ACES, Version 6.6

A Revised Allowable Cut Simulation Microcomputer Program

User's Manual

Dietmar W. Rose

Revised April 1995

Staff Paper Series No. 97

DEPARTMENT OF FOREST RESOURCES

College of Natural Resources
and the Agricultural Experiment Station
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St. Paul, Minnesota
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User's Manual

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STAFF PAPER SERIES NO. 97

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PREFACE

ACES Version 6.6 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 237K of available RAM to run ACES and the graphing program ACESGRAF called by ACES. ACES, Version 6.6 is a radically different version of all ACES Versions 5.0 and lower. ACES, Version 5.0 and lower and ACESGRAF, Version 5.0 and lower will no be longer supported. ACESGRAF alone requires about 166K RAM. 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. 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 ACES diskette.

This manual describes how to use ACES, a program that 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. Being familiar with basic principles of forest regulation and allowable cut determination is also helpful. Several references are provided with this manual.

The program allows the user to quickly 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 age class distribution. Input data required for the program consist of stand data describing current inventories of the cover type 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 ACES diskette. To do this you should format a new diskette and copy the hidden system files onto it. You should then copy each file on the ACES diskette to the new diskette. Do not use the DISKCOPY or DISKCOMP facilities. 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 ACES program. New versions may be obtained by returning the original ACES diskette to the authors. Please send a preaddressed and prestamped envelope with a blank and formatted diskette. Request for modifications of ACES to fit a particular user's need will be handled on an individual case basis.

Disclaimer: Although all software on the ACES 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.
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 (ACES) 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 ACES 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.
INSTALLATION OF ACES

Using DOS

Before using the ACES disk, make a working copy and label it. The ACES 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 ACES program disk in drive A, type COPY A:*.* B:, and press <ENTER> to start the copy procedure.

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 ACES.

Using SETUP Program

An installation program SETUP on the program diskette can be used also to install the program 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:\ACES. The following shows some of the input screens the user will see during installation:

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

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

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

Enter new path or <ENTER> for default path
ACES INSTALLATION PROGRAM

NEW INPUT DRIVE FOR ACES FILES: a:
DEFAULT DESTINATION DRIVE FOR ACES FILES: C:\ACES

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

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

Enter new path or <ENTER> for default path

ACES INSTALLATION PROGRAM

FINAL INPUT DRIVE FOR ACES FILES: a:\
FINAL DESTINATION DRIVE for ACES files: C:\ACES

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

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

To run ACES, simply type <ACES> from the
created directory C:\ACES

Press a key to continue...

Copying files to directory: C:\ACES
C:\ACES\ACESGRAF.EXE
C:\ACES\ACES.EXE
C:\ACES\SETUP.EXE
3 file(s) copied
C:\ACES\DATA\ACESPAR.EXP
C:\ACES\DATA\ACESDAT.EXP

ACES program has been successfully installed in drive D:\ACES
Press a key to continue...
PROGRAM INPUTS

ACES 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

- 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 program will provide a warning if the multiplier falls outside a specified range. Everytime either species or the growth multiplier are changed, stocking for each stand is recalculated because the underlying yield model has changed.

(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 ACES 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 ACES 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.

• 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 ACES) 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 ACES.

Data files saved under earlier versions of the ACES 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 ACES. Otherwise, ACES 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.

All data are entered either from the keyboard or are loaded directly from previously created disk files. After data has been entered, it 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, ACES 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 and optional annual inventory summary

C. Periodic and optional annual allowable cut calculations

D. Periodic and optional annual harvest reports

E. Plots of major simulation results when volume control methods are simulated are only generated on the screen during an ACES run. ACES 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 ACES and as long as these files have not been deleted or been overwritten by a new ACES run by simply typing **ACESGRAF** at the system prompt.
INSTRUCTIONS FOR USING ACES

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

The computer needs to be turned on. Place the ACES 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 ACES 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 ACES from a hard disk, you simply type ACES 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, ACES will display the program title and software disclaimer screens:

ACES Version 6.6
ALLOWABLE CUT EVALUATION PROGRAM

Written By
Dietmar W. Rose

Portions Copyright Microsoft Basic 7.1, 1990.
All rights reserved.

Copyright 1994 by Dietmar Rose.

Press any key to continue....
ACES SOFTWARE DISCLAIMER

All the software on the ACES 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. Future revisions of ACES will be available by returning the program diskette or a blank diskette and a check for $15 payable to the author. The author will develop customized versions of this software for any other covertyper or species for a small fee. Please call or write if you have questions. For permission to use/copy this software or obtain program updates write to:

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New Brighton, Minnesota 55112
Tel. (612)636-7395 or (612)624-9711
E-Mail (Internet): drose@mercury.forestry.umn.edu

Press any key to continue....

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

ACES Main Menu

1. Overview
2. Technical Reference
3. Set default paths
4. Review Yield Tables
5. Sample Run
6. Run ACES
7. View ACES Output
8. Print ACES Output
9. View ACES Graphs
10. Exit ACES

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

9
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:

ACES USER INFORMATION AND OVERVIEW

ACES is a user-friendly microcomputer program written for the IBM personal computer and IBM compatibles in Microsoft BASIC. These computers should have at least 230K of available RAM memory to run ACES and ACESGRAF. ACESGRAF alone can be run with 165K RAM.

ACES 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. The program is currently dimensioned to handle up to 650 stands. In the simulation, 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 should not start with the maximum of 1500 stands, but leave room for any new stands that will be created through stand splitting.

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....
Stand information may be entered from

(1) the keyboard,
(2) from a previously created file stored on a disk prior to program execution or generated through keyboard input in a previous run.

In each case, data entered for each stand are:
(1) Acreage of stand
(2) Age of stand
(3) Stand volume per acre in cu ft, cords, bd ft
(4) Stand stocking percent (calculated by program or read from file that was saved with stocking information
(5) Site index of stand

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

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

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.

Press any key to continue....

MAIN MENU Option 2 - Technical Reference

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

The three references below provide important background information on forest regulation and the growth and yield model used in the ACES simulation program. These references and a user's manual are shipped with the program when purchased.


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 ACES 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

   Enter new path for output files
   *

Main Menu Option 4 - Review Yield Table

This option provides the user an opportunity to review the growth and yield model used by ACES.
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 or can directly enter a file name. The program utilizes a default path, but the latter can changed if desired:

YIELD TABLE 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

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

(1) ASPEN.YLD
(2) REDP.YLD
(3) REDPB.YLD

Select by entering a number or highlight
using cursor and pressing <Enter> or Spacebar

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

Red pine          Paper birch
Jack pine         Maple-birch
Balsam fir        Oak-hickory
Aspen             Black spruce
N. White cedar    Balm of Gilead
Tamarack           White pine
Elm-ash-soft maple White spruce

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option
Yield Table Editing Menu: 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 site index: 55
(2) Ending yield table age: 100
(3) Beginning yield table age: 5
(4) Yield table age interval: 5
(5) Top diameter for pulpwood in inches: 4
(6) Top diameter for sawtimber in inches: 9
(7) 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 <E> dit 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 ending age of the yield table.

Yield Table Editing Menu: 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 site index: 55
(2) Ending yield table age: 100
(3) Beginning yield table age: 5
(4) Yield table age interval: 5
(5) Top diameter for pulpwood in inches: 4
(6) Top diameter for sawtimber in inches: 9
(7) Accept current parameter values.

Input new ending age? 85

Edit Quit

The following displays the kind of output that ACES 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 ACES 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.
Yield Information (per acre) for: Red pine
Site Index = 55 Growth Multiplier = 1
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>Total Volume cu ft</th>
<th>Pulpwood Volume cu ft</th>
<th>Sawtimber Volume cu ft</th>
<th>Total Volume M bd 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>
</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>
</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>
</tr>
<tr>
<td>20</td>
<td>72.52</td>
<td>22.00</td>
<td>799.84</td>
<td>597.54</td>
<td>0.88</td>
<td>67.48</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>
</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>
</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>
</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>
</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>45.12</td>
</tr>
<tr>
<td>50</td>
<td>99.65</td>
<td>54.52</td>
<td>1981.72</td>
<td>1575.78</td>
<td>3.88</td>
<td>42.19</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>
</tr>
</tbody>
</table>

Press any key to continue....

Yield Information (per acre) for: Red pine
Site Index: 55
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>Total Volume cu ft</th>
<th>Pulpwood Volume cu ft</th>
<th>Sawtimber Volume cu ft</th>
<th>Total Volume M bd ft</th>
</tr>
</thead>
<tbody>
<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>
</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>
</tr>
<tr>
<td>70</td>
<td>111.99</td>
<td>69.69</td>
<td>2618.28</td>
<td>2139.47</td>
<td>6.41</td>
<td>32.87</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>
</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>
</tr>
</tbody>
</table>

Press any key to continue....

