depletion will
be held 10 years or more before sale.

For internal rate of return calculations, all intermediate in-
comes (ie; tax refunds, thinning revenues, etc.) are reinvested
at the calculated rate of return.

For present net worth calculation, all intermediate incomes are
reinvested at the discount rate.

For composite rate of return calculations, all intermediate incomes are reinvested at the discount rate.

Mast Calculations

An estimate of average hard mast yield (acorns only) in pounds/acre is provided in all growth projection reports. This information also is reported according to species, product, dbh, and cut/leave categories when simulating and reporting harvests. Mast production can be used as a Priority criteria in the Auto Tree Marker module for selecting trees to harvest. For example, YIELD-MS can mark a thin which removes the trees which contribute the least to mast production. The mast estimates are based on data published in the Forest Service Handbook. Williamson (1983) summarized tabular values in the form of equations which are used in YIELD-MS. Mast levels predicted by YIELD-MS should be inter-preted as average annual yields, unadjusted for soundness or seasonal fluctuations.

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ANNUAL EQUIVALENT VALUE -- Net Present Worth expressed as an annuity over the planning horizon, computed at the discount rate.

ANSI.SYS -- The PC-MS DOS supplied screen and keyboard control device driver. It is installed by placing the command DEVICE=ANSI.SYS into a second file called CONFIG.SYS. The driver is activated when the operating system is booted from the disk volume containing these two files.

BASAL AREA PER ACRE -- The sum of the cross-sectional areas in square feet of all trees within an acre measured four and one half feet above ground level.

BENEFIT COST RATIO -- Sum of all revenues discounted to present year divided by sum of all costs discounted to present year. The project is considered profitable if the value is greater than one.

BOOT TRACKS -- The portion of a diskette which stores the PC-MS DOS operating system. Boot tracks can be installed during the format phase of a new diskette by using the /S option.

CAPITAL GAINS TAX RATE -- The percent rate at which capital gains income (e.g.,timber sale revenues, land sale proceeds, etc.) are taxed.

CASH FLOW STREAM -- A time series of revenues and costs internally estimated by YIELD-MS for the purpose of calculating profitability measures within the planning horizon time period.

COMPOSITE RATE OF RETURN -- The rate of financial return assuming that all intermediate revenues are reinvested at the specified discount rate.

CONFIG.SYS -- The PC-MS DOS system configuration file. Each time DOS is started, it searches the root directory of the device for this file. If found, it reads the file and interprets the text commands within. (See PC-MS DOS Manual "Configuring Your System"). Set FILES=20 or more and DEVICE=ANSI.SYS for proper operation of YIELD-MS.

CURSOR -- The screen pointer, generally a blinking horizontal line or reverse video, single character rectangle.

DECIMAL CODE -- The numeric representation of device control codes used by YIELD-MS to communicate with terminals or printers.

DIF -- Data Interchange Format

DISCOUNT RATE -- The average annual percentage rate of interest for the best alternative investment opportunity over the planning horizon time period.

HARD DISK -- A disk storage device sometimes referred to as a fixed disk, hard drive, or Winchester drive. They typically have much greater storage capacity and faster access speed than floppy disk drives. Generally, the disk storage medium is not removable.

INFLATION RATE -- The average annual percentage rate of change to apply to a stumpage price or to a financial transaction. They can be "real" or "nominal" as long as consistency is maintained throughout the analysis.

INFORM -- Integrated Forest Management System is a menu shell for access to TVAFIE, TIPS, YIELD-MS, INFORM-ED, TIPSLIST, and TXTDIF.

INTERNAL RATE OF RETURN -- The percentage rate at which discounted revenues equal discounted costs. It is assumed that all intermediate revenues (i.e., thinning revenue, tax refunds, etc.) are reinvested into the project. The project is considered profitable if the IRR exceeds the discount rate.

LOCAL VOLUME TABLE -- The estimated average volume or weight per tree component delineated by species, dbh class, product and grade.

LOTUS 123 -- A popular spreadsheet program which also generates graphs.

MARGINAL FEDERAL TAX BRACKET -- The average annual percentage rate at which additional income is taxed. Due to the progressive structure of federal income tax tables, the marginal rate is always greater than the average rate.

MATH CHIP -- A co-processing chip which speeds math calculations on PC's. Includes 8087 series, 80287, and 80387. This chip is nearly imperative for productive operation of YIELD-MS.

NET PRESENT WORTH -- Sum of all revenues discounted to the present year minus the sum of all costs discounted to the present year. The project is considered profitable if the NPW is greater than zero.

NIPF -- Non Industrial Private Forest. Pertains to forest lands which are not in corporate or public ownership. This category of ownership comprises three fourths of the forested land base in the Southern region of the U.S.

PC-MS DOS -- The operating system designed by MicroSoft Corp. for controlling operations on the IBM PC and compatible machines. The YIELD-MS program requires use of release 2.0 or greater.

PERCENT STOCKING -- basal area per acre expressed as a proportion of that amount of basal area considered "normal" for the site

quality and age.

PLANNING HORIZON -- The time period defined by beginning and ending year for which all management activities for the ownership are to be planned. The beginning year is used as a reference for inflation rate data. Revenues and wood production resulting from timber harvests or other activities scheduled outside of the planning horizon time frame are not included in financial analyses.

PULPWOOD STUMPAGE PRICE -- The price per selected unit (cord, cunit, ton green weight, ton dry weight) of pulpwood in dollars relative to the beginning year of the planning horizon.

RAM -- Random Access Memory. The amount of internal memory available measured in units of KiloBytes (1024 standard characters). YIELD-MS may be operated on computers which have a minimum of 512 KB of installed RAM memory.

RAM DISK -- A pseudo disk where a portion of RAM is set aside to act as a storage device. RAM disks typically have very fast access speeds but store data only as long as the machine is on. They are particularly useful as scratch space for temporary work files.

SAWTIMBER STUMPAGE PRICE -- The price per selected unit (MBF, cord, cunit, ton green weight, ton dry weight) of sawtimber in dollars relative to the beginning year of the planning horizon.

SENSITIVITY ANALYSIS -- An iterative analysis where the magnitude and direction of change for response variables is compared against systematic changes made in an independent variable. For instance, one might analyze simulated changes in net present value in response to a range of discount rates.

SST -- stand stock table file created by the TIPS to store stand and stock table information. YIELD-MS appends information onto this file in order to save data from a session.

STAND -- is an aggregation of trees occupying a specific area and relatively uniform in species composition, age, and condition.

STAND/STOCK TABLE -- the stand table stores the frequency of trees delineated by species, dbh class, product and grade. The stock table is the product of the stand table multiplied by the local volume table.

TRANSACTION -- A category of financial input data referring typically to a management expense or revenue.

TREE GRADE -- quality assessment (1=best - 5=worst) for sawtimber trees. Tree grade is an indicator of suitability for wood products and thus highly correlated with dollar value.

TIPS -- TVA Inventory Processing System

TVAFIE -- TVA Forest Inventory Edit program for inputting and managing cruise field data

TXTDIF -- A utility for converting files from txt format to DIF format. DIF format generally is recognized by commercial spreadsheet and graphics software.

WRK --the extension given to worksheet files created by Lotus 123.

YIELDplus -- Timber Yield Forecasting and Planning Tool. YIELDplus is a microcomputer program which performs single stand, single strategy growth, yield and financial analysis.

APPENDICES

(A)   Directory of files in YIELD-MS system


```
ADIF      DAT
DFALTC    DAT
DFALTM    DAT
EXAMPLE   GR1
EXAMPLE   GR2
EXAMPLE   GR3
GATC      DAT
GATCR     DAT
GATD      DAT
GATDBH    DAT
GATM      DAT
GATMORT   DAT
HELP      HLP
MORTF     DAT
SETNAM    DAT
SETUP01   DAT
TRANS     DAT
USERID
YIELDMS   EXE
```

(B)   Format of the Master Species File MASPEC.DAT

The following list outlines the format (FORTRAN) for a single record. The INFORM-ED program can be used to edit the MASPEC.DAT file. MASPEC.DAT is a DAF, RECL=982

VARIABLE	COLUMNS	FORMAT
Species Code (SPC)	1 - 3	A3
Species Name	4 - 27	A24
Fast/Slow (FS)	28 - 28	A1
Pulpwood Equation System (P)	29 - 29	I1
TVA Coefficients	30 - 69	4F10.5
USFS Coefficients	70 - 229	20F8.5
Green lbs:Cuft Ratio (GWR)	230 - 237	F8.4
Dry lbs:Cuft Ratio (DWR)	238 - 245	F8.4
Cuft:Cord Equation (CDa, CDb)	246 - 261	2F8.4
Boardfoot Method (B)	262 - 262	I1
Girard Form Class (FC)	263 - 264	I2
USFS Crossover Dbh (CD)	265 - 266	I2
TVA Equation Form (E)	267 - 268	I2
Log Rule (LR)	269 - 270	I2
Dead Tree (DT)	271 - 272	I2
TVA Dbh Adjustment (DA)	273 - 274	I2
Dbh Growth Coefficients (Dcoeffs)	275 - 434	16F10.5
Survival Coefficients (Scoeffs)	435 - 594	16F10.5
Dbh Growth Codes (Dcodes)	595 - 610	8I2
Survival Rate Codes (Scodes)	611 - 626	8I2
Grade Change Prob.(G1D,P1-G5D,P5)	627 - 650	8I3
CSTWIGS Coefficients	651 - 830	18F10.5
Mast Lower & Upper Dbh Class	831 - 834	2I2
Mast Regression Coefficients	835 - 866	4F8.4
GATWIGS (USFS) Species Code	867 - 869	I3
Stand Type (GATWIG)	870 - 872	A3
NETWIGS Dbh and Survival Coeff.	873 - 962	9F10.5
TIMSALE Setup Groups	963 - 982	10I2

Important: The last record in the file must be for the miscellaneous "MSC" species code. All slots (for each author) must be filled for this record since it is used as a default.

(C)   Format of Stand/Stock Table Files "SST"

REC#   VARIABLE   COLUMNS   FORMAT
Header Record:
  1   hardwire the character "Q"   1 - 1   A1
  1   hardwire the character "N"   2 - 2   A1
  2   compartment name   1 - 24   A24
  2   stand name   25 - 48   A24
  2   acres   49 - 55   F7.1
  2   b0 & b1 fast growing cores   56 - 75   2F10.5
  2   b0 & b1 slow growing cores   76 - 95   2F10.5
  2   physiographic region code   96 - 96   I1
  2   forester name   97 - 120   A24
  3   date   1 - 6   A6
  3   log rule   7 - 7   A1
  3   number of species   8 - 9   I2
  3   sawtimber graded (Y/N)   10 - 10   A1
  3   Metric option (Y/N)   11 - 11   A1
  3   3 char species codes   12 - 101   30A3
  3   site index (50 year)   102 - 104   I3
  3   stand age   105 - 107   I3
  4   % error for SawBA, SawG1   1 - 50   10F5.1
        or Saw(all grades combined),
        SawG2, SawG3, SawG4, SawG5,
        SawStems, PulpBA, Pulpvol,
        PulpStems
  4   Cut/leave (Y/N)   51   A1

LOOP THRU SPECIES BY SPECIES FOR EACH SPECIES IN THE TRACT
FOR THE VARIABLES LISTED BELOW: BEGINNING IN RECORD # 5
Stand Table Records:
Sawtimber
        grade 1 # trees/acre   1 - 120   20F6.2
o │   grade 2 # trees/acre   1 - 120   20F6.2
p │   grade 3 # trees/acre   1 - 120   20F6.2
t │   grade 4 # trees/acre   1 - 120   20F6.2
   │   grade 5 # trees/acre   1 - 120   20F6.2

Pulpwood
        grade 1 # trees/acre   1 - 120   20F6.2
o │   grade 2 # trees/acre   1 - 120   20F6.2
p │   grade 3 # trees/acre   1 - 120   20F6.2
t │   grade 4 # trees/acre   1 - 120   20F6.2
   │   grade 5 # trees/acre   1 - 120   20F6.2

If Cut/Leave mode then: Report "Cut" Stand Table Records on
first pass then report the "leave" trees on second pass.

Local Volume Table Records:
        topwood   cuft/tree   1 - 120   20F6.1
        crownwood cuft/tree   1 - 120   20F6.1
        pulpwood cuft/tree   1 - 120   20F6.1
        sawtimber   bdft/tree   1 - 120   20F6.1
        sawtimber   cuft/tree   1 - 120   20F6.1

(D)   Format of Annual Diameter Growth Increments File ADIF.DAT

This sequential file may be edited with a text editor. The last record must be for the miscellaneous species code "MSC". The format (FORTRAN) for a single record is listed below. An unlimited number of records may be installed.

VARIABLE	COLUMNS	FORMAT
species code	1 - 3	A3
dbh growth rate(inches/year)		
2" dbh class	4 - 9	F6.2
4" dbh class	10 - 15	F6.2
.	.	.
.	.	.
.	.	.
40" dbh class	118 - 123	F6.2

(E)   Format of Survival Rates File MORTF.DAT

This sequential file may be edited with a text editor. The last
record must be for the miscellaneous species code "MSC". The
format (FORTRAN) for a single record is listed below. An
unlimited number of records may be installed.

VARIABLE	COLUMNS	FORMAT
species code	1 - 3	A3
% annual survival probability		
2" dbh class	4 - 9	F6.2
4" dbh class	10 - 15	F6.2
.	.	.
.	.	.
.	.	.
40" dbh class	118 - 123	F6.2

(F) Sample Graph Files

File EXAMPLE.GR1 (trends over time)

	BASAL-AREA	#-STEMS	SAWTIMBER	LIQ-$-VAL	ACH-NET-CASH
1992	127.19	380.00	7.71	583.28	-137.03
1993	128.12	371.68	7.96	615.28	-137.11
1994	129.09	363.60	8.20	647.30	-137.49
1995	130.08	355.75	8.44	679.41	-138.21
1996	131.09	348.12	8.69	711.67	-138.97
1997	132.12	340.70	8.95	744.12	-139.77
1998	133.17	333.48	9.21	776.78	-140.61
1999	134.23	326.46	9.47	809.67	-141.66
2000	135.30	319.61	9.75	842.81	-142.91
2001	136.37	312.95	10.03	876.18	-144.22
2002	137.44	306.45	10.31	909.78	-168.74
2003	107.11	171.83	9.52	929.98	-170.15
2004	108.55	169.39	9.81	967.07	-171.62
2005	109.97	166.99	10.10	1004.09	-173.16
2006	111.35	164.61	10.40	1041.02	-174.75
2007	112.71	162.26	10.69	1077.82	-176.42
2008	114.03	159.94	11.00	1114.47	-178.15
2009	115.33	157.64	11.30	1150.96	-179.96
2010	116.58	155.37	11.60	1187.25	-181.84
2011	117.81	153.13	11.91	1223.31	-183.80
2012	119.00	150.91	12.22	1259.12	1678.00

File EXAMPLE.GR2 (stand composition by species)

CODE	NAME		BA	#STEMS	LIQ$VAL	PULP	TOP	CROWN	GRADE1	GRADE2	GRADE3	GRADE4	GRADE5
BLO	"BLACK OAK	"	6.33	20.00	3.36	.84	.00	.27	.00	.00	.00	.00	.00
WHO	"WHITE OAK	"	14.18	20.00	163.81	.37	.79	1.44	.00	1.06	.00	.00	.00
SWG	"SWEETGUM	"	4.36	60.00	1.28	.32	.00	.19	.00	.00	.00	.00	.00
YEP	"YELLOW POPLAR	"	22.91	30.00	132.25	1.23	.86	1.61	1.77	.00	.00	.00	.00
HIC	"HICKORY	"	4.80	40.00	1.56	.39	.00	.19	.00	.00	.00	.00	.00
SHP	"SHORTLEAF PINE	"	13.31	30.00	28.97	3.22	.00	.55	.00	.00	.00	.00	.00
DOG	"DOGWOOD	"	2.62	60.00	.00	.14	.00	.07	.00	.00	.00	.00	.00
REM	"RED MAPLE	"	3.27	40.00	1.18	.29	.00	.27	.00	.00	.00	.00	.00
PER	"PERSIMMON	"	1.96	10.00	1.07	.27	.00	.15	.00	.00	.00	.00	.00
ASH	"ASH	"	7.42	20.00	3.19	.80	.00	.46	.00	.00	.00	.00	.00
LOP	"LOBLOLLY PINE	"	9.82	20.00	70.88	.25	.30	.73	.00	.00	1.10	.00	.00
CHO	"CHESTNUT OAK	"	7.85	10.00	36.50	.00	.70	.80	.00	.67	.00	.00	.00
SCO	"SCARLET OAK	"	10.69	10.00	122.80	.00	.81	2.02	.00	.80	.00	.00	.00
BEE	"BEECH	"	17.67	10.00	16.41	.00	1.21	2.17	.00	.00	.00	.00	2.31

File EXAMPLE.GR3 (stand composition over dbh)

DBH	BA	#STEMS	LIQ$VAL	PULP	TOP	CROWN	GRADE1	GRADE2	GRADE3	GRADE4	GRADE5
2	2.40	110.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4	6.11	70.00	1.59	.54	.00	.19	.00	.00	.00	.00	.00
6	11.78	60.00	8.83	1.44	.00	.90	.00	.00	.00	.00	.00
8	13.96	40.00	8.13	1.52	.00	.86	.00	.00	.00	.00	.00
10	16.36	30.00	8.71	2.18	.00	.91	.00	.00	.00	.00	.00
12	23.56	30.00	127.12	2.44	1.00	1.65	.00	.67	1.10	.00	.00
14	21.38	20.00	285.12	.00	1.61	3.19	.00	1.86	.00	.00	.00
16	13.96	10.00	127.34	.00	.86	1.06	1.77	.00	.00	.00	.00
18	17.67	10.00	16.41	.00	1.21	2.17	.00	.00	.00	.00	2.31
20	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
22	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
24	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
30	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
32	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
34	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
36	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
38	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
40	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

(G) Format of SETNAM.DAT File

SETNAM.DAT is a 10 record file which stores the names for the
SETUP01.DAT, SETUP02.DAT„..SETUP1O.DAT files.

