ACES

ALLOWABLE CUT EVALUATION SIMULATOR

A Microcomputer Program for Determination of Allowable Cuts for a MacIntosh Computer[1]

Version 1.0 User's Manual

by

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PREFACE

This manual describes how to use ACES, a program which calculates allowable cuts according to various volume control and area control methods and simulates the growth of a specified inventory over time with an allowable
cut being implemented. The discussion in this manual assumes a basic understanding of computer systems. It is also helpful to be familiar with the model on which ACES is based and basic principles of allowable cut determination.

To obtain a diskette copy of ACES write to Dr. Rose at:

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To defer the cost of duplicating, postage, and handling, a charge of $50.00 will be made. Checks should be made payable to the Department of Forest Resources, University of Minnesota.

To use ACES, you need a Macintosh with at least 1MB RAM memory. The recommended version of the System Software to be used is version 6.0.2. It is also desirable to have a printer.

Program protection: It is the user's responsibility to backup the ACES diskette. This can be done by simply copying the contents of the ACES diskette to another diskette. The original ACES diskette should be kept locked (write-protected) and used solely for archival purposes. Do not use the original ACES diskette for everyday use.

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. Requests 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 our knowledge, contains no errors, neither the University of Minnesota, the Department of Forest Resources, nor the authors claim any responsibility for any errors that do arise. The authors would appreciate having any errors or problems brought to their attention. This is a preliminary Macintosh version of ACES. Future refinements and extensions to additional timber species are planned.

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 having to perform 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).

Beyond this, ACES is a menu-driven microcomputer program written for the Macintosh in Turbo Pascal. The program allows the user to quickly calculate allowable cuts using one of six volume control methods or area control with adjustment for site productivity. Input data required for the program consist of stand data describing current inventories of the covertype for which allowable cuts are to be calculated and a number of run parameters. Stand data or stand parameter inputs created via keyboard input may be permanently saved before logging off to facilitate future analysis with similar data and to reduce the time and effort for data entry. Most input statements are checked by the program for correctness.

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.

PROGRAM INSTALLATION

The user has several choices for using the program. After making a backup copy according to the instructions in the PREFACE, he may boot up the system and execute ACES from the copy created. The diskette may be inserted into any available 3.5" drive of the system. Or if so desired the program and associated files can be copied to a Hard disk. The files on the ACES diskette must stay at the same level. If the Help file is not in the same folder as the application the online help will not function correctly.

PROGRAM OVERVIEW

This program 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 uniform (with respect to age, stocking, and site index) management units labelled stands. The program is currently dimensioned to handle up to 600 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. Initial stands lose their identity after cutting because all stands are merged into a new ageclass and an average site index is computed. At present two species (red pine and aspen) and the associated yield functions may be chosen.

Other user specified information includes:

(A) Rotation age--age at which harvest would always occur if the forest were regulated.
(B) Minimum cutting age--A warning will be given if stands less than this age are cut.
(C) Anticipated stocking percent under management--the stocking level that can be maintained with management after a stand has been cut over.
(D) Interval (in years) at which allowable cut is reevaluated--the program will cut the forest according to the specified formula for this number of years at which time a revised calculation will be made.
(E) Number of times allowable cut is to be reevaluated at the interval specifies above.
(F) Cut determination method--one of the standard allowable cut formulas discussed.
(G) Stocking percent of young stands is requested to prevent the problems of poor yield predictions by the yield model for young stands.

For an exact description of how the program calculates these items see Rose and Burk (1980).

All inputs may be integer except stocking (see below).

Stand information entered includes:
1. Acreage of stand
2. Age of stand
3. Stocking level of stand (volume/acre in cubic feet or cords or percent normal stocking)
4. Site index of stand

When stocking is entered as volume/acre, stocking percent is calculated from the ratio of stand volume and yield table volume. Stocking is limited to 170 percent of normal yield table stocking and for stands less than 6 years old is set at the user specified stocking for young stands.

