ACESDB, Version 3.3

An Allowable Cut Simulation Microcomputer Program
with Stand-Level Treatment Constraints
Relational Database Version¹

User's Manual²

Dietmar W. Rose³

January 1996

STAFF PAPER SERIES NO. 111

¹ Research Supported by the College of Natural Resources and Minnesota Agricultural Experiment Station and Minnesota Forest Industries, Inc.

² Contribution No. 22,252 of the Minnesota Agricultural Experiment Station.

³ Professor, Department of Forest Resources, University of Minnesota, St. Paul, MN 55108.
The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status, or sexual orientation.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREFACE</td>
<td>1</td>
</tr>
<tr>
<td>INSTALLATION OF ACESDB</td>
<td>2</td>
</tr>
<tr>
<td>Using DOS</td>
<td>2</td>
</tr>
<tr>
<td>Using SETUP Program</td>
<td>3</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>4</td>
</tr>
<tr>
<td>PROGRAM INPUTS</td>
<td>4</td>
</tr>
<tr>
<td>PROGRAM OUTPUTS</td>
<td>7</td>
</tr>
<tr>
<td>INSTRUCTIONS FOR USING ACESDB</td>
<td>7</td>
</tr>
<tr>
<td>Main Menu Options</td>
<td>9</td>
</tr>
<tr>
<td>Option 1: Overview</td>
<td>9</td>
</tr>
<tr>
<td>Option 2: Technical Reference</td>
<td>11</td>
</tr>
<tr>
<td>Option 3: Set Paths Defaults</td>
<td>11</td>
</tr>
<tr>
<td>Description of General File Entry Option</td>
<td>12</td>
</tr>
<tr>
<td>Option 4: Review Yield Tables</td>
<td>13</td>
</tr>
<tr>
<td>Suboption 1: View Old Yield Tables</td>
<td>13</td>
</tr>
<tr>
<td>Suboption 2: Print Old Yield Tables</td>
<td>13</td>
</tr>
<tr>
<td>Suboption 3: Generate New Yield Tables</td>
<td>13</td>
</tr>
<tr>
<td>Suboption 4: Exit Yield Table Program</td>
<td>16</td>
</tr>
<tr>
<td>Option 5: Create Stand Database</td>
<td>16</td>
</tr>
<tr>
<td>Checking for Data Inconsistencies</td>
<td>19</td>
</tr>
<tr>
<td>Option 6: Run ACESDB</td>
<td>21</td>
</tr>
<tr>
<td>Data Entry Options</td>
<td>22</td>
</tr>
<tr>
<td>Option 1 (Recall run parameter file)</td>
<td>22</td>
</tr>
<tr>
<td>Option 2: Enter new run parameters)</td>
<td>22</td>
</tr>
<tr>
<td>Main Editing Menu Options</td>
<td>Page</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Option 1: Edit stand data</td>
<td>23</td>
</tr>
<tr>
<td>Option 2: Edit run parameters</td>
<td>25</td>
</tr>
<tr>
<td>Option 3: Perform Calculations</td>
<td>28</td>
</tr>
<tr>
<td>Option 4: Return to MAIN Menu</td>
<td>38</td>
</tr>
<tr>
<td>Option 6: View ACESDB Output</td>
<td>38</td>
</tr>
<tr>
<td>Option 7: Print ACESDB Output</td>
<td>38</td>
</tr>
<tr>
<td>Option 8: View ACESDB Graphs</td>
<td>39</td>
</tr>
<tr>
<td>Option 1: Set Paths Parameters</td>
<td>41</td>
</tr>
<tr>
<td>Option 2: Enter Plot Data File</td>
<td>42</td>
</tr>
<tr>
<td>Option 3: Exit ACESGRAF</td>
<td>43</td>
</tr>
<tr>
<td>Option 9: Exit ACESDB</td>
<td>43</td>
</tr>
<tr>
<td>MODEL LIMITATIONS</td>
<td>44</td>
</tr>
<tr>
<td>LITERATURE CITED</td>
<td>44</td>
</tr>
<tr>
<td>APPENDIX I - Sample Stand Data File and Run Parameter Files</td>
<td>45</td>
</tr>
<tr>
<td>APPENDIX II - Sample Output Listings</td>
<td>48</td>
</tr>
<tr>
<td>APPENDIX III - Program Running Tips</td>
<td>48</td>
</tr>
</tbody>
</table>
ACESDB Version 3.3 is a menu-driven microcomputer program written in Microsoft Professional Basic Version 7.1 for application on the IBM personal computer and its compatibles. These computers must have at least 315K of available RAM to run ACESDB. The amount of available RAM is defined as the total amount of RAM in your computer minus the amount allocated to DOS and any utility programs that may be installed. The program takes advantage of an integrated database managing language in Professional Basic, version 7.1. This requires that a database manager program PROISAM is loaded prior to running ACESDB. PROISAM needs extensive amount of RAM and would make it difficult to run most programs. Fortunately, most of PROISAM can be loaded into expanded memory and only about 62K will reside in lower memory below 640K. To create expanded memory, the computer needs RAM in excess of 1 MB. Prosam does not take advantage of more than 1 MB. The user needs to have sufficient RAM on the working PC and make the proper changes in the CONFIG.SYS file. The user is referred to the up-to-date documentation file README.DOC which comes with the program to see suggestions for how to configure the DOS CONFIG.SYS file properly. One line in the CONFIG.SYS file loads the DOS expanded memory manager EMM386.EXE which creates 1024K of expanded memory. The major advantage of this program use of relational database management is that the size of inventories that can be handled by the program are limited only by available hard disk storage.

The graphing program ACESGRAF associated with ACESDB alone requires about 185K RAM. Because the program generates graphics output, it requires a graphics card. A color monitor is preferable to a monochrome display with a graphics card. Finally, it requires DOS (Disk Operating System) version 3.0 or later, and the ACESDB diskette.

This manual describes how to use ACESDB, a program which calculates allowable cuts according to various volume control and area control methods and simulates the growth of a specified inventory over time with an allowable cut being implemented at user-specified intervals. The discussion in this manual assumes a basic understanding of computer systems. It is also helpful to be familiar with basic principles of forest regulation and allowable cut determination. Several references are provided with this manual.

ACESDB allows the user to calculate allowable cuts using one of eight volume control methods (including a user defined annual cut) or area control with adjustment for site productivity. The program evaluates the impact of different regulation or allowable cut methods on a forest property in terms of growth, growing stock, and ageclass distribution. A number of different simulation scenarios can be selected.

1. A normal run in which a rotation age is applied to all stands.

2. A run where a user specified percent of the total stand acreage has to be above a base or extended rotation age at all times.

3. A run in which for a user specified percent of stands an extended rotation is used. In this case, a different extended rotation can be set for two site index classes. Stands are assigned to an extended rotation randomly with probability of selection proportional to acres by site index and age.
Input data required for the program consist of stand data describing current inventories of the covertype for which allowable cuts are to be calculated and a number of run parameters. Stand data or stand parameter inputs created via keyboard input may be permanently saved before logging off to facilitate future analysis with these data and to reduce the time and effort for data entry. Editing options facilitate the future modifications of any of these data for additional analyses. All input statements are checked by the program for correctness. An error message will appear on the screen if the user enters an unacceptable input value. The user can correct the data entry error at this point and proceed with the analysis.

**Program protection:** It is the user’s responsibility to backup the ACESDB diskette. Copy each file on the ACESDB diskette to the new diskette. Consult your Disk Operating System manual for details. Copies should only be made for backup purposes.

**Program updates:** Users will be notified of any major changes made to the ACESDB program. New versions may be obtained by returning the original ACESDB diskette to the authors. Please send a pre-addressed and pre-stamped envelope with a blank and formatted diskette. Request for modifications of ACESDB to fit a particular user’s need will be handled on an individual case basis.

**Disclaimer:** Although all software on the ACESDB diskette has been extensively tested and checked for accuracy and, to the best of the author’s knowledge, contains no errors, the author does not accept any responsibility for any errors that do arise. The author would appreciate having any errors or problems brought to his attention.

**INSTALLATION OF ACESDB**

**Using DOS**

Before using the ACESDB disk, make a working copy and label it. The ACESDB disk is not copy protected, so follow these steps to make a working copy on a diskette:

1. Put your DOS disk in drive A.
2. At the A>, type `FORMAT B:/S` and press `<ENTER>`.
3. Put a blank working copy disk in drive B.
4. Press any key to continue. When asked if you want to format another disk, type N and press `<ENTER>`, if necessary.
5. Remove your DOS disk from drive A, put the ACESDB program disk in drive A, type `COPY A:*.* B:` and press `<ENTER>` to start the copy procedure. Make sure to also copy the sample input file with extension ".EXP" in the \DATA subdirectory.

Put the program disk away in a safe place and use the working copy for your applications. You may also use the COPY command to transfer all program files to any other drive including a hard disk or utilize the SETUP program supplied with ACESDB.
Using SETUP Program

A generic installation program SETUP on the program diskette can be used also to install the this and other programs developed by the author and all necessary files to any specified hard disk. Simply insert the program diskette in a drive, type `<SETUP>` and follow the simple instructions on the screen. The proper files will be copied to the hard disk. Drive "A" is the default input drive, but the system will determine from which drive the SETUP program was activated. The default destination drive and directory is C:\ACESDB. The SETUP program itself will not be saved to the hard disk. After an opening screen the user will see a list of install options:

<table>
<thead>
<tr>
<th>PROGRAM INSTALL OPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Install ACES</td>
</tr>
<tr>
<td>(2) Install ACESREDP</td>
</tr>
<tr>
<td>(3) Install ACESDB</td>
</tr>
<tr>
<td>(4) Install REDPTHIN</td>
</tr>
<tr>
<td>(5) Install CASH</td>
</tr>
<tr>
<td>(6) Install DRES</td>
</tr>
<tr>
<td>(7) EXIT</td>
</tr>
</tbody>
</table>

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Select option 3 to install ACESDB. A screen with 4 options appears. If the default destination drive is acceptable to the user, option 3, Install ACESDB, can be directly executed. If the user wants a different destination directory, option 2 would be executed first, which will require the user to input a new path. If that path does not exist, program SETUP will make the directory and a \DATA and \OUTPUT subdirectories first.

<table>
<thead>
<tr>
<th>ACESDB INSTALLATION PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFAULT INPUT DRIVE FOR ACESDB FILES: A:\</td>
</tr>
<tr>
<td>DEFAULT DESTINATION DRIVE FOR ACESDB FILES: C:\ACESDB</td>
</tr>
</tbody>
</table>

(1) Change input drive/directory for ACESDB files...
(2) Create destination drive/directory for ACESDB files...
(3) Install ACESDB as specified...
(4) Exit the installation program...

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Option 3 will copy the appropriate files into the destination drive and subdirectories. After the installation is completed, the following message will appear:

To run ACESDB, simply type `<ACESDB.BAT>` from the created directory C:\ACESDB

Press a key to continue...

ACESDB program has been successfully installed in drive D:\ACESDB
Press a key to continue...
The user can then review some information on other forestry decision software developed by the author.

**INTRODUCTION**

"The organization and control of the growing stock for a sustained yield of forest products from a specified forest area has traditionally been called forest regulation" (Meyer, Recknagel, Stevenson, and Bartoo 1962). The regulation of a forest property is one of the major tasks practicing foresters face. The primary regulation tool available to managers is the timing and size of timber cuts.

However, evaluating all of the potential alternatives may require many calculations. This process can become very tedious and time consuming. Therefore, microcomputer algorithms have been developed to simplify the task of enumerating the various alternatives. This manual describes the use of one set of algorithms in the form of the Allowable Cut Evaluation Simulator - Database Version (ACESDB) software. Input requirements are limited to stand data and various run parameters.

Access to these algorithms or models does not diminish the decision makers need to understand the conceptual basis of allowable cut calculations and the importance of the data inputs required for application of these tools. The user is thus encouraged to study one or more publications that provide a basic introduction to the topic, e.g., Rose and Burk (1980); Meyer et al. (1961); Clutter et al. (1983); Leuschner (1984), Buongiorno and Gilless (1987).

The objectives of this manual are:

1. To describe how ACESDB is used for allowable cut calculations.
2. To illustrate the various output options of the program through examples.
3. To facilitate data preparation for allowable cut analysis and to support classroom instruction and independent study.

**PROGRAM INPUTS**

ACESDB can be used to organize and develop allowable cut schedules. Program inputs consist of the following information:

(1) Stand data required for each stand includes:

   acres, age, volume in cu ft, cords or bd ft per acre, and site index.

Additionally, several title lines (1-5 lines, 60 characters/line) can be entered to describe a specific analysis and two parameters need to be specified for the stand data:
Volume Units: 1 = Cu ft, 2 = Cords, 3 = bd ft

Covertype Selected:

1. Red pine
2. Jack pine
3. Balsam fir
4. Aspen
5. N. White cedar
6. Tamarack
7. Elm-ash-soft maple
8. Paper birch
9. Maple-birch
10. Oak-hickory
11. Black spruce
12. Balm of Gilead
13. White pine
14. White spruce

(2) Run parameters including:

- Discount rate (percent)
- Demand curve: $/unit = a - b*Quantity Harvested
- Volume Output Units: (Cu ft, cords, or bd ft)
- Ageclass Width: Years
- Rotation: Years
- Minimum Cutting Age: Years
- Anticipated Stocking after Harvest: Percent

The user can control the level at which stands will grow after the first harvest. Entering 100 percent implies that regenerated stands will grow at the same rate as the internal growth and yield equations for the selected covertype. It is important that the user review the yield information (option 4 of Main Menu) before entering this anticipated stocking percent. If the yield data for the user's property suggest different volumes, an appropriate percentage should be entered. If stand observed volumes are for example twice as high as the ones from the yield equation than 200 percent would be entered. The current version of ACESDB does not model approach towards normality. The approach towards normality concept accounts for the observations that understocked stands tend to grow relatively faster because individual trees tend to have less competition and more growing space. Not having incorporated an approach towards normality model in ACESDB implies that stands that are understocked at the beginning of the simulation period, will remain at the same stocking level until the first harvest. After the first harvest, stands are assumed to grow at the stocking level entered by the user.