Do you want to save data on a file
Yes No

Saving ACES Yield Table File
Enter path or <ENTER> for default path: c:\aces\OUTPUT

Enter data filename, or press only <ENTER> to return

*redpine*
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. 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 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.

Saving ACES Yield Table File
Enter path or <ENTER> for default path: c:\aces\OUTPUT

Enter data filename, or press only <ENTER> to use
default name: c:\aces\OUTPUT\Redpine.Yld

File c:\aces\OUTPUT\Redpine.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 <Y>yes and be prompted for a new file name.

Enter data filename, or press only <ENTER> to use
default name: c:\aces\OUTPUT\Redpine.Yld

Suboptions 3: Exit Yield Table Program

This option will return user to the ACES Main Menu.

MAIN MENU Option 5 - Sample Run

This option provides the user the opportunity to see an application of the program before running it with personal data. A sample stand and run parameters are automatically loaded into the program. The program will display an error message if these files are not on the same directory as the ACES program. The corresponding files ACESDAT.EXP and ACESPAR.EXP are listed in Appendix I. The program will display the Main Editing Menu first. If option 3, Perform calculations, is selected at this point, the program will display the run parameters followed by the stand list:

<table>
<thead>
<tr>
<th>MAIN EDITING MENU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Edit stand data</td>
</tr>
<tr>
<td>2. Edit run parameters</td>
</tr>
<tr>
<td>3. Perform calculations</td>
</tr>
<tr>
<td>4. Return to MAIN MENU</td>
</tr>
</tbody>
</table>

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option
SUMMARY OF CURRENT RUN PARAMETERS

1. Discount Rate (Percent): 4.00
2. Demand Curve: $/Cu Ft = a - b * Quan Harv with
   \[ a = 5 \quad b = 0 \]
3. Volume Output (1=Cu ft, 2=Cords, 3=Bd ft): Cu Ft
4. Ageclass Width: 5 Years
5. Rotation: 50 Years
6. Min. Cutting Age: 35 Years
7. Anticipated Stocking after Harvest: 100.00 Percent
8. Interval to Reevaluate Allowable Cut: 10 Years
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: 79.000
15. Cu ft/bd ft conversion: 0.158

Press any key to continue....

STAND DATA INPUT AND EDITING SECTION

Use the arrow keys to move through the list.
11 stand records for covertype: Aspen  Growth Multiplier = 1

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1400.00</td>
<td>105</td>
<td>613.00 Cu Ft</td>
<td>24</td>
<td>55</td>
</tr>
<tr>
<td>2</td>
<td>8300.00</td>
<td>95</td>
<td>1334.00</td>
<td>56</td>
<td>55</td>
</tr>
<tr>
<td>3</td>
<td>25700.00</td>
<td>85</td>
<td>1503.00</td>
<td>67</td>
<td>55</td>
</tr>
<tr>
<td>4</td>
<td>60800.00</td>
<td>75</td>
<td>1177.00</td>
<td>57</td>
<td>55</td>
</tr>
<tr>
<td>5</td>
<td>150800.00</td>
<td>65</td>
<td>1681.00</td>
<td>89</td>
<td>55</td>
</tr>
<tr>
<td>6</td>
<td>383200.00</td>
<td>55</td>
<td>1394.00</td>
<td>84</td>
<td>55</td>
</tr>
<tr>
<td>7</td>
<td>409000.00</td>
<td>45</td>
<td>1194.00</td>
<td>84</td>
<td>55</td>
</tr>
<tr>
<td>8</td>
<td>286300.00</td>
<td>35</td>
<td>801.00</td>
<td>70</td>
<td>55</td>
</tr>
<tr>
<td>9</td>
<td>199600.00</td>
<td>25</td>
<td>441.00</td>
<td>53</td>
<td>55</td>
</tr>
<tr>
<td>10</td>
<td>177600.00</td>
<td>15</td>
<td>323.00</td>
<td>66</td>
<td>55</td>
</tr>
<tr>
<td>11</td>
<td>244700.00</td>
<td>5</td>
<td>198.00</td>
<td>141</td>
<td>55</td>
</tr>
</tbody>
</table>

Edit: Volume Unit  Growth Multiplier  Covertype Stand  Add/Delete Stand  Quit

The user can scroll through this list and perform any of the edit functions shown in the footer of the table. The program proceeds unless the following message appears first:
### STAND DATA INPUT AND EDITING SECTION

Use the arrow keys to move through the list.
11 stand records for covertype: Aspen  Growth Multiplier = 1

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age Years</th>
<th>Volume/acre Cu Ft</th>
<th>Stocking Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1400.00</td>
<td>105</td>
<td>613.00</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>8300.00</td>
<td>95</td>
<td>1334.00</td>
<td>41</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>9</td>
<td>199600.00</td>
<td>25</td>
<td>441.00</td>
<td>44</td>
</tr>
<tr>
<td>10</td>
<td>177600.00</td>
<td>15</td>
<td>325.00</td>
<td>55</td>
</tr>
<tr>
<td>11</td>
<td>244700.00</td>
<td>5</td>
<td>198.00</td>
<td>122</td>
</tr>
</tbody>
</table>

The file has not been saved with stocking data.
Do you want to save file now with stocking data

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Edit: Volume Unit Growth Multiplier Covertype Stand Add/Delete Stand Quit

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 the data are not saved now, the old data format is maintained. If the sample data file has no data inconsistencies, thus the program gives the option to go directly to the ACES calculations without further review of the run parameters. For (Y>es, the program again returns to the MAIN EDITING MENU, for <N>o, the next screen will be:

### STAND DATA INPUT AND EDITING SECTION

Use the arrow keys to move through the list.
11 stand records for covertype: Aspen  Growth Multiplier = 1

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age Years</th>
<th>Volume/acre Cu Ft</th>
<th>Stocking Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1400.00</td>
<td>105</td>
<td>613.00</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>8300.00</td>
<td>95</td>
<td>1334.00</td>
<td>56</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>9</td>
<td>199600.00</td>
<td>25</td>
<td>441.00</td>
<td>53</td>
</tr>
<tr>
<td>10</td>
<td>177600.00</td>
<td>15</td>
<td>325.00</td>
<td>66</td>
</tr>
<tr>
<td>11</td>
<td>244700.00</td>
<td>5</td>
<td>198.00</td>
<td>141</td>
</tr>
</tbody>
</table>

You can run ACES now without further editing.
Do you want to review/edit run parameters first.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Edit: Volume Unit Growth Multiplier Covertype Stand Add/Delete Stand Quit

The program has gone through a series of internal data checks including calculation of stand stocking and displayed the stand editing menu. Since no errors are present in the sample file, the user may proceed directly with the calculations. If "No" is selected, the program will return to the MAIN EDITING MENU first and any of the options shown can be selected:
Upon selecting option 3, the program will begin the simulation. First, however, the user has an option to change a parameter that acts as a multiplier to the calculated growth of stands:

Growth for stands under age 5 is set to zero to avoid overestimates due to yield model problems. Do you want to set to a different age limit.

Yes No

To make this decision, 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 the growth for especially the early ages and make his own judgment for setting this requested parameter. It appears that the growth model GIP overestimates growth for young stands. Such a bias will directly influence the allowable cut calculation like in the Austrian formula, but will indirectly influence allowable cut calculations by all volume methods because growing stock volumes are a part of all formulas and growing stock volumes reflect naturally the growth that is being accumulated. If a "Yes" is selected, the computer will request a new age limit:

Enter new age limit for which growth is assumed zero.

The program will always store the results of the simulation in an ASCII file named "ACES.TBL". 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:

File c:\aces\OUTPUT\ACES.TBL exists and will be overwritten unless you specify a new name

Press a key to continue...

Outputs will be saved to file c:\aces\OUTPUT\ACES.TBL Do you want to save outputs under another file name

Yes No

For "N" the program begins the calculations and when finished store the results in file "ACES.TBL" and begin the display of results on the screen. For "Y" the program will ask for an output drive and a file name while checking for any user errors.
Saving ACES Output File

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

Enter data filename, or press only <ENTER> to use default name: c:\aces\OUTPUT\ACES.TBL

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. 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 ASCII output file "ACES.TBL" or the one specified by the user can be later recalled for printing or incorporation into a forest planning report. After the output file name has been specified 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.

You may now press the <F10> key any time to stop calculations
Press a key to continue...