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

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. The user specified age-class width is used to output results. Otherwise area, yield, and harvest information are printed out for each stand at the average harvest age determined according to present forest conditions and the cut determination methodology. Totals and averages at average harvest age are also given. Finally, a projected cutting schedule is output. This schedule is valid when the cutting level being used has fully regulated the forest. For both types of output, allowable cut estimates are given for all methodologies. Volumes are given in cubic feet or cords. Users can also reevaluate the allowable cut for additional years and completely rerun a problem (with the same stands) with different initial specifications.

The program was written to facilitate user implemented changes of any or all of the user inputs.

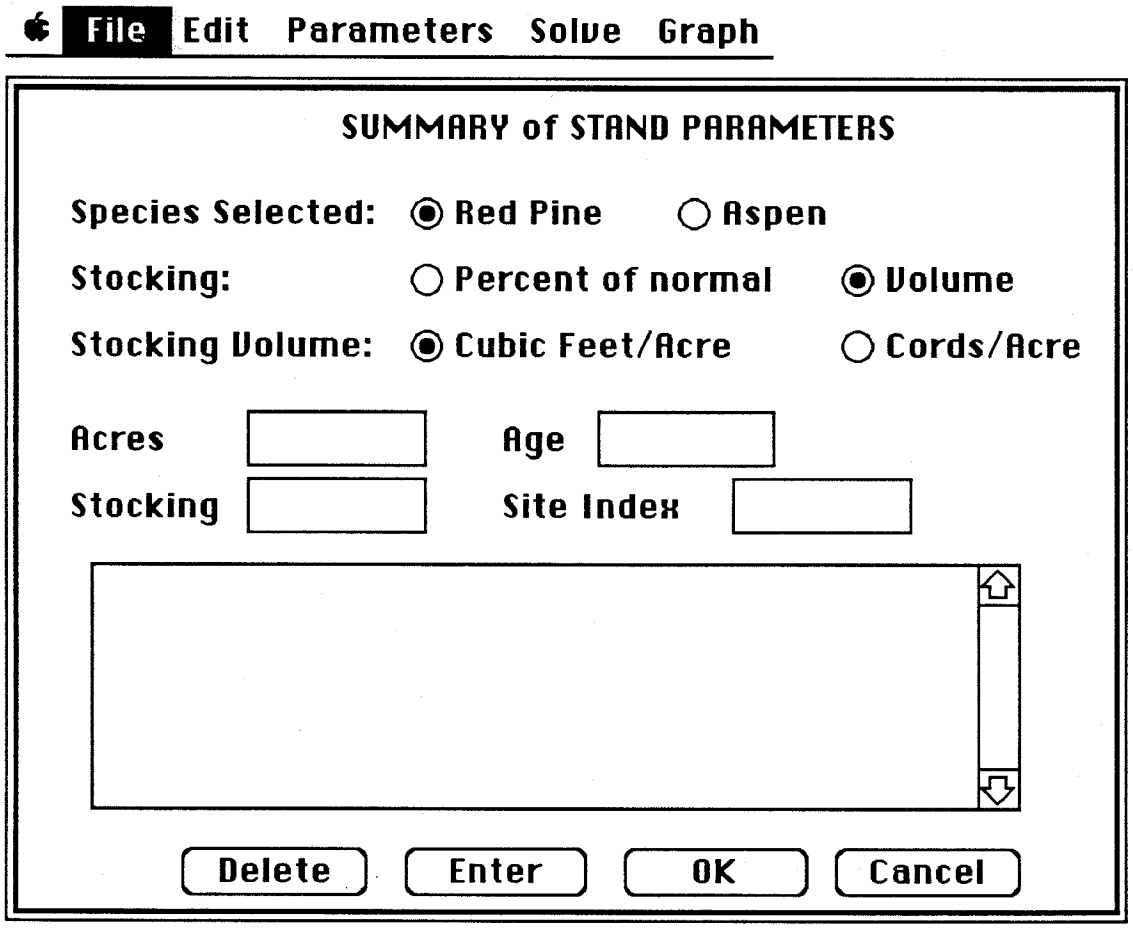
For further information, users should consult:

Rose, D.W. and T.E. Burk. 1980. Development of a model for simulation of forest regulation techniques. University of Minnesota, Agricultural Experiment Station, Tech. Bull. 324. 22p.