This is a SEQ. file

VARIABLE	COLUMNS	FORMAT
Number	1 - 2	I2
Name	4 - 23	A20

(H)   Format of SETUP01.DAT - SETUP1O.DAT Files

These files store TIMSALE Setup data. They are DAF, RECL=82

VARIABLE	COLUMNS	FORMAT
group number (1-15)	1 - 2	I2
Group Name	3 - 17	A15
Sawtimber Unit (1=cunit, 2=cord, 3=tongwt, 4= tondwt, 5=mbf, 6=cmeter, 7=mtngrn, 8=mtndry)	18 - 18	I1
Pulpwood Unit (1=cunit, 2=cord, 3=tongwt, 4= tondwt, 6=cmeter, 7=mtngrn, 8=mtndry)	19 - 19	I1
Sawtimber Price/Unit (Ungraded, Grade 1 - 5)	20 - 61	6F7.2
Pulpwood Price/Unit (Pulpwood, Topwood, Crownwood)	62 - 82	3F7.2

June, 1992

A USER MANUAL FOR

INFORM-ED

INFORM Data File Editor Utility Program

Version 2.0

By

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Forest Resources Development
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DISCLAIMER

The INFORM-ED program has been carefully tested for operational reliability and to the best of our knowledge it contains no errors. However, neither TVA, nor FORS, nor the authors claim responsibility for its accuracy.

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INTRODUCTION

INFORM-ED (TVA **INFORM** Data File **ED**itor Program) is part of the INFORM software package developed by the Tennessee Valley Authority. INFORM-ED performs two main functions. They are to edit the master species file (MASPEC.DAT), and to edit TIMSALE (i.e., TIMber SALE) Setups. The file MASPEC.DAT is a storehouse of equations, conversion factors, and other critical data which is tapped by various INFORM programs during execution. By editing the contents of this file, you can customize INFORM to local standards. For example, you may wish to create a new species code or change the Girard form class used in volume calculations for a particular species. TIMSALE Setup is terminology for unique assignments of species groups to tree species which share the same stumpage prices and units for measuring volume. For example, you might assign all oak species into a group named OAK where all sawtimber volume estimates are converted to value using a common stumpage price per mbf. Your selections are stored as a TIMSALE Setup which can be recalled repeatedly by YIELD-MS, BATCH-YIELD-MS, or TIPS, thus saving you time.

TIMSALE Setups are stored in files named SETUP01.DAT, SETUP02.DAT SETUP1O.DAT. Up to 10 separate TIMSALE Setups are supported for a given INFORM installation. Each Setup can consist of a maximum of 15 separate species groups. Many users may find that one Setup is adequate. Preparing multiple TIMSALE Setups should prove useful to managers of large forest properties which span a variety of market conditions. Since TIMSALE Setups are optional when operating YIELD-MS, some users may not find it beneficial to use them at all. However, a TIMSALE Setup is mandatory for BATCH-YIELD-MS operation when value calculations are desired or for TIPS operation when the new "volume-by-log-heights" feature is accessed.

YIELD-MS can tap TIMSALE Setups via the following menu selections: Parameter Data, Market Stumpage Prices, Import (See YIELD-MS User Manual). Once the TIMSALE Setup is successfully imported, YIELD-MS will use the species groupings for TIMSALE Reports of volume or value. Failing to prepare TIMSALE Setups with INFORM-ED does not preclude defining species groups and entering stumpage prices within YIELD-MS. However, in lieu of a TIMSALE Setup to import, YIELD-MS will require that you manually enter this data for each session. BATCH-YIELD-MS relies solely on a specified TIMSALE Setup as a means for converting volume estimates to value (i.e., no value calculations are possible within BATCH-YIELD-MS unless a valid TIMSALE Setup has been created beforehand). BATCH-YIELD-MS can be directed to use a particular TIMSALE Setup by editing the options (i.e., "OPT") file TIMSALE Setup # (1-10) data item (See BATCH-YIELD-MS User Manual).

In summary, it is wise to take the time to organize your species into groups via a TIMSALE Setup. Later you can use it repeatedly in various INFORM programs

GETTING STARTED

Hardware/Software Requirements

The INFORM-ED program operates on PC/MS DOS compatible microcomputer systems. The program requires 172 KB of RAM net of the operating system and memory resident programs. INFORM-ED will operate on the PC/MS DOS 3.3 or greater operating systems. As with other programs in the INFORM system, this program requires the installation of the file ANSI.SYS via the CONFIG.SYS file for proper screen control. Consult the INFORM Manual for complete installation instructions.

Pointers

Although INFORM-ED supports the editing of both MASPEC.DAT and TIMSALE Setups, the functions are only superficially related. The MASPEC.DAT file stores the pool of species which potentially may be linked to a particular species group within a TIMSALE Setup. Otherwise, editing MASPEC.DAT versus preparing TIMSALE Setups can be approached as separate tasks.

The master species data file, MASPEC.DAT, contains a variety of species-specific data used by the TIPS, TVAFIE, YIELD-MS, and other INFORM programs. Each record (line) represents the data describing a single tree species. A record is 982 bytes (characters) long. Up to 100 separate records including "MSC" (miscellaneous) can be stored in MASPEC.DAT although most INFORM programs can use a maximum of-30 separate species at a time. Detailed descriptions of the uses for various MASPEC.DAT data items are given in the TIPS Technical Reference Manual and in the YIELD-MS User's Manual. Figure 1 describes the file format. You are strongly encouraged to familiarize yourself with the various items within this file before attempting to use the INFORM-ED program. Some changes to MASPEC.DAT, such as creating a new species code or changing the Girard form class are simple. Other changes, such as changing volume equation coefficients or growth and yield equations are more technical.

INFORM-ED is easy to use. The up, down, left, and right arrow keys, and the Tab keys can be used to navigate from one field to the next. To edit a field, you can use the Insert, Delete, Backspace, left arrow, and right arrow keys for assistance. Press Enter to accept the displayed value and advance to the next field. Error trapping is employed on all numeric fields. However, INFORM-ED cannot determine for example, if you install volume equation coefficients which cause TIPS to bomb due to some anomaly.

As a precaution against inadvertent modifications, erasures, or power failures, a backup of the master species file is automatically made each time you begin an editing session using INFORM-ED. The backup is stored in file MASPEC.BAK. If the need arises, use DOS COPY to replace MASPEC.DAT with MASPEC.BAK.

VARIABLE	COLUMNS	FORMAT
Species Code (SPC)	1 - 3	A3
Species Name	4 - 27	A24
Fast/Slow (FS)	28 - 28	A1
Pulpwood Equation System (P)	29 - 29	I1
TVA Coefficients	30 - 69	4F10.5
USFS Coefficients	70 - 229	20F8.5
Green lbs:Cuft Ratio (GWR)	230 - 237	F8.4
Dry lbs:Cuft Ratio (DWR)	238 - 245	F8.4
Cuft:Cord Equation (CDa, CDb)	246 - 261	2F8.4
Boardfoot Method (B)	262 - 262	I1
Girard Form Class (FC)	263 - 264	I2
USFS Crossover Dbh (CD)	265 - 266	I2
TVA Equation Form (E)	267 - 268	I2
Log Rule (LR)	269 - 270	I2
Dead Tree (DT)	271 - 272	I2
TVA Dbh Adjustment (DA)	273 - 274	I2
Dbh Growth Coefficients (Dcoeffs)	275 - 434	16F10.5
Survival Coefficients (Scoeffs)	435 - 594	16F10.5
Dbh Growth Codes (Dcodes)	595 - 610	8I2
Survival Rate Codes (Scodes)	611 - 626	8I2
Grade Change Prob.(G1D,P1-G5D,P5)	627 - 650	8I3
CSTWIGS Coefficients	651 - 830	18F10.5
Mast Lower & Upper Dbh Class	831 - 834	2I2
Mast Regression Coefficients	835 - 866	4F8.4
GATWIGS (USFS) Species Code	867 - 869	I3
Stand Type (GATWIG)	870 - 872	A3
NETWIGS Dbh and Survival Coeff.	873 - 962	9F10.5
TIMSALE Setup Groups	963 - 982	10I2

Figure 1 - Master Species File (MASPEC.DAT) Format

A total of 100 species may be included in the MASPEC.DAT file. The last species in the file will have the code "MSC" for miscellaneous. If TIPS or other INFORM programs encounter a species code not in the list, the volume coefficients, etc., for miscellaneous will be used by default. In order to save disk space and reduce execution time, you may want to consider deleting unnecessary species from the MASPEC.DAT file.

With certain options, you are prompted for a species code. You may terminate the action of some options and return to the option prompt by entering a blank (i.e., " ") as a species code.

3

If you are using the AUTOMENU driver program, start INFORM-ED by moving the marker to the INFORM-ED menu item and pressing the Return key (Screen 1). To run INFORM-ED directly from DOS, type **INFORMED**. Regardless of whether DOS or AUTOMENU is used, the screen will clear and the main menu will be displayed.

```
╔══════════════════════════════════════════════════════════╗
║  ▌<TVA INFORM 3> Integrated Forest Management System▐     ║
║                                            MENU 1 OF 2    ║
║        1 - Run TVAFIE (TVA Forest Inventory Editor)      ║
║                                                          ║
║        2 - Run TIPS (TVA Inventory Processing System)    ║
║                                                          ║
║        3 - Run YIELD-MS (Timber Planning Tool Mixed Stands)║
║                                                          ║
║     →▶ 4 - ▌Run INFORM-ED (Master Species File Editor)▐  ║
║                                                          ║
║        5 - Run BATCH-YIELD-MS                            ║
║                                                          ║
║        6 - Run LISTER (INFORM Reports Printing Utility)  ║
║                                                          ║
║        7 - Run SCAN (File Display Utility)               ║
║                                                          ║
║        8 - Disk Operating System                        ║
║          ▌Edit master species file or TIMSALE Setups.▐  ║
║ September 25, 1992  3:20:23 pm    NUM     CTRL    Memory: 404 K ║
║                    Press H for Help                      ║
╚══════════════════════════════════════════════════════════╝
```

Screen 1 - INFORM System Menu Screen

4

After initiating execution of INFORM-ED from the INFORM System Menu or by typing **INFORMED** from DOS, the program is loaded and the main menu (Screen 2) appears. It permits you to edit the master species file, prepare TIMSALE Setups, set the path, access DOS, and quit the program.
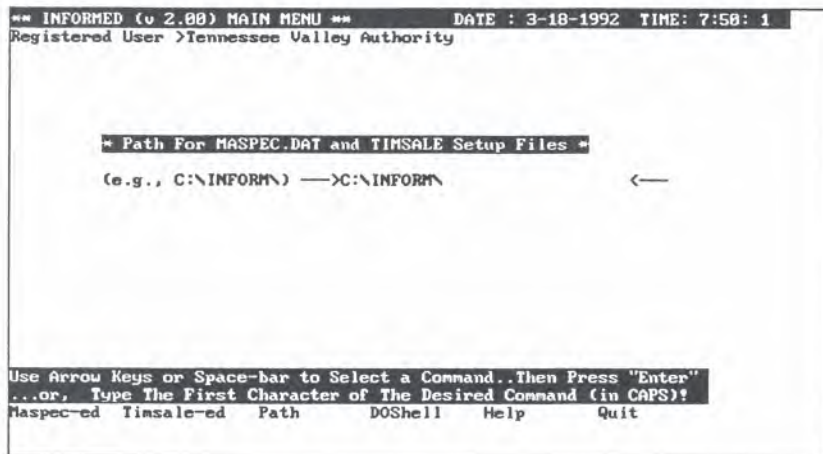
Screen 2 - INFORM-ED Main Menu

More specifically the commands are:

Maspec-ed opens the MASPEC.DAT file and allows you to print a summary report of the entire file, add, delete, or edit the fields for a particular species, or make a global change across all species for a single field at a time.

Timsale-ed allows you to select a Setup and label it, name up to 15 species groups, assign the species group number to the desired species, and edit stumpage prices and inflation rates for pulp-wood and sawtimber within each species group.

Path points to the volume and directory which stores the MASPEC.DAT, SETNAM.DAT, and SETUP01-10.DAT files to edit. INFORM-ED remembers the Path between sessions if you exit using Quit.

DOShell interrupts INFORM-ED to perform DOS chores such as erasing a file, checking a disk, printing a file, etc.

Help screens are provided with each menu.

Quit is used to exit the program and ensure that all files are properly closed and that the Path is properly stored for future use.

MASTER SPECIES EDIT COMMANDS (Maspec-ed)

The Maspec-ed menu (Screen 3) includes commands to print a spe-
cies list summary report, add a new species, delete a species,
edit the fields for a species, and make global changes for a
single field across all species.

```
                        MASTER SPECIES FILE MENU
ASH    BOX    ERC    MUL    REM    SWG    YEB    MSC
ASP    BUC    HAC    MWO    RIB    SWO    YEP
BAS    BUO    HAM    MYP    SAS    SYC    ZBO
BEE    BUT    HEM    NRO    SCO    TUP    ZCH
BIR    CHO    HIC    OSO    SHO    VIP    ZCO
BLC    COT    HOL    OVO    SHP    WAO    ZHL
BLG    CUC    LOP    PEC    SIM    WHO    ZLP
BLL    CYP    MAG    PER    SLP    WHP    ZSB
BLO    DOG    MIC    PIO    SRO    WIE    ZSC
BLW    ELM    MRO    POO    SWB    WIO    ZSO



Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)?
  Return      Print      Add      Delete      Edit      Global      Help
```

Screen 3 - Master Species File Edit Menu

More specifically the commands are:

<u>Return</u> to the Main menu.

<u>Print</u> a condensed listing of MASPEC.DAT (less volume and growth
and yield equation coefficients). The print-out requires 132
columns per line (Figure 2). You may direct the report to a
file.

<u>Add</u> a new species to MASPEC.DAT. Be prepared to supply the name
of an existing species as a template, then change the species
name and other data as necessary. You may not add a species code
called "MSC" or "ALL".

<u>Delete</u> a species when you want to conserve on disk space or if
you have exhausted the maximum number of slots (i.e, 100 includ-
ing miscellaneous). You may not delete species code "MSC".

<u>Edit</u> permits you to change the value for any field within a
species. (See the next section for a full description of editing
features).

<u>Global</u> changes across all species for a single field can be made
by pressing Enter after navigating (with the arrow and tab keys)
to the field of choice. Use this powerful command thoughtfully.

#	SPC	SPECIES-NAME	FS	P	GWR	DWR	CDa	CDb	B	FC	CD	E	LR	DT	DA	G1D	P1	G2D	P2	G3D	P3	G4D	P4	USFS	GATWIG
1	ASH	ASH	F	1	48.00	41.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	540	NON
2	ASP	ASPEN	S	1	57.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	371	NON
3	BAS	BASSWOOD	F	1	38.00	28.00	77.1	1.4	1	78	11	1	0	0	-4	16	80	14	90	10	20	10	0	950	NON
4	BEE	BEECH	S	1	54.00	45.00	77.1	1.4	1	78	11	1	0	0	-4	16	25	14	75	10	20	10	0	531	NON
5	BIR	BIRCH	S	1	57.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	371	NON
6	BLC	BLACK CHERRY	S	1	45.00	35.00	77.1	1.4	1	78	11	1	0	0	-4	16	80	14	90	10	20	10	0	762	NON
7	BLG	BLACK GUM	S	1	45.00	35.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	693	NON
8	BLL	BLACK LOCUST	S	1	58.00	48.00	77.1	1.4	1	78	11	1	0	0	-4	16	25	14	75	10	20	10	0	901	NON
9	BLO	BLACK OAK	S	1	64.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	837	OAK
10	BLW	BLACK WALNUT	S	1	58.00	38.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	602	NON
11	BOX	BOXELDER	F	1	50.00	38.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	313	NON
12	BUC	BUCKEYE	S	1	63.00	51.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	330	NON
13	BUO	BUR OAK	S	1	64.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	823	OAK
14	BUT	BUTTERNUT	S	1	58.00	38.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	601	NON
15	CHO	CHESTNUT OAK	S	1	63.00	47.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	832	OAK
16	COT	COTTONWOOD	F	1	38.00	28.00	77.1	1.4	1	78	11	1	0	0	-4	16	80	14	90	10	20	10	0	740	NON
17	CUC	CUCUMBER TREE	F	1	59.00	35.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	651	NON
18	CYP	CYPRESS	F	1	53.00	36.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	221	NON
19	DOG	DOGWOOD	F	1	50.00	34.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	611	NON
20	ELM	ELM	S	1	56.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	970	NON
21	ERC	EASTERN REDCEDAR	F	1	37.00	33.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	60	NON
22	HAC	HACKBERRY	S	1	56.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	460	NON
23	HAM	HARD MAPLE GROUP	S	1	56.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	318	NON
24	HEM	EASTERN HEMLOCK	F	1	50.00	28.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	260	NON
25	HIC	HICKORY	S	1	63.00	51.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	400	NON
26	HOL	HOLLY	F	1	59.00	35.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	591	NON
27	LOP	LOBLOLLY PINE	F	1	53.00	36.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	131	PIN
28	MAG	MAGNOLIA	F	1	59.00	35.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	652	NON
29	MIC	MISC. CONIFERS	F	1	52.00	36.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	132	NON
30	MRO	MISC. RED OAKS	S	1	64.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	833	OAK
31	MUL	MULBERRY	F	1	50.00	34.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	680	NON
32	MWO	MISC. WHITE OAKS	S	1	63.00	48.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	802	OAK
33	MYP	MISC. YELLOW PINES	F	1	52.00	36.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	131	PIN
34	NRO	NORTHERN RED OAK	S	1	64.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	833	OAK
35	OSO	osage orange	F	1	50.00	34.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	641	NON
36	OVO	OVERCUP OAK	S	1	63.00	48.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	822	OAK
37	PEC	PECAN	S	1	58.00	38.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	602	NON
38	PER	PERSIMMON	F	1	50.00	34.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	611	NON
39	PIO	PIN OAK	S	1	63.00	47.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	830	OAK
40	POO	POST OAK	S	1	63.00	48.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	835	OAK
41	REM	RED MAPLE	F	1	50.00	38.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	316	NON
42	RIB	RIVER BIRCH	S	1	57.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	371	NON
43	SAS	SASSAFRAS	F	1	50.00	34.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	611	NON
44	SCO	SCARLET OAK	S	1	64.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	806	OAK
45	SHO	SHINGLE OAK	S	1	63.00	47.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	817	OAK