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:
DISTRIBUTION OF GROWING STOCK IN YEAR 0

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Site (ft)</th>
<th>Area (acres)</th>
<th>Yield/acre</th>
<th>Total yield (Cords)</th>
<th>M Cords</th>
<th>Annual growth (Cords, Cords/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>55</td>
<td>1400</td>
<td>7.75</td>
<td>10,563</td>
<td>59</td>
<td>0.04</td>
</tr>
<tr>
<td>100</td>
<td>55</td>
<td>8300</td>
<td>16.89</td>
<td>140,154</td>
<td>888</td>
<td>0.11</td>
</tr>
<tr>
<td>90</td>
<td>55</td>
<td>25700</td>
<td>19.03</td>
<td>488,951</td>
<td>3718</td>
<td>0.14</td>
</tr>
<tr>
<td>80</td>
<td>55</td>
<td>60800</td>
<td>14.90</td>
<td>905,843</td>
<td>8461</td>
<td>0.14</td>
</tr>
<tr>
<td>70</td>
<td>55</td>
<td>150800</td>
<td>21.28</td>
<td>3208.795</td>
<td>37868</td>
<td>0.25</td>
</tr>
<tr>
<td>60</td>
<td>55</td>
<td>383200</td>
<td>17.65</td>
<td>6761.782</td>
<td>104479</td>
<td>0.27</td>
</tr>
<tr>
<td>50</td>
<td>55</td>
<td>409000</td>
<td>15.11</td>
<td>6181.595</td>
<td>131184</td>
<td>0.32</td>
</tr>
<tr>
<td>40</td>
<td>55</td>
<td>286300</td>
<td>10.14</td>
<td>2902.865</td>
<td>90788</td>
<td>0.32</td>
</tr>
<tr>
<td>30</td>
<td>55</td>
<td>199600</td>
<td>5.58</td>
<td>1114.223</td>
<td>57869</td>
<td>0.29</td>
</tr>
<tr>
<td>20</td>
<td>55</td>
<td>177600</td>
<td>4.09</td>
<td>726.137</td>
<td>80582</td>
<td>0.45</td>
</tr>
<tr>
<td>10</td>
<td>55</td>
<td>244700</td>
<td>2.51</td>
<td>613.299</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Total: 1947400  11.84  23054.504  515875  0.26
Desirable: 12.88  25089.840  891638  0.46

Annual Simulation Steps
Annual Cutting Report for Planning Period: 1 Year: 1 (all volumes in Cords)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearcut 1</td>
<td>105</td>
<td>1400</td>
<td>1400</td>
<td>10863</td>
<td>7.76</td>
<td>607539</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearcut 2</td>
<td>95</td>
<td>8300</td>
<td>8300</td>
<td>140134</td>
<td>16.89</td>
<td>467385</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearcut 3</td>
<td>85</td>
<td>25700</td>
<td>25700</td>
<td>24566</td>
<td>19.03</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Price = $ 5.00/ Cords
Revenue = $ 3092011
Cum. Rev. = $ 3092011
Cum. NPW. = $ 3092011

A similar report is displayed for each year of the simulation, followed at each planning interval with a summary report of allowable cuts and finally the stand distribution at the end of the planning period:

Annual Simulation Steps
Annual Cutting Report for Planning Period: 1 Year:10 (all volumes in Cords)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearcut 6</td>
<td>64</td>
<td>350240</td>
<td>31358</td>
<td>618402</td>
<td>19.72</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Price = $ 5.00/ Cords
Revenue = $ 3092011
Cum. Rev. = $ 30920116
Cum. NPW. = $ 26082146

VOLUME CONTROL ALLOWABLE CUT SUMMARY FOR PLANNING PERIOD 1
(Avg. Annual Allowable Cut According To: Tabular Check actually simulated)

Tabular Check = 618402 Cords
Modified Barnes = 635125 Cords
Austrian = 414108 Cords
Chapman = 563851 Cords
Hundeshagen = 656547 Cords
Von Mantel = 709369 Cords
Hanzlik = 598175 Cords
User Input = 0 Cords
ACTUAL CUTTING SUMMARY FOR ALLOWABLE CUT METHOD SELECTED

Clearcut/yr = 31132 acres
Clearcut/yr = 618402 Cords
Avg. ann. allow. cut exceeded = 0 Cords

Press any key to continue....

This latter output report is shown for each year of the simulation. At the end of every planning period a similar report is generated showing the averages for the planning period as well as the growing stock distribution.

### 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 Cords</th>
<th>Total yield M Cords</th>
<th>Annual growth Cords Cords/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>55</td>
<td>310000</td>
<td>19.94</td>
<td>6180.608</td>
<td>72939</td>
</tr>
<tr>
<td>60</td>
<td>55</td>
<td>409000</td>
<td>17.72</td>
<td>7246.728</td>
<td>111973</td>
</tr>
<tr>
<td>50</td>
<td>55</td>
<td>286300</td>
<td>12.59</td>
<td>3605.565</td>
<td>76516</td>
</tr>
<tr>
<td>40</td>
<td>55</td>
<td>199600</td>
<td>7.67</td>
<td>1530.234</td>
<td>47858</td>
</tr>
<tr>
<td>30</td>
<td>55</td>
<td>177600</td>
<td>6.93</td>
<td>1231.582</td>
<td>63942</td>
</tr>
<tr>
<td>20</td>
<td>55</td>
<td>244700</td>
<td>8.77</td>
<td>2145.670</td>
<td>238114</td>
</tr>
<tr>
<td>10</td>
<td>55</td>
<td>198198</td>
<td>2.96</td>
<td>586.098</td>
<td>150289</td>
</tr>
<tr>
<td>0</td>
<td>55</td>
<td>122002</td>
<td>0.77</td>
<td>93.816</td>
<td>0</td>
</tr>
</tbody>
</table>

Total

<table>
<thead>
<tr>
<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>1947400</td>
<td>11.62</td>
<td>22620.297</td>
<td>761631</td>
<td>0.39</td>
</tr>
</tbody>
</table>

Desirable

<table>
<thead>
<tr>
<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>12.88</td>
<td>25089.840</td>
<td>891638</td>
<td>0.46</td>
<td></td>
</tr>
</tbody>
</table>

Press any key to continue....

If allowable cuts are calculated annually, a report is generated annually also. The distribution of growing stocks is displayed every planning period:

### DISTRIBUTION OF GROWING STOCK IN YEAR 10

<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>70</td>
<td>55</td>
<td>321279</td>
<td>19.94</td>
<td>6405.482</td>
<td>75593</td>
</tr>
<tr>
<td>60</td>
<td>55</td>
<td>409000</td>
<td>17.72</td>
<td>7246.728</td>
<td>111973</td>
</tr>
<tr>
<td>50</td>
<td>55</td>
<td>286300</td>
<td>12.59</td>
<td>3605.565</td>
<td>76516</td>
</tr>
<tr>
<td>40</td>
<td>55</td>
<td>199600</td>
<td>7.67</td>
<td>1530.234</td>
<td>47858</td>
</tr>
<tr>
<td>30</td>
<td>55</td>
<td>177600</td>
<td>6.93</td>
<td>1231.582</td>
<td>63942</td>
</tr>
<tr>
<td>20</td>
<td>55</td>
<td>244700</td>
<td>8.77</td>
<td>2145.670</td>
<td>238114</td>
</tr>
<tr>
<td>10</td>
<td>55</td>
<td>117206</td>
<td>2.61</td>
<td>305.480</td>
<td>110813</td>
</tr>
<tr>
<td>0</td>
<td>55</td>
<td>345208</td>
<td>0.29</td>
<td>100.538</td>
<td>0</td>
</tr>
</tbody>
</table>

Total

<table>
<thead>
<tr>
<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>1947400</td>
<td>11.59</td>
<td>22571.277</td>
<td>724809</td>
<td>0.37</td>
</tr>
</tbody>
</table>

Desirable

<table>
<thead>
<tr>
<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>12.88</td>
<td>25089.840</td>
<td>891638</td>
<td>0.46</td>
<td></td>
</tr>
</tbody>
</table>

Cut/Year = 46241 Acres 623683 Cords

Press any key to continue....
The same type of output is generated for all years/planning periods simulated in a run. 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:

<table>
<thead>
<tr>
<th>Do you wish to run additional simulation periods?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

Enter number of additional intervals for simulation: 1

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:

<table>
<thead>
<tr>
<th>Do you want to change any of the run parameters?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

If the answer for additional simulation periods was "Y", and a "1" was entered for one additional period, but no run parameters were changed, output for an additional period follows beginning with the condition of the inventory at the end of the last period.