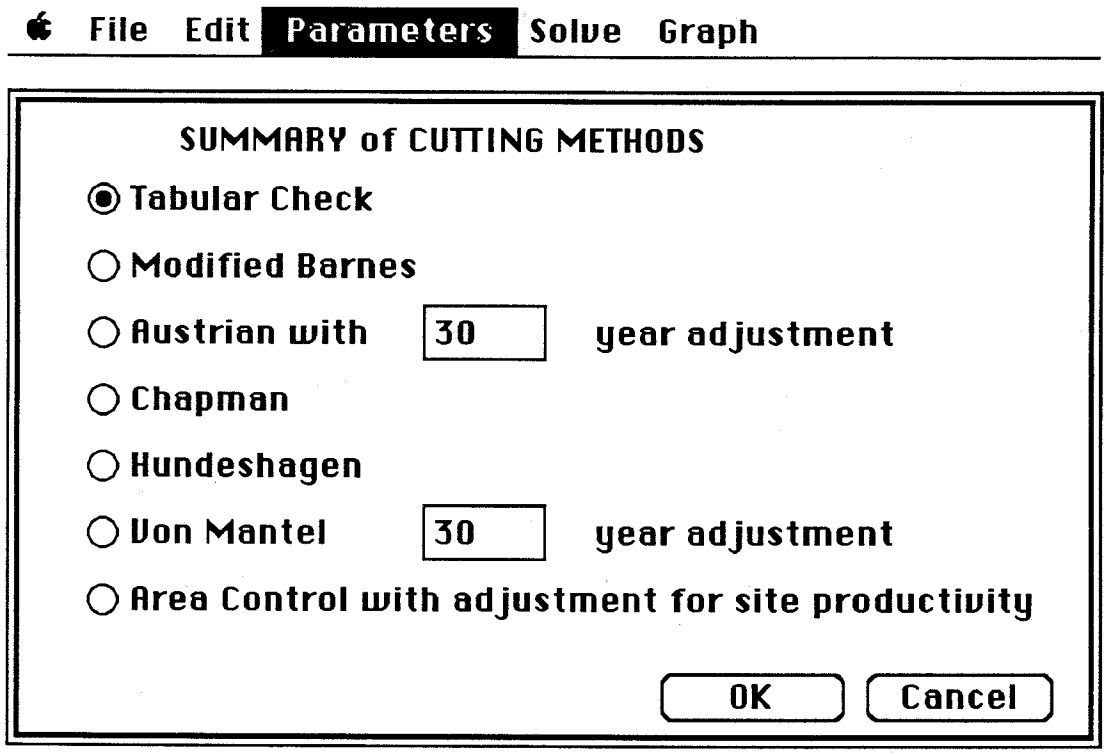
PROGRAM INPUTS AND OUTPUTS

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 species, acres, age, stocking either in volume units (cubic feet or cords) or as a stocking percent, and site index. Shown below is an example of the dialog box used for inputting these values.