- Growth multiplier (default value 1.0):

the user can carry out sensitivity analyses on growth by entering a different value from the default multiplier. For example, setting the multiplier to 1.1 would increase growth by 10 percent for as long as this parameter was not changed. The user can change this parameter after each simulation period. The program will provide a warning if the multiplier falls outside a specified range. The reader
should carefully study the chapter on option 5, Create Stand Database, about the importance of properly setting this parameter for stocking calculations.

- **Interval to Reevaluate Allowable Cut:** Years

- **Number of Times to Evaluate Allowable Cut:**

  The program limits the number depending on the simulation interval chosen.

- **Cut Determination Method:**

  1. Tabular Check
  2. Barnes Method
  3. Austrian
  4. Chapman
  5. Von Mantel
  6. Hundeshagen
  7. Hanzlik
  8. User input of annual volume cut
  9. Area control adjusted for site productivity

- **Adjustment period for Austrian formula**

- **Cutting Priority:**

  1 = Decreasing age, 2 = decreasing age and site

- **Abbreviated Output:** (Yes or No)

  Abbreviated output includes summaries of growing stock distributions at each planning interval grouped by a user specified ageclass width and information about allowable cuts as well as the graphical output options; the long output additionally provides annual and individual stand-level harvest and residual stocking information.

- **Cubic feet/cord conversion factor (default 79)**

- **Cubic feet/board foot conversion factor (default 0.158)**

  The program carries out all internal growth functions and stocking calculations in cubic feet. The yield model projects total cubic foot volumes. When cord or board foot volumes are entered, they are converted to cubic feet before growth and yield functions are activated or stocking calculations are carried out. Thus the user needs to fully understand the impact of entering a specific conversion factor. Conversion factors should reflect the required volume unit on the basis of total cubic foot tree volume. Outputs, therefore, also reflect total tree volumes in the requested unit and may have to be scaled to estimate usable volumes using different conversion factors. The yield table board foot volumes (option 4 in ACESDB) are board foot volumes in the traditional sense and thus have no relation to the conversion factor that a user would enter. To avoid any problems of interpretation, it is recommended to convert stand inventory volumes into total cubic foot volumes before running ACESDB.

Data files saved under earlier versions of the ACESDB program are not directly compatible with this program version. Each existing data file must be edited prior to retrieving it with the new version of ACESDB. Otherwise, ACESDB will respond with an error message and will not proceed with calculations until a valid file has been entered or valid inputs have been entered via the keyboard. Appendix I provides a listing of sample stand data input and run parameter files.
Stand data are loaded from previously created disk files while run parameters can be loaded from previously stored files or be entered via the keyboard. Data can be easily edited from within the program. An option to save program input values (stand data as well as run parameters) is provided.

PROGRAM OUTPUTS

After all input data has been entered and the appropriate calculations have been performed by the program, ACESDB displays the results on the screen, and writes the same output to a user specified disk file:

A. Stand data and run parameter summaries

B. Periodic inventory summary

C. Periodic and annual cutting records

D. Plots of major simulation results when volume control methods are simulated are only generated on the screen during an ACESDB run. ACESDB writes four output files of the plot data. These files are read by a stand-alone program called ACESGRAF.EXE to generate the plots. The user thus can generate these plots also after having left ACESDB and as long as these files have not been deleted or been overwritten by a new ACESDB run by simply typing ACESGRAF at the system prompt.

INSTRUCTIONS FOR USING ACESDB

In this section, the various ACESDB input screens will be displayed and discussed to provide assistance when entering and/or editing data. The best way to learn how to use ACESDB, is to follow through a complete session utilizing all key options that are available such as is done below.

Place the ACESDB disk in drive A and close the drive door. The program will then load and start to run automatically. If the computer is on and you see the A> on the screen, type ACESDB and then press the <ENTER> key. Do not cover the write protect notch on your working copy disk if you want the program to save data files and write output files to the disk during program operation. If you write protect your working disk, you will need access to another drive to save data and program outputs. To run ACESDB from a hard disk, you simply type ACESDB from the directory in which the program files reside. The <ENTER> key is used to send typed information from the keyboard and the screen (monitor) to the central processing unit of the microcomputer. The <ENTER> key must be pressed after typing in the appropriate response to the various data entry prompts within the program. After completing the above step, ACESDB will display the program title and software disclaimer screens:
ACERDB Version 3.3
ALLOWABLE CUT EVALUATION PROGRAM
Written By
Dietmar W. Rose
Portions Copyright Microsoft Basic 7.1, 1990.
All rights reserved.
Copyright 1995 by Dietmar Rose.
Press any key to continue.

ACERDB SOFTWARE DISCLAIMER
All the software on the ACERDB diskette has been extensively tested and
checked for accuracy and, to the best of the author's knowledge, contains
no errors. However, the author does not provide any guarantees and is not
responsible for errors that may arise during the use of this software.
Any errors found by the users should be brought to the author's attention
in order to incorporate appropriate changes in future versions. Minor
program revisions will be available by returning the program diskette or a
blank diskette and a check for $25 payable to the author. The author will
develop customized versions of this software for any other coventype or
species for a small fee. Please call or write if you have questions. For
permission to use or copy this software or obtain program updates write to:

Dr. Dietmar W. Rose
1539 12th Terrace NW
New Brighton, Minnesota 55112
Tel. (612)636-7395 or (612)624-9711
E-Mail (Internet): drose@mercury.forestry.umn.edu

Press any key to exit the software disclaimer screen and to display the following MAIN MENU
screen:

<table>
<thead>
<tr>
<th>COPYRIGHT</th>
<th>ACERDB: ALLOWABLE CUT EVALUATION SIMULATOR</th>
<th>Version 3.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>Database Version</td>
<td>December 1995</td>
</tr>
<tr>
<td>Dietmar Rose</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ACERDB Main Menu

1. Overview
2. Technical Reference
3. Set default paths
4. Review Yield Tables
5. Create Stand Database
6. Run ACERDB
7. View ACERDB Files
8. Print ACERDB Files
9. View ACERDB Databases
10. View ACERDB Graphs
11. Exit ACERDB

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

8
MAIN MENU OPTIONS

Main Menu Option 1 - Overview

This option provides an overview of the ACES program over several screens. After reading an overview screen, press any key to review the next screen. After reading all screens, press any key to return to the MAIN MENU:

ACESDB VERSION 3.3 USER INFORMATION AND OVERVIEW

ACESDB is a user-friendly microcomputer program written for the IBM personal computer and IBM compatibles in Microsoft BASIC. The computer should have at least 315K of available RAM memory to run ACESDB and needs 62K for the integrated relational database manager. The associated graphing program ACESGRAF can be run with 185K RAM.

ACESDB calculates allowable cuts for even-aged forest inventories according to area and several volume control methods. It allows study of the impact on growing stock volumes, growth, and harvest volumes produced when various standard cut determination methods are applied to the forest. It is assumed that the user can divide the forest into a finite number of management units. There is no limit to the number of stands because data are stored in a relational database.

These stands are grown according to a normal or average yield function adjusted by the stocking percent of the subject stand. Stands maintain their identity throughout, but new stands are created when only partial stands are needed to meet the allowable cut. The user can choose not to split stands to meet allowable cuts exactly.

Press any key to continue....

The program simulates up to 14 Lake States cover types and associated yield functions may be chosen. The functions can be reviewed and be saved to a file for comparison with growth and yield information of the user’s forest property and appropriate adjustments of simulation results to reflect any observed differences. Other user specified information includes:

(A) Interest rate and price information.
(B) Rotation age-the harvest age for all stands in regulated forest.
(C) Minimum cutting age.
(D) Anticipated stocking percent under management- the stocking level that management can maintain after a stand has been cut over.
(E) Interval (in years) at which allowable cut is reevaluated - The program will cut the forest according to the specified formula with this number of years at which time a revised calculation is done.
(F) Number of times allowable cut is to be reevaluated at the interval specified above.
(G) Cut determination method- one of 8 volume allowable cut formulas (including an option for a user specified allowable cut input) or area control with adjustment for site productivity.
(H) Adjustment period for Austrian allowable cut formula.
(I) Volume units conversion factors.

Press any key to continue....
(H) Max. age which can be cut even if allowable cut is exceeded. Volume of stands up to that age will be liquidated over the years below even if allowable cut is exceeded.

(I) The number of years starting with year 1 over which stands with age = a user defined age will be harvested even if the allowable cut is being exceeded. The volumes of these old stands will be liquidated over the number of years specified. If zero then no liquidation of old stands will take place.

(J) The future year when stands with age = a user defined age will be harvested even if the allowable cut is being exceeded. Any old stands are liquidated every year after the year specified.

A stand database is created from a raw data file using option 5. A relational database is stored only after the raw data have passed all consistency test. The corrected raw data file can also be saved. With a stand database the following parameters are saved:

1) Covertype Code, 2) Volume Unit, and 3) Growth Multiplier and the following attributes for each stand:

Press any key to continue....

(1) Simulation Year
(2) Stand ID
(3) Covertype
(4) Owner Group
(5) Acreage of stand
(6) Age of stand
(7) Stand volume per acre in cu ft, cords, bd ft
(8) Stand stocking percent
(9) Site index of stand
(10) Stand treatment class
(11) Stand tag

The order in which the stands are entered is arbitrary. The database sorts the stand inventory according to a user specified cutting priority:

(1) By decreasing age
(2) By decreasing age and site index

The user is prompted for the percentages of each species component within the elected covertype.

Press any key to continue....

A number of different simulation scenarios can be selected.

1. A normal run in which a rotation age is applied to all stands.

2. A run where a user specified percent of the total stand acreage has to be above a base or extended rotation age at all times.

3. A run in which for a user specified percent of stands an extended rotation is used. In this case, a different extended rotation can be set for two site index classes. Stands are assigned to an extended rotation randomly with probability of selection proportional to acres by site index and age.

See the user's manual for more details.

Press any key to continue....
The user may also choose between two types of output. In all cases, current stand acreage, site index, yield/acre, total yield, and growth are output along with the allowable cut level for the period and the acres cut in the period. For the detailed output version, annual harvest and inventory reports are written to an output file.

Allowable cut estimates are given for all methods. Users can also reevaluate the allowable cut for additional years and completely rerun a problem (with the same stands). The program was written to facilitate user implemented changes of any or all of the user inputs.

For further information, users should consult:

Technical Reference (choice 2 on the MAIN MENU) and textbooks on forest management and read the ACESDB.DOC ASCII file for any new information on program development and for a proper understanding of the integrated database manager PROJSAM which requires 63K of RAM memory and must be loaded into expanded memory.

Press any key to continue....

MAIN MENU Option 2 - Technical Reference

This option provides the key reference for the ACESDB program. After noting the technical reference, press any key to return to the MAIN MENU.

ACESDB TECHNICAL REFERENCES

The four references below provide important background information on forest regulation and the growth and yield model used in the simulation program. The references and user's manual are shipped with the program.


Press any key to continue....

MAIN MENU Option 3 - Set Paths Defaults

This option allows the user to set the directories and paths from where data will be read and where outputs will be stored. The program reads in default values from file "ACES.PTH". When the user changes any path parameters, the new values will be written to this file and will become the default values the next time ACESDB is being run. When entering on a highlighted
item, the program will prompt the user for a new path and retain the old path, if no new value is entered:

```
SET FILE DRIVE PATHS
1. Current Data Input Path= c:\aces\data\ 
2. Current Run Output Path= c:\aces\output\ 
3. Finished - Accept Current Settings

Enter the path you wish to change
Use Arrow or Number Keys to highlight
Press Spacebar or Enter to execute
```

Description of General File Entry Options

Whenever the program displays a menu for any type of file entry choices, the procedures described below to access a file can be used. The type of file that can be entered depends on whether an input file (stand data, parameters, stand database) or output file (output table, output database) are being requested by the program. The program will make the appropriate selection of file names with valid extensions and provide a message if an illegal file is being requested. In some cases a menu with 3 suboptions will appear, in other cases a list of files matching a certain type will be directly displayed. In the case of main menu option 5 for example, the program will show a list of files that have a .DAT extension (i.e., the extensions appended to standard data files) for a user specified disk drive. Yield table files have a .YLD extension, run parameter files have a .PAR extension, database files have a .MDB extension, output tables have a .TBL extension, and plot files have a .PLT extension as a part of their file names. The user can select a file by hitting the <Enter> key on a highlighted file. In addition, three entry keys at the bottom of the screen allow the user to change the path and the file extension. Changing the file extension should, however not be activated normally, since the program at any given step requires distinct file types and the shown file type is the correct one. The experienced user, however can use this file selection screen at any time to see what files of any type are in any directory. As long as an illegal file is not selected by entering such a highlighted file, the user can go back to the legitimate file extension to select an appropriate file. Simply escaping the screen via the <Esc> or <Q> uit keys will return the user to a place in the program where various steps are feasible.
If a file is being requested that was not created by ACESDB, a message that the file was not created by ACESDB will appear and the user will be returned to the program main menu.

Main Menu Option 4 - Review Yield Table

This option provides the user an opportunity to review the growth/yield model used by ACESDB.