Figure 2 — Master Species File Report (continued next page)

#	SPC	SPECIES-NAME	FS	P	GWR	DWR	CDa	CDb	B	FC	CD	E	LR	DT	DA	G1D	P1	G2D	P2	G3D	P3	G4D	P4	USFS	GATWIG
46	SHP	SHORTLEAF PINE	F	1	52.00	36.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	110	PIN
47	SIM	SILVER MAPLE	F	1	50.00	38.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	317	NON
48	SLP	SLASH PINE	F	1	53.00	36.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	131	PIN
49	SRO	SOUTHERN RED OAK	S	1	64.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	812	OAK
50	SWB	SWEETBAY	F	1	59.00	35.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	653	NON
51	SWG	SWEETGUM	F	1	50.00	34.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	611	NON
52	SWO	WHITE OAK	S	1	63.00	48.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	804	OAK
53	SYC	SYCAMORE	F	1	38.00	28.00	77.1	1.4	1	78	11	1	0	0	-4	16	80	14	90	10	20	10	0	731	NON
54	TUP	TUPELO	S	1	45.00	35.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	691	NON
55	VIP	VIRGINIA PINE	F	1	52.00	36.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	132	PIN
56	WAO	WATER OAK	S	1	63.00	47.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	827	OAK
57	WHO	WHITE OAK	S	1	63.00	48.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	802	OAK
58	WHP	WHITE PINE	F	1	36.00	25.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	129	PIN
59	WIE	WINGED ELM	S	1	56.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	970	NON
60	WIO	WILLOW OAK	S	1	63.00	47.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	831	OAK
61	YEB	YELLOW BIRCH	S	1	57.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	371	NON
62	YEP	YELLOW POPLAR	F	1	38.00	28.00	77.1	1.4	1	78	11	1	0	0	-4	16	80	14	90	10	20	10	0	621	NON
63	ZBO	BLACKJACK OAK	S	1	64.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	807	OAK
64	ZCH	CHINQUAPIN OAK	S	1	63.00	48.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	826	OAK
65	ZCO	CHERRYBARK OAK	S	1	64.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	813	OAK
66	ZHL	HONEY LOCUST	S	1	58.00	48.00	77.1	1.4	1	78	11	1	0	0	-4	16	25	14	75	10	20	10	0	552	NON
67	ZLP	LONGLEAF PINE	F	1	55.00	41.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	131	PIN
68	ZSB	SWEET BIRCH	S	1	57.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	371	NON
69	ZSC	SWAMP CHESTNUT OAK	S	1	63.00	48.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	825	OAK
70	ZSO	SHUMARK OAK	S	1	64.00	44.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	80	10	20	10	0	834	OAK
71	MSC	MISCELLANEOUS	F	1	50.00	40.00	77.1	1.4	1	78	11	1	0	0	-4	16	45	14	75	10	20	10	0	999	NON

Figure 2 — Master Species File Report (continued previous page)

Edit

After entering a valid species code (Screen 4), a menu appears which allows you to advance to the next page of data, to begin actual editing of the fields on the page, and to print the fields for the selected species. The fields for each record in MASPEC.DAT are displayed and edited within three separate pages (Screen 5, 6, and 7).

```
                    MASTER SPECIES FILE MENU
ASH    BOX    ERC    MUL    REM    SWG    VEB    MSC
ASP    BUC    HAC    MWO    RIB    SWO    YEP
BAS    BUO    HAM    MYP    SAS    SYC    ZBO
BEE    BUT    HEM    NRO    SCO    TUP    ZCH
BIR    CHO    HIC    OSO    SHO    VIP    ZCO
BLC    COT    HOL    OVO    SHP    WAO    ZHL
BLG    CUC    LOP    PEC    SIM    WHO    ZLP
BLL    CYP    MAG    PER    SLP    WHP    ZSB
BLO    DOG    MIC    PIO    SRO    WIE    ZSC
BLW    ELM    MRO    POO    SWB    WIO    ZSO




              Enter Species Code --->NRO<---


Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)!
   Return     Print      Add      Delete     Edit      Global     Help
```

Screen 4 — Edit Species Menu

```
            DATA FOR SPECIES CODE> NRO          Page> 1 of 3
        Species code (SPC)= NRO
            Species-Name= NORTHERN RED OAK
            Fast/Slow (FS)= S
Pulpwood Equat. System (P)= 1
TVA Coeffs=          .53000         .08272         .00000         .00000

USFS Coeffs=         .02777         .76524         .00811        1.02199
                     .02670         .74844         .00974         .95868
                   -1.97257        4.04188        -4.38210         .07549
                    1.09058         .17826         .00983        1.00126
                     .72005        9.06390        -1.01358         .33344

 Green lbs:Cuft Ratio (GWR)= 64.0000
  Dry lbs:Cuft Ratio (DWR)= 44.0000
Cuft:Cord Equat. (CDa, CDb)= 77.1000      1.4300
    Boardfoot Method (B)= 1         Form Class (FC)= 78
USFS crossover dbh (CD)= 11    TVA Equat. Forms (E)= 1    Log Rule (LR)=  0
        Dead Tree (DT)=  0       TVA Dbh Adj. (DA)= -4
Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)!
   Return     Next      Edit      Print      Help
```

Screen 5 — Edit Values For Species, Page 1 of 3

```
            DATA FOR SPECIES CODE> NRO          Page> 2 of 3
Dcoeffs=         1.01800        .03400       -.01638        .00000
                  .00000        .00000        .00000        .00000
                  .00000        .00000        .00000        .00000
                  .00000        .00000        .00000        .00000

Scoeffs=          .90477        .09523       -.14490        .00000
                  .00000        .00000        .00000        .00000
                -2.48000        .31200      34.83000        .00000
                  .00000        .00000        .00000        .00000

Dcodes=   2     0     1     2     0     0     0     0
Scodes=   0     0     1     0     0     0     0     0

G1D=  16  P1=  45  G2D=  14  P2=  80  G3D=  10  P3=  20  G4D=  10  P4=   0

CSTWIGS=   .06332     .59455     .01594     .69043     .00385     .01173
           .62906  115.41290     .00752    6.69414     .00572    2.04648
          -.23262    1.46694    1.68080     .64563     .05612     .00365
Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)!
   Return     Next      Edit      Print      Help
```

Screen 6 — Edit Values For Species, Page 2 of 3

```
        DATA FOR SPECIES CODE> NRO          Page> 3 of 3
Mast Lower & Upper Dbh Class= 10      30
Mast Coeffs=        6.21570       -.26270        .00340      -39.11950

GATWIGS (USFS) species code= 833   Stand Type (GATWIG)= OAK

NETWIGS=        .00089        .09797       .01882
               1.96783        .09220       .02230
                .03206        .00427       .00475




Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or, Type The First Character of The Desired Command (in CAPS)?
  Return      Next        Edit      Print      Help
```

Screen 7 — Edit Values For Species, Page 3 of 3

A description of each field follows:

Species Code (SPC)

Within the file MASPEC.DAT, data are organized according to one
species per record. The first field (i.e., the first three
characters) of each record (i.e., line of data) contains the
species code. Species codes are case sensitive (e.g., "LOP" and
"lop" are unique). You may enter 2 or 1 character codes, howev-
er, blanks are part of the code (e.g., " L" is not the same as
"L "). You may use numeric codes, such as those employed by the
U.S. Forest Service.

Species Name

A 24-character species name is associated with each species code.

Fast/Slow Growing Designation (FS)

This is a single character code indicating whether the species is
considered fast or slow growing. This code is used in associa-
tion with the increment core growth projection feature in YIELD-
MS to stratify the sample data into two sets. Valid values are
"F" and "S."

Pulpwood Equation System (P)

This single digit field provides the code that determines the
method for calculating pulpwood volume by TIPS. A "1" indicates
that the TVA system of one of a set of five equation forms (each
using up to four coefficients) is to be used. A set of TVA-
derived coefficients is supplied as a default. Similarly, a "2"
means that the pulpwood volume methodology, including coeffi-
cients, supplied by the U.S. Forest Service (Clark et al. 1985,

1985a) are to be used by TIPS to derive pulpwood volumes. Further discussion of the pulpwood volume calculation methodology is provided in the TIPS Technical Reference Manual.

TVA Volume Coefficients

There are four coefficients (i.e., a, b, c, and d) that may be used in conjunction with a set of five different equations. The default coefficients are those used in versions 3.4 and 4.0 of the TVA Inventory Processor software. These default coefficients provide estimates of pulpwood cubic foot volume of wood and bark. An anomaly associated with these coefficients requires that the dbh be reduced by .4" before calculating volume. Therefore, the TVA dbh adjustment (DA) field, listed later, should be set to -4 if these coefficients are used. If you want to substitute your own coefficients, then follow these steps.

1. Set Pulpwood Equation System (P)= 1
2. Set the TVA Dbh Adjustment (DA)= 0
3. Select a TVA Equation Form (E) of 1 through 5
4. Enter the appropriate TVA Volume Coefficients

USFS Volume Coefficients

If the USFS method is to be used in calculating pulpwood volume for a species, a set of 20 coefficients must be loaded into the master species file for that species. Also, some of these coefficients are used in calculating topwood and crownwood. Regardless of the pulpwood volume calculation method, users should refer to the publications by Clark et al. (1985a, 1986, 1986a) and Clark and Schroeder (1986). In referring to the tables by Clark et al., note that coefficients are supplied for calculating volumes on a wood and bark and on a wood-only basis. The user should decide which of the two sets of coefficients to use. Default values are on a wood-only basis.

The first four fields (coefficients) deal with estimating cubic foot pulpwood volume on a total tree basis as a function of dbh and height to a four-inch top. Some default values were taken from Table 17 in the publications mentioned above. Others were taken from similar unpublished results by Clark. The value in field 1 corresponds to the a' coefficient in Table 17 (Clark et al. 1985a:56, 1986:65-66, 1986a:47; Clark and Schroeder 1986:52). The second field contains the value of the b coefficient for trees less than 11.0 inches dbh. Field number 3 contains the value for the a" term, while field 4 stores the value of the b term for trees greater than 11.0 inches dbh. The value for the c term in Table 17 equals the first b term and is therefore redundant and not entered again.

Fields 5 through 8 correspond to the a', b, a", and b terms found in Clark's (op. cit.) Table 18, which gives coefficients for estimating pulpwood cubic foot volume (total stem) as a function

of dbh and height to a four-inch top. Specifically, field 5 corresponds to the value of a', field 6 corresponds to the b term for trees less than 11.0 inches dbh, field 7 to the a" term, and field 8 to the b term for trees greater than 11.0 inches.

Refer to Table 24 (Clark et al. 1985a:64, 1986:76, 1986a:53; Clark and Schroeder 1986:61) for assigning values to fields 9, 10, and 11. These fields contain the coefficients for estimating above-stump cubic foot volume (taken to a specified d.o.b. top diameter) as a proportion of total stem volume. Fields 9, 10, and 11 correspond to the values of the a, b, and c terms, respectively, in Table 24.

Field numbers 12, 13, and 14 contain the regression coefficients for estimating sawlog cubic foot volume as a function of dbh and sawlog merchantable height. These fields correspond to the a, b, and c terms, respectively, as given in Table 22 from Clark et al. (1985a:62, 1986a:51) and Clark and Schroeder (1986:59).

Regression coefficients for estimating total tree cubic foot volume (above stump) as a function of dbh and sawlog merchantable height are stored in fields 15 through 17. These fields contain the regression equation coefficients corresponding to the a, b, and c terms, respectively, found in Table 21 from Clark et al. (1985a:61, 1986a:51) and Clark and Schroeder (1986:59).

The final three fields (18, 19, and 20) store coefficients for estimating stem volume to a specified diameter (outside bark) top as a proportion of the sawlog volume. Fields 18, 19, and 20 contain the coefficients for the a, b, and c terms, respectively, from Table 26 by Clark et al. (1885a:66, 1986:78, 1986a:55) and Clark and Schroeder (1986:63).

Green lbs:Cubic Foot Ratio (GWR)

This field contains the weight of a cubic foot of green (i.e., freshly cut) wood or wood and bark. The publications by Clark et al. (1985a, 1986, 1986a) provide green weights for some hardwood species sampled in the Southeast. Smith (1985) gives green and dry weights for North Central species. Be sure that assumptions about bark are consistent with the pulpwood volume estimating equations.

Dry lbs:Cubic Foot Ratio (DWR)

This field contains the weight of a cubic foot of dry (i.e., zero percent moisture content) wood or wood and bark. Dry weights (on a wood only basis) for various species may be found in Forbes (1955:14.3). Default green and dry weights are based primarily on information from Forbes.

Cuft:Cord Equation CD(a), CD(b)

To determine volume in cords as a function of cubic foot volume and dbh, an equation of the following form is used:

Cords = Cuft/(a + bD)

where: D= dbh
a= CD(a), default of 77.1
b= CD(b), default of 1.43

This equation is programed into INFORM programs to return a value in the range of 76 to 115 cuft per cord. If you desired, for example, for all INFORM programs to use 80 cuft per cord regardless of dbh, then enter 80 for CD(a) and 0 for CD(b).

Boardfoot Method (B)

This single digit field determines the method for calculating sawtimber boardfoot volumes by TIPS. A "1" indicates that the set of three log rule equations by Wiant and Castaneda (1977) will be used to calculate sawtimber volume. Similarly, a "2" indicates that equations by Clark et al. (1985:57) will be used. See the TIPS Technical Reference Manual for details on these equations.

Girard Form Class (FC)

Form class is defined as "the percentage ratio between the diameter, inside bark, at the top of the first 16-foot log and the diameter outside bark at breast height . . ." (Mesavage and Girard:1). A default form class value of 78 is supplied. This value is frequently edited. Computed boardfoot volume changes by 3% for each deviation from 78. You may enter a value in the range of 65 through 90.

USFS Crossover Dbh (CD)

The U.S. Forest Service equations (Clark et al. 1985) are segmented by dbh range. (CD) is the dbh where the first equation is switched to the second. Note that if the Pulpwood Equation System (P) was set to 1, then (CD) is irrelevant.

TVA Equation Forms (E)

(E) corresponds to the TVA pulpwood volume calculation equation forms as defined below. The default value is 1. Note that if the Pulpwood Equation System (P) equals 2 (indicating that the USFS equations are to be used), then this field is unnecessary.
(see next page)

1. $V = a + bD^2H$

2. $V = a + bD^2 + cH + dD^2H$

3. $V = a + bD^cH^d$

4. $V = {}_D{}^2 / (a+b/c)$

5. $V = a + b(D^2H)^c$

   where: V = volume in cubic feet
            D = dbh in inches
            H = height in feet to a 4" top
       a,b,c,d= coefficients

Log Rule (LR)- used when variable log rule is selected in TIPS, YIELD-MS, or BATCH-YIELD-MS.

   1= Scribner, 2 or 0= International, 3= Doyal

Dead Tree (DT)

This field is useful for setting up species codes relating to snags, dens, and other dead trees which supply wildlife habitat or serve as criteria to determine "old-growth" designation. The default is 0. Entering a 1 will signal INFORM programs not to calculate volume, weight, or basal area.

0= live trees, 1=dead trees

TVA dbh Adjustment (DA)

 (DA) is the tenths of inches to add to dbh before feeding it to the TVA pulpwood volume equations. Normally (DA) should equal 0 except when using coefficients shipped by TVA with the INFORM system. In this case, (DA) should equal -4 due to an equation anomaly.

YIELD-MS Data

The remaining fields in a MASPEC.DAT file record store data used by YIELD-MS and BATCH-YIELD-MS. Included are estimating equation coefficients for dbh growth and survival, equation use codes, and grade change probabilities. Consult the YIELD-MS User Manual for further information on the growth and yield models used by YIELD-MS.

DBH Growth Coefficients (Dcoeff's)

The first four fields store the coefficients for G-HAT (Harrison

et al. 1986a, 1986b). Fields 5-8 store coefficients for SILVAH (Marquis et al. 1984). The remaining eight fields are vacant.

Survival Rate Equation Coefficients (Scoeff's)

Fields 1-3 store the coefficients for G-HAT. Fields 5-6 store coefficients for SILVAH. Fields 9-11 store coefficients for OAKSIM (Hilt, 1983, 1985). Fields 4, 7, 8 and 12-16 are vacant.

Diameter Growth Codes (Dcodes)

Field 1 is used for GHAT, and stores a "1" if age is required and a "2" if age is not required. The second field is not used. Field 3 is used by SILVAH and contains an "a" or "2" to denote equation form. Field 4, used by SILVAH, contains a species group number used in stocking percent calculations. Fields 5-8 are vacant.

Survival Codes (Scodes)

Fields 1 and 2 are currently left vacant. Field number 3, which is used by SILVAH, stores a "1," "2," or "3" to denote equation form. Fields 4 through 8 are currently vacant.