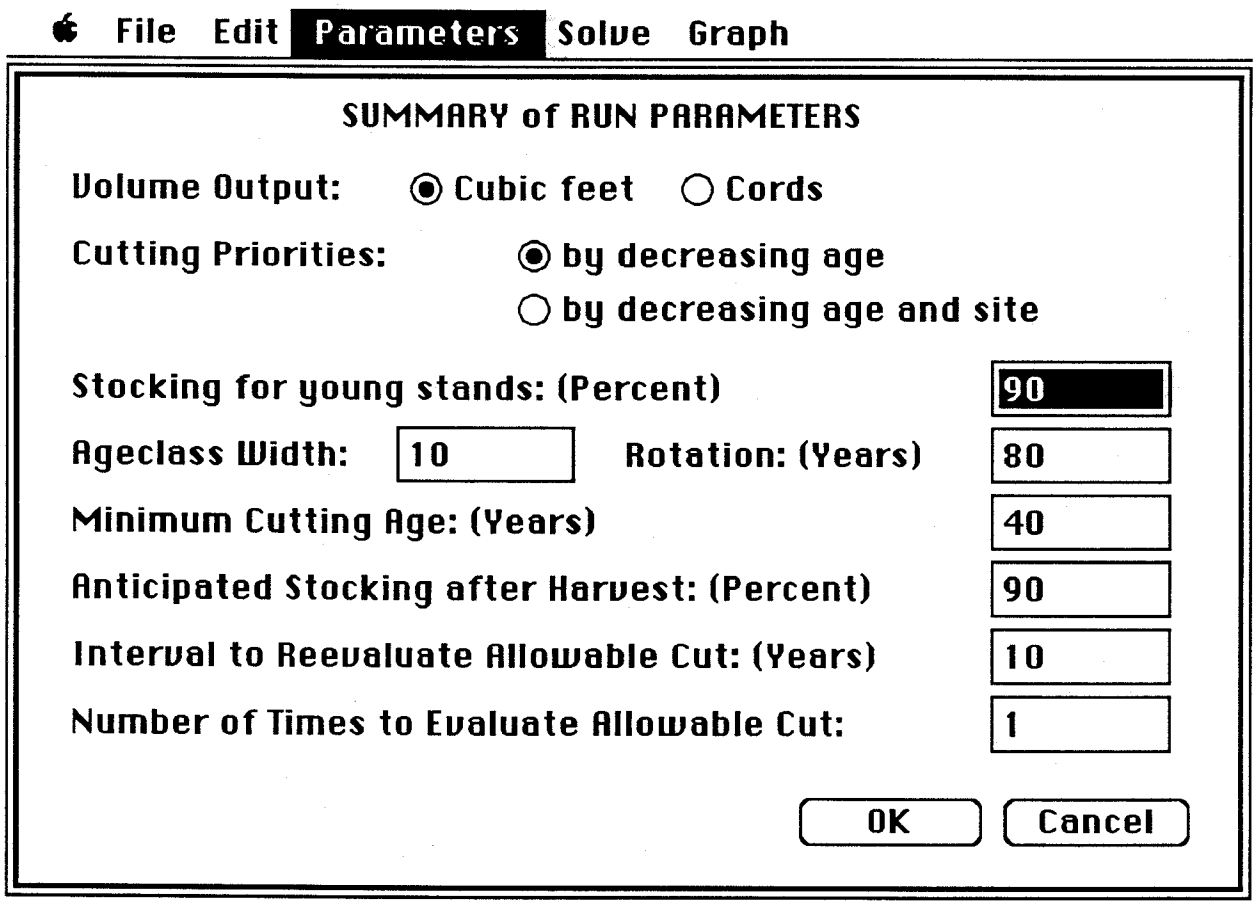
2) Cutting method including: the Cut Determination method chosen and the adjustment period. Shown below is the dialog box in which these values are entered.



3) Run parameters including:

Volume Output units (cubic feet or cords)
Cutting Priorities: By decreasing age or decreasing age and site
Stocking for young stands: percent
Ageclass Width: years
Rotation: years
Minimum Cutting Age: years
Anticipated Stocking after Harvest: percent
Interval to Reevaluate Allowable Cut: years
Number of Times to Evaluate Allowable Cut

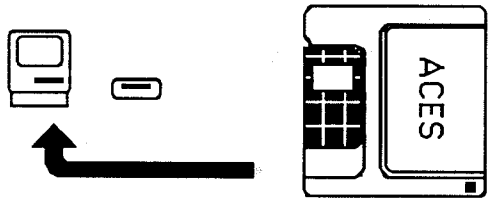
Shown below is the dialog box in which these values are entered.