Yield Table Selection Menu
1. View Old Yield Tables
2. Print Old Yield Tables
3. Generate New Yield Tables
4. Exit Yield Table Program

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Suboptions 1 and 2: View/Print Old Yield Tables

For both options 1 and 2, a screen with output file choices will open and the user has the options to review and enter from a list of file choices. The program utilizes a default path, but the latter can be changed if desired using the Change <P> ath option. General data entry procedures for any type of file are described below. If the file REDPINE.YLD was selected for review, the program would continue with:

Do you want to view c:\aces\output\REDPINE.YLD?
Yes
No

Suboptions 3: Generate New Yield Tables

This option allows the user to produce yield tables for user-specified parameters. The program will generate this information for any of the 14 covertypes for user-specified site indices and utilization standards.

Covertype Selection Menu

Use the arrow keys to move through the list.
Hit the <Enter> key to select the highlighted covertype.

Red pine
Jack pine
Balsam fir
Aspen
N. White cedar
Tamarack
Elm-ash-soft maple

Paper birch
Maple-birch
Oak-hickory
Black spruce
Balm of Gilead
White pine
White spruce

Quit - currently highlighted covertype will be selected.
Yield Table Editing Menu for: Red pine

Highlight the parameter you wish to edit using the arrow keys. 
Press <E> to edit the parameter and <Q> or <ESC> to quit.

1. Desired volume unit: Cu Ft
2. Desired site index: 55
3. Ending yield table age: 100
4. Beginning yield table age: 5
5. Yield table age interval: 5
6. Top diameter for pulpwood in inches: 4
7. Top diameter for sawtimber in inches: 9
8. Growth multiplier: 1
9. Accept current parameter values.

Edit                    Quit

If E for edit is entered, an editing menu will appear with a set of default parameters that the user may change as desired. One simply needs to move the cursor to the field to be edited and hit the <Enter> or <Exit> key. The program will prompt the user for a new value. Every value entered is checked for its validity and an appropriate error message will be displayed if an unacceptable value is entered by the user. Below is one example of such an edit for the growth multiplier of the yield table. This growth multiplier can be used to calibrate the yield model to specific local conditions. Once an acceptable growth multiplier has been found, it should be used as an important parameter of the stand data file which affects the calculation of current stand stocking conditions as well as how stands will be grown in the simulation.

Yield Table Editing Menu for: Red pine

Highlight the parameter you wish to edit using the arrow keys. 
Press <E> to edit the parameter and <Q> or <ESC> to quit.

1. Desired volume unit: Cu Ft

Do you want volume output in:
1. Cu Ft/acre
2. Cords/acre
3. Bd Ft/acre
Enter corresponding letter from below

| Cu Ft | Cords | Bd Ft |

Edit                    Quit

The following displays the kind of output that ACESDB will produce. If a file for saving this data was specified, it will contain the same information in a ASCII format for recalling and printing and incorporation into a report. The user should note, however, that ACESDB itself uses total stand volumes in calculating allowable cuts, i.e., the user needs to make appropriate adjustments of these allowable cut volumes to reflect the specific utilization standards in effect.

14
Yield Information (per acre) for: Red pine  
Site Index = 55 Growth Multiplier = 1.00  
Pulpwood top diameter (inches): 4 Sawtimber top diameter (inches): 9

<table>
<thead>
<tr>
<th>AGE (Years)</th>
<th>BA (sq ft)</th>
<th>Height (ft)</th>
<th>--------Volume--------</th>
<th>Total Pulpwood</th>
<th>Sawtimber</th>
<th>Growth M bd ft</th>
<th>Total Volume Cu Ft</th>
<th>Cu Ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>44.83</td>
<td>3.91</td>
<td>162.49</td>
<td>115.62</td>
<td>0.09</td>
<td>120.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>57.02</td>
<td>9.57</td>
<td>367.72</td>
<td>266.44</td>
<td>0.27</td>
<td>89.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>65.63</td>
<td>15.74</td>
<td>583.16</td>
<td>429.42</td>
<td>0.54</td>
<td>75.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>72.82</td>
<td>22.00</td>
<td>799.84</td>
<td>597.54</td>
<td>0.88</td>
<td>67.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>78.35</td>
<td>28.14</td>
<td>1013.46</td>
<td>767.03</td>
<td>1.28</td>
<td>61.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>83.47</td>
<td>34.06</td>
<td>1221.68</td>
<td>935.56</td>
<td>1.72</td>
<td>56.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>88.05</td>
<td>39.68</td>
<td>1423.16</td>
<td>1101.57</td>
<td>2.21</td>
<td>52.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>92.23</td>
<td>44.97</td>
<td>1617.19</td>
<td>1264.03</td>
<td>2.74</td>
<td>48.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>96.07</td>
<td>49.92</td>
<td>1803.41</td>
<td>1422.25</td>
<td>3.30</td>
<td>46.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>99.65</td>
<td>54.62</td>
<td>1981.72</td>
<td>1575.78</td>
<td>3.88</td>
<td>42.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>103.00</td>
<td>58.79</td>
<td>2152.16</td>
<td>1724.37</td>
<td>4.49</td>
<td>39.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>106.16</td>
<td>62.73</td>
<td>2314.90</td>
<td>1867.86</td>
<td>5.11</td>
<td>37.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>109.15</td>
<td>66.36</td>
<td>2470.18</td>
<td>2006.21</td>
<td>5.75</td>
<td>34.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>111.99</td>
<td>69.64</td>
<td>2618.28</td>
<td>2139.47</td>
<td>6.41</td>
<td>32.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>114.70</td>
<td>72.76</td>
<td>2759.51</td>
<td>2267.71</td>
<td>7.07</td>
<td>31.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>117.30</td>
<td>75.56</td>
<td>2894.19</td>
<td>2391.05</td>
<td>7.74</td>
<td>29.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>119.79</td>
<td>78.13</td>
<td>3022.66</td>
<td>2509.66</td>
<td>8.42</td>
<td>27.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>122.19</td>
<td>80.47</td>
<td>3145.24</td>
<td>2623.67</td>
<td>9.10</td>
<td>26.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>124.50</td>
<td>82.61</td>
<td>3262.27</td>
<td>2733.30</td>
<td>9.79</td>
<td>24.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>126.74</td>
<td>84.56</td>
<td>3374.07</td>
<td>2838.75</td>
<td>10.48</td>
<td>23.58</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Press any key to continue....

This option gives the user an opportunity to save the yield table information on a user specified file and disk drive. The program will check for the validity of the indicated disk drive, the file name, and any other error and prompt the user to take a corrective action if necessary. Anytime ACESDB saves any file, it will prompt the user with a message before overwriting an existing file with the same name or provide the option to select another file name. The program appends the file name with the extension ".YLD". The user can proceed to produce as many tables as desired by choosing option 4 from the Main Menu repeatedly.

Do you want to save yield table on a file?  
Yes  No

General Description of File Saving Procedure

The next block of information provides an example of how the program lets the user save files and the kind of overwrite protection the program will provide. The user can accept a default path or enter a new path and then enter a file name. If work was done on a file such as editing, a default file name will appear on the screen which can either be accepted or be overwritten:

Saving ACES Yield Table File

Enter path or <ENTER> for default path: c:\aces\output\  
>  
Enter data filename, or press only <ENTER> to return  
>REDPIPE <

File c:\aces\output\REDPIPE.YLD exists.  
Do you want to overwrite file?  
Yes  No
To rename the entered file name, i.e., not to override an existing file, the user would enter \(<\text{Y}\)\>es and be prompted for a new file name. **This file overwrite protection is activated throughout the program for any file operation.** Now the user has a chance to change any parameter and generate another yield table:

<table>
<thead>
<tr>
<th>Do you want to change any parameters?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

For \(<\text{N}\)\> the program will return to the yield table menu, for \(<\text{Y}\)\>es the program will return to the yield table parameter editing screen.

**Suboptions 3: Exit Yield Table Program**

This option will return user to the ACESDB Main Menu.

**MAIN MENU Option 5 - Create Stand Database**

The user needs to understand well the purpose of this option which is a necessary step before program option 6 can be run. Option 5 reads in ASCII files of raw stand data that the user has created using text processors, editors, or database management programs. A special program ACESDATA is under development which will allow stand data creation from files or from the keyboard for stand files up to 6000 stands. Until this program becomes available, the key is to understand the file structure of this stand data file which is explained in detail in appendix 1. Essentially the file needs an identifier that lets the program recognize it as a legitimate data file, an indicator of the covertype or species which the data represent, and for each stand seven or eight variables: stand id, covertype, owner, acre, age, volume/acre, stocking (optional; if missing, program will calculate stocking), and site index. The volume/acre unit needs also be identified via a parameter. The file also contains two logical parameters which indicate whether the data have undergone internal testing for consistencies, one dealing with stocking, the other with overall data correctness. After the data have passed all error checks, the file can be saved with the corrections. The two logical parameters at this stage are set to a value of "True." The next time this file is loaded, the program would know that data testing had already been performed. At this time also a relational database version of the data file can be stored under any or the same file name. Raw data files and relational database files are differentiated only by their file extensions, ".\text{DAT}" in the first and ".\text{MDB}" in the latter case. Since stand growth for a stand is based on the volume of a stand in comparison to the internal yield table, a stocking percent is calculated for each stand from the ratio of stand volume to yield table volume. As we have seen under option 4, "Review Yield Tables", it is important that the yield table calibration via the growth multiplier has been settled on before. The user is prompted for this growth multiplier because it will be needed to correctly figure yield table volumes for a given age and site index for comparison with the actual stand volume.
The species, volume unit and growth multiplier parameters are read in with the stand data file. These parameters can be changed now. Remember that a species and growth multiplier change will lead to a recalculation of stocking. To understand impact of growth multiplier. run option 4: Review Yield Tables.

Press a key to continue...

You may press the <F10> key any time to leave the data error checking loop that will be performed after a data file has been entered. You will lose your changes, but might prefer to do your editing outside.

Press a key to continue...

Then the raw stand data file input menu allows the user to load a file. The user is prompted for an input file of raw stand data and after selecting option 1 will see the stand data file entry choices menu. While selection 2 will return the user to the ACESDB Main Menu. In the stand data file entry choice 1 will display a default data path and if accepted, a list of all files with extension "DAT". Moving the cursor to one of the files and hitting the <Enter> key will load the file. The second file entry choice requests the user to enter a directory path and a file name without an extension which is assumed to be "DAT". One of two message will be displayed now:

ASCII Raw Stand Data File Input Menu

1. Recall stand data files stored on disk.
2. Return to Main Menu.

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Only files with extension "DAT" will be displayed for option 1. If for the file selected, e.g., SAMPDB.DAT, a relational database already exists, the user will be prompted to delete this file or to provide a new file name:

Database c:\aces\data\SAMPDB.MDB already exist.
Do you want to delete it.

Yes    No

Enter a new file name (extension assumed MDB)?

At this stage, the user can either enter a descriptive stand title if none was present in the stand data file or edit an existing one. In the following for example the file had already 3 descriptive title lines. If the user answers <Y> es to provide a new title, the input screen will blank the existing lines and provide space for up to 5 new input lines. If the stand file is saved later, it will contain the new input title.

STAND FILE TITLE INPUT SECTION

Line 1 : A small sample file that the user should run to
Line 2 : test various program options and related outputs.
Line 3 : Aggregated aspen covertype records from MN FIA.
If the stand file had no title to begin with then the option is offered to create a title. A blank input box can be filled with up to 5 lines as above. After the stand title input section, the program begins its internal checks of the stand data.

Then a display of the current stand parameters is shown and the user has an option to change the growth multiplier. Changing the growth multiplier will results in different stocking levels for each stand and might require some corrective action if unusual stocking levels are calculated.
The new multiplier at this stage will be stored in the stand raw data and database files when they are saved at a later stage.

Checking for Data Inconsistencies

Whenever a stand data file has been read in from a file, the program goes through a series of internal checks for data consistencies. This procedure will ensure that there are no bad records containing for example negative ages, zero site indices, or volumes/acre that result in extreme stocking percents. Following are sample screens from an input file that was entered. After this the program begins a loop across all records to check for data consistencies as described above. Below are a few example screens of errors that were discovered by the program and for which a corrective action was requested from the user. When errors are detected, the program switches to a stand editing screen in which the user can edit any item by first activating the \(<\text{E}>\) dit key at the bottom of the screen. Any changes made will only become effective after using the \(<\text{S}>\) ave Changes key. After all errors have been detected and corrected, the user has the option to save the stand data and database files. MDB files are loaded when option 6 is used. These files must have been checked for errors. Editing is also possible later when a relational database has been loaded for running the program and the current database screen is displayed with a number of options. All growth projections internally are done in cubic feet, and all stand volumes whether entered as cords, cubic feet or bd ft are converted to cubic feet. The cu ft/cord conversion used is 79 ft³/cord, the cu ft/bd ft conversion is 6.329. The program will check each entry and give specific error messages if incorrect data are entered.
Stand Data First Checking Loop - w/o stocking checks

Stand No.  Acres  Age  Volume/acre  Site  Index
2          -2600.00 58   1329.00   45

Negative or zero acreage for stand 2
You must edit before proceeding
Press a key to continue...