<table>
<thead>
<tr>
<th>Do you wish to run additional simulation periods?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

For a "N" answer the program will continue with an option for plotting major results in the case that one of the volume control methods was simulated. For area control no plots are being generated.

<table>
<thead>
<tr>
<th>Do you wish to rerun same stand data with new run parameters?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

Here a "N" response will bring up the **MAIN MENU** which provides the option to begin with new existing data files, the creation of new input files and the option to quit. A "Y" response will bring up the **MAIN EDITING MENU** and the user has a chance edit stand data and/or run parameters before proceeding to carry out a new calculation. We will discuss here first option 4 of the **MAIN MENU**.
Main Menu Option 6 - Run ACES

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:

**STAND DATA INPUT MENU**

1. Recall stand data 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

Enter path or <ENTER> for default path: C:\ACES\DATA\ *

(1) AC200.DAT
(2) ACES.DAT
(3) ACES77.DAT
(4) ACES90.DAT
(5) ACESHIGH.DAT
(6) ACESLOW.DAT
(7) ACESMED.DAT
(8) AFRAST.DAT
(9) ASP200.DAT
(10) More... 

Select by entering a line number or highlight using cursor and pressing <Enter> or Spacebar

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...

Whenever the cover type or growth multiplier is changed, stocking needs to be recalculated. Any stand data file has an implied growth multiplier.

Press a key to continue...

Parameters currently stored in stand data file C:\ACES\DATA\ 
Species = Red pine  Volume Unit = Cu Ft  Growth Multiplier = 1.00

Do you want to change volume units? 
Yes  No
Change to:
1. Cu Ft/acre
2. Cords/acre
3. Bd Ft/acre
Enter corresponding letter from below
Cu Ft  Cords  Bd Ft

Parameters reset to:
Species = Red pine  Volume Unit = Cords  Growth Multiplier = 1.00

Do you want to change the covertype?
Yes  No

Covertype Selection Menu
Red pine  Paper birch
Jack pine  Maple-birch
Balsam fir  Oak-hickory
Aspen  Black spruce
N. White cedar  Balm of Gilead
Tamarack  White pine
Elm-ash-soft maple  White spruce

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

Parameters reset to:
Species = Red pine  Volume Unit = Cords  Growth Multiplier = 1.00

Do you want to enter new growth multiplier?
Yes  No

Enter new growth multiplier?

Parameters reset to:
Species = Red pine  Volume Unit = Cords  Growth Multiplier = 1.10
Press any key to continue....

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
**RUN PARAMETER FILE ENTRY 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

Enter path or <ENTER> for default path: C:\ACES\DATA\  

(1) ACES.PAR  
(2) SAMPLE.PAR  
(3) FR5226.PAR  
(4) GEIS90.PAR  
(5) HOWARD.PAR  
(6) POTFTHN.PAR  
(7) POTLTHN.PAR  
(8) POTLTHN.PAR  
(9) POTLTHN.PAR  
(10) More...  
Select by entering a line number or highlight
using cursor and pressing <Enter> or Spacebar

**Data Entry Option 1 (Recall stand data from previously created files)**

**Suboption 1: See the list of filenames**

The program will show a list of valid stand data or run parameter files that have a valid .DAT or .PAR extension (i.e., the extensions appended to ACES data files) for a user specified disk drive. The user can select a file by hitting the <Enter> key on a highlighted file.

**STAND DATA INPUT MENU**

1. Recall stand data 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

**STAND DATA FILE ENTRY 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

Enter path or <ENTER> for default path: C:\ACES\DATA\  

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Suboption 2: Enter the data filename

This option will retrieve an existing data file previously created with ACES. All stand files have a .DAT extension and all run parameter files have a .PAR extension as a part of their file names. To retrieve a specific ACES data file from the STAND DATA INPUT MENU, enter 2. Specify the disk drive where the data file is located and then enter the appropriate file name. Because the program automatically appends an extension of .DAT onto every file name when it is created and retrieved, the user does not need to add this information. Therefore, to recall the data file called FILE1.DAT, the user would simply enter FILE1 when prompted for the file name. Press <ENTER>, instead of entering a file name, if you are unsure of the data file name to be retrieved or to return to the MAIN MENU. You might need to edit the file using a text editing program. Appendix I shows the sample stand data and run parameter files ACESDAT.EXP and ACESPAR.EXP. The user may refer to these to make appropriate corrections in existing files that do not conform to this version of ACES. Save this edited ACES file in DOS format and then reenter the ACES program.

Enter data filename, or press only <ENTER> to return
to the MAIN MENU: *bear.dat*

Program assumes an extension of .DAT
No period and extension. Reenter file name

Press a key to continue...

STAND DATA FILE ENTRY 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

Now 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 result in different stocking levels for each stand and might require some corrective action if unusual stocking levels are calculated. 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 already had 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 test
Line 2: various program options and related outputs.
Line 3: Aggregated aspen covertype records from Minnesota FIA.

Do you want to input a new stand file title?
Yes
No

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...

STAND FILE TITLE INPUT SECTION
Line 1: A new title for the stand file can be entered to
Line 2: remind user of special features or circumstances
Line 3: such as source of data, year of origin, etc.
Line 4: 

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.

Do you want to input a stand file title?
Yes
No

Parameters currently stored in stand data file C:\ACES\DATA\ Species = Red pine  Volume Unit = Cu Ft  Growth Multiplier = 1.00

Do you want to change volume units?
Yes
No

Change to:
1. Cu Ft/acre
2. Cords/acre
3. Bd Ft/acre
Enter corresponding letter from below
Cu Ft  Cords  Bd Ft

Parameters reset to:
Species = Aspen  Volume Unit = Cords  Growth Multiplier = 1.00
Do you want to change species?
   Yes  No

Covertype Selection Menu
Red pine          Paper birch
Jack pine         Maple-birch
Balsam fir        Oak-hickory
Aspen             Black spruce
N. White cedar    Balm of Gilead
Tamarack          White pine
Elm-ash-soft maple White spruce

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

Do you want to enter new growth multiplier?
   Yes  No

Whenever the growth multiplier is changed, stocking needs to be recalculated. Any stand data file has an implied growth multiplier.
   Press a key to continue...

Enter new growth multiplier?

The user can change the multiplier at this stage and the new value will be stored in the stand raw data and database files when they are saved at a later stage. After a multiplier has been entered, all changes are written to the stand data file.

Stand data file has not been checked yet or no stocking data on stand data file. Program will need to run data checks and/or calculate stocking first.
   Press a key to continue...

If a file with the proper extension of "DAT" or "PAR" is being requested that was not created by ACES, a message that the file that you are trying to recall was not created by ACES will appear. All ACES data files are uniquely identified when created such that it is not possible to recall other data files, despite their .DAT or .PAR extensions. The FILE ENTRY CHOICES Menu automatically reappears after the error message is cleared by pressing any key to continue:

Illegal data file, not created by ACES. There is a format error in data file or the file is empty
You must either exit from ACES and correct the file with a line editor or use another input file for the analysis

Press any key to continue...
Suboption 3: Return to the MAIN MENU

With this option the user can return to the MAIN MENU. He might for example want to read the model overview again or simply quit the session.

Data Entry Option 2 (Enter New Stand Data):

This option is designed for entry of new data into ACES via the terminal keyboard. If data is to be entered from the keyboard, ACES will prompt the user to begin entry of various inputs. The user has the option of specifying a title for the analysis to keep better track of a number of analyses. Title information will subsequently appear on the top of each page of the ACES output. If you want to discontinue entry of title lines, press <ENTER> twice. Before stand data can be entered, the user must enter the volume units of the stand data to be entered and the coverytype represented by the data.
STAND DATA INPUT AND EDITING SECTION
Use the arrow keys to move through the list. 
0 stand records. Covertype must be entered. Growth Multiplier 1

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Site Index Percent</th>
</tr>
</thead>
</table>

Is volume for stand data input in:
1. Cu Ft/acre
2. Cords/acre
3. Bd Ft/acre
Enter corresponding letter from below

Cu Ft   Cords   Bd Ft

**Covertype Selection Menu**
- 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

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

**Growth multiplier? 1.0**

You will not be able to enter stocking. The program will calculate stocking percents by comparing entered volumes with yield table volumes before the simulation begins. The user can edit stocking after completing entries. Begin adding stands by repeatedly activating <A>dd.

Press a key to continue...