Grade Change Probabilities (G1D,P1..G4D,P4)

These data are arranged by grade category (grades 1-4) in pairs consisting of the threshold dbh class associated with a particular grade (G1D..G4D), and secondly, the probability percent (expressed as an integer value, i.e., 90% = 90) of moving up a grade (e.g., migrating from grade 2 to grade 1) once the threshold dbh of the next grade is reached (P1..P4). There are four pairs, corresponding to grades 1 through 4, respectively. For example, G1D is the threshold dbh required for a tree to become a grade 1, and P1 is the percent probability that a grade 2 tree becomes a grade 1 upon growing to the threshold dbh. Default values are taken from Ernst and Marquis, 1979.

CS-TWIGS Coefficients

The first 18 fields contain the dbh and survival estimating equation coefficients for Central States TWIGS (Shifley, 1987). Fields 19 and greater contain coefficients for TWIGS variants from other regions.

In particular, fields 1-6 store the coefficients for the potential growth equation. Fields 7-9 contain coefficients for the modifier function. The crown ratio coefficients comprise fields 10-13. Fields 14-18 store coefficients for survival equations.

Mast Lower and Upper Dbh Class

YIELD-MS estimates the annual per acre mast yield (pounds) by using equations which key on species and dbh. The Mast Lower and Upper Dbh Class fields refer to the range of dbh classes in which the equation operates.

Mast Coefficients

The four fields used for the Mast Regression Coefficients are for an equation of the form:

$$Mast(lbs) = aD + bD^2 + cD^3 + d$$

Where: D= dbh
a,b,c,d= coefficients.

GA-TWIGS (USFS)

This field contains the USFS three digit species code. Due to the complexity of the GA-TWIGS prediction system, the coefficients for growth and survival are stored in other files (Bolton and Meldahl, 1986).

Stand Type (GA-TWIG)

This code used by GA-TWIGS only must be set to:

NON= non commercial   OAK= oak types   PIN= pine types

NE-TWIGS coefficients

These 9 fields store the NE-TWIGS growth and survival coefficients (Hilt and Teck, 1989)

Print

A report can be generated detailing all 3 pages of data for a particular species (Figure 3).

```
          Species code (SPC)= NRO
            Species-Name= NORTHERN RED OAK
          Fast/Slow (FS)= S
Pulpwood Equat. System (P)= 1
TVA Coeffs=            .53000          .00272          .00000          .00000

USFS Coeffs=           .02777          .76524          .00811         1.02199
                       .02670          .74844          .00974          .95868
                     -1.97257         4.04188         -4.38210          .07549
                      1.09058          .17826          .00983         1.00126
                       .72005         9.06390         -1.01358          .33344


 Green lbs:Cuft Ratio (GWR)= 64.0000
   Dry lbs:Cuft Ratio (DWR)= 44.0000
Cuft:Cord Equat. (CDa, CDb)= 77.1000        1.4300
    Boardfoot Method (B)= 1          Form Class (FC)= 78
USFS crossover dbh (CD)= 11   TVA Equat. Forms (E)= 1      Log Rule (LR)= 0
        Dead Tree (DT)= 0     TVA Dbh Adj. (DA)= -4


Dcoeffs=      1.81800          .03400         -.01630          .00000
               .00000          .00000          .00000          .00000
               .00000          .00000          .00000          .00000
               .00000          .00000          .00000          .00000

Scoeffs=       .90477          .09523         -.14490          .00000
               .00000          .00000          .00000          .00000
             -2.48000          .31200        34.83000          .00000
               .00000          .00000          .00000          .00000

Dcodes=   2      0      1      2      0      0      0      0
Scodes=   0      0      1      0      0      0      0      0

G1D=  16  P1=  45  G2D=  14  P2=  80  G3D=  10  P3=  20  G4D=  10  P4=   0

CSTWIGS=      .06332     .59455      .01594     .69043     .00385      .01173
              .62906  115.41290      .00752    6.69414     .00572     2.04648
             -.23262    1.46694     1.68080     .64563     .05612      .00365



Mast Lower & Upper Dbh Class= 10      30
Mast Coeffs=           6.21570         -.26270          .00340       -39.11950

GATWIGS (USFS) species code= 833    Stand Type (GATWIG)= OAK

NETWIGS=       .00089          .09797          .01802
              1.96783          .89220          .82230
               .03206          .00427          .00475

TVA INFORM-ED (v 2.00)  Date: 3-17-1992  Time: 14: 8:44       REGISTERED USER > Tennessee Valley Authority
```

Figure 3 — Sample Report of The Values For Northern Red Oak

Global

Global changes across all species (for a single field at a time) can be made by pressing Enter after navigating (with the arrow and tab keys) to the field of choice and typing in the desired value (Screen 8).

```
 GLOBAL CHANGE FOR ALL SPECIES CODES          Page> 1 of 3

         Species code (SPC)= ALL
               Species-Name=
              Fast/Slow (FS)= F
Pulpwood Equat. System (P)= 1
TVA Coeffs=           .49000          .00276         .00000         .00000

USFS Coeffs=          .83723          .71982         .00431        1.16934
                      .82836          .72988         .00664        1.03183
                    -1.41374         3.95184        -4.18394         .03965
                     1.17987          .19897         .00788        1.02600
                      .73865        17.18958        -1.15775         .36675

 Green lbs:Cuft Ratio (GWR)=  58.0000
   Dry lbs:Cuft Ratio (DWR)=  40.0000
Cuft:Cord Equat. (CDa, CDb)=  77.1000       1.4300
    Boardfoot Method (B)= 1         Form Class (FC)=:78:
USFS crossover dbh (CD)= 11    TVA Equat. Forms (E)=  1    Log Rule (LR)=  8
        Dead Tree (DT)= 0         TVA Dbh Adj. (DA)= -4
Use the arrow and tab keys to navigate to the field you wish to change.
Enter the desired value and Press Enter

---> Girard Form Class (used only for boardfeet calc.)      <---
```

Screen 8 – Global Change Menu

This command is useful for example, when you want to change the boardfoot calculation method or the form class to the same value for every, or nearly every species. Use the arrow and tab keys to navigate through the page. Only press Enter after you have zeroed in on the desired field and typed in the desired value. Avoid using the Enter key to advance to the desired field as this will annoy you with a prompt asking if you want to store the value for all species.

TIMSALE SETUPS EDITING (Timsale-ed)

TIMSALE Setups are groupings of species created by you. Define up to 15 species groups. Then, provide a name for each group. Last, assign stumpage prices and inflation rates to the group. For example, you might create a species group named "Yellow Pine", assign it to loblolly and slash pines, and enter stumpage prices and inflation rates unique to yellow pines for your region. You also may create other species groups, for example, for hardwoods. Save the entire Setup to disk under the Setup name of your choice. Up to 10 Setups may be created. You might create a separate Setup for different regions or for different timber types. Often, you may find that one Setup is adequate for all of your needs. The files used to store TIMSALE Setups are MASPEC.DAT, SETNAM.DAT, and SETUP01„10.DAT. These files must be in the same directory as your INFORM programs. Navigate to these files on your disk by using the Path command.

After selecting the Timsale-ed option from the main menu, the following menu (Screen 9) is displayed which allows you to select a Setup, name the species groups, assign groups to species, and enter/edit stumpage price and inflation data by species group. Returning out of the menu automatically saves your data.


```
                         TIMSALE SETUPS MENU
ASH    BOX    ERC    MUL    REM    SWG    YEB    MSC
ASP    BUC    HAC    MWO    RIB    SWO    YEP
BAS    BUO    HAM    MYP    SAS    SYC    ZBO
BEE    BUT    HEM    NRO    SCO    TUP    ZCH
BIR    CHO    HIC    OSO    SHO    VIP    ZCO
BLC    COT    HOL    OVO    SHP    WAO    ZHL
BLG    CUC    LOP    PEC    SIM    WHO    ZLP
BLL    CYP    MAG    PER    SLP    WHP    ZSB
BLO    DOG    MIC    PIO    SRO    WIE    ZSC
BLW    ELM    MRO    POO    SWB    WIO    ZSO




Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or, Type The First Character of The Desired Command (in CAPS)!
  Return     Select      Names      Assign     Prices      Help
```

Screen 9 - Initial Timsale-ed Menu

More specifically the commands are:

Return to the main menu.

Select a TIMSALE Setup from a maximum of 10.

Name the species groups for up to 15 slots.

Assign a species group number to each species in MASPEC.DAT.

Price sawtimber and pulpwood stumpage and optionally enter inflation rates for each species group.

Before you can perform any commands you must select a Setup even
if you are creating one. You may edit the Setup name at this
time. We will develop an example Setup for northern Alabama
stumpage markets (Screen 10).

Screen 10 — Select and name a Setup

Normally, you now will name the species groups. It is better
that you do not embed blank group names. In other words, use
slot #1 for the first species group, slot #2 for the second, and
so forth (Screen 11).

Screen 11 — Name The Species Groups

Next, you might assign species group numbers to the desired spe-
cies (Screen 12).

```
                        TIMSALE SETUPS MENU
ASH: 3: BOX 14  ERC 10  MUL 18  REM  4  SWG  4  YEB  4  MSC  4
ASP 14  BUC 14  HAC  4  MWO  2  RIB  4  SWO  2  YEP  4
BAS  7  BUO  2  HAM  7  MYP  5  SAS 14  SYC  4  ZBO  4
BEE  4  BUT  4  HEM 13  NRO  1  SCO  1  TUP  4  ZCH  2
BIR  4  CHO  9  HIC  6  OSO 10  SHO  1  VIP  5  ZCO  1
BLC  4  COT 14  HOL 14  OVO  2  SHP  5  WAO  1  ZHL 10
BLG  4  CUC 14  LOP  5  PEC  4  SIM  4  WHO  2  ZLP  5
BLL 10  CYP 13  MAG  4  PER 12  SLP  5  WHP 11  ZSB  2
BLO  1  DOG 14  MIC 13  PIO  1  SRO  1  WIE  4  ZSC  2
BLW 12  ELM  4  MRO  1  POO  4  SWB  4  WIO  1  ZSO  1


                     **SETUP # 2: Northern Alabama  **
   1 Red/Black Oaks    2 White Oaks      3 Ash          4 Misc. Hardwoods
   5 Yellow Pine       6 Hickory         7 Hard Maple/Basw  8 Yellow Poplar
   9 Chestnut Oak     10 Posts & Cedar  11 White Pine    12 Walnut/Persim.
  13 Misc. Conifer    14 Non-Commercial 15

Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or, Type The First Character of The Desired Command (in CAPS)!
  Return     Select     Names    |Assign|    Prices      Help
---> Assign species group number to species                <---
```

Screen 12 — Assign Species Groups To Desired Species

Last, you might enter/edit stumpage prices and inflation rates
for each species group (Screen 13).

```
                    1 "Red/Black Oaks "

SAWTIMBER Stumpage Prices and Inflation Rates by: MBF

           Ungraded   Grade-1   Grade-2   Grade-3   Grade-4   Grade-5
  PRICE $    78.00    273.00    182.00     17.00 .    2.00      2.00
INFLATION%      4         5         4         4         4         4



  PULPWOOD Stumpage Prices and Inflation Rates by: CORD

           Pulpwood   Topwood   Crownwood
  PRICE $    6.00      6.00        .00
INFLATION%      4         4         0



Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
...or, Type The First Character of The Desired Command (in CAPS)!
  Return     Next     Previous   |Edit|     Help
```

Screen 13 — Edit Stumpage Prices And Inflation Rates

The commands for the Prices menu are:

Return to the Timsale-ed menu.

Next species group of 15 possible is displayed.

Previous species group of 15 possible is displayed.

Edit the stumpage prices and inflation rates for sawtimber and
pulpwood.

Ungraded refers to sawtimber trees for which grade data have not been collected. Enter the price for the average grade.

Grade-1 through 5 refers to the price by tree grade. These price data are relevant if you have assessed tree grade in the field and want to account for quality/value differences attributed to tree grade. Stumpage price bulletins typically do not publish prices by tree grade; you will have to develop your own estimates. One technique is to consult delivered log price-by-grade bulletins, discount for logging costs, and however difficult, discount for upper stem logs.

Pulpwood refers to pulpwood trees, topwood is the merchantable volume in sawtimber trees net of the sawlogs, and crownwood is heavy limbs (minimum 4" in diameter).

Inflation is the annual, compound rate of price change in real or nominal units. The choice to use real or nominal units should be based on the type of financial analysis you anticipate performing. Note, inflation rates are irrelevant if you do not perform a growth projection.

PRINTER OPERATIONS

PRINTER OPERATIONS

A common menu is used just prior to the printing of any INFORM-ED
reports. It (Screen 14) permits you to proceed to print assuming
you have a printer and it is properly connected, configured, and
on-line. You also can direct reports to ASCII files by using the
File command. The Help screen associated with Screen 14 provides
tips for configuring your printer for condensed mode. The print-
er control code sequences for 9 pin dot matrix and HP Laserjet
III printers are given.

```
                         * PRINTER CHECK *

MAKE CERTAIN THAT PRINTER IS ON-LINE, PROPERLY CONFIGURED, AND
SET TO TOP-OF-FORM BEFORE PROCEEDING TO PRINT.



User Arrow Keys or Space-bar to Select a Command.Then Press "Enter"
...or,  Type The First Character of The Desired Command (in CAPS)!


        Print-now Configure   File      Help      Abort


CONFIGURE PRINTER...ENTER # OF CODES IN CONTROL SEQUENCE  (X)> 5
CONFIGURE PRINTER...ENTER DECIMAL CODE #1  (XXX)>    27
CONFIGURE PRINTER...ENTER DECIMAL CODE #2  (XXX)>    38
CONFIGURE PRINTER...ENTER DECIMAL CODE #3  (XXX)>   107
CONFIGURE PRINTER...ENTER DECIMAL CODE #4  (XXX)>    50
CONFIGURE PRINTER...ENTER DECIMAL CODE #5  (XXX)> : 83:


   Sample configuration for a HP Laserjet III
```

Screen 14 - Printer Operations

INFORM-ED summary reports require 132 character/line output. The
printer must be configured accordingly (i.e., 9" wide paper
requires a pitch of 16.5 CPI). If printer options are not con-
trolled by manual switches and/or you wish to configure the
printer directly from INFORM-ED, then select the Configure
command. Most printers can be configured by a sequence of codes.
The Configure command prompts for the number of codes comprising
a sequence and then accepts each code individually. Enter the
Decimal representation of each code (See table in your printer
user manual).

For example, an IBM ProPrinter would be configured by:

Number of codes = 2
code # 1 = 027   (decimal for ESCape)
code # 2 = 015   (decimal for *)

An HP Laserjet III would be configured by:

Number of codes = 5
code # 1 = 027
code # 2 = 038
code # 3 = 107
code # 4 = 050
code # 5 = 083

Before proceeding be sure the printer is on-line. After success-
fully configuring the printer and exiting INFORM-ED, the printer
will automatically be configured with the same code sequence on
future executions of INFORM-ED. Thus it is unnecessary to recon-
figure the printer unless a different type of printer is substi-
tuted.

Abort allows you to cancel the print-out before it begins and
return to the prior menu screen.

Direct Report To ASCII File

This option is useful when integration of reports into other
documents is anticipated or if you don't have a printer. Specify
the name of the file without an extension. The extension TXT is
automatically tacked on. INFORM-ED checks if the file already
exists and gives you the option to replace the existing file
 (Screen 15).

Screen 15 — Direct Reports To ASCII File

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DEFAULT SPECIES CODES

CODE	SPECIES	CODE	SPECIES
ASH	ASH	SRO	SOUTHERN RED OAK
ASP	ASPEN	SWB	SWEETBAY
BAS	BASSWOOD	SWG	SWEETGUM
BEE	BEECH	SWO	WHITE OAK
BIR	BIRCH	SYC	SYCAMORE
BLC	BLACK CHERRY	TUP	TUPELO
BLG	BLACK GUM	VIP	VIRGINIA PINE
BLL	BLACK LOCUST	WAO	WATER OAK
BLO	BLACK OAK	WHO	WHITE OAK
BLW	BLACK WALNUT	WHP	WHITE PINE
BOX	BOXELDER	WIE	WINGED ELM
BUC	BUCKEYE	WIO	WILLOW OAK
BUO	BUR OAK	YEB	YELLOW BIRCH
BUT	BUTTERNUT	YEP	YELLOW POPLAR
CHO	CHESTNUT OAK	ZBO	BLACKJACK OAK
COT	COTTONWOOD	ZCH	CHINQUAPIN OAK
CUC	CUCUMBER TREE	ZCO	CHERRYBARK OAK
CYP	CYPRESS	ZHL	HONEY LOCUST
DOG	DOGWOOD	ZLP	LONGLEAF PINE
ELM	ELM	ZSB	SWEET BIRCH
ERC	EASTERN REDCEDAR	ZSC	SWAMP CHESTNUT OAK
HAC	HACKBERRY	ZSO	SHUMARD OAK
HAM	HARD MAPLE GROUP	MSC	MISCELLANEOUS
HEM	EASTERN HEMLOCK		
HIC	HICKORY		
HOL	HOLLY		
LOP	LOBLOLLY PINE		
MAG	MAGNOLIA		
MIC	MISC. CONIFERS		
MRO	MISC. RED OAKS		
MUL	MULBERRY		
MWO	MISC. WHITE OAKS		
MYP	MISC. YELLOW PINES		
NRO	NORTHERN RED OAK		
OSO	OSAGE ORANGE		
OVO	OVERCUP OAK		
PEC	PECAN		
PER	PERSIMMON		
PIO	PIN OAK		
POO	POST OAK		
REM	RED MAPLE		
RIB	RIVER BIRCH		
SAS	SASSAFRAS		
SCO	SCARLET OAK		
SHO	SHINGLE OAK		
SHP	SHORTLEAF PINE		
SIM	SILVER MAPLE		
SLP	SLASH PINE		

November, 1992

A USER MANUAL FOR

BATCH-YIELD-MS

Timber Yield Planning Tool for Mixed Stands

Version 2

By

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DISCLAIMER

BATCH-YIELD-MS 2 has been carefully tested for operational reliability and to the best of our knowledge it contains no errors. However, neither TVA, nor FORS, nor the author claim responsibility for its accuracy.