*** ACESDB: Edit Stand Data. ***
Use the arrow keys to move through the list.
Stand:  2

General Stand Data
Stand ID:  2
Acres:  -2600.00
Age:   58
Volume: 1329.00
Stocking: 0.975
Site:   45

Edit  Save Changes  Quit w/o Saving

Each individual stand record is checked in this loop. Once finished, the program will loop through all stands to calculate the implied stocking percent of the stand by comparing actual stand volume to the yield table volume. In this loop various caution flags allow the user to correct for stocking percents that appear to be outside the norm:

Stand Data Stocking Checking Loop
Stand No.  Acres  Age  Volume/acre  Stocking  Site  Index
1          1300.00   5     1207.00  0.661  60

Stand 1 has an implied stocking of > 7 Do you accept overwrite of 2 or edit other data affecting stocking.
Yes  No

*** ACESDB: Edit Stand Data. ***
Use the arrow keys to move through the list.
Stand:  1

General Stand Data
Stand ID:  1
Acres:  1300.00
Age:  5
Volume: 1207.00
Stocking: 0.661
Site:  60

What is the new volume/acre? 123

Edit  Save Changes  Quit w/o Saving

Changes must be saved to become effective using the <S>ave Changes key and a message will indicate that the edited record has been stored. When the program has looped over all stand data records and all encountered errors have been corrected, the following message will be displayed:
The stand data file has passed all consistency test. You may save file now with a parameter that indicates so and will speed future data entry. Do you want to save relational database file now.

Yes
No

The program has gone through a series of internal data checks including calculation of stand stocking. If the data are not saved now, the old data format including any existing errors is maintained. There are two check parameters in the stand file, one indicates whether stocking data have been calculated and stored, the other is a check parameter which indicates whether the data have passed all consistency checks. That parameter is turned to "-1" or <True> when all data have passed the consistency test and the user answers yes to the next prompt. If the user chooses to save the data now, he will be prompted for the information and the stand file is stored in the format shown in the appendix. If "No" is selected, the program will return to the main menu. If the file is loaded at a later time again, the program will skip the data checking routines which speeds data entry considerably. If the file name already exists on the drive, the user has the option to overwrite the file or to provide a new file name. If the existing file is overwritten, all information previously contained in the file will be destroyed (i.e., erased). Once a user understands the very simple file structure (see also Appendix II for an example), it is much easier to generate the data outside ACESDB with a text editor.

---

Saving ACESDB Stand Database File

Enter path or <ENTER> for default path: c:\aces\data\  

Enter data filename, or press only <ENTER> to use default name: c:\aces\data\SAMPDB.MDB

---

Do you want to save raw data file now.

Yes
No

For <Y> es, the user can supply a different database file name, for <N> o the existing database file in the selected directory will be deleted and overwritten.

---

Saving ACESDB Stand Raw Data File

Enter path or <ENTER> for default path: c:\aces\data\  

Enter data filename, or press only <ENTER> to use default name: c:\aces\data\SAMPDB.DAT

---

All stands loaded into the database will by default have been tagged for inclusion into a simulation run. The user needs to use the untag function described later to exclude stands from a simulation run.
Main Menu Option 6 - Run ACESDB

This option allows the user to either enter data for a simulation from the keyboard or to recall previously stored data from a storage device (hard disk or diskette). The data belong to two categories, stand data and run parameters. Correspondingly, two menu types will appear. The user should run initially the small sample database "SAMPDBCK.MDB". Any run parameter file may be selected and edited to begin a simulation run. Before ACESDB begins operating, it makes a temporary copy of the stand database selected because in the process of growth and harvesting stand data records are changed. When the simulation is terminated by the user, the temporary stand database is erased while the original stand database remains in the data directory.

STAND DATABASE INPUT MENU
1. Recall stand data files stored on disk.
2. Return to Main Menu.
Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Only files with extension ".MDB" will be displayed for option 1.

c:\aces\DATA\SAMPDBCK.MDB is a database for Aspen with Cu Ft/acre and a growth multiplier of 1. A change in any of these parameters requires creation of a new database. Do you want select other database or make parameter changes. For changes use main menu option 5.

Yes No

Now the user is prompted for a run parameter file:

RUN PARAMETER INPUT MENU
1. Recall run parameter files stored on disk.
2. Enter new data.
3. Return to Main Menu.
Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Option 1 (Recall Run Parameter File)

Only files with extension ".PAR" will be displayed for option 1 and the user makes an appropriate selection.

Data Entry Option 2 (Enter New Run Parameters)

This option is designed for entry of new run parameter data via the terminal keyboard. If option 1 is selected, the user will see a summary screen with default parameters which can be edited if
desired. It simplifies the data entry process, as only some of the parameters will be changed in most situations.
The editing procedure will be described in a later chapter. If the user chooses to quit or escape this screen without any editing, he will have an opportunity to save the default data on a file. If editing was performed on the data, then a chance to save the edited data will be provide by the program:

If you run ACESDB now, it will use the default parameters. The default values will be lost if they are not saved. Do you want to save default values now?

Yes  No

Main Editing Menu Options

After the stand data and run parameter files have been successfully entered, the program provides an option to edit any inputs before calculations are carried out. The beginning point for data review and editing can be reached when the screen displays the prompt:

**MAIN EDITING MENU**

1. View/Edit Stand Data
2. View/Edit Run Parameters
3. Perform/Continue Calculations
4. Return to MAIN MENU

Use Numeric or Arrow Keys to select option Press <Enter> to execute the option

Option 1 (Edit stand data)

This option may be selected to edit the stand data. It will produce the stand data list in as many screens as required followed by several questions that will permit the editing of the run title,
stand data including the modification of existing stand data, the deletion of stands, and the addition of stand data. This option first will generate a listing of the current stand database.

*** ACESDB DATABASE: List of Stands. ***
Use the arrow keys to move through the list.
There are 19595 stands.

<table>
<thead>
<tr>
<th>Sim</th>
<th>Stand Yr</th>
<th>Cov Own</th>
<th>Acres</th>
<th>Age</th>
<th>Volume</th>
<th>Growth</th>
<th>Stocking</th>
<th>Site Treatn</th>
<th>Tag</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0904815w703</td>
<td>4 1</td>
<td>3</td>
<td>35</td>
<td>8.56</td>
<td>0.00</td>
<td>0.383</td>
<td>76</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0904815w1804</td>
<td>4 1</td>
<td>7</td>
<td>35</td>
<td>8.56</td>
<td>0.00</td>
<td>0.383</td>
<td>76</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0904815w1903</td>
<td>4 1</td>
<td>33</td>
<td>30</td>
<td>5.85</td>
<td>0.00</td>
<td>0.358</td>
<td>66</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0904815w1908</td>
<td>4 1</td>
<td>11</td>
<td>29</td>
<td>9.97</td>
<td>0.00</td>
<td>0.474</td>
<td>81</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0904815w3001</td>
<td>4 1</td>
<td>14</td>
<td>29</td>
<td>9.97</td>
<td>0.00</td>
<td>0.474</td>
<td>81</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0904815w3004</td>
<td>4 1</td>
<td>56</td>
<td>50</td>
<td>19.42</td>
<td>0.00</td>
<td>0.740</td>
<td>70</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0904815w3003</td>
<td>4 1</td>
<td>51</td>
<td>40</td>
<td>15.56</td>
<td>0.00</td>
<td>0.738</td>
<td>67</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0904815w3006</td>
<td>4 1</td>
<td>51</td>
<td>67</td>
<td>17.91</td>
<td>0.00</td>
<td>0.642</td>
<td>62</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0904815w3010</td>
<td>4 1</td>
<td>37</td>
<td>8</td>
<td>9.57</td>
<td>0.00</td>
<td>1.000</td>
<td>55</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0904815w1302</td>
<td>4 1</td>
<td>9</td>
<td>35</td>
<td>8.56</td>
<td>0.00</td>
<td>0.383</td>
<td>76</td>
<td>0</td>
</tr>
</tbody>
</table>

**Edit Stand Add Stand Delete Stand Find Stand Reorder Stands Tag UnTag Quit**

Stand Data Base: c:\aces\data\ASPEH.ADB

The user can scroll through this list and perform any of the edit functions shown in the footer of the table. The sample data file has no data inconsistencies, thus the program gives the option to go directly to the ACESDB calculations without further review of the run parameters. Within the stand editing routine, the user may use the cursor keys to select an entry for editing. Upon hitting the <Enter> key on a selected field, an empty field will be displayed for entry of a new number. The program will check for the validity of any entry and give appropriate error messages so that a corrective action can be taken by the user. If the user does not enter a new value, but simply uses the <Enter> key, the old field value will be displayed. Stand stocking is a variable that is calculated on the basis of the entered age, volume, and site index. Every time that one or more of these three variables is changed through editing, a new stocking percent is calculated. The program provides messages concerning possible problems with these implied stocking percents for simulation purposes and provides further opportunities to take corrective action. Stocking is an important variable because growth for any stand, calculated from the yield table on the basis of age and site index, is corrected by that stocking percent until the first clearcut. After that, the stocking percent for stands will be equal to a value entered by the user as parameter "Anticipated stocking after harvest."

*** ACESDB: Edit Stand Data. ***
Use the arrow keys to move through the list.
Stand: 0904815w0703

General Stand Data

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand ID:</td>
<td>0904815w0703</td>
</tr>
<tr>
<td>Acres :</td>
<td>3.00</td>
</tr>
<tr>
<td>Age :</td>
<td>35</td>
</tr>
<tr>
<td>Volume :</td>
<td>8.56</td>
</tr>
<tr>
<td>Stocking:</td>
<td>0.383</td>
</tr>
<tr>
<td>Site :</td>
<td>76</td>
</tr>
</tbody>
</table>

**Edit** **Save Changes** **Quit w/o Saving**
The <F>ind functions allows for searching the database for specific records while the <R>order function lets the user sort the database according to various sort criteria:

Find stand ID or Age?
   ID
   Age

Search for what age? 55

Find age: 55

Is this the age you want
   Yes
   No

Select the ordering you prefer by highlighting your choice and pressing ENTER or the SPACEBAR. (The current ordering is highlighted.)

(1). By Stand ID
(2). By Age.
(3). By Site Index and Age.

Option 2 (Edit run parameters)

This option may be selected to edit any of the run parameters before beginning the simulations. The program will display a summary of the current run parameters and prompt the user for any changes. Within the run parameter editing routine, the user may use the cursor keys to select an entry for editing. Upon hitting the <Enter> key on a selected field, a prompt will provide the user the opportunity to enter a new parameter. The program will check for the validity of any entry and give appropriate error messages so that a corrective action can be taken by the user.

Run Parameters Editing Menu
Highlight the parameter you wish to edit using the arrow keys.

1. Discount Rate Selected : 4
2. Demand Curve: $/Cords = a - b * Quan Harv : a = .79 b = 0
3. Volume Output (1-Cu ft, 2=Cords, 3=Bd ft) : Cords
4. Ageclass Width (Years) : 10
5. Rotation (Years) : 50
6. Mn. Cutting Age (Years) : 40
7. Anticipated Stocking Percent after Harvest : 100
8. Interval to Reevaluate Allowable Cut (Yrs) : 10
9. Number of Times to Evaluate Allowable Cut : 1
10. Cut Determination Method (1-9) : Tabular Check
11. Adjustment period for Austrian formula : 20
12. Cutting Priority (1-Age, 2-Age and Site) : 1
13. Detailed Annual Output Reports (Y or N) : Y
14. Cu ft/cord conversion factor : 79
15. Cu ft/bd ft conversion factor : 158
16. Age to cut above allowable cut over spec. years : 50
17. Years over which old stands can be liquidated : 0
18. Future year for allowing old stand liquidation : 999

   Edit       Quit
The user simply moves the cursor to the parameter to be dined and hits the <Enter> key. The program will prompt for an appropriate input which in the case of some items are menus as for example the output units for a simulation run:
Run Parameters Editing Menu
Highlight the parameter you wish to edit using the arrow keys.

1. Discount Rate Selected : 4
2. Demand Curve: $/Cords = a - b * Quan Harv : a = .79 b = 0
3. Volume Output (1=Cu ft, 2=Cords, 3=Bd ft) : Cords
4. Ageclass Width (Years) : 10
5. Rotation (Years) : 50
6. Min.
7. Anti
8. Inte
9. Numb
10. Cut
11. Adj
12. Cutt
13. Det
14. Cu f
15. Cu ft/bd ft conversion factor : .158
16. Age to cut above allowable cut over spec. years : 50
17. Years over which old stands can be liquidated : 0
18. Future year for allowing old stand liquidation : 999

For run parameter 10, the following menu screen will appear:

Cut Determination Option

1. Tabular Check
2. Modified Barnes
3. Austrian
4. Chapman
5. Hundeshagen
6. Von Mantel
7. Hanzlik
8. User input of allowable annual volume cut
9. Area Control adjusted for site productivity

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

If option 8 is chosen, the following input will be requested from the user:

Enter annual allowable cut in Cords (currently 0)?

The number requested is in the same units as the output units that the user requested under option three. This number will be stored always in cubic foot volume equivalent when the edited data are saved as a parameter file. When the file is recalled, the user inputted annual volume cut will be automatically be converted into whatever output units the user selects at the time. Initially and whenever another volume control method than 8 is chosen, this parameter will be zero.

If you run ACESDB now, it will use the edited data. The changes will be lost if they are not saved now.
Do you want to save changes now.

Yes  No
For "Yes", the program will first provide the option to save the data before proceeding to the MAIN EDITING MENU. The program will again check for the validity of the indicated disk drive, the file name, and any other error and prompt the user to take a corrective action if necessary. If the file name already exists on the drive, the user has the option to overwrite the file or to provide a new file name. The program automatically appends an extension of .PAR onto every file that is saved. Once a user understands the very simple file structure (see also Appendix I for an example), it is easier to generate the data outside ACESDB with a text editor. After any editing operation, the program will return to the MAIN Editing Menu

```
MAIN EDITING MENU
1. View/Edit Stand Data
2. View/Edit Run Parameters
3. Perform/Continue Calculations
4. Return to MAIN MENU
Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option
```

As long as an edit is requested it will open a screen with the appropriate prompt. After editing has been completed, the option for saving the edited parameters exists. It is important to note that any editing that has taken place will be reflected in the current data set and will be carried forward into the following calculations even if the file is not saved.