Do you want to save data on a file
Yes   No

Saving ACES Stand Data File

Enter path or <ENTER> for default path: C:\ACES\DATA\*
Enter data filename, or press only <ENTER> to return

*ACES *

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. The program now automatically will ask for the covertype:

Before data entry can begin, the program displays the message that stand stocking cannot be entered by the user since it is calculated:

At this point entry of the stand data can begin by hitting the <Add> key. A data entry field for the first stand variable "Acres" will be highlighted:

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&gt;1200</td>
<td>&gt;15</td>
<td>&gt;2.5</td>
<td>&lt;</td>
<td>&gt;55</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1200.00</td>
<td>15</td>
<td>2.50</td>
<td>31</td>
<td>55</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1200.00</td>
<td>15</td>
<td>2.50</td>
<td>31</td>
<td>55</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1200.00</td>
<td>15</td>
<td>2.50</td>
<td>31</td>
<td>55</td>
</tr>
<tr>
<td>2</td>
<td>225.00</td>
<td>5</td>
<td>0.50</td>
<td>18</td>
<td>65</td>
</tr>
<tr>
<td>3</td>
<td>980.00</td>
<td>45</td>
<td>12.00</td>
<td>39</td>
<td>65</td>
</tr>
<tr>
<td>4</td>
<td>1567.00</td>
<td>95</td>
<td>24.00</td>
<td>53</td>
<td>55</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Edit: Volume Unit Growth Multiplier Covertype Stand Add/Delete Stand Quit
Upon entry, a new data entry field is highlighted and the full stand record will be displayed. The user proceeds by repeatedly hitting <Add> to enter all the required stand data up to a maximum of 300 stands. Upon completion, any entry can be edited by moving the cursor to a field and hitting <E> for <Edit> or any of the other keys that permit editing of the stand volume units, or covertype code. Additionally, stands may be added or deleted at this time also. When finished, hit <Esc> to produce a summary screen with an option to save the data:

The program proceeds with an option to save the data. The program automatically appends an extension of .DAT to every stand data file that is saved. The program again 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. 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 I for an example), it is much easier to generate the data outside ACES with a text editor. Before the stand data are used in the simulation, the program goes through a series of checks. For example, it will require the user to edit stands with zero site index.

If stand data were entered from the keyboard, the program provides the option to save the data. The data will be saved in that case including the stocking column. If any editing took place, the program will provide an option to save the changes first. On the other hand if data were saved, upon recall of the data, the following message would appear:
If you run ACES now, it will use the edited data. The changes including stocking calculations and edits will be lost if they are not saved now. Do you want to save changes now.

Yes No

Edit: Volume Unit Growth Multiplier Covertype Stand Add/Delete Stand Quit

If no editing was performed, the program will proceed with:

You can run ACES now without further editing. Do you want to review/edit run parameters first.

Yes No

For "YES", the program will return to the main editing menu.

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 <E>dit key at the bottom of the screen. Any changes made will only become effective after using the <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. 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.

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 raw data and relational database files 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.

**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.

**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

**SUMMARY OF CURRENT RUN PARAMETERS**

1. Discount Rate (Percent): 4.00
2. Demand Curve: $/Cu Ft = a - b * Quan Harv with $a= 5 \ b= 0$
3. Volume Output (1=Cu ft, 2=Cords, 3=Bd ft): Cu ft
4. Ageclass Width: 5 Years
5. Rotation: 50 Years
6. Min. Cutting Age: 35 Years
7. Anticipated Stocking after Harvest: 100.00 Percent
8. Interval to Reevaluate Allowable Cut: 10 Years
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): 2
13. Detailed Annual Output Reports (Y or N): Y
14. Cu ft/cord conversion: 79.000
15. Cu ft/bd ft conversion: 0.158

Do you want to change any run parameters?
Yes  No

For a "No" answer, the user will have an opportunity to save the data on a file:

If you run ACES 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

For a "Yes" answer, the parameter editing menu appears. The user simply moves the cursor to the parameter to be edited and hits the <Enter> key. The program will prompt for an appropriate input which in the case of some items are menus.
Run Parameters Editing Menu
Highlight the parameter you wish to edit using the arrow keys.
Press <E> to edit the parameter and <Q> or <ESC> to quit.

1. Discount Rate Selected : 4
2. Demand Curve: $/Cu Ft = a - b * Quan Harv : a= 5 b= 0
3. Volume Output (1=Cu ft, 2=Cords, 3=Bd ft) : Cu Ft
4. Ageclass Width (Years) : 5
5. Rotation (Years) : 50
6. Min. Cutting Age (Years) : 35
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) : Y
13. Detailed Annual Output Reports (Y or N) : Y
14. Cu ft/cord conversion factor : 79
15. Cu ft/bd ft conversion factor : .158

-Edit- -Quit-

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 ACES 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 ACES with a text editor. After any editing operation, the program will return to the MAIN Editing Menu:

```
MAIN EDITING MENU
1. Edit stand data
2. Edit run parameters
3. Perform calculations
4. Return to MAIN MENU

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

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 inconsistencies even if option 3 "Perform Calculations" is selected from the Main Editing Menu. 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. The program displays one screen at a time and will only proceed to the next screen until any necessary corrections have been made.

```
STAND DATA INPUT AND EDITING SECTION
Use the arrow keys to move through the list.
200 stand records for covertype: Aspen Growth Multiplier = 1

<table>
<thead>
<tr>
<th>Stand</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>800.00</td>
<td>66</td>
<td>1625.00</td>
<td>55</td>
<td>81</td>
</tr>
<tr>
<td>25</td>
<td>1100.00</td>
<td>53</td>
<td>1943.00</td>
<td>89</td>
<td>71</td>
</tr>
<tr>
<td>26</td>
<td>1100.00</td>
<td>96</td>
<td>2857.00</td>
<td>88</td>
<td>73</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>900.00</td>
<td>37</td>
<td>995.00</td>
<td>52</td>
<td>79</td>
</tr>
<tr>
<td>32</td>
<td>800.00</td>
<td>56</td>
<td>2976.00</td>
<td>109</td>
<td>83</td>
</tr>
<tr>
<td>33</td>
<td>900.00</td>
<td>76</td>
<td>2516.00</td>
<td>97</td>
<td>67</td>
</tr>
<tr>
<td>34</td>
<td>1100.00</td>
<td>12</td>
<td>51.00</td>
<td>10</td>
<td>63</td>
</tr>
<tr>
<td>35</td>
<td>1100.00</td>
<td>28</td>
<td>1575.00</td>
<td>119</td>
<td>70</td>
</tr>
<tr>
<td>36</td>
<td>1000.00</td>
<td>28</td>
<td>1182.00</td>
<td>73</td>
<td>81</td>
</tr>
</tbody>
</table>