INSTRUCTIONS FOR USING ACES

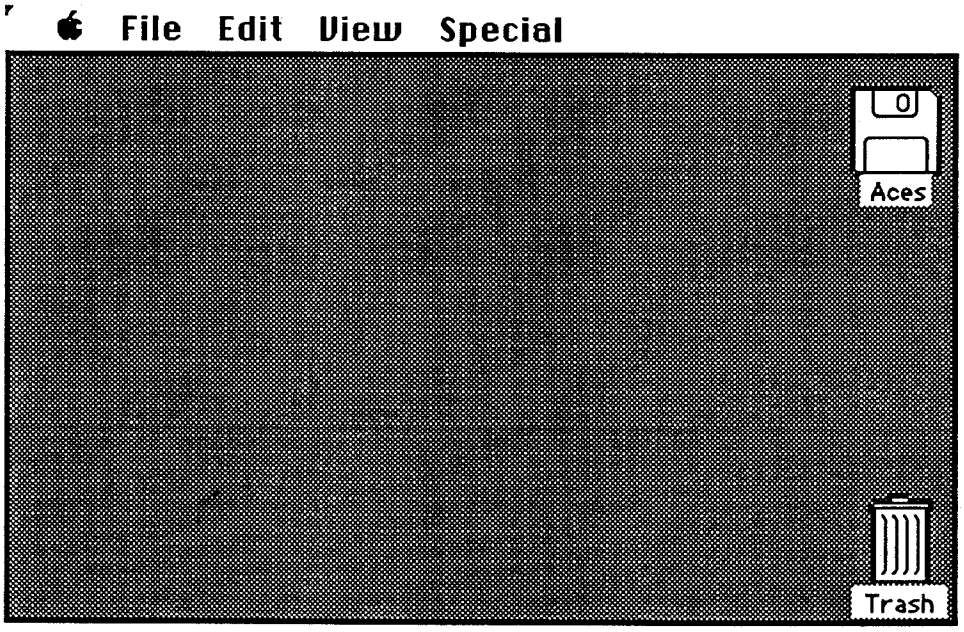
I. How to Start

1. Turn on the computer using the power switch on the back.
2. Once you see a picture of a computer diskette with a flashing "?" mark in it you can insert the "ACES" disk into the slot. Make sure you insert as shown below.

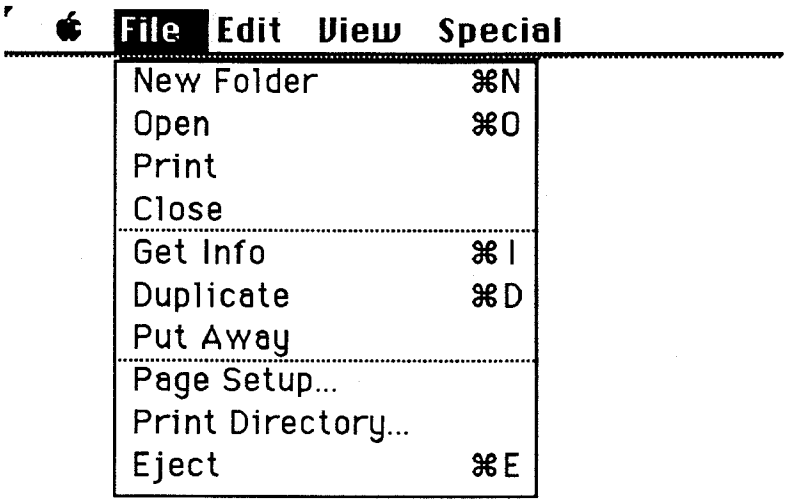


II. Starting a Lesson

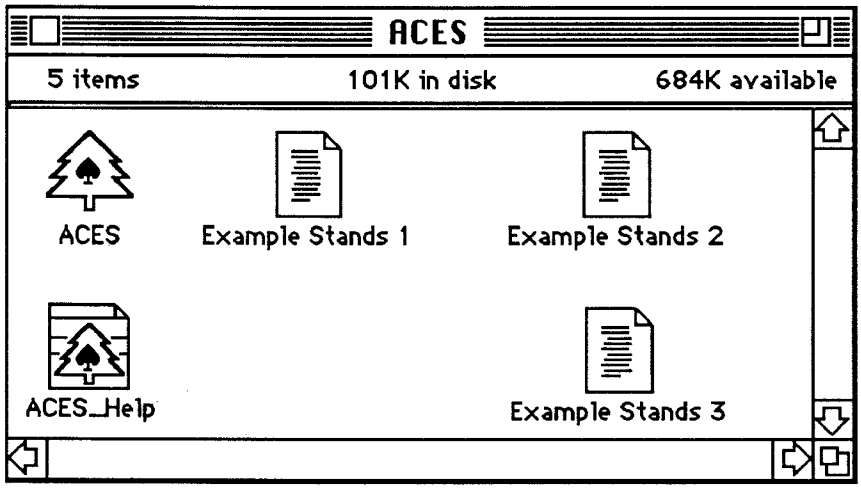
1. You see a screen as in the picture below. You will notice a bar across the top of the screen. This is called the menu-bar.