**Option 3 (Perform calculations)**

This option may be selected to perform economic calculations. The Edit Stand Data option must be used to tag stands for simulation. The program will always store the results of the simulation in an ASCII file with the same name as the stand data input file except that it will receive automatically the extension ".TBL".

```
Outputs will be saved to file C:\ACES\OUTPUT\ACESDB.TBL
Do you want to save outputs under another file name
Yes      No
```

If that file exists from a previous run, a warning message will be displayed. The program provides an option, however, for the user to change the name to another name with the following prompt:

```
Outputs will be saved to file C:\ACES\OUTPUT\ACESDB.TBL
File C:\ACES\OUTPUT\ACESDB.TBL exists and will be overwritten unless you specify a new name.
Do you want to save outputs under another file name
Yes      No
```

A run output database with the same name as selected for the output table except with a file extension of ".MDB" will be created also. The program will check whether this run output database already exists:

29
If no stands were tagged, the following warning message will appear and the user is returned to the Main Menu.

**MAIN EDITING MENU**

1. View/Edit Stand Data  
2. View/Edit Run Parameters  
3. Perform/Continue Calculations  
4. Return to MAIN MENU

Use Numeric or Arrow Keys to select option  
Press <Enter> to execute the option

The user should load the stand database and run parameter files again, but now select option 1, "View/Edit Stand Data" from the Editing Menu. Once the stand file is displayed on the screen, proceed to use the Ctrl-T<ag> function to tag all stands in a coverted type or covertedtype/owner group as seen below. When completed, the files that were tagged, will display a tag and will be included in the subsequent simulation run. The user may also use the T<ag> function alone to tag any individual stand(s) for inclusion in a simulation run. The Ctrl-U<ntag> function will untag all stands.
After leaving the stand list, the Main Editing Menu will be displayed again. Now the user can go directly to option 3, Perform/Continue Calculations. The user will be prompted for the output table name and output database name again. Then the user can select from a menu of treatment choices which determine specific constraints on the allowable cut simulation. The first option treats all stands the same, i.e., a stand can be harvested if it has reached rotation age and allowable cut has not been met yet for the simulation year. Option 2 forces the model to maintain a user specified percent of all stands to be above the rotation age. If the beginning inventory does not have acreage to satisfy this constraint, cutting will be delayed essentially. Option 3 makes a random selection of a user specified percent of stands and assigns them to an extended rotation which the user assigns for up to two different site classes.

For option 2, the user has two choices. For one, a percent of all acres will be kept above the base rotation entered in the parameter editing menu, for two, a percent of the acreage is kept above an extended rotation:
For option 3, the user enters the percent of land to be kept above rotation as well as the extended rotation. If the extended rotation is different for two site classes, the user is prompted for the site index break:

Enter % of forest land area to be kept above specified rotation?

Parameters Editing Menu
Default Percent of Land with Extended Rotation Ages
Highlight the parameter you wish to edit using the arrow keys.
Press <E> to edit the parameter and <C> to continue.
Percent of stands with extended rotation: 20
Edit Continue

Input a new percent for stands with extended rotation?

Is there only one extended rotation for all sites? Yes No

Enter site index break between 2 rotations?

Enter rotation for site 1?

Enter rotation for site 2?

Since program ACESDB reads and writes a lot from databases, runs for large data files generally require a lot of running time. The program can be speeded up by running it in a RAM or virtual drive. This requires special lines in the CONFIG.SYS file as in the sample shown below.

The next prompts let the user choose select screen pauses between key screen output tables. For <N>0, the program will simply execute faster, but all outputs are written to the selected output file and can be reviewed at a later stage. The option to choose between annual or periodic calculations of the allowable cut simply means that in the first case the allowable cut is recalculated on the basis of the status of the inventory after one year of growing and harvesting while in the second case, this recalculation occurs at the user specified planning interval. Using the annual recalculation option is not recommended since the inventory typically does not change sufficiently through growth and harvesting in one year to impact on the allowable cut calculation.

Do you wish to pause between screens? Yes No

Also a batch file, ACEVIRTE.BAT is supplied with ACESDB to load necessary run files to a virtual drive E. If the user creates a virtual drive in another directory, this file needs to be edited appropriately. When the program runs in virtual memory, the user can make sure that the stand
database is erased from the virtual drive before the simulation to make more space on the drive. The program will work with a working copy of the database.

Are you running program on a virtual drive?
Yes   No

Screen pausing will be set to off for runs in virtual memory automatically even if user has selected screen pausing. This is done so run does not have to be monitored. No additional run periods can be added. If you are running program on a RAM drive you can delete stand database on the RAM drive to create more space in RAM drive for the run database. Do you want to erase stand database to create more space in RAM.

Yes   No

Since the starting stand database could have many different covertypes, and the user tagged for example all aspen stands, the program needs a reconfirmation of which covertype is to be used in the simulation:

Do you want to keep selected covertype Aspen for simulation. For no, new growth parameters will be loaded after selecting covertype
Yes   No

After quitting this screen the following prompt will appear which permits the user to set a different lower age for zero growth:

Growth for stands under age 5 is not predicted due to the nature of the yield regression model. It is captured after stands reach age 5. Press a key to continue...

The user should review the yield table for the covertype being simulated. This can be done from main menu item number 4. By selecting a one-year age interval for the yield table, the user can see that the growth for especially the early ages might be unreliable.

The growth and yield calculations should be recorded in the same units as the stand volume units. If stand volumes are commercial pulpwood volumes up to a 4 inch top, the user would accept the default, if not, a new top diameter outside bark can be selected:

All volumes are commercial volumes. A default of a 4 inch top diameter outside bark is used in the run. Do you want to set a different top diameter?
Yes   No

Input top diameter for pulpwood?

Since ACESDB simulates covertypes of typically mixed species stands and calculates only covertype volumes, the user has an option to specify the species composition of the covertype or
The selected species composition percentages are used by the program to write species-specific summaries to the output tables and provide more detailed graphs of harvest volumes. The user can select any cell using the cursor keys and upon hitting <Enter>, will be asked for a new cell value. The program keeps track of the column totals and provides an error message if the column total exceeds 100 percent:

<table>
<thead>
<tr>
<th>Species Composition within Covetypes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spec/Typ: RPIN JPIN BLFR ASPN NWCD TAMR ELAM PBRC MBCH OAKH BSPR BGIL WPIN WSPR</td>
</tr>
<tr>
<td>Ash 0.0 0.0 0.0 0.0 0.0 3.4 0.0 55.8 0.0 0.0 0.0 6.1 0.0 5.4 0.0 0.0</td>
</tr>
<tr>
<td>Elm 0.0 0.0 0.0 0.0 0.0 0.0 0.0 4.9 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Slvr Maple 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Aspen 4.7 7.9 12.4 66.7 0.0 0.0 5.7 16.5 3.3 4.4 0.0 14.8 7.6 11.6</td>
</tr>
<tr>
<td>P Birch 0.0 0.0 8.6 7.7 4.0 0.0 0.0 55.8 6.3 4.8 0.0 5.3 6.7 4.8</td>
</tr>
<tr>
<td>Blm of Gil 0.0 0.0 0.0 3.4 0.0 0.0 0.0 4.0 0.0 0.0 0.0 0.0 55.5 0.0 3.1</td>
</tr>
<tr>
<td>H Maple 0.0 0.0 0.0 0.0 0.0 0.0 0.0 3.1 58.6 3.9 0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Basswood 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Y Birch 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Oak 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Wh Pine 9.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Red Pine 69.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>J Pine 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Wh Spruce 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Bals Fin 2.7 2.1 48.6 8.6 8.6 0.0 5.6 8.9 0.0 0.0 0.0 7.7 51.5 15.5</td>
</tr>
<tr>
<td>Bick Spr 0.0 6.5 4.0 0.0 6.6 15.7 0.0 0.0 0.0 84.8 0.0 0.0 3.1</td>
</tr>
<tr>
<td>Tamarack 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Wh Cedar 0.0 0.0 5.7 0.0 67.0 7.2 8.4 0.0 0.0 0.0 0.0 0.0 3.3 3.8 0.0</td>
</tr>
<tr>
<td>Misc. 14.0 7.6 16.4 13.6 10.4 2.5 15.6 15.7 22.6 17.1 5.2 8.0 16.5 22.5</td>
</tr>
<tr>
<td>Total 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00 100.00</td>
</tr>
</tbody>
</table>

The user can then choose between two options that would allow for stands to be split into smaller parts in order to meet the allowable cut for the year exactly or prevent stand splitting. In general, if stands are relatively small, stand splitting is not important since it increases the size of the database every time a stand is split. If stands are large, preventing stand splitting can lead to the allowable cut being exceeded substantially in some years.

| Should stands be split to meet allowable cut exactly? |
|------------------|------------------|
| Yes              | No               |
The allowable cut can be recalculated every year or only at the user specified planning interval. The second option is usually preferable since the allowable cut calculations, especially for the Tabular Check, are very computation intensive, but more importantly because the inventory does not change sufficiently from one year to the next to warrant a recalculation of the allowable cut.

<table>
<thead>
<tr>
<th>Should allowable cuts be calculated:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Annually</td>
</tr>
<tr>
<td>2. Each Planning Period</td>
</tr>
<tr>
<td>Enter corresponding letter from below</td>
</tr>
<tr>
<td>Annually</td>
</tr>
<tr>
<td>Planning Period</td>
</tr>
</tbody>
</table>

Before the simulation begins, the user can provide a descriptive run title of up to 5 lines which will be printed on top of the output file. For <Y>es, the user can enter up to 5 descriptive lines.

<table>
<thead>
<tr>
<th>Do you want to input a run title?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

Enter up to 5 lines of text up to 60 characters long. Press <ENTER> at the end of each line
Press a key to continue...

**RUN TITLE INPUT SECTION**

Line 1: >The user can now enter up to 5 descriptive lines
Line 2: >

The user can obtain a listing of the initial stand database in the output table. This is only recommended, if the stand list is small. The stand database can always be reviewed by using the stand edit option or main menu option 9, View ACESDB Databases.

<table>
<thead>
<tr>
<th>Do you want to write to the output file table a full list of the initial stand database records.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The database contains 21 records.</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

You may now press the <F10> key any time to stop simulation. You will loose your results, and will have to restart the program.
Press a key to continue...

Now the program will begin its calculations. A message will indicate that the run can be interrupted at any time by simply hitting the <F10> key. Screen output will begin as soon as the calculations are finished. Output begins with a summary of the initial growing stock distribution followed by estimates of the allowable cuts for 7 volume control methods. These output summaries are repeated for each specified planning interval. Appendix II shows sample listings from the output reports written to an ASCII file on the output directory:
<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Site (ft)</th>
<th>Area (acres)</th>
<th>Yield/acre Cords</th>
<th>Total yield M Cords</th>
<th>Annual growth Cords Cords/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>55</td>
<td>1400</td>
<td>5.67</td>
<td>7.932</td>
<td>42.7</td>
</tr>
<tr>
<td>100</td>
<td>55</td>
<td>8300</td>
<td>12.33</td>
<td>102.337</td>
<td>648.6</td>
</tr>
<tr>
<td>90</td>
<td>55</td>
<td>25700</td>
<td>13.89</td>
<td>356.973</td>
<td>2714.4</td>
</tr>
<tr>
<td>80</td>
<td>55</td>
<td>60800</td>
<td>10.88</td>
<td>661.329</td>
<td>4176.8</td>
</tr>
<tr>
<td>70</td>
<td>55</td>
<td>150800</td>
<td>15.54</td>
<td>2342.761</td>
<td>27647.5</td>
</tr>
<tr>
<td>60</td>
<td>55</td>
<td>383200</td>
<td>12.88</td>
<td>4936.997</td>
<td>76283.8</td>
</tr>
<tr>
<td>50</td>
<td>55</td>
<td>40900</td>
<td>11.03</td>
<td>4613.172</td>
<td>95774.4</td>
</tr>
<tr>
<td>40</td>
<td>55</td>
<td>286300</td>
<td>7.40</td>
<td>2119.592</td>
<td>66290.5</td>
</tr>
<tr>
<td>30</td>
<td>55</td>
<td>199600</td>
<td>4.08</td>
<td>813.564</td>
<td>42238.9</td>
</tr>
<tr>
<td>20</td>
<td>55</td>
<td>177600</td>
<td>2.99</td>
<td>530.177</td>
<td>50835.9</td>
</tr>
<tr>
<td>10</td>
<td>55</td>
<td>244700</td>
<td>1.83</td>
<td>447.782</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1947400</td>
<td>8.64</td>
<td>16832.613</td>
<td>376657</td>
</tr>
<tr>
<td>Desirable</td>
<td></td>
<td>8.03</td>
<td>15636.776</td>
<td>712950</td>
<td>0.37</td>
</tr>
</tbody>
</table>

Press any key to continue....

No screen output will appear for the individual simulation years, only a short message on the screen indicating which simulation year is being processed currently. There is, however, output being written annually to the output file. At the end of each planning period, a summary of the average allowable cut appears on the screen followed by a table with data on the growing stock distribution. If allowable cuts are calculated annually, an annual report of the allowable cuts. At the end of each planning period, a harvest report database screen is displayed in which harvest information can be reviewed. This report is also written to the run output file. The following shows output from a small database contained in file SAMPDBCK.MDB on the program diskette.