CONTENTS

FIGURES

SCREENS

INTRODUCTION

BATCH-YIELD-MS is a tool used to form the basis of a stand re-
cords database system for a forest. BATCH-YIELD-MS produces
results consistent with YIELD-MS. The difference is that BATCH-
YIELD-MS can successively process an unlimited number of stands
in a single run. It could be operated at the beginning of each
year in order to update the volume data stored in a forest level,
stand records database. Or, it could be used to calculate allow-
able cut by growing an entire forest forward to determine the
average annual volume increase.

An electronic forest level, stand records database has several
advantages over manual record keeping procedures (Figure 1)
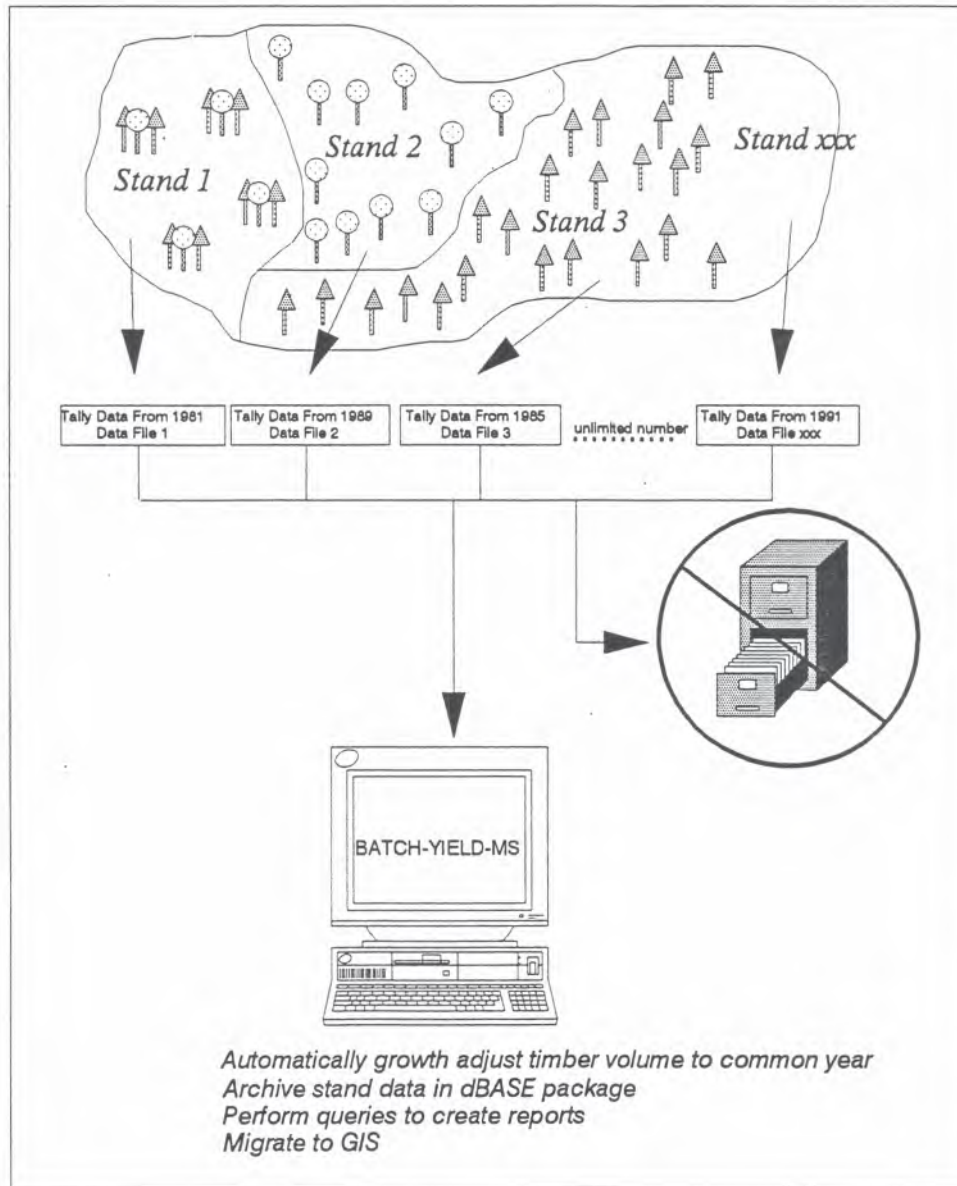
Figure 1 - Forest Stand Records Database Concept

Like TIPS, BATCH-YIELD-MS operates at the Compartment level. The .UTR (compartment list) file defines which stand's .SST files are to be processed into database compatible output files during a run. You designate the year to project volumes to. The program simulates growth of each stand encountered from the year of inventory to the designated year. Entering a zero for the projection year defeats the growth simulation feature of the program. BATCH-YIELD-MS accesses an options file (extension .OPT) to determine your selection of equation types, ingrowth assumptions, stumpage prices, English or Metric units, and other program parameters. You must use a text editor (e.g., DOS 5.0 EDIT or a word processor operated in non-document mode) to change items in this file. A file named OPTION.OPT is shipped with the program as a default. Also, a file which logs processing activity is produced with each run. The .LOG extension is used to denote these files. Error, warning, and other messages which accumulate over a run are stored in .LOG files.

BATCH-YIELD-MS processes multiple .SST files into ASCII type, volume summary files (i.e., files with extensions .V01, .V02, and .V03). These files in turn may be imported into stand record database systems previously built using commercial packages such as dBASE IV. The INFORM distribution disk(s) provides database file skeletons (extension .DBF), screen generation form files (extension .SCR), and printed report generating files (extension .FRM) specially designed to link BATCH-YIELD-MS with dBASE IV. Users of other commercial database packages may develop equivalent database files according to the file formats documented in this user manual.

BATCH-YIELD-MS is computationally intensive. Benchmark testing revealed average processing time per stand ranging from 5 seconds for an 80486 (33 mhz) PC to 120+ seconds for an 8088 (10 mhz) PC XT. In rank order, processing time is most influenced by: a math co-processor, hard disk access time, processor clock speed, and use of a disk cache. Processing time varies directly by the number of species per stand, by whether the "by-grade" option is exercised, and by the number of years in the growth projection period. Typical processing time is doubled if the GA-TWIGS equation system is selected and doubled again if disk space conserving features (new with this version) are selected.

The BATCH-YIELD-MS process for loading a stand records database generally consists of the following steps:

1. Pick Options: Use a text editor to check selections within file OPTION.OPT (or file of different name with extension .OPT). This ASCII file contains your choice for growth model and other important information that BATCH-YIELD-MS needs for processing. The .OPT Files section describes run-time options in detail.

2. Data Organization: Organize your stand inventory data (i.e., .FIE and .SST files) for all of the stands which you wish to process. BATCH-YIELD-MS processing is performed at the Compartment level via a .UTR file. "Compartment" is arbitrary terminology for one or more stands which you wish to process in a single run. There is no upper limit on the number of stands processed. To maximize speed, use TIPS in advance to generate an .SST file for each stand which you want included in the BATCH-YIELD-MS run. The .UTR file should point to an .SST or an .FIE file for each stand in the compartment. In the case where an .FIE file is pointed too, BATCH-YIELD-MS will tap TIPS to create the needed equivalent .SST file on the fly, provided the appropriate switch is activated in the OPTIONS.OPT or other specified .OPT file (see below).

<u>Disk Space Conserving Feature</u>

If disk space is limited and speed is not crucial, you may allow BATCH-YIELD-MS to automatically access TIPS on the fly to produce needed .SST files, provided the particular .FIE file is found in the location designated by the .UTR file. This feature is activated by setting the "MAKE MISSING SST FILE USING TIPS" switch to "Y" in your options (i.e., .OPT) file (see Figure 2). BATCH-YIELD-MS also can be instructed to delete .SST files once they have performed their duty. This feature is activated by setting the "KEEP SST FILES IN BATCH-YIELD-MS" switch to "N" in your options file. Activating both of these two features greatly slows processing time, however, it conserves disk space by creating .SST files only for as long as they are needed and then deleting them. The Run BATCH YIELD-MS section provides details on building and using .UTR files.

3. **Launch BATCH-YIELD-MS:** Access BATCH-YIELD-MS from the INFORM System menu. After selecting/building a .UTR file, BATCH-YIELD-MS requires you to supply the path and names for the .V01, .V02, and .V03 files to be built (Screen 1). Leave fields blank for files that you do not wish to create. Then type Go and BATCH-YIELD-MS sequentially accesses each .SST file specified in the .UTR file. Progress is tabulated in the .LOG file. This step may take several days of continuous processing if thousands of stands are involved and a slow computer is being used.

```
** BATCH YIELDMS (v 2.00) MAIN MENU    Date=10-23-1992 Time=13:27:48   **

  Compartment name > EXAMPLE COMPARTMENT

      V01 Filename > C:\INFORM\EXAMPLE

      V02 Filename > C:\INFORM\EXAMPLE

      V03 Filename > C:\INFORM\EXAMPLE

   OPTion Filename > OPTION

      LOG Filename > C:\INFORM\EXAMPLE

Year To Project To > 1992

Runtime Statistics──────────────────────────────────────────
File  name >                                       #      of
Message >

    Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
    ...or,  Type The First Character of The Desired Command (in CAPS)!
         Edit      Options      Go      Quit     DOShell     Help
```

Screen 1 - BATCH-YIELD-MS Main Menu

4. Load Database: When BATCH-YIELD-MS has completed processing, you may wish to review the .LOG file and see if processing was complete (Screen 2). The .V01, .V02, and .V03 files may be appended into a commercial database package such as dBASE IV. Within the database package, screen forms, and reports may be developed to enhance the appearance and usefulness of the data. The "APPLYING BATCH-YIELD-MS TO dBASE IV" section provides details on this process.

```
LIST            05-13-92 15:49 ♦ SMITH.LOG
***BATCHYMS RUN   Date= 5-13-1992    Time= 9:28:32   ***
Compartment Name: Smith Property

NUMBER  STANDID           MESSAGE           SUCCESSFUL?    STAND-NAME

    1   MH      Processing Successful !          YES       C:\INFORM\MH
    2   MHP     Warning: Ungraded data, slot 1 used.  YES  C:\INFORM\MHP
    3   NP      Processing Successful !          YES       C:\INFORM\NP













Command▶    *** End-of-file ***        Keys:↑↓↔ PgUp PgDn Q=next X=exit ?=Help
```

Screen 2 - Sample .LOG File View Using SCAN

5. Maintenance: Repeat steps 3 and 4 once per year to grow your forest and keep the volumes stored in your stand records database theoretically current. Although each user has a different procedure, the database must be kept current if trees are harvested. One way to handle this problem is to edit the .FIE files using TVAFIE to reflect post harvest conditions and rerun these stands through BATCH-YIELD-MS and append the results into the appropriate database files.

Run BATCH YIELD-MS (RUNBYMS)

Once .FIE files have been processed by TIPS (Make-SST's module) into .SST files, you are ready to run BATCH-YIELD-MS. Optionally, you may direct BATCH-YIELD-MS to operate TIPS on the fly to create needed .SST files. This option is discussed further in the next section. BATCH-YIELD-MS is best operated through the AUTOMENU INFORM System Menu. Move the marker to the proper menu item and press Enter (Screen 3). BATCH-YIELD-MS permits the sequential (batch) processing of an unlimited number of stands per compartment in a single run. Before processing may begin, you must create or edit a .UTR (i.e., compartment list of stands) file containing the name of the compartment in the first record (i.e., header record) followed by the filenames of all desired stands in the compartment in each additional record (no file extensions). TVAFRONT (RUNBYMS mode) serves as the front end for BATCH-YIELD-MS. Its function is to create/edit .UTR files and/or launch BATCH-YIELD-MS execution. If you desire to process only one stand, then your .UTR file will consist of the compartment name on line 1 and the filename for that stand on line 2. UTR files may be re-used.


```
║<TVA INFORM 3> Integrated Forest Management System║

                                              MENU 1 OF 2
        1 - Run TVAFIE (TVA Forest Inventory Editor)

        2 - Run TIPS (TVA Inventory Processing System)

        3 - Run YIELD-MS (Timber Planning Tool Mixed Stands)

        4 - Run INFORM-ED (Master Species File Editor)

     →  5 - Run BATCH-YIELD-MS

        6 - Run LISTER (INFORM Reports Printing Utility)

        7 - Run SCAN (File Display Utility)

        8 - Disk Operating System
     Build files for forestwide stand records database

October 14, 1992  2:43:58 pm        NUM      CTRL        Memory: 404 K

                    Press H for Help
```
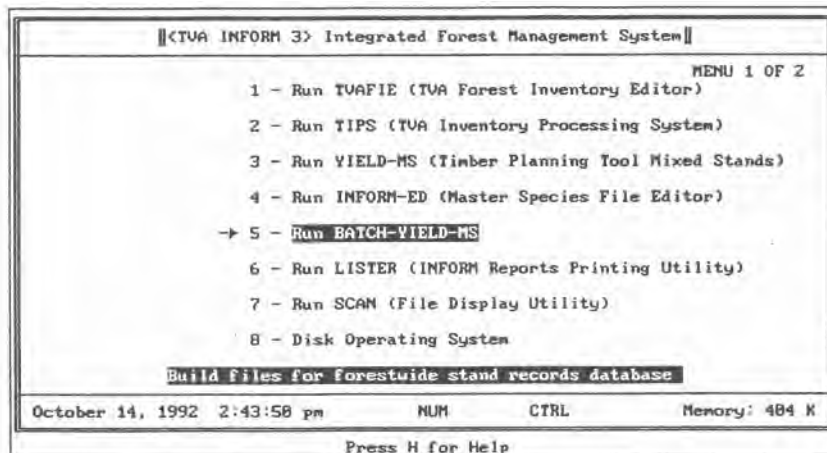
Screen 3 - INFORM Integrated Forest Management System Menu

The RUNBYMS mode of TVAFRONT opens with a menu (Screen 4) which is used for selecting a .UTR file to execute BATCH-YIELD-MS, creating a new .UTR file, editing an old .UTR file, changing disk volume, or changing directory. Similar to the TVAFRONT menu used by TVAFIE, a mouse can be used to make selections (use a double-click as Enter); otherwise, use the Tab and arrow keys to position the cursor and the Enter key to make a selection. Press Esc if you desire to abort the program. You can create a new .UTR file by highlighting <CREATE>.UTR and pressing Enter or edit an existing .UTR file by highlighting it and pressing **F2=Edit**. Launch BATCH-YIELD-MS by simply pointing to the desired .UTR file and pressing Enter or double-click with a mouse on Enter=Go.
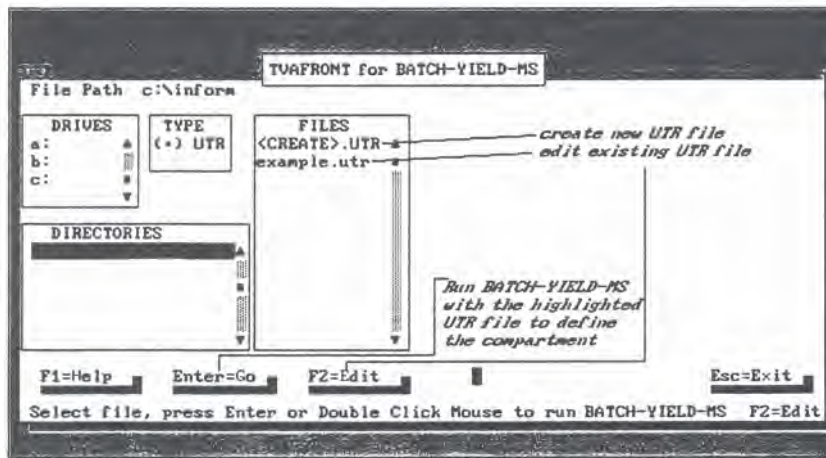
Screen 4 - TVAFRONT (RUNBYMS)

Editing the contents of a .UTR file is easy; typing of .SST file-
names is not necessary. The screen is divided into several boxes
 (Screen 5). Navigate between boxes by using the Tab key or a
mouse. The box entitled **FILES** displays the names of
candidate .SST filenames to choose from for building the .UTR
file; the box on the far right displays the **UTR** File (i.e.,
compartment name on the first line followed by the names of .SST
files comprising the compartment on additional lines).
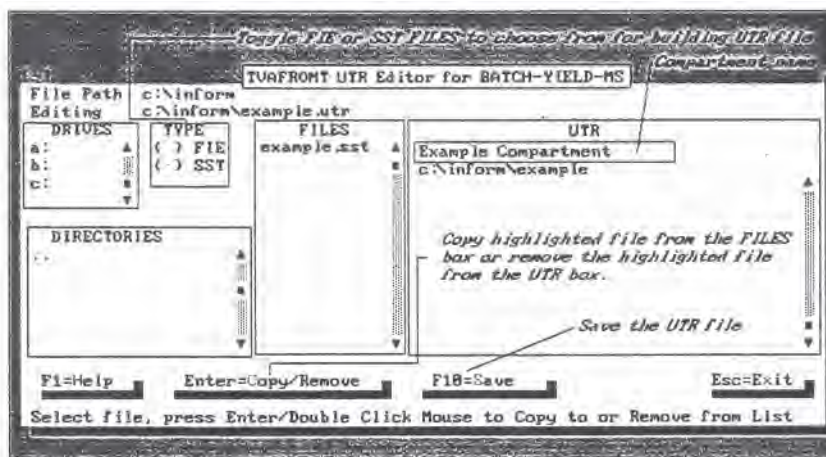
Screen 5 - TVAFRONT (Edit UTR)

If you wish to process only one stand, then the **UTR** box should
show the compartment name on line one and the appropriate stand
filename on line two. You point (single click with a mouse or
use the arrow keys) to highlight .SST filenames in the **FILES** box
and press Enter (double-click with mouse) in order to copy the
filename and path to the **UTR** box. Repeat this process until you
complete building the list of .SST filenames for the Compartment.
Remove filenames from the **UTR** box by highlighting them and press-
ing Enter (this does not delete the file, only its name). You may
save the contents of the **UTR** box and specify a .UTR filename
when prompted using the **F10=Save** command; then press Esc to exit.