Press <Enter> key to go to next screen
Press a key to continue...
```

Edit: Volume Unit Growth Multiplier Covertype Stand Add/Delete Stand Quit
<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Stocking Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>900.00</td>
<td>46</td>
<td>1113.00</td>
<td>52</td>
<td>76</td>
</tr>
<tr>
<td>37</td>
<td>800.00</td>
<td>56</td>
<td>1972.00</td>
<td>71</td>
<td>85</td>
</tr>
<tr>
<td>38</td>
<td>1100.00</td>
<td>48</td>
<td>1033.00</td>
<td>53</td>
<td>68</td>
</tr>
<tr>
<td>39</td>
<td>900.00</td>
<td>35</td>
<td>1912.00</td>
<td>114</td>
<td>73</td>
</tr>
<tr>
<td>40</td>
<td>900.00</td>
<td>66</td>
<td>2855.00</td>
<td>91</td>
<td>86</td>
</tr>
<tr>
<td>41</td>
<td>1100.00</td>
<td>56</td>
<td>1586.00</td>
<td>108</td>
<td>49</td>
</tr>
<tr>
<td>42</td>
<td>800.00</td>
<td>2</td>
<td>221.00</td>
<td>418</td>
<td>57</td>
</tr>
</tbody>
</table>

Stand 38 has an implied stocking of 418 percent or more. Do you accept program overwrite of 200 percent. Yes No

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Stocking Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>1000.00</td>
<td>28</td>
<td>1182.00</td>
<td>73</td>
<td>81</td>
</tr>
<tr>
<td>37</td>
<td>900.00</td>
<td>56</td>
<td>3092.00</td>
<td>111</td>
<td>85</td>
</tr>
<tr>
<td>38</td>
<td>1100.00</td>
<td>16</td>
<td>437.00</td>
<td>61</td>
<td>65</td>
</tr>
<tr>
<td>39</td>
<td>1000.00</td>
<td>66</td>
<td>1462.00</td>
<td>60</td>
<td>69</td>
</tr>
<tr>
<td>40</td>
<td>800.00</td>
<td>59</td>
<td>2584.00</td>
<td>95</td>
<td>81</td>
</tr>
<tr>
<td>41</td>
<td>800.00</td>
<td>70</td>
<td>3673.00</td>
<td>121</td>
<td>81</td>
</tr>
</tbody>
</table>

Stocking is normally calculated from the ratio of stand volume yield table volume. If you edit stocking, volume will not be adjusted. Do you want to edit anyhow. Yes No
Stand Data Input and Editing Section
Use the arrow keys to move through the list.
200 stand records for covertype: Aspen  Growth Multiplier = 1

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>800.00</td>
<td>2</td>
<td>221.00</td>
<td>100</td>
<td>57</td>
</tr>
<tr>
<td>49</td>
<td>800.00</td>
<td>3</td>
<td>0.00</td>
<td>0</td>
<td>68</td>
</tr>
<tr>
<td>50</td>
<td>1100.00</td>
<td>78</td>
<td>2610.00</td>
<td>100</td>
<td>67</td>
</tr>
<tr>
<td>51</td>
<td>1100.00</td>
<td>18</td>
<td>740.00</td>
<td>100</td>
<td>82</td>
</tr>
<tr>
<td>52</td>
<td>1100.00</td>
<td>15</td>
<td>77.00</td>
<td>100</td>
<td>71</td>
</tr>
<tr>
<td>53</td>
<td>800.00</td>
<td>1</td>
<td>100.00</td>
<td>100</td>
<td>66</td>
</tr>
</tbody>
</table>

55 Stand 49, age 3 has no volume. This implies zero stocking and growth until the first harvest.
Do you want to edit stand stocking?

Yes  No

80

Edit: Volume Unit  Growth Multiplier  Covertype  Stand  Add/Delete  Stand  Quit

Stand Data Input and Editing Section
Use the arrow keys to move through the list.
200 stand records for covertype: Aspen  Growth Multiplier = 1

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>800.00</td>
<td>2</td>
<td>221.00</td>
<td>100</td>
<td>57</td>
</tr>
<tr>
<td>49</td>
<td>800.00</td>
<td>3</td>
<td>0.00</td>
<td>0</td>
<td>68</td>
</tr>
<tr>
<td>50</td>
<td>1100.00</td>
<td>78</td>
<td>2610.00</td>
<td>100</td>
<td>67</td>
</tr>
<tr>
<td>51</td>
<td>1100.00</td>
<td>18</td>
<td>740.00</td>
<td>100</td>
<td>82</td>
</tr>
<tr>
<td>52</td>
<td>1100.00</td>
<td>15</td>
<td>77.00</td>
<td>100</td>
<td>71</td>
</tr>
<tr>
<td>53</td>
<td>800.00</td>
<td>1</td>
<td>100.00</td>
<td>100</td>
<td>66</td>
</tr>
</tbody>
</table>

54 Stocking is normally calculated from the ratio of stand volume yield table volume. If you edit stocking, volume will not be adjusted. Do you want to edit anyhow?

Yes  No

80

Edit: Volume Unit  Growth Multiplier  Covertype  Stand  Add/Delete  Stand  Quit

39
STAND DATA INPUT AND EDITING SECTION
Use the arrow keys to move through the list.
200 stand records for covertype: Aspen Growth Multiplier = 1

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1100.00</td>
<td>8</td>
<td>888.00</td>
<td>145</td>
<td>85</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>78</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>87</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>85</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>86</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>68</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>72</td>
</tr>
<tr>
<td>10</td>
<td>1200.00</td>
<td>15</td>
<td>457.00</td>
<td>48</td>
<td>80</td>
</tr>
<tr>
<td>11</td>
<td>800.00</td>
<td>66</td>
<td>2740.00</td>
<td>112</td>
<td>69</td>
</tr>
<tr>
<td>12</td>
<td>1100.00</td>
<td>60</td>
<td>1843.00</td>
<td>62</td>
<td>87</td>
</tr>
</tbody>
</table>

Edit: Volume Unit Growth Multiplier Covertype Stand Add/Delete Stand Quit

STAND DATA INPUT AND EDITING SECTION
Use the arrow keys to move through the list.
200 stand records for covertype: Aspen Growth Multiplier = 1

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1100.00</td>
<td>8</td>
<td>888.00</td>
<td>145</td>
<td>85</td>
</tr>
<tr>
<td>2</td>
<td>1100.00</td>
<td>16</td>
<td>96.00</td>
<td>10</td>
<td>78</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>87</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>85</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>86</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>68</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>72</td>
</tr>
<tr>
<td>10</td>
<td>1200.00</td>
<td>16</td>
<td>145.00</td>
<td>17</td>
<td>72</td>
</tr>
<tr>
<td>11</td>
<td>1200.00</td>
<td>15</td>
<td>457.00</td>
<td>48</td>
<td>80</td>
</tr>
<tr>
<td>12</td>
<td>800.00</td>
<td>66</td>
<td>2740.00</td>
<td>112</td>
<td>69</td>
</tr>
</tbody>
</table>

Edit: Volume Unit Growth Multiplier Covertype Stand Add/Delete Stand Quit

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 file is loaded at a later time again, the program will skip the data checking routines which speeds data entry considerably.

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 file now. For yes file will be saved as: c:\aces\DATA\ACES.DAT

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. Edit stand data
2. Edit run parameters
3. Perform 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 data:

The following note appears if a stand was read in from a file for which stand stocking had never been calculated or edited and not been saved to a new file.

```
Stand stocking is calculated by dividing stand volume by the yield
table volume. Stand stocking for some stands was set by the program
to 100% if yield table volume for that age was negative or age was zero.
For stands with illegal data (negative age or volume or zero/negative
site index stocking was set temporarily to 0. Editing is required.

Press a key to continue...
```

Whenever an edited stand file is saved, the file will contain also the calculated/edited stocking percents so that the user does not have to go through all the stocking checks, the next time the stand file is requested. The computer will display:

```
Stand stocking was calculated already and has been edited before.
You still can edit further and save any changes you make.

Press a key to continue...
```

This will be followed by the run title input section described on page 24. The new title entered will be seen the next time the dit menu is activated which generates the new stand listing that reflects any editing changes that were made during the session.

41
For "Yes", the user can enter up to 5 lines of a new title, the old title, if one existed will be lost. Below, 2 new title lines are entered. They will be displayed with a new stand listing:

```
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: *This will change the original title to:
Line 2: *1977 aspen inventory, Bear Island State Forest
Line 3: *
```

```
STAND DATA INPUT AND EDITING SECTION
Use the arrow keys to move through the list.
11 stand records for covertype: Aspen  Growth Multiplier = 1