VOLUME CONTROL ALLOWABLE CUT SUMMARY FOR PLANNING PERIOD 1
(Avg. Annual Allowable Cut According To: Tabular Check actually simulated)
Tabular Check = 544747 Cords
Modified Barnes = 558487 Cords
Austrian = 436449 Cords
Chapman = 488285 Cords
Hundeshagen = 600122 Cords
Von Mantel = 673305 Cords
Hanzlik = 486105 Cords
User Input = 0 Cords

ACTUAL CUTTING SUMMARY FOR ALLOWABLE CUT METHOD SELECTED
Clearcut/yr = 37742 acres
Clearcut/yr = 544747 Cords
Avg. ann. allow. cut shortfall = 0 Cords

Press any key to continue....
DISTRIBUTION OF GROWING STOCK AT BEGINNING OF PLANNING PERIOD 1

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Site (ft)</th>
<th>Area (acres)</th>
<th>Yield/acre</th>
<th>Total yield M Cords</th>
<th>Annual growth Cords/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>55</td>
<td>252778</td>
<td>14.56</td>
<td>3679.676</td>
<td>4342.7</td>
</tr>
<tr>
<td>60</td>
<td>55</td>
<td>409000</td>
<td>12.94</td>
<td>5290.825</td>
<td>81751.0</td>
</tr>
<tr>
<td>50</td>
<td>55</td>
<td>286300</td>
<td>9.20</td>
<td>2632.686</td>
<td>55870.2</td>
</tr>
<tr>
<td>40</td>
<td>55</td>
<td>199600</td>
<td>5.60</td>
<td>1117.319</td>
<td>3494.3</td>
</tr>
<tr>
<td>30</td>
<td>55</td>
<td>177600</td>
<td>5.06</td>
<td>899.220</td>
<td>46686.0</td>
</tr>
<tr>
<td>20</td>
<td>55</td>
<td>244700</td>
<td>6.40</td>
<td>1566.598</td>
<td>173851.8</td>
</tr>
<tr>
<td>10</td>
<td>55</td>
<td>228270</td>
<td>2.16</td>
<td>493.488</td>
<td>125965.6</td>
</tr>
<tr>
<td>0</td>
<td>55</td>
<td>149152</td>
<td>0.57</td>
<td>85.586</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Total 1947400 8.10 15765.393 562494 0.29
Desirable 8.03 15636.776 712950 0.37

Press any key to continue....

*** ACESDB DATABASE: Harvest Report ***
Use the arrow keys to move through the list.
There are 15 harvest records. All volume units in Cords

<table>
<thead>
<tr>
<th>Stand ID</th>
<th>Parent Stand</th>
<th>Year of Harvest</th>
<th>Age</th>
<th>Harvested Acres</th>
<th>Volume Harvested</th>
<th>Volume/Acre Harvested</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>105</td>
<td>1400</td>
<td>10863</td>
<td>7.76</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>1</td>
<td>95</td>
<td>8300</td>
<td>140154</td>
<td>16.89</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>1</td>
<td>85</td>
<td>25445</td>
<td>484108</td>
<td>19.03</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>2</td>
<td>86</td>
<td>255</td>
<td>4878</td>
<td>19.16</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>3</td>
<td>76</td>
<td>41939</td>
<td>630248</td>
<td>15.03</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>3</td>
<td>77</td>
<td>18861</td>
<td>285854</td>
<td>15.16</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>3</td>
<td>67</td>
<td>16071</td>
<td>349271</td>
<td>21.73</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>4</td>
<td>68</td>
<td>28927</td>
<td>635125</td>
<td>21.96</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>5</td>
<td>69</td>
<td>28639</td>
<td>635125</td>
<td>22.18</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>6</td>
<td>70</td>
<td>28361</td>
<td>635125</td>
<td>22.39</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>3</td>
<td>77</td>
<td>18861</td>
<td>285854</td>
<td>15.16</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>3</td>
<td>67</td>
<td>16071</td>
<td>349271</td>
<td>21.73</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>4</td>
<td>68</td>
<td>28927</td>
<td>635125</td>
<td>21.96</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>5</td>
<td>69</td>
<td>28639</td>
<td>635125</td>
<td>22.18</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>6</td>
<td>70</td>
<td>28361</td>
<td>635125</td>
<td>22.39</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>3</td>
<td>77</td>
<td>18861</td>
<td>285854</td>
<td>15.16</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>3</td>
<td>67</td>
<td>16071</td>
<td>349271</td>
<td>21.73</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>4</td>
<td>68</td>
<td>28927</td>
<td>635125</td>
<td>21.96</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>5</td>
<td>69</td>
<td>28639</td>
<td>635125</td>
<td>22.18</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>6</td>
<td>70</td>
<td>28361</td>
<td>635125</td>
<td>22.39</td>
</tr>
</tbody>
</table>

Find Harvest for a Stand Find Harvest Year Quit

Stand Data Base: c:\aces\DATA\SAMPLE.MDB

At the end of the run the program provides an opportunity to extend the analysis in several ways.
One is to extend the simulation with the current data for additional simulation periods, the second is to start the simulation with totally new data or after editing any of the current input data, i.e., stand data and/or run parameters. The program asks:

Do you wish to run additional simulation periods? Yes No

37
For \(< Y \> es, the user can supply a number. If 4 is entered and the planning period is 10, then 40 more years would be simulated.

\[
\text{Enter number of additional intervals for simulation? 1}
\]

If the answer for additional simulation periods was "Y", and a "1" was entered for one additional period, the user will have first an option to change either stand data or run parameters.

\[
\text{Do you wish to change stand data or any run parameters?}
\begin{array}{cc}
\text{Yes} & \text{No}\end{array}
\]

For a \(< Y \> es, the Main Editing Menu would appear and permit the user to edit any data before the simulation would be continued. After each simulation period or block of simulation periods, the user will have the option to change any of the run parameters, e.g., rotation age or the allowable cut method. Choosing "1" for the number of times to evaluate allowable cut (option 9 in run parameter editing menu), the user can for example provide a user defined allowable cut for the simulation period and change it before an additional period is selected. For \(< Y \> es, the parameter editing screen will open and after leaving that screen, the program will continue its calculation for the additional simulation intervals selected with screen outputs as seen above. For a \(< N \> o answer, output for the additional period selected follows beginning with the condition of the inventory at the end of the last period.

\[
\begin{array}{|c|c|c|c|c|c|c|}
\hline
\text{Age} & \text{Site} & \text{Area} & \text{Yield/acre} & \text{Total yield} & \text{Annual growth} & \hline
\text{years} & \text{(ft)} & \text{(acres)} & & & & \\
70 & 55 & 252778 & 14.56 & 3679.676 & 43424.7 & 0.17 \\
60 & 55 & 409000 & 12.94 & 5290.825 & 81751.0 & 0.20 \\
50 & 55 & 286300 & 9.20 & 2632.684 & 55870.2 & 0.20 \\
40 & 55 & 199600 & 5.60 & 1117.319 & 34944.3 & 0.18 \\
30 & 55 & 177600 & 5.06 & 899.220 & 46686.0 & 0.26 \\
20 & 55 & 244700 & 6.40 & 1566.598 & 173851.8 & 0.71 \\
10 & 55 & 228270 & 2.16 & 493.488 & 125965.6 & 0.55 \\
0 & 55 & 149152 & 0.57 & 85.586 & 0.0 & 0.00 \\
\hline
\end{array}
\]

\[
\text{Press any key to continue}.
\]

38
VOLUME CONTROL ALLOWABLE CUT SUMMARY FOR PLANNING PERIOD 2  
(Avg. Annual Allowable Cut According To: Tabular Check actually simulated)  
Tabular Check = 563405 Cords  
Modified Barnes = 561887 Cords  
Austrian = 568924 Cords  
Chapman = 489052 Cords  
Hundeshagen = 562073 Cords  
Von Mantel = 630616 Cords  
Hanzlik = 507113 Cords  
User Input = 0 Cords  

ACTUAL CUTTING SUMMARY FOR ALLOWABLE CUT METHOD SELECTED  
Clearcut/yr = 36579 acres  
Clearcut/yr = 543405 Cords  
Avg. ann. allow. cut exceeded = 0 Cords  

Press any key to continue....

DISTRIBUTION OF GROWING STOCK AT BEGINNING OF PLANNING PERIOD 2

<table>
<thead>
<tr>
<th>Age</th>
<th>Site</th>
<th>Area (acres)</th>
<th>Yield/acre</th>
<th>Total yield M Cords</th>
<th>Annual growth Cords/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>55</td>
<td>295990</td>
<td>14.62</td>
<td>4326.234</td>
<td>51054.9</td>
</tr>
<tr>
<td>60</td>
<td>55</td>
<td>286300</td>
<td>10.78</td>
<td>3086.314</td>
<td>47688.1</td>
</tr>
<tr>
<td>50</td>
<td>55</td>
<td>199600</td>
<td>6.95</td>
<td>1387.790</td>
<td>29451.3</td>
</tr>
<tr>
<td>40</td>
<td>55</td>
<td>177600</td>
<td>6.95</td>
<td>1234.956</td>
<td>38623.4</td>
</tr>
<tr>
<td>30</td>
<td>55</td>
<td>264700</td>
<td>10.86</td>
<td>2657.066</td>
<td>137950.6</td>
</tr>
<tr>
<td>20</td>
<td>55</td>
<td>228270</td>
<td>5.42</td>
<td>1237.416</td>
<td>107548.7</td>
</tr>
<tr>
<td>10</td>
<td>55</td>
<td>366988</td>
<td>2.76</td>
<td>1012.820</td>
<td>199877.5</td>
</tr>
<tr>
<td>0</td>
<td>55</td>
<td>147952</td>
<td>0.57</td>
<td>84.801</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1947400</td>
<td>7.72</td>
<td>15027.397</td>
<td>612195</td>
</tr>
<tr>
<td>Desirable</td>
<td></td>
<td></td>
<td>8.03</td>
<td>15636.776</td>
<td>712950</td>
</tr>
</tbody>
</table>

Press any key to continue....

Do you wish to run additional simulation periods?  
Yes  No

For a <N>o answer, the user can select to rerun the original problem after selecting to edit any data or not:

Do you want to write to the output file table a full list of the stand database records.  
The database contains 21 records.  
Yes  No

Do you want to write to the output file table a full list of the harvest database records.  
The database contains 15 records.  
Yes  No

Do you wish to rerun after editing stand data or run parameters?  
Yes  No

39
For <N>o, the program will return to the MAIN MENU, for <Y>es, the Main Editing Menu will be displayed.

**Option 4 (Return to MAIN MENU)**

This option will return the user to the MAIN MENU described above on page 9. By selecting this option, the user has decided to discontinue further processing of the current simulation alternative. All data entries will be lost if this option is selected after previously specifying that data should not be saved. In addition to being able to begin processing a new alternative from the MAIN MENU, the user may also exit the program.

**Main Menu Option 7 - View ACESDB Files**

This option is used to view stand data ASCII files, parameter files, or program output generated during a run or any output tables generated in any previous run. As stated before, ACESDB output tables are saved under a user specified file name or a default name. The program automatically adds the extension ".TBL" to each output file. All parameter files have an extension ".PAR" and all stand data files have the extension ".DAT". When option 7 is selected from the main menu, the following screen appears. The user can select a file type by entering one of the three a highlighted letters or escaping the menu without any selection. As before, the user can select a file of the selected type on the default or any other path and once selected will be prompted on whether the file is actually to be viewed.

<table>
<thead>
<tr>
<th>ACESDB VIEW FILE SELECTION MENU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. View run parameter files</td>
</tr>
<tr>
<td>2. View input stand data files</td>
</tr>
<tr>
<td>3. View output tables</td>
</tr>
<tr>
<td>4. View plot files</td>
</tr>
<tr>
<td>5. Return to ACESDB program</td>
</tr>
</tbody>
</table>

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Depending on the file type selected, a list of files with the appropriate extension in the default directory will be displayed:

<table>
<thead>
<tr>
<th>OUTPUT FILE CHOICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use the arrow keys to move through the list.</td>
</tr>
<tr>
<td>Hit the &lt;Enter&gt; key to select the highlighted file.</td>
</tr>
<tr>
<td>There are 7 files.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Path - C:\ACES\OUTPUT\</th>
<th>File extension - *.TBL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Path</td>
<td>Change File Specification</td>
</tr>
<tr>
<td>CASH.TBL</td>
<td>ASPENER2.TBL</td>
</tr>
<tr>
<td>ASPENIMP.TBL</td>
<td>ASPENEXT.TBL</td>
</tr>
<tr>
<td>ASPENER6.TBL</td>
<td>ASPENR40.TBL</td>
</tr>
<tr>
<td>ASPENR60.TBL</td>
<td>CASH.TBL</td>
</tr>
</tbody>
</table>
The user selects a file by highlighting it using the cursor keys and then hitting <Enter>. A prompt whether the selected file is actually to be viewed will be displayed first:

Do you want to view c:\aces\output\ASPEHER2.TBL?
Yes  No

For <Yes>, the program will display the output on the screen.

Main Menu Option 8 - Print ACESDB Files

This option is used to print program output generated during a run or any output tables generated in any previous run. A file is selected the same way as described under option 7. If a selected file is to be printed, a message to adjust the printer is displayed.

ACESD PRINT FILE SELECTION MENU
1. Print run parameter files
2. Print input stand data files
3. Print output tables
4. Print plot files
5. Return to ACESDB program
Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Depending on the file type selected, a list of files with the appropriate extension in the default directory will be displayed:

PARAMETER FILE CHOICES
Use the arrow keys to move through the list.
Hit the <Enter> key to select the highlighted file.
There are 16 files.