2. First click once on the picture of the diskette "ACES" on the screen, and the picture will be highlighted. Then move the mouse until it is over the word **File** in the Menu Bar, then while pressing the mouse button drag downwards until **Open** is hilited. Now release the button.

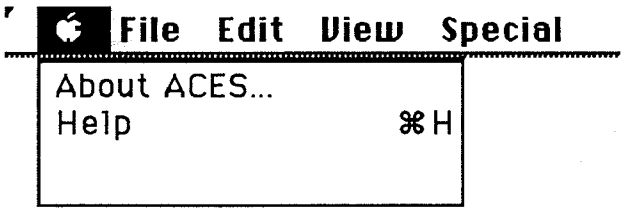


3. Now you see on the screen a rectangular box with pictures in it. If this is your first time you will move the arrow cursor over the "ACES" icon and click once on the mouse button. Then you will choose **Open** from the **File** menu as you did above. You are now in the lesson.



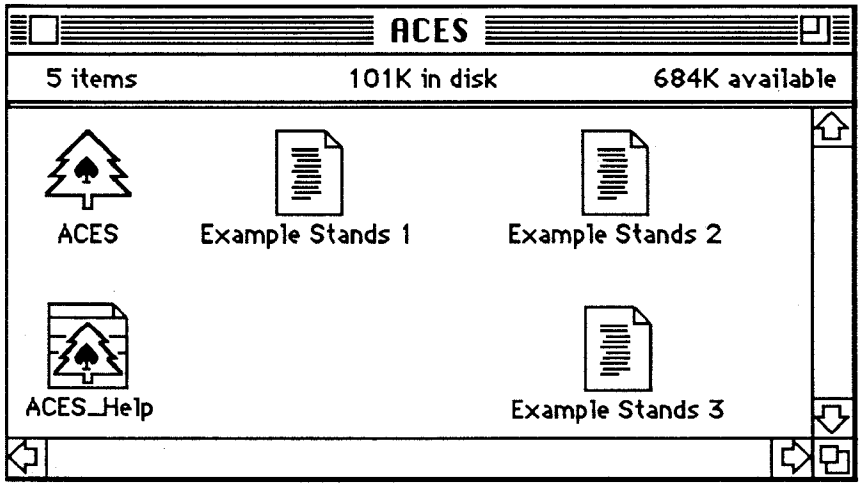
III. Inside the Lesson

1. Once you are within Aces there is an on-line help facility available. This help information briefly explains what all the menu commands do. To access the help information move the mouse until it is over the picture of an apple in the Menu Bar, then while pressing the mouse button drag downwards until **Help** is hilighted. Now release the button. You are now inside the help dialog box. At this point select a topic you need help with by positioning the cursor over the line the topic is on and clicking it once. Then click the cursor over the Help button. This will take you into a text window that contains information about the topic you selected. To close this information box click the cursor over the square in the top left corner of the screen.

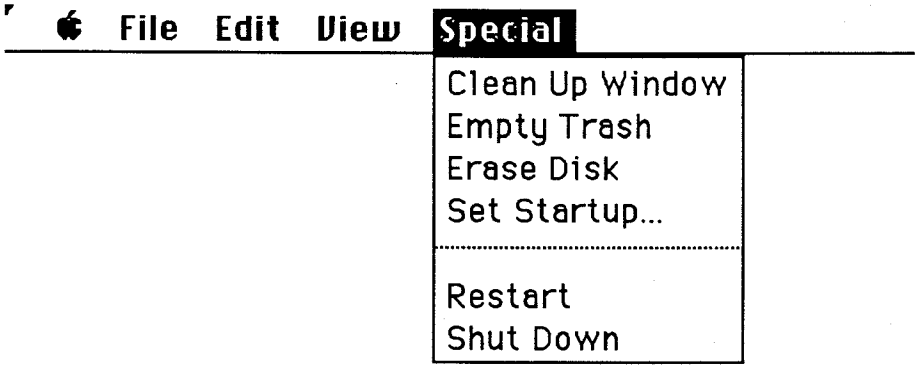


IV. Quitting

1. The quit selection is in the **File** menu. It can be chosen whenever you want to quit. When you wish to leave you should always choose quit first. After you have chosen "**Quit**" wait until you see the picture below:



2. Now choose "**Shut Down**" from the Special Menu. This will eject the disk from the machine for you. Now turn it off.



ADDITIONAL COMMENTS

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.

As can be seen, the editing features of ACES make it easy to examine many allowable cut options for one or many inventory situations. While outputs that would be impossible to generate by hand can be quickly generated by ACES, users should be aware of a number of limitations of the current model. These weaknesses are all related to the way in which growth and yields are calculated. ACES regulates and projects only pure, even-aged stands of a species (currently red pine, aspen, and northern hardwoods). 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. If the contribution of secondary species, e.g., birch, are of no interest for the allowable cut calculations, the associated volumes need to be subtracted out after terminating the simulations.

Two other cautions are that stands are grown according to a growth equation for fully-stocked, normal forests. If the current stocking of an initial stand is 100 percent that stand will grow at the same rate of a fully-stocked, normal stand described in the model equations (see also Rose and Burk 1980). 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 or overstocked stands may grow above or below the rate of a fully-stocked stand.

If stand stocking is entered as a volume, the program calculates the stocking percent as the ratio of the actual stand volume and the associated yield table volume. Stocking is limited to 170 percent for stands with actual stocking more than 170 percent of normal stocking. On the other hand, if actual stocking is less than 1 percent of normal stocking, stocking is set at 1 percent.

Growth for stands under age 5 is assumed to be zero due to the unreliability of the growth model for these younger ages. As soon as these stands become older than 5 years, they will grow at the percent specified by the user for the stocking of young stands, i.e., if stocking for young stands was entered as 90, these stands will grow at 90 percent of normal yield after age 5.

LITERATURE CITED

Clutter, J.L., J.C. Fortson, L.V. Pienaar, G.H. Brister, and R.L. Bailey. 1983. Timber Management: A Quantitative Approach. John Wiley and Sons. New York. 333p.

Leuschner, W.A. 1984. Introduction to Forest Resource Management. John Wiley and Sons. New York. 298p.

Meyer, A.H., A.B. Recknagel, D.D. Stevenson, and R.A. Bartoo. 1961. Forest Management (2nd Edition). John Wiley and Sons. New York. 282p.

Rose, D.W. and T.E. Burk. 1980. Development of a model for simulation of forest regulation techniques. University of Minnesota, Agricultural Experiment Station, Technical Bulletin 324. 22p.

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A Microcomputer Program for Determination of Allowable Cuts, Version 1.0

PRICE: $50.00
MEDIA: 3 1/2" 800k diskette
USER'S GUIDE: printed listing
TECHNICAL MANUAL: Publication
ON LINE HELP: yes
EXAMPLE SESSIONS: 3 1/2" disk, printed listing

COPYRIGHT: University of Minnesota
COPYING: restricted, only by authors' permission
PERIODIC UPDATES: yes, on request
WARRANTY: no
ANSWER QUESTIONS: yes
NUMBER INSTALLED: 3

COMPUTER SYSTEM: Macintosh with 1MB RAM
SYSTEM REQUIREMENTS: printer
SOURCE CODE: 3 1/2" diskette in Turbo Pascal (compiled executable version)

CONTACT: Dietmar W. Rose, Department of Forest Resources, College of Natural Resources, University of Minnesota, 1530 N. Cleveland Avenue, St. Paul, Minnesota 55108; Tel. (612)624-9711; Fax: 612-625-5212

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A copy of the executable code plus test data is available through the contact person shown above. Make checks payable to the University of Minnesota, Department of Forest Resources.