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1400.00</td>
<td>105</td>
<td>613.00</td>
<td>17.61</td>
</tr>
<tr>
<td>2</td>
<td>8300.00</td>
<td>95</td>
<td>1334.00</td>
<td>40.89</td>
</tr>
<tr>
<td>3</td>
<td>25700.00</td>
<td>85</td>
<td>1503.00</td>
<td>49.72</td>
</tr>
<tr>
<td>4</td>
<td>60800.00</td>
<td>75</td>
<td>1177.00</td>
<td>42.65</td>
</tr>
<tr>
<td>5</td>
<td>150800.00</td>
<td>65</td>
<td>1681.00</td>
<td>68.05</td>
</tr>
<tr>
<td>6</td>
<td>383200.00</td>
<td>55</td>
<td>1394.00</td>
<td>64.77</td>
</tr>
<tr>
<td>7</td>
<td>409000.00</td>
<td>45</td>
<td>1194.00</td>
<td>66.21</td>
</tr>
<tr>
<td>8</td>
<td>286300.00</td>
<td>35</td>
<td>801.00</td>
<td>56.28</td>
</tr>
<tr>
<td>9</td>
<td>199600.00</td>
<td>25</td>
<td>441.00</td>
<td>43.51</td>
</tr>
<tr>
<td>10</td>
<td>177600.00</td>
<td>15</td>
<td>323.00</td>
<td>55.39</td>
</tr>
<tr>
<td>11</td>
<td>244700.00</td>
<td>5</td>
<td>198.00</td>
<td>121.86</td>
</tr>
</tbody>
</table>
```

For <\V> the program will ask for the volume unit:
STAND DATA INPUT AND EDITING SECTION
Use the arrow keys to move through the list.
There are 11 stand records. Covertype must be entered.

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age</th>
<th>Volume/acre</th>
<th>Stocking</th>
<th>Site Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1400.00</td>
<td>105</td>
<td>613.00</td>
<td>17.61</td>
<td>55</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>1. Cu Ft/acre</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>2. Cords/acre</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>3. Bd Ft/acre</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>Cu Ft Cords Bd Ft</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>10</td>
<td>177600.00</td>
<td>15</td>
<td>323.00</td>
<td>55.39</td>
<td>55</td>
</tr>
<tr>
<td>11</td>
<td>244700.00</td>
<td>5</td>
<td>198.00</td>
<td>121.86</td>
<td>55</td>
</tr>
</tbody>
</table>

Edit Volume Unit Edit Covertype Edit Stand Add Stand Delete Stand Quit

For <C> the program will ask for the covertype:

Input the covertype for the stand data entered

<table>
<thead>
<tr>
<th>Covertype Selection Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red pine</td>
</tr>
<tr>
<td>Jack pine</td>
</tr>
<tr>
<td>Balsam fir</td>
</tr>
<tr>
<td>Aspen</td>
</tr>
<tr>
<td>N. White cedar</td>
</tr>
<tr>
<td>Tamarack</td>
</tr>
<tr>
<td>Elm-ash-soft maple</td>
</tr>
</tbody>
</table>

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

For <G> the program will ask for the new growth multiplier:

New Growth multiplier?

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."

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Acres</th>
<th>Age Years</th>
<th>Volume/acre Cu Ft</th>
<th>Stocking Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1250.00</td>
<td>105</td>
<td>1890.00</td>
<td>54.30</td>
</tr>
<tr>
<td>2</td>
<td>875.00</td>
<td>45</td>
<td>345.00</td>
<td>15.50</td>
</tr>
<tr>
<td>3</td>
<td>1990.00</td>
<td>15</td>
<td>105.00</td>
<td>23.18</td>
</tr>
<tr>
<td>4</td>
<td>565.00</td>
<td>30</td>
<td>390.00</td>
<td>41.10</td>
</tr>
<tr>
<td>5</td>
<td>1235.00</td>
<td>30</td>
<td>967.00</td>
<td>79.15</td>
</tr>
</tbody>
</table>

Edit: Volume Unit Growth Multiplier Covertype Stand Add/Delete Stand Quit

If a stocking field is highlighted for editing, the following message will appear:

```
Stocking is normally calculated from the ratio of stand volume yield table volume. If you edit stocking, volume will not be adjusted. Do you want to edit anyhow?

Yes    No
```

If "Y" is answered, the user can proceed with overwriting the stocking field with a new entry without the volume being adjusted. When all desired changes have been made, the user can then save all changes. For a "Yes", the user will be prompted for a drive, file name, and the various associated questions and error checks as described before. If the data are saved, the program will automatically save also the stocking field in the data file and indicate the existence of this stocking field by a -1 as
the fourth parameter in the line before the stand data (see appendix for example). If the data are not saved, then the user would have to go through all necessary editing of stocking related problems again. With large data input files, this task can become quite tedious. On the other hand, the user needs to be aware that once stocking changes are saved, the next time the data are read in, the program will not check for all stocking related problems anymore. Even if data changed through the editing procedure were not saved, the program calculations will utilize the edited information. After changes have been made, the user again has a chance to review the newest stand list and will have other opportunities to make corrections, deletions, and/or additions.

You can run ACES now without further editing. Do you want to review/edit stand and/or run parameters first.

Yes  No

For a "YES", the program will return to the edit menu, otherwise the ACES calculations will begin without further editing.

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.

<table>
<thead>
<tr>
<th>SUMMARY OF CURRENT RUN PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Discount Rate (Percent): 4.00</td>
</tr>
<tr>
<td>2. Demand Curve: $/Cords = a - b * Quan Harv with a = 5 b = 0</td>
</tr>
<tr>
<td>3. Volume Output (1=Cu ft, 2=Cords, 3=Bd ft): Cords</td>
</tr>
<tr>
<td>4. Ageclass Width: 10 Years</td>
</tr>
<tr>
<td>5. Rotation: 65 Years</td>
</tr>
<tr>
<td>6. Min. Cutting Age: 45 Years</td>
</tr>
<tr>
<td>7. Anticipated Stocking after Harvest: 100.00 Percent</td>
</tr>
<tr>
<td>9. Interval to Reevaluate Allowable Cut: 10 Years</td>
</tr>
<tr>
<td>10. Number of Times to Evaluate Allowable Cut: 3</td>
</tr>
<tr>
<td>11. Cut Determination Method (1-9): Tabular Check</td>
</tr>
<tr>
<td>12. Adjustment period for Austrian formula: 20</td>
</tr>
<tr>
<td>13. Cutting Priority (1=Age, 2=Age and Site): 1</td>
</tr>
<tr>
<td>14. Abbreviated Output (Y or N): Y</td>
</tr>
<tr>
<td>15. Cu ft/cord conversion: 79.000</td>
</tr>
<tr>
<td>16. Cu ft/bd ft conversion: 0.158</td>
</tr>
</tbody>
</table>

Do you want to change any run parameters?  Yes  No
Run Parameters Editing Menu
Highlight the parameter you wish to edit using the arrow keys.
Press <E> to edit the parameter and <Q> or <ESC> to quit.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Discount Rate Selected</td>
<td>4</td>
</tr>
<tr>
<td>2. Demand Curve: $/Cu Ft = a - b * Quan Harv</td>
<td>a=5 b=0</td>
</tr>
<tr>
<td>3. Volume Output (1=Cu ft, 2=Cords, 3=Bd ft)</td>
<td>Cu Ft</td>
</tr>
<tr>
<td>4. Ageclass Width (Years)</td>
<td>5</td>
</tr>
<tr>
<td>5. Rotation (Years)</td>
<td>50</td>
</tr>
<tr>
<td>6. Min. Cutting Age (Years)</td>
<td>35</td>
</tr>
<tr>
<td>7. Anticipated Stocking Percent after Harvest</td>
<td>100</td>
</tr>
<tr>
<td>8. Interval to Reevaluate Allowable Cut (Yrs)</td>
<td>10</td>
</tr>
<tr>
<td>9. Number of Times to Evaluate Allowable Cut</td>
<td>1</td>
</tr>
<tr>
<td>10. Cut Determination Method (1-9)</td>
<td>Tabular Check</td>
</tr>
<tr>
<td>11. Adjustment period for Austrian formula</td>
<td>20</td>
</tr>
<tr>
<td>12. Cutting Priority (1=Age, 2=Age and Site)</td>
<td>1</td>
</tr>
<tr>
<td>13. Detailed Annual Output Reports (Y or N)</td>
<td>Y</td>
</tr>
<tr>
<td>14. Cu ft/cord conversion factor</td>
<td>79</td>
</tr>
<tr>
<td>15. Cu ft/bd ft conversion factor</td>
<td>.158</td>
</tr>
</tbody>
</table>

After performing an edit, the run parameter summary screen will always be displayed with the new values. 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. All data are first checked by the program for appropriateness. This includes checking for negative or zero numbers as well as for any extremes in site index, volume, and implied stocking percent. If any problems are encountered, the program will open the editing routine and provide appropriate messages to the user for correcting any problems before proceeding with the simulation. Once the simulation begins, outputs in the format of the sample run above or other form depending on user inputs for an allowable cut method and selection of an abbreviated or long output option will appear on consecutive screens.

### Do you wish to pause between screens?

- **Yes**
- **No**

With this option, the user can select to review each output screen. For **<Yes>**, the user needs to hit the **<Enter>** key after each screen, for **<No>** the program will not pause between screens.

### Should allowable cuts be calculated:

1. Annually
2. Each Planning Period

Enter corresponding letter from below

- **Annually**
- **Planning Period**
With this option, the user can select to have the allowable cut be recalculated every year or only every planning period.

This question will appear after the end of any simulation run or period:

<table>
<thead>
<tr>
<th>Do you wish to rerun after editing stand data or run parameters?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

**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 ACES Output**

This option is used to view program output generated during a run or any output tables generated in any previous run. As stated before, ACES output tables are saved under a user specified file name or the default name "ACES". The program automatically adds the extension ".TBL" to each output file. When option 6 is selected from the main menu, the following screen appears. For option 1, the program will request the user to enter a drive letter and then display a list of ACES files that have a valid .TBL extension for a user specified disk drive. The user can select a file by hitting the <Enter> key on a highlighted file. For option 2, the program will prompt the user for a drive letter and the name of the file. For option 3 or <Quit> under option 1, the program will return to the same menu shown below, and the user can make another selection.

**ACES 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

Enter path or <ENTER> for default path: C:\ACES\OUTPUT\  

- (1) AC200.TBL
- (2) ACES.TBL
- (3) ACES77.TBL

Select by entering a line number or highlight using cursor and pressing <Enter> or Spacebar
The example above shows the screen when option 1 was selected. If the user hits <Enter> or <Select file> on the highlighted file "ACES.TBL", the program will respond with

![Prompt: Do you want to view c:\bc7\files\ACES.TBL?]

Yes No

For <Yes>, the program will display the output on the screen. The message to turn on the printer will appear.

**Main Menu Option 8 - Print ACES Output**

This option is used to print program output generated during a run or any output tables generated in any previous run. When option 7 is selected from the main menu, the following screen appears. For option 1, the program will request the user to enter a drive letter and then display a list of ACES files that have a valid .TBL extension for a user specified disk drive. The user can select a file by hitting the <Enter> key on a highlighted file. For option 2, the program will prompt the user for a drive letter and the name of the file. For option 3 or <Quit> under option 1, the program will return to the same menu shown under option 7 above, and the user can make another selection. If the user hits <Enter> or <Select file> on a highlighted file, e.g., "ACES.TBL", the program will respond with

![Prompt: Do you want to print c:\bc7\files\ACES.TBL?]

Yes No

For <Yes>, the following message to turn on the printer will appear:

*Turn the printer on and set it to the top of the page*  
*Press a key to continue...*

**Main Menu Option 9 - View ACES Graphics**

This option allows the user to view the current ACES output in form of graphs by calling ACESGRAF, a stand-alone program. However, the user should execute it after leaving ACES due to memory limitations.

*The graphing program ACESGRAF requires about 165K of RAM. Due to memory requirements of ACES it is recommended to run ACESGRAF after leaving ACES. Leave ACES and run graphing program by typing ACESGRAF at the DOS prompt. Press a key to continue...*

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 ACES outputs (default ACES.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 ACES.

ACES Graph Menu

PLOT DATA FILE ENTRY CHOICES

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

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

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\ 
2. 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 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

Enter path or <ENTER> for default path: C:\ACES\OUTPUT\  
  
(1) AC200.PLT
(2) ACES.PLT
(3) ACES77.PLT

Select by entering a line number or highlight
using cursor and pressing <Enter> or Spacebar

The program checks for the validity of the entered file and then displays eight 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.

ACEs Graph Menu

1. Plot Allowable Cuts
2. Plot Revenues
3. Plot Discounted Revenues
4. Plot Acres Clearcut
5. Plot Volume Clearcut
6. Plot Growing Stocks
7. Plot Growth
8. Plot Ageclass distributions
9. Plot All Ageclass distributions
10. Return to Graph Input Menu

Use Numeric or Arrow Keys to select option
Press <Enter> to execute the option
For option 3, 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? |
```