6

Automatically Creating .SST Files With TIPS On The Fly

Unique to BATCH-YIELD-MS is the ability to create and process .UTR files which are comprised of the names of .SST and/or .FIE filenames. Note Screen 5 can toggle the .FIE or .SST extension for the **FILES** box. Normally, the .UTR files created and used for BATCH-YIELD-MS are comprised of the names of .SST files while .UTR files used by TIPS are comprised of .FIE file-names. Recall that an .SST file consists simply of a stand/stock table which has been processed by TIPS from "cruise data" stored in an .FIE counterpart file. BATCH-YIELD-MS execution efficiency is maximized by operating TIPS in advance and using the Make-SST's module to create .SST files. However, .SST files can consume large amounts of disk storage when a large number of stands are being processed.

To alleviate disk storage problems, it is possible to submit .UTR files comprised of .FIE (or a mix of .FIE and .SST) filenames directly to BATCH-YIELD-MS in lieu of all .SST filenames. When BATCH-YIELD-MS encounters a stand filename (less extension) within a .UTR file it presumes it's an .SST file; if it is not found, it then checks for an .FIE counterpart. If BATCH-YIELD-MS finds an .FIE counterpart it will automatically suspend process-ing, access TIPS to create the missing .SST file, then resume processing. In order to activate this option, the line labeled "MAKE MISSING SST FILE USING TIPS (1=Y 2=N):1:" in the OPTION.OPT file (Figure 2) must be set to 1=Yes. Additionally, setting the line labeled "KEEP SST FILES IN BATCH-YIELD-MS (1=Y 2=N):1:" to 2=No will direct BATCH-YIELD-MS to delete an .SST file once it has served its purpose, thus conserving disk space. These fea-tures are discussed further in this user manual.

.OPT Files

Use a text editor to check the OPTION.OPT file (Figure 2) for the run-time options you desire. You may rename or copy this file as long as you retain the extension .OPT. The location of data fields in the file cannot be altered or a read error will occur.

Use of the OPTION.OPT file is shared with the OAKREGEN program. As a result, some of the information in the file used by BATCH-YIELD-MS is not used by OAKREGEN and vice-versa. For example, BATCH-YIELD-MS does not need to know the ranges for oak sprout ratings and OAKREGEN does not need to know stumpage prices. The following codes should be used to edit OPTION.OPT.

```
****OPTions File****

DBH GROWTH RATES:
Method (C/E/F)                                :E:
Author Code (1-6)                             :5:
Site Index override (20-150)                  : 80:
Age override (20-150)                         : 50:
BAMAX (50-300)                                :200:
Region override code (1-5)                    :5:
Forest type code (1-18)                       :13:

SURVIVAL RATES:
Method (E/F)                                  :E:
Author Code (1-6)                             :5:

INGROWTH:
Minimum sawtimber dbh (10,12,14")             :12:

STUMPAGE PRICES:
TIMSALE Setup # (1-10)                        : 1:

GROWTH PROJECTION:
Step increment                               : 1:

VOLUME UNITS:
Sawtimber (1-8)                               :5:
Pulpwood (1-4, 6-8)                           :2:

MASPEC.DAT VOLUME
Volume letter (A,B,C,D,E,F,G)                 :C:

THRESHOLD SEEDLING STOCKING % VALUE:
FOR ADEQUATE ADVANCE REPRODUCTION (0-99)  :30:

RANGES FOR # MORE SPROUTS NEEDED TO
ACHIEVE NEW OAK STAND RATINGS              LO           HI
                           CERTAIN  :  0:        :  0:
                           LIKELY   :  1:        :100:
                           POSSIBLE :101:        :200:
                           DOUBTFUL :201:        :999:

AREA SWITCH (1=ACRES, 2=HECTARES):        :1:

KEEP SST FILES IN BATCH-YIELD-MS (1=Y 2=N):1:

MAKE MISSING SST FILE USING TIPS (1=Y 2=N):1:

LOGRULE MAKING SST'S (1=S 2=I 3=D 4=V)    :4:

BY GRADE IF MAKING MISSING SST'S (1=Y 2=N):1:
```

Figure 2 — OPTION.OPT File

Author Codes

1 Harrison, W.C., T.E. Burk and D.E. Beck (1986) SJAF *G-HAT*

2 Marquis, D.A., R.L. Ernst and S.L. Stout (1984) NE-96, *SILVAH*

3 Hilt, D.E. (1985) USFS-NEFES NE-562 (No GROAK adjuster)*OAKSIM*

4 Bolton, R.K. and R.S. Meldahl (1989) AL Exp. Sta Pub.*GA-TWIGS*

5 Shifley, S.R. (1987) USFS-NCFES NC-279 *CS-TWIGS*

6 Hilt, D.E. USFS-NEFES Res. Pro. NE-4153, Delaware,OH *NE-TWIGS*

Region Codes*

1 Blue Ridge
2 Lower Coastal Plain
3 Upper Coastal Plain
4 Piedmont
5 Valley and Ridge

Forest Types*

 1 White Pine Hemlock
 2 Loblolly Pine Pln
 3 Shortleaf Pine Pln
 4 Longleaf Pine Pln
 5 Longleaf Pine
 6 Slash Pine
 7 Loblolly Pine
 8 Shortleaf Pine
 9 Virginia Pine
10 Red Cedar
11 Pond Pine
12 Pitch Pine
13 Oak Pine
14 Oak Hickory
15 Chestnut Oak
16 Southern Scrub Oak
17 Oak Gum Cypress
18 Elm Ash Cottonwood

Consult the YIELD-MS User Manual for more complete information on
growth and yield options.

* Applicable only for Author Code 4 (GA-TWIGS)

Volume Units

1 Cunits
2 Cords
3 Tons Green
4 Tons Dry
5 Mbf
6 Cubic Meters
7 Metric Tons Green
8 Metric Tons Dry

MASPEC.DAT Volume

Enter the volume drive letter where the MASPEC.DAT file resides.

Area Switch (1=ACRES, 2=HECTARES)

Enter a 1 for acres or a 2 for hectares. Selecting acres results
in units of feet, square feet, and pounds. Selecting hectares
'automatically results in units of meters, square meters, and
kilograms.

Keep SST Files In BATCH-YIELD-MS (1=Y 2=N)

Once an .SST file has performed its duty, you may instruct BATCH-
YIELD-MS to 1=keep or 2=delete it. If you select 1=keep, be sure
that you have adequate disk capacity. This is particularly
important if you are accumulating .SST files on the fly by ac-
cessing TIPS automatically (see description of "MAKE MISSING SST
FILES USING TIPS"). Select 2=delete if disk capacity is limited.
Note: selecting 2 will result in .SST files being stripped wheth-
er they were created on the fly or not.

Make Missing SST Files Using TIPS (1=Y 2=N)

When set to 1=Yes, if BATCH-YIELD-MS encounters a missing .SST
file, it will attempt to create one on the fly by accessing TIPS
and then resuming normal processing. It works as follows: If
an .SST file specified by the .UTR file is missing, BATCH-YIELD-
MS checks the directory for the equivalent .FIE file. If it is
not found, BATCH-YIELD-MS moves on to the next stand specified in
the .UTR file. If the equivalent .FIE file is found, BATCH-YIELD-
MS automatically chains to TIPS, creates the needed .SST file,
returns to BATCH-YIELD-MS, and resumes processing. An extreme
application of this feature would be to process a .UTR file for
which no .SST files exist. Combining this feature with "KEEP SST
FILES IN BATCH-YIELD-MS" set to 2=No, the desired .V01, .V02,
and .V03 files could be created without a single .SST file clut-
tering your hard disk.

Log Rule Making SST's (1=S 2=1 3=D 4=V)

This is the log rule used by TIPS to create an .SST file if "MAKE
MISSING SST FILES" is set to 1=Yes. The codes are 1=Scribner,
2=International, 3=Doyal, and 4=Variable (i.e., uses log rule
unique for each species installed in MASPEC.DAT).

By Grade If Making Missing SST's (1=Y 2=N)

This directs TIPS to create .SST files by grade (1=yes), or not
(2=no) if "MAKE MISSING SST FILES" is set to 1=Yes.

Edit the OPTION.OPT (or equivalent file using extension .OPT)
with a text editor or a word processor in non-document mode. Be
careful not to alter the position of the data fields delimited by
colons (turn Insert off on your editor). If you have an editor
called EDIT (standard with DOS 5.0) installed on your machine,
you can edit OPTION.OPT as follows: From the INFORM System Menu
(Screen 6) run SCAN.

```
████ <TVA INFORM 3> Integrated Forest Management System (PROTOTYPE) ██

                                               MENU 1 OF 2
          1 - Run TVAFIE (TVA Forest Inventory Editor)

          2 - Run TIPS (TVA Inventory Processing System)

          3 - Run YIELD-MS (Timber Planning Tool Mixed Stands)

          4 - Run INFORM-ED (Master Species File Editor)

          5 - Run BATCH-YIELD-MS

          6 - Run LISTER (INFORM Reports Printing Utility)

      →► 7 - Run SCAN (File Display Utility)

          8 - Disk Operating System
        Examine files (e.g., .TXT, or .OPT) on the monitor

 September 25, 1992  2:12:04 pm      NUM            Memory: 427 K

                    Press H for Help
```

Screen 6 – Edit OPTION.OPT (Run SCAN)

Then select OPTION.OPT and press Edit (Screen 7)

```
T..                 GATCR    .DAT    SCAN     .COM
342TIPS .EXE        GATD     .DAT    SETNAM   .DAT
482TIPS .EXE        GATDBH   .DAT    SETUP01  .DAT
ADIF    .DAT        GATM     .DAT    SETUP02  .DAT
ANSI    .SYS        GATMORT  .DAT    SMITH    .UTR
AUTO    .BAT        HELP     .HLP    TALLY    .DRW
AUTOEXEC.BAT        HELPBAT  .HLP    TIPS     .EXE
AUTOMENU.COM        HELPINFD.HLP     TRANS    .DAT
AUTOMENU.MDF        HELPOAK  .HLP    TVAFIE   .CNF
AUTOTEMP.BAT        HELPTIPS.HLP     TVAFIE   .CMT
BATCHYMS.EXE        INFORM   .BAT    TVAFIE   .COM
CAPSLOCK.COM        INFORM30.EXE     TVAFIE   .EXE
CHKLIST .CPS        INFORM30.ZIP     TVAFRONT.EXE
CONFIG  .CMF        INFORMED.EXE     TXTDIF   .EXE
CONFIG  .SYS        INSTALL  .BAT    USERID
DFALTC  .DAT        LISTER   .EXE    UTRED    .EXE
DFALTM  .DAT        MASPEC   .DAT    UTRFRONT.EXE
DUALMODE.BAT        MASPEC   .SML    YIELDMS .EXE
EXAMPLE .FIE        MORTF    .DAT
EXAMPLE .REG        OAKREGEN.EXE
EXAMPLE .SST        OPTION   .OPT
EXAMPLE .UTR        README   .TXT
GATC    .DAT        RUNTIPS  .COM
List  Copy  Del  Edit  Move  Path  Ren  Sort    ViewArc   1-9  F1=Help  F10=Exit
```

Screen 7 - Edit OPTION.OPT (Run EDIT)

Make the desired changes in OPTION.OPT and save it when done
 (Screen 8).

```
 File  Edit  Search  Options                          Help
                            OPTION.OPT
****OPTions File****                       ┌──────────────────┐
                                           │ etting Started   │
DBH GROWTH RATES:                          │Keyboard          │
Method (C/E/F)                   :E:       ├──────────────────┤
Author Code (1-6)                :5:       │About...          │
Site Index override (20-150)     : 80:     └──────────────────┘
Age override (50-150)            : 50:
BAMAX (50-300)                   :200:
Region override code (1-5)       :5:
Forest type code (1-18)          :13:

SURVIVAL RATES:
Method (E/F)                     :E:
Author Code (1-6)                :5:

IMGROWTH:
Minimum sawtimber dbh (10,12,14) :12:

STUMPAGE PRICES:
TIMSALE Setup # (1-10)           : 1:

F1=Help │ Displays information on loading and using the MS-DOS Editor
```

Screen 8 - Edit OPTION.OPT (Make Selections And Save)

.LOG Files

After typing Go, BATCH-YIELD-MS will flash messages as execution
proceeds (Screen 9). The .LOG file (Figure 3) will accumulate
these messages so that you may audit a run for completeness. Use
a text editor or the SCAN utility to check the .LOG file contents
after a run has completed (see Screen 2).

NUMBER	STAND-ID	MESSAGE	SUCCESSFUL?	STAND-NAME
1	MIXED	Processing Successful	YES	C:\INFORM\MIXED.SST
2	HARDWOOD	Error: Reading SST file	NO	C:\INFORM\HARDWOOD.SST
3	PINE	Processing Successful	YES	C:\INFORM\PINE.SST

Figure 3 - .LOG File Format

```
** BATCH YIELDMS (v 2.00) MAIN MENU     Date=10-23-1992 Time=13:29:57   **

  Compartment name > EXAMPLE COMPARTMENT

      V01 Filename > C:\INFORM\EXAMPLE

      V02 Filename > C:\INFORM\EXAMPLE

      V03 Filename > C:\INFORM\EXAMPLE

   OPTion Filename > OPTION

      LOG Filename > C:\INFORM\EXAMPLE

Year To Project To > 1992

Runtime Statistics
File  name > EXAMPLE.SST                              #     1 of      1
Message >Calculating Basal Area

   Use Arrow Keys or Space-bar to Select a Command..Then Press "Enter"
   ...or,  Type The First Character of The Desired Command (in CAPS)!
        Edit      Options      Go      Quit      DOShell      Help
```

Screen 9 — BATCH-YIELD-MS During Execution

.VO1, .VO2, and .VO3 Files

BATCH-YIELD-MS may produce a .V01, .V02, and .V03 file for each
run. To defeat the production of any of these files, simply
leave the filename field blank. Each record in a .V01 file
summarizes information for an individual stand. .V02 file re-
cords contain individual species data for a stand. .V03 files are
similar to .V02 but contain a greatly expanded amount of data.
The content of .V01, .V02, and .V03 files is entirely arbitrary.
The intent was to design files that met the specifications for
the TVA STANDFINDER database system. Undoubtedly, future re-
leases of BATCH-YIELD-MS will contain the option to produce .VO4
and other types of files as user demand warrants.

The .V01 format (Figure 4) provides basic volume information
while the .V02 format (Figure 5) provides a breakdown of basal
area by species. A .V01 file can be rearranged to produce a
database form as in Screen's 10 and 11 while .V02 files can yield
a database form as in Screen 12.

Field	Type	Width	Decimal	Definition
1	Character	8		Stand Filename
2	Numeric	5	1	Sawtimber BA (Cut)
3	Numeric	5	1	Sawtimber BA (Leave)
4	Numeric	5	1	Sawtimber Error BA
5	Numeric	5	2	Sawtimber Volume Grade 1 (Cut)
6	Numeric	5	2	Sawtimber Volume Grade 1 (Leave)
7	Numeric	6	1	Sawtimber Value Grade 1
8	Numeric	5	1	Sawtimber Error Grade 1
9	Numeric	5	2	Sawtimber Volume Grade 2 (Cut)
10	Numeric	5	2	Sawtimber Volume Grade 2 (Leave)
11	Numeric	6	1	Sawtimber Value Grade 2
12	Numeric	5	1	Sawtimber Error Grade 2

Figure 4 — .V01 File Format

13

Field	Type	Width	Decimal	Definition
13	Numeric	5	2	Sawtimber Volume Grade 3 (Cut)
14	Numeric	5	2	Sawtimber Volume Grade 3 (Leave)
15	Numeric	6	1	Sawtimber Value Grade 3
16	Numeric	5	1	Sawtimber Error Volume Grade 3
17	Numeric	5	2	Sawtimber Volume Grade 4 (Cut)
18	Numeric	5	2	Sawtimber Volume Grade 4 (Leave)
19	Numeric	6	1	Sawtimber Value Grade 4
20	Numeric	5	1	Sawtimber Error Volume Grade 4
21	Numeric	5	2	Sawtimber Volume Grade 5 (Cut)
22	Numeric	5	2	Sawtimber Volume Grade 5 (Leave)
23	Numeric	6	1	Sawtimber Value Grade 5
24	Numeric	5	1	Sawtimber Error Volume Grade 5
25	Numeric	4		Sawtimber Stems (Cut)
26	Numeric	4		Sawtimber Stems (Leave)
27	Numeric	5	1	Sawtimber Error Stems
28	Numeric	5	1	Sawtimber Avg Dbh (Cut)
29	Numeric	5	1	Sawtimber Avg Dbh (Leave)
30	Numeric	5	1	Pulpwood BA (Cut)
31	Numeric	5	1	Pulpwood BA (Leave)
32	Numeric	5	1	Pulpwood Error BA
33	Numeric	5	1	Pulpwood (Cut)
34	Numeric	5	1	Pulpwood (Leave)
35	Numeric	6	1	Pulpwood Value
36	Numeric	5	1	Pulpwood Error
37	Numeric	4		Pulpwood Stems (Cut)
38	Numeric	4		Pulpwood Stems (Leave)
39	Numeric	5	1	Pulpwood Error Stems
40	Numeric	5	1	Pulpwood Avg Dbh (Cut)
41	Numeric	5	1	Pulpwood Avg Dbh (Leave)
42	Numeric	4		Year measured
43	Numeric	4		Year reported
44	Numeric	5	3	Growth Rate: Saw (Cut)
45	Numeric	5	3	Growth Rate: Saw (Leave)
46	Numeric	6	2	Growth Rate: Sawunit ($)
47	Numeric	5	3	Growth Rate: Pulp (Cut)
48	Numeric	5	3	Growth Rate: Pulp (Leave)
49	Numeric	6	2	Growth Rate: Pulp ($)
50	Numeric	6	1	Mast (lbs.): Sawtimber (Cut)
51	Numeric	6	1	Mast (lbs.): Sawtimber (Leave)
52	Numeric	6	1	Mast (lbs.): Pulpwood (Cut)
53	Numeric	6	1	Mast (lbs.): Pulpwood (Leave)
54	Character	5		GRADE or UNGRD (if data were UNGRD, then Grade 1 slot is used for display
55	Character	6		Sawtimber volume unit: CUNIT CORD TONGRN TONDRY MBF CMETER MTNGRN MTNDRY
56	Character	6		Pulpwood volume unit: CUNIT CORD TONGRN TONDRY CMETER MTNGRN MTNDRY
57	Character	7		ACRE or HECTARE (volumes are either per acre or per hectare)
58	Character	7		USFS size class for "cut" trees: SEEDSAP POLETIM SAWTIMB
59	Character	7		USFS size class for "leave" trees: SEEDSAP POLETIM SAWTIMB
60	Character	7		USFS size class for "all" trees: SEEDSAP POLETIM SAWTIMB
61	Numeric	7	1	Stand acres (hectares)
** Total **				387 bytes/stand (including blanks)