ACES.PAR OAKHCK.PAR
ACESDB.PAR PABPIR.PAR
ACESREDP.PAR REDPIN.PAR
ASPPN.PAR TAMARK.PAR
BALSFI.PAR WHPINE.PAR
BLMGL.PAR WHSPRC.PAR
COKKASPN.PAR
ELMASH.PAR
JPTINE.PAR
NWHCEDE.PAR

Change Path Change File Specification Quit
Path = C:\ACES\DATA\  File extension = *.PAR
The user selects a file by highlighting it using the cursor keys and then hitting <Enter>. A prompt whether the selected file is actually to be printed will be displayed first:

Do you want to print c:\aces\data\ACESDB.PAR?
Yes  No

For <Yes>, the following message to turn on the printer will appear:
Main Menu Option 9 - View ACESDB Databases

This option lets the user review any stand database previously created. This includes simulated stand databases. File selection is as before except that the program is looking for files with extension "\*.MDB" only. Once a file has been selected, two types of output screens will be displayed in sequence, first a listing of the stand database and then a listing of the complete harvest record database. Both these databases can be reviewed using the cursor keys and specific search and sort functions can be activated.

ACESDB DATABASE FILE CHOICES
1. See the list of filenames.
2. Enter the data filename.
3. Return to the MAIN MENU.

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

Only files with extension "\*.MDB" will be displayed for option 1.

*** ACESDB DATABASE: List of Stands. ***
There are 19995 stands.

<table>
<thead>
<tr>
<th>Sim</th>
<th>Year</th>
<th>Stand</th>
<th>Cov</th>
<th>Own</th>
<th>Age</th>
<th>Acres</th>
<th>Volume</th>
<th>Growth</th>
<th>Stocking</th>
<th>Site</th>
<th>Treat</th>
<th>Tag</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1996</td>
<td>15455</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>18</td>
<td>9.83</td>
<td>0.63</td>
<td>1.000</td>
<td>76</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>100</td>
<td>1996</td>
<td>15104</td>
<td>4</td>
<td>1</td>
<td>7</td>
<td>18</td>
<td>9.83</td>
<td>0.63</td>
<td>1.000</td>
<td>76</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>100</td>
<td>1996</td>
<td>15293</td>
<td>4</td>
<td>1</td>
<td>33</td>
<td>17</td>
<td>7.31</td>
<td>0.57</td>
<td>1.000</td>
<td>66</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>100</td>
<td>1996</td>
<td>15408</td>
<td>4</td>
<td>1</td>
<td>11</td>
<td>17</td>
<td>10.42</td>
<td>0.69</td>
<td>1.000</td>
<td>81</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>100</td>
<td>1996</td>
<td>15401</td>
<td>4</td>
<td>1</td>
<td>14</td>
<td>17</td>
<td>10.42</td>
<td>0.69</td>
<td>1.000</td>
<td>81</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>100</td>
<td>1996</td>
<td>15404</td>
<td>4</td>
<td>1</td>
<td>56</td>
<td>22</td>
<td>10.22</td>
<td>0.53</td>
<td>1.000</td>
<td>70</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>100</td>
<td>1996</td>
<td>15405</td>
<td>4</td>
<td>1</td>
<td>51</td>
<td>18</td>
<td>7.92</td>
<td>0.56</td>
<td>1.000</td>
<td>67</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>100</td>
<td>1996</td>
<td>15406</td>
<td>4</td>
<td>1</td>
<td>51</td>
<td>35</td>
<td>12.65</td>
<td>0.36</td>
<td>1.000</td>
<td>62</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>100</td>
<td>1996</td>
<td>15410</td>
<td>4</td>
<td>1</td>
<td>37</td>
<td>56</td>
<td>15.62</td>
<td>0.23</td>
<td>1.000</td>
<td>55</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>100</td>
<td>1996</td>
<td>15102</td>
<td>4</td>
<td>1</td>
<td>9</td>
<td>56</td>
<td>9.83</td>
<td>0.63</td>
<td>1.000</td>
<td>76</td>
<td>1</td>
<td>*</td>
</tr>
</tbody>
</table>

Edit Stand Add Stand Delete Stand Find Stand Reorder Stands Tag UnTag Quit

Stand Data Base: c:\aces\data\ASPEH25.MDB

42
This option allows the user to view the current ACESDB output in form of graphs by calling ACESGRAF, a stand-alone program. While a routine is included in the program that checks for the best screen mode depending on the computer and its graphics capabilities, the graphics portion of the program might not work in all cases. In that case, the user should let the author know the type of problem that occurred and information on the specific computer system. A modification of the program for that specific situation will be attempted at the earliest convenient time.

A "Y" answer will generate a menu which allows the user to enter a name of a file with plot data generated in the current or any previous run. The plot data files have an extension ".PLT" and have the same name as the file name for the ACESDB outputs (default ACESDB.TBL) or specified by the user. If the user chooses the selection option one below, the system will display all files with a "PLT" extension. By selecting one of the files, the plot file is automatically loaded. If the second entry option is used, the user needs to enter only the common part of the plot file name, in this case ACESDB. After leaving the program ACESDB, the user needs to enter ACESGRAF to activate the graphing program. ACESGRAF reads the files with extension ".PLT" that are created with any ACESDB simulation runs.

This option due to memory limitations needs to be run after leaving ACESDB. Leave ACESDB and run graphing program by typing ACESGRAF at the DOS prompt.

Press a key to continue...

After leaving program ACESDB, the user can activate the graphing program by typing <ACESGRAF> from the prompt.
ACESGRAF MAIN Menu

PLOT DATA FILE ENTRY CHOICES

1. Program information
2. Set path parameters.
3. Enter plot data filename.
4. Exit ACESGRAF.

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option

The ACESGRAF program is designed to plot information generated by
the allowable cut simulation programs ACES Version 7.6 and also
ACESDB Version 3.3 and higher. The program requires the path file
ACESGRAF.PTH in the same directory in which ACESGRAF.EXE is stored.
This path file is rewritten when the user selects a new path option
from within ACESGRAF (menu option 2). There is currently no way to
output the graphs to a printer. The user should report any problems
with graphing to the author so that these problems can be fixed.
In general a computer with a VGA graphics card should have no problems.

Press any key to continue....

Suboption 1: Set Path Parameters

For option 1, the user can change the default path to another path from which to read plot files:

SET FILE DRIVE PATHS

1. Current Path for Plot Files= c:\aces\output\n2. Finished (Accept current settings)

Enter the path you wish to change
Use Arrow or Number Keys to highlight
Press Spacebar or Enter to execute

Suboption 2: Enter Plot Data File

ACES/ACESDB PLOT OUTPUT FILE CHOICES

1. See the list of filenames.
2. Enter the data filename.
3. Return to the MAIN MENU.

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option
The selection procedure is as before except that the program will look for files with extension ".PLT" only. After a file has been selected, the graphing menu will appear. The program checks for the validity of the entered file and then displays nine options for plotting key results of the simulation.

Plots can only be seen on the screen. The user simply type the menu number or uses the cursor key to highlight a specific choice. Upon hitting the <Enter> key the program will display the associated graphic output. In the case of area control, no plots are being generated. The first plot shows the allowable cuts for all volume control methods over the planning horizon as well as the volume cut that would have been calculated under area control with adjustment for site productivity. Plot 2 shows the harvest revenues under the user selected volume control method. Plot 3 displays the discounted harvest revenues for any user defined discount rate or the rate that was used in the simulation (default value). The user is requested to enter a discount rate or to accept the default rate used in the original data input for the run.

Input discount rate in % or enter for default 4?

Plots 4 and 5 will display harvest acres and volumes, plots 6 and 7 will display both actual and regulated growth and growing stock volumes over the planning horizon. Plots 8 and 9 display ageclass information and require the user to enter a planning period between "1" and the last simulated period. The sixth option generates a bar graph of the ageclass distributions of all periods side by side in order to assess how ageclasses changed over time. The seventh option will return the user to the ACESDB graph module - File entry choices where additional files with plot data can be read in or a return to the ACESDB simulations can be requested.

Suboption 3: Exit ACESGRAF

This option will return the user to the ACESDB Main Menu.
Main Menu Option 11 - Exit

This option is used to exit the program, returning to the operating system. All program processing will be terminated if this option is selected.

THANK YOU FOR USING ACESDB VERSION 3.3

If you have any questions or comments concerning the use of this program, contact:

Dr. Dietmar W. Rose
1539 12th Terrace NW
New Brighton, Minnesota 55112
Tel. (612)536-7395 or (612)524-9711
E-Mail (Internet): drose@mercury.forestry.umn.edu

Press any key to continue....

Appendix II provides output listings for sample runs of ACESDB. A desirable procedure in any simulation analysis is to examine how sensitive key system variables, e.g., growing stock volumes, growth, age-class distributions, and allowable-cut volumes are to changes in various run parameters such as control method, interval of allowable cut recalculation, stocking under management, etc. Knowledge about the impacts of the various run parameters is an essential part of the assessment of the risk associated with an allowable cut decision. It gives valuable insights into what might happen if alternative cutting scenarios were implemented. The editing features of ACES make it easy to examine many allowable cut options for one or many inventory situations.

MODEL LIMITATIONS

While outputs that would be impossible to generate by hand can be quickly generated by ACES, users should be aware of a number of limitations of the current model. These weaknesses are all related to the way in which growth and yields are calculated. ACES regulates and projects 14 major covertypes. One question then arises of how to deal with mixed stands that are predominant in many of the covertypes in northern Minnesota. The only current solution is to assign all initial stand volumes to the major species, e.g., aspen, of the covertype and to assume that the total growing stock volume will grow according to the model for the major species.

Two other cautions are that stands are grown according to growth equations that were derived from empirical data on a large number of stands across Minnesota (see Walters and Ek 1991). They reflect the largely understocked stands that can be found in Minnesota. If the current stocking of an initial stand is 100 percent that stand will grow at the same rate as a stand described in the model equations. On the other hand, an initial stand that currently is 50 percent stocked or the initial stand volume of which is 50 percent in comparison to a fully stocked stand will grow at 50 percent of the rate of a normal, fully-stocked stand until the harvest. After clearcutting it will grow at the percent of normal growth expressed in the user-provided parameter of stand stocking under management. Thus, one needs to accept first the validity of the growth
projections of the growth model. Accepting this growth projection still does not overcome the problem that understocked stands may grow above or below the rate of a fully-stocked stand depending on the stocking percent. If entered stands have relatively larger volumes per acre than the yield equation, the model will reflect this in growing such stands at rates above those in the equations. The model also does not simulate any thinnings at this time.

LITERATURE CITED


Walters, D.K. and A.R. Ek. 1991. Whole stand models of yield and density for mixed stands developed from forest inventory and analysis data. (in preparation)
APPENDIX I

STAND DATA FILE

Run option 5 "Create Stand Database" first. You will need a data file with raw stand data using a text editor or via a database program and store it as an ASCII file with a file extension of ".DAT". An example structure for a stand data file is shown below:

<table>
<thead>
<tr>
<th>Species</th>
<th>Vol.</th>
<th>Unit</th>
<th>Growth Multiplier</th>
<th>Stocking Calc.</th>
<th>Data Checked</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;1&quot;</td>
<td>.40</td>
<td>1040</td>
<td>105,613.55</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>&quot;10&quot;</td>
<td>.40</td>
<td>17760</td>
<td>15,323.55</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>&quot;11&quot;</td>
<td>.40</td>
<td>244700</td>
<td>5,198.55</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>&quot;2&quot;</td>
<td>.40</td>
<td>8300</td>
<td>95,133.55</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>&quot;3&quot;</td>
<td>.40</td>
<td>25700</td>
<td>85,1503.55</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>&quot;4&quot;</td>
<td>.40</td>
<td>60800</td>
<td>75,1177.55</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>&quot;5&quot;</td>
<td>.40</td>
<td>150800</td>
<td>65,1681.55</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>&quot;6&quot;</td>
<td>.40</td>
<td>383200</td>
<td>55,1394.55</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>&quot;7&quot;</td>
<td>.40</td>
<td>409000</td>
<td>45,1194.55</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>&quot;8&quot;</td>
<td>.40</td>
<td>286300</td>
<td>35,801.55</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>&quot;9&quot;</td>
<td>.40</td>
<td>199600</td>
<td>25,441.55</td>
<td>1.00</td>
<td>0</td>
</tr>
</tbody>
</table>

Line 1: ACESDB DATA FILE, 2
Line 2: Northeastern Minnesota aspen inventory for 1977
Line 3: Volume in cu ft per acre
Line 4: Species Vol. Unit Growth Multiplier Stocking Calc. Data Checked
LINE 5: 4 1 1.00 0 0
LINE 6: "1" .4,0,1400,105,613,.24099999666214,55
LINE 7: "10" .4,0,177600,15,323,.657000005245209,55
etc.