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 acreage harvested under the user selected volume control method and area control. Plot 3 will display both actual and desirable growth and growing stock volumes over the planning horizon. Plot 4 displays net present values (NPV) for each cutting method. Plot type 5 displays the ageclass distribution for a user defined planning period between "1" and the last simulated period, here "3":

Enter planning period or a number between 1 and 3:  

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 ACES graph module - File entry choices where additional files with plot data can be read in or a return to the ACES simulations can be requested.

**Suboption 3: Exit ACESGRAF**

This option will return the user to the ACES Main Menu.

**Main Menu Option 10 - Exit ACES**

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 the ACES Simulation Program
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)436-7396 or (612)624-9711
E-Mail (Internet): drose@mercury.forestry.umn.edu

Press any key to continue....
```

Appendix II provides output listings for sample runs of ACES. 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 ACES can quickly generate outputs that would be impossible to generate by hand, users should be aware of many 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

LISTINGS OF SAMPLE STAND DATA FILE AND RUN PARAMETER FILE

STAND DATA FILE

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" or you can create within ACES.

Program ACES creates a file with the same file name, but the extension ".DAT" after going through a number of internal data checks.

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.

Example structure for a stand data file:

```
ACES DATA FILE,
ACES Sample Stand Data File
Northeastern Minnesota Aspen Inventory for 1977
Species Vol. Unit Growth Multiplier Stocking Calc. Data Checked
Line 5: 4 1 1.00 -1 -1
```

Line 1: ACES 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 -1 -1
Line 6: 1400.00 105 613.00 55
Line 7: 8300.00 95 1334.00 55
etc.

Explanations:

Line 1: necessary first line indicating that stand file is an ACES 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 ACES 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: acres, age, volume/acre, site index for stand 1
Line 7: acres, age, volume/acre, site index for stand 2

etc.

Line n: acres, age, volume/acre, site index for stand n

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

ACES DATA FILE,
ACES Sample Stand Data File
Northeastern Minnesota Aspen Inventory for 1977
Species Vol. Unit Growth Multiplier Stocking Calc. Data Checked
<table>
<thead>
<tr>
<th>Age</th>
<th>Vol</th>
<th>Species</th>
<th>Unit</th>
<th>Growth</th>
<th>Multiplier</th>
<th>Stocking</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>105</td>
<td>1400.00</td>
<td>1</td>
<td>0.241</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>8300.00</td>
<td>95</td>
<td>1334.00</td>
<td>0.556</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25700.00</td>
<td>85</td>
<td>1503.00</td>
<td>0.669</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60800.00</td>
<td>75</td>
<td>1177.00</td>
<td>0.567</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150800.00</td>
<td>65</td>
<td>1681.00</td>
<td>0.892</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>385200.00</td>
<td>55</td>
<td>1394.00</td>
<td>0.836</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>409000.00</td>
<td>45</td>
<td>1194.00</td>
<td>0.839</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>286300.00</td>
<td>35</td>
<td>801.00</td>
<td>0.699</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>199600.00</td>
<td>25</td>
<td>441.00</td>
<td>0.529</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>177600.00</td>
<td>15</td>
<td>323.00</td>
<td>0.657</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>244700.00</td>
<td>5</td>
<td>198.00</td>
<td>1.409</td>
<td>55</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 ACES", will load the stand database file. Such a file had to be originally be created.

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. Make Stocking Calc. and Data Checked both -1 in line 5 of your checked file when you are certain that the data are without errors.

Run for example option 5, select a parameter file and then the "Sample.DAT" data file. You will see that this file passes all the tests and can then be saved. When you load "SAMPLE.DAT" with program option 6, the program will run without any problems.

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

ACES PARAMETER FILE (necessary first line in each run parameter file)
4,5,0,2,10,65,45,100,10,1,0,20,1,"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
- 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 - Partial Sample Listings of File Outputs for Different Options

The three report components below, summary of stand data, summary of run parameters, and the initial growing stock distribution are part of every report, but are shown only once here to save space.

**Sample 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 stand numbers from a partial stand clearcut also show their parent stand number.

See file "Sample1.TBL" on ACES output directory on diskette

**Sample 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.

See file "Sample2.TBL" on ACES output directory on diskette

**Sample 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.

See file "Sample3.TBL" on ACES output directory on diskette

**Sample 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.

See file "Sample3.TBL" on ACES output directory on diskette
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.

To run ACES, type <ACES> at the prompt of the directory where ACES was installed.

To run ACESGRAF, type <ACESGRAF> at the prompt.

2. Stand Data File Preparation

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

3. ACES Output Files

ACES 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.

"SAMPLE.TAB" is a file that I use to make sure that the Tabular Check iterations converge properly. You can delete them at various intervals.

"SAMPLE.ASC" is a file that writes some periodic cutting results which are easy to import into QuatroPro for plotting "Run.ERR" is an error file which is only written if errors occur that have not been found yet during my programming. If no errors occurred, the file is killed at run end.

4. RECOMMENDED TEST RUNS

The user use option 6, Run ACES, and load the test file "DATATEST.DAT" which 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. The user will note certain errors in the stand data file. After running option 5 and making appropriate corrections, the file was saved as "DATACHKD.DAT" listed below.

Listing of "DATATEST.DAT"

ACES DATA FILE, 5
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
Species Vol. Unit Growth Multiplier Stocking Calc. Data Checked
4 1 1.00 0 0
1300.00 5 123.00 60
-2600.00 58 1329.00 45
1300.00 -54 1536.00 54
1100.00 42 1180.00 0
2200.00 61 1643.00 57
1100.00 12 0 85

Listing of Corrected File "DATATEST.DAT" Saved as "DATACHKD.DAT"

ACES DATA FILE, 5
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
4 1 1.00 -1 -1
1300.00 5 123.00 0.692 60
2600.00 58 1329.00 0.975 45
1300.00 54 1536.00 0.955 54
1100.00 42 1180.00 0.879 55
2200.00 61 1643.00 0.876 57
1100.00 12 124.00 0.143 85