Figure 4 - .V01 File Format

```
|Field          Type      Width  Decimal   Definition                                                       |
|                                                                                                            |
| 1            Character    8               Stand Filename                                                   |
| 2            Character    3               Species code from INFORM                                         |
| 3            Numeric      5        1      Sawtimber Grade 1 (Total) BA                                      |
| 4            Numeric      5        1      Sawtimber Grade 2 (Total) BA                                      |
| 5            Numeric      5        1      Sawtimber Grade 3 (Total) BA                                      |
| 6            Numeric      5        1      Sawtimber Grade 4 (Total) BA                                      |
| 7            Numeric      5        1      Sawtimber Grade 5 (Total) BA                                      |
| 8            Numeric      5        1      Pulpwood BA (Total)                                               |
| 9            Numeric      5        1      Sawtimber BA (Cut)                                                |
|10            Numeric      5        1      Sawtimber BA (Leave)                                              |
|11            Character    7               ACRE or HECTARE (volumes are either per acre or per hectare)     |
|12            Character    5               GRADE or UNGRD (if data were UNGRD, then Grade 1 slot is used for display |
|13            Numeric      7        1      Stand acres (hectares)                                            |
|14            Numeric      4               Year measured                                                    |
|15            Numeric      4               Year reported                                                    |
|** Total **                                93 bytes/species (including blanks)                              |
```

Figure 5 — .V02 File Format

Screen 10 — Sample Volume Data Screen From V01.SCR (part 1)

Screen 11 — Sample Volume Data Screen From V01.SCR (part 2)

15

```
┌────────────────────────────────────────────────────────────────────┐
│ Records   Organize   Go To   Exit                                  │
│                    ┌─────────────────┐                             │
│                    │     V02 File    │                             │
│                    │Basal Area / ACRE│                             │
│                    └─────────────────┘                             │
│    Year Measured 1990      Stand_ID> EXAMPLE      Year Reported 1992│
│                              50.0 ACRE                             │
│                                                                    │
│              ┌─────────────SAWTIMBER─────────────┐      SAWTIMBER  │
│ SPECIES  GRADE-1 GRADE-2 GRADE-3 GRADE-4 GRADE-5 PULPWOOD  TOTAL   CUT  LEAVE│
│  BLO       0.0     0.0     0.0     0.0     0.0     5.7     6.5    0.0   0.0  │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│ Edit    ║C:\inform\V02        ║Rec 1/14     ║File ║      NumCaps   │
└────────────────────────────────────────────────────────────────────┘
```

Screen 12 — Sample Volume Data Screen From V02.SCR

The .V03 file (Figure 6) contains the essence of the TIPS print-out. ".V03" files can become quite large. A variety of screens and reports can be made with these files. ".V03" files store the stand table, and local volume table for each stand, one record per species. A variety of reports can be produced by multiplying either the sawtimber, pulpwood, topwood, or crownwood volume per tree (i.e., local volume table) by the matching number of trees per acre or hectare (i.e., stand table).

Field	Type	Width	Decimal	Definition
1	Character	8		Stand Filename
2	Character	3		Species code from INFORM
3	Character	5		DEAD or LIVE
4-23	Numeric	7	2	Sawtimber stand table # trees/acre (hectare) by dbh class
24-43	Numeric	7	2	Pulpwood stand table # trees/acre (hectare) by dbh class
44-63	Numeric	6	3	Sawtimber local volume table (volume/tree) by dbh class
64-83	Numeric	6	3	Pulpwood local volume table (volume/tree) by dbh class
84-103	Numeric	6	3	Topwood local volume table (volume/tree) by dbh class
104-123	Numeric	6	3	Crownwood local volume table (volume/tree) by dbh class
124-143	Numeric	6	2	Mast local volume table (weight of acorns/tree) by dbh class
144	Numeric	4		Year measured
145	Numeric	4		Year reported
146	Character	5		GRADE or UNGRD
147	Character	6		Sawtimber volume unit: CUNIT CORD TONGRN TONDRY MBF CMETER MTNGRN MTNDRY
148	Character	6		Pulpwood volume unit: CUNIT CORD TONGRN TONDRY CMETER MTNGRN MTNDRY
149	Character	7		ACRE or HECTARE (volumes are either per acre or per hectare)
150	Numeric	7	1	Stand acres (hectares)
** Total **				1071 bytes/species (including blanks)

Figure 6 — .V03 File Format

16

APPLYING BATCH-YIELD-MS TO dBASE IV

BATCH-YIELD-MS is a powerful tool for building the basics of a
stand records database and/or GIS system. You may wish to use
parts of any or all of the files generated by BATCH-YIELD-MS.
BATCH-YIELD-MS can be operated yearly to update (for growth and
mortality) the inventory data for a complete forest to the cur-
rent year. BATCH-YIELD-MS can build the .V01, .V02, and .V03
files either with or without a growth projection. They may be
loaded into dBASE IV by following these steps:

    1. After BATCH-YIELD-MS has completed a run, from the DOS prompt,
rename the files created by BATCH-YIELD-MS ending with exten-
sion's .V01, .V02, and .V03 to have the extension .TXT. For
example,

```
C:> RENAME EXAMPLE.V01 V01.TXT
C:> RENAME EXAMPLE.V02 V02.TXT
C:> RENAME EXAMPLE.V03 V03.TXT
```

This is necessary because dBASE is picky about file extensions.

    2. Enter dBASE IV (or similar package with ASCII file importing
capability) and create file skeletons using Figures 4-6 as
guides. Or, if you are using dBASE IV, use the V01.DBF, V02.DBF,
and V03.DBF files provided with the INFORM distribution disks
(Screen 13).


```
 Layout   Organize   Append   Go To   Exit            ▓▓▓▓▓▓▓

                                            Bytes remaining:    3674

 ┌─────┬────────────┬────────────┬───────┬──────┬───────┐
 │ Num │ Field Name │ Field Type │ Width │ Dec  │ Index │
 ├─────┼────────────┼────────────┼───────┼──────┼───────┤
 │  1  │ STAND_ID   │ Character  │   8   │      │   N   │
 │  2  │ V01_02     │ Numeric    │   5   │  1   │   N   │
 │  3  │ V01_03     │ Numeric    │   5   │  1   │   N   │
 │  4  │ V01_04     │ Numeric    │   5   │  1   │   N   │
 │  5  │ V01_05     │ Numeric    │   5   │  2   │   N   │
 │  6  │ V01_06     │ Numeric    │   5   │  2   │   N   │
 │  7  │ V01_07     │ Numeric    │   6   │  1   │   N   │
 │  8  │ V01_08     │ Numeric    │   5   │  1   │   N   │
 │  9  │ V01_09     │ Numeric    │   5   │  2   │   N   │
 │ 10  │ V01_10     │ Numeric    │   5   │  2   │   N   │
 │ 11  │ V01_11     │ Numeric    │   6   │  1   │   N   │
 │ 12  │ V01_12     │ Numeric    │   5   │  1   │   N   │
 │ 13  │ V01_13     │ Numeric    │   5   │  2   │   N   │
 │ 14  │ V01_14     │ Numeric    │   5   │  2   │   N   │
 │ 15  │ V01_15     │ Numeric    │   6   │  1   │   N   │
 │ 16  │ V01_16     │ Numeric    │   5   │  1   │   N   │
 └─────┴────────────┴────────────┴───────┴──────┴───────┘

          Enter the field name. Insert/Delete field:Ctrl-N/Ctrl-U
 Field names begin with a letter and may contain letters, digits and underscores
```

Screen 13 - dBASE IV File Skeleton For .V01 Type

3. From the database package, append the .TXT files into the
appropriate .DBF file (Screen 14).

```
 Layout   Organize   Append   Go To   Exit
┌─────┬────────────┬─────────────────────────────────────────────┬──────────────────┐
│ Num │ Field Name │  Enter records from keyboard           es  │                  │
│     │            │  Append records from dBASE file             │                  │
│  1  │ STAND_ID   │■ Copy records from non-dBASE file           │      <C:>         │
│  2  │ V01_02     │ M┌──────────────────────────────────────┐   │                  │
│  3  │ V01_03     │ M│   RapidFile                  (.rpd)  │   │ <parent>         │
│  4  │ V01_04     │ M│   dBASE II                   (.db2)  │   │ JUNK.TXT         │
│  5  │ V01_05     │ M│   Framework II               (.fw2)  │   │ README.TXT       │
│  6  │ V01_06     │ M│   Lotus 1-2-3                (.wks)  │   │ V01.TXT   ■      │
│  7  │ V01_07     │ M│   VisiCalc                   (.dif)  │   │ V02.TXT          │
│  8  │ V01_08     │ M│   SYLK-Multiplan                     │   │ V03.TXT          │
│  9  │ V01_09     │ M│   Text fixed-length fields   (.txt)  │   │                  │
│ 10  │ V01_10     │ M│ ■ Blank delimited            (.txt)  │   │                  │
│ 11  │ V01_11     │ M│   Character delimited  {"} (.txt)  │   │                  │
│ 12  │ V01_12     │ Numeric    5      1      N └─────────────────┘                  │
│ 13  │ V01_13     │ Numeric    5      2      N                                      │
│ 14  │ V01_14     │ Numeric    5      2      N                                      │
│ 15  │ V01_15     │ Numeric    6      1      N                                      │
│ 16  │ V01_16     │ Numeric    5      1      N                                      │
└─────┴────────────┴────────────────────────────────────────────────────────────────┘
        Position selection bar: ↑↓    Select: ←┘    Leave picklist: Esc
    Add records to database file from text file, fields separated by blanks
```

Screen 14 — dBASE IV Append Of Blank Delimited .V01 type
           ASCII File

4. From the database package, devise forms and reports for view-
ing and printing the data. The .SCR and .FRM files provided on
the INFORM disks can be used with dBASE IV for this purpose.
These files must initially be compiled by dBASE before they can
be used. This is easily accomplished by modifying the layout and
saving.

6 Repeat these steps each year to grow your forest electronically
until stands are cut or re-inventoried. This way, your stand
records database system will display the theoretically current
volumes regardless of how long ago the stands were inventoried.

The APPENDIX contains sample .V01, .V02, and .V03 screen forms
and reports prepared with the dBASE IV .SCR and .FRM files pro-
vided on the INFORM disks.

(A) Sample dBASE IV Reports

V01.FRM

Page No.   1   V01 File
10/28/92

                        Stand_ID> EXAMPLE
                          50.0 ACRE

Year Measured 1990   Year Reported 1992

VARIABLE	CUT	LEAVE	TOTAL	$--VALUE	%-ERROR
SAWTIMBER		Per ACRE			
USFS Size Class	N/A	SAWTIMB	SAWTIMB		
BA (sqft/sqm)	0.0	71.5	71.5		100.0
Grade 1 (MBF)	0.00	2.02	2.02	$ 120.90	100.0
Grade 2 (MBF)	0.00	2.62	2.62	$ 172.10	100.0
Grade 3 (MBF)	0.00	1.29	1.29	$ 23.00	100.0
Grade 4 (MBF)	0.00	0.00	0.00	$ 0.00	
Grade 5 (MBF)	0.00	2.09	2.09	$ 0.00	100.0
Total (MBF)	**0.00**	**8.02**	**8.02**	**$ 316.00**	
# Stems	0	62	62		100.0
Avg Dbh (in/cm)	0.0	14.5			
Growth/yr (MBF)	0.000	0.155	0.155	$ 18.35	
Hard Mast (lbs/kg)	0.0	122.3	122.3		
PULPWOOD					
BA (sqft/sqm)	0.0	57.6	57.6		100.0
Volume (CORD)	0.0	7.6	7.6	$ 48.10	100.0
# Stems	0	302	302		100.0
Avg Dbh (in/cm)	0.0	5.9			
Growth/yr (CORD)	0.000	0.019	0.019	$ 0.21	
Hard Mast (lbs/kg)	0.0	0.0	0.0		

Average Dbh, BA, and hard mast are reported in metric units if the stand area is in hectares and english units if the stand area is in acres.

V02.FRM

Stand_ID> EXAMPLE   50.0 ACRE   Year Measured 1990   Year Reported 1992

SPPCODE	GRADE-1	GRADE-2	GRADE-3	GRADE-4	GRADE-5	PULPWOOD	TOTAL	CUT	LEAVE
			SAWTIMBER					SAWTIMBER	
					BA/ACRE				
BLO	0.0	0.0	0.8	0.0	0.0	5.7	6.5	0.0	0.8
WHO	0.8	10.3	0.0	0.0	0.0	3.6	14.7	0.0	11.1
SWG	0.0	0.0	0.0	0.0	0.0	4.6	4.6	0.0	0.0
YEP	14.5	0.0	1.0	0.0	0.0	8.0	23.5	0.0	15.5
HIC	0.0	0.0	0.0	0.0	0.0	4.8	4.8	0.0	0.0
SHP	0.0	0.0	0.0	0.0	0.0	13.6	13.6	0.0	0.0
DOG	0.0	0.0	0.0	0.0	0.0	2.8	2.8	0.0	0.0
REM	0.0	0.0	0.0	0.0	0.0	3.8	3.8	0.0	0.0
PER	0.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0
ASH	0.0	0.0	1.0	0.0	0.0	6.6	7.6	0.0	1.1
LOP	0.0	0.7	7.3	0.0	0.0	2.0	10.0	0.0	8.0
CHO	0.0	8.0	0.0	0.0	0.0	0.0	8.0	0.0	8.0
SCO	0.9	10.0	0.0	0.0	0.0	0.0	10.9	0.0	10.9
BEE	0.0	0.0	0.0	0.0	16.1	0.0	16.1	0.0	16.1
TOTAL	16.2	29.0	10.1	0.0	16.1	57.5	128.9	0.0	71.5

Note: Alt data based on BATCH-YIELD-MS projection since inventory.