Explanations:
Line 1: necessary first line indicating that stand file is an ACESDB data file with 2 title lines
Line 2: title line 1
Line 3: title line 2
Line 4: A blank line or a line with the text "Species Vol. Unit Growth Multiplier Stocking Calc. Data Checked" which simply explains the next line
Line 5: Lists the species chosen, the volume units/acre chosen, the growth multiplier and a logical value for the next two variables with -1 = true and 0 = false to indicate whether the stand data file has gone through a data check. If the two values are 0 as in this example, program ACESDB will run the data through intensive checks, prompt for corrections of any bad data, calculate appropriate stocking values, and then store the file if desired with the corrections. At that stage, the new file would have the values -1 or true for the last two variables.
Line 6: stand ID, covertype, owner, acres, age, volume/acre, site index for stand 1
Line 7: stand ID, covertype, owner, acres, age, volume/acre, site index for stand 2
etc.
Line n: stand ID, covertype, owner, acres, age, volume/acre, site index for stand n

48
After data checking, the new stand file might look like the following with stocking now calculated and displayed and the two logical variables set to -1 (=True). Now lines 6, 7, etc. contain also the calculated stocking for the stands:

Line 6: stand ID, covertype, owner, acres, age, volume/acre, stocking, site index for stand 1
Line 7: stand ID, covertype, owner, acres, age, volume/acre, stocking, site index for stand 2

ACESDB DATA FILE
A small sample file that the user should run to 
test various program options and related outputs.
Aggregated aspen covertype records from MN FIA.
Species Vol. Unit Growth Multiplier Stocking Calc. Data Checked
<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>1.00</th>
<th>-1</th>
<th>-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.01400.105,613..2414.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>4.0.17760.15,323..667.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>4.0.24470.5,198.1.409.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4.0.8300.95.1534..5557.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4.0.25700.85.1503..6688.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4.0.60800.75,1177..5669.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4.0.150800.65,1681..8922.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4.0.383200.55,1394..836.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>4.0.409000.45,1194..8394.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>4.0.286300.35,801..6995.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>4.0.199600.25,441..5289.55</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The next time, this data file is read, the file would pass all data consistency checks and reduce the work that the user originally invested in cleaning up the data file. Program option 6, "Run ACESDB", will load a relational stand database file. Such a file had to be originally be created using option 5, "Create Stand Database."

If you can create an ASCII file like described above with acres, age, volume/acre, stocking, site index all checked and consistent, especially stocking at a reasonable level independent of the other stand variables, the program should run without trouble. Set "Stocking Calculated" to -1 in line 5 of your file only when stocking data are already in the file and set "Data Checked" to -1 only if you are certain that the data are without errors. It is safer to set "Data Checked" equal to 0 and let the program go through a number of tests (see example files below).

Make sure that the first line includes the words "ACES DATA FILE" and the number of title lines if you want to give the file a title. You can have up to 5 title lines. The user might want to test run the three stand data files included with the program, DATABAD.DAT, DATATEST.DAT, and DATACHKD.DAT. Using these three files as input in run option 5, "Create Stand Database" will let the user understand various program functions. In the file DATABAD.DAT stocking has not been calculated, and the data have not been checked for consistency. When first running data files, it is a good idea to set the "Data Checked" parameter to 0. In addition, errors were built into this file on purpose such as a negative acreage, a negative age, a negative volume, and a zero site index. The program will force the user to correct these problems.

Run sample data file "ACESBAD.DAT" to learn about error editing.
ACESDB DATA FILE,

This is a small test data set in which intentionally
various types of errors were included. The user should
use this file to learn the various editing steps to clean
up a data file. Save the cleaned up file under a new name
so that this test data set remains for future learning.

Species  Vol. Unit  Growth Multiplier  Stocking Calc.  Data Checked

    "1" ,4,0,1300,5,123,60
    "2" ,4,0,2600,58,1329,45
    "3" ,4,0,1300,54,-1536,54
    "4" ,4,0,1100,42,1180,0
    "5" ,4,0,2200,61,1645,57
    "6" ,4,0,1100,12,450,45

Run data file "DATATEST.DAT" which does not contain errors, but for which stocking has not
been calculated to see how the final file after saving will look like. When saved as file
"DATACHKD.DAT", it will appear as that file listed further below.

ACESDB DATA FILE,

This is a small test data set in which intentionally
various types of errors were included. The user should
use this file to learn the various editing steps to clean
up a data file. Save the cleaned up file under a new name
so that this test data set remains for future learning.

Species  Vol. Unit  Growth Multiplier  Stocking Calc.  Data Checked

    "1" ,4,0,1300,5,123,60
    "2" ,4,0,2600,58,1329,45
    "3" ,4,0,1300,54,-1536,54
    "4" ,4,0,1100,42,1180,0
    "5" ,4,0,2200,61,1645,57
    "6" ,4,0,1100,12,450,45

Program ACESDB creates a relational database of the file with the same file name, but the
extension ".MDB" after going through a number of internal data checks.

ACESDB DATA FILE,

This is a small test data set in which intentionally
various types of errors were included. The user should
use this file to learn the various editing steps to clean
up a data file. Save the cleaned up file under a new name
so that this test data set remains for future learning.

Species  Vol. Unit  Growth Multiplier  Stocking Calc.  Data Checked

    "1" ,4,0,1300,5,123,60,692424587451361,60
    "2" ,4,0,2600,58,1329,974945007395032,45
    "3" ,4,0,1300,54,1536,955078727182279,54

50
Run for example option 5, select a data file, e.g., file with extension ".DAT." You will see that this file passes all the tests and can then be saved. It will also create the relational database file "DATACHKD.MDB." When you load "DATACHKD.MDB" with program option 6, the program will run without any problems.

To prepare a raw stand data file, the user is reminded of the species and volume parameter codes below:

The species codes are as follows:
1. Red pine
2. Jack pine
3. Balsam fir
4. Aspen
5. N. White cedar
6. Tamarack
7. Elm-ash-soft maple
8. Paper birch
9. Maple-birch"
10. Oak-hickory
11. Black spruce
12. Balm of Gilead
13. White pine
14. White spruce

The volume units are:
1. Cubic feet/acre
2. Cords/acre
3. Board feet/acre

When a stand data file is generated using a text editor, make sure that the first line includes the words "ACES DATA FILE" and the number of title lines

RUN PARAMETER FILE

ACESDB PARAMETER FILE (necessary first line in each run parameter file)
4,5,0,2,10,65,45,100,1,10,1,1,0,20,1,"Y",79,.158

- Discount rate percent
- Demand curve parameters (intercept and slope)
- Volume Output Units
- Ageclass Width
- Rotation
- Minimum Cutting Age
• Anticipated Stocking Percent after Harvest
• Growth Multiplier
• Interval to Reevaluate Allowable Cut
• Number of Times to Evaluate Allowable Cut
• Cut Determination Method
• User defined allowable cut volume (0 unless option 8 for cut determination method)
• Adjustment period for Austrian formula
• Cutting Priority
• Abbreviated Output
• Cu ft/cord conversion factor
• Cu ft/bd ft conversion factor

Appendix II - Description of File Outputs for Different Run Options

ACESDB writes to the output directory files with various extensions:

The next four will have before the period the same name as the output file name chosen by the user, e.g., SAMPLE:

"SAMPLE.TBL" are the run outputs: this output file can become very large especially if the long output option in the run parameter editing menu is chosen. Find out by comparing runs with short and long output what the differences are.

"SAMPLE.PLT" is a file that is loaded when the graphing program is used and contains information from a run that pertains to the run associated with SAMPLE.TBL.

Three report components, summary of stand data, summary of run parameters, and the initial growing stock distribution are part of every report.

Run with Periodic Allowable Cut Calculation and Detailed Output

The allowable cut is calculated only once for every planning period and is kept constant at the calculated level during the selected planning period. The detailed output option generates annual stand-level harvest reports as well as growing stock distribution reports. Newly created stands from a partial stand clearcut and, therefore, splitting of a stand receive a new stand number and the stand number of the parent.

Run with Periodic Allowable Cut Calculation and Brief Output

The allowable cut is calculated only once for every planning period and is kept constant at the calculated level during the selected planning period. The brief output option generates annual aggregate harvest reports and only periodic growing stock distribution reports.

Run with Annual Allowable Cut Calculation and Detailed Output

The allowable cut is calculated once for every year of the planning period. The detailed output option generates annual stand-level harvest reports as well as growing stock distribution reports.
Run with Annual Allowable Cut Calculation and Brief Output

The allowable cut is calculated once for every year of the planning period. The brief output option generates annual aggregate harvest reports and only periodic growing stock distribution reports.

Appendix III - Program Running Tips

1. Program Installation

The first step is to install the programs on your hard disk. Insert your diskette into drive A or B and type <SETUP>. This will start the installation program. Simply follow the instructions on the screen and read the corresponding chapter in the user’s manual.

2. Creating expanded memory and changing CONFIG.SYS file

ACESDB Version 3.3 is a menu-driven microcomputer program written in Microsoft Professional Basic Version 7.1 for application on the IBM personal computer and its compatibles. These computers must have at least 320K of available RAM to run ACESDB.

The program takes advantage of an integrated database managing language in Professional Basic, version 7.1. This requires that a database manager program PROISAM is loaded prior to running ACESDB. PROISAM needs extensive amount of RAM and would make it difficult to run most programs. Fortunately, most of PROISAM can be loaded into expanded memory and only about 63K will reside in lower memory below 640K. If expanded memory has not been successfully created, PROISAM will take up more than 300K of conventional memory which might not leave enough conventional memory to run the program. To check on the allocation of memory at any time, the user can use the DOS command "mem /c |more". To create expanded memory, the computer needs RAM in excess of 1 MB. Proisam does not take advantage of more than 1 MB. Therefore, in the CONFIG.SYS sample lines below, a DOS expanded memory manager EMM386.EXE is loaded and then a RAM drive of 1024K is created in expanded memory. The user needs to have sufficient RAM on the working PC and make the proper changes in the CONFIG.SYS file.

The major advantage of this program use of relational database management is that the size of inventories that can be handled by the program are limited only by available hard disk storage. In the following sample CONFIG.SYS file, on boot-up a menu with two choices will appear, one for a regular DOS session and the QBX choice to create expanded memory for loading of PROISAM which is needed to run ACESDB. This second option needs to be activated at boot-up time.

CONFIG.SYS File Example

[Menu]
    menuitem = DOS, Run DOS applications
    menuitem = QBX, Run QBX/Proisam
    menucolor = 7, 1
    menudefault = QBX, 20
[DOS]
device=c:\dos\ansi.sys
device=C:\DOS\HIMEM.SYS
device=C:\DOS\EMM386.EXE
dos=high
SHELL=C:\DOS\COMMAND.COM C:\DOS /P /E:1024
DEVICEHIGH=C:\DOS\RAMDRIVE.SYS 13000 /E
DEVICE=C:\DOS\SMARTDRV.EXE
FILES=65
BUFFERS=10
STACKS=9,256
goto end

[QBX]
DEVICE=C:\DOS\HIMEM.SYS
DOS=HIGH, UMB
SHELL=C:\DOS\COMMAND.COM C:\DOS /P /E:1024
REM Line below to run PROISAM which needs expanded memory:
DEVICE=C:\DOS\EMM386.EXE 1024 RAM
REM Line below creates RAM drive in expanded memory /a
device=c:\dos\ramdrive.sys 1024 /a
DEVICE=C:\DOS\SMARTDRV.EXE
FILES=65
BUFFERS=40
STACKS=9,256
goto end

:end

3. Running ACESDB

To run ACESDB, type <ACESDB> at the prompt of the directory where ACESDB was installed. ACESDB.BAT is a batch file which will install the required PROISAM database manager (Professional Indexed Sequential Access Method) of the Professional Basic Version 7.1 program language, load ACESDB.EXE for a run and un-install PROISAM at the end of the run to free up RAM memory. The following are the lines in the ACESDB.BAT batch file:

    proisam
    acedsb
    proisam /d

To run ACESGRAF, type <ACESGRAF> at the prompt.
4. Running ACESDB in a Virtual Drive

Program execution will slow substantially for large stand database files because of the large number of accesses to the database to keep individual stand records updated during the simulation. Program execution can be increased substantially by running the program in virtual memory. This requires that the PC on which the program is running has sufficient RAM to install a virtual drive. A virtual drive acts like a hard disk except that there are no moving parts and that the drive and all information on it disappears when the system is shut off. An additional line in the CONFIG.SYS file like shown below installs a 25 MB RAM drive:

```
devicehigh=c:\dos\ramdrive.sys 25000 /a
```

Once the drive is installed any program pus input and output data that do not exceed 17 MB can be run on that drive. It is only important to copy any results back to the hard disk at the end of the run or before the machine is turned off. Typically, the computer system will create the virtual drive in the next available drive on the system, normally drive D. But it could be also drive E or another drive letter depending on what other drives have been installed with the configuration file. The sample batch file ACEVIRTE.BAT listed below copies all relevant data for running ACESDB to a virtual drive E. In addition, the user needs to move a stand database file (extension .MDB and a run parameter file to the E:\DATA subdirectory using a file manager or the DOS copy command:

```
e:
cd e:
mkdir e:\data
mkdir e:\output
c:
cd c:\aces
copy acesdb.exe e:
copy acesgraf.exe e:
copy aces1nd3.mdb e:
copy viewfile.exe e:
copy proisam.exe e:
copy acevirte.pth e:\acesdb.pth
copy acevirte.pth e:\acesgraf.pth
copy acevirte.pth e:\viewfile.pth
copy acesdb.bat e:
copy viewfile.bat e:
cd data
copy specomp e:\data
copy viewfile e:\data
echo Copy data and parameter file you want to run
echo on virtual drive manually before running ACESDB!
```

Another batch file "ACEVIRTD.BAT" is provided with the program that will move the appropriate files for a run in a virtual drive D. If another drive letter is required, the user needs to edit the drive designator e: or d: in the batch files above to the appropriate drive letter.
To automatically copy key simulation results to the hard disk directory, e.g., C:\ACES, the user may add the following lines to the ACESDB.BAT batch file.

rem old lines
    proisam
    acesdb
    proisam /d
rem add new lines
    cd data
    copy *.mdb c:\aces\data
    cd..
    cd output
    copy *. * c:\aces\output

The new lines will copy the created output database with extension ".MDB" from the data subdirectory to a data subdirectory on the hard disk and all output files from the output directory to the output directory on the hard disk. This procedure is useful for long unattended runs when a power failure might wipe everything off the virtual drive. If a power failure occurs after a run has been completed, the automatic copying procedure will have safely moved the key outputs to the hard disk. When adding these lines to the "ACESDB.BAT" file, the user needs to edit the file to reflect the preferred directory and subdirectory settings and they, of course, have to be present at the time of the computer run.