Page No. 1	V03 Report
Date 10/28/92	Total Mast in lb/kg
	By Diameter Class

Species	2"	4"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	Total
	Stand ID> EXAMPLE					Stand Size > 50.0							Year Reported 1992					Year Measured 1990			
							Per ACRE														
BLO	0.00	0.00	0.00	0.00	0.00	2.05	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.12
WHO	0.00	0.00	0.00	0.00	0.00	0.04	25.29	4.43	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.96
SWG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
YEP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SHP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DOG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LOP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHO	0.00	0.00	0.00	0.00	0.00	30.59	4.49	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.27
SCO	0.00	0.00	0.00	0.00	0.00	0.00	46.20	8.34	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54.98
BEE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00	32.69	76.04	12.95	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	122.33

VO3STALL.FRM

V03 Report
Total Number of
Stems By Diameter Class

Species		Stand ID> EXAMPLE					Stand Size > 50.0					Year Reported 1992						Year Measured 1990				
	2"	4"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	Total
										Per ACRE											
BLO	0.00	8.79	0.69	0.01	8.80	0.96	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.28
WHO	0.00	0.00	0.00	9.01	0.80	0.02	8.66	1.23	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.77
SWG	26.43	19.39	10.17	0.99	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.01
YEP	0.00	0.00	0.00	8.38	9.27	1.23	0.05	8.17	1.65	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.84
HIC	18.16	9.74	0.36	9.12	0.61	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.00
SHP	0.00	0.00	8.95	9.64	0.80	8.96	0.91	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.28
DOG	35.24	20.02	1.58	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.88
REM	17.45	9.20	8.85	2.12	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.78
PER	0.00	0.00	8.61	0.94	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.58
ASH	0.00	0.00	8.42	1.04	8.43	1.31	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.25
LOP	0.00	0.00	8.95	0.67	0.01	8.94	0.91	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.50
CHO	0.00	0.00	0.00	0.00	0.00	8.74	1.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.81
SCO	0.00	0.00	0.00	0.00	0.00	0.00	8.28	1.38	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.73
BEE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.80	1.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.84
Total	97.28	67.14	56.58	41.96	28.94	30.17	19.92	10.86	9.57	1.10	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	363.55

VO3STPUL.FRM

V03 Report
Number of Pulpwood
Stems By Diameter Class

Species	Stand ID> EXAMPLE 2"	4"	6"	8"	10"	Stand Size > 12"	50.0 14"	16"	18"	20"	22"	24"	Year Reported 1992 26"	28"	30"	32"	Year Measured 1990 34"	36"	38"	40"	Total
										Per ACRE											
BLO	0.00	8.79	0.69	0.01	8.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.29
WHO	0.00	0.00	0.00	9.01	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.81
SWG	26.43	19.39	10.17	0.99	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.01
YEP	0.00	0.00	0.00	8.38	9.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.65
HIC	18.16	9.74	0.36	9.12	0.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.99
SHP	0.00	0.00	8.95	9.64	0.80	8.94	0.91	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.26
DOG	35.24	20.02	1.58	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.88
REM	17.45	9.20	8.85	2.12	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.78
PER	0.00	0.00	8.61	0.94	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.58
ASH	0.00	0.00	8.42	1.04	8.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.89
LOP	0.00	0.00	8.95	0.67	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.63
CHO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BEE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	97.28	67.14	56.58	41.96	28.94	8.94	0.91	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	301.77

Page No.   1
Date 10/28/92

V03 Report
Number of Sawtimber
Stems By Diameter Class

Species	Stand ID> EXAMPLE 2"	4"	6"	8"	10"	Stand Size > 12"	14"	16"	18"	20"	22"	Year Reported 1992 24"	26"	28"	30"	32"	Year Measured 1990 34"	36"	38"	40"	Total
										Per ACRE												
BLO	0.00	0.00	0.00	0.00	0.00	0.96	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99
WHO	0.00	0.00	0.00	0.00	0.00	0.02	8.66	1.23	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.96
SWG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
YEP	0.00	0.00	0.00	0.00	0.00	1.23	0.05	8.17	1.65	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.19
HIC	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
SHP	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
DOG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASH	0.00	0.00	0.00	0.00	0.00	1.31	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.36
LOP	0.00	0.00	0.00	0.00	0.00	8.94	0.91	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.87
CHO	0.00	0.00	0.00	0.00	0.00	8.74	1.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.81
SCO	0.00	0.00	0.00	0.00	0.00	0.00	8.28	1.38	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.73
BEE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.80	1.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.84
Total	0.00	0.00	0.00	0.00	0.00	21.23	19.01	10.84	9.57	1.10	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	61.78

V03 Report

Pulpwood Volume

By Diameter Class

	Stand ID> EXAMPLE					Stand Size >	50.0						Year Reported 1992				Year Measured 1990				
Species	2"	4"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	Total

Per ACRE

Volumes are reported in CORD

Species	2"	4"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	Total
BLO	0.000	0.000	0.014	***.***	0.660	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.675
WHO	0.000	0.000	0.000	0.333	0.066	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.399
SWG	0.000	0.000	0.183	0.045	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.230
YEP	0.000	0.000	0.000	0.369	0.732	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.101
HIC	0.000	0.000	0.008	0.274	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.331
SHP	0.000	0.000	0.331	0.395	0.096	2.181	0.280	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.293
DOG	0.000	0.000	0.033	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.035
REM	0.000	0.000	0.186	0.095	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.294
PER	0.000	0.000	0.232	0.042	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.277
ASH	0.000	0.000	0.135	0.047	0.531	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.713
LOP	0.000	0.000	0.224	0.030	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.255
CHO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SCO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BEE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	0.000	0.000	1.346	1.632	2.154	2.181	0.280	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	7.603

V03 Report
Sawtimber Volume
Stems By Diameter Class

Species	Stand ID> EXAMPLE 8"	10"	12"	14"	16"	Stand Size > 50.0 18"	20"	22"	24"	26"	28"	30"	Year Reported 1992 32"	34"	36"	38"	40"	Total	Year Measured 1990 Topwood
										Per ACRE									All topwood
						Sawtimber volumes reported in MBF													measured in CORD
BLO	0.000	0.000	0.074	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.077	0.060
WHO	0.000	0.000	0.002	0.918	0.196	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.126	1.029
SWG	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
YEP	0.000	0.000	0.095	0.006	1.446	0.351	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.923	1.292
HIC	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001
SHP	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001
DOG	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
REM	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ASH	0.000	0.000	0.101	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.107	0.083
LOP	0.000	0.000	0.983	0.103	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.089	0.404
CHO	0.000	0.000	0.586	0.116	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.708	0.847
SCO	0.000	0.000	0.000	0.662	0.219	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.897	1.029
BEE	0.000	0.000	0.000	0.000	0.000	1.802	0.281	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.093	1.494
Total	0.000	0.000	1.842	1.814	1.871	2.179	0.306	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.022	6.241

VO3BAALL.FRM

V03 Report
Total Basal Area
By Diameter Class

Stand ID> EXAMPLE   Stand Size >   50.0   Year Reported 1992   Year Measured 1990

Per ACRE

Species	2"	4"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	Total
BLO	0.000	0.767	0.135	0.003	4.800	0.754	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.492
WHO	0.000	0.000	0.000	3.145	0.436	0.016	9.258	1.717	0.088	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	14.661
SWG	0.577	1.692	1.997	0.346	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.628
YEP	0.000	0.000	0.000	2.925	5.056	0.966	0.053	11.407	2.916	0.196	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	23.520
HIC	0.396	0.850	0.071	3.183	0.333	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.841
SHP	0.000	0.000	1.757	3.365	0.436	7.037	0.973	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	13.597
DOG	0.769	1.747	0.310	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.840
REM	0.381	0.803	1.738	0.740	0.087	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.749
PER	0.000	0.000	1.691	0.328	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.035
ASH	0.000	0.000	1.653	0.363	4.598	1.029	0.053	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	7.696
LOP	0.000	0.000	1.757	0.234	0.005	7.021	0.973	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.019
CHO	0.000	0.000	0.000	0.000	0.000	6.864	1.101	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.021
SCO	0.000	0.000	0.000	0.000	0.000	0.000	8.851	1.927	0.124	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.902
BEE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	13.784	2.203	0.079	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	16.066
Total	2.122	5.859	11.109	14.647	15.784	23.695	21.295	15.163	16.912	2.400	0.079	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	129.066

(B) SAVER.DAT File Format

Record #	Contents
1	path/ filename. V01
2	path/filename.V02
3	path/filename.V03
4	path/ filename. LOG
5	path/ filename. OPT
6	path/filename.UTR
7	Stand # in UTR file to resume processing with
8	Log rule code (1=Scribner, 2=Int. 3=Doyal, 4=Var.)
9	By grade (1=Yes 2=No)
10	Year to project to

(C) DUALMODE.BAT

```
echo off
rem DUALMODE.BAT
rem Batch file to simultaneously run TIPS and BATCH-YIELD-MS.
rem Presumes that BATCH-YIELD-MS has already been executed from TVAFRONT
rem or normally. This BAT file sits just below command which normally
rem executes BATCH-YIELD-MS to go make SST file and resume.
rem The loop is stopped when either BATCH-YIELD-MS or TIPS delete @@@@@@@.UTR
:NEXT
IF NOT EXIST @@@@@@@.UTR GOTO END
TIPS @@@@@@@.UTR
BATCHYMS @@@@@@@.UTR
GOTO NEXT
:END
AUTO
```

(D) dBASE IV Files Defined

FILENAME	DEFINITION
V01.DBF	V01 database file skeleton summarizes basal area, volume, #stems, mast, sampling error, and growth rates by sawtimber/pulpwood, by grade, and by cut/leave on a per acre (hectare) basis (one record per stand).
V02.DBF	V02 database file skeleton summarizes basal area, by sawtimber/pulpwood, by grade, by cut/leave on a per acre (hectare) basis (one record per species per stand).
V03.DBF	V03 database file skeleton summarizes #stems, average volumes per tree, average mast per tree, by dbh class, by sawtimber/pulpwood, on a per acre (hectare) basis (one record per species per stand).
V01.SCR	V01 screen shows summary of one stand at a time in part #1 for sawtimber, part # 2 for pulpwood.
V02.SCR	V02 screen shows summary of one species per stand at a time.
V01.FRM	V01 report shows basal area, volume, growth, sampling error summary, by sawtimber/pulpwood, by cut/leave, by grade, for each stand.
V02.FRM	V02 report shows basal area by sawtimber/pulpwood, by grade, by cut/leave, banded by individual species for each stand.
V03MAST.FRM	V03 report shows mast weight for all sawtimber and pulpwood, by dbh class, banded by species for each stand.
V03STALL.FRM	V03 report shows #stems for all sawtimber and pulpwood by dbh class, banded by species for each stand.
V03STPUL.FRM	V03 report shows #stems for all pulpwood by dbh class, banded by species for each stand.
V03STSAW.FRM	V03 report shows #stems for all sawtimber by dbh class, banded by species for each stand.
V03VOPUL.FRM	V03 report shows volume of pulpwood by dbh class, banded by species for each stand.
V03VOSAW.FRM	V03 report shows volume of sawtimber, by dbh class, banded by species for each stand.
V03BAALL.FRM	V03 report shows basal area of all sawtimber and pulpwood by dbh class, banded by species for each stand.

Note: all screens and reports express values on a per acre (hectare) basis. Screens and reports can be modified to express values on a per stand basis by editing calculated fields to include the product of the stand area.

OAKREGEN USER SUPPLEMENT

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OAKREGEN (Figure 1) is a program designed to process multiple "SST" and "REG" file pairs (Figure 2) into a single record per stand summary file (i.e., ROT). The Regeneration OuTput file contains the computed index for the expected success in regenerating the site to oak following a clearcut harvest (Figure 3). The format for the ROT file is: Standid, yes/no for 1) advance reproduction adequate, and 2) advance reproduction plus stump sprouts adequate, the mean stocking value %, the # of sprouts deficient, and a qualitative rating of whether the # of sprouts deficient makes a future oak stand certain, likely, possible, or doubtful. Criteria for the ratings are in OPTION.OPT.
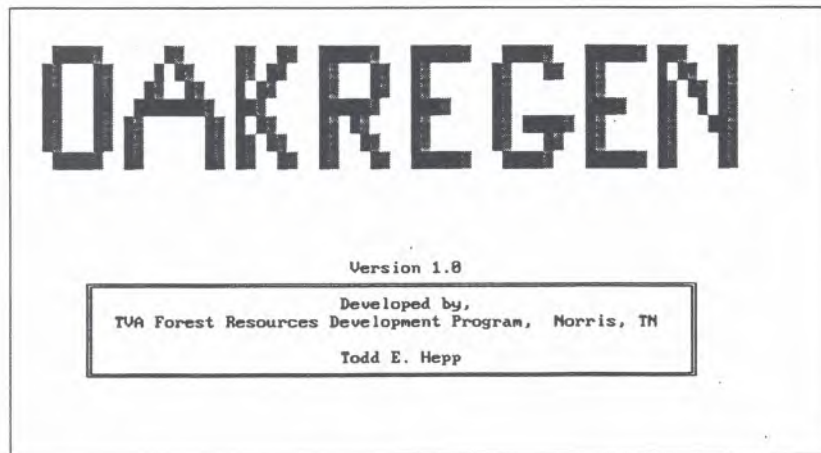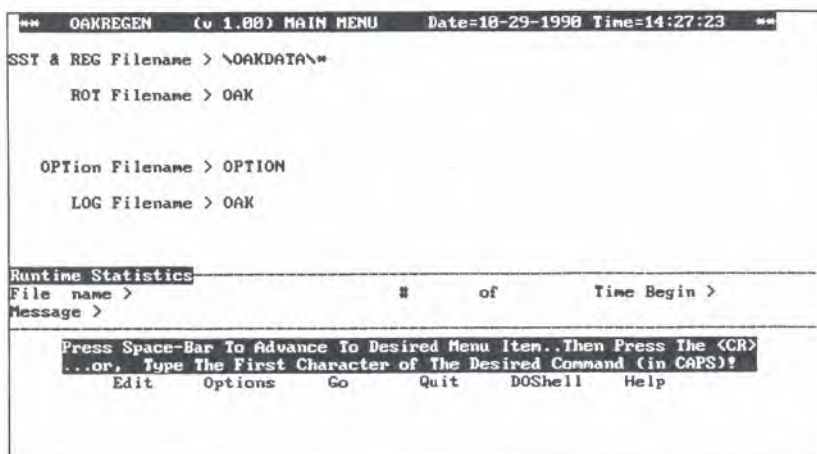

Figure 1 - Banner Screen

Figure 2 - OAKREGEN Main Menu Screen

```
        ***OAKREGEN RUN  Date= 10-12-1990   Time= 15:24: 4  ***

  ------------------------OAK------------------------    -------DES-------  -------UND-------
        ADVANCED      ADEQUATE         # MORE  FUTURE   % OF              % OF
        REPRODUCTION  WITH      MEAN   SPROUTS OAK      PLOTS MEAN MEAN   PLOTS MEAN MEAN
 STANDID >or= 30%  STUMP SPROUTS? SV%  NEEDED  STAND    OCC.  DIAM HT     OCC.  DIAM HT     #-PLOTS

 MIXED SP   YES       YES        31     0    CERTAIN   100   .6   3.0    100   .9   8.0     26
 LOWER 40   NO        NO         22    49    POSSIBLE   71   .7   4.1     64   .8   7.1     34
 UPLAND 50  NO        YES        28     0    LIKELY    100  1.6  13.0    100   .8   8.1     46
 SKUNK HILL NO        NO         11   181    DOUBTFUL  100  1.1  11.3    100   .9   9.7     36
```

Figure 3 - Sample OAKREGEN Regeneration Output

OAKREGEN uses the stand stock table in "SST" files to determine
stump sprout capability combined with advanced seedling reproduc-
tion inventory data stored in "REG" files. This information is
processed using the tables and factors described in Sander,
Johnson, and Rogers (1984), Evaluating Oak Advance Reproduction
In The Missouri Ozarks, USDA-FS, NCFES, NC-251, 16 pp. OAKREGEN
also summarizes data collected for DESirable and UNDesirable
seedlings. In this case the % of plots with an observation, the
mean diameter, and the mean height are reported.

Operations

OAKREGEN is a batch program. A wildcard provision permits you to
process an unlimited number of stands in a single run. The
program uses a "SST" file (stand/stock table file) and a "REG"
file (storing regeneration plot data) for each stand processed.
Use INFORM (TVAFIE & TIPS) to generate "SST" files. Use a text
editor to prepare "REG" files. Reviewing the LOG file will alert
you to any missing files or bad data following your run

"REG" Files Format
"REG" files must be paired to "SST" files for each stand using
the same file name as the "SST" file but with the "REG" exten-
sion. "REG" and "SST" files must reside in the same subdirecto-
ry. The format for "REG" files is as follows.

```
ITEM                                  COLUMNS
Sample #                              1-3 (right justify)
Aspect                                5-6 (NE, SE, SW, NW)
Slope                                 8-9 (UPper, MIddle, LOwer)
Oak Ground Diameter                   11-13 (inches, nearest tenth)
Oak Height                            15-16 (feet)
Other DESirables Ground Diameter      18-20 (inches, nearest tenth)
Other DESirables Height               22-23 (feet)
UNDesirables Ground Diameter          25-27 (inches, nearest tenth)
UNDesirables Height                   29-30 (feet)
```

EXAMPLE RECORD--> I001 NE UP 1.2 12 0.6 03 0.9 08I

Each 30 byte record represents the tallest tree observed in a 4.3' radius plot. "0.0" should be entered for Ground Diameter in plots with no seedling.

Use a text editor to check the OPTION.OPT file for the run-time options you desire. Type **OAKREGEN** to begin execution of the program. The DOShell is handy for checking location of "SST" and "REG" files before setting up your run. OAKREGEN will flash messages as execution progresses. The LOG file will accumulate these messages so that you may audit your run for completeness.

```
****OPTions File****

DBH GROWTH RATES:
Method (C/E/F)                          :E:
Author Code (1-6)                       :5:
Site Index override (20-150)            : 80:
Age override (20-150)                   : 50:
BAMAX (50-300)                          :200:
Region override code (1-5)              :5:
Forest type code (1-18)                 :13:

SURVIVAL RATES:
Method (E/F)                            :E:
Author Code (1-6)                       :5:

INGROWTH:
Minimum sawtimber dbh (10,12,14)        :12:

STUMPAGE PRICES:
TIMSALE Setup # (1-10)                  : 1:

GROWTH PROJECTION:
Step increment                          : 1:

VOLUME UNITS:
Sawtimber (1-5)                         :5:
Pulpwood (1-4)                          :2:

MASPEC.DAT VOLUME
Volume letter (A,B,C,D,E,F,G)           :C:

THRESHOLD SEEDLING STOCKING % VALUE:
FOR ADEQUATE ADVANCE REPRODUCTION (0-99) :30:

RANGES FOR # MORE SPROUTS NEEDED TO
ACHIEVE NEW OAK STAND RATINGS               LO        HI
                             CERTAIN : 0:      : 0:
                             LIKELY  : 1:      :100:
                             POSSIBLE :101:    :200:
                             DOUBTFUL :201:    :999:
```

Figure 4 - OPTION.OPT File

OPTION.OPT
Use a text editor to check the OPTION.OPT file (Figure 4) for the
run-time options you desire. You may rename or copy this file as
long as you retain the extension OPT. The location of data
fields in the file cannot be altered or a read error will occur.
Use of the OPTION.OPT file 'is shared with the OAKREGEN program.
As a result, some of the information in the file used by BATCH-
YIELD-MS is not used by OAKREGEN and vice-versa. For example,
BATCH-YIELD-MS does not need to know the ranges for oak sprout
ratings and OAKREGEN does not need to know stumpage prices or
growth and 'yield options. The last 5 items in the file (in bold)
are the only ones which effect OAKREGEN.

The threshold seedling stocking value for adequate advance repro-
duction refers to the Gingrich stocking value for oak. Sander et
al recommends a value of 30. Users may edit this value to con-
form with their own standards. The # of more sprouts needed
ranges for CERTAIN, LIKELY, POSSIBLE, and DOUBTFUL ratings also
may be